The effect of hole leakage and Auger recombination on the temperature sensitivity of GaInAsSb/GaSb mid-infrared lasers

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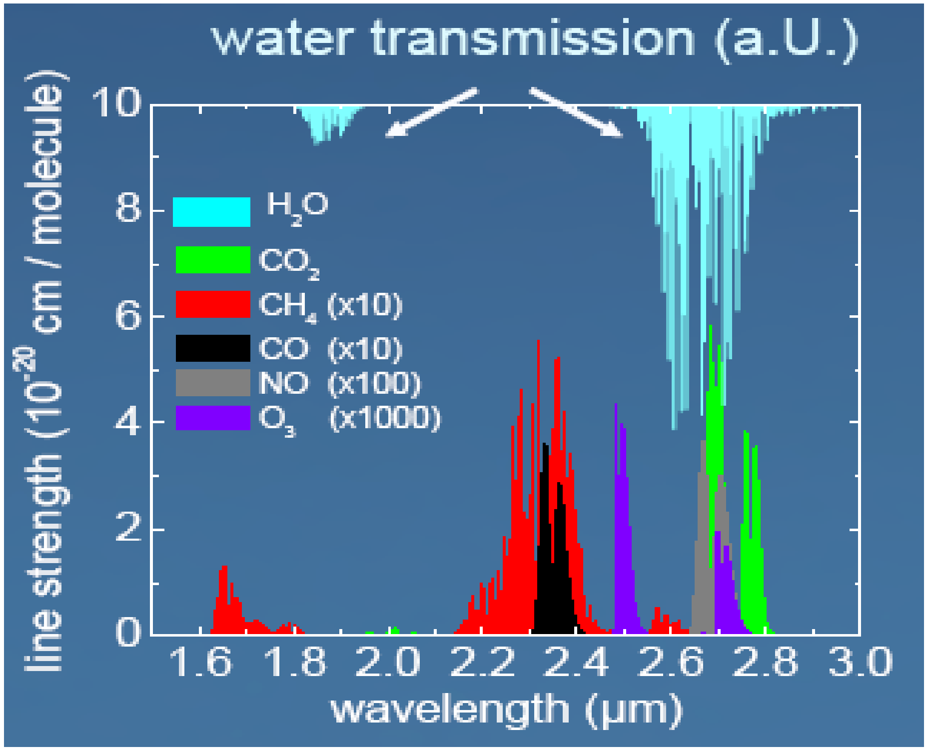
Motivation



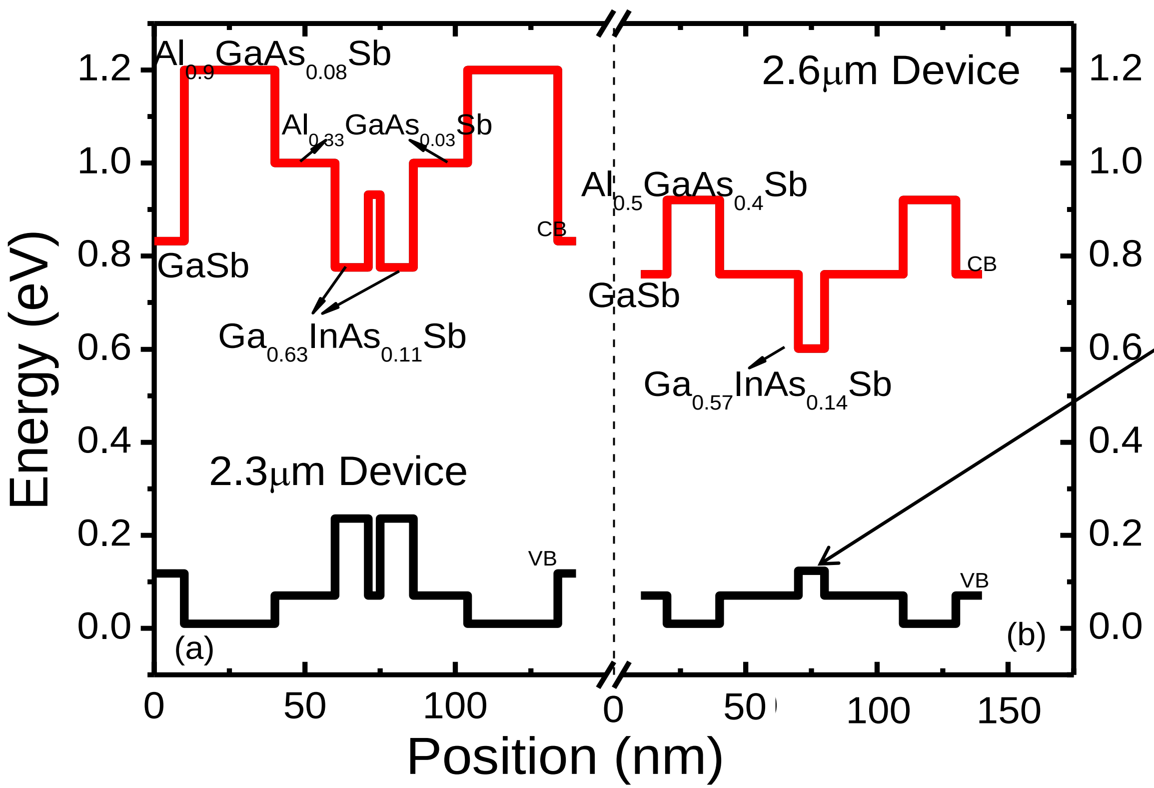
- ❑ **Air pollution monitoring**
- ❑ **Medical diagnostics**
- ❑ **Gas analysis**

Absorption spectrum of some identified gases of interest.

CW, RT MIR Lasers are required!!

Interband Lasers Studied

λ(µm)	Ga	In	As	Sb	Barrier	strain	#QWs	Well width
2.3	0.63	0.37	0.11	0.89	$Al_{0.33}Ga_{0.67}As_{0.03}Sb_{0.97}$	1.6%	2	11nm
2.6	0.57	0.43	0.14	0.86	GaSb	1.7%	1	10nm



- Reduced VB offset in the 2.6µm device

Temperature Dependence of J_{th}

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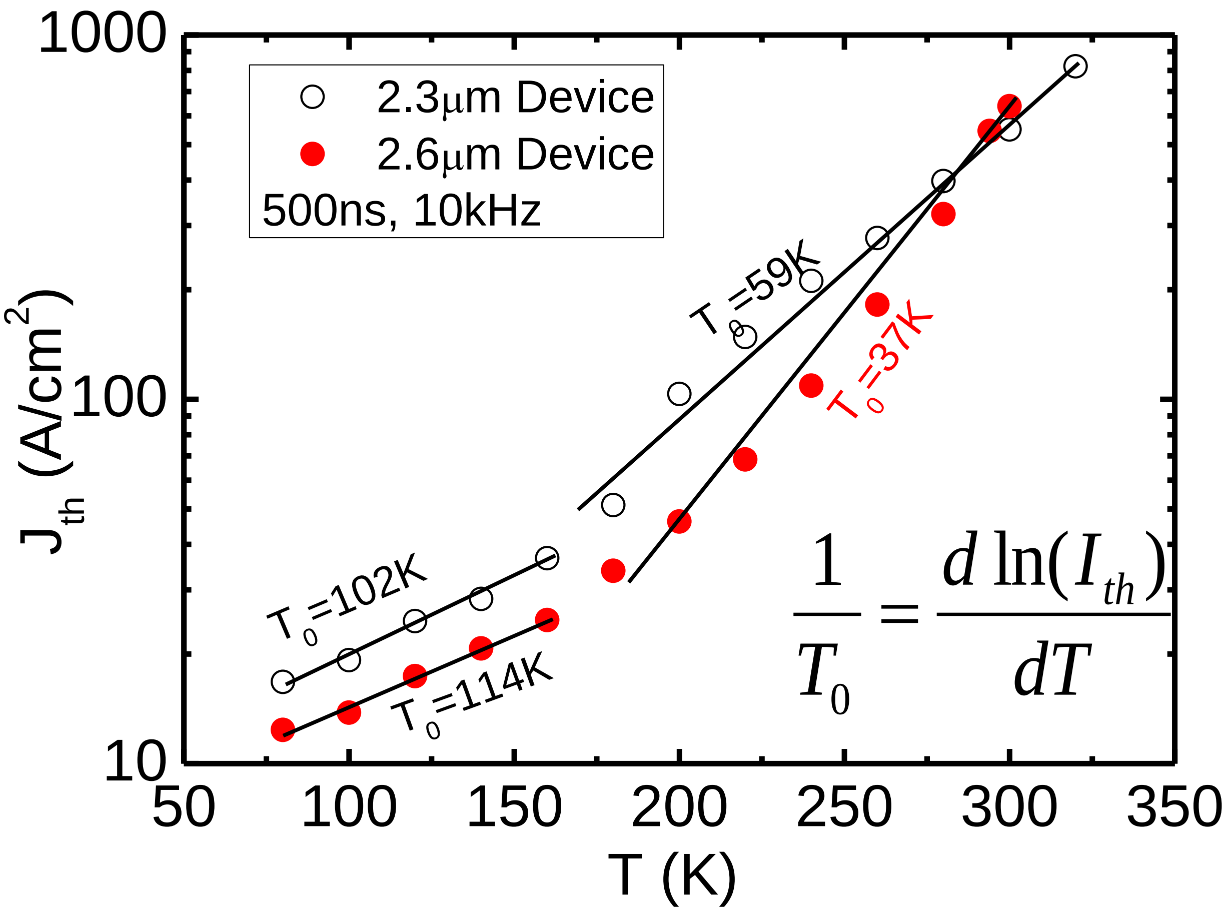
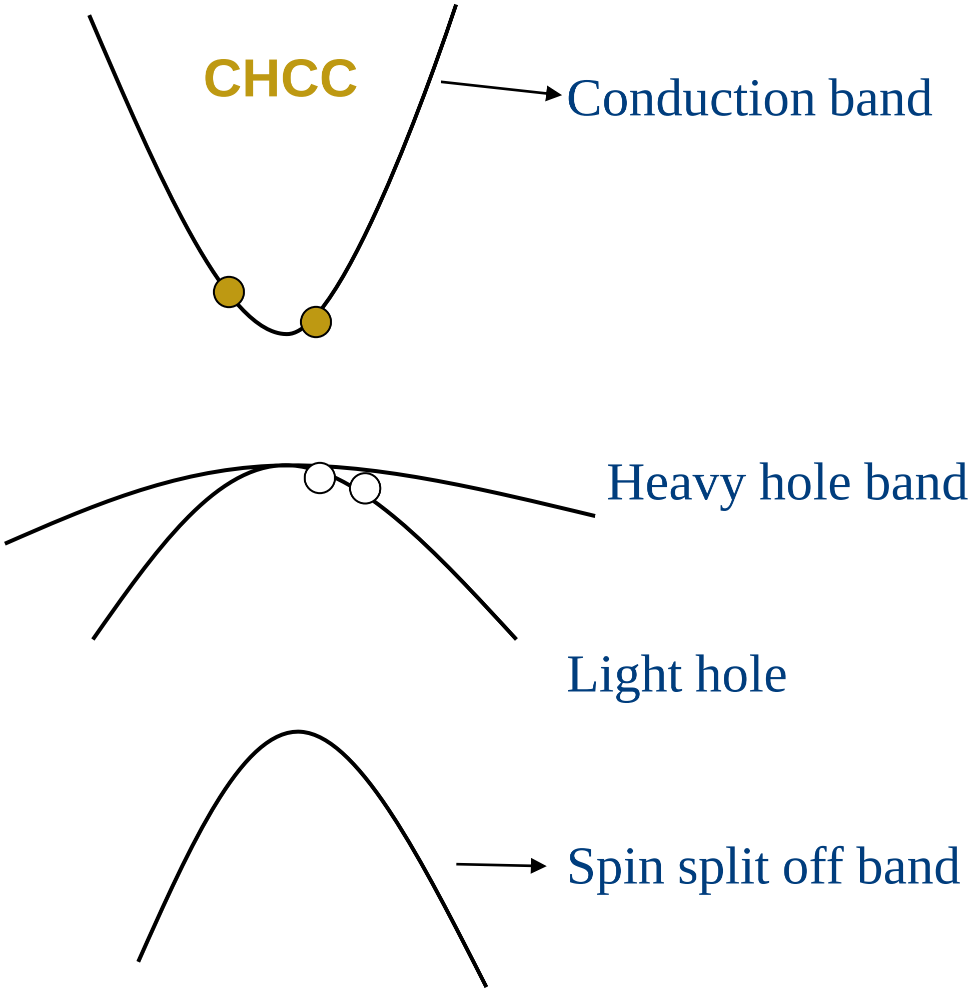


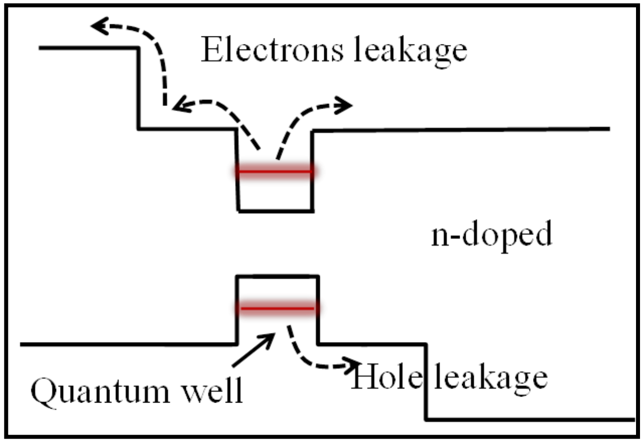
- ❑ In the 2.3μm devices have a T_0 of ~**59±3K** in the temperature range of 200K≤ T ≤300K,
- ❑ In the 2.6μm devices T_0 values measured are **37±2K** for 200K≤ T ≤300K,

- ❑ **Lower T_0 at higher T suggests, the presence of loss process**

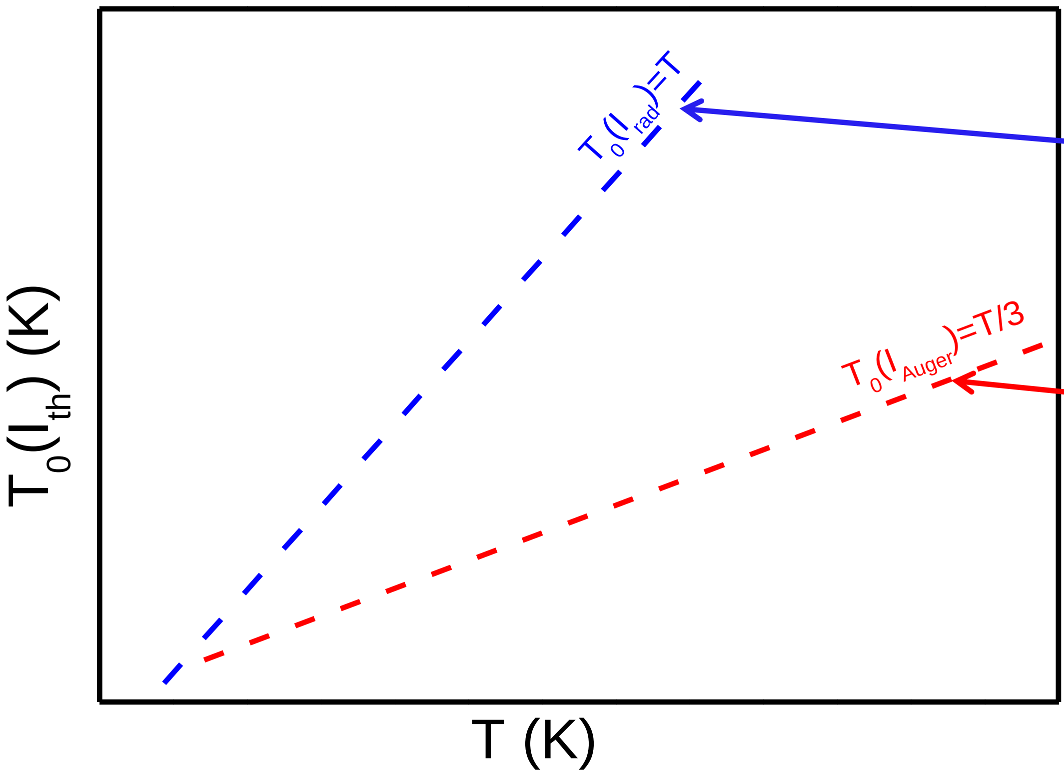
Loss mechanisms in MIR inter-band lasers



- ❑ Auger recombination
- ❑ Defects
- ❑ Carrier leakage
- ❑ IVBA (optical loss)



T_0 analysis



$$T_0(I_{rad}) = \frac{T}{1+2x}$$

$$for\ x = 0, T_0(I_{rad}) = T$$

$$T_0(I_{Auger}) = \frac{T}{3 + 3x + \frac{E_a}{kT}}$$

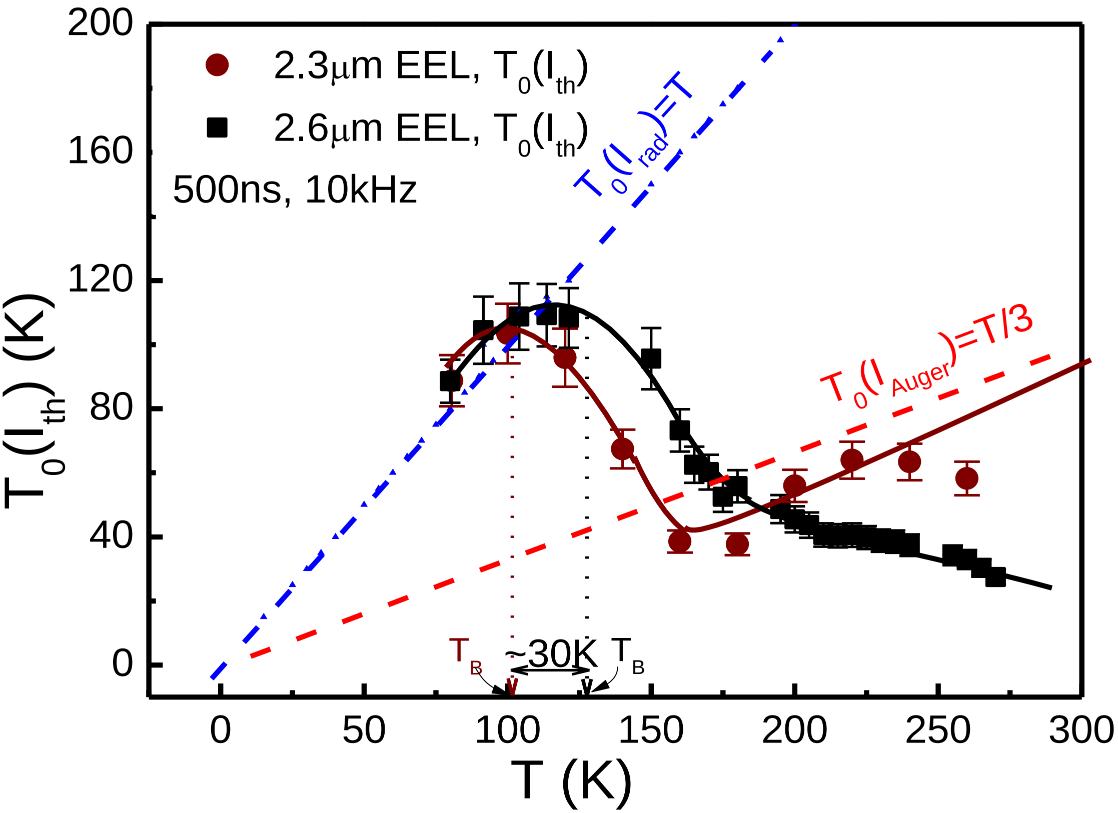
$$for\ x = 0, T_0(I_{Auger}) \approx T_0/3$$

$$T_0(I_{Auger}) = \frac{T}{3 + \frac{3T}{\Gamma g_0} \cdot \frac{d\alpha_i}{dT} + \frac{E_a}{kT}}$$

If optical loss (α) is occurring, T_0 will continue to decrease as T increases

S. J. Sweeney and P. J. A. Thijs, 2003 IEEE Leos Annual Proc., 1 and 2, 2003.

Temperature Dependence of T_0



$T_0 \sim T_0(I_{rad})$ at T≤100K/130K

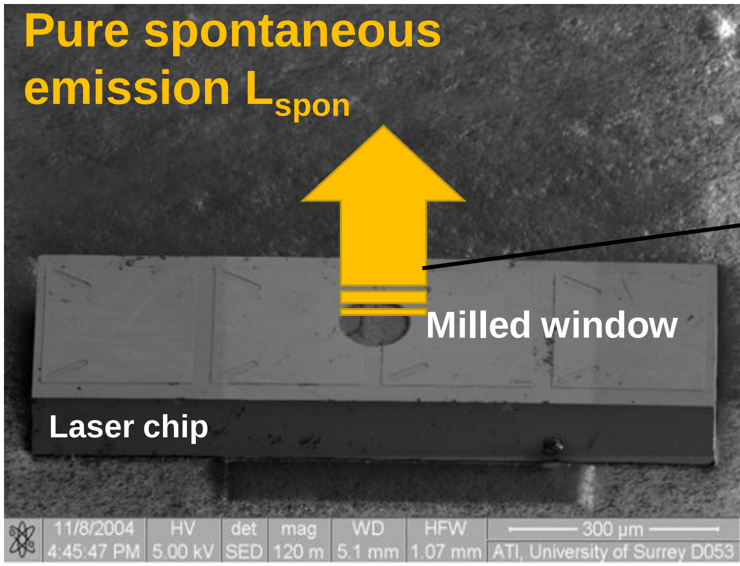
- **T_0(2.3µm)~$T_0(I_{Auger})$at T>160K**

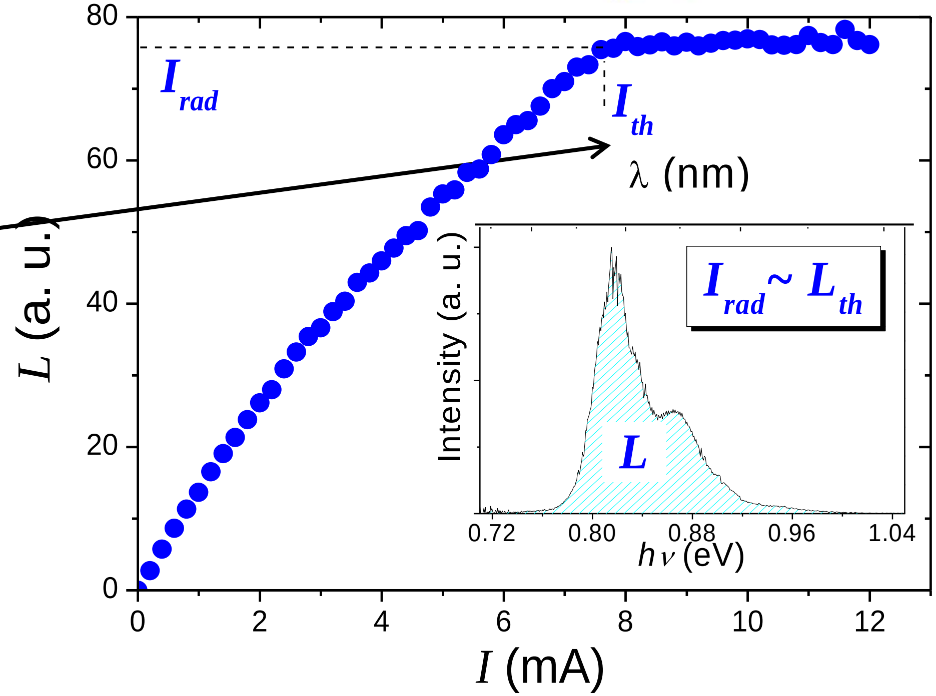
T_0 (2.6µm) decreases away from $T_0(I_{Auger})$ at T≥160K

T_0 values are calculated using the 3-point centred moving difference technique

- Reduced Auger at T≤130K, Increased Auger at T≥130K
- Optical loss (α) sets in, at T≥160K in the 2.6µm device

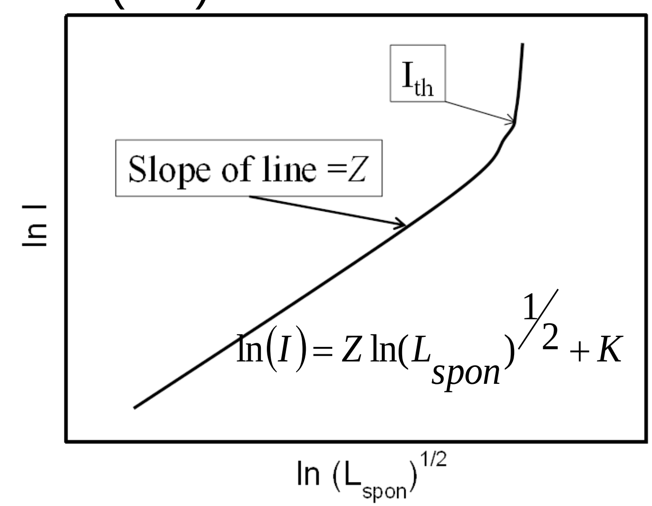
Spontaneous emission (L_{spon}) measurements





- $I_{rad} \sim L_{spon}$ at threshold
- By measuring J_{rad}, other current paths in a diode laser can be deduced
  - **Through Z analysis, the dominant current path at various T ranges can be deduced**

$$I = eV\left(An + Bn^2 + Cn^3\right) + I_{leak}$$



Temperature dependence of L_{spon} in EEL

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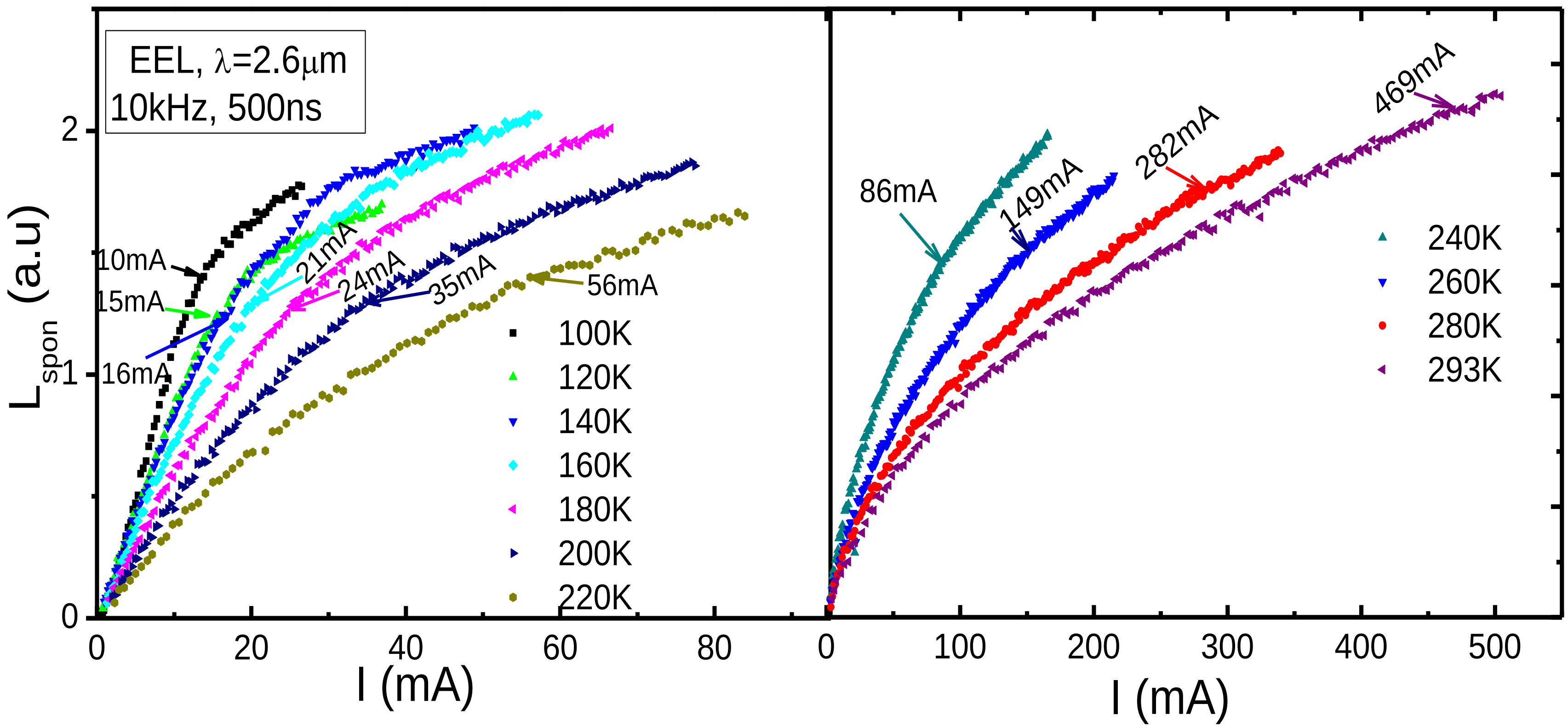
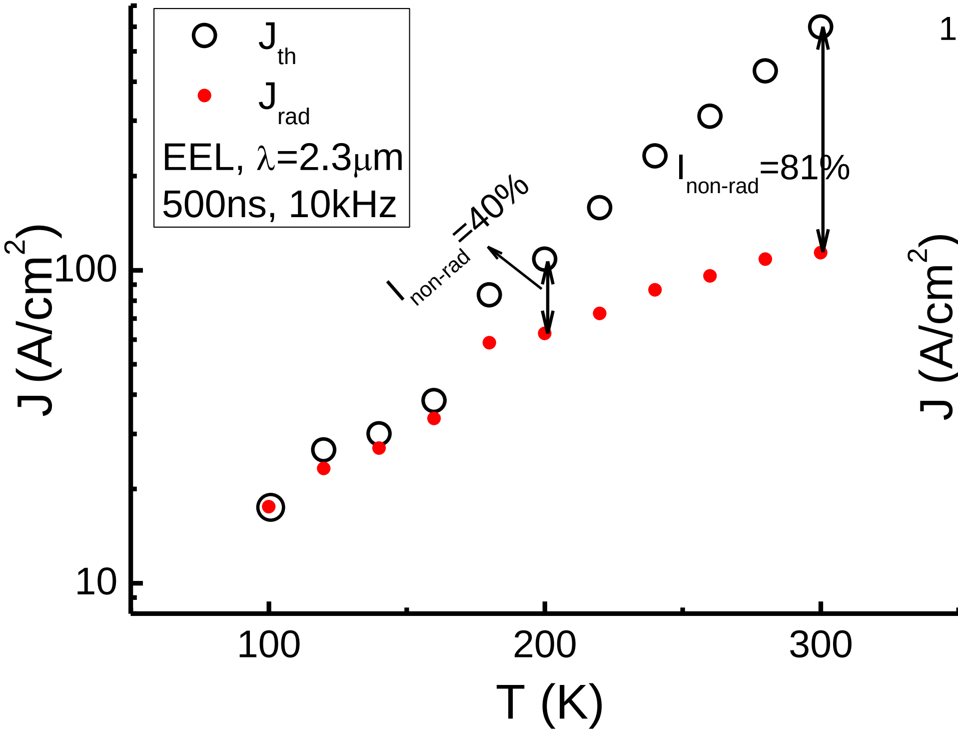
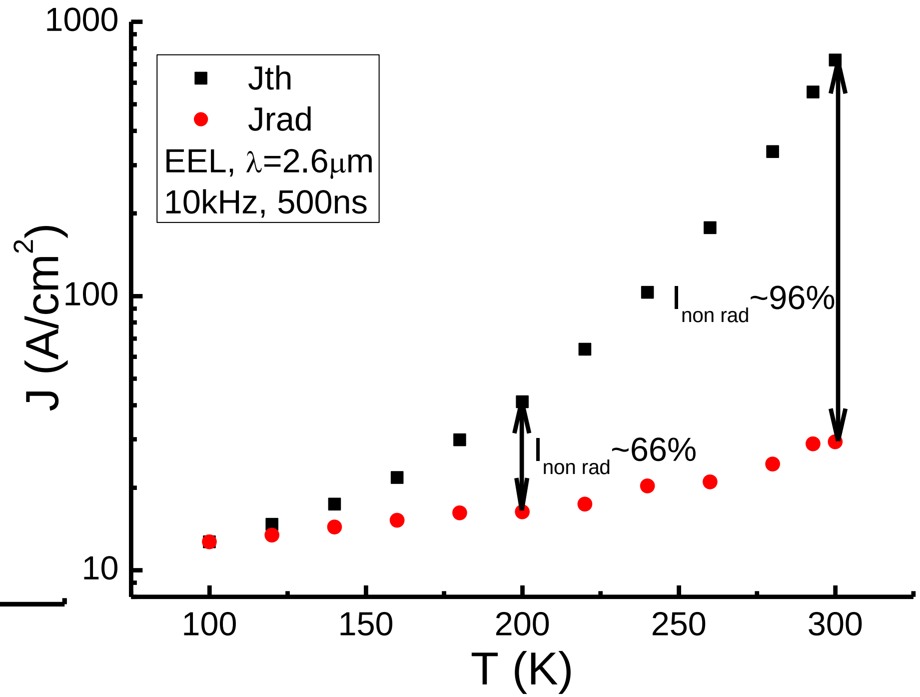


- ❑ Poor Pinning of L_{spon} in both devices.
- ❑ Indicates that carrier density increases above threshold.
- ❑ Degrades slope efficiency

Temperature dependence of J_{th} (J_{rad} and $J_{non-rad}$)





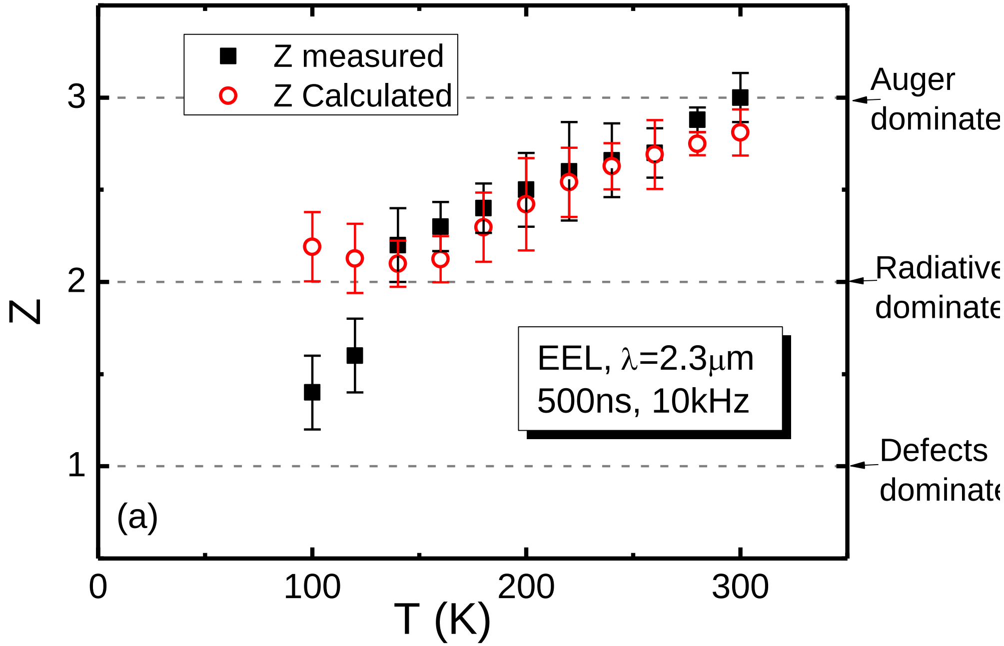
For the 2.3μm device:

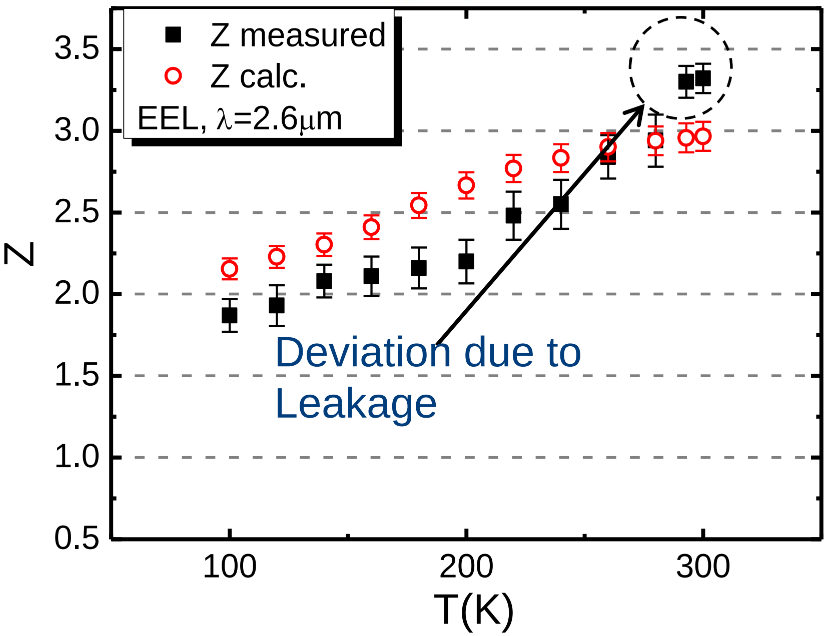
- ❑ **~81% J_{th} at RT is non-radiative**
- ❑ **~40% of J_{th} at 200K is non-radiative**

For the 2.6μm device:

- ❑ **~96% J_{th} at RT is non-radiative**
- ❑ **~66% of J_{th} at 200K is non-radiative**

Z Analysis



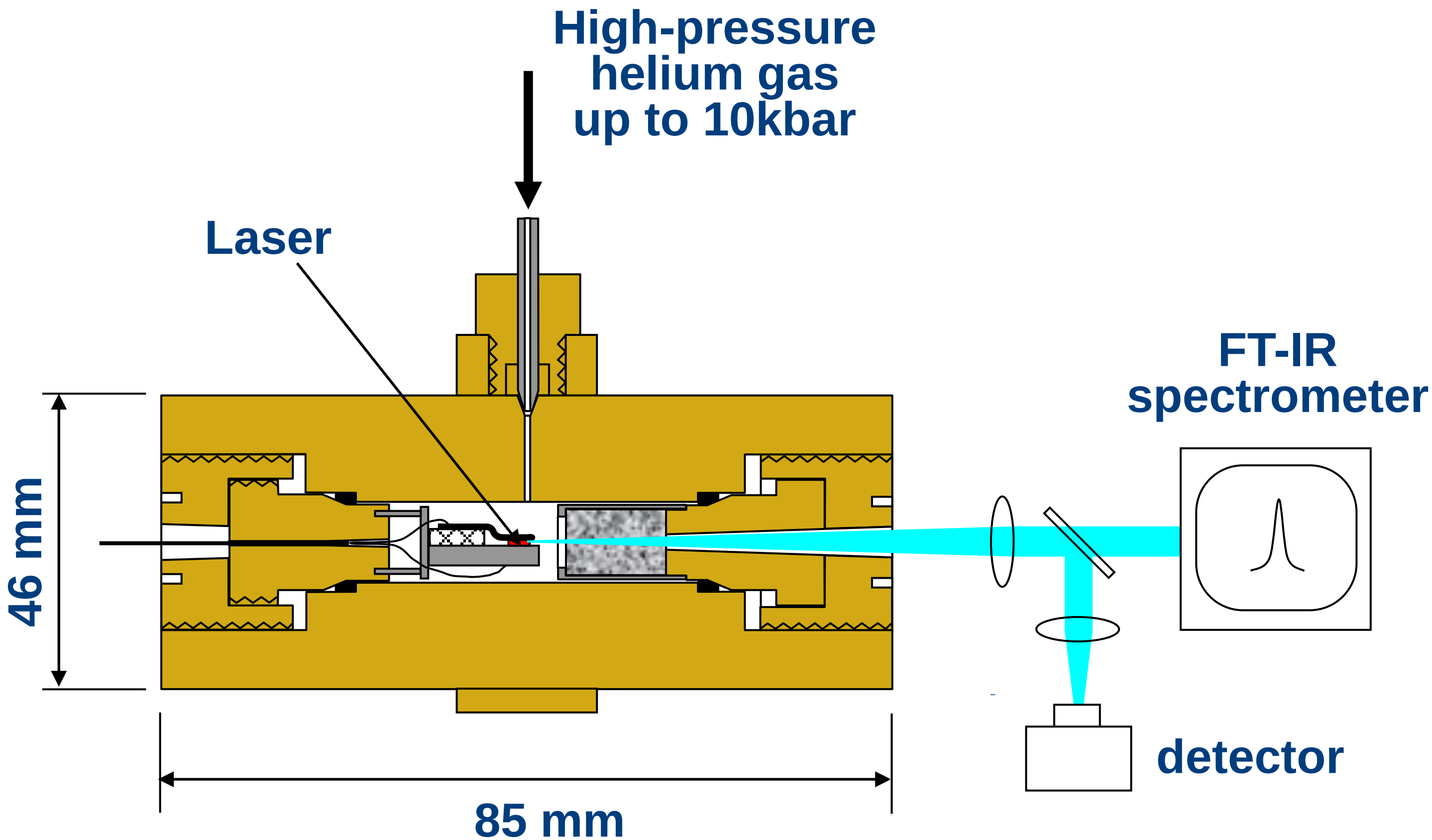


- ❑ Measured Z suggests that Auger may be the dominant loss process in both devices at RT

- ❑ In the 2.6μm device, Z>3 suggests that carrier leakage may be involved due to its reduced VB offset

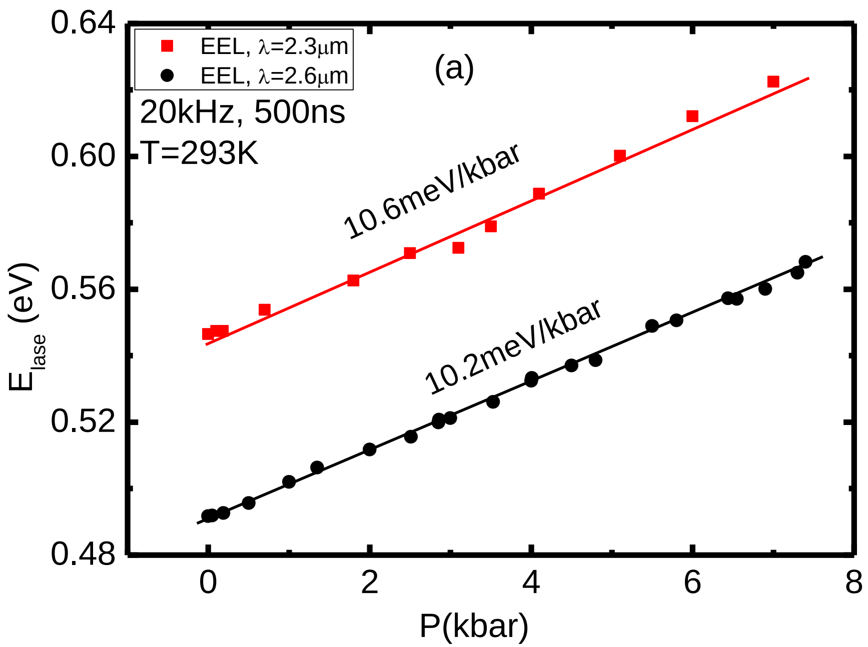
High pressure system using helium gas

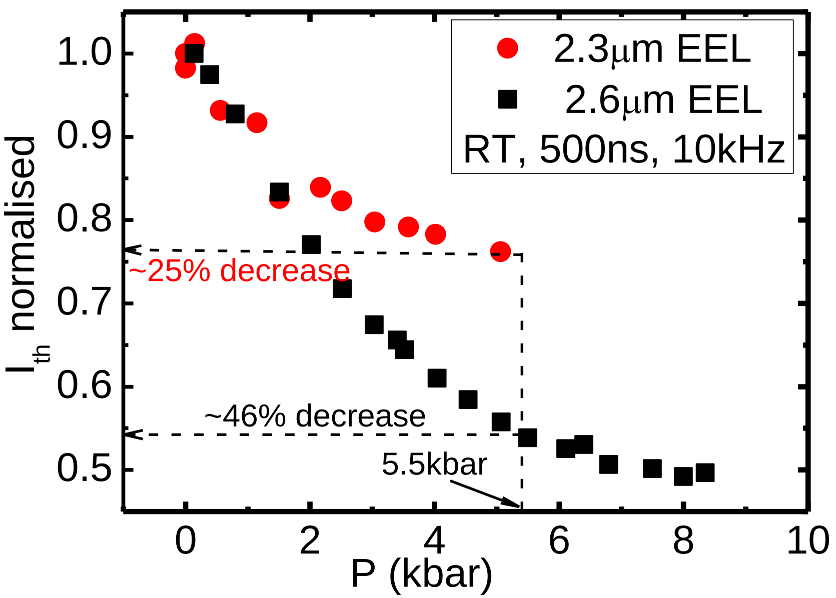
- Hydrostatic pressure increases the bandgap of III-V semiconductors
- This reduces the probability of Auger recombination



Pressure cell was mounted inside a cryostat with variable temperatures from 80-300K

Pressure dependence measurement

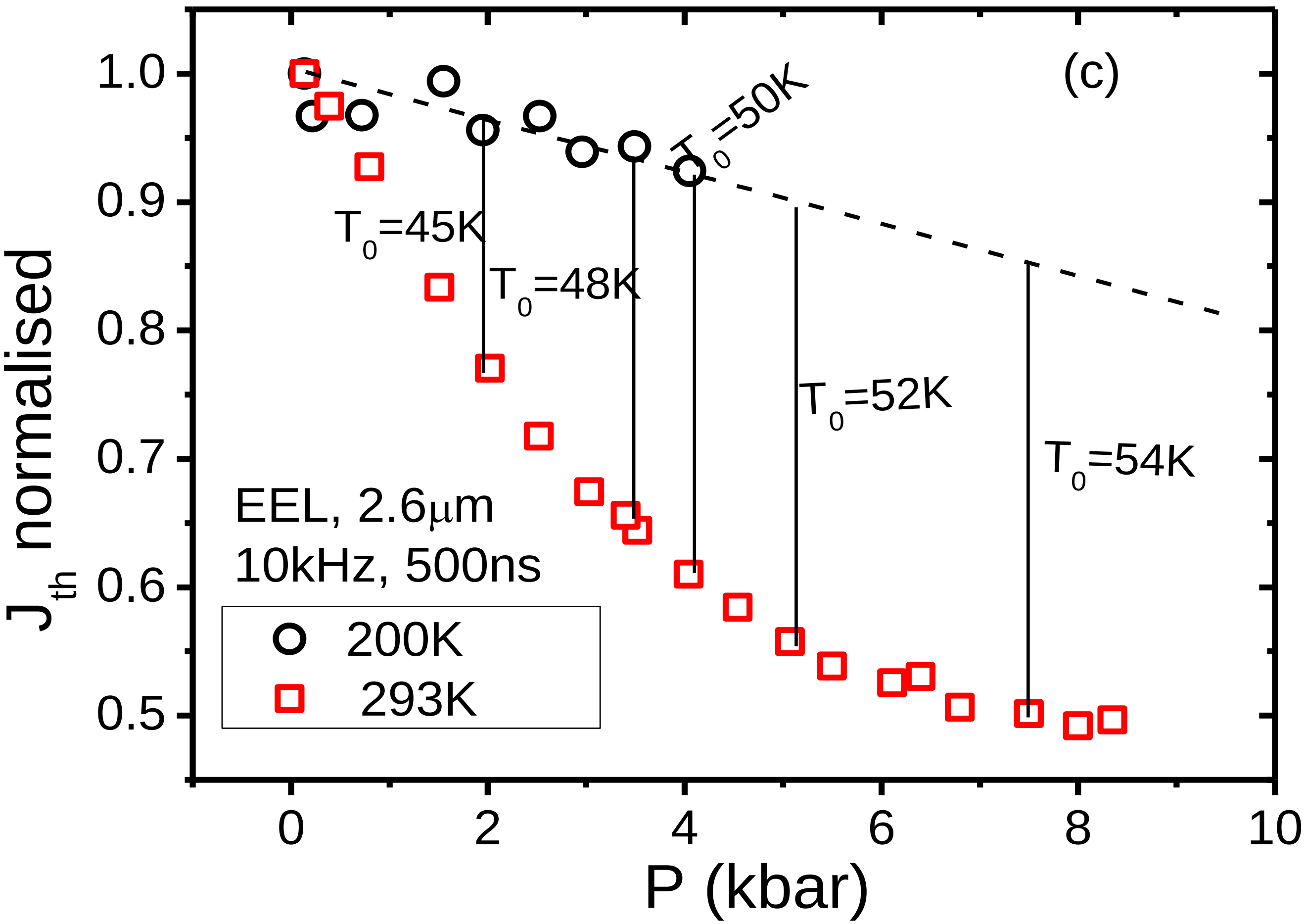




- ❑ J_{th} decreases with pressure by ~25% in the 2.3µm device at 5.5kbar.
- ❑ J_{th} decreases with pressure by 46% in the 2.6µm device at 5.5kbar.

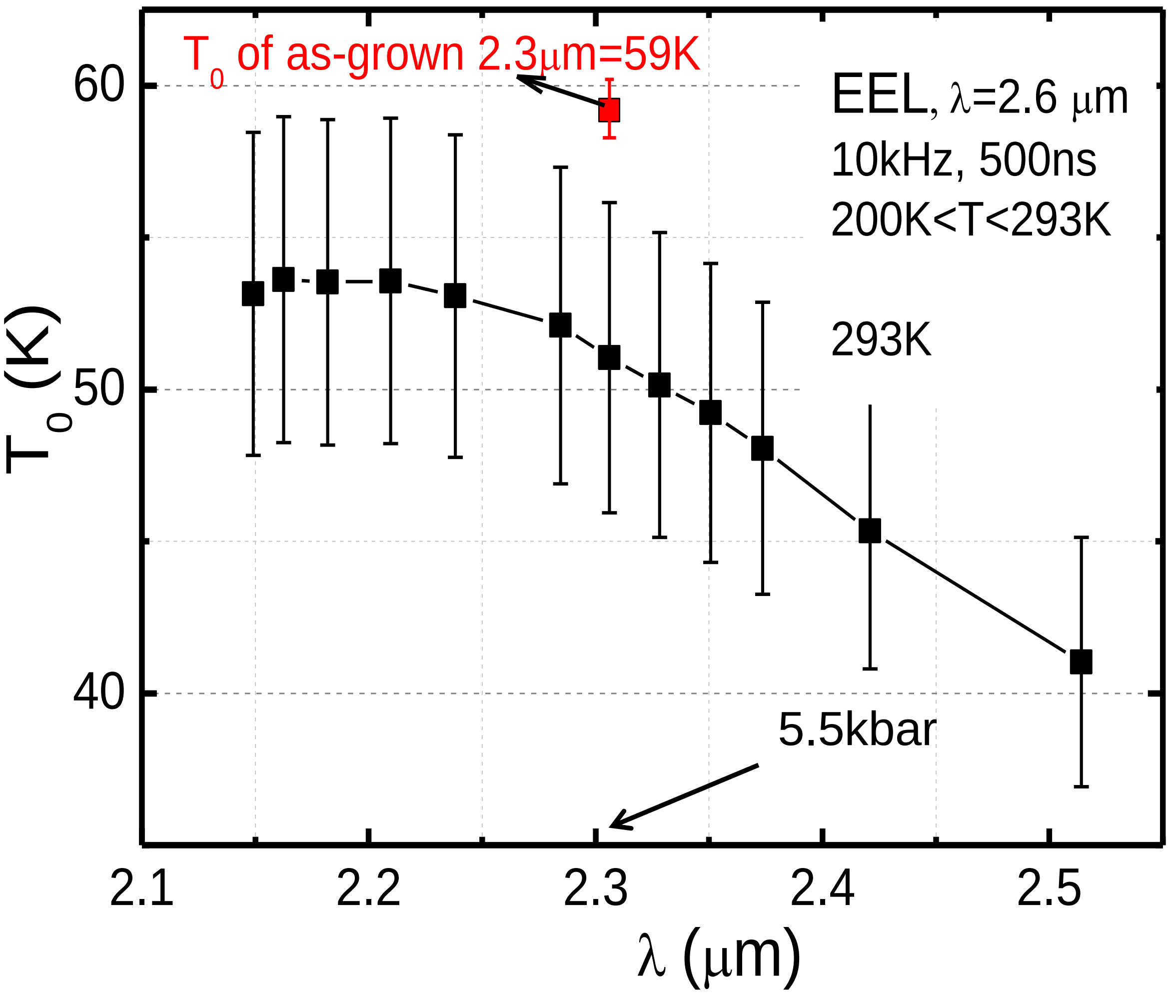
- ❑ This indicates that Auger is the dominant loss process in both devices

Pressure dependence measurement



- Increasing pressure reduces Auger and improves T_0 from 45K to~54K at 7.7kbar

Pressure dependence measurement



- At a pressure of 5.5kbar, the 2.6μm device operates at 2.3μm
- But 2.6μm device with 46% less Auger has T_0 of ~ 52K compared to the as-grown 2.3μm device T_0 of ~59K at RT

Even though leakage is occurring, the temperature sensitivity is mainly determined by Auger recombination.

Conclusions

- GaInAsSb/GaSb based MIR lasers investigated
- J_{th} of devices is dominated by non radiative Auger recombination
- Reduced VB offset is a possible path for hole leakage. However, this has much less influence on T_0.
- Temperature sensitivity is mainly due to Auger recombination; reducing Auger will enhance device performance.

Thank Y☺U

2013 Conference on Lasers and Electro-Optics Europe and International Quantum Electronics Conference

Advance Programme

Munich ICM

International Congress
Centre Munich, Germany

12 - 16 May 2013

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- European Physical Society / Quantum Electronics and Optics Division
- IEEE
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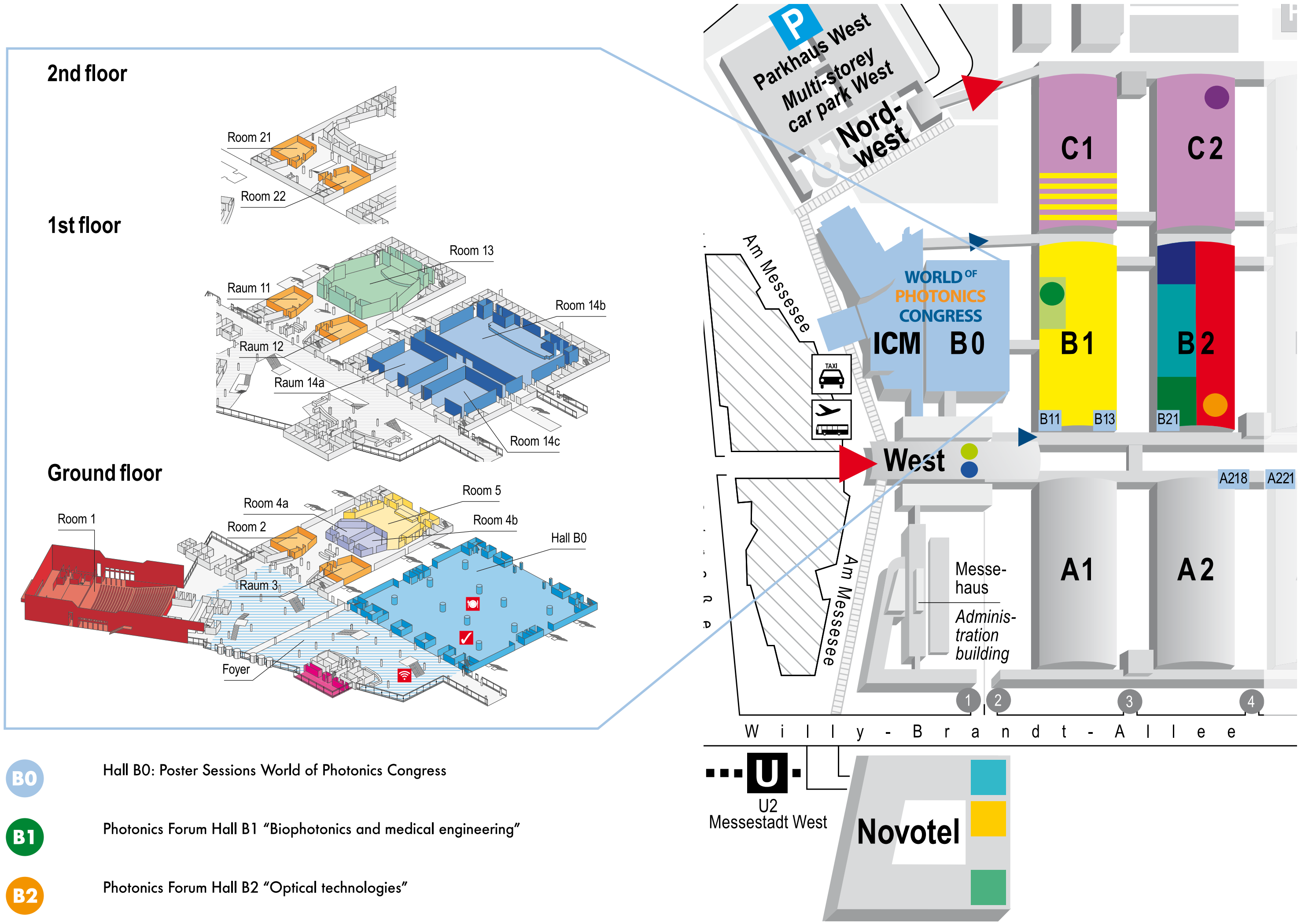

B0 Hall B0: Poster Sessions World of Photonics Congress

B1 Photonics Forum Hall B1 "Biophotonics and medical engineering"

B2 Photonics Forum Hall B2 "Optical technologies"

C2 Photonics Forum Hall C2 "Lasers and laser systems for production engineering"

B11 Conference room "Einstein"

B13 Conference room "Hertz"

B21 Conference room "Maiman"

A218 Short courses CLEO/Europe—IQEC

A221 Short courses CLEO/Europe—IQEC

Novotel Conference room "Wright"

Novotel Conference room "Zeppelin"

Novotel Conference room "Lindbergh"

Speakers' check-in

Catering

IBC ICM Business Center

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INTERNATIONAL YEAR OF LIGHT 2015

GENERAL INFORMATION

TECHNICAL PROGRAMME

CLEO®/Europe 2013
2013 Conference on Lasers and Electro-Optics Europe

IQEC 2013
International Quantum Electronics Conference

Munich, ICM Congress Centre, Germany, 12 - 16 May 2013

Sponsored by
- European Physical Society Quantum Electronics and Optics Division
- IEEE
- The Optical Society

Welcome to the 2013 Conference on Lasers and Electro-Optics Europe and the International Quantum Electronics Conference (hereafter CLEO®/Europe-IQEC 2013) at the World of Photonics Congress 2013

Following on from the very successful previous conferences held in Amsterdam (1994), Hamburg (1996), Glasgow (1998), Nice (2000) and Munich (2003, 2005, 2007, 2009, 2011), the General and Programme Chairs warmly welcome you to CLEO®/Europe-IQEC 2013 conference, which is being held in Munich from May 12 - 16, 2013. We extend a special welcome to postgraduate and PhD students attending, and we wish them every success, especially if this is their first participation in a major scientific conference.

The CLEO®/Europe-IQEC conference series has established a strong tradition as the largest, most comprehensive and prestigious gathering of optics and photonics researchers and engineers in Europe. With technical co-sponsorship provided by the European Physical Society (EPS), the Institute of Electrical and Electronics Engineers (IEEE) and the Optical Society (OSA), CLEO®/Europe and IQEC has a strong international presence in the complementary research areas of laser science, photonics and quantum electronics. More specifically, CLEO®/Europe emphasizes applied physics, optical engineering and applications of photonics and laser technology, whereas IQEC emphasizes basic research in laser physics, nonlinear optics and quantum optics.

This combination provides a unique forum to benefit from informative overviews and discuss recent advances in a wide spectrum of topics, from fundamental light-matter interactions and new sources of coherent light to technology development, system engineering and applications in industry, science and medicine. Over five days CLEO®/Europe-IQEC 2013 will showcase over 1400 technical contributions in the form of oral presentations (in parallel sessions) and posters from industry, university and research organizations drawn from countries around the world and will provide an unparalleled opportunity to bring together scientists, engineers and end-users of laser and photonics technology under the same roof. As in former years, the meeting will be complemented by ***LASER 2013 World of Photonics***, the world's largest tradeshow of laser and optical technology, which will provide researchers with the opportunity to see the latest developments in a very wide range of laser sources, optical and photonics products, and components.

CLEO®/Europe-IQEC is co-located with a number of smaller specialist conferences and topical meetings, including:
- ECBO - European Conferences on Biomedical Optics organised by The Optical Society (OSA) and SPIE,
- LIM 2013 - Lasers in Manufacturing organised by WLT-German Scientific Laser Society,
- Optical Metrology organised by SPIE Europe,
- together with a series of specialist conferences organised by the the European Optical Society (EOS).

All of the co-located conferences will share registration, allowing delegates to attend sessions of all the conferences.

Conference Structure and Technical Sessions

CLEO®/Europe-IQEC consists of a large number of technical presentations in a number of different formats:

A **Plenary Talk** is a broad-scope, 45 or 60-minute long talk given by a world-leading scientist and accessible to a general technical audience including conference attendees, exhibitors, and exhibit visitors. Plenary talks are not held in parallel with other sessions, allowing maximum possible attendance. In 2013, it is our pleasure to feature three plenary talks by **Adolf Giesen** (German Aerospace Center (DLR), Institute of Technical Physics, Stuttgart, Germany) who will discuss recent advances and future prospects for "Thin Disk Lasers", **Alain Aspect** (Institut d'Optique, Palaiseau, France) who will discuss "Coherent Back Scattering and Anderson Localization of Ultra Cold Atoms" and Stefan W. Hell (Max Planck Institute for Biophysical Chemistry, Göttingen, Germany) who will discuss the topic of "Nanoscopy with Focused Light".

Keynote Presentations (45 minute talk) and **Tutorials** (60 minute talk) are also given by the world leaders in particular technical areas, but are generally directed at a more specific audience, and are given in parallel with other sessions. Keynotes provide a survey of exciting recent developments, and Tutorials are particularly valuable for those unfamiliar with a field, allowing them to rapidly come up to speed.

An attractive feature of the CLEO®/Europe technical programme has been the **Tech-Focus** format. Tech-Focus sessions concentrate on selected photonics applications of industrial importance. CLEO®/Europe-IQEC 2013 features two Tech-Focus sessions on ***Fibre and Solid State Lasers: A Comparison from an Industrial Point of View*** jointly held with LIM 2013, which showcase this exciting field through presentations from leading academic and industrial researchers. Both sessions take place on Tuesday afternoon.

Additionally three other sessions are jointly held with other co-located conferences:

Two sessions on ***"Biophotonics and Applications"*** jointly held with ECBO take place on Sunday afternoon.
A session on ***"Precision Processing in Micro to Nano Scale by Ultrafast Lasers"*** jointly held with LIM 2013 takes place on Tuesday morning.

Another much appreciated feature of the CLEO®/Europe-IQEC meetings has been the special **Symposia** organized to anticipate and capture emerging fields by placing emphasis on fast developing, well defined topics. Five such symposia have been identified for CLEO®/Europe-IQEC 2013:

- **JS*I*:** Nuclear Photonics
- **JS*II*:** Photonics for Defence and Security
- **JS*III*:** Dynamics of Random Waves and Extreme Events
- **JS*IV*:** Quantum Coherent Effects in Biology
- **JS*V*:** Superconducting Optics

CLEO®/Europe-IQEC 2013 will also present twelve **Short Courses**:

- The course on ***Frequency Combs and Applications*** will be presented by **Thomas Udem** (Max-Planck-Institut für Quantenoptik, Garching, Germany).
- The course on ***Fibre Amplifiers*** will be presented by **Rüdiger Paschotta** (RP Photonics Consulting GmbH, Bad Dürrheim, Germany).
- The course on ***Applications of Photonic Crystals*** will be presented by **Thomas Krauss** (University of St. Andrews, St. Andrews, United Kingdom).
- The course on ***High Harmonic Generation and Attosecond Science*** will be presented by **John Tisch** (Imperial College, London, United Kingdom).
- The course on ***Practical Quantum Optics*** will be presented by **Gerd Leuchs** (University of Erlangen, Erlangen, Germany).
- The course on ***Ultrafast Lasers and Applications*** will be presented by **Frank Wise** (Cornell University, Ithaca, United States).
- The course on ***Silicon Photonics*** will be presented by **Dries Van Thourhout** (Ghent University, Ghent, Belgium).
- The course on ***Ultrashort Pulse Characterization*** will be presented by **Selçuk Aktürk** (Istanbul Technical University, Istanbul, Turkey).
- The course on ***Optical Parametric Oscillators*** will be presented by **Majid Ebrahim-Zadeh** (ICFO, Barcelona, Spain).
- The course on ***Optical Coherence Tomography: Technology and Applications*** will be presented by **Wolfgang Drexler** (Medical University Vienna, Vienna, Austria).
- The course on ***Laser Tweezers and Applications*** will be presented by **Miles Padgett** (University of Glasgow, Glasgow, United Kingdom).
- The course on ***Laser Beam Analysis, Propagation and Spatial Shaping Techniques*** will be presented by **James R. Leger** (University of Minnesota, Minneapolis, United States).

The courses will take place in parallel from Sunday morning, 12 May 2013 to Thursday morning, 16 May 2013 at the ICM Congress Centre or in the Exhibition Hall (A2).

The conference will also have two postdeadline sessions scheduled for Wednesday evening, 15 May 2013 (18:45 to 20:15). The purpose of the postdeadline sessions is to give the audience the chance to listen to the latest breaking news at the conference, and is usually one of the most interesting events that certainly contributes to the great atmosphere that makes the CLEO®/Europe-IQEC conference a unique event.

In addition to the technical sessions involving oral presentations, all scientific areas of both CLEO®/Europe and IQEC will be covered in **Poster Sessions**, which will provide an interactive and less formal way for researchers to discuss their work, to interact, and to exchange ideas.

CLEO®/Europe-IQEC is now established as the largest and most comprehensive gathering of optics and photonics researchers and engineers in Europe, spanning classical and quantum optical science, laser technology and photonics applications.

The conference programme could not have been organized without the vital support and effort of 251 scientists, forming 28 technical programme sub-committees, who have assembled an excellent series of talks and posters covering a wide range of fields in optics and quantum electronics. The technical programme consists of 3 plenary sessions, 5 tutorial, 8 keynote, and 84 invited talks, and 1323 contributed oral presentations and posters. The Conference Chairs would like to extend sincere thanks to the technical programme committee members for all their hard work.

A conference as large as CLEO®/Europe-IQEC requires two years of planning and organisation, and we would like to thank the staff of the European Physical Society and the local conference chair in Munich for invaluable professional assistance during this period. We would also like to thank all the Sponsoring Societies for guidance and support, and for their invaluable advice, which ensures that this conference remains at the core of optics and photonics research in Europe.

Organisers, societies and committees, however, can only do so much. The real success of CLEO®/Europe-IQEC 2013 rests on the efforts and commitment of researchers and students, who all contribute to the tremendous evolution of our research field and the high quality of the papers that will be presented.

We thank you all!

GENERAL INFORMATION

Member Societies of the European Physical Society

Albanian Physical Society	Lithuanian Physical Society
Armenian Physical Society	Association Luxembourgeoise des Physiciens
Austrian Physical Society	Moldovan Physical Society
Belarusian Physical Society	Physical Society of Montenegro
Belgian Physical Society	Netherlands Physical Society
Union of Physicists in Bulgaria	Norwegian Physical Society
Croatian Physical Society	Polish Physical Society
Czech Physical Society	Portuguese Physical Society
Danish Physical Society	Society of Physicists of Macedonia
Estonian Physical Society	Romanian Physical Society
Finnish Physical Society	United Physical Society of the Russian Federation
French Physical Society	Serbian Physical Society
Georgian Physical Society	Slovak Physical Society
German Physical Society	Society of Mathematicians Physicists and Astronomers of Slovenia
Hellenic Physical Society	Royal Spanish Physical Society
Eötvös Loránd Physical Society	Swedish Physical Society
Icelandic Physical Society	Swiss Physical Society
Israel Physical Society	Turkish Physical Society
Italian Physical Society	Ukrainian Physical Society
Latvian Physical Society	The Institute of Physics (IOP)
Liechtenstein Scientific Society (Physical Section)	

GENERAL INFORMATION

	SUNDAY		MONDAY		TUESDAY		WEDNESDAY		THURSDAY
	ROOM 12	ROOM 22	ROOM A218	ROOM A221	ROOM A218	ROOM A221	ROOM A218	ROOM A221	ROOM A218
08:30							SH-1A Short Course 1: Ultrashort Pulse Characterization 1	SH-3A Short Course 3: Optical Parametric Oscillators 1	SH-5A Short Course 5: Laser Beam Analysis, Propagation and Spatial Shaping Techniques 1
09:00	SH-10A Short Course 10: Frequency Combs and Applications 1	SH-8A Short Course 8: Fibre Amplifiers 1							
09:30									
10:00							COFFEE BREAK		
10:30	COFFEE BREAK						SH-1B Short Course 1: Ultrashort Pulse Characterization 2	SH-3B Short Course 3: Optical Parametric Oscillators 2	SH-5B Short Course 5: Laser Beam Analysis, Propagation and Spatial Shaping Techniques 2
11:00	SH-10B Short Course 10: Frequency Combs and Applications 2	SH-8B Short Course 8: Fibre Amplifiers 2							
11:30									
12:00									
12:30	LUNCH BREAK								
13:00									
13:30									
14:00					SH-12A Short Course 12: Ultrafast Lasers and Applications 1	SH-11A Short Course 11: Silicon Photonics 1	SH-2A Short Course 2: Optical Coherence Tomography: Technology and Applications 1	SH-7A Short Course 7: Laser Tweezers and Applications 1	
14:30	SH-4A Short Course 4: Applications of Photonic Crystals 1		SH-9A Short Course 9: High Harmonic Generation and Attosecond Science 1	SH-6A Short Course 6: Practical Quantum Optics 1					
15:00									
15:30					COFFEE BREAK				
16:00	COFFEE BREAK		COFFEE BREAK		SH-12B Short Course 12: Ultrafast Lasers and Applications 2	SH-11B Short Course 11: Silicon Photonics 2	SH-2B Short Course 2: Optical Coherence Tomography: Technology and Applications 2	SH-7B Short Course 7: Laser Tweezers and Applications 2	
16:30	SH-4B Short Course 4: Applications of Photonic Crystals 2		SH-9B Short Course 9: High Harmonic Generation and Attosecond Science 2	SH-6B Short Course 6: Practical Quantum Optics 2					
17:00									
17:30									
18:00									
18:30									
19:00									
19:30									

Time	ROOM 1	ROOM 4A	ROOM 4B	ROOM 13A	ROOM 13B	ROOM 14A	ROOM 14B	ROOM 21	ROOM 22
08:30									
09:00–10:30	CF/IE-1 Ultrafast Electron Dynamics	IF-1 Pulse Manipulation with Nonlinear Optics	CC-1 Ultra Broadband and High Terahertz Fields	CA-1 Nonlinear Frequency Conversion	CB-1 Quantum Cascade Lasers and Long Wavelength Emitters I	CM-1 Laser Ablation	CD-1 Pulsed mid-IR Sources	CK-1 Photonic Crystals	
10:30–11:00	COFFEE BREAK								
11:00–12:30	CF/IE-2 CEP Control and Attosecond Phenomena	IF-2 New Approaches in Nonlinear Light Propagation	CC-2 Terahertz Imaging and Sensing	CA-2 Visible Lasers	CB-2 Quantum Cascade Lasers and Long Wavelength Emitters II	CM-2 Future Applications of Laser	CD-2 Nonlinear Wave Mixing Phenomena	CK-2 Silicon Photonics	
12:30–13:30	LUNCH BREAK								
13:30–14:30	CA, CC, CL, CM AND IF POSTER SESSION – HALL B0								
14:30–16:00	CF/IE-3 Pulse Shaping and Characterization	IF-3 Nonlinear Light Interactions in Quantum Systems	CC-3 Terahertz Sources	CA-3 Mid-IR-Lasers	CL-1 / ECBO Biophotonics and Applications I	CJ-1 Fibres and Components	CD-3 Nonlinear Optics in Photonic Crystal Fibers	CK-3 Novel Materials and Structures	IH-1 Mapping Near Fields
16:00–16:30	COFFEE BREAK								
16:30–18:00	CF/IE-4 High-energy Ultrafast Sources	IF-4 Nonlinear Optical Interactions in Structured Materials	CC-4 Terahertz Field Manipulation	CA-4 Yb-Doped Lasers	CL-2 / ECBO Biophotonics and Applications II	CJ-2 Mode-locked Fiber Lasers	CD-4 Nonlinear Imaging and Spectroscopy	CK-4 Micro-nanostructured Optical Fibers	
18:00–20:00									

Time	ROOM 1	ROOM 2	ROOM 3	ROOM 4A	ROOM 4B	ROOM 13A	ROOM 13B	ROOM 14A	ROOM 14B	ROOM 21	ROOM EINSTEIN
08:30	PL-1 CLEO/Europe 2013 Plenary Talk										
	COFFEE										
09:30	PL-2 World of Photonics Opening with Plenary Talk										
11:00	CF/IE-5 Novel Methods in Ultrafast Optics	JSI-2 Nuclear Photonics	CH-1 Advances in Spectroscopy I	ID-1 Frequency Standards and Spectroscopy	CI-1 Next Generation Transmission	IA-1 Strong Coupling		IB-1 Photon Pair Sources and Detectors	CD-5 Optical Parametric Oscillators	CK-5 Microstructures for Energy and Sensing	CE-1 Semiconductor Materials and Devices
12:30	EXHIBITION AND LUNCH BREAK										
13:30	CB, CK, IB, ID, AND JSIV POSTER SESSIONS – HALL B0										
14:30	CF/IE-6 Supercontinuum Generation and Filamentation			ID-2 Frequency Combs	CL-3 Applied Biophotonics	IA-2 Quantum Photonics	CB/CC-1 Terahertz Quantum Cascade Semiconductor Lasers	CJ-3 Modal Instabilities in Fibres	CD-6 Frequency Conversion based on Quadratic Nonlinearities	JSIV-1 Quantum Coherent Effects in Biology I	CE-2 Thin Films and Nanostructures
16:00	COFFEE BREAK										
16:30	CF/IE-7 High Harmonic Generation			ID-3 Precision Measurements	CL-4 Structural Imaging	IA-3 Quantum Effects	CB-3 Ultrafast Semiconductor Lasers I	CJ-4 Coherent Combining	CD-7 New Devices for Frequency Conversion based on Quadratic Nonlinearities	JSIV-2 Quantum Coherent Effects in Biology II	CE-3 Photonic Nanowires - Materials and Applications
18:00	LASER WORLD OF PHOTONICS OPENING RECEPTION ICM FOYER, GROUND FLOOR, CONGRESS CENTRE (END 22:00)										

Time	ROOM 1	ROOM 4A	ROOM 4B	ROOM 11	ROOM 13A	ROOM 13B	ROOM 14A	ROOM 14B	ROOM 21	ROOM EINSTEIN
08:30–10:00	CD-8 New Guiding Phenomena	JSV-1 Superconducting Optics	CI-2 Integrated Circuits		CM-3 / LIM Precision Processing in Micro to Nano Scale by Ultrafast Lasers	CB-4 Ultrafast Semiconductor Lasers II	IB-2 Integrated Quantum Photonics and Simulation	CA-5 Yb-Doped Thin Disk Lasers	IG-1 Synchronization Dynamics and Opto-mechanical Self-organization	CE-4 Optical Fibres and Waveguides
10:00–10:30	COFFEE BREAK									
10:30–12:30	PL-3 IQEC 2013 Plenary Talk and Awards Ceremony									
12:30–13:00	EXHIBITION AND LUNCH BREAK									
13:00–14:00	CD, CE, CI, IC AND JSV POSTER SESSIONS – HALL B0									
14:00–15:30	CD-9 UV – Sources	IC-1 Atomic Quantum Simulators	CL-5 Microscopic and Sensing Technologies	CH-2 Novel Optical Sensing Systems	TF-1 / LIM Fibre and Solid State Lasers: a Comparison from an Industrial Point of View I	CB-5 Dynamics and Chaos in Semiconductor	IB-3 QIP with Light and Matter	CA-6 Ultrafast Solid-State Lasers	CG-1 Ionization Dynamics	CE-5 Optical Metamaterials and Plasmonics
15:30–16:00	COFFEE BREAK									
16:00–17:30	CD-10 Optical Devices for Data Processing	IC-2 Ultracold Atoms: Clocks, Spins and Lattices	CL-6 Mesoscopic Devices		TF-2 / LIM Fibre and Solid State Lasers: a Comparison from an Industrial Point of View II	CB-6 Advanced Structures	IB-4 Quantum Networking	CA-7 High Energy Scaling Concepts	CG-2 Ultrafast Dynamics in Attosecond Time Scale	CE-6 Laser Materials
19:00–20:00	CLEO®/EUROPE-IQEC CONFERENCE RECEPTION (END 23:00)									

GENERAL INFORMATION

Time	ROOM 1	ROOM 4A	ROOM 4B	ROOM 13A	ROOM 13B	ROOM 14A	ROOM 14B	ROOM 21	ROOM EINSTEIN
08:30–10:00		II-1 Quantum and Graphene Plasmonics	CI-3 Optical Signal Processing	CA-8 High Inversion Laser System	JSII-1 Photonics for Defence and Security: Spectroscopy Imaging and Detection	CJ-5 High Peak Power Fibre Sources	CM-4 Ultrafast Phenomena and Nanostructuring	IA-4 Quantum State Control	CE-7 Nonlinear Materials
10:00–10:30	COFFEE BREAK								
10:30–12:00		II-2 Plasmonics Antennas and Waveguides	CI-4 Opto-Electronic Devices	CA-9 Novel Solid-State Laser Concepts	JSII – 2 Photonics for Defence and Security: Coherent Sources	CJ-6 Ultrafast Fibre Sources	CM-5 Material Processing with Shaped Laser Beams	IA-5 Non-Classical Light	CE-8 Lithium Niobate - Fabrication and Characterization
12:00–13:00	EXHIBITION AND LUNCH BREAK								
13:00–14:00	CF/IE, CJ, II, JSII AND JSIII POSTER SESSIONS – HALL B0								
14:00–15:30	CD-11 Application of Solitons	IG-2 Light Beam Propagation in Disordered and Periodic Systems	CI-5 Advanced Concepts for Communications	CA-10 Beam Control	JSIII-1 Light Emission and Propagation in Random Media	CJ-7 Wavelength-Tuning and Conversion	CF/IE-8 Ultrafast Fibre and Waveguide Lasers	IA-6 Coherent Effects	CE-9 Functional Optical Materials
15:30–16:00	COFFEE BREAK								
16:00–17:30	CD-12 Solitons and Nonlinearly Driven Self-organization	IG-3 Polaritons and Quantum Fluids	CH-3 Advances in Optical Sensor Devices	CK-6 Plasmonic Nanos-tructures and Applications	JSIII-2 Rogue Waves and Soliton Dynamics	CJ-8 Fibre Laser Sources	CF/IE-9 Ultrafast Optical Pa-rametric Amplifiers	IH-2 Heat and Energy Control	CG-3 Plasma Based Sources
17:30–18:30	EPS QEOD HAPPY HOUR ICM FOYER, GROUND FLOOR, CONGRESS CENTRE								
18:45–20:00				PD-A Postdeadline Session A (end 20:15)	PD-B Postdeadline Session B (end 20:15)				

Time	ROOM 1	ROOM 4A	ROOM 4B	ROOM 13A	ROOM 13B	ROOM 14A	ROOM 14B	ROOM 21	ROOM 22	ROOM EINSTEIN
08:30–10:00	CJ-9 Raman Effects in Fibre Sources	II-3 Controlling and Harvesting Light with Plasmons	CH-4 Metrology of Materials and Structures	CK-7 Advanced Structures for Light Sources	CB-7 Semiconductor Lasers for Optical Communications	IB-5 Quantum Communication	CF/IE-10 Ultrafast Spectroscopy	IA-7 Cavity-Opto Mechanics	CG-4 Ultrafast High Power Lasers	IH-3 Controlling Light Emission at the Nanoscale
10:00–10:30	COFFEE BREAK									
10:30–12:00	CJ-10 Two Micron Fibre Cases	II-4 Transformation Optics and Metamaterials	CH-5 Advances in Spectroscopy II	CK-8 Light Management in Structures	CB-8 Semiconductor Vertical Cavity Surface Emitting Lasers	IB-6 Photonic Quantum Computing	CF/IE-11 Ultrafast Microphotonics and Plasmonics	CM-6 Transparent Material Processing	CG-5 Waveform Synthesis and Control	IH-4 Quantum Nanophotonics
12:00–13:00	EXHIBITION AND LUNCH BREAK									
13:00–14:00	CG, CH, IA, IG AND IH POSTER SESSIONS – HALL B0									
14:00–15:30	CJ-11 Special Fibres	IG-4 Solitons and Dynamics in Cavities	CH-6 Optical Sensor Applications	CK-9 Integrated Photonic Devices	CB-9 High Efficiency/ High Brightness Semiconductor Lasers	IB-7 Fundamentals of Quantum Information	CF/IE-12 Mid Infrared and Terahertz Phenomena	CM-7 Femtosecond Laser Writing	CG-6 FEL and High Photon Energy Science	IH-5 Ultrafast Nanophotonics
15:30–16:00	COFFEE BREAK									
16:00–17:30	CJ-12 Novel Waveguide Materials	IG-5 Rogue Waves, Extreme Events and Nonlinear Wave Dynamics	CH-7 Frontiers of Optical Sensing	CK-10 Micro-optics and Integrated Sensors	CB-10 Disk and Mid-Infrared Semiconductor Lasers	IB-8 Quantum State Characterization	CF/IE-13 Charge Dynamics in Solids	CM-8 Laser Processing from Polymers to Fibres	CG-7 Field Driven Interactions	IH-6 Quantum Dots. Optical Forces
17:30–18:00	CONFERENCE ENDS									
18:00										
18:30										
19:00										
19:30										
20:00										

How to find the room?

A map locating the rooms can be found in the inner cover of the advance programme.

Talks:
All talks take place in the congress centre (so called ICM) with the exception of the Einstein room (formerly B11) located in the exhibition hall B1.
To save space in the layout of the parallel sessions, all locations were abbreviated to the strict minimum such as "Room 1" instead of "Room 1, Ground Floor / 1st Floor, Congress Centre". Below you will find the detailed locations of all the rooms:
Room 1, Ground Floor / 1st Floor, Congress Centre
Room 2, Ground Floor, Congress Centre
Room 3, Ground Floor, Congress Centre
Room 4a, Ground Floor, Congress Centre
Room 4b, Ground Floor, Congress Centre
Room 11, 1st Floor, Congress Centre
Room 13a, 1st Floor, Congress Centre
Room 13b, 1st Floor, Congress Centre
Room 14a, 1st Floor, Congress Centre
Room 14b, 1st Floor, Congress Centre
Room 21, 2nd Floor, Congress Centre
Room 22, 2nd Floor, Congress Centre
Foyer ICM, Ground Floor, Congress Centre
Foyer ICM, 1st Floor, Congress Centre
Room Einstein (formerly B11), 1st Floor, Exhibition Hall B1*

Short courses:
Room 12, 1st Floor, Congress Centre
Room 22, 2nd Floor, Congress Centre
Room A218 & Room A221, 1st Floor, Exhibition Hall A2/A3 *
(*Access via west entrance)

Posters:
All CLEO®/Europe-IQEC 2013 Posters take place in the **Hall B0**, Ground Floor, Congress Centre.

SHORT COURSES

SH-10 **Short Course 10: Frequency Combs and Applications**
Thomas Udem, Max-Planck-Institut für Quantenoptik, Garching, Germany
Sunday, 09:00 – 12:30 • Room 12

SH-8 **Short Course 8: Fibre Amplifiers**
Rüdiger Paschotta, RP Photonics Consulting GmbH, Bad Dürrheim, Germany
Sunday, 09:00 – 12:30 • Room 22

SH-4 **Short Course 4: Applications of Photonic Crystals**
Thomas Krauss, University of St. Andrews, St. Andrews, United Kingdom
Sunday, 14:30 – 18:00 • Room 12

SH-9 **Short Course 9: High Harmonic Generation and Attosecond Science**
John Tisch, Imperial College, London, United Kingdom
Monday, 14:30 – 18:00 • Room A218

SH-6 **Short Course 6: Practical Quantum Optics**
Gerd Leuchs, University of Erlangen, Erlangen, Germany
Monday, 14:30 – 18:00 • Room A221

SH-12 **Short Course 12: Ultrafast Lasers and Applications**
Frank Wise, Cornell University, Ithaca, USA
Tuesday, 14:00 – 17:30 • Room A218

SH-11 **Short Course 11: Silicon Photonics**
Dries Van Thourhout, Ghent University, Ghent, Belgium
Tuesday, 14:00 – 17:30 • Room A221

SH-1 **Short Course 1: Ultrashort Pulse Characterization**
Selçuk Aktürk, Istanbul Technical University, Istanbul, Turkey
Wednesday, 08:30 – 12:00 • Room A218

SH-3 **Short Course 3: Optical Parametric Oscillators**
Majid Ebrahim-Zadeh, ICFO, Barcelona, Spain
Wednesday, 08:30 – 12:00 • Room A221

SH-2 **Short Course 2: Optical Coherence Tomography: Technology and Applications**
Wolfgang Drexler, Medical University Vienna, Vienna, Austria
Wednesday, 14:00 – 17:30 • Room A218

SH-7 **Short Course 7: Laser Tweezers and Applications**
Miles Padgett, University of Glasgow, Glasgow, United Kingdom
Wednesday, 14:00 – 17:30 • Room A221

SH-5 **Short Course 5: Laser Beam Analysis, Propagation and Spatial Shaping Techniques**
James R. Leger, University of Minnesota, Minneapolis, United States
Thursday, 08:30 – 12:00 • Room A218

PLENARY TALKS

PL-1: **CLEO/Europe 2013 Plenary Talk**
Thin Disk Lasers
Adolf Giesen, Institute of Technical Physics, DLR, Stuttgart, Germany
Monday, 08:30 – 09:15 • Room 1

PL-2 **World of Photonics Opening with Plenary Talk**
Nanoscopy with Focused Light
Stefan W. Hell, Max Planck Institute for Biophysical Chemistry, Göttingen, Germany
Monday, 09:30 – 10:45 • Room 1

(Together with words of welcome)

PL-3 **IQEC 2013 Plenary Talk and Awards Ceremony**
Coherent Back Scattering and Anderson Localization of Ultra Cold Atoms
Alain Aspect, Laboratoire Charles Fabry, Institut d'Optique, Palaiseau, France
Tuesday, 10:30 – 12:30 • Room 1

(Together with award ceremonies)

TUTORIAL TALKS

CM-2 **Future Applications of Laser**
Resource Efficiency Improvements through Laser Processing of Designer Materials
Bill O'Neil, University of Cambridge, Cambridge, United Kingdom
Sunday, 11:00 – 12:00 • Room 14a

CL-1/ECBO **Biophotonics and Applications I (Session jointly held with ECBO)**
Photoacoustic Tomography: Ultrasonically Breaking through the Optical Diffusion and Diffraction Limits
Lihong Wang, Washington University, St. Louis, MO, United States
Sunday, 14:30 – 15:30 • Room 13b

CG-2 **Ultrafast Dynamics in Attosecond Time Scale**
Attosecond Science and Technology
Paul Corkum, University of Ottawa, Ontario, Canada
Tuesday, 16:00 – 17:00 • Room 21

II-4 **Transformation Optics and Metamaterials**
Geometry and Light: The Science of Invisibility
Ulf Leonhardt, Weizmann Institute of Science, Rehovot, Israel
Thursday, 10:30 – 11:30 • Room 4a

IB-7 **Fundamentals of Quantum Information**
Quantum Information Tools
Klaus Mølmer, Aarhus University, Aarhus, Denmark
Thursday, 14:00 – 15:00 • Room 14a

KEYNOTE TALKS

CC-1 **Ultra Broadband and High Terahertz Fields**
Ultrabroadband THz Pulses - From Millimeter Waves to the Infrared
Hartmut Roskos, Johann Wolfgang Göthe-Universität, Frankfurt am Main, Germany
Sunday, 09:00 – 09:45 • Room 4b

IF-4 **Nonlinear Optical Interactions in Structured Materials**
Optical Data Storage with Diffraction-Unlimited Resolution
Min Gu, Swinburne University of Technology, Hawthorn, Australia
Sunday, 16:30 – 17:15 • Room 4a

CK-5 **Microstructures for Energy and Sensing**
Optofluidic for Energy Applications
Demetri Psaltis, Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland
Monday, 11:00 – 11:45 • Room 21

CF/IE-7 **High Harmonic Generation**
Frontiers in Extreme Nonlinear Optics: Attosecond-to-Zeptosecond Coherent Kiloelectronvolt X-rays on a Tabletop
Tenio Popmintchev, JILA, and University of Colorado, Boulder, CO, United States
Monday, 16:30 – 17:15 • Room 1

CJ-4 **Coherent Combining**
Coherent Combining of Fiber and Solid-State Lasers
Gregory D. Goodno, Northrop Grumman Aerospace Systems, Redondo Beach, CA, United States
Monday, 16:30 – 17:15 • Room 14a

IC-1 **Atomic Quantum Simulators**
Quantum Simulations using Ultracold Atoms
Immanuel Bloch, Max-Planck Institute of Quantum Optics, Garching, Germany
Tuesday, 14:00 – 14:45 • Room 4a

How to read the Session Codes?

The following pages are the abstracts of the papers which will be presented at CLEO®/Europe-IQEC 2013.

All CLEO®/Europe sessions are on a white background and have a code which begins with a **C**.

All IQEC sessions are on a shaded background and have a code that begins with an **I**.

Exceptions as mentioned below are on a dark background:

- Short courses referenced with a **SH**
- Plenary talks referenced with a **PL**
- Tech-focus sessions (jointly held with the LIM conferences) referenced with a **TF**
- CLEO®/Europe-IQEC joint symposia referenced with a **JS**.
- The ECBO-CLEO/Europe joint sessions referenced with **CL-1/ECBO** and **CL-2/ECBO**
- **CF/IE** sessions as being joint sessions of CLEO®/Europe-IQEC
- CLEO-LIM joint session on Precision Processing in Micro to Nano Scale by Ultrafast Lasers referenced with **CM-3/LIM**

Oral Presentations

Oral presentations have a code made up of three parts, *e.g.*

CD-1.1 TUE (Invited) 09:00

The first part indicates the Conference, the topic title, the session title and the placement of the presentation within the session, *e.g.*

CD-1.1 = CLEO®/Europe
CD-1.1 = Applications of Nonlinear Optics
CD-1.1 = Pulsed mid-IR Sources
CD-1.1 = First paper presented in the "Pulsed mid-IR Sources" session of the CD topic

The second part indicates the day on which the presentation takes place.

SUN = Sunday TUE = Tuesday THU = Thursday
MON = Monday WED = Wednesday

The figures on the right indicate at what time the talk begins (9:00 am). Plenary, Tutorial, Keynote and Invited Talks are recognised as being marked in brackets.

Posters

Poster presentations have a code made up of two parts, *e.g.*

ID-P.1 MON 13:30

The first part indicates the Conference, the topic title, the poster destination, and the order of the presentation within the topic, *e.g.*

ID-P.1 = IQEC
ID-P.1 = Precision Metrology and Frequency Combs
ID-P.1 = Poster
ID-P.1 = First poster in the "Precision Metrology and Frequency Combs" topic of the IQEC conference.

The second part indicates the day on which the poster presentation takes place (same abbreviations as for the orals). All posters are displayed per topic according their reference numbers over the conference days (see days at a glance).

GENERAL INFORMATION

IG-2 **Light Beam Propagation in Disordered and Periodic Systems**
High-Resolution Imaging with Scattered Light
Allard Mosk, University of Twente, Enschede, The Netherlands
Wednesday, 14:00 – 14:45 • Room 4a

IH-2 **Heat and Energy Control**
Broadband Management of Light Using Nanophotonics for Solar and Thermal Applications
Shanhui Fan, University of Stanford, Stanford, CA, United States
Wednesday, 16:00 – 16:45 • Room 21

INVITED TALKS

IF-1 **Pulse Manipulation with Nonlinear Optics**
Broadband Deep-Ultraviolet Femtosecond Pulse Generation by Third-order Nonlinear Optical Processes in Thin Media
Helder Crespo, University of Porto, Porto, Portugal
Sunday, 09:00 – 09:30 • Room 4a

CD-1 **Pulsed mid-IR Sources**
Nonlinear Optics with High Power Femtosecond Mid-infrared Pulses
Daniil Kartashov, Technical University, Vienna, Austria
Sunday, 09:00 – 09:30 • Room 14b

CB-1 **Quantum Cascade Lasers I**
Recent Progress on Single-mode Quantum Cascade Lasers
Borislav Hinkov, ETH Zürich, Zürich, Switzerland
Sunday, 09:30 – 10:00 • Room 13b

CM-1 **Laser Ablation**
Film-Free Laser Microprinting of Complex Materials
Pere Serra, Universitat de Barcelona, Applied Physics and Optics, Barcelona, Spain
Sunday, 09:30 – 10:00 • Room 14a

CF/IE-1 **Ultrafast Electron Dynamics**
Strong-field Photoemission of Electron Pulses from Sharp Metallic Tips
Claus Ropers, Göttingen University, Göttingen, Germany
Sunday, 10:00 – 10:30 • Room 1

CK-1 **Photonic Crystals**
Ultra-Narrowband Nonlinear Wavelength Conversion Using Coupled Photonic Crystal Nanocavities
Nobuyuki Matsuda, NTT Basic Research Laboratories & Nanophotonics Center, Atsugi, Japan
Sunday, 10:00 – 10:30 • Room 21

CF/IE-2 **CEP Control and Attosecond Phenomena**
Generation of Gigawatt-scale Isolated Attosecond Pulses
Eiji Takahashi, RIKEN, Wako, Japan
Sunday, 12:00 – 12:30 • Room 1

CC-3 **Terahertz Sources**
Room-Temperature Terahertz Generation Using Vertical-External-Cavity Surface-Emitting Lasers
Martin Koch, Philipps-Universität Marburg, Marburg, Germany
Sunday, 14:30 – 15:00 • Room 4b

CA-3 **Mid-IR-Lasers**
Mid-IR Solid-State Lasers for Spectroscopy and Metrology Applications
Gianluca Galzerano, Istituto di Fotonica e Nanotecnologie - CNR, Milano, Italy
Sunday, 14:30 – 15:00 • Room 13a

IF-3 **Nonlinear Light Interactions in Quantum Systems**
Optical Parametric Oscillation with Distributed Feedback in Cold Atoms
Willian Guerin, University of Tübingen, Tübingen, Germany
Sunday, 15:00 – 15:30 • Room 4a

CK-3 **Novel Materials and Structures**
Graphene, Plasmonic and Silicon Optical Modulators
Volker Sorger, George Washington University, Washington, United States
Sunday, 15:00 – 15:30 • Room 21

CC-3 **Terahertz Sources**
THz Emission from Intrinsic Josephson Junctions in High Tc Superconductors for Imaging Applications
Kazuo Kadowaki, University of Tsukuba, Tsukuba, Japan
Sunday, 15:30 – 16:00 • Room 4b

CL-1 / ECBO **Biophotonics and Applications I (Session jointly held with ECBO)**
Improved Precision in Optical Tweezers via Squeezed Light
Warwick Bowen, The University of Queensland, Brisbane, Australia
Sunday, 15:30 – 16:00 • Room 13b

CA-4 **Yb-Doped Lasers**
Solid State Crycoolers: Developments and Prospective
Mansoor Sheik-Bahae, University of New Mexico, Albuquerque, United States
Sunday, 16:30 – 17:00 • Room 13a

CL-2 / ECBO **Biophotonics and Applications II (Session jointly held with ECBO)**
Noninvasive Fluorescence Imaging through Strongly Scattering
Jacopo Bertolotti, University of Twente, Enschede, The Netherlands & University of Florence, Florence, Italy
Sunday, 16:30 – 17:00 • Room 13b

CJ-2 **Mode-locked Fiber Lasers**
Investigations on Positively Chirped Pulses in a Thulium-Doped Fiber Laser
Frithjof Haxsen, Laser Zentrum Hannover, Hannover, Germany
Sunday, 17:00 – 17:30 • Room 14a

CL-2 / ECBO **Biophotonics and Applications II (Session jointly held with ECBO)**
Combination of Optical Micromanipulation with Raman Spectroscopy for Cell Sorting
Christoph Kraft, Institute of Photonic Technology, Jena, Germany
Sunday, 17:30 – 18:00 • Room 13b

CD-4 **Nonlinear Imaging and Spectroscopy**
Label Free Nonlinear Imaging in Microscopy and Endoscopy
Hervé Rigneault, Université Aix-Marseille, Marseille, France
Sunday, 17:30 – 18:00 • Room 14b

JSI-1 **Nuclear Photonics**
Nuclear Photonics with Extreme Gamma-ray Sources
Chris P.J. Barty, Lawrence Livermore National Laboratory, CA, United States
Monday, 11:00 – 11:30 • Room 2

CI-1 **Next Generation Transmission**
400G/1T Superchannels Enabling Next Generation Optical Communications
Sethumadhavan Chandrasekhar and Xiang Liu, Alcatel-Lucent Bell Labs, Holmdel, United States
Monday, 11:00 – 11:30 • Room 4b

JS1-2 **Nuclear Photonics**
Nuclear Processes and Nuclear Decay Modifications in Plasmas
Vincent Méot, CEA/DAM Ile de France, Arpajon, France
Monday, 11:30 – 12:00 • Room 2

IA-1 **Strong Coupling**
Quantum Networks based on Single Atoms in Optical Cavities
Stephan Ritter, Max-Planck-Institut für Quantenoptik, Garching, Germany
Monday, 12:00 – 12:30 • Room 13a

CE-1 **Semiconductor Materials and Devices**
Nano-scale Characterization of Semiconductors Using Helium Temperature Scanning Transmission Electron Microscopy Cathodoluminescence
Jürgen Christen, Otto-von-Guericke-University, Magdeburg, Germany
Monday, 12:00 – 12:30 • Room Einstein

IA-2 **Quantum Photonics**
Photonic Quantum Technologies
Jeremy O'Brien, University of Bristol, Bristol, United Kingdom
Monday, 14:30 – 15:00 • Room 13a

CJ-3 **Modal Instabilities in Fibres**
Mode Instabilities in Large Mode Area Fiber Amplifiers
Tino Eidam, Friedrich Schiller University, Jena, Germany
Monday, 14:30 – 15:00 • Room 14a

CL-3 **Applied Biophotonics**
Super Resolution Imaging of Single DNA-Protein Interactions
Erwin Peterman, Vrije University, Amsterdam, The Netherlands
Monday, 15:00 – 15:30 • Room 4b

ID-2 **Frequency Combs**
Microresonator Frequency Combs
Scott Papp, NIST, Boulder, United States
Monday, 15:30 – 16:00 • Room 4a

JSIV-1 **Quantum Coherent Effects in Biology I**
Quantum Coherence Explored at the Level of Individual Light-Harvesting Complexes
Niek Van Hulst, ICFO, Castelldefels, Spain
Monday, 15:30 – 16:00 • Room 21

ID-3 **Precision Measurements**
Is the Electron Round? Particle Physics with Cold and Ultracold Molecular Beams
Edward Hinds, Imperial College, London, United Kingdom
Monday, 16:30 – 17:00 • Room 4a

JSIV-2 **Quantum Coherent Effects in Biology II**
Robust Design Principles for Quantum Enhanced Excitation Transport
Andreas Buchleitner, Albert-Ludwigs-University, Freiburg in Brisgau, Germany
Monday, 16:30 – 17:00 • Room 21

CE-3 **Photonic Nanowires - Materials and Applications**
III-V and III-Nitride Nanowires for LED Applications
Lars Samuelson, Nanometer Structure Consortium at Lund University, Lund, Sweden
Monday, 16:30 – 17:00 • Room Einstein

CL-4 **Structural Imaging**
Imaging Molecular Organization of Cell Membranes and Proteins Assemblies using Polarimetric Fluorescence Microscopy
Sophie Brasselet, Fresnel Institute, Marseille, France
Monday, 17:00 – 17:30 • Room 4b

CB-3 **Ultrafast Semiconductor Lasers I**
Optical Frequency Combs using Ultrafast Diode Lasers: Techniques and Applications
Peter J. Delfyett, CREOL, The College of Optics and Photonics, Orlando, FL, United States
Monday, 17:30 – 18:00 • Room 13b

CD-8 **New Guiding Phenomena**
Electro-optic Routing of Spatial Solitons in Nematic Liquid Crystals
Armando Piccardi, University Roma Tre, Rome, Italy
Tuesday, 08:30 – 09:00 • Room 1

JSV-1 **Superconducting Optics**
Superconducting Single Photon Detectors
Sae Woo Nam, NIST, Boulder, United States
Tuesday, 08:30 – 09:00 • Room 4a

CM-3 / LIM **Precision Processing in Micro to Nano Scale by Ultrafast Lasers (Session jointly held with LIM)**
Welding of Glass/Glass and Si/Glass Using Ultrashort Laser Pulses
Isamu Miyamoto, Osaka University, Osaka, Japan
Tuesday, 08:30 – 09:00 • Room 13a

IB-2 **Integrated Quantum Photonics and Simulation**
Quantum Simulation with Integrated Photonics
Fabio Sciarrino, Sapienza Università di Roma, Rome, Italy
Tuesday, 08:30 – 09:00 • Room 14a

IG-1 **Synchronization Dynamics and Opto-mechanical Self-organization**
Synchronization of N Coupled Dipoles: from Anderson to Dicke
Robin Kaiser, INLN, Valbonne, France
Tuesday, 08:30 – 09:00 • Room 21

CI-2 **Integrated Circuits**
Low Energy Consumption and High Speed Germanium-Based Optoelectronic Devices
Laurent Vivien, Université Paris Sud, Orsay, France
Tuesday, 09:00 – 09:30 • Room 4b

CM-3 / LIM **Precision Processing in Micro to Nano Scale by Ultrafast Lasers (Session jointly held with LIM)**
Delocalization of Focused Intense Ultra-short Laser Pulses in Air and Transparent Solids
Vitaly Konov, General Physics Institute, Moscow, Russia
Tuesday, 09:00 – 09:30 • Room 13a

JSV-1 **Superconducting Optics**
Producing Correlated Photons Using Superconducting Circuits
Göran Johansson, Chalmers University of Technology, Gothenburg, Sweden
Tuesday, 09:15 – 09:45 • Room 4a

CM-3 / LIM **Precision Processing in Micro to Nano Scale by Ultrafast Lasers (Session jointly held with LIM)**
Three-Dimensional Laser Lithography: Finer Features Faster
Georg von Freymann, University of Kaiserslautern, Kaiserslautern, Germany
Tuesday, 09:30 – 10:00 • Room 13a

IG-1 **Synchronization Dynamics and Opto-mechanical Self-organization**
Collective Dynamics in Optomechanical Arrays
Florian Marquardt, University of Erlangen-Nüremberg, Erlangen, Germany
Tuesday, 09:30 – 10:00 • Room 21

TF-1 **Fibre and Solid State Lasers: a Comparison from an Industrial Point of View I (Session jointly held with LIM)**
Next Generation of Ultra-High Brightness Direct Diode Lasers
Jay Liebowitz, TeraDiode Inc., Wilmington, United States
Tuesday, 14:00 – 14:30 • Room 13a

CA-6 **Ultrafast Solid-State Lasers**
Carbon Nanotube and Graphene Saturable Absorbers: a New Generic Mode-Locking Technology?
Fabian Rotermund, Ajou University, Suwon, South Korea
Tuesday, 14:00 – 14:30 • Room 14b

TF-1 **Fibre and Solid State Lasers: a Comparison from an Industrial Point of View I (Session jointly held with LIM)**
Applications and Market Segments for Ultra-High Brightness Direct Diode Lasers
Wolfgang Gries, Directphotonics Industries GmbH, Berlin, Germany
Tuesday, 14:30 – 15:00 • Room 13a

IB-3 **QIP with Light and Matter**
Trapped Ions for Simulating Interacting Spins
Christian Roos, University of Innsbruck, Innsbruck, Austria
Tuesday, 14:30 – 15:00 • Room 14a

CG-1 **Ionization Dynamics**
Looking Inside the Recollision Process
Nirit Dudovich, Weizmann Institute, Rehovot, Israel
Tuesday, 14:30 – 15:00 • Room 21

CE-5 **Optical Metamaterials and Plasmonics**
Optical Gain in Metamaterials and Plasmonic Systems: from Loss Compensation to Stimulated Emission
M.A. Noginov, Norfolk State University, Norfolk, VA, United States
Tuesday, 14:30 – 15:00 • Room Einstein

IC-1 **Atomic Quantum Simulators**
Exploring Cavity-Mediated Long-Range Interactions in a Quantum Gas
Tobias Donner, ETH Zurich, Zurich, Switzerland
Tuesday, 15:00 – 15:30 • Room 4a

TF-1 **Fibre and Solid State Lasers: a Comparison from an Industrial Point of View I (Session jointly held with LIM)**
The Power of Choice of Solid State Lasers for Successful Industrial Laser Applications
Klaus Loeffler, Trumpf Laser- und Systemtechnik GmbH, Ditzingen, Germany
Tuesday, 15:00 – 15:30 • Room 13a

TF-2 **Fibre and Solid State Lasers: a Compraison from an Industrial Point of View II (Session jointly held with LIM)**
Recent Developments in Fiber Lasers and their Applications
Michael Grupp, IPG Laser GmbH, Burbach, Germany
Tuesday, 16:00 – 16:30 • Room 13a

IB-4 **Quantum Networking**
Quantum Networks Enabled by Quantum Optics
Jeff H. Kimble, California Institute of Technology, Pasadena, United States
Tuesday, 16:00 – 16:30 • Room 14a

CE-6 **Laser Materials**
Engineering of Refractive Index and Doping Level of $KY_{1-x-y-z}Gd_xLu_yYb_z(WO_4)_2$ Layers for a Cladding-side-pumped Channel Waveguide Laser
Markus Pollnau, University of Twente, Enschede, The Netherlands
Tuesday, 16:00 – 16:30 • Room Einstein

CD-10 **Optical Devices for Data Processing**
High Speed, High Performance All-optical Information Processing Utilizing Nonlinear Optical Transients
Daniel Brunner, Instituto de Física Interdisciplinar y Sistemas Complejos (IFISC), UIB, Palma de Mallorca, Spain
Tuesday, 16:30 – 17:00 • Room 1

TF-2 **Fibre and Solid State Lasers: a Comparison from an Industrial Point of View II (Session jointly held with LIM)**
Ultrafast Solid State Laser with High Pulse Energy - New Applications
Hans Amler, Photon Energy GmbH, Ottensoos, Germany
Tuesday, 16:30 – 17:00 • Room 13a

CA-7 **High Energy Scaling Concepts**
The Opportunity of High Average and High Peak Power Lasers
John Collier, Rutherford Appleton Laboratory, Chilton, United Kingdom
Tuesday, 16:30 – 17:00 • Room 14b

IC-2 **Ultracold Atoms: Clocks, Spins and Lattices**
Matter-wave Clocks: Measuring Time and Mass, and Testing General Relativity
Holger Mueller, University of California, Berkeley, United States
Tuesday, 17:00 – 17:30 • Room 4a

TF-2 **Fibre and Solid State Lasers: a Comparison from an Industrial Point of View II (Session jointly held with LIM)**
Ultrafast Fiber Lasers and Bulk Lasers for Material Processing - A Comparison
Norman Hodgson, Coherent Inc., Santa Clara, CA, United States
Tuesday, 17:00 – 17:30 • Room 13a

JSII-1 **Photonics for Defence and Security: Spectroscopy Imaging and Detection**
QCL Based Detection of Hazardous Substances
Kumar Patel, Pranalytica Inc., Santa Monica, CA, United States
Wednesday, 08:30 – 09:00 • Room 13b

II-1 **Quantum and Graphene Plasmonics**
Quantum Effects in Tunnelling Plasmonics
Javier Aizpurua, Materials Physics Center (CSIC-UPV/EHU) and DIPC, Donostia-San Sebastián, Spain
Wednesday, 09:00 – 09:30 • Room 4a

IA-5 **Non-Classical Light**
Biological Measurement beyond the Quantum Limit
Michael Taylor, University of Queensland, Brisbane, Australia
Wednesday, 10:30 – 11:00 • Room 21

JSII-2 **Photonics for Defence and Security: Coherent Sources**
CW mid-IR OPO Based on OP-GaAs
Peter Schunemann, BAE Systems Inc., Nashua, NH, United States
Wednesday, 11:00 – 11:30 • Room 13b

CM-5 **Material Processing with Shaped Laser Beams**
Femtosecond laser micro and nano processing with nondiffracting Bessel and accelerating Airy beams
François Courvoisier, Université de Franche-Comté, Besançon, France
Wednesday, 11:30 – 12:00 • Room 14b

JSIII-1 **Light Emission and Propagation in Random Media**
Tailoring the Spatial Coherence of Random Laser
Hui Cao, Yale University, New Haven, CT, United States
Wednesday, 14:30 – 15:00 • Room 13b

CF/IE-8 **Ultrafast Fibre and Waveguide Lasers**
High-Performance Femtosecond Fiber Lasers Based on Self-Similar Pulse Propagation
William Renninger, Cornell University, Ithaca, United States
Wednesday, 15:00 – 15:30 • Room 14b

CD-12 **Solitons and Nonlinearly Driven Self-organization**
Enlightening the Rules of Disorder: from Broadband Energy Harvesting to Many Body Solitons and Light Condensation Dynamics
Andrea Fratalocchi, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia
Wednesday, 16:30 – 17:00 • Room 1

CK-6 **Plasmonic Nanostructures and Applications**
Integrated Plasmonic NanoBiosensors
Hatice Altug, Boston University, Boston, USA
Wednesday, 16:30 – 17:00 • Room 13a

JSIII-2 **Rogue Waves and Soliton Dynamics**
Solitonization of the Anderson Localization
Claudio Conti, Università Sapienza, Rome, Italy
Wednesday, 17:00 – 17:30 • Room 13b

CG-3 **Plasma Based Sources**
Single Attosecond Pulses from Plasma Mirrors
Antonin Borot, Laboratoire d'Optique Appliquée, ENSTA Paristech, Ecole Polytechnique, CNRS UMR 7639, Palaiseau, France
Wednesday, 17:00 – 17:30 • Room Einstein

II-3 **Controlling and Harvesting Light with Plasmons**
Plasmon Induced Light Harvesting
Peter Nordlander, Rice University, Houston, United States
Thursday, 08:30 – 09:00 • Room 4a

IH-3 **Controlling Light Emission at the Nanoscale**
Accessing Forbidden Transitions: Magnetic Dipoles and Electric Quadrupoles for Nano-optics
Rashid Zia, Brown University, Providence, United States
Thursday, 09:00 – 09:30 • Room Einstein

CB-7 **Semiconductor Lasers for Optical Communications**
Multi-wavelength Hybrid Silicon Lasers for Optical Interconnects
Martijn Heck, University of California, Santa Barbara, United States
Thursday, 09:00 – 09:30 • Room 13b

CH-4 **Metrology of Materials and Structures**
Phase-Space Measurement and Coherence Synthesis of Optical Beams
Jason W. Fleischer, Princeton University, Princeton, United States
Thursday, 09:30 – 10:00 • Room 4b

CH-5 **Advances in Spectroscopy II**
Precision Metrology with Coherent Dual Frequency Combs
Nathan R. Newbury, NIST, Boulder, CO, USA
Thursday, 10:30 – 11:00 • Room 4b

IH-4 **Quantum Nanophotonics**
Controlling Stationary and Flying Qubits for Solid-state Quantum Networks
Mete Atature, University of Cambridge, Cambridge, United Kingdom
Thursday, 10:30 – 11:00 • Room Einstein

IH-4 **Quantum Nanophotonics**
Optical Nonlinearity With Few-Photon Pulses Using A Quantum Dot-Pillar Cavity Device
Loïc Lanco, Laboratoire de Photonique et de Nanostructures, Marcoussis and Université Paris Diderot - Paris 7, Paris, France
Thursday, 11:30 – 12:00 • Room Einstein

CJ-11 **Special Fibres**
Inhibited-coupling Guiding Hollow Core Photonic Crystal Fibers
Fetah Benabid, Université de Limoges, Limoges, France and University of Bath, Bath, UK
Thursday, 14:00 – 14:30 • Room 1

CG-6 **FEL and High Photon Energy Science**
Non-linear FEL Science
Robin Santra, Center for Free-Electron Science, DESY, Hamburg, Germany
Thursday, 14:00 – 14:30 • Room 22

CH-6 **Optical Sensor Applications**
Optical Readout of Coupling between a Nanomembrane and an LC Circuit at Room Temperature
Tolga Bagci, QUANTOP, Niels Bohr Institute, Copenhaguen, Denmark
Thursday, 14:30 – 15:00 • Room 4b

CB-9 **High Efficiency/High Brightness Semiconductor Lasers**
Efficiency droop of GaN Lasers and LEDs

Jörg Hader, University of Arizona, Tucson, USA
Thursday, 14:30 – 15:00 • Room 13b

CK-9 **Integrated Photonic Devices**
Integrated Photonic Devices in III-V Semiconductors for Optical Communications
Mike J. Wale, Oclaro Technology Ltd., Towcester, United Kingdom
Thursday, 15:00 – 15:30 • Room 13a

CF/IE-12 **Mid Infrared and Terahertz Phenomena**
Imaging ultrafast nanoscale dynamics with a THz-pulse-coupled STM
Tyler Cocker, University of Alberta, Edmonton, Canada
Thursday, 15:00 – 15:30 • Room 14b

CF/IE-13 **Charge Dynamics in Solids**
Ultrafast Electronic Charge Dynamics in Solids Mapped by Femtosecond X-ray Diffraction
Thomas Elsaesser, Max-Born-Institute, Berlin, Germany
Thursday, 16:00 – 16:30 • Room 14b

TECH FOCUS SESSIONS

TF-1 **Fibre and Solid State Lasers: a Comparison from an Industrial Point of View I (Session jointly held with LIM)**
Tuesday, 14:00 – 15:30 • Room 13a

TF-2 **Fibre and Solid State Lasers: a Comparison from an Industrial Point of View II (Session jointly held with LIM)**
Tuesday, 16:00 – 17:30 • Room 13a

CLEO®/Europe 2013 SESSIONS

CA SOLID-STATE LASERS

CA-1 **Nonlinear Frequency Conversion**
Sunday, 09:00 – 10:30 • Room 13a

CA-2 **Visible Lasers**
Sunday, 11:00 – 12:30 • Room 13a

CA-3 **Mid-IR-Lasers**
Sunday, 14:30 – 16:00 • Room 13a

CA-4 **Yb-Doped Lasers**
Sunday, 16:30 – 18:00 • Room 13a

CA-5 **Yb-Doped Thin Disk Lasers**
Tuesday, 08:30 – 10:00 • Room 14b

CA-6 **Ultrafast Solid-State Lasers**
Tuesday, 14:00 – 15:30 • Room 14b

CA-7 **High Energy Scaling Concepts**
Tuesday, 16:00 – 17:30 • Room 14b

CA-8 **High Inversion Laser System**
Wednesday, 08:30 – 10:00 • Room 13a

CA-9 **Novel Solid-State Laser Concepts**
Wednesday, 10:30 – 12:00 • Room 13a

CA-10 **Beam Control**
Wednesday, 14:00 – 15:30 • Room 13a

CB SEMICONDUCTOR LASERS

CB-1 **Quantum Cascade Lasers and Long Wavelength Emitters I**
Sunday, 09:00 – 10:30 • Room 13b

CB-2 **Quantum Cascade Lasers and Long Wavelength Emitters II**
Sunday, 11:00 – 12:45 • Room 13b

CB/CC – 1 **Terahertz Quantum Cascade Semiconductor Lasers**
Monday, 14:30 – 16:00 • Room 13b

CB-3 **Ultrafast Semiconductor Lasers I**
Monday, 16:30 – 18:00 • Room 13b

CB-4 **Ultrafast Semiconductor Lasers II**
Tuesday, 08:30 – 10:00 • Room 13b

CB-5 **Dynamics and Chaos in Semiconductor**
Tuesday, 14:00 – 15:30 • Room 13b

CB-6 **Advanced Structures**
Tuesday, 16:00 – 17:30 • Room 13b

CB-7 **Semiconductor Lasers for Optical Communications**
Thursday, 08:30 – 10:00 • Room 13b

CB-8 **Semiconductor Vertical Cavity Surface Emitting Lasers**
Thursday, 10:30 – 12:00 • Room 13b

CB-9 **High Efficiency/High Brightness Semiconductor Lasers**
Thursday, 14:00 – 15:30 • Room 13b

CB-10 **Disk and Mid-Infrared Semiconductor Lasers**
Thursday, 16:00 – 17:30 • Room 13b

CC TERAHERTZ SOURCES AND APPLICATIONS

CC-1 **Ultra Broadband and High Terahertz Fields**
Sunday, 09:00 – 10:30 • Room 4b

CC-2 **Terahertz Imaging and Sensing**
Sunday, 11:00 – 12:30 • Room 4b

CC-3 **Terahertz Sources**
Sunday, 14:30 – 16:00 • Room 4b

CC-4 **Terahertz Field Manipulation**
Sunday, 16:30 – 18:00 • Room 4b

CD APPLICATIONS OF NONLINEAR OPTICS

CD-1 **Pulsed mid-IR Sources**
Sunday, 09:00 – 10:15 • Room 14b

CD-2 **Nonlinear Wave Mixing Phenomena**
Sunday, 11:00 – 12:30 • Room 14b

CD-3 **Nonlinear Optics in Photonic Crystal Fibers**
Sunday, 14:30 – 16:00 • Room 14b

CD-4 **Nonlinear Imaging and Spectroscopy**
Sunday, 16:30 – 18:00 • Room 14b

CD-5 **Optical Parametric Oscillators**
Monday, 11:00 – 12:30 • Room 14b

CD-6 **Frequency Conversion based on Quadratic Nonlinearities**
Monday, 14:30 – 16:00 • Room 14b

CD-7 **New Devices for Frequency Conversion based on Quadratic Nonlinearities**
Monday, 16:30 – 18:00 • Room 14b

CD-8 **New Guiding Phenomena**
Tuesday, 08:30 – 10:00 • Room 1

CD-9 **UV - Sources**
Tuesday, 14:00 – 15:30 • Room 1

CD-10 **Optical Devices for Data Processing**
Tuesday, 16:00 – 17:30 • Room 1

CD-11 **Application of Solitons**
Wednesday, 14:00 – 15:30 • Room 1

CD-12 **Solitons and Nonlinearly Driven Self-organization**
Wednesday, 16:00 – 17:30 • Room 1

CE OPTICAL MATERIALS, FABRICATION AND CHARACTERIZATION

CE-1 **Semiconductor Materials and Devices**
Monday, 11:00 – 12:30 • Room Einstein

CE-2 **Thin Films and Nanostructures**
Monday, 14:30 – 16:00 • Room Einstein

CE-3 **Photonic Nanowires - Materials and Applications**
Monday, 16:30 – 18:00 • Room Einstein

CE-4 **Optical Fibres and Waveguides**
Tuesday, 08:30 – 10:00 • Room Einstein

CE-5 **Optical Metamaterials and Plasmonics**
Tuesday, 14:00 – 15:30 • Room Einstein

CE-6 **Laser Materials**
Tuesday, 16:00 – 17:30 • Room Einstein

CE-7 **Nonlinear Materials**
Wednesday, 08:30 – 10:00 • Room Einstein

CE-8 **Lithium Niobate - Fabrication and Characterization**
Wednesday, 10:30 – 12:00 • Room Einstein

CE-9 **Functional Optical Materials**
Wednesday, 14:00 – 15:30 • Room Einstein

CF/IE ULTRAFAST SCIENCE AND TECHNOLOGY *(JOINT TOPIC AREA WITH IQEC 2013)*

CF/IE-1 **Ultrafast Electron Dynamics**
Sunday, 09:00 - 10:30 • Room 1

CF/IE-2 **CEP Control and Attosecond Phenomena**
Sunday, 11:00 – 12:30 • Room 1

CF/IE-3 **Pulse Shaping and Characterization**
Sunday, 14:30 – 16:00 • Room 1

CF/IE-4 **High-energy Ultrafast Sources**
Sunday, 16:30 – 18:00 • Room 1

CF/IE-5 **Novel Methods in Ultrafast Optics**
Monday, 11:00 – 12:30 • Room 1

CF/IE-6 **Supercontinuum Generation and Filamentation**
Monday, 14:30 – 16:00 • Room 1

CF/IE-7 **High Harmonic Generation**
Monday, 16:30 – 18:00 • Room 1

CF/IE-8 **Ultrafast Fibre and Waveguide Lasers**
Wednesday, 14:00 – 15:30 • Room 14b

CF/IE-9 **Ultrafast Optical Parametric Amplifiers**
Wednesday, 16:00 - 17:30 • Room 14b

CF/IE-10 **Ultrafast Spectroscopy**
Thursday, 08:30 – 10:00 • Room 14b

CF/IE-11 **Ultrafast Microphotonics and Plasmonics**
Thursday, 10:30 – 11:45 • Room 14b

CF/IE-12 **Mid Infrared and Terahertz Phenomena**
Thursday, 14:00 – 15:30 • Room 14b

CF/IE-13 **Charge Dynamics in Solids**
Thursday, 16:00 – 17:30 • Room 14b

CG HIGH-FIELD LASER PHYSICS AND ATTOSECOND TECHNOLOGIES

CG-1 **Ionization Dynamics**
Tuesday, 14:00 – 15:30 • Room 21

CG-2 **Ultrafast Dynamics in Attosecond Time Scale**
Tuesday, 16:00 – 17:30 • Room 21

CG-3 **Plasma Based Sources**
Wednesday, 16:00 – 17:30 • Room Einstein

CG-4 **Ultrafast High Power Lasers**
Thursday, 08:30 – 10:00 • Room 22

CG-5 **Waveform Synthesis and Control**
Thursday, 10:30 – 12:00 • Room 22

CG-6 **FEL and High PhotonEnergy Science**
Thursday, 14:00 – 15:30 • Room 22

CG-7 **Field Driven Interactions**
Thursday, 16:00 – 17:30 • Room 22

CH OPTICAL SENSING AND METROLOGY

CH-1 **Advances in Spectroscopy I**
Monday, 11:00 – 12:30 • Room 3

CH-2 **Novel Optical Sensing Systems**
Tuesday, 14:00 – 15:45 • Room 11

CH-3 **Advances in Optical Sensor Devices**
Wednesday, 16:00 – 17:15 • Room 4b

CH-4 **Metrology of Materials and Structures**
Thursday, 08:30 – 10:00 • Room 4b

CH-5 **Advances in Spectroscopy II**
Thursday, 10:30 – 11:45 • Room 4b

CH-6 **Optical Sensor Applications**
Thursday, 14:00 – 15:30 • Room 4b

CH-7 **Frontiers of Optical Sensing**
Thursday, 16:00 – 17:15 • Room 4b

CI OPTICAL TECHNOLOGIES FOR COMMUNICATIONS AND DATA STORAGE

CI-1 **Next Generation Transmission**
Monday, 11:00 – 12:30 • Room 4b

CI-2 **Integrated Circuits**
Tuesday, 08:30 – 10:00 • Room 4b

CI-3 **Optical Signal Processing**
Wednesday, 08:30 – 10:00 • Room 4b

CI-4 **Opto-Electronic Devices**
Wednesday, 10:30 – 12:00 • Room 4b

CI-5 **Advanced Concepts for Communications**
Wednesday, 14:00 – 15:30 • Room 4b

CJ FIBRE AND GUIDED WAVE LASERS AND AMPLIFIERS

CJ-1 **Fibres and Components**
Sunday, 14:30 – 16:00 • Room 14a

GENERAL INFORMATION

CJ-2 **Mode-locked Fiber Lasers**
Sunday, 16:30 – 18:00 • Room 14a

CJ-3 **Modal Instabilities in Fibres**
Monday, 14:30 - 16:00 • Room 14a

CJ-4 **Coherent Combining**
Monday, 16:30 – 18:00 • Room 14a

CJ-5 **High Peak Power Fibre Sources**
Wednesday, 08:30 – 10:00 • Room 14a

CJ-6 **Ultrafast Fibre Sources**
Wednesday, 10:30 – 12:00 • Room 14a

CJ-7 **Wavelength-Tuning and Conversion**
Wednesday, 14:00 – 15:30 • Room 14a

CJ-8 **Fibre Laser Sources**
Wednesday, 16:00 – 17:30 • Room 14a

CJ-9 **Raman Effects in Fibre Sources**
Thursday, 08:30 – 10:00 • Room 1

CJ-10 **Two Micron Fibre Cases**
Thursday, 10:30 – 12:00 • Room 1

CJ-11 **Special Fibres**
Thursday, 14:00 – 15:30 • Room 1

CJ-12 **Novel Waveguide Materials**
Thursday, 16:00 – 17:30 • Room 1

CK MICRO- AND NANO-PHOTONICS

CK-1 **Photonic Crystals**
Sunday, 09:00 – 10:30 • Room 21

CK-2 **Silicon Photonics**
Sunday, 11:00 – 12:30 • Room 21

CK-3 **Novel Materials and Structures**
Sunday, 14:30 – 16:00 • Room 21

CK-4 **Micro-nanostructured Optical Fibers**
Sunday, 16:30 – 18:00 • Room 21

CK-5 **Microstructures for Energy and Sensing**
Monday, 11:00 – 12:30 • Room 21

CK-6 **Plasmonic Nanostructures and Applications**
Wednesday, 16:00 – 17:30 • Room 13a

CK-7 **Advanced Structures for Light Sources**
Thursday, 08:30 - 10:00 • Room 13a

CK-8 **Light Management in Structures**
Thursday, 10:30 – 12:00 • Room 13a

CK-9 **Integrated Photonic Devices**
Thursday, 14:00 – 15:30 • Room 13a

CK-10 **Micro-optics and Integrated Sensors**
Thursday, 16:00 – 17:30 • Room 13a

CL BIOPHOTONICS AND APPLICATIONS

CL-1/ECBO **Biophotonics and Applications I (Session jointly held with ECBO)**
Sunday, 14:30 – 16:00 • Room 13b

CL-2/ECBO **Biophotonics and Applications II (Session jointly held with ECBO)**
Sunday, 16:30 – 18:00 • Room 13b

CL-3 **Applied Biophotonics**
Monday, 14:30 – 16:00 • Room 4b

CL-4 **Structural Imaging**
Monday, 16:30 – 18:00 • Room 4b

CL-5 **Microscopic and Sensing Technologies**
Tuesday, 14:00 – 15:30 • Room 4b

CL-6 **Mesoscopic Devices**
Tuesday, 16:00 – 17:30 • Room 4b

CM MATERIALS PROCESSING WITH LASERS

CM-1 **Laser Ablation**
Sunday, 09:00 – 10:30 • Room 14a

CM-2 **Future Applications of Laser**
Sunday, 11:00 – 12:30 • Room 14a

CM-3/LIM **Precision Processing in Micro to Nano Scale by Ultrafast Lasers (Session jointly held with LIM)**
Tuesday, 08:30 – 10:00 • Room 13a

CM-4 **Ultrafast Phenomena and Nanostructuring**
Wednesday, 08:30 – 10:00 • Room 14b

CM-5 **Material Processing with Shaped Laser Beams**
Wednesday, 10:30 – 12:00 • Room 14b

CM-6 **Transparent Material Processing**
Thursday, 10:30 – 12:15 • Room 21

CM-7 **Femtosecond Laser Writing**
Thursday, 14:00 – 15:30 • Room 21

CM-8 **Laser Processing from Polymers to Fibres**
Thursday, 16:00 – 17:30 • Room 21

JOINT CLEO®/EUROPE IQEC 2013 SYMPOSIA TOPICS

JSI NUCLEAR PHOTONICS

JSI-1 **Nuclear Photonics**
Monday, 11:00 – 12:30 • Room 2

JSII PHOTONICS FOR DEFENCE AND SECURITY

JSII-1 **Photonics for Defence and Security: Spectroscopy Imaging and Detection**
Wednesday, 08:30 – 10:00 • Room 13b

JSII-2 **Photonics for Defence and Security: Coherent Sources**
Wednesday, 10:30 – 12:00 • Room 13b

JSIII DYNAMICS OF RANDOM WAVES AND EXTREME EVENTS

JSIII-1 **Light Emission and Propagation in Random Media**
Wednesday, 14:00 – 15:30 • Room 13b

JSIII-2 **Rogue Waves and Soliton Dynamics**
Wednesday, 16:00 – 17:30 • Room 13b

JSIV QUANTUM COHERENT EFFECTS IN BIOLOGY

JSIV-1 **Quantum Coherent Effects in Biology I**
Monday, 14:30 – 16:00 • Room 21

JSIV-2 **Quantum Coherent Effects in Biology II**
Monday, 16:30 – 18:00 • Room 21

JSV SUPERCONDUCTING OPTICS

JSV-1 **Superconducting Optics**
Tuesday, 08:30 – 10:00 • Room 4a

IQEC 2013 SESSIONS

IA QUANTUM OPTICS

IA-1 **Strong Coupling**
Monday, 11:00 – 12:30 • Room 13a

IA-2 **Quantum Photonics**
Monday, 14:30 – 16:00 • Room 13a

IA-3 **Quantum Effects**
Monday, 16:30 – 18:00 • Room 13a

IA-4 **Quantum State Control**
Wednesday, 08:30 – 10:00 • Room 21

IA-5 **Non-Classical Light**
Wednesday, 10:30 – 12:00 • Room 21

IA-6 **Coherent Effects**
Wednesday, 14:00 – 15:30 • Room 21

IA-7 **Cavity-Opto Mechanics**
Thursday, 08:30 – 10:00 • Room 21

IB QUANTUM INFORMATION, COMMUNICATION, AND SIMULATION

IB-1 **Photon Pair Sources and Detectors**
Monday, 11:00 – 12:30 • Room 14a

IB-2 **Integrated Quantum Photonics and Simulation**
Tuesday, 08:30 – 10:00 • Room 14a

IB-3 **QIP with Light and Matter**
Tuesday, 14:00 – 15:30 • Room 14a

IB-4 **Quantum Networking**
Tuesday, 16:00 – 17:30 • Room 14a

IB-5 **Quantum Communication**
Thursday, 08:30 – 10:00 • Room 14a

IB-6 **Photonic Quantum Computing**
Thursday, 10:30 – 12:00 • Room 14a

IB-7 **Fundamentals of Quantum Information**
Thursday, 14:00 – 15:30 • Room 14a

IB-8 **Quantum State Characterization**
Thursday, 16:00 – 17:30 • Room 14a

IC ULTRACOLD QUANTUM MATTER

IC-1 **Atomic Quantum Simulators**
Tuesday, 14:00 – 15:30 • Room 4a

IC-2 **Ultracold Atoms: Clocks, Spins and Lattices**
Tuesday, 16:00 – 17:30 • Room 4a

ID PRECISION METROLOGY AND FREQUENCY COMBS

ID-1 **Frequency Standards and Spectroscopy**
Monday, 11:00 – 12:30 • Room 4a

ID-2 **Frequency Combs**
Monday, 14:30 – 16:00 • Room 4a

ID-3 **Precision Measurements**
Monday, 16:30 – 18:00 • Room 4a

IE/CF ULTRAFAST SCIENCE AND TECHNOLOGY *(JOINT TOPIC AREA WITH CLEO®/EUROPE 2013 ALSO LISTED AS CF/IE)*

IF FUNDAMENTALS OF NONLINEAR OPTICS

IF-1 **Pulse Manipulation with Nonlinear Optics**
Sunday, 09:00 – 10:30 • Room 4a

IF-2 **New Approaches in Nonlinear Light Propagation**
Sunday, 11:00 – 12:30 • Room 4a

IF-3 **Nonlinear Light Interactions in Quantum Systems**
Sunday, 14:30 – 16:00 • Room 4a

IF-4 **Nonlinear Optical Interactions in Structured Materials**
Sunday, 16:30 – 18:00 • Room 4a

IG DYNAMICS, SOLITONS AND SELF-ORGANIZATION

IG-1 **Synchronization Dynamics and Opto-mechanical Self-organization**
Tuesday, 08:30 – 10:00 • Room 21

IG-2 **Light Beam Propagation in Disordered and Periodic Systems**
Wednesday, 14:00 – 15:30 • Room 4a

IG-3 **Polaritons and Quantum Fluids**
Wednesday, 16:00 – 17:30 • Room 4a

IG-4 **Solitons and Dynamics in Cavities**
Thursday, 14:00 – 15:30 • Room 4a

IG-5 **Rogue Waves, Extreme Events and Nonlinear Wave Dynamics**
Thursday, 16:00 – 17:30 • Room 4a

IH LIGHT-MATTER INTERACTIONS AT THE NANO-SCALE

IH-1 **Mapping Near Fields**
Sunday, 14:30 – 16:00 • Room 22

IH-2 **Heat and Energy Control**
Wednesday, 16:00 – 17:30 • Room 21

IH-3 **Controlling Light Emission at the Nanoscale**
Thursday, 08:30 – 10:00 • Room Einstein

IH-4 **Quantum Nanophotonics**
Thursday, 10:30 – 12:00 • Room Einstein

IH-5 **Ultrafast Nanophotonics**
Thursday, 14:00 – 15:30 • Room Einstein

IH-6 **Quantum Dots. Optical Forces**
Thursday, 16:00 – 17:30 • Room Einstein

II PLASMONICS AND METAMATERIALS

II-1 **Quantum and Graphene Plasmonics**
Wednesday, 08:30 – 10:00 • Room 4a

II-2 **Plasmonics Antennas and Waveguides**
Wednesday, 10:30 – 12:00 • Room 4a

II-3 **Controlling and Harvesting Light with Plasmons**
Thursday, 08:30 – 10:00 • Room 4a

II-4 **Transformation Optics and Metamaterials**
Thursday, 10:30 – 12:00 • Room 4a

GENERAL INFORMATION

CLEO®/Europe 2013 Topics

CA - Solid-state Lasers

Advances in solid-state lasers: novel solid-state lasers and amplifiers; high-power and high-energy lasers; power-scalable laser architectures, solid-state micro-chip and nanolasers; random lasers; pulse generation; short wavelength lasers; mid-infrared lasers; tunable lasers; intracavity wavelength conversion; upconversion lasers; thermal effects and their mitigation, beam quality characterisation; linewidth reduction and wavelength tuning techniques; amplitude and frequency stability; novel pump sources and pumping configurations; laser resonator design; spectroscopic characterisation of solid-state gain media; advanced laser crystals and glasses; laser characterisation and modelling, novel solid-state lasers for system applications.

CHAIR: David Burns, *University of Strathclyde, Glasgow, United Kingdom*

CB – Semiconductor Lasers

New technology, devices and applications; semiconductor optical amplifiers; modelling of semiconductor lasers and optical amplifiers; novel characterization techniques; vertical (extended) cavity surface emitting lasers; optically-pumped semiconductor lasers, photonic crystal semiconductor lasers, micro-cavity lasers; quantum dot/dash lasers; semiconductor ring lasers; short wavelength lasers: blue and green; near-infrared long wavelength lasers; mid-infrared and far-infrared semiconductor lasers: quantum cascade lasers and THz lasers; high power and high brightness lasers; short-pulse generation, mode locking; functional applications: switching, clock recovery, signal processing; semiconductor lasers in integrated photonic circuits; nonlinear dynamics of semiconductor lasers: optical feedback, coupled lasers, optical injection, spatial and temporal instabilities, synchronization, multimode dynamics, chaos.

CHAIR: Guido Giuliani, *Università di Pavia, Pavia, Italy*

CC - Terahertz Sources and Applications

Sources for generating terahertz (far- infrared) radiation in the approximate range from 200 GHz to 10 THz. These sources can be based on various physical principles, including ultrafast time-domain systems, direct generation using terahertz lasers, and sources based on nonlinear optical mixing; applications using terahertz radiation for sensing, spectroscopy and imaging; advances in terahertz communications; new terahertz measurement techniques and instrumentation, including advances in imaging configurations, detector technologies, and terahertz optical components and waveguides; and terahertz optical measurements using surface plasmons, near-field effects, photonic crystals and metamaterials, and nonlinear optics; and terahertz imaging and modeling of plumes, turbulent air, or gaseous flows.

CHAIR: Jérôme Faist, *ETH - Institute for Quantum Electronics, Zürich, Switzerland*

CD - Applications of Nonlinear Optics

Novel applications of nonlinear optical phenomena and new devices; nonlinear frequency conversion for the UV, visible and IR; telecommunications applications and all-optical switching; all-optical delay lines and slow light; optical parametric devices such as optical parametric amplifiers and oscillators; nonlinear optics in waveguides and fibres, including photonic crystal structures and microstructured optical fibres; quasi-phasematched materials and devices; novel nonlinear materials and structures; stimulated scattering processes and devices; optical solitons and their applications; optical limiting; spatial and spatio-temporal nonlinear processes including filamentation; electro-optic and Kerr devices in crystals and semiconductors; Raman based devices including amplifiers and lasers; nonlinear probing of surfaces; multi-photon imaging and coherent Raman microscopy.

CHAIR: Ulf Peschel, *University of Erlangen-Nuremberg, Erlangen, Germany*

CE - Optical Materials, Fabrication and Characterization

Fabrication of optical materials; new crystalline and glass laser materials in bulk, fiber and waveguide geometry; micro- and nano-fabrication and -engineering techniques; optical characterisation of laser and nonlinear materials, micro-structured fiber and photonic crystal waveguides, micro- and nano-crystalline materials, single defect centres, quantum wells, quantum wires and quantum dots, nano-tubes and nano-needles, innovative organic materials.

CHAIR: Stefan Kück, *Physikalisch- Technische Bundesanstalt, Braunschweig, Germany*

CF/IE - Ultrafast Science and Technology (joint topic area with IQEC 2013)

Femtosecond and picosecond pulse generation from solid state, fiber and waveguide sources; mode-locked and Q-switched lasers; few-cycle optical pulses; ultrashort-pulse semiconductor lasers and devices; ultrafast parametric and nonlinear optical conversion; ultrashort-pulse mid-IR and THz radiation; pulse compression; super-continuum generation; dispersion compensation; ultrafast electro-optics; pulse-shaping; carrier-envelope effects; ultrafast characterization methods and measurement techniques, ultrafast optoelectronic systems and devices; applications of ultrafast technology, femtosecond pulse filamentation and applications. This topical area will also feature papers on fundamentals of ultrafast nonlinear processes and ultrafast spectroscopy in physics, chemistry, and biology; coherent control using femtosecond pulses; ultrafast microscopic techniques; electro-optic sampling; femtochemistry; ultrafast x-ray experiments and attosecond phenomena.

CHAIR: Giulio Cerullo, *Politecnico di Milano, Milano, Italy*

CG - High-field Laser Physics and Attosecond Technologies

Laser and parametric chirped-pulse amplification; generation, compression, carrier-envelope phase (CEP) stabilization and characterization of Petawatt pulses; CEP and light waveform synthesis metrology; strong field ionization and attosecond XUV/x-ray pulse generation; generation of high brightness attosecond pulses; probing of non-linear and ultrafast dynamics by intense free-electron laser pulses; optimal control of ultrafast non-linear processes; time-resolved Auger spectroscopy, XUV/soft x-ray spectroscopy, interferometry and microscopy; time-resolved Coulomb explosion imaging; strongly coupled electron-nuclear dynamics in molecules; attosecond and femtosecond electron diffraction imaging of molecular structures; dynamics in fixed-in-space molecules; ultrafast electron dynamics in bulk media, nanostructures and quantum-confined structures; probing of surface electron dynamics and physiochemical processes via time-resolved UPS/soft XPS; time-resolved XAS, XANES & EXAFS; femtosecond-laser-produced plasmas; relativistic nonlinear optics; laser-driven particle acceleration.

CHAIR: Matthias Kling, *Max Planck Institute, Garching, Germany*

CH - Optical Sensing and Metrology

Optical sensing and metrology allow for inspection of a wide range of objects, from the macroscopic to the nanometric scale. This topic area focuses on recent progress in all aspects of optical sensing and metrology, particularly in new photonic sensor technologies and applications. Papers are solicited on the following and related topics: new trends in optical remote sensing; fiber sensors using conventional and photonic crystal fibers; active multispectral and hyperspectral imaging; sensor multiplexing; novel spectroscopic techniques, applications and systems; optical precision metrology; novel measurement methods and devices based on interferometry; holography; diffractometry or scatterometry; critical dimension metrology; virtual metrology; multiscale surface metrology; UV and DUV microscopy; resolution enhancement technologies in microscopy; inverse problems; adaptive optics; phase retrieval.

CHAIR: Tomas Nasilowski, *Military University of Technology (MUT), Warsaw, Poland*

CI - Optical Technologies for Communications and Data Storage

Fibre devices including dispersion compensating and nonlinear fibres, fibre propagation and polarization effects, fibre amplifiers and fibre lasers, fibre gratings and fibre grating-based devices; semiconductor devices for generation, processing and detection of optical signals including laser sources, detectors and modulators, performance monitoring devices, switches, picosecond and femtosecond pulse sources; optical components for enabling WDM and OTDM systems including filtering and switching devices; digital signal processing and coding techniques; communication and access networks; optical sub-systems including clock recovery techniques, packet/burst switching subsystems, advanced modulation formats, subcarrier-multiplexing, receivers for coherent detection, radio-over-fiber and microwave photonic technologies, optical regeneration, switching and frequency conversion; optics in storage area networks, optical delays and buffering, holographic and 3D optical data storage, near-field recording and super-resolution, photorefractives.

CHAIR: Stefan Wabnitz, *Università di Brescia, Brescia, Italy*

CJ - Fibre and Guided Wave Lasers and Amplifiers

Waveguide and fibre laser oscillator and amplifiers including novel waveguide and fibre geometries; power scaling of waveguide and fibre lasers - including beam combination techniques (for both pump and signal beams) and new waveguide coupling approaches; upconversion lasers; nonlinear effects in waveguides and fibres - including nonlinear frequency conversion and pulse generation and compression; advances in fibre waveguide materials; fabrication techniques for doped waveguide and fibre devices; active microstructured fibre and waveguide laser devices; novel waveguide and fibre sources for industrial applications.

CHAIR: Thomas Schreiber, *Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany*

CK - Micro- and Nano-Photonics

The intensive research nowadays being carried out in the area of nanostructured materials for photonic applications has branched in many directions but keeps a common goal. This is learning and profiting from the novel phenomena occurring when light is created, transported and detected in environments where either dimensionality or size are reduced and, in particular, when light-matter interaction occurs in regions smaller than or similar to the wavelength of light. This trend has earned the term nanophotonics. Such a vast field includes but is not restricted to periodic or quasi-periodic nanostructures (photonic crystals), plasmonic and metamaterial devices; integrated optics; optical MEMS; materials aspects and fabrication techniques, including inorganic/organic nano-layers/wires, nanocrystals in periodic structures and single molecules; issues related to order/disorder in nanostructured materials; and applications tending to the integration into photonic devices for biology, lighting, communication, sensing and energy efficiency.

CHAIR: Valerio Pruneri, *ICFO-The Institute of Photonic Sciences and ICREA, Castelldefels, Barcelona, Spain*

CL - Biophotonics and Applications

This topic area addresses emerging concepts in biophotonics: single particle/molecule detection and tracking; spatio-temporal manipulation of light fields for biomedicine; enhanced linear and non linear excitation and detection; micro-fluidics, optofluidics and micro-optics; new optical probes for local measurements – including organic and inorganic nanoparticles, electric fields and temperature measurements; New routes and modalities for optical detection in biophotonics: non linear processes; spectroscopy; holography, adaptive optics, phase conjugation time reversal etc; physics of optical phenomena in biological media: scattering; coherence; polarization; symmetry and invariance. Advanced light sources and geometries for microscopy, phototherapy, surgery, biomedicine *etc.*

CHAIR: Kishan Dholakia, *University of St. Andrews, St. Andrews, Fife, United Kingdom*

CM - Materials Processing with Lasers

Fundamentals of laser-materials interactions: phase transformation, chemical reactions, diffusion processes, ablation; analytical and numerical mathematical modelling; high-power laser-materials processing: welding, cutting, surface treatment; laser ablation; thin-film growth: PLD, LCVD; direct write techniques: MAPLE, LIFT, near-field techniques; 2D and 3D micro/nano structuring; plasma related processes; laser assisted nanosynthesis; fundamentals and applications of femtosecond micromaching; ultrafast laser processing: volume modification, index engineering; laser-assisted manufacturing.

CHAIR: Boris Chichkov, *Laser Zentrum Hannover, Hannover, Germany*

IQEC 2013 Topics

IA - Quantum Optics

This topical area will feature papers on multimode and mesoscopic quantum optics; single photon emission and absorption; quantum light sources and applications; nonlocality and quantum interference; squeezing and entanglement; quantum correlations and measurement; quantum optics in circuits and cavities; quantum coherence; slow light and quantum memories; quantum imaging and quantum lithography.

CHAIR: Axel Kuhn, *Oxford University, Oxford, United Kingdom*

IB - Quantum Information, Communication, and Simulation

This topical area will highlight recent innovations in all areas of the field, from algorithm and protocol development to experimental implementations of quantum computers and quantum communication systems. Of especial interest are results in quantum simulations, quantum key distribution, quantum logic gates, entanglement distribution and distillation, conversion of information between static and flying qubits, and quantum memories. In addition, novel platforms, devices and materials for quantum information processing, such as integrated devices, nano-mechanics, ion-trap arrays, superconducting structures, quantum dots and cavity QED based quantum gates will be covered.

CHAIR: Christine Silberhorn, *Universität Paderborn, Paderborn, Germany*

IC - Ultracold Quantum Matter

This topical area will feature papers on recent developments in few- and many-body phenomena with ultracold quantum gases of atoms and molecules. These will include: quantum simulation of strongly correlated systems with artificial gauge fields, frustration, disorder and impurities; out-of-equilibrium many-body phenomena; superfluidity and thermodynamics in Bose and Fermi systems; dipolar physics with atoms and molecules; Efimov physics; quantum atom interferometry; controllable multiparticle entanglement; hybrid systems.

CHAIR: Giovanni Modugno, *LENS / Department of Physics, University of Florence, Florence, Italy*

ID - Precision Metrology and Frequency Combs

This topical area will deal with the ultimate limitations of measurement precision as imposed by the nature of quanta. It will feature papers on precision interferometry and spectroscopy, novel methods of laser spectroscopy, tests of fundamental symmetries, quantum metrology, definition of basic units, and the constancy of fundamental constants.

CHAIR: Ekkehard Peik, *Physikalisch-Technische Bundesanstalt (PTB) Braunschweig, Germany*

IE/CF - Ultrafast Science and Technology (joint topic area with CLEO®/Europe 2013)

Femtosecond and picosecond pulse generation from solid state, fiber and waveguide sources; mode-locked and Q-switched lasers; few-cycle optical pulses; ultrashort-pulse semiconductor lasers and devices; ultrafast parametric and nonlinear optical conversion; ultrashort-pulse mid-IR and THz radiation; pulse compression; super-continuum generation; dispersion compensation; ultrafast electro-optics; pulse-shaping; carrier-envelope effects; ultrafast characterization methods and measurement techniques, ultrafast optoelectronic systems and devices; applications of ultrafast technology, femtosecond pulse filamentation and applications. This topical area will also feature papers on fundamentals of ultrafast nonlinear processes and ultrafast spectroscopy in physics, chemistry, and biology; coherent control using femtosecond pulses; ultrafast microscopic techniques; electro-optic sampling; femtochemistry; ultrafast x-ray experiments and attosecond phenomena.

CHAIR: Giulio Cerullo, *Politecnico di Milano, Milan, Italy*

IF - Fundamentals of Nonlinear Optics

This topical area will feature papers on nonlinear optical phenomena including frequency conversion, wave mixing, parametric processes, electromagnetic induced transparency, lasing without inversion, slow light and dark states, temporal and spatial solitons, novel nonlinear optical materials and nano-structures, nonlinear optical fibers, media with extreme nonlinear properties, nonlinear imaging, nonlinear manipulation and characterization of short pulses.

CHAIR: Sophie Brasselet, *Fresnel Institute, Marseille, France*

IG – Dynamics, Solitons and Self-organization

This topical area features papers on the formation of self-organized spatio-temporal structures in optical systems. Topics include a large variety of phenomena such as nonlinear dynamics, pattern formation and dissipative solitons, beam filamentation, instabilities, synchronization, complex behaviour, and extreme events. Applications of these phenomena in, for example, information processing, chaos control and optical communication are also considered. Systems of interest encompass single active or passive photonic devices as well as coupled systems and networks, including novel optical systems such as polariton condensates, quantum dot lasers, microlasers, photonic crystal microcavities, optomechanical systems.

CHAIR: Thorsten Ackemann, *University of Strathclyde, Glasgow, United Kingdom*

IH – Light-matter Interactions at the Nano-scale

This topical area will feature papers on all the aspects of light-matter interaction at the nanoscale including single photon emitters (quantum dots, NV centers) and related physics (nanoantennas, microcavities), strong coupling, non-linear optics at the nanoscale, photovoltaics, sources and detectors at the nanoscale, optical forces (optical tweezers at nanoscale, Casimir and Casimir-Polder forces) and radiative heat transfer at the nanoscale.

CHAIR: Jean-Jacques Greffet, *Institut d'Optique, Palaiseau, France*

II – Plasmonics and Metamaterials

This topical area will feature papers on metal nanophotonics, including nanoantennas, plasmonic cavities and waveguides, ranging from fundamental designs and proof-of-concept studies to application-oriented work. Another thrust are metamaterials, ranging from implementations at optical frequencies to work in the THz and RF regimes. We particularly welcome papers on active plasmonics and metamaterials, systems with gain, hybrid materials assemblies, nonlinear metamaterials, and three-dimensional structures.

CHAIR: Stefan Maier, *Imperial College, London, United Kingdom*

Joint CLEO®/EUROPE-IQEC 2013 TOPICS

JSI - Joint Symposium on Nuclear Photonics

The recent development of high intensity lasers, very brilliant γ or ion beams and coherent x-ray sources opens new perspectives for nuclear physics studies in extreme conditions. Nuclear properties in presence of a very high electromagnetic field or the study of nuclear reaction, excitation, deexcitation rates in hot and dense plasmas are new domains of investigation. They are of prime importance in particular for the population of isomeric states and element synthesis in astrophysics, and for the issue of energy storage in nuclei. The aim of this symposium is to bring together theorists and experimentalists from different related areas such as direct laser-driven interactions, half-life modifications in plasmas, atomic effects in nuclear excitation and decay, UHI-driven particle sources and coherent X-ray sources.

Topics include:

- Nuclear physics in laser induced plasma (excitation processes in plasma, effect of high temperatures on astrophysics, effect of high temperatures on transmutation)
- Nuclear physics in laser fields (laser-driven excitations and review of nuclear experiments which can be carried out at XFEL)
- Nuclear physics with monoenergetic g-beams (review of experiments which can be carried out at Compton backscattering facilities)
- Techniques and facilities of UHI-driven particle beams, brilliant monoenergetic g-beams, coherent X-ray sources for nuclear physics.
- NEET and NEEC and the inverse processes with possible applications to gamma ray lasers.

CO-CHAIRS:
Franck Gobet, *Centre Etudes Nucléaires, Bordeaux, France*
Ken Ledingham, *University of Strathclyde, Glasgow, United Kingdom*

JSII - Joint Symposium on Photonics for Defence and Security

Today, worldwide security is significantly affected by the increasing globalization and the emergence of new military and non-military threats. Low-intensity conflicts, asymmetric warfare, peace keeping missions in urban theaters, border security, and the continued rise in terrorism. All this has created a need for new and innovative technical solutions where photonics are playing, and will continue to play, a key role. Optical sensing is now extending from the UV, through the visible and the infrared, into the terahertz frequency range, offering novel imaging systems with increased discrimination capabilities, and spectroscopic techniques that can help characterize suspicious materials. Laser systems have evolved which enable three-dimensional imaging, directed infrared countermeasures, and other new defense concepts. This symposium will focus on novel and improved techniques and applications of photonics for security and defence. It aims at bringing together engineers and scientists from academia, industry and government from around the world to exchange results and ideas in this field.

Topics include:
Active imaging, range gated flash imaging systems and applications, three dimensional imaging, hyper spectral, multispectral and polarimetric imaging. Automated target detection and identification. Enabling laser and focal plane arrays technologies.
Light detection and ranging, incoherent and coherent LIDAR, laser velocimetry, vibrometry and profilometry. Obstacle detection and landing aid applications. 3D scanning. LIDAR-RADAR concepts, *i.e.*, RF modulated waveforms. Enabling technologies, such as eye-safe fiber laser with arbitrary waveforms capability, novel semiconductor lasers, advanced detectors, and non-mechanical beam steering.
Spectroscopic techniques for sensing biological and chemical species, including time resolved fluorescence, absorption, Raman, and LIBS spectroscopy. Detection and imaging of illegal substances, and in vapor phase, in liquids, and as solid traces. Hidden objects detection. Stand-off detection of improvised explosive devices and antipersonnel mines. Dedicated laser and detector technologies from the UV to the THz range.
Directed energy applications such as infrared countermeasures and laser weapon concepts. Infrared laser sources incl. high power solid-state and fiber lasers developments. Incoherent and coherent beam combining concepts. Propagation and turbulences effects mitigation. Beam directors and adaptive optics. Femtosecond lasers and associated effects, *e.g.*, filamentation and remote plasma generation.

CO-CHAIRS:
Eric Lallier, *Thales Research and Technology, Palaiseau, France*
Jerry Meyer, *Naval Research Labs, USA*
Joachim Wagner, *Fraunhofer IAF, Freiburg, Germany*

JSIII - Joint Symposium on Dynamics of Random Waves and Extreme Events

There has been significant recent development in the observation and understanding of random waves and extreme event dynamics. However, the range of topical areas covering this field is extremely broad, from meteorology over optics to ultracold matter. The aim of this symposium is to present the recent progress in this field by bringing together experts from different areas such as dynamics of linear and nonlinear random waves, random surface waves, optical turbulences, instabilities in lasers cavities, pattern formation in liquid crystals, temporal extreme events in optical fibers and waveguides, as well as spatial extreme events in bulk media or rogue waves in Bose-Einstein condensates.

CO-CHAIRS:
Goëry Genty, *Tampere University of Technology, Tampere, Finland*
Stefan Skupin, *Max Planck Institute, Dresden, Germany*

JSIV - Joint Symposium on Quantum Coherent Effects in Biology

This topical area will deal with the existence and potential importance of quantum coherence in biological processes. It will include: vibrational and electronic coherence in ultrafast light-activated processes; spin effects on magnetosensitivity; ultra-high time-resolution transient absorption and ultrafast multidimensional spectroscopy; theoretical predictions on the importance of quantum coherence in biology.

CO-CHAIRS:
Philipp Kukura, *University of Oxford, Oxford, United Kingdom*
Marcus Motzkus, *University of Heidelberg, Heidelberg, Germany*

JSV - Joint Symposium on Superconducting Optics

This joint symposium highlights the growing role of superconducting materials and circuits in quantum optics. It will focus on the development of quantum circuits based on superconducting materials. These circuits provide an ideal playground for exploring atomic physics and quantum optics with microwave photons as well as a scalable blueprint for quantum computing. The symposium will also explore the wide ranging applications of superconducting detectors in quantum optics and quantum information, highlighting high performance superconducting technologies for infrared single photon detection, and implementations in applications such as quantum key distribution, quantum metrology and quantum information processing.

Co-Chairs:
Franco Nori, *RIKEN Advanced Science Institute, Saitama, Japan*
Robert Hadfield, *Heriot-Watt University, Edinburgh, United Kingdom*

JOINT SESSIONS CLEO®/Europe and LIM:

One session on Precision Processing in Micro to Nano Scale by Ultrafast Lasers (CM-3/LIM) to take place on Tuesday morning is jointly organised by CLEO®/Europe (CM committee) and LIM, and will comprise three invited papers.

CO-CHAIRS:
Michael Schmidt, *Universität Erlangen-Nürnberg, Erlangen, Germany (LIM)*
Boris Chichkov, *Laser Zentrum Hannover, Hannover, Germany (CLEO)*

Two Tech Focus sessions on Fibre and Solid-State Lasers - A Comparison from an Industrial Point of View (TF-1/LIM and TF-2/LIM) to take place on Tuesday afternoon are jointly organised by CLEO®/Europe and LIM.

CO-CHAIRS:
Michael Schmidt, *Universität Erlangen-Nürnberg, Erlangen, Germany (LIM)*
Clemens Hönninger, *Amplitude Systèmes, Pessac, France (CLEO)*

GENERAL INFORMATION

JOINT SESSIONS CLEO®/Europe and ECBO:

Two sessions on Biophotonics and Applications (CL-1/ECBO and CL-2/ECBO) to be presented on Sunday afternoon are jointly organised by CLEO®/Europe (CL committee) and ECBO.

CO-CHAIRS:
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Andreas H. Hielscher, *Columbia University, New York, USA / Jürgen Popp, Friedrich-Schiller University of Jena, Jena, Germany (ECBO)*

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CD - Applications of Nonlinear Optics
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Universita di Roma "La Sapienza", Roma, Italy

CE - Optical Materials, Fabrication and Characterization
CHAIR: Stefan Kück,
Physikalisch- Technische Bundesanstalt, Braunschweig, Germany

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CF/IE - Ultrafast Science and Technology (joint topic area with IQEC 2013)
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CG - High-field Laser Physics and Attosecond Technologies
CHAIR: Matthias Kling,
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CH - Optical Sensing and Metrology

CHAIR: Tomas Nasilowski,
Military University of Technology (MUT), Warsaw, Poland

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JSV - Joint Symposium on Superconducting Optics
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NOTES

GENERAL INFORMATION

GENERAL INFORMATION

Abstracts of the papers to be presented at CLEO®/Europe-IQEC 2013 appear in this advance programme. The presentation of the large number of contributed papers requires that there be up to ten parallel sessions during the conference. The programme includes twelve short courses, two tech-focus sessions, twelve CLEO®/Europe topics, eight IQEC topics, one joint CLEO®/Europe-IQEC topic and five joint CLEO®/Europe-IQEC symposia. The short courses and all the sessions will be held at the International Congress Centre in Munich.

The CLEO®/Europe-IQEC 2013 technical programme features 1423 presentations. These include 3 plenary, 5 tutorial, 8 keynote, 78 invited and 6 tech-focus talks. The conference also features 764 oral contributions and 559 poster presentations. Two postdeadline sessions (18 oral talks) are also added.

Conference Dates

CLEO®/Europe-IQEC 2013 will be running from **Sunday 12 May, 9:00 to Thursday 16 May, 17:30**.

2013 LASER World of PHOTONICS Opening with Plenary Talk

The official LASER World of PHOTONICS opening will take place right after the CLEO®/Europe plenary talk on **Monday 13 May, beginning from 9:30, Room 1**.

The ceremony will start with a couple of welcome addresses and will be followed by a Plenary Talk. 2013 will mark the 40th anniversary of the LASER World of PHOTONICS. Messe Munich will honour the exhibitors of the first event.

Time schedule:

09:30 – 10:00
- Welcoming by **Norbert Bargmann**, Deputy CEO of Messe München International.
- Welcoming by **Peter Loosen**, President of the Steering Committee World of Photonics Congress, Fraunhofer Institute for Laser Technology (ILT), Aachen, Germany.

10:00 – 10:45
- Plenary Talk on "**Nanoscopy with Focused Light**" by **Stefan W. Hell**, Max Planck Institute for Biophysical Chemistry, Göttingen, Germany.

Prizes and Awards

A series of Prize and Award ceremonies will take place during the Plenary session scheduled **Tuesday 14 May from 10:30 to 12:30, Room 1**.

During this session **Alain Aspect**, *Institut d'Optique, Palaiseau, France* will present a plenary talk on "Coherent Back Scattering and Anderson Localization of Ultra Cold Atoms".

The following Prizes and Awards will be presented:
- **2013 Awards of the European Physical Society – Quantum Electronics and Optics Division:**
  - (2) Quantum Electronics Prizes.
  - (2) Fresnel Prizes.
  - (4) PhD Thesis Prizes.

See EPS-QEOD Prize Ceremony brochure.

- **EPS Emmy Noether Distinction for Women in Physics**
- **OSA Fellow Awards**
- **DPG/OSA Herbert Walther Award.**

See programme in the parallel sessions.

Poster Sessions

Posters are a major attraction and provide an intimate interaction between the presenter and the viewer. To allow participants to see as many posters as possible, all CLEO®/Europe-IQEC 2013 posters will be displayed in the **Hall B0** (ground floor) next to the ICM centre. The conference will feature 5 poster sessions taking place from Sunday to Thursday after lunchtime. There will be no oral presentations during this time.

Poster time schedules:
- **Sunday:** 13:30 - 14:30 (topics CA, CC, CL, CM and IF)
- **Monday:** 13:30 - 14:30 (topics CB, CK, IB, ID and JSIV)
- **Tuesday:** 13:00 - 14:00 (topics CD, CE, CI, IC and JSV)
- **Wednesday:** 13:00 - 14:00 (topics CF/IE, CJ, II, JSII and JSIII)
- **Thursday:** 13:00 - 14:00 (topics CG, CH, IA, IG and IH)

All authors are requested to display posters on their allocated boards on the morning of their assigned poster day. In order to present their work and answer questions, they are requested to be present in the vicinity of their poster during that day between the assigned time schedules. The schedule of the poster sessions is presented on the respective pages of the advance programme.

Each author is provided with a bulletin board measuring 950 mm wide × 1755 mm high on which to display a summary of the paper. Tape to fix the posters will be provided (pins cannot be applied).

Note: A catering counter with drinks and snacks will be built up in the middle of the hall.

Speakers' Information

Duration of the talks:
- Contributed presentations are 15 minutes including discussion
- Invited presentations are 30 minutes including discussion
- Tutorial presentations are 60 minutes including discussion
- Keynote presentations are 45 minutes including discussion
- Plenary presentations are 45 or 60 minutes including discussion

Speakers are asked to check-in with the session chair in the room of their relevant session ten minutes before the beginning of the session.

During the World of Photonics Congress a network-based presentation system will be used along with a congress specific interface to ensure a high quality of all presentations.

Speakers were requested to upload their presentations prior to the conference, to a protected server of M Events Cross Media GmbH (http://www.m-events.com) until May 11, 2013. Those who did not do it are kindly requested to do it on-site in the **Speakers' Check-IN (Hall B0, ground floor, congress centre)**.

Important:
In any case all speakers need to check their presentations at the Speakers' Check-IN when they arrive to the ICM!

Please be assured that the presentations are securely protected against any external access. This applies for both the on line upload as well as the upload on-site. After the conference all submitted files will be deleted from all storage media.

Upload on-site at the Speakers' Check-IN:
Your final and complete presentations must be submitted to the Speakers' Check-IN at least three hours prior to the scheduled session.

This regulation does not apply for sessions that start before 10 a.m. - in this case we recommend uploading your final presentation one day prior to your lecture.

The Speakers' Check-IN is located in the hall B0, ground floor, congress centre and will be open during the following hours, with technicians available to assist you:

- Sunday, 12 May 2013: 07:00 - 18:30
- Monday, 13 May 2013: 07:00 - 18:30
- Tuesday, 14 May 2013: 07:00 - 18:30
- Wednesday, 15 May 2013: 07:00 - 18:30
- Thursday, 16 May 2013: 07:00 - 12:00

Note: Even though there are more than 20 uploading stations available at the Speakers' Check-IN, there might be waiting periods at peak times.

Guidelines for presentation formats:
Only presentation material in the form of MS-PowerPoint 2010 or earlier versions (*.ppt and *.pptx) with a screen ratio of 4:3 and a minimum resolution of 1024×768 will be accepted. If you are using PowerPoint 2007 or older please do not forget to submit any videos as separate files as PowerPoint will not include them into the presentation. Only MS Office standard fonts are supported. Custom fonts cannot be embedded. No provisions are being made for overhead or traditional slide presentations.

Presentation Technology:
Each meeting room is equipped with a laptop, a data-projector and podium microphone and/or wireless lavalieres. A network-based presentation system will be used along with a conference specific interface to ensure the perfect quality of all presentations. Therefore, **own laptops cannot be connected in the lecture room. All presentations must be uploaded in advance to the server**.

Laser pointers are not provided.

Internet access will not be available during the presentation.

Tech-Focus Sessions

A feature of CLEO®/Europe-IQEC 2013 will be the Tech-Focus sessions which will concentrate on a selected Fibre and Solid-State Lasers topic. It will consist of a combination of extended tutorial introductory material and authoritative technical reviews. CLEO®/Europe-IQEC 2013 will feature two Tech-Focus sessions on **Fibre and Solid-State Lasers: a Comparison from an Industrial Point of View,** jointly held with the LIM conferences and taking place on **Tuesday afternoon, Room 13a**.
All paid registrants are invited to attend the Tech-Focus sessions at no additional charge. Those wishing to attend the Tech-Focus who are NOT FULL FEE registrants must pay the one-day fee.

Short Courses

Twelve short courses at an extra cost will be presented in parallel from Sunday 12 May to Thursday 16 May 2013 (half days each). Each course is scheduled in two parts: Course Part I (1 hour ½), coffee break, Course Part II (1 hour ½). The courses are open to attendees of the World of Photonics Congress and Laser World of Photonics Exhibition subject to payment of the course fee.
Advance registration is required in order to obtain the short course material. This material will not be available for purchase during the conference.

Laboratory Tours

Guided laboratory tours through selected Munich (Garching) Laser Laboratories will take place on Friday, 17 May 2013.

The programme will be published beginning of May.
See http://www.cleoeurope.org/laboratory-tours.

CLEO®/Europe-IQEC participants can sign up for the laboratory visits during the conference: They will be invited to sign up on lists hanging on the message board located in the corridor between Entrance West and ICM.

If possible, Laboratory tour attendants should book their return flights in the evening, to be sure, that there is enough time.

Important: Transport!
Munich suburban map and respective information on "Tickets for public transport"; please glance the bottom of this site:
http://www.mpq.mpg.de/cms/mpq/en/metanavigation/contact/directions/index.html

Transportation will need to be arranged by the visitor!

To find connections from your hotel to the laboratory of your choice, please go to the Munich Public Transport Internet site (MVV) with a screen for English speakers:
http://efa.mvv-muenchen.de/mvv/XSLT_TRIP_REQUEST2?language=en
You can enter either the street or subway station near your hotel as a starting point and, respectively, the same choice, for your intended destination. Please type in the field "arrival": 9:35. You head for Garching? Please specify by typing: "Garching b München".

Reception and Social Events

Opening Reception with celebration of the 40th LASER World of PHOTONICS.
Monday 13 May 2013, from 17:30 to 22:00,
ICM Foyer, Ground Floor, Congress Centre
All exhibitors and attendees of the World of Photonics Congress are cordially invited to attend the opening reception "Bavarian evening". Enjoy music, food and cold drinks and use the atmosphere to network.

CLEO®/Europe-IQEC Conference Dinner
Tuesday 14 May 2013, beginning from 19:00,
Löwenbräukeller, Munich
The delegates registered with the CLEO®/Europe-IQEC 2013 are invited to the conference reception at a special cost of € 10,- per participant and € 35,- per additional guest. The dinner will take place at the famous Löwenbräukeller (http://www.loewenbraeukeller.com/en/) in downtown Munich. A rich selection of fine Bavarian food will be provided.

Happy Hour
Wednesday 15 May 2013, from 17:30 to 18:30,
ICM Foyer, Ground Floor, Congress Centre
The event is sponsored by the Quantum Electronics and Optics Division of the European Physical Society. Beer and pretzels will be served. Depending on the weather the event may also take place outside.

Exhibition Information

From 13 to 16 May, a major exhibition of laser and electro-optic equipment and services, LASER World of PHOTONICS 2013 will be held in conjunction with the congress.

The latest technology first hand will be exhibited. The range of products exhibited will cover innovative optical technologies:
- Laser and Optoelectronics;
- Optics;
- Manufacturing Technology for Optics;
- Sensors, Test and Measurement;
- Laser and Laser Systems for Production Engineering;
- Optical Information and Communication;
- Biophotonics and Medical Engineering;
- Imaging;
- Illumination and Energy;
- Security.

All conference registrants will have free entrance to the technical exhibition. Longer lunch breaks are organised to allow visits to the exhibition.

This combination of theory and practice, an extensive program of conferences and related events and the presence of all market leaders, decision-makers and users make LASER World of PHOTONICS unique and, at the same time, the most important international information and networking platform for the industrial, research and development sectors.

LASER World of PHOTONICS features more than 1,000 exhibitors from more than 30 countries and gives you a complete overview of all the latest trends and applications. The international research community meets the industry at the World of Photonics Congress that is held in conjunction with LASER World of PHOTONICS.

Further information on the exhibition is available at http://world-of-photonics.net/en/laser/visitors

Opening hours of the exhibition

The exhibition will be opened from Monday through Wednesday 09:00 - 17:00 and on Thursday 09:00 - 16:00.

Application Panels

The application panels organized by Messe München International are now a permanent part of the World of Photonics Congress. The series of lectures that are held in the forums of the LASER World of PHOTONICS 2013 exhibition halls bridge the gap between science and practical application.
Well-known speakers from industry and research institutes report on the latest research and development findings in the sector of optical technologies and discuss the latest challenges with you. The Applications Panels at the 2013 fair will feature a number of new sectors for photonics applications. A series of 16 panels will be held on the four days of LASER World of PHOTONICS at the trade-fair centre in Munich from May 13 – 16, 2013. Broken down into three main categories – *i.e.* Biophotonics and Medical Engineering (4 topics - Hall B1), Lasers and Laser Systems for Production Engineering (7 topics - Hall C2) and Optical Technologies (7 topics - Hall B2) – they will give attendees a comprehensive look at the latest trends and developments.

New topics include:
- Laser applications and optical diagnostics in ophthalmology
- Unmet Needs in Photonics and Medicine
- Laser–Additive Manufacturing
- Organic and Printed Electronics, Partner: OE-A
- Optronical Systems in Security Applications
- High-power diode lasers and VCSELs: most efficient and flexible beam sources

The admission is free for the Laser World of PHOTONICS participants. Some panels are held in German and some in English. For further information, see the separate brochure.

On-Site Facilities for Attendees

Online database

The entire program of events at the World of Photonics Congress is available online at http://world-of-photonics.net/en/photonics-congress/structure/conference-program-2013. The database features versatile search functions and can help you to compile a personal congress schedule that you can transfer to your PDA. It also features information about all lectures and poster shows on specific topics and about the companies with exhibits at the fair.

W-LAN Lounge

All congress participants using their own laptops/netbooks/pads have free access to the Internet in the W-LAN Lounge at the Congress Centre (ICM, ground floor, foyer).

Career Center (Main Entrance West, Booth 800)

Societies can publish job advertisements on a job board and congress attendees like students can use the career coaching. Stock position on job board is charged. Messe München and wirth + partner Consulting Group manage the LASER World of PHOTONICS Career Center.

At the Career Center, job applicants can find job, training and apprenticeship openings of LASER World of PHOTONICS exhibitors. At the same time, personnel consultants offer career coachings free of charge for Young Professionals and professionally experienced engineers and physicists on every trade fair day between 10 am and 5 pm. You can register for the career coaching either on site at the trade fair or in advance at info@wirth-partner.com or +49 (0)89 / 4599580.

Find out about the job openings already now in our on line career centre at http://www.world-of-photonics.net/en/laser/start/hidden/Jobboerse2013

Catering

All conference attendees are invited to attend the free coffee breaks as marked in the tables of the days at a glance (first pages of the advance programme). Lunches are not included in the conference fee.
A number of gastronomy facilities are available on site.
Depending on the weather the beer garden outside will be open.
Besides three permanent food-service operations in the foyer – the ICM Bistro, ICM Bar and ICM Café – you can also visit the restaurant "Am See", which can be reached directly via the 1st floor.
Snack bars with large assortments of snacks and beverages are located on the ground floor in each hall. The snack bars in the ICM are located on the ground floor and the first floor.
Full-service restaurants are located on the first floors of the East and West Entrances and above the halls.
Other **self-service restaurants** located on the **first floor** can also be found in the exhibition halls offering international cuisine:
- **Food Galery**, between Halls A1 and A2 (at the south end).
  When the weather is nice, the terrace is open. The restaurant has a seating capacity of 350.

- **Valentin's** (Bavarian cuisine), between Halls B2 and B3 (along the Expressway). Almost all of its international dishes are prepared in front of the patrons. The restaurant has a seating capacity of 370.
- **Asia Garden** (Asian cuisine), between Halls B4 and B5 (along the Expressway). The restaurant features Asian-style décor and serves wok dishes and Asian specialties. The restaurant has a seating capacity of 300.
- **Paganini** (Italian cuisine), between Halls A5 and A6 (at the south end). When the weather is nice, the terrace is open. The restaurant has a seating capacity of 300.

Many **snack bars** located in the exhibition halls offer Alpine, American, Asian, and Italian cuisine. A catering counter with drinks and snacks will be built up in the middle of the hall B0 during the poster sessions.

Other catering places can be found at the "Riem Arcaden" shopping centre located at the exit of the "Messestadt West" subway station.

Business Centre

The ICM centre offers a first-class International Business-Centre (open from Sunday to Thursday from 08:00 to 19:00 hour, closed Saturday).

Office services are currently proposed at cost:

- PC workstation with printers (applications from all MS Office packages)
- Internet access
- Laptop connections
- Prepaid wireless-LAN connect card including support (requested in case you are not in the W-LAN Lounge at the congress centre)
- E-mail (receive/send)
- Colour/black-and-white copies
- Fax (receive/send)
- Stamps

It also offers additional services:

- Information about cultural attractions in Munich
- Hotel information
- Flight/train information
- Information about Munich International Trade Fairs
- Taxi service (directly in front of ICM main entrance)

Banks

No bank-counter but ATM-machines to withdraw money (one is located between the "Messehaus" and hall A1, another is located between halls A4 and B4);
At the "Riem Arcaden" (three-minute walk from West Entrance) you will find:

- An ATM self-service machine (Münchner Bank).
- A branch office of the Sparda-Bank for customers to make deposits and withdraw funds. No currency exchange.

A ReiseBank branch is located at the Munich East train station (Ostbahnhof, Orleansplatz 11).
Other banks are also to be found in the centre of Munich or at the main railway station.

Taxi service

The taxi service is located in front of the ICM main entrance.

Airport shuttle

An airport shuttle is organised in connection with the trade fair from 12 to 16 May 2013. Cost € 8 one-way, € 13,50 round trip.
Shuttle buses directly stop in front of the West, East and North Entrances and in front of the entrance of the ICM Congress Centre.
Shuttle buses provide service between the Munich Airport and the trade-fair centre during the following schedule (every 30 minutes, on the hour and half-hour):
Airport -Trade-fair centre: 8 am - 6 pm
Trade-fair centre - Airport: 9:30 am - 7 pm
The trip takes approximately 45 minutes. Information regarding departure locations and special fares is available at all information counters at the trade-fair centre.

First-aid

First-aid stations are located in the East and West Entrances.
As a service partner of Munich International Trade Fairs, Aicher Ambulanz Union is responsible for the medical needs of guests and visitors at the trade-fair center and the ICM. Phone: +49 89 742200, +49 89 949-28103 (for first-aid emergency call), mobile: +49 171 5663514.

Pharmacy

The nearest pharmacy is "SaniPlus" in the Riem Arcaden shopping centre. It is located on the ground floor in the right portion of the building. **Opening hours:** Monday through Saturday 09:00 - 20:00.

Optician

The Optician "Fielmann" has a retail outlet in the Riem Arcaden shopping centre.

Groceries with bakery, cloakroom, and Information/travel service… are located in the Main Hall of the Entrance West leading to Halls A1 and B1.

Post office

Deutsche Post has a small branch office in the Riem Arcaden shopping centre (lower level next to the "Edeka" supermarket).

Dry cleaning

"Pan-o-tex" dry cleaning is located in the Riem Arcaden shopping centre.

Message Board

A message board will be installed. Participants should consult it daily for internal messages. It will be placed in the corridor between Entrance West and ICM.

Press Services

All members of the Press are requested to register by Messe Munich. They will receive the conference material and badges that will admit them to all technical sessions and the exhibition.

Conference Venue

CLEO®/Europe-IQEC 2013 will take place at the New Munich Trade Fair Centre at the ICM - International Congress Centre, Am Messesee 6, 81829 Munich, Germany.
Please visit http://www.messe-muenchen.de/ or http://www.icm-muenchen.de.

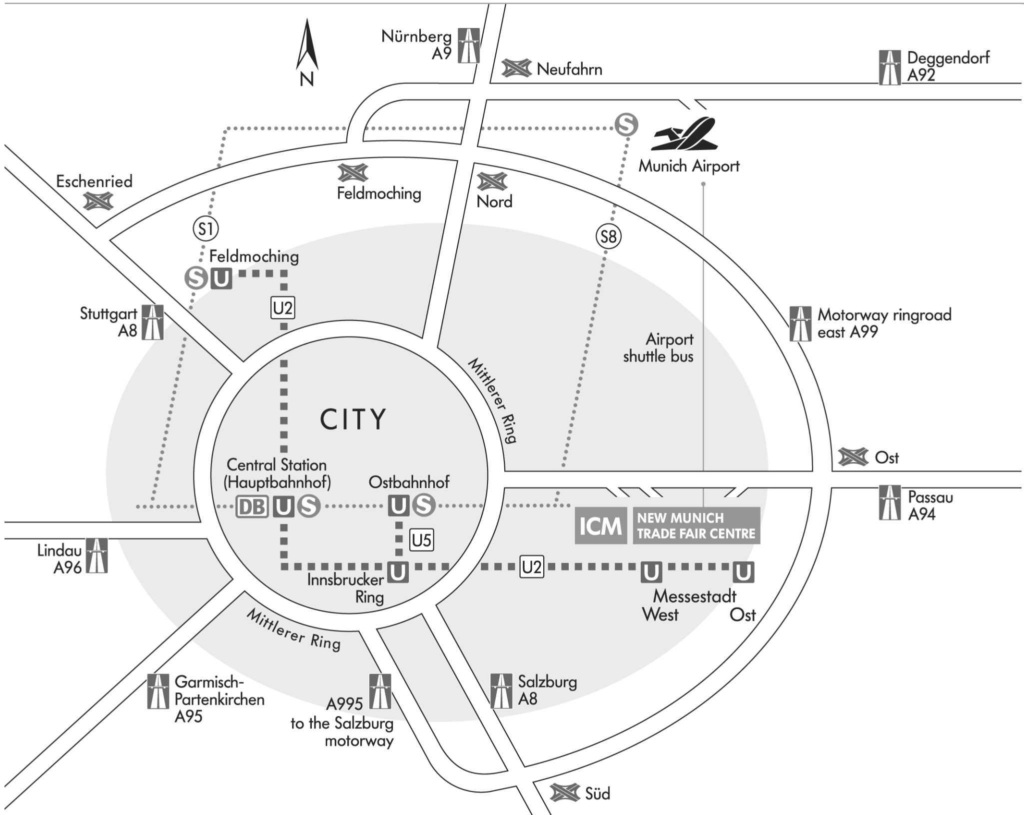
How to reach the ICM Centre

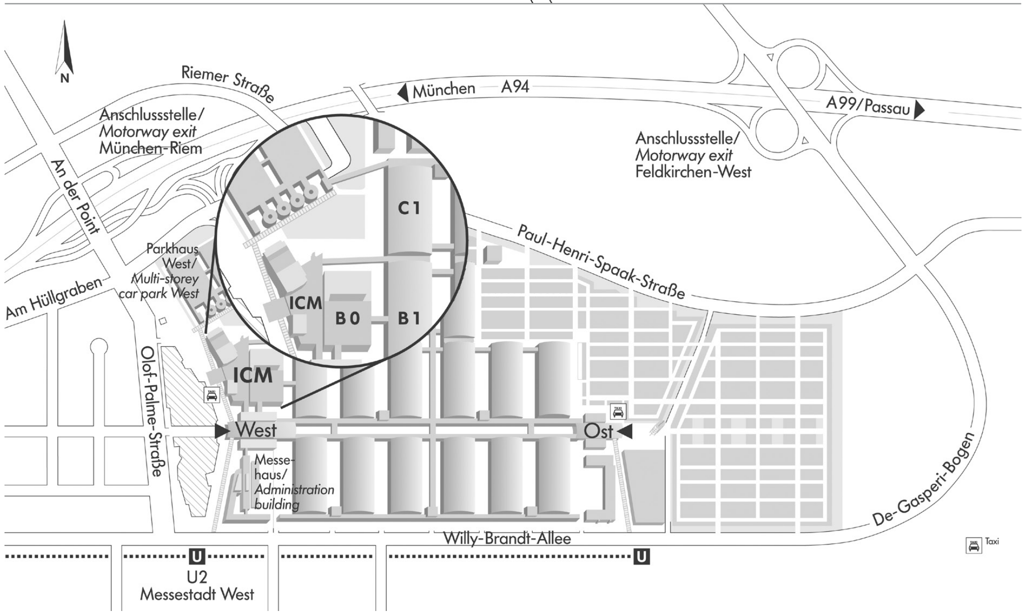
By car:
simply follow the trade fair signs from the outskirts and throughout the city to the ICM. There you will find parking space.

By train:
The ICM is about 20 minutes from Munich central station (Hauptbahnhof) by underground U2, exit "Messestadt West". The U2 subway runs from 4:12 in the morning to about 1:00 after midnight. Further information on the underground is available at http://www.mvv-muenchen.de/ or at the information counters on the trade fair grounds.

From the airport:
At Munich airport, the station for urban railway lines S1 and S8 is directly below the central area. Trains in the direction of the city centre run at

GENERAL INFORMATION





10-minute intervals. There are two routes from the airport to the ICM:

- **Route S1 / U2:** S1 from the airport to Feldmoching station or Munich Central Station (Hauptbahnhof). Change to underground U2 that takes you directly to the ICM - Messestadt West.
- **Route S8 / U2:** S8 from the airport to Munich central station (Hauptbahnhof). Change to underground U2 that takes you directly to the **ICM - Messestadt West**.

By taxi from the airport:
Taxis are available in front of the terminals. The journey takes about 35 minutes, depending on the volume of traffic (cost around 60 EUR).

By hire car from the airport:
All the major car rental firms are represented at Munich airport. The car rental centre with its own parking facilities is in front of module A, to the north of car park P6.
Please take the following route: From Munich Airport follow the signs "Messe/ICM" on the A92 in the direction of Munich to the motorway intersection Eching/Neufahrn. Then take the A9 in the direction of Munich to the motorway intersection München-Nord. Continue on the motorway ring road A99 in the direction of Salzburg to the motorway intersection München-Ost. Then take the A94 in the direction of Munich to the exit Feldkirchen-West or München-Riem. The journey takes about 35 minutes, depending on the volume of traffic.

How to take a taxi from the ICM Centre to the airport
You will find taxi ranks at all trade fair entrances and in front of the ICM going to the airport (Central Building).

Airport shuttle
An airport shuttle is organised in connection with the trade fair from 12 to 16 May 2013. Cost € 8 one-way, € 13,50 round trip.
Shuttle buses directly stop in front of the West, East and North Entrances and in front of the entrance of the ICM Congress Centre.
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The trip takes approximately 45 minutes. Information regarding departure locations and special fares is available at all information counters at the trade-fair centre.

Conference Registration

CONFERENCE REGISTRATION FEES	
EPS/OSA/IEEE Member *with the online digest*	€ 590
Non-Member *with the on line digest*	€ 710
EPS/OSA/IEEE Student Member (*) *with the online digest*	€ 195
Student Non-Member (*) *with the online digest*	€ 230
One Day without the online digest	€ 290
Student (*) extra fee for Short Course	€ 220
Regular extra fee for Short Course	€ 350
Reception ticket per participant	€ 10
Additional reception ticket per guest	€ 35
(All registration fees are exempt from Value Added Tax). (*) Applications for the student rates must include a photocopy of an official student identity card, which must also be presented on-site when collecting registration materials.	

The full week registration fee for the meeting includes admission to all CLEO®/Europe-IQEC 2013 technical sessions, as well as to those of all conferences collocated with Laser 2013. It includes admission to the technical exhibition. Digest will be online. A login and password will be given. Coffee Breaks are included (as mentioned in the days at a glance). Tickets for public transportation are not included in the fees.

One-day registration fees are available for those wishing to attend one particular session rather than the whole conference. Please note that the online digest will not be included. Coffee Breaks are included. Tickets for public transportation are not included in the fees.

Note: One-day registration tickets are activated on the day the participant goes through the gates of the congress or the fair and will only be valid for that day.

Registration forms are available on site.

Cancellation Policy

An administration charge of € 50 will be made for processing refunds. A request for cancellation must be made in writing. In the case of cancellation, requests received on or before Wednesday, 1 May 2013 will be refunded (less the administration charge). No refunds will be available if notice of cancellation is received after 2 May 2013.

Note to Exhibitors

Each exhibitor at LASER World of PHOTONICS 2013 is entitled to one free ticket to the World of Photonics Congress 2013. Each exhibitor may also purchase up to five congress tickets for a special price.

All tickets are personalized, *i.e.* they are valid only for the person whose name appears on the ticket, and they are not transferrable.

Special tickets to the World of Photonics Congress may only be ordered and used by exhibiting companies.

The official Congress Proceedings are not included in the discount price for special tickets for exhibitors.

Tickets will be pre-produced and will be available for pick-up at the World of Photonics Registration Desk in the West Entrance. Messe Munich manages the order of these tickets.

Beyond that, exhibitors must purchase any additional tickets to the World of Photonics Congress from one of the organizing scientific associations at the regular price.

Please note:
Neither the free special tickets nor the discount special tickets are available to speakers or poster presenters appearing at the World of Photonics Congress 2013. Speakers and poster presenters must register with the respective organizing association.

Registration Hours and Location

Registration for technical sessions will take place at the ICM centre. To enter the ICM centre please take the main Entrance West (named "Haupteingang WEST").
CLEO®/Europe-EQEC 2013 registration counters are located on the left side at the end of the main corridor just prior you enter the exhibition halls.

Registration Hours

Saturday 11 May	16:00-18:00
Sunday 12 May	08:00-17:00
Monday 13 May	08:00-17:00
Tuesday 14 May	08:00-17:00
Wednesday 15 May	08:00-17:00
Thursday 16 May	08:00-15:00

Conference Hours

Sunday 12 May	09:00-12:30 / 13:30-18:00 (CB-2 until 12:45)
Monday 13 May	08:30-12:30 / 13:30-18:00
Tuesday 14 May	08:30-12:30 / 13:00-17:30
Wednesday 15 May	08:30-12:00 / 13:00-17:30 and 18:45-20:15
Thursday 16 May	08:30-12:15 / 13:00-17:30 (CM-6 until 12:15)

Short Course Hours

Sunday 12 May	09:00-12:30 / 14:30-18:00
Monday 13 May	14:30-18:00
Tuesday 14 May	14:00-17:30
Wednesday 15 May	08:30-12:00 / 14:00-17:30
Thursday 16 May	08:30-12:00

Supports
All supports were distributed. No additional requests can be received.

Hotel Information

The ICM is located about 20 minutes from the Munich Central Station (Hauptbahnhof) by underground U2, exit "Messestadt West". Whether you are looking for a hotel, a guesthouse, a private accommodation, or a boarding house you should be able to find your accommodation downtown or in the surrounding area of Munich.

Messe Munich has arranged for an on-line hotel reservation which can also be used for the CLEO®/Europe-IQEC 2013 participants at:
http://www.tradefairs.com/index.html

The Hotel Guide of the Munich Trade Fairs offers you a large variety of accommodation possibilities for a pleasant stay. Whether near the ICM or centrally located and in the middle of the nightlife of Munich's trendy neighbourhoods or close to the mountains with a high recreation value - here you will find a comprehensive offer of accommodation in and around Munich as well as in the alpine upland - meeting your personal criteria.

Hotels can be directly searched and booked via the Hotel Directory.

Hotels, pensions, apartments or youth hostels in Munich can also be found at:
http://www.munich-info.de/hotels/welcome_en.html

A larger variety of rooms can be found using the links:
http://www.muenchen.de/health/Service/4Hotel/511/index.html
http://www.muenchen.de/int/en/accomodation-hotels.html

Rooms, apartments and holidays homes can be found using the following link:
http://www.checkin-muenchen.de/index.php?mms=1

Transportation in Munich

Munich offers very good transportation means (hire cars, trams, metro and buses).
Participants of the World of PHOTONICS congress who use local public transportation to get to Neue Messe Munich must buy a travel ticket, at their own expense.

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Tickets can be purchased from all bus drivers, tram drivers, automatic ticket-dispensing machines at stations (S and U-Bahn stops) and from kiosks displaying the MVV logo. Some ticket machines accept 10 € and 20 € banknotes and most will give change. Please have some small coins ready! You can select your respective language on the ticket machines.

Buy your ticket depending on the zones you will cross and the time length you will need to travel:

- **Stripe ticket (Streifenkarte):** Stamp two stripes per zone. You are allowed to change and interrupt your journey. Return and round trips are not permitted.
- **Single trip ticket:** Valid for one person for one trip. You are allowed to change and interrupt your journey. Return and round trips are not permitted. The fare depends on the number of zones passed through.
- **Single day ticket (Tageskarte):** The most popular day tickets are also available as excellent value-for-money 3-day tickets. If you want to stay for 2 days, 4 days or even longer, simply combine the 1-day ticket and 3-day tickets.
- **Partner day ticket:** Available for as many trips as you like for up to five adults together.

Fares for single day tickets

1. Inner District (Innenraum)	
white zone	€ 5,80
2. Munich XXL (München XXL)	
white and green zones	€ 7,80
3. Outer District (Außenraum)	
green, yellow, red zones	€ 5,80
4. Entire Network (Gesamtnetz)	
all zones	€ 11,20

Fare for 3-day Inner District

white zone	€ 14,30

For your trip Munich city / Munich airport you will need a stripe ticket (8 stamps) or an entire network ticket. Inner District includes the city centre (Marienplatz, Hauptbahnhof, ...) and Neue Messe Munich.

Once you have purchased your ticket, be sure to validate it by stamping it in the blue boxes you will see. This should be done prior to entering the station or immediately after boarding a bus or tram. To validate a stripe ticket (Streifenkarte) you must fold back the sections not required and insert the ticket into the validating machine (see below for number of required sections). Once you have validated your ticket, you can travel with any form of transport as long as you continue to travel in the same direction.

More information on the MVV, see:
http://www.mvv-muenchen.de/en/homepage/index.html

A subway map can be downloaded from:
http://www.travelsthroughgermany.com/website2/munichsubway.htm

Munich, Germany

The celebrated capital of Bavaria, located in the foothills of the Alps, is one of the major cities in Europe. The 1,3 million inhabitants city is famous for its science and industry environment. Munich offers fantastic opportunities for shopping, museums, theatres, art galleries and sightseeing. Its October beer festival is world famous. Tourist attractions include the Bavarian beer and South German cuisine tradition, and many half-day or one-day excursion opportunities to the nearby Bavarian Alps or places such as the fairy-tale castle of Neuschwanstein or the beautiful Tegernsee.

In May the weather is likely to be warm and the sun is likely to shine, although rain is not impossible. Munich enjoys an outstanding public transportation system, and the modern Münchner Messe complex where CLEO®/Europe-IQEC 2013 and all Laser 2013 events will be held is easy to reach from the airport, from the city centre and from most parts of the city by U-Bahn and S-Bahn lines. Shuttle bus service to the Munich airport will be available as well during most of the Laser 2013 week.

Munich's Churches:

Munich is well-known for its many churches, among them:

▸ **Frauenkirche (Church Of Our Lady),**
1 Frauenplatz,Munich

Opening hours: 07:00-19:00,Thu 07:00-20:30, Fri 07:00-18:00 (no visits during the church services).
Getting there: all S-Bahn train, U-Bahn lines 3/6 to Marienplatz

▸ **Alter Peter (Church Of St. Peter),**
1 Rindermarkt,Munich
Opening hours: daily 07:30-19:00, Wed afternoon closed (no visits during the church services).
Opening hours of the tower: Mon-Sat 09:00-19:00, Sun and holidays 10:00-19:00
Getting there: all S-Bahn trains,U-bahn lines 3/6, Bus 52 to Marienplatz

▸ **Heiliggeistkirche,**
Tal 77, 80331 Munich,
Tel. 089/22 44 02
Opening hours: 7.00-18.00 (Midday from 12.00-15.00 and no visits during the church services)
Getting there: U-Bahn lines 3/6 to Marienplatz

Munich's Museums:

▸ **Glyptothek**
Königsplatz 3, 80333 München,
Tel. 089/28 61 00
Opening hours: Tue, Wed, Fr-Su 10:00-17:00, Thu 10.00-20.00, Mo closed
Cost: Adult 3,50 €, Reduced 2,50 €, Sun 1,00 €
Getting there: U-Bahn line 2 to Königsplatz
The Glyptothek was commissioned by the Crown Prince (later King) Ludwig I of Bavaria alongside other projects as a monument to ancient Greece. It contains sculptures dating from the archaic age (around 650 BC) to the Roman era (around 550 AD).

▸ **Deutsches Museum**
Museumsinsel 1, 80538 München, Tel: 089 / 2179-0 oder 2179 433 (recorded information)

Opening hours: daily 9:00-17:00
Getting there: all S-Bahn trains, to Isartor; Tram 18, to Museumsinsel
The Deutsches Museum is the world's largest Museum of science and technology.
The laws of nature, instruments and technological

methods are presented on a scientifically high level using an entertaining way.

Also part of the Deutsches Museum: the Verkehrszentrum (featuring all kinds of vehicles - from formula 1 car to bicycle) and the Flugwerft (focussing on airplanes)

▸ **Deutsches Museum Verkehrszentrum**
Theresienhöhe 14a, 80339 München,
Tel. 89/21 79 529
Opening hours: daily 9:00-17:00, Thu 9.00-20.00

▸ **Deutsches Museum Flugwerft Schleißheim**
Effnerstr. 18, 85764 Oberschleißheim,
Tel. 089/315 71 40
Opening hours: daily 9:00-17:00
Getting there: S-Bahn line 1 to Oberschleißheim, Bus 292

▸ **Neue Pinakothek**
Barer Str. 29, Entrance at Theresienstraße, 80799 München,
Tel. 089/238 05-195

Opening hours: daily (except Mo) 10:00-17:00, Tue and Thu 10:00-20:00
Getting there: Tram 27 to Pinakothek
The museum contains outstanding works of European art and sculpture from the late 18th to the beginning of the 20th century.

▸ **Kunsthalle der Hypo-Kulturstiftung**
Theatinerstr. 15, 80333 München,
Tel. 089/22 44 12
Opening hours: daily 10:00-18:00, Thu till 21:00
Getting there: U-Bahn lines 3/4/5/6 to Odeonsplatz or Tram 19
http://www.hypo-kunsthalle.de

▸ **Villa Stuck**
Prinzregentenstr. 60, 81675 München,
Tel. 089/45 55 51 25
Opening hours: Tue-Su 10:00-17:00, Tue till 21:00, Mo closed
Getting there: U-Bahn line 4 to Prinzregentenplatz or U-Bahn line 5 to Max-Weber-Platz or Bus 53 or Tram 18 to Friedensengel
http://www.villastuck.de/

▸ **Bayerisches Nationalmuseum**
Prinzregentenstr. 3, 80538 München,
Tel. 089/211 24-1
Opening hours: Tue-Su 10:00-17:00, Mo closed, Thu 10:00-20:00
Getting there: Bus 53, Tram 17 to Haus der Kunst/Nationalmuseum, U-Bahn lines 4/5 to Lehel
http://www.bayerisches-nationalmuseum.de/Engl/b.htm

▸ **Münchner Stadtmuseum**
Sankt-Jakobs-Platz 1, 80331 München,
Tel. 089/233-223 70 and 233-255 86
Opening hours: Tue- Su 10:00-18:00 (Mondays closed)
Getting there: all S-Bahn trains to Marienplatz, U-Bahn line 3/6 to Marienplatz, U-Bahn lines 1/2 to Sendlinger Tor, Bus 52 to Viktualienmarkt, Bus 56 to Blumenstraße
http://www.muenchner-stadtmuseum.de/en.html

Munich's famous places to be visited:

▸ **Marienplatz**

The Marienplatz is named according to the column of the Virgin Mary at its centre. The statue, erected in 1638 to celebrate the end of the Swedish invasion, is topped by a gilded statue of Virgin Mary which was sculpted earlier, in 1590 by Hubert Gerhard. At each corner of the column's pedestal is a statue of a putti, created by Ferdinand Murmann. The four putti's symbolize the city's overcoming of war, pestilence, hunger and heresy.
The place is famous for its carillon in the New Town Hall Tower (Glockenspiel im Rathausturm). This is the largest carillon in Germany, with near-lifesize figures performing the traditional Coopers' Dance and a jousting match. Three times a day at 11:00, 12:00 and 17:00.
The Marienplatz is a central place for the city's Founding Festival as well as for Fasching (carnival) celebrations and the popular Christmas market. The major restaurants, coffees and shops are located in this area. Shops are completely closed on Sunday.

▸ **Königsplatz**
Commissioned by Ludwig I, this neo-Classical square boasts the Propyläen gateway and the Glyptothek, a small but enchanting collection of Greek and Roman sculpture. Also the sight of an annual summer outdoor concert series.

▸ **Isartor (Isar Gate)**
Most easterly of Munich's three remaining town gates, dating from the 14th century. Careful restoration has recreated the dimensions and appearance of the original structure. The Isar Gate accommodates the Valentin Museum.

▸ **Karlstor (Charles' Gate)**
Westerly town gate from 14th century. Incorporated at the end of the 18th century into the square known as "Stachus" (officially Karlsplatz). Today it marks one end of Munich's primary pedestrian zone.

▸ **Sendlinger Tor (Sendlinger Gate)**
Remaining towers of southerly fortifications from the 14th century.

Beer Gardens

Nothing defines Munich more than its beer. You cannot talk about one without the other and you could never fully discover Munich without at least sampling its brews. Today the Munich breweries dispense 123 million gallons of beer annually. That is why many beer gardens are located in Munich:

▸ **Augustiner-Großgaststätte**
Pedestrian Zone, Neuhauser Straße 16, 80331 Munich, Tel. 089/2 60 41 06.
The Augustiner Großgaststätte is one of the

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more traditional Munich establishments, with a history that reaches back to 1328. The Augustin Brothers began brewing something heavenly in Augustiner's back rooms up until 1855 when the actual brewing plant was moved to Landsberger Straße. Today Augustiner Großgaststätte is a traditional beer hall with a small courtyard beer garden, smack dab in the middle of Munich's Marienplatz pedestrian zone. The food is great and the beer is the best.

- **Altes Hackerhaus**
Sendlinger Str. 14, Munich,
Tel. 089/2605026, http://www.hackerhaus.de
Opening hours: 9 am to midnight daily.
Located in Munich's newspaper publishing district and near Sendlinger Tor, Altes Hackerhaus has a long history involving two of the City's most renowned beer producing families, the Hackers and the Pschorrs. An entire wall in the restaurant is dedicated to the family tree, dating back to 1738 when the first Hackerhaus was founded. Highlights include a small but comfortable interior courtyard beer garden, and an outstanding restaurant serving excellent Bavarian fare. Although average by Munich high standards, Altes Hackerhaus benefits from its proximity to the Marienplatz (just a few blocks away) and easy access from the nearby U-Bahn stop at Sendlinger Tor.

- **Chinesischer Turm (Chinese Tower)**

One of Munich's largest beer gardens, and perhaps its most famous. With more than 7,000 seats around the famous erzat Chinese pagoda in the middle of Englischer Garten (900-acre park with shaded paths, brooks, ponds and swans), this place could hardly be overlooked.
Location: Englischer Garten 3, open from 11:00 to midnight.
The park stretches from the centre of the city (near Odeonsplatz) to the northern city border.
Access: The best way to reach it is the bus No. 54 from "Muenchner Freiheit" underground station (exit at stop "Chinesischer Turm")

Munich is very famous for its **theatres** but also for its **Olympic Park** (see http://www.olympiapark.de/index.html) located Spiridon-Louis-Ring 21, 80809 Munich, Tel.: 089/30 67 - 0, Fax: 089/30 67 - 22 22
Getting there: U-Bahn line 3 to Olympiazentrum

Further information on Munich is available at http://www.muenchen.de/ (8 languages available).

Conference Management

European Physical Society
6 rue des Frères Lumière • 68200 Mulhouse, France

This programme is edited by **P. Helfenstein** and **A. Wobst**.

Language

English is the official language of the conferences.

NOTES

SHORT COURSES

CLEO®/Europe IQEC 2013 will present twelve Short Courses held in parallel. These courses will take place **from Sunday 12 May 2013 to Thursday 16 May 2013** at the ICM (Rooms 12 and 22) or the Exhibition Halls (Rooms A218 and A221). The courses are at extra cost.

Advance registration is recommended in order to obtain the short course material. This material will not be available for purchase during the conference.

The courses are intended for engineers, scientists and graduate students with some general knowledge of optics and photonics who wish to improve their detailed understanding of the particular technical domains covered. Each course is scheduled in two parts: Course Part I (90 minutes), coffee break, Course Part II (90 minutes).

Detailed Programme:

▸ SUNDAY, 9:00–12:30, Room 12

Short Course 10:

Frequency Combs and Applications

Thomas Udem,
Max-Planck-Institut für Quantenoptik, Garching, Germany

Course description:

A laser frequency comb allows the conversion of the very rapid oscillations of visible light of some 100s of THz down to frequencies that can be handled with conventional electronics. This capability has enabled the most precise laser spectroscopy experiments yet, that allowed testing quantum electrodynamics, to determine fundamental constants and to search for possible slow changes of these constants.

Using an optical frequency reference in combination with a laser frequency comb has made it possible to construct all optical atomic clocks that are now outperforming even the best cesium atomic clocks. Direct frequency comb spectroscopy by employing individual modes of the comb may be used for recording broadband molecular absorption. While this has practical relevance for sensitive trace gas analysis, frequency combs may be converted to the extreme ultra violet where no single mode laser exists.

Therefore this method might allow high-resolution laser spectroscopy in this unexplored region for the first time. Frequency combs are also used to calibrate astronomical spectrographs and might reach an accuracy that is sufficient to observe the change of the expansion rate of the universe in real time and to find Earth-like extra solar planets. I will discuss the frequency comb principles in detail and present the various applications.

Benefits and Learning Objectives:

- A short history of the frequency comb.
- Basic properties both, in the time domain and frequency domain.
- Frequency metrology.
- Time domain applications.
- Practical issues for setting up and running a frequency comb.
- Various methods of direct frequency comb spectroscopy.
- XUV frequency combs.
- Applications such as all optical clocks and in astronomy.

Intended Audience:

This course is intended to be beneficial for graduate students and industrial and academic researchers who plan to work with frequency combs.

Biography:

Thomas Udem studied physics at the University of Giessen/Germany and at the University of Washington in Seattle/USA. In 1993 he received his diploma from the University of Giessen. After that he was working towards the PhD at the Max-Planck Institute of Quantum Optics in Garching/Germany, which he received from the Ludwigs Maximilians Universität Munich/Germany in 1997. Since then he has been working at the Max-Planck Institut of Quantum Optics and at the National Institute for Standards and Technology in Boulder/USA. In 2004 he received his habilitation from the Ludwigs Maximilians Universität Munich/Germany and became a fellow of the Max-Planck Institute of Quantum Optics. His scientific work includes precision optical metrology that involves simple atomic systems such as hydrogen, opto-mechanics and precision spectroscopy with ion traps and precision astronomy. In addition he is conducting research that aims at making XUV radiation from high harmonic generation useful for high-resolution spectroscopy. In 2006 he received the Röntgen Award of the University of Giessen. He is a fellow of the Optical Society of America and the American Physical Society as well as a member of the German Physical Society.

▸ SUNDAY, 9:00 – 12:30, Room 22

Short Course 8:

Fibre Amplifiers

Rüdiger Paschotta,
RP Photonics Consulting GmbH, Bad Dürrheim, Germany

Course description:

This course begins with a general introduction to laser amplifiers, explaining the basic physical principles and properties of amplifiers, including *e.g.* four-level vs. quasi-three-level gain media, gain saturation in steady state and in pulse amplification, and amplified spontaneous emission (ASE). It then continues with more specific details for fibre amplifiers, including an overview on different amplifying ions and host media, double-clad fibres, mode areas, effective transition cross sections, influence of the pump wavelength, and ASE limitations. After a discussion of continuous-wave amplification, specific issues of pulse amplification will be discussed for the pulse duration regimes of nanoseconds, picosecond and femtoseconds. Finally, a brief overview on the physical modeling of amplifiers will be given. In order to obtain an improved qualitative and quantitative understanding of various effects, various case studies supported by numerical simulations with the software RP Fiber Power will be presented. These demonstrate, for example, the typical strong saturation effects, characteristics of ASE, differences between forward and backward pumping, issues of cladding pumping, and challenges for emission of Yb-doped amplifiers at short wavelengths.

Benefits and Learning Objectives:

- Understand the basic principles of laser amplifiers.
- Know the key properties of rare-earth-doped fibres, such as different dopant ions, effective transition cross sections, effective mode area, gain saturation characteristics, *etc.*
- Understand various techniques for alleviating various detrimental effects.
- Identify the key limitations for the performance of continuous-wave and pulsed amplifiers, and roughly quantify the typically possible performance figures.

TECHNICAL PROGRAMME

Intended Audience:
This course is intended for researchers and industry people with a basic background in laser technology, but not necessarily with a detailed expertise on optical amplifiers or fibre technology.

Biography:
Rüdiger Paschotta is an expert in laser physics, nonlinear optics and fiber technology. He originally had a career as a researcher, working at the University of Konstanz (Germany), the Optoelectronics Research Center (UK), the University of Paderborn (Germany) and ETH Zurich (Switzerland). Since mid 2005, he is working full time in his company RP Photonics Consulting GmbH, which moved to Bad Dürrheim, Germany, in 2010. He is providing technical consultancy primarily for companies being active in laser technology and related fields. Also, RP Photonics offers simulation software for fiber amplifiers and lasers as well as for various other fields in photonics.
Rüdiger Paschotta became well known also as the author of the open-access Encyclopedia of Laser Physics and Technology.

▸ **SUNDAY, 14:30 – 18:00, ROOM 12**

Short Course 4:

Applications of Photonic Crystals

Thomas Krauss,
University of St. Andrews, St. Andrews, United Kingdom

Course description:
Photonic crystals came to the fore in the early 90's due to their ability to confine light and control its flow to an unprecedented degree. The field has since made major technological advances and has evolved from a scientific curiosity to the stage where many interesting applications can be considered. The presence of photonic crystals is now felt across the entire photonics spectrum and any major photonics conference will feature them in a variety of sessions, ranging from LEDs for light extraction to solar cells for light trapping, to photonic circuits for low power optical switching and modulation, to enhanced nonlinear effects, and to strong confinement effects for optical biosensing and for quantum optics. I will provide the conceptual background for these applications. After establishing their band structure as the main framework for describing the properties of photonic crystals, I will explore the key properties that make them unique and that allow us to tailor their properties for specific applications, addressing questions such as, "What determines the wavelength response and bandwidth?"; "Why do photonic crystal cavities exhibit such a high Q-factor?"; "What is slow light and why is it interesting?"; "How can we use photonic crystals to couple light in and out of high index materials?"

Benefits and Learning Objectives:
- Understand the photonic band structure and how it relates to the physical lattice.
- Appreciate how the band structure relates to photonic functionalities and applications.
- Determine the wavelength response and bandwidth of a photonic crystal structure.
- Appreciate the origin of the strong confinement offered by photonic crystals and how extremely high Q-factors can be created in very small volumes, *e.g.* for strong light-matter interaction and for quantum optics.
- Appreciate the concept of slow light waveguides and its applications.
- Be able to design grating couplers and relate their properties to LEDs for light extraction and to solar cells for light trapping.
- For each application, appreciate the unique advantages that photonic crystals may offer.

Intended Audience:
The course is appropriate for researchers and applications engineers who have heard about photonic crystals and are considering them for specific applications, but need to understand better how they work and what functionalities they might be able to offer. The course is conceptual and intuitive and only uses mathematical tools where absolutely necessary. It only assumes an appreciation for the major concepts in photonics, such as optical modes, phase and interference effects, as well as solid-state concepts such as crystal lattices, dispersion curves and band structures.

Biography:
Thomas F. Krauss has moved from St Andrews to York University where he has started a full-time position in Jan 2013. He is in the process of setting up a State-of-the-Art nanofabrication laboratory in the York Nanocentre that is due to be completed April 2013. Krauss pioneered the development of planar photonic crystals worldwide in the 1990s and he is one of the leading researchers in the field, with 240 refereed journal publications, >900 annual citations and an "h"-factor of 50. He gives 10-15 invited presentations and chairs 2-3 conferences per year. He has led industrial projects (sponsored *e.g.* by Intel and Osram) and has coordinated a number of EU projects, *e.g.* FP5-PICCO (2000-2003) and FP6-SPLASH (2007-2010). He is a Fellow of the Royal Society of Edinburgh, the Optical Society (OSA) and the Institute of Physics.

▸ **MONDAY, 14:30 – 18:00, ROOM A218**

Short Course 9:

High Harmonic Generation and Attosecond Science

John Tisch,
Imperial College, London, United Kingdom

Course description:
The course aims to provide an overview of the exciting topic of High Harmonic Generation (HHG) and Attosecond Science from the perspective of a leading experimentalist working in the field. Specifically, the course participants will learn about the relation of HHG to other "strong-field" processes; enabling ultrafast laser technology for HHG; introduction to the theory of HHG in terms of both the single-atom response and phase-matching; details on experimental implementations of HHG; HHG dependencies on key experimental parameters; key properties of HHG radiation and comparison to other short wavelength sources; the central role of HHG in Attosecond Science, including generation and characterisation of attosecond pulse trains and isolated attosecond pulses; scientific applications of HHG, including diffraction imaging, ultrafast spectroscopy, seeding of free-electron lasers, attosecond-resolution measurements; current challenges and future perspectives for HHG.

Benefits and Learning Objectives:
- Recognise that HHG is an important short-wavelength light generation phenomenon that can arise in a strong-field laser matter interaction.

- Appreciate the enabling laser technology and understand the pivotal role that HHG plays in Attosecond Science as a proven route to generating attosecond duration light pulses.
- Comprehend the basic physical principles of HHG in terms of both the single emitter and macroscopic (phase-matching) responses.
- Understand the semi-classical 3-step recollision model of HHG.
- Be familiar with the various experimental implementations of HHG and gain an appreciation of the dependencies on key experimental parameters.
- Learn about the key properties of HHG radiation and how it relates to other short-wavelength sources.
- Gain an appreciation of the scientific applications of HHG, especially in attosecond science.
- Obtain a perspective of the current state of the art of HHG and an appreciation of important recent developments as well as trends for future research.

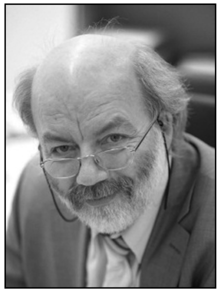
Intended Audience:
This course is aimed at researchers with little or no background in high harmonic generation or attosecond science, as well as those more familiar with the topic, who wish to improve their understanding and keep abreast of recent developments in the field and learn about some of the experimental details that don't appear in journal articles!

Biography:
John W.G. Tisch is a Professor of Laser Physics at the Blackett Laboratory, Imperial College London. His research interests are ultrafast laser physics and high-intensity laser-matter interactions, especially the generation and application of high-power femtosecond laser pulses to generate coherent x-ray pulses of attosecond duration. He is a recognised world-authority on High Harmonic Generation (HHG) and Attosecond Science and Technology and joint founder of the UK Attosecond Programme. Tisch has been an elected member of the Commission on Atomic, Molecular, and Optical Physics of the International Union of Pure and Applied Physics, and has also served on a number of international conference committees, including High Field Short Wavelength and CLEO. He was one of the Founding Chairs of the international conference series "Ultrafast Dynamical Imaging of Matter" and is Joint General Chair for the conference Ultrafast Optics IX. He is a member of the international Scientific Advisory Committee for the Extreme Light Infrastructure (ELI) European project and a Fellow of the Institute of Physics. He has dual Swiss and Australian nationality and is married with two children. In his spare time he enjoys competitive running, cycling, tennis, carpentry and playing trumpet and piano.

▸ **MONDAY, 14:30 – 18:00, Room A221**

Short Course 6:

Practical Quantum Optics



Gerd Leuchs,
University of Erlangen, Erlangen, Germany

Course description:
What does it mean if optics is quantum? Is hardcore quantum optics solely concerned with the study of fundamental physics questions or is it also useful for practical applications? The course will give answers to these questions. An introduction to quantum aspects in optics will be given and experimental demonstrations will underline some of the counter intuitive quantum phenomena. The generation, propagation and detection of quantum light are central topics. Practical quantum optics is all about noise, noise reduction and over coming established sensitivity limits in interferometry, imaging, communication and sensing. Such applications of modern quantum optical technologies will be addressed in detail. Mathematical descriptions of the light field and its interaction with matter will be given whenever necessary but emphasis is put on practical considerations. Possible limits that quantum effects may impose on or opportunities that they may offer for applications in industry in the foreseeable future will be discussed.
Experimental demonstrations at the course:
Demonstration of the different properties of classical and quantum noise.
Demonstration of the strong correlations of photon pairs generated in parametric down conversion.

Benefits and Learning Objectives:
- Understanding the quantum limitations in optics – such as in sensing, amplification and phase conjugation – and appreciating the opportunities.
- Learn the basic tools for describing quantum noise.
- Acquire the practical skills for experimenting with non classical light – generation, characterization and control.
- Learn to assess the potential benefit when attempting to exploit quantum aspects in standard optical scenarios including telecom applications.

Intended Audience:
The course is designed to appeal to an audience without prior experience in quantum optics as well as to researchers who want to refresh and be updated with current trends. This course is intended to be beneficial for graduate students and industrial and academic researchers alike having a general interest in quantum optics and its practical application.

Biography:
Gerd Leuchs studied Physics and Mathematics at the University of Cologne until 1975 and finished with the diploma degree. In 1975 he moved to the University of Munich as research associate in the group of Prof. Dr. H. Walther. His PhD-thesis in 1978 deals with the fine structure splitting of sodium Rydberg atoms. From 1979 to 1980 he was visiting fellow at the University of Colorado in Boulder, USA. In 1982 he received the Habilitation degree at the University of Munich on multiphoton processes in atoms. 1980 he obtained a Feodor-Lynen Stipend of the Alexander-von-Humboldt Foundation and, from 1983 to 1985, a Heisenberg-Fellowship of the Deutsche Forschungsgemeinschaft, which he used to work at JILA and NIST in Boulder. From 1985 to 1989 he led the gravitational wave detection group of the Max-Planck-Society in Garching. There one focus of his research was the generation of quantum noise reduced light beams and their application towards the improvement of the sensitivity of laser interferometers. From 1990 to 1994 he served as Technical Director of Nanomach AG at Buchs in Switzerland. After having spent 5 years in industry he took over the chair of optics at the University of Erlangen-Nuremberg and continued to do research on quantum noise reduced light, this time focussing on soliton pulses in optical fibers including world first demonstrations. This led to the generation of entangled intense beams with applications in quantum information and quantum key distribution. He discovered, that quantum cryptography

with intense coherent beams has no in principle distance limitation that came as a surprise. Since 1994 he is Professor of Physics at the University Erlangen-Nuremberg. In 2000 he started the Center of Modern Optics at Erlangen. In 2004 he was appointed Fellow of the Optical Society of America and Fellow of the Institute of Physics, UK. In 2005 he won the Quantum Electronics Prize of the European Physical Society and was appointed member of the German Academy of Science Leopoldina. From 2004 to 2008 he served as director of the 'Max Planck Research Group of Optics, Information and Photonics'. After two successful scientific evaluations the Max Planck Society decided to establish the new Max Planck Institute for the Science of Light at Erlangen and since January 2009 Gerd Leuchs is one of the directors of the Max-Planck Institute for the Science of Light (MPL).
Gerd Leuchs published more than 250 publications in peer reviewed scientific journals and numerous invited papers; he is editor of 3 books and inventor of 10 patents. In 2012 he received the cross of merit of the Federal republic of Germany. Since 2012 he is Adjunct Professor at the University of Ottawa in Canada.

▸ **TUESDAY, 14:00 – 17:30, ROOM A218**

Short Course 12:

Ultrafast Lasers and Applications

Frank Wise,
Cornell University, Ithaca, United States

Course description:
The course will provide a self-contained overview of ultrafast optical techniques. After a brief review of the fundamental linear and nonlinear processes, the propagation and generation of ultrashort light pulses will be covered. Pulse formation in important solid-state and fiber lasers and amplifiers will be described. The achievable performance of each device will be discussed along with the factors that limit the performance. Applications to the generation of electromagnetic pulses in new frequency regimes (terahertz and ultrafast x-rays pulses, *e.g.*) will be touched on briefly. Techniques for the measurement of short pulses will be described. Example applications will include studies of ultrafast phenomena in solids and molecules, nonlinear microscopies for biological imaging, and generation of frequency combs.

Benefits and Learning Objectives:
Students will
- Learn how linear and nonlinear wave processes govern the formation and propagation of ultrashort pulses.
- Understand techniques for measuring ultrashort pulses.
- Become familiar with the key parameters of practical short-pulse sources.
- Learn the basic features of ultrafast-optical measurements.
- Gain an overview of the field of ultrafast science, including recent developments.

Biography:
Frank Wise received a BS degree from Princeton University, an MS degree from the University of California-Berkeley, and a PhD degree from Cornell University. Since 1989 he has been on the faculty in Applied Physics at Cornell. He has 25 years of experience developing sources of ultrashort pulses and using them to measure ultrafast phenomena in semiconductors, molecules, nanostructures, and glasses. He is an author or co-author on about 200 papers in refereed journals and holds 10 patents. Highlights of his research include the first time-domain observation of intramolecular vibration. In recent years his group has developed new pulse-shaping techniques for femtosecond fiber lasers, which have led to order-of-magnitude increases in the pulse energy over prior designs. This work includes lasers that support self-similar evolution or recently-identified dissipative solitons. Wise developed the first commercial femtosecond laser, in 1986, and this led to the creation of Clark Instrumentation, Inc. (now Clark-MXR, Inc.) to market femtosecond lasers and associated instruments. His group is now transferring ultrafast fiber-laser technology to industry.

▸ **TUESDAY, 14:00 – 17:30, ROOM A221**

Short Course 11:

Silicon Photonics

Dries Van Thourhout,
Ghent University, Ghent, Belgium

Course description:
The course will discuss both fundamentals and applications of silicon photonics. Silicon photonics is rapidly emerging as an attractive platform for realizing cheaper photonic integrated circuits. Active optical cables based on silicon photonics are now already being employed in some of the highest performance supercomputers and several major semiconductor companies have announced activities in this domain.
The course will start with explaining the reasons for this sudden interest and the possible advantages of the platform. Next the fundamentals of the waveguide platform and its performance will be discussed (straight and bend waveguides, filters, fiber-chip coupling …). Subsequently we will also discuss more advanced devices such as detectors, high-speed modulators and lasers. In each case we will also touch upon the problems that still need to be resolved and give a comprehensive overview of the current state-of-the-art.
In a second part we will discuss on the integration in a standard CMOS processing environment and on different approaches to integrate silicon photonics circuits with optical circuits.
Finally we give a review of current and future applications, in optical communications, optical interconnect and optical sensing.
The course will contain extensive references for further study.

Benefits and Learning Objectives:
- Understand why silicon photonics forms a promising platform for realizing densely integrated photonic integrated circuits.
- Understand the operation of basic (splitters, filters, couplers) and more advanced (detectors, modulators, lasers) silicon photonics devices.
- Understand the main challenges still to be resolved.
- Get insight in the different approaches to combine silicon photonics with electronics.
- Get insight in the fabrication technology and in possibilities for getting processed devices in a cost-effective way, *e.g.* though the epixfab multiproject wafer service.
- Understand for what type of applications silicon photonics may form a suitable technology platform.

Intended audience:
The course targets members from academia and industry who want to get a comprehensive review of current state of the art in silicon photonics and get insight in its advantages and challenges. It is intended for researchers with little or no background in silicon photonics as well as those with a more specialist view who want to get a broader understanding of the emerging developments in the field. The course in particular could benefit those wanting to get insight in the question "is silicon photonics the solution for my problem?"

Biography:
Dries Van Thourhout got his PhD in applied physics from Ghent University in 2000 and subsequently spent 2 years at Bell Laboratories, Crawford Hill, NJ US. Currently he is a professor at Ghent University and associated with imec, Europe's largest nano-electronics research centre. He has extensive experience in integrated optics, silicon photonics and heterogeneous integration on silicon photonics. He has worked on fundamental research topics (such as optomechanics and nanocrystals) but has also been involved in more application-oriented projects such as the EU projects WADIMOS (optical interconnect) and SMARTFIBER (silicon photonics read out chip for fibre bragg sensing), which he is coordinating. He is also strongly involved in the EU funded integrated project HELIOS, which covers the whole value chain of silicon photonics. He has authored or coauthored over 150 journal publications, over 300 conference contributions and over 10 patents. He has given tutorials on silicon photonics at major conferences such as OFC, ACP and CLEO. He is associated reviewer for IEEE PTL and holder of an ERC starting grant. In 2012 he was awarded with the "Laureate of the Academy" prize of the Belgian Academy of Sciences.

▸ **WEDNESDAY, 8:30 – 12:00, ROOM A218**

Short Course 1:

Ultrashort Pulse Characterization

Selçuk Aktürk,
Istanbul Technical University,
Istanbul, Turkey

Course description:
The course will start with a quick introduction to Ultrafast Optics, Nonlinear Optics and fundamentals of pulse characterization. Then, characterizations methods from the most basic (*i.e.* autocorrelations) to recent and advanced ones will be covered in detailed. Applicability, advantages and limitations of various approaches will be reviewed.
Specifically, the course participants will learn about the basic principles and limitations of autocorrelation and interferometric approaches; complete intensity and phase measurement using more advanced techniques such as Frequency Resolved Optical Gating (FROG), Spectral phase interferometry for direct electric-field reconstruction (SPIDER) and related methods. Particular considerations for measurements in extreme cases such as near-single-cycle regime and very complicated temporal structures will be reviewed. Finally, extensions of the methods to include spatial evolutions and complete spatio-temporal pictures will be covered.

Benefits and Learning Objectives:
- Understand the basic principles of Ultrafast Optics and Nonlinear Optics.
- Understand the basics of ultrashort pulse characterization.
- Learn the basics of autocorrelation and Interferometric autocorrelation.
- Learn the basics of intensity and phase measurements with more advanced techniques.
- Obtain a detailed understanding, applicability and limitations of commonly used methods.
- Identify the critical issues, relevant to measurements of pulses in the single-cycle regime.
- Obtain an understanding of spatio-temporal dynamics of femtosecond pulses.
- Learn the necessary techniques for spatio-temporal pulse measurements.
- Obtain the relevant practical skills for building of pulse characterization devices.
- Obtain an appreciation for recent trends and advances in the area of pulse characterization.

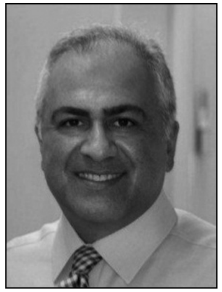
Intended audience:
This course is intended for researchers working with fundamental or applied aspects of Ultrafast Optics, in both academic and industrial institutions. Basic background and familiarity in Ultrafast Optics will be sufficient. Ultrashort pulse characterization methods will be covered from basic concepts to advanced techniques.

Biography:
Selçuk Aktürk received his BS degree in Physics from Bilkent University in Ankara, Turkey (2001), and PhD degree in Physics from Georgia Institute of Technology in Atlanta, Ga, USA (2005). He worked as a post-doc researcher at GaTech and Research Scientist at Swamp Optics LLC until 2006. He continued his post-doctoral research at Laboratoire d'Optique Appliquée, Ecole Polytechnique – ENSTA in Palaiseau, France from 2006 to 2009. Since April 2009, he is at the Istanbul technical University, Department of Physics, currently at Associate Professor level.
Selçuk Akturk's research activities involve ultrashort pulse characterization in time and space, of interactions of high intensity laser pulses with matter, and laser material processing. He co-authored about 40 peer-reviewed journal articles and numerous conference proceedings. His achievements were recognized by several awards from institutions including Georgia Institute of Technology, Turkish Academy of Sciences, The Abdus-Salam International Centre for Theoretical Physics and International Commission for Optics. He is a member of Optical Society of America and SPIE.

▸ **WEDNESDAY, 8:30 – 12:00, ROOM A221**

Short Course 3:

Optical Parametric Oscillators



Majid Ebrahim-Zadeh,
The Institute of Photonic Sciences (ICFO),
Barcelona, Spain

Course description:
This course provides an overview of optical parametric oscillators (OPOs), from basic operation principles to advanced devices. The course will begin with a description of the fundamental concepts in nonlinear optics and frequency conversion, followed by a discussion of OPO devices, an overview of the latest advances in OPO technology, and applications. The discussion will cover OPOs operating in all temporal regimes, from the continuous-wave (cw) to the ultrafast femtosecond time-scales.
Specifically, the course participants will gain knowledge of the basic principles of nonlinear frequency conversion and optical parametric

generation; phase-matching, amplification and tuning; OPO design issues, including nonlinear material and pump laser selection criteria; OPO operation in different time-scales, generic device architectures, pumping and resonance configurations; cw OPOs: singly-resonant, pump-enhanced, doubly- and triply-resonant oscillators, pump power threshold and frequency behaviour, frequency tuning and control, solid-state, fiber, and semiconductor disk laser pumping, visible to mid-IR generation, novel device architectures; pulsed OPOs: operating principle, threshold condition, compact all-solid-state oscillators, high- and low-energy devices, single-mode operation, UV to mid-IR and THz generation; synchronously-pumped OPOs: picosecond OPOs: high-repetition-rate cw and pulsed oscillators, solid-state, Ti:sapphire and fiber laser pumping, birefringent and quasi-phase-matched devices, UV to mid-IR generation; femtosecond OPOs: Ti:sapphire, solid-state, and fiber-pumped devices, collinear and noncollinear pumping, birefringent and quasi-phase-matched oscillators, spectral and temporal control, UV to mid-IR generation; applications of OPO devices in spectroscopy, trace gas sensing, imaging, frequency synthesis and comb generation; commercial developments in OPO technology.

Benefits and Learning Objectives:

- Understand the basic principles of optical parametric generation and amplification of light.
- Learn the operating principles of optical parametric devices, in particular optical parametric oscillators (OPOs).
- Obtain an understanding of nonlinear gain, phase-matching, operation threshold, device architectures, resonator configurations, tuning, spectral and temporal behaviour.
- Identify the critical issues in the design of optical parametric devices, including material and pump laser selection.
- Acquire the required skills and apply the necessary procedures in the practical implementation of OPO devices in cw, pulsed, picosecond and femtosecond operation.
- Learn the necessary techniques for spatial, spectral, and temporal control of OPO devices in differerent operating regimes.
- Gain a perspective of current OPO technology, the important recent developments in the field, as well as novel and emerging applications of OPO sources.

Intended Audience:

This course is intended for researchers with little or no background in OPOs, as well as those more familiar with the subject area, who wish to enhance their understanding and update their knowledge of the latest developments in OPO device technology. The course will benefit graduate students and other industrial and academic researchers already involved or in early stages in OPO development.

Biography:

Majid Ebrahim-Zadeh is an ICREA (Institucio Catalana de Recerca i Estudis Avancats) Professor at ICFO-The Institute of Photonic Sciences, Barcelona, Spain. He has been active in the advancement of nonlinear frequency conversion technology and parametric sources for over 20 years. His contributions to the field have led the realization of new generations of innovative light sources from the UV to mid-IR and in all time-scales, from continuous-wave to ultrafast picosecond and femtosecond regime. He has published over 450 journal papers and peer-reviewed communications, including 70 invited papers and 11 post-deadline papers at major international conferences. He has edited 2 books and has authored 11 major invited book chapters and reviews in volumes such as Science, OSA Handbook of Optics, Springer, Handbook of Laser Technology and Applications, Laser and Photonics Review, and Phil. Tans. Roy. Soc. A (2003). He has been a regular instructor of the short course on OPOs at CLEO/USA since 1997 and at CLEO/Europe since 2007.

Majid Ebrahim-Zadeh has served more than 40 times on the technical, organizing, advisory, and steering committees of major international conferences and has chaired 3 international conferences. He has served as advisory editor of Optics Letters, guest editor of J. Opt. Soc. Am. B, topical editor of Optics Letters, associate editor of Advances in Nonlinear Optics, and associate editor of IEEE Photonics Journal, and serves as the current Chair of Nonlinear Optics Technical Group at OSA. Majid Ebrahim-Zadeh is the co-founder, president and chief scientist of Radiant Light (www.radiantis.com), a company he created from his research laboratory in Barcelona in 2005. He is a recipient of Innova Prize for technology innovation and enterprise (Spain: 2004), Berthold Leibinger Innovationspreis (Germany: 2010), and a fellow of OSA and SPIE.

▸ **WEDNESDAY, 14:00 – 17:30, Room A218**

Short Course 2:

Optical Coherence Tomography and Applications

Wolfgang Drexler,
Medical University Vienna, Vienna, Austria

Course description:

This course aims to provide a comprehensive, focused overview of optical coherence tomography (OCT) from basic operation principles to advanced state-of-the-art technology. The course introduces OCT technology and applications not only from an optical and technological viewpoint, but also from biomedical and clinical perspectives. The different parts of the course are presented in a style comprehensible to a broad audience. The course will begin with a discussion of fundamental OCT concepts, key technological components (broad bandwidth and swept source laser technology, high speed detection technologies) parameters (imaging resolution, imaging speed, penetration depth, imaging sensitivity), critical design issues and data analysis and signal post processing in OCT leading to a review of the current state-of-the-art OCT technologies (commercial and scientific).

Multispectral functional extensions of OCT (Doppler OCT, Doppler angiography, spectroscopic OCT, OCT elastography, optophysiology) as well as contrast enhanced OCT (polarization sensitive OCT, contrast agents in OCT), hybrid multimodal OCT imaging approaches (adaptive optics OCT; OCT/multiphoton microscopy; OCT/photoacoustic tomography; OCT/fluorescence imaging; OCT/Coherent Anti-Stokes Raman Scattering) and their (bio)medical and nonmedical applications will also be presented. Finally OCT technology transfer, OCT market and the economic impact of OCT as well as possible future directions of OCT will be discussed.

Benefits and Learning Objectives:

- Understand the basic principles of OCT (time domain OCT, spectral/Fourier domain OCT, swept source OCT, full-field OCT, digital holoscopy)

- Obtain an appreciation for limitations of different OCT technologies
- Gain a perspective of current light source technologies in OCT
- Obtain an overview of state-of-the-art OCT developments including ultrahigh speed and resolution, functional, contrast enhanced, hybrid multi-modal OCT
- Presentation of biologic, clinical and nonmedical applications of OCT
- Get insight into the OCT market and technology transfer as well as possible future directions

Intended Audience:
This course is intended for researchers with background in optics, biophotonics and optical imaging (especially optical coherence tomography - OCT) as well as for those familiar with the subject area who wish to enhance their understanding and update their knowledge of the emerging developments in this field. The course will benefit researchers in both industry and academia and will be of interest not only to physicists, scientists and engineers, but also to biomedical and clinical researchers from different medical specialties.

Biography:
Wolfgang Drexler received his MS and PhD in Electrical Engineering in 1991 and 1995, respectively, at the Technical University of Vienna, Austria. From 2006 to 2009 he was a Full Professor of Biomedical Imaging at the School of Optometry and Vision Sciences at Cardiff University, Wales, UK. Since 2010 he is an Honorary Distinguished Professor at Cardiff University, UK. Since October 2009 he is a Full Professor of Medical Physics and the Head of the Center for Medical Physics and Biomedical Engineering at the Medical University of Vienna, Austria and is also Director of the Christian Doppler Laboratory for Laser Development and their Application in Medicine since 2011. He spent 2 years at the Massachusetts Institute of Technology (MIT), Cambridge, USA, received the Austrian START Award from the Austrian Science Fund in 2001, the COGAN Award from ARVO in 2007, the Fear Memorial Award in 2008, the Gabriel Coscas Medal in 2009, the EVER Acta Silver Medal in 2010, the DOG's Innovator's Award in 2011 as well as the Edridge Green Medal from The Royal College of Ophthalmologists in 2012.
He is a member of the Austrian Academy of Science and has published more than 155 publications (including Nature Medicine and PNAS) in peer reviewed journals and is first, co-author or corresponding author of more than 400 conference proceedings or abstracts resulting in a h-index of 49. His group's publications have been cited more than 7700 times in the last 10 years with more than 900 citations in years 2008, 2010 and 2011. He is (Co)Editor of 11 books, including "Optical Coherence Tomography: Technology and Applications" (2008). Wolfgang Drexler gave more than 160 invited or keynote talks since 2000 and has accomplished more than € 8.7 million research grant income in the last decade.

▸ **WEDNESDAY, 14:00 – 17:30, ROOM A221**

Short Course 7:

Laser Tweezers and Applications

Miles Padgett,
University of Glasgow, Glasgow, United Kingdom

Course description:
This course is intended for researchers with little or no background in Laser Tweezers as well as for those familiar with the subject area wishing to enhance their understanding and update their knowledge of the field. The course will benefit researchers in both industry and academia.
The course will provide an overview of Laser Tweezers starting from their basic operational principles to advanced systems that use spatial light modulators to trap and move many objects simultaneously. The course will cover the fundamental concepts and the critical design issues for anyone wishing to build or modify a tweezers system.
Specifically, the course participants will learn about the pros and cons of various optical configurations; strategies for multi-trap control; algorithms for holographic beam formation; user interfaces and options for high-speed position and force measurements. A guide will be given to free to down-load software for hologram design and spatial light modulator control.
We hope also to exhibit a commercial system with input from the suppliers to answer questions regarding possible customisation.

Benefits and Learning Objectives:
- Understand the basic principles of Laser Tweezers.
- Compare and contrast the various configurations for optical manipulation.
- Understand the benefits and restrictions of different trap steering approaches.
- Consider the pros and cons of various algorithms for hologram calculation and control of spatial light modulators.
- Review the various options for tweezers-human interface.
- Examine how high-speed video can be employed to give both force and position measurement.
- Consider various example applications and what tweezers can do that other technologies cannot.

Biography:
Miles Padgett is Professor of Optics in the School of Physics and Astronomy at the University of Glasgow. He heads a 15-person team covering a wide spectrum from blue-sky research to applied commercial development, funded by a combination of Miles Padgett is Professor of Optics in the School of Physics and Astronomy at the University of Glasgow. He heads a 15-person team covering a wide spectrum from blue-sky research to applied commercial development, funded by a combination of government charity and industry. In 2001 he was elected to Fellowship of the Royal Society of Edinburgh. In 2007/8 he was a Leverhulme Trust, Royal Society Senior Research Fellow. From 2009 he holds a Royal Society/Wolfson Merit Award. In 2011 he was appointed to the Kelvin Chair of Natural Philosophy and became a Fellow of the Optical Society. In 2008 Padgett was awarded the UK Institute of Physics, Optics and Photonics Division Prize for a "distinguished record of achievement in research that spans fundamental aspects of optical angular momentum and applied optical sensors". In 2009 Padgett was awarded the Institute of Physics, Young Medal "for pioneering work on optical angular momentum". Padgett is recognised for his studies in the field of optics and in particular of optical angular momentum. His contributions include an optical spanner for spinning micron-sized cells, use of orbital angular momentum to increase the data capacity of communication systems and an angular form of the quantum Einstein-PodolskyRosen (EPR) paradox. With respect to Optical Tweezers, Padgett's Group and their collaborators have focused on the use of spatial light modulators for forming multiple traps coupled to various user interfaces for high-speed interactive use.

▸ **THURSDAY, 8:30 – 12:00, Room A218**

Short Course 5:

Laser Beam Analysis, Propagation and Spatial Shaping

James R. Leger,
University of Minnesota,
Minneapolis,
United States

Course description:
The propagation and focusing properties of real laser beams are greatly influenced by beam shape, phase distortions, degree of coherence, and aperture truncation effects. The ability to understand, predict, and correct these real-world effects is essential to modern optical engineering. Attendees of this course will learn a variety of techniques for measuring and quantifying the important characteristics of real laser beams, be able to calculate the effects of these characteristics on optical system performance, and explore a variety of beam shaping techniques to optimize specific optical systems.
The course starts with a basic and intuitive description of Gaussian beam characteristics from an ideal laser. These concepts are extended to non-Gaussian beams (*e.g.* high-order Hermite Gaussian beams, top-hat shapes, laser arrays, and non-diffracting beams) and the relative merits of various beam shapes are discussed. Beam characterization methods such as M2, Strehl ratio, and TDL are reviewed. Simple expressions for estimating the effects of laser aberrations and coherence on beam focusing and propagation are reviewed. Coupling of light into single and multi-mode fibres, as well as far-field light concentration limits are explored as real-world examples. The constant radiance theorem and étendue are employed as engineering tools to optimize optical design, and simple analytical tools are presented to estimate the effects of spatial beam shape, phase aberrations, and coherence on beam concentration. The course ends with a description of internal and external cavity beam shaping techniques using phase modulation (*e.g.* diffractive optical methods) and polarization modulation (*e.g.* cylindrical vector beams).

Benefits and Learning Objectives:
This course will enable participants to:
- Measure the quality of a laser beam using several methods.
- Interpret the meaning of various laser specifications.
- Understand Gaussian laser beam properties from an intuitive standpoint.
- Predict the propagation and focusing properties of non-ideal and aberrated laser beams.
- Determine the concentration limits of a light field.
- Design optimal beam concentration optics.
- Compare different beam profiles for specific applications and calculate ideal performance.
- Design beam shaping optics using polarization and phase manipulation.

Intended Audience:
This course is designed to provide laser engineers, optical system designers, and technical management professionals with a working knowledge of laser beam characterization, analysis, and modification. Physical and intuitive explanations of most topics are designed to make the concepts accessible to a wide range of participants.

Biography:
James Leger received his BS degree in Applied Physics from the California Institute of Technology (1974) and Ph.D. degree in Electrical Engineering from the University of California, San Diego (1980). He has held previous positions at the 3M Company, and MIT Lincoln Laboratory. He is currently professor of Electrical Engineering at the University of Minnesota, where he holds both the Cymer Professorship of Electrical Engineering and the Mr. and Mrs. George W. Taylor distinguished professorship. His research group is studying a wide variety of optical techniques, including laser mode control and beam shaping techniques, spectral and coherent laser beam combining, optical metrology, solar energy optics, design of nonclassical imaging systems, and microoptical engineering. James Leger is currently serving as deputy editor of Optics Express, and has recently served as a member of the CLEO (US) steering committee and the Board of Directors of the Optical Society of America.
James Leger has been awarded the 1998 Joseph Fraunhofer Award/Robert M. Burley Prize by the Optical Society of America, the 1998 Eta Kappa Nu outstanding teaching professor award, the 2000 George Taylor Award for Outstanding Research at the University of Minnesota, the 2006 Eta Kappa Nu Outstanding teaching Professor award, the ITSB professor of the year award (2006), the Morse Award for Outstanding Undergraduate Teaching (2006), the George Taylor Distinguished Teaching Award (2007), and the George Taylor Service Award (2008). He has recently been inducted into the academy of distinguished teachers at the University of Minnesota. He is a Fellow of the Optical Society of America, Fellow of the Institute of Electrical and Electronic Engineers (IEEE), and Fellow of the International Society of Optical Engineers (SPIE).

NOTES

TECH-FOCUS SESSIONS

An attractive feature of the CLEO®/Europe technical programme has been the **Tech Focus** format. Tech-Focus sessions concentrate on selected photonics applications of industrial importance. The 2013 programme features two Tech-Focus sessions entitled **"Fibre and Solid-State Lasers - A Comparison from an Industrial Point of View - High Power"** jointly held with the LIM 2013 conference, which showcase this exciting field through presentations from leading academic and industrial researchers. Both sessions consisting of a total of 6 invited presentations take place on Tuesday afternoon.

CLEO®/Europe-IQEC 2013 paid registrants are invited to attend the Tech-Focus sessions at no additional charge. Those wishing to attend the Tech-Focus who are NOT FULL FEE registrants of the conferences must pay the one-day fee.

▸ **Tuesday, 14:00 – 15:30**
Location: *Room 13a*

TF-1: Fibre and Solid State Lasers: a Comparison from an Industrial Point of View I (Session jointly held with LIM)

TF-1/LIM.1 TUE 14:00

Next Generation of Ultra-High Brightness Direct Diode Lasers

•**J. Liebowitz, R. Huang, B. Chann, J. Burgess, M. Kaiman, R. Overman, and P. Tayebati,** *TeraDiode, Wilmington, United States*
Wavelength beam combining allows use of direct diode lasers for steel cutting and keyhole welding, traditionally performed by multi-kilowatt CO_2, fiber, and disk lasers. This innovation lowers laser cost in these applications.

TF-1/LIM.2 TUE 14:30

Applications and Market Segments for Ultra-High Brightness Direct Diode Lasers

•**W. Gries, S. Heinemann, H. Fritsche, and W. Süptitz,** *Directphotonics Industries GmbH, Berlin, Germany*
Ultra-highbrightness (UHB) direct diode laser systems with kW output power are on the verge of market introduction. This talk discusses applications and market dynamics of UHB direct diode lasers.

TF-1/LIM.3 TUE 15:00

The Power of Choice of Solid State Lasers for Successful Industrial Laser Applications

•**K. Loefffler,** *TRUMPF Laser und Systemtechnik GmbH, Ditzingen, Germany*
The presentation will show on examples from successful laser applications the use and need for the different solid-state laser resonator concepts. It will describe CW-high power as well as short pulse lasers in the ps / and ns range.

▸ **Tuesday 16:00 – 17:30**
Location: *Room 13a*

TF-2: Fibre and Solid State Lasers: a Comparison from an Industrial Point of View II (Session jointly held with LIM)

TF-2/LIM.1 TUE 16:00

Recent Developments in Fiber Lasers and their Applications

•**M. Grupp,** *IPG Laser GmbH, Burbach, Germany*
Over the past few years fiber lasers gained a huge market share in all kind of industrial applications. Reason for this wide acceptance is the continuous development of specialized and adapted lasers suited for the requirements of the applications.

TF-2/LIM.2 TUE 16:30

Ultrafast Solid State Laser with High Pulse Energy – New Applications

•**H. Amler, S. Sobolewski, and J. Thumbs,** *Photon Energy GmbH, Ottensoos, Germany*
Usually for marking applications ns-lasers are used. Since a new ps-laser source is available with lower costs, new possibilities are opened up to use the advantages of this laser type also for marking applications.

TF-2/LIM.3 TUE 17:00

Ultrafast Fiber Lasers and Bulk Lasers for Material Processing - A Comparison

•**N. Hodgson, R. Knappe, and M. Bengtsson,** *Coherent Inc., Santa Clara, CA, United States*
The technology and performance of high energy picosecond and femtosecond lasers in fiber and bulk solid state geometry are reviewed. Ultrafast laser systems providing pulse energies of up to 100s of microJoules are compared with respect to their applicability in material processing.

PLENARY SESSIONS

PL-1: CLEO®/Europe 2013 Plenary Talk

▸ **Monday, 8:30 – 9:15**
Location: *Room 1*

PL-1.1 MON

Thin Disk Lasers

Adolf Giesen,
DLR, German Aerospace Center, Stuttgart, Germany

Biography
Dr. Adolf Giesen received his Ph.D. in 1982 at the University of Bonn, Germany. Then, he joined DLR (the German Aerospace Center), institute of Technical Physics at Stuttgart working on rf-excited CO_2-lasers. In 1986 he moved to the University of Stuttgart, Institut für Strahlwerkzeuge as head of the laser development department. At the University he continued working on CO_2-lasers as well as on optical components for high power lasers. In 1992 he started working on thin disk lasers (in collaboration between the University of Stuttgart and DLR). 2002 he received the "Berthold Leibinger Preis" for the invention and the work on thin disk lasers and in 2004 he received the "Rank Prize" also for the invention and the work on thin disk lasers. Since 2007 he is director of the Institute of Technical Physics of DLR and he is continuing the work on high power lasers, especially for aerospace applications as well as for security and defence applications.

Abstract
The design ideas of thin disk lasers will be explained. Results for continuous wave operation and for pulsed operation show the capability for building high power lasers with high efficiency and good beam quality, simultaneously.

PL- 2: World of Photonics Opening with Plenary Talk

▸ **Monday, 09:30 – 10:45**
Location: *Room 1*

Words of Welcome will also be addressed during the session.

PL-2.1 MON

Nanoscopy with Focused Light

Stefan Hell, *Max Planck Institute for Biophysical Chemistry, Göttingen, Germany*

Biography

Stefan W. Hell is a director at the Max Planck Institute for Biophysical Chemistry in Göttingen, where he leads the Department of Nano-Biophotonics. He also leads a research group at the German Cancer Research Center (DKFZ) in Heidelberg.
Stefan W. Hell received his diploma (1987) and doctorate (1990) in physics from the University of Heidelberg. From 1991 to 1993 he worked at the European Molecular Biology Laboratory, followed with stays as a senior researcher at the University of Turku, Finland, between 1993 and 1996, and as a visiting scientist at the University of Oxford, England, in 1994. In 1997 he joined the Max Planck Institute for Biophysical Chemistry in Göttingen, where he has built up his current group dedicated to subdiffraction-resolution microscopy. In 2003, following his appointment as a director, he established the Department of Nano-Biophotonics. Stefan W. Hell is credited with having developed the first viable approach for overcoming Abbe's diffraction barrier in a far-field light microscope. For his work he has received several awards, including the Prize of the International Commission in Optics (2000), the Otto-Hahn-Prize (2009), the Gothenburg Lise-Meitner Prize (2011), and the Körber European Science Award (2011).

Abstract

Throughout the 20th century the resolution of optical microscopy relying on conventional lenses was limited by diffraction. We show how this limit can be radically overcome and how this change impacts various fields of science.

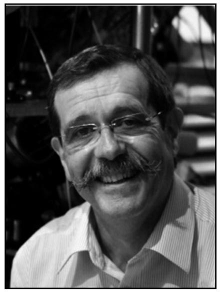
PL-3: IQEC 2013 Plenary Talk and Awards Ceremony

▸ **Tuesday, 10:30 – 12:30**
Location: Room 1

A series of Prizes and Award Ceremonies will also be presented during the session.

PL-3.1 MON

Coherent Back Scattering and Anderson Localization of Ultra Cold Atoms



Alain Aspect, *Laboratoire Charles Fabry, Institut d'Optique, Palaiseau, France*

Biography

Born in 1947, Alain Aspect is an alumni of ENS Cachan and Université d'Orsay. After three years teaching in Cameroon, he became a lecturer at ENS Cachan, with his research at Institut d'Optique.
In 1985 he took a research position at ENS/Collège de France, with Claude Cohen-Tannoudji.
Since 1992 he has been a CNRS senior researcher (emeritus since 2012), at Institut d'Optique.
He is also a professor at Institut d'Optique Graduat School (Augustin Fresnel chair), and at Ecole Polytechnique, in Palaiseau.
He is a member of the Académie des Sciences (France), Académie des Technologies (France), National Academy of Sciences (USA), OAW (Austria).

Research

Alain Aspect first research bore upon tests of Bell's inequalities with entangled photon pairs (PhD 1983), then wave-particle duality for single photons.
With Claude Cohen-Tannoudji he developed new methods for cooling atoms with lasers.
Since 1992, he is in the Atom Optics group that he has established at Institut d'Optique, where research bears upon quantum atom optics, quantum degenerate gases and atom lasers, quantum simulators of disordered materials.

Abstract

Ultra cold atoms in a disordered potential created with a laser speckle are used to study Anderson Localization and Coherent Back Scattering.

TUTORIAL TALKS

▸ **Sunday, 11:00 – 12:00**
Location: Room 14a

CM-2.1 SUN

Resource Efficiency Improvements through Laser Processing of Designer Materials

•**William O'Neill,** *University of Cambridge, Cambridge, United Kingdom*

This tutorial explores the laser technologies and processes that can effect change in the resource efficiencies of production operations. Three basic visions are presented along with case studies to demonstrate their implementation.

▸ **Sunday, 14:30 – 15:30**
Location: Room 13b

CL-1/ECBO.1 SUN

Photoacoustic Tomography: Ultrasonically Breaking through the Optical Diffusion and Diffraction Limits

•**Lihong V. Wang,** *Washington University, St. Louis, MO, United States*

Photoacoustic tomography provides in vivo multiscale functional, metabolic, molecular, and histologic imaging across the scales of organelles, cells, tissues, and organs with consistent contrast. Penetration and resolution have reached 7 cm and 90 nm, respectively.

▸ **Tuesday, 16:00 – 17:00**
Location: Room 21

CG-2.1 TUE

Attosecond Science and Technology

•**Paul Corkum,** *University of Ottawa and National Research Council, Ontario, Canada*

Describes the physics and technology of attosecond pulse generation and characterization, both in space and in time. It then generalizes from characterizing attosecond pulses to imaging valence electrons and their changes during a photochemical reaction.

▸ **Thursday, 10:30 – 11:30**
Location: Room 4a

II-4.1 THU

Geometry and Light: The Science of Invisibility

•**Ulf Leonhardt,** *Weizmann Institute of Science, Rehovot, Israel*

Science Magazine listed transformation optics among the top 10 science insights of the decade 2000-2010. The tutorial gives an introduction into this subject that may, literally, transform optics.

▸ **Thursday, 14:00 – 15:00**
Location: Room 14a

IB-7.1 THU

Quantum Information Tools

•**Klaus Mølmer,** *Aarhus University, Aarhus, Denmark*
This tutorial will present an introduction to the basic ideas of quantum information processing and an overview of candidate physical implementations, tools and ideas pursued in quantum computing research.

KEYNOTE TALKS

▸ **Sunday, 9:00 – 9:45**
Location: Room 4b

CC-1.1 SUN

Ultrabroadband THz Pulses - From Millimeter Waves to the Infrared

•**Hartmut Roskos,** *Mark Thomson, Johann Wolfgang Göthe-Universität, Frankfurt am Main, Germany*
An overview is given of the generation, coherent detection and application of ultra-broadband terahertz pulses which cover substantial parts - or all - of the far-infrared and infrared spectral regimes.

▸ **Sunday, 16:30 – 17:15**
Location: Room 4a

IF-4.1 SUN

Optical Data Storage with Diffraction-Unlimited Resolution

•**Min Gu, Swinburne** *University of Technology, Hawthorn, Australia*
We show our recent progress on optical data storage with superresolution optics of lamda/24 and lamda/26 in newly designed photopolymerisation and photoreduction materials, respectively.

▸ **Monday, 11:00 – 11:45**
Location: Room 21

CK-5.1 MON

Optofluidic for Energy Applications

•**Demetri Psaltis,** *Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland*
We will discuss optofluidic solar fuel systems that rely on microstructured components with combined optical and fluidic functionality to improve the efficiency of solar energy harvesting.

▸ **Monday, 16:30 – 17:15**
Location: Room 1

CF/IE-7.1 MON

Frontiers in Extreme Nonlinear Optics: Attosecond-to-Zeptosecond Coherent Kiloelectronvolt X-rays on a Tabletop

•**Tenio Popmintchev,** *JILA, and University of Colorado, Boulder, CO, United States*
We present experimentally and theoretically a unified picture of phase matching of high harmonic generation spanning the electromagnetic spectrum from the vacuum ultraviolet to the keV X-ray region, combining both microscopic and macroscopic physics.

▸ **Monday, 16:30 – 17:15**
Location: Room 14a

CJ-4.1 MON

Coherent Combining of Fiber and Solid-State Lasers

•**Gregory D. Goodno,** *Northrop Grumman Aerospace Systems, Redondo Beach, CA, United States*
We review recent advances in coherent laser combining, including active laser control methods, diffractive optics beam combining, and high coherence fiber and SSL amplifiers that have enabled unprecedented brightness scaling of cw sources.

▸ **Tuesday, 14:00 – 14:45**
Location: Room 4a

IC-1.1 TUE

Quantum Simulations using Ultracold Atoms

•**Immanuel Bloch,** *Max-Planck Institute of Quantum Optics, Garching, Germany*
Ultracold quantum gases offer remarkable opportunities for probing and controlling quantum matter. In my talk I will discuss highlights and future perspectives of this interdisciplinary research field.

▸ **Wednesday, 14:00 – 14:45**
Location: Room 4a

IG-2.1 WED

High-Resolution Imaging with Scattered Light

•**Allard Mosk,** *University of Twente, Enschede, The Netherlands*
Wavefront shaping allows unprecedented control of scattered laser light. This discovery has spurred recent advances in focusing and imaging with scattered light, ranging from high-resolution microscopy to noninvasive optical imaging through scattering layers.

▸ **Wednesday, 16:00 – 16:45**
Location: Room 21

IH-2.1 WED

Broadband Management of Light Using Nanophotonics for Solar and Thermal Applications

•**Shanhui Fan,** *University of Stanford, Stanford, CA, United States*
There is enormous potential for the use of nanophotonics in solar and thermal applications. In this talk, we show that one can use nanophotonic approach to enhance both the voltage and the current of the solar cells. We also show one can use nanophotonics effectively for a number of emerging thermal applications, including both novel approach for radiative cooling in the far field, and active control of heat flow in the near field.

NOTES

ROOM 1

9:00 – 10:30

CF/IE-1: Ultrafast Electron Dynamics

Chair: Lukas Gallmann, ETH Zurich, Zurich, Switzerland

CF/IE-1.1 SUN 9:00

The influence of nuclear motion on the electron dynamics in an efficient sub-cycle control of the molecule K_2

•R. Siemering[1], P. von den Hoff[1], T. Bayer[2], H. Braun[2], T. Baumert[2], M. Wollenhaupt[2], and R. de Vivie-Riedle[1]; [1]Department für Chemie, Ludwig-Maximilians-Universität, München, Germany; [2]Institut für Physik und CINSaT, Universität Kassel, Kassel, Germany

Selective population of dressed states (SPODS) is a control pathway in atoms and molecules including explicitly the electron dynamics. We highlight the influence of the nuclear motion on the electron dynamics in the potassium dimer.

CF/IE-1.2 SUN 9:15

Direct laser acceleration of non-relativistic electrons at a photonic structure

•J. Breuer[1] and P. Hommelhoff[2,1]; [1]Max Planck Institute of Quantum Optics, Garching, Germany; [2]Department of Physics, Friedrich Alexander University Erlangen Nuremberg, Erlangen, Germany

We report direct laser acceleration of non-relativistic 28keV-electrons at a dielectric grating with the inverse Smith-Purcell effect. We observe an acceleration gradient of 25MeV/m, already comparable to state-of-the-art RF-linacs and expect 1.5GeV/m for relativistic electrons.

CF/IE-1.3 SUN 9:30

Ultrafast restoration of valence electrons in 1,3-butadiene probed by time-resolved photoelectron spectroscopy with high harmonic pulses

A. Makida, H. Igarashi, T. Fujiwara, and •T. Sekikawa; Hokkaido University, Sapporo, Japan

Ultrafast recovery of the valence electrons to the ground state in 1,3-butadiene with a time constant of 53 fs after photoexcitation was observed by time-resolved photoelectron spectroscopy using high harmonic pulses.

ROOM 4a

9:00 – 10:30

IF-1: Pulse Manipulation with Nonlinear Optics

Chair: Rachel Grange, Friedrich Schiller University, Jena, Germany

IF-1.1 SUN (Invited) 9:00

Broadband deep-ultraviolet femtosecond pulse generation by third-order nonlinear optical processes in thin media

•H. Crespo[1], F. Silva[1], and R. Weigand[2]; [1]IFIMUP-IN and Departamento de Física e Astronomia, Faculdade de Ciências, Universidade do Porto, R. do Campo Alegre 687, 4169-007, Porto, Portugal; [2]Departamento de Óptica, Facultad de Ciencias Físicas, Universidad Complutense de Madrid, Avda. Complutense s/n, 28040, Madrid, Spain

We demonstrate the generation and measurement of broadband deep-ultraviolet pulses using third-order nonlinear optical processes in thin media. These results are well described by simulations. The new pulse measuring technique of dispersion-scan is also discussed.

IF-1.2 SUN 9:30

Self-Compression to Sub-3-Cycle Duration of Mid-IR Optical Pulses via Nonlinear Propagation in Bulk

•M. Hemmer[1], M. Baudisch[1], A. Thai[1], and J. Biegert[1,2]; [1]ICFO - Institute of Photonic Sciences, Barcelona, Spain; [2]ICREA - Institucio Catalana de Recerca i Estudis Avancats, Barcelona, Spain

Mid-IR pulses with 3-cycle duration (32 fs) and 2 uJ energy at 3.2 um wavelength and 160 kHz repetition rate were generated via nonlinear propagation of 7-cycle duration mid-IR pulses through Yttrium Aluminum garnet (YAG).

ROOM 4b

9:00 – 10:30

CC-1: Ultra Broadband and High Terahertz Fields

Chair: Martin Koch, Phillips-University Marburg, Marburg, Germany

CC-1.1 SUN (Keynote) 9:00

Ultra-broadband THz Pulses - From Millimeter Waves to the Infrared

•H. Roskos and M. Thomson; Goethe University, Frankfurt, Germany

An overview is given of the generation, coherent detection and application of ultra-broadband terahertz pulses which cover substantial parts - or all - of the far-infrared and infrared spectral regimes.

ROOM 13a

9:00 – 10:30

CA-1: Nonlinear Frequency Conversion

Chair: Valdas Pasiskevicius, KTH Stockholm, Stockholm, Sweden

CA-1.1 SUN 9:00

118 nm VUV Generation Using Microchip Laser

•R. Bhandari[1], N. Tsuji[2], T. Suzuki[3], M. Nishifuji[2], and T. Taira[1]; [1]Institute for Molecular Science, Okazaki, Japan; [2]Nippon Steel & Sumitomo Metal, Futtsu, Japan; [3]Nippon Steel Technoresearch Corporation, Futtsu, Japan

We report the first demonstration of ninth harmonic generation of a Nd:YAG/Cr4+:YAG passively Q-switched microchip laser output, generating 118 nm VUV. This output was used for single-photon ionization of benzene in a time-of-flight mass-spectroscope.

CA-1.2 SUN 9:15

Absorption Coefficient and Raman Gain in CVD Diamond as Functions of Pump Wavelength: Towards Efficient Diamond Raman Lasers

•V. Savitski[1], S. Reilly[1], W. Lubeigt[2], and A. Kemp[1]; [1]Institute of Photonics, University of Strathclyde, Glasgow, United Kingdom; [2]Department of Electronic and Electrical Engineering, University of Strathclyde, Glasgow, United Kingdom

Raman gain in synthetic diamond is measured at different wavelengths taking into account absorption losses. It is found to scale linearly with the pump wavenumber. A 6W intracavity diamond Raman laser will be discussed.

CA-1.3 SUN 9:30

Narrow-linewidth UV laser source at 257 nm

•X. Délen[1], L. Deyra[1], A. Benoit[2,3], M. Hanna[1], F. Balembois[1], B. Coquelin[2], D. Sangla[2], F. Salin[2], J. Didierjean[4], and P. Georges[1]; [1]Laboratoire Charles Fabry, Palaiseau, France; [2]Eolite systems, Pessac, France; [3]Institut de recherche XLIM, Limoges, France; [4]Fibercryst, Vileurbanne, France

We report on a narrow-linewidth pulsed laser source emitting over 3 W at 257 nm. An Yb:YAG single crystal fiber power amplifier is used to overcome the Brillouin limitation in glass fibers.

ROOM 13b

9:00 – 10:30

CB-1: Quantum Cascade Lasers and Long Wavelength Emitters I

Chair: Martijn Heck, University of California, Santa Barbara, CA, United States

CB-1.1 SUN 9:00

EC tuning of a two color QCL active region design in the 3 to 4 μm region

•*S. Riedi, A. Bismuto, A. Hugi, M. Beck, and J. Faist; Institute for Quantum Electronics, ETH Zurich, Zurich, Switzerland*

A broadband Quantum-Cascade-Laser in the 3 to 4 μm region was tuned over 549 cm-1 using a grating-tuned external cavity set-up. The junction-up mounted device was HR and AR coated and operated in pulsed mode.

CB-1.2 SUN 9:15

Mid-wave infrared (3-5um) AlInSb resonant-cavity LEDs

•*L. Meriggi[1], M.J. Steer[1,2], M. Sorel[1], C.N. Ironside[1], I.G. Thayne[1], and C. MacGregor[2]; [1]University of Glasgow, Glasgow, United Kingdom; [2]Quantum Device Solutions, Glasgow, United Kingdom*

We present a mid-wave infrared AlInSb resonant cavity LED with a 5-pairs bottom Distributed Bragg Reflector. Measured photoluminescence shows 2.5-fold emission enhancement at 4-4.5um and clear Fabry-Pérot modes, validating the modelled cavity reflectivity and dimensions.

CB-1.3 SUN (Invited) 9:30

Recent progress on single-mode quantum cascade lasers

•*B. Hinkov[1], P. Jouy[1], A. Hugi[1], A. Bismuto[1,2], M. Beck[1], S. Blaser[2], and J. Faist[1]; [1]Institute for Quantum Electronics, Swiss Federal Institute of Technology (ETH) Zürich, Zürich, Switzerland; [2]Alpes Lasers SA, Neuchâtel, Switzerland*

Recent progress on single-mode quantum cascade lasers is reviewed. Special emphasis is put on below-1W dissipation devices, monolithic master-oscillator power-amplifier geometries with peak power above 1W and switchable twin distributed feedback grating sources.

ROOM 14a

9:00 – 10:30

CM-1: Laser Ablation

Chair: Peter Kozansky, University of Southampton, Southampton, United Kingdom

CM-1.1 SUN 9:00

Synthesis and Characterization of Hybrid Copper-Chitosan Nanoantimicrobials by Femtosecond Laser-Ablation in Liquids

•*A. Ancona[1], C. Palazzo[3], A. Trapani[3], T. Sibillano[1], F.P. Mezzapesa[1], R.A. Picca[2], M.C. Sportelli[2], E. Bonerba[4], G. Tantillo[4], G. Trapani[3], and N. Cioffi[2]; [1]CNR-Istituto di Fotonica e Nanotecnologie U.O.S. Bari, Bari, Italy; [2]Università degli Studi di Bari, Dipartimento di Chimica, Bari, Italy; [3]Università degli Studi di Bari, Dipartimento di Farmacia-Scienze del Farmaco, Bari, Italy; [4]Università degli Studi di Bari, Dipartimento di Medicina Veterinaria, Bari, Italy*

We report on the synthesis by fs-laser ablation in liquids of novel copper-chitosan composite biodegradable nano-antimicrobial material. The hybrid nanocolloids were characterized by several techniques. Bioactivity tests demonstrated their efficacy against Gram-negative bacteria proliferation.

CM-1.2 SUN 9:15

Uni-directional liquid spreading realized by laser-based surface structuring

•*E. Fadeeva, J. Koch, and B.N. Chichkov; Laser Zentrum Hannover e.V., Hannover, Germany*

Slanted microspikes have been fabricated by ultra-short pulse laser irradiation of solid targets, placed at different angles to the incident laser beam. On the structured surfaces liquid guidance in a one preferred direction is demonstrated.

CM-1.3 SUN (Invited) 9:30

Film-free laser microprinting of complex materials

A. Patrascioiu, J.M. Fernández-Pradas, J.L. Morenza, and •P. Serra; Departament de Física Aplicada i Òptica, Universitat de Barcelona, Barcelona, Spain

The mechanisms of ejection taking place during the film-free laser printing of liquids are investigated through time-resolved imaging; the acquired images reveal a complex jetting dynamics driven by a laser-generated cavitation bubble.

ROOM 14b

9:00 – 10:15

CD-1: Pulsed mid-IR Sources

Chair: Thomas Schreiber, Frauhnhofer IOF, Jena, Germany

CD-1.1 SUN (Invited) 9:00

Nonlinear Optics with High Power Femtosecond Mid-Infrared Laser Pulses

•*D. Kartashov[1], S. Ališauskas[1], A. Pugžlys[1], A. Zheltikov[2,3], J. Kasparian[4], J.-P. Wolf[4], D. Faccio[5], and A. Baltuška[1]; [1]Photonics Institute, Vienna University of Technology, Vienna, Austria; [2]Russian Quantum Center, International Laser Center, Physics Department of M.V. Lomonosov Moscow State University, Moscow, Russia; [3]Department of Physics and Astronomy, Texas A&M University, College Station, United States; [4]Université de Genève, Genève, Switzerland; [5]Institute of Photonics and Quantum Sciences, Heriot-Watt University, Edinburgh, United Kingdom*

We present review of experimental and numerical investigations of interaction of high power mid-infrared femtosecond laser radiation with gases and solids. High-order nonlinear processes and new regimes of filamentation in gases and solids are discussed.

CD-1.2 SUN 9:30

Enhancement and shape control of weak molecular absorption signal with chirped-pulse mid-IR lasers

•*E. Sorokin[1], N. Tolstik[2], and I.T. Sorokina[2]; [1]TU, Wien, Austria; [2]NTNU, Trondheim, Austria*

The weak molecular absorption signal is enhanced by 140 times by power-tuning of a chirped-pulse mid-IR oscillator spectrum edge. The signal shape is continuously tuned between dispersion-like and peak-like by propagating in ZBLAN fiber.

ROOM 21

9:00 – 10:30

CK-1: Photonic Crystals

Chair: Kestutis Staliunas, Universitat Politecnica de Catalunya and ICRES, Terrassa, Spain

CK-1.1 SUN 9:00

Multifunctionnal self-collimating mesoscopic photonic crystals

•*A. Monmayrant[1], F. Lozes-Dupuy[1], O. Gauthier-Lafaye[1], G. Magno[2], M. Grande[2], G. Calò[2], and V. Petruccelli[2]; [1]LAAS-CNRS, Toulouse, France; [2]Politecnico di Bari, Bari, Italy*

The new concept of curvature index is exploited to design multifunctional self-collimating mesoscopic photonic crystals in all-positive index materials. High reflectivity and antireflection are achieved by suitably tailoring the structure parameters through simple design criteria.

CK-1.2 SUN 9:15

Silica Microbeams for Tunable Bragg Gratings

•*P. Cooper, C. Holmes, L. Carpenter, C. Sima, P. Mennea, J. Gates, and P. Smith; Optoelectronics Research Centre, Southampton, United Kingdom*

A silica microbeam has been fabricated on a silicon substrate. The microbeam contains an integrated single-mode optical waveguide and Gaussian apodized Bragg grating. The Bragg grating is thermally tuned and displays a tuning of 45pm/mW.

CK-1.3 SUN 9:30

Fano interference between resonant and leaky waves in 1D silicon photonic crystal microcavities

•*K. Mehta, J. Orcutt, and R. Ram; Massachusetts Institute of Technology, Cambridge, United States*

Interference between resonant and leaky second-order mode transmission through a high Q 1D silicon photonic crystal microresonator, fabricated photolithographically within a CMOS process, gives rise to strongly tunable linear and nonlinear Fano interference.

ROOM 1

CF/IE-1.4 SUN 9:45

Ultrafast Electron Dynamics in an Amino Acid Measured by Attosecond Pulses

L. Belshaw[1], •F. Calegari[2], M. Duffy[1], A. Trabattoni[2], F. Frassetto[3], L. Poletto[3], M. Nisoli[2], and J. Greenwood[1]; [1]Centre for Plasma Physics, School of Maths and Physics, Queen's University Belfast, Belfast, United Kingdom; [2]Politecnico di Milano, Department of Physics, CNR-IFN, Milano, Italy; [3]Institute of Photonics and Nanotechnologies, CNR-IFN, Padova, Italy

We investigated the ultrafast charge-migration in the amino-acid phenylalanine. By measuring the yield of a doubly-charged ion vs. delay between a 1.5-fs XUV pulse and a 6-fs pulse, a 30-fs charge migration process was measured.

CF/IE-1.5 SUN (Invited) 10:00

Strong-field Photoemission of Electron Pulses from Sharp Metallic Tips

•C. Ropers; University of Göttingen, Göttingen, Germany

Localized photoemission from single metallic nanotips is investigated with ultrashort pulses in a wavelength range between 0.8 and 8 micrometers. Kinetic energies of hundreds of eV and strong-field dynamics characteristic of spatial localization are observed.

ROOM 4a

IF-1.3 SUN 9:45

Soliton Molecules: 4 Symbols for Quaternary Data Transmission

•P. Rohrmann, A. Hause, and F. Mitschke; Universität Rostock, Institut für Physik, Rostock, Germany

Fiber-optic solitons can form stable molecules in dispersion-managed fibers. First experimental observations of a three-soliton molecule are reported. Using a flexible pulse shaper existence regimes of these bound states are mapped out.

IF-1.4 SUN 10:00

Unifying the Description of Fiber-Optic Frequency Conversion: From Cascaded Four-Wave Mixing to Cherenkov Radiation

•M. Erkintalo[1], Y. Xu[1], S.G. Murdoch[1], J.M. Dudley[2], and G. Genty[3]; [1]Department of Physics, University of Auckland, Auckland, New Zealand; [2]Institut FEMTO-ST, CNRS UMR 6174, Universite de Franche-Comte, Besancon, France; [3]Optics Laboratory, Tampere University of Technology, Tampere, Finland

We show theoretically and experimentally that cascaded fiber-optic four-wave mixing can mimic a higher-order nonlinear process and drive the amplification of a selected sideband. This process provides a physical frequency-domain interpretation of soliton-induced Cherenkov radiation.

IF-1.5 SUN 10:15

Optical signal enhancement in supercontinuum generation

•L. Orsila[1], J. Sand[2], G. Genty[2], and G. Steinmeyer[1,3]; [1]Optoelectronics Research Centre, Tampere University of Technology, Tampere, Finland; [2]Department of Physics, Tampere University of Technology, Tampere, Finland; [3]Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie (MBI), Berlin, Germany

The noise amplification capabilities of supercontinuum generation are exploited to enhance a weak optical intensity modulation by a factor of 30. This mechanism may enable retrieval of faint and otherwise undetectable signals in ultrafast optics.

ROOM 4b

CC-1.2 SUN 9:45

Ultra-energetic THz pulses from a laser-driven particle accelerator

•A. Gopal[1,2], P. Singh[1], S. Herzer[1], A. Schmidt[1], A. Reinhard[1], W. Ziegler[1], G. Paulus[1,2], U. Dillner[3], T. May[3], H.-G. Meyer[3], D. Broemmel[4], A. Karmakar[4], and P. Gibbon[4]; [1]Friedrich-Schiller University Jena, Jena, Germany; [2]2 Helmholtz Institute Jena, Förbelsteig, Jena, Germany; [3]3 Institute of Photonic Technologies,, Jena, Germany; [4]Institute of Advanced Simulation, Forschungszentrum Juelich, Juelich, Germany

We report the experimental realization of a GW class T-ray source based on laser-driven particle accelerators. The source has been characterized in detail. PIC simulations have been carried out to identify the source of T-rays.

CC-1.3 SUN 10:00

Multi-octave MV/cm pulses filling the THz gap

•C. Vicario[1], C. Ruchert[1], and C.P. Hauri[1,2]; [1]Paul Scherrer Institute, 5232 Villigen PSI, Switzerland; [2]Ecole Polytechnique Federale de Lausanne, 1015 Lausanne, Switzerland

1.5 MV/cm THz electric fields are efficiently generated in organic crystals. The multi-octave spectrum extends over the full THz gap (0.1-10 THz). The source initiates coherent magnetization dynamics in thin ferroelectric film.

CC-1.4 SUN 10:15

Ultrabroadband Infrared Pulse Ranging from Terahertz Region to Near Infrared Using Air for both Generation and Detection

•E. Matsubara, M. Nagai, and M. Ashida; Osaka University, Osaka, Japan

We generated ultrabroadband coherent infrared pulses with 1-200 THz spectral range and detected their electric-field profile in a range up to 150 THz using air as media and sub-mJ 10-fs pulses as a light source.

ROOM 13a

CA-1.4 SUN 9:45

Power Scaling of Efficient Diamond Raman Lasers with 1240 nm and 1485 nm Output

•A. McKay, O. Kitzler, and R. Mildren; Macquarie University, Sydney, Australia

We report an external cavity diamond Raman laser with quantum conversion efficiency approaching 65% and output powers of 14.5 W. This represents a substantial improvement in efficiency compared to other high-average-power crystalline Raman lasers.

CA-1.5 SUN 10:00

Megawatt peak power, 1 kHz, 266 nm sub nanosecond laser source based on single-crystal fiber amplifier

•L. Deyra[1], I. Martial[2], F. Balembois[1], J. Diderjean[2], and P. Georges[1]; [1]Laboratoire Charles Fabry, Institut Optique, CNRS, Univ Paris-Sud, Palaiseau, France; [2]Fibercryst SAS, Villeurbanne, France

We report the realization of a MW peak power UV source at 266 nmbased on the fourth harmonic generation with LBO/BBO of a Nd:YAG passively Q:switched oscillator amplified in a single-crystal fiber.

CA-1.6 SUN 10:15

Continuous-wave emission from a self-Raman vortex laser

•A. Lee[1], T. Omatsu[2], and H. Pask[1]; [1]Macquarie University, Sydney, Australia; [2]Chiba University, Chiba, Japan

We report the first demonstration of a diode end-pumped Nd:GdVO4 self-Raman laser which generates a first-order vortex mode at the first-Stokes wavelength (1173 nm).

ROOM 14b

CD-1.3 SUN 9:45

Mid infrared supercontinuum generation in nanotapered chalcogenide-silica step-index waveguides

•N. Granzow[1], M. Schmidt[1,6], W. Chang[1], L. Wang[1], Q. Coulombier[2], J. Troles[3], P. Toupin[3], I. Hartl[4], K. Lee[4], M. Fermann[4], L. Wondraczek[5], and P. Russell[1]; [1]Max Planck Institute for the Science of Light, Erlangen, Germany; [2]University of Lille1, Lille, France; [3]University of Rennes I, Rennes, France; [4]IMRA America, Inc., Ann Arbor, United States; [5]Otto Schott Institute, Jena, Germany; [6]Institute of Photonic Technology, Jena, Germany

We explore the use of a silica fiber with a sub-wavelength chalcogenide glass core and an inversely tapered launch ”spike” for efficient supercontinuum generation out to the mid infrared.

ROOM 21

CK-1.4 SUN 9:45

Experimental characterization of hydrogenated amorphous silicon photonic crystal waveguides

•L. Carletti[1], C. Grillet[1], R. Orobtchouk[1], T. Benyattou[1], P. Rojo-Romeo[1], X. Letartre[1], J.-M. Fedeli[2], and C. Monat[1]; [1]Institut des Nanotechnologies de Lyon (INL), Lyon, France; [2]CEA-Leti, Grenoble, France

We report the linear characterization of photonic crystal waveguides realized in a CMOS compatible platform based on hydrogenated amorphous silicon. This platform is highly promising for compact and low power all-optical signal processing on-chip.

ROOM 13b

CB-1.4 SUN 10:00

Towards Mid-Infrared On-Chip Sensing utilizing a bi-functional Quantum Cascade Laser/Detector

•B. Schwarz[1], P. Reininger[1], O. Baumgartner[2], T. Zederbauer[1], H. Detz[1], A.M. Andrews[1], W. Schrenk[1], H. Kosina[2], and G. Strasser[1]; [1]Institute for Solid State Electronics and Center for Micro- and Nanostructures, Vienna, Austria; [2]Institute for Microelectronics, Vienna, Austria

We demonstrate the monolithic integration of a quantum cascade laser and detector based on a bi-functional active region. With a detector signal of 191.5mV at room-temperature, we move a significant step towards mid-infrared on-chip sensing.

CB-1.5 SUN 10:15

Wavelength Tuning and Polarisation Control with an Integrated Tunable Birefringent Filter for Quantum Cascade Lasers

D. Dhirhe[1], T.J. Slight[2], B.M. Holmes[1], D.C. Hutchings[1], and •C.N. Ironside[1]; [1]School of Engineering, University of Glasgow, Glasgow, United Kingdom; [2]CST Global Ltd, 4 Stanley Boulevard, Hamilton International Technology Park, Blantyre, Glasgow, United Kingdom

We discuss the design, modelling, fabrication and characterization of integrated tunable birefringent for quantum cascade lasers. We describe how it can be employed to tune the wavelength and polarisation state of a quantum cascade laser.

ROOM 14a

CM-1.4 SUN 10:00

Electrochemistry Assisted Laser Ablation in Liquid : A General Strategy for Fabricating Polyoxometalate Nanostructures

•G.W. Yang, P. Liu, Y. Liang, H.B. Li, and J. Xiao; Sun Yat-sen University, Guangzhou, China, People's Republic of (PRC)

We propose a general strategy for fabricating polyoxometalate nanostructures: electrochemistry assisted laser ablation in liquid (ECLAL). This is a green, simple, and catalyst-free approach under the ambient environment.

CM-1.5 SUN 10:15

Femtosecond Laser Pulse Absorption at the Surface of Dielectrics

•M. Lebugle, N. Sanner, R. Clady, D. Grojo, O. Utéza, and M. Sentis; Aix Marseille Université, CNRS, LP3 UMR 7341, MARSEILLE, France

We present experimental results concerning the energy balance of a 30 fs pulse of moderate intensity (10 TW.cm-2 to 1 PW.cm-2) focused on dielectrics. Absorption is retrieved and linked with damage and ablation phenomena.

ROOM 14b

CD-1.4 SUN 10:00

Mid-infrared supercontinuum generation in suspended-core Chalcogenide and Tellurite optical fibers

I. Savelli[1], O. Mouawad[1], J. Fatome[1], •B. Kibler[1], C. Finot[1], F. Désévédavy[1], G. Gadret[1], J.-C. Jules[1], P.-Y. Bony[1], H. Kawashima[2], W. Gao[2], T. Kohoutek[2], T. Suzuki[2], Y. Ohishi[2], and F. Smektala[1]; [1]Laboratoire Interdisciplinaire Carnot de Bourgogne, Dijon, France; [2]Toyota Technological Institute, Nagoya, Japan

We report the experimental generation of mid-infrared supercontinuum in tellurite and chalcogenide suspended-core fibers pumped close to their zero-dispersion in femtosecond regime. The resulting supercontinua extend until 2.8μm in tellurite and 3.2μm in chalcogenide fibers.

ROOM 21

CK-1.5 SUN (Invited) 10:00

Ultra-Narrowband Nonlinear Wavelength Conversion Using Coupled Photonic Crystal Nanocavities

•N. Matsuda[1,2], E. Kuramochi[1,2], H. Takesue[1], K. Shimizu[1], Y. Tokura[1], and M. Notomi[1,2]; [1]NTT Basic Research Laboratories, Atsugi, Japan; [2]NTT Nanophotonics Center, Atsugi, Japan

We demonstrate four-wave-mixing nonlinear wavelength conversion using multiple resonances of resonantly-coupled 10 high-Q silicon photonic crystal nanocavities. An idler optical field was successfully generated with a conversion bandwidth as small as 500 MHz.

ROOM 1

11:00 – 12:30

CF/IE-2: CEP Control and Attosecond Phenomena

Chair: Günter Steinmeyer, MBI Berlin, Berlin Germany

CF/IE-2.1 SUN 11:00

High spatio temporal quality, CEP controlled, sub10fs frontend light source based on XPW

A. Ricci[1,2], •A. Jullien[1], J.-P. Rousseau[1], and R. Lopez-Martens[1]; [1]Laboratoire d'Optique Appliquée, Palaiseau, France; [2]Thales Optronique SA, Elancourt, France

300uJ, sub-10fs pulses with excellent spectro-temporal quality are produced by XPW filtering. High-fidelity of this injector is highlighted. Measured CEP drift is 170mrad rms. Complex spatio-temporal dynamics of XPW pulse shortening XPW is investigated.

CF/IE-2.2 SUN 11:15

Towards CEP stabilized pulses from a KLM Yb:YAG thin-disk oscillator

•O. Pronin[1], M. Seidel[2], J. Brons[2], F. Lücking[1], I. Angelov[2], V. Kalashnikov[3], V. Pervak[1], A. Apolonski[1,2], T. Udem[2], and F. Krausz[1,2]; [1]Ludwig-Maximilians-University, Munich, Garching, Germany; [2]Max-Planck-Institute of Quantum Optics, Garching, Germany; [3]Vienna University of Technology, Vienna, Austria

The 45 W output from a KLM thin-disk laser is spectrally broadened and compressed below 30 fs. The first experiment on carrier-envelope phase stabilization of a thin-disk laser is performed via control of the pump-diode-current.

CF/IE-2.3 SUN 11:30

Broadband phase coherence between an ultrafast laser and an OPO using lock-to-zero CEO stabilization

•R. McCracken[1], J. Sun[2], C. Leburn[1], and D. Reid[1]; [1]Heriot Watt University, Edinburgh, United Kingdom; [2]Huazhong University of Science & Technology, Wuhan, China, People's Republic of (PRC)

The carrier-envelope-offset frequencies of the pump, signal, idler and related sum-frequency mixing pulses have been locked to 0 Hz in a 20-fs-Ti:sapphire-pumped optical parametric oscillator, satisfying a critical prerequisite for optical attosecond pulse synthesis.

ROOM 4a

11:00 – 12:30

IF-2: New Approaches in Nonlinear Light Propagation

Chair: Christope Finot, Université de Bourgogne, Dijon, France

IF-2.1 SUN 11:00

Vortex Light Bullets in Fibre Arrays - Properties, Decay and Experimental Schemes

K. Prater[1], •F. Eilenberger[1], S. Minardi[1], U. Röpke[2], J. Kobelke[2], K. Schuster[2], H. Bartelt[2], S. Nolte[1], A. Tünnermann[1], and T. Pertsch[1]; [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität, Jena, Germany; [2]Institute of Photonic Technology, Jena, Germany

We present first results on the observation of discrete Vortex Light Bullets, spatiotemporal, solitary waves with stabilizing angular momentum. We present simulations of their evolution behavior, discuss excitation and display first experimental findings.

IF-2.2 SUN 11:15

Generalized Dispersive Wave Emission in Fiber Optics

K. Webb, Y. Xu, M. Erkintalo, and •S. Murdoch; University of Auckland, Auckland, New Zealand

We demonstrate, both numerically and experimentally, how a pump in the normal dispersion regime can emit a dispersive wave via the same mechanism that allows standard dispersive wave emission from an anomalous pump.

IF-2.3 SUN 11:30

Nonparaxial Soliton Refraction at Optical Interfaces with $\chi^{(3)}$ and $\chi^{(5)}$ Susceptibilities

•J. Christian[1], E. McCoy[1], G. McDonald[1], J. Sanchez-Curto[2], and P. Chamorro-Posada[2]; [1]University of Salford, Manchester, United Kingdom; [2]Universidad de Valladolid, Valladolid, Spain

We give an overview of recent research results for the arbitrary-angle refraction of bright solitons. A new Snell's law for cubic-quintic nonlinearity will be derived and tested, and predictions of giant Goos-Hänchen shifts also presented.

ROOM 4b

11:00 – 12:30

CC-2: Terahertz Imaging and Sensing

Chair: Kazuo Kadowaki, University of Tsukuba, Tsukuba, Japan

CC-2.1 SUN 11:00

Photoconductive terahertz microprobes for high-resolution contact-free imaging of large-scale sheet conductivity distributions

•M. Nagel[1], A. Safiei[2], C. Matheisen[1], S. Sawallich[1], T.M. Pletzer[2], and H. Kurz[1,2]; [1]AMO GmbH, Aachen, Germany; [2]Institute of Semiconductor Electronics, Aachen, Germany

A novel non-destructive contact-free measurement tool for sheet-conductivity imaging with up to 3 micrometre resolution is presented. Based on photoconductive THz near-field transmission probing it is especially attractive for large-scale samples with inhomogeneous carrier-lifetime distributions.

CC-2.2 SUN 11:15

Development and evaluation of high-sensitivity terahertz camera

•N. Nemoto[1], N. Kanda[2,3], K. Konishi[3], S. Kurashina[4], T. Sasaki[4], N. Oda[4], and M. Kuwata-Gonokami[1,3]; [1]Development of Physics, The University of Tokyo, Tokyo, Japan; [2]RIKEN Advanced Science Institute, Wako, Japan; [3]Photon Science Center, The University of Tokyo, Tokyo, Japan; [4]Guidance and Electro-Optics Division, Tokyo, Japan

We have developed THz camera consisting of uncooled microbolometer focal plane arrays and evaluated sensitivity of the new THz camera. Its sensitivity is three times larger than that of commercially available THz camera called IRV-T0830.

CC-2.3 SUN 11:30

Detection of a 2.8 THz quantum cascade laser with a semiconductor nanowire FET

•M. Ravaro[1,2], M. Locatelli[1,2], L. Viti[3], M.L. Pea[3], D. Ercolani[3], L. Consolino[1,2], S. Bartalini[1,2], A. Tredicucci[3], L. Sorba[3], M.S. Vitiello[3], and P. De Natale[1,2]; [1]INO, Istituto Nazionale di Ottica - CNR, Florence, Italy; [2]LENS, European Laboratory for NonLinear Spectroscopy, Sesto Fiorentino, Italy; [3]NEST, Istituto Nanoscienze - CNR and Scuola Normale Superiore, Pisa, Italy

We report a THz system composed by an InAs nanowire FET detector and a 2.8 THz bound-to continuum QCL. We demonstrate transmission imaging with high resolution and signal-to-noise ratio.

ROOM 13a

11:00 – 12:30

CA-2: Visible Lasers

Chair: Mauro Tonelli, University of Pisa, Pisa, Italy

CA-2.1 SUN 11:00

Tunable Intracavity Blue/Violet Light Generation in a Cr:LiCAF+BiBO Solid-state External-cavity Laser

•H. Maestre, A.J. Torregrosa, and J. Capmany; Communications Engineering Dept. Universidad Miguel Hernández, Elche, Alicante, Spain

In this communication we present a tunable source of blue/violet light based on intracavity second harmonic generation in a BiBO crystal inside a Cr:LiCAF laser obtaining second harmonic tunability between 390-415 nm.

CA-2.2 SUN 11:15

High power single-crystal fiber CW 946 nm laser and blue generation based on Rubidium-doped PPKTP

•L. Deyra[1], C. Liljestrand[2], J. Diderjean[3], C. Canalias[2], F. Laurell[2], F. Balembois[1], and P. Georges[1]; [1]Laboratoire Charles Fabry, Institut Optique, CNRS, Univ Paris-Sud, Palaiseau, France; [2]Royal Institute of Technology, Roslagstullsbacken, Stockholm, Sweden; [3]Fibercryst SAS, Villerbanne, France

We present a 11.5W, CW and polarized 946 nm laser based on Nd:YAG single-crystal fiber and its extracavity second harmonic generation in periodically-poled, rubidium-doped KTP (PPRKTP.We obtain 800mW of 473nm blue power.

CA-2.3 SUN 11:30

Anisotropic Absorption and Luminescence and Quasi-CW Laser Operation of Eu3+:KGd(WO4)2 Monoclinic Crystal

•P. Loiko[1], V. Dashkevich[2], S. Bagaev[3], V. Orlovich[2], A. Yasukevich[1], K. Yumashev[1], N. Kuleshov[1], S. Vatnik[3], and A. Pavlyuk[4]; [1]Center for Optical Materials and Technologies, Belarusian National Technical University, Minsk, Belarus; [2]B.I. Stepanov Institute of Physics, National Academy of Sciences of Belarus, Minsk, Belarus; [3]Institute of Laser Physics, Siberian Branch of RAS, Novosibirsk, Russia; [4]A.V. Nikolaev Institute for Inorganic Chemistry, Siberian Branch of RAS, Novosibirsk, Russia

Anisotropic absorption and luminescence of Eu3+-doped potassium gadolinium tungstate crystal was investigated. Quasi-cw Eu:KGd(WO4)2 laser operating at room temperature at the wavelength of 703nm (5D0-7F4 transition) was demonstrated for the first time.

ROOM 13b

11:00 – 12:45

CB-2: Quantum Cascade Lasers and Long Wavelength Emitters II

Chair: Guido Giuliani, University di Pavia, Pavia, Italy

CB-2.1 SUN 11:00

Broadband tunable quantum cascade lasers for external cavity

•*N. Akikusa*[1], *K. Fujita*[2], *T. Dougakiuchi*[2], *A. Ito*[1], *and T. Edamura*[2]; [1]*Hamamatsu Photonics Development Bureau, Hamamatsu, Japan*; [2]*Hamamatsu Photoniocs Central Research Labs, Hamamatsu, Japan*

A homogeneous broad gain bandwidth quantum cascade laser for external cavity is demonstrated. Spectrally homogeneous gain of anticrossed dual-upper state (DAU) design provide wide and stable wavelength tunability with external cavity configuration.

CB-2.2 SUN 11:15

Distributed-Feedback Quantum Cascade Laser at 3.2 μm

•*J.M. Wolf*[1], *A. Bismuto*[2], *M. Beck*[1], *and J. Faist*[1]; [1]*Institute for Quantum Electronics, Zurich, Switzerland*; [2]*Alpes Lasers SA, Neuchâtel, Switzerland*

We present single mode emission from Distributed-Feedback QCL done via optical lithography ranging from 3.19 to 3.3μm with peak power of up to 120mW at -20 °C. Threshold current densities of 4.8kA/cm^2 were measured.

CB-2.3 SUN 11:30

Polarization Versatility of Surface Emitting Ring Cavity Quantum Cascade Lasers

•*C. Schwarzer, R. Szedlak, L. Burgstaller, A. Genner, T. Zederbauer, H. Detz, A.M. Andrews, W. Schrenk, and G. Strasser*; *Vienna University of Technology, Vienna, Austria*

We present our resent investigations on far field characteristics of ring cavity quantum cascade lasers. Depending on the device design, an azimuthally, radially or linearly polarized far field can be realized.

ROOM 14a

11:00 – 12:30

CM-2: Future Applications of Laser

Chair: Boris Chichkov, Laser Zentrum, Hannover, Germany

CM-2.1 SUN (Tutorial) 11:00

Resource Efficiency Improvements through Laser Processing of Designer Materials

•*W. O'Neill*; *University of Cambridge, Cambridge, United Kingdom*

This tutorial explores the laser technologies and processes that can effect change in the resource efficiencies of production operations. Three basic visions are presented along with case studies to demonstrate their implementation.

ROOM 14b

11:00 – 12:30

CD-2: Nonlinear Wave Mixing Phenomena

Chair: Tamas Nagy, Leibniz University, Hannover and Laser-Laboratorium, Göttingen, Germany

CD-2.1 SUN 11:00

Four Wave Mixing efficiency in hydrogenated amorphous silicon waveguides

•*C. Lacava*[1], *P. Minzioni*[1], *E. Baldini*[1], *J.M. Fedeli*[2], *and I. Cristiani*[1]; [1]*Dipartimento di Ingegneria Industriale e dell'Informazione, Università di Pavia, Pavia, Italy*; [2]*CEA-Leti Minatec Campus, Grenoble, France*

Four-Wave-Mixing efficiency and conversion bandwidth in hydrogenated amorphous silicon waveguides fabricated by PECVD is reported. Measuring a large number of samples, a reliable value of the nonlinear parameter γ=790 W-1m-1 was obtained

CD-2.2 SUN 11:15

Phase-matched Cascaded of Nonlinear Bragg Scattering

Y. Xu[1], *M. Erkintalo*[1], *G. Genty*[2], *and* •*S. Murdoch*[1]; [1]*University of Auckland, Auckland, New Zealand*; [2]*Tampere University of Technology, Tampere, Finland*

We demonstrate, both numerically and experimentally, how a nonlinear Bragg scattering cascade can mimic the direct phasematching of a higher-order nonlinearity. The cascade is shown to significantly relax the phasematching requirements for nonlinear Bragg scattering.

CD-2.3 SUN 11:30

Continuous-wave optical modulation at the frequency of molecular motion

•*S.-i. Zaitsu*[1,2,3] *and T. Imasaka*[1,3]; [1]*Department of Applied Chemistry, Graduated School of Engineering, Kyushu University, Fukuoka, Japan*; [2]*PRESTO, Japan Science and Technology Agency, Saitama, Japan*; [3]*Division of Optoelectronics and Photonics, Center for Future Chemistry, Kyushu University, Fukuoka, Japan*

We demonstrate highly efficient generation of a continuous-wave sideband with a frequency spacing of over 10 THz. This scheme is based on the phase-matched interaction with gaseous molecules in a dispersion-compensated high-finesse optical cavity.

ROOM 21

11:00 – 12:30

CK-2: Silicon Photonics

Chair: Peter Smith, University of Southampton, Southampton, United Kingdom

CK-2.1 SUN 11:00

Silicon micro-ring resonators with tunable Q-factor for ultra-low power parametric signal generation

•*M.J. Strain*[1], *P. Orlandi*[2], *C. Lacava*[3], *F. Morichetti*[4], *A. Melloni*[4], *P. Bassi*[2], *I. Cristiani*[3], *and M. Sorel*[1]; [1]*University of Glasgow, Glasgow, United Kingdom*; [2]*Università di Bologna, Bologna, Italy*; [3]*Università di Pavia, Pavia, Italy*; [4]*Politecnico di Milano, Milan, Italy*

A compact micro-ring resonator incorporating a tunable coupler section is presented for active control of the device Q-factor. Four wave mixing signal generation is demonstrated with sub-mW input powers.

CK-2.2 SUN 11:15

Mid-Infrared Difference-Frequency Generation in Silicon Waveguides Strained by Silicon Nitride

•*F. Bianco*[1], *M. Cazzanelli*[1], *A. Yeremyan*[1], *M. Ghulinyan*[2], *G. Pucker*[2], *D. Modotto*[3], *S. Wabnitz*[3], *and L. Pavesi*[1]; [1]*University of Trento, Trento, Italy*; [2]*Bruno Kessler Foundation, Trento, Italy*; [3]*Università di Brescia, Brescia, Italy*

We experimentally demonstrate and theoretically model mid-infrared difference-frequency generation in silicon waveguides where a quadratic nonlinear response is introduced through straining by a silicon nitride overlayer.

CK-2.3 SUN 11:30

Ultrafast optical modulation using slow light photonic crystal waveguides

•*A. Opheij*[1], *N. Rotenberg*[1], *D.M. Beggs*[1], *I.H. Rey*[2], *T.F. Krauss*[2], *and K. Kuipers*[1]; [1]*FOM Institute AMOLF, Amsterdam, The Netherlands*; [2]*University of St Andrews, St Andrews, United Kingdom*

By optically pumping a silicon photonic crystal waveguide the bandstructure can be shifted in an ultrafast manner. Using this phenomenon we demonstrate how a slow-light photonic crystal waveguide can function as an ultrafast modulator.

ROOM 1

CF/IE-2.4 SUN 11:45

Optimizing phase matching of high-order harmonic radiation in the range up to 1 keV

•*J. Seres*[1], *E. Seres*[1,2], *B. Landgraf*[1,2], *B. Ecker*[2,3], *B. Aurand*[2,3], *T. Kühl*[2,3], *and C. Spielmann*[1,2]; [1]*Friedrich Schiller University, Jena, Germany*; [2]*Helmholtz Institute Jena, Jena, Germany*; [3]*GSI Helmholtz Centre for Heavy Ion Research, Darmstadt, Germany*

We present a detailed experimental study to predict guidelines for maximizing the short wavelength high-order harmonic generation signal without perfect phase matching in helium in the 0.2-1 keV spectral range using 800 nm light pulses.

CF/IE-2.5 SUN (Invited) 12:00

Generation of Gigawatt-scale Isolated Attosecond Pulses

•*E. Takahashi*; *RIKEN, Wako, Japan*

We successfully generated a microjoule isolated attosecond pulse (IAP) for investigating attosecond nonlinear phenomena in atoms and molecules. Our generation method paves the way of the applications of IAP for the next attosecond frontier.

ROOM 4a

IF-2.4 SUN 11:45

Trapping of dispersive waves in solitonic resonators and its role in supercontinuum generation

•*A. Yulin*[1], *R. Driben*[2,3], *B. Malomed*[2], *and D. Skryabin*[4]; [1]*Centro de Física Teórica e Computacional, Faculdade de Ciências, Universidade de Lisboa, Lisbon, Portugal*; [2]*Department of Physical Electronics, Faculty of Engineering, Tel Aviv University, Tel Aviv, Israel*; [3]*Department of Physics & CeOPP, University of Paderborn, Paderborn, Germany*; [4]*Centre for Photonics and Photonic Materials, Department of Physics, University of Bath, Bath, United Kingdom*

It is shown that dispersive waves can be trapped between optical solitons during supercontinuum generation. The dispersive waves mediated inter-soliton interactions and the modification of the spectrum of the trapped waves are studied in detail.

IF-2.5 SUN 12:00

Understanding the fission of higher-order solitons under the action of the higher-order dispersion.

•*R. Driben*[1,2], *B. Malomed*[1], *D. Skryabin*[3], *and A. Yulin*[4]; [1]*Department of Physical Electronics, Faculty of Engineering, Tel Aviv University, Tel-Aviv, Israel*; [2]*Department of Physics & CeOPP, University of Paderborn, Paderborn, Germany*; [3]*Centre for Photonics and Photonic Materials, Department of Physics, University of Bath, Bath, United Kingdom*; [4]*4Centro de Física Teórica e Computacional, Faculdade de Ciências, Universidade de Lisboa, Lisboa, Portugal*

A mechanism of creating an optical Newton's cradle in the form of a chain of solitons is proposed for understanding fission of higher-order soliton in optical fibers caused by higher-order dispersion.

IF-2.6 SUN 12:15

Long-range incoherent solitons

C. Michel[1], *B. Kibler*[2], •*G. Xu*[2], *J. Garnier*[3], *and A. Picozzi*[2]; [1]*Laboratoire de Physique de la Matiere Condensee, Nice, France*; [2]*Laboratoire Interdisciplinaire Carnot de Bourgogne, Dijon, France*; [3]*Laboratoire de Probabilites et Modeles Aleatoires, Paris, France*

We show that a highly nonlocal or noninstantaneous nonlinear response prevents the natural process of thermalization of incoherent optical waves: The field self-organizes into long-range incoherent solitons, which constitute nonequilibrium stable states of the system.

ROOM 4b

CC-2.4 SUN 11:45

Radiation-Harvesting Resonant Superconducting sub-THz Metamaterial Bolometer

•*V. Savinov*[1], *V.A. Fedotov*[1], *P.A.J. de Groot*[2], *and N.I. Zheludev*[1,3]; [1]*Optoelectronics Research Centre & Centre for Photonic Metamaterials, University of Southampton, Southampton, United Kingdom*; [2]*School of Physics and Astronomy & Centre for Photonic Metamaterials, University of Southampton, Southampton, United Kingdom*; [3]*Centre for Disruptive Photonic Technologies, Nanyang Technological University, Singapore, Singapore*

We demonstrate a sub-THz superconducting metamaterial bolometer with selective response that exploits intermolecular electromagnetic interactions in the electrically interconnected network of superconducting resonators, and superconducting phase-transition edge sensitivity of the electrical interconnect.

CC-2.5 SUN 12:00

Super thin planar lens for terahertz beam control

•*Y. Zhang, J. Ye, D. Hu, X. Wang, S. Feng, and W. Sun*; *Department of Physics, Capital Normal University, Beijing, China, People's Republic of (PRC)*

A new approach is proposed to fabricate terahertz elements. A lens with 4mm focus length for 0.75THz is design, fabricated, and experimentally demonstrated. The thickness of the lens is only 1/4000 of the illuminating wavelength.

CC-2.6 SUN 12:15

THz-Comb-Assisted Molecular Spectroscopy

L. Consolino[1], •*S. Bartalini*[1], *A. Taschin*[2], *P. Bartolini*[2], *M.S. Vitiello*[1,3], *H. Beere*[4], *D. Ritchie*[4], *A. Tredicucci*[3], *P. Cancio Pastor*[1], *R. Torre*[2], *and P. De Natale*[1]; [1]*Istituto Nazionale di Ottica - CNR, Firenze, Italy*; [2]*European Laboratory for Non-Linear Spectroscopy, Sesto Fiorentino, Italy*; [3]*NEST, Istituto Nanoscienze - CNR, Pisa, Italy*; [4]*Cavendish Laboratory, University of Cambridge, J J Thomson Avenue, Cambridge, United Kingdom*

We report on the first measurements of the absolute frequency of a molecular transition in the THz domain, performed by a CW THz quantum cascade laser (QCL) and assisted by a THz Frequency Comb Synthetizer.

ROOM 13a

CA-2.4 SUN 11:45

Q-Switched and Mode-Locked 639-nm Pr:YLF Laser with Cr :YAG Saturable Absorber

•*R. Abe, J. Kojou, K. Masuda, K. Hirosawa, and F. Kannari*; *Department of Electronics and Electrical Engineering, Keio University, 3-14-1, Hiyoshi, Kohoku-ku, Yokohama, Japan*

We demonstrated the first Q-switched mode-locking of Pr3+:YLF laser using a Cr4+:YAG saturable absorber at 639 nm. The highest Q-switched mode-lock laser power was 475 mW at an absorbed pump power of 4 W.

CA-2.5 SUN 12:00

Novel Rare Earth Solid State Lasers with Emission Wavelengths in the Visible Spectral Range

•*P.W. Metz*[1], *F. Moglia*[1], *F. Reichert*[1], *S. Müller*[1], *D.-T. Marzahl*[1], *N.-O. Hansen*[1], *C. Kränkel*[1,2], *and G. Huber*[1,2]; [1]*Institute of Laser-Physics, Hamburg, Germany*; [2]*The Hamburg Center For Ultrafast Imaging, Hamburg, Germany*

We present a 2.9-W Pr^{3+}:$LiYF_4$ cw-laser with a record optical-to-optical efficiency of 71% and the first laser operation of Sm^{3+}:$LiLuF_4$ (606 nm, 649 nm), Dy^{3+}:$LiLuF_4$ (578 nm, 661 nm), and Tb^{3+}:LaF_3 (543 nm).

CA-2.6 SUN 12:15

Multi-Watt Diode-Pumped Alexandrite Laser Operation

•*M. Damzen, G. Thomas, and A. Minassian*; *Imperial College London, London, United Kingdom*

We demonstrate the world's first multi-Watt (6.4W) diode-pumped Alexandrite laser operating with high pulse energy (23.4mJ) and high efficiency, offering breakthrough potential as a future remote sensing source or compact ultrafast amplifier.

ROOM 13b

CB-2.4 SUN 11:45

Quantum cascade laser spectrometer for frequency metrology and high accuracy molecular spectroscopy around 10 μm

S. Mejri, P.L.T. Sow, O. Lopez, S.K. Tokunaga, A. Goncharov, B. Argence, B. Chanteau, C. Chardonnet, A. Amy-Klein, •B. Darquié, and C. Daussy; Laboratoire de Physique des Lasers, Université Paris 13, Sorbonne Paris Cité, CNRS, Villetaneuse, France

We are developing a ~10 μm quantum cascade laser (QCL) based spectrometer suitable for precision molecular spectroscopy. We have measured a record ~200-kHz free-running linewidth and phase-locked a QCL to an ultra-narrow stabilized CO_2 laser.

CB-2.5 SUN 12:00

Nonlinear dynamics and Modulation Properties of Optically Injected Quantum Cascade Lasers

•C. Wang[1], F. Grillot[2], V. Kovanis[3], and J. Even[1]; [1]Université Européenne de Bretagne, INSA, CNRS FOTON, Rennes, France; [2]Telecom Paristech, Ecole Nationale Supérieure des Télécommunications, CNRS LTCI, Paris, France; [3]3ElectroScience Laboratory, Ohio State University, Columbus, United States

The bifurcation scenarios and modulation properties of injection-locked quantum cascade lasers are theoretically investigated. No frequency dip occurs in the modulation response while both positive and negative detunings enhance the modulation bandwidth.

CB-2.6 SUN 12:15

Transverse-electric polarized intersubband electroluminescence from quantum cascade structures based on InAs/AlInAs quantum dashes

•V. Liverini[1], L. Nevou[1], F. Castellano[1,2], A. Bismuto[1], M. Beck[1], F. Gramm[3], and J. Faist[1]; [1]Institute for Quantum Electronics, ETH Zurich, Zurich, Switzerland; [2]CNR, Istituto Nanoscienze, Pisa, Italy; [3]Electron Microscopy ETH Zurich (EMEZ), ETH Zurich, Zurich, Switzerland

We demonstrate room-temperature transverse-electric electroluminescence from a quantum cascade structure based on InAs/AlInAs quantum dashes. The 110meV electroluminescence originates from a laterally-confined dash state, confirmed by its dependence on crystallographic orientation and intersubband absorption measurements.

CB-2.7 SUN 12:30

Robust, frequency-stable and accurate mid-IR laser spectrometer based on frequency comb metrology of quantum cascade lasers up-converted in orientation-patterned GaAs

•S. Schiller[1], M. Hansen[1], I. Ernsting[1], S. Vasilyev[1], A. Grisard[2], E. Lallier[2], and B. Gerard[3]; [1]Heinrich-Heine-Universität, Düsseldorf, Germany; [2]Thales Research and

ROOM 14a

CM-2.2 SUN 12:00

Direct Laser Texturing of Biomimetic Surfaces for Neural Tissue Engineering

•E. Stratakis[1,2], C. Simitzi[1,2], A. Ranella[1], P. Eustathopoulos[2], I. Pediaditakis[2], I. Charalampopoulos[2], I. Athanasakis[2], A. Gravanis[1,2], and C. Fotakis[1,2]; [1]Institute of Electronic Structure and Laser, Foundation for Research & Technology Hellas (IESL-FORTH), Heraklion, Greece; [2]University of Crete, Heraklion 714 09, Greece., Heraklion, Greece

We present the differential response of primary neuronal cells on direct laser textured biomimetic micro/nano structured surfaces for neural tissue engineering applications. The role of surface energy to tune neuron cells behaviour is emphasized.

CM-2.3 SUN 12:15

Femtosecond laser structuring and plasma polishing of AlN ceramics

•K. Kurselis[1], T. Burgermeister[2], K. Pyka[2], J. Keller[2], H. Partner[2], T. Mehlstäubler[2], R. Kiyan[1], C. Reinhardt[1], and B. Chichkov[1]; [1]Laser Zentrum Hannover e.V., Hannover, Germany; [2]Physikalisch-Technische Bundesanstalt, Braunschweig, Germany

Novel two-stage technique to micromachine AlN ceramics by femtosecond laser is demonstrated. Based on ablation and plasma polishing, it enables up to 400 cubic micrometers per pulse removal rate and 350 nm Ra surface roughness.

ROOM 14b

CD-2.4 SUN 11:45

Filter-driven four wave mixing dual-mode mode-locked laser based on an integrated nonlinear microring resonator

•M. Peccianti[1], A. Pasquazi[2], B.E. Little[3], S.T. Chu[4], D.J. Moss[5], and R. Morandotti[2]; [1]Institute for Complex Systems-CNR, Rome, Italy; [2]INRS-EMT, Varennes, Canada; [3]Infinera Ltd, Sunnyvale, United States; [4]Department of Physics and Materials Science, City University of Hong Kong, Hong Kong, Hong Kong; [5]CUDOS and IPOS, School of Physics, University of Sydney, Sydney, Canada

We demonstrate a mode-locked laser based on a nonlinear microring resonator embedded in a filter-driven four wave mixing design capable of generating a 200GHz train of short pulses, auto-modulated with a monochromatic radiofrequency sub-carrier.

CD-2.5 SUN 12:00

Modulational Instability Phase-matched by Higher-order Dispersion Terms in Dispersion-oscillating Optical Fibers

M. Droques[1], •A. Kudlinski[1], G. Bouwmans[1], G. Martinelli[1], A. Mussot[1], A. Armaroli[2], and F. Biancalana[2]; [1]Laboratoire PhLAM UMR CNRS 8523, IRCICA, Université Lille 1, Villeneuve d'Ascq, France; [2]Max Planck Research Group 'Nonlinear Photonic Nanostructures' Max Planck Institute for the Science of Light, Erlangen, Germany

We experimentally demonstrate that higher-order dispersion phase-matching process also occurs in optical fiber with oscillating dispersion and that it leads to the generation of new modulation instability frequencies.

CD-2.6 SUN 12:15

Nonlinear beam shaping by non-collinear interactions

•A. Shapira[1], I. Juwiler[2], and A. Arie[1]; [1]Tel Aviv University, Tel Aviv, Israel; [2]Sami Shamoon College of Engineering, Ashdod, Israel

A new method for one and two dimensional efficient beam shaping is presented, employing a non-collinear quasi phase-matched interaction in a crystal whose quadratic nonlinear coefficient is encoded by a computer generated hologram pattern.

ROOM 21

CK-2.4 SUN 11:45

Small-footprint Integrated Bragg Gratings in SOI Spiral Waveguides

•A.D. Simard[1], Y. Painchaud[2], and S. LaRochelle[1]; [1]Centre d'optique, photonique et laser (COPL), Université Laval, Québec, Canada; [2]TeraXion, Québec, Canada

We fabricated 2-mm long Bragg gratings in SOI spiral waveguides without any spectral degradation by compensating in the design the effective index variations caused by the curvature. Devices had a small footprint of 200x190 um2.

CK-2.5 SUN 12:00

Integrated Four-Wave Mixing Source for Coherent anti-Stokes Raman Scattering Based on Silicon Nitride

•J. Epping[1], M. Kues[2], P. van der Slot[1], C. Lee[1,3], C. Fallnich[2], and K. Boller[1]; [1]University of Twente, Enschede, The Netherlands; [2]Westfälische Wilhelms-Universität, Münster, Germany; [3]FOM Institute DIFFER, Niuwegein, The Netherlands

We propose and theoretical investigate a light source for CARS based on seeded four-wave mixing in silicon nitride waveguides. A wide tuning range (1290-2750cm^{-1}) is expected via pumping at a wavelength of 1058nm.

CK-2.6 SUN 12:15

Low loss SiGe waveguides in the MID-IR

•C. Grillet[1,2], P. Ma[3], B. Luther-Davies[3], D. Hudson[2], C. Monat[1], S. Madden[3], D. Moss[2], M. Brun[4], P. Labeye[4], S. Ortiz[4], and S. Nicoletti[4]; [1]Institut des Nanotechnolgies de Lyon, Ecully, France; [2]Centre for Ultrahigh bandwidth Devices for Optical Systems, Sydney, Australia; [3]Centre for Ultrahigh bandwidth Devices for Optical Systems, Canberra, Australia; [4]CEA-LETI, Grenoble, France

We report low propagation loss in Si/SiGe waveguides in the mid-infrared with losses as low as 0.5 dB/cm at wavelength 4.75 μm. SiGe represents a truly promising CMOS-compatible integrated photonic platform for the mid-IR.

ROOM 1	ROOM 4a	ROOM 4b	ROOM 13a

ROOM 1

14:30 – 16:00

CF/IE-3: Pulse Shaping and Characterization

Chair: Eberhard Riedle, Ludwig-Maximilians Universität, Munich, Germany

CF/IE-3.1 SUN 14:30

Pulse Shaping in the Mid-Infrared by a Deformable Mirror

A. Cartella[1], •C. Manzoni[2], S. Bonora[3], M. Först[1], G. Cerullo[2], and A. Cavalleri[1]; [1]Max-Planck Institute for the Structure and Dynamics of Matter, CFEL, University of Hamburg, Hamburg, Germany; [2]IFN-CNR, Dipartimento di Fisica - Politecnico di Milano, Milan, Italy; [3]IFN-CNR, LUXOR, Padova, Italy

We present a pulse shaping scheme operating in the mid-infrared range at wavelengths up to 20 microns. The spectral phase is controlled by a suitably designed deformable mirror in a grating-based 4f-configuration.

CF/IE-3.2 SUN 14:45

Characterization of sub-two-cycle pulses from a hollow-core fiber compressor in the spatiotemporal and spatio-spectral domains

B. Alonso[1,2], M. Miranda[2], F. Silva[2], V. Pervak[3,4], J. Rauschenberger[3], J. San Román[1], •Í. Sola[1], and H. Crespo[2]; [1]Grupo de Investigación en Óptica Extrema (GIOE), Universidad de Salamanca, E-37008, Salamanca, Spain; [2]IFIMUP-IN and Departamento de Física e Astronomia, Universidade do Porto, Rua do Campo Alegre 687, 4169-007, Porto, Portugal; [3]UltraFast Innovations GmbH, Am Coulombwall 1, 85748, Garching, Germany; [4]Ludwig-Maximilians-Universität München, Department für Physik, Am Coulombwall 1, 85748, Garching, Germany

We characterized the full spatiotemporal and spatio-spectral amplitude and phase of

ROOM 4a

14:30 – 16:00

IF-3: Nonlinear Light Interactions in Quantum Systems

Chair: Jens Biegert, ICFO, Castelldefels, Barcelona, Spain

IF-3.1 SUN 14:30

Nonlinear magneto-optical effects and quantum coherences in cold rubidium atoms in an optical dipole trap

•A. Wojciechowski, K. Sycz, A. Stabrawa, M. Piotrowski, J. Zachorowski, and W. Gawlik; Institute of Physics, Jagiellonian University, Krakow, Poland

We investigate nonlinear magneto-optical effects in cold atoms. Nonlinearity results from creation of Zeeman coherences and thus can be controlled by magnetic fields or, alternatively, used for high-precision magnetometry.

IF-3.2 SUN 14:45

Transverse self-organization in cold atoms due to opto-mechanical coupling

•G. Labeyrie[1], P. Gomes[2], E. Tesio[2], R. Kaiser[1], W. Firth[2], G. Robb[2], G.-L. Oppo[2], and T. Ackemann[2]; [1]Institut Non Linéaire de Nice, Sophia Antipolis, France; [2]University of Strathclyde, Glasgow, United Kingdom

We report the observation of transverse self-organization in cold atoms under the action of a single, retro-reflected pump laser beam. The instability, resulting in hexagonal light and density patterns, is driven by opto-mechanical coupling.

ROOM 4b

14:30 – 16:00

CC-3: Terahertz Sources

Chair: Thomas Dekorsy, Konstanz University, Konstanz, Germany

CC-3.1 SUN (Invited) 14:30

Room-temperature terahertz generation using vertical-external-cavity surface-emitting lasers

M. Wichmann[1], A. Chernikov[1], M.K. Shakfa[1], M. Scheller[2], J.V. Moloney[2], S.W. Koch[1], and •M. Koch[1]; [1]Faculty of Physics and Material Sciences Center, Philipps-Universität Marburg, Marburg, Germany; [2]College of Optical Sciences, The University of Arizona, Tucson, United States

We present a terahertz source based on intracavity difference frequency generation within a dual color vertical-external-cavity surface-emitting laser. In addition, we study the temporal stability of this source via streak-camera measurements.

ROOM 13a

14:30 – 16:00

CA-3: Mid-IR-Lasers

Chair: Christian Kränkel, University of Hamburg, Hamburg, Germany

CA-3.1 SUN (Invited) 14:30

Mid-IR Solid-State Lasers for Spectroscopy and Metrology Applications

•G. Galzerano, N. Coluccelli, A. Gambetta, M. Cassinerio, and P. Laporta; Istituto di Fotonica e Nanotecnologie - CNR and Dipartimento di Fisica del Politecnico di Milano, Milan, Italy

We report on the generation of wide bandwidth coherent radiation in the mid-infrared spectral region from 2.1 to 2.6 um based on room-temperature Cr2+:ZnSe laser crystals.

ROOM 13b

14:30 – 16:00

CL-1/ECBO: Biophotonics and Applications I (Session jointly held with ECBO)

Chair: Kishan Dholakia, University of St. Andrews, Fife, U.K. & Andreas H. Hielscher, Columbia University, New York, NY, USA

CL-1/ECBO.1 SUN (Tutorial) 14:30

Photoacoustic Tomography: Ultrasonically Breaking through the Optical Diffusion and Diffraction Limits

•L.V. Wang; Washington University, Department of Biomedical Engineering, St. Louis, MO, United States

Photoacoustic tomography provides in vivo multiscale functional, metabolic, molecular, and histologic imaging across the scales of organelles, cells, tissues, and organs with consistent contrast. Penetration and resolution have reached 7 cm and 90 nm, respectively.

ROOM 13b

Technology, Palaiseau, France; [3]III-V Labs, Campus Polytechnique, Palaiseau, France
We demonstrate a robust and simple method for measurement, stabilization and tuning of the frequency of cw mid-infrared lasers. We demonstrate 100kHz-level frequency inaccuracy, frequency instability <10 kHz, controlled frequency tuning and long-term stability

ROOM 14a

ROOM 14b

ROOM 21

ROOM 14a

14:30 – 16:00

CJ-1: Fibres and Components
Chair: Mathias Jäger, Institute of Photonic Technology, Jena, Germany

CJ-1.1 SUN 14:30

All-fiber Kilowatt Signal Combiners for High Power Fiber Lasers
•A. Braglia, A. Califano, M. Olivero, A. Penna, and G. Perrone; Politecnico di Torino, Department of Electronics and Telecommunications, Torino, Italy
The fabrication of multi-kilowatt fiber-fused signal combiners for fiber laser power scaling is presented. Characterization results up to 2kW have validated the manufacturing procedure and highlight the suitability for further power increases.

CJ-1.2 SUN 14:45

Side Pumping Scheme for All-Fiber Counter-Pumping of High Power Single-Frequency Fiber Amplifiers
•T. Theeg[1,2], H. Sayinc[1,2], J. Neumann[1,2], L. Overmeyer[1,3], and D. Kracht[1,2]; [1]Laser Zentrum Hannover e.V., Hannover, Germany; [2]Centre for Quantum Engineering and Space-Time Research - QUEST, Hannover, Germany; [3]Institut für Transport- und Automatisierungstechnik, Hannover, Germany
We focus on the impact of an all-fiber pump combiner on a counter-pumped single-frequency Ytterbium fiber amplifier with an output power of 300 W. The all-fiber system is designed for very narrow linewidth amplification.

ROOM 14b

14:30 – 16:00

CD-3: Nonlinear Optics in Photonic Crystal Fibers
Chair: Daniil Kartashov, Photonics Institute Vienna, Vienna, Austria

CD-3.1 SUN 14:30

Efficient spectral broadening of multi-mJ pulses in long hollow fibers
T. Rohrlapper[1], P. Simon[2], U. Morgner[1], and •T. Nagy[1,2]; [1]Institut für Quantenoptik, Leibniz Universität Hannover, Hannover, Germany; [2]Laser-Laboratorium Göttingen e.V., Göttingen, Germany
Long stretched flexible hollow fibers were used for spectral broadening of multi-mJ femtosecond pulses. Spectra supporting 3.4fs pulses with excellent beam quality were achieved at 65% transmission. The scalability of the approach will be discussed.

CD-3.2 SUN 14:45

Broadband Cherenkov Radiation by Using Group-velocity-matching in Index-guiding Photonic Crystal Fiber
•X. Zeng[1,2], S. Wang[2], H. Guo[1], and M. Bache[1]; [1]Technical University of Denmark, Kgs. Lyngby, Denmark; [2]Shanghai University, Shanghai, China, People's Republic of (PRC)
We numerically investigate broadband optical Cherenkov radiation in small-core solid index-guiding photonic crystal fibers with three zero dispersion wavelengths. Group velocity matching between the soliton and radiation enables broad conversion bandwidth and enhances the efficiency.

ROOM 21

14:30 – 16:00

CK-3: Novel Materials and Structures
Chair: Tapio Niemi, Tampere University of Technology, Tampere, Finland

CK-3.1 SUN 14:30

Experimental Demonstration of Photonic Floquet Topological Insulators
•J.M. Zeuner[1], Y. Plotnik[2], M.C. Rechtsman[2], Y. Lumer[2], M. Segev[2], and A. Szameit[1]; [1]Institute of Applied Physics, Friedrich-Schillier-Universität Jena, Jena, Germany; [2]Technion, Israel Institute of Technology, Haifa, Israel
We experimentally demonstrate the first photonic Floquet topological insulator, which brings the striking concept of a completely new phase of matter with an insulating bulk and a conducting edge from electronics to optics.

CK-3.2 SUN 14:45

Reconfigurable Metamaterials Controlled by Lorentz, Ampere and Coulomb forces: Towards GHz Bandwidth
•J. Valente[1], E. Plum[1], J.-Y. Ou[1], and N. Zheludev[1,2]; [1]Optoelectronics Research Centre, Southampton, United Kingdom; [2]Centre for Disruptive Photonic Technologies, Singapore, Singapore
We demonstrate a family of nanostructured reconfigurable metamaterials, optical properties of which can be modulated in the visible and near-IR parts of the spectrum with external stimuli such as magnetic fields, electric currents and voltages.

ROOM 22

14:30 – 16:00

IH-1: Mapping Near Fields
Chair: Fritz Keilmann, Ludwig-Maximilians-Universität, Munich, Germany

IH-1.1 SUN 14:30

Mapping Nanoscale Optical Fields: a Magnetic Surprise
•B. le Feber[1], N. Rotenberg[1], D. Beggs[1,2], and K. Kuipers[1]; [1]FOM Institute AMOLF, Amsterdam, The Netherlands; [2]Bristol University, Bristol, United Kingdom
We find that an aperture probe collects signal not only from the electric near-field, but also from the magnetic near-field. We show how we can identify both electric and magnetic contributions in our measurements.

IH-1.2 SUN 14:45

Near-field characterization of a plasmonic antenna based on fluorescence photocounts and decay rate measurements
•V. Krachmalnicoff[1], D. Cao[1], A. Cazé[1], E. Castanié[1], R. Pierrat[1], N. Bardou[2], S. Collin[2], R. Carminati[1], and Y. De Wilde[1]; [1]Institut Langevin, ESPCI ParisTech, CNRS, Paris, France; [2]Laboratoire de Photonique et Nanostructures (LPN-CNRS), Marcoussis, France
We report on the experimental and theoretical study of the local density of states and intensity fluctuations of the electro-magnetic field at the surface of a plasmonic nanoantenna. Theory and experiments are in good agreement.

NOTES

ROOM 1

4.5-fs post-compressed pulses by combining d-scan and STARFISH techniques, which enabled studying the spatial chirp of the post-compression in the temporal and spectral domains.

CF/IE-3.3 SUN 15:00

Spatio-temporal metrology of high power femtosecond lasers

•*V. Gallet*; *Commissariat à l'énergie atomique et aux énergies alternatives, Saclay, France*

We demonstrate three approaches for the spatiotemporal characterization of femtosecond lasers. Partial information is obtained through the spatially-resolved spectrum. We use interferometers based on optical fibers, in scanning or single shot mode, for complete reconstruction.

CF/IE-3.4 SUN 15:15

Complete Spatial Characterization of an Optical Wavefront Using a Variable-Separation Pinhole Pair

•*D. Lloyd, K. O'Keeffe, and S. Hooker*; *Department of Physics, University of Oxford, Clarendon Laboratory, Oxford, United Kingdom*

We present a technique for the complete characterization of the transverse spatial properties of an optical wavefront. Recovery of the spectrally-resolved profiles of phase, intensity, and spatial coherence is achieved in a single scan.

CF/IE-3.5 SUN 15:30

Pulse measurement from near to mid-IR using third harmonic generation dispersion scan in multilayer graphene

•*F. Silva*[1,2], *M. Miranda*[1,3], *S. Teichmann*[2], *M. Baudisch*[2], *M. Massicotte*[2], *F. Koppens*[2], *J. Biegert*[2,4], *and H. Crespo*[1]; [1]*IFIMUP-IN and Departamento de Fisica e Astronomia, Porto, Portugal*; [2]*ICFO-Institut de Ciencies Fotoniques, Barcelona, Spain*; [3]*Department of Physics, Lund University, Lund, Sweden*; [4]*ICREA-Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain*

ROOM 4a

IF-3.3 SUN (Invited) 15:00

Optical parametric oscillation with distributed feedback in cold atoms

•*W. Guerin*[1,2], *A. Schilke*[1], *P. Courteille*[3], *and C. Zimmermann*[1]; [1]*Physikalisches Institut, Eberhard-Karls-Universität Tübingen, Tübingen, Germany*; [2]*Institut Non Linéaire de Nice, CNRS, Université de Nice Sophia-Antipolis, Valbonne, France*; [3]*Instituto de Fisica de São Carlos, Universidade de São Paulo, São Carlos, Brazil*

We report the observation of distributed feedback lasing in an ordered cold atom sample. The atoms simultaneously provides gain via four-wave mixing and feedback via Bragg reflection. We discuss the properties of this system.

IF-3.4 SUN 15:30

Demonstration of reconfigurable optical functions inspired by quantum effects

•*C. Ciret*[1,2], *V. Coda*[1,2], *A.A. Rangelov*[3], *and G. Montemezzani*[1,2]; [1]*Université de Lorraine, LMOPS, Metz, France*; [2]*Supélec, LMOPS, Metz, France*; [3]*Department of physics, Sofia University, Sofia, Bulgaria*

Properly designed photoinduced waveguide structures possess direct analogies with quantum effects, which are useful for novel optical functions. The analogy of three-waveguide systems with Electromagneti-

ROOM 4b

CC-3.2 SUN 15:00

A continuous-wave, solid-state Stimulated Polariton THz Source

•*A. Lee and H. Pask*; *Macquarie University, Sydney, Australia*

We present a diode end-pumped solid-state source which generates frequency-tunable continuous-wave (CW) terahertz (THz) radiation through stimulated polariton scattering (SPS) in a Mg-doped LiNbO3 crystal with low pump power requirements (3.76 W).

CC-3.3 SUN 15:15

Counter-Propagating Difference-Frequency Generation in Diamond with Terahertz Fields

M. Clerici[1,2], *L. Caspani*[1], *E. Rubino*[1,3], *M. Peccianti*[4], *M. Cassataro*[1,5], *A. Busacca*[5], *T. Ozaki*[1], *D. Faccio*[2], *and* •*R. Morandotti*[1]; [1]*INRS-EMT, Varennes, Canada*; [2]*School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom*; [3]*Dipartimento di Scienza e Alta Tecnologia, Università degli Studi dell' Insubria, Como, Italy*; [4]*Institute for complex Systems-CNR, Roma, Italy*; [5]*DIEET, Università di Palermo, Palermo, Canada*

We show that both sum- and difference-frequency generation occur when overlapping an intense terahertz field with optical pulses in diamond. Remarkably, the difference-frequency generation process is naturally phase-matched for counter-propagating waves.

CC-3.4 SUN (Invited) 15:30

THz Emission from Intrinsic Josephson Junctions in High-Tc Superconductors for Imaging Applications

•*K. Kadowaki*[1,2,3,4], *M. Tsujimoto*[2,3,4], *K. Delfanazari*[2,3,4], *T. Kitamura*[2,3,4], *K. Ishida*[2,3,4], *C. Watanabe*[2,3,4], *S. Sekimoto*[2,3,4], *H. Minami*[1,2,3,4], *and T. Kashiwagi*[1,2,3,4]; [1]*Faculty of Pure & Applied Sciences, University of Tsukuba, Tsukuba, Japan*; [2]*Graduate School of Pure & Applied Sciences, University of Tsukuba, Tsukuba, Japan*; [3]*CREST-JST, Tokyo, Japan*; [4]*National*

ROOM 13a

CA-3.2 SUN 15:00

High-Pulse-Energy Cryogenic Ho:YLF Laser Pumped by a Tm:fiber Laser

•*H. Fonnum, E. Lippert, and M. Haakestad*; *Norwegian Defence Research Establishment (FFI), Kjeller, Norway*

A cryogenically cooled Ho:YLF oscillator delivering Q-switched pulses of 550 mJ and beam quality M2 = 1.5 is demonstrated. The pump is a 100-W-Tm-fiber laser, giving a pulse energy to power efficiency of 5.5 J/kW.

CA-3.3 SUN 15:15

In-band Pumped Ho3+:KY3F10 2 μm Laser

•*M. Schellhorn*[1], *D. Parisi*[2], *S. Veronesi*[2], *G. Bolognesi*[2], *M. Eichhorn*[1], *and M. Tonelli*[2]; [1]*French-German Research Institute, ISL, Saint-Louis, France*; [2]*NEST-Istituto Nanoscienze-CNR, and Dipartimento di Fisica Universita di Pisa, Pisa, Italy*

A maximum laser power of 2.4 W was obtained at a wavelength of ~ 2040 nm for 23 W of absorbed pump power with a slope efficiency of 21.6 % with respect to absorbed power.

CA-3.4 SUN 15:30

In-band diode pumped high power Ho:YLF laser

•*K. Scholle*[1], *S. Lamrini*[1], *F. Gatzemeier*[1], *P. Koopmann*[2], *and P. Fuhrberg*[1]; [1]*LISA laser products OHG, Katlenburg, Germany*; [2]*Institute of Laser-Physics, University of Hamburg, Hamburg, Germany*

We present the first directly in-band pumped Ho:YLF laser using a GaSb diode stack with a center wavelength of 1930 nm as pump source. 8.7 W cw output power at room temperature were achieved.

ROOM 13b

CL-1/ECBO.2 SUN (Invited) 15:30

Improved Precision in Optical Tweezers via Squeezed Light

•*W. Bowen, M.A. Taylor, J. Janousek, V.R. Daria, J. Knittel, B. Hage, and H. Bachor*; *The University of Queensland, Brisbane, QLD, Australia*

Squeezed light is used to improve the precision of particle tracking in living yeast cells. This first biological application of squeezed light allows the cytoplasm viscoelasticity to be determined 64% faster than equivalent classical experiments.

ROOM 14a

CJ-1.3 SUN 15:00

514 W monolithic fiber laser with a femtosecond inscribed fiber Bragg grating

•*R.G. Krämer[1], A. Liem[2], C. Voigtländer[1], J.U. Thomas[1], D. Richter[1], T. Schreiber[2], A. Tünnermann[1,2], and S. Nolte[1,2]; [1]Institute of Applied Physics, Jena, Germany; [2]Fraunhofer Institute of Applied Optics and Precision Engineering, Jena, Germany*

We report on a monolithic cw fiber laser realized via fiber Bragg grating inscribed directly into the active core by ultrashort pulses with an output power of 514W in an Yb-doped large mode area fiber.

CJ-1.4 SUN 15:15

Evolution of lasing during FBG-inscription in a Yb-Al-doped laser fiber

•*J. Fiebrandt, M. Leich, S. Jetschke, M. Rothhardt, M. Jäger, and H. Bartelt; Insitute of Photonic Technology, Jena, Germany*

We report on the inscription of a fiber Bragg grating in a Yb-Al-doped fiber under pumping conditions and on the spectral properties of a laser operating with such a grating.

CJ-1.5 SUN 15:30

Inverse laser drilling of transparent materials for the production of optical components

•*M. Werner, D. Esser, and H.-D. Hoffmann; Fraunhofer Institute for Laser Technology, Aachen, Germany*

Investigations of laser driven 3D volume glass processing are presented. The process allows for high flexibility in geometry compared to conventional Stack and Draw technique. A Photonic fiber preform has been manufactured.

ROOM 14b

CD-3.3 SUN 15:00

Frequency-dissymmetric nonlinear sideband generation in a photonic crystal fibre

•*M. Barbier[1], P. Leproux[2], P. Roy[2], and P. Delaye[1]; [1]Laboratoire Charles Fabry, Institut d'Optique, CNRS, Université Paris-Sud, Palaiseau, France; [2]XLIM, Université de Limoges, CNRS, Limoges, France*

We observe an unexpected frequency-dissymmetric sideband generation due to the combination of self-phase-modulation-induced spectral broadening and spontaneous four-wave mixing in the normal dispersion regime of a photonic crystal fibre.

CD-3.4 SUN 15:15

Photoionization-induced Nonlinear Phenomena in Gas-filled Photonic Crystal Fibers

•*M. Saleh[1] and F. Biancalana[1,2]; [1]Max Planck Institute for the Science of Light, Erlangen, Germany; [2]School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom*

We have developed a model to describe pulse propagation in gas-filled photonic crystal fibers. We have shown that the photoionization process can induce soliton self-frequency blue-shift, asymmetric self-phase modulation, and universal modulational instability.

CD-3.5 SUN 15:30

Impulsive Raman-induced spectral broadening in hydrogen-filled HC-PCF

•*F. Belli[1], A. Abdolvand[1], J.C. Travers[1], W. Chang[1], A.M. Walser[1], and P.S.J. Russell[1,2]; [1]Max Planck Institute for the Science of Light, Erlangen, Germany; [2]Department of Physics, University of Erlangen-Nuremberg, Erlangen, Germany*

Strong and asymmetrical spectral broadening is reported in hydrogen-filled HC-PCF excited impulsively with 40 fs pulses. Experimental and numerical results confirm that

ROOM 21

CK-3.3 SUN (Invited) 15:00

Graphene, Plasmonic and Silicon Optical Modulators

•*V. Sorger; George Washington University, Washington, United States*

Here we present two demonstrations of electro-optic modulators (EOM)based on emerging materials, namely Graphene and Indium-Tin-Oxide(ITO). These devices feature high performance (ER=1dB/mm), low insertion loss (<1dB/mm) and broadband operation (>300nm).

CK-3.4 SUN 15:30

Dielectric particles can behave as dual metamaterials

•*X. Zambrana-Puyalto[1,2], X. Vidal[1], M.L. Juan[1,2], and G. Molina-Terriza[1,2]; [1]Department of Physics&Astronomy, Macquarie University, 2109 NSW, Australia; [2]ARC Center of Excellence for Engineered Quantum Systems, Macquarie University, 2109 NSW, Australia*

We unveil the role of cylindrical and duality symmetry to obtain metamaterials that can fulfill the zero forward or backscattering

ROOM 22

IH-1.3 SUN 15:00

Single NV Centers in Nanodiamond as Three Dimensional Scanning Lifetime Probe

•*A.W. Schell, P. Engel, and O. Benson; Humboldt-Universität zu Berlin - AG Nanooptik, Berlin, Germany*

A single NV center in nanodiamond as scanning probe is used for 3D single photon lifetime microscopy. The change in the LDOS in the vicinity of silver nanowires is measured with high resolution.

IH-1.4 SUN 15:15

Plasmonic scattering from single subwavelength holes: separating the electric and magnetic contributions

•*N. Rotenberg[1], B. le Feber[1], M. Spasenovic[1], T.L. Krijger[1], J.F. Garcia de Abajo[2], and K. Kuipers[1]; [1]FOM Institute AMOLF, Amsterdam, The Netherlands; [2]IQFR-CSIC, Madrid, Spain*

A series of near-field measurements are used in conjunction with theoretical calculations to determine the electric and magnetic polarizabilities of single subwavelength holes in metal films. The results explain plasmonic scattering from these nanoscopic objects.

IH-1.5 SUN 15:30

A gold nanotip enhanced optical fibre device for plasmonic near-field microscopy

•*P. Uebel[1], S. Bauerschmidt[1], M. Schmidt[3,1], and P. Russell[1,2]; [1]Max Planck Institute for the Science of Light, Erlangen, Germany; [2]Department of Physics, University of Erlangen-Nuremberg, Erlangen, Germany; [3]Institute of Photonic Technology, Jena, Germany*

We developed a device for detecting near-fields using a plasmonic nanotip-enhanced

NOTES

ROOM 1

Graphene is highly attractive for nonlinear optics and laser applications due to its strong, broadband nonlinearity. We employ THG in graphene for few-cycle pulse characterisation using d-scan from the near- to mid-IR.

CF/IE-3.6 SUN 15:45

The coherent artifact in modern pulse measurements

M. Rhodes[1], •G. Steinmeyer[2], J. Ratner[1], and R. Trebino[1]; [1]Georgia Institute of Technology, Atlanta, United States; [2]Max-Born-Institut, Berlin, Germany

Dynamically unstable pulse trains may give rise to artifacts in modern pulse characterization techniques similar to the coherence spike in autocorrelation. These artifacts may lead to severe misinterpretation of FROG and SPIDER measurements.

ROOM 4a

cally Induced Transparency and the Autler-townes effect is demonstrated.

IF-3.5 SUN 15:45

Laser Light Condensation Phenomenon

G. Oren, A. Bekker, and •B. Fischer; Technion- Israel Institute of Technology, Haifa, Israel

We present a classical laser light condensation phenomenon based on weighting the modes in a loss-gain scale rather than in photon-energy, and discuss the problems to observe regular photon Bose-Einstein condensation in laser cavities.

ROOM 4b

Institute for Materials Science, Tsukuba, Japan

A recent development of THz radiation from high temperature superconductor Bi2Sr2CaCu2O8+d not only from the fundamental aspect of the radiation mechanism but also from the aspects on the various imaging applications will be shown.

ROOM 13a

CA-3.5 SUN 15:45

Power Scaling of Thin-Disk Tm-Lasers Based on Tm:KLu(WO4)2/KLu(WO4)2 Epitaxy

S. Vatnik[1], I. Vedin[1], M. Segura[2], •X. Mateos[2], M.C. Pujol[2], M. Aguiló[2], F. Díaz[2], V. Petrov[3], and U. Griebner[3]; [1]Institute of Laser Physics, av Lavrentjeva 13/3,, Novosibirsk, Russia; [2]Física i Cristallografia de Materials i Nanomaterials (FiCMA-FiCNA), Universitat Rovira i Virgili (URV),, Tarragona, Spain; [3]-Born-Institute for Nonlinear Optics and Short Pulse Spectroscopy, 2A Max-Born-Street, D-12489, Berlin, Germany

We study the power scaling potential of 5% Tm-doped KLu(WO4)2 epitaxy in quasi-CW regime for use in thin-disk lasers to simplify drastically the pump geometry to a simple reflection at the highly reflecting epitaxial side.

ROOM 13b

ROOM 1

16:30 – 18:00

CF/IE-4: High-energy Ultrafast Sources

Chair: Claus Ropers, Georg-August Universität, Göttingen, Germany

CF/IE-4.1 SUN 16:30

Compact gigawatt-class sub-picosecond Yb:YAG thin-disk regenerative chirped-pulse amplifier with high average power at up to 800 kHz

•R. Fleischhaker, R. Gebs, A. Budnicki, M. Wolf, J. Kleinbauer, and D. Sutter; TRUMPF Laser GmbH + Co. KG, Schramberg, Germany

We present sub-picosecond pulses obtained from a single-disk regenerative amplifier based on an industrial laser system (0.6 m^2 footprint). We use chirped-pulse amplification with a very compact single-pass grating compressor at up to 160 W average power.

ROOM 4a

16:30 – 18:00

IF-4: Nonlinear Optical Interactions in Structured Materials

Chair: Andrzej Miniewicz, Wroclaw University of Technology, Wroclaw, Poland

IF-4.1 SUN (Keynote) 16:30

Optical data storage with diffraction-unlimited resolution

•M. Gu; Swinburne University of Technology, Hawthorn, Australia

We show our recent progress on optical data storage with superresolution optics of lamda/24 and lamda/26 in newly designed photopolymerisation and photoreduction materials, respectively.

ROOM 4b

16:30 – 18:00

CC-4: Terahertz Field Manipulation

Chair: Jérôme Faist, ETH - Institute for Quantum Electronics, Zurich, Switzerland

CC-4.1 SUN 16:30

Nonlinear Intersubband Dynamics in Quantum Wells Driven by Intense Few-Cycle Terahertz Pulses

•D. Dietze, J. Darmo, and K. Unterrainer; Photonics Institute, Vienna University of Technology, Vienna, Austria

We demonstrate the direct observation of non-equilibrium intersubband dynamics in quantum wells induced by intense terahertz pulses and further discuss coherent electron population transfer, THz induced undressing of intersubband plasmons, and the THz Stark effect.

ROOM 13a

16:30 – 18:00

CA-4: Yb-Doped Lasers

Chair: Andreas Voss, Universität Stuttgart, Stuttgart, Germany

CA-4.1 SUN (Invited) 16:30

Solid State Optical Crycoolers: Developments and Prospective

•M. Sheik-Bahae[1], S. Melgaard[1], M. Ghasemkhani[1], A. Albrecht[1], R. Epstein[1], and D. Seletskiy[1,2]; [1]University of New Mexico, Albuquerque, United States; [2]University of Konstanz, Konstanz, Germany

Recent progress in laser cooling of solids has led to the first demonstration of an all-solid-state cryocooler. Cooling to 115K from room temperature and heat lifts of 100 mW has been achieved in high purity 10% Yb:YLF crystals.

ROOM 14a

CJ-1.6 SUN 15:45

Fundamental Gaussian mode content measurements on active large core CCC fibers

•*M. Karow*[1,2], *C. Zhu*[3], *D. Kracht*[1,2], *J. Neumann*[1,2], *A. Galvanauskas*[3], *and P. Weßels*[1,2]; [1]*Laser Zentrum Hannover e.V., Hannover, Germany*; [2]*Centre for Quantum-Engineering and Space-Time Research - QUEST, Hannover, Germany*; [3]*Department of Electrical Engineering and Computer Science, Ann Arbor, United States*

The overlap of single-frequency laser beams, amplified in active chirally coupled core fibers, with the TEM00-mode is investigated using a non-confocal scanning ring cavity. Up to 186W TEM00-mode power were extracted.

ROOM 14b

the non-instantaneous Raman response of the gas plays a key role.

CD-3.6 SUN 15:45

Nonlinear optics in hollow core PCF filled with gaseous and supercritical xenon

•*M. Azhar*[1], *N. Joly*[2,1], *J. Travers*[1], *F. Tani*[1], *and P. Russell*[1,2]; [1]*Max Planck Institute for the Science of Light, Erlangen, Germany*; [2]*Dept. of Physics, Friedrich-Alexander Universitat, Erlangen, Germany*

Kagomé-style hollow-core photonic crystal fiber filled with high pressure gaseous or supercritical Xe offers a nonlinearity comparable to that of fused silica, together with pressure-tunable dispersion. Spectral broadening and intermodal four-wave mixing are reported.

ROOM 21

condition. Excitation with vortex beams is essential to achieve it.

CK-3.5 SUN 15:45

Mode Symmetries Required for Creating Photonic Dirac Cones in the Brillouin-Zone Center

•*K. Sakoda*; *National Institute for Materials Science, Tsukuba, Japan*

The mode-symmetry requirement for creating photonic Dirac cones in the Brillouin-zone center by accidental degeneracy is examined by a degenerate perturbation theory newly developed for the vector electromagnetic field of periodic structures.

ROOM 22

fibre. The device is fabricated without using any sophisticated nanostructuring equipment and can be connected to standard optical devices such as spectrometers or analyzers.

IH-1.6 SUN 15:45

Biomedical imaging by infrared nanoscopy (nano-FTIR)

•*S. Amarie*[1], *A. Cernescu*[2], *T. Geith*[3], *S. Milz*[4], *F. Bamberg*[4], *and F. Keilmann*[2]; [1]*Neaspec GmbH, Martinsried, Germany*; [2]*Ludwig-Maximilians-University München and Center for NanoScience, Munich, Germany*; [3]*Department of Clinical Radiology, Ludwig-Maximilians-University, Großhadern Campus, Munich, Germany*; [4]*Anatomische Anstalt, Ludwig-Maximilians-University, Munich, Germany*

We recently applied the principles of FTIR to scattering-type Scanning Near-field Optical Microscopy (s-SNOM). Results on human bone sections show detail at a resolution of 20 nm (i.e. two orders of magnitude improved resolution).

NOTES

ROOM 13b

16:30 – 18:00

CL-2/ECBO: Biophotonics and Applications II (Session jointly held with ECBO)

Chair: Kishan Dholakia, University of St. Andrews, Fife, U.K. & Jürgen Popp, University of Jena, Germany

CL-2/ECBO.1 SUN (Invited) 16:30

Noninvasive Fluorescence Imaging through Strongly Scattering Layers

•*J. Bertolotti*[1,2], *E. van Putten*[1], *C. Blum*[3], *A. Lagendijk*[1,4], *W. Vos*[1], *and A. Mosk*[1]; [1]*Complex Photonic Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, The Netherlands*; [2]*University of Florence, Dipartimento di Fisica, Florence, Italy*; [3]*Nanobiophysics, MESA + Institute for Nanotechnology, University of Twente, Enschede, The Netherlands*; [4]*FOM Institute for Atomic and Molecular Physics (AMOLF), Amsterdam, The Netherlands*

We retrieve the image of a small fluorescent object hidden behind an opaque screen without any need to access the back nor any a-priori knowledge about either the object or the screen itself.

ROOM 14a

16:30 – 18:00

CJ-2: Mode-locked Fiber Lasers

Chair: Ammar Hideur, CNRS-UMR, Rouen, France

CJ-2.1 SUN 16:30

Passively mode-locked laser based on an ultra-large dispersion Yb-doped fiber

•*A. Hideur*[1], *C. Lecaplain*[1], *H. Wang*[1], *S. Février*[2], *and K. Qian*[1]; [1]*CORIA UMR CNRS 6614, Rouen, France*; [2]*Xlim UMR 6172 CNRS, Limoges, France*

We report on the first realization of a passively mode-locked oscillator featuring a resonant dispersion Yb-doped Bragg fiber. The laser delivers 950 mW average power at a repetition rate of 34 MHz which corresponds to more than 27 nJ energy.

ROOM 14b

16:30 – 18:00

CD-4: Nonlinear Imaging and Spectroscopy

Chair: Gregor Knopp, Paul Scherrer Institut, Villigen, Switzerland

CD-4.1 SUN 16:30

Using a single-beam-CARS setup for the full characterization of the third-order susceptibility and elimination of strong two-photon excited fluorescence

•*A. Wipfler, J. Rehbinder, T. Buckup, and M. Motzkus*; *Physikalisch-Chemisches Institut, Ruprecht-Karls-Universität Heidelberg, Heidelberg, Germany*

We present an approach to characterize the third-order susceptibility of molecules using shaped femtosecond laser pulses. Beyond that a slight modification of our scheme allows for the elimination of strong two-photon excited fluorescence in CARS measurements.

ROOM 21

16:30 – 18:00

CK-4: Micro-nanostructured Optical Fibers

Chair: Stefano Pelli, CNR-IFAC "Nello Carrara", Sesto Fiorentino, Italy

CK-4.1 SUN 16:30

Theory of optical activity in twisted photonic crystal fibers

•*T. Weiss*[1], *X. Xi*[1], *G. Wong*[1], *F. Biancalana*[1,2], *S. Barnett*[3], *M. Padgett*[4], *and P. Russell*[1,5]; [1]*Max Planck Institute for the Science of Light, Erlangen, Germany*; [2]*School of Engineering & Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom*; [3]*Department of Physics, University of Strathclyde, Glasgow, United Kingdom*; [4]*Department of Physics, University of Glasgow, Glasgow, United Kingdom*; [5]*Department of Physics, University of Erlangen-Nuremberg, Erlangen, Germany*

Using a perturbative approach and symmetry, a theoretical model is developed to model optical activity in continuously twisted photonic crystal fibers. The results are in excellent agreement with both numerical calculations and experimental measurements.

ROOM 1

CF/IE-4.2 SUN 16:45

1 mJ, 380 fs ultrashort pulses from an Yb:YAG single crystal fiber power amplifier

•*X. Délen[1], Y. Zaouter[2], I. Martial[3], N. Aubry[3], J. Didierjean[3], C. Hönninger[2], E. Mottay[2], F. Balembois[1], and P. Georges[1]; [1]Laboratoire Charles Fabry, Palaiseau, France; [2]Amplitude Systemes, Pessac, France; [3]Fibercryst, Villeurbanne, France*

We demonstrate the amplification of femtosecond pulses in Yb:YAG single crystal fiber pumped by a 75 W high brightness diode. 1 mJ, 380 fs pulses were obtained at 10 kHz with an excellent beam quality.

CF/IE-4.3 SUN 17:00

Flexible 500W Innoslab laser system with pulse durations from 0.5ps to 7.5ps and 300μJ pulse energy

•*T. Mans, J. Dolkemeyer, and C. Schnitzler; Amphos GmbH, Aachen, Germany*

We present a 500W average power ultrafast laser system with fs and ps pulse durations with full integration of all components necessary for remote operation integrated in a sealed-off housing.

CF/IE-4.4 SUN 17:15

High-energy Mid-infrared Cr:ZnS Chirped-pulse Oscillator

•*N. Tolstik[1], E. Sorokin[2], and I. Sorokina[1]; [1]Department of Physics, The Norwegian University of Science and Technology, Trondheim, Norway; [2]Photonics institute, TU Wien - Vienna University of Technology, Vienna, Austria*

Mid-IR Cr:ZnS chirped-pulse oscillator with 8.5 nJ pulse energy was demonstrated. The laser output power reached 0.88 W at 2.35 um wavelength. This is the highest chirped pulse energy directly from the oscillator in mid-IR

CF/IE-4.5 SUN 17:30

Dual-Beam Ultra High Temporal Contrast Ti:Sa Laser System Based on a Double CPA Technique

•*M. Kalashnikov, L. Ehrentraut, G. Priebe, M. Schnürer, H. Schönnagel, S. Steinke, and W. Sandner; Max-Born-Institut, Berlin, Germany*

A dual-beam Ti:sapphire laser system with a front end that implements XPW temporal filtering runs at 10Hz

ROOM 4a

IF-4.2 SUN 17:15

Nonlinear Cerenkov radiation from a single ferroelectric domain wall

•*Y. Sheng[1], V. Roppo[2], K. Kalinowski[1], and W. Krolikowski[1]; [1]Australian National University, Canberra, Australia; [2]Laboratoire de Photonique et de Nanostructures CNRS UPR 20, Marcoussis, France*

We report on the observation of Cerenkov-type second-harmonic generation in the vicinity of the ferroelectric domain wall. We discuss the physics origin of this effect and demonstrate its application in three-dimensional visualization of ferroelectric-domain structures.

IF-4.3 SUN 17:30

Discharge Mechanism and Threshold in Second Harmonic Generation by Periodically Poled LiTaO3

•*O. Louchev[1], H. Hatano[2], S. Wada[1], and K. Kitamura[2]; [1]RIKEN, Wako, Japan; [2]NIMS, Tsukuba, Japan*

Combined theoretical and experimental study of the damage threshold for high-repetition pulsed second harmonic generation by periodically poled LiTaO3 is done

ROOM 4b

CC-4.2 SUN 16:45

The Terahertz Polarization Pulse Shaping

M. Sato[1,2], •T. Higuchi[2,3,4], N. Kanda[2,3,5,6], K. Konishi[2,6], K. Yoshioka[2,4], T. Suzuki[1,2,7], K. Misawa[1,2,7], and M. Kuwata-Gonokami[2,3,4,6]; [1]Department of Applied Physics, Tokyo University of Agriculture and Technology, Tokyo, Japan; [2]CREST, Japan Science and Technology Agency, Tokyo, Japan; [3]Department of Applied Physics, The University of Tokyo, Tokyo, Japan; [4]Department of Physics, The University of Tokyo, Tokyo, Japan; [5]Extreme Photonics Research Group, RIKEN Advanced Science Institute, Tokyo, Japan; [6]Photon Science Center, The University of Tokyo, Tokyo, Japan; [7]Interdisciplinary Reserch Unit in Photon-nano Science, Tokyo University of Agriculture and Technology, Tokyo, Japan

We proposed and demonstrated terahertz polarization pulse shaping by tailoring the incident laser pulse for the desired terahertz waveform through optical rectification in a nonlinear optical crystal along its threefold axis.

CC-4.3 SUN 17:00

Effective Surface Conductivity Approach for Graphene Metamaterials Based Terahertz Devices

•*A. Andryieuski[1], F. Pizzocchero[2], T. Booth[2], P. Bøggild[2], and A. Lavrinenko[1]; [1]DTU Fotonik, Technical University of Denmark, Kongens Lyngby, Denmark; [2]DTU Nanotech, Technical University of Denmark, Kongens Lyngby, Denmark*

We propose a description of graphene metamaterials properties through the effective surface conductivity. On the example of tunable absorber we demonstrate that this approach allows for fast and efficient design of functional terahertz devices.

CC-4.4 SUN 17:15

Terahertz antireflection properties of sub-wavelength metallic double wire grid structures

•*V. Paeder, J. Darmo, and K. Unterrainer; Vienna University of Technology, Vienna, Austria*

The potential of metallic double wire grid structures as anti-reflection coatings for the terahertz frequency range is theoretically and experimentally demonstrated. Using a semi-analytical model, structures with nearly 100% transmission for GaAs and cyclo-olefin copolymer substrates are reached.

CC-4.5 SUN 17:30

Directionality Control of the THz Radiation from Two Filaments

•*S. Mitryukovskiy, Y. Liu, A. Houard, B. Prade, and A. Mysyrowicz; Laboratoire d'Optique Appliquée, ENSTA/CNRS/Ecole Polytechnique, Palaiseau, France*

We demonstrate that it is possible to control the directionality of the Terahertz radiation emitted by two adja-

ROOM 13a

CA-4.2 SUN 17:00

First laser operation from diode-pumped highly doped Yb:Gd2O3 and Yb:Y2O3 crystals grown by flux method

•*F. Druon[1], M. Velazquez[2], P. Veber[2], S. Janicot[1], O. Viraphong[2], G. Buse[2], M. Abdou Ahmed[3], T. Graf[3], D. Rytz[4], and P. Georges[1]; [1]Laboratoire Charles Fabry, Institut d'Optique, Palaiseau, France; [2]Institut de Chimie de la Matière Condensée de Bordeaux, Pessac, France; [3]Institut für Strahlwerkzeuge, Stuttgart, Germany; [4]gmbh, Idar-Oberstein, Germany*

We present, the first laser experiments ever demonstrated with Yb:Gd2O3 and with Yb:Y2O3 crystals grown by new flux method. These highly doped crystals are diode pumped in the watt range with very good effciency.

CA-4.3 SUN 17:15

High power Yb:CALGO multi-crystal oscillator

•*A.-L. Calendron[1], M. Lederer[2], H. Cankaya[1], and F.X. Kaertner[1,3,4]; [1]Center for Free-Electron Laser Science, Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany; [2]European XFEL, Hamburg, Germany; [3]Physics Department and Hamburg Center of Ultrafast Imaging, University of Hamburg, Hamburg, Germany; [4]Dept. of EECS and Research Laboratory of Electronics, MIT, Cambridge, United States*

We report on nearly 23W continuous wave output power out of 88W absorbed pump power from a dual-crystal Yb:CaAlGdO4 laser resonator, with a good beam quality.

CA-4.4 SUN 17:30

High power amplification in Yb:YAG single crystal fibers

•*S. Piehler[1], X. Delen[2], N. Aubry[3], J. Didierjean[3], T. Graf[1], M. Abdou Ahmed[1], F. Balembois[2], and P. Georges[2]; [1]Institute für Strahlwerkzeuge, University of Stuttgart, Stuttgart, Germany; [2]Laboratoire Charles Fabry, Institut d'Optique, Paris, France; [3]Fibercryst SAS, Lyon, France*

ROOM 13b

CL-2/ECBO.2 SUN 17:00

Holographic approach for optical poration and trapping of developing embryos

•M.L. Torres-Mapa[1], M. Antkowiak[2,3], H. Cizmarova[1], D. Ferrier[2], K. Dholakia[1], and F. Gunn-Moore[2,3]; [1]SUPA, School of Physics and Astronomy, University of St Andrews, Fife, United Kingdom; [2]School of Biology, University of St Andrews, Fife, United Kingdom; [3]SULSA, Fife, United Kingdom

We demonstrate a holographic approach using a Ti:Sapphire laser and spatial light modulator for optical injection and trapping of developing embryos. Our results show that optical tools maybe useful for embryo manipulation.

CL-2/ECBO.3 SUN 17:15

Microparticle manipulation using modal superpositions in air-filled hollow-core photonic crystal fiber

•O.A. Schmidt, X. Jiang, F. Babic, T.G. Euser, and P.S.J. Russell; Max Planck Institute for the Science of Light, Erlangen, Germany

Coherent superpositions of the two lowest order modes of a soft glass photonic crystal fiber are used to control the axial and radial position of dielectric particles optically trapped inside the air-filled hollow core.

CL-2/ECBO.4 SUN (Invited) 17:30

Combination of Optical Micromanipulation with Raman Spectroscopy for Cell Sorting

•C. Krafft[1], S. Dochow[1], and J. Popp[1,2]; [1]Institute of Photonic Technology, Jena, Germany; [2]Institute of Physical Chemistry and Abbe Center of Photonics, Jena, Germany

Raman activated cell sorting (RACS) offers prospects to complement the widely applied fluorescence activated

ROOM 14a

CJ-2.2 SUN 16:45

Ultra-high repetition-rate-selectable passive harmonic mode locking of a fiber laser

•C. Lecaplain and P. Grelu; Laboratoire Interdisciplinaire Carnot de Bourgogne, U.M.R. 6303 C.N.R.S., Dijon Cedex, France

We demonstrate a passive harmonically mode-locked erbium-doped fiber laser that operates stably at selectable harmonics spanning from the 209th to the 920th, which corresponds to repetition rates ranging from 5 to 22 GHz.

CJ-2.3 SUN (Invited) 17:00

Investigations on Positively Chirped Pulses in a Thulium-doped Fiber Laser

•F. Haxsen[1,2], D. Wandt[1,2], U. Morgner[1,2,3], J. Neumann[1,2], and D. Kracht[1,2]; [1]Laser Zentrum Hannover e.V., Hannover, Germany; [2]Centre for Quantum Engineering and Space-Time Research - QUEST, Hannover, Germany; [3]Institut für Quantenoptik, Leibniz Universität Hannover, Hannover, Germany

We present investigations on positively chirped pulse operation of a hybridly mode-locked thulium-doped fiber laser. The experimentally observed results could be reproduced well and provided deeper insight into the pulse evolution.

CJ-2.4 SUN 17:30

Study of a high power self mode locked ytterbium rod-type fiber laser with tunable pulse duration

P. Deslandes[1,2], •M. Perrin[2], J. Saby[1], D. Sangla[1], F. Salin[1], and E. Freysz[2]; [1]Eolite Systems, Pessac, France; [2]University of Bordeaux I, Talence, France

We have designed and modeled a new ytterbium rod-type fiber laser. The pulse duration is adjusted with a

ROOM 14b

CD-4.2 SUN 16:45

Cross-polarized Femtosecond Stimulated Raman Scattering Spectroscopy

•S. Dobner[1], P. Groß[2], and C. Fallnich[1]; [1]Institut für Angewandte Physik, Westfälische Wilhelms-Universität, Münster, Germany; [2]Institut für Physik, Carl von Ossietzky Universität, Oldenburg, Germany

We present cross-polarized femtosecond stimulated Raman scattering (xFSRS), a method to measure the spectral Raman intensity and phase over a broad spectral range, potentially in a single shot.

CD-4.3 SUN 17:00

Balanced-detection Raman Induced Kerr Effect Microscopy

V. Kumar, E. Molotokaite, C. Manzoni, •D. Polli, G. Cerullo, and M. Marangoni; Politecnico di Milano, Milan, Italy

We demonstrate a novel coherent Raman imaging technique which is background-free, scales linearly with concentration, is absent of non-resonant background and accesses both real and imaginary parts of the non-linear response, enabling vibrational phase imaging.

CD-4.4 SUN 17:15

Scanless two-photon microscopy with a 30 fs laser by means of a diffractive dispersion compensation module

J. Pérez-Vizcaíno[1], O. Mendoza-Yero[1], G. Mínguez-Vega[1], R. Martínez-Cuenca[1], •P. Andrés[2], and J. Lancis[1]; [1]GROC-UJI, Institut de Noves Tecnologies de la Imatge, Castellón de la Plana, Spain; [2]Universitat de València, Valencia, Spain

We demonstrate real-time efficient generation of wide-field fluorescence signals in scanless two-photon microscopy with a 30 fs laser pulse by exploiting diffractive optical elements encoded into a spatial light modulator and a three-lens dispersion-compensated module.

CD-4.5 SUN (Invited) 17:30

Label free nonlinear imaging in microscopy and endoscopy

•H. Rigneault; Institut Fresnel, CNRS, Aix-Marseille University, Ecole Centrale Marseille, Marseille, France

We review the assets and constrains of coherent Raman scattering imaging (CARS and SRS) and the reduction of their associated artifacts in microscopy and endoscopy.

ROOM 21

CK-4.2 SUN 16:45

An azimuthally polarized light source for the optical near field

•D. Ploss[1], A. Kriesch[1], H. Pfeifer[1], P. Banzer[2], and U. Peschel[1]; [1]Institute of Optics, Information and Photonics, University of Erlangen-Nuremberg, Erlangen, Germany; [2]Max Planck Institute for the Science of Light, Erlangen, Germany

We introduce a novel method to create a predominantly azimuthally polarized mode for nanoscale probing in the near field. The polarization is generated inside a modified NSOM tip, whose aperture acts as efficient modal filter.

CK-4.3 SUN 17:00

Transverse Excitation of Plasmonic Slot Nano-Resonators Embedded in Gold-Coated Microfiber Tips

•M. Ding, M. Zervas, and G. Brambilla; Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom

A plasmonic slot rectangular nano-resonator embedded in metal-coated optical microfiber tip is theoretically and experimentally demonstrated for the first time, which shows strong localization in three dimensions and strong enhancement factor (7.24x103)

CK-4.4 SUN 17:15

Microsphere resonator integrated inside a microstructured optical fiber

•K. Kosma[1], G. Zito[1], K. Schuster[2], and S. Pissadakis[1]; [1]Foundation for Research and Technology-Hellas (FORTH), Institute of Electronic Structure and Laser (IESL), Heraklion, Greece; [2]Institute of Photonic Technology Jena, Jena, Germany

An integrated in-fiber microresonator coupler is presented, consisting of a dielectric microsphere encapsulated inside the capillary of a Microstructured Optical Fiber. Whispering-Gallery Modes of this microcavity are demonstrated and studied for different excitation schemes.

CK-4.5 SUN 17:30

SUSY fibers for integrated optical angular momentum multiplexing

•M.-A. Miri[1], M. Heinrich[1], R. El-Ganainy[2], and D.N. Christodoulides[1]; [1]CREOL, The College of Optics and Photonics, University of Central Florida, Orlando, United States; [2]Department of Physics, University of Toronto, Toronto, Canada

ROOM 1

and generates optical pulses with temporal contrast in excess of 10^11 at the power level of 100 TW.

CF/IE-4.6 SUN 17:45

High Power Top-Hat Pulses for Efficient OPA Pumping

•*G. Fan, T. Balciunas, G. Andriukaitis, A. Pugzlys, and A. Baltuska; Vienna University of Technology, Vienna, Austria*

We demonstrate phase-only shaping of high-energy broadband Yb amplifier pulses using acousto-optic programmable dispersion filter (AOPDF) for the generation of a top-hat temporal profile that provides efficient pumping of an optical parametric amplifier.

ROOM 4a

revealing the mechanism of generation and heating of the conductive band electrons and discharge.

IF-4.4 SUN 17:45

High symmetry orders probed by polarized Coherent Anti Stokes Raman Scattering and Four Wave Mixing

•*J. Duboisset, F.-Z. Bioud, P. Gasecka, P. Ferrand, H. Rigneault, and S. Brasselet; Institut Fresnel, Marseille, France*

We implement incident polarizations tuning in FWM and CARS to probe molecular order, using a generic method to read-out symmetry information in crystalline and less organized samples.

ROOM 4b

cent femtosecond laser filaments formed in air.

CC-4.6 SUN 17:45

Evanescent-Wave Proton Post-accelerator Driven by Intense THz Pulses

•*L. Pálfalvi[1], J. Fülöp[2,3], G. Tóth[1], and J. Hebling[1,2]; [1]Department of Experimental Physics, University of Pécs, Pécs, Hungary; [2]MTA-PTE High-Field Terahertz Research Group, Pécs, Hungary; [3]ELI-HU Mkft, Szeged, Hungary*

A compact, cost effective solution is proposed for post-acceleration and monochromatization of protons leaving a laser driven accelerator. The evanescent field of intense THz pulses is used for acceleration and monochromatization.

ROOM 13a

In this paper, we present a power scaling experiment of Yb:YAG Single crystal fiber amplifiers. A maximum power of 140 W is obtained for a seed and pump powers of 40 W and 515W respectively.

CA-4.5 SUN 17:45

12W efficient air cooled diode-pumped actively Q-switched Yb:KGd(WO4)2 laser

V.E. Kisel[1], •A.S. Rudenkov[1], A.E. Gulevich[1], N.V. Kondrtyuk[1], A.S. Yasukevich[1], N.V. Kuleshov[1], and A.A. Pavlyuk[2]; [1]Center for Optical Materials and Technologies, Belarusian National Technical University, Minsk, Belarus; [2]Nikolaev Institute for Inorganic Chemistry, Siberian Branch of Russian Academy of Sciences, Novosibirsk, Russia

Compact diode-pumped actively Q-switched Yb:KGW laser is demonstrated with optical-to-optical efficiency of 50%. Output power of 12.2 W with repetition rate up to 50 kHz and pulse duration of 10-24 ns was obtained.

NOTES

ROOM 13b

cell sorting. Raman spectra of optically trapped cells are collected in microfluidic chips and are used for their identification.

ROOM 14a

spectral filter from picoseconds to femtoseconds, with 10W average power, at 104 MHz.

CJ-2.5 SUN 17:45

7 nJ High-Fidelity 60 fs Pulses at 1035 nm from an Integrated Ytterbium Fiber Oscillator with a Higher-Order-Mode Fiber

•*A. Fernandez*[1], *L. Zhu*[1], *V. Kalashnikov*[1], *A. Verhoef*[1], *K. Jespersen*[2], *D. Lorenc*[1], *L. Grüner-Nielsen*[2], *and A. Baltuska*[1]; [1]*Institut für Photonik, Technische Universtität Wien, Wien, Austria*; [2]*OFS Denmark, Brøndby, Denmark*

We present a mode-locked Ytterbium-doped fiber oscillator operating in the net normal-dispersion regime, delivering 7 nJ pulses that can be dechirped down to 62 fs. A higher-order mode fiber is used for intracavity dispersion compensation.

ROOM 14b

ROOM 21

Supersymmetry provides a versatile platform in synthesizing a new class of optical structures with desired functionalities. Here we extend SUSY to two-dimensional fiber geometries that could facilitate integrated optical angular momentum multiplexing schemes.

CK-4.6 SUN 17:45

Enhanced Second Harmonic Generation in Microfiber Loop Resonators

•*R. Ismaeel, T. Lee, M. Gouveia, and G. Brambilla*; *Optoelectronics research centre, Southampton, United Kingdom*

Resonantly enhanced surface second harmonic generation was experimentally demonstrated by fabricating a loop resonator from a 770nm diameter silica microfiber. The conversion efficiency was enhanced by a factor of 5.7 compared to the straight microfiber.

NOTES

13:30 – 14:30

IF-P: IF Poster Session

IF-P.1 SUN

Second harmonic generation and two-photon excitation fluorescence from individual nanocrystals of pyrazoline derivatives

•*P. Karpinski*[1], *A. Szukalski*[1], *L. Sznitko*[1], *J. Mysliwiec*[1], *A. Miniewicz*[1], *P. Ferrand*[2], *H. Rigneault*[2], *and S. Brasselet*[2]; [1]*Wroclaw University of Technology, Wroclaw, Poland*; [2]*University Aix Marseille, Fresnel Institut, Marseille, France*

We investigate the quadratic nonlinear optical properties of individual nanocrystals of different derivatives of pyrazoline. We measure angular polarization dependence of second harmonic and two-photon fluorescence signals and their relation with a possible crystallographic structure.

IF-P.2 SUN

Pressure tunable cascaded third order nonlinearity and temporal pulse switching

•*F. Eilenberger*[1], *M. Bache*[2], *S. Minardi*[1], *and T. Pertsch*[1]; [1]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität, Jena, Germany*; [2]*DTU Fotonik, Department of Photonics Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark*

We investigate the impact of phase-mismatched, cascaded third harmonic generation on pulse propagation in noble-gas filled Kagome fibers. The pressure tunable cascade facilitates temporal switching even in the presence of intrinsic higher order Kerr effect.

IF-P.3 SUN

Optomechanical Nonlinearity and Bistability in Dielectric Metamaterials

J. Zhang[1], •*K.F. MacDonald*[1], *and N.I. Zheludev*[1,2]; [1]*University of Southampton, Southampton, United Kingdom*; [2]*Nanyang Technological University, Singapore, Singapore*

We introduce a new type of dielectric metamaterial, inherently free of Joule losses, which exhibits a strong optomechanical nonlinearity, asymmetric transmission and optical bistability at optical intensities of less than 0.2 mW/μm2.

IF-P.4 SUN

Negative-frequency resonant radiation in quadratic media

•*M. Conforti*[1], *N. Westerberg*[2], *F. Baronio*[1], *S. Trillo*[3], *and D. Faccio*[2]; [1]*University of Brescia, Brescia, Italy*; [2]*Heriot-Watt University, Edinburgh, United Kingdom*; [3]*University of Ferrara, Ferrara, Italy*

We show that the extremely blue-shifted dispersive wave emitted in Kerr media owing to the coupling with the negative-frequency branch can be observed in quadratic media via second-harmonic generation.

IF-P.5 SUN

Kerr frequency combs in the normal and anomalous regimes

•*A. Coillet, R. Henriet, I. Balakireva, L. Larger, and Y. Chembo*; *FEMTO-ST, Besançon, France*

High-Q crystalline whispering-gallery mode resonators are used to generate optical frequency combs through four-wave-mixing in both normal and anomalous regimes of dispersion. A modal description provides analytical insight into these two phenomenologies.

IF-P.6 SUN

Study of multilayer nonlinear dielectric-metal structures: towards low power plasmon-solitons in realistic waveguides

W. Walasik[1,2], *Y. Kartashov*[2], *and* •*G.R. Renversez*[1]; [1]*Institut Fresnel & Université d'Aix-Marseille, Marseille, France*; [2]*ICFO, Universitat Politecnica de Catalunya, Castelldefels, Spain*

Using several improved vector models we study plasmon-soliton waves in multilayer monlinear dielectric-metal planar structures. For the first time we obtain low power plasmon-solitons in structures compatible with fabrication technology of chalcogenide waveguides.

IF-P.7 SUN

Experimental observation of the spectral Gouy phase shift

•*E.R. Andresen*[1], *C. Finot*[2], *D. Oron*[3], *and H. Rigneault*[1]; [1]*Institut Fresnel, CNRS, Aix-Marseille Université, École Centrale Marseille, Marseille, France*; [2]*Laboratoire Interdisciplinaire Carnot de Bourgogne, CNRS, Université de Bourgogne, Dijon, France*; [3]*Department of Physics of Complex Systems, Weizmann Institute of Science, Rehovot, Israel*

Using interferometry based on a 4-f pulse shaper, we experimentally observe the Gouy phase shift of a parabolic pulse subjected to spectral focusing in an optical fiber.

IF-P.8 SUN

Optical Kerr effect in nematic doped with azo-benzene functionalized POSS nanoparticles

•*A. Miniewicz*[1], *B. Mossety-Leszczak*[2], *J. Girones*[1], *P. Karpinski*[1], *H. Galina*[2], *and M. Dutkiewicz*[3]; [1]*Wroclaw University of Technology, Wroclaw, Poland*; [2]*Rzeszow University of Technology, Rzeszow, Poland*; [3]*Adam Mickiewicz University of Poznan, Poznan, Poland*

Light-induced refractive index changes in nematic LC doped by azo-benzene functionalized POSS nanoparticles are reported. Optical Kerr effect experiment proves that nematic doped with polyhedral silsesquinoxane shows all-optical switching at low cw laser power.

IF-P.9 SUN

Soliton delay driven by cascading and Raman responses

•*H. Guo*[1], *X. Zeng*[1,2], *B. Zhou*[1], *and M. Bache*[1]; [1]*Group of Ultrafast Nonlinear Optics, DTU Fotonik, Technical University of Denmark (DTU), Kgs. Lyngby, Denmark*; [2]*Key Laboratory of Special Fiber Optics and Optical Access Networks, Shanghai University, Shanghai, China, People's Republic of (PRC)*

We analytically and numerically study the soliton pulse delay driven by the first order of cascading and Raman responses and demonstrate a potential delay balance by tuning the cascading delay time through phase mismatch.

IF-P.10 SUN

Influence of Phase Coherence on Seeded Supercontinuum Generation

•*S.T. Sørensen*[1], *C. Larsen*[1], *U. Møller*[1], *P.M. Moselund*[2], *C.L. Thomsen*[2], *and O. Bang*[1,2]; [1]*DTU Fotonik, Technical University of Denmark, Kgs. Lyngby, Denmark*; [2]*NKT Photonics A/S, Birkerød, Denmark*

The supercontinuum noise properties can be controlled by modulating the pump with a seed pulse. We investigate the influence of the seed's phase-coherence and demonstrate the need to seed coherently to achieve a low-noise supercontinuum.

IF-P.11 SUN

Nonlinear magneto-optical rotation with amplitude-modulated light

•*P. Anielski*[1], *J. Sudyka*[1], *W. Gawlik*[1], *and S. Pustelny*[1,2]; [1]*Center for Magneto-Optical Research, M. Smoluchowski Institute of Physics, Jagiellonian University, Krakow, Poland*; [2]*Department of Physics, University of California at Berkeley, Berkeley, United States*

Various quantum superpositions states between Zeeman sublevels are created on demand in warm 85Rb vapour with the use of amplitude-modulated laser excitation. The coherence lifetime on the order of 1s is measured.

IF-P.12 SUN

Tuning Curve of Type-0 Spontaneous Parametric Down-Conversion

•*S. Lerch, B. Bessire, C. Bernhard, A. Stefanov, and T. Feurer*; *Institute of Applied Physics, Bern, Switzerland*

We study the tuning curve of entangled photons generated by type-0 spontaneous parametric down-conversion in a PPKTP crystal. We demonstrate the X-shaped spatiotemporal structure of the spectrum by means of measurements and numerical simulations.

IF-P.13 SUN

Trans-spectral orbital angular momentum transfer via 4WM in Rb vapor

G. Walker[1], *E. Riis*[2], *S. Franke-Arnold*[1], *and* •*A. Arnold*[2]; [1]*University of Glasgow, Glasgow, United Kingdom*; [2]*University of Strathclyde, Glasgow, United Kingdom*

We transfer orbital angular momentum (OAM) from near-infrared pump light (780+776nm) to blue light (420nm) using a highly efficient single-pass near-resonant four-wave-mixing process in Rb vapour.

IF-P.14 SUN

Nonlinear Conversion between Ultrashort Radially- and Azimuthally-Polarized Pulses in an Anisotropic Media

•*M. Suzuki*[1], *K. Yamane*[1,2], *Y. Toda*[1,2], *and R. Morita*[1,2]; [1]*Hokkaido University, Sapporo, Japan*; [2]*JST, CREST, Sapporo, Japan*

Nonlinear conversion between ultrashort radially- and azimuthally-polarized pulses in an anisotropic crystal is investigated. It is analyzed with the spatially-extended Stokes parameters, which are the integrals of the Stokes parameters in a beam cross section.

IF-P.15 SUN

Effect of Domain Shape on Noncollinear Second-Harmonic Emission in Disordered Quadratic Media

•*M. Ayoub*[1], *M. Passlick*[1], *P. Roedig*[1], *K. Koynov*[2], *S. Kroesen*[1], *J. Imbrock*[1], *and C. Denz*[1]; [1]*Institute of Applied Physics, Muenster, Germany*; [2]*Max Planck Institute for Polymer Research, Mainz, Germany*

The effect of the individual domain shape in nonlinear photonic structures on the noncollinearly emitted second-harmonic signal is experimentally studied and numerically proved in different size distributions, ranging from the nano to the micro scale.

13:30 – 14:30

CL-P: CL Poster Session

CL-P.1 SUN

PNA-modified photonic crystal fibers for DNA detection

•*A. Candiani*[1], *S. Giannetti*[1], *A. Bertucci*[2], *R. Mwad Naife*[4], *H. Al-Janabi*[4], *M. Konstantaki*[3], *A. Cucinotta*[1], *S. Pissadakis*[3], *R. Corradini*[2], *and S. Selleri*[1]; [1]*Information Engineering Department, University of Parma, Parma, Italy*; [2]*Department of Chemistry, University of Parma, Parma, Italy*; [3]*Institute of Electronic Structure and Laser (IESL), Foundation for Research and Technology - Hellas (FORTH), Heraklion, Greece*; [4]*Institute of Laser for Postgraduate Studies, University of Baghdad, Baghdad, Iraq*

Functionalized photonic crystal fibers Bragg gratings for specific DNA detection are presented. Spectral measurements in reflection mode show a clear wavelength shift of the resonant peaks when specific DNA targets are detected

CL-P.2 SUN

Towards refractive index corrected optical coherence tomography as a navigation tool for bone surgery

•*M. Rahlves*[1], *J. Diaz Diaz*[2], *J. Thommes*[2], *O. Majdani*[3], *B. Roth*[1], *T. Ortmaier*[2], *and E. Reithmeier*[1]; [1]*Hannover Center for Optical Technologies, Leibniz Universität Hannover, Hannover, Germany*; [2]*Institute of Mechatronic Systems, Leibniz Universität Hannover, Hannover, Germany*; [3]*Clinic for Laryngology, Rhinology and Otology, Hannover Medical School, Hannover, Germany*

We present a strategy for geometrical calibration and refractive index correction for Optical Coherence Tomography in bone. This enables quantitative measurements inside bone materials and forms the basis for optical navigation in robot aided surgery.

CL-P.3 SUN

Enhancing Two-Photon Excited Fluorescence by Using Thermal Light

•*A. Jechow*[1,2], *M. Seefeldt*[2], *H. Kurzke*[2], *A. Heuer*[2], *and R. Menzel*[2]; [1]*Centre for Quantum Dynamics, Griffith University, Brisbane, Australia*; [2]*University of Potsdam, Institute of Physics and Astronomy, Photonics, Potsdam, Germany*

The photon bunching effect of thermal light is exploited to enhance the efficiency of two-photon excited fluorescence in a common fluorophore and water soluble quantum dots. This has potential applications in microscopy.

CL-P.4 SUN

Second Harmonic Generation imaging of collagen fibrillogenesis

S. Bancelin[1], *C. Aimé*[2], *V. Machairas*[3], *E. Decencière*[3], *C. Albert*[2], *G. Mosser*[2], *T. Coradin*[2], *and* •*M.-C. Schanne-Klein*[1]; [1]*Ecole Polytechnique - LOB (CNRS, Inserm), Palaiseau, France*; [2]*Lab. for Chemistry of Condensed Matter, UPMC-Collège de France - CNRS, Paris, France*; [3]*Centre of Mathematical Morphology -Mines ParisTech, Fontainebleau, France*

We visualized collagen fibrillogenesis using time-lapse Second Harmonic Generation microscopy and obtained reproducible kinetics of the fibril 3D density. Correlation to Transmission Electron Microscopy showed that SHG detect fibrils down to 30-50 nm diameter.

CL-P.5 SUN

Determination of axial fluorophore distributions without strong focusing apertures using noncollinear optical parametric amplification

•*M. Gräfe*[1], *A. Hoffmann*[1], *and C. Spielmann*[1,2]; [1]*Institute of Optics and Quantumelectronics, Abbe Center of Photonics, Jena, Germany*; [2]*Helmholtzintitut, Jena, Germany*

A new method is presented for investigation of structured fluorescence samples using low numerical apertures for ophthalmologic application. It is used to determine the axial fluorophore distribution along the propagation direction of an excitation pulse.

CL-P.6 SUN

Nonparaxial Circular and Weber beams from caustics

•*A. Mathis, F. Courvoisier, L. Froehly, R. Giust, L. Furfaro, M. Jacquot, and J. Dudley*; *Universite de Franche-Comte, BESANCON, France*

Using a caustic-based approach and an appropriate modeling of high-numerical aperture microscope objectives with Debye integral, we report analytical solutions for different nonparaxial accelerating beams and experimental realization actually in the nonparaxial regime.

CL-P.7 SUN

Optical tweezers assembly line for the micro-assembly of functional zeolite nanocontainer structures

•*Á. Barroso*[1], *M. Woerdemann*[1], *M. Veiga-Gutiérrez*[2], *L. De Cola*[2], *and C. Denz*[1]; [1]*Institute of Applied Physics, University of Muenster, Muenster, Germany*; [2]*Physics Institute and Center for Nanotechnology (CeNTech), University Münster, Muenster, Germany*

We present an optical tweezers assembly line that enables the construction of sophisticated 2D and 3D photonic functional structures of zeolite L crystals nanocontainers.

CL-P.8 SUN

Microscopic Second-order Susceptibility Tensor Analysis

•*M.J. Huttunen*[1], *L. Naskali*[1], *M. Virkki*[1], *G. Bautista*[1], *A. Dér*[2], *and M. Kauranen*[1]; [1]*Department of Physics, Tampere University of Technology, Tampere, Finland*; [2]*Institute of Biophysics, Biological Research Centre of the Hungarian Academy of Sciences, Szeged, Hungary*

We demonstrate microscopic tensor analysis technique based on polarized second-harmonic generation microscopy and genetic algorithms. The technique is applied to characterize nonlinear responses of bacteriorhodopsin chromoproteins, and could provide a new diagnostic tool of tissues.

CL-P.9 SUN

On-chip microparticle detection and sizing using a dual-wavelength waveguide laser

E.H. Bernhardi, K.O. van der Werf, A.J.F. Hollink, K. Wörhoff, R.M. de Ridder, V. Subramaniam, and •*M. Pollnau*; *University of Twente, Enschede, The Netherlands*

An integrated intra-laser-cavity microparticle sensor based on a dual-phase-shift, dual-wavelength distributed-feedback channel waveguide laser in ytterbium-doped aluminium oxide is presented. Single micro-particles with diameters ranging between 1 μm and 20 μm are detected.

CL-P.10 SUN

Adapted AWG Design for Localised Spectroscopic Measurements

•*Z. Hu*[1], *H. Yin*[2], *A. Glidle*[2], *and J. Cooper*[2]; [1]*Division of Medical and Biological Measurements, National Institute of Metrology, Beijing, China, People's Republic of (PRC)*; [2]*School of Engineering, University of Glasgow, Glasgow, United Kingdom*

For localised spectroscopic measurements, AWG design was modified to work with microfluidic system. Lens curvatures were incorporated into the ends of the integrated waveguides and the controllable focusing properties were evaluated by fluorescence measurements.

CL-P.11 SUN

Laser Diode Vibrometry for Non-Contact Monitoring of the Arterial Stiffness: Detection of the Heart Beat and Measurement of the Pulse Wave Velocity

G. Capelli[1], *M. Benedetti*[1,2], *M. Norgia*[1,3], *and* •*G. Giuliani*[1,2]; [1]*University of Pavia, Pavia, Italy*; [2]*Julight S.r.l., Pavia, Italy*; [3]*Politecnico di Milano, Milano, Italy*

We demonstrate the simultaneous use of two diode laser vibrometers to measure the heart rate and arterial Pulse Wave Velocity without contact. This tool can be applied to cardiovascular risk prevention on a large scale.

CL-P.12 SUN

Optical Injector of Particles for X-ray Diffractive Imaging

•*R. Kirian*[1], *N. Eckerskorn*[2], *A. Rode*[2], *J. Kupper*[1,3,4], *D. DePonte*[1], *and H. Chapman*[1,3,4]; [1]*Center for Free-Electron Laser Science, DESY, Hamburg, Germany*; [2]*Laser Physics Centre, Research School of Physics and Engineering, Australian National University, Canberra, Australia*; [3]*Department of Physics, University of Hamburg, Hamburg, Germany*; [4]*The Hamburg Centre for Ultrafast Imaging, Hamburg, Germany*

We apply a high aspect-ratio first order Bessel beam, formed by imaging a vortex beam through an axicon, to guide biological macromolecules and viruses to the focus of femtosecond x- ray free-electron-laser for coherent diffractive imaging.

CL-P.13 SUN

Cell Material interaction investigated by Digital Holographic Microscopy

•*L. Miccio*[1], *P. Memmolo*[1,2], *F. Merola*[1], *S. Fusco*[2], *V. Embrione*[2], *P. Netti*[2], *and P. Ferraro*[1]; [1]*Istituto Nazionale di Ottica del CNR, Pozzuoli, Italy*; [2]*Istituto Italiano di Tecnologia, Napoli, Italy*

Investigation of the interaction between cells and substrates is performed by Digital Holographic Microscopy. The potentiality of this well known interferometric technique is exploited to investigate the cross talk interaction between cell and biomaterials.

CL-P.14 SUN

High-resolution phase and amplitude modulation using a digital micromirror device

•*S.A. Goorden, J. Bertolotti, H. Yilmaz, D. Akbulut, W.L. Vos, and A.P. Mosk*; *Complex Photonic Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, The Netherlands*

We demonstrate a new phase and amplitude modulation method using a digital micromirror device. This provides the high level of control, high resolution and high speed required by many wavefront shaping applications.

CL-P.15 SUN

Monolithic Y-branch dual wavelength DBR diode laser at 671 nm for Shifted Excitation Raman Difference Spectroscopy

•*M. Maiwald, J. Fricke, A. Ginolas, J. Pohl, B. Sumpf, G. Erbert, and G. Tränkle*; *Ferdinand-Braun-Institut, Berlin, Germany*

A monolithic dual wavelength diode laser at 671 nm will be presented. Electro-optical and spectral properties will be given. Raman experiments demonstrate the suitability of these devices for shifted excitation Raman difference spectroscopy (SERDS).

CL-P.16 SUN

All-Fiber Nanosecond Laser System Generating Supercontinuum Spectrum for Photoacoustic Imaging

S. Yavas[1], E.A. Kipergil[2], O. Akcaalan[1], Y.B. Eldeniz[3], U. Arabul[2], H. Erkol[2], M.B. Unlu[2], and •F.O. Ilday[1]; [1]Bilkent University, Ankara, Turkey; [2]Bogazici University, Istanbul, Turkey; [3]Ankara University, Ankara, Turkey

We demonstrate an integrated fiber-laser system to be used in photoacoustic-imaging. It is producing nanosecond-pulses, covering from 600-1100 nm, which allows independent complete control over pulse duration, energy, and pulse train through custom-developed FPGA electronics.

13:30 – 14:30

CM-P: CM Poster Session

CM-P.1 SUN

Ciliary white light generated during femtosecond laser ablation on transparent dielectrics

*•Y. Liu[1], Y. Brelet[1], Z. He[2], L. Yu[3], S. Mitrykovskiy[1], A. Houard[1], B. Foresiter[1], A. Couairon[4], and A. Mysyrowicz[1]; [1]Laboratoire d*Optique Appliquée, Palaiseau, France; [2]University of Antwerp, Antwerp, Belgium; [3]Laboratoire de Physique des Interfaces et des Couches Minces, Palaiseau, France; [4]Centre de Physique Théorique, Ecole Polytechnique, Palaiseau, France*

We report on a new nonlinear optical phenomenon, coined as ciliary white light, during laser ablation on transparent dielectrics. It is universally observed on 14 different dielectrics including glasses, crystals and polymers.

CM-P.2 SUN

Pulsed Laser Generation of Novel Nanomaterials for Organic Electronics

•E. Stratakis[1,2], M.M. Stylianakis[2,3], K. Savva[1,2], C. Fotakis[1,2], and E. Kymakis[3]; [1]Institute of Electronic Structure and Laser, Foundation for Research & Technology Hellas, (IESL-FORTH), P.O. Box 1527, Heraklion 711 10, Greece., Heraklion, Greece; [2]University of Crete, Heraklion 714 09, Greece., Heraklion, Greece; [3]Center of Materials Technology and Photonics & Electronic Engineering Department, Technological Educational Institute (TEI) of Crete, Heraklion, 71003, Greece, Heraklion, Greece

We present the application of ultrafast lasers for the photochemical reduction [1], functionalization and doping of graphene oxide sheets for organic electronics applications. [1] E. Kymakis et al. Adv. Funct. Mater. 2013, DOI: 10.1002/adfm.201202713.

CM-P.3 SUN

Highly Antibacterial UHMWPE Surfaces by Pulsed Laser Ablation of Titanium Targets

•D. Delle Side[1,2], P. Alifano[3], V. Nassisi[1,2], A. Talà[3], S.M. Tredici[3], and L. Velardi[1,2]; [1]Leas, Dipartimento di Matematica e Fisica, Università del Salento, Lecce, Italy; [2]INFN section of Lecce, Lecce, Italy; [3]Laboratorio di Microbiologia, DiSTeBA, Università del Salento, Lecce, Italy

Results about an highly antibacterial UHMWPE implanted with Ti ions obtained by Laser Ablation are presented. Morphological and elemental analysis and antibacterial tests show substantial enhancements with respect to the blank material.

CM-P.4 SUN

Nanosecond pulsed laser irradiation of silver-doped nanocomposite glass

•L. Fleming and A. Abdolvand; School of Engineering, Physics and Mathematics, University of Dundee, Dundee, United Kingdom

Glass embedded with silver nanoparticles is modified using a nanosecond pulsed laser at 532 nm. The modified areas show a broadening and red shift of the SPR band, in accordance with the Maxwell-Garnett theory.

CM-P.5 SUN

Creating metallic films by laser irradiation of silver ion exchanged glasses

•S. Wackerow and A. Abdolvand; School of Engineering, Physics & Mathematics, University of Dundee, Dundee, United Kingdom

Glass with silver ions was fabricated and irradiated at scanning speed of 14 mm/s using a nanosecond laser at 355 nm, leading to spatially-selective one-step precipitation of silver particles and fabrication of glass-silver composite.

CM-P.6 SUN

Fabrication of a DFB Laser in SU-8 by Direct Femtosecond Laser Writing

W. Horn, •S. Kroesen, and C. Denz; University of Muenster, Muenster, Germany

We demonstrate the fabrication of a DFB laser in Rhodamin 6G doped SU-8 by femtosecond laser writing. We characterize spectral emission, threshold and lifetime by optically pumping the device with a pulsed Nd:YAG laser source.

CM-P.7 SUN

Dental Tissue Ablation by means of a Picoseconds Laser

•M. Sozzi[1], C. Fornaini[2], A. Cucinotta[1], E. Merigo[2], P. Vescovi[2], and S. Selleri[1]; [1]Department of Information Engineering, University of Parma, Parma, Italy; [2]Oral medicine and Laser-assisted Surgery Unit, Dental School, Parma, Italy

An "in vitro" study of dental surfaces ablation, by means of a 1064nm picoseconds laser, has been carried out. High quality holes have been drilled, avoiding cracks, carbonization, and high temperature rise by proper cooling.

CM-P.8 SUN

Study of the Stress-Strain State in Glass-Carbon Plates after Ultrafast Laser Processing

•T. Sokolova, Y. Chebotarevsky, E. Surmenko, A. Konyushin, I. Popov, and D. Bessonov; Gagarin Saratov State Technical University, Saratov, Russia

Paper describes the theoretical simulation of the mechanical stresses that occur in a glass-carbon plate under the influence of a series of ultrashort laser pulses with high energy density.

CM-P.9 SUN

Laser-assisted Microstructuring and Blackening of Copper

•G. Tang, A. Hourd, and A. Abdolvand; School of Engineering, Physics and Mathematics, University of Dundee, Dundee, United Kingdom

Large-area microstructures have been induced on copper surfaces using a 532 nm nanosecond laser to produce black copper, which absorbs 97% of light from 250-750 nm, and over 80% between 750-2500 nm.

CM-P.10 SUN

Multiple-wavelength DFB laser based on 3D surface relief gratings

•X. Wu[1,2], D. Sun[2], I. Ledoux-Rak[1], C.T. Nguyen[1], and N.D. Lai[1]; [1]Labotoire de Photonique et Moléculaire, UMR CNRS 8537, Ecole Normal Supérieure de Cachan, Cachan, France; [2]Condensed Matter Physics, East China Normal University, 3663 Zhongshan Road North, Shanghai, China, People's Republic of (PRC)

Polymer-based 3D structures are fabricated by holographically assembling multiple 1D surface relief gratings. By varying the period of each 1D layer, these structures allow to realize multiple-wavelength distributed feedback lasers.

CM-P.11 SUN

Laser Induced Plasma Detection by Flat and Circular Interdigital Electrodes in Laser Material Processing

•Y.-J. Chang, C.-T. Chen, C.-C. Ho, J.-C. Hsu, and C.-L. Kuo; National Yunlin University of Science and Technology, Douliou, China, Republic of (ROC)

We propose flat and circular interdigital electrode designs to increase the detection signal of laser-induced plasma for monitoring laser material processing. The results indicated the signal increase by 2.5 times and 3.3 time, respectively.

CM-P.12 SUN

Microfabrication of notches for electric contacts in the conductive ceramic fiber by femtosecond pulses

•A. Alesenkov, L. Mažule, G. Choževskis, K. Stankevičiute, D. Paipulas, and V. Sirutkaitis; Laser Research Centre, Villnius, Lithuania

With the help of femtosecond laser micromachining technology we demonstrate fabrication of micronotches in conductive ceramic fibres. The notches, with 60-200 um width are intended to attach electrical wires in the metallic mould wear sensor.

CM-P.13 SUN

Time Resolved and Spectral Analysis of Solar Absorber Cu-Al and Al-Al Laser Weld Emission

•P. Siozos; Institute of Electronic Structure and Laser - Foundation for Research and Technology Hellas, Heraklion, Greece

The time resolved and spectral analysis of emission during laser welding in the fabrication of solar heat collectors is presented. The results provide significant information concerning laser welding, for the optimization of the weld quality.

CM-P.14 SUN

Ultrafast laser ablation giving unstructured surface roughness prior to the emergence of LIPSS

•M. Ardron and D. Hand; Heriot Watt University, Edinburgh, United Kingdom

Ultrafast laser pulses around the ablation threshold form LIPSS on metal regardless of surface preparation. Experimental results suggest initial ablation gives unstructured roughness allowing further pulses to couple with plasmons via scattering and grating-like interaction.

CM-P.15 SUN

Direct laser fabrication of composite material 3D microstructured scaffolds

•S. Rekstyte[1], E. Balciunas[1,2], D. Baltriukiene[2], V.

Rutkunas[3], V. Bukelskiene[2], R. Gadonas[1], and M. Malinauskas[1]; [1] Vilnius University, Faculty of Physics, Department of Quantum Electronics, Laser Research Center, Vilnius, Lithuania; [2] Vilnius University, Institute of Biochemistry, Department of Biological Models, Vilnius, Lithuania; [3] Vilnius University, Institute of Odontology, Faculty of Medicine, Vilnius, Lithuania
We present manufacturing of 3D microporous composite material scaffolds for tissue engineering applications. We use the advantage of flexible direct laser fabrication to create biologically inert rigid support structures filled with a biodegradable fine mesh.

CM-P.16 SUN

Direct femtosecond laser writing of waveguide structures and Bragg gratings for integrated NIR optics using multi scan technique

M. Thiel, •G. Flachenecker, M. Köhring, and W. Schade; Fraunhofer Heinrich-Hertz-Institute, Goslar, Germany
We present a multi scan technique to produce integrated optics for NIR light sources. Basic element is a bundle of parallel, slightly overlapping single waveguides. The waveguide bundles are very well suited for implementing Bragg gratings.

CM-P.17 SUN

Fabrication of ridge waveguides by femtosecond-laser structuring of (Yb,Nb):RTP/RTP using beam multiplexing with a Spatial Light Modulator

*•A. Ruiz de la Cruz[1], J. Cugat[2], R. Solé[2], A. Ferrer[3], J. Massons[2], X. Mateos[2], J.J. Carvajal[2], M. Aguiló[2], G. Lifante[2], F. Díaz[2], and J. Solís[1]; [1] Laser Processing Group, Instituto de Óptica (CSIC), Madrid, Spain; [2] Física i Cristal*lografia de Materials i Nanomaterials (FiCMA-FiCNA). Universitat Rovira i Virgili, Tarragona, Spain; [3] Ultrafast Dynamics Group, Institute for Quantum Electronics, ETH Zurich, Zurich, Switzerland*
We fabricated ridge waveguides, inscribing trenches in a (Yb,Nb):RTP epilayer with a fs-laser using the approximation scanning technique multiplexing the beam with a SLM. We achieved propagation losses lower than 4 dB/cm for λ=972 nm.

CM-P.18 SUN

Basic mechanisms and main types of reliefs in laser direct nanostructuring technological materials

•V. Tokarev, V. Artemov, A. Galstyan, A. Obidin, I. Randoshkin, and V. Shmakov; A.M. Prokhorov General Physics Institute, Russian Academy of Sciences, Moscow, Russia
Experimental study of direct laser surface nanostructuring of a number of technological materials by nanosecond excimer laser irradiation, combined with our previous theoretical study of basic mechanisms of nanostructures formation, have shown that 5 main types of reliefs are possible.

CM-P.19 SUN

Fabrication of SERS active surface structures on rotating polyimide sample by excimer laser irradiation

•T. Csizmadia, Z. Bengery, J. Kopniczky, I. Hanyecz, and B. Hopp; Department of Optics and Quantum Electronics, University of Szeged, Szeged, Hungary
In this study the fabrication of polyimide nanostructures by excimer laser irradiation is presented and the suitability of the produced morphologies in surface enhanced Raman scattering spectroscopy applications is demonstrated.

CM-P.20 SUN

Optimized hydrogen sensing properties of nanocomposite NiO:Au and NiO:Pd thin films at ppb-concentration levels

•M. Kandyla[1], C. Chatzimanolis[1,2], C. Charitidis[2], M. Guziewicz[3], and M. Kompitsas[1]; [1] National Hellenic Research Foundation, Athens, Greece; [2] National Technical University of Athens, Athens, Greece; [3] Institute of Electron Technology, Warsaw, Poland
We present results on the fabrication of p-type NiO:Au and NiO:Pd thin-film electrochemical sensors, which are able to detect hydrogen in air at ppb-level concentrations, operating at low temperatures.

CM-P.21 SUN

Alleviating the mechanical tolerances in femtosecond laser micromachining by diffractive focusing

•S. Torres-Peiró, J. González-Ausejo, O. Mendoza-Yero, G. Mínguez-Vega, and J. Lancis; GROC-UJI, Institut de Noves Tecnologies de la Imatge (INIT), Castellón, Spain
Demonstration of the alleviating mechanical tolerances in micromachining processes employing 30fs pulses and diffractive lenses by means of the study of the ablation region along the axial direction

CM-P.22 SUN

Laser-Induced Forward Transfer-Assisted Flip-Chip Bonding of Optoelectronic Components

•K. Kaur[1], J. Missinne[1], B. Vandecasteele[1], G. Steenberge[1], S. Perinchery[2], R. Mandamparambil[2], and E. Smits[2]; [1] Centre for Microsystems Technology, IMEC/Ghent University, Gent, Belgium; [2] TNO/Holst Centre, Eindhoven, The Netherlands
We report the Laser-Induced Forward Transfer (LIFT) of micro-bumps of silver nanoparticle and solder based paste for flip-chip bonding of single VCSEL chips. The electrical characterization results of the bonded chips are also presented.

CM-P.23 SUN

Experimental and numerical study of cw green laser crystallization of a-Si:H thin films

O. García[1], D. Munoz-Martin[1], J.J. García-Ballesteros[1], Y. Chen[1], •M. Morales[1], J. Cárabe[2], J.J. Gandía[2], and C. Molpeceres[1]; [1] Centro Láser UPM, Universidad Politécnica de Madrid, Madrid, Spain; [2] CIEMAT, Madrid, Spain
In this work, experimental and numerical study results of cw green laser crystallization of a-Si:H thin films are presented.

The process parameters predicted by the numerical model are consistent with those experimentally observed.

CM-P.24 SUN

Self-Assembled Nanostructuring of a-Si:H Films with Ultrashort Light Pulses

•M. Gecevičius[1], M. Beresna[1], A. Kazanskii[2], and P. Kazansky[1]; [1] Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom; [2] Physics Department, M.V. Lomonosov Moscow State University, Moscow, United Kingdom
Dichroism and record high birefringence of femtosecond laser induced nanostructures in oxidized a-Si:H is demonstrated. Ultrafast laser writing can be used for printing integrated polarization optical elements with submicron precision in amorphous silicon thin films.

CM-P.25 SUN

Rapid, low-cost patterning of microstructures in polydimethylsiloxane via mask-less laser-machining

•C. Sones, I. Katis, B. Mills, M. Feinaeugle, A. Mosayyebi, J. Butement, and R. Eason; Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom
We report on use of a rapid and mask-less laser machining procedure that enables the creation of micron-scale structures in polydimethylsiloxane (PDMS), used commonly in implementation of lab-on-chip devices and micro-contact printing.

CM-P.26 SUN

Non-thermal Material and Tissue Processing with 100 MHz and 500 MHz Repetition Rate Bursts

•C. Kerse[1], H. Kalaycioglu[2], Ö. Akçaalan[2], B. Eldeniz[3], F.Ö. Ilday[2], H. Hoogland[4], and R. Holzwarth[4]; [1] Department of Electrical and Electronics Engineering, Bilkent University, Ankara, Turkey; [2] Department of Physics, Bilkent University, Ankara, Turkey; [3] Department of Electrical and Electronics Engineering, Ankara Unversity, Ankara, Turkey; [4] Menlo Systems GmbH, Munich, Germany
We demonstrate efficient micro-machining results on Cu and dentin samples obtained with high repetition rate (100 MHz and 500 MHz) pulses in the form bursts from an in-house developed mJ-level Yb integrated fiber amplifier.

CM-P.27 SUN

Hydrogenated amorphous silicon films grown by pulsed laser deposition

•M. Kandyla, A. Mellos, and M. Kompitsas; National Hellenic Research Foundation, Athens, Greece
We employ pulsed laser deposition for the fabrication of a-Si:H solar cells in the p-i-n configuration. Varying the PLD parameters, we optimize the morphology, conductivity, and optical properties of the a-Si:H layers for maximum efficiency.

CM-P.28 SUN

Thermoelectric generator fabricated via laser-induced forward transfer

•M. Feinaeugle[1], C. Sones[1], E. Koukharenko[2], and R. Eason[1]; [1] Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom; [2] School of Physics and Astronomy, ECS, University of Southampton, Southampton, United Kingdom
We report on laser-induced forward transfer as a novel method to fabricate thermoelectric generators on polymer substrates. The thermoelectric voltage and resistance of the device were determined as a measure of the device's thermoelectric performance.

CM-P.29 SUN

Laser-induced forward transfer on compliant receivers

•M. Feinaeugle, P. Horak, C. Sones, and R. Eason; Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom
We present the role of compliant polymer films on receivers during laser-induced forward transfer of thin solid films. Experiments and finite element simulation show the influence of such films on adhesion and morphology of deposits.

CM-P.30 SUN

The Laser Furnace: A Revolution in Ceramics and Glass Processing?

I. de Francisco, V. Lennikov, R. Lahoz, L.A. Angurel, L.C. Estepa, and •G.F. de la Fuente; ICMA (CSIC-Univ. Zaragoza), Zaragoza, Spain
This work presents a novel processing tool, which combines laser irradiation with a continuous roller furnace, with the aim of processing ceramics and glass products without thermo-mechanical damage.

CM-P.31 SUN

Structural and magnetic characterization of magnetite deposits prepared by infrared pulsed laser deposition

•*M. Oujja*[1], *M. Sanz*[1], *E. Rebollar*[1], *J.F. Marco*[1], *J. de la Figuera*[1], *M. Monti*[1], *A. Bollero*[2], *J. Camarero*[2,3], *F.J. Pedrosa*[2], *M. García-Hernández*[4], *and M. Castillejo*[1]; [1]*Instituto de Química Física Rocasolano, CSIC, Madrid, Spain*; [2]*IMDEA Nanoscience, Instituto Madrileño de Estudios Avanzados en Nanociencia, Campus Universidad Autónoma de Madrid, Madrid, Spain*; [3]*Departamento de Física de la Materia Condensada, Instituto Nicolás Cabrera, Campus Universidad Autónoma de Madrid, Madrid, Spain*; [4]*Instituto de Ciencias Materiales de Madrid, CSIC, Madrid, Spain*

Thin films of magnetite were deposited on different single crystal substrates by pulsed laser deposition at 1064 nm and characterized by XRD, AFM, Raman and Möussbauer spectroscopies, MOKE and SQUID.

13:30 – 14:30

CC-P: CC Poster Session

CC-P.1 SUN

InGaAs/AlInGaAs THz Quantum Cascade Lasers

•*K. Ohtani, M. Beck, G. Scalari, and J. Faist*; *Institute for Quantum Electronics, ETH Zurich, Zurich, Switzerland*

We report on operation of InGaAs/AlInGaAs THz quantum cascade laser. The devices exhibit a low threshold current density (100 A/cm2) with output power (1-2 mW) at 10 K in continuous wave mode.

CC-P.2 SUN

Mid-infrared frequency comb spanning an octave based on an Er fiber laser and difference-frequency generation

•*S. Amarie*[1] *and F. Keilmann*[2]; [1]*Neaspec GmbH, Martinsried, Germany*; [2]*LASNIX, Berg, Germany*

We describe a coherent mid-infrared continuum source (18 - 75 THz) covering the full infrared ”fingerprint” molecular vibration region. Application in near-field microscopy will be shown.

CC-P.3 SUN

Multi-cavity terahertz quantum cascade lasers

•*D. Bachmann*[1], *M. Krall*[1], *M. Martl*[1], *H. Detz*[2], *A.M. Andrews*[2], *G. Strasser*[2], *K. Unterrainer*[1], *and J. Darmo*[1]; [1]*Institute of Photonics, Vienna, Austria*; [2]*Institute of Solid-State Electronics, Vienna, Austria*

In a systematic investigation, the multi-purpose of sectioned terahertz quantum cascade laser cavities is demonstrated. Dependent on the operation mode, THz amplification, modulation or detection can be achieved concurrently in a single device.

CC-P.4 SUN

Pulsed THz generation from InAs/GaAs quantum dot structures

•*N.S. Daghestani*[1], *M. Alduraibi*[2,3], *M. Missous*[2], *T. Ackemann*[4], *and M.A. Cataluna*[1]; [1]*University of Dundee, Dundee, United Kingdom*; [2]*University of Manchester, Manchester, United Kingdom*; [3]*King Saud University, Riyadh, Saudi Arabia*; [4]*University of Strathclyde, Glasgow, United Kingdom*

Pulsed terahertz radiation from surfactant-mediated grown InAs/GaAs quantum-dot based antennas was measured using photoconductive time-domain methods for the first time. The devices combine high resistivity, low dark currents, and sub-picosecond carrier lifetimes.

CC-P.5 SUN

THz emission from quantum dot-based THz antennas oumped by a tunable quantum-dot laser diode

•*R. Leyman*[1], *D. Carnegie*[1], *K. Fedorova*[1], *N. Bazieva*[1], *S. Schulz*[2], *C. Reardon*[2], *E. Clarke*[3], *and E. Rafailov*[1]; [1]*University of Dundee, Dundee, United Kingdom*; [2]*University of St Andrews, St Andrews, United Kingdom*; [3]*EPSRC National Centre for III-V Technologies, University of Sheffield, Sheffield, United Kingdom*

We demonstrate an efficient THz source comprising an InAs quantum dot-based semiconductor antenna optically pumped by a tunable dual-mode quantum-dot semiconductor laser, giving tunable CW THz output signal between around 250 GHz and 3 THz.

CC-P.6 SUN

Generation of broadband terahertz Laguerre-Gaussian beam

R. Imai[1], •*N. Kanda*[2,3], *T. Higuchi*[4], *Z. Zheng*[1], *K. Konishi*[2], *and M. Kuwata-Gonokami*[1,2,4]; [1]*Department of Applied Physics, The University of Tokyo, Tokyo, Japan*; [2]*Photon Science Center, The University of Tokyo, Tokyo, Japan*; [3]*RIKEN Advanced Science Institute, Wako, Japan*; [4]*Department of Physics, The University of Tokyo, Tokyo, Japan*

We demonstrate a method to generate broadband terahertz Laguerre-Gaussian beam with the topological charge of +1 and -1 by mode conversion from broadband THz radial beam using a quarter wave plate and a polarizer.

CC-P.7 SUN

Efficient Coupling of Broadband Terahertz Radial Beams to Metal Wires

•*Z. Zheng*[1], *N. Kanda*[2,3], *K. Konishi*[3], *and M. Kuwata-Gonokami*[1,3,4]; [1]*Department of Applied Physics, The University of Tokyo, Tokyo, Japan*; [2]*RIKEN Advanced Science Institute, Saitama, Japan*; [3]*Photon Science Center, The University of Tokyo, Tokyo, Japan*; [4]*Department of Physics, The University of Tokyo, Tokyo, Japan*

we demonstrate efficient coupling to metal wires from propagating mode by introducing broadband terahertz radial beams, and experimental investigations to determine coupling efficiency are performed, the maximum coupling efficiency is as large as 60%.

CC-P.8 SUN

THz propagation in hybrid hollow core fibers with metal wires inclusion

•*R. Leonhardt*[1], *J. Anthony*[1], *and A. Argyros*[2]; [1]*Physics Dept, University of Auckland, Auckland, New Zealand*; [2]*Institute of Photonic and Optical Sciences (IPOS), School of Physics, The University of Sydney, Sydney, Australia*

We present novel designs for hollow-core THz waveguides that include metal wires. For the HE11-like mode attenuation in the order of 0.4 cm-1 can be achieved. Experimental results agree well with numerical fully-vectorial finite-difference simulations.

CC-P.9 SUN

Generation and Field-Resolved Detection of Ultrafast Synthetic Multi-THz Transients

•*D.V. Seletskiy, C. Schmidt, B. Mayer, A. Pashkin, and A. Leitenstorfer*; *Department of Physics and Center for Applied Photonics, University of Konstanz, Konstanz, Germany*

Intense fundamental and second harmonic few-cycle multi-THz pulses are combined to generate synthetic waveforms with strongly symmetry-broken temporal envelope. Access to these waveforms sets an exciting platform for novel experiments in THz nonlinear optics.

CC-P.10 SUN

Carrier envelope phase control of monocycle THz pulses using an artificial dispersive medium

M. Nagai, E. Matsubara, Y. Minowa, and •*M. Ashida*; *Osaka Univ., Toyonaka, Japan*

We experimentally control carrier envelope phase of intense monocycle THz pulse by passing through an artificial dispersive medium based on the parallel metal plates. This gives us a new field of phase-sensitive THz nonlinear spectroscopy.

CC-P.11 SUN

Nonlinear phase shifts of bichromatic pump waves during terahertz wave generation in air

•*K. Steponkevičius, V. Pyragaite, V. Smilgevičius, and V. Vaičaitis*; *Vilnius university Laser Research Center, Vilnius, Lithuania*

It is shown that the properties of terahertz radiation generated in air by tightly focused bichromatic femtosecond laser pulses can be well explained only if the nonlinear phase shifts of both pump waves are considered.

CC-P.12 SUN

Broadband THz-Wave Generation with Organic Crystals OH1 and DSTMS

•*M. Jazbinsek, B. Ruiz, C. Medrano, and P. Günter*; *Rainbow Photonics AG, Zurich, Switzerland*

We report on efficient THz-wave generation and detection in a broad THz range 1-12 THz using recently developed OH1 and DSTMS electro-optic crystals and evaluate the corresponding phase-matching configurations for femtosecond and nanosecond pump-laser sources.

CC-P.13 SUN

Influence of the acquisition method on terahertz tomography

J.-P. Guillet[1], *B. Recur*[2], *L. Frederique*[2], •*I. Manek-Hönninger*[1], *P. Desbarats*[2], *and P. Mounaix*[1]; [1]*LOMA, Bordeaux 1 University, CNRS UMR 5798, Talence, France*; [2]*LaBRI, Bordeaux 1 University, CNRS UMR 5800, Talence, France*

Terahertz tomography is a technique which allow to recontruct the structure of an object. In this work, we study the influence the acquisition method on the noise of terahertz tomography with different reconstruction algorithms.

CC-P.14 SUN

Understanding and controlling on-axis and off-axis THz emission patterns from 2-color femtosecond laser filaments

•*A. Koulouklidis*[1,2], *M. Massaouti*[1], *A. Gorodetsky*[1], *and S. Tzortzakis*[1,2]; [1]*Institute of Electronic Structure and Laser (IESL), Foundation for Research and Technology - Hellas (FORTH), Heraklion, Greece*; [2]*Department of Materials Science and Technology, University of Crete, Heraklion, Greece*

We present new experimental findings coupled with a comprehensive model explaining both on-axis and off-axis components of the far-field spatial distribution of intense broadband THz beams generated by femtosecond laser filaments in gases.

Hall B0

CC-P.15 SUN

Properties and Origin of Frequency Noise in Mid-IR Distributed Feedback Quantum Cascade Lasers

•L. Tombez[1], S. Schilt[1], G. Di Domenico[1], S. Blaser[2], A. Muller[2], T. Gresch[2], B. Hinkov[3], M. Beck[3], J. Faist[3], and D. Hofstetter[1]; [1]University of Neuchatel, Neuchatel, Switzerland; [2]Alpes Lasers SA, Neuchatel, Switzerland; [3]ETH Zurich, Zurich, Switzerland

We present and compare the frequency-noise properties of ridge and buried-heterostructure DFB-QCLs at 4.55um. The physical origin of the noise is discussed, showing the dominant contribution of internal electrical noise.

CC-P.16 SUN

A coherent quantum cascade laser array for high power emission

•R. Vallon[1], B. Parvitte[1], D. Mammez[1], G.-M. de Naurois[2], M. Carras[2], and V. Zéninari[1]; [1]Groupe de Spectrométrie Moléculaire et Atmosphérique, UMR 7331 CNRS Université de Reims, Reims, France; [2]III-V Lab, GEI Alcatel-Thales-CEA Leti, Palaiseau, France

In the framework of the ANR project called COCASE, we develop a coherent quantum cascade laser array to obtain high power emission for the development of a photoacoustic spectrometer devoted to trace gas detection.

13:30 – 14:30

CA-P: CA Poster Session

CA-P.1 SUN

Cross-correlator for the Diagnostics of 3D Ellipsoidal Shaped UV Laser Pulses for the Future XFEL Low-emittance Photo-injector

A. Poteomkin[1], A. Andrianov[1], E. Gacheva[1], V. Zelenogorsky[1], S. Mironov[1], E. Khazanov[1], •M. Martyanov[2], E. Syresin[3], M. Krasilnikov[4], and F. Stephan[4]; [1]Institute of Applied Physics of the Russian Academy of Sciences, Nizhny Novgorod, Russia; [2]European Organization for Nuclear Research, Geneva, Switzerland; [3]Joint Institute for Nuclear Research, Dubna, Russia; [4]Photo Injector Test Facility at Deutsches Electronen-Synchrotron, Zeuthen, Germany

As a part of the development the photo-injector laser driver generated 3D ellipsoidal UV pulses a need for an appropriate diagnostic system appeared. For this purpose special ultrafast scanning cross-correlator setup was created.

CA-P.2 SUN

A Continuous-Wave Medical Yellow Laser at 561 nm

•J. Gao, X. Dai, L. Zhang, H. Sun, and X. Wu; Suzhou Institute of Biomedical Engineering and Technology, Chinese Academy of Sciences, Suzhou, China, People's Republic of (PRC)

A high power continuous-wave medical yellow laser at 561 nm is presented. The maximum output power is ~2.3 W, with a beam quality factor of ~2.0 and an instability factor of ~2.0%.

CA-P.3 SUN

Efficient Pr^{3+}:$SrAl_{12}O_{19}$ laser pumped with four diode lasers

•D.-T. Marzahl[1], F. Reichert[1], P.W. Metz[1], N.-O. Hansen[1], and G. Huber[1,2]; [1]Institute of Laser-Physics, Hamburg, Germany; [2]The Hamburg Centre for Ultrafast Imaging, Hamburg, Germany

In this contribution we report on efficient laser operation of Pr^{3+}-doped $SrAl_{12}O_{19}$. The crystal was excited from both side each with two InGaN laser diodes, which were combined at polarization beam splitter cubes.

CA-P.4 SUN

Frequency-doubled power-scaled Pr:YAlO3 laser generation at 373.5 nm wavelength

•M. Fibrich[1,2] and H. Jelínková[1]; [1]Czech Technical University in Prague, FNSPE, Prague, Czech Republic; [2]Institute of Physics of the AS CR, Prague, Czech Republic

Laser-diode pumped continuous-wave frequency-doubled power-scaled Pr:YAlO3 laser system operating in the violet spectral range at 373.5 nm wavelength is described. As a pumping sources, two 1W GaN laser-diodes were used.

CA-P.5 SUN

A barium tungstate anti-Stokes Raman laser

C. Wang[1], •X. Zhang[1], Z. Cong[1], Z. Liu[1], W. Wei[1], W. Wang[1], Z. Wu[1], Y. Zhang[1], L. Li[1], X. Chen[1], P. Li[1], H. Zhang[2], and Q. Wang[1]; [1]School of Information Science & Engineering and Shandong Provincial Key Laboratory of Laser Technology and Application, Shandong University, Jinan, China, People's Republic of (PRC); [2]State Key Laboratory of Crystal Materials, Shandong University, Jinan, China, People's Republic of (PRC)

A BaWO4 anti-Stokes Raman laser is investigated. The first and second order anti-Stokes lasers are obtained with the highest energies of 0.76 mJ and 0.12 mJ and the conversion efficiencies of 0.95% and 0.15%, respectively.

CA-P.6 SUN

Faraday Isolator with 33 dB Isolation Degree at the 1.5 kW CW Laser Power

•I. Snetkov and O. Palashov; Institute of Applied Physics of the Russian Academy of Sciences, Nizhny Novgorod, Russia

Experimentally demonstrate a prototype of a water cooled Faraday isolator with compensation of thermally induced depolarization inside the magnetic field with a record level of 33 dB isolation at the 1.5 kW cw laser power

CA-P.7 SUN

1.5 kW Burst of Picosecond Pulses with Scalable Energy and Average Power Generated by Diode Pumped Nd-laser System

B. Oreshkov, V. Aleksandrov, H. Iliev, A. Trifonov, and •I. Buchvarov; Sofia University, Sofia, Bulgaria

We report generation of a burst of picoseconds pulses easily scalable using diode pumped Nd-based technology. Burst of 6ps-pulses with duration (10μs-100μs) , 1510-430 W is obtained at 0.5 kHz repetition rate.

CA-P.8 SUN

Hybrid Q-Switched Laser Source With Timing Jitter Lower Than 100 ns at High Repetition Rate (30 kHz)

•F. El Bassri[1,2], L. Jaffres[3], A. Jalocha[2], D. Pagnoux[1], and V. Couderc[1]; [1]Xlim, photonics department, Limoges, France; [2]CILAS, Orléans, France; [3]Horus Lasers, Limoges, France

We present an active/passive Q-switched laser source based on a dual cavity configuration with modulated pump power, emitting 600 ps pulses at tunable repetition rate up to 30 kHz with timing jitter < 100 ns.

CA-P.9 SUN

Near Diffraction Limited Pulses with 52-mJ, 1.2 ns at 0.5 kHz, Generated by Nd-based MOPA

D. Chuchumishev[1], B. Oreshkov[1], •A. Gaydardzhiev[1], A. Trifonov[1], and I. Buchvarov[1,2]; [1]Department of Physics, Sofia University, Sofia, Bulgaria; [2]Northwestern University Feinberg School of Medicine, Chicago, United States

We present Nd-based, diode pumped amplifier system emitting up to 52-mJ pulse energy with 1.2-ns pulse duration and near diffraction limited beam (quality factor <1.3), operating at 0.5-kHz repetition rate.

CA-P.10 SUN

Tunability and CW efficient laser operation in KLa(XO4)2:Nd3+, (X = W or Mo), disordered laser crystals

•M. Rico[1,2] and X. Han[2]; [1]Centro de Láseres Pulsados Ultracortos, CLPU, Villamayor, Spain; [2]Instituto de Ciencia de Materiales de Madrid, CSIC, Madrid, Spain

RT CW laser operation for disordered crystals (Nd3+:KLa(WO4)2 and Nd3+:KLa(MoO4)2) with slope efficiency to > 50% output power (>6 W for KLM) and tunable laser (15 nm range for KLW) are demonstrated in several configurations.

CA-P.11 SUN

Passive Mode-locking of a Diode Pumped Nd:ScYSiO5 Laser

V. Aleksandrov[1], •H. Iliev[1], L. Zheng[2], L. Su[2], J. Xu[2], G. Aka[3], and I. Buchvarov[1]; [1]Department of Physics, Sofia University, Sofia, Bulgaria; [2]Shanghai Institute of Ceramics, Chinese Academy of Sciences, Shanghai, China, People's Republic of (PRC); [3]Laboratoire de Chimie de la Matière Condensée de Paris, Paris, France

Single wavelength, passive mode-locking of Nd:ScYSiO5 disordered laser crystal is demonstrated, achieving output power of 150mW at 99MHz repetition rate and 5.7ps pulse duration as well as dual wavelength mode-locking with output power of 500mW.

CA-P.12 SUN

Control of Spectral Parameters in Vanadate Lasers

•S. Anatoly; Prokhorov General Physics Institute of the Russian Academy of Sciences, Moscow, Russia

We have experimentally investigate, for the first time, angular dependences of the luminescence intensity of Stark transitions in Nd-doped vanadate crystals. We suggest some directions to create active media with new parameters.

CA-P.13 SUN

High Repetition Rate Electro-optical Cavity-dumped Nd:GdVO4 Laser

•Y. Ma, X. Yu, X. Li, C. Wang, R. Yan, and J. Yu; Harbin Institute of Technology, Harbin, China, People's Republic of (PRC)

High repetition rate electro-optical cavity-dumped YVO4/Nd:GdVO4 laser pumped by 808 nm LD and GdVO4/Nd:GdVO4 laser pumped 879 nm LD are presented. The pulse width remained constant at ~3.8 ns for both two lasers.

CA-P.14 SUN

Diode-side-pumped Nd:YAG slab laser with self-adaptive resonator

•J. Jabczynski, W. Zendzian, M. Kaskow, L. Gorajek, J. Kwiatkowski, and K. Kopczynski; Military University of Technology, Warsaw, Poland

Four-wave-mixing inside Nd :YAG slab pumped by 2D laser diode stacks, in self adaptive closed-loop resonator was exploited to achieve 250 mJ energy in free-running with parameter M2 < 1.4.

CA-P.15 SUN

High Efficiency Multi-Mode Laser-Diode-Pumped Cavity-Dumped Ytterbium-Doped Yttrium Aluminium Garnet Laser

•*N. Shimojo[1], S. Matsubara[1], M. Inoue[1], D. Kimura[1], Y. Sasatani[1], A. Maruko[1], D. Mizuno[1], M. Nishio[1], and S. Kawato[1,2,3]; [1]Graduate School of Engineering, University of Fukui, Fukui, Fukui, Japan; [2]Research and Education Program for Life Science, University of Fukui, Fukui, Japan; [3]Japan Synchrotron Radiation Research Institute (JASRI), Fukui, Japan*

A laser-diode-pumped cavity-dumped microchip Yb:Y3Al5O12 laser was developed with the slope efficiency of 72% and optical-to-optical conversion efficiency of 56%, which are the highest in laser-diode-pumped short pulse lasers.

CA-P.16 SUN

Versatile Pulsed Source using a pulsed diode seed and ultrahigh gain bounce geometry amplifier

•*A. Teppitaksak, G. Thomas, and M. Damzen; Imperial College London, London, United Kingdom*

A flexible high peak power laser source is investigated with a pulsed diode seed laser (duration 3ns @ 100kHz) experiencing 43dB gain in a Nd:YVO4 bounce amplifier (and gain > 50dB with CW seed) at 1064nm.

CA-P.17 SUN

Tunability of Yb:LuAG Laser with High Dopant Concentration

•*J. Šulc[1], J. Měsíček[1], Z. Hubka[1], H. Jelínkova[1], K. Nejezchleb[2], and V. Škoda[2]; [1]Czech Technical University in Prague, FNSPE, Prague, Czech Republic; [2]Crytur, Ltd. Turnov, Turnov, Czech Republic*

Yb:LuAG crystals with Yb-doping concentration 15 and 20 % were investigated as the active medium of tunable diode pumped laser. Using birefringent filter, 35 nm wide tunability was reached (1025-1060 nm for 20 % doping).

CA-P.18 SUN

Efficient performance of Yb:YAG/Cr,Yb:YAG self-Q-switched microchip lasers under high-brightness laser-diode pumping

•*J. Dong, Y. Cheng, and Y. Ren; Department of Electronic Engineering, School of Information Science and Technology, Xiamen University, Xiamen, China, People's Republic of (PRC)*

We report on highly efficient performance of Yb:YAG/Cr,Yb:YAG self-Q-switched microchip lasers by bonding Yb:YAG to Cr,Yb:YAG crystal under high-brightness laser-diode pumping.

CA-P.19 SUN

Comparative study of Nd:YAG solar laser performance in end-pumping and side-pumping configurations

•*J. Almeida, D. Liang, and D. Garcia; CEFITEC, Departamento de Física, FCT, Universidade Nova de Lisboa, Campus de Caparica, Portugal*

A comparative study of Nd:YAG solar laser performances in end-pumping and side-pumping configurations is reported. The highest collection efficiency is achieved with end-pumping configuration, while side-pumping approach provides the best beam brightness figure of merit.

CA-P.20 SUN

Approaching the Thermodynamical Limit of Optical Pumping — Intra-cavity Pumped Thin Disk Laser with Very Low Quantum Defect

•*C. Vorholt and U. Wittrock; Muenster, University of Applied Sciences, Steinfurt, Germany*

We demonstrate the first intra-cavity pumped thin disk laser. The laser has a quantum defect of only 1.74%, a slope efficiency of 8.27% and an average output power of 10.33 W.

CA-P.21 SUN

Radiation-Balanced Thin-Disk Laser System

•*G. Nemova[1] and R. Kashyap[1,2]; [1]Department of Engineering Physics, Polytechnique de Montréal, Montréal, Canada; [2]Department of Electrical Engineering, Polytechnique de Montréal, Montréal, Canada*

A novel scheme for an athermal laser, which consists of a series of radiation-balanced thin disks placed inside a single resonator, is presented. Heat generated during the amplification process is offset by anti-Stokes emission.

CA-P.22 SUN

Efficiency of Single-Mode Thin-Disk Lasers

•*J. Perchermeier and U. Wittrock; Muenster University of Applied Sciences, Photonics Laboratory, Steinfurt, Germany*

The thermo-optical aberrations of the gain medium of an Yb:YAG thin-disk laser were measured with high resolution. Moreover, we investigated how the TEM_{00} mode radius affects the beam quality and output power of different resonators.

CA-P.23 SUN

High power femtosecond 1030nm burst-mode front-end and pre-amplifier for the European XFEL pump-probe laser development

•*M. Kellert[1], K. Kruse[1], M. Pergament[1], G. Kulcsar[2], T. Mans[3], and M. Lederer[1]; [1]European X-Ray Free-Electron Laser-Facility GmbH, Hamburg, Germany; [2]Laser Impulse, Heikendorf, Germany; [3]Amphos GmbH, Aachen, Germany*

We present the 100kHz - 4.5MHz, 400W burst-mode femtosecond Yb:YAG pre-amplifier with Ytterbium-all-fiber front-end of the European X-ray Free-Electron Laser Facility (European XFEL) non-collinear optical parametric amplifier development for pump-probe experiments at the European XFEL.

CA-P.24 SUN

Fiber based modulator systems at 1053 nm for *shaped long pulse on LULI2000

•*M. Loïc, Z. Ji Ping, B. Erick, and A. Patrick; Laboratoire pour l'utilisation des lasers Intenses, Ecole Polytechnique, Palaiseau, France*

LULI2000 is one of the most energetic laser facilities in Europe. We present a new ns fiber-based front-end for upgrading the LULI2000 facility.

CA-P.25 SUN

Wavelength selection, spatial filtering and polarization control of an Er:YAG laser cavity by resonant-grating mirror

•*A. Aubourg[1,2], M. Rumpel[3], M. Abdou-Ahmed[3], J. Didierjean[2], N. Aubry[2], T. Graf[3], F. Balembois[1], and P. Georges[1]; [1]Laboratoire Charles Fabry, Institut d'Optique, Palaiseau, France; [2]Fibercryst, Villeurbanne, France; [3]Institut für Strahwerkzeuge, Stuttgart, Germany*

A resonant grating mirror concurrently fullfil the task of an etalon, a pinhole and a polarizer inside an Er:YAG cavity, leading to comparable beam characteristics with a simplier design.

CA-P.26 SUN

Diode pumped Er:YAG single crystal fiber laser passively Q-switched with Cr:ZnSe saturable absorber emitting at 1645 nm or 1617 nm

•*A. Aubourg[1,2], J. Didierjean[2], N. Aubry[2], F. Balembois[1], and P. Georges[1]; [1]Laboratoire Charles Fabry, Institut d'Optique, Palaiseau, France; [2]Fibercryst, Villeurbanne, France*

We successfully passively Q-switched a diode pumped Er:YAG cavity emitting at 1645 nm or 1617 nm depending on the inserted losses. Pulse energies went up to 0.5 mJ at 820 Hz.

CA-P.27 SUN

2 μm Diode Pumped Tm:YAG Laser with 180 mJ Pulse Energy

•*A. Heinrich[1], M. Harlander[1], T. Bragagna[1], C. Hagen[2], and B. Nussbaumer[2]; [1]Pantec Biosolutions AG, Ruggell, Liechtenstein; [2]Pantec Engineering AG, Ruggell, Liechtenstein*

A pulsed, diode-pumped, monolithic 2 μm laser is presented. The Tm:YAG laser rod is side-pumped by qcw laser diodes (785 nm) and generates at room temperature 200 μs pulses at 100 Hz with 180 mJ.

CA-P.28 SUN

InP-Diode Laser Stack Pumped Ho:YAG or Cr:ZnSe Thin Disk Lasers

•*G. Renz, J. Speiser, and A. Giesen; German Aerospace Center, Stuttgart, Germany*

Direct diode pumping of Ho:YAG or Cr:ZnSe with InP-diode-laser stacks at 1908 nm in thin disk laser concepts lead to 22 W and 4.2 W cw output power at 2090 nm and 2400 nm, respectively

CA-P.29 SUN

Ho^{3+} Lasing at 2060 nm in co-doped (Ho,Tm):KLu$(WO_4)_2$

•*X. Mateos[1,2], V. Jambunathan[2], M.C. Pujol[2], M. Aguiló[2], F. Díaz[2], U. Griebner[1], and V. Petrov[1]; [1]Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, 2A Max-Born-Street, D-12489, Berlin, Germany; [2]Física i Cristallografia de Materials i Nanomaterials (FiCMA-FiCNA), Universitat Rovira i Virgili (URV),, Tarragona, Spain*

Improved operation of the co-doped (Ho,Tm):KLu$(WO_4)_2$ laser is reported under Ti:sapphire laser pumping with Ho oscillation at 2060 nm and tuning range as wide as 160 nm, presumably related to both ions.

CA-P.30 SUN

Diode-Pumped Dysprosium-doped-PbGa2S4 Mid-Infrared Laser

M. Doroshenko[1], M. Jelinek[2], J. Sulc[2], •H. Jelinkova[2], M. Nemec[2], V. Osiko[1], V. Badikov[3], and D. Badikov[3]; [1]A M Prokhorov General Physics Institute of RAS, Moscow, Russia; [2]Czech Technical University in Prague, Prague, Czech Republic; [3]Kuban State University, Krasnodar, Russia

Dy:PbGa2S4 laser generating at 4320nm pumped by 1.7um laser-diode was investigated. Slope efficiency 10% and pulsed output power 9.5mW for 120mW absorbed power was reached (5ms, 20Hz). In CW maximum output power was 48mW.

CA-P.31 SUN

Compression of Long-Cavity Ti:sapphire Oscillator Pulses with Large-Mode-Area Photonic Crystal Fibers

•*J. Fekete[1], P. Rácz[1], and P. Dombi[1,2]; [1]Wigner Research Centre for Physics, Budapest, Hungary; [2]Max-Planck-Institut für Quantenoptik, Garching, Germany*

We performed nonlinear compression of transform limited 75-fs laser pulses delivered by a long-cavity Ti:sapphire oscillator to 18-fs, 100-nJ pulses using large mode area photonic crystal fibres and chirped mirrors in a simple, scalable scheme.

Hall B0

CA-P.32 SUN

First Results of ChemCam on Mars and Further Laser Developments for New Space Programs

•*B. Faure*[1], *E. Durand*[2], *S. Maurice*[3], *D. Bruneau*[4], *and F. Montmessin*[4]; [1]*CNES, Toulouse, France*; [2]*Thales Optronique S.A., Elancourt, France*; [3]*IRAP, Toulouse, France*; [4]*LATMOS, Guyancourt, France*

First results of ChemCam (LIBS Instrument onboard Curiosity Martian Rover) are presented. New developments on the solid-state ChemCam laser for new space programs are presented. First results relative to these new developments are presented.

NOTES

ROOM 1

8:30 – 9:15

PL-1: CLEO/Europe 2013 Plenary Talk
Chair: W. Andrew Clarkson, University of Southampton, Southampton, United Kingdom

PL-1.1 MON (Plenary) 8:30

Thin Disk Lasers
•*A. Giesen; DLR, German Aerospace Center, Stuttgart, Germany*
The design ideas of thin disk lasers will be explained. Results for continuous wave operation and for pulsed operation show the capability for building high power lasers with high efficiency and good beam quality, simultaneously.

9:30 – 10:45

PL-2: World of Photonics Opening with Plenary Talk
Chair: Peter E. Andersen, Technical University of Denmark, Roskilde, Denmark

9:30

Words of Welcome by Norbert Bargmann, Deputy CEO Messe Munich International. Honor of exhibitors of the first LASER World of PHOTONICS.
Words of Welcome by Prof. Dr. Peter Loosen, President of the Steering Committee World of Photonics Congress, Fraunhofer Institute for Laser Technology (ILT), Aachen, Germany.

PL-2.1 MON (Plenary) 10:00

Nanoscopy with Focused Light
•*S.W. Hell; Max Planck Institute for Biophysical Chemistry, Göttingen, Germany*
Throughout the 20th century the resolution of optical microscopy relying on conventional lenses was limited by diffraction. We show how this limit can be radically overcome and how this change impacts various fields of science.

ROOM 1

11:00 – 12:30

CF/IE-5: Novel Methods in Ultrafast Optics
Chair: Roberto Osellame, Politecnico di Milano, Milan, Italy

CF/IE-5.1 MON 11:00

Acousto-optic Fastscan Delay with Scan Rates exceeding 30 kHz and sub-20-Attosecond Precision
•*O. Schubert[1], M. Eisele[1], V. Crozatier[2], N. Forget[2], D. Kaplan[2], and R. Huber[1]; [1]University of Regensburg, Regensburg, Germany; [2]Fastlite, Valbonne Sophia Antipolis, France*
We introduce a fastscan-delay based on an acousto-optic programmable dispersive filter. The precision of 20 as and scan rates exceeding 30 kHz make this fiber-compatible device ideally suited for a broad variety of pump-probe experiments.

CF/IE-5.2 MON 11:15

Phase-locked pulses for two-dimensional spectroscopy by a birefringent delay line
•*C. Manzoni[1], D. Brida[2], and G. Cerullo[1]; [1]IFN-CNR, Dipartimento di Fisica, Politecnico di Milano, Milan, Italy; [2]Department of Physics and Center for Applied Photonics, University of Konstanz, Konstanz, Germany*
We introduce a device for the generation of collinear, interferometrically locked ultrashort pulse pairs. Their delay is controlled with attosecond precision and

ROOM 2

11:00 – 12:30

JSI-1: Nuclear Photonics
Chair: Ken Ledingham, University of Strathclyde, Glasgow, United Kingdom

JSI-1.1 MON (Invited) 11:00

Nuclear Photonics with Extreme Gamma-ray Sources
•*C.P.J. Barty; Lawrence Livermore National Laboratory, Livermore, United States*
Tunable, polarized, mono-energetic, gamma-ray (MEGa-ray) beams can be created via Compton scattering of pulsed lasers off of ultra-bright electron beams.

ROOM 3

11:00 – 12:30

CH-1: Advances in Spectroscopy I
Chair: Krzysztof Abramski, Wroclaw University of Technology, Wroclaw, Poland

CH-1.1 MON 11:00

Mid-infrared frequency comb based-on low threshold optical parametric oscillator
Y. Jin, •J. Mandon, S. Cristescu, and F. Harren; Institute for Molecules and Materials, Nijmegen, The Netherlands
We present a low threshold mid-infrared optical-parametric-oscillator based on an Yb-frequency comb. The idler can be continuously tuned from 2.7 to 4.8 um, generating an ideal radiation for frequency comb spectroscopy in the mid- infrared.

CH-1.2 MON 11:15

Fully stabilized dual-comb spectrometer based on a mid-IR quantum-cascade-laser frequency comb
•*G. Villares[1], A. Hugi[1], S. Blaser[2], H.C. Liu[3], and J. Faist[1]; [1]Institute for Quantum Electronics, ETH Zurich, Zurich, Switzerland; [2]Alpes Lasers SA, Neuchâtel, Switzerland; [3]Key Laboratory of Artificial Structures and Quantum Control, Department of Physics, Shanghai Jiao Tong University, Shanghai, China, People's Republic of (PRC)*

ROOM 4a

11:00 – 12:30

ID-1: Frequency Standards and Spectroscopy
Chair: Livio Gianfrani, Seconda Università di Napoli, Naples, Italy

ID-1.1 MON 11:00

Yb^+ Single-Ion Optical Frequency Standard with Systematic Uncertainty at the 10^{-17} Level
N. Huntemann, B. Lipphardt, M. Okhapkin, C. Tamm, and •E. Peik; Physikalisch-Technische Bundesanstalt, Braunschweig, Germany
A frequency standard based on the electric octupole transition in a trapped $^{171}Yb^+$ ion is described. Hyper-Ramsey excitation leads to a signal that is immune to the light shift induced by the probe laser.

ID-1.2 MON 11:15

Comparing PTB's optical 171Yb+ ion and 87Sr lattice clock
•*C. Grebing, S. Falke, N. Huntemann, N. Lemke, B. Lipphardt, U. Sterr, C. Tamm, H. Schnatz, E. Peik, and C. Lisdat; PTB, Braunschweig, Germany*
We present results of an optical frequency comparison between a 171Yb+ ion and a 87Sr lattice clock. The uncertainty was dominated by the systematic uncertainty of the clocks, which was in the range of 5x10^-17.

ROOM 4b

11:00 – 12:30

CI-1: Next Generation Transmission
Chair: Liam Barry, Dublin City University, Dublin, Ireland

CI-1.1 MON (Invited) 11:00

400G/1T Superchannels Enabling Next Generation Optical Communications
•*S. Chandrasekhar and X. Liu; Bell Labs, Alcatel-Lucent, Holmdel, United States*
We review recent advances in the generation, detection, and transmission of high spectral efficiency optical superchannels that utilize both orthogonal-frequency-division-multiplexing for optical carrier modulation and/or carrier multiplexing, and non-orthogonal approaches. Optical networking implications are addressed.

NOTES

ROOM 13a

11:00 – 12:30

IA-1: Strong Coupling

Chair: Markus Hennrich, University of Innsbruck, Innsbruck, Austria

IA-1.1 MON 11:00

Adaptive Quantum Non-Demolition Measurement of Fock States

•*B. Peaudecerf[1], T. Rybarczyk[1], S. Gerlich[1], I. Dotsenko[1], S. Gleyzes[1], M. Brune[1], J.-M. Raimond[1], and S. Haroche[1,2]; [1]Laboratoire Kastler Brossel, Paris, France; [2]Collège de France, Paris, France*

Rydberg atoms interacting dispersively with a high-Q cavity field perform quantum nondestructive measurement of its photon number. We report on speeding up this measurement by optimizing in real-time the settings of individual atomic state detections.

IA-1.2 MON 11:15

Simulating single-photon-single-atom absorption experiments with an optical resonator

•*M. Bader[1,2], S. Heugel[1,2], A. Chekhov[3], M. Sondermann[1,2], and G. Leuchs[1,2]; [1]Max-Planck-Institute for the Science of Light, Erlangen, Germany; [2]Institute of Optics, Information and Photonics, University Erlangen-Nuremberg, Erlangen, Germany; [3]Department of Physics, M.V. Lomonosov Moscow State University, Moscow, Russia*

ROOM 14a

11:00 – 12:30

IB-1: Photon Pair Sources and Detectors

Chair: Gregor Weihs, University of Innsbruck, Innsbruck, Austria

IB-1.1 MON 11:00

High-efficiency Bragg Grating Enhanced On-chip Photon-number-resolving Detectors

•*P.L. Mennea[1], B. Calkins[2], B.J. Metcalf[3], T. Gerrits[2], A.E. Lita[2], J.C. Gates[1], W.S. Kolthammer[3], J.B. Spring[3], P. Humphries[3], N.A. Tomlin[2], A.E. Fox[2], A. Lamas-Linares[2], R.P. Mirin[2], S.W. Nam[2], I.A. Walmsley[3], and P.G.R. Smith[1]; [1]University of Southampton, Southampton, United Kingdom; [2]National Institute of Standards and Technology, Boulder, United States; [3]University of Oxford, Oxford, United Kingdom*

We present our latest developments in high-efficiency telecom-band integrated photon-number-resolving detectors using superconducting Transition Edge Sensors (TESs), evanescently coupled with a UV-written waveguide. Bragg gratings are utilised both to increase detection efficiency and aid characterisation.

IB-1.2 MON 11:15

Ultra-bright source of polarization-entangled photons in a linear double-pass configuration

•*F.O. Steinlechner[1], S. Ramelow[2,3], M. Jofre[1], M. Gilaberte[1], T. Jennewein[4], J.P. Torres[1,4], M.W. Mitchell[1,5], and V. Pruneri[1,5]; [1]ICFO-Institut de Ciències Fotòniques, Barcelona, Spain; [2]Institute for Quantum Optics and Quantum Information, Austrian Academy of Sciences, Vienna, Austria; [3]Quantum Optics, Quantum Nanophysics, Quantum In-*

ROOM 14b

11:00 – 12:30

CD-5: Optical Parametric Oscillators

Chair: Harald Schwefel, Max-Planck-Institut für die Physik des Lichtes, Erlangen, Germany

CD-5.1 MON 11:00

Pulse Compression in a Synchronously Pumped Optical Parametric Oscillator with a Graphene Saturable Absorber

C. Laporte[1], •J.-B. Dherbecourt[1], J.-M. Melkonian[1], M. Raybaut[1], C. Drag[2], and A. Godard[1]; [1]ONERA - the French Aerospace Lab, Palaiseau, France; [2]Laboratoire Aimé Cotton, CNRS-Université Paris Sud 11, Orsay, France

We report on the first experimental demonstration of pulse length compression in a synchronously pumped optical parametric oscillator by use of an intracavity ultrafast graphene saturable absorber.

CD-5.2 MON 11:15

Sub-ns OPO based on PPKTP with 1 mJ Idler Energy at 2800 nm

•*D. Chuchumishev[1], G. Marchev[2], I. Buchvarov[1], V. Pasiskevicius[3], F. Laurell[3], and V. Petrov[2]; [1]Department of Physics, Sofia University, Sofia, Bulgaria; [2]Max-Born-Institute for Nonlinear Optics and Ultrafast Spectroscopy, Berlin, Germany; [3]Department of Applied Physics, Royal Institute of Technology, Stockholm, Sweden*

Output energy of 1 mJ is obtained for the

ROOM 21

11:00 – 12:30

CK-5: Microstructures for Energy and Sensing

Chair: Pietro Ferraro, CNR-INO, Firenze, Italy

CK-5.1 MON (Keynote) 11:00

Optofluidics for Energy Applications

•*D. Psaltis; Ecole Polytechnique Federale de Lausanne, Lausanne, Switzerland*

We will discuss optofluidic solar fuel systems that rely on microstructured components with combined optical and fluidic functionality to improve the efficiency of solar energy harvesting.

ROOM EINSTEIN

11:00 – 12:30

CE-1: Semiconductor Materials and Devices

Chair: Michael Jetter, University of Stuttgart, Stuttgart, Germany

CE-1.1 MON 11:00

Control of the absorption recovery time in GaSb SESAMs

•*J. Paajaste[1], S. Suomalainen[1], A. Härkönen[1], U. Griebner[2], G. Steinmeyer[1,2], and M. Guina[1]; [1]Optoelectronics Research Centre, Tampere University of Technology, Tampere, Finland; [2]Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany*

We report on fabrication and design parameters of GaSb-based SESAMs and their associated absorption recovery time characteristics; SESAMs grown at different temperatures, with different composition and strain, and employing different optical designs.

CE-1.2 MON 11:15

Coherent Acoustic Phonons in Semiconductor Bragg Mirrors

•*F. Schättiger, O. Ristow, M. Hettich, and T. Dekorsy; University of Konstanz, Konstanz, Germany*

We report on coherent acoustic phonon spectroscopy of semiconductor Bragg mirrors. Comparing the experimental results with the calculated acoustic phonon dispersions enables a high accuracy determination of the structural parameters.

ROOM 1

stability<λ/360 in the spectral range from UV to mid-IR.

CF/IE-5.3 MON 11:30

Ultralow Jitter Mode-Locked Lasers at 1.5 micron for a subfemtosecond

•*M. Xin*[1], *K. Ahmed*[1], *and F. Kärtner*[1,2]; [1]*Center for Free-Electron Laser Science, Deutsches Elektronen-Synchrotron, Hamburg, Germany*; [2]*Department of Electrical Engineering and Computer Science and Research Laboratory of Electronics, Massachusetts Institute of Technology, Cambridge, United States*

The timing jitter of two femtosecond-pulse-train lasers is characterized by a Balanced Optical cross-correlator with sub-100 as resolution. The measurement results showed that these two lasers are capable of constructing a sub-fs timing distribution system.

CF/IE-5.4 MON 11:45

Temporal overlapping for HHG seeded EUV-FEL operation by using EOS-based timing-drift controlling system

•*S. Matsubara*[1], *T. Togashi*[1], *E. Takahashi*[2], *K. Midorikawa*[2], *M. Aoyama*[3], *K. Yamakawa*[3], *T. Sato*[4,5], *A. Iwasaki*[5], *S. Owada*[5], *K. Yamanouchi*[5], *T. Hara*[4,1], *K. Ogawa*[4], *T. Ohshima*[4,1], *Y. Okayasu*[1,4], *Y. Otake*[4,1], *H. Tanaka*[4,1], *T. Tanaka*[4,1], *H. Tomizawa*[4,1], *T. Watanabe*[1,4], *M. Yabashi*[4,1], *T. Ishikawa*[4], *and K. Togawa*[4,1]; [1]*Japan Synchrotron Radiation Research Institute, Hyogo, Japan*; [2]*RIKEN Advanced Science Institute, Saitama, Japan*; [3]*Japan Atomic Energy Agency, Kyoto, Japan*; [4]*RIKEN SPring-8 Center, Hyogo, Japan*; [5]*The University of Tokyo, Tokyo, Japan*

ROOM 2

JSI-1.2 MON (Invited) 11:30

Nuclear processes and nuclear decay modifications in plasmas

•*V. Méot*; *CEA/DAM Ile de France, Arpajon, France*

Nuclear processes in plasmas involving the coupling between the atom and the nucleus will be described. Nuclear lifetime modifications generated by the plasma environment and attempts to observe it, will be presented.

ROOM 3

We realize a fully stabilized dual-comb spectrometer covering 14 cm-1 with individual tooth linewidth of 4 MHz by using mid-IR QCL based frequency combs centered at 1430 cm-1.

CH-1.3 MON 11:30

Methane sensing at 3.4um using Chirped Laser Dispersion Spectroscopy with DFG source

•*M. Nikodem*[1,2], *K. Krzempek*[3], *G. Plant*[2], *K. Abramski*[3], *and G. Wysocki*[2]; [1]*Wroclaw Research Centre EIT+, Wroclaw, Poland*; [2]*Princeton University, Princeton, United States*; [3]*Wroclaw University of Technology, Wroclaw, Poland*

A chirped laser dispersion spectroscopy (CLaDS) system for open-path methane sensing is presented. Differential frequency generation source provides access to the fundamental methane transitions and enables optimal performance of CLaDS technique in mid-infrared.

CH-1.4 MON 11:45

Simultaneous spectral and temporal laser pulse characterization in the nanosecond range employing an all-fiber Time-Delay Spectrometer

T. Tieß[1], *M. Rothhardt*[1], •*M. Jäger*[1], *and H. Bartelt*[1,2]; [1]*Institute of Photonic Technology, Jena, Germany*; [2]*Abbe Center of Photonics, FSU Jena, Jena, Germany*

We demonstrate a novel method for a simultaneous spectral and temporal characterization of single light pulses in the nanosecond scale based on the principle of a fiber-based Time-Delay spectrometer.

ROOM 4a

ID-1.3 MON 11:30

Development of compact lattice optical clocks towards future space clocks

•*S. Schiller*[1], *A. Görlitz*[1], *G.M. Tino*[2], *U. Sterr*[3], *C. Lisdat*[3], *P. Gill*[4], *E.M. Rasel*[5], *K. Bongs*[6], *D. Calonico*[7], *W. Kaenders*[8], *S. Bize*[9], *and R. Holzwarth*[10]; [1]*Heinrich-Heine-Universität, Düsseldorf, Germany*; [2]*Universita di Firenze, Firenze, Italy*; [3]*Physikalisch-Technische Bundesanstalt, Braunschweig, Germany*; [4]*National Physical Laboratory, Teddington, United Kingdom*; [5]*Leibniz Universität, Hannover, Germany*; [6]*University of Brimingham, Birmingham, United Kingdom*; [7]*Istituto Nazionale di Ricerca Metrologica, Torino, Italy*; [8]*Toptica GmbH, München, Germany*; [9]*Observatoire de Paris, Paris, France*; [10]*Menlo Systems GmbH, München, Germany*

Compact, low-power consumption and robust lattice optical clock apparata have been developed, as a first step towards instruments for use in space. The clock transitions of both bosonic 88Sr and fermionic 171Yb have been observed

ID-1.4 MON 11:45

Asynchronous Mid-IR Optical Parametric Oscillator Frequency Combs

Z. Zhang[1,3], *X. Fang*[1,2], •*T. Gardiner*[3], *and D.T. Reid*[1]; [1]*Heriot-Watt University, Edinburgh, United Kingdom*; [2]*Tianjin University, Tianjin, China, People's Republic of (PRC)*; [3]*National Physical Laboratory, London, United Kingdom*

We report high-power, carrier-envelope-offset (CEO) frequency stabilized, asynchronous dual frequency combs operating at 3.3-micrometer. The two channels, each with 100 mW average power, share all

ROOM 4b

CI-1.2 MON 11:30

Highly Scalable Integrated Discrete Fourier Transformation Filter in Silicon-on-Insulator for Next Generation WDM Systems

•*A. Rahim*[1], *J. Bruns*[1], *K. Voigt*[1], *K. Petermann*[1], *S. Schwarz*[2], *and C. Schaeffer*[2]; [1]*Technische Universität, Berlin, Germany*; [2]*Helmut-Schmidt Universität, Hamburg, Germany*

We present a highly scalable integrated optical filter to perform discrete fourier transformation to demultiplex OFDM sub-carriers in the next generation WDM systems. The performance of a filter fabricated in SOI technology is also presented.

CI-1.3 MON 11:45

Optical 36QAM Transmitter based on Two Tandem IQ Modulators with Simplified Driving Electronics

•*G.-W. Lu, T. Sakamoto, and T. Kawanishi*; *National Institute of Information and Communications Technology, Tokyo, Japan*

We propose and demonstrate an optical 36QAM transmitter, consisting of two tandem IQ modulators driven by binary and 3-level electronics. Compared with the single-IQ modulator scheme requiring 6-level electronics, the complexity in electronics is reduced.

ROOM 13a

The energy storage efficiency inside an optical resonator is an analogue for the dynamics of single-photon-single-atom absorption experiments. We present experiments on coupling a light pulse to a resonator with high efficiency.

IA-1.3 MON 11:30

Strong coupling between single atoms and non-transversal photons

•J. Volz, C. Junge, D. O'Shea, and A. Rauschenbeutel; Atominstitut, Vienna University of Technology, Vienna, Austria

We investigate the interaction between single atoms and non-transversally polarized photons in whispering-gallery-mode microresonators. Our experimental results show that the non-transversal polarization decisively alters the physics of strong light-matter interaction.

IA-1.4 MON 11:45

Observation and measurement of interaction-induced dispersive optical nonlinearities in an ensemble of cold Rydberg atoms

•V. Parigi[1,2], E. Bimbard[1], J. Stanojevic[1], A.J. Hilliard[1,3], F. Nogrette[1], R. Tualle-Brouri[1], A. Ourjoumtsev[1], and P. Grangier[1]; [1]Laboratoire Charles Fabry, Institut d'Optique, CNRS, Université Paris-Sud, Palaiseau, France; [2]Laboratoire Kastler Brossel, Université Pierre et Marie Curie, Ecole Normale Supérieure, CNRS, Paris, France; [3]QUANTOP, Institut for Fysik og

ROOM 14a

formation, University of Vienna, Faculty of Physics, Vienna, Austria; [4]Department of Signal Theory and Communications, Universitat Politecnica de Catalunya, Barcelona, Spain; [5]ICREA-Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain

We present the brightest, high-visibility source of polarization entangled photons, based on collinear non-degenerate spontaneous parametric down-conversion emission from a single periodically poled $KTiOPO_4$ crystal, in a linear double-pass configuration.

IB-1.3 MON 11:30

Spatial Multiplexing of Monolithic Silicon Heralded Single Photon Sources

•M. Collins[1], C. Xiong[1], T. Vo[2], A. Clark[1], I. Rey[3], J. He[1], S. Shahnia[1], C. Reardon[4], M. Steel[5], T. Krauss[4], and B. Eggleton[1]; [1]Centre for Ultrahigh bandwidth Devices for Optical Systems (CUDOS), Institute of Photonics and Optical Science (IPOS), School of Physics, University of Sydney, Sydney, Australia; [2]Maritime Operations Division, Defence Science and Technology Organisation, Sydney, Australia; [3]SUPA, School of Physics and Astronomy, University of St. Andrews, St. Andrews, United Kingdom; [4]Department of Physics, University of York, York, United Kingdom; [5]CUDOS, MQ Photonics Research Centre, Department of Physics and Astronomy, Macquarie University, Sydney, Australia

We present the first demonstration of spatial multiplexing of two integrated heralded single photon sources enhancing the single photon rate by > 60%. Photons are generated at telecommunication wavelengths in monolithic silicon photonic crystal waveguides.

IB-1.4 MON 11:45

A highly efficient integrated two-color source for heralded single photons

•S. Krapick, H. Herrmann, B. Brecht, V. Quiring, H. Suche, and C. Silberhorn; Applied Physics, University of Paderborn, Warburger Str. 100, 33098 Paderborn, Germany

Future quantum network applications will rely on the development of highly efficient single-photon sources with multiple functionalities. We demonstrate an integrated source, which combines parametric down-conversion with a wavelength division demultiplexer on one chip.

ROOM 14b

380 ps long idler pulses at 2800 nm from a short-cavity singly-resonant 500-Hz OPO employing PPKTP and near-diffraction-limited, single-frequency, sub-nanosecond pump source at 1064 nm

CD-5.3 MON 11:30

Dual-wavelength synchronously-pumped femtosecond optical parametric oscillator using antiresonant ring interferometer

•A.E. Martin[1], V.R. Badarla[1], and M.E. Zadeh[1,2]; [1]Institute of Photonic Sciences (ICFO), Barcelona, Spain; [2]Institucio Catalana de Recerca i Estudis Avancats (ICREA), Barcelona, Spain

We demonstrate a novel technique for coupling of two synchronously-pumped optical parametric oscillators using an antiresonant ring interferometer, providing dual-wavelength operation with arbitrary tuning and high intracavity power in each beam without gain coupling.

CD-5.4 MON 11:45

3.3 - 3.7 micrometer Nested Cavity OPO pumped by an amplified micro-laser for portable DIAL

•J. Barrientos-Barria[1], J.-B. Dherbecourt[1], M. Raybaut[1], A. Godard[1], J.-M. Melkonian[1], M. Lefebvre[1], B. Faure[2], and G. Souhaité[2]; [1]Onera, The french aerospace lab, Palaiseau, France; [2]Teem Photonics, Meylan, France

We present here a new laser transmitter for DIAL LIDAR, based on a 3.3 - 3.7 micrometer nested cavity OPO, pumped by a specifically designed nanosecond micro-laser amplified to 200*J level.

ROOM 21

CK-5.2 MON 11:45

Quasi-bidimensional disordered structures for light trapping in thin-film solar cells.

M. Burresi[1,2], •F. Pratesi[1], K. Vynck[1], M. Prasciolu[3], M. Tormen[4], and D. Wiersma[1,2]; [1]1. European Laboratory for Non-linear Spectroscopy (LENS), Sesto Fiorentino, Firenze, Italy; [2]2. Istituto Nazionale di Ottica (CNR-INO), Firenze, Italy; [3]3. IOM-CNR, Laboratorio TASC, Trieste, Italy; [4]4. Laboratorio Nazionale TASC-INFM, Basovizza, trieste, Italy

A novel kind of disordered quasi-bidimen-

ROOM EINSTEIN

CE-1.3 MON 11:30

Ga(As)Sb/GaAs quantum dots for emission around 1300 nm

•J. Richter, J. Strassner, T.H. Loeber, and H. Fouckhardt; University of Technology, Physics Department, Kaiserslautern, Germany

Steps of optimization to shift the Ga(As)Sb/GaAs quantum dot (QD) photoluminescence and QD laser emission to 1300 nm wavelength by varying the MBE epitaxial growth parameters are reported.

CE-1.4 MON 11:45

Modification Of Eu Incorporation Sites By The Dissociation Of Hydrogen Defect Complexes In Mg and Eu Co-Doped Gallium Nitride

•B. Mitchell[1], J. Poplawsky[1], Y. Fujiwara[2], and V. Dierolf[1]; [1]Lehigh University, Bethlehem, USA; [2]Osaka University, Osaka, Japan

To improve the efficiency of Eu:GaN samples, Mg was added as a co-dopant. This resulted in the creation of new incorporation sites with enhanced excitation efficiency, but which are modified under electron beam exposure.

ROOM 1

We have demonstrated HHG-seeded FEL operation in the EUV region with EOS-based timing-drift control to maximize temporal overlap between HH-pulses and electron bunches. The seeding operation was successful with a hit rate over 20%.

CF/IE-5.5 MON 12:00

Development of active gratings for ultrafast monochromators

F. Frassetto[1], S. Bonora[1], G. Brusatin[2], G. Della Giustina[2], S. Stagira[3], C. Vozzi[1], E. Zanchetta[2], and •L. Poletto[1]; [1]CNR-Institute pof Photonics and Nanotechnologies, Padova & Milano, Italy; [2]Department of Industrial Engineering, University of Padova, Padova, Italy; [3]Department of Physics, Politecnico di Milano, Milano, Italy

The design of active deformable gratings to be used in grazing-incidence monochromators for XUV ultrafast pulses is discussed. A double-grating configuration has been realized to demonstrate the compensation of the grating front-tilt.

CF/IE-5.6 MON 12:15

Resonance Scanning Interferometer for Group Delay Dispersion Measurements

•M. Trubetskov[1,2], M. von Pechmann[4], I. Angelov[1], O. Razskazovskaya[1], K. Vodopyanov[3], F. Krausz[1,4], and V. Pervak[4,5]; [1]Max-Planck Institute of Quantum Optics, Garching, Germany; [2]Research Computing Center, Moscow State University, Moscow, Russia; [3]Univ. Central Florida, CREOL, Orlando, United States; [4]Ludwig-Maximilians-Universitaet Muenchen, Garching, Germany; [5]Ultrafast Innovations GmbH, Garching, Germany

We developed a Resonance Scanning Interferometer for group delay and group delay dispersion measurements based on intermirror spacer resonances. High resolution is achieved by simultaneous processing of measurement scans obtained for different spacer thicknesses.

ROOM 2

JSI-1.3 MON 12:00

Triggered de-excitation of nuclear isomer in plasma: the case of ^{84m}Rb.

•D. Denis-Petit[1], V. Bagnoud[3], T. Bonnet[1], M. Comet[2], A. Frank[3], F. Gobet[1], G. Gosselin[2], F. Hannachi[1], V. Méot[2], P. Morel[2], M. Tarisien[1], and M. Versteegen[1]; [1]Centre d'Etudes Nucléaires de Bordeaux-Gradignan, Gradignan, France; [2]CEA, DAM, DIF, Arpajon, France; [3]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany

We have undertaken the study of the triggered de-excitation of the ^{84m}Rb isomer in laser produced plasma. Preliminary nuclear and atomic physics experiments were conducted and the first results will be presented.

JSI-1.4 MON 12:15

Search for the Low Energy Nuclear Excitation with a Femtosecond Plasma: an Overview and Perspectives

•A. Savelyev; Lomonosov Moscow State Univ., Moscow, Russia

Recent experimental attempts to observe the low energy nuclear excitation with femtosecond lasers are discussed. An ionized electron motion in the superintense laser field might lead to the nuclear excitation through inverse internal conversion, inelastic scattering and photoexcitation.

ROOM 3

CH-1.5 MON 12:00

3DIntegrated Optical Component for SpectroInterferometry

A. Saviauk, •S. Minardi, F. Dreisow, S. Nolte, and T. Pertsch; Institute of Applied Physics, Abbe Center of Photonics, Friedrich-SchillerUniversität, MaxWienPlatz 1, Jena, Germany

We present a compact setup based on a three-dimensional integrated optical component, allowing the measurement of the mutual coherence properties of three channels of polychromatic light. Applications to astronomical interferometry and multichannel metrology are foreseen.

CH-1.6 MON 12:15

High-resolution integrated photonic micro-spectrographs for radial velocity exoplanet astronomy

•N. Cvetojevic[1,2,3], H. Fernando[4], N. Jovanovic[5], J. Lawrence[1,2,6], R. Haynes[4], J. Bland-Hawthorn[7], and M. Withford[1,2,3]; [1]MQ Photonics Research Centre, Dept. of Physics and Astronomy, Macquarie University, Sydney, Australia; [2]Research Centre in Astronomy, Astrophysics & Astrophotonics, Dept. Physics and Astronomy, Macquarie University, Sydney, Australia; [3]Centre for Ultrahigh Bandwidth Devices for Optical Systems (CUDOS), Sydney, Australia; [4]innoFSPEC, Leibniz-Institut für Astrophysik, Potsdam, Germany; [5]Subaru Telescope, National Astronomical Observatory of Japan, Hilo, United States; [6]Australian Astronomical Observatory (AAO), Sydney, Australia; [7]Sydney Institute for Astronomy, University of Sydney, Sydney, Australia

We report on a comprehensive redesign of arrayed waveguide grating architecture to vastly improve the performance of an integrated photonic micro-spectrograph for high-resolution exoplanet astronomy.

ROOM 4a

the components for mid-infrared generation and CEO-frequency detection.

ID-1.5 MON 12:00

Comb-assisted precision spectroscopy of NH3 at 9.1 μm

•D. Gatti[1], A. Mills[2], M. Devizia[3], I. Hartl[4], L. Gianfrani[3], M. Marangoni[1], and M. Fermann[2]; [1]Politecnico di Milano and IFN-CNR, Milano, Italy; [2]IMRA America Inc., Ann Arbor, United States; [3]Seconda Università di Napoli, Caserta, Italy; [4]Deutsches Elektronen-Synchrotron, Hamburg, Germany

A coherent phase lock of a quantum-cascade-laser to a thulium-fiber frequency comb is exploited for the investigation of multi-line absorption spectra of ammonia at 9.1 μm with extremely high metrological quality.

ID-1.6 MON 12:15

Quantum Limited Measurements with Optical Frequency Combs

•P. Jian[1], O. Pinel[1,2], J. Roslund[1], R. Schmeissner[1], B. Lamine[1], C. Fabre[1], and N. Treps[1]; [1]Laboratoire Kastler Brossel, Université Pierre et Marie Curie, ENS, CNRS, Paris, France; [2]Centre for Quantum Computation and Communication Technology, Department of Quantum Science, The Australian National University, Canberra, Australia

Optical frequency combs are used to achieve quantum limited (in the sense of the quantum Cramér-Rao bound) space-time positioning measurements, in vacuum and in air, by means of pulse shaping techniques and homodyne detection scheme.

ROOM 4b

CI-1.4 MON 12:00

Traceback Equalization for Non-Uniformly Synthesized Optical QAM Signals

•T. Sakamoto, G.-W. Lu, and T. Kawanishi; National Institute of Information and Technology, Tokyo, Japan

QAM signals synthesized from binary data sequences is non-uniformly distorted. We propose a novel equalizing scheme called traceback equalization to solve the problem. By the equalizer, the non-uniform distortion is effectively compensated for.

CI-1.5 MON 12:15

Analytical formulation framework for directly modulated/detected OOFDM systems

•C. Sánchez, B. Ortega, and J. Capmany; Institute of Telecommunications and Multimedia Applications (ITEAM), Group of Optical & Quantum Communications, Valencia, Spain

A complete theoretical framework which aims to mathematically describe the most significant physical dynamics/mechanisms on the performance of directly modulated/detected OOFDM systems is presented. Results show good agreement between evaluation of theoretical expressions and simulations.

ROOM 13a

Astronomi, Aarhus Universitet, Aarhus, Denmark
We measured dispersive optical nonlinearities in an ensemble of cold Rydberg atoms placed inside an optical cavity. A simple model explains these by the progressive appearance of a Rydberg blockaded volume within the medium

IA-1.5 MON (Invited) 12:00

Quantum Networks based on Single Atoms in Optical Cavities

•*S. Ritter, C. Nölleke, C. Hahn, A. Reiserer, A. Neuzner, M. Uphoff, M. Mücke, E. Figueroa, J. Bochmann, and G. Rempe*; *Max-Planck-Institut für Quantenoptik, Garching, Germany*

Single atoms in optical cavities are ideally suited as universal quantum network nodes. We demonstrate the reversible exchange of quantum information and the creation of remote entanglement between two identical nodes in remote, independent laboratories.

ROOM 14a

IB-1.5 MON 12:00

Decorrelated PDC Source at Telecom Wavelengths with Identical Signal and Idler

•*G. Harder[1], V. Ansari[1], B. Brecht[1], T. Dirmeier[2], C. Marquardt[2], and C. Silberhorn[1,2]*; *[1]Applied Physics, University of Paderborn, Warburger Strasse 100, 33098 Paderborn, Germany*; *[2]Max Planck Institute for the Science of Light, Guenther-Scharowsky-Str. 1, 91058 Erlangen, Germany*

We realize an ultrafast, efficient type-II parametric downconversion source in a periodically poled KTP waveguide at telecom wavelengths producing separable and symmetric photon pairs. Their indistinguishability and purity is verified by Hong-Ou-Mandel interference measurements.

IB-1.6 MON 12:15

Ultra-narrowband Photon Pair Source for Solid State Quantum Memories Based on Widely Non-degenerate Cavity-enhanced Downconversion

•*D. Rieländer[1], J. Fekete[1], M. Cristiani[1], and H. de Riedmatten[1,2]*; *[1]ICFO-The Institute of Photonic Sciences, Castelldefels, Spain*; *[2]ICREA-Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain*

We report on a photon pair source, ideally suited for long distance quantum communication. One photon of the pair is compatible with a solid state quantum memory and the other photon is at telecommunication wavelength.

ROOM 14b

CD-5.5 MON 12:00

Whispering gallery optical parametric oscillators: coupling is the key

•*C. Werner[1], T. Beckmann[1], K. Buse[1,2], and I. Breunig[1]*; *[1]University of Freiburg - IMTEK, Freiburg, Germany*; *[2]Fraunhofer Institute of Physical Measurement Techniques, Freiburg, Germany*

We show that the coupling strength is the key parameter for the performance of whispering gallery optical parametric oscillators. Moving the coupling prism by only 500 nm yields a 4-orders-of-magnitude efficiency change.

CD-5.6 MON 12:15

Optical Parametric Oscillator based detection of hydrogen cyanide for bio-medical applications

D. Arslanov, Y. Jin, J. Mandon, S. Cristescu, and •*F. Harren*; *Radboud University, Institute for Molecules and Materials, Nijmegen, The Netherlands*

Versatile optical parametric oscillator based spectrometer was developed for long-term trace gas emission experiments. The detector was successfully tested for the detection of Hydrogen Cyanide from plants and Pseudomonas bacteria; next to exhaled human breath.

ROOM 21

sional photonic structures are presented as light trapping architecture to be applied on thin-film photovoltaic cells. Experimental and numerical results reveal their broadband and omidirectional absorption properties.

CK-5.3 MON 12:00

Optical hydrogen sensors based on Au/Pd core shell nanorod arrays

•*M. Nasir, W. Dickson, J.-S. Bouillard, A. Mansourian, D. O'Connor, G. Wurtz, and A. Zayats*; *King's College London, London, United Kingdom*

We describe a novel optical hydrogen sensor based on gold/palladium core-shell nanorod arrays synthesized using highly ordered porous alumina template that provide extremely high sensitivity due to the modification of plasmonic resonances of the arrays.

CK-5.4 MON 12:15

3D lithography of polymers for micro-photonic applications

S. Grilli[1], •*S. Coppola[1,2], V. Vespini[1], F. Merola[1], A. Finizio[1], and P. Ferraro[1]*; *[1]CNR-INO, Pozzuoli (NA), Italy*; *[2]Università degli Studi di Napoli "Federico II", Dipartimento di Ingegneria dei Materiali, Napoli, Italy*

We present a novel approach for fabricating a wide variety of soft solid-like microstructures, thus leading to a new concept in 3D lithography. Applications as optical tweezers and active microresonators are reported.

ROOM EINSTEIN

CE-1.5 MON (Invited) 12:00

Nano-scale Characterization of Semiconductors Using Helium Temperature Scanning Transmission Electron Microscopy Cathodoluminescence

•*J. Christen*; *Otto-von-Guericke-University, Institute of Experimental Physics, Magdeburg, Germany*

Luminescence spectroscopy is one of the most utilized optical characterization techniques. Its combination with the high spatial resolution of transmission electron microscopy, provides a unique, extremely powerful tool for the optical nano-characterization of semiconductors.

ROOM 1

14:30 – 16:00

CF/IE-6: Supercontinuum Generation and Filamentation

Chair: Luc Bergé, CEA, Arpajon, France

CF/IE-6.1 MON 14:30

Investigation of Plasma Filament Decay in Gases at Different Pressures

•S. Bodrov[1,2], A. Murzanev[1], Y. Sergeev[1], Y. Malkov[1], M. Tsarev[2,1], N. Aleksandrov[3], I. Kochetov[4], and A. Stepanov[1]; [1]Institute of Applied Physics of Russian Academy of Sciences, Nizhny Novgorod, Russia; [2]University of Nizhny Novgorod, Nizhny Novgorod, Russia; [3]Moscow Institute of Physics and Technology, Dolgoprudny, Russia; [4]Troitsk Institute of Innovation and Fusion Research, Troitsk, Russia

Plasma filament decay in air, N2 and Ar for pressure range p=1-760 Torr was investigated experimentally by combination of transverse optical interferometry and pulsed terahertz scattering techniques and discussed theoretically.

CF/IE-6.2 MON 14:45

Remotely pumped stimulated emission at 337 nm in atmospheric nitrogen

•P. Polynkin[1], D. Kartashov[2], A. Schmitt-Sody[3], S. Alisauskas[2], A. Pugzlys[2], A. Baltuska[2], J. Moloney[1], and W. Roach[3]; [1]College of Optical Sciences, University of Arizona, Tucson, United States; [2]Photonics Institute, Vienna University of Technology, Vienna, Austria; [3]Air Force Research Labs, Kirtland Air Force Base, Albuquerque, United States

Stimulated emission at 337nm in atmospheric nitrogen pumped by an energetic picosecond laser pulse at 1,053nm is reported. The gain at 337nm is seeded by the spectral tail of the third harmonic of the pump.

CF/IE-6.3 MON 15:00

A New Regime of Femtosecond Mid-Infrared Filamentation in Transparent Solids

•S. Ališauskas[1], D. Kartashov[1], A. Pugžlys[1], D. Faccio[2], A. Zheltikov[3,4], A. Voronin[3], and A. Baltuška[1]; [1]Photonics Institute, Vienna University of Technology, Vienna, Austria; [2]Institute of Photonics and Quantum

ROOM 4a

14:30 – 16:00

ID-2: Frequency Combs

Chair: Ekkehard Peik, Physikalisch-Technische Bundesanstalt, Braunschweig, Germany

ID-2.1 MON 14:30

Steady-state and instabilities of octave-spanning Kerr frequency combs modeled using a generalized Lugiato-Lefever equation

•M. Erkintalo[1], H. Randle[1], T. Sylvestre[2], and S. Coen[1]; [1]Department of Physics, The University of Auckland, Auckland, New Zealand; [2]Institut FEMTO-ST, Universite de Franche-Comte, Besancon, France

A generalized Lugiato-Lefever equation is numerically solved to model Kerr frequency combs. Excellent agreement is obtained with past experiments. Simulations are orders-of-magnitude faster than with any other technique and reveal different regimes of comb stability.

ID-2.2 MON 14:45

Octave-spanning Ti:Sapphire laser with repetition rate >4 GHz

•A. Rolland[1,2], T. Fortier[2], and S.A. Diddams[2]; [1]Institut de Physique de Rennes, Rennes, France; [2]National Institute of Standards and Technology, Boulder, United States

We experimentally develop an octave-spanning Ti:Sapphire laser operating at multi-gigahertz repetition rates. By optimizing the total group dispersion delay intracavity, we reach an octave bandwidth for a repetition rate at 4.3 GHz.

ID-2.3 MON 15:00

Spectral broadening of microresonator based frequency combs for self-referencing

•T. Herr[1], J. Jost[1], V. Brasch[1], M. Pfeiffer[1], C. Wang[1], M. Gorodetsky[2], and T. Kippenberg[1]; [1]Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland; [2]Faculty of Physics, M.V. Lomonosov Moscow State University, Moscow, Russia

ROOM 4b

14:30 – 16:00

CL-3: Applied Biophotonics

Chair: Halina Rubinsztein-Dunlop, University of Queensland, Kenmore, Brisbane, Australia

CL-3.1 MON 14:30

Distinguishing immature and mature HIV-1 particles by superresolution optical fluorescence microscopy

•V. Mönkemöller[1], W. Hübner[1], B. Dale[2], B.K. Chen[2], G.P. McNerney[3], and T. Huser[1]; [1]Biomolecular Photonics, University of Bielefeld, Bielefeld, Germany; [2]Immunology Institute, Mount Sinai School of Medicine, New York, United States; [3]NSF Center for Biophotonics Science and Technology, University of California, Davis, United States

Individual HIV particles are characterized by single molecule based superresolution fluorescence microscopy techniques in order to track the position and infection state of individual HIV virions in 4D with a spatial resolution down to 20nm.

CL-3.2 MON 14:45

Quantifying molecular colocalization in live cell fluorescence microscopy

•F. Humpert[1], I. Yahiatene[1], M. Lummer[2], M. Sauer[3], and T. Huser[1,4]; [1]Biomolecular Photonics, Bielefeld, Germany; [2]Molecular Cellpysiology, Bielefeld, Germany; [3]Biotechnology and Biophysics, Würzburg, Germany; [4]Center for Biophotonics Schience and Technology, Sacramento, United States

We introduce a novel, quantitative measure that enables a significantly improved analysis for colocalization in fluorescence microscopy. This analysis can readily be extended to the evaluation of images with more than just two color channels.

CL-3.3 MON (Invited) 15:00

Super Resolution Imaging of Single DNA-Protein Interactions

G. Wuite[1], •E. Peterman[1], S. Hell[2], G. Sitters[1], and I. Heller[1]; [1]VU University, Amsterdam, The Netherlands; [2]Max Planck Institute for Biophysical Chemistry, Göttingen, Germany

We developed an optical tweezers combined

ROOM 13a

14:30 – 16:00

IA-2: Quantum Photonics

Chair: Stefan Götzinger, Max Planck Institute for the Science of Light, Erlangen, germany

IA-2.1 MON (Invited) 14:30

Photonic Quantum Technologies

K. Aungskunsiri, D. Bonneau, J. Carolan, D. Fry, J. Hadden, S. Ho, J. Kennard, S. Knauer, E. Martin-Lopez, J. Meinecke, G. Mendoza, J. Munns, M. Piekarek, K. Poulios, X. Qiang, N. Russell, R. Santagati, A. Santamato, P. Shadbolt, P. Sibson, J. Silverstone, O. Snowdon, N. Tyler, J. Wang, C. Wilkes, S.R. Whittaker, J. Barreto, D. Beggs, X. Cai, P. Jiang, A. Laing, J.C.F. Matthews, G.D. Marshall, A. Peruzzo, X.-Q. Zhou, J.G. Rarity, M.G. Thomson, and •J.L. O'Brien; University of Bristol, Bristol, United Kingdom

Quantum photonics will deliver disruptive information, communication and sensor technologies by harnessing quantum effects. We report efforts to develop the key components single photon sources and detectors, and reconfigurable waveguide circuits and their integration.

IA-2.2 MON 15:00

Measuring higher-order interferences with a five-path interferometer

•T. Kauten, B. Gschösser, P. Mai, Z. Vörös, and G. Weihs; Institut für Experimentalphysik, Innsbruck, Austria

We performed a five-path interferometer experiment to determine an upper bound for possible higher-order interference terms,

ROOM 13b

14:30 – 16:00

CB/CC-1: Terahertz Quantum Cascade Semiconductor Lasers

Chair: Thomas Dekorsy, University of Konstanz, Konstanz, Germany

CB/CC-1.1 MON 14:30

Phase-locked arrays of surface-emitting terahertz distributed feedback quantum cascade lasers

•G. Xu[1], Y. Halioua[1], R. Colombelli[1], S.P. Khanna[2], L. Li[2], E.H. Linfield[2], A.G. Davies[2], H. Beere[3], and D.A. Ritchie[3]; [1]Institut d'Electronique Fondamentale, Univ. Paris Sud, Orsay, France; [2]School of Electronic and Electrical Engineering, University of Leeds, Leeds, United Kingdom; [3]Cavendish Laboratory, University of Cambridge, Cambridge, United Kingdom

We report phase-locked arrays of surface-emitting terahertz quantum cascade lasers. Single-mode emission is consistently obtained and the laser emission pattern shows a main central lobe as narrow as 6 degrees in the array direction.

CB/CC-1.2 MON 14:45

Broadband homogeneous quantum cascade laser emitting at 2.3 THz

•M. Rösch, G. Scalari, M. Beck, and J. Faist; Institute for Quantum Electronics, ETH Zürich, Zürich, Switzerland

We report a broadband homogeneous quantum cascade laser emitting at 2.3 THz with a bandwidth of 765 GHz above the noise level in pulsed mode. The laser operates up to a temperature of 140 Kelvin.

CB/CC-1.3 MON 15:00

Exceptional points in coupled microdisk THz quantum cascade lasers

•M. Brandstetter, M. Liertzer, C. Deutsch, H. Detz, A.M. Andrews, W. Schrenk, G. Strasser, K. Unterrainer, and S. Rotter; Vienna University of Technology, Vienna, Austria

We investigated coupled microdisk terahertz (THz) quantum cascade lasers (QCLs)

ROOM 14a

14:30 – 16:00

CJ-3: Modal Instabilities in Fibres

Chair: Kent Erik Mattsson, Technical University Denmark, Kgs. Lyngby, Denmark

CJ-3.1 MON (Invited) 14:30

Mode instabilities in large-mode-area fiber amplifiers

•*T. Eidam[1,2], C. Jauregui[1], H.-J. Otto[1], F. Jansen[1], F. Stutzki[1], J. Limpert[1,2,3], and A. Tünnermann[1,2,3]; [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Jena, Germany; [2]Helmholtz-Institute Jena, Jena, Germany; [3]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

Today the onset of mode instabilities is one of the most limiting effects for average-power scaling of fiber lasers. We give an overview about possible theoretical explanations and discuss first experiments demonstrating mitigation strategies.

CJ-3.2 MON 15:00

On the power threshold of mode instabilities

•*C. Jauregui[1], H.-J. Otto[1], F. Stutzki[1], F. Jansen[1], J. Limpert[1,2], and A. Tünnermann[1,2,3]; [1]Institute of Applied Physics, Jena, Germany; [2]Helmholtz-Institute Jena, Jena, Germany; [3]Fraunhofer Institute for Applied Optics and Precision*

ROOM 14b

14:30 – 16:00

CD-6: Frequency Conversion based on Quadratic Nonlinearities

Chair: Ulf Peschel, University of Erlangen, Erlangen, Germany

CD-6.1 MON 14:30

Narrow-Band, Mid-Infrared, $CdSiP_2$ Based Seeded Optical Parametric Generator Pumped by 120-ps, Single Mode 1064 nm Laser

A. Tyazhev[1], •F. Pirzio[2], A. Agnesi[2], G. Reali[2], V. Petrov[1], G. Marchev[1], P.G. Schunemann[3], and K.T. Zawilski[3]; [1]Max-Born-Institute, Berlin, Germany; [2]Università di Pavia, Pavia, Italy; [3]BAE Systems, Inc, Nashua, Italy

We demonstrated low-threshold, efficient optical parametric amplification in $CdSiP_2$ pumping at 1064 nm with 120-ps-long pulses at 230-kHz repetition rate and seeding at the signal wavelength for generation of bandwidth-limited idler pulses at 6100 nm.

CD-6.2 MON 14:45

Broad and tunable second harmonic generation from 250 to 430 nm from a 80 MHz picosecond white light source

•*M. Bradler and E. Riedle; LS für BioMolekulare Optik, LMU, München, Germany*

We show tunable second harmonic generation from 250 to 430 nm from a visible picosecond supercontinuum Megahertz source, study the influence of the numerical aperture on the frequency doubling process, and perform broadband achromatic doubling.

CD-6.3 MON 15:00

Blue-to-red tunable SHG from a diode-pumped PPKTP waveguide

•*K. Fedorova[1], G. Sokolovskii[1,2], P. Battle[3], I. Krestnikov[4], D. Livshits[4], and E. Rafailov[1]; [1]Photonics & Nanoscience Group, University of Dundee, Dundee, United Kingdom; [2]Ioffe Physico-Technical Institute, St. Petersburg, Russia; [3]AdvR Inc., Montana, United States;*

ROOM 21

14:30 – 16:00

JSIV-1: Quantum Coherent Effects in Biology I

Chair: Philipp Kukura, University of Oxford, Oxford, United Kingdom

JSIV-1.1 MON 14:30

High Frequency Vibrational Coherences and Coupling in the Excited State of Polyenic Biochromophores

•*T. Buckup, J.P. Kraack, M.S. Marek, and M. Motzkus; Physikalisch-Chemisches Institut, Ruprecht-Karls-Universität Heidelberg, Heidelberg, Germany*

High-frequency vibrational coherences in the excited state of Retinals (RETs) and Carotenoids (CARs) are investigated with pump-DFWM. Newly observed C=C stretching bands in the excited states of RETs and CARS is discussed.

JSIV-1.2 MON 14:45

Femtosecond stimulated Raman spectroscopy in 1D and 2D - direct observation of intramolecular motions and intermolecular interactions

•*M. Kloz, R. van Grondelle, and J. Kennis; Free University Amsterdam, Amsterdam, The Netherlands*

Femtosecond pump-probe experiments greatly contributed to understanding of elementary events in photosynthesis. Lately also more complex multi-pulse experiments such as femtosecond stimulated Raman spectroscopy were harnessed to study physical nature of life.

JSIV-1.3 MON 15:00

On Origin of Coherence Dynamics in Biological Complexes

•*D. Zigmantas[1], D. Palecek[1], J. Dostal[1], J. Alster[1], and V. Butkus[2]; [1]Lund Universty, Lund, Sweden; [2]Vilnius University, Vilnius, Lithuania*

We employed polarization 2D spectroscopy, Fourier analysis and modelling of beats with

ROOM EINSTEIN

14:30 – 16:00

CE-2: Thin Films and Nanostructures

Chair: Jürgen Christen, Universität Magdeburg, Magdeburg, Germany

CE-2.1 MON 14:30

Superhydrophobic Sputtered Al2O3 Coating Films with High Transparency

•*D. Tulli[1], P. Mazumder[3], D. Infante[1], A. Carrilero[1], and V. Pruneri[1,2]; [1]ICFO, Barcelona, Spain; [2]ICREA, Barcelona, Spain; [3]Corning Inc., Sullivan Park, NY, United States*

Sputtered Alumina thin film with roughness of 20 to 50 nm was formed by immersion in boiling water. High transparency, low haze and superhydrophobic behaviour create a great potential for an anti-reflection coating on glass.

CE-2.2 MON 14:45

Durable, Superhydrophobic, Antireflection and Low Haze Glass Surfaces using scalable metal dewetting nanostructuring

•*D. Infante[1], A. Carrilero[1], D. Tulli[1], K.W. Koch[2], P. Mazumder[2], L. Tian[2], and V. Pruneri[1,3]; [1]ICFO-Institut de Ciències Fotòniques, Castelldefels, Spain; [2]Corning Inc., Corning, United States; [3]ICREA-Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain*

Antireflective properties of nanostructured glass substrates, that were fabricated by etching a self-assembled metallic mask in an industrially scalable process, have been investigated both experimentally and theoretically. Moreover, their wetting behavior could be turned superhydrophobic.

CE-2.3 MON 15:00

Oxidation-free and ultra-smooth thin silver films grown on a copper seed layer

•*N. Formica[1], D.S. Ghosh[1], A. Carrilero[1], T. Lai Chen[1], R. Simpson[2], and V. Pruneri[1,3]; [1]ICFO, Institute of Photonic Sciences, Castelldefels, Barcelona, Spain; [2]Singapore University of Techonology and Design, Singapore, Singapore; [3]ICREA,Institucio*Catalana*

NOTES

ROOM 1

Sciences, Heriot-Watt University, Edinburgh, United Kingdom; [3]Physics Department, Russian Quantum Center, International Laser Center, M.V. Lomonosov Moscow State University, Moscow, Russia; [4]Department of Physics and Astronomy, Texas A&M University, College Station, United States

We present experimental and numerical investigation of a new filamentation regime of mid-infrared femtosecond pulses in solids. Efficient emission of dispersive waves without fundamental spectrum broadening and continuum generation is observed in this regime.

CF/IE-6.4 MON 15:15

Femtosecond Laser Filaments and Aerodynamics

•*M. Lenzner, J. Yeak, and K. Kremeyer; PM & AM Research, Tucson, United States*

The air disturbance generated by a femtosecond laser-induced plasma can significantly alter nonlinear optical effects for these pulses during propagation. For pulse repetition rates above 1 kHz, a pulse consequently affects its successor.

CF/IE-6.5 MON 15:30

Compressible octave-spanning supercontinuum generation by two-color excitation in the group velocity horizon

•*A. Demircan[1], S. Amiranashvili[2], C. Brée[2], and G. Steinmeyer[3]; [1]Invalidenstr. 114, Berlin, Germany; [2]Weierstrass Institute for Applied Analysis and Stochastics, Berlin, Germany; [3]Max-Born-Institute, Berlin, Germany*

A novel two-color excitation scheme is discussed for generation of broadband white-light continua with superior coherence properties in photonic crystal fibers. These continua enable compression close to single-cycle temporal duration.

CF/IE-6.6 MON 15:45

Frequency up-conversion and pulse compression mediated by soliton plasma interactions in gas-filled photonic crystal fiber

•*P. Hölzer[1], W. Chang[1], J.C. Travers[1], and P.S.J. Russell[1,2]; [1]Max Planck Insti-*

ROOM 4a

We demonstrate spectral broadening of a low noise, near-infrared, microresonator based frequency comb to close to two thirds of an optical octave. This opens a viable route towards self-referencing of microresonator based comb generators.

ID-2.4 MON 15:15

Low phase-noise mid-infrared frequency combs based on microresonators

C. Wang[1,2], T. Herr[1], P. Del'Haye[2,6], A. Schliesser[1,2], R. Holzwarth[2,3], T. Hänsch[2,4], N. Picqué[2,4,5], and •T. Kippenberg[1]; [1]École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland; [2]Max-Planck-Instiut für Quantenoptik, Munich, Germany; [3]Menlo Systems GmbH, Martinsried, Germany; [4]Ludwig-Maximilians-Universität München, Munich, Germany; [5]Institut des Sciences Moléculaires d'Orsay, CNRS, Orsay, France; [6]National Institute of Standards and Technology, Boulder, United States

We present mid-infrared frequency combs from crystalline MgF2 micro-resonators at 2.5 micron-wavelength. Low phase-noise is confirmed by both heterodyne beat note and transmission noise measurements.

ID-2.5 MON (Invited) 15:30

Microresonator frequency combs

•*S. Papp, P. Del'Haye, and S. Diddams; National Institute of Standards and Technology, Boulder, CO, United States*

We will describe recent experiments with microresonator-based optical frequency combs that characterize their time- and frequency-domain behavior. Our work explores low-noise operating regimes of microcombs for precision metrology applications.

ROOM 4b

with multicolor confocal and STED fluorescence microscopy. It allows visualization of proteins on DNA with high spatial resolution (50 nm) and temporal resolution (<50 ms).

CL-3.4 MON 15:30

Experimental observation of synchronization in a biomechanical rotational motors system

•*C. Denz, L. Dewenter, Á. Barroso, C. Alpmann, and M. Woerdemann; Institut für Angewandte Physik, Westfälische Wilhelms-Universität Münster, Münster, Germany*

We demonstrate the hydrodynamic interaction and synchronization in bio-mechanical systems, as pairs of flagellated bacteria, in dependence of their distance and show first, promising results.

CL-3.5 MON 15:45

Maximum control of light propagation through turbid media in the presence of noise

•*H. Yilmaz, W.L. Vos, and A.P. Mosk; Complex Photonic Systems (COPS), MESA+ Institute for Nanotechnology, University of*

ROOM 13a

and to test for the possibility of quantum mechanical wavefunctions based on quaternions or octonions rather than complex numbers.

IA-2.3 MON 15:15

Single quantum dots as photon pair emitters

•*A. Predojević[1], T. Huber[1], M. Ježek[2], H. Jayakumar[1], T. Kauten[1], G.S. Solomon[3], R. Filip[2], and G. Weihs[1]; [1]Institute for Experimental Physics, University of Innsbruck, Innsbruck, Austria; [2]Department of Optics, Palacký University, Olomouc, Czech Republic; [3]Joint Quantum Institute, National Institute of Standards and Technology and University of Maryland, Gaithersburg, United States*

We present our measurements performed on a quantum dot system suitable for the generation of time-bin entangled photon pairs.

IA-2.4 MON 15:30

Bell States Generation on a III-V Semiconductor Chip at Room Temperature

A. Orieux[1], G. Boucher[1], •A. Eckstein[1], A. Lemaître[2], P. Filloux[1], I. Favero[1], G. Leo[1], T. Coudreau[1], A. Keller[3], P. Milman[1], and S. Ducci[1]; [1]Université Paris Diderot, Sorbonne Paris Cité, Laboratoire Matériaux et Phénomènes Quantiques, CNRS-UMR 7162, Paris, France; [2]Laboratoire de Photonique et Nanostructures, Marcoussis, France; [3]Université Paris Sud, Institut des Sciences Moléculaires d'Orsay, CNRS - UMR 8214, Orsay, France

We demonstrate the generation of polarization entangled Bell states at room temperature and telecom wavelength on a 3-5 semiconductor chip. A theoretical model provides ways to understand and control the amount of entanglement.

IA-2.5 MON 15:45

Integrated quantum interferometry with three-dimensional geometry

•*N. Spagnolo[1], C. Vitelli[2,1], L. Aparo[1], P. Mataloni[1], F. Sciarrino[1], A. Crespi[3,4], R. Ramponi[3,4], and R. Osellame[3,4]; [1]Dipartimento di Fisica, Sapienza Università*

ROOM 13b

showing counter- intuitive behavior under certain operating conditions, which can be attributed to the occurrence of an exceptional point in the laser equations.

CB/CC-1.4 MON 15:15

THz quantum cascade lasers operating on radiative states of a 2D Photonic crystals resonator

•*Y. Halioua[1], G. Xu[1], S. Moumdji[1], R. Colombelli[1], L. Li[2], and E. Linfield[2]; [1]Institut d'Electronique Fondamentale, Univ. Paris Sud, CNRS UMR8622, 91405 Orsay, France, Orsay, France; [2]School of Electronic and Electrical Engineering, University of Leeds, Leeds, United Kingdom*

We demonstrate a photonic-crystal design which permits to develop photonic-crystal band-edge lasers operating on radiative modes of a 2D photonic structure, with enhanced power extraction efficiency. The approach is demonstrated using THz quantum cascade lasers.

CB/CC-1.5 MON 15:30

Terahertz Photonic Crystal Quantum Cascade Laser Coupled to a Second Order Bragg Vertical Extractor

•*C. Bonzon[1], Z. Diao[2], G. Scalari[1], M. Beck[1], J. Faist[1], and R. Houdré[2]; [1]Eidgenössische Techniche Hochschule Zürich (ETHZ), Institut für Quantenelektronik, Zürich, Switzerland; [2]Ecole Polytechnique Fédérale de Lausanne (EPFL), Institut de Physique de la Matière Condensée, Lausanne, Switzerland*

We present single mode surface emission around 3.1 THz of a Quantum Cascade Laser. A deep etched 2D photonic crystal double metal cavity supports the laser mode and uses second order Bragg gratings as extractors.

CB/CC-1.6 MON 15:45

Fabrication and Characterization of Terahertz Emitting GaAs/AlGaAs Micropillar Quantum Cascade Structures in a Double Metal Waveguide

•*M. Krall[1,3], M. Brandstetter[1,3], C. Deutsch[1,3], H. Detz[2,3], T. Zederbauer[2,3],*

ROOM 14a

Engineering, Jena, Germany

The latest developments in the theoretical understanding of mode instabilities are presented. A semi-analytical formula for the prediction of the mode-instability threshold is introduced and several mitigation strategies are proposed and discussed.

CJ-3.3 MON 15:15

Temperature as a guiding mechanism for high-power very-large-mode-area active fibers

•*F. Jansen*[1], *F. Stutzki*[1], *H.-J. Otto*[1], *C. Jauregui*[1], *J. Limpert*[1,2], *and A. Tünnermann*[1,2,3]; [1]*Institute of Applied Physics, Friedrich-Schiller-University Jena, Jena, Germany*; [2]*Helmholtz-Institute Jena, Jena, Germany*; [3]*Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany*

Temperature is demonstrated to be a viable guiding mechanism for high power very large mode area fibers. An index-antiguiding-core fiber delivering 129W in effective single-mode operation is demonstrated. The relation to gain-guiding-index-antiguiding fibers is discussed.

CJ-3.4 MON 15:30

Mitigation Strategies for Mode Instabilities in High-Power Fiber-Laser Systems

•*H.-J. Otto*[1], *C. Jauregui*[1], *F. Stutzki*[1], *F. Jansen*[1], *J. Limpert*[1,2], *and A. Tünnermann*[1,2,3]; [1]*Institute of Applied Physics, Jena, Germany*; [2]*Helmholtz-Institute, Jena, Germany*; [3]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

We present an approach to mitigate mode instabilities based on a dynamic mode excitation scheme. The beam quality was significantly improved at output powers well above the power threshold. Other mitigation strategies will be discussed.

CJ-3.5 MON 15:45

Highly Efficient 90μm Core Rod fiber Amplifier Delivering >300W Without Beam Instabilities

•*M. Laurila*[1], *M.M. Jørgensen*[2], *J. Laegsgaard*[2], *and T.T. Alkeskjold*[1]; [1]*NKT Photonics, Birkeroed, Denmark*; [2]*DTU*

ROOM 14b

[4]*Innolume GmbH, Dortmund, Germany*

We demonstrate all-room-temperature CW second harmonic generation with 174 nm tunability from blue to red (between 478 nm and 652 nm) in a single PPKTP waveguide pumped by broadly-tunable semiconductor laser diodes.

CD-6.4 MON 15:15

High-efficiency 5-beam pumped non-collinear parametric amplification

•*G. Mennerat*[1], *B. Trophème*[2], *and B. Boulanger*[3]; [1]*CEA-Saclay, IRAMIS, Gif-sur-Yvette, France*; [2]*CEA-CESTA, Le Barp, France*; [3]*Institut Néel, Grenoble, France*

We report on beam combining through non-collinear optical parametric amplification in LBO pumped by five beams in nanosecond régime. 27% overall energy tranfer and output signal energy of 63 mJ were measured at 725 nm.

CD-6.5 MON 15:30

Thermal challenges in high power optical parametric amplifiers

•*S. Demmler*[1], *J. Rothhardt*[1,2], *S. Hädrich*[1,2], *T. Peschel*[3], *J. Limpert*[1,2], *and A. Tünnermann*[1,2,3]; [1]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller University Jena, Jena, Germany*; [2]*Helmholtz-Institute Jena, Jena, Germany*; [3]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

Investigations of thermal effects due to residual absoption of BBO in high average power optical parametric amplifiers are presented. Based on the findings guidelines for further power scaling of such nonlinear devices are given.

CD-6.6 MON 15:45

5 mJ, Sub-nanosecond PPSLT OPA at 0.5 kHz, Tunable in the Water Absorption Band at 3 microns

D. Chuchumishev[1], *A. Gaydardzhiev*[1], *C.-P. Richter*[2], *and* •*I. Buchvarov*[1,2]; [1]*Department of Physics, Sofia University, Sofia, Bulgaria*;

ROOM 21

different origin to gain a better understanding of quantum beats phenomenon in biological complexes.

JSIV-1.4 MON 15:15

Coherent Electronic and Vibrational Dynamics in the Electronic 2D Spectra of Molecular Dimers

•*V. Butkus*[1,2], *D. Abramavicius*[1,3], *and L. Valkunas*[1,2]; [1]*Vilnius University, Vilnius, Lithuania*; [2]*Center for Physical Sciences and Technology, Vilnius, Lithuania*; [3]*Jilin University, Changchun, China, People's Republic of (PRC)*

Coherent dynamics of simulated 2D electronic spectra of the molecular dimer is considered as the amplitude and phase dependence on resonant coupling and vibrational frequency. Typical signatures for electronic, vibrational or mixed coherences are identified.

JSIV-1.5 MON (Invited) 15:30

Quantum Coherence Explored at the Level of Individual Light-Harvesting Complexes

R. Hildner[1,2], *D. Brinks*[1], *R.J. Cogdell*[3], *and* •*N.F. van Hulst*[1,4]; [1]*ICFO - the Institute of Photonic Sciences, Castelldefels - Barcelona, Spain*; [2]*Experimentalphysik IV, Universität Bayreuth, Bayreuth, Germany*; [3]*Institute of Molecular, Cell and Systems Biology, University of Glasgow, Glasgow, United Kingdom*; [4]*ICREA - Institucio Catalana de Recerca i Estudis Avancats, Barcelona, Spain*

We demonstrate ultrafast quantum coherent energy transfer within single light-harvesting complexes (LH2) under physiological conditions: The quantum coherence persists at least 400 fs. Strikingly, changing transfer pathways in individual complexes are revealed on second timescale.

ROOM EINSTEIN

de Recerca i estudis Avançats, Barcelona, Spain

We show an effective method, relying on a 1nm Copper seed layer, to produce the thinnest continuous nano-metric Ag films ever reported and not subjected to any oxidation even after 4 months of storage.

CE-2.4 MON 15:15

Third-harmonic and multiphoton excitation fluorescence microscopy of single and few layer graphene

•*A. Säynätjoki*[1], *L. Karvonen*[1], *J. Riikonen*[1], *W. Kim*[1], *S. Mehravar*[2], *R. Norwood*[2], *N. Peyghambarian*[2], *H. Lipsanen*[1], *and K. Kieu*[1]; [1]*Aalto University, Department of Micro and Nanosciences, Espoo, Finland*; [2]*University of Arizona, College of Optical Sciences, Tucson, United States*

Graphene was studied with simultaneous third-harmonic and multiphoton excitation fluorescence microscopy. Both CVD grown and exfoliated graphene were studied. The method is straightforward and fast, making it efficient in characterization of single- and few-layer graphene.

CE-2.5 MON 15:30

Effects of Surface Deep Traps on Third- and High-Order Optical Nonlinearities in Photopolymerizable Semiconductor CdSe Quantum Dot-Polymer Nanocomposites

Y. Adachi[1], *R.-i. Yamagami*[1], •*Y. Tomita*[1], *T. Nakashima*[2], *and T. Kawai*[2]; [1]*University of Electro-Communications, Tokyo, Japan*; [2]*Nara Institute of Science and Technology, Nara, Japan*

We investigate the effect of surface deep traps on third- and high-order optical nonlinearities at a wavelength of 532 nm in photopolymerizable semiconductor CdSe quantum dot-polymer nanocomposites by means of a degenerate multiwave mixing experiment.

CE-2.6 MON 15:45

Highly efficient and photostable bulk and thin film dye lasers based on new pyrromethene derivatives

•*L. Cerdán*[1], *G. Durán-Sampedro*[2], *A.R. Agarrabeitia*[2], *M.E. Pérez-Ojeda*[1], *A. Costela*[1], *I. García-Moreno*[1], *I. Esnal*[3],

NOTES

ROOM 1

tute for the Science of Light, Erlangen, Germany; [2]Department of Physics, University of Erlangen-Nuremberg, Erlangen, Germany
Photoionization-induced self-frequency blue-shift of fundamental solitons in Ar-filled PCF is numerically studied. For 1.7 μJ pulses the wavelength shifts from 1500 to 815 nm while the pulse compresses from 30 to 4 fs.

16:30 – 18:00

CF/IE-7: High Harmonic Generation

Chair: Mauro Nisoli, Politecnico di Milano, Milan, Italy

CF/IE-7.1 MON (Keynote) 16:30

Frontiers in Extreme Nonlinear Optics: Attosecond-to-Zeptosecond Coherent Kiloelectronvolt X-rays on a Tabletop
•*T. Popmintchev; JILA, University of Colorado at Boulder, Boulder, United States*
We present experimentally and theoretically a unified picture of phase matching of high harmonic generation spanning the electromagnetic spectrum from the vacuum ultraviolet to the keV X-ray region, combining both microscopic and macroscopic physics.

ROOM 4a

16:30 – 18:00

ID-3: Precision Measurements

Chair: Stephan Schiller, Heinrich-Heine University, Düsseldorf, Germany

ID-3.1 MON (Invited) 16:30

Is the electron round? Particle physics with cold and ultracold molecular beams
•*E.A. Hinds; Centre for Cold Matter, Imperial College, London SW7 2AZ, United Kingdom*
Micro-Hz resolution spectroscopy of YbF molecules provides a sensitive way to search for the electric dipole moment of the electron. This places strong constraints on possible new particle physics in the 1-100 TeV range

ROOM 4b

Twente, P.O. Box 217, 7500 AE, Enschede, The Netherlands
We realize maximum control of light through turbid media in noisy conditions. A two-step optimization enables a high degree of control that is only limited by standard quantum noise.

16:30 – 18:00

CL-4: Structural Imaging

Chair: Monika Ritsch-Marte, Innsbruck Medical University, Innsbruck, Austria

CL-4.1 MON 16:30

In Vivo Three-Photon Imaging of Subcortical Structures of an Intact Mouse Brain using Quantum Dots
•*N. Horton, K. Wang, C.-C. Wang, and C. Xu; Cornell University, Ithaca, United States*
Three-photon fluorescence microscopy at the 1700 nm spectral window enables in vivo imaging of subcortical structures in an intact mouse brain. Subcortical imaging using three-photon excitation of quantum dots may further improve the penetration depth.

CL-4.2 MON 16:45

Interferometric Second Harmonic Generation microscopy for tissue imaging
M. Rivard[1], K. Popov[2], M. Laliberté[1], A. Bertrand-Grenier[1], F. Martin[1], H. Pépin[1], C.P. Pfeffer[3], C. Brown[4], L. Ramunno[2], and •F. Légaré[1]; [1]INRS-EMT, Varennes, Canada; [2]University of Ottawa, Ottawa, Canada; [3]Ludwig-Maximilians-University Munich, Munich, Germany; [4]University of Oxford, Oxford, United Kingdom
We combine Second Harmonic Generation (SHG) microscopy and interferometry to image, at the sub-micron scale, the relative orientation of noncentrosymmetric proteins such as collagen in tendon. Our observations are explained with a numerical model.

ROOM 13a

di Roma, Roma, Italy; [2]Center of Life NanoScience @ La Sapienza, Istituto Italiano di Tecnologia, Roma, Italy; [3]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche (IFN-CNR), Milano, Italy; [4]Dipartimento di Fisica, Politecnico di Milano, Milano, Italy
We report the experimental observation of three-photon interference in an integrated three-port directional coupler realized by ultrafast laser-writing, and we discuss potential application in the field of quantum interferometry.

16:30 – 18:00

IA-3: Quantum Effects

Chair: Tatjana Wilk, Max-Planck-Institut für Quantenoptik, Garching, Germany

IA-3.1 MON 16:30

Time-resolved double-slit interference pattern measurement with entangled photons
•*P. Kolenderski[1,2], C. Scarcella[3], K. Johnsen[1], D. Hamel[1], C. Holloway[1], K. Shalm[1], S. Tisa[4], A. Tosi[3], K. Resch[1], and T. Jennewein[1]; [1]Institute for Quantum Computing, University of Waterloo, Waterloo, Canada; [2]Institute of Physics, Nicolaus Copernicus University, Torun, Poland; [3]Politecnico di Milano, Dipartimento di Elettronica e Informazione, Milano, Italy; [4]Micro Photon Device, Bolzano, Italy*
There is debate about how individual particles passing through a double slit setup build up the well-known interference pattern. We report the pattern formation by photons using time-resolved single-photon sensitive measurements.

IA-3.2 MON 16:45

Demonstration of the Quantum Zeno Effect on the Nitrogen Vacancy Center in Nanodiamond
•*J. Wolters, M. Strauß, R.S. Schönfeld, and O. Benson; Nano-Optics, Institute of Physics, Humboldt-Universität zu Berlin, Berlin, Germany*
We experimentally demonstrate the quantum Zeno effect on a solid state spin, namely the nitrogen vacancy center in nanodiamond. Our experiment is supported by a detailed analysis of the population dynamics via a semi-classical model.

ROOM 13b

A.M. Andrews[2,3], W. Schrenk[3], G. Strasser[2], and K. Unterrainer[1,3]; [1]Photonics Institute, Vienna University of Technology, Vienna, Austria; [2]Institute of Solid State Electronics, Vienna University of Technology, Vienna, Austria; [3]Center for Micro- and Nanostructures, Vienna University of Technology, Vienna, Austria
We are presenting results from the fabrication and characterization of GaAs/AlGaAs micropillar arrays in a double metal waveguide. The micropillar arrays are formed by structuring a terahertz quantum cascade laser heterostructure.

16:30 – 18:00

CB-3: Ultrafast Semiconductor Lasers I

Chair: Maria Ana Cataluna, University of Dundee, Dundee, United Kingdom

CB-3.1 MON 16:30

Generation of ultra-high repetition rate optical pulses through external injection in passively mode-locked monolithical semiconductor lasers
•*V. Pusino, M. Sorel, and M.J. Strain; University of Glasgow, Glasgow, United Kingdom*
Passively mode-locked semiconductor lasers in a Fabry-Pérot configuration show locking at repetition rates up to 910GHz when two external continuous waves are injected in the saturable absorber, with mutual spacing multiple of the fundamental frequency.

CB-3.2 MON 16:45

A Fast Time Domain Travelling Wave method for simulation of Quantum Dot Lasers and Amplifiers
•*M. Gioannini, P. Bardella, and I. Montrosset; . Department of Electronics and Telecommunication, Politecnico di Torino, Torino, Italy*
We present a Fast Time Domain Travelling Wave simulator for Quantum Dot lasers and amplifiers. The method is applied to the simulation of wide band SOAs and single section Fabry Perot lasers emitting optical pulses.

ROOM 14a

Fotonik, Kgs. Lyngby, Denmark
Fiber designs with resonant structures can be robust to thermal load. We demonstrate 314W of average power from ROD fiber amplifier using a fiber design with resonant structure.

16:30 – 18:00
CJ-4: Coherent Combining
Chair: Thomas Schreiber, Fraunhofer IOF, Jena, Germany

CJ-4.1 MON (Keynote) 16:30
Coherent Combining of Fiber and Solid-State Lasers
•G. Goodno; Northrop Grumman Aerospace Systems, Redondo Beach, United States
We review recent advances in coherent laser combining, including active laser control methods, diffractive optics beam combining, and high coherence fiber and SSL amplifiers that have enabled unprecedented brightness scaling of cw sources.

ROOM 14b

[2]Northwestern University, Feinberg School of Medicine, Chicago, United States
We demonstrate 5-mJ pulse energy in 580-ps laser pulses from mid-IR, PPSLT based optical parametric oscillator-amplifier system, tunable in the highly interesting water absorption band between 3000-nm and 3500-nm, operated at 0.5-kHz repetition rate.

16:30 – 18:00
CD-7: New Devices for Frequency Conversion based on Quadratic Nonlinearities
Chair: Concita Sibilia, Università di Roma La Sapienza, Rome, Italy

CD-7.1 MON 16:30
Nonlinear beam splitter based on second-harmonic generation by femtosecond laser-induced phase gratings in lithium niobate
•J. Imbrock, S. Kroesen, M. Ayoub, W. Horn, and C. Denz; Institute of Applied Physics and Center for Nonlinear Science, Muenster, Germany
An integrated nonlinear photonic beam splitter device based on noncollinear second-harmonic generation is induced by a directly femtosecond laser written phase grating in lithium niobate. The efficiency, bandwidth, and tuning characteristic are examined.

CD-7.2 MON 16:45
Propagation of second-harmonic generation in $LiNbO_3$ nanowires
•A. Sergeyev, R. Geiss, E.-B. Kley, T. Pertsch, and R. Grange; Institute of Applied Physics, Abbe Center of Photonics, Friedrich Schiller University, Jena, Germany
We demonstrate propagation of second-harmonic (SH) in a 29 μm long $LiNbO_3$ nanowire. We show that nanowire length and facets significantly influence the SH signal. We excite fluorescent dyes with the delivered SH signal.

ROOM 21

16:30 – 18:00
JSIV-2: Quantum Coherent Effects in Biology II
Chair: Marcus Motzkus, University of Heidelberg, Heidelberg, Germany

JSIV-2.1 MON (Invited) 16:30
Robust design principles for quantum enhanced excitation transport
M. Walschaers[1,2], R. Mulet[1,3], T. Wellens[1], and •A. Buchleitner[1]; [1]Institute of Physics, Albert-Ludwigs-University, Freiburg i. Brsg., Germany; [2]Instituut voor Theoretische Fysica, KU Leuven, Heverlee, Belgium; [3]Complex System Group, Department of Theoretical Physics, University of Havana, Cuba, Cuba
We propose a model for highly efficient quantum transport through finite, disordered systems, which is statistically robust against configurational changes. We discuss the potential relevance thereof for excitation transport in photosynthetic light harvesting complexes.

ROOM EINSTEIN

J. Bañuelos[3], I. López-Arbeloa[3], and M.J. Ortiz[2]; [1]Instituto Química-Física Rocasolano (CSIC), Madrid, Spain; [2]Facultad de Ciencias Químicas, Universidad Complutense de Madrid, Madrid, Spain; [3]Facultad de Ciencia y Tecnología, Universidad del País Vasco, Bilbao, Spain
Laser materials based on new derivatives of commercial pyrromethene dyes doped into PMMA are evaluated as rods and thin-films. Laser efficiencies up to 53% and 40-fold photostability enhancements when compared to parent dyes are reported.

16:30 – 18:00
CE-3: Photonic Nanowires - Materials and Applications
Chair: Mikhail A. Noginov, Norfolk State University, Norfolk, United States

CE-3.1 MON (Invited) 16:30
III-V and III-Nitride Nanowires for LED Applications
•L. Samuelson; Lund University, Lund, Sweden; Glo AB, Lund, Sweden
I will describe the status of our research on the growth of ideal III-V and III-nitride nanowires, and the way these can be used for on-chip infrared LEDs as well as for visible LEDs.

NOTES

ROOM 1

CF/IE-7.2 MON 17:15

Intra-cavity extreme ultraviolet light source based on a mode locked Ti:sapphire oscillator with 9.4 MHz repetition rate

•E. Seres[1,2,3], J. Seres[2], and C. Spielmann[1,2]; [1]Helmholtz Institute Jena, Jena, Germany; [2]Friedrich Schiller University, Jena, Germany; [3]Vienna University of Technology, Vienna, Austria

A high harmonic source based on the intra-cavity wavelength conversion in a Ti;sapphire oscillator has been realized. Using Xe as nonlinear medium EUV pulses up to 30 eV have been measured at 9.4MHz repetition rate.

CF/IE-7.3 MON 17:30

Two-pulse Lensless Imaging With a Broadband High-Harmonic Source

•S. Witte, V.T. Tenner, D.W.E. Noom, and K.S.E. Eikema; LaserLaB Amsterdam, VU University Amsterdam, The Netherlands

We demonstrate coherent lensless imaging with broadband extreme-ultraviolet radiation from a table-top high-harmonic source, using a two-pulse Fourier-transform imaging scheme and a multi-wavelength phase retrieval algorithm. We obtain diffraction-limited images at wavelengths below 50 nm.

ROOM 4a

ID-3.2 MON 17:00

Ramsey-Comb Spectroscopy

•J. Morgenweg and K. Eikema; VU University, Amsterdam, The Netherlands

We introduce and experimentally demonstrate a "Ramsey-comb" based on two amplified frequency comb pulses, resulting in kHz-level accuracy on two-photon transitions in Rb and Cs that challenges traditional frequency comb spectroscopy.

ID-3.3 MON 17:15

Laser Spectroscopy of Th+ above 7 eV Excitation Energy for Electronic Bridge Excitation of the Th-229 Nucleus

O.A. Herrera Sancho, N. Nemitz, C. Tamm, M. Okhapkin, and •E. Peik; Physikalisch-Technische Bundesanstalt, Braunschweig, Germany

Laser excitation of a nuclear transition in Th-229 is proposed as the basis of an optical clock. Two-photon excitation of electronic levels of Th+ may be used to excite the nucleus via electronic bridge processes.

ID-3.4 MON 17:30

Long distance ultra-stable frequency dissemination on a dedicated wavelength channel of a telecommunication network.

O. Lopez[1], P.-E. Pottie[2], B. Chanteau[1], F. Stefani[1], A. Bercy[1], •C. Chardonnet[1], G. Santarelli[3], and A. Amy-Klein[1]; [1]Laboratoire de Physique des Lasers, Université Paris 13, Villetaneuse, France; [2]LNE-SYRTE, Observatoire de Paris, CNRS, Paris, France; [3]Laboratoire Photonique, Numérique et Nanosciences, Talence, France

We have demonstrated an ultra-stable opti-

ROOM 4b

CL-4.3 MON (Invited) 17:00

Imaging molecular organization of cell membranes and proteins assemblies using polarimetric fluorescence microscopy

X. Wang, A. Kress, J. Savatier, H. Rigneault, J. Duboisset, P. Ferrand, and •S. Brasselet; Institut Fresnel, Aix-Marseille Université, campus St Jérôme, Marseille, France

A general polarization-resolved fluorescence confocal microscopy method is presented, based on a full control of the excitation polarization state. We image directly molecular orientational order in a biological sample, independently on its orientation or morphology.

CL-4.4 MON 17:30

Simultaneous two-photon absorption and stimulated Raman scattering imaging by spatial overlap modulation microscopy

•K. Isobe[1], H. Kawano[2], A. Suda[3], A. Kumagai[2], A. Miyawaki[2], and K. Midorikawa[1]; [1]RIKEN Advanced Science Institute, Wako, Japan; [2]RIKEN Brain Science Institute, Wako, Japan; [3]Tokyo University of Science, Noda, Japan

We show the separation of two-photon absorption signals from stimulated Raman scattering signals by spatial overlap modula-

ROOM 13a

IA-3.3 MON 17:00

Quantum coherent control of Gaussian multipartite entanglement

•G. Patera[1], C. Navarrete-Benlloch[2,3], G.J. de Valcárcel[2], and C. Fabre[4]; [1]Laboratoire de Physique des Lasers, Atomes et Molécules, Université Lille 1, Villeneuve d'Ascq, France; [2]Departament d'Òptica, Universitat de Velència, Burjassot, Spain; [3]Max-Planck-Institut für Quantenoptik, Garching, Germany; [4]Laboratoire Kastler-Brossel, Université Pierre et Marie Curie-Paris6, ENS, CNRS, Paris, France

We theoretically show that optical parametric oscillators can produce a great variety of multipartite entangled states by an appropriate control of the parametric interaction, that we accomplish by tailoring the spatio-temporal shape of the pump.

IA-3.4 MON 17:15

Simultaneous observation of super-Heisenberg scaling and spin squeezing in a nonlinear measurement of atomic spins

•R. Sewell[1], M. Napolitano[1], N. Behbood[1], G. Colangelo[1], F. Martin Ciurana[1], and M. Mitchell[1,2]; [1]ICFO, Barcelona, Spain; [2]ICREA, Barcelona, Spain

We report a nonlinear alignment-to-orientation conversion measurement of atomic spins that simultaneously shows super-Heisenberg scaling and demonstrates spin squeezing. The measurement achieves a sensitivity of 990 spins, competitive with the best reported linear techniques.

IA-3.5 MON 17:30

Quantum Frequency Conversion of Visible Single Photons from a Quantum Dot to a Telecom Band

•A. Lenhard[1], S. Zaske[1], C. Keßler[2], J. Kettler[2], C. Arend[1], C. Hepp[1], R. Albrecht[1], W.-M. Schulz[2], M. Jetter[2], P. Michler[2], and C. Becher[1]; [1]Universität des Saarlandes, Saarbrücken, Germany; [2]Institut für Halbleiteroptik und Funktionelle Grenzflächen and Research Center SCoPE, Stuttgart, Germany

We report on quantum frequency conversion of visible single photons from a semi-

ROOM 13b

CB-3.3 MON 17:00

Monolithically Integrated InP-based Optical Pulse Shaper

•M.S. Tahvili[1], S. Latkowski[1], X.J.M. Leijtens[1], M.J. Wale[1,2], P. Landais[3], M.K. Smit[1], and E.A.J.M. Bente[1]; [1]COBRA Research Institute, Eindhoven University of Technology, Eindhoven, The Netherlands; [2]Oclaro Ltd, Caswell Towcester, United Kingdom; [3]School of Electronic Engineering, Dublin City University, Dublin, Republic of Ireland

We demonstrate spectral phase manipulation of highly chirped optical pulses with an ultra-compact optical pulse shaper. The device integrates a 20x50GHz arrayed waveguide grating with 20 phase modulators and 20 semiconductor optical amplifiers.

CB-3.4 MON 17:15

A continuous chimera state in an optical comb

•B. Kelleher[1,2], T. Habruseva[1,2], S.P. Hegarty[1], G. Huyet[1,2], and E.A. Viktorov[1,3]; [1]Tyndall National Institute, Cork, Republic of Ireland; [2]Cork Institute of Technology, Cork, Republic of Ireland; [3]Université Libre de Bruxelles, Brussels, Belgium

A continuous chimera state is demonstrated in the optical comb generated by a passively mode locked quantum dot laser by means of optical linewidth measurements, phase recovery techniques and a bifurcation analysis and confirmed numerically.

CB-3.5 MON (Invited) 17:30

Optical Frequency Combs using Ultrafast Diode Lasers: Techniques and Applications

•P. Delfyett; CREOL, The College of Optics and Photonics, Orlando, FL, United States

Semiconductor optical amplifier based mode-locked fiber lasers are used as sources of ultrastable optical frequency combs. These combs are used for applications in real time optical waveform synthesis, coherent arbitrary waveform measurement, and matched filtering.

ROOM 14a | ROOM 14b | ROOM 21 | ROOM EINSTEIN | NOTES

ROOM 14a

CJ-4.2 MON 17:15

Passive coherent combining of 15 fiber lasers by phase contrast filtering

•*F. Jeux*[1,2], *A. Desfarges-Berthelemot*[1], *V. Kermène*[1], *and A. Barthelemy*[1]; [1]*Xlim Institut de recherche UMR 7252, Limoges, France;* [2]*Astrium SAS, Paris, France*

We report new passive phase-locking technique applied to fiber laser array. 15 fiber amplifiers are efficiently coupled in a single laser cavity by a specific phase contrast filtering.

CJ-4.3 MON 17:30

4-channel Coherently Combined femtosecond Fiber CPA system Delivering 1.3 mJ Pulses with 532 W Average Power

•*A. Klenke*[1,3], *S. Breitkopf*[1], *M. Kienel*[1], *T. Gottschall*[1], *T. Eidam*[1,3], *S. Hädrich*[1,3], *J. Rothhardt*[1,3], *J. Limpert*[1,2,3], *and A. Tünnermann*[1,2,3]; [1]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Albert-Einstein-Str. 15, 07745 Jena, Germany, Jena, Germany;* [2]*Fraunhofer Institute for Applied Optics and Precision Engineering, Albert-Einstein-Str.*

ROOM 14b

CD-7.3 MON 17:00

Cascaded Up-Conversion Of Twin-Beam OPG In Nonlinear Photonic Crystals

•*M. Levenius, V. Pasiskevicius, and K. Gallo; KTH - Royal Institute of Technology, Stockholm, Sweden*

We study cascaded frequency up-conversion processes initiated by twin-beam optical parametric generation in hexagonally poled LiTaO3 by 806nm pump. Exploiting several reciprocal lattice vectors in both steps, results in multi-beam generation at wavelength ranges 400-610nm.

CD-7.4 MON 17:15

New Design Opportunities For Ultrafast Quasi-Phasematching Devices

•*C. Phillips*[1,2], *L. Gallmann*[2], *and M. Fejer*[1]; [1]*Stanford University, Stanford, United States;* [2]*ETH Zurich, Zurich, Switzerland*

We will discuss new quasi-phasematching design techniques and opportunities, including OPCPA gain-narrowing suppression, and custom pulse synthesis, based on convex optimization. We will also discuss how apodization can be performed systematically for chirped-QPM devices

CD-7.5 MON 17:30

Functionalizing nonlinear crystals

•*A. Shapira*[1], *A. Libster*[1], *Y. Lilach*[2], *and A. Arie*[1]; [1]*Tel Aviv University, Tel Aviv, Israel;* [2]*Tel Aviv University Center for Nanoscience and Nanotechnology, Tel Aviv, Israel*

Nonlinear crystals are functionalized by sputtering a thin metallic layer on their exit facet and patterning it by focused-ion-beam milling. This enables to shape or filter the nonlinearly generated beam without compromising the conversion efficiency.

ROOM 21

JSIV-2.2 MON 17:00

Coherent internal conversion of pyrene revealed by pump-probe and ultrabroad 2D-UV spectroscopy

•*I. Pugliesi, N. Krebs, and E. Riedle; LS für BioMolekulare Optik, LMU, Munich, Germany*

In pyrene dissolved in methanol the coherent excitation of vibrational states survives the S_2-S_1 internal conversion. Pump-probe and 2D-UV measurements provide the experimental framework that identifies the mechanism behind this process on the vibrational level.

JSIV-2.3 MON 17:15

Coherent Photoisomerization and Quantum Yield of Biomimetic Molecular Switches

M. Ngueye[1], *I. Schapiro*[2,3], *S. Fusi*[4], •*S. Haacke*[1], *M. Olivucci*[3,4], *and J. Léonard*[1]; [1]*CNRS - Université de Strasbourg, Strasbourg, France;* [2]*Max Planck Institute for Chemical Energy Conversion, Mülheim an der Ruhr, Germany;* [3]*Bowling Green State University, Bowling Green, United States;* [4]*Università degli Studi di Siena, Siena, Italy*

Femtosecond broadband pump-probe spectroscopy reveals vibrational low-frequency coherences in rhodopsin-mimicking photoswitches, due to out-of-plane motion and ring inversions. The relation between reaction speed and quantum yield is critically re-examined.

JSIV-2.4 MON 17:30

Conical Intersection Dynamics in Rhodopsin and its Analog Isorhodopsin

•*D. Polli*[1], *D. Brida*[1], *C. Manzoni*[1], *K.M. Spillane*[2], *M. Garavelli*[3], *P. Kukura*[2], *O. Weingart*[4], *R.A. Mathies*[5], *and G. Cerullo*[1]; [1]*Politecnico di Milano, Milan, Italy;* [2]*Oxford University, Oxford, United Kingdom;* [3]*Università di Bologna, Bologna, Italy;* [4]*Heinrich Heine Universität, Düsseldorf, Germany;* [5]*University of California at Berkeley, Berkeley, United States*

We study the conical intersection dynamics

ROOM EINSTEIN

CE-3.2 MON 17:00

Photon-counting Raman Spectroscopy of Silicon Nanowires

•*M. Collins*[1], *C. Grillet*[1,2], *S. Shahnia*[1], *A. Clark*[1], *P. Grosse*[3], *B. Ben Bakir*[3], *S. Menezo*[3], *J.-M. Fedeli*[3], *C. Xiong*[1], *D. Moss*[1], *B. Eggleton*[1], *and C. Monat*[2]; [1]*Centre for Ultrahigh-bandwidth Devices for Optical Systems (CUDOS), Institute of Photonics and Optical Science (IPOS), School of Physics, University of Sydney, Sydney, Australia;* [2]*Université de Lyon, Institut des Nanotechnologies de Lyon (INL, Ecully, France;* [3]*CEA-Leti MINATEC Campus, Grenoble, France*

We report the first direct measurements of the SpRS spectra over a broad bandwidth in a photonic integrated platform using photon-counting spectroscopy. We apply this to CMOS compatible amorphous silicon and crystalline silicon nanowire devices.

CE-3.3 MON 17:15

Retrieving the spatial distribution of cavity modes in ZnO nanowires by near-field imaging and electrodynamics simulations

•*F. Güell*[1], *A.R. Goñi*[2], *J.O. Ossó*[3], *L.A. Perez*[4], *E.A. Coronado*[4], *and J.R. Morante*[1,5]; [1]*Universitat de Barcelona, Barcelona, Spain;* [2]*ICMAB-CSIC, Bellaterra, Spain;* [3]*MATGAS 2000 A.I.E., Bellaterra, Spain;* [4]*Universidad Nacional de Córdoba, Córdoba, Argentina;* [5]*IREC-Institut de Recerca en Energia de Catalunya, Sant Adrià de Besós, Spain*

Scanning near-field optical microscopy was used to map out the evanescent fields of optically excited ZnO nanowires. Different excitation wavelengths reveal a different spatial distribution of the electromagnetic fields associated to each cavity mode.

CE-3.4 MON 17:30

Strong Two-Photon Excitation Fluorescence from GaAs and InP Nanowires on Glass Substrate

•*L. Karvonen*[1], *A. Säynätjoki*[1], *V. Dhaka*[1], *T. Haggren*[1], *S. Honkanen*[2], *S. Mehravar*[3], *R. Norwood*[3], *N. Peyghambarian*[3], *H. Lipsanen*[1], *and K. Kieu*[3]; [1]*Department of Micro and Nanosciences, Aalto University, Espoo, Finland;* [2]*Department of Physics and Mathematics, University of Eastern Finland, Joensuu, Finland;* [3]*College of Optical Sciences, University of Arizona,*

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ROOM 1

CF/IE-7.4 MON 17:45

Polarization-controlled quasi-phase matching for linearly and circularly polarized high harmonic generation

•*L. Liu, K. O'Keeffe, and S. Hooker*; *University of Oxford, Oxford, United Kingdom*

A new class of quasi-phase matching high harmonic generation is proposed where the polarization of the driving field is controlled in a waveguide. The first circularly polarized quasi-phase matched source is shown to be possible.

ROOM 4a

cal link over 540 km over a public fiber network carrying Internet data traffic. The result shows fractional frequency stability, of 6x10-15 at 1s and <10-18 after 10000s integration time.

ID-3.5 MON 17:45

A high sensitivity fiber optic gyroscope on multiplexed telecommunication network

•*C. Clivati[1,2], D. Calonico[1], G.A. Costanzo[2], A. Mura[1], M. Pizzocaro[1,2], and F. Levi[1]*; [1]*Istituto Nazionale di Ricerca Metrologica, Torino, Italy*; [2]*Politecnico di Torino, Torino, Italy*

We describe the realization of a fiber optic gyroscope exploiting the Sagnac effect on a 47 km multiplexed telecommunication network, that coexists with Internet data traffic. The sensitivity is suitable to detect large seismic events.

ROOM 4b

tion microscopy, which provides simultaneous two-photon absorption and stimulated Raman scattering imaging.

CL-4.5 MON 17:45

Imaging Lipid Films using Polarization-Sensitive Third-Harmonic Generation

•*G. Bautista[1], M.J. Huttunen[1], S. Pfisterer[2], K. Kanerva[2], E. Ikonen[2], and M. Kauranen[1]*; [1]*Department of Physics, Tampere University of Technology, Tampere, Finland*; [2]*Institute of Biomedicine/Anatomy, University of Helsinki, Helsinki, Finland*

We demonstrate third-harmonic generation microscopy of lipid films using tightly focused linear, circular and radial polarizations. The technique revealed strongly anisotropic regions in lipid films suggesting that the lipid films displayed molecular ordering.

ROOM 13a

conductor quantum dot to the telecom O-band. We could prove the preservation of coherence and single photon statistics in this process.

IA-3.6 MON 17:45

Quantum Pattern Recognition

•*P.W.H. Pinkse[1], S.A. Goorden[1], M. Horstmann[1], B. Škorić[2], and A.P. Mosk[1]*; [1]*MESA+ Institute for Nanotechnology, University of Twente, Enschede, The Netherlands*; [2]*Eindhoven University of Technology, Eindhoven, The Netherlands*

We perform quantum pattern recognition with much fewer photons than the complexity of the sought arbitrary pattern.

ROOM 13b

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ROOM 14a

7, 07745 Jena, Germany, Jena, Germany; [3]Helmholtz-Institute Jena, Max-Wien-Platz 1, 07743 Jena, Germany, Jena, Germany

We report on a fiber CPA system consisting of four coherently combined fiber amplifiers. With this system, we could achieve an average power of 532 W with pulse energies of up to 1.3 mJ.

CJ-4.4 MON 17:45

Energy scaling of ultrafast fiber systems using chirped and divided pulse amplification

•Y. Zaouter[1], F. Guichard[1,2], L. Daniault[2], M. Hanna[2], F. Morin[1], C. Hönninger[1], E. Mottay[1], F. Druon[2], and P. Georges[2]; [1]Amplitude Systemes, Pessac, France; [2]Laboratoire Charles Fabry - Institut d'Optique - CNRS - Université Paris-Sud, Palaiseau, France

We implemented for the first time both chirped and divided pulse amplification in the same femtosecond fiber amplifier setup leading to the generation of 430 μJ, 320 fs pulses at 100 kHz

ROOM 14b

CD-7.6 MON 17:45

Contact poling of RKTP with silicon pillars

H. Kianirad, A. Zukauskas, •T. Frisk, C. Canalias, and F. Laurell; Applied Physics Department, Royal Institute of Technology, Stockholm, Sweden

An array of silicon pillars was used as contact electrode for poling a 5 *m x 5 *m period 2D-domain pattern in a RKTP crystal. This technique shows promise for the next generation nanodomain engineering.

ROOM 21

in the visual pigment Rhodopsin and its 9-cis analog Isorhodopsin combining broadband sub-20-fs ultrafast spectroscopy with detailed hybrid quantum-mechanical/molecular-mechanical simulations.

JSIV-2.5 MON 17:45

Revealing the role of excited state nuclear coherence in the photoisomerisation of bacteriorhodopsin by population assisted impulsive Raman

•M. Liebel and P. Kukura; Physical and Theoretical Chemistry Laboratory, Oxford, United Kingdom

We apply population assisted impulsive Raman spectroscopy (PAIRS) to reveal the coherent structural evolution of the retinal chromophore during the primary step in the photocycle of the proton pump bacteriorhodopsin

ROOM EINSTEIN

Tucson, United States

We report the observation of extremely strong two-photon excitation fluorescence from GaAs and InP NWs. The NWs were grown on a glass substrate using atmospheric pressure MOVPE. NWs were characterized by multi-photon microscope.

CE-3.5 MON 17:45

Surface Acoustic Wave-Driven Carrier Dynamics As A Contact-less Probe For Mobilities Of Photogenerated Carriers In Undoped Nanowires

J. Kinzel[1], F. Schülein[1], M. Weiss[1], D. Rudolph[2], G. Koblmüller[2], J. Finley[2], G. Abstreiter[2], A. Wixforth[1], and •H. Krenner[1]; [1]Experimentalphysik 1, Universität Augsburg, Augsburg, Germany; [2]Walter Schottky Institut, TU München, Garching, Germany

We study the dynamics of photogenerated carriers in single nanowires induced by a surface acoustic wave. We extract the transport mobilites of electrons and holes by directly comparing the observed emission modulation to numerical simulations.

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13:30 – 14:30

CK-P: CK Poster Session

CK-P.1 MON

Mode Control Of Light Scattering By Nanoparticles

•B. Hourahine and F. Papoff; Department of Physics, SUPA, University of Strathclyde, Glasgow, United Kingdom

We demonstrate that is is possible to substantially change the optical properties of nanoparticles by control of the coupling of incident light fields with the intrinsic optical modes of these structures using simple interference effects.

CK-P.2 MON

SERS from Ag and Au nanoarrays made using photochemical patterning

•S. Damm[1], N.C. Carville[1], M. Manzo[2], K. Gallo[2], B.J. Rodriguez[1], and J. Rice[1]; [1]School of Physics and Conway Institute of Biomolecular and Biomedical Research, University College Dublin, Dublin, Republic of Ireland; [2]Department of Applied Physics, KTH-Royal Institute of Technology, Stockholm, Sweden

SERS from Au and Ag nanoarray patterns created using proton exchange process, where the polarization properties of the surface of ferroelectric LiNbO3 substrate is altered, creating site specific Au and Ag nanoparticle deposition.

CK-P.3 MON

Strong Near Field Coupling and Enhanced Energy Extraction in Metal Nanostructures

D. McArthur, •B. Hourahine, and F. Papoff; University of Strathclyde, Glasgow, United Kingdom

We show that a gold nanodisc at sub-wavelength distances from a dipole source can extract a larger amount of energy from the source and induce greater transmission than the surrounding dielectric medium alone.

CK-P.4 MON

Stationary and ultrafast optical behavior of a 1D-photonic cavity containing gold nanoparticles

•R. Morea[1], X. Wang[2], J. Gonzalo[1], and B. Palpant[2]; [1]Instituto de Optica, CSIC, Madrid, Spain; [2]Ecole Centrale Paris, Laboratoire de Photonique Quantique et Moléculaire, UMR 8537-CNRS, Ecole Normale Supérieure du Cachan, Châtenay-Malabry, France

We show that interference effects in Fabry-Perot type photonic cavities containing Au nanoparticles allow increasing their ultrafast transient transmittance by more than one order of magnitude at wavelengths close to that of the defect mode.

CK-P.5 MON

Analysis of gold nanoantennas utilising plasmonic field enhancement for high-order harmonic generation

•M. Noack[1,2], N. Pfullmann[1,2], C. Waltermann[1,2], M. Kovacev[1,2], V. Knittel[3], D. Akemeier[4], A. Hütten[4], A. Leitenstorfer[3], and U. Morgner[1,2]; [1]QUEST Centre for Quantum Engineering and Space-Time Research, Hannover, Germany; [2]Institut für Quantenoptik, Leibniz Universität Hannover, Hannover, Germany; [3]Department of Physics and Center for Applied Photonics, Konstanz, Germany; [4]Thin Films & Physics of Nanostructures, Department of Physics, Bielefeld, Germany

We present an analysis of gold nanoantennas to facilitate high-order harmonic generation with a laser oscillator. In experiments plasma-lines and low order harmonics are observed. Experimental issues are discussed and explained by a theoretical model.

CK-P.6 MON

Mesoscopic Light Trapping in Random Arrays of Semiconductor Nanowires

•T. Strudley[1], T. Zehender[2], E. Bakkers[2], and O. Muskens[1]; [1]Faculty of Physics and Astronomy, University of Southampton, Southampton, United Kingdom; [2]Department of Applied Physics, Eindhoven University of Technology, Eindhoven, The Netherlands

Arrays of semiconductor nanowires have been grown with exceptionally small optical mean free paths. These random arrays demonstrate significant fluctuations in transmission, allowing the investigation of mesoscopic light transport in a three dimensional medium.

CK-P.7 MON

Demonstration of Wavelength Tuning of Silica Toroid Microcavity via Additional Laser Reflow

•W. Yoshiki, K. Ishikawa, and T. Tanabe; Keio University, Yokohama, Japan

We demonstrate the resonant wavelength tuning of a silica toroid microcavity by conducting additional laser reflow. Our study implies better controllability in cavity quantum electrodynamics and electromagnetically induced transparency based on an ultra-high Q cavity.

CK-P.8 MON

Fluorescence in Planar and Ridge Waveguides Fabricated in Erbium-Doped Lithium-Niobate-On-Insulator (Er:LNOI)

C.E. Rüter[1], •D. Kip[1], G. Stone[2], V. Dierolf[2], H. Hu[3], and W. Sohler[3]; [1]Helmut Schmidt University, Hamburg, Germany; [2]Lehigh University, Bethlehem, United States; [3]University of Paderborn, Paderborn, Germany

Waveguide ridges are fabricated in Erbium-doped lithium-niobate-on-insulator (Er:LNOI) substrates using precision diamond-blade dicing. First results of the investigation of Erbium centers using Raman and fluorescence spectroscopy are presented.

CK-P.9 MON

Fiber polarization mode excitation applied to confocal microscopy

•C. Zeh[1], T. Härtling[1], and L.M. Eng[2]; [1]Fraunhofer Institute for Nondestructive Testing IZFP, Dresden Branch, Dresden, Germany; [2]Institut für Angewandte Photophysik, Technische Universität Dresden, Dresden, Germany

The contribution has been withdrawn by the authors.

CK-P.10 MON

Optical Fiber Nanotips as carriers for Molecular Beacon-based Biosensors

•S. Pelli[1], A. Barucci[1], A. Giannetti[1], F. Cosi[1], S. Tombelli[1], C. Trono[1], G.C. Righini[1,2], and F. Baldini[1]; [1]Istituto di Fisica Applicata "Nello Carrara", Sesto Fiorentino (Firenze), Italy; [2]Centro Fermi, Roma, Italy

We present a biosensor using a molecular beacon immobilized on an optical fibre nanotip.

We focus on the mRNA detection useful for cancer theranostics, in this case for survivin protein monitoring and inhibition.

CK-P.11 MON

Light propagation in disordered media: from Maxwell equations to a spherical p-spin model and light condensation effects

•L.D. Tóth and A. Fratalocchi; King Abdullah University of Science and Technology, Thuwal, Saudi Arabia

We develop a novel theory to tackle the complexity of light mode condensation in the presence of disorder and strong localization. We numerically investigate our findings by performing a massively parallel ab-initio FDTD simulation campaign.

CK-P.12 MON

Role of spatial coherence in the Goos-Hänchen shift.

•M. Merano, G. Umbriaco, and G. Mistura; Dipartimento di Fisica e Astronomia G. Galilei, Università degli studi di Padova, Padova, Italy

We investigate experimentally the role of spatial coherence in the Goos-Hänchen shift. We find that beams generated from sources with a low spatial coherence suffer the same shift of a fully coherent beam.

CK-P.13 MON

Focussing by a Flat Woodpile 3D Photonic Crystal

•L. Maigyte[1], C. Cojocaru[1], V. Purlys[2], J. Trull[1], D. Gailevicius[2], M. Peckus[2,3], M. Malinauskas[2], and K. Staliunas[1,4]; [1]Departament de Física i Enginyeria Nuclear, Universitat Politècnica de Catalunya, Terrassa, Spain; [2]Laser Research Center, Department of Quantum Electronics, Vilnius University, Vilnius, Lithuania; [3]Center for Physical Sciences and Technology, Vilnius, Lithuania; [4]Institució Catalana de Recerca i Estudis Avançats (ICREA), Barcelona, Spain

In this paper we report numerical and experimental observation of a beam focusing behind a flat 3D woodpile photonic crystal at the visible wavelength range.

CK-P.14 MON

Resonantly Enhanced Second and Third Harmonic Generation in Microfibre Loop Resonators

•T. Lee[1], N. Broderick[2], R. Ismaeel[1], M. Gouveia[1], and G. Brambilla[1]; [1]University of Southampton, Southampton, United Kingdom; [2]University of Auckland, Auckland, New Zealand

We theoretically study resonantly enhanced surface second harmonic and third harmonic generation in microfibre loop resonators, with focus on the effect of the resonance properties, bistability and co-resonance between the pump and harmonic signals.

CK-P.15 MON

Plasmonic Slot Nano-Resonators in Gold-Coated Microfibers

•M. Ding, G. Brambilla, and M. Zervas; Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom

We have studied plasmonic slot nanoresonators (PSNRs) embedded in a gold-coated microfiber which show strong localization in three dimensions. The intensity enhancement and the resonance wavelength depend on both the PSNR and microfiber dimensions.

CK-P.16 MON

Group velocity dispersion manipulation in integrated waveguides

J.M. Chavez Boggio[1], D. Bodenmüller[1], T. Fremberg[1], M. Böhm[2], R. Haynes[1], and •M.M. Roth[1]; [1]innoFSPEC-VKS, Leibniz-Institut für Astrophysik Potsdam (AIP), An der Sternwarte 16, D-14482 Potsdam, Germany, D-14482 Potsdam, Germany; [2]innoFSPEC-InFaSe, University of Potsdam, Physikalische Chemie, Karl-Liebknecht-Str. 24-25, Haus 25, D-14476 Golm, Germany, D-14476 Golm, Germany

Chromatic dispersion engineering in silicon nitride waveguides is investigated. Flat dispersion (+/- 0.6ps/nm-km) over 1000nm is numerically demonstrated in waveguides with three cladding layers.

Hall B0

CK-P.17 MON

Tailoring of dispersion in silicon vertical slot waveguides

•*M.J. Strain*[1], *C. Lacava*[2], *P. Minzioni*[2], *and M. Sorel*[1]; [1]*University of Glasgow, Glasgow, United Kingdom*; [2]*Università di Pavia, Pavia, United Kingdom*

Propagation characteristics of vertical slot waveguides in silicon are presented including waveguide losses and group velocity dispersion. Varying the slot rail width and gap dimensions produces a means by which to control waveguide dispersion lithographically.

CK-P.18 MON

Nano-wire Photonics Circuits for Astronomical Applications

•*H.N.J. Fernando*[1], *R. Eisermann*[2], *A. Stoll*[1], *S.H.N. Tharanga*[1], *O. Streicher*[1], *R. Haynes*[1], *L. Zimmermann*[2], *and M.M. Roth*[1]; [1]*innnoFSPEC-Astrophysicalysches Institut Potsdam, Potsdam, Germany*; [2]*IHP GmbH, innovative Mikroelektronik im Technologiepark, Frankfurt, Germany*

Promising experimental results with silicon-nitride nano-wire photonic circuits were achieved for Astro/Bio-photonics applications. Several circuits were designed without grating-couplers, with 15μm access waveguide separation for high integration-density. Waveguide and excess-loss, <0.8dB/cm and 3dB, respectively achieved.

CK-P.19 MON

Chirped Photonic Crystals for Spatial Filtering of Light Beams

•*L. Maigyte*[1], *V. Purlys*[2], *D. Gailevicius*[2], *M. Peckus*[2,3], *M. Malinauskas*[2], *and K. Staliunas*[1,4]; [1]*Departament de Física i Enginyeria Nuclear, Universitat Politècnica de Catalunya, Terrassa, Spain*; [2]*Laser Research Center, Department of Quantum Electronics, Vilnius University, Vilnius, Lithuania*; [3]*Center for Physical Sciences and Technology, Vilnius, Lithuania*; [4]*Institució Catalana de Recerca i Estudis Avançats (ICREA), Barcelona, Spain*

We show, theoretically and experimentally that chirped photonic crystals (where longitudinal period varies along the propagation direction) can provide a substantial spatial (angular) filtering of the light beams with efficiencies up to around 50%.

CK-P.20 MON

Implementation of Photonic Crystal Simulations into a Monte Carlo Code to Investigate Light Extraction from Scintillators

•*C. Thalhammer*[1,2], *J. Breuer*[3], *A. Popescu*[2], *H. Hedler*[2], *and T. Niendorf*[1]; [1]*Berlin Ultrahigh Field Facility, Max-Delbrueck Center for Molecular Medicine, Berlin, Germany*; [2]*Siemens Corporate Technology, München, Germany*; [3]*Siemens Healthcare, Forchheim, Germany*

Photonic crystals are a promising technology to increase the light extraction from scintillators. Two simulation techniques were combined to investigate the impact of photonic crystals on total yield and propagation times of extracted photons.

CK-P.21 MON

Polarization and Nonlinear Effects in Diffraction-Induced Laser Pulse Splitting in One-Dimensional Photonic Crystals

S. Svyakhovskiy[1], *A. Skorynin*[1], *V. Bushuev*[1], *S. Chekalin*[2], *V. Kompanets*[2], *A. Maydykovskiy*[1], *T. Murzina*[1], *V. Novikov*[1], *and* •*B. Mantsyzov*[1]; [1]*Department of Physics, M. V. Lomonosov Moscow State University, Moscow, Russia*; [2]*Institute of Spectroscopy RAS, Troitsk, Russia*

Polarization and nonlinear effects in Bragg diffraction-induced laser pulse splitting in PC are studied theoretically and experimentally. Splitting time as well number of outgoing pulses are influenced significantly by the polarization of incident pulse.

CK-P.22 MON

Sputtered silica defect embedded in artificial opals: synthesis and optical properties

P.N. Hong[1,2], *P. Benalloul*[1], *L. Coolen*[1], *A. Maître*[1], *and* •*C. Schwob*[1]; [1]*Institut des NanoSciences de Paris, Paris, France*; [2]*Institut of Materials Science, Hanoi, Vietnam*

We propose an original and reliable method to engineer a defect layer between two photonic crystals. Optical characterizations of the structures and fluorescence properties of nano-emitters embedded in the defect will be presented.

CK-P.23 MON

Enhancement upconversion luminescence in InAs-quantum dots embedded GaAs photonic-crystal slab line-defect waveguide

•*H. Oda*[1], *A. Yamanaka*[1], *N. Ozaki*[2], *N. Ikeda*[3], *and Y. Sugimoto*[3]; [1]*Chitose Institute of Science and Technology, Chitose, Japan*; [2]*Wakayama University, Wakayama, Japan*; [3]*National Institute for Materials Science, Tsukuba, Japan*

In this work, we present the 1.55 μm to 1.3 μm upconversion luminescence based on two-photon absorption in InAs-quantum dots GaAs photonic-crystal slab line defect waveguide.

CK-P.24 MON

Unconventional infrared absorption with polaritonic photonic crystals

•*G.C.R. Devarapu and S. Foteinopoulou*; *School of Physics, College of Engineering, Mathematics and Physical Sciences (CEMPS), University of Exeter, Exeter, United Kingdom*

We propose a novel mechanism for unconventional absorption harnessing in the Restrahlen band of a seminconductor, which relies on manipulating the energy velocity and its gradient at the interface of a suitably constructed photonic crystal.

CK-P.25 MON

Near field focusing of beams reflected by flat mirror

•*Y.-c. Cheng*[1], *S. Kicas*[2], *M. Peckus*[2], *J. Trull*[1], *C. Cojocaru*[1], *R. Vilaseca*[1], *R. Drazdys*[2], *and K. Staliunas*[1,3]; [1]*Departament de Física i Enginyeria Nuclear,Universitat Politècnica de Catalunya, Terrassa, Spain*; [2]*Laser Research Center, Dep. Of Quantum Electronics, Vilnius, Lithuania*; [3]*Institució Catalana de Reserca i Estudis Avançats (ICREA), Barcelona, Spain*

We predict generally that narrow beams can focus in reflection from flat interface photonic structures, and we demonstrate the effect experimentally in particular realization, i.e. in reflection from one-dimensional chirped mirror with flat surface.

CK-P.26 MON

Micro/Nano-Structuration of Silicon using Photonic Nanojet Mechanism

•*L.N.D. Kallepalli*[1], *D. Grojo*[1], *L. Charmasson*[1], *P. Delaporte*[1], *O. Utéza*[1], *A. Merlen*[2], *and A. Sangar*[2]; [1]*Aix Marseille Université, CNRS, LP3 UMR 7341, 13288, Marseille, France*; [2]*Aix Marseille Université et Sud Toulon Var, CNRS, IM2NP UMR 7334, 83957, Toulon, France*

We have successfully fabricated large scale arrays of micro/nano-craters on silicon substrates using Langmuir-Blodgett deposition technique and UV nanosecond laser-assisted photonic nanojet ablation from C18 functionalized silica microspheres. Details of structured samples will be discussed.

CK-P.27 MON

Experimental Implementation of Zero order Quarter and Half Wave Plates using customised Nanostructured Birefringent Material.

A. Waddie[1], •*R. Buczynski*[1,2], *J. Nowosielski*[1], *and M. Taghizadeh*[1]; [1]*Institute of Photonics and Quantum Sciences, EPS, Heriot-Watt University, Edinburgh, United Kingdom*; [2]*Glass Laboratory, ITME, Warsaw, Poland*

In this paper we present the full experimental verification of the nanostructured birefringent material and demonstrate its use as a zero-order half and quarter wave plate in a optical fibre compatible manner.

CK-P.28 MON

Air/Polymer microcavities inspected by Fourier image spectroscopy

•*M. Lopez-Garcia, L. Cheng, M. Taverne, X. Zheng, D. Ho, R. Oulton, and J. Rarity*; *Photonics Group, University of Bristol, Tyndall Avenue, BS8 1TH, Bristol, United Kingdom*

We experimentally show here that low refractive index cavities can be accurately fabricated inside 3D photonic structures. Besides, Fourier image spectroscopy shown modal dispersion of cavity modes opening new possibilities for photonic cavities design.

CK-P.29 MON

Prototype of Thermo-optic Switch Consisting of Mach-Zehnder Polymer Waveguide Drawn by Focused Proton Beam

•*K. Miura*[1], *T. Satoh*[2], *Y. Ishii*[2], *M. Koka*[2], *K. Takano*[3], *T. Ohkubo*[2], *A. Yamazaki*[2], *W. Kada*[2], *A. Yokoyama*[2], *T. Kamiya*[2], *H. Kiryu*[1], *Y. Ozawa*[1], *A. Kubota*[1], *and O. Hanaizumi*[1]; [1]*Gunma University, Kiryu, Japan*; [2]*Japan Atomic Energy Agency, Takasaki, Japan*; [3]*Osaka University, Osaka, Japan*

In our previous work, we demonstrated single-mode Y-junction and Mach-Zehnder (MZ) type PMMA-based waveguides drawn by proton beam writing (PBW). In this work, we first attempted to fabricate a thermo-optic switch using the MZ waveguide.

CK-P.30 MON

3D imaging by low one-photon absorption technique

•*Q. Li, M.T. Do, I. Ledoux-Rak, and N.D. Lai*; *Laboratoire de Photonique Quantique et Moléculaire,Ecole Normale Supérieure de Cachan, Cachan, France*

A new method for 3D imaging based on low one-photon absorption is theoretically and experimentally demonstrated. As compared to the two-photon-absorption (TPA) technique, this method is suitable using a continuous laser or an incoherent light.

CK-P.31 MON

Self-synchronization of Radiating 2D Spaser Array

•*A.V. Dorofeenko*[1,2], *A.A. Zyablovsky*[1,2], *A.P. Vinogradov*[1,2], *E.S. Andrianov*[1,2], *A.A. Pukhov*[1,2], *and A.A. Lisyansky*[3]; [1]*Institute for Theoretical and Applied Electromagnetics RAS, Moscow, Russia*; [2]*Moscow Institute of Physics and Technology, Dolgoprudniy, Moscow reg., Russia*; [3]*Department of Physics, Queens College of the City University of New York, New York, United States*

We show that a two-dimensional array of spasers can be self-synchronized so that all the dipole moments oscillate in phase. Such an array produces a narrow beam of coherent light due to superradiance.

CK-P.32 MON

Self-pulsation in a photonic-crystal coupled-cavity laser

A. Yacomotti, S. Haddadi, and •*S. Barbay*; *Laboratoire de Photonique et de Nanostructures, Marcoussis, France*

A novel scheme for controllable self-pulsing operation in a semiconductor photonic-crystal nanolaser is presented. Parameters suitable for an experimental realization are proposed on the basis of coupled photonic-crystal L3 cavities leading to 35ps duration pulses.

CK-P.33 MON

Integrated planar Bragg grating stabilized diode lasers

•*J. Gates, S. Lynch, C. Holmes, C. Sima, P. Mennea, and P. Smith*; *Optoelectronics Research Centre, Southampton, United Kingdom*

An external grating stabilised laser suitable for use in spectroscopy around 1650nm is based on a semiconductor chip coupled to a UV written planar Bragg grating, with power of 7mW and a sub 500kHz line-width.

CK-P.34 MON

Photon-localization induced random lasing from an amplifying periodic-on-average random system

•*A.K. Tiwari and S. Mujumdar*; *Nano-optics and Mesoscopic Optics Laboratory, Tata Institute of Fundamental Research,, Mumbai, India*

We experimentally demonstrate random lasing from an amplifying periodic-on-average random system. Transfer matrix calculations show that lasing originates from localized near-bandedge modes and is frequency-sensitive.

CK-P.35 MON

Photon Management in Two-dimensional Disordered Media

•*M. Burresi*[1,2], *K. Vynck*[1,3], *F. Pratesi*[1], *F. Riboli*[1], *and D.S. Wiersma*[1,2]; [1]*European Laboratory for Non-linear Spectroscopy (LENS), Via N. Carrara 1, 50019, Sesto Fiorentino, Italy*; [2]*Istituto Nazionale di Ottica (CNR-INO), Largo Fermi 6, 50125, Firenze, Italy*; [3]*Institut Langevin, ESPCI ParisTech, 1 rue Jussieu, 75005, Paris, France*

A new nanophotonic strategy based on engineeered-disorder light trapping approaches will be proposed to harvest solar radiation in absorbing thin films. These photonic architectures are applied to a realistic solar cell and numerically investigated.

13:30 – 14:30

CB-P: CB Poster Session

CB-P.1 MON

Narrow linewidth, micro-integrated extended cavity diode laser for precision potassium atom interferometry in micro-gravity environment

•*E. Luvsandamdin*[1], *C. Kuerbis*[1], *A. Sahm*[1], *A. Wicht*[1,2], *G. Erbert*[1], *and G. Traenkle*[1]; [1]*Ferdinand-Braun-Institut Leibniz-Institut fuer Hoechstfrequenztechnik, Berlin, Germany*; [2]*Humboldt-Universitaet zu Berlin, Berlin, Germany*

We present a very compact, robust, narrow linewidth micro-integrated extended cavity laser (ECDL) for precision potassium atom interferometry in a micro-gravity environment.

CB-P.2 MON

Actively Mode-Locked Semiconductor Disk Laser Using Vertical Cavity Modulator

•*J. Rautiainen, A. Rantamäki, M. Tavast, and O.G. Okhotnikov*; *Optoelectronics Research Centre, Tampere, Finland*

An actively mode-locked semiconductor disk laser using a low-loss broadband vertical-cavity modulator has been demonstrated for the first time. Accurate control of the repetition rate and pulse duration could be useful for various upcoming applications.

CB-P.3 MON

Identification of the delay time in semiconductor lasers with optical feedback

•*M.C. Soriano*[1], *R.M. Nguimdo*[2], *and P. Colet*[1]; [1]*IFISC (CSIC-UIB), Palma de Mallorca, Spain*; [2]*APHY, Vrije Universiteit Brussel, Brussels, Belgium*

In this contribution, we discuss the effect of using different observables in the identification of delay times in semiconductor lasers subject to delayed optical feedback.

CB-P.4 MON

Spatially resolved Stokes parameters of small area oxide-confined Vertical-Cavity Surface-Emitting Lasers

•*A. Molitor*[1], *S. Hartmann*[1], *P. Debernardi*[2], *and W. Elsäßer*[1,3]; [1]*Institute of Applied Physics, Technische Universität Darmstadt, Darmstadt, Germany*; [2]*Istituto di Elettronica e di Ingegneria dell Informazione e delle Telecomunicazioni, Torino, Italy*; [3]*Center of Smart Interfaces, Technische Universität Darmstadt, Darmstadt, Germany*

We present experimentally obtained spatially resolved Stokes parameters of small area VCSELs. These results in comparison with numerical simulations of the VCSELs emitted light will grant an insight into the complex polarization behavior of VCSELs.

CB-P.5 MON

Wavelength Control of Integrated Semiconductor Lasers with Tunable Intra-cavity Arrayed Waveguide Gratings Operating at 1.7 μm

•*Y. Jiao*[1,2], *B. Tilma*[1], *P. Thijs*[1], *M. Smit*[1], *and E. Bente*[1]; [1]*COBRA, Eindhoven University of Technology, Eindhoven, The Netherlands*; [2]*Centre for Optical and Electromagnetic Research, Hangzhou, China, People's Republic of (PRC)*

In this contribution we present a control method and its experimental verification for a laser using tunable arrayed waveguide gratings. In combination with QD materials or AMQWs the tuning can be extended for e.g. application in optical coherence tomography.

CB-P.6 MON

Subkilohertz-narrowed, frequency/phase-locked mid-IR quantum cascade lasers for high-precision molecular spectroscopy

•*F. Cappelli, S. Bartalini, P. Cancio, I. Galli, G. Giusfredi, D. Mazzotti, and P. De Natale*; *Istituto Nazionale di Ottica (INO) - CNR and European Laboratory for Nonlinear Spectroscopy (LENS), Sesto Fiorentino FI, Italy*

We narrow QCL radiation below 1 kHz by using two different techniques: frequency locking to a molecular transition and phase locking to an absolutely-referenced difference-frequency-generated source. Applications of both techniques are presented.

CB-P.7 MON

Emission wavelength multistability in semiconductor ring lasers

•*A. Perez-Serrano*[1], *J. Javaloyes*[2], *and S. Balle*[3]; [1]*Weierstrass Institute (WIAS), Berlin, Germany*; [2]*Universitat de les Illes Balears (UIB), Palma de Mallorca, Spain*; [3]*IMEDEA (UIB-CSIC), Esporles, Spain*

We theoretically investigate wavelength multistability in semiconductor ring lasers by performing dynamical simulations and the linear stability analysis of a spatio-temporal traveling wave model. We discuss the effect of carrier diffusion and spatial hole burning.

CB-P.8 MON

Anti-colliding design for passively mode-locked lasers

•*J. Javaloyes and S. Balle*; *Departament de Fisica, Universitat de les iles baleares, Palma de Mallorca, Spain*

The performance of two-section, passively mode-locked semiconductorlasers is analyzed placing the saturable absorber section close to an anti-reflection coated facet. This leads to shorter pulses, increased output power and reduced jitter.

CB-P.9 MON

Improved Performance of Slotted Single-Mode Lasers

•*A. Abdullaev*[1], *Q. Lu*[1], *W.-H. Guo*[2], *M. Nawrocka*[1], *J. OCallaghan*[3], *and J. Donegan*[1]; [1]*Trinity College Dublin, Dublin, Republic of Ireland*; [2]*Department of Electrical & Computer Engineering, University of California Santa Barbara, California, United States*; [3]*Tyndall National Institute, Cork, Republic of Ireland*

Slotted single-mode lasers integrated with semiconductor-optical-amplifier (SOA) is presented. The laser exhibits a threshold ~19mA with the SOA unbiased. Stable single mode performance has been demonstrated with SMSR >50 dB and output power >45mW.

CB-P.10 MON

Eight-Channel Slotted Single-Mode Laser Array

•*Q. Lu*[1], *W.-H. Guo*[2], *M. Nawrocka*[1], *A. Abdullaev*[1], *J. OCallaghan*[3], *and J. Donegan*[1]; [1]*Trinity College Dublin, Dublin, Republic of Ireland*; [2]*Department of Electrical & Computer Engineering, University of California Santa Barbara, California, United States*; [3]*Tyndall National Institute, Cork, Republic of Ireland*

An 8-channel single-mode laser array based on slots is presented. Lasing wavelengths span ~21nm has been obtained with the threshold of 17~20mA, slope efficiency >0.2mW/mA and SMSR >50dB for the fabricated array.

CB-P.11 MON

Increasing the luminance of a red emitting laser light source by spectral beam combining

G. Blume, •*D. Feise, A. Sahm, B. Eppich, and K. Paschke*; *Ferdinand-Braun-Institut, Berlin, Germany*

Spectral beam combining of a bar of DBR tapered lasers near 635 nm at a power level > 1 W improved the beam propagation factor. The incoherent multi-wavelength emission of the bar reduced the speckle contrast.

CB-P.12 MON

1 Watt from 1.56 um Single Frequency Semiconductor Disk Laser

•*A. Rantamäki*[1], *J. Rautiainen*[1], *A. Sirbu*[2], *A. Mereuta*[2], *E. Kapon*[2], *and O. Okhotnikov*[1]; [1]*Optoelectronics Research Centre, Tampere University of Technology, Tampere, Finland*; [2]*Ècole Polytechnique Fèdèrale de Lausanne, Lausanne, Switzerland*

1.56 um single-frequency semiconductor disk laser with 1 watt of output power and coherence length over 5 km in optical fiber is demonstrated. The result presents the highest power reported for this type of lasers.

CB-P.13 MON

Different Values for the Linewidth Enhancement Factor of a Quantum-Dots Laser obtained using Optical and Electrical Modulation

M. Soldo[1], M.T. Todaro[2,3], C. Belmonte Palmero[1,4], V. Tasco[2], A. Passaseo[2], M.J. Latorre Vidal[1], M. De Vittorio[2,3], and •G. Giuliani[1]; [1]University of Pavia, Pavia, Italy; [2]National Nanotechnology Laboratory NNL, Istituto Nanoscienze CNR, Lecce, Italy; [3]Istituto Italiano di Tecnologia @ Università del Salento, Arnesano (Lecce), Italy; [4]Vrije Universiteit Brussel, Brussels, Belgium

The alpha-factor of 1300nm QD laser measured applying external optical modulation is nearly zero, while its value is 3 under current modulation. This difference is attributed to the plasma effect in the wetting layer

CB-P.14 MON

Random lasers driven by engineered pumping

M. Leonetti[1,2], C. Conti[2,3], and •C. Lopez[1]; [1]Instituto de Ciencia de Materiales (CSIC), Madrid, Spain; [2]Istituto dei Sistemi Complessi (CNR), Rome, Italy; [3]Department of Physics, University Sapienza, Rome, Italy

Without a cavity random lasers are intrinsically uncontrollable. Engineering the scattering elements helps controlling emission frequency. Engineering the pumping gives access to parameters such as feedback regime, synchronisation, mode size and single mode selection.

CB-P.15 MON

Modelling Dilute Nitride 1.3 um Quantum Well Lasers: Incorporation of N compositional Fluctuations

X. Sun and •J. Rorison; University of Bristol, Bristol, United Kingdom

Compositional fluctuations of N in GaInNAs result in quantum dot-like fluctuations in the conduction band edge. It is observed to reduce the photon luminescence intensity, broaden the line-width and increase the laser threshold.

CB-P.16 MON

Design and performances of simplified external cavity laser diodes using CRIGF mirrors

X. Buet[1,2], •A. Monmayrant[1,2], S. Calvez[1,2], C. Tourte[1,2], F. Lozes-Dupuy[1,2], and O. Gauthier-Lafaye[1,2]; [1]CNRS, LAAS, Toulouse, France; [2]Univ de Toulouse, LAAS, Toulouse, France

Cavity-Resonator-Integrated-Grating-Filters combine resonant-grating-filters performances and large angular tolerance. Wavelength stabilization of a 850 nm emitting semiconductor laser is achieved using a simplified cat's eye cavity. System performances will be discussed, together with pathways for ameliorations.

CB-P.17 MON

Investigation of design parameters of 633 nm diode lasers with internal surface gratings for narrow spectral linewidth

•D. Feise[1], G. Blume[1], W. John[1], J. Pohl[1], B. Sumpf[1], H. Thiem[2], M. Reggentin[2], J. Wiedmann[2], and K. Paschke[1]; [1]Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany; [2]eagleyard Photonics GmbH, Berlin, Germany

Wavelength stabilized diode lasers for applications in spectroscopy and interferometry have been developed by monolithic integration of tenth order surface DBR gratings. The influence of design parameters like grating period et al. will be presented.

CB-P.18 MON

Generation of Single Frequency Highly Coherent High-Order Laguerre Gaussian Modes with Vertical-External-Cavity-Surface-Emitting-Laser

•M. Sellahi[1], M. Myara[1], I. Sagnes[2], S. Blin[1], and A. Garnache[1]; [1]IES-CNRS UMR5214, Université de Montpellier 2, Montpellier, France; [2]LPN-CNRS, Marcoussis, France

We demonstrate the generation of single frequency high order Laguerre Gauss transverse modes with Vertical-External-Cavity-Surface-Emitting-Laser. This was achieved by means of sub-wavelength metallic masks deposited on GaAs semiconductor structures and the spatial-hole-burning based mode interaction.

CB-P.19 MON

High-Power Optically Pumped Semiconductor Disk Lasers Using Second-Harmonic Generation

•A. Hein, S. Menzel, M. Rampp, A. Ziegler, and P. Unger; Institute of Optoelectronics, Ulm University, Germany

Characteristics of optically pumped semiconductor disk lasers are presented for the fundamental and second-harmonic regime at 1040nm and 520nm, respectively. High efficiencies for both spectral regions, and wide tuning of the second-harmonic is demonstrated.

CB-P.20 MON

Locking of Laser Cavity Solitons Trapped by Defects in VCSELs

P. Paulau[1], C. McIntyre[2], Y. Noblet[2], W.J. Firth[2], P. Colet[3], T. Ackemann[2], and •G.-L. Oppo[2]; [1]Technische Universität, Berlin, Germany; [2]University of Strathclyde, Glasgow, United Kingdom; [3]IFISC Universitat Illes Balears, Palma de Mallorca, Spain

Defects due to growth fluctuations in semiconductor lasers induce trapping and frequency shifts of laser cavity solitons. We experimentally and theoretically demonstrate frequency and phase locking of trapped solitons in VCSELs with frequency-selective feedback.

CB-P.21 MON

InP quantum dot based semiconductor disk laser emitting at 655 nm

•H. Kahle, R. Bek, F. Hargart, C. Kessler, E. Koroknay, T. Schwarzbäck, M. Jetter, and P. Michler; Institut für Halbleiteroptik und Funktionelle Grenzflächen and Research Center SCoPE, University of Stuttgart, Germany

We present an InP quantum dot semiconductor disk laser emitting at a wavelength of 654 nm. Investigations of the laser system show an output power of 1.4 W with a slope efficiency of 25.4%.

CB-P.22 MON

Characterization of 60GHz passively mode-locked quantum well Fabry-Perot laser for RoF and WPAN applications

•K. Carney, R. Maldonado-Basilio, S. Philippe, and P. Landais; Rince Institute, Dublin City University, Dublin, Republic of Ireland

Characterization of a passively mode-locked FP laser operating at 60GHz with only d.c. bias applied is presented. A beat tone linewith of 10kHz is measured, making the device suitable for RoF and WPAN applications.

CB-P.23 MON

Mode-Locked semiconductor laser with controllable intracavity dispersion and absorption

•J.C. Balzer[1], B. Döpke[1], A. Klehr[2], G. Erbert[2], G. Tränkle[2], and M.R. Hofmann[1]; [1]Lehrstuhl für Photonik und Terahertztechnologie, Ruhr Universität Bochum, Bochum, Germany; [2]Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany

We present an experimental analysis of the influence of intracavity group delay dispersion and absorption on the performance of a passively mode locked semiconductor laser diode.

CB-P.24 MON

Fast controlled switching of modes in semiconductor lasers

•S. Slipchenko; Ioffe Physical-Technical Institute, St Peterburg, Russia

Mode switching effects in semiconductor lasers based on asymmetric heterostructure with low internal optical losses have been investigated and physical principles of new type fast optical power switcher have been developed.

CB-P.25 MON

Spectral gain and cavity loss characterization of an optically-pumped external-cavity surface-emitting quantum well laser

•C.R. Head[1], K.G. Wilcox[1], O.J. Morris[1], A.P. Turnbull[1], H.E. Beere[2], I. Farrer[2], D.A. Ritchie[2], and A.C. Tropper[1]; [1]School of Physics and Astronomy, Southampton University, Southampton, United Kingdom; [2]Cavendish Laboratory, University of Cambridge, Cambridge, United Kingdom

We present two novel methods exploiting the transient laser build-up behavior in order to extract spectral laser gain and cavity loss parameters of a 1-micrometer optically-pumped external-cavity surface-emitting quantum well laser.

CB-P.26 MON

Colliding Pulse Modelocked Lasers for Terahertz Photomixing

•C. Brenner[1], H. Horstkemper[1], I. Cámara Mayorga[2], A. Klehr[3], G. Erbert[3], and M. Hofmann[1]; [1]Ruhr-Universität, Bochum, Germany; [2]Max-Planck Institut, Bonn, Germany; [3]Ferdinand-Braun-Institut, Berlin, Germany

Observation of frequencies up to 1THz with a standard homodyne THz detection setup incorporating colliding pulse modelocked lasers. Presentation of background and results.

CB-P.27 MON

Theoretical analysis of timing jitter in two-section passively mode-locked semiconductor lasers

•A. Pimenov[1], N. Rebrova[2,3], D. Rachinskii[4,5], and A. Vladimirov[1,3]; [1]Weierstrass Institute, Berlin, Germany; [2]Tyndall National Institute, Cork, Republic of Ireland; [3]Cork Institute of Technology, Cork, Republic of Ireland; [4]University College Cork, Cork, Republic of Ireland; [5]University of Texas at Dallas, Dallas, United States

We consider a delay-differential model of a passively mode-locked semiconductor laser. We apply perturbation theory to obtain estimate of pulse timing jitter and study the dependence of noise induced characteristics on laser parameters.

CB-P.28 MON

Efficiency optimization of high power diode lasers at low temperatures

•C. Frevert, P. Crump, H. Wenzel, S. Knigge, F. Bugge, and G. Erbert; Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany

9xx-nm long-cavity (4 mm) high power broad-area lasers achieve power conversion efficiency of 74% at -55°C, increased by 10% compared to room temperature. We demonstrate experimentally that this is dominated by improved differential internal efficiency.

CB-P.29 MON

Influence of the length of the absorber section on the mode locking behaviour of a 1064nm DBR laser determined on a single device

•A. Klehr, T. Prziwarka, O. Brox, F. Bugge, H. Wenzel, and

G. Erbert; *Ferdinand Braun Institut, Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany*

The influence of the length of the absorber section on the mode locking behaviour of a 1064nm DBR laser is investigated. Optimal mode locking was obtained for lengths 0.2mm-0.3mm and absorber voltages -2V to -3V.

CB-P.30 MON

1064 nm wavelength stabilized hybrid ns-MOPA diode laser system for high peak power and low spectral width

•*A. Klehr, B. Sumpf, N. Vu, H. Wenzel, G. Erbert, and G. Tränkle*; *Ferdinand Braun Institut, Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany*

A DBR master oscillator power amplifier (MOPA) system for the generation of ns-pulses with high peak power of 16 W and narrow spectral line with a side mode suppression rate > 42 dBm is realized.

CB-P.31 MON

De-synchronization Events and Leader-Laggard Dynamics Interchange in Chaos Semiconductor Lasers Networks

•*M. Bourmpos, A. Argyris, and D. Syvridis*; *National and Kaposidtrian University of Athens, Ilisia, Athens, Greece*

Well-synchronized coupled lasers in star networks with chaotic emission are shown to exhibit short de-synchronization events. Increased biasing of central hub laser turns from lagging to leading the dynamics of the network, eliminating these events.

CB-P.32 MON

Dynamical characterization of monolithic MOPAs emitting at 1.5 um

J. Javaloyes[1], *M. Vilera*[2], *A. Consoli*[2], *P. Adamiec*[2], *J.M. García-Tijero*[2], *S. Aguilera*[2], *I. Esquivias*[2], *and* •*S. Balle*[1,3]; [1]*Dept. de Física, Univ. Illes Balears, Palma de Mallorca, Spain*; [2]*ETSI Telecomunicación-CEMDATIC, Univ. Politécnica de Madrid, Madrid, Spain*; [3]*Insitut Mediterrani d'Estudis Avançats, IMEDEA (CSIC-UIB), Esporles, Spain*

We study the dynamical characteristics of a monolithic flared MOPA at 1.5 μm. Radio-frequency and optical spectra under CW biasing evidence regimes of self-pulsations and compound cavity effects. A Travelling-Wave-Model reproduces the observed dynamics.

CB-P.33 MON

Bursting in an Optically Injected Two-Mode Laser: The Cusp-Pitchfork Bifurcation

•*S. Osborne*[1], *N. Blackbeard*[1], *S. O'Brien*[1], *and A. Amann*[1,2]; [1]*Tyndall National Institute, University College Cork, Cork, Republic of Ireland*; [2]*School of Mathematical Sciences, University College Cork, Cork, Republic of Ireland*

We present an interesting bursting mechanism in a two-mode laser subjected to optical injection. We show that this bursting is organized by an interaction between a cusp and pitchfork of limit-cycles.

CB-P.34 MON

How to control single mode emission of VCSEL arrays?

•*T. Czyszanowski*[1], *M. Dems*[1], *M. Wasiak*[1], *R.P. Sarzala*[1], *E. Lamothe*[2], *N. Volet*[2], *V. Iakovlev*[2], *and E. Kapon*[2]; [1]*Institute of Physics, Lodz University of Technology, Lodz, Poland*; [2]*Laboratory of Physics of Nanostructures, Ecole Polytechnique Federal de Lausanne (EPFL), Lausanne, Switzerland*

In this paper we present the simulation results of optimization of carrier injection, heat flow and optical confinement aimed for single mode operation of VCSEL arrays.

CB-P.35 MON

Widely-Tunable Five-Section Slotted Lasers

•*M. Nawrocka*[1], *Q. Lu*[1], *W.-H. Guo*[2], *A. Abdullaev*[1], *F. Bello*[1], *J. OCallaghan*[3], *and J. Donegan*[1]; [1]*Trinity College Dublin, Dublin, Republic of Ireland*; [2]*Department of Electrical & Computer Engineering, University of California Santa Barbara, California, United States*; [3]*Tyndall National Institute, Cork, Republic of Ireland*

A re-growth free five-section tunable laser based on slots suitable for photonic integration is presented. A discrete tuning range ~ 55nm with SMSR>30dB has been reported for the fabricated device using the Vernier tuning effect.

CB-P.36 MON

Dynamics of colliding pulse passively semiconductor mode-locked ring lasers with an intra-cavity Mach-Zehnder modulator

•*V. Moskalenko*[1], *J. Javaloyes*[2], *M. Smit*[1], *S. Balle*[2], *and E. Bente*[1]; [1]*Technical University of Eindhoven, Eindhoven, The Netherlands*; [2]*Universitat de les Illes Baleares, Palma de Mallorca, Spain*

We study the dynamics of InGaAsP/InP passively mode-locked quantum well ring lasers in the presence of a gain flattening intra-cavity frequency dependent filter. Control and pulse width reduction is achieved.

CB-P.37 MON

Traveling wave modelling and mode analysis of semiconductor ring lasers

•*M. Radziunas*; *Weierstrass Institute, Berlin, Germany*

The traveling wave model is used for analyzing dynamics of semiconductor ring lasers. Dependence of instantaneous optical modes on model parameters, and the role of these modes within different dynamical regimes are analyzed.

CB-P.38 MON

Theoretical study of beam quality improvement in spatially modulated broad area edge-emitting devices

•*M. Radziunas*[1], *R. Herrero*[2], *M. Botey*[3], *and K. Staliunas*[2,4]; [1]*Weierstrass Institute, Berlin, Germany*; [2]*Departament de Física i Enginyeria Nuclear,Universitat Politècnica de Catalunya, Terrassa, Spain*; [3]*Departament de Física i Enginyeria Nuclear,Universitat Politècnica de Catalunya, Barcelona, Spain*; [4]*Institució Catalana de Recerca i Estudis Avançats (ICREA), Barcelona, Spain*

We analyze properties of broad area amplifiers and lasers with longitudinally and laterally modulated electrical contact. We demonstrate how a proper choice of the spatial periods improves the far fields of the emitted beam.

CB-P.39 MON

High resolution mapping of the dynamics of a nonlinear semiconductor laser system

•*J. Toomey, Y. Noblet, C. Nichkawde, and D. Kane*; *MQ Photonics Research Centre, Macquarie University, Sydney, Australia*

High resolution time series from a semiconductor laser with optical feedback system have been analysed and mapped to confirm previously identified major dynamical regions, observe new low feedback dynamics, and to test reproducibility over time.

CB-P.40 MON

Why Phtonic-Crystal VCSELs do not provide high power emission in the single-mode regime?

•*L. Frasunkiewicz*[1], *T. Czyszanowski*[1], *M. Wasiak*[1], *M. Dems*[1], *R.P. Sarzala*[1], *W. Nakwaski*[1], *and K. Panajotov*[2]; [1]*Institute of Physics, Lodz University of Technology, Lodz, Poland*; [2]*Department of Applied Physics and Photonics, Vrije Universiteit Brussels, Brussels, Belgium*

In this paper we investigate the influence of parameters of photonic crystal on the slope efficiency, emitted power and tuning range in single mode VCSELs.

CB-P.41 MON

Analysis of gain properties in silver-clad nanowire lasers

•*Z. Abdul Sattar and K.A. Shore*; *Bangor University, Bangor, United Kingdom*

Analysis of GaN nanowire lasers is performed for wavelengths in the range 330nm-830nm. Modal gains of order 8000cm-1 and 1100cm-1 are found for TE01 and TM01 modes respectively thereby enabling lasing with appropriate cavity lengths.

13:30 – 14:30

JSIV-P: JSIV Poster Session

JSIV-P.1 MON

Ultrafast Energy Transfer and Excitonic Coupling in an Artificial Photosynthetic Antenna

•*M. Maiuri*[1], *J. Snellenburg*[2], *I. van Stokkum*[2], *S. Pillai*[3], *D. Gust*[3], *T. Moore*[3], *A. Moore*[3], *R. van Grondelle*[2], *G. Cerullo*[1], *and D. Polli*[1]; [1]*Politecnico di Milano, Milano, Italy*; [2]*Department of Physics and Astronomy, VU University Amsterdam, Amsterdam, The Netherlands*; [3]*Department of Chemistry & Biochemistry, Arizona State University, Tempe, United States*

Combining ultrafast spectroscopy with target analysis on an artificial photosynthetic antenna, we quantify around 37% of Carotenoid to Phthalocyanine energy transfer efficiency and identify spectral signatures of excited state coupling between the two moieties

JSIV-P.2 MON

Selective probing of electronic and nuclear coherences using time-resolved off-resonant excitation of Raman-active vibration modes

•*E. Gaižauskas*; *Vilnius university, Vilnius, Lithuania*

Raman enhanced four-wave mixing in three-level quantum system was analized theoretically. It was shown, that signall efficiency induced by weak resonant probe allows one to tell electronic coherences from the nuclear one.

Hall B0

13:30 – 14:30

IB-P: IB Poster Session

IB-P.1 MON

Demonstration of a Fully Tuneable Entangling Gate for Continuous-Variable Cluster Computation

•*S. Yokoyama*[1], *R. Ukai*[1], *S.C. Armstrong*[1,2], *J.-i. Yoshikawa*[1], *P. van Loock*[3], *and A. Furusawa*[1]; [1]*The University of Tokyo, Tokyo, Japan*; [2]*The Australian National University, Canberra, Australia*; [3]*University Mainz, Mainz, Germany*

We present a fully tuneable entangling gate, T_Z, in the context of one-way quantum computations. We demonstrate T_Z via a three-mode optical cluster state by propagating two independent modes through and tuning the entanglement strength.

IB-P.2 MON

Quantum state fusion in photons

•*N. Spagnolo*[1], *C. Vitelli*[2,1], *L. Aparo*[1], *F. Sciarrino*[1], *E. Santamato*[3], *and L. Marrucci*[3,4]; [1]*Dipartimento di Fisica, Sapienza Università di Roma, Roma, Italy*; [2]*Center of Life NanoScience @ La Sapienza, Istituto Italiano di Tecnologia, Roma, Italy*; [3]*Dipartimento di Scienze Fisiche, Università di Napoli "Federico II", Compl. Univ. di Monte S. Angelo, Napoli, Italy*; [4]*CNR-SPIN, Complesso Universitario di Monte S. Angelo, Napoli, Italy*

We propose and experimentally demonstrate a physical process, named quantum state fusion, in which two input qubits written in two input photons in different degrees of freedom are combined into a single output photon.

IB-P.3 MON

Virtual Noiseless Amplification

•*J. Janousek*[1], *H. Chrzanowski*[1], *S. Hosseini*[1], *S. Assad*[1], *T. Symul*[1], *N. Walk*[2], *T. Ralph*[2], *and P.K. Lam*[1]; [1]*Australian National University, Canberra, Australia*; [2]*University of Queensland, Brisbane, Australia*

We show an experimental implementation of a virtual noiseless amplifier, via post-selective measurements performed on a pair of EPR entangled Gaussian beams. Using the NLA protocol, we realize a dramatic increase in entanglement.

IB-P.4 MON

Complete experimental toolbox for alignment-free quantum communication

•*V. D'Ambrosio*[1], *E. Nagali*[1], *S. Walborn*[2], *L. Aolita*[3], *S. Slussarenko*[4], *L. Marrucci*[4], *and F. Sciarrino*[1]; [1]*Sapienza, Università di Roma, Rome, Italy*; [2]*Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil*; [3]*Dahlem Center for Complex Quantum Systems, Berlin, Germany*; [4]*Università di Napoli Federico II, Naples, Italy*

Standard quantum communication approaches need a shared reference frame. This issue can be overcome by encoding information in hybrid polarization-orbital angular momentum single photon states.

IB-P.5 MON

Entanglement Swapping with Local Certification: Application to Remote Micromechanical Resonators

M. Abdi[1,2], •*S. Pirandola*[3], *P. Tombesi*[1], *and D. Vitali*[1]; [1]*School of Science and Technology, University of Camerino, Camerino, Iran*; [2]*Department of Physics, Sharif University of Technology, Tehran, Iran*; [3]*Department of Computer Science, University of York, York, United Kingdom*

We propose a protocol for entanglement swapping which involves tripartite systems. The generation of remote entanglement induced by the Bell measurement can be certified by additional local measurements. We apply the protocol to optomechanical systems.

IB-P.6 MON

High-rate single photons in a pure quantum state for quantum communication

•*C. Kurz*[1], *J. Huwer*[1,2], *M. Schug*[1], *P. Müller*[1], *and J. Eschner*[1]; [1]*Experimentalphysik, Universität des Saarlandes, Saarbrücken, Germany*; [2]*ICFO – The Institute of Photonic Sciences, Castelldefels (Barcelona), Spain*

We generate high-rate single photons in a single quantum state by spontaneous Raman scattering in a trapped ion. Photon frequency, polarization and temporal shape are laser-controlled. The photons create quantum jumps in another, distant ion.

IB-P.7 MON

Fast real-time random numbers from vacuum fluctuations

•*T. Symul, S. Assad, and P.K. Lam*; *Australian National University, Canberra, Australia*

We present a robust quantum random number generator based on measuring the quantum fluctuations of the vacuum field. Our device achieves a real-time continuous generation bandwidth of 5.7Gb/s and is made available on the Internet.

IB-P.8 MON

Multimode homodyne detection as a tool for cluster state generation and gaussian quantum computation

•*G. Ferrini*; *Laboratoire Kastler Brossel, Paris, France*

We study a compact way to implement simple measurement-based quantum computations in a CV-Optical setting. Our method is based on the multi-pixel measurement of correlated states produced by a SPOPO in a suitable basis.

IB-P.9 MON

Direct characterization of any linear photonic device

•*S. Rahimi-Keshari*[1], *M. Broome*[1,2], *R. Fickler*[3,4], *A. Fedrizz*[1,2], *T. Ralph*[1], *and A. White*[1,2]; [1]*Centre for Quantum Computer and Communication Technology, School of Mathematics and Physics, University of Queensland, Brisbane, Australia*; [2]*Centre for Engineered Quantum Systems, School of Mathematics and Physics, University of Queensland, Brisbane, Australia*; [3]*Quantum Optics, Quantum Nanophysics, Quantum Information, University of Vienna, Vienna, Austria*; [4]*Institute for Quantum Optics and Quantum Information, Vienna, Austria*

We introduce an effcient method for characterizing any multi-mode linear photonic network. Our method employs a standard laser source and photodetectors to directly determine all moduli and non-trivial phases of the matrix describing the network.

IB-P.10 MON

Widely-tunable, spectrally pure, high efficient photon pairs generation at telecom wavelength

•*R. Jin*[1], *R. Shimizu*[2], *K. Wakui*[1], *H. Benichi*[1], *and M. Sasaki*[1]; [1]*National Institute of Information and Communications Technology, Tokyo, Japan*; [2]*University of Electro-Communications, Tokyo, Japan*

We theoretically and experimentally investigate the spectral tunability and purity of photon pairs generated from periodically poled KTiOPO4. The spectral purity can be higher than 0.98 when the wavelength is tuned from 1460 nm to 1675 nm.

IB-P.11 MON

Optimal Unambiguous Discrimination of Two Incompatible Quantum Measurements

•*M. Miková*[1], *M. Sedlák*[1], *I. Straka*[1], *M. Mičuda*[1], *M. Ziman*[2,3], *M. Ježek*[1], *J. Fiurášek*[1], *and M. Dušek*[1]; [1]*Faculty of Science, Palacký University, Olomouc, Czech Republic*; [2]*Research Center for Quantum Information, Slovak Academy of Sciences, Bratislava, Slovakia*; [3]*Faculty of Informatics, Masaryk University, Brno, Czech Republic*

We have experimentally demonstrated one-copy optimal unambiguous discrimination of two incompatible quantum measurements. Our linear-optics implementation used pairs of photon entangled in polarization, unambiguous state discrimination, and electronic feed-forward.

IB-P.12 MON

Towards a basic quantum repeater link over 400m with heralded entanglement of 87Rb-atoms

•*K. Redeker*[1], *D. Burchardt*[1], *N. Ortegel*[1], *J. Hofmann*[1], *M. Krug*[1], *M. Weber*[1], *W. Rosenfeld*[1,2], *and H. Weinfurter*[1,2]; [1]*Fakultät für Physik, Ludwig-Maximilians-Universität, München, Germany*; [2]*Max-Planck-Institut für Quantenoptik, München, Germany*

We present our progress towards a basic quantum repeater link establishing entanglement between two single trapped 87Rb-atoms separated by a distance of 400m.

IB-P.13 MON

Demonstration of Nonlocal Dispersion Cancelled Two-Photon Bessel Interference in Frequency Domain

B. Galmes, J.-P. Decurey, I. Mbodji, L. Furfaro, K. Phan Huy, L. Larger, J.M. Dudley, and •*J.-M. Merolla*; *FEMTO-ST, Besançon, France*

We present a method to perform a non local cancellation dispersion. Distance independent two photon Bessel interference in frequency domain shows that the introduction of a local negative dispersion allows compensating the global dispersion effect.

IB-P.14 MON

Qudit implementations with broadband energy-time entangled photons

•*B. Bessire, C. Bernhard, A. Stefanov, and T. Feurer*; *Institute of Applied Physics, Bern, Switzerland*

We demonstrate generic qudit encoding in the spectrum of energy-time entangled photons by means of pulse shaping techniques known from fs-laser physics. Two-photon interference is realized up to d=4 using two different discretization schemes.

IB-P.15 MON

Photonic phase-gate using Rydberg atoms and microwaves

•*D. Paredes-Barato, H. Busche, D. Maxwell, D. Szwer, M. Jones, and C. Adams*; *Joint Quantum Centre Durham-Newcastle, Durham, United Kingdom*

We propose a deterministic photonic phase-gate scheme using microwave control of Rydberg polaritons. Processing fidelities in excess of 90% are expected for realistic experimental parameters.

IB-P.16 MON

Bipartite Quantum Correlations in a Fast-Light Medium Generated with Four-Wave-Mixing in Rubidium Vapour

•*U. Vogl, R. Glasser, and P. Lett*; *NIST and Joint Quantum Institute, Gaithersburg, United States*

We demonstrate the propagation of bipartite quantum correlations through a fast-light medium with four-wave-mixing in rubidium vapor, and explore the possible advancement and the noise-characteristics of the system.

Hall B0

IB-P.17 MON

State transfer with time-dependent Hamiltonians in waveguide arrays

•*S. Weimann*[1], *A. Kay*[2], *R. Keil*[1], *S. Nolte*[1], *and A. Szameit*[1]; [1]*Institute of applied Physics, Abbe Center of Photonics, Friedrich-Schiller-University Jena, Jena, Germany*; [2]*Department of Mathematics, Royal Holloway, University of London, Egham, United Kingdom*

We emulate perfect quantum state transfer through a chain of spin-1/2-particles with time-dependent couplings in waveguide arrays. The robustness of the transfer scheme to imperfections of the couplings is analyzed experimentally.

IB-P.18 MON

A reversible optical memory for twisted photons

•*L. Veissier*[1], *A. Nicolas*[1], *L. Giner*[1], *D. Maxein*[1], *A. Sheremet*[2], *E. Giacobino*[1], *and J. Laurat*[1]; [1]*Laboratoire Kastler Brossel, Paris, France*; [2]*State Polytechnic University, Saint Petersburg, Russia*

We report on an optical memory which enables the reversible mapping of Laguerre-Gaussian modes at the single-photon level. This opens the possibility of storage of qubits encoded in orbital angular momentum.

IB-P.19 MON

Broadband Quantum-Correlated Photon-Pairs in the O-Band Generated from a Dispersion-Engineered Silicon Waveguide

•*M.T. Liu*[1], *Y. Huang*[1,2], *W. Wang*[3], *and H.C. Lim*[1,3]; [1]*School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore, Singapore*; [2]*Currently with Institute of Microelectronics, Agency for Science, Technology and Research (A*STAR), Singapore, Singapore*; [3]*Emerging Systems Division, DSO National Laboratories, Singapore, Singapore*

We demonstrate the first broadband source of quantum-correlated photon-pairs in the O-band using a 2.6-mm-long dispersion-engineered silicon waveguide.

IB-P.20 MON

Multidimensional Quantum Walks: Diabolical Points, Optical Wave-like propagation and Multipartite Entanglement

G.J. de Valcárcel[1], *C. Di Franco*[4], *M. Hinarejos*[2], *A. Pérez*[2], *E. Roldán*[1], *A. Romanelli*[3], *and* •*F. Silva*[1]; [1]*Departament d'Òptica, Universitat de València, Burjassot, Spain*; [2]*Departament de Física Teòrica and IFIC, Universitat de València and CSIC, Burjassot, Spain*; [3]*Instituto de Física, Facultad de Ingeniería, Universidad de la República, Montevideo, Uruguay*; [4]*Centre for Theoretical, Atomic, Molecular and Optical Physics; Queen's University, Belfast, United Kingdom*

We study multidimensional quantum walks concentrating on their dispersion relation. We describe wave-like propagation as well as dynamics governed by diabolical points. We demonstrate that alternate QWs exhibit genuine multipartite entanglement and discuss their implementability.

13:30 – 14:30

ID-P: ID Poster Session

ID-P.1 MON

Broadband Fabry-Perot cavity for quantum-limited frequency comb metrology

•*R. Schmeissner, V. Thiel, C. Fabre, and N. Treps*; *Laboratoire Kastler Brossel, Paris, France*

We study a broadband, high finesse optical cavity in combination with spectrally resolved balanced homodyne detection as a tool to analyze the modal structure of a 40nm FWHM optical frequency comb in amplitude and phase.

ID-P.2 MON

Carrier-envelope frequency stabilization of a Ti:sapphire oscillator using different pump lasers

•*A. Vernaleken*[1], *B. Schmidt*[2], *T.W. Hänsch*[1], *R. Holzwarth*[1,2], *and P. Hommelhoff*[1,3]; [1]*Max-Planck-Institut für Quantenoptik, Garching, Germany*; [2]*Menlo Systems GmbH, Martinsried, Germany*; [3]*Universität Erlangen-Nürnberg, Erlangen, Germany*

The suitability of several commercial pump lasers for operation with a carrier-envelope offset frequency stabilized Ti:sapphire oscillator is investigated. We find that they are all well-suited for the purpose.

ID-P.3 MON

Phase Noise and Spectral Bandwidth of SiN Microresonator Frequency Combs

•*V. Brasch, T. Herr, M. Pfeiffer, J. Jost, and T. Kippenberg*; *École Polytechnique Fédéral de Lausanne (EPFL), Lausanne, Switzerland*

The phase noise behavior and bandwidth of microresonator frequency combs are determined by the microresonator properties such as the dispersion and Q-factor. We measure and relate the properties of the comb and of the resonator.

ID-P.4 MON

Soliton mode-locking in optical microresonators

•*T. Herr*[1], *V. Brasch*[1], *J. Jost*[1], *C. Wang*[1], *N. Kondratiev*[2], *M. Gorodetsky*[2], *and T. Kippenberg*[1]; [1]*Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland*; [2]*M.V. Lomonosov Moscow State University, Moscow, Russia*

We demonstrate soliton mode-locking in a continuously pumped, non-linear optical MgF_2 microresonator, resulting in low-noise frequency comb spectra and ultrashort pulses of 200 fs duration with a repetition rate of 35.2 GHz.

ID-P.5 MON

Minimum Requirements for Feedback Enhanced Force Sensing

•*G.I. Harris*[1], *D. McAuslan*[1], *T. Stace*[1], *A. Doherty*[2], *and W.P. Bowen*[1]; [1]*Centre for Engineered Quantum Systems, Brisbane, Australia*; [2]*Centre for Engineered Quantum Systems, Sydney, Australia*

Thermomechanical noise is a limiting factor in many MEMS and NEMS based sensors. It has been proposed that feedback can enhance force sensing. However, we show the same enhancement can be made with postprocessing alone.

ID-P.6 MON

Mid-IR frequency control using an optical frequency comb and a remote near-infrared frequency reference

B. Chanteau[1], *B. Argence*[1], *O. Lopez*[1], *W. Zhang*[2], *D. Nicolodi*[2], *M. Abgrall*[2], *F. Auguste*[1], *P.L.T. Sow*[1], *S. Mejri*[1], *S.K. Tokunaga*[1], *C. Daussy*[1], *B. Darquié*[1], *G. Santarelli*[2,3], *C. Chardonnet*[1], *Y. Le Coq*[2], *and* •*A. Amy-Klein*[1]; [1]*Laboratoire de Physique des Lasers, Villetaneuse, France*; [2]*LNE-SYRTE, Paris, France*; [3]*Laboratoire Photonique, Numérique et Nanosciences, Talence, France*

We present a new method for accurate mid-infrared frequency stabilization against a near-infrared reference conveyed in a long-distance fibre link and continuously monitored against atomic fountain clocks. Stability below 3x10-14 was demonstrated at 30 THz.

ID-P.7 MON

Multipole, nonlinear and anharmonic contributions to uncertainties of clocks on neutral atoms in optical lattices

•*V. Ovsiannikov*[1] *and V. Pal'chikov*[2]; [1]*Voronezh State University, Voronezh, Russia*; [2]*VNIIFTRI, Mendeleevo, Russia*

Contributions to standard frequency shifts, linear and quadratic in laser intensity, determined by E1, M1 and E2 interactions of atoms with a trapping field of magic-wavelength optical lattice are analyzed in harmonic and anharmonic approximations.

ID-P.8 MON

Compact and Robust Repumper Light Source for Sr Single-Ion Traps

•*T. Fordell, T. Lindvall, T. Hieta, and M. Merimaa*; *Centre for Metrology and Accreditation (MIKES), Espoo, Finland*

An unpolarized, incoherent repumper for Sr single-ion clocks is presented. This broadband, all-fibre ASE source prevents dark states from forming, requires no frequency stabilization, is adjustment free, and can be switched off electronically during interrogation.

NOTES

ROOM 1

8:30 – 10:00

CD-8: New Guiding Phenomena

Chair: Miroslav Karpierz, Warsaw University of Technology, Warsaw, Poland

CD-8.1 TUE (Invited) 8:30

Electro-optic routing of spatial solitons in nematic liquid crystals

•*A. Piccardi, A. Alberucci, and G. Assanto; Nonlinear Optics and OptoElectronics Lab (NooEL), University of Rome Roma Tre, Rome, Italy*

We present several configuration of planar nematic liquid crystal cells for the electric control of optical spatial solitons propagation by achieving amplitude and frequency modulation of linear and nonlinear properties of the medium.

CD-8.2 TUE 9:00

Diffraction resisting zero-order Bessel-like and higher-order vortex Bessel-like beams with arbitrary trajectories

•*N.K. Efremidis[1], I.D. Chremmos[1], J. Zhao[2,3], Z. Chen[2], and D.N. Christodoulides[3]; [1]Department of Ap-*

ROOM 4a

8:30 – 10:00

JSV-1: Superconducting Optics

Chair: Robert Hadfield, University of Glasgow, U.K. & Franco Nori, Riken, Japan and The University of Michigan, Ann Arbor, USA

JSV-1.1 TUE (Invited) 8:30

Superconducting Single Photon Detectors

•*S.W. Nam[1], B. Calkins[1], T. Gerrits[1], A.E. Lita[1], F. Marsili[1], V.B. Verma[1], I. Vayshenker[1], R.P. Mirin[1], M. Shaw[2], W. Farr[2], and J.A. Stern[2]; [1]NIST, Boulder, United States; [2]JPL, Pasadena, United States*

Superconducting single photon detectors can offer performance that is unmatched by any other detector technology. We describe our research to improve these detectors so that these detectors can be used in systems with detection efficiency approaching 100%.

JSV-1.2 TUE 9:00

Enhanced absorptance of infrared single-photon detectors comprising plasmonic structure integrated NbN pattern on silicon substrate

G. Szekeres, Á. Sipos, and •M. Csete; University of Szeged, Department of Optics and

ROOM 4b

8:30 – 10:00

CI-2: Integrated Circuits

Chair: Yonglin Yu, Huazhong University of Science and Technology, China

CI-2.1 TUE 8:30

Application of InAs quantum dots for high-speed photodiodes in fiber optics

•*T. Umezawa, K. Akahane, A. Kanno, and T. Kawanishi; National Institute of Information and Communication Technology, Tokyo, Japan*

We designed and demonstrated a new high speed PIN photodiode using an InAs/InAlGaAs quantum dot absorption layer for future fiber optic technology. The design and the basic properties including avalanche multiplication have been discussed.

CI-2.2 TUE 8:45

Application Specific Photonic Integrated Circuits for Telecommunications

•*S. Stopiński[1,2], K. Ławniczuk[1,2], K. Welikow[1], A. Jusza[1], P. Gdula[1], P. Szczepański[1], X. Leijtens[2], M. Smit[2], and R. Piramidowicz[1]; [1]Institute of Microelectronics and Optoelectronics of Warsaw University of Technology, Warsaw, Poland; [2]COBRA Research Institute, Eindhoven University of Technology, Eindhoven, The Netherlands*

In this work several InP-based photonic integrated circuits for application in telecommunication systems and networks are demonstrated. The design and measurement results of chips fabricated in multi-project wafer runs according to generic concept are presented.

CI-2.3 TUE (Invited) 9:00

Low energy consumption and high speed germanium-based optoelectronic devices

D. Marris-Morini[1], P. Chaisakul[1], M.-S. Rouifed[1], J. Frigerio[2], G. Isella[2], D. Chrastina[2], and •L. Vivien[1]; [1]Institut d'Electronic Fondamentale - CNRS-Univ.

ROOM 13a

8:30 – 10:00

CM-3/LIM: Precision Processing in Micro to Nano Scale by Ultrafast Lasers (Session jointly held with LIM)

Chair: Boris Chichkov, Laser Zentrum, Hannover, Germany

CM-3/LIM.1 TUE (Invited) 8:30

Welding of Glass/Glass and Si/Glass using Ultrashort Laser Pulses

•*I. Miyamoto; Osaka University, Osaka, Japan; Erlangen Graduate School of Advanced Optical Technologies, Erlangen, Germany*

Laser energy deposition process in glass/glass and Si/glass using ultrashort laser pulses at high-pulse repetition rates is discussed by simulation model based on thermal conduction theory, and the weld joints are characterized by different tests.

CM-3/LIM.2 TUE (Invited) 9:00

Delocalization of focused intense ultra-short laser pulses in air and transparent solids

•*V. Konov, V. Kononenko, S. Klimentov, and P. Pivovarov; General Physics Institute, Moscow, Russia*

ROOM 13b

8:30 – 10:00

CB-4: Ultrafast Semiconductor Lasers II

Chair: Judy Rorison, University of Bristol, United Kingdom

CB-4.1 TUE 8:30

Optimized InAs/AlGaAs Quantum Dot Semiconductor Optical Amplifier Tapered Geometry For Enhanced Beam Quality and Optical Gain

•*C. Mesaritakis[1], A. Kapsalis[1], C. Simos[1], H. Simos[1], M. Krakowski[2], and D. Syvridis[1]; [1]National and Kapodistrian University of Athens, Athens, Greece; [2]Alcatel - Thales 3-5 Lab, Palaiseau, France*

A novel quantum dot amplifier design is compared to an optimized flared geometry. Measurements revealed enhancement in beam quality in terms of M2 and coupling. This design exhibited increased gain by a factor of 6dB.

CB-4.2 TUE 8:45

Picosecond pulse generation with 34W peak power using a monolithic quantum-dot tapered mode-locked laser and tapered optical amplifier

•*L. Drzewietzki[1], S. Breuer[1], M. Rossetti[2], T. Xu[2], P. Bardella[2], H. Simos[3], C. Mesaritakis[3], M. Ruiz[4], I. Krestnikov[5], D. Livshits[5], M. Krakowski[4], D. Syvridis[3], I. Montrosset[2], E. Rafailov[6], and W. Elsäßer[1]; [1]Technische Universität Darmstadt, Darmstadt, Germany; [2]Politecnico di Torino, Torino, Italy; [3]National and Kapodistrian University of Athens, Athens, Greece; [4]Alcatel-Thales III-V Lab, Palaiseau Cedex, France; [5]Innolume GmbH, Dortmund, Germany; [6]University of Dundee, Dundee, United Kingdom*

Generation of ultra-short pulses by a mode-locked monolithic tapered QD laser and tapered QD SOA yielding a peak-power of 34W with a pulse width of 1.62ps at a repetition rate of 16 GHz is demonstrated.

CB-4.3 TUE 9:00

Passively mode-locked red VECSEL

•*A. Härkönen, S. Ranta, T. Leinonen, J. lyytikäinen, and M. Guina; Optoelectronics Research Centre, Tampere University of Technology, Tampere, Finland*

We demonstrate a passively SESAM mode-

ROOM 14a

8:30 – 10:00

IB-2: Integrated Quantum Photonics and Simulation

Chair: Andreas Poppe, Austrian Institute of Technology, Vienna, Austria

IB-2.1 TUE (Invited) 8:30

Quantum simulation with integrated photonics

•*F. Sciarrino; Sapienza Università di Roma, Rome, Italy*

Integrated photonic circuits with three dimensional geometries, realized with ultrafast laser writing, have a strong potential to perform quantum information processing. By adopting such approach we report several experiments of quantum simulation.

IB-2.2 TUE 9:00

Anderson localization of bosonic and fermionic two-particle systems with integrated optics

•*L. Sansoni[1], F. Sciarrino[1,2], P. Mataloni[1,2], A. Crespi[3,4], R. Osellame[3,4], R. Ramponi[3,4], V. Giovannetti[5], and R. Fazio[5,6]; [1]Dipartimento di Fisica, Sapienza Università di Roma, Roma, Italy; [2]Istituto Nazionale di Ottica, Consiglio Nazionale delle Ricerche (INO-CNR), Firenze, Italy; [3]Istituto di Fotonica e Nanotecnologie, Con-*

ROOM 14b

8:30 – 10:00

CA-5: Yb-Doped Thin Disk Lasers

Chair: Evgeni Sorokin, Technical University, Vienna, Austria

CA-5.1 TUE 8:30

Towards high average output power and short pulse duration of SESAM modelocked thin disk lasers

•*C. Schriber[1], C. Saraceno[1], F. Emaury[1], M. Golling[1], K. Beil[2], C. Krankel[2,3], T. Südmeyer[1,4], G. Huber[2,3], and U. Keller[1]; [1]ETH Zürich, Zurich, Switzerland; [2]Universität Hamburg, Hamburg, Germany; [3]The Hamburg Centre for Ultrafast Imaging, Hamburg, Germany; [4]University of Neuchâtel, Neuchâtel, Switzerland*

We explore the pulse duration limits of high-power SESAM modelocked thin disk lasers based on Yb-doped sesquioxides. We achieve 25 W and 185 fs with Yb:Lu2O3. The novel broadband gain material Yb:(Sc,Y,Lu)2O3 enables 101-fs pulses.

CA-5.2 TUE 8:45

Yb:CALGO thin-disk femtosecond oscillator

S. Ricaud[1,5], A. Jaffres[2], K. Wentsch[3], A. Suganuma[2], B. Viana[2], P. Loiseau[2], B. Weichelt[3], M. Abdou Ahmed[3], T. Graf[3], D. Rytz[4], C. Hönninger[5], E. Mottay[5], P. Georges[1], and •F. Druon[1]; [1]Laboratoire Charles Fabry, Institut d'Optique, Palaiseau, France; [2]Chimie-Paristech, Laboratoire de Chimie de la Matière Condensée de Paris, Paris, France; [3]Institut für Strahlwerkzeuge, Stuttgart, Germany; [4]FEE gmbh, Idar-Oberstein, Germany; [5]Amplitude Systemes, Pessac, France

We present the first results on high-power fs oscillators based on Yb:CALGO in thin disk architecture. We demonstrate 28 W, 1.3 uJ, 300 fs pulses and 20 W, 0.9 uJ, 197 fs pulses.

CA-5.3 TUE 9:00

Yb:CaGdAlO$_4$ Thin Disk Laser with 70% Slope Efficiency

•*K. Beil[1], B. Deppe[1,2], and C. Kränkel[1,2]; [1]Institute of Laser-Physics, Hamburg, Germany; [2]The Hamburg Centre for Ultrafast Imaging, Hamburg, Germany*

ROOM 21

8:30 – 10:00

IG-1: Synchronization Dynamics & Opto-mechanical Self-organization

Chair: Thorsten Ackemann, University of Strathclyde, Glasgow, United Kingdom

IG-1.1 TUE (Invited) 8:30

Synchronization of N coupled dipoles: From Anderson to Dicke

•*R. Kaiser; INLN, Nice, France*

Interferences in multiple scattering of light in dense media is expected to lead to Anderson localisation. We show that the synchronisation between the induced dipoles rather leads to extended Dicke super- and subradiance.

IG-1.2 TUE 9:00

Spontaneous Opto-Mechanical Structures in Cold Atomic Gases

•*E. Tesio[1], G. Robb[1], T. Ackemann[1], P. Gomes[1], A. Arnold[1], W. Firth[1], G.-L. Oppo[1], G. Labeyrie[2], and R. Kaiser[2]; [1]University of Strathclyde, Glasgow, United Kingdom;*

ROOM EINSTEIN

8:30 – 10:00

CE-4: Optical Fibres and Waveguides

Chair: Stefan Kück, Physikalisch-Technische Bundesanstalt, Braunschweig, Germany

CE-4.1 TUE 8:30

Delivery of high-power nanosecond and picosecond pulses through a hollow-core Negative Curvature Fibre for micro-machining applications

•*P. Jaworski[1], F. Yu[2], R.R.J. Maier[1], W.J. Wadsworth[2], T.A. Birks[2], J.C. Knight[2], J.D. Shephard[1], and D.P. Hand[1]; [1]Applied Optics and Photonics group, School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom; [2]Centre for Photonics and Photonic Materials, Department of Physics, University of Bath, Bath, United Kingdom*

High-power picosecond pulses, required for high-precision micro-machining in the IR spectral region with average power above 36W and energy of 92uJ were delivered through a hollow-core Negative Curvature Fibre and demonstrated in fibre-based laser micro-machining.

CE-4.2 TUE 8:45

Experimental and numerical investigations on asymmetric fused fibre couplers consisting of different single-mode fibres

•*G. Pelegrina-Bonilla[1], K. Hausmann[1,2], H. Tünnermann[1,2], P. Weßels[1,2], H. Sayinc[1,2], U. Morgner[1,2,3], J. Neumann[1,2], and D. Kracht[1,2]; [1]Laser Zentrum Hannover e.V., Hannover, Germany; [2]Centre for Quantum Engineering and Space-Time Research - QUEST, Hannover, Germany; [3]Institut für Quantenoptik, Leibniz Universität Hannover, Hannover, Germany*

The maximum coupling in an asymmetric fused fibre coupler is improved from 20% to 85% by systematically tuning the pretaper length. The trends in coupler performance and coupling mechanism are analysed using GPU accelerated BPM.

CE-4.3 TUE 9:00

Birefringence optimization in PM fibers by specifically influencing the draw induced intrinsic stresses

•*F. Just, R. Spittel, S. Grimm, S. Unger, J. Bierlich, M. Jäger, K. Schuster, and H. Bartelt; Institute of Photonic Technology, Jena, Ger-*

NOTES

ROOM 1

plied Mathematics, University of Crete, Heraclion, Greece; [2]Department of Physics and Astronomy, San Francisco State University, San Francisco, United States; [3]CREOL/College of Optics & Photonics, University of Central Florida, Orlando, United States

We propose a method for generating linear and nonlinear fundamental Bessel-like optical beams and higher-order vortex Bessel-like beams that follow arbitrary trajectories with a remarkably invariant main lobe. Our results are experimentally verified in free-space.

CD-8.3 TUE 9:15

Self-Organized Optical Waveguides Targeting Luminescent Objects in Photopolymers

•*T. Yoshimura and M. Seki; Tokyo University of Technology, Hachioji, Tokyo, Japan*

Self-organized waveguides targeting luminescent objects in photopolymers was investigated to find that, with increasing the write beam wavelength, tolerance of lateral misalignment increases while waveguides diffuse due to an increase in the write beam diffraction.

CD-8.4 TUE 9:30

Sharp Transition between ballistic and diffusive Transport in PT-symmetric Media

•*T. Eichelkraut, R. Heilmann, S. Stützer, S. Nolte, and A. Szameit; Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Jena, Germany*

It is theoretically and experimentally demonstrated that in PT-symmetric media ballistic and diffusive transport coexist, but on different time scales. The transition between both regimes is rather sharp and depends only on the gain-loss ratio.

ROOM 4a

Quantum Electronics, Szeged, Hungary

Novel reflector, nano-cavity-array and nano-cavity-deflector-array integrated SNSPD devices were designed, consisting of NbN patterns on silica substrate. It was shown that the coupled plasmonic resonances result in huge absorptance enhancement on long periodic integrated devices.

JSV-1.3 TUE (Invited) 9:15

Producing correlated photons using superconducting circuits

•*G. Johansson; Chalmers University of Technology, Gothenburg, Sweden*

In this talk, I will discuss the production of correlated pairs of microwave photons using superconducting circuits. Starting from the basic non-linear element, i.e. the Josephson junction, I'll cover both theory and recent experimental demonstrations.

ROOM 4b

Paris Sud, Orsay, France; [2]L-Ness - Dipartimento di Fisica del Politecnico di Milano, Como, Italy

We report recent results obtained on Ge/SiGe quantum well optoelectronic device for high speed and low power consumption light modulation at telecom wavelengths.

CI-2.4 TUE 9:30

Integrated Microwave Photonic Signal Processors in TriPleX Waveguide

•*L. Zhuang[1], A. Leinse[2], R. Heideman[2], P. van Dijk[3], and C. Roeloffzen[1,3]; [1]University of Twente, Enschede, The Netherlands; [2]LioniX BV, Enschede, The Netherlands; [3]SATRAX BV, Enschede, The Netherlands*

Various complex RF functionalities have been demonstrated on the integrated microwave photonic signal processors realized in TriPleX waveguide technology, including an integrated beamformer which enables full Ku-band, squint-free, seamless-beamsteering, satellite-tracking phased array antennas.

ROOM 13a

It is shown that both in gases and transparent materials plasma, produced by leading part of intense fs-ps laser pulses, results in strong intensity limitation. Up to 99% of pulse energy can be scattered outside focused beam caustic.

CM-3/LIM.3 TUE (Invited) 9:30

Three-Dimensional Laser Lithography: Finer Features Faster

E. Waller[1], M. Renner[1], M. Thiel[2], A. Radke[2], and •*G. von Freymann[1,2]; [1]University of Kaiserslautern, Kaiserslautern, Germany; [2]Nanoscribe GmbH, Eggenstein-Leopoldshafen, Germany*

SLM based three-dimensional laser lithography shrinks the voxels axial elongation down to 1.9 by amplitude and phase modulation. Multiple voxels reduce writing times by one order of magnitude, scanning the beam gains another two orders.

ROOM 13b

locked 675nm VECSEL generating 19 ps pulses at a repetition rate of ~1 GHz and 40 mW average power.

CB-4.4 TUE 9:15

SESAM mode-locked red AlGaInP semiconductor disk laser emitting at 665 nm

•*T. Schwarzbäck, R. Bek, H. Kahle, M. Jetter, and P. Michler; Institut für Halbleiteroptik und Funktionelle Grenzflächen and Research Center SCoPE, University of Stuttgart, Stuttgart, Germany*

We present a mode-locked AlGaInP based red-emitting semiconductor disk laser. Using a SESAM in a v-shaped cavity, a repetition rate of 810 MHz with a FWHM pulse duration below 50 ps will be shown.

CB-4.5 TUE 9:30

Mode-locked operation of a 2-um GaSb-based semiconductor disk laser using a single-walled carbon-nanotube saturable absorber

•*S. Kaspar[1], M. Rattunde[1], J. Wagner[1], C. Schilling[1], W. Bronner[1], A. Bächle[1], S.Y. Choi[2], D.-I. Yeom[2], F. Rotermund[2], A. Schmidt[3], and U. Griebner[3]; [1]Fraunhofer-Institute for Applied Solid State Physics, Freiburg, Germany; [2]Department of Physics & Division of Energy and Systems Research, Ajou University, Suwon, Korea, South; [3]Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany*

A mode-locked semiconductor disk laser emitting around 2050 nm using a single-walled carbon nanotubes based saturable absorber is demonstrated generating ps-pulses with average powers up to 50 mW at 1.1 GHz.

ROOM 14a

siglio Nazionale delle Ricerche (IFN-CNR), Milano, Italy; [4]Dipartimento di Fisica, Politecnico di Milano, Milano, Italy; [5]NEST, Scuola Normale Superiore and Istituto di Nanoscienze - CNR, Pisa, Italy; [6]Center for Quantum Technologies, National University of Singapore, Singapore, Singapore

By exploiting polarization entanglement of photons to simulate different quantum statistics, we experimentally investigate the interplay between the Anderson localization mechanism and the bosonic/fermionic symmetry of the wave function on an integrated quantum walk.

IB-2.3 TUE 9:15

Simulations of two particle dynamics employing dynamic coin control in 2D quantum walks

A. Schreiber[1,2], •F. Katzschmann[1], A. Gabris[3], P.P. Rohde[1], K. Laiho[1,2], M. Štefaňák[3], V. Potocek[3], C. Hamilton[3], I. Jex[3], and C. Silberhorn[1]; [1]Applied Physics, University of Paderborn, Warburger Strasse 100, 33098 Paderborn, Germany; [2]Max-Planck-Institute for the Science of Light, Günther-Scharowsky-Str. 1 / Bau 24, 91058 Erlangen, Germany; [3]Department of Physics, Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University in Prague, Brehová 7, 115 19 Praha, Czech Republic

We present the simulation of interacting bosonic particles, exhibiting bunching or anti-bunching behavior. Our approach uses a photonic realization of a 2D discrete-time quantum walk exploiting the dynamic access to the coin state.

IB-2.4 TUE 9:30

On-chip quantum teleportation

•B. Metcalf[1], N. Thomas-Peter[1], J. Spring[1], P. Humphreys[1], N. Langford[1], S. Kolthammer[1], M. Barbieri[1], X.-M. Jin[1], J. Gates[2], D. Kundys[2], B. Smith[1], P. Smith[2], and I. Walmsley[1]; [1]Clarendon Laboraoty, University of Oxford, Oxford, United Kingdom; [2]Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom

We present results showing the first quantum teleportation of a single qubit photonic state on an integrated photonic chip.

ROOM 14b

We report on thin disk laser experiments using a 5.9% Yb-doped $CaGdAlO_4$. At 30 W of output power, 70% slope efficiency and 57% optical-to-optical efficiency represent the best values obtained with this material so far.

CA-5.4 TUE 9:15

109 W Yb:YAl3(BO3)4 thin-disk oscillator

•B. Weichelt[1], K.S. Wentsch[1,2], A. Voss[1], A. Gross[3], V. Wesemann[3], D. Rytz[3], M. Abdou Ahmed[1], and T. Graf[1]; [1]Institut für Strahlwerkzeuge, Stuttgart, Germany; [2]Graduate School of Excellence advanced Manufacturing Engineering, Stuttgart, Germany; [3]Forschungsinstitut für mineralische und metallische Werkstoffe-Edelsteine/Edelmetalle-GmbH (FEE), Idar-Oberstein, Germany

First demonstration of an Yb:YAl3(BO3)4 thin-disk laser operation achieving 109 W of output power with 50.2% optical efficiency. Comprehensive high power characterization of the Yb:YAB disk with further investigations regarding fundamental mode and mode-locked operation.

CA-5.5 TUE 9:30

An Yb:CaF2 thin-disk laser

•K.S. Wentsch[1,2], B. Weichelt[2], F. Druon[2], M. Abdou Ahmed[2], and T. Graf[2]; [1]Graduate School of Excellence Manufacturing Engineering, Stuttgart, Germany; [2]Institut für Strahlwerkzeuge, Stuttgart, Germany

First investigation of SESAM passively mode-locked Yb:CaF2 thin-disk laser is presented in this contribution. High power capability was demonstrated by reaching 250W of output power with an optical efficiency of 47%.

ROOM 21

[2]Institut Non Linéaire de Nice, Sophia Antipolis, France

We investigate transverse self-organization due to opto-mechanical density redistributions in cold gases. Spontaneous hexagon formation for the intensity and density distributions is found in both a cavity and a single mirror feedback geometry.

IG-1.3 TUE 9:15

Ultra-Low-Threshold Optical Pattern Formation in a Cold Atomic Vapor

•B.L. Schmittberger, J.A. Greenberg, and D.J. Gauthier; Duke University, Durham, North Carolina, United States

We observe ultra-low-threshold pattern formation in laser driven cold atoms. We report a new theoretical model accounting for our observed fifth-order nonlinearity and the role of Sisyphus cooling in lowering the threshold.

IG-1.4 TUE (Invited) 9:30

Collective Dynamics in Optomechanical Arrays

•F. Marquardt; Institute for Theoretical Physics, University of Erlangen-Nuremberg, Erlangen, Germany

We discuss the collective dynamics of optomechanical arrays, where localized optical and mechanical modes interact via radiation pressure. We predict a transition towards synchronized mechanical motion, both in the classical and the quantum regime.

ROOM EINSTEIN

many

The stress induced birefringence of polarization maintaining fibers is significantly influenced by their preparation history (e.g. fiber drawing). Using tomographic stress measurements, we show that an additional thermal annealing improves the birefringence of panda fibers.

CE-4.4 TUE 9:15

Image transport in a polymer Anderson localized optical fiber

S. Karbasi[1], R. Frazier[1], K. Koch[2], and •A. Mafi[1]; [1]University of Wisconsin-Milwaukee, Milwaukee, WI, United States; [2]Corning Incorporated, Corning, NY, United States

We use transverse Anderson localization in polymer disordered optical fibers to transport images at a resolution greater than 28.5 lines per millimeter.

CE-4.5 TUE 9:30

Light Spectral Filter Based On Spatial Adiabatic Passage

•R. Menchon-Enrich[1], A. Llobera[2], J. Vila-Planas[2], V.J. Cadarso[3], J. Mompart[1], and V. Ahufinger[1]; [1]Departament de Física, Grup d'Òptica, Universitat Autònoma de Barcelona, Bellaterra, Barcelona, Spain; [2]Institut de Microelectrònica de Barcelona (IMB-CNM, CSIC), Bellaterra, Barcelona, Spain; [3]Microsystems Laboratory (LMIS1), École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland

We experimentally demonstrate that a system of three coupled CMOS-compatible silicon oxide waveguides operates via spatial adiabatic passage as a simultaneous high and low-pass spectral filtering device for visible light.

NOTES

ROOM 1

CD-8.5 TUE 9:45

Artificial retinal glial-like waveguides for biomimetic volume optics

E. DelRe[1], A. Pierangelo[2], •J. Parravicini[1], S. Gentilini[3], and A. Agranat[4]; [1]Department of Physics, University of Rome "La Sapienza", Rome, Italy; [2]LPICM, Ecole Polytechnique, CNRS, Palaiseau, France; [3]ISC-CNR, University of Rome "La Sapienza", Rome, Italy; [4]Applied Physics Department, Hebrew University of Jerusalem, Jerusalem, Israel

We demonstrate in paraelectric photorefractive crystals the use of three-dimensional funnel index of refraction patterns analogous to those of retinal Glial cells as support for tunable and multi-functional volume optical component miniaturization and integration.

ROOM 4a

JSV-1.4 TUE 9:45

Strongly Interacting Many Body Physics with Circuit Quantum Electrodynamics Networks

•M. Leib[1], L. Neumeier[1], F. Deppe[2], A. Marx[2], R. Gross[2], and M. Hartmann[1]; [1]TU Munich, Munich, Germany; [2]Walther-Meißner-Institut, Munich, Germany

We propose experiments involving networks of either Josephson junction intersected superconducting resonators or superconducting resonators intersected by multiple Josephson junctions. Because of the non conserved number of excitations in these networks we concentrate on the driven dissipative regime.

ROOM 4b

CI-2.5 TUE 9:45

1D optical SUSY structures for selective mode filtering

•M. Heinrich[1], M.-A. Miri[1], S. Stützer[2], R. El-Ganainy[3], S. Nolte[2], A. Szameit[2], and D.N. Christodoulides[1]; [1]CREOL, The College of Optics and Photonics, University of Central Florida, Orlando, United States; [2]Institute of Applied Physics, Friedrich Schiller Universität, Jena, Germany; [3]Department of Physics, University of Toronto, Toronto, Canada

We demonstrate that supersymmetry endows dissimilar optical structures with the same scattering and guided wave characteristics. We explore continuous supersymmetric one-dimensional settings, as well as SUSY photonic lattices, for designing versatile integrated filtering arrangements.

ROOM 13a

ROOM 13b

CB-4.6 TUE 9:45

Passively Modelocked VECSEL using a Single-Layer Graphene Saturable Absorber Mirror

•C.A. Zaugg[1], Z. Sun[2], D. Popa[2], S. Milana[2], T. Kulmala[2], R.S. Sundaram[2], V.J. Wittwer[1], M. Mangold[1], M. Golling[1], Y. Lee[3], J.-H. Ahn[3], A.C. Ferrari[2], and U. Keller[1]; [1]ETH Zürich, Institute for Quantum Electronics, Department of Physics, Zürich, Switzerland; [2]University of Cambridge, Department of Engineering, Cambridge, United Kingdom; [3]Sungkyunkwan University, School of Advanced Materials Science and Engineering and Advanced Institute of Nanotechnology, Suwon, Korea, South

A single-layer graphene saturable absorber mirror (GSAM) was used to modelock an optically pumped VECSEL. Sub-ps pulses at a repetition rate of 1.49 GHz and an average output power of 17 mW were achieved.

ROOM 1

10:30 – 12:30

PL-3: IQEC 2013 Plenary Talk and Awards Ceremony

Chair: Vahid Sandoghdar, Max Planck Institute for the Science of Light, Erlangen, Germany

This session will feature a plenary talk presented by Alain Aspect, Institut d'Optique, France together with a series of Prize and Award Ceremonies as described hereunder:

PL-3.1 TUE (Plenary)

Coherent Back Scattering and Anderson Localization of Ultra Cold Atoms

•A. Aspect; Institut d'Optique, Palaiseau, France

Ultra cold atoms in a disordered potential created with a laser speckle are used to study Anderson Localization and Coherent Back Scattering.

Prize and Award Ceremonies

2013 Awards of the European Physical Society - Quantum Electronics and Optics Division:

Quantum Electronics Prizes

The 2013 Prize for fundamentals aspects of Quantum Electronics and Optics is awarded to **Maciej Lewenstein**, *The Institute of Photonic Sciences (ICFO), Castelldefels (Barcelona), Catalan Institution for Research and Advanced Studies (ICREA), Barcelona, Spain*. The Prize is awarded to Professor Lewenstein for outstanding contributions to several areas of theoretical quantum optics and to the use of quantum gases for quantum information and to attosecond optics.

The 2013 Prize for applied aspects of Quantum Electronics and Optics is awarded to **Federico Capasso**, *Harvard University, Cambridge, MA, United States*. The Prize is awarded to Professor Capasso for seminal contributions to the invention and demonstration of the quantum cascade laser.

Fresnel Prizes

The 2013 Fresnel Prize for fundamental aspects is awarded to **Yu-Ao Chen**, *National Laboratory for Physical Sciences at Microscale and Department of Modern Physics, University of Science and Technology of China, Hefei, P. R. China*, for outstanding achievements in the fields of multi-photon entanglement, quantum communication, quantum computation and quantum simulation based on manipulation of photons and atoms.

The 2013 Fresnel Prize for applied aspects is awarded to **Gerasimos Konstantatos**, *The Institute of Photonic Sciences (ICFO), Castelldefels (Barcelona), Spain*, for salient contributions to the science and technology of solution-processed quantum dots and their applications to a variety of optoelectronic devices with ground-breaking performances.

PhD Thesis Prizes

The 2013 Thesis Prizes for fundamental aspects are awarded to: **Pascal Del'Haye**, *National Institute of Standards and Technology, Boulder, CO, USA* and **Thomas Monz**, *University of Innsbruck, Institute for Experimental Physics, Innsbruck, Austria*.

The 2013 Thesis Prizes for applied aspects are awarded to: **Florian Kaiser**, *UniversitÃľ de Nice Sophia-Antipolis, Nice, France* and **Clara Saraceno**, *ETH Zurich, Zurich and University of NeuchÃćtel, NeuchÃćtel, Switzerland*.

See EPS-QEOD Prize Ceremony Brochure.

EPS Emmy Noether Distinction for Women in Physics:

The 2013 EPS Emmy Noether Distinction for Women in Physics goes to **Alessandra Gatti**, *Institute of Photonics and Nanotechnologies [IFN-CNR], Como, Italy*. The distinction was awarded to Alessandra Gatti for her contributions to physics – the introduction of concepts of quantum images, spatial entanglement, and quantum entangled images. "These concepts contributed in a substantial way to the birth of a new field – quantum imaging" reads in the letter of nomination. She contributed as well to ghost-imaging that, as she proved in her work, can be realized even by using classically correlated beams. The selection committee took also into account Alessandra Gatti's exceptional organizational capabilities as a coordinator of the European project HIDEAS (High Dimensional Entangled Systems). Alexandra Gatti will receive her diploma during the Awards Ceremony.

ROOM 14a

IB-2.5 TUE 9:45

Fabrication and characterisation of an integrated-optic controlled-phase gate

•*T. Meany*[1], *D. Biggerstaff*[2,3], *A. Fedrizzi*[2,3], *M. Broome*[2,3], *M. Delanty*[1], *A. Gilchrist*[4], *M. Steel*[1], *A. White*[2,3], *and M. Withford*[1]; [1]*Centre for Ultrahigh bandwidth Devices for Optical Systems (CUDOS,) MQ Photonics Research Centre, Department of Physics and Astronomy, Macquarie University, North Ryde, Australia*; [2]*Centre for Engineered Quantum Systems(EQuS), School of Mathematics and Physics, University of Queensland, Brisbane, Australia*; [3]*Centre for Quantum Computer,and Communication Technology, School of Mathematics and Physics, University of Queensland, Brisbane, Australia*; [4]*EQus, Department of Physics and Astronomy, Macquarie University, North Ryde, Australia*

We describe the fabrication and classical characterisation of a new laser written quantum circuit, a controlled-phase gate. We minimise losses at 800nm, produce accurate coupling ratios and extract the unitary of the circuit.

ROOM 14b

CA-5.6 TUE 9:45

1-kHz Pulsed Pumped Yb:YAG Thin Disk Regenerative Amplifier

•*T. Miura, M. Chyla, M. Smrž, S. Sankar, P. Severová, O. Novák, A. Endo, and T. Mocek*; *HiLASE Project, Institute of Physics of the ASCR, Prague, Czech Republic*

We have obtained 30-mJ output at 1-kHz from Yb:YAG thin disk regenerative amplifier. By applying the pulsed pumping method, we have improved the efficiency from 12% to 19%, and achieved 24-mJ output with Gaussian mode.

ROOM 21

ROOM EINSTEIN

CE-4.6 TUE 9:45

Pristine spider silk fibers as waveguiding microstructure in free space and in an integrated photonic chip

•*N. Huby*[1], *A. Renault*[1], *S. Beaufils*[1], *V. Vié*[1], *T. Lefèvre*[2], *F. Paquet-Mercier*[2], *M. Pézolet*[2], *and B. Bêche*[1]; [1]*Institute of Physics of Rennes, Rennes, France*; [2]*Centre de recherche sur les matériaux avancés, Québec, Canada*

Waveguiding properties of spider silk fiber are presented in free space and in integrated chip. Efficient propagation and optical coupling are demonstrated in both cases. These results pave the way for biophotonic applications.

NOTES

ROOM 1

The Herbert Walther Award:

The Optical Society (OSA) and the Deutsche Physikalische Gesellschaft (DPG) will present the 2013 Herbert Walther Award to **H. Jeff Kimble** of the *California Institute of Technology (Caltech), Pasadena, USA* for his pioneering experimental contributions to quantum optics, cavity quantum electrodynamics, and quantum information science. The Herbert Walther Award honors Professor Herbert Walther for the seminal influence of his groundbreaking innovations in quantum optics and atomic physics and for his numerous contributions to the international scientific community. Established in 2007, the Award recognizes distinguished contributions in quantum optics and atomic physics as well as leadership in the international scientific community. Kimble will join the list of esteemed past recipients including Alain Aspect, Marlan O. Scully, Serge Haroche and David J. Wineland.

OSA Fellow Member Recognition:

OSA Fellows will be recognized during the Awards Ceremony of CLEO/Europe-IQEC 2013. **Philip Russell**, OSA 2013 Vice President, will recognize six scientists as "OSA Fellows".

The distinction will go to:

Thorsten Ackemann, *University of Strathclyde, UK*
Christoph Harder, *Harder & Partner GmbH, Switzerland*
Martti Kauranen, *Tampere University of Technology, Finland*
Brian W. Pogue, *Dartmouth College, USA*
Markus Pollnau, *University of Twente, The Netherlands*
Monika Ritsch-Marte, *Innsbruck Medical University, Austria*

NOTES

ROOM 1

14:00 – 15:30

CD-9: UV - Sources

Chair: Luc Bergé, CEA, Arpajon, France

CD-9.1 TUE 14:00

Tunable fiber-laser-based picosecond source for the ultraviolet

•*C.K. Suddapalli*[1], *G.K. Samanta*[2], *A. A*[2], *and M. Ebrahim-Zadeh*[1,3]; [1]*ICFO-The Institute of Photonic Sciences, Barcelona, Spain*; [2]*Theoretical Physics Division, Physical Research Laboratory, Ahmedabad, India*; [3]*Institucio Catalana de Recerca i Estudis Avancats (ICREA), Passeig Lluis Companys 23, Barcelona, Spain*

We report a picosecond UV source at 240-MHz tunable across 316-339 nm based on intracavity frequency doubling of fiber-laser-green-pumped MgO:sPPLT OPO in BiB3O6, providing 30 mW of average power at 334.48 nm.

CD-9.2 TUE 14:15

Direct Low-Harmonic Generation in Gas at MHz Repetition Rate

•*L. Petraviciute - Lötscher*[1,2], *W. Schneider*[1,2], *P. Rußbüldt*[3], *B. Gronloh*[4], *H.-D. Hoffmann*[3], *M.F. Kling*[1], *and A. Apolonski*[1,2]; [1]*Max-Planck-Institut für Quantenoptik, Garching, Germany*; [2]*Ludwig-Maximilians-Universität München, Garching, Germany*; [3]*Fraunhofer-Institut für Lasertechnik, Aachen, Germany*; [4]*Lehrstuhl für Lasertechnik, RWTH Aachen University, Aachen, Germany*

Extreme ultraviolet radiation was generated by a frequency doubled (515nm) Yb:YAG Innoslab amplifier. High-energy (240W) amplifier without chirped pulse amplification and a nonlinear pulse compression (600fs pulse duration) was utilized for harmonic generation.

CD-9.3 TUE 14:30

Stable, continuous-wave, fiber-laser-based, ultraviolet generation in BiB3O6

•*K. Devi*[1], *S. Chaitanya Kumar*[1], *and M. Ebrahim-Zadeh*[1,2]; [1]*ICFO-Institut de Ciencies Fotoniques, Barcelona, Spain*; [2]*Institucio*

ROOM 4a

14:00 – 15:30

IC-1: Atomic Quantum Simulators

Chair: Holger Müller, University of Califonia, Berkeley, United States

IC-1.1 TUE (Keynote) 14:00

Quantum Simulations using Ultracold Atoms

•*I. Bloch*; *Max Planck Institute of Quantum Optics, Garching, Germany*; *Ludwig-Maximilians University, Munich, Germany*

Ultracold quantum gases offer remarkable opportunities for probing and controlling quantum matter. In my talk I will discuss highlights and future perspectives of this interdisciplinary research field.

ROOM 4b

14:00 – 15:30

CL-5: Microscopic and Sensing Technologies

Chair: Jürgen Popp, Friedrich-Schiller University, Jena, Germany

CL-5.1 TUE 14:00

Towards endoscopes with no distal optics

•*E.R. Andresen*[1], *G. Bouwmans*[2], *S. Monneret*[1], *and H. Rigneault*[1]; [1]*Institut Fresnel, CNRS, Aix-Marseille Université, École Centrale Marseille, Marseille, France*; [2]*IRCICA USR3380 - PhLAM UMR8523, Université Lille 1, Villeneuve d'Ascq, France*

We report a step towards lens-less scanning endomicroscopy. A fiber bundle relays a shaped wavefront, resulting in focusing at the distal end without distal optics. Video-rate imaging is achieved by galvanometric scanning through the bundle.

CL-5.2 TUE 14:15

Quantitative phase noise in two color low coherence Digital Holographic Microscope

•*Z. Monemhaghdoust*[1], *F. Montfort*[1,2], *Y. Emery*[2], *C. Depeursinge*[2,3], *and C. Moser*[1]; [1]*EPFL, Laboratory of Applied Photonics Devices, Lausanne, Switzerland*; [2]*Lyncée Tec SA, Lausanne, Switzerland*; [3]*EPFL, Laboratory of Applied Optics, Lausanne, Switzerland*

A Volume Diffractive Optical Element (VDOE) is placed in the reference arm of an off-axis short coherence DHM. This enables nanometric-resolution surface topography in short coherence and high-speed vertical scanning, through field of view enlargement.

CL-5.3 TUE 14:30

Completely background free broadband coherent anti-Stokes Raman scattering spectroscopy

•*X. Liu*[1,2], *H. Niu*[2], *W. Liu*[2], *D. Chen*[2], *B. Zhou*[1], *and M. Bache*[1]; [1]*Technical University of Denmark, DTU Fotonik, Department*

ROOM 11

14:00 – 15:45

CH-2: Novel Optical Sensing Systems

Chair: Tomasz Nasilowski, Military University of Technology, Warsaw, Poland

CH-2.1 TUE 14:00

Optical Cavity-Enhanced Surface Plasmon Resonance refractive index sensing

•*A. Giorgini*[1], *S. Avino*[1], *P. Malara*[1], *G. Gagliardi*[1], *M. Casalino*[3], *M. Iodice*[3], *G. Coppola*[3], *P. Adam*[4], *J. Homola*[4], *and P. De Natale*[2]; [1]*Istituto Nazionale di Ottica (INO)-CNR, Napoli, Italy*; [2]*Istituto Nazionale di Ottica (INO)-CNR, Firenze, Italy*; [3]*Istituto per la Microelettronica e Microsistemi (IMM)-CNR, Napoli, Italy*; [4]*Institute of Photonics and Electronics, Academy of Sciences of the Czech Republic, Prague, Czech Republic*

A new approach to SPR-based sensing is presented here. An SPR sensor, realized with a typical Kretschmann configuration, is integrated in an optical cavity resonator. Refractive index variations are measured by a cavity-ring-down technique.

CH-2.2 TUE 14:15

A broadband cavity ring-down spectrometer for the near infrared

•*K. Salffner, M. Böhm, O. Reich, and H.-G. Löhmannsröben*; *University of Potsdam, Institute of Chemistry, Physical Chemistry, innoFSPEC, Potsdam, Germany*

We report on a cavity ring-down spectrometer based on a near-infrared broadband light source. First successful measurements of the ring-down signal of a cavity filled with carbon dioxide have been performed.

CH-2.3 TUE 14:30

Bragg Wavelength Sensitivity of Higher Order Modes to Temperature and Strain in Highly Birefringent Microstructured Fibers

•*T. Tenderenda*[1,2], *M. Murawski*[1,2], *M. Szymanski*[1,2], *M. Becker*[3], *M. Rothhardt*[3],

ROOM 13a

14:00 – 15:30

TF-1/LIM: Fibre and Solid State Lasers: a Comparison from an Industrial Point of View I (Session jointly held with LIM)

Chair: Michael Schmidt, University of Erlangen, Erlangen, Germany

TF-1/LIM.1 TUE (Tech Focus) 14:00

Next Generation of Ultra-High Brightness Direct Diode Lasers

•*J. Liebowitz, R. Huang, B. Chann, J. Burgess, M. Kaiman, R. Overman, and P. Tayebati*; *TeraDiode, Wilmington, United States*

Wavelength beam combining allows use of direct diode lasers for steel cutting and keyhole welding, traditionally performed by multi-kilowatt CO2, fiber, and disk lasers. This innovation lowers laser cost in these applications.

TF-1/LIM.2 TUE (Tech Focus) 14:30

Applications and Market Segments for Ultra-High Brightness Direct Diode Lasers

•*W. Gries, S. Heinemann, H. Fritsche, and W. Süptitz*; *Directphotonics Industries GmbH, Berlin, Germany*

ROOM 13b

14:00 – 15:30

CB-5: Dynamics and Chaos in Semiconductor

Chair: Pascal Landais, Dublin City University, Dublin, Ireland

CB-5.1 TUE 14:00

Nonequilibrium Laser Dynamics of Quantum-Dot Lasers with Optical Feedback and Injection

•B. Lingnau[1], W. Chow[2], E. Schöll[1], and K. Lüdge[1]; [1]Institut für Theoretische Physik, TU Berlin, Berlin, Germany; [2]Sandia National Laboratories, Albuquerque, United States

Due to the nonequilibrium between resonant and off-resonant states in QD lasers, the α-factor will inaccurately describe their dynamics. Using a more elaborate model, we predict new interesting dynamics in optical injection and feedback setups.

CB-5.2 TUE 14:15

Polarization Chaos from a Free-Running Quantum Dot Laser Diode

•M. Virte[1,2], K. Panajotov[2,3], H. Thienpont[2], and M. Sciamanna[1]; [1]Optel Research Group and LMOPS (Laboratoire Matériaux Optiques, Photoniques et Systèmes) EA-4423, Supélec - Université de Lorraine, Metz, France; [2]Brussels Photonic Team, Department of Applied Physics and Photonics (B-PHOT TONA), Vrije Universiteit Brussels, Brussels, Belgium; [3]Institute of Solide State Physics, Sofia, Bulgaria

In this contribution, we demonstrate generation of polarization chaos, i.e. chaotic mode hopping between two elliptically polarized states, in a free-running quantum dot vertical-cavity surface-emitting laser and provide a theoretical framework of the phenomenon.

CB-5.3 TUE 14:30

Experimental distinction of weak and strong chaos in delay-coupled semiconductor lasers

•M.C. Soriano[1], X. Porte[1], D.A. Arroyo-Almanza[2], C.R. Mirasso[1], and I. Fischer[1]; [1]IFISC (CSIC-UIB), Palma de Mallorca,

ROOM 14a

14:00 – 15:30

IB-3: QIP with Light and Matter

Chair: Thomas Symul, Australian National University, Canberra, Australia

IB-3.1 TUE 14:00

Heralded photonic interaction between distant single ions

•M. Schug[1], J. Huwer[1,2], C. Kurz[1], P. Müller[1], and J. Eschner[1]; [1]Universität des Saarlandes, Saarbrücken, Germany; [2]ICFO - Institut de Ciences Fotoniques, Barcelona, Spain

We establish photonic interaction between two distant single calcium ions. Triggered single photons with controlled temporal shape are released in the sender ion; their absorption by the receiver ion is detected employing a quantum-jump scheme.

IB-3.2 TUE 14:15

Teleportation of the polarization state of a coherent light pulse onto a single atom

•N. Ortegel[1], D. Burchardt[1], R. Garthoff[1], J. Hofmann[1], M. Krug[1], W. Rosenfeld[1,2], and H. Weinfurter[1,2]; [1]Fakultät für Physik, Ludwig-Maximilians Universität München, München, Germany; [2]Max-Planck Institut für Quantenoptik, Garching, Germany

We successfully performed quantum teleportation of the polarization state of an attenuated laser pulse onto the spin state of a single ^{87}Rb-atom trapped at a distance of 20 meters.

IB-3.3 TUE (Invited) 14:30

Trapped Ions for Simulating Interacting Spins

B. Lanyon, C. Hempel, P. Jurcevic, R. Blatt, and •C.F. Roos; Institute for Quantum Optics and Quantum Information, Innsbruck, Austria

ROOM 14b

14:00 – 15:30

CA-6: Ultrafast Solid-State Lasers

Chair: Evgeni Sorokin, Technical University of Vienna, Vienna, Austria

CA-6.1 TUE (Invited) 14:00

Carbon Nanotube and Graphene Saturable Absorbers: A New Generic Mode-Locking Technology?

•F. Rotermund; Ajou University, Suwon, Korea, South

Saturable absorbers based on carbon nanostructures such as carbon nanotubes and graphene are successfully used for mode-locking of a variety of ultrafast bulk solid-state lasers. Recent progress in such novel mode-locking devices will be presented.

CA-6.2 TUE 14:30

CW, Q-switched and mode-locking oscillations at 2.1 μm in novel Tm3+:Lu2O3 ceramics lasers

•O. Antipov[1], A. Novokov[1], A. Zinoviev[1], H. Yagi[2], A. Lagatsky[3], W. Sibbett[3], and E. Ivakin[4]; [1]Insitute of Applied Physics of Rus-

ROOM 21

14:00 – 15:30

CG-1: Ionization Dynamics

Chair: Markus Kitzler, Technical University, Vienna, Austria

CG-1.1 TUE 14:00

Tunneling Time in Ultrafast Science is Real and Probabilistic

•L. Gallmann, A. Landsman, M. Weger, J. Maurer, R. Boge, A. Ludwig, S. Heuser, C. Cirelli, and U. Keller; Department of Physics, Institute of Quantum Electronics, ETH Zurich, Zurich, Switzerland

We present an experimental approach and results of an angular streaking experiment with elliptically polarized intense few-cycle laser pulses that indicate a real tunneling time in tunnel ionization for the first time.

CG-1.2 TUE 14:15

Measurement of Attosecond Photo-ionization Delay in Xenon

•A. Verhoef[1], A. Mitrofanov[1], M. Krikunova[2,3], N. Kabachnik[4,5], M. Drescher[2], and A. Baltuska[1]; [1]Institut für Photonik, Technische Universtität Wien, Wien, Austria; [2]Institut für Experimentalphysik, Universität Hamburg, Hamburg, Germany; [3]Institut für Optik und Atomare Physik, Technische Universität Berlin, Berlin, Germany; [4]Institute of Nuclear Physics, Moscow State University, Moscow, Russia; [5]European XFEL GmbH, Hamburg, Germany

We present first results of simultaneous attosecond streaking measurements of shake-up electrons and Auger electrons emitted from xenon. The spectral overlap of the electronic wavepackets allows for reliable reconstruction of the relative phases.

CG-1.3 TUE (Invited) 14:30

Looking Inside the Recollision Process

D. Shafir[1], H. Soifer[1], B.D. Bruner[1], M. Dagan[1], Y. Mairesse[2], C. Vozzi[3], S. Stagira[3], S. Patchkovskii[4], M.Y. Ivanov[5,6], O. Smirnova[6], and •N. Dudovich[1]; [1]Weizmann Institute of Science, Rehovot, Israel; [2]CELIA

ROOM EINSTEIN

14:00 – 15:30

CE-5: Optical Metamaterials and Plasmonics

Chair: Regine Frank, Institut für Theoretische Physik, Tübingen, Germany

CE-5.1 TUE 14:00

Electrically Controlled Liquid Crystal Plasmonic Metamaterials

•O. Buchnev[1], J.-Y. Ou[1], M. Kaczmarek[2], N.I. Zheludev[1,3], and V.A. Fedotov[1]; [1]Optoelectronics Research Centre and Centre for Nanostructured Photonic Metamaterials, University of Southampton, Southampton, United Kingdom; [2]School of Physics and Astronomy, University of Southampton, Southampton, United Kingdom; [3]Centre for Disruptive Photonic Technologies, Nanyang Technological University, Singapore, Singapore

We experimentally demonstrate high-contrast electrical modulation of near-IR spectra of plasmonic metamaterials loaded with liquid crystals. That was achieved engaging volume and, for the first time, in-plane switching modes in the resulting plasmonic hybrid devices

CE-5.2 TUE 14:15

Optical Magnetism in all-dielectric Metamaterials

J. Zhang[1], J.-Y. Ou[1], •K.F. MacDonald[1], and N.I. Zheludev[1,2]; [1]University of Southampton, Southampton, United Kingdom; [2]Nanyang Technological University, Singapore, Singapore

We present the first experimental demonstration of a new mechanism to achieve visible and near-infrared magnetic resonances in purely dielectric metamaterials, realized through coupling between pairs of closely spaced, geometrically dissimilar dielectric rods.

CE-5.3 TUE (Invited) 14:30

Optical Gain in Metamaterials and Plasmonic Systems: from Loss Compensation to Stimulated Emission

•M.A. Noginov; Center for Materials Research, Norfolk State University, Norfolk, VA, United States

ROOM 1

Catalana de Recerca i Estudis Avancats (ICREA), Barcelona, Spain

We report stable cw UV generation in single-pass configuration based on sum-frequency mixing of 1064nm and 532nm radiations for the first time, in BIBO, providing >68mW of UV power with frequency deviation <437kHz over >2.5hrs.

CD-9.4 TUE 14:45

Generation of sub-10 fs UV light by up-conversion of visible pulses

A. Candeo, P. Farinello, •C. Manzoni, and G. Cerullo; IFN-CNR, Dipartimento di Fisica, Politecnico di Milano, Milan, Italy

We introduce a simple system for the generation of broadband UV pulses in the 320-380 nm spectral range by up-conversion of ultrabroadband visible pulses. UV pulse duration is ~8 fs, close to the transform-limit.

CD-9.5 TUE 15:00

High-power UV Light Generation in Picosecond Pulse Trains

•M. Martyanov[1], M. Divall[2], E. Gacheva[3], C. Hessler[1], and V. Fedosseev[1]; [1]European Organization for Nuclear Research (CERN), Geneva, Switzerland; [2]Paul Scherrer Institute (PSI), Villigen, Switzerland; [3]Institute of Applied Physics (IAP RAS), Nizhny Novgorod, Russia

The 4th harmonic generation of Nd:YLF photo-injector drive laser in the BBO crystals was experimentally investigated for burst of 8 ps pulses with 300 W UV mean power within the 140 us burst

ROOM 4a

IC-1.2 TUE 14:45

Quantum phases and transport of one-dimensional disordered bosons

•L. Tanzi[1], C. D'Errico[1,2], E. Lucioni[1], L. Gori[1], M. Inguscio[1,2], and G. Modugno[1,2]; [1]LENS and Dipartimento di Fisica e Astronomia, Università di Firenze, Firenze, Italy; [2]Consiglio Nazionale delle Ricerche-INO, Firenze, Italy

We experimentally study the equilibrium quantum phases and the dynamical transport properties of disordered interacting systems, by employing one dimensional ultracold bosons in optical lattices.

IC-1.3 TUE (Invited) 15:00

Exploring cavity-mediated long-range interactions in a quantum gas

•T. Donner[1], F. Brennecke[1], R. Mottl[1], R. Landig[1], K. Baumann[1,2], and T. Esslinger[1]; [1]Institute of Quantum Electronics, ETH Zurich, Zurich, Switzerland; [2]Department of Physics, Stanford University, Stanford, California, United States

We observe how cavity mediated long-range atom-atom interactions lead to a phase transition in a quantum gas, and study the mode-softening of an excitation and the divergence of density fluctuations in this open system.

ROOM 4b

Dept. of Photonics Engineering, DK-2800 Kgs. Lyngby, Denmark; [2]Key Laboratory of Optoelectronic Devices and Systems of Ministry of Education and Guangdong Province, Institute of Optoelectronics, Shenzhen University, shenzhen, China, People's Republic of (PRC)

We use iterative XFROG algorithm, first completely background free broadband coherent anti-Stokes Raman scattering spectroscopy.

CL-5.4 TUE 14:45

Depolarization Sensing by Field Orthogonality Breaking

•M. Alouini and J. Fade; Institut de Physique de Rennes, Université Rennes 1, CNRS, Rennes, France

A new depolarization sensing modality based on the concept of field orthogonality breaking and compatible with remote sensing through optical fibers is presented. First experimental validations pave way for high sensitivity realtime depolarization endoscopic imaging.

CL-5.5 TUE 15:00

In situ visualization of collagen architecture in biological tissues using polarization-resolved Second Harmonic microscopy

I. Gusachenko[1], G. Latour[1], Y. Goulam Houssen[1], V. Tran[2], J.-M. Allain[2], and •M.-C. Schanne-Klein[1]; [1]Ecole Polytechnique - LOB (CNRS, Inserm), Palaiseau, France; [2]Ecole Polytechnique - LMS (CNRS, Mines ParisTech), Palaiseau, France

We implemented polarization-resolved SHG microscopy to probe the main orientation and the local disorder of collagen fibril assemblies in rat-tail tendons and human corneas. We successfully retrieved structural information in agreement with theoretical models.

ROOM 11

H. Bartelt[3], P. Mergo[4], K. Poturaj[2,4], M. Makara[4], K. Skorupski[2,4], P. Marc[1], L. Jaroszewicz[1], and T. Nasilowski[1,2]; [1]Institute of Applied Physics, Military University of Technology, Warszawa, Poland; [2]InPhoTech Ltd, Warszawa, Poland; [3]Institute of Photonic Technology, Jena, Germany; [4]Maria Curie-Sklodowska University, Lublin, Poland

In our paper we present the results of fiber Bragg grating inscription in a dual mode highly birefringent microstructured fiber, followed by an investigation of longitudinal strain and temperature sensitivities of the propagated modes.

CH-2.4 TUE 14:45

Using a Multimode Fiber as a High Resolution, Low Loss Spectrometer

B. Redding, S. Popoff, and •H. Cao; Department of Applied Physics, New Haven, United States

We demonstrate a high-resolution, low-loss spectrometer using simply a single multimode fiber and a camera. The input spectra are reconstructed from the speckle patterns generated by interference between fiber modes after calibrating the wavelength-dependent speckle.

CH-2.5 TUE 15:00

Application of a shaped, divergent Laser Beam for the optical Measurement of the Size and Density of ambient Particulate Matter

•R. Schrobenhauser[1,2], R. Strzoda[2], A. Hartmann[2], M. Fleischer[2], and M.-C. Amann[1]; [1]TU Munich, Munich, Germany; [2]Siemens AG, Munich, Germany

We present a new method to measure particle size and mass based on a shaped, divergent laser beam using the inertia-dependent particle movement inside an optical measurement chamber based on three measurement steps.

ROOM 13a

Ultra-high brightness (UHB) direct diode laser systems with kW output power are on the verge of market introduction. This talk discusses applications and market dynamics of UHB direct diode lasers.

TF-1/LIM.3 TUE (Tech Focus) 15:00

The Power of Choice of Solid State Lasers for Successful Industrial Laser Applications

•K. Loeffler; TRUMPF Laser und Systemtechnik GmbH, Ditzingen, Germany

The presentation will show on examples from successful laser applications the use and need for the different solid state laser resonator concepts. It will describe CW-high power as well as short pulse lasers in the ps / and ns range.

ROOM 13b

Spain; [2]Centro de Investigaciones en Optica, Leon, Mexico

We demonstrate the onset of strong and weak chaos in the dynamics of semiconductor lasers with delayed optical feedback (coupling). We provide guidelines for the identification and discuss the importance for synchronization-based applications.

CB-5.4 TUE 14:45

Fast Random Bit Generation Based on a Single Chaotic Semiconductor Ring Laser

•*R.M. Nguimdo[1], G. Verschaffelt[1], J. Danckaert[1], X. Xaveer Leijtens[2], J. Jeroen Bolk[2], and G. Van der Sande[1]; [1]Applied Physics Research Group, APHY, Vrije Universiteit Brussel, Brussels, Belgium; [2]COBRA Research Institute, Eindhoven University of Technology, Eindhoven, The Netherlands*

We numerically and experimentally show that a single chaotic semiconductor ring laser developing chaos with a bandwidth of about 2 GHz can generate true random bits with a bit rate up to 40 Gb/s.

CB-5.5 TUE 15:00

Experimental Criteria for High-Speed Random Bit Generation Using a Chaotic Semiconductor Laser

•*N. Oliver[1], M.C. Soriano[1], D.W. Sukow[2], and I. Fischer[1]; [1]Instituto de Física Interdisciplinar y Sistemas Complejos (IFISC) UIB-CSIC, Palma de Mallorca, Spain; [2]Department of Physics and Engineering, Washington and Lee University, Lexington, Virginia, United States*

We implement an ultra fast random bit generator based on a chaotic semiconductor laser. In addition, we provide detailed insight into the interplay of dynamical properties, acquisition conditions and postprocessing using simple and robust methods.

ROOM 14a

Laser-manipulated strings of trapped ions are an interesting system for implementing quantum simulations of interacting spins. I will present experiments with small ion crystals and discuss the prospects of doing experiments with long ion strings.

IB-3.4 TUE 15:00

Coherent Quantum Transport in Waveguide Lattices

•*R. Keil[1], A. Perez-Leija[1,2], A. Kay[3,4], H. Moya-Cessa[2,5], S. Nolte[1], L.-C. Kwek[4,6], B. Rodríguez-Lara[5], A. Szameit[1], and D. Christodoulides[2]; [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Jena, Germany; [2]CREOL, The College of Optics & Photonics, University of Central Florida, Orlando, United States; [3]Keble College, University of Oxford, Oxford, United Kingdom; [4]Centre for Quantum Technologies, National University of Singapore, Singapore, Singapore; [5]INAOE, Coordinacíon de Optica, Puebla, Mexico; [6]Institute of Advanced Studies (IAS) and National Institute of Education, Nanyang Technological University, Singapore, Singapore*

The coherent transport of quantum states through a spin chain is emulated by classical light evolution in a tailored array of coupled waveguides. A fidelity of 84% is achieved across 19 sites with full coherence.

ROOM 14b

sian Academy of Science, Nizhny Novgorod, Russia; [2]Konoshima Chamical Co., Osaka, Japan; [3]University of St Andrews, St Andrews, St. Andrews, Japan; [4]Insitute of Physics of National Academy of Science, Minsk, Belarus

The novel Tm:Lu2O3 ceramics lasers with diode/laser pumping at 796 or 810 nm were created and optimized for high efficiency and high power oscillations at 2.03-2.1 μm in CW, active Q-switched and passive mode-locking regimes.

CA-6.3 TUE 14:45

Femtosecond pulse generation with Tm-doped sesquioxides

•*A.A. Lagatsky[1], P. Koopmann[2], O.L. Antipov[3], C.T.A. Brown[1], G. Huber[2], and W. Sibbett[1]; [1]School of Physics and Astronomy, University of St Andrews, St Andrews, United Kingdom; [2]Institute of Laser-Physics, University of Hamburg, Hamburg, Germany; [3]Institute of Applied Physics of the Russian Academy of Sciences, Nizhny Novgorod, Russia*

Recent progress in the development of Tm-doped sesquioxides femtosecond lasers in the 2-2.1 μm spectral region is reported. In particular, 105-fs pulses are generated with $Tm:LuScO_3$ at 2020 nm using a SESAM mode-locking approach.

CA-6.4 TUE 15:00

Sub-70 fs Kerr-lens mode-locked Yb:CaF2 laser oscillator delivering up to 2.3 W

•*P. Sévillano[1], G. Machinet[1], F. Guichard[1], R. Dubrasquet[1,2], P. Camy[3], J.L. Doualan[3], R. Moncorgé[3], P. Georges[4], F. Druon[4], D. Descamps[1], and E. Cormier[1]; [1]CELIA Université Bordeaux 1, Talence, France; [2]Azur Light System, Talence, France; [3]CIMAP, Caen, France; [4]Laboratoire Charles Fabry, Palaiseau, France*

By means of a high-brightness optical pumping scheme with a fiber laser, we demonstrate Kerr-lens mode locking with an Yb:CaF2 laser crystal. Stable 68 fs pulses are produced at an average power of 2.3 W.

ROOM 21

- Université Bordeaux, Talence, France; [3]Institute for Photonics and Nanotechnologies, Milano, Italy; [4]National Research Council of Canada, Ontario, Canada; [5]Imperial College London, London, United Kingdom; [6]Max-Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany

In this talk I will describe how by adding a weak perturbation allows us to probe both the ionization times and the recollision times in simple atomic systems.

CG-1.4 TUE 15:00

New features of strong-field ionization with low-frequency fields in the tunnelling regime

•*J. Durá[1], N. Camus[2], A. Thai[1], A. Britz[1], M. Hemmer[1], M. Baudisch[1], A. Senftleben[2], J. Ullrich[2,3], R. Moshammer[2], and J. Biegert[1,4]; [1]ICFO-Institut de Ciencies Fotoniques, Castelldefels, Spain; [2]Max-Planck-Institut für Kernphysik, Heidelberg, Germany; [3]Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany; [4]ICREA-Institucio Catalana de Recerca i Estudis Avançats, Barcelona, Spain*

We observe surprising low-energy features in the first 3D momentum measurement of mid-IR photoionization of Argon and Oxygen in the tunneling regime despite ponderomotive energies nearing 100 eV.

ROOM EINSTEIN

We show that optical gain in metamaterials and plasmonic systems can conquer optical loss in metallic components and provide for a new functionality by enabling amplification and stimulated emission.

CE-5.4 TUE 15:00

Si-nanorod-based plasmonic metamaterials:modeling and experiment

•*S. Peruch[1], J. Bouillard[1], D. O'Connor[1], W. Dickson[1], G. Wurtz[1], A. Zayats[1], X. Han[2], T. Akalin[2], and G. Larrieu[3]; [1]king's college london, london, United Kingdom; [2]IEMN CNRS UMR 8520, Lille 1 University, lille, France; [3]. LAAS-CNRS, Toulouse University, toulouse, France*

We propose a fast and efficient analytical model for modelling silicon based plasmonic metamaterials, with the possibility of engineering them in order to exploit the optical properties of Si for amplification and switching.

ROOM 1

CD-9.6 TUE 15:15

High-power, narrow-width, high-repetition-rate, 5.9 eV light source using a passive optical cavity for laser-based photoelectron spectroscopy

•J. Omachi[1,2], K. Yoshioka[2,3], and M. Kuwata-Gonokami[1,2,3]; [1]Photon Science Center, The University of Tokyo, Hongo, Bunkyo-ku, Tokyo, Japan; [2]CREST, JST, Honcho, Kawaguchi, Saitama, Japan; [3]Department of Physics, The University of Tokyo, Hongo, Bunkyo-ku, Tokyo, Japan

We demonstrated efficient generation of a high-repetition-rate, 0.34 meV linewidth, 5.9 eV light source from a 10 ps, 1 W Ti:sapphire oscillator by using a passive enhancement cavity. This is ideal for high-resolution ARPES.

ROOM 4a

ROOM 4b

CL-5.6 TUE 15:15

Endoscopic polarimetric imaging system based on a spectrally encoded polarization states genetator

•J. Vizet, J. Desroches, A. Barthélémy, J. Brevier, and D. Pagnoux; XLIM research institute, Photonics department, UMR CNRS 7252, Limoges, France

We describe a novel endoscopic polarimetric imaging device for early diagnosis of biological tissue diseases, in vivo in situ. Based on a spectrally encoded polarization state generator, it allows rapid birefringence and depolarization measurements.

ROOM 11

CH-2.6 TUE 15:15

Phase-shifting interferometry to determine the absolute diameter of a silicon sphere using a frequency-tunable diode laser

•X. Wu, Y. Li, H. Wei, and J. Zhang; State Key Lab of Precision Measurement Technology & Instruments, Department of Precision Instrument, Tsinghua University, Beijing, China, People's Republic of (PRC)

A chain of temporal synthetic wavelengths is used to measure the absolute diameter of a silicon sphere with an accuracy of 3 nm in air, where the fractional interference phase is measured by phase-shifting interferometry.

CH-2.7 TUE 15:30

RF-modulated optical pulses generated by non-resonant frequency-shifted feedback for Lidar-Radar velocimetry

•M. Vallet[1], J. Barreaux[2], M. Romanelli[1], J. Thévenin[1], L. Wang[1], and M. Brunel[1]; [1]Institut de Physique de Rennes, Rennes, France; [2]University of Twente, Enschede, The Netherlands

A radio-frequency modulated pulse train is generated by means of a frequency-shifted feedback on a Q-switched laser. The phase coherence of the modulation allows one to perform Lidar-Radar measurements on indoor moving targets.

ROOM 13a

ROOM 1

16:00 – 17:30

CD-10: Optical Devices for Data Processing

Chair: Stefan Wabnitz, Università di Brescia, Brescia, Italy

CD-10.1 TUE 16:00

Plasma column from laser filamentation in air as a virtual radio-frequency antenna

•G. Point[1], Y. Brelet[1], A. Houard[1], J. Carbonnel[1], L. Arantchouk[2], B. Prade[1], Y.-B. André[1], and A. Mysyrowicz[1]; [1]Laboratoire d'Optique Appliquée, ENSTA Paris-Tech/Ecole Polytechnique/CNRS, Palaiseau, France; [2]Laboratoire de Physique des Plasmas, Ecole Polytechnique/CNRS, Palaiseau, France

We demonstrate the use of a plasma column created by femtosecond filamentation and heated by means of a high-voltage discharge

ROOM 4a

16:00 – 17:30

IC-2: Ultracold Atoms : Clocks, Spins and Lattices

Chair: Tobias Donner, ETH, Zurich, Switzerland

IC-2.1 TUE 16:00

Particle and hole dynamics of ultracold Fermi gases in optical lattices

•J. Heinze[1], J.S. Krauser[1], N. Fläschner[1], B. Hundt[1], S. Götze[1], A. Itin[1,2,3], L. Mathey[1,2], K. Sengstock[1,2], and C. Becker[1,2]; [1]Institut für Laser-Physik, Universität Hamburg, Hamburg, Germany; [2]Zentrum für optische Quantentechnologien, Universität Hamburg, Hamburg, Germany; [3]Space Research Institute, RAS, Moscow, Russia

We present the experimental realization of photoconductivity in ultracold fermions in an optical lattice, using lattice amplitude

ROOM 4b

16:00 – 17:30

CL-6: Mesoscopic Devices

Chair: Halina Rubinsztein-Dunlop, University of Queensland, Kenmore, Brisbane, Australia

CL-6.1 TUE 16:00

Miniature Spectrometer and Beam Splitter for an Integrated Optical Coherence Tomography System

B.I. Akca[1], B. Považay[2], A. Alex[2], K. Wörhoff[1], R. de Ridder[1], W. Drexler[2], and •M. Pollnau[1]; [1]Integrated Optical MicroSystems Group, MESA+ Institute for Nanotechnology, University of Twente, Enschede, The Netherlands; [2]Center for Medical Physics and Biomedical Engineering, Medical University of Vienna, Vienna, Austria

In this paper we present an important step toward a cheap, compact, and quasi-

ROOM 13a

16:00 – 17:30

TF-2/LIM: Fibre and Solid State Lasers: a Comparison from an Industrial Point of View II (Session jointly held with LIM)

Chair: Clemens Hönninger, Amplitude Systems, Pessac, France and Cambridge, USA

TF-2/LIM.1 TUE (Tech Focus) 16:00

Recent Developments in Fiber Lasers and their Applications

•M. Grupp; IPG Laser GmbH, Burbach, Germany

Over the past few years fiber lasers gained a huge market share in all kind of industrial applications. Reason for this wide acceptance is the continuous development of specialized and adapted lasers suited for the requirements of the applications.

ROOM 13b

16:00 – 17:30

CB-6: Advanced Structures

Chair: Stefan Breuer, Technical University Darmstadt, Darmstadt, Germany

CB-6.1 TUE 16:00

Integrated Optically Isolated Laser Source via Non-Reciprocal Counter-Propagating Four-Wave Mixing

•L. Meriggi[1], M. Simonetta[2], M. Soldo[2], G. Russo[2], M. Zanola[1], M.J. Strain[1], M. Sorel[1], and G. Giuliani[2]; [1]University of Glasgow, Glasgow, United Kingdom; [2]University of Pavia, Pavia, Italy

An optically isolated laser source is proposed based on two DFB lasers and a SOA, where non-reciprocal FWM occurs in the two counterpropagating directions. An iso-

ROOM 13b

CB-5.6 TUE 15:15

Photon Statistics of Quantum Dot Superluminescent Diodes at the Transition from Amplified Spontaneous Emission to Stimulated Emission

•*S. Hartmann*[1], *A. Molitor*[1], *M. Blazek*[1,3], *and W. Elsäßer*[1,2]; [1]*Institute of Applied Physics, Technische Universität Darmstadt, Darmstadt, Germany*; [2]*Center of Smart Interfaces, Technische Universität Darmstadt, Darmstadt, Germany*; [3]*EVONIK Industries AG, Hanau, Germany*

We demonstrate the simultaneous tailoring of first and second order coherence properties of light emitted by a Quantum-Dot Superluminescent Diode by applying optical feedback. A continuous change from thermal to Poissonian photon statistics is observed.

ROOM 14a

IB-3.5 TUE 15:15

Experimental test of the robustness of the non-classicality of single photons

•*T. Huber*[1], *A. Predojević*[1], *M. Ježek*[2], *D. Föger*[1], *G. Solomon*[3], *R. Filip*[2], *and G. Weihs*[1]; [1]*Institut für Experimentalphysik, Universität Innsbruck, Innsbruck, Austria*; [2]*Department of Optics, Palacký University, Olomouc, Czech Republic*; [3]*Joint Quantum Institute, National Institute of Standards and Technology and University of Maryland, Gaithersburg, United States*

We performed a measurement revealing the goodness of the non-classicality of single photons in a lossy or noisy environment using a semiconductor quantum dot as single-photon emitter.

ROOM 14b

CA-6.5 TUE 15:15

21.4 kW peak power from a gigahertz multimode-diode-pumped solid-state laser with carrier envelope offset frequency detection

•*A. Klenner, M. Golling, and U. Keller*; *Department of Physics, Institute for Quantum Electronics, ETH Zurich, Zurich, Switzerland*

A gigahertz multimode-diode-pumped Yb-doped solid-state laser delivers 121 fs pulses at an average power of 3.33 W, resulting in 21.4 kW peak power. The carrier envelope offset frequency was detected with >30 dB S/N ratio.

ROOM 21

CG-1.5 TUE 15:15

Attosecond Spatial Control of Ionizing Electron Wave Packets

L. Zhang[1], •*X. Xie*[1], *S. Roither*[1], *D. Kartashov*[1], *M. Schöffler*[1], *D. Shafir*[2,3], *P. Corkum*[3], *A. Baltuška*[1], *A. Staudte*[3], *and M. Kitzler*[1]; [1]*Photonics Institute, Vienna University of Technology, Vienna, Austria*; [2]*Joint Laboratory for Attosecond Science of the National Research Council and the University of Ottawa, Ottawa, Canada*; [3]*Department of Physics of Complex Systems, Weizmann Institute of Science, Rehovot, Israel*

We demonstrate experimentally spatial control of electron wavepackets released from atoms with two-color orthogonal laser pulses. It is shown that electron-electron correlation in nonsequential double ionization can be determined by the spatial field shape.

ROOM EINSTEIN

CE-5.5 TUE 15:15

Characterising Few and Single Nano-Antennas with Rotating Polarisation

•*G. Lilley, T. Moldaschl, and K. Unterrainer*; *Photonics Institute, Vienna University of Technology, Vienna, Austria*

In this work, we present a novel technique to efficiently and quantitatively characterize the extinction cross-section of few and single nano-antennas by using laser light with a rotating polarisation.

ROOM 14a

16:00 – 17:30

IB-4: Quantum Networking

Chair: Christian Roos, University of Innsbruck, Innsbruck, Austria

IB-4.1 TUE (Invited) 16:00

Quantum Networks Enabled by Quantum Optics

•*H.J. Kimble*; *California Institute of Technology, Pasadena, United States*

An overview of quantum networks is presented from formal to physical. Research at Caltech is described for the realization of lithographic quantum optical networks composed of single atoms that interact strongly by way of single photons.

ROOM 14b

16:00 – 17:30

CA-7: High Energy Scaling Concepts

Chair: Frédéric Druon, Institut d'Optique, Palaiseau, France

CA-7.1 TUE 16:00

Cryogenically Cooled End Pumped Yb:YAG Zigzag Slab Laser

•*M. Ganija, D. Ottaway, P. Veitch, and J. Munch*; *School of Chemistry and Physics, Adelaide, Australia*

We report a 210W, cryogenically cooled end pumped zigzag slab with diffraction limited beam quality. We discuss the challenges associated with cooling a crystal from room to cryogenic temperatures in a robust laser head design.

ROOM 21

16:00 – 17:30

CG-2: Ultrafast Dynamics in Attosecond Time Scale

Chair: Mauro Nisoli, Polytecnico Milano, Milan, Italy

CG-2.1 TUE (Tutorial) 16:00

Attosecond Science and Technology

•*P. Corkum*; *Joint Attosecond Science Laboratory, University of Ottawa and National Research Council of Canada, Ottawa, Canada*

Describes the physics and technology of attosecond pulse generation and characterization, both in space and in time. It then generalizes from characterizing attosecond pulses to imaging valence electrons and their changes during a photochemical reaction.

ROOM EINSTEIN

16:00 – 17:30

CE-6: Laser Materials

Chair: Stefan Kück, Physikalisch-Technische Bundesanstalt, Braunschweig, Germany

CE-6.1 TUE (Invited) 16:00

Engineering of refractive index and doping level of KY(1-x-y-z)Gd(x)Lu(y) Yb(z)(WO4)2 layers for a cladding-side-pumped channel waveguide laser

S. Aravazhi[1], *D. Geskus*[1], *K. van Dalfsen*[1], *S.A. Vázquez-Córdova*[1], *C. Grivas*[1,2], *U. Griebner*[3], *S.M. García-Blanco*[1], *and* •*M. Pollnau*[1]; [1]*University of Twente, Enschede, The Netherlands*; [2]*On leave from: University of Southampton, Southampton, United Kingdom*; [3]*Max Born Institute, Berlin, Germany*

Growth of single-crystalline KY(1-x-y-z)Gd(x)Lu(y)Yb(z)(WO4)2 layers with

NOTES

ROOM 1

as an effective radio-frequency emitting antenna.

CD-10.2 TUE 16:15

Phase-sensitive amplification in a $\chi^{(3)}$ photonic chip.

•*J. Schröder[1], R. Neo[1], Y. Paquot[1], D.-Y. Choi[2], S. Madden[2], B. Luther-Davies[2], and B.J. Eggleton[1]; [1]Centre for Ultrahigh Bandwidth Devices (CUDOS), The School of Physics, The University of Sydney, Sydney, Australia; [2]CUDOS, Laser Physics Centre, Research School of Physics and Engineering, Australian National University, Canberra, Australia*

We demonstrate phase-sensitive amplification inside a $\chi^{(3)}$ chalcogenide waveguide. Our experiment is based on an elegant spectral slicing scheme using a spectral pulse-shaper. We achieve 10 dB of phase-sensitive gain.

CD-10.3 TUE (Invited) 16:30

High speed, high performance all-optical information processing utilizing nonlinear optical transients

•*D. Brunner, M.C. Soriano, C.R. Mirasso, and I. Fischer; Instituto de Física Interdisciplinar y Sistemas Complejos (IFISC), UIB, Palma de Mallorca, Spain*

Nonlinear transients can be utilized for information processing systems. By optically inducing transient states in a telecommunication laser diode, we experimentally perform all-optical information processing, achieving data rates exceeding gigabyte per second.

ROOM 4a

modulation. The observed dynamics are reminiscent of a nonlinear pendulum and we find excellent agreement with semiclassical calculations.

IC-2.2 TUE 16:15

Observing the onset of effective mass of a Bose-Einstein condensate in an optical lattice

•*R. Chang, S. Potnis, R. Ramos, C. Zhuang, M. Hallaji, A. Hayat, F. Duque-Gomez, J.E. Sipe, and A.M. Steinberg; Department of Physics and the Institute for Optical Sciences, University of Toronto, Toronto, Canada*

We subject a BEC in an optical lattice to an abruptly applied force, finding that while the effective mass is an accurate description at long timescales, the initial response is described by the bare mass.

IC-2.3 TUE 16:30

Stern-Gerlach Interferometer on an Atom Chip

•*S. Machluf, Y. Japha, and R. Folman; Ben-Gurion University, Be'er Sheva, Israel*

We theoretically propose and analyze, and experimentally demonstrate, the building blocks of a matter-wave beam-splitter based on magnetic field gradients, which can be used for freely propagating or trapped Bose-Einstein condensates or thermal ensembles.

IC-2.4 TUE 16:45

Exploring quantum magnetism in a chromium Bose-Einstein Condensate

A. De Paz[2,1], A. Chotia[1,2], A. Sharma[2,1], E. Maréchal[1,2], P. Pedri[2,1], L. Vernac[2,1], B. Laburthe-Tolra[1,2], and •O. Gorceix[2,1]; [1]LPL, CNRS, UMR7538, Villetaneuse, France; [2]Laboratoire de Physique des Lasers, Université Paris13, Sorbonne Paris Cité,

ROOM 4b

maintenance-free spectral-domain OCT system by integrating its central components, the beam splitter and spectrometer, on a silicon chip.

CL-6.2 TUE 16:15

Singlet Oxygen luminescence detection with a fibre-coupled superconducting nanowire single-photon detector

•*N. Gemmell[1], A. McCarthy[1], B. Liu[2], M. Tanner[1], S. Dorenbos[3], V. Zwiller[3], M. Patterson[2], G. Buller[1], B. Wilson[4], and R. Hadfield[5]; [1]Heriot Watt University, Edinburgh, United Kingdom; [2]Juravinski Cancer Centre and McMaster University, Hamilton, Canada; [3]Kalvi Institute of Nanoscience, Delft University of Technology, Delft, The Netherlands; [4]Ontario Cancer Institute & University of Toronto, Toronto, Canada; [5]University of Glasgow, Glasgow, United Kingdom*

We report on the direct monitoring of singlet oxygen luminescence at 1270 nm wavelength using a fibre coupled superconducting nanowire single photon detector. These results open the pathway to practical dose monitoring in photodynamic therapy.

CL-6.3 TUE 16:30

Low threshold microgoblet dye lasers for biosensing applications

•*S. Wiegele[1], T. Grossmann[1], T. Beck[1], J. Fischer[1], T. Wienhold[2], T. Mappes[2,3], and H. Kalt[1]; [1]Institute for Applied Physics, Karlsruhe Institute for Technology, Karlsruhe, Germany; [2]Institute of Microstructure Technology, Karlsruhe Institute of Technology, Karlsruhe, Germany; [3]Carl Zeiss AG, Corporate Research and Technology, Jena, Germany*

We report on goblet-shaped microcavity lasers consisting of dye-doped polymers showing thresholds as low as 0.5 nJ in air and 1.6 nJ in water. Proof-of-principle experiments show that these lasers are suitable for biosensing applications.

CL-6.4 TUE 16:45

Detection of Plasmonic Nanoparticles Using Whispering Gallery Mode Resonators

•*J. Swaim[1], J. Knittel[1], and W. Bowen[1,2]; [1]Department of Physics, University of Queensland, Brisbane, Australia; [2]Centre for Engineered Quantum Systems, University of Queensland, Brisbane, Australia*

ROOM 13a

TF-2/LIM.2 TUE (Tech Focus) 16:30

Ultrafast Solid State Laser with High Pulse Energy - New Applications

•*H. Amler, S. Sobolewski, and J. Thumbs; Photon Energy GmbH, Ottensoos, Germany*

Usually for marking applications ns-lasers are used. Since a new ps-laser source is available with lower costs, new possibilities are opened up to use the advantages of this laser type also for marking applications.

ROOM 13b

lation of 20dB is experimentally demonstrated.

CB-6.2 TUE 16:15

Switchable Multiwavelength Emission Using Semiconductor Ring Laser With Optical Filtered Feedback

•*M. Khoder[1], G. Verschaffelt[1], R.M. Nguimdo[1], X. Leijtens[2], J. Bolk[2], and J. Danckaert[1]; [1]Applied Physics research group, Vrije Universiteit Brussel, Brussels, Belgium; [2]COBRA Research Institute, Eindhoven University of Technology, Eindhoven, The Netherlands*

We present experiments and numerical simulations of a novel integrated approach to obtain multi-wavelength emission from a semiconductor ring laser. The approach is based on balancing gain differences between modes using on-chip filtered optical feedback.

CB-6.3 TUE 16:30

Multiwavelength Laser Based on Superimposed Bragg Gratings on Multiquantum Well AlGaInAs-InP

•*A.D. Simard[1], M.J. Strain[2], V. Pusino[2], M. Sorel[2], and S. LaRochelle[1]; [1]Centre d'optique, photonique et laser (COPL), Université Laval, Québec, Canada; [2]Department of Electronics and Electrical Engineering, University of Glasgow, Glasgow, United Kingdom*

We demonstrate a novel multiwavelength laser structure based on superimposed Bragg gratings on multiquantum well AlGaInAs-InP. A passively mode locked regime with a repetition rate tunable over 17 GHz is presented.

CB-6.4 TUE 16:45

Continuously tunable, narrow linewidth mm-wave generation from a monolithically integrated triple DFB laser chip

M. Zanola[1,2], M. Sorel[1], G. Giuliani[2], and •M.J. Strain[1]; [1]University of Glasgow, Glasgow, United Kingdom; [2]Università di Pavia, Pavia, Italy

ROOM 14a

IB-4.2 TUE 16:30

Quantum networking with time-bin encoded qu-d-its using single photons emitted on demand from an atom-cavity system

•A. Holleczek, O. Barter, P.B.R. Nisbet-Jones, J. Dilley, and A. Kuhn; *University of Oxford, Oxford, United Kingdom*

We report on the on-demand delivery of photonic qu-d-its produced by full coherent control of the single-photon generation in a strongly-coupled atom-cavity system. Additionally, we demonstrate that these photons can be used for LOQC.

IB-4.3 TUE 16:45

Synchronization and Quantum Correlations in Harmonic Networks

G. Manzano, F. Galve, G. Giorgi, •P. Colet, E. Hernández-García, and R. Zambrini; Instituto de Física Interdisciplinar y Sistemas Complejos, IFISC (CSIC-UIB), Palma de Mallorca, Spain

Quantum synchronization in networks of

ROOM 14b

CA-7.2 TUE 16:15

Efficient Operation of a Pulsed Diode Pumped Cryogenic Gas Cooled Yb:YAG Multislab Amplifier Delivering 7.4 J at 10 Hz

•P. Mason, K. Ertel, S. Banerjee, J. Phillips, A. Lintern, J. Greenhalgh, C. Hernandez-Gomez, and J. Collier; Central Laser Facility, STFC Rutherford Appleton Laboratory, Didcot, United Kingdom

Improvements to the DiPOLE prototype diode-pumped cryogenic gas-cooled Yb:YAG multislab amplifier have enabled efficient and stable operation at repetition rates up to 10 Hz delivering 7.4 J pulses with an optical-to-optical efficiency of 23%.

CA-7.3 TUE (Invited) 16:30

The Opportunity of High Average and High Peak Power Lasers

•J. Collier, K. Ertel, P. Mason, S. Banerjee, J. Phillips, A. Lintern, J. Greenhalgh, and C. Hernandez-Gomez; Central Laser Facility, Science and Technology Facilities Council, Rutherford Appleton Laboratory, Harwell-Oxford Campus, Chilton, OX11 0QX, United Kingdom

This talk will describe our scalable diode pumped laser concept called DiPOLE that will in principle offer diode driven PW+ class lasers as a new basis for applications based on compact, efficient and reliable sources.

ROOM 21

ROOM EINSTEIN

systematic variations of Y3+, Gd3+, Lu3+, and Yb3+ concentrations onto KY(WO4)2 substrates is investigated w.r.t. lattice mismatch, refractive-index contrast, and Yb3+ spectroscopy. A cladding-side-pumped channel waveguide laser is demonstrated.

CE-6.2 TUE 16:30

Actively Q-Switch operation of diode-pumped Er3+, Yb3+, Ce3+: Ca2Al2SiO7 single crystal laser at 1.5-1.6 μm

•A. Jaffrès[1], B. Viana[1], P. Loiseau[1], G. Aka[1], C. Larat[2], and E. Lallier[2]; [1]LCMCP, Paris, France; [2]TRT, Palaiseau, France

First demonstration of actively Q-Switch laser operation in Er, Yb, Ce:Ca2Al2SiO7 under diode-pumping in safe eye range is realized. Comparison is done with commercial phosphate glass.

CE-6.3 TUE 16:45

Multiwatt Compact Ceramic Yb:YAG Passively Q-switched Laser

A. Agnesi[1], L. Carrà[1], •F. Pirzio[1], G. Reali[1], J.T. Thomas[2], S. Veronesi[2], M. Tonelli[2], J. Li[3], Y. Pan[3], and J. Guo[3]; [1]University of Pavia, Pavia, Italy; [2]NEST Istituto Nanoscienze - CNR and Dip. di Fisica Università of Pisa, Pisa, Italy; [3]Key Lab. of Transparent Opto-

NOTES

ROOM 1

CD-10.4 TUE 17:00

Optoelectronic nonlinear transient computing with multiple delays

•*R. Martinenghi, A. Baylón-Fuentes, X. Fang, M. Jacquot, Y.K. Chembo, and L. Larger; University of Franche-Comte & FEMTO-ST/Optics Dpt, Besancon, France*

A versatile photonic nonlinear transient computer is reported. Its hybrid analogue and digital architecture allows for an easy reconfiguration, and for direct implementation of in-line processing. Computational efficiency in parameter space is reported.

CD-10.5 TUE 17:15

10GHz bandwidth nonlinear delay electro-optic phase dynamics for ultra-fast nonlinear transient computing

•*A. Baylon-Fuentes, R. Martinenghi, M. Jacquot, Y.K. Chembo, and L. Larger; University of Franche-Comte, FEMTO-ST/Optics Dpt, Besancon, France*

Photonic computing is performed via complex nonlinear dynamical transients. Electro-optic nonlinear delay phase dynamics is designed with Telecom grade devices, allowing up to 10GHz bandwidth for information processing according to Reservoir Computing concepts.

ROOM 4a

Villetaneuse, France

We study atomic spin dynamics in a chromium BEC loaded in 3D optical lattices. Dynamics that either change or maintain magnetization are analyzed with special focus on dipolar interactions.

IC-2.5 TUE (Invited) 17:00

Matter-wave clocks: measuring time and mass, and testing general relativity

•*H. Mueller; University of California, Berkeley, Berkeley, United States*

We demonstrate a clock referenced to the Compton frequency of a cesium atom; a proposed gravitational Aharonov-Bohm experiment; and tests of general relativity and their interpretation in the standard model extension. Matter waves are clocks.

ROOM 4b

We demonstrate optical detection of 40 nm x 10 nm gold nanorods using a frequency stabilized microtoroid resonator. We show that the technique is reproducible, with measured frequency shifts in good agreement with theoretical predictions.

CL-6.5 TUE 17:00

Optical Manipulation of Single Cells in Femtosecond Laser Fabricated Lab-on-chip

•*R. Martinez Vazquez[1], F. Bragheri[1], P. Minzioni[2], N. Bellini[1,3], P. Paiè[1], G. Nava[2], R. Ramponi[1], I. Cristiani[2], and R. Osellame[1]; [1]Istituto di Fotonica e Nanotecnologie IFN - CNR, Dipartimento di Fisica, Politecnico di Milano, Milano, Italy; [2]Dipartimento di Ingegneria Industriale e dell'Informazione, Università degli Studi di Pavia, Pavia, Italy; [3]SUPA, School of Physics and Astronomy, University of St. Andrews, St. Andrews, United Kingdom*

Femtosecond laser micromachining has been successfully used to fabricate integrated optofluidic devices, which allows the analysis of cell-mechanical properties, fluorescence detection and sorting of single cells by means of optical forces inside a microfluidic chip.

CL-6.6 TUE 17:15

Charge-driven dispensing of picolitre drops for biomolecules microarrays by Pyro-Electro-hydrodynamic system

•*S. Grilli[1], L. Miccio[1], O. Gennari[1], S. Coppola[1,2], V. Vespini[1], P. Orlando[3], and P. Ferraro[1]; [1]CNR-INO, Pozzuoli, Italy; [2]University of Naples Federico II, Napoli, Italy; [3]CNR-IBP, Napoli, Italy*

Spontaneous charge effects are used here for the first time for dispensing small volumes of DNA solution for microarray applications. The technique appears promising also for concentrating analytes in very diluted solutions.

ROOM 13a

TF-2/LIM.3 TUE (Tech Focus) 17:00

Ultrafast Fiber Lasers and Bulk Lasers for Material Processing - A Comparison

•*N. Hodgson, R. Knappe, and M. Bengtsson; Coherent Inc., Santa Clara, CA, United States*

The technology and performance of high energy picosecond and femtosecond lasers in fiber and bulk solid state geometry are reviewed. Ultrafast laser systems providing pulse energies of up to 100s of microJoules are compared with respect to their applicability in material processing.

ROOM 13b

Generation of mm-wave signals from a three DFB laser system on a single chip is presented. Continuous tunability over a 40GHz range is demonstrated, with improved linewidths achieved through a four-wave-mixing, mutual injection locking process.

CB-6.5 TUE 17:00

Organic semiconductor distributed feedback (DFB) laser pixels fabricated via nanograting transfer and ink-jet printing

•*X. Liu[1,2], S. Klinkhammer[1,2], Z. Wang[1,2], K. Sudau[3], N. Mechau[1,3], C. Vannahme[2,1], T. Mappes[2], and U. Lemmer[1]; [1]Light Technology Institute (LTI) and Center for Functional Nanostructures (CFN), Karlsruhe Institute of Technology, Karlsruhe, Germany; [2]Institute of Microstructure Technology (IMT), Karlsruhe Institute of Technology, Karlsruhe, Germany; [3]InnovationLab GmbH, Heidelberg, Germany*

Nanograting transfer and ink-jet printing are demonstrated as two novel processing methods to fabricate spatially defined organic semiconductor distributed feedback (DFB) laser pixels with a high yield.

CB-6.6 TUE 17:15

Room Temperature Plasmonic Nanowire Laser Near The Surface Plasmon Frequency

•*T. Sidiropoulos[1], S. Geburt[2], R. Röder[2], M. Ogrisek[2], S. Maier[1], C. Ronning[2], and R. Oulton[1]; [1]Imperial College London, London, United Kingdom; [2]University of Jena, Jena, Germany*

We present room temperature plasmonic lasing from semiconductor nanowires. Slow group velocity, associated with frequencies close to the surface plasmon resonance appears as a strong blueshift in the lasing frequency.

ROOM 14a

dissipating oscillators is studied and it is shown to witness robust non-classical correlations.

IB-4.4 TUE 17:00

Hybrid Quantum Teleportation

•*S. Takeda*[1], *T. Mizuta*[1], *M. Fuwa*[1], *P. van Loock*[2], *and A. Furusawa*[1]; [1]*Department of Applied Physics, School of Engineering, The University of Tokyo, Tokyo, Japan*; [2]*Institute of Physics, Johannes-Gutenberg Universität Mainz, Mainz, Germany*

We experimentally realize deterministic, unconditional quantum teleportation of photonic qubits through the hybrid technique: continuous-variable teleportation of qubits. Optimally tuning the teleporter's feedforward gain enables a faithful qubit transfer even with imperfect resource squeezing.

IB-4.5 TUE 17:15

Two Fundamental Experimental Tests of Nonclassicality with Qutrits

J. Ahrens[1], *E. Amselem*[1], *A. Cabello*[2], *and* •*M. Bourennane*[1]; [1]*Stockholm University, Stockholm, Sweden*; [2]*Sevilla University, Sevilla, Spain*

We report on experiments, the first one is the simplest task for which quantum mechanics provides an advantage over classical physics. The second one is on contextual correlations by sequentially measuring pairs of compatible observables.

ROOM 14b

CA-7.4 TUE 17:00

High Energy and Power Cryogenic Composite-Thin-Disk Yb:YAG Laser

•*L.E. Zapata*[1], *W. Huang*[1], *H. Cankaya*[2], *A.-L. Calendron*[2], *H. Lin*[1], *E. Granados*[1], *K.-H. Hong*[1], *and F.X. Kärtner*[1,2]; [1]*Research Laboratory of Electronics, Massachusetts Institute of Technology, Cambridge, MA, United States*; [2]*Center for Free-Electron Laser Science, DESY and Department of Physics, University of Hamburg, Hamburg, Germany*

A cryogenic Yb:YAG composite-thin-disk CPA design is presented with the ultimate goal of delivering 1J, 10 ps, pulses at 100 Hz. First results on the 100 mJ preamplifier stage will be presented

CA-7.5 TUE 17:15

High-power and High-energy Cryogenically Cooled Disk Laser

•*I. Mukhin, E. Perevezentsev, O. Vadimova, I. Kuznetsov, O. Palashov, and E. Khazanov*; *Institute of Applied Physics of the Russian Academy of Science, Nizhny Novgorod, Russia*

Cryogenic disk laser with ~0.12 J of output energy at 0.5 kHz repetition rate was developed by using composite active elements made of Yb:YAG ceramics and its active cooling by liquid nitrogen jet

ROOM 21

CG-2.2 TUE 17:00

Ultrafast Dynamics of Highly-Excited States in N2 Molecules Excited by Attoseconds Pulses

•*F. Calegari*[1], *A. Trabattoni*[1], *S. Anumula*[1], *M. Lucchini*[2], *L. Wang*[3], *F. Frassetto*[4], *L. Poletto*[4], *M. Hochlaf*[5], *G. Sansone*[1], *M. Vrakking*[6], *and M. Nisoli*[1]; [1]*Politecnico di Milano, Department of Physics, CNR-IFN, Milano, Italy*; [2]*ETH Zurich, Physics Departme, Zurich, Switzerland*; [3]*Institute of Physics, Beijing National Laboratory for Condensed Matter Physics, Chinese Academy of Sciences, Beijing, China, People's Republic of (PRC)*; [4]*Institute of Photonics and Nanotechnologies, CNR-IFN, Padova, Italy*; [5]*Université Paris-Est, MSME UMR 8208 CNRS, Marne-la-Vallée, France*; [6]*Max-Born-Institut, Berlin, Germany*

We used velocity-map-imaging to measure electronic and nuclear dynamics in N2 molecules excited by extreme-ultraviolet pulses. A time-to-space mapping of autoionization channel is demonstrated; complex dynamics of highly-excited states on sub-8-femtosecond time-scale is found.

CG-2.3 TUE 17:15

Controlling Molecular Isomerization and Fragmentation with Laser-Induced Electron Recollision

X. Xie[1], *K. Doblhoff-Dier*[2], *S. Roither*[1], *M. Schöffler*[1], *D. Kartashov*[1], *H. Xu*[1,3], *T. Rathje*[4,5], *G. Paulus*[4,5], *A. Baltuška*[1], *S. Gräfe*[2], *and* •*M. Kitzler*[1]; [1]*Photonics Institute, Vienna University of Technology, Austria*; [2]*Institute for Theoretical Physics, Vienna University of Technology, Austria*; [3]*State Key Laboratory on Integrated Optoelectronics, College of Electronic Science and Engineering, Jilin University, Changchun, China, People's Republic of (PRC)*; [4]*Institute of Optics and Quantum Electronics, Friedrich-Schiller-University Jena, Germany;* [5]*Helmholtz Institute Jena, Germany*

We show experimentally and theoretically that fragmentation and isomerization reactions in polyatomic molecules can be controlled by selective electron removal from inner-valence shells during carrier-envelope phase-sensitive recollision induced double ionization with few-cycle laser pulses.

ROOM EINSTEIN

functional Inorganic Materials, Shanghai Institute of Ceramics, Chinese Academy of Sciences, Shanghai, China, People's Republic of (PRC)

We present Yb:YAG ceramic crystals growth, spectroscopic characterization and laser experiments. In passive Q-switching operation, pumping with a fiber-coupled 25-W laser diode we demonstrated up to 4.4-W-average power, 7-ns-long pulses at 48 kHz repetition rate.

CE-6.4 TUE 17:00

Fabrication and Characterization of Room-temperature-bonded Composite Lasers

•*I. Shoji, T. Ishikawa, T. Yamauchi, K. Hara, and S. Matsumoto*; *Chuo University, Tokyo, Japan*

We have succeeded in fabrication and laser oscillation of Nd:YAG/YAG and Yb:YAG/YAG composite lasers using the room-temperature-bonding technique. Development of new composites with superior thermal properties is expected by use of this technique.

CE-6.5 TUE 17:15

Dispersion and Anisotropy of Thermo-Optical Properties of Tetragonal GdVO4 and YVO4 Laser Host Crystals

•*P. Loiko*[1], *K. Yumashev*[1], *V. Matrosov*[2], *and N. Kuleshov*[1]; [1]*Center for Optical Materials and Technologies, Belarusian National Technical University, Minsk, Belarus*; [2]*Solix, Ltd., Minsk, Belarus*

Thermo-optic coefficients and thermal coefficients of the optical path were determined in YVO4 and GdVO4 for wide spectral range of 0.4-1.1μm. Detailed analysis of anisotropic thermal lens effect was performed for Nd-doped vanadates.

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Hall B0

13:00 – 14:00

CD-P: CD Poster Session

CD-P.1 TUE

Non-Permanent Optically Induced Long-Period Gratings for Energy Transfer between Transverse Fiber Modes using Femtosecond Pulses

•*T. Walbaum, T. Hellwig, and C. Fallnich*; *Westfälische Wilhelm-Universität, Münster, Germany*

We present the conversion of transverse fiber modes using non-permanent long-period gratings generated by femtosecond pulses via multimode interference, and the temporal as well as the spectral profiles of the converted pulses are analyzed numerically.

CD-P.2 TUE

Experimental Verification of Femtosecond Transverse Mode Conversion Induced by Non-Permanently Written Long-Period Gratings

•*T. Walbaum, M. Schnack, T. Hellwig, and C. Fallnich*; *Institut für Angewandte Physik, Westfälische Wilhelm-Universität, Münster, Germany*

We present the experimental demonstration of optically induced femtosecond transverse mode conversion. The necessary long-period grating is non-permanently written through the Kerr effect by the multimode interference of a co-propagating cross-polarized write beam.

CD-P.3 TUE

Brillouin gain spectra in all-solid chalcogenide-tellurite photonic bandgap fiber

•*T. Cheng, M. Liao, W. Gao, Z. Duan, D. Deng, T. Suzuki, and Y. Ohishi*; *Toyota Technological Institute, Nagoya, Japan*

A new way to suppress stimulated Brillouin scattering by using an all-solid chalcogenide-tellurite photonic bandgap fiber is presented. The compositions of the chalcogenide and the tellurite glass are As2Se3 and TZLB.

CD-P.4 TUE

Mid-Infrared Supercontinuum Generation in a 1.3 cm As2S3 Fiber with Suspended-Core Structure

•*W. Gao[1], M.E. Amraoui[2], M. Liao[1], H. Kawashima[1], Z. Duan[1], D. Deng[1], T. Cheng[1], T. Suzuki[1], Y. Messaddeq[2], and Y. Ohishi[1]*; [1]*Research Center for Advanced Photon Technology, Toyota Technological Institute, Nagoya, Japan*; [2]*Centre d'optique, Photonique et Laser, Université Laval, Quebec, Canada*

We demonstrate the mid-Infrared supercontinuum generation in a 1.3 cm suspended-core As2S3 microstructured optical fiber experimentally. The SC range changed with different pump wavelengths from 2200 to 2600 nm.

CD-P.5 TUE

Efficient Second-Harmonic Generation of Broadband Radiation in the Nonlinear Crystal with Constant Axial Temperature Gradient

•*J. Želudevičius, K. Regelskis, N. Gavrilin, and G. Račiukaitis*; *Center for Physical Sciences & Technology, Vilnius, Lithuania*

Results of numerical and experimental analysis of SHG in a nonlinear crystal with a constant axial temperature gradient are presented. The highly efficient (>65%) SHG of broadband radiation was demonstrated by use of this method.

CD-P.6 TUE

Formation and Amplification of Flat Top Picosecond Pump Pulses for OPCPA Systems

•*J. Adamonis[1,2], R. Antipenkov[2], J. Kolenda[2,3], A. Michailovas[2,3], A. Piskarskas[1], A. Varanavicius[1], and A. Zaukevicius[1,2]*; [1]*Vilnius University, Vilnius, Lithuania*; [2]*Ekspla, Vilnius, Lithuania*; [3]*Institute of Physics of Center for physical science and technology, Vilnius, Lithuania*

Flat top OPCPA pump pulses extending 50 ps plateau time interval were formed by cascade second harmonic generation. Shaped pulses were amplified up to F=0.128 J/cm2 energy fluence with modest pulse envelope temporal modulation.

CD-P.7 TUE

Multiphoton upconversion in rare earth doped nanocrystals for sub-diffractive microscopy

L. Caillat[1,2], F. Pellé[1], B. Hajj[2], •V. Shynkar[2], D. Chauvat[2], and J. Zyss[2]; [1]*Chimie ParisTech, Paris, France*; [2]*Ecole Normale Supérieure, Cachan, France*

We propose a new microscopy with a significant improvement in lateral resolution below diffraction limit based on high nonlinear multy-photons low excitation energy upconversion process in rare earth doped nanoparticles for cellular and animal imaging.

CD-P.8 TUE

Indirect exciton mediated optical transistors

•*J. Wilkes*; *Cardiff University, Cardiff, United Kingdom*

A new design for an all-optical transistor is proposed and analysed by numerical modelling. Dipole-orientated indirect excitons in coupled quantum wells are used as an operating medium to control the switching of light with light.

CD-P.9 TUE

Mid-infrared supercontinuum generation in tapered ZBLAN fiber with a standard Erbium mode-locked fiber laser

•*I. Kubat[1], C. Agger[1], P.M. Moselund[2], and O. Bang[1,2]*; [1]*DTU Fotonik, Kongens Lyngby, Denmark*; [2]*NKT Photonics A/S, Birkerød, Denmark*

Short tapers implemented in realistic ZBLAN fiber results in an IR Supercontinuum in the 0.86-4.36μm spectral range covering much of the ZBLAN transmission window when using an Erbium fiber laser to drive the broadening process.

CD-P.10 TUE

40 GHz nonlinear all optical switching in a Mach-Zehnder interferometer integrated device

•*C. Lacava[1], M.J. Strain[2], I. Cristiani[1], and M. Sorel[2]*; [1]*Dipartimento di Ingegneria Industriale e dell'Informazione, Università di Pavia, Pavia, Italy*; [2]*School of Engineering, University of Glasgow, Glasgow, United Kingdom*

Here we propose a fully integrated silicon Mach-Zehnder interferometer for all optical switching operation. A 40% switching level at f=40 GHz was obtained using a 27dBm pump power. No Free Carrier-related degradation effects were observed.

CD-P.11 TUE

Pulse comression in Er/Yb-doped fibres

M. Zajnulina[1], •J.M. Chavez Boggio[1], M. Böhm[2], A.A. Rieznik[3], R. Haynes[1], and M.M. Roth[1]; [1]*Leibnitz-Institut für Astrophysik, Potsdam, Germany*; [2]*University of Potsdam, Potsdam, Germany*; [3]*Instituto Technologico de Buenos Aires and CONICET, Buenos Aires, Argentina*

The possibility of higher-order soliton compression was studied in Er/Yb-doped fibres. The stability of compressed pulses was investigated for such initial parameters as input power, nonlinear coefficient, and group velocity dispersion.

CD-P.12 TUE

High-power, Picosecond, Fiber-laser Green Source Based on BiB3O6 for Synchronous Pumping of MgO:sPPLT Optical Parametric Oscillator

•*C.K. Suddapalli[1] and M. Ebrahim-Zadeh[1,2]*; [1]*ICFO-The Institute of Photonic Sciences, Barcelona, Spain*; [2]*Institucio Catalana de Recerca i Estudis Avancats (ICREA), Passeig Lluis Companys 23, Barcelona, Spain*

We report a high-power, picosecond, fiber-laser-green source based on BiB3O6, providing 5.4W (<0.24%rms) of green-power at 532nm to synchronously pump an MgO:sPPLT near-infrared OPO tunable across 874-1008nm(signal) and 1126-1359nm(idler) with >0.5W over entire tuning range.

CD-P.13 TUE

Intense Lyman-α light source for generation of ultra-slow Muon

•*Y. Oishi[1], K. Okamura[2], K. Miyazaki[1], N. Saito[1], M. Iwasaki[1], and S. Wada[1,2]*; [1]*RIKEN, Wako, Japan*; [2]*MEGAOPTO Corp., Wako, Japan*

We develop an all-solid-state 1062.78 nm laser system. Its can applied to generation of intense Lyman-alpha coherent light source by use of two-photon resonant four-wave mixing.

CD-P.14 TUE

Soliton-Like Propagation in Dispersion-Managed Silicon Nanowaveguides

•*O. Tsilipakos[1], D. Zografopoulos[2], and E. Kriezis[1]*; [1]*Department of Electrical and Computer Engineering, Aristotle University of Thessaloniki, Thessaloniki, Greece*; [2]*Consiglio Nazionale delle Ricerche, Istituto per la Microelettronica e Microsistemi, Roma, Italy*

Dispersion-managed soliton-like pulse-train propagation in silicon nanowaveguides is theoretically studied. We investigate into the maximum achievable pulse repetition rate. The application of a carrier-sweep bias allows for bit rates beyond 1.28 Tbit/s.

CD-P.15 TUE

Double-seed stabilization of a continuum generated from fourth-order modulation instability

K. Hammani[1], C. Finot[1], R. Habert[2], A. Mussot[2], and •A. Kudlinski[2]; [1]*Laboratoire Interdisciplinaire Carnot de Bourgogne, Dijon, France*; [2]*Laboratoire PhLAM, Lille, France*

We experimentally and numerically study a fourth-order modulation instability process in a microstructured fiber. Using a single seed cannot reduce the large fluctuations : two seeds slightly detuned from the maximum gain frequency are required.

CD-P.16 TUE

Guiding of meter scale AC discharges by laser filamentation in air

•*A. Houard[1], Y. Brelet[1], G. Point[1], J. Carbonnel[1], Y.-B. André[1], B. Prade[1], L. Arantchouk[2], and A. Mysyrowicz[1]*; [1]*Laboratoire d'Optique Appliquee, ENSTA ParisTech, Ecole Polytechnique, CNRS, Palaiseau, France*; [2]*Laboratoire de Physique des Plasmas, Ecole Polytechnique, CNRS, Palaiseau, France*

We report experiments of laser-guided discharges obtained in air with high voltage bursts delivered by a compact Tesla coil. Characteristics of the guided discharges are studied for electrode gaps ranging from 30 to 170 cm.

CD-P.17 TUE

Tunable multi-wavelength active conversion of 1550 nm signals in a Cr3+:LiCAF-PPSLT laser

•*A.J. Torregrosa, H. Maestre, and J. Capmany*; *Communications Engineering Department, Universidad Miguel Hernandez, Elche, Spain*

We report tunable and multiple wavelength conversion in the communications band from single-pass difference frequency generation in PPSLT crystals placed inside a tunable self-injection-locked diode-pumped Cr3+:LiCAF cavity.

CD-P.18 TUE

Optimized Nanosecond Broadband Laser Source for Application in Nonlinear Imaging

•F. El Bassri[1,2], A. De Angelis[1], D. Pagnoux[1], and V. Couderc[1]; [1]Xlim Institute, Photonics department, Limoges, France; [2]CILAS, Orléans, France

We present an efficient source for nonlinear imaging emitting both broadband Stokes signal generated in a PCF and nanosecond pump signal, from a single microchip laser, spatially and temporally overlapped in a LMA fiber

CD-P.19 TUE

Nonlinear imaging of surfaces with confocal and interferometric SHG microscopy using a broadband 1550 nm fs-fiber laser

•A. Prylepa[1,2], J. Duchoslav[1,2], C. Reitböck[1,2], K. Hingerl[2], and D. Stifter[1,2]; [1]Christian Doppler Laboratory for Microscopic and Spectroscopic Material Characterization, Linz, Austria; [2]Center for Surface and Nanoanalytics (ZONA), Linz, Austria

Confocal and interferometric second harmonic generation microscope combined with linear low-coherence imaging capabilities was developed by using a broadband fs-fiber laser at 1550 nm and applied for investigations of materials surfaces and subsurfaces.

CD-P.20 TUE

Dual-correlated pumping scheme for phase-noise retention in FWM

•A. Anthur[1], R. Watts[2], J. O'Carroll[2], D. Venkitesh[1], and L. Barry[2]; [1]Department of Electrical Engineering, IIT Madras, Chennai, India; [2]RINCE, School of Electronic Engineering, Dublin City University, Dublin, Republic of Ireland

A coherent technique is used to study the phase noise relationship between four-wave mixing (FWM) components. A new scheme is proposed to prevent the phase noise increase in conjugate, normally associated with FWM.

CD-P.21 TUE

Highly efficient SHG at 561 nm using a QD laser and a PPLN waveguide

•K. Fedorova[1], G. Sokolovskii[1,2], I. Krestnikov[3], D. Livshits[3], and E. Rafailov[1]; [1]University of Dundee, Dundee, United Kingdom; [2]Ioffe Physico-Technical Institute, St. Petersburg, Russia; [3]Innolume GmbH, Dortmund, Germany

A compact high-power yellow-green CW laser source at 561nm based on frequency-doubling of a quantum-dot fiber-Bragg-grating laser in a PPLN waveguide is demonstrated with output power in excess of 90mW and conversion efficiency of 52.34%.

CD-P.22 TUE

Experimental demonstration of stimulated Raman scattering in the evanescent field of a tapered nanofiber immersed in a liquid

*•L. Shan[1], G. Pauliat[1], G. Vienne[2,3], L. Tong[2], and S. Lebrun[1]; [1]Laboratoire Charles Fabry, Institut d*Optique, CNRS, Univ Paris-Sud, Palaiseau, France; [2]State Key Laboratory of Modern Optical Instrumentation, Department of Optical Engineering, Zhejiang University, Hangzhou, China, People's Republic of (PRC); [3]Present adress : Data Storage Institute, Agency for Science, Technology and Research, (A*STAR), Singapore, Singapore*

We present the first experimental demonstration of stimulated Raman scattering in the evanescent field of a nanofiber immersed in a liquid which opens the way to the study of a new kind of versatile experiments.

CD-P.23 TUE

Phase locking of two infrared sources separated by 500 nm (100 THz)

•N. Chiodo[1], F. Du-Burck[2], and O. Acef[1]; [1]LNE-SYRTE, Observatoire de Paris, CNRS, Paris, France; [2]LPL, université Paris 13, CNRS, Villetaneuse, France

We report on phase locking of two IR lasers separated by 500 nm (1.5 and 1.03 *m), using independent harmonic generation processes in PPLN crystals. The phase lock is achieved within a 500 kHz bandwidth.

CD-P.24 TUE

Improving the Performance of Fiber Optic Parametric Amplifiers with Optical Phase Conjugation

•M. Jazayerifar, S. Warm, and K. Petermann; Technische Universität Berlin, Berlin, Germany

Using the optical phase conjugation method we propose a modified fiber optic parametric amplifier (FOPA) that causes less nonlinear cross-talk than a conventional FOPA in WDM communication systems and verify this comparison with numerical simulations.

CD-P.25 TUE

Terabit/s Physical Random Bit Generation Based on Optoelectronic Phase-Chaos Systems

•R.M. Nguimdo[1], P. Colet[2], and J. Danckaert[1]; [1]Applied Physics Research Group, APHY, Vrije Universiteit Brussel, 1050 Brussels Belgium, Brussels, Belgium; [2]IFISC (CSIC-UIB), Campus Universitat Illes Balears, E-07122 Palma de Mallorca, Spain, Palma de Mallorca, Spain

We propose an optoelectronic phase-chaos system based on telecom components for parallel generation of statistically independent random bit streams. The system can generate 1 Tb/s sequences passing all NIST tests for randomness.

CD-P.26 TUE

Energy Shedding during Nonlinear Self-Focusing of Laser Pulses

•C. Travis[1], G.-L. Oppo[1], G. Norris[2], and G. McConnell[2]; [1]Department of Physics, University of Strathclyde, Glasgow, United Kingdom; [2]SIPBS, University of Strathclyde, Glasgow, United Kingdom

Energy shedding takes place as ultra-short spatio-temporal pulses propagate in a nonlinear medium. We characterise different mechanisms of energy shedding depending on the balance of nonlinearity, dispersion, diffraction, and saturation in the system.

CD-P.27 TUE

All-optical control of discrete light propagation in Photonic Liquid Crystal Fibers

•K. Rutkowska, U. Laudyn, and P. Jung; Warsaw University of Technology, Warsaw, Poland

Results of theoretical studies and experimental tests on discrete light propagation in photonic crystal fibers are presented. Output spatial light intensity profile can be tuned dynamically by varying optical power of the signal beam.

CD-P.28 TUE

Linear detection of sub-bandgap energy photons in silicon : a photo-assisted Shockley-Read mechanism

•B. Vest[1], E. Lucas[1], J. Jaeck[1], R. Haïdar[1,2], and E. Rosencher[1,2]; [1]ONERA, The French Aerospace Lab, Palaiseau, France; [2]École Polytechnique, Département de Physique, Palaiseau, France

We investigate the linear response of silicon PIN diodes to sub-bandgap photons (1.4 um-1.6 um). We propose a model, based on the Shockley-Read process, to explain this result observed by many authors.

CD-P.29 TUE

High repetition rates and high quality optical pulse train generator based on solitons over finite background

J. Fatome, B. Kibler, and •C. Finot; Laboratoire Interdisciplinaire Carnot de Bourgogne, Dijon, France

We take advantage of the strong temporal compression affecting a soliton over finite background evolving in a nonlinear fiber. A delay-line interferometer enables the generation of high-quality high-repetition rate pulse trains with the background annihilated.

CD-P.30 TUE

Tapered Liquid-Core All-Fibre Devices for Low-Threshold Raman Generation

L. Xiao, N. Healy, and •A. Peacock; Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom

The first demonstration of a highly compact tapered liquid-core all-fibre optical device is presented. The low integration and tapering losses allow for cascaded Raman scattering, with a threshold two times lower than an untapered structure.

CD-P.31 TUE

Monolithic PM Raman fiber laser at 1679 nm for Raman amplification at 1810 nm

•A.S. Svane and K. Rottwitt; DTU Fotonik, Department of Photonics Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark

We present a Monolithic PM Raman fiber laser at 1679 nm with 67 % slope efficiency and demonstrate a Raman amplifier at 1810 nm with 9 dB on/off gain in 4.3 km PM fiber.

CD-P.32 TUE

Degenerated four-wave mixing in chiral nematic liquid crystal exhibiting Bragg-like reflection

•P. Karpinski and A. Miniewicz; Wroclaw University of Technology, Wroclaw, Poland

We report about novel configuration for optical phase conjugation phenomenon in dye-doped chiral nematic liquid crystal exhibiting Bragg reflection. We observe temperature dependent light stop-band and enhancement of optical nonlinearity due to 'slow light' propagation.

CD-P.33 TUE

Highly Efficient Discrete Band Mid-Infrared to Near-Infrared Wavelength Conversion Relying on Si1-xGex Alloys

•A. Bogris[1,2], A. Kapsalis[1], D. Syvridis[1], M. Brun[3], P. Labeye[3], and S. Nicoletti[3]; [1]Department of Informatics and Telecommunications, University of Athens, Athens, Greece; [2]Department of Informatics, Technological Educational Institute of Athens, Athens, Greece; [3]CEA, LETI, Grenoble, France

The properties of mid-infrared to near-infrared up-converters relying on Si1-xGex alloys are numerically investigated. The aspects of the waveguide design for efficient wavelength conversion from (4-5μm) to (1.3-1.6μm) are highlighted for various Ge concentrations

CD-P.34 TUE

Generation of on-axis optical filaments by means of Dammann lenses

•*J. Pérez-Vizcaíno*[1], *O. Mendoza-Yero*[1], *R. Borrego-Varillas*[1,2], *G. Mínguez-Vega*[1], *J. Rodríguez Vázquez de Aldana*[1], *and J. Lancis*[1]; [1]*Instituto de Nuevas Tecnologías de la Imagen, Castellón, Spain*; [2]*Universidad de Salamanca, Salamanca, Spain*

Dynamical spatial shaping of a 30 fs laser beam by encoding Dammann lenses in a spatial light modulator allows us the formation up to six on-axis stable and stationary filaments in a fused silica sample.

CD-P.35 TUE

Nonlinear-optical response and Raman signals of nanocrystalline lithium niobate

•*B. Knabe*[1], *K. Buse*[1], *G. Stone*[2], *and V. Dierolf*[2]; [1]*Department of Microsystems Engineering (IMTEK), University of Freiburg, Freiburg, Germany*; [2]*Department of Physics, Lehigh University, Bethlehem, United States*

The non-centrosymmetric structure of lithium niobate nanocrystals is examined by frequency doubling and Raman spectroscopy. The nanocrystals exhibit the full nonlinear-optical coefficients. The measured vibrational modes indicate a crystal symmetry found in stoichiometric lithium niobate.

CD-P.36 TUE

hase matching for efficient nonlinear frequency generation in hybrid Si/Chalcogenide glass slot waveguides

P.W. Nolte, C. Bohley, and •*J. Schilling*; *ZIK SiLi-nano, Martin-Luther-University, Halle, Germany*

We theoretically investigated the situation for degenerate four wave mixing in silicon slot waveguides which are infiltrated by a chalcogenide glass (e.g. As_2S_3) promising efficient frequency generation within the vicinity of the pump wavelength.

CD-P.37 TUE

Characterization of a Single-frequency-pumped Continuous-wave Extracavity Diamond Raman Laser

•*O. Kitzler, A. McKay, and R. Mildren*; *MQ Photonics Research Centre, Macquarie University, Sydney, Australia*

We report a continuous-wave diamond Raman laser of output power 15W pumped by a single-longitudinal-mode Yb fibre laser at 35% conversion efficiency. Operating conditions enabling single mode output are analysed.

CD-P.38 TUE

1.5W Compact Green Laser Module for Laser Display Applications

Y. Gan, J. Sun, and •*C.-Q. Xu*; *McMaster University, Hamilton, Canada*

We demonstrate a novel miniaturized green laser array using an mGreen laser module. A two-beam array shows a combined green light output power of over 1.5W with an optical-to-optical conversion efficiency of 30%.

CD-P.39 TUE

Directional Selective Nonlinear Transmission of Femtosecond Pulses in Glass-Metal Nanocomposites

•*S. Mohan*[1,2], *H. Graener*[2], *M. Bache*[1], *and G. Seifert*[3]; [1]*DTU Fotonik, Technical University of Denmark, Kgs. Lyngby, Denmark*; [2]*Physics Institute, Martin-Luther-University Halle-Wittenberg, Halle, Germany*; [3]*Centre of Innovation Competence SiLi-nano, Martin-Luther-University Halle-Wittenberg, Halle, Germany*

Through femtosecond Z-scan measurements, we show that silver-doped nanocomposite glass samples give directionally sensitive optical limiting. A theoretical model explains this as interplay between self-focusing and two-photon absorption in the nanoparticle layer.

CD-P.40 TUE

Stimulated Raman scattering with a rapidly tunable non-collinear optical parametric oscillator

•*C. Hoffmann*[1], *T. Lang*[1,2], *and U. Morgner*[1,2,3]; [1]*Institute of Quantum Optics, Leibniz Universität Hannover, Hannover, Germany*; [2]*Center for Quantum Engineering and Space-Time Research, Hannover, Germany*; [3]*Laser Zentrum Hannover, Hannover, Germany*

We present the fast acquisition of broadband Raman spectra covering the range of 3400-960 cm^{-1} via stimulated Raman scattering (SRS) with an update rate of 19.6 Hz. For realization a rapidly tunable NOPO is employed.

CD-P.41 TUE

Self-phase-locked degenerate femtosecond optical parametric oscillator based on BiB3O6

•*V.R. Badarla*[1], *A.E. Martin*[1], *and M.E. Zadeh*[1,2]; [1]*Institute of Photonic Sciences (ICFO), Barcelona, Spain*; [2]*Institucio Catalana de Recerca i Estudis Avancats (ICREA), Barcelona, Spain*

We present the first self-phase-locked degenerate femtosecond OPO based on a birefringent material (BiB3O6) synchronously-pumped by Ti:sapphire laser. The OPO provides an output spectrum as broad as 46 nm with 190 fs pulses.

CD-P.42 TUE

Kerr effect induced transient group-velocity dispersion of fused silica measured via real-time MIIPS and spectral interferometry

G. Rasskazov[1], *A. Ryabtsev*[1], *D. Pestov*[2], *V.V. Lozovoy*[1], *and* •*M. Dantus*[1,2]; [1]*Department of Chemistry, Michigan State University, East Lansing, United States*; [2]*Biophotonic Solutions Inc., East Lansing, United States*

We demonstrate the measurement of transient dispersion in fused silica by RT-MIIPS. The results are validated via Fourier Transform Spectral Interferometry. The observed dispersion modulation is explained within a theoretical model.

CD-P.43 TUE

High-speed stroboscopic imaging with frequency-doubled supercontinuum

•*P. Ryczkowski*[1], *A. Nolvi*[2], *I. Kassamakov*[2], *G. Genty*[1], *and E. Haeggström*[2]; [1]*Tampere University of Technology, Tampere, Finland*; [2]*University of Helsinki, Helsinki, Finland*

We present a frequency-doubled supercontiunuum light source with 1ns long pulses and tunable repetition rate for 3D stroboscopic imaging with sub-100 nm accuracy.

CD-P.44 TUE

Nonlinear interaction of two crossing beams in chiral nematic liquid crystals

•*U. Laudyn*[1], *F. Sala*[1], *M. Sierakowski*[1], *E. Nowinowski-Kruszelnicki*[2], *and M. Karpierz*[1]; [1]*Warsaw University of Technology, Faculty of Physics, Warsaw, Poland*; [2]*Military University of Technology, Warsaw, Poland*

In this work, we present experimental and numerical results showing interaction of two crossing beams occurring in two planes simultaneously.

CD-P.45 TUE

Hole-Size Increasing PCFs for Blue-Extended Supercontinuum Generation

•*S.T. Sørensen*[1], *C. Larsen*[1], *C. Jakobsen*[2], *C.L. Thomsen*[2], *and O. Bang*[1,2]; [1]*DTU Fotonik, Technical University of Denmark, Kgs. Lyngby, Denmark*; [2]*NKT Photonics A/S, Birkerød, Denmark*

We demonstrate supercontinuum generation into the deep-blue in single-mode PCFs with increasing hole-size fabricated directly at the draw-tower, and report a record 3 dB spectral flatness in the region 363-628nm.

CD-P.46 TUE

Picosecond pulse burst generation using cascaded Stimulated Brillouin Scattering in a chalcogenide As2Se3 fiber cavity

•*T.F.S. Buettner, I.V. Kabakova, D.D. Hudson, and B.J. Eggleton*; *Centre for Ultrahigh-bandwidth Devices for Optical Systems (CUDOS), Institute of Photonics and Optical Science (IPOS), School of Physics, University of Sydney, Sydney, Australia*

We demonstrate a compact approach for the generation of ultra-high frequency picosecond pulse bursts based on cascaded Stimulated Brillouin Scattering in a chalcogenide As2Se3 fiber cavity and investigate the stability of the laser.

CD-P.47 TUE

Highly Sensitive Dispersion Map Extraction from Highly Nonlinear Fibers Using BOTDA Probing of Parametric Amplification

•*F. Alishahi*[1], *A. Vedadi*[1], *A. Denisov*[2], *M. Soto*[2], *K. Mehrany*[3], *C.S. Brès*[1], *and L. Thévenaz*[2]; [1]*Photonics Systems Laboratory, Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland*; [2]*Group for Fiber Optics, Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland*; [3]*Electronics and Electrical Dept., Sharif University of Technology, Tehran, Iran*

Using an enhanced scheme for probing the distribution of parametric processes along fibers, a rapid and simple technique to map zero dispersion wavelength fluctuations of less than 0.02 nm with 2 meters resolution is demonstrated.

CD-P.48 TUE

Intensity Noise of Normal-Pumped Picosecond Supercontinuum Generation

•*U. Møller*[1] *and O. Bang*[1,2]; [1]*DTU Fotonik, Department of Photonics Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark*; [2]*NKT Photonics A/S, Birkerød, Denmark*

We investigate the intensity noise in normal-pumped picosecond supercontinuum generation, where higher-order Raman lines cross into the anomalous dispersion regime at high power levels. The noise properties are compared to those of anomalous-pumped supercontinuum generation.

CD-P.49 TUE

Non-quadratic intensity dependence of the second harmonic signal from the p^+-Si/SiO_2 interface due to ultrafast photo-induced charge carrier screening

•*P. Neethling*[1], *E. Rohwer*[1], *and H. Stafast*[1,2]; [1]*Laser Research Institute, Physics department, University of Stellenbosch, Stellenbosch, South Africa*; [2]*Institute of Photonic Technology (IPHT) and Faculty of Physics and Astronomy, Friedrich Schiller University, Jena, Germany*

The instantaneous electric field induced second harmonic signals from highly boron doped Si with natural oxide, attributed to the built-in interfacial electric field, show a non-quadratic dependence on the incident, two-photon resonant, femtosecond laser intensity.

13:00 – 14:00

CE-P: CE Poster Session

CE-P.1 TUE

Structural and optical properties of epitaxially grown Nd^{3+}-doped $InYO_3$ thin films on Lu_2O_3

•*S.-H. Waeselmann*[1], *S. Heinrich*[1], *C. Kränkel*[1,2], *and G. Huber*[1,2]; [1]*Institute of Laser-Physics, Hamburg, Germany*; [2]*The Hamburg Centre for Ultrafast Imaging, Hamburg, Germany*

Thin lattice matched Nd^{3+} doped $InYO_3$ films were grown epitaxially on Lu_2O_3 substrates via Pulsed Laser Deposition. We present several advantageous characteristics of the films, that make them interesting for optically active waveguides.

CE-P.2 TUE

Investigation of second order optical nonlinearity at the surface of GaP nanowaveguides

•*M. Swillo*[1], *R. Sanatinia*[2], *and S. Anand*[2]; [1]*School of Engineering Sciences, Royal Institute of Technology (KTH), Stockholm, Sweden*; [2]*School of Information and Communication Technology, Royal Institute of Technology (KTH), Kista, Sweden*

Optical second order nonlinearity at the surface of GaP nanowaveguides is determined with respect to the bulk. Presented method utilizes polarization measurement of the second harmonic generation and mode confinement in nanowaveguides with various diameters.

CE-P.3 TUE

Ultra-Smooth Ridge Waveguides in Lithium Niobate Fabricated by Diamond Blade Dicing and High Temperature In-Diffusion of Titanium

•*C.E. Rüter, S. Suntsov, and D. Kip*; *Helmut Schmidt University, Hamburg, Germany*

Fabrication of ridge waveguides in lithium niobate with propagation losses below 0.1dB/cm is reported. The substrate covered with titanium is structured using optical grade dicing followed by in-diffusion at 1120°C, resulting in ultra-flat surfaces.

CE-P.4 TUE

Experimental Investigation of a Single Chrial Nano-Structure Made of a Composite Material

•*P. Wozniak*[1,2], *K. Höflich*[1], *S. Fritsch*[1,2], *S. Christiansen*[1,3], *P. Banzer*[1,2], *and G. Leuchs*[1,2]; [1]*Max Planck Institute for the Science of Light, Erlangen, Germany*; [2]*Institute of Optics, Information and Photonics, Friedrich-Alexander-University Erlangen Nurnberg, Erlangen, Germany*; [3]*Institute of Photonic Technology, Jena, Germany*

Electron-beam-induced deposition results in nanostructures made of a composite material of unknown optical parameters. By retrieving its refractive index, we investigate the interaction between a single chiral nano-structure and a tightly focused circularly polarized beam.

CE-P.5 TUE

Er3+-doped LiYF4-Polymer Nanocomposites for S+C+L Band Amplification

•*X. Xue, S. Uechi, W. Gao, T. Suzuki, and Y. Ohishi*; *Toyota Technological Institute, Nagoya, Japan*

Er3+-doped LiYF4-bisphenol A ethoxylate diacrylates nanocomposites were prepared. Under the excitation of a 978 nm laser, the optically transparent nanocomposites showed intense and broad emissions in S+C+L band.

CE-P.6 TUE

Influence of Chromium and Niobium Co-doping on Laser Damage Threshold of Raman Active Crystals

•*L. Ivleva, P. Zverev, I. Voronina, E. Dunaeva, and A. Nekhoroshik*; *A.M. Prokhorov General Physics Institute, Russian Academy of Sciences, Moscow, Russia*

Raman active CaMoO4 and BaWO4 crystals were grown from the melt with special Cr3+ and Nb5+ impurity dopants. The optimization of their concentration leads to significant increase of the laser damage threshold.

CE-P.7 TUE

Photoluminescent properties of the ZnSe:Yb crystals in the excitonic region

•*I. Radevici*[1,2], *K. Sushkevich*[2], *V. Sirkeli*[1,2], *H. Huhtinen*[1], *D. Nedeoglo*[2], *and P. Paturi*[1]; [1]*Wihuri Physical Laboratory, Department of Physics and Astronomy, University of Turku, Turku, Finland*; [2]*Faculty of Physics and Engineering, Moldova State University, Chisinau, Moldova, Republic of*

Temperature evolution of the ZnSe:Yb samples photoluminescent spectra were studied. Edge band concentration shift to the higher energies was observed. An assumption about occupation of selenium vacancies sites by Yb ions is made.

CE-P.8 TUE

90° Phase-matched Difference-frequency Generation at 5.34-7.48 μm in BaGa4S7

K. Kato[1,2], •*T. Mikami*[2], *and V. Petrov*[3]; [1]*Chitose Institute of Science and Technology, Chitose, Japan*; [2]*Okamoto Optics Works, Inc., Yokohama, Japan*; [3]*Max-Born-Institute for Nonlinear Optics and Ultrafast Spectroscopy, Berlin, Germany*

The BaGa4S7 was used to generate the 5.34-7.48μm pulses by mixing the BBO/OPO output with its pump source at 1.0642μm under the temperature-tuned 90° phase-matching conditions. The new Sellmeier and thermo-optic dispersion formulas are presented.

CE-P.9 TUE

Thermal conductivity versus Yb3+ concentration in Yb :CALGO: a material for high power ultrafast laser

•*A. Jaffrès*[1], *A. Suganuma*[1], *B. Viana*[1], *P. Loiseau*[1], *S. Ricaud*[2], *P. Georges*[2], *and F. Druon*[2]; [1]*LCMCP, Paris, France*; [2]*LCFIO, Palaiseau, France*

Thermal conductivity values were experimentally determined for various ytterbium contents (2-15%) in the laser material Yb :CaGdAlO4. The variation is modeling with sites distribution and physical parameters.

CE-P.10 TUE

NIR to visible upconversion in double-clad optical fiber co-doped with Yb3+/Ho3+

•*M. Kochanowicz, D. Dorosz, J. Zmojda, and J. Dorosz*; *Bialystok University of Technology, Bialystok, Poland*

In the paper the upconversion luminescence in antimony-silicate-germanate glass and double-clad optical fiber co-doped with Yb3+/Ho3+ was investigated. Luminescence bands at 547 nm (Ho3+:5S2(5F4)->5I8) and 659 nm (Ho3+:5F5->5I8) was obtained.

CE-P.11 TUE

Study on exposure strategy influences on optical propagation losses in silicon waveguides fabricated by electron beam lithography

•*J. Bolten, C. Manecke, T. Wahlbrink, M. Waldow, and H. Kurz*; *AMO GmbH, Aachen, Germany*

In this work we demonstrate the beneficial effect of a multi pass exposure strategy on optical propagation losses of silicon waveguide structures fabricated using electron beam lithography, reducing those losses by at least 1.5 dB/cm.

CE-P.12 TUE

Facet Machining of Silica Waveguides with Nanoscale Roughness without Polishing or Lapping

•*L. Carpenter, H.L. Rogers, C. Holmes, J.C. Gates, and P.G.R. Smith*; *University of Southampton, Southampton, United Kingdom*

We show optical quality facets can be machined into silica using a precision dicing technique, with a Sa = 4.9 nm. In addition an integrated optic structure will be presented to characterise the interface loss.

CE-P.13 TUE

Evolution of a conically diffracted Gaussian beam in free space

•*S. Grant and A. Abdolvand*; *University Of Dundee, Dundee, United Kingdom*

Various parameters relating to the evolution of a Gaussian beam as it propagates along one of the optic axes of four KGd(WO4)2 crystals of differing lengths are reported, along with its cross section.

CE-P.14 TUE

Self-chaining of nanoparticles in polymethyl methacrylate through electrode-free dielectrophoresis

•*O. Gennari*[1], *V. Pagliarulo*[1], *S. Coppola*[1,2], *V. Vespini*[1], *L. Miccio*[1], *S. Grilli*[1], *and P. Ferraro*[1]; [1]*INO-CNR, Pozzuoli, Italy*; [2]*Department of Chemical Materials and Production Engineering., Napoli, Italy*

We propose an electrode-free dielectrophoretic approach for aligning nanoparticles into wires dispersed in non-aqueous suspensions of polymethyl methacrylate. The electric field gradients are generated through spontaneous charge templates arising pyroelectrically onto functionalized ferroelectric crystals.

CE-P.15 TUE

Cascade Conical Diffraction

•*S. Grant and A. Abdolvand*; *University of Dundee, Dundee, United Kingdom*

The use of multiple biaxial crystals in cascade configuration to produce conical diffraction is investigated. The polarization dependence and the effect of the relative angles of the crystals is reported as is the free-space cross-section.

CE-P.16 TUE

Laser texturing of ZnO:Al front contact for efficiency enhancement in thin-film silicon solar cells

•*D. Canteli*[1], *S. Fernández*[1], *J.D. Santos*[1], *J.P. González*[1], *C. Molpeceres*[2], *I. Torres*[1], *J. Cárabe*[1], *and J.J. Gandía*[1]; [1]*Centro de Investigaciones Energéticas, Medioambientáles y Tecnológicas, Madrid, Spain*; [2]*Centro Láser de la Universidad Politécnica de Madrid, Madrid, Spain*

A 355nm nanosecond laser source is used to texture AZO thin films. The textured films show appropriated morphology and good optoelectronic properties to be used in thin film silicon solar cells.

CE-P.17 TUE

Mapping Purity of Single-Walled Carbon Nanotubes in Bulk Samples with Multiplex Coherent Anti-Stokes Raman Microscopy

A.S. Duarte[1,2], *J. Rehbinder*[1], *R.R.B. Correia*[2], •*T. Buckup*[1], *and M. Motzkus*[1]; [1]*Physikalisch-Chemisches Institut, Ruprecht-Karls-Universität Heidelberg, Heidelberg, Germany*; [2]*Instituto de Física, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil*

Multiplex Coherent anti-Stokes Raman microscopy was used to retrieve information about impurities in a spin-coated SWNT distribution. An impurity map was constructed using the ratio between the D- and G-band in SWNTs vibrational spectrum.

CE-P.18 TUE

Kinetics of Equivalent Temperature of Nonlinear-Optical Crystals

O. Ryabushkin[1,2], D. Myasnikov[1,2], •A. Konyashkin[1,2], and O. Vershinin[1,2]; [1]Moscow Institute of Physics and Technology, Dolgoprudnyy, Russia; [2]NTO "IRE-Polus", Fryazino, Russia

Novel method is proposed for determination of nonlinear-optical crystal heat transfer and optical absorption coefficients by measuring kinetics of crystal*s temperature-dependent piezoelectric resonance frequency during interaction with laser radiation.

CE-P.19 TUE

Photoluminescence emission in Er-activated good quality fluorotellurite thin film glasses

•R. Morea[1], A. Miguel[2], T. Teddy-Fernandez[1], J. Fernandez[2,3], R. Balda[2,3], and J. Gonzalo[1]; [1]Instituto de Optica, CSIC, Madrid, Spain; [2]Dept. of Applied Physics I, Universidad del Pais Vasco UPV/EHU, Bilbao, Spain; [3]Materials Physics Center CSIC-UPV/EHU and Donostia International Physics Center, San Sebastian, Spain

Good quality Er-doped fluorotellurite thin films glasses are produced by pulsed laser deposition. We show that their photoluminescence emission characteristics can be greatly improved through annealing treatments and discuss the responsible processes for that behavior.

CE-P.20 TUE

Analysis and fabrication of optical active nanostructures inspired by the blue Morpho butterfly

•R.H. Siddique[1], S. Diewald[2], J. Leuthold[1,3], and H. Hölscher[1]; [1]Institute for Microstructure Technology (IMT), Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany; [2]Center for Functional Nanostructures (CFN), Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany; [3]Institute of Photonics and Quantum Electronics (IPQ), Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany

Morpho butterfly nanostructures reflect blue in wide angle that outplays the regular interference theorem. Our experimental and theoretic analysis reveals alternative thin layers with Christmas tree shape are the origin of this fascinating blue irradiance.

CE-P.21 TUE

New route to Bi+-doped crystals: preparation and NIR luminescence of K, Rb and Cs ternary chlorides, containing univalent bismuth.

•A. Romanov[1,2], A. Veber[3], Z. Fattakhova[4], D. Vtyurina[4], O. Usovich[5], F. Grigoriev[1,2], E. Haula[4], L. Trusov[5], P. Kazin[5], V. Korchak[4], V. Tsvetkov[3], and V. Sulimov[1,2]; [1]Research Computing Center of M.V. Lomonosov Moscow State University, Moscow, Russia; [2]Dimonta Ltd., Moscow, Russia; [3]A.M. Prokhorov General Physics Institute, Russian Academy of Sciences, Moscow, Russia; [4]N.N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, Moscow, Russia; [5]Department of Chemistry, M.V. Lomonosov Moscow State University, Moscow, Russia

The ternary chlorides, doped with univalent bismuth can be prepared by crystallization from Lewis acidic melts. These crystals exhibit long-lived luminescence in NIR and can be the perspective optical media for broadband light amplification.

CE-P.22 TUE

Distributed Fibre Analysis with cm Resolution Using Gated Flexural Acoustic Waves

•E.P. Alcusa-Sáez[1], A. Díez[1], M. González-Herráez[2], and M.V. Andrés[1]; [1]Universidad de Valencia, Burjassot, Spain; [2]Universidad de Alcalá de Henares, Alaclá de Henares, Spain

Accurate characterization of small fibre inhomogeneities along sections of about 1m, with centimetric resolution, is demonstrated using a time-domain distributed in-fibre acousto-optic interaction based on the propagation of short flexural acoustic wave packets.

CE-P.23 TUE

Band-Edge and Random Lasing in Blue Phase Liquid Crystals

C.-W. Chen[1], H.-C. Jau[1], C.-C. Lin[1], •T.-H. Lin[1], C.-T. Wang[1], I.-C. Khoo[2], and C.-H. Lee[1]; [1]Department of Photonics, National Sun Yat-Sen University, Kaohsiung, China, Republic of (ROC); [2]Electrical Engineering Department, Pennsylvania State University, University Park, Pennsylvania, United States

The contribution has been withdrawn by the authors.

CE-P.24 TUE

Study of Femtosecond Laser-induced Grating in Lead Silicate Glasses

S. Chouli, M. Tondusson, and •E. Freysz; LOMA, Université Bordeaux 1, Talence, France

We have studied the formation of gratings in PbO glasses induced by femtosecond pulses. These efficient gratings are produced in few picoseconds. The photo-induced refractive index change scales almost linearly with the PbO molar content

CE-P.25 TUE

Luminescent properties of PMMA-based nanocomposites doped with Pr3+:YF3-Y2O3 nanocrystallites

•A. Jusza[1], L. Lipinska[2], P. Polis[3], and R. Piramidowicz[1]; [1]Institute of Microelectronics and Optoelectronics, Warsaw University of Technology, Warsaw, Poland; [2]Institute of Electronic Materials Technology, Warsaw, Poland; [3]Faculty of Material Science and Engineering, Warsaw University of Technology, Warsaw, Poland

In this work we report the recent results of our investigation on visible emission of the PMMA-based nanocomposites doped with YF3, YF3-Y2O3 (YOF) and Y2O3 activated with Pr3+ ions, synthesized from the single-source precursor.

CE-P.26 TUE

Self-assembling of liquid crystal droplets on lithium niobate substrates driven by pyroelectric effect

•F. Merola[1], S. Grilli[1], S. Coppola[1,2], V. Vespini[1], S. De Nicola[1], P. Maddalena[3], C. Carfagna[4], and P. Ferraro[1]; [1]CNR-INO, Pozzuoli, Italy; [2]Università Federico II, Dip. Ingegneria, Napoli, Italy; [3]Università Federico II, Dip. Scienze Fisiche, Napoli, Italy; [4]CNR-ICTP, Pozzuoli, Italy

Liquid crystal droplets are driven by pyroelectric effect on lithium niobate substrate covered with Polydimethylsiloxane. Droplets assemble themselves in different patterns such as microlens arrays.

CE-P.27 TUE

Photodarkening in optical fibres: comparative study of photo-induced defects using different photon sources

•D. Milanese[1], M. Chiesa[2], S. Taccheo[3], K. Mattsson[4], H. Gebavi[3], T. Robin[5], L. Lablonde[5], D. Mechin[6], A. Monteville[6], F. Freyria[1], and B. Bonelli[1]; [1]Politecnico di Torino - DISAT, Torino, Italy; [2]Dipartimento di Chimica, Università di Torino, Torino, Italy; [3]Swansea University, Swansea, United Kingdom; [4]DTU Fotonik, Technical University of Denmark, Lyngby, Denmark; [5]iXFiber S.A.S., Lannion, France; [6]PERFOS, R&D Platform of Photonics Bretagne, Lannion, Italy

This report compares the effect of photon sources at different energies on Ce/Yb-doped optical materials for high power lasers. The investigation aims at studying the mechanism of photodarkening for the development of photodarkening-free fibres.

CE-P.28 TUE

Conical refraction: A dual-cone model

•G.S. Sokolovskii[1,2], D.J. Carnegie[1], T.K. Kalkandjiev[3], and E.U. Rafailov[1]; [1]University of Dundee, Dundee, United Kingdom; [2]Ioffe Physico-Technical Institute, St.Petersburg, Russia; [3]Conerefringent Optics SL, Barcelona, Spain

We propose a dual-cone model of conical refraction involving the interference of two light cones behind the exit facet of the crystal and demonstrating an excellent agreement with experiment.

CE-P.29 TUE

Microstructured Plastic Optical Fibers with Limited Modal Dispersion and Bending Losses

•K. Welikow[1], P. Gdula[1], P. Szczepanski[1,2], R. Buczynski[3,4], and R. Piramidowicz[1]; [1]Institute of Microelectronics and Optoelectronics, Warsaw, Poland; [2]National Institute of Telecommunication, Warsaw, Poland; [3]Institute of Electronic Materials Technology, Warsaw, Poland; [4]Faculty of Physics, University of Warsaw, Warsaw, Poland

New geometries of polymer microstructured fibers are proposed for limiting macrobending losses and modal dispersion. The numerical analyses are confronted with measurement results of manufactured mPOFs to verify applicability of developed model.

CE-P.30 TUE

DC electric field assisted fabrication and optical analysis of silver-doped nanocomposite glass

•S. Wackerow and A. Abdolvand; School of Engineering, Physics & Mathematics, University of Dundee, Dundee, United Kingdom

We present DC electric field assisted fabrication of glass with embedded silver nanoparticles. Optical analyses of the fabricated nanocomposites and their depth profiles were performed using cross-section images with an unprecedented clarity.

CE-P.31 TUE

Optical properties of the Bi+ centre in KAlCl4 crystal

•A. Veber[1], A. Romanov[2,3], O. Usovich[4], Z. Fattakhova[5], E. Haula[5], V. Korchak[5], L. Trusov[4], P. Kazin[4], V. Sulimov[2,3], and V. Tsvetkov[1]; [1]A.M. Prokhorov General Physics Institute, Russian Academy of Sciences, Moscow, Russia; [2]Research Computer Center, M.V. Lomonosov Moscow State University, Moscow, Russia; [3]Dimonta Ltd., Moscow, Russia; [4]Department of chemistry, M.V.Lomonosov Moscow State University, Moscow, Russia; [5]N.N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, Moscow, Russia

Optical properties of the Bi+ center in KAlCl4 crystal host have been studied as a function of temperature. Experimental data were analyzed in terms of electron-phonon interaction of Bi+ center with the host crystal.

CE-P.32 TUE

Investigating the efficiency limitations of GaN-based emitters

•B. Crutchley, I. Marko, A. Adams, and S. Sweeney; University of Surrey, Guildford, United Kingdom

In this paper we investigate the efficiency droop causing mechanisms in InGaN blue-green LEDs. From pressure and temperature dependence measurements we find that a carrier density dependent defect-related process is likely to cause efficiency droop.

CE-P.33 TUE

Fast transient bleaching in Rh-6G functionalized TiO2 nanoparticles: charge transfer dynamics

•L. Menezes[1], E. Almeida[1], C. Araújo[1], A. Brito-Silva[2], A. Batista[2], and G. Machado[2]; [1]Departamento de Física, Universidade Federal de Pernambuco, Recife-PE, Brazil; [2]Centro de Tecnologias Estratégicas do Nordeste (CETENE), Recife-PE, Brazil

Charge transfer dynamics in Rh6G-functionalized amorphous TiO2 nanoparticles is investigated using transient bleaching (TB) spectroscopy. The TB shows a faster signal as compared to the bleaching of the free dye in solution.

CE-P.34 TUE

Longitudinal acoustic phonons in 3-dimensional cobalt supracrystals detected by broadband picosecond acoustics

•D. Polli[1], I. Lisiecki[2], C. Yan[2], E. Duval[3], G. Cerullo[1], and M.-P. Pileni[2]; [1]Politecnico di Milano, Milano, Italy; [2]Université Pierre et Marie Curie, Paris, France; [3]Université Lyon, Lyon, France

Longitudinal acoustic phonons with few-GHz frequency were launched with femtosecond pulses and detected in three-dimensional supracrystals of 7-nm cobalt nanocrystal spheres. We extract the speed of sound (1100 m/s), which interestingly strongly depends on temperature.

CE-P.35 TUE

Fabrication and Characterization of Zirconium - doped Periodically Poled Lithium Niobate

M.V. Ciampolillo[1], G. Pozza[1], •M. Bazzan[1], N. Argiolas[1], A. Zaltron[1], L. Bacci[1], C. Sada[1], G. Nava[2], and P. Minzioni[2]; [1]University of Padova, Padova, Italy; [2]University of Pavia, Pavia, Italy

We present here our recent result on the fabrication and characterization of periodically poled structures in optical damage resistant Zr * doped lithium niobate.

13:00 – 14:00

IC-P: IC Poster Session

IC-P.1 TUE

Towards a Bose-Fermi mixture experiment in a 2D optical lattice with high optical resolution

•N. Meyer[1,2], M. Perea-Ortiz[1], C. O'Neale[1], M. Holynski[1], M. Baumert[1], K. Bongs[1], and J. Kronjaeger[1]; [1]School of Physics and Astronomy, Birmingham, United Kingdom; [2]Institute of Laserphysics, Hamburg, Germany

Presented is a versatile setup for Bose-Fermi mixtures in optical potential including simultaneous magneto-optical trapping of two species, magnetic transport and cooling towards a BEC. In the context of this project new technologies were developed.

IC-P.2 TUE

Chaotic Dynamics of Bose-Einstein Condensates in Optical Cavities

•M. Diver, G. Robb, and G.-L. Oppo; Institute of Complex Systems, SUPA and Department of Physics, University of Strathclyde, Glasgow, United Kingdom

We consider a Bose-Einstein condensate interacting with a laser beam in an optical cavity. The modulated optical lattice induces chaotic oscillations that occur when increasing the amplitude of the pump beyond the bistable regime.

IC-P.3 TUE

Institut de Ciencies Fotoniques

•T. Vanderbruggen[1], S. Palacios[1], N. Martinez[1], and M. Mitchell[1,2]; [1]ICFO - Institut de Ciencies Fotoniques, Castelldefels (Barcelona), Spain; [2]ICREA - Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain

We propose a new method to produce a continuous source of spin-polarized cold atoms which are all-optically guided after their extraction from a magneto-optical trap (MOT).

IC-P.4 TUE

Microwave ring trap for ultracold atoms

•G. Sinuco, K. Burrows, and B. Garraway; School of Physics and Astronomy, University of Sussex, Brighton, United Kingdom

We propose a ring trap for ultracold alkali atoms via a combination of external and induced microwave fields. We consider the trapping characteristics, the trap lifetimes, and its feasibility in an atom-chip configuration.

IC-P.5 TUE

High-contrast spatial interference of BECs

C. Carson, M. Zawadzki, P. Griffin, E. Riis, and •A. Arnold; University of Strathclyde, Glasgow, United Kingdom

We use magnetic levitation and an optical plug to obtain 95% contrast spatial interference between two BECs. Interference patterns with fringe periods of 85microns (individual de Broglie wavelengths of 170microns) are possible with 200ms levitation.

IC-P.6 TUE

Towards an interferometer with thermal atoms trapped on a chip

M. Ammar[1], M. Dupont-Nivet[1], L. Huet[1], C. Guerlin[1,2], J. Reichel[2], P. Rosenbusch[3], I. Bouchoule[4], C. Westbrook[4], and •S. Schwartz[1]; [1]Thales Research and Technology, Palaiseau, France; [2]Laboratoire Kastler-Brossel, Paris, France; [3]LNE-SYRTE, Paris, France; [4]Laboratoire Charles Fabry de l'Institut d'Optique, Palaiseau, France

We will discuss the possibility of building a trapped-atom interferometer without a Bose-Einstein condensate, to weaken the effect of atomic interactions, by using internal state labeling and two coplanar waveguides on an atom chip.

IC-P.7 TUE

Temperature Limits in Laser Cooling of Free Atoms with Three-level Transitions

•F. C. Cruz[1], M. L. Sundheimer[2], and W. C. Magno[2]; [1]Instituto de Fisica Gleb Wataghin, Universidade Estadual de Campinas, Campinas, Brazil; [2]Departamento de Fisica, Universidade Federal Rural de Pernambuco, Recife, Brazil

We consider laser cooling of free atoms with simultaneous two-color excitation of three-level cascade transitions finding theoretically that temperatures below the Doppler limits associated with each one of the individual transitions are obtained.

IC-P.8 TUE

Collision of Discrete Breathers in Two-Species Bose-Einstein Condensates in Optical Lattices

•R. Campbell[1], M. Borkowski[2], and G.-L. Oppo[1]; [1]University of Strathclyde, Glasgow, United Kingdom; [2]University N Copernicus, Torun, Poland

Coupled discrete nonlinear Schrodinger equations describe two-species BEC in deep optical lattices. The collision of travelling discrete breathers can be either elastic or inelastic depending on the sign of the inter-species interaction parameter.

13:00 – 14:00

JSV-P: JSV Poster Session

JSV-P.1 TUE

Nano-Optical Measurements of Novel Superconducting Single Photon Detector Designs

•R.M. Heath[1], M.G. Tanner[1], L. San-Emeterio-Alvarez[2], W. Jiang[2], Z.H. Barber[2], R.J. Warburton[3], and R.H. Hadfield[1]; [1]University of Glasgow, Glasow, United Kingdom; [2]University of Cambridge, Cambridge, United Kingdom; [3]University of Basel, Basel, Switzerland

We present nano-optical studies of novel superconducting nanowire single photon detector designs, including spatial-resolvable multi-photon absorption. Local response and timing properties are investigated especially of SNAPs, and more recent results enhancing photoresponse will be presented.

13:00 – 14:00

CI-P: CI Poster Session

CI-P.1 TUE

Comparison of 850-nm and 1550-nm VCSELs for Low-Cost Short-Reach IM/DD and OFDM SMF/MMF Links

•F. Karinou, L. Deng, R. Rodes, J. Bevensee Jensen, K. Prince, and I. Tafur Monroy; Technical University of Denmark, Copenhagen, Denmark

We report on the experimental performance of a multimode 850-nm and a single-mode 1550-nm VCSEL employing IM/DD and OFDM-QPSK over SMF and MMF links for their potential application in low-cost, rack-to-rack optical interconnects.

CI-P.2 TUE

Theoretical Study on Linewidth Characteristics of SGDBR Lasers for Coherent Optical Communications

W. Chen[1], •Y. Yu[1], J. Zhao[1], K. Shi[2], and L. Barry[2]; [1]Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, Wuhan, China, People's Republic of (PRC); [2]The Rince Institute, Dublin City University, Dublin, Republic of Ireland

We investigate linewidth of SGDBR lasers with a model based on the TLLM method, in which spontaneous emission noise and shot noise are included. Simulated results show the linewidth varies with increasing the phase current.

CI-P.3 TUE

First order optical differentiator based on an FBG in transmission

•M.A. Preciado, X. Shu, P. Harper, and K. Sugden; Aston Institute of Photonic Technologies, Birmingham, United Kingdom

The experimental demonstration of a single element, all fiber approach for first-order differentiator based on a fiber Bragg grating in transmission is reported, showing a good performance over an operational bandwidth of ~2 nm.

CI-P.4 TUE

Free-space optical polarization demultiplexing and multiplexing by means of conical refraction

•A. Turpin[1], Y. Loiko[1], T.K. Kalkandjiev[1,2], and J. Mompart[1]; [1]Departament de Física, Universitat Autònoma de Barcelona, Bellaterra, Spain; [2]Conerefringent Optics SL, Avda Cubelles 28, Vilanova i la Geltrú, Spain

We present a novel technique for polarization multiplexing for free space optical communications by means of conical refraction that allows increasing in one order of magnitude the channel capacity in a propagation distance of 4m.

CI-P.5 TUE

Experimental Caracterization of a Burst-Enabled O-OFDM Transceiver

•J.M. Fabrega, M. Svaluto Moreolo, F.J. Vilchez, and L. Nadal; Centre Tecnologic de Telecomunicacions de Catalunya, Castelldefels, Spain

A burst-enabled tunable IM/DD O-OFDM based on Hartley transform is investigated and experimentally characterized. Its transmission performances have been assessed in terms of tunability and in the presence of EDFA transients.

CI-P.6 TUE

Noise suppression characteristics of negative feedback optical amplifier using an optical triode

•A. Syafiq, Y. Fujikawa, and Y. Maeda; Kinki University, Higashi-Osaka, Japan

We investigated the relationship of inverted negative feedback signal intensity with bit error rate using optical triode. It was found out that power penalty was improved by 15 dB and noise suppression characteristic was obtained.

CI-P.7 TUE

High-Power Dense Wavelength Division Multiplexer (HP-DWDM) for Diode Lasers using Volume Bragg Gratings (VBG)

•S. Hengesbach[1], N. Krauch[2], C. Holly[1], M. Traub[2], and D. Hoffmann[2]; [1]Chair for Laser Technology, Aachen, Germany; [2]Fraunhofer Institute for Laser Technology, Aachen, Germany

The authors present a compact dense wavelength division multiplexer with 1.5 nm center wavelength spacing for five spectrally stabilized diode laser bars with low beam quality (14 mm mrad). The multiplexing efficiency amounts 85 %.

CI-P.8 TUE

An Optically Modulated Radio Frequency Backscatter Wireless Data Link

H. Cantu[1], •C. Ironside[1], B. Romeira[2], A. Kelly[1], and J. Figueiredo[2]; [1]University of Glasgow, Glasgow, United Kingdom; [2]Universidade do Algarve, Faro, Portugal

Optical modulation of the impedance of an antenna coupled photo-detector is used to convert data from optical to wireless domains. Radio frequency backscatter is exploited as a low cost, low power, data link technology solution.

CI-P.9 TUE

Mechanical Robustness of MMF Datacom Interconnections using Center-Launching Technique

•A. Boletti, A. Gatto, P. Boffi, P. Martelli, E. Centeno Nieves, and M. Martinelli; Politecnico di Milano, Milano, Italy

Robustness to mechanical perturbations of center-launching technique in multi-mode fiber is demonstrated compliant to ETSI recommendations to implement fully-transparent board-to-board and data server fiber interconnections where only the fundamental mode propagates without higher-order modes excitation.

CI-P.10 TUE

Generalized directional coupling for high-precision manipulation of the optical phase for classical and quantum light

•R. Heilmann, R. Keil, S. Nolte, and A. Szameit; Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-University, Jena, Germany

A precise method for optical phase manipulation of classical and quantum light in integrated waveguide structures is presented. We employ generalized directional couplers which allow the exact tuning of the effective index in such structures.

CI-P.11 TUE

Performance Comparison between Electrical and Optical Backplanes

•A. Boletti[1], D. Giacomuzzi[2], G. Parladori[2], P. Boffi[1], and M. Martinelli[1]; [1]Politecnico di Milano, Milan, Italy; [2]Alcate-Lucent Italia S.p.A., Vimercate, Italy

Comparison between performance of copper interconnections and fiber optics backplane is shown also by simulations to demonstrate their limitations in frequency and capabilities in terms of capacity, power budget and consumption.

CI-P.12 TUE

Optical Switch based on Microring Resonators and Phase change Materials

•M. Rudé[1], J. Pello[2], R. Simpson[3], J. van der Tol[2], and V. Pruneri[1,4]; [1]ICFO-Institut de Ciències Fotòniques, Castelldefels, Spain; [2]Eindhoven University of Technology, Eindhoven, The Netherlands; [3]Singapore University of Technology and Design, Singapore, Singapore; [4]ICREA-Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain

We demonstrate optical switching at telecommunication wavelengths in a silicon microring resonator with a modulation of 10 dB, induced by a laser-driven transition from the amorphous to the crystalline phase of a Ge2Sb2Te5 overcladding layer.

CI-P.13 TUE

Equivalent Modeling of Micro-bending in Multimode-fibers with Parabolic Index Profile using Discrete Coupling

•A. Juarez, E. Krune, and K. Petermann; Technische Universität Berlin, Berlin, Germany

A discrete model to estimate modal-coupling and its losses in MMF is presented and validated using coupled mode theory. The amount of discrete-coupling points can be reduced significantly if the overall losses are the same.

CI-P.14 TUE

8QAM regeneration using a phase-sensitive amplifier with dual-conjugated pumps

•B. Stiller[1,2], G. Onishchukov[1,2], B. Schmauss[3], and G. Leuchs[1,2]; [1]Max Planck Institute for the Science of Light, Erlangen, Germany; [2]Institute of Optics, Information and Photonics, University of Erlangen, Erlangen, Germany; [3]Institute of Microwaves and Photonics, University of Erlangen, Erlangen, Germany

Phase regeneration of an 8QAM signal with two amplitude levels in a phase-sensitive amplifier with two conjugated pumps is numerically investigated. Effects limiting regenerator performance are identified and improvement possibilities are considered.

CI-P.15 TUE

Investigating the influence of thermal coefficients on 2-D WH/TS OCDMA code propagation in optical fiber

•T. Osadola[1], S. Idris[1], I. Glesk[1], and W. Kwong[2]; [1]Department of Electronic and Electrical Engineering, University of Strathclyde, Glasgow, United Kingdom; [2]Hofstra University, Hempstead, United States

Extensive studies have been carried out to analyse the bit error rate of a 32-User, 2D-WH/TS OCDMA system propagating under the influence of environmental temperature variation caused by thermal coefficients of an optical fibre.

CI-P.16 TUE

Phase modulation technique for high modulation wide band planar Bragg grating fabrication

•C. Sima, J. Gates, C. Holmes, H. Rogers, P. Mennea, M. Zervas, and P. Smith; Optoelectronics Research Centre, Southampton, United Kingdom

A phase modulation controlled direct grating system is presented for fabricating high modulation, wide spectral band integrated Bragg gratings. The method also offers greater fabrication speed with a higher fidelity of control.

CI-P.17 TUE

WDM-Filters fabricated with Hydrogenated Amorphous Silicon Ring and Racetrack Resonators

•T. Lipka, J. Amthor, and J. Müller; Hamburg University of Technology, Institute of Micro Systems Technology, Hamburg, Germany

Wavelength-division multiplexers with low footprint were designed and realized with low-loss hydrogenated amorphous silicon. Four and eight channel devices based on cascaded racetrack and ring resonators were optically characterized and will be presented.

NOTES

ROOM 4a

8:30 – 10:00

II-1: Quantum and Graphene Plasmonics

Chair: Peter Nordlander, Rice University, Houston, USA

II-1.1 WED 8:30

Excitation of plasmon modes in a graphene monolayer supported on a 2D subwavelength silicon grating

•*X. Zhu[1,2], W. Yan[1,2], P.U. Jepsen[1], O. Hansen[3,4], A. Mortensen[1,2], and S. Xiao[1,2]; [1]Department of Photonics Engineering, Technical University of Denmark, DK-2800 Kongens Lyngby, Denmark; [2]Center for Nanostructured Graphene (CNG), Technical University of Denmark, DK-2800 Kongens Lyngby, Denmark; [3]Department of Micro and Nanotechnology, Technical University of Denmark, DK-2800 Kongens Lyngby, Denmark; [4]Center for Individual Nanoparticle Functionality (CINF), Technical University of Denmark, DK-2800 Kongens Lyngby, Denmark*

We experimentally demonstrate graphene-plasmon excitation in a continuous graphene monolayer resting on a 2D subwavelength silicon grating. Measured transmission spectra illustrate the excitation of graphene-plasmons, which is further supported by numerical simulations.

II-1.2 WED 8:45

Ultrastrong light-matter coupling between high-mobility 2DEG and superconducting THz metasurfaces.

•*G. Scalari[1], C. Maissen[1], S. Cibella[2], R. Leoni[2], E. Giovine[2], P. Carelli[3], D. Hagenmüller[4], S. de Liberato[4], C. Ciuti[4], F. Valmorra[1], M. Beck[1], and J. Faist[1]; [1]Institute of Quantum Electronics, ETH Zürich, Zürich, Switzerland; [2]CNR-IFN, Institute for Photonics and Nanotechnologies, Rome, Italy; [3]DSFC, Università dell' Aquila, L'Aquila, Italy; [4]Laboratoire Matériaux et Phénomènes Quantiques, Université Paris Diderot-Paris 7 and CNRS, Paris, France*

We demonstrate ultrastrong light-matter coupling between a superconductor-based THz metasurface and the cyclotron transition of a single high-mobility two-dimensional electron gas. We measure a normalized coupling ratio of $\Omega/\omega = 0.27$ for ω=420 GHz.

II-1.3 WED (Invited) 9:00

Quantum effects in tunnelling plasmonics

•*J. Aizpurua[1], R. Esteban[1], P. Nordlander[2], and A. Borisov[3]; [1]Materials Physics Center (CSIC-UPV/EHU) and DIPC, Donostia-San Sebastián, Spain; [2]Laboratory for Nanophotonics, Rice University, Houston, United States; [3]Institut des Sciences Moléculaires d'Orsay, CNRS-Université Paris-Sud, Orsay, France*

As dimensions between metallic nanoparticles become subnanometric, quantum effects such as electron spill-

ROOM 4b

8:30 – 10:00

CI-3: Optical Signal Processing

Chair: Stefan Wabnitz, University of Brescia, Italy

CI-3.1 WED 8:30

A universal all-fiber Omnipolarizer

J. Fatome[1], S. Pitois[1], P. Morin[1], P.-Y. Bony[1], E. Assémat[1], D. Sugny[1], A. Picozzi[1], H.-R. Jauslin[1], G. Millot[1], V. Kozlov[2,3], •M. Guasoni[1], and S. Wabnitz[2]; [1]Laboratoire Interdisciplinaire Carnot de Bourgogne, Dijon, France; [2]Università di Brescia, Brescia, Italy; [3]St.-Petersburg State University, St.-Petersburg, Russia

We experimentally demonstrate an unexpected capability of light to self-organize its own state-of-polarization in optical fibers into universal, environmentally robust states. This polarizing device: Omnipolarizer, can operate as a digital PBS or as ideal polarizer.

CI-3.2 WED 8:45

Fiber Optical Parametric Polarizer

•*T. Sylvestre[1], B. Stiller[1], J. Fatome[2], P. Morin[2], S. Pitois[2], and C. Menyuk[3]; [1]Institut FEMTO-ST, Besancon, France; [2]Laboratoire Interdisciplinaire Carnot de Bourgogne, Dijon, France; [3]Department of Computer Science and Electrical Engineering, Baltimore, United States*

We demonstrate a fiber-optical parametric polarizer, i.e., a polarizing device based on parametric amplification in optical fibers. A large degree of polarization was achieved for both the signal and idler waves with 25 dB gain.

CI-3.3 WED 9:00

All-Optical Phase Regeneration of Multi-level Amplitude and Phase Shift Keyed Signals

•*G. Hesketh[1] and P. Horak[2]; [1]Optoelectronics Research Centre, Southampton, United Kingdom; [2]Optoelectronics Research Centre, Southampton, United Kingdom*

We investigate the effect of four-wave-mixing based phase regeneration on the transmission capacity of fiber optic links for complex modulation formats. The benefits of a novel regenerator with reduced excess amplitude

ROOM 13a

8:30 – 10:00

CA-8: High Inversion Laser System

Chair: Frédéric Druon, Institut d'Optique Graduate School, Laboratoire Charles Fabry, Palaiseau, France

CA-8.1 WED 8:30

Diode-pumped Yb:LuAG and Yb:YAG disk laser amplifiers with high pulse energies

•*M. Siebold[1], M. Loeser[1], D. Albach[1], F. Röser[1], S. Banerjee[2], and U. Schramm[1]; [1]Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany; [2]Central Laser Facility, STFC Rutherford Appleton Laboratory, Didcot, United Kingdom*

We report the first short-pulse amplification to several hundred millijoule energies in ceramic Yb:LuAG. We demonstrated ns-pulse output from a diode-pumped Yb:LuAG amplifier at an energy of 580 mJ and an efficiency of 28%.

CA-8.2 WED 8:45

Millijoule Femtosecond Pulses at 5 kHz from cw-Pumped Ho:YAG Regenerative Amplifier

•*P. Malevich[1], G. Andriukaitis[1], T. Floery[1], A. Verhoef[1], S. Alisauskas[1], A. Pugzlys[1], A. Baltuska[1], L. Tan[2,3], C.F. Chua[2], P.B. Phua[2,3], and A. Fernandez[1]; [1]Photonics Institute, Vienna University of Technology, Vienna, Austria; [2]Nanyang Technological University, Singapore, Singapore; [3]DSO National Laboratories, Singapore, Singapore*

A novel cw Tm-fiber laser pumped femtosecond Ho:YAG room-temperature CPA system is presented. The 5-kHz system delivers 3mJ pulses with >12nm bandwidth and an average power of 15W. The output is compressed to 530fs FWHM.

CA-8.3 WED 9:00

High Energy, High Repetition Rate Picosecond Pulses from a Quasi-CW Diode Pumped Nd:YAG System

•*D.W.E. Noom, S. Witte, and K.S.E. Eikema; LaserLaB Amsterdam, VU University Amsterdam, Amsterdam, The Netherlands*

We present a 300 Hz repetition rate quasi-CW diode-pumped Nd:YAG laser system, producing 80 mJ, 60 ps pulses at 532 nm, aimed at parametric amplification of ultrashort pulses for high-flux soft X-ray generation.

ROOM 13b

8:30 – 10:00

JSII-1: Photonics for Defence and Security: Spectroscopy Imaging and Detection

Chair: Eric Lallier, Thales Research and Technology, Palaiseau, France

JSII-1.1 WED (Invited) 8:30

QCL Based Detection of Hazardous Substances

•*K.N. Patel; Pranalytica, Inc., Santa Monica, CA, United States*

I will describe use of MWIR and LWIR QCLs, generating high power tunable radiation in the 3.5μm-12μm region, for high sensitivity in-situ and standoff detection of chemical warfare agents, hazardous toxic industrial chemicals and explosives.

JSII-1.2 WED 9:00

Kilometre-range, high resolution depth imaging using 1560 nm wavelength single-photon detection

•*A. McCarthy[1], N. Krichel[1,2], N. Gemmell[1], X. Ren[1], M. Tanner[1,3], S. Dorenbos[4], V. Zwiller[4], R. Hadfield[1,3], and G. Buller[1]; [1]School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom; [2]Helia Photonics Ltd, Livingston, United Kingdom; [3]School of Engineering,University of Glasgow, Glasgow, United Kingdom; [4]Kalvi Institute of Nanoscience,Delft*

ROOM 14a

8:30 – 10:00

CJ-5: High Peak Power Fibre Sources

Chair: Oliver de Vries, IOF, Jena, Germany

CJ-5.1 WED 8:30

50 uJ, 90 ps monolithic fiber amplifier passively Q-switched microchip laser with low timing jitter

•*G. Machinet, C. Pierre, and P. Dupriez; Alphanov, Talence, France*

We report on a 50uJ, 90ps monolithic fiber amplifier system seeded by a passively Q-switched microchip laser incorporating a simple timing jitter reduction scheme while providing controlled tunable repetition rates.

CJ-5.2 WED 8:45

75kW peak power 50ps pulsed fiber laser system

•*Y. Kamba[1], K. Tei[1], S. Yamaguchi[1], J. Enokidani[2], and S. Sumida[2]; [1]Tokai University, Hiratsuka, Japan; [2]OPT-i Co., Ltd., Kashiwa, Japan*

We report on a high peak power pulsed Yb-doped fiber laser with 75kW peak power and 30W average power. We demonstrated a tunable 50ps-2ns pulse width, a tunable 200kHz-8MHz repetition rate and wavelength conversion.

CJ-5.3 WED 9:00

Fiber Amplifier CPA System using Divided-Pulse Amplification for multi-mJ Extraction

•*M. Kienel[1], A. Klenke[1,3], S. Breitkopf[1], T. Eidam[1,3], C. Jauregui[1], J. Limpert[1,2,3], and A. Tünnermann[1,2,3]; [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Jena, Germany; [2]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany; [3]Helmholtz-Institute Jena, Jena, Germany*

ROOM 14b

8:30 – 10:00

CM-4: Ultrafast Phenomena and Nanostructuring

Chair: Stefan Nolte, Friedrich Schiller University of Jena, Jena, Germany

CM-4.1 WED 8:30

Nanograting Imprinted with Femtosecond-Laser-Induced Plasmonic Near-Field

•*K. Miyazaki and G. Miyaji; Kyoto University, Uji, Japan*

We have shown that the ultrafast excitation of surface plasmon polaritons can be controlled to directly imprint a homogeneous nanograting on GaN surface in air, using a simple two-step process of femtosecond laser ablation.

CM-4.2 WED 8:45

Multiphoton-avalanche absorption yields with femtosecond laser pulses in the wavelength range 1300-2200nm

•*S. Leyder[1], D. Grojo[1], P. Delaporte[1], W. Marine[2], M. Sentis[1], and O. Utéza[1]; [1]Aix-Marseille Université, CNRS, LP3(Lasers, Plasmas et Procédés Photoniques), UMR7341, Marseille, France; [2]Aix-Marseille Université, CNRS, CINAM(Centre Interdisciplinaire de Nanoscience de Marseille), UMR7325, Marseille, France*

We measure multiphoton-avalanche absorption yields inside various band gap materials with femtosecond laser pulses at different wavelengths. It provides an original data set to test models for strong field ionization by femtosecond lasers.

CM-4.3 WED 9:00

Unambiguous Evidence of Two Plasmon Decay During Ultrafast Laser Writing in Glass

•*A. Patel, M. Gecevičius, R. Drevinskas, M. Beresna, and P. Kazansky; Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*

$3\omega/2$ emission has been observed during ultrafast laser experiments in the regime of permanent modification in glass. This explicitly demonstrates the existence of two plasmon decay clarifying the issues of plasma concentra-

ROOM 21

8:30 – 10:00

IA-4: Quantum State Control

Chair: Valentina Parigi, Laboratoire Charles Fabry, Paris, France

IA-4.1 WED 8:30

Large Optical Phase Shift from a Single Trapped Atomic Ion

•*A. Jechow[1,2], E. Streed[1], B. Norton[1], S. Haendel[1], V. Bluhms[1], and D. Kielpinski[1]; [1]Centre for Quantum Dynamics, Griffith University, Brisbane, Australia; [2]University of Potsdam, Institute of Physics and Astronomy, Photonics, Potsdam, Germany*

We have used a single trapped atomic ion to induce and measure a large optical phase shift of 1.3 radians in light scattered by the atom by utilizing spatial interferometry based on absorption imaging.

IA-4.2 WED 8:45

Parametric feedback cooling of a single atom inside an optical cavity

•*T. Wilk, C. Sames, H. Chibani, C. Hamsen, A.C. Eckl, P. Altin, and G. Rempe; Max-Planck-Institut für Quantenoptik, Garching, Germany*

We observe for the first time parametric feedback cooling of the radial and axial motion of a single atom held in an intra-cavity standing wave dipole trap.

IA-4.3 WED 9:00

Coherent manipulation of cold cesium atoms in a nanofiber-based two-color dipole trap

•*P. Schneeweiss, R. Mitsch, D. Reitz, C. Sayrin, and A. Rauschenbeutel; Vienna Center for Quantum Science and Technology & Atominstitut, Vienna University of Technology, Vienna, Austria*

We measure the ground state coherence properties of the clock transition of cesium atoms in a nanofiber-based two-color dipole trap. Using a sufficiently large magnetic

ROOM EINSTEIN

8:30 – 10:00

CE-7: Nonlinear Materials

Chair: Markus Pollnau, University of Twente, The Netherlands

CE-7.1 WED 8:30

On the reactive ion etching of RbTiOPO4

•*A. Choudhary[1], J. Cugat[2], P. Kannan[1], R. Sole[2], F. Diaz[2], M. Aguilo[2], H. Chong[3], and D. Shepherd[1]; [1]Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom; [2]Universitat Rovira i Virgili, Tarragona, Spain; [3]Electronics and Computer Science, University of Southampton, Southampton, United Kingdom*

We discuss the reactive ion etching of a non-linear crystal, RbTiOPO4 in a fluorine rich environment and the process optimisation to fabricate single-mode channel waveguides in (Yb,Nb):RbTiOPO4 for lasing application around 1 micron.

CE-7.2 WED 8:45

the Kerr nonlinearity of the beta-barium borate crystal

M. Bache[1], •H. Guo[1], B. Zhou[1], and X. Zeng[1,2]; [1]Group of Ultrafast Nonlinear Optics, DTU Fotonik, Technical University of Denmark (DTU), Kgs. Lyngby, Denmark; [2]Key Laboratory of Special Fiber Optics and Optical Access Networks, Shanghai University, Shanghai, China, People's Republic of (PRC)

The beta-barium borate crystal is popular for ultrafast cascading. We measure the main Kerr nonlinearity, and after correcting similar literature data for deterministic contributions we obtain an average value in excellent agreement with our results.

CE-7.3 WED 9:00

High-sensitivity measurement of residual absorption of lithium triborate crystals

•*N. Waasem[1], F. Kühnemann[1], and K. Buse[1,2]; [1]Fraunhofer Institute for Physical Measurement Techniques IPM, Freiburg, Germany; [2]Department of Microsystems Engineering, University of Freiburg, Freiburg, Germany*

Absorption is measured from 410-2600 nm in lithium triborate crystals, employing a photoacoustic spectrome-

ROOM 4a

out and coherent tunneling modify their optical response. We introduce a theoretical framework to describe quantum effects in realistic plasmonic systems.

II-1.4 WED 9:30

Magnetic graphene metamaterial

•N. Papasimakis[1], S. Thongrattanasiri[2], N. Zheludev[1,3], and F.J. Garcia de Abajo[2]; [1]Optoelectronics Research Centre & Centre for Photonic Metamaterials, Southampton, United Kingdom; [2]Instituto de Química Física Rocasolano - Consejo Superior de Investigaciones Científicas, Madrid, Spain; [3]Centre for Disruptive Photonic Technologies, Nanyang Technological University, Singapore, Singapore

We demonstrate a magnetic graphene metamaterial consisting of split ring resonators with very high (>100) wavelength to unit-cell ratios and high quality factors not attainable by thin layers of conventional noble metals.

II-1.5 WED 9:45

From individual to strongly coupled metallic nanocavities

A. Salomon[1], Y. Prior[1], R. Kolkowski[2], and •J. Zyss[2]; [1]Weizmann Institute of Sciences, Rehovot, Israel; [2]Ecole Normale Supérieure de Cachan, Cachan, France

Polarized SHG imaging evidences strong coupling between metallic nanocavities at comparatively long range. Coupled triangular nanocavities lose their individual three-fold octupolar symmetry to adopt the lower symmetry of a single dipolar entity.

ROOM 4b

noise are demonstrated.

CI-3.4 WED 9:15

Impact of Four-wave Mixing Phase Noise Transfer on Wavelength Converted QPSK Signals

•S. Tayeb Naimi, S. O Duill, and L. Barry; Dublin City University, Dublin, Republic of Ireland

We calculate impairments of a 10 GBaud QPSK signal due to the phase noise transfer of the four-wave mixing process. We show how this effect places limits on pump sources used in wavelength converters.

CI-3.5 WED 9:30

Wavelength conversion of ps-duration pulses induced in mode-locked semiconductor lasers via strong optical injection.

•R. Watts[1], R. Rosales[2], S. Murdoch[3], F. Lelarge[4], A. Ramdane[3], and L. Barry[1]; [1]School of Electronic Engineering, Dublin City University, Dublin, Republic of Ireland; [2]CNRS Laboratory for Photonics and Nanostructures, Marcoussis, France; [3]Physics Department, University of Auckland, Auckland, New Zealand; [4]III-V Lab, ajoint laboratory of "Alcatel Lucent Bell Labs" and "Thales Research and Technology", Marcoussis, France

A 48GHz passively mode-locked semiconductor laser is used as both a high repetition-rate pulse source and also nonlinear wavelength convertor to achieve wavelength conversion up to 25nm for 1ps-duration pulses via strong external optical injection.

CI-3.6 WED 9:45

All Optical Clock Recovery of 40 GHz Quantum Dash Mode-Locked Laser to Return-to-Zero 160 Gb/s data stream

•J. Parra-Cetina[1], J. Luo[2], N. Calabretta[2], and P. Landais[1]; [1]Dublin City University, Dublin, Republic of Ireland; [2]Cobra Research Institute, Eindhoven, The Netherlands

All optical clock recovery of 40 GHz quantum dash mode-locked laser has been achieved under injection of the 160 Gb/s coherent wavelength converted signal featuring no spectral component at 40 GHz.

ROOM 13a

CA-8.4 WED 9:15

Thermal and Non-Thermal Lensing of Yb:YAG and Tm:YAG Thin Slab Laser Gain Media

•B. Fulford[1,2], D. Hall[1], J. Lee[2], and H. Baker[1]; [1]Heriot-Watt University, Edinburgh, United Kingdom; [2]Rofin-Sinar UK Ltd., Kingston upon Hull, United Kingdom

The effective lens strength of edge-pumped Yb:YAG and Tm:YAG thin slabs under various conditions are compared. Discrepancy with a purely thermal model is discussed relative to the population difference profile and electronic refractive index change.

CA-8.5 WED 9:30

Temperature Development in Yb:YAG Thin-Disk Lasers at High Inversion Densities Confirming Nonlinear Losses

•U. Wolters, K. Beil, C. Kraenkel, K. Petermann, and G. Huber; Institute of Laser Physics, University of Hamburg, Hamburg, Germany

At high outcoupling transmissions strong heat is generated in Yb:YAG thin-disk lasers, revealing a nonlinear loss process that reduces laser efficiency. These losses are analysed and compared to the photoconductivity results found in Yb:YAG.

CA-8.6 WED 9:45

Multimode Laser-Diode Pumped Continuous-Wave Stoichiometric Yb3Al5O12 Laser

•D. Kimura[1], S. Matsubara[1], K. Otani[1], T. Ueda[1], M. Inoue[1], N. Shimojo[1], Y. Sasatani[1], A. Maruko[1], D. Mizuno[1], M. Nishio[1], and S. Kawato[1,2,3]; [1]Graduate School of Engineering, University of Fukui, Fukui, Japan; [2]Research and Education Program for Life Science, University of Fukui, Fukui, Japan; [3]Japan Synchrotron Radiation Research Institute (JASRI),, Sayo, Japan

A laser-diode-pumped, continuous-wave microchip stoichiometric Yb3Al5O12 laser was realized at room temperature. It is the first for the laser-diode-pumped, continuous-wave stoichiometric Yb lasers, to our knowledge.

ROOM 13b

University of Technology, Delft, The Netherlands

Centimetre-scale resolution depth imaging of low-signature targets at kilometre range was demonstrated using the single-photon time-of-flight approach at 1560nm wavelength with a superconducting nanowire single photon detector.

JSII-1.3 WED 9:15

Long Range Active Hyperspectral Target Identification Using Near-IR Supercontinuum Light Source

•A. Manninen[1], T. Kääriäinen[1], T. Parviainen[2], S. Buchter[3], M. Heiliö[3], and T. Laurila[1,4]; [1]Centre for Metrology and Accreditation, Espoo, Finland; [2]Defense Forces Technical Research Centre, Lakiala, Finland; [3]Lasersec Systems, Jorvas, Finland; [4]Metrology Research Institute, Aalto University, Espoo, Finland

Active hyperspectral measurement at distances up to 250 meters in the daytime has been demonstrated. Cost efficient supercontinuum source employing a graded index optical fiber was used as the light source.

JSII-1.4 WED 9:30

Looking beyond smoke and flames. A challenge for people safety, met thanks to Digital Holography at 10.6μm

•V. Bianco[1], M. Paturzo[1], M. Locatelli[2], E. Pugliese[2], A. Finizio[1], A. Pelagotti[2], P. Poggi[2], L. Miccio[1], R. Meucci[2], and P. Ferraro[1]; [1]CNR-National Institute of Optics, Pozzuoli (Naples), Italy; [2]CNR-National Institute of Optics, Florence, Italy

Here we show that a clear imaging of alive people through smoke and flames is possible by Digital Holography at far infrared. A lensless configuration is the key to get rid of the flame emissions.

JSII-1.5 WED 9:45

Broadband Quantum Cascade Lasers monolithically multiplexed on Silicon for mid-infrared spectroscopy

G. Maisons[1], •B. Gerard[1], B. Simozrag[1], V. Trinité[1], M. Carras[1], M. Brun[2], S. Boutami[2], P. Labaye[2], and S. Nicoletti[2]; [1]III-V Lab, Palaiseau, France; [2]CEA-LETI, Grenoble, France

We present the realizations of a QCL monolithic, widely tuneable,source in the mid-Infrared for laser spectroscopy.

ROOM 14a

A state-of-the-art chirped-pulse fiber amplification system for energy scaling is presented. Using divided-pulse-amplification with an active stabilization sytem and pulse train tailoring, this system is able to extacting multi-mJ pulse energies from a LMA fiber.

CJ-5.4 WED 9:15

High Peak Power, High-Energy, High-Average Power Pulsed Fibre Laser System with Versatile Pulse Duration and Shape

•*A. Malinowski, P. Gorman, C. Codemard, F. Ghiringhelli, A. Boyland, A. Marshall, and M. Durkin*; *SPI Lasers UK Ltd, Southampton, United Kingdom*

We demonstrate a 1061nm all-fibre MOPA system with average power of 265W, capable of pulse energies up to 10.6mJ, peak powers exceeding 100kW with adjustable pulse duration in the range 500ps-500ns.

CJ-5.5 WED 9:30

Imposing Temporal and Frequency Characteristics in a System of Coherently Combined High Peak Power Photonic Crystal Fiber Lasers

•*B. Shulga and A. A. Ishaaya*; *Ben-Gurion University of the Negev, Beer-Sheva, Israel*

We experimentally demonstrate efficient intracavity coherent combining of two high peak and average power rod-type photonic crystal fiber lasers. Furthermore, temporal and frequency content imposing of one channel on the other is investigated.

CJ-5.6 WED 9:45

Kilowatt level transform-limited 150 ns monolithic pulsed fiber laser emitting in the L band

•*G. Canat, L. Lombard, J. Le Gouët, and A. Dolfi-Bouteyre*; *Onera, The French Aerospace Lab, Palaiseau, France*

We report on a 1kW peak power pulsed fiber laser emitting at 1579nm limited by stimulated Brillouin scattering. This fiber monolithic MOPFA operates at 4kHz generating 150ns duration pulses with M2<1.2 for CO2 remote sensing.

ROOM 14b

tion and nanograting formation.

CM-4.4 WED 9:15

Role of Multiple Shots of Femtosecond Laser Pulses in Periodic Nanostructure Formation on Silicon Surface

•*G. Miyaji and K. Miyazaki*; *Kyoto University, Uji, Japan*

Pump-probe measurements of reflectivity have shown that superimposed multiple shots of low-fluence femtosecond laser pulses on silicon surface accumulate non-thermal bonding structure change to decrease the ablation threshold and induce subsequent formation of periodic nanostructures.

CM-4.5 WED 9:30

Large area, high speed inscription of laser-induced periodic surface structures (LIPSS) in Cr using a high repetition rate fs-laser.

•*A. Ruiz de la Cruz[1], R. Lahoz Espinosa[2], J. Siegel[1], G. de la Fuente Leis[2], and J. Solís Céspedes[1]*; [1]*Laser Processing Group, Instituto de Óptica (CSIC), Madrid, Spain*; [2]*Instituto de Ciencia de Materiales de Aragón, CSIC, Universidad de Zaragoza, Zaragoza, Spain*

We have produced highly uniform LIPSS over large areas ($\sim cm^2$) on Cr with a fs-laser at high repetition rates. The structures can be fabricated at very high scan speeds ($\sim m/s$) over a large processing window.

CM-4.6 WED 9:45

120 nm resolution and 55nm line width achieved in visible light STED-lithography

•*T.A. Klar, R. Wollhofen, and J. Jacak*; *Institute of Applied Physics, Johannes Kepler University, Linz, Austria*

Adding stimulated emission depletion (STED) to two photon lithography enables substantial sub-Abbe lithography. Using 780nm for two-photon excitation and 532nm for STED, we obtain structure sizes of 55 nm, and a resolution of 120 nm.

ROOM 21

offset field, coherence times in the milliseconds-range have been obtained.

IA-4.4 WED 9:15

Detecting The Motional State Of Single Atoms In A High-Finesse Optical Cavity By Heterodyne Spectroscopy

•*S. Yoon[1], R. Reimann[1], S. Manz[1], T. Kampschulte[1,2], N. Thau[1], W. Alt[1], and D. Meschede[1]*; [1]*institut für Angewandte Physik, Universität Bonn, Bonn, Germany*; [2]*Departement Physik, Universität Basel, Basel, Switzerland*

We observe the quantized motion of single atoms strongly coupled to a high-finesse optical cavity and investigate dynamics of cavity-assisted atom cooling by means of photon-counting heterodyne spectroscopy.

IA-4.5 WED 9:30

Excitation of a single atom with a temporally shaped light pulses

S.A. Aljunid[1,2], •*V. Leong[1], D.H. Lan[3], Y. Wang[1], G. Maslennikov[1], V. Scarani[1,4], and C. Kurtsiefer[1,4]*; [1]*Centre for Quantum Technologies, Singapore, Singapore*; [2]*L'Universite Paris Nord, Paris, France*; [3]*University of Twente, Twente, The Netherlands*; [4]*Physics Department, National University of Singapore, Singapore, Singapore*

We demonstrate that temporal shaping of the envelope of a weak coherent optical pulses changes the excitation probability of a single trapped atom. Pulses with rising exponential envelope outperform other shapes in accordance with calculations.

IA-4.6 WED 9:45

Magneto-optical traps on a chip using micro-fabricated gratings

C. Nshii[1], M. Vangeleyn[1], J. Cotter[2], P. Griffin[1], E. Hinds[2], C. Ironside[3], P. See[4], A. Sinclair[4], E. Riis[1], and •*A. Arnold[1]*; [1]*University of Strathclyde, Glasgow, United Kingdom*; [2]*Imperial College, London, United Kingdom*; [3]*University of Glasgow, Glasgow, United Kingdom*; [4]*National Physical Laboratory, Teddington, United Kingdom*

We have realised a single-input-beam magneto-optical chip trap which loads 10^8 atoms from a $1cm^3$ capture volume and delivers sub-Doppler temperatures. The on-chip gratings will also enable simple formation of stable 3D optical lattices.

ROOM EINSTEIN

ter. Crystals from different manufacturers are compared. The measurements reveal large differences in the residual absorption at wavelengths below 550 nm.

CE-7.4 WED 9:15

Second order nonlinear optical susceptibility of nonelectrically poled DR1-doped PMMA host-guest polymers

•*A. Sugita, Y. Sato, K. Ito, K. Murakami, N. Mase, and Y. Kawata*; *Shizuoka University, Hamamatsu, Japan*

We will present second order nonlinear optical susceptibility of nonelectrically poled DR1-doped PMMA host-guest polymers. The nonlinearity of deff~1.0pm/V was obtained from the materials with 1.0 micron-thickness just by annealing without external field applications.

CE-7.5 WED 9:30

Ferroelectric Liquid-Crystalline Polymers for Photoinduced Switching of Nonlinear Optical Response

•*M. Virkki[1], A. Priimagi[2,3], K. Ogawa[2], J.-i. Mamiya[2], M. Kauranen[1], and A. Shishido[2]*; [1]*Department of Physics, Tampere University of Technology, Tampere, Finland*; [2]*Chemical Resources Laboratory, Tokyo Institute of Technology, Yokohama, Japan*; [3]*Department of Applied Physics, Aalto University, Espoo, Finland*

We present the first observation of high-contrast photoinduced switching of second-order nonlinear optical response in crosslinked ferroelectric liquid-crystalline polymers. The fully reversible switching behaviour is triggered by two-photon absorption-induced photoisomerization of the crosslinking azobenzene molecules.

CE-7.6 WED 9:45

Multimodal Nonlinear Imaging of Suspended Carbon Nanotubes Using Circular Polarizations

•*G. Bautista[1], M.J. Huttunen[1], O. Herranen[2], A. Johansson[2], P. Myllyperkiö[3], M. Ahlskog[2], M. Pettersson[3], and M. Kauranen[1]*; [1]*Department of Physics, Tampere University of Technology, Tampere, Finland*; [2]*Nanoscience Center, Department of Physics, University of Jyväskylä, Jyväskylä, Finland*; [3]*Nanoscience Center, Department of Chemistry, University of Jyväskylä, Jyväskylä, Finland*

We demonstrate multimodal second-harmonic and third-harmonic generation microscopy of suspended carbon nanotubes using circularly polarized excitation. Our results suggest the possibility of performing nonlinear chirality detection at the single nanotube or nanotube bundle levels.

ROOM 4a

10:30 – 12:00

II-2: Plasmonics Antennas and Waveguides

Chair: Javier Aizpurua, CSIC-UPV EHU, Donostia-San Sebastian, Spain

II-2.1 WED 10:30

Third harmonic spectroscopy of complex plasmonic Fano structures

•B. Metzger[1], M. Hentschel[1,2], T. Schumacher[1,2], M. Lippitz[1,2], and H. Giessen[1]; [1]4th Physics Institute and Research Center SCoPE, University of Stuttgart, Stuttgart, Germany; [2]Max Planck Institute for Solid State Research, Stuttgart, Germany

We perform third-harmonic spectroscopy of complex plasmonic nanoantennas which exhibit EIT-like Fano resonances in their linear extinction spectrum. Strong third harmonic emission is found at the lower energy mode of the coupled plasmonic system.

II-2.2 WED 10:45

Nanoantenna probes: Mode mapping and Nanoscale Imaging

•A. Singh[1], G. Calbris[1], and N.F.v. Hulst[1,2]; [1]ICFO - The Institute of Photonic Sciences, Castelldefels (Barcelona), Spain; [2]ICREA - Instutucio Catalana de Recerca i Estudis Avançats, Barcelona, Spain

We present stand-alone nanoantenna probes, where the nanoantenna is fabricated onto a fiber tip using FIB. We demonstrate a novel near-field scanning technique for sub-wavelength size mode imaging of dipole and gap optical nanoantenna tips.

II-2.3 WED 11:00

Deeply subwavelength SPP components for nanophotonic circuitry

*•A. Kriesch[1,2,3], S.P. Burgos[3], D. Ploss[1,2], H. Pfeifer[1,2], H.A. Atwater[3], and U. Peschel[1,2,3]; [1]Institute of Optics, Information and Photonics, University of Erlangen-Nuremberg and Max Planck Institute for the Science of Light, Erlangen, Germany; [2]Erlangen Graduate School in Advanced Optical Technologies, University of Erlangen-Nuremberg, Germany and Cluster of Excellence for *Engineering of Advanced Materials* (EAM), University of Erlangen-Nuremberg, Erlangen, Germany; [3]Thomas J. Watson Institute of Applied Physics, California Institute of Technology, Pasadena, United States*

We propose a novel scheme for plasmonic nanocircuits based on different plasmonic functional units like optimized optical Yagi antennas and ultrashort optical directional couplers. Those units are interconnected with low loss plasmonic SPP gap waveguides.

ROOM 4b

10:30 – 12:00

CI-4: Opto-Electronic Devices

Chair: Daniele Modotto, Università di Brescia, Brescia, Italy

CI-4.1 WED 10:30

All-optical, Non-volatile, Chalcogenide Phase-change Meta-switch

B. Gholipour[1], J. Zhang[1], J. Maddock[1], •K.F. MacDonald[1], D.W. Hewak[1], and N.I. Zheludev[1,2]; [1]University of Southampton, Southampton, United Kingdom; [2]Nanyang Technological University, Singapore, Singapore

Bistable all-optical switching in a chalcogenide phase-change metamaterial delivers high-contrast optical signal modulation across the visible to mid-infrared spectral range in device structures down to 1/27 of a wavelength thick.

CI-4.2 WED 10:45

Electrostatic Control of Dual-core Optical Fibre with NEMS Functionality

•N. Podoliak, Z. Lian, P. Horak, and W.H. Loh; University of Southampton, Southampton, United Kingdom

We model an optical fibre with suspended cores for electrostatic actuation of the cores. With metal wires in the cladding, an applied voltage of 30V will move the cores, and change the fibre optical properties.

CI-4.3 WED 11:00

Optical guiding and loss mechanisms in electro-optically induced waveguides based on isotropic phase liquid crystals

•M. Blasl, H. Hartwig, K. Bornhorst, and F. Costache; Fraunhofer Institute for Photonic Microsystems, Dresden, Germany

A model for loss and guiding mechanisms in electro-optically induced waveguide devices based on nematic liquid crystals in isotropic phase was developed. Together with experimental data, an in-depth understanding of device characteristics was achieved.

ROOM 13a

10:30 – 12:00

CA-9: Novel Solid-State Laser Concepts

Chair: Patrick Georges, Institut d'Optique Graduate School, Palaiseau, France

CA-9.1 WED 10:30

Rotating Cavity Laser: A New Approach for Power Scaling Solid State Lasers

•M. Eckold, J.I. Mackenzie, and W.A. Clarkson; Optoelectronics Research Centre, University of Southampton,, Southampton, United Kingdom

A novel laser architecture for scaling output power and avoiding deleterious thermal effects based on a resonator with a rotating periscope is described. The laser yielded 16W of output limited by available pump power.

CA-9.2 WED 10:45

High-performance intra-cavity polarization- and wavelength-selective grating-mirrors for Yb:YAG thin-disk lasers

•M. Rumpel[1], M. Möller[2], F. Habel[3], A. Voss[1], C. Moormann[2], M. Schacht[3], M. Abdou Ahmed[1], and T. Graf[1]; [1]IFSW Universität Stuttgart, Stuttgart, Germany; [2]AMO GmbH, Aachen, Germany; [3]LASER COMPONENTS GmbH, Olching, Germany

The latest results obtained with grating-mirrors for thin-disk lasers are presented. Very high laser efficiency, narrow spectral emission bandwidth, large wavelength tuning range and high polarization purity were achieved without thermal problems.

CA-9.3 WED 11:00

Active Mirrors For kW-Class Fundamental-Mode Thin-Disk Lasers

•S. Piehler, B. Weichelt, A. Voss, M. Abdou Ahmed, and T. Graf; Institut für Strahlwerkzeuge, Stuttgart, Germany

Power scaling of fundamental-mode thin-disk lasers is limited by the aspherical phase-distortions in the laser crystal. We will present recent results achieved with deformable mirrors for intra-cavity compensation of these distortions at the kW-level.

ROOM 13b

10:30 – 12:00

JSII-2: Photonics for Defence and Security: Coherent Sources

Chair: Hans Joachim Wagner, IAF Freiburg, Germany

JSII-2.1 WED 10:30

100mJ Q-Switched Er:YAG diode-pumped laser system

•C. Larat[1], M. Schwarz[1], E. Lallier[1], and E. Durand[2]; [1]Thales Research & Technology France, Palaiseau, France; [2]Thales Optronique SAS, Elancourt, France

We report on a Er:YAG laser system delivering 100mJ in 100ns pulses at 1645nm. Oscillator and amplifiers are end-pumped with 1470nm fibre-coupled laser-diodes. Repetition rate: 30Hz; beam quality: M2<3.6.

JSII-2.2 WED 10:45

Multi-wavelength and multi-band infrared semiconductor lasers

•R. Ostendorf, S. Hugger, M. Rattunde, C. Schilling, S. Kaspar, R. Aidam, A. Baechle, C. Manz, R. Driad, F. Fuchs, and J. Wagner; Fraunhofer Institute for Applied Solid State Physics, Freiburg, Germany

We present a comprehensive overview of various techniques to combine different types of short- and mid-infrared semiconductor-based laser sources for use in sensing and security related applications.

JSII-2.3 WED (Invited) 11:00

CW mid-IR OPO based on OP-GaAs

•P. Schunemann, L. Pomeranz, S. Setzler, C. Jones, and P. Budni; BAE Systems, Inc., Nashua, NH, United States

The first successful OP-GaAs continuous wave optical parametric oscillator, and the first cw OPO in any crystal pumped at a wavelength > 1.55 microns, achieved 5.3 W of mid-IR output from 24.7 W pump.

ROOM 14a

10:30 – 12:00

CJ-6: Ultrafast Fibre Sources

Chair: Thomas Andersen, NKT Photonics, Birkerod, Danemark

CJ-6.1 WED 10:30

fs mode-locked fiber laser continuously tunable from 976 nm to 1070 nm

•*R. Royon*[1], *J. Lhermite*[1], *L. Sarger*[2], *and E. Cormier*[1]; [1]*CELIA BORDEAUX 1, TALENCE, France*; [2]*LOMA BORDEAUX 1, TALENCE, France*

We report on tunable femtosecond pulse generation from an all-normal dispersion Yb-doped-fiber-oscillator emitting from 976nm to 1070nm. The laser delivers chirped pulses of 10ps with an energy of 220nJ. Pulses are externally recompressed below 350fs.

CJ-6.2 WED 10:45

Discrete spatial dispersion scheme for amplification and shaping of femtosecond pulses in a multicore fiber

•*P. Rigaud*[1], *T. Mansuryan*[1], *G. Bouwmans*[2], *D. Labat*[2], *V. Kermene*[1], *Y. Quiquempois*[2], *A. Desfarges-Berthelemot*[1], *and A. Barthélémy*[1]; [1]*XLIM Institut de Recherche, Limoges, France*; [2]*Institut IRCICA, Villeneuve d'Ascq, France*

A compact scheme for amplification of ultrashort pulses is investigated based on the pulse spectrum splitting in narrow bands which are separately amplified in the different cores of a multicore fiber and subsequently coherently recombined

CJ-6.3 WED 11:00

33-fs Yb-fiber laser comb locked to Cs-atomic clock

•*C. Şenel*[1,2], *R. Hamid*[1], *C. Erdogan*[1], *M. Çelik*[1], *O. Kara*[1], *and O. Ilday*[2]; [1]*TÜBITAK National Metrology Institute (UME), Kocaeli, Turkey*; [2]*Department of Physics, Bilkent University, Ankara, Turkey*

We report an oscillator, designed using a new theoretical methodology, the output of which was amplified in a scheme that eliminates gain filtering and stabilized its repetition and carrier-envelope-offset frequency to Cs atomic clocks.

ROOM 14b

10:30 – 12:00

CM-5: Material Processing with Shaped Laser Beams

Chair: Marc Sentis, Aix Marseille University, Marseille, France

CM-5.1 WED 10:30

Spiral relief formation in an azo-polymer film by the irradiation of a circularly polarized optical vortex beam

•*M. Watabe*[1], *K. Miyamoto*[1], *and T. Omatsu*[1,2]; [1]*Chiba University, Chiba, Japan*; [2]*JST CREST, Tokyo, Japan*

Spiral-relief formation in an azo-polymer by the irradiation of a circularly-polarized vortex beam was presented. The phenomenon was originated by the angular momentum transfer of the vortex beam to the azo-polymer through light-induced mass migration.

CM-5.2 WED 10:45

Double Surface Plasmon Resonances Obtained with Bessel-Beam-Written Nanoslits Arrays

•*R. Sahin*[1], *E. Simsek*[2], *and S. Akturk*[1]; [1]*Istanbul Technical University, Department of Physics, Istanbul, Turkey*; [2]*George Washington University, Electrical and Computer Engineering, Washington DC, United States*

We fabricate nanoslit arrays on semi-transparent gold films, with femtosecond laser Bessel beams. We measure transmission spectra and obtain double resonance dips resulting from metal-air and metal-glass interfaces. Our theoretical studies confirm the observed behavior.

CM-5.3 WED 11:00

Modification of Transparent Materials by Tightly Focused Annular, Radially and Azimuthally Polarized Ultrafast Laser Beams

•*J. Zhang, M. Gecevičius, M. Beresna, and P. Kazansky*; *Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*

Cylindrically polarized annular beam is produced by femtosecond laser written S-waveplate. Self-assembled nanostructures cannot be produced by longitudinal field component radial polarization. Despite lower intensity ring-shaped azimuthally polarized beam induced larger retardance than radial.

ROOM 21

10:30 – 12:00

IA-5: Non-Classical Light

Chair: Ana Predojevic, University of Innsbruck, Innsbruck, Austria

IA-5.1 WED (Invited) 10:30

Biological measurement beyond the quantum limit

•*M. Taylor*[1], *J. Janousek*[2], *V. Daria*[2], *J. Knittel*[1], *B. Hage*[2], *H.-A. Bachor*[2], *and W. Bowen*[1]; [1]*Centre for Engineered Quantum Systems, University of Queensland, Brisbane, Australia*; [2]*Department of Quantum Science, Australian National University, Canberra, Australia*

We demonstrate the first biological measurement with precision surpassing the quantum noise limit. Lipid particles within a living yeast cell are tracked with sub-shot noise sensitivity, thereby revealing the biological dynamics of the cellular cytoplasm.

IA-5.2 WED 11:00

Observation of scalable, highly multimode entanglement in frequency combs with ultrafast pulse shaping

•*J. Roslund, R. Medeiros de Araújo, C. Fabre, and N. Treps*; *Laboratoire Kastler Brossel, Paris, France*

Ultrafast pulse shaping is utilized to fully characterize the squeezed vacuum output of an OPO synchronously pumped by a femtosecond pulse train. This experiment demonstrates scalable, highly multimode state creation in a single beam.

ROOM EINSTEIN

10:30 – 12:00

CE-8: Lithium Niobate - Fabrication and Characterization

Chair: Volkmar Dierolf, Lehigh University, Bethlehem, USA

CE-8.1 WED 10:30

UV laser-induced poling inhibited domain building blocks for photonic and nonlinear optical microstructures

G. Zisis[1], •*S. Mailis*[1], *Y. Ying*[2], *and E. Soergel*[3]; [1]*Optoelectronics Research Centre University of Southampton, Southampton, United Kingdom*; [2]*Avago Technologies, Singapore, Singapore*; [3]*Institute of Physics, University of Bonn, Bonn, Germany*

We demonstrate that partial overlap of UV laser irradiated tracks on the +z face of lithium niobate crystals allows the composition of arbitrary shaped complex large scale ferroelectric domain structures by inhibition of poling.

CE-8.2 WED 10:45

Domain Wall Motion of MgO Doped Stoichiometric Lithium Niobate

J.W. Choi[1], *D.-K. Ko*[1], *J.H. Ro*[2], *and* •*N.E. Yu*[1]; [1]*Gwangju Institute of Science and Technology, Gwangju, Korea, South*; [2]*Pusan National University, Busan, Korea, South*

In stoichiometric LN, sidewise wall velocity of a single hexagonal domain was measured to 0.015 ~ 4.58 μm/s in range 0.6 to 3.9 kV/mm. Asymmetric in-out shape and lattice interaction was estimated using Ising-model.

CE-8.3 WED 11:00

Control of the properties of micro-structured waveguides in LiNbO3 fabricated by direct femtosecond laser inscription

•*H. Karakuzu, M. Dubov, and S. Boscolo*; *Aston University, Birmingham, United Kingdom*

We report on buried waveguides fabricated in lithium niobate by the method of direct femtosecond laser inscription. We demonstrate numerically that the dispersion and other properties of such waveguides can be controlled by their geometry.

ROOM 4a

II-2.4 WED 11:15

Optical phased array nanoantenna link

•*D. Dregely*[1], *K. Lindfors*[1,2], *M. Lippitz*[1,2], *and H. Giessen*[1]; [1]*4th Physics Institute and Research Center SCoPE, University of Stuttgart, Stuttgart, Germany*; [2]*Max Planck Institute for Solid State Research, Stuttgart, Germany*

We experimentally realized an optical phased array nanoantenna link using plasmonic antennas as transmitter and receiver. Phase control of the individual array elements led to beam steering at optical frequencies.

II-2.5 WED 11:30

Scattering, interference, and switching of ultrashort surface plasmon polaritons

•*C. Reinhardt, T. Birr, W. Cheng, U. Zywietz, A. Evlyukhin, and B. Chichkov*; *Laser Zentrum Hannover, Hannover, Germany*

Interference and scattering of ultrashort surface plasmon-polaritons (SPPs) are studied. Interference of SPPs is applied to tracking and autocorrelation of ultrashort SPPs. Ultrafast SPP-light scattering is demonstrated and applications as ultrafast switches are discussed.

II-2.6 WED 11:45

Properties of Highly-Nonlinear Hybrid Silicon-Plasmonic Waveguides

•*A. Pitilakis and E. Kriezis*; *Aristotle University of Thessaloniki, Thessaloniki, Greece*

We provide a theoretical investigation of nonlinear hybrid silicon-plasmonic waveguides exploiting a metal wedge. These waveguides can provide an exceptionally high nonlinear parameter, while limiting the relative importance of the detrimental free-carrier effects.

ROOM 4b

CI-4.4 WED 11:15

Magnetic-Force-Induced Tunable Long-Period Fibre Grating and Its Application in Erbium-Doped Fibre Systems

•*H. Sakata, K. Yamahata, and K. Wakamiya*; *Shizuoka University, Hamamatsu, Japan*

We present a tunable notch filter based on magnetic-force-induced fibre grating. A loss amplitude is adjustable over 20 dB using a magnet with a coil spring. The device is also demonstrated in erbium-doped fibre systems.

CI-4.5 WED 11:30

Broadband All-Fiber Mode Multiplexer for Future MDM-WDM Transmission over Few-Mode Fibers

•*C. Tsekrekos and D. Syvridis*; *National and Kapodistrian University of Athens, Athens, Greece*

An all-fiber broadband mode multiplexer for mode and wavelength division multiplexing over few-mode fibers (FMFs) is analyzed. The multiplexer is based on cascaded FMF couplers and is optimized for operation over the C band.

CI-4.6 WED 11:45

Observation of Switching and Pulsed Behaviour in a Noise-Driven Resonant Tunneling Diode Excitable Optoelectronic Oscillator

•*B. Romeira*[1], *J. Javaloyes*[2], *C. Ironside*[3], *J. Figueiredo*[1], *S. Balle*[2], *O. Piro*[2], *H. Cantu*[3], *and A. Kelly*[3]; [1]*Centro de Electrónica, Optoelectrónica e Telecomunicações, Departamento de Física, Universidade do Algarve, Faro, Portugal*; [2]*Departament de Fisica, Universitat de les Illes Baleares, Palma, Spain*; [3]*School of Engineering, University of Glasgow, Glasgow, United Kingdom*

We demonstrate, experimentally and numerically, the dynamical behaviour of a simple noise activated optoelectronic oscillator comprising a resonant tunnelling diode-laser diode (RTD-LD) circuit, which exhibits switching and pulsed behavior that is characteristic of excitable systems.

ROOM 13a

CA-9.4 WED 11:15

650fs pulses at 1045nm from a passively Q-switched Nd:YVO4 microchip laser system

•*R. Lehneis*[1], *A. Steinmetz*[1], *J. Limpert*[1], *and A. Tünnermann*[1,2]; [1]*Friedrich-Schiller-Universität Jena, Abbe Center of Photonics, Institute of Applied Physics, Albert-Einstein-Str. 15, 07745 Jena, Germany*; [2]*Fraunhofer Institute for Applied Optics and Precision Engineering, Albert-Einstein-Str. 7, 07745 Jena, Germany*

We present a novel concept to produce sub-ps pulses from a passively Q-switched Nd:YVO4 microchip laser system with a tunable emission wavelength. Pedestal-free 650fs pulses are demonstrated with a wavelength shift from 1064nm to 1045nm.

CA-9.5 WED 11:30

Compact 'prism-by side-pumped' solid-state laser

•*T. Dascalu, G. Salamu, N. Pavel, O. Grigore, and F. Voicu*; *National Institute for Laser Plasma & Radiation Physics, Magurele, Romania*

A novel laser geometry that couples the pump beam into the active crystal through a prism is proposed. A rectangular-shaped Nd:YAG laser that yields pulses with 1.8-mJ energy at optical efficiency of 18% is demonstrated.

CA-9.6 WED 11:45

Laser Pulse Control of a Q-switched Nd:YVO4 Bounce Geometry Laser using a Secondary Cavity

•*E. Arbabzadah*[1], *P. Shardlow*[2], *and M. Damzen*[1]; [1]*Imperial College London, London, United Kingdom*; [2]*Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*

A novel method for pulse control in an ultrahigh gain Q-switched Nd:YVO4 laser is presented. A secondary cavity clamps excessive amplifier gain allowing single pulsed operation from very high (800kHz) to low (e.g.1kHz) repetition rates.

ROOM 13b

JSII-2.4 WED 11:30

Widely tunable optoelectronic oscillator based on a dual-frequency laser

•*J. Maxin, G. Pillet, L. Morvan, and D. Dolfi*; *Thales Research and Technology France, Palaiseau, France*

We present a widely tunable (2.5 to 5.5 GHz) and low noise(10Hz linewidth and -110 dBc/Hz @10 kHz phase noise) optoelectronic oscillator, that can find applications either in radar, electronic warfare or lidar systems.

JSII-2.5 WED 11:45

Large bandwidth interferometric technique for coherent beam combining

•*M. Antier, J. Bourderionnet, C. Larat, E. Lallier, E. Lenormand, and A. Brignon*; *Thales Research & Technology, Palaiseau, France*

We demonstrate fiber phase-locking system using an interferometric method. The system allows complete phase error map measurement in a single acquisition. A 1kHz correction loop bandwidth was achieved, with a residual lambda/50 rms phase error.

ROOM 1

14:00 – 15:30

CD-11: Application of Solitons

Chair: Ulf Peschel, University of Erlangen, Erlangen, Germany

ROOM 4a

14:00 – 15:30

IG-2: Light Beam Propagation in Disordered and Periodic Systems

Chair: Gian-Luca Oppo, University of Strathclyde, Glasgow, United Kingdom

ROOM 4b

14:00 – 15:30

CI-5: Advanced Concepts for Communications

Chair: Sonia Boscolo, Aston University, Birmingham, United Kingdom

ROOM 13a

14:00 – 15:30

CA-10: Beam Control

Chair: Jacob Mackenzie, University of Southampton, United Kingdom

ROOM 13b

14:00 – 15:30

JSIII-1: Light Emission and Propagation in Random Media

Chair: Goëry Genty, Tampere University of Technology, Tampere, Finland

ROOM 14a

CJ-6.4 WED 11:15

Compression of uJ-level fs Pulses from a Monolithic Yb-fiber Amplifier at 1 um Wavelength in a Hollow-Core Photonic Bandgap Fiber

•*A. Verhoef[1], T. Andersen[2], T. Flöry[1], L. Zhu[1], A. Galvanauskas[3], A. Baltuska[1], and A. Fernández[1]; [1]Institut für Photonik, Technische Universtität Wien, Wien, Austria; [2]NKT Photonics A/S, Birkerød, Denmark; [3]Center for Ultrafast Optical Science, University of Michigan, Ann Arbor, United States*

We present pulse compression results from an all Yb-FCPA. The use of a DCF stretcher and HCPBF compressor allowed to obtain 250-nJ, 220-fs pulses, enabling direct fiber delivery of microjoule-energy femtosecond laser pulses.

CJ-6.5 WED 11:30

Balancing Gain Narrowing with Self Phase Modulation: 100-fs, 800-nJ from an All-Fiber-Integrated Yb Amplifier

•*A. Rybak[1,2], I. Pavlov[1,2], C. Senel[1,3], and F.Ö. Ilday[1]; [1]Bilkent University, Ankara, Turkey; [2]TUBITAK National Metrology Institute (UME), Kocaeli, Turkey; [3]Institute of Physics, Kiev, Ukraine*

We developed an all-fiber-integrated Yb-amplifier, generating 1.15-microjoule, 20-ps pulses, compressed to 100 fs. Gain narrowing is balanced by Kerr nonlinearity through optimization of each amplifier stage using numerical simulations.

CJ-6.6 WED 11:45

Frequency-doubled pico-second vortex fiber laser formed by a stressed Yb-doped fiber MOPA system

•*M. Koyama[1], T. Hirose[1], A. Shimomura[1], K. Miyamoto[1], and T. Omatsu[1,2]; [1]Chiba Univ., Chiba, Japan; [2]JST-CREST, Tokyo, Japan*

Frequency-doubling of a pico-second vortex laser formed of a stressed Yb-doped fiber was performed. Conversion efficiency of 21% was obtained. The helicity of frequency-doubled vortex output was controlled by tuning the stress in the fiber.

ROOM 14b

CM-5.4 WED 11:15

Silicon chiral bump formed by optical vortex laser ablation

•*S. Takizawa[1], F. Takahashi[1], K. Toyoda[1], K. Miyamoto[1], R. Morita[2,3], and T. Omatsu[1,3]; [1]Chiba University, Chiba, Japan; [2]Hokkaido University, Hokkaido, Japan; [3]JST CREST, Tokyo, Japan*

Silicon (Si) chiral bump formation by the single-shot deposition of the optical vortex pulse was demonstrated. The chiral bump formed on the proceeded surface exhibited a height of 1.5um and tip diameter of 0.8um, respectively.

CM-5.5 WED (Invited) 11:30

Femtosecond laser micro and nano processing with nondiffracting Bessel and accelerating Airy beams

•*F. Courvoisier[1], A. Mathis[1], J. Zhang[1], L. Froehly[1], V. Jukna[2], L. Furfaro[1], M. Jacquot[1], R. Giust[1], P.-A. Lacourt[1], A. Couairon[2], and J. Dudley[1]; [1]Universite de Franche-Comte, Besancon, France; [2]Ecole Polytechnique, Palaiseau, France*

The control of nonlinear light propagation with non-diffracting Bessel and Airy beams has open up several exciting applications in the field of ultrafast laser micro-nano machining. High aspect ratio and curved machining are reported.

ROOM 21

IA-5.3 WED 11:15

Multi-mode Quantum Networks

•*J. Janousek[1], S. Armstrong[1], B. Hage[1], J.F. Morizur[2], P.K. Lam[1], and H. Bachor[1]; [1]Australian National University, Canberra, Australia; [2]Laboratoire Kastler Brossel, Paris, France*

We report on the experimental preparation of various multi-mode entangled states, with the ability to switch between them in real-time. Up to N-mode entanglement is measured with just one detector, here N = 8.

IA-5.4 WED 11:30

Measuring nonlocal coherence with weak-field homodyne detection

•*T. Bartley[1], G. Donati[1], X.-M. Jin[1,2], A. Datta[1], M. Barbieri[1], and I. Walmsley[1]; [1]Clarendon Laboratory, Department of Physics, University of Oxford, Oxford, United Kingdom; [2]Department of Physics, Shanghai Jiao Tong University, Shanghai, China, People's Republic of (PRC)*

Using a weak-field homdodyne detector, we experimentally observe nonlocal coherence between different photon number components across two modes. This is a direct application of a hybrid detector which counts photons with a phase reference.

IA-5.5 WED 11:45

Entanglement-enhanced probing of a delicate material system

•*F. Wolfgramm[1], C. Vitelli[2], F. Beduini[1], N. Godbout[3], and M.W. Mitchell[1,4]; [1]ICFO - Institut de Ciencies Fotoniques, Castelldefels (Barcelona), Spain; [2]Center of Life Nanoscience at La Sapienza, Istituto Italiano di Tecnologia, Rome, Italy; [3]COPL, Département de Génie Physique, École Polytechnique de Montréal, Montréal, Canada; [4]ICREA-Institució Catalana de Recerca i Estudis Avançats, barcelona, Spain*

Using atom-tuned narrowband NooN states we demonstrate non-destructive probing of an atomic ensemble with *sensitivity per photon* and *sensitivity per damage* to the ensemble beyond the standard quantum limit.

ROOM EINSTEIN

CE-8.4 WED 11:15

Photorefractivity Vs. Wavelength a Comparative Study of Mg- and Zr- Doped Lithium Niobate Crystals

•*G. Nava[1], P. Minzioni[1], I. Cristiani[1], N. Argiolas[2], M. Bazzan[2], M.V. Ciampolillo[2], G. Pozza[2], A. Zaltron[2], and V. Degiorgio[1]; [1]Quantum Electronics Lab, Dip. di Ingegneria Industriale e dell*Informazione, University of Pavia, Pavia, Italy; [2]Dip. di Fisica e Astronomia, University of Padova, Padova, Italy*

Photorefractivity of Mg- and Zr- doped Lithium Niobate samples was compared considering different wavelengths and high intensities. Zr doping yield the same photorefractivity suppression og Mg while requiring half of the dopant concentration.

CE-8.5 WED 11:30

Equivalent Temperature of Nonlinear-Optical Crystals in Process of Laser Frequency Conversion

O. Ryabushkin[1,2], •A. Konyashkin[1,2], D. Myasnikov[1,2], V. Tyrtyshnyy[2], and A. Baranov[1,2]; [1]Moscow Institute of Physics and Technology, Dolgoprudnyy, Russia; [2]NTO "IRE-Polus", Fryazino, Russia

Novel method of piezoelectric resonance spectroscopy allows to measure precisely the nonlinear-optical crystal equivalent temperature in process of laser frequency conversion. This method was applied for PPLN crystal temperature measurement in second harmonic generation experiment.

CE-8.6 WED 11:45

High-sensitivity absorption spectroscopy of lithium niobate crystals in the near and mid infrared regime

•*S. Fieberg[1], F. Kühnemann[1], and K. Buse[1,2]; [1]Fraunhofer Institute for Physical Measurement Techniques IPM, Freiburg, Germany; [2]Department of Microsystems Engineering IMTEK, University of Freiburg, Freiburg, Germany*

Impurity band strengths of lithium niobate crystals of different stoichiometry and doping are studied in the wavelength range 1460 to 1890 nm and 2450 to 4000 nm using a photothermal common-path interferometer.

ROOM 14a

14:00 – 15:30

CJ-7: Wavelength-Tuning and Conversion

Chair: Carsten Thomsen, NKT Photonics, Birkerod, Danemark

ROOM 14b

14:00 – 15:30

CF/IE-8: Ultrafast Fibre and Waveguide Lasers

Chair: Lasse Orsila, ORC Tampere, Tampere, Finland

ROOM 21

14:00 – 15:30

IA-6: Coherent Effects

Chair: Morgan Mitchell, ICFO, Barcelona, Spain

ROOM EINSTEIN

14:00 – 15:30

CE-9: Functional Optical Materials

Chair: Harald Schwefel, Max-Planck-Institut für die Physik des Lichtes, Erlangen, Germany

NOTES

ROOM 1

CD-11.1 WED 14:00

Robustness of Gap-Solitons in disordered photonic crystal waveguides

•*S. Malaguti, G. Bellanca, and S. Trillo*; *Department of Engineering, University of Ferrara, Ferrara, Italy*

We demonstrate a localized-to-ballistic transition for Gap-Solitons in disordered photonic crystal waveguides. We prove that for solitons this transition goes faster than the square of the group velocity, highlighting their improved robustness against disorder.

CD-11.2 WED 14:15

Spontaneous generation of spectral incoherent solitons through supercontinuum generation

B. Kibler[1], •*G. Xu*[1], *C. Michel*[1], *A. Kudlinski*[2], *B. Barviau*[1,2], *G. Millot*[1], *and A. Picozzi*[1]; [1]*Laboratoire Interdisciplinaire Carnot de Bourgogne, Dijon, France*; [2]*Laboratoire PhLAM, Lille, France*

We study experimentally the incoherent regime of supercontinuum generation in photonic crystal fibers. We report a transition from continuous to discrete spectral incoherent solitons in the low-frequency edge of the supercontinuum spectrum.

CD-11.3 WED 14:30

near- and mid-IR few-cycle self-defocusing soliton compression in PPLN waveguide

•*H. Guo*[1], *X. Zeng*[1,2], *B. Zhou*[1], *and M. Bache*[1]; [1]*Group of Ultrafast Nonlinear Optics, DTU Fotonik, Technical University of Denmark (DTU), Kgs. Lyngby, Denmark*; [2]*Key Laboratory of Special Fiber Optics and Optical Access Networks, Shanghai University, Shanghai, China, People's Republic of (PRC)*

We demonstrate numerically near- and mid-

ROOM 4a

IG-2.1 WED (Keynote) 14:00

High-Resolution Imaging with Scattered Light

•*A.P. Mosk*; *University of Twente, Enschede, The Netherlands*

Wavefront shaping allows unprecedented control of scattered laser light. This discovery has spurred recent advances in focusing and imaging with scattered light, ranging from high-resolution microscopy to non-invasive optical imaging through scattering layers.

ROOM 4b

CI-5.1 WED 14:00

Optical Packet Switching by All-Optical Header Recognition Using 1.55-μm Polarization Bistable VCSEL

•*T. Katayama, T. Okamoto, and H. Kawaguchi*; *Nara Institute of Science and Technology, Ikoma, Japan*

We demonstrated an optical header processing system that switches 40-Gb/s payloads to a designated port depending on the state of selected one bit in a 500-Mb/s 4-bit header using a 1.55-μm polarization bistable VCSEL.

CI-5.2 WED 14:15

Fiber non-Turing all-optical computer for solving complex decision problems

•*K. Wu*[1], *J.G.d. Abajo*[2,3], *C. Soci*[1], *P.P. Shum*[1], *and N.I. Zheludev*[1,2]; [1]*Centre for Disruptive Photonic Technologies, Nanyang Technological University, Singapore, Singapore*; [2]*Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*; [3]*IQFR-CSIC, Madrid, Spain*

We demonstrate an all-optical computer that solves one of the most difficult complexity problems, the Hamiltonian challenge of finding if a map can be traveled in a way that each town is visited exactly once.

CI-5.3 WED 14:30

Stable 100 GHz Pulses Generated by Injection Locking of Multiple Lasers to an Optical Frequency Comb

•*D.S. Wu, D.J. Richardson, and R. Slavík*; *University of Southampton, Optoelectronics Research Centre, Southampton, United Kingdom*

Optical pulses were generated by combining three semiconductor lasers phase locked to

ROOM 13a

CA-10.1 WED 14:00

Selective control of wavefront helicity in a side-pumped

•*M. Sato*[1], *Y. Tokizane*[1,2], *K. Miyamoto*[1], *and T. Omatsu*[1,2]; [1]*Chiba Univ., Chiba, Japan*; [2]*CREST, Tokyo, Japan*

Selective control of the wavefront helicity in a side-pumped Nd:YVO4 vortex laser was demonstrated by driving a pumping optics. A maximum vortex output power of 14W was achieved at a pump power of 47W.

CA-10.2 WED 14:15

Controlling the handedness of directly excited Laguerre Gaussian modes in a solid-state laser

•*D. Lin, J.M.O. Daniel, and W.A. Clarkson*; *Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*

A novel approach for directly exciting the lowest order Laguerre-Gaussian donut mode with controllable handedness of the helical phase front trajectory in an end-pumped solid-state laser is described.

CA-10.3 WED 14:30

Tunable milli-joule level 2um fractional vortex optical parametric amplifier

•*T. Yusufu*[1], *Y. Tokizane*[1,2], *M. Yamada*[1], *K. Miyamoto*[1], *and T. Omatsu*[1,2]; [1]*Chiba University, Chiba, Japan*; [2]*CREST, Tokyo, Japan*

Milli-joule-level tunable 2um fractional vortex laser formed by a 1um vortex pumped optical parametric oscillator and a parametric amplifier was demonstrated. Maximum

ROOM 13b

JSIII-1.1 WED 14:00

Emission Properties of Random Laser Media with a Bubble Structure

•*T. Okamoto and R. Yoshitome*; *Kyushu Institute of Technology, Iizuka, Japan*

Lasing properties are investigated for dye-doped polymer random media in which non-scattering regions are distributed. Experimental results showed that the frequency selectivity of the inhomogeneous structure results in higher emission intensities than conventional random lasers.

JSIII-1.2 WED 14:15

A random laser with cold atoms

•*W. Guerin, Q. Baudouin, N. Mercadier, V. Guarrera, and R. Kaiser*; *Institut Non Linéaire de Nice, CNRS, Université de Nice Sophia-Antipolis, Valbonne, France*

We report the observation of random lasing in a cold atom sample. The atoms simultaneously provide stimulated emission via Raman gain and feedback via multiple scattering. We discuss the properties of this system.

JSIII-1.3 WED (Invited) 14:30

Tailoring the Spatial Coherence of Random Lasers

•*H. Cao*[1], *B. Redding*[1], *and M. Choma*[2]; [1]*Department of Applied Physics, Yale University, New Haven, United States*; [2]*Department of Diagnostic Radiology, Yale School of Medicine, New Haven, United States*

We show that the spatial coherence of a random laser can be tuned by adjusting the scat-

ROOM 14a

CJ-7.1 WED 14:00

Recent progress in passively stabilized single-frequency Brillouin fiber lasers with doubly-resonant cavities

•*A. Fotiadi*[1,3,5], *V. Spirin*[1,2], *C. López-Mercado*[2], *D. Kinet*[1], *E. Preda*[1], *I. Zolotovskii*[3], *E. Zlobina*[4], *S. Kablukov*[4], *and P. Mégret*[1]; [1]*University of Mons, Mons, Belgium*; [2]*CISESE, Ensenada, Mexico*; [3]*Ulyanovsk State University, Ulyanovsk, Russia*; [4]*Institute of Automation and Electrometry, RAS, Novosibirsk, Russia*; [5]*Ioffe Physico-Technical Institute, St.Petersburg, Russia*

Brillouin fiber lasers with doubly-resonant cavities are successfully stabilized through self-injection locking and dynamical population grating mechanisms. Pump-to-Stokes conversion efficiency of ~40% and Stokes linewidths <500Hz are achieved for both laser configurations.

CJ-7.2 WED 14:15

All-fiber laser source for CARS-Microscopy

•*T. Gottschall*[1], *M. Baumgartl*[1], *M. Chemnitz*[1], *J. Abreu-Afonso*[2], *T. Meyer*[3], *B. Dietzek*[3], *J. Popp*[3], *J. Limpert*[1], *and A. Tünnermann*[1,4]; [1]*Friedrich-Schiller-Universität Jena, Institute of Applied Physics, Abbe Center of Photonics, Jena, Germany*; [2]*Departmento de Física Aplicada-ICMUV, Universidad de Valencia, Burjassot, Spain*; [3]*Institut für Photonische Technologien Jena (IPHT) e.V.,, Jena, Germany*; [4]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

An all-fiber CARS laser based on four-wave-mixing (FWM) and its application to CARS microscopy is presented. In addition we demonstrate the enhancement of the spectral resolution by cw-seeding.

CJ-7.3 WED 14:30

High-power Yb- and Tm-doped Fiber Amplifiers Seeded by a Femtosecond Er:fiber System

•*S. Kumkar, M. Wurnam, P. Storz, D. Fehrenbacher, D. Brida, and A. Leitenstorfer; Department of Physics, University of Konstanz, Konstanz, Germany*

Synchronous high-power Yb: and Tm:fiber amplifiers coherently seeded by the same

ROOM 14b

CF/IE-8.1 WED 14:00

Picosecond pulses from a Fourier domain mode locked (FDML) laser

•*C. Eigenwillig*[1], *S. Todor*[2], *W. Wieser*[1], *B. Biedermann*[1], *T. Klein*[1], *C. Jirauschek*[2], *and R. Huber*[1]; [1]*Ludwig-Maximilians-Universität, Munich, Germany*; [2]*Technische Universität, Munich, Germany*

We present latest results of a novel approach for short pulse generation by using FDML lasers. Simulations based on our FDML theory predict how almost bandwidth limited pulses might be achieved in the future.

CF/IE-8.2 WED 14:15

Cladding-pumped high-power mode-locked thulium laser based on fiber prepared by powder sinter technology

•*D. Gaponov*[1], *R. Dauliat*[1], *R. Jamier*[1], *S. Grimm*[2], *K. Schuster*[2], *and P. Roy*[1]; [1]*Xlim UMR CNRS-Université de Limoges n°7252, Limoges, France*; [2]*Institute of Photonic Technology, Jena, Germany*

We report on generation of high average power picosecond pulses directly from the modelocked thulium fiber laser by using efficient cladding pumped Tm-doped fiber fabricated with new glass powder technology.

CF/IE-8.3 WED 14:30

Fundamentally mode-locked Yb3+-doped glass waveguide lasers with repetition rate of up to 15.2 GHz

•*A. Choudhary*[1], *A. Lagatsky*[2], *P. Kannan*[1], *W. Sibbett*[2], *C. Brown*[2], *and D. Shepherd*[1]; [1]*Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*; [2]*SUPA, School of Physics and Astronomy,University of St.Andrews, St.Andrews,*

ROOM 21

IA-6.1 WED 14:00

Loading and unloading of cavity excitation using a strongly coupled quantum dot in a photonic molecule

•*R. Bose*[1], *K. Roy Choudhury*[1], *T. Cai*[1], *G.S. Solomon*[2], *and E. Waks*[1]; [1]*Department of Electrical Engineering, University of Maryland, College Park, College Park, United States*; [2]*National Institute of Standards and Technology, Gaithersburg, United States*

We will present the interaction of a single QD coupled to a 2D photonic molecule. We will discuss time-resolved experiments in this scheme.

IA-6.2 WED 14:15

Experimental investigation of the transition between Autler-Townes splitting and electromagnetically-induced transparency models

L. Giner[1], •*V. Lucile*[1], *B. Sparkes*[2], *A. Sheremet*[3], *A. Nicolas*[1], *O. Mishina*[1], *M. Scherman*[1], *S. Burks*[1], *I. Shomroni*[4], *D. Kupryanov*[3], *P.K. Lam*[2], *E. Giacobino*[1], *and J. Laurat*[1]; [1]*Laboratoire Kastler Brossel, Paris, France*; [2]*Australian National University, Canberra, Australia*; [3]*State Polytechnic University, Saint Petersburg, Russia*; [4]*Weizmann Institute of Science, Rehovot, Israel*

We experimentally investigated with cold Cesium atoms a quantitative test to objectively discerning Autler-Townes splitting from electromagnetically-induced transparency, and demonstrated that it is very sensitive to the specific properties of the medium.

IA-6.3 WED 14:30

Narrowband source of correlated photon pairs via four-wave mixing in a cold atomic ensemble

B. Srivathsan[1], *G.K. Gulati*[1], •*M.Y.B. Chng*[1], *G. Maslennikov*[1], *D. Matsukevich*[1,2], *A. Cerè*[1], *and C. Kurtsiefer*[1,2]; [1]*Center for Quantum Technologies, Singapore, Singapore*; [2]*Department of Physics, National University of Singapore, Singapore, Singapore*

ROOM EINSTEIN

CE-9.1 WED 14:00

Flexible Optical Microcavities and Their Sensing Application

•*V.D. Ta*[1], *R. Chen*[1], *D.M. Nguyen*[1], *and H. Sun*[1,2]; [1]*Division of Physics and Applied Physics, School of Mathematical and Physical Sciences, Nanyang Technological University, Singapore 639798, Singapore*; [2]*Centre for Disruptive Photonic Technologies (CDPT), Nanyang Technological University, Singapore 639798, Singapore*

Two different kinds of microcatives namely microfibers and hemispheres are fabricated based on a novel material composition. By doping dye molecules into these structures, optically pumped microlasers and high sensitive refractive index sensors are demonstrated.

CE-9.2 WED 14:15

Binary oxide mixtures as a keystone for new coated components in the UV: Multiscale study of nanosecond laser-induced damage

•*C. Gouldieff*[1], *F. Wagner*[1], *J.-Y. Natoli*[1], *L. Jensen*[2], *M. Mende*[2], *and D. Ristau*[2,3]; [1]*Institut Fresnel, Marseille, France*; [2]*Laser Zentrum Hannover e.V., Hannover, Germany*; [3]*QUEST, Hannover, Germany*

We investigate the laser damage resistance of oxide mixture thin films to multiple nanosecond pulses. Pure materials and binary mixtures are studied in the UV range to understand the physics of possible fatigue effects.

CE-9.3 WED 14:30

Complex polarization in non z-cut whispering gallery mode resonators

•*F. Sedlmeir*[1,2,3], *M. Hauer*[2], *J. Fürst*[1,2], *D.V. Strekalov*[1], *and H.G.L. Schwefel*[1,2]; [1]*Max Planck Institute for the Science of Light, Erlangen, Germany*; [2]*Institute for Optics, Information and Photonics, University of Erlangen-Nürnberg, Erlangen, Germany*; [3]*SAOT, School in Advanced Optical Tech-*

NOTES

ROOM 1

IR self-defocusing cascading quadratic nonlinearities using all-normal dispersion PPLN waveguides. The chosen quasi-phase matching pitch gives octave-spanning bandwidths, allowing for few-cycle soliton compression and generation of an octave-spanning supercontinuum.

CD-11.4 WED 14:45

Spatial Soliton Dynamics in Curved Photonic Lattices

•*F. Diebel, P. Rose, M. Boguslawski, and C. Denz*; *Institut für Angewandte Physik and Center for Nonlinear Science (CeNoS), Westfälische Wilhelms-Universität Münster, 48149 Münster, Germany*

We report on the first experimental observation of stable and oscillating solitons in photorefractive photonic Weber lattices. The experimentally observed dynamic behavior of the Weber soliton is corroborated by comprehensive numerical simulations.

CD-11.5 WED 15:00

Spatio-temporal cleaning of a femtosecond laser pulse by a filament conjugate mirror

•*A. Jarnac[1], M. Durand[2], A. Houard[1], Y. Liu[1], B. Prade[1], M. Richardson[2], and A. Mysyrowicz[1]*; *[1]Laboratoire d'Optique Appliquée, ENSTA Paris-tech/CNRS/Polytechnique, Palaiseau, France*; *[2]Townes Laser Institute, CREOL, University of Central Florida, Orlando, United States*

A phase conjugate mirror was formed in air with two counter propagating filaments. This mirror can clean efficiently a femtosecond laser pulse both spatially and temporally.

ROOM 4a

IG-2.2 WED 14:45

Bound states in a temporal fiber network with parity-time symmetry

•*A. Regensburger[1,2,3], M.-A. Miri[4], C. Bersch[1,2], J. Naeger[1], G. Onishchukov[1,2,3], D.N. Christodoulides[4], and U. Peschel[1,3]*; *[1]Institute of Optics, Information and Photonics, University of Erlangen-Nürnberg, Erlangen, Germany*; *[2]Max Planck Institute for the Science of Light, Erlangen, Germany*; *[3]Erlangen Graduate School in Advanced Optical Technologies (SAOT), Erlangen, Germany*; *[4]CREOL, College of Optics and Photonics, University of Central Florida, Orlando, United States*

We report on the first experimental observation of localized defect states in a large-scale parity-time (PT) symmetric photonic lattice. The system is realized in a time-multiplexed network consisting of two coupled optical fiber loops.

IG-2.3 WED 15:00

Complex beam dynamics in PT-symmetric optical lattices

•*K. Makris[1], R. El-Ganainy[2], and D. Christodoulides[3]*; *[1]Department of Electrical Engineering, Princeton University, Princeton, United States*; *[2]Max Planck Institute for the Physics of Complex Systems, Dresden, Germany*; *[3]College of Optics and Photonics (CREOL), University of Central Florida, Orlando, United States*

The complex beam dynamics close to the exceptional point of a PT-symmetric optical lattice is systematically examined. Absence of anomalous diffraction, non-hermitian negative refraction, nonlinear evolution of power oscillations, and soliton formation are also investigated.

ROOM 4b

a 250-MHz repetition rate frequency comb using a combination of optical and electrical phase locked loops. The timing jitter was only 193*6 fs.

CI-5.4 WED 14:45

Evaluation of Radio-over-Fiber Link for 45-GHz- and 60-GHz-Band Simultaneous Transmissions

•*A. Kanno and T. Kawanishi*; *National Institute of Information and Communications Technology, Koganei, Japan*

We configure and evaluate a broadband RoF signal simultaneous transmission system for 45-GHz and 60-GHz bands. Observed flatness of the frequency response at these bands and dynamic range are 2 dBp-p and 22 dB, respectively.

CI-5.5 WED 15:00

First Investigation of Fast OFDM Radio over Fibre System at 60 GHz Using Direct Laser Modulation

•*H. Shams and J. Zhao*; *Photonic Systems Group (PSG), Tyndall National Institute, University College Cork (UCC), Cork, Republic of Ireland*

Fast OFDM (F-OFDM) was investigated for the first time in 60GHz radio-over-fiber system using direct laser modulation and optical frequency quadruple technique. The performance was evaluated for 10.3Gbps 4ASK F-OFDM and 16QAM conventional OFDM.

ROOM 13a

fractional vortex energy of 3.1mJ was obtained at a pump-energy of 19mJ.

CA-10.4 WED 14:45

high energy and broadband Yb:CaF2 multipass amplifier using passive coherent combining

F. Friebel[1], S. Ricaud[1,4], A. Pellegrina[2], M. Hanna[1], E. Mottay[4], P. Camy[3], J.-L. Doualan[3], R. Moncorge[3], P. Georges[1], F. Druon[1], and •*D. Papadopoulos[1,2]*; *[1]Laboratoire Charles Fabry, Institut d'Optique, CNRS, Univ. Paris Sud, 2, Avenue Augustin Fresnel, Palaiseau, France*; *[2]Laboratoire d'Utilisation des Lasers Intenses, Ecole Polytechnique, Palaiseau, France*; *[3]Centre de recherche sur les Ions, les Matériaux et la Photonique, CEA-CNRS-ENSICAEN, Université de Caen, Caen, France*; *[4]Amplitude Systèmes, 11 avenue de Canteranne, Cité de la Photonique, Pessac, France*

We report a diode-pumped Yb:CaF2 160-mJ, 20 Hz multipass amplifier using coherent combining in order to overcome damage threshold problems. The combination efficiency of the passive coherent combination is up to 96%.

CA-10.5 WED 15:00

The Prospects for Yb- and Nd-Doped Tungstate Microchip Lasers

•*V. Savitski[1], R. Birch[1], E. Fraczek[1], A. Kemp[1], P. Loiko[2], K. Yumashev[2], N. Kuleshov[2], and A. Pavlyuk[3]*; *[1]Institute of Photonics, University of Strathclyde, Glasgow, United Kingdom*; *[2]Center for Optical Materials and Technologies, Belarusian National Technical University, Minsk, Belarus*; *[3]A.V.Nikolaev Institute for Inorganic Chemistry, Siberian Branch of RAS, Novosibirsk, Russia*

Nd:KGd(WO4)2 and Yb:KY(WO4)2 crystals cut along the Ng-axis are used in quasi-microchip plane-plane lasers for the first time. Output powers up to 900mW are demonstrated. Cavity designs based on thermal lens sensitivity factors are discussed.

ROOM 13b

tering strength or the excitation volume. We then demonstrate speckle-free imaging using a random laser with low spatial coherence.

JSIII-1.4 WED 15:00

Observation of anomalous diffusion in a 1D optical random dimer

•*S. Stützer[1], U. Naether[2], T. Kottos[3], R.A. Vicencio[2], M.I. Molina[2], A. Tünnermann[1], S. Nolte[1], D.N. Christodoulides[4], and A. Szameit[1]*; *[1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität, Jena, Germany*; *[2]Departamento de Fisica and MSI-Nucleus on Advanced Optics, Center for Optics and Photonics (CEFOP), Facultad de Ciencias, Universidad de Chile, Santiago, Chile*; *[3]Department of Physics, Wesleyan University, Middletown (Connecticut), United States*; *[4]College of Optics and Photonics, University of Central Florida, Orlando, United States*

We experimentally demonstrate anomalous diffusion in a disordered system with short-range correlations. The prototypical case of a random dimer is realized in a waveguide array and a localization-delocalization transition is observed.

ROOM 14a

ultrabroadband and passively phase-stable Er:fiber system are demonstrated. Microjoule-level pulse energy and sub 200-fs operation at a repetition rate of 10 MHz are achieved.

CJ-7.4 WED 14:45

Efficient CW All-fiber Optical Parametric Oscillator Operating Below 1 μm

•*E. Zlobina*[1], *S. Kablukov*[1], *and S. Babin*[1,2]; [1]*Institute of Automation and Electrometry, Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia*; [2]*Novosibirsk State University, Novosibirsk, Russia*

CW tunable all-fiber optical parametric oscillator based on photonic crystal fiber operating below 1 μm is realized for the first time. The FOPO has 9.7% slope efficiency and 460 mW output power at 972 nm.

CJ-7.5 WED 15:00

Ultra-broadband Wavelength Swept Tm-doped Fibre Laser

•*M. Tokurakawa*[1], *J.M.O. Daniel*[1], *C.S. Chenug*[2], *H. Liang*[2], *and W.A. Clarkson*[1]; [1]*Optoelectronics Research Centre, Univeristy of Southampton, Southampton, United Kingdom*; [2]*School of Science & Technology, Nottingham Trent University, Nottingham, United Kingdom*

A wavelength-swept Tm fibre laser source employing two fibre gain stages to achieve wide wavelength tuning is reported. The laser yielded over 500mW of output and had scanning range from 1750nm to 2080nm.

ROOM 14b

United Kingdom

Passive mode locking of a diode-pumped monolithic Yb:Glass channel waveguide laser is reported. 811 fs pulses are generated with an average power of 27 mW and a pulse repetition frequency of 15.2 GHz at 1047nm.

CF/IE-8.4 WED 14:45

All-fiber femtosecond Cherenkov laser at visible wavelengths

•*X. Liu*[1], *J. Laegsgaard*[1], *U. Møller*[1], *H. Tu*[2], *S. Boppart*[2], *and D. Turchinovich*[1,3]; [1]*DTU Fotonik, Technical University of Denmark, Kgs. Lyngby, Denmark*; [2]*Biophotonics Imaging Laboratory, University of Illinois at Urbana-Champaign, Urbana, United States*; [3]*Max Planck Institute for Polymer Research, Mainz, Germany*

We demonstrate an all-fiber femtosecond Cherenkov laser with pulse duration of sub-160-fs, and 3 dB spectral bandwidth not exceeding 36 nm, operating at 580-630 nm. The laser intensity noise is as low as -103 dBc/Hz.

CF/IE-8.5 WED (Invited) 15:00

High-Performance Fiber Lasers Based on Self-Similar Pulse Propagation

•*W. Renninger and F. Wise*; *Cornell University, Ithaca, United States*

Stable mode-locking is achieved in a fiber laser based on self-similar propagation of a parabolic pulse in the amplifier section. Self-similar mode-locking offers routes to high energy, few-cycle pulses from low-noise all-fiber sources.

ROOM 21

We demonstrate a bright and narrowband source of time-correlated photon pairs of wavelength 762nm and 795nm generated via four-wave mixing in cold Rubidium-87 atoms using a cascade decay level scheme.

IA-6.4 WED 14:45

Slow-Light-Enhanced Correlated Photon Pair Generation in a Silicon Photonic Crystal Coupled-Resonator Optical Waveguide

•*N. Matsuda*[1,2], *H. Takesue*[1], *K. Shimizu*[1], *Y. Tokura*[1], *E. Kuramochi*[1,2], *and M. Notomi*[1,2]; [1]*NTT Basic Research Laboratories, Atsugi, Japan*; [2]*NTT Nanophotonics Center, Atsugi, Japan*

We generate quantum-correlated photon pairs from a silicon photonic-crystal coupled-resonator optical waveguide. A slow light mode enhanced the spontaneous four-wave mixing from which we obtained photon pairs with a corresponding nonlinear constant of 9,000 /W/m.

IA-6.5 WED 15:00

Photon Blockade Effect in the Ultrastrong Coupling Regime

•*A. Ridolfo*[1], *M. Leib*[1], *S. Savasta*[2], *and M.J. Hartmann*[1]; [1]*Technische Universität München, Munich, Germany*; [2]*Universitá di Messina, Messina, Italy*

We show photon coincidence counting statistics in the ultrastrong coupling regime. Exploiting the correct input-output relations within a suitable Master Equation approach, we calculate correlation functions that are valid for arbitrary degrees of light-matter interaction.

ROOM EINSTEIN

nologies, Erlangen, Germany

Birefringent whispering gallery mode resonators whose optical axis are tilted against their symmetry axis show complex polarization eigenstates. We present Stoke measurements of the through- and outcoupled light.

CE-9.4 WED 14:45

Broadband multiple light scattering in white LED diffusers

•*W.L. Vos*[1], *T.W. Tukker*[2], *A.P. Mosk*[1], *A. Lagendijk*[1], *and W.L. IJzerman*[3]; [1]*Complex Photonic Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, The Netherlands*; [2]*Philips Lighting - Light Sources and Electronics,, Eindhoven, The Netherlands*; [3]*Philips Lighting - Optics, Eindhoven, The Netherlands*

We present diffuse optical transmission and reflectivity of diffusers typical of commercial white LEDs. By invoking nanophotonic diffusion theory we derive the mean free path. A model without adjustable parameters agrees well with our data.

CE-9.5 WED 15:00

One-photon absorption direct laser writing: a novel approach for fabrication of three-dimensional sub-micrometric structures

•*M.-T. Do, Q. Li, T.T.N. Nguyen, I. Ledoux-Rak, and N.D. Lai*; *Ecole Normale Supérieure de Cachan, Cachan, France*

We demonstrate successfully the fabrication of desired sub-micrometric structures on demand by using the low one-photon absorption direct laser writing technique. This technique presents great advantages, because 3D structures can be achievable with a simple continuous laser.

NOTES

ROOM 1

CD-11.6 WED 15:15

Kerr Frequency Comb Generation in the Normal Dispersion Regime of Dispersion Oscillating Telecom Fiber

•C. Finot[1], J. Fatome[1], A. Sysoliatin[2], A. Kosolapov[2], and S. Wabnitz[3]; [1]Université de Bourgogne, Dijon, France; [2]Fiber Optics Research Center, Moscow, Russia; [3]Università di Brescia, Brescia, Italy

We experimentally demonstrate the generation of unequal spacing Kerr frequency combs and multiple four wave mixing sidebands in the normal dispersion regime of a dispersion oscillating highly nonlinear telecom fiber.

16:00 – 17:30

CD-12: Solitons and Nonlinearly Driven Self-organization

Chair: Thomas Pertsch, Friedrich Schiller University, Jena, Germany

CD-12.1 WED 16:00

Soliton pulse compression in adiabatically tapered silicon photonic wires

•S. Lavdas[1], J. Driscoll[2], R. Grote[2], R. Osgood[2], and N. Panoiu[1]; [1]University College London, London, United Kingdom; [2]Columbia University, New York, United States

We demonstrate that one can achieve temporal compression of ultra-short optical pulses by more than three times in millimetre-long adiabatically tapered silicon photonic nanowire waveguides when the optical pulses propagate in the soliton regime.

ROOM 4a

IG-2.4 WED 15:15

Beam Shaping in Spatially Modulated Broad Area Semiconductor Amplifiers

•R. Herrero[1], M. Botey[2], K. Staliunas[1,4], and M. Radziunas[3]; [1]Universitat Politècnica de Catalunya, Terrassa, Spain; [2]Universitat Politècnica de Catalunya, Barcelona, Spain; [3]Weierstrass Institute, Berlin, Germany; [4]Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain

We propose a beam shaping mechanism in broad area semiconductor amplifiers by spatial pump modulation on a micron scale. Spatial filtering and substantial improvement of the beam quality during amplification is predicted under realistic parameters.

16:00 – 17:30

IG-3: Polaritons and Quantum Fluids

Chair: Dmitry Skryabin, University of Bath, United Kingdom

IG-3.1 WED 16:00

Soliton and shock waves in an exciton polariton quantum pond

•L. Dominici[1,2], M. De Giorgi[1,2], D. Ballarini[1,2], E. Cancellieri[3], F. Laussy[4], E. Giacobino[3], A. Bramati[3], G. Gigli[1,2,5], and D. Sanvitto[1,2]; [1]Istituto Italiano di Tecnologia, IIT-Lecce, Lecce, Italy; [2]NNL, Istituto Nanoscienze - CNR, Lecce, Italy; [3]Laboratoire Kastler Brossel, Université Pierre et Marie Curie-Paris 6, École Normale Supérieure et CNRS, Paris, France; [4]Fisica Teorica de la Materia Condensada, Universidad Autonoma de Madrid, Madrid, Spain; [5]Innovation Engineering Department, University of Salento, Lecce, Italy

We demonstrate for the first time the presence of shock waves and standing soliton formation in an exciton polariton condensate resonantly created in a semiconductor microcavity.

ROOM 4b

CI-5.6 WED 15:15

Long-range, High Bit-rate Secure Key Distribution Link Utilizing Raman Ultra-long Fiber Laser (UFL)

•A. El-taher[1], O. Kotlicki[2], J. Scheuer[2], P. Harper[1], and S. Turitsyn[1]; [1]Aston University, Birmingham, United Kingdom; [2]Tel Aviv University, Tel Aviv, Israel

A novel, ultralong fiber-laser based, secure key distribution scheme comprising standard components, exhibiting error-free key distribution with record-levels 500km range and 100Bps bit-rate is demonstrated. The scheme represents an inexpensive, long-range technology for secure communication.

16:00 – 17:15

CH-3: Advances in Optical Sensor Devices

Chair: Stavros Pissadakis, Foundation for Research and Technology IESL-FORTH, Heraklion, Greece

CH-3.1 WED 16:00

Dual-polarization optofluidic biodetection based on polymer microring resonators

•C. Delezoide[1], C. Noguès[2], R. Castro[1], J. Lautru[3], M. Buckle[2], I. Ledoux-Rak[1], J. Zyss[3], and C.T. Nguyen[1]; [1]LPQM - ENS Cachan, Cachan, France; [2]LBPA - ENS Cachan, Cachan, France; [3]Institut d'Alembert - ENS Cachan, Cachan, France

We present the real-time dual-polarization optofluidic detection of binding events of an antigen/antibody biological system with a polymeric vertically-coupled microring resonator as transducer.

ROOM 13a

CA-10.6 WED 15:15

Solid-state dual-frequency laser free from anti-phase noise

•A. El Amili[1], G. Loas[1], S. De[2], S. Schwartz[3], G. Feugnet[3], J.-P. Pocholle[3], F. Bretenaker[2], and M. Alouini[1,3]; [1]Institut de Physique de Rennes, Université de Rennes 1, Rennes, France; [2]Laboratoire Aimé-Cotton, CNRS-Université Paris 11, Orsay, France; [3]Thales Research and Technology, Palaiseau, France

A reduction of more than 20 dB of the intensity noise at the antiphase relaxation oscillation frequency is experimentally demonstrated in a two-polarization dual-frequency solid-state laser without any optical or electronic feedback loop.

16:00 – 17:30

CK-6: Plasmonic Nanostructures and Applications

Chair: Sergei Romanov, Max Planck Institute for the Science of Light, Erlangen, Germany

CK-6.1 WED 16:00

Broad-spectrum chiral optical response in achiral structures patterned from silver nanoparticles by plasmon-assisted two-photon direct laser lithography

•X. Vidal[1,2], W.J. Kim[2], A. Baev[2], V. Tokar[2,3], H.S. Jee[2], M.T. Swihart[2,4], and P.N. Prasad[2,4]; [1]Macquarie University, Sydney, Australia; [2]Institute for Lasers, Photonics and Biophotonics, Buffalo, United States; [3]Taras Shevchenko National University of Kyiv, Kyiv, Ukraine; [4]University at Buffalo, Buffalo, United States

We demonstrate a combined bottom-up and top-down technique for producing submicron-patterned structures that exhibit chiral optical response from ultraviolet to infrared wavelengths. Plasmon-enhanced molecular chirality provides chiral response without broken symmetry in the patterned structures.

ROOM 13b

JSIII-1.5 WED 15:15

Position-Dependent Diffusion of Light in Disordered Waveguides

A. Yamilov[1], R. Sarma[2], B. Redding[2], B. Payne[1], H. Noh[2,3], and •H. Cao[2]; [1]Missouri University of Science and Technology, Rolla, United States; [2]Yale University, New Haven, United States; [3]Kookmin University, Seoul, Korea, South

Position-dependent diffusion coefficient is observed experimentally in disordered optical waveguides. Strong wave interference effects make the diffusion coefficient depend on the size, shape of the random medium as well as the material absorption.

16:00 – 17:30

JSIII-2: Rogue Waves and Soliton Dynamics

Chair: Stefan Skupin, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany

JSIII-2.1 WED 16:00

RogueWaves of the Vector Nonlinear Schrodinger Equations

•F. Baronio[1], M. Conforti[1], S. Wabnitz[1], and A. Degasperis[2]; [1]University of Brescia, Brescia, Italy; [2]Sapienza University, Roma, Italy

We present a semirational vector solution of coupled nonlinear Schrodinger equations. This family of solutions includes known vector Peregrine solutions, bright- and dark-rogue solutions, and novel vector freak waves.

ROOM 14a

CJ-7.6 WED 15:15

Mid-IR supercontinuum generation in thulium-doped fiber amplifier.

•*V. Kamynin*[1], *Y. Sadovnikova*[2], *A. Kurkov*[1], *and V. Tsvetkov*[1]; [1]*Prokhorov General Physics Institute, Moscow, Russia*; [2]*Moscow State University of Instrument Engineering and Computer Science, Moscow, Russia*

Thulium doped fiber amplifier was used as medium for Mid-IR supercontinuum generation. High spectral power density and flatness in the range from 1850 to 2550 nm was observed.

16:00 – 17:30

CJ-8: Fibre Laser Sources

Chair: Johannes Nold, Fraunhofer IOF, Jena, Germany

CJ-8.1 WED 16:00

Eyesafe Wind LIDAR Based On A Coherently-Beam-Combined Laser Source

•*L. Lombard, M. Valla, C. Planchat, D. Goular, B. Augère, P. Bourdon, and G. Canat*; *Onera, The French Aerospace Lab, Palaiseau, France*

We report on a coherent wind LIDAR based on a pulse laser source made of two coherently-beam-combined amplifiers. The LIDAR performances are compared using the combined-amplifier and the single-amplifier of the same power.

ROOM 14b

16:00 – 17:30

CF/IE-9: Ultrafast Optical Parametric Amplifiers

Chair: Daniele Brida, Konstanz University, Konstanz, Germany

CF/IE-9.1 WED 16:00

Ultra-stable fiber pumped CEP-stabilized dual stage OPCPA System

•*J. Matyschok*[1], *T. Binhammer*[2], *T. Lang*[1,3], *O. Prochnow*[2], *S. Rausch*[2], *P. Rudawski*[4], *C.L. Arnold*[4], *A. L'Huillier*[4], *and U. Morgner*[1,3,5]; [1]*Institute of Quantum Optics, Leibniz Universität Hannover, Hannover, Germany*; [2]*VENTEON Laser Technologies GmbH, Garbsen, Germany*; [3]*Centre for Quantum Engineering and Space-Time Research (QUEST), Hannover, Germany*; [4]*Department of Physics, Lund University, Lund, Sweden*; [5]*Laser Zentrum Hannover (LZH), Hannover, Germany*

OPCPA pulses with 800 MW of peak-power at high repetition rates with excellent power and CEO phase stability are reported, together with detailed numerical analysis of the parametric amplification process.

ROOM 21

IA-6.6 WED 15:15

Monolithic generation and manipulation of nondegenerate photon pairs within a silicon-on-insulator quantum photonic circuit

•*J. Silverstone*[1], *D. Bonneau*[1], *R. Hadfield*[2], *V. Zwiller*[3], *J. Rarity*[1], *J. O'Brien*[1], *and M. Thompson*[1]; [1]*University of Bristol, Bristol, United Kingdom*; [2]*University of Glasgow, Glasgow, United Kingdom*; [3]*TU Delft, Delft, The Netherlands*

We report the first on-chip quantum interference between photons generated in two discrete spontaneous four-wave mixing sources, and the manipulation of this biphotonic state using silicon-on-insulator integrated optics.

16:00 – 17:30

IH-2: Heat and Energy Control

Chair: Rashid Zia, Brown University, Providence, United States

IH-2.1 WED (Keynote) 16:00

Broadband Management of Light Using Nanophotonics for Solar and Thermal Applications

•*S. Fan*; *Stanford University, Ginzton Laboratory, Stanford, CA, United States*

There is enormous potential for the use of nanophotonics in solar and thermal applications. In this talk, we show that one can use nanophotonic approach to enhance both the voltage and the current of the solar cells. We also show one can use nanophotonics effectively for a number of emerging thermal applications, including both novel approach for radiative cooling in the far field, and active control of heat flow in the near field.

ROOM EINSTEIN

CE-9.6 WED 15:15

Influence of the shell geometry on the state of charge of CdSe/CdS dot-in- rods nanonocrystals

•*M. Manceau*[1], *S. Vezzoli*[1], *F. Pisanello*[2,4], *L. Carbone*[3], *E. Giacobino*[1], *M. De Vittorio*[2,4], *and A. Bramati*[1]; [1]*Laboratoire Kastler Brossel, Université Pierre et Marie Curie, CNRS UMR 8552, Ecole Normale Supérieure, Paris, France*; [2]*Istituto Italiano di Tecnologia (IIT), Center for Bio-Molecular Nanotechnology, Arnesano, Lecce, Italy*; [3]*Center for Neuroscience and Cognitive Systems @UNITN, Istituto Italiano di Tecnologia, Rovereto, Italy*; [4]*National Nanotechnology Laboratory, CNR-Nano, Università del Salento, Dipartimento Ingegneria dell innovazione, Arnesano, Lecce, Italy*

The state of charge of colloidal nanocrystals is critical for their application as light sources. Performing lifetime measurements on CdSe/CdS dot-in-rods, we show different charging trends depending on the length and thickness of the rods.

16:00 – 17:30

CG-3: Plasma Based Sources

Chair: Laszlo Veisz, Max-Planck-Institute of Quantum Optics, Garching, Germany

CG-3.1 WED 16:00

Effective interaction of intense ultra-short laser pulse with nano-structure targets

•*A. Andreev*; *Max Born Institute, Berlin, Germany*

It is shown that optimal foil target relief of nm scale significantly rise laser pulse absorption and improves fast particles and X-ray yield. Generated short electron bunches can be used for production of attosecond pulses

NOTES

ROOM 1

CD-12.2 WED 16:15

Appearances and Disappearances of Fermi Pasta Ulam Recurrence in Nonlinear Fiber Optics

•*A. Mussot*[1], *A. Kudlinski*[1], *M. Droques*[1], *P. Szriftgiser*[1], and *N. Akhmediev*[2]; [1]*Laboratoire PhLAM UMR CNRS 8523, IRCICA, Université Lille 1, illeneuve d'Ascq, France*; [2]*Optical Sciences Group, Research School of Physics and Engineering, The Australian National University, Canberra, Australia*

We show experimentally and numerically that FPU recurence in low dispersion nonlinear fiber optics experiences multiple appearances and disappearances.

CD-12.3 WED (Invited) 16:30

Enlightening the rules of disorder: from broadband energy harvesting to many-body solitons and light condensation dynamics

•*A. Fratalocchi*; *PRIMALIGHT (www.primalight.org); Faculty of Electrical Engineering, Faculty of Applied Mathematics and Computational Science, Thuwal, Saudi Arabia*

In this invited talk I will discuss the dynamics of light in disordered systems, ranging from energy harvesting to light condensation dynamics, shock waves in disordered replicas and soliton gases, covering both theory and experiments.

ROOM 4a

IG-3.2 WED 16:15

Macroscopic self-trapping and non-linear Josephson oscillations in coupled polariton condensates

A. Amo[1], *M. Abbarchi*[1], •*V.G. Sala*[1], *D.D. Solnyshkov*[2], *H. Flayac*[2], *L. Ferrier*[1], *I. Sagnes*[1], *E. Galopin*[1], *A. Lemaître*[1], *G. Malpuech*[2], and *J. Bloch*[1]; [1]*Laboratoire de Photonique et Nanostructures, CNRS, Marcoussis, France*; [2]*Institut Pascal, PHOTON-N2, Clermont Université, Blaise Pascal University, CNRS, Aubière, France*

Exciton-polaritons are mixed light-matter particles with strong non-linearities. Here we report the experimental observation of macroscopic self-trapping and non-linear Josephson oscillations of two coupled polariton condensates in engineered photonic molecules etched in a semiconductor microcavity.

IG-3.3 WED 16:30

Spin-induced spontaneous symmetry breaking of exciton-polariton patterns

•*A. Werner*[1,2], *O.A. Egorov*[1,2], and *F. Lederer*[1,2]; [1]*Institute of Condensed Matter Theory and Solid State Optics, Jena, Germany*; [2]*Abbe Center of Photonics, Jena, Germany*

We study theoretically the influence of the exciton spin dynamics on the existence and stability of spatial polariton patterns in a semiconductor microcavity. We find spontaneous symmetry breaking of the polarization.

IG-3.4 WED 16:45

Terahertz Josephson plasma solitons in high-Tc superconductors

•*L. Zhang*[1], *E. Casandruc*[1], *M. Eckstein*[1], *A. Dienst*[2], *D. Fausti*[1,2,3], *Y. Laplace*[1], and *A. Cavalleri*[1,2]; [1]*Max-Planck Research Department for Structual Dynamics, University of Hamburg-CFEL, Hamburg, Germany*; [2]*Department of Physics, University of Oxford,*

ROOM 4b

CH-3.2 WED 16:15

Fabry-Perot Vapor Microsensor onto Fibre Endface Fabricated by Multiphoton Polymerization Technique

•*V. Melissinaki*[1,2], *M. Vamvakaki*[1,3], *M. Farsari*[1], and *S. Pissadakis*[1]; [1]*Foundation for Research and Technology-Hellas (FORTH), Institute of Electronic Structure and Laser (IESL), Heraklion, Greece*; [2]*Department of Physics, University of Crete, Heraklion, Greece*; [3]*Department of Materials Science and Technology, Heraklion, Greece*

A Fabry-Perot optical hybrid microsensor, fabricated by multiphoton polymerization technique onto a SMF28 fibre endface, is presented. This fibre sensing probe is investigated for measuring vapour concentration of organic solvents.

CH-3.3 WED 16:30

Study on Detection of Contamination of Pure Water Using Silica Microsphere

•*J. Nishimura and T. Tanabe*; *Keio Univ., Yokohama, Japan*

The resonance shift of silica microspheres is studied as regards monitoring the purity of water. We found that the adsorption lengthens the resonance wavelength while the reaction of silica with pure water shortens it.

CH-3.4 WED 16:45

Characterization of optical strain sensors based on silicon waveguides

•*W. Westerveld*[1,2], *J. Pozo*[2], *P. Muilwijk*[2], *S. Leinders*[1], *P. Harmsma*[2], *E. Tabak*[2], *T. van den Dool*[2], *K. van Dongen*[1], *M. Yousefi*[3], and *P. Urbach*[1]; [1]*Delft University of Technology, Delft, The Netherlands*; [2]*TNO, Delft, The Netherlands*; [3]*Photonic Sensing Solu-*

ROOM 13a

CK-6.2 WED 16:15

Three-dimensional Winged Nanocone Optical Antennas

•*M.J. Huttunen*[1], *D. Andriano*[1], *J. Mäkitalo*[1], *K. Lindfors*[2], *M. Lippitz*[2,3], and *M. Kauranen*[1]; [1]*Department of Physics, Tampere University of Technology, Tampere, Finland*; [2]*Max Planck Institute for Solid State Research, Stuttgart, Germany*; [3]*4. Physics Institute, University of Stuttgart, Stuttgart, Germany*

We fabricate and characterize three-dimensional winged nanocone optical antennas, which can couple transverse field components of incident light into localized near-fields at the apex of the cones.

CK-6.3 WED (Invited) 16:30

Integrated Plasmonic NanoBiosensors

•*H. Altug*[1,2], *R. Adato*[1,2], *A. Artar*[1], *K. Chen*[1], and *S. Aksu*[1]; [1]*Boston University, Boston, United States*; [2]*Ecole Polytechnique Federale de Lausanne, Lausanne, Switzerland*

We will demonstrate plasmonic and metamaterial based integrated nano-biosensors and ultrasensitive infrared absorption spectroscopy. These systems by enabling monitoring of molecular-protein interactions in real-time within aqueous solutions can be important for biomedical sciences and pharmacology.

ROOM 13b

JSIII-2.2 WED 16:15

Real time spectra and wavelength correlation maps: new insights into octave-spanning supercontinuum generation and rogue waves

•*T. Godin*[1], *B. Wetzel*[1], *T. Sylvestre*[1], *L. Larger*[1], *J.-M. Merolla*[1], *A. Ben Salem*[2], *R. Cherif*[2], *M. Zghal*[2], *A. Kudlinski*[3], *A. Mussot*[3], *G. Genty*[4], *F. Dias*[5], and *J.M. Dudley*[1]; [1]*Institut FEMTO-ST, Besançon, France*; [2]*University of 7th November, Sup'Com, Cirta'Com Laboratory, Ariana, Tunisia*; [3]*PhLAM/IRCICA - Université de Lille, Villeneuve d'Ascq, France*; [4]*Department of Physics, Tampere University of Technology, Tampere, Finland*; [5]*School of Mathematical Sciences, University College Dublin, Dublin, Republic of Ireland*

We report real-time measurements of shot-to-shot spectral instabilities of an octave-spanning supercontinuum. Spectral correlations derived from experimental data reveal physical signatures of nonlinear processes including soliton-dispersive wave interactions and Raman soliton wavelength jitter.

JSIII-2.3 WED 16:30

Coherence and single-shot spectra of noise-like pulse trains

•*A. Runge, C. Aguergaray, N.G.R. Broderick, and M. Erkintalo*; *University of Auckland, Auckland, New Zealand*

We report on experimental of coherence and fluctuations in noise-like ultrafast fiber oscillators. Single-shot spectral measurements of the megahertz pulse train reveal significant roundtrip-to-roundtrip variations that are washed out when using conventional time-averaged techniques.

JSIII-2.4 WED 16:45

Dissipative rogue waves through multi-pulse collisions in a fiber laser

•*C. Lecaplain*[1], *P. Grelu*[1], *J.-M. Soto-Crespo*[2], and *N. Akhmediev*[3]; [1]*Laboratoire Interdisciplinaire Carnot de Bourgogne, U.M.R. 6303 C.N.R.S., Dijon Cedex, France*; [2]*Instituto de Optica, C.S.I.C., Madrid, Spain*; [3]*Optical Sciences Group, Research School of Physics and*

ROOM 14a

CJ-8.2 WED 16:15

Single-mode Yb-free Er-doped all-fiber laser cladding-pumped at 976 nm with record efficiency of 40 % and output power of 75 W

•*L. Kotov*[1,2], *M. Likhachev*[1], *M. Bubnov*[1], *O. Medvedkov*[1], *M. Yashkov*[3], *A. Guryanov*[3], *S. Fevrier*[4,5], *J. Lhermite*[4], *and E. Cormier*[4]; [1]*Fiber optics research center of the Russian Academy of Sciences, Moscow, Russia*; [2]*Moscow institute of physics and technology (state university), Dolgoprudny, Russia*; [3]*Institute of High Purity Substances of the Russian Academy of Sciences, Nizhny Novgorod, Russia*; [4]*Centre Lasers Intenses et Applications, Université Bordeaux 1, Talence, France*; [5]*Xlim, University of Limoges, Limoges, France*

We present the high power cladding pumped all-fiber laser based on the newly developed Erbium doped fiber. Output power of 75 W with record efficiency of 40 % was obtained through optimization of fiber design.

CJ-8.3 WED 16:30

Optical Repetition Rate Control of an Erbium-doped All-Fiber Laser

•*T. Hellwig, S. Rieger, T. Walbaum, and C. Fallnich*; *Institut für Angewandte Physik, Westfälische Wilhelms-Universität, Münster, Germany*

Optical repetition rate stabilization of a mode-locked all-fiber Erbium laser by changing the refractive index of an intra-cavity Ytterbium-doped fiber via optical pumping is presented.

CJ-8.4 WED 16:45

SBS suppression in high power single frequency fiber amplifiers by longitudinal varying strain

L. Zhang, J. Hu, S. Cui, and •*Y. Feng*; *Shanghai Institute of Optics and Fine Mechanics, Shanghai, China, People's Republic of (PRC)*

The contribution has been withdrawn by the authors.

ROOM 14b

CF/IE-9.2 WED 16:15

NIR and MIR tunable 130 fs Supercontinuum-Seeded OPA with 25 nJ Pulse Energy and 5 MHz Repetition Rate

•*T. Hansel*[1], *W. Köhler*[2], *A. Assion*[2], *J. Bethge*[1], *and E. Büttner*[1]; [1]*Angewandte Physik und Elektronik GmbH, Berlin, Germany*; [2]*Femtolasers Produktions GmbH, Vienna, Austria*

A novel OPA based femtosecond light source tunable in the NIR and MIR spectral region with 5MHz rep-rate and 140mW maximum power is presented. The system is self-seeded by a supercontinuum generated in a YAG-crystal.

CF/IE-9.3 WED 16:30

Broadly-tunable near- and mid-IR source by direct pumping of an OPA with a 42 MHz femtosecond multi-Watt Yb:KGW oscillator

•*J. Krauth*[1], *A. Steinmann*[1], *R. Hegenbarth*[1], *M. Conforti*[2], *and H. Giessen*[1]; [1]*4th Physics Institute and Research Center SCOPE, University of Stuttgart, Stuttgart, Germany*; [2]*CNISM, Dipartimento di Ingegneria dell'Informazione, Università di Brescia, Brescia, Italy*

We generate over half a watt tunable from 1380-1830 nm, several hundred milliwatts from 2.41-4.22 μm and milliwatt level mid-IR radiation (4.85-9.33 μm) by pumping an OPA directly with a Yb:KGW oscillator at 41.7 MHz.

CF/IE-9.4 WED 16:45

Impact of parasitic, cascaded, and spatial effects to the spatio-temporal pulse shaping dynamics in optical parametric amplifiers

•*T. Lang*[1,2], *A. Harth*[1,2], *M. Schultze*[1], *and U. Morgner*[1,2]; [1]*Institute of Quantum Optics, Leibniz Universität Hannover, Hannover, Germany*; [2]*Centre for Quantum Engi-*

ROOM 21

IH-2.2 WED 16:45

Heat transfer and non-equilibrum Casimir forces in nanostructured surfaces

•*R. Guérout, S. Reynaud, and A. Lambrecht*; *Laboratoire Kastler-Brossel, ENS, UPMC, CNRS, Paris, France*

I'll review recent calculations for Casimir interactions between nanostructured surfaces both at thermodynamic equilibrium and out

ROOM EINSTEIN

CG-3.2 WED 16:15

Sub-2-Cycle Laser-Driven Wakefield Electron Acceleration

•*S.-W. Chou*[1,2], *J. Xu*[1], *D. Cardenas*[1], *D. Rivas*[1,2], *T. Wittmann*[1], *F. Krausz*[1,2], *S. Karsch*[2,1], *and L. Veisz*[1]; [1]*Max-Planck-Institut für Quantenoptik, Garching, Germany*; [2]*Ludwig-Maximilians-Universität, Garching, Germany*

We report on the first laser-driven electron acceleration experiment with a sub-2-cycle (sub-5 fs) multi-TW laser. About 10 MeV dark-current-free mono-energetic electron bunches were observed with charge few pC charge and few-10 mrad divergence.

CG-3.3 WED 16:30

Isolated Attosecond Pulse Generation in Transition Metal Ablation Plumes

•*T. Witting*[1], *R. Ganeev*[2], *F. Frank*[1], *M. Tudorovskaya*[3], *W. Okell*[1], *Z. Abdelraman*[1], *D. Fabris*[1], *C. Hutchinson*[1], *M. Lein*[3], *J. Marangos*[1], *and J. Tisch*[1]; [1]*Blackett Laboratory, Imperial College London, London, United Kingdom*; [2]*Institute of Electronics, Tashkent, Uzbekistan*; [3]*Institut für Theoretische Physik and Centre for Quantum Engineering and Space-Time Research (QUEST), Leibniz Universität Hannover, Hannover, Germany*

We generate high order harmonics in transition-metal ablation plumes using a sub-2-cycle driving pulse. The giant photo-ionization resonances allow drastic flux enhancements. TDSE modelling and first experiments suggest sub-fs pulse durations from this source.

CG-3.4 WED 16:45

High-order harmonic generation from controlled plasma mirrors

•*S. Monchocé*; *Commissariat à l'Energie Atomique, Gif-sur-Yvette, France*

We demonstrate experimentally that varying the density gradient of a plasma mirror allows control over the harmonic generation mechanisms. At very high intensity, this pa-

NOTES

ROOM 1

CD-12.4 WED 17:00

Bright Dispersive Waves in Dual-Core Microstructured Fiber under Different Laser Pumps

A. Tonello[1], K. Krupa[1], M. Andreana[1], V. Couderc[1], G. Manili[2], •D. Modotto[2], U. Minoni[2], S. Wabnitz[2], A. Barthélémy[1], A. Labruyère[1], B.M.I. Shalaby[1], P. Leproux[1], and A.B. Aceves[3]; [1]Université de Limoges, XLIM, Limoges, France; [2]Università di Brescia, Brescia, Italy; [3]Southern Methodist University, Dallas, United States

An efficient dispersive wave generation around 1550 nm is obtained thanks to the dispersive properties of a dual-core microstructured fiber. Experimental and numerical results on the role of pump pulse wavelength and duration are reported.

CD-12.5 WED 17:15

Suppression of temporal cavity soliton interactions by phase modulation of the driving beam

•J.K. Jang, M. Erkintalo, S.G. Murdoch, and S. Coen; The University of Auckland, Auckland, New Zealand

We experimentally demonstrate a technique to suppress long-range interactions between temporal cavity solitons. Under sinusoidal phase modulation of the driving beam, cavity solitons are locked to the adjacent phase maxima.

ROOM 4a

Oxford, United Kingdom; [3]Physics department, University of Trieste, Trieste, Italy

We show that Josephson plasma solitions in layered high-temperature superconductors can be excited with a strong terahertz electromagnetic field and detected by a transparency window in the perturbed loss function of the material.

IG-3.5 WED 17:00

Temporal long-range order in dynamic condensates

A. Hayat[1], C. Lange[1], L.A. Rozema[1], •R. Chang[1], S. Potnis[1], H.M. van Driel[1], A.M. Steinberg[1], M. Steger[2], D.W. Snoke[2], L.N. Pfeiffer[3], and K.W. West[3]; [1]Department of Physics, Centre for Quantum Information and Quantum Control, and Institute for Optical Sciences, University of Toronto, Toronto, Canada; [2]Department of Physics and Astronomy, University of Pittsburgh, Pittsburgh, United States; [3]Department of Electrical Engineering, Princeton University, Princeton, United States

We study interference between two dynamic exciton-polariton condensates, resonantly injected at different times, observing for the first time long-range temporal coherence in this system. This constitutes a new probe of ultrafast coherent dynamics in exciton-polaritons.

IG-3.6 WED 17:15

All-optical Polariton Transistor

•D. Ballarini[1,2], M. De Giorgi[1,2], E. Cancellieri[3], R. Houdré[4], E. Giacobino[5], R. Cingolani[1], A. Bramati[5], G. Gigli[1,2,6], and D. Sanvitto[1,2]; [1]Istituto Italiano Tecnologia, Lecce, Italy; [2]Istituto Nanoscienze - CNR, Lecce, Italy; [3]Universidad Autonoma de Madrid, Madrid, Spain; [4]EPFL, Lausanne, Switzerland; [5]LKB, Paris, France; [6]University of Salento, Lecce, Italy

We experimentally demonstrate the working principle of an all-optical transistor in semiconductor planar microcavities, based on the nonlinear interactions between two polariton fluids. The operation as AND/OR gate is shown in a three transistors configuration.

ROOM 4b

tions, Amsterdam, The Netherlands

We present an extensive proof of the principle of silicon microring resonators operating as strain sensors as well as a complete study of the influence of the design choices and physical effects.

CH-3.5 WED 17:00

Diaphragm Etching in Extrinsic Fabry-Perot Interferometric Fiber Optic Pressure Sensors

S. Poeggel, •D. Tosi, G. Leen, and E. Lewis; University of Limerick, Limerick, Republic of Ireland

We present a novel technique for diaphragm etching in extrinsic Fabry-Perot interferometric fiber optic sensors. The proposed approach accurately monitors online the surface etching in hydrofluoric acid, modeling the Fabry-Perot cavity evolution.

ROOM 13a

CK-6.4 WED 17:00

Geometrical Control of the Resonances and Mode Composition in Hybrid Plasmonic Photonic Crystals

•S. Romanov[1,2], K. Bley[3], K. Landfester[3], C. Weiss[3], and U. Peschel[1]; [1]Institute of Optics, Information and Photonics, University of Erlangen-Nuremberg, Erlangen, Germany; [2]Ioffe Physical Technical Institute, St. Petersburg, Russia; [3]Max Planck Institute for Polymer Research, Mainz, Germany

Hybrid colloidal plasmonic-photonic crystals was gradually turned into plasmonic crystals by etching. Progressively, dielectric waveguiding and Mie modes were substituted by surface plasmon-polariton modes. The unusual extraordinary transmission spike emerged due to Fano resonance.

CK-6.5 WED 17:15

Broadband visible light absorption and plasmons emission through a self organized plasmonic crystal

H. Frederich[1], C. Lethiec[1], F. Wen[2], J. Laverdant[3], C. Schwob[1], T. Popescu[4], L. Douillard[4], L. Coolen[1], and •A. Maître[1]; [1]Université Pierre et Marie Curie, Paris, France; [2]Laboratory for Nanophotonics,Rice University, Main St. Houston, United States; [3]LPMCN, Université de Lyon, Université Lyon 1 and CNRS, Villeurbanne, France; [4]Service de Physique et Chimie des Surfaces et Interfaces, CEA, IRAMIS, Gif sur Yvette, France

A mesoscopic plasmonic crystal (opal with a upper gold film) couples efficiently incident light to plasmons over a large visible spectrum. Plasmons excited by nanocrystals close to crystal surface, are radiating in farfield, increasing luminescence

ROOM 13b

Engineering, Canberra, Australia

Following the first experimental observation of a new mechanism for rogue wave (RW) formation (PRL 108, 233901 (2012)), we provide an extensive experimental study in mode-locked laser where comparison with non-RW pulsating regimes is provided.

JSIII-2.5 WED (Invited) 17:00

Solitonization of the Anderson localization

•C. Conti; ISC-CNR and Dipartimento di Fisica, Università Sapienza, Roma, Italy

We will report on a theoretical approach for the one dimensional nonlinear Schroedinger equation describing the effect of nonlinearity on disorder induced localization.

ROOM 14a

CJ-8.5 WED 17:00

Power Noise Sources of Single Frequency Fibre Amplifiers

•*H. Tünnermann*[1,2], *T. Theeg*[1,2], *H. Sayinc*[1,2], *J. Neumann*[1,2], *D. Kracht*[1,2], *and P. Weßels*[1,2]; [1]*Laser Zentrum Hannover e.V., Hannover, Germany*; [2]*Centre for Quantum Engineering and Space-Time Research - QUEST, Hannover, Germany*

We show an analysis of single frequency fibre amplifier noise in the frequency region from 1-100000 Hz based on the fibre amplifier dynamics and identify additional critical noise sources in high power fibre amplifiers.

CJ-8.6 WED 17:15

Development of an 813-nm Tm-doped ZBLAN fiber amplifier for the Sr optical lattice clock

•*Y.-i. Takeuchi*[1], *M. Uehara*[1], *K. Kohno*[2], *M. Musha*[1], *K. Nakagawa*[1], *and K.-i. Ueda*[1]; [1]*Institute for Laser Science, University of Electro-Communications, Tokyo, Japan*; [2]*Institute of Industrial Science, University of Tokyo, Tokyo, Japan*

We have developed the narrow linewidth master oscillator fiber power amplifier system based on a Tm doped ZBLAN fiber at 813nm for the Sr optical lattice clock with the maximum output power of 1 W.

ROOM 14b

neering and Space-Time Research (QUEST), Hannover, Germany

We present a novel (2+1)D theoretical model including spatial, temporal, and parasitic effects in fs-OPAs. The simulation of a two-color-pumped OPA is compared with experimental data and prominent features in intensity and phase are explained.

CF/IE-9.5 WED 17:00

Fourier Plane Optical Parametric Amplification for simultaneous up-scaling of laser pulse energy and bandwidth

•*B. Schmidt, N. Thire, M. Boivin, A. Laramée, F. Poitras, G. Lebrun, T. Ozaki, J.-C. Kieffer, H. Ibrahim, and F. Légaré*; *INRS-EMT, Varennes, Canada*

Employing parametric amplification in Fourier domain rather than in time domain circumvents phase mismatch and damage threshold limitations of laser amplifiers and enabled CEP stable, 1.43mJ, sub-two cycle pulses at 1.8 micrometer.

CF/IE-9.6 WED 17:15

250 MW Peak Power Ultrafast mid-IR OPCPA

•*A. Thai*[1], *M. Baudisch*[1], *M. Hemmer*[1], *H. Ishizuki*[2], *T. Taira*[2], *and J. Biegert*[1,3]; [1]*ICFO - Institute of Photonic Sciences, Barcelona, Spain*; [2]*Laser Research Center for Molecular Science, Okazaki, Japan*; [3]*ICREA - Institucio Catalana de Recerca i Estudis Avancats, Barcelona, Spain*

A mid-IR OPCPA system operating at 3.1 um wavelength delivering CEP stable optical pulses with up to 20 uJ output energy at 160 kHz with pulse duration as short as 65 fs is reported.

ROOM 21

of equilibrium in the framework of the scattering theory.

IH-2.3 WED 17:00

Can nanophotonics control the Förster resonance energy transfer efficiency?

•*C. Blum*[1], *N. Zijlstra*[1], *A. Lagendijk*[2,3], *M. Wubs*[4], *A.P. Mosk*[2], *V. Subramaniam*[1,5], *and W.L. Vos*[2]; [1]*Nanobiophysics (NBP), MESA+ Institute for Nanotechnology, University of Twente, Enschede, The Netherlands*; [2]*Complex Photonic Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, The Netherlands*; [3]*FOM-Institute AMOLF, Science Park, Amsterdam, The Netherlands*; [4]*Department of Photonics Engineering, Technical University of Denmark, Lyngby, Denmark*; [5]*MIRA Institute for Biomedical Technology and Technical Medicine, University of Twente, Enschede, The Netherlands*

We address the question whether the local density of optical states (LDOS) affects Förster energy transfer (FRET). We observe that the FRET efficiency is controlled by the LDOS, while the FRET rate is unaffected.

IH-2.4 WED 17:15

Temperature dependence of the atom-surface interaction in thermal equilibrium

•*A. Laliotis*[1], *T. Passerat de Silans*[2], *I. Maurin*[1], *M.-P. Gorza*[1], *M. Ducloy*[1], *and D. Bloch*[1]; [1]*Laboratoire de Physique des Lasers UMR 7538 du CNRS et de l'Universite Paris13, Villetaneuse, France*; [2]*Federal University of Paraiba, Joao-Pesoa, Brazil*

We report on spectroscopic measurements of the temperature dependence of the van der Waals atom-surface interaction in thermal equilibrium. Our experiments verify QED predictions for temperatures up to 1000 K.

ROOM EINSTEIN

rameter changes the laser-induced plasma curvature, and hence the beam divergence.

CG-3.5 WED (Invited) 17:00

Single attosecond pulses from plasma mirrors

•*A. Borot*[1], *J. Wheeler*[1], *A. Malvache*[1], *S. Monchocé*[2], *H. Vincenti*[2], *A. Ricci*[1,3], *F. Quéré*[2], *and R. Lopez-Martens*[1]; [1]*Laboratoire d'Optique Appliquée, ENSTA-Paristech, Ecole Polytechnique, CNRS UMR 7639, Palaiseau, France*; [2]*Service des Photons, Atomes et Molécules, CEA, DSM/IRAMIS, CEN Saclay, Gif-sur-Yvette, France*; [3]*Laser Solutions Unit, Thales Optronique SA, Elancourt, France*

We demonstrate for the first time the generation of isolated attosecond pulses from plasmas driven by few-cycle lightwaves with near-relativistic intensity. This is also the first experimental demonstration of the attosecond lighthouse effect.

NOTES

Room 13a

18:45 – 20:15

PD-A: Postdeadline Session A

Chair: Patrick Georges, Institut d'Optique Graduate School, Palaiseau, France

PD-A.1 WED 18:45

Surface RABBITT for determination of absolute ionization phase: a novel route towards absolute photoemission delays

•*R. Locher[1], L. Castiglioni[2], M. Lucchini[1], M. Greif[2], L. Gallmann[1], J. Osterwalder[2], M. Hengsberger[2], and U. Keller[1]; [1]ETH Zurich, Zurich, Switzerland; [2]University of Zurich, Zurich, Switzerland*

Extending the RABBITT technique to noble metal surfaces with simultaneous gas phase RABBITT we extracted absolute surface specific ionization phases for low energy photons (25eV - 35eV). This phase gives access to absolute photoemission delays.

PD-A.2 WED 18:55

Pushing the limits of environmentally stable fibre lasers: 120 fs, 4.2 nJ, all-PM all-fibre

•*C. Aguergaray, A. Runge, M. Erkintalo, and N. Broderick; Physics Department, University of Auckland, Auckland, New Zealand*

We present a multi nano-Joules ultra-short pulse laser combining all key features that fibre technology has to offer. We demonstrate the shortest pulse duration combined with the highest pulse energy out of an all-PM-fibre laser.

PD-A.3 WED 19:05

High energy, monolithic fiber femtosecond lasers

•*M. Mielke[1], X. Peng[1], K. Kim[1], T. Booth[1], W. Lee[1], G. Masor[1], X. Gu[1], R. Lu[1], M. Hamamoto[1], R. Cline[1], J. Nicholson[2], J. Fini[2], X. Liu[2], A. DeSantolo[2], P. Westbrook[2], R. Windeler[2], E. Monberg[2], F. DiMarcello[2], C. Headley[2], and D. DiGiovanni[2]; [1]Raydiance, Petaluma, United States; [2]OFS Laboratories, Somerset, United States*

We describe monolithic fiber femtosecond lasers with up to 300 μJ pulse energy and duration <500 fs. The energy is 6x higher than any previous demonstration, and the form factor is optimized for industrial manufacturing.

PD-A.4 WED 19:15

Thulium-doped Channel Waveguide Laser with 1.6 W of Output Power and Exceeding 80% Slope Efficiency

•*K. van Dalfsen[1], S. Aravazhi[1], C. Grivas[2], S.M. Garcia-Blanco[1], and M. Pollnau[1]; [1]University of Twente, Enschede, The Netherlands; [2]University of Southampton, Southampton, United Kingdom*

A thulium-doped channel waveguide laser in a monoclinic double tungstate delivered 1.6 Watts of output power and a slope efficiency exceeding 80 percent.

PD-A.5 WED 19:25

Photonic-crystal based concave mirror for highly coherent stable external-cavity semiconductor laser

•*M.S. Seghilani[1], M. Sellahi[1], I. Sagnes[2], G. Beaudoin[2], X. Lafosse[2], L. Legratiet[2], P. Lalanne[3], M. Myara[1], and A. Garnach[1]; [1]IES-CNRS UMR5214, Université Montpellier 2, Montpellier, France; [2]LPN-CNRS, Marcoussis, France; [3]Laboratoire Photonique, Numérique et Nanosciences, Institut d'Optique-Bordeaux, Talence, France*

Low loss, high reflectivity and aberrations free photonic crystal (PC) based Bragg mirror is demonstrated, the design and the realization are described. Highly coherent SC laser is obtained using the PC based mirror.

PD-A.6 WED 19:35

Measuring Bacteria Activity with an Optically Trapped Microparticle

•*T. Lohmüller[1], S.R. Kirchner[1], S. Nedev[1], S. Carretero[1], A. Mader[2], M. Leisner[2], and J. Feldmann[1]; [1]Photonics and Optoelectronics Group, Physics Department and CeNS, LMU Munich, Munich, Germany; [2]Chair for Experimental Physics: Soft Matter Physics and Biophysics, Physics Department and CeNS, LMU Munich, Munich, Germany*

We report how the fluidic noise generated by a single bacteria cell can be measured and quantified by using an optically trapped silica microparticle as a highly sensitive detector.

PD-A.7 WED 19:45

On-Chip Random Spectrometer

B. Redding, S.-F. Liew, R. Sarma, and •H. Cao; Yale University, New Haven, United States

We develop a compact, high-resolution on-chip spectrometer based on multiple scattering of light through a disordered medium. We achieve wavelength resolution of 0.75 nm and 25 nm bandwidth using a 25μm - 50μm scattering structure.

PD-A.8 WED 19:55

FDML Raman: New High Resolution SRS with ultra broadband spectral coverage

•*S. Karpf, M. Eibl, W. Wieser, T. Klein, and R. Huber; Ludwig-Maximilians-Universität, Munich, Germany*

An all fiber based system for high speed, high resolution Raman sensing is presented. The system is based on a wavelength swept Fourier Domain Mode Locked (FDML) laser for the detection of the Raman signal.

PD-A.9 WED 20:05

An Ultra-Compact CO_2 Isotope Analyzer Exclusively Based on Quantum Cascade Technology

•*M. Mangold[1], B. Tuzson[1], H. Looser[2], D. Hofstetter[3], Y. Bonetti[4,5], J. Faist[4], and L. Emmenegger[1]; [1]Empa - Swiss Federal Laboratories for Materials Testing and Research, Dübendorf, Switzerland; [2]FHNW, University of Applied Sciences, Institute for Aerosol and Sensor Technology, Windisch, Switzerland; [3]Université de Neuchâtel, Institut de physique, Neuchatel, Switzerland; [4]ETHZ, Institut für Quantenelektronik, Zürich, Switzerland; [5]FIRST-Lab, HCI E 121, Wolfgang-Pauli-Str. 10, Zürich, Switzerland*

We report on an ultra-compact gas spectrometer exclusively employing III-V semiconductor technology. It relies on a quantum cascade laser and a quantum cascade detector. We demonstrate its suitability for high precision CO_2 isotope composition measurements.

Room 13b

18:45 – 20:15

PD-B: Postdeadline Session B

Chair: Jürgen Eschner, Universität des Saarlandes, Saarbrücken, Germany

PD-B.1 WED 18:45

Pulse-Picked Octave-Spanning Microresonator-Based Frequency Comb for Optical Self-Referencing

•*P. Del'Haye, D. Cole, S. Papp, and S. Diddams; National Institute of Standards and Technology, Boulder, United States*

We demonstrate an octave-spanning and coherent microresonator-based optical frequency comb with an electronically accessible mode spacing of 25.6 GHz. This is accomplished with pulse picking and external broadening in highly nonlinear fiber.

PD-B.2 WED 18:55

Coherent scattering from aligned single quantum emitters in a dielectric nanoguide

•*S. Faez, P. Türschmann, S. Götzinger, and V. Sandoghdar; Max Planck Institute for the Science of Light, Erlangen, Germany*

We have developed a new solid-state platform for waveguide-QED, where both high optical densities and single emitter addressability are achieved. Our work paves the way for study of quantum transport in 1-dimensional photonic wires.

PD-B.3 WED 19:05

Teleportation using a Quantum Dot Entangled-Light-Emitting Diode

•*J. Nilsson[1], R.M. Stevenson[1], K.H.A. Chan[1,2], J. Skiba-Szymanska[1], M. Lucamarini[1], M.B. Ward[1], A.J. Bennett[1], C.L. Salter[1,2], I. Farrer[1], D.A. Ritchie[2], and A.J. Shields[1]; [1]Cambridge Research Laboratory, Toshiba Research Europe Limited, Cambridge, United Kingdom; [2]Cavendish Laboratory, University of Cambridge, Cambridge, United Kingdom*

We demonstrate quantum teleportation using entangled photons produced by a quantum dot integrated in a light-emitting diode. The single-photon nature of our device and its electrical operation could help reduce complexity in quantum information applications.

PD-B.4 WED 19:15

Self-synchronization of a NV spin qu-bit on a radio-frequency field enabled by microwave dressing

•*S. Rohr[1], E. Dupont-Ferrier[1], A. Gloppe[1], P. Verlot[1], B. Pigeau[1], V. Jacques[2], and O. Arcizet[1]; [1]Institut Néel, Grenoble, France; [2]Laboratoire de Photonique Quantique et Moléculaire, Cachan, France*

We experimentally emulate the dynamics of a single NV electronic spin coupled to a nanomechanical resonator and explain a self-synchronization effect of the spin dynamics on the simulated mechanical motion.

PD-B.5 WED 19:25

Single-Photon and Photon-Number-Resolving Detectors Integrated with Waveguide Circuits

•*D. Sahin[1], A. Gaggero[2], P. Jiang[3], Z. Zhou[1], S. Jahanmirinejad[1], F. Mattioli[2], R. Leoni[2], J. Beetz[4], M. Lermer[4], M. Kamp[4], S. Höfling[4], M. Thompson[3], and A. Fiore[1]; [1]COBRA Research Institute, Eindhoven University of Technology, Eindhoven, The Netherlands; [2]Istituto di Fotonica e Nanotecnologie, CNR, Rome, Italy; [3]Centre for Quantum Photonics, H. H. Wills Physics Laboratory & Department of Electrical and Electronic Engineering, University of Bristol, United Kingdom; [4]Technische Physik and Wilhelm Conrad Röntgen Research Center for Complex Material Systems, Universität Würzburg, Germany*

We report the integration of two key quantum measurement functionalities with waveguide circuits: A multimode interference coupler integrated with two superconducting single-photon detectors, and a waveguide photon-number-resolving detector able to measure up to four photons.

Room 13b

PD-B.6 WED 19:35

All-Optical Control of Photon Drag Current in Graphene

•*P. Obraztsov*[1,2], *T. Kaplas*[2], *S. Garnov*[1], *M. Kuwata-Gonokami*[3], *A. Obraztsov*[2,4], *and Y. Svirko*[2]; [1]*A.M. Prokhorov General Physics Institute, Moscow, Russia*; [2]*Department of Physics and Mathematics, University of Eastern Finland, Joensuu, Finland*; [3]*Department of Physics, Graduate School of Science and Photon Science Center, The University of Tokyo, Tokyo, Japan*; [4]*Department of Physics, M.V. Lomonosov Moscow State University, Moscow, Russia*

By irradiating unbiased graphene with linearly polarized light we observe ultrafast in-plane current due to the photon drag effect. We demonstrate all-optical control of the photocurrent in space and time domain using two-beam excitation setup.

PD-B.7 WED 19:45

Observation of dispersive-wave emission by temporal cavity solitons

•*J.K. Jang, S.G. Murdoch, S. Coen, and M. Erkintalo*; *Physics Department, The University of Auckland, Auckland, New Zealand*

We report the first experimental observation of dispersive-wave emission by temporal cavity solitons. This could lead to broader microresonator Kerr frequency combs and supports the idea that Kerr combs are constituted of cavity solitons.

PD-B.8 WED 19:55

All-optical polarization-based temporal cloaking

P.-Y. Bony, P. Morin, •*M. Guasoni, S. Pitois, and J. Fatome*; *Laboratoire Interdisciplinaire Carnot de Bourgogne, Dijon, France*

We present an experimental demonstration of temporal cloaking of a 10-Gbit/s incident signal based on the concept of nonlinear self-organization of light state of polarization in optical fiber-based systems.

PD-B.9 WED 20:05

Nanoparticle Measurement in the Optical Far-Field

•*D. Little*[1], *R. Kuruwita*[1], *A. Joyce*[1], *Q. Gao*[2], *T. Burgess*[2], *C. Jagadish*[2], *and D. Kane*[1]; [1]*Macquarie University, Sydney, Australia*; [2]*Australian National University, Canberra, Australia*

Radii of single nanowires are measured in the optical far-field using interferometric microscopy. Radius measurements are demonstrated to be accurate to within 2% of the nominal value, highlighting the nanometrology potential of this technique.

NOTES

Hall B0

13:00 – 14:00

CF/IE-P: CF/IE Poster Session

CF/IE-P.1 WED

4-f prism-based pulse shaper supporting single-cycle pulses in the visible

•*A. Harth[1,2], T. Nagy[1], J. Andrade[1], S. Rausch[1,2], C. Hoffmann[1], T. Lang[1,2], T. Binhammer[3], and U. Morgner[1,2,4]; [1]Leibniz Universität Hannover, Hannover, Germany; [2]Centre for Quantum Engineering and Space-Time Research (Quest), Hannover, Germany; [3]Venteon Laser Technologies GmbH, Hannover, Germany; [4]Laser Zentrum Hannover e.V., Hannover, Germany*

We discuss the limitations of a 4f-prism based pulse shaper for the phase control over 400THz in the visible and expose the potential of pulse compression to nearly one optical cycle.

CF/IE-P.2 WED

Versatile dual stage tunable NOPA with pulse duration down to 17 fs and energy up to 3 microJ at 500 kHz repetition rate

•*J. Nillon[1,2], O. Crégut[1], C. Bressler[2], and S. Haacke[1]; [1]IPCMS, Strasbourg, France; [2]European XFEL, Hamburg, Germany*

We report on a new ultrashort NOPA tunable between 500 and 1000 nm. It delivers pulse energies up to 3,1 microJ and pulse duration down to 17 fs at 500 kHz.

CF/IE-P.3 WED

Investigation of temporal compression of few-cycle pulses from an ultrabroadband, multi-mJ optical parametric amplifier

•*D. Franz[1], H. Fattahi[1,2], V. Pervak[1], M. Trubetskov[1], E. Fedulova[1], N. Karpowicz[2], Z. Major[1,2], and F. Krausz[1,2]; [1]Ludwig-Maximilians-Universität München, Munich, Germany; [2]Max-Planck-Institut für Quantenoptik, Munich, Germany*

We numerically investigate the compression of an ultrabroad spectrum (670 - 1400 nm) using double- angle chirped mirrors. Despite large residual group-delay-dispersion oscillations, the good match between design and target promises a compression close to the transform limit.

CF/IE-P.4 WED

Carrier-envelope phase control of Yb:KGW laser and parametric amplifiers

•*T. Stanislauskas[1,2], R. Antipenkov[1], V. Martinenaite[1,2], L. Karpavicius[1], A. Varanavicius[1], V. Sinkevicius[2], P. Miseikis[2], D. Grigaitis[2], and T. Balciunas[3]; [1]Vilnius University, Faculty of Physics, Department of Quantum electronics, Vilnius, Lithuania; [2]Light Conversion Ltd., Vilnius, Lithuania; [3]Vienna University of Technology, Photonics Institute, Vienna, Austria*

An optimized CEP stabilization of the all-solid-state Yb:KGW laser system and different OPA setups pumped by this laser are presented with CEP noise value as low as 130 mrad after the laser amplifier.

CF/IE-P.5 WED

Frequency Dependent Dynamics of Semiconductor Microcavities under Ultrafast Carrier Switching

•*G. Ctistis[1], E. Yüce[1], J. Claudon[2], A.P. Mosk[1], J.-M. Gérard[2], and W.L. Vos[1]; [1]Complex Photonic Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, The Netherlands; [2]CEA/INAC/SP2M, Nanophysics and Semiconductor Laboratory, Grenoble, France*

We present ultrafast reflectivity measurements on the dynamics of optically excited free carriers in semiconductor microcavities. We observe that the relaxation dynamics of the switched cavity is strongly frequency dependent, which points towards multiple carrier populations.

CF/IE-P.6 WED

Mode Locking At and Below the CW Threshold

S. Yefet and •A. Pe'er; Bar Ilan University, Ramat Gan, Israel

We explore experimentally a new regime of operation for mode locking in a Ti:Sapphire laser with enhanced Kerr nonlinearity, where the threshold for pulsed operation is lowered below the threshold for continuous-wave operation.

CF/IE-P.7 WED

Efficient broadband 400 nm noncollinear second harmonic generation of chirped femtosecond laser pulses in BBO and LBO

•*O. Gobert[1], G. Mennerat[1], R. Maksimenka[1,2], N. Fedorov[1], M. Perdrix[1], D. Guillaumet[1], C. Ramon[3,4], J. Habib[3,4], C. Prigent[3,4], D. Vernhet[3,4], T. Oksenhendler[2], and M. Comte[1]; [1]CEA-Saclay, IRAMIS, Gif sur Yvette, France; [2]FASTLITE, Orsay, France; [3]CNRS, INSP, UMR7588, Paris, France; [4]Université Pierre et Marie Curie, INSP, UMR7588, 4 Place Jussieu, Paris, France*

We report on 400 nm broadband noncollinear type I SHG in BBO and LBO with tilted pulse-fronts chirped fs pulses. Conversion up to 65% is obtained and 45 fs duration measured (UV WIZZLER) after compression.

CF/IE-P.8 WED

Simulation of Dissipative Solitons in a Fiber Laser Oscillator at Presence of Strong Raman Scattering

•*A. Bednyakova[1,2], M. Fedoruk[1,2], E. Podivilov[2,3], D. Kharenko[2,3], S. Babin[2,3], V. Kalashnikov[4], and A. Apolonski[3,5]; [1]Institute of Computational Technologies SB RAS, Novosibirsk, Russia; [2]Novosibirsk State University, Novosibirsk, Russia; [3]Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia; [4]Institut fuer Photonik, Vienna, Austria; [5]Ludwig-Maximilians-Universitaet, Garching, Germany*

We report on comparison of numerical simulation with experimental results for the Yb fiber laser oscillator with 30-m cavity demonstrating stable generation of chirped dissipative solitons at presence of strong Raman scattering.

CF/IE-P.9 WED

High repetition rate PetaWatt Titanium Sapphire laser system for laser plasma acceleration

•*F. Lureau, S. Laux, O. Casagrande, O. Chalus, C. Radier, F. Caradec, C. Derycke, P. Jougla, G. Brousse, and C. Simon-Boisson; Thales Optronique SAS, Elancourt, France*

We describe the design and performance of a PetaWatt laser based on Titanium Sapphire that operates at an unprecedented repetition rate of 1 Hz. Results of the operation above 1 PetaWatt peak power are presented

CF/IE-P.10 WED

Realization of multi-dimensional laser mode combs by an actively mode-locked fiber-laser

•*G. Oren, A. Schwartz, A. Bekker, and B. Fischer; Technion- Israel Institute of Technology, Haifa, Israel*

We present a first realization of an effective multi-dimensional mode-comb with nearest-neighbor mode interaction, constructed by multifrequency active mode-locking. It is also a rare physical realization of the multi-dimensional spherical-model (of magnetic spins in statistical-mechanics).

CF/IE-P.11 WED

Ultrafast and Broadband Optical Nonlinearities from Strongly Phase-Mismatched Second Harmonic Generation

•*B. Zhou[1], A. Chong[2], F. Wise[2], and M. Bache[1]; [1]DTU Fotonik, Technical University of Denmark, Kgs. Lyngby, Denmark; [2]Department of Applied and Engineering Physics, Cornell University, Ithaca, United States*

A novel protocol for generating strong, ultrafast and octave-spanning cascaded nonlinearity for a wide range of wavelengths is proposed. A near-IR experiment in lithium niobate shows soliton compression and octave-spanning supercontinuum generation, verifying the hypothesis.

CF/IE-P.12 WED

Chirped pulse four-wave Raman mixing

O. Shitamichi[1] and •T. Imasaka[1,2]; [1]Department of Applied Chemistry, Graduate School of Engineering, Kyushu University, Fukuoka, Japan; [2]Division of Optoelectronics and Photonics, Kyushu University, Fukuoka, Japan

The degree of chirp in the anti-Stokes Raman emission generated by a two-color pump beam consisting of two chirped pulses based on four-wave Raman mixing of hydrogen was investigated using a frequency-resolved optical gating system

CF/IE-P.13 WED

Few-cycle Nonlinear Mid-IR Pulse Generated with Cascaded Quadratic Nonlinearities

•*M. Bache, X. Liu, and B. Zhou; DTU Fotonik, Department of Photonic Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark*

We study nonlinear mid-IR crystals and assess their potential for ultrafast cascaded nonlinearities in the type 0 phase-matching interaction. Few-cycle, broadband energetic mid-IR pulses can be generated from compressing multi-cycle mid-IR pulses with self-defocusing solitons.

CF/IE-P.14 WED

Modulation instability in the sub-cycle regime

•*F. Tani[1], J. Travers[1], and P. Russell[1,2]; [1]Max Planck Institute for the Science of Light, Erlangen, Germany; [2]Department of Physics, University of Erlangen-Nuremberg, Erlangen, Germany*

Full-field numerical calculations are used to study modulational instability in Xe-filled PCF in parameter ranges where the pump pulse breaks up into high intensity sub-cycle structures. The resulting broad MI-induced spectrum compares well with experiment.

CF/IE-P.15 WED

Long-Lived Electronic Polarization and Nonlinear Optical Effects of Fluorescent Molecules in Solution.

•*A. Konar, V. Lozovoy, and M. Dantus; Michigan State University, East Lansing, United States*

The long-lived electronic polarization from IR144 in methanol is investigated by a pair of pulses delayed interferometrically using a pulse shaper while monitoring the stimulated emission. A phenomenological model is used to simulate the data.

CF/IE-P.16 WED

Monochromatic extreme-ultraviolet ultrafast beamline

•*L. Poletto[1], M. Coreno[2], F. Frassetto[1], D. Gauthier[5], C. Grazioli[3], R. Ivanov[3,5], P. Miotti[1], B. Ressel[3,5], C. Spezzani[3], S. Stagira[4], and G. De Ninno[3,5]; [1]CNR-Institute of Photonics and Nanotechnologies, Padova, Italy; [2]CNR-Institute of Inorganic Methodologies and Plasmas, Trieste, Italy; [3]Sincrotrone Trieste S.C.p.A., Trieste, Italy; [4]Politecnico di Milano-Department of Physics,* *Milano, Italy; [5]University of Nova Gorica, Ajdovscina, Slovenia*

The characterization of a monochromatic beamline for high-order harmonics is presented. The monochromator adopts a design that joins two geometries in a single instrument to give high/low temporal resolution and low/high spectral resolution.

CF/IE-P.17 WED

Measuring few-cycle laser pulses: a comparative study between dispersion-scan and FROG

•*F. Silva[1], M. Miranda[1,2], and H. Crespo[1]; [1]IFIMUP-IN and Departamento de Física e Astronomia, Universidade do Porto, Porto, Portugal; [2]Department of Physics, Lund University, Lund, Sweden*

Dispersion scan is a recent, straightforward pulse measurement technique especially suitable for few-cycle pulses. In this work we compare measurements of a few-cycle oscillator using SHG-d-scan and SHG-FROG, exploring differences and advantages of each technique.

CF/IE-P.18 WED

Single diffractive optical element pulse shaper

•*O. Mendoza-Yero[1], V. Loriot[2,3], J. Pérez-Vizcaíno[1], G. Mínguez-Vega[1], J. Lancis[1], R. de Nalda[2], and L. Bañares[3]; [1]GROC-UJI, Institut de Noves Tecnologies de la Imatge, Castellón de la Plana, Spain; [2]Instituto de Química Física Rocasolano, Madrid, Spain; [3]Facultad de Ciencias Químicas, Universidad Complutense de Madrid, Madrid, Spain*

We experimentally demonstrate an extremely compact, programmable and user-friendly pulse sharper composed of a single diffractive optical element encoded into a spatial light modulator. This allows compensating for efficiency losses and correct wavefront aberrations simultaneously.

CF/IE-P.19 WED

Femtosecond Fiber CPA System Seeded by Bandwidth-Limited Picosecond Pulses

•*J. Želudevičius, R. Danilevičius, K. Viskontas, N. Rusteika, and K. Regelskis; Center for Physical Sciences & Technology, Vilnius, Lithuania*

We present femtosecond fiber laser system with 400 fs duration 58 uJ energy pulses based on the CPA design and seeded by bandwidth-limited picosecond pulses.

CF/IE-P.20 WED

Selctive detection of phonon-plasmon coupled oscillation in indium phosphide using a coherent control technique

•*K. Nakamura[1,2], S.-i. Harada[1,2], and J. Hu[1]; [1]Tokyo Institute of Technology, Yokohama, Japan; [2]Japan Science and Technology Agency, Kawaguchi, Japan*

Coherent oscillations of the LO phonon-plasmon coupled mode, which have very short lifetime and usually been hidden in strong LO-phonon oscillations, have been selectively observed using femtosecond transient reflecticity measurement with a coherent control technique.

CF/IE-P.21 WED

XPW based Self-Referenced Spectral Interferometry for few-cycle pulse characterization in the short wavelength IR

•*A. Trisorio[1], S. Grabielle[2], M. Divall[1], N. Forget[2], and C. Hauri[1,3]; [1]Paul Scherrer Institut, Villigen, Switzerland; [2]Fastlite, Nice, France; [3]Ecole Polytechnique Federale de Lausanne, Lausanne, Switzerland*

Ultra-short infrared pulses are fully characterized using Self-Referenced Spectral Interferometry. The device is capable of accurate measurement of few-cycle pulses (down to 13 fs at 1.6 μm) over the 1.2-2 μm spectral range.

CF/IE-P.22 WED

Kerr-lens Mode Locking Without Nonlinear Astigmatism

S. Yefet and •A. Pe'er; Bar Ilan University, Ramat Gan, Israel

We demonstrate complete cancellation of the nonlinear astigmatism in a mode locked Ti:Sapphire laser. We use a novel cavity folding where no special, power specific compensation is needed and the Kerr nonlinearity is efficiently exploited.

CF/IE-P.23 WED

Modeling the Nonlinear Refractive Index in Atomic Gases

•*C. Köhler[1], R. Guichard[2], E. Lorin[3], S. Chelkowski[4], A.D. Bandrauk[4], L. Bergé[1], and S. Skupin[5,6]; [1]CEA-DAM, DIF, Arpajon, France; [2]CNRS, UMR 7614, LCPMR, Paris, France; [3]Carleton University, Ottawa, Canada; [4]Université de Sherbrooke, Sherbrooke, Canada; [5]MPIPKS, Dresden, Germany; [6]Friedrich Schiller University, Jena, Germany*

We show that saturation of the nonlinear polarization of gases irradiated by intense laser pulses results from ionized electrons, by comparing numerical solutions of the time dependent Schrödinger equation to various models of laser filamentation.

CF/IE-P.24 WED

What are we observing by the detection frequency resolved measurement of coherent phonons?

•*Y. Kayanuma[1], Y. Mizumoto[1], Y. Mori[2], G. Oohata[2], and K. Mizoguchi[2]; [1]Research Organization for the 21st Century, Osaka Prefecture University, Sakai, Japan; [2]Graduate School of Sciences, Osaka Prefecture University, Sakai, Japan*

The detection frequency resolved reflection by the coherent phonon are analyzed by a simple model of semiconductors. The experimental features are well reproduced as a result of band-gap modulation by the LO phonon.

CF/IE-P.25 WED

Femtosecond laser-induced pulsed ultrasound source in water

Y. Brelet[1], •A. Jarnac[1], A. Houard[1], R. Guillermin[2], J.-P. Sessarego[2], J. Carbonnel[1], Y.-B. André[1], D. Fattaccioli[3], and A. Mysyrowicz[1]; [1]Laboratoire Optique Appliquée, ENSTA ParisTech-Ecole Polytechnique-CNRS,, Palaiseau, France; [2]Laboratoire de Mécanique et Acoustique, Marseille, France; [3]DGA TN, Toulon, France

We experimentally investigate the acoustic wave generated by an incident ultra short laser pulse in water. The subsequent acoustic wave presents a broadband signal in the ultrasound range.

CF/IE-P.26 WED

Dynamics of third harmonic yield from a femtosecond laser filament in air

•*Y. Liu[1], Y. Brelet[1], S. Mitryukovskiy[1], A. Houard[1], A. Couairon[2], and A. Mysyrowicz[1]; [1]Laboratoire d'Optique Appliquee, Palaiseau, France; [2]Centre de Physique Théorique, Ecole Polytechnique, Palaiseau, France*

Third harmonic generation from a focused femtosecond laser pulse in air is studied in the parameter space. An optimal focusing condition is observed and the crucial role of plasma is identified.

CF/IE-P.27 WED

Dynamics of Fourier Domain Mode Locked Lasers

S. Slepneva[1,2], B. O'Shuaghnessy[1,2], •B. Kelleher[1,2], S.P. Hegarty[1], A.G. Vladimirov[1,2,3], and G. Huyet[1,2]; [1]Tyndall National Institute, Cork, Republic of Ireland; [2]Cork Institute of Technology, Cork, Republic of Ireland; [3]Weierstrass Institute for Applied Analysis and Stochastics, Berlin, Germany

We analyse the dynamics of Fourier Domain Mode Locked lasers and show that the sweeping asymmetry in the output originates from the nonlinearities of the amplifier resulting in two regions: chaos and mode group stepping.

CF/IE-P.28 WED

THz generation by filamentation of two-color femtosecond laser pulses

L. Bergé[1], S. Skupin[2], C. Koehler[1], I. Babushkin[3], and •J. Herrmann[4]; [1]CEA, DAM, DIF, Arpajon, France; [2]Max Planck Institute PKS, Dresden, Germany; [3]Weierstrass-Institut, Berlin, Germany; [4]Max Born Institut, Berlin, Germany

Terahertz (THz) radiation produced by two-color laser filaments is numerically investigated. The dominant mechanism for THz generation is shown to be plasma currents. Calculated THz spectra for various pump pulses agree with previous experimental observations.

CF/IE-P.29 WED

Asynchronous ultrafast pump-probe experiments: Towards high speed ultrafast imaging with ultrahigh spectral resolution

•*A. Abbas[1,2,3], Y. Guillet[1], J.-M. Rampnoux[2], J. Carlier[3], P. Rigail[3], E. Mottay[3], B. Audoin[1], and S. Dilhaire[2]; [1]Université de Bordeaux, CNRS, UMR 5295, Talence, France; [2]Université de Bordeaux, CNRS, UMR 5798, Talence, France; [3]Amplitude Systèmes, Pessac, France*

We report on a system able to record movies of ultrafast processes over 20 ns with a sub-picosecond time resolution. A movie of GHz surface acoustic waves propagating over 10000 micron-squared is presented.

CF/IE-P.30 WED

Characterization of a liquid-crystal pulse shaper over 0.36-PHz bandwidth

•*R. McCracken and D. Reid; Heriot Watt University, Edinburgh, United Kingdom*

Using in-line interferometry and an iterative-fitting algorithm we have characterized the phase response of a liquid-crystal spatial light modulator over a 0.36-PHz bandwidth. The calibration also retrieves the wavelength-dependent refractive index of the liquid-crystal.

CF/IE-P.31 WED

(110)-Oriented GaAs/AlGaAs Multiple Quantum Well Microposts for High-Speed Polarization Switching of Spin-Controlled VCSELs

•*N. Yokota, K. Ikeda, and H. Kawaguchi; Nara Institute of Science and Technology, Ikoma, Japan*

We measured the electron spin relaxation time τ_s in (110)-oriented GaAs/AlGaAs MQW microposts. A long τ_s of 0.74 ns was obtained for 0.5-μm posts suitable for high-speed switching of lasing circular polarizations in spin-controlled VCSELs.

CF/IE-P.32 WED

GHz dynamics of a single nanoparticle-substrate contact probed by femtosecond intrinsic common-path interferometry

•*Y. Guillet[1], S. Minissale[1], S. Ravaine[2], and B. Audoin[1]; [1]Université de Bordeaux, CNRS, UMR 5295, Talence, France; [2]Amplitude Systèmes, Pessac, France*

Hall B0

We report on an all-optical and femtosecond time-resolved technique to investigate the adhesion between a single gold nanoparticle and a substrate in the GHz range. The detection scheme relies on an intrinsic common-path interferometer.

CF/IE-P.33 WED

Dynamics of coherent optical phonons in chalcogenide compounds

•*K. Norimatsu*[1,2], *S.-i. Uozumi*[1,2], *K. Igarashi*[1], *S. Yamamoto*[1], *T. Sasagawa*[1], *and K.G. Nakamura*[1,2]; [1]*Materials and Structures Laboratory, Tokyo Institute of Technology, Yokohama, Japan*; [2]*CREST, Japan Science and Technology Agency, Kawaguchi, Japan*

Coherent oscillations of anisotropic Eg phonons have been observed in chalcogenide compounds (Bi2Se3, Bi2Te3, Sb2Te3) in addition to two isotropic A1g phonons using electro-optic sampling. The higher frequency phonons have the shorter lifetime.

CF/IE-P.34 WED

Measurement of orbital angular momentum spectrum of optical vortices based on electric-field reconstruction in spatial domain

•*K. Yamane, Z. Yang, K. Shigematsu, Y. Toda, and R. Morita*; *Department of Applied Physics, Hokkaido University, and JST CREST, Sapporo, Japan*

A new measurement method for orbital angular momentum spectra of optical vortices, based on electric-field reconstruction in spatial domain, is demonstrated. The method is applicable to ultrabroadband optical vortices, and enables quasi-real-time measurement.

CF/IE-P.35 WED

Cross-correlation frequency-resolved optical gating by molecular vibration for ultrashort pulse

•*X. Liu*[1,2], *H. Niu*[2], *W. Liu*[2], *D. Chen*[2], *B. Zhou*[1], *and M. Bache*[1]; [1]*Technical University of Denmark, DTU Fotonik, Department Dept. of Photonics Engineering, DK-2800 Kgs. Lyngby, Denmark*; [2]*Key Laboratory of Optoelectronic Devices and Systems of Ministry of Education and Guangdong Province, Institute of Optoelectronics, Shenzhen University, shenzhen, China, People's Republic of (PRC)*

Abstract: We experimentally demonstrate a molecular-vibration-based cross-correlation frequency-resolved optical gating (XFROG) technique for ultrashort pulse measurements, which use laser-induced impulsive Raman free induction decay of molecules vibrations as the gate function.

CF/IE-P.36 WED

Electron impact excitation of helium and neon atoms in filamentary plasma gratings

•*L. Shi, W. Li, H. Zhou, D. Wang, L. Ding, and H. Zeng*; *East China Normal University, Shanghai, China, People's Republic of (PRC)*

We demonstrated a femtosecond pulse driven electron-impact method to efficiently enhance the fluorescence emission from filament-induced neon and helium ionization. Such an all-optical method holds the potential to improve the sensitivity of laser-induced breakdown spectroscopy.

CF/IE-P.37 WED

Ultrafast carrier dynamics of surfactant-mediated-grown InAs/GaAs quantum-dot structures designed for THz applications

•*N.S. Daghestani*[1], *M. Alduraibi*[2,3], *T. Piwnoski*[4], *T. Ochalski*[4], *G. Huyet*[4], *M. Missous*[2], *T. Ackemann*[5], *and M.A. Cataluna*[1]; [1]*University of Dundee, Dundee, United Kingdom*; [2]*University of Manchester, Manchester, United Kingdom*; [3]*King Saud University, Riyadh, Saudi Arabia*; [4]*Tyndall National Institute, Cork, Republic of Ireland*; [5]*University of Strathclyde, Glasgow, United Kingdom*

Pump-probe investigations show that carrier lifetime in InAs/GaAs quantum-dot structures is dramatically faster when excited at 800nm than at 1245nm. Annealed samples exhibit shorter carrier lifetime than as-grown, increasing with pump power in both structures.

CF/IE-P.38 WED

Carrier-envelope phase of ultrashort pulses generated by optical rectification process

•*T. Fuji*[1], *Y. Nomura*[1], *Y.-T. Wang*[2], *A. Yabushita*[2], *and C.-W. Luo*[2]; [1]*Institute for Molecular Science, Okazaki, Japan*; [2]*National Chiao Tung University, Hsinchu, China, Republic of (ROC)*

The carrier-envelope phase of the pulse generated through the optical rectification was investigated. A clear difference of the carrier-envelope phase determination between the difference frequency generation and the optical rectification has been found.

CF/IE-P.39 WED

Attosecond Larmor Clock

•*J. Kaushal and O. Smirnova*; *Max Born Institute, Berlin, Germany*

We present a new method to time strong field ionisation in circularly polarised fields using spin-orbit interaction between the ionising electron and core as a clock.

CF/IE-P.40 WED

Generation of spectrally shaped UV-vis supercontinuum femtosecond pulses by means of diffractive lenses

•*R. Borrego-Varillas*[1,3], *C. Romero*[2], *B. Alonso*[1], *I. Gallardo-Gonzalez*[2], *O. Mendoza-Yero*[3], *G. Minguez-Vega*[3], *I. Sola*[1], *J. San Roman*[1], *and J. Rodriguez Vazquez de Aldana*[1]; [1]*Universidad de Salamanca, Salamanca, Spain*; [2]*Centro de Láseres Pulsados, Salamanca, Spain*; [3]*GROC-INIT, Universitat Jaume I, Castelló, Spain*

We demonstrate the use of diffractive lenses to generate tunable supercontinuum pulses in the visible. An isolated anti-Stokes wing is described. The filament formation is studied and a complete characterization of the pulses is provided.

CF/IE-P.41 WED

Higher-order Kerr effect and harmonic cascading in gases

•*M. Bache*[1], *F. Eilenberger*[2], *and S. Minardi*[2]; [1]*Technical University of Denmark, DTU Fotonik, Department of Photonics Engineering, Lyngby, Denmark*; [2]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universitaet Jena, Jena, Germany*

We show that cascading from the Kerr effect and the higher-order Kerr effect can modify the observed nonlinear index in gases: for near-IR wavelengths the observed saturation intensity increases, while it decreases for longer wavelengths.

CF/IE-P.42 WED

Improved performance characteristics for the integrated photonic pupil remapping interferometer Dragonfly

•*N. Jovanovic*[1], *S. Gross*[2], *A. Arriola*[2], *N. Charles*[3], *P. Tuthill*[3], *B. Norris*[3], *P. Stewart*[3], *J. Lawrence*[4], *and M. Withford*[3]; [1]*Subaru Telescope, Hilo, United States*; [2]*Macquarie University, Sydney, Australia*; [3]*University of Sydney, Sydney, Australia*; [4]*Australian Astronomical Observatory, Sydney, Australia*

We present the considerable performance improvements of the ultrafast laser inscribed 3D pupil remapping photonic chips utilised in the Dragonfly astronomical interferometer and the associated gains to the instrument as a whole.

CF/IE-P.43 WED

Generation of tuneable and ultrahigh repetition rate by fractional Talbot effect in frequency-shifted feedback lasers

•*H. Guillet de Chatellus, O. Jacquin, O. Hugon, W. Glastre, and e. Lacot*; *CNRS/UJF Laboratoire Interdisciplinaire de Physique, Saint Martin d'Hères, France*

We demonstrate in a seeded frequency shifted feedback laser, the generation of Fourier-limited pulses at tuneable and ultrahigh repetition rates, limited only by the laser spectral bandwidth. This property is interpreted as fractional Talbot effect.

CF/IE-P.44 WED

Supercontinuum generation in bulk diamond - experiment and the model

•*T. Kardaś*[1], *A. Lapini*[2], *B. Gadomska*[1], *and R. Righini*[2]; [1]*Department of Chemistry, University of Warsaw, Warsaw, Poland*; [2]*European Laboratory for Non-linear Spectroscopy (LENS), Universitá di Firenze, Florence, Italy*

Supercontinuum was generated in a bulk diamond crystal. The blue edge of supercontinuum was found to be 615 nm. Nonlinear envelope equation with strong Raman response was used for modeling.

13:00 – 14:00

CJ-P: CJ Poster Session

CJ-P.1 WED

H2-blocking in Yb-doped Fiber through Pump Excitation to Enhance Photodarkening Resistivity

•*A. Pal, M. Saha, A. Dhar, and R. Sen*; *Fiber optics & Photonics Division, CSIR-Central glass & Ceramic Research Institute, Kolkata, India*

The enhancement of photodarkening resistivity as high as 95% is achieved through H2-treatment of Yb-doped fiber, irrespective of Yb-concentration. H2-blocking employing the pump excitation in the fiber indicates negligible photodarkening even after post-diffusion of interstitial-H2.

CJ-P.2 WED

Enhanced thermal-effect resilience in distributed modal filtering large mode area photonic crystal fibers

•*E. Coscelli*[1], *F. Poli*[1], *T. Alkeskjold*[2], *M. Jørgensen*[3], *A. Cucinotta*[1], *and S. Selleri*[1]; [1]*Information Engineering Department, University of Parma, Parma, Italy*; [2]*NKT Photonics A/S, Birkerød, Denmark*; [3]*DTU Fotonikm Technical University of Denmark, Lyngby, Denmark*

Thermal effects on the single-mode regime of large mode area fibers have been investigated through numerical simulations. Results have shown that distributed modal filtering photonic crystal fibers provide enhanced resilience towards thermally-induced multi-mode behavior.

Hall B0

CJ-P.3 WED

Er:LiLuF4 upconversion waveguide laser with femtosecond-laser written circular cladding structures

•*F. Moglia*[1], *S. Müller*[1], *T. Calmano*[1], *C. Kränkel*[1,2], *and G. Huber*[1,2]; [1]*Institut für Laser-Physik - Uni Hamburg, Hamburg, Germany*; [2]*The Hamburg Centre for Ultrafast Imaging, Hamburg, Germany*

Upconversion waveguide lasers are realized by inscribing circular claddings in an Er:LiLuF4 crystal via a femtosecond-laser. By Ti:Sapphire pumping at 974 nm, laser oscillation at 552.6 nm was achieved with Pout = 10 mW.

CJ-P.4 WED

Mirrorless optical parametric oscillator in a stitched GaN waveguide

•*C. Montes, P. Aschieri, and M. de Micheli*; *LPMC-CNRS, Universite de Nice-Sophia Antipolis, F-06108 Nice, France*

A sequence of submicronic periodically poled GaN waveguide elements, jointed by uniformly polarized domains representing stitching errors, achieve a mirrorless optical parametric oscillator unsensitive to them due to the coherence of the generated backscattered wave.

CJ-P.5 WED

Monolithic thulium-doped fiber laser with UV femtosecond-laser-induced fiber-Bragg-grating pair

•*P. Peterka*[1], *P. Honzátko*[1], *M. Becker*[2], *F. Todorov*[1], *M. Písařík*[3], *O. Podrazký*[1], *and I. Kašík*[1]; [1]*Institute of Photonics and Electronics ASCR, v.v.i., Prague, Czech Republic*; [2]*Institute of Photonic Technology, Jena, Germany*; [3]*SQS Vláknová optika a.s., Nová Paka, Czech Republic*

Highly integrated thulium-doped fiber laser emitting at 1951 nm and its characteristics are presented. To our knowledge, this is the first rare-earth-doped fiber laser with a FBG pair written with deep UV femtosecond laser radiation.

CJ-P.6 WED

Refining the Modelling of Mode-Locked Fiber Lasers

•*M. Erkintalo, C. Aguergaray, A. Runge, and N. Broderick*; *Department of Physics, The University of Auckland, Auckland, New Zealand*

We present a refined model for the simulation of mode-locked fiber lasers. Using full generalized envelope equations and rigorously modelled gain dynamics we obtain remarkable agreement with experiments.

CJ-P.7 WED

Experimental Investigation of Delivery and Spectral Broadening of Nanosecond Laser Pulses in Bragg fiber with Silica Core

•*M. Jelinek*[1], *V. Kubecek*[1], *H. Jelinkova*[1], *V. Matejec*[2], *I. Kasik*[2], *and O. Podrazky*[2]; [1]*Czech Technical University in Prague, FNSPE, Prague, Czech Republic*; [2]*Institute of Photonics and Electronics AS CR, v.v.i., Prague, Czech Republic*

Delivery of 1.06um nanosecond millijoule-level laser pulses through the laboratory-fabricated silica-core Bragg fiber was investigated. Fiber transmittance up to 55% in fundamental transversal-mode was achieved together with significant spectral broadening ranging from 850 to 1650nm.

CJ-P.8 WED

Nonlinear Spectral Transformation of Partially Coherent Pulses of Mode-locked Fiber Laser

S. Kobtsev, •*S. Smirnov, A. Ivanenko, and S. Kukarin*; *Novosibirsk State University, Novosibirsk, Russia*

Applicability of novel partially coherent lasing regimes for second harmonic generation is considered for the first time. It's shown that such regimes are very promising having comparable transformation efficiency and higher peak power and energy.

CJ-P.9 WED

All-fiber Ho-doped laser tunable from 2.1 to 2.045 μm

•*S. Antipov*[1], *V. Kamynin*[2], *S. Kablukov*[3,4], *K. Raspopin*[5], *and A. Kurkov*[2]; [1]*Lomonosov Moscow State University, Moscow, Russia*; [2]*General Physics Istitute of the Russian Academy of Sciences, Moscow, Russia*; [3]*Insitute of Automation and Electrometry, Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia*; [4]*Novosibirsk State University, Novosibirsk, Russia*; [5]*Inversion Fiber Co. Ltd., Novosibirsk, Russia*

All-fiber continuous-wave Ho-doped laser utilizing the compressed Bragg grating reflector was realized with emission wavelength tuned from 2.1 to 2.045 μm and the maximum output power of 3.4 W with variation <7.5% over tuning range.

CJ-P.10 WED

Temporal and Statistical Properties of the Ytterbium Doped Fiber Laser

•*A. Bednyakova*[1,3], *O. Gorbunov*[2], *M. Politko*[2,3], *S. Kablukov*[2], *S. Smirnov*[3], *D. Churkin*[4,3], *M. Fedoruk*[1,3], *S. Turitsyn*[4], *and S. Babin*[2,3]; [1]*Institute of Computational Technologies SB RAS, Novosibirsk, Russia*; [2]*Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia*; [3]*Novosibirsk State University, Novosibirsk, Russia*; [4]*Aston Institute of Photonic Technologies, Birmingham,, United Kingdom*

We present experimental measurement and full numerical modelling of temporal and statistical properties of narrow-bandwidth quasi-CW Ytterbium doped fiber laser. Modelling demonstrates the same stochastic nature of the YDFL radiation as observed in experiment.

CJ-P.11 WED

Engineering Wavelength Conversion Span in Cascaded Broadband Cherenkov Radiation

•*S. Wang*[1], *J. Hu*[1], *H. Guo*[2], *and X. Zeng*[1,2]; [1]*Shanghai University, Shanghai, China, People's Republic of (PRC)*; [2]*Technical University of Denmark, Kgs. Lyngby, Denmark*

We propose an efficient approach of engineering the wavelength conversion over 500 nm through optical Cherenkov radiation. Cascaded soliton spectral tunneling is numerically demonstrated in two-segment photonic crystal fibers with three zero dispersion wavelengths.

CJ-P.12 WED

NLSE-based modelling of a random distributed feedback fiber laser

•*D. Churkin*[1,2] *and S. Smirnov*[3]; [1]*Aston University, Birmingham, United Kingdom*; [2]*Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia*; [3]*Novosibirsk State University, Novosibirsk, Russia*

For the first time we report full NLSE-based numerical modelling of a random distributed feedback fiber laser based on Rayleigh scattering, including calculation of spectral and statistical properties of radiation.

CJ-P.13 WED

Wavelength and Pulse Width Tunable 1 μm Yb-doped Programmable Fiber Laser

Y. Kim, A. Archambault, A. Dupuis, B. Burgoyne, G. Pena, and •*A. Villeneuve*; *Genia Photonics Inc., Laval, Canada*

We present an Yb programmable laser where the wavelength and the pulse width can be tuned independently. Wavelengths are tuned from 1020 to 1080 nm and the shortest pulse after compression is 4 ps.

CJ-P.14 WED

Gain-switched, Yb-doped, all-fiber laser with narrow bandwidth

•*C. Larsen*[1], *M. Giesberts*[2], *S. Nyga*[2], *O. Fitzau*[2], *H.D. Hoffmann*[2], *and O. Bang*[1,3]; [1]*DTU Fotonik - Department of Photonics Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark*; [2]*Fraunhofer-Institute for Lasertechnology, Aachen, Germany*; [3]*NKT Photonics A/S, Birkerød, Denmark*

We demonstrate that an all-fiber, narrow bandwidth, high pulse energy pulsed laser can be constructed from commercially available components by applying gain-switching. After single-stage amplification the pulses are frequency doubled in ppSLT with high efficiency.

CJ-P.15 WED

Annealing of pre-darkened ytterbium doped silica-Kinetic model

•*K.E. Mattsson*; *DTU Fotonik, Lyngby, Denmark*

A common description by =Si<O2-Yb color center three-electron bond energies is through a Markov state statistical model in this presentation shown to match annealing data from pre-darkened ytterbium co-doped silica material of several sources.

CJ-P.16 WED

Development of a cascaded Raman fiber laser with 6.5 W output power at 1480nm supported by detailed numerical simulations

•*M. Steinke*[1,2], *E. Schreiber*[1,2], *D. Kracht*[1,2], *J. Neumann*[1,2], *and P. Weßels*[1,2]; [1]*Laser Zentrum Hannover e.V., Hannover, Germany*; [2]*Centre for Quantum-Engineering and Space-Time Research - QUEST, Hannover, Germany*

A cascaded Raman fiber laser delivering 6.5W output power at 1480nm was developed and optimized with a detailed numerical analysis. Comparison of experimental and simulated results shows good agreement with respect to all significant parameters.

CJ-P.17 WED

Precision-dicing of Nd:YAG ridge waveguides: A new platform for efficient integrated lasers

•*D. Kip*[1], *C.E. Rüter*[1], *Y. Jia*[2], *F. Chen*[2], *S. Akhmadaliev*[3], *and S. Zhou*[3]; [1]*Helmut Schmidt University, Hamburg, Germany*; [2]*Shandong University, Jinan, China, People's Republic of (PRC)*; [3]*Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany*

Ridge channel waveguides in a neodymium-doped YAG crystals are fabricated using a combination of carbon ion implantation and diamond blade dicing, yielding high slope efficiency of 43% and output powers up to 84mW.

CJ-P.18 WED

30 W, CW Yb-doped fiber laser tunable over 144 nm

•*R. Royon*[1], *J. Lhermite*[1], *L. Sarger*[2], *and E. Cormier*[1]; [1]*CELIA BORDEAUX 1, TALENCE, France*; [2]*LOMA BORDEAUX 1, TALENCE, France*

An ytterbium-doped fiber laser continuously tunable from 976nm to 1120nm and delivering up to 30W of average power linearly-polarized is demonstrated. Moreover the bandwidth of our system can be tuned from 100pm to more than 1nm.

CJ-P.19 WED

Spectral width optimization in random DFB fiber laser

•*I. Vatnik*[1], *D. Churkin*[1,2], *and S. Babin*[1,3]; [1]*Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia*; [2]*Aston Institute of Photonic Technologies, Birmingham, United Kingdom*; [3]*Novosibirsk State University, Novosibirsk, Russia*

We experimentally study power and spectral properties of random distributed feedback laser depending on the cavity length. Increase of the random DFB fiber laser length results in narrower generation spectrum.

CJ-P.20 WED

High-power Widely Tunable Raman Fiber Laser

•*A. El-Taher*[1], *P. Harper*[1], *S. Babin*[2], *and S. Turitsyn*[1]; [1]*Aston University, Birmingham, United Kingdom*; [2]*Institute of Automation and Electrometry, Novosibirsk, Russia*

A possibility to greatly increase a tuning range and output power of the Raman fiber laser by combining effects of highly-nonlinear fiber and Rayleigh-scattering based feedback in the cavity has been demonstrated.

CJ-P.21 WED

Efficient Spectral Broadening and Recompression of 200 fs Pulses from a Monolithic Yb-FCPA to 66 fs

•*T. Flöry*[1], *K. Regelskis*[2], *A.J. Verhoef*[1], *I. Bugar*[1], *L. Zhu*[1], *A. Zheltikov*[3,4], *A. Fernández*[1], *and A. Baltuska*[1]; [1]*Institut für Photonik, Technische Universität Wien, Wien, Austria*; [2]*Center for Physical Sciences and Technology, Vilnius, Lithuania*; [3]*Institute for Quantum Studies, Department of Physics, College Station, United States*; [4]*International Laser Center, M.V. Lomonosov Moscow State University, Moscow, Russia*

We present pulse post-compression down to 66-fs of a 200-fs microjoule-level ytterbium-doped fiber chirped-pulse amplifier. Post-compression is achieved in a 20-cm long piece of large mode area fiber and subsequent compression in a prism compressor.

CJ-P.22 WED

All-fiber passively Q-switched Erbium/Samarium laser

•*C.E. Preda, G. Ravet, and P. Mégret*; *University of Mons, Mons, Belgium*

We present the experimental demonstration of a novel and simple all-fiber configuration, where an Er-doped fiber laser, using Sm-doped fiber as a saturable absorber, oscillates in self-Q-switch operation by using a cw pumping.

CJ-P.23 WED

Optical Parametric Amplification in Capillary-Assisted Chalcogenide Optical Fibers

•*S. Singh, S. Varshney, and P. Datta*; *Indian Institute of Technology, Kharagpur, India*

We present detailed theoretical investigation of tunable optical parametric amplification in a 20cm long capillary-assisted chalcogenide optical fiber pumped at 2.94μm wavelength with 20W CW laser for generation of wide bandwidth radiations in mid-infrared range.

CJ-P.24 WED

Square Pulse Generation from All-Normal-Dispersion Graphene Oxide Mode-Locked Yb-Doped Fiber Laser

•*Z. Cheng*[1], *S. Wu*[2], *Q.-H. Yang*[2], *and P. Wang*[1]; [1]*Institute of Laser Engineering, Beijing University of Technology, Beijing, China, People's Republic of (PRC)*; [2]*School of Chemical Engineering and Technology, Tianjin University, Tianjin, China, People's Republic of (PRC)*

We demonstrated a mode-locked Yb-doped fiber laser with graphene oxide as saturable absorber, delivering square-shaped nanosecond pulse with highest pulse energy of 137nJ. The laser spectrum was Lorentz-shaped at 1064.9nm with bandwidth of 0.19nm.

CJ-P.25 WED

Vapor-Phase Doping of Ytterbium in High Power Laser Fiber

•*R. Sen, M. Saha, A. Pal, and M. Pal*; *Fiber optics & Photonics Division, CSIR-Central glass & Ceramic Research Institute, Kolkata, India*

A state-of-the-art facility for vapor-phase deposition of rare-earth compounds has been established and process technology optimized for fabricating large core preforms/fibers doped with Yb- and Al- oxides with excellent longitudinal and radial uniformity.

CJ-P.26 WED

Single-pulse operation in actively Q-switched erbium-doped fiber lasers

•*Y. Barmenkov*[1], *L. Escalante-Zarate*[1], *S. Kolpakov*[2], *A. Kir'yanov*[1], *and M. Andres*[2]; [1]*Centro de Investigaciones en Optica, Leon, Mexico*; [2]*Universidad de Valencia, Valencia, Spain*

The features of an actively Q-switched erbium-doped fibre laser arranged in symmetric and quasi-symmetric configurations are reported. It is shown that single per modulation period Q-switch pulses without any multi-pulse structuration are attainable using both schemes.

CJ-P.27 WED

Suppression of photo-darkening by Ca additive in Yb-doped silica fiber

•*Y. Fujimoto*[1], *S.-i. Sugiyama*[2], *M. Murakami*[1], *H. Nakano*[2], *T. Sato*[3], *and H. Shiraga*[1]; [1]*Institute of Laser Engineering, Osaka University, Suita, Japan*; [2]*Kinki University, Faculty of science and Engineering, Higashiosaka City, Japan*; [3]*Shin-Etsu Quartz Products Co., Ltd., Koriyama, Japan*

We found that Ca additive effectively suppresses the photo-darkening effect in Yb-doped silica fiber even at 6.0 wt% of high Yb2O3 concentration. Ca ion works as a stabilizer to maintain the Yb3+ valence state.

CJ-P.28 WED

3.3 MHz repetition rate all-fiber laser oscillator mode-locked by polarization rotation in PM fiber

•*S. Boivinet*[1,2], *J.-B. Lecourt*[1], *A. Cserteg*[1], *D. Giannone*[1], *Y. Hernandez*[1], *and P. Mégret*[2]; [1]*Multitel, Mons, Belgium*; [2]*University of Mons, Mons, Belgium*

We present an all-fiber passively mode-locked laser at 1031 nm based on non-linear polarization evolution in fully polarization maintaining cavity. The pulses duration is 2.83 picoseconds at a repetition rate of 3.3 MHz.

CJ-P.29 WED

Fundamental Mode Amplification in 140 um Core Diameter Fiber

M. Vanhotsker, •*B. Shulga, and A. A. Ishaaya*; *Ben-Gurion University of the Negev, Beer-Sheva, Israel*

We experimentally demonstrate the preservation and amplification of the fundamental mode in highly multimode passive and active fibers. We investigate the performance as function of fiber length, coiling radius and amplification conditions.

CJ-P.30 WED

Infrared supercontinuum generation in soft-glass photonic crystal fiber pumped with a femtosecond Er-doped fiber laser mode-locked by graphene saturable absorber

•*R. Buczynski*[1,2], *G. Sobon*[3], *J. Sotor*[3], *G. Stepniewski*[1], *D. Pysz*[1], *T. Martynkien*[4], *M. Klimczak*[1], *R. Stepien*[1], *and K. Abramski*[3]; [1]*Department of Glass, Institute of Electronic Materials Technology, Warsaw, Poland*; [2]*Faculty of Physics, University of Warsaw, Warsaw, Poland*; [3]*Laser & Fiber Electronics Group, Wroclaw University of Technology, Wroclaw, Poland*; [4]*Instutute of Physics, Wroclaw University of Technology, Wroclaw, Poland*

A generation of flat, broadband infrared supercontinuum is reported in the single mode photonic crystal fiber made of lead-bismuth-galate glass. The fiber is pumped with a femtosecond Er-doped fiber laser mode-locked by graphene saturable absorber.

CJ-P.31 WED

Efficient single-frequency pulsed all-fibre amplifier for coherent lidar

•*C. Bollig, P.-G. Hofmeister, M. Kunze, J. Schmidt, S. Fayed, and R. Reuter*; *Physics Department, University of Oldenburg, Oldenburg, Germany*

An efficient Erbium-amplifier is demonstrated which delivers up to 20 uJ single-frequency pulses with 100 mW average power for only 800 mW of pump power. No signs of SBS were present at this power.

CJ-P.32 WED

Highly Efficient fs-Laser Inscribed Yb:YAG Waveguide Lasers Fabricated with a Novel Writing Scheme

T. Calmano[1], *S. Müller*[1], •*C. Kränkel*[1,2], *and G. Huber*[1,2]; [1]*Institute of Laser-Physics, University of Hamburg, Hamburg, Germany*; [2]*The Hamburg Centre for Ultrafast Imaging, Hamburg, Germany*

Femtosecond-laser written Yb(7%):YAG waveguide-lasers with a record high optical-to-optical efficiency of 67% and an output power of more than 1W are presented. For the waveguide fabrication a novel writing-scheme with an oscillating translation was applied.

CJ-P.33 WED

160 W single-frequency laser based on active tapered double-clad fiber amplifier

•*A. Trikshev*[1], *A. Kurkov*[1], *V. Tsvetkov*[1], *S. Filatova*[2], *J. Kertulla*[3], *V. Filippov*[3], *O. Okhotnikov*[3], *and Y. Chamorovskiy*[4]; [1]*Prokhorov General Physics Institute, Russian Academy of Sciences, Moscow, Russia*; [2]*Moscow State University of Instrument Engineering and Computer Science, Moscow, Russia*; [3]*Optoelectronics Research Centre, Tampere University of Technology, Tampere, Finland*; [4]*Institute of Radio Engineering and Electronics of the Russian Academy of Sciences, Moscow, Russia*

160 W single-frequency laser based on two stage fiber amplifiers is presented. A GTWave fiber is used for the first stage and tapered double-clad fiber is used for the second stage of amplifier.

CJ-P.34 WED

High-average-power nanosecond pulsed Yb-doped PCF fiber laser systems

•*T. Yamamura*[1,3], *H. Yoshida*[2], *K. Tsukamoto*[2], *H. Fujita*[2], *N. Miyanaga*[2], *M. Ishikawa*[1,3], *T. Sakagawa*[1,3], *and M. Tsukamoto*[4]; [1]*Kataoka Corp., Kyoto, Japan*; [2]*Institute of Laser Engineering, Osaka University, Osaka, Japan*; [3]*Advanced Laser and Process Technology Research Association, Tokyo, Japan*; [4]*Joining and Weiding Research Institute, Osaka University, Osaka, Japan*

We have developed a high-peak and high-average power Yb-doped rod PCF fiber laser system. The output power has been achieved to about 393 W by a 100-um PCF-rod type fiber.

CJ-P.35 WED

Pump Power Reduction by Photodarkening in Yb-doped Fibres

•*S. Yoo*[1], *N. Li*[2], *X. Yu*[2], *and J. Sahu*[3]; [1]*Nanyang Technological University, Singapore, Singapore*; [2]*Singapore Institute of Manufacturing Technology, Singapore, Singapore*; [3]*University of Southampton, Southampton, United Kingdom*

Hall B0

We present direct quantitative measurement of pump power reduction by photodarkening in Yb-doped fibres. Together with shortened fluorescence lifetime, the results experimentally reveal the photodarkening influences pump efficiency in addition to the excess background loss.

CJ-P.36 WED

Design curves based optimization and fabrication of a high gain Yb-Er co-doped optical amplifier based on phosphate glasses

•G.C. Scarpignato[1,3], J. Lousteau[2], E. Mura[1], N.G. Boetti[1], S. Abrate[2], D. Milanese[1], L. Bastard[3], and J.-E. Broquin[3]; [1]DISAT, Politecnico di Torino, Torino, Italy; [2]Istituto Superiore Mario Boella, Torino, Italy; [3]IMEP-LAHC UMR 5130, Grenoble, France

The current report discusses the fabrication and characterization of a short core pumped fiber amplifier based on Yb3+/Er3+ co-doped phosphate glasses. An original representation using design curves was specially developed for the optimization process.

CJ-P.37 WED

sub-50 fs all fiber yb-doped laser with anomalous-dispersion photonic crystal fiber

•Z. Zhang[1], Ç. Şenel[1,2], R. Hamid[2], and F.Ö. Ilday[1]; [1]Department of Physics, Bilkent University, Ankara, Turkey; [2]TUBITAK National Metrology Institute (UME), Kocaeli, Turkey

We demonstrate an all-fiber-integrated, dispersion-managed Yb-doped oscillator incorporating a segment of anomalous-dispersion PCF. Residual birefringence of the PCF is used as a fiber-integrated Lyot filter, which enables self-starting operation. Pulses are compressed to 42 fs.

CJ-P.38 WED

First demonstration of a laser emission in hybrid nanostructured optical fibres based on SiO2 / SnO2 system doped by ytterbium ions

G. Granger[1], C. Restoin[1], P. Roy[1], R. Jamier[1], S. Rougier[1], A. Lecomte[2], J.-M. Blondy[1], and •D. Gaponov[1]; [1]Xlim Research Institute, Limoges, France; [2]SPCTS, Limoges, France

In this contribution we demonstrate the first fabrication of SiO2 - SnO2 nanostructured optical fibre. The incorporation of ytterbium ions leads to an original laser emission.

CJ-P.39 WED

all-fiber dispersion-managed mode-locked Yb-doped fiber faser based on carbon nanotubes

•Z. Zhang[1], D. Popa[2], Z. Sun[2], T. Hasan[2], A. Ferrari[2], and F.Ö. Ilday[1]; [1]Department of Physics, Bilkent University, Ankara, Turkey; [2]Department of Engineering, University of Cambridge, Cambridge, United Kingdom

We have presented an all-fiber dispersion-managed Yb-doped fiber laser with SWNT SA. Using PCF for dispersion compensation, in the net normal dispersion regime mode-locked pulses with large linear chirp have been obtained, which can be compressed to 118 fs.

CJ-P.40 WED

Generation of ultrashort pulse with high peak power using Mach-Zehnder-modulator-based flat comb generator and chirped pulse amplification

•I. Morohashi[1], T. Sakamoto[1], K. Hara[2], M. Oikawa[2], T. Kawanishi[1], and I. Hosako[1]; [1]National Institute of Information and Communications Technology, Tokyo, Japan; [2]Optohub Co., Ltd, Saitama, Japan

By combining a Mach-Zehnder-modulator-based flat comb generator and a chirped pulse amplifier, high peak power ultrashort pulse generation was demonstrated. 200 fs-order pulse with the peak power of 3.5 kW were demonstrated.

CJ-P.41 WED

A novel seven-core multicore tellurite fiber

•T. Cheng, Z. Duan, M. Liao, W. Gao, D. Deng, T. Suzuki, and Y. Ohishi; Toyota Technological Institute, Nagoya, Japan

A novel seven-core multicore tellurite fiber is proposed and fabricated . Each core with high index is made of TLWMN glass. The background with low index is made of TZNL glass.

CJ-P.42 WED

Narrowband fibre laser using a cylindrical optical microresonator as feedback element

E. Rivera-Perez[1,2], •A. Diez[1], M.V. Andres[1], J.L. Cruz[1], and A. Rodriguez-Cobos[2]; [1]Departamento de Fisica Aplicada-ICMUV, Universidad de Valencia, Burjassot, Spain; [2]Instituto de Investigacion en Comunicacion Optica, San Luis Potosi, Mexico

A narrowband erbium doped fibre laser is presented. The feedback is provided by a WGM of a cylindrical microresonator. A single laser line with 50 dB signal-to-noise ratio and 35 kHz linewidth was achieved.

CJ-P.43 WED

Time- and Position-Dependant Modelling of High-Power Low-Repetition-Rate Er-Yb-Fiber Amplifier

I. Pavlov[1], E. Dulgergil[2], P. Elahi[1], and •F.O. Ilday[1]; [1]Bilkent University, Ankara, Turkey; [2]Meteksan Savunma Inc., Ankara, Turkey

We report numerical and experimental study of nanosecond-pulse propagation in Er-Yb-fiber laser-amplifier. Pulse shaping due to time-dependent gain saturation along the gain fiber is analyzed. We demonstrate 100-microjoule, 5-ns, 100-kHz pulses from an all-fiber system.

CJ-P.44 WED

Experimental Investigation of Bending Properties of Large Mode Area Photonic Crystal Fibre with Double Lattice Constant Structure

•M. Napierała[1,2], E. Bereś-Pawlik[3], P. Mergo[4], F. Berghmans[5], H. Thienpont[5], L. Jaroszewicz[2], and T. Nasilowski[1,2]; [1]InPhoTech Ltd., Warsaw, Poland; [2]Military University of Technology, Warsaw, Poland; [3]Wrocław University of Technology, Wrocław, Poland; [4]Maria Curie-Skłodowska University, Lublin, Poland; [5]Vrije Universiteit Brussel, Brussels, Belgium

We demonstrate LMA PCF with double lattice constant structure. Our fibre allows extracting the excellent quality beam from the very large core while bent around 10 cm radius, which is confirmed experimentally.

13:00 – 14:00

JSII-P: JSII Poster Session

JSII-P.1 WED

EMCCD imaging of strongly ionizing radioactive materials for safety and security

•J. Sand[1], S. Ihantola[2], K. Peräjärvi[2], H. Toivonen[2], A. Nicholl[3], E. Hrnecek[3], and J. Toivonen[1]; [1]Tampere University of Technology, Tampere, Finland; [2]STUK - Radiation and Nuclear Safety Authority Finland, Helsinki, Finland; [3]European Commission, Joint Research Centre, Institute for Transuranium Elements, Karlsruhe, Germany

An electron-multiplying camera is used in the imaging of alpha radiation-induced radioluminescence in air. The method enables rapid detection of strong alpha emitters in security and safety applications.

JSII-P.2 WED

Detection of Hazardous Substances Using Broadband-Tuneable Quantum Cascade Laser Based Mid-Infrared Spectroscopy

•F. Fuchs, S. Hugger, J. Jarvis, Q. Yang, R. Ostendorf, C. Schilling, R. Driad, R. Aidam, A. Bächle, W. Bronner, and J. Wagner; Fraunhofer Institute for Applied Solid State Physics IAF, Freiburg, Germany

The use of external cavity quantum cascade lasers for the detection of hazardous substances is reported. Stand-off detection of explosives employing imaging backscattering spectroscopy and detection of contaminants in water has been demonstrated.

JSII-P.3 WED

μ-Stripes high power quantum cascade lasers arrays

•M. Carras, B. Gerard, G.M. De Naurois, G. Maisons, B. Simozrag, and V. Trinité; III-V Lab, Palaiseau, France

We will introduce a new way to improve the power of the quantum cascade lasers while keeping a good beam quality: micro-stripes array technology.

13:00 – 14:00

II-P: II Poster Session

II-P.1 WED

High Q-factor plasmonic filters in nanoscale metal-insulator-metal waveguides

•P. Neutens[1,2], L. Lagae[1,2], and P. Van Dorpe[1,2]; [1]Imec, Leuven, Belgium; [2]KU Leuven department of Physics, Leuven, Belgium

We demonstrate by FDTD simulations that 1-D nanoscale photonic plasmonic crystals can be made with a top-down approach starting from a planar layer stack, improving the ease of fabrication and still obtaining Q-factors over 100.

II-P.2 WED

Phase evolution along integrated localized surface plasmon chain

M. Fevrier[1,2], P. Gogol[1,2], A. Apuzzo[3], S. Blaize[3], R. Megy[1,2], G. Lerondel[3], and •B. Dagens[1,2]; [1]Univ. Paris-Sud, Institut d'Electronique Fondamentale, Orsay, France; [2]CNRS, UMR 8622, Orsay, France; [3]Laboratoire de Nanotechnologie et d'Instrumentation Optique, CNRS-UMR 6279, Université de technologie de Troyes, Troyes, France

Phase evolution of localized surface plasmon (LSP) modes is measured along a periodic gold nanorod chain integrated on silicon waveguide. Numerical analysis of this phase at different wavelengths clarifies LSP mode excitation mechanisms.

II-P.3 WED

Harmonic generation in plasmonic nanowires

•*A. de Hoogh, M. Wulf, N. Rotenberg, and K. Kuipers; FOM Institute AMOLF, Amsterdam, The Netherlands*

Near-field measurements reveal efficient second and third harmonic generation from a surface plasmon polariton propagating along a plamonic nanowire. The influence of nanowire dimensions on the amplitude of the nonlinear signals is investigated.

II-P.4 WED

Passive plasmonic filters in metallic slot waveguides

•*P. Neutens[1,2], L. Lagae[1,2], and P. Van Dorpe[1,2]; [1]Imec, Leuven, Belgium; [2]KU Leuven department of Physics, Leuven, Belgium*

We present the numerical and experimental demonstration of plasmonic Bragg filters and resonators metallic slot waveguides. Tuning of the optical bandgap, the resonance center wavelength and the Q-factor will be shown.

II-P.5 WED

Tailoring channel plasmon polaritons in metallic V-grooves

•*C. Smith, A. Thilsted, R. Marie, C. Vannahme, and A. Kristensen; Technical University of Denmark, Kgs. Lyngby, Denmark*

The intensity distributions of channel plasmon polaritons in metallic V-groove waveguides are tailored via controlled variation of the V-shaped cross section profile. Experiments measuring propagation length and coupling efficiency agree with numerical simulations.

II-P.6 WED

Towards a microscopic description of the optical nonlinearities of gold-based plasmonic devices

•*F. Biancalana[2] and A. Marini[1]; [1]Max Planck Institute for the Science of Light, Erlangen, Germany; [2]Heriot-Watt University, Edinburgh, United Kingdom*

We describe the so-called thermo-modulational nonlinear effects on surface plasmon polaritons guided along gold nanowires, by introducing a NLS to model pulse propagation and predicting the appearance of a previously unknown intense spectral redshift.

II-P.7 WED

Reflection, Transmission, Absorption, Diffraction and Gain in Plasmonic-Photonic Ag-Capped Monolayers of Dye-Doped Nanospheres

•*N. Arnold, B. Ding, C. Hrelescu, and T.A. Klar; Institute of Applied Physics, Johannes Kepler University, Linz, Austria*

General framework for oblique irradiation modeling, which accounts for reflection, transmission absorption and diffraction, is presented. In our hybrid plasmonic-photonic structure, we find gain-enhanced extraordinary transmission, reflection, diffraction and various types of polarization conversion.

II-P.8 WED

Enhancing the fluorescence of thick-shell single CdSe-CdS nanocrystals through their coupling with plasmon resonances of gold films

•*D. Canneson[1], I. Mallek-Zouari[1], S. Buil[1], X. Quélin[1], C. Javaux[2], B. Mahler[2], B. Dubertret[2], and J.-P. Hermier[1,3]; [1]Groupe d'Etude de la Matière Condensée, Université de Versailles-Saint-Quentin-en-Yvelines, CNRS UMR8635, Versailles, France; [2]Laboratoire de Physique et d'Etude des Matériaux, CNRS UMR8213, Paris, France; [3]Institut Universitaire de France, Paris, France*

We investigate the classical and quantum properties of the emission of single CdSe-CdS nanocrystals with a thick shell coupled to plasmon modes of gold films. Strong enhancement of the nanocrystal fluorescence is reported.

II-P.9 WED

Second Harmonic Circular Dichroism from Au Covered Polystyrene Nanospheres

•*A. Belardini[1], G. Leahu[1], A. Benedetti[1], M. Centini[1], F. Mura[1], S. Sennato[1], C. Sibilia[1], F. Buatier de Mongeot[2], C. Martella[2], M. Giordano[2], and D. Chiappe[2]; [1]Univ.Roma 1 Dip SBAI, Roma, Italy; [2]Univ.Genova Dip Fisica, Genova, Italy*

Measurements of the second harmonic circular dichroism arising from polystyrene nanospheres partially capped by thin Au layer show the presence of a geometrical induced chiral response due to mutual coupling of the nanopatterned metal caps

II-P.10 WED

Optical magnetic response of laser fabricated Si nanoparticles

•*U. Zywietz[1], A. Evlyukhin[1], W. Cheng[1], S. Novikov[2], C. Reinhardt[1], S. Bozhevolnyi[2], and B. Chichkov[1]; [1]Laser Zentrum Hannover e. V., Hannover, Germany; [2]Institute of Technology and Innovation, Odense M, Denmark*

Femtosecond laser-induced transfer is used to fabricate spherical Si nanoparticles with unique characteristics. Measured light scattering spectra of individual Si nanoparticles with radii of 50-300 nm demonstrate strong resonant responses in the visible spectral range.

II-P.11 WED

Direct mapping of plasmonic near-fields using infrared far-field vibrational spectroscopy

•*D. Dregely[1], F. Neubrech[1], H. Duan[2], and H. Giessen[1]; [1]4th Physics Institute and Research Center SCoPE, University of Stuttgart, Stuttgart, Germany; [2]Department of Physics and Microelectronics, Hunan University, Changsha, China, People's Republic of (PRC)*

We mapped plasmonic near-field intensities by resonantly enhanced infrared far-field spectroscopy. We positioned a molecular probe at different locations of plasmonic antennas and measured the local vibrational signal with FTIR spectroscopy.

II-P.12 WED

Nonlinear gyrotropy in isotropic metamaterials

•*I. Shadrivov; Australian National University, Canberra, Australia*

We propose and demonstrate experimentally a metamaterial which chirality can be dynamically induced in a non-chiral medium. This becomes possible in a racemic mixture of metallic spirals, where one type of spirals is nonlinear.

II-P.13 WED

3D Metallic Photonic Crystals with Optical Bandgaps

•*M. Farsari, I. Sakellari, N. Vasilantonakis, K. Terzaki, D. Gray, C. Soukoulis, M. Vamvakaki, and M. Kafesaki; IESL-FORTH, Heraklion, Greece*

We present the fabrication and characterization of high resolution, three-dimensional metallic woodpile structures, with bandgaps at optical wavelengths. These are made using Direct fs Laser Writing and selective metallization with electroless plating.

II-P.14 WED

Non-Radiating Excitations, Vector Potential Waves and Toroidal Metamaterials

•*V. Savinov[1], V.A. Fedotov[1], A.V. Rogacheva[1], D.P. Tsai[2,3], and N.I. Zheludev[1,4]; [1]Optoelectronics Research Centre & Centre for Photonic Metamaterials, University of Southampton, Southampton, United Kingdom; [2]Department of Physics, National Taiwan University, Taipei, Taiwan, China, Republic of (ROC); [3]Research Center for Applied Sciences, Academia Sinica, Taipei, Taiwan, China, Republic of (ROC); [4]Centre for Disruptive Photonic Technologies, Nanyang Technological University, Singapore, Singapore*

We report on electromagnetic metamaterials that exploit interference between electrical and toroidal dipolar modes of excitation to generate non-trivial gauge-irreducible vector potential in the absence of scattered electromagnetic fields.

II-P.15 WED

Plasmonic Crystals for solid-state lighting

•*G. Lozano[1], S.R. Rodriguez[1], M.A. Vercshuuren[2], and J. Gomez Rivas[1,3]; [1]FOM Institute AMOLF, Eindhoven, The Netherlands; [2]Philips Research, Eindhoven, The Netherlands; [3]COBRA Institute, Eindhoven University of Technology, Eindhoven, The Netherlands*

It is generally believed that plasmonic structures only provide benefits for light emission when used with low quantum efficiency emitters. Herein we demonstrate a very large emission increase using emitters developed for solid-state lighting applications.

II-P.16 WED

A study in geometry: interferometric control of resonant coupling

•*N. Rotenberg[1], D.M. Beggs[1], J.E. Sipe[2], and K. Kuipers[1]; [1]FOM Institute AMOLF, Amsterdam, The Netherlands; [2]University of Toronto, Toronto, Canada*

Control over resonant coupling is demonstrated using two-component gratings that provide two coupling pathways. By tuning the relative phase between the two components, coupling to surface plasmons can be turned on/off, or made directional.

II-P.17 WED

Effective medium theory for Kapitza stratified media

•*A. Ciattoni[1] and C. Rizza[2]; [1]Consiglio Nazionale delle Ricerche, CNR-SPIN, Coppito, L'Aquila, Italy; [2]Dipartimento di Scienza e Alta Tecnologia, Università dell'Insubria, Como, Italy*

We show that a medium with rapidly and deeply modulated permittivity hosts a novel regime of diffractionless propagation. Results are checked through the exact transmissivity analysis of a large modulation depth metal-dielectric layered slab.

Hall B0

13:00 – 14:00

JSIII-P: JSIII Poster Session

JSIII-P.1 WED

Stabilizing optical rogue waves with fiber topography

•*A. Bendahmane*[1], *A. Mussot*[1], *A. Kudlinski*[1], *G. Genty*[2], *and J. Dudley*[3]; [1] *Laboratoire PhLAM UMR CNRS 8523, IRCICA, Université Lille 1, Villeneuve d'Ascq, France*; [2] *Tampere University of Technology, Optics Laboratory, Tampere, Finland*; [3] *Institut FEMTO-ST, UMR CNRS 6174, Université de Franche-Comté, Besançon, France*

We demonstrate for the first time that a particular fiber topography can lead to sustained optical rogue waves. Experimental feasibility of implementing such a varying-topography along a photonic crystal fiber is also discussed.

JSIII-P.2 WED

Shallow water rogue waves in nonlinear optical fibers

•*S. Wabnitz*[1], *C. Finot*[2], *J. Fatome*[2], *and G. Millot*[2]; [1] *Dipartimento di Ingegneria dell Informazione, Università degli Studi di Brescia, Brescia, Italy*; [2] *Laboratoire Interdisciplinaire Carnot de Bourgogne, Dijon, France*

Propagation of a phase modulated continuous wave in normally dispersive optical fibers leads to self-similar and flat-top pulses called flaticons. Upon collision, flaticons merge into a single, high-intensity rogue pulse analogous to sneaker waves.

JSIII-P.3 WED

Experimental demonstration of Rogue waves in disordered Luneburg-type photonic networks

•*I. Pitsios*[1,2], *M. Mattheakis*[3], *M. Thevenet*[1], *D. Gray*[1], *G.P. Tsironis*[1,3], *and S. Tzotzakis*[1,2]; [1] *Institute of Electronic Structure and Laser, Foundation for Research and Technology Hellas, Heraklion, Greece*; [2] *Materials Science and Technology Department, University of Crete, Heraklion, Greece*; [3] *Physics Department, University of Crete, Heraklion, Greece*

We study extreme waves in disordered Luneburg-type photonic networks demonstrating both experimentally and numerically the existence of rogue waves. We discuss the conditions the phenomenon appears and compare to other systems in optics.

JSIII-P.4 WED

Observation of a Photonic Berezinski-Kosterlitz-Thouless Transition

G. Situ[1] *and* •*J. Fleischer*[2]; [1] *Shanghai Institute of Optics and Fine Mechanics, Shanghai, China, People's Republic of (PRC)*; [2] *Princeton University, Princeton, United States*

The contribution has been withdrawn by the authors.

JSIII-P.5 WED

Long-range Correlations and the Random Mass Dirac Model on an Integrated Optical Platform

•*R. Keil*[1], *J. Zeuner*[1], *F. Dreisow*[1], *M. Heinrich*[1,2], *A. Tünnermann*[1], *S. Nolte*[1], *and A. Szameit*[1]; [1] *Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Jena, Germany*; [2] *CREOL, The College of Optics & Photonics, University of Central Florida, Orlando, United States*

The Dirac equation with spatial mass disorder is emulated by an ensemble of waveguide lattices, including the regime of power-law decaying correlation functions. The results apply to Dirac fermions and a variety of magnetic solids.

JSIII-P.6 WED

Coherent and Incoherent Rogue Waves in Seeded Supercontinuum Generation

•*S.T. Sørensen*[1], *C. Larsen*[1], *U. Møller*[1], *P.M. Moselund*[2], *C.L. Thomsen*[2], *and O. Bang*[1,2]; [1] *DTU Fotonik, Technical University of Denmark, Kgs. Lyngby, Denmark*; [2] *NKT Photonics A/S, Birkerød, Denmark*

Deterministic supercontinuum can be generated by seeding the modulation instability-induced pulse break-up. We investigate the influence of the modulation instability gain on seeding and demonstrate the generation of coherent and incoherent rogue waves.

JSIII-P.7 WED

Transition from diffraction in regular to Anderson localization in randomized nondiffracting photonic structures

•*M. Boguslawski, S. Brake, P. Rose, F. Diebel, and C. Denz*; *Institue of Applied Physics and Center for Nonlinear Science (CeNoS), Muenster, Germany*

We report on the experimental realizations of Anderson localization in optically induced randomized potentials. Implementing nondiffracting beams of randomized intensities offers a powerful method to bring disorder into regular structures.

NOTES

ROOM 1

8:30 – 10:00

CJ-9: Raman Effects in Fibre Sources

Chair: Ryszard Buczynski, University of Warsaw, Warsaw, Poland

CJ-9.1 THU 8:30

Radial and azimuthal polarized all-fiber Raman oscillator

•*C. Jocher[1], C. Jauregui[1], M. Becker[2], M. Rothhardt[2], J. Limpert[1,3], and A. Tünnermann1[1,3,4]; [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Jena, Germany; [2]Institute of Photonic Technology, Jena, Germany; [3]Helmholtz-Institute Jena, Jena, Germany; [4]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

We demonstrate an all-fiber Raman fiber oscillator for the generation of radially and azimuthally polarized beams. The influence and compensation of elliptical fiber cores is theoretically and experimentally investigated.

CJ-9.2 THU 8:45

Fibre Raman laser directly pumped by multimode laser diode at 975 nm

•*T. Yao and J. Nilsson; Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom*

We present the first-ever continuous-wave fiber Raman laser pumped directly by multimode diodes. The output power reaches 4 W at 1019 nm and the slope efficiency 55% with 3 km of multimode graded-index fiber.

CJ-9.3 THU 9:00

Raman Gain and Random Distributed Feedback Generation in Nitrogen Doped Silica Core Fiber

•*A. Lanin[1], D. Churkin[1,2], K. Golant[3], and S. Turitsyn[1]; [1]Aston University, Birmingham, United Kingdom; [2]Institute of Automation*

ROOM 4a

8:30 – 10:00

II-3: Controlling and Harvesting Light with Plasmons

Chair: Thomas Klar, Johannes-Kepler-Universität, Linz, Austria

II-3.1 THU (Invited) 8:30

Plasmon Induced Light Harvesting

•*P. Nordlander; Rice University, Houston, United States*

Plasmons are can focus light into to nanometer sized hotspots and also be efficient sources of hot energetic electrons. These processes can be exploited in light harvesting applications.

II-3.2 THU 9:00

Tunable light emission in Reconfigurable Plasmonic Metamaterials

•*G. Adamo[3,1], W.T. Chen[2], E. Plum[1], J.-Y. Ou[1], J. So[1], D.P. Tsai[2], and N. Zheludev[1,3]; [1]Optoelectronics Research Centre & Centre for Photonics Metamaterials, Univer-*

ROOM 4b

8:30 – 10:00

CH-4: Metrology of Materials and Structures

Chair: Stefano Selleri, University of Parma, Italy

CH-4.1 THU 8:30

Spectral-Domain Low-Coherence Dynamic Light Scattering and Its Application to Measurement of the Air-Liquid Interface Effect

•*T. Watarai and T. Iwai; Tokyo University of Agriculture and Technology, Koganei, Japan*

The proposed method realizes seamless measurements of the diffusion phenomenon of particles depending on the scattering position without any scanning operation.

The experimental results showed the decrease of the diffusion coefficient close to the interface.

CH-4.2 THU 8:45

Assessment of used Turbine Blades on and beneath the Surface for Product Regeneration: Generation of a Damage Model based on Reflection, Geometry Measurement and Thermography

•*M. Krauß[1], W. Frackowiak[2], A. Pösch[1], M. Kästner[1], W. Reimche[2], E. Reithmeier[1], and H.J. Maier[2]; [1]Leibniz Universität Hannover : Institute of Measurement and Automatic Control, Hannover, Germany; [2]Leibniz Universität Hannover : Institute of Materials Science, Hannover, Germany*

For the inspection of used parts from aero engines a hierarchical inspection is developed. This multiscale approach uses hints from the macro scale to determine areas for a higher resolution measurement with different sensor principles.

CH-4.3 THU 9:00

Optical Spectroscopy in the time-domain beyond 1.1 μm: a tool for the characterization of diffusive media

•*A. Farina[1], I. Bargigia[2], A. Bahgat Shehata[3], A. Dalla Mora[2], A. Tosi[3], F. Zappa[3], P. Taroni[2], R. Cubeddu[1,2], and A. Pifferi[1,2];*

ROOM 13a

8:30 – 10:00

CK-7: Advanced Structures for Light Sources

Chair: Markus Pollnau, University of Twente, The Netherlands

CK-7.1 THU 8:30

Single Photon Nanophotonics Using NV Centers in Three-Dimensional Laser-Written Microstructures

•*A.W. Schell[1], J. Kaschke[2], J. Fischer[2], R. Henze[1], J. Wolters[1], M. Wegener[2], and O. Benson[1]; [1]Humboldt-Universität zu Berlin - AG Nanooptik, Berlin, Germany; [2]Institute of Applied Physics, DFG-Center for Functional Nanostructures, Institute of Nanotechnology, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany*

Combination of NV-center-containing nanodiamonds with a photoresist for 3D two-photon laser-lithography allows for easy integration and combination of single-photon emitters and microstructures. Single-photon emission from different 3D quantum-photonic elements like waveguides and resonators is shown.

CK-7.2 THU 8:45

On-Chip Quantum Optics with Electrically Driven Quantum Dot Micropillar Cavities

C. Hopfmann[1], F. Albert[2], E. Stock[1], M. Lermer[2], C. Schneider[2], S. Höfling[2], A. Forchel[2], M. Kamp[2], and •S. Reitzenstein[1]; [1]Technische Universität Berlin, Berlin, Germany; [2]Universität Würzburg, Würzburg, Germany

A novel concept for on-chip quantum optics using an internal electrically pumped microlaser is presented. The microlaser resonantly excites a quantum dot - microcavity system operating in the weak coupling regime of cavity quantum electrodynamics.

CK-7.3 THU 9:00

A laser diode for integrated photon pair generation at telecom wavelength

G. Boucher[1], A. Orieux[1], F. Boitier[1], •A. Eckstein[1], E. Galopin[2], A. Lemaître[2], C. Manquest[1], I. Favero[1], G. Leo[1], and S. Ducci[1]; [1]Université Paris Diderot, Sor-

ROOM 13b

8:30 – 10:00

CB-7: Semiconductor Lasers for Optical Communications

Chair: Erwin Bente, Technische Universiteit, Eindhoven, Netherlands

CB-7.1 THU 8:30

High-Speed Oxide Confined 850-nm VCSELs Operating Error-Free at 47 Gbit/s at room temperature and 40 Gbit/s at 85°C

P. Westbergh[1], R. Safaisini[1], E. Haglund[1], J.S. Gustavsson[1], •A. Larsson[1], and A. Joel[2]; [1]Chalmers University of Technology, Göteborg, Sweden; [2]IQE Europe Ltd., Cardiff, United Kingdom

We demonstrate high-speed VCSELs capable of reaching small signal modulation bandwidths up to 28 GHz and error-free data transmission up to 47 Gbit/s at room temperature and 40 Gbit/s at 85°C.

CB-7.2 THU 8:45

Transmission over 50 km using a directly modulated integrated two-section discrete mode laser at 1550 nm

•*J. O'Carroll[1,2], P.M. Anandarajah[1], R. Zhou[1], R. Phelan[2], B. Kelly[2], J. O'Gorman[3], and L.P. Barry[1]; [1]The Rince Institute, Dublin City University, Dublin, Republic of Ireland; [2]Eblana Photonics Ltd., Dublin, Republic of Ireland; [3]Xylophone Optics Ltd., Dublin, Republic of Ireland*

A two-section device is presented, where optical injection from an integrated master to a slave laser is used to improve the device parameters, including its transmission performance. Transmission over 50 km is demonstrated at 1550nm.

CB-7.3 THU (Invited) 9:00

Multi-wavelength Hybrid Silicon Lasers for Optical Interconnects

•*M. Heck, M. Davenport, G. Kurczveil, S. Jain, and J. Bowers; University of California Santa Barbara, Santa Barbara, United States*

Integrated multi-wavelength sources are

ROOM 14a

8:30 – 10:00

IB-5: Quantum Communication

Chair: Allessandro Fedrizzi, University of Queensland, Brisbane St Lucia, Australia

IB-5.1 THU 8:30

Free space quantum key distribution over 500 meters using electrically driven quantum dot single photon sources

•*M. Rau*[1], *T. Heindel*[2], *S. Unsleber*[2], *C. Schneider*[3], *S. Frick*[1], *G. Vest*[1], *S. Nauerth*[1], *M. Lermer*[3], *M. Kamp*[3], *S. Reitzenstein*[2], *A. Forchel*[3], *S. Höfling*[3], *and H. Weinfurter*[1,4]; [1]*Fakultät für Physik, Ludwig-Maximilians-Universität München, Germany*; [2]*Institut für Festkörperphysik, Technische Universität Berlin, Germany*; [3]*Technische Physik and Wilhelm Conrad Röntgen Research Center for Complex Material Systems, Universität Würzburg, Germany*; [4]*Max-Planck-Institut für Quantenoptik, Garching, Germany*

We successfully demonstrated freespace QKD using electrically driven InAs quantum dot single photon sources embedded in micropillar cavities. The electrical excitation scheme allows a much tighter integration of the source compared to optically pumped schemes.

IB-5.2 THU 8:45

Quantum information in the presence of loss

•*J. Rarity, A.B. Young, B. Bell, and C. Hu*; *Merchant Venturers School of Engineering, Bristol, United Kingdom*

We will examine the limitations losses pose to quantum information tasks, and summarise novel ways in which to circumvent losses to perform quantum metrology and loophole free violations of bell inequalities.

IB-5.3 THU 9:00

Experimental demonstration of continuous-variable quantum key distribution over 80 km of standard telecom fiber

•*P. Jouguet*[1,2], *S. Kunz-Jacques*[2], *A. Leverrier*[3], *P. Grangier*[4], *and E. Diamanti*[1];

ROOM 14b

8:30 – 10:00

CF/IE-10: Ultrafast Spectroscopy

Chair: Hristo Iglev, Technishe Universität München, Munich, Germany

CF/IE-10.1 THU 8:30

Time-resolved Measurement of Vibrational Wave-Packet Dynamics of H2+ Using Multicolor Probe Pulses

•*Y. Furukawa*[1], *T. Okino*[2,1], *Y. Nabekawa*[1], *A. Eilanlou*[1], *E. Takahashi*[1], *K. Yamanouchi*[2], *and K. Midorikawa*[1]; [1]*RIKEN Advanced Science Institute, Wako, Japan*; [2]*The University of Tokyo, Bunkyo, Japan*

We report on a real-time imaging of the ultrafast vibrational wave-packet dynamics of molecular hydrogen ions performed with an extreme ultraviolet pump and multicolor probe pulses generated through high harmonic generation scheme.

CF/IE-10.2 THU 8:45

Dynamical coupling of molecular rotation and Coulomb explosion

•*S. Weber*[1,2], *M. Oppermann*[1], *L. Frasinski*[1], *and J. Marangos*[1]; [1]*Imperial College London, London, United Kingdom*; [2]*CEA Saclay, IRAMIS, Service des Photons, Atomes et Molécules, Gif-sur-Yvette, France*

The first observation of 1/8th rotational revival in impulsively aligned CO2 molecules probed by Coulomb explosion is reported. Such a dynamic gives insight in the coupling arising between rotation wavepacket and strong field dynamic.

CF/IE-10.3 THU 9:00

Time-resolved cluster dynamics driven by 1.5-micrometer laser pulses

H. Ruf[1], *M. Negro*[2], *B. Fabre*[1], *D. Staedter*[3], *F. Dorchies*[1], *M. Devetta*[2], *C. Vozzi*[2], *Y. Mairesse*[1], *and* •*S. Stagira*[2]; [1]*Centre Lasers Intenses et Applications, Université de Bor-*

ROOM 21

8:30 – 10:00

IA-7: Cavity-Opto Mechanics

Chair: Stephan Ritter, Max-Planck-Institut für Quantenoptik, Garching, Germany

IA-7.1 THU 8:30

Optomechanical Dark Mode

•*H. Wang, C. Dong, V. Fiore, and M. Kuzyk*; *University of Oregon, Eugene, Oregon, United States*

We demonstrate an optomechanical dark mode that decouples from the mechanical oscillator, but enables state transfer between optical modes, providing a mechanism for pursuing quantum optomechanics without cooling the mechanical system to its ground state.

IA-7.2 THU 8:45

Optomechanically Induced Transparency in a Membrane-in-The-Middle Setup at Room Temperature

M. Karuza[1,2], *C. Biancofiore*[1], *P. Zucconi Galli Fonseca*[1], *M. Galassi*[1], *R. Natali*[1], *P. Tombesi*[1], *G. Di Giuseppe*[1], *and* •*D. Vitali*[1]; [1]*School of Science and Technology, University of Camerino, Camerino, Italy*; [2]*Department of Physics, University of Rijeka, Rijeka, Croatia*

We demonstrate electromagnetically induced transparency in a cavity optomechanics setup formed by a thin semitransparent membrane within a cavity. We infer a pulse delay of hundreds of microseconds, tunable by shifting the membrane.

IA-7.3 THU 9:00

Cavity Optomechanics With Photonic Crystal Nanomembrane

•*M. Kevin*[1], *A. Thomas*[1], *K. Aurélien*[1], *D. Samuel*[1], *B. Tristan*[1], *C. Pierre-François*[1], *H. Antoine*[1], *R.-P. Isabelle*[2], *and B. Remy*[2]; [1]*Laboratoire Kastler Brossel, Paris, France*;

ROOM 22

8:30 – 10:00

CG-4: Ultrafast High Power Lasers

Chair: Peter Dombi, Wigner Research Centre for Physics, Budapest, Hungary

CG-4.1 THU 8:30

ELI-ALPS, the Attosecond Facility of the Extreme Light Infrastructure

D. Charalambidis[1,2], *Z. Diveki*[1,3], *P. Dombi*[1,4,5], *J.A. Fulop*[1,6], *M. Kalashnikov*[1,7], *R. Lopez-Martens*[1,8], •*K. Osvay*[1,9], *and E. Racz*[1,10]; [1]*ELI-Hu Nkft.,, Szeged, Hungary*; [2]*FORTH, Crete, Greece*; [3]*Imperial College, London, United Kingdom*; [4]*Max-Planck Institut für Quantenoptik, Garching, Germany*; [5]*Wigner Research Centre for Physics, Budapest, Hungary*; [6]*MTA-PTE High-Field THz Research Group, Pecs, Hungary*; [7]*Max-Born-Institut, Berlin, Germany*; [8]*Laboratoire d*Optique Appliquee, Palaiseau, France*; [9]*University of Szeged, Szeged, Hungary*; [10]*Obuda University, Budapest, Hungary*

The ELI-ALPS facility is a laser-based research infrastructure where cutting-edge very few cycle intense laser pulses and attosecond light sources are to be implemented and used for basic and applied research.

CG-4.2 THU 8:45

ELI Extreme Light Infrastructure Science and Technology with ultra intense Lasers

•*G. Korn, B. LeGarrec, and B. Rus*; *ELI Beamlines, Prague, Czech Republic*

We will be giving an overview on the development of the ELI-beamline facility. The main objective of the ELI-Beamlines Project is delivery of ultra-short high-energy pulses for the generation and applications of high-brightness X-ray sources and accelerated particles.

CG-4.3 THU 9:00

Sub-5-fs Multi-TW Optical Parametric Synthesizer

•*L. Veisz*[1], *D. Rivas*[1], *G. Marcus*[1], *X. Gu*[1], *D. Cardenas*[1], *J. Mikhailova*[1], *A. Buck*[1,2], *T. Wittmann*[1], *C. Sears*[1], *J. Xu*[1], *D. Herrmann*[3], *O. Razskazovskaya*[2], *V. Pervak*[2], *and F.*

ROOM EINSTEIN

8:30 – 10:00

IH-3: Controlling Light Emission at the Nanoscale

Chair: Willem L. Vos, University of Twente, Enschede, The Netherlands

IH-3.1 THU 8:30

Quantum efficiency of single NV centers in nanodiamonds

•*A. Mohtashami, M. Frimmer, and A.F. Koenderink*; *FOM Institute AMOLF, Amsterdam, The Netherlands*

We report on the first experimental quantification of the quantum efficiency of single NV centers in nanodiamonds. Using a nanomechanically moving mirror to apply calibrated LDOS variations, we find quantum efficiencies between 10% and 90%.

IH-3.2 THU 8:45

Magneto-Electric Antennas for Directed Light Emission

•*I.M. Hancu*[1], *A.G. Curto*[1], *M. Castro-López*[1], *M. Kuttge*[1], *and N.F. van Hulst*[1,2]; [1]*ICFO - The Institute of Photonic Sciences, Castelldefels, Spain*; [2]*Institució Catalana de Recerca i Estudis Avançats (ICREA), Barcelona, Spain*

We demonstrate directional light emission from split-ring resonators by exploiting the interference of their magnetic and electric dipole moments. These subwavelength antennas are broadband and robust with respect to the position of local sources.

IH-3.3 THU (Invited) 9:00

Accessing Forbidden Transitions: Magnetic Dipoles and Electric Quadrupoles for Nano-Optics

•*R. Zia*; *Brown University, Providence, United States*

We demonstrate how naturally occurring

ROOM 1

and Electrometry SB RAS, Novosibirsk, Russia; [3]Kotel'nikov Institute of Radio Engineering and Electronics of RAS, Moscow, Russia
Random distributed feedback laser generation is demonstrated for the first time in nitrogen doped fiber. High Raman gain coefficient results in efficient random generation in fiber of 500 meters only.

CJ-9.4 THU 9:15

Raman-driven destabilization of giant-chirp oscillators: fundamental limitations to energy scalability

•*C. Aguergaray, A. Runge, M. Erkintalo, and N. Broderick; Auckland University, Auckland, New Zealand*

We study the destabilization of a GCO mode-locking operation through the emergence of a frequency-downshifted Stokes signal. Our results indicate that SRS imposes an ultimate limit on the energy scalability of GCO via cavity lengthening.

CJ-9.5 THU 9:30

Raman soliton amplification by Tm-Ho:fiber for high-efficiency Watt-level ultrashort pulses in the range 1.8-1.92 um

•*N. Coluccelli, M. Cassinerio, G. Galzerano, and P. Laporta; Dipartimento di Fisica - Politecnico di Milano and Istituto di Fotonica e Nanotecnologie - CNR, Milan, Italy*

Tm-Ho:fiber amplifier seeded by low-power raman soliton is reported. 250-MHz pulse trains tunable from 1.84 to 1.92 *m with corresponding powers from 2.5 to 3 W and durations from 70 to 90 fs are demonstrated.

ROOM 4a

sity of Southampton, Southampton, United Kingdom; [2]Department of Physics, National Taiwan University, Taipei, China, Republic of (ROC); [3]Centre for Disruptive Photonics Technologies, Nanyang Technological University, Singapore, Singapore
We show that new intense luminescence lines associated with collective plasmonic states can be artificially created by metamaterial nanostructuring of plasmonic metals and tuned by electrical nanoscale reconfiguration of metamaterial

II-3.3 THU 9:15

Large Area Self-Assembled Plasmonic-Photonic Crystals for Spectral and Directional Reshaping of Fluorescence

•*C. Hrelescu[1], B. Ding[1], N. Arnold[1], G. Isic[1,2], and T.A. Klar[1]; [1]Institute of Applied Physics, Johannes Kepler University, Linz, Austria; [2]Institute of Physics, University of Belgrade, Belgrade, Serbia and Montenegro*

We report on the spectral and directional modification of fluorescence by hybrid plasmonic-photonic structures. Spectroscopic experiments and numerical simulations reveal different fluorescence coupling mechanisms to dispersive photonic crystal modes and to localized void plasmons.

II-3.4 THU 9:30

Noninvasive optical glucose monitoring at physiological levels using a functionalized plasmonic sensor

•*M. Mesch[1], C. Zhang[2], P.V. Braun[2], P. Rapp[3], C. Tarin[3], and H. Giessen[1]; [1]4th Physics Institute and Research Center SCoPE, University of Stuttgart, Germany; [2]Department of Materials Science and Engineering, University of Illinois, Urbana-Champaign, USA; [3]Institute for System Dynamics, University of Stuttgart, Germany*

We demonstrate noninvasive glucose monitoring using optical measurements of a plasmonic nanostructure that was functionalized using aminophenyboronic acid. This allows detection of the glucose in the vicinity of the gold nanostructure reproducibly at millimolar levels.

ROOM 4b

[1]Consiglio Nazionale delle Ricerche, Milano, Italy; [2]Politecnico di Milano-Dipartimento di Fisica, Milano, Italy; [3]Politecnico di Milano-Dipartimento di Elettronica, Informazione e Bioingegneria, Milano, Italy
A system for time-resolved diffuse optical spectroscopy for wavelengths longer than 1.1 μm is used for the characterization of some media like lipid, collagen, fruit and ex-vivo bone.

CH-4.4 THU 9:15

Nanometer Optical Coherence Tomography using broad-bandwidth XUV and soft x-ray radiation - XCT

•*S. Fuchs[1,2], A. Blinne[1], C. Rödel[1,2], U. Zastrau[1], V. Hilbert[1], M. Wünsche[1], E. Förster[1,2], and G.G. Paulus[1,2]; [1]Institute of Optics and Quantum Electronics, University of Jena, Jena, Germany; [2]Helmholtz Institute Jena, Jena, Germany*

We report on the extension of Optical Coherence Tomography using extreme ultraviolet and soft x-ray radiation and demonstrate an axial resolution of nanometers in silicon- and carbon-based samples.

CH-4.5 THU (Invited) 9:30

Phase-space Measurement and Coherence Synthesis of Optical Beams

L. Waller[1], G. Situ[2], and •J. Fleischer[3]; [1]University of California, Berkeley, Berkeley, United States; [2]Shanghai Institute of Optics and Fine Mechanics, Shanghai, China, People's Republic of (PRC); [3]Princeton University, Princeton, United States

We present new methods of creating and recording the four-dimensional {x,y,k_x,k_y} phase space of optical beams. We give examples of coherence structures that cannot be discovered using traditional intensity measurements in x-space or k-space only.

ROOM 13a

bonne Paris Cité, Laboratoire Matériaux et Phénomènes Quantiques, CNRS-UMR 7162,, Paris, France; [2]Laboratoire de Photonique et Nanostructures, CNRS-UPR20, Marcoussis, France
We report on electrically pumped Bragg mode lasing at 782 nm at room temperature in an AlGaAs structure designed for type-II internal parametric down conversion showing a second harmonic generation efficiency of 35 %W-1cm-2.

CK-7.4 THU 9:15

Shedding light on periodic orbits in triangular organic micro-billiard lasers

•*C. Lafargue[1], S. Bittner[1], C. Ulysse[2], A. Grigis[3], J. Zyss[1], and M. Lebental[1]; [1]Ecole normale supérieure de Cachan, Cachan, France; [2]Laboratoire de Photonique et de Nanostructures, Marcoussis, France; [3]Université Paris 13, Villetaneuse, France*

Organic microlasers of triangular shapes are investigated experimentally and the periodic orbits on which the lasing modes are based are determined. This allows new insights into the unsolved mathematical problem of periodic orbits in triangles

CK-7.5 THU 9:30

Multilayer distributed feedback dye lasers: Enhanced emission wavelength and sensing

•*C. Vannahme, C.L.C. Smith, M. Leung, F. Richter, M. Brøkner Christiansen, and A. Kristensen; Department of Micro- and Nanotechnology, Technical University of Denmark, DTU Nanotech, Kgs. Lyngby, Denmark*

Simple yet precise emission wavelength modelling of multilayer hybrid distributed feedback dye lasers is presented. The influence of the thickness of a high index top layer on emission wavelength and sensitivity is examined.

ROOM 13b

essential components for future high-capacity optical interconnects. We present our work on integrated hybrid silicon arrayed-waveguide grating-based lasers, mode-locked comb lasers and wideband quantum-well-intermixed single-frequency laser arrays.

CB-7.4 THU 9:30

Multi-channel wavelength conversion using four-wave mixing in semiconductor ring lasers

•*A. Perez-Serrano[1], J. Javaloyes[2], and S. Balle[3]; [1]Weierstrass Institute (WIAS), Berlin, Germany; [2]Universitat de les Illes Balears (UIB), Palma de Mallorca, Spain; [3]IMEDEA (UIB-CSIC), Esporles, Spain*

We propose to use a semiconductor ring laser to perform simultaneous multi-channel wavelength conversion by four-wave mixing. Cross-talk effects, arising from the peculiar four-wave mixing cascade of modes and their cross-gain saturation, are discussed.

ROOM 14a

[1]*LTCI, CNRS - Telecom ParisTech, 46 rue Barrault, 75013, Paris, France;* [2]*SeQureNet, 23 avenue d'Italie, 75013, Paris, France;* [3]*Institute for Theoretical Physics, ETH Zurich, 8093, Zurich, Switzerland;* [4]*Laboratoire Charles Fabry de l'Institut d'Optique - CNRS - Univ. Paris-Sud 11, 2 avenue Augustin Fresnel, Campus Polytechnique, 91127, Palaiseau, France*

A continuous-variable quantum key distribution experiment using only standard telecommunication components is presented. We distributed secret keys over 80 km while taking into account finite-size effects and all known device imperfections.

IB-5.4 THU 9:15

Unconditional security of Gaussian post-selected continuous variable quantum key distribution

N. Walk[1], •*T. Symul*[2], *P.K. Lam*[2], *and T. Ralph*[1]; [1]*University of Queensland, Brisbane, Australia;* [2]*Australian National University, Canberra, Australia*

We extend the proof of security for continuous variable quantum key distribution protocols using post-selection to account for arbitrary eavesdropping attacks by employing the concept of an equivalent entanglement based protocol using noiseless linear amplification.

IB-5.5 THU 9:30

Quantum teleportation over 143 km using active feed-forward between two Canary Islands

•*X. Ma; IQOQI, Vienna, Vienna, Austria; VCQ, Vienna, Univ. of Vienna, Vienna, Austria*

The contribution has been withdrawn by the authors.

ROOM 14b

deaux, CEA, CNRS, Bordeaux, France; [2]*IFN-CNR & Dipartimento di Fisica - Politecnico di Milano, Milan, Italy;* [3]*Université de Toulouse, Toulouse, France*

We studied the ultrafast dynamics of atomic clusters exposed to intense femtosecond pulses in the mid-infrared from an OPA. Our results show that MIR sources can be efficiently exploited in the investigation of laser-cluster interaction.

CF/IE-10.4 THU 9:15

Manipulating charge separation dynamics of zinc phthalocyanine based TiO2 films through asymmetrical push-pull structures

•*D. Sharma*[1], *G. Steen*[1], *T. Torres*[2], *J. Herek*[1], *and A. Huijser*[1]; [1]*University of Twente, Enschede, The Netherlands;* [2]*Universidad Autonoma de Madrid, Cantoblanco, Spain*

Manipulation of the anchoring ligand results in significant changes in the charge separation dynamics of zinc phthalocyanine sensitized TiO2 films, investigated through femtosecond pump-probe spectroscopy.

CF/IE-10.5 THU 9:30

Ultrafast spectroscopy of dinaphthylpolyynes

D. Fazzi[1], *F. Scotognella*[1,2], *A. Milani*[3], *D. Brida*[2], *C. Manzoni*[4], *E. Cinquanta*[5], *L. Ravagnan*[5], *P. Milani*[5], *F. Cataldo*[6], *M. Negro*[2], *S. Stagira*[2], *and* •*C. Vozzi*[4]; [1]*Center for Nano Science and Technology CNST@Polimi, Istituto Italiano di Tecnologia, Milano, Italy;* [2]*Dipartimento di Fisica, Politecnico di Milano, Milano, Italy;* [3]*Dipartimento di Chimica, Materiali e Ing. Chimica "G. Natta", Politecnico di Milano, Milano, Italy;* [4]*CNR - Istituto di Fotonica e Nanoteconologie, Milano, Italy;* [5]*CIMAINA and Dipartimento di Fisica, Università degli Studi di Milano, Milano, Italy;* [6]*Actinium Chemical Research s.r.l., Roma, Italy*

We investigated experimentally and theo-

ROOM 21

[2]*Laboratoire de Photonique et de Nanostructures, Marcoussis, France*

We present a new generation of optomechanical device designed to perform quantum optomechanics experiment. It combines the high reflectivity of a photonic crystal, with the high mechanical Q-factor and low mass of a suspended nanomembrane.

IA-7.4 THU 9:15

Fabry-Perot Cavity Optomechanics with Ultrahigh Mechanical-*Q*-Factor Quartz Micropillars at Cryogenic Temperature

•*L. Neuhaus, A. Kuhn, S. Zerkani, S. Deléglise, D. García-Sánchez, T. Briant, P.-F. Cohadon, and A. Heidmann; Laboratoire Kastler Brossel, ENS, UPMC, CNRS, Paris, France*

We present recent progress towards optical detection of the zero-point-motion of a 25 μg-mechanical quartz resonator. We discuss the optimization of our system to achieve ground state cooling by classical and laser refrigeration techniques.

IA-7.5 THU 9:30

Squeezing-enhanced Optomechanical Transduction Sensitivity

•*U.B. Hoff*[1], *G.I. Harris*[2], *L.S. Madsen*[1], *H. Kerdoncuff*[1], *M. Lassen*[1], *B.M. Nielsen*[1], *W.P. Bowen*[2], *and U.L. Andersen*[1]; [1]*Department of Physics, Technical University of Denmark, Kgs. Lyngby, Denmark;* [2]*Centre of Excellence in Engineered Quantum Systems, University of Queensland, St. Lucia, Australia*

We experimentally demonstrate a squeezing-enhanced transduction sensitivity in microcavity optomechanics. Probing the mechanical vibrations of a toroidal microcavity with seeded phase-squeezed vacuum we achieve a transduction sensitivity -0.72(± 0.01) dB below the shot noise level.

ROOM 22

Krausz[1,2]; [1]*Max-Planck-Institut für Quantenoptik, Garching, Germany;* [2]*Ludwig-Maximilians-Universität München, Garching, Germany;* [3]*Ludwig-Maximilians-Universität München, München, Germany*

We report on the design and setup of an optical parametric synthesizer delivering <5 fs pulses at 16 TW power. The extended spectrum is amplified in two separate parts using two-color pumped OPCPA.

CG-4.4 THU 9:15

Contrast improvement at petawatt-class lasers using ultrafast optical parametric amplification

•*F. Wagner*[1], *C.P. Joao*[2], *J. Fils*[3], *T. Gottschall*[4], *J. Hein*[5], *J. Körner*[5], *J. Limpert*[4], *M. Roth*[1], *T. Stöhlker*[3], *and V. Bagnoud*[3]; [1]*Institut für Kernphysik, Technische Universität Darmstadt, Darmstadt, Germany;* [2]*Instituto de Plasmas e Fusao Nuclear-Laboratorio Associado, Instituto Superior Technica, Lisbon, Portugal;* [3]*GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany;* [4]*Institute of Applied Physics, Friedrich Schiller University, Jena, Germany;* [5]*Institute for Optics and Quantum Electronics, Friedrich Schiller University, Jena, Germany*

We report on the development of a new compact temporal contrast boosting module for petawatt-class lasers. Using this module we were able to achieve an ASE contrast better than 10 orders of magnitude.

CG-4.5 THU 9:30

High Repetition Rate Carrier-envelope Phase Stable Few-cycle OPCPA for Strong Field Physics

•*S. Hädrich*[1,2], *J. Rothhardt*[2,1], *S. Demmler*[1], *M. Krebs*[1], *J. Limpert*[1,2], *and A. Tünnermann*[1,2,3]; [1]*Friedrich Schiller University Jena, Jena, Germany;* [2]*Helmholtz-Institute Jena, Jena, Germany;* [3]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

A sub-two cycle optical parametric chirped pulse amplifier is presented at up to 1 MHz. Carrier envelope phase drifts are minimized by finding a new source of instabilities. Experiments on high harmonic generation are shown.

ROOM EINSTEIN

magnetic dipole and electric quadrupole transitions in a range of solid-state emitters can help to address electronic systems, redesign active photonic devices, and probe magnetic light-matter interactions at the nanoscale.

IH-3.4 THU 9:30

High Purcell effect and directional emission for semi-conductor nanocrystals deterministically positionned in a plasmonic patch antenna

C. Belacel[1,2,4], *B. Habert*[3], *F. Bigourdan*[3], *F. Marquier*[3], *S. Michaelis de Vasconcellos*[4], *X. Lafosse*[4], *L. Coolen*[1,2], *C. Schwob*[1,2], *B. Dubertret*[5], *J.J. Greffet*[3], *P. Senellart*[4], •*A. Maître*[1,2], *and C. Javeaux*[5]; [1]*Université Pierre et Marie Curie-Paris 6, Paris, France;* [2]*Institut des NanoSciences de Paris, Paris, France;* [3]*Laboratoire Charles Fabry, Institut d'Optique Graduate School, CNRS, Palaiseau, France;* [4]*Laboratoire de Photonique et de Nanostructures, Marcoussis, France;* [5]*Laboratoire de Physique et d'Etude des Matériaux, Paris, France*

We realize a plasmonic patch antenna, by

ROOM 1

CJ-9.6 THU 9:45

Wavelength correlation maps in Raman supercontinuum generation

•*A. Aalto*[1], *E. Nyström*[1], *P. Ryczkowski*[1], *J.M. Dudley*[2], *and G. Genty*[1]; [1]*Tampere University of Technology, Tampere, Finland*; [2]*Université de Franche-Comté, Besançon, France*

We report on the experimental characterization of spectral correlation maps in supercontinuum generation arising from cascaded stimulated Raman scattering. Our analysis provides insight into the dynamics of the broadening process and noise amplification.

10:30 – 12:00

CJ-10: Two Micron Fibre Cases

Chair: Thomas Andersen, NKT Photonics, Birkerod, Danemark

CJ-10.1 THU 10:30

High power, high energy Tm-doped Q-switched large-pitch fiber laser

•*F. Stutzki*[1], *F. Jansen*[1], *C. Jauregui*[1], *J. Limpert*[1,2,3], *and A. Tünnermann*[1,2,3]; [1]*Institute of Applied Physics, Friedrich-Schiller-University Jena, Jena, Germany*; [2]*Helmholtz-Institute Jena, Jena, Germany*; [3]*Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Jena, Germany*

We present a new record for the pulse energy of Tm-doped fiber oscillators. A pulse energy of 2.4mJ with 33W average power, 15ns pulse duration and beam quality factor of M2<1.3 is reported.

ROOM 4a

II-3.5 THU 9:45

Twists and shifts make nonlinear metamaterials

M. Liu[1], *Y. Sun*[1], *D. Powell*[1], •*I. Shadrivov*[1], *M. Lapine*[2], *R. McPhedran*[2], *and Y. Kivshar*[1]; [1]*Australian National University, Canberra, Australia*; [2]*University of Sydney, Sydney, Australia*

We propose a new concept of torsional metamaterials, by exploiting internal rotation within meta-atoms. We demonstrate that it is a more efficient approach for creating strong nonlinear response enhanced by near-field interactions.

10:30 – 12:00

II-4: Transformation Optics and Metamaterials

Chair: Peter Nordlander, Rice University, Houston, United States

II-4.1 THU (Tutorial) 10:30

Geometry and Light: the Science of Invisibility

•*U. Leonhardt*; *Weizmann Institute of Science, Rehovot, Israel*

Science Magazine listed transformation optics among the top 10 science insights of the decade 2000-2010. The tutorial gives an introduction into this subject that may, literally, transform optics.

ROOM 4b

10:30 – 11:45

CH-5: Advances in Spectroscopy II

Chair: Jose Pozo, TNO, Delft, Netherlands

CH-5.1 THU (Invited) 10:30

Precision Metrology with Coherent Dual Frequency Combs

•*N. Newbury*; *NIST, Boulder, CO, United States*

Coherent dual-frequency comb techniques allow one to read out the relative phase and amplitude on a tooth by tooth basis across a broadband frequency comb. Applications include precision spectroscopy, ranging and frequency transfer.

ROOM 13a

CK-7.6 THU 9:45

Novel physics in photonic crystal nanolasers : Dynamics and Coherence

•*A. Lebreton, I. Abram, R. Braive, I. Sagnes, I. Robert-Philip, and A. Beveratos*; *CNRS - Laboratoire de Photonique et de Nanostructures, Marcoussis, France*

Lasers of diffraction-limited volumes involve the interaction of small numbers of particles (photons and dipoles). We demonstrate that these small populations of discrete particles induce large intensity noise in the output of the laser.

10:30 – 12:00

CK-8: Light Management in Structures

Chair: Hatice Altug, EPFL, Lausanne, Switzerland

CK-8.1 THU 10:30

Tracking the spectral evolution of slow light en route

•*M. Wulf*[1], *D.M. Beggs*[1], *N. Rotenberg*[1], *I.H. Rey*[2], *T.F. Krauss*[2], *and K. Kuipers*[1]; [1]*FOM Institute for Atomic and Molecular Physics, Amsterdam, The Netherlands*; [2]*University of St. Andrews, St. Andrews, United Kingdom*

We measure the in situ spectral evolution of an ultrashort pulse propagating inside a slow-light photonic crystal waveguide. This allows us to characterize nonlinear effects inside an integrated nanophotonic circuit.

ROOM 13b

CB-7.5 THU 9:45

Bidirectional Secure Key-Exchange Using Chaotic Semiconductor Lasers

•*X. Porte, M.C. Soriano, D. Brunner, and I. Fischer*; *IFISC (UIB-CSIC), Palma de Mallorca, Spain*

We demonstrate the experimental implementation of a secure key-exchange protocol based on delay-coupled semiconductor lasers. We discuss its robustness against desynchronization events and the influence of different parameters on the bit rate and security.

10:30 – 12:00

CB-8: Semiconductor Vertical Cavity Surface Emitting Lasers

Chair: Mariangela Gioannini, Politecnico di Torino, Turin, Italy

CB-8.1 THU 10:30

Square-wave emission in Vertical-Cavity Surface-Emitting Lasers

•*M. Marconi*[1], *J. Javaloyes*[2], *S. Barland*[1], *M. Giudici*[1], *and S. Balle*[3]; [1]*Insitut Non-linéaire de Nice, Valbonne, France*; [2]*Universitat de les Illes Baleares, Palma de Mallorca, Spain*; [3]*Institut Mediterrani d'Estudis Avançats, Esporles, Spain*

We induce stationary biased VCSELs to emit regular square-wave optical signal. This operation is obtained by applying crossed-polarization reinjection to VCSEL and, for weak dichroism devices, by adding also polarization-selective optical feedback.

ROOM 14a

IB-5.6 THU 9:45

Timing Synchronization with Photon Pairs for Quantum Communications

T. Lorünser, A. Happe, and •A. Poppe; AIT Austrian Institute of Technology, Vienna, Austria

We present a fully autonomous coincidence window tracking software for our quantum communication system. It is capable of real-time processing and remarkably, neither prior knowledge of the peer clock offsets, nor are their drifts required.

10:30 – 12:00

IB-6: Photonic Quantum Computing

Chair: Shigeki Takeuchi, Hokkaido University, Sapporo, Japan

IB-6.1 THU 10:30

BosonSampling with realistic single-photon sources

M. Broome[1,2], •A. Fedrizzi[1,2], S. Rahimi-Keshari[2], A. Brańczyk[3], J. Dove[4], S. Aaronson[4], T. Ralph[2], and A. White[1,2]; [1]Centre for Engineered Quantum Systems, School of Mathematics and Physics, University of Queensland, Brisbane, Australia; [2]Centre for Quantum Computer and Communication Technology, School of Mathematics and Physics, University of Queensland, Brisbane, Australia; [3]Department of Chemistry and Centre for Quantum Information and Quantum Control, University of Toronto, Toronto, Canada; [4]Computer Science and Artificial Intelligence Laboratory, Massachusetts Institute of Technology, Cambridge, USA

ROOM 14b

retically the photo-physical properties of a class of linear sp-carbon chains (α,ω-dinaphthylpolyyne). The role of molecular conformers is fundamental for understanding the steady state properties, and the ultrafast transient absorption features.

CF/IE-10.6 THU 9:45

Multi-Delay, Phase-Coherent Pulse Pair Generation for Precision Ramsey-Comb Spectroscopy

•J. Morgenweg and K. Eikema; VU University, Amsterdam, The Netherlands

We present a parametric amplifier system capable of producing coherent pulse-pairs at the mJ-level with adjustable delays well into the microsecond range. The phase for different delays remains constant within 10 mrad.

10:30 – 11:45

CF/IE-11: Ultrafast Microphotonics and Plasmonics

Chair: Petra Gross, Universität Oldenburg, Oldenburg, Germany

CF/IE-11.1 THU 10:30

All-optical Switching of a Microcavity Repeated at Terahertz Clock Rates

•E. Yüce[1], G. Ctistis[1], J. Claudon[2], E. Dupuy[2], R.D. Buijs[1], B. de Ronde[1], A.P. Mosk[1], J.-M. Gérard[2], and W.L. Vos[1]; [1]Complex Photonic Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, P.O. Box 217, 7500 AE, Enschede, The Netherlands; [2]CEA-CNRS-UJF Nanophysics and Semiconductors Joint Laboratory, CEA/INAC/SP2M, 17 rue des Martyrs, 38054, Grenoble, France

We have repeatedly and reproducibly switched a GaAs-AlAs planar microcavity operating in the "original" telecom band by exploiting the virtually instantaneous Kerr effect. We achieve repetition times as fast as 300 fs.

ROOM 21

IA-7.6 THU 9:45

Quantum Interface Between Optics and Microwaves with Optomechanics

S. Barzanjeh[1], M. Abdi[1,2], G. Milburn[3], P. Tombesi[1], and •D. Vitali[1]; [1]School of Science and Technology, University of Camerino, Camerino, Italy; [2]Department of Physics, Sharif University of Technology, Tehran, Tehran, Iran; [3]Centre for Engineered Quantum Systems, School of Physical Sciences, The University of Queensland, Brisbane, Australia

We describe a quantum interface between an optical and a microwave field based on their common interaction with a nanomechanical resonator, resulting in a source of optical-microwave two-mode squeezing.

10:30 – 12:15

CM-6: Transparent Material Processing

Chair: Marta Castillejo, Spanish National Research Council (CSIC), Madrid, Spain

CM-6.1 THU 10:30

Ultrashort pulse-induced nanogratings: temperature stable optically active phase elements

•F. Zimmermann[1], S. Richter[1], C. Vetter[1], S. Döring[1], A. Tünnermann[1,2], and S. Nolte[1,2]; [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Jena, Germany; [2]Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany

We present femtosecond direct written optical components exhibiting circular birefringence. In order to use these nanograting-based phase elements under harsh conditions we demonstrate their resistibility against temperatures up to 850°C.

ROOM 22

CG-4.6 THU 9:45

High-energy pulse synthesis of optical parametric amplifiers

•G. Cirmi[1,3], S. Fang[1,3], S.-H. Chia[1,3], O.D. Mücke[1,3], F.X. Kärtner[1,2,3,4], C. Manzoni[5], P. Farinello[5], and G. Cerullo[5]; [1]Center for Free-Electron Laser Science, Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany; [2]Physics Department, University of Hamburg, Hamburg, Germany; [3]The Hamburg Center of Ultrafast Imaging, Hamburg, Germany; [4]Department of Electrical Engineering and Computer Science and Research Laboratory of Electronics, Cambridge, United States; [5]IFN-CNR, Dipartimento di Fisica, Politecnico di Milano, Milan, Italy

We demonstrate pulse synthesis of three optical parametric amplifiers, with 40-45 μJ energies each, resulting in a 1.9-fs transform-limited pulse duration. Scalability to the mJ level should easily be achieved, allowing for strong-field physics experiments.

10:30 – 12:00

CG-5: Waveform Synthesis and Control

Chair: Lukas Gallmann, ETH Zurich, Zurich, Switzerland

CG-5.1 THU 10:30

Acoustic frequency combs for versatile carrier-envelope phase control

•B. Borchers, M. Mero, and G. Steinmeyer; Max-Born-Institut, Berlin, Germany

A novel approach for carrier-envelope phase stabilization is revealed, offering unconditional long-term stabilization with near-megahertz servo bandwidth and versatile slow drift compensation using only a single acousto-optic device.

ROOM EINSTEIN

deterministically positioning a cluster of nanocrystals inside antenna. Its emission is highly directive and the Purcell effect reach 80 for dipoles parallel to the antenna axis.

IH-3.5 THU 9:45

Plasmonic nanoantennas for enhanced single molecule analysis at micromolar conentrations

D. Punj[1], M. Mivelle[2], T. Van Zanten[2], •H. Rigneault[1], N. Van Hulst[2], M. Garcia-Parajo[2], and J. Wenger[1]; [1]Institut Fresnel, CNRS, Aix-Marseille University, Ecole Centrale Marseille, Marseille, France; [2]ICFO Institut de Ciences Fotoniques, Castelldefels, Spain

We introduce a novel type of plasmonic nanoantenna especially designed for enhanced (up to 1100-fold) single molecule analysis in solutions at high concentrations (10 micromolar).

10:30 – 12:00

IH-4: Quantum Nanophotonics

Chair: Agnès Maître, Université Pierre et Marie Curie, Paris, France

IH-4.1 THU (Invited) 10:30

Controlling stationary and flying qubits for solid-state quantum networks

•M. Atature; University of Cambridge, Cambridge, United Kingdom

I will discuss how resonance fluorescence allows control of quantum dot spins as well as coherent generation of tailored single photons suitable for distributed quantum networks.

ROOM 1

CJ-10.2 THU 10:45

Bandwidth-Controllable Tunable Q-Switched Thulium Fibre Laser

•*J.M.O. Daniel and W.A. Clarkson*; *Optoelectronics Research Centre University of Southampton, Southampton, United Kingdom*

A tunable Q-switched thulium fibre laser source with continuously-adjustable linewidth is described. The laser yielded peak power above 1kW at 1960nm and the spectral width could be varied from 0.6nm to 15nm.

CJ-10.3 THU 11:00

Tuneable Operation of Core and Cladding Pumped Holmium Fibre Lasers

•*N. Simakov[1,2], A. Hemming[1], W.A. Clarkson[2], A. Carter[3], and J. Haub[1]*; [1]*Defence Science and Technology Organisation, Edinburgh, Australia*; [2]*ORC, University of Southampton, Southampton, United Kingdom*; [3]*Nufern Inc., East Granby, United States*

We report the tuning range of a resonantly, cladding pumped holmium doped fibre (HDF) and compare this to the tuning range of a core pumped HDF. Further optimisation of double clad holmium fibres is discussed.

CJ-10.4 THU 11:15

LMA effectively single-mode thulium doped fibre with normal dispersion at wavelengths around 2um

•*C. Baskiotis, A. Heidt, S. Alam, and D. Richardson*; *Optoelectronics Research Centre, Southampton, United Kingdom*

ROOM 4a

ROOM 4b

CH-5.2 THU 11:00

Ultra-rapid coherent anti-Stokes Raman dual-comb spectroscopy and microscopy

•*T. Ideguchi[1], S. Holzner[1], B. Bernhardt[1,3], G. Guelachvili[2], N. Picqué[1,2,3], and T. Hänsch[1,3]*; [1]*Max Planck Institut für Quantenoptik, Garching, Germany*; [2]*Institut des Sciences Moléculaires d'Orsay, CNRS, Orsay, France*; [3]*Ludwig-Maximilians-Universität München, München, Germany*

Ultra-broadband nonlinear Raman spectroscopy with two laser frequency combs is demonstrated. A Raman spectrum spanning 1200 cm-1 is measured within less than 300 microseconds at 4 cm-1 resolution with a signal-to-noise ratio of 1250.

CH-5.3 THU 11:15

Nonlinear Dual-Comb Spectroscopy with Two-Photon Excitation

•*S.A. Meek[1], A. Hipke[1,2], T.W. Hänsch[1,2], and N. Picqué[1,2,3]*; [1]*Max-Planck-Institut für Quantenoptik, Garching, Germany*; [2]*Ludwig-Maximilians-Universität, Fakultät*

ROOM 13a

CK-8.2 THU 10:45

Combining slow-light and carrier induced nonlinearities in photonic crystal nanocavities

•*K. Bencheikh[1], A. Yacomotti[1], P. Grinberg[1], I. Sagnes[1], F. Raineri[1], Y. Dumeige[2], and A. Levenson[1]*; [1]*Laboratoire de Photonique et de Nanostructures, Marcoussis, France*; [2]*Université Européenne de Bretagne, CNRS Foton, Lannion, France*

We implement coherent population oscillation and carrier-induced nonlinear refractive index in a semiconductor active nanocavity to strongly increase the photonic lifetime and manipulate its optical response.

CK-8.3 THU 11:00

Superballistic transport in hybrid photonic lattices

•*S. Stützer[1], T. Kottos[2], A. Tünnermann[1], S. Nolte[1], D.N. Christodoulides[3], and A. Szameit[1]*; [1]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität, Jena, Germany*; [2]*Department of Physics, Wesleyan University, Middletown (Connecticut), United States*; [3]*College of Optics and Photonics, University of Central Florida, Orlando, United States*

We present experimental evidence for a new transport regime that is faster than ballistic. Our results reveal that disordered regions in a lattice can speed up wave transport for finite times in a time-independent Hamiltonian.

CK-8.4 THU 11:15

Random amplification of coherent light in diffusive random lasers

•*R. Uppu and S. Mujumdar*; *Nano-optics and Mesoscopic Optics Laboratory, Tata Institute of Fundamental Research,, Mumbai, India*

We demonstrate the amplification by an or-

ROOM 13b

CB-8.2 THU 10:45

Impact of Photon Lifetime on the High-Speed performance of 1.3-um Wavelength Wafer-Fused VCSELs

•*D. Ellafi[1], V. Iakovlev[1], A. Sirbu[1], G. Suruceanu[2], A. Mereuta[2], A. Caliman[2], and E. Kapon[1,2]*; [1]*Laboratory of Physics of Nanostructures, École Polytechnique Fédérale de Lausanne (EPFL), CH-1015, Lausanne, Switzerland*; [2]*BeamExpress S.A., 1015, Lausanne, Switzerland*

Investigation of the impact of photon lifetime on 1.3-um wafer-fused VCSELs is reported. A significant improvement in both static and dynamic VCSEL performance is demonstrated.

Keywords: VCSEL, high speed, modulation, photon lifetime, damping,

CB-8.3 THU 11:00

Comparing the Performance of 980 nm VCSELs with Different High-Contrast-Grating designs

•*P. Debernardi[1], R. Orta[1], and W. Hofmann[2]*; [1]*IEIIT-CNR, Torino, Italy*; [2]*TUB, Berlin, Germany*

Our vectorial and 3D VCSEL code can now handle High-Contrast-Grating in an efficient and rigorous way. It is applied to a 980 nm HCG-VCSEL and two different HCG schemes are designed and discussed in detail.

CB-8.4 THU 11:15

Dynamic Characteristics of Inverted Grating Relief VCSELs for Cs-Based Microscale Atomic Clocks

M.J. Miah, A. Al-Samaneh, D. Wahl, and •*R. Michalzik*; *Institute of Optoelectronics, Ulm University, Ulm, Germany*

ROOM 14a

BosonSampling is a novel task promising to answer whether quantum computers can truly outperform their classical counterparts. We experimentally tested the key assumption of BosonSampling with three single photons interfering in a tunable photonic circuit.

IB-6.2 THU 10:45

Experimental Demonstration of Quantum Data Compression

•*L.A. Rozema*[1], *D. Mahler*[1], *A. Hayat*[1], *P.S. Turner*[2], *and A.M. Steinberg*[1]; [1]*Centre for Quantum Information & Quantum Control and Institute for Optical Sciences, Department of Physics, University of Toronto, Toronto, Canada*; [2]*Department of Physics, Graduate School of Science, The University of Tokyo, Tokyo, Japan*

Redundant copies of classical information can be discarded, allowing compression. However, additional copies of quantum data yield more information, making classical ideas inapplicable. We present experimental results for 3 qubits; compressing N=3 qubits into log(N+1)=2.

IB-6.3 THU 11:00

Experimental Realisation of Shor's Quantum Factoring Algorithm using Qubit Recycling

•*E. Martín-López, A. Laing, T. Lawson, R. Alvarez, X.-Q. Zhou, and J.L. O'Brien*; *Centre for Quantum Photonics. University of Bristol, Bristol, United Kingdom*

We address the huge resource requirement of Shor's quantum algorithm using qubit recycling. Together with novel higher-dimensional encoding techniques, we factored N=21 for the first time, using an optical circuit with two consecutive C-NOT gates.

IB-6.4 THU 11:15

On demand single photon-driven controlled-NOT gate

•*D.J.P. Ellis*[1], *M.A. Pooley*[1,2], *A.J. Bennett*[1], *R.B. Patel*[1,2], *A.K.H. Chan*[1,2], *I. Farrer*[2], *D.A. Ritchie*[2], *and A.J. Shields*[1]; [1]*Toshiba Research Europe Ltd, Cambridge, United Kingdom;*

ROOM 14b

CF/IE-11.2 THU 10:45

Superfluorescent 1.1 ps Pulse-On-Demand Generation in InGaN Laser

•*D.L. Boiko*[1], *X. Zeng*[1], *T. Weig*[2], *U.T. Schwarz*[2], *L. Sulmoni*[3], *J.-M. Lamy*[3], *and N. Grandjean*[3]; [1]*CSEM Centre Suisse d'Electronique et de Microtechnique, Neuchatel, Switzerland*; [2]*Fraunhofer Institute for Applied Solid State Physics IAF, Freiburg, Germany*; [3]*EPFL Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland*

We report generation of solitary pulses of the width below 1.1 ps from a tandem-cavity InGaN/InGaN laser diodes in 415-425 nm wavelength range and we show that observed pulses are caused by cooperative superfluorescence.

CF/IE-11.3 THU 11:00

Adaptive spiral phase elements for the generation of few-cycle vortex pulses

M. Bock[1], *J. Brunne*[2], *A. Treffer*[1], *S. König*[1], *U. Wallrabe*[2], *and* •*R. Grunwald*[1]; [1]*Max Born Institute, Berlin, Germany*; [2]*IMTEK University Freiburg, Freiburg, Germany*

The flexible generation of few-cycle vortex pulses with optical orbital momentum is enabled by novel types of low-dispersion, damage-resistant, thermally tunable spiral phase MEMS of large phase deviation. Specific ultrashort-pulse laser applications are proposed.

CF/IE-11.4 THU 11:15

Optical Excitation of Unipolar Tesla Magnetic Pulses in Plasmonic Nanostructures

•*E. Atmatzakis*[1], *A. Tsiatmas*[1], *N. Papasimakis*[1], *V. Fedotov*[1], *B. Luk'yanchuk*[2], *F.J. Garcia de Abajo*[3], *and N. Zheludev*[1,4];

ROOM 21

CM-6.2 THU 10:45

Laser Ablation inside Transparent Thin Films

K. Kumar[1], *K.K. Lee*[2], *J. Li*[2], *J. Nogami*[1], •*P.R. Herman*[2], *and N. Kherani*[2]; [1]*Department of Materials Science and Engineering, Toronto, Canada*; [2]*Department of Electrical and Computer Engineering, Toronto, Canada*

Femtosecond laser interactions were optimized in thin-transparent films on silicon substrates to enable interface blistering, catapulting, digital surface machining and internal void structures; applications include anti-reflective inverted-pyramid photovoltaics, film coloring, microfluidic patterning and lab-in-a-film.

CM-6.3 THU 11:00

Advances in Femtosecond Laser Micro-inscription and Ablation of Optical Coherence Tomography and Optical Coherence Elastography Phantoms

•*G.N. Smith*[1], *K. Kalli*[2], *and M.J. Withford*[1]; [1]*OptoFab & MQ Photonics Research Centre, Macquarie University, Sydney, Australia*; [2]*Department of Electrical Engineering / Computer Engineering and Informatics, Limassol, Cyprus*

Demonstration of advances in femtosecond laser inscription and micromachining of high-precision 3-dimensional refractive index modifications in fused silica and athermal titanium dioxide doped silicone ablation to create Optical Coherence Tomography (OCT) and Optical Coherence Elastography (OCE) phantoms.

CM-6.4 THU 11:15

Picosecond pulsed laser-assisted reshaping of metallic nanoparticles embedded in a glass matrix

•*M.A. Tyrk, W.A. Gillespie, and A. Abdolvand*; *University of Dundee, Dundee, United Kingdom*

ROOM 22

CG-5.2 THU 10:45

Direct Carrier-Envelope Phase Control of an Amplified Laser System

•*T. Balciunas*[1], *T. Flöry*[1], *T. Stanislauskas*[2], *R. Antipenkov*[2], *A. Varanavicius*[2], *A. Baltuska*[1], *and G. Steinmeyer*[3]; [1]*Photonics Institute, Vienna University of Technology, Vienna, Austria*; [2]*Faculty of Physics, Vilnius University, Vilnius, Lithuania*; [3]*Max Born Institute, Berlin, Germany*

Direct carrier-envelope phase stabilization of an Yb:KGW MOPA laser system is demonstrated with a record-breaking residual phase jitter below 100 mrad, opening a new avenue towards high-energy CEP-stabilized parametric sources.

CG-5.3 THU 11:00

Synthesis of isolated optical attosecond pulses

•*M. Hassan*[1], *T. Luu*[1], *A. Moulet*[1], *O. Razskazovskaya*[2], *N. Karpowicz*[1], *V. Pervak*[2], *F. Krausz*[1,2], *and E. Goulielmakis*[1]; [1]*Max-Planck-Institut für Quantenoptik, Munich, Germany*; [2]*Department für Physik, Ludwig-Maximilians-Universität (LMU), Am Coulombwall 1, D-85748 Garching, Munich, Germany*

We report on the synthesis and precise control of isolated, intense attosecond pulses in optical frequencies. We use them to explore new control strategies of electrons in atoms and materials.

CG-5.4 THU 11:15

Attosecond Sampling of Arbitrary Optical Waveforms

•*A. Wyatt*[1], *T. Witting*[2], *A. Schiavi*[1], *D. Fabris*[2], *J. Marangos*[2], *J. Tisch*[2], *and I. Walmsley*[1]; [1]*Clarendon Laboratory, University of Oxford, Oxford, United Kingdom;*

ROOM EINSTEIN

IH-4.2 THU 11:00

Real-time observation of ultrafast Rabi oscillations between excitons and plasmons in J-aggregate/metal hybrid nanostructures

P. Vasa[1,2], *W. Wang*[1], *R. Pomraenke*[1], *M. Lammers*[1], *M. Maiuri*[3], *C. Manzoni*[3], *G. Cerullo*[3], *and* •*C. Lienau*[1]; [1]*Institut für Physik, Carl von Ossietzky Universität Oldenburg, Oldenburg, Germany*; [2]*Department of Physics, Indian Institute of Technology Bombay, Mumbai, India*; [3]*IFN-CNR, Dipartimento di Fisica, Politecnico di Milano, Milano, Italy*

We report the first real-time observation of ultrafast Rabi oscillations in J-aggregate/metal nanostructures, evidencing coherent energy transfer between excitonic quantum emitters and SPP fields. This presents a new approach towards coherent, all-optical ultrafast plasmonic devices.

IH-4.3 THU 11:15

Coupling of a single N-V center in diamond to a fiber-based microcavity

•*R. Albrecht*[1], *A. Bommer*[1], *C. Deutsch*[2,3], *J. Reichel*[2], *and C. Becher*[1]; [1]*Universität des Saarlandes, Fachrichtung 7.2 (Experimentalphysik), Campus E2.6, 66123 Saar-*

ROOM 1

We present a thulium doped large mode area fibre ensuring low-loss single-mode operation and normal dispersion for the fundamental core mode around a wavelength of 1930nm as well as an effective area larger than 600um2.

CJ-10.5 THU 11:30

All-Fiber Broadband Frequency Comb Source at 2050 nm Center Wavelength

A. Thai[1,2], •H. Hoogland[1], M. Engelbrecht[1], J. Biegert[2,3], and R. Holzwarth[1]; [1]Menlo Systems, Munich, Germany; [2]ICFO - Institut de Ciences Fotoniques, Castelldefels (Barcelona), Spain; [3]ICREA - Institucio Catalana de Recercai Estudis Avançats, Barcelona, Spain

We report on an all PM fiber system with a broadband amplifier based on co-doped Tm/Ho fiber, operating at 2050 nm center wavelength with 126 nm bandwidth and 670 mW ouput power at 100 MHz.

CJ-10.6 THU 11:45

35 kW Peak Power Picosecond Pulsed Thulium-doped Fibre Amplifier System Seeded by a Gain-Switched Laser Diode at 2 μm

•A.M. Heidt[1], Z. Li[1], J. Sahu[1], P.C. Shardlow[1], M. Becker[2], M. Rothhardt[2], M. Ibsen[1], R. Phelan[3], B. Kelly[3], S.-u. Alam[1], and D.J. Richardson[1]; [1]Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom; [2]Institute of Photonic Technology, Jena, Germany; [3]Eblana Photonics Ltd., Dublin, Republic of Ireland

We present the generation of picosecond pulses at 2 μm wavelength with a gain-switched laser diode and their amplification up to 3.5 μJ energy and 35 kW peak power in a Thulium-doped fiber amplifier system.

ROOM 4a

II-4.2 THU 11:30

A Hybrid Fabrication Approach for Near-Infrared Double-Helix Metamaterials

•M. Decker[1], I. Staude[1], M. Renner[2], E. Waller[2], D.N. Neshev[1], G. von Freymann[2], and Y.S. Kivshar[1]; [1]Nonlinear Physics Centre, Research School of Physics and Engineering, The Australian National University, Canberra, Australia; [2]Physics Department and Research Center OPTIMAS, University of Kaiserslautern, Kaiserslautern, Germany

We employ a novel approach for fabricating three-dimensional metamaterials, which combines direct laser writing with electron-beam lithography. We experimentally realize and investigate a double-helix chiral metamaterial operating in the near-infrared spectral range.

II-4.3 THU 11:45

Design and characterization of metamaterial building blocks using electric current multipoles

•P. Grahn, A. Shevchenko, and M. Kaivola; Aalto University, Espoo, Finland

We present a general theoretical model for the design and characterization of metamaterials in terms of the electric current multipole moments that light excites in the structural units of the material.

ROOM 4b

für Physik, Munich, Germany; [3]Institut des Sciences Moléculaires d'Orsay, CNRS, Orsay, France

We present the latest results in extending dual comb spectroscopy to two-photon transitions. By measuring two-photon excitation of gas-phase rubidium and liquid-phase dye samples, we demonstrate both the high resolution and speed of the technique.

CH-5.4 THU 11:30

Detection of KCl and KOH using Collinear Photofragmentation and Atomic Absorption Spectroscopy

T. Sorvajärvi, J. Rossi, and •J. Toivonen; Tampere University of Technology, Tampere, Finland

Collinear photofragmentation and atomic absorption spectroscopy is used in pump-probe fashion to simultaneously detect KCl and KOH in the flame of single particle combustion reactor.

ROOM 13a

der of magnitude of an external seed signal by a disordered amplifying medium. An optimal disorder strength is seen to offer the most efficient amplification.

CK-8.5 THU 11:30

Resonant States in Functionalized Waveguide Arrays - Guidonic Resonant Tunneling Double Barrier

•N. Belabas Plougonven[1], G. Bouwmans[2], E. Cambril[1], A. Talneau[1], A. Levenson[1], C. Minot[1], and J.-M. Moison[1]; [1]Laboratory of Photonic and Nanostructures, Route de Nozay, , 91460 Marcoussis, France; [2]Laboratoire Phlam-IRCICA, Parc Scientifique de la Haute Borne, 59658 Villeneuve d'Ascq, France

We demonstrate discrete resonant states in functionalized coupled waveguide arrays theoretically and experimentally. Our double barrier patterning of the coupling creates tunnel resonances in the transmitted intensity, which paves the way towards all optical control.

CK-8.6 THU 11:45

Optically excited field emitter arrays with plasmonic gate electrodes as ultrafast electron sources

•A. Mustonen; Paul Scherrer Institute, Villigen, Switzerland

We propose using plasmonic structures to enhancement electron emission generated by ultrafast laser pulses applied on metallic field emitter arrays. By integration gate electrode that supports surface plasmon polaritons, the device electron yield can be increased by 30 times.

ROOM 13b

We present the dynamic behavior of inverted grating relief VCSELs for Cs-based microscale atomic clocks. The required 5GHz modulation bandwidth is reached close above threshold. An intrinsic 3dB bandwidth exceeding 25GHz is obtained at 80°C.

CB-8.5 THU 11:30

Optical Injection of a 1.3um Wavelength VCSEL with Intracavity Patterning

•C. Long[1], N. Volet[1], B. Dwir[1], V. Iakovlev[1], A. Sirbu[1], A. Mereuta[2], A. Caliman[2], G. Suruceanu[2], and E. Kapon[1,2]; [1]Ecole Polytechnique de Lausanne, Lausanne, Switzerland; [2]BeamExpress SA, Lausanne, Switzerland

We present the optical injection response of wafer-fused long wavelength VCSELs with and without intracavity patterning. Nonlinear responses such as limit cycle oscillations and four wave mixing are seen, and results summarized on dynamics maps.

CB-8.6 THU 11:45

Vertical-Cavity Surface-Emitting Laser Arrays for Miniaturized Integrated Optical Lattice Modules

•A. Bergmann, A. Hein, and R. Michalzik; Institute of Optoelectronics, Ulm, Germany

We present the fabrication of 850nm GaAs-based 2-D VCSEL arrays with small device pitch for optical trapping. The modules are wire-bondable despite a few-micrometer distance between top surface and a compactly integrated microfluidic chip.

ROOM 14a

[2]*Cavendish Laboratory, University of Cambridge, Cambridge, United Kingdom*

We present a two-qubit quantum gate using indistinguishable photons from an InAs quantum dot. Here our emitter, optical circuitry and detectors are all semiconductor. This represents a promising avenue towards fully integrated, scalable quantum computing.

IB-6.5 THU 11:30

Implementation of a quantum Fredkin gate using an entanglement resource

•*F. Ferreyrol*[1], *T.C. Ralph*[2], *and G.J. Pryde*[1]; [1]*Centre for Quantum Dynamics and Centre for Quantum Computation and Communication Technology, Griffith University, Brisbane, Australia*; [2]*Department of Physics and Centre for Quantum Computation and Communication Technology, University of Queensland, Brisbane, Australia*

We experimentally realise an optical quantum Fredkin gate. We use an entanglement resource and an expanded Hilbert space technique for adding control to an arbitrary quantum operation, leading to a quite simple experimental setup.

IB-6.6 THU 11:45

Operational Significance of Discord Consumption

•*T. Symul*[1], *H. Chrzanowski*[1], *A. Syed*[1], *P.K. Lam*[1], *T. Ralph*[2], *M. Gu*[3], *K. Modi*[3], *and V. Vedral*[3]; [1]*Australian National University, Canberra, Australia*; [2]*University of Queensland, Brisbane, Australia*; [3]*National University of Singapore, Singapore, Singapore*

We demonstrate that discord can be consumed to encode information that can only be accessed by coherent quantum interactions. We experimentally verify that the amount of information recovered is quantified by the discord consumed.

ROOM 14b

[1]*Optoelectronics Research Centre & Centre for Photonic Metamaterials, Southampton, United Kingdom*; [2]*Data Storage Institute, Agency for Science, Thechnology and Research, Singapore, Singapore*; [3]*Instituto de Química Física Rocasolano - Consejo Superior de Investigaciones Científicas, Madrid, Spain*; [4]*Centre for Disruptive Photonic Technologies, Nanyang Technological University, Singapore, Singapore*

Ultrafast excitation of bimetallic plasmonic ring resonator arrays leads to transient intense thermoelectric currents with sub-ps lifetimes and Tesla-scale magnetic fields confined at the nanoscale.

CF/IE-11.5 THU 11:30

Tracking the temporal and spectral evolution of femtosecond pulses on plasmonic nanowires

•*M. Wulf, A. de Hoogh, N. Rotenberg, and K. Kuipers*; *FOM Institute for Atomic and Molecular Physics, Amsterdam, The Netherlands*

We track the temporal and spectral dynamics of femtosecond pulses propagating along plasmonic nanowires. The group index and the propagation length are extracted and the evolution of the spectral density reveals nonlinear processes.

ROOM 21

We report on efficient picosecond laser-induced optical dichroism in glasses with embedded spherical silver nanoparticles. The modifications depend on the beam polarization and the number of irradiated pulses per spot.

CM-6.5 THU 11:30

In-situ characterization of Fs laser shaping of quasi-percolated Ag nanoparticle layers embedded in amorphous Al2O3

G. Baraldi, •*J. Gonzalo, and J. Siegel*; *Instituto de Optica, CSIC, Madrid, Spain*

We demonstrate fs-laser induced reshaping of heterogeneous, non-spherical and randomly oriented Ag nanoparticles embedded in dielectric thin films. Optimum choice of laser fluence and polarization narrows and blueshifts the absorption band and induces polarization anisotropy.

CM-6.6 THU 11:45

Formation of disruptions in molten fused silica induced by heat accumulation of ultrashort laser pulses at high repetition rates

•*S. Richter*[1], *F. Burmeister*[1,2], *F. Zimmermann*[1], *S. Döring*[1], *A. Tünnermann*[1,2], *and S. Nolte*[1,2]; [1]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Jena, Germany*; [2]*Fraunhofer Institute of Applied Optics and Precision Engineering, Jena, Germany*

We investigate the structure and periodicity of disruptions within the heat affected material in fused silica after irradiation with ultrashort laser pulses at high repetition rates for laser welding. We propose a model, which explains their formation.

CM-6.7 THU 12:00

Fabrication of ultra-low bend loss optical waveguides

•*A. Arriola*[1,2,3], *S. Gross*[1,2], *N. Jovanovic*[1,4,5], *N. Charles*[6], *P.G. Tuthill*[6], *S.M. Olaizola*[3], *A. Fuerbach*[1,2], *and M.J. Withford*[1,2,4]; [1]*Centre for Ultrahigh-bandwidth Devices for Optical Systems (CUDOS), Sydney, Australia*; [2]*MQ Photonics Research Centre, Dept. of Physics and Astronomy, Macquarie University, Sydney, Australia*; [3]*CEIT and Tecnun, Donostia-San Sebastian, Spain*; [4]*Research Centre in Astronomy, Astrophysics and Astrophotonics,*

ROOM 22

[2]*Blackett Laboratory, Imperial College London, London, United Kingdom*

We demonstrate a novel method to measure the complete temporal waveform of arbitrary ultrafast optical pulses, including carrier envelop phase, with attosecond temporal resolution using high harmonic generation with a few cycle pulse.

CG-5.5 THU 11:30

Circularly Polarized Attosecond Pulses for Attosecond Magnetics

•*A.D. Bandrauk*; *Canada Research Chair,Universite de Sherbrooke, Sherbrooke, Canada*

Circularly polarized attosecond pulses are obtained from molecular high order harmonic generation by circularly polarized IR pulses with Thz pulses.Such attosecond pulses create currents which generate attosecond magnetic fields inside molecules.

CG-5.6 THU 11:45

Shaping polarization of attosecond pulses via laser control of electron and hole dynamics

•*F. Morales*[1], *I. Barth*[1], *V. Serbinenko*[1], *S. Patchkovskii*[2], *and O. Smirnova*[1]; [1]*Max-Born-Institut for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany*; [2]*Steaci Institute for Molecular Sciences, Ontario, Canada*

We present a mechanism to control the polarization of attosecond pulses generated after HHG. It uses both the fundamental radiation and its second harmonic oriented in perpendicular geometry, both linearly polarized.

ROOM EINSTEIN

brücken, Germany; [2]*Laboratoire Kastler Brossel, ENS/UPMC-Paris 6/CNRS, 24 rue Lhomond, 75005 Paris, France*; [3]*Menlo Systems GmbH, 82125 Martinsried, Germany*

We demonstrate room temperature coupling of a single Nitrogen-Vacancy center in a diamond nanocrystal to a fiber-based microcavity in a phonon-assisted coupling regime and hereby realize a narrow bandwidth widely tunable single photon source.

IH-4.4 THU (Invited) 11:30

Optical Nonlinearity With Few-Photon Pulses Using A Quantum Dot-Pillar Cavity Device

V. Loo[1,2], *C. Arnold*[1], *O. Gazzano*[1], *A. Lemaître*[1], *I. Sagnes*[1], *O. Krebs*[1], *P. Voisin*[1], *P. Senellart*[1], *and* •*L. Lanco*[1,2]; [1]*Laboratoire de Photonique et de Nanostructures, Marcoussis, France*; [2]*Université Paris Diderot - Paris 7, Paris, France*

We demonstrate giant optical nonlinearity in a quantum dot- cavity device, with a record threshold at 8 incident photons per pulse. Furthermore, we discuss how optical nonlinearities can be obtained at the single-photon limit.

ROOM 1

14:00 – 15:30

CJ-11: Special Fibres

Chair: Johannes Nold, Fraunhofer IOF, Jena, Germany

CJ-11.1 THU (Invited) 14:00

Inhibited-coupling guiding hollow core photonic crystal fibers

•*F. Benabid; GPPMM group, Xlim Research Institute, CNRS, Universite de Limoges, Limoges, France; Physics department, University of Bath, Bath, United Kingdom*

We review the recent development on inhibited-coupling guiding hollow-core photonic crystal fiber and on the physical principles that led to the unique combination of record loss figures, quasi-single mode operation and very low dispersion

ROOM 4a

14:00 – 15:30

IG-4: Solitons and Dynamics in Cavities

Chair: Massimo Giudici, Institut Non Linéaire de Nice, Valbonne, France

IG-4.1 THU 14:00

Ultra-weak acoustic interactions of temporal cavity solitons

•*J.K. Jang, M. Erkintalo, S.G. Murdoch, and S. Coen; The University of Auckland, Auckland, New Zealand*

We report on the weakest interactions ever observed between solitons. Cavity solitons recirculating in an optical fiber loop are found to shift their temporal separation by a few nanoseconds over millions of kilometres of propagation.

IG-4.2 THU 14:15

Observation of Vortex Soliton States in Vertical-Cavity Surface-Emitting Lasers with Feedback

•*J. Jimenez Garcia[1], Y. Noblet[1], P. Paulau[2], D. Gomila[3], G.-L. Oppo[1], and T. Ackemann[1]; [1]SUPA and Department of Physics, University of Strathclyde, Glasgow, United Kingdom; [2]TU Berlin, Institut für Theoretische Physik, Berlin, Germany; [3]IFISC, (CSIC-UIB), Campus Universitat Illes Balears, Palma de Mallorca, Spain*

We investigate experimentally and theoretically vortex soliton states in a VCSEL with frequency-selective feedback. We discuss

ROOM 4b

14:00 – 15:30

CH-6: Optical Sensor Applications

Chair: Elfed Lewis, University of Limerick, Limerick, Ireland

CH-6.1 THU 14:00

Optically Monitored Catalytic Photonic Crystal Fibre Microreactor

•*A.M. Cubillas[1,2], M. Schmidt[2,3], T.G. Euser[1], B.J.M. Etzold[2,3], N. Taccardi[2,3], S. Unterkofler[1], P. Wasserscheid[2,3], and P.S.J. Russell[1,2,4]; [1]Max Planck Institute for the Science of Light, Erlangen, Germany; [2]Excellence Cluster "Engineering of Advanced Materials", Erlangen, Germany; [3]Lehrstuhl für Chemische Reaktionstechnik, University of Erlangen-Nuremberg, Erlangen, Germany; [4]Department of Physics, University of Erlangen-Nuremberg, Erlangen, Germany*

We demonstrate that a hollow-core photonic crystal fibre can be turned into a catalytically active microreactor by depositing metallic catalyst nanoparticles in its core. We investigate the liquid-phase hydrogenation of azobenzene in such a fibre.

CH-6.2 THU 14:15

Ultrasensitive Cavity Optomechanical Magnetometry

•*E. Sheridan, S. Forstner, H. Rubinszstein-Dunlop, and W.P. Bowen; The University of Queensland, Brisbane, Australia*

We demonstrate a microscale room-temperature cavity optomechanical magnetometer with picoTelsa sensitivity. The sensitivity outperforms any previous room temperature magnetometer of its size. Such ultrasensitive magnetometers may have significant applications in areas such as low-field MRI.

ROOM 13a

14:00 – 15:30

CK-9: Integrated Photonic Devices

Chair: Wolfgang Sohler, Universität Paderborn, Paderborn, Germany

CK-9.1 THU 14:00

Extremely efficient two-section polarization converter for InGaAsP-InP photonic integrated circuits

•*D. Dzibrou, J. van der Tol, and M. Smit; Group of Photonic Integration, Eindhoven University of Technology, Eindhoven, The Netherlands*

We report fabrication and measurements of two-section polarization converter for InGaAsP-InP photonic integrated circuits. Polarization conversion efficiency is 99.8

CK-9.2 THU 14:15

Silicon-Organic Hybrid (SOH) IQ Modulator for 16-QAM at 112 Gbit/s

•*D. Korn[1], R. Palmer[1], H. Yu[3], P.C. Schindler[1], L. Alloatti[1], M. Baier[1], R. Schmogrow[1], W. Bogaerts[3], S.K. Selvaraja[3], G. Lepage[4], M. Pantouvaki[4], J. Wouters[4], P. Verheyen[4], J. Van Campenhout[4], P. Absil[4], R. Baets[3], R. Dinu[5], C. Koos[1,2], W. Freude[1,2], and J. Leuthold[1,2]; [1]Institute of Photonics and Quantum Electronics (IPQ), Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany; [2]Institute of Microstructure Technology (IMT), Karlsruhe Institute of Technology (KIT), Eggenstein-Leopoldshafen, Germany; [3]Photonics Research Group, Ghent University * IMEC, Department of Information Technology, Gent, Belgium; [4]Imec, Leuven, Belgium; [5]GigOptix Inc., Bothell (WA), United States*

We demonstrate a non-resonant silicon-organic hybrid modulator based on CMOS technology, using the Pockels effect in an organic material. We achieved a record-high

ROOM 13b

14:00 – 15:30

CB-9: High Efficiency/High Brightness Semiconductor Lasers

Chair: Gottfried Strasser, Vienna University of Technology, Vienna, Austria

CB-9.1 THU 14:00

High efficiency, 8W narrow-stripe broad-area lasers with in-plane beam-parameter-product below 2 mm mrad

•*P. Crump, K.-H. Hasler, H. Wenzel, S. Knigge, F. Bugge, and G. Erbert; Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany*

Narrow-stripe broad-area (NBA) lasers are shown to operate simultaneously with lateral beam parameter product < 2mm mrad, continuous wave output power > 7W and power conversion efficiency of 57%, as needed for industrial processing applications.

CB-9.2 THU 14:15

Tunable and highly brilliant laser sources at 1120 nm

•*K. Paschke, C. Fiebig, G. Blume, J. Fricke, F. Bugge, H. Wenzel, and G. Erbert; Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany*

High-brilliance diode lasers at 1120nm are essential for non-linear frequency conversion to reach 560nm. We present monolithic DBR-ridge-waveguide lasers emitting up to 1W, with a tunability of 8nm using resistive heaters next to the DBR.

ROOM 14a

14:00 – 15:30

IB-7: Fundamentals of Quantum Information

Chair: Miloslav Dusek, University of Olomouc, Olomouc, Czech Republic

IB-7.1 THU (Tutorial) 14:00

Quantum Information Tools

•*K. Molmer*; *University of Aarhus, Aarhus, Denmark*

This tutorial will present an introduction to the basic ideas of quantum information processsing and an overview of candidate physical implemetations, tools and ideas pursued in quantum computing research.

ROOM 14b

14:00 – 15:30

CF/IE-12: Mid Infrared and Terahertz Phenomena

Chair: Giulio Cerullo, Politecnico di Milano, Milan, Italy

CF/IE-12.1 THU 14:00

Temporal Slicing of Intense Multi-THz Transients Using an Ultrafast Semiconductor Switch

•*C. Schmidt, B. Mayer, J. Bühler, D.V. Seletskiy, D. Brida, A. Pashkin, and A. Leitenstorfer*; *Department of Physics and Center for Applied Photonics, University of Konstanz, Konstanz, Germany*

Intense multi-THz transients are temporally controlled with sub-cycle precision using an ultrafast plasma mirror. Field-resolved detection is used to monitor the results of temporal slicing.

CF/IE-12.2 THU 14:15

Optical generation of a broadband acoustic frequency comb in the 100 GHz frequency range

•*M. Grossmann[1], O. Ristow[1], M. Hettich[1], C. He[1], R. Waitz[1], P. Scheel[1], A. Bruchhausen[2], M. Schubert[1], V. Gusev[3], E. Scheer[1], and T. Dekorsy[1]*; *[1]University of Konstanz, 78464 Konstanz, Germany; [2]Instituto Balseiro \& Centro Atomico Bariloche (CNEA), and CONICET, Bariloche, Argentina; [3]Institut des Molecules et Matériaux du Mans, UMR CNRS 6283, Universite du Maine, Maine, France*

We demonstrate the first generation and de-

ROOM 21

Dept. of Physics and Astronomy, Macquarie University, Sydney, Australia; [5]Australian Astronomical Observatory (AAO), Sydney, Australia; [6]Sydney Institute for Astronomy (SIFA), Sydney, Australia

We present a novel way to fabricate low bend loss femtosecond-laser written optical waveguides permitting full-3D devices. We used a thermal annealing process to selectively erase zones of the initially generated refractive index modification.

14:00 – 15:30

CM-7: Femtosecond Laser Writing

Chair: Roberto Osellame, Politecnico di Milano, Milan, Italy

CM-7.1 THU 14:00

Femtosecond Laser Written Photonic Circuits for Quantum Simulation

•*A. Crespi[1], R. Osellame[1], R. Ramponi[1,2], L. Sansoni[3], F. Sciarrino[3], and P. Mataloni[3]*; *[1]Istituto di Fotonica e Nanotecnologie - Consiglio Nazionale delle Ricerche, Milano, Italy; [2]Dipartimento di Fisica - Politecnico di Milano, Milano, Italy; [3]Dipartimento di Fisica - Sapienza Università di Roma, Roma, Italy*

We demonstrate complex optical waveguide circuits, fabricated by femtosecond laser writing technology, implementing discrete-time quantum walks of polarization-entangled photon pairs. Tight phase control and polarization independent behaviour are shown.

CM-7.2 THU 14:15

Anti-resonant reflecting optical waveguides (ARROW) inscribed by the femtosecond direct-write technique

•*S. Gross, M. Alberich, A. Arriola, M.J. Withford, and A. Fuerbach*; *MQ Photonics Research Centre, Centre for Ultrahigh-bandwidth Devices for Optical Systems (CUDOS), Dept. of Physics and Astronomy, Macquarie University, North Ryde, Australia*

We demonstrate the fabrication of anti-resonant reflecting optical waveguides (ARROW) using the femtosecond laser direct-write technique. Their strongly wavelength dependent optical properties represent an

ROOM 22

14:00 – 15:30

CG-6: FEL and High Photon Energy Science

Chair: Laszlo Veisz, Max-Planck-Institute of Quantum Optics, Garching, Germany

CG-6.1 THU (Invited) 14:00

Non-linear FEL Science

•*R. Santra*; *Center for Free-Electron Laser Science, DESY, Hamburg, Germany; Department of Physics, University of Hamburg, Hamburg, Germany*

I will discuss the interaction of atoms with radiation pulses from x-ray free-electron lasers. In the studies presented, the peak intensity approaches 10^{18} W/cm^2 and the photon energy ranges from 1.5 keV to 5.5 keV.

ROOM EINSTEIN

14:00 – 15:30

IH-5: Ultrafast Nanophotonics

Chair: Christoph Lienau, University of Oldenburg, Oldenburg, Germany

IH-5.1 THU 14:00

Ultrafast Terahertz Dynamics of a Cold Exciton-Polariton Gas

•*J.-M. Ménard[1], C. Poellmann[1], M. Porer[1], E. Galopin[2], A. Lemaître[2], A. Amo[2], J. Bloch[2], and R. Huber[1]*; *[1]University of Regensburg, Regensburg, Germany; [2]CNRS-Laboratoire de Photonique et Nanostructures, Marcoussis, France*

THz absorption of the intra-excitonic 1s-2p resonance traces the matter part of polaritons while they cool into a condensed phase. A macroscopic population of the zero-momentum state is investigated in comparison with simultaneous photoluminescence measurements.

IH-5.2 THU 14:15

Ultrafast Metamaterial Optical Modulator

•*A. Neira, G. Wurtz, P. Ginzburg, and A. Zayats*; *King's College of London, London, United Kingdom*

The ultrafast third order nonlinearity of metals is used for the design of a modulator which further enhances its effect by patterning the metal as a metamaterial.

ROOM 1

CJ-11.2 THU 14:30

High average power and high energy transport of ultrashort pulses with a low loss Kagome hollow-core photonic crystal fiber for micromachining.

•*G. Machinet*[1], *B. Debort*[2], *R. Kling*[1], *J. Lopez*[1,3], *F. Gerome*[2], *F. Benabid*[2], *and P. Dupriez*[1]; [1]*Alphanov, Talence, France*; [2]*GPPMM group XLIM, Limoges, France*; [3]*CELIA, Talence, France*

A kagome hollow-core photonic-crystal-fiber transports 93μJ sub-picosecond pulses at high repetition rate. The fiber-delivered pulses are used to for micromachining on various materials and the effect of fiber delivery on material processing is investigated.

CJ-11.3 THU 14:45

Spatially coherent top-hat beam output from a large mode area microstructured single-mode fibre

•*P. Calvet*[1,2], *C. Valentin*[1], *Y. Quiquempois*[1], *G. Bouwmans*[1], *Q. Coulombier*[1], *L. Bigot*[1], *M. Douay*[1], *A. Mussot*[1], *and E. Hugonnot*[2]; [1]*CNRS, Université Lille 1, PhLAM/IRCICA, Lille, France*; [2]*Commissariat à l'Énergie Atomique et aux Énergies Alternatives, Centre d'Études Scientifique d'Aquitaine, Bordeaux, France*

We present the first experimental demonstration of a single-mode large-mode-area fibre delivering a top-hat beam. S2-measurement confirms the fibre is single-mode which is of crucial importance for many industrial applications.

CJ-11.4 THU 15:00

Depressed-Clad Large Mode Area Amplifier Fiber with Selective Doping Yielding Near Diffraction-Limited Beam Quality

•*V. Roy, C. Paré, H. Zheng, P. Laperle, L. Desbiens, and Y. Taillon*; *Institut national d'optique, Québec, Canada*

A depressed-clad LMA fiber with selective doping that yields near diffraction-limited beam quality (M2=1.1) is reported. The fiber

ROOM 4a

their bistability, properties and phase locking between a vortex and a fundamental soliton and between two vortices.

IG-4.3 THU 14:30

Polarization dynamics of bound state solitons in a carbon nanotubes mode locked erbium doped fiber laser

C. Mou, •*S. Sergeyev, A. Rozhin, and S. Turitsyn*; *Aston Institute of Photonic Technologies, Birmingham, United Kingdom*

We have demonstrated various polarization dynamics of bound state solitons in a carbon nanotube mode locked erbium doped fiber laser. Both locked and precessing polarization states have been observed for single and multiple bound state solitons.

IG-4.4 THU 14:45

Dissipative soliton excitability induced by spatial inhomogeneities and drift

P. Parra-Rivas[1,2], •*D. Gomila*[1], *M.A. Matías*[1], *and P. Colet*[1]; [1]*IFISC, Instituto de Física Interdisciplinar y Sistemas Complejos (CSIC-UIB), Palma de Mallorca, Spain*; [2]*Applied Physics Research Group (APHY), Vrije Universiteit Brussel, Brussels, Belgium*

We show that excitability is generic in systems displaying cavity solitons when spatial inhomogeneities and drift are present. Our scenario provides a general theoretical understanding of oscillatory regimes of cavity solitons reported in semiconductor microresonators.

IG-4.5 THU 15:00

Dynamics of the Modulational Instability in Microresonator Frequency Combs

•*T. Hansson, D. Modotto, and S. Wabnitz*; *Università di Brescia, Brescia, Italy*

An analysis is made of the nonlinear dynamics of the modulational instability for microresonator frequency combs described by the mean-field Lugiato-Lefever model.

ROOM 4b

CH-6.3 THU (Invited) 14:30

Optical Readout of Coupling Between a Nanomembrane and an LC Circuit at Room Temperature

•*T. Bagci*[1], *A. Simonsen*[1], *E. Zeuthen*[1], *J. Taylor*[2], *L.G. Villanueva*[3], *S. Schmid*[3], *A. Sørensen*[1], *A. Schliesser*[1], *K. Usami*[1], *and E.S. Polzik*[1]; [1]*QUANTOP, Niels Bohr Institute, Copenhagen, Denmark*; [2]*Joint Quantum Institute/NIST, Maryland, United States*; [3]*Department of Micro-and Nanotechnology, Technical University of Denmark, DTU Nanotech, Lyngby, Denmark*

We demonstrate optical interferometric readout of coupling between a mechanical resonator (nanomembrane) and a room temperature LC circuit. Our system serves as a promising candidate for sensitive optical detection of weak electrical signals.

CH-6.4 THU 15:00

Low-Cost Miniature Fiber Optic Extrinsic Fabry-Perot Interferometric Sensor for Cardiovascular Pressure Measurement

S. Poeggel, •*D. Tosi, G. Leen, and E. Lewis*; *University of Limerick, Limerick, Republic of Ireland*

We present a fiber optic pressure sensor based on extrinsic Fabry-Perot interferometry. The pressure probe is low-cost, biocompatible, with pressure accuracy 0.1 mmHg,

ROOM 13a

single-carrier single-polarization data rate of 112 Gbit/s using a 16QAM format.

CK-9.3 THU 14:30

Re-inventing Multimode Interference Couplers Using Subwavelength Gratings

•*A. Ortega-Moñux*[1], *R. Halir*[1], *A. Maese-Novo*[1], *C. Alonso-Ramos*[1], *L. Zavargo-Peche*[1], *D. Pérez-Galacho*[1], *Í. Molina-Fernández*[1], *J.G. Wangüemert-Pérez*[1], *P. Cheben*[2], *J.H. Schmid*[2], *J. Lapointe*[2], *D. Xu*[2], *and S. Janz*[2]; [1]*Dpto. de Ingeniería de Comunicaciones, ETSI Telecomunicación, Universidad de Málaga, Málaga, Spain*; [2]*National Research Council Canada, Ottawa, Canada*

We use the concept of subwavelength grating (SWG) refractive-index-engineering to propose and experimentally demonstrate a reduced size, slotted 2x2 MMI coupler. We also present an ultra-broadband 2x2 MMI coupler which is based on SWG dispersion-engineering.

CK-9.4 THU 14:45

Locally induced electro-optic activity in silicon nanophotonic devices

•*C. Matheisen*[1], *M. Nagel*[1], *S. Sawallich*[1], *M. Waldow*[1], *B. Chmielak*[2], *T. Wahlbrink*[1], *J. Bolten*[1], *and H. Kurz*[1,2]; [1]*AMO GmbH, Aachen, Germany*; [2]*Institute of Semiconductor Electronics, Aachen, Germany*

An integrated electro-optic Mach-Zehnder modulator in silicon-nanophotonic-based technology is demonstrated using a novel CMOS-compatible process for local $\chi^{(2)}$-induction. Photo-conductive THz near-field probes are applied to monitor the local restriction and quality of the activated areas.

CK-9.5 THU (Invited) 15:00

Integrated Photonic Devices in III-V Semiconductors for Optical Communications

•*M.J. Wale*; *Oclaro Technology Ltd., Towcester, United Kingdom*

Photonic integrated circuit (PIC) technology provides an important key to the realization of high performance communications systems. The paper will examine systems needs and show how III-V semiconductor-

ROOM 13b

CB-9.3 THU (Invited) 14:30

Efficiency droop of GaN lasers and LEDs

•*J. Hader*[1,2], *J. Moloney*[1,2], *and S. Koch*[3]; [1]*Nonlinear Control Strategies Inc., Tucson, United States*; [2]*University of Arizona, Tucson, United States*; [3]*Philipps University Marburg, Marburg, Germany*

Fully microscopic many-body models are used to investigate the possible causes of the efficiency droop. It is shown that the most plausible cause is density-activated defect recombination with contributions from transport- and delocalization related processes.

CB-9.4 THU 15:00

High-power and Reliable Operation of Window-Structured 915 nm Laser Diodes with 90 μm Aperture

•*T. Nagakura, T. Morita, K. Torii, M. Takauji, J. Maeda, M. Miyamoto, and H. Yoshida*; *Hamamatsu Photonics K.K., Hamamatsu, Japan*

We report the reliable 915 nm broad-area laser diode with 90 μm aperture. A stable operation at 15 W over 1000 h was obtained

ROOM 14a

IB-7.2 THU 15:00

Witnessing Trustworthy Single-Photon Entanglement with Local Homodyne Measurements

•*O. Morin*[1], *J.-D. Bancal*[2], *M. Ho*[2], *P. Sekatski*[2], *V. D'Auria*[1], *N. Gisin*[2], *J. Laurat*[1], *and N. Sangouard*[2]; [1]*Laboratoire Kastler Brossel, UPMC, ENS CNRS, Paris, France*; [2]*Group of Applied Physics, University of Geneva, Geneva, Switzerland*

We demonstrate a novel trustworthy witness

ROOM 14b

tection of a broadband acoustic frequency comb with 120 GHz central frequency and 200 GHz bandwidth in a Al/Si membrane.

CF/IE-12.3 THU 14:30

Single-shot detection of mid-infrared spectra by chirped-pulse upconversion with four-wave difference frequency generation in gases

•*T. Fuji*[1], *Y. Nomura*[1], *Y.-T. Wang*[2], *A. Yabushita*[2], *and C.-W. Luo*[2]; [1]*Institute for Molecular Science, Okazaki, Japan*; [2]*National Chiao Tung University, Hsinchu, China, Republic of (ROC)*

Chirped-pulse upconversion of mid-infrared continuum with four-wave difference frequency generation in gases is realized. Single-shot detection of the entire mid-infrared spectrum from 250 to 5500 cm-1 is demonstrated.

CF/IE-12.4 THU 14:45

A Novel Time-Resolved mid-IR Setup for the Investigation of Vibrational Dynamics in Aqueous Nanoclusters

•*J.C. Werhahn*[1], *M. Bradler*[2], *D. Hutzler*[1], *S. Fuhrmann*[1], *E. Riedle*[2], *H. Iglev*[1], *and R. Kienberger*[1]; [1]*Physik-Department E11, TU München, Garching, Germany*; [2]*LS für BioMolekulare Optik, LMU München, München, Germany*

A novel mid-IR pump probe setup, tunable between 2000 and 4000 cm-1 is presented. It yields one of the shortest IR probe pulses available today.

Measurements on ice and confined water nanoclusters will be discussed.

CF/IE-12.5 THU (Invited) 15:00

Imaging ultrafast nanoscale dynamics with a THz-pulse-coupled STM

•*T. Cocker*[1], *V. Jelic*[1], *M. Gupta*[2], *S. Molesky*[2], *J. Burgess*[1], *G. De Los Reyes*[1], *L. Titova*[1], *Y. Tsui*[2], *M. Freeman*[1], *and F. Hegmann*[1]; [1]*Department of Physics, University of Alberta, Edmonton, Canada*; [2]*Department of Electrical and Computer Engineering, University of Alberta, Edmonton, Canada*

We present a novel ultrafast imaging sys-

ROOM 21

avenue to dispersion engineered direct-write photonics.

CM-7.3 THU 14:30

Electro-optical Tuning of Waveguide Embedded Bragg Gratings in Lithium Niobate Induced by Direct Femtosecond Laser Writing

•*S. Kroesen*[1], *U. Patel*[2], *W. Horn*[1], *J. Imbrock*[1], *and C. Denz*[1]; [1]*University of Muenster, Muenster, Germany*; [2]*Sardar Vallbhbhai National Institute of Technology, Surat, India*

We report direct integration of electro-optical tunable Bragg grating waveguides (BGWs) in lithium niobate by direct femtosecond laser writing. The low loss two-dimension waveguides are modulated periodically to obtain narrowband reflections in the c-band.

CM-7.4 THU 14:45

Coherent Stitching of Light in Femtosecond Laser Formed Multi-Layered Volume Gratings

•*M.L. Ng, D. Chanda, and P.R. Herman*; *Dept. of Electrical & Computer Engineering, University of Toronto, Toronto, Canada*

We propose and demonstrate a novel method for improving diffraction efficiency through strategic arrangement of multi-layered weak phase gratings to coincide with self-imaging Talbot planes. Enhanced diffraction is demonstrated in femtosecond laser written volume gratings.

CM-7.5 THU 15:00

Direct laser writing of metastable modifications in lithium niobate crystal with ultrashort laser pulses

•*D. Paipulas*[1], *A. Čerkauskaite*[1], *V. Sirutkaitis*[1], *V. Mizeikis*[2], *and S. Juodkazis*[3]; [1]*Vilnius University, Laser Research Center, Vilnius, Lithuania*; [2]*Shizuoka University, Division of Global Research Leaders, Hamamatsu, Japan*; [3]*Swinburne University of Technology, Melbourne, Australia*

ROOM 22

CG-6.2 THU 14:30

Generation of Coherent Soft X-ray Radiation at High Repetition Rate

•*J. Rothhardt*[1,2], *S. Demmler*[2], *S. Hädrich*[2], *M. Krebs*[2], *J. Limpert*[1,2], *and A. Tünnermann*[1,2]; [1]*Helmholtz-Institute Jena, Jena, Germany*; [2]*Friedrich-Schiller-University, Jena, Germany*

We report on the generation of coherent soft x-rays at high repetition rate. A flux of 2*10^5 photons/s has been measured at 200 eV. Scaling to shorter wavelengths and higher photon flux is discussed.

CG-6.3 THU 14:45

Carrier-Envelope Phase-Dependent High-Harmonic Generation in the Water Window Using a Few-Cycle Infrared Light Source

•*N. Ishii*[1], *K. Kaneshima*[1], *K. Kitano*[1], *T. Kanai*[1], *S. Watanabe*[2], *and J. Itatani*[1]; [1]*Institute for Solid State Physics, University of Tokyo, Chiba, Japan*; [2]*Research Institute for Science and Technology, Tokyo University of Science, Chiba, Japan*

We report on the generation of carrier-envelope phase-dependent high harmonics in the water window using few-cycle, phase-stabilized intense infrared pulses. This observation indicates that a 50-eV-wide attosecond continuum is generated around 300 eV.

CG-6.4 THU 15:00

Beyond Carbon K-edge harmonic emission using spatially and temporally synthesized laser field

•*J.A. Pérez-Hernández*[1], *M. Ciappina*[2,3], *M. Lewenstein*[3,4], *L. Roso*[1], *and A. Zaïr*[5]; [1]*Centro de Láseres Pulsados (CLPU), Salamanca, Spain*; [2]*ICFO-Institut de Ciènces Fotòniques, Barcelona, Spain*; [3]*Auburn University, Alabama, United States*; [4]*ICREA-Institució Catalana de Recerca i Estudis*

ROOM EINSTEIN

IH-5.3 THU 14:30

Strong-field photoemitted electrons from metallic tips show carrier-envelope phase effects

B. Piglosiewicz[1,2], *S. Schmidt*[1,2], *D. Park*[1,2], *J. Vogelsang*[1,2], •*P. Groß*[1,2], *C. Manzoni*[3], *P. Farinello*[3], *G. Cerullo*[3], *and C. Lienau*[1,2]; [1]*Institut für Physik, Carl von Ossietzky Universität, Oldenburg, Germany*; [2]*Center of Interface Science, Carl von Ossietzky Universität, Oldenburg, Germany*; [3]*IFN-CNR, Dipartimento die Fisica, Politecnico di Milano, Milano, Italy*

We report on the first observation of pronounced carrier-envelope-phase effects on strong-field photoemission of electrons from nanometric gold tips and present a new way to steer and control the motion of electrons around metallic nanoparticles.

IH-5.4 THU 14:45

Ultrafast Strong-Field Photoemission from Plasmonic Nanoparticles

•*P. Dombi*[1,2], *A. Hörl*[3], *P. Rácz*[1], *I. Márton*[1], *A. Trügler*[3], *J.R. Krenn*[3], *and U. Hohenester*[3]; [1]*Wigner Research Centre for Physics, Budapest, Hungary*; [2]*Max-Planck-Institut für Quantenoptik, Garching, Germany*; [3]*Institut für Physik, Karl-Franzens-Universität, Graz, Austria*

We demonstrate strong-field electron emission from various plasmonic nanoparticles induced by ultrashort laser pulses. Significant electric field enhancement attributed to surface plasmons enable the generation of up to 25-eV electrons in nano-localized fields around nanoparticles.

IH-5.5 THU 15:00

Ultrafast dynamics of quantum confined carriers in a single CdSe nanowire

•*T. Schumacher*[1,2], *H. Giessen*[2], *and M. Lippitz*[1,2]; [1]*Max Planck Institute for Solid State Research, Heisenbergstrasse1, D-70569 Stuttgart, Germany*; [2]*4th Physics Institute, University of Stuttgart, Pfaffenwaldring 57, D-70550 Stuttgart, Germany*

Nonlinear spectroscopy allows us to track for the first time the decay and re-emission

ROOM 1

effective mode area could possibly be scaled over 1000micron2 and still allow for reasonably good beam quality.

CJ-11.5 THU 15:15

Very large mode area Solid-Core Photonic BandGap fiber laser with hetero-structured cladding and Yb-doped Sol-Gel core

•*A. Baz, L. Bigot, G. Bouwmans, H. El Hamzaoui, M. Bouazaoui, and Y. Quiquempois*; *PhLAM-IRCICA, Université Lille 1, Villeneuve d'Ascq, France*

We report the realization of a double clad LMA, Yb-doped, SC-PBGF with hetero-structured cladding, and a Sol-Gel made core. We measured a laser efficiency of 61.5% around 1.06μm wavelength, and a record MFD of 36um.

16:00 – 17:30

CJ-12: Novel Waveguide Materials

Chair: Annamaria Cucinotta, University of Parma, Parma, Italy

CJ-12.1 THU 16:00

Phosphate Glass Core and Silica Cladding Laser Fiber.

B. Denker[1], B. Galagan[1], V. Kamynin[1], A. Kurkov[1], Y. Sadovnikova[1], •S. Semenov[2], S. Sverchkov[1], V. Velmiskin[2], and E. Dianov[2]; [1]*A.M.Prokhorov General Physics Institute, Moscow, Russia*; [2]*Fiber Optics Research Center, Moscow, Russia*

Fabrication and tests of a composite fiber prepared by melting Yb-Er phosphate glass in a silica cladding are presented. 1.54 μm lasing was demonstrated under core pumping into Yb absorption band.

ROOM 4a

IG-4.6 THU 15:15

Nonlinear dynamics of optoeletronic oscillators based on whispering-gallery mode resonators

•*A. Coillet, R. Henriet, P. Salzenstein, K. Phan-Huy, L. Larger, and Y. Chembo*; *FEMTO-ST, Besançon, France*

We propose a nonlinear dynamics framework to study the stability and transient behavior of an optoelectronic oscillator based on whispering-gallery mode resonators. Experimental results are provided and successfully compared to numerical simulations.

16:00 – 17:30

IG-5: Rogue Waves, Extreme Events and Nonlinear Wave Dynamics

Chair: Philippe Grelu, Université de Bourgogne, Dijon, France

IG-5.1 THU 16:00

Rogue incidents in the optical event horizon

•*A. Demircan[1], S. Amiranashvili[2], C. Brée[2], C. Mahnke[3], F. Mitschke[3], and G. Steinmeyer[4]*; [1]*Invalidenstr. 114, Berlin, Germany*; [2]*Weierstrass Institute for Applied Analysis and Stochastics (WIAS), Berlin, Germany*; [3]*Institute for Physics, University of Rostock, Rostock, Germany*; [4]*Max-Born-Institute (MBI), Berlin, Germany*

Dispersive radiation captured in the optical event horizon of a soliton may induce severe reshaping of the latter, significantly increasing its peak power. This effect contributes to

ROOM 4b

with tiny pressure drift. System characterization on simulated cardiovascular system is presented.

CH-6.5 THU 15:15

Stabilized high-power laser for gravitational wave detection

•*C. Bogan[1], K. Danzmann[1], M. Frede[2], H. Kim[1], P. King[3], P. Kwee[1], J. Poeld[1], O. Puncken[2], R. Savage[3], F. Seifert[1], P. Wessels[2], L. Winkelmann[2], and B. Willke[1]*; [1]*Albert-Einstein-Institut, Hannover, Germany*; [2]*Laser Zentrum Hannover e.V., Hannover, Germany*; [3]*LIGO Laboratory, California Institute of Technology, Pasadena, United States*

Advanced gravitational wave detectors have stringent requirements concerning the frequency and the power stabilization of their 200 W laser sources. We demonstrate how these were fulfilled using a combination of several active and passive stabilization schemes.

16:00 – 17:15

CH-7: Frontiers of Optical Sensing

Chair: Hanne Ludvigsen, Aalto University, Aalto, Finland

CH-7.1 THU 16:00

High-spatial resolution second-harmonic interferometry: a robust method towards quantitative phase imaging of transparent dispersive materials

•*F. Brandi[1], F. Conti[2,3], M. Tiberi[2,3], F. Giammanco[2,3], and A. Diaspro[1]*; [1]*Istituto Italiano di Tecnologia, Genova, Italy*; [2]*Università degli Studi di Pisa, Pisa, Italy*; [3]*Plasma Diagnostics & Technologies Ltd., Pisa, Italy*

We present a novel method, based on a compact fiber coupled second-harmonic interferometer, for high sensitivity and fast measurements of chromatic dispersion with mi-

ROOM 13a

based PICs enable these to be addressed.

16:00 – 17:30

CK-10: Micro-optics and Integrated Sensors

Chair: Marco Marangoni, Politecnico di Milano, Milan, Italy

CK-10.1 THU 16:00

High-Sensitivity Monitoring of Nanomechanical Motion using Optical Heterodyne Detection

•*S. Mueller[1,2], S. Weis[1], and T. Kippenberg[1]*; [1]*École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland*; [2]*Ludwig-Maximilians-Universität München, München, Germany*

We demonstrate the application of heterodyne detection to readout the motion of a nanomechanical mode. The down-mixing of nanomechanical frequencies enables the use of high-sensitivity detectors providing unsurpassed measurement sensitivity for the

ROOM 13b

by optimized window structure.

CB-9.5 THU 15:15

Aluminium Free Active Region 780nm Tapered Semiconductor Optical Amplifiers for Rubidium Pumping

A. Jammot, J. Bebe, M. Lamponi, Y. Robert, E. Vinet, M. Lecomte, M. Garcia, O. Parillaud, and •M. Krakowski; *III-V Lab, Palaiseau, France*

We present a new tapered Semiconductor Optical Amplifier (SOA) structure, based on an Al free active region and entirely gain guided, that exhibits more than 600mW output power at a wavelength of 780nm.

16:00 – 17:30

CB-10: Disk and Mid-Infrared Semiconductor Lasers

Chair: Michael J. Strain, University of Glasgow, Glasgow, United Kingdom

CB-10.1 THU 16:00

Narrow Linewidth Ultraviolet Semiconductor Disk Laser

•*D. Paboeuf, P.J. Schlosser, and J.E. Hastie*; *Institute of Photonics, University of Strathclyde, Glasgow, United Kingdom*

We present frequency stabilisation of an AlGaInP-based red-emitting semiconductor disk laser with intracavity second harmonic generation for highly coherent, tunable ultraviolet emission. Spectral linewidth <25kHz at 339nm is achieved, relative to a reference cavity.

ROOM 14a

for single-photon entanglement based only on local homodyne measurements. This operational test is well suited for quantum networks, and highlights the potential of the optical hybrid approach.

IB-7.3 THU 15:15

Bell Violation with Entangled Photons, Free of the Fair-Sampling Assumption

•*M. Giustina*[1,2], *A. Mech*[1,2], *S. Ramelow*[1,2], *B. Wittmann*[1,2], *J. Kofler*[1,3], *J. Beyer*[4], *A. Lita*[5], *B. Calkins*[5], *T. Gerrits*[5], *S.W. Nam*[5], *R. Ursin*[1], *and A. Zeilinger*[1,2]; [1]*Institute for Quantum Optics and Quantum Information, Vienna, Austria*; [2]*Quantum Optics, Quantum Nanophysics, Quantum Information, University of Vienna, Faculty of Physics, Vienna, Austria*; [3]*Max Planck Institute of Quantum Optics (MPQ), Garching, Germany*; [4]*Physikalisch-Technische Bundesanstalt, Berlin, Germany*; [5]*National Institute of Standards and Technology (NIST), Boulder, CO, United States*

Using superconducting transition-edge sensors and a photon pair source based on spontaneous parametric downconversion, we present the first demonstration of a Bell experiment using photons for which the well-known fair-sampling (or detection) loophole was closed.

16:00 – 17:30

IB-8: Quantum State Characterization

Chair: Mohamed Bourennane, Stockholm University, Stockholm, Sweden

IB-8.1 THU 16:00

Experimental Demonstration of Adaptive Quantum State Estimation

•*S. Takeuchi*[1,2], *R. Okamoto*[1,2], *M. Iefuji*[1,2], *S. Oyama*[1,2], *K. Yamagata*[3], *H. Imai*[4], *and A. Fujiwara*[3]; [1]*R.I.E.S., Hokkaido University, Sapporo, Japan*; [2]*I. S. I. R., Osaka University, Osaka, Japan*; [3]*Dept. Mathematics, Osaka Univ., Osaka, Japan*; [4]*University of Pavia, Pavia, Italy*

The first experimental demonstration of adaptive quantum state estimation (AQSE) is reported. The angle of linear polarization of single photons is estimated using AQSE, and the strong consistency and asymptotic

ROOM 14b

tem capable of unprecedented simultaneous nanometer spatial resolution (2 nm) and subpicosecond temporal resolution (500 fs) based on coupling terahertz pulses to a scanning tunnelling microscope.

16:00 – 17:30

CF/IE-13: Charge Dynamics in Solids

Chair: Christoph Lienau, University of Oldenburg, Oldenburg, Germany

CF/IE-13.1 THU (Invited) 16:00

Ultrafast Electronic Charge Dynamics in Solids Mapped by Femtosecond X-ray Diffraction

•*T. Elsaesser*[1], *F. Zamponi*[1], *P. Rothhardt*[1], *J. Stingl*[1], *B. Freyer*[1], *M. Woerner*[1], *and A. Borgschulte*[2]; [1]*Max-Born-Institute, Berlin, Germany*; [2]*EMPA, Duebendorf, Switzerland*

Transient electron density maps and the interplay of electron and lattice motions in ionic materials are studied by x-ray powder diffraction with laser-driven hard x-ray sources providing a 100-fs time resolution.

ROOM 21

We report on photorefractive modification creation in three-dimensional space of pure and iron-doped lithium niobate crystals with femtosecond laser pulses. We demonstrate how modifications can be locally or globally modified using the same laser beam.

CM-7.6 THU 15:15

Observation of Spectral Gouy Shift in femtosecond laser pulse written Volume Bragg Gratings

•*D. Richter*[1], *C. Voigtländer*[1], *R.G. Krämer*[1], *J.U. Thomas*[1], *A. Tünnermann*[1,2], *and S. Nolte*[1,2]; [1]*Institute of Apllied Physics, Friedrich-Schiller-Universität Jena, Jena, Germany*; [2]*Fraunhofer Institute for Applied Optics and Precision Engineering, Jena, Germany*

We present our observation of the spectral Gouy shift when probing a VBG with a fiber. While varying the distance between fiber and grating the central wavelength of the reflection signal shifts.

16:00 – 17:30

CM-8: Laser Processing from Polymers to Fibres

Chair: Maria Farsari, IESL-FORTH, Heraklion, Crete, Greece

CM-8.1 THU 16:00

High Resolution Single-Pulse Multiphoton Polymerisation using a Digital Multimirror Device

•*B. Mills, J. Grant-Jacob, M. Feinaeugle, and R. Eason*; *Optoelectronics Research Centre, Southampton, United Kingdom*

We present a rapid and high resolution approach to multiphoton polymerisation, achieved through spatial intensity patterning by a digital multimirror device. Regions of ~30um have been polymerised by a single 150fs pulse, with sub-micron resolution.

ROOM 22

Avançats, Barcelona, Spain; [5]*Imperial College London, London, United Kingdom*

We investigate how the combination of temporal and spatial laser field synthesis results in a dramatic cut-off extension far beyond the semi-classical limit. Our scheme allows coherent XUV photons generation beyond the carbon K-edge

CG-6.5 THU 15:15

Spectral chracterization of fully phase matched high harmonics generated in a hollow waveguide for free electron laser seeding

•*F. Ardana-Lamas*[1,2], *A. Trisorio*[1], *G. Lambert*[3], *B. Vodungbo*[3], *V. Malka*[3], *P. Zeitoun*[3], *and C. Hauri*[1,2]; [1]*Paul Scherrer Institute, Villigen PSI, Switzerland*; [2]*École Polytechniqe Fédérale de Lausanne, Lausanne, Switzerland*; [3]*Laboratoire d'Optique Appliquée,ENSTA-CNRS-Polytechniqe, Palaiseau, France*

Development of high brilliance high-order harmonic sources is fundamental for FEL seeding. In this paper we present a fully phase-matched high harmonic source that delivers 10^{10} photons/second with photon energies up to 160 eV.

16:00 – 17:30

CG-7: Field Driven Interactions

Chair: Robin Santra, CFEL, DESY, Hamburg, Germany

CG-7.1 THU 16:00

Electron rescattering in photoemission from metal tips as a nanoscale probe of near-field enhancement

•*S. Thomas*[1], *M. Krüger*[1], *M. Förster*[1], *and P. Hommelhoff*[1,2]; [1]*Max Planck Institute of Quantum Optics, Garching, Germany*; [2]*University of Erlangen-Nuremberg, Erlangen, Germany*

We measure the strength of optical near-field enhancement at metal nanotips by studying electron rescattering, a phenomenon well-known from attosecond science. The experimental results agree well with Maxwell simulations.

ROOM EINSTEIN

of excitations in a single CdSe nanowire. We further discuss an optical nanoantenna to improve the signal.

IH-5.6 THU 15:15

Switching spontaneous emission in microcavities in the time domain

•*H. Thyrrestrup*[1], *A. Hartsuiker*[1], *J.-M. Gérard*[2], *and W.L. Vos*[1]; [1]*Complex Photonics Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, The Netherlands*; [2]*CEA/INAC/SP2M, Nanophysics and Semiconductor Laboratory, 17 rue des Martyrs, Grenoble Cedex, France*

We have theoretically studied the excited state population and emitted intensity dynamics for an emitter whose decay rate is manipulated in time, faster than its it stationary decay time, and observe intriguing strongly non-exponential decays.

16:00 – 17:30

IH-6: Quantum Dots. Optical Forces

Chair: Mete Atature, University of Cambridge, Cambridge, United Kingdom

IH-6.1 THU 16:00

Magneto-optical spectroscopy of charged CdSe nanocrystals

•*P. Tamarat*[1,2], *M.J. Fernée*[1,2], *C. Sinito*[1,2], *Y. Louyer*[3], *and B. Lounis*[1,2]; [1]*University of Bordeaux, LP2N, Talence, France*; [2]*Institut d'Optique & CNRS, LP2N, Talence, France*; [3]*University of Bordeaux, LOMA, Talence, France*

A CdSe core-shell nanocrystal is engineered to efficiently ionize at cryogenic temperatures resulting in trion emission. The finite nanometre size of the nanocrystals introduces an acoustic phonon bottleneck, inhibiting spin relaxation.

ROOM 1

CJ-12.2 THU 16:15

An ion-exchanged Thulium-doped germanate glass channel waveguide laser operating near 1.9 micron

P. Kannan, •A. Choudhary, J. Mackenzie, X. Feng, and D. Shepherd; Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom

We demonstrate for the first time to our knowledge, an ion-exchanged Tm:germanate glass channel waveguide laser. Lasing was observed near 1.9 micron with an incident threshold power of 83mW and a propagation loss of 0.3dB/cm.

CJ-12.3 THU 16:30

Thulium-doped Yttria Planar Waveguide Laser Grown by Pulsed Laser Deposition

•J. Szela, K.A. Sloyan, T.L. Parsonage, J.I. Mackenzie, and R.W. Eason; Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom

We demonstrate the first crystalline Tm:Y2O3 planar waveguide laser fabricated by pulsed laser deposition. Lasing at 1951nm, 35mW was obtained for 600mW of incident 797nm Ti:sapphire pump, with a 9% slope efficiency.

CJ-12.4 THU 16:45

High Gain, Short Length Optical Amplifier in Heavily Doped Phosphate Glass for Miniature Optics.

•T.T. Fernandez[1], J. del Hoyo[1], V. Berdejo[2], A. Ruiz de la Cruz[1], A. Ferrer[3], I. Ortega-Feliu[4], J.A. Vallés[2], M.A. Rebolledo[2], and J. Solís[1]; [1]Laser Processing Group, Instituto de Óptica (CSIC), Madrid, Spain; [2]Departamento de Física Aplicada 13A, Facultad de Ciencias, Universidad de Zaragoza,

ROOM 4a

the formation of optical rogue waves.

IG-5.2 THU 16:15

Rogue Waves in the Beam Profiles of Multifilaments

•S. Birkholz[1], C. Brée[1,2], A. Demircan[3], E.T.J. Nibbering[1], S. Skupin[4,5], G. Genty[6], and G. Steinmeyer[1,6]; [1]Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie (MBI), Berlin, Germany; [2]Weierstraß-Institut für Angewandte Analysis und Stochastik, Berlin, Germany; [3]Invalidenstraße 114, Berlin, Germany; [4]Max Planck Institute for the Physics of Complex Systems, Dresden, Germany; [5]Friedrich Schiller University, Institute of Condensed Matter Theory and Optics, Jena, Germany; [6]Tampere University of Technology, Tampere, Finland

A novel scenario of optical rogue-wave formation is reported. In contrast to fiber-optical rogue waves, mechanical turbulence is identified as the driver for the emergence of waves with extreme amplitudes in optical filamentation.

IG-5.3 THU 16:30

Experimental and numerical study of the predictability of rogue waves in semiconductor lasers

•J. Zamora-Munt[1], B. Garbin[2], S. Barland[2], M. Giudici[2], J.R. Rios Leite[3], C. Masoller[4], and J.R. Tredicce[3,5]; [1]IFISC (CSIC-UIB), Campus Universitat Illes Balears, Palma de Mallorca, Spain; [2]Universite de Nice Sophia Antipolis, Institut Non-Lineaire de Nice, Valbonne, France; [3]Departamento de Fisica, Universidade Federal de Pernambuco, Recife, Brazil; [4]Departament de Fisica i Enginyeria Nuclear, Universitat Politecnica de Catalunya, Terrassa, Spain; [5]Universite de la Nouvelle Caledonie - Pole Pluridisciplinaire de la Matiere et del Énvironnement, Nouvelle Caledonie, New Caledonia

Rogue waves in a semiconductor laser with optical injection are demonstrated experimentally and numerically. We show that the extreme pulses are predictable and that noise plays an important role in controlling their appearance

IG-5.4 THU 16:45

Competing Wave-Breaking Mechanisms in Second Harmonic Generation

•M. Conforti[1], F. Baronio[1], and S. Trillo[2];

ROOM 4b

crometer resolutions. An outlook is given towards quantitative phase dispersion imaging.

CH-7.2 THU 16:15

Quantum-limited, cavity-free nano-optomechanical vectorial coupling with SiC nanowires and Carbon nanotubes

•A. Gloppe[1], P. Verlot[1], E. Dupont-Ferrier[1], A. Kuhn[1], B. Pigeau[1], S. Rohr[1], A. Siria[2], P. Poncharal[2], P. Vincent[2], G. Bachelier[1], and O. Arcizet[1]; [1]Institut Néel, CNRS, Université Joseph Fourier, Grenoble, France; [2]Laboratoire de Physique de la Matière Condensée et Nanostrctures, Lyon, France

We investigate the nano-optomechanical properties between a nanowire and a focused beam of light. Based on such a system, we report unprecedently sensitive vectorial detection of nanomechanical motion using SiC nanowires and Carbon nanotubes.

CH-7.3 THU 16:30

Bicell fiber optics homodyne phase demodulator - experimental results.

Z. Holdynski[1,2], •I. Merta[1], T. Nasilowski[1,2], and L. Jaroszewicz[1]; [1]Military University of Technology, Warsaw, Poland; [2]InPhoTech Ltd, Warsaw, Poland

We report novel possibility of phase demodulation using bicell photodetector. Homodyne fiber demodulator reconstruct widely frequency shifted different types of signals. Proposed setup highly limited data processing and enable extreme measurement precision.

CH-7.4 THU 16:45

Acoustically tagged photons for ultimate sensitivity imaging

•W. Glastre, O. Jacquin, O. Hugon, H. Guillet de Chatellus, and E. Lacot; Laboratoire Interdisciplinaire de Physique, Saint Martin

ROOM 13a

GHz frequency domain.

CK-10.2 THU 16:15

Broad-spectral-range synchronized flat-top arrayed-waveguide grating applied in a 225-channel cascaded spectrometer

•B.I. Akca[1], C.R. Doerr[2], G. Sengo[1], K. Wörhoff[1], M. Pollnau[1], and R.M. de Ridder[1]; [1]Integrated Optical MicroSystems Group, MESA+ Institute for Nanotechnology, University of Twente, Enschede, The Netherlands; [2]Acacia Communications, Inc.,, Maynard, United States

We demonstrate a new pass-band flattening method by introducing 3-dB balanced couplers to a Mach Zehnder-synchronized arrayed waveguide grating (AWG) configuration over a broad spectral range.

CK-10.3 THU 16:30

Flat-focal-field Integrated Spectrometer Using a Field-flattening Lens

•B.I. Akca, G. Sengo, M. Pollnau, A. Driessen, K. Wörhoff, and R.M. de Ridder; Integrated Optical MicroSystems Group, MESA+ Institute for Nanotechnology, University of Twente, Enschede, The Netherlands

In this work, an alternative way of designing a flat-focal-field arrayed-waveguide grating using an integrated field-flattening lens is presented

CK-10.4 THU 16:45

On-Chip Collimated Planar Free Space Gaussian Beams utilising Optical Lenses on a Silicon on Insulator Chip

•G. Ren, T.G. Nguyen, and A. Mitchell; CUDOS, School of Electrical and Computer En-

ROOM 13b

CB-10.2 THU 16:15

High-efficiency yellow VECSEL with an output power of about 12 W

•E. Kantola, T. Leinonen, S. Ranta, M. Tavast, and M. Guina; Optoelectronics Research Centre, Tampere University of Technology, Tampere, Finland

We report a high power (11.7 W) yellow-orange VECSEL emitting around 589 nm. The conversion efficiency from pump to yellow radiation was about 19 %. The output power was limited by the pump available.

CB-10.3 THU 16:30

Modeless highly coherent Frequency-shifted-feedback Vertical External Cavity Surface Emitting Laser

•M. Sellahi[1], I. Sagnes[2], G. Beaudoin[2], M. Myara[1], and A. Garnache[1]; [1]IES-CNRS UMR5214, Université de Montpellier 2, Montpellier, France; [2]LPN-CNRS, Marcoussis, France

We demonstrate the 1rst broadband modeless Frequency Shifted Feedback laser based on VeCSEL technology. It exhibits TEM00 operation with 300 Ghz bandwidth, linear polarization and 30 mW output power in Continuous wave operation.

CB-10.4 THU 16:45

Mid-IR Quantum Dot VECSEL

•A. Khiar, M. Witzan, A. Hochreiner, M. Eibelhuber, T. Schwarzl, and G. Springholz; Johannes Kepler University, 4040 Linz, Austria

ROOM 14a

efficiency predicted mathematically are verified.

IB-8.2 THU 16:15

Experimental Characterization of Cluster States using Fibre Sources

•*B. Bell[1], M. Tame[2], A. Clark[3], A. McMillan[1], R. Nock[1], W. Wadsworth[4], and J. Rarity[1]; [1]University of Bristol, Bristol, United Kingdom; [2]Imperial College London, London, United Kingdom; [3]University of Sydney, Sydney, Australia; [4]University of Bath, Bath, United Kingdom*

Using photonic crystal fibre sources of photon pairs, we characterize entangled states of three and four photons, locally equivalent to cluster states, which we use to demonstrate logic gates for measurement based quantum computing.

IB-8.3 THU 16:30

Experimental state estimation for spatial qubits

•*P. Kolenderski[1,2], K. Johnsen[1], C. Scarcella[3], D. Hamel[1], K. Shalm[1], S. Tisa[4], A. Tosi[3], K. Resch[1], and T. Jennewein[1]; [1]Institute for Quantum Computing, University of Waterloo, Waterloo, Canada; [2]Institute of Physics, Nicolaus Copernicus University, Torun, Poland; [3]Politecnico di Milano, Dipartimento di Elettronica e Informazione, Milano, Italy; [4]Micro Photon Device, Bolzano, Italy*

An estimation of a spatially encoded qubit state is demonstrated by implementing a 28-element quantum measurement using an array of detectors and carefully designed imaging optics.

IB-8.4 THU 16:45

Experimental Analysis of Qudit Entangled States using the time-energy degree of freedom

•*D.L. Richart[1,2], W. Laskowski[1,2,3], Y. Fischer[1,2], and H. Weinfurter[1,2]; [1]Max*

ROOM 14b

CF/IE-13.2 THU 16:30

Ultrafast Non-Thermal Electron Dynamics in Single Layer Graphene

•*D. Brida[1], C. Manzoni[2], G. Cerullo[2], A. Tomadin[3], M. Polini[3], R.R. Nair[4], A.K. Geim[4], K.S. Novoselov[4], S. Milana[5], A. Lombardo[5], and A.C. Ferrari[5]; [1]University of Konstanz, Konstanz, Germany; [2]Politecnico di Milano, Milano, Italy; [3]NEST, Scuola Normale Superiore, Pisa, Italy; [4]University of Manchester, Manchester, United Kingdom; [5]University of Cambridge, Cambridge, United Kingdom*

We study the ultrafast dynamics of non-thermal electron relaxation in graphene upon impulsive excitation. The 10-fs resolution two-color pump-probe allows us to observe non-equilibrium electron relaxation at early times unveiling Auger processes and charge multiplication.

CF/IE-13.3 THU 16:45

Femtosecond Low-Energy Dynamics of a Charge Density Wave in $TiSe_2$

•*M. Porer[1], J.-M. Ménard[1], H. Dachraoui[2], U. Leierseder[1], K. Groh[1], J. Demsar[3], U. Heinzmann[2], and R. Huber[1]; [1]Department*

ROOM 21

CM-8.2 THU 16:15

The effect of porosity on cell ingrowth in 3D laser-fabricated biodegradable scaffolds for bone regeneration

P. Danilevicius[1], L. Georgiadi[1,2], F. Claeyssens[3], C. Paterman[3], M. Chatzinikoloaidou[1,2], and •M. Farsari[1]; [1]IESL-FORTH, Heraklion, Greece; [2]Department of Materials Science and Technology, University of Crete, Heraklion, Greece; [3]Kroto Research Institute, University of Sheffiled, Sheffield, United Kingdom

We demonstrate the fabrication by Direct Laser Writing of 3D biodegradable scaffolds with different pore sizes. We investigate the material biodegradability and effect of scaffold porosity on cell adhesion and proliferation using mouce pre-osteoblastic cells.

CM-8.3 THU 16:30

Laser 3D nanostructuring of polymers: mechanisms study and targeted applications

•*M. Malinauskas[1], A. Zukauskas[1], G. Seniutinas[2,3], D. Paipulas[1], V. Sirutkaitis[1], and S. Juodkazis[2,3]; [1]Laser Research Center, Department of Quantum Electronics, Physics Faculty, Vilnius University, Vilnius, Lithuania; [2]Micro-Photonics Centre, Engineering and Industrial Sciences Faculty, Swinburne University of Technology, Melbourne, Australia; [3]Melbourne Centre for Nanofabrication, 151 Wellington Road, Clayton, Melbourne, Australia*

We present recent study on high-precision direct laser fabrication of polymers focussing on light matter interaction mechanisms at nanoscale: multiphoton absorption, avalanche ionization and thermal effects. We show possible applications in integrated microoptics and biomedicine.

CM-8.4 THU 16:45

Initiator-Free Multiphoton Polymerization for 3D Nanostructure Fabrication

•*A. Giakoumaki[1,2], E. Kabouraki[1,3], M. Vamvakaki[1,3], and M. Farsari[1]; [1]IESL-*

ROOM 22

CG-7.2 THU 16:15

Multidimensional High Harmonic Spectroscopy

•*V. Serbinenko and O. Smirnova; Max Born Institute, Berlin, Germany*

We consider high harmonic generation in orthogonally polarized fundamental and weak multicolor fields as multidimensional pump-probe spectroscopy. We present analytical approach, which extracts information about electron subcycle dynamics directly from the modulation of HHG signal.

CG-7.3 THU 16:30

Interrupted virtual single-photon transition

•*J. Herrmann[1], M. Weger[1], R. Locher[1], M. Sabbar[1], P. Rivière[2,3], U. Saalmann[3], J.-M. Rost[3], L. Gallmann[1], and U. Keller[1]; [1]Department of Physics, Institute of Quantum Electronics, ETH Zurich, Zürich, Switzerland; [2]Departamento de Química, Universidad Autónoma de Madrid, Madrid, Spain; [3]Max Planck Institute for the Physics of Complex Systems, Dresden, Germany*

We report optical gain created by the interruption of the temporal evolution of the dipole response of a quantum-mechanical two-level system. A transient absorption experiment in helium confirms the results of our theoretical study.

CG-7.4 THU 16:45

Optical Response of Electron Wave-packet Interference Revisited

•*M. Lucchini, J. Herrmann, A. Ludwig, M. Sabbar, R. Locher, L. Gallmann, and U. Keller; Department of Physics, Institute of*

ROOM EINSTEIN

IH-6.2 THU 16:15

Blinking suppression and biexcitonic emission

D. Canneson[1], L. Biadala[1], S. Buil[1], •X. Quélin[1], C. Javaux[2], B. Dubertret[2], and J.-P. Hermier[1,3]; [1]Université de Versailles Saint-Quentin - GEMaC, Versailles, France; [2]ESPCI - LPEM, Paris, France; [3]Institut Universitaire de France, Paris, France

Intensity fluctuations of thick shell CdSe/CdS nanocrystals are studied between room temperature. The statistic of the emission is determined, as well as the Quantum Yield and the lifetime of the trion and the charged biexciton.

IH-6.3 THU 16:30

Evidence of macroscopic coherence at room temperature: Rabi oscillation induced pulse break-up in a quantum dot amplifier

M. Kolarczik[1], •N. Owschimikow[1], Y. Kaptan[1], U. Woggon[1], J. Korn[2], B. Lingnau[2], E. Schöll[2], and K. Lüdge[2]; [1]Institut für Optik und Atomare Physik, Technische Universität Berlin, Berlin, Germany; [2]Institut für Theoretische Physik, Technische Universität Berlin, Berlin, Germany

Intense laser pulse propagating through an inverted quantum dot ensemble develop a periodic modulation of their temporal envelope. Numerical simulations confirm that this signature is consistent with optically induced Rabi oscillations in the material system.

IH-6.4 THU 16:45

A Transformation-Optical Approach to Enhance Optical Gradient Forces with Metamaterials

•*V. Ginis[1], P. Tassin[2], C.M. Soukoulis[2], and I. Veretennicoff[1]; [1]Vrije Universiteit Brus-*

ROOM 1

Zaragoza, Spain; [3]Ultrafast Dynamics Group, Institute for Quantum Electronics, ETH Zurich, Zurich, Switzerland; [4]Centro Nacional de Aceleradores, Universidad de Sevilla, Sevilla, Spain

We demonstrate high gain waveguides written in heavily doped (Er,Yb) La-Al-P glass. Combining high repetition rate, slit shaping and glass composition optimization, we fabricated a 5.1 dB/cm short waveguide (1,7 cm) lasing at 1534 nm.

CJ-12.5 THU 17:00

Visible laser operation of Pr,Mg:$SrAl_{12}O_{19}$ waveguides

•*F. Reichert[1], T. Calmano[1], S. Müller[1], D.-T. Marzahl[1], P.W. Metz[1], and G. Huber[1,2]; [1]Institut of Laser-Phyics, Hamburg, Germany; [2]The Hamburg Centre for Ultrafast Imaging, Hamburg, Germany*

We present green, red, and deep-red laser operation of fs-laser-written waveguides inscribed in bulk Pr,Mg:$SrAl_{12}O_{19}$ material. Output powers of 36mW, 1065mW, and 504mW were obtained, respectively. Waveguides were characterized for losses and mode field diameters.

CJ-12.6 THU 17:15

Efficient direct-laser written Yb:ZBLAN Waveguide Laser

•*G. Palmer[1,2], S. Gross[1], A. Fuerbach[1], D. Lancaster[3], T. Monroe[3], and M. Withford[1]; [1]Department of Physics and Astronomy, Centre for Ultrahigh Bandwidth Devices for Optical Systems (CUDOS), MQ Photonics Research Centre, Macquarie University, Sydney, Australia; [2]European XFEL GmbH, Hamburg, Germany; [3]Institute for Photonics and Advanced Sensing (IPAS), Scholl of Chemistry and Physics, University of Adelaide, Adelaide, Australia*

We present an Yb:ZBLAN waveguide laser fabricated by rapid direct fs-laser writing. The laser provides low lasing threshold and slope efficiencies in excess of 80 %. Insertion losses are as low as -0.7 dB/cm.

ROOM 4a

[1]University of Brescia, Brescia, Italy; [2]University of Ferrara, Ferrara, Italy

We show that two modes interacting nonlinearly in the weakly dispersive regime can exhibit a coexistence of wave breaking mechanisms, such that a gradient catastrophe yielding a dispersive shock wave competes with modulational instability.

IG-5.5 THU 17:00

Dispersive time stretching measurements of real-time spectra and statistics for supercontinuum generation around 1550 nm

•*B. Wetzel[1], A. Stefani[1], L. Larger[1], P.-A. Lacourt[1], J.-M. Merolla[1], T. Sylvestre[1], A. Kudlinski[2], A. Mussot[2], G. Genty[3], F. Dias[4], and J.M. Dudley[1]; [1]Institut FEMTO-ST, UMR 6174 CNRS-Université de Franche-Comté, Besançon, France; [2]PhLAM/IRCICA CNRS-Université Lille 1, USR 3380/UMR 8523, Villeneuve d'Ascq, France; [3]Department of Physics, Tampere University of Technology, Tampere, Finland; [4]School of Mathematical Sciences, University College Dublin, Dublin, Republic of Ireland*

We report experimental real time measurements of supercontinuum generation spectral fluctuations around 1550 nm, yielding direct characterization of statistics and correlations across a 200 nm bandwidth. Experimental results are in excellent agreement with numerical simulations.

IG-5.6 THU 17:15

Conical diffraction, pseudospin, and nonlinear wave dynamics in photonic Lieb lattices

•*D. Leykam[1], O. Bahat-Treidel[2], and A. Desyatnikov[1]; [1]The Australian National University, Canberra, Australia; [2]The University of Queensland, Brisbane, Australia*

We demonstrate theoretically that wave dynamics in Lieb lattices are governed by an integer pseudo-spin. Different pseudo-spin states can be distinguished by conical diffraction patterns. The nonlinearity reduces circular to four-fold discrete rotational symmetry.

ROOM 4b

d'Hères, France

An imaging system combining the high sensitivity of acoustically tagged Laser Optical Feedback Imaging and the high resolution of Synthetic Aperture Laser technique is presented; a potential application is optically resolved imaging through scattering media.

CH-7.5 THU 17:00

An Archimedean Screw made of light

•*C. Vetter, T. Eichelkraut, and A. Szameit; Institute of Applied Physics, Jena, Germany*

We report on the flexible experimental realization of spatially spiralling intensity distributions that can rotate in time. For this purpose we employ interfering Bessel beams of different order.

ROOM 13a

gineering, RMIT University, Melbourne, Australia

An on-chip optical lens which can launch and maintain wide and well-collimated Gaussian beam in free space was fabricated and measured.

CK-10.5 THU 17:00

Diffractive and Refractive Microlens Integration with Single Photon Detector Smart Pixels

•*A. Waddie[1], A. McCarthy[1], G. Buller[1], S. Tisa[2], and M. Taghizadeh[1]; [1]Institute of Photonics and Quantum Sciences, EPS, Heriot-Watt University, Edinburgh, United Kingdom; [2]Micro Photon Devices, Bolzano, Italy*

In this paper we present details of the integration of diffractive and refractive microlens arrays with a customised single photon avalanche photodiode smart-pixel array including an analysis of the angular tolerance of the composite structure.

CK-10.6 THU 17:15

Integrated Polymer Microlenses for Two-dimensional Collimation of Light from Single-mode Optical Waveguides

•*L. Chang, N. Ismail, R.M. de Ridder, M. Pollnau, and K. Wörhoff; Integrated Optical Microsystems Group, MESA+ Institute for Nanotechnology, University of Twente, Enschede, The Netherlands*

We demonstrate direct on-chip integration of reflowed polymer microlenses, which enables light collimation from planar channel waveguides in both lateral and vertical directions. A divergence angle reduced by a factor of 25 is demonstrated experimentally.

ROOM 13b

Mid-infrared Vertical External Cavity Surface Emitting Lasers based on quantum dot active regions have been realized. The active regions consist of PbTe dots in a CdTe host matrix. The lasers cover the wavelength range 2.7-4.3um.

CB-10.5 THU 17:00

Power scaling of narrow-linewidth 2 μm GaSb-based semiconductor disk laser

•*S. Kaspar, M. Rattunde, S. Adler, T. Töpper, C. Manz, K. Köhler, and J. Wagner; Fraunhofer-Institut für Angewandte Festkörperphysik, Freiburg, Germany*

A 2 μm GaSb-based semiconductor-disk-laser with < 60 kHz linewidth, > 1 W CW-output power has been realized. The feasibility of further power scaling into the > 2 W range will be demonstrated.

CB-10.6 THU 17:15

The effect of hole leakage and Auger recombination on the temperature sensitivity of GaInAsSb/GaSb mid-infrared lasers

B.A. Ikyo[1], I.P. Marko[1], K. Hild[1], •A.R. Adams[1], S. Arafin[2], M.-C. Amann[2], and S.S. Sweeney[1]; [1]Advanced Technology Institute and Department of Physics, University of Surrey, Guildford, United Kingdom; [2]Walter Schottky Institut, Technische Universität München, Garching, Germany

Type-I GaInAsSb/GaSb lasers emitting at 2.3μm and 2.6μm are investigated using temperature and pressure. We show that Auger recombination and to a lesser extent hole leakage determine the temperature dependence of Jth in these devices.

ROOM 14a

Planck Institute for Quantum Optics, Garching, Germany; [2]Ludwig Maximilian Universität München, München, Germany; [3]Institute of Theoretical Physics and Astrophysics, University of Gdansk, Gdansk, Poland

We present experimental results on the efficient reconstruction of qudit entangled quantum states with dimensions up to 2x8 encoded in the time-energy degree of freedom.

IB-8.5 THU 17:00

Characterization and Manipulation of Energy Entangled Qudits

•*A. Stefanov, C. Bernhard, B. Bessire, and T. Feurer*; *University of Bern, Institute of Applied Physics, Bern, Switzerland*

We show the experimental realization of energy-bins entangled qudits, with dimension up to 4. We performed tomographic characterization of the states and showed violation of Bell inequalities for maximally and non-maximally entangled states.

IB-8.6 THU 17:15

Characterisation of the spatial purity of photon pairs generated in a multimode non-linear waveguide

M. Karpiński, C. Radzewicz, and •K. Banaszek; *Faculty of Physics, University of Warsaw, Warsaw, Poland*

We verified experimentally spatial purity of photon pairs generated via type-II parametric down-conversion in a multimode periodically poled potassium titanyl phosphate nonlinear waveguide. The process was restricted to fundamental spatial modes by exploiting intermodal dispersion.

ROOM 14b

of Physics, University of Regensburg, Regensburg, Germany; [2]Molecular and Surface Physics, University of Bielefeld, Bielefeld, Germany; [3]Department of Physics, Ilmenau University of Technology, Ilmenau, Germany

The collective terahertz free-carrier response of $1T-\mathrm{TiSe}_2$ is tracked during ultrafast photo-induced melting of a charge-density wave. The subsequent reordering exhibits high sensitivity to the carrier density, as expected within an excitonic model.

CF/IE-13.4 THU 17:00

Photoexcitation Cascade and Multiple Hot Carrier Generation in Graphene

•*K.-J. Tielrooij[1], J. Song[2,3], S. Jensen[4,5], A. Centeno[6], A. Pesquera[6], A. Zurutuza Elorza[6], M. Bonn[4], L. Levitov[2], and F. Koppens[1]*; *[1]ICFO - Institute de Ciencies Fotoniques, Catelldefels (Barcelona), Spain; [2]Department of Physics, Massachusetts Institute of Technology, Cambridge, United States; [3]School of Engineering and Applied Sciences, Harvard University, Cambridge, United States; [4]Max Planck Institute for Polymer Research, Mainz, Germany; [5]FOM Institute AMOLF, Amsterdam, The Netherlands; [6]Graphenea SA, Donostia-San Sebastian, Spain*

We show that energy relaxation of photoexcited e-h pairs in doped single-layer graphene is dominated by e-e scattering, which leads to the creation of secondary hot electrons from the conduction band ("hot-carrier multiplication").

CF/IE-13.5 THU 17:15

Ultrafast Hot Exciton Dissociation at Organic Interfaces

•*M. Maiuri[1], G. Grancini[2], D. Fazzi[2], A. Petrozza[2], D. Brida[1], G. Cerullo[1], and G. Lanzani[1,2]*; *[1]Politecnico di Milano, Milano, Italy; [2]CNST@Polimi, IIT, Milano, Italy*

We probe charge generation in PCPDTBT:PCBM blend. Exploiting sub-15-fs time resolution, for sufficient high pump energy, hot charge-transfer excitons are produced in less than 50 fs, that can rapidly separate into free polarons.

ROOM 21

FORTH, Heraklion, Greece; [2]Department of Chemistry, University of Crete, Heraklion, Greece; [3]Department of Materials Science and Technology, Heraklion, Greece

We demonstrate for the first time the fabrication and characterization of 3D nanostructures by multiphoton polymerization using a material without photoinitiator. We show that polymerization occurs through a photo-induced redox initiation.

CM-8.5 THU 17:00

Core-scanned fibre Bragg gratings inscribed using ultrashort pulses and a point by point setup

•*R.G. Krämer[1,2], R.J. Williams[2], M.J. Withford[2], A. Tünnermann[1], and S. Nolte[1]*; *[1]Institute of Applied Physics, Jena, Germany; [2]Centre for Ultrahigh-bandwidth Devices for Optical Systems, MQ Photonics Research Centre, Sydney, Germany*

We present a core-scanning technique for fibre Bragg gratings using a point-by-point inscription setup, that has markedly reduced scattering losses, flexible grating period and larger-area modifications with potential for inscription into large mode area fibres.

CM-8.6 THU 17:15

Laser Crystallisation of Semiconductor Core Optical Fibres

•*N. Healy[1], S. Mailis[1], T. Day[2], P. Sazio[1], J. Badding[2], and A. Peacock[1]*; *[1]Optoelectronics Research Centre, Southampton, United Kingdom; [2]Penn State University, Pennsylvania, United States*

A laser annealing technique is used to crystallise the core of an amorphous silicon optical fibre. The core of the resulting fibre has high material quality and its optical transmission losses are dramatically reduced.

ROOM 22

Quantum Electronics, ETH Zurich, CH-8093 Zurich, Switzerland

Photoabsorption around the first ionization threshold and in the presence of a strong infrared field was studied in helium. The previously introduced wavepacket interference picture was found to not completely explain the observed optical response.

CG-7.5 THU 17:00

Extreme Nonlinear Optical Processes with Beams Carrying Orbital Angular Momentum

•*C. Kern[1,2], M. Zürch[1,2], P. Hansinger[1,2], A. Dreischuh[3], and C. Spielmann[1,2,4]*; *[1]Institute of Optics and Quantum Electronics, Friedrich-Schiller-University Jena, Jena, Germany; [2]Abbe Center of Photonics, Jena, Germany; [3]Department of Quantum Electronics, Faculty of Physics, Sofia University, Sofia, Bulgaria; [4]Helmholtzinstitut Jena, Jena, Germany*

We show experimental evidence that optical vortices can be produced in the extreme ultraviolet (XUV) using high-harmonic generation (HHG) driven by ultra-short laser pulses. We found that such beams can survive high nonlinearities.

CG-7.6 THU 17:15

The role of the Kramers-Henneberger atom in the higher-order Kerr effect

S. Patchkovskii[1], •M. Richter[2], F. Morales[2], O. Smirnova[2], and M. Ivanov[2,3,4]; *[1]Steacie Institute for Molecular Sciences, National Research Council of Canada, Ottawa, Canada; [2]Max-Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Berlin, Germany; [3]Department of Physics, Humboldt University, Berlin, Germany; [4]Department of Physics, Imperial College London, South Kensington Campus, London, United Kingdom*

We discuss the connection between strong-field ionization, saturation of the Kerr response, and the formation of the Kramers-Henneberger atom and long-living excitations in intense external fields.

ROOM EINSTEIN

sel, Brussel, Belgium; [2]Iowa State University, Ames, IA, United States

We show how transformation optics allows to enhance optical forces between two optical waveguides over several magnitudes by altering the perceived distance between the waveguides. This transformation can be implemented using single-negative metamaterial thin films.

IH-6.5 THU 17:00

Resonant optical trapping and back-action effects in hollow photonic crystal cavities

•*N. Descharmes, U.P. Dharanipathy, M. Tonin, Z. Diao, and R. Houdré*; *Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland*

We report on the first experimental demonstration of resonant optical trapping of dielectric particles in hollow photonic crystal cavities. The existence of mutual interaction between the confined field and the particle is revealed.

IH-6.6 THU 17:15

Time Domain Investigation of Radio Frequency Acousto-Mechanical Tuning of Photonic Crystal Nanocavity Modes

•*S.S. Kapfinger[1], D.A. Fuhrmann[1], S.M. Thon[2], H. Kim[2], D. Bouwmeester[2], P.M. Petroff[3], A. Wixforth[1], and H.J. Krenner[1]*; *[1]Lehrstuhl für Experimentalphysik 1, Universität Augsburg, Augsburg, Germany; [2]Physics Department, University of California, Santa Barbara, United States; [3]Materials Department, University of California, Santa Barbara, United States*

The dynamic spectral tuning of a photonic crystal nanocavity with embedded quantum dots by a radio frequency surface acoustic wave is investigated in the time domain. The observed characteristics promise real-time control of light-matter interactions.

13:00 – 14:00

CG-P: CG Poster Session

CG-P.1 THU

Micro-focusing of XUV attosecond pulses by grazing-incidence toroidal mirrors

•L. Poletto[1], F. Frassetto[1], F. Calegari[3], A. Trabattoni[2], and M. Nisoli[2]; [1]CNR-Institute of Photonics and Nanotechnologies, Padova, Italy; [2]Politecnico of Milano, Department of Physics, Milano, Italy; [3]CNR-Institute of Photonics and Nanotechnologies, Milano, Italy

The design of optical systems for micro-focusing of XUV attosecond pulses through grazing-incidence toroidal mirrors is presented. Two mirrors are used in a compensated configuration to provide high demagnification of the source with negligible aberrations.

CG-P.2 THU

Single cycle midIR pulse: spatial, temporal and absolute phase characterisation

•S. Weber[1,2], T. Witting[1], J. Tisch[1], and J. Marangos[1]; [1]Imperial College London, London, United Kingdom; [2]CEA Saclay, IRAMIS, Service des Photons, Atomes et Molécules, Gif-sur-Yvette, France

1.7 cycles midIR pulse has been measured via a tunable SEA-F-SPIDER arrangement providing both temporal and spatial characterisation. The intrinsic CEP stability of the pulse is monitored and stabilised from a simple interferometric measurement.

CG-P.3 THU

A Conceptually General Coherent X-Ray Attosecond Pulse Shaper

•C. Serrat and N. Suarez; Polytechnical University of Catalonia, Terrassa, Spain

We present a tool for control of the spectral phase and amplitude in high-order harmonic generation. Isolated attosecond pulses are produced by means of a folding effect on the electron quantum trajectories generating the harmonics.

CG-P.4 THU

Control of Fragmentation Reactions in Impulsively Aligned Polyatomic Molecules by Selective Removal of Inner-Valence Electrons

X. Xie[1], K. Doblhoff-Dier[2], H. Xu[1], S. Roither[1], A. Iwasaki[3], M. Schöffler[1], D. Kartashov[1], K. Yamanouchi[3], A. Baltuška[1], S. Gräfe[2], and •M. Kitzler[1]; [1]Photonics Institute, Vienna University of Technology, Vienna, Austria; [2]Institute for Theoretical Physics, Vienna University of Technology, Vienna, Austria; [3]Department of Chemistry, School of Science, The University of Tokyo, Japan

We show experimentally and theoretically that alignment dependent ionization from specific lower-lying molecular orbitals into a certain electronically excited dissociative ionic state allows implementing a control scheme for fragmentation and isomerization reactions in polyatomic molecules.

CG-P.5 THU

Tabletop Lensless Imaging Apparatus using an Ultrashort High Harmonic XUV Source

•M. Zürch[1], C. Kern[1], and C. Spielmann[1,2]; [1]Institute of Optics and Quantum Electronics, Jena, Germany; [2]Helmholtzinstitut Jena, Jena, Germany

We present an apparatus based on an ultrafast laser and high harmonic generation that allows for high-resolution lensless imaging with a selectable wavelength in the XUV-regime. Images with resolution in the micron-range were recorded.

CG-P.6 THU

Optically Produced Collimated Quasimonoenergetic Electron Beams For Laser-Plasma Acceleration

•Y. Malkov[1], A. Stepanov[1], D. Yashunin[1], L. Pugachev[2], P. Levashov[2], N. Andreev[2], and A. Andreev[3]; [1]Institute of Applied Physics of the Russian Academy of Sciences, Nizhny Novgorod, Russia; [2]Joint Institute for High Temperatures of the Russian Academy of Sciences, Moscow, Russia; [3]Vavilov State Optical Institute (GOI) Research Institute for Laser Physics, St Petersburg, Russia

We studied generation of quasimonoenergetic electron bunches in the 0.2-0.8 MeV range when 10^17 W/cm^2 femtosecond laser radiation interacted with aluminum foil edge. PIC simulations confirm acceleration in the self-modulated laser wakefield in preplasma.

CG-P.7 THU

Development of a carrier-envelope phase stabilized, few-cycle laser system for precision spectroscopy in the time domain

•T. Kanai, T. Mizuno, and T. Azuma; RIKEN, Wako-shi, Japan

We report on a novel methodology of attosecond physics to explore fundamental physics and the present status of our laser and spectroscopy system, which was specially designed for this purpose from scratch.

CG-P.8 THU

Far field characteristics of a petawatt-class laser using plasma mirrors

•V. Bagnoud[1], C. Brabetz[2], B. Zielbauer[1], G. Scott[3,4], H. Powell[4], and D. Neely[3,4]; [1]GSI Helmholtz Center for Heavy Ion Research, Darmstadt, Germany; [2]Johann Wolfgang Goethe University, Frankfurt, Germany; [3]Rutherford Appleton Laboratory, Didcot, United Kingdom; [4]University of Strathclyde, Glasgow, United Kingdom

We propose and demonstrate a setup to directly measure the focus of a high-energy petawatt-class laser using plasma mirrors. This leads to new insights on the effect of plasma mirrors on the laser far field.

CG-P.9 THU

Photoemission enhancement from copper illuminated with a radial polarized femtosecond laser pulse

•H. Tomizawa[1,2], H. Dewa[1], A. Mizuno[1], and T. Taniuchi[1]; [1]Japan Synchrotron Radiation Research Institute, Hyogo, Japan; [2]RIKEN SPring-8 Center, Hyogo, Japan

We have developed a new compact of photocathode gun utilizes laser coherency, using radial-polarization on a metal cathode. The enhancement factor of photoemission was observed 1.4 times at 1.6 GV/m of the laser Z-field.

CG-P.10 THU

Isolated attosecond pulses by self-compression in short gas-filled fibers

•P.N. Anderson[1], P. Horak[1], J.G. Frey[2], and W.S. Brocklesby[1]; [1]Optoelectronics Research Centre, University of Southampton, Southampton, United Kingdom; [2]Chemistry, University of Southampton, Southampton, United Kingdom

Numerical simulations predict that self-compression and HHG can be performed in-situ within short gas-filled fibers to generate isolated 350 as XUV pulses from 40 fs NIR fields.

CG-P.11 THU

Optimized Conditions for Intense Isolated Attosecond Pulse Generation

•G. Ma[1,2], J. Mikhailova[1], F. Krausz[1,3], G. Tsakiris[1], and L. Veisz[1]; [1]Max-Planck-Institut für Quantenoptik, Garching, Germany; [2]Shanghai Institute of Optics and Fine Mechanics, Shanghai, China, People's Republic of (PRC); [3]Ludwig-Maximilians-Universität München, Garching, Germany

Optimized conditions for efficiently generating intense isolated attosecond pulses via relativistic high harmonic generation are investigated by simulations. An unrivalled high efficiency of about 1% for harmonics below 40nm is predicted in our coming experiment.

CG-P.12 THU

Attosecond pulse shaping

•D. Austin[1] and J. Biegert[1,2]; [1]Institut de Ciencies Fotoniques, Barcelona, Spain; [2]Institució Catalana de Recerca i Estudis Avançats, 08010 Barcelona, Spain, Barcelona, Spain

We propose arbitrary shaping of attosecond pulses produced using high harmonic generation - including attosecond chirp compensation - using quasi-phase matching with a modulation of the dipole excitation that is spatially addressable along the the propagation axis.

CG-P.13 THU

Electron-ion correlation effects in strong field ionization

•L. Torlina[1], M. Ivanov[1,2,3], Z. Walters[4,1], and O. Smirnova[1]; [1]Max Born Institute, Berlin, Germany; [2]Humboldt University, Berlin, Germany; [3]Imperial College London, London, United Kingdom; [4]Max Planck Institute for the Physics of Complex Systems, Dresden, Germany

Strong field ionization is a fundamentally multielectron process which may leave the ion in different excited states. We develop an analytical theory accounting for ionic excitations induced by coupling between the departing and core electrons.

CG-P.14 THU

The R-matrix method for attosecond spectroscopy

A. Harvey, F. Morales, O. Smirnova, and •D. Brambila; Max-Born-Institut, Berlin, Germany

We present calculations of photoelectron angular distributions ionized by a HHG source, and HHG spectra, from aligned CO_2, and compare to experiment. We discuss our newly adapted R-matrix codes, an essential component of the calculations.

CG-P.15 THU

Power Efficient Relativistic Multi-Stage Stable UV Channel Formation in Underdense Plasmas

•A.B. Borisov and C.K. Rhodes; University of Illinois at Chicago, Chicago, United States

Stability control of multi-TW relativistic channels leads to power efficient stable multi-stage UV channel formation in underdense plasmas with the efficiency of power transport into the channel exceeding 90%.

CG-P.16 THU

Sub-fs pulse generation and characterisation in the VUV

•D. Fabris[1], T. Witting[1], J. Henkel[2], F. Frank[1], W. Okell[1], Z. Abdelrahman[1], M. Lein[2], J. Marangos[1], and J. Tisch[1]; [1]Imperial College London, London, United Kingdom; [2]Institut für Theoretische Physik and Centre for Quantum Engineering and Space-Time Research, Leibniz Universität, Hannover, Germany

The method for production and characterisation of a sub-fs VUV (10-20eV) pulse will be discussed. Theoretical simulations predicts atime duration of ~700as. Preliminary measurements show a photon flux of ~1010 photons\shot.

CG-P.17 THU

Plateau structure in photoelectron spectra of Kr gas induced by intense circular polarized laser pulses

•*T. Mizuno, T. Kanai, and T. Azuma*; *RIKEN Adavance Science Institute, wako, Japan*

We found the plateau structure of photoionization of Kr gas by circular polarization light. This is not explained by traditional rescattering process.

CG-P.18 THU

The LILIA (Light Ions laser Induced Acceleration) experiment at LNF

S. Agosteo[1], M.P. Anania[2], C. De Martinis[3], D. Delle Side[4], A. Fazzi[1], G. Gatti[2], D. Giove[3], D. Giulietti[5], L. Gizzi[6], L. Labate[6], P. Londrillo[7], •V. Nassisi[4], A. Pola[1], S. Sinigardi[7], G. Turchetti[7], V. Varoli[1], L. Velardi[4], G. Buccolieri[4], and M. Caresana[1]; [1]*INFN and Polytechnic of Milan, Milan, Italy*; [2]*INFN LNF Frascati, Frascati, Italy*; [3]*INFN and University of Milan, Milan, Italy*; [4]*INFN LEAS and University of Salento, Lecce, Italy*; [5]*INFN and University of Pisa, Pisa, Italy*; [6]*INFN and CNR of Pisa, Pisa, Italy*; [7]*INFN and University of Bologna, Bologna, Italy*

A laser named FLAME by $10^{19}\ W/cm^2$ has been deployed. An experiment of light ions acceleration through laser-matter interaction (LILIA) has been proposed. Using Al targets protons of more than 1.6 MeV have been detected.

CG-P.19 THU

Enhanced High Harmonic Generation Driven by Two-Color Laser Pulses with Two Foci

F. Lu[1], •Y. Xia[1], S. Zhang[2], D. Chen[1], Y. Zhao[1], and B. Liu[1]; [1]*National Key Laboratory of Tunable Laser Technology, Harbin Institute of Technology, Harbin, China, People's Republic of (PRC)*; [2]*Department of physics, Harbin Institute of Technology, Harbin, China, People's Republic of (PRC)*

We demonstrate a enhancement of high harmonic generation in CO_2 by using two color laser pulses with two foci. The intensity of harmonic H23 increased by a factor of 65 compared to a single focus.

CG-P.20 THU

Pulse Contrast Enhancement at the Orion Laser Facility

•*S. Elsmere, T. Bett, C. Danson, S. Duffield, D. Egan, M. Girling, E. Harvey, D. Hillier, N. Hopps, D. Hoarty, D. Hussey, M. Norman, S. Parker, P. Treadwell, and D. Winter*; *AWE, Reading, United Kingdom*

Contrast enhancement of a pettawatt beam line has been demonstrated by frequency doubling, at sub aperture, of a 500 J pulse. Details of beam line performance are presented showing a pulse contrast greater than 10^{13}.

CG-P.21 THU

Proposal for sub-femtosecond pulse generation with controlled carrier-envelope phase

Z. Tibai[1], G. Tóth[1], M. Mechler[2], J. Fülöp[2], and •J. Hebling[1,2]; [1]*Institute of Physics, University of Pécs, Pécs, Hungary*; [2]*MTA-PTE High-Field Terahertz Research Group, Pécs, Hungary*

We propose a robust method for producing few-cycle pulses with prescribed shaped in the EUV-VUV spectral range by coherent undulator radiation of relativistic ultrathin electron layers, which are produced by IFEL.

CG-P.22 THU

On the Accuracy of the Single-shot Two-dimensional Angular Dispersion Measurement

•*A. Börzsönyi[1,2], A. Andrásik[1], A. Kovács[1], M. Gstalter[2,3], and K. Osvay[1]*; [1]*Department of Optics and Quantum Electronics, University of Szeged, Szeged, Hungary*; [2]*CE Optics Kft., Szeged, Hungary*; [3]*École Nationale Supérieure de Physique, Univ. of Strasbourg, Strasbourg, France*

The accuracy of the two-dimensional technique for single-shot measurement of angular dispersion has been characterized. The precision of 0.1microrad/nm allows it being a tool for real time monitoring of attosecond driving laser beams.

13:00 – 14:00

IA-P: IA Poster Session

IA-P.1 THU

Quantum control of spin-correlations in ultracold lattice gases

P. Hauke[1], •R. Sewell[1], M. Mitchell[1,2], and M. Lewenstein[1,2]; [1]*ICFO, Barcelona, Spain*; [2]*ICREA, Barcelona, Spain*

We describe a new technique for preparing and detecting spatial spin-correlations and multipartite entanglement in a quantum lattice gas based on entropic cooling via quantum non-demolition (QND) measurement and feedback.

IA-P.2 THU

Propagation of few-photon states in waveguide arrays

•*N. Belabas Plougonven, C. Minot, I. Abram, I. Robert-Philip, and A. Beveratos*; *Laboratory for Photonic and Nanostructures, Marcoussis, France*

We quantitatively explore the ability of coupled waveguide arrays to characterize and manipulate two-photon and NOON states. We emphasize in particular the potential of patterned arrays in which the coupling is structured.

IA-P.3 THU

Programming quantum interference with multiple scattering

•*S.R. Huisman, T.J. Huisman, T.A.W. Wolterink, A.P. Mosk, and P.W.H. Pinkse*; *MESA+ Institute for Nanotechnology, University of Twente, Enschede, The Netherlands*

We control quantum interference in opaque scattering materials by phase modulation of incident optical modes.

IA-P.4 THU

Two-Photon Rydberg Excitation of Trapped Strontium Ions

•*C. Maier, F. Pokorny, G. Higgins, and M. Hennrich*; *Institute for Experimental Physics, Innsbruck, Austria*

An alternative method for trapped-ion quantum computing may be realized by exciting the ions into Rydberg states. We will discuss ideas and progress of our experimental setup to realise two-photon Rydberg excitation of strontium ions.

IA-P.5 THU

Synthesis of arbitrary interference patterns with high visibility

S. Shabbir, M. Swillo, and •G. Björk; *School of Engineering Sciences, KTH Royal Institute of Technology, SE - 106 91, Stockholm, Sweden*

Using coherent state input, we demonstrate the synthesis of arbitrary interference patterns and conclude that it is neither the shape of the interference pattern nor the visibility that differentiates quantum and classical interference.

IA-P.6 THU

Experimental Generation of 2000-Mode Entangled Graph States

•*S. Yokoyama[1], C. Sornphiphatphong[1], T. Kaji[1], R. Ukai[1], S.C. Armstrong[1,2], S. Suzuki[1], J.-i. Yoshikawa[1], N.C. Menicucci[3], and A. Furusawa[1]*; [1]*The University of Tokyo, Tokyo, Japan*; [2]*The Australian National University, Canberra, Australia*; [3]*The University of Sydney, NSW, Australia*

We report on the generation of a 2000-mode fully entangled graph state, suitable as a resource for quantum information protocols. The graph is created by entangling 1000 pairs of temporally encoded EPR states.

IA-P.7 THU

Measurement-induced amplification of optical cat-like states

A. Laghaout[1], J. Neergaard-Nielsen[1], J. Rigas[2], C. Kragh[1], A. Tipsmark[1], and •U. Lund Andersen[1,2]; [1]*Department of Physics, Technical University of Denmark, Lyngby, Denmark*; [2]*Quantum Information Theory Group, Institut für Theoretische Physik I,and Max-Planck Research Group, Institute of Optics, Information and Photonics,Universität Erlangen-Nürnberg, Erlangen, Germany*

An amplification scheme of coherent state superpositions (CSS) is proposed using homodyne heralding. The width of homodyne post-selection is accounted for, as well as the impurity of squeezing for approximate CSSs. Recursive amplification is analyzed.

IA-P.8 THU

Fast and non-destructive vector field magnetometry with cold atomic ensembles

•*N. Behbood[1], F. Martin Ciurana[1], G. Colangelo[1], M. Napolitano[1], R. Sewell[1], and M. Mitchell[1,2]*; [1]*ICFO - The Institute of Photonic Sciences, Castelldefels (Barcelona), Spain*; [2]*ICREA - Institucio Catalana de Recerca i Estudis Avanc ats, Bacelona, Spain*

We report on a fast, nondestructive and sensitive measurement technique that uses atomic spin precession and non-destructive Faraday rotation probing to measure all three components of the magnetic field with kHz bandwidth.

IA-P.9 THU

Dispersion Sensitivity of Amplitude and Phase Modulated Time-Energy Entangled Photons

•*C. Bernhard, B. Bessire, A. Stefanov, and T. Feurer*; *University of Bern, Institute of Applied Physics, Bern, Switzerland*

We investigate the effect of dispersion on spatial light modulator shaped time-energy entangled photons. We compare two coincidence detection descriptions for different shaper functions as a function of the dispersion.

IA-P.10 THU

Dynamical suppression of unwanted transitions in multistate quantum systems

•*G. Genov and N. Vitanov*; *Department of Physics, Sofia University, Sofia, Bulgaria*

We propose a method to suppress unwanted transition channels and achieve perfect population transfer in multistate quantum systems by using composite pulse sequences.

Hall B0

IA-P.11 THU

Nonclassical lasing in circuit quantum electrodynamics

•*C. Navarrete-Benlloch*[1], *J.J. García-Ripoll*[2], *and D. Porras*[3]; [1]*Max-Planck Institute for Quantum Optics, Garching, Germany*; [2]*Instituto de Física Fundamental - CSIC, Madrid, Spain*; [3]*Universidad Complutense, Madrid, Spain*

We show how a proper driving of the gap of a superconducting qubit interacting with the modes of a resonator allows for the generation of nonclassical states of the latter both through cooling and amplification.

IA-P.12 THU

An on-chip cross-waveguide QD spin-photon interface and its applications

•*A.B. Young*[1], *A.J. Ramsey*[4], *I.J. Luxmoore*[2], *N.A. Wasley*[2], *A.C.T. Thijssen*[3], *A. Laing*[1,3], *M.G. Thompson*[1,3], *A.M. Fox*[2], *M.S. Skolnick*[2], *J.G. Rarity*[1], *and R. Oulton*[1,3]; [1]*Merchant Venturers School of Engineering, University of Bristol, Woodland Road, Bristol, BS8 1TR, UK, Bristol, United Kingdom*; [2]*School of Physics and Astronomy, University of Sheffield, Sheffield, S3 7RH, UK, Sheffield, United Kingdom*; [3]*HH Wills Physics Laboratory, University of Bristol, Tyndall Avenue, Bristol, BS8 1FD, UK, Bristol, United Kingdom*; [4]*Hitachi Cambridge Laboratory, Hitachi Europe Limited, Cambridge, CB3 OHE, UK, Cambridge, United Kingdom*

We present a quantum dot spin-photon interface in a linear optical circuit that is simple to fabricate and may be used to produce >100 photon cluster states and entangle remote spins.

IA-P.13 THU

Photon pair generation in quadratic waveguide arrays: A classical optical simulation

•*M. Gräfe*[1], *A.S. Solntsev*[2], *R. Keil*[1], *A. Tünnermann*[1], *S. Nolte*[1], *A.A. Sukhorukov*[2], *Y.S. Kivshar*[2], *and A. Szameit*[1]; [1]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Jena, Germany*; [2]*Nonlinear Physics Centre, Research School of Physics and Engineering, The Australian National University, Canberra, Australia*

Biphoton generated through spontaneous parametric down-conversion and their correlated quantum walks in one-dimensional nonlinear waveguide arrays are investigated. We experimentally emulate this process by the linear evolution of classical light in a two-dimensional structure.

IA-P.14 THU

Towards a down-conversion source of positively spectrally correlated and decorrelated photon pairs at telecom wavelength

•*T. Lutz*[1,2], *P. Kolenderski*[1,3], *and T. Jennewein*[1]; [1]*Institute for Quantum Computing, University of Waterloo, Waterloo, Canada*; [2]*Universität Ulm, Ulm, Germany*; [3]*Nicolaus Copernicus University, Torun, Poland*

We experimentally characterize a spontaneous parametric down-conversion source, based on a Beta-Barium-Borate crystal capable of emitting photons with positive or no spectral correlations. Our system employs a carefully designed detection method exploiting two InGaAs detectors.

IA-P.15 THU

Single-cycle squeezing from chirped quasi-phase-matched optical parametric down-conversion

D. Horoshko[1,2] *and* •*M. Kolobov*[1]; [1]*Laboratoire PhLAM, Université Lille 1, Villeneuve d'Ascq, France*; [2]*B. I. Stepanov Institute of Physics, NASB, Minsk, Belarus*

We describe the generation of squeezed light with an octave-broad spectrum of squeezing by means of parametric down-conversion in a quasi-phase-matched nonlinear crystal with a linear chirp of the spatial frequency of periodical poling .

IA-P.16 THU

Generation of Narrowband, Entangled Photon Pairs in Birefringent Fibre

•*A. McMillan*[1], *A. Clark*[2], *B. Bell*[1], *W. McCutcheon*[1], *T. Wu*[1], *W. Wadsworth*[3], *and J. Rarity*[1]; [1]*University of Bristol, Bristol, United Kingdom*; [2]*University of Sydney, Sydney, Australia*; [3]*University of Bath, Bath, United Kingdom*

An entangled photon pair source based on cross-polarised four-wave mixing in spliced sections of conventional birefringent optical fibre is demonstrated. The generated pair photons are widely separated in wavelength at 850nm and 1420nm.

IA-P.17 THU

Entanglement of macroscopic Bell states

•*T. Iskhakov*[1], *B. Kanseri*[2], *G. Rytikov*[3], *M. Chekhova*[1,4,5], *and G. Leuchs*[1,5]; [1]*Max-Planck Institute for the Science of Light, Erlangen, Germany*; [2]*Institut d'Optique Graduate School, Paris, France*; [3]*Ivan Fedorov State University of Printing Arts, Moscow, Russia*; [4]*M. V. Lomonosov Moscow State University, Moscow, Russia*; [5]*University of Erlangen-Nurenberg, Erlangen, Germany*

We generated a full set of macroscopic Bell states containing 10^6 photons per pulse, proved their entanglement, and observed the photon-number correlations with respect to both polarization and frequency modes.

IA-P.18 THU

Optimal Temporal Mode Extraction for Quantum State Engineering via a Direct Multimode Analysis of Homodyne Data

•*O. Morin, C. Fabre, and J. Laurat*; *Laboratoire Kastler Brossel, UPMC, ENS, CNRS, Paris, France*

We propose a novel method to experimentally extract the optimal temporal mode in quantum state engineering. This technique only relies on a multimode analysis of homodyne data.

IA-P.19 THU

Spatially multimode Raman scattering: optical memory and new, direct method for measuring diffusion

•*R. Chrapkiewicz and W. Wasilewski*; *Faculty of Physics, University of Warsaw, Warsaw, Poland*

We present first to our knowledge generation and retrieval of spatially multimode collective excitations in warm Rubidium vapors. Analyzing their their decoherence we retrieve diffusion coefficients. Using Raman interface we produce highly correlated delayed images.

IA-P.20 THU

Two-photon spectra of quantum systems

•*E. del Valle*[1], *A. Gonzalez-Tudela*[2], *F.P. Laussy*[2], *C. Tejedor*[2], *and M.J. Hartmann*[1]; [1]*Technische Universität München, München, Germany*; [2]*Universidad Autónoma de Madrid, Madrid, Spain*

We apply our recently developed method to compute time and frequency resolved N-photon correlations to analyse different open quantum systems (light-matter coupling, resonance fluorescence, single and two-photon generation, entangled systems) via their "two-photon spectrum".

IA-P.21 THU

Non-collinear retrieving of stored orbital angular momentum of light in cold atoms

R. de Oliveira[1], •*L. Pruvost*[2], *P. Barbosa*[1], *D. Felinto*[1], *D. Bloch*[3], *and J. Tabosa*[1]; [1]*Universidade Federal de Pernambuco, Recife, Brazil*; [2]*Université Paris-Sud, Orsay, France*; [3]*Université Paris-Nord, Villetaneuse, France*

We report on the storage and non-collinear retrieving of orbital angular momentum of light in an ensemble of cold cesium atoms. The stored and retrieved beams are shown to have the same orbital angular momentum.

IA-P.22 THU

Single photon interference via induced coherence with and without induced emission

•*A. Heuer, S. Raabe, and R. Menzel*; *Institute of Physics and Astronomy, University of Potsdam, Germany*

Two signal beams emitted from two parametric down converters show first order interference by the process of induced coherence. The differences, if induced coherence occur with or without stimulated emission were under investigation.

IA-P.23 THU

Chronocyclic Wigner function of ultrafast time-frequency entangled parametric downconversion states

•*B. Brecht and C. Silberhorn*; *Applied Physics, University of Paderborn, Warburger Strasse 100, 33098 Paderborn, Germany*

We present an alternative description of time-frequency entangled ultrafast PDC states, based on the chronocyclic Wigner function formalism. Our approach combines the seemingly disparate continuous and discrete variable theories and highlights remarkable similarities between them.

IA-P.24 THU

Indistinguishable particles in non-Hermitian lattices and their correlations

•*M. Gräfe*[1], *R. Heilmann*[1], *R. Keil*[1], *T. Eichelkraut*[1], *M. Heinrich*[2], *S. Nolte*[1], *and A. Szameit*[1]; [1]*Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Jena, Germany, Jena, Germany*; [2]*CREOL, The College of Optics & Photonics, University of Central Florida, Orlando, United States*

We present a novel approach to investigate quantum random walks of indistinguishable particles in non-Hermitian lattices exhibiting loss. Especially analyzed are two-particle dynamics in quasi-parity-time-symmetric systems for a variety of input states.

IA-P.25 THU

Spin cooling via incoherent feedback in an ensemble of cold Rb atoms

•*N. Behbood*[1], *F. Martin Ciurana*[1], *G. Colangelo*[1], *M. Napolitano*[1], *R. Sewell*[1], *and M. Mitchell*[1,2]; [1]*ICFO - The Institute of Photonic Sciences, Castelldefels (Barcelona), Spain*; [2]*ICREA - Institucio Catalana de Recerca i Estudis Avanc ats, Bacelona, Spain*

We report an experimental study of a new technique for spin cooling an ensemble of ultracold atoms via quantum non-demolition measurement and incoherent feedback.

IA-P.26 THU

Towards Observation of Quantum Optomechanical Correlations

•*S. Deléglise, A. Tavernarakis, T. Karassouloff, P. Verlot, S. Zerkani, J. Teissier, D. Garcia-Sanchez, T. Briant, P.-F. Cohadon, and A. Heidmann*; *Laboratoire Kastler Brossel, Paris, France*

Radiation pressure is responsible for the quantum back-action noise in continuous interferometric position measurements. We have designed a table-top experiment to demonstrate this effect and realize various quantum optics experiments with an optomechanical system.

IA-P.27 THU

Direct observation of sub-binomial light

•T. Bartley[1], G. Donati[1], X.-M. Jin[1,2], A. Datta[1], M. Barbieri[1], and I. Walmsley[1]; [1]Clarendon Laboratory, Department of Physics, University of Oxford, Oxford, United Kingdom; [2]Department of Physics, Shanghai Jiao Tong University, Shanghai, China, People's Republic of (PRC)

We present an experiment showing direct observation of sub-binomial light. We show that the binomial parameter provides a reliable, direct witness of nonclassicality when using multiplexed on-off detectors to measure a variety of optical states.

IA-P.28 THU

Photon Number Squeezing with a Noisy Fiber Amplifier Source by Balanced Detection Technique

•S. Sawai, H. Kawauchi, K. Hirosawa, and F. Kannari; Department of Electronics and Electrical Engineering, Keio University, Yokohama, Japan

We achieved photon number squeezing at 1.55 μm using a noisy erbium-doped fiber laser, making use of collinear balanced detection technique, where intensity noise at a specific radio-frequency is canceled between two pulses.

IA-P.29 THU

Subwavelength Interference with Classical Light

•P. Hong and G. Zhang; The MOE Key Laboratory of Weak Light Nonlinear Photonics and School of Physics, Nankai University, Tianjin, China, People's Republic of (PRC)

We achieved subwavelength interference of a double-slit mask without post-selected operation with a new calssical source, which is realized by using a spatial light modulator to modulate a laser beam.

13:00 – 14:00

IH-P: IH Poster Session

IH-P.1 THU

Manipulating light matter interaction with Mie resonators

•G. Boudarham[1], B. Rolly[1], R. Abdeddaim[1], J.-M. Greffin[1], B. Stout[1], S. Bidault[2], and N. Bonod[1]; [1]Institut Fresnel, CNRS UMR 7249, Campus Universitaire de Saint-Jérôme, Marseille, France; [2]Institut Langevin, ESPCI Paris-Tech, CNRS UMR 7587, Paris, France

We show theoretically that near-infrared quadrupolar magnetic resonances in silicon particles can preferentially promote magnetic versus electric radiative deexcitation in trivalent erbium ions at 1.54 μm, and vice versa.

IH-P.2 THU

Radiative Coupling of Quantum Dots in a Disordered Photonic Crystal Waveguide

•M. Minkov and V. Savona; Ecole Polytechnique Federale de Lausanne EPFL, Lausanne, Switzerland

For a system of two quantum dots in a disordered W1 waveguide, we perform a detailed theoretical analysis of the magnitude and distance dependence of the photon-mediated dot-dot excitation transfer rate.

IH-P.3 THU

Tunnelling of vacuum fluctuations in a 3D photonic band gap; strongly inhibited spontaneous emission

•E. Yeganegi[1], A. Lagendijk[1,2], A. Mosk[1], and W. Vos[1]; [1]Complex Photonic Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, The Netherlands; [2]FOM Institute for Atomic and Molecular Physics (AMOLF), Amsterdam, The Netherlands

We map the frequency-dependent inhibition of spontaneous emission in 3D photonic bandgap crystals. Measurements show that the inhibition factor is frequency dependent which suggest intriguing finite size effects whereby vacuum fluctuations tunnel into the bandgap.

IH-P.4 THU

Sub 10-nm accuracy in positioning plasmonic nanostructures on self-assembled GaAs quantum dots

•K. Lindfors[1,2], M. Pfeiffer[1,2], B. Fenk[1], F. Phillipp[3], P. Atkinson[4], A. Rastelli[4], O.G. Schmidt[4], H. Giessen[2], and M. Lippitz[1,2]; [1]Max Planck Institute for Solid State Research, Stuttgart, Germany; [2]4. Physics Institute and Research Center SCOPE, University of Stuttgart, Stuttgart, Germany; [3]Max Planck Institute for Intelligent Systems, Stuttgart, Germany; [4]IFW Dresden, Dresden, Germany

We demonstrate a flexible method based on solid-state quantum emitters whose position we can determine with nanometer precision that allows us to fabricate nanostructures positioned with sub-10 nm accuracy with respect to the emitter.

IH-P.5 THU

Coherent optical nanoscopy

A. Mohammadi[1] and •M. Agio[2]; [1]Persian Gulf University, Bushehr, Iran; [2]European Laboratory for Nonlinear Spectroscopy (LENS), Sesto Fiorentino, Italy

The contribution has been withdrawn by the authors.

IH-P.6 THU

Controlled coupling of single color centers to a photonic crystal cavity in monocrystalline diamond

•J. Riedrich-Möller[1], S. Pezzagna[2], J. Meijer[2], M. Fischer[3], S. Gsell[3], M. Schreck[3], and C. Becher[1]; [1]Universität des Saarlandes, Experimentalphysik FR 7.2, Campus E 2.6, 66123 Saarbrücken, Germany; [2]Universität Leipzig, Nukleare Festkörperphysik, Linnéstrasse 5, 04103 Leipzig, Germany; [3]Universität Augsburg, Experimentalphysik IV, Universitätsstrasse 1 Nord, 86159 Augsburg, Germany

We present strategies for controlled coupling of single color centers to photonic crystal cavities in diamond by both fabricating a cavity around a pre-localized color center and implanting single ions into pre-fabricated cavities.

IH-P.7 THU

Three-dimensional emission patterns from flat organic microlasers

•S. Bittner[1], C. Lafargue[1], C. Ulysse[2], J. Zyss[1], and M. Lebental[1]; [1]Laboratoire de Photonique Quantique et Moléculaire, Ecole Normale Supérieure de Cachan, CNRS UMR 8537, Cachan, France; [2]Laboratoire de Photonique et de Nanostructures, CNRS UPR20, Route de Nozay, Marcoussis, France

We investigate the three-dimensional far-field emission from flat organic microlasers and observe emission out of the cavity plane. The connection between the emission patterns and diffraction at a dielectric edge is investigated.

IH-P.8 THU

Nano Spatially and Femto Temporally Localized Laser Source

P.N. Melentiev[1], A.E. Afanasiev[1], A.A. Kuzin[2], A.S. Baturin[2], and •V.I. Balykin[1]; [1]Institute for Spectroscopy Russian Academy of Sciences, Troitsk, Moscow reg., Russia; [2]Moscow Institute of Physics and Technology, Dolgoprudniy, Moscow reg., Russia

We study photoluminescence and nonlinear optical processes from single nanohole and nanoslit. These two physical effects and using a microcavity opens up the possibility of constructing of nano spatially and femto temporally wavelength tunable light source.

IH-P.9 THU

Parametric polariton scattering as a source of entangled light

•L. Einkemmer[1], S. Portolan[2], Z. Vörös[1], and G. Weihs[1]; [1]Universtity of Innsbruck, Innsbruck, Austria; [2]Atominstitut, Technical University of Vienna, Vienna, Austria

We theoretically study various polariton scattering schemes, and evaluate their merit as a source of entangled photons. We investigate the effect of phonons and that of resonant Rayleigh scattering on the quality of entanglement.

IH-P.10 THU

Parametric polariton scattering in quantum wires and coupled planar microcavities

L. Einkemmer[1], •P. Mai[1], S. Mathias[1], Z. Vörös[1], G. Weihs[1], A.M. Andrews[2], H. Detz[2], G. Strasser[2], K. Winkler[3], A. Forchel[3], C. Schneider[3], S. Höfling[3], and M. Kamp[3]; [1]Department of Experimental Physics, University of Innsbruck, Innsbruck, Austria; [2]Institute of Solid State Electronics, Technical University of Vienna, Vienna, Austria; [3]Department of Technical Physics, University of Würzburg, Würzburg, Germany

Using time-correlated photon counting, we experimentally study parametric polariton scattering, with the aim of producing entangled photon pairs. We model the system theoretically by numerical simulations based on a quantum Langevin approach.

IH-P.11 THU

Plasmonic Amplifier of the Evanescent Field of Free Electrons

•J.-K. So[1], J.-Y. Ou[1], G. Adamo[1,2], F.J. García de Abajo[1,3], K.F. MacDonald[1], and N.I. Zheludev[1,2]; [1]Optoelectronics Research Centre & Centre for Photonic Metamaterials, University of Southampton, Southampton, United Kingdom; [2]Centre for disruptive Photonic Technologies, Nanyanag Technological University, Singapore, Singapore; [3]IQFR - CSIC, Madrid, Spain

We show experimentally for the first time that free-electron evanescent fields can be amplified by a plasmonic nanolayer in much that same way as optical evanescent fields are amplified in the poor-man's superlens.

IH-P.12 THU

Determination of the orientation of a single nano-emitter by polarisation analysis

C. Lethiec[1], J. Laverdant[2], C. Javaux[3], B. Dubertret[3], C. Schwob[1], L. Coolen[1], and •A. Maître[1]; [1]Institut des Nanosciences de Paris, Paris, France; [2]LPMCN, Lyon, France; [3]LPEM, Paris, France

We determine by emission polarization analysis the nature of emitting dipoles (linear-1D or 2 linear orthogonal incoherent dipoles-2D). By rotating the analyzer, we can infer from the polarized transmitted intensity the orientation of the emitter.

IH-P.13 THU

Optimized Thermal Conductivity Enhancement of Polar Nanotubes due to Surface Phonon-Polaritons

•*J. Ordonez-Miranda, L. Tranchant, T. Antoni, and S. Volz*; *Ecole Centrale Paris, Paris, France*

We study the contribution of the surface phonon-polaritons to the thermal conductivity of polar nanotubes. For a SiO2 nanotube, values of about 1 W/m.K are obtained, which are comparable to its bulk phonon thermal conductivity.

IH-P.14 THU

Enhancement of second-harmonic generation from gold nanoparticles through passive elements

•*R. Czaplicki*[1], *H. Husu*[1,2], *J. Mäkitalo*[1], *R. Siikanen*[1], *J. Lehtolahti*[3], *J. Laukkanen*[3], *M. Kuittinen*[3], *and M. Kauranen*[1]; [1]*Tampere University of Technology, Department of Physics, Tampere, Finland*; [2]*Centre for Metrology and Accreditation (MIKES), Espoo, Finland*; [3]*University of Eastern Finland, Department of Physics and Mathematics, Joensuu, Finland*

We show that the presence of passive elements enhances second-harmonic generation from arrays of active metal nanoparticles. Our results provide a completely new concept for optimizing the nonlinear response of metamaterials.

IH-P.15 THU

Size dependent surface plasmon resonance broadening in non-spherical nanoparticles: single gold nanorods

•*V. Juvé*[1,3], *M.F. Cardinal*[2,4], *A. Lombardi*[1], *A. Crut*[1], *P. Maioli*[1], *L. M. Liz-Marzan*[2], *N. Del Fatti*[1], *and F. Vallée*[1]; [1]*FemtoNanoOptics group, Université Lyon 1, CNRS, Institut Lumière Matière,43 Bd du 11 Novembre, 69622, Villeurbanne, France*; [2]*Departamento de Quimica Fisica, Universidade de Vigo, 36310, Vigo, Spain*; [3]*Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie,D-12489, Berlin, Germany*; [4]*Department of Chemistry, North,2145 Sheridan Road, Evanston, United States*

We investigate the quantum size effects in metallic non-spherical nanoparticles.

The linewidth of the localized surface plasmon resonance is measured in single gold nanorods and shows a dependence on the two geometrical dimensions.

IH-P.16 THU

Plasmonic Oligomers as Effective Red Light Scatterers to Enhance the Performance of Organic Solar Cells

•*F. Pastorelli*[1,2], *S. Bidault*[3], *J. Martorell*[2,4], *and N. Bonod*[1]; [1]*Institut Fresnel, Marseille, France*; [2]*ICFO-Institut de Ciències Fotòniques, Barcelona, Spain*; [3]*Institut Langevin, Paris, France*; [4]*Universitat Politecnica de Catalunya, Terrassa, Spain*

Metallic nanoparticles are being embedded in organic photovoltaic devices to better harvest the sun radiation. However, isolated nanoparticles have limited potential in such thin-film devices. We overcame this limitation by using dimers and trimers solutions.

IH-P.17 THU

Shape dependence of the quadratic nonlinear properties of gold nanoparticles

A. Anu[1], *A. Lehoux*[2], *J. Zyss*[1], *H. Remita*[2], *and* •*I. Ledoux-Rak*[1]; [1]*LPQM, Institut d'Alembert, ENS Cachan, Cachan, France*; [2]*LCP, Université Paris Sud, Orsay, France*

We explore the quadratic nonlinear optical (NLO) properties of gold nanorods, showing the higher nonlinearity of high aspect ratio particles. A strong exaltation of NLO properties of dyes attached to nanorods is also evidenced.

IH-P.18 THU

A Plasmonic Switch based on Electrically Controlled Cavity Resonances

•*C. McPolin, D. O'Connor, J.-S. Bouillard, A. Krasavin, W. Dickson, G. Wurtz, and A. Zayats*; *King's College London, London, United Kingdom*

We numerically demonstrate a compact plasmonic switch, based on a cavity structure, that allows for the signal to be dynamically controlled via electrical means, yielding extinction ratios of up to 9dB.

IH-P.19 THU

Measurements on the Optical Transmission Matrices of Strongly Scattering Nanowire Layers

•*D. Akbulut*[1], *T. Strudley*[2], *J. Bertolotti*[1], *T. Zehender*[3], *E.P.A.M. Bakkers*[3,4], *A. Lagendijk*[1], *W.L. Vos*[1], *O.L. Muskens*[2], *and A.P. Mosk*[1]; [1]*Complex Photonic Systems (COPS), MESA+ Institute for Nanotechnology, University of Twente, Enschede, The Netherlands*; [2]*School of Physics and Astronomy, University of Southampton, Southampton, United Kingdom*; [3]*Department of Applied Physics, Eindhoven University of Technology, Eindhoven, The Netherlands*; [4]*Kavli Institute of Nanoscience, Delft University of Technology, Delft, The Netherlands*

We measure optical transmission matrices of strongly scattering GaP nanowire layers. Measured matrices show presence of correlations in the transmitted fields. We study the measured matrices to retrieve optical properties of the samples.

IH-P.20 THU

strongly scattering optical phenomena in GaAs powder

T. van der Beek[1], *P. Barthelemy*[2], *P.M. Johnson*[1], *D.S. Wiersma*[3], *and* •*A. Lagendijk*[1]; [1]*FOM Institute AMOLF, Amsterdam, The Netherlands*; [2]*Delft University of Technology, Delft, The Netherlands*; [3]*LENS and CNR-INO, Firenze, Italy*

The contribution has been withdrawn by the authors.

IH-P.21 THU

Quantum coherence controls the charge separation in a prototypical artificial light harvesting system

S.M. Falke[1], *C.A. Rozzi*[2], *N. Spallanzani*[2], *A. Rubio*[2], *E. Molinari*[2], *D. Brida*[3], *M. Maiuri*[3], *G. Cerullo*[3], *H. Schramm*[1], *J. Christoffers*[1], *and* •*C. Lienau*[1]; [1]*für Physik, Carl von Ossietzky Universität, Oldenburg, Germany*; [2]*CNR, Centro S3, Centro S3, Modena, Italy*; [3]*IFN-CNR, Dipartimento di Fisica, Politecnico di Milano, Milano, Italy*

We report ultrafast nonlinear spectra and first-principles quantum-dynamics simulations of an artificial prototypical light harvesting system - a supramolecular triad. Our results provide strong evidence for quantum-correlated wavelike motion inducing the ultrafast photoinduced charge transfer.

IH-P.22 THU

Cooperative Electromagnetic Interactions and Linwidth Narrowing in Discrete Metamaterial Systems

•*S. Jenkins and J. Ruostekoski*; *School of Mathematics, University of Southampton, Southampton, United Kingdom*

We show how cooperative electromagnetic interactions between discrete resonators can lead to the formation and narrowing of a transmission resonance in planar metamaterials. Our results are in excellent agreement with previous experimental observations.

13:00 – 14:00

CH-P: CH Poster Session

CH-P.1 THU

Tilted Planar Bragg Grating Refractometers

•*C. Holmes, H. Rogers, K. Daly, L. Carpenter, C. Sima, P. Mennea, J. Gates, G. D'Alessandro, and P. Smith*; *University of Southampton, Southampton, United Kingdom*

Tilted planar Bragg gratings are demonstrated as effective refractometers. Increased design flexibility, compared to more traditional fibre regimes, is explored and coupling into cladding and plasmonic modes is understood using a developed numerical approach.

CH-P.2 THU

Resonance Micromechanical Mass Sensor with Holographic Interferometer

•*R. Romashko*[1,2], *T. Efimov*[1], *and Y. Kulchin*[1,2]; [1]*Institute of Automation and Control Processes, F.E.B. R.A.S, Vladivostok, Russia*; [2]*Far-Eastern Federal University, Vladivostok, Russia*

We present experimental results of applying an adaptive interferometry technique based on dynamic hologram recorded in photorefractive crystal for measurement of nano-objects mass adsorbed at micromechanical resonators with pico-gram resolution.

CH-P.3 THU

Optical Measurements on Rotating Micro-Tools

•*M. Benedetti*[1,2], *G. Capelli*[1,2], *M. Norgia*[1,3], *and G. Giuliani*[1,2]; [1]*University of Pavia, Pavia, Italy*; [2]*Julight S.r.l., Pavia, Italy*; [3]*Politecnico di Milano, Milano, Italy*

The vibrations and eccentricity of rotating micro-tools (diameter 600 um, speed up to 30,000 rpm) are measured through a custom-made triangulation laser sensor.

CH-P.4 THU

Self-Mixing Dual-Frequency Laser Doppler Velocimeter

•*C.-H. Cheng, L.-C. Lin, and F.-Y. Lin*; *Institute of Photonics Technologies, Department of Electrical Engineering, National Tsing Hua University, Hsinchu, China, Republic of (ROC)*

Self-mixing dual-frequency laser Doppler velocimeter based on the hybrid dynamics of the optical injection and the optical feedback of a semiconductor laser has been demonstrated. It shows the direction discriminability and high sensitivity.

CH-P.5 THU

Fiber Optic Vector Magnetic Field Gradient Sensing System

•*A. Davis*; *US Naval Research Laboratory, Washington, DC, United States*

The contribution has been withdrawn by the authors.

Hall B0

CH-P.6 THU

Electro-Optic High Voltage Sensor for Utility Application

•*S. Wildermuth*[1,2], *K. Bohnert*[1], *S. Marchese*[1], *O. Steiger*[1], *J. van Mechelen*[1], *L. Rodoni*[1], *G. Eriksson*[3], *and J. Czyzewski*[4]; [1]*ABB Switzerland Ltd., Corporate Research, Baden-Dättwil, Switzerland*; [2]*ABB AG, Corporate Research, Ladenburg, Germany*; [3]*ABB Sweden Ltd., Corporate Research, Västeras, Sweden*; [4]*ABB Switzerland Ltd., High Voltage Components, Micafil Bushings, Zurich, Switzerland*

We have developed an electro-optic ac-voltage sensor based on a novel concept for high-voltage-proof packaging. It passed all required dielectric tests (operating voltage: 300kV). Accuracy of 0.2% over a wide temperature range was experimentally verified.

CH-P.7 THU

High-Feedback DFB/FBG-Induced Noise Analysis and Static/Dynamic strain Sensing Applications

•*D. Tosi*[1] *and G. Perrone*[2]; [1]*University of Limerick, Limerick, Republic of Ireland*; [2]*Politecnico di Torino, Torino, Italy*

High-feedback chaotic noise induced in DFB laser and FBG system is analyzed through eigendecomposition. Sensing application as static+dynamic FBG interrogation is presented.

CH-P.8 THU

Influence of the Mode Field Diameter on the Strain and Temperature Sensitivity of Different Fibres

•*M. Murawski*[1,2], *Z. Holdynski*[1,2], *M. Szymanski*[1,2], *T. Tenderenda*[1,2], *L. Ostrowski*[1,2], *A. Lukowski*[1,2], *K. Pawlik*[1,2], *M. Napierala*[1,2], *P. Marc*[1], *L. Jaroszewicz*[1], *and T. Nasilowski*[1,2]; [1]*Institute of Applied Physics, Military University of Technology, Warsaw, Poland*; [2]*InPhoTech Ltd, Warsaw, Poland*

In this paper we present the theoretical and experimental study of the influence of the mode field diameter on the fiber sensitivity to the temperature and longitudinal strain.

CH-P.9 THU

Coupled waveguide integrated optic segment piston sensor for the GMT

•*F. Bennet*[1], *K. Uhlendorf*[1], *R. Gardhouse*[1], *R. Conan*[1], *B. Espeland*[1], *and A. Bouchez*[2]; [1]*Research School of Astronomy and Astrophysics, Australian National University, Mount Stromlo Observatory, Canberra, Australia*; [2]*Giant Magellan Telescope Organization, P.O. Box 90933, Pasadena, United States*

Integrated optic segment piston sensor for the GMT uses laser-written coupled waveguides produce an output signal dependant on the segment piston. Segment piston with a sensitivity of less than 35nm with input Strehl >15%.

CH-P.10 THU

Polymer Fiber Optic Sensors for Strain Monitoring in Solid Rocket Motors' Propellant

•*C. Riziotis*[1], *L. Eineder*[2], *L. Bancallari*[3], *and G. Tussiwand*[2]; [1]*1National Hellenic Research Foundation, Theoretical and Physical Chemistry Institute, Photonics for Nanoapplications Laboratory, Athens, Greece*; [2]*2Bayern-Chemie GmbH, Missile Propulsion Systems, Aschau am Inn, Germany*; [3]*3MBDA Italia S.p.A, Missile Systems, La Spezia, Italy*

Polymer Optical Fibers embedded in the propellant of Solid Rocket Motors are demonstrated for monitoring strains higher than 10%. A new architecture incorporating a closed-loop fiber is proposed and its theoretical behaviour is experimentally verified.

CH-P.11 THU

Full Characterisation of a Focussed Extreme Ultraviolet Beam Using a Non-Redundant Array of Apertures

•*A.D. Parsons*[1], *P. Baksh*[1], *R.T. Chapman*[2,3], *B. Mills*[1], *J.G. Frey*[2], *and W.S. Brocklesby*[1]; [1]*Optoelectronics Research Centre, Southampton, United Kingdom*; [2]*School of Chemistry, Southampton, United Kingdom*; [3]*Rutherford Appleton Laboratories, Didcot, United Kingdom*

A novel technique for full coherent beam profiling utilising a Non-Redundant array of apertures is present. The technique is applied experimentally in the EUV using a high harmonic source and the results investigated by simulations.

CH-P.12 THU

Measuring the Optical Properties of Natural Silks

•*D. Little and D. Kane*; *MQ Photonics Research Centre, Department of Physics and Astronomy, Macquarie University, Sydney, Australia*

There is an emerging interest in natural silks as an optical material. Here we present an accessible new technique for measuring the optical properties of these challenging samples, including the first reported optical absorption measurements.

CH-P.13 THU

Dual Frequency Combs Fourier Transform Spectrometer in Mid-infrared Region based on Femtosecond Optical Parametric Oscillators

•*Y. Jin, J. Mandon, S. Cristescu, and F. Harren*; *Institute for Molecules and Materials, Nijmegen, The Netherlands*

A dual frequency combs Fourier transform spectrometer is demonstrated for the mid-infrared region. Based on optical parametric oscillators(OPO), the spectral coverage tuned from 2.7um to 4.7um, make it suitable for trace gas sensing.

CH-P.14 THU

Ultrafast Leak Detection of Hydrocarbons Using a 3.3 um Fabry-Perot Quantum Cascade Laser

•*J. Jágerská*[1], *B. Tuzson*[1], *H. Looser*[2], *H. Prinz*[3], *A. Bismuto*[4,5], *M. Beck*[4], *and L. Emmenegger*[1]; [1]*Empa, Swiss Federal Laboratories for Materials Science and Technology, Dübendorf, Switzerland*; [2]*FHNW, University of Applied Sciences, Windisch, Switzerland*; [3]*Wilco AG, Wohlen, Switzerland*; [4]*ETH Zürich, Zürich, Switzerland*; [5]*Alpes Lasers SA, Neuchâtel, Switzerland*

We present a Mid-IR optical analyzer based on 3.3um Fabry-Perot QCL for industrial leak detection of aerosol propellants. Insensitive to water interference and operated without wavelength scanning, it reaches 1ppm precision within 10ms of measurement.

CH-P.15 THU

Detecting exoplanets with extreme adaptive optics and a single-mode fibre fed spectrograph

•*N. Jovanovic*[1], *N. Cvetojevic*[2], *O. Guyon*[1], *F. Martinache*[1], *and J. Lawrence*[3]; [1]*Subaru Telescope, Hilo, United States*; [2]*Macquarie University, Sydney, Australia*; [3]*Australian Astronomical Observatory, Sydney, Australia*

We report on a novel astronomical spectrograph design that combines several photonic technologies with an extreme adaptive optics system in order to achieve the high precision required for characterizing near Earth mass exoplanets.

CH-P.16 THU

A Quantum Cascade Laser based mid-infrared Sensor for the Detection of Carbon Monoxide and Nitrous Oxide in the Jet of a Microwave Plasma preheated Auto-Ignition Burner

•*F. Schad*[1], *F. Eitel*[2], *S. Wagner*[2,3], *A. Dreizler*[2,3], *and W. Elsäßer*[1,3]; [1]*Institute for Applied Physics, Darmstadt, Germany*; [2]*Institute of Reactive Flows and Diagnostics, Darmstadt, Germany*; [3]*Center of Smart Interfaces, Darmstadt, Germany*

We report on mid-infrared TDLAS sensor for detection of N2O and CO in a microwave-plasma preheated auto-ignition burner. We achieve normalized detection limits below 8ppm*m for both molecules at elevated temperatures of up to 2000K.

CH-P.17 THU

Fluorescence excitation emission matrix spectroscopy of strongly absorbing samples using fibre-optic probes

•*D. Munzke*[1], *J. Saunders*[2], *H. Omrani*[2], *O. Reich*[1], *and H.-P. Loock*[2]; [1]*University of Potsdam - innoFSPEC, Potsdam, Germany*; [2]*Queen's University, Kingston, Canada*

Fluorescence emission excitation matrix spectroscopy using fibre-optic probes is applied for the investigation of strongly absorbing samples. Four detector configurations are discussed. Theoretical simulations are validated with experimental results on strongly absorbing oil-contaminated jet fuel.

CH-P.18 THU

Non-destructive real-time monitor to measure 3D-bunch charge distribution with spectral decoding EO-sampling

•*H. Tomizawa*[1,2], *Y. Okayasu*[1], *S. Matsubara*[1], *T. Togashi*[1], *K. Ogawa*[1], *T. Matsukawa*[3], *and H. Minamide*[3]; [1]*Japan Synchrotron Radiation Research Institute, Hyogo, Japan*; [2]*RIKEN SPring-8 Center, Hyogo, Japan*; [3]*RIKEN, Sendai, Japan*

We developed a novel 3D-BCD monitor. This 3D-BCD monitor is based on an Electro-Optic sampling technique with multiple EO crystal detectors in spectral decoding. We successfully demonstrated the first bunch measurement with DAST crystal.

CH-P.19 THU

Adaptive Phase Estimation with Squeezed Thermal Light

•*A. Berni*[1], *L. Madsen*[1], *M. Lassen*[1], *B. Nielsen*[1], *M. Paris*[2], *and U. Andersen*[1]; [1]*Department of Physics, Technical University of Denmark, Lyngby, Denmark*; [2]*Department of Physics, Univeristà degli Studi di Milano, Milano, Italy*

In this work we investigate experimentally an adaptive phase estimation protocol, in which the phase information is encoded in a squeezed thermal state and extracted by means of homodyne measurements and Bayesian post-processing.

CH-P.20 THU

Phase Noise Performance of Double-Loop Optoelectronic Microwave Oscillators

R.M. Nguimdo[1], *Y.K. Chembo*[2], •*P. Colet*[1], *and L. larger*[2]; [1]*Instituto de Física Interdisciplinar y Sistemas Complejos, IFISC (CSIC-UIB), Palma de Mallorca, Spain*; [2]*UMR CNRS FEMTO-ST 6174/Optics Department, Universite Franché-Comté, Besançon, France*

We introduce an optoelectronic oscillator for ultra-pure microwave generation with two nonlinearly-coupled delay loops. Besides reducing the phase noise spurious peaks, this system allows for stable microwave emission with larger amplitude.

Hall B0

CH-P.21 THU

Nanometrology using localized surface plasmon resonance spectroscopy

•*C. Jeppesen*[1], *D.N. Lindstedt*[2], *A.V. Laurberg*[2], *A. Kristensen*[3], *and N.A. Mortensen*[1]; [1]*Department of Photonics Engineering, DTU Fotonik, Technical University of Denmark, Kongens Lyngby, Denmark*; [2]*Danish Technological Institute, Taastrup, Denmark*; [3]*Department of Micro- and Nanotechnology, DTU Nanotech, Technical University of Denmark, Kongens Lyngby, Denmark*

Initial results on the characterization technique: localized surface plasmon resonance (LSPR) spectroscopy is presented. The LSPR spectroscopy is utilized to evaluate 4” wafer scale fabrication uniformity and its potential as a nanometrology tool is discussed.

CH-P.22 THU

Ultrasensitive plenoptic microscope for imaging through turbid media

•*W. Glastre, O. Hugon, O. Jacquin, H. Guillet de Chatellus, and E. Lacot*; *Laboratoire Interdisciplinaire de Physique, Saint Martin d’Hères, France*

An ultrasensitive plenoptic microscope combining Laser Optical Feedback Imaging and Synthetic Aperture techniques is presented; a comparison with a classical setup based on a microlens array is made.

CH-P.23 THU

Nanometrology of sub-wavelength circular holes in gold nanofilms using Optical Surface Profilometry

•*D. Little and D. Kane*; *MQ Photonics Research Centre, Department of Physics & Astronomy, Macquarie University, Sydney, Australia*

We measure the diameter of sub-wavelength circular holes in gold nanofilm using an optical surface profile, demonstrating the potential of optical surface profilometry as a viable nanometrology technique.

CH-P.24 THU

Optical fringe pattern processing using empirical mode decomposition based algorithms

•*M. Trusiak and K. Patorski*; *Institute of Micromechanics and Photonics, Warsaw University of Technology, Warsaw, Poland*

In the paper two empirical mode decomposition based fringe pattern processing techniques are presented. First algorithm performs fringe pattern enhancement and normalization, the second one separates fringe families encountered in grating interferometry (moiré) methods.

CH-P.25 THU

A Hollow Waveguide Michelson Interferometer

•*J. Banerji*[1], *A.R. Davies*[2], *and R.M. Jenkins*[3]; [1]*Physical Research Laboratory, Navrangpura, India*; [2]*Royal Holloway University of London, Egham, United Kingdom*; [3]*HollowGuide Ltd, Malvern, United Kingdom*

A novel Michelson interferometer is proposed where hollow waveguides guide the input radiation between the interferometer components. Significant decreases in sensitivity to angular misalignment are predicted with potential performance benefits for sensing, metrology and spectrometry.

CH-P.26 THU

High-resolution broadband spectroscopy with a resonator-based phase modulator

•*N. Berger*; *Technion - Israel Institute of Technology, Haifa, Israel*

Considerable enhancement of the resolution and spectral range of Fabry-Perot spectrometers is proposed. A 1-MHz resolution within a 62.9-GHz range is numerically demonstrated for a finesse of 72. The spectral range can achieve 10 THz.

13:00 – 14:00

IG-P: IG Poster Session

IG-P.1 THU

Mirror transformation of Airy pulses under the action of third order dispersion.

•*R. Driben*[1,2], *Y. Hu*[3], *Z. Chen*[4], *B. Malomed*[1], *and R. Morandotti*[3]; [1]*Department of Physical Electronics, Faculty of Engineering, Tel-Aviv University, Tel-Aviv, Israel*; [2]*Department of Physics & CeOPP, University of Paderborn, Paderborn, Germany*; [3]*Institut National de la Recherche Scientifique, Varennes, Québec, Montreal, Canada*; [4]*Department of Physics & Astronomy, San Francisco State University, San Francisco, United States*

By analytical and numerical studies we demonstrate the mirror transformation of Airy pulses propagating in fibers with strong positive third order dispersion. After reaching a focal point, Airy pulse propagates with its acceleration reversed.

IG-P.2 THU

Generation of ultra-compressed solitons with propagation invariant, high tunable wavelength shift in Raman inactive gas-filled hollow-core photonic crystal fibers

•*R. Driben*[1,2] *and B. Malomed*[1]; [1]*Department of Physical Electronics, Faculty of Engineering, Tel-Aviv, Israel*; [2]*Department of Physics & CeOPP, University of Paderborn, Paderborn, Germany*

Generating of ultra-compressed solitons with propagation invariant, high tunable wavelength up and dawnshift in Raman inactive gas-filled hollow-core PCFs is proposed. Universal optimal third order dispersion strength parameter was found for the compression and conversion.

IG-P.3 THU

Polarization-domain-wall complexes in fiber lasers

•*C. Lecaplain*[1], *P. Grelu*[1], *and S. Wabnitz*[2]; [1]*Laboratoire Interdisciplinaire Carnot de Bourgogne, U.M.R. 6303 C.N.R.S., Dijon Cedex, France*; [2]*Dipartimento di Ingegneria dell’Informazione, Università di Brescia, Brescia, Italy*

We study theoretically and experimentally the emergence of polarization-domain walls in fiber oscillators. We highlight their complex composite nature and the multifaceted range of dynamics available while exploring the system parameters.

IG-P.4 THU

Rogue Waves Generated through Quantum Chaos

•*C. Liu*[1], *A. Falco*[2], *T. Krauss*[3], *and A. Fratalocchi*[1]; [1]*PRIMALIGHT, Department of Electrical Engineering and Department of Applied Mathematics and Computational Science, KAUST, Thuwal, Saudi Arabia*; [2]*School of Physics and Astronomy, University of St. Andrews, St. Andrews, United Kingdom*; [3]*Department of Physics, University of York, York, United Kingdom*

We demonstrate a new avenue to generation of rouge waves in a linear optical micro-cavity based on the phenomenon of quantum chaos by analytical theory and ab-initio simulation.

IG-P.5 THU

Characterization of the synchronization regimes of a self-injected two-frequency laser

M. Romanelli, L. Wang, •*M. Brunel, and M. Vallet*; *Institut de Physique de Rennes, Rennes, France*

We characterize quantitatively the bounded-phase and the phase-locked regimes of a self-injected dual-frequency laser. By measuring the phase noise spectra, we show that the quality of the locking is the same for both regimes.

IG-P.6 THU

Pattern formation in optomechanical cavities

•*J. Ruiz-Rivas*[1], *C. Navarrete-Benlloch*[2], *G. Patera*[3], *E. Roldán*[1], *and G.J. de Valcárcel*[1]; [1]*Universitat de València, Valencia, Spain*; [2]*Max-Planck Institut für Quantenoptik, Munich, Germany*; [3]*Université de Lille, Lille, France*

We predict pattern formation, including cavity solitons, in an optomechanical cavity in which one of its mirrors can be deformed by radiation pressure.

IG-P.7 THU

Information processing using an electro-optic oscillator subject to multiple delay lines

•*S. Ortín*[1], *L. Appeltant*[2], *L. Pesquera*[1], *G. Van der Sande*[2], *J. Danckaert*[2], *and J.M. Gutiérrez*[1]; [1]*Instituto de Física de Cantabria (IFCA), Santander, Spain*; [2]*Vrije Universiteit Brussel, Brussels, Belgium*

We show numerically that a opto-electronic delay oscillator with multiple delay lines can solve high-demanding memory tasks. The inclusion of the extra delay lines increases the memory capacity of the photonic reservoir computer.

IG-P.8 THU

Front pinning induced by spatial inhomogeneous forcing in a Fabry-Pérot Kerr cavity with negative diffraction

•*V. Odent, S. Coulibaly, P. Glorieux, M. Taki, and E. Louvergneaux*; *Laboratoire de Physique des Lasers, Atomes et Molécules, Lille, France*

We evidence the pinning of propagating fronts subjected to inhomogeneous spatial forcing. The analytical results are confirmed by experiments in a Pérot-Fabry Kerr cavity pumped by a Gaussian profile and submitted to negative diffraction.

IG-P.9 THU

Diffractive resonant radiation by spatial solitons in waveguide arrays

•*F. Biancalana*[2] *and T. Tran*[1]; [1]*Max Planck Institute for the Science of Light, Erlangen, Germany*; [2]*Heriot-Watt University, Edinburgh, United Kingdom*

We study analytically and numerically a new kind of diffractive resonant radiation emitted by spatial solitons, generated in waveguide arrays with Kerr nonlinearity, which mimics the resonant radiation emitted by solitons in optical fibers.

IG-P.10 THU

Suppression of Modulation Instability by Spatio-Temporal Modulation

•*K. Staliunas*; *UPC&ICREA, Barcelona, Spain*

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We show by analytical and numerical studies, that modulation instability can be universally suppressed by resonant spatio-temporal modulation of the system. We study universal CGLE model, but also consider implementation in concrete nonlinear optical systems.

IG-P.11 THU

Control of excitable pulses in an optically injected semiconductor laser

M. Turconi, B. Garbin, M. Feyereisen, M. Giudici, and •S. Barland; Institut Non Lineaire de Nice, Valbonne, France

We demonstrate the control of excitable intensity pulses in a semiconductor laser with injected signal. Triggering those pulses via a phase modulation may prove useful due to the signal regeneration property of excitable systems.

IG-P.12 THU

Delay Induced Instabilities of Cavity Solitons in Passive and Active Laser Systems

•M. Tlidi[1], A. Vladimirov[2,3], A. Pimenov[2], K. Panajotov[4], D. Puzyrev[5], S. M. Yanchuk[5], and S. M. Gurevich[6]; [1]Université Libre de Bruxelles (ULB), Bruxelles, Belgium; [2]Weierstrass Institute, Berlin, Germany; [3]Cork Institute of Technology, Cork, Republic of Ireland; [4]Vrije Universiteit Brussel, Brussel, Belgium; [5]Humboldt University of Berlin, Berlin, Germany; [6]University of Münster, Münster, Germany

We study delayed feedback effect on the dynamics of solitons in passive and active optical devices. We investigate the dependence of the drift instability threshold and soliton velocity on feedback phase and carrier relaxation rate.

IG-P.13 THU

Semi-analytical model for the evolution of femtosecond pulses during supercontinuum generation in synchronously pumped ring cavities

•M.J. Schmidberger[1,2], F. Biancalana[1,3], P.S.J. Russell[1,2], and N.Y. Joly[2,1]; [1]Max Planck Institute for the Science of Light, Erlangen, Germany; [2]Department of Physics, University of Erlangen-Nuremberg, Erlangen, Germany; [3]School of Engineering & Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom

We study supercontinuum generation in synchronously pumped photonic crystal fibre ring cavities using a numerically efficient, semi-analytical multiscale model based on a discrete map built up from numerical solutions of the generalised nonlinear Schrödinger equation.

IG-P.14 THU

Polarization characteristics of superoscillatory beams

•K. Makris[1], D. Papazoglou[2,3], S. Tzortzakis[2,3], and D. Psaltis[4]; [1]Department of Electrical Engineering, Princeton University, Princeton, United States; [2]Institute of Electronic Structures and Laser, Foundation for Research and Technology Hellas, Heraklion, Greece; [3]Materials Science and Technology Department, University of Crete, Heraklion, Greece; [4]School of Engineering, Swiss Federal Institute of Technology Lausanne (EPFL), Lausanne, Switzerland

Polarization aspects of superoscillations are analyzed. A method that controls the polarization of the subwavelength regions with respect to the surrounding high intensity lobes is presented. Vectorial superoscillatory solutions of Maxwell's equations are also examined.

IG-P.15 THU

Impact of Optical Feedback on a Quantum Dot Laser Emitting Simultaneously from the Ground and Excited States

•M. Virte[1,2], K. Panajotov[2,3], and M. Sciamanna[1]; [1]Optel Research Group and LMOPS (Laboratoire Matériaux Optiques, Photoniques et Systèmes) EA-4423, Supélec - Université de Lorraine, Metz, France; [2]Brussels Photonics Team, Department of Applied Physics and Photonics (B-PHOT TONA), Vrije Universiteit Brussels, Brussels, Belgium; [3]Institute of Solid State Physics, Sofia, Bulgaria

We theoretically study the impact of optical feedback on the mode competition between the ground and excited state of a quantum dot laser. We bring new light and provide a theoretical framework for recent experiments.

IG-P.16 THU

Resilience of large amplitude coherent output in coupled lasers

•J. Zamora-Munt, M.A. Matías, and P. Colet; IFISC (CSIC-UIB), Campus Universitat Illes Balears, Palma de Mallorca, Spain

We study synchronization in laser arrays coupled through global frequency-filtered feedback and through direct optical injection on some elements into others. A suitable mathematical framework allows to understand the effect of the coupling topologies.

IG-P.17 THU

Delay feedback induces drift of multipeaks cavity solitons in VCSEL devices

•E. Averlant[1,3], A. Vladimirov[2], K. Panajotov[3], H. Thienpont[3], and M. Tlidi[1]; [1]Faculté des Sciences, Université Libre de Bruxelles, Brussels, Belgium; [2]Weierstrass Institute for Applied analysis and stochastics, Berlin, Germany; [3]Department of applied physics and photonics(IR-TONA), Vrije Universiteit Brussel, Brussels, Belgium

We show that cavity solitons exhibit a spontaneous motion in VCSELS subject to injection and delay feedback. Their speed and the threshold of their drift are derived in the limit of nascent bistability.

IG-P.18 THU

On-off and Multistate Intermittencies in Cascaded Random Distributed Feedback Fibre Laser

•A. Lanin[1], S. Sergeyev[1], D. Nasiev[1], D. Churkin[1,2], and S. Turitsyn[1]; [1]Aston University, Birmingham, United Kingdom; [2]Institute of Automation and Electrometry SB RAS, Novosibirsk, Russia

We experimentally study intermittency in cascaded random distributed feedback fiber laser. The on-off intermittency developed near the second Stokes wave generation threshold is changed into multistate intermittencies at higher power.

IG-P.19 THU

Parametric resonance in periodically tapered optical fibres: scalar and vectorial modulational instability bands

•A. Armaroli[1] and F. Bianalana[1,2]; [1]Max Planck Research Group "Nonlinear Photonic Nanostructures" Max Planck Institute for the Science of Light, Erlangen, Germany; [2]School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom

We analyse the modulational instability (MI) process induced by periodic variations of the parameters of an optical fibre along the propagation direction. It occurs in situations where conventional MI is forbidden and is widely tunable.

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