XVI International Conference on Ultrafast Phenomena
Topical Meeting and Tabletop Exhibit

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Connect with the most accomplished international scientists, researchers, engineers and business leaders as they shape the future of optics, photonics and laser science.

ABOUT UP:

The 2008 Ultrafast Phenomena Conference will be the sixteenth in a series on advances in research on ultrafast science and technology. This meeting is widely recognized as the major international forum for the discussion of new work in this rapidly moving field. The 2008 conference will bring together a multidisciplinary group sharing a common interest in the generation of ultrashort pulses in the picosecond, femtosecond, and attosecond regimes and their applications to studies of ultrafast phenomena in physics, chemistry, material science, electronics, biology, engineering, and medical applications. In addition, submissions involving real world applications of ultrafast technology are encouraged. A tabletop exhibit featuring leading companies will be held in conjunction with the meeting.

Plan to attend UP 2008!

Postdeadline Submission Deadline: Monday May 26th

Topic Categories:

- **Generation and Measurement** – New sources, new wavelength regimes, nonlinear frequency conversion techniques, amplifiers, attosecond pulse generation, pulse shaping, pulse diagnostics and measurement techniques and frequency standards.
- **Physics** – Ultrafast nonlinear optical processes, kinetics of nonequilibrium processes, quantum confinement, coherent transients, nonlinear pulse propagation, novel ultrafast spectroscopic techniques, high intensity physics, X-ray and plasma physics.
- **Chemistry** – Vibrational and conformational dynamics, energy transfer, kinetics of laser-induced chemistry, proton and electron transfer, solvation dynamics, wavepacket motion and coherent control of reactions.
- **Biology** – Ultrafast processes in photosynthesis, vision, heme proteins, photoisomerization in chromoproteins, wavepacket motion and medical applications.
- **Electronics & Optoelectronics** – Photoconductivity, generation, propagation and detection of ultrafast electrical signals, terahertz radiation, electro-optical sampling and detectors.
- **Applications** – Real world applications of ultrafast technology, including ultrafast near-field, nonlinear, and confocal microscopes, high speed communication, micromachining and more.

General Chairs:
Paul Corkum, *Steacie Inst. for Molecular Science, Canada*
Sandro De Silvestri, *Politecnico of Milan and ULTRAS INFM-CNR, Italy*
Keith Nelson, *MIT, USA*

Program Chairs:
Eberhard Riedle, *Ludwig-Maximilians Univ. of Munich, Germany*
Robert Schoenlein, *Lawrence Berkeley National Laboratory, USA*
Committees

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Erik Nibbering, *Max-Born Inst., Berlin*
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Charles Schmuttenmaer, *Yale Univ., USA*
Tamar Seideman, *Northwestern Univ., USA*
Mark Stockman, *Georgia Tech., USA*
Albert Stolow, *Steacie Institute for Molecular Sciences, Ottawa, Canada*
Antoinette Taylor, *Los Alamos National Lab, USA*
Andrei Tokmakoff, *MIT, USA*
Rick Trebino, *Georgia Tech., USA*
Niek Van Hulst, *ICFO,Barcelona, Spain*
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Tabletop exhibit space will be available at the Conference Centre.
The location of the exhibitor booths will be in a large area in front to the exit of the conference room and close to all activities, in order to allow easy and frequent contacts with the attendees (please visit the Conference Centre website: www.stresacongressi.it).

The exhibition space includes: (i) an individual booth of 3x2 meter size (with a light and three walls); (ii) a sign at the top with the company name and logo; (iii) electricity (10/16 Amp.); (iv) one office table with a glass top; (v) one cabinet; (vi) four chairs. In addition it will be provided: (i) an attendee list for one time mailing (no emails); (ii) one technical badge; (iii) one ticket to the conference reception; (iv) one technical digest; (v) two exhibitor personnel badges. Internet connection will be available at the Conference site without any charge.

The fee is Euro 1200 per booth.

In case of interest, download the contract for an exhibition space here.

All conditions are stipulated on the contract.
In order to be considered, the contract must be duly filled out and accompanied with the payment information.

**Deadline to return the signed contract is 14 March 2008.**

Sponsorship opportunities at UP 2008

Increase your company visibility amongst qualified attendees with a sponsorship at the event. Current sponsorship opportunities include:
- Coffee break
- Reception
- Attendee bags
- Registration material inserts
- Advertising signage placements

Plus other customizable promotional opportunities.
Invited Papers:

MON1.1 - 8:30 “Ultrafast coherent X-ray diffractive imaging with the FLASH Free-Electron Laser”
1Centre for Free-Electron Laser Science, University of Hamburg and DESY, Hamburg, Germany; 2HASYLAB, DESY, Hamburg, Germany; 3Lawrence Livermore National Laboratory, Livermore CA, USA, 4SLAC, Menlo Park CA, USA; 5Department of Physics, Clarendon Laboratory, University of Oxford, Oxford, UK; 6Uppsala University, Uppsala, Sweden; 7Lawrence Berkeley National Laboratory, Berkeley CA, USA; 8Institut für Experimentelle Physik, Universität Duisburg-Essen, Germany.

MON3.1 - 14:00 “Automated 2D IR and Vis spectroscopies using pulse shaping”
Martin Zanni
University of Wisconsin-Madison, USA.

MON4A.1 - 16:15 “Ultrabroadband Er:fiber systems and applications”
Alfred Leitenstorfer1, Alexander Sell1, Daniel Träutlein1, Florian Adler1, Konstantinos Moutzouris1, Florian Sotier1, Matthias Kahl1, Rudolf Bratschitsch1, Rupert Huber1, and Elisa Ferrando-May2
1Department of Physics and Center for Applied Photonics, University of Konstanz, D-78457 Konstanz, Germany; 2Department of Biology and Center for Applied Photonics, University of Konstanz, D-78457 Konstanz, Germany.

TUE1.1 - 8:30 “Ultrafast Molecular and Materials Dynamics probed by Coherent X-Rays,”
Margaret Murnane and Henry Kapteyn
JILA, University of Colorado, Boulder, CO, USA.

TUE3.1 - 14:00 “Ultrafast X-ray probing of electron dynamics”
Stephen R. Leone
University of California and LBNL, Berkeley, CA, USA.

TUE4A.1 - 16:15 “Real-time evolution of the valence orbitals in a dissociating molecule as revealed by femtosecond photoelectron spectroscopy”
Philippe Wernet1, Michael Odelius2, Kai Godehusen1, Jérôme Gaudin1, Olaf Schwarzkopf1, and Wolfgang Eberhardt1
1BESSY, Berlin, Germany; 2Stockholm University, Stockholm, Sweden.

WED1.1 - 8:30 “Ultrafast energy transfer and primary processes in photosynthesis”
Richard J. Cogdell
Division of Biochemistry and Molecular Biology, IBL. Glasgow Biomedical Research Centre, University of Glasgow, 126 University Place, Glasgow G12 8TA, Scotland, UK.

WED2A.1 - 10:45 “The evolving femtosecond laser frequency comb”
Scott Diddams, Danièle Braje, Tara Fortier, Leo Hollberg, Matt Kirchner, Vela Mbele, Stephanie Meyer, Qudsia Quraishi, and Shijun Xiao
NIST, 325 Broadway, Boulder, Colorado, USA.

WED3.1 - 14:00 “Ultrafast photoemission electron microscopy: imaging light with electrons on femto-nano scale”
Hrvoje Petek1,2 and Atsushi Kubo1,3
1Department of Physics and Astronomy, University of Pittsburgh, Pittsburgh, PA 15260 USA; 2Donostia
International Physics Center, Donostia-San Sebastian 20018 Spain; 3PRESTO, Japan Science and Technology Agency, 4-1-8 Honcho Kawaguchi, Saitama, Japan.

**WED4A.1 - 16:15** "Generation of octave-spanning Raman comb with absolute-phase control"

*Masayuki Katsuragawa1, Feng-Lei Hong2, Masaki Arakawa1, and Takayuki Suzuki1*

1Department of Applied Physics and Chemistry, University of Electro-Communications, 1-5-1 Chofugaoka, Chofu, Tokyo 182-8585, Japan; 2National Institute of Advanced Industrial Science and Technology, 1-1-1, Umezono, Tsukuba 305-8563, Ibaraki, Japan.

**THU1.1 - 8:30** “Ultrafast structural dynamics of polar solids studied by femtosecond X-Ray diffraction”

*Thomas Elsaesser1, Clemens von Korff Schmising1, Nickolai Zhavoronkov1, Matias Bargheer1,2, Michael Woerner1, Markus Braun3, Peter Gilch3, Wolfgang Zinth3, I. Vrejoiu4, D. Hesse4, and M. Alexe4*

1Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie, D-12489 Berlin, Germany; 2Institut für Physik, Universität Potsdam, D-14469 Potsdam, Germany; 3Biomolekulare Optik, Department für Physik, Ludwig-Maximilians-Universität, D-80538 München, Germany; 4Max-Planck-Institut für Mikrostrukturphysik, D-06120 Halle, Germany.

**THU2A.1 - 10:45** “Femtosecond X-Ray absorption spectroscopy of a photoinduced spin-crossover process”

*Christopher Milne1, Van-Thai Pham1, Wojciech Gawelda1,3, Amal El Nahhas1, Renske M. van der Veen1,2, Steven L. Johnson2, Paul Beaud2, Gerhard Ingold2, Camelia Borca2, Daniel Grolimund2, Rafael Abela2, Majed Chergui1, and Christian Bressler1*

1Laboratoire de Spectroscopie Ultrarapide, Ecole Polytechnique Fédérale de Lausanne, CH-1015 Lausanne, Switzerland; 2Swiss Light Source, Paul-Scherrer Institut, CH-5232 Villigen-PSI, Switzerland; 3Present Address: Laser Processing Group, Instituto de Óptica, CSIC, Serrano 121, E-28006 Madrid, Spain.

**THU3.4 - 14:45** “Dynamic metamaterials at terahertz frequencies”

*Hou-Tong Chen1, Abul Azad1, John O’Hara1, Antoinette Taylor1, Willie Padilla2, and Richard Averitt3*

1MPA-CINT, MS K771, Los Alamos National Laboratory, Los Alamos, New Mexico 87545, Mexico; 2Department of Physics, Boston College, Chestnut Hill, Massachusetts 02467, USA; 3Department of Physics and Photonics Center, Boston University, Boston, Massachusetts 02215, USA.

**FRI1A.1 - 8:30** “Ultrafast 2D-IR spectroscopy of a molecular monolayer”

*Jens Bredenbeck1,2, Avishek Ghosh1, Marc Smits1, and Mischa Bonn1*

1FOM Institute for Atomic and Molecular Physics, Kruislaan 407, 1098 SJ, Amsterdam, the Netherlands; 2Institut für Biophysik, Universität Frankfurt, Max von Laue-Str. 1, 60438 Frankfurt, Germany.

**FRI2.1 - 10:45** “Sub-100-as soft-X-ray pulses”

*Eleftherios Goulielmakis1, Martin Schultze1, Michael Hofstetter2, Matthias Uiberacker2, Justin Gagnon1, Vladislav Yakovlev2, Ulf Kleineberg2, and Ferenc Krausz1,2*

1Max-Planck-Institut für Quantenoptik, Hans-Kopfermann-Strasse 1, D-85748 Garching, Germany; 2Department für Physik, Ludwig-Maximilians-Universität, am Coulombwall 1, Germany.
Conference Programme

Monday, June 9, 2008

08:15 - 08:30 Auditorium Welcome and Opening Remarks
MON1 08:30 - 10:15 Auditorium Photon and Electron Sources of the Future
10:15 - 10:45 Coffee Break
MON2A 10:45 - 12:30 Auditorium Attosecond Spectroscopy
MON2P 10:45 - 12:30 Panoramica Dynamics of Low-Dimensional Systems
12:30 - 14:00 Lunch Break
MON3 14:00 - 15:45 Auditorium Two-Dimensional Spectroscopy
15:45 - 16:15 Coffee Break
MON4A 16:15 - 18:00 Auditorium Novel Fiber and High Power Sources
MON4P 16:15 - 18:00 Panoramica Liquid Dynamics
MONIa 18:00 - 20:00 Poster Area Poster I a - Applications
MONIc 18:00 - 20:00 Poster Area Poster I c - Generation and Measurement
MONId 18:00 - 20:00 Poster Area Poster I d - Physics
MONIe 18:00 - 20:00 Poster Area Poster I e - Chemical Physics
MONIf 18:00 - 20:00 Poster Area Poster I f - Chemistry
MONIg 18:00 - 20:00 Poster Area Poster I g - Biology

Tuesday, June 10, 2008

TUE1 08:30 - 10:15 Auditorium High Harmonics as Structural Probes
10:15 - 10:45 Coffee Break
TUE2A 10:45 - 12:30 Auditorium Control of Molecular Processes
TUE2P 10:45 - 12:30 Panoramica Applications of Ultrafast Pulses
12:30 - 14:00 Lunch Break
TUE3 14:00 - 15:45 Auditorium Coherent Molecular Dynamics
15:45 - 16:15 Coffee Break
TUE4A 16:15 - 18:00 Auditorium Photoinduced Reactions
TUE4P 16:15 - 18:00 Panoramica Ultrafast Electronics and Optoelectronics
TUEIIa 18:00 - 20:00 Poster Area Poster II a - Applications
TUEIIb 18:00 - 20:00 Poster Area Poster II b - Electronics and Optoelectronics
TUEIIc 18:00 - 20:00 Poster Area Poster II c - Generation and Measurement
TUEIId 18:00 - 20:00 Poster Area Poster II d - Physics
TUEIIe 18:00 - 20:00 Poster Area Poster II e - Chemical Physics
<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Location</th>
<th>Session</th>
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</thead>
<tbody>
<tr>
<td><strong>Wednesday, June 11, 2008</strong></td>
<td></td>
<td></td>
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<tr>
<td>WED1</td>
<td>08:30 - 10:15</td>
<td>Auditorium</td>
<td>Light Harvesting</td>
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<td>10:15 - 10:45</td>
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<td>Coffee Break</td>
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<tr>
<td>WED2A</td>
<td>10:45 - 12:30</td>
<td>Auditorium</td>
<td>Frequency Combs and Waveform Synthesis</td>
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<tr>
<td>WED2P</td>
<td>10:45 - 12:30</td>
<td>Panoramica</td>
<td>Structural Dynamics in Biological Systems</td>
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<td>12:30 - 14:00</td>
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<td>Lunch Break</td>
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<td>WED3</td>
<td>14:00 - 15:45</td>
<td>Auditorium</td>
<td>Electron Dynamics and Plasmonics</td>
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<td></td>
<td>15:45 - 16:15</td>
<td></td>
<td>Coffee Break</td>
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<tr>
<td>WED4A</td>
<td>16:15 - 18:00</td>
<td>Auditorium</td>
<td>Octave-Spanning Pulse Generation</td>
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<td>WED4P</td>
<td>16:15 - 18:00</td>
<td>Panoramica</td>
<td>Nanooptics and Microscopy</td>
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<td>20:00</td>
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<td>Gala Dinner at Hotel Regina Palace</td>
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<td><strong>Thursday, June 12, 2008</strong></td>
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<tr>
<td>THU1</td>
<td>08:30 - 10:15</td>
<td>Auditorium</td>
<td>Ultrafast X-Ray and Electron Diffraction</td>
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<tr>
<td></td>
<td>10:15 - 10:45</td>
<td></td>
<td>Coffee Break</td>
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<tr>
<td>THU2A</td>
<td>10:45 - 12:30</td>
<td>Auditorium</td>
<td>Ultrafast Charge Transfer</td>
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<tr>
<td>THU2P</td>
<td>10:45 - 12:30</td>
<td>Panoramica</td>
<td>Ultrafast Diagnostics</td>
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<tr>
<td></td>
<td>12:30 - 14:00</td>
<td></td>
<td>Lunch Break</td>
</tr>
<tr>
<td>THU3</td>
<td>14:00 - 15:45</td>
<td>Auditorium</td>
<td>Ultrafast Condensed Phase Dynamics</td>
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<td>15:45 - 16:15</td>
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<td>Coffee Break</td>
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<tr>
<td>THUIIIa</td>
<td>16:15 - 18:15</td>
<td>Poster Area</td>
<td>Poster III a - Applications</td>
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<tr>
<td>THUIIIc</td>
<td>16:15 - 18:15</td>
<td>Poster Area</td>
<td>Poster III c - Generation and Measurement</td>
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<td>THUIIId</td>
<td>16:15 - 18:15</td>
<td>Poster Area</td>
<td>Poster III d - Physics</td>
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<td>THUIIIe</td>
<td>16:15 - 18:15</td>
<td>Poster Area</td>
<td>Poster III e - Chemical Physics</td>
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<td>THUIIIg</td>
<td>16:15 - 18:15</td>
<td>Poster Area</td>
<td>Poster III g - Biology</td>
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<td>THU4</td>
<td>18:30 - 20:00</td>
<td>Auditorium</td>
<td>Postdeadline session</td>
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<td><strong>Friday, June 13, 2008</strong></td>
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<tr>
<td>FRI1A</td>
<td>08:30 - 10:15</td>
<td>Auditorium</td>
<td>Dynamics at Interfaces</td>
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<td>FRI1P</td>
<td>08:30 - 10:15</td>
<td>Panoramica</td>
<td>Tunable Ultrafast Pulse Generation</td>
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<td>10:15 - 10:45</td>
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<td>Coffee Break</td>
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<tr>
<td>FRI2</td>
<td>10:45 - 12:30</td>
<td>Auditorium</td>
<td>High Harmonic and Attosecond Pulse Generation</td>
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Ultrafast coherent X-ray diffractive imaging with the FLASH Free-Electron Laser. **Ultrafast coherent X-ray diffractive imaging with the FLASH Free-Electron Laser.**

**Auditorium**

8:30–10:15

**MON1.1** 8:30

**Ultrafast coherent X-ray diffractive imaging with the FLASH Free-Electron Laser.**

**MON1.2** 9:00

X-ray induced transient optical reflectivity for fs X-ray/optical cross-correlation at Free-Electron Lasers, **Cornelius Gahl**

**MON1.3** 9:15

An All-Optical Synchrotron Light Source. **Heinrich Schoepp**

**MON1.4** 9:30

Monoenergetic Electron Acceleration Driven by a Sub-10-fs OPCPA System. **László Veisz**

**MON1.5** 9:45

Absolute phase signature in THz emission from a femtosecond filament in argon. **Christoph Hauri**

**MON1.6** 10:00

Shaping Entangled Photon Pairs with Attosecond Precision. **Florian Züll and Thomas Feurer**
MON2A • Attosecond Spectroscopy

Auditorium
10:45–12:30
MON2A • Attosecond Spectroscopy

Chair: Marc Vrakking, AMOLF, Amsterdam, The Netherlands

MON2A.1 • 10:45
Attosecond angular streaking: an ideal technique to measure electron tunneling time, • Petriessa Ecke1, Adrian Peiffer1, Claudio Cirelli1, Ursula Keller1, Reinhard Dörner2, André Staude3, Harm-Geert Muller4, and Markus Büttiker5, 1Physics Department, ETH Zurich, CH-8093 Zurich, Switzerland, 2Institut für Kernphysik, Johann Wolfgang Goethe Universität, Max-von-Laue-Str. 1, 60438 Frankfurt am Main, Germany, 3Scieic Institute for Molecular Sciences, National Research Council of Canada, 100 Sussex Drive, Ottawa, Ontario K1A 0R6, Canada, 4FOM-Institute for Atomic and Molecular Physics, Kruislaan 407, 1098 SJ Amsterdam, The Netherlands, 5Physics Department, University of Geneva, CH-1211 Geneva, Switzerland.

We explore the possibility to measure tunneling time and provide initial experimental results using attosecond angular streaking that demonstrated a temporal localization accuracy of 24 as rms and an estimated resolution of 200 as.

MON2A.2 • 11:00
Attosecond excitation of electron wave packets, • Marko Swoboda1, Giuseppe Sansone2, Thomas Remetter1, Johan Mauritssson2, Kathrin Klünder1, Per Johnsson1, Matthias F. Kling4, Freek Kellkensberg1, Wing Kiu Siu2, Omair Ghafe1, Sergey Zherebtsov3, Irina Znakovskaya1, Thorsten Uphaues4, Enrico Benedetti1, Federico Ferrari1, Franck Lépine2, Marc J. J. Vrakking1, Kenneth J. Schafer5, Anne L’Huillier1, and Mauro Nisoli1, 1Department of Physics, Lund Institute of Technology, P.O. Box 118, SE-221 00 Lund, Sweden, 2National Laboratory for Ultrafast and Ultraintense Optical Science CNR Istituto Nazionale per la Fisica della Materia, Department of Physics, Politecnico, Piazza Leonardo da Vinci 32,20133, Italy, 3FOM-Institute AMOLF, Kruislaan 407, 1098 SJ Amsterdam, The Netherlands, 4Max-Planck Institut für Quantenoptik, Hans-Kopfermann Strasse 1, D-85748 Garching, Germany, 5Department of Physics and Astronomy, Louisiana State University, Baton Rouge, Louisiana.

We present experiments, supported by time-dependent calculations, on the dynamics of helium bound states after coherent attosecond excitation in the presence of a strong infrared laser field.

MON2A.3 • 11:15
Strong Field Coherent Control Using 2D Spatio-Temporal Mapping, • Barry D. Brauer, Haim Suchowski, Adi Natan, and Yaron Silberberg, Department of Physics of Complex Systems, Weizmann Institute of Science, Rehovot 76100, Israel.

Multiphoton excitation in Rubidium can be effectively controlled using simple pulse shaping parameters. Interplay between ionization and dynamic Stark shifts is revealed by mapping onto 2D landscapes using a recently developed spatio-temporal coherent control technique.

MON2A.4 • 11:30
Femtosecond Buildup of Ultrastrong Light-Matter Interaction, • Georg Günter1, • Aji A. Anappara2, Jakob Hees1, Silvan Lein1, Lucía Sorba2, Giorgio Biasiol1,2, Alessandro Tredicucci1, Alfred Leitenstorfer1, and Rupert Huber1, 1Department of Physics and Center for Applied Photonics, University of Konstanz, Universitätsstraße 10, 78464 Konstanz, Germany, 2NEST CNR-INFM and Scuola Normale Superiore, Piazza dei Cavalieri 7, I-56126 Pisa, Italy, 3Lab. Nazionale TASC CNR-INFM, Area Science Park, I-34012 Trieste, Italy.

An intersubband transition in a GaAs/AlGaNas quantum well waveguide structure is optically switched on by 12-fs pulses. Multi-THz field transients resonantly trace the non-adiabatic formation of a squeezed quantum vacuum of ultrastrongly coupled cavity polaritons.

MON2A.5 • 11:45
Attosecond control of electron localization in one- and two-color dissociative ionization of H2 and D2, • Giuseppe Sansone1, Freek Kellkensberg2, Matthias Kling2, Wing Kiu Siu2, Omair Ghafe1, Per Johnsson1, Sergey Zherebtsov3, Irina Znakovskaya1, Thorsten Uphaues4, Enrico Benedetti1, Federico Ferrari1, Franck Lépine2, Marko Swoboda3, Thomas Remetter2, Anne L’Huillier2, Mauro Nisoli1, and Marc Vrakking2, 1National Laboratory for Ultrafast and Ultraintense Optical Science CNR Istituto Nazionale per la Fisica della Materia, Department of Physics, Politecnico, Piazza Leonardo da Vinci 32,20133, Italy, 2FOM-Institute AMOLF, Kruislaan 407, 1098 SJ Amsterdam, The Netherlands, 3Max-Planck Institut für Quantenoptik, Hans-Kopfermann Strasse 1, D-85748 Garching, Germany, 4Université Lyon 1; CNRS; LASIM, UMR 5579, 43 bvd. du 11 novembre 1918, F-69622 Villeurbanne, France, 5Department of Physics, Lund University, P.O. Box 118, SE-221 00 Lund, Sweden.

We report experiments where an attosecond pulse launches a wavepacket on the dissociative state of D2+, and a few-cycle IR pulse localizes the electron on one ionic fragment with attosecond sensitivity to the XUV-IR delay.

MON2A.6 • 12:00
Simultaneous Description of Electron and Nuclear Dynamics: A Quantum Approach for Multi-Electron Systems, • Philipp von den Hoff, Dorothée Geppert, and Regina de Vivie-Riedle, Department Chemie und Biochemie, LMU München, Butenandtstr. 11, 81377 München, Germany. A new and efficient approach to describe molecular electron and nuclear dynamics simultaneously is presented. The method is tested for the photodissociation of D2 and allows for a successive extension to multi-electron systems.

MON2A.7 • 12:15
Attosecond Photoelectron Spectroscopy of Electron Tunneling in Dissociating Hydrogen Molecular Ion, • Stefanie Gräfe1, Volker Engel2, and Misha Yu. Ivanov1, 1Steacie Institute of Molecular Sciences, National Research Council Canada, 100 Sussex Drive, Ottawa ON K1A 0R6 Canada, 2Institute for Physical Chemistry, Würzburg University, Am Hubland, 97074 Würzburg, Germany.

We demonstrate the potential of intense-field pump-probe (attosecond XUV) photoelectron spectroscopy to monitor coupled nuclear-electronic tunneling dynamics between the two protons during dissociative ionization of the hydrogen molecular ion.
MON2P • Dynamics of Low-Dimensional Systems

Panoramica
10:45–12:30
MON2P • Dynamics of Low-Dimensional Systems
Chair: Michael Wörner, Max-Born-Institute, Berlin, Germany

MON2P.1 • 10:45
Ultrafast Coherent Interactions in Quantum Wells Studied by Two-Dimensional Fourier-Transform Spectroscopy.
Tianhao Zhang, Irina Kucnetsova, Lijun Yang, Alan Bristow, Xingcan Dai, Xiaolin Li, Torsten Meier, Peter Thomas, Shaai Makame, Richard Mirin, and Steven Cundiff.
JILA, University of Colorado & NIST, Boulder, USA; Department of Physics, Philipps University, Marburg, Germany; Department of Chemistry, University of California, Irvine, USA; Department of Physics, University of Texas, Austin, USA; Department Physik, Universität Paderborn, Paderborn, Germany; National Institute of Standards and Technology, Boulder, USA.

Many-body effects dominate the polarization studies of heavy- and light-hole excitons. Accurate simulations require Coulomb correlations beyond Hartree-Fock approximation. Raman and light-hole excitons. Accurate simulations require Coulomb, and while biexcitonic spectral phase information is revealed by this method deconvolves many-body phenomena.

MON2P.2 • 11:00
Two-quantum Two-dimensional Fourier Transform Electronic Spectroscopy of Biexcitons in GaAs Quantum Wells.
Katherine Stone, Kenan Gundogdu, Daniel Turner, Xiaolin Li, Steven Cundiff, and Keith Nelson.
Department of Chemistry, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139, USA; Department of Physics, University of Texas at Austin, Austin, Texas 78712, USA; JILA, University of Colorado and National Institute of Standards and Technology, Boulder, Colorado 80309, USA.

Coherent excitonic interactions in GaAs quantum wells are observed by two-quantum two-dimensional Fourier transform electronic spectroscopy. Biexcitonic spectral phase information revealed by this method deconvolves many-body phenomena described by the Hamiltonian for multiple interacting electrons.

MON2P.3 • 11:15
Three-Pulse Echo Peak Shift Spectroscopy of Disordered Semiconductor Quantum Wells and Dense Atomic Vapors.
Steven Cundiff, Virginia Lorenz, Sam Carter, Zhigang Chen, Shaai Makame, and Wei Zhuang.
JILA, University of Colorado and National Institute of Standards and Technology, Boulder, Colorado, 80309-0440 USA; Department of Chemistry, University of California, Irvine, California, 92697-2025 USA.

Three-pulse echo peak shift spectroscopy yields the correlation function of the frequency fluctuations due to acoustic phonons for excitons in disordered semiconductor quantum wells and fluctuations due to atomic motion in a potassium vapor.

MON2P.4 • 11:30
Teasing a Quasiparticle the Ultrafast Nonlinear Response of the Fröhlich Polaron in GaAs.
Michael Wörner, Wilhelm Kuehnel, Klaus Reimann, Thomas Elsaesser, and Rudolf Hey.
Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie, 12489 Berlin, Germany; Paul-Drude-Institut für Festkörperlektronik, 10117 Berlin, Germany.

Ultrafast acceleration of polarons in a strong THz field results in an oscillatory occurrence of midinfrared gain/absorption with the LO phonon frequency. THz pump midinfrared probe measurements give the first insight into the internal motion of a quasiparticle.

MON2P.5 • 11:45
Coherently controlled ballistic charge currents in unbiased bulk silicon and single-walled carbon nanotubes.
Department of Physics and Institute for Optical Sciences, University of Toronto, ON M5S 1A7, Canada.

Phase-related fundamental and second harmonic femtosecond pulses induce directional charge motion in group IV materials at 300K. THz emission reveals peak current densities of 0.5 kA/cm² in silicon and currents of 1 nA per nanotube.

MON2P.6 • 12:00
Ultrafast dynamics of coherent phonons in the aligned single-walled carbon nanotubes.
Keiko Kato, Kanie Ishitoka, Masahiro Kitajima, Jie Tang, and Hrvoje Petek.
Advanced Nano-Characterization Center, National Institute for Materials Science, Tsukuba, Ibaraki, Japan; Innovative Materials Engineering Laboratory, National Institute for Materials Science, Tsukuba, Ibaraki, Japan; Department of Physics and Astronomy, University of Pittsburgh, Pittsburgh, PA, USA.

Sub-10 fs pulses allow real time observation of coherent phonons in aligned bundles of single-walled carbon nanotubes. While electronic excitation is strongly dependent on the axis of the carbon nanotubes, G-mode coherent phonons is not.

MON2P.7 • 12:15
Evidence for electron correlation in (6,5) carbon nanotubes from pump-probe spectroscopy with broadband pulses.
Larry Luer, Jared Crochet, Tobias Herte, Dario Polli, and Guglielmo Lanzani.
National Laboratory for Ultrafast and Ultraintense Optical Science, INFM-CNR, Dipartimento di Fisica, Politecnico di Milano, Italy; Department of Physics and Astronomy & Vanderbilt Institute of NanoScale Science and Engineering (VINSE), Vanderbilt University, 6301 Stevenson Center Lane, Nashville, TN 37235, USA; CNISM and Dipartimento di Fisica, Politecnico di Milano, P.za L. da Vinci 32, 20133 Milano (Italy).

Pump-probe spectroscopy with 10 fs time resolution is performed on (6,5) carbon nanotubes. We decompose the spectra into contributions from the first and second exciton, demonstrating their electronic correlation.
Two-Dimensional Spectroscopy

**Chair:** Erik Nibbering, Max-Born-Institute, Berlin, Germany

**MON3.1 • 14:00**

*Invited*

Automated 2D IR and Vis spectroscopies using pulse shaping.

**Martin Zanni,** University of Wisconsin-Madison, USA.

We present a method for collecting 2D infrared and visible spectroscopies that uses a pulse shaper and a pump-probe beam geometry. This approach reduces the technical hurdles for implementing these techniques and makes many new experiments possible.

**MON3.2 • 14:30**

Relaxation-Assisted Dual-Frequency Two-Dimensional Infrared Spectroscopy: Measuring Distances and Bond Connectivity.

**Igor Rubtsov,** Sri Ram Naraharisetty, Christopher Keating, and Valeriy Kasyanenko; Tulane University, New Orleans, USA.

Potential of a novel relaxation-assisted 2DIR spectroscopy method is demonstrated on several molecular systems, including model compounds, peptides, and transition metal complexes. Cross-peaks for modes separated by distances greater than 11 Å can be easily detected.

**MON3.3 • 14:45**

Triggered-exchange Two-dimensional Infrared Spectroscopy of Metal Carbonyl Photodissociation Dynamics.

**Carlos R. Baiz,** Matthew J. Nee, Robert McCanne, Jessica M. Anna, and Kevin J. Kabarych; University of Michigan, Ann Arbor, MI, USA.

We present an ultrafast study of the excited state dynamics of metal carbonyls using triggered-exchange Fourier transform 2DIR spectroscopy.

**MON3.4 • 15:00**

Observation of Quantum Coherence in Photosynthetic Complexes by Two-Dimensional Electronic Spectroscopy.

**Tessa Calhoun**¹, Gabriela Schlau-Cohen¹, Naomi Ginsberg¹, Roberto Bassi², and Graham Fleming¹; ¹Department of Chemistry, University of California, Berkeley and Physical Biosciences Division, Lawrence Berkeley National Laboratory, Berkeley, California 94702, USA, ²Dipartimento Scientifico e Tecnologico, Facolta di Scienze, Universita di Verona, Strada Le Grazie, I-37134, Verona, Italy.

Two-dimensional Fourier transform electronic spectroscopy is employed to investigate quantum beating in the major light-harvesting complex II. The importance of this beating, arising from the electronically coherent nature of energy transfer between chromophores, is discussed.

**MON3.5 • 15:15**

Vibrational Beating in Two-Dimensional Electronic Spectra.

**Alexandra Nemeth**¹, Franz Milota¹, Tomas Mancal², Vladimir Lukes³, Harald F. Kauffmann¹, and Jaroslav Sperling¹; ¹Department of Physical Chemistry, University of Vienna, Währingerstraße 42, 1090 Vienna, Austria, ²Institute of Physics, Faculty of Mathematics and Physics, Charles University, Ke Karlovu 5, 12116 Prague, Czech Republic, ³Department of Chemical Physics, Slovak Technical University, Radlinskeho 9, 81237 Bratislava, Slovakia.

We trace vibrational wavepacket motion in two-dimensional electronic spectra of a two-level electronic system. The vibronic evolution induces a periodic beating pattern of the diagonal-to-antidiagonal peak width ratio, similar to the one for electronic coherences.

**MON3.6 • 15:30**

Novel Coherent Multidimensional Spectroscopy Signals Designed to Probe Electron Correlations in Semiconductors and Molecular Aggregates.

**Shaul Mukamel,** Lijun Yang, Zhenyu Li, Rafal Oszwaldowski, and Darius Abramavicius; Chemistry department, University of California Irvine, USA.

Principles for the design of pulse sequences for multidimensional spectroscopy are surveyed. Many-body effects for electrons in molecules and semiconductors, and excitons in molecular complexes, are revealed through correlation-induced signals.
Single-cycle THz radiation was generated by optical rectification of Yb-fiber laser pulses with 250 fs duration and 10 \( \mu \)J energy. We obtained an average power of 0.5 mW at 1 MHz repetition rate.

**MON4A.4 17:15**

Millijoule Pulse Energy High Repetition Rate Femtosecond Fiber CPA System: Results, Micromachining Application and Scaling Potential. 

- **Fabian Röser**, Jan Rothhardt, Tino Eidam, Oliver Schmidt, Damian N. Schimpf, Antonio Ancona, Stefan Nolte, Jens Limpert, and Andreas Tünnemann; Institute of Applied Physics, Friedrich-Schiller-University Jena, Germany.

We report on an ytterbium-doped fiber CPA system delivering millijoule energy 800 fs pulses at high repetition rates and average powers exceeding 100 W. A micromachining application and average power scaling potential are also presented.

**MON4A.5 17:30**

Femtosecond thin disk lasers with >10 \( \mu \)J pulse energy for high field physics at multi-megahertz repetition rates.


- **2 Centre d’optique, photonique et laser, Université Laval, Pav. d’optique-photonique, Québec G1V 0A6, Canada.**

We discuss a modelocked femtosecond thin disk laser generating record-high 11 \( \mu \)J pulse energy. We present photoelectron imaging spectroscopy measurements in argon and xenon at megahertz repetition rate with peak intensities up to \( 6 \cdot 10^{13} \) W/cm\(^2\).

**MON4A.6 17:45**

Ultra-High Intensity-High Contrast 300-TW Laser at 0.1 Hz Repetition Rate.

- **Victor Yanovsky**, Vladimir Chvykov, Galina Kalinchenko, Pascal Rousseau, Thomas Planckon, Takeshi Matsuoka, Anatoly Maksimchuk, John Nees, Gilles Cheriaux, Gerard Mourou, and Karl Krushelnick; 1FOCUS Center and Center for Ultrafast Optical Science, University of Michigan, 2LOA, UMR 7639 ENSTA-CNRS-Ecole Polytechnique, F-91761, Palaiseau Cedex, France.

We demonstrate the highest intensity -300 TW laser by developing booster amplifying stage to the HERCULES-50 TW-Ti:sapphire laser. To out knowledge this is the first Petawatt-scale laser at 0.1 Hz repetition rate.
Panoramica
16:15–18:00

MON4P  ●  Liquid Dynamics

Panoramica

16:15–18:00

MON4P  ●  Liquid Dynamics

Chair: Shaul Mukamel, Department of Chemistry, University of California, Irvine, USA

MON4P.1  ●  16:15

Vibrational energy relaxation in liquid-to-supercritical ammonia studied by femtosecond mid-infrared spectroscopy. Tim Schäfer1, Dirk Schwarzer1, Jörg Lindner2, and Peter Vohringer2; 1Max-Planck-Institut für biophysikalische Chemie, Göttingen, Germany, 2Rheinische Friedrich-Wilhelms-Universität, Bonn, Germany.

Chemistry textbooks often cite ammonia as an associated liquid forming extended hydrogen-bond networks similar to water. We have conducted the first ever fs-MIR-experiments aimed at exploring the vibrational dynamics in this system under liquid-to-supercritical conditions.

MON4P.2  ●  16:30

Probing Intermolecular Couplings in the Two-Dimensional Infrared Photon Echo Spectrum of Liquid Water - Simulation Study. Alexander Paarmann1, Tomoyuki Hayashi2, Shaul Mukamel2, and R. J. Dwayne Miller1; 1Institute for Optical Sciences, Departments of Chemistry and Physics, University of Toronto, 80 St George Street, Toronto, Ontario, M5S3H6 Canada., 2Department of Chemistry, University of California, Irvine, California 92697-2025, USA.

The 2D-IR photon echo spectrum of the OH stretching vibration in liquid water is simulated by direct numerical propagation, explicitly including intermolecular coupling. Intermolecular energy transfer times and the 2D-IR spectrum closely agree with experiment.

MON4P.3  ●  16:45

Heterogeneous Dynamics of Coupled Vibrations. Dan Cringus, Thomas I. C. Jansen, and Maxim S. Pshenichnikov; Zernike Institute for Advanced Materials, University of Groningen, Nijenborgh 4, 9747 AG Groningen, The Netherlands.

Frequency-dependent dynamics of coupled stretch vibrations of a water molecule are revealed by 2D IR correlation spectroscopy. These are caused by non-Gaussian fluctuations of the environment around the individual OH stretch vibrations.

MON4P.4  ●  17:00

Observation of immobilized water in hydrophobic hydration. Huib Bakker; AMOLF, Kruislaan 407, 1098 SJ Amsterdam, The Netherlands.

Using femtosecond mid-infrared spectroscopy we find that water molecules in the hydration shells of hydrophobes show much slower orientational dynamics than pure liquid water. Each methyl group is observed to immobilize four water OH groups.

MON4P.5  ●  17:15

Collective Breakdown of H-Bonding in Ice. Hristo Iglev and Marcus Schmeisser; Physik-Departmen E11, Technische Universität Münchon.

We report on ultrafast bulk melting of ice by an infrared laser pulse. Our experiments show that homogeneous melting occurs only for an energy deposition beyond the superheating limit of 330 K.

MON4P.6  ●  17:30

The Dynamics of Aqueous Hydroxide Ion Transport Probed via Ultrafast Vibrational Echo Experiments. Sean T. Roberts, Poul B. Petersen, Krupa Ramasesha, and Andrei Tokmakoff; Department of Chemistry and George Harrison Spectroscopy Laboratory, Massachusetts Institute of Technology, Cambridge MA 02139.

We use peakshift, transient grating, and 2D IR measurements to probe the dynamics of NaOD solutions. Our experiments suggest that OD- possesses a stable solvation shell and signatures of fast intermolecular proton transfer are observed.

MON4P.7  ●  17:45

Glasslike Behaviour in Aqueous Electrolyte Solutions. David Turton1, Johannes Hunger2, Glenn Hefter3, Richard Buchner2, and Klaus Wynne1; 1Department of Physics, SUPA, University of Strathclyde, Glasgow G4 0NG, UK, 2Institut für Physikalische und Theoretische Chemie, Universität Regensburg, D-93040 Regensburg, Germany, 3Chemistry Department, Murdoch University, Murdoch, WA 6150, Australia.

Ultrafast optical Kerr effect studies and dielectric relaxation spectroscopy applied to the relaxation dynamics of aqueous solutions, resolves the apparent conflicts between viscosity and rotational relaxation, and implies a jamming transition at high concentration.
MONIa • Poster I a - Applications

MONIa • Poster I a - Applications

MONIa.1 • 18:00
Multiphoton Microscopy by Multiexcitonic Ladder
Climbing in Colloidal Quantum Dots, Nir Rubin Ben-Haim
and Dan Oron; Dept. of Physics of Complex Systems,
Weizmann Institute of Science, Rehovot, Israel.

Depth resolved multiphoton microscopy is performed by collecting the fluorescent emission of two-exciton states in colloidal quantum dots. This process involves two consecutive resonant absorption events, thus requiring unprecedented low excitation energy and peak power.

MONIa.2 • 18:00
Real-time wave-packet engineering using a sensitive wave-packet spectrometer and a pulse-shaper, Kazuhiko Misawa and Kengo Horikoshi; Department of Applied Physics, Tokyo University of A&T, Koganei, Japan.

Real-time wave-packet engineering was demonstrated by full capture of the phase-controlled wave-packet motions. Optimal pulses were obtained for selective excitation of either twisting or bending motion in a cyanine dye molecule.

MONIa.3 • 18:00
Lensless Imaging at 70nm Resolution using Tabletop Coherent Soft X-rays, Richard L. Sandberg, Changyong Song, Przemyslaw W. Wachulak, Daisy A. Raymondson, Ariel Paul, Anne E. Sakdinawat, Chan La-O-Vorakiat, William F. Schlotter, Mario C. Marconi, Carmen S. Menoni, Margaret M. Murnane, Jorge J. Rocca, Henry C. Kapteyn, and Janwei Miao; 1Department of Physics and JILA, University of Colorado and NIST, Boulder, Colorado, USA, 2Department of Physics & Astronomy and California NanoSystems Institute, University of California, Los Angeles, California, USA, 3Department of Electrical and Computer Engineering, Colorado State University, Fort Collins, Colorado, USA, 4Center for X-ray Optics at Lawrence Berkeley National Laboratory, Berkeley, California, USA, 5Stanford Synchrotron Radiation Laboratory, SLAC, Menlo Park, California, USA.

We use curvature correction and high-numerical-aperture imaging to demonstrate a soft-x-ray diffraction microscope with 70-90 nm resolution using two tabletop coherent sources. The near-diffraction-limited resolution demonstrated is a first for x-ray diffractive imaging.

MONIa.4 • 18:00
Grating Enhanced Ponderomotive Scattering for Characterization of Femtosecond Electron Pulses, Christoph T. Hebeisen, German Sciaini, Maher Harb, Ralph Ernstorfer, Thibault Dartigalongue, Sergei G. Kruglik, and R. J. Dwayne Miller; Institute for Optical Sciences and Departments of Chemistry and Physics, University of Toronto, 80 St. George St., Toronto, ON, M5S 3H6 Canada.

We demonstrate a method for measuring the duration of femtosecond electron pulses capable of 10 fs accuracy, using the ponderomotive force of the intensity grating produced by counterpropagating laser pulses in the microjoule energy range.

MONIa.5 • 18:00
CARS microspectrometer with a suppressed nonresonant background, Ruben Zadoyan, Michael Karavitis, Tommaso Baldacchini, and John Carter; Technology and Applications Center, Newport Corp. 1791 Deere ave. Irvine, CA 92606.

We describe a multiplex CARS microspectrometer utilizing a photonic crystal fiber. Enhanced contrast is achieved by subtracting the nonresonant signal in real time. The approach is demonstrated on the images of polystyrene beads.
MONIc • Poster I c - Generation and Measurement

Poster Area
18:00–20:00
MONIc • Poster I c - Generation and Measurement

MONIc.1 • 18:00
Sub-10-fs XUV Tunable Pulses at the Output of a Time-Delay-Compensated Monomochromator. Luca Poletto1, Paolo Villoresi2, Enrico Benetti2, Federico Ferrari3, Salvatore Stagira2, Giuseppe Sansone1, and Mauro Nisoli2; 1CNR-INFM, Università di Padova, Padova, Italy, 2CNR-INFM, Dipartimento di Fisica, Politecnico di Milano, Milano, Italy. Extreme-ultraviolet pulses, produced by high-order-harmonic generation, have been spectrally selected by a time-delay-compensated monochromator. Temporal characterization has been obtained using cross-correlation method: pulses as short as 8 fs, with high photon flux, have been measured.

MONIc.2 • 18:00
Highly Efficient, Low Cost, Diode-Pumped Femtosecond Cr:LiCAF Lasers. Umit Demirbas1, Alphan Sennaroglu1,2, Franz X. Kärner1, and James G. Fujimoto1; 1Department of Electrical Engineering and Computer Science and Research Laboratory of Electronics, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge, MA 02139, USA, 2Laser Research Laboratory, Department of Physics, Koç University, Rumelifeneri, Sariyer, 34450 Istanbul, Turkey. Low cost, single-mode diode pumping of Cr+:LiCAF generates 72-fs pulses with 178 mW power, at a record 54% slope efficiency. Single-mode and multi-mode diode pumped Cr3+:LiCAF are compared as an alternative to femtosecond Ti:Sapphire technology.

MONIc.3 • 18:00
Complete Characterization of High Harmonic Pulses by Photoelectron Spectral Laundering Interferometry. Taro Sekikawa, Eisuke Haraguchi, Tatsuya Okamoto, Takashi Tanigawa, and Mikio Yamashita; Department of Applied Physics, Hokkaido University and JST-CREST, Kita13 Nishi 8, Kita-ku, Sapporo 060-8628, Japan. The complete characterization of the19th harmonic of Ti:sapphire laser was demonstrated using the photoelectron spectral Laundering interferometry for the first time. The frequency chip of a harmonic pulse was sensitively detected by this method.

MONIc.4 • 18:00
Environmentally stable 200-fs Yb-doped fiber laser with dispersion compensation by photonic crystal fiber. Samuli Kivistö1, Robert Henra1, Aleksey Kosolapov2, Andrei Levchenko3, Sergei Semjonov2, Evgenii Dianov2, and Oleg Okhotnikov1; 1Optoelectronics Research Centre, Tampere University of Technology, FIN-33101 Tampere, Finland, 2Fiber Optics Research Centre, Moscow, 119333, Russia. We report environmentally stable mode-locked Yb-doped fiber laser with dispersion compensation by index-guided solid-core photonic crystal fiber. The photonic crystal fiber and Faraday rotator in the cavity allow for robust 200-fs operation at 1 um.

MONIc.5 • 18:00
Measurement of Electron Pulse Duration by Attosecond

Streaking. Peter Reckenhaevel1, Martin Centurion1, Vladislav S. Yakovlev2, Matthias Lezis1, Ferenc Krausz1,2, and Ernst E. Fill1; 1Max-Planck-Institut für Quantenoptik, Hans-Kopfermann-Straße 1, D-85748 Garching, Germany, 2Department for Physik der Ludwig-Maximilians-Universität München, Am Coulombwall 1, D-85748 Garching, Germany. Abstract: We propose a new method to measure the duration of ultrashort electron pulses using the principle of laser assisted Auger-decay.

MONIc.6 • 18:00
Quantum Path Interference in the Wavelength Dependence of High-Harmonic Generation. Kenichi Ishikawa1,2, Klaus Schiessl1, Emil Persson1, and Joachim Burgdörfer2; 1University of Tokyo, Tokyo, Japan, 2PRESTO-JST, Kawaguchi, Japan, 3Vienna University of Technology. We investigate the fundamental-wavelength dependence of high-harmonic generation yield. Superimposed on a smooth power-law dependence, we find surprisingly strong and rapid fluctuations on a fine wavelength scale, due to quantum-path interferences.

MONIc.7 • 18:00
Picosecond Time-Resolved Vibrational Circular Dichroism Spectroscopy. Mathias Bonnemain and Jan Helbing; Physikalisch-Chemisches Institut, Universität Zürich, Winterthurerstrasse 190, CH-8057 Zürich, Switzerland. We report for the first time transient vibrational circular dichroism measurements. An open shell transition metal complex was used as a test molecule for this proof of principle experiment.

MONIc.8 • 18:00
Adapting AOPDF operation for single-molecule experiments. Daan Brinks1, Fernando D. Stefani1, and Niek F. van Hulst1,2; 1ICFO - Inst. of Photonic Sciences, Castelldefels (Barcelona), Spain, 2ICREA - Inst. Catalana de Recerca i Estudis Avancats, Barcelona, Spain. We propose a configuration for phase control of single molecules that employs an acousto-optic programmable dispersive filter (AOPDF). We use bunched pulses and apply the AOPDF in a double pass configuration to overcome challenges of repetition rate and spatial uniformity.

MONIc.9 • 18:00
Designer Femtosecond Pulse Shaping Using Grating-Engineered Quasi-PhaseMatching in Lithium Niobate. Łukasz Kornaszewski1, Markus Kohler1, Usman Sapavin2, and Derryck Reid1; 1Ultrafast Optics Group, School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, EH14 4AS, UK, 2Laser-Matter Interaction Laboratory, NPO Akadempirobor, Academy of Sciences of Uzbekistan, Tashkent 700125, Uzbekistan. Tailored femtosecond pulses with fully engineered intensity and phase profiles are demonstrated using second-harmonic generation of an Er:fiber laser in an aperiodically-poled lithium niobate crystal. The profiles created include square, stepped, double and triple pulses.

MONIc.10 • 18:00
Direct Measurement of Spectral Phase for Ultrashort Laser Pulses Based on Intrapulse Interference. Bingwei Xu, Vadim Lozovoy, Yves Coello, and Marcos Danutis; Michigan State
We present a method for the direct spectral phase measurement of ultrafast laser pulses. The second-derivative of the unknown spectral phase is revealed by the experimental 2D-contour plot and can be measured without mathematical manipulation.

MONIc.11 • 18:00
Generation of Polarization-shaped Ultraviolet Femtosecond Pulses, Reimer Selle\textsuperscript{1}, Patrick Nuernberger\textsuperscript{1,2}, Florian Langhofer\textsuperscript{1,2}, Frank Dimler\textsuperscript{1,2}, Susanne Fechner\textsuperscript{1}, Gustav Gerber\textsuperscript{1}, and Tobias Brixner\textsuperscript{1,2}; \textsuperscript{1}Physikalisches Institut, Universität Würzburg, Am Hubland, 97074 Würzburg, Germany, \textsuperscript{2}Institut für Physikalische Chemie, Universität Würzburg, Am Hubland, 97074 Würzburg, Germany.

We demonstrate the generation and characterization of polarization-shaped femtosecond laser pulses in the ultraviolet. Polarization-shaped near-infrared pulses are frequency-converted in an interferometrically stable setup comprising two perpendicularly oriented nonlinear crystals.

MONIc.12 • 18:00
All-Optical Quasi-Phase Matching and Electron Trajectory Control of High-Order Harmonic Generation at 140 eV, Amy Lytle, Xiaoshi Zhang, Paul Arpin, Oren Cohen, Margaret Murnane, and Henry Kapteyn; JILA, University of Colorado at Boulder, Boulder, Colorado 80303 USA.

We extend all-optical quasi-phase matching of high harmonic generation to 140-150 eV, where conventional phase matching is not possible. We also demonstrate enhancement of a single electron quantum trajectory.
Clocking the Collapse of a Mott Gap

Simon Wall

Ehrke1, Arzang Ardavan1, Andrea Cavalleri1, *Daniele Brida2, Stefano Bonora2, Giulio Cerullo2, H. Matsuzaki3, Hiroshi Okamoto3, Y. Takahashi4, and T. Hasegawa4, *Clarendon Laboratory, University of Oxford, Oxford, UK, 2 Dipartimento di Fisica, Politecnico di Milano, Italy, 3 Department of Physics, University of Tokyo, Japan, 4 Correlated Electron Research Center, Tsukuba, Japan.

Impulsive photo-doping is used to initiate the collapse of a correlation gap in the Mott insulator ET-F2TCNQ. This electronic phase transition occurs within 19 fs, driven by carrier de-localization over approximately two unit cells.

MONId.6 • 18:00

Transient Dielectric Function of Fs-Laser Excited Bismuth.

Andrei Rodé1, Davide Boschetto2, Thomas Gur1, and Antoine Rousse2, 1 Laser Physics Centre, The Australian National University, Canberra, ACT 0200, Australia, 2 Laboratoire of Applied Optics, ENSTA/Ecole Polytechnique, Chemin de la haniere, Palaiseau, France.

Time-resolved study of dielectric function of femtosecond laser excited bismuth demonstrates that excitation of coherent phonons leads to a solid-plasma phase transition, and into a quasi-stable excited state, which lasts up to 4 ns.

MONId.7 • 18:00

Comparison of parallel and perpendicular polarized counterpropagating light for quasi-phase-matching high harmonic generation. *Tom Robinson1, Kevin O’Keeffe1, Matt Landreman2, Brendan Dromey3, Matt Zepf3, and Simon Hooker1, 1 Department of Physics, Clarendon Laboratory, Oxford University, Parks Road, Oxford, OX1 3PU, United Kingdom, 2 Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139, USA, 3 Department of Physics and Astronomy, Queen University Belfast, BT7 1NN, United Kingdom.

The effect of the polarization of counter-propagating pulses on suppression of high harmonic generation is investigated. The results agree well with simple models of harmonic suppression and have application to quasi-phase-matching of harmonics.
polarization. Results indicate that coherent A1g phonons couple to photoexcited electrons much more strongly than Eg phonons.

**MONId.10 • 18:00**

Transient waveguiding in a rotationally excited molecular gas, •Francesca Calegari, Caterina Vozi, Sergei Gasilov, Enrico Benedetti, Giuseppe Sansone, Mauro Nisoli, Sandro De Silvestri, and Salvatore Stagira; Cnr-Infn Ultras, Dipartimento di Fisica, Politecnico di Milano, Milano, I-20133, Italy.

Transient waveguiding and spectral broadening of a delayed probe pulse were observed in the wake of a laser filament in Nitrogen and Oxygen. The observed effects are ascribed to the excitation of rotational wavepackets.

**MONId.11 • 18:00**

Time resolved structure evolution in protein coated gold nanoparticles probed by pulsed x-ray scattering, •Anton Plech1, Hyotcherl Ihee2, Marco Cammarata3, Andreas Siems1, Vassilios Kotaidis1, Flavio Ciesla1, Jangbok Kim2, Kyung Hwan Kim2, and Jae Hyuk Lee2; 1Center for Applied Photonics, University of Konstanz, Konstanzstr. 10, D-78457 Konstanz, 2ESRF, BP 220, 6, rue J. Horovitz, F-38043 Grenoble, 3National Creative Research Initiative Center for Time-Resolved Diffraction, Department of Chemistry and School of Molecular Science (BK21), Korea Advanced Institute of Science and Technology (KAIST), Daejeon, 305-701, Republic of Korea.

Laser-excited gold nanoparticles in aqueous suspension as nanoscale heat sources act on a short time on the surrounding. By employing pulsed x-ray scattering the structural reaction of an absorbed protein layer is temporally resolved.

**MONId.12 • 18:00**

Chirped-pulse Raman amplification for two-color high-intensity, Peng Dong, Franklin Grigsby, and Mike Downer; FOCUS Center, University of Texas at Austin, Department of Physics, Austin, TX 78712, USA.

The poster has been rescheduled to THU11c.12.

**MONId.13 • 18:00**

Generation of Ultrashort Optical Pulses Using Multiple Coherent Anti-Stokes Raman Scattering Signals in a Crystal and Observation of the Raman Phase, •Eiichi Matsubarja1,2, Taro Sekikawa1,2, and Mikio Yamashita1,2; 1Department of Applied Physics, Hokkaido University, Kita-13, Nishi-8, Kita-ku, Sapporo, 060-8628, Japan, 2Core Research for Evolutional Science and Technology, Japan Science and Technology Agency, Japan.

We have measured and controlled the spectral phase of multiple coherent anti-Stokes Raman-scattering signals in LiNbO3. Isolated pulses with 25-fs duration (640-780 nm) are generated and discrete phase shifts due to Raman coherence are observed.

**MONId.14 • 18:00**

All dispersive mixers compressor for femtosecond lasers, •Vladimir Pervak1, Catherine Teisser2, Atsushi Sugita2, Ferenc Krausz2, and Alexander Apolonski1; 1Ludwig Maximilian University, Munich, Germany, 2Max-Planck-Institute of Quantum Optics.

We report on the development of highly dispersive mixers for chirped-pulse amplifiers (CPA). The designed mixers are potentially capable of replacing the prisms in the existing CPA compressors making them more compact and stable.
In present experiments gradual change from the frequency comb excitation to pulse by pulse excitation of Rb atoms is observed. Shown results could lead to the development of a new method for system coherence monitoring.

MONId.20 • 18:00
Magnon-enhanced phonon damping at Gd(0001) and Tb(0001) surfaces, Alexey Melnikov1, Alexey Povolotskiy2, and Uwe Bovensiepen1; 1Freie Universität Berlin, Department of Physics, Arnimallee 14, 14195 Berlin-Dahlem, Germany, 2St. Petersburg State University, Laser Research Institute, St. Petersburg, 19850, Russia.

Phonon damping is investigated by time-resolved second harmonic generation at lanthanide surfaces. Near the Curie temperature we encounter an anomaly originating from phonon-magnon scattering evidenced by a more pronounced effect for Tb compared to Gd.

MONId.21 • 18:00
Coherent Orbital Excitations in Photo-excited Manganites, Simon Wall1, Dario Polli2, Giulio Cerullo2, Dharmalingam Prabhakaran1, Andrew Boothroyd1, Yoshihori Tokura1, Yasuhide Tomioka2, and Andrea Cavalleri1; 1Department of Physics, University of Oxford, Clarendon Laboratory, Parks Road, Oxford, OX1 3JP, UK, 2Dipartimento di Fisica, Politecnico di Milano, P.za L. da Vinci 32, 20133 Milano, Italy.

10-fs resolution pump-probe experiments are used to observe high-frequency coherent orbital excitations in the room temperature phase of 2D and 3D Colossal Magneto-Resistive manganites.

MONId.22 • 18:00
Exciton Dephasing in Semiconducting Single-Walled Carbon Nanotubes, Ying-Zhong Ma1, Matthew W. Graham1, Alexander A. Green2, Samuel I. Stupp3, Mark C. Hersam3, and Graham R. Fleming1; 1Department of Chemistry, University of California, Berkeley, and Physical Biosciences Division, Lawrence Berkeley National Laboratory, Berkeley, California 94720-1460, USA, 2Department of Materials Science and Engineering, Northwestern University, Evanston, Illinois 60208-3108, USA.

Two-pulse four-wave mixing experiments at various excitation intensities and temperatures enable the contributions of exciton-exciton and exciton-phonon scattering to exciton dephasing to be separated. We identify the dominant phonon mode, and estimate the homogeneous linewidth.

MONId.23 • 18:00
Mode selective Excitation of Coherent Phonons in Bismuth by Femtosecond Pulse Pair, Kazutaka Nakamura1, Hiroshi Takahashi1, Kunie Ishioka2, Masahiro Kitajima2, Jean-Christophe Delaglès3, Hiroyuki Kasukiti1, Kouichi Hosaka4, Hisashi Chiba5, Renji Ohmori6, Kazuya Watanabe7, and Yoshiyasu Matsumoto8; 1Tokyo Institute of Technology, Yokohama, Japan, 2National Institute for Materials Science, Tsukuba, Japan, 3Institute of Molecular Science, Okazaki, Japan, 4University of Kyoto, Kyoto, Japan.

Coherent phonons (A1g and Eg modes) of bismuth are excited by irradiation of two femtosecond pulses. Amplitude and phase are controlled by change of intervals in a time range of vibrational period and/or optical cycle.

MONId.24 • 18:00
Probing Anomalous Spectral Diffusion and Exciton Fluctuations by Coherent Multidimensional Spectroscopy, Frantisek Sanda1 and Shaad Mkaemel2; 1Charles University, Faculty of Mathematics and Physics, Ke Karlovu 5, 121 16 Praha, Czech Republic, 2University of California, Department of Chemistry, Irvine, CA, USA.

Novel signatures of anomalous algebraic spectral relaxation, non Gaussian fluctuations and bath-induced transition dipole moments in two dimensional optical lineshapes of excitonic aggregates are predicted using stochastic models with long algebraical relaxation tails.

MONId.25 • 18:00
Efficient and Highly Coherent Extreme-Ultraviolet High-Harmonic Source, Sven Teichmann1, Bo Chen2, Jeffrey Davis1, Lap Van Dao1, and Peter Hannaford3; 1ARC Centre of Excellence for Coherent X-Ray Science and Centre for Atom Optics and Ultrafast Spectroscopy, Swinburne University of Technology, Hawthorn, Victoria 3122, Australia, 2ARC Centre of Excellence for Coherent X-Ray Science and School of Physics, The University of Melbourne, Parkville, Victoria 3052, Australia.

We report on a femtosecond-laser-based high-harmonic generation argon-cell source that efficiently delivers two to seven highly coherent and Gaussian-beam-like harmonics in a tunable band from 26 to 43 nm.

MONId.26 • 18:00
Electronically Driven Structural Dynamics of Si Resolved by Femtosecond Electron Diffraction, Maher Harb1, Weina Peng2, Germán Scaini1, Christoph Hebeisen1, Ralph Ernstorfer1, Thiabult Dartigalongue1, Mark Eriksson2, Max Lagally2, Sergei Kruglik1, and Dwayne Miller1; 1Institute for Optical Sciences and Departments of Physics and Chemistry, University of Toronto, 80 St. George Street, Toronto, Ontario M5S 3H6, Canada, 2University of Wisconsin-Madison, Madison, Wisconsin 53706, US.

Femtosecond electron diffraction studies of (001)-oriented crystalline Si found that at low excitation, longitudinal and transverse [001] acoustic phonon modes were thermally excited. At 11% valence excitation, the lattice collapsed non-thermally in <500 fs.

MONId.27 • 18:00
Molecular Recollision Interferometry in High Harmonic Generation, Xibin Zhou, Robynne Lock, Nick Wagner, Wen Li, Henry Kapteyn, and Margaret Murnane; JILA and Department of Physics, University of Colorado, Boulder CO 80309-0440, USA.

Using extreme-ultraviolet interferometry, we directly observe π phase shifts in high harmonics generated from transiently aligned molecules. This data directly reflects the quantum interferences in the electron wave packet due to the two-center molecular structure.
MONIe • Poster 1 e - Chemical Physics

Poster Area
18:00–20:00
MONIe • Poster 1 e - Chemical Physics

MONIe.1 • 18:00
Non-Condon vibronic coupling of coherent molecular vibration in MEH-PPV induced by a visible few-cycle pulse laser, Takayoshi Kobayashi1,2, Jun Zhang1, and Zhuan Wang1;
1Department of Applied Physics and Chemistry and Institute for Laser Science, The University of Electro-Communications, Chofu, Tokyo, 182-8585, Japan, 2Department of Electrophysics, National Chiao Tung University, 1001 Hsin-Chu 30055,Taiwan. The dependence of coherent vibrational amplitudes at 128 wavelengths in MEH-PPV (EL polymer) with 1-fs resolution gave the evidence of non-Condon effect due to 11Bu-exciton strongly coupled with m-1Ag state essential in the third-order nonlinearity.

MONIe.2 • 18:00
Discriminating Nearly Identical Biomolecules with Optimal Control, Véronique Boutou1, Matthias Roth2, Laurent Guyon1, Jon Rosland2, François Courvoisier1, Luigi Bonacina3, Ariana Rondi3, Jerome Extermann3, Herschel Rabitz2, and Jean-Pierre Wolf1,3; 1Université Lyon 1, LASIM, UMR CNRS 5579, 43 bd da 11 November 1918, F69622 Villeurbanne Cedex, France, 2Department of Chemistry, Princeton University, Princeton, NJ 08544, USA, 3GAP, University of Geneva, 20 rue de l’Ecole de Medecine, CH 1211 Geneva 4, Switzerland. We demonstrate that discriminating between the optical emission of nearly identical flavins in solution is possible by shaping the UV part of a complex multipulse control field, consistent with the concept of optimal dynamic discrimination.

MONIe.3 • 18:00
Specific Channel of Energy Dissipation in Carotenoids: Coherent Spectroscopic Study, Masazumi Fujiwara1, Kensei Yamauchi1, Mitsuru Sugisaki1, Andrew Gall2, Bruno Robert2, Cogdell Richard3, and Hideki Hashimoto1; 1CREST-JST and Department of Physics, Graduate School of Science, Osaka City University, 3-3-138 Sugimoto, Sumiyoshi-ku, Osaka 558-8585, Japan, 2Commissariat a l’Energie Atomique (CEA), Institut de Biologie et Technologies de Saclay (iBiTecS) and Centre National de la Recherche Scientifique (CNRS), Gif-sur-Yvette, F-91191, France, 3Institute of Biomedical & Life Sciences, Glasgow Biomedical Research Centre, University of Glasgow, Glasgow G12 8QQ, Scotland, UK. We investigated transient grating signals in β-carotene homologues which were measured using sub-20-fs optical pulses. The results clearly show that the central C=C stretching mode is the major channel of energy dissipation to the environment.

MONIe.4 • 18:00
Ultrafast dynamics of light-harvesting function of β-carotene in carbon nanotubes, Masayuki Yoshizawa1,2, Kenta Abe3, Daisuke Kosumi1, Kazuhiro Yanagi3, Yasumitsu Miyata1, and Yutaka Kataura2,3; 1Department of Physics, Graduate School of Science, Tohoku University, Sendai 980-8578, Japan, 2JST, CREST, Kawaguchi, Saitama, 332-0012, Japan, 3Nanotechnology Institute, National Institute of Advanced Industrial Science and Technology, Tsukuba, 305-8562, Japan. Ultrafast dynamics of β-carotene encapsulated in single-walled carbon nanotubes (SWCNTs) was investigated by femtosecond absorption spectroscopy. Energy transfer from the excited states of β-carotene to SWCNTs (light-harvesting function) has been observed.

MONIe.5 • 18:00
Dissociative Ionization Dynamics of Ethanol Molecule with High Intensity Femtosecond Pump-Probe Excitation, Hiroki Yazawa1, Hiroshi Hashimoto1, Kannari Fumihiko1, Ikakura Ryuji2, and Yamanouchi Kuoru2; 1Department of Electronics and Electrical Engineering, Keio University, 2Department of Chemistry, School of Science, The University of Tokyo, 113-0033, Japan. Using various types of intense femtosecond pump-probe excitation, the vibrational wavepacket dynamics and the deformation of laser-induced potential energy surface relevant to C-C bond and C-O bond breaking reaction of ethanol molecules was experimentally studied.
Mid-IR-Induced Nuclear Wavepacket Motion of a Hydrogen Bonding System: Effects of Mechanical and Electrical Anharmonic Couplings. •Kunihiko Ishii, Satoshi Takeuchi, and Tahei Tahara; Molecular Spectroscopy Laboratory, RIKEN, 2-1 Hirosawa, Wako, Saitama 351-0198, Japan.

Coherent hydrogen-bond stretching vibration was observed by probing ultrafast visible absorption change after mid-infrared excitation of a hydrogen-bonded chromophore. The underlying mechanism was discussed on a theoretical basis considering mechanical and electrical anharmonicities.

Ultrafast Photodecomposition of Dibenzoyl Peroxide studied by Time-Resolved Infrared Spectroscopy. •Christian Reichardt1, Tim Schäfer1, Jörg Schroeder2, Peter Vöhringer3, and •Dirk Schwarzer1; 1Max-Planck-Institut für biophysikalische Chemie, Göttingen, Germany, 2Institut für Physikalische Chemie, Georg-August-Universität Göttingen, Göttingen, Germany, 3Institut für Physikal. & Theoret. Chemie, Universität Bonn, Germany.

The photodissociation of dibenzoyl peroxide is controlled by its S1-lifetime and in 0.4 ps leads to a benzoxyloxy/phenyl radical pair plus CO2 via concerted bond breakage of the O-O and the phenyl-C(carbonyl) bond.

Real-Time Monitoring of Structural Evolution in Cis-Stilbene Photoisomerization by Ultrafast Time-Domain Raman Spectroscopy. •Satoshi Takeuchi1, Sanford Ruhman2, Takao Tsuneda3, Mahito Chiba4, Tetsuya Taketsugu5, and Tahei Tahara2; 1Molecular Spectroscopy Laboratory, RIKEN, Wako 351-0198, Japan, 2Department of Physical Chemistry, Hebrew University, Jerusalem 91904, Israel, 3School of Engineering, The University of Tokyo, Tokyo 113-8656, Japan, 4National Institute of Advanced Industrial Science and Technology, Tsukuba 305-6568, Japan, 5Graduate School of Science, Hokkaido University, Sapporo 060-0810, Japan.

We studied the vibrational structure of reactive S1 cis-stilbene through wavepacket motions generated impulsively at various delay-times. They showed gradual frequency downshift, demonstrating highly anharmonic nature of the excited-state potential and structural evolution with photoisomerization.

Direct Femtosecond Observation of Tight and Loose Ion Pairs upon Photoinduced Bimolecular Electron Transfer. •Omar F. Mohammed1, Katrin Adamczyk2, Natalie Banerji1, Jens Dreyer1, Bernhard Lang3, •Erik T. J. Nibbering2, and Eric Vauthery1; 1Department of Physical Chemistry, University of Geneva, 30 Quai Ernest-Ansermet, CH-1211 Geneva 4, Switzerland, 2Max Born Institut für Nichtlineare Optik und Kurzzeitspektroskopie, Max-Born-Strasse 2 A, D-12489 Berlin, Germany.

We observe tight and loose ion pairs in bimolecular electron transfer with ultrafast infrared spectroscopy. For large exergonicity tight donor-acceptor pairs do not rearrange into loose complexes before the reaction proceeds, contrasting generally accepted models.

Orientalional dynamics of OH- in liquid water. •Søren Rud Keiding, Svend Knak Jensen, Christian Petersen, and Jan Thøgersen; Department of Chemistry, University of Aarhus, Denmark.

Using transient absorption spectroscopy we have studied the rotational anisotropy of the charge transfer to solvent transition in OH- in liquid water. Measurements are performed in a thin liquid jet as function of temperature.

Pathways of vibrational relaxation after N-H stretching excitation in intermolecular hydrogen bonds. •Valeri Kozich, Jens Dreyer, and Wolfgang Werncke; Max-Born-Institut, Max-Born-Strasse 2A, D-12489 Berlin, Germany.

Pathways of vibrational relaxation of azaindole dimers after NH stretching excitation have been studied by picosecond infrared-pump/anti-Stokes resonance Raman-probe spectroscopy. Our measurements indicate relaxation via a manifold of vibrations with N-H bending character.

Ultrafast Charge Migration Following Ionization in Oligopeptides. •Alexander I. Kuleff, Siegfried Lümmenn, and Lorenz S. Cederbaum; Theoretische Chemie, PCI, Universität Heidelberg, Im Neuenheimer Feld 229, 69120 Heidelberg, Germany.

Electron correlation can be the driving force for ultrafast charge migration. Using ab initio calculations we demonstrate that the positive charge created by ionization of an oligopeptide can migrate throughout the system within just few femtoseconds.

Origin of Negative and Dispersive Anti-Stokes Features in Femtosecond Stimulated Raman Spectroscopy. •Renee Frontiera, Sangseok Shim, and Richard Mathies; Department of Chemistry, University of California, Berkeley, California 94720.

Negative anti-Stokes femtosecond stimulated Raman features seen off-resonance and dynamic dispersive lineshapes seen on resonance are experimentally characterized and explained by multiple four-wave mixing processes that contribute to the total signal.

Reactive Dynamics in Constrained Environments. •Minako Kondo, Ismael Heisler, and Stephen Meech; University of East Anglia, Norwich, UK.

Ultrafast excited state reactions of Auramine are studied in inverse micelles with water droplets between 1 and 10nm. Dynamics, inhomogeneous and a function of droplet size, are discussed in terms of interfacial and confinement effects.

Symmetry Dependent Solution of Donor-Substituted Triarylboranes. •Uwe Megerle1, Christoph Lambert2, Eberhard Riedle1, and Stefan Lochbrunner3; 1LS für BioMolekulare Optik, LMU München, Oettingenstr. 67, D-80538 Munich, Germany, 3Institut für Organische Chemie, Universität Würzburg, Am Hubland, D-97074 Würzburg, Germany, 2Institut für Physik, Universität Rostock.
Femtosecond transient absorption reveals an accelerated solvation for a highly symmetric donor-substituted triarylborane compared to its less symmetric counterpart. We explain this by ultrafast intramolecular charge delocalization over the subchromophores of the symmetric compound.

**MONIf.11 • 18:00**


Thorben Cordes¹, Torsten Schadendorf², Markus Lipp¹, Karola Rück-Braun², and Wolfgang Zinth¹; ¹LS für BioMolekulare Optik, LMU München, Oettingenstraße 67, D-80538 München, Germany, ²TU-Berlin, Institut für Chemie, Straße des 17. Juni 135, D-10623 Berlin, Germany.

The kinetics of the Z to E photoisomerization of Hemithioindigo with variations of substitution and temperature are investigated using transient absorption spectroscopy. Effective tuning of energy barriers in the excited electronic state can be achieved by chemical substitution.

**MONIf.12 • 18:00**

Coherent Control of Retinal Isomerization in Bacteriorhodopsin in the High Intensity Regime.

Andrei C. Floorean¹, David Cardoza², James L. White², Janos K. Lanyi³, Roseanne J. Sension¹, and Philip H. Bucksbaum²; ¹Department of Physics, University of Michigan, Ann Arbor, MI 48109, USA, ²Department of Physics, Stanford University, Stanford, CA 94305, USA, ³School of Medicine, University of California, Irvine, CA 92697, USA, ⁴PULSE Center, SLAC, Menlo Park, CA 94025, USA.

This paper has been moved to TUE2A.2.

**MONIf.13 • 18:00**

Attosecond electron dynamics in the conduction band of organic electronic materials.

Hiromi Ikeura-Sekiguchi¹ and Tetsuhiro Sekiguchi²; ¹National Institute of Advanced Industrial Science and Technology (AIST), Central 2-5, 1-1-1 Umezono, Tsukuba, Ibaraki 305-8568, Japan, ²Japan Atomic Energy Agency (JAEA), Tokai, Naka, Ibaraki 319-1195, Japan.

Attosecond electron-delocalization time can be probed by core-hole-clock method. The method has been applied to probe electron delocalization through the empty conduction band or electron tunnelling into the continuum for organic electronic materials.
MONIg.4 • 18:00
Two-Dimensional Electronic Spectroscopy of the Low-Light Adapted Light Harvesting Complex 4. •Elizabeth L. Read1,2, Gabriela S. Schlau-Cohen1,2, Gregory S. Engel3, Toni Georgiou4, Miroslav Z. Papiz4, and Graham R. Fleming1,2; 1Department of Chemistry, University of California, Berkeley, CA 94720, USA, 2Physical Biosciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA 94720, USA, 3Current Address: Department of Chemistry, The University of Chicago, Chicago, IL, 60637, USA, 4Department of Synchrotron Radiation, STFC Daresbury Laboratory, Warrington, Cheshire WA4 4AD, United Kingdom.
Two-dimensional electronic spectroscopy of Light Harvesting Complex 4 from photosynthetic bacteria reveals excited state dynamics on two different timescales and the presence of weakly absorbing states that mediate energy transfer to other complexes.

MONIg.5 • 18:00
Three-pulse photon echo spectroscopy as a probe of flexibility and conformational heterogeneity in protein folding. •Emily A. Gibson and Ralph Jimenez; JILA and Department of Chemistry & Biochemistry, University of Colorado, Boulder USA.
Abstract: We investigate the equilibrium unfolding of Zn-cytochrome c by three-pulse photon echo peak shift (3PEPS) spectroscopy, revealing denaturant-dependent timescales of protein motion and inhomogenous broadening. Results are consistent with a two-state model.

MONIg.6 • 18:00
Ultrafast rebinding of CO to carboxymethyl cytochrome c probed by femtosecond vibrational spectroscopy. •Jooyoung Kim, Jaeheung Park, Taegon Lee, and Manho Lim; Department of Chemistry and Chemistry institute for Functional Materials, Pusan National University, Busan, 609-735 Korea.
The relationships between protein dynamics, structure and function is elucidated by comparing femtosecond vibrational spectra of CO photolyzed from carboxymethyl cytochrome c in aqueous solution with those from ligand binding heme proteins.
TUE1 • High Harmonics as Structural Probes

Auditorium
8:30–10:15

TUE1 • High Harmonics as Structural Probes
Chair: Stephen Leone, University of California and Lawrence Berkeley National Laboratory, USA

TUE1.1 • 8:30
Invited
Ultrafast Molecular and Materials Dynamics probed by Coherent X-Rays.
Margaret Murnane and Henry Kapteyn; JILA, University of Colorado, Boulder, CO, USA.
Ultrafast short-wavelength light is ideal as a probe of complex, highly-excited systems. We observe for the first time the decay of core-excited atoms adsorbed onto a surface, and core-excited molecular dissociation.

TUE1.2 • 9:00
Large Amplitude Modulation of High-Order Harmonic Generation from Vibrationally Excited Molecules.
Wen Li1, Xibin Zhou1, Robynne Lock1, Henry Kapteyn1, Margaret Murnane1, Serguei Patchkovskii2, and Albert Stolow2; 1JILA and Department of Physics, University of Colorado, Boulder, CO, 80309, 2Steacie Institute of Molecular Sciences, National Research Council of Canada, Ottawa, ON Canada.
We observe large vibrationally-induced modulations in high harmonic conversion in N2O4. We explain this result as due to different electronic states of cations, leading to preferential emission at the outer turning point of the vibration.

TUE1.3 • 9:15
HOMO-1 Contribution in High Harmonic Generation.
Markus Guehr, Brian K. McFarland, Joseph P. Farrell, and Philip H. Bucksbaum; Stanford PULSE Center, Physics Department, Stanford University CA 94305 and SLAC CA 94025, USA.
We observe the contribution of the HOMO-1 orbital in high harmonic generation on N2 and discuss the harmonic modulation in the rotational revivals.

TUE1.4 • 9:30

TUE1.5 • 9:45
High-order harmonic generation in high intensity laser-solid interactions.
Cedric Thaury1, Fabien Quere1, Herve George1, Jean-Paul Geindre2, Pascal Monot1, and Philippe Martin1; 1Service des Photons, Atomes et Molécules, Commissariat à l’Energie Atomique, DSM/DRECAM, CEN Saclay, 91191 Gif-sur-Yvette, France, 2Laboratoire pour l’Utilisation des Lasers Intenses, CNRS, Ecole Polytechnique, 91128 Palaiseau, France.
We will discuss the two mechanisms involved in high-order harmonic generation from plasma mirrors, and show that they can be clearly identified experimentally. The phase and coherence properties of these harmonics will be analyzed.

TUE1.6 • 10:00
Feasibility of probing coherent optical phonons by Extreme Ultraviolet radiation based on high-order harmonic generation.
Evangelos Papalazarou1, Davide Boschetto1, Julien Gautier1, Constance Valentin1, Marino Marsi2, Philippe Zeitoun1, and Philippe Balcou3; 1Laboratoire d’Optique Appliquée, Chemin de la Hunière, F-91761 Palaiseau, France, 2Laboratoire de Physique des Solides, Bât 510, Université Paris-Sud, 91405 Orsay, France, 3Centre Lasers Intenses et Applications, Université Bordeaux 1, CNRS, CEA, Domaine du Haut Carré, 351 Cours de la Libération, 33405 Talence, France.
We report a new experimental approach used to time-resolve coherent high-amplitude optical phonons within the Brillouin zone of a Bismuth (111) crystal by extreme ultraviolet (XUV) femtosecond pulses based on high-order harmonic generation in rare gases.

Ultrafast Multiphoton Crystallography.
Marina Gertsovolf1,2, Hubert Jean-Ruel1, Pattathil P. Rajeev1, David M. Rayner1, and Paul B. Corkum1; 1National Research Council of Ottawa, Ottawa, Ontario K1A 0R6, Canada, 2University of Ottawa, Ottawa, Ontario K1N 6N5, Canada.
We show that non-resonant multiphoton ionization of dielectric crystals depends on the alignment of the laser field to the crystal lattice. Through absorption measurements we probe the local symmetry non-invasively, anywhere inside the sample.
Femtosecond pulse shaping for measurements at the nano-scale, \textit{\textsuperscript{1}}Fernando D. Stefani, \textit{\textsuperscript{1}}Daan Brinks, \textit{\textsuperscript{1}}Niek F. van Hulst, \textit{\textsuperscript{2}}ICFO, Mediterranean Technology Park, 08860 Castelldefels (Barcelona), Spain, \textit{\textsuperscript{3}}ICREA - Inst. Catalana de Recerca i Estudis Avançats, 08015, Barcelona, Spain. With the aim of applying shaped optical pulses to the investigation of individual nano-systems and molecules, the implications of spatio-temporal distortions induced by different shaping techniques are investigated.

Coherent Control of Retinal Isomerization in Bacteriorhodopsin in the High Intensity Regime, Andrei C. Florea\textsuperscript{1}, David Cardoza\textsuperscript{2}, James L. White\textsuperscript{2}, Janos K. Lanyi\textsuperscript{1}, \textit{\textsuperscript{1}}Roseanne J. Sension, \textit{\textsuperscript{2}}and Philip H. Bucksbaum\textsuperscript{2,4}; \textit{\textsuperscript{1}}Department of Physics, University of Michigan, Ann Arbor, MI 48109, USA, \textit{\textsuperscript{2}}Department of Physics, Stanford University, Stanford, CA 94305, USA, \textit{\textsuperscript{3}}School of Medicine, University of California, Irvine, CA 92697, USA, \textit{\textsuperscript{4}}PULSE Center, SLAC, Menlo Park, CA 94025, USA. We use a learning algorithm to optimize retinal isomerization in bacteriorhodopsin. The yield increases linearly beyond the saturation of the first excited state. The results are modeled including the influence of one-photon and multiphoton transitions.

Quantum Control of the Photoinduced Wolff Rearrangement of Diazonaphthoquinone in the Condensed Phase using Mid-Infrared Spectroscopy, Daniel Wolpert\textsuperscript{1}, Marco Schade\textsuperscript{2}, Gustav Gerber\textsuperscript{1}, and \textit{\textsuperscript{1}}Tobias Brixner\textsuperscript{1,2}; \textit{\textsuperscript{1}}Physikalisches Institut, Universität Würzburg, Am Hubland, 97074 Würzburg, Germany, \textit{\textsuperscript{2}}Institut für Physikalische Chemie, Universität Würzburg, Am Hubland, 97074 Würzburg, Germany. A shaped ultraviolet pump - mid-infrared probe setup is employed for spectroscopy and quantum control of the photoinduced Wolff rearrangement of diazonaphthoquinone in the condensed phase.

Coherent Control of Matter Waves Passing Through a
TUE2P.1 • Filament-induced electric events in thunderstorms.

Jérôme Kasparian1,2, Roland Ackermann1, Yves-Bernard André3, Grégoire Méchain3, Guillaume Méjean3, Bernard Prade3, Philipp Rohwetter4, Estelle Salmon1, L.A. Verb Schil2, Kamil Stelmaszczyk4, Jin Yu1, André Mysyrowicz2, Roland Sauerbrey5, Ludger Wöste4, and Jean-Pierre Wolf6,7; 1Teramobile, Université Lyon 1; CNRS; LASIM UMR 5579, 43 Bd du 11 novembre 1918, F-69622 Villeurbanne Cedex, France, 2GAP, Université de Genève, 20 rue de l’école de Médecine, CH-1211 Genève 4, Switzerland, 3Teramobile, LOA, UMR CNRS 7639, ENSTA-Ecole Polytechnique, Chemin de la Hunière, F-91761 Palaiseau Cedex, France, 4Teramobile, Institut für Experimentalphysik, Freie Universität Berlin, Arnimallee 14, D-14195 Berlin, Germany, 5Directed Energy Directorate (AFRL/DELS), Air Force Research Laboratory, 3550 Aberdeen Blvd, SE, Kirtland AFB, NM 87117, USA, 6Teramobile, Institut für Optik und Quantenelektronik, Friedrich Schiller Universität, Max-Wien-Platz 1, D-07743 Jena, Germany.

Following positive laboratory-scale experiments, we investigated the ability to trigger real-scale lightning using ionized filaments generated by ultrashort laser pulses in the atmosphere. Under thunderstorm conditions, we observed electric events synchronized with the laser pulses.

TUE2P.2 • Optimizing laser-induced refractive index changes in “thermal” glasses.

Razvan Stoian1, Alexandre Mermillod-Blondin1, Cyril Maclaur1, Nicolas Huot1, Eric Audouard1, Igor M. Burakov2, Nadezhda M. Bulgakova2, Yury P. Meschcheryakov2, Arkadi Rosenfeld2, and Ingolf V. Hertel2; 1Laboratoire Hubert Curien (UMR 5516 CNRS), Université Jean Monnet, 18 rue Pr. Benoit Lauras, 42000 Saint Etienne, France, 2Institute of Thermophysics SB RAS, 1 Acad. Lavrentyev Avenue, 630090 Novosibirsk, Russia, 3Design and Technology Branch of Lavrentyev Institute of Hydrodynamics SB RAS, Terskikhovoi Street 29, 630090 Novosibirsk, Russia, 4Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie, Max-Born-Straße 2a, 12489 Berlin, Germany.

Ultrafast laser radiation induces negative refractive index changes in glasses characterized by high thermal expansion. Programmable tailoring of laser intensity envelopes can create positive refractive index changes and guiding structures may thus be generated.

TUE2P.3 • Femtosecond laser fabrication for the integration of optical sensors in microfluidic lab-on-chip devices.

Roberto Ossellame1, Rebeca Martinez Vazquez1, Chaitanya Dongre2, Roland Dekker2, Hugo Hoekstra2, Roberta Ramponi2, Markus Polnau2, and Giulio Cerullo3; 1IFN-CNR, Dipartimento di Fisica del Politecnico, Milano, Italy, 2IOMS, University of Twente, The Netherlands.

Femtosecond lasers enable the fabrication of both optical waveguides and buried microfluidic channels on a glass substrate. The waveguides are used to integrate optical detection in a commercial microfluidic lab-on-chip for capillary electrophoresis.
TUE3 • Coherent Molecular Dynamics

Auditorium
14:00–15:45

TUE3 • Coherent Molecular Dynamics
Chair: Margaret Murnane, JILA, University of Colorado, Boulder, CO, USA

TUE3.1 • 14:00 • Invited
Ultrafast X-ray probing of electron dynamics. •Stephen R Leone; University of California and LBNL, Berkeley, CA, USA.
High order harmonic generation is used both to probe atomic and molecular processes through core level spectroscopy and to generate isolated attosecond pulses to study the timescales of electronic dynamics.

TUE3.2 • 14:30
Polarization-Resolved Pump-Probe Spectroscopy with High Harmonics. •Eric Mével1, Yann Mairesse1, Stefan Haessler2, Baptiste Fabre1, Julien Higuem1, Willem Boutu1, Pierre Breger1, Eric Constant1, Dominique Descamps1, Stéphane Petit1, and Pascal Salières1; 1CELIA, Université Bordeaux 1, UMR 5107 (CNRS, Bordeaux 1, CEA), 351 Cours de la Libération, 33405 Talence Cedex, France, 2CEA-Saclay, DSM, Service des Photons, Atomes et Molécules, 91191 Gif-sur-Yvette, France.
High Harmonic generation can be used as a probe of the rotating medium with attosecond and angstrom resolutions. We show that polarization-resolved pump-probe spectroscopy with high harmonics improves the detection sensitivity of rotationally excited molecules.

TUE3.3 • 14:45
Direct measurement of the angular-dependence of molecular ionization cross-sections by time-resolved extreme-ultraviolet spectroscopy. •Isabelle Thomann, Robynne Lock, Chan La-O-Vorakiat, Etienne Gagnon, Arvinder Sandhu, Henry C. Kapteyn, Margaret M. Murnane, and Wen Li; JILA, University of Colorado, 440 UCB, Boulder, CO 80309-0440, USA.
We present a novel method for determining molecular neutral-to-ionic transition dipoles, by measuring time-dependent ionization yields from transiently aligned molecules. Results for N2 and CO2 are presented.

TUE3.4 • 15:00
Field-Free Unidirectional Molecular Rotation, Sharly Fleischer, Ilya Sh. Averbakh, and •Yehiam Prior; Department of Chemical Physics, Weizmann Institute of Science, Rehovot, Israel 76100.
By varying the polarization and delay between two ultrashort laser pulses, we control the plane, speed, and sense of molecular rotation. This control may be implemented to individual components within a molecular mixture.

TUE3.5 • 15:15
Attosecond Control of Quantum Interferences in Aligned Molecules. •Stefan Haessler1, Willem Boutu1, Hamed Merdji1, Pierre Breger1, Gavin Waters2, Marek Stankiewicz3, Leszek Fransinski4, Richard Taieb5, Jerome Cailler5, Alford Maquet5, Patrick Monchicourt1, Bertrand Carre1, and Pascal Salières1; 1CEA-Saclay, DSM, Service des Photons, Atomes et Molécules, 91191 Gif sur Yvette, France, 2J.J. Thomson Physical Laboratory, University of Reading, Whiteknights, Reading RG6 6AF, UK, 3Institute of Physics, Jagellonian University, ul. Reymonta 4, 30-059 Kraków, Poland, 4The Blackett Laboratory, Imperial College London, Princeton Road, London SW7 2BW, UK, 5UPMC Univ Paris 06, Laboratoire de Chimie Physique-Matière et Rayonnement, 11 rue Pierre et Marie Curie, 75231 Paris, France.
We control the quantum interference occurring between a molecular orbital and an ultrafast laser-driven electron wavepacket. The phase jump measured in the resulting harmonic emission contains signatures of Coulombic wavepacket distortion and allows attosecond pulse-shaping.

TUE3.6 • 15:30
Attosecond coincidence spectroscopy of diatomic molecules. •M. Lezias1, Z. Ansari2, M. Böttcher2, B. Manschwertus2, W. Sandner2, A. Verhoeff3, G.G. Paulus3, A. Saenz4, D.B. Milosevic5, and H. Rotte2; 1Max-Planck-Institut für Quantenoptik, Hans-Kopfermann-Str. 1, D-85748 Garching, Germany, 2Max-Born-Institute, Max-Born-Str. 2A, D-12489 Berlin, Germany, 3Dept of Physics, Texas A&M University, College Station, TX 77843, USA, 4Institut für Physik, Humboldt-Universität zu Berlin, Hausvogteiplatz 5-7, D-10117 Berlin, Germany, 5Faculty of Science, University of Sarajevo, Zmaja od Bosne 35, 71000 Sarajevo, Bosnia and Herzegovina.
Sub-cycle ionization of Ar-dimer by few-cycle laser fields is investigated with COLTRIMS. Low energy photoelectrons show clear deviations from double slit interference. We suggest that breakdown of the single-active electron approximation could be responsible for such. effect.
Real-time Evolution of the Valence Orbitals in a Dissociating Molecule as Revealed by Femtosecond Photoelectron Spectroscopy, Philippe Werner¹, Michael Odellus², Kai Godehusen¹, Jérôme Gaudin¹, Olaf Schwarzkopf¹, and Wolfgang Eberhardt¹; ¹BESSY, Berlin, Germany, ²Stockholm University, Stockholm, Sweden.

We follow in real time the evolution of the valence orbitals of Br2 molecules as the bonds break during dissociation with femtosecond vacuum-ultraviolet photoelectron spectroscopy and with simulations of the nuclear and electron dynamics.

Influence of the Environment on Reaction Dynamics: Excited State Intramolecular Proton Transfer in the Gas Phase and Solution, Christian Schriever¹, Stefan Lochbrunner², and Eberhard Riedle¹; ¹LS für BioMolekulare Optik, LMU München, Oettingenstr. 67, D-80538 Munich, Germany, ²present address: Institut für Physik, Universität Rostock, Universitätspark 3, D-18055 Rostock, Germany.

Femtosecond transient absorption reveals very similar excited state intramolecular proton transfer and associated wavepacket dynamics in the gas phase and in solution. There are striking differences for the kinetics associated with the subsequent internal conversion.

Photoreaction from a light generated non-equilibrium state, Simone Draxler¹, Stephan Malkmus¹, Thomas Brust¹, Jessica A. DiGirolamo², Watson J. Lees², Markus Braun¹, and Wolfgang Zinth¹; ¹BioMolekulare Optik, Fakultät für Physik, Ludwig-Maximilians-Universität München, Oettingenstr. 67, D-80538 München, Germany, ²Department of Chemistry and Biochemistry, Florida International University, 11200 SW 8th St., Miami, FL, 33199, USA.

We report on the acceleration of the S1 photoreaction combined with the dramatic increase of the photochemical quantum efficiency, when the reaction is directly preceded by another ultrafast photoreaction.

Excited-State Nuclear Wavepacket Motion of an Ultrafast Inorganic Molecular Switch, Kunihiko Ishii, Satoshi Takeuchi, and Taihei Tahara; Molecular Spectroscopy Laboratory, RIKEN, 2-1 Hirosawa, Wako, Saitama 351-0198, Japan.

Ultrafast photo-induced structural change of [Cu(dmphen)2]⁺ was studied by pump-probe spectroscopy with 25-fs time-resolution. The observed nuclear wavepacket motion unveiled a new mechanism of photo-induced Jahn-Teller distortion that is a key of inorganic molecular switches.

Femtosecond Electronic Dynamics via a Conical Funnel, Eric Smith, William Peters, and David Jonas; Department of Chemistry and Biochemistry, University of Colorado, Boulder, Colorado 80309-0215, USA.

Femtosecond polarization spectroscopy measures electronic wavepacket motion after vibrational wavepackets are excited near an energetically inaccessible conical intersection in a free-base naphthalocyanine. Partial equilibration via the conical funnel takes place within ~100 fs.

Capturing Transient Structure in Solution by Transient X-ray Diffraction, Jae Hyuk Lee¹, Jae Kyo Kim², Joonghan Kim¹, Qingyu Kong³, Marco Cammarata³, Maciej Lorenc³, Michael Wulff³, and Hyotcherl Ihee³; ¹Center for Time-Resolved Diffraction, Department of Chemistry, Korea Advanced Institute of Science and Technology, Daejeon, Korea, ²Department of Chemistry, Pusan National University, Busan, Korea, ³European Synchrotron Radiation Facility, Grenoble, France.

Here we report tracking of structural and kinetic information for photo-induced elimination of 1,2-diodotetrafluoroethane in solution by transient x-ray diffraction. The transient structure of CF2CF2I is determined to be classical mixture and following structural dynamics is elucidated.
Single Shot Linear Detection of THz Electromagnetic Fields on the Fs to Ps Scale. •Uli Schmidhammer, Vincent De Waele, and Mehran Mostafavi; Laboratoire de Chimie Physique - ELYSE, UMR8000 CNRS-Université Paris Sud, 91405 Orsay, France.

We report single shot electro-optic sampling based on spectral encoding with a supercontinuum as optical probe whose polarization state is analyzed in balanced detection.

Intense THz Pulses and 11-fs Electro-optic Sampling with a Multi-Branch Er:fiber/Ti:sapphire Hybrid Amplifier. •Alexander Sell, Rüdiger Scheu, Rupert Huber, and Alfred Leitenstorfer; Department of Physics and Center for Applied Photonics, University of Konstanz, Universitätsstraße 10, 78464 Konstanz, Germany.

We combine a four-branch Er:fiber laser with a high-power Ti:sapphire amplifier for high-field THz generation and electro-optic detection with 11-fs pulses. Frequency mixing of phase-correlated fiber branches generates multi-THz seed spectra up to 100 THz.

Frequency selective surface sensor for terahertz bio-sensing applications. •Michael Nagel¹, Gregor Klar², Mohammad Awad³, Heinrich Kurz³, Albrecht Bartels², and Thomas Dekorsy²; ¹Institute of Semiconductor Electronics, RWTH Aachen University, 52074 Aachen, Germany, ²Department of Physics and Center for Applied Photonics, University of Konstanz, D-78457 Konstanz, Germany.

Using high-speed asynchronous optical sampling, read-out of novel terahertz surface sensors directed at bio-sensing applications is presented. The surface sensor is based on periodically arranged metallic THz split ring resonators on a 27-micrometer-thin polymer membrane.

Single cycle THz pulses in 1D and 2D photonic crystal structures. •Peter Peier¹, Soenke Pilz¹, Taras Kononenko², Sergei Pimenov², and Thomas Feurer¹; ¹Institute of Applied Physics, University of Bern, Sidlerstrasse 5, 3012 Bern, Switzerland, ²General Physics Institute, Russian Academy of Science, Vavilov-Str. 38, 119991 Moscow, Russia.

We present coherent time-resolved near-field imaging of single-cycle THz pulses in 1D and 2D photonic crystals. The results agree well with simulations and reveal the bandgaps and the dispersive properties of the photonic structures.

Measurement of Dispersion Properties of Silver Nanowires Used as Surface Plasmon Waveguides. •Jess M. Gunn, Scott H. High, and Marcos Dantus; Department of Chemistry, Michigan State University, East Lansing MI 48824 USA.

Surface plasmon waves created by shaped femtosecond pulses are used to control the two-photon induced plasmon emission of silver nanoparticles. A quantitative measurement of the dispersion properties of surface plasmon waveguides is given.

Hot Dirac Fermions Dynamics in Epitaxial Graphene. •Dong Sun¹, Zong-Kwei Wu¹, Charles Divin¹, Xuebin Li², Claire Berger², Walter de Heer², Phillip First², and Theodore Norris¹; ¹Center for Ultrafast Optical Science, University of Michigan, Ann Arbor, MI, 48109-2099, ²School of Physics, Georgia Institute of Technology, Atlanta, GA, 30332.

We report the first application of nondegenerate ultrafast pump-probe spectroscopy to epitaxial graphene. The DT spectra can be understood in terms the effect of hot thermal carrier distributions on interband transitions with no electron-hole interaction.
Resonant and Nonresonant Stimulated Parametric Fluorescence, Xuejun Liu, Mark Mero, James L. Thomas, and Wolfgang Rudolph; Department of Physics and Astronomy, University of New Mexico, Albuquerque, New Mexico 87131, USA.

A femtosecond four-wave mixing microscopy with polarized detection has been applied to selectively image dyes while suppressing signals from host materials. The image signal persists even after photobleaching, making this technique attractive for biological microscopy.

Femtosecond pump-probe spectroscopy as an instrument for nanostructured materials investigation, Sergey V. Chekalin; Institute of Spectroscopy RAS, 142190 Troitsk, Moscow Region, Russia; e-mail: chekalin@isan.troisk.ru.

The femtosecond pump-probe technique was used to investigate the difference spectra dynamics in heterophase fullerene-metal nanostructures. The relaxation at the same metal-to-fullerene ratio strongly depends on the mutual distribution of nanocomposite components.


First Step Towards a Femtosecond VUV Microscope: Zone Plate Optics as, Jérôme Gaudin, Stefan Rehbein, Peter Guttmann, Sophie Godê, Gerd Schneider, Philippe Wernet, and Wolfgang Eberhardt; BESSY, Albert Einstein Strasse 15, 12489 Berlin, Germany.

We demonstrate the efficiency of zone plate optics as a high-order harmonics monochromator in the photon energy range from 30 to 70 eV. This is the first step towards a VUV microscope with femtosecond time resolution.

Interferometrically detected femtosecond CARS in a single beam of shaped femtosecond pulses, Bernhard von Vacano, Jean Rehbinder, Tiago Buckup, and Marcus Motzkus; Physikalische Chemie, Philipps-Universität Marburg, Hans-Meerwein-Strasse, D-35043 Marburg, Germany.

Photonic integration of functions such as excitation, probing and interferometry in shaped broadband pulses allows huge simplification of coherent anti-Stokes Raman scattering (CARS) for microspectroscopy, paving the way to cost-efficient implementations, e.g. all-fibre solutions.
Two-dimensional pulse shapers capable of more than phase & amplitude modulation, Ge Wang, Hiroki Yazawa, Yoshiro Esumi, Tomoaki Abe, and Fumihiko Kannari; Department of Electronics and Electrical Engineering, Keio University, 3-14-1, Hiyoshi, Kohoku-ku, Yokohama, 223-8522, Japan.

We perform polarization control as well as phase & amplitude modulation using a 2D LC-SLM, and also pulse shaping on two-color laser with a 2D MEMS-MMA SLM.

Terahertz wave from coherent LO phonon in a GaAs/AlAs multiple quantum well under an electric field, Kohji Mizoguchi, Yusuke Kanzawa, Masaaki Nakayama, Shingo Saito, and Kiyomi Sakai; Osaka Prefecture University, Sakai, Japan, Osaka City University, Osaka, Japan, National Institute of Information and Communications Technology, Kobe, Japan.

We report on the enhancement of the terahertz wave from the coherent LO phonon in a GaAs/AlAs multiple quantum well by applying an electric field.

Improved Fast Scanning TeraHz Pulse System, Bernhard Heinemann, Colleen J. Fox, and Hermann Harde; Helmut-Schmidt-Universität, Holstenhofweg 85, 22043 Hamburg, Germany.

We demonstrate the operation of a fast scanning laser system that was modified to improve and to increase the time resolution as well as spectral width for femtosecond time-resolved optical pump-probe or THz time-domain spectroscopy.

Adaptive Phase Shaping in a Fiber Chirped Pulse Amplification System, Nikita K. Daga, Fei He, Hazel S. S. Hung, Naveed Naz, Jerry Prawiharjo, David C. Hanna, David J. Richardson, and David P. Shepherd; Optoelectronics Research Centre, University of Southampton, Southampton, UK.

We demonstrate adaptive spectral phase shaping in a fiber chirped pulse amplification system. The adaptive process, controlled by a simulated annealing algorithm, resulted in three times improvement in the autocorrelation peak intensity of 65uJ pulses.

Near-Field Imaging of Single-Cycle THz Pulses Transmitted Through Sub-Wavelength Plasmonic Structures, Hannes Merbold and Thomas Feurer; Institute of Applied Physics, University of Berne, Sidlerstr. 5, 3012 Bern, Switzerland.

We experimentally and numerically investigate the spatiotemporal evolution of single-cycle THz pulses transmitted through sub-wavelength plasmonic structures. Employing a polaritonic approach the near field of the THz wave is monitored and compared to simulations.
TUEIIc.1 • 18:00
Asymptotic pulse shapes and pulse self-compression in femtosecond filaments, Carsten Krüger, Ayhan Demircan, Gero Stibenz, Nickolai Zhavoronkov, and Günter Steinmeyer; 1Westeras-Institut für Angewandte Analysis und Stochastik, Mohrenstr. 39, 10117 Berlin, Germany, 2Max-Born-Institut, Max-Born-Straße 2a, 12489 Berlin, Germany.
The balance of Kerr-type and plasma-mediated self-amplitude modulations can give rise to self-stabilizing asymptotic pulse shapes in filament propagation. These solitonic-like solutions resemble experimental data and constitute the major mechanism for self-compression in femtosecond filaments.

TUEIIc.2 • 18:00
Two dimension spatial light modulator with an over-two-octave bandwidth for high-powered mono-cycle optical pulses, Kouji Hara, Takashi Tanigawa, Naoya Nakagawa, Yu Sakakibara, Shao boo Fang, Taro Sekikawa, and Mikio Yamashita; Department of Applied Physics, Hokkaido University, and Core Research for Evolutional Science and Technology, Japan Science and Technology Agency, Kita-13, Nishi-8, Kitaku, Sapporo, 060-8628 Japan.
We performed feedback phase compensation experiment using a two-dimension spatial light modulator operating from 260 to 1100 nm, which is useful for ultrabroadband and high-powered optical pulses.

TUEIIc.3 • 18:00
Noncollinear Optical Parametric Amplification Pumped by the Third Harmonics of a Ti:Sapphire Laser, Takashi Tanigawa, Keisaku Yamane, Taro Sekikawa, and Mikio Yamashita; Department of Applied Physics, Hokkaido University, and Core Research Evolutional Science and Technology, Japan Science and Technology Agency, Kita-13, Nishi-8, Kitaku, Sapporo, 060-8628 Japan.
Broadband amplification in the 380-490 nm region was achieved by ultraviolet (UV) pumped noncollinear optical parametric amplification. This result leads to 6 fs UV pulse generation and can be utilized to amplify monocycle pulses.

TUEIIc.4 • 18:00
Vector Pulse Shaper Assisted Short Pulse Characterization, Andreas Galler and Thomas Feurer; Institute of Applied Physics, University of Bern, Sidlerstrasse 5 CH-3012 Bern, Switzerland.
We demonstrate that shaper-assisted pulse characterization is able to imitate most standard pulse characterization methods. If a polarization shaper is used even more complex schemes, such as SPIDER, can be realized.

TUEIIc.5 • 18:00
Femtosecond Spectral Interferometry with Attosecond Accuracy by Correction for Spectrometer Resolution Asymmetry, Michael Yezbacher, Trevor Courtney, William Peters, and David Jonas; Department of Chemistry and Biochemistry, University of Colorado, Boulder, Colorado
80309-0215, USA.
Asymmetry in the line spread function of the spectrometer causes delay dependent nonconstant phase shifts. Fourier deconvolution with the complex-valued optical transfer function allows accurate spectral phase recovery.

TUEIIc.6 • 18:00
Sub-10 fs Pulse Generation in Vacuum Ultraviolet Using Chirped Four Wave Mixing in Hollow Fibers, Joachim Herrmann, Ihor Babushkin, and Frank Noack; Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Max-Born-Str. 2a, D-12489 Berlin, Germany.
We investigate the potential of four-wave mixing for UV pulse generation in hollow waveguides with unprecedented short pulse durations (up to 2.5 fs) at 160 nm using broadband chirped 800 nm idler pulses.

TUEIIc.7 • 18:00
Compression of an Ultraviolet Pulse by Molecular Phase Modulation and Self-Phase Modulation, Yuichiro Kida, Shin-ichi Zaitsu, and Totaro Imasaka; 1Department of Applied Chemistry, Graduate School of Engineering, Kyushu University, 744, Motooka, Fukuoka 819-0395, Japan, 2Division of Translational Research, Center for Future Chemistry, Kyushu University, 744, Motooka, Fukuoka 819-0395, Japan.
A compression scheme for an ultraviolet pulse to sub-15 fs is reported. Frequency modulation of an ultraviolet pulse by molecular rotations and by self-phase modulation results in a compressed pulse with small intensities of sub-pulses.

TUEIIc.8 • 18:00
Temporal Optimization of Ultrabroadband Optical Parametric Chirped Pulse Amplification, Jeffrey Moses, Cristian Manzoni, Shu-Wei Huang, Giulio Cerullo, and Franz X. Kärtner; 1Department of Electrical Engineering and Computer Science and Research Laboratory of Electronics, Massachusetts Institute of Technology, Cambridge, MA 02139, USA, 2ULTRAS-INFM-CNRS Dipartimento di Fisica, Politecnico, Piazza L. da Vinci 32, 20133 Milano, Italy.
Critical optimization considerations are presented for ultrabroadband, high-power optical parametric chirped-pulse amplifiers, where simultaneous suppression of superfluorescence and maximization of both conversion efficiency and bandwidth is required. Numerical simulations verify theory.

TUEIIc.9 • 18:00
To add to the debate on a possible variation of the fine structure constant, frequency comb spectroscopy on laser cooled (calcium) ions in a linear Paul trap is pursued.

TUEIIc.10 • 18:00
Carrier envelope offset control of broad Raman sidebands by locking two pump laser frequencies to a single optical cavity, Takayuki Suzuki, Masataka Hirai, Ryo Tanaka, and Masayuki Katsuragawa; 1ULTRAS-INFM-CNRS Dipartimento di Fisica, Politecnico, Piazza L. da Vinci 32, 20133 Milano, Italy, 2JST-PRESTO, Saitama, Japan.
We generate broad Raman sidebands with zero carrier-envelope-offset by frequency-locking the pump lasers to
a single optical cavity. It is shown in both spectral and temporal domains that the carrier-envelope-offset is controlled to discrete values.

TUEIIc.11  •  18:00
Generation of High Energy Pulses from a Fiber-based Femtosecond Oscillator, •Jungkwuen An¹, Dongeon Kim¹, J. W. Dawson², M. J. Messerly², and C. P. J. Barty³; ¹Department of Physics, Pohang University of Science and Technology, Pohang 790-784, South Korea, ²Photon Science and Applications Program, Lawrence Livermore National Laboratory, Livermore, California 94550, USA.
The high energy pulse can be achieved by exploiting self-similar propagation regime. In this regime, mode-lock pulse can be generated without dispersive optics such as gratings or prisms in the cavity.

TUEIIc.12  •  18:00
Spatial phase control and applications of high-order harmonics, •Constance Valentin¹, Julien Gautier¹, Evaggelos Papalazarou¹, Christoph Hauri¹, Gilles Rey¹, Philippe Zeitoun¹, Stéphane Sebban¹, Věra Hajkova², Jaromir Chalupsky², Ludek Vysin³, and Libor Juha²; ¹Laboratoire d’Optique Appliquée - ENSTA, Ecole Polytechnique, CNRS UMR 7639, Chemin de la Hunière, F-91761 Palaiseau Cedex, France, ²Institute of Physics - Na Slovance 2, Cz-18221 Prague, Czech Republic, ³Faculty of Biomedical Engineering - Zikova 4, Cz-16636 Prague, Czech Republic.
We present experimental results of control of high-order harmonic wave-fronts. We have reached a spatail phase with rms distortions of lambda/7 at 32nm ensuring very tight focusing. Applications using this XUV source are reported.
Third Harmonic Generation enhanced by a laser-induced plasma and. ●Klaas Hartinger and Randy Bartels; Colorado State University, Fort Collins, CO 80523, USA.
We demonstrate THG enhanced more than 60-fold by a laser-induced plasma and the subsequent modulation of conversion efficiency due to the presence of a rotational wave packet, induced by a short moderately intense laser pulse.

Detection of THz Frequency Acoustic Waves via Coherent THz Radiation Emission. ●Evan Reed1, Michael Armstrong1, Kiyong Kim2, and James Glownia3; 1Lawrence Livermore National Laboratory, Livermore, CA, USA, 2Los Alamos National Laboratory, Los Alamos, NM, USA, 3DOE Office of Basic Sciences, Washington, D.C., USA.
Using molecular dynamics simulations, we find that acoustic waves of THz frequencies can be detected via THz radiation coherently emitted when they propagate past an interface between materials with different piezoelectric coefficients.

Non-interferometric two-dimensional Fourier transform spectroscopy. ●Jeffrey Davis1, Lap van Dao1, Harry Quiney2, Peter Hannaford2, and Keith Nagent1; 1Centre for Atom Optics and Ultrafast Spectroscopy, Swinburne University of Technology, Victoria 3122, Australia, 2School of Physics, University of Melbourne, Victoria 3010, Australia.
We demonstrate a technique that determines the phase of the femtosecond photo echo emission from spectrally resolved intensity data. The validity is shown using simulated data, and its significance revealed in real two-colour experiments.

Single-stage Pulse Compression and High-Energy Supercontinuum generation from a Chirped-pulse oscillator. ●Alexander Faerbach1,2, Christopher Miese1, and Wolfgang Koehler2; 1Centre for Ultra high bandwidth Devices for Optical Systems and MQ Photonics Research Centre, Macquarie University, Sydney, NSW 2109, Australia, 2Femtolasers Produktions GmbH, Fernkornrassge 10, 1100 Wien, Austria.
We demonstrate the generation of high-energy supercontinuum pulses by coupling the uncompressed pulses of a Ti:sapphire Chirped-pulse oscillator into a microstructure fibre which features a highly anomalous dispersion at the centre wavelength of the laser.

Simulations of Frequency-Resolved Optical Gating for measuring very complex pulses. ●Lina Xu, Erik Zeek, and Rick Trebino; School of Physics, Georgia Institute of Technology, Atlanta, GA, USA, 30332.
We study the performance of the iterative algorithm in the Frequency-Resolved Optical Gating (FROG) family of techniques and find that it can reliably retrieve the intensity and phase of even very complex ultrashort laser pulses.

Nanoscale Heat Transport Probed with Ultrafast Soft X-Rays. ●Mark Siemens1, Qing Li2, Margaret Murnane1, Henry Kapteyn1, Ronggui Yang1, and Keith Nelson2; 1University of Colorado at Boulder, 440 UCB, Boulder, Colorado 80309, USA, 2Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge, Massachusetts 02139, USA.
We characterize heat transport in nanostructures using coherent soft x-rays to probe thermally induced surface deformation. By varying the substrate temperature, we observe the transition from diffusive to quasi-ballistic heat transport regimes.

Ultrafast Dynamics of Electron-Hole Plasma Coupled to Optical Phonons in a ZnO Thin Film. ●Hideki Ichida1, Shuji Wakaiki2, Kohji Mizoguchi3, Deji Kim4, Yasuo Kanae5, and Masaaki Nakayama6; 1Venture Business Laboratory, Center for Advanced Science and Innovation, Osaka University, 2-1 Yamada-oka, Suita, Osaka 565-0871, Japan, 2Department of Applied Physics, Graduate School of Engineering, Osaka City University, 3-3-138 Sugimoto, Sumiyoshi-ku, Osaka 558-8585, Japan, 3Department of Physical Science, Graduate School of Science, Osaka Prefecture University, 1-1 Gakuen, Naka-ku, Sakai, Osaka 599-859, Japan.
We report on ultrafast photoluminescence dynamics of electron-hole plasma coupled to longitudinal-optical phonons in a ZnO thin film. The dynamical change of the electron-hole-pair density is characterized by time-resolved-photoluminescence spectra measured with an optical-Kerr-gating method.

Time-resolved X-ray Absorption Spectroscopy of Photoinduced Insulator-Metal Transition in a Colossal Magnetoresistive Manganese. ●Matteo Rini1, Ron Tobey2, Simon Wall2, Yi Zhu1, Yasuhide Tomioka1, Yoshinori Tokura1, Andrea Cavalleri3, and Robert Schoenlein1; 1Lawrence Berkeley National Laboratory, 1 Cyclotron Road, MS 2-300, Berkeley, CA 94720, 2Department of Physics, Clarendon Laboratory, University of Oxford, Parks Road, Oxford OX1 3PU, United Kingdom, 3Correlated Electron Research Center, AIST Tsukuba Central 4, Tsukuba, Ibaraki, 305-8562 Japan.
We studied the ultrafast insulator-metal transition in a manganite by means of picosecond X-ray absorption at the O K- and Mn L-edges, probing photoinduced changes in O-2p and Mn-3d electronic states near the Fermi level.

Large-amplitude coherent phonons in semimetals. ●Oleg Misochko1, Michael Lebedev1, Kunie Ishioka2, Masahiro Kitajima3, Sergey Chekalin1, and Thomas Dekorsy4; 1Institute of Solid State Physics, Russian Academy of Sciences,142432 Chernogolovka, Moscow region, Russia, 2National Institute for Materials Science,1-2-1 Sengen, Tsukuba, 305-0047 Ibaraki, Japan, 3Institute of Spectroscopy, Russian Academy of Sciences,142190 Troits, Moscow region, Russia, 4Physics Department, Konstanz University, 78457 Konstanz, Germany.
We report on the ultrafast dynamics of two, different in symmetry, large-amplitude coherent phonons in Bi and Sb. A systematic study was made of the variation of the nonlinear lattice dynamics with pulse duration, excitation strength, temperature and probe wavelength.
TUEId.10  •  18:00
Generation and control of coherent conical pulses in seeded optical parametric amplification. Ottavia Jedrkiewicz1, Matteo Clerici2, Daniele Faccio1, and Paolo Di Trapani1,2.
1Cnism and Dipartimento di Fisica e Matematica, Università dell’Insubria, Como (Italy), 2Department of Quantum Electronics, Vilnius University, Vilnius (Lithuania).
We propose a new technique for high-energy conical pulse generation based on continuum seeded parametric amplification process in quadratic nonlinear media.

TUEId.11  •  18:00
Laser-induced solid-solid phase transition in As under pressure: A theoretical prediction. Eeuwe S. Zijlstra, Nils Huntemann, and Martin E. Garcia; Theoretische Physik, Universität Kassel, Heinrich-Plett-Str. 40, 34132 Kassel, Germany.
On the basis of ab initio calculations we predict that in arsenic pressure: A theoretical prediction, under solid pressure a solid-solid phase transition from the A7 into the simple cubic structure can be induced by an ultrashort laser pulse.

TUEId.12  •  18:00
Rabi Oscillations in a Shallow Donor System Driven by Intense THz Radiation. Peter Gaal1, Wilhelm Kuehnl1, Klaus Reimann1, Michael Woerner1, Thomas Elsaesser2, and Rudolf Hey2.
1Max-Burned-Institut, Berlin, Germany, 2Paul-Drude-Institut, Berlin, Germany.
Carrier-wave Rabi oscillations between bound impurity levels are demonstrated by ultrafast THz propagation experiments. Modelling with an ensemble of two-level systems yields good agreement up to a driving field of 5 kV/cm.

TUEId.13  •  18:00
The electronic and spin dynamics in thin iron films have been investigated by means of time-resolved reflectivity and magneto-optical Kerr effect. The electron-magnon and the electron-phonon coupling times are extrapolated and their influence is discussed.

TUEId.14  •  18:00
Ultrafast terahertz response driven by photoinduced insulator to metal transitions in layered organic salt. Hideki Nakaya1, Yoshiyuki Takahashi1, Shinichiro Iwai1, Kaoru Yamamoto2, Kyuya Yukashi2, and Shingo Saito1.
1Department of Physics, Tohoku University, Sendai, Japan, 2Institute of Molecular Science, Okazaki, Japan.
Photoinduced insulator to metal transition in two-dimensional organic salt alpha-(ET)2Cu[N(CN)2]Br was investigated by mid-IR pump-probe spectroscopy. Photoinduced microscopic and semi-macroscopic metallic domains were characterized by a transient THz spectrum.

TUEId.15  •  18:00
Photoinduced macroscopic oscillation between insulator and metal in layered organic Mott insulator. Yohei Kawakami1, Shinichiro Iwai1, Naoki Yoneyama2, Takahiko Sasaki2, and Norio Kobayashi1.
1Department of Physics, Tohoku University, Sendai, Japan, 2Institute for Materials Research, Sendai, Japan.
Photoinduced insulator to metal transition in two-dimensional organic Mott insulator kapp-(d-ET)2Cu[N(CN)2]Br was investigated by mid-IR pump-probe spectroscopy. Photoinduced macroscopic GHz oscillation between the Mott insulator and the metal, reflecting the competitive phase diagram, was observed.

TUEId.16  •  18:00
X-ray absorption near-edge spectroscopy (XANES) with ultra-short laser-based X-ray source for Warm Dense AI structural study. Fabien Dorchies, Marion Harmand, Claude Fourment, Sebastien Hulin, Joao Jorge Santos, and Olivier Peyrusse; CELIA, UMR 5107 University Bordeaux 1 - CEA - CNRS, 33405 Talence, France.
A broadband X-ray source is optimized for time-resolved near-edge absorption spectroscopy. High quality absorption spectra are obtained through aluminum samples and compared with calculations. This structural diagnostic is designed for transient Warm Dense Matter studies.

TUEId.17  •  18:00
Retaining high laser intensities and generating plasma channels over long distances in air by using an axicon. Selcuk Akturk1, Bing Zhou1, Benjamin Pasquier1, Aurelien Houard1, Michel Franco1, Arnaud Couairon2, and Andre Myzyrowicz1.
1Laboratoire d’Optique Appliquée, Ecole Nationale Supérieure des Techniques Avancées-École Polytechnique, CNRS UMR 7639 F-91761 Palaiseau cedex France, 2Centre de Physique Théorique, CNRS UMR 7644, Ecole Polytechnique, F-91128 Palaiseau Cedex, France.
Focusing a Gaussian beam with an axicon generates Bessel beams, which retain high on axis intensity over long distances.
We focus ultrashort pulses with an axicon to generate long plasma channels in air.

TUEId.18  •  18:00
Temporal Dynamics of polaritons in a strongly-coupled organic-semiconductor microcavity. Tersilla Virgili1, Samira Ceccarelli2, Dario Poli1, Guglielmo Lanzani1, Giulio Cerrillo1, and David G. Lidzey2.
1IFN, CNR Dipartimento di Fisica, Politecnico di Milano, P.zza Leonardo Da Vinci 32, 20132 Milano, Italy, 2Department of Physics and Astronomy, University of Sheffield, Hicks Building, Hounsfield Road, Sheffield S37RH United Kingdom.
Using pump-probe spectroscopy, we investigate exciton-polariton dynamics in a strongly-coupled organic microcavity. We observe Rabi oscillations, decay of polaritons and the signature of the upper-branch cavity polaritons scattering to the exicton reservoir with photon emission.

TUEId.19  •  18:00
Electron emission from atomic clusters irradiated with 10 fs laser pulses. Yasin El-Taha1, Emma Springate2, Rob Carley3, Firoz Rajgara1, Delphine Darios1, Chris Froud2, Stefano Bonori2, Dan Symes3, John Tisch4, Roland Smith5, Deepak Mathur3, and Jon Marangoz1.
1Blackett Laboratory, Imperial College London, Prince Consort Road, South Kensington,
We present the first study of atomic clusters irradiated by ultra-short pulses (< 25fs). A weak prepulse has been shown to allow energetic coupling with the clusters enhancing the electron yield.

TUEId.20 • 18:00
Multi-electron Dynamics In Molecular High Harmonic Generation. Gerald Jordan and ●Armin Scrinzi; Photonics Institute, Vienna Univ. of Technology, Vienna, Austria.
We demonstrate the significance of multi-electron dynamics, in particular core polarization by the laser, in molecular HHG, as various simplifying models of increasing complexity fail in reproducing the multi-electron spectra obtained using the MCTDHF method.

TUEId.21 • 18:00
Coherent Control of Population Transfer in an Ionic Multilevel System using Phase- and Amplitude-Shaped Femtosecond Pulses. ●Andreas Galler and Thomas Feurer; Institute of Applied Physics, University of Bern, Sidlerstrasse 5 CH-3012 Bern, Switzerland.
We demonstrate selective control of population transfer in a multilevel system through phase- and amplitude-modulated femtosecond pulses. A combination of adiabatic rapid passage and amplitude modulation allows controlling the final population of individual states.

TUEId.22 • 18:00
Manipulation of the spin-orbit precession. Sebastien Weber, ●Béatrice Chatel, and Bertrand Girard; Laboratoire Collisions Agrégats Réactivité, CNRS, Université de Toulouse, Toulouse, France.
Spin precession is investigated through a pump-probe technique. The excited wave packet corresponds to a precession of spin and orbital momentum around the total angular momentum. Shaped laser pulses is used to control this dynamics.

TUEId.23 • 18:00
Laser-Induced Selective Alignment of Water Spin Isomers. Erez Gershman and ●Ilya Averbakh; Department of Chemical Physics, Weizmann Institute of Science, Rehovot, Israel 76100.
We consider laser alignment of ortho and para water spin isomers using short off-resonance laser pulses. Selective alignment of individual spin modifications is possible with a proper pair of pulses.

TUEId.24 • 18:00
Sub-20-fs Optical Pump-X-ray Probe Spectroscopy beyond the Si K Edge. ●Enikoe Seres and Christian Spielmann; Physikalisches Institut EP1, Universität Würzburg, D-97074 Würzburg, Germany.
We report on time resolved X-ray absorption spectroscopy using high harmonic radiation up to 3.5 keV. With our setup we gained insight into the structural dynamic of silicon with a temporal resolution of 20 fs.

TUEId.25 • 18:00
Terahertz Nonlinear Response and Coherent Quantum Control of Dark Excitons in Cu2O. ●Tobias Kampfrath1, Silvan Leinß2, Konrad v. Volkmar1, Martin Wolf1, Alfred Leitenstorfer2, and Rupert Huber3; 1Department of Physics, Freie Universität Berlin, Arnimallee 14, 14195 Berlin, Germany, 2Department of Physics and Center for Applied Photonics, University of Konstanz, Universitätsstraße 10, 78464 Konstanz, Germany.
The nonlinear response of a cold 1s-para exciton gas in Cu2O to intense multi-terahertz pulses is studied. A partial internal Rabi flop coherently promotes 70% of the optically dark quasiparticles into the 2p state.

TUEId.26 • 18:00
Frequency Shifts at the Fiber-Optical Event Horizon. ●Stephen Hill1, Christopher E. Kaklewicz1, Thomas G. Philbin1,2, Scott Robertson1, Friedrich König1, and Ulf Leonhardt1; 1School of Physics and Astronomy, University of St Andrews, North Haugh, St Andrews, Fife, KY16 9SS, UK, 2Max Planck Research Group of Optics, Information and Photonics, Günther-Scharowsky-Str.1, Bau 24, D-91058 Erlangen, Germany.
Event horizons can be simulated by waves in a moving medium. Using ultrashort pulses in microstructured optical fibers, we have performed the first experimental demonstration of an artificial event horizon in optics.

TUEId.27 • 18:00
Study of fast electron transport dynamics in relativistic laser-solid interaction using multispectral, monochromatic X-ray imaging. ●Luca Labate1,2, Antonio Giulietti1,2, Danilo Giulietti1,2,3, Leonida A. Gizz1,2, Petra Koester1,2,3, Tadzio Levato1,2,3, Flavio Zumponi1, Andrea Luebcke1, Tino Kaempffer4, Ingo Uschmann4, Eckart Foerster4, Anna Antonicci5, and Dimitri Batani2,3; 4Intense Laser Irradiation Laboratory - IPCF, Consiglio Nazionale delle Ricerche, Pisa, Italy, 5INFN, Sezione di Pisa, Italy, 6Dipartimento di Fisica, Universita’ di Pisa, Italy, 7Institut für Optik und Quantenelektronik, Friedrich-Schiller-Universitat, Jena, Germany, 8Dipartimento di Fisica, Universita’ di Milano Bicocca, Italy.
The results, both experimental and numerical, of a recent experiment aimed to study fast electron propagation in solids are reported. The technique allowed multispectral, monochromatic imaging of the X-ray emission from multi-layer targets.
Electron Injection Dynamics of Perylene Derivatives into ZnO and TiO2 Particle Films, J. Szarko, A. Neubauer, L. Socaciau-Siebert, A. Bartelt, F. Birkner, K. Schwarzburg, and Rainer Eichberger; Dynamics of Interfacial Reactions-SE 4, Hahn-Meitner-Institute Berlin, Glienicker Strasse 100, 14109 Berlin, Germany.

The injection dynamics two perylene dyes bound to ZnO and TiO2 nanoparticles was investigated with femtosecond transient absorption simultaneously monitoring the rise of the cationic and the decay of the excited state.

Coherent phonons in cyanine dye monomers and J-aggregates, Tersilla Virgili1, Samira Ceccarelli2, Larry Luer1, Guglielmo Lanzani1, Giulio Cerullo1, and David G. Lidzey1; 1IFN, INFM CNR Dipartimento di Fisica, Politecnico di Milano, Piazza Leonardo Da Vinci 32, 20132 Milano, Italy, 2Department of Physics and Astronomy, University of Sheffield, Hicks Building, Hounsfield Road, Sheffield S37RH United Kingdom.

Using pump-probe spectroscopy, we investigate coherent oscillations in cyanine dye, in monomeric form and in J-aggregate. We identify a low energetic intramolecular mode amplified in the J-aggregate film producing a modulation of the excitonic coupling.

Ultrafast Dynamics of Photoexcited Sodium-Water Clusters, Hongtao Liu1, Jan Philippe Müller1, Claus Peter Schulz1, Christian Schröter1, Nick Zhavoronkov1, and Ingolf Volker Hertel1,2; 1Max-Born-Institut, 12489 Berlin, Germany, 2Fachbereich Physik, Freie Universität Berlin, 14195 Berlin, Germany.

The lifetimes of the first electronically excited state of Na(H2O)n, clusters (n up to 40) are measured using two colour pump-probe spectroscopy. The measured lifetimes are compared to those of water cluster anions.

Electronic Excitations in Pentacene Films: Singlet versus Triplet Dynamics, Henning Marciniak1, Bert Nickel2, and Stefan Lochbrunner1; 1Institut für Physik, Universität Rostock, Universitätstrasse 3, 18055 Rostock, Germany, 2Fakultät für Physik und CeNS, Ludwig-Maximilians-Universität, Geschwister-Scholl-Platz 1, 80539 München, Germany.

Polarization dependent femtosecond spectroscopy shows that photoexcited excitons in microcrystalline pentacene films decay within 70 fs to a non fluorescing singlet species while triplets are formed in a small fraction on the picosecond time scale.

Coherent Control of the Exciton Dynamics in the FMO Protein, Maaike Milder1, Ben Brueggemann2, Mette Miller3, and Jennifer Herek4; 1FOM-Institute for Atomic and Molecular Physics (AMOLF), Amsterdam, The Netherlands, 2Humboldt Universität, Institut für Physik AG Halbleitertheorie, Berlin, Germany, 3University of Southern Denmark, Department of Biochemistry and Molecular Biology, Odense, Denmark, 4Optical Sciences Group, MESA+ Institute for NanoTechnology, University of Twente, Enschede, The Netherlands.

We have achieved first steps toward coherent control of excitonic energy migration in the FMO pigment-protein complex, by combining femtosecond pulse shaping with a feedback loop using an evolutionary algorithm, as well as complementary simulations.
Coherently Enhanced Ionization and Fragmentation. Xin Zhu, Vadim Lozovoy, and Marcos Dantus; Michigan State University, Department of Chemistry, East Lansing, Michigan 48823.

We report the observation of coherently enhanced fragment ion ejection pathway. The ions formed through this process exhibit very sensitive dependence upon the time-frequency structures of the laser pulses.

Single-Shot Time Domain Measurement of Phase Response of Ultrafast Vibrational Quantum Beating. Jesse W. Wilson, Philip Schlup, and Randy A. Bartels; Electrical and Computer Engineering Department, Colorado State University, Fort Collins, CO 80523, USA.

Phase-sensitive time-domain Fourier transform spectroscopy is used to measure vibrational Raman spectra in solid, liquid and gas phase samples. The pump-probe configuration measures phase shifts directly via spectral holography in scanned or single-shot modes.

Vibrational Coherence Transfer in Metal Carbonyls: Solvent single-shot modes. phase shifts directly via spectral holography in scanned or gas phase samples. The pump-probe configuration measures phase shifts directly via spectral holography in scanned or single-shot modes.

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The finite duration of chemical exchange events can be observed using two-dimensional infrared spectroscopy.

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Chain Length Dependence of Two-Dimensional Infrared Spectral Pattern Characteristic to 310-Helix Peptides. Hiroaki Maekawa1, Fernando Formaggio2, Claudio Toniolo2, and Nien-Hui Ge2; 1Department of Chemistry, University of California, Irvine, California 92697-2025, USA, 2Institute of Biomolecular Chemistry, CNR, Padova Unit, Department of Chemistry, University of Padova, 35131 Padova, Italy.

Two-dimensional infrared spectra of Z-(Alb)nOrBu (n = 3, 5, 8, and 10) were measured to investigate how they depend on the peptide chain length. The onset of the 310-helical spectral signature appears to occur at the pentapeptide.

Ultrafast Exciton Dynamics of J- and H-Aggregates of Porphyrin Catechol in Aqueous Solution. Hirendra Ghosh and Sandeep Verma; Radiation & Photochemistry Division, Bhabha Atomic Research Centre, Trombay, Mumbai - 400 085, INDIA.

Porphyrin catechol found to form J- and H-aggregates in different pH at certain concentration. Ultrafast exciton dynamics of J- and H-aggregates found to be 200 fs and 100 fs respectively as monitored by femtosecond spectroscopy.

Chirp Effects on Vibrational Wave Packets in Large Molecules: A Multimode Perspective. Amir Wand1, Ofir Shoshanin1, Shinshon Kallath1, Ronnie Kosloff1, and Sanford Rahaman2; 1Department of Physical Chemistry and the Farkas Center for Light-Induced Processes, The Hebrew University, Jerusalem, 91904, Israel, 2Department of Physical Chemistry and The Fritz Haber Research Center, The Hebrew University, Jerusalem, 91904, Israel.

Linear chirp which optimally induces vibronic wave packets in large molecules is addressed by theory and experiment. Results allow better definition for “following” of nuclear dynamics by the instantaneous pump frequency in the multidimensional case.

The solvent dependent conformations of a Glycine-Alanine-Methylamide dipeptide: A two-dimensional infrared study. Marco Candelaresi1, Paolo Foggii1, 2 and Manuela Lima1; 1Via Nello Carrara 1 50019 Sesto Fiorentino (FI), 2Via Elce di Sotto 8 06100 Perugia.

The D2O and DMSO solutions of the Glycine-Alanine-Methylamide dipeptide: A two-dimensional infrared study. Marco Candelaresi1, Paolo Foggii1, 2 and Manuela Lima1; 1Via Nello Carrara 1 50019 Sesto Fiorentino (FI), 2Via Elce di Sotto 8 06100 Perugia.

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The solvent dependent conformations of a Glycine-Alanine dipeptide: A two-dimensional infrared study. Marco Candelaresi1, Paolo Foggii1, 2 and Manuela Lima1; 1Via Nello Carrara 1 50019 Sesto Fiorentino (FI), 2Via Elce di Sotto 8 06100 Perugia.
Coherent wave packet motions in the electronic excited states prepared by impulsive nuclear rearrangement such as electronic transition, internal conversion, and chemical reaction are observed directly by ultrafast 35 fs time-resolved spontaneous fluorescence.

**TUEII.f.12 • 18:00**

Ultrafast isomerization dynamics of biomimetic photoswitches. Julien Briand, Divya Sharma, Jérémie Léonard, Jan Helbing, Andrea Cannizzo, Majed Chergui, Vittorio Zanirato, Stefan Haacke, and Massimo Olivucci;

1 Institut de Physique et Chimie des Matériaux de Strasbourg, UMR 7504 ULP CNRS, F-67034 Strasbourg, France,
2 Physikalisch-Chemisches Institut, Universität Zürich, Winterthurerstr. 190, CH-8057 Zürich, Switzerland,
3 Laboratoire de Spectroscopie Ultrarapide, ISIC - EPFL, BSP, CH-1015 Lausanne (CH),
4 Dipartimento di Scienze Farmaceutiche, Università di Ferrara, 44100 Ferrara (I),
5 Dipartimento di Chimica, Università degli Studi di Siena, 53100 Siena (I).

Femtosecond UV-VIS and mid-IR experiments show that a new class of biomimetic photoswitches photo-isomerizes in less than 300 fs. In close analogy to rhodopsin, the isomerization is driven by motion along stretch and torsional coordinates.

**TUEII.f.13 • 18:00**

Exchange Transient 2D-IR Spectroscopy probes the remixing of vibrational eigenstates upon electronic excitation - a benchmark for DFT calculations. Andreas Messmer, Peter Hamm, Ana Maria Blanco Rodríguez, Antonín Vlček Jr., Stanislav Žalší, and Jens Bredenbeck;

1 Institute for Physical Chemistry, University of Zurich, Winterthurerstr. 190, CH-8057 Zurich, Switzerland,
2 Institute for Biophysics, Johann Wolfgang Goethe-University Frankfurt, Max von Laue-Str.1, D-60438 Frankfurt (Main), Germany,
3 School of Biological and Chemical Sciences, Queen Mary, University of London, Mile End Road, London E1 4NS, United Kingdom,
4 J. Heyrovský Institute of Physical Chemistry, Academy of Sciences of the Czech Republic, Dolejškova 3, CZ-18223 Prague, Czech Republic.

The composition of excited state vibrations can be disentangled by projecting the groundstate vibrations on them using exchange transient two-dimensional IR spectroscopy. The results challenge time-dependent DFT calculations.
Ultrafast Energy Transfer and Primary Processes in Photosynthesis. ●Richard J. Cogdell, Division of Biochemistry and Molecular Biology, IBLS, Glasgow Biomedical Research Centre, University of Glasgow, 126 University Place, Glasgow G12 8TA, Scotland, UK.

This paper uses purple photosynthetic bacteria to present an overview of the primary reactions in photosynthesis, since there are both x-ray crystal structures of all the pigment-protein complexes involved and extensive ultrafast studies using them.


Department of Chemistry, University of California, Berkeley, CA 94720-1460, USA.

Physical Biosciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA 94720, USA.

Current address: Department of Chemistry, University of Chicago, Chicago, IL 60637, USA.

Department of Chemical Physics, Lund University, P.O. Box 124, SE-22100, Lund, Sweden.

Dipartimento Scientifico e Tecnologico, Facoltà di Scienze, Università di Verona, Strada Le Grazie, I-37134, Verona, Italy.

Two-dimensional femtosecond broadband electronic spectroscopy was used to observe two dominant parallel pathways of energy transfer in the major light harvesting complex of Photosystem II in plants.


Department of Chemistry, University of North Carolina at Chapel Hill, Chapel Hill, NC 27599 USA.

Department of Chemistry and James Franck Institute, The University of Chicago, 929 East 57th Street, Chicago, Illinois, 60637 USA.

2-D photon echo measurements and simulations establish that the energy level fluctuations of the phycocyanobilin pigment dimer become anti-correlated after 100fs due to protein motions on the several nanometer scale.


Chemistry department, University of California Irvine, USA.

The photon-echo signal is invariant to certain permutation symmetries of optical pulses. These are used to unravel coherence and population energy transfer pathways and design chirality-induced techniques for probing coherent and dissipative dynamics.

Flavin-excitation initiated electron transfer along three tryptophan amino acids in DNA photolyase was studied. Combining ultrafast polarization and mutagenesis approaches the chain was shown to act as efficient nanowire allowing transprotein electron-transfer in <4 ps.

Quantum Coherence Accelerating Photosynthetic Energy Transfer. ●Hohjai Lee, Yuan-chung Cheng, and Graham Fleming.

Department of Chemistry, University of California, Berkeley and Physical Bioscience Division, Lawrence Berkeley National Laboratory, Berkeley, CA 94720, USA.

We present how a long-lasting coherence enhances energy transfer efficiency in a photosynthetic complex based on an analysis of data collected by a newly developed two-color electronic coherence photon echo technique and theoretical simulations.
The evolving femtosecond laser frequency comb.  

The CEO-Phase Stabilized Few-Cycle Waveform Synthesizer.

High-power, mHz linewidth Yb:fiber optical frequency comb for high harmonic generation.

High Harmonic Frequency Combs for High Resolution Spectroscopy.

Ultrafast double pulse parametric amplification for precision Ramsey metrology.

Towards Versatile Coherent Pulse Synthesis using Femtosecond Laser and Optical Parametric Oscillator.

Utilizing coherent pulse-addition inside a passive optical cavity, we achieve >3kW average power for HHG at a 136MHz pulse repetition rate.
Panoramica

10:45–12:30

WED2P • Structural Dynamics in Biological Systems

Chair: Sandy Ruhman, The Hebrew University, Jerusalem, Israel

WED2P.1 • 10:45

Energy transfer along a Poly(Pro) - peptide. ●Wolfgang Zinth1, Wolfgang J. Schreier1, Tobias E. Schrader1, Florian O. Koller1, Markus Löweneck2,3, Hans-Jürgen Musiol2, and Luis Moroder2; 1LS für BioMolekulare Optik, LMU München, München, Germany, 2Max-Planck Institut für Biochemie, Martinsried, Germany, 3present address: Senn Chemicals, Dielsdorf, Switzerland.

Using a novel molecular thermometer, p-nitro-phenylalanine, we investigate the transport of vibrational excess energy along a poly(Pro) sequence. Time resolved IR-spectroscopy reveals that heat transfer proceeds at a speed of several Å per picosecond.

WED2P.2 • 11:00

Energy Transport in Peptide Helices around the Glass Transition, ●Ellen Backus1, Phuong Nguyen2, Virgilia Botan1, Rolf Pfister1, Alessandro Moretto3, Marco Crisma3, Claudio Toniolo3, Gerhard Stock2, and Peter Hamm1; 1Physikalisch-Chemisches Institut, Universität Zürich, Winterthurerstrasse 190, CH-8057 Zürich, Switzerland, 2Institut für Physikalische und Theoretische Chemie, J.W. Goethe Universität, Max-von-Laue-Strasse 7, D-60438 Frankfurt, Germany, 3Institute of Biomolecular Chemistry, University of Padova, via Marzola 1, I-35131 Padova, Italy.

The energy transport through a small helical peptide has been studied as function of temperature. Surprisingly, the diffusive transport dominates at high temperature, while at low temperature ballistic transport seems to be important.

WED2P.3 • 11:15

Ultrafast Vibrational Dynamics of Adenine-Thymine Base Pairs in Hydrated DNA. Jason R. Dwyer, Lukas Szyc, ●Erik T. J. Nibbering, and Thomas Elsaesser; Max-Born-Institute, Max-Born-Str. 2 A, D-12489 Berlin, Germany.

We report femtosecond two-color pump-probe studies of the congested N-H/O-H stretching absorption of high-quality thin films of DNA oligomers in a broad hydration range. Different vibrational excitations are separated and their characteristic relaxation times identified.

WED2P.4 • 11:30

Photodynamics of Blue Light Sensing Proteins Viewed Through Ultrafast Vibrational Spectroscopy: BLUF Domain of AppA and Its Mutants. Allison Stelling1, Minako Kondo2, Kate Ronayne3, Peter Tonge1, and ●Stephen Meech2; 1SUNY Stonybrook, New York, USA, 2University of East Anglia, Norwich, UK, 3Rutherford Appleton Laboratory, STFC, Didcot, UK.

The mechanism of blue light sensing in the photoactive protein AppA is investigated by transient infra-red spectroscopy, mutagenesis and isotope editing. Modes associated with the flavin excited state and perturbation of the protein are detected.

WED2P.5 • 11:45

Direct observation of ligand transfer and bond formation in cytochrome c oxidase using mid-infrared chirped-pulse upconversion, Johanne Treufet, Kevin Kubarchy, Jean-Christophe Lambry, Eric Pilet, Jean-Baptiste Masson, Jean-Louis Martin, Martin Vos, Manuel Joffre, and ●Antonigri Alexandrou; Laboratoire d’Optique et Biosciences, Ecole Polytechnique, Palaiseau, France.

We time resolved the CO ligand transfer process in the bimetallic active site of cytochrome c oxidase, using mid-infrared chirped-pulse upconversion to observe the full vibrational signature of Fe-CO bond breaking and Cu-CO bond formation.

WED2P.6 • 12:00

Tryptophan Residues as Natural Ultrafast Voltmeters in Retinal Proteins, ●Jérémie Léonard1, Erwin Portuondo-Campa2, Andrea Cannizzo2, Franck Van Mourik2, Jorg Tittor3, Stefan Haacke1, and Majed Chergui2; 1Institut de Physique et Chimie des Matériaux de Strasbourg, UMR 7504 ULP - CNRS, F-67034 Strasbourg, France, 2Laboratoire de Spectroscopie Ultrarapide, ISIC - EPFL, BSR, CH-1015 Lausanne, Switzerland, 3Max-Planck-Institut für Biochemie, 82152 Martinsried, Germany.

The comparison between UV transient absorption spectra of wild type bacteriorhodopsin and two tryptophan-mutant proteins gives evidence for the possibility to use tryptophans as ultrafast probes for the photo-induced dipole moment change in retinal proteins.

WED2P.7 • 12:15

Interrogating fiber formation kinetics with automated 2D-IR spectroscopy, ●David Strasfeld, Yan Ling, Sang-Hee Shim, and Martin Zanni; Department of Chemistry, University of Wisconsin - Madison, Madison, WI 53706-1396.

We extract structural kinetics towards better understanding the aggregation pathway of amylin, the protein component of the amyloid fibers found to inhibit pancreatic cell function in type II diabetes patients, using automated 2D-IR spectroscopy.
Ultrafast Electron and Spin Dynamics in Nickel. \textcopyright{} WED3.2 \textbullet{} Invited

Ultrafast photoemission electron microscopy: imaging light with electrons on femto-nano scale. \textcopyright{} WED3.3

Ultrafast Electron Dynamics in Quantum Well States of Pb/Si(111). \textcopyright{} WED3.4

Quantum well states are compatible with Fermi liquid theory if inter-subband scattering is considered.

Direct Visualization of Electron Emission from a Metal Surface under Intense Laser Illumination. \textcopyright{} WED3.5

Attosecond Nanoplasmonic Field Microscope. \textcopyright{} WED3.6
WED4A • Octave-Spanning Pulse Generation

Auditorium
16:15–18:00
WED4A • Octave-Spanning Pulse Generation
Chair: Kjeld Eikema, FOM Institute for Atomic and Molecular Physics, Amsterdam, The Netherlands

WED4A.1 • 16:15 • Invited
Generation of octave-spanning Raman comb with absolute-phase control. Masayuki Katsuragawa1, Feng-Lei Hong2, Masaki Arakawa1, and Takayuki Suzuki1; 1Department of Applied Physics and Engineering, University of Electro-Communications, 1-5-1 Chofugaoka, Chofu, Tokyo 182-8585, Japan, 2National Institute of Advanced Industrial Science and Technology, 1-1-1, Umezono, Tsukuba 305-8563, Ibaraki, Japan.

We show a novel octave-spanning comb generation having precise frequency-spacing of a Raman transition. We also demonstrate that the carrier-envelope-offset of the Raman comb is precisely controlled by stabilizing the comb to an optical frequency-standard.

WED4A.2 • 16:45
Tunable, octave-spanning supercontinuum driven by X-Waves formation in condensed Kerr media. Alessandro Averchi1, Daniele Faccio1, Miroslav Kolesik2, Jerome V. Moloney2, Arnaud Couairon3, and Paolo Di Trapani1,3; 1CNISM and Department of Physics and Mathematics, University of Insubria, Via Valleggio 11, 22100 Como, Italy, 2ACMS and Optical Science Center, University of Arizona, Tucson, 85721 AZ, 3Centre de Physique Théorique, CNRS, Ecole Polytechnique, F-91128, Palaiseau, France, 4Department of Quantum Electronics, Vilnius University, Saulėtekio Ave. 9, bdg. 3, LT-10222, Vilnius, Lithuania.

We generate octave-spanning blue-shifted continuum in ultrashort laser pulse filamentation in fused silica. Bandwidth and central wavelength can be tuned modifying the input pulse focusing condition. The process is explained in terms of X-Waves generation.

WED4A.3 • 17:00
Toward Ultrafast Optical Waveform Synthesis with a Stabilized Ti:Sapphire Frequency Comb. Matthew Kirchner1, Tara Fortier1, Danielle Brune1, Andy Winder1, Leo Hollberg1, and Scott Diddams1; 1National Institute of Standards and Technology, Boulder, Colorado 80305, USA, 2Electrical and Computer Engineering, Purdue University, West Lafayette, Indiana 47907, USA.

We have developed a system for line-by-line control of a stabilized Ti:Sapphire optical frequency comb. We show individually-addressed 20 GHz comb modes around 970 nm and apply simple masks to demonstrate individual mode control.

WED4A.4 • 17:15
Multimillijoule Optically Synchronized and Carrier-Envelope-Phase-Stable Chirped Parametric Amplification at 1.5 µm. Oliver D. Mücke1, Dmitry Sidorov1, Peter Dombi1, Andrius Baltuška2, Skirmantas Ališauskas2, Jonas Pocius1, Linas Gininas2, and Romualdas Danielius3; 1Photonics Institute, Vienna University of Technology, Gusshausstrasse 27-387, A-1040, Vienna, Austria, 2Laser Research Center, Vilnius University, Saulėtekio av. 10, LT-10223 Vilnius, Lithuania, 3Light Conversion Ltd., P/O Box 1485, Light Conversion Ltd., P/O Box 1485, Saulėtekio av. 10, LT-10223 Vilnius, Lithuania av. 10, LT-10223 Vilnius, Lithuania.

We demonstrate two optical parametric amplifier schemes, based on β-barium-borate and periodically-poled lithium tantalate respectively, generating ultrabroadband pulses in the 1-2 µm range. Using a deformable mirror compressor we obtain 8.5-fs pulses at 1.6 µm.

Using time-resolved two-photon photoemission electron microscopy we demonstrate simultaneous spatial and temporal control of nanooptical fields. Cross correlation measurements reveal the ultrafast spatial switching of the local excitation on a subdiffraction length scale.


Flat and nanostructured metal nano-tips driven by sub-10 fs pulses at an 80-MHz repetition rate serve for nano-confined light and electron generation. We demonstrate control of spatial emission properties and analyze nonlinear generation processes.

Attosecond Free Electron Pulses for Diffraction and Microscopy. Peter Baum and Ahmed H. Zewail. Pasadena CA 91125, USA.

In synthesized gratings of optical fields, free non-relativistic electrons compress to pulses of 15 attosecond duration. Such pulses have potential to advance ultrafast electron diffraction and microscopy to the domain of attosecond electron dynamics.

Ultrafast Wide-Field Fluorescence Microscopy. Lars Gundlach and Piotr Piotrowiak. Department of Chemistry, Rutgers University Newark, 73 Warren St, Newark, NJ 07102, USA.

We present an ultrafast Kerr-gated microscope capable of collecting diffraction limited 2D fluorescence images with sub 100 fs resolution. The ultrafast fluorescence dynamics of gold nanoparticles is presented to exemplify the capabilities of the instrument.


By using extreme numerical-aperture solid-immersion microscopy at 1553 nm we demonstrate, under certain circumstances, polarization-sensitive imaging with resolution values approaching 100 nm which substantially surpass the classical scalar diffraction-limit embodied by Sparrow’s resolution criterion.

Fiber-optical analogue of the event horizon. Friedrich Koenig, Thomas Philbin, Christopher Kuklewicz, Scott Robertson, Stephen Hill, and Ulf Leonhardt. School of Physics and Astronomy, University of St. Andrews, North Haugh, St. Andrews, KY16 8QR, UK.

We present a realistic scheme for an artificial event horizon in optics with ultrashort pulses in microstructured fibers that can probe the quantum effects of horizons, particularly Hawking radiation. We also show experimental progress.

Factoring numbers with interfering random waves. Sébastien Weber, Béatrice Chatel, and Bertrand Girard. Laboratoire Collisions, Agrégats, Réactivité, IRSAMC (CNRS, Université de Toulouse, UPS), France.

Factorisation of numbers using Gauss sums is improved by choosing randomly the terms in the sum. Ghost factors are so eliminated and the required number of terms of the truncated sum varies as ln N.
Ultrafast Heating of Bismuth Observed by Time Resolved Electron Diffraction

Chair: Dwayne Miller, University of Toronto, Canada

Ultrafast Structural Dynamics of Polar Solids Studied by Femtosecond X-Ray Diffraction. • Thomas Elsaesser1, Clemens von Korff Schmising1, Nickolai Zhavoronkov1, Matias Bargheer1,2, Michael Woerner1, Markus Braun3, Peter Gilch4, Wolfgang Zinth1, I. Vrejoiu1, D. Hesse4, and M. Alexe4;
1Max-Born-Institut für Nichtlineare Optik und Karzzeitspektroskopie, D-12489 Berlin, Germany, 2Institut für Physik, Universität Potsdam, D-14469 Potsdam, Germany, 3Biomolekulare OPitk, Department für Physik, Ludwig-Maximilians-Universität, D-80538 München, Germany, 4Max-Planck-Institut für Mikrostrukturphysik, D-06120 Halle, Germany.

We study photoinduced structural dynamics in ferroelectric superlattices and polar molecular crystals. Elongations of coupled phonon modes affecting ferroelectric polarizations and structural changes connected with the solvation of molecular dipoles are determined quantitatively.

Atomic Motion in Laser Excited Bismuth Studied with Femtosecond X-Ray Diffraction. • Paul Beaud1, Steve L. Johnson1, Chris J. Milne2, Faton Krasniqi1, Ekaterina Vorobeva1, and Gerhard Ingold1; 1Swiss Light Source, Paul Scherrer Institut, CH-5232 Villigen, Switzerland, 2Laboratoire de Spectroscopie Ultrarapide, Ecole Polytechnique Fédérale de Lausanne, CH-1015 Lausanne, Switzerland.

Asymmetric grazing incidence femtosecond x-ray diffraction is applied to investigate carrier transport, carrier relaxation and phonon coupling in laser excited bismuth crystals.

Ultrafast Heating of Bismuth Observed by Time Resolved Electron Diffraction. Ping Zhou1, • Ivan Rajkovic1, Manuel Ligges1, Thomas Payer1, Frank Meyer zu Heringdorf1,2, Michael Horn-von Hoegen1,2, and Dietrich von der Linde1;
1Institut für Experimentelle Physik, Universität Duisburg-Essen, Lotharstr. 1, 47048 Duisburg, Germany, 2Center for Nanointegration Duisburg-Essen (CeNIDE), Universität Duisburg-Essen, Lotharstr. 1, 47048 Duisburg, Germany.

We describe time resolved electron diffraction on bismuth films. Lattice heating following femtosecond laser excitation is observed via the transient Debye-Waller-effect. Different heating processes with different time constants were observed.

Femtosecond X-Ray Diffraction Study of the Ultrafast Coupling between Magnetization and Structure in the Ferromagnet SrRuO3. • Clemens von Korff Schmising1, Matias Bargheer1, Anders Harpoth1, Nikolai Zhavoronkov1, Zanaira Ansari1, Michael Woerner1, Thomas Elsaesser1, Ionela Vrejoiu2, Dietrich Hesse3, and Marin Alexe4;
1Max-Born-Institut für Nichtlineare Optik und Karzzeitspektroskopie, D-12489 Berlin, Germany, 2Institut für Physik, Universität Potsdam, 14469 Potsdam, Germany, 3Fachbereich Physik und Center für Nanointegration Universität Duisburg-Essen (CeNIDE), 47057 Duisburg, Germany.

Femtosecond optical excitation of magnetically ordered SrRuO3 nanolayers leads to an ultrafast demagnetization and a concomitant magnetoelastic contractive stress. The resulting ultrafast structural response of the sample is imaged by femtosecond X-ray diffraction.
Auditorium
10:45–12:30

THU2A • Ultrafast Charge Transfer

Chair: Tahei Tahara, Molecular Spectroscopy Laboratory, RIKEN, Japan

THU2A.1 • 10:45 • Invited

Femtosecond X-Ray Absorption Spectroscopy of a Photoinduced Spin-Crossover Process, Christopher Milne¹, Van-Thai Pham¹, Wojciech Gawelda¹,³, Amal El Nahhas¹, Renske M. van der Veen¹,², Steven L. Johnson², Paul Beaud², Gerhard Ingold², Camelia Borca², Daniel Grolimund², Rafael Abela², Majed Chergui³, and Christian Bressler¹; ¹Laboratoire de Spectroscopie Ultrarapide, Ecole Polytechnique Fédérale de Lausanne, CH-1015 Lausanne, Switzerland, ²Swiss Light Source, Paul-Scherrer Institut, CH-5232 Villigen-PSI, Switzerland, ³Present Address: Laser Processing Group, Instituto de Óptica, CSIC, Serrano 121, E-28006 Madrid, Spain.

We present ultrafast x-ray absorption studies of photoexcited aqueous iron tris-bipyridine with 160 fs and with 70 ps temporal resolution to monitor the structural evolution in this spin-crossover complex.

THU2A.2 • 11:15

Aqueous Proton Transfer Pathways in Bimolecular Acid-Base Neutralization, Omar F. Mohammed¹, Katrin Adamiczky¹, Dina Pines², Ehud Pines², and Erik T. J. Nibbering¹; ¹Max Born Institut für Nichtlineare Optik und Kurzzeitspektroskopie, Max-Born-Strasse 2 A, D-12489 Berlin, Germany, ²Department of Chemistry, Ben Gurion University of the Negev, P.O. Box 653, Beer-Sheva 84105, Israel.

We expand the classic Eigen-Weller reaction model with solvent-switch pathways, mediating proton transfer between acids and bases, having one or several water molecules, activated by the solvent and controlled by the base strength.

THU2A.3 • 11:30

The solvated electron dynamics in aqueous solutions: first measurement of the lifetime of the contact pair by using three-pulse-spectroscopy, Hristo Iglev, Martin K. Fischer, and Alfred Laubereau; Physik-Departmen E11, Technische Universität München.

We demonstrate manipulation of the ultrafast electron detachment and recombination dynamics using femtosecond pump-repump-probe spectroscopy. The predicted electron-atom-contact pair is verified for the first time and its lifetime directly measured in aqueous halide solutions.

THU2A.4 • 11:45

Naphthalene Bismides: on the Way to Ultrafast Opto-electronic Devices, Igor Pugliesi¹, Patrizia Krok¹, Alfred Błaszczyk¹, Marcel Mayor¹,³, and Eberhard Riedle¹; ¹Zernike Institute for Advanced Materials, University of Groningen, Groningen, The Netherlands, ²Faculty of Physics and International Laser Center, Lomonosov Moscow State University, Moscow, Russia.

Visible-pump IR-probe spectroscopy is used to study the ultrafast charge dynamics in MEH-PPV based charge-transfer complexes and donor-acceptor blends. Transient anisotropy of the polymer polaron band provides invaluable insights into excitation localisation and charge-transfer pathways.

THU2A.5 • 12:00

Ultrafast Charge Photogeneration in MEH-PPV Charge-Transfer Complexes, Artem Bakulin¹, Dmitry Paraschuk², Maxim Pshenichnikov¹, and Paul van Loosdrecht¹; ¹Zernike Institute for Advanced Materials, University of Groningen, Groningen, The Netherlands, ²Faculty of Physics and International Laser Center, Lomonosov Moscow State University, Moscow, Russia.

Generation of Narrowband Ultrashort Pulses Tunable in the mid-IR and the Application to Vibrational Energy Transfer in a Modified Amino Acid, Karin Haiser, Florian O. Koller, Markus Huber, Tobias E. Schrader, Nadja Regner, Wolfgang J. Schreier, and Wolfgang Zinth; Lehrstuhl für BioMolekulare Optik, Department für Physik der Ludwig-Maximilians-Universität München, Öttingenstr. 67, 80538 München.

Difference frequency mixing of pulses with adjustable chirp produce narrowband tunable pulses in the mid infrared. They are used for selective excitation of vibrational modes in IR-pump-IR-probe experiments on a modified amino acid.
THU2P • Ultrafast Diagnostics

Panoramica
10:45–12:30

THU2P • Ultrafast Diagnostics
Chair: Rick Trebino, Georgia Institute of Technology, Swamp Optics, LLC, Atlanta, USA

THU2P.1 • 10:45
Single-shot carrier-envelope phase measurement of few-cycle laser pulses. Tibor Wittmann1, Balint Horvath1, Wolfram Helm1, Michael Schützel1, Xin Gu1, Adrian L Cavalieri1, Gerhard G Paulus2,3, and Reinhard Kienberger1; 1Max-Planck-Institut für Quantenoptik, D-85748 Garching, Germany, 2Institute of Optics and Quantum Electronics, Friedrich-Schiller-University, 07783 Jena, Germany, 3Department of Physics, Texas A&M University, College Station, TX 77843.

Above-threshold ionization spectra of rescattered electrons were captured using a single-shot stereo-ATI phase meter, allowing measurement of the carrier-envelope phase of individual laser pulses, consecutively, and at multi-kHz repetition rate for the first time.

THU2P.2 • 11:00
Strong-Field Momentum State Mapping, Xinhua Xie1, Armin Sirrin2, Marlene Wickenhauser1, Andrius Baltauskas1, Ingo Barth2, and Markus Kitzler1; 1Photronics Institute, Vienna University of Technology, Austria, 2Institute for Physical and Theoretical Chemistry, Free University of Berlin, Germany.

We numerically demonstrate novel features in both ionization and high-harmonic generation from bound states with a net internal angular momentum. Applications such as creation of circularly polarized attosecond X-ray pulses are discussed.

THU2P.3 • 11:15
Optical mapping of attosecond ionization dynamics by few-cycle light pulses, Aart Jan Verhoef1, Alexander Mitrofanov1, Aleksei Zheltikov2, Andrius Baltauskas1, and Evgeny Serbryannikov2; 1Vienna University of Technology, 2Moscow State University.

Few-cycle light pulses are used to map ultrafast ionization dynamics in time and frequency domains by all-optical means. Tunneling ionization encodes an attosecond phase mask, suggesting a method for attosecond shaping of high-intensity optical fields.

THU2P.4 • 11:30

Polarization, Phase and Amplitude Control and Characterization of Ultrafast Laser Pulses, Philip Schlup1, Omid Masihzadeh1, Lina Xu2, Rick Trebino2, and Randy A. Bartels1; 1Colorado State University, Department of Electrical and Computer Engineering, Fort Collins CO 80523, USA, 2School of Physics, Georgia Institute of Technology, Atlanta GA 30332, USA.

We demonstrate complete control over the polarization, phase and amplitude state of an ultrafast laser pulse using a single, linear spatial light modulator, and introduce a self-referenced method for characterization the polarization state.

THU2P.5 • 11:45
Silicon-Chip-Based Single-Shot Ultrafast Optical Oscilloscope, Mark Foster, Reza Salem, David Geraghty, Amy Turner, Michal Lipson, and Alexander Gaeta; Cornell University, Ithaca, NY, USA.

We demonstrate a single-shot ultrafast optical oscilloscope using a four-wave-mixing-based parametric temporal lens integrated on a CMOS-compatible silicon photonic chip. Experimentally, we demonstrate waveform measurement with a 100-ps record length and sub-750-fs resolution.

THU2P.6 • 12:00
Time-resolved off-axis digital holography for characterization of ultrafast phenomena in water, Tadas Balcianas1, Andrius Melninkaitis1, Gintaras Tamosauskas2, and Valdas Sirutkaitis1; 1Laser Research Centre, Vilnius University, Vilnius LT-10223, Lithuania, 2Department of Quantum Electronics, Vilnius University, Vilnius LT-10222, Lithuania.

We present the application of time-resolved off-axis digital holography for the investigation of refractive index properties of laser-induced plasma filaments in water. The propagation of femtosecond laser pulse was characterized using time-resolved off-axis digital holography.

THU2P.7 • 12:15
3 GHz RF Streak Camera for Diagnosis of sub-100 fs, 100 keV Electron Bunches, Thijs van Oudheusden, Jacco Nolhman, Willem Op’t Root, and Jom Luiten; Department of Applied Physics, Eindhoven University of Technology, P.O. Box 513, 5600 MB Eindhoven, The Netherlands.

We have designed and built a 3GHz radio-frequency cavity for use as an ultrafast streak camera to measure with 20fs resolution the duration of electron bunches that are suitable for single-shot ultrafast electron diffraction experiments.
THU3 • Ultrafast Condensed Phase Dynamics

Auditorium
14:00–15:45

THU3 • Ultrafast Condensed Phase Dynamics

Chair: Thomas Elsaesser, Max-Born-Institute, Berlin, Germany

THU3.1 • 14:00

THz Slow Motion of an Ultrafast Insulator-Metal Transition in \( \text{VO}_2 \): Coherent Structural Dynamics and Electronic Correlations. Rupert Huber, Carl Kübler, Henri Ehrke, Rene Lopes, Andrej Halabica, Richard F. Haglund, and Alfred Leitenstorfer; 1Department of Physics and Center for Applied Photonics, University of Konstanz, Universitätsstraße 10, 78464 Konstanz, Germany, 2Department of Physics and Astronomy and Institute of Advanced Materials, Nanoscience and Technology, University of North Carolina, Chapel Hill, North Carolina 27599, USA, 3Department of Physics and Astronomy and Institute for Nanoscale Science and Technology, Vanderbilt University, Nashville, Tennessee 37235, USA.

The multi-THz conductivity of \( \text{VO}_2 \) recorded during a photoinduced insulator-metal transition directly reveals the femtosecond dynamics of V–V stretching modes and electronic correlations. We suggest a novel qualitative model for the nonthermal phase transition.

THU3.2 • 14:15

Phono-Induced Orbital Melting in \( \text{La}_3/2\text{Sr}_1/2\text{MnO}_4 \). Raanan Tobey, Dharmalingam Prabhakaran, Andrew Boothroyd, and Andrea Cavalleri; Department of Physics, University of Oxford, OX1 3PU Oxford, UK.

Resonant excitation of Mn-O stretching modes results in ultrafast melting of long range orbital order in the layered manganite \( \text{La}_3/2\text{Sr}_1/2\text{MnO}_4 \). Our experiments clarify the microscopic mechanism underpinning the recently-discovered phono-induced phase transition in manganites.

THU3.3 • 14:30

Ultrafast Gigantic Photo-Response in Charge-Ordered Organic Salt (EDO-TTF)2PF6 on 10-fs time scales. Jiro Itatani, Matteo Rini, Andrea Cavalleri, Ken Onda, Tadahiko Ishikawa, Sho Oghara, Shin-ya Kosihara, XiangFeng Shao, Yoshiaki Nakano, Hideki Yamochi, Gunzi Saito, and Robert W. Schoenlein; 1Lawrence Berkeley National Laboratory, Berkeley, CA, USA, 2ERATO, Japan Science and Technology Agency, 3-5 Sannanchou, Tokyo, Japan, 3Department of Physics, Clarendon Laboratory, University of Oxford, Oxford, United Kingdom, 4Department of Materials Science, Tokyo Institute of Technology, Tokyo, Japan, 5Research Center for Low Temperature and Materials Science, Kyoto University, Kyoto, Japan, 6Division of Chemistry, Graduate School of Science, Kyoto University, Kyoto, Japan.

The initial dynamics of photo-induced phase transition in (EDO-TTF)2PF6 was investigated using 10-fs laser pulses. We observed sub-20-fs gigantic photo-responses (\(|\Delta R/R| > 100\%\)) and a clear signature of a structural bottleneck (\( \sim 60 \) fs) for the first time.

THU3.4 • 14:45

Dynamic Metamaterials at Terahertz Frequencies. Hou-Tong Chen, Abul Azad, John O’Harra, Antoinette Taylor, Willie Padilla, and Richard Averitt; 1MPS-CINT, MS K771, Los Alamos National Laboratory, Los Alamos, New Mexico 87545, Mexico, 2Department of Physics, Boston College, Chestnut Hill, Massachusetts 02467, USA, 3Department of Physics and Photonics Center, Boston University, Boston, Massachusetts 02215, USA.

Metamaterials fabricated for operation at terahertz frequencies are presented. Optical excitation enables control of the metamaterial resonance amplitude and frequency.

THU3.5 • 15:15

The Effect of Spin-Polarized Electrons on the THz Emission from Photoexcited GaAs(111). James Schleicher, Shayne Harr, and Charles Schmuttenmaer; Yale University, Department of Chemistry, 225 Prospect St., New Haven, CT 06520, USA.

We report the dependence of optical rectification and shift currents in unbiased GaAs(111) on the excitation beam polarization using THz emission spectroscopy. The emission when exciting slightly above bandgap is strongly influenced by spin-polarized electrons.

THU3.6 • 15:30

Nonlinear Lattice Response Observed Through Terahertz SPM. János Hebling, Matthias C. Hoffmann, Ka-Lo Yeh, György Tóth, and Keith A. Nelson; 1Massachusetts Institute of Technology, 77 Massachusetts Ave., Cambridge, MA, 02139, 2Department of Experimental Physics, University of Pécs, 7624 Hungary.

Self-phase-modulation of ultrashort THz pulses was observed in lithium niobate at 100 MW/cm2 intensity level. The effect, observed in time and frequency domains, suggests 1000x larger n2 than at visible wavelengths.
Ultrafast Laser Calligraphy. •Peter Kazansky1, Weijia Yang1, Yuri Svirko2, Yasuhiro Shimotsuma3, and Kazuyuki Hirao3;  
1Optoelectronics Research Centre, University of Southampton, SO17 1BJ, United Kingdom, 2Department of Physics and Mathematics, University of Joensuu, FI-80101, Finland, 3Department of Material Chemistry, Graduate School of Engineering, Kyoto University, Kyoto, Sakyoku 606-8501, Japan.
Control of structural modifications inside transparent materials by varying the direction of pulse front tilt is demonstrated, achieving a calligraphic style of writing. Anisotropic ultrafast laser cavitation in the irradiated region is observed.

Spatio-temporal optimization of transient electron plasma formation in bulk dielectrics for waveguide writing with fs laser pulses. •Jan Siegel, Wojciech Gawelda, Daniel Puerto, Andres Ferrer, Alejandro Ruiz de la Cruz, and Javier Solis; Laser Processing Group, Instituto de Óptica, C.S.I.C., 28006 Madrid, Spain.
This poster has been withdrawn by the authors.

Advantages of two-photon microscopy with ultrashort pulses. •Yair Andegeko, Peng Xi, Kyle Sprague, and Marcos Dantus; Department of Chemistry, Michigan State University, East Lansing MI 48824.
We demonstrate qualitatively and quantitatively higher fluorescence intensity, deeper penetration, and improved signal-to-noise ratio for biomedical imaging with dispersion free ultrashort sub-10 fs pulses.

Ultraprecisely machined microoptics for fs-pulse shaping and replication. •Hans Knuppertz1, Michael Bohling1, Jürgen Jahns1, Martin Bock2, and Rüdiger Grunwald2; 1Lehrgebiet Optische Nachrichtentechnik, FernUniversität Hagen, Universitätsstr. 27/PRG, D-58084 Hagen, Germany, 2Max-Born-Institute for Nonlinear Optics and Short-Pulse Spectroscopy, Max-Born-Str. 2a, D-12489 Berlin, Germany.
Two reflective systems for the filtering and replication of optical fs-pulses are presented: an integrated microoptical pulse shaper and an interferometer using a retroreflector array. We describe design, fabrication and demonstration experiments and compare results.

Development of laser-based imaging systems for medical diagnostics. •Stefan Witte1, Erwin Peterman1, Ruud Brakenhoff2, Guus van Dongen2, Ruud Toonen3, Huib Mansvelder3, and Marie Louise Groot1; 1Laser Centre Vrije Universiteit, De Boelelaan 1081, 1081 HV Amsterdam, The Netherlands, 2Otolaryngology/Head-Neck Surgery, Vrije Universiteit Medical Centre, De Boelelaan 1117, 1081 HV Amsterdam, The Netherlands, 3Center for Neurogenomics and Cognitive Research, Vrije Universiteit, De Boelelaan 1085, 1081 HV Amsterdam, The Netherlands.
We present a laser system with high wavelength flexibility, suitable for nonlinear microscopy and optical coherence tomography, for visualization of disease-related morphological changes in vivo. First results on in-vitro samples are discussed.
Femtosecond passively mode-locked fiber lasers using saturable Bragg reflectors. 

Objective. Jérôme Extermann1, Luigi Bonacina1, François Courvoisier2, Denis Kiselev3, Yannick Mugnier3, Ronan Le Dantec3, and Jean-Pierre Wolf4; 1GAP-Biophotonics Université de Genève, Genève, Switzerland; 2Institut FEMTO-ST Université de Franche-Comté, UMR CNRS 6174, Besançon, France; 3Symme Polytech’ Savoie, Annecy le Vieux, France. We present a technique to characterize ultrashort pulses at the focal plane of a high numerical aperture (NA) objective with unprecedented spatial resolution, by performing a FROG measurement with a single nanocrystal as nonlinear medium.

Nano-FROG: Frequency Resolved Optical Gating by a Nanometric Object at the Focal Plane of a high NA

Objective. Justin Gagnon1, Vladislav Yakovlev1,2, Eleftherios Goulielmakis1, Martin Schultz1, and Ferenc Krausz1,2; 1Max-Planck-Institut für Quantenoptik, D-85748 Garching, Germany; 2Department für Physik, Ludwig-Maximilians-Universität München, D-85748 Garching, Germany. We present a technique to characterize ultrashort pulses at the focal plane of a high numerical aperture (NA) objective with unprecedented spatial resolution, by performing a FROG measurement with a single nanocrystal as nonlinear medium.

A New Generalized Projections Algorithm Geared Towards Sub-100 Attosecond Pulse Characterization

Objective. William Brocklesby2, Matthew Praeger3, and Rafael Tejedor4; 1Department of Electrical Engineering and Computer Science, Massachusetts Institute of Technology, Cambridge, MA 02139 USA; 2Chemistry Department, Temple University, 1901 N. 13th Street, Philadelphia, Pennsylvania, 19122, USA. We developed a new algorithm for characterizing attosecond pulses from streaked spectra. We compare our algorithm to the current one used for attosecond characterization, and show that it is better suited for sub-100 attosecond pulses.

Autocorrelation Experiments with Ultrashort Soft X-ray FEL Pulses

Objective. Parijat Das1, Suresh Prasad1, Pratik Patil2, John Milner2, Tushar Gupta3,4, Nobuhiko Tanaka5, Waldemar Vincent6,7, and Shuo Hong8; 1Department of Chemistry, University of California, Berkeley, USA; 2Department of Mechanical Engineering, University of California, Berkeley, USA; 3Department of Physics, University of California, Berkeley, USA; 4Lawrence Berkeley National Laboratory, Berkeley, California, USA; 5Osaka University, Osaka, Japan; 6Department of Physics, University of Southern California, USA; 7Department of Chemistry, University of Southern California, USA; 8Department of Chemistry, City University of New York, USA. We report first direct measurements of the average coherence time and pulse length of soft x-ray pulses from the free electron laser at DESY (FLASH) by means of linear and nonlinear autocorrelation.

Characterization of Mid-Infrared Pulses

Objective. Eleftherios Goulielmakis1,2, Kevin F. Lee1,2, Adeline Bonvallet1,2, and Manuel Joffre1,2; 1Laboratoire d’Optique et Biosciences, Ecole Polytechnique, Centre National de la Recherche Scientifique, 91128 Palaiseau, France; 2Institut National de la Santé et de la Recherche Médicale, U696, 91128 Palaiseau, France. We characterize mid-infrared pulses using upconversion to the visible regime by mixing with two collinear time-delayed replicas of an 800 nm chirped pulse. The phase is encoded as a function of the time-delay.

Noncollinear optical parametric amplification of cw light, continua and vacuum fluctuations.

Objective. Markus Breuer, Christian Homann, and Eberhard Riedle; LS für BioMolekulare Optik, Ludwig-Maximilians-Universität München, Oettingenstraße 67, 80538 München, Germany. Seed sources for NOPAs are compared. Single-mode cw light renders Fourier-limited femtosecond and fully tunable picosecond µJ output pulses, OPG leads to random spectral fluctuations and a sapphire continuum delivers identical pulses on every shot.

Intensity and phase measurements of the spatio-temporal electric field of focusing ultrashort pulses.

Objective. Pamela Bowlan, Pablo Gabolde, and Rick Trebino; Georgia Tech School of Physics, 837 state st, Atlanta GA 30332, USA. We present the first technique for directly measuring the complete spatio-temporal field of ultrashort pulses at and near a focus. Our method uses an experimentally simple and high-spectral-resolution variant of spectral interferometry (SEA TADPOLE).

Modeling of octave-spanning sub-two cycle Titanium:sapphire lasers: simulation and experiment.

Objective. Michelle Y. Sander, Helder M. Crespo, Jonathan R. Birge, and Franz X. Kaertner; Department of Electrical Engineering and Computer Science and Research Laboratory of Electronics, Massachusetts Institute of Technology, Cambridge, Massachusetts, 02139, USA. It is shown that a one-dimensional temporal model can quantitatively predict the spectral output and pulse shape of a sub-two-cycle octave-spanning Ti:sapphire laser.


Objective. Oleksandr Isaienko and Eric Borguet; Chemistry Department, Temple University, 1901 N. 13th Street, Philadelphia, Pennsylvania, 19122, USA. A non-collinear KTP-OPA to provide ultra-broadband mid-infrared pulses was designed and characterized. With proper pulse-front and phase correction, the system has a potential for high-time resolution vibrational VIS-IR-SFG spectroscopy.

Spatially resolved Ar* and Ar+* imaging as a diagnostic for capillary based high harmonic generation.

Objective. Richard Chapman1, Jeremy Frey1, Christopher Froud2, Edward Rogers2, William Brockleshy3, Matthew Praeger2, James Grant-Jacob2, and Sarah Stebbings2; 1Department of Chemistry, University of Southampton SO17 1BJ, UK; 2Optoelectronics Research Centre, University of Southampton, SO17 1BJ, UK; 3Department of
Spectrally resolved imaging of Ar/Ar+ created by high harmonic generation is demonstrated, and used as a diagnostic of capillary geometry on XUV generation efficiency.

THUIIIc.11 • 16:15
Polarization, ionization and spatial gates in single attosecond pulse generation. Valer Tosa¹, Carlo Altucci², and Raffaele Velotta²; ¹National Institute R&D Isotopic and Molecular Technologies, 400293 Cluj-Napoca, Romania, ²CNISM, Dipartimento Scienze Fisiche, Universita FedericoII, 80126, Napoli, Italia.
We show that in polarization-gating techniques ionization dynamics and three-dimensional propagation effects act as additional gates in single attosecond pulse generation. We propose novel laser field configurations generating single harmonic bursts using long laser pulses.

THUIIIc.12 • 16:15
Chirped-pulse Raman amplification for two-color high-intensity. Peng Dong, Franklin Grigsby, and Mike Downer; FOCUS Center, University of Texas at Austin, Department of Physics, Austin, TX 78712, USA.
We report generation and compression of millijoule-level first Stokes sideband (873nm) of 800nm TW pulses by inserting a multi-stage barium nitrate Raman shifter-amplifier into a conventional Ti:sapphire chirped pulse amplification system.
On the Absence of Carrier Multiplication in InAs Core/Shell/Shell Nanocrystals, •Meirav Ben-Lulu, David Mocatta, Uri Banin, and Sanford Ruhman; Department of Physical Chemistry and the Farkas Institute for Light Induced Processes, The Hebrew University, Jerusalem 91904, Israel.

An ultrafast pump-probe methodology for detecting spontaneous carrier multiplication is applied to InAs/CdSe/ZnSe Core/Shell1/Shell2. Contrary to previous reports no carrier multiplication following above-band gap photoexcitation is observed, questioning the ubiquity of this phenomenon.

Ultrafast Laser-Induced Electron Emission from Field Emission Tips and First Applications, •Catherine Kealhofer1, Peter Hommelhoff2, Seth Foreman3, and Mark Kasevich1; 1Physics Department, Stanford University, Stanford, California, 94305, 2Max Planck Institute of Quantum Optics, Garching, Germany.

We describe a laser-triggered electron source based on a field emission tip. Numerical results indicate that the electron emission times can be sub-femtosecond. We are exploring applications of this source to ultrafast SEM.

Three-Dimensional Electronic Spectroscopy of Excitons in GaAs Quantum Wells, •Daniel Turner, Katherine Stone, Kenan Gundogdu, and Keith Nelson; Massachusetts Institute of Technology, Cambridge Massachusetts 02139, USA.

Three-dimensional electronic four wave-mixing spectroscopy of GaAs quantum wells is demonstrated. A previously inaccessible two-dimensional projection correlating events between the first two time periods is used to more accurately measure the bixonction binding energy.

Temporal Splitting of Ultrashort Laser Pulses Undergoing Self-Focusing in the Anomalous Dispersion Regime, •Samuel E Schrauth, Bonggu Shim, Aaron D Slepkov, Luat T Vuong, and Alexander L Gaeta; Applied and Engineering Physics, Cornell University, Ithaca, New York 14853 USA.

We show that the dynamics of ultrashort pulses undergoing self-focusing can be greatly altered via temporal pulse shaping. Specifically, we observe that super-Gaussian pulses undergo pulse-splitting, whereas Gaussian pulses undergo spatio-temporal collapse.

Nonlinear Optical Response of Metal Nanoantennas, •Barbara Wild, Jörg Merlein, Tobias Hanke, Alfred Leitenstorfer, and Rudolf Bratschitsch; Department of Physics and Center for Applied Photonics, University of Konstanz, D-78464 Konstanz, Germany.

We have excited bowtie-shaped metal nanoantennas fabricated via colloidal lithography with ultrashort light pulses. The spectrum emitted by the nanoantennas consists of a broadband continuum overlapped with a narrowband second harmonic signal.

Ultrafast spin dynamics in wide bandgap semiconductors and semiconductor nanostructures, •Nils Janßen1, Tobias Hanke1, Florian Sotier1, Markus Beyer1, Tobias Graf2, Mario Gjukic2, Martin Brandt2, Kelly Whitaker2, Daniel Gamelin3, Clemens Simbrunner4, Andrea Navarro-Quezada4, Alberto Bonanni4, and Rudolf Bratschitsch1; 1Department of Physics and Center for Applied Photonics, University of Konstanz, D-78457 Konstanz, Germany, 2Walter Schottky Institut, Technical University of Munich, D-85748 Garching, Germany, 3Department of Chemistry, University of Washington, Seattle, WA 98195, USA, 4Institute of Semiconductor and Solid State Physics, Johannes Kepler University, A-4040 Linz, Austria.

Time-resolved Faraday rotation measurements on doped GaN layers reveal exchange coupling of itinerant carriers to dopants in different oxidation states. In colloidal ZnO quantum dots competing recombination processes result in a biexponentially decaying spin coherence.

Phonon Softening in Bi and Sb Single Crystal: Toward a Simple Cubic Phase?, •Dantele Fausti1, Oleg Mishchko2, and Paul van Loosdrecht1; 1Rug, Groningen, The Netherlands, 2Institute of Solid State Physics, Moscow, Russia.

We use time-resolved Raman spectroscopy to reveal ultrafast thermodynamical and structural information simultaneously. The ultrafast phonon softening in Bismuth and Antimony is interpreted as a precursor of a non-thermodynamical cubic phase.

Filament-induced ultrafast AND-gate in rare gas, •Pierre Béjot, Yannick Petit, Luigi Bonacina, Jérôme Kasparian, Michel Moret, and Jean-Pierre Wolf; GAP-Biophotonics Université de Genève, Genève, Switzerland.

We demonstrate experimentally how high harmonic generation in Argon by ultrashort laser filamentation. This process is used to build an ultrafast optical AND gate between the driving pulse and a probe beam.

Observing Signatures of Molecular Structure by High-order Harmonic Generation, •Ricardo Torres1, Nathaniel Kajumba1, Thomas Siegel1, Immacolata Proccino2, Jonathan Underwood2, Joseph Robinson1, Sarah Baker1, John Tisch1, Rebeca de Nalda1, Will Bryan1, Raffaele Velotta3, Carlo Altucci3, Edmond Turcu1, and Jon Marangos1; 1The Blackett Laboratory, Imperial College London, London SW7 2BW, UK, 2Department of Physics and Astronomy, University College London, London WC1E 6BT, UK, 3Instituto de Química Física Rocasolano, CSIC, 28006 Madrid, Spain.

We demonstrate experimentally how high harmonic generation can show signatures of the orbital structure of polyatomic molecules. Calculations in the strong field approximation are shown in good agreement with the results, and new experimental approaches are discussed.
VUV Thomson Scattering in Warm Dense Matter at FLASH,
1 R. Fäustlin, S. Toleikis, Th. Bornath, L. Cao, T. Döppner,
2 S. Düsserdt, E. Förster, C. Fortmann, S. H. Glenser,
3 S. Gude, G. Gregori, A. Höll, R. Irsgä, T. Laarmann,
4 H. J. Lee, K.-H. Meiwes-Broer, A. Przystawik, P. Radcliffe,
5 R. Redmer, H. Reinholz, G. Röpke, R. Thiele, J. Tiggesbäumer,
6 N. X. Truong, Th. Techentscher, I. Uschmann,
7 and U. Zastrau; 1 Universität Rostock,
8 Universitätsplatz 3, 18051 Rostock, Germany,
2 Friedrich-Schiller-Universität Jena, Max-Wien-Platz 1, 07743
9 Jena, Germany, 3 LLNL, 7000 East Av., Livermore, CA 94550,
10 USA, 4 University of Oxford, Parks Road, Oxford OX1 3PU,
11 United Kingdom, 5 MBI, Max-Born-Str. 2A, 12489 Berlin,
6 Germany, 6 University of California, Berkley, CA 94720, USA,
7 DESY, Notkestr. 85, 22607 Hamburg, Germany.

We present the first attempt to diagnose electron temperature and
density of a plasma via Thomson Scattering in the Warm
Dense Matter Regime using Vacuum Ultraviolet Free Electron
Laser radiation.

THUIId.11 • 16:15
Time Resolved Photoluminescence (PL) Studies of
In0.2Ga0.8As/GaAs Quantum Wells in Ultrahigh Magnetic
Fields. Jihoon Lee1, Xiaoming Wang1, David Reitze1, Stephen
McGill2, Young-Dahl Jho3, Junichiro Kono4, Alexey Belyanin5,
and Glenn Solomon5; 1 Department of Physics, University of
Florida, Gainesville, Florida 32611, 2 National High Magnetic
Field Laboratory, Tallahassee, Florida, 32310, 3 Department of
Information and Communications, GIST, Oryong-dong, Buk-gu,
Gwangju, 500-712, Republic of Korea, 4 Department of
Electrical and Computer Engineering, Rice University, Houston,
Texas 77005, 5 Department of Physics, Texas A&M University,
College Station, Texas 77843, 6 Solid Quantum Processes and
Metrology Division, NIST, Gaithersburg, Maryland 20899-8423.

The dynamics of dense magneto-plasmas excited by intense
femtosecond laser pulses in In0.2Ga0.8As/GaAs multiple quantum wells were studied by time-resolved methods under
ultrahigh magnetic fields.

THUIId.12 • 16:15
Ultrashort soft x-ray pulses from a femtosecond slicing
source for time-resolved laser pump-x-ray probe
experiments. Niko Pontius1, Christian Stamm1, Torsten
Kachel1, Rolf Mützner1, Torsten Quast2, Karsten Holldack1,
Shaukat Khan1,3, Hermann A. Därr1, and Wolfgang Eberhardt1;
1 BESSY GmbH, 12489 Berlin, Germany, 2 Physikalisches
Institut der Universität Münster, 48149 Münster, Germany,
3 Institut für Experimentalphysik, Universität Hamburg, 22761
Hamburg, Germany.

The new femtosecond-slicing source generates energy-tunable
femtosecond x-rays pulses which are used for time-resolved soft
x-ray spectroscopy. We report on the experimental setup and
show first results using the laser pump and x-ray probe
technique.

THUIId.13 • 16:15
Non-equilibrium spin-dynamics of Gd(0001) studied by
time-resolved second harmonic generation and magnetic
linear dichroism in 4f core-level photoemission. Alexey
Melnikov1, Helena Prima-Garcia2, Martin Lisowski2, Tanja
Gießel2, Ramona Weber2, Roland Schmidt2, Cornelius Gahl2,
Nadezhda Bulgakova3, Uwe Bovensiepen1, and Martin
Weinelt1,2; 1 Freie Universität Berlin, Fachbereich Physik,
Arnimallee 14, 14195 Berlin, Germany, 2 Max-Born-Institut,
Max-Born-Straße 2 A, 12489 Berlin, Germany, 3 Institute of
Thermophysics SB RAS, 1 Lavrentyev Ave., 630090 Novosibirsk,
Russia.

Spin-dynamics in Heisenberg ferromagnets was studied at
Gd(0001). Dynamics of valence spins fundamentally differs
from that in itinerant ferromagnets. The 4f spin-lattice
interaction time is estimated to about 100ps by laser pump-
and/or synchrotron probe experiments.

THUIId.14 • 16:15
Fast Longitudinal and Transverse Structural Relaxation
Dynamics in Liquid Glycerol. Christoph Klieber1, Thomas
Pezeril1, Stephane Andrieu2, and Keith Nelson3; 1 Department
of Chemistry, Massachusetts Institute of Technology, Cambridge,
MA 02139, USA, 2 Laboratoire de Physique des Materiaux
UMR7556, Universite H. Poincare, 54506 Vandoeuvre, France.

Novel picosecond ultrasonic techniques for longitudinal and
transverse acoustic pulse generation have been employed to
probe structural relaxation dynamics in liquid glycerol at
gigahertz frequencies over a wide temperature range.

THUIId.15 • 16:15
Nonlinear optical effects in germanium in the THz range.
János Hebling1,2, Matthias Hoffman1, Harold Y Hwang3,
Ka-Lo Yeh4, and Keith A Nelson1; 1 Massachusetts Institute
of Technology, 77 Massachusetts Ave., Cambridge, MA, 02139,
2 Department of Experimental Physics, University of Pécs,
7624 Hungary.

Absorption saturation and self-phase-modulation of ultrashort
THz pulses was observed in germanium at THz intensities of
100 MW/cm2. These effects, observed both in temporal and
frequency domain are likely caused by free carriers.

THUIId.16 • 16:15
Two-dimensional Fourier transform electronic spectroscopy
with a pulse-shaper. Jeffery A. Myers, Kristin L. M. Lewis,
Patrick F. Tekavec, and Jennifer P. Ogilvie; Department of
Physics and Biophysics, University of Michigan, Ann Arbor, MI,
48109, USA.

We report 2D electronic spectra obtained using a pulse-shaper in
a pump-probe geometry. We demonstrate the method at visible
wavelengths on a dye system and discuss the benefits of this
approach compared to other implementations.

THUIId.17 • 16:15
Relativistic Attosecond Electron Pulses from Cascaded
Acceleration using Ultra-intense Radially Polarized Laser
Beams. Charles Varin1, Pierre-Louis Fortin2, and Michel
Piché2; 1 University of Ottawa, Ottawa, Ontario KIN 6N9,
Canada, 2 Centre d’optique, photonique et laser, Université
Laval, Québec, QC G1V 0A6, Canada.

Attosecond electron pulses with peak energy above 200 MeV
could be produced with ultrafast 100-TW radially polarized
laser beams in a two-stage configuration. Such electron beams
would be collimated and quasi-monoenergetic.
Femtosecond laser excitation of α-quartz causes oscillations in the transmission of probe light due to coherent phonons modulating the refractive index of the sample. Polarization, temperature and fluence dependent data will be presented.

**THUIId.19 • 16:15**

**Frequency dependence of the molecular reorientation of liquid water.**

Huib Bakker; AMOLF, Kruislaan 407, 1098 SJ Amsterdam, The Netherlands.

Using multi-color femtosecond mid-infrared spectroscopy we find that the reorientation of liquid water involves large frequency jumps. In contrast to recent theoretical predictions, we find that the jumping probability is strongly frequency dependent.

**THUIId.20 • 16:15**

**Structural Dynamics in Organic Semiconductors, Henrik T. Lemke¹, Tine Ejdrup¹, Dag W. Breiby², Peter Hammershøj³, and Martin M. Nielsen⁴.**

1Centre for Molecular Movies, Niels Bohr Institute, University of Copenhagen, Universitetsparken 5, 2100 Copenhagen, Denmark., 2Department of Physics, Norwegian University of Science and Technology, Høgskolen i Trondheim, Norway.

The first time resolved X-ray structural investigation of electron-phonon coupling in thin films of organic semiconductors. Standing acoustic waves were found, arising from the mechanical coupling at the interface between the film and substrate material.

**THUIId.21 • 16:15**

**Photoexcitation Decay in DNA-Wrapped Carbon Nanotubes: Exciton Transport and Annihilation, Richard Sutton¹, Konstantin Litvinenko¹, Konstantinos Bourdakos¹, Quan-Hong Yang², Tom Brown³, and Jeremy Allam⁴.**

1Advanced Technology Institute, University of Surrey, Guildford, UK., 2Optoelectronics Research Centre, University of Southampton, Southampton, UK., 3School of Chemistry, University of Southampton, Southampton, UK.

Intensity-dependent degenerate and non-degenerate pump-probe measurements on DNA-wrapped carbon nanotubes show that the photoexcitation decay is determined by the dimensionality and the enhanced electron-electron interactions in the nanotube.

**THUIId.22 • 16:15**

**Influence of Lattice Heating Time on Strain Wave Dynamics in InSb.**

Faton Krasniqi, Steven Johnson, Paul Beaud, Maik Kaiser, Daniel Grolimund, and Gerhard Ingold; Swiss Light Source, Paul Scherrer Institute, CH-5232 Villigen PSI, Switzerland.

Time resolved X-ray diffraction with sub-picosecond time resolution is used to investigate the fluence dependence of the lattice heating time in InSb.

**THUIId.23 • 16:15**

**Ultrafast carrier dynamics in spherical CdSe core / elongated CdS shell nanocrystals.**

Maria Grazia Lupo¹, Margherita Zavelani Rossi², Guglielmo Lanzani², Luigi Carbone¹, Liberato Manna³, and Roberto Cingolani¹. ¹Italy, NNL CNR-INFM, Università degli Studi di Lecce, Italy, ²Dipartimento di Fisica Politecnico di Milano, piazza Leonardo da Vinci 32 Milano Italy.

We use femtosecond pump probe transient spectroscopy to study ultrafast carrier dynamics CdSe/CdS asymmetric core/shell nanorods and to obtain information about the different mechanisms responsible of radiative and non radiative recombination.

**THUIId.24 • 16:15**

**Momentum-resolved lifetime study of image potential states using a novel 500 kHz two-color fiber-laser based NOPA system.**

Klaus Duncker, Mario Kiel, and Wolf Widdra; Martin-Luther-Universität Halle-Wittenberg, 06120 Halle, Germany.

The momentum-dependent lifetimes of image potential states at a Ag(001) surface have been determined by the use of a novel fiber-based laser-amplifier working at 500 kHz that drives two independent NOPAs.

**THUIId.25 • 16:15**

**Ultrafast Photoinduced Ferromagnetic Order in a Magnetic Semiconductor Heterostructure, Ingrid Cotoros², Jigang Wang¹, Xinyu Liu², Jacek K. Furdyna², and Daniel S. Chemla¹.**

1Department of Physics, University of California at Berkeley and Materials Science Division, Lawrence Berkeley National Laboratory, Berkeley CA, USA., 2Department of Physics, University of Notre Dame, Notre Dame IN, USA.

We report ultrafast enhancement of ferromagnetism in GaMnAs via photo-excited holes. The ultrafast magnetization increase close to the critical Curie temperature constitutes the first transient evidence of photoinduced phase transition from para-to ferromagnetic state.

**THUIId.26 • 16:15**

**A Compact Synchrotron Radiation Source Driven by a Laser-Plasma Wakefield Accelerator.**

Richard Shanks¹, Jordan Gallacher¹, Enrico Brunetti¹, Mark Wiggins¹, Hans Peter Schlenvoigt², Kerstin Haupt², Alexander Debus², Fabian Budde², Oliver Jakel², Sebastian Pfotenhauer², Heinrich Schwoerer²-³, Erich Rohwer³, and Dino Jaroszynski³. ¹Department of Physics, Scottish Universities Physics Alliance, University of Strathclyde, Glasgow G4 0NG, UK., ²Institut für Optik und Quantenelektronik, Friedrich-Schiller-Universität, 07743 Jena, Germany., ³Laser Research Institute, University of Stellenbosch, 7602 Matieland, South Africa.

This presentation outlines the first demonstration of a compact synchrotron radiation source driven by a laser-plasma wakefield accelerator. Mono energetic electron bunches were produced and combined with an undulator to produce visible synchrotron radiation.
Control of Excited-State Population and Vibrational Coherence with Shaped Resonant and Near-Resonant Excitation, Tiago Buckup1, Jürgen Hauer1, Carles Serrat2,3, and Marcus Motzkus1; 1Physikalische Chemie, Philipps Universität Marburg, 35043 Marburg, Germany; 2ICFO-Institut de Ciencies Fotòniques, 08860 Castelldefels, Barcelona, Spain; 3Tecnologies Digitals i de la Informació, Universitat de Vic, 08500 Vic, Spain.

The enhancement of vibrational coherence and population transfer using tailored pulses has been investigated numerically and experimentally. The general control mechanism is based on the control of the absorption coefficient after excitation with multipulses.

Pump-push-probe transient spectroscopy of isolated conjugated oligomers, Jenny Clark1, Juan Cabanillas-Gonzalez1, Tersilla Virgili1, Luca Bazzana2, and Guglielmo Lanzani1; 1Dipartimento di Fisica, IFN, CNR, Politecnico di Milano, Piazza Leonardo Da Vinci 32, Milano, Italy; 2LUCEAT Spa. Viale G. Marconi, 31, Dello (BS) Italy.

We use a transient pump-push-probe technique to study intrinsic charge photogeneration and subsequent recombination in isolated conjugated molecules. Furthermore, we demonstrate stimulated emission switching with large on/off ratio in doped polymer optical fibers.

Photomodulation of Interfacial Electron Transfer by Optical Switches, Lars Dworak, Victor Matylitsky, and Josef Wachtveitl; Institut für Physikalische und Theoretische Chemie, Max von Laue-Strasse 7, Johann Wolfgang Goethe-Universität Frankfurt, 60438 Frankfurt am Main, Germany.

The dynamics of 4-(phenylazo)benzoic acid coupled to Al2O3 and TiO2 films is described. The drastically altered photochemistry of the optical switch upon absorption to TiO2 films reflects the competition between electron transfer and intramolecular relaxation.

Two-color two-dimensional Fourier transform spectroscopy of energy transfer, Kristin L. M. Lewis, Jeffrey A. Myers, Patrick F. Tekavec, and Jennifer P. Ogilvie; Department of Physics and Biophysics, University of Michigan, Ann Arbor, MI, 48109, USA.

We report two-color 2D electronic spectra obtained using a diffractive-optics-based approach. We employ the two color method to study a simple system consisting of a donor/acceptor pair exhibiting fluorescence resonance energy transfer.

Energy redistribution in large molecules on the subpicosecond timescale, Mikael Kjellberg1, Olof Johansson2, Eleanor E.B. Campbell2, Alexander V. Bulgakov3, and Klavs Hansen1; 1Department of Physics, Göteborg University, SE-41296, Göteborg, Sweden; 2School of Chemistry, Edinburgh University, Edinburgh EH9 3JJ, Scotland; 3Institute of Thermophysics SB RAS, 1 Lavrentyev Ave. 630090 Novosibirsk, Russia.

Photoelectron spectra of C60, C70 and several polyaromatic hydrocarbon molecules after 160 fs laser ionization have been measured with a momentum map electron spectrometer. The spectra are thermal in nature.
Poster Area
16:15–18:15
THUIII.1 16:15
Ultrafast Dynamics of Dansylated POPAM Dendrimers and Energy Transfer in their Dye Complexes. •Jukka Aumanen1, Tero Kesti2, Ville Sundström2, Fritz Vogtle2, and Jouko Korppi-Tommola1. 1Department of Chemistry, Nanoscience Center, P.O. Box 35, FIN–40014 University of Jyväskylä, Finland; 2Department of Physical Chemistry, Lund University, Chemical Center, Box 124, SE-22100 Lund, Sweden. We have studied internal dynamics of dansylated poly(propyleneamine) dendrimers of different generations in solution and excitation energy transfer from dansyl chromophores to xanthene dyes that form van der Waals complexes with the dendrimers.

THUIII.2 16:15
Broadband femtosecond fluorescence up-conversion and Photon Echo experiments in the UV. •Olivier Brâm, Andrea Cannizzo, Ahmad Aijzarzadeh Oskouei, Andreas Tortschanoff, Frank van Mourik, and Majed Chergui; École Polytechnique Fédérale de Lausanne (EPFL), Laboratoire de Spectroscopie Ultrarapide, ISIC, FSB, BSP; CH-1015 Lausanne, Switzerland. The study of a small UV dye in different solvents with fluorescence up-conversion and photon-echo techniques in the UV range provides new insight in cooling relaxation and solvation dynamics of non-polar molecules in polar solvents.

THUIII.3 16:15
Propagation and beam geometry effect on 2D Fourier transform spectra of multi-level systems. •Byungmoon Cho, Michael Zetbacher, Katherine Kitney, Eric Smith, and David Jonas; Department of Chemistry and Biochemistry, University of Colorado, Boulder, Colorado, 80308, USA. We calculate 4-level two-dimensional (2D) Fourier transform spectra including propagation and beam geometry distortions which are 14% for optical density of 0.2 and 25% for crossing angle of 10 degrees.

THUIII.4 16:15
Probing Photodynamics of Retinal Protonated Schiff-Base with 7 fs Impulsive Vibrational Spectroscopy. •Oshrat Bismuth1, Noga Friedman1, Mordechai Sheves2, and Sanford Rahman1. 1Department of Physical Chemistry and Farkas Center for Light Induced Processes, The Hebrew University, Jerusalem 91904, Israel; 2Department of Organische Chemie, The Weizmann Institute of Science, Rehovot 76100, Israel. Frequency of C=C coherences following impulsive excitation of Retinal Protonated Schiff-Base blue shifts over time ending near that of S0. Assignment of this feature and relevance to the elusive S1 C=C frequency are discussed.

THUIII.5 16:15
The 2DIR Spectroscopy on CD Modes of Leucine-d10 Side Chain. •Sri Ram G Naraharisetty1, Valeriy M Kasyanenko1, Jörg Zimmermann2, Megan Thielges2, Floyd E Romesberg2, and Igor V Rubtsov1. 1Tulane University, New Orleans, LA 70118, USA; 2The Scripps Research Institute, La jolla, CA-9203, USA. We show that perdeuterated side chain of leucine amino acid and related compounds can serve as a useful structural reporter, suitable for studying proteins using 2DIR spectroscopy. Strong direct-coupling and relaxation-assisted C–D/C=O and C-D/Am–II cross-peaks were measured.

THUIII.6 16:15
A Time-resolved Vibrational Spectroscopy Study on Adenine/Thymine Based Nucleic Acid Systems. •Susan Quinn1, Gerard W. Doorley1, David A. McGovern1, Anthony W. Parker2, Kate L. Ronayne2, Mike Towrie2, and John M. Kelly1. 1School of Chemistry and Centre for Chemical Synthesis and Chemical Biology, Trinity College, Dublin 2, Ireland; 2Central Laser Facility, Science and Technology Research Council, Rutherford Appleton Laboratory, Chilton, Didcot, Oxfordshire. OX11 OQX, UK. The excited state properties of adenine and thymine in nucleotide, dinucleotide and polynucleotides (single and double-strands) are probed using ultrafast transient infrared spectroscopy. The differing deactivation processes and the involvement of excimers/exciplexes are considered.

THUIII.7 16:15
Electron Transfer in a Donor/Acceptor System Coupled to the Surface of Semiconductor Nanoparticles: Direct Electron Transfer vs. Electron Transfer Through Surface. •Víctor Matylitsky, Lars Dvorak, and Josef Wachtveitl; Institute for Physical and Theoretical Chemistry, J. W. Goethe-University Frankfurt, Max-von-Laue-Straße 7, D-60438 Frankfurt am Main, Germany. Photophysics of molecular donor/acceptor pair coupled to surface of semiconductor nanoparticles was studied via transient absorbance spectroscopy. Competition between electron injection to semiconductor nanoparticle and direct electron transfer in donor/acceptor pair through space was observed.

THUIII.8 16:15
Intramolecular Vibrational Energy Redistribution Measured by Femtosecond Pump-Probe Experiments in a Hollow Waveguide. •Alexander Kashnarenko, Vitaly Krylov, Eduard Miloglyadov, Martin Quack, and Georg Seyfang; Laboratory of Physical Chemistry, ETH-Zürich, Wolfgang-Pauli-Straße 10, 8092 Zurich, Switzerland. In femtosecond pump-probe experiments the intramolecular vibrational energy redistribution was investigated in the gas phase for CF3CHFI, CHBrFI, CHBrClF, C6H6. To increase the measured probe signal the experiments have been performed in a hollow waveguide.

THUIII.9 16:15
Ultrafast Vibrational Dynamics of Homo- and Hetero-Dimers of Excited-State-Proton-Transfer Compounds. •Poul B. Petersen, Sean T. Roberts, Mathew Kanan, Krupa Ramasesha, Daniel G. Nocera, and Andrei Tokmakoff; Department of Chemistry, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139, USA. The poster has been withdrawn by the authors.

THUIII.10 16:15
Femtosecond Time-Resolved Fluorescence Spectroscopy of N6,N6-Dimethyladenine: New Explanation of the "Dual
Fluorescence Dynamics from Decay and Rise Time Measurements at Threshold, Nina Schwalb and Friedrich Temps; Institut für Physikalische Chemie, Christian-Albrechts-Universität zu Kiel, Olshausenstr. 40, 24098 Kiel, Germany.

Femtosecond measurements of the fluorescence-time profiles of N⁶,N⁶-dimethyladenine in a wide wavelength range following excitation at threshold and much higher show identical dynamics, requiring a new explanation for the so-called “dual fluorescence” of the molecule.

THUIIf.11 • 16:15
Coherent Control of the Efficiency of an Artificial Light-Harvesting Complex, Janne Savolainen¹,², Riccardo Fanciulli², Niels Dijkstra², Ana Moore³, Jürgen Hauer⁴, Tiago Buck³u, Marcus Motzka³, and Jennifer Herek¹; ¹Optical Sciences, University of Twente, The Netherlands, ²FOM Institute AMOLF, Amsterdam, The Netherlands, ³Dept. of Chemistry and Biochemistry, Arizona State University, Tempe, USA, ⁴Physikalische Chemie, Philipps-Universität, Marburg, Germany.

Coherent control over the branching ratio between competing pathways for energy flow is realised for artificial light-harvesting complex. Direct insights to the mechanism featuring quantum interference of a low-frequency mode are presented.

THUIIf.12 • 16:15
Assignment of the Excited-State Infrared-Spectra in the Course of the Ring Opening Reaction of a Photochromic Dihydroazulene, Tobias E. Schrader¹, Uli Schmidhammer², Wolfgang J. Schreier³, Florian O. Koller¹, and Igor Pugliesi¹; ¹LS für BioMolekulare Optik, LMU München, Oettingenstr. 67, D-80538 Munich, Germany, ²Laboratoire de Chimie Physique, UMR8000 CNRS-Université Paris Sud, Bât 349, F-91405 Orsay, France.

With femtosecond infrared spectroscopy and ab initio calculations we could assign the transient spectrum at 1 ps to the ring opened product of the dihydroazulene photo induced reaction. Thus, ring-opening proceeds within 1 ps.

THUIIf.13 • 16:15

Time-resolved coincidence imaging of ultrafast molecular dynamics is exemplified on NO2 photodissociation. The combination of coincidence imaging with pulse shaping to study mechanisms in coherent control will be presented.

THUIIf.14 • 16:15
Ultrafast time and frequency domain vibrational dynamics of the CaF₂/H₂O interface, Ali Eftekhari-Bafrooei, Satoshi Nihonyanagi, and Eric Borguet; 1901 N. 13th Street, Philadelphia PA, 19122, USA.

The structure of water at the CaF₂/KOH interface was studied by vibrational sum-frequency-generation (SFG) spectroscopy and ultrafast SFG-Free Induction Decay, suggesting the presence of weakly hydrogen bonded OH at high pH.
THUIIIg.1 • 16:15
Real-time observation of the bond length modulation of carbon double bond during the photoisomerization of bacteriorhodopsin. Takayoshi Kobayashi1,2,3,4 and Atsushi Yabushita5; 1JST, ICORP, Ultrashort Pulse Laser Project, 3 Bancho-Building, 5 Bancho, 3 Bancho, Chiyoda-ku, Tokyo, 102-0075, Japan, 2Department of Applied Physics and Chemistry and Institute of Laser Research, 3Department of Electrophysics, National Chiao Tung University, 1001 Ta Hsueh Road, Hsinchu, 30050 Taiwan, 4Institute of Laser Engineering, Osaka University, 2-6 Yamada-oka, Suita, Osaka 565-0871 Japan.

The observation of the real time frequency of C=O stretching mode shows that the bond length is modulated in the order of 10mÅ by torsion of the C13=C14 double bond with a period of 200 fs.

THUIIIg.2 • 16:15
Electron Transfer in Photosynthetic Reaction Centers: Optimization in Model and Nature. Benjamin P. Fingerhat1, Wolfgang Zinth2, and Regina de Vivie-Riedle1; 1Department Chemie und Biochemie, Ludwig-Maximilians-Universität München, Butenandt-Str. 11, D-81377 Munich, Germany, 2Max-Planck-Institute of Biophysics, Max-von-Laue-Strasse 7, 60438 Frankfurt am Main, Germany.

We discuss the principles of optimal charge separation processes in bacterial reaction centers. Non-adiabatic electron transfer theory is combined with a Darwinian optimization. Our results reveal the fundamental boundary conditions for efficient charge separation.

THUIIIg.3 • 16:15
Coherently Controlled Release of Drugs in Ophthalmology. Tiago Buckup, Jens Möhring, Volker Settels, Jens Träger, Hee-Cheol Kim, Norbert Hampp, and Marcus Motzkus; Physikalische Chemie, Philipps Universität Marburg, D-35043 Marburg, Germany.

The photocleavage of a coumarin derivative dimer is a promising mechanism for laser controlled drug release in medical applications. We investigate the efficiency of the two-photon induced cleavage in open- and closed-loop control schemes.

THUIIIg.4 • 16:15
Light Harvesting, Energy Transfer and Photoprotection in the Fucoxanthin-Chlorophyll Proteins of Cyclotella meneghiniana. Nina Gildenhoff1, Sergiu Amarie1, Anja Beer2, Kathi Gundermann2, Claudia Büchel2, and Josef Wachtveitl1; 1Institut für Physikalische und Theoretische Chemie, Max von Laue-Strasse 7, Johann Wolfgang Goethe-Universität Frankfurt, 60438 Frankfurt am Main, Germany, 2Max-Planck-Institute of Biophysics, Max-von-Laue-Strasse 7, 60438 Frankfurt am Main, Germany.

The excitation energy transfer and the protective role of diadinoxanthin and diatoxanthin in two different Fucoxanthin-Chlorophyll-Proteins have been investigated using femtosecond transient absorption spectroscopy.

THUIIIg.5 • 16:15
Primary Reaction Dynamics of Green Absorbing Proteorhodopsin Observed by Femtosecond Infrared and Visible Spectroscopy. Karsten Neumann1, Mirka-Kristin Verhoeffen1, Ingrid Weber2, Clemens Glaubitz2, and Josef Wachtveitl1; 1Institut für Physikalische und Theoretische Chemie, Johann Wolfgang Goethe Universität, Max-von-Laue-Str. 7, 60438 Frankfurt am Main, Germany, 2Institut für Biophysikalische Chemie, Johann Wolfgang Goethe Universität, Max-von-Laue-Str. 9, 60438 Frankfurt am Main, Germany.

We study the light driven proton pump proteorhodopsin at two pH values. The comparison of transient absorption spectroscopy in the visible and infrared spectral range provides detailed information on the first steps in the photocycle.

THUIIIg.6 • 16:15
Photodynamics of Collagen Model Peptides: Towards the Monitoring of Folding and Unfolding of Tertiary Structures in Real Time. Lisa Lorenz1, Karsten Neumann1, Ulrike Kasebauch2, Luis Moroder2, and Josef Wachtveitl1; 1Institut für Physikalische und Theoretische Chemie, Max von Laue-Strasse 7, Johann Wolfgang Goethe-Universität Frankfurt, 60438 Frankfurt am Main, Germany, 2Max-Planck-Institute of Biochemistry, Am Klopferspitz 18, D-82152 Martinsried. Trans-cis-isomerization of a specially designed collagen-sample and its azobenzene-clamp are examined by time-resolved-spectroscopy. The bistable functionality of the azobenzene-switch is conserved upon binding, making this model peptide suitable for investigation of tertiary structure formation.
FRI1A • Dynamics at Interfaces

Auditorium
8:30–10:15
FRI1A • Dynamics at Interfaces
Chair: Peter Hamm, University of Zürich, Switzerland

FRI1A.1 • 8:30 • Invited
Ultrafast 2D-IR spectroscopy of a molecular monolayer.
• Jens Bredenbeck\textsuperscript{1,2}, Avishek Ghosh\textsuperscript{1}, Marc Smits\textsuperscript{1}, and Mischa Bonn\textsuperscript{1}; \textsuperscript{1}FOM Institute for Atomic and Molecular Physics, Kruislaan 407, 1098 SJ Amsterdam, the Netherlands; \textsuperscript{2}Institut für Biophysik, Universität Frankfurt, Max von Laue-Str. 1, 60438 Frankfurt, Germany.

We report on ultrafast 2-dimensional vibrational surface spectroscopy, providing information on coupling and energy transfer between vibrations of surface molecules. As a 4th order technique, it is bulk-forbidden in centrosymmetric materials and hence surface specific.

FRI1A.2 • 9:00
Frozen Dynamics and Insulation of Water at the Lipid Interface.
• Artem Bakulin, Dan Cringus, Maxim Pshenichnikov, and Douwe Wiersma; Zernike Institute for Advanced Materials, University of Groningen, Groningen, The Netherlands.

2D IR correlation spectroscopy reveals extremely slow dynamics and splitting of the OH-stretching mode of water in anionic micelles. Water at the lipid interface behaves as if the molecules were isolated in a frozen environment.

FRI1A.3 • 9:15
Vibrational dynamics of water at biological interfaces using ultrafast time-resolved sum frequency spectroscopy.
• Avishek Ghosh\textsuperscript{1,2}, Richard Kramer Campen\textsuperscript{1}, Maria Sovago\textsuperscript{1}, and Mischa Bonn\textsuperscript{1,2}; \textsuperscript{1}FOM-Institute for Atomic and Molecular Physics (AMOLF), Kruislaan 407, 1098 SJ Amsterdam, The Netherlands; \textsuperscript{2}Leiden Institute of Chemistry, Leiden University, P.O. Box 950, 2300 RA Leiden, The Netherlands.

We report studies on ultrafast vibrational dynamics of water molecules at model biological interfaces using a newly developed surface-specific femtosecond pump-probe spectroscopy technique.

FRI1A.4 • 9:30
Ultrafast Dynamics at Liquid Interfaces Investigated with Femtosecond Time-Resolved Multiplex Electronic Sum-Frequency Generation (TR-ESFG) Spectroscopy.
• Kentaro Sekiguchi, Shoichi Yamaguchi, and Tahei Tahara; RIKEN (The Institute of Physical and Chemical Research), 2-1 Hirosawa, Wako 351-0198, Japan.

We developed a new nonlinear spectroscopy, femtosecond time-resolved electronic sum-frequency generation (TR-ESFG) spectroscopy, to investigate ultrafast dynamics at liquid interfaces. Transient electronic spectra of dyes at the air/water interface were obtained for the first time.

FRI1A.5 • 9:45
Radiationless Transitions and Angular Momentum Transfer in Semiconductor Nanocrystals.
• Gregory Scholes, Jeongho Kim, and Cathy Wong; Department of Chemistry, 80 St. George Street, Institute for Optical Sciences, and Centre for Quantum Information and Quantum Control, University of Toronto, Toronto, Ontario M5S 3H6 (Canada).

Measurements of ultrafast relaxation processes for population in the exciton fine structure states of CdSe nanocrystals are reported and discussed. Relationships between the mechanism of these dynamics and size and shape of nanocrystals are described.

FRI1A.6 • 10:00
A New Technique to Measure Time-Resolved Circular Dichroism: Ultrafast Conformational Dynamics of 1,1’-Bi-2-naphthol.
• Claire Niezborala and François Hache; LOB, Ecole Polytechnique, 91128 Palaiseau, France.

Using a new time-resolved circular dichroism technique, we study the conformational relaxation of excited state (R)-1,1’-Bi-2-naphthol and show a twenty degree decrease of the dihedral angle in Ethanol on a one hundred picosecond timescale.
FRI1P • Tunable Ultrafast Pulse Generation

Panoramica
8:30–10:15

FRI1P • Tunable Ultrafast Pulse Generation
Chair: Andrius Baltuska, Vienna University of Technology, Austria

FRI1P.1 • 8:30
Generation of Broadband mid-infrared Pulses from an Optical Parametric Amplifier. •Cristian Manzoni, Daniele Brida, Giovanni Cirmi, Marco Marangoni, Sandro De Silvestri, and Giulio Cerullo; Dipartimento di Fisica, Politecnico di Milano, Piazza L. Da Vinci, 32, 20133 Milan, Italy.

We generate broadband mid-IR pulses from an 800-nm-driven optical parametric amplifier in LiIO3. Exploiting its broad phase-matching bandwidth around 1 µm, we produced 2-µJ idler pulses in the 3-4 µm range supporting 30-fs transform-limited duration.

FRI1P.2 • 8:45
Optimized 2-micron Optical Parametric Chirped Pulse Amplifier for High Harmonic Generation. •Jeffrey Moses, Oliver D. Mücke, Shu-Wei Huang, Andrew Benedick, Edilson L. Falcão-Filho, Kyung-Han Hong, Aleem M. Siddiqui, Jonathan R. Birge, F. Ömer Ilday, and Franz X. Kärtner; Department of Electrical Engineering and Computer Science and Research Laboratory of Electronics, Massachusetts Institute of Technology, Cambridge, MA 02139, USA.

An optical parametric chirped pulse amplification system producing high-energy, few-cycle pulses at 2-micron wavelength for high harmonic generation is demonstrated. Simultaneous optimization of conversion efficiency, bandwidth and signal-to-noise ratio is obtained.

FRI1P.3 • 9:00
Generation of sub-20-fs, two-color deep-ultraviolet pulses by four-wave mixing through filamentation in gases. •Takao Fuji, Takuya Horio, and Toshihori Siczuki; Chemical Dynamics Laboratory, RIKEN, Wako, Japan.

Generation of ultrashort pulses at 260 nm and 200 nm by four-wave mixing through filamentation in neon gas is demonstrated. The both pulses were simultaneously compressed down to sub-20 fs by a grating-based compressor.

FRI1P.4 • 9:15
Efficient ultrafast four-wave optical parametric amplification in condensed bulk media. •Audrius Dubietis1, Heli Valta1,2, Gintaras Tamosauskas1, and Algis Piskarskas1, 2Department of Quantum Electronics, Vilnius University, Sauletekio Ave. 9, bldg. 3, LT-10222 Vilnius, Lithuania, 2Institute of Physics, University of Tartu, Riia 142, 51014 Tartu, Estonia.

Highly efficient broadband four-wave optical parametric amplification in bulk Kerr media (water and fused silica) is demonstrated by means of non-collinear phase-matching and cylindrical focusing geometry without onset of beam break-up and filamentation.

FRI1P.5 • 9:30
Cascade four-wave mixing technique for high-power few-cycle pulse generation. •Helder Crespo1,2 and Rosa Weigand3; 1Departamento de Física, Faculdade de Ciências, Universidade do Porto, 4169-007 Porto, Portugal, 2Currently with the Research Laboratory of Electronics, Massachusetts Institute of Technology, Cambridge, MA 02139-4307, USA, 3Departamento de Óptica, Faculdad de Ciencias Físicas, Universidad Complutense de Madrid 28040 Madrid, Spain.

Near-single-cycle 2.7-fs visible-UV pulses are obtained from Fourier synthesis of a 1.4-octave spectrum, generated by cascaded four-wave mixing of amplified ultrashort laser pulses in bulk silica, and characterized using broadband cross-correlation frequency resolved optical gating.

FRI1P.6 • 9:45
2 MHz repetition rate - 15 fs fiber amplifier pumped optical parametric amplifier. •Stefan Hädrich1, Jan Rothhardt1, Fabian Roser1, Damian Schimpf1, Jens Limpert1, and Andreas Tünnermann1,2; 1Friedrich Schiller Universität Jena, Institute of Applied Physics, Albert-Einstein-Str. 15, 07745 Jena, Germany, 2Institute of Applied Optics and Precision Engineering, Albert-Einstein-Str. 7, 07745 Jena, Germany.

An optical parametric amplifier pumped by a fiber amplifier producing ultrashort pulses with durations of 15.6 fs at 2 MHz repetition rate is presented together with scaling considerations to tens of µJ pulse energy.

FRI1P.7 • 10:00
Octave-wide tunable NOPA pulses at up to 2 MHz repetition rate. •Christian Homann, Christian Schriefer, Peter Baum, and Eberhard Riedle; LS für BioMolekulare Optik, Ludwig-Maximilians-Universität München, Oettingenstrasse 67, 80538 München, Germany.

Based on noncollinear parametric amplification, we demonstrate frequency conversion of the 230 fs pulses of a high repetition rate ytterbium-doped fiber amplifier system to octave wide tunable femtosecond pulses with down to 20 fs duration.
FRI2 • High Harmonic and Attosecond Pulse Generation

Auditorium
10:45–12:30

FRI2 • High Harmonic and Attosecond Pulse Generation
Chair: Mauro Nisoli, Politecnico di Milano, Milan, Italy

FRI2.1 • 10:45  • Invited

Sub-100-as soft-X-ray pulses.  • Eleftherios Goulielmakis\(^1\), martin Schultze\(^1\), Michael Hofstetter\(^2\), Matthias Uberacker\(^2\), Justin Gagnon\(^1\), Vladislav Yakovlev\(^2\), Ulf Kleineberg\(^2\), and Ferenc Krausz\(^1,2\);  • Max-Planck-Institut für Quantenoptik, Hans-Kopfermann-Strasse 1, D-85748 Garching, Germany,  • Department für Physik, Ludwig-Maximilians-Universität, am Coulombwall 1, Germany.

We demonstrate generation of powerful sub-100-as soft-x-ray pulses by means of 1.5-cycle waveform-controlled laser fields. Our new tool opens the door for exploring electronic processes on a time scale approaching the atomic unit.

FRI2.2 • 11:15

Generation of High-order Harmonics with a Near-IR Self-phase-stabilized Parametric Source.  • Caterina Vozzi\(^1\), Francesca Calegari\(^1\), Fabio Frassetto\(^2\), Enrico Benedetti\(^3\), Mauro Nisoli\(^1\), Giuseppe Sansone\(^1\), Luca Poletto\(^2\), Paolo Villoresi\(^2\), and Salvatore Stagira\(^1\);  • INFN-CNR ULTRAS, Dipartimento di Fisica, Politecnico di Milano,  • INFN-CNR LUXOR, Dei Università di Padova.

We generated high-order harmonics with self-phase-stabilized near-IR pulses produced by a parametric source. We observed a significant cutoff extension with respect to 800-nm driving pulses at comparable peak intensity.

FRI2.3 • 11:30

Quasi-Phase-Matched High-Order Harmonic Generation in the Soft-X-ray Regime.  • Josef Seres\(^1,2\), Vlad S. Yakovlev\(^3\), Enikő Szeres\(^1,2\), Christina Streli\(^2\), Peter Wobrauschek\(^4\), Ferenc Krausz\(^5,5\), and Christian Spielmann\(^1\);  • Physikalisches Institut EP1, Universität Würzburg, D-97074 Würzburg, Germany,  • Institut für Photonik, Technische Universität Wien, A-1040 Wien, Austria,  • Depart für Physik, Ludwig-Maximilians-Universität München, D-85748 Garching, Germany,  • Atom Institut, Technische Universität Wien, A-1020 Wien, Austria,  • Max-Planck-Institut für Quantenoptik, D-85748 Garching, Germany.

We realized quasi-phase-matched generation soft x-rays emitted from two gas jets. The harmonic signal has been enhanced in a broad range (250eV to 600eV) having a maximum of two orders of magnitude at 400eV.

FRI2.4 • 11:45

Optically-induced phase structures and quasi-phase matching of high harmonic generation at keV energies.  • Oren Cohen, Tenio Popmintchev, Amy Lytle, Henry Kaptayn, and Margaret Murnane;  • JILA, University of Colorado, Boulder, CO 80309-0440 USA.

Multiple weak quasi-cw waves can induce complex phase modulated structures in the high-harmonic generation process. These "photonic" structures can be used for quasi-phase-matched frequency upconversion even into the hard x-ray region.

FRI2.5 • 12:00

Study of quantum-paths interference in the high harmonics generation.  • Amelle Zair\(^1\), Mirko Holler\(^1\), Florian Schapper\(^1\), Lukas Gallmann\(^1\), Ursula Keller\(^1\), Adam Wyatt\(^2\), Antoine Monmayrant\(^2\), Ian Walmsley\(^2\), Eric Cormier\(^2\), Thierry Auguste\(^3\), Jean-Pascal Caume\(^3\), and Pascal Salières\(^4\);  • Physics Department, ETH Zurich, CH-8093 Zurich, Switzerland,  • Clarendon Laboratory, Parks Road, Oxford OX1 3PU, UK,  • CELIA, CNRS-CEA-Université Bordeaux 1, 351 cours de la Libération, 33405 Talence, France,  • Services des Photons, Atomes et Molécules, CEA-Saclay, 91191 Gif-sur-Yvette, France.

We studied the intensity dependent high-order harmonics generated in Neon when several electron trajectories contribute to the emission. We directly experimentally observed quantum-paths interference and highlight the contribution of many trajectories in the generation process.

FRI2.6 • 12:15

Enhanced Harmonic Generation in Gas Jets with Expanding Clusters.  • Bonggu Shim, Xiaohui Gao, Todd Ditmire, and Mike Downer;  • FOCUS center, Department of Physics, University of Texas at Austin, Austin, TX 78712, USA.

We report femtosecond-time-resolved enhancement and anisotropy of third-harmonic generation in highly ionized clustered argon at intensities exceeding 10\(^15\) W/cm\(^2\). Results suggest a path to phase-match high-order harmonic generation in dense plasmas with ultrahigh intensity.