17th International Conference on Ultrafast Phenomena (UP)

July 18–23, 2010, The Silvertree Hotel and Snowmass Conference Center, Snowmass Village, CO, USA

The major international forum showcasing new work in the rapidly moving field of ultrafast science and technology. Learn more.

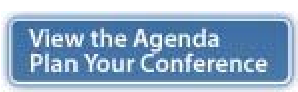
Follow Miaochan Zhi, as she blogs about UP!
The blog features many great pictures from the conference. Enjoy the great pictures of yourself and your colleagues!

Pre-Registration is now closed. You may still register on-site at the Snowmass Conference Center (Snowmass Village, Colorado) beginning Sunday, July 18.

Take advantage of all UP has to offer:

- Selected renowned experts presenting invited talks
- Oral presentations selected during a highly competitive peer-review process
- Postdeadline Session reporting critical breakthroughs
- Poster sessions providing one-on-one discussion time with presenters
- Tabletop exhibit
- Daily networking events
- Proceedings

Conference Program



View the conference program and plan your itinerary for the conference

- Browse speakers and the agenda of sessions
- Browse sessions by type or day
- Use Advanced Search to search by author, title, OCIS code and more
- Plan and print your personal itinerary before coming to the conference
- Download your personal itinerary to your mobile device
- Add your personal itinerary to your electronic calendar
- Email your itinerary to a colleague who might be interested in attending

Download pages from the program book!

- Agenda of Sessions
- Abstracts
- Key to Authors and Presiders

Special Opportunities for Students and Young Professionals

Special Events Details

- Welcome Reception
- Poster Sessions
- Conference Dinner
- Post Deadline Sessions

Sponsor:

OSA

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July 18–23, 2010, The Silvertree Hotel and Snowmass Conference Center, Snowmass Village, CO, USA

Program

The program for 17th International Conference on Ultrafast Phenomena (UP) will be held Monday, July 19, 2010 through Friday, July 23, 2010. No technical sessions are scheduled for Sunday, July 18; however participants may register and pick up their materials on Sunday afternoon and are encouraged to attend the Welcome Reception on Sunday evening.

- Online Conference Program
- About the meeting topics
- Special Events
- Invited speakers

Follow Miaochan Zhi, as she blogs about UP!

Online Conference Program

Searchable Conference Program Available Online!

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- Agenda of Sessions
- Abstracts
- Key to Authors and Presiders

About the 17th International Conference on Ultrafast Phenomena

The 2010 International Conference on Ultrafast Phenomena will be the 17th 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.

This year's conference will bring together a multi-disciplinary 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.

Papers were considered in the following 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
- Frequency standards

o **Physics**
- Ultrafast processes in condensed matter
- Nonlinear optics and plasmonics
- Kinetics of nonequilibrium processes
- Quantum confinement
- Coherent transients
- Nonlinear pulse propagation
- Novel ultrafast spectroscopic techniques
- High intensity physics
- X-ray and plasma physics

o **Chemistry**
- Ultrafast reactions
- Conformational and solvent dynamics
- Energy transfer
- Proton and electron transfer
- Transient molecular structure
- Wavepacket motion
- Coherent control of reactions

o **Biology**
- Ultrafast processes in photosynthesis
- Vision
- Heme proteins
- Photoisomerization in chromoproteins
- Wavepacket motion
- Medical applications

o **Electronics and Optoelectronics**
- Photoconductivity
- Generation
- Propagation and detection of ultrafast electrical signals
- Terahertz radiation
- Electro-optical sampling
- Detectors

o **Applications**

Real world applications of ultrafast technology, including ultrafast near-field, nonlinear, and confocal microscopes, high speed communication, micromachining and more!

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Chairs & Committee Members

The Technical Program Chairs and Committee Members are integral to the success of the meeting. These volunteers dedicate countless hours to planning, including such critical activities as raising funds to support the event, securing invited speakers, reaching out to colleagues to encourage submissions, reviewing papers, and scheduling sessions. On behalf of OSA, its Board, and its entire staff, we extend enormous gratitude to the following members of the 17th International Conference on Ultrafast Phenomena Technical Program Committee.

Program Committee

Information for Conference Chairs and Committee Members

Information for Session Chairs/Presiders

Program Committee

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If you are a member of the committee and have any questions or concerns at any point along the way, please refer to the information below or contact your program manager.

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Exhibit: July 19-22, 2010 at The Silvertree Hotel and Snowmass conference Center, Snowmass Village, CO, USA

Reserve your exhibit space at the UP meeting, where more than 200 industry experts and top scientists and developers will share their latest research and collaborate on new and future applications within this specialized field. Exhibiting at the UP exhibit offers you an extremely targeted opportunity to display your company's Ultrafast products to top industry experts.

Reserve Your Exhibit Space

Bonus: You will receive one free technical pass for every tabletop space or 10'x10' booth you purchase.

Current Exhibitor List (as of July 12, 2010)

Biophotonics Solutions
Boulder Nonlinear
Coherent
Fastlite
Femtolasers
Idesta QE
IFG
Kapteyn Murnane Laboratories
Lighthouse Photonics
Menlo Systems
Mesa Photonics
Newport
Optigrate
Photonics Media
Swamp Optics
Toptica
Ultrafast Innovations
Venteon Laser Tech

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Idesta Quantum Electronics is a Massachusetts Institute of Technology (MIT) spin-off company that develops ultrafast lasers and optics as well as photonics tools for the ultrafast community. Products are developed in close collaboration with its founding partners, Professors Franz Kärtner and Jim Fujimoto at MIT. Our current portfolio includes the Octavius octave spanning, sub-6-fs Ti:Sa laser and an advanced tool for pulse characterization based on two-dimensional-shearing-interferometry. idestaQE is a strategic partner of Thorlabs (www.thorlabs.com)

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Special Events

Conference Welcome Reception
Sunday, July 18, 2010, 6:30 p.m.-7:30 p.m.

Meet with colleagues from around the world and start the conference excitement early by attending the Welcome Reception. This reception is the perfect kick-off to this year's meeting. Light hors d'oeuvres will be served. Free to all Technical Conference Attendees. Additional tickets can be purchased at Registration for US $50.

Poster Sessions
Monday, July 19, 2010, 3:45 p.m.-4:45 p.m. and 6:30 p.m.-7:30 p.m.
Tuesday, July 20, 2010, 3:45 p.m.-4:45 p.m. and 6:30 p.m.-7:30 p.m.
Thursday, July 22, 2010, 3:45 p.m.-6:00 p.m.

Poster presentations offer a great way to communicate new research findings and provide an opportunity for lively and detailed discussion between presenters and interested viewers. There are three poster sessions featuring a number of outstanding presentations. Don't miss the nearly 150 posters scheduled throughout the week. On Monday and Tuesday, the poster presentations will extend into the evening and will include drinks and snacks, allowing you even more time to interact with presenters.

Conference Dinner
Wednesday, July 21, 2010, 6:30 p.m.-9:00 p.m.

The Conference Dinner provides another great opportunity to network with your colleagues and to make new connections. Free to all Technical Conference Attendees. Additional tickets can be purchased at Registration for US $75.

Postdeadline Paper Presentations
Thursday, July 22, 2010, 8:00 p.m.-10:00 p.m.

Hear exciting discussions of new and significant material in rapidly advancing areas during the postdeadline paper session. A limited number of postdeadline submissions will be selected for presentation, and only those papers judged to be truly excellent and compelling in their timeliness will be accepted.

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Invited Speakers

MA1, Femtosecond Molecular Photocrystallography, ***Hubert Jean-Ruel****, Meng Gao, Ryan R. Cooney, Cheng Lu, Germán Sciaini, Dwayne R. J. Miller; Univ. of Toronto, Canada*

MD1, High Harmonic Generation by High Energy OPA Source, *E. J. Takahashi, P. Lan, Y. Nabekaw,* ***Katsumi Midorikawa****; RIKEN, Japan*

MG1, Ultrafast Magnetism: Coherent Processes and Angular Momentum Transfer, ***Jean-Yves Bigot****, Christine Boeglin, Mircea Vomir, Valérie Halté, Eric Beaurepaire; CNRS, Univ. of Strasbourg, France*

TuA1, High-Energy Isolated Attosecond Pulses, *Matteo Lucchini, Federico Ferrari, Francesca Calegari, Caterina Vozzi, Salvatore Stagira, Giuseppe Sansone,* ***Mauro Nisoli****; Politecnico di Milano, Italy*

TuC6, Cycle-Engineered Coherent Steering of Electrons with a Multicolor Optical Parametric Synthesizer, ***Tadas Balčiūnas***[1]*, Giedrius Andriukaitis[1], Aart J. Verhoef[1], Oliver D. Mücke[1], Audrius Pugžlys[1], Andrius Baltuška[1], Darius Mikalauskas[2], Linas Giniūnas[2], Romualdas Danielius[2], Matthias Lezius[3], Ronald Holzwarth[3,4]; [1]Photonics Inst., Vienna Univ. of Technology, Austria, [2]Light Conversion Ltd., Lithuania, [3]Max-Planck-Inst. of Quantum Optics, Germany, [4]Menlo Systems GmbH, Germany*

TuD1, Tracking Ultrafast Chemical Reaction Dynamics Using Transient 2-DIR Spectroscopy, *Carlos R. Baiz, Robert McCanne, Jessica M. Anna,* ***Kevin J. Kubarych****; Univ. of Michigan, USA*

WA1, High Harmonics Generation by Plasmonic Resonance of Metal Nanostructures and Its Applications, ***Seung-Woo Kim****, Joonhee Choi, Seungchul Kim, In-Yong Park; KAIST, Republic of Korea*

WD1, Quantum-Coherent Energy Transfer in Marine Algae at Ambient Temperature via Ultrafast Photon Echo Studies, *Cathy Y. Wong, Hoda Hossein-Nejad, Carles Curutchet,* ***Gregory Scholes****; Univ. of Toronto, Canada*

ThA1, High Harmonic Spectroscopy of Small Molecules: Waiting for HODO, *Y. Mairesse[1], J. Higuet[1], N. Dudovich[2], D. Shafir[2], B. Fabre[1], E. Mevel[1], E. Constant[1], D. Villeneuve[3], P. Corkum[3], S. Patchkovskii[3], M. Yu. Ivanov[4], Z. Walters[5],* ***Olga Smirnova***[5]*; [1]Univ. Bordeaux 1, France, [2]Weizmann Inst. of Science, Israel, [3]Natl. Res. Council Canada, Canada, [4]Imperial College London, UK, [5]Max-Born-Inst., Germany*

ThC1, Coherent Measurements of High-Order Electronic Correlations in GaAs Quantum Wells, ***Daniel Turner****, Keith A. Nelson; MIT, USA*

ThD2, Vibrational Energy Transport in Peptides and Proteins, ***Peter Hamm***[1]*, Marco Schade[1], Ellen H. G. Backus[1], Alessandro Moretto[2], Claudio Toniolo[2]; [1]Inst. of Physical Chemistry, Univ. of Zürich, Switzerland, [2]Inst. of Biomolecular Chemistry, Padova Unit, CNR, Dept. of Chemistry, Univ. of Padova, Italy*

FA1, Transient Electronic Structure of Solids and Surfaces Studied with Time- and Angle-Resolved Photoemission, *L. Rettig[1], R. Cortes[1,2], H. A. Dürr[3], J. Fink[3], U. Bovensiepen[4],* ***Martin Wolf***[1,2]*; [1]Freie Univ. Berlin, Germany, [2]Fritz-Haber-Inst. of the Max-Planck-Society, Germany, [3]Helmholtz-Zentrum Berlin, Germany, [4]Dept. of Physics, Univ. Duisburg-Essen, Germany*

FB1, Attosecond Angular Streaking and Tunneling Delay Time in Strong Laser Field Ionization, *P. Eckle, A. N. Pfeiffer, C. Cirelli, A. Staudte, R. Dörner, H. G. Muller,* ***Ursula Keller****; ETH Zürich, Switzerland*

	UP I Anderson Room	UP II Hoagland
Sunday, July 18		
3:00 p.m.–6:00 p.m.	**Registration Open,** *Lobby*	
6:30 p.m.–7:30 p.m.	**Welcome Reception,** *Rooftop Garden*	
Monday, July 19		
7:00 a.m.–5:30 p.m.	**Registration Open,** *Lobby*	
8:15 a.m.–8:30 a.m.	**Opening Remarks**	
8:30 a.m.–10:15 a.m.	**MA • Electron and X-Ray Diffraction**	
10:15 a.m.–10:45 a.m.	**Coffee Break/Exhibits,** *Erickson/Carroll/Sinclair Rooms*	
10:15 a.m.–4:15 p.m.	**Exhibits Open,** *Erickson/Carroll/Sinclair Rooms*	
10:45 a.m.–12:30 p.m.	**MB • Single-Cycle Pulse Generation**	**MC • 0-D and 1-D Quantum Systems**
12:30 p.m.–2:00 p.m.	**Lunch Break** *(on your own)*	
2:00 p.m.–3:45 p.m.	**MD • High Harmonic Generation**	
3:45 p.m.–4:15 p.m.	**Coffee Break/Exhibits,** *Erickson/Carroll/Sinclair Rooms*	
3:45 p.m.–4:45 p.m.	**ME • Poster Session I,** *Rooftop Garden*	
4:45 p.m.–6:45 p.m.	**MF • Water**	**MG • Strongly Correlated Materials**
6:30 p.m.–7:30 p.m.	**ME •Poster Session I (Continued),** *Rooftop Garden*	
Tuesday, July 20		
7:30 a.m.–5:30 p.m.	**Registration Open,** *Lobby*	
8:30 a.m.–10:15 a.m.	**TuA • Attosecond Pulse Generation**	
10:15 a.m.–10:45 a.m.	**Coffee Break/Exhibits,** *Erickson/Carroll/Sinclair Rooms*	
10:15 a.m.–4:15 p.m.	**Exhibits Open,** *Erickson/Carroll/Sinclair Rooms*	
10:45 a.m.–12:30 p.m.	**TuB • Metamaterials and Plasmonics**	**TuC • Optical Parametric Amplifiers**
12:30 p.m.–2:00 p.m.	**Lunch Break** *(on your own)*	
2:00 p.m.–3:45 p.m.	**TuD • Chemical Reaction Dynamics**	
3:45 p.m.–4:15 p.m.	**Coffee Break/Exhibits,** *Erickson/Carroll/Sinclair Rooms*	
3:45 p.m.–4:45 p.m.	**TuE • Poster Session II,** *Rooftop Garden*	
4:45 p.m.–6:30 p.m.	**TuF • Shaped Pulses**	**TuG • Transient Biomolecular Structures**
6:30 p.m.–7:30 p.m.	**TuE •Poster Session II (Continued),** *Rooftop Garden*	

	UP I Anderson Room	UP II Hoagland
Wednesday, July 21		
8:00 a.m.–5:00 p.m.	**Registration Open,** *Lobby*	
8:30 a.m.–10:15 a.m.	**WA • Optical Antennas and Nanosystems**	
10:15 a.m.–10:45 a.m.	**Coffee Break/Exhibits,** *Erickson/Carroll/Sinclair Rooms*	
10:15 a.m.–4:15 p.m.	**Exhibits Open,** *Erickson/Carroll/Sinclair Rooms*	
10:45 a.m.–12:30 p.m.	**WB • Molecular Electron Correlation**	**WC• Novel Ultrafast Techniques**
12:30 p.m.–2:00 p.m.	**Lunch Break** *(on your own)*	
2:00 p.m.–3:45 p.m.	**WD • Photosynthesis**	
3:45 p.m.–4:15 p.m.	**Coffee Break/Exhibits,** *Erickson/Carroll/Sinclair Rooms*	
4:15 p.m.–5:45 p.m.	**WE • Attosecond Spectroscopy I**	
7:30 p.m.–9:30 p.m.	**Conference Dinner**	
Thursday, July 22		
8:00 a.m.–5:00 p.m.	**Registration Open,** *Lobby*	
8:30 a.m.–10:15 a.m.	**ThA • Attosecond Spectroscopy II**	
10:15 a.m.–10:45 a.m.	**Coffee Break/Exhibits,** *Erickson/Carroll/Sinclair Rooms*	
10:15 a.m.–4:15 p.m.	**Exhibits Open,** *Erickson/Carroll/Sinclair Rooms*	
10:45 a.m.–12:30 p.m.	**ThB • Light Driven Dynamics in Biomolecules**	**ThC • Quantum Coherence Correlations**
12:30 p.m.–2:00 p.m.	**Lunch Break** *(on your own)*	
2:00 p.m.–3:45 p.m.	**ThD • Vibrational Coherence and Energy Transport**	
3:45 p.m.–4:15 p.m.	**Coffee Break/Exhibits,** *Erickson/Carroll/Sinclair Rooms*	
3:45 p.m.–6:00 p.m.	**ThE • Poster Session III,** *Rooftop Garden*	
6:00 p.m.–8:00 p.m.	**Dinner Break** *(on your own)*	
8:00 p.m.–10:00 p.m.	**Postdeadline Papers Session**	
Friday, July 23		
8:30 a.m.–12:00 p.m.	**Registration Open,** *Lobby*	
8:30 a.m.–10:15 a.m.	**FA• Surfaces and Interfaces**	
10:15 a.m.–10:45 a.m.	**Coffee Break,** *Foyer*	
10:45 a.m.–12:15 p.m.	**FB • Strong Field Ionization Dynamics**	
12:30 p.m.–12:45 p.m.	**Closing Remarks**	

Anderson Room	Hoaglund Room

Sunday, July 18, 3:00 p.m.–6:00 p.m. Registration Open, *Lobby*

Sunday, July 18, 6:30 p.m.–7:30 p.m. Welcome Reception, *Rooftop Garden*

Monday, July 19, 7:00 a.m.–5:30 p.m. Registration Open, *Lobby*

Opening Remarks

Monday, July 19
8:15 a.m.–8:30 a.m.

MA • Electron and X-Ray Diffraction

Monday, July 19
8:30 a.m.–10:15 a.m.
Majed Chergui; École Polytechnique Fédérale de Lausanne, Switzerland, Presider

MA1 • 8:30 a.m. **Invited**

Femtosecond Molecular Photocrystallography, *Hubert Jean-Ruel, Meng Gao, Ryan R. Cooney, Cheng Lu, Germán Sciaini, Dwayne R. J. Miller; Univ. of Toronto, Canada.* Femtosecond electron diffraction is used to directly observe the cooperative structural changes associated with the order-to-order phase transition of photochromic molecular crystals**,** involving classic cyclization and cycloreversion reaction mechanisms.

MA2 • 9:00 a.m.

Ultrafast Order Parameter Melting in a 2-D Charge Density Wave 1T-TaS2 Probed by Femtosecond Electron Diffraction, *Maximilian Eichberger[1], Hanjo Schäfer[1], Marina Krumova[1], Jure Demsar[1], Helmuth Berger[2], Gustavo Moriena[3], German Sciaini[3], Dwayne R. J. Miller[3]; [1]Univ. of Konstanz, Germany, [2]École Polytechnique Fédérale de Lausanne, Switzerland, [3]Univ. of Toronto, Canada.* We present the first study of the order parameter dynamics in a Charge-Density-Wave system utilizing femtosecond electron diffraction. The results reveal an ultrafast suppression of the CDW order, whose recovery proceeds on the picosecond timescale.

MA3 • 9:15 a.m.

Ultrafast Electron Diffraction from Aligned Molecules, *Martin Centurion[1], Peter Reckenthaeler[2], Ferenc Krausz[2], Ernst Fill[2]; [1]Univ. of Nebraska at Lincoln, USA, [2]Max-Planck-Inst. für Quantenoptik, Germany.* We present experimental results on ultrafast electron diffraction from transiently aligned molecules in the absence of external (aligning) fields. The molecules are aligned selectively through a photodissociation reaction using a femtosecond laser pulse.

MA4 • 9:30 a.m.

Single-Shot, Femtosecond Electron Diffraction, *Peter Pasmans, Thijs van Oudheusden, Marieke de Loos, Bas van der Geer, Arjan Klessens, Jom Luiten; Eindhoven Univ. of Technology, Netherlands.* High-quality electron diffraction patterns can be recorded in a single sub-picosecond shot by using radio-frequency compression techniques to overcome the Coulomb expansion of the required electron bunches. First single-shot diffraction measurements are presented.

MA5 • 9:45 a.m.

X-Ray Powder Diffraction with Femtosecond Time Resolution, *Flavio Zamponi, Zunaira Ansari, Jens Dreyer, Michael Woerner, Thomas Elsaesser; Max-Born-Inst. für Nichtlineare Optik und Kurzzeitspektroskopie, Germany.* Transient electronic charge density maps with 30 picometer spatial and 100 femtosecond temporal resolution derived from Debye Scherrer experiments unravel for the first time a concerted electron and proton transfer in hydrogen-bonded $(NH_4)_2SO_4$ crystals.

MA6 • 10:00 a.m.

Ultrafast Lattice Dynamics in FeRh during a Laser-Induced Magnetic Phase Transition, *Uladzimir Shymanovich[1], Wei Lu[1], Matthieu Nicoul[1,2], Alexander Tarasevitch[1], Dietrich von der Linde[1], Klaus Sokolowski-Tinten[1]; [1]Univ. Duisburg-Essen, Germany, [2]Univ. Köln, Germany.* Time-resolved X-ray diffraction is used to study the lattice response of FeRh during a laser-driven anti-ferromagnetic to ferromagnetic phase transition. The experiments reveal a fast and a slow component in the induced expansion dynamics.

10:15 a.m.–10:45 a.m. Coffee Break/Exhibits, ***Erickson/Carroll/Sinclair Rooms***

10:15 a.m.–4:15 p.m. Exhibits Open, ***Erickson/Carroll/Sinclair Rooms***

MB • Single-Cycle Pulse Generation

Monday, July 19
10:45 a.m.–12:30 p.m.
Franz X. Kärtner; MIT, USA, Presider

MB1 • 10:45 a.m.
Approaching the Full Octave: Noncollinear Optical Parametric Chirped Pulse Amplification with Two-Color Pumping, *Christian Homann[1], Daniel Herrmann[1,2], Raphael Tautz[2,3], Laszlo Veisz[2], Ferenc Krausz[2,4], Eberhard Riedle[1]; [1]LS für BioMolekulare Optik, Ludwig-Maximilians-Univ. München, Germany, [2]Max-Planck-Inst. für Quantenoptik, Germany, [3]LS für Photonik und Optoelektronik, Ludwig-Maximilians-Univ. München, Germany, [4]LS für Laserphysik, Ludwig-Maximilians-Univ. München, Germany.* We amplify ultrabroadband spectra (580-1000 nm) to mJ energies by applying different pump wavelengths in subsequent stages of a NOPCPA chain. As proof-of-principle we compress pulses composed by this new technique close to their Fourier-Limit.

MB2 • 11:00 a.m.
Generation of Single-Cycle Light Pulses with Compact Er:Fiber Technology, *Günther Krauss, Tobias Hanke, Alexander Sell, Stefan Eggert, Rupert Huber, Alfred Leitenstorfer; Univ. of Konstanz, Germany.* Based on a two-branch Er:fiber laser system we demonstrate the synthesis of 4.3 fs pulses, corresponding to single cycles of light in the telecom frequency band.

MB3 • 11:15 a.m.
Towards CEP Stable, Single-Cycle Pulse Compression with Bulk Material, *Bruno E. Schmidt[1,2], Pierre Béjot[3], Andrew D. Shiner[2], Philippe Lassonde[1], Carlos Trallero-Herrero[2], Jean-Pierre Wolf[4], David M. Villeneuve[2], Jean-Claude Kieffer[1], Paul B. Corkum[2], François Légaré[1]; [1]INRS, Canada, [2]Joint Lab for Atto-Second Science, Univ. of Ottawa and Natl. Res. Council Canada, Canada, [3]Univ. de Bourgogne, France, [4]Univ. de Genève, Switzerland.* We demonstrate both experimentally and numerically that self-steepening during propagation in a hollow-fiber followed by linear propagation through glass in the anomalous dispersion enables pulse compression down to 1.6 cycles at 1.8 μm wavelength.

MB4 • 11:30 a.m.
Phase-Locked Single-Cycle Pulses in the Multi-THz Range with Peak Electric Fields Exceeding 10 MV/cm, *Friederike Junginger[1], Alexander Sell[1], Olaf Schubert[1], Bernhard Mayer[1], Daniele Brida[2], Marco Marangoni[2], Giulio Cerullo[2], Rupert Huber[1], Alfred Leitenstorfer[1]; [1]Univ. of Konstanz, Germany, [2]Politecnico di Milano, Italy.* Single-cycle idler transients covering the 6-60 THz frequency window with peak amplitudes exceeding 10 MV/cm are generated by parametric amplification of 1.3-μm pulses in GaSe. The temporal trace of the phase-stable waveform is detected electro-optically.

MB5 • 11:45 a.m.
Self-Referenced Oscillator Pulse Train with Constant Carrier-Envelope-Offset Phase, *Stefan Rausch[1,2], Thomas Binhammer[3], Anne Harth[1,2], Uwe Morgner[1,2,4]; [1]Inst. of Quantum Optics, Leibniz Univ. Hannover, Germany, [2]Ctr. for Quantum Engineering and Space-Time Res. (QUEST), Germany, [3]VENTEON Laser Technologies GmbH, Germany, [4]Laser Zentrum Hannover, Germany.* We present an oscillator pulse train stabilized to carrier-envelope-offset frequency zero with 65 attosecond timing jitter. The excellent locking performance is verified by recording the interference of more than 10^{10} pulses in an out-of-loop interferometer.

MC • 0-D and 1-D Quantum Systems

Monday, July 19
10:45 a.m.–12:30 p.m.
Antoinette J. Taylor; Los Alamos Natl. Lab, USA, Presider

MC1 • 10:45 a.m.
Ultrafast Few-Fermion Optoelectronics of a Single Quantum Dot, *Markus Zecherle[1], Claudia Ruppert[1], Emily C. Clark[2], Jonathan J. Finley[2], Markus Betz[1,3]; [1]Physik-Dept., Technischen Univ. München, Germany, [2]Walter Schottky Inst., Technischen Univ. München, Germany, [3]Experimentelle Physik, Technische Univ. Dortmund, Germany.* Population dynamics, excited biexciton states, excitonic and conditional biexcitonic Rabi oscillations in a single quantum dot embedded in a photodiode are investigated combining pump-probe techniques with a sensitive photocurrent readout.

MC2 • 11:00 a.m.
Linewidth and Coupling of Interfacial GaAs Quantum Dots Measured with Optical Two-Dimensional Fourier Transform Spectroscopy, *Galan Moody[1], Mark E. Siemens[1], Alan D. Bristow[1], Xingcan Dai[1], Denis Karaiskaj[1], Allan S. Bracker[2], Dan Gammon[2], Steven T. Cundiff[1]; [1]JILA, NIST, Univ. of Colorado, USA, [2]NRL, USA.* Optical two-dimensional Fourier-transform spectroscopy is used to study interfacial GaAs quantum dots (QDs). We extract the temperature dependence of the QD homogeneous linewidth and energy relaxation from quantum well excitons to the lower energy QDs.

MC3 • 11:15 a.m.
Probing Biexcitons in Quantum Dots Using Femtosecond Pump/Probe and Two Dimensional Electronic Spectroscopy, *Pooja Tyagi[1], Katherine Stone[2], Daniel Turner[2], Samuel Sewall[1], Keith Nelson[2], Patanjali Kambhampati[1]; [1]McGill Univ., Canada, [2]MIT, USA.* We report on the electronic structure of biexcitons in CdSe quantum dots using state-selective femtosecond pump/probe spectroscopy. The pump/probe experiments are compared to direct probing of biexcitons via two-dimensional electronic spectroscopy.

MC4 • 11:30 a.m.
Hot Carrier Dynamics in Lead Sulfide Nanocrystals, *Byungmoon Cho, William K. Peters, Robert J. Hill, Trevor L. Courtney, David M. Jonas; Univ. of Colorado, USA.* Hot carriers in PbS nanocrystals are directly probed. The data are consistent with bulk-like small, high velocity electron and hole wavepackets that initially feel little or no quantum confinement, except for collisions with the surface.

MC5 • 11:45 a.m.
Ultrafast Excitation Energy Transfer in Small Carbon Nanotube Aggregates, *Larry Lüer[1], Jared Crochet[2], Tobias Hertel[2], Giulio Cerullo[3], Guglielmo Lanzani[4]; [1]Madrid Inst. of Advanced Studies, IMDEA Nanociencia, Spain, [2]Univ. of Würzburg, Germany, [3]Politecnico di Milano, Italy, [4]Italian Inst. of Technology, Italy.* Ultrafast inter-tube exciton transfer in small aggregates of carbon nanotubes is studied by femtosecond spectroscopy with degenerate broadband pulses. After separation of population dynamics from coherent effects, transfer times below 10 fs are obtained.

Anderson Room	Hoaglund Room

MB • Single-Cycle Pulse Generation—Continued

MB6 • 12:00 p.m.
Adiabatic Frequency Conversion of Ultrafast Pulses, *Haim Suchowski[1], Barry D. Bruner[1], Ady Arie[2], Yaron Silberberg[1]; [1]Weizmann Inst. of Science, Israel, [2]Tel Aviv Univ., Israel.* A method for efficient frequency conversion of ultrafast pulses is demonstrated using an adiabatic aperiodically poled KTP crystal. We produce broadband blue pulses centered at 450 nm by upconverting 30 fs pulses in the near-IR.

MB7 • 12:15 a.m.
Temporal and Spatial Lensing with an Intense Single-Cycle Terahertz Pulse, *Yuzhen Shen, G. L. Carr, James B. Murphy, Thomas Y. Tsang, Xijie Wang, Xi Yang; Brookhaven Natl. Lab, USA.* We demonstrate that an intense subpicosecond single-cycle terahertz pulse in an electro-optic medium can act as a temporal and spatial lens to phase modulate and focus a co-propagating ultrashort laser pulse.

MC • 0-D and 1-D Quantum Systems—Continued

MC6 • 12:00 p.m.
Ultrafast Measurement of Mid-Infrared Internal Exciton Transitions of Separated Single-Walled Carbon Nanotubes, *Jigang Wang[1,2], Matt. W Graham[3], Yingzhong Ma[3], Graham R. Fleming[3], Robert. A. Kaindl[2]; [1]Dept. of Physics and Astronomy, Ames Lab, Iowa State Univ., USA, [2]Materials Sciences Div., Lawrence Berkeley Natl. Lab, USA, [3]Univ. of California at Berkeley and Physical Biosciences Div., Lawrence Berkeley Natl. Lab, USA.* We report ultrafast mid-infrared studies of individualized semiconducting carbon nanotubes. Transient spectra of (6,5) and (7,5) nanotubes evidence a photoinduced resonance around 200 meV, associated with intra-excitonic transitions that reflect quasi-1-D exciton formation and dynamics.

MC7 • 12:15 p.m.
Two-Dimensional Electronic Spectroscopy of Semiconducting Single-Walled Carbon Nanotubes , *Matthew W. Graham[1], Tessa R. Calhoun[1], Alex A. Green[2], Mark C. Hersam[2], Graham R. Fleming[1]; [1]Univ. of California at Berkeley, USA, [2]Northwestern Univ., USA.* Application of 2-D Fourier transform electronic spectroscopy for semiconducting SWNTs is demonstrated to decongest complex exciton dynamics. Analysis provides the E_{22} homogeneous linewidth, and elucidates the role of vibrational and multi-exciton states in population relaxation.

12:30 p.m.–2:00 p.m. Lunch Break *(on your own)*

NOTES

MD • High Harmonic Generation

Monday, July 19
2:00 p.m.–3:45 p.m.
Andrius Baltuska; Vienna Univ. of Technology, Austria, Presider

MD1 • 2:00 p.m. **Invited**

High Harmonic Generation by High Energy OPA Source, *E. J. Takahashi, P. Lan, Y. Nabekaw, Katsumi Midorikawa; RIKEN, Japan.* We have demonstrated efficient generation of water-window X-ray harmonics by using an IR parametric source in neutral rare-gas media. Generation of isolated attosecond pulses by mixing IR and 800 nm laser fields is also discussed.

MD2 • 2:30 p.m.

Short Wavelength Generation at High Repetition Rate by Direct High Harmonic Generation, *Steffen Hädrich[1,2], Jan Rothhardt[1,2], Manuel Krebs[1], Stefan Nolte[1], Jens Limpert[1,2], Andreas Tünnermann[1,2,3]; [1]Friedrich-Schiller-Univ. Jena, Germany, [2]Helmholtz-Inst. Jena, Germany, [3]Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany.* Short wavelength generation by direct high harmonic generation of high repetition rate fiber laser based systems is presented. We show possibilities for peak power enhancement, pulse shortening and increased conversion efficiency.

MD3 • 2:45 p.m.

Power Scaling of High-Repetition-Rate HHG, *Arman Cingöz[1], Dylan C. Yost[1], Jun Ye[1], Axel Ruehl[2], Martin Fermann[2], Ingmar Hartl[2]; [1]JILA, NIST, Univ. of Colorado, USA, [2]IMRA America, Inc., USA.* We report on cavity-enhanced HHG with a frequency comb delivering 120-fs pulses and 80-W average power at 154-MHz repetition rates. With 5-kW average intracavity powers, average HHG powers beyond the microwatt level have been achieved.

MD4 • 3:00 p.m.

High Power Femtosecond Frequency Comb for Intracavity High Harmonic Generation, *Jane Lee, Justin Paul, R. Jason Jones; Univ. of Arizona, USA.* We report on a high power (~6.5 Watts) Ti:sapphire based frequency comb (50MHz) generating ~25 microjoule pulses inside an enhancement cavity. Intracavity high-harmonic generation produces over 2.5 microwatts integrated power from 73 to 53 nm.

MD5 • 3:15 p.m.

XUV Frequency Comb Spectroscopy, *Christoph Gohle[1,2], Dominik Z. Kandula[1], Tjeerd J. Pinkert[1], Wim Ubachs[1], Kjeld S. E. Eikema[1]; [1]Laser Ctr. Vrije Univ., Netherlands, [2]Ludwig-Maximilians-Univ., Germany.* We report the first demonstration of frequency comb metrology at extreme ultraviolet wavelengths (XUV), based on parametric amplification and high-harmonic generation of frequency comb pulses, which results in an 8-fold improved helium ionization potential.

MD6 • 3:30 p.m.

Temporal Gating Based on Electron Wavepacket Diffusion for XUV Supercontinuum Generation, *Francesca Calegari[1], Caterina Vozzi[1], Matteo Negro[1], Fabio Frassetto[2], Luca Poletto[2], Paolo Villoresi[2], Giuseppe Sansone[1], Mauro Nisoli[1], Sandro De Silvestri[1], Salvatore Stagira[1]; [1]Politecnico di Milano CNR-IFN, Italy, [2]Univ. di Padova CNR-IFN, Italy.* We demonstrate experimentally and theoretically a gating technique based on the electron wavepacket diffusion for the generation of a broadband XUV continuum exploiting the combination of infrared and visible driving pulses in a two-color scheme.

3:45 p.m.–4:15 p.m. Coffee Break/Exhibits, *Erickson/Carroll/Sinclair Rooms*

Monday, July 19, 3:45 p.m.–4:45 p.m. and 6:30 p.m–7:30 p.m.
Rooftop Garden

ME1
Spatio-Temporal Characterization of Single-Order High Harmonic Pulses Separated by Pulse-Front-Tilt Compensator, *Motohiko Ito, Yoshimasa Kataoka, Taro Sekikawa; Dept. of Applied Physics, Hokkaido Univ., Japan.* Extreme ultraviolet single-order harmonic pulses, separated by a pulse-front-tilt compensator, were spatially and temporally characterized to have a spot size of 58 μm at focus and a pulse duration of 47 fs.

ME2
Femtosecond Laser-Induced Ionization/Dissociation of Amino Acids and Their Derivatives, *Christine L. Kalcic, Gavin E. Reid, Marcos Dantus; Michigan State Univ., USA.* Ultrafast photodissociation mass spectra are presented for the protonated amino acids and their derivatives. The spectral library is used to better understand the mechanism by which a Ti:Sapphire laser activates trapped ions to induce fragmentation.

ME3
Chirped-Probe-Pulse Femtosecond Coherent Anti-Stokes Raman Scattering for Single-Laser-Pulse Flame Temperature Measurements, *Daniel R. Richardson[1], Robert P. Lucht[1], Waruna D. Kulatilaka[2], Sukesh Roy[2], James R. Gord[3]; [1]Purdue Univ., USA, [2]Spectral Energies, LLC, USA, [3]AFRL, Wrigth Patterson Air Force Base, USA.* Single-laser-pulse temperature measurements are made at 1000 Hz by femtosecond coherent anti-Stokes Raman scattering (CARS) with a chirped-probe-pulse. The temporal decay of the Raman coherence is mapped onto the frequency of the CARS signal.

ME4
Coherent Effects in the Carbonyl Containing Carotenoid Fucoxanthin, *Nina Gildenhoff, Kathi Gundermann, Claudia Büchel, Josef L. Wachtveitl; Goethe-Univ. Frankfurt, Germany.* Coherent effects in the isolated carbonyl containing carotenoid fucoxanthin in various solvents and fucoxanthin within the fucoxanthin-chlorophyll protein were investigated using femtosecond transient absorption spectroscopy.

ME5
Ultrafast Excited-State Dynamics and Photochemistry of Base-off Adenosylcobalamin and n-Propylcobalamin, *Jian Peng, Roseanne J. Sension; Univ. of Michigan, USA.* UV-visible femtosecond transient absorption spectroscopy was used to investigate the photochemistry of base-off cobalamins. The results highlight the influence of the lower axial ligand on the electronic structure and the reactivity of the C-Co bond.

ME6
Femtosecond Photoisomerization Study on Azobenzene-Derivative Bound by DNA, *Tao Chen[1], Kazumasa Igarashi[1], Atsushi Yamaguchi[1], Naoya Nakagawa[1], Keisaku Yamane[1], Taiga Fujii[2], Hiroyuki Asanuma[2], Mikio Yamashita[1]; [1]Dept. of Applied Physics, Hokkaido Univ. and CREST-JST, Japan, [2]Graduate School of Engineering, Nagoya Univ. and CREST-JST, Japan.* First observation of femtosecond absorbance change in azobenzene-derivative (AzD) bound by double-strand DNA, that by single-strand DNA and Azd shows trans-to-cis photoisomerization rate per pulse in the former is much lower than in the latter.

ME7
Relaxation Dynamics of 8'-Apo-β-Caroten-8'-al: Excitation Energy Dependence , *Yoonsoo Pang[1,2], Graham R. Fleming[1,2]; [1]Univ. of California at Berkeley, USA, [2]Lawrence Berkeley Natl. Lab, USA.* Infrared and visible transient absorption measurements of the carotenoid 8'-apo-β-caroten-8'-al following the direct S_1 excitation and the hot S_2 excitation show a distinct relaxation dynamics which generates a long-lived species.

ME8
Fulgides: Efficiency of the Ring-Opening Reaction Tuned by Optical Pre-Excitation, *Thomas Brust[1], Simone Draxler[1], Watson J. Lees[2], Karola Rück-Braun[3], Markus Braun[1,4], Wolfgang Zinth[1]; [1]Ludwig-Maximilians-Univ. München, Germany, [2]Florida Intl. Univ., USA, [3]Technische Univ. Berlin, Germany, [4]Goethe-Univ. Frankfurt, Germany.* Multipulse femtosecond absorption experiments show that the quantum efficiency for ring-opening of indolylfulgides is strongly increased when a ring-closure reaction precedes by only a few picoseconds.

ME9
Femtosecond UV Studies of Relaxation Processes in Cytochrome C, *Andrea Cannizzo, Oliver Bräm, Cristina Consani, Frank van Mourik, Majed Chergui; École Polytechnique Fédérale de Lausanne, Switzerland.* UV Femtosecond fluorescence and transient-absorption studies of ferric and ferrous cytochrome-C are presented. We characterize their photocycles which are described in terms of a model based on electron metal-to-heme back-donation from occupied metal *d* orbitals.

ME10
Highly Efficient Energy Transfer in a Dyad with Orthogonally Arranged Transition Dipole Moments: Beyond the Limits of Förster? *Igor Pugliesi[1], Andreas Walter[2], Heinz Langhals[2], Eberhard Riedle[1]; [1]LS für BioMolekulare Optik, Ludwig-Maximilians-Univ. München, Germany, [2]Dept. für Chemie, Ludwig-Maximilians-Univ. München, Germany.* Perylene bisimide dyads mediate an ultrafast energy transfer contradicting the Förster approximation through their transition densities. The high monomeric fluorescence quantum yield leads to near unit efficiency making them suitable candidates for molecular electronic circuitry.

ME11
Unusually Rapid Energy Transfer and Internal Conversion in Xanthorhodopsin and Its Carotenoid Antenna, *Jingyi Zhu[1], Itay Gdor[1], Elena Smolensky[2], Noga Friedman[2], Mordechai Sheves[2], Sandford Ruhman[1]; [1]Hebrew Univ. of Jerusalem, Israel, [2]Weizmann Inst. of Science, Israel.* Internal conversion and energy transfer from S_2 of the salinixanthine antenna in xanthorhodopsin takes less than 30 fs, leading to lower singlets with rotated transition dipoles. This timescale questions models of resonant electronic energy transfer.

ME12
Uncovering Coherent and Incoherent Vibrational Interactions in a Transition Metal Mixed Valence Complex Using Femtosecond Two-Dimensional Infrared Spectroscopy, *Michael Lynch, Mark Cheng, Benjamin Van Kuiken, Stephanie Daifuku, Munira Khalil; Univ. of Washington, USA.* Femtosecond polarization-selective nonlinear infrared spectroscopies reveal a detailed molecular picture of coherent and incoherent vibrational relaxation dynamics of a cyano-bridged mixed valence complex in a polar solvent.

Monday, July 19, 3:45 p.m.–4:45 p.m. and 6:30 p.m–7:30 p.m.
Rooftop Garden

ME13
Monitoring the External Vibrational Control of Excitation-Energy Transfer Using Pump-Probe Polarization Spectroscopy, *Jason D. Biggs, Jeffrey A. Cina; Univ. of Oregon, USA.* We have developed a method for controlling electronic-excitation transfer in chromophore dimers using pulse-induced nuclear motion. We further developed the framework needed to simulate various nonlinear optical experiments on such systems.

ME14
Excitation Energy Dependence of the S1 and ICT State Dynamics in Marine Carotenoids Studied by Femtosecond One- and Two-Photon Pump-Probe Spectroscopy, *Daisuke Kosumi[1], Satoshi Maruta[1], Toshiyuki Kusumoto[1], Ritsuko Fujii[1], Mitsuru Sugisaki[1], Masahiko Iha[2], Harry A. Frank[3], Hideki Hashimoto[1]; [1]JST, CREST, Osaka City Univ., Japan, [2]South Product Co. Ltd., Japan, [3]Univ. of Connecticut, USA.* The ultrafast excited state dynamics of fucoxanthin in a polar solvent have been investigated by femtosecond one- and two-photon pump-probe spectroscopic measurements. Transient absorption spectra and their kinetics depend strongly on excitation energy.

ME15
Sensitizer Exchange Dynamics in Air and Solvent Filled Semiconductor Nanocavities, *Jouko E. I. Korppi-Tommola[1], Jan Helbing[2], Niko Humalamäki[1], Matti Haukka[3], Esben Andresen[4], Peter Hamm[2]; [1]Univ. of Jyväskylä, Finland, [2]Univ. Zürich, Switzerland, [3]Univ. of Joensuu, Finland, [4]Univ. Aix Marseille, France.* Multiple dye binding sites and their exchange in equilibrium in air and solvent filled sensitized titanium oxide nanocavities were identified by 2DIR spectroscopy. Binding geometry and flexibility may influence electron injection efficiency of solar cells.

ME16
Ultrafast Polarized Raman as a Probe of Solvation Shell Structure and Dynamics in Aqueous Salt Solutions, *Ismael A. Heisler, Stephen R. Meech; Univ. of East Anglia, UK.* An ultrafast diffractive optic transient grating experiment was used to record isotropic THz Raman spectra of aqueous ions. A low frequency mode, absent in pure water, associated with halide - water H-bond modes is reported.

ME17
Conserving Optical Coherence through the Conical Intersection during Retinal Isomerization in Bacteriorhodopsin, *Valentin I. Prokhorenko[1], Alexei Halpin[1], Leonid S. Brown[2], R. J. Dwayne Miller[1]; [1]Univ. of Toronto, Canada, [2]Univ. of Guelph, Canada.* Two-dimensional electronic spectroscopy of retinal isomerization in bacteriorhodopsin allows tracking the dynamics of the reaction coordinate. Optically induced coherence still persists even after 5 ps, where no excited-state population of the initial isomer is present.

ME18
Selective Excitation of Resonances in 2-D Fourier Transform Optical Spectroscopy with Tailored Pulse Shapes, *Patrick Wen, Dylan H. Arias, Daniel B. Turner, Keith A. Nelson; MIT, USA.* Shaped pulses, with phase windows and double amplitudes, are tailored for specific resonances in 2-D Fourier transform optical spectroscopy. Pulses, designed using Feynman pathway analysis, selectively enhance biexciton peaks in 2-D spectra of quantum wells.

ME19
Ultrafast Dynamics of Phosphate-Water Interactions in Hydrated DNA, *Lukasz Szyc, Ming Yang, Thomas Elsaesser; Max-Born-Inst. für Nichtlineare Optik und Kurzzeitspektroskopie, Germany.* Interactions between DNA and the surrounding water shell are mapped via the ultrafast response of the asymmetric phosphate stretching vibration $\nu_{AS}(PO_2)^-$. The water shell serves as the primary heat sink for excess energy.

ME20
Semiconductor Saturable Absorbers for Ultrafast THz Signals, *Matthias C. Hoffmann[1], Dmitry Turchinovich[2]; [1]Max-Planck Res. Dept. for Structural Dynamics, Univ. of Hamburg, Germany, [2]DTU Fotonik, Dept. of Photonics Engineering, Technical Univ. of Denmark, Denmark.* We demonstrate saturable absorber behavior of n-type semiconductors in the THz frequency range using nonlinear THz spectroscopy. Further, we observe THz pulse shortening and increase of the group refractive index at high field strengths.

ME21
Conductivity in Dye-Sensitized TiO_2 Probed by Optical-Pump THz-Probe Spectroscopy, *Jan C. Brauer, Joël Teuscher, Angela Punzi, Jacques-Edouard Moser; École Polytechnique Fédérale de Lausanne, Switzerland.* Employing optical-pump THz-probe spectroscopy we have investigated the photo- induced conductivity dynamics in dye-sensitized mesoporous anatase films as well as the influence of dye aggregates on the injection dynamics.

ME22
Compact and Widely Tunable Sub-50 fs Laser Source with 30 mW to 300 mW Output Power at 44 MHz Repetition Rate for Nonlinear Spectroscopy Applications, *Bernd Metzger, Andy Steinmann, Felix Hoos, Sebastian Pricking, Harald Giessen; 4th Physics Inst., Univ. of Stuttgart, Germany.* We pump tapered fibers with a novel Yb:KGW oscillator and compress different spectral parts of the supercontinuum using a simple prism sequence to generate tunable sub-50 fs pulses in the visible and near IR.

ME23
Non-Collinear Optical Parametric Amplification of near-IR Pulses in $KTiOPO_4$ at a High Repetition Rate, *Oleksandr Isaienko[1,2], Eric Borguet[1], Peter Voehringer[2]; [1]Temple Univ., USA, [2]Inst. for Physical and Theoretical Chemistry, Univ. of Bonn, Germany.* We demonstrate broadband non-collinear optical parametric amplification of near-IR pulses in bulk $KTiOPO_4$ pumped with 800-nm pulses at 250-kHz repetition rate. Conversion efficiencies of ~20% are achieved when employing two subsequent NOPA stages.

ME24
Synthesis of Subfemtosecond Periodic Waveforms, *Han-Sung Chan[1,2], Zhi-Ming Hsieh[3], Wei-Hong Liang[1,2], A. H. Kung[2,4], Chao-Kuei Lee[5], Ru-Pin Pan[1], Lung-Han Peng[3]; [1]Natl. Chiao Tung Univ., Taiwan, [2]Academia Sinica, Taiwan, [3]Natl. Taiwan Univ., Taiwan, [4]Natl. Tsing Hua Univ., Taiwan, [5]Natl. Sun Yat-Sen Univ., Taiwan.* Periodic optical waveforms of arbitrary shape in the femtosecond and subfemtosecond time scale are synthesized from a comb generated by molecular modulation.

ME25
Continuum Generation in Laser Host Materials towards Table-Top OPCPA, *Maximilian Bradler, Peter Baum, Eberhard Riedle; LS für BioMolekulare Optik, Ludwig-Maximilians-Univ. München, Germany.* We demonstrate white-light generation in seven previously unutilized laser host materials with up to ps pump pulses. Only μJ pulses are necessary for stable continua with smooth, plateau-like spectra from deep UV to the infrared.

ME26
Characterization of Isolated Attosecond Pulses with Ultrabroad Bandwidth, *Sabih D. Khan, Michael Chini, Steve Gilbertson, Zenghu Chang; Dept. of Physics, Kansas State Univ., USA.* We report a new technique for attosecond pulse characterization based on interference of quantum transitions induced by single infrared photons.

ME27
Generation and Amplification of 400 nm Band Picosecond Optical Pulses by GaInN Laser Diodes, *Rintaro Koda[1], Tomoyuki Oki[1,2], Takao Miyajima[1], Hideki Watanabe[1], Masaru Kuramoto[1,2], Masao Ikeda[1,2], Hiroyuki Yokoyama[2]; [1]Advanced Materials Labs, Sony Corp., Japan, [2]New Industry Creation Hatchery Ctr., Tohoku Univ., Japan.* We demonstrate the generation of 20W peak power, 3ps optical pulses using a combination of a GaInN-based, mode-locked laser diode and an optical amplifier. A strong nonlinear phase shift over 4π has also been observed.

ME28
Linear Characterization of Attosecond Pulses, *Oren Raz, Osip Schwartz, Dan Oron, Nirit Dudovich; Weizmann Inst. of Science, Israel.* We propose a linear method for characterizing attosecond pulses. The method is based on the polarization state of each spectral component, and some a-priori knowledge about the measured pulse: Gaussian (or faster) decay in time.

ME29
Harmonic Continua by Chirp Assisted Polarization Gating, *Mirko Holler, Florian Schapper, Thomas Remetter, Lukas Gallmann, Ursula Keller; ETH Zürich, Switzerland.* We demonstrate a new scheme to generate harmonic continua starting with 12 fs laser pulses based on polarization gating. The effectiveness of the gating method is confirmed by an SFA calculation.

ME30
Strategies for Scatter Removal in Two-Dimensional Electronic Spectroscopy in the Pump-Probe Geometry, *Kristin L. M. Lewis, Jeffrey A. Myers, Franklin Fuller, Patrick F. Tekavec, Jennifer P. Ogilvie; Univ. of Michigan, USA.* We present experimental strategies for removing scatter from multiple sources in two dimensional electronic spectroscopy in the pump-probe geometry. Uncorrected, pump-pump scatter and phase-matched pump-probe signals can distort 2-D peak shapes, complicating their interpretation.

ME31
Optically-Pumped SESAM for Fast Switching between Continuous Wave and Passively Mode Locked Regimes of a Femtosecond Pulse Cr^{4+}:forsterite Laser, *Christopher G. Leburn, Christian T. A. Brown, Wilson Sibbett; Univ. of St Andrews, UK.* We report on fast switching between continuous-wave mode-locked and continuous-wave operation of a Cr^{4+}:forsterite femtosecond laser operating at 1300 nm, by means of a GaInNAs SESAM that is optically excited by an external diode laser.

ME32
Full Control of Polarization Shaped Pulses Using a Phase-Locked Mach-Zehnder Interferometer, *Masaaki Sato, Takayuki Suzuki, Kazuhiko Misawa; Tokyo Univ. of Agriculture and Technology, Japan.* We achieved reliable and stable generation of pulses with all possible polarization states by a Mach-Zehnder pulse shaper stabilized using an external laser diode. We generated and measured chiral pulses with twisted polarizing orientation.

ME33
Carrier-Envelope Phase Stabilized Soliton-Effect Compressed Sub-Two-Cycle Pulse Source, *Alexandra A. Amorim[1,2], Luís M. Bernardo[1], Franz X. Kärtner[3], Helder Crespo[1]; [1]IFIMUP and IN - Inst. of Nanoscience and Nanotechnology, Dept. de Física, Faculdade de Ciências, Univ. do Porto, Portugal, [2]Dept. de Física, Inst. Superior de Engenharia do Porto, Portugal, [3]Dept. of Electrical Engineering and Computer Science and Res. Lab of Electronics, MIT, USA.* We present a simple and efficient scheme for generating carrier-envelope phase stabilized sub-two-cycle pulses based on soliton-effect self-compression of standard femtosecond laser pulses in millimeter-long highly-nonlinear photonic crystal fibers.

ME34
Strong HOMO Signature in High Order Harmonics Driven in CO_2 by a Few-Cycle 1.5 μm Parametric Source, *Caterina Vozzi[1], Matteo Negro[1], Francesca Calegari[1], Fabio Frassetto[2], Mauro Nisoli[1], Luca Poletto[2], Giuseppe Sansone[1], Paolo Villoresi[2], Sandro De Silvestri[1], Salvatore Stagira[1]; [1]Politecnico di Milano, Italy, [2]Univ. di Padova, Italy.* High order harmonics driven by an ultrafast IR parametric source were generated in aligned CO_2; the experimental results present a clear spectral minimum related to the HOMO structure.

ME35
Below-Threshold High-Order Harmonics Probed with Aligned Molecules, *Hadas Soifer[1], Pierre Botheron[2], Dror Shafir[1], Adi Diner[1], Oren Raz[1], Barry Bruner[1], Yann Mairesse[2], Bernard Pons[2], Nirit Dudovich[1]; [1]Weizmann Inst. of Science, Israel, [2]Univ. de Bordeaux 1-CNRS-CEA, France.* We present a new approach to probe the High-Harmonic Generation process. We use aligned molecules to study below-threshold harmonics and identify two distinct contributions to the emitted harmonics.

ME36
Electron Release Times in Double Ionization by Elliptically Polarized Laser Pulses, *Adrian N. Pfeiffer[1], Claudio Cirelli[1], Mathias Smolarski[1], Ursula Keller[1], Reinhard Dörner[2]; [1]ETH Zürich, Switzerland, [2]Inst. für Kernphysik, Johann Wolfgang Goethe Univ., Germany.* We explore the possibility to measure the electron release times in double ionization by elliptically polarized laser pulses and provide experimental results for a 30-fs and a 5-fs laser pulse.

ME37
Direct Frequency Comb Spectroscopy in a Linear Paul Trap, *Anne Lisa Wolf[1,2], Jonas Morgenweg[1], Steven van den Berg[2], Wim Ubachs[1], Kjeld S. E. Eikema[1]; [1]Vrije Univ., Netherlands, [2]Van Swinden Lab, Netherlands.* Direct frequency comb spectroscopy is demonstrated for ions in a Paul trap for the first time. We measured a single-photon transition at 394 nm in a crystal of calcium ions with 0.5 MHz accuracy.

Monday, July 19, 3:45 p.m.–4:45 p.m. and 6:30 p.m–7:30 p.m.
Rooftop Garden

ME38

Observation of High Energy Protons Ejected from Small Polyatomic Molecules in Laser Induced Fragmentation, *Stefan Roither[1], Xinhua Xie[1], Daniil Kartashov[1], Li Zhang[1], Huailiang Xu[2], Atshushi Iwasaki[2], Markus Schöffler[3], Georg Reider[1], Reinhard Dörner[3], Kaoru Yamanouchi[2], Andrius Baltuška[1], Markus Kitzler[1]; [1]Photonics Inst., Vienna Univ. of Technology, Austria, [2]Dept. of Chemistry, School of Science, Univ. of Tokyo, Japan, [3]Inst. für Kernphysik, J. W. Goethe Univ. Frankfurt, Germany.* Remarkably high energies of protons ejected from three different species of small polyatomic molecules during laser-induced fragmentation are observed using coincidence momentum spectroscopy. The results imply that the responsible field-driven dynamics are a general phenomenon.

ME39

Quantized Extrinsic Piezoelectricity in Quantum Dots Revealed by Coherent Acoustic Phonons, *Pooja Tyagi, Ryan Cooney, Samuel Sewall, D. M. Sagar, Jonathan Saari, Patanjali Kambhampati; McGill Univ., Canada.* Employing real time observation of coherent acoustic phonons, we demonstrate a novel extrinsic piezoelectric response of quantum dots, that is quantized, tunable and an order of magnitude larger than their intrinsic piezo response.

ME40

Nanolocalization of Ultrashort Time-Reversed Pulses in Random Nanoparticle Assemblies, *Dominik Differt[1], F. Javier García de Abajo[2], Walter Pfeiffer[1], Christian Strüber[1], Dmitri V. Voronine[1]; [1]Univ. of Bielefeld, Germany, [2]Inst. de Optica, Spain.* Localization of time-reversed optical fields in random nano-assemblies is investigated. It is shown that a structural hierarchy of the scatterers (i.e., the presence of a far-field reverberation chamber) improves the nanolocalization of time-reversed waves.

ME41

Transient Reversal of a Peierls-Transition: Extreme Phonon Softening in Laser-Excited Bismuth, *Wei Lu[1], Matthieu Nicoul[1,2], Uladzimir Shymanovich[1], Alexander Tarasevitch[1], Martin Kammler[1], Michael Horn von Hoegen[1], Dietrich von der Linde[1], Klaus Sokolowski-Tinten[1]; [1]Univ. Duisburg-Essen, Germany, [2]Univ. Köln, Germany.* Laser-excited coherent optical phonons in Bismuth were investigated using time-resolved X-ray diffraction. The observed extreme softening of the excited A_{1g}-mode presents strong indication that the Peierls-distortion defining the equilibrium structure of Bismuth is transiently reversed.

ME42

Noncollinear Broadband Terahertz-Pump—Terahertz-Probe Spectroscopy of Semiconductors, *Matthias C. Hoffmann, Vikaran Khanna, Andrea Cavalleri; Max-Planck Res. Dept. for Structural Dynamics, Univ. of Hamburg, Germany.* Saturated absorption and intervalley scattering in n-type semiconductors were observed using noncollinear THz-pump—THz probe spectroscopy with ultrabroadband probe pulses.

ME43

Electron-Phonon Coupling in Cuprate High-Temperature Superconductors Determined from Femtosecond Electron Relaxation Rates, *Christoph Gadermaier[1], Alexander S. Alexandrov[2,3], Viktor V. Kabanov[1], Primoz Kusar[1], Tomaz Mertelj[1], Xin Yao[4], Cristian Manzoni[5], Daniele Brida[5], Giulio Cerullo[5], Dragan Mihailovic[1]; [1]Complex Matter Dept., Jozef Stefan Inst., Slovenia, [2]Dept. of Physics, Loughborough Univ., UK, [3]Jozef Stefan Inst., Slovenia, [4]Dept. of Physics, Shanghai Jiao Tong Univ., China, [5]Natl. Lab for Ultrafast and Ultraintense Optical Science, INFM-CNR, Dept. di Fisica, Politecnico di Milano, Italy.* The strong electron-phonon interaction in cuprate superconductors determined from femtosecond electron relaxation times suggest a fundamental importance of phonons and in particular polaronic effects in the high-temperature superconductivity mechanism.

ME44

3-D Magnetization and Anisotropy Dynamics in Thin Iron Films Studied with Time-Resolved Magneto-Optical Kerr Effect, *Ettore Carpene[1], Eduardo Mancini[1], Claudia Dallera[1], Ezio Puppin[2], Sandro De Silvestri[1]; [1]IFN-CNR, Dept. di Fisica, Politecnico di Milano, Italy, [2]CNISM, Dept. di Fisica, Politecnico di Milano, Italy.* We investigated the three-dimensional dynamics of the magnetization vector launched by a short laser pulse in thin Fe films. Our experiment provides the direct evidence of the phenomenological mechanism triggering the magnetization precession.

ME45

Withdrawn

ME46

Coherent Polarons in Ferromagnetic $La_{0.7}Sr_{0.3}MnO_3$, *Michael Först[1], Cristian Manzoni[1], Stefan Kaiser[1], Yasuhide Tomioka[2], Yoshinori Tokura[3], Andrea Cavalleri[1]; [1]Max-Planck Res. Group for Structural Dynamics, Univ. of Hamburg, Germany, [2]Correlated Electron Engineering Group, AIST, Japan, [3]Dept. of Applied Physics, Univ. of Tokyo, Japan.* Polarons, mixed modes of solids comprising electronic and lattice excitations, underpin the electronic properties of strongly-correlated oxides. We demonstrate their coherent formation in ferromagnetic $La_{0.7}Sr_{0.3}MnO_3$, enabled via direct lattice excitation in the mid-infrared.

ME47

Nonlinear Josephson Effect in High-T_c Cuprates, *A. Dienst[1], M. C. Hoffmann[2], D. Fausti[2], S. Pyon[3], T. Takayama[3], H. Takagi[3,4], A. Cavalleri[1,2]; [1]Univ. of Oxford, UK, [2]Max-Planck Dept. for Structural Dynamics, Univ. of Hamburg, Germany, [3]Univ. of Tokyo, Japan, [4]RIKEN Advanced Science Inst., Japan.* The high-temperature superconductor $La_{1.84}Sr_{0.16}CuO_4$ is excited with high intensity terahertz pulses tuned to the 1.9-terahertz Josephson Plasma Resonance. The strong interlayer tunneling current modulates the microscopic properties of the superconductor.

ME48

Ultrafast Resonant Soft X-Ray Scattering in Manganites: Direct Measurement of Time-Dependent Orbital Order, *Henri Ehrke[1,2,3], Raanan I. Tobey[1,2], Simon Wall[1,2], Stuart A. Cavill[3], D. Prabhakaran[1], Andrew T. Boothroyd[1], Michael Gensch[4], P. Reutler[5], Alexandre Revcolevschi[5], Sarnjeet S. Dhesi[3], Andrea Cavalleri[1,2]; [1]Univ. of Oxford, UK, [2]Max-Planck Dept. for Structural Dynamics, Univ. of Hamburg, Germany, [3]Diamond Light Source, UK, [4]Helmholtz Zentrum Berlin, Germany, [5]Lab de Physico-Chimie de l'Etat Solide, Univ. Paris Sud, France.* We present ultrafast resonant soft-X-ray diffraction measurements of time-dependent orbital order in the single-layer-manganite $La_{0.5}Sr_{1.5}MnO_4$. These experiments reveal the appearance of a metastable phase with reduced ordering, different from any thermal state of the system.

Monday, July 19, 3:45 p.m.–4:45 p.m. and 6:30 p.m–7:30 p.m.
Rooftop Garden

ME49
Configuration Extraction of Coulomb-Induced Nonlinearities in Semiconductor Quantum Wells, *Ryan P. Smith[1], Andrew C. Funk[1], Jared K. Wahlstrand[1], Steven T. Cundiff[1], Johannes T. Steiner[2], Martin Schafer[2], Mackillo Kira[2], Stephan W. Koch[2]; [1]JILA, NIST, Univ. of Colorado, USA, [2]Dept. of Physics and Material Sciences Ctr., Philipps-Univ., Germany.* We report quantitative spectrally-resolved transient absorption in GaAs quantum wells. Microscopic modeling extracts many-body configurations and attributes effects to observed spectra. Our techniques allow investigation of the effects of light statistics on many-body interactions.

ME50
Femtosecond Study of Photodoping Phenomena in a Parent Compound of a High-Temperature Superconductor, *Markus Beyer[1], Kyungwan Kim[1], Viktor Kabanov[2,3], Hanjo Schäfer[1], Gennady Logvenov[4], Ivan Bozovic[4], Jure Demsar[1,2,3]; [1]Physics Dept. and Ctr. of Applied Photonics, Univ. Konstanz, Germany, [2]Zukunftskolleg, Univ. Konstanz, Germany, [3]Complex Matter Dept., Jozef Stefan Inst., Slovenia, [4]Brookhaven Natl. Lab, Condensed Matter and Materials Science, USA.* We present the first spectrally-resolved study of the femtosecond dynamics in La_2CuO_4, the undoped parent-compound of the high-temperature superconductor. The data reveal strong band-gap renormalization and the appearance of in-gap states attributed to photo-doping.

ME51
Coherent Control of the Selected Excited State by Two-Color Multipulse Excitation, *Kenta Abe[1], Ryosuke Nakamura[1,2], Hideki Hashimoto[2,3], Masayuki Yoshizawa[1,2]; [1]Tohoku Univ., Japan, [2]JST, CREST, Japan, [3]Osaka City Univ., Japan.* The selected excited state is controlled by combination of the first pump pulse generating the target state and the second shaped pump pulse. Coherent vibrations can be induced even in the optically forbidden state.

ME52
Strongly Coupled Vibronic Modes Investigated by Means of Four-Wave Mixing Spectroscopy, *Mitsuru Sugisaki[1], Daisuke Kosumi[1], Keisuke Saito[1], Ritsuko Fujii[1], Richard J. Cogdell[2], Hideki Hashimoto[1]; [1]Osaka City Univ., Japan, [2]Univ. of Glasgow, UK.* Vibronic coherent oscillations of carotenoids have been investigated under various excitation conditions. It was found that coupled modes can be excited in the stimulated photon-echo configuration. A model that explains the results is discussed.

NOTES

MF • Water

Monday, July 19
4:45 p.m.–6:45 p.m.
R. J. Dwayne Miller; Univ. of Toronto, Canada, Presider

MF1 • 4:45 p.m.
Three-Dimensional Infrared Spectroscopy (3-D-IR) of Isotopically Substituted Liquid Water, *Sean Garrett-Roe[1], Fivos Perakis[1], Francesco Rao[2], Peter Hamm[1]; [1]Inst. of Physical Chemistry, Univ. of Zürich, Switzerland, [2]Lab de Chimie Biophysique/ISIS, Univ. de Strasbourg, France.* Three-dimensional infrared spectroscopy (3-D-IR) of isotopically substituted liquid water reveals heterogeneous dynamics on the 500-700 fs timescale. We attribute this behavior to local differences in the timescale of hydrogen-bond network rearrangements.

MF2 • 5:00 p.m.
Orientational Dynamics of Water Probed with 2-D-IR Anisotropy Measurements, *Krupa Ramasesha, Rebecca A. Nicodemus, Aritra Mandal, Andrei Tokmakoff; MIT, USA.* We use polarization-selective ultrafast 2-D IR infrared spectroscopy to probe joint orientational and spectral dynamics of HOD in D_2O. Our experiments show rapid reorientation concurrent with return of strained hydrogen bonds to a stable configuration.

MF3 • 5:15 p.m.
Water Dynamics near Hydrophobes: An Ultrafast Infrared Spectroscopy Study, *Artem A. Bakulin[1], Christian Petersen[2], Huib J. Bakker[2], Maxim S. Pshenichnikov[1]; [1]Univ. of Groningen, Netherlands, [2]FOM-Inst. for Atomic and Molecular Physics, Netherlands.* With 2-D IR and polarization-resolved pump-probe spectroscopy we observe a strong slowing-down of the hydrogen-bond and orientational dynamics of water near hydrophobic groups that scales with solute concentration and the size of the hydrophobic group.

MF4 • 5:30 p.m.
Ultrafast Conversions of Hydrogen-Bonded Structures in Liquid Water Observed via Femtosecond Soft X-Ray Spectroscopy, *Nils Huse[1], Haidan Wen[2], Hana Cho[1,3], Tae Kyu Kim[3], Robert W. Schoenlein[1], Aaron M. Lindenberg[2,4]; [1]Lawrence Berkeley Natl. Lab, USA, [2]SLAC Natl. Accelerator Lab, USA, [3]Pusan Natl. Univ., Republic of Korea, [4]Stanford Univ., USA.* X-ray spectroscopic studies relate distinct spectral features to water molecules in lose and tight H-bond environments. Femtosecond X-ray measurements show that vibrational excitation/relaxation increases weakly H-bonded water at the direct expense of tightly H-bonded water.

MF5 • 5:45 p.m.
Hydrogen Bonds in Aqueous Hydrates: Experiment and Theory, *Jasper C. Werhahn[1], Stanislav Pandelov[1], George S. Fanourgakis[2], Hristo Iglev[1], Sotiris S. Xantheas[2]; [1]Technical Univ. of Munich, Germany, [2]Pacific Northwest Natl. Lab, USA.* Systematic infrared pump-probe measurements on aqueous salt hydrates are combined with theoretical calculations of their structural and energetical parameters. We establish unambiguous correlations of the spectral and geometrical parameters of the aqueous hydrogen bond.

MG • Strongly Correlated Materials

Monday, July 19
4:45 p.m.–6:45 p.m.
Robert Schoenlein; Lawrence Berkeley Natl. Lab, USA, Presider

MG1 • 4:45 p.m. **Invited**
Ultrafast Magnetism: Coherent Processes and Angular Momentum Transfer, *Jean-Yves Bigot, Christine Boeglin, Mircea Vomir, Valérie Halté, Eric Beaurepaire; CNRS, Univ. of Strasbourg, France.* Understanding the induced demagnetization of magnetic metals interacting with femtosecond laser pulses necessitates taking into consideration the spin-orbit coupling. Here we explore the dynamics of this fundamental interaction in the presence of the laser field.

MG2 • 5:15 p.m.
CDW-Superlattice Suppression Probed in Time-Resolved XUV Photoemission at the Border of the Brillouin Zone, *Timm Rohwer, Stefan Hellmann, Martin Wiesenmayer, Christian Sohrt, Ankatrin Stange, Bartosz Slomski, Lutz Kipp, Kai Rossnagel, Michael Bauer; Christian-Albrechts Univ. zu Kiel, Germany.* Time- and angle-resolved XUV-photoemission at the border of the first Brillouin zone is employed to monitor the ultrafast suppression of a (2x2x2) reconstruction characteristic for the charge density wave (CDW) phase in 1*T*-$TiSe_2$.

MG3 • 5:30 p.m.
Laser Induced CDW Melting in $TiSe_2$ Optical and X-Ray Time Resolved Study, *Ekaterina Vorobeva[1], Steven L. Johnson[1], Paul Beaud[1], Urs Staub[1], Raquel R. A. De Souza[1], Chris J. Milne[1,2], Gerhard Ingold[1], A. N. Titov[3,4]; [1]Paul Scherrer Inst., Switzerland, [2]École Polytechnique Fédérale de Lausanne, Switzerland, [3]Inst. of Metal Physics, Russian Acad. of Sciences, Russian Federation, [4]Inst. of Metallurgy, Russian Acad. of Sciences, Russian Federation.* Femtosecond laser and X-ray pump/probe measurements indicate an ultrafast laser induced structural phase transition in 1T-$TiSe_2$, mediated by an A_{1g} amplitude mode of a CDW.

MG4 • 5:45 p.m.
Photo-Induced Superconductivity in Charge Ordered LESCO ($La_{1.8-x}Er_{0.2}Sr_xCuo_4$, X=0.125) , *Daniele Fausti[1,2], Raan Tobey[3], Nicky Dean[3], S. Pyon[4], T. Takayama[4], Hidenori Takagi[4], Andrea Cavalleri[1,3]; [1]Max-Plank Group for Structural Dynamics, Univ. of Hamburg, Germany, [2]Dept. of Physics, Clarendon Lab, Univ. of Oxford, UK, [3]Dept. of Physics, Univ. of Oxford, UK, [4]Dept. of Advanced Materials, Univ. of Tokyo, Japan.* Photo-excitation of Cu-O vibrations with 17 µm wavelength pulses $La_{1.8-x}Er_{0.2}Sr_xCuO_4$ results in a quantum coherent state, revealed by the presence of a Josephson Plasma Resonance characteristic of layered superconductors.

MF • Water—Continued

MF6 • 6:00 p.m.
Template-Substrate Dynamics Studied by 2-DIR: A Random Merry-Go-Round of Water on a Crown, *Martin Olschewski, Stephan Knop, Jaane Seehusen, Jörg Lindner, Peter Vöhringer; Rheinische Friedrich-Wilhelms-Univ. Bonn, Germany.* Femtosecond two-dimensional infrared spectroscopy in the OH-stretching spectral region was used to unravel the ultrafast hydrogen-bond recognition dynamics within the prototypical supramolecular template-substrate complex of a water molecule and a crown ether.

MF7 • 6:15 p.m.
Mechanism for Indirect Photo-Ionization of Water Studied by Pump-Repump-Probe Spectroscopy, *Hristo Iglev, Martin K. Fischer, Alfred Laubereau; Technische Univ. München, Germany.* Three-pulse spectroscopy of water after excitation at 9.2 eV provides clear evidence for novel fast recombination channel. Comparison with similar data measured after photodetachment of aqueous hydroxide elucidates the mechanism of indirect photo-ionization of water.

MF8 • 6:30 p.m.
Ultrafast Vibrational Dynamics of Hydrated DNA Studied by Two-Dimensional Infrared Spectroscopy, *Ming Yang, Łukasz Szyc, Thomas Elsaesser; Max-Born-Inst. für Nichtlineare Optik und Kurzzeitspektroskopie, Germany.* 2-D infrared spectroscopy separates interacting NH stretching modes of DNA from OH stretching excitations of its water shell. DNA-water interactions slow down the structural dynamics of the hydration shell compared to bulk water.

MG • Strongly Correlated Materials—Continued

MG5 • 6:00 p.m.
Ultrafast Phonon and Quasiparticle Dynamics in Superconducting $YBa_2Cu_3O_{7-\delta}$ Studied by Multi-THz Spectroscopy, *Michael Porer[1], Alexej Pashkin[1], Markus Beyer[1], Kyung Wan Kim[1,2], Christian Bernhard[2], Xin Yao[3], Yoram Dagan[4], Rudi Hackl[5], Andreas Erb[5], Jure Demsar[1,6], Alfred Leitenstorfer[1], Rupert Huber[1]; [1]Dept. of Physics and Ctr. for Applied Photonics, Univ. of Konstanz, Germany, [2]Dept. of Physics, Univ. of Fribourg, Switzerland, [3]Dept. of Physics, Jiao Tong Univ., China, [4]School of Physics and Astronomy, Tel Aviv Univ., Israel, [5]Walther-Meissner-Inst., Germany, [6]Complex Matter Dept., Josef Stefan Inst., Slovenia.* We probe the mid-infrared dielectric response of optimally doped $YBa_2Cu_3O_{7-\delta}$ after 12-fs optical excitation to simultaneously trace quasiparticles and specific lattice modes. Our results identify an extremely non-thermal regime and highly selective electron-phonon coupling.

MG6 • 6:15 p.m.
Ultrafast Polaron Dynamics in Multiferroic $LuFe_2O_4$, *J. Lee[1], D. Talbayev[1], C. L. Zhang[2], X. S. Xu[3], S.-W. Cheong[2], A. J. Taylor[1], R. P. Prasankumar[1]; [1]Ctr. for Integrated Nanotechnologies, Los Alamos Natl. Lab, USA, [2]Dept. of Physics and Astronomy, Rutgers Univ., USA, [3]Dept. of Chemistry, Univ. of Tennessee, USA.* Temperature-dependent femtosecond optical spectroscopy is used to track polaron dynamics in the spin and charge frustrated system $LuFe_2O_4$, revealing the influence of charge and spin ordering on polaron excitation, redressing, and coupling to on-site excitations.

MG7 • 6:30 p.m.
Photoinduced Dynamics of a Quasi-1-D Organic Conductor over a Range from 10 fs to 100 ps, *Ken Onda[1], Sho Ogihara[1], Jiro Itatani[2], Tadahiko Ishikawa[1], Yoichi Okimoto[1], Shinya Koshihara[1], Xiangfeng Shao[3,4], Yoshiaki Nakano[3], Hideki Yamochi[3], Gunizi Saito[5]; [1]Tokyo Inst. of Techonology, Japan, [2]Univ. of Tokyo, Japan, [3]Kyoto Univ., Japan, [4]Lanzhou Univ., China, [5]Meijo Univ., Japan.* We studied ultrafast photoinduced phase transition in the organic conductor $(EDO\text{-}TTF)_2PF_6$ using a 10-fs broadband pulse and a picosecond narrowband pulse, and revealed the roles of coherent molecular vibrations and the charge melting process.

6:30 p.m.–7:30 p.m. ME • Poster Session I—Continued, *Rooftop Garden*

Anderson Room	Hoaglund Room

Tuesday, July 20, 7:30 a.m.–5:30 p.m. Registration Open, *Lobby*

TuA • Attosecond Pulse Generation

Tuesday, July 20
8:30 a.m.–10:15 a.m.
Katsumi Midorikawa; RIKEN, Japan, Presider

TuA1 • 8:30 a.m. **Invited**

High-Energy Isolated Attosecond Pulses, *Matteo Lucchini, Federico Ferrari, Francesca Calegari, Caterina Vozzi, Salvatore Stagira, Giuseppe Sansone, Mauro Nisoli; Politecnico di Milano, Italy.* We demonstrate the generation of isolated sub-160-attosecond pulses with *on-target* pulse-energy of a few nanojoules, thus showing a pulse-energy enhancement from one to three orders of magnitude compared with the generating methods demonstrated so far.

TuA2 • 9:00 a.m.

Generation and Optimization of Isolated Attosecond Pulses, *Phillip M. Nagel[1,2], Thomas Pfeifer[3], Mark J. Abel[1,2], Marie J. Bell[1,2], Hiroki Mashiko[1,2], Annelise R. Beck[1,2], Colby P. Steiner[1,2], Joseph S. Robinson[2], Daniel M. Neumark[1,2], Stephen R. Leone[1,2]; [1]Univ. of California at Berkeley, USA, [2]Lawrence Berkeley Natl. Lab, USA, [3]Max-Planck-Inst. for Nuclear Physics, Germany.* Two techniques for generation and optimization of isolated attosecond pulses are demonstrated experimentally. Ionization gating is used to relax pulse duration and carrier-envelope phase (CEP) requirements, while CEP-scanning enables easy optimization of attosecond pulse contrast.

TuA3 • 9:15 a.m.

Bright, Coherent, Attosecond Soft X-Ray Harmonics Spanning the Water Window from a Tabletop Source, *Ming-Chang Chen, Paul Arpin, Tenio Popmintchev, Michael Gerrity, Matt Seaberg, Bosheng Zhang, Dimitar Popmintchev, Alon Bahabad, Margaret Murnane, Henry Kapteyn; JILA, Univ. of Colorado at Boulder, USA.* We generate fully spatially coherent, ultrafast soft X-ray beams in the water window region of the spectrum using phase matched high harmonic upconversion of a 2 μm driving laser.

TuA4 • 9:30 a.m.

Interplay between Gdd-Induced Polarization Gating and Ionization for Isolated Attosecond Pulse Generation from Multi-Cycle Driving Pulses, *Carlo Altucci[1], Raffaele Velotta[1], Valer Tosa[2], Fabio Frassetto[3], Luca Poletto[3], Paolo Villoresi[3], Caterina Vozzi[4], Matteo Negro[4], Francesca Calegari[4], Sandro De Silvestri[4], Salvatore Stagira[4]; [1]Univ. di Napoli Federico II, Italy, [2]Natl. Inst. for R&D Isotopic and Molecular Technologies, Romania, [3]Univ. di Padova, Italy, [4]Politecnico di Milano, Italy.* A new scheme is employed to generate single-shot XUV continua by 15-fs 800-nm pulses. Continua are due to the formation of a single attosecond pulse and attributed to the interplay between polarization and ionization gating.

TuA5 • 9:45 a.m.

Laser Driven Parametric Amplification of XUV and Soft-X-Rays in Neutral Gases, *Jozsef Seres[1], Enikoe Seres[1], Daniel Hochhaus[2,3,4], Boris Ecker[2,5,6], Daniel Zimmer[2,6], Vincent Bagnoud[2], B. Aurand[3,5,6], B. Zielbauer[2,5,6], Thomas Kuehl[2,5], Christian Spielmann[1]; [1]Friedrich-Schiller-Univ. Jena, Germany, [2]GSI Helmholtz Ctr. for Heavy Ion Res., Germany, [3]EMMI, Extreme Matter Inst., Germany, [4]Johann-Wofgang von Goethe-Univ., Germany, [5]Johannes-Gutenberg-Univ. Mainz, Germany, [6]Helmholtz Inst., Germany.* We present the first theoretical description and also experimental evidence for the amplification of XUV and soft-X-ray radiation by parametric stimulated emission in neutral gases driven by near-IR laser pulses reaching small-signal-gain up to 8000.

TuA6 • 10:00 a.m.

Using Ion-Imaging to Study the Effect of Gouy Phase Shift and Wave-Front Distortions on Attosecond Pump-Probe Measurements, *Niranjan Shivaram, Adam Roberts, Lei Xu, Arvinder Sandhu; Univ. of Arizona, USA.* We utilize ion-imaging to perform a detailed characterization of the effects of Gouy phase mismatch and wave-front distortions on attosecond resolved, pump-probe measurements of XUV/IR and IR/IR ionization of He and Xe atoms.

10:15 a.m.–10:45 a.m. Coffee Break/Exhibits, ***Erickson/Carroll/Sinclair Rooms***

10:15 a.m.–4:15 p.m. Exhibits Open, ***Erickson/Carroll/Sinclair Rooms***

Anderson Room	Hoaglund Room

TuB • Metamaterials and Plasmonics

Tuesday, July 20
10:45 a.m.–12:30 p.m.
Mark I. Stockman; Georgia State Univ., USA, Presider

TuB1 • 10:45 a.m.
Ultrafast All-Optical Coupling of Light to Surface Plasmons on Planar Gold Films, *Nir Rotenberg, Markus Betz, Henry M. van Driel; Univ. of Toronto, Canada.* We demonstrate that transient optical gratings generated by femtosecond near-infrared pulses can be utilized to couple visible light into surface plasmon polaritons on thin unstructured gold films. Pump-probe experiments reveal a 1.0 ps launch window.

TuB2 • 11:00 a.m.
Superconductor Terahertz Metamaterials, *Hou-Tong Chen, Hao Yang, Quanxi Jia, Antoinette J. Taylor; Los Alamos Natl. Lab, USA.* We demonstrate THz metamaterials comprised of high temperature superconducting film ($YBa_2Cu_3O_7$) replacing the metal structure. They exhibit unique properties that are not achievable using metals, which may result in both interesting applications and underlying physics.

TuB3 • 11:15 a.m.
Radiative Coupling in Planar Metamaterials Studied by THz Time-Domain Spectroscopy, *Hannes P. Merbold[1], Andreas Bitzer[1], Jan Wallauer[2], Hanspeter Helm[2], Markus Walther[2], Thomas Feurer[1]; [1]Inst. of Applied Physics, Univ. of Bern, Switzerland, [2]Freiburg Materials Res. Ctr., Univ. of Freiburg, Germany.* We employ near- and far-field measurements of single-cycle THz pulses and numerical simulations to investigate the influence of diffraction in metamaterial arrays. We find that radiative coupling leads to substantial modifications of the spectral response.

TuB4 • 11:30 a.m.
Ultrafast Pump-Probe Spectroscopy of a Dual-Band Negative Index Metamaterial, *Keshav M. Dani[1], Zahyun Ku[2], Prashanth C. Upadhya[1], Rohit P. Prasankumar[1], S. R. J. Brueck[2], Antoinette J. Taylor[1]; [1]Ctr. for Integrated Nanotechnologies, Los Alamos Natl. Lab, USA, [2]Ctr. for High Technology Materials, Univ. of New Mexico, USA.* We study the nonlinear optical response of a dual-band negative-index metamaterial with two-color pump-probe spectroscopy. We demonstrate the utility of the device as a nanoscale, structurally tunable, subpicosecond all-optical modulator.

TuB5 • 11:45 a.m.
Terahertz Radiation from Multiplexed Photo-Dember Currents, *Gregor Klatt[1], Florian Hilser[1], Wenchao Qiao[1], Raphael Gebs[1], Albrecht Bartels[1], Klaus Huska[2], Uli Lemmer[2], Georg Bastian[3], Michael B. Johnston[4], Milan Fischer[5], Jérôme Faist[5], Thomas Dekorsy[1]; [1]Univ. of Konstanz, Germany, [2]Univ. Karlsruhe, Germany, [3]Univ. of Applied Sciences Trier, Germany, [4]Univ. of Oxford, UK, [5]ETH Zürich, Switzerland.* We investigate a novel method to generate intense THz radiation by multiplexing coherent photo-Dember currents in a lateral geometry. These THz emitters are passive devices with a peak frequency at about 1.5 THz.

TuC • Optical Parametric Amplifiers

Tuesday, July 20
10:45 a.m.–12:30 p.m.
Sandro De Silvestri; Politecnico di Milano, Italy, Presider

TuC1 • 10:45 a.m.
Demonstration of Cavity-Enhanced Optical Parametric Chirped-Pulse Amplification System at High Repetition Rate, *Aleem M. Siddiqui[1], Kyung-Han Hong[1], Jeffrey Moses[1], Jian Chen[1], F. Ömer Ilday[2], Franz X. Kärtner[1]; [1]MIT, USA, [2]Bilkent Univ., Turkey.* First experimental demonstration of cavity-enhanced OPCPA at 78 MHz with <1 W of pump power is presented. For comparison, we demonstrated saturated gain in a single-pass experiment from 6-W Yb-fiber pump and Er-fiber signal sources.

TuC2 • 11:00 a.m.
96 kHz Fiber-Amplifier-Pumped Few-Cycle Pulse Optical Parametric Chirped Pulse Amplifier System, *Franz Tavella[1,2], Arik Willner[1], Steffen Hädrich[2,3], Jan Rothhardt[2,3], Enrico Seise[2,3], Jens Limpert[2,3], Stefan Düsterer[1,2], Holger Schlarb[1], Josef Feldhaus[1,2], Jörg Roßbach[1,4], Andreas Tünnermann[2,3,5]; [1]Deutsches Elektronensynchrontron DESY, Germany, [2]Helmholtz-Inst. Jena, Germany, [3]Friedrich-Schiller-Univ. Jena, Germany, [4]Univ. of Hamburg, Germany, [5]Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany.* An optical parametric chirped pulse amplifier with few-cycle pulses and high average power is demonstrated. This is the precursor of a system that will work at higher average power at the FLASH free electron laser.

TuC3 • 11:15 a.m.
The Development of Angularly-Dispersed Non-Collinear Optical Parametric Amplifier for Generation of High Power Optical Pulses in Monocycle Regime, *Keisaku Yamane[1,2], Takashi Tanigawa[1,2], Taro Sekikawa[1,2], Mikio Yamashita[1,2]; [1]Hokkaido Univ., Japan, [2]Core Res. Evolutional Science and Technology, JST, Japan.* We greatly improved our angularly-dispersed NOPA system and introduced a new stretcher for seed pulses. Consequently, we achieved the broadest gain bandwidth ranging from 500 to 1030 nm with output pulse energy of 45 μJ.

TuC4 • 11:30 a.m.
6 Cycle, 3.8 μJ, Mid-IR OPCPA at 100 kHz, *Olivier Chalus[1], Alexandre Thai[1], Jens Biegert[1,2]; [1]ICFO, Spain, [2]ICREA, Spain.* A mid-IR OPCPA generates 6 cycle pulses (67 fs at 3.1 μm) with compressed energy of 3.8 μJ at 100 kHz. The source is passively CEP stabilized through DFG.

TuC5 • 11:45 a.m.
Widely Tunable Infrared Pulse Generation up to 5 μm with Novel Optical Parametric Amplifiers at 100 kHz Repetition Rate, *Maximilian Bradler, Eberhard Riedle, Christian Homann; LS für BioMolekulare Optik, Ludwig-Maximilians-Univ. München, Germany.* Two-color pumping with strong pre-amplification and idler-seeding is demonstrated for efficient, broadband, tunable mid-infrared collinear optical parametric amplification. It is shown for low pump energies and high repetition rates, and implemented on various laser systems.

TuB • Metamaterials and Plasmonics—Continued

TuB6 • 12:00 p.m.
Localizing Few-Cycle Light Pulses in Space and Time in Random Dielectric Media, *Manfred Mascheck[1], Slawa Schmidt[1], Martin Silies[1], Parinda Vasa[1], David Leipold[2], Erich Runge[2], Kokoro Kitamura[3], Takashi Yatsui[3], Motoichi Ohtsu[3], Christoph Lienau[1]; [1]Inst. für Physik, Carl von Ossietzky Univ., Germany, [2]Inst. für Physik und Inst. für Mikro- und Nanotechnologien, Technische Univ. Ilmenau, Germany, [3]School of Engineering, Univ. of Tokyo, Japan.* We directly visualize, for the first time, the weak localization of light in both space and time in a disordered array of ZnO nanoneedles using a novel diffraction-limited second-harmonic microscope with few-cycle time resolution.

TuB7 • 12:15 p.m.
Anderson Localization of Single Cycle THz Pulses in Random Media, *Florian Enderli[1], Andreas Bitzer[1], Frank Scheffold[2], Thomas Feurer[1]; [1]Inst. of Applied Physics, Univ. of Bern, Switzerland, [2]Dept. of Physics, Univ. of Fribourg, Switzerland.* We present two approaches based on THz time domain spectroscopy and polaritonics to visualize Anderson localization in 2-D systems. In both femtosecond pump/probe experiments are used to observe single-cycle THz-pulses propagating through random media.

TuC • Optical Parametric Amplifiers—Continued

TuC6 • 12:00 p.m. **Invited**
Cycle-Engineered Coherent Steering of Electrons with a Multicolor Optical Parametric Synthesizer, *Tadas Balčiūnas[1], Giedrius Andriukaitis[1], Aart J. Verhoef[1], Oliver D. Mücke[1], Audrius Pugžlys[1], Andrius Baltuška[1], Darius Mikalauskas[2], Linas Giniūnas[2], Romualdas Danielius[2], Matthias Lezius[3], Ronald Holzwarth[3,4]; [1]Photonics Inst., Vienna Univ. of Technology, Austria, [2]Light Conversion Ltd., Lithuania, [3]Max-Planck-Inst. of Quantum Optics, Germany, [4]Menlo Systems GmbH, Germany.* Directional electron generation asymmetry is measured using incommensurate-frequency multicolor pulses that are carrier-envelope-phase-locked. The demonstrated Yb-laser-pumped OPA technology produces a shot-to-shot-stable femtosecond field combining three carrier frequencies that can be set to an arbitrary ratio.

12:30 p.m.–2:00 p.m. Lunch Break *(on your own)*

NOTES

TuD • Chemical Reaction Dynamics

Tuesday, July 20
2:00 p.m.–3:45 p.m.
Eberhard Riedle; Ludwig-Maximilians-Univ. München, Germany, Presider

TuD1 • 2:00 p.m. **Invited**

Tracking Ultrafast Chemical Reaction Dynamics Using Transient 2DIR Spectroscopy, *Carlos R. Baiz, Robert McCanne, Jessica M. Anna, Kevin J. Kubarych; Univ. of Michigan, USA.* Phototriggered reactions can be monitored in real time with bond-by-bond structural selectivity using multidimensional IR spectroscopy as a probe. We have applied this powerful approach to photoproduct orientational relaxation and geminate rebinding reactions.

TuD2 • 2:30 p.m.

Ultrafast Spin-State Conversion in Solvated Transition Metal Complexes Probed with Femtosecond Soft X-Ray Spectroscopy, *Nils Huse[1], Hana Cho[1,2], Tae Kyu Kim[2], Lindsey Jamula[3], James K. McCusker[3], Frank M. F. de Groot[4], Robert W. Schoenlein[1]; [1]Lawrence Berkeley Natl. Lab, USA, [2]Pusan Natl. Univ., Republic of Korea, [3]Michigan State Univ., USA, [4]Utrecht Univ., Netherlands.* We report the first femtosecond soft X-ray spectroscopy of solvated transition-metal complexes: Structural dynamics mediate ultrafast spin-state conversion and symmetry-specific valence-charge localization. This study demonstrates the unique potential of ultrafast soft X-ray spectroscopy in solutions.

TuD3 • 2:45 p.m.

Time-Resolved X-Ray Emission Spectroscopy, *György Vankó[1], Pieter Glatzel[2], Van-Thai Pham[3], Rafael Abela[4], Daniel Grolimund[4], Camelia N. Borca[4], Steven L. Johnson[4], Chris Milne[3], Wojciech Gawelda[5], Andreas Galler[5], Christian Bressler[5]; [1]KFKI Res. Inst. for Particle and Nuclear Physics, Hungary, [2]KFKI Res. European Synchrotron Radiation Facility, France, [3]École Polytechnique Fédérale de Lausanne, Switzerland, [4]Paul-Scherrer Inst., Switzerland, [5]European XFEL GmbH, Germany.* We present ultrafast X-ray emission studies of photoexcited aqueous iron tris-bipyridine with 70 ps temporal resolution to monitor the spin state changes in this spin-crossover complex.

TuD4 • 3:00 p.m.

Solvated Electron Scavenging by Metal Cations: A Microscopic Picture Derived from the Transient Effect, *Uli Schmidhammer[1], Pascal Pernot[1], Pierre Jeunesse[1], Shigeo Murata[2], Mehran Mostafavi[1]; [1]Lab de Chimie Physique, Univ. Paris Sud, France, [2]AIST, Japan.* The decay of the solvated electron generated by picosecond electron radiolysis is measured for highly concentrated oxidizers in a viscous solvent. Analyzing the non-exponential kinetics reveals molecular parameters of the reaction, particularly its distance distribution.

TuD5 • 3:15 p.m.

Ultrafast Generation of Aqueous Carbonic Acid, *Katrin Adamczyk[1], Mirabelle Prémont-Schwarz[1], Dina Pines[2], Ehud Pines[2], Erik T. J. Nibbering[1]; [1]Max-Born-Inst. für Nichtlineare Optik und Kurzzeitspektroskopie, Germany, [2]Ben-Gurion Univ. of the Negev, Israel.* We generate carbonic acid, a molecule of elusive nature, by ultrafast protonation of bicarbonate in aqueous solution, which follows the free energy reactivity correlation known for carboxylate anions, with an associated pK_a-value of 3.45 ±0.15.

TuD6 • 3:30 p.m.

Molecular Reaction Dynamics of Excited-State Intramolecular Proton Transfer Revealed by Isotope Dependence, *Junghwa Lee, Chul Hoon Kim, Taiha Joo; Dept. of Chemistry, Pohang Univ. of Science and Technology, Republic of Korea.* Deuterium isotope dependence on the excited-state intramolecular proton transfer rate and nuclear wave packet motions was investigated by time-resolved fluorescence. High time resolution reveals the role of OH stretching motion on the proton transfer reaction.

3:45 p.m.–4:15 p.m. Coffee Break/Exhibits, *Erickson/Carroll/Sinclair Rooms*

Tuesday, July 20, 3:45 p.m.–4:45 p.m. and 6:30 p.m.–7:30 p.m.
Rooftop Garden

TuE1

Soft X-Ray Interferometer for Time-Resolved Diagnostics of Laser-Aided Nano-Fabrication, *Tohru Suemoto[1], Kota Terakawa[1], Yasuo Minami[1], Yoshihiro Ochi[2], Noboru Hasegawa[2], Tetsuya Kawachi[2], Takuro Tomita[3], Minoru Yamamoto[3], Manato Deki[3]; [1]Inst. for Solid State Physics, Univ. of Tokyo, Japan, [2]JAEA, Japan, [3]Univ. of Tokushima, Japan.* An interferometer is constructed utilizing 13.9 nm radiation from a plasma-based soft X-ray laser. Single-shot measurement with a time-resolution of 7 ps is performed to observe the initial stage of the ablation process in platinum.

TuE2

Systematic Study of Delay-Based Adaptive Coherent Control, *Di Yang, Daan P. Sprünken, Alexander C.W. van Rhijn, Peter van der Walle, Ting Lee Chen, Herman L. Offerhaus, Jennifer L. Herek, Aliakbar Jafarpour; Univ. of Twente, Netherlands.* We show five simultaneous fundamental improvements in adaptive ultrafast spectroscopy by estimating the group delay, rather than phase. Numerical results are confirmed by experiments, and issues such as generality and noise robustness are studied quantitatively.

TuE3

High-Power Wavelength-Tunable Ti:Sa Amplifier System for Ultra-Cold Electron Generation for Compact FELs, *Christoph P. Hauri, Romain Ganter, Frederic Le Pimpec, Clemens Ruchert, Alexandre Trisorio; Paul Scherrer Inst., Switzerland.* We demonstrate an ultra-stable high-power Ti:sapphire system with a tunable central wavelength in the IR and UV. The laser is used to generate ultra-cold electron bunches for driving future compact Free Electron Lasers.

TuE4

Energy Flow in the Light Harvesting Complex Manipulated by Pre-Excitation of the Energy Accepter, *Ryosuke Nakamura[1,2], Takuya Yoshioka[1], Kenta Abe[1], Shunnsuke Sakai[3], Katsunori Nakagawa[2,3], Mamoru Nango[2,3], Hideki Hashimoto[2,4], Masayuki Yoshizawa[1,2]; [1]Dept. of Physics, Graduate School of Science, Tohoku Univ., Japan, [2]JST, CREST, Japan, [3]Dept. of Life and Materials Engineering, Graduate School of Engineering, Nagoya Inst. of Technology, Japan, [4]Dept. of Physics, Graduate School of Science, Osaka City Univ., Japan.* Energy transfer from carotenoid is partially blocked by pre-excitation of the energy accepter, bacteriochlorophyll *a*. By analyzing induced changes in energy flow, the energy transfer and competing internal conversion dynamics in the complexes are elucidated.

TuE5

Coherent Control of Multidimensional Nonlinear Optical Signals with Shaped Laser Pulses, *Dmitri V. Voronine[1], Darius Abramavicius[2], Shaul Mukamel[2]; [1]Univ. Bielefeld, Germany, [2]Univ. of California at Irvine, USA.* Multidimensional nonlinear optical signals with shaped laser pulses are simulated using closed-form expressions that contain pulse envelopes. Multiparameter coherent control using linear and higher-order chirp is applied to photosynthetic excitons to enhance weak cross peaks.

TuE6

Ultrafast Proton Transfer in Fluorescent and Photochromic Proteins, *Andras Lukacs[1], Minako Kondo[1], Ismael A. Heisler[1], Atsushi Miyawaki[2], Hidekazu Tsutsui[2], Michael Towrie[3], Gregory Greetham[3], Peter J. Tonge[4], Deborah Stoner-Ma[4], Stephen R. Meech[1]; [1]Univ. of East Anglia, UK, [2]Lab for Cell Function Dynamics, RIKEN, Japan, [3]Rutherford Appleton Lab, UK, [4]Stony Brook Univ., USA.* Transient IR and ultrafast fluorescence are used to probe primary processes in two proteins. S65T GFP exhibits proton transfer on a short H-bond, while transient IR probes primary photochemistry in the optical highlighter protein kikGR.

TuE7

Structurally-Sensitive Rebinding Dynamics of Solvent-Caged Radical Pairs: Exploring the Viscosity Dependence, *Carlos R. Baiz, Robert McCanne, Kevin J. Kubarych; Univ. of Michigan, USA.* Solvent-caged radical rebinding dynamics are studied using non-equilibrium 2-D IR and dispersed vibrational echo spectroscopy.

TuE8

Femtosecond Relaxation Dynamics of Core and Surface Localized Electronic States in $Au_{24}PdL_{18}$, *Stephen A. Miller, Christina A. Fields-Zinna, Royce W. Murray, Andrew M. Moran; Univ. of North Carolina at Chapel Hill, USA.* Femtosecond transient grating spectroscopies probe the relaxation dynamics of the monolayer protected clusters $Au_{24}Pd(SCH_2CH_2Ph)_{18}$ and $Au_{25}(SCH_2CH_2Ph)_{18}^{-}$. The signals reveal an ultrafast internal conversion process between excited states spatially localized to the core and semiring moieties.

TuE9

A Peptide Capping Layer over Gold Nanoparticles, *Marco Schade[1], Paul M. Donaldson[1], Alessandro Moretto[2], Claudio Toniolo[2], Peter Hamm[1]; [1]Inst. of Physical Chemistry, Univ. of Zürich, Switzerland, [2]Inst. of Biomolecular Chemistry, Padova Unit, CNR, Dept. of Chemistry, Univ. of Padova, Italy.* We study gold nanoparticles capped with a layer of helical peptides. Energy transport through the peptides is initiated by exciting the plasmon resonance. 2-D-IR spectroscopy is used to gain structural information about the capping layer.

TuE10

Highly Exergonic Bimolecular Electron Transfer beyond Marcus Theory, the Importance of Molecular Structure and Dynamics, *Bernhard Lang[1], Katrin Adamczyk[2], Natalie Banerji[1], Diego Villamaina[1], Jens Dreyer[2], Erik T. J. Nibbering[2], Eric Vauthey[1]; [1]Univ. of Geneva, Switzerland, [2]Max-Born-Inst. für Nichtlineare Optik und Kurzzeitspektroskopie, Germany.* The combination of visible and mid infrared transient absorption yields a direct insight into structural dynamics and determination of distinct reaction pathways in highly exergonic electron transfer, asking for refinement of existing theories.

TuE11

Femtosecond Fluorescence up-Conversion Studies of Electron Injection in Dye Sensitized Solar Cells, *Olivier Bräm, Andrea Cannizzo, Majed Chergui; École Polytechnique Fédérale de Lausanne, Switzerland.* Short lived (≤30 fs) fluorescence of RuN719 dye adsorbed on TiO_2 semiconductor substrate shows a ~3 fold decrease in intensity compared to the non-injecting Al_2O_3 substrate, indicative of an injection time of about 3 fs.

TuE12

Photoswitching Cycle of a Nitro-Substituted Spiropyran: Ring-Opening and Ring-Closure Dynamics, *Johannes Buback, Martin Kullmann, Patrick Nuernberger, Ralf Schmidt, Frank Würthner, Tobias Brixner; Univ. of Wuerzburg, Germany.* We perform pump-repump-probe transient absorption experiments on a spiropyran-merocyanine system demonstrating a complete closed-form/open-form/closed-form photoswitching cycle. We provide first direct experimental proof of spiropyran-derived merocyanine ring closure and measure the ring-opening dynamics.

Tuesday, July 20, 3:45 p.m.–4:45 p.m. and 6:30 p.m.–7:30 p.m.
Rooftop Garden

TuE13
Mapping Chirp Effects on Impulsive Vibrational Spectroscopy in Multidimensional Systems, *Amir Wand, Shimshon Kallush, Ofir Shoshanim, Oshrat Bismuth, Ronnie Kosloff, Sanford Ruhman; Hebrew Univ. of Jerusalem, Israel.* Experiment and theory applied to a range of polyatomics map chirp effects on impulsive vibrational spectroscopy. Pump detuning, solvent dissipation and mode displacements are factors determining the optimal chirp, as well as its inter-mode dependence.

TuE14
Time-Domain Raman Tracking of Ultrafast Flattening Distortion in Organometallic Complex, *Satoshi Takeuchi[1], Munetaka Iwamura[2], Hidekazu Watanabe[1], Tahei Tahara[1]; [1]RIKEN, Japan, [2]Univ. of Toyama, Japan.* We studied vibrational structures of the metal-to-ligand-charge-transfer state of Cu(I)-diimine complexes through wavepacket motions generated impulsively at various delay-times. The obtained "instantaneous" Raman data provided firm vibrational evidences for ultrafast nature of the flattening distortion.

TuE15
Excitation-Energy Dependence of Ultrafast Electron Injection from a Model Carotenoid, *Jacquelyn M. Burchfield, Emily J. Glassman, Graham R. Fleming; Univ. of California at Berkeley, USA.* Energy-dependent excitation to the second excited state of β-apo-8′-carotenoic acid bound to an electron-accepting nanoparticle reveals a second decay pathway allowing electron injection into basic nanoparticles from a lower-energy state available only under high-energy excitation.

TuE16
Multi-Dimensional Electronic Spectroscopy of J-Aggregates, *Dylan H. Arias, Katherine W. Stone, Keith A. Nelson; MIT, USA.* Multi-dimensional electronic spectroscopy, via spatiotemporal pulse-shaping, is used to study excitons in J-aggregates. Correlation spectra elucidate spectral diffusion while a two-quantum experiment reveals couplings between the first and second manifolds of exciton states.

TuE17
Can Retinal Isomerization in Bacteriorhodopsin Be Coherently Controlled in the Strong Field Limit? *Valentin I. Prokhorenko[1], Alexei Halpin[1], Philip J. M. Johnson[1], Leonid S. Brown[2], R. J. Dwayne Miller[1]; [1]Univ. of Toronto, Canada, [2]Univ. of Guelph, Canada.* We observe experimentally that the isomerization efficiency of bacteriorhodopsin increases by chirping the excitation pulses at moderate excitation levels. Under strong fields (>100 GW/cm^2), the isomerization becomes corrupted, most likely from ionization of the protein.

TuE18
Ultrafast Vibrational Dynamics in Quasi-Linear Arrays of Hydrogen-Bonds Explored by 2DIR-Spectroscopy, *Stephan Knop[1], Jaane Seehusen[1], Jörg Lindner[1], Dirk Schwarzer[2], Peter Vöhringer[1]; [1]Rheinische Friedrich-Wilhelms-Univ., Germany, [2]Max-Planck-Inst. für Biophysikalische Chemie, Germany.* Femtosecond mid-infrared pump-probe and two-dimensional spectroscopy in the OH-stretching spectral region was used to elucidate the dynamics of vibrational energy relaxation and dynamic line broadening in artificial low-dimensional hydrogen-bond wires of different lengths.

TuE19
Band Filling Dynamics and Auger Recombination in Lead Sulfide Nanocrystals, *William K. Peters, Byungmoon Cho, Robert J. Hill, Trevor L. Courtney, David M. Jonas; Univ. of Colorado at Boulder, USA.* Pump energy dependent pump probe transients were recorded in lead sulfide nanocrystals. Band filling dynamics were observed on a few-hundred femtosecond timescale followed by Auger dynamics over tens to hundreds of picoseconds.

TuE20
Terahertz Radiation with a Continuous Spectral Bandwidth Reaching beyond 100 THz from a Laser-Induced Gas Plasma, *Volker Blank, Mark D. Thomson, Hartmut G. Roskos; Physikalisches Inst., Johann Wolfgang Goethe-Univ., Germany.* The generation of coherent terahertz radiation with a spectrum covering the range from below 1 THz to more than 100 THz is demonstrated, using an air-plasma with sub-20-fs two-color optical excitation.

TuE21
Toward Single-Cycle Pulse Generation in Single-Crystal Diamond, *Miaochan Zhi, Kai Wang, Alexei V. Sokolov; Texas A&M Univ., USA.* We generate a broad band of frequency sidebands by focusing two infrared beams non-collinearly into diamond. We use a pulse shaper to adjust phases across the spectrum of 3 sidebands and obtain 13 fs pulses.

TuE22
Generation of Ultra-Short Gamma Ray Pulses via Laser Compton Scattering in UVSOR-II Electron Storage Ring, *Yoshitaka Taira[1,2], Masahiro Adachi[2,3], Heisyun Zen[2,3], Takanori Tanikawa[3], Naoto Yamamoto[1], Masato Hosaka[1], Yoshifumi Takashima[1], Kazuo Soda[1], Masahiro Katoh[1,2,3]; [1]Graduate School of Engineering, Nagoya Univ., Japan, [2]UVSOR, Inst. for Molecular Science, Natl. Inst.s of Natural Sciences, Japan, [3]School of Physical Sciences, Graduate Univ. for Advanced Studies, Japan.* We have generated laser Compton scattering gamma rays via head-on and horizontal 90-degree collision in an electron storage ring; this result will provide a tunable ultra-short gamma ray pulse source.

TuE23
Polarization Pulse Shaping Using Nonlinear Optical Processes, *Marco T. Seidel, Suxia Yan, Zhengyang Zhang, Howe-Siang Tan; School of Physical and Mathematical Sciences, Nanyang Technological Univ., Singapore.* We demonstrate a scheme for mid infrared polarization pulse shaping by using two perpendicularly oriented nonlinear optical processes in a near-interferometric stable beam geometry. This method can be generalized to produce ultraviolet polarization shaped pulse.

TuE24
The Evolution of Signal-to-Noise Ratio in Superfluorescence-Contaminated Optical Parametric Chirped-Pulse Amplification, *Cristian Manzoni[1], Jeffrey Moses[2], Franz X. Kärtner[2], Giulio Cerullo[1]; [1]Politecnico di Milano, Italy, [2]MIT, USA.* Using a numerical model consistent with quantum mechanics, we study the evolution of signal-to-noise ratio in chirped-pulse parametric amplification with significant quantum-noise contamination. For realistic amplifier parameters, noise performance can have order-of-magnitude dependence on design.

Tuesday, July 20, 3:45 p.m.–4:45 p.m. and 6:30 p.m.–7:30 p.m.
Rooftop Garden

TuE25
Measuring Time Profiles of Ultraweak Ultrashort Pulses by Time Domain Superresolution, *Osip Schwartz, Oren Raz, Ori Katz, Nirit Dudovich, Dan Oron; Dept. of Physics of Complex Systems, Weizmann Inst. of Science, Israel.* We demonstrate an optical nonlinearity free ultrashort pulse characterization technique relying on spectral component localization in time domain. Ultraweak pulses in NIR to XUV range can be characterized with resolution depending only on integration time.

TuE26
Single-Shot Detection and Stabilization of Carrier Phase Drifts of Mid-IR Pulses, *Cristian Manzoni, Michael Först, Henri Ehrke, Matthias C. Hoffmann, Andrea Cavalleri; Max-Planck Res. Group for Structural Dynamics, Univ. of Hamburg, Germany.* We introduce a new scheme for single-shot characterization of the absolute-phase jitter of mid-IR pulses. The system detects phase drifts of self-phase stabilized sources; a control scheme compensating long-term drifts is also demonstrated.

TuE27
Ultrabroadband Optical Parametric Chirped-Pulse Amplifier in the Mid-Infrared Using Aperiodically Poled Mg:LiNbO$_3$, *Clemens Heese[1], Christopher R. Phillips[2], Lukas Gallmann[1], Martin M. Fejer[2], Ursula Keller[1]; [1]ETH Zürich, Switzerland, [2]Stanford Univ., USA.* We present a new approach to amplification of few-cycle laser pulses in the mid-infrared spectral region using diode-pumped solid-state lasers. At 100-kHz repetition rate pulse energies of 1.5-μJ and and durations of 75-fs are generated.

TuE28
Generation and Characterization of Phase and Amplitude Modulated Femtosecond UV Pulses, *Jens Möhring, Tiago Buckup, Marcus Motzkus; Univ. Heidelberg, Germany.* To enable flexible generation of femtosecond UV pulses in time resolved experiments we present a novel setup capable of generation, direct UV phase modulation and shaper assisted characterization of phase and amplitude modulated UV pulses.

TuE29
Mode-Locking of an Er:Yb:Glass Laser with Single Layer Graphene, *Chien-Chung Lee, Guillermo Acosta, Scott Bunch, Thomas R. Schibli; Univ. of Colorado, USA.* Pulses as short as 260fs have been generated in an Er:Yb:glass laser by saturable absorber mode-locking using graphene as the only mode-locking mechanism. These novel saturable absorbers present a low-cost, ultra-broadband alternative to traditional SESAMs.

TuE30
Characterization of an Asynchronously Mode-Locked Erbium-Doped Fiber Laser Operating at 10GHz, *Camila C. Dias, Eunezio A. De Souza; Univ. Presbiteriana Mackenzie, Brazil.* We investigated the dynamic operation of an asynchronous mode-locking EDFL at 10GHz as a deviation from the synchronous regime. We observed that the soliton shifts the central wavelength speeding up to stabilize the asynchronous mode-locking.

TuE31
Tunable Broadband Optical Generation via Giant Rabi Shifting in Micro-Plasmas, *Ryan Compton, Alex Filin, Dmitri A. Romanov, Mateusz Plewicki, Robert J. Levis; Temple Univ., USA.* A new coherent laser-source arising from giant time-dependent generalized Rabi shifting has been demonstrated. A 1 ps laser is transformed into a pulse with bandwidth corresponding to a 70 fs pulse via time-dependent Rabi shifting.

TuE32
Electron-Energy Resolved Measurement of the Cascaded Auger Decay in Krypton, *Aart J. Verhoef[1], Alexander Mitrofanov[1], Xuan Trung Nguyen[1], Maria Krikunova[2], Nikolay Kabachnik[2], Markus Drescher[2], Andrius Baltuška[1]; [1]Vienna Univ. of Technology, Austria, [2]Univ. Hamburg, Germany.* The cascaded Auger decay following excitation with 92-eV soft-X-ray pulses from the 3p-subshell in Krypton has been energy-and-time-resolved for the first time. The decay time of the $4s^{-1}4p^{-1}np \rightarrow 4p^{-2}+e$ transition is measured to be 50±10 fs.

TuE33
Ultrafast, Element-Specific, Demagnetization Dynamics Probed Using Coherent High Harmonic Beams, *Stefan Mathias[1,2], Chan La-O-Vorakiat[1], Patrik Grychtol[3], Roman Adam[3], Mark Siemens[1], Justin M. Shaw[4], Hans Nembach[5], Martin Aeschlimann[2], Claus M. Schneider[3], Tom Silva[5], Margaret M. Murnane[1], Henry C. Kapteyn[1]; [1]JILA, Univ. of Colorado, USA, [2]Univ. of Kaiserslautern, Germany, [3]Inst. of Solid State Res., Res. Ctr. Jülich, Germany, [4]Electromagnetics Div., USA, [5]NIST, USA.* High harmonics from a tabletop laser are used to probe ultrafast demagnetization of a compound material (Permalloy) with elemental selectivity. We achieve the highest time resolution, element-specific, measurements to date at 55 fs.

TuE34
Elliptical Dichroism of High Harmonics Emitted from Aligned Molecules, *Robynne M. Lock, Xibin Zhou, Margaret M. Murnane, Henry C. Kapteyn; JILA and Dept. of Physics, Univ. of Colorado, USA.* By analyzing the polarization of harmonics emitted by aligned molecules driven by elliptically-polarized driving laser fields, we observe a structure-dependent dichroism. This suggests that electron dynamics within the molecule influence high harmonic generation.

TuE35
Degree-of-Alignment Dependence of High-Order Harmonic Generation from CO$_2$ Molecules, *Kosaku Kato, Shinichirou Minemoto, Hirofumi Sakai; Dept. of Physics, Graduate School of Science, Univ. of Tokyo, Japan.* Degree-of-alignment dependence of high-order harmonic generation from CO$_2$ molecules shows that the harmonic orders at which the harmonic intensities are suppressed due to destructive interference remain almost same orders irrespective of different degrees of alignment.

TuE36
Manipulating the Dissociation of H$_2$ (D$_2$) by Phase-Stable Laser Pulses, *Manuel H. Kremer[1], Bettina Fischer[1], Bernold Feuerstein[1], Vitor L. B. de Jesus[2], Vandana Sharma[1], Christian Hofrichter[1], Artem Rudenko[3], Uwe Thumm[4], Claus Dieter Schröter[1], Robert Moshammer[1], Joachim Ullrich[1]; [1]Max-Planck-Inst. für Kernphysik, Germany, [2]Inst. Federal de Educação, Ciência e Tecnologia do Rio de Janeiro (IFRJ), Brazil, [3]Max-Planck Advanced Study Group at CFEL, Germany, [4]James R. Macdonald Lab, Kansas State Univ., USA.* Fully differential data on H$_2$ (D$_2$)-dissociation in carrier-envelope-phase (CEP)stabilized 6fs laser pulses were recorded with a reaction microscope. By varying the CEP control over the proton emission direction, and, thus, the charge localization was achieved.

TuE37
IR-Assisted Ionization of He+/He++ by Attosecond Extreme Ultraviolet (EUV) Radiation, *Predrag Ranitovic, C. W. Hogle, X. Zhou, M. M. Murnane, H. C. Kapteyn; JILA, Univ. of Colorado, USA.* High harmonics, in form of attosecond pulse trains, are used to coherently excite He^*/He^{*+} states just below the He^+/He^{++} ionization threshold. IR-induced He^+ yield shows evidence of sub-cycle modulation of atomic stark shift.

Tuesday, July 20, 3:45 p.m.–4:45 p.m. and 6:30 p.m.–7:30 p.m.
Rooftop Garden

TuE38

Ultrafast Coherent Phonon Dynamics in Metallic Single-Walled Carbon Nanotubes, *Keiko Kato, Atsushi Ishizawa, Katsuya Oguri, Hideki Gotoh, Hidetoshi Nakano, Tetsuomi Sogawa; NTT Basic Res. Labs, NTT Corp., Japan.* We report the first observation of coherent phonons in separated metallic single-walled carbon nanotubes (SWCNTs). Due to structure-dependent electron-phonon couplings, radial breathing phonon mode is hardened with photo-carriers in metallic but not in semiconducting SWCNTs.

TuE39

Dynamics of Spin-Lattice Relaxation in $Co_xFe_{3-x}O_4$Nanocrystals, *Tai-Yen Chen, Chih-Hao Hsia, Hsiang-Yun Chen, Dong Hee Son; Texas A&M Univ., USA.* Spin-lattice relaxation rates in colloidal $Co_xFe_{3-x}O_4$ nanocrystals were investigated as a function of size and Co content via pump-probe Faraday rotation measurements to investigate spin-lattice relaxation rate in nanoscale magnetic materials.

TuE40

Dynamic Electron Molecular Vibration (EMV) Interference during Photoinduced Metallization in Charge Ordered Organic Salt, *Yohei Kawakami[1], Takeshi Fukatsu[1], Hirotake Itoh[1,2], Shinichiro Iwai[1,2], Takahiko Sasaki[2,3], Kaoru Yamamoto[4], Kyuya Yakushi[4]; [1]Dept. of Physics, Tohoku Univ., Japan, [2]JST, CREST, Japan, [3]Inst. for Materials Res., Tohoku Univ., Japan, [4]Inst. for Molecular Science, Japan.* Interference between intermolecular electronic oscillation (period; 18 fs) and intramolecular vibration (22 fs) shows that excited state is initially dressed by the C=C vibration during the photoinduced insulator to metal transition in layered organic salt.

TuE41

Motional Narrowing of Phonon Spectrum Driven by Ultrafast Dielectric Fluctuation in Organic Dimer Mott Insulator, *Keisuke Itoh[1], Hideki Nakaya[1], Yohei Kawakami[1], Takeshi Fukatsu[1], Hirotake Itoh[1,2], Shinichiro Iwai[1,2], Takahaiko Sasaki[2,3], Shingo Saito[4]; [1]Dept. of Physics, Tohoku Univ., Japan, [2]JST, CREST, Japan, [3]Inst. for Materials Res., Tohoku Univ., Japan, [4]NICT, Japan.* Motional narrowing of phonon spectrum was observed in organic dimer Mott insulator, reflecting ultrafast dielectric fluctuation which is driven by flip of the dimer dipole. Moreover, this phonon is coherently induced by the electronic excitation.

TuE42

Dynamics of Coherent Phonons in Disordered Graphite, *Ikufumi Katayama[1], Sho Koga[1], Toru Shimada[2], Keiko Kato[3], Shunichi Hishita[3], Daisuke Fujita[3], Jun Takeda[1], Masahiro Kitajima[4]; [1]Yokohama Natl. Univ., Japan, [2]Free Univ. of Berlin, Germany, [3]Natl. Inst. of Materials Science, Japan, [4]Natl. Defense Acad., Japan.* High-frequency coherent phonons in Ar^+-implanted graphite have been investigated with a 7.5 fs Ti:sapphire laser and electro-optic sampling method. Coherent oscillations of G- and D-modes are clearly observed with time-dependent frequency-shifts.

TuE43

Femtosecond Coherent Vibrational Relaxation in PVA Film Detected by Coherent Anti-Stokes Raman Spectroscopy, *Takanori Kozai, H. Miyagawa, N. Tsurumachi, S. Koshiba, S. Nakanishi, H. Itoh; Kagawa Univ., Japan.* Coherent vibrational relaxation is investigated for CH and OH stretch modes in PVA film by femtosecond coherent anti-Stokes Raman spectroscopy. The vibrational relaxation for CH mode is found faster than that for OH mode.

TuE44

Two-Dimensional Electronic Coherently Controlled Spectroscopy Reveals Long-Lived Induced Phase Memory, *Valentin I. Prokhorenko, Alexei Halpin, R. J. Dwayne Miller; Univ. of Toronto, Canada.* Using phase-shaped excitation pulses we measured 2-D electronic spectra of an organic dye and found that the specific pulse shapes affects the 2-D profiles even at very long waiting times (up to 100 ps).

TuE45

Dynamics of Carriers and the Influence of the Quantum Confined Stark Effect in ZnO/ZnMgO Quantum Wells , *Christopher R. Hall[1], Lap V. Dao[1], K. Koike[2], S. Sasa[2], H. H. Tan[3], M. Inoue[2], Mitsuaki Yano[2], Chenupatti Jagadish[3], Jeffrey A. Davis[1]; [1]Swinburne Univ. of Technology, Australia, [2]Osaka Inst. of Technology, Japan, [3]Australian Natl. Univ., Australia.* We reveal the dynamics of carrier-induced screening of the internal electric field in ZnO quantum wells. By controlling the potential profile of the quantum wells we demonstrate the ability to tune the excited state lifetimes.

TuE46

Interplay between the Electronic and Lattice Parts of the Order Parameter in a 1-D Charge Density Wave System Probed by Femtosecond Spectroscopy, *Hanjo Schäfer[1], Viktor Kabanov[2,3], Markus Beyer[1], Katica Biljakovic[4], Jure Demsar[1,3]; [1]Univ. Konstanz, Germany, [2]Univ. Konstanz, Slovenia, [3]Jozef Stefan Inst., Slovenia, [4]Inst. of Physics, Croatia.* Utilizing the time-dependent-Ginzburg-Landau model we show that numerous phonon modes appearing below critical-temperature in a one-dimensional charge-density-wave originate from linear coupling of the electronic part of the order parameter to the phonons at modulation wavevector.

TuE47

30-fs Hole-Transfer Dynamics in Polymer/PCBM Bulk Heterojunction, *Artem A. Bakulin[1], Jan C. Hummelen[2], Paul H. M. van Loosdrecht[1], Maxim S. Pshenitchnikov[1]; [1]Zernike Inst. for Advanced Materials, Univ. of Groningen, Netherlands, [2]Stratingh Inst. for Chemistry, Univ. of Groningen, Netherlands.* Methanofullerene PCBM is used in the majority of modern plastic photovoltaic devices. Using visible-IR ultrafast spectroscopy we resolve the 30-fs hole-transfer following PCBM excitation and show that PCBM exciton harvesting depends on the blend morphology.

TuE48

The Effect of Pulse Chirp on Two-Dimensional Fourier Transform Spectra, *Patrick F. Tekavec, Jeffrey A. Myers, Kristin L. M. Lewis, Franklin Fuller, Jennifer P. Ogilvie; Univ. of Michigan, USA.* We investigate the effect of pulse chirp on the shape of absorptive 2-D electronic spectra. We present calculations on a model system as well as experimental results on an organic dye molecule.

TuE49

Spin Dynamics Excited with Mid-Infrared Femtosecond Laser Pulses, *Amani Zagdoud, Mircea Vomir, Michele Albrecht, Marie Barthelemy, Jean-Yves Bigot; Univ. de Strasbourg, France.* We have studied the spins and charges dynamics of ferromagnetic thin films excited with ultra-short mid-infrared laser pulses. We show that the demagnetization still occurs even for small perturbations around the Fermi level.

Tuesday, July 20, 3:45 p.m.–4:45 p.m. and 6:30 p.m.–7:30 p.m.
Rooftop Garden

TuE50

Coherent Phonons in Oxide Superlattices Observed by Optical and X-Ray Pump-Probe Techniques, *Marc Herzog[1], Roman Shayduk[2], Wolfram Leitenberger[1], Renske M. van der Veen[3,4], Christopher J. Milne[3,4], Steven L. Johnson[3], Ionela Vrejoiu[5], Marin Alexe[5], Dietrich Hesse[5], Matias Bargheer[1]; [1]Univ. of Potsdam, Germany, [2]Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Germany, [3]Paul Scherrer Inst., Switzerland, [4]École Polytechnique Fédérale de Lausanne, Switzerland, [5]Max-Planck-Inst. für Mikrostrukturphysik, Germany.* We investigated the generation and propagation of coherent phonons in an oxide superlattice of $SrRuO_3$ and $SrTiO_3$. The rich dynamics resulted in drastic modulations of various Bragg peaks on a 1-ps timescale.

TuE51

The Structural Evolution of Photochromic Reaction in Spirooxazine Traced with Sub-40fs Transient Absorption Spectroscopy, *R. Sai Santosh Kumar[1], Larry Lüer[2], Guglielmo Lanzani[1]; [1]Ctr. for Nano Science and Technology, Politecnico di Milano, Italy, [2]Madrid Inst. for Advanced Studies, IMDEA Nanociencia, Spain.* Using sub-40fs transient absorption spectroscopy we trace the structural evolution of a substituted photochromic spiro-phenanthro-oxazine molecule from the spectral changes in the time domain, and by studying coherent oscillations in the frequency domain.

TuE52

Momentum Imaging of Three-Body Fragmentation Pathways in Polyatomic Molecules, *Li Zhang[1], Stefan Roither[1], Xinhua Xie[1], Daniil Kartashov[1], Atshushi Iwasaki[2], Huailiang Xu[2], Markus Schöffler[3], Georg Reider[1], Reinhard Dörner[3], Kaoru Yamanouchi[2], Andrius Baltuška[1], Markus Kitzler[1]; [1]Photonics Inst., Vienna Univ. of Technology, Austria, [2]Dept. of Chemistry, School of Science, Univ. of Tokyo, Japan, [3]Inst. für Kernphysik, J. W. Goethe Univ. Frankfurt, Germany.* Using coincidence momentum spectroscopy we show that the external laser field's properties driving the internal molecular dynamics have negligible influence on the decision to follow a given fragmentation pathway in three-body fragmentation of polyatomic molecules.

NOTES

TuF • Shaped Pulses

Tuesday, July 20
4:45 p.m.–6:30 p.m.
Marcus Motzkus; Philipps Univ. Marburg, Germany, Presider

TuF1 • 4:45 p.m.
High-Finesse Dispersion-Free Cavities for Broadband Filtration of Laser Comb Lines, *Li-Jin Chen[1], Guoqing Chang[1], Chih-Hao Li[2], Alex Glenday[2], Andrew J. Benedick[1], David F. Phillips[2], Ronald L. Walsworth[2], Franz X. Kärtner[1]; [1]MIT, USA, [2]Harvard-Smithsonian Ctr. for Astrophysics, Harvard Univ., USA.* Dispersion-free cavities using dielectric mirrors with complementary dispersion are proposed for broadband filtration of laser comb lines. The technique enables us to implement a green astro-comb with 40GHz spacing for calibration of astronomical spectrographs.

TuF2 • 5:00 p.m.
Grism-Based Pulse Shaper for Line-by-Line Control of More than 600 Comb Lines, *Matthew S. Kirchner[1,2], Scott A. Diddams[2]; [1]Univ. of Colorado, USA, [2]NIST, USA.* We construct a line-by-line pulse shaper using a grism dispersive element and achieve control of over six hundred 21 GHz comb lines. The 13.4 THz bandwidth is the largest ever controlled in a line-by-line manner.

TuF3 • 5:15 p.m.
Programmable High Resolution Broadband Pulse Shaping Using a 2-D VIPA-Grating Pulse Shaper with a Liquid Crystal on Silicon (LCOS) Spatial Light Modulator, *V. R. Supradeepa, Daniel E. Leaird, Andrew M. Weiner; Purdue Univ., USA.* We demonstrate programmable spectral shaping with simultaneous broad-bandwidth(>40nm) and high-resolution(<4GHz) using a 2-D VIPA-Grating pulse-shaper with a LCOS SLM. The apparatus is capable of scaling to bandwidths of 100s of nm with sub-GHz resolution.

TuF4 • 5:30 p.m.
Shaped Sub-20 fs UV Pulses: Handling Spatio-Temporal Coupling, *Nils Krebs, Rafael A. Probst, Eberhard Riedle; LS für BioMolekulare Optik, Ludwig-Maximilians-Univ. München, Germany.* Based on acousto-optical shaping performed directly in the UV spectral range, we demonstrate that correct beam focusing is essential to get fully wavelength tunable, nearly Fourier limited as well as complex structured sub-20 fs pulses.

TuF5 • 5:45 p.m.
Linear Characterization of Ultrafast Nonlinear Spatiotemporal Dynamics, *Daniel E. Adams[1], Thomas A. Planchon[2], Jeff A. Squier[1], Charles G. Durfee[1]; [1]Colorado School of Mines, USA, [2]Howard Hughes Medical Inst., USA.* We use time-domain Spatially and Spectrally Resolved Interferometry (SSRI) to characterize nonlinear lensing, cross-polarized wave generation and ionization induced defocusing. SSRI yields t- and ω-dependent wavefronts and can measure ultrafast material response.

TuG • Transient Biomolecular Structures

Tuesday, July 20
4:45 p.m.–6:30 p.m.
Peter Hamm; Univ. Zürich, Switzerland, Presider

TuG1 • 4:45 p.m.
Light-Switchable HTI-Peptides: Ultrafast Structural Changes and Coupling between the Electronically Excited Chromophore and Amide Groups, *Nadja Regner[1], Teja T. Herzog[1], Karin Haiser[1], Christian Hoppmann[2], Jörg Sauermann[3], Karola Rueck-Braun[2], Martin Engelhard[3], Thorben Cordes[1,4], Wolfgang Zinth[1]; [1]Ludwig-Maximilians-Univ., Germany, [2]Technische Univ. Berlin, Germany, [3]Max-Planck-Inst. for Molecular Physiology, Germany, [4]Dept. of Physics and Biological Physics, Univ. of Oxford, UK.* Hemithioindigo (HTI) is used as a structural trigger for attached peptides. Ultrafast, directly driven and slower, allosteric structural changes are induced by the HTI switch. Pronounced electronic interactions occur between the HTI and amino acids.

TuG2 • 5:00 p.m.
Mapping GFP Structural Evolution during Excited-State Proton Transfer with Femtosecond Stimulated Raman, *Chong Fang, Renee R. Frontiera, Rosalie Tran, Richard A. Mathies; Univ. of California at Berkeley, USA.* We use femtosecond stimulated Raman spectroscopy to view transient structural changes of the photoexcited GFP-chromophore, identifying low-frequency ring-wagging motions that gate excited-state proton transfer. Mechanistic insights on reactive systems require structural probing with femtosecond resolution.

TuG3 • 5:15 p.m.
Excited State Dynamics in Variable-Length DNA A Tracts Reflect Base Stacking Disorder and Not Exciton Delocalization, *Charlene Su[1], Bern Kohler[2]; [1]Ohio State Univ., USA, [2]Montana State Univ., USA.* Excited states in single-stranded all-adenine oligonucleotides decay to long-lived charge transfer states if the bases are well stacked, while poor base stacking found near the ends of the strand leads to monomer-like nonradiative decay.

TuG4 • 5:30 p.m.
Distinguishing between Two and Three-State Equilibrium Folding with Three-Pulse Photon Echo Peak Shift (3PEPS) Spectroscopy, *Zhaochuan Shen[1], Emily Gibson[2], Ralph Jimenez[1]; [1]JILA, NIST, Univ. of Colorado, USA, [2]Dept. of Physics, Univ. of Colorado, USA.* We investigate the equilibrium unfolding of Zn-cytochrome c by three-pulse photon echo peak shift spectroscopy. The wavelength dependence of the asymptotic peak shift reveals a bimodal inhomogeneous distribution function characteristic of two-state unfolding.

TuG5 • 5:45 p.m.
Picosecond Time-Resolved Resonance Raman Investigation of Primary Structural Transition of the Heme Induced by Nitric Oxide Rebinding, *Sergei G. Kruglik[1,2], Byung-Kuk Yoo[1], Stefan Franzen[3], Marten H. Vos[2], Jean-Louis Martin[1,3], Michel Negrerie[1]; [1]Lab d'Optique et Biosciences, École Polytechnique, France, [2]Lab Acides Nucléiques et Biophotonique, Univ. Pierre et Marie Curie, France, [3]North Carolina State Univ., USA.* We probed the heme iron motion for several proteins, measuring the evolution of the iron-histidine Raman intensity in picosecond range. The movement of the iron towards the planar heme after nitric oxide binding is retarded.

Anderson Room	Hoaglund Room

TuF • Shaped Pulses—Continued

TuF6 • 6:00 p.m.
Coherent Control of a Single Molecule, *Daan Brinks[1], Fernando D. Stefani[2], Florian Kulzer[3], Richard Hildner[1], Niek F. van Hulst[1,4]; [1]ICFO, Spain, [2]Univ. de Buenos Aires, Argentina, [3]Univ. Lyon 1, France, [4]ICREA, Spain.* Coherent control of single molecules at room-temperature is exploited to investigate conformational disorder between chemically identical molecules. Highly efficient control is achieved by adapting the excitation field to each specific molecule in its local nano-environment.

TuF7 • 6:15 p.m.
Coherent Raman Microscopy with a Fiber-Format Femtosecond Laser Oscillator, *Alessio Gambetta, Vikas Kumar, Giulia Grancini, Dario Polli, Cristian Manzoni, Roberta Ramponi, Giulio Cerullo, Marco Marangoni; Politecnico di Milano, Italy.* A novel highly simplified architecture for Coherent Raman Scattering microscopy (CARS and SRS) is demonstrated, where multiple tunable narrowband picosecond pulses are generated by spectral compression of femtosecond pulses emitted by a compact Er-fiber oscillator.

TuG • Transient Biomolecular Structures—Continued

TuG6 • 6:00 p.m.
Ultrafast Multidimensional Infrared Spectroscopy of Transient Structures - New Insights into the FeFe [Hydrogenase] Enzyme Reaction Mechanism, *Gerald M. Bonner[1], Andrew I. Stewart[1], Joseph A. Wright[2], Spyridon Kaziannis[1], Stefano Santabarbara[1], Ian P. Clark[3], Gregory M. Greetham[3], Michael Towrie[3], Anthony W. Parker[3], Christopher J. Pickett[2], Neil T. Hunt[1]; [1]Univ. of Strathclyde, UK, [2]Univ. of East Anglia, UK, [3]STFC Rutherford Appleton Lab, UK.* The structures of intermediate species pertaining to the reaction mechanism of the FeFe[hydrogenase] enzyme are investigated using ultrafast transient-2-D-IR and pump-probe methods. 2-D-IR spectroscopy provides additional insights into the vibrational dynamics of the active site.

TuG7 • 6:15 p.m.
Protein Structure Determination in Complex Environments Using 2-D IR Spectroscopy, *Chris T. Middleton, Ann Marie Woys, Yu-Shan Lin, Allam S. Reddy, Wei Xiong, Juan J. de Pablo, James L. Skinner, Martin Zanni; Univ. of Wisconsin at Madison, USA.* We apply isotope labelling, molecular dynamics simulations and 2-D IR spectroscopy to the membrane bound antibiotic peptide ovispirin. From the 2-D lineshapes, we ascertained the peptide secondary structure and orientation in the bilayer.

6:30 p.m.–7:30 p.m. TuE • Poster Session II—Continued, ***Rooftop Garden***

NOTES

Wednesday, July 21, 8:00 a.m.–5:00 p.m. Registration Open, *Lobby*

WA • Optical Antennas and Nanosystems

Wednesday, July 21
8:30 a.m.–10:15 a.m.
Keith Nelson; MIT, USA, Presider

WA1 • 8:30 a.m. **Invited**

High Harmonics Generation by Plasmonic Resonance of Metal Nanostructures and Its Applications, *Seung-Woo Kim, Joonhee Choi, Seungchul Kim, In-Yong Park; KAIST, Republic of Korea.* 3-D nanostructures are designed and tested as the plasmonic waveguide to enhance the incident femtosecond laser for the high harmonics generation of EUV radiation.

WA2 • 9:00 a.m.

Deterministic Control of Subwavelength Field Localization in Plasmonic Nanoantennas, *Martin Aeschlimann[1], Michael Bauer[2], Daniela Bayer[1], Tobias Brixner[3], Stefan Cunovic[4], Alexander Fischer[1], Pascal Melchior[1], Walter Pfeiffer[4], Martin Rohmer[1], Christian Schneider[1], Christian Strüber[4], Philip Tuchscherer[3], Dmitri V. Voronine[4]; [1]Univ. of Kaiserslautern, Germany, [2]Univ. Kiel, Germany, [3]Univ. Würzburg, Germany, [4]Univ. Bielefeld, Germany.* Subwavelength photoemission localization and switching in plasmonic bowtie nanoantennas is achieved experimentally. Analytic and adaptive control schemes are investigated, and agreement between both approaches is demonstrated.

WA3 • 9:15 a.m.

Strong-Field Photoelectron Emission From Metal Nanostructures, *Reiner Bormann, Max Gulde, Alexander Weismann, Sergey Yalunin, Claus Ropers; Univ. of Göttingen, Germany.* Photoelectron emission from metallic nanotips is studied experimentally and theoretically in the strong-field regime. The passage from multiphoton to tunnel emission is clearly resolved, and explained in terms of a one-dimensional quantum mechanical treatment.

WA4 • 9:30 a.m.

Terahertz Near-Field Imaging of Electric and Magnetic Resonances in Plasmonic High Frequency Devices, *Andreas Bitzer[1,2], Jan Wallauer[1], Hannes Merbold[2], Florian Enderli[2], Thomas Feurer[2], Hanspeter Helm[1], Markus Walther[1]; [1]Univ. of Freiburg, Germany, [2]Univ. of Bern, Switzerland.* We report a terahertz near-field imaging approach providing spatially resolved measurements of amplitude, phase, and polarization of the electric field. Using this approach we extract the microscopic near-field signatures in plasmonic devices and planar metamaterials.

WA5 • 9:45 a.m.

Few-Femtosecond Time-Domain Optical Response Function Reconstruction of a Plasmonic Nanostructure, *Xiaoji G. Xu[1], Kseniya S. Deryckx[1], Alexandria Anderson[1], Günter Steinmeyer[2], Markus Raschke[1]; [1]Univ. of Washington, USA, [2]Max-Born-Inst. für Nichtlineare Optik und Kurzzeitspektroskopie, Germany.* Femtosecond plasmonic response function of individual metallic nanostructures is obtained with precise phase and amplitude from second-harmonic correlation measurement and spectrogram analysis. Dephasing rate of $\tau = 20$ fs at the Drude limit is obtained.

WA6 • 10:00 a.m.

Few-Cycle Nonlinear Optics with Single Plasmonic Nanoantennas, *Tobias Hanke, Günther Krauss, Daniel Träutlein, Alfred Leitenstorfer, Rudolf Bratschitsch; Dept. of Physics and Ctr. for Applied Photonics, Univ. of Konstanz, Germany.* Optical antennas are excited resonantly with sub-10-fs pulses in the near infrared. Intense third harmonic emission allows measurement of a sub-cycle plasmon dephasing time of 2 fs, demonstrating efficient radiation coupling of these broadband nanodevices.

10:15 a.m.–10:45 a.m. Coffee Break/Exhibits, ***Erickson/Carroll/Sinclair Rooms***

10:15 a.m.–4:15 p.m. Exhibits Open, ***Erickson/Carroll/Sinclair Rooms***

Anderson Room	Hoaglund Room

WB • Molecular Electron Correlation

Wednesday, July 21
10:45 a.m.–12:30 p.m.
Graham R. Fleming; Lawrence Berkeley Natl. Lab, USA, Presider

WB1 • 10:45 a.m.
Selective Nonlinear Response-Preparation in the Electronic Ground-State by Means of Degenerate Four-Wave-Mixing, *Jan P. Kraack, Tiago Buckup, Marcus Motzkus; Univ. Heidelberg, Germany.* Femtosecond Degenerate Four-Wave-Mixing was employed to selectively prepare vibrational coherence-dynamics in electronic ground-states of bio-physically active chromophores. The method can be used to determine pure vibrational coherence evolution in the ground-state.

WB2 • 11:00 a.m.
Wave Packet Reconstruction on Unknown Potential Surfaces by Two-Colour Non-Linear Wave Packet Interferometry, *Heide N. Ibrahim[1], Craig Chapman[2], Hiroyuki Katsuki[1], Jeffrey A. Cina[2], Kenji Ohmori[1]; [1]Natl. Inst.s of Natural Sciences, Japan, [2]Dept. of Chemistry and Oregon Ctr. for Optics, Univ. of Oregon, USA.* The reconstruction of quantum mechanical states on weakly characterized potential energy surfaces by two-colour non-linear wave packet interferometry is presented and surveyed for the (well-known) model system Iodine in a jet.

WB3 • 11:15 a.m.
Visible Two-Dimensional Spectroscopy with sub-7 fs Pulses Uncovers Ultrafast Electron-Phonon Coupling Dynamics, *Franz Milota[1], Tomas Mančal[2], Vladimir Lukeš[3], Alexandra Nemeth[4], Jaroslaw Sperling[4], Harald F. Kauffmann[4,5], Jürgen Hauer[4]; [1]Lehrstuhl für BioMolekulare Optik, Ludwig-Maximilians-Univ. München, Germany, [2]Inst. of Physics, Faculty of Mathematics and Physics, Charles Univ., Czech Republic, [3]Dept. of Chemical Physics, Slovak Technical Univ., Slovakia, [4]Dept. of Physical Chemistry, Univ. of Vienna, Austria, [5]Ultrafast Dynamics Group, Faculty of Physics, Vienna Univ. of Technology, Austria.* Electronic two-dimensional spectroscopy with sub-7 fs resolution with the aid of simulations and quantum chemistry reveals the time scale and underlying dynamics of electron-phonon coupling, internal vibrational redistribution, and double quantum resonances in solvated Zinc-Phthalocyanine.

WB4 • 11:30 a.m.
Measurement of Electron Correlation Using Two-Dimensional Electronic Double-Quantum Coherence Spectroscopy, *Vanessa M. Huxter[1,2], Jeongho Kim[2,3], Gregory D. Scholes[2]; [1]Univ. of California at Berkeley, USA, [2]Univ. of Toronto, Canada, [3]KAIST, Republic of Korea.* Two-dimensional electronic double-quantum coherence spectroscopy (2-D-DQCS) is a vibrationally sensitive, background-free measure of the electronic correlations between double and single excited states. 2-D-DQCS measurements of organic dye molecules including wavelength and solvent dependence are reported.

WB5 • 11:45 a.m.
The Influence of Homoconjugation on Ultrafast Dynamics in Cyclohexa-1,4-diene, *Oliver Schalk, Andrey E. Boguslavskiy, Michael S. Schuurman, Albert Stolow; Steacie Inst. of Molecular Sciences, Natl. Res. Council Canada, Canada.* The influence of homoconjugation on ultrafast dynamics of cyclohexa-1,4-diene was investigated by time-resolved photoelectron spectroscopy in comparison with cyclohexene. While little influence is seen on excited states, both molecules exhibit clearly different ground state dynamics.

WC • Novel Ultrafast Techniques

Wednesday, July 21
10:45 a.m.–12:30 p.m.
Thomas Feurer; Univ. of Bern, Switzerland, Presider

WC1 • 10:45 a.m.
Frequency-Domain Streak Camera for Ultrafast Imaging of Evolving Luminal Velocity Objects, *Zhengyan Li, Rafal Zgadzaj, Xiaoming Wang, Stephen Reed, Yang Zhao, Michael C. Downer; Dept. of Physics, Univ. of Texas at Austin, USA.* We supplement Frequency-Domain Holography with a Frequency-Domain Streak Camera to capture the time evolution of luminal velocity refractive index structures in a single shot. A single spectrometer acquires all data.

WC2 • 11:00 a.m.
Compact and Low-Cost Fs Diode-Pumped Cr:Colquiriite Laser Technology, *James G. Fujimoto, Umit Demirbas, Duo Li, Andrew Benedick, Gale S. Petrich, Jonathan R. Birge, Jing Wang, Sheila Nabanja, Leslie A. Kolodziejski, Alphan Sennaroglu, Franz X. Kärtner; MIT, USA.* Diode-pumped femtosecond Cr:Colquiriite lasers are a versatile, low-cost complementary technology to Ti:Sapphire. Modelocked tuning of >100-nm, GHz repetition-rates and timing jitters of 156 attoseconds (10 kHz-10 MHz) are demonstrated from different Cr:Colquiriite laser implementations.

WC3 • 11:15 a.m.
Fast Fe-Doped ZnO Scintillator for Accurate Synchronization of Femtosecond Pulses from XFEL and Conventional Ultrafast Laser, *Toshihiko Shimizu[1,2], Kohei Yamanoi[1,2], Tomoharu Nakazato[1,2], Kohei Sakai[1], Nobuhiko Sarukura[1,2], Dirk Ehrentraut[3], Tsuguo Fukuda[3], Mitsuru Nagasono[2], Tadashi Togashi[2], Shinichi Matsubara[2,4], Kensuke Tono[2], Atsushi Higashiya[2], Makina Yabashi[2], Hiroaki Kimura[2,4], Haruhiko Ohashi[2,4], Tetsuya Ishikawa[2]; [1]Inst. of Laser Engineering, Osaka Univ., Japan, [2]RIKEN, Japan, [3]WPI Advanced Inst. for Materials Res., Tohoku Univ., Japan, [4]Japan Synchrotron Radiation Res. Inst., Japan.* The luminescence rise time of a Fe-doped ZnO X-ray scintillator was measured to be less than 4 ps. This allows timing control between XFEL pulses and femtosecond lasers to within a few picosecond accuracy.

WC4 • 11:30 a.m.
Time-Resolved Vibrational Circular Dichroism and Optical Rotation with Utrashort Laser Pulses, *Mathias Bonmarin, Jan Helbing; Univ. Zürich, Switzerland.* We present recent progress in enhancing chiral vibrational signals using ellipsometric methods and broad band detection for the improvement of our first transient vibrational circular dichroism measurements.

WC5 • 11:45 a.m.
Atmospheric Pressure Femtosecond Laser Imaging Mass Spectrometry, *Yves Coello, A. Daniel Jones, Tissa C. Gunaratne, Marcos Dantus; Michigan State Univ., USA.* We present a novel imaging mass spectrometry technique using femtosecond laser pulses to ablate and ionize the sample at ambient conditions with improved lateral resolution (1μm), as demonstrated here with an image of vegetable cells.

WB • Molecular Electron Correlation—Continued

WB6 • 12:00 p.m.
Femtosecond Dynamics of Small Molecules Excited Studied with Vacuum-Ultraviolet Pulse Pairs, *Thomas K. Allison[1,2], Travis W. Wright[3], Adam M. Stooke[1], Champak Khurmi[2], Jeroen van Tilborg[2], Yanwei Liu[2], Roger W. Falcone[1,2], Ali Belkacem[2]; [1]Univ. of California at Berkeley, USA, [2]Lawrence Berkeley Natl. Lab, USA, [3]Univ. of California at Davis, USA.* We use a split mirror interferometer to combine two colors of a high order harmonic source with variable delay. We report on the photodissociation dynamics of O_2 and C_2H_4 excited at 160 nm.

WB7 • 12:15 p.m.
The Photoprotective Properties of Adenine: Time-Resolved Photoelectron Spectroscopy at Different Excitation Wavelengths, *Susanne Ullrich, N. L. Evans, Hui Yu, A. N. Brouillette; Univ. of Georgia, USA.* Competing deactivation pathways in Adenine are identified using wavelength-dependent time-resolved photoelectron spectroscopy. Excited state lifetimes associated with $\pi\pi^* \rightarrow n\pi^* \rightarrow$ground state relaxation decrease with increasing excitation energies and an additional pathway is accessible around 6eV.

WC • Novel Ultrafast Techniques—Continued

WC6 • 12:00 p.m.
Differential Multiphoton Microscopy, *Jeffrey Squier, Jeff Field, Erich Hoover, Eric Chandler, Michael Young, Dawn Vitek; Colorado School of Mines, USA.* High-speed nonlinear imaging systems capable of dynamically imaging differences in depth, excitation polarization, excitation wavelength, beam shape, and pulse shape with single element detection are presented for the first time.

WC7 • 12:15 p.m.
Label-Free Live Brain Imaging with Ultrafast Nonlinear Microscopy, *Stefan Witte, Adrian Negrean, Johannes C. Lodder, Guilherme T. Silva, Christiaan P. J. de Kock, Huibert D. Mansvelder, Marloes L. Groot; Vrije Univ. Amsterdam, Netherlands.* We demonstrate that third-harmonic generation microscopy using an ultrafast optical parametric oscillator is a powerful technique for imaging live brain tissue with sub-cellular resolution, without the need for fluorescent dyes.

12:30 p.m.–2:00 p.m. Lunch Break *(on your own)*

NOTES

WD • Photosynthesis

Wednesday, July 21
2:00 p.m.–3:45 p.m.
Ralph Jimenez; JILA, USA, Presider

WD1 • 2:00 p.m. **Invited**

Quantum-Coherent Energy Transfer in Marine Algae at Ambient Temperature via Ultrafast Photon Echo Studies, *Cathy Y. Wong, Hoda Hossein-Nejad, Carles Curutchet, Gregory D. Scholes; Univ. of Toronto, USA.* Experiments using two-dimensional photon echo spectroscopy reveal that electronic excitations are coherently coupled in a family of light-harvesting antenna proteins isolated from marine cryptophyte algae, thereby influencing energy transfer.

WD2 • 2:30 p.m.

Towards Understanding the Role of Coherent Dynamics in Natural Light-Harvesting, *Jan Olšina, František Šanda, Tomáš Mančal; Faculty of Mathematics and Physics, Charles Univ. in Prague, Czech Republic.* Specially tailored projection operator is proposed to improve theoretical description of a molecular system driven by fluctuating light. Coherent dynamics predicted by different theoretical methods are compared.

WD3 • 2:45 p.m.

Optimization of the Fast Charge Separation in Artificial Photosynthesis for Efficient Transport, *Benjamin P. Fingerhut[1], Wolfgang Zinth[2], Regina de Vivie-Riedle[1]; [1]Dept. Chemie und Biochemie, Ludwig-Maximilians-Univ. München, Germany, [2]BioMolekulare Optik, Fakultät für Physik, Ludwig-Maximilians-Univ. München and Ctr. for Integrated Protein Science München, Germany.* The concepts of bacterial photosynthesis are extended to the design of artificial photochemical devices. With multi-objective genetic algorithms we reveal the energetic, morphologic and kinetic requirements of an optimized charge-separating unit coupled to diffusive transport.

WD4 • 3:00 p.m.

Signatures of Quantum Exciton Transport in Two-Dimensional Coherent Optical Signals of Photosynthetic Complexes, *Darius Abramavicius, Shaul Mukamel; Univ. of California at Irvine, USA.* We present simulations of two dimensional spectra in the photosynthetic reaction center of photosystem II that clearly establish wavelike energy transport at room temperature. This transport mechanism survives decoherence due to the fluctuating protein environment.

WD5 • 3:15 p.m.

Two-Dimensional Electronic Spectroscopy of the Qy Band of Photosystem II Reaction Centers, *Jeffrey A. Myers, Kristin L. M. Lewis, Franklin Fuller, Patrick F. Tekavec, Jennifer P. Ogilvie; Univ. of Michigan, USA.* We present two-dimensional electronic spectroscopy studies on the dynamics of D1-D2 cyt.b559 reaction center complexes from plant photosystem II at 77 K. Our two-dimensional spectra are compared with models based on current theory.

WD6 • 3:30 p.m.

Elucidation of Electronic Structure and Quantum Coherence in LHCII with Polarized 2-D Spectroscopy, *Gabriela S. Schlau-Cohen[1,2], Tessa R. Calhoun[1,2], Naomi S. Ginsberg[1,2], Matteo Ballottari[3], Roberto Bassi[3], Graham R. Fleming[1,2]; [1]Univ. of California at Berkeley, USA, [2]Lawrence Berkeley Natl. Lab, USA, [3]Univ. of Verona, Italy.* Polarized, broadband two-dimensional electronic spectroscopy is performed on light harvesting complex II. The results both reveal spectral features which can experimentally test site energies for the first time and also isolate quantum coherence signals.

3:45 p.m.–4:15 p.m. Coffee Break/Exhibits, *Erickson/Carroll/Sinclair Rooms*

WE • Attosecond Spectroscopy I

Wednesday, July 21
4:15 p.m.–5:45 p.m.
Ursula Keller; ETH Zürich, Switzerland, Presider

WE1 • 4:15 p.m.
Attosecond Transient Absorption Spectroscopy for Real-Time Observation of Valence Electron Motion, *Adrian Wirth[1], Eleftherios Goulielmakis[1], Zhi-Heng Loh[2,3], Robin Santra[4,5], Nina Rohringer[6], Vladislav S. Yakovlev[7], Sergey Zherebtsov[1], Thomas Pfeifer[2,3], Abdallah M. Azzeer[8], Matthias F. Kling[1], Stephen R. Leone[2,3], Ferenc Krausz[1,7]; [1]Max-Planck-Inst. für Quantenoptik, Germany, [2]Univ. of California at Berkeley, USA, [3]Chemical Sciences Div., Lawrence Berkeley Natl. Lab, USA, [4]Argonne Natl. Lab, USA, [5]Dept. of Physics, Univ. of Chicago, USA, [6]Lawrence Livermore Natl. Lab, USA, [7]Dept. für Physik, Ludwig-Maximilians-Univ., Germany, [8]Physics and Astronomy Dept., King Saud Univ., Saudi Arabia.* Combining attosecond technology and X-ray absorption spectroscopy further expands the horizon of attosecond science. In a proof-of-principle experiment we traced valence electron motion in real time and completely reconstructed the strong-field initiated spin-orbit wavepacket coherence.

WE2 • 4:30 p.m.
Visualizing Electron Rearrangement in Space and Time during the Transition from a Molecule to Atoms, *Wen Li[1,2], Agnieszka A. Jaroń-Becker[1], Craig W. Hogle[1], Vandana Sharma[1], Xi Bin Zhou[1], Andreas Becker[1], Henry C. Kapteyn[1], Margaret M. Murnane[1]; [1]JILA and Dept. of Physics, Univ. of Colorado, USA, [2]Dept. of Chemistry, Wayne State Univ., USA.* Using strong field ionization and time-resolved reaction microscope techniques, we visualize both in space and time the dynamical evolution of the electrons as a molecular bond ruptures, and discover new aspects to the electronic dynamics.

WE3 • 4:45 p.m.
Pump-Control Experiments to Enhance the Electron Localizability in Dissociating H_2 with Phase-Stable Laser Pulses, *Bettina Fischer[1], Manuel H. Kremer[1], Vandana Sharma[1], Bernold Feuerstein[1], Thomas Pfeifer[1], Vitor L. B. de Jesus[2], Christian Hofrichter[1], Artem Rudenko[3], Uwe Thumm[4], Claus Dieter Schröter[1], Robert Moshammer[1], Joachim Ullrich[1]; [1]Max-Planck-Inst. für Kernphysik, Germany, [2]Inst. Federal de Educação, Ciência e Tecnologia do Rio de Janeiro, Brazil, [3]Max-Planck Advanced Study Group at CFEL, Germany, [4]James R. Macdonald Lab, Kansas State Univ., USA.* The first two-pulse measurements with carrier-envelope-phase (CEP) stabilized laser pulses on H_2 were recorded with a reaction microscope. The role of a coherent wave packet in the dissociating H_2^+ for the charge localization is investigated.

WE4 • 5:00 p.m.
High-Order Harmonic Generation from Aligned Molecules with Intense Femtosecond 800- and 1300-nm Pulses, *Shinichirou Minemoto, Kosaku Kato, Hirofumi Sakai; Univ. of Tokyo, Japan.* Harmonic intensities from aligned CO_2 molecules measured as a function of pump-probe delay with 800- and 1300-nm pulses modulate out of phase with ion yields at the same harmonic photon energies, supporting two-center interference picture.

WE5 • 5:15 p.m.
Ultrafast Hydrogen Migration in Allene in Intense Laser Fields: Evidence in Three-Body Coulomb Explosion, *Huailiang Xu, Tomoya Okino, Kaoru Yamanouchi; Univ. of Tokyo, Japan.* Ultrafast hydrogen migration in allene (CH_2=C=CH_2) occurring within 20 fs in intense laser fields was investigated by coincidence momentum imaging. The ultrafast spread of the distribution of a proton covering the entire molecule was visualized.

WE6 • 5:30 p.m.
Observation of Optical Bullets Formed in Laser-Driven Plasma Bubble Accelerators, *P. Dong[1], S. A. Reed[1], S. A. Yi[1], S. Kalmykov[1], G. Shvets[1], N. H. Matlis[2], C. McGuffey[3], S. S. Bulanov[3], V. Chvykov[3], G. Kalintchenko[3], K. Krushelnick[3], A. Maksimchuk[3], T. Matsuoka[3], A. G. R. Thomas[3], V. Yanovsky[3], M. C. Downer[1]; [1]Univ. of Texas at Austin, USA, [2]Lawrence Berkeley Natl. Lab, USA, [3]Ctr. for Ultrafast Optical Science, Univ. of Michigan, USA.* Laser-driven plasma "bubble" accelerators, which produce mono-energetic electron beams, are shown to reshape co-propagating probe pulses into optical "bullets" that visualize the bubble directly.

7:30 p.m.–9:30 p.m. Conference Dinner, *Anderson/Hoaglund Rooms*

Thursday, July 22, 8:00 a.m.–5:00 p.m. Registration Open, *Lobby*

ThA • Attosecond Spectroscopy II

Thursday, July 22
8:30 a.m.–10:15 a.m.
Kaoru Yamanouchi; Univ. of Tokyo, Japan, Presider

ThA1 • 8:30 a.m. **Invited**

High Harmonic Spectroscopy of Small Molecules: Waiting for HODO, *Y. Mairesse[1], J. Higuet[1], N. Dudovich[2], D. Shafir[2], B. Fabre[1], E. Mevel[1], E. Constant[1], D. Villeneuve[3], P. Corkum[3], S. Patchkovskii[3], M. Yu. Ivanov[4], Z. Walters[5], O. Smirnova[5], Olga Smirnova[5]; [1]Univ. Bordeaux 1, France, [2]Weizmann Inst. of Science, Israel, [3]Natl. Res. Council Canada, Canada, [4]Imperial College London, UK, [5]Max-Born-Inst., Germany.* We use high harmonic spectroscopy to characterize the attosecond dynamics of multi-electron re-arrangement during strong-field ionization of molecules. We reconstruct the relative phase between different ionization continua to characterize the hole left upon ionization.

ThA2 • 9:00 a.m.

Driving Electronic Wavepackets by Attosecond Half-Cycle Pulses, *Xinhua Xie[1], Stefan Roither[1], Daniil Kartashov[1], Li Zhang[1], Emil Persson[2], Stefanie Gräfe[2], Markus Schöffler[3], Matthias Lezius[4], Georg Reider[1], Reinhard Dörner[3], Joachim Burgdörfer[2], Andrius Baltuška[1], Markus Kitzler[1]; [1]Photonics Inst., Vienna Univ. of Technology, Austria, [2]Inst. for Theoretical Physics, Vienna Univ. of Technology, Austria, [3]Inst. für Kernphysik, J. W. Goethe Univ. Frankfurt, Germany, [4]Max-Planck Inst. for Quantum Optics, Germany.* We study the feasibility of using attosecond half-cycle pulses for quantum control of electron wavepacket motion. Measured strong asymmetries in electron-momentum-spectra are explained by quantum simulations to result from excited state dynamics and Coulomb effects.

ThA3 • 9:15 a.m.

Attosecond Transient Absorption around the Ionization Threshold of Helium, *Florian Schapper[1], Mirko Holler[1], Paula Rivière[2], Lukas Gallmann[1], Ulf Saalmann[2], Jan-Michael Rost[2], Ursula Keller[1]; [1]ETH Zürich, Switzerland, [2]Max-Planck-Inst. for the Physics of Complex Systems, Germany.* We observe theoretically and experimentally the IR-assisted absorption of an attosecond pulse train in a helium gas target. The transmitted photon yield is modulated on an attosecond time-scale, and a spectrally localized emission occurs.

ThA4 • 9:30 a.m.

Investigating Two-Photon Double Ionization of D_2 by XUV-Pump / XUV-Probe Experiments at Flash, *Oliver Herrwerth[1], Yuhai H. Jiang[2], Artem Rudenko[3], Jhon F. Pérez-Torres[4], Lutz Foucar[3], Moritz Kurka[2], Kai U. Kühnel[2], Michael Toppin[2], Etienne Plésiat[4], Fernando Morales[4], Fernando Martín[4], Till Jahnke[5], Reinhard Dörner[5], Jose L. Sanz-Vicario[6], Jvan van Tilborg[7], Ali Belkacem[7], Michael Schulz[8], Kiyoshi Ueda[9], Theo J. M. Zouros[10], Stefan Düsterer[11], Roldf Treusch[11], Claus D. Schröter[2], Matthias Lezius[1], Matthias F. Kling[1], Robert Moshammer[2], Joachim Ullrich[2]; [1]Max-Planck-Inst. für Quantenoptik, Germany, [2]Max-Planck-Inst. für Kernphysik, Germany, [3]Max-Plank Advanced Study Group at CFEL, Germany, [4]Dept. de Química C-9, Univ. Autónoma de Madrid, Spain, [5]Inst. für Kernphysik, Univ. Frankfurt, Germany, [6]Inst. de Física, Univ. de Antioquia, Colombia, [7]Lawrence Berkeley Natl. Lab, USA, [8]Univ. of Missouri, USA, [9]Inst. of Multidisciplinary Res. for Advanced Materials, Tohoku Univ., Japan, [10]Dept. of Physics, Univ. of Crete, Greece, [11]DESY, Germany.* Using a novel split-mirror set-up attached to a Reaction Microscope at the Free electron LASer in Hamburg (FLASH) we demonstrate an XUV-pump - XUV-probe experiment by tracing the ultra-fast nuclear wave-packet motion in the D_2^+.

ThA5 • 9:45 a.m.

Ultrafast Control of Fragmentation Pathways of Soft X-Ray Driven Dissociation of Triatomic N_2O Molecules, *Xibin Zhou, Predrag Ranitovic, Craig Hogle, Margaret Murnane, Henry Kapteyn; JILA and Dept. of Physics, Univ. of Colorado, USA.* Ultrashort X-ray pulses initiate a coulomb explosion of N_2O through two distinct fragmentation pathways, corresponding to breaking an NN or NO bond. The branching ratio between these channels is controlled using a 30fs infrared pulse.

ThA6 • 10:00 a.m.

Molecular Processes Controllable by Electron Dynamics, *Philipp von den Hoff, Regina de Vivie-Riedle; Dept. Chemie, Ludwig-Maximilians-Univ., Germany.* Based on our calculations, we elucidate the role of light driven electron wavepacket motion for the control of molecular processes. We highlight the system requirements defining the time window for electronic coherence and efficient control.

10:15 a.m.–10:45 a.m. Coffee Break/Exhibits, ***Erickson/Carroll/Sinclair Rooms***

10:15 a.m.–4:15 p.m. Exhibits Open, ***Erickson/Carroll/Sinclair Rooms***

Anderson Room	Hoaglund Room

ThB • Light Driven Dynamics in Biomolecules

Thursday, July 22
10:45 a.m.–12:30 p.m.
Sandy Ruhman; Hebrew Univ. of Jerusalem, Israel, Presider

ThB1 • 10:45 a.m.
Vibrationally-Mediated Dynamics in β-Carotene Probed with Broadband 2-D Electronic Spectroscopy, *Tessa R. Calhoun[1,2], Jeffrey A. Davis[3], Graham R. Fleming[1,2]; [1]Univ. of California at Berkeley, USA, [2]Lawrence Berkeley Natl. Lab, USA, [3]Swinburne Univ. of Technology, Australia.* Competing electronic pathways exhibiting energy dependence across a single vibronic excitation are observed in β-carotene for the first time with broadband two-dimensional electronic spectroscopy at 77K. The origins and implications of these features are discussed.

ThB2 • 11:00 a.m.
Coherent Multidimensional Spectroscopies Refine the Energy Level Scheme of β-Carotene, *Niklas Christensson[1], Franz Milota[1], Alexandra Nemeth[1], Harald F. Kauffmann[1,2], Jürgen Hauer[1]; [1]Dept. of Physical Chemistry, Univ. of Vienna, Austria, [2]Ultrafast Dynamics Group, Faculty of Physics, Vienna Univ. of Technology, Austria.* Electronic single- and double-quantum coherence spectroscopy (*1Q*- and *2Q-2D*) of β-carotene reveals the energetic position, transition strength and spectral properties of a novel excited state above S_2 with a transition in the visible spectral region.

ThB3 • 11:15 a.m.
Coherent Effects in Carotenoids, *Jeffrey A. Davis[1], Evelyn Cannon[1], Lap V. Dao[1], Peter Hannaford[1], Keith A. Nugent[2], Harry M. Quiney[2]; [1]Swinburne Univ. of Technology, Australia, [2]Univ. of Melbourne, Australia.* Long-lived vibrational coherences in carotenoids are enhanced when the carotenoid is within the LH2 light-harvesting complex. Electronic coherence of the bright transition is also made observable in LH2, revealing new details of excited state evolution.

ThB4 • 11:30 a.m.
Direct Observation of the Conical Intersection in cis-trans Photoisomerization of Rhodopsin, *Dario Polli[1], Piero Altoè[2], Oliver Weingart[3], Philipp Kukura[4], Katelyn Spillane[5], Cristian Manzoni[1], Daniele Brida[1], Gaia Tomasello[2], Giorgio Orlandi[2], Richard A. Mathies[5], Marco Garavelli[2], Giulio Cerullo[1]; [1]Politecnico di Milano, Italy, [2]Univ. di Bologna, Italy, [3]Univ. Duisburg-Essen, Germany, [4]ETH Zürich, Switzerland, [5]Univ. of California at Berkeley, USA.* High-time-resolution broadband pump-probe spectroscopy of rhodopsin reveals loss of reactant and appearance of photoproduct features within ≈100fs, which are signatures of a wavepacket moving through a conical intersection. Experiments are supported by molecular dynamics simulations.

ThB5 • 11:45 a.m.
Coherent Torsional Motion and Isomerization Dynamics across a Conical Intersection, *Julien Briand[1], Jérémie Léonard[1], Vinizio Zanirato[2], Massimo Olivucci[3], Stefan Haacke[1]; [1]Univ. Strasburg - IPCMS, France, [2]Univ. di Ferrara, Italy, [3]Bowling Green State Univ., USA.* The ultrafast isomerisation dynamics of indanylidene-pyrroline photo-switches show evidence for vibrational coherences along the reaction coordinate. We observe, to our knowledge for the first time, a dependence of wavepacket decoherence on the isomerization direction.

ThC • Quantum Coherence Correlations

Thursday, July 22
10:45 a.m.–12:30 p.m.
Alfred Leitenstorfer; Univ. Konstanz, Germany, Presider

ThC1 • 10:45 a.m. **Invited**
Coherent Measurements of High-Order Electronic Correlations in GaAs Quantum Wells, *Daniel Turner, Keith A. Nelson; MIT, USA.* Multidimensional high-order coherent spectroscopy reveals correlations among more than two excitons. Features in the fifth-order and seventh-order spectra allow us to measure the extent of exciton correlations in a semiconductor nanostructure.

ThC2 • 11:15 a.m.
Two-Quantum Coherences in Optical Two-Dimensional Fourier Transform Spectroscopy, *Steven Cundiff[1], Denis Karaiskaj[1], Xingcan Dai[1], Lijun Yang[2], Alan D. Bristow[1], Marten Richter[2], Richard P. Mirin[3], Shaul Mukamel[2]; [1]JILA, NIST, Univ. of Colorado, USA, [2]Univ. of California at Irvine, USA, [3]NIST, USA.* We present optical two-dimensional Fourier transform spectra for the pulse sequence sensitive to two-quantum coherences. In semiconductors, two-quantum coherences occur due to biexcitons and many-body effects, in a potassium vapor, they arise from atomic interactions.

ThC3 • 11:30 a.m.
Coherent Energy Transport between Coupled Quantum Wells Studied by Two-Dimensional Terahertz Spectroscopy, *Wilhelm Kuehn[1], Klaus Reimann[1], Michael Woerner[1], Thomas Elsaesser[1], Rudolf Hey[2]; [1]Max-Born-Inst. für Nichtlineare Optik und Kurzzeitspektroskopie, Germany, [2]Paul-Drude-Inst. für Festkörper Elektronik, Germany.* A coupled quantum well system is extensively studied by fully phase-resolved 2-D intersubband spectroscopy. We observe prominent oscillatory features, caused by a coherent LO-phonon mediated charge transport between both wells within 120fs.

ThC4 • 11:45 a.m.
Ultrafast THz Response of Few-Layer Epitaxial Graphene, *Hyunyong Choi[1], Ferenc Borondics[1], David A. Siegel[1,2], Shuyun Zhou[1,2], Michael C. Martin[1], Alessandra Lanzara[1,2], Robert A. Kaindl[1]; [1]Lawrence Berkeley Natl. Lab, USA, [2]Univ. of California at Berkeley, USA.* Ultrafast measurements of few-layer epitaxial graphene are reported along with its equilibrium optical conductivity. We observe transient THz electrodynamics consistent with photoexcited holes in a dense Dirac electron plasma, which recombine on a picosecond timescale.

Anderson Room	Hoaglund Room

ThB • Light Driven Dynamics in Biomolecules—Continued

ThB6 • 12:00 p.m.
Time-Energy Map of Photoelectron Angular Anisotropy for Investigation of Ultrafast Internal Conversion, *Takao Fuji[1,2], Yoshi-Ichi Suzuki[1,2,3], Takuya Horio[1,2,3], Toshinori Suzuki[1,2,3]; [1]CREST, JST, Japan, [2]RIKEN, Japan, [3]Kyoto Univ., Japan.* Ultrafast internal conversion of pyrazine through a conical intersection was observed by photoelectron imaging with 22 fs time-resolution. The 2-D time-energy map of the photoelectron angular anisotropy revealed a clear signature of the internal conversion.

ThB7 • 12:15 p.m.
Dynamic Vibrational Stark Spectroscopy: Measuring the Solvent Response in Ultrafast Charge-Transfer Reactions, *Carlos R. Baiz, Kevin J. Kubarych; Univ. of Michigan, USA.* We present the first implementation of dynamic vibrational Stark-effect spectroscopy and demonstrate its use as a probe of non-equilibrium dynamics in phototriggered charge-transfer reactions.

ThC • Quantum Coherence Correlations—Continued

ThC5 • 12:00 p.m.
Controlling "Mottness" in a Correlated Electron System via Coherent Vibrational Excitation, *Stefan Kaiser[1], Ra'anan I. Tobey[2], Nicky Dean[2], Cristian Manzoni[1], Hiroshi Okamoto[3], Jun'ya Tsutsumi[3], Tatsuo Hasegawa[3], Andrea Cavalleri[1,2]; [1]Univ. of Hamburg, Germany, [2]Dept. of Physics, Univ. of Oxford, Clarendon Lab, UK, [3]AIST, Japan.* Control of onsite electronic wavefunctions is achieved in the organic conductor (BEDT-TTF)-F_2TCNQ by resonant excitation of localized molecular vibrational modes of the BEDT molecule. In this way, the onsite two-particle Coulomb repulsion can be modulated.

ThC6 • 12:15 p.m.
All-Optical Coherent Control of Electrical Currents in Single GaAs Nanowires, *Claudia Ruppert[1], Sebastian Thunich[1], Gerhard Abstreiter[2], Anna Fontcuberta i Morral[2,3], Alexander W. Holleitner[2], Markus Betz[1,4]; [1]Technische Univ. München, Germany, [2]Walter-Schottky-Inst., Technische Univ. München, Germany, [3]Lab des Matériaux Semiconducteurs. Inst. des Matériaux, École Polytechnique Fédérale de Lausanne, Switzerland, [4]Technische Univ. Dortmund, Germany.* A phase-stable superposition of femtosecond pulses and their second harmonic induces ultrashort microampere current bursts in single unbiased GaAs nanowires. Current injection relies on quantum interference of one- and two-photon absorption pathways.

12:30 p.m.–2:00 p.m. Lunch Break *(on your own)*

NOTES

Anderson Room	Hoaglund Room

ThD • Vibrational Coherence and Energy Transport

Thursday, July 22
2:00 p.m.–3:45 p.m.
Gregory Scholes; Univ. of Toronto, Canada, Presider

ThD1 • 2:00 p.m.
Ultrafast Coupled Electronic and Lattice Dynamics in Exciton Self-Trapping: Correlation of the Localization Length and Acoustic Phonon Dynamics, *J. G. Mance, F. X. Morrissey, A. D. Van Pelt, S. L. Dexheimer; Washington State Univ., USA.* We probe the dynamics of exciton self-trapping using femtosecond impulsive excitation techniques. We find a low frequency oscillatory response consistent with coherent acoustic phonon generation, with an acoustic wavelength that scales with exciton localization length.

ThD2 • 2:15 p.m. **Invited**
Vibrational Energy Transport in Peptides and Proteins, *Peter Hamm[1], Marco Schade[1], Ellen H. G. Backus[1], Alessandro Moretto[2], Claudio Toniolo[2]; [1]Inst. of Physical Chemistry, Univ. of Zürich, Switzerland, [2]Inst. of Biomolecular Chemistry, Padova Unit, CNR, Dept. of Chemistry, Univ. of Padova, Italy.* We investigate the vibrational energy flow in 3_{10}-helical peptide structures. Several local heaters reveal very similar results, indicating that energy randomizes very quickly. Nevertheless, intra-site IVR slows down vibrational energy transport on the picosecond timescale.

ThD3 • 2:45 p.m.
Multiply Excited Vibrational States of Docking-Site CO Simultaneously Observed with Ground-State Bleach after Photolysis from Heme Proteins, *Patrick Nuernberger, Kevin F. Lee, Adeline Bonvalet, Jean-Louis Martin, Marten H. Vos, Manuel Joffre; Lab d'Optique et Biosciences, École Polytechnique, France.* We simultaneously observe ultrafast ligand dissociation and docking-site absorption in carboxy-heme proteins. Highly sensitive visible pump/infrared probe spectroscopy reveals multiply excited vibrational states exhibiting distinct differences for hemoglobin and FixL.

ThD4 • 3:00 p.m.
Ultrafast Dynamics of the BLUF Mutant dAppA Q63E Revealed by TRIR and Fluorescent Upconversion, *Andras Lukacs[1], Allison Haigney[2], Minako Kondo[1], Richard Brust[2], Greg Greetham[3], Mike Towrie[3], Peter J. Tonge[2], Stephen R. Meech[1]; [1]School of Chemistry, Univ. of East Anglia, UK, [2]Dept. of Chemistry, Stony Brook Univ., USA, [3]Central Laser Facilty, Rutherford Appleton Lab, UK.* Primary processes in blue light sensing proteins are investigated by ultrafast vibrational and fluorescence spectroscopy. A major role for modulation of H-bonded interaction between flavins and a critical Q63 residue are revealed through mutagenesis.

ThD5 • 3:15 p.m.
Initial Relaxation Dynamics of Retinal Protonated Schiff-Bases Determined by Pump Degenerate Four Wave Mixing, *Tiago Buckup, Jan P. Kraack, Marcus Motzkus; Univ. Heidelberg, Germany.* Initial relaxation-dynamics of photo-excited all-trans retinal protonated Schiff-bases were investigated with Pump-Degenerate Four Wave Mixing. It is presented that low-frequency modes are excitable only within a short time of relaxation from the Franck-Condon point.

ThD6 • 3:30 p.m.
Deciphering Excited State Evolution in Halorhodopsin with Stimulated Emission Pumping, *Oshrat Bismuth[1], Pavel Komm[1], Noga Friedman[2], Tamar Eliash[2], Mordechai Sheves[2], Sanford Ruhman[1]; [1]Hebrew Univ., Israel, [2]Weizmann Inst. of Science, Israel.* Femtosecond pump, NIR dump experiments demonstrate that contrary to previous reports, nonexponential internal conversion in Natronomonas pharaonis Halorhodopsin doesn't reflect bifurcation in the fluorescent state to short lived reactive, and slowly decaying non reactive populations.

3:45 p.m.–4:15 p.m. Coffee Break/Exhibits, *Erickson/Carroll/Sinclair Rooms*

Thursday, July 22
3:45 p.m.–6:00 p.m.
Rooftop Garden

ThE1

Pulse Shaper Based Strategies for Selective Single-Beam CARS Spectroscopy, *Paul Wrzesinski, Dmitry Pestov, Vadim Lozovoy, Marcos Dantus; Michigan State Univ., USA.* The use of chirp, sinusoidal and binary phase shaping for mode-specific excitation in single-beam CARS is experimentally evaluated in terms of signal-to-background and selectivity. The advantages and disadvantages of each pulse shaping scheme are discussed.

ThE2

Ultrafast Optical Response of Lead Lanthanum Zirconium Titanate Ceramics, *Atsushi Sugita, Masashi Morimoto, Yoshimasa Kawata, Naoki Wakiya, Hisao Suzuki; Shizuoka Univ., Japan.* We will report ultrafast optical response of lead lanthanum zirconium titanate ceramics. The photo-induced birefringence was by approximately 20 times larger than that of SiO_2, while its optical response was shorter than 70 fs.

ThE3

Optical Magnetic Field Detection: Intracavity Phase Interferometry, *Andreas Schmitt-Sody, Koji Masuda, Andreas Velten, Jean-Claude Diels; Dept. of Physics and Astronomy, Univ. of New Mexico, USA.* A new approach to magnetometry is demonstrated. Using intracavity phase to frequency conversion a sensitivity of 10nT corresponding to a polarization rotation of $2x10^{-9}$rad can be achieved, using a short TGG crystal as sensing element.

ThE4

Coherent Nuclear Motion of Blue Copper Protein; Plastocyanin: Comparing LMCT and d-d Excitation, *Yutaka Nagasawa[1], Kenji Fujita[1], Tetsuro Katayama[1], Yukihide Ishibashi[1], Hiroshi Miyasaka[1], Teruhiro Takabe[2], Satoshi Nagao[3], Shun Hirota[3]; [1]Osaka Univ., Japan, [2]Meijo Univ., Japan, [3]Nara Inst. of Science and Technology, Japan.* Ultrafast transient absorption measurement was carried out for a blue copper protein, plastocyanin, with excitation at LMCT (597 nm) and d-d band (895 nm). Franck-Condon and Herzberg-Teller type coherent nuclear oscillations were observed.

ThE5

Determining Chlorophyll Orientation in the CP29 Light Harvesting Complex with Arithmetic Polarized 2-D Electronic Spectroscopy, *Naomi S. Ginsberg[1,2], Jeffrey A. Davis[3], Matteo Ballottari[4], Yuan-Chung Cheng[5], Roberto Bassi[4], Graham R. Fleming[1,2]; [1]Lawrence Berkeley Natl. Lab, USA, [2]Univ. of California at Berkeley, USA, [3]Swinburne Univ. of Technology, Australia, [4]Univ. of Verona, Italy, [5]Natl. Taiwan Univ., Taiwan.* The relative orientation of chlorophyll transition dipole moments in the light harvesting complex CP29 is determined directly from experimental measurements of a set of polarized two-dimensional electronic spectra in combination with polarization tensor relations.

ThE6

Ultrafast Excited State Dynamics in Genomic DNA, *Kimberly de La Harpe[1], Bern Kohler[2]; [1]Ohio State Univ., USA, [2]Montana State Univ., USA.* Excited electronic states in a genomic DNA sequence containing all four DNA bases were studied using femtosecond transient absorption spectroscopy. Long-lived excited states observed in each single strand separately are conserved in the duplex DNA.

ThE7

Induced Fit and Ultrafast Vibrational Dynamics in Host-Guest-Chemistry Explored by 2DIR-Spectroscopy, *Britta Valentin, Stephan Knop, Martin Olschewski, Jörg Lindner, Peter Vöhringer; Rheinische Friedrich-Wilhelms-Univ. Bonn, Germany.* Femtosecond two-dimensional infrared spectroscopy in the NH- and CH-stretching spectral region was used to unravel structural details and the vibrational energy flow in the supramolecular host-guest complex of an ammonium cation and a cryptand.

ThE8

fs-Fluorescence Measurements of the Adenine Dinucleotide: Direct Observation of the Excimer State, *Mayra C. Stuhldreier, Carmen Schüler, Joscha Kleber, Friedrich Temps; Inst. für Physikalische Chemie, Christian-Albrechts-Univ. zu Kiel, Germany.* Femtosecond time-resolved fluorescence measurements on the adenine dinucleotide d(pApA) revealed wavelength-dependent, complex excited-state relaxation dynamics via monomer-like and via excimer states, depending on the degree of base stacking.

ThE9

Ultrafast Photochemistry of Mercury Dithizonates, *Heinrich Schwoerer[1], Karel von Eschwege[2], Gurthwin Bosman[1], Patrizia Krok[1], Jeanet Conradie[2]; [1]Laser Res. Inst., Stellenbosch Univ., South Africa, [2]Dept. of Chemistry, Univ. of the Free State, South Africa.* We investigate the photoreaction of mercury dithizonate, and find an ultrafast radiationless reaction into the syn and anti configuration with almost equal probability, which is interpreted by a conical intersection between excited and ground state.

ThE10

Dynamic Solvent Effects on Equilibrium Isomerization: Kramers Theory Revisited with 2DIR Chemical Exchange, *Jessica M. Anna, Kevin J. Kubarych; Univ. of Michigan, USA.* Using ultrafast two dimensional infrared chemical exchange spectroscopy we monitored the equilibrium exchange between two dicobalt octacarbonyl isomers in linear alkane solvents. Results were inconsistent with a Markovian hydrodynamic viscosity implicating Kramers-Hubbard and/or frequency-dependent friction.

ThE11

The Influence of Solvent and Chirp on the Excited State Dynamics of 7-Dehydrocholesterol in Solution, *Kuo-Chun Tang, Kenneth G. Spears, Roseanne J. Sension; Univ. of Michigan, USA.* UV-visible femtosecond transient absorption spectroscopy and UV pulse shaping were used to probe the excited state dynamics of 7-dehydrocholesterol (provitamin D_3) in solution.

ThE12

Separating Sub-Ensembles on Ultrafast Timescales: Multiple-Population Period Transient Spectroscopy (MUPPETS), *Champak Khurmi, Mark A. Berg; Univ. of South Carolina, USA.* Multidimensional incoherent spectroscopy has analogs of echoes, stimulated echoes, hole-burning and correlation spectroscopy. These MUPPETS methods disentangle complex, nonexponential kinetics. A pathway formulation extends MUPPETS to many processes and systematically treats high-order transient gratings.

Thursday, July 22
3:45 p.m.–6:00 p.m.
Rooftop Garden

ThE13

Ultrafast Intramolecular Charge Transfer (ICT) Dynamics of 4-(Dimethylamino) Benzonitrile (DMABN) , *Myeongkee Park, Chulhoon Kim, Taiha Joo; Dept. of Chemistry, Pohang Univ. of Science and Technology, Republic of Korea.* Formation times of intramolecular charge-transfer (ICT) state of 4-(dimethylamnio)benzonitrile (DMABN) in acetonitrile are resolved by time constants of 30 fs, 180 fs, and 2.7 ps, denoting the ICT state can be created through multi ways.

ThE14

The First Picoseconds in the Life of Benzhydryl Cations: Ultrafast Generation and Chemical Reactions, *Christian F. Sailer[1], Benjamin P. Fingerhut[2], Johannes Ammer[2], Christoph Nolte[2], Igor Pugliesi[1], Herbert Mayr[2], Regina de Vivie-Riedle[2], Eberhard Riedle[1]; [1]LS für BioMolekulare Optik, Ludwig-Maximilians-Univ. München, Germany, [2]Dept. Chemie, Ludwig-Maximilians-Univ. München, Germany.* For benzhydryl chloride compounds we observe that photodissociation only leads to radical pairs. The typically observed cations are formed by subsequent electron transfer. Reactions of cations in neat alcohols can then occur within 2.6 ps.

ThE15

Ultrafast Molecular Planarization through a Conical Intersection, *Jenny Clark[1], Giovanni Cirmi[2], Guglielmo Lanzani[2]; [1]Cavendish Labs, Univ. of Cambridge, UK, [2]Politecnico di Milano, Italy.* Pump-push-probe experiments on fluorene-heptamer in solution reveal ultrafast planarization of the molecular backbone, within 200 fs, at variance with typical time scale of 40 ps. This suggests relaxation through a conical intersection.

ThE16

New Insights into the Excited State Relaxation Network of Carotenoids, *Tiago Buckup, Marie S. Marek, Marcus Motzkus; Ruprecht-Karls-Univ. Heidelberg, Germany.* By applying DFWM and pump-DFWM to lycopene and β-carotene detailed knowledge about the internal conversion between the S_2 and S_1 state is gained. An additional very fast dynamics directly after excitation of S_2 is discussed.

ThE17

Solvent Dependent Spectral Diffusion in Hydrogen Bonding Environments, *John T. King, Kevin Kubarych; Univ. of Michigan, USA.* The spectral diffusion of $Mn_2(CO)_{10}$ in hydrogen bonding solvents was studied using ultrafast two-dimensional infrared spectroscopy. In a series of alcohols with increasing chain length, the dynamics of hydrogen bonding environments can be selectively studied.

ThE18

Ultrafast, Protein-Based All-Optical Switching, *Zsuzsanna Heiner[1], László Fábián[1], Mark Mero[2], Miklós Kiss[3], Károly Osvay[3], András Dér[1]; [1]Inst. of Biophysics, Hungarian Acad. of Sciences, Hungary, [2]HAS Res. Group of Laser Physics, Hungarian Acad. of Sciences, Hungary, [3]Dept. of Optics and Quantum Electronics, Univ. of Szeged, Hungary.* A picosecond all-optical switch based on the bR-K transition of the photocycle of the chromoprotein bacteriorhodopsin is demonstrated by an integrated optical waveguide structure. The results are expected to have implications for fast telecommunication.

ThE19

Generation of Stable and Clean 8-fs Pulses at 400nm in a Hollow Fiber for UV Pump-Probe Experiment, *Jun Liu[1,2], Kotaro Okamura[1,2], Yuichiro Kida[1,2], Takahiro Teramoto[1,2], Takayoshi Kobayashi[1,2,3,4]; [1]Univ. of Electro-Communications, Japan, [2]JST, Japan, [3]Natl. Chiao Tung Univ., Taiwan, [4]Osaka Univ., Japan.* Stable and clean 8-fs pulses at 400 nm were obtained using a beam pointing stabilizer before a hollow-fiber compressor and a prism pair together with a deformable mirror system for dispersive compensation.

ThE20

Measuring the Spatiotemporal Field of Diffracting and Non-Diffracting Ultrashort Pulses, *Pamela Bowlan[1], Madis Lõhmus[2], Peeter Piksarv[2], Heli Valtna-Lukner[2], Peeter Saari[2], Rick Trebino[1]; [1]Georgia Tech, USA, [2]Univ. of Tartu, Estonia.* Using SEA TADPOLE, we directly measure the spatiotemporal field of pulses after diffracting off of simple apertures observing the "boundary wave pulses". We also measure the spatiotemporal field of non-diffracting, superluminal Bessel-X pulses.

ThE21

Characterization of High-Frequency, Quantum-Limited Timing Jitter in Stretched-Pulse and Soliton, Passively-Modelocked Fiber Lasers, *Jonathan A. Cox, Amir H. Nejadmalayeri, Franz X. Kärtner; MIT, USA.* We measured the timing jitter, with unprecedented sensitivity and bandwidth, between pairs of similar 80MHz stretched-pulse and 200MHz soliton, passively mode-locked lasers with 400pJ pulse energy, to be 7.3fs and 4.6fs [10kHz, 10MHz], respectively.

ThE22

Single-Dispersive-Element Pulse Compressor, *Vikrant K. Chauhan, Pamela Bowlan, Jacob Cohen, Rick Trebino; Georgia Tech, USA.* We introduce an ultrashort-laser-pulse compressor that is compact and automatically aligned for distortion-free output. It uses a single prism and a single grating, and it compensates for significant material dispersion up to third order.

ThE23

Simply Measuring Many-Picosecond Ultrashort Pulses with High Spectral Resolution, *Jacob Cohen, Pamela Bowlan, Vikrant Chauhan, Rick Trebino; Georgia Tech, USA.* We introduce three new techniques for measuring relatively long and very complex ultrashort pulses, allowing the measurement of pulses as long as 120ps with 39fs resolution.

ThE24

Few-Cycle OPCPA System with More than 1μJ at 143kHz, *Marcel Schultze[1], Thomas Binhammer[2], Andy Steinmann[1], Guido Palmer[1], Moritz Emons[1], Uwe Morgner[1,3]; [1]Leibniz Univ. Hannover, Germany, [2]Venteon Laser Technologies GmbH, Germany, [3]Laser Zentrum Hannover (LZH), Germany.* An OPCPA system delivering 8.8 fs pulses with 1.3 μJ of energy at 143 kHz repetition rate is presented. Pump and seed for the parametric amplification are simultaneously generated by a broadband Ti:sapphire oscillator.

Thursday, July 22
3:45 p.m.–6:00 p.m.
Rooftop Garden

ThE25

Completely Characterizing Single Attosecond Pulses by the Modified Spectral Phase Interferometry, *Jiangfeng Zhu[1,2], Shaobo Fang[1,2], Keisaku Yamane[1,2], Tao Chen[1,2], Mikio Yamashita[1,2]; [1]Dept. of Applied Physics, Hokkaido Univ., Japan, [2]Core Res. for Evolutional Science and Technology, JST, Japan.* Complete characterization of single attosecond pulses by the modified spectral phase interferometry is presented considering the frequency-dependent spectral shear. The results show no principle limitation of characterizing arbitrary short single attosecond pulses.

ThE26

High-Order Harmonic Generation by Few-Cycle Pulses from Filamentation, *Daniel S. Steingrube[1,2], Emilia Schulz[1,2], Thomas Binhammer[3], Tobias Vockerodt[1,2], Uwe Morgner[1,2], Milutin Kovacev[1,2]; [1]Inst. für Quantenoptik, Leibniz Univ. Hannover, Germany, [2]QUEST, Ctr. for Quantum Engineering and Space-Time Res., Germany, [3]VENTEON Laser Technologies GmbH, Germany.* High-order harmonics are generated in a semi-infinite gas cell by ultra-short pulses from a filament compressed to pulse duration of 7 fs. Harmonic spectra in different noble gases are obtained yielding a continuous structure.

ThE27

Bandwidth-Enhanced Noncollinear Optical Parametric Amplification via Anamorphic Pumping, *Philip J. M. Johnson, Valentyn I. Prokhorenko, R. J. Dwayne Miller; Univ. of Toronto, Canada.* We present a scheme for anamorphic pumping to enhance the amplified bandwidth in a single-pass blue-green NOPA, resulting in up to 100THz output. This represents a significant gain in amplified bandwidth over conventional focusing.

ThE28

Self-Trapping of Supercontinuum Generated by Femtosecond Pulses in a Noble Gas, *Trenton R. Ensley, Dmitry A. Fishman, Lazaro A. Padilha, Scott Webster, David J. Hagan, Eric W. Van Stryland; CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* We present an experimental and theoretical study of self-trapping that includes self-focusing and the production of plasma for supercontinuum generated in noble gases using ultra-short laser pulses.

ThE29

Advanced Compton Scattering Light Source R&D at LLNL, *Felicie Albert, Scott G. Anderson, Gerry G. Anderson, Andy J. Bayramian, Shawn M. Betts, Tak S. Chu, David J. Gibson, Roark A. Marsh, Michael J. Messerly, Miroslav Y. Shverdin, Sheldon S. Wu, Fred V. Hartemann, Craig W. Siders, Christopher P. J. Barty; Lawrence Livermore Natl. Lab, USA.* We report the design and current status of a monoenergetic laser-based Compton scattering 0.5-2.5 MeV γ-ray source. Previous nuclear resonance fluorescence results and future linac and laser developments for the source are presented.

ThE30

Photoemission-Coherent Auger Decay, *Aart J. Verhoef[1], Alexander Mitrofanov[1], Xuan Trung Nguyen[1], Maria Krikunova[2], Markus Drescher[2], Armin Scrinzi[1,3], Andrius Baltuška[1]; [1]Vienna Univ. of Technology, Austria, [2]Univ. Hamburg, Germany, [3]Ludwig-Maximilians-Univ. München, Germany.* In the presence of an IR-field, high-energy Auger-electrons are emitted with the same kinetic energy as IR-streaked electrons directly XUV-ionized from the 4s-subshell in Krypton. Interference of the two electronic wave-packets is experimentally observed.

ThE31

High Harmonic Generation for Study of Rotational Raman Coherence, *Lap Van Dao, Khuong Ba Dinh, Peter Hannaford; Swinburne Univ. of Technology, Australia.* The modulation of the intensity of phase-matched high-harmonic radiation from field-free aligned diatomic molecules due to changes of the nonlinear refractive index is used to determine rotational coherence in the ground state of molecules.

ThE32

Isolating Spectral Contributions from Local Field Effects in an Atomic Vapor Using Two-Quantum 2-D FT Optical Spectroscopy, *Katherine W. Stone, Keith A. Nelson; MIT, USA.* Two-quantum 2-D Fourier transform optical spectroscopy is used to separate the contributions of dipole-dipole interactions to the overall nonlinear optical response which isolates them from the atomic resonances in rubidium vapor that generated them.

ThE33

Coherent Control of Population Transfer in an Open Quantum System in the One-Photon Limit, *Valentin I. Prokhorenko, Philip J. M. Johnson, R. J. Dwayne Miller; Univ. of Toronto, Canada.* Using chirped excitation pulses on the level of ≤ 1 photon per field mode we are able to manipulate the excited state population of a dye molecule in a solvent by ~4%.

ThE34

Space-Time Coupling in Femtosecond Scalar and Vector Pulse Shaping, *Franziska Frei, Reto Bloch, Thomas Feurer; Inst. of Applied Physics, Univ. of Bern, Switzerland.* We present analytical as well as experimental results of space-time coupling in femtosecond scalar and vector pulse shaping. In focusing geometry, the influence of space-time coupling on nonlinear light matter interaction is discussed.

ThE35

Non-Born-Oppenheimer Wavepacket Revivals in a Polyatomic Molecule, *Andrey E. Boguslavskiy, Dave Townsend, Michael S. Schuurman, Albert Stolow; Steacie Inst. for Molecular Sciences, Natl. Res. Council Canada, Canada.* Non-Born-Oppenheimer wavepacket revivals have been observed in 1,4-diazabicyclo[2.2.2]octane using time-resolved photoelectron spectroscopy. Upon photoexcitation, he wavepacket oscillates between the first two excited states for over 14 ps - a behavior only seen in diatomics before.

ThE36

Terahertz Generation via Two Color Photoionization in Pre-Formed Plasma, *Yong-Sing You, Ki-Yong Kim; Univ. of Maryland, USA.* The generation of terahertz radiation is examined when two-color laser fields are mixed in pre-formed plasma created by another laser pulse. The result confirms the key role of tunneling ionization in the terahertz generation mechanism.

ThE37

Photoconductivity in TiO_2 Nanotubes Measured by Time Resolved Terahertz Spectroscopy, *Christiaan Richter, Charles Schmuttenmaer; Yale Univ., USA.* Picosecond time resolved photoconductivity of TiO_2 single crystals, nanoparticles, and nanotubes is reported. Long range photoconductivity of both nanomaterials is impaired. The THz data reveal a very different microscopic mechanism reducing conductivity nanotubes vs. nanoparticles.

Thursday, July 22
3:45 p.m.–6:00 p.m.
Rooftop Garden

ThE38

Non-Degenerate Pump-Probe Spectroscopy of Single GaN Nanowires, *Prashanth C. Upadhya[1], Julio A. Martinez[2], Qiming Li[2], George T. Wang[2], Brian S. Swartzentruber[2], Antoinette J. Taylor[1], Rohit P. Prasankumar[1]; [1]Ctr. for Integrated Nanotechnologies, Los Alamos Natl. Lab, USA, [2]Sandia Natl. Labs, USA.* Spatially-resolved ultrafast transient absorption measurements on a single GaN nanowire give insight into carrier relaxation dynamics as a function of the probe polarization and position on the nanowire on a femtosecond timescale.

ThE39

Measurement of Effective Refractive Index Ellipse of $LiNbO_3$ Subwavelength Slab Waveguide for Thz Phonon Polariton Wave, *Chengliang Yang[1], Qiang Wu[1], Christopher A. Werley[2], Jingjun Xu[1], Keith A. Nelson[2]; [1]Nankai Univ., China, [2]MIT, USA.* The propagation process of THz phonon polariton wave in 50 micrometer $LiNbO_3$ slab waveguide is recorded using polarization gating imaging system. The effective refractive indexes of different models are calculated from the dispersion curves.

ThE40

Ultrafast Photoinduced Phase Conversion to a Metallic State in Quasi-One-Dimensional Platinum Complexes under Extremely High-Density Excitation, *Taro Kawano[1], Ikufumi Katayama[2], Taeho Shin[3], Johanna Wolfson[3], Keith A. Nelson[3], Jun Takeda[1]; [1]Graduate School of Engineering, Yokohama Natl. Univ., Japan, [2]Interdisciplinary Res. Ctr., Yokohama Natl. Univ., Japan, [3]MIT, USA.* Ultrafast photoinduced phase conversion from a charge-density wave state to a metallic state in quasi-one-dimensional platinum complexes is successfully demonstrated by single-shot pump-probe spectroscopy with dual echelons under extremely high-density excitation above 1 photon/platinum site.

ThE41

THz Kerr Effect in Relaxor Ferroelectrics, *Harold Y. Hwang[1], Matthias C. Hoffmann[2], Nathaniel C. Brandt[1], Keith A. Nelson[1]; [1]MIT, USA, [2]Univ. of Hamburg, Germany.* THz-induced optical birefringence was observed in the relaxor ferroelectrics KTN and KLTN. The dynamics observed may arise from the onset of ferroelectric nanodomains.

ThE42

Observation of THz Nonlinearity in CVD-Grown Graphene, *Harold Y. Hwang, Nathaniel C. Brandt, Hootan Farhat, Allen L. Hsu, Jing Kong, Keith A. Nelson; MIT, USA.* Nonlinear transmission experiments were performed on CVD-grown graphene. THz-induced transparency and nonlinear THz generation were observed at high THz field strengths.

ThE43

Coherent Nonlinear Response Surviving at Room Temperature Caused by Ultrafast Radiative Decay of Confined Excitons, *Masaaki Ashida[1], Masayoshi Ichimiya[1,2], Keita Mochizuki[1], Hideki Yasuda[3], Hajime Ishihara[3], Tadashi Itoh[1]; [1]Osaka Univ., Japan, [2]Osaka Dental Univ., Japan, [3]Osaka Prefecture Univ., Japan.* Temperature dependence of degenerate four-wave mixing spectra of confined excitons in CuCl thin films was investigated. The nonlinear optical response was observed even at room temperature because of the ultrafast radiative decay.

ThE44

Ultrafast Dynamic Ellipsometry and Spectroscopies of Laser Shocked Materials, *Shawn McGrane, Cynthia Bolme, Von Whitley, David Moore; Los Alamos Natl. Lab, USA.* Ultrafast ellipsometry and transient absorption spectroscopies are used to measure material dynamics under extreme conditions of temperature, pressure, and volumetric compression induced by shock wave loading with a chirped, spectrally clipped shock drive pulse.

ThE45

Ultrafast Genration of Dense Dirac Fermions in Graphene Monolayer: Evidence for Three-Particle Coulomb Scattering, *Tianqi Li, Liang Luo, Myron Hupalo, Michael C. Tringides, Jigang Wang; Dept. of Physics and Astronomy, Ames Lab, Iowa State Univ., USA.* A power law dependence $I^{1/3}$ of the amplitude of femtosecond diffenrential relfecltivity in highly photo-excited graphene monolayer indicates three-particle decay, allowing for generation of dense Dirac fermions beyond phase space filling within 35 fs.

ThE46

Ultrafast Coherent High-Field Electron Transport in GaAs, *Wilhelm Kuehn[1], Peter Gaal[1], Klaus Reimann[1], Michael Woerner[1], Thomas Elsaesser[1], Rudolf Hey[2]; [1]Max-Born-Inst. für Nichtlineare Optik und Kurzzeitspektroskopie, Germany, [2]Paul-Drude-Inst. für Festkörper Elektronik, Germany.* With strong terahertz pulses we observe at T=300K in GaAs coherent ballistic electron transport across half the Brillouin zone. At T=80K we find additionally terahertz driven tunneling from the valence into the conduction band.

ThE47

Probing Electron Transfer in Polymer/Fullerene Blends Using Ultrahigh Time Resolution Coherent Vibrational Spectroscopy, *Sarah M. Falke[1], Daniele Brida[2], Giulio Cerullo[2], Christoph Lienau[1]; [1]Inst. für Physik, Carl von Ossietzky Univ. Oldenburg, Germany, [2]Natl. Lab for Ultrafast and Ultraintense Optical Science, CNR-INFM, Politecnico di Milano, Italy.* We report nonlinear optical spectra of polymer/fullerene-blends measured with unprecedented 10-fs-time resolution. Our results suggest that the photoinduced charge-generation in such blends proceeds via a hybrid electronic state delocalized over the polymer and fullerene moieties.

ThE48

Intermolecular Correlation Effects in the Electronic Relaxation Dynamics of Organic Single Crystals, *Brantley A. West[1], Jordan M. Womick[1], Ke Jie Tan[2], Laurie E. McNeil[1], Andrew M. Moran[1]; [1]Univ. of North Carolina at Chapel Hill, USA, [2]Nanyang Technological Univ., Singapore.* Nonlinear optical techniques are used to investigate the influence of specific thermally driven nuclear motions on <100 fs electronic relaxation processes in organic single crystals. Experiments and simulations suggest the importance of spatial correlated fluctuations.

ThE49

Light-Induced Modulation of Ferroelectric Polarization Probed Using Time-Resolved X-Ray Scattering, *Dan Daranciang[1], Haidan Wen[2], Matt Highland[3], Brad Perkins[4], Nathaniel Brandt[4], Keith Nelson[4], Jorgen Larsson[5], Donald Walko[3], Eric Dufresne[3], Paul Fuoss[3], Brian Stephenson[3], Aaron Lindenberg[1,2]; [1]SLAC Natl. Accelerator Lab, USA, [2]Stanford Univ., USA, [3]Argonne Natl. Lab, USA, [4]MIT, USA, [5]Lund Univ., Sweden.* Time-resolved X-ray diffraction techniques are used to visualize atomic-scale displacements within the unit cell of the nanoscale ferroelectric $PbTiO_3$. A picosecond all-optically-induced polarization modulation is observed, associated with a large-amplitude carrier-induced increase in the polarization.

Thursday, July 22
3:45 p.m.–6:00 p.m.
Rooftop Garden

ThE50
Molecular Vibrational Response of Ice Layers after Ultrashort-Laser Excitation of Metal Surfaces, *Juraj Bdžoch[1], Martin Wolf[1,2], Christian Frischkorn[1]; [1]Freie Univ. Berlin, Germany, [2]Fritz-Haber-Inst. der Max-Planck-Gesellschaft, Germany.* Electron injection into thin, crystalline D_2O layers on a Ru(001) surface after UV excitation has been investigated using broadband sum-frequency generation spectroscopy, whereby a signal enhancement by several orders of magnitude is observed.

ThE51
Probing Ultrafast Dynamics of 5f Electrons in Crystalline UO_2, *Yong Q. An, Antoinette J. Taylor, Tomasz Durakiewicz, George Rodriguez; Los Alamos Natl. Lab, USA.* We find the lifetimes of photoexcited 5f electrons in crystalline UO_2, ~1.2 ns for midgap states and ~2 μs for upper Hubbard band states at low temperatures, identify magnetic transitions, and observe picosecond intraband relaxation.

ThE52
Conductivity Dynamics in the Correlated Metallic State of V_2O_3, *Mengkun Liu[1], Brian Pardo[1], Mumtaz M. Qazilbash[2], Sun J. Yun[3], Byung G. Chae[3], Bong J. Kim[3], Dimitri N. Basov[2], Richard D. Averitt[1]; [1]Boston Univ., USA, [2]Univ. of California at San Diego, USA, [3]ETRI, Republic of Korea.* We report on time resolved studies of V_2O_3 which undergoes a metal-insulator transition at ~150K. In metallic state, we observe coherent terahertz conductivity oscillations in hundred-picosecond time scale following optical excitation with 35-fs 800nm pulses.

ThE53
One Dimensional Exciton Diffusion in J-Aggregates, *Henning Marciniak[1], Xue-Qing Li[2], Frank Würthner[2], Stefan Lochbrunner[1]; [1]Univ. of Rostock, Germany, [2]Univ. of Würzburg, Germany.* The annihilation dynamics of excitons in J-aggregates of substituted perylene bisimides is investigated by femtosecond absorption spectroscopy. The comparison with models shows that the excitons are only mobile along one dimension.

6:00 p.m.–8:00 p.m. Dinner Break *(on your own)*

8:00 p.m.–10:00 p.m. Postdeadline Papers Session

NOTES

Anderson Room	Hoaglund Room

Friday, July 23, 8:30 a.m.–12:00 p.m. Registration Open, *Lobby*

FA • Surfaces and Interfaces

Friday, July 23
8:30 a.m.–10:15 a.m.
Jean-Yves Bigot; CNRS, Univ. of Strasbourg, France, Presider

FA1 • 8:30 a.m. **Invited**

Transient Electronic Structure of Solids and Surfaces Studied with Time- and Angle-Resolved Photoemission, *L. Rettig[1], R. Cortes[1,2], H. A. Dürr[3], J. Fink[3], U. Bovensiepen[4], Martin Wolf[1,2]; [1]Freie Univ. Berlin, Germany, [2]Fritz-Haber-Inst. of the Max-Planck-Society, Germany, [3]Helmholtz-Zentrum Berlin, Germany, [4]Dept. of Physics, Univ. Duisburg-Essen, Germany.* The dynamics of highly correlated materials are studied by femtosecond time- and angle-resolved photoemission spectroscopy. In the new FeAs based superconductors electron-phonon coupling plays a decisive role leading to strongly momentum dependent carrier relaxation.

FA2 • 9:00 a.m.

Attosecond-Time-Resolved Studies of Electron Dynamics on Surfaces, *Stefan Neppl[1], Dietrich Menzel[1], Peter Feulner[1], Ralph Ernstorfer[1], Reinhard Kienberger[1], Adrian L. Cavalieri[2], Elisabeth Magerl[2], Michael Stanislawski[2], Nicholas Karpowicz[2], Ferenc Krausz[2]; [1]Technical Univ. of Munich, Germany, [2]Max-Planck-Inst. of Quantum Optics, Germany.* We report on time-resolved experiments to investigate the attosecond dynamics of photoelectrons generated by ultra-short XUV pulses on clean metal surfaces and in well-defined adsorbate-metal interfaces.

FA3 • 9:15 a.m.

Nanoscale Imaging of the Interface Dynamics in Polymer Blends by Femtosecond Pump-Probe Confocal Microscopy, *Dario Polli, G. Grancini, T. Virgili, J. Clark, M. Celebrano, G. Lanzani, G. Cerullo; Politecnico di Milano, Italy.* Pump-probe measurements of phase-separated conjugated-polymer films, combining 150-fs temporal and 300-nm spatial resolution, allow one to highlight "dynamical" interfaces, i.e. borders of phase-separated islands that behave differently in terms of transient absorption and relaxation dynamics.

FA4 • 9:30 a.m.

Transient 2-D IR Spectroscopy of Charge Injection at Organic-Inorganic Interfaces, *Wei Xiong, Jennifer E. Laaser, Peerasak Paoprasert, Ryan A. Franking, Robert J. Hamers, Padma Gopalan, Matrin T. Zanni; Univ. of Wisconsin at Madison, USA.* Transient 2-D IR spectroscopy suppresses the signal of free electrons injected at organic-inorganic interfaces, which dominate standard transient spectra. Consequently, vibrational features are better resolved, permitting study of charge injection from different conformations of dyes.

FA5 • 9:45 a.m.

Ultrafast Phase Change in $Ge_2Sb_2Te_5$ Induced by Selective Excitation of Coherent Phonons, *Kotaro Makino[1], Junji Tominaga[2], Muneaki Hase[1]; [1]Univ. of Tsukuba, Japan, [2]AIST, Japan.* We demonstrate ultrafast phase change from amorphous to crystalline state by selective excitation of coherent phonons in $Ge_2Sb_2Te_5$. We have observed phonon frequency shift corresponding to the structural change within 270 fs after photoexcitation.

FA6 • 10:00 a.m.

Coherent Acoustic Phonons in Highly Oriented Bismuth Films Monitored by Femtosecond Electron Diffraction, *Germán Sciaini[1], Masaki Hada[2], Jiro Matsuo[2], Angelo Karantza[1], Gustavo Moriena[1], R. J. Dwayne Miller[1]; [1]Dept.s of Chemistry and Physics, and Inst. for Optical Sciences, Univ. of Toronto, Canada, [2]Quantum Science Res. Ctr., Kyoto Univ., Japan.* Femtosecond electron diffraction opens new vistas for determining elastic properties at nanoscale. We report on the detection of coherent acoustic phonons generated via fs laser photoexcitation in ultrathin (110)-highly oriented films of Bismuth.

10:15 a.m.–10:45 a.m. Coffee Break, *Foyer*

FB • Strong Field Ionization Dynamics

Friday, July 23
10:45 a.m.–12:15 p.m.
Margaret Murnane; Univ. of Colorado, USA, Presider

FB1 • 10:45 a.m. **Invited**

Attosecond Angular Streaking and Tunneling Delay Time in Strong Laser Field Ionization, *P. Eckle, A. N. Pfeiffer, C. Cirelli, A. Staudte, R. Dörner, H. G. Muller, Ursula Keller; ETH Zürich, Switzerland.* We use attosecond angular streaking to place an intensity-averaged upper limit of 12 attoseconds on the tunneling delay time in strong field ionization of a helium atom. This is much shorter than the Keldysh time.

FB2 • 11:15 a.m.

Optical Detection of Attosecond Ionization Dynamics in Transparent Solids, *Alexander Mitrofanov[1], Aart J. Verhoef[1], Evgenii E. Serebryannikov[2], Julien Lumeau[3], Leonid B. Glebov[3], Aleksei M. Zheltikov[2], Andrius Baltuška[1]; [1]Vienna Univ. of Technology, Austria, [2]M.V. Lomonosov Moscow State Univ., Russian Federation, [3]Univ. of Central Florida, USA.* We demonstrate an all-optical pump-probe technique to resolve attosecond ionization dynamics in transparent solids. First experimental evidence of attosecond ionization dynamics in different materials is presented, and compared to Kerr-nonlinearity and third harmonic generation.

FB3 • 11:30 a.m.

Anomalous Anisotropy in the Explosion of Rare-Gas Clusters Irradiated with Intense Few-Cycle Laser Pulses, *Eva Skopalová[1], Yasin C. El-Taha[1], Amelle Zaïr[1], Matthias Hohenberger[1], Emma Springate[2], John W. G. Tisch[1], Roland A. Smith[1], Jonathan P. Marangos[1]; [1]Imperial College London, UK, [2]Central Laser Facility, UK.* We report anomalous anisotropy in short pulse driven cluster explosions, with more energetic ions emitted in the direction *perpendicular* to the laser polarization. This anisotropy decreases and eventually reverts as the pulse length is increased.

FB4 • 11:45 a.m.

Intense Femtosecond X-Ray Photoionization Studies of Nitrogen - How Molecules Interact with Light from the LCLS, *Matthias Hoener[1,2], Li Fang[1], Oleg Kornilov[2], Oliver Gessner[2], Nora Berrah[1]; [1]Western Michigan Univ., USA, [2]Lawrence Berkeley Natl. Lab, USA.* Photoionization studies of molecular nitrogen have been performed using intense femtosecond X-ray pulses produced by the Linac Coherent Light Source. Partial ion yields and kinetic energy release spectra reveal a new regime of light-matter interaction.

FB5 • 12:00 p.m.

Molecular Orbital Imaging Using Strong-Field Driven Attosecond Emission, *Stefan Haessler[1], Zsolt Diveki[1], Jeremie Caillat[2,3], Willem Boutu[1], Cecilia Giovanetti-Teixeira[2,3], Thierry Ruchon[1], Thierry Auguste[1], Pierre Breger[1], Alfred Maquet[2,3], Bertrand Carré[1], Richard Taieb[2,3], Pascal Salières[1]; [1]CEA-Saclay, IRAMIS, France, [2]UPMC Univ. Paris 06, France, [3]CNRS, UMR, France.* Advanced characterization of the attosecond emission from aligned N_2 molecules allows us to identify multi-orbital contributions to the generation process. Tomographic reconstruction of the corresponding electronic wavepacket is performed with Ångström-spatial and attosecond-temporal resolution.

Closing Remarks

Friday, July 23
12:30 p.m.–12:45 p.m.

Key to Authors and Presiders
(**Bold** denotes Presider or Presenting Author)

17th International Conference on Ultrafast Phenomena (UP)

July 18-23, 2010
The Silvertree Hotel and Snowmass Conference Center
Snowmass Village, Colorado, USA

Update Sheet

Presentation Updates:

ME35, **Below-Threshold High-Order Harmonics Probed with Aligned Molecules**, will be presented by Barry Bruner; *Weizmann Inst. of Science, Israel* (Monday, 3:45 p.m.–4:45 p.m. and 6:30 p.m.–7:30 p.m.).

TuE30, **Characterization of an Asynchronously Mode-Locked Erbium-Doped Fiber Laser Operating at 10GHz**, will be presented by Camila C. Dias; *Univ. Presbiteriana Mackenzie, Brazil* (Tuesday, 3:45 p.m.–4:45 p.m. and 6:30 p.m.–7:30 p.m.).

ThD6, **Deciphering Excited State Evolution in Halorhodopsin with Stimulated Emission Pumping**, will be presented by Pavel Komm; *Hebrew Univ., Israel* (Thursday, 3:30 p.m.).

Follow the UP Blog!

http://ultrafastphenomena.blogspot.com/

Miaochan Zhi will be blogging about the conference throughout the week. Join the conversation!

On behalf of the UP organizers and management, a special thanks to Miaochan!

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17th International Conference on Ultrafast Phenomena (UP) Postdeadline Presentations

• Thursday, July 22, 2010 •

Anderson/Hoaglund
8:00 p.m.–10:00 p.m.
PDP • Postdeadline Papers Session

PDP1 • 8:00 p.m.
Scalable High-Energy Sub-Cycle Waveform Synthesis, *Shu-Wei Huang[1], Giovanni Cirmi[1], **Jeffrey Moses**[1], Kyung-Han Hong[1], Andrew Benedick[1], Li-Jin Chen[1], Enbang Li[2], Benjamin Eggleton[2], Giulio Cerullo[3], Franz X. Kärtner[1]; [1]MIT, USA, [2]Univ. of Sydney, Australia, [3]Politecnico di Milano, Italy.* We demonstrate attosecond level synchronized and carrier-envelope phase-locked few-cycle 800-nm and 2-μm pulse trains seeded from a single Ti:sapphire oscillator. This system enables scalable, high-energy pulses lasting less than single electric-field cycle for high-field physics.

PDP2 • 8:15 p.m.
Photo-Induced Structure Phase Transition Probed by Femtosecond Electron Diffraction, ***Junjie Li****, Xuan Wang, Haidong Zhou, Jun Zhou, Jianming Cao; Physics Dept. and Natl. High Magnetic Field Lab, Florida State Univ., USA.* The melting of orthorhombic structure of $La_{0.84}Sr_{0.16}MnO_3$ is studied by femtosecond electron diffraction. The measurements indicate the destruction of orthorhombic structure involves a fast process of 1.21 ps and a slow one of 27.3 ps.

PDP3 • 8:30 p.m.
Opening a New Spectral Window on Retinal Protein Photochemistry, *Boris Loevsky[1], Amir Wand[1], Oshrat Bismuth[1], Noga Friedman[2], Mordechai Sheves[2], **Sanford Ruhman**[1]; [1]Hebrew Univ. of Jerusalem, Israel, [2]Weizmann Inst., Israel.* Probing the spectroscopy of the active chromophore in retinal proteins in the NIR for the first time shows new absorption features which support a three-state model for the photochemical dynamics of retinal proteins.

PDP4 • 8:45 p.m.
Tunability of THz Emission Originating from Sub-Cycle Electron Bursts in a Laser Induced Plasma, ***Tadas Balčiūnas****[1], Dusan Lorenc[1], Misha Ivanov[2], Olga Smirnova[3], Audrius Pugžlys[1], Aleksei M. Zheltikov[4], Daniel Dietze[1], Juraj Darmo[1], Karl Unterrainer[1], Tim Rathje[5], Gerhard G. Paulus[5], Andrius Baltuška[1]; [1]Photonics Inst., Vienna Univ. of Technology, Austria, [2]Dept. of Physics, Imperial College London, United Kingdom, [3]Max Born Inst., Germany, [4]M.V. Lomonosov Moscow State Univ., Russian Federation, [5]Inst. of Optics and Quantum Electronics, Germany.* THz emission tunability is demonstrated in a plasma driven by a two-color incommensurate-frequency field and described as a sub-cycle optical-field ionization followed by continuum-continuum electron transitions similarly to the Brunel mechanism of harmonics generation.

PDP5 • 9:00 p.m.
Remote Terahertz Coherent Detection using Ultraviolet Plasma Emission, ***Jingle Liu****, Jianming Dai, X.-C. Zhang; Rensselaer Polytechnic Inst., USA.* We present an "all-optical" technique of remote terahertz wave coherent detection by coherently controlling the ultra-violet photo-emission from two-color laser-induced gases. Coherent THz wave detection at a distance of 10 meters has been demonstrated.

PDP6 • 9:15 p.m.
Probing Intraband Conductivity Dynamics in Graphene, ***Jinho Lee****[1], Keshav M. Dani[1], Aditya Mohite[2], Rishi Sharma[3], Antoinette Taylor[1], Rohit P. Prasankumar[1]; [1]Ctr. for Integrated Nanotechnologies, Los Alamos Natl. Lab, USA, [2]Physical Chemistry & Applied Spectroscopy, Los Alamos Natl. Lab, USA, [3]Nuclear and Particle Physics, Astrophysics & Cosmology, Los Alamos Natl. Lab, USA.* We use ultrafast optical spectroscopy to investigate intraband conductivity dynamics in a graphene monolayer grown by chemical vapor deposition, revealing the effect of the conical band structure on two-dimensional Dirac quasiparticles.

PDP7 • 9:30 p.m.
Spatio-Temporal Dynamics of Laser Filamentation Measured via Impulsive Raman Scattering, *Johanan Odhner[1,2], Dmitri A. Romanov[1,3], **Robert J. Levis**[1,2]; [1]Ctr. for Advanced Photonics Res., College of Science and Technology, Temple Univ., USA, [2]Dept. of Chemistry, Temple Univ., USA, [3]Dept. of Physics, Temple Univ., USA.* The spatio-temporal dynamics of laser filamentation in air probed using impulsive Raman excitation reveals the formation of a sub 9fs pulse. The shortest feature corresponds to the formation of bandwidth between 450 and 330nm.

PDP8 • 9:45 p.m.
First Attosecond Pulse Control by Multilayer Mirrors above 100 eV Photon Energy, ***Michael Hofstetter****[1,2], Martin Schultze[1,2], Markus Fieß[2], Alexander Guggenmos[1,2], Justin Gagnon[1,2], Elisabeth Magerl[2], Elisabeth Bothschafter[2], Ralph Ernstorfer[2], R. Kienberger[2,3], Eric Gullikson[4], Ferenc Krausz[1,2], Ulf Kleineberg[1,2]; [1]Ludwig Maximilians Univ., Germany, [2]Max Planck Inst. für Quantenoptik, Germany, [3]Technische Univ. München, Germany, [4]Ctr. for X-Ray Optics, Lawrence Berkeley Natl. Lab, USA.* We report on our latest achievements in quantitatively controlling attosecond pulse parameters up to 180 eV by means of aperiodic, XUV multilayer mirrors focusing on a high signal to noise ratio and controlling spectral phase.

Key to Authors and Presiders

(Bold denotes Presider or Presenting Author)