OSA
Optical Society of America

UP

International Conference on Ultrafast Phenomena

14th International Conference on Ultrafast Phenomena

July 25-30, 2004
Toki Messe Convention Center
Niigata, Japan

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About UP

The 2004 Ultrafast Phenomena Conference will be the fourteenth in a series on advances in research on ultrafast science and technology. This meeting is widely recognized as the major international forum for the discussion of new work in this rapidly moving field.

The 2004 conference will bring together a multidisciplinary group sharing a common interest in the generation of ultrashort pulses in the picosecond, femtosecond, and attosecond regimes and their applications to studies of ultrafast phenomena in physics, chemistry, material science, electronics, biology, engineering, and medical applications. In addition, submissions involving real world applications of ultrafast technology are encouraged. A tabletop exhibit featuring leading companies will be held in conjunction with the meeting.

Meeting Topics

Generation and Measurement

New sources, new wavelength regimes, nonlinear frequency conversion techniques, amplifiers, attosecond pulse generation, pulse shaping, pulse diagnostics and measurement techniques, and frequency standards.

Physics

Ultrafast nonlinear optical processes, kinetics of nonequilibrium processes, quantum confinement, coherent transients, nonlinear pulse propagation, novel ultrafast spectroscopic techniques, high intensity physics, X-ray and plasma physics.

Chemistry

Vibrational and conformational dynamics, energy transfer, kinetics of laser-induced chemistry, proton and electron transfer, solvation dynamics, wavepacket motion and coherent control of reactions.

Biology

Ultrafast processes in photosynthesis, vision, heme proteins, photoisomerization in chromoproteins, wavepacket motion and medical applications.

Electronics & Optoelectronics

Photoconductivity, generation, propagation and detection of ultrafast electrical signals, terahertz radiation, electro-optical sampling and detectors.

Applications

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

Plenary Speaker - Thursday, July 29, 2004, 8:30 - 9:10 p.m.

Peering Into the Future, Charles V. Shank, *Univ. of California, USA*

Advances in technology and scientific discovery have propelled the field of Ultrafast Phenomena to its current state of development. In this talk I will describe some particularly promising directions that will impact this field in the next decade. New tools are about to become available that will open new windows in the exploration of ultrafast events in space and time. Free electron lasers, synchrotrons, laser particle accelerators and nonlinear optics will all be a part of the future. The impacts on science and technology will be broad and deep.

Charles Vernon Shank has served as Director of Ernest Orlando Lawrence Berkeley National Laboratory in Berkeley, California, since September of 1989. A nationally recognized scientist and research leader, he oversees the oldest and most varied of the Department of Energy's multi-program research laboratories, with a budget of more than $490 million and a workforce of over 4,000.

In addition to his duties as Laboratory Director, Dr. Shank has a unique triple appointment as professor at the University of California, Berkeley, in the departments of physics, chemistry, and electrical engineering and computer sciences. He graduated from UC Berkeley in 1965 and went on to receive his M.S. and Ph.D. degrees there in 1969.

Following graduation, Dr. Shank joined the staff at AT&T Bell Laboratories. During his 20-year career at Bell Laboratories, he held numerous leadership positions and was Director of the Electronics Research Laboratory just before returning to Berkeley. At Bell Laboratories, he made pioneering contributions to the study of ultrafast events that occur in a millionth of a billionth of a second using short laser pulses. He contributed to fiber optic communications with the co-invention of the distributed feedback laser, a component in high data rate transmission systems.

He has been elected to the National Academy of Sciences, the National Academy of Engineering, and the American Academy of Arts and Sciences. He is a Fellow of the American Association for the Advancement of Science, the American Physical Society, the Institute of Electrical and Electronics Engineers, and the Optical Society of America.

Invited Speakers

The list of invited speakers includes:

- MA1, **Generation of a single-cycle optical pulse**, David Walker, Miros Shverdin, Deniz Yavuz, Guang-Yu Yin; *Stanford Univ., USA*.
- MA6, **Toward a terawatt few-optical-cycle driver laser for attosecond spectroscopy**, Andrius Baltuska; Photonics Inst., *Vienna Univ. of Technology, Austria*.
- MB1, **Dynamics of hydrogen bonds in water: Vibrational echoes and two-dimensional infrared spectroscopy**, Andrei Tokmakoff; *MIT, USA*.
- MC1, **Dynamic molecular imaging**, Paul Corkum; *Natl. Res. Council of Canada, Canada*.
- MD1, **Femtosecond electron diffraction**, R. J. Dwayne Miller, J. R. Dwyer, C. T. Hebeisen, R. E. Jordan, B. J. Siwick; *Univ. of Toronto, Canada*.
- MD3, **Ultrafast X-ray diffraction**, Dietrich von der Linde; *Univ. of Duisburg-Essen, Germany*.
- TuA1, **Carrier-envelope phase controlled quantum interference in a semiconductor**, Tara M. Fortier[1], Peter Roos[1], David J. Jones[1,2], Steven T. Cundiff[1], Ravi Bhat[3], John E. Sipe[3]; *[1]JILA, Univ. of Colorado, USA, [2]Univ. of British Columbia, Canada, [3]Univ. of Toronto, Canada*.
- TuD1, **Light propagation control in photonic crystals**, Masaya Notomi; *; NTT Basic Res. Labs. Japan*.
- WA1, **Femtochemistry in the electronic groundstate: IR-Driven Cis-Trans isomerisation of HONO**, Peter Hamm; *Univ. Zurich, Switzerland*.
- WA5, **Ultrafast double proton transfer: symmetry breaking wavepacket motion and absence of deuterium isotope effect**, Stefan Lochbrunner, Kai Stock, Christian Schiever, Eberhard Riedle; *Ludwig-Maximilians-Univ., Germany*.
- WA6, **Bimodal intermolecular proton transfer in acid-base neutralization reactions in water**, Matteo Rini[1], Omar F. Mohammed[1], Jens Dreyer[1], Erik T. Nibbering[1], Ben-Zion Magnes[2], Dina Pines[2], Ehud Pines[2]; *[1]Max Born Inst., Germany, [2]Ben Gurion Univ. of the Negev, Israel*.
- WC1, **Imaging nanostructures with picosecond ultrasonic pulses**, Brian C. Daly1[1], Niels C. Holme1[1], Takashi Buma1[1], Cyril

Branciard[1], Theodore B. Norris[1], Stanley Pau[2], Donald M. Tennant[2], Joseph A. Taylor[2], John E. Bower[2]; *[1]Univ. of Michigan, USA, [2]Bell Labs, Lucent Technologies, USA*.

- ThA1, **Sub-20-fs study of energy relaxation in carotenoids in solution and inside light-harvesting complexes**, Giulio Cerullo[1], Dario Polli[1], Guglielmo Lanzani[1], Hideki Hashimoto[2], Richard J. Cogdell[3]; *[1]Politecnico di Milano, Italy, [2]Dept. of Physics, Osaka City Univ., Japan, [3]Div. of Biochemistry and Molecular Biology, Univ. of Glasgow, UK*.
- ThB1, **Quasi-phase matching of high harmonic generation in the "water window" soft x-ray region**, Emily A. Gibson[1], Ariel Paul[1], Sterling Backus[1], Ra'anan Tobey[1], Margaret M. Murnane[1], Henry C. Kapteyn[1], Ivan P. Christov[2]; *[1]JILA, Univ. of Colorado, USA, [2]Dept. of Physics, Sofia Univ., Bulgaria*.
- ThB5, **Generation of sub 4-fs high harmonic pulses and their application to the above-threshold ionization**, Taro Sekikawa, Atsushi Kosuge, Teruto Kanai, Shuntaro Watanabe; *Univ. of Tokyo, Japan*.
- ThC1, **Watching proteins function with picosecond time-resolved X-ray crystallography**, Philip A. Anfinrud1[1], Friedrich Schotte1[1], Michael Wulff[2]; *[1]NIH, USA, [2]European Synchrotron and Radiation Facility, France.*
- FB1, **Imaging of localized silver plasmon dynamics with sub-fs time and nano-meter spatial resolution**, Atsushi Kubo, Ken Onda, Hrvoje Petek, Zhijun Sun, Yun S. Jung, Hong K. Kim; *Univ. of Pittsburgh, USA*.
- FB2, **Ultrafast dynamics of light transmission through plasmonic crystals**, Christoph Lienau[1], Claus Ropers[1], Roland Müller[1], Gero Stibenz[1], Günter Steinmeyer[1], Doo-Jae Park[2], Yeo-Chan Yoon[2], Dai-Sik Kim[2]; *[1]Max Born Inst., Germany, [2]Seoul Natl. Univ., Republic of Korea*.
- FB4, **Plasma based processes for optical surface modifications in Germany**, Fumiaki Miyamaru, Masanori Hangyo; *Res. Ctr. for Superconductor Photonics, Japan*.

Publications

Advance Programs

The *Advance Program* will be available online at least six weeks prior to the meeting. Registrants will receive and *an Advance Program* on-site. Authors submitting papers, past meeting participants, and current committee members will automatically receive an email directing them to the *Advance Program* on the web.

Technical Digests

The UP *Technical Digest* will be a CD comprised of the summaries of papers being presented during the UP meeting. Each registrant will receive a copy of the *Technical Digest* CD on-site. Extra copies can be purchased at the meeting for a special price of $45.

Conference Proceedings

In addition to the Technical Digest CD, each full technical registration includes one copy of the *Conference Proceedings*. The *Conference Proceedings* will be published by Springer-Verlag. Instructions on submitting manuscripts will be mailed to all corresponding authors presenting papers.

Agenda

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- Sunday, July 25, 2004
- Monday, July 26, 2004
- Tuesday, July 27, 2004
- Wednesday, July 28, 2004
- Thursday, July 29, 2004
- Friday, July 30, 2004

Sunday, July 25, 2004

Time	Event / Location
2:00 PM - 7:00 PM	Registration
7:00 PM - 9:00 PM	Welcome Reception *Room 301*

Monday, July 26, 2004

Time	Event / Location
8:00 AM - 12:00 PM	Registration/Speaker and Presider Check-in
8:15 AM - 8:30 AM	Opening Remarks *Marine Hall (4F)*
8:30 AM - 10:30 AM	**MA**, Generation and Measurement *Marine Hall (4F)*
10:30 AM - 11:00 AM	Coffee Break
11:00 AM - 1:00 PM	**MB**, Hydrogen Bond Dynamics *Marine Hall (4F)*
1:00 PM - 2:30 PM	Lunch Break (on your own)
2:30 PM - 4:00 PM	**MC**, Strong Field Molecular Physics *Marine Hall (4F)*
4:00 PM - 4:30 PM	Coffee Break
4:30 PM - 6:00 PM	**MD**, Diffraction and Short-Wavelength

	Imaging *Marine Hall (4F)*
6:00 PM - 7:30 PM	Dinner Break (on your own)
7:30 PM - 9:30 PM	**ME**, Poster Session I (Exhibition) *Rooms 301 and 302*

Tuesday, July 27, 2004

Time	Event/Location
8:00 AM - 5:00 PM	Registration/Speaker and Presider Check-in
8:15 AM - 10:30 AM	**TuA**, Ultrafast Condensed Matter and Plasma Physics *Marine Hall (4F)*
10:30 AM - 11:00 AM	Coffee Break
11:00 AM - 1:00 PM	**TuB**, Multidimensional Spectroscopy *Marine Hall (4F)*
1:00 PM - 2:30 PM	Lunch Break (on your own)
2:30 PM - 4:00 PM	**TuC**, Plasmon Field Enhancement *Marine Hall (4F)*
4:00 PM - 4:30 PM	Coffee Break
4:30 PM - 6:00 PM	**TuD**, Waveguides and Propagation *Marine Hall (4F)*
6:00 PM - 7:30 PM	Dinner Break (on your own)
7:30 PM - 9:30 PM	**TuE**, Poster Session II (Exhibition) *Rooms 301 and 302*

Wednesday, July 28, 2004

Time	Event/Location
8:00 AM- 5:00 PM	Registration/Speaker and Presider Check-in
8:15 AM - 10:30 AM	**WA**, Photo-Induced Reaction Dynamics *Marine Hall (4F)*
10:30 AM - 11:00 AM	Coffee Break
11:00 AM - 1:00 PM	**WB**, Imaging and Terahertz *Marine Hall (4F)*

1:00 PM - 2:00 PM	Lunch Break (on your own)
2:00 PM - 3:30 PM	**WC**, Phonons *Marine Hall (4F)*
4:00 PM - 6:00 PM	Excursion (ticket required)
6:00 PM - 8:00 PM	Banquet

Thursday, July 29, 2004

Time	Event / Location
8:00 AM - 5:00 PM	Registration/Speaker and Presider Check-in
8:15 AM - 10:30 AM	**ThA**, Ultrafast Processes in Organic Materials *Marine Hall (4F)*
10:30 AM - 11:00 AM	Coffee Break
11:00 AM - 1:00 PM	**ThB**, High Order Harmonics and Phase Effects *Marine Hall (4F)*
1:00 PM - 2:30 PM	Lunch Break (on your own)
2:30 PM - 4:30 PM	**ThC**, Biology *Marine Hall (4F)*
4:30 PM - 5:00 PM	Coffee Break
5:00 PM - 6:30 PM	**ThD**, Poster Session III (Exhibition) *Rooms 301 and 302*
6:30 PM - 8:30 PM	Dinner Break (on your own)
8:30 PM - 9:10 PM	Plenary session: Peering into the Future -- Dr. Charles Shank *Marine Hall (4F)*
9:10 PM - 10:00 PM	Postdeadline Papers *Marine Hall (4F)*

Friday, July 30, 2004

Time	Event / Location
8:00 AM - 12:00	Registration/Speaker and Presider Check-in
8:30 AM - 10:30 AM	**FA**, Sources and Metrology *Marine Hall (4F)*

10:30 AM - 11:00 AM	Coffee Break
11:00 AM - 1:00 PM	**FB**, Plasmons in Periodic Structures *Marine Hall (4F)*
1:00 PM - 1:15 PM	Closing Remarks *Marine Hall (4F)*

Agenda of Sessions

Tuesday January 14, 2003

Time	Event
4:00pm-6:00pm	Registration, City Center Ballroom Foyer

Wednesday January 15, 2003

Time	Event
7:30am-5:00pm	Registration, City Center Ballroom Foyer

8:30am-8:45am	OPENING REMARKS, City Center 1
8:45am-10:30am	WA, ULTRAFAST OPTICS, City Center 1
10:30am-4:00pm	Exhibits Open, City Center 2
10:30am-11:00am	Coffee Break, City Center 2
11:00am-12:00pm	WB, ULTRAFAST SWITCHING, City Center 1
12:00pm-1:30pm	Lunch Break
1:30pm-3:30pm	WC, ULTRAFAST PHYSICS AND SPECTROSCOPY, City Center 1
3:30pm-4:00pm	Coffee Break, City Center 2
4:00pm-5:00pm	WD, ULTRAFAST IMAGING, City Center 1
5:00pm-6:30pm	POSTDEADLINE PAPER SESSION, City Center 1
6:30pm-8:30pm	Conference Banquet, Potomac Room

Thursday January 16, 2003

Time	Event
7:30am–5:00pm	Registration, City Center Ballroom Foyer
8:30am-10:15am	ThA, ULTRAFAST LASERS, City Center 1
10:00am-4:00pm	Exhibits Open, City Center 2
10:15am-11:00am	Coffee Break, City Center 2
11:00am-12:00pm	ThB, ULTRAFAST OPTOELECTRONIC DEVICES, City Center 1
12:00pm-1:30pm	Lunch Break
1:30pm-3:15pm	ThC, ULTRAFAST OPTICAL/MILLIMETER-WAVE APPLICATIONS, City Center 1
3:15pm-3:45pm	Coffee Break, City Center 2
3:45pm-5:00pm	ThD, ULTRAFAST ELECTRONICS, City Center 1
5:00pm-5:15pm	CLOSING REMARKS, City Center 1

Sunday, July 25, 2004

2:00 p.m.–7:00 p.m.
Registration

Room 301
7:00 p.m.–9:00 p.m.
Welcome Reception

Monday, July 26, 2004

Marine Hall (4F)
8:15 a.m.–8:30 a.m.
Opening Remarks

Marine Hall (4F)
8:30 a.m.–10:30 a.m.
MA • Generation and Measurement
Selcuk Akturk; Georgia Tech, USA, Presider

MA1 ● 8:30 a.m. Invited
Generation of a single-cycle optical pulse, *David Walker, Miros Shverdin, Deniz Yavuz, Guang-Yu Yin; Stanford Univ., USA.* We report the generation of a train of single-cycle optical pulses. Phase-adjusting Raman sidebands from 1.6 microns to 410 nm, produces a waveform having pulsewidth, 1.5 fs; period, 11 fs; and peak power, 1 MW.

MA2 ● 9:00 a.m.
Self-referenced measurement of the complete electric field of ultrashort pulses in time and space, *Pablo Gabolde, Selcuk Akturk, Rick Trebino; Georgia Tech, USA.* We propose and demonstrate a technique based on Fourier-synthesis digital holography and frequency-resolved optical gating to measure the complete spatio-temporal behavior of potentially arbitrary ultrashort laser pulses.

MA3 ● 9:15 a.m.
Sub-10 fs, multi-mJ Ti:sapphire laser system with a pressure-gradient hollow fiber, *Yu Oishi[1], Akira Suda[1], Fumihiko Kannari[2], Katsumi Midorikawa[1]; [1]RIKEN, Japan, [2]Keio Univ., Japan.* A 1-kHz repetition rate Ti:sapphire chirped-pulse a.m.plification system with a pressure-gradient hollow fiber was developed to generate sub-10 fs, multi-mJ pulses.

MA4 ● 9:30 a.m.
Long-term stabilization and control of CEP of idler from NOPA, *Shunsuke Adachi, Takayoshi Kobayashi; Dept. of Physics, Faculty of Science, Univ. of Tokyo, Japan.* Compressed idler pulse from NOPA with a deformable mirror was characterized by SFM XFROG and long-term CEP of the idler was stabilized and controlled by *f*-to-2*f* interferometry scheme.

MA5 ● 9:45 a.m.
CEO phase preservation in chirped-pulse optical parametric a.m.plification of 17.3-fs pulses, *Jens Biegert[1], Christoph P. Hauri[1], Philip Schlup[1], Wouter Kornelis[1], Florian W. Helbing[1], Ursula Keller[1], Gunnar Arisholm[2]; [1]Swiss Federal Inst. of Technology (ETH), Switzerland, [2]Forsvarets forsknings Inst. (Norwegian Defence Res. Establishment), Norway.* We demonstrate the preservation of the carrier-envelope offset (CEO) phase in a chirped-pulse optical parametric a.m.plifier (CPOPA), which yields 85-uJ CEO phase-stabilized pulses that are recompressed to a near-transform-limited duration of 17.3 fs.

MA6 ● 10:00 a.m. Invited
Toward a terawatt few-optical-cycle driver laser for attosecond spectroscopy, *Andrius Baltuska; Photonics Inst., Vienna Univ. of Technology, Austria.* We discuss strategies for developing an ultra-high peak power phase-stable source of few-cycle laser pulses. Experiments with a phase-stable 0.1-TW 5-fs Ti:sapphire a.m.plifier and the progress in construction of a 1-TW OPCPA will be presented.

10:30 a.m.–11:00 a.m.
Coffee Break

Marine Hall (4F)
11:00 a.m.–1:00 p.m.
MB • Hydrogen Bond Dynamics
Peter Hamm; Univ. Zurich, Switzerland, Presider

MB1 ● 11:00 a.m. Invited
Dynamics of hydrogen bonds in water: Vibrational echoes and two-dimensional infrared spectroscopy, *Andrei Tokmakoff; MIT, USA.* Water hydrogen bond dynamics are studied by interpreting the OH frequency correlation function of HOD in D_2O obtained from vibrational echoes with molecular dynamics simulations. Heterogeneous hydrogen bond dynamics are investigated using 2D IR spectroscopy.

MB2 ● 11:30 a.m.
IR photon-echo spectroscopy of water: the thermalization effects, *Maxim S. Pshenichnikov, Sergey Yeremenko, Douwe A. Wiersma; Univ. of Groningen, Netherlands.* The larger part of the nonlinear response in IR photon-echo and transient-grating spectroscopy on HDO-D_2O mixtures at >1-ps delays is found to originate from the D_2O refractive index modulation due to local volume thermalization.

MB3 ● 11:45 a.m.
Multilevel coherences of the O-H stretching vibration in intermolecular hydrogen bonds investigated with infrared photon echo spectroscopy, *Nils Huse[1], Jens Dreyer[1], Erik T. J. Nibbering[1], Thomas Elsaesser[1], Barry D. Bruner[2], Michael L. Cowan[2], R. J. Dwayne Miller[2]; [1]Max Born Inst., Germany, [2]Univ. of Toronto, Canada.* We demonstrate that the multilevel structure of hydrogen bonded O-H stretching transitions, caused by anharmonic coupling with low-frequency modes and Fermi resonances with overtone/combination levels, dominate femtosecond mid-infrared photon echo signals.

MB4 ● 12:00 p.m.
Dual-frequency 2D IR photon echo of a hydrogen bond, *Igor V. Rubtsov, Keshav Kumar, Robin M. Hochstrasser; Univ. of Pennsylvania, USA.* Dual-frequency 2D IR heterodyned photon echo experiments with independently tunable mid-IR pulses are presented. Intermolecular hydrogen bonding between NH and CO groups is characterized via observation of interaction of the NH and CO vibrational modes.

MB5 ● 12:15 p.m.
Vibrational energy relaxation in water-acetonitrile mixtures, *Dan Cringus, Sergey Yeremenko, Maxim S. Pshenichnikov, Douwe A. Wiersma; Univ. of Groningen/Dept. of Chemical Physics, Netherlands.* IR pump-probe spectroscopy is used to study the effect of hydrogen bonding on the vibrational energy relaxation pathways. Hydrogen bonding accelerates the population relaxation from 12ps in diluted acetonitrile solution to 700fs in bulk water.

MB6 ● 12:30 p.m.
Cascaded energy redistribution upon O-H stretch excitation in an intramolecular hydrogen bonded system, *Karsten Heyne[1], Erik T. J. Nibbering[1], Thomas Elsaesser[1], Milena Petkovic[2], Oliver Kühn[2]; [1]Max-Born Inst., Germany, [2]Freie Univ. of Berlin, Inst. für Chemie, Germany.* We demonstrate in a combined two-colour pump-probe and quantum dynamical study that excitation of the O-H stretching oscillator of a medium-strong intramolecular hydrogen bond is redistributed along the O-H bending vibration.

MB7 • 12:45 p.m.
Pure intermolecular energy relaxation of the OH bending vibration of water molecules dissolved in organic liquids, *Gerhard Seifert, Toralf Patzlaff, Katarzyna Paradowska-Moszkowska, Heinrich Graener; Martin-Luther-Univ. Halle-Wittenberg, Germany.* A strong solvent dependence was found investigating the intermolecular OH bending relaxation of water dissolved in various organic liquids. This allows to explain comprehensively the vibrational relaxation of monomeric water molecules in the liquid phase.

1:00 p.m.–2:30 p.m.
Lunch Break (on your own)

Marine Hall (4F)
2:30 p.m.–4:00 p.m.
MC • Strong Field Molecular Physics
Albert Stolow; Natl. Res. Council of Canada, Canada, Presider

MC1 • 2:30 p.m. Invited
Dynamic molecular imaging, *Paul Corkum; Natl. Res. Council of Canada, Canada.* Intense laser pulses allow new approaches for imaging molecules: *Coulomb explosion* and *re-collision.* With re-collision we can excite (or diffract from) a molecule, even taking holographic or tomographic image. All approaches can achieve ~attosecond time-resolution.

MC2 • 3:00 p.m.
Control of multiphoton ionization processes in aligned I_2 molecules by optimizing time-dependent polarization of femtosecond pulses, *Takayuki Suzuki, Shinichirou Minemoto, Tsuneto Kanai, Hirofumi Sakai; Univ. of Tokyo, Japan.* Multiphoton ionization processes in aligned I_2 molecules are actively controlled by optimizing time-dependent polarization of femtosecond pulses. Thereby, both external and internal degrees of freedom in molecules are simultaneously controlled for the first time.

MC3 • 3:15 p.m.
Tomographic imaging of molecular orbitals with high harmonic generation, *Jiro Itatani[1], Jerome Levesque[1], Dirk Zeidler[1], Micael Spanner[2], Paul B. Corkum[1], David M. Villeneuve[1]; [1]Steacie Inst. for Molecular Sciences, Natl. Res. Council of Canada, Canada, [2]Univ. of Waterloo, Canada.* High harmonics produced in aligned molecules contain the structural information of bound-state electronic states. We have successfully reconstructed tomographic images of the highest occupied molecular orbital (HOMO) of N_2 from a set of harmonic spectra.

MC4 • 3:30 p.m.
Femtosecond infrared vibrational up-pumping of liquid phase $W(CO)_6$, *Thomas I. Witte[1], Marcus C. Motzkus[1], Karl L. Kompa[1], Jacob S. Yeston[2], Edwin J. Heilweil[2]; [1]Max-Planck Inst. for Quantum Optics, Germany, [2]NIST, USA.* $W(CO)_6$/n-hexane CO-stretch excitation using 5 micron femtosecond pulses transfers vibrational population to v>5 characterized by transient mid-IR spectroscopy and Bloch model calculations. These results constitute significant steps towards controlling molecular ground state reactions.

MC5 • 3:45 p.m.
Coherent vibrational climbing in carboxy-hemoglobin, *Cathie Ventalon, James M. Fraser, Marten H. Vos, Antigoni Alexandrou, Jean-Louis Martin, Manuel Joffre; Ecole Polytechnique, France.* We demonstrate vibrational climbing up to level v=6 in carboxyhemoglobin by use of intense negatively-chirped infrared pulses. We measure the position and width of all absorption lines, and the lifetimes of the first excited states.

4:00 p.m.–4:30 p.m.
Coffee Break

Marine Hall (4F)
4:30 p.m.–6:00 p.m.
MD • Diffraction and Short-Wavelength Imaging

Philip A. Anfinrud; Natl. Inst. of Health, USA, Presider

MD1 ● 4:30 p.m. Invited
Femtosecond electron diffraction, *R. J. Dwayne Miller, J. R. Dwyer, C. T. Hebeisen, R. E. Jordan, B. J. Siwick; Univ. of Toronto, Canada.* High brightness electron gun and pulse characterization concepts open the door to temporally resolving relative atomic motions during structural transitions. An atomistic view of melting under strongly driven conditions illustrates the new information now attainable.

MD2 ● 5:00 p.m.
Femtosecond electron diffraction: direct and real time probing both coherent and thermal atomic motions, *Hyuk Park, Zhao Hao, Chenggang Tao, Florentin Popescu, Jianming Cao; Physics Dept./NHMFL, Florida State Univ., USA.* We report a direct and real-time measurement of both coherent and thermal atomic motions using femtosecond electron diffraction , which provides for the first time a clear atomic-level view of laser-induced structural dynamics.

MD3 ● 5:15 p.m. Invited
Ultrafast X-ray diffraction, *Dietrich von der Linde; Univ. of Duisburg-Essen, Germany.* In the last few years the generation of femtosecond pulses in the X-ray regime has become possible. These ultrashort X-ray pulses have enabled femtosecond time-resolution to be extended to X-rays.

MD4 ● 5:45 p.m.
Coherent imaging of laser-plasma interactions using high-harmonic EUV light, *Xiaoshi Zhang[1], Ariel R. Libertun[1], Ariel J. Paul[1], Margaret M. Murnane[1], Henry Kapteyn[1], Yanwei Liu[2], David Attwood[2]; [1]Univ. of Colorado, USA, [2]Univ. of California, USA.* We demonstrate very high spatial coherence of the EUV light generated using HHG, and use this light to generate EUV images of the explosion of a micron-size water droplet illuminated by an intense femtosecond laser.

6:00 p.m.–7:30 p.m.
Dinner Break (on your own)

Rooms 301 and 302
7:30 p.m.–9:30 p.m.
ME • Poster Session I (Exhibition)

ME1
Two-dimensional spectroscopy by spectrally resolved real-time resonant coherent Raman scattering in polydiacetylene, *Nobuhisa Ishii[1], Shunsuke Adachi[1], Takayoshi Kobayashi[1], Eiji Tokunaga[2], Tatsumi Kimura[3], Hiro Matsuda[3]; [1]Dept. of Physics, Graduate School of Science, Univ. of Tokyo, Japan, [2]Dept. of Physics, Graduate School of Science, Tokyo Univ. of Science, Japan, [3]Natl. Inst. of Advanced Industrial Science and Technology, Japan.* Spectrally resolved real-time coherent resonant Raman scattering was theoretically calculated and observed by a 4-fs ultrashort pulse. An introduced optical frequency- and vibrational time-resolved two-dimensional spectrum reveals the electronic ground-state dynamics below the absorption edge.

ME2
Optical frequency measurement precision of femtosecond laser optical comb system and the stability of its HF reference frequency, *Hiroyuki Ito, Ying Li, Miho Fujieda, Michito Imae, Mizuhiko Hosokawa; Communications Res. Lab, Japan.* Repetition rate of femtosecond frequency comb is controlled by HF frequency standards. We investigate the relation between the stability of HF frequency standards and the optical frequency measurement capability of femtosecond frequency comb.

ME3
Solid-state phase transition onset detection in estrogen-like chemical via terahertz transmission spectroscopy, *Alex V. Quema[1], Masahiro Goto[1], Masahiro Sakai[1], Riadh El Ouenzerfi[1], Hiroshi Takahashi[1], Shingo Ono[1], Nobuhiko Sarukura[1], Gerardo Janairo[2]; [1]Inst. for Molecular Science, Japan, [2]Chemistry Dept., De La Salle Univ., Philippines.* Solid-state phase transition onset in an endocrine-

disrupting estrogen-like chemical (1,4-naphthol) is detected using terahertz transmission spectroscopy. Differential scanning microscopy and temperature-dependent X-ray diffraction analysis confirmed the occurrence of such phenomenon.

ME4
Maximum entropy method for misplacement phase error correction in terahertz time-domain reflection spectroscopy, *Yusuke Ino[1], Ryo Shimano[1], Makoto Kuwata-Gonokami[1], Erik M. Vartiainen[2], Yuri P. Svirko[3], Kai E. Peiponen[3]; [1]Gonokami Lab, Dept. of Applied Physics, Univ. of Tokyo, Japan, [2]Dept. of Electrical Engineering, Lappeenranta Univ. of Technology, Finland, [3]Dept. of Physics, Univ. of Joensuu, Finland.* We develop a numerical method for the misplacement phase error correction in terahertz time-domain reflection spectroscopy. The method is based on the maximum entropy algorithm, dramatically which simplifies the experimental procedure.

ME5
Micrometer and sub-micrometer structures fabrication and analysis with femtosecond laser micro-nanomachining system, *Egidijus Vanagas, Jouji Kawai, Dmitri Tuzhilin, Hirofumi Musasa, Pavel Rutkovski, Igor Kudryashov, Shoji Suruga; Tokyo Instruments, Inc., Japan.* A concept of modular laser processing system, which can be flexibly optimized for processing by femtosecond laser pulses, is presented. The system capabilities and fabricated structures are demonstrated.

ME6
Molecular phase-to-amplitude converter using femtosecond wave packet engineering, *Isao Matsuda, Kazuhiko Misawa, Naoyuki T. Hashimoto, Roy Lang; Tokyo Univ. of A&T, Japan.* We show a molecular phase-to-amplitude converter, which converts the optical phase information of femtosecond pulses into spontaneous emission a.m.plitude in a cyanine dye molecule through the coherent excitation of the quantum wave packet.

ME7
Femtosecond laser effects on osseous tissues, *Bruno Girard; Univ. of Toronto, Canada.* We have investigated the effects of femtosecond laser irradiation on living bone samples and demonstrated intact enzymatic activity on the surface of cells immediately adjacent to cells removed by laser irradiation suggesting no thermal damage.

ME8
Femtosecond laser material processing–How short is short?, *Yehiam Prior[1], Kaiyin Zhang[1], Vladimir Batenkov[1], Yuri Paskover[1], Ilya Sh. Averbukh[1], Frank Korte[2], Carsten Fallnich[2]; [1]Weizmann Inst. of Science, Israel, [2]Laser Zentrum Hannover, Germany.* Temporal shaping of femtosecond laser pulses is used for the optimization of laser material processing. We find that the shortest pulse is not always the best in terms of ablation efficiency and quality.

ME9
Diode-pumped Cr:LiCAF laser for ultrahigh resolution optical coherence tomography, *Philipp C. Wagenblast[1], Tony H. Ko[1], Vikas Sharma[1], James G. Fujimoto[1], Franz X. Kaertner[1], Uwe Morgner[2]; [1]MIT, USA, [2]Max-Planck-Inst. für Kernphysik, Germany.* Ophthalmic ultrahigh resolution Optical Coherence Tomography is demonstrated with a diode-pumped Cr:LiCAF laser. Imaging of the retina with 3.4 µm resolution is achieved. The laser is a promising low-cost light source for OCT imaging.

ME10
Photodissociation dynamics studied via time-resolved coincidence imaging spectroscopy, *Oliver Geßner[1], Engelene Ter-Heersche Chrysostom[2], Anthony Lee[1,3], James P. Shaffer[4], Carl C. Hayden[2], Albert Stolow[3,1]; [1]Steacie Inst. for Molecular Sciences, Natl. Res. Council, Canada, [2]Combustion Res. Facility, Sandia Natl. Labs., USA, [3]Dept. of Chemistry, Queen's Univ., Canada, [4]Dept. of Physics and Astronomy, Univ. of Oklahoma, USA.* Femtosecond time resolved photoelectron-photoion Coincidence Imaging Spectroscopy was used to study the non-adiabatic photodissociation dynamics of the NO dimer at 209 nm. Correlated photoelectron-photofragment energy and angular distributions reveal new details of the dissociation dynamics.

ME11
A unified analysis of ultrafast vibrational and orientational dynamics of HOD in D_2O, *Joseph J. Loparo, Christopher J. Fecko, Joel D. Eaves, Sean T. Roberts, Andrei Tokmakoff; MIT, USA.*Broadband infrared spectroscopy measures the ensemble-averaged vibrational dephasing, lifetime, and orientational dynamics of the OH stretch of HOD in D_2O. Two-dimensional infrared spectroscopy probes spectral heterogeneity, revealing a slight frequency dependence to spectral diffusion.

ME12
Pump-probe near-field optical microscopy of molecular aggregates using supercontinuum, *Tetsuhiko Nagahara, Kohei Imura, Hiromi Okamoto; Inst. for Molecular Science, Japan.* A novel apparatus for femtosecond pump-probe near-field optical microscopy is described. Probe pulses in visible to near-infrared regions are generated by focusing laser pulses in microstructure fiber. Excited-state dynamics of porphyrin J-aggregates are presented.

ME13
Vibrational excitation and energy redistribution after ultrafast proton transfer of TINUVIN, *Wolfgang Werncke, Valeri Kozich, Jens Dreyer; Max-Born-Inst., Germany.* Vibrational excitation and energy redistribution after ultrafast intramolecular proton transfer of TINUVIN is investigated by picosecond resonance Raman spectroscopy. It is demonstrated that a low-frequency proton transfer promoting mode serves as the major accepting mode.

ME14
Amplitude spectra of molecular vibration modes in phthalocyanine: comparison with Raman excitation profile, *Takayoshi Kobayashi, M. Hirasawa, Y. Sakazaki, H. Hane; Dept. of Physics, Univ. of Tokyo, Japan.* We performed for the first time a comparative study of vibrational-amplitude profile with the Raman-excitation profile, and focused the difference between them, which provides important information about the phase related to the Raman process.

ME15
Time-resolved CARS studies of vibrational coherences in the condensed phase: I_2 in solid krypton, *Michael Karavitis[1], Ilya Goldschleger[1], V. Ara Apkarian[1], Takayuki Kumada[2]; [1]Dept. of Chemistry, Univ. of California, USA, [2]Advanced Science Res. Ctr., Japan Atomic Energy Res. Inst., Japan.* Vibrational dephasing in the prototypical system of I_2 isolated in solid Kr is studied using TRCARS. Decay $|0><v|$ of coherences for $v= 1\text{-}19$, as a function of temperature ($T= 6\text{-}45$ K), are extracted and analyzed.

ME16
Time resolved direct probing of the change in the local solvent response following excitation of a solute, *David F. Underwood, David A. Blank; Univ. of Minnesota, USA.* The change in the low frequency non-resonant Raman response in solution has been measured at a time after resonant excitation of a solute using a two-dimensional mixed resonant, non-resonant time domain spectroscopy.

ME17
Vibrational and rotational relaxation dynamics of anions in reverse micelles by ultrafast infrared spectroscopy, *Jeffrey C. Owrutsky, Gerald M. Sando, Qun Zhong, Andrew P. Baronavski; NRL, USA.* Vibrational energy and rotational relaxation times for triatomic anions in the water pools of reverse

micelles (RM) were measured by ultrafast infrared spectroscopy. The dynamics are slower than in bulk water due to confinement effects.

ME18

Formation and dynamics of photoexcited breathers in conjugated polymers, *Sergei Tretiak, Andrei Piryatinski, Avadh B. Saxena, Richard L. Martin, Alan R. Bishop; Los Alamos Natl. Lab, USA.* Formation and decay mechanisms of photoinduced nonlinear vibronic excitations ("breathers") in conjugated polymers are studied using quantum-chemical excited state molecular dynamics approach. Possible correlated electronic and vibrational spectroscopic signatures of photoexcited breathers are predicted.

ME19

Phase analysis of vibrational wavepackets in the ground and the excited states in polydiacetylene, *Mitsuhiro Ikuta[1], Yoshiharu Yuasa[1], Takayoshi Kobayashi[1], Tatsumi Kimura[2], Hiroo Matsuda[2]; [1]Dept. of Physics, Faculty of Science, Univ. of Tokyo, Japan, [2]Natl. Inst. of Advanced Industrial Science and Technology, Japan.* Wavepackets of C-C and C=C stretching modes in the ground state start to oscillate π-out-of-phase with C≡C stretching mode. All the three modes in the self-trapped states observed indicate an acetylene-like structure not a butatriene-like.

ME20

A stimulated-emission photon-echo study of the chromophore-solvent dynamics of coumarin 153 in methanol, *Delmar S. Larsen; Vrije Univ. Amsterdam, Netherlands.* A novel technique for studying excited state solvation dynamics of Coumarin 153 in methanol is probed via a photon echo process through a stimulated emission transition and via the traditional ground-state absorption transition.

ME21

Femtosecond photo-induced dissociation of the trihalide anions I_3^- and I_2Br^- in solution, *Peter Salén[1], Peter van der Meulen[1], Django Andrews[2], Carl Lineberger[2], Ming Liu[3]; [1]Stockholm Univ., Sweden, [2]JILA, USA, [3]KTH, Sweden.* We present the results of 390 nm photo-induced dissociation of I_3^- and I_2Br^- in methanol- and acetonitrile solution. Measurements indicate solvent dependence of vibrational coherence and a noticeable spin-orbit mixing for the diiodide fragment.

ME22

Bimodal water dynamics at the surface of micelles and proteins, *Sundaram Balasubramanian[1], Sudip Chakraborty[2], Sanjoy Bandyopadhyay[2], Subrata Pal[3], Biman Bagchi[3]; [1]Jawaharlal Nehru Centre for Advanced Scientific Res., India, [2]Indian Inst. of Technology, India, [3]Indian Inst. of Science, India.* Dynamics of interfacial water molecules at the surface of aqueous micelles and proteins have been investigated using large-scale atomistic molecular dynamics simulations. We observe a "universal" bimodal dynamics, in agreement with recent solvation dynamics experiments.

ME23

Calculating ultrafast nonlinear optical signals from molecules in condensed media, *Mary A. Rohrdanz, Jeffrey A. Cina; Univ. of Oregon, USA.* We are calculating time-resolved coherent anti-Stokes Raman scattering signals from iodine molecules in cryogenic argon using semi-classical Gaussian wave packet dynamics. Evolving Wigner functions are used to analyze the dynamics underlying the nonlinear optical signal.

ME24

Numerical synthesis of optimal laser pulses for manipulating dissociation wave packets of I_2^- in water, *Yoshikazu Nishiyama, Tsuyoshi Kato, Yukiyoshi Ohtsuki, Hirohiko Kono, Yuichi Fujimura; Tohoku Univ., Japan.* A linearlized optimal control method in combination with mixed quantum/classical molecular dynamics simulation is used for numerically investigating the possibility of controlling dissociation wave packets of diiodide ions (I_2^-) in water.

ME25

Time-resolved spectroscopy of an azobenzene derivative with a small S_1-S_2 energy gap, *Masahide Hagiri[1], Nobuyuki Ichinose[1], Toshihiro Nakayama[1], Changli Zhao[2], Hiroaki Horiuchi[2], Hiroshi Hiratsuka[2];*

[1]Kyoto Inst. of Technology, Japan, [2]Gunma Univ., Japan. Femtosecond time-resolved absorption spectroscopy on the relaxation dynamics of trans-(4-methoxyphenylazo)-4'-nitrobenzene has indicated the rapid internal conversion of the S_2 state which is facilitated by the small energy gap between the S_2 and S_1 states.

ME26
Vibrational phase characterization in femtosecond-pumped molecules by path-length modulation, *Takashi Taneichi, Takao Fuji, Yoshiharu Yuasa, Takayoshi Kobayashi; Univ. of Tokyo, Japan.* The ultrafast dynamics of a cyanine dye is studied by the pump-probe spectroscopy using 20-fs pulses establishing a high sensitivity on the molecular vibration. The simulation reproduces the observed phase dependence on the mode frequencies.

ME27
Photo-thermalization dynamics of azulene in supercritical fluids studied by the transient grating method, *Yoshifumi Kimura[1], Yoshinori Yamamoto[2], Masahide Terazima[2]; [1]Inter Natl. Innovation Ctr., Kyoto Univ., Japan, [2]Dept. of Chemistry, Graduate School of Science, Kyoto Univ., Japan.* Transient grating spectroscopy has been applied to the study on the vibrational energy relaxation of azulene in supercritical xenon and ethane. The roles of the V-T and V-V energy transfers are discussed.

ME28
Ultrafast excitation energy migration processes in various porphyrin arrays, *Dongho Kim; Yonsei Univ., Dept. of Chemistry, Republic of Korea.* We have investigated excitation energy migration processes in various forms of porphyrin arrays (linear, cyclic, box) by time-resolved spectroscopic techniques in terms of exciton coupling between adjacent porphyrin units in these arrays.

ME29
High-order harmonic generation from argon ions up to 250 eV, *Emily A. Gibson[1], Ariel Paul[1], Nick Wagner[1], Sterling Backus[1], Margaret M. Murnane[1], Henry C. Kapteyn[1], Ivan P. Christov[2]; [1]JILA, Univ. of Colorado, USA, [2]Dept. of Physics, Sofia Univ., Bulgaria.* We demonstrate that harmonic generation from ions can extend to significantly higher energies than emission from neutrals. We extend the highest cutoff observed in argon using 800 nm light from 100 eV to 250 eV.

ME30
High-order harmonic generation from femtosecond laser-aligned molecules, *Kenzo Miyazaki, Masanori Kaku, Keita Masuda; Kyoto Univ., Japan.* We report a sensitive pump-probe method to observe time-dependent revival structure in field-free alignment of molecules, where the pump fs pulse creates a rotational wave packet and the delayed probe pulse generates high-order harmonics.

ME31
Generation of 14-fs ultrashort pulse in all fiber scheme by use of highly nonlinear hybrid fiber, *Takashi Hori, Norihiko Nishizawa, Toshio Goto; Nagoya Univ., Japan.* We demonstrated the all fiber pulse compression using the highly nonlinear hybrid fiber. The 100-fs pulse from the fiber laser was compressed into 14-fs pulse at the Ctr. wavelength of 1560 nm.

ME32
Mid-infrared femtosecond pulse generation by optical parametric a.m.plification under broadband QPM condition, *Satoshi Ashihara, Manabu Ikeda, Tsutomu Shimura, Kazuo Kuroda; Inst. of Industrial Science, Univ. of Tokyo, Japan.* We have generated femtosecond pulses of 700-nm bandwidths in a 3-4 μm spectral range by an optical parametric a.m.plifier based on periodically-poled $LiNbO_3$. Numerical study indicates the possibility for generating ~25-fs pulses by pre-chirp compensation.

ME33
Teflon photonic crystal fiber as polarization-preserving waveguide in THz region, *Masahiro Goto, Alex Quema, Hiroshi Takahashi, Shingo Ono, Nobuhiko Sarukura; Inst. for Molecular Science, Japan.* The construction of long and non-polarization changing photonic fiber waveguide was demonstrated using

highly flexible plastic materials. Due to its relatively low-loss coefficient, the possibility of preparing longer photonic fiber waveguide can be easily attained.

ME34
High peak power ultrashort pulse generation using all-fiber chirped pulse amplification system with small core multimode fiber, *Jun Takayanagi[1], Norihiko Nishizawa[1], Hiroyuki Nagai[2], Makoto Yoshida[2], Toshio Goto[1]; [1]Nagoya Univ., Japan, [2]AISIN SEIKI Co. Ltd., Japan.* We present an all-fiber chirped pulse amplification system based on a single mode Er-doped fiber and a multimode fiber with 25 μm core diameter. The peak power of the output pulses amounts to 44 kW.

ME35
Evaluation of complex optical constants of semiconductor wafers using terahertz ellipsometry, *Takeshi Nagashima, Masanori Hangyo; Res. Ctr. for Superconductor Photonics, Japan.* We have developed terahertz ellipsometry by combining ellipsometry with time domain spectroscopy in the terahertz frequency region. Complex optical constants of Si wafers with various carrier concentration were measured by the terahertz ellipsometry.

ME36
Optimization of a 40 GHz regeneratively and harmonically mode-locked fiber laser under PLL operation and its longitudinal mode characteristics, *Masato Yoshida, Taro Yaguchi, Shinji Harada, Masataka Nakazawa; RIEC, Tohoku Univ., Japan.* We report the optimum operating conditions for a 40 GHz regeneratively and harmonically mode-locked erbium-doped fiber laser. We point out that there is temperature-dependent longitudinal-mode-hopping with time that is not controlled with a phase-locked-loop operation.

ME37
Spectral broadening of 50 milli Joule laser pulses in neon-filled Herriot multiple-pass cell, *Muhammad Nurhuda[1], Akira Suda[2], Katsumi Midorkawa[2]; [1]Physics Dept., Brawijaya Univ., Indonesia, [2]RIKEN, Japan.* We present proposal for spectral broadening of 50 milli-Joule femtosecond laser-pulses in neon-filled Herriot multiple-pass cell. The results show that after 10 passes the pulse can be compressed to 4.5 fs, with energy 24 mJ.

ME38
Carrier-envelope phase fluctiations of the a.m.plified laser pulses transmitted through neon-filled hollow fiber for pulse compression, *Atsushi Ishizawa, H. Nakano; NTT Basic Res. Labs, Japan.* An additional carrier-enveloped phase fluctuations of 0.47 rad was induced in white light generated in a hollow fiber due to the non-uniformity of self-phase modulation in the fiber.

ME39
Spatial chirp and pulse-front tilt in ultrashort laser pulses and their measurement, *Selcuk Akturk, Xun Gu, Erik Zeek, Rick Trebino; Georgia Tech, USA.* We show that two physically different definitions of spatial chirp exist. We also show that pulse-front-tilt arises, not only from angular dispersion, but also from spatial and temporal chirp. We verify these results using GRENOUILLE.

ME40
Generation of frequency-tunable THz waves by using birefringent crystal and grating pair, *Ryuzi Yano[1], Hideki Gotoh[1], Toshiaki Hattori[2]; [1]NTT Basic Res. Labs, Japan, [2]Univ. of Tsukuba, Japan.* By using a birefringent crystal and a grating pair, we succeeded in generating frequency-tunable THz waves. The carrier-envelope phase of the THz waves were free from the instability of the optics.

ME41
Efficient generation of high-order sum and difference frequencies in the XUV region by combining a weak, longer-wavelength field, *Yutaka Nomura, Tsuneto Kanai, Shinichirou Minemoto, Hirofumi Sakai; Dept. of Physics, Graduate School of Science, Univ. of Tokyo, Japan.* We demonstrate the efficient generation of sum and difference frequencies in the extreme-ultraviolet wavelength region both

experimentally and theoretically. The importance of the wavelength of the weak combined field is emphasized.

ME42
Femtosecond pulse recoding and regeneration by a two-photon gated periodic diffractive optics, *Hajime Nishioka, Ken-Ichi Ueda; Inst. for Laser Science, Japan.* A new scheme for pulse recording, time-reversed playback, and self-phase regeneration in a nonlinear diffractive device was proposed. The pulse regeneration has been demonstrated in a two-photon absorbing glass plate.

ME43
Estimation of proton source size generated by ultraintense laser pulses using a Thomson mass spectrometer, *Yuji Oishi[1], Takuya Nayuki[1], Takashi Fujii[1], Yasushi Takizawa[1], Xiaofang Wang[1], Toshimitsu Yamazaki[1], Koshichi Nemoto[1], Tomohiko Seikya[2], Kazuhiko Horioka[2], Alex Andreev[3]; [1]Ctrl. Res. Inst. of Electric Power Industry, Japan, [2]Tokyo Inst. of Technology, Japan, [3]Res. Inst. for Laser Physics, Russian Federation.* Source size of proton beams generated by irradiation of 55 fs, 6.6 x10^{18} W/cm^2 laser pulses on a 5-μm-thick copper tape target were estimated using a Thomson mass spectrometer.

ME44
Magnetically induced evolution of terahetz radiation spectrum emitted from InAs up to 27 T, *Hiroshi Takahashi[1], Alex Quema[2], Masahiro Goto[2], Shingo Ono[2], Nobuhiko Sarukura[2], Gen Nishijima[3], Kazuo Watanabe[3]; [1]Graduate Univ. for Advanced Studies, Japan, [2]Inst. for Molecular Science, Japan, [3]Tohoku Univ., Japan.* THz-radiation from femtosecond-laser-irradiated InAs (100) surface is investigated. It is found that THz-radiation spectrum exhibits two inter-related phenomena in a strong magnetic field under the Voigt configuration.

ME45
Generation of rotational Raman emissions and self-compressed femtosecond pulses in a hydrogen gas, *Shin-Ichi Zaitsu, Yuichiro Kida, Totaro Imasaka; Dept. of Applied Chemistry, Kyushu Univ., Japan.* We observed the characteristics of a femtosecond laser pulse after passing the beam through a hydrogen gas. The pulse compression accompanied by Stokes emissions implies the coherently spectral broadening based on a Raman rotational coherence.

ME46
Effects of target condition on solid surface harmonics in the extreme ultraviolet range, *Tsuneyuki Ozaki[1], Jean-Claude Kieffer[1], Hidetoshi Nakano[2], Atsushi Ishizawa[2]; [1]INRS-EMT, Univ. du Québec, Canada, [2]NTT Basic Res. Labs, Japan.* Effects of target condition on the intensity of solid surface harmonics in the extreme ultraviolet spectral range is investigated using a high-intensity Ti:sapphire laser system.

ME47
Microstructured fiber feedback pulse compression, *Muneyuki Adachi[1,2], Keisaku Yamane[1], Ryuji Morita[1], Mikio Yamashita[1]; [1]Hokkaido Univ., Japan, [2]Nidek Co., Ltd., Japan.* A feedback system that combined modified-SPIDER and 4-*f* active-chirp compensation enabled us to compress photonic-crystal-fiber and tapered-fiber outputs to 6.6 and 8.4 fs. Compressed-pulse results well agree with fringe-resolved autocorrelation measurement ones.

ME48
Terahertz two-dimensional spectroscopic imaging with a high speed CMOS camera, *Taijiro Yonera, Fumiaki Miyamaru, Masahiko Tani, Masanori Hangyo; Osaka Univ., Japan.* We have developed a THz imaging system based on two-dimensional EO sampling using a high-speed CMOS camera, which enables a high SNR THz-imaging by the dynamic subtraction and laser-intensity normalization.

ME49
Excitonic quantum beats dressed with coherent phonons, *Kohji Mizoguchi, T. Furuichi, O. Kojima, M. Nakayama, K. Akahane, N. Yamamoto, N. Ohtani; Dept. of Applied Physics, Osaka City Univ., Japan.* We report on excitonic quantum beats dressed with coherent phonons in GaAs/AlAs multiple quantum wells.

We discuss the dispersion relation of the dressed quantum beat vs. the splitting energy of the heavy-hole and light-hole excitons.

ME50
Chirp control of free carrier dynamics in GaAs, *Toshiaki Hattori, Takeshi Yogi, Yoshikazu Hama, Naoki Watanabe; Inst. of Applied Physics, Univ. of Tsukuba, Japan.* Chirp-controlled dynamics of free carriers in GaAs was observed using 13-fs pump pulses. We observed increase in pump-probe signal for negatively chirped pump pulses, which is explained by a pump-dump process and bandgap renormalization.

ME51
Evidence of higher-order nonlinearities on excitonic FWM signal in microscopic theory and experiment, *L. Wischmeier[1], I. Rückmann[1], J. Gutowski[1], M. Buck[2], S. Schumacher[2], G. Czycholl[2], F. Jahnke[2]; [1]Inst. für Festkörperphysik, Univ. of Bremen, Germany, [2]Inst. für Theoretische Physik, Univ. of Bremen, Germany.* The intensity dependence and the polarization state of the four-wave-mixing signal at the excitonic resonance of a ZnSe single-quantum well is studied and compared with a microscopic model covering coherent higher-order optical nonlinearities.

ME52
Paper withdrawn.

ME53
Ultrafast anisotropic processes of exciton magnetic polarons in CdTe/CdMnTe quantum wires, *R. Naganuma[1], Takashi Kita[1], S. Nagahara[1], O. Wada[1], L. Marshal[2], H. Mariette[2]; [1]Kobe Univ., Japan, [2]Univ. J. Fourier, Grenoble I, France.* We have studied dynamics of exciton magnetic polarons in CdTe/CdMnTe quantum wires. Anisotropic ultrafast evolution of the exciton magnetic polaron formation process has been found for magnetic fields parallel and perpendicular to the wire direction.

ME54
Direct visualization of transient absorption by real-time pump-probe imaging spectroscopy, *Jun Takeda[1], Naoki Furukawa[1], Chad E. Mair[2], Valeria D. Kleiman[2]; [1]Yokohama Natl. Univ., Japan, [2]Univ. of Florida, USA.* We report a new method to visualize ultrafast transient absorption of materials. This method enables us to simultaneously map frequency- and time-resolved absorbance changes with femtosecond time resolution in real-time.

ME55
Femtosecond wavepacket dynamics of potassium adsorbate on Pt(111), *Kazuya Watanabe[1], Noriaki Takagi[1], Yoshiyasu Matsumoto[2,1]; [1]Graduate Univ. for Advanced Studies, Japan, [2]Inst. for Molecular Science, Japan.* Femtosecond wavepacket dynamics of potassium adsorbed on Pt(111) is investigated by femtosecond time-resolved second harmonic generation under an ultra-high vacuum condition. Detailed potassium coverage dependence is explored.

ME56
Absolute displacement interferometry of ultrafast laser-produced plasma expansion, *George Rodriguez, Steven A. Clarke, Antoinette J. Taylor; Los Alamos Natl. Lab, USA.* Microscopic interferometric measurement of plasma expansion and surface motion *during* the laser-heating period of a metal target using a single ultrafast pump pulse is reported. A spatial resolution of approximately a few nanometers is achieved.

ME57
Control of tunnel ionization in molecules by intense femtosecond laser pulses with time-dependent polarization, *Tsuneto Kanai, Shinichirou Minemoto, Hirofumi Sakai; Dept. of Physics, Graduate School of Science, Univ. of Tokyo, Japan.* We propose a new way of controlling tunnel ionization in molecules by time-dependent polarization pulses. The model consists of the successful combination of the MO-ADK theory reflecting the symmetry of molecular orbitals and Landau-Zener resonances.

ME58
Time-resolved electron imaging of femtosecond Laser ablation, *Yasuaki Okano, Yoichiro Hironaka, Ken-Ichi Kondo, Kazutaka G. Nakamura; Materials and Structures Lab, Tokyo Inst. of Technology, Japan.* Pulsed electrons generated by intense femtosecond laser irradiation onto a metal target were applied for an electron imaging. An instantaneous charge-separated field built up at a femtosecond-laser-irradiated surface of a copper film was visualized.

ME59
Adaptive polarization control of molecular dynamics, *Tobias Brixner[1], Gerhard Krampert[1], Thomas Pfeifer[1], Reimer Selle[1], Gustav Gerber[1], Matthias Wollenhaupt[2], Oksana Graefe[2], Christian Horn[2], Dirk Liese[2], Thomas Baumert[2]; [1]Physikalisches Inst., Univ. of Würzburg, Germany, [2]Experimentalphysik III, Univ. of Kassel, Germany.* We demonstrate that the use of time-dependent light polarization opens a new level of control over quantum systems. K_2 molecules we show that polarization-shaped laser pulses increase the multiphoton-ionization yield compared to linearly-polarized laser pulses.

ME60
Generation of coherent zone boundary phonons by impulsive excitation of molecules, *Markus Gühr, Nikolaus Schwentner; Inst. für Experimentalphysik, Freie Univ. of Berlin, Germany.* Coherent zone boundary phonons in rare gas solids are observed in ultrafast pump-probe spectroscopy of molecular dopants. The excitation is impulsive during the pump pulse and phonons are decoupled from the molecular vibrations.

ME61
Electron acceleration through spatiotemporal pulse shaping of ultrashort laser pulses, *Darius H. Torchinsky, Thomas Feurer, Keith A. Nelson; MIT, USA.* A novel approach to electron acceleration using spatiotemporal pulse shaping is described. Simulations using parameters of commonly available Ti:Sapphire systems (I~10^{11}W/cm^2) yield single electron energies on the order of a few MeV.

ME62
Control of the frequency chirp rate of high harmonic pulses, *Jens Biegert[1], Mathis Bruck[1], Christoph P. Hauri[1], Arne Heinrich[1], Florian W. Helbing[1], Wouter Kornelis[1], Philip Schulup[1], Ursula Keller[1], Rodrigo Lopex-Martens[2], Johan Mauritson[2], Per Johnsson[2], Katalin Varju[2], Anne L'Huillier[2], Mette Gaarde[3], Kenneth J. Schafer[3]; [1]Swiss Federal Inst. of Technology (ETH), Switzerland, [2]Lund Univ., Sweden, [3]Louisiana State Univ., USA.* We measured and controlled the chirp rate of harmonics. Furthermore, we have directly measured and confirmed, through simulations, that chirp on the pump is transferred to the qth harmonic as q times the fundamental chirp.

ME63
Time-resolved mid-infrared spectroscopy of excitons in Cu_2O, *Motoyoshi Kubouchi[1,2], Ryo Shimano[1,2], Kosuke Yoshioka[1,2], Andre Mysyrowicz[3], Makoto Kuwata-Gonokami[1,2]; [1]Dept. of Applied Physics, Univ. of Tokyo, Japan, [2]SORST (JST), Japan, [3]Lab d'Optique Appliquee, ENSTA, Ecole Polytechnique, France.* Formation and thermalization dynamics of the yellow series excitons in Cu_2O are observed by monitoring the 1s to 2p Lyman transition with femtosecond mid-infrared transient absorption spectroscopy. We discover fast and efficient generation of paraexcitons.

ME64
Dynamical Symmetry Breaking induced by Ultrashort Laser Pulses in $KTaO_3$, *Eiichi Matsubara[1], Jun-Ichi Takahashi[1], Kuon Inoue[1,2], Eiichi Hanamura[1,2]; [1]Japan Sciense and Technology Agency, Japan, [2]Chitose Inst. of Science and Technology, Japan.* Raman selection rule is violated under resonant pumping of Raman-active two-phonons at the Brillouin zone edge in $KTaO_3$ by two ultrashort laser pulses. Originally Raman-inactive single phonons become observable in the CARS spectra.

ME65
Ultra-wide bandwidth THz emission from a semiconductor irradiated with intense, radially polarized, Bessel-Gauss pulses, *Kenneth J. Chau, Abdulhakem Y. Elezzabi; Ultrafast Photonics and Nano-Optics Lab, Canada.* Terahertz generation from a radially-polarized Bessel-Gauss pulse focused onto

a semiconductor is investigated. Current densities (10^{11} A/m^2) exceeding those in typical photoconductive emitters and broadband (≥ 25 THz) emission result from strong ponderomotive and electrostatic screening.

ME66
Amplitude collapse and revival of chirped coherent phonon under high-fluence optical excitation, *Kunie Ishioka[1], Muneaki Hase[1], Masahiro Kitajima[1], Oleg V. Misochko[2]; [1]Natl. Inst. of Materials Science, Japan, [2]Inst. of Solid State Physics, Russian Acad. of Science, Russian Federation.* Collapse-revival on picosecond timescale is observed for the chirped coherent phonon of bismuth under intense photo-excitation at 10K. This phenomenon, having no classical analogue, is explained by the quantum interference of wavepackets in anharmonic potential.

ME67
SPASER as ultrafast nanoscale phenomenon and device, *Mark I. Stockman[1], David J. Bergman[2]; [1]Georgia State Univ., USA, [2]Tel Aviv Univ., Israel.* We theoretically introduce surface plasmon a.m.plification by stimulated emission of radiation (SPASER) as an ultrafast phenomenon and device. Spaser is predicted to generate femtosecond, nanoscale-localized pulses of nearly atomic-strength local fields. Various applications are discussed.

ME68
Principal component analysis: gaining insight from feedback learning algorithms, *James L. White, Brett J. Pearson, Philip H. Bucksbaum; FOCUS Ctr., Physics Dept., Univ. of Michigan, USA.* Feedback learning algorithms are used to search for optical pulse shapes for quantum control. We use principal component analysis to analyze the pulse shapes found by these algorithms to learn about the system's quantum dynamics.

ME69
Pulsed terahertz spectroscopy and imaging applied to inspection of explosives and inflammable liquids, *Kohji Yamamoto[1], Keiko Yagi[1], Mariko Yamaguchi[1], Fumiaki Miyamaru[1], Masahiko Tani[1], Masanori Hangyo[1], Takeshi Ikeda[2], Akira Matsushita[2], Kenji Koide[2], Michiaki Tatsuno[2], Yukio Minami[2]; [1]Res. Ctr. for Superconductor Photonics, Osaka Univ., Japan, [2]Forensic Science Lab, Osaka Prefectural Police Headquaters, Japan.* We examined applicability of pulsed terahertz spectroscopy and imaging to detection of explosives and inflammable liquids. We confirm that THz techniques are quite efficient for inspection of hazardous materials used for terrorist activities.

ME70
Time and frequency domain investigations on ultrafast photoisomerization reaction dynamics of PYP, *Haik Chosrowjan[1], Seiji Taniguchi[1], Noboru Mataga[1], Norio Hamada[2], Fumio Tokunaga[2], Masashi Unno[3]; [1]Inst. for Laser Technology, Japan, [2]Osaka Univ., Japan, [3]Tohoku Univ., Japan.* Low frequency modes of PYP, several mutant and analogue systems have been investigated by fluorescence up-conversion and resonance Raman scattering techniques, complemented by DFT and *ab initio* MO calculations. Their role in photoisomerization is discussed.

Tuesday, July 27, 2004

8:00 a.m.–5:00 p.m.
Registration/Speaker and Presider Check-in

Marine Hall (4F)
8:15 a.m.–10:30 a.m.
TuA • Ultrafast Condensed Matter and Plasma Physics
Dai-Sik Kim; Seoul Natl. Univ., Republic of Korea, Presider

TuA1 ● 8:15 a.m. Invited
Carrier-envelope phase controlled quantum interference in a semiconductor, *Tara M. Fortier[1], Peter Roos[1], David J. Jones[1,2], Steven T. Cundiff[1], Ravi Bhat[3], John E. Sipe[3]; [1]JILA, NIST & Univ. of Colorado at Bouder, USA, [2]Univ. of British Columbia, Canada, [3]Univ. of Toronto, Canada.* We demonstrate quantum interference of injected photocurrents in a semiconductor using a phase stabilized modelocked Ti:sapphire laser. Using this technique we detect the carrier-envelope evolution with a 40 dB signal to noise ratio.

TuA2 ● 8:45 a.m.
Phase-resolved nonlinear response of modulation-doped quantum wells under femtosecond intersubband excitation, *Tina Shih[1], Chih-Wei Luo[1], Klaus Reimann[1], Michael Woerner[1], Thomas Elsaesser[1], Ines Waldmüller[2], Andreas Knorr[2], R. Hey[3], K. H. Ploog[3]; [1]Max-Born-Inst., Germany, [2]Technische Univ., Germany, [3]Paul-Drude-Inst., Germany.* Coherent nonlinear propagation of ultrafast electric field transients through intersubband resonances of GaAs/AlGaAs quantum wells shows Rabi oscillations for low electron densities, while radiative coupling between quantum wells dominates the nonlinearity at high densities.

TuA3 ● 9:00 a.m.
Ultrafast mid-infrared dynamics in the colossal magnetoresistance pyrochlore $Tl_2Mn_2O_7$, *Rohit P. Prasankumar[1], Antoinette J. Taylor[1], Richard D. Averitt[1], Hidekazu Okamura[2], Hideto Imai[3], Yuichi Shimakawa[3], Yoshimi Kubo[3]; [1]Los Alamos Natl. Lab, USA, [2]Kobe Univ., Japan, [3]NEC Corporation, Japan.* An optical pump, mid-infrared (IR) probe system is used to investigate ultrafast temperature-dependent dynamics of the colossal magnetoresistance pyrochlore $Tl_2Mn_2O_7$. The dynamics change appreciably near the Curie temperature (T_c), indicating a dependence on ferromagnetic ordering.

TuA4 ● 9:15 a.m.
Femto-magnetism visualized in three dimensions, *Jean-Yves Bigot, Mircea Vomir, Leandro H. Andrade, Luca Guidoni, Eric Beaurepaire, Jacek Arabski; Inst. de Physique et Chimie des Materiaux de Strasbourg, France.* We measured the three-dimensional real-space trajectory of the magnetization in ferromagnetic metallic films perturbed by femtosecond optical pulses. It reveals the dynamics of the initial ultrafast demagnetisation followed by the spin precession and damping.

TuA5 ● 9:30 a.m.
Photo-induced demagnetization observed by time-resolved magneto-optical Kerr effect and mid-infrared transmittance spectroscopy in Ga0.94Mn0.06As, *Eiji Kojima[1], Jean Benoit Heroux[1], Ryo Shimano[1], Yoshiaki Hashimoto[2], Shingo Katsumoto[2], Iye Yasuhiro[2], Makoto Kuwata-Gonokami[1]; [1]Dept of Applied Physics, Tokyo Univ., Japan, [2]Inst. of Solid State Physics, Tokyo Univ., Japan.* The spin response of a dilute magnetic Ga0.94Mn0.06As semiconductor sample subject to femtosecond photoexcitation is observed by time-resolved magneto-optical Kerr effect and mid-infrared differential transmittance. A correlation between ferromagnetism and MIR transmittance spectra is found.

TuA6 ● 9:45 a.m.
Dynamic coupling-decoupling crossover in the current-driven vortex-state in $Tl_2Ba_2CaCu_2O_8$ studied using terahertz time-domain spectroscopy, *Verner K. Thorsmølle[1], Richard D. Averitt[1], Martin P. Maley[1], Lev N. Bulaevskii[1], Antoinette J. Taylor[1], Igor Aranson[2]; [1]Los Alamos Natl. Lab, USA, [2]Argonne Natl. Lab, USA.*Employing terahertz time-domain spectroscopy in transmission, we have measured the Josephson plasma resonance in $Tl_2Ba_2CaCu_2O_8$ high-T_c thin films, and studied the current-driven coupling-decoupling crossover in the driven vortex lattice. A dynamic phase transition is observed.

TuA7 ● 10:00 a.m.
Ultrafast insulator-to-metal switching by pohotoinduced Mott transition, *Shinichiro Iwai[1,2], Y. Okimoto[3], M. Ono[4], H. Matsuzaki[4], H. Kishida[4,2], H. Okamoto[3,4], Y. Tokura[3,4]; [1]Tohoku Univ., Japan, [2]PRESTO-JST, Japan, [3]CERC, AIST, Japan, [4]Univ. of Tokyo, Japan.* Photoinduced Mott transition in correlated electron system from a CT insulator to a metal was demonstrated by mid IR reflection pump-probe. Photogeneration of the metal and recovery of the insulator occur within a few picoseconds.

TuA8 • 10:15 a.m.
Ultrafast 2-D radiative transport in a micron-scale aluminum plasma excited at relativistic intensity, *Benjamin T. Bowes[1,2], Michael C. Downer[1,2], Hans Langhoff[3], Marc Wilcox[4,2], Bixue Hou[2,4], John Nees[4,2], Gerard Mourou[4,2]; [1]Univ. of Texas at Austin, USA, [2]FOCUS Ctr., USA, [3]Physikalisches Inst. der Univ. Wurzburg, Germany, [4]Ctr. for Ultrafast Optical Science, USA.* Using femtosecond microscopy, we observe a thermal/ionization front expand radially at ~10^8cm/s from a λ^2-size spot of an aluminum target excited at >10^{18}W/cm^2. Numerical modeling shows transport is predominantly radiative and may be initially nonlocal.

10:30 a.m.–11:00 a.m.
Coffee Break

Marine Hall (4F)
11:00 a.m.–1:00 p.m.
TuB • Multidimensional Spectroscopy
Taiha Joo; Pohang Univ. of Sci. and Tech., Republic of Korea, Presider

TuB1 • 11:00 a.m.
Two-dimensional IR spectroscopy of transient species, *Jens Bredenbeck, Jan Helbing, Peter Hamm; Physikalisch-Chemisches Inst., Univ. of Zürich, Switzerland.* Transient two-dimensional infrared spectroscopy (T2D-IR) extends 2D-IR spectroscopy to the non-equilibrium regime. We demonstrate different types of T2D-IR experiments for a charge transfer state of [Re(CH)$_3$-bpy(CO)$_3$Cl], including the vibrational analogue of NMR-exchange spectroscopy.

TuB2 • 11:15 a.m.
Thermal denaturing of proteins: Equilibrium and transient studies using nonlinear infrared probes, *Hoi Sung Chung, Munira Khalil, Adam W. Smith, Ziad Ganim, Andrei Tokmakoff; MIT, USA.* Thermal unfolding of β-sheets in ribonuclease A and ubiquitin is revealed by disappearance of cross peaks in 2D IR spectra. Transient unfolding probed with vibrational echoes following a temperature jump reveals nanosecond to millisecond kinetics.

TuB3 • 11:30 a.m.
Structures and dynamics of small peptides by coherent two-dimensional infrared spectroscopy, *Nien-Hui Ge, Denis Karaiskaj, Soohwan Sul, Ying Jiang; Univ. of California at Irvine, USA.* Coherent 2D IR techniques with various pulse sequences and polarization conditions reveal new spectral features associated with multiple conformations of acetylproline-NH$_2$. We illustrate distinct spectral signatures of α- and 3_{10}-helical conformations for an 8-unit peptide.

TuB4 • 11:45 a.m.
Peptide secondary structure determination from three pulse vibrational spectroscopy, *Wei Zhuang, Darius Abramavicius, Shaul Mukamel; Dept. of Chemistry, Univ. of California at Irvine, USA.* Coherent nonlinear spectra of a.m.ide I modes of secondary structural motiffs of peptides are predicted for the signals generated at $-k_1+k_2+k_3$ and $k_1+k_2-k_3$, Polarization dependent infrared fields applied for oriented samples give unique signatures.

TuB5 • 12:00 p.m.
Two-dimensional optical heterodyne spectroscopy of molecular complexes, *Graham R. Fleming; Univ. of California at Berkeley, USA.* Optical heterodyne two-dimensional (2D) photon echoes from room-temperature BIC J-aggregates were recorded. Analysis of the time-dependent 2D spectrum reveals the frequency dependence of the exciton relaxation, and discriminates diagonal and off-diagonal exciton phonon coupling.

TuB6 • 12:15 p.m.
A degenerate four-wave mixing spectroscopy device based on two dimensional pulse shaping, *Thomas Hornung, Joshua C. Vaughan, Thomas Feurer, Keith A. Nelson; MIT, USA.* Degenerate, noncollinear, optically heterodyned, spectrally resolved, multidimensional femtosecond $\chi^{(3)}$ measurements are executed

with waveforms, delays, and phases of all fields controlled by a single active device. Extension to higher-order and IR spectroscopies is possible.

TuB7 ● 12:30 p.m.
2-dimensional measurement of the solvent intermolecular response in solvation, *Norbert F. Scherer; Univ. of Chicago, USA.* The solvent intermolecular response in solvation is studied by 2-D polarizability response spectroscopy. The isotropic and anisotropic solvent response spectra of Coumarin 153 in CH_3CN, measured during solvation, reveal enhanced translational vs. orientational dynamics.

TuB8 ● 12:45 p.m.
Optical two-dimensional Fourier-transform spectroscopy of semiconductor quantum wells, *Camelia N. Borca, Tianhao Zhang, Steven T. Cundiff; JILA, NIST and Univ. of Colorado, USA.* We demonstrate optical two-dimensional Fourier transform spectroscopy of heavy- and light-hole excitons in GaAs quantum wells. This is enabled by active interferometric stabilization of the excitation pulse separation and of a reference pulse.

1:00 p.m.–2:30 p.m.
Lunch Break (on your own)

Marine Hall (4F)
2:30 p.m.–4:00 p.m.
TuC • Plasmon Field Enhancement
Masanori Hangyo; Res. Ctr. for Superconductor Photonics, Osaka Univ., Japan, Presider

TuC1 ● 2:30 p.m.
Terahertz access to the nanoworld, *Roland Kersting[1], Hou-Tong Chen[2], Nick Karppwicz[2], Gyu Cheon Cho[3]; [1]Univ. of Munich, Germany, [2]Rensselaer Polytechnic Inst., USA, [3]IMRA America, USA.* We report on time-resolved terahertz near-field microscopy with a spatial resolution of 150 nm. Terahertz time-domain experiments identify a novel imaging mechanism, which allows for nanoscale THz studies of organic and inorganic materials.

TuC2 ● 2:45 p.m.
Femtosecond formation of phonon-plasmon coupled modes studied by ultrabroadband THz spectrocopy, *R. Huber[1], C. Kübler[1], S. Tübel[1], A. Brodschelm[1], F. Köhler[2], R. Meyer[2], M.-C. Amann[2], A. Leitenstorfer[3]; [1]Technische Univ. of Münich, Germany, [2]Walter Schottky Inst. (E26), Technische Univ. of Münich, Germany, [3]Fachbereich Physik, Univ. of Konstanz, Germany.* Exploiting ultrabroadband THz spectroscopy, we study the coupled phonon-plasmon system in photoexcited InP in the extreme non-equilibrium. The ultrafast buildup of many-particle correlations leads to the formation of hybrid excitations on the femtosecond time scale.

TuC3 ● 3:00 p.m.
Surface plasmon assisted 26 fs, 0.4 keV electron pulse generation, *Scott E. Irvine, Abdulhakem Y. Elezzabi; Univ. of Alberta, Canada.* We report on the generation of 0.4 keV, 26-fs electron pulses using laser pulses from a low-intensity, 80 MHz repetition rate, Ti:Sapphire oscillator. This work is complemented with particle simulations using the finite-difference time-domain method.

TuC4 ● 3:15 p.m.
Space-time control in ultrafast nano-optics, *T. Brixner[1], J. Schneider[1], W. Pfeiffer[1], F. J. Garcia de Abajo[2]; [1]Univ. of Würzburg, Germany, [2]Ctr. Mixto CSIC-UPV/EHU, Spain.* The interaction of optimally polarization-shaped laser pulses with nanostructures allows simultaneous spatial and temporal control of electric fields below the diffraction limit. Simulations show that the localized nonlinear response can be scanned without mechanical movements.

TuC5 ● 3:30 p.m.
Ultrafast near-field microscope imaging of electron and phonon relaxation in single gold nanoparticle, *Kohei Imura, Tetsuhiko Nagahara, Hiromi Okamoto; Inst. for Molecular Science, Japan.*

Ultrafast temporal responses of local density of states in single gold nanorods have been imaged by combining near-field microscope with time-resolved technique. Spatially dependent dynamics of surface plasmon in the rod has been found.

TuC6 ● 3:45 p.m.
Coherent control of ultrafast linear and nonlinear phenomena in nanostructures, *Mark I. Stockman[1], David J. Bergman[2], Takayoshi Kobayashi[3]; [1]Georgia State Univ., USA, [2]Tel Aviv Univ., Israel, [3]Univ. of Tokyo, Japan.* We theoretically investigate the unique possibility to control distribution of ultrafast local optical fields, both linear and nonlinear, in nanosystems with nanometer spatial resolution and in time on the femtosecond scale. Various applications are discussed.

4:00 p.m.–4:30 p.m.
Coffee Break

Marine Hall (4F)
4:30 p.m.–6:00 p.m.
TuD • Waveguides and Propagation
Masataka Nakazawa; Res. Inst. of Electrical Communication, Tohoku Univ., Japan, Presider

TuD1 ● 4:30 p.m. Invited
Light propagation control in photonic crystals, *Masaya Notomi; NTT Basic Res. Labs, Japan.* Recent progress on components consisting of PBG waveguides and resonators in SOI photonic-crystal slabs are reviewed. By combining low-loss waveguides and high-Q resonators, we have designed and fabricated multi-port devices: resonant-tunneling filters and channel-drop filters.

TuD2 ● 5:00 p.m.
3D photonic devices fabricated in glass by a femtosecond oscillator, *Andrew M. Kowalevicz, Jr.[1], Vikas Sharma[2], Erich P. Ippen[2], James G. Fujimoto[2], Kaoru Minoshima[3]; [1]Harvard/MIT, USA, [2]MIT, USA, [3]Natl. Inst. of Advanced Industrial Science and Technology, Japan.* Three-dimensional devices are fabricated using femtosecond pulses from an extended cavity oscillator. A 3-waveguide symmetric directional coupler, a micro-ring resonator and a device composed of two orthogonally oriented 2D devices are demonstrated and analyzed.

TuD3 ● 5:15 p.m.
Writing of photonic devices and waveguide lasers by a diode-pumped femtosecond oscillator, *Roberto Osellame[1], Nicola Chiodo[1], Giuseppe Della Valle[2], Stefano Taccheo[2], Roberta Ramponi[2], Giulio Cerullo[2], Alexander Killi[3], Uwe Morgner[3], Max Lederer[4], Daniel Kopf[4]; [1]IFN C.N.R., Italy, [2]Dipartimento di Fisica, Politecnico, Italy, [3]Max Planck Inst. für Kernphysik, Germany, [4]HighQLaser Production GmbH, Austria.* We demonstrate active waveguide writing by a compact diode-pumped cavity dumped femtosecond Yb:glass oscillator. The waveguides are perfectly mode-matched to standard single-mode telecom fibers at 1.55 mm and show internal gain and laser action.

TuD4 ● 5:30 p.m.
Toward the fabrication of hybrid polymer/metal three-dimensional microstructures, *Tommaso Baldacchini[1], C. N. Lafratta[1], R. A. Farrer[1], A. C. Pons[1], J. Pons[1], J. T. Fourkas[1], M. J. Naughton[1], Bahaa E. Saleh[2], Malvin C. Teich[2]; [1]Boston College, USA, [2]Boston Univ., USA.* In this paper we present preliminary results on the fabrication of hybrid polymer/metal microstructures. Multiphoton-induced processes are first used to fabricate three-dimensional dielectric microstructures and then to selectively deposit metallic patterns on their surfaces.

TuD5 ● 5:45 p.m.
Production of 3D, dichroitic microstructures in nanocomposite glasses by femtosecond laser pulses, *Gerhard Seifert, Alexander V. Podlipensky, Amin Abdolvand, Jens Lange, Heinrich Graener; Martin-Luther-Univ. Halle-Wittenberg, Germany.* Deforming metal nanoparticles in glass by femtosecond laser pulses, 3-dimensional dichroitic microstructures have been produced. This technique has a large potential for production of optoelectronic elements and long-time data storage.

6:00 p.m.–7:30 p.m.
Dinner Break (on your own)

Rooms 301 and 302
7:30 p.m.–9:30 p.m.
TuE • Poster Session II (Exhibition)

TuE1
Coherent cooling of molecular vibrational motion with laser-induced dipole forces, *Hiromichi Niikura, Paul B. Corkum, David M. Villeneuve; Natl. Res. Council of Canada, Canada.* Applying an intense laser pulse whose duration is shorter than one vibrational period at the appropriate time, we show that a vibrational wave packet can be accelerated, decelerated, or dissociated.

TuE2
Phase transition in VO_2: Time-domain assignment of cause and effect in presence of strong correlations, *Andrea Cavalleri[1], Thomas Dekorsy[2], Henry Chong[1], Jean Claude Kieffer[3], Robert W. Schoenlein[1]; [1]Lawrence Berkeley Lab, USA, [2]Forschungszentrum Rossendorf, Germany, [3]Univ. du Quebec, Canada.* We establish a time-domain hierarchy between structural and electronic effects in the model strongly correlated system VO2. We find that the insulator-to-metal transition is driven directly by structural change rather than by electron-electron correlations.

TuE3
Cooper pair breaking dynamics in MgB_2 using optical-pump terahertz-probe spectroscopy, *Jure Demsar[1], Richard D. Averitt[2], Antoinette J. Taylor[2], Viktor V. Kabanov[1]; [1]Jozef Stefan Inst., Slovenia, [2]Los Alamos Natl. Lab, USA.* Cooper pair-breaking dynamics have been resolved for the first time in MgB_2. We present an analysis of the PBD using the Rothwarf-Taylor model, enabling the determination of the bare quasiparticle recombination and phonon pair-breaking rates.

TuE4
Time resolved harmonic generation from exploding noble-gas clusters, *Bonggu Shim, Greg Hays, Mykhailo Fomytskyi, Alexey Arefiev, Breizman Boris, Todd Ditmire, Mike C. Downer; Univ. of Texas, USA.* Third-harmonic generation from noble-gas clusters by ultrashort probe pulses is more sharply resonantly-enhanced than linear absorption following heating by an ultrashort pump pulse, in qualitative agreement with simulations of cluster expansion and collective electron dynamics.

TuE5
Correlation of the electronic transitions in semiconducting single-walled carbon nanotubes, *Ying-Zhong Ma[1], Jens Stenger[1], Susan L. Dexheimer[1], Graham R. Fleming[1], Sergei M. Bachilo[2], Richard E. Smalley[2], R. B. Weisman[2]; [1]Dept. of Chemistry, Univ. of California at Berkeley, and Physical Biosciences Div., Lawrence Berkeley Natl. Lab, USA, [2]Dept. of Chemistry, Ctr. for Nanoscale Science and Technology, and Ctr. for Biological and Environmental Nanotechnology, Rice Univ., USA.* Frequency-resolved femtosecond transient absorption was applied to study the spectral properties and excited-state dynamics in semiconducting single-walled carbon nanotubes. We find that the electronic transitions are intrinsically correlated, revealing the excitonic nature of the states.

TuE6
Temporal self-compression of intense femtosecond pulses propagating in argon-filled hollow Waveguides, *Emily A. Gibson[1], Nick Wagner[1], Sterling Backus[1], Margaret M. Murnane[1], Henry C. Kapteyn[1], Ivan P. Christov[2]; [1]JILA, Univ. of Colorado, USA, [2]Dept. of Physics, Sofia Univ., Bulgaria.* We demonstrate temporal compression of intense femtosecond 800-nm pulses in a hollow-core fiber filled with low-pressure argon gas, without any subsequent dispersion compensation. We achieve a final compressed pulse width of ~ 13 fs.

TuE7
Ultrafast dynamics of periodic arrays of holes in a gold film, *Valérie Halté[1], Abdelkrim Benabbas[1], Luca Guidoni[1], Jean-Yves Bigot[1], Aloyse Degiron[2], Henry J. Lezec[2], Thomas W. Ebbesen[2], Peter N. Saeta[3]; [1]IPCMS-GONLO, France, [2]ISIS, France, [3]Dept of Physics, Harvey Mudd College, USA.* We show that the enhanced transmission of gold nanostructures made of arrays of holes exhibits two kinds of resonances. Their spectral position and line-width strongly depend on the electron dynamics induced by femtosecond optical pulses.

TuE8
Observation and manipulation of quantum interferences in ladder climbing, *Beatrice Chatel, Jerome Degert, Sabine Stock, Bertrand Girard; LCAR-IRSAMC-CNRS, France.* Two-photon excitation of a quantum ladder system by a chirped pulse leads to strong interferences in the excited state population. The interest of such scheme in the project of the artificial star will be discussed.

TuE9
Energetic proton and deuteron generation from a microporous polytetrafluoroethylene film with deuterated polystyrene using a 2.4-TW table-top laser, *H. Takahashi[1,2], S. Okihara[2], S. Ohsuka[1,2], M. Fujimoto[1,2], S. Okazaki[1], T. Ito[1], S. Aoshima[1,2], Y. Tsuchiya[1,2]; [1]Ctrl. Res. Lab, Hamamatsu Photonics K.K., Japan, [2]CREATE Shizuoka of JST, REFOST, Japan.* Protons and deuterons over 1 MeV in energy were generated by 2.4-TW, 50-fs, 10-Hz laser pulses interacting with a film target. In particular, microporous polytetrafluoroethylene film infiltrated with deuterated polystyrene was effective for this target.

TuE10
Optically induced magnetization and ultrafast spin dynamics of magnetic ions in ionic crystals, *Toshiro Kohmoto, Yukio Fukuda, Masakazu Kunitomo, Kazuki Nakazono, Shigenori Furue; Kobe Univ., Japan.* Optically induced magnetizations in Tm^{2+}:CaF_2 and Cr^{3+}:Al_2O_3 are observed by using the polarization spectroscopy. Quantum-beat free-induction decay and ultrafast spin-lattice relaxation near room temperature in the ground states of the magnetic ions are investigated.

TuE11
Ultrafast intersubband relaxation and carrier cooling in GaN/AlN multiple quantum wells, *Junichi Hamazaki[1], Hideyuki Kunugita[1], Kazuhiro Ema[1], Satoshi Matsui[2], Youhei Ishii[2], Takayuki Morita[2], Akihiko Kikuchi[2], Katsumi Kishino[2]; [1]Dept. of Physics, Sophia Univ., Japan, [2]Dept. of Electric and Electronics Engineering, Sophia Univ., Japan.* We have investigated intersubband relaxation dynamics in GaN/AlN MQW by two-color pump-probe technique. We have clarified the ultrafast relaxation scenario including thermalization and cooling processes, and found that relaxation is influenced by hot-phonon effect.

TuE12
Ultrafast dynamics of a two-hole state in photo-induced ion desorption, *Yosuke Kayanuma, Akira Yasui, Takayuki Uozumi; Graduate School of Engineering, Osaka Prefecture Univ., Japan.* A full quantum mechanical calculation for the dynamics of ion desorption by the two-hole instability is presented. It is shown that the Coulomb repulsion stabilizes the two-hole state, and increases the probability of desorption.

TuE13
Dephasing suppression of excitons in semiconductors, *Tadashi Kishimoto[1], Atsushi Hasegawa[2], Yasuyoshi Mitsumori[3], Masahide Sasaki[2], Fujio Minami[1]; [1]Tokyo Inst. of Technology, Japan, [2]Communications Res. Lab, Japan, [3]Tohoku Univ., Japan.* The dephasing control of excitons was performed in GaSe by using successive three pulses, i.e., six-wave-mixing. By comparing the signal profile between four-wave-mixing and six-wave-mixing, the dephasing time is lengthened by an additional pulse irradiation.

TuE14
Polarization-dependent phenomenon induced by the interaction between focused femtosecond laser and transparent materials, *Yasuhiko Shimotsuma[1], Jiarong Qiu[2], Peter G. Kazansky[2,3], Kazuyuki Hirao[1]; [1]Kyoto Univ., Japan, [2]Photon Craft Project, Japan Science and Technology Agency, Japan, [3]Univ. of Southampton, UK* .Polarization-dependent phenomenon is observed inside transparent materials after

irradiation by a focused single femtosecond laser beam. The phenomenon is interrupted in terms of the interaction of interference between incident light field and electron plasma wave.

TuE15
High-energy protons emitted from a polymer-coated metal foil by 60-fs laser irradiation, *Hiroaki Kishimura[1], Hiroto Morishita[1], Yasuhisa Okano[1], Yasuaki Okano[1], Yoichiro Hironaka[1], Ken-Ichi Kondo[1], Kazutaka G. Nakamura[1], Yuji Oishi[2], Koshichi Nemoto[2]; [1]Materials and Structures Lab, Tokyo Inst. of Technology, Japan, [2]Ctrl. Res. Inst. of Electric Power Industry, Japan.* High-energy protons are generated by a 60-fs-laser irradiation on a polymer-coated thin metal foil. The intensity of protons from the polyvinylmethylether-coated target is enlarged about 80 times higher than that from the uncoated target.

TuE16
Ultrafast quenching of the ring closure reaction in photochromic switches selfassembled on gold nano-particles, *Pieter R. Hania, Audrius Pugzlys, Tibor Kudernac, Harry T. Jonkman, Koos Duppen; Univ. of Groningen, Netherlands.* We report ultrafast, with a time constant of 300 fs, quenching of the ring-closure reaction in photochromic switches, self-assembled on gold nano-particles. The quenching reveals strongly mixed electronic states of the switch molecules and gold.

TuE17
Terahertz emission induced by laser excited ferromagnetic films, *J. Y. Bigot[1], J. Arabski[1], Eric Beaurepaire[1], G. M. Turner[2], S. M. Harrel[2], M. C. Beard[2], C. A. Schmuttenmaer[2]; [1]IPCMS, France, [2]Yale Univ., USA.* The laser induced ultrafast demagnetization of ferromagnetic films results in the emission of a terahertz electromagnetic pulse that has been detected using free-space electro-optic sampling. Measured E(t) is explained by Maxwell equations.

TuE18
Population-split genetic algorithm for phase retrieval of ultrafast laser pulses, *Ching-Wei Chen[1], Ci-Ling Pan[1], Su-Frang Shu[2], Chao-Kuei Lee[3]; [1]Inst. of Electro-Optical Engineering, NCTU, Taiwan Republic of China, [2]Dept. of Electronic Engineering, Ching Yun Univ., Taiwan Republic of China, [3]Inst. of Electro-Optical Engineering, NSYU, Taiwan Republic of China.* We report a complete femtosecond pulse retrieval technique that combines population split genetic algorithm and interferometric autocorrelation. After 200 GA generations, the pulse width, phase, chirp could be determined with a convergence error of 6×10^{-3}.

TuE19
Real-time observation of phase-controlled vibrational wavepackets in iodine molecules, *Yukinori Sato[1], Hisashi Chiba[1], Masahiro Honda[1], Yusuke Hagihara[1], Katsutoshi Fijiwara[1], Kiyoshi Ueda[1], Kenji Ohmori[2]; [1]IMRAM, Tohoku Univ., Japan, [2]Inst. for Molecular Science, Japan.* Employing a sequence of three 100fs-laser pulses with two variable time delays, evolution of the double-pulse-controlled wave-packet is observed in real time for the vibrational motion on the B state of Iodine.

TuE20
Eight-frame observation of propagation behavior of 0.49-mJ, 45-fs optical pulses generated by a 1-kHz laser system, *Masatoshi Fujimoto, Shin-ichiro Aoshima, Yutaka Tsuchiya; Hamamatsu Photonics K.K., Japan.* We succeeded in observing instantaneous profiles of 0.49-mJ, 45-fs pulses propagating in an atmosphere. A laser system with 1-kHz repetition enabled us to measure them with a sufficient signal-to-noise ratio.

TuE21
Pulse-measurement challenges at 1.5 microns: several-cycle pulses and several-element devices, *Selcuk Akturk[1], Mark Kimmel[1], Rick Trebino[1], Sergei Naumov[2], Evgeni Sorokin[2], Irina Sorokina[2]; [1]Georgia Inst. of Technology, USA, [2]Inst. für Photonik, Technical Univ. of Wien, Austria.* We have demonstrated frequency-resolved optical gating (FROG) for measuring several-cycle 1.5-micron pulses using an angle-dithered-crystal geometry. We have also demonstrated experimentally very simple GRENOUILLE device for measuring few-hundred-fs 1.5-micron pulses using the nonlinear-optical crystal Proustite.

TuE22
Single-shot phase measurement by spectral phase interferometry using a streak camera, *Takeshi Akagawa, Kazuhiko Misawa, Roy Lang; Tokyo Univ. of A&T, Japan.* We show a single-shot measurement of the nonlinear phase shift and the a.m.plitude change given to a particular femtosecond pulse in a modulated pulse train using spectral phase interferometry and a streak camera.

TuE23
Ultrabroad-band noncollinear optical parametric a.m.plification in some new nonlinear optical crystals, *Pathik Kumbhakar, Takayoshi Kobayashi; Dept. of Physics, Univ. of Tokyo, Japan.* Some new nonlinear optical crystals have been found to be suitable for generation of tunable visible ultrafast laser radiation by type-I noncollinear OPA. Moreover, the condition for ultrabroad-band parametric amplification has been derived straightforwardly.

TuE24
Dynamical Stark effect of excitons in Cu_2O by resonant pulsed excitation of the 1*s*-2*p* transition, *Kosuke Yoshioka, Motoyoshi Kubouchi, Ryo Shimano, Makoto Kuwata-Gonokami; Dept. of Applied Physics, Faculty of Engineering, Univ. of Tokyo, Japan.* We examine perturbed free induction decay of 1*s* orthoexcitons in Cu_2O under resonant pumping of 1*s*-2*p* transition. Fourier transform pump-probe spectra indicate deep Stark potential of 2.7 meV with pump intensity of 4.8 MW/cm^2.

TuE25
Wavepacket interferometry and wavepacket dynamics in condensed phase, *Matias Bargheer[1,2], Markus Guehr[2], Mizuho Fushitani[2], Nikolaus Schwentner[2]; [1]Max-Born-Inst., Germany, [2]Freie Univ. of Berlin, Germany.* The diatomic Cl_2 in Ar solid is examined to discuss the a.m.plitude and phase information obtained by wavepacket interferometry in condensed phase and to contrast it with femtosecond pump-probe and linear absorption spectra.

TuE26
Ultrafast light induced charge disordering around phase transition temperature in 2D spin ladder compound NaV_2O_5, *Motoo Aiba, Makoto Nakajima, Masahiko Isobe, Yutaka Ueda, Tohru Suemoto; Inst. for Solid State Physics, Univ. of Tokyo, Japan.* The light induced phenomena on charge-ordered phase in NaV_2O_5 has been investigated by femtosecond time-resolved reflection spectroscopy. The large reflectivity change refers to processes of the destruction and reconstruction of the charge order.

TuE27
Molecular state reconstruction using nonlinear wave packet interferometry, *Travis S. Humble, Jeffrey A. Cina; Univ. of Oregon, USA.* We investigate reconstruction of optically prepared vibrational wave packets using nonlinear wave packet interferometry. Simulated results for a model photodissociative diatomic demonstrate the technique's effectiveness in identifying dynamics induced by shaped laser pulses.

TuE28
Femtosecond coherent spectroscopic study of Zn(II)porphyrin by chirping-controlled ultrashort pulses, *Min-Chul Yoon, Sung Cho, Dongho Kim; Yonsei Univ. / Dept. of Chemistry, Republic of Korea.* Impulsively photo-induced coherent vibrational wave packet dynamics of Zn(II)porphyrin in the electronic ground and excited states have been investigated. Chirped ultrashort pulses enable us to control generation and propgation of wave packet on individual surface.

TuE29
Two-dimensional femtosecond coherent anti-Stokes Raman scattering spectroscopy using a chirped supercontinuum generated from a photonic crystal fiber, *Hideaki Kano, Hiro-O Hamaguchi; Univ. of Tokyo, Japan.* Two-dimensional femtosecond CARS spectroscopy is performed using a Ti:sapphire oscillator. The CARS signal of cyclohexane exhibits well-defined beats with a period of 430fs, which agrees well with a frequency difference between two C-H stretching modes.

TuE30
Ultrafast relaxation inside proteins: Calculation and measurement of electron-vibration coupling in enzymes, *Byung Moon Cho[1], Ian P. Mercer[1], Ian R. Gould[1], David R. Klug[1], Ross C. Walker[2]; [1]Imperial College, UK , [2]The Scripts Res. Inst., USA.* Electron-vibration coupling in alcohol dehydrogenase and zinc substituted myoglobin was calculated using a quantum mechanics/molecular mechanics method [2,3]. Good agreement with experimental measurements demonstrates the viability of the method.

TuE31
A 40-fs time-resolved absorption study of *cis*-stilbene in solution: Observation of coherent nuclear wavepacket motion in reactive excited state, *Kunihiko Ishii, Satoshi Takeuchi, Tahei Tahara; Inst. of Physical and Chemical Res. (RIKEN), Japan.* Photoisomerization reaction of *cis*-stilbene in solution was studied by time-resolved absorption spectroscopy with 40-fs resolution. Rapidly damping coherence of a ~220 cm^{-1} vibrational mode was observed in the reactive excited state.

TuE32
Three pulse four wave mixing for the study of coherent interactions, nuclear dynamics and solvation dynamics in liquids, *June-Sik Park, Taiha Joo; Pohang Univ. of Science and Technology, Republic of Korea.* We use diffractive optics and material path to control time delay with interferometric accuracy in three pulse scattering. Signal is detected with or without spectral resolution to give wealth of information on nuclear dynamics.

TuE33
Ultrafast intramolecular electron transfer of 9,9'-bianthryl as studied by femtosecond time-resolved near-infrared absorption and anisotropy in the 950-1500 nm region, *Tomohisa Takaya[1], Koichi Iwata[2], Hiro-o Hamaguchi[1], Haruo Kuroda[3]; [1]Dept. of Chemistry, Univ. of Tokyo, Japan, [2]Res. Ctr. for Spectrochemistry, Univ. of Tokyo, Japan, [3]IR-FEL Res. Ctr., Res. Inst. for Science and Technology, Tokyo Univ. of Science, Japan.* Femtosecond near-IR absorption and its anisotropy of 9,9'-bianthryl in the 950-1500 nm region reveal that the locally-excited (LE) state is directly connected to the charge-transfer (CT) state in 0.3 ps.

TuE34
Ultrafast vibrational dynamics of rotaxanes, *Olaf F.A. Larsen[1], Sander Woutersen[1], David A. Leigh[2], Dhiredj C. Jagesar[3], Albert M. Brouwer[3], Wybren J. Buma[3]; [1]FOM Inst. for Atomic and Molecular Physics, Netherlands, [2]School of Chemistry, Univ. of Edinburgh, UK , [3]Molecular Excited States Group, Univ. of Amsterdam, Netherlands.* A rotaxane system, consisting of a macrocycle attached to a thread by hydrogen bonds, has been studied by 2D-vibrational spectroscopy. The results suggest backfolding of the thread towards the macrocycle, and reveal conformational flexibility.

TuE35
Design of multilayer mirrors for the reflection of sub-femtosecond pulses in the XUV spectral region, *Alexander S. Pirozhkov[1], Hiroyuki Daido[1], Sergei V. Bulanov[1], Eugene N. Ragozin[2]; [1]Advanced Photon Res. Ctr., JAERI, Japan, [2]P. N. Lebedev Physical Inst., Russian Acad. of Sciences, Russian Federation.* Theoretically demonstrated that aperiodic multilayer mirrors can compress negatively and positively chirped XUV pulses. In particular, temporal profiles of reflected trains of positively chirped high-order harmonics of a laser radiation were calculated.

TuE36
Wavefront control in high harmonics generation with few- and many-optical-cycle laser pulses, *Paolo Villoresi[1], Stefano Bonora[1], Michele Pascolini[1], Luca Poletto[1], Caterina Vozzi[2], Giuseppe Sansone[3], Salvatore Stagira[3], Mauro Nisoli[3]; [1]INFM – Padova Univ., Italy, [2]INFM – Univ.' di Milano, Italy, [3]INFM – Politecnico Milano, Italy.* The wavefront of a ultrafast pulse is modified with a deformable-mirror. The generation of high-order harmonics with both few- and many-optical-cycle pulses is controlled and optimised with a closed loop that controls the wavefront shape.

TuE37
Direct reconstruction of streaked electronic wavepackets, *Vladislav S. Yakovlev, Olga Smirnova, Ferdinand Bammer, Armin Scrinzi; Inst. of Photonics, Austria.* We present new techniques for complete direct reconstruction of an electronic wavepacket created by interaction of an attosecond light pulse with an atom, applicable for linear and oscillating laser streaking fields.

TuE38
Stimulated Brillouin scattering in ultrahigh-speed femtosecond soliton pulse compression with a dispersion-decreasing fiber, *Toshihiko Hirooka, Shinpei Ono, Ken-ichi Hagiuda, Masataka Nakazawa; Tohoku Univ., Japan*. We report that stimulated Brillouin scattering in a dispersion-decreasing fiber plays a very important role in ultrahigh-speed femtosecond soliton compression that exceeds 40-GHz. A stable 40-GHz, 100-fs pulse train was successfully generated by suppressing SBS.

TuE39
Linewidth and RIN measurements of longitudinal modes in ultrahigh-speed mode-locked laser diodes, *Kentaro Haneda[1], Hiroyuki Yokoyama[1], Yo Ogawa[2], Masataka Nakazawa[1]; [1]Tohoku Univ., Japan, [2]Oki Electric Industry Co., Japan.* The longitudinal linewidth and corresponding RIN of 10 and 40-GHz mode-locked laser-diodes is measured for the first time. The cavity Q-value is a dominant parameter of the linewidth. The mode-dependence of the RIN is observed.

TuE40
Tunable wavelength pulse shaping of visible NOPA outputs with an Acousto-Optic Programmable Dispersive Filter, *Daniel Kaplan[1], Pierre Tournois[2], Béatrice Chatel[3], Antoine Monmayrant[3]; [1]Fastlite, France, [2]Fastlife, France, [3]IRSAMC-UPS, France.* An Acousto-Optic Programmable Dispersive Filter is used to pulse shape a NOPA. We analyse limitations due to spectral dispersion, Kerr effect and acoustic attenuation. Better than 30 fs pulse duration is experimentally demonstrated.

TuE41
FROG measured 185 fs pulses generated by down-chirped dispersion-managed breathing-mode semiconductor laser, *Bojan Resan, Luis Archundia, Peter J. Delfyett, Jr.; School of Optics/CREOL & FPCE, Univ. of Central Florida, USA*. Linear down chirp compensation revealed 185 fs pulses measured by SHG-FROG generated from a dispersion-managed semiconductor mode-locked laser. Up or down chirping allows broader mode-locked spectra depending on the temporal and spectral semiconductor gain dynamics.

TuE42
Direct measurement of the group delay of ultrashort pulses utilizing molecular vibrations, *Pedro J. Rizo, Takayoshi Kobayashi; Univ. of Tokyo, Japan.* A new method for chirp characterization of ultrashort pulses utilizing pump-probe setup and detection system is demonstrated. Coherent intramolecular vibrations impulsively excited in neat liquids are used to measure the relative delay of femtosecond pulses.

TuE43
Evaluation of oscillation frequency stability of a diode laser using a fs laser optical comb, *Hiromichi Kobayashi[1], Toshiya Nimonji[1], Akihiko Sawamura[1], Takashi Sato[1], Masashi Ohkawa[1], Takeo Maruyama[1], Taizoh Yoshino[2], Hiroo Kunimori[2], Mizuhiko Hosokawa[2], Hiroyuki Ito[2], Ying Li[2], Shigeo Nagano[2], Seiji Kawamura[3]; [1]Niigata Univ., Japan, [2]Communication Res. Lab, Japan, [3]Natl. Astronomical Observatory, Japan.* We have stabilized the oscillation frequency of a diode laser using the Faraday effect of Rb absorption lines. The stabilized laser frequency was measured by means of a femtosecond mode-locked pulse laser optical comb generator.

TuE44
Charge generation in inorganic/ organic photovoltaic blends, *Sebastian Westenhoff, Sophia C. Hayes, Carlos Silva, Neil C. Greenham; Univ. of Cambridge, UK* . We apply ultrafast spectroscopy to investigate charge generation kinetics in blends of semiconducting polymers and cadmium selenide nanocrystals with photovoltaic applications. The rate is limited by diffusion of the primary excitons in the polymer network.

TuE45
Excitation of terahertz plasma oscillations in a field-effect heterostructure device by ultrashort optical pulses: Physics and modeling, *Victor Ryzhii[1], Irina Khmyrova[1], Maxim Ryzhii[1], Akira Satou[1], Taiichi Otsuji[2], Michael S. Shur[3]; [1]Univ. of Aizu, Japan, [2]Kyushu Inst. of Technology, Japan, [3]Rensselaer Polytechnic Inst., USA.* We report on the proposal and modeling of a heterostructure device similar to a field-effect transistor using optical excitation of electron plasma oscillations and intended for generation of terahertz signals.

TuE46
Ultrafast electrooptic deflector using quasi-velocity-matching, *Kyoji Shibuya, Shintaro Hisatake, Haruya Kitano, Tetsuro Kobayashi; Osaka Univ., Japan.* We propose an ultrafast electrooptic deflector using quasi-velocity-matching and demonstrate the beam deflection with the repetition of 16.25 GHz and the maximum resolvable spot number of 12.5.

TuE47
VO_2 nano-particles in silica: ultrafast phase transition and shape-dependent optical switching at 1.55 µm, *Matteo Rini[1], Andrea Cavalleri[1], Robert Schoenlein[1], Richard Haglund[2], Rene Lopez[2], leonard C. feldman[2], Lynn boatner[3], Tony Haynes[3]; [1]Lawrence Berkeley Natl. Lab, USA, [2]Vanderbilt Univ., USA, [3]Oak Ridge Natl. Lab, USA.* We report on the ultrafast insulator-metal phase transition of nanorods of VO_2 in Silica. The magnitude of the 1.55-µm, room temperature optical switching can be controlled by particle size and geometry.

TuE48
External generation of flat power envelope THz modulation sidebands from a CW laser based on electrooptic phase modulator, *Shintaro Hisatake, Yuko Nakase, Kyouji Shibuya, Masato Tobinaga, Tetsuro Kobayashi; Osaka Univ., Japan.* Generation of 50 sidebands spaced by 16.25 GHz within 3-dB bandwidth forming 1.7 ps pulses with 32.5 GHz repetition rate from a CW laser has been demonstrated.

TuE49
Ultrafast infrared pump probe spectroscopy reveals vibrational self-trapping in an α-helix, *Julian Edler, Peter Hamm; Univ. of Zürich, Switzerland.* Infrared pump probe experiments on the NH mode of an α-helix reveal two excited state absorption signals, which are an explicit indication of self-localized vibrational excitons.

TuE50
Molecular orientation of CH_3F induced by phase-controlled lights, *Hideki Ohmura, Fumiyuki Itoh, M. Tachiya; Natl. Inst. of Advanced Industrial Science and Technology, Japan.* We investigate molecular orientation of CH_3F induced by phase-controlled two-color pulses consisting of a fundamental pulse (ω) and its second harmonic pulse (2ω) with an intensity of 1.0×10^{12} W/cm^2 and a pulse-duration of 130 fs.

TuE51
Solvation dynamics of N-methylacetamide in D_2O, $CDCl_3$, and DMSO-d_6, *Matthew F. DeCamp, Justine M. McCracken, Andrei Tokmakoff; MIT, USA.* We study a.m.ide I vibrational solvation dynamics of N-methylacetamide in D_2O, $CDCl_3$, and DMSO-d_6. Three pulse photon echo and 2D-IR measurements characterize the frequency correlation function, which reflects fluctuating electric fields acting on the vibration.

TuE52
Energy flow in carotenoids, studied with pump-deplete-probe, multiphoton and coherent control spectroscopy, *Tiago Buckup[1], Wendel Wohlleben[1,2], Bjoern Heinz[1], Marcus Motzkus[1,2], Janne Savolainen[3], Jennifer L. Herek[3], Hideki Hashimoto[4], Richard J. Cogdell[5]; [1]Max-Planck-Inst. für Quantenoptik, Germany, [2]Philipps-Univ. of Marburg, Germany, [3]FOM-Inst. for Atomic and Molecular Physics, Netherlands, [4]Dept. of Physics, Osaka City Univ., Japan, [5]IBLS, Univ. Glasgow, UK .* We introduce alternative techniques to study unattributed carotenoid deactivation signals in broadband transient absorption. These are shaped VIS excitation, nonlinear IR excitation, or insertion of an additional IR depletion pulse to manipulate excited state population.

TuE53
Real-time spectroscopy of charge-transfer excitation in phthalocyanine tin dichloride, *Masakatsu Hirasawa, Yuzo Sakazaki, Hiroki Hane, Takayoshi Kobayashi; Dept. of Physics, Univ. of Tokyo, Japan.* Charge-transfer (CT)-excited state in phthalocyanine tin dichloride is observed by real-time vibrational spectroscopy with a 6-fs pulse laser. The main absorption (Q-band) has no obvious CT character in the primary stage of the photocarrier generation.

TuE54
Propagation and detection distortions of four-wave mixing signals: Application to 2D spectroscopy, *Nadia Belabas, David M. Jonas; Univ. of Colorado, USA.* We present a computationally efficient three dimensional Fourier transform algorithm for four-wave mixing signal calculation in optically dense samples of arbitrary nonlinear response. Memory effects and lineshape distortion on integrated and bidimensional signals are demonstrated.

TuE55
Coherent nuclear motion in reacting molecules: Ultrafast pump-probe spectroscopy of proton transfer in solution, *Satoshi Takeuchi, Tahei Tahara; Inst. of Physical and Chemical Res., Japan.* Time-resolved stimulated emission of 10-hydroxybenzoquinoline was measured with 27-fs resolution, showing beating features due to the excited-state wavepacket motion during the proton transfer. Coherent nuclear motion and its relation to the reaction coordinate are discussed.

TuE56
Exciton diffusion dynamics in an organic semiconductor nanostructure, *Clement Daniel[1], Carlos Silva[1], Laura M. Herz[1], David Beljonne[2], Freek J. Hoeben[3], Pascal Jonkheijm[3], Albertus P. Schenning[3], Bert W. Meijer[3]; [1]Univ. of Cambridge, UK , [2]Univ. of Mons-Hainaut, Belgium, [3]Eindhoven Univ. of Technology, Netherlands.* We present ultrafast studies and Monte Carlo simulations of exciton diffusion dynamics in isolated supramolecular helices of conjugated oligomers. We model ultrafast energy relaxation, depolarization, and exciton bimolecular annihilation dynamics with unprecedented molecular detail.

TuE57
Optimal control of femtosecond photoisomerization of retinal in rhodopsin: Effects of conical intersections, *Mayumi Abe[1], Yukiyoshi Ohtsuki[1], Yuichi Fujimura[1], Wolfgang Domcke[2]; [1]Tohoku Univ., Japan, [2]Technical Univ. of Munich, Germany.* Femtosecond laser pulses that control the photoisomerization of retinal in rhodopsin are numerically designed using quantum optimal control theory. Preparation of squeezed reactant packets through multiple electronic transitions is essential for creating localized product packets.

TuE58
Femtosecond pump-probe measurements of solvation dynamics of hydrogen-bonding complexes in non-associating solvents, *Dina Pines[1], Ehud Pines[1], Ying-Zhong Ma[2], Graham R. Fleming[3]; [1]Chemistry Dept., Israel, [2]Chemistry Dept. , Univ. of California at Berkeley, USA, [3]Chemistry Dept., Univ. of California at Berkeley, Lawrence Berkeley Natl. Lab, USA.* We present an ultrafast pump-probe study of solvation of hydrogen-bonding complexes in nonassociating solvents. Additional sub-100fs blue-shift was observed in HPTA-DMSO complexes over the solvation response of uncomplexed HPTA and that of its methoxy-derivative.

TuE59
Coherent control of non-radiative transitions: long-range electron transfer, *Boris D. Fainberg[1,2], Vladimir Gorbunov[1], Sheng H. Lin[3]; [1]Holon Academic Inst. of Technology, Dept. of Sciences, Israel, [2]Raymond and Beverly Sackler Faculty of Exact Sciences, School of Chemistry, Tel-Aviv Univ., Israel, [3]Inst. of Atomic and Molecular Science, Academia Sinica, Taiwan Republic of China.* We have extended the concepts and ideas of optical population transfer to radiationless transitions controlled with strong electromagnetic field. It provides a possibility to realize "non-radiative" analogies to pump-dump process and adiabatic rapid passage.

TuE60
Vibrational and electronic coherence observed in two-dimensional integrated three-pulse photon echo, *Yutaka Nagasawa, Mayu Ogasawara, Yukako Nakagawa, Yoshio Mori, Tadashi Okada, Hiroshi Miyasaka; Graduate School of Engineering Science, Osaka Univ., Japan.* Two-dimensional integrated three-pulse photon echo measurement was carried out on polyvinylalcohol and saccharide glasses at low temperature to investigate the effect of vibrational coherence on dephasing and rephasing of electronic coherence.

TuE61
Polaritonics in complex structures: Confinement, bandgap materials, and coherent control, *David W. Ward[1], Eric J. Statz[1], Jaime D. Beers[1], Thomas Feurer[1], John D. Joannopoulos[1], Keith A. Nelson[1], Ryan M. Roth[2], Richard M. Osgood[2], Kevin J. Webb[3]; [1]MIT, USA, [2]Columbia Univ., USA, [3]Purdue Univ., USA.* We report on the design, fabrication, and testing of ferroelectric patterned materials in the guided-wave and polaritonic regime. We demonstrate their functionality and exploit polariton confinement for a.m.plification and coherent control using temporal pulse shaping.

TuE62
Achromatic second harmonic generation: Tunable ultraviolet pulses with sub-10 fs duration, *Peter Baum, Stefan Lochbrunner, Eberhard Riedle; LS fürBioMolekulare Optik, Germany.* Achromatic frequency doubling has been used to generate tunable sub-10fs UV pulses. A simple 2+3-prism arrangement is sufficient for a 100nm spectrum with a Fourier limit of 2.9fs and a pulse compressed to 7.1fs.

TuE63
Spatially encoded spectral interferometry for complete characterisation of attosecond XUV pulses, *E. Cormier[1], I. A. Walmsley[2], E. M. Kosik[3,2], L. Corner[2], Louis F. DiMauro[4]; [1]CELIA, Univ. Bordeaux, France, [2]Clarendon Lab, Oxford Univ., UK , [3]Inst. of Optics, USA, [4]Brookhaven Natl. Lab, USA.* We propose a variant of the spectral phase interferometry for direct electric field reconstruction (SPIDER) technique for characterisation of attosecond pulses directly in the XUV by spatially encoding the phase information onto an interferogram.

TuE64
Spatially encoded spectral interferometry for complete characterization of ultrashort pulses, *Ellen M. Kosik[1,2], Aleksander S. Radunsky[1,2], Ian A. Walmsley[2], Christophe Dorrer[3]; [1]Inst. of Optics, Univ. of Rochester,USA, [2]Clarendon Lab, UK , [3]Bell Labs, Lucent Technologies, USA.* We present a modification of the SPIDER technique for characterizing ultrashort pulses with reduced spectrometer resolution and without the creation of identical replicas of the unknown pulse. This technique is ideal for ultra-broadband pulse characterization.

TuE65
Mechanism crossover of terahertz radiation from InAs surface induced by a magnetic field at high density excitation, *Makoto Nakajima[1], Yuji Oda[1], Tohru Suemoto[1], Shingo Saito[2]; [1]Inst. for Solid State Physics, Japan, [2]Kansai Advanced Res. Ctr., Japan.* The excitation-density dependence of the terahertz radiation from InAs surface under magnetic fields was investigated. A drastic change of the emitted waveforms was observed and was explained by the crossover of the radiation mechanism.

TuE66
Full characterization of ultraviolet and visible 10-fs pulses with zero-additional-phase SPIDER, *Peter Baum, Stefan Lochbrunner, Eberhard Riedle; LS fürBioMolekulare Optik, Germany.* The novel ZAP-SPIDER allows to fully characterize the temporal a.m.plitude and phase of the shortest ultraviolet and visible pulses available today. The pulse shape is measured directly at an experimental interaction point.

TuE67
Investigation on the parameters of dense electronic plasmainduced by femtosecond laser in fused silica, *Gong Qihuang Gong, Quan Sun, Choaxin Wu, Hong Yang, Honging Jiang; Peking Univ., China.* Electron plasma induced by femtosecond laser in fused silica was investigated by pump-probe time-

resolved shadow and interferometric imaging. Electron collision time is 1.7 fs at density around $10^{19}cm^{-3}$ and the plasma lifetime is 170fs.

Wednesday, July 28, 2004

8:00 a.m.–3:30 p.m.
Registration/Speaker and Presider Check-in

Marine Hall (4F)
8:15 a.m.–10:30 a.m.
WA • Photo-Induced Reaction Dynamics
Tahei Tahara; RIKEN, Japan, Presider

WA1 ● 8:15 a.m. Invited
Femtochemistry in the electronic groundstate: IR-Driven Cis-Trans isomerisation of HONO, *Peter Hamm; Univ. of Zürich, Switzerland.* The IR-driven *cis-trans*-isomerization of nitrous acid (HONO) is investigated. Quantum beats are observed which are discussed in terms of a common delocalized state connecting the *cis* and the *trans* configuration of the molecule.

WA2 ● 8:45 a.m.
Monitoring an ultrafast photo-isomerization by femtosecond fluorescence, absorption, and IR spectroscopy, *Peter Gilch, Bernhard Schmidt, Constanze Sobotta, Markus Braun, Florian Koller, Tobias Schrader, Arne Sieg, Wolfgang Schreier, Wolfgang Zinth; Sektion Physik, Ludwig-Maximilians-Univ. of Münich, Germany.* Four distinct stages (motion on an excited state surface, internal conversion, vibrational cooling and slow structural re-arrangements) of the photo-isomerization of an azobenzene are identified by combination of femtosecond fluorescence, absorption, and IR techniques.

WA3 ● 9:00 a.m.
Measurement of conical intersection dynamics by impulsive femtosecond polarization spectroscopy, *Darcie A. Farrow, Wei Qian, Eric Ryan Smith, David M. Jonas; Dept. of Chemistry and Biochemistry, Univ. of Colorado, USA.* The ~100 fs anisotropy decay from 0.4 toward 0.1 after excitation of a degenerate transition in a square molecule can be predicted from quantum beats of asymmetric vibrations and curve crossing at a conical intersection.

WA4 ● 9:15 a.m.
Teaching lasers to twist molecules, *Gerhard Vogt, Gerhard Krampert, Patrick Niklaus, Fabrizio Santoro, Gustav Gerber; Physikalisches Inst., Univ. Würzburg, Germany.* We report on optimal control of the photoisomerization reaction of 3,3-diethyl-2,2-thiacyanine iodide (NK88) dissolved in methanol. Enhancement as well as reduction of the relative yield of cis- to trans-isomers are achieved.

WA5 ● 9:30 a.m. Invited
Ultrafast double proton transfer: Symmetry breaking wavepacket motion and absence of deuterium isotope effect, *Stefan Lochbrunner, Kai Stock, Christian Schiever, Eberhard Riedle; Ludwig-Maximilians-Univ., Germany.* Coherent excitation of an optically inactive vibration solely by an ultrafast photochemical reaction is found in double proton transfer of [2,2'-Bipyridyl]-3,3'-diol. Absence of a deuterium isotope effect proofs the dominant role of skeletal modes.

WA6 ● 10:00 a.m. Invited
Bimodal intermolecular proton transfer in acid-base neutralization reactions in water, *Matteo Rini[1], Omar F. Mohammed[1], Jens Dreyer[1], Erik T. Nibbering[1], Ben-Zion Magnes[2], Dina Pines[2], Ehud Pines[2]; [1]Max Born Inst., Germany, [2]Ben Gurion Univ. of the Negev, Israel.* We present an ultrafast mid-infrared study of excited-state intermolecular proton transfer in photoacid-base pairs in water. Observation of bimodal reaction dynamics demand refinement of the established Eigen-Weller mechanism.

10:30 a.m.–11:00 a.m.
Coffee Break

Marine Hall (4F)
11:00 a.m.–1:00 p.m.
WB • Imaging and Terahertz
X.C. Zhang, Rensselaer Polytechnic Inst., USA, Presider

WB1 ● 11:00 a.m.
Real-time, ultrahigh resolution optical coherence tomography at 1.5 um using a femtosecond fiber laser continuum, *Norihiko Nishizawa, Yu Chen, Pei-Lin Hsiung, Vikas Sharma, Tony H. Ko, Erich P. Ippen, James G. Fujimoto; MIT, Res. Lab. of Electronics, USA.* Ultrahigh resolution, real-time OCT is demonstrated with <5.4 um resolution in tissue at 1.4-1.7 um wavelengths using a high power continuum generated by a modelocked stretched-pulse Er-doped fiber laser and highly nonlinear fiber.

WB2 ● 11:15 a.m.
Selective two-photon functional imaging through scattering media based on binary phase shaping, *Igor Pastirk, Johanna M. Dela Cruz, Vadim V. Lozovoy, Marcos Dantus; Michigan State Univ., USA.* We demonstrate experimentally selective two-photon functional imaging through a scattering medium, (a thin slab of chicken), based on concepts of coherent control. The selectivity, achieved using binary phase shaping, is maintained by the ballistic photons.

WB3 ● 11:30 a.m.
Engineering cost function for optimizing coherent control between processes with different nonlinearities, *Jianfang Chen[1,2], Yasuo Nabekawa[1,2], Katsumi Midorikawa[1,2], Hiroyuki Kawano[3], Hideaki Mizuno[3], Atsushi Miyawaki[3], Takasumi Tanabe[4], Fumihiko Kannari[4]; [1]Laser Technology Lab, RIKEN, Japan, [2]Saitama Univ., Japan, [3]Brain Science Inst., RIKEN, Japan, [4]Keio Univ., Japan.* We apply coherent control to enhance the contrast between two-photon absorption of fluorescent label and three-photon absorption of biomaterial with engineered cost function, leading to reduced three-photon absorption without loss of valuable two-photon fluorescence.

WB4 ● 11:45 a.m.
Two-photon absorption imaging with shaped femtosecond laser pulses, *Warren S. Warren[2,1], Anthony Miller[2], Wolfgang Wagner[3], Tong Ye[1], Martin Fischer[1], Gunay Yurtsever[1]; [1]Univ. of Pennsylvania, USA, [2]Princeton Univ., USA, [3]Rutgers Univ., USA* Femtosecond laser pulse shaping permits background-free detection of two-photon absorption, which tends to refill spectral holes. This opens up new spectroscopic windows for monitoring tissue characteristics.

WB5 ● 12:00 p.m.
Single-shot terahertz imaging, *Rakchanok Rungsawang[1], A. Mochiduki[2], S. Okuma[2], T. Hattori[2]; [1]Inst. of Applied Physics, Univ. of Tsukuba, Japan, [2]Inst. of Applied Physics, Japan.* Terahertz imaging with single-shot detection was conducted. This enables observing ultrafast phenomena at a rate of 1000 frames/s. A large-aperture photoconductive antenna was used to generate large-dimension and powerful THz field.

WB6 ● 12:15 p.m.
Magnetically controlled 2π liquid crystal Terahertz phase shifter, *Chao-Yuan Chen[1], Cho-Fan Hsieh[2], Ru-Pin Chao[2], Ci-Ling Pan[1]; [1]Inst. of Electro-Optical Engineering, Natl. Chiao Tung Univ., Taiwan Republic of China, [2]Dept. of Electrophysics, Natl. Chiao Tung Univ., Taiwan Republic of China.* Tunable phase shift up to 2π at 1 THz is achieved with a liquid-crystal device. A sandwiched LC cell is used in this work. This device can be operated over a broad range (-10º~61º).

WB7 ● 12:30 p.m.
Transient grating generation and waveform shaping of free-space propagating, picosecond, narrow-band THz radiation, *Andrei G. Stepanov[1], Janos Hebling[2], Jürgen Kuhl[1]; [1]Max Planck Inst. for Solid State Res., Germany, [2]Res. Group of Nonlinear and Quantum Optics, Hungarian Acad. of Sciences, and Dept. of Experimental Physics, Univ. of Pécs, Hungary.*We demonstrate the generation and waveform

shaping of free-space propagating, picosecond, narrow-band, tunable THz radiation via a transient polarization grating induced by two femtosecond pulses in a $LiNbO_3$ crystal. The generation efficiency is discussed.

WB8 • 12:45 p.m.
Ultrabroadband detection of multi-THz field transients with GaSe electro-optic sensors, *C. Kübler[1], R. Huber[2], S. Tübel[2], A. Leitenstorfer[1]; [1]Fachbereich Physik, Univ. of Konstanz, Germany, [2]Physik-Dept. E11, Technische Univ. of Münich, Germany.* Electro-optic detection with unprecedented bandwidth is implemented with GaSe sensors by phase matching. We directly record transform-limited 28-fs pulses containing spectral components beyond 120 THz. Continuous tunability is demonstrated between 14 THz and 31 THz.

1:00 p.m.–2:00 p.m.
Lunch Break (on your own)

Marine Hall (4F)
2:00 p.m.–3:30 p.m.
WC • Phonons
Hrvoje Petek; Univ. of Pittsburgh, USA, Presider

WC1 • 2:00 p.m. Invited
Imaging nanostructures with picosecond ultrasonic pulses, *Brian C. Daly[1], Niels C. Holme[1], Takashi Buma[1], Cyril Branciard[1], Theodore B. Norris[1], Stanley Pau[2], Donald M. Tennant[2], Joseph A. Taylor[2], John E. Bower[2]; [1]Univ. of Michigan, USA, [2]Bell Labs, Lucent Technologies, USA.* We describe a novel imaging technique that employs coherent acoustic phonon pulses which are generated and detected by ultrafast optical methods. Sub-micron resolution images of Al patterns lithographically etched on a Si substrate are shown.

WC2 • 2:30 p.m.
Ultrahigh frequency acoustic phonon generation and spectroscopy with Deathstar pulseshaping, *Jaime D. Beers, Masashi Yamaguchi, Thomas Feurer, Benjamin J. Paxton, Keith A. Nelson; MIT, USA.* A novel pulse shaping technique is used to generate tunable multiple-cycle acoustic waves with 5-500 GHz frequencies. These are used for study of nanoscale inhomogeneities and dynamics in a.m.orphous materials.

WC3 • 2:45 p.m.
Probing of thermal acoustic transients in materials using EUV radiation, *Ra'anan I. Tobey[1], Erez H. Gershgoren[1], Mark E. Siemens[1], Henry C. Kapteyn[1], Margaret M. Murnane[1], Thomas Feurer[2], Keith A. Nelson[2]; [1]JILA, Univ. of Colorado, USA, [2]MIT, USA.* The first application of EUV high-harmonic light to probe the nonlinear optical photoacoustic response of a sample is reported. This will enable measurements of thermal and acoustic transients in materials with sub-100nm resolution and wavelength.

WC4 • 3:00 p.m.
Ultrafast dynamics of coherent electron-phonon interaction in silicon, *Masahiro Kitajima[1,2], Muneaki Hase[1,3], Anka M. Constantinescu[3], Hrvoje Petek[3]; [1]Natl. Inst. for Materials Science, Japan, [2]Univ. of Tsukuba, Japan, [3]Univ. of Pittsburgh, USA.* A coherent response of silicon to excitation with a 10-femtosecond laser pulse is reported. Transforming the transient reflectivity signal into frequency-time space reveals the carrier-phonon interactions leading to the coherent phonon generation.

WC5 • 3:15 p.m.
Ultrafast near edge X-ray absorption measurement of the insulator-to-metal transition in VO_2, *Andrea Cavalleri[1], Henry Chong[1], Sylvain Fourmaux[2], Ernie Glover[1], Philip Heimann[1], Jean Claude Kieffer[2], Howard Padmore[1], Robert Schoenlein[1]; [1]Lawrence Berkeley Natl. Lab, USA, [2]Univ. du Quebec, Canada.* We measure the insulator-to-metal transition in VO2 using time-resolved Near-Edge X-ray Absorption. Picosecond pulses of synchrotron radiation are used to detect the red-shift in the Vanadium L3 edge at 516 eV, associated with bandgap collapse.

4:00 p.m.–6:00 p.m.
Excursion (ticket required)

6:00 p.m.–8:00 p.m.
Banquet

Thursday, July 29, 2004

8:00 a.m.–5:00 p.m.
Registration/Speaker and Presider Check-in

Marine Hall (4F)
8:15 a.m.–10:30 a.m.
ThA • Ultrafast Processes in Organic Materials
Jean-Yves Bigot; Inst. de Physique et Chimie des Materiaux de Strasbourg, France, Presider

ThA1 ● 8:15 a.m.
Sub-20-fs study of energy relaxation in carotenoids in solution and inside light-harvesting complexes, *Giulio Cerullo[1], Dario Polli[1], Guglielmo Lanzani[1], Hideki Hashimoto[2], Richard J. Cogdell[3]; [1]Politecnico di Milano, Italy, [2]Dept. of Physics, Osaka City Univ., Japan, [3]Div. of Biochemistry and Molecular Biology, Univ. of Glasgow, UK.* Using sub-20-fs pulses, tunable from the UV to the IR, we study the S2-->S1 internal conversion dynamics in several carotenoids. We resolve an intermediate excited state and directly determine the energy transfer efficiency to bacteriochlorophylls.

ThA2 ● 8:45 a.m.
Real time tracking of the peaks in transition difference spectra during vibrational periods in PDA, *Yoshiharu Yuasa[1], Mitsuhiro Ikuta[1], Takayoshi Kobayashi[1], Tatsumi Kimura[2], Hiroo Matsuda[2]; [1]Dept. of Physics, Univ. of Tokyo, Japan, [2]Natl. Inst. of Advanced Industrial Science and Technology, Japan.* Molecular dynamics are investigated using spectrally resoled pump-probe measurement. Stokes shift associated with geometrical relaxation and electronic spectral change caused by lattice vibration are directly observed in time by a novel peak-energy tracing method.

ThA3 ● 9:00 a.m.
Ultrafast charge photogeneration and exciton regeneration at polymeric semiconductor heterojunctions, *Arne C. Morteani[1], Paiboon Sreearunothai[1], Laura M. Herz[2], Richard H. Friend[1], Carlos Silva[1]; [1]Univ. of Cambridge, UK , [2]Univ. of Oxford, UK.* We investigate photoexcitation dynamics in blends of electron and hole transporting conjugated polymers. Excitons that dissociate at the heterojunction can be regenerated efficiently via geminate-pair recombination and endothermic energy transfer from intermediate exciplex states.

ThA4 ● 9:15 a.m.
Ultrafast exciton transport in organic nanotubes, *Audrius Pugzlys, Pieter R. Hania, Catalin Didraga, Victor A. Malyshev, Jasper Knoester, Koos Duppen; Univ. of Groningen, Netherlands.* Exciton dynamics between the inner and outer walls of double-layer cylindrical aggregates is measured. Downhill transport is fast (275 fs) and excitation intensity independent. Uphill transport is much slower (3.5 ps) and involves exciton-exciton annihilation.

ThA5 ● 9:30 a.m.
Ultrafast molecule to semiconductor electron transfer via different anchor groups in ultra-high-vacuum, *Rainer Eichberger; Hahn-Meitner-Inst., Germany.* Electron transfer in the wide band limit occurs from the donor perylene to TiO2 via the carboxyl group in 13 fs and via the phosphonate group in 28 fs.

ThA6 ● 9:45 a.m.
Energy transfer in phenylene ethynylene dendrimers, *Evrim Atas[1], Chad E. Mair[1], Joseph S. Melinger[2], Zhonghua Peng[3], Valeria D. Kleiman[1]; [1]Univ. of Florida, USA, [2]NRL, USA, [3]Univ. of Missouri at Kansas City, USA.* Ultrafast energy transfer in dendritic phenylene ethynylene molecules has been investigated using both transient absorption and fluorescence up-conversion. The nature of electronic excitations and the mechanisms directing the excitation energy to the trap are discussed.

ThA7 ● 10:00 a.m.
From ultrafast spectroscopy to bidirectional molecular switches: Dihydroazulene / vinylheptafulvene, *Ulrich Schmidhammer[1], Vincent de Waele[1], Guy Butinx[2], Eberhard Riedle[1]; [1]LS fürBioMolekulare Optik, Germany, [2]LASIR (UMR 8516), France.* The primary mechanism of photoconversion is investigated for two dihydroazulenes with sub-30fs UV and visible pulses. The back reaction, that is normally not accessible optically, can be achieved with a second pulse delayed by 25ps.

ThA8 ● 10:15 a.m.
Novel time- and frequency-resolved double pump spectroscopy of short-lived precursors: The solvated electron in methanol, *Andy Thaller, Robert Laenen, Alfred Laubereau; Technical Univ. Münich, Germany.* A combined investigation of the generation process and relaxation dynamics after reexcitation of intermediates of solvated electrons is presented. The experimental technique provides a much more detailed picture of charge separation in methanol.

10:30 a.m.–11:00 a.m.
Coffee Break

Marine Hall (4F)
11:00 a.m.–1:00 p.m.
ThB • High Order Harmonics and Phase Effects
Katsumi Midorikawa; RIKEN, Japan, Presider

ThB1 ● 11:00 a.m. Invited
Quasi-phase matching of high harmonic generation in the "water window" soft x-ray region, *Emily A. Gibson[1], Ariel Paul[1], Sterling Backus[1], Ra'anan Tobey[1], Margaret M. Murnane[1], Henry C. Kapteyn[1], Ivan P. Christov[2]; [1]JILA, Univ. of Colorado, USA, [2]Dept. of Physics, Sofia Univ., Bulgaria.* We demonstrate that high-order harmonic generation can be phase-matched in the "water window" region of the spectrum around 300eV using hollow fibers with a periodically modulated diameter.

ThB2 ● 11:30 a.m.
Adaptive engineering of coherent soft x-rays, *Thomas Pfeifer, Dominik Walter, Carsten Winterfeldt, Christian Spielmann, Gustav Gerber; Physikalisches Inst., Univ. of Würzburg, Germany.* We demonstrate the generation of arbitrarily shaped spectra of coherent soft x-rays by adaptive control of the driving laser pulses. These are the first steps towards coherent control in the soft x-ray and attosecond-pulse shaping.

ThB3 ● 11:45 a.m.
Phase-driven strong-field processes in the multi-optical-cycle regime, *Giuseppe Sansone[1], Salvatore Stagira[1], Mauro Nisoli[1], Sandro De Silvestri[1], Caterina Vozzi[2], Michele Pascolini[3], Luca Poletto[3], Paolo Villoresi[3], Giuseppe Tondello[3]; [1]Politecnico di Milano, Italy, [2]Univ. degli Studi, Italy, [3]Univ. di Padova, Italy.* For the first time we show, both experimentally and theoretically, that the strong-field processes involved in high-order harmonic generation are significantly affected by the pulse carrier-envelope phase even in the multi-optical-cycle regime.

ThB4 ● 12:00 p.m.
Generation of strong soft x-ray field based on high-order harmonics, *Hiroki Mashiko[1,2], Akira Suda[2], Katsumi Midorikawa[1,2], [1]RIKEN, Japan, [2]Saitama Univ., Japan.* We have generated strong soft x-ray field based on high-order harmonics. The highest intensity at 29.6 nm is 1 x 1014 W/cm2.

ThB5 ● 12:15 p.m. Invited
Generation of sub 4-fs high harmonic pulses and their application to the above-threshold ionization, *Taro Sekikawa, Atsushi Kosuge, Teruto Kanai, Shuntaro Watanabe; Univ. of Tokyo, Japan.* Sub 4-fs high harmonic pulses with a photon energy of 27.9 eV were fully characterized by cross-correlation frequency resolved optical gating technique. Above-threshold ionization by the high harmonic pulses was observed.

ThB6 ● 12:45 p.m.
Spatiotemporal determination of the absolute phase of few-cycle laser pulses, *Fabrizio Lindner[1], Gerhard Paulus[2,3], Herbert Walther[1,3], Andrius Baltuska[4], Eleftherios Goulielmakis[4], Matthias Lezius[4,5], Ferenc Krausz[1,4]; [1]Max-Planck-Inst. für Quantenoptik, Germany, [2]Dept. of Physics, Texas A & M Univ., USA, [3]Sektion Physik, Ludwig-Maximilians-Univ., Germany, [4]Inst. für Photonik, Technische Univ.of Wien, Austria, [5]Inst. für Ionenphysik, Univ. of Innsbruck, Austria.* We determined the carrier-envelope phase of few-cycle laser pulses by measuring the photoionization asymmetry from xenon. The Gouy phase shift is also measured, providing the first full spatiotemporal depiction of the light pulse's electric field.

1:00 p.m.–2:30 p.m.
Lunch Break (on your own)

Marine Hall (4F)
2:30 p.m.–4:30 p.m.
ThC • Biology
Graham R. Fleming; Univ. of California at Berkeley, USA, Presider

ThC1 ● 2:30 p.m. Invited
Watching proteins function with picosecond time-resolved X-ray crystallography, *Philip A. Anfinrud[1], Friedrich Schotte[1], Michael Wulff[2]; [1]NIH, USA, [2]European Synchrotron and Radiation Facility, France.* The structural changes associated with ligand translocation in myoglobin and its L29F mutant have been determined with time-resolved X-ray crystallography and rendered in molecular movies with < 2-Å spatial resolution and < 150-ps time resolution.

ThC2 ● 3:00 p.m.
Direct observations of ligand rebinding trajectories in myoglobin by femtosecond mid-IR spectroscopy, *Manho Lim, Seongheun Kim; Pusan Natl. Univ., Republic of Korea.* The rebinding dynamics of NO in photolyzed MbNO are investigated by femtosecond mid-IR spectroscopy. The spectra with conformer-specific kinetics reveal the details of ligand binding trajectories and suggest that the conformational relaxation controls ligand-binding barrier.

ThC3 ● 3:15 p.m.
Ultrafast polarization and vibrational motions in bacteriorhodopsin studied by coherent infrared emission spectroscopy, *Anne Colonna[1], Jean-Christophe Lambry[1], Manuel Joffre[1], Jean-Louis Martin[1], Marten H. Vos[1], Géza I. Groma[2]; [1]Lab for Optical Biosciences, France, [2]Inst. of Biophysics, Biological Res. Ctr. of the Hungarian Acad. , Hungary.* The primary events in bacteriorhodopsin are investigated by coherent infrared emission spectroscopy of oriented purple membranes. Longlived vibrational motions involving charge displacements are observed following sudden (<11 fs) macroscopic membrane polarization appearing upon visible excitation.

ThC4 ● 3:30 p.m.
Energy transfer pathways in Photosystem I studied by one and two color photon echo spectroscopy, *Jens Stenger[1], Harsha M. Vaswani[1], Mino Yang[2], Petra Fromme[3], Graham R. Fleming[1]; [1]Lawrence Berkeley Natl. Lab and Univ. of California at Berkeley, USA, [2]Chungbuk Natl. Univ., Republic of Korea, [3]Arizona State Univ., USA.* One and two color three pulse photon echo spectroscopy is used to probe ultrafast energy transfer, energetic disorder and correlation between the 96 non-equivalent chlorophylls in the photosynthetic light-harvesting complex Photosystem I.

ThC5 • 3:45 p.m.
Entire view of coherent oscillations in ultrafast fluorescence for photoactive yellow protein, *Ryosuke Nakamura[1], Norio Hamada[1], Hideki Ichida[1], Yasuo Kanematsu[1], Fumio Tokunaga[2]; [1]JST-CREST, Venture Business Lab, Osaka Univ., Japan, [2]JST-CREST, Osaka Univ., Japan.* Remarkable oscillatory components are observed in the 2-dimentional time-wavelength map of ultrafast fluorescence for photoactive yellow protein, by using the optical Kerr gating system with 180-fs time resolution and 5-nm spectral resolution.

ThC6 • 4:00 p.m.
Carotenoid excited state dynamics explored with multi-pulse transient absorption, *Emmanouil Papagiannakis, Delmar S. Larsen, Mikas Vengris, Ivo H.M. van Stokkum, Rienk van Grondelle; Vrije Univ., Netherlands.* Pump-dump-probe and pump-repump-probe transient-absorption experiments with broad-band detection have allowed the identification of a hitherto unknown relaxation pathway in β-carotene after high-energy excitation, and the disentanglement of the S_1 and intramolecular-charge-transfer states of peridinin.

ThC7 • 4:15 p.m.
Observation and control of all-*trans*-β-carotene wavepacket motion using pump-degenerate four-wave mixing, *Thomas Hornung[1,2], Hrvoje Skenderović[2], Karl-Ludwig Kompa[2], Marcus Motzkus[2,3]; [1]MIT, USA, [2]Max-Planck-Inst. für Quantenoptik, Germany, [3]Philipps-Univ., Germany.* Wavepacket dynamics on the ground and optically dark, first electronic state of all-*trans*-β-carotene are studied with 16 fs time resolution using pump-degenerate four-wave mixing spectroscopy. Moreover control over the vibrational ground state modes is shown.

4:30 p.m.–5:00 p.m.
Coffee Break

Rooms 301 and 302
5:00 p.m.–6:30 p.m.
ThD • Poster Session III (Exhibition)

ThD1
Typesetting THz waveforms, *Joshua C. Vaughan, T. Feurer, Thomas Hornung, Keith A. Nelson; MIT, USA.* We demonstrate temporal-shaping of THz waveforms in $LiNbO_3$ by spatially shaping femtosecond excitation pulses with a spatial-light modulator. The generated THz waveforms are approximately proportional to the first spatial derivative of the excitation beam profile.

ThD2
Femtosecond synchronization of RF-signals with optical pulse trains, *Jung-Won Kim, Michael H. Perrott, Franz X. Kaertner; MIT, USA.* A synchronization scheme for extraction of low jitter RF-signals from optical pulse trains, which is robust against photo-detector nonlinearities, is described. Sub-100fs timing jitter between the extracted RF-signal and a 100MHz pulse train is demonstrated.

ThD3
Bright high-order harmonic generation at 13 nm and coherence measurement, *Hyung Taek Kim, I.J. Kim, V. Tosa, Y.S. Lee, C.H. Nam; Korea Advanced Inst. of Science and Technology, Republic of Korea.* Bright high-order harmonic generation at 13 nm was achieved by utilizing self-guided and chirped laser pulses in a 9-mm long Ne gas jet. The spatial coherence of the bright harmonics was measured by double-pinhole interference.

ThD4
Towards electric field reconstruction using coherent transients in a two-level system, *Antoine Monmayrant, Beatrice Chatel, Bertrand Girard; LCAR-IRSAMC-CNRS, France.* Interaction between a two-level system and a weak chirped pulse leads to oscillations of the excited state amplitude, named "coherent transients". Their extreme sensitivity to the pulse shape provides a tool for electric field measurement.

ThD5
Ultrabroadband terahertz field detection by proton-bombarded InP photoconductive antennas, *Tze-An Liu[1], Ci-Ling Pan[1], Masahiko Tani[2], Makoto Nakajima[2], Masanori Hangyo[2], Kiyomi Sakai[3], Shin-Ichi Nakashima[4]; [1]Inst. of Electro-Optical Engineering, Natl. Chiao Tung Univ., Taiwan Republic of China, [2]Res. Ctr. for Superconductor Photonics, Osaka Univ., Japan, [3]Kansai Advanced Res. Ctr., Communications Res. Lab, Japan, [4]Natl. Inst. of Advanced Industrial Science and Technology, Power Electronics Res. Ctr., Japan.* Detection of ultrabroadband THz radiation with photoconductive antennas fabricated on proton-bombarded InP ($InP:H^+$) substrates has been investigated. A promising result was obtained for the $InP:H^+$ photoconductive antenna with a proton dosage of $1x10^{15}$ ions/cm^2.

ThD6
Attosecond pulse generation during the laser pulse reflection at the plasma-vacuum interface, *Alexander S. Pirozhkov, Hiroyuki Daido, Sergei V. Bulanov; Advanced Photon Res. Ctr., JAERI, Japan.* We demonstrate the dependence of high-order harmonic generation and attosecond pulse formation during the laser – overdense plasma interaction on the carrier-envelope phase.

ThD7
Control of spectral broadening of tens milli Joule laser pulses in argon-filled hollow fiber using conjugate pressure gradient, *Muhammad Nurhuda[1], Akira Suda[2], Katsumi Midorikawa[2]; [1]Physics Dept., Brawijaya Univ., Malang, Indonesia, [2]RIKEN (Inst. of Physical and Chemical Res.), Japan.* A proposal for spectral broadening of tens milli Joule femtosecond laser pulses in argon-filled hollow fiber will be presented. The simulation results show that the plasma-induced spectral broadening can be controlled using pressure gradient method.

ThD8
Experimental and theoretical study of a visible noncollinear optical parametric amplified pulse with 200 THz bandwidth, *Xiaojun Fang[1], Takayoshi Kobayashi[2]; [1]Kobayashi Res. Group, Dept. of Physics, Univ. of Tokyo, Japan, [2]Dept. of Physics, Univ. of Tokyo, Japan.* We numerically simulated the operation of a visible beta-barium borate noncollinear phase-matching optical parametric a.m.plifier (NOPA) pumped by a frequency-doubled 1-kHz Ti:sapphire amplifier. The theoretical results almost perfectly match the experimental results.

ThD9
Excitation wavelength dependence of the proton transfer reaction of WT-Green Fluorescent Protein, *Dan I. Huppert, Pavel Leiderman, Moran Ben-Ziv, Liat Genosar, Lior Cohen; Tel-Aviv Univ., Israel.* Pump probe and photon counting were used to measure the proton transfer of WT-GFP excited by either 266 nm or 400 nm femtosecond pulses. The proton transfer rate is slower when excited by 266 nm.

ThD10
Controllability in dissociative ionization of organic molecules with pulse-shaped intense laser fields, *Hiroki Yazawa[1], Tatsuyoshi Okamoto[1], Takasumi Tanabe[1], Mio Yamanaka[1], Fumihiko Kannari[1], Ryuji Itakura[2], Kaoru Yamanouchi[2]; [1]Keio Univ., Japan, [2]Univ. of Tokyo, Japan.* Fragmentations at dissociative ionization of various molecules in intense laser fields are investigated. Some yield ratios exhibit monotonous changes against the laser pulse width. Fine pulse shape does not affect those fragmentations.

ThD11
Coherent nuclear dynamics coupled with electron transfer reaction in porphyrin-ferrocence dyads, *Satoru Nakashima[1], Minoru Kubo[1], Masana Otani[1], Msataka Murakami[1], T. Ishibashi[1], Masakazu Yasuda[1], Hiroshi Miyasaka[1], Yukie Mori[2], Hiroshi Imahori[2]; [1]Osaka Univ., Japan, [2]Kyoto Univ., Japan.* We report coherent nuclear dynamics coupled with photoinduced electron transfer using a newly designed donor-acceptor system with a strong electronic coupling. The reaction coordinate involve coherent intramolecular motions of the selective modes.

ThD12
Exciton dynamics in pentacene and tetracene studied using optical pump-probe spectroscopy, *Verner K. Thorsmolle[1], Richard D. Averitt[1], Jure Demsar[1], Darryl L. Smith[1], Antoinette J. Taylor[1], Xiaoliu Chi[2], Arthur P. Ramirez[3]; [1]Los Alamos Natl. Lab, USA, [2]Columbia Univ., USA, [3]Bell Labs, Lucent Technologies, USA.* We present room temperature photoinduced reflection and transmission measurements in pentacene and tetracene single crystals using optical pump-probe spectroscopy. Singlet exciton recombination, singlet-triplet fission, excited singlet, and triplet state absorption is observed.

ThD13
Subpicosecond pulse radiolysis study on geminate ion recombination process in n-dodecane, *Yoichi Yoshida, A. Saeki, T. Kozawa, J. Yang, S. Tagawa; Osaka Univ., Japan.* The geminate ion recombination process in n-dodecane was studied by using the subpicosecond pulse radiolysis. The geminate decay within 50 ps could not explained by the Smoluchowski equation based on the diffusion theory.

ThD14
Quantum control of a chiral molecular motor driven by linearly polarized laser pulses, *Masahiro Yamaki[1], Yukiyoshi Ohtsuki[1], Hirohiko Kono[1], Yuichi Fujimura[1], Kunihito Hoki[2]; [1]Dept. of Chemistry, Tohoku Univ., Japan, [2]Dept. of Chemistry, Univ. of Toronto, Canada.* We demonstrate quantum control of a chiral molecular motor driven by linearly polarized ultrashort laser pulses. Electric fields of laser pulses to drive the motor in desired directions are designed using a quantum control method.

ThD15
Broadband high power optical chirped pulse amplification, *Nobuhisa Ishii[1,2], Rytis Butkus[3], Andrius Baltuska[1,2], Valerijus Smilgevicius[3], Romualdas Danielius[3], Algis Piskarskas[3], Ferenc Krausz[2,4]; [1]Inst. of Photonics, Technical Univ. of Vienna, Austria, [2]Quantum Optics of Max-Planck-Inst., Austria, [3]Quantum Electronics Dept. & Laser Res. Ctr., Vilnius Univ., Lithuania, [4]Quantum Optics of Max-Planck-Inst., Germany.* We report a 110-THz 8-mJ non-collinear optical parametric chirped pulse a.m.plification in type I BBO. The seed laser was actively synchronized with a picosecond Nd:YAG pump laser.

ThD16
2.8-fs transform-limited optical-pulse generation and characterization, *Keisaku Yamane, Toshihiko Kito, Ryuji Morita, Mikio Yamashita; Hokkaido Univ., Japan.* We compensated for chirp of ultrabroad-band pulses with an over-one-octave bandwidth (460 – 1060 nm) using a feedback method. Consequently, 2.8-fs, 1.46-cycle transform-limited pulses were generated.

ThD17
Incoherent manipulation of the photoactive yellow protein photocycle with dispersed pump-dump-probe spectroscopy, *Delmar S. Larsen[1], Ivo H.M. van Stokkum[1], Mikas Vengris[1], Frank L. de Weerd[1], Rienk van Grondelle[1], Michael van der Horst[2], Klaas J. Hellingwerf[2]; [1]Free Univ. Amsterdam, Netherlands, [2]Swammerdam Inst. for Life Sciences, Netherlands.* The dynamics responsible for triggering the Photoactive Yellow Protein photocycle have been disentangled with the dispersed ultrafast pump-dump-probe spectroscopy technique, where the photocycle can be started and interrupted with appropriately tuned and timed laser pulses.

ThD18
Backbone folding and fluctuation dynamics of a dipeptide in membrane environment, *Victor Volkov; Physical Chemistry Inst., Univ. of Zürich, Switzerland.* Spectral and temporal analysis of diagonal and cross peaks in two-dimensional infrared response from Trp-Ala-Alkyl didpeptide, indicate a change in structure and in ultra-fast backbone dynamics when the molecule inserts into a membrane.

ThD19
Restricted rotational motion of CO in a protein internal cavity: Observation of non-separating four-point correlation functions by IR pump-probe spectroscopy, *Jan Helbing[1], Peter Hamm[1], Karin Nienhaus[2], Ulrich Nienhaus[3,2]; [1]Univ. of Zürich, Switzerland, [2]Univ. of Ulm, Germany, [3]Univ. of Illinois, USA.* Polarization-dependent transient infrared spectroscopy probes the restricted ultrafast orientational

motion of CO inside the Xe4 cavity of myoglobin. The four-point correlation function $\langle\mu(0)\mu(0)\mu(T)\mu(T+t)\rangle$ does not factorize and only its full evaluation reproduces the observed anisotropies.

ThD20
Laser Coulomb explosion imaging for probing molecular structure and dynamics, *Francois Legare[1], Kevin F. Lee[2], Patrick W. Dooley[3], Igor V. Litvinyuk[4], David M. Villeneuve[3], Andre D. Bandrauk[1], Paul B. Corkum[3]; [1]Univ. de Sherbrooke, Canada, [2]McMaster Univ., Canada, [3]Natl. Res. Council Canada, Canada, [4]Kansas State Univ., USA.* We measure molecular structure of D_2O and SO_2 with ~0.3-Angstrom resolution using laser Coulomb explosion imaging. Exciting a vibrational wave packet we observe 3-D molecular dynamics with sub-5fs resolution.

ThD21
Ultrafast IR spectroscopy on aqueous reverse-micellar nano-droplets, *Jörg Lindner[1], Peter Vöhringer[1], Dan Cringus[2], Maaike Milder[2], Maxim S. Pshenichnikov[2], Douwe A. Wiersma[2]; [1]Univ. Louis Pasteur, Faculté de Chimie, France, [2]Dept. of Chemistry, Univ. of Groningen, Netherlands.*The ultrafast dynamics of water nano-droplets (1-10 nm size) of the L_2-phase of the ternary mixture H_2O-AOT-CCl_4 have been studied using frequency-resolved mid-infrared pump-probe spectroscopy in the spectral region of the OH-stretching vibration.

ThD22
Phonon-polariton based THz spectroscopy, *Benjamin J. Paxton, Masashi Yamaguchi, Keith A. Nelson; MIT, USA.* We demonstrate a THz spectrometer based on grating interferometric measurement of phonon-polariton propagation before and after interaction with a sample. The temperature dependent dielectric response of the relaxor ferroelectric KTN was measured.

ThD23
Single-shot transient absorption of I_3^- in solution and in single crystals, *Peter R. Poulin, Keith A. Nelson; MIT, USA.* A new single-shot femtosecond spectroscopy method has been applied to the study of triiodide photochemistry in solution and in Lab-grown single crystal samples.

ThD24
Light-harvesting function of carotenoids in bacterial photosynthesis: The roles of the newly-identified $1^1B_u^-$ State, *Ferdy S. Rondonuwu, Yasushi Koyama; Kwansei Gakuin Univ., Japan.* The roles of carotenoid $1^1B_u^-$ state in the light-harvesting function were investigated. The state functions as the internal conversion mediator, precursor for rapid triplet states formation and a donor state in the carotenoid-to-bacteriochlorophyll singlet-energy transfer.

ThD25
Ultrafast gain dynamics of the green fluorescent protein fused with single chain antibody Fv fragments, *Pascal Didier[1], Luca Guidoni[1], Jean-Yves Bigot[1], Etienne Weiss[2]; [1]Inst. de physique et chimie des matériaux de Strasbourg, France, [2]Ecole supérieure de biotechnologie de Strasbourg, France.* We investigated the excited-state dynamics of a Green Fluorescent Protein mutant (GFPuv) fused with a Single Chain antibody fragment (scFv). Pump-probe differential transmission spectra depend on the folded state of scFv linked to the GFPuv.

ThD26
Ultrafast conformational changes in hemoproteins studied by time-resolved circular dichroism, *Thibault Dartigalongue, François Hache; Lab d'Optique et Biosciences, France.* Photodissociation of carboxy-myoglobin and -hemoglobin is studied by time-resolved circular dichroism spectroscopy in the Soret band. The conformational reorganization of the heme pocket is shown to occur on a very short timescale (< 100ps).

ThD27
Ultrafast solvent-dependent excited state dynamics of retinal studied by broad-band fluorescence up-conversion, *Goran Zgrablic, Kislon Voïtchovsky, Majed Chergui, Stefan U. Haacke; Swiss Fed. Inst. of Technology, Switzerland.* A novel broad-band fluorescence up-conversion experiment allows identifying

the transient spectral signatures of intra-molecular excited state relaxation in all-trans retinal protonated Schiff bases. Conclusions are drawn regarding the "catalytic" role of the protein for isomerization.

ThD28
Photophysics of horse heart cytochrome *c*: Time-resolved resonance Raman and transient absorption studies, *Simona Cianetti[1,2], Sergei G. Kruglik[3,2], Michel Négrerie[2], Jean Louis Martin[2], Marten H. Vos[2]; [1]LENS Univ. of Florence, Italy, [2]LOB Ecole Polytechnique, France, [3]B.I.Stepanov Inst. of Physics, Belarus.* Transient resonant Raman studies with 0.6 ps time resolution demonstrate that the methionine is photodissociated from ferrous, but not from ferric cytochrome *c*. Heme cooling and ligand recombination occur in 1.8 and 5 ps respectively.

ThD29
The CO oscillator as a probe of ligand dissociation dynamics in myoglobin, *Jennifer P. Ogilvie[1], Thomas Polack[1], Stefan Franzen[2], Marten H. Vos[1], Manuel Joffre[1], Jean Louis Martin[1], Antigoni Alexandrou[1]; [1]Laboratoire d'Optique et Biosciences, France, [2]North Carolina State Univ., USA.* We report spectrally-integrated, visible-pump, mid-infrared probe studies of the CO ligand in myoglobin. Supported by density functional calculations, we find that the CO oscillator strength and frequency changes occur on disparate timescales following dissociation.

ThD30
Excited-state dynamics of the $1B_u^+$, $3A_g^-$, $2A_g^-$, and $1B_u^-$ states in all-trans-spirilloxanthin as revealed by sub-5-fs time-resolved absorption spectroscopy, *Takayoshi Kobayashi[1], K. Nishimura[1], F. S. Rondonuwu[2], Y. Koyama[2]; [1]Dept. of Physics, Univ. of Tokyo, Japan, [2]Kwansei Gakuin Univ., Japan.* The $1B_u^+$, $3A_g^-$, $2A_g^-$, and $1B_u^-$ states were identified for the first time. The lifetimes of the first three were determined to be 10 ± 2, 25 ± 2 and 140 ± 30 fs, respectively.

ThD31
Ultrafast excited and ground-state isomerization dynamics of the Green Fluorescent Protein chromophore in solution, *Mikas Vengris[1], Ivo H.M. van Stokkum[1], Rienk van Grondelle[1], Delmar S. Larsen[1], Xiang He[2], Alasdair F. Bell[2], Peter J. Tonge[2]; [1]Vrije Univ., Amsterdam, Netherlands, [2]SUNY at Stony Brook, USA.* Ultrafast dispersed pump-dump-probe spectroscopy was applied to a model Green Fluorescent Protein chromophore in solution. Sub-ps photodynamics in the excited and ground state has been observed that is ascribed to a hula-twist isomerization mechanism.

ThD32
Fourier transform measurement of two-photon excitation spectra: applications to microscopy and quantum control, *Kevin J. Kubarych, Jennifer P. Ogilvie, Antigoni Alexandrou, Manuel Joffre; Lab d'Optique et Biosciences, France.* We report a novel Fourier transform method of measuring two-photon excitation spectra. We demonstrate this method using a simple dye system and discuss its applications in two-photon fluorescence microscopy and quantum control.

ThD33
Spectral-temporal soliton dynamics analysis near second zero-dispersion point in photonic crystal fibers, *Anatoly Efimov[1], Antoinette J. Taylor[1], Fiorenzo G. Omenetto[1], Nicolas Joly[2], Jonathan C. Knight[2], William J. Wadsworth[2], Philip St. J. Russell[2]; [1]Los Alamos Natl. Lab, USA, [2]Univ. of Bath, UK.* The propagation dynamics of an ultrashort optical pulse near the second zero-dispersion point of a small-core high-delta photonic crystal fiber is investigated using cross-correlation frequency-resolved optical gating. Negative dispersion slope strongly influences the observed behavior.

ThD34
Photon-echo study of the electron-phonon coupling strength in molecules and molecular aggregates, *Valentin I. Prokhorenko[1],[2], Rienk van Grondelle[2], R.J. Dwayne Miller[1]; [1]Univ. of Toronto, Canada, [2]Vrije Univ. Amsterdam, Netherlands.* A method for direct measurement of the system-bath coupling strength in molecules and molecular aggregates, based on the three pulse photon echo technique with non-trivial time ordering of interacting laser pulses, is proposed and realized.

ThD35
Dynamics of carotenoids probed by femtosecond absorption, fluorescence, and Raman spectroscopy, *Masayuki Yoshizawa[1], D. Kosumi[1], M. Komukai[1], K. Yanagi[2], H. Hashimoto[2]; [1]Dept. of Physics, Tohoku Univ., Japan, [2]Osaka City Univ., Japan.* Ultrafast optical responses in -carotene and lycopene depend on the pump wavelength. Excess vibrational energy induced by the photoexcitation remains longer than several picoseconds in the excited states and slows down the relaxation kinetics.

ThD36
Fast spin dynamics of optically induced magnetization in aqueous solutions of magnetic ions, *Shigenori Furue, Toshiro Kohmoto, Masakazu Kunitomo, Yukio Fukuda; Kobe Univ., Japan.* Fast spin dynamics of optically induced magnetization in aqueous solutions of transition-metal ions is studied by the polarization spectroscopy. Concentration dependence suggests the decay of the magnetization is caused by the spin-spin interaction.

ThD37
Fast photo-induced phase switching in organic conductor crystal; $(EDO)_2PF_6$, *Matthieu C. Chollet[1], Laurent Guerin[1],[2], Naoki Uchida[3], Souichi Fukaya[1], Tadahiko Ishikawa[3], Shin-Ya Koshihara[1,4], Kazunari Matsuda[5], Akira Ota[6], Hideki Yamochi[6], Gunzi Saito[6]; [1]Tokyo Inst. of Technology, Japan, [2]Univ. of Rennes, France, [3]Tokyo Inst. of Technology, Japan, [4]ERATO, JST, Japan, [5]KAST, JST, PRESTO, Japan, [6]Kyoto Univ., Japan.* Organic conductor $(EDO)_2PF_6$ crystal shows metal (M)-insulator (I) transition at 280 K. Here, we report the occurrence of highly efficient photo-conversion from insulator to metal phase within a few pico-seconds.

ThD38
Photon number squeezing of ultrabroadband pulses generated by microstructure fibers, *Hiroto Furumochi[1], Atsushi Tada[1], Kennichi Hirosawa[1], Fumihiko Kannari[1], Masahiro Takeoka[2], Masataka Nakazawa[3]; [1]Keio Univ., Japan, [2]Communitications Res. Lab, Japan, [3]Tohoku Univ., Japan.* Quantum correlation in broadband spectra generated with a microstructure fiber is experimentally and theoretically studied. We experimentally obtained the squeezing of -4.6dB. Quantum correlation a.m.ong the spectral components is analyzed with QNLSE including Raman effect.

ThD39
Detection of four-wave mixing signal from single layer quantum dots, *Michio Ikezawa, Fumitaka Suto, Yasuaki Masumoto, Hong-Wen Ren; Inst. of Physics, Univ. of Tsukuba, Japan.* The authors studied four-wave mixing of two kinds of single layer quantum dots, that is strain-induced GaAs quantum dots and self-assembled InP quantum dots, by using highly-sensitive heterodyne method.

ThD40
Intense coherent optical phonons driven by impulsive excitonic interference under electric fields, *Osamu Kojima, Kohji Mizoguchi, Masaaki Nakayama; Osaka City Univ., Japan.* We report on intense coherent longitudinal optical phonons driven by the impulsive interference between the excitons with higher subbands in a GaAs/AlAs multiple quantum well under applied electric fields.

ThD41
Plasmon enhanced ultrafast optical transmission in metallic nano-arrays, *Anthony Dechant, Abdulhakem Y. Elezzabi; Univ. of Alberta, Canada.* Periodic, sub-wavelength silver slit arrays have a significant effect on the propagation of ultrashort optical pulses. Due to surface plasmon effects, enhanced transmission, significant pulse train re-radiation, and super-luminal light flow are observed.

6:30 p.m.–8:30 p.m.
Dinner Break (on your own)

Marine Hall (4F)
8:30 p.m.–9:00 p.m.
Plenary Session: Peering into the Future

Charles V. Shank, Univ. of California at Berkeley, USA.

Marine Hall (4F)
9:00 p.m.–10:00 p.m.
Postdeadline Papers

Friday, July 30, 2004

8:00 a.m.–12:00 p.m.
Registration/Speaker and Presider Check-in

Marine Hall (4F)
8:30 a.m.–10:30 a.m.
FA • Sources and Metrology
Erich Ippen; MIT, USA, Presider

FA1 ● 8:30 a.m.
A new ultrastable cesium optical atomic clock with a 9.1926-GHz regeneratively mode-locked fiber laser, *Masatsugu Yakabe[1], Ko Nito[1], Masato Yoshida[1], Masataka Nakazawa[1], Yasuki Koga[2], Ken Hagimoto[2], Takeshi Ikegami[2]; [1]Tohoku Univ., Japan, [2]Natl. Inst. of Advanced Industrial Science and Technology, Japan.* A new Cs atomic clock is demonstrated by using a mode-locked fiber laser. Frequency stabilities of 4.8×10^{-12} for τ=1 s and 6.3×10^{-13} for τ=50 s are obtained when using a 1-m long Cs tube.

FA2 ● 8:45 a.m.
Frequency transfer of optical standards through fiber network using 1550-nm mode-locked sources, *Kevin Holman[1], David Jones[2], R. Jason Jones[1], Jun Ye[1]; [1]Jila/ Univ. of Colorado and NIST, USA, [2]Univ. of British Columbia, Canada.* A 1550-nm mode-locked laser source phase locked to an optical atomic clock was used to transfer precise optical/radio frequency signals over a fiber network with ultrahigh stability.

FA3 ● 9:00 a.m.
Femtosecond laser frequency combs with 1-Hz-level linewidths, *Albrecht O. Bartels, Scott A. Diddams, Chris W. Oates, Jim C. Bergquist, Leo Hollberg; NIST, USA.* The relative linewidth between two stabilized femtosecond laser frequency combs can be as low as 23 mHz. An upper limit of ≈4 Hz on the absolute linewidth of the individual frequency comb components is determined.

FA4 ● 9:15 a.m.
Frequency metrology with a turnkey all-fiber system, *Thomas R. Schibli[1], Kaoru Minoshima[1], Feng-Lei Hong[1], Hajime Inaba[1], Atsushi Onae[1], Hirokazu Matsumoto[1], Ingmar Hartl[2], Martin E. Fermann[2]; [1]AIST, Japan, [2]IMRA America, Inc., USA.* The repetition-rate and carrier envelope offset frequency of a turnkey, all-fiber-based continuum generator are phase-locked to a highly-stable atomic clock, H-maser. The performance of the system is evaluated and compared to a traditional Ti:sapphire-based comb.

FA5 ● 9:30 a.m.
Femtosecond laser optical frequency synthesizers with uncertainty at the 10^{-19} level, *Long Sheng Ma[1], Lennart Robertsson[1], Massimo Zucco[1], Zhiyi Bi[2], Robert Windeler[3], Albrecht Bartels[4], Guido Wilpers[4], Chris Oates[4], Leo Hollberg[4], Scott A. Diddams[4]; [1]Bureau InterNatl. des Poids et Mesures, France, [2]Physics Dept., East China Normal Univ., China, [3]OFS Labs, USA, [4]NIST, USA.* We verify the accuracy of femtosecond laser optical frequency synthesizers that employ microstructure fibers with those that directly generate a broadband output. No limitation of either system is found at fractional frequency levels approaching 1x10^{-19}.

FA6 ● 9:45 a.m.
Coherent Amplification of femtosecond pulses with passive enhancement cavities, *R. Jason Jones, Long-Sheng Ma, Jun Ye; Jila/ Univ. of Colorado and NIST, USA.* We demonstrate a general technique for

a.m.plification of femtosecond pulses through coherent buildup in an external cavity. Intracavity pulse enhancement >110 times is demonstrated for 49-femtosecond pulses with up to 50 % dumping efficiency.

FA7 • 10:00 a.m.
Generation of ultra-broadband high energy pulses without external amplification, *Alexander Fuerbach[1], Alma Fernandez[2], Takao Fuji[2], Harald Mayer[2], Peter Dombi[2], Ferenc Krausz[2], Alexander Apolonski[2]; [1]Femtolasers Produktions GmbH, Austria, [2]Photonics Inst., Christian Doppler Lab, Vienna Univ. of Technology, Austria.* We report on the generation of ultra-broadband radiation from a Chirped-pulse oscillator. By spectral broadening in a single-mode fibre, output spectra corresponding to a Fourier-limited pulse duration of 5,7 fs at 40 nJ were achieved.

FA8 • 10:15 a.m.
Subpicosecond spatiotemporal pulse compression in a nonlinear defocusing material, *Nils C. Nielsen[1], Tilman Höner zu Siederdissen[1], Jürgen Kuhl[1], Martin Schaarschmidt[2], Jens Förstner[2], Andreas Knorr[2], Stephan W. Koch[3], Harald Giessen[4]; [1]Max-Planck-Inst. für Festkörperforschung, Germany, [2]Inst. für Theoretische Physik, Technische Univ. of Berlin, Germany, [3]Dept. of Physics and Material Sciences Ctr., Philipps-Univ., Germany, [4]Inst. für Angewandte Physik, Univ. of Bonn, Germany.* We demonstrate temporal and spatial pulse compression and modulational instabilities in the nonlinear defocusing regime near the band edge of bulk GaAs. Experiment and theory show that spatiotemporal coupling is responsible for these surprising phenomena.

10:30 a.m.–11:00 a.m.
Coffee Break

Marine Hall (4F)
11:00 a.m.–1:00 p.m.
FB • Plasmons in Periodic Structures
Mark I. Stockman; Georgia State Univ., USA, Presider

FB1 • 11:00 a.m. Invited
Imaging of localized silver plasmon dynamics with sub-fs time and nano-meter spatial resolution, *Atsushi Kubo, Ken Onda, Hrvoje Petek, Zhijun Sun, Yun S. Jung, Hong K. Kim; Univ. of Pittsburgh, USA.* Images of local plasmons on a silver grating excited by 400-nm fs pulses are obtained with 0.3-fs time and 50-nm spatial resolution. The technique is based on interferometric time-resolved two-photon photoemission and photoelectron emission microscopy.

FB2 • 11:30 a.m. Invited
Ultrafast dynamics of light transmission through plasmonic crystals, *Christoph Lienau[1], Claus Ropers[1], Roland Müller[1], Gero Stibenz[1], Günter Steinmeyer[1], Doo-Jae Park[2], Yeo-Chan Yoon[2], Dai-Sik Kim[2]; [1]Max Born Inst., Germany, [2]Seoul Natl. Univ., Republic of Korea.* We study experimentally the ultrafast dynamics of light transmission through plasmonic 2D- and 1D-nanocrystals. Two interfering transmission channels are identified: ultrafast non-resonant transmission due to photon tunneling, and time-delayed resonant re-emission of surface plasmons.

FB3 • 12:00 p.m.
Excitation and propagation of surface plasmon polaritons on metallic periodic structures, *Garik Torosyan, Christian Rau, Boris Pradarutti, René Beigang; Kaiserslautern Technical Univ., Germany.* Surface plasmon polaritons are excited on a periodic structure of metallic cylinders with ultrashort THz pulses. Propagation and damping of the surface plasmons as well as reemitted THz radiation is ivestigated experimentally.

FB4 • 12:15 p.m. Invited
Temporal spectroscopic behavior of terahertz pulses transmitted through metal hole arrays, *Fumiaki Miyamaru, Masanori Hangyo; Res. Ctr. for Superconductor Photonics, Japan.* Temporal spectroscopic behaviors of the terahertz single pulse, which transmitted through the metal hole array, has been

investigated using the short-time Fourier-transform, and mechanisms of the time delay at the surface plasmon-polariton resonance was discussed.

FB5 ● 12:45 p.m.
Surface-plasmon-polariton enhanced tunneling of THz radiation through arrays of sub-wavelength apertures, *Jaime Gómez Rivas, Christoph Janke, Peter Haring Bolivar, Heinrich Kurz; RWTH Aachen, Germany.* Terahertz transmission through periodic arrays of sub-wavelength apertures made from highly doped silicon is analyzed. Sharp resonances with enhanced transmission (up to 70% of the radiation incident on the apertures is transmitted) are observed.

1:00 p.m.–1:15 p.m.
Closing Remarks