OSA
Optical Society of America

LACEA

Laser Applications to Chemical and Environmental Analysis

Ninth Topical Meeting and Tabletop Exhibit

February 9-11, 2004

Radisson Hotel Annapolis
Annapolis, Maryland

Technical Program Committee

General Chairs

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- John W. Daily, *Univ. of Colorado, USA*
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- Douglas S. Baer, *Los Gatos Res., USA*
- Paul J. Dagdigian, *Johns Hopkins Univ., USA*
- Peter Fielden, *UMIST, UK*
- Alan Fried, *Natl. Ctr. for Atmospheric Res., USA*
- Claire F. Gmachl, *Lucent Tech., USA*
- Jim Gord, *Wright Patterson AFB, USA*
- Stefan Jakobs, *Max-Planck Inst., Germany*
- Andrzej W. Miziolek, *US Army, USA*
- David Sonnenfroh, *Physical Sciences Inc., USA*
- Michael Webber, *Pranalytica Inc., USA*
- Azer Yalin, *Colorado State Univ., USA*

About LACEA

February 9-11, 2004

New developments in optical sources, instrumentation, and spectroscopic techniques are principal driving forces for the increased use of lasers in chemical analysis and environmental monitoring. These developments arise in a variety of fields and technology areas, promoting the need for an international, interdisciplinary forum to communicate advances to scientists and engineers in the field. The ninth topical meeting is intended to continue the tradition of state-of-the-art research and applications presented in an informal atmosphere designed to foster communication among researchers and practitioners. In addition to the topics traditionally presented in the conference, the present committee intends to add emphasis to optical biophysics and biochemistry.

Meeting Topics

Topics to be covered:

- Applications of new laser sources to analytical spectroscopy
- Diode laser applications in combustion, industrial and atmospheric measurements
- Laser diagnostics for combustion
- Laser based detection coupled to microanalytical separations
- Micro-optical systems for chemical and biochemical analysis
- Laser based detection for high density chemical sensing arrays
- Development and applications of single-molecule spectroscopy (including biomolecules)
- Optical biophysics and biochemistry

Invited Speakers

Plenary Speaker

- **Laser spectroscopy for environmental and medical diagnostics**, Sune Svanberg, *Lund Inst. of Tech., Sweden* TuA

Invited Speakers

- **QCL-based sensors from 3 to 100 microns**, Mark Allen, *Physical Sciences, Inc.*, USA **WD1**
- **Cavity-enhanced instrumentation for atmospheric monitoring**, Doug Baer, *Los Gatos Res., USA* **MC1**
- **Mechanical asymmetry in single kinesin molecules measured by laser trapping**, Nick Carter, *Marie Curie Res. Inst., UK* **TuB1**
- **From the Earth to the moon and beyond: Development of LIBS for space exploration**, David Cremers, *Los Alamos Natl. Lab., USA* **WC1**
- **Evaluation of Raman scattering experiments in turbulent hydrocarbon flames**, Andreas Dreizler, *Tech. Univ. of Darmstadt*, Germany **MD1**
- **Microfabricated polymer sensing systems for chemical and biochemical applications**, Peter Fielden, *UMIST, UK* **MB1**
- **Application of jet REMPI and LIBS to air toxic monitoring**, Brian Gullet, *Environmental Protection Agency, USA* **TuD1**
- **Environmental monitoring with pulsed quantum cascade lasers: Seeking sensitivity and stability**, Dave Nelson, *Aerodyne Res., USA* **WB1**
- **Quantitative scattering measurements of condensed phase materials**, Terry Parker, *Colorado School of Mines, USA* **MF1**
- **Imaging protein and membrane dynamics in living cells**, Rainer Pepperkok, *European Molecular Biology Lab., Germany* **TuC1**
- **Recent advances in the HITRAN spectroscopic database for atmospheric and environmental modeling**, Laurence Rothman, *Harvard-Smithsonian Ctr. for Astrophysics, USA* **WA1**
- **Laser based techniques for addressing security issues**, Jeffrey Steinfeld, *MIT, USA* **MA**

Publications

Conference Program

The *Conference Program* is now available online. Authors submitting papers, past meeting participants, and current committee members will automatically be notified by email when the *Conference Program* is available.

Technical Digest

The LACEA *Technical Digest* will contain the camera-ready summaries of papers presented during the meeting. At the meeting, each registrant will receive a copy of the *Technical Digest* on CD-ROM. Extra copies can be purchased at the meeting for a special price of US$ 45.

Agenda of Sessions

Monday, February 9, 2004

Time	Event
2:00 p.m. – 5:00 p.m.	**Registration** *Concourse*

Monday, February 9, 2004

Time	Event
7:00 a.m. – 6:30 p.m.	**Registration** *Concourse*
8:15 a.m. – 8:20 a.m.	**Opening Remarks** *Arundel B Ballroom*
8:20 a.m. – 9:00 a.m.	**MA, Keynote Session** *Arundel B Ballroom*
9:00 a.m. – 11:20 a.m.	**MB, Novel Technologies I** *Arundel B Ballroom*
9:30 a.m. – 6:30 p.m.	**Exhibits** *Arundel C Ballroom*
9:40 a.m. – 10:00 a.m.	**Coffee Break** *Arundel C Ballroom*
11:20 a.m. – 1:00 p.m.	**Lunch Break (On Your Own)**
1:00 p.m. – 2:40 p.m.	**MC, CRDS/ICOS** *Arundel B Ballroom*
2:40 p.m. – 2:55 p.m.	**Coffee Break** *Arundel C Ballroom*
2:55 p.m. – 4:55 p.m.	**MD, Combustion I** *Arundel B Ballroom*
4:55 p.m. – 6:30 p.m.	**ME, Poster Session I (including postdeadline posters)** *Arundel C Ballroom*
6:30 p.m. –	**Dinner Break (On Your**

8:00 p.m.	**Own)**
8:00 p.m. – 9:40 p m.	**MF, Combustion II** *Arundel B Ballroom*

Tuesday, February 10, 2004

Time	Event
7:00 a.m. – 6:30 p.m.	**Registration** *Concourse*
8:20 a.m. – 9:20 a.m.	**TuA, Plenary Session** *Arundel B Ballroom*
9:20 a.m. – 11:50 a.m.	**TuB, Bio-Optical I** *Arundel B Ballroom*
10:00 a.m. – 10:30 a.m.	**Coffee Break** *Arundel C Ballroom*
10:00 a.m. - 6:30 p.m.	**Exhibits** *Arundel C Ballroom*
11:50 a.m. – 1:20 p.m.	**Lunch Break (On Your Own)**
1:20 p.m. – 3:20 p.m.	**TuC, Bio-Optical II** *Arundel B Ballroom*
3:20 p.m. – 3:35 p.m.	**Coffee Break** *Arundel C Ballroom*
3:35 p.m. – 5:15 p.m.	**TuD, Environmental I** *Arundel B Ballroom*
5:15 p.m. – 6:30 p.m.	**TuE, Poster Session II** *Arundel C Ballroom*
6:30 p.m. – 8:30 p.m.	**TuF, Poster Session III & Conference Reception** *Calvert Ballroom*

Wednesday, February 11, 2004

Time	Event
7:00 a.m. – 6:00 p.m.	**Registration** *Concourse*
8:15 a.m. –	**WA, Environmental II**

9:55 a.m.	*Arundel B Ballroom*
9:30 a.m. – 4:00 p.m.	**Exhibits** *Arundel C Ballroom*
9:55 a.m. – 10:15 a.m.	**Coffee Break** *Arundel C Ballroom*
10:15 a.m. – 12:15 p.m.	**WB, Environmental/Combustion** *Arundel B Ballroom*
12:15 p.m. – 1:45 p.m.	**Lunch Break (On Your Own)**
1:45 p.m. – 3:25 p.m.	**WC, LIBS & Raman** *Arundel B Ballroom*
3:25 p.m. – 3:40 p.m.	**Coffee Break** *Arundel C Ballroom*
3:40 p.m. – 5:40 p.m.	**WD, Novel Technologies II** *Arundel B Ballroom*
5:40 p.m. – 6:00 p.m.	**Closing Remarks** Arundel B Ballroom

Sunday, February 8, 2004

Room: Concourse
2:00 p.m.–5:00 p.m.
Registration

Monday, February 9, 2004

Room: Concourse
7:00 a.m.–6:30 p.m.
Registration

Room: Arundel B Ballroom
8:15 a.m.–8:20 a.m.
Opening Remarks

Room: Arundel B Ballroom
8:20 a.m.–9:00 a.m.
MA • Laser based techniques for addressing security issues
Jeffrey Steinfeld, MIT, USA, Keynote Speaker

9:00 a.m.–11:20 a.m.
MB • Novel Technologies I (with coffee break)
Mark Linne, Lund Inst. of Tech., Sweden, Presider

MB1 • 9:00 a.m. (Invited)
Microfabricated polymer sensing systems for chemical and biochemical applications: a disposable flow cytometer, *Peter R. Fielden, Nicholas J. Goddard, Stephan S. Mohr; UMIST, UK.* Flow cytometers fabricated from polymers instead of glass usually have poor signal-noise ratios because of background fluorescence. We describe a configuration that largely rejects background fluorescence using the flow channel as a leaky optical waveguide.

Room: Arundel C Ballroom
9:30 a.m.–6:30 p.m.
Exhibit Hours

Room: Arundel C Ballroom
9:40 a.m.–10:00 a.m.
Coffee Break

Room: Arundel B Ballroom
MB2 • 10:00 a.m.
Chemical identification based on absorption spectroscopy by using widely-tunable monochromatic THz source, *Wei Shi, Yujie J. Ding; Lehigh Univ., USA.* We demonstrate that a widely-tunable monochromatic THz source, developed by us, can be used to identify chemicals in the gas phase based on absorption spectroscopy by tuning the input wavelength.

MB3 • 10:20 a.m.
Highly stable tunable dual-wavelength Q-switched fiber laser for DIAL applications, *Utkarsh Sharma[1], Chang-Seok Kim[1], Jin U. Kang[1], Nathaniel M. Fried[2]; [1]Johns Hopkins Univ., USA, [2]Johns Hopkins School of Medicine, USA.* We demonstrate a stable dual-wavelength Q-switched fiber laser source for applications in Differential Absorption Lidar (DIAL). It features tunable wavelengths, narrow linewidth and high stability in an efficient, cost effective, compact and light system.

MB4 • 10:40 a.m.
Recent advances in quartz-enhanced gas-phase photoacoustic spectroscopy, *Anatoliy A. Kosterev, Frank K. Tittel; Rice Univ., USA.* Quartz crystal tuning forks were used as resonant microphones for photoacoustic gas sensing. This results in a novel technique for performing gas analysis of extremely small samples and sensor immunity to external acoustic noise.

MB5 • 11:00 a.m.
Chemical sensors based on photonic crystal nanolasers, *Marko Loncar[1], Mark L. Adams[2], Brett Maune[2], Michael Hochberg[2], Stephen Quake[2], Axel Scherer[2], Yueming Qiu[3]; [1]Harvard Univ., USA, [2]Caltech, USA, [3]Jet Propulsion Lab., USA.* Photonic crystal nano-lasers that permit introduction of analyte within the peak of the optical field of the lasing mode are realized, and they are used to perform spectroscopic tests on femtoliter volumes of analyte.

11:20 a.m.–1:00 p.m.
Lunch Break (on your own)

Room: Arundel B Ballroom
1:00 p.m.–2:40 p.m.
MC • CRDS/ICOS
Michael E. Webber, Pranalytica, Inc., USA, Presider

MC1 • 1:00 p.m. (Invited)
Cavity-enhanced instrumentation for atmospheric monitoring, *Doug Baer, Manish Gupta, Tom Owano, Anthony O'Keefe; Los Gatos Res., USA.* Instruments based on cavity-enhanced absorption spectroscopy provide high measurement sensitivity and accuracy in compact, robust packages. Applications to atmospheric monitoring of trace gases using near-infrared diode lasers and mid-infrared quantum cascade lasers will be presented.

MC2 • 1:40 p.m.
Intracavity laser absorption spectroscopy and Cavity Ring-Down Spectroscopy in low pressure flames. Comparison and perspectives. *Igor Rahinov, Nurit Ditzian, Anatoly Goldman, Sergey Cheskis; Tel Aviv Univ., Israel.* Intracavity laser absorption spectroscopy and Cavity Ring-Down Spectroscopy were used for temperature and concentration measurements of O, HCO, CH_2, OH, CH, CN, NH, NH_2, HNO and NO_2 in hydrocarbon flames. Comparison of methods are presented.

MC3 • 2:00 p.m.
High-resolution cavity ring-down spectroscopy of $H_2{}^{16}O$ at 10687.36 cm^{-1}, *Joseph T. Hodges, NIST, USA.* We describe a frequency-stabilized cavity ring-down spectroscopy apparatus enabling high-resolution line shape measurements of water vapor. The measured line strength and broadening parameter for the $H_2{}^{16}O$ transition at wavenumber 10687.36/cm^{-1} are compared to literature values.

MC4 • 2:20 p.m.
Application of cavity ring-down spectroscopy to sputter erosion measurements, *Azer Yalin, Vijay Surla, John Williams, Paul Wilbur; Colorado State Univ., USA.* In this paper we introduce the use of the cavity ring-down spectroscopy technique for sputter erosion measurements. The suitability of the technique is discussed and initial results for titanium sputtering by argon ions are presented.

Room: Arundel C Ballroom
2:40 p.m.–2:55 p.m.
Coffee Break

Room: Arundel B Ballroom
2:55 p.m.–4:55 p.m.
MD • Combustion I
J. Houston Miller, George Washington Univ., USA, Presider

MD1 • 2:55 p.m. (Invited)
Evaluation of Raman scattering experiments in turbulent hydrocarbon flames, *Andreas Dreizler, Tech. Univ. of Darmstadt, Germany.* Simultaneous OH and CH2O PLIF imaging provides instantaneous two-dimensional heat-release rate measurements for investigating an acoustically forced bluff body stabilized flame. Results will provide insight into combustion instabilities in low emission gas turbine combustors.

MD2 • 3:35 p.m.
Statistical comparisons of time resolved PLIF and DNS data from turbulent flame kernels, *Sara Gashi, Johan Hult, Karl W. Jenkins, Stuart Cant, Clemens F. Kaminski; Univ. of Cambridge, UK.* In this paper we present a direct comparison between experimental 2D PLIF data of OH with 2D slices of fully resolved 3D DNS data for turbulent flame kernels in lean methane/air mixtures.

MD3 • 3:55 p.m.
Measurement of nitric oxide in gas turbine and coal combustor exhaust using a diode-laser-based ultraviolet absorption sensor, *Thomas N. Anderson[1], Robert P. Lucht[1], Rodolfo Barron-Jimenez[2], Sherif Hanna[2], Jerald A. Caton[2], Thomas Walther[3], Michael S. Brown[4], Sukesh Roy[4], James R. Gord[5], Ian Critchley[6], Luis Flamand[6]; [1]Purdue Univ., USA, [2]Texas A&M Univ., USA, [3]TU Darmstadt, Germany, [4]Innovative Scientific Solutions, Inc., USA, [5]Air Force Res. Lab., Propulsion Directorate, USA, [6]Honeywell Engines and Systems Services, USA.* A diode-laser system based on sum-frequency mixing has been developed for ultraviolet absorption measurements of nitric oxide. Results from measurements on a gas turbine engine and a particulate-laden coal combustor exhaust stream are discussed.

MD4 • 4:15 p.m.
Heat release imaging of acoustically forced turbulent flames, *Babatunde O. Ayoola[1], Ramanarynan Balachandran[1], Jonathan H. Frank[2], Epaminondas Mastorakos[1], Clemens F. Kaminski[1]; [1]Univ. of Cambridge, UK, [2]Sandia Natl. Labs., USA.* Simultaneous OH and CH_2O PLIF imaging provides instantaneous two-dimensional heat-release rate measurements for investigating an acoustically forced bluff body stabilized flame. Results will provide insight into combustion instabilities in low emission gas turbine combustors.

MD5 • 4:35 p.m.
Laser induced fluorescence spectroscopy in flames using blue diode lasers, *Iain S. Burns, Johan Hult, Clemens F. Kaminski; Univ. of Cambridge, UK.* Laser induced fluorescence of seeded indium atoms has been performed in an atmospheric pressure premixed stoichiometric methane-air flame using blue diode lasers. The resulting data shows high spectral resolution and strong signal to noise ratio.

Room: Arundel C Ballroom
4:55 p.m.–6:30 p.m.
ME • Poster Session I (including postdeadline posters)

ME1 • 4:55 p.m.
Fourier transform laser spectroscopy of combustible gas mixtures, *Kevin McNesby, Thuvan Nguyen, Andrzej Miziolek, Frank Delucia; U.S. Army Res. Lab., USA.* Fourier transform methods are used to separate wavelengths of light from two mixed, modulated lasers used to measure combustible gas mixtures. Gases investigated include methane, oxygen, and vapor from the military fuel JP-8.

ME2 • 4:55 p.m.
Determination of trace element concentrations in vegetation by laser induced breakdown spectroscopy, *John W. Branch, Jr., Larry Robinson, Elijah Johnson, Lewis Johnson; Florida A&M Univ., USA.* Laser Induced Breakdown Spectroscopy (LIBS) was used to determine trace elements in cattails. Comparisons of the LIBS technique with atomic absorption were made for known and unknown concentrations. Results show strong correlations between the techniques.

ME3 • 4:55 p.m.
Application of Resonance Enhanced Multi-Photon Ionization Time of Flight Mass Spectrometry for the on-line characterization of diesel generator air toxics emissions, *Lukas Oudejans[1], Brian K. Gullett[2,3]; [1]Arcadis, USA, [2]U.S. Environmental Protection Agency, USA, [3]Office of Res. and Development, Natl. Risk Management Res. Lab., USA.* The REMPI-TOFMS technique has been applied to the exhaust of a diesel generator to measure real time concentration levels of aromatic air toxics. Transient events (cold start) were observed using the 1 s resolution.

ME4 • 4:55 p.m.
Detection of explosives and explosives related compounds by jet-REMPI Time of Flight Mass Spectrometry, *Bethany V. Pond[1,2], Jude Kessler[3], Katy Briggs[4], Michael J. Coggiola1, David R. Crosley[1], Harald Oser[1]; [1]SRI Intl., USA, [2]Stanford Univ., USA, [3]Trinity Coll., USA, [4]Pacific Lutheran Univ., USA.* The detection of explosives and explosives related compounds was undertaken in order to examine the possibility of detecting land mines and other unexploded ordinance through the use of Laser Ionization Time of Flight Mass Spectrometry.

ME5 • 4:55 p.m.
Laser-induced fluorescence real-time sensing of trace plastics and dissolved organic compounds in water/seawater, *Vasanthi Sivaprakasam, Robyn Conmy, Paula Coble, Dennis K. Killinger; Univ. of South Florida, USA.* A dual wavelength (266 nm and 355 nm) laser induced fluorescence system using multipath excitation and emission collection optics has been developed and characterized for the detection of dissolved organic compounds and plastics in water/seawater.

ME6 • 4:55 p.m.
Detection of heavy metals by laser-induced breakdown spectroscopy after deposition onto silica, *Christopher E. Spiese, Tom L. Fisher, Richard R. Hark; Juniata Coll., USA.* The analysis of various metal solutions deposited on silica thin-layer chromatography plates is reported. The correlation between mass density and observed signal is examined. Detection limits and spectroscopic characteristics are reported for each metal.

ME7 • 4:55 p.m.
Early detection of acute rejection in lung transplant recipients using laser-based detection of exhaled nitric oxide, *Matt McCurdy[1], Yury Bakhirkin[1], Chad Roller[1], Anatoliy Kosterev[1], Robert Curl[1], Frank Tittel[1], Mark Allen[2]; [1]Rice Univ., USA, [2]Physical Sciences, Inc, USA.* A pulsed quantum cascade laser operating at 5.2 microns is used for detection of nitric oxide in exhaled breath of lung transplant recipients. We investigated the feasibility of an off-axis integrated cavity output spectroscopy technique.

ME8 • 4:55 p.m.
Measurements of laser-induced carbon plasma, *László Nemes[1], Anna M. Keszler[1], James O. Hornkohl[2], Christian G. Parigger[2]; [1]Chemical Res. Ctr., Hungary, [2]The Univ. of Tennessee Space Inst., USA.* We report measurements of time-average demission spectra following laser-induced breakdown of graphite in CO_2 and helium background gases, and of allene C_3H_4 and helium mixtures with prominent C^+, C^{++}, H_β and C_2 features.

ME9 • 4:55 p.m.
Role of model complexity on the prediction of nitric oxide LIF spectra, *John W. Daily[1], Wolfgang G. Bessler[2], Christof Schulz[2], Volker Sick[3], Thomas Settersten[4]; [1]Dept. of Mechanical Engineering, Univ. of Colorado at Boulder, USA, [2]Physikalisch-Chemisches Inst., Univ. Heidelberg, Germany, [3]Dept. of Mechanical Engineering, Univ. of Michigan, USA, [4]Sandia Natl. Labs., USA.* LIF of nitric oxide is an important tool for making quantitative measurements in many applications. Here we evaluate simplified data reduction models by comparison with a detailed, transient rate equation model.

ME10 • 4:55 p.m.
Using of the tunable CO_2-laser without frequency stabilization for diagnostics of CO_2 gas mixture at barometric pressure, *K. Arshinov; Inst. of Technical Acoustics of Natl. Academy of Sciences of Belarus, Belarus.* It is presented a technique for determining temperature and pressure of CO_2 in gas mixture using

absorption factor spectral distribution. Errors calculated for tunable frequency stabilized and unstabilized CO_2 laser by the covariance matrix technique.

ME11 • 4:55 p.m.
Trace ammonia monitoring for NASA human space flight, *Andrew R. Awtry, J. Houston Miller; George Washington Univ., USA.* The development of cavity ringdown spectroscopy for atmospheric monitoring in manned space vehicles is reported. An external-cavity diode laser is used as to pump an optical cavity. Both ammonia and acetylene spectral results are presented.

6:30 p.m.–8:00 p.m.
Dinner Break (on your own)

Room: Arundel B Ballroom
8:00 p.m.–9:40 p.m.
MF • Combustion II
Paul J. Dagdigian, Johns Hopkins Univ., USA, Presider

MF1 • 8:00 p.m. (Invited)
Quantitative scattering measurements of condensed phase material, *Terry Parker, Colorado School of Mines, USA.* Absolute scattering measurements can be used to quantify diameters, volume fractions, and accompanying errors for condensed phase ensembles. This technique will be discussed in the context of a diesel spray and a silica producing flame.

MF2 • 8:40 p.m.
OH ground-state energy transfer investigated using picosecond IR-UV polarization spectroscopy, *Thomas B. Settersten[1], Xiangling Chen[1], Brian D. Patterson[1], Sukesh Roy[2], Robert P. Lucht[3]; [1]Sandia Natl. Labs., USA, [2]Innovative Scientific Solutions, Inc., USA, [3]Purdue Univ., USA.* Picosecond infrared-ultraviolet polarization spectroscopy was used in a pump-probe configuration to investigate relaxation of molecular alignment and orientation and state-to-state energy transfer in the electronic ground state of the hydroxyl radical in an atmospheric-pressure flame.

MF3 • 9:00 p.m.
Combined high repetition-rate OH PLIF and stereoscopic PIV for studies of turbulence/chemistry interactions, *Johan Hult, Adam Harvey, Clemens F. Kaminski; Univ. of Cambridge, UK.* A combined high repetition-rate OH laser induced fluorescence imaging and stereoscopic PIV technique is presented. It is capable of capturing and resolving individual turbulence/chemistry interaction events, such as local extinction or re-ignition, in jet flames.

MF4 • 9:20 p.m.
UV absorption of CO_2 for temperature diagnostics, *Ethan Barbour[1], Mathew Oehlschlaeger[1], Daniel Mattison[1], David Davidson[1], Christof Schulz[1,2], Jay Jeffries[1], Ronald Hanson[1]; [1]Stanford Univ., USA, [2]Univ. of Heidelberg, Germany.* CO2 absorption between 200 and 350nm has a strong temperature dependence providing a potential new diagnostic. The viability of this diagnostic strategy to determine gas temperature in combustion systems and shock-heated gases is reported here.

Tuesday, February 10, 2004

Room: Concourse
7:00 a.m.–6:30 p.m.
Registration

Room: Arundel B Ballroom
8:20 a.m.–9:20 a.m.
TuA • Laser spectroscopy for environmental and medical diagnostics
Sune Svanberg, Dept. of Physics, Lund Inst. of Tech., Sweden; Lund Laser Ctr., Lund Univ., Sweden, Plenary Speaker

Room: Arundel B Ballroom
9:20 a.m.–11:50 a.m.
TuB • Bio-Optical I (with coffee break)
Clemens F. Kaminski, Univ. of Cambridge, UK, Presider

TuB1 • 9:20 a.m. (Invited)
Mechanical asymmetry in single kinesin molecules measured by laser trapping, *Nick Carter, Marie Curie Res. Inst., Germany.*

Room: Arundel C Ballroom
10:00 a.m.–10:30 a.m.
Coffee Break

Room: Arundel C Ballroom
10:00 a.m.–6:30 p.m.
Exhibit Hours

Room: Arundel B Ballroom
TuB2 • 10:30 a.m.
Characterization of malignant tissue cells using laser induced breakdown spectroscopy, *Akshaya Kumar[1], Fang-Yu Yueh[2], Jagdish P. Singh[2], Shane Burgess[3]; [1]Dept. of Physics, Tuskegee Univ., USA, [2]Diagnostic Instrumentation and Analysis Lab., Mississippi State Univ., USA, [3]Coll. of Veterinary Medicine, Mississippi State Univ., USA.* Laser induced breakdown spectroscopy (LIBS) has been used to distinguish malignant and normal tissue of the dogs. Preliminary LIBS spectra of tissue samples were analyzed and the results have compared with the ICP analysis.

TuB3 • 10:50 a.m.
Tunable laser spectroscopy measurement of exhaled nitric oxide: effect of flow rate, *James D. Jeffers[1], Chad B. Roller[1], Khosrow Namjou[1], William Potter[2], Patrick J. McCann[3]; [1]Ekips Technologies, USA, [2]Univ. of Tulsa, USA, [3]Univ. of Oklahoma, USA.* NO and CO_2 concentrations in breath were simultaneously measured with a mid-IR laser spectrometer at different exhalation flow rates. Exhalation flow rates are shown to affect measured NO concentrations for both asthmatic and non-asthmatic subjects.

TuB4 • 11:10 a.m.
Effects of fixation on cyan fluorescent protein and its fluorescence resonance energy transfer efficiency, *Alex Domin, Ming Jun Lan, Clemens F. Kaminski; Univ. of Cambridge, UK.* Fixation of samples is commonly used in fluorescence microscopy of cells. We show that fixation can have dramatic effects on the fluorescence properties of cyan fluorescent protein and on its ability to engage in FRET.

TuB5 • 11:30 a.m.
Fluorescence 3D microscopy with 100 nm resolution, *Stefan Jakobs, MPI biophysical Chemistry, Germany.* Live cell fluorescence imaging of GFP labelled mitochondria of budding yeast cells using 4Pi-confocal microscopy is presented. This technique allows 3-5 times finer optical sectioning than confocal microscopy.

11:50 a.m.–1:20 p.m.
Lunch Break (on your own)

Room: Arundel B Ballroom
1:20 p.m.–3:20 p.m.
TuC • Bio-Optical II
Stefan Jakobs, MPI biophysical Chemistry, Germany, Presider

TuC1 • 1:20 p.m. (Invited)
Imaging protein and membrane dynamics in living cells, *Rainer Pepperkok, European Molecular Biology Lab., Germany.*

TuC2 • 2:00 p.m.
Multiple UV wavelength excitation and fluorescence of bioaerosols, *Vasanthi Sivaprakasam, A. Huston, J. Eversole, C. Scotto; Naval Res. Lab., USA.* A multiple wavelength excitation bioaerosol sensor has been developed and characterized for classifying various types of aerosols, including biological organisms and non-biological interferents.

TuC3 • 2:20 p.m.
Temporal- and spectral analysis of multi-color FLIM measurements, *Wolfgang Becker, Axel Bergmann; Becker & Hickl GmbH, Germany.* We present an approach which uses time- and spectral information to discriminate dynamic processes from concentration effects in fluorescence imaging measurements. Our instrumentation covers a TCSPC based multi-wavelength detection together with a laser scanning microscope.

TuC4 • 2:40 p.m.
Multidimensional tissue imaging by matrix assisted laser desorption/ionization-ion mobility-mass spectrometry: advantages, challenges, and prospects for proteomics, *John A. McLean, Stacy D. Sherrod, David H. Russell; Lab. for Biological Mass Spectrometry, Dept. of Chemistry, Texas A&M Univ., USA.* MALDI-imaging mass spectrometry correlates detailed analyte information with spatial distribution in biological tissue sections. By combining post-ionization ion mobility separation with mass analysis, difficult peak assignments arising from spectrum congestion are alleviated.

TuC5 • 3:00 p.m.
Conformational changes in peptides revealed by time-resolved anisotropy and FRET measurements, *Andreas Brockhinke, K. Lotte, R. Plessow; Univ. Bielefeld, Germany.* Förster resonance energy transfer (FRET) and time-resolved anisotropy studies are combined to study conformational rearrangements of the NPY signal peptide.

Room: Arundel C Ballroom
3:20 p.m.–3:35 p.m.
Coffee Break

Room: Arundel B Ballroom
3:35 p.m.–5:15 p.m.
TuD • Environmental I
Alan Fried, National Ctr. for Atmospheric Res., USA, Presider

TuD1 • 3:35 p.m. (Invited)
Application of Jet REMPI and LIBS to Air Toxic Monitoring, *Brian Gullett, Environmental Protection Agency, USA.* Laser-based instruments are being developed for real time measurements of air toxics. These measurements will be applied to pollutant formation mechanisms, determination of emission factors, compliance monitoring, and hazard sensors.

TuD2 • 4:15 p.m.
Small orbital planetary lidar for measurement of water vapor, cloud and aerosol profiles, *Graham R. Allan[1,2], Michael A. Krainak[1], Arlyn E. Andrews[1], Amelia M. Gates[1], James B. Abshire[1]; [1]NASA GSFC, USA, [2]Sigma Space Corp., USA.* Active remote sensing measurements of the total water vapour column content are presented using a frequency tuned DBR laser and a hard target return for a 0.4 Km open path.

TuD3 • 4:35 p.m.
Laser sounder approach for measuring atmospheric CO_2 from orbit, *Michael Krainak, Arlyn Andrews, Graham Allan, John Burris, G. James Collatz, Haris Riris, Mark Stephen, Xiaoli Sun, James Abshire; NASA Goddard Space Flight Ctr., USA.* We report on an active remote sensing approach using an erbium

fiber amplifier based transmitter for atmospheric CO_2 measurements in an overtone band near 1.57 micron and initial horizontal path measurements to <1% precision.

TuD4 • 4:55 p.m.
Raman-shifted eye-safe aerosol lidar development, *Scott M. Spuler, Shane Mayor; Natl. Ctr. for Atmospheric Res., USA.* The authors present the design and first observations of an backscatter lidar at a wavelength of 1543 nm. The transmitter utilizes stimulated Raman scattering in methane to shift the Nd:YAG fundamental to this eye-safe wavelength.

Room: Arundel C Ballroom
5:15 p.m.–6:30 p.m.
TuE • Poster Session II

TuE1 • 5:15 p.m.
Laser induced fluorescence and incandescence measurements in soot-reduced opposed flow heptane/air flames, *Kevin McNesby, Thuvan Nguyen, Andrzej Miziolek, Frank Delucia; U.S. Army Res. Lab., USA.* Planar laser induced fluorescence and planar laser induced incandescence are used to measure OH radical concentration and soot volume fraction in opposed flow heptane/air flames to which a soot reducing additive has been added.

TuE2 • 5:15 p.m.
High temperature water vapor measured with VCSEL near 940 nm, *Heidi Cattaneo, Toni Laurila, Rolf Hernberg; Tampere Univ. of Tech., Finland.* Vertical-cavity surface-emitting lasers were used to detect high-temperature water vapor in a heated absorption cell. Temperature dependent optical densities were obtained at high temperature for several absorption transitions near 940 nm.

TuE3 • 5:15 p.m.
Polarization effects in time-resolved LIF spectra of small radicals affected by energy transfer, *U. Lenhard, A. Bülter, Andreas Brockhinke; Univ. Bielefeld, Germany.* LIF measurements are seriously affected by collision-induced processes (quenching, rotational and vibrational energy transfer, polarization scrambling). In this contribution, we investigate polarization effects in OH spectra and present a model to take them into account.

TuE4 • 5:15 p.m.
LASKIN: Efficient simulation of spectra affected by energy transfer, *A. Bülter, U. Lenhard, U. Rahmann, K. Kohse-Höinghaus, Andreas Brockhinke; Univ. Bielefeld, Germany.* A simulation package (LASKIN) is presented that allows the calculation of the temporal evaluation of fluorescence spectra affected by energy transfer and that might be used as design tool for quantiative experiments.

TuE5 • 5:15 p.m.
Exploring the applicability and limitations of laser-induced incandescence for soot detection, *H. A. Michelsen, M. Y. Gershenzon, P. O. Witze; Sandia Natl. Labs., USA.* We have measured temporal profiles of laser-induced incandescence of soot and analyzed the results with a model that describes particle heating by absorption, oxidation, and annealing and cooling by sublimation, radiative emission, and conduction.

TuE6 • 5:15 p.m.
Mid-infrared sensing of carbon monoxide in industrial glass furnaces, *Ulrike Willer[1], Alireza Khorsandi[1], Wolfgang Schade[1], Lothar Wondraczek[2]; [1]Inst. für Physik und Physikalische Technologien, Germany, [2]Inst. für Nichtmetallische Werkstoffe, Germany.* The P(28) line is used to detect carbon monoxide directly in the atmosphere of a glass furnace. A concentration of 300 ppm is found, in good agreement with conventional measurements in the exhaust gas stream.

TuE7 • 5:15 p.m.
Diode laser absorption spectroscopy of copper, cadmium, and indium near 325 nm, *Toni Laurila, Rolf Hernberg; Optics Lab., Tampere Univ. of Tech., Finland.* A novel frequency-doubled external-cavity diode

laser has been applied to the characterization of Cu, Cd, and In transitions near 325 nm. Voigt profiles have been fitted to the data taking into account the hyperfine structure.

TuE8 • 5:15 p.m.
Calculation of Boltzmann fractions for the prediction of temperature-insensitive absorption lines, *Joachim W. Walewski[1,2], Anders Elmqvist[3,2]; [1]Dept. of Mechanical Engineering, Univ. of Wisconsin - Madison, USA, [2]Division of Combustion Physics, Lund Inst. of Tech., Sweden, [3]Gymnasieskolan i Eslöv, Sweden.* A critical assessment of a widely applied approach for the prediction of temperature-insensitive absorption lines is presented. This approach was found to suffer from significant shortcomings.

TuE9 • 5:15 p.m.
Diatomic Hönl-London factors computations, *James O. Hornkohl[1], Christian G. Parigger[1], László Nemes[2]; [1]The Univ. of Tennessee Space Inst., USA, [2]Chemical Res. Ctr., Hungary.* We present our method to compute for essentially all diatomic molecules the rotational line-strength factors. These Hönl-London factors are ordered according to angular momentum quantum number, parity, term value, and vacuum wave number.

TuE10 • 5:15 p.m.
High-temperature multiple species diode laser sensor, *S. D. Wehe[1], M. G. Allen[1], W. Von Drasek[2], E. Fauve[2]; [1]Physical Sciences Inc., USA, [2]American Air Liquide, USA.* Detailed spectral survey analysis to detect multiple H_2O lines for gas temperature determination and CO detection using a single diode laser is presented. Survey results have been demonstrated on both laboratory and industrial combustion processes.

TuE11 • 5:15 p.m.
Trace-species measurements from phase shift of transient-grating signals, *Michael S. Brown[1], Terrence R. Meyer[1], James R. Gord[2]; [1]Innovative Scientific Solutions, Inc., USA, [2]Propulsion Directorate, Wright-Patterson Air Force Base, USA.* Amplitude-based detection of trace species in reacting flows is often problematic. We introduce a means of monitoring the concentration of an absorbing species through detection of the phase shift of a transient grating signal.

Room: Calvert Ballroom
6:30 p.m.–8:30 p.m.
TuF • Poster Session III and Conference Reception

TuF1 • 6:30 p.m.
Optical investigations of solid oxide fuel cell modules, *John D. Black; Rolls-Royce plc, UK.* Surface temperature distribution on solid oxide fuel cell modules at operating temperature, determined from visible images, gives information cell condition. NIR spectroscopy is a promising method for monitoring gas composition within ceramic fuel channels.

TuF2 • 6:30 p.m.
Detection of explosives and explosive-related compounds by ultraviolet cavity ring-down spectroscopy, *Christopher Ramos, Paul J. Dagdigian; Johns Hopkins Univ., USA.* Cavity ring-down absorption spectroscopy is being evaluated for its ability to detect trace amounts of explosives and their breakdown products. Ultraviolet ring-down spectra, covering 230 nm - 250 nm, of such compounds are discussed here.

TuF3 • 6:30 p.m.
Jet-REMPI-TOFMS detection of hazardous air pollutants using a compact tunable UV laser source, *Harald Oser[1], Michael J. Coggiola[1], Steve E. Young[1], David R. Crosley[1], Rhett J. Barnes[2], Eli Margelith[2], Katy Briggs[3]; [1]SRI Intl., USA, [2]OPOTEK, Inc., USA, [3]Pacific Lutheran Univ., USA.* The application of a broadband laser was examined and compared with a narrow band laser in order to examine the limits of detection for hazardous air pollutants through a compact Laser Ionization Time-of-Flight Mass Spectrometer.

TuF4 • 6:30 p.m.
Analysis of thermal desorption properties of CS2, C6H6, and H2O using tunable laser absorption spectroscopy, *Luke McSpadden[1], Gaurav Singh[1], Marcus Evans[1], Patrick McCann[1], Jim Jeffers[2], Chad Roller[2], Khosrow Namjou[2]; [1]Univ. of Oklahoma, USA, [2]Ekips Tech., Inc., USA.* A thermal desorption unit was added to a IV-VI semiconductor mid-IR laser spectroscopy system. The adsorption and desorption characteristics of benzene, carbon disulfide, and water vapor were studied in real-time with several sorbent materials.

TuF5 • 6:30 p.m.
Quantum cascade external cavity and DFB laser systems in the mid-infrared spectral range: devices and applications, *Lars Hildebrandt[1], Sandra Stry[1], Richard Knispel[1], Joachim R. Sacher[1], Thomas Beyer[2], M. Braun[2], Armin Lambrecht[2], Tobias Gensty[3], Wolfgang Elsäßer[3], Ch. Mann[4], F. Fuchs[4]; [1]Sacher Lasertechnik Group, Germany, [2]Fraunhofer-Inst. für Physikalische Messtechnik, Germany, [3]Inst. of Applied Physics, Darmstadt Univ. of Tech., Germany, [4]Fraunhofer-Inst. für Angewandte Festkörperphysik, Germany.* Quantum cascade laser (QCL) are an excellent tool for MIR-spectroscopy. We report on the design and realization of pulsed and cw-QCL in external cavity (EC) and DFB configurations for the application of NO measurements.

TuF6 • 6:30 p.m.
Development of an injection-seeded, pulsed optical parametric generator for high-resolution spectroscopy, *Waruna D. Kulatilaka, Thomas L. Bougher, Robert P. Lucht; Purdue Univ., USA.* The development of a pulsed, tunable optical parametric generator system for high resolution spectroscopy is discussed. The BBO-crystal-based optical parametric generator is seeded with infrared laser radiation from a DFB diode laser system.

TuF7 • 6:30 p.m.
Far infrared spectroscopy of selected explosives, *Yunqing Chen[1], Haibo Liu[1], Yanqing Deng[1], Dmitry Veksler[1], Michael Shur[1], X.- C. Zhang[1], Dunja Schauki[2], Michael J. Fitch[2], Robert Osiander[2]; [1]Ctr. for Terahertz Res., Rensselaer Polytechnic Inst., USA, [2]Applied Physics Lab., John Hopkins Univ., USA.* We report recent results of far-infrared spectroscopy of several explosive materials in 5 cm^{-1} to 600 cm^{-1} region. New absorption resonances between 30 cm^{-1} to 100 cm^{-1} are identified.

TuF8 • 6:30 p.m.
Design and performance assessment of a stable astigmatic Herriott cell for trace gas measurements on airborne platforms, *Christoph Dyroff[1], Alan Fried[1], Dirk Richter[1], James Walega[1], Mark S. Zahniser[2], J. Barry McManus[2]; [1]National Center for Atmospheric Research, USA, [2]Aerodyne Research, Inc., USA.* The present paper discusses a new, more stable, astigmatic Herriott cell employing carbon fiber stabilizing rods. Laboratory tests revealed a factor of two improvement in measurement stability compared with a present commercial design.

TuF9 • 6:30 p.m.
New room-temperature 2.3µm DFB-diode lasers: first spectroscopic characterization and CO-detection, *Volker Ebert[1], Carsten Giesemann[1], Johannes Koeth[2], Holger Teichert[1]; [1]Univ. of Heidelberg, Germany, [2]Nanoplus GmbH, Germany.* A new 2.3µm-DFB-diode laser with lateral metal gratings is characterized with regard to static/dynamic tuning properties and used to realize the in-situ CO-detection in a 500kW incinerator with a resolution of 10-3OD or 400ppm CO.

TuF10 • 6:30 p.m.
Bio-organic nanoprobes for tumor detection, *M. Eccleston, J. Lee, F. Gilchrist, N. Slater, C. F. Kaminski; Univ. of Cambridge,UK.* A novel class of biocompatible, pH responsive bio-polymers exhibiting FRET in low pH environments is reported. Conformational and spectral properties of this novel class of fluorescent reporter molecules are discussed, as well as potential applications.

TuF11 • 6:30 p.m.
Highly efficient and selective ultra trace determination by laser resonance ionization mass spectrometry for rare radionuclide determination, *Klaus Wendt[1], Ch. Geppert[1], A. Schmitt[1], P.*

Schumann[1], N. Trautmann[2], B. A. Bushaw[3]; [1]Inst. für Physik, Johannes Gutenberg-Univ. Mainz, Germany, [2]Inst. für Kemchemie, Johannes Gutenberg-Univ. Mainz, Germany, [3]Pacific Northwest Natl. Lab., USA. Resonance ionization mass spectrometry developed into a versatile technique for determination of rare radionuclides, due to outstanding selectivity and detection limits. Recent applications on 41Ca, 152,154Gd, 236U and 239-244Pu concern environmental, biomedical and fundamental investigations.

TuF12 • 6:30 p.m.
Detection of chemical compounds inside nano-particles using laser ionization TOFMS with DMA, *Yoshihiro Deguchi[1], Kohei Kawazoe[1], Nobuyuki Tanaka[2], Takeshi Ichiji[2]; [1]Mitsubishi Heavy Industries, Ltd., Japan, [2]Central Res. Inst. of Electric Power Industry, Japan.* Laser ionization TOFMS with DMA was applied to detect organic substances in nano-particles. The system was demonstrated to successfully detect the signal in the mass range of 80 to 250 in 50nm and 100nm particles.

Wednesday, February 11, 2004

Room: Concourse
7:00 a.m.–6:00 p.m.
Registration

Room: Arundel B Ballroom
8:15 a.m.–9:55 a.m.
WA • Environmental II
Mark Linne, Lund Inst. of Tech., Sweden, Presider

WA1 • 8:15 a.m. (Invited)
Recent advances in the HITRAN spectroscopic database for atmospheric and environmental modeling, *Laurence S. Rothman, Harvard-Smithsonian Ctr. for Astrophysics, USA.* The current HITRAN spectroscopic database is described. Recent advances in both experimental and quantum-mechanical theoretical methods are providing more accurate parameters for the archive. These advances are also providing greater spectral coverage and completeness.

WA2 • 8:55 a.m.
Ultra-sensitive ambient trace-gas sensor using CO2 lasers and photoacoustic spectroscopy, *Michael B. Pushkarsky[1], Michael E. Webber[1], C. Kumar N. Patel[1,2]; [1]Pranalytica, Inc., USA, [2]Dept. of Physics & Astronomy, UCLA, USA.* An ambient trace-gas sensor based on photoacoustic spectroscopy and CO2 lasers has been developed with a minimum detectivity for ammonia better than 50 parts-per-trillion. This sensor has been deployed in an intercomparison with ion chromatography.

WA3 • 9:15 a.m.
Agricultural ammonia sensor using diode lasers and photoacoustic spectroscopy, *Michael B. Pushkarsky[1], Michael E. Webber[1], C. Kumar N. Patel[1,2]; [1]Pranalytica, Inc., USA, [2]Dept. of Physics & Astronomy, UCLA, USA.* A trace-gas sensor based on fiber-amplifier enhanced photoacoustic spectroscopy has been developed for measuring ambient ammonia in agricultural settings. Results will be presented from measurements made at agricultural facilities in California throughout late autumn.

WA4 • 9:35 a.m.
A quantum cascade laser-based sensor for measurement of the stable isotopomers of carbon dioxide, *David M. Sonnenfroh, Michelle Silva, Mark Allen; Physical Sciences Inc., USA.* We describe the development of a quantum cascade laser-based absorption spectrometer for measurement of the major stable isotopes of CO_2 in the natural atmosphere. We present demonstration measurements of $^{12}CO_2$ and $^{13}CO_2$ at 4.3 μm.

Room: Arundel C Ballroom
9:30 a.m.–4:00 p.m.
Exhibit Hours

Room: Arundel C Ballroom
9:55 a.m.–10:15 a.m.
Coffee Break

Room: Arundel B Ballroom
10:15 a.m.–12:15 p.m.
WB • Environmental/Combustion
David M. Sonnenfroh, Physical Sciences Inc., USA, Presider

WB1 • 10:15 a.m. (Invited)
Environmental monitoring with pulsed quantum cascade lasers: Seeking sensitivity and stability, *David D. Nelson[1], J. Barry McManus[1], Joanne Shorter[1], Quan Shi[1], Mark Zahniser[1], Barbara Wyslouzil[2]; [1]Aerodyne Res., USA, [2]Worcester Polytechnic Institute, USA.* Peltier cooled, pulsed quantum cascade lasers have been used to measure atmospheric trace gases in closed path and open path configurations with high sensitivity and stability. Detected species include NH_3, NO, N_2O and CO_2.

WB2 • 10:55 a.m.
Mid-IR polarization spectroscopy applied for detection of methane at atmospheric pressure, *Martin Rupinski[1], Zhongshan Li[1], Johan Zetterberg[1], Zeyad Alwahabi[2], Marcus Aldén[1]; [1]Division of Combustion Physics, Lund Inst. of Tech., Sweden, [2]School of Chemical Engineering, Univ. of Adelaide, Australia.* Methane was studied with mid-infrared polarization spectroscopy (PS) in an atmospheric gas jet. Detection limit was investigated and laser induced fluorescence and PS spectra for the P, Q, and R branch are presented.

WB3 • 11:15 a.m.
Detection of atomic hydrogen using picosecond laser-induced polarization spectroscopy, *Sukesh Roy[1], Thomas B. Settersten[2], Brian Patterson[2], Robert P. Lucht[3], James R. Gord[4]; [1]Innovative Scientific Solutions, Inc., USA, [2]Sandia Natl. Labs., USA, [3]Purdue Univ., USA, [4]Air Force Res. Lab., USA.* Two-color, two-photon, laser-induced polarization spectroscopy of atomic hydrogen using nearly transform-limited picosecond laser pulses is demonstrated. The broadening of the spectral line and the shift in transition frequency with laser power are also investigated.

WB4 • 11:35 a.m.
Quantitative multi-line NO-LIF temperature imaging in flames over a wide pressure range, *Wolfgang G. Bessler[1], Helmut Kronemayer[1], Christof Schulz[1], Tonghun Lee[2], Jay B. Jeffries[2], Ronald K. Hanson[2]; [1]PCI, Heidelberg Univ., Germany, [2]Stanford Univ., USA.* A novel multi-line temperature imaging technique based on NO laser-induced fluorescence is performed in combination with efficient spectra fitting. The technique yields absolute temperatures and is robustly applicable to different steady combustion and flow systems.

WB5 • 11:55 a.m.
Quantitative two-photon LIF imaging of atomic oxygen in flames with picosecond excitation, *Jonathan H. Frank, Thomas B. Settersten, Brian D. Patterson, Xiangling Chen; Combustion Res. Facility, USA.* Quantitative two-photon laser-induced-fluorescence (LIF) imaging of atomic oxygen is demonstrated in premixed methane flames with picosecond pulsed lasers at 226 nm. Picosecond excitation offers a significant advantage over nanosecond excitation by significantly reducing photolytic interference.

12:15 p.m.–1:45 p.m.
Lunch Break (on your own)

Room: Arundel B Ballroom
1:45 p.m.–3:25 p.m.
WC • LIBS and Raman
Mike Angel, USC, USA, Presider

WC1 • 1:45 p.m. (Invited)
From the Earth to the moon and beyond: Development of LIBS for space exploration, *David Cremers, Los Alamos Natl. Lab., USA.*

WC2 • 2:25 p.m.
Temperature correction and pulse-to-pulse LIBS spectral variability, *Frank De Lucia, Jr.; Army Res. Lab., USA.* The goal of this work is to evaluate a method to improve the shot to shot variability of LIBS atomic emission intensities by attempting to correct for the temperature variations found in individual LIBS sparks.

WC3 • 2:45 p.m.
Laser induced breakdown spectroscopy (LIBS) study of surface oxidation of bulk aluminum and aluminum particles, *Thuvan H. Nguyen, Frank C. DeLucia, Andrzej W. Miziolek, Kevin L. McNesby; Army Research Lab., USA.* We are evaluating LIBS for quantitative analysis of surface oxidation of bulk and particulate aluminum. With that goal in mind, we studied the signals from aluminum, aluminum oxide, and oxygen under a variety of atmospheres.

WC4 • 3:05 p.m.
TBA.

Room: Arundel C Ballroom
3:25 p.m.–3:40 p.m.
Coffee Break

Room: Arundel B Ballroom
3:40 p.m.–5:40 p.m.
WD • Novel Technologies II
Peter R. Fielden, UMIST, UK, Presider

WD1 • 3:40 p.m. (Invited)
QCL-based sensors from 3 to 100 microns, *Mark Allen, Physical Sciences, Inc., USA.* This paper reviews recent progress in applying QCL lasers to high-sensitivity detection of hydrocarbon; cavity-enhanced detection of trace breath species; and THz wavelength devices for detection of explosives.

WD2 • 4:20 p.m.
Novel sources for spectroscopic sensing using femtosecond fiber lasers and nonlinear fiber processes, *Joachim W. Walewski, Scott T. Sanders; Dept. of Mechanical Engineering, Univ. of Wisconsin - Madison, USA.* Using a femtosecond fiber laser operating at 1560 nm, we have generated both longer and shorter wavelengths in subsequent nonlinear fiber processes. These strategies provide a versatile and rugged light source for spectroscopic sensing.

WD3 • 4:40 p.m.
Measurements of cesium using laser ionization mass spectrometry, *Leticia S. Pibida[1], B. A. Bushaw[2]; [1]NIST, USA, [2]Pacific Northwest Natl. Lab., USA.* Isotopic ratio measurements of 135Cs to 137Cs were performed using Resonance Ionization Mass Spectrometry to determine the chronological age of nuclear fuel burn-up samples. Initial cesium content measurements were performed on a lake sediment sample.

WD4 • 5:00 p.m.
Ballistic imaging in the liquid core of a spray, *Mark Linne[1], Megan Paciaroni[2], Tyler Hall[2], Terry Parker[2]; [1]Lund Inst. of Tech., Sweden, [2]Colorado School of Mines, USA.* Single-shot ballistic imaging has been applied to two spray systems: a steady water spray and a transient diesel spray. In both cases, ballistic imaging reveals important fluid-mechanical structures formerly obscured by a fog of droplets.

WD5 • 5:20 p.m.
Spectroscopic performance evaluation of optical fiber amplified coherent diode and fiber laser sources for difference frequency generation, *Dirk Richter, Alan Fried, Christoph Dyroff, James G. Walega; NCAR, USA.* The spectroscopic performance of fiber coupled near-IR pump lasers was tested with and without frequency mixing components.

Room: Arundel B Ballroom
5:40 p.m.–6:00 p.m.
Closing Remarks