OSA
Optical Society of America

LACEA

Laser Applications to Chemical and Environmental Analysis

Eighth Topical Meeting and Tabletop Exhibit

February 7–10, 2002
Millennium Hotel
Boulder, Colorado

The organizers of LACEA gratefully acknowledge the support of the Air Force Office of Scientific Research.

About LACEA

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 eighth 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.

Speakers

The list for plenary and invited speakers during the main program include a session code for easy reference.

Plenary

- Cavity ring-down spectroscopy: An overview
  Richard N. Zare, Stanford Univ., USA [FE1]

Invited

- Microoptics for laser applications
  Hans Peter Herzig, Univ. of Neuchatel, Switzerland [SA1]
- Multidimensional and multiscalar laser diagnostics in turbulent combusting flows
  Johan Hult, Lund Inst. of Tech., Sweden [ThB1]
- Recent progress in the science and technology of LIBS
  Andrzej Miziolek, Army Res. Lab., USA [FA1]
- Fluorescence correlation spectroscopy and its impact on single molecule biophysics
  Petra Schwille, Max-Planck Inst., Germany [ThC1]
- Using picosecond pulses for gas-phase laser diagnostics
  Thomas B. Settersten, Sandia Natl. Lab, USA [FB1]
- Miniaturized QC and TDL laser spectrometers for biogenic gases and isotope ratios on Mars, Titan, and Venus
  Chris Webster, Jet Propulsion Lab., USA [SuA1]
- New advances in optical microscopy of biological systems
  Sunney Xie, Harvard Univ., USA [ThA1]

Publications

>> Advance Programs

There will not be a printed version of the LACEA Advance Program. The program will be available online only starting November 30, 2001.

>> Technical Digests

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

>> Applied Optics Special Issue

The LACEA meeting will continue its tradition of soliciting contributed manuscripts of the meeting presentations for a special issue of Applied Optics to be published Spring 2003. Look for the issue announcement and relevant dates in the February 2002 issue of Applied Optics.

LACEA Exhibitor List

As of January 29, 2002

- Access Laser Co.
- Avantes Inc
- Koheras A/S
- Photonics Spectra
- Positive Light
- Sacher Lasertechnik, LLC

Agenda of Sessions

Wednesday, February 6, 2002	
Time	**Event**
2:00pm - 7:00pm	Registration Flat Iron Room

Thursday, February 7, 2002	
Time	**Event**
7:00am - 5:00pm	Registration/Speaker and Presider Check-In Flat Iron Room
8:00am - 8:20am	Opening Remarks Century Room
8:20am - 10:00am	ThA: Biological or Biomedical I Century Room
10:00am - 10:40am	Coffee Break Millennium Room Exhibits Open 10:00am - 5:00pm
10:40am - 12:20pm	ThB: Combustion I Century Room
12:20pm - 2:00pm	Lunch Break
2:00pm - 3:40pm	ThC: Biological or Biomedical II Century Room
3:40pm - 4:20pm	Coffee Break Millennium Room
4:20pm - 5:40pm	ThD: Nonlinear Techniques Century Room

Friday, February 8, 2002	
Time	**Event**
7:00am - 5:00pm	Registration/Speaker and Presider Check-In Flat Iron Room
8:00am - 10:000am	FA: Laser Induced Breakdown Spectroscopy Century Room
10:00am - 10:40am	Coffee Break Millennium Room Exhibits Open 10:00am - 5:00pm
10:40am - 12:20pm	FB: Combustion II Century Room
12:20pm - 2:00pm	Lunch Break
2:00pm - 3:00pm	FC: Combustion III Century Room
3:00pm - 4:00pm	FD: Cavity Ringdown Spectroscopy Century Room
4:00pm - 4:40pm	Coffee Break

	Millennium Room
4:40pm - 5:40pm	FE: Plenary Session Century Room

Saturday, February 9, 2002	
Time	**Event**
7:30am - 12:30pm	Registration/Speaker and Presider Check-In Flat Iron Room
8:00am - 10:00am	SaA: Instrumentation I Century Room
10:00am - 10:40am	Coffee Break Millennium Room
10:40am - 12:20pm	SaB: Diode Lasers and Applications I Century Room
12:20pm - 7:00pm	Lab tour or recreation time
7:00pm - 9:00pm	SaC: Poster Session & Reception Millennium Room

Sunday, February 10, 2002	
Time	**Event**
7:30am - 12:00pm	Registration/Speaker and Presider Check-In Flat Iron Room
8:00am - 10:00am	SuA: Instrumentation II Century Room
10:00am - 10:40am	Coffee Break Millennium Room
10:40am - 12:20pm	SuB: Diode Lasers and Applications II Century Room
12:20pm - 12:30pm	Closing Remarks Century Room

Abstracts

■ Thursday
■ February 7, 2002

Room: Flagstaff
8:20am–10:00am
ThA ■ Biological or Biomedical I
Michael D. Barnes, Oak Ridge Natl. Lab., USA, Presider

ThA1 8:20am (Invited)
PLACEHOLDER—New advances in optical microscopy of biological systems, *Sunney Xie, Harvard Univ., USA.*
Invited speaker placeholder

ThA2 9:00am
Single molecule fluorescence correlation spectroscopy in an electrophoretic mobility shift assay, *Alan Van Orden, Colorado State Univ., USA; Dale J. LeCaptain, Central Michigan Univ., USA.*
A capillary electrophoresis-based electrophoretic mobility shift assay is described wherein fluorescence correlation spectroscopy is used to resolve the bound and unbound fractions of a DNA-protein complex on the basis of their characteristic electrophoretic flow velocities.

ThA3 9:20am
Probing single ion luminescence in rare-earth doped nanocrystals, *A. Mehta, T. Thundat, M.D. Barnes, Oak Ridge Natl. Lab., USA; R. Bhargava, Nanocrystals Tech., USA; A. Bartko, L. Peyser, R.M. Dickson, Georgia Inst. of Tech., USA.*
We describe experiments probing single europium and terbium ions in isolated nanocrystals (2 –15 nm diam.) using fluorescence microscopy techniques. Emission pattern imaging also shows patterns that are distinctly characteristic of single dipoles.

ThA4 9:40am
Second harmonic generation technique for monitoring of thermo-induced processes in biotissue, *A. Lalayan, Yerevan State Univ., Armenia; E. Janunts, Armenian State Engineering Univ., Armenia.*
Second harmonic generation in collagen contained animal biotissue under picosecond laser irradiation have been studied during conventional and laser heating. Experimental comparison of second harmonic generation and two-photon fluorescence nonlinear optical phenomena has been performed in ordered native tissue.

Room: Flagstaff
10:40am–12:20pm

ThB ■ Combustion I

Clemens Kaminski, Univ. of Cambridge, UK, Presider

ThB1 10:40am (Invited)
Multidimensional and multiscalar laser diagnostics in turbulent combusting flows, *Johan Hult, Lund Inst. of Tech., Sweden.*
Measurements in jet flames and engines of time resolved fuel concentration fields, simultaneous OH and velocity fields and three-dimensional soot concentrations, using a high speed laser diagnostic imaging system are presented.

ThB2 11:20am
Raman/Rayleigh/LIF/CRDS measurements in premixed CH4/N2/O2 atmospheric pressure flames, *Christopher B. Dreyer, Mark Linne, Colorado School of Mines, USA.*
Measurements of N2, O2, CH4, CO2, and H2O have been made by vibrational raman scattering and OH by laser induced fluorescence (LIF) and cavity ringdown spectroscopy (CRDS) as a function of height in a premixed methane/air flame at atmospheric pressure.

ThB3 11:40am
In situ measurement of CO, H2O, and gas temperature in a lignite-fired power-plant, *H. Teichert, T. Fernholz, V. Ebert, Univ. of Heidelberg, Germany.*
A diode laser based in situ absorption spectrometer is presented for the simultaneous detection of CO (1560nm), water (813nm) and the gas temperature within the combustion chamber of a 600MW lignite-fired power-plant.

ThB4 12:00pm

Nanoscaled particle size distributions and gas temperatures from time-resolved LII measurements, *T. Lehre, B. Jungfleisch, R. Suntz, H. Bockhorn, Univ. Karlsruhe, Germany.*

LII signals are measured in sooting premixed atmospheric and low-pressure flames. Soot particle size distribution P(r) and gas temperature T are measured independently. LII model parameters are validated. P(r) and T are estimated using non-linear regression.

Room: Flagstaff

2:00pm–3:40pm

ThC ■ Biological or Biomedical II

Andreas Brockhinke, Univ. Bielefeld, Germany, Presider

ThC1 2:00pm (Invited)

Fluorescence correlation spectroscopy and its impact on single molecule biophysics, *Petra Schwille, Unaffiliated, Germany.*

Confocal fluorescence correlation spectroscopy (FCS) combines single molecule sensitivity with high statistical confidence and has proved to be an extremely powerful tool for detection and temporal investigation of biomolecules in solution and living cells.

ThC2 2:40pm

A mid infrared, high power, cw, continuous tunable PPLN OPO for trace gas detection within life science, *M. van Herpen, S. te Lintel Hekkert, F.J.M. Harren, Univ. of Nijmegen, The Netherlands; S.E. Bisson, Sandia Natl. Labs., USA.*

A 2 W continuous wave optical parametric oscillator based on periodically poled lithium niobate and tunable over the 3.0-3.8 micrometer wavelength region is used in combination with photoacoustic spectroscopy to trace small hydrocarbons for applications in medicine and biology.

ThC3 3:00pm

Longitudinal studies of nitric oxide and carbon dioxide in human breath with a single IV-VI mid-IR laser, *Chad Roller, Khosrow Namjou, Jim Jeffers, Ekips Tech., Inc., USA; Adom Mock, Columbia Univ., USA; Patrick J. McCann, Joe Grego, Univ. of Oklahoma, USA.*

NO and CO2 were measured simultaneously in exhaled breath from seven subjects 10 times over a period of 12 days. Exhaled CO2 was used to estimate NO values as laser characteristics fluctuate over time.

ThC4 3:20pm

Measurement of 13C02/12C02 ratio using tunable diode laser based Raman spectroscopy and an atomic vapor filter, *Philip L. Varghese, Claudia Navarro, Manfred Fink, Univ. of Texas at Austin, USA.*
We describe a novel scheme for detecting the isotopic ratio (13C/12C) in gaseous carbon dioxide. Raman scattering is excited with a tunable near-infrared diode laser and isotopic discrimination is obtained with an atomic vapor filter.

Room: Flagstaff
4:20pm–5:40pm

ThD ■ Nonlinear Techniques

Mark G. Allen, Physical Sciences Inc., USA, Presider

ThD1 4:20pm

Far-infrared semiconductor laser for molecular spectroscopy, *R.E. Peale, A.V. Muravjov, E.W. Nelson, Univ. of Central Florida, USA; S.G. Pavlov, V.N. Shastin, Russian Acad. of Science, Russia; C.J. Fredricksen, Zaubertek, Inc., USA.*
The feasibility of the p-Ge laser for far-infrared laser spectroscopy is enhanced by recent progress in single mode selection and tunable external cavities, allowing continuous tuning from 50-140 cm-1 without mode-hops.

ThD2 4:40pm

Tunable silver and gold substrates for surface enhanced raman spectroscopy, *R. Gupta, W.A. Weimer, Zyvex Corp., USA.*
Use of specific combinations of thermal evaporation parameters allows the deposition of surface plasmon resonance tunable silver and gold island films on glass substrates. The utility of these films for surface enhanced Raman spectroscopy is demonstrated.

ThD3 5:00pm

All-telecom diode laser based mid-IR source for spectroscopic detection of HF, H2O, and HDO, *Dirk Richter, Alan Fried, Geoffrey S. Tyndall, Natl. Ctr. for Atmospheric Res., USA; Eduardo Oteiza, Coherent, Inc., USA; Miklos Erdelyi, Frank K. Tittel, Rice Univ.,USA.*

A novel difference-frequency mixing architecture for coherent generation of tunable mid-infrared light is reported. Two CW single-frequency diode laser pump sources operating at 1.56 and 0.98 microns were mixed in a periodically poled LiNbO3 crystal and generated 0.25 mW of tunable mid-infrared light at 2.64 microns. The performance of this new source was demonstrated by the spectroscopic detection of HF and water isotopes H2(16,17,18)O and HD(16)O at various reduced pressures. Using direct absorption spectroscopy, a peak-to-peak noise equivalent absorbance of ~1E-4 was observed (0.6 s integration time), corresponding to a HF detection sensitivity of 12 ppb.m at a sampling pressure of 50 Torr.

ThD4 5:20pm

Towards a practical theory of polarisation spectroscopy, *J. Walewski, Lund Inst. of Tech., Sweden; C.F. Kaminski, Univ. of Cambridge, UK; S.F. Hanna, R.P. Lucht, Texas A&M Univ., USA.*

We present a simple phenomenological theory of polarisation spectroscopy and apply it in an assessing fashion to measurements and detailed theoretical calculations. Our model serves also to interpret polarisation spectroscopy measurements of relative OH concentrations.

Room: Flagstaff
8:00am–10:00am

FA ■ Laser Induced Breakdown Spectroscopy (LIBS)

Kevin L. McNesby, U.S. Army Res. Lab., USA, Presider

FA1 8:00am (Invited)
PLACEHOLDER—Recent progress in the science and technology of LIBS, *Andrzej W. Miziolek, US Army Res. Lab., USA.*
Invited speaker placeholder

FA2 8:40am
From hot ellipsoid to colder torus: Structure and temperature changes of laser induced plasmas, *K. Hutchison, L. Hüwel, M. Kubitzki, M. Longenecker, K. Rowold, Wesleyan Univ. USA; L. Cadwell, Providence College, USA.*
Using time resolved emission spectroscopy we have recorded changes in both shape and spectral content of the light emitting region of laser generated sparks in argon during the first 100 microseconds after the laser pulse.

FA3 9:00am
Laser induced breakdown spectroscopy of liquid and solid samples in the presence of magnetic field, *Virendra N. Rai, CAT, India; Awadhesha K. Rai, Univ. of Agriculture and Tech., India; Fang Yu Yueh, Jagdish P. Singh, Mississippi State Univ., USA.* The emission properties of laser-produced plasma in the presence of magnetic field from liquid as well as solid samples have been presented. It was found that emission intensity increases by 1.5 - 2 times. This enhancement was due to an increase in the rate of recombination of plasma.

FA4 9:20am
Rapid field screening of soils for heavy metals with spark-induced breakdown spectroscopy (SIBS), *Richard T. Wainner, Amy J.R. Hunter, Physical Sciences Inc., USA.*
Spark-induced breakdown spectroscopy (SIBS) is a new technique that has evolved from the growing field of LIBS. Here we apply portable SIBS technology to the ideally-suited task of detecting small concentrations (10 ppm) of heavy metals in soils.

FA5 9:40am

Laser induced breakdown spectroscopy of nineteenth century daguerreotypes, *John C. Miller, Oak Ridge Natl. Lab., USA; D. Anglos, Foundation for Res. and Tech., Greece.*

Laser-induced breakdown spectroscopy (LIBS) has been applied for the first time to 150-year old daguerreotypes, as a prelude to laser ablation cleaning of tarnished examples.

Room: Flagstaff

10:40am–12:20pm

FB ■ Combustion II

Jae Won Hahn, Korea Res. Inst. of Standards, South Korea, Presider

FB1 10:40am (Invited)

Using picosecond pulses for gas-phase laser diagnostics, *T.B. Settersten, Sandia Natl. Labs., USA.*

This work provides an introduction to picosecond laser diagnostics. The temporal and spectral characteristics of picosecond pulses, modeling of their interactions with molecules, and examples of gas-phase diagnostic applications are described.

FB2 11:20am

Energy transfer in OH, CH, and NO: implications for quantitative LIF measurements, *A. Buelter, U. Lenhard, U. Rahmann, A. Brockhinke, Univ. Bielefeld, Germany.*

Collision-induced processes (quenching, rotational and vibrational energy transfer, polarization scrambling) affect most LIF experiments. For OH, CH and NO, these processes are studied with picosecond resolution. Methods to obtain quench-free data and implications for flame measurements are discussed.

FB3 11:40am

Predictions of chemical species via diode laser spectroscopy, *Shin-Juh Chen, Joel A. Silver, Southwest Sciences, Inc.; Werner J.A. Dahm, Univ. of Michigan; Nancy D. Piltch, NASA Glenn Research Ctr., USA.*

A technique to predict temperature and chemical species in flames from absorbance measurement of one chemical species is presented. Predicted temperature and mole fractions of methane and water agreed well with measured and published results.

FB4 12:00pm

Strategies for NO laser-induced fluorescence in methane/air flames at pressures between 1 and 60 bar, *Wolfgang G. Bessler, Christof Schulz, Univ. Heidelberg, Germany; Dong-Ill Shin, Tonghun Lee, Jay B. Jeffries, Ronald K. Hanson, Stanford Univ., USA.* Measurements in laminar premixed methane/air flames at pressures between 1 and 60 bar are used here to compare strategies for NO LIF detection exciting selected transitions in the A-X (0,0), (0,1), and (0,2) bands.

Room: Flagstaff

2:00pm–3:00pm

FC ■ Combustion III

Jae Won Hahn, Korea Res. Inst. of Standards, South Korea, Presider

FC1 2:00pm

Investigations on laser-induced incandescence (LII) for soot diagnostics at high pressure, *Max Hofmann, Wolfgang G. Bessler, Joachim Gronki, Christof Schulz, Heidelberg Univ., Germany; Helga Jander, Göttingen Univ., Germany.*
LII has been investigated in sooting ethylene/air flames at 1 - 15 bar with wavelength-, energy-density- and time-resolved detection. LII decay coefficients increase linearly with pressure. Pressure influence on the LII intensity is limited with prompt detection.

FC2 2:20pm

Temperature-dependent absorption by CO2: Implications for UV diagnostics in high-temperature flames, *Christof Schulz, Joachim Gronki, Heidelberg Univ., Germany; Jon D. Koch, David F. Davidson, Jay B. Jeffries, Ronald K. Hanson, Stanford Univ., USA.*
Absorption spectra of hot (900 - 3050 K) CO2 have been measured at 190 - 320 nm. A parameter set allows the calculation of absorption cross sections relevant for laser diagnostic in combustion processes.

FC3 2:40pm

In-situ flame measurements of NO and CO using mid-IR QC lasers, *Shawn D. Wehe, David M. Sonnenfroh, Mark G. Allen, Physical Sciences Inc., USA; Claire Gmachl, Frederico Capasso, Lucent Tech., USA.*
Room-temperature Quantum Cascade Lasers (QCL) allow high-sensitivity measurements of trace gas absorption in the 4.6-11 micron wavelength region. Important combustion generated pollutants such as CO and NO exhibit strong fundamental absorption bands in this region and sub-ppm detection limits are projected. the paper will present initial results for both species obtained in a laboratory flat-flame burner.

Room: Flagstaff
3:00pm–4:00pm

FD - Cavity Ringdown Spectroscopy (CRDS)

Mark A. Linne, Colorado School of Mines, USA, Presider

FD1 3:00pm

Development of an enhanced cavity absorption sensor for air monitoring, *A.R. Awtry, M.E. Moses, J.H. Miller, The George Washington Univ., USA.*

The progress on the development of a sensor for the detection of ambient levels of a set of air contaminants is reported. A 1.55 mm external-cavity tunable diode laser is used as a light source that can be incorporated into either Integrated Cavity Output Spectroscopy (ICOS) or cw-Cavity Ringdown Spectroscopy (cw-CRDS). Both techniques exploit the sensitivity enhancements provided by the long effective pathlength from the optical cavity created between two mirrors. Initial experiments of ICOS and cw-CRDS have been performed to determine the sensitivity, selectivity, and reproducibility of this method. In the continuing work, the sensitivity of cw-CRDS will be compared with ICOS to determine which method holds greater promise for a practical sensor.

FD2 3:20pm

Theoretical model analysis of the dynamic saturation in cavity ringdown spectroscopy, *Jae Yong Lee, Jae Won Hahn, Korea Res. Inst. of Standards and Science, Korea.*

Transient saturation in cavity ringdown spectroscopy is theoretically modeled with coupled rate equations accounting for the dynamics of intracavity photons and absorber population, which permits a recipe for retrieving original spectra in the saturation regime.

FD3 3:40pm

Sensitive absorption measurements based on novel cavity enhanced spectroscopy techniques, *Doug Baer, Manish Gupta, Anthony O'Keefe, Joshua Paul, Los Gatos Res., USA.*

A novel absorption diagnostic technique based on off-axis paths in high-finesse optical cavities using near-infrared and mid-infrared lasers provides extremely high sensitivities. Applications to environmental monitoring and industrial process control will be presented.

Room: Flagstaff
4:40pm–5:40pm

FE ■ Plenary Session

Mark A. Linne, Colorado School of Mines, USA, Presider

FE1 4:40pm (Plenary)
Cavity ring-down spectroscopy: An overview,
Richard N. Zare, Stanford Univ., USA.
Cavity ring-down spectroscopy (CRDS) permits absorption measurements to be made with an increase of several orders of magnitude in sensitivity over more traditonal approaches. Novel applications to gases, plasmas, liquids, and solids will be presented.

■ Saturday
■ February 9, 2002

Room: Flagstaff
8:00am–10:00am

SaA ■ Instrumentation I

Alfredo E. Bruno, Novartis Pharma AG, Switzerland, Presider

SaA1 8:00am (Invited)
PLACEHOLDER—Microoptics for laser applications, *Hanz Pere Herzig, Univ. of Neuchatel, Switzerland.*
Invited speaker placeholder

SaA2 8:40am
Tunable semiconductor laser spectroscopy in hollow optical waveguides, *G.J. Fetzer, A.S. Pittner, Arete Assoc., USA.*
A spectrometer based on tunable semiconductor lasers and hollow optical waveguides is discussed. Results are presented that characterize the function of the spectrometer in terms of sensitivity, response time, species cross interference and stability.

SaA3 9:00am
Development of a CMOS active-pixel phase-sensitive detector imaging array, *R. Swartzendruber, S. Sedarsky, N. Middleton, M. Linne, Colorado School of Mines, USA.*
We describe the development of a new imaging array that performs phase-sensitive detection signal processing at the chip level, at each pixel. It is predicted to detect 10-5 modulation depth at 1,000 frames/sec.

SaA4 9:20am
Microphotonic laser-based sensors for the rapid detection of approach to lower explosion limit for hydrocarbon vapors, *Kevin L. McNesby, Andrzej W. Miziolek, Army Res. Lab., USA.*
Microphotonic sensors for rapid (10 msec) measurement of vapors from hydrocarbon fuels JP-8, DF-2, and gasoline are discussed. Sensors systems include dual wavelength NIR systems, Fourier transform-based systems, and Mid-IR (interband cascade) systems.

SaA5 9:40am

Fractionation of aerosol particles produced by laser ablation in ICP-MS analysis, *J. Koch, L. Feldmann, N. Jakubowski, K. Niemax, Inst. of Spectrochemistry and Applied Spectroscopy, Germany.*

The element composition of aerosol particles produced by laser ablation of brass and steel in Ar and He and deposited on the wall of the transport tube to an ICP have been measured. Depending on the experimental parameters and the matrix, the element composition of the aerosol particles deviated from the stoichiometric element ratios of the bulk and varied along the tube.

Room: Flagstaff

10:40am–12:20pm

SaB ■ Diode Lasers and Applications I

Douglas S. Baer, Los Gatos Res., USA, Presider

SaB1 10:40am

Analysis by diode laser absorption spectroscopy in a linear dielectric barrier discharge, *K. Kunze, M. Miclea, J. Franzke, K. Niemax Inst. of Spectrochemistry and Applied Spectroscopy, Germany; C. Vadla, Inst. of Physics, Croatia.*

The diagnostic as well as the application of a miniaturized dielectric barrier discharge as detector for analytical spectrometry were investigated using diode laser absorption spectrometry of the excited species produced in the plasma.

SaB2 11:00am

Sculpted tone burst modulation spectroscopy, *Chris Hovde, Southwest Sciences, Inc., USA.*

By manipulating the amplitude modulation waveform for tone burst spectroscopy, the response of a tunable diode laser spectrometer can be tailored to avoid the effects of many interference fringes that otherwise limit sensitivity.

SaB3 11:20am

Wavelength agile external cavity diode laser for trace gas detection, *Jeffrey S. Pilgrim, Southwest Sciences, Inc.*

We have developed an external cavity diode laser that is wavelength modulated with injection current. The laser has broad spectral coverage and is inexpensive. We have obtained a minimum detectable absorbance of 5E-05.

SaB4 11:40am

Evanescent-field laser sensor for in-situ monitoring of volcano gas emissions, *Ulrike Willer, Irina Kostjucenko, Christian Bohling, Thomas Zentgraf, Dirk Scheel, Wolfgang Schade, Tech. Univ. Clausthal, Germany.*
A DFB laser diode (1.57 μm) is guided through a pure core fused silica fiber. Tuning the laser frequency across molecular resonances will change the frustrated (FTR) and the attenuated total reflection (ATR). Such an evanescent-field laser sensor is used for in-situ monitoring of H2S in volcano gases at the site "Solfatara" (Italy).

SaB5 12:00pm

Spectroscopic trace gas detection with pulsed quantum cascade lasers, *Anatoliy A. Kosterev, Frank K. Tittel, Rice Univ., USA; Shawn Wehe, David M. Sonnenfroh, Mark G. Allen, Physical Sciences Inc., USA; Rudeger Kohler, Claire Gmachl, Federico Capasso, Deborah L. Sivco, Alfred Y. Cho, Lucent Tech., USA.*
Pulsed quantum cascade lasers operating at wavelength of 10 and 4.6 microns were used for detection of ammonia and carbon monoxide, respectively. Variations of atmospheric CO concentration were continuously monitored with 12 ppbv precision using a 1 m optical pathlength.

Room: Canyon
7:00pm–9:00pm

SaC ■ Poster Session

SaC1

Corrections for quantitative NO concentration measurements using time-resolved picosecond laser-induced fluorescence, *J.J. Driscoll, V. Sick, Univ. of Michigan USA; R.L. Farrow, P.E. Schrader, Sandia Natl. Labs, USA.*
The corrections necessary to obtain nitric oxide mole fractions from picosecond laser-induced fluorescence signals are outlined.

SaC2

Optimization of the mode matching in pulsed cavity ringdown spectroscopy, *Dong-Hoon Lee, Youngjee Yoon, Bongsoo Kim, Korea Advanced Inst. of Science and Tech., Korea; Jae Yong Lee, Yong Shim Yoo, Jae Won Hahn, Korea Res. Inst. of Standards and Science, Korea.*
A simple and reliable method is presented for optimizing the mode matching of pulsed cavity-ringdown spectroscopy (CRDS). The method is based on monitoring the non-degenerate transversal mode beating induced by beam clipping and slight cavity misalignment.

SaC3

Spatial-domain cavity ringdown: A potential toward broadband cavity ringdown spectroscopy, *Jae Yong Lee, Yong Shim Yoo, Jae Won Hahn, Korea Res. Inst. of Standards and Science, Korea.*

We propose and demonstrate the idea of spatial-domain cavity ringdown (CRD) technique. The feasibility of the new concept toward broadband CRD implementation is supported by a firm theoretical background and a preliminary experiment.

SaC4

Real-time ground level atmospheric nitric oxide measured by calibrated TDLAS system, *Adam Mock, Columbia Univ., USA; Chad Roller, Jim Jeffers, Khosrow Namjou, Ekips Tech., USA; Patrick J. McCann, Joe Grego, Univ. of Oklahoma, USA.*

A calibrated TDLAS system was used to measure real-time ground level atmospheric NO levels near a busy suburban street. A sample atmospheric NO concentration trend diagram from midday is presented.

SaC5

Maximum-likelihood estimation of model parameters for experiments with pulsed lasers, *Thomas Metz, Joachim Walewski, Lund Inst. of Tech., Sweden; Clemens F. Kaminski, Univ. of Cambridge, UK.*

A fitting method is presented for evaluation of nonlinear spectroscopy experiments. Correct treatment of laser intensity fluctuations increases the accuracy and precision and avoids significantly wrong results. The method is compared to common fitting schemes.

SaC6

Detection of conformational changes in proteins with FRET, *R. Plessow, K. Lotte, A. Brockhinke, Univ. Bielefeld, Germany.*

Foerster resonance energy transfer (FRET) is detected using a combination of two techniques: picosecond time-resolved LIF and excitation-emission spectroscopy. This allows the quantitative determination of distances within and in between proteins.

■ Sunday
■ February 10, 2001

Room: Flagstaff
8:00am–10:00am
SuA ■ Instrumentation II
Richard M. Williams, Pacific Northwest Natl. Lab., USA, Presider

SuA1 8:00am (Invited)
Miniaturized QC and TDL laser spectrometers for biogenic gases and isotope ratios on Mars, Titan, and Venus, *Christopher R. Webster, Jet Propulsion Lab., USA.*
QC lasers have been flown in Earth's stratosphere, making the first atmospheric measurements, and are now incorporated into miniature tunable laser spectrometers for biogenic gases and isotope ratios as biosignatures on Mars and other planets.

SuA2 8:40am
UV laser induced fluorescence portable system for the detection of plastic and organic compounds in water, *Vasanthi Sivaprakasam, Dennis K. Killinger, Univ. of South Florida, USA.*
A 266 nm Laser Induced Fluorescence system that is 1000 times more sensitive than existing in situ fluorescence sensors has been developed and tested for the detection of plastics and organics in water.

SuA3 9:00am
Design of a line-scanned handheld imager for detecting natural gas leaks, *R.P. Bambha, T.A Reichardt, T.J. Kulp, R.L. Schmitt, Sandia Natl. Labs., USA.*
An active infrared imager capable of both single- and differential-frequency detection of methane is being developed for handheld operation. The device will be capable of producing real-time video images of methane plumes.

SuA4 9:20am
Development and evaluation of a portable gas imager using a fiber-amplifier-pumped PPLN OPO illuminator, *Thomas J. Kulp, Karla M. Armstrong, Ricky Sommers, Dahv A.V. Kliner, Uta-Barbara Goers, Sal Birtola, Sandia Natl. Labs.,USA; Lew Goldberg, Jeffrey P. Koplow, Sean Moore, Naval Res. Lab., USA; Thomas G. McRae, Laser Imaging Systems, USA.*
Active imaging allows real-time video imaging of gases through their attenuation of backscattered laser radiation. We describe the development and testing of a portable gas imager that employs a fiber-amplifier-pumped PPLN OPO as its illuminator.

SuA5 9:40am
Ultra-sensitive ammonia detection for industrial applications using photoacoustic spectroscopy, *Michael E. Webber, Michael B. Pushkarsky, Ohan Baghdassarian, L. Ravi Narasimhan, C. Kumar N. Patel, Pranalytica, Inc., USA.*
An industrial trace-ammonia sensor based on photoacoustic spectroscopy and CO2 lasers has been developed with a minimum detectivity in the parts-per-billion range. This sensor is capable of making simultaneous measurements of up to twenty gas samples with an optically multiplexed arrangement of optoacoustic cells.

Room: Flagstaff
10:40am–12:20pm
SuB ■ Diode Lasers and Applications II
Juan-Carlos Rolon, Ecole Centrale Paris, France, Presider

SuB1 10:40am
Rubust external cavity diode laser (ECDL) with implemented antireflection coated blue laserdiodes and their performance in atom absorption spectroscopy, *Lars Hildebrandt, Joachim Sacher, Richard Knispel, Sacher Lasertechnik Group, Germany.*
For the first time we present antireflection coated "blue" laserdiodes and their performance in Littrow and Littman ECDL. The relevance of the achieved progress in ECDL technology for construction of ECDL-based sensor systems for in-situ analysis is discussed.

SuB2 11:00am
Wavelength-agile diode laser sensors for monitoring gas properties in harsh environments, *Scott T. Sanders, Jay B. Jeffries, Jian Wang, Ronald K. Hanson, Stanford Univ., USA.*
Extended wavelength tuning of diode lasers enable the extension of scanned wavelength absorption techniques to transient, high pressure, hostile environments. Examples using frequency agile VCSELs and new wavelength tuning strategies are presented.

SuB3 11:20am
Low cost, low power diode laser sensing: A weather balloon hygrometer, *Mark E. Paige, Southwest Sciences, Inc., USA.*
An inexpensive diode laser hygrometer is described. The engineering advances of this system greatly increase the applicability of diode laser sensors for commercial sensing applications.

SuB4 11:40am

A Near-IR TDL-based sensor for eddy covariance flux measurements of CO2, *David Sonnenfroh, Mark Allen, Physical Sciences Inc., USA; Gerry Livingston, Univ. of Vermont, USA.*

We describe some of the design considerations for a near-IR TDL-based sensor for eddy covariance flux measurements of CO2 and H2O. Initial data from recent field trials will be discussed.

SuB5 12:00pm

External cavity diode laser based on a transmission grating, *Toni Laurila, Timo Joutsenoja, Rolf Hernberg, Tampere Univ. of Tech., Finland; Markku Kuittinen, Univ. of Joensuu, Finland.*

Design and characterization of an external cavity diode laser at 650 nm based on a transmission grating is described. The transmission grating enables compact design and removes the beam direction variation during the wavelength tuning.