2012 LSO Workshop
Speaker Abstracts and Bios

Ken Barat, Lawrence Berkeley National Laboratory

ANSI Z136.8 - Update on New Standard for Laser Safety in R&D

This is a review of the newly published ANSI standard for Laser Safety in the Research, Development and Testing Environment. The presentation will highlight areas where the Z136.8 standard varies from Z136.1-2007 as well as new features to the Z136 series.

Laser Reference Guides-Cradle to Grave

Taking a cradle to grave approach the laser safety program at LBNL has developed three laser user guides. A laser lab design guide, a laser user reference guide and a laser disposal guide. The presentation will review the rationale and substance of each guide as well as the value it gives to the laser user and laser safety program. As well as how to obtain free copies.

Ken Barat is Laser Safety Officer for Lawrence Berkeley National Laboratory and former LSO for the National Ignition Facility Directorate. Ken chaired the first 7 DOE LSO Workshops. Awards: Jim Rockwell Award for Exceptional Contributions to Laser Safety, 2009; Jim Rockwell Award for Laser Safety Leadership, 2005; Tim Renner User Service Award, 2001 (Advanced Light Source). Textbook publications: SPIE text Laser Safety in R&D - in progress; Laser Safety Tools & Training, 2009, CRC Press; Laser Safety Management, 2006, CRC Press; Laser Safety Chapter 11 in "Medical Applications of Lasers," Kluwer Academic Publishers, 2002; Laser Institute of America, Laser Safety Guide 10th Edition and LIA Guide for the Selection of Laser Eye Protection Fifth Edition contributing author. LIA Fellow, IEEE Senior Member, ANSI Z136.8 Chair. Presenter at International meetings (UK Laser Forum, IRPA, ILSC, Photonics west). Keynote speaker, Scandinavian Laser Safety Conference, 2011.

Johannes Bauer, SLAC National Accelerator Laboratory

Radiological Dose Rates from Laser-Target Interactions at 10^{17}-10^{20} W/cm^2 Irradiance

High irradiances by tightly focused lasers on targets may create ionizing radiation. This talk describes the work of the SLAC Radiation Protection Department prior to user operation of a high-irradiance laser at the Linac Coherent Light Source (LCLS).
After creating a model from previous measurements to predict the level of such ionizing radiation, radiation measurements were taken at the Jupiter Laser Facility of Lawrence Livermore National Laboratory (LLNL) for irradiances of 10^{20} W/cm^2 and energies of 50 to 400 J. The measurements continued at the SLAC LCLS laser facility which is designed for up to 3×10^{18} W/cm^2, 150 mJ at 10 Hz.
The talk presents the model, results of the measurement at LLNL and SLAC, and describes controls that mitigate the ionizing radiation hazards.

Johannes Bauer studied Physics in Regensburg, Germany, in Tempe, AZ, and finally, for his PhD, in Amherst, MA. He came to SLAC for his dissertation experiment. Six years ago, he joined SLAC's Radiation Protection Department. As member of the Radiation Physics Group, he supports SSRL, the Stanford Synchrotron Radiation Lightsource, and is currently assigned to the LCLS photon beamlines.

Stephen Benson, Thomas Jefferson National Accelerator Laboratory

The Jefferson Lab FEL: User Operation and Laser Safety in its User Labs

Jefferson Lab operates a versatile user facility with two broadband tunable free-electron lasers, one in the IR and one in the visible and UV. The facility has the capability of using both the high power FEL as well as both low (class 3b) and high power (class 4) conventional lasers. We have developed a user-friendly laser protection system that allows operation with many different lasers at many different wavelengths in a safe but convenient manner. This presentation describes the laser facility, some of the unique laser hazards in it, and how the hazards are ameliorated. Some new systems for operating in environments with the potential for multiple laser wavelengths will also be introduced.

Dr. Benson began his career in FELs on the Stanford SCA FEL at HEPL. He commissioned the Mark III user facility at Stanford University and then at Duke University. He was the first to demonstrate third harmonic lasing in a FEL and assisted in efforts to achieve the first lasing at the second and fifth harmonics. Since 1992 he has worked on developing high power IR to UV FELs. The Jefferson Lab IR FEL presently has the FEL power record at 14.7 KW average power and the UVFEL has emitted 150 W at 370 nm. He won the FEL prize in 2000 for his part in developing the first kilowatt average power FEL. He is an APS fellow. He is the laser system supervisor for the FEL facility at Jefferson Lab and developed the specifications and procedures for its laser personnel safety system.

Uwe Bergmann, SLAC National Accelerator Laboratory

The LCLS Free Electron X-Ray Laser -- Overview of Facility and its Science

With ultrashort and ultrabright x-ray pulses (> 10^{12} photons in pulses of < 100 femtosecond length) X-ray Free electron lasers provide revolutionary unique new capabilities to study a wide range of phenomena. Starting operations in 2009 the Linac Coherent Light Source (LCLS) at SLAC has been the first of such machines delivering 500 eV – 10 keV x-rays to users. LCLS is now nearing three years of operations and some of the science examples and highlights are reviewed. Finally, we will present new upgrades and capabilities of LCLS, as well as the launch of LCLS II, which is expected to deliver user beam by 2018.

Uwe Bergmann earned a Ph.D. in physics from Stony Brook University in 1994 and did his postdoctoral work at the European Synchrotron Radiation Facility in Grenoble, France, and Lawrence Berkeley National Laboratory in Berkeley, California, before he became a scientist at DOE's Lawrence Berkeley National Laboratory in 1999. He also became an assistant researcher in the Department of Applied Science at the University of California, Davis, in 2000. He then moved on from these positions to become a staff scientist at SLAC's Stanford Synchrotron Radiation Lightsource (SSRL) in 2003. He is currently a senior staff scientist at SLAC and the Deputy Director of the Linac Coherent Light Source (LCLS), the world's first X-ray free electron laser.

Thomas Bett, AWE, Aldermaston, UK

Laser Safety arrangements at AWE and the Orion High Intensity Plasma Physics Research Facility (presented by Graham White; see below)

Panel Discussion on Alignment and On-the-Job Training

Joanna Casson, Los Alamos National Laboratory

Review of Recent Laser Incidents at DOE facilities

This talk will review the laser incidents at DOE Facilities from 2009-2012. In 2009-2012 there were 5 laser-related lessons learned reports and 17 ORPS reports. Incidents at SLAC in 2009 and INL in 2011 resulted in an injury to a worker. The INL accident will be discussed in a later talk at the Workshop. I will also go into detail about the 2012 incident at LANL where a software setting allowed a laser marker to fire without user input. There were no workers injured.

Panel Discussion on Alignment and On-the-Job Training

Joanna Casson is the Laser Safety Officer at the Los Alamos National Laboratory. She earned an A. B. in Physics from Bryn Mawr College and an M.S. in Electrical Engineering from the University of New Mexico. Her research has included using lasers to study the nonlinear properties of both ices grown under stratospheric conditions and organic thin films and to characterize small integrated lens/scanner devices and waveguides. Her current project is imaging quantum dots with a TEM. She has been an LSO for 8 years and became LANL LSO in 2008. She helped develop two of the three required laser safety courses for laser users. She has been chair and vice-chair of DOE's EFCOG laser safety subgroup.

Ryan Coffee, SLAC National Accelerator Laboratory

Panel Discussion on Alignment and On-the-Job Training

Jay Dawson, Lawrence Livermore National Laboratory

Fiber Lasers: Technology, Applications and associated Laser Safety

Lasers that employ optical fiber as the gain medium were first invented in the early 1960's. However, they did not make significant advances nor were they truly practical until they were rediscovered by the University of Southampton in the mid-1980's. In the interim, two key advances occurred. First, the technology to manufacture low-loss optical fibers was developed by the telecom industry and came into wide spread use and second, the technology needed to make practical semiconductor diode lasers was developed. The combination of these two technologies has permitted the development of extremely high power, near diffraction limited laser systems. Since their rediscovery in the mid-1980's fiber lasers have risen in output power from a few milli-watts to multi-kilowatt average powers. Further, these lasers are extremely efficient electrically as well as being reliable and easy to use. Thus they have propagated widely in research, government and industrial applications. This talk will review how optical fibers are fabricated, how fiber lasers work, the current state of the art in fiber lasers and most importantly what safety considerations do and do not apply to this relatively new class of lasers.

Jay Dawson received his B.S. in physics from Carnegie Mellon University, Pittsburgh, PA in 1988 and a Ph.D. in applied physics from California Institute of Technology, Pasadena, CA in 1993. His PhD. thesis research was on single frequency erbium fiber lasers. Between 1993 and 2002, Jay worked for 3M Company and Cidra Corporation performing product development in specialty fibers including polarization maintaining and erbium doped optical fibers, high power fiber lasers, optical fiber current sensors and fiber Bragg grating manufacturing.

Since 2002, Jay has led development of a number of fiber laser projects at LLNL and currently leads the fiber laser group. The fiber laser guide star project produced 10W of 589nm light. The short pulse injection seed laser project developed a fiber laser front end for NIF enabling NIF beamlines to produce high energy, petawatt pulses at the system output. Jay led an internal team that has studied fiber laser power and energy scaling. Recently, he led the team that installed an optical fiber draw tower at LLNL in order to enable the in house draw of photonic crystal fibers. He is currently the principle investigator on the DARPA STO FiLPs program.

Jay's current research interests are in exploring ways to push the present limits of fiber lasers. This includes understanding how to get higher quality and shorter pulses from fiber laser systems, scaling the power and energy output of single aperture fiber lasers via novel waveguide designs and combining the output of multiple fiber lasers to generate high energy, high average power fiber laser systems.

Mike Dunne, Lawrence Livermore National Laboratory

National Ignition Facility: High Energy Density Science, Ignition and Applications

The National Ignition Facility (NIF), the world's largest and most energetic laser system, is now operational at Lawrence Livermore National Laboratory. The NIF's 192 beams are capable of delivering 1.8-megajoule, 500-terawatt, ultraviolet laser light, over 60 times more energy than any previous laser system. The NIF can create temperatures of more than 100 million degrees and pressures more than 100 billion times Earth's atmospheric pressure. These conditions, exceeding those at the center of the sun, have never before been created in the laboratory. This facility is designed to compress fusion targets to the conditions required for thermonuclear burn, liberating more energy than is required to initiate the fusion reaction. The system flexibility allows multiple target designs to be fielded, offering substantial scope for optimization of a robust target design. Current experiments on NIF are focusing on creating fusion ignition and burn to demonstrate the viability of inertial confinement fusion (ICF). The ignition program is being conducted via the National Ignition Campaign (NIC)—a partnership between LLNL, Los Alamos National Laboratory, Sandia National Laboratories, the University of Rochester Laboratory fo

, Massachusetts Institute of Technology, and many others.

There are two major near-term goals: beginning integrated ignition experiments with cryogenic, layered ignition targets, and the demonstration of a reliable and repeatable ignition platform. The scope for NIC includes the ignition physics program as well as the development of the diagnostics, targets, target cryogenic system, phase plates and other

optics, and personnel and environmental protection activities required to execute ignition experiments. The NIC will also develop the infrastructure and processes required to operate NIF as a national user facility to be available for national and international fundamental science experiments.
Achieving ignition, coupled to the technology development undertaken by the NIC team is judged to provide a solid basis for future scientific and technological development in support of inertial fusion energy (IFE). LLNL, in collaboration with many national and international partners, is actively pursuing the Laser Inertial Fusion Energy (LIFE) concept. A self-consistent point design has been established that couples specific driver, target and chamber designs and other technologies required to implement a 1-GW commercialization demonstration consistent with fusion-based power production in the 2020s time frame. The requirements-based approach being undertaken will define where further research and technology development is required to construct a LIFE power plant. This talk discusses the current status of the NIC, the experimental steps needed to achieve ignition, and the progress towards developing LIFE to enable the delivery of fusion energy as a viable carbon free energy source.

Professor Mike Dunne joined Lawrence Livermore National Laboratory in 2010 as program director for Laser Fusion Energy. This role includes leadership of the LIFE (Laser Inertial Fusion Energy) project, which is designed to build from National Ignition Facility ignition to deliver electrical power for the United States at the Gigawatt scale per plant. He was previously the leader of the European laser fusion program, HiPER - a consortium of 26 institutions across 10 countries. Professor Dunne has also held the post of Director of the UK's Central Laser Facility. He spent 10 years at AWE Aldermaston, holding group leader and strategic senior management roles, and as a visiting professor at Imperial College London, where he obtained his Ph.D. in Plasma Physics. Professor Dunne is a Fellow of the Royal Society for the encouragement of Arts, Manufacturers and Commerce, and a member of the American Physical Society and the European Physical Society. He has received a number of awards and is the author of over 60 technical papers, over 30 invited talks, and numerous press and media reports.

Bill Ertle, Rockwell Laser Industries

ANSI Z136.1 - Status on Updates for next Revision, and Work by TSC-4 Committee on Control Measures and Training

Mr. Ertle has been associated with Rockwell Laser Industries (RLI) since 1989 where he now holds the position of President. Bill has provided in-depth lectures and training presentations for numerous RLI Training Institute courses, industry conferences, as well as presentations for events such as the International Laser Safety Conference (ILSC), the American Society for Laser Medicine and Surgery (ASLMS) and the DOE LSO Workshop. Bill has also authored and co-authored numerous laser safety articles and is an editor of the RLI series of laser safety guides.
Bill is the Chairman of the ANSI Z136 Technical Subcommittee on Control Measures and Training (TSC-4) and a voting member of the Accredited Standards Committee, the main Z136 committee. He is also the Secretary of IEC TC 76, the international laser

safety standards committee responsible for the 60825 series and other laser safety standards.
Bill is an active member of the Laser Institute of America (LIA) and a former member of their Board of Directors. He is a Certified Laser Safety Officer (CLSO) and a Certified Medical Laser Safety Officer (CMLSO) by the Board of Laser Safety and is a Fellow in the American Society for Lasers in Medicine and Surgery (ASLMS). Bill is a graduate of Xavier University, Cincinnati, OH.

Dennis Ford, Abbott Vascular

Nanoparticle Hazards and Mitigation in Laser Manufacturing

The speaker will discuss the process Abbott Vascular adopted to control nanoparticles produced by a picosecond laser used in manufacturing. A timeline showing discussion and decision activities will be shown. Data will be presented on several material emissions by particle size and location both pre and post mitigation.

Mr. Ford has over thirty years experience in all aspects of laser development and manufacturing. Mr. Ford has worked for a variety of industries including ten years with government contractors, six years as an independent consultant and sixteen years with medical laser device manufacturers. He has many years of experience in various areas of responsibility. His career has been divided nearly equally into three phases. Mr. Ford's early years were spent in government sponsored R&D with over twenty published articles to his credit. During his next career phase Mr. Ford worked in industry with design and manufacturing responsibilities. Recently Mr. Ford has been involved with quality and regulatory functions. He has been the Laser Safety Officer for Abbott Vascular since 2007.

Alan Fry, SLAC National Accelerator Laboratory

LCLS: User Operation and Laser Safety in its Experimental Halls

The LCLS at SLAC is the world's first hard X-ray free electron laser (FEL), producing tunable X-rays with energies as high as 7 millijoules and pulse duration as short as 4 femtoseconds. About 2/3 of the experiments on the LCLS require optical lasers to be used in conjunction with the X-rays in a pump-probe configuration; here the optical pulse is used to prepare the sample prior to an experiment involving the X-ray pulses, or vice versa. While the LCLS provides unprecedented opportunities for breakthrough scientific experiments, many aspects of the LCLS environment result in unprecedented challenges for laser safety. Users require wavelengths from ranging from the extreme ultraviolet (30 nm) to terahertz (300nm) with almost every wavelength in between, and often require complex variations of the laser parameters during the setup. Experiments are typically given only 5 half-days of LCLS beam time, and preceding experiments and other activities limit access to the experimental hutches until just a few days before the experiment starts. Users often want to work on the laser setup, but rarely have time to become fully trained and certified to work independently under the safety policies at SLAC. Ultimately it falls to the LCLS laser division personnel to plan and execute the optical experiments, to meet the users' challenging technical requirements, and conduct this work under SLAC's strict safety guidelines. Thanks to an experienced staff and a

strong relationship with our LSO, I hope to convince the audience that we do this rather well.

Alan Fry is a Staff Scientist and the Deputy Director of the Laser Science and Technology Division of the LCLS at SLAC, a team of 15 laser scientists and engineers who support laser operations at the LCLS and other SLAC scientific programs. Prior to joining SLAC, Dr. Fry worked in the laser industry at Coherent Inc. and Positive Light where he developed market-leading commercial ultrafast laser products for scientific and industrial applications, including ultrafast oscillators, high energy regenerative amplifiers, pulse shapers, terawatt lasers, and DPPS pump lasers.

Paul Golan, Department of Energy - SLAC Site Office

Welcome to SLAC

Paul Golan is the SLAC Site Office (SSO) Manager for the Department of Energy. The mission of the SSO is to manage the U.S. Department of Energy performance-based management and operating contract for the safe, secure, effective and efficient operation of the SLAC National Accelerator Laboratory in support of the missions of the U.S. Department of Energy and the Office of Science.

Cliff Greenberg, Nikon

Panel Discussion on Embedded Lasers

Cliff Greenberg is the Safety Manager and LSO at Nikon Precision in Belmont. Nikon sells, installs and services lithography scanners and steppers to the semiconductor industry. He has been with Nikon for over 17 years and involved in safety for over 20 years. Cliff has also been a member of the industry group SEMI, participating in the authorship and revision of safety standards for the industry. Among other duties, Cliff provides USA safety standards information to his design colleagues in Japan, trains over 300 FSE's in the United States, and achieves an industry-leading safety record: minimal recordable incidents and NO laser incidents in his work history. (pause to knock on wood.) His current Class 1 systems have 20 different laser sources, ranging from Class 1 to Class 4.

Joshua Hadler, National Institute of Standards and Technology

Laser Pointer Characterization and Evaluation at NIST

The NIST Laser Radiometry Project in the Quantum Electronics and Photonics Division in joint effort with the NIST Office of Safety Health and Environment, have performed a study of green laser pointers and handheld green lasers. The availability and the use of such devices have grown rapidly with the advent of modern manufacturing capabilities. With increasing proliferation of these lasers devices, accurate measurements are needed to ensure their safe use. This talk will cover the issues pertaining to these devices as they apply to measurement technologies and methods. Accurate measurement of possibly multiple wavelengths requires an understanding of both the source technology and the detectors used to measure them. A model measurement system is presented that can enable quick and accurate assessment of laser pointers and handheld laser devices, that is

affordable and simple to operate. A review of the output characteristics of numerous green laser pointers is presented for discussion.

Joshua Hadler is the NIST Chief Laser Safety Officer, and has been with NIST since July 2002, and has been a Laser Safety Officer within the Quantum Electronics and Photonics Division since 2003. Mr. Hadler is a Physicist and Calibration Leader in the Laser Radiometry project of the Quantum Electronics and Photonics division in Boulder. In addition to Mr. Hadler's scientific duties, he is the program manager for the laboratory laser safety program at NIST. Mr. Hadler brings a broad range of experience to the safety program at NIST. Prior to joining NIST, Mr. Hadler was an Engineering Physicist at the Stanford Linear Accelerator Center, in Menlo Park, CA, with numerous scientific and safety responsibilities. Following his work at SLAC, Mr. Hadler worked at the University of Colorado at the Laboratory for Atmospheric and Space Physics, helping develop space flight instrumentation. Between CU and NIST, Mr. Hadler worked at ILX Lightwave, in Boulder, developing fiber optic test and measurement equipment. Mr. Hadler's experience brings a combination of research and industry perspective to both his research and safety duties at NIST.

R. DeWayne Holcomb, University of Texas

Laser Safety at a Research University

A research university has intrinsic differences from industry or government that affect the way lasers are used and controlled. Ever expanding research tools incorporating lasers have attracted a broad spectrum of traditional and non-traditional laser users. Multiple roles of PIs and lab workers, and a compartmentalized organizational structure create a unique environment, compounded by grant funding, State Institution rules, and layers of multi-agency regulations. The Safety Office is sometimes juxtaposed to these agendas, as its focus is on the well being of the people in the process, not the end result. This presentation will focus on challenges facing EHS departments who must implement safe work practices without impeding research, and also the University's role in grooming safety conscious scientists. (The University of Texas at Austin is home to ~85 Laser PIs, ~ 500+ laser users, and ~400 class 3B and 4 lasers.)

R. DeWayne Holcomb started his career in the US Naval Nuclear Program, and has continued working in the field of Health Physics since his discharge in 1987. He has worked in various radiation and laser programs across the country, including three major research Universities, NASA and DOE facilities, and commercial industry. He maintains his CLSO and NRRPT, and recently sat for the CHP Part II exam. DeWayne has a B.S. in Technology from Excelsior College, Albany NY.

Jay Jamali, Enviro Safetech

OSHA Inspections

This presentation will go over the expectations of OSHA inspectors in case of a complaint or accident inspection. This presentation will cover what a LSO should do before, during and after an OSHA inspection. Topics include: IRT (Inspector Response Team) development, recordkeeping, training, Laser Generated Air Contaminants, annual inspection, NHZ, signs, labels, PPE, medical, inventory, Laser Control Areas and Temporary LCA, emergency procedures, interlocks, etc.

Karen Kelley, University of Maryland

Accident Investigation - Toxic Byproducts from Laser Ionizing SF6

This presentation will discuss an incident at the University of Maryland involving an exposure to hazardous decomposition products of sulfur hexafluoride that were formed during an experiment involving super-continuum generation. The presentation will cover the health effects experienced by the researcher and the findings and recommendations that resulted from the investigation.

Karen Kelley has a BS in Mathematics, an MS in Environmental Health and is a Certified Industrial Hygienist and Certified Laser Safety Officer. Karen is currently the Manager of Laboratory Safety and Industrial Hygiene at the University of Maryland. Prior to coming to Maryland, Karen was a Senior Industrial Hygienist and the Laser Safety Officer at the University of Pennsylvania. Karen has approximately 17 years of experience in the occupational safety and health field.

Jamie King, Lawrence Livermore National Laboratory

Panel Discussion on Embedded Lasers

Jamie King is a Certified Laser Safety Officer with over 20 years of experience practicing laser safety. He is the laser safety officer for Lawrence Livermore National Laboratory and the National Ignition Facility. Jamie is a longtime member of the Laser Institute of America and the Bay Area Laser Safety Officers. He currently serves as the Secretary for the Department of Energy, Energy Facility Contractors Group, Laser Safety Subgroup.

Peter King, California Institute of Technology

Laser Safety for LIGO

The Laser Interferometer Gravitational Wave Observatory (LIGO) is a large scale Michelson interferometer that uses lasers for a variety of tasks ranging from detection of gravitational waves to calibration of its sensor signals. Currently undergoing an extensive upgrade, LIGO now uses lasers that range from the visible to the far infrared with power levels of a few milliwatts to hundreds of watts, all at the same time and in the same area. The safety requirements combined with the detector requirements present some laser safety challenges. The approach adopted by LIGO towards laser safety will be presented.

Panel Discussion on Alignment and On-the-Job Training

Peter King is the Laser Safety Officer for the LIGO Project. He received his PhD in optically pumped far infrared lasers for plasma fusion diagnostics from the University of Sydney. He is sub-system lead for the pre-stabilized laser and has been with LIGO since 1997. His research areas include low noise, single mode, single frequency lasers; power noise stabilization and high power photodetectors.

Doug Kresse, Coherent Inc.

Laser Safety Risks for Service Engineers

This presentation focuses on service engineers and the recurring laser safety risks they encounter specifically relating to beam exposure during the different stages of Ti-sapphire and optical parametric amplifier system installation, service and operation. The emphasis of the presentation pertains primarily to exposure hazards to the eyes, and skin protection is discussed to a lesser extent. Also, control measures such as laser beam blocks are explored, including the use of power meters and other anodized materials in the beam path. From here, the presentation looks at the complexity of working at SLAC and other DOE installations while conforming to its safety requirements.

Doug Kresse has been working at Coherent Inc for over 30 years, including 15 years in field service. He installs and services mJ laser amplifier systems, and currently covers the entire west coast from Canada to Mexico. He has performed many installation and service visits for universities and businesses in the Bay Area, including SLAC. The short pulse nature of these mJ laser systems means that the peak power per pulse can be billions of watts, so safety is of the utmost importance.

Thomas Lieb, L*A*I International

Interlocks and other Engineering Controls

Thomas Lieb has more than 25 years experience in laser safety and laser safety training, and is President of L*A*I International, an independent company providing consulting, and safety containment systems for material processing lasers. Tom is a member of BALSO (Bay Area Laser Safety Officers), a Certified Laser Safety Officer (CLSO), and a member of the Board of Laser Safety. He is also a member of ASC and the Ad Com of Z136 Safe Use of Lasers, Chairman of the sub-committee for ANSI Z136.9 Safe Use of Lasers in a Manufacturing Environment; contributor to ANSI B11.21 Design, Construction, Care, and Use of Laser Machine Tools (and other sub-committees). He is a current (2010-2012) member of the Board of Directors of the Laser Institute of America (LIA); and involved in the past and current offering of the PAS (Practical Application Seminars), concurrent to the International Laser Safety Conference. Tom has been involved for many years in international laser safety issues, with customers in the US, Canada, Europe and Asia. He is a member of IEC/TC 76 on the Laser Safety Standard IEC [EN] 60825 and Convener of the sub-committee for ISO/IEC [EN] 11553 Safety of Machines, Laser Processing Machines (General and Hand-held). He was 2008 recipient of the IEC's "1906 Award" for contribution to electro-technology and the work of the IEC (International Electrotechnical Commission). Tom has authored a number of technical papers and articles for publication, and contributed to the CLSO's Best Practices in Laser Safety manual, and the textbook Laser Materials Processing, Migliore et al., Marcel Kekker, NY.

Brent Nasca, Honeywell FM&T/Kansas City Plant

Panel Discussion on Embedded Lasers

Brent M. Nasca is the only Health Physics staff member at the DOE/NNSA Kansas City Plant Operated by Honeywell Federal Manufacturing and Technologies. He serves as the Radiation Safety and Laser Safety Officer.
He is a team member of the Health, Safety, and Environment Office which includes 23 personnel for a facility employing ~ 3,000 people.
Prior to Honeywell, Brent worked as a Radiological Control Technician at the Brown's Ferry Nuclear Power Plant operated by the Tennessee Valley Authority and Charleston Naval Shipyard. Brent has an Associates Degree in Engineering Technology and a B.S. degree in General Studies with an emphasis in Occupational Safety and Health. He is a Registered Radiation Protection Technologist with NRRPT.

Barbara O'Kane, National Renewable Energy Laboratory

Overview of the DOE's EFCOG Laser Safety Subgroup - its Role and Work Activities

Laser Safety is a subgroup of the Environmental Safety and Health Working Group, which is a section of the Energy Facility Contractor Group (EFCOG). EFCOG "promotes excellence in all aspects of the operation, management, and integration of DOE facilities in a safe, environmentally sound, efficient and cost-effective manner through the ongoing exchange of information on lessons learned." The Laser Safety Subgroup (LSSG) establishes an effective network for laser safety experts from DOE facilities. The LSSG also sponsors the annual DOE Laser Safety Officer Workshop which has been hosted at DOE and university sites. This talk will focus on the goals of the LSSG and what has been accomplished to date.

Barb O'Kane is the Safety and Health Manager and Laser Safety Officer for the National Renewable Energy Laboratory in Golden, Colorado. She is currently the chair of the Laser Safety Subgroup EFCOG. She has a bachelor's degree in Botany and a master's degree in Industrial Hygiene; both from Colorado State University. She maintains professional certifications in Industrial Hygiene, Safety and Laser Safety. She has worked as a safety and IH professional in industry and research for more than 15 years. She is married and has two boys with whom she pursues fun in the great outdoors. If she wasn't doing all this safety stuff, she'd love to own and work in a bakery.

Adrian Pfeiffer, Lawrence Berkeley National Laboratory

Attosecond lasers systems and applications

Since the first generation of an attosecond pulse in 2001, the field of attosecond science has grown fast and attracted many research groups. Nevertheless, the generation and characterization of attosecond pulses is still far away from being routine. The seed for attosecond pulses are few-cycle femtosecond pulses in the infrared regime, which are converted to attosecond pulse trains in the extreme ultraviolet regime through high harmonic generation. The low intensity of currently available attosecond pulses prevents the direct extension of femtosecond pump-probe techniques to the attosecond time

domain. Instead, attosecond pump-probe measurements usually make use of a weak attosecond pulse and a synchronized intense infrared pulse. The first decade of attosecond science has yielded real time measurements of fundamental processes, such as the inner-shell Auger decay, the measurement of tunneling time, and the observation of electron movement in the valence shell of an atom.

Adrian Pfeiffer studied physics in Freiburg, London and Heidelberg. After receiving his diploma degree from Heidelberg University in 2006 he joined the Institute of Quantum Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich. His research in the group of Prof. Ursula Keller focused on the development of the attoclock method. He received his PhD in 2011 and joined thereafter the group of Prof. Stephen Leone in Berkeley, where he currently works on the attosecond transient absorption technique.

Al Roth, Newport Corporation

Key Laser Safety Practices for Supervisors and Managers

One of the key tasks of those responsible for overseeing laser safety in their respective operations is engaging Supervisors & Managers in the prevention of injuries. This presentation seeks to provide ideas for the "tool belt" worn by laser safety staff, to help educate management on where their support is critical in those efforts. Topics covered include importance of reporting incidents, incident management & lessons learned examples and the Supervisor/Manager role in directly making a positive impact on laser and general workplace safety.

Al Roth has over 25 years experience in the field of Occupational/Environmental Health & Safety. He has served as an effective external consultant or internal staff member within a variety of industries including manufacturing, engineering, information technology, retail, transportation and construction. These companies include Treasure Craft/Pfaltzgraff Ceramics, The Vons Companies and Toro Irrigation.

Mr. Roth has proven expertise in developing and managing Emergency Response and Business Continuation plans that are effective in cost and responsiveness. His current position is as Director of Environmental, Health & Safety for Newport Corporation with responsibilities in support of the global operations of a major laser, optics and scientific research equipment manufacturer.

His affiliations include American Society of Safety Engineers, Orange County Red Cross, National Safety Council and Orange County Disaster Recovery Alliance. Mr. Roth is a graduate of California State University – Long Beach, UC Irvine and has the designation of Certified Safety Professional.

Mr. Roth has presented on a variety of emergency management and health/safety topics at several professional development conferences (ASSE, National Safety Council, American Red Cross). He and his family currently reside in Lake Forest, CA.

Tekla Staley, Idaho National Laboratory

Hand Injury from Unexpected Laser Beam during Laser Servicing

A technician at the INL received 2nd degree burns to his left middle and ring fingers while performing maintenance on a Class IV industrial laser. The task required "target" placement in the beam path to verify mirror alignment. The technician, believing the laser was in a safe mode, reached into the beam pathway to place the target, saw a flash and immediately withdrew his hand. Investigation included a review of lab-wide safety procedures, equipment-specific operating procedures, maintenance documents, and training records, interviews of maintenance technicians, safety support, and management personnel, and a physical verification of equipment condition. The investigation found weaknesses in training, work direction details, the performance of work following vendor-recommended safe work practices, safety professionals' understanding of a complex system, and reliance on the maintenance technician's training and experience to conduct an effective hazard analysis.

Panel Discussion on Embedded Lasers

Tekla Staley is a senior health and safety engineer at the Idaho National Laboratory, certified in industrial hygiene, safety, and laser safety. She has a degree in chemistry and a minor in business management from the College of Idaho and 27 years of experience in industrial hygiene and safety. Tekla has been employed at various facilities within the INL (the Reactor Technologies Complex, Test Area North, Idaho Nuclear Technologies and Engineering Center, and the Specific Manufacturing Capabilities facility) since 1990, with additional experience in semiconductor manufacturing safety, asbestos abatement and pharmacy safety and security. She has actively promoted integrated safety management concepts throughout her career, and has had oversight responsibilities for the INL Asbestos and Laser Safety programs since 2002. She was the lead industrial hygienist assigned to the Management Self Assessment for startup of the PBF-632 Biological Decontamination Project, a test bed project that can be used to evaluate biological decontamination technologies, sampling protocol, and other operational parameters, and to provide a training facility for first responders engaged in biological decontamination efforts; the Three Mile Island Fuel Drying and Storage project; the Cask Dismantlement project; has consulted with US Army personnel on proposed methods for destruction of VX nerve agent; and assists DOE-ID in providing independent industrial hygiene assistance at other US Army contract facilities in the US, including the Army Tank Plant in Lima, OH, and the Aberdeen Proving Grounds, in Maryland. Tekla is also a member of the ANSI Z136 Technical Subcommittee on the Safe Use of Lasers in a Manufacturing Environment (TSC-9).

Graham White, AWE, Aldermaston, UK

Laser Safety arrangements at AWE and the Orion High Intensity Plasma Physics Research Facility (presented on behalf of Graham and Thomas Bett)

AWE is the centre for research and production of the UK nuclear deterrent. Numerous lasers are used throughout AWE for research and production purposes. These lasers are often used in novel ways combining conventional laser hazards with other, sometimes, non conventional hazards.

The major laser facility at AWE is the Orion high intensity laser facility for plasma physics which is nearing completion. The commissioning of the 12 beams, ten long pulse (ns 5kJ) & two short pulse (sub-ps 1PW), was completed in December 2011. Currently the facility is undergoing a capability programme to demonstrate that the facility has the ability to field an experimental programme in high temperature high density plasma physics. The current programme consists of integrated commissioning of the target diagnostics systems, 2ω conversion of one of the short pulse beams and fielding an experiment to demonstrate the facilities capability.

This paper looks at the laser safety management arrangements at AWE and the Orion laser facility. It includes information of four laser safety training videos that were produced by AWE in conjunction with NPL (National Physics Laboratory) for use in the laser safety training programme. The videos cover, general laboratory laser safety, laser alignment, laser classes and laser protective eyewear. Short previews from the video will be given during the presentation.

Graham White is the Laser Safety Officer for the Plasma Physics department (which includes the Orion Laser Facility) at the Atomic Weapons Establishment (AWE), Aldermaston, UK. He is also the Orion Facility Manager with responsibility for the safe operation of the Orion laser facility. He has work at Aldermaston for 26 years in a number of engineering and management roles which included the Facility Manager/Laser Safety Officer of the HELEN laser facility prior to taking up his current role on Orion. Prior to working at AWE Graham spent a number of year as a marine engineer working for Shell UK.

Michael Woods, SLAC National Accelerator Laboratory

UV Laser Radiation: Skin Hazards and Skin Protection Controls

This talk examines the potential for hazardous skin exposures to ultraviolet (UV) laser radiation and provides guidance for safety controls to protect the skin. Skin hazard descriptions and controls requirements related to UV lasers found in the ANSI safety standard and the OSHA Technical Manual on Laser Safety are presented. Examples are presented of UV laser operation with calculated MPEs (Maximum Permissible Exposures) and NHZs (Nominal Hazard Zones, where the exposure may exceed the MPE).

Compilation of Lessons Learned Events at SLAC

A list of ~25 lessons learned events have been compiled during the last 3 years of laser operation at SLAC. This talk gives an overview of this compilation which is routinely updated and made available to SLAC laser personnel. Some specific examples will be discussed. The compilation includes one injury accident and 1 near miss incident. Some

other general comments: 12 events had a required laser safety barrier compromised, 3 events had safety configuration control issues, 7 events had engineering configuration design issues, 9 events had malfunctions in the engineered laser safety system, 9 events had administrative procedure mis-steps, 3 events had electrical safety issues, and 3 events had laser eyewear issues.

Michael Woods, CLSO, is the Laser Safety Officer at the SLAC National Accelerator Laboratory. He is an Engineering Physicist, with a B.Sc. in Engineering Physics from Queen's University in Kingston, Ontario, Canada and a Ph.D. in High Energy Physics from the University of Chicago. He has spent 15 years as a researcher in experimental particle physics and accelerator physics, utilizing high power laser systems for photo-injectors, Compton polarimeters and electron beam diagnostics. He became SLAC LSO in 2008. He is a member of the ANSI Z136 SSC-1, TSC-4 and TSC-5 committees and is vice-chair of DOE's EFCOG laser safety subgroup.