

Technical Program



Sixteenth Annual Directed Energy Symposium

10-14 March 2014
Huntsville, Alabama

and

Directed Energy Education
Workshop
14 March 2014

Symposium Information

Locations of Symposium Events

Most symposium sessions will be held at the Westin Huntsville Hotel in rooms identified in the program. Classified sessions will be held at an offsite location.

Buses

Because of the short distance between locations (5 min walk), very limited bus transportation will be available on Thursday. Offsite locations will not open until 45 min prior to designated start times showing in the program. It is important to not arrive prior to this designated time as no access will be granted for early arrival. Once sessions start, buses will run every 20 mins. Buses will run freely during breaks and immediately following the end of the session. The last bus to run following the sessions will run 20 min after the end of the last talk.

Breakfasts

Breakfast snacks will be served every morning at the Westin starting at 0700. Speakers are encouraged to eat breakfast with their session chairs on the day of their presentation. Look for table tents to designate your session's breakfast table.

Lunches and Breaks

Lunch will be served Tuesday - Thursday at the Westin. Limited coffee and snacks during breaks will be available Tuesday - Friday.

Directed Energy Education Workshop

The DE Education Workshop is a separate event from the Symposium, scheduled for Friday, 14 March, at the hotel. Any Symposium registrant may attend the Workshop.

SECURITY NOTE:

Letters listed in this agenda after presentation titles indicate distribution statements as follows:

A - information is public release

C - information is limited to U.S. citizens who are employees of the U.S. Federal Government or its contractors

D - information is limited to U.S. citizens who are employees of the U.S. Department of Defense or its contractors

MONDAY

Short Courses

0700 **Registration at Westin**

0800 **Morning and all day short courses begin**

MORNING COURSES

1. Introduction to High Energy Laser Systems

John Wachs

Westin Room A

2. Windows and Coatings for HEL Systems

Bill Decker

Westin Room B

3. Predictive Avoidance

Limited Distribution C

LeAnn Brasure & Heather Witts

Westin Room C

ALL DAY COURSES

4. Introduction to Free Electron Lasers

Dinh Nguyen & Stephen Milton

Westin Room D

1200 **Break for Lunch**

1300 **Afternoon short courses begin and all day courses resume**

AFTERNOON COURSES

6. Introduction to HPM Systems

Limited Distribution C

Mark Rader

Westin Room A

7. Diffraction and Laser Beams

Yakov Soskind

Westin Room B

8. Introduction to HEL Lethality Science

Limited Distribution C

Chuck LaMar, Robert Cozzens, David Loomis

Westin Room C

TUESDAY MORNING

Plenary Session (Open)

Westin

- 0700 **Registration and Breakfast Snacks at Westin**
- 0800 **Welcome**
- 0805 **Call to Order, Administrative Remarks**
Mr Noel Paschal, Sympoisum Chairman
- 0830 *Dr Spiro Lekoudis, ASD (R&E)/Research*
- 0900 *RADM (ret) Nevin Carr, former Navy CNR*
- 0930 *Mr Richard DeFatta, SMDC Tech Center*
- 1000 **Break**
- 1030 *Ms Susan Levine, JNLWD*
- 1100 *Dr Mark Swinson, JIEDDO*
- 1130 **DEPS Status and Recognitions**
Dr Tim Andreadis, DEPS President
- 1200 **Lunch**

Upcoming 2014 Directed Energy Professional Society Events

Advanced High Power Laser Conferences

Includes the SSDLTR, Gas, FEL and
USPL Conferences

(Co-located with the SPIE DSS)

5-9 May 2014 - Baltimore, MD

Directed Energy Systems Symposium

25-29 August 2014 - Monterey, CA



TUESDAY AFTERNOON

Laser Systems/Demonstrations (Limited Distribution C)

Chair: *Terry Bauer, USASMDC/ARSTRAT*

Westin Room A

- 1300 **Current Advances in Space Deconfliction for High Energy Laser Battlefield Weapons (C)**
Steven Gabriel, SERCO, Inc.
- 1330 **HEL MD 10kW Demonstration (C)**
Terry Bauer, USASMDC/ARSTRAT
- 1400 **Lockheed Martin Area Defense Anti-Munitions (ADAM) System (C)**
Jeffrey Fixler, Lockheed Martin
- 1430 **Break**
- 1500 **HEL MD Subsystem Concepts (C)**
Dee Formby, USASMDC/ARSTRAT
- 1530 **HEL MD Subsystem Concepts (C)**
Kenya McLin, USASMDC/ARSTRAT
- 1600 **NPS High Energy Laser Beam Control Research Testbed, Status and Capabilities (C)**
Lewis DeSandre, Naval Postgraduate School
- 1630 **Range Force Protection Test Bed (A)**
Dick Bradshaw, Scientic, Inc.
- 1730 **Reception and Poster Session at Westin**

TUESDAY AFTERNOON

RF Systems/Demonstrations (Limited Distribution C/Open)

Chair: *Luis Hernandez*, BAE Systems
Westin Room B

Session is Limited Distribution C

- 1300 **Coupled Electrical & Environmental Effects (CE3) Testing (C)**
Michael Strizich, MicroNet Solutions Inc

Session is now Open

- 1330 **Remote Engine Stopping: Microwave Barriers (A)**
Ralph Hoover, e2v Aerospace and Defense
- 1400 **Suppression of Electron Multipactor in HPM Systems (A)**
Jonathan Spaulding, Air Force Research Laboratory
- 1430 **Break**

RF Technology (Limited Distribution C)

Chair: *Jeff Alexander*, Sandia National Laboratories

- 1500 **Mechanism(s) Underlying Nanosecond Electric Pulse Incapacitation (C)**
Bennett Ibey, Air Force Research Laboratory
- 1530 **Determining the Utility of a Peak Electric Field Limit for High-Peak-Power Microwave Exposures (C)**
Bennett Ibey, Air Force Research Laboratory
- 1600 **Identifying the Causality of HPM-Induced Upset in Electronic Systems Using the Functional Investigative Toolkit (FIT) (F)**
Sameer Hemmady, TechFlow Scientific
- 1630 **Status of Electronic Battle Damage Assessment at Sandia National Laboratories (A)**
Jeffery Williams, Sandia National Laboratories
- 1730 **Reception and Poster Session at Westin**

TUESDAY AFTERNOON

Lethality (Limited Distribution D/Open)

Chair: *Chuck LaMar*, USASMDC/ARSTRAT
Westin Room C

Session is Limited Distribution D

- 1300 **Overview of Recent Navy HEL Lethality Tests (D)**
Christopher Lloyd, NSWSD
- 1330 **3D Heat Transfer Modeling for Use in Army Test Design and Test Analysis (D)**
Chuck LaMar, USASMDC/ARSTRAT

Session is now Open

- 1400 **A Novel Glare Device Using Thermal Lensing in the Eye (A)**
Robert Thomas, Air Force Research Laboratory 711 HPW/RHDO
- 1430 **Break**
- 1500 **Mechanism for Threshold-Level Damage to the Retina for Near-Infrared Nanosecond Pulse Exposures (A)**
Benjamin Rockwell, Air Force Research Laboratory 711 HPW/RHDO
- 1530 **Optical Imaging for Analysis of Retinal Lesions Induced by Laser Radiation (A)**
Joel Bixler, TASC, Inc
- 1600 **Measuring High-Power Laser Emission Using Radiation Pressure (A)**
Paul Williams, National Institute of Standards and Technology
- 1730 **Reception and Poster Session at Westin**

TUESDAY AFTERNOON

Free Electron Lasers (Open)

Chair: *Dinh Nguyen*, Los Alamos National
Laboratories

Westin Room D

- 1300 **The CSU Accelerator and the FEL Facility (A)**
Sandra Biedron, Colorado State University
- 1330 **A Two-Frequency Gun for High Current Thermionic Cathode Electron Injection Systems (A)**
Jonathan Edelen, Colorado State University
- 1400 **Pulsed-Wire Method for Characterization of Undulator Magnet (A)**
Alex D'Audney, Colorado State University
- 1430 **Break**
- 1500 **Non-Invasive Beam Detection in FEL Accelerator (A)**
Joel Williams, Colorado State University
- 1530 **Study of CSR Effects in the Jefferson Laboratory FEL Driver (A)**
Christopher Hall, Colorado State University
- 1600 **Beam Position Monitoring in the CSU Accelerator Facility (A)**
Joshua Einstein, Colorado State University
- 1730 **Reception and Poster Session at Westin**

TUESDAY EVENING

Open Poster Session

- Control Systems Development for the Thomas Jefferson National Accelerator Facility FEL and Energy Recovery Linac: Analysis of Trajectory Response Data & Initial Feedback Control Testing (A)**
Auralee Morin, Colorado State University
- Detection of Crack Initiation Times on Silicon Wafer Surface Induced by a NIR-CW Laser (A)**
Sungho Choi, Hanyang University
- Recent High Power RF Source Developments at SLAC National Accelerator Laboratory (A)**
Jeff Neilson, SLAC National Accelerator Laboratory
- Dynamic Data Driven - Bidirectional Reflectance Distribution Function (DDD-BRDF) Measurement (A)**
Samuel Freda, Air Force Institute of Technology
- Solar and Lunar Position Calculator and Surface Albedo Integration into LEEDR (A)**
Jeffrey Hole, Air Force Institute of Technology
- Recirculating Rb Diode Pumped Alkali Laser Gain Cell (A)**
Kevin Lapp, Air Force Institute of Technology
- Integration of Laser Tracking System (A)**
Riley Hampton, Air Force Institute of Technology
- Physics-Based Imaging and Tracking of Ballistics, UAVs, and LEO Satellites Graphical User Interface: Active Vs. Passive Tracking Study/GUI Improvements (A)**
Nathan Wurst, Air Force Institute of Technology
- Numerical Investigation of Particle Shape Effects on Near-field Electromagnetic Flux (A)**
Keith Prussing, Georgia Institute of Technology

Limited Poster Session

- Analysis of Thermal Blooming of a Laser Beam Propagating in Air Enclosed in a Pipe (C)**
Bahman Hafizi, Naval Research Laboratory
- HELMD Tests Demonstrate Counter-UAV and Counter-RAM Capability (D)**
Mike Meline, Boeing

WEDNESDAY MORNING

Industry Panel Plenary Session (Open)

Moderator: *Mark Neice*, DEPS

Westin Room A

0700 **Registration and Breakfast Snacks at Westin**

0800 **Laser Industry Panel**

Panel Members:

Dave DeYoung, Boeing

Keith Coleman, Boeing

Steve Hixson, Northrop Grumann

Doug Graham, Lockheed Martin

David Mordaunt, Raytheon

1000 **Break**

Laser Systems/Demonstrations (Limited Distribution D)

Chair: *Christopher Lloyd*, NAVSEA

1030 **Defence R&D Canada - DE Research
Program Update (D)**

Dominik Pudo, Defence R&D Canada

1100 **DRDC High Energy Laser - 2013
Field Trial Results (D)**

Dominik Pudo, Defence R&D Canada

1130 **Solid State HEL Vibration Exposure and
Performance - Maritime Laser
Demonstrator (D)**

Phil Maki, Northrop Grumman Corporation

1200 **Lunch**

WEDNESDAY MORNING

Modeling & Simulation (Limited Distribution D/C)

Chair: *Steven Fiorino*, Air Force Institute of
Technology

Westin Room B

Session is Limited Distribution D

1030 **Advanced Concepts Event (ACE-13)
Results (D)**

Rudy Martinez, Air Force Research
Laboratory/RDMW

Session is now Limited Distribution C

1100 **Virtual Prototyping and Optimization of
Directed Energy Systems (C)**

Nate Lockwood, Air Force Research
Laboratory/RDHE

1130 **LIDAR Measurements to Validate LEEDR
Aerosol Boundary Layer
Characterizations (C)**

Steven Fiorino, Air Force Institute of
Technology/ENP

1200 **Lunch**

WEDNESDAY MORNING

Lethality (Limited Distribution C)

Chair: *D. David Lyman*, Leidos

Westin Room C

- 1030 **Co-Illumination of Materials Using Continuous Wave and Ultrashort Pulse Lasers (C)**
Mike Helle, US Naval Research Laboratory
- 1100 **Short-Pulse Laser Interactions with Metallic Surfaces and the Production of RF Radiation (C)**
Joseph Penano, US Naval Research Laboratory
- 1130 **The Threat of Directed Energy Weapons (C)**
John O'Hara, NSA
- 1200 **Lunch**

WEDNESDAY MORNING

Free Electron Lasers (Limited Distribution C/Open)

Chair: *Sarwat Chappel*, Office of Naval Research

Westin Room D

Session is Limited Distribution C

- 1030 **4K Superconducting Linacs for MW-Class Free Electron Lasers (C)**
Charles Boulware, Niowave, Inc.
- 1100 **Nonlinear Harmonic Suppression in FEL (C)**
Karen Horovitz, Colorado State University

Session is now Open

- 1130 **X-Band RF Power Generation Via an L-Band Accelerator System and Uses (A)**
Taylan Sipahi, Colorado State University
- 1200 **Lunch**

WEDNESDAY AFTERNOON

Laser Technology (Limited Distribution D/Open)

Chair: *Adam Aberle*, USASMDC/ARSTRAT
Westin Room A

Session is Limited Distribution D

- 1300 **Robust Electric Laser Initiative (RELI)-
Program Changes, Status and Results (D)**
Don Seeley, HEL JTO
- 1330 **Status of Northrop Grumman's RELI
Coherently Combined Fiber Laser
Development (D)**
Marty Wachs, Northrop Grumman
- 1400 **Lockheed Martin's SBC Fiber Laser Source
and Recent Performance Results (D)**
Robert Afzal, Lockheed Martin Aculight
- 1430 **Break**
- 1500 **Recent Results for High Power Planar
Waveguide Laser Testing at Raytheon (D)**
David Mordaunt, Raytheon Space and
Airborne Systems

Session is now Open

- 1530 **Investigation of Dual-Seeded Raman
Resonator for High-Power 1178 nm
Generation (A)**
Cody Mart, Air Force Research Laboratory
- 1600 **Transverse Modes and Synchronization of
Laser Diode Arrays (A)**
Nair Niketh, University of Tennessee

WEDNESDAY AFTERNOON

RF Technology (Limited Distribution D/Open)

Chair: *Jeff Alexander*, Sandia National Laboratories
Westin Room B

Session is Limited Distribution D

- 1300 **Dual Pulse Marx Bank Technology
Maturation (D)**
Matt Domonkos, Air Force Research
Laboratory

Session is now Open

- 1330 **Nonlinear Time Reversal in Semi-
Reverberant Complex Enclosures (A)**
Trystan Koch, Envisioneering Inc. /
University of Maryland, College Park
- 1400 **Methodology for Analyzing RF Effects on
Printed Circuit Boards (A)**
David Vigliano, Sandia National Laboratories,
University of New Mexico
- 1430 **Break**
- 1500 **Modeling High Average Current and High
Bunch Charge Beams in MICHELLE-
eBEAM (A)**
John Petillo, Leidos Corporation
- 1530 **Peak Power Gain via Time Reversal in
Semi-Reverberant Complex Enclosures (A)**
Victor Mendez, Naval Research Laboratory

Conference Overview by Room Assignment

OPEN

LIMITED

CLASSIFIED

| | Westin Room A | Westin Room B | Westin Room C | Westin Room D | Offsite Location |
|-------------------|---|--|--|--|---|
| Tuesday 1300 | Laser Systems/ Demonstrations <i>Page 3</i> | RF Systems/ Demonstrations & RF Technology <i>Page 4</i> | Lethality <i>Page 5</i> | Free Electron Lasers <i>Page 6</i> | |
| Tuesday 1730 | Reception at Westin Lobby/Foyer Open and Limited Poster Session <i>Page 7</i> | | | | |
| Wednesday 0800 | Industry Panel & Laser Systems/ Demonstrations <i>Page 8</i> | Modeling and Simulation <i>Page 9</i> | Lethality <i>Page 10</i> | Free Electron Lasers <i>Page 11</i> | |
| Wednesday 1430 | Laser Technology <i>Page 12</i> | RF Technology <i>Page 13</i> | Enablers: Power, Thermal, etc. <i>Page 16</i> | Invited Talk & Novel Ideas and Technology <i>Page 17</i> | |
| Thursday 0800 | Laser Technology <i>Page 18</i> | Beam Propagation <i>Page 19</i> | Beam Control Technology <i>Page 20</i> | | Classified Session <i>Page 21</i> |
| Thursday 1300 | Enablers: Power, Thermal, etc. <i>Page 22</i> | Standards and Terminology <i>Page 23</i> | Beam Control Technology <i>Page 24</i> | Beam Propagation <i>Page 25</i> | Classified Session <i>Page 26</i> |
| Friday 0800 | Education Workshop <i>Page 29</i> | Lethality <i>Page 27</i> | Bioeffects <i>Page 28</i> | | |

WEDNESDAY AFTERNOON

Enablers: Power, Thermal, etc (Limited Distribution C)

Chair: *Charles Oberly*, UES, Inc
Westin Room C

1300 **Establishment and Initial Operation of a 400kW Integrated Power and Thermal Management System (IPTMS) with Emulated DEW Loads (C)**

Fernando Rodriguez, Air Force Research Laboratory

1330 **Integrated Power and Thermal Management System Demonstration, Team Management, Systems Integration and Hardware Status (C)**
Steve Gagne, Rolls Royce North American Technologies, Inc

1400 **Status of Thermal Management System for the Integrated Power and Thermal Management System Demonstrator Effort (C)**

Peter Brennan, Northrup Grumman

1430 **Break**

Chair: *Steve Gagne*, Rolls Royce North American Technologies, Inc.

1500 **Implementation of Hardware Emulation within a Lab Testbed for an Integrated Power and Thermal Management System for DEWs (IPTMSD) (C)**

Michelle Bash, PC Krause and Associates

1530 **Toward Operation of a Turbine Engine as Part of an Integrated Power and Thermal Management System (IPTMS) for Fast Transient DEW Applications (C)**

Fernando Rodriguez, Air Force Research Laboratory

1600 **Modeling and Validation of a Lab Generator-Rectifier System Utilized Within an Integrated Power and Thermal Management System for DEWs (IPTMSD) (C)**

Michelle Bash, PC Krause and Associates

1630 **Results from a LabTest of a 400kW Electrical Load Emulator which Simulates a High Power Laser for DEW Applications (C)**

Benjamin Razidlo, Air Force Research Lab

WEDNESDAY AFTERNOON

Invited Talk (Open)

Westin Room D

1300 **Invited Presentation: Impacts of Recent Policy Changes**

Bill Decker, Defense Acquisition University

1430 **Break**

Novel Ideas and Technology (Limited Distribution D/Open)

Chair: *Edward Montgomery*, USASMDC/SRSTRAT

Session is Limited Distribution D

1500 **Experimental Results of a Broadband Nonlinear Metamaterial for Counter HPM Applications (D)**

Walter Wall, US Naval Research Laboratory

1530 **Doppler-Shifted Multi-Frequency HPRF Gun Using an Integrated Microstrip Array Antenna (F)**

Thomas Cannon, NSWC, Indian Head Division, IHEODTD

Session is now Open

1600 **Field Emission Current from Single Walled Carbon Nanotubes with Adsorbates: A Density Functional Study (A)**

Tim Fleming, 711 HPW/RHD-HECOE

1630 **Multiphase Cooling of High Power Magnetrons (A)**

Aaron Wallo, Naval Surface Warfare Center

THURSDAY MORNING

Laser Technology (Open)

Chair: *Robert Snead*, USASMDC/ARSTRAT

Westin Room A

0700 Registration and Breakfast Snacks at Westin

0800 Reliability-Based Approach to Determine Life-Cycle Acceptability of Innovative High Energy Laser Technology (A)

William Wessels, UAH Research Institute

0830 Coherent Optical Module for Phased Array System Stabilization (A)

Yakov Soskind, DHPC Technologies, Inc.

0900 Coherent Beam Combining using an Electronically Controlled 2x2 Optical Switch (A)

Waylin Wing, University of Alabama

0930 Cladded Crystal Fibers for High Power Lasers (A)

Brandon Shaw, Naval Research Laboratory

1000 Break

Chair: *Adam Aberle*, USASMDC/ARSTRAT

1030 50 μ m-Core Yb-doped Leakage Channel Fiber with Flattened Mode (A)

Fanting Kong, ECE/COMSET, Clemson University

1100 High Pressure Lineshapes for Diode Pumped Alkali Lasers (A)

Glen Perram, Air Force Institute of Technology

1130 Wavelength Tunable VCSEL Solutions for Seed Lasers in Directed Energy Systems (A)

Christopher Chase, Bandwidth10

1200 Lunch

THURSDAY MORNING

Beam Propagation (Limited Distribution D/C)

Chair: *Stephen Hammel*, Navy SPAWAR

Westin Room B

0700 Registration and Breakfast Snacks at Westin

Session is Limited Distribution D

0800 Environmental Laser Test Facility (D)

Sean Ross, Air Force Research Laboratory/
RDLTS

Session is now Limited Distribution C

0830 Minimizing Scintillation using Pseudo-Partially Coherent Beams (A)

Meredith Lipp, United States Naval Academy

0900 Nonlinear Self-Focusing of Ultrashort Laser Pulses in Atmospheric Turbulence (C)

Joseph Penano, U.S. Naval Research Laboratory

0930 The Integrated Atmospheric Characterization System (IACS) (C)

Dave Roberts, Georgia Tech

1000 Break

1030 The Maritime Atmospheric Characterization System (MACS) Aerosol Transmission LIDAR (C)

Steve Hammel, SPAWAR Systems Center

1100 Weather-Degraded Optical Sensor Performance Trades for a Mobile, Ground, Tactical HEL Weapon System (C)

Welman Gebhart, Radiance Technologies

1130 Improved Correlation of Thermal Blooming Distortion Number and Far-Field Irradiance in a Turbulent Environment (C)

Steven Fiorino, Air Force Institute of Technology/ENP

1200 Lunch

THURSDAY MORNING

Beam Control Technology (Limited Distribution C/Open)

Chair: *Kenneth Billman*, Schafer Corporation
Westin Room C

0700 Registration and Breakfast Snacks at Westin

Session is Limited Distribution C

0800 HEL JTO Beam Control Technology
Development and Transition Opportunities (C)
Keith Bush, Schafer Corp.

0830 Beacon Beams for Deep Turbulence High
Energy Laser Beam Directors (C)
Michael Helle, Naval Research Laboratory

0900 3-D Nonlinear Optical Nano-Composites (C)
Michael Helle, Naval Research Laboratory

Session is Now Open

0930 Anti-Reflective Surface Structures for High
Energy Laser Optics (A)
Lynda Busse, Naval Research Laboratory
Academy

1000 Break

1030 Atmospheric Compensation of Slewing
Beam Using Sequential Diversity Imaging (A)
Allan Wirth, Northrop Grumman/AOA

1100 The Scattering of Partially Coherent
Electromagnetic Beam Illumination from a
Statistically Rough Perfectly Reflecting
Surface (A)
Mark Spencer, Air Force Institute of
Technology

1200 Lunch

THURSDAY MORNING

Classified Session

Chair: *Jeff Alexander*, Sandia National Laboratories
Offsite Location

0700 Registration and Breakfast Snacks at Westin

0720 Buses Begin to Offsite Location

0800 An Analysis of Surveillance Sensor
Requirements for Detection of Mini and
Micro Unmanned Aerial Vehicles (F)

8030 Backpack Mountable Man-Portable Laser
System Development and Testing (D)

0900 Countermeasures to Improve Mortar
Resistance to a Laser Defense System (D)

0930 Break

1000 Compact, Integrated Optical Waveguide
Based, High Power(100's kW) Laser
Technology (D)

1030 Technology Transition in a Tough
Environment (C)

1100 Disruption of Small Boat Command, Control,
and Communications Capabilities (C)

1130 Solid State High Power Microwave Source
Development (C)

1200 Lunch

THURSDAY AFTERNOON

Enablers: Power, Thermal, etc. (Open/Limited Distribution D)

Chair: *Larry Phillips*, USASMDC/ARSTRAT
Westin Room A

Session is Open

1300 **Designing and Building Thermal and Power Management for DEW Systems - An OEMs Perspective (A)**

Skip Williams, Applied Companies

1330 **High Efficiency and High Power Density Generator Rated for 1 MW (A)**

Cristian Anghel, Honeywell Aerospace

1400 **Electric Power and Thermal Cooling for Mobile Laser Weapon Systems (A)**

Theron Henderson, Scientific Inc.

1430 **Status of Electronic Battle Damage Assessment at Sandia National Laboratories (A)**

Jeffery Williams, Sandia National Laboratories

1500 **Break**

Session is now Limited Distribution D

1530 **Laser Weapon System Battle Management Opportunities (D)**

Stan Souvenir, Radiance

1600 **Thermal Management for High Energy Solid State Laser Systems (D)**

Sean Ross, Air Force Research Laboratory/RDLTS

1630 **Transient, Finite Element Thermal Analyses of a High Power Density Lithium-Ion Battery for DEW Applications (D)**

Peter Brennen, Northrop Grumman Aerospace Systems

THURSDAY AFTERNOON

Standards and Terminology (Limited Distribution C)

Chair: *Brian Strickland*, USASMDC/ARSTRAT
Westin Room B

1300 **OSD's Perspective on Directed Energy Standards and Terminology (C)**

Kip Kendrick, ASD(R&E)/Weapons

1330 **DEW Standards - Where to Start? (C)**

Jack Slater, Schafer Corp

1400 **Part 1 - Calculation of "Beam Quality" Using the Power in the Bucket (PIB) Curves (C)**

Brian Strickland, US Army SMDC/Army Forces Strategic Command

1430 **Break**

Chair: *Jack Slater*, Schafer Corp.

1500 **Part 2 - Calculation of "Beam Quality" Using the Power in the Bucket (PIB) Curves (C)**

Brian Strickland, US Army SMDC/Army Forces Strategic Command

1530 **Beam Quality for HEL Weapon Systems Propagation Codes: Issues and Recommendations (C)**

Welman Gebhart, Radiance Technologies

1600 **Laser Government Diagnostic System (C)**

Dennis Harris, MIT-LL

1630 **HPM Effects Test Methodology Standardization Update (C)**

Grady Patterson, TechFlow Scientific

THURSDAY AFTERNOON

Beam Control Technology (Limited Distribution D)

Chair: *Harold Schall*, Boeing Directed Energy
Westin Room C

- 1300 **PMN Based Deformable Mirrors, a
Manufacturer's Perspective (A)**
Jeffrey Cavaco, AOA Xinetics
- 1330 **Large Stroke Deformable Mirror with
Thermal Control (C)**
Jeffrey Cavaco, AOA Xinetics
- 1400 **Long Burn HEL Deformable Mirror
Technology (C)**
Marc Jacoby, Optical Physics Co
- 1430 **Break**
- 1500 **Simulation of Phased Array Laser
Propagation with Sub-Aperture Piston and
Tilt Compensation (C)**
Jack McCrae, AFIT/ENP
- 1530 **Investigating the Effect of Apparent Jitter
on AFIT Active Pointer/Tracker (AAPT)
Performance for AAOL (C)**
Matthew Krizo, AFIT Center for Directed
Energy
- 1600 **Utility of Speckle Effects for Aimpoint
Identification in Tactical Active Tracking
Engagements (D)**
Noah Van Zandt, AFIT Center for Directed
Energy
- 1630 **Boeing Design of HELMD Beam Shaping
Optics (D)**
David O'Brien, Boeing

THURSDAY AFTERNOON

Beam Propagation (Open)

Chair: *Stephen Hammel*, Navy SPAWAR
Westin Room D

- 1300 **Scattering from a Rough Surface in
Presence of Atmospheric Turbulence (A)**
Santasri Basu, Air Force Institute of
Technology
- 1330 **Determination of the Inner Scale of
Turbulence: A Comparison of a Direct
Thermal Analysis to Measuring the Angle of
Arrival and Scintillation of a Thin Beam (A)**
Richard Watkins, US Naval Academy
- 1400 **Thermal Blooming Experiments Using
High-Power, Single-Mode Fiber Lasers (A)**
Richard Fischer, Naval Research Laboratory
- 1430 **Break**

THURSDAY AFTERNOON

Classified Session

Chair: *Jeff Alexander*, Sandia National Labs

Offsite Location

- 1300 CHAMP JCTD Summary (C)
- 1330 CHAMP All Up Round Effects Summary (C)
- 1400 CHAMP Operational Utility (C)
- 1430 Post CHAMP: The Way Forward (C)
- 1500 Break
- 1530 Optimizing Directed Energy Systems for CIED Applications (C)
- 1600 Detection and Pre-detonation of IEDs with Magnetic Fields (C)
- 1630 Ultra-Wide Band Directed Energy Interactions with Materials and Systems of Interest for Naval Applications (C)

FRIDAY MORNING

Lethality (Limited Distribution D)

Chair: *D. David Lyman*, Leidos

Westin Room B

- 0700 Registration and Breakfast Snacks at Westin
- 0800 HEL Lethality of Carbon Fiber Reinforced Composite Material (D)
Robert Cozzens, Naval Research Laboratory
- 0830 UAV Instrumentation for Counter-ISR Engagement (D)
Edward Trzcienski, AEGIS Technologies
- 0900 Army Dynamic Scoring System (Dist D)
Richard Lee, Leidos
- 1200 Symposium Adjourns

FRIDAY MORNING

Bioeffects (Limited Distribution C)

Chair: *Stephanie Miller*, 711 HPW/RHDR

Westin Room C

- 0700 **Registration and Breakfast Snacks at Westin**
- 0800 **Active Denial Optimization (C)**
Jeff Whitmore, Air Force Research Laboratory
- 0825 **Empirical and Simulated Bioeffect Levels for Radio Frequency and Millimeter Wave Exposures : The Path to a Battlefield Standard (C)**
Jason Payne, Air Force Research Lab
- 0850 **Radiofrequency Standards: Ensuring Personnel Safety and Maximizing System Utility (C)**
Jeff Whitmore, Air Force Research Lab
- 0915 **Modeling & Simulation Dosimetry Assessment for Radio Frequency Vehicle Stopper (RFVS) Technology (C)**
Andrew Atkinson, Air Force Research Lab
- 0940 **NIR Skin Damage Thresholds & Mechanisms: 1070 nm & 1319 nm Wavelengths (C)**
Robert Thomas, Air Force Research Lab
- 1005 **Break**
- 1020 **Target Reflected Energy Measurements (TREM) Testing in HEL Hazard Analysis Model Program - Implications for Hazards (C)**
Semih Kumru, Air Force Research Lab
- 1045 **Survey of Perceptions of Directed Energy on the Battlefield (C)**
Benjamin Buch, Stanford University
- 1110 **Laser Eye Protection Vulnerability Modeling (C)**
Brenda Novar, Air Force Research Lab
- 1135 **Non-lethal Laser Small Arms Fire Suppression Study (C)**
Leon McLin, Air Force Research Lab
- 1200 **Symposium Adjourns**

FRIDAY MORNING

Education Workshop (Open)

Moderator: *Don Seeley*, HEL-JTO

Westin Room A

- 0700 **Registration and Breakfast Snacks at Westin**
- 0800 **Bachelors to PhD: An Education Stimulated by Research in Directed Energy (A)**
Mark Spencer, Air Force Institute of Technology
- 0830 **Utilizing Undergraduates Research as Curriculum and Technical Research Resources at the U.S. Coast Guard Academy**
James Royce, U.S. Coast Guard Academy
- 0900 **2013 AFIT Directed Energy Summer Intern (DESI) Program Review**
Jessica Vetter, AFIT Center for Directed Energy
- 0930 **DEPS Education Grant**
Mark Neice, Directed Energy Professional Society
- 1000 **Break**
- 1030 **Army Research Laboratory Summer Interns Report**
- 1100 **Navy Research Laboratory Summer Interns Report**
- 1130 **Air Force Research Laboratory Summer Interns Report**
- 1200 **Workshop Adjourns**

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