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Technical Program



Twelfth Annual Directed Energy Symposium

2 - 6 November 2009
San Antonio, Texas

Directed Energy Education
Workshop

6 November 2009
San Antonio, Texas

SPONSORED BY HEL JTO

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Locations of Symposium Events

Most Symposium sessions will be held at the San Antonio Convention Center in rooms that are identified in the program. Exceptions include these: Reception Tuesday evening - Hyatt Regency Hotel, Reception Wednesday evening - Buckhorn Museum, Secret Sessions - Offsite Location.

Transportation

The Convention Center is a short distance from the hotels and attendees are encouraged to walk. Limited bus transportation will be provided from the hotels to the convention center. Buses will start at 0630 and run until 15 minutes after the end of the sessions. Buses will run from the Convention Center to the Secret sessions and will shuttle between these locations continually approximately every 20 minutes (on the hour, 20, & 40). Do not bring cell phones, pagers, writing materials, or bags to the offsite sessions.

Bus transportation will be available for the DE Bioeffects Facility Tour on Wednesday. Buses will leave from the Convention Center.

The Buckhorn Museum is a short distance from the hotels and attendees are requested to walk. Limited bus transportation will be provided for those unable to walk from the hotels to the Buckhorn Museum on Wednesday evening for the reception.

Breakfasts

Pastries and coffee will be served every morning at the Convention Center. Speakers Breakfast will be available for speakers only on the day of their presentation.

Lunches

Lunch will be served Tuesday - Thursday at the Convention Center. Limited coffee and snacks during breaks will be available at the convention center and the offsite location Tuesday to Friday morning.

Directed Energy Education Workshop

The DE Education Workshop is a separate event from the Symposium, scheduled for Friday 6 November at the Hyatt Hotel. Any Symposium registrant may attend the Workshop.

MONDAY

Short Courses

- 0700 Registration at Convention Center
- 0800 Short Courses Begin
1. Introduction to High Energy Laser Systems
Convention Center Room 101A
 2. Introduction to High Power Microwave
Convention Center Room 101B
 3. Introduction to Applications of HEL (Limited)
Convention Center Room 102A
 4. Scaleable Bio-Effects (Secret)
Offsite Location
 5. RF Directed Energy Effects (Secret)
Offsite Location
- 1200 Break for Lunch
- 1300 Afternoon Short Courses Begin
6. Applying DALE in a Directed Energy System
Simulation (Limited)
Convention Center Room 101A
 7. Thin Disk Lasers and Applications (Limited)
Convention Center Room 101B
 9. Laser Induced Sensor Effects (Secret)
Offsite Location
 10. Ultrashort Bio-Effects
Convention Center Room 102A

TUESDAY MORNING

Plenary Session (Open)

Convention Center, Mission Ballroom A/B

- 0700 Registration at Convention Center
- 0800 Introduction
Dr. Garrett Polhamus, Chief, Directed Energy Bioeffects Division, Human Effectiveness Directorate, 711th Human Performance Wing of the Air Force Research Laboratory
- 0815 Welcome
Major General Thomas Travis, Commander, 59th Medical Wing, Wilford Hall Medical Center
- 0845 Keynote
Mr. Joseph Sciabica, Executive Director, Air Force Research Laboratory
- 0930 The Cyber Wavefront: Exploring the Role of Directed Energy in Cyberspace
Mr. Michael Kretzer, Technical Director, 688th Information Operations Wing. AFSPC
- 1015 Break
- 1045 Directed Energy and Research Opportunities in Homeland Security
Dr. Starnes Walker, Director of Research, Department of Homeland Security
- 1130 DEPS Session
Dr. William Baker, Directed Energy Professional Society
- 1200 Lunch
Sponsored by Boeing

TUESDAY AFTERNOON

Bioeffects - mmWave & HPM (Open)

Chairs: *John D'Andrea*, and *John Ziriox*,
USN NAMRU/SA

Convention Center, Mission Room A

- 1300 **W-Band High Power Sources with Permanent Magnet Transport**
Baruch Levush, Naval Research Laboratory
- 1330 **Modeling Whole-Body Millimeter-Wavelength Irradiation Irreversible Damage**
Luisiana Cundin, CMI\AFRL\RHDR
- 1400 **Modeling Millimeter-Wave Propagation**
Luisiana Cundin, CMI\AFRL\RHDR
- 1430 **Quasi-Optical W-band Sheet Beam Klystron (QO-WSBK) for Active Denial System (ADS) Applications**
Larry Barnett, University of California
- 1500 **Break**
- 1530 **Some Past Research on Bioeffects of Pulsed Electromagnetic Energy**
Ronald Seaman, General Dynamics
- 1600 **Quantification of Multiple Nanosecond Electrical Pulse Exposure in Mammalian Cells**
Bennett Ibey, AFRL 711th HPW/RHDR
- 1630 **RHDR Theory and Modeling Efforts for Short Pulse Research**
William Roach, AFRL 711th HPW/RHDR
- 1700 **Modeling Ultra-Short Blumlein Pulses**
Luisiana Cundin, CMI\AFRL\RHDR
- 1730 **Poster Sessions at Hyatt Evening Reception**

TUESDAY AFTERNOON

Student Session (Open)

Chair: *Don Seeley*, High Energy Laser Joint
Technology Office

Convention Center, Mission Room B

- 1300 **Opening Remarks**
Don Seeley, HEL JTO, Chair
- 1310 **Intracavity Second Harmonic Generation of Cs Laser**
Timothy Genda and Benjamin Naumann,
US Air Force Academy
- 1330 **Measuring the Fine-Structure Mixing Rate Cross Sections of Rb(5p) with 3He**
Benjamin Naumann and Timothy Genda,
US Air Force Academy
- 1350 **Development of an Optically Pumped Cesium Dimer Laser**
Omar Qassim, University of New Mexico
- 1410 **Multialkali Coatings for Dispenser Photocathodes**
Eric Montgomery, University of Maryland
- 1430 **Thermal Tuning of Volume Bragg Gratings for Spectral Beam Combining**
Derrek Drachenberg, University of Central
Florida
- 1450 **Break**
- 1520 **Non-Intrusive Field Characterization with Slab Coupled Optical Sensor for Interior Packaging**
Richard Gibson, Brigham Young University
- 1540 **Millimeter-Wave Solid-State Reactive Sintering of Nd:YAG Ceramic Laser Host Materials**
Chad Stephenson, Bethel College
- 1600 **Modeling Kinematics for Optical Beam Pointing**
Angela Roush, USNA
- 1620 **Modeling Terahertz Propagation in Brownout Conditions**
Phillip Grice, Brown University

TUESDAY AFTERNOON

Beam Control (Limited)

Chair: *John Albertine*, consultant
Convention Center, River Room

- 1300 **Long-Range Propagation of High-Power, Single-Mode Fiber Lasers**
Richard Fischer, Naval Research Laboratory
- 1330 **Field and Laboratory Validation of Surface Layer Optical Turbulence, Off-Axis Irradiance, and Desert Sand Optical Properties Models**
Steven Fiorino, Air Force Institute of Technology
- 1400 **Adaptive Optics Mitigation of Thermal Blooming Effects Using a Weighted Distortion Number**
Mark Spencer, Air Force Institute of Technology
- 1430 **Development of a Feedforward Compensation Technique Using an Adaptive Filter to Predict Source Position in the Mitigation of Platform Induced Jitter**
Joe Watkins, US Naval Academy
- 1500 **Break**
- 1530 **Target-in-the-loop Incoherent Beam Combining with Six Independent Transmitters**
Tanwin Chang, Northrop Grumman/AOA
- 1600 **Integrated Adaptive Telescope System**
Allan Wirth, Xinetics
- 1630 **Advanced Wavefront Control Processor**
Allan Wirth, Xinetics
- 1700 **Compact Off-Axis Beam Director for HEL Applications**
Chris Lieto, Northrop Grumman
- 1730 **Poster Sessions at Hyatt Hotel Evening Reception**

WEDNESDAY MORNING

FEL Technology and Testing (Open)

Chair: *Quentin Saulter*, Office of Naval Research
Convention Center, Mission Room A

- 0700 **Registration at Convention Center**
- 0800 **Demonstrated Production of 1nC Bunch Charge with the JLab GTS DC Photoemission Gun**
Carlos Hernandez-Garcia, Jefferson Laboratory
- 0825 **The Challenges of Drive Laser Systems For MW-class Free-Electron-Lasers Based On Photocathode-Injector Energy-Recovery-Linac**
Shukui Zhang, Jefferson Laboratory
- 0850 **Electron Bunch Dynamics in High-Average Current Injectors for FELs**
Luke Johnson, University of Maryland
- 0915 **Diamond Current Amplifier Fabrication and Characterization**
Joan Yater, Naval Research Laboratory
- 0940 **Multialkali Coatings for Dispenser Photocathodes**
Eric Montgomery, University of Maryland
- 1005 **Break**
- 1035 **RF-Gated, Field Emitter Electron Source**
Matt Virgo, Argonne National Laboratory
- 1105 **Progress on the Development of High Quantum Efficiency Photocathodes at BNL**
Ilan Ben-Zvi, Brookhaven National Laboratory
- 1130 **Progress on the Superconducting Injector and High-Current ERL at BNL**
Ilan Ben-Zvi, Brookhaven National Laboratory
- 1200 **Lunch**

WEDNESDAY MORNING

Laser Programs and Applications (Limited/Open)

Chairs: *Lynn Ebbesen*, Northrop Grumman
Convention Center, Room 101 A/B

- 0700 **Registration at Convention Center**
- 0800 **Tactical Mission Concepts and Applications for Phased Array HEL Systems (Limited)**
Kevin Probst, The CORE Group
- 0830 **Deployment Optimization of Multiple Cooperative Engagement HELs Using DEST**
Steven Hall, Lockheed Martin Space Systems

Session is now Open

- 0900 **Status of Textron's J-HPSSL 100 kW ThinZag Laser Program**
Daniel Trainor, Textron Defense Systems
- 0930 **The Role of the Satellite Assessment Center and Laser Owner/Operators in Predictive Avoidance**
Bryan Blasy, Air Force Research Laboratory
- 1000 **Break**
- 1030 **DoD Instruction 5000.02 and its Impact on Directed Energy Programs**
William Decker, Defense Acquisition University
- 1100 **Spectroscopic and Kinetic Measurements on Alkali Atom-Rare Gas Excimers**
Steven Davis, Physical Sciences Inc.
- 1130 **Laser System for Space Debris Cleaning**
Alexander Rubenchik, Lawrence Livermore National Laboratory
- 1200 **Lunch**

WEDNESDAY MORNING

Bioeffects: General Topics (Limited)

Chair: *Bruce Stuck*, USAMRD
Convention Center, River Room

- 0700 **Registration at Convention Center**
- 0800 **Results from the Thermal Laser Field Evaluation**
Semih Kumru, Air Force Research Laboratory
- 0830 **Physiological Effects of Electro-Muscular Incapacitation Devices**
John Ziriak, Naval Medical Research Unit San Antonio
- 0900 **Muscle Contraction Force Scales with the Duration of Nanosecond E-field Bursts**
Brian Cooper, University of Florida
- 0930 **The Solid-State Active Denial System RF Source and Antenna Development**
George Bates, Northrop Grumman
- 1000 **Break**
- 1030 **Comparison of Experimentally Obtained Specific Absorption Rate (SAR) with Results of Finite-Difference Time-Domain (FDTD) Modeling of Swine**
Ronald Seaman, General Dynamics
- 1100 **What Lies Beneath the Surface - Chemical and Thermal Stimuli, Pain Perception and Behavioral Outcomes**
Maureen McConnell, Air Force Research Laboratory
- 1130 **High Energy Laser Collateral Assessment Tool**
Albert Bailey, Northrop Grumman
- 1200 **Lunch**

WEDNESDAY MORNING

RF and HPM (Secret)

Chair: *Peter Turchi*, Los Alamos National Laboratory
Offsite Location

- 0700 Registration at Convention Center
- 0800 Buses Depart for Offsite Location
- 0830 RF Weapons - The Myths and Facts
- 0855 Susceptibility of COTS Passive Infrared Devices to HPM
- 0920 MEGA Demonstration System
- 0945 Thermoelastic Response of a Human Head to a Pulsed Microwave Source: A Computer Simulation Study
- 1010 Break
- 1035 Electromagnetic Field Distribution as a Function of Building Materials Using Wideband RF Technology
- 1100 Using DE Technology to Search for Improvised Nuclear Devices (INDs)
- 1130 Buses return from offsite location
- 1200 Lunch

WEDNESDAY MORNING

Intelligence (Secret)

Chairs: *Wendy Kunkel*, National Air and Space Intelligence Center, and *Megan Smith*, Navy/ NMIC
Offsite Location

- 0800 Buses Depart for Offsite Location
- 0830 Asia RFW Threats
- 0850 Asia Ground-Based Air Defense and Anti-Satellite Directed Energy Weapons
- 0910 ROW RFW Threats Overview
- 0930 ROW Ground-Based Air Defense and Anti-Satellite Directed Energy Weapons
- 0950 Real World Lasing Incidents
- 1010 Break
- 1030 Future Naval Laser Weapons
- 1100 Foreign Pulsed Power for Directed Energy Weapons
- 1130 Buses return from offsite location
- 1200 Lunch

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WEDNESDAY AFTERNOON

Laser Novel Concepts (Open)

Chair: *Mark Neice*, High Energy Laser Joint Technology Office

Convention Center, Mission Room A

- 1300 Prospects for High Power Diamond Raman Lasers
Richard Mildren, MQ Photonics Research Centre
- 1330 Underwater Intense Laser Acoustic Source Directivity and Frequency Control Demonstration
Melissa Hornstein, Naval Research Laboratory
- 1400 EOIL Power Scaling in a 1-5 kW Supersonic Discharge-Flow Reactor
Wilson Rawlins, Physical Sciences Inc.
- 1430 Catalytic Enhancement of Singlet Oxygen for Hybrid Electric Discharge Oxygen-Iodine Laser Systems
Wilson Rawlins, Physical Sciences Inc.
- 1500 Break
- 1530 Pulsed, Optically-Pumped Rubidium Laser Scaled to 24 x Threshold
Clifford Sulham, Air Force Institute of Technology
- 1600 Systematic Technology Development of the Electric Oxygen-Iodine Laser
David Carroll, CU Aerospace
- 1630 Transversely Pumped Cesium Vapor Amplifier
Boris Zhdanov, US Air Force Academy
- 1800 Evening Reception at the Buckhorn Museum

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WEDNESDAY AFTERNOON

FEL Technology (Limited)

Chair: *Jeremy Martin*, Office of Naval Intelligence
Convention Center, River Room

- 1300 **Power Beaming to UAVs, USVs and UUVs**
Roy Whitney, Jefferson Laboratory
- 1330 **FEL Seed Laser Requirements and Simulations of the Brookhaven Amplifier Experiments**
Joseph Penano, Naval Research Laboratory
- 1400 **Atmospheric Propagation of High-Average-Power FEL Pulse Trains**
Bahman Hafizi, Icarus Research, Inc.
- 1430 **High Average Power Free-electron Laser Resonator Concepts**
Stephen Benson, Jefferson Laboratory
- 1500 **Break**
- 1530 **Endpoint Energy Measurements in a High-Gradient CW NCRF Injector**
Dinh Nguyen, Los Alamos National Laboratory
- 1600 **A Driver Accelerator for High-Power FEL Systems**
David Douglas, Jefferson Laboratory
- 1630 **Optimization of Wall Plug Efficiency in a High-Power FEL System**
David Douglas, Jefferson Laboratory
- 1700 **Systems Engineering Studies of High Power Free Electron Lasers for Ship Defense**
Michael Phillips, Advanced Energy Systems Inc.
- 1800 **Evening Reception at the Buckhorn Museum**

WEDNESDAY AFTERNOON

Improvised Explosive Devices (IED) Defeat (Secret)

Chair: *Eugene Bednarz*, Air Force Research Laboratory
Offsite Location

- 1300 **Buses Depart for Offsite Location**
- 1330 **IED Resonant Backscatter Recognition Using Non-Negative Matrix Factorization**
- 1400 **RF Energy Requirements for Initiation of Detonators**
- 1430 **System-Level RF Effects Testing of Improvised Explosive Devices**
- 1500 **Break**
- 1530 **Update on the Banshee Counter-IED System**
- 1600 **Design and Development of Radio Frequency DE IED Neutralizer Concept**
- 1630 **Buses return from offsite location**
- 1800 **Evening Reception at the Buckhorn Museum**

WEDNESDAY AFTERNOON

DE Technology and Applications (Secret)

Chair: *Roy Hamil*, Air Force Research Laboratory
Offsite Location

- 1300 **Buses Depart for Offsite Location**
- 1330 **Full System Performance of the Advanced Tactical Laser Prototype Hardware**
- 1400 **Impact of TREM Results on the ATL Military Utility**
- 1430 **Water Vapor Control on COIL: Performance and System Impact**
- 1455 **Importance of Multi-dimensional Heat Flow for an HEL Damaging a Tactical Target**
- 1520 **Break**
- 1555 **Air to Air Laser Lethality Using LEWAT-EF**
- 1620 **Field Tests of Susceptibility of BLACK CAT Passive Infrared Devices to RF**
- 1645 **Micro Electromechanical System Susceptibility to High Power Microwave Radiation**
- 1710 **Buses return from offsite location**
- 1800 **Evening Reception at the Buckhorn Museum**

Concurrent Sessions by Room and Time

	Convention Center Mission Room A	Convention Center Mission Room B	Convention Center River Room	Convention Center Room 101 A/B	Offsite	Offsite
	Open	Limited	Secret			
Tuesday 1300	Bioeffects - mmWave & HPM (Open)	Student Session (Open)	Beam Control (Limited)			
Wednesday 0800	FEL Technology and Testing (Open)		Bioeffects: General Topics (Limited)	Laser Programs and Applications (Limited/ Open)	RF and HPM (Secret)	Intelligence (Secret)
Wednesday 1300	Laser Novel Concepts (Open)		FEL Technology (Limited)		IED Defeat (Secret)	DE Technology and Applications (Secret)
Thursday 0800	FEL - M & S (Open)	DE - General Topics (Open)	DE Technology (Limited)	Transitioning DE Technology to the Warfighter (OPEN)	ADS Bioeffects and Alternative Applications (Secret)	LGE & Explosive Detection (Secret)
Thursday 1300	Bioeffects: Laser and Terahertz (Open)	Laser Technology (Open)	Laser M&S + Beam Control (Limited)		ADS + Vehicle/ Vessel Stopping (Secret)	Program Reviews (Secret)
Friday 0800	Non-Lethal Weapon Technology (Limited)	Laser Systems + Power/ Thermal Management (Limited)		DE Transition and Testing (Limited)	DE Education Workshop at Hyatt (Open)	

THURSDAY MORNING

FEL - Modeling and Simulations (Open)

Chair: *Roy Whitney*, Jefferson Laboratory
Convention Center, Mission Room A

- 0700 **Registration at Convention Center**
- 0800 **Status of the NPS Cathode and Superconducting Electron Gun Experiments**
John Lewellen, Naval Postgraduate School
- 0830 **SASE & Laser Seeded FEL Amplifiers**
James Murphy, Brookhaven National Laboratory
- 0900 **Numerical Issues in the Simulation of Free-Electron Lasers**
Henry Freund, Science Applications International Corporation
- 0930 **Electron Transport and Photoemission in Coated Semiconductors and Thin Films**
Kevin Jensen, Naval Research Laboratory
- 1000 **Break**
- 1030 **High-Average Current Injectors for High-Power FELs**
Phillip Sprangle, Naval Research Laboratory
- 1100 **Electron Beam Quality and Stability Effects in FEL Amplifiers and Oscillators**
Joseph Blau, Naval Postgraduate School
- 1130 **Comparative Study of Free-Electron Laser Simulations**
Joseph Blau, Naval Postgraduate School
- 1200 **Lunch**

THURSDAY MORNING

Transitioning DE Technology to the Warfighter (Open)

Convention Center, Room 101A/B

- 1030 **Invited Talk**
William Decker, Defense Acquisition University

THURSDAY MORNING

Directed Energy - General Topics (Open)

Chair: *Jorge Beraun*, Air Force Research Laboratory
Convention Center, Mission Room B

- 0700 **Registration at Convention Center**
- 0800 **Airborne Target Irradiance and Imagery Measurement Risk Reduction Test-bed**
Larry McKee, Directed Energy Test and Evaluation Capability
- 0830 **Effects on Electronics of Extremely High-Frequency RF Directed Energy**
Alan Mar, Sandia National Labs
- 0900 **High Energy Laser Ground Target Irradiance Measurement Capability**
Mike Bertin, Directed Energy Test and Evaluation Capability
- 0930 **High Bandwidth, Atmospheric Optical Turbulence Measurements Utilizing the Balloon Ring Platform**
Demos Kyrazis, R-Cubed, Inc.
- 1000 **Break**
- 1030 **Preliminary VHF Radar and High-Data-Rate Optical Turbulence Profile Observations Using a Balloon-Ring Platform**
Frank Eaton, Air Force Research Laboratory
- 1100 **Tri-Service Study 2011**
Minh Vuong, Directed Energy Test and Evaluation Capability
- 1200 **Lunch**

THURSDAY MORNING

DE Technology (Limited)

Chair: *Carol Sullivan*, DDR&E/Research
Convention Center, River Room

- 0700 **Registration at Convention Center**
- 0800 **Producing Microwaves with a Ferroelectric Generator Power Source**
David Hemmert, HEM Technologies
- 0830 **Biotechnological Nanowarfare: Directed Electromagnetic Energy Control**
Jonathan Kiel, Air Force Research Laboratory
- 0900 **Testing of Vector Inversion Based Rf Sources at NSWCC DD**
Zac Shotts, Radiance Technologies
- 0930 **Modeling and Measuring the Wideband Threat Source Antenna Pattern**
Jeffrey Schleher, Directed Energy Test and Evaluation Capability
- 1000 **Break**
- 1030 **How to Validate an HPM M&S Tool Illustration with a Realistic Example of a Simulation Tool and a Test Chamber**
Maqsood Mohammed, Jacobs Technology
- 1100 **Comparison of Optical Limiting Materials with Microsecond Visible Laser Exposure**
Molly Miller, 711 HPW/RHDO
Air Force Research Laboratory
- 1130 **Acceptance Test Results for the Directed Energy Test and Evaluation Capability High Power Microwave Narrowband Threat Systems**
J. Mark DelGrande, Directed Energy Test and Evaluation Capability
- 1200 **Lunch**

THURSDAY MORNING

ADS Bioeffects and Alternative Applications (Secret)

Chair: *Stephanie Miller and Noel Montgomery*,
Air Force Research Laboratory

Offsite Location

- 0700 **Registration at Convention Center**
- 0800 **Buses Depart for Offsite Location**
- 0830 **Active Denial System Transition Challenges**
- 0855 **ADS Bioeffects: From Frustration Canyon to Deployment**
- 0920 **Effects of Variable Spot Size on Human Exposure to 95-Ghz Millimeter Wave Energy**
- 0945 **Design, Construction, and Testing of a High Sampling Speed Detector Array for Direct Measurement of Millimeter Wave Beam Uniformity in Active Denial Systems**
- 1010 **Break**
- 1040 **Effects of Variable Spot Size on Human Exposure to 95-Ghz Millimeter Wave Energy - Moving Subjects**
- 1105 **Pain Intolerability from Short Small Spot 95-Ghz Exposures at Various Heat Rates, Final Results**
- 1130 **Buses return from offsite location**
- 1200 **Lunch**

THURSDAY MORNING

Laser Guided Energy (LGE) and Explosive Detection (Secret)

Chair: *Wallace Clark*, Air Force Research Laboratory
Offsite Location

- 0700 Registration at Convention Center
- 0800 Buses Depart for Offsite Location
- 0830 Thermal and Electrical Modeling of Discharge Channel Conductivity
- 0900 Laser Guided Energy Range Scaling
- 0930 Resistance and Capacitance of Long Distance Laser Filament Guided Discharges
- 1000 Break
- 1030 Sensitivity of Scattered Electromagnetic Fields to the Material Properties of Explosively Formed Penetrators
- 1100 Phenomenology Study of Resonant Backscatter from EFPs
- 1130 Buses return from offsite location for lunch
- 1200 Lunch

THURSDAY AFTERNOON

Bioeffects: Laser and Terahertz (Open)

Chair: *Robert Thomas*, Air Force Research Laboratory
Convention Center, Mission Room A

- 1300 Terahertz Radiation Research Summary
Gerald Joseph Wilmink, 711th HPW/RHDR
Air Force Research Laboratory
- 1330 A Measurement Challenge: Exploring the Effectiveness of Directed Energy on Human Behavior
Christina Hinojosa, Conceptual MindWorks, Inc.
- 1400 Method for Measuring Threshold Temperature for Laser-Induced Cell Death
Michael Denton, Northrop Grumman
- 1430 Human Assessment of Laser Devices
Leedjia Svec, USN NAMRU-San Antonio
- 1500 Break
- 1530 Sensitive Evaluation of Laser Lesions in the Non-Human Primate Retina
Ginger Pocock, Air Force Research Laboratory
- 1600 Thermal Ablation of Biological Tissue
Elharith Ahmed, Northrop Grumman
- 1630 Evaluation of Tracking and Warning Effectiveness of a Rifle-Mounted Non-Lethal Laser in Open-Water Naval Engagements
Jeremy Beer, Naval Medical Research Unit
- 1700 Adaptive Reflection Modeling
Albert Bailey, Northrop Grumman

THURSDAY AFTERNOON

Laser Technology (Open)

Chair: *Edward Duff*, Air Force Research Laboratory
Convention Center, Mission Room B

- 1300 **Dynamical Stability Analysis of High-Power Passively Phased Fiber Laser Arrays**
Eric Bochove, Air Force Research Laboratory
- 1330 **Nanoscopic Control of Laser Dye, Dopant and Media**
Joseph Lichtenhan, Hybrid Plastics Inc
- 1400 **Impact of Annealing on the Optical Properties of Thin Film Oxides**
Carmen Menoni, Colorado State University
- 1430 **Break**
- 1500 **Diode Pumped Alkali Laser Kinetics: Energy Pooling and Second Order Processes**
Paul Jones, Air Force Institute of Technology
- 1530 **Joint High Power Solid State Laser Demonstration at Northrop Grumman**
Marty Wacks, Northrop Grumman Aerospace Systems
- 1600 **Origin of Wavefront Aberration in Weakly-Compressible Shear Layers**
Miguel Visbal, Air Force Research Laboratory
- 1630 **Cryogenically-Cooled Yb:YAG Ceramics Active-Mirror Laser**
Kenji Takeshita, Mitsubishi Heavy Industries, Ltd.

THURSDAY AFTERNOON

Laser Modeling and Simulation + Beam Control (Limited)

Chairs: *Chuck LaMar*, Space & Missile Defense Command
Convention Center, River Room

- 1300 **Model Comparison for Accurately Predicting Membrane Mirror Deformation and Snap-Down**
Michael Steinbock, Air Force Institute of Technology
- 1330 **Beam Drift Analysis**
William Laughlin, Physical Sciences Inc
- 1400 **Performance Model of Laser Weapon Systems Comprised of Multiple Tiled Subapertures**
Richard Bartell, Air Force Institute of Technology
- 1430 **Potential Impacts of Sea Surface Temperature Changes on Maritime High Energy Laser Engagements**
Steven Fiorino, Air Force Institute of Technology
- 1500 **Break**
- 1530 **Optimization of Power and Aperture for the Counter Rocket, Artillery, and Mortar Mission**
Chuck LaMar, USASMDC
- 1600 **DARPA's Adaptive Photonic Phase-Locked Elements (APPLE) System - Test Results**
Andrew McKie, Raytheon NCS
- 1630 **First Light from the Integrated Solid State Laser Testbed**
Sean Ross, AFRL/RDL
- 1700 **RF Field Measurements for a TESLA Cage Cavity**
John Noonan, Argonne National Laboratory

THURSDAY AFTERNOON

Active Denial System + Vehicle & Vessel Stopping (Secret)

Chair: *Kirk Hackett*, Air Force Research Laboratory

Offsite Location

- 1300 Buses Depart for Offsite Location
- 1330 An Efficient Numerical Approach to Thermal Bioeffects Modeling With an Eye on System Performance
- 1355 Effects of Pharmacological Agents on the Perception of Pain from Millimeter Wave Exposure
- 1420 Behavioral Effects of Active Denial System (ADS) on Operators of Motor Vehicles
- 1455 Small Vessel Stopping Utilizing HPM (Update)
- 1515 Break
- 1545 Evaluation of High Power Electrical Vehicle Stopping Systems for Pre-Emplaced Applications
- 1610 Evaluation of High Power RF Technology for Non-Lethal Vessel Stopping
- 1635 RF Susceptibility Levels of GaAs and GaN Based Low Noise Amplifier
- 1700 Buses return from offsite location

THURSDAY AFTERNOON

Program Reviews (Secret)

Chair: *Kevin Anchor*, AAC/XR

Offsite Location

- 1300 Buses Depart for Offsite Location
- 1330 USAF Directed Energy Net Assessment (DENA) Study
 - Vulnerability Assessment of Blue Systems
 - Campaign-Level Results
 - Mitigation Strategies
- 1440 ELLA: Status and Plans
- 1505 Break
- 1520 Barracuda Version 2 and 3 System Development and Testing
- 1545 FEL Accelerator Component Development at AES
- 1610 Evaluation of Industrial and Shipboard Control System Susceptibility to High Power Radio Frequency Sources
- 1635 Laser Weapon System (LaWS) Development and Testing
- 1700 Buses return from offsite location

FRIDAY MORNING**Non-Lethal Weapon Technology (Limited)**

Chair: *David Law*, Joint Non-Lethal Weapons Directorate

Convention Center, Mission Room A

- 0700 **Registration at Convention Center**
- 0800 **Portable RF LL Device for Law Enforcement - Portable ADS**
Joe Cecconi, National Institute Justice
- 0830 **Overview of JNLWP Directed Energy Vehicle/Vessel Stopping Programs**
Scott Griffiths, Joint Non-Lethal Weapons Directorate
- 0900 **JNLWD Solid State Non-Linear Transmission Line HPM Source Development at Los Alamos National Laboratory**
Steven Russell, Los Alamos National Laboratory
- 0930 **Numerical Simulations of Efficient Generation of HPM in a Solid State, Periodically Loaded Non-linear Transmission Line**
Quinn Marksteiner, Los Alamos National Laboratory
- 1000 **Break**
- 1030 **Design and Construction of a 1.5 KHz Rep Rate Vector Inversion Generator Based RF Transmitter for Non-Lethal Weapons Applications**
Zac Shotts, Radiance Technologies
- 1100 **Ultra-Short Pulse Laser-Generated Plasma Flares in Air and on Dielectric Surfaces**
Joseph Penano, Naval Research Laboratory
- 1130 **Modeling and Simulation of a Distributed Sound and Light Array for use as a Hail-and-Warn System**
Robert Baran, Naval Surface Warfare Ctr
- 1200 **Symposium Adjourns**

FRIDAY MORNING**Laser Systems + Power/Thermal Management (Limited)**

Chair: *James Mulroy*, Raytheon

Convention Center, Mission Room B

- 0700 **Registration at Convention Center**
- 0800 **Flight Demonstrated ATL Lethality**
Bryan Kelchner, Boeing
- 0825 **HEL Target Effects on Tracker and Aimpoint Maintenance**
Paul Knowlton, Boeing
- 0850 **High Power Alkali Vapor Lasers**
Jason Zweiback, General Atomics Aeronautical System
- 0915 **Optical Device Detection Using Laser Illumination**
Walter Zacherl, Photonics Research Center, USMA
- 0940 **Test Ideas for a High Power SSL Testbed**
Josef Shwartz, Northrop Grumman Aerospace Systems
- 1005 **Break**
- 1035 **Lightweight Power/Thermal System for Ground Platform Applications Capable of Delivering Megawatt Class Shaft Power**
Charles Oberley, Air Force Research Laboratory
- 1100 **Thermal Energy Storage (TES) Technologies for Directed Energy Weapons**
Levi Elston, Air Force Research Laboratory
- 1125 **Li-Ion Battery as a Pulse Power Source for DEW**
Kamen Nechev, Saft America
- 1200 **Symposium Adjourns**

FRIDAY MORNING

Directed Energy Transition and Testing (Limited)

Chair: *Jimmy Fleming*, Air Force Research Laboratory

Convention Center, Room 101 A/B

- 0700 **Registration at Convention Center**
- 0800 **Enabling Directed Energy Capability Through Test Infrastructure Investment**
Todd Steiner, Test Resource Management Ctr
- 0830 **Behavioral Response to Non-Lethal Directed Energy Technologies: A Research FrameWork**
Jimmy Fleming, 711 HPW/RHDJ
Air Force Research Laboratory
- 0900 **Using International Cooperation to Transition Directed Energy**
Kelly McDonald, NAVAIR Weapons Division
- 0930 **Modeling HPM Coupling to IEDs**
Larry Bacon, Sandia National Laboratory
- 1000 **Break**
- 1030 **Air Armament Center (AAC) Role in Transitioning Directed Energy (DE) Technologies**
John Corley, AAC/XR, Eglin AFB
- 1100 **Demonstration, Testing, and Evaluation of a Distributed Sound and Light Array for use as a Hail-and-Warn System**
Randy Woods, Naval Surface Warfare Ctr
- 1130 **Laser Detection and Monitoring of Non-Lethal Laser in Maritime Naval Engagements**
David Freeman, HJF/ Naval Medical Research Unit-SA
- 1200 **Symposium Adjourns**

FRIDAY

DE Education Workshop (Open)

Hyatt Hotel

- 0700 **Registration at Hyatt Hotel**
- 0800 **HEL JTO Overview**
Don Seeley, High Energy Laser Joint Technology Office
- 0815 **DEPS Overview**
Sam Blankenship, Directed Energy Professional Society
- 0830 **2009 AFIT DE Summer Intern Program**
Marken Houle, Air Force Institute of Technology
- 0850 **Model Comparison for Accurately Predicting Membrane Mirror Deformation and Snap-Down**
Michael Steinbock, Air Force Institute of Technology
- 0910 **Modeling THz Propagation in Bownout Conditions**
Phillip Grice, Air Force Institute of Technology
- 0930 **Spectrograph for Use with IR Lasers**
Karlene Karrfalt, Army Research Laboratory
- 0950 **Break**
- 1020 **Thermal Effects on the Performance of Optics in Use with High Power Lasers**
Conor Pogue, Naval Research Laboratory
- 1040 **Millimeter Wave Solid-State Reactive Sintering of Nd:YAG Ceramic Laser Host Materials**
Chad Stephenson, Naval Research Laboratory
- 1100 **The Center of Excellence for High Energy Lasers - A Status Report**
David Hostutler, Air Force Research Laboratory
- 1120 **Enhancing Science Courses and Laboratories at a Women's College Using LIDAR**
Gary Gimmestad, Georgia Tech Research Institute

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