

Technical Program 2010 Directed Energy Systems Symposium



Beam Control Conference
DE Effects Mitigation Conference
DE Modeling and Simulation Conference
Employment of DE Weapons Conference
HEL Lethality Conference
High Power Microwave Workshop

12 - 16 April
Monterey, California

Visit www.deps.org
for current updates

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Important Phone Numbers:

Monterey Police 831-646-3914

NPS Emergency Police 831-656-2555

Salinas Valley Memorial Hospital 831-755-0700

NPS Quarterdeck 831-656-2441

General Symposium Info 505-450-1165

General Information

Security

- DE Systems Symposium is SECRET/ NOFORN
- DEPS issued ID badges & valid gov't ID are required
- Wireless electronic devices are prohibited in classified sessions
- Classified materials must be processed through DEPS security
- Classified notes **MAY ONLY BE TAKEN IN NOTEBOOKS PROVIDED BY SECURITY STAFF** (No note-taking in Opening Plenary)
- Classified and sensitive but unclassified conversations and discussions are restricted to designated meeting rooms only
- Cameras and photography must be authorized by the DEPS Symposium security manager
- Audio and video recording is prohibited
- Security concerns should be addressed to a DEPS Security Team member - identified by a RED BADGE
- Failure to adhere to security standards could result in denied/revoked Symposium registration

Meals

- Breakfast is available Tuesday through Friday at the Hyatt.
- Lunch is available at Hermann Hall at NPS on Tuesday and Wednesday. Box lunch is available Thursday at the Hyatt.
- Refreshment services will be available at all locations throughout the week.
- The Welcome/Exhibitor Reception will be held on Tuesday evening in the exhibit hall at the Hyatt.
- A Wine Tasting Reception will be held on Wednesday evening at the Hyatt.

Buses

NPS is a short walk from the Hyatt Hotel and attendees are encouraged to walk. For those unable to walk, buses will run approx every 15 mins during the following hours:

Monday - Thursday	0700 - 1730
Friday	0700 - 1230

Buses will leave from the Hyatt and drop off at various locations at NPS. We encourage attendees to not bring cell phones, laptops, or notebooks to NPS.

MONDAY

Short Courses

0700 Registration at Hyatt

0800 Short Courses Begin

Directed Energy 101 (Open)

David Kiel and George Harrison

Hyatt Hotel, Spyglass I

Systems Engineering & HEL Programs (Open)

Bill Decker

Hyatt Hotel, Spyglass II

Free Space Laser Communications (Limited)

Arun Majundar

Hyatt Hotel, Regency IV

RF Effects on Electronics (Secret)

John Tatum and Timothy Clarke

Naval Postgraduate School, Spanagel Hall

ALL DAY COURSES

Introduction to Beam Control (Open) ALL DAY

Paul Merritt

Hyatt Hotel, Oak Tree I-II

Laser Effects (Limited) ALL DAY

Nick Morley, lead instructor

Hyatt Hotel, Regency V

Laser-Induced Sensor Effect (Secret) ALL DAY

Joel Davis

Naval Postgraduate School, ME Auditorium

1200 Break for Lunch

1300 Short Courses Begin/Resume

Quantum Key Distribution (Limited)

Richard Hughes

Hyatt Hotel, Spyglass I

HELSEEM (Limited)

Robin Ritter

Hyatt Hotel, Spyglass II

Phased Array HEL Systems (Limited)

Kevin Probst and Paul McMannamon

Hyatt Hotel, Regency IV

Scalable Bioeffects (Secret)

Jill McQuade and Justin Zohner

Naval Postgraduate School, Spanagel Hall

1715 Last bus returns from NPS

TUESDAY MORNING

PLENARY SESSION

Opening Plenary

NPS, King Hall

- 0700 **Registration and Breakfast at Hyatt
Speaker Breakfast at Hyatt
Buses begin to NPS**
- 0800 **Call to Order - Symposium Co-Chairs**
Mr. Mark Neice / Brig Gen Donald Streater
USAF (ret.)
- 0805 **Presentation of Colors, Pledge of
Allegiance, and Security Comments**
Dr. Karl van Bibber
Vice President, Naval Postgraduate School
- 0810 **Opening Remarks**
Mr. Mark Neice
- 0830 **DoD Development Planning**
Mr. Terry Jaggars
Principal Deputy for Systems Engineering,
Office of the Under Secretary of Defense,
Office of Defense Research and Engineering
- 0915 *Dr. Lawrence Grimes*
Office of the Undersecretary of Defense
Office of Defense Research and Engineering
- 1000 **Break**
- 1030 **Directed Energy Requirements**
Major General Tom Andersen
Air Combat Command / Requirements
- 1100 **USA SMDC/ARSTRAT Directed Energy
Technology Programs**
Dr. Steven Messervy
Deputy to the Commander for Research,
Development and Acquisition,
US Army Space and Missile Defense Center
- 1130 **Technology Transition**
CAPT Heide Stefanshyn-Piper
Chief Engineer, NAVSEA, Future Capability
- 1200 **Lunch at NPS Only**
Soviet HEL Programs, 1965-1980
Prof Petr Zarubin
Chair of Moscow Institute of
Radioelectronics and Automatics

TUESDAY AFTERNOON

JOINT SESSION

INTEL (Secret)

NPS, ME Auditorium

Begins at 1300 - See page 14 for Information

TUESDAY AFTERNOON

BEAM CONTROL

Adaptive Optics (Limited)

Hyatt Hotel, Regency IV-VI

Chair: *Patrick Kelly, AFRL/RDS*

- 1300 **Branch Points in Deep Turbulence Adaptive
Optics (Invited)**
Darryl Sanchez, AFRL/RDS
- 1330 **Path-Resolved Turbulence Diagnostics:
Implications for Adaptive Optics
Performance**
Matthew Whiteley, MZA Associates
- 1350 **Phase Diversity Adaptive Optics Testbed for
Laboratory Experimentation**
Justin Mansell, MZA Associates
- 1410 **Passive Adaptive Optics for HEL Testing**
Allan Wirth, Northrop Grumman
- 1430 **Break**

Advanced Adaptive Optics (Limited)

Chair: *Darryl Sanchez, AFRL/RDS*

- 1500 **Overview of ASALT's JTO project**
Patrick Kelly, AFRL/RDS
- 1520 **The Aggregate Behavior of Branch Points
- Persistent Pupil Plane Branch Point Pairs**
Denis Oesch, SAIC
- 1540 **Using Branch Points to Measure
Atmospheric Turbulence Layers**
Carolyn Tewksbury, AFRL/RDS
- 1600 **Experimental Results Demonstrating MEMS
Performance**
Julie Smith, AFRL/RDS
- 1730 **Welcome/Exhibitor Reception**
Hyatt, Regency I-III

TUESDAY AFTERNOON

EFFECTS MITIGATION

Mitigation Requirements (Secret)

NPS, Ingersoll Hall

Chair: *Anthony Cain*, AFRL/RXPJA

- 1300 **DENA**
- 1330 **Air Combat Command Directed Energy Protection Options**
- 1400 **US Army Laser Hardening Standard**
- 1430 **Break**
- 1500 **Directed Energy: Impact on Law Enforcement Aviation and Homeland Defense**

DE Effects Mitigation Tactics/Training (Secret)

Chair: *Anthony Cain*, AFRL/RXPJA

- 1530 **USAF Training/TTP Development vs Low Powered Laser Threat**
- 1600 **Directed Energy Weapon (DEW) Tactical Mitigation**
- 1715 **Last bus leaves NPS**
- 1730 **Welcome/Exhibitor Reception**
Hyatt, Regency I-III

TUESDAY AFTERNOON

MODELING & SIMULATION

DE Sources/Device Modeling and Simulation (Limited)

Hyatt Hotel, Big Sur

Chair: *Al Kehs*, GTS

- 1300 **Study of Aberrations in an Unstable Resonator**
Justin Mansell, MZA Associates
- 1330 **Analysis and Comparison of Single Crystal and Polycrystalline Nd:YAG Optical Properties**
Ryan Springer, Naval Air Systems Command
- 1400 **Strain Based Fatigue Simulation of Bellows Expansion Joint Using Ansys Workbench**
Vijaya Nagdeve, Mechwell Industries
- 1430 **Break**
- 1500 **Test Cell Design for Diamond Field-Emitter-Array Cathodes in Free-Electron Lasers**
Samuel Hallock, NPS
- 1530 **Model-Based Design Optimization, Automatic Generation of Fast-Running Surrogate Models, and Surrogate-Based Optimization for Directed Energy Weapons Systems**
Steve Coy, MZA Associates
- 1600 **Modeling Of Sequentially Switched Bypass Circuits**
Oved Zucker, Polarix
- 1730 **Welcome/Exhibitor Reception**
Hyatt, Regency I-III

TUESDAY AFTERNOON

EMPLOYMENT OF DE WEAPONS

Counter RAM (Limited)

Hyatt Hotel, Spyglass

Chair: *Kraig Sheetz, USMA*

- 1300 **Aircraft Avoidance Considerations for HEL CRAM Engagements**
Phil Maki, Maki Engineering
- 1330 **Eye Safety Considerations for HEL CRAM Engagements**
Phil Maki, Maki Engineering
- 1400 **Break**
- 1430 **Value Modeling to Score Alternative System Designs for Forward Operating Base Defense**
Matt Krause, USMA
- 1500 **High Energy Laser as an Army Defense Against Rockets, Artillery, and/or Mortars**
Joshua Maurmeier, USMA
- 1530 **Finite Element Thermal Model for a Mortar Targeted by a High Energy Laser**
Stephen Wathen, USMA
- 1600 **Federated Simulation Architecture for Analysis**
Matt Krause, USMA
- 1730 **Welcome/Exhibitor Reception**
Hyatt, Regency I-III

TUESDAY AFTERNOON

HEL LETHALITY

Foreign Threat Description (Secret)

NPS, Glasgow Hall

Chair: *Robert Roybal, AFRL/RDLE*

- 1300 **Foreign UAV Threat**
- Systems Engineering Modeling and Analysis (Secret)**
Chair: *Joel Anspach, Boeing SVS*
- 1330 **High Energy Laser Tactical Target Damage Analysis**
- 1400 **Application of Robust Lethality Modeling Methods in LEWAT**
- 1430 **Break**
- 1500 **Implications of Missile Variability on Target Typing and Lethality for Directed Energy Weapon Systems**
- 1530 **Modeling of RAM Dynamic Engagements**
- 1600 **System Level Lethality Issues in the CRAM Mission**
- 1630 **Error Analysis in Dynamic Engagements**
- 1715 **Last bus leaves NPS**
- 1730 **Welcome/Exhibitor Reception**
Hyatt, Regency I-III

TUESDAY AFTERNOON

HIGH POWER MICROWAVE

HPM Sources (Secret)

NPS, Spanagel Hall

Chair: *Aaron Dougherty*, Naval Research Laboratory

- 1300 **Explosively Generated RF Effects**
- 1330 **Integration of the DETEC HPM NBTS-B Test Simulator**
- 1400 **Antenna Design for the DETEC HPM NBTS-B Test Simulator**
- 1500 **Results from a Compact, Repetitively-Pulsed Relativistic Magnetron Experiment**
- 1530 **Recent Progress Toward Achieving 2 MW on a 95 GHz Gyrotron**
- 1600 **Design of Ferroelectric Generators for High Power Microwave Power Sources**
- 1630 **Developing Modeling and Simulation Tools for High-Power Inductive Output Tubes**
- 1715 **Last bus leaves NPS**
- 1730 **Welcome/Exhibitor Reception**
Hyatt, Regency I-III

WEDNESDAY MORNING

JOINT SESSION

Symposium Joint Session

NPS, King Hall

Chair: *Tom Meyer*, DEPS

- 0700 **Registration and Breakfast at Hyatt**
Speaker Breakfast at Hyatt
Breakfast Sponsored by Textron
Buses begin to NPS
- 0800 **Introduction**
Dr. Tom Meyer, DEPS
- 0810 **ABL**
Lt Col Matt Zuber, U.S. Air Force
- 0900 **LAWS**
Captain Dave Kiel, U.S. Navy
- 0930 **JHPSSL/PTS Integration**
Col Jim Jaworsky, U.S. Army
- 1000 **Break**
- 1030 **Counter Personnel (ADS)**
Dr. Diana Loree, U.S. Air Force
- 1100 **Counter IED**
Mr. Ben Lagasca, U.S. Army
- 1130 **Counter Electronics**
Dr. Tim Andreadis, Naval Research Laboratory
- 1200 **Lunch at NPS Only**

WEDNESDAY MORNING

BEAM CONTROL

Aero-Optic Effects (Limited)

Hyatt Hotel, Spyglass

Chair: *Frank Eaton*, AFRL/RDS

- 0700 **Registration and Breakfast at Hyatt**
Breakfast Sponsored by Textron
- 0800 **Time-Resolved Schlieren for Aero-Optic Measurements**
Donald Wittich, AFRL/RDSEW
- 0820 **Measurement of Dynamic Turbulent Flow with ESPI**
John DeLong, Photonics Research Center
- 0840 **Aerodynamic Design of an Aircraft-Mounted Pod for Improved Aero-Optic Performance**
Mark Rennie, University of Notre Dame
- 0900 **Aero-Optic Effects of a Wing Tip Vortex**
Mark Rennie, University of Notre Dame
- 0920 **Feed-Forward Adaptive Optical Mitigation of Aero-Optics**
David Goorskey, MZA Associates
- 0940 **Break**

Directed Energy Systems (Limited)

Chair: *Donald Seely*, HEL JTO

- 1000 **The DoD Architecture Framework 2.0; Key to Fielding High Energy Laser Systems**
William Decker, Defense Acquisition University
- 1020 **Multiple Beam Alignment Diagnostic for the Navy's "Laser Weapon System" (LaWS) Incoherent Beam Combining**
Jake Sames, Penn State
- 1040 **Laser Weapon System on a Fighter or Small Aircraft**
Patrick Saunders, AFRL/RDS
- 1100 **Post-CDR Maturation of the Beam Control Subsystem for the US Army High Energy Laser Technology Demonstrator (HEL TD)**
Edward Montgomery, USA SMDC
- 1120 **Small UAV Directed Energy Defense Systems**
Brian Goldberg, Adsys Controls, Inc.
- 1140 **Capabilities of HEL Beam Control Systems Against Maneuvering Targets**
Travis Taylor, USA SMDC
- 1200 **Lunch at NPS Only**

WEDNESDAY MORNING

BEAM CONTROL

Phased Array Projection (Limited)

Hyatt Hotel, Regency IV-VI

Chair: *Dan Marker*, AFRL/RDSE

- 0700 **Registration and Breakfast at Hyatt**
Breakfast Sponsored by Textron
- 0800 **Wavefront Control Concept for Adaptive Phase-locked Fiber-Collimator Array: Wavefront Sensing and Control System Integration**
Mikhail Vorontsov, University of Dayton
- 0825 **An Improved Beam Director for the DARPA Adaptive Photonic Phase-Locked Elements (APPLE) System**
Andrew McKie, Raytheon
- 0845 **Phased Array Design for Air to Ground Applications**
Scott Harris, Flatiron Research
- 0905 **Evaluation and Test Results for the DARPA APPLE Phase 1 Array**
Scott Harris, Flatiron Research
- 0925 **A Spreadsheet Model of Phased Array System Weight, Volume, and Performance with Mission Examples**
Kevin Probst, The CORE Group
- 0945 **Break**

Phased Array Sensors (Limited)

Chair: *Larry Huntley*, AFRL/RDSE

- 1030 **Heterodyne Imaging and Wavefront Sensing**
Dan Marker, AFRL/RDSE
- 1055 **Phased Array of Phased Array Technology Development Using the IMAGE Testbed**
Paul McManamon, University of Dayton
- 1115 **Compensation for Tilt in a Hexagonal Array of Apertures**
Shon Neal, AFRL/RDTA
- 1135 **Compensation for Tilt in a 3X3 Square Array of Apertures**
Robert Richard, AFRL/RDTA
- 1200 **Lunch at NPS Only**

WEDNESDAY AFTERNOON

JOINT SESSION

Special INTEL (Secret - by invitation only) NPS, SCIF

Begins at 1300 - During the intelligence sessions, attendees will get an overview of the available intelligence data and gaps concerning one foreign country's laser weapons program. A discussion time will follow when attendees are invited to bring their technical expertise and experience to bear on some of the pressing questions the intelligence community is investigating. Discussion will be followed by an overview of the analysis and conclusions of the various agencies of the intelligence community who follow laser weapons development. Participants need only attend one session. Wednesday and Thursday sessions are by invitation only.

WEDNESDAY AFTERNOON

BEAM CONTROL

DE Demonstration Programs (Secret)

NPS, King Hall

Chair: *Dan Herrick*, AFRL/RDS

- 1300 THEL Target Effects on Tracker and Aimpoint Maintenance
- 1320 HEL Target Effects on Tracker and Aimpoint Maintenance
- 1340 Opportunities and Challenges for the Next Generation DE Beam Control Architecture
- 1400 ABL HPSI Flight Test Aimpoint Maintenance
- 1420 ABL HPSI Flight Test Inertial Pointing
- 1440 ABL HPSI Flight Test Jitter Control
- 1500 Break
- 1510 ABL HPSI Flight Test Passive Tracking
- 1530 ABL HPSI Flight Test Ranging
- 1550 ABL HPSI Flight Test Wavefront Control
- 1610 ABL HPSI HiTC Optics Integration
- 1650 ABL HPSI Flight Test Active Tracking
- 1715 Last bus leaves NPS
- 1730 Wine Tasting / Reception
Hyatt, Regency I-III

WEDNESDAY AFTERNOON

BEAM CONTROL

Space Based Beam Control (Limited)

Hyatt Hotel, Spyglass

Chair: *Dennis Oesch*, SAIC

- 1300 Active Imaging Experiment at Starfire
Optical Range Description, Results and Plans Forward
Joshua Kann, Boeing
- 1330 Interactions of Two Deformable Mirrors in Series, Looking in Different Directions Through a Single Telescope
Dennis Montera, AFRL/RDSA
- 1400 New Techniques for the Live Update of Gain Tables in NGS and LGS WFS Operation
Michael Olikier, SAIC
- 1430 Experimental Demonstration of Real Time Gradient Gain Correction for Sodium Beacon Laser Guide Star
Katia Shtyrkova, AFRL/RDS
- 1730 Wine Tasting / Reception
Hyatt, Regency I-III

WEDNESDAY AFTERNOON

EFFECTS MITIGATION

DE Effects Mitigation Tactical (Secret)

NPS, Ingersoll Hall

Chair: *Scott Nichelson*, 711 HPW/RHDR

- 1300 **Optical Cross Section Reduction Techniques**
- 1330 **Sensor Protection for USAF Tactical Systems**
- 1400 **Intrinsic Hardening of MWIR Focal Plane Arrays**
- 1430 **Laser Damage and Protection Measurements on Short Wave Infrared Sensors for Nanosecond and Longer Duration Pulses**
- 1500 **Break**
- 1530 **Materials Approach to C-HEL for UAV's**
- 1600 **On Using Shock Waves to Deflect High Energy Laser Beams**
- 1715 **Last bus leaves NPS**
- 1730 **Wine Tasting / Reception**
Hyatt, Regency I-III

WEDNESDAY AFTERNOON

MODELING & SIMULATION

Propagation Modeling & Simulation (Limited)

Hyatt Hotel, Regency IV-VI

Chair: *Steven Fiorino*, AFIT

- 1300 **THz Free Electron Laser Design and Atmospheric Propagation**
Aaron Zimmer, NPS
- 1330 **Impact of Track Algorithm Performance on Laser Weapon System Performance**
Rick Bartell, AFIT
- 1400 **Optical Path Differences resulting from Differences in Simulated Aero-Optic Turbulence**
James Bowers, AFIT
- 1430 **Break**
- 1500 **Enhanced Performance Model of Laser Weapon Systems Comprised of Multiple Tiled Subapertures; Turbulence and Thermal Blooming Effects**
Salvatore Cusumano, AFIT
- 1530 **Three-Dimensional Optical Turbulence Assessments from Doppler Weather Radar for Laser Applications**
Steven Fiorino, AFIT
- 1730 **Wine Tasting / Reception**
Hyatt, Regency I-III

WEDNESDAY AFTERNOON

EMPLOYMENT OF DE WEAPONS

Applications (Secret)

NPS, ME Auditorium

Chair: *Walter Cole*, USMA

- 1300 Target Discrimination with a Laser Interrogation
- 1330 The Bolt on Laser Technology (BOLT) Conceptual System
- 1400 Airborne Active Denial Weapon Concept of Operation
- 1430 Break
- 1500 Directed Energy and the Counter-IED Fight
- 1530 Integrated Protective Shield
- 1600 Sensor Optimization for Remote Laser Tagging Tracking
- 1630 Collateral Effects Measurements and Predictions from ATL Flight Test
- 1715 Last bus leaves NPS
- 1730 Wine Tasting / Reception
Hyatt, Regency I-III

WEDNESDAY AFTERNOON

HEL LETHALITY

Bio Effects (Secret)

NPS, Glasgow Hall

Chair: *Justin Zohner*, AFRL/RHDO

- 1300 HEL Bioeffects on Porcine Tissue: Hyperion Review
- 1330 ARTEMIS: an HEL Bioeffects Feasibility Study

Component Response (Secret)

Chair: *James Horkovich*, Raytheon

- 1400 Susceptibility of a FMA Antenna to 1.07 Micron Laser Irradiation
- 1430 Break
- 1500 Going Out With a Bang: Laser Engagement of a High Strength Steel Pressure Vessel
- 1530 Single-Shot and Multiple-Shot Damage Thresholds of InSb Focal Plane Array at 4 micron: From Damaging a Single Pixel to Deactivating a Whole Array
- 1600 A Review of Cook-Off Modeling in High Energy Laser Dynamic Engagements
- 1630 HEL Effects Testing of Electrical Distribution Components
- 1715 Last bus leaves NPS
- 1730 Wine Tasting / Reception
Hyatt, Regency I-III

	Tues AM	Tues PM	Wed AM	Wed PM	Thurs AM	Thurs PM	Fri AM
King Hall	Opening Plenary		Symp Joint Session	BEAM CONTROL	M&S		DPAD/ Closing Plenary
Glasgow Hall		LETHALITY		LETHALITY	LETHALITY	LETHALITY	
ME Auditorium		INTEL		EMPLOYMENT	EFFECTS MITIGATION	M&S	
Ingersoll Hall		EFFECTS MITIGATION		EFFECTS MITIGATION	EFFECTS MITIGATION	EFFECTS MITIGATION	
Spanagel Hall		HPM		HPM	HPM	HPM	HPM
					BEAM CONTROL		
SCIF				INTEL		INTEL	
Hyatt Regency IV-VI		BEAM CONTROL	BEAM CONTROL	M&S	BEAM CONTROL		
Hyatt Spyglass		EMPLOYMENT	BEAM CONTROL	BEAM CONTROL	EMPLOYMENT	BEAM CONTROL	
Hyatt Big Sur		M&S			BEAM CONTROL	BEAM CONTROL	

WEDNESDAY AFTERNOON

HIGH POWER MICROWAVE

HPM Effects (Secret)

NPS, Spanagel Hall

Chair: *Tim Andreadis*, Naval Research Laboratory

- 1300 Resistive Waveguide Attenuator
- 1330 Response of Pyroelectric Sensors to High Power Microwave
- 1400 Susceptibility of COTS Passive Infrared Devices to HPM in Static and Dynamic Environments
- 1430 Break
- 1500 High Dynamic Range High Power Microwave Threat Detection System
- 1530 Overview of Effects Testing Efforts Supporting the RF Vehicle Stopper System
- 1600 A Simple Model for an HPM Counter-IED Effect
- 1630 RF Energy Requirements for Initiation of Detonators
- 1715 Last bus leaves NPS
- 1730 Wine Tasting / Reception
Hyatt, Regency I-III

THURSDAY MORNING

BEAM CONTROL

Free-Space Optical Links Through Turbulence (Limited)

Hyatt Hotel, Big Sur

Chair: *Mark Gruneisen*, AFRL/RDSE

- 0700 Registration and Breakfast at Hyatt
Speaker Breakfast at Hyatt
- 0830 Deep Turbulence Characterization over 149 km Propagation Path with Coherent Multi-Beam Atmospheric Transceiver (COMBAT) System (Invited)
Mikhail Vorontsov, University of Dayton
- 0900 Fade-Tolerant Free-Space Lasercomm Demonstration
Paul Idell, Boeing
- 0930 Break
Session Moves to NPS
- #### Free-Space Lasercom and Secure Communication (Secret)
- NPS, Spanagel Hall
- 1015 Some Laser Communication Experiments Using Adaptive Optics (Invited)
- 1100 AFRL Compact Laser Terminal Experiment
- 1130 Optical Communication Experiments at the Starfire Optical Range
- 1200 Box Lunch at Hyatt
Poster Sessions at Hyatt and NPS

THURSDAY MORNING

BEAM CONTROL

Pointing and Tracking I (Limited)

Hyatt Hotel, Regency IV-VI

Chair: *Paul Berger*, MIT/LL

- 0700 **Registration and Breakfast at Hyatt**
- 0800 **Comparing Tracking Algorithms with a Tactical End-to-End Model**
Jim Lasche, AFRL/RDSE
- 0820 **Target-in-the-Loop Beam Projection with Adaptive Phase-locked Fiber-Collimator Array**
Mikhail Voronstov, University of Dayton
- 0840 **A System Engineering Approach for Active Track Design Synthesis and Initial Performance Evaluation**
James Negro, Boeing
- 0900 **Investigation Into the Use of a Feedforward Compensation Technique in Control Algorithms to Mitigate Platform Induced Jitter**
Richard Watkins, USNA
- 0920 **New Techniques for Aimpoint/Trackpoint Separation and 3D Image Tracking**
Brian Goldberg, Adsys Controls, Inc.
- 0940 **Break**

Pointing and Tracking II (Limited)

Chair: *Al Ogloza*, HEL JTO

- 1000 **Improved Jitter Control Using a Globalized Control Approach for Laser Relay Systems**
Leslie Chrzan, CSA Engineering
- 1020 **Tight Laser Beacon Formation Through Simulated Turbulence**
Vladimir Markov, MetroLaser
- 1040 **Residual Error in Finite Bandwidth Tracking Simulations with Accurate Phase Screens**
Eric Magee, MZA Associates
- 1100 **3D LADAR Pointing and Tracking for HELs**
Scott Shaw, MIT/LL
- 1120 **RAM Target Dynamics and HEL Engagements**
Phil Maki, Maki Engineering

THURSDAY MORNING

MODELING & SIMULATION

Weapon/Target Engagement Modeling (Secret)

NPS, King Hall

Chair: *John Tatum*, ARL

- 0700 **Registration and Breakfast at Hyatt**
Speaker Breakfast at Hyatt
Buses begin to NPS
- 0800 **HPM Effectiveness Modeling**
- 0830 **Expedient Algorithms for Modeling the Effects of Intentional Electromagnetic Interference**
- 0900 **The Free Electron Laser Operating Aboard the Electric Ship**
- 0930 **Modeling and Simulation in the Design of the High Energy Laser Technology Demonstrator (HEL TD)**
- 1000 **Break**
- 1030 **An HPM Engagement Design Process**
- 1100 **ABL Flight Data Comparison to LMWOC Simulation Results**
- 1200 **Box Lunch at Hyatt**
Poster Sessions at Hyatt and NPS

THURSDAY MORNING

EFFECTS MITIGATION

HPM Effects Mitigation (Secret)

NPS, Ingersol Hall

Chair: *Jill McQuade*, 711 HPW/RHDR

- 0700 Registration and Breakfast at Hyatt
Speaker Breakfast at Hyatt
Buses begin to NPS
- 0800 White Sands Test Center HPM Test
Capabilities
- 0830 HPM Hardening Testing of Shelters/Buildings
- 0850 Passive Sensors for RF Situational
Awareness
- 0910 Threat Responsive Materials for Aperatures
- 0930 Break
- 1000 Autonomous Instrumentation of a
Composite Enclosure for High Power
Microwave Testing
- 1020 Performance Evaluation of a Nickel-
Nanostrand Composite Aerospace
Electronics Enclosure and Novel Fiber
Optic Connector to High Power Microwaves
- 1050 HPM Effects on Photovoltaic Cells
- 1110 Composite UAV / Missile Body HPM
Hardness Testing
- 1130 FDTD Modeling For HPM Swine Exposures
on GPU Hardware
- 1200 Box Lunch at Hyatt
Poster Sessions at Hyatt and NPS

THURSDAY MORNING

EFFECTS MITIGATION

DE Effects Mitigation: Personnel (Secret)

NPS, ME Auditorium

Chair: *Justin Zohner*, 711 HPW/RHDO

- 0700 Registration and Breakfast at Hyatt
Speaker Breakfast at Hyatt
Buses begin to NPS
- 0800 Building the Technology Foundation for
Air Force Laser Eye Protection
- 0830 Laser Engagement Modeling
- 0900 Modeling Physical Coverage and Assessing
Visual Compatibility of Laser Eye Protection
- 0930 Display Compatibility Modeling for
Laser Eye Protection
- 1000 Break
- 1030 LEP Optical and Environmental Testing
Methodologies
- 1100 Agile Filters to Mitigate Laser Jamming
of NVGs
- 1130 NVG Pulsed Laser Susceptibility and
Mitigation
- 1200 Box Lunch at Hyatt
Poster Sessions at Hyatt and NPS

THURSDAY MORNING

EMPLOYMENT OF DE WEAPONS

Effects Mitigation (Limited)

Hyatt Hotel, Spyness

Chair: *John Wachs*, SMDC

- 0700 **Registration and Breakfast at Hyatt
Speaker Breakfast at Hyatt
Buses begin to NPS**
- 0800 **Strategic Roadmap for Predictive
Avoidance or Aircraft**
Frank Arena, Southern Aerospace Corp
- 0830 **Exposure to Backscatter Laser Radiation**
Edward Early, TASC
- 0900 **A Two Scale Model to assess the Risk of
Laser Glint Reflections from Sea Surface**
Shawn Gay, Metatech
- 0930 **Mitigating Glint-Related Predictive
Avoidance Issues**
Bryan Blasy, AFRL
- 1000 **Break**

T&E Considerations (Limited)

Chair: *John Hartke*, USMA

- 1030 **Collaborative Technology and Dynamic
Air traffic Management Expands Laser
Test Operations Envelope**
James Torres, Southern Aerospace Corp
- 1100 **Tri-Service Study 2011: Identifying Directed
Energy Test and Evaluation Infrastructure
Requirements**
Minh Young, DETEC
- 1200 **Box Lunch at Hyatt
Poster Sessions at Hyatt and NPS**

THURSDAY MORNING

HEL LETHALITY

System/Subsystem Test (Secret)

NPS, Glasgow Hall

Chair: *Javon Evanoff*, Ball Aerospace

- 0700 **Registration and Breakfast at Hyatt
Speaker Breakfast at Hyatt
Buses begin to NPS**
- 0800 **Modeling and Field Test Verification of the
Impact of Structural Modifiers on Ballistic
Missile Vulnerability**
- 0830 **High Energy Laser testing of a Surface-to-
Air Missile Radome Under Simulated Flight
Conditions**
- 0900 **Experimental Testing of High Explosive
Targets to Examine the Effects of Laser
Spot Size, Position, and Angle**
- 0930 **An Analysis of the Navy Laser Weapon
System (LaWS) Engagement of Unmanned
Aerial Vehicle**
- 1000 **Break**
- 1030 **Navy Laser Weapon System (LaWS)
Lethality Assessment Testing**

Test Facilities, Instrumentation, Diagnostics and Technology (Secret)

Chair: *David Lyman*, SAIC

- 1100 **Solid State Laser Testbed Experiment
(SSLTE) Future Test Program at HELSTF**
- 1200 **Box Lunch at Hyatt
Poster Sessions at Hyatt and NPS**

THURSDAY MORNING

HIGH POWER MICROWAVE

HPM Sources (Secret)

NPS, Spanagel Hall

Chair: *Aaron Dougherty*, Naval Research Laboratory

- 0700 Registration and Breakfast at Hyatt
Speaker Breakfast at Hyatt
Buses begin to NPS
- 0800 Solid State HPM Source Characterization
and Target Effects Test Results
- 0830 Compact Explosive driven Pulsed RF using
Vector Inversion Generators as both Power
Conditioning and RF source
- 0900 Explosive driven Ferroelectric Pulse
Generators in Cylindrical Geometry
- 0930 TTU Vicator
- 1200 Box Lunch at Hyatt
Poster Sessions at Hyatt and NPS

THURSDAY LUNCH

JOINT SESSION

Poster Session (Open)

Hyatt Hotel, Regency Main

Chair: *Courtney Rister*, AFRL/RDLE

- 1130 Poster Session Begins (through 1330)
Box lunch at Hyatt Only
- Atmospheric Monitoring for Directed Energy
Modeling & Simulation and Field Experiments
Ross Conrad, AFRL/RDSEW
 - Comparison of MST Radar and High Bandwidth
Optical Turbulence Profile Observations Using a
Balloon-Ring Platform
Frank Eaton, AFRL/RDSEW
 - Suppression of Beam Jitter Using Optimal
Wavefront Control
Keith Powell, University of Arizona, Steward Obs.
 - Determination of the Dynamic Response of an
Optical Laser Platform Subjected to Dual
Harmonic Forcing Functions
Angela Roush, United State Naval Academy
 - Optical Laser Cross Section Measurements of a
GaAs Solar Panel at 1.06 Microns
Michael Dexter, AFRL/RDLE
 - Qualitative Analysis and Chaos in a Transmission
Line Connected to Nonlinear Circuits
Ioana Triandaf, Naval Research Lab

THURSDAY LUNCH

JOINT SESSION

Poster Session (Limited)

Hyatt Hotell, Regency Main

Chair: *Courtney Rister*, AFRL/RDLE

1130 Poster Session Begins (through 1330)
Box lunch at Hyatt Only

- **TASAT Signature Model Validation for SSA**
David Medina, AFRL/RDLEA
- **Wave-Optics Simulations Demonstrating the Nullspace Technique for Estimating Subaperture Gain Variation in Natural Guide Star Adaptive Optics Systems**
Daniel Roskey, AFRL/RDS
- **Explosive driven Ferroelectric Pulse Generators in Cylindrical Geometry**
Spencer Rendall, Radiance Technologies
- **Compact Explosive driven Pulsed RF using Vector Inversion Generators as both Power Conditioning and RF source**
Zachary Roberts, Radiance Technologies
- **UAV Component Material Study I**
Ly Dao, AFRL/RDLE
- **Balloon Borne HEL Target Board Materials Study**
Shane Johnson, AFRL/RDLE
- **HEL Material Effects and Environmental Interaction Study at 1.07 μ m**
Chris Lloyd, Navy
- **Sensor Optimization for Remote Laser Tagging, Tracking, and Locating Applications**
Aaron Schinder, AFRL/RDLE
- **Simulations of a Proposed 95GHz, 2.5MW CW Gyrotron Interaction Cavity and Beam Tunnel Using 3D PIC**
Peter Mardahl, AFRL/RDHE

THURSDAY LUNCH

JOINT SESSION

Poster Session (Secret)

NPS, King Hall Foyer

Chair: *Courtney Rister*, AFRL/RDLE

1130 Poster Session Begins (through 1330)
Box lunch at Hyatt Only

- **NoBILL: A Wavefront Sensing Approach that Eliminates the Need for a Beacon Illuminator Laser in Directed Energy Systems**
- **Unique Compact Pulsed Power Driver for the CHAMP Demonstrator**
- **CHAMP Overview**
- **RF Energy Requirements for Initiation of Detonators**
- **CHAMP Payload Integration**
- **A Simple Model for an HPM Counter-IED Effect**
- **CHAMP Platform Integration**
- **CHAMP Mission Planning**
- **CHAMP Initial Modeling, Simulation, and Experiment**
- **Laser-EO Sensor Damage Summary**
- **Single-Shot and Multiple-Shot Damage Thresholds of InSb Focal Plane Array at 4 micron from Damaging a Single Pixel to Deactivating a Whole Array**
- **Application of Robust Lethality Modeling Methods in LEWAT**
- **High Energy Laser testing of a Surface-to-Air Missile Radome Under Simulated Flight Conditions**

THURSDAY AFTERNOON

JOINT SESSION

Special INTEL (Secret - by invitation only)
NPS, SCIF

Begins at 1300 - See page 14 for Information

THURSDAY AFTERNOON

BEAM CONTROL

Components (Limited)

Hyatt Hotel, Spyglass

Chair: *Leslie Chrzan*, CSA Engineering

1300 **Fast Steering Mirror Sense and Control System for Space and Airborne Applications**

Jim Coward, SA Photonics

1330 **Thermally Managed Deformable Mirror**

Jeffrey Cavaco, Northrop Grumman/Xinetics

1400 **Large Aperture CVC SiC Mirrors for High Energy Laser Applications**

Bill Goodman, Trex Enterprises

1430 **Wavefront Sensor System Study**

Russ Vernon, MZA Associates

1500 **Break**

1530 **Enhancing the Survivability of HEL-Transmitting Oxyfluoride Glass (OFG™) when Operating in Harsh DE Environments**

Ken Billman, Lockheed Martin

1600 **Ghosts: A Potential Source of Damage in Optical Systems**

Jeremiah Montoya, Ball Aerospace

THURSDAY AFTERNOON

BEAM CONTROL

Aero-Optics Effects in Free-Space Communication (Limited)

Hyatt Hotel, Big Sur

Chair: *Arun Majumdar*, NAWC

1300 **Aero-Optical Issues for Free-Space Communication (Invited)**

DJ Wittich, AFRL/RDS

1400 **Investigation of Aero-Optical and Free Stream Turbulence Effects on UAV to Satellite Free Space Optical Communications Uplinks and Downlinks**

Jeffrey Barchers, Nutronics, Inc.

1430 **Break**

Free-Space Quantum Communication (Limited)

Chair: *Imelda DeLarue*, AFRL/RDS

1500 **Free-Space Quantum Communications (Invited)**

Richard Hughes, LANL

1530 **Free Space Quantum Key Distribution with Combined Optical Clock and Quantum Key Signal**

Jeffrey Hunt, Boeing

1600 **Free-Space Quantum Key Distribution with Multilevel Encoding via Transverse Field Modulation**

Mark Grueinsen, AFRL/RDSE

1630 **Assessment and Resolution of Issues Associated with Quantum Communication Over a Long Propagation Path (Invited)**

Glen Tyler, the Optical Science Company

THURSDAY AFTERNOON

EFFECTS MITIGATION

DEW Threat Warning (Secret)

NPS, Ingersoll Hall

Chair: *Noel Montgomery*, 711 HPW/RHDR

- 1300 **M2-A Sensor Evaluation for Airborne Detection of Harassing and Damaging Laser Energy**
- 1330 **Camera-Based Laser Warning Architectures**
- 1400 **AFRL/RV Program Review**

DE Effects Mitigation Strategy (SECRET)

Chair: *Rett Benedict*, Schafer

- 1430 **Space Systems Hardening against Lasers - A History**
- 1500 **Break**
- 1530 **On-Orbit Laser Irradiance**
- 1600 **Fixed Wavelength Directed Energy Mitigation**
- 1630 **Space Based Surveillance System (SBSS) Payload Directed Energy Threat Assessment**
- 1700 **Design For Hardening - Spacecraft Structural Hardening**

THURSDAY AFTERNOON

MODELING & SIMULATION

Mission Level Modeling and Simulation and Visualization (Secret)

NPS, ME Auditorium

Chair: *Bryan Knott*, NAVSEA

- 1330 **CHAMP Military Utility Study Process**
- 1400 **Using the Navy's Effectiveness Tool Box (ETB) to Simulate a High Energy Laser (HEL) Engagement with an Unmanned Aerial Vehicle**
- 1430 **Break**
- 1500 **High Power Microwave (HPM) Beams in Distributed Interactive Simulation (DIS)**
- 1530 **Enhancing the Communications and Radar Electronic Attack Model with Radio Frequency Directed Energy Weapon Effects**
- 1600 **Scaling Law Engagement Modeling and Visualization**
- 1630 **Optimizing System Efficiency of High Power Free Electron Lasers**

THURSDAY AFTERNOON

HEL LETHALITY

Test Facilities, Instrumentation, Diagnostics and Technology (Secret)

NPS, Glasgow Hall

Chair: *David Lyman*, SAIC

- 1330 Development of a High Accuracy Gonioreflectometer For Measurement of the Reflectivity of Targets of High Energy Laser Weapon Systems
- 1400 Comparing HEL Target Response Test Results with High Fidelity Simulations Using Real-Time Beam Profile Diagnostics

Material Interaction (Secret)

Chair: *Jeff Thomas*, Penn State University

- 1430 A Summary of 30 Years of Lethality Testing and Analysis
- 1500 Break
- 1530 Laser Effects on Advanced Composites Aircraft Structures
- 1600 A Material Response Study on sensor Optimization for Laser Tagging, Tracking, and Locating
- 1630 HEL Material Effects and Environmental Interaction Study at 1.07 μm

THURSDAY AFTERNOON

HIGH POWER MICROWAVE

CHAMP (Secret)

NPS, Spanagel Hall

Chair: *Larry Altgilbers*, US SMDC

- 1330 CHAMP Overview
- 1400 CHAMP Payload Integration
- 1430 CHAMP Initial Modeling, Simulation, and Experiment
- 1500 Break
- 1530 CHAMP Platform Integration
- 1600 Unique Compact Pulsed Power Driver for the CHAMP Demonstrator
- 1630 CHAMP Mission Planning

FRIDAY MORNING

HIGH POWER MICROWAVE

HPM Systems (Secret)

NPS, Spanagel Hall

Chair: *Mark Rader, US SMDC*

- 0700 Registration and Breakfast at Hyatt
Speaker Breakfast at Hyatt
Buses begin to NPS
- 0800 New Generation Test Bed Development for
Active Denial Technology Migration
- 0830 Upcoming Technologies for ADT
- 0900 ADS Antenna: Limitations and Next-Gen

**Tours of the NPS FEL Facility
Leave Spanagel Hall at 0900
Sign-up required
See DEPS staff**

Upcoming Events

**Annual DE Symposium
Bethesda, Maryland
15 - 19 November 2010**

**Systems Symposium
Monterey, California
28 March - 1 April 2011**

FRIDAY MORNING

PLENARY SESSION

Decentralized Predictive Avoidance/ Deconfliction

NPS, King Hall

- 0700 Registration and Breakfast at Hyatt
Speaker Breakfast at Hyatt
Buses begin to NPS
- 0800 Introduction
Dr Steven Fiorino, AFIT
- 0805 Laser Clearinghouse
LT Heather Lehmann, USN
- 0820 HELSTF
Mr William Sutton, USASMDC
- 0840 Navy LMD (LaWS Demo)
Mr David Newton, NSWCCD
- 0905 ABL CTF
1Lt Carlos Matos-Ramos and 1Lt Bryan Synder
- 0925 HELTDA (HEL Tactical Decision Aid)
Dr Steven Fiorino
- 0945 Discussion/Questions
- 1000 Break

Closing Plenary Session

- 1025 Call to Order - Symposium Co-Chairs
*Mr. Mark Neice / Brig Gen Donald Streater
USAF (ret.)*
- 1030 DE Effects Mitgation Conference
Mr. Noel Montgomery, AFRL/RHD
- 1050 Employment of DE Weapons Conference
LtCol John Hartke, USMA
- 1010 DE Modeling and Simulation Conference
Ms. Linda Lamberson, AFRL/RD
- 1030 HEL Lethality
Dr. J. Thomas Schriempf, NAVSEA
- 1150 DE Beam Control Conference
Dr. Richard Carreras, AFRL/RDSE
- 1210 HPM Workshop
Dr. Mark Rader, US SMDC
- 1230 Symposium Adjourns

Symposium Co-chairmen:

Mark Neice

Don Streater

Symposium Program Coordinator:

David Loomis

Conference Chairmen:

Richard Carreras, DE Beam Control

Noel Montgomery, Effects Mitigation

Linda Lamberson, DE M&S

John Hartke, Employment of DE Weapons

J. Thomas Schriempf, HEL Lethality

Mark Rader, HPM Workshop

Symposium Coordinator:

Cynnamon Spain

Security Coordinator:

Rhonda Peyton

Registration / Short Courses:

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