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 Jaggers*  
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/RXPA
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/RXPA
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

Agenda Subject to Change
Visit www.deps.org for Daily Updates
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
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<th>Time</th>
<th>Event</th>
<th>Presenter(s)</th>
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<td>0700</td>
<td>Registration and Breakfast at Hyatt Breakfast Sponsored by Textron</td>
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<td>0800</td>
<td>Time-Resolved Schlieren for Aero-Optic Measurements</td>
<td>Donald Wittich, AFRL/RDSEW</td>
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<td>0820</td>
<td>Measurement of Dynamic Turbulent Flow with ESPI</td>
<td>John DeLong, Photonics Research Center</td>
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<td>0840</td>
<td>Aerodynamic Design of an Aircraft-Mounted Pod for Improved Aero-Optic Performance</td>
<td>Mark Rennie, University of Notre Dame</td>
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<td>0900</td>
<td>Aero-Optic Effects of a Wing Tip Vortex</td>
<td>Mark Rennie, University of Notre Dame</td>
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<td>0920</td>
<td>Feed-Forward Adaptive Optical Mitigation of Aero-Optics</td>
<td>David Goorskey, MZA Associates</td>
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<tr>
<td>0940</td>
<td>Break</td>
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<td></td>
<td>Directed Energy Systems (Limited)</td>
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<td>1000</td>
<td>The DoD Architecture Framework 2.0; Key to Fielding High Energy Laser Systems</td>
<td>William Decker, Defense Acquisition University</td>
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<td>1020</td>
<td>Multiple Beam Alignment Diagnostic for the Navy’s “Laser Weapon System” (LaWS)</td>
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<td>Incoherent Beam Combining</td>
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<td>1040</td>
<td>Laser Weapon System on a Fighter or Small Aircraft</td>
<td>Jake Sames, Penn State</td>
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<td>1100</td>
<td>Post-CDR Maturation of the Beam Control Subsystem for the US Army High Energy Laser Technology Demonstrator (HEL TD)</td>
<td>Edward Montgomery, USA SMDC</td>
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<td>1120</td>
<td>Small UAV Directed Energy Defense Systems</td>
<td>Brian Goldberg, Adsys Controls, Inc.</td>
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<td>1140</td>
<td>Capabilities of HEL Beam Control Systems Against Maneuvering Targets</td>
<td>Travis Taylor, USA SMDC</td>
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<td>1200</td>
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<td>0800</td>
<td>Wavefront Control Concept for Adaptive Phase-locked Fiber-Collimator Array: Wavefront Sensing and Control System Integration</td>
<td>Mikhail Vorontsov, University of Dayton</td>
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<td>0825</td>
<td>An Improved Beam Director for the DARPA Adaptive Photonic Phase-Locked Elements (APPLE) System</td>
<td>Andrew McKie, Raytheon</td>
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<td>0845</td>
<td>Phased Array Design for Air to Ground Applications</td>
<td>Scott Harris, Flatiron Research</td>
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<td>0905</td>
<td>Evaluation and Test Results for the DARPA APPLE Phase 1 Array</td>
<td>Scott Harris, Flatiron Research</td>
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<td>0925</td>
<td>A Spreadsheet Model of Phased Array System Weight, Volume, and Performance with Mission Examples</td>
<td>Kevin Probst, The CORE Group</td>
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<td>0945</td>
<td>Break</td>
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<td>Phased Array Sensors (Limited)</td>
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<td>1030</td>
<td>Heterodyne Imaging and Wavefront Sensing</td>
<td>Dan Marker, AFRL/RDSE</td>
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<td>1055</td>
<td>Phased Array of Phased Array Technology Development Using the IMAGE Testbed</td>
<td>Paul McManamon, University of Dayton</td>
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<td>1115</td>
<td>Compensation for Tilt in a Hexagonal Array of Apertures</td>
<td>Shon Neal, AFRL/RDTA</td>
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<tr>
<td>1135</td>
<td>Compensation for Tilt in a 3X3 Square Array of Apertures</td>
<td>Robert Richard, AFRL/RDTA</td>
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<td>1200</td>
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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.

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

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 Oliker, 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

Agenda Subject to Change
Visit www.deps.org for Daily Updates
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

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

Agenda Subject to Change
Visit www.deps.org for Daily Updates
**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

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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

---

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

---

**WEDNESDAY AFTERNOON**

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Hyatt, Regency I-III

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**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

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1100 AFRL Compact Laser Terminal Experiment

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Poster Sessions at Hyatt and NPS

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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

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

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
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**EMPLOYMENT OF DE WEAPONS**

**THURSDAY MORNING**

**THURSDAY MORNING**

**HEL LETHALITY**

**System/Subsystem Test (Secret)**

NPS, Glasgow Hall

Chair: Javon Evanoff, Ball Aerospace

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<td>Experimental Testing of High Explosive Targets to Examine the Effects of Laser Spot Size, Position, and Angle</td>
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<td>An Analysis of the Navy Laser Weapon System (LaWS) Engagement of Unmanned Aerial Vehicle</td>
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**EMPLOYMENT OF DE WEAPONS**

**Effects Mitigation (Limited)**

Hyatt Hotel, Spyglass

Chair: John Wachs, SMDC

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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
JOINT SESSION

Poster Session (Limited)
Hyatt Hotel, Regency Main
Chair: Coutney Rister, AFRL/RDLE

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

- TASAT Signature Model Validation for SSA
  David Medina, AFRL/RDLE

- Wave-Optics Simulations Demonstrating the
  Nullspace Technique for Estimating Subaperture
  Gain Variation in Natural Guide Start 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 um
  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

JOINT SESSION

Poster Session (Secret)
NPS, King Hall Foyer
Chair: Coutney 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
1500 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/RY Program Review

**DE Effects Mitigation Strategy (SECRET)**  
Chair: *Rett Benedict, Schaefer*  
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

#### 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
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 um

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

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, USASMD

0840  Navy LMD (LaWS Demo)
       Mr David Newton, NSWCDD

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 Mitigation 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

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
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

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Cynnamon Spain

Security Coordinator:  
Rhonda Peyton

Registration / Short Courses:  
Donna Storment

Payments and Receipts:  
Tiffany Bjelke