Technical Program
2012 Directed Energy Systems Symposium

Counter DE Weapons Conference
DE Modeling and Simulation Conference
Employment of DE Weapons Conference
HEL Lethality Conference
RF DE Weapons Workshop

2 - 5 April 2012
Gaithersburg, Maryland

Co-Sponsored by
High Energy Laser Joint Technology Office
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General Information

Security
- DE Systems Symposium is SECRET / NOFORN
- Attendees will be issued NIST ID badges on site and
  must have valid gov’t ID available at all Symposium
events
- 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 and Closing 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
- Failure to adhere to security standards could result
  in denied/revoked Symposium registration

Meals
- Breakfast is available Tuesday - Thursday at the
  Hilton Gaithersburg Hotel.
- Lunch is available Tuesday - Thursday at NIST
  Cafeteria.
- Refreshment services will be available throughout
  the week.

Reception
A strolling reception in Olde Towne Gaithersburg will
be held on Tuesday evening. Buses will depart Hilton
at 1615 and last bus will return at 1900. Conference
ID will be required to enter food locations. See
additional flyer for map and details.
General Information

Buses
Parking is limited at the NIST facility and all are encouraged to take the provided shuttle bus. Buses will run from the Hilton Gaithersburg Hotel to NIST during the following hours:
Mon 0730 - 1715 (approx every 30 mins)
Tues - Thurs 0700 - 1730 (approx every 15 min)
Do not bring cell phones, laptops, or notebooks to NIST. DEPS staff will not be responsible for your items.

NIST Facility Tours
Two tours of the NIST facility are scheduled for Thursday lunch time, 1200 and 1245. The tours are 45 min in length and limited to 25 people per tour. For tour sign up please visit the registration desk once you arrive and add your name to your selected tour time.

Symposium Phone Number
Cynnamon Spain  505-450-1165
### TUESDAY MORNING

#### PLENARY SESSION

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<td>0700</td>
<td>Buses begin to NIST</td>
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<td>Registration at NIST</td>
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<td>0800</td>
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<td>Keynote Speaker</td>
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<td>0830</td>
<td>Lieutenant General James A. Abrahamson, USA Air Force (ret.), former Director, Strategic Defense Initiative Organization</td>
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<td>0900</td>
<td>Better Buying Power Efficiencies</td>
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<td>0930</td>
<td>Bleed Us Not Into Temptation - Surviving with your “DE S&amp;Tation Unknown”</td>
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<td>1000</td>
<td>Break</td>
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<td>1030</td>
<td>Directed Energy Innovation in “Interesting Times”</td>
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<td>1100</td>
<td>Electric Fires</td>
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<tr>
<td>1130</td>
<td>The Promise of Directed Energy Weapons</td>
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### MODELING AND SIMULATION

#### HELSEEM Showcase (Secret Distribution D)

NIST, Green Room, 1500-1600

Chairs: Chris McCracken, Air Force Research Laboratory/ RDTA and Robin Ritter, TAU Technologies

#### HPM Simulation Management Software (Limited Distribution C)

NIST, Green Room, 1600-1700

Chair: Nathaniel Lockwood, Air Force Research Laboratory/RDHEC

The M&S Conference is hosting two mature software “Showcases” for Symposium attendees. The showcases are designed as an interactive demonstration, incorporating step-by-step instruction and simulation runs with existing Government-owned software packages, addressing operationally relevant scenarios. The two showcases we are highlighting are the High Energy Laser System End-to-End Model (HELSEEM) tool and the HPM Simulation Management Software (HSMS) tool.
TUESDAY AFTERNOON

COUNTER DE WEAPONS

CDEW Session (Secret)
NIST, LR B
Chair: David Schafer, Air Force Research Laboratory/RDH
1300 Issues Affecting Solar Panel Survivability to High Energy Lasers
1325 AFRL Efforts to Protect Satellites from Electromagnetic Energy Weapons
1345 Switchable Electromagnetic Windows
1405 Design and Testing of HPM Immune UAS Systems
1630 Strolling Reception in Olde Towne Gaithersburg (DEPS ID Required)

MODELING & SIMULATION

System, Engagement, and Mission Assessment (Limited Distribution D)
NIST, LR C
Chair: Bryan Knott, Naval Surface Warfare Center
1300 IWEA
Christopher McCracken, Air Force Research Laboratory/RDTA
1330 Addressing the Challenges in High-Fidelity Physics-Based Multidisciplinary HEL Modeling
Robert Praus, MZA Associates Corporation
1400 An Integrated Software Environment for Model-Based Engineering of Laser Weapons Systems - Recent Progress
Steve Coy, Timelike Systems LLC
1430 System Engineering Trades for HELs on Remotely-Piloted Aircraft
Marc Hallada, Schafer Corporation
1500 Break

Propagation Modeling (Limited Distribution D)
NIST, LR C
Chair: Steven Fiorino, Air Force Institute of Technology
1530 Simulated Active and Passive Tactical Imaging from an Airborne Platform
Robin Ritter, Tau Technologies
1600 Turbulence Measurement in the Atmospheric Boundary Layer Using Cellular Telephone Signals
Lee Burchett, Air Force Institute of Technology
1630 LADAR Performance Simulations with a High Spectral Resolution Atmospheric Transmittance and Radiance Model- LEEDR
Benjamin Roth, Air Force Institute of Technology
1630 Strolling Reception in Olde Towne Gaithersburg (Conference ID Required)
EMPLOYMENT OF DE WEAPONS

DE Acquisition Challenges / Solutions Round Table (Open)
NIST, LR A
Chair: Kraig Sheetz, US Military Academy
1300 - 1430
1430 Break

HEL Sub Systems (Limited Distribution D)
NIST, LR A
Chair: Kraig Sheetz, US Military Academy
1500 Laser Close-In Weapon System
   Gerald Uyeno, Raytheon Missile Systems
1530 Advanced Energy Storage for Directed Energy Weapons
   Mike Marcel, A123 Systems
1600 Large Stable Aluminum Optics for Aerospace Applications
   Daniel Vukobratovich, Raytheon Missile Systems
1630 Strolling Reception in Olde Towne Gaithersburg (Conference ID Required)

TUESDAY AFTERNOON

HEL LETHALITY

System / Sub-System Test Results (Secret)
NIST, Red Room
Chair: Mike Libeau, Naval Surface Warfare Center / DD
1300 Multi-kW Fiber Laser Lethality Testing Against Missiles
1330 Satellite Vulnerability to Lasers
1400 Engagement Angle Dependency Test
1430 Break

Target Vulnerability Assessment (Secret)
NIST, Red Room
Chair: Darren Luke, Air Force Research Laboratory / RDLE
1500 Examination of Roll Rate on RAM Failure Time
1530 Counter-Communications System JUONS Target Lethality Assess
1600 Defeat Speed of Light Initiative (DSOLWI) Smart Bomb Laser Effects
1630 Strolling Reception in Olde Towne Gaithersburg (Conference ID Required)
TUESDAY AFTERNOON

RF DE WEAPONS

RF Sources and Antennas
(Limited Distribution D and C)
NIST, Green Room
Chair: Michael Haworth, Air Force Research Laboratory/RDHE

Session is Limited Distribution D
1300 Beam Profiler for High Power, High Frequency Sources (D)
   David Thomas, Aegis Technologies

Session is now Limited Distribution C
1330 20-Hz Burst-Mode Operation of a Relativistic Magnetron Having No RF
   Pulse Shortening
   Michael Haworth, Air Force Research Laboratory/RDHE

1400 Relativistic Magnetron Experiments Utilizing a Compact Permanent Magnet Solenoid
   Brad Hoff, Air Force Research Laboratory/RDHP

1430 Break

1500 Innovative Solid State Agile Radio Frequency Source
   Andrew Yuenger, Naval Air Warfare Center, Weapons Division

1530 Metal Plate Lenses for High Power Microwave Applications
   Julie Lawrance, Air Force Research Laboratory/RDHP

1600 Emerging High Dielectric Materials and Their Impact on Directed Energy Systems
   Randy Curry, University of Missouri

1630 Strolling Reception in Olde Towne Gaithersburg (Conference ID Required)

WEDNESDAY MORNING

JOINT SESSION

Symposium Joint Session (Secret)
NIST, Red Room
Chair: Chuck LaMar, Space and Missile Defense Command

0630 Breakfast at Hilton Gaithersburg
0700 Buses begin to NIST
   Registration at NIST
0800 Introduction and Security Comments
0815 The Airborne Laser Testbed’s High Power Test Campaign to System Demonstration
0845 The Airborne Laser Testbed’s Directed Energy Performance
0915 The Airborne Laser Testbed’s Science and Technology Test Campaign
0945 The Airborne Laser Testbed’s Science and Technology Test Results: Aero-Optical and Aero-Mechanical Wavefronts
1015 Break
1030 Recent Developments and Near Term Directions for Navy Laser Weapons System (LaWS) Testbed
1050 HELADS Demonstrator Laser Weapon System
1120 Results from High Energy Laser Technology Demonstrator (HELTD) Low Power Testing
1200 Lunch at NIST

MODELING AND SIMULATION

HPM Simulation Management Software Showcase (Limited Distribution C)
NIST, Green Room, 1030 - 1200
Chair: Nathaniel Lockwood, Air Force Research Laboratory/RDHEC
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JOINT SESSION

Student Session (Limited Distribution D)
NIST, LR D
Chair: Don Seeley, HEL Joint Technology Office

1300 Helicon Mode Development on a Small Helicon Plasma Experiment (HPX)
Stephen Nolan, CGAPL (Physics) U.S. Coast Guard Academy

1325 Pre-Stage Magnetic Coil to Enhance Helicon Mode Excitation on a Small Helicon Plasma Experiment (HPX)
Carter Schlank, CGAPL (Physics) U.S. Coast Guard Academy

1350 A Numerical Model of Laser Damage Effects on Quasi-Isotropic Sandwich Structures Including Material Ablation
Andrew Tresansky, United States Naval Academy

1415 HEL Used for C-RAM and Counter UAV Missions
Jeffrey Gorn, United States Military Academy

1440 Break

1500 Modeling the Vulnerability of Unmanned Aerial Systems Targeted by High Energy Lasers
John Paulson, United States Military Academy

1525 Modeling the Destruction of a Mortar Targeted by a Laser Defense System
Zachary Brownlee, U.S Military Academy

1550 Control of Platform Induced Jitter for the Multiple Beam Directed Energy System
Zachary Patrick, United States Naval Academy

1615 Isolation of Thermal and Strain Responses in Composites using Embedded Fiber Bragg Grating Temperature Sensors
Kyle Elam, United States Naval Academy

1640 An Adaptive Infinity Control Algorithm for Jitter Control and Target Tracking
Shane Moran, United States Naval Academy

HEL LETHALITY

Material Interaction / High Fidelity Modeling (Secret)
NIST, Red Room
Chair: Chris Lloyd, Naval Surface Warfare Center/ DD

1300 A Numerical Model of Laser Damage Effects on Quasi-Isotropic Sandwich Structures Including Material Ablation

1330 Vulnerability Assessment of an Anti-Ship Cruise Missile

1400 Vulnerability Module Integration with the Dynamic Aimpoint Laser Engagement Tool

1430 Break

1500 Progress in High-Fidelity Physics-Based Multidisciplinary HEL Modeling

1530 Weather Climatology and Effects on High Energy Laser Propagation and Lethality

1600 Outdoor High Energy Laser Testing on Static UAS Wings and Fuel Systems

1630 HEL Lethality of Carbon Based Materials
HEALTHY LETHALITY

Test Facilities, Instrumentation, Diagnostics and Techniques (Limited Distribution D)

NIST, LR A
Chair: Craig Walters, Craig Walters Associates

1300 Facility Modifications at the Aerodynamic and Propulsion Test Unit in Support of Directed Energy Laser Lethality Ground Testing
Alexander Hausman, Air Force / AEDC

1330 High Energy Laser Tests in a Flight-Representative Environment
Adam Goss, 46 TG/OL-AC

1400 Adjunct Tracker Scoring System Development, Data Collection, and Data Analysis
Richard Lee, Science Applications International Corporation

1430 Break

MODELING & SIMULATION

Verification, Validation, and Accreditation (Limited Distribution C)

NIST, LR C
Chair: Javon Evanoff, Ball Aerospace Corporation

1600 Experimental Validation of the Photostress Recovery Model (PREMO)
Peter Smith, TASC Inc.

1630 JREM VV&A
Walter Clover, TechFlow Scientific

1700 The Verification and Validation of a Component-Based Laser Weapon System SWAP Model
Daniel Sharpes, Air Force Research Laboratory/RDTA

RF DE WEAPONS

RF Systems and Effects (Secret Distribution D)

NIST, Green Room
Chair: Diana Loree, Air Force Research Laboratory/RD

1300 The Army Research Laboratory Electronic Warfare/Electronic Attack Program

1330 The Army Research Laboratory REDLINE Program

1400 Modeling and Measurements of Inductive Coupling to Detonators

1430 Break

1500 A New Technology for Identification of Electronics

1530 Effects Testing with a High Power BWO

1600 Results from Recent High Power Microwave (HPM) “Back Door” Effects Testing

1630 Results from Recent High Power Microwave (HPM) “Front Door” Effects Testing

1700 Performance of a High Gain Fixed Angle Antenna for a Ground Based Application
WEDNESDAY AFTERNOON

INTEL

INTEL Session (Secret)
NIST, LR B

1300  Collateral Hazards of Foreign Electro-Optic Countermeasures
1320  Foreign Ground Combat Laser Threat
1350  Worldwide Laser Weapons Development
1430  Break
1500  A New Class of Laser Weapon: The DPAL - Diode Pumped Alkali Laser
1520  Worldwide Emerging RFW Capabilities

THURSDAY MORNING

JOINT SESSION

Joint Session Modeling & Simulation Conference and RF DE Weapons Workshop (Limited Distribution C)
NIST, LR C

Chair: Timothy Clarke, Air Force Research Laboratory/RDHE

0630  Breakfast at Hilton Gaithersburg
0700  Buses begin to NIST
0800  X-Ray Safety Calculations Near HPM Sources Using ICEPIC and GEANT4/ParRT
      Nathaniel Lockwood, Air Force Research Laboratory/RDHE
0830  Design and Simulation of a Megawatt Class Conventional Magnetron
      Timothy Fleming, Air Force Research Laboratory/RDHE
0900  A New Method for Calculating Adsorption Probabilities Using Direct Simulation Monte Carlo Techniques
      Brook Bentley, Air Force Institute of Technology
0930  High Power Microwave High Performance Computing Software Applications Institute
      Nathaniel Lockwood, Air Force Research Laboratory/RDHEC
1000  Break
1030  Novel Solid Pulse Forming Lines for Compact Pulsed Power
      Susan Heidger, Air Force Research Laboratory/RDHP
1100  Application of the Nested High Voltage Generator to HPM
      Richard Adler, Applied Energetics
1200  Lunch at NIST
      NIST Facility Tours (see page 2)
THURSDAY MORNING

COUNTER DE WEAPONS

CDEW Sessions 1 & 2
(Limited Distribution D)
NIST, LR A
Chair: David Schafer, Air Force Research Laboratory/RDHL
0630 Breakfast at Hilton Gaithersburg
0700 Buses begin to NIST
Registration at NIST
0800 Design of a C-DEW-Enabled Fire Control Vision System Testbed: Focal Plane Shift and Revised Eye Protection Threshold Requirements
Timothy Pritchett, U.S. Army Research Laboratory
0830 Material Coatings and Structures to Counter the Effects of HEL Weapons
Keith Caruso, Johns Hopkins University
0900 Thermal Barrier Materials for Counter HEL
Collin Bright, Naval Research Laboratory
0930 Detection and Identification of Directed Energy Weapons and Their Targeting Systems
Leo Volfson, Torrey Pines Logic
1000 Break
1030 Counter Radio Frequency Directed Energy Methodology
John Tatum, SURVICE Engineering Company
1100 Green Production of Low Cost, Lightweight Nanostructured Shielding Materials
Jennifer Lalli, NanoSonic, Inc.
1130 Hyperspectral Imaging as a Tool for Material Damage Assessment Under Laser-Material Interactions
Cameron Keenan, Air Force Institute of Technology
1200 Lunch at NIST
NIST Facility Tours (see page 2)

EMPLOYMENT OF DE WEAPONS

HEL Employment Considerations
(Secret Distribution D)
NIST, LR B
Chair: John Hartke, US Military Academy
0630 Breakfast at Hilton Gaithersburg
0700 Buses begin to NIST
Registration at NIST
0800 Strike Aircraft: Synergistic Weapons and a Smarter Way to Survive
0830 Aeroeffects Performance and Prediction - A Summary of the Aeroeffects Workshop - 2011
0900 Developing a Climatology for Laser-Relevant Parameters Using Archived Synoptic Weather Data
0930 On the Probability of Hitting a Spacecraft During a Laser Counter-Artillery Engagement
1000 Break
1030 Employment of RF Systems
(Secret Distribution C)
NIST, LR B
Chair: John Hartke, US Military Academy
1030 MAX POWER v1.5 Testing Results
1100 All-Dielectric Frequency Selective Surfaces for High Power Microwave Systems
1130 COTS Network Centric Equipment Effects from the Advanced Fast Electromagnetic Pulse Simulator (AFEMPS)
1200 Lunch at NIST
NIST Facility Tours (see page 2)

MODELING AND SIMULATION

HELSEEM Showcase (Secret Distribution D)
NIST, Green Room, 1030-1200
Chairs: Chris McCracken, Air Force Research Laboratory/ RDTA and Robin Ritter, TAU Technologies
THURSDAY MORNING

HEL LETHALITY

Material Interaction / High Fidelity Modeling (Secret)
NIST, Red Room
Chairs: Chris Lloyd, Naval Surface Warfare Center
and Steve Baird, Space and Missile Defense Command

0630 Breakfast at Hilton Gaithersburg
0700 Buses begin to NIST
Registration at NIST
0800 Sustained Burning of Cotton Fabric: HEL Testing and Analysis
0830 Laser Beam Penetration of Generic Composite Wing Components
0900 Laser Beam Penetration and Hole Growth of Painted and Unpainted Aluminum Coupons
0930 Overview of the Artimus II Test Series
1000 Break
1030 Study of Transient Evaporation During High Energy Laser Interaction
1100 Prediction of Laser Damage Using a Coupled Thermo-Mechanical Finite-Element Approach
1130 Multiple Surface Laser Penetration Modeling
1200 Lunch
NIST Facility Tours (see page 2)

THURSDAY NOON

JOINT SESSION

Limited Distribution D Session
NIST, LR A, 1200-1430

An Integrated Software Environment for Model-Based Engineering of Laser Weapons Systems
Steve Coy, Timelike Systems LLC

HEL Lethality of Carbon Based Materials
Robert Cozzens, NRL

High Energy Laser Tests in a Flight-Representative Environment
Adam Goss, 46 TG/OL-AC

Weather Climatology and Effects on High Energy Laser Propagation and Lethality
Wilford Gebhart, Radiance Technologies

System Engineering Trades for HELs on Remotely-Piloted Aircraft
Marc Hallada, Schafer Corporation

Engagement Angle Dependency Test
Justin Harms, AFRL/RDLE

Facility Modifications at the Aerodynamic and Propulsion Test Unit in Support of Directed Energy Laser Lethality Ground Testing
Alexander Hausman, Air Force / AEDC

Laser Effects Testing in Relevant Environments
Braden Childers, LHMEL / UES, Inc.

Chuck LaMar, SMDC

Adjunct Tracker Scoring System Development, Data Collection, and Data Analysis
Richard Lee, SAIC

Outdoor High Energy Laser Testing on Static UAS Wings and Fuel Systems
Chris Lloyd, NSWC Dahlgren

Multiple Surface Laser Penetration Modeling
Darren Luke, AFRL/RDLE

A Graduate-Developed Framework for Evaluating the Effectiveness of Counter-Directed Energy Weapons
Jessica Marshall, ASDL, GTRI
**THURSDAY NOON**

**JOINT SESSION**

**Limited Distribution D Session (continued)**
NIST, LR A, 1200-1430

**Prediction of Laser Damage Using a Coupled Thermo-Mechanical Finite-Element Approach**
*David Medina*, AFRL/RDLEA

**Development of a Laboratory Experimental Platform to Validate Laser Engagement Models**
*Jordan Smith*, United States Military Academy

**Chaos in a Transmission Line Connected to Nonlinear Circuits**
*Ioana Triandaf*, Naval Research Laboratory

**Laser Beam Penetration of Generic Composite Wing Components**
*Craig Walters*, Craig Walters Associates

**Laser Beam Penetration and Hole Growth of Painted and Unpainted Aluminum Coupons**
*Craig Walters*, Craig Walters Associates

**Secret Poster Session**
NIST, Red Room 1200-1430

**Satellite Vulnerability to Lasers**

**Defeat Speed of Light Initiative (DSOLWI) Smart Bomb Laser Effects**

**Counter-Communications System JUONS Target Lethality Assess**

**Examination of Roll Rate on RAM Failure Time**

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**THURSDAY AFTERNOON**

**JOINT SESSION**

**Symposium Closing Plenary (Secret)**
NIST, Red Room

1400 **Introduction**
*Mr. William Decker*, Defense Acquisition University and *Dr. Malcolm O’Neill*, Lt. Gen US Army (ret.)

1420 **HEL Lethality Conference**
*Mr. Robert Roybal*, Co-Conference Chair

1440 **DE Modeling & Simulation Conference**
*Dr. Nicholas Morley*, Co-Conference Chair

1500 **RF DE Weapons Workshop**
*Dr. Diana Loree*, Co-Conference Chair

1520 **Counter DEW Conference**
*Mr. David Schafer*, Conference Chair

1540 **Employment of DE Weapons Conference**
*Lt Col John Hartke*, Co-Conference Chair

1600 **Symposium Adjourns**
Symposium Co-Chairmen:  
William Decker and Malcolm O’Neill

Symposium Program Coordinator:  
David Loomis

Conference Chairs:  
Counter DE Weapons  
David Schafer

DE Modeling and Simulation  
Nicholas Morley, Benjamin Call & Dwight Smith

Employment of DE Weapons  
John Hartke and Kraig Sheetz

HEL Lethality  
Robert Roybal and Robert Ulibarri

RF DE Weapons  
Diana Loree and Mike Haworth

Symposium Coordinator and Short Courses:  
Cynnamon Spain

Security Coordinator:  
Rhonda Peyton

Registration, Payments and Receipts:  
Tiffany Bjelke