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Technical Program 2011 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**

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

**Co-Sponsored by
High Energy Laser Joint Technology Office**

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Tours of NPS Directed Energy Facilities

Tours of Naval Postgraduate School DE facilities are available at the following times: Tuesday 1300 to 1400 – Wednesday 1100 to 1200 – Thursday 1300 to 1400. You must sign up for one of these times at the registration desk. The tour will include the beam control facilities, hosted by Professor Brij Agrawal. The tour will last 45 minutes to an hour; space will be limited to 30 persons. Tours will leave promptly at the designated time from outside of King Hall at NPS. If you are not present for your designated tour time your slot will be forfeited. Rescheduling is on a space available basis. See the registration desk for additional information.

Important Phone Numbers:

Monterey Police 831-646-3914

NPS Emergency Police 831-656-2555

Community Hospital of Monterey 831-625-4900

NPS Quarterdeck 831-656-2441

General Symposium Info 505-450-1165

General Information

Security

- DE Systems Symposium is SECRET/ NOFORN
- Attendees must wear DEPS issued ID badges & valid gov't ID 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 - Friday at the Hyatt.
- Lunch is available at Hermann Hall at NPS on Tuesday and Wednesday. Box lunch is available Thursday at NPS, King Hall during the poster session.
- Refreshment services will be available at all locations throughout the week.
- The Monterey Bay Aquarium Reception will be held at 1900 on Tuesday.
- The Exhibitor Reception will be held at 1730 on Wednesday evening in the exhibit hall 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 Hilton Garden Inn and drop off at various locations at NPS. Do not bring cell phones, laptops, or notebooks to NPS. DEPS staff will not be responsible for your items.

MONDAY

SHORT COURSES

- 0700 **Registration at Hyatt**
Buses begin to NPS
- 0800 **Short Courses Begin**
 - **Intro to the Physics of DE (Limited) (FULL DAY)**
Hyatt, Big Sur II
 - **Systems Engineering for DE Systems**
Hyatt, Oak Tree III
 - **HPM Applications for Radar and Air Defense**
Hyatt, Spyglass I
 - **Laser Protection for Electro-Optic Sensors (Secret)**
NPS, Ingersoll Hall
 - **Understanding Laser Effects from a Systems Engineering Perspective (Secret)**
NPS, ME Aud
- 1200 **Break for Lunch**
- 1300 **Short Courses Begin/Resume**
 - **HEL In Extended Air Defense Simulation (Limited)**
Hyatt, Spyglass I
 - **Joint RF Effects Model (Limited)**
Hyatt, Spyglass II
 - **Predictive Avoidance (Limited)**
Hyatt, Big Sur I
 - **HEL Warfighter Familiarization (Secret)**
NPS, ME Aud
- 1715 **Last bus returns from NPS**

MONDAY

MODELING AND SIMULATION

HELEEOS Showcase

Chair: *Steve Fiorino*, AFIT, Center for Directed Energy

HELSEEM Showcase

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

NPS, Ingersoll Hall

1500-1700

The M&S Conference is hosting a mature software 'Showcase' for conference attendees. This session is designed as an interactive demonstration, incorporating step-by-step instruction and simulation runs with existing Government-owned software packages, addressing operationally-relevant scenarios. This year we are showcasing the HELEEOS, HELSEEM, and JREM tools. For JREM showcases, see pages 14 & 25. HELEEOS and HELSEEM showcases are offered again; see page 32.

TUESDAY MORNING

PLENARY SESSION

Opening Plenary

NPS, King Hall

- 0700 **Registration and Breakfast at Hyatt Buses begin to NPS**
- 0800 **Call to Order and Security Comments**
MG John Urias, USA (ret.), Raytheon
and Mr. John Wachs, Schafer Corp
Symposium Co-Chairs
- 0815 **Welcome**
VADM Daniel T. Oliver, USN (ret.)
- 0830 **Keynote Address:**
Soldiers as the Decisive Edge
The Honorable Dr. Malcolm O'Neill
Lt Gen USA (ret.), Assistant Secretary of
the Army (Acquisition, Logistics, and
Technology), Department of Defense
- 0915 **Topics in Weapons, Research and Engineering**
Dr. Spiro Lekoudis, Director, Weapons
Systems, Office of the Assistant Secretary
of Defense, Research and Engineering
- 1000 **Break**
- 1030 **Naval Aviation and Directed Energy Weapons**
RDML Mat Winter, Commander, Naval Air
Warfare Center, Weapons Division
- 1100 **Moving DE Forward: An Army Perspective**
BG Roger Mathews, USA, Commandant,
US Army ADA School
- 1130 **USAF Combat Weapons System Concepts for the Near Mid and Far Term**
Dr. David Robie, HQE ACC/ST
- 1200 **Lunch at NPS**

TUESDAY AFTERNOON

JOINT SESSION

Joint Session Modeling & Simulation and RF DE Weapons (Secret)

NPS, King Hall

- 1300 Vulnerability of Desktop Computer Systems
to Wideband Waveforms: I
- 1330 Vulnerability of Desktop Computer Systems
to Wideband Waveforms: II
- 1400 HPM Tactical & Target Vulnerability
- 1430 Break
- 1500 CHAMP Military Utility Study - Initial Results
- 1530 Development of a Megawatt-Class
Conventional Magnetron
- 1900 Monterey Bay Aquarium Reception
Buses begin loading at 1830

TUESDAY AFTERNOON

COUNTER DE WEAPONS

Keynote / Personnel Survivability (Secret)

NPS, Ingersoll Hall

See separate CDEW handout for details

- 1900 Monterey Bay Aquarium Reception
Buses begin loading at 1830

TUESDAY AFTERNOON

MODELING & SIMULATION

Modeling and Simulation Systems Applications (Limited Distribution C)

Hyatt Hotel, Big Sur

Chair: *Steve Fiorino*, AFIT Center for Directed Energy

- 1300 **An Experimental Study of the Probability Density Function of a Turbulence Induced Fluctuating Laser Beam**
Svetlana Avramov-Zamurovic, U.S. Naval Academy
- 1330 **Collision-Induced-Absorption in Molecular Oxygen within the 1-micron Wavelength Window Region**
Michael Thomas, Johns Hopkins University
- 1400 **Numerical Solution for a Transient Temperature Distribution on a Finite Domain Induced by a Rotating or Dithering Laser Beam**
Hong Zhou, Naval Postgraduate School
- 1430 **Break**
- 1500 **Chebyshev Based Spectral Methods for Electromagnetic Wave Propagation in Random Media with Absorbing Boundary Conditions**
Ramesh Kolar, Naval Postgraduate School
- 1530 **Characterizing Membrane Deformable Mirror Fit Error Using Partial Differential Equations and Comparison to Actual Mirror Performance**
Matthew Krizo, AFIT Center For Directed Energy
- 1600 **Use of GPUs for Speeding up FEL Systems Optimizations**
Michael Phillips, Advanced Energy Systems
- 1630 **Model-Based Systems Engineering for Laser Weapons Systems**
Steve Coy, MZA Associates Corporation
- 1900 **Monterey Bay Aquarium Reception**
Buses begin loading at 1830

TUESDAY AFTERNOON

EMPLOYMENT OF DE WEAPONS

Acquisition and Testing (Limited Distribution D)

Hyatt Hotel, Regency VI

Chair: *Bill Decker*, Defense Acquisition University

- 1300 **Directed Energy Test and Evaluation Capability Project Capabilities Available for Use**
Cyndi Mora, Directed Energy Test and Evaluation Capability
- 1330 **Across the Valley of Death: Transitioning DE to Production**
John Cserep, USAF Air Armament
- 1400 **Legality of a High Energy Laser Weapon System**
Ben Koenigsfeld, US Military Academy
- 1430 **Break**
- 1500 **DoD Initiatives on “Better Buying” and Their Impact on Directed Energy Programs**
William Decker, Defense Acquisition University
- 1900 **Monterey Bay Aquarium Reception**
Buses begin loading at 1830

Agenda Subject to Change

Visit www.deps.org for Daily Updates

TUESDAY AFTERNOON

HEL LETHALITY

Lethality Sessions (Secret)

NPS, Glasgow Hall

Counter ISR

- 1300 Eyes of the Enemy Threat Tactics and Counter Unmanned Aerial System (UAS) Concept of Operations (CONOPS)
- 1330 Failure Modes and Effects Analysis (FMEA) of a Typical EO/IR Sensor
- 1400 A Preliminary Analysis of UAV Counter Intelligence, Surveillance, and Reconnaissance (CISR) Operations during High Energy Laser (HEL) Engagements using the Navy's Laser Weapon System (LaWS)
- 1430 Break
- 1500 EO/IR Sensor Design and Laser Lethality Testing of Their Materials
- 1530 Kill Assessment Signatures for Intelligence, Surveillance, and Reconnaissance (ISR) Assets

Component Response / Material Interaction

- 1600 Army Laser Tests of RAM-like Metals with a High Power 1.06um CW Fiber Laser
- 1630 Update on HEL Bioeffects
- 1900 Monterey Bay Aquarium Reception
Buses begin loading at 1830

TUESDAY AFTERNOON

INTEL

DEW Intelligence Overview (SCI)

NPS, ME Auditorium

GENSER

- 1300 2009-2010 Directed Energy Weapons Developments
- 1330 Update on Foreign Ground-Based Laser Weapon Development
- 1400 Naval Laser Weapons Development
- 1430 Break
- 1500 Aircraft Laser Incidents Update
- 1530 Potential Laser Weapon Technologies
- 1600 Worldwide Radiofrequency Weapons Development Highlights
- 1715 Last bus leaves NPS
- 1900 Monterey Bay Aquarium Reception
Buses begin loading at 1830

WEDNESDAY MORNING

COUNTER DE WEAPONS

Personnel Survivability / Air & Munitions Structures Survivability

NPS, Ingersoll Hall

0700 Registration and Breakfast at Hyatt
Buses begin to NPS

See separate CDEW handout for details

1200 Lunch at NPS

WEDNESDAY MORNING

MODELING & SIMULATION

M&S Wargaming (Secret)

NPS, King Hall

- 0700 Registration and Breakfast at Hyatt
Buses begin to NPS
- 0800 Integration of DE Concepts in an LVC
Environment
- 0830 Using Modeling and Simulation to
Demonstrate the effectiveness of
Directed Energy (DE) Systems
- 0900 The Effects of Airflow on the Reflectance of
Painted and Unpainted Aluminum Exposed
to High Energy Laser Irradiation
- 0930 Laser Eye Protection, Vulnerability
Modeling, and Model Validation
- 1000 Break
- 1030 *Weaponneering High Power Microwave
Weapons*
- 1100 The Influence of Some Practical Factors
on HPM Engagement Outcome
- 1130 Advanced Concept Event (ACE) Update
- 1200 Lunch at NPS

JREM Showcase at 1030 - see page 14

WEDNESDAY MORNING

EMPLOYMENT

Service Perspectives (Secret)

NPS, ME Auditorium

- 0700 Registration and Breakfast at Hyatt
Buses begin to NPS
- 0800 Trade Space for Current Navy Tactical
Laser System Concepts
- 0830 Air Combat Command DE Enabling Concept
- 0900 USAF DE Roadmap
- 0930 An Assessment of Army Near-Term Ground
Based HEL Demonstration Capabilities
- 1000 Break
- 1200 Lunch at NPS

MODELING AND SIMULATION

JREM Showcase

NPS, ME Auditorium

Chairs: *Timothy Clarke and Charles Davis*, Air Force
Research Laboratory/RDHE

1030 - 1200

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WEDNESDAY MORNING

EMPLOYMENT

Atmospheric Effects and Applications of Beam Steering (Limited Distribution D)

Hyatt, Regency VI

Chair: *Kraig Sheetz*, US Military Academy

- 0700 Registration and Breakfast at Hyatt
- 0800 Estimating the Probability of Cloud-Free
Line-of-Sight (PCFLOS) for Laser
Propagation to Space
Joel Davis, Ball Aerospace
- 0830 Atmospheric Scintillation and Laser Eye
Safety Considerations
Dustin Johnston, Schafer Corp
- 0900 Break
- 1030 HEL Phased Array Technologies,
Architectures and Employment Options
Kevin Probst, The Core Group
- 1100 An APPLE-based Architecture for Directed
Energy Weapons
Terry Dorschner, Raytheon
- 1130 A Compact All-electronic Beam Director
for the DARPA Adaptive Photonic Phase
Locked Elements (APPLE) System
Andrew McKie, Raytheon
- 1200 Lunch at NPS

	Tues AM	Tues PM	Wed AM	Wed PM	Thurs AM	Thurs PM	Fri AM
King Hall	Opening Plenary	JOINT M&S / RFDEW	M&S	Symposium Joint Session	RF DE Weapons	LETHALITY	Closing Plenary
					M&S Showcase	M&S Showcase	
Glasgow Hall		LETHALITY	LETHALITY		Joint M&S / LETHALITY	EMPLOYMENT	
						LETHALITY	
ME Auditorium		INTEL	EMPLOYMENT		Counter DE Weapons	Joint EMP/ M&S	
			M&S Showcase				
Ingersoll Hall		Counter DE Weapons	Counter DE Weapons		Counter DE Weapons	Counter DE Weapons	
Hyatt Regency VI		EMPLOYMENT	EMPLOYMENT				
Hyatt Big Sur		M&S	RF DE Weapons				
			CDEW				

WEDNESDAY MORNING

HEL LETHALITY

Lethality Sessions (Secret)

NPS, Glasgow Hall

0700 Registration and Breakfast at Hyatt
Buses begin to NPS

System / Sub-System Test Result

- 0800 Experimental Testing of High Explosive Targets to Examine the Effects of Target Fill and Roll Rate
- 0830 Susceptibility of Commercial GaAs/Ge Solar Cell Arrays to 1.07 Micron Laser Irradiation
- 0900 High Energy Laser Component Testing of a Representative Missile Guidance Section
- 0930 High Energy Laser Effects on UAV Fuel Tanks
- 1000 Break

Systems Engineering Modeling and Analysis / Target Vulnerability Assessment (Secret)

- 1030 UAV Vulnerability Update Using Data Collected During the Navy's Laser Weapon System (LaWS) Maritime Demonstration Testing at San Nicholas Island (SNI), CA
- 1100 Multiple Surface Laser Penetration Modeling
- 1130 Mapping High Energy Laser Injury to Burn Degree and Likelihood of Mortality
- 1200 Lunch at NPS

WEDNESDAY MORNING

RF DE WEAPONS

RF DE Weapons Session One (Limited Distribution D)

Hyatt, Big Sur

Chairs: *Mark Henderson and Kelly McDonald*, Naval Air Warfare Center

- 0700 Registration and Breakfast at Hyatt
- 0800 Tripod-Mounted Solid State Active Denial Weapon Demonstrator
Kenneth Brown, Raytheon
- 0830 NLTL Based HPM System Engag. Model
John Borchardt, Sandia National Labs
- 0900 Scalable Photoconductive-Switch-Based High Power Microwave Sources and Effects
John McGeehan, BAE Systems - Technology Solutions
- 1200 Lunch at NPS

COUNTER DE WEAPONS

Counter DE Weapons Research (Open)

Hyatt, Big Sur

See separate CDEW handout for details

JOINT SESSION**Symposium Joint Session**

NPS, King Hall

Chair: *Tom Meyer*, DEPS

- 1300 **Introduction and Security Comments**
Tom Meyer, DEPS
- 1305 **CHAMP**
Robert Torres, Air Force Research Laboratory
- 1345 **LaWS**
Brian Hankla, Naval Surface Warfare Center
- 1410 **Counter-Electronics**
Mark Rader, Space and Missile Defense
Command
- 1435 **MLD**
Ron Flatley, Naval Surface Warfare Center
- 1500 **SSLTE**
John Wachs, Schafer Corp.
- 1515 **Break**
- 1535 **Counter-IED**
Frank Peterkin, Naval Surface Warfare Center
- 1600 **HELLADS DLWS**
Jerry Wilson, US Army PEO
- 1625 **MAX POWER**
Jeff Heggemeier, Air Force Research
Laboratory/RDHA
- 1650 **DRM**
David Kiel, NAVSEA PMS-405
- 1730 **Exhibitor Reception**

THURSDAY MORNING

JOINT SESSION

Joint Session Modeling and Simulation and Lethality (Secret)

NPS, Glasgow Hall

- 0700 Registration and Breakfast at Hyatt
Buses begin to NPS
- 0800 Physics and Engagement Modeling of
C-RAM using Predictive Kill
- 0830 High Energy Laser Defended Footprint
Sensitivities to Mission, Threat, and
Weather
- 0900 Methodology for Determining HEL Laydowns
for Coverage and Effectiveness in EADSIM
- 0930 Effects-Based Precision Engagement
Modeling Framework
- 1000 Break
- 1030 Development of a Methodology for
Performing HEL Vulnerability Assessments
of Tactical Targets
- 1200 Poster Session
Box Lunch at NPS

THURSDAY MORNING

COUNTER DE WEAPONS

HPM Survivability (Secret)

NPS, ME Auditorium

- 0700 Registration and Breakfast at Hyatt
Buses begin to NPS

See separate CDEW handout for details

- 1200 Poster Session
Box Lunch at NPS

THURSDAY MORNING

COUNTER DE WEAPONS

**Threat Warning & Sensing /
EO/IR Sensor Survivability (Secret)**
NPS, Ingersoll Hall

0700 Registration and Breakfast at Hyatt
Buses begin to NPS

See separate CDEW handout for details

1200 Poster Session
Box Lunch at NPS

THURSDAY MORNING

RF DE WEAPONS

RF DE Weapons Session Two (Secret)
NPS, King Hall

0700 Registration and Breakfast at Hyatt
Buses begin to NPS

0800 HPM Tactical Target Vulner. M

0825 Design of a High Power BWO System

0850 DEW Mitigation Effects on Electronic
Circuits by Differential Signaling

0915 Material Modification and Control of Laser
Induced Electromagnetic Emission

0935 Small Diameter Radio Frequency Spots and
Behavioral

1000 Break

MODELING AND SIMULATION

JREM Showcase

NPS, King Hall

Chairs: *Timothy Clarke*, Air Force Research
Laboratory/RDHE and *Charles Davis*

1030-1200

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1200 Poster Session
Box Lunch at NPS

JOINT SESSION**Poster Session (Limited)**

NPS, King Hall

Chair: *Adekunbi Adewunmi “Kunbi”*, Air Force
Research Laboratory/RDLE

- **Model-Based Systems Engineering for Laser Weapons Systems** *Steve Coy*, MZA Associates Corp
- **Megawatt Mobile Prime Power Development for MAX POWER** *Robert Richter-Sand*, SAIC
- **Magnetron Modulator Development for MAX POWER** *Robert Richter-Sand*, SAIC
- **HPM Transmitter and Antenna Development for MAX POWER** *Robert Richter-Sand*, SAIC
- **MAX POWER Rapid System Integration** *Robert Richter-Sand*, SAIC
- **Perfect Reflector** *Srini Krishnamurthy*, SRI International
- **Interdisciplinary Feasibility Study of a Directed Energy Weapon for C-RAM Missions** *Andrew Demoss*, US Military Academy
- **Directed Energy Engagement Model for an 81mm Mortar** *Bethany Houdeshell*, US Military Academy
- **Probability of Inadvertently Hitting a Spacecraft with a Laser in a Counter-Artillery Engagement** *Roger Burk*, US Military Academy

Poster Session (Secret)

- **Lethality Experiments with a Powerful Laser Simulator**
- **HEL Precision Strike Study Results**
- **EO/IR Sensor Design and Laser Lethality Testing of Their Materials**
- **Multiple Surface Laser Penetration Modeling**
- **Testing Uncertainties Caused by Measurement Errors of Spot Size and Description of Spot Size Measurements**
- **Lethality Experiments with a Powerful Laser Simulator**
- **HEL Precision Strike Study Results**

(continued on p. 28)

THURSDAY NOON

JOINT SESSION

Poster Session (Secret)

NPS, King Hall

(continued from pg. 27)

- EO/IR Sensor Design and Laser Lethality Testing of Their Materials
- Multiple Surface Laser Penetration Modeling
- Testing Uncertainties Caused by Measurement Errors of Spot Size and Description of Spot Size Measurements
- Predictive Modeling of Laser Effects on Satellite Solar Panels
- Laser Effects Scaling to Short Wavelengths: Painted Steel
- High-Energy Laser Ignition of Fuels on Aircraft Systems
- BITS, Beam Irradiance on Target System
- Using High Speed Cameras with Illumination to View Material Response of an Laser Irradiated Target
- Weighted Average of Temperature-Dependent Optical and Thermophysical Properties of Detector Materials for Use with Bartoli Model Damage Threshold Models
- Using UAV Telemetry Data to Determine Overall UAV Systems Response to Damage Incurred During High Energy Laser (HEL) Engagements using the Navy's Laser Weapon System (LaWS)
- Complex Target Penetration Test Series
- Experimental Testing of Five Types of Mortar Targets
- Experimental Testing of High Explosive Targets to Examine the Effects of Target Fill and Roll Rate
- Analysis of Power at Target of LaWS
- Failure Modes and Effects Analysis (FMEA) of a Typical EO/IR Sensor
- LaWS SNI Overview

THURSDAY AFTERNOON

JOINT SESSION

Joint Session with Employment and Modeling and Simulation (Secret)

NPS, ME Auditorium

- 1330 Three-Dimensional Optical Assessments from Doppler Weather Radar for Laser Applications
- 1400 Propagation of Laser Light Through Aero-Optical Flow: Preliminary Investigation of Moist Air with Aerosols
- 1430 Break
- 1500 Laser MASINT Applications of Quantified Atmospheric Scatter Simulations
- 1530 Computational Thermal Model for Destroying a Mortar with a High Energy Laser
- 1600 Effect of HEL onto a 81mm Mortar
- 1630 Quantifying Future Qualities of the Laser System

THURSDAY AFTERNOON

COUNTER DE WEAPONS

**EO/IR Sensor Survivability and
Space Systems Survivability (Secret)**

NPS, Ingersoll Hall

See separate CDEW handout for details

THURSDAY AFTERNOON

EMPLOYMENT

CHAMP (Secret)

NPS, Glasgow Hall

- 1300 Air Vehicle Integration
- 1330 Pulse Power System Overview
- 1400 HPM Source Support Systems
- 1430 Session Adjourns

LETHALITY

Lethality Poster Session

NPS, King Hall

- 1300 Poster Session thru 1430

**Test Facilities, Instrumentation,
Diagnostics and Techniques (Secret)**

NPS, Glasgow Hall

- 1430 Break
- 1500 Lethality Experiments with a Powerful Laser Simulator
- 1530 Imaging Fourier-Transform Spectrometry as a New Tool for Laser Lethality
- 1600 Irradiance Assessment Using Laser Beam Imagery During UAV Engagement for the Navy's "Laser Weapon System" (LaWS)
- 1630 BITS, Beam Irradiance on Target System

THURSDAY AFTERNOON

MODELING AND SIMULATION

HELEEOS Showcase

Chair: *Steve Fiorino*, AFIT, Center for Directed Energy

HELSEEM Showcase

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

NPS, King Hall

1500-1700

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FRIDAY

JOINT SESSION

Closing Plenary

NPS, King Hall

Chair:

- 0700 **Registration and Breakfast at Hyatt Buses begin to NPS**
- 0800 **Call to Order / Closing Remarks / Introductions**
MG John Urias, USA (ret) and Mr. John Wachs, Symposium Co-Chairs
- 0820 **Employment of Directed Energy Weapons**
Dr. John Hartke and LtCol. Kraig Sheetz
- 0840 **Directed Energy Modeling and Simulation**
Ms. Linda Lamberson and Mr. Ben Call
- 0900 **High Energy Laser Lethality**
Mr. Chuck LaMar and Mr. Robert Roybal
- 0920 **RF / Directed Energy Weapons Workshop**
Mr. Mark Henderson and Ms. Kelly McDonald
- 0940 **Counter Directed Energy Weapons**
Mr. Tony Cain and Dr. Tim Andreadis
- 1000 **Symposium Adjourn**

Symposium Co-chairmen:
John Urias and John Wachs

Symposium Program Coordinator:
David Loomis

Conference Chairs:

Counter DE Weapons
Anthony Cain and Tim Andreadis

DE Modeling and Simulation
Linda Lamberson and Benjamin Call

Employment of DE Weapons
John Hartke and Kraig Sheetz

HEL Lethality
Chuck LaMar and Robert Roybal

RF DE Weapons
Mark Henderson and Kelly McDonald

Symposium Coordinator:
Cynnamon Spain

Security Coordinator:
Rhonda Peyton

Registration / Short Courses:
Donna Storment

Payments and Receipts:
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www.deps.org