

**Nineteenth Annual
Directed Energy
Symposium
Technical Program**



**13 - 16 February 2017
Huntsville, Alabama**

General Information

Security

- Attendees will be issued conference specific badges on site and must have valid government ID available at all Symposium events
- Wireless electronic devices are prohibited in classified sessions
- No note taking in any classified facility
- Classified discussions and sensitive unclassified discussions are restricted to designated meeting rooms only
- No cameras or photography allowed
- 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 and your information forwarded to authorities

Buses

Although the offsite location is within walking distance, buses will be available to transport to and from each location approximately every 20 minutes and will end service 15 minutes after the last talk completes. Do not bring cell phones, laptops, or notebooks on the bus. DEPS staff will not be responsible for your items.

Bus schedule:

Wednesday: 0730 to 1730

Please note: The buses will not be able to travel back to the hotel from the offsite facility after the final speaker begins. Drivers are required to remain available for the entire groups departure and cannot be pulled away for just a few. Those that are not on the buses immediately following the last presentation will be responsible for their own taxi ride back to the hotel.

MONDAY

SHORT COURSES

Morning Courses 0800-1200

- 1: Intro to HEL Systems
Westin Hotel, Mediterranean III
- 2: Windows and Coatings for HEL Systems
Westin Hotel, Mediterranean I
- 3: Directed Energy Bio-Effects (Limited C)
Westin Hotel, Mediterranean V
- 4: Intro to HEL Lethality Science
Westin Hotel, Mediterranean II

Afternoon Courses 1300-1700

- 5: Intro to HEL Lethality Science (continued)
Westin Hotel, Mediterranean II
- 6: Transitioning DE Technology to the Warfighter
Westin Hotel, Mediterranean I
- 7: RF DE Effects (Limited C)
Westin Hotel, Mediterranean III
- 8: Optical Turbulence
Westin Hotel, Mediterranean V
- 9: Introduction to RF Systems (Limited D)
Westin Hotel, Mediterranean VI

DE Systems Symposium

**25 - 29 September 2017
Monterey, California**

**AUDIO AND VIDEO RECORDING IS
PROHIBITED AT ALL DEPS SPONSORED EVENTS**

TUESDAY MORNING

Plenary Session

Westin Hotel Mediterranean Ballroom (Open)

- 0700 **Breakfast and Registration at Westin**
- 0815 **Welcome Statement**
Dr Brian Strickland, SMDC and
Mr Peter Weiland, Radiance Technologies
- 0830 **Representative Mo Brooks**
5th Congressional District, Alabama
- 0900 **RADM Mike Manazir**
US Navy, Chief of Naval Warfare Systems
(OPNAV N9)
- 0930 **Brigadier General Tom Wilcox**
USAF, Chief of Plans & Programs, AF Global
Strike Command
- 1000 **Break**
- 1020 **Mr Thomas E. Webber**
Director, Space and Missile Defense
Technical Center
- 1050 **Mr Richard Matlock**
Program Executive for Advanced Technology,
Missile Defense Agency
- 1120 **Dr David Burns**
Director of Science & Technology, NASA
Marshall Space Flight Center
- 1200 **Lunch**
- 1245 **DEPS Fellows Recognition Ceremony**

TUESDAY AFTERNOON

DE Systems and Programs

Westin Mediterranean Room III (Limited/Open)

Chair: *Birtha Otey*, USASMDC/ARSTRAT

- 1300 **Status of USMC Directed Energy Weapon
Review and Approval Process (DE Weapon
RAP) (D)**
Stuart Shoppell, Naval Surface Warfare
Center, DD
- 1330 **Ground Based Air Defense (GBAD) Directed
Energy (DE) On-the-Move (OTM) Program
Overview (D)**
Jorge Hernandez, Naval Surface Warfare
Center Dahlgren Division
- 1400 **Joint Laser Deconfliction and Safety
System Test Program (F)**
James Latourell, Naval Surface Warfare
Center-Dahlgren Division
- 1430 **Break**
- 1500 **Integration and System Readiness Level
Tools for Technology Transition (C)**
Sean Ross, AFRL/RDLA
- 1530 **High Energy Laser Mobile Test Truck
(HELMTT) Participation in the Maneuver
Fires Integration Experiment 2016 (C)**
Adam Aberle, US Army SMDC/ARSTRAT
- 1600 **Military Applications of Laser Power
Beaming (A)**
Tom Nugent, LaserMotive
- 1630 **Fielding Operationally Viable Directed
Energy Weapons (A)**
David Stoudt, Booz Allen Hamilton, Inc.
- 1730 **Exhibitor Reception and Poster Session**

Tour of NASA Marshall Space Flight Center

Friday, 17 February 0800-1200

See page 24 for details

TUESDAY AFTERNOON

HPM Systems, Technologies and Effects

Mediterranean Room IV (Limited/Open)

Chair: *Ryan Hoffman*, Navy

- 1300 **Miniaturization and Performance Enhancement of Ferrite NLTL HPRF Sources Through Simulation and Measurement (D)**
Michael Geiler, Metamagnetics Inc.
- 1330 **Order of Magnitude Reduction of the Volume and Weight of a High Power Helical Antenna Array with Dielectric Loading (D)**
Kevin O'Connor, NanoElectromagnetics LLC
- 1400 **Computational Electromagnetic Modeling and RF Characterization of Broadband Radiation Generation by Excitation of Superconducting and Cu-based Loop Antennas (C)**
Timothy Haugan, The Air Force Research Laboratory
- 1430 **Break**
- 1500 **Solid State Active Denial Technology (SS-ADT) W-Band Demonstration System and Related W-Band Research Initiatives (C)**
Thomas Shadis, US ARMY RDECOM-ARDEC
- 1530 **Solid State High Power RF Short Pulse Array In-Air Power Combining (C)**
Shawn Higgins, NAWCWD
- 1600 **Tunable Broadband GHz/THz Electromagnetic Radiation Generated Via Ultrafast Laser Pulsing of Inductively Charged Superconducting Antennas (A)**
Timothy Haugan, The Air Force Research Laboratory
- 1630 **ICEPIC Simulations of CPI BMD's S-Band VMS-1143B Magnetron (A)**
Andrey Andreev, Booz Allen Hamilton
- 1730 **Exhibitor Reception and Poster Session**

TUESDAY AFTERNOON

HEL Effects

Westin Mediterranean Room V (Limited/Open)

Chair: *Chuck Lamar*, USASMDC/ARSTRAT

- 1300 **Solid State Laser Testbed Dynamic Scoring System: Recent Upgrades and Performance Results (D)**
Daniel Duffin, Radiance Technologies
- 1330 **Summary of Fiberglass Testing (D)**
Allan Westenhofer, Radiance Technologies
- 1400 **HEL Lethality of Carbon Fiber Materials (F)**
Fabiola Lopez, US Army Space and Missile Defense Command
- 1430 **Break**
- 1500 **High Energy Laser Weapon Performance Measurement in Dynamic Engagements (C)**
Charles LaMar, USA SMDC
- 1530 **Generic Small-UAV Lethality Target - the Mallard (C)**
Allan Westenhofer, Radiance Technologies
- 1600 **Laser Induced Damage Measurements on Silica Windows with Antireflective Surface Structures at 1064 nm (A)**
Lynda Busse, Naval Research Laboratory
- 1730 **Exhibitor Reception and Poster Session**

Book Signing

Laser Weapon Development at Redstone Arsenal, 1960-2015

Author Ronald Miller will sign copies of his book near the DEPS booth during the Exhibitors Reception on Tuesday Evening

TUESDAY AFTERNOON

Student Session

Mediterranean Room II (Limited/Open)

Chair: *Doug Nelson*, USASMDC/ARSTRAT

- 1300 **Objective Architecture for Tactical Energy Management of Directed Energy Weapons (D)**
Bonnie Johnson, Naval Postgraduate School
- 1330 **A Systems Engineering Approach to the Employment of High Energy Lasers (HELs) in a Multi-Platform Engagement Scenario (D)**
Bonnie Johnson, Naval Postgraduate School
- 1400 **SBS Investigations of an All-Solid Ytterbium-doped Photonic Bandgap Fiber Amplifier (A)**
Cody Mart, Air Force Research Laboratory
- 1430 **Break**
- 1500 **Novel Concepts for Slow Wave Structures used in High Power Backward Wave Oscillators (A)**
Ushemadzoro Chipengo, Electroscience Lab
The Ohio State University
- 1530 **Electrical Characterization of Lightweight Nanocarbon Materials for High Energy Laser Positional Sensor (HELPS) Applications (A)**
Andrew Jevitt, United States Naval Academy
- 1600 **Atmospheric Optical Turbulence: Model Comparison and Relative Terrestrial Influence on Diurnal Trends in a Range of Maritime Environments (A)**
William Bourque, United States Naval Academy
- 1730 **Exhibitor Reception and Poster Session**

TUESDAY EVENING

Limited Distribution Poster Session

Westin Mediterranean Room I (Limited)

ABLE-ETS System Architecture (D)

Robert Pawlak, NSWC

Unmanned Aerial System (UAS) Vulnerabilities to High Power Radio Frequency (HPRF) (D)

Francis Baylon, U.S. Army RDECOM-ARDEC

Thermal Management Challenges in Integrating Laser Weapon Systems (C)

Sean Ross, AFRL/RDLA

Integration and System Readiness Level Tools for Technology Transition (C)

Sean Ross, AFRL/RDLA

Status of Cryogenic/Superconducting Components for MW-Class Electric Power Systems (C)

Timothy Hagan, The Air Force Research Laboratory

Open Poster Session

Westin Prefunction Area (Open)

Millimeter Wave Radar for Atmospheric Turbulence Characterization and Wind Profiling for Improved Naval Operations (A)

Bahman Hafizi, Naval Research Laboratory

High Strength Microwave Sintered Transparent Ceramics for HEL Systems (A)

Ben Rock, U.S. Naval Research Laboratory

Metrology and Calibration (METCAL) for Navy Laser Weapons: The Need and Importance (A)

Subrata Sanyal, Naval Surface Warfare Center

Metrology and Calibration (METCAL) for Navy Laser Weapons: NSWC Corona Efforts (A)

Subrata Sanyal, Naval Surface Warfare Center

Overview of SiC High-Voltage Switch Development and Evaluation at the U.S. Army Research Laboratory (A)

Heather O'Brien, U.S. Army Research Laboratory

Atmospheric Optical Turbulence: Model Comparison and Relative Terrestrial Influence on Diurnal Trends in a Range of Maritime Environments (A)

William Bourque, United States Naval Academy

WEDNESDAY MORNING**HEL Technology 1**

Westin Mediterranean Room III (Open/Limited)

Chair: *Brett Hokr*, USASMDC/ARSTRAT

- 0700 **Breakfast and Registration at Westin**
- 0800 **Evolution of Super-High Efficiency Fiber-Coupled Sources (SHEFS) for All-Fiber MOPAs (A)**
Aland Chin, Somerville Laser Technology, LLC
- 0830 **Measurement of Critical for Damage Temperatures in Gain Medium of Operating DPAL (A)**
Boris Zhdanov, Air Force Academy
- 0900 **Unstable Resonator Design for Diode Pumped Alkali Lasers (A)**
Glen Perram, Air Force Institute of Technology
- 0930 **Pump-Probe Spectroscopy of Argon in a High Pressure Capacitively Coupled Discharge (A)**
Ben Eshel, Air Force Institute of Technology
Department of Engineering Physics

1000 **Break****Session is now Limited Distribution**

- 1030 **Characterization of a Diode Pumped Alkali Laser with a Flowing Gain Medium (D)**
Paul Moran, Air Force Research Laboratory/RDLTD
- 1100 **Transient and Steady State Thermal Characterization of High Energy Laser Beam Dissipation in Turbulent Fluid Media (C)**
Andrew Hall, Kratos Defense and Security Solutions
- 1130 **3 kW Single Mode Coherently Combined and Switched All-Fiber Source (D)**
Joshua Rothenberg, Northrop Grumman Aerospace Systems
- 1200 **Lunch**

WEDNESDAY MORNING**Beam Control Systems and Technology**

Westin Mediterranean Room IV (Limited/Open)

Chair: *Jenny Niles*, USASMDC/ARSTRAT

- 0700 **Breakfast and Registration at Westin**
- 0800 **Synthetic Scene Generation of Actively Illuminated Targets (D)**
Jonathan Stohs, Air Force Research Laboratory/RDL
- 0830 **DAFHI (Dynamic Acquisition for HEL Integration): Update (D)**
Timothy Wolfe, Air Force Research Laboratory, Laser Technology Branch
- 0900 **Evaluation of Two State-of-the-Art Inertial Reference Units (D)**
Evan Threlkeld, Air Force Research Laboratory
- 0930 **Adaptive Optics Research and Capabilities at the Starfire Optical Range (C)**
Michael Steinbock, Air Force Research Laboratory/RDSS - Starfire Optical Range
- 1000 **Break**
- 1030 **ABCD Wave-Optics Modeling Progress and Updates (C)**
Michael Steinbock, Air Force Research Laboratory/RDSS - Starfire Optical Range
- 1100 **Modeling Coherence Reduction in a Light Pipe via Coherent Mode Representations (D)**
Robert Raynor, Air Force Research Laboratory/RDLT
- 1130 **Modelling Waveguide Generated Mitigation of Speckle on an Actively Illuminated Target (A)**
Trevor Moore, Air Force Research Laboratory
- 1200 **Lunch**

Beam Propagation 1

Westin Mediterranean Room V (Limited/Open)

Chair: *Amanda Black*, USASMDC/ARSTRAT

- 0800 **CFD Simulations of Advanced Turret Concept at Off-Design Conditions With and Without Flow Control (D)**
David Weston, Air Force Research Laboratory - Aerodynamic Technology Branch
- 0830 **Computational Study of Flow Control Techniques for Canonical Turret Configuration with Enhanced Geometric Resolution (D)**
Michael Frede, Air Force Research Laboratory/RQVA
- 0900 **Laboratory Generation of Aero-Optics Turbulence to Simulate a Slewing Airborne Turret (C)**
David Dayton, Applied Technology Associates
- 0930 **Multiple Aperture Approach to Wavefront Prediction for Adaptive-Optic Applications (A)**
Matthew Kemnetz, University of Notre Dame

Power and Thermal for DE 1

Westin Mediterranean Room II (Limited)

Chair: *Kenya Lynch*, USASMDC/ARSTRAT

- 0700 **Breakfast and Registration at Westin**
- 0800 **Experimental Study of Ice Thermal Energy Storage in a High Rate Heat Exchanger (D)**
Joshua Sole, Mainstream Engineering Corp.
- 0830 **SWaP-Optimized Liquid Nitrogen Generator Comprised of Commercially Proven Components (F)**
Joshua Sole, Mainstream Engineering Corp.
- 0900 **Compact 250 kV Capacitors for Directed Energy Applications: Test Results and Impacts (C)**
Randy Curry, University of Missouri
- 0930 **Thermal Management Challenges in Integrating Laser Weapon Systems (C)**
Sean Ross, Air Force Research Laboratory/RDLA
- 1000 **Break**
- 1030 **Advances in Fuel Cells Power Sources for Directed Energy Applications (C)**
William Smith, Infinity Fuel Cell and Hydrogen, Inc.
- 1100 **Evaluation of the Performance of COTS Diode Laser Fiber Pumps Over a Wide Temperature Range and Modeling of the Subsequent Trade-offs in HEL Thermal System Design (C)**
George Turner, MIT Lincoln Laboratory
- 1130 **Advantages and Suitability of Utilizing Hydrated Salts for High-Rate Low-SWaP Thermal Energy Storage (C)**
Nicholas Maniscalco, Raytheon Company
- 1200 **Lunch**

WEDNESDAY MORNING

Classified Session

Offsite Location

Chair: *David Lyman*, Radiance Technologies, Inc

- 0700 **Breakfast and Registration at Westin**
- 0715 **Buses to Offsite Location**
- 0800 **Counter-Rocket Artillery and Mortar (C-RAM) Laser Lethality Testing by SMDC: Recent Results (D)**
- 0830 **Vulnerability of the Passenger Compartment of Ground Vehicles to HEL Weapons (D)**
- 0900 **Vulnerability of the Drive Train of Ground Vehicles to HEL Weapons (D)**
- 0930 **HPEM Effects on Unmanned Aircraft Systems (UAS) (C)**
- 1000 **Break**
- 1030 **Air Force Directed Energy Weapons Flight Plan (C)**
- 1100 **Electro-Optics Counter-Measures for Counter ISR (C)**
- 1130 **Linear Photonic Switch Status (F)**
- 1200 **Lunch**

WEDNESDAY AFTERNOON

HEL Technology 2

Westin Mediterranean Room III (Open)

Chair: *Adam Aberle*, USASMDC/ARSTRAT

- 1300 **Wavelength Agility of a Two-Photon Pumped Alkali Laser (A)**
Nathan Haluska, Air Force Institute of Technology
- 1330 **Spectroscopy of Metastable Xenon in High Pressure Plasma Discharges (A)**
Carl Sanderson, University of Alabama in Huntsville
- 1400 **Development of All-Crystalline Clad Single Crystal Fiber for High Power Lasers (A)**
Brandon Shaw, Naval Research Laboratory
- 1430 **Break**
- 1500 **VECSELs as a Fiber Laser Pump Source for Directed Energy Applications (A)**
John Joseph, Optipulse Inc.
- 1530 **Functional Crystalline Materials for High Energy Solid State Lasers (A)**
Stuart (Shizhuo) Yin, Penn State Univ/
General Opto Solutions, LLC
- 1600 **Pulsed Discharge - Diode Pumped Ar Laser (A)**
Michael Heaven, Emory University
- 1630 **Safety Considerations for Laser Power Beaming (A)**
Tom Nugent, LaserMotive
- 1700 **The Self Q-Switched Tm/Ho Doped Co-Axial Fiber Laser (A)**
George Newburgh, Army Research Laboratory

WEDNESDAY AFTERNOON

Beam Propagation 2

Westin Mediterranean Room IV (Limited/Open)

Chair: *Amanda Black*, USASMDC/ARSTRAT

- 1300 **Estimation of Atmospheric Parameters from Time-Lapse Imagery (C)**
Santasri Bose-Pillai, AFIT
- 1330 **Opto-Mechanical Sensitivity Analysis for the Integrated Atmospheric Characterization System Optical Turbulence Profiler (IACS OTP) (C)**
Nathan Meraz, Georgia Tech Research Institute Electro-Optical Systems Laboratory
- 1400 **Analysis of Turbulence Anisotropy Measured with a Hartmann Sensor (C)**
Jack McCrae, Air Force Institute of Technology AFIT/ENP
- 1430 **Break**
- 1500 **Characterization of Atmospheric Properties with Small Unmanned Aircraft Systems (sUAS) (A)**
Alex Clark, Kratos Defense
- 1530 **Tunable Diode Laser Absorption Spectroscopy for DPAL, COIL and SSL Systems in Open Paths (A)**
Christopher Rice, Air Force Institute of Technology
- 1600 **Dual-Beacon Differential Image Motion Monitor for Measuring Atmospheric Turbulence at Horizontal Paths (A)**
Daniel Whitley, Kratos Weapons & Defense Solutions

WEDNESDAY AFTERNOON

Power and Thermal for DE 2

Westin Mediterranean Room V (Open/Limited/Open)

Chair: *Kenya Lynch*, USASMDC/ARSTRAT

- 1300 **Coolant Flow Reduction in HEL Thermal Management Systems Using Acceleration-Insensitive Two-Phase Microchannel Heatsinks (A)**
Geoff Campbell, Science Research Laboratory, Inc.
- 1330 **Prediction of the Junction Temperatures of Single Emitters in a High-Energy Laser Diode Bar (A)**
Bongtae Han, University of Maryland
- 1400 **Hybrid Method to Predict Spectral Power Distribution of High-Energy Laser Diode Arrays (A)**
Bongtae Han, University of Maryland
- 1430 **Break**
- Session is now limited for one talk**
- 1500 **Status of Cryogenic/Superconducting Components for MW-Class Electric Power Systems (C)**
Timothy Haugan, The Air Force Research Laboratory
- 1530 **Fast Charge Algorithm for Large Lithium Ion Battery Packs (A)**
Gary Grider, DRS Technologies
- 1600 **Thermal Mitigation of Transient Pulses (A)**
Lauren Boteler, U.S. Army Research Laboratory

WEDNESDAY AFTERNOON

Education Workshop

Westin Mediterranean Room II (Open)

Chair: *Harro Ackermann*, HEL JTO

- 1300 **Welcome to the Educational Workshop**
Harro Ackermann, HEL JTO
- 1305 **JTO/DEPS Educational Initiative**
Mark Neice, DEPS
- 1320 **The 2016 AFIT Directed Energy Summer Intern Program (A)**
Sara Kraft, Air Force Institute of Technology
- 1340 **Modification of Fine-Structure Collisional Transfer Cross Sections in Dense Inert Buffer Gases (A)**
Jeremiah Wells, US Air Force Academy
- 1400 **The Rare Gas Laser: a Potential HEL System (A)**
Ben Eshel, Air Force Institute of Technology
- 1420 **Verification of BRDF Improvements by Comparisons to Modified Beckmann-Kirchhoff Scatter Theory (A)**
James Ethridge, AFIT-SOCHE
- 1440 **Break**
- 1500 **The Path to a Career in Directed Energy (A)**
Noah Van Zandt, AF Institute of Technology
- 1520 **Surface Temperature Measurements of a Water Drop during Laser Strike (A)**
Nicholas Payne, USNA
- 1540 **Laser Propagation in a Maritime Environment (A)**
Charles Stabler, US Naval Academy
- 1600 **Characterizing the Response of Embedded Fiber Bragg Grating Sensors to Directed Energy Attacks (A)**
Michael Ross, US Naval Academy
- 1620 **Planned Atmospheric Visibility Measurements in a Turbulent Wind Tunnel: Towards Characterizing High Energy Laser Propagation in the Marine Boundary Layer (A)**
Tyler Galpin, University of New Hampshire
- 1640 **Multiple Aperture Approach to wavefront Prediction for Adaptive-Optic Applications (A)**
Matthew Kemnetz, University of Notre Dame

WEDNESDAY AFTERNOON

Counter DEW

Offsite Location (Secret)

Chair: *Bob Cozzens*, Naval Research Laboratory

- 1300 **Cleanly HEL Ablating Camouflage Coatings (D)**
- 1330 **Microwave Reflections from Laser Produced Atmospheric-Plasmas and Acoustic Shocks (A)**
- 1400 **Protecting Printed Circuit Boards Under High Power Microwave Emissions (C)**
- 1430 **Break**
- 1500 **Recent Developments at NSRDEC in Microwave Reflective Materials (C)**
- 1530 **Thermal Penetration Protection of Carbon Fiber Reinforced Polymer (CFRP) Composite (D)**
- 1600 **Development of HEL Hardened UAS Skin Systems (D)**
- 1630 **Chaff for Counter High Energy Laser Defense (D)**
- 1700 **Simulation of Pulsed Laser-induced Environmental Changes on Laser Propagation (C)**

Non-DoD Applications: Propulsion

Westin Mediterranean Room III (Open)

Chair: *Les Johnson*, NASA Marshall Space Flight Center

- 0700 **Breakfast and Registration at Westin**
- 0800 **A Concept for Producing Very Large Propulsive Forces using High-Q Asymmetric High Energy Laser Resonators (A)**
Travis Taylor, U.S. Army SMDC
- 0830 **Solar Sails and Directed Energy: Next Steps toward a Space Propulsion Infrastructure (A)**
Les Johnson, NASA Marshall Space Flight Center
- 0900 **Directed Energy for Small Relativistic Probes to Enable Interstellar Exploration (A)**
Philip Lubin, Physics Dept University of California
- 0930 **Directed Energy Application to Orbital Debris Mitigation (A)**
Edward Montgomery, MontTech, LLC
- 1000 **Break**
- 1030 **A Strategic Roadmap for Commercializing Low-Cost Beamed Energy Propulsion Launch Systems (A)**
Eric Davis, Institute for Advanced Studies at Austin
- 1100 **Hybrid Laser-Chemical Rocket Engine and Launch System (A)**
Thomas Nugent, LaserMotive
- 1130 **A Means to Assess and Validate the Effects of Ground Based High Energy Lasers on Small Satellites for Proving Propulsion and Increasing Power Available (A)**
Peter Weiland, Radiance Technology
- 1200 **Lunch**
- 1245 **DEPS Annual Report**

Modeling & Simulation 1

Westin Mediterranean Room IV (Limited)

Chair: *Doug Nelson*, USASMDC/ARSTRAT

- 0700 **Breakfast and Registration at Westin**
- 0800 **Development, Incorporation and Testing of an Index-of-Refractive Variance Transport Solver within the NASA FUN3D CFD Model: FUN3D-IRS (D)**
William Coirier, Kratos/Digital Fusion Solutions, Inc.
- 0830 **An Overview of the CFD-AO Model and Recent Upgrades (D)**
William Coirier, Kratos/Digital Fusion Solutions, Inc.
- 0900 **Model for Visualizing HEL - Target Interaction (D)**
Gamze Erten, Raytheon SAS
- 0930 **711 Human Performance Wing Support to Modeling and Simulation Weapon Concepts (D)**
Richard Vickery, 711 Human Performance Wing
- 1000 **Break**
- 1030 **4D Weather Cubes and CFLOS from Numerical Weather Prediction Data (C)**
Jarred Burley, AFIT/ENP
- 1100 **Evaluation of Probabilistic Climatology as a Determiner for HEL System Performance (C)**
Jaclyn Schmidt, AFIT
- 1130 **Comparison of Polychromatic Wave-Optics Models (C)**
Noah Van Zandt, AFIT/Center for Directed Energy
- 1200 **Lunch**
- 1245 **DEPS Annual Report**

THURSDAY MORNING**HEL Technology 3**

Westin Mediterranean Room V (Limited)

Chair: *Steve Renfrow*, Scientific, Inc.

- 0800 **Irradiance Collection Readout System (ICRS) HEL Mortar Target Testing (D)**
David Ward, SemQuest Inc
- 0830 **HELMTT and MEHEL Laser Diagnostics Using LBADS at MFIX 2016 (C)**
Theron Henderson, Scientific Inc.
- 0900 **HELMTT Laser Diagnostics Using LBADS at RTC 2.0 & 2.5 (C)**
Theron Henderson, Scientific Inc.
- 0930 **Highly Efficient Operation of a Double-Clad Er-Nanoparticle-Doped Fiber Laser (A)**
Jun Zhang, U.S. Army Research laboratory
- 1000 **Break**

Ultra Short Pulse Laser 1

Westin Room 3 (Limited)

Chair: *Joseph Penano*, US Navy Research Laboratory

- 1030 **Experimental Demonstration of Nonlinear Self-Guiding of a High-Power Laser Beam through Deep Turbulence (D)**
Gregory DiComo, Research Support Instruments
- 1100 **AFRL PHEENIX Laser Experiment (C)**
Andreas Schmitt-Sody, Air Force Research Lab
- 1130 **High Power Picosecond Carbon Dioxide Laser based on Injection Seeded Unstable Resonator (C)**
Joseph Penano, Naval Research Laboratory
- 1200 **Lunch**
- 1245 **DEPS Annual Report**

THURSDAY MORNING**HPM and CDEW**

Westin Mediterranean Room II (Limited)

Chair: *Ryan Hoffman*, Navy

- 0800 **High-Power Airborne Microwave Optimization Tool (D)**
Bonnie Johnson, Naval Postgraduate School
- 0830 **Recent Results of Silicon-based Photoconductive Solid-State Switches for 500-kHz Continuous Pulse-Repetition-Frequency (C)**
Noah Kramer, University of Missouri Kansas City
- 0900 **A Measurement System for, and Introduction of Materials with Expected RF Power Dependent Complex Permittivity and Permeability (C)**
John Lancaster, University of Missouri Kansas City
- 0930 **Solid-State Material Development for Counter-HPM Applications S (C)**
Stephan Young, University of Missouri - Kansas City
- 1000 **Break**
- 1030 **The Directed Energy Test Science and Technology Non-Intrusive HPM Sensor Program (A)**
Jeffrey Schleher, American Systems
- 1200 **Lunch**
- 1245 **DEPS Annual Report**

Non-DoD Applications: Power Beaming

Westin Mediterranean Room III (Limited/Open)

Chair: *Peter Weiland*, Radiance Technologies

- 1330 **Directed Energy for Wireless Power Beaming in Space-borne Applications (D)**
Hooman Kazemi, Raytheon Space and Airborne Company
- 1400 **Progress in Microwave Power Transmission - W.C. Brown Re-Visited (A)**
James McSpadden, Raytheon
- 1430 **Power Beaming to an Energy Storage Air Ship (A)**
Daniel O'Neil, National Aeronautics and Space Administration (NASA)
- 1500 **Break**
- 1530 **Directed Energy Commercialization: The International Beams-2-Biotech Private-Public Partnership (A)**
Paul Shirley, WAVE
- 1600 **Pulse Power for Rock Excavation (A)**
Peter Weiland, Radiance Technology
- 1630 **Directed Energy for Planetary Defense and Asteroid Manipulation (A)**
Travis Brashears, UCSB Physics Dept.
- 1700 **Directed Energy: Enabler of Human Expansion into the Solar System (A)**
Edward (Sandy) Montgomery, MontTech, LLC

Modeling & Simulation 2

Westin Mediterranean Room IV (Limited/Open)

Chair: *Susan Johnson*, USASMDC/ARSTRAT

- 1330 **Directed Energy Models and Effects Repository Tutorial (C)**
Grady Patterson, XL Scientific
- 1400 **Integrated Weapon Concept Analysis: An Iterative Approach to the M&S Pyramid (C)**
Linda Lamberson, Air Force Research Laboratory - Directed Energy Directorate
- 1430 **Polarimetric Monte Carlo Modeling of Spherical Particles in the Atmosphere (C)**
Brett Hokr, US Army Space and Missile Defense Command
- 1500 **Break**
- 1530 **DE Weaponing: The Road to JMEmS (C)**
Linda Lamberson, Air Force Research Laboratory - Directed Energy Directorate
- 1600 **Jittered Uniform Annular Beams (A)**
Charles Albers, Radiance Technologies
- 1630 **Predictive Thermal Model for Phase Change within Steel Heated by Laser Energy (A)**
Noah Siegel, United States Military Academy

Ultra Short Pulse Laser 2

Westin Mediterranean Room V (Limited/Open)

Chair: *Joseph Penano*, Navy Research Laboratory

- 1330 **Beaconless AO Technique for Beam Control of the Ultra-Short Pulse Laser (C)**
Vladimir Markov, Advanced Systems & Technologies, Inc.
- 1400 **Air Lasing through Femtosecond Filamentation (A)**
Pavel Polynkin, College of Optical Sciences, University of Arizona
- 1430 **High Power Picosecond Carbon Dioxide Laser: Modeling and Design (A)**
Luke Johnson, Naval Research Laboratory
- 1500 Break
- 1530 **Scintillation Statistics in Optically Nonlinear, Turbulent Atmosphere (A)**
John Palaastro, Naval Research Laboratory
- 1600 **Extreme Light Interactions with Liquid Targets at Relativistic Conditions (A)**
William Roquemore, Aerospace Systems Directorate AFRL

Tour of NASA Facilities

Please join us for an optional tour of NASA Marshall Space Flight Center on Friday, 17 February from 0830-1130. NASA Marshall has been at the forefront of US Space exploration having launched the first US satellite on the Redstone Rocket in 1958. The tour will highlight the historical significance of Marshall and also cover its current missions such as the Operational Support Center for the International Space Station and the facilities associated with the development and testing of the SLS.

A bus will pick up tour participants at the hotel lobby main entrance at 0800 and should have everyone back to the hotel by noon.

Education Workshop 2

Westin Mediterranean Room II (Limited/Open)

Chair: *Harro Ackerman*, HEL JTO

- 1330 **Wavefront Sensor for the Midwave Infrared Region (C)**
Thomas Meissner, Rose-Hulman Institute of Technology
- 1350 **Metamaterial-Enhanced Resistive Wall Amplifier (A)**
Tyler Rowe, University of Wisconsin-Madison
- 1410 **Bandgap Dependence of Particle Induced CW Laser Damage (A)**
Andrew Brown, University of Minnesota
- 1430 **Atomic Vapor Laser Isotope Separation**
Thomas Parker, US Military Academy
- 1450 **Modified Wafer-Level Segmented Contact Method (A)**
Daniel Lauriola, Rose-Hulman Institute of Technology
- 1510 Break
- 1530 **Illumination Module for Particle Image Velocimetry (PIV) (A)**
Serang Park, Rose-Hulman Institute of Technology
- 1600 **Development of Low Pressure High Density Plasmas on the Helicon Plasma Experiment (HPX) (A)**
Anita Green, US Coast Guard Academy
- 1620 **Implementation of External Magnetic Fields to Create Low Pressure High Density Plasmas on the Helicon Plasma Experiment (HPX) (A)**
Jordon Hopson, US Coast Guard Academy
- 1640 **Spectrometer Development in Support of Thomson Scattering Investigations for the Helicon Plasma Experiment (HPX) (A)**
Eva Sandri, US Coast Guard Academy

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