

# 2020 Propulsion and Power Program Review

Dr. Mitat Birkan | October 5-8, 2020 | Virtual

## Agenda Day 1 | Monday, October 5, 2020

Time	Topic	Speaker
11:00-11:30	Zoom Login	
11:30-12:00	INTRODUCTION	
THEME: Low-cost, networked cruise missiles and smart munitions, and propellants (2030 USAF Science and Technology Strategy)		
12:00-13:30	Piezoeenergetics Coupled Piezoelectric and Nanoenergetic Materials with Adaptable and Tailorable Reactivity	2018 MURI: Son, Steven (PI-Purdue), Yetter, Wang, Duin (Penn State), Zhou (Georgia Tech), Zacharia (UC-Riverside), Sehirlioglu (Case Western)
13:30-14:00	DISCUSSION	
14:00-14:30	BREAK	
14:30-14:50	More than Piezoelectricity: Harnessing Electroactive Materials for Function	Groven, Lori (SDSMT)
14:50-15:10	Exploratory Study of the Decomposition and Combustion Process of Ionically Conducting Gel and Solid Propellants	Young, Greg (VA Tech)
15:10-15:30	Laser Spectroscopy for Nano- and piezo-energetics	Goldenstein, Christopher (Purdue)
15:30-15:50	DISCUSSION	
15:50-16:20	BREAK	
THEME: Electromagnetic pulse attacks on critical infrastructure (EXECUTIVE OFFICE OF THE PRESIDENT)		
16:20-17:20	Plasma-Based Reconfigurable Photonic Crystals and Metamaterials	2014 MURI: Cappelli, Mark (PI-Stanford), Hopwood (Tufts), Randall (PennState), Raja (UT Austin), Shumlak (Univ. of Washington), Wirz (UCLA)
17:20-17:40	DISCUSSION	
1740	MEETING ADJOURNED FOR THE DAY	

Agenda Day 2   Tuesday, October 6, 2020		
Time	Topic	Speaker
10:30-11:00	Zoom Login	
THEME: Small satellites and low-cost launch (2030 USAF Science and Technology Strategy), cislunar environment to exercise selected space superiority (Future of Space 2060)		
11:00-11:30	AFRL In-Space Propulsion Branch Electric Propulsion Program – Electrospays and High Power EP	Eckhard, Daniel (AFRL / RQRS)
ELECTROSPRAYS		
11:30-11:50	Mass and Charge Evolution in Electro spray Plumes for High Delta-V Thrusters	Wirz, Richard (UCLA)
11:50-12:10	Electro spray Plume Dynamics in the Near-extraction region	Davis, McKenna (NDSEG Fellow, UCLA)
12:10-12:40	BREAK	
12:40-13:10	Designing High Molecular Weight Ionic Liquids for In-Space Propulsion	Ghiassi, Kamran (AFRL / RQRP)
13:10-13:30	Modeling of Ion-Emitting Taylor Cones for Electro spray Propulsion	Gamero-Castano, Manuel (UCI)
13:30-13:50	A New Facility for Electro spray Propulsion Studies with Spatial Resolution of the Full Beam and High-Resolution Mass Analysis	De La Mora, Juan (Yale University)
13:50-14:10	DISCUSSION	
14:10-14:40	BREAK	
14:40-15:00	Electro-Active Polymers for Robust and Flexible Electro spray Propulsion	Lozano. Paulo (MIT)
15:00-15:20	Investigation of Ionic Liquid Monopropellant Plasma using Optical Diagnostics	Lemmer, Kristina (Western Michigan University)
15:20-15:40	Combustion Mechanisms of HAN-based Green Monopropellants	Shafirovich, Evgeny (UTEP)-HBCU
15:40-16:10	DISCUSSION / BREAK	
16:10-16:30	Physics of Beamed-Microwave Plasmas in Supersonic Flows	Micci, Michael: Bilen, Sven (Penn State)
16:30-17:00	DISCUSSION / BREAK	
1700	MEETING ADJOURNED FOR THE DAY	

Agenda Day 3   Wednesday, October 7, 2020		
Time	Topic	Speaker
10:30-11:00	Zoom Login	
THEME: Advanced space-related power and propulsion capabilities (EXECUTIVE OFFICE OF THE PRESIDENT)		
PLASMA PROPULSION		
Airbreathing Electric Propulsion for Very Low Earth Orbit		
11:00-11:30	Tightly Coupled Multi-physics Modeling of High Power Electric Propulsion for Very Low Earth Orbit	Martin, Robert(AFRL / RQRS)
11:30-11:50	Comprehensive Study of Plasma-Wall Sheath Transport Phenomena, and Ionization and Acceleration of N2/O2 Mixtures for Air-Breathing Electric Propulsion	Walker, Mitchell (Georgia Tech)
11:50-12:10	Developing Methods of Control of Self-Organized Plasma Structures in Devices Relevant to Electric Propulsion, and Electron-Beam Generated ExB Plasma for Air-Breathing Propulsion	Raitses, Yevgeny (Princeton University)
12:10-12:30	Hot Magnetized Plasma Acceleration Devices and Modes for Agile Plasma Thrusters	Cappelli, Mark (Stanford University)
12:30-13:00	DISCUSSION	
13:00-13:30	BREAK	
Time-resolved Experimental Observations of the Plasma State Combined with Machine Learning Algorithms		
13:30-13:50	Data-Driven Calibration Model for Hall Effect Thruster Dynamics	Greve, Christine (NDSEG Fellow, TAMU)
13:50-14:10	Data-driven Models for Prediction and Control of Plasma Processes and Applications with Poorly Understood Physics	Jorns, Benjamin (Univ. of Michigan-YIP)
14:10-14:30	Rapid Optimization of Non-Equilibrium Plasmas using New Breakthroughs in Data Science	Little, Justin (Univ. of Washington-YIP)
14:30-14:50	DISCUSSION	
14:50-15:20	BREAK	
15:20-15:40	Experiment, Modeling, and Simulation of Advanced Materials - Plasma Interactions in the Space Environment	Rovey, Joshua (UIUC)

<b>15:40-16:00</b>	Coherent Structures in Magnetized ExB Discharges and Mechanism(s) of the Anomalous Electron Current	Smolyakov, Andrei (University of Saskatchewan)
<b>16:00-16:20</b>	Exploring New Concepts Towards Multi-mode Low-power Robust Electric Propulsion	Keidar, Michael (George Washington University)
<b>16:20-16:40</b>	<b>DISCUSSION / BREAK</b>	
<b>16:40</b>	<b>MEETING ADJOURNED FOR THE DAY</b>	

Agenda Day 4   Thursday, October 8, 2020		
Time	Topic	Speaker
12:30-13:00	Zoom Login	
STRUCTURAL BATTERIES		
13:00-13:40	Morphological and Interfacial Effects in Aramid-Graphene Composites for Structural Energy and Power	
13:40-14:00	Designing Structural Batteries with High Energy Density and Enhanced Safety	
14:00-14:30	DISCUSSION / BREAK	
OTHER		
14:30-14:50	Prediction of Basic Operation of Electro-Spray Thrusters Using High Fidelity Modeling	Boyd, Iain (University of Colorado)
14:50	MEETING ADJOURNED	