

45th AIAA Plasmadynamics and Lasers Conference 2014

Held at the AIAA Aviation Forum 2014

**Atlanta, Georgia, USA
16-20 June 2014**

ISBN: 978-1-63266-944-5

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

The contents of this work are copyrighted and additional reproduction in whole or in part are expressly prohibited without the prior written permission of the Publisher or copyright holder. The resale of the entire proceeding as received from CURRAN is permitted.

For reprint permission, please contact AIAA's Business Manager, Technical Papers. Contact by phone at 703-264-7500; fax at 703-264-7551 or by mail at 1801 Alexander Bell Drive, Reston, VA 20191, USA.

TABLE OF CONTENTS

LASER PHYSICS

Laser Generated Plasma Using a Dual Pulse Approach with Application to Laser Ignition (AIAA 2014-2071)	1
<i>Ciprian Dumitrasche, Azer Yalin, Mikhail Shneider</i>	
Shock Train Formation in COIL Lasers (AIAA 2014-2072)	10
<i>Ilya A. Zilberter, Jack R. Edwards</i>	
Effect of Ionization Waves on Propagation of a Laser-supported Detonation Wave (AIAA 2014-2073)	23
<i>Kohei Shimamura, Hiroyuki Koizumi</i>	
Development of a Photonic Crystal Fiber Delivery System for Laser Ignition in Engines (AIAA 2014-2074)	28
<i>Ciprian Dumitrasche, Jordan Rath, Azer Yalin, Sreenath Gupta</i>	

DIAGNOSTICS I

Emission Spectroscopy Characterization of Thermal Protection System Materials in Arc-Heated Flows (AIAA 2014-2112)	36
<i>Douglas A. Codron, Brett A. Cruden, Thanh S. Ho</i>	
Time-Resolved Electron Temperature and Number Density Measurements in a Nanosecond Pulse Filament Discharge Using Thomson Scattering (AIAA 2014-2113)	49
<i>A. Roettgen, I.V. Adamovich, W.R. Lempert</i>	
Radar REMPI Measurements of N₂ Rotational Temperature (AIAA 2014-2114)	72
<i>Sean McGuire, Richard B. Miles</i>	
Measurement of Continuum Breakdown During Disc Spindown in Low Pressure Air (AIAA 2014-2115)	80
<i>Tathagata Acharya, Jordan Falgoust, Michael James Martin, Richard Eric Rasmussen</i>	

PLASMA-BASED FLOW CONTROL I

Numerical Simulations Investigating Flow Over Flat Plate Suction Perforations Driven by Dielectric Barrier Discharge Plasma Actuation (AIAA 2014-2116)	94
<i>Philip E. Morgan, Miguel R. Visbal</i>	
Application of Linear Sliding Discharges for Flow Control: Study of the Energy Coupling Mechanisms (AIAA 2014-2117)	116
<i>P. Castera, P.-Q. Elias, C.O. Laux</i>	
Nanosecond Pulsed Discharge Plasma Actuation: Characteristics and Flow Control Performance (AIAA 2014-2118)	129
<i>Yun Wu, Yinghong Li, Hua Liang, Jun Li</i>	
Effect of Dielectric Material on Thermal Effect Produced by ns-DBD Plasma Actuator (AIAA 2014-2119)	150
<i>R. Winkel, G. Correale, M. Kotsonis</i>	

ADVANCED CONCEPTS AND ADVANCED COMPUTATIONAL MODELING OF PLASMAS AND LASERS

Modeling of an Electric Propulsion System: Towards a Hybrid System (AIAA 2014-2233)	164
<i>Alex G. Christou, Manish Jugroot</i>	
Laser Space Communication Concept for Deep-Space Interplanetary Missions Using CubeSats (AIAA 2014-2234)	173
<i>Adarsh Rajguru</i>	
Modeling of Non-equilibrium Plasmas in an Inductively Coupled Plasma Facility (AIAA 2014-2235)	201
<i>W. Zhang, A. Lani, H.B. Chew, M. Panesi</i>	
Normal Glow Discharge with Axial Magnetic Field in Molecular Hydrogen (AIAA 2014-2236)	221
<i>S.T. Surzhikov, J. Shang</i>	
A Three-Dimensional Numerical Study of Supernova Remnant Type-Ia Evolution in an Inhomogeneous Interstellar Medium (AIAA 2014-2238)	239
<i>M.V. Ermishkin, S.T. Surzhikov</i>	

PLASMA AND LASER ENHANCED COMBUSTION/PROPULSION

Large Eddy Simulation of Nanosecond Plasma Enhanced Ignition of H₂ Jets Injected Into Supersonic O₂ Crossflow (AIAA 2014-2239).....	258
<i>Sharath Nagaraja, Liwei Zhang, Vigor Yang</i>	
Effects of a Microwave Induced Argon Plasma Jet on Premixed and Nonpremixed Methane/Air Mixtures (AIAA 2014-2240).....	285
<i>C.A. Fuh, W. Wu, C. Wang</i>	
Influence of Excited Oxygen Generated by a RF Plasma Discharge on Atmospheric Partially-Premixed CH₄/O₂ and H₂/O₂ Flames (AIAA 2014-2241).....	297
<i>K. Zähringer, K. Plivavka, D. Thévenin, N. Kuntner, U. Riedel</i>	
Characterization of a Spark Ignition System for Flameholding Cavities (AIAA 2014-2242).....	309
<i>Stefan Brieschenk, Quentin Pontalier, Duffaut Alexandre, Zachary J. Denman, Anand Veeraravagan, Vincent Wheatley, Michael Smart</i>	
Code Development to Determine the Temperature from the OH* Chemiluminescence Recordings in a Supersonic Combusting Flow (AIAA 2014-2243)	326
<i>Tamara Sopek, Stefan Brieschenk, Philippe Lorrain, Timothy J. McIntyre, Russell R. Boyce</i>	
Two Dimensional OH Radical Measurements in Argon Plasma-Assisted Combustion Flame of Premixed and Nonpremixed Methane/Air Mixtures Using Cavity Ringdown Spectroscopy (AIAA 2014-2244).....	336
<i>W. Wu, C.A. Fuh, C. Wang</i>	
Hydrogen Plasma Assisted Ignition by NS discharge behind Reflected Shock Wave (AIAA 2014-2245).....	349
<i>Andrey Yu. Starikovskiy</i>	

AERO-OPTICS I

Aero-Optical Evaluation of Notional Turrets in Subsonic, Transonic and Supersonic Regimes (AIAA 2014-2355).....	361
<i>William J. Coirier, Chris Porter, Jennie Barber, James Stutts, Matthew Whiteley, David Goorskey, Richard Drye</i>	
Aero-Optic Characterization of Supersonic Boundary Layers in the Trisonic Gasdynamics Facility (AIAA 2014-2356)	385
<i>Donald J. Wittich III, Michael Paul, Hamza Ahmed, Anwar Ahmed, Adam Smith, Stanislav Gordeyev</i>	
Low-Dimensional Dynamics and Modeling of Shock-Separation Interaction over Turrets at Transonic Speeds (AIAA 2014-2357)	395
<i>Alexander Vorobiev, Stanislav Gordeyev, Eric Jumper, Sivararam Gogineni, Alexis Marruffo, Donald J. Wittich III</i>	
Investigation of Turbulent Shock Boundary Interaction Unsteadiness and Its Effects on Aero-Optics in a Mach 2 Ramp Flow (AIAA 2014-2358).....	413
<i>Michael D. White, Miguel R. Visbal</i>	

RE-ENTRY AND SPACECRAFT CONCEPTS

Characterization of Stagnation-Point Heat Flux for Earth Entry (AIAA 2014-2374)	428
<i>A.M. Brandis, C.O. Johnston</i>	
Numerical Investigation of the Dynamic Triggering of Electrodynamic Aerobraking at High Altitudes Using an Ablator with Alkali Metal (AIAA 2014-2375)	448
<i>Hiroshi Katsurayama, Takashi Abe</i>	
Non-Equilibrium Flow Field of RAM-C II Probe (AIAA 2014-2376)	460
<i>Daniil A. Andrienko, J. Shang, S.T. Surzhikov, George P. Huang</i>	
Effect of the Flight Condition on the Thermochemical Non-Equilibrium Phenomenon for Super-Orbital Reentry Vehicles (AIAA 2014-2377)	477
<i>Hirotaka Otsu, Kazuhiko Yamada, Takashi Abe</i>	
Investigation of Dissociation Phenomena in Nonequilibrium Shock Layers (AIAA 2014-2378).....	486
<i>Alessandro Munafò, Kevin Heritier, M. Panesi</i>	
USV3 Aerodynamics Assessment: A Step Forward in the Ongoing Design Phase (AIAA 2014-2379).....	505
<i>D. Cinquegrana, F. Petrosino, G. Pezzella, F. Capizzano, G. Andreutti, P. Catalano, M. De Stefano Fumo</i>	

RADIATION/AERO-OPTICS II

On View-Factor Approach for Radiation Transfer Equation (AIAA 2014-2488).....	516
<i>Daniil A. Andrienko, S.T. Surzhikov, J. Shang, George P. Huang</i>	
Radiation Transport Analysis of Emission Spectroscopic Measurements in the Plenum Region of the NASA IHF Arc Jet Facility (AIAA 2014-2489)	533
<i>Michael W. Winter, Dinesh K. Prabhu</i>	

eRC Model for Prediction of Molecular Bands Radiation for Stardust Entry Conditions (AIAA 2014-2490).....	554
<i>S. Surzhikov, J. Shang</i>	
Subsonic Boundary-Layer Wavefront Spectra for a Range of Reynolds Numbers (AIAA 2014-2491).....	578
<i>Adam Smith, Stanislav Gordeyev, Theresa Saxton-Fox, Beverley McKeon</i>	
Simulating Jet Exhaust for Optical Propagation Calculations (AIAA 2014-2492).....	589
<i>Henrik Edefur, Christer Fureby, Markus Henriksson, Oskar Parmhed, Shia-Hui Peng, Stefan Wallin, Niklas Zettervall</i>	
Shack-Hartmann Wavefront Measurements of Supersonic Turbulent Boundary Layers in the TGF (AIAA 2014-2493).....	615
<i>Adam Smith, Stanislav Gordeyev, Hamza Ahmed, Anwar Ahmed, Donald J. Wittich III, Michael Paul</i>	
The Removal of Tunnel Vibration Induced Corruption in Aero-Optical Measurements (AIAA 2014-2494).....	627
<i>Nicholas De Lucca, Stanislav Gordeyev, Adam Smith, Eric Jumper, Matthew Whiteley, Tyler Neale</i>	

DIAGNOSTICS II

The Combined Use of the Schlieren Effect and the Absorption Spectroscopy for the Velocimetry of Supersonic and Hypersonic Flows (AIAA 2014-2535).....	638
<i>Danilo Almeida Machado, Antonio Carlos de Oliveira, Dermeval Carinhana Junior</i>	
Experimental Setup for Vacuum Ultraviolet Spectroscopy for Earth Re-entry Testing (AIAA 2014-2536).....	646
<i>Tobias Hermann, F. Zander, Hannes Fulge, S. Lohle, S. Fasoulas</i>	
Aerothermodynamic Investigation of Inductively Heated CO₂ Plasma Flows for Mars Entry Testing (AIAA 2014-2537).....	663
<i>T. Marynowski, S. Lohle, F. Zander, A. Meindl, S. Fasoulas</i>	
Rayleigh and Thomson Scattering Diagnostics of Laser Air Sparks: A Testbed for Tailoring Laser Plasmas (AIAA 2014-2538).....	682
<i>Christopher M. Limbach, Richard B. Miles</i>	
Characterization of an Electron Gun Based on a Pseudospark for Application in Hypersonic Shock Tunnels (AIAA 2014-2539).....	696
<i>Ana Paula Lasmar Guimarães, Dermeval Carinhana Jr., Antonio Carlos de Oliveira</i>	

DBD ACTUATORS

Properties of Flows Induced by DBD Plasma Actuators with Fine Structural Exposed Electrodes (AIAA 2014-2667).....	703
<i>Hiroki Hagiwara, Satoshi Ogata, Takehiko Segawa</i>	
Development of a Multilevel Plasma Generator for Dielectric Barrier Discharge Actuators (AIAA 2014-2668).....	712
<i>Carlo A. Borghi, Andrea Cristofolini, Filopimin A. Dragonas, Gabriele Grandi, Gabriele Neretti</i>	

SPECIAL SESSION: NATO-RTO-AVT-190, STANDARDIZATION OF DBD ACTUATORS

(RTO) Characterization of the Time-Dependent Behaviour of Dielectric Barrier Discharge Plasma Actuators (AIAA 2014-2807).....	721
<i>Arash Naghib-Lahouti, Rogerio Pimentel, Philippe Lavoie</i>	
Numerical Simulation of Sinusoidal Driven DBD Actuators and Comparisons with Experiments (AIAA 2014-2808).....	732
<i>F. Rogier, G. Dufour, K. Kourtzamidis</i>	
Electromagnetic and Ozone Emissions from Dielectric Barrier Discharge Plasma Actuators (RTO) (AIAA 2014-2809).....	739
<i>Nicole M. Houser, Philippe Lavoie, Rogerio Pimentel, Yves de Villers, Tommy Ringuelette</i>	
Evaluation of Dielectric-Barrier-Discharge Actuator Substrate Materials (AIAA 2014-2810).....	751
<i>Stephen P. Wilkinson, Emilie J. Stochi, Godfrey Sauti, Tian-Bing Xu, Mary Ann Meador, Haiquan Guo</i>	
Understanding SDBD Actuators: An Experimental Study on Plasma Characteristics (AIAA 2014-2811).....	780
<i>R. Geuns, S. Goekce, G. Plyushchev, P. Leyland, Rogerio. Pimentel, A. deChamplain, Y. Jean</i>	
Flow Control at Subsonic Speeds using Serpentine Plasma Actuators (AIAA 2014-2812).....	793
<i>H. Zare-Behtash, K. Kontis, S. Roy</i>	
Author Index	