

Sunday, July 9, 2017

- 13:00-15:00** Public Lecture (open to everybody, in Japanese), Hall
Organized by Department of Aerospace Engineering, Nagoya University
第 31 回国際衝撃波シンポジウム市民講演会
「CHUBU が育てた飛行機とロケット、空を翔ける！」

「CHUBU が作るロケットの話」
三菱重工業(株) 安井正明

「国産旅客機 MRJ (Mitsubishi Regional Jet) を世界の空へ」
三菱航空機(株) 佐倉潔
- 15:00-16:00** Exhibition: Students' Aerospace Activities, Atrium
Organized by Department of Aerospace Engineering, Nagoya University
- 16:00-18:00** Registration & Welcome Cocktail, Gallery

Monday, July 10, 2017

- 8:00-8:45** Registration, Foyer
8:45-9:00 Opening, Hall
Prof. Akihiro Sasoh, Chair, ISSW31
Prof. Tomohide Niimi, Dean, School of Engineering, Nagoya University
- 9:00-9:45** Paul Vieille Lecture, Hall
Chair: Kazuyoshi Takayama
Aerodynamic Testing at Duplicated Hypersonic Flight Conditions with Hyper-Dragon
Prof. Zonglin Jiang^{1,2}, H. Yu²
¹LHD, Institute of Mechanics, Chinese Academy of Sciences, China
²School of Engineering Sciences, University of CAS, China
- 9:55-11:15** Student Competition (1), Hall
Chair & Judge : Patrick Gnemmi, Adrien Lemal
- 9:55-10:15** Characterisation of Curved Axisymmetric Internal Shock Waves
A.A. Filippi, B.W. Skews

*Flow Research Unit, School of Mechanical, Industrial and Aeronautical Engineering,
University of the Witwatersrand, South Africa*

- 10:15-10:35 **Aft-body effects on lip shock-wave laminar free-interaction**
William Schuyler Hinman, Craig T. Johansen
University of Calgary, Canada
- 10:35-10:55 **Numerical Investigation on the Effects of Air Dissociation upon Hypersonic Projectile in Standard Atmospheric Air**
HirotaKa Kasahara, Akiko Matsuo
Keio University, Japan
- 10:55-11:15 **Optimisation and Design of a Fully Instrumented Mach 12 Nozzle for the X3 Expansion Tube**
Pierpaolo Toniato, David Edward Gildfind, Peter Albert Jacobs, Richard Gareth Morgan
School of Mechanical and Mining Engineering, University of Queensland, Australia
- 9:55-11:15 Student Competition (2), Symposium**
Chair & Judge: Daniel Livescu, Jan Martinez Schramm
- 9:55-10:15 **Contribution to the Development of a Fast Running Method for Blast Waves Propagation**
Julien RIDOUX¹, Nicolas Lardjane¹, François Coulouvrat², Laurent Monasse³
¹*CEA, France*
²*Institut Jean Le Rond d'Alembert, Université Pierre et Marie Curie, France*
³*CERMICS, CEA, France*
- 10:15-10:35 **Direct Numerical Simulations of Interaction Between Planar Shock Wave and Homogeneous Isotropic Turbulence at Low Turbulent Mach Number**
K. Tanaka¹, T. Watanabe¹, K. Nagata¹, A. Sasoh¹, Y. Sakai¹, T. Hayase²
¹*Nagoya University, Japan*
²*Tohoku University, Japan*
- 10:35-10:55 **The Reflection of Cylindrical Shock-Wave Segments on Cylindrical Wall Segments**
Bright Bekithemba Ndebele, Beric Skews
Flow Research Unit, University of the Witwatersrand, South Africa
- 10:55-11:15 **Geometrical perception of convex surface reflections**
Meital Geva, Omri Ram, Oren Sadot, Gabi Ben-Dor
Pearlstone Center for Aeronautical Engineering Studies, Department of Mechanical Engineering, Faculty of Engineering Sciences, Ben-Gurion University of the Negev, Israel
- 9:55-11:15 Student Competition (3), Room A**
Chair & Judge: Eric Johnsen, Vincent Wheatley
- 9:55-10:15 **Numerical Investigation of P-M Flow with Condensation in Large-Scale Domain by**

GPU-Accelerated Solver

Luying Wang, Wei Ran, Fenghua Qin, Xisheng Luo

Department of Modern Mechanics, University of Science and Technology of China, China

10:15-10:35 **Interaction of Cylindrical Converging Shock Wave with SF₆ Gas Bubble**

Yu Liang, Zhigang Zhai, Xisheng Luo

Department of Modern Mechanics, University of Science and Technology of China, China

10:35-10:55 **Numerical study on the single-mode Richtmyer-Meshkov instability in a cylindrical geometry**

Lili Liu, Juchun Ding, Zhigang Zhai, Ting Si, Xisheng Luo

Department of Modern Mechanics, University of Science and Technology of China, China

10:55-11:15 **The Evolution of a Square SF₆ Gas Cylinder Impacted by a Converging Shock Wave**

C. Zheng, Z. Chen, H. Zhang, S. Zhu

Key Laboratory of Transient Physics, Nanjing University of Science and Technology, China

9:55-11:15 Student Competition (4), Room B

Chair & Judge: Susumu Kobayashi, Yunfeng Liu

9:55-10:15 **Laboratory Simulation of Explosions Using Conical Shock Tubes**

Obed Samuelraj Isaac, Jagadeesh Gopalan

Department of Aerospace Engineering, Indian Institute of Science, India

10:15-10:35 **Optimising the X3R Reflected Shock Tunnel Free-Piston Driver for Long Duration Test Times**

Samuel J Stennett, David E Gildfind, Peter A Jacobs

Centre for Hypersonics, The University of Queensland, Australia

10:35-10:55 **Driver Condition Development for High Enthalpy Operation of the X3 Expansion Tube**

Andreas Andrianatos, David Gildfind, Richard Morgan

Centre for Hypersonics, School of Mechanical and Mining Engineering, University of Queensland, Australia

10:55-11:15 **Revisiting Shock Propagation in a Temperature Gradient**

Sembian Sundarapandian, Michael Liverts, Nicholas Apazidis

KTH - Royal Institute of Technology, Sweden

9:55-11:15 Student Competition (5), Room C

Chair & Judge: David Mee, Shlomi Pistinner

9:55-10:15 **CO and H₂O Time-histories in a Shock-heated H₂S/CH₄ Blend near Atmospheric Pressure**

Clayton R Mulvihill, Olivier Mathieu, Eric L Petersen

Department of Mechanical Engineering, Texas A&M University, USA

- 10:15-10:35 **Numerical Study of Hydrogen-Air Detonation in Vibrational Nonequilibrium**
L.S. Shi¹, P. Zhang¹, C.Y. Wen¹, H. Shen², M. Parsani², D.L. Zhang³
¹*The Hong Kong Polytechnic University, Hong-Kong*
²*King Abdullah University of Science and Technology (KAUST), Computer Electrical and Mathematical Science and Engineering Division (CEMSE), Extreme Computing Research Center (ECRC), Saudi Arabia*
³*State Key Laboratory of High Temperature Gas Dynamics, Institute of Mechanics, Chinese Academy of Sciences, China*
- 10:35-10:55 **Investigation on Vibrational Nonequilibrium Effect on ZND detonation model**
Ken C. K. Uy, L. S. Shi, C. Y. Wen
The Hong Kong Polytechnic University, Hong Kong
- 10:55-11:15 **Application of NO Laser Induced Fluorescence in JF-10 Detonation-Driven Shock Tunnel**
H. Yan^{1,2}, S. Zhang¹, X. Yu^{1,2}
¹*State Key Laboratory of High Temperature Gas Dynamics, Institute of Mechanics, Chinese Academy of Sciences, China*
²*School of Engineering Science, University of Chinese Academy of Sciences, China*
- 11:15-11:35 **Coffee Break, Atrium**
- 11:35-12:35 **Student Competition (6), Hall**
Chair & Judge: Patrick Gnemmi, Adrien Lemal
- 11:35-11:55 **Flow-field for an Accelerating Axisymmetric Body**
I. Mahomed¹, H. Roohani¹, B.W. Skews¹, I.M. A. Gledhill²
¹*University of the Witwatersrand, Flow Research Unit, Johannesburg, Gauteng, South Africa*
²*CSIR, Pretoria, Gauteng, South Africa*
- 11:55-12:15 **Prediction of Stagnation-Point Radiative Heating for FIRE II**
S. M. Jo, G. Park, O. J. Kwon
Department of Aerospace Engineering, Korea Advanced Institute of Science and Technology (KAIST), South Korea
- 12:15-12:35 **Initial testing of a 2m Mach-10 free-piston Shock tunnel**
Junmou Shen, Handong Ma, Chen Li, Xing Chen, Zhixian Bi
Second Institute, China Academy of Aerospace Aerodynamics, China
- 11:35-12:35 **Student Competition (7), Symposium**
Chair & Judge: Daniel Livescu, Jan Martinez Schramm

- 11:35-11:55 **Measurement of Velocity Fluctuations and Overpressure of Spherical Shock Wave in Grid Turbulence**
K. Inokuma, S. Nishio, T. Watanabe, K. Nagata, A. Sasoh, Y. Sakai
Nagoya University, Japan
- 11:55-12:15 **Upstream Pressure Induced MR-RR Shock Transitions**
R. Arun Kumar, G. Rajesh
Department of Aerospace Engineering, IIT Madras, India
- 12:15-12:35 **Investigation of an Expansion Fan/Shock Wave Interaction between High Aspect Ratio Wedges**
L. Nel¹, B. Skews²
¹ *Aeronautic Systems Competency, Defence Peace Safety and Security, Council for Scientific and Industrial Research, Meiring Naudé Road, Pretoria, 0001, South Africa*
² *Flow Research Unit, School of Mechanical, Industrial and Aeronautical Engineering, University of the Witwatersrand, South Africa*
- 11:35-12:35 Student Competition (8), Room A**
Chair & Judge: Eric Johnsen, Vincent Wheatley
- 11:35-11:55 **Numerical study of dusty shock reflection over a double wedge**
Jingyue Yin, Juchun Ding, Xisheng Luo
Advanced Propulsion Laboratory, Department of Modern Mechanics, University of Science and Technology of China, China
- 11:55-12:15 **Large Eddy Simulation of Expansion Wave Diffraction**
Z. Shaikh, B.W. Skews
Flow Research Unit, School of Mechanical, Industrial and Aeronautical Engineering, University of the Witwatersrand, South Africa
- 12:15-12:35 **Jetting in Strong Shock Reflections Through Low Isentropic Exponent Gases: Experiments and Navier-Stokes Simulations**
S. SM. Lau-Chapdelaine, Q. Xiao, M. I. Radulescu
University of Ottawa, Canada
- 11:35-12:35 Student Competition (9), Room B**
Chair & Judge: Susumu Kobayashi, Yunfeng Liu
- 11:35-11:55 **Numerical analysis of surface heat flux in a forward facing cavity**
Sudarshan B¹, Saravanan S²
¹ *Department of Aerospace Engineering, Indian Institute of Science, India*
² *Assistant Professor, B.M.S. College of Engineering, India*

²*Department of Aerospace Engineering, Indian Institute of Science, India*

11:55-12:15 **Effect of Dielectric Barrier Discharge Plasma Actuators (DBD-PA) on Boundary Layer Separation Control in Hypersonic Flows**

Snehal U M, Mohammed Ibrahim, G. Jagadeesh

Indian Institute of Science Bangalore, India

12:15-12:35 **Shock wave propagation through a series of perforated plates**

O. Ram, G. Ben-Dor, O. Sadot

Shock Tube Laboratory, Protective Technologies R&D Center, Faculty of Engineering Sciences, Ben-Gurion University of the Negev, Israel

11:35-12:35 Student Competition (10), Room C

Chair & Judge: David Mee, Shlomi Pistinner

11:35-11:55 **Study on Mach stem shape of the asymmetric overall Mach reflection**

Y. Tao, W.D. Liu, X.Q. Fan

Science and Technology on Scramjet Laboratory, National University of Defense Technology, China

11:55-12:15 **Time-Resolved Optical Flow of Supersonic Bevelled Nozzles**

H. D. Lim¹, T. H. New¹, Y. D. Cui², Shengxian Shi³

¹ *Nanyang Technological University, Republic of Singapore*

² *National University of Singapore, Republic of Singapore*

³ *Shanghai Jiao Tong University, People's Republic of China*

12:15-12:35 **Experiments in Supersonic Gaseous Ejector using 2D PIV Technique**

S. K. Karthick, Srisha M. V. Rao, G. Jagadeesh, K. P. J. Reddy

Department of Aerospace Engineering, Indian Institute of Science, India

12:35-13:35 Poster Session (1) Student Competition & Lunch, Atrium

Judge : Wei Zhao, Randall Paton

Measurement of Temperature Field around Spiked Bodies at Hypersonic Mach Numbers

A. Sneh Deep, B. Yedhu Krishna, C. Gopalan Jagadeesh

Department of Aerospace Engineering, Indian Institute of Science, India

Transmitted wave of shock wave through various materials

Hiroki Henmi¹, Susumu Kobayashi¹, Taketoshi Koita²

¹ *System Engineering, Saitama Institute of Technology, Japan*

² *Mechanical Engineering, Saitama Institute of Technology, Japan*

Experimental Study of Radiation behind Reflected Air Shock Waves

Sota Yamazaki¹, Akira Harasawa¹, Masato Funatsu²

¹*Dept. of Mechanical Science and Technology, School of Science and Technology, Gunma University, Japan*

²*Div. of Mechanical Science and Technology, Graduate School of Science and Technology, Gunma University, Japan*

Effect of Imaging Blurring on 3D Computed Tomography of Chemiluminescence

K. Wang^{1,2}, F. Li¹, X. Yu^{1,2}

¹*State Key Laboratory of High Temperature Gas Dynamics, Institute of Mechanics, China*

²*School of Engineering Science, University of Chinese Academy of Sciences, China*

Experimental Investigate on the Flame-Shock Wave Interactions in a Confined Combustion Chamber

Jianfu Zhao, Lei Zhou, Haiqiao Wei, Dongzhi Gao, Zailong Xu

State Key Laboratory of Engines, Tianjin University, China

Numerical Simulation of Supersonic/Hypersonic Flow for TSTO's Staging Separation

H. Iwafuji¹, Y. Kurata¹, M. Kanazaki¹, T. Fujikawa², K. Yonemoto²

¹ *Tokyo Metropolitan University, Japan*

²*Kyusyu Institute of Technology, Japan*

Shock Train Structures in Rectangular Ducts

F. Gnani, H. Zare-Behtash, C. White, K. Kontis

School of Engineering, University of Glasgow, UK

PLIF-based concentration measurement of OH behind the blast wave emanating from an oxy-hydrogen detonation-driven shock tube

S. K. Karthick, P. R. Rajitha, S. Janardhanraj, Y. Krishna, G. Jagadeesh

Department of Aerospace Engineering, Indian Institute of Science, India

An interaction between shock wave and vortex induced by small volume high pressure shock tube

Tomohiro Maekawa¹, Minoru Yaga¹, Hiroshi Fukuoka², Nao Kuniyoshi³

¹*Mechanical Systems Engineering, University of the Ryukyus, Japan*

²*Mechanical Engineering, National Institute of Technology, Japan*

³*Marine Electronics and Mechanical Engineering, Tokyo University of Marine Science and*

Technology, Japan

Experimental investigation of film cooling technique over a blunt body in hypersonic flow

Sindhu J L K, Mohammed Ibrahim. S, K. P. J. Reddy

Department of Aerospace engineering, Indian Institute of Science, India

Wavefront Aberration in a Laser Beam Induced by Supersonic Flow Field around a Wedge

Sangyoon Lee¹, Mancheol Jeong¹, Minwook Chang¹, In-Seuck Jeung¹, Hyoung Jin Lee²

¹*Department of Mechanical and Aerospace Engineering, Seoul National University, South Korea*

²*LIG Nex1 Co., Ltd., Seoul National University, South Korea*

13:35-14:20 Plenary Lecture, Hall

Chair: Jiming Yang

Experimental studies of shock wave related phenomena at the Ben Gurion University – A Review

Prof. Oren Sadot

Department of Mechanical Engineering, Faculty of Engineering Sciences, Ben-Gurion University of the Negev, Israel

14:30-15:50 Richtmyer-Meshkov Instability (1), Symposium

Chair: Riccardo Bonazza

14:30-14:50 Light/heavy converging Richtmyer-Meshkov instability in a conventional shock tube

L. Biamino¹, **G. Jourdan**¹, L. Houas¹, M. Vandenboomgaerde², D. Souffland²

¹*Aix-Marseille Université, IUSTI, CNRS UMR 7343, France*

²*CEA/DAM/DiF, France*

14:50-15:10 Numerical Study on a Single-mode Interface Impacted by a Converging Shock

Juchun Ding, Zhigang Zhai, Ting Si, Xisheng Luo

Department of Modern Mechanics, University of Science and Technology of China, China

15:10-15:30 Wave Patterns in the Interaction of an Incident Shock with an Elliptic Gas Cylinder

Wenbin Zhang, Liyong Zou

Institute of Fluid Physics, CAEP, People's Republic of China

15:30-15:50 A study of shock-induced, variable density mixing

Swathi M. Mula, Adam A. Martinez, Nick Denissen, **Kathy Prestridge**

Los Alamos National Laboratory, USA

- 14:30-15:50 Diagnostics/Flow Visualization (1), Room A**
Chair: Harald Kleine
- 14:30-14:50 **Temperature Measurement in a Shock Tunnel Using Tunable Diode Laser Absorption Spectroscopy**
M. Kannan, Y. Krishna, G. Jagadeesh and K. P. J. Reddy
Department of Aerospace Engineering, Indian Institute of Science, India
- 14:50-15:10 **Molecular Tagging Velocimetry of NH Fluorescence in a High-enthalpy Rarefied Gas Flow**
S. Zhang¹, X. Yu^{1,2}, H. Yan^{1,2}, H. Huang¹, L. Liu¹
¹*Institute of Mechanics, Chinese Academy of Sciences, P.R.China*
²*School of Engineering Science, University of Chinese Academy of Sciences, P.R.China*
- 15:10-15:30 **Measurements of Jet A Vapor Concentration Using Interband Cascade Laser**
Po-Hsiung Chang¹, Jiun-Ming L¹, Chiang Juay Teo¹, Boo Cheong Khoo¹, Christopher M. Brophy², Robert G. Wright²
¹*National University of Singapore, Singapore*
²*Naval Postgraduate School, USA*
- 15:30-15:50 **Research on the Continuous Rotating Detonation Wave in a Hollow Chamber with Laval Nozzle (fit to presenter's window)**
Shijie Liu, Hailong Zhang, Weidong Liu
Science and Technology on Scramjet Laboratory, National University of Defense Technology, China
- 14:30-15:50 Blast Waves (1), Room B**
Chair: Charles Needham
- 14:30-14:50 **Interaction of a Blast Wave with a Material Interface**
Eric Johnsen¹, M. T. Henry de Frahan²
¹*Mechanical Engineering Department, University of Michigan, USA*
²*National Renewable Energy Laboratory, USA*
- 14:50-15:10 **Effects of Liquid Impurity on Laser-Induced Gas Breakdown in Quiescent Gas: Experimental and Numerical Investigations**
T. Ukai, H. Zare-Behtash, C. White, K. Kontis
School of Engineering, University of Glasgow, UK
- 15:10-15:30 **Attenuation of Blast Wave in a Duct with Expansion Region (Effects of configuration, porous panel, and acoustic material)**
M. Ishiguro, Y. Takakura
Graduate School of Tokai University, Japan
- 15:30-15:50 **Experimental study on Configuration Effects of Supersonic Projectiles in**

Transitional Ballistic Regimes

C. M. Athira, G. Rajesh

Department of Aerospace Engineering, Indian Institute of Technology Madras, India

- 14:30-15:50 Plasmas/ Magnetohydrodynamics (1), Room C**
Chair: Christian Mundt
- 14:30-14:50 **Study of MHD Effects in the High-Enthalpy Shock Tunnel Göttingen (HEG) using a 30T Pulsed Magnet System**
J. Martinez Schramm, K. Hannemann
DLR, Institute for Aerodynamics and Flow Technology, Department Spacecraft Bunsenstrasse 10, Germany
- 14:50-15:10 **An Electrodynamic Aerobraking Experiment in a Rarefied Arc-Heated Flow**
H. Katsurayama¹, N. Fukuda¹, T. Toyodome¹, Y. Katoh¹, K. Tomita², M. Matsui³
¹*Yamaguchi University, Japan*
²*Kyusyu University, Japan*
³*Shizuoka University, Japan*
- 15:10-15:30 **Parametrical Quasi-resonant Amplification of Alfvén Waves in Heat-Releasing Isentropically Unstable Media**
S.A. Belov¹, N.E. Molevich¹, D.I. Zavershinskiy¹, D.S. Ryashchikov¹, S.Yu. Pichugin²
¹ *Department of Physics, Samara National Research University, Russia*
² *Department of Theoretical Physics, Lebedev Physical Institute, Russia*
- 15:30-15:50 **Two-Dimensional MHD Structures in Heat-Releasing Plasma**
D.S. Riashchikov, N.E. Molevich, D.I. Zavershinsky
Samara National Research University, Russia
Lebedev Physical Institute, Russia
- 15:50-16:10 Coffee Break, Atrium**
- 16:10-17:50 Chemical Kinetics, Symposium**
Chair: E. Arunan
- 16:10-16:30 **A Study on Soot Formation Characteristics of a Gasoline Surrogate Fuel Using a Shock Tube**
Yuki Nagata, Kazuhiro Ishii
Department of Mechanical Engineering, Yokohama National University, Japan
- 16:30-16:50 **Shock Tube Study of Nitric Oxide Addition on Ignition Delay Time of n-Dodecane/Air Mixture**
Jiankun Shao, Yangye Zhu, Chris Almodovar, David F. Davidson, Ronald K. Hanson
Department of Mechanical Engineering, Stanford University, USA

- 16:50-17:10 **A Study of the Chemiluminescence of CH*, OH*, C₂* and CO₂* during the Ignition of C₂H₂-O₂-Ar Mixture behind Reflected Shock Waves**
 Vladimir Nikolaevich Smirnov¹, **Anatoly Mikhailovich Tereza**¹, Pavel Aleksandrovich Vlasov^{1,2}, Irina Vladimirovna Zhiltsova¹
¹*Semenov Institute of Chemical Physics, Russian Academy of Sciences, Russia*
²*National Research Nuclear University "MEPhI", Russia*
- 17:10-17:30 **Effect of Dimethyl Methylphosphonate (DMMP) Addition on H₂, CH₄, and C₂H₄ ignition Behind Reflected Shock Waves**
Olivier Emile Mathieu, W. D. Kulatilaka, Eric L. Petersen
Department of Mechanical Engineering, Texas A&M University, USA
- 17:30-17:50 **Ignition Delay Times of Methane and Hydrogen Highly Diluted in Carbon Dioxide**
 Jiankun Shao¹, David F. Davidson¹, **Ronald K. Hanson**¹, Subith Vasu²
¹*Department of Mechanical Engineering, Stanford University, USA*
²*Mechanical & Aerospace Engineering, University of Central Florida, USA*
- 16:10-17:50 Facilities, Room A**
Chair: Herbert Olivier
- 16:10-16:30 **CFD Evaluation and Experiment test of the running time of the Ludwig Tube Quiet Wind Tunnel**
Junmou Shen, Ying Zhang, Dan Wang, Ruiqu Li, Jian Gong
China Academy of Aerospace Aerodynamics, China
- 16:30-16:50 **Development and Performance Study of Shock Tube with Extended Test-time for Materials Research**
Jayaram Vishakantaiah¹, Gowtham Balsubramaniam¹, Subba Rao Keshava²
¹*Shock Induced Materials Chemistry Laboratory, Solid State and Structural Chemistry Unit, Indian Institute of Science, India*
²*Haldipur Hydraulieks, Bangalore – 560091, India*
- 16:50-17:10 **Liquid-Coupled Dual Piston Driver for Small-Scale Impulse Facilities**
Sean O'Byrne, Rhys McCormack, Harald Hermann Kleine
School of Engineering and IT, University of New South Wales, Canberra, Australia
- 17:10-17:30 **Aerodynamic Force Measurement Techniques in JF12 Shock Tunnel**
YF. Liu, YP. Wang, CK. Yuan, CT. Luo, ZL. Jiang
Institute of Mechanics, Chinese Academy of Sciences, China
School of Engineering Sciences, University of Chinese Academy of Sciences, China
- 17:30-17:50 **Development of a Total Enthalpy and Reynolds Number Matched Apollo Re-entry Condition in the X2 Expansion Tunnel**
Timothy G. Cullen, Christopher M. James, Rowan J. Gollan, Richard G. Morgan
School of Mechanical and Mining Engineering, The University of Queensland, Australia

- 16:10-17:50 Blast Waves(2), Room B**
Chair: Manjit Singh
- 16:10-16:30 **An Investigation of Stationary and Moving Cased Charge Detonations in Stone Lined Pipes**
Orlando A. Soto¹, **Joseph D. Baum**¹, Fumiya Togashi¹, Rainald Lohner², Michael E. Giltrud and J. Bell³
¹*Applied Simulations, Inc, USA*
²*George Mason University, USA*
³*Defenses Threat Reduction Agency, USA*
- 16:30-16:50 **Air Blast from a Structural Reactive Material Solid**
Fan Zhang¹, Maxime Gauthier², Cristian V. Cojocaru²
¹*Defence Research and Development Canada, Canada*
²*National Research Council Canada, Canada*
- 16:50-17:10 **Non-Ideal Blast Waves from Particle-Laden Explosives**
Quentin T. Pontalier, M.G. Lhoumeau, **David L. Frost**
Mechanical Engineering Department, McGill University, Canada
- 17:10-17:30 **Experimental and numerical investigation of blast wave interaction with a three level building**
Jacques Massoni¹, Laurent Biamino¹, Georges Jourdan¹, Lazhar Houas¹, **Ozer Igra**²
¹*Aix Marseille University, CNRS, IUSTI, France*
²*Ben Gurion University, Israel; Peter the great St. Petersburg Polytechnic University, Russia*
- 17:30-17:50 **CFD models of shocks and flow fields associated with decelerating spheres in terms of flow history and inertial effects (fit to presenter's window)**
Hamed Roohani¹, Irvy M.A. Gledhill², Beric W. Skews¹
¹*Flow Research Unit, School of Mechanical, Industrial and Aeronautical Engineering, University of the Witwatersrand, South Africa*
²*Aeronautic Systems/Flow Research Unit, School of Mechanical, Industrial and Aeronautical Engineering, CSIR/University of the Witwatersrand, South Africa*
- 16:10-17:50 Supersonic Jet, Room C**
Chair: Takeharu Sakai
- 16:10-16:30 **Numerical Study of Heat Transfer on Confined Under-expanded Impinging Jet from Slot into A Plenum**
Tinglong Huang, **Lianjie Yue**, Xinyu Chang
Institute of Mechanics, Chinese Academy of Sciences, China
- 16:30-16:50 **Exploration of under-expanded free and impinging supersonic jet flows**

David DONJAT, Francois Nicolas, Olivier Leon, Francis Micheli, Guy Le Besnerais, F. Champagnat
ONERA, France

16:50-17:10 **Estimation of the Particle Drag Coefficients for Compressible and Rarefied Flows Using PIV and MTV Data**

Taro Handa¹, Shunsuke Koike², Kohei Imabayashi³

¹*Toyota Technological Institute, Japan*

²*Japan Aerospace Exploration Agency, Japan*

³*Kyushu University, Japan*

17:10-17:30 **PIV studies on the effect of number of lobes in a supersonic ESTS lobed nozzle**

S.K. Karthick, V. Albin, **Srisha M.V. Rao**, G. Jagadeesh

Department of Aerospace Engineering, Indian Institute of Science, India

17:30-17:50 **Hypersonic Flow Computations by Using an Equivalent Gas Model (fit to presenter's window)**

Shlomy Shitrit, Eran Arad

Aeronautical Systems, RAFAEL Advanced Defense Systems LTD., Israel

18:30-18:50 **Grand Sumo Tournament Lecture, Hall**

Prof. Kazuyoshi Takayama

Professor Emeritus of Tohoku University, Japan

18:50-20:50 **Shocking Sound Waves - Concert by Participants, Hall**

Tuesday, July 11, 2017

8:30-9:00 **Registration, Foyer**

9:00-9:45 **Plenary Lecture, Hall**

Chair: Akihiro Sasoh

Shock Compression Spectroscopy Under a Microscope

Prof. Dana D. Dlott

*School of Chemical Sciences and Fredrick Seitz Materials Research Laboratory,
University of Illinois at Urbana-Champaign, USA*

9:55-12:15 **Supersonic and Hypersonic Flows (1), Hall**

Chair: Klaus Hannemann

9:55-10:15 **Pressure Measurements around an Electric Discharge Produced on a Wedge in a**

Supersonic Flow

P. Gnemmi, C. Rey, B. Sauerwein, M. Bastide

French German Research Institute of Saint-Louis (ISL), France

10:15-10:35 **Thermal Spike Conception for Wave Drag Reduction of Blunt Bodies at Different Supersonic Speeds**

P. Georgievskiy, V. Levin

Institute of Mechanics, Moscow State University, Russia

10:35-10:55 **Critical Condition of Bow-Shock Instability around Edged Blunt Body**

N. Ohnishi¹, Y. Inabe¹, K. Ozawa², K. Ohtani²

¹*Department of Mechanical Systems Engineering, Tohoku University, Japan*

²*Institute of Fluid Science, Tohoku University, Japan*

10:55-11:15 **Variation in spanwise direction of transonic buffet on a three-dimensional wing**

Y. Kojima¹, A. Hashimoto², T. Aoyama², M. Kameda¹

¹*Tokyo University of Agriculture and Technology, Japan*

²*Japan Aerospace Exploration Agency, Japan*

11:15-11:35 **Numerical simulation of Laser-Ablation Propulsion Performance for Spherical Capsule**

C. Xie, T. D. Tran, K. Mori

Aerospace Engineering, Nagoya University, Japan

11:35-11:55 **Boundary layer transition measurements on sharp and blunt cones in the T4 Stalker Tube**

David John Mee, Sreekanth Raghunath

Centre for Hypersonics, School of Mechanical and Mining Engineering, The University of Queensland, Brisbane, Australia

11:55-12:15 **Shock Shape Transition on Spherically Blunted Cones in Hypersonic Flows**

Jan Martinez Schramm¹, Hans G Hornung², **Klaus Hannemann**¹

¹*German Aerospace Center, DLR, Institute for Aerodynamics and Flow Technology, Germany*

²*GALCIT, Caltech, USA*

9:55-12:15 Detonation and Combustion (1), Symposium

Chair: Victor Golub

9:55-10:15 **Effect of Hydrodynamic Instabilities on the Development of Hydrogen-Air Flames**

N.B. Anikin, V.A. Simonenko, A.V. Pavlenko, A.A. Tiaktev, I.L. Bugaenko, Yu.A. Piskunov

Russian Federal Nuclear Center - Zababakhin All-Russia Research Institute of Technical Physics (RFNC-VNIITF), Russia

10:15-10:35 **Gas Flow with Stabilized Detonation in a Plane Channel**

V. Levin, **T. Zhuravskaya**

Institute of Mechanics, M.V. Lomonosov Moscow State University, Russia

- 10:35-10:55 **The influence of shock reflections on detonation re-initiation**
L. Li¹, C.J. Teo¹, B.C. Khoo¹, J. Li², P.H. Chang²
¹*Department of Mechanical Engineering, National University of Singapore, Singapore*
²*Temasek Laboratories, National University of Singapore, Singapore*
- 10:55-11:15 **Crumpling Behavior of Graphene Oxide in Jet A-1 Vapor in Air and Its Effects on Combustion Process**
Jiun-Ming Li¹, Po-Hsiung Chang¹, Lei Li¹, Yiyuan Liu¹, Van Bo Nguyen¹, **Chiang Juay Teo¹**, Boo Cheong Khoo¹, Van Cuong Mai², Hongwei Duan²
¹*Temasek Laboratories, National University of Singapore, Singapore*
²*School of Chemical and Biomedical Engineering, Nanyang Technological University, Singapore*
- 11:15-11:35 **Decaying Modes of Propagation of Detonation and Flame Front in Narrow Channel**
S. V. Golovastov, G. Yu. Bivol
Joint Institute for High Temperatures of the Russian Academy of Sciences (JIHT RAS), Russia
- 11:35-11:55 **Numerical Study on a Cycle of Liquid Pulse Detonation Engines**
Van Bo NGUYEN¹, Quoc Thien Phan¹, Li Jiun-Ming¹, **Khoo Boo Cheong¹**, Chiang Juay Teo²
¹*Temasek Laboratories, National University of Singapore, Singapore*
²*Department of Mechanical Engineering, National University of Singapore, Singapore*
- 11:55-12:15 **Investigation of High-Frequency Pulse Detonation Cycle with Fuel Phase Transition**
H. Taki¹, K. Takao¹, N. Hirota¹, K. Matsuoka¹, J. Kasahara¹, H. Watanabe², A. Matsuo², T. Endo³
¹*Nagoya University, Japan*
²*Keio University, Japan*
³*Hiroshima University, Japan*
- 9:55-12:15 Shock Wave Reflection/Interaction (1), Room A**
Chair: Oren Sadot
- 9:55-10:15 **Revisiting temperature measurements at the focus of spherically converging shocks in argon**
M. Liverts, N. Apazidis
Mechanics, KTH Royal Institute of Technology, Sweden
- 10:15-10:35 **Interaction of multiple cylindrical expanding shock waves**
S. Qiu¹, N. Amen², V. Eliasson²
¹*Aerospace and Mechanical Engineering, University of Southern California, USA*
²*Structural Engineering, University of California, San Diego, USA*

- 10:35-10:55 **Experimental and numerical investigation of a shock wave propagation through a bifurcation**
A. Marty¹, L. Biamino¹, G. Jourdan¹, E. Daniel¹, J. Massoni¹, L. Houas¹, D. Leriche²
¹*mechanics, CNRS, IUSTI UMR 7343, Aix-Marseille University, France*
²*DGA/Techniques Navales, Avenue de la Tour Royal, France*
- 10:55-11:15 **A Compact High Order Finite Volume Method for Computing Shock Waves on Arbitrary Grids**
Lingquan Li¹, **Hong Luo**¹, Yuxin Ren²
¹*Mechanical and Aerospace Engineering, North Carolina State University, USA*
²*Mechanical and Aerospace Engineering, Tsinghua University, China*
- 11:15-11:35 **Partial Confinement of Detonation Products by Shock Reflection from a Convergent Nozzle Opening**
Y. Schweitzer, Y. Lefler, A. Ravid, D. Sidilkover, S. Pistinner, A. Fedotov-Gefen, G. Lifshitz
Soreq NRC, Israel
- 11:35-11:55 **Shock Interaction on a V-shaped Blunt Leading Edge**
Zhiyu Zhang, Zhufei Li, Fengshou Xiao, Yujian Zhu, Jiming Yang
Department of Modern Mechanics, University of Science and Technology of China, China
- 11:55-12:15 **On Hysteresis at Axisymmetric Curved Shock Reflection from an Axial Cylinder**
B. Shoesmith, E. Timofeev
Mechanical Engineering, McGill University, Canada
- 9:55-11:55 Shock Waves in Solids/Impact and Compaction, Room B**
Chair: Yasuhiro Tanabe
- 9:55-10:15 **Shock wave propagation through heterogeneous cementitious composites**
M. Foglar¹, A. Horska¹, R. Hajek¹, J. Pachman²
¹*Concrete and Masonry Structures, Czech Technical University in Prague, Czech Republic*
²*Department of Energetic Materials, University of Pardubice, Czech Republic*
- 10:15-10:35 **PHASE TRANSITIONS of TITANIUM under DYNAMIC LOADING**
M.V. Zhernokletov, O.N. Aprelkov, **A.E. Kovalev**, M.G. Novikov, L.I. Kanunova, D.N. Zamotaev, A.N. Malyshev, E.V. Koshatova, D.V. Kryuchkov, A.M. Ivin, V.I. Skokov, A.M. Podurets, M.I. Tkachenko, S.N. Ulanov, S.I. Kirshanov, A.B. Mezhevov, O.V. Myasoedov
Russian Federal Nuclear Center – All-Russia Research Institute of Experimental Physics, Institute of Physics of Explosion, Russia
- 10:35-10:55 **RESULTS of INVESTIGATIONS of PHASE TRANSITIONS of SHOCK COMPRESSED METALS**
M.V. Zhernokletov, V.V. Glushchenko, A.E. Kovalev, P.V. Matveev, A.M. Podurets, V.G.

Simakov

*Russian Federal Nuclear Center – All-Russia Research Institute of Experimental Physics,
Institute of Physics of Explosion, Russia*

10:55-11:15

Mathematical modeling of the impact of high-speed metallic plates

S. Vladimirovna Fortova¹, P. Utkin¹, V. Shepelev¹, T. Narkunas²

¹*Institute for Computer Aided Design of the Russian Academy of Sciences, Russia*

²*Moscow Institute of Physics and Technology, Russia*

11:15-11:35

Application of Riemann Solver for Compressible and Non-Expanding Fluid to Impact on Regolith

K. Suzuki

Graduate School of Frontier Sciences, The University of Tokyo, Japan

11:35-11:55

Equation of state and phase transformations of zirconium in shock waves

K. V. Khishchenko

Joint Institute for High Temperatures RAS, Russia

11:55-12:15

Calculation of Intensity Profiles behind a Shock Wave Travelling in Air at speeds exceeding 12 km/s (fit to presenter's window)

A. Lemal, S. Matsuyama, S. Nomura, H. Takayanagi, K. Fujita

JAXA, Chofu Aerospace Centre, Japan

9:55-12:15

Shock Waves in Dense Gases, Room C

Chair: Yoshitaka Sakamura

9:55-10:15

In-pipe aerodynamic characteristics of a projectile in comparison with free-flight for transonic Mach numbers between 0.5 and 1.5

R. Hruschka, D. Klatt

French-German Research Institute of Saint Louis, France

10:15-10:35

Assessment of real gas effects on SCO₂ flows with shock waves

Senthil Kumar Raman, Heuy Dong Kim

Andong National University, South Korea

10:35-10:55

Structure of shock waves in noble gases under high density conditions

Z. A. Walenta, A. M. Słowicka

Institute of Fundamental Technological Research, Polish Academy of Sciences, Poland

10:55-11:15

Selective Shock-Refraction Properties in Non-Ideal Fluids

E. Toubert, N. Alferez

Mechanical Engineering, Imperial College London, United Kingdom

11:15-11:35

Ballistic Range Experiment and Numerical Simulation of Shock Stand-off Distances over Spheres in CO₂

Dongjun Liao, Sen Liu, Jie Huang, Hexiang Jian, Aimin Xie, Zonghao Wang

Hypervelocity Aerodynamics Institute, China Aerodynamics Research and Development

Center, China

11:35-11:55 **A Numerical Investigation of Oblique Shock Waves in Non-Ideal Compressible-Fluid Flows**

G. Gori, D. Vimercati, A. Guardone

Aerospace Science and Technology, Politecnico di Milano, Italy

11:55-12:15 **Singularity formation in the geometry of perturbed shocks of general Mach number**

W. Mostert¹, D.I. Pullin¹, R. Samtaney², **V. Wheatley**³

¹*Graduate Aerospace Laboratories, California Institute of Technology, USA*

²*Mechanical Engineering, King Abdullah University of Science and Technology, Saudi Arabia*

³*School of Mechanical and Mining Engineering, University of Queensland, Australia*

12:15-13:30 **Poster Session (2) & Lunch, Atrium**

Measurement of Plasma Formed by High-speed Impact to Estimate Temperature at Impact Point

Yuta Motoyama¹, Koki Umeda¹, Takanari Sakai¹, Satoshi Kinoshita², Keiko Watanabe²

¹*Department of Advanced Mechanical Engineering and Robotics, Ritsumeikan University, Japan*

²*Department of Mechanical Engineering, Ritsumeikan University, Japan*

Spectral Radiant Intensity Calculation of Air in Shock tube

Jun-Ming Lyu¹, Xiao-Li Cheng¹, Ji-Jun Yu¹, Fei Li², Xi-Long Yu²

¹*China Academy of Aerospace Aerodynamics, China*

²*Institute of Mechanics, Key Laboratory of High Temperature Gas Dynamics, China*

Experimental studies around shock tube for dynamic calibrations of high-frequency pressure transducers

M. Lavayssière, J. Luc, A. Lefrançois

Gramat, CEA, France

Numerical Investigation of the Interaction Between a Planar Shock Wave with a Square Bubble Containing Different Gases

Dan Igra¹, Ozer Igra²

¹*Aerodynamics Group, Rafael, Israel*

²*Department of Mechanical Engineering, Ben Gurion University, Israel*

Propagation Behavior and Mitigation of Shock Wave along Water inside a Rectangular Tube

Yuta Sugiyama¹, Yoshio Nakayama¹, Kaisei Nishimura², Kiyonobu Ohtani³, Akiko Matsuo²

¹*National Institute of Advanced Industrial Science and Technology, Japan*

²*Keio University, Japan*

³*Institute of Fluid Science, Tohoku University, Japan*

Underwater Shock Waves by Explosion in a Closed Space

Kiyonobu Ohtani¹, Toshihiro Ogawa¹, Atsuhiko Nakagawa², Keiichi Nakagawa³

¹*Institute of Fluid Science, Tohoku University, Japan*

²*Department of Neurosurgery, Tohoku University Hospital, Japan*

³*School of Engineering, The University of Tokyo, Japan*

To the Complex Approach to the Numerical Investigation of the Shock Wave – Dense Particles Bed Interaction

Dmitry Alekseevich Sidorenko, Pavel Sergeevich Utkin

Department of the Numerical Methods and the Turbulence, Institute for Computer Aided Design of the Russian Academy of Sciences, Russia

Collision of underwater explosion with compressible porous wall

Kazutaka KITAGAWA¹, Daiki NAGAIHRO¹, Kiyonobu OHTANI², Atsushi ABE³

¹*Mechanical Engineering, Aichi Institute of Technology, Japan*

²*Institute of Fluid Science, Tohoku University, Japan*

²*ITOCHU Techno-Solutions, Japan*

Temperature Distribution Measurement for the Comprehension of the Interaction Phenomena between the Shock Wave and the DC Discharged Field

Kenji Okada¹, Kohei Suwata¹, Takuhiro Kito¹, Atsushi Matsuda¹, Shinji Koizumi²

¹*Meijo University, Japan*

²*DENSO TECHNO Co., Ltd., Japan*

Blast Wave Propagation Affected by Ground Characteristics

Azi Lipshtat, **Shlomi Pistinner**

Soreq Nuclear Research Center, Israel

Experimental Study of Normal Shock Wave-Isotropic Turbulence Interaction Using Counter-Driver Shock Tube

Takahiro Tamba, Masaya Kayumi, Hirokatsu Kawasaki, Hiroki Fujiwara, Akira Iwakawa, Akihiro Sasoh

Department of Aerospace Engineering, Nagoya University, Japan

Passive Control of Hypersonic Separated Flow around Spiked Bodies

G Balakalyani, **G Jagadeesh**

Department of Aerospace Engineering, Indian Institute of Science, India

Strength and Frequency of Underwater Shock Waves Related to Sterilization Effects on a Marine Bacterium

Jingzhu Wang¹, Akihisa Abe², Naoyuki Ito², Kota Nishibayashi²

¹*Key Laboratory for Mechanics in Fluid Solid Coupling Systems, Institute of Mechanics, Chinese Academy of Sciences, China*

School of Engineering Science, University of Chinese Academy of Sciences, China

²*Graduate School of Maritime Sciences, Kobe University, Japan*

Disturbance Waves behind the Shock Propagating through Non-uniform Gas

Fedor Vasilievich Shugaev, **Aleksandr Kalinchenko**

Physics Faculty, Lomonosov Moscow State University, Russia

Measurement and Formulation of Velocity, Attitude and Trajectory of Moving Object Using Magnet-Coil Method for High-Speed Penetration Experiment

Shun Iwata¹, Keiko Watanabe²

¹*Department of Advanced Mechanical Engineering and Robotics, Ritsumeikan University, Japan*

²*Department of Mechanical Engineering, Ritsumeikan University, Japan*

Dust Lofting behind shock waves what is the dominate Lofting Mechanism

Yael Lefler¹, **S. Pistinner**¹, A. Yafe², O. sadot²

¹*Simulations and Diagnostics, Soreq Nuclear Research Center, Israel*

²*Ben-Gurion University of the Negev, Israel*

Influence of Matrix Resin on Impact Resistance of CFRP by a Small Sphere

Toshimitsu Kawai¹, Toshihira Irisawa¹, **Yasuhiro Tanabe**¹, M. Nakayama², A. Yoshimura²

¹*Department of Chemical Engineering, Nagoya University, Japan*

²*Structure / Composite Materials Technology Unit, JAXA, Japan*

Improvement of Impact Resistance of Ceramics by using Resin-based Materials

Shin Yamashita, Takuya Suzuki, S. Fujimori, Toshihira Irisawa, **Yasuhiro Tanabe**

Department of Materials Design Innovation, Nagoya University, Japan

Multiple Reflected Shock Wave in Closed Volume with Granular Screen

Olga Mirova, **Sergey V Golovastov**, Andrey Kotelnikov, Victor Golub, Tatyana Bazhenova

Physical Gas-Dynamics, Joint Institute for High Temperatures of the Russian Academy of Sciences (JIHT RAS), Russia

Schlieren Tomography to Visualise Three Dimensional Supersonic Flows

S Vaisakh, **T M Muruganandam**

Department of Aerospace Engineering, Indian Institute of Technology Madras, India

Numerical Simulation of a Water Column deformation and breakup by Shock Wave

Tomohiro Kamiya, Makoto Asahara, Takeshi Miyasaka

Department of Mechanical Engineering, Gifu University, Japan

Experimental Study on Grid Turbulence Interacting with a Spherical Shock wave

Yasumasa Ito¹, Yudai Ato¹, Yasuhiko Sakai¹, Koji Iwano¹, Koji Nagata², Akihiro Sasoh²

¹*Dept. of Mechanical Systems Engineering, Nagoya University, Japan*

²*Dept. of Aerospace Engineering, Nagoya University, Japan*

Study of Shock Impact Pressure Amplification and Attenuation of Acoustic Waves in E-Glass Material

V. Jayaram¹, **K. R. Kannan**¹, G. Arvind Raj², K. P. J. Reddy²

¹*Shock Induced Materials Chemistry Laboratory, SSCU, Indian Institute of Science, India*

²*LHSR, Department of Aerospace Engineering, Indian Institute of Science, India*

Computations of a Shock Layer Flow with a Vibrational-Specific Kinetics Model

Marie-Claude DRUGUET¹, Arnaud BULTELL², Vincent MOREL³, Julien ANNALORO⁴

¹*CNRS UMR 7343, IUSTI, Aix-Marseille Univ., France*

²*CNRS UMR 6614, CORIA, Normandie University, France*

³*CNRS UPR 3346, PPRIME, ISAE-ENSMA, Poitiers University, France*

⁴*CNES, DCT/TV/PR, France*

13:30-14:15 Plenary Lecture, Hall

Chair: Ronald Hanson

Kinetic Shock Tubes: Recent Developments for the Study of Homogeneous and Heterogeneous Chemical Processes

Dr. Nabiha Chaumeix

Centre national de la recherche scientifique (CNRS), France

- 14:15-15:30** **Subway Transportation from "Nagoya Daigaku" to "Shiyakusyo (City Hall)"**
- 15:30-18:00** **Watching Grand Sumo Tournament, Aichi Prefectural Gymnasium**
- 18:30-20:30** **IAC Dinner Meeting**
- 18:30-** **Student Exchange Program organized by Takahiro Tamba and Nana Mitani**

Wednesday, July 12, 2017

- 8:00-8:30** **Registration, Foyer**
- 8:30-9:15** **Ray Stalker Lecture, Hall**
Chair: Richard Morgan
Legacy at T5
Prof. Joanna M. Austin
California Institute of Technology, USA
- 9:30-19:30** **Excursion (Takayama & Shirakawa-go)**

Thursday, July 13, 2017

- 8:30-9:00** **Registration, Foyer**
- 9:00-9:45** **Plenary Lecture, Hall**
Chair: Jagadeesh Gopalan
Structure and Unsteadiness of Swept-Ramp Shock Wave / Turbulent Boundary Layer Interactions
Prof. Noel T. Clemens
Department of Aerospace Engineering and Engineering Mechanics, The University of Texas at Austin, USA
- 9:55-11:15** **Supersonic and Hypersonic Flows (2), Hall**
Chair: Hideyuki Tanno
- 9:55-10:15** **The role of three-dimensional shock wave interaction in the complex hypersonic**

heating

Chun WANG^{1,2}, Gaoxiang XIANG^{1,2}, Zonglin JIANG^{1,2}, Xudong LI³, Zengmin SHI³

¹*State Key Laboratory of High-temperature Gasdynamics, Institute of Mechanics, Chinese Academy of Sciences, China*

²*Dept. of Aerospace Engineering Science of UCAS, China*

³*Beijing Institute of Aerospace Long March Vehicle, China*

10:15-10:35 **Thermo-structural design of hypersonic vehicle sharp leading edges for thermo-erosive stability using finite element modelling**

Anupam Purwar

Centre of Excellence in Hypersonics, Indian Institute of Science, Bangalore, India

10:35-10:55 **Comparative Heat Flux Measurement of a Sharp Cone between Three Hypersonic Test Facilities at LHD**

Qiu Wang, Song Wu, Jinping Li, Pan Lu, Wei Zhao, Zonglin Jiang, Jiwei Li

¹*State Key Laboratory of High Temperature Gas Dynamics, Institute of Mechanics, Chinese Academy of Sciences, China*

10:55-11:15 **Investigation of the Heat transfer in Hypersonic Flow on Modified Spike Blunt Bodies**

Gopalakrishna N, Saravanan S

Department of Aerospace Engineering, Indian Institute of Science, India

9:55-11:15 Detonation and Combustion (2), Symposium

Chair: Jiro Kasahara

9:55-10:15 **Propagation Mechanism of Detonations in Rough Walled Tube**

Jian Li, Tianwei Yang, Xiahu Wang, Jianguo Ning

State Key Laboratory of Explosion Science and Technology, Beijing Institute of Technology, China

10:15-10:35 **Experimental Research on the Detonation in Gaseous Mixtures with Suspended Aluminum Particles**

Xiaoyuan Zhang¹, Hong Chen^{1,2}, Jinping Li¹, Shizhong Zhang^{1,2}, Hongru Yu^{1,2}

¹*State Key Laboratory of High-Temperature Gas Dynamics, Institute of Mechanics, Chinese Academy of Sciences, China*

²*School of Engineering Science, University of Chinese Academy of Sciences, China*

10:35-10:55 **The Influence of Spatial Heterogeneity in Energetic Material on Non-ideal Detonation Propagation**

Jianling Li¹, Duowang Tan², Hongbin Li¹, Lei Zhao¹, Xiaocheng Mi³, Andrew J. Higgins³

¹*School of Power and Energy, Northwestern Polytechnical University, China*

²*Institute of Fluid Physics, China Academy of Engineering Physics, China*

³*Department of Mechanical Engineering, McGill University, Canada*

- 10:55-11:15 **Flame Propagation over the Heat Absorbing Substrate**
Victor V Golub, Andrei E Korobov, Anton Yu Mikushkin, Vladislav V Volodin
Joint Institute for High Temperatures, RAS, Izhorskaya st. 13 bld. 2, Moscow, 125412, Russia
- 9:55-11:15 Shock/Boundary Layer Interaction (1), Room A**
Chair: Takakage Arai
- 9:55-10:15 **Oxygen Catalytic Recombination on Titanium Surface**
Yosheph Yang, Gisu Park
Aerospace Engineering, Korea Advanced Institute of Science and Technology (KAIST), South Korea
- 10:15-10:35 **Surface Heat Transfer of Tertiary Gas Mixtures with Roughness Controlled**
Kim IkHyun, Gisu Park
Aerospace Engineering, Korea Advanced Institute of Science and Technology, Chinese Academy of Sciences, South Korea
- 10:35-10:55 **Experimental study of ejection of particles from shock-loaded metals**
K. Ten¹, E. Pruel¹, A. Kashkarov¹, I. Rubtsov¹, A. Muzyrya², K. Prosvirnin², G. Rykovanov², E. Smirnov², M. Stolbikov², L. Shekhtman³, V. Zhulanov³, B. Tolochko⁴
¹*Russian Academy of Sciences, Lavrentiev Institute of Hydrodynamics SB RAS, Russia*
²*Russian Federal Nuclear Center, Zababakhin All-Russian Scientific Research Institute of Technical Physics, Russia*
³*Budker Institute of Nuclear Physics SB RAS, Russia*
⁴*Institute of Solid State Chemistry and Mechanochemistry SB RAS, Russia*
- 10:55-11:15 **Numerical Simulations of Transverse Jet in Supersonic Crossflow toward an Understanding of Interaction Mechanism**
Toshihiro Iwasa¹, Keiichiro Fujimoto², Daiki Muto², Nobuyuki Tsuboi³
¹*Kyushu Institute of Technology, Japan*
²*Japan Aerospace Exploration Agency, Japan*
³*Kyushu Institute of Technology, Japan*
- 9:55-11:15 Multiphase Flow (1), Room B**
Chair: Marianne Omang
- 9:55-10:15 **Simulation of shock-bubbles interaction using a four-equation homogeneous model**
Eric Goncalves^{1,2}, Dia Zeidan^{1,2}
¹*ENSMA, Pprime, UPR 3346 CNRS, France*
²*School of Basic Sciences and Humanities, German Jordanian University, Jordan*
- 10:15-10:35 **Surface Jetting Induced by Explosion in Liquid below an Immersed Bubble**

Yujian Zhu, Guifu Zhang, Jiming Yang

Department of Modern Mechanics, University of Science and Technology of China, China

10:35-10:55 **Generation Frequency of Rebound Shock Waves from Bubble Collapses in Cavitation Jet**

Kota NISHIBAYASHI¹, Akihisa ABE¹, Jingzhu WANG²

¹*Graduate School of Maritime Sciences, Kobe University, Japan*

²*Key Laboratory for Mechanics in Fluid Solid Coupling Systems, Institute of Mechanics, Chinese Academy of Sciences, China*

10:55-11:15 **Experimental Study on the Influence of Underwater Explosion Depth on the Disintegration of Thin Resin Plate Attached Microbubbles**

Taketoshi Koita¹, Mingyu Sun², Yoshio Fukushima³, Linshi Guo³, Xilu Zhao³, Susumu Kobayashi³

¹*Faculty of Engineering, Saitama Institute of Technology, Japan*

²*Institute of Fluid Science, Tohoku University, Japan*

³*Graduate School of Engineering, Saitama Institute of Technology, Japan*

9:55-11:15 Shock Waves in Internal Flows (1), Room C

Chair: Khoo Boo Cheong

9:55-10:15 **Effect on Shock Train Behaviour of the Addition of a Cavity for Supersonic Intakes**

Andrew Russell¹, H Zare-Behtash¹, K Kontis¹

¹*School of Engineering, University of Glasgow, UK*

10:15-10:35 **Measurement of shock wave attenuation in microchannels**

Jerome Giordano¹, Pierre Perrier¹, Lionel Meister¹, **Martin Brouillette**²

¹*Aix Marseille Université CNRS IUSTI, France*

²*Shock Wave Laboratory, Université de Sherbrooke, Sherbrooke, J1K 2R1, Canada*

10:35-10:55 **Experimental Investigation of Shock Wave Characteristics in Small Scale Circular Channel**

Ritik Singh, Ezequiel F Médici, **Kazuya Tajiri**

Mechanical Engineering-Engineering Mechanics, Michigan Technological University, USA

10:55-11:15 **Shock Oscillations in a Supersonic Diffuser Flow with Varying Stagnation Pressure**

Jintu K James, **Muruganandam T M**

Department of Aerospace Engineering, Indian Institute of Technology, Madras, Chennai, India

11:15-11:35 Coffee Break, Atrium

11:35-12:35 Supersonic and Hypersonic Flows (3), Hall

Chair: Zonglin Jiang

- 11:35-11:55 **Skin friction measurement based on SSLCCs in hypersonic wind tunnel**
Chen. Xing, **Bi. Zhixian**, Wen. Shuai, Yao. Dapeng, Pan. Junjie
China Academy of Aerospace Aerodynamic, China
- 11:55-12:15 **Experimental study on hypersonic pitch-up anomaly in shock tunnel**
Hideyuki Tanno, Tomoyuki Komuro, Kazuo Sato, Katsuhiro Itoh
Kakuda Space Center, Japan Aerospace Exploration Agency, Japan
- 12:15-12:35 **Review on Film Cooling in High-speed Flows**
Kosuke Fujiwara¹, R. Sriram, Konstantinos Kontis¹, Takeomi Ideta²
¹*School of Engineering, University of Glasgow, UK*
²*IHI Corporation, Japan*
- 11:35-12:35 Plasmas / Magnetohydrodynamics (2), Symposium**
Chair: Fan Zhang
- 11:35-11:55 **Laser-induced shock waves in micro tubes**
Ulrich Teubner^{1,2}, Yun Kai^{1,2}, Walter Garen¹, Theodor Schlegel¹
¹*Institute for Laser and Optics, Hochschule Emden/Leer, University of Applied Sciences, Germany*
²*Institute of Physics, Carl von Ossietzky University of Oldenburg, Germany*
- 11:55-12:15 **Gas-Dynamic Flow behind Shock Wave Initiated by a Sliding Surface Discharge Channel**
Irina Mursenkova, Ekaterina Koroteeva, Yugan Liao, Irina Znamenskaya
Faculty of Physics, Lomonosov Moscow State University, Russia
- 12:15-12:35 **Mode transition from fast-gas ionization wave to laser-supported detonation wave**
Kohei Shimamura¹, Naoto Ozaki¹, Kohei Matsui², Kimiya Komurasaki²
¹*Engineering Mechanics and Energy, University of Tsukuba, Japan*
²*The University of Tokyo, Japan*
- 11:35-12:35 Multiphase Flow (2), Room A**
Chair: Kazuya Tajiri
- 11:35-11:55 **A Study of Dispersion, Vaporization, and Combustion of Burnable Liquids Surrounding Charges**
Fumiya Togashi¹, Rainald Lohner², Joseph D. Baum¹, Orlando A. Soto¹, J. Bell³
¹*Applied Simulations Inc., USA*
²*CFD Center, George Mason University, USA*
³*Defense Threat Reduction Agency, USA*
- 11:55-12:15 **Multi-scale Simulation of the Interaction of a Shock Wave and a Cloud of Particles**
S. Taverniers, **Gustaaf B. Jacobs**¹, Oishik Sen², H.S. Udaykumar³, Vasilis Fountoulakis¹
¹*Department of Aerospace Engineering, San Diego State University, USA*

²*Department of Industrial and Mechanical Engineering, University of Iowa, USA*

12:15-12:35 **Numerical Investigation of Dust Lifting Induced by Vertical Shock Wave**

Kei Shimura, Akiko Matsuo

Department of Mechanical Engineering, Keio University, Japan

11:35-12:35 Spectroscopy, Room B

Chair: Xilong Yu

11:35-11:55 **The Effect of Adaptive Sampling on Fluorescence Velocimetry Measurements in High-Speed Flows**

Laurent Michel Le Page, Sean O'Byrne, L. Gai

School of Engineering and Information Technology, University of New South Wales, Canberra, Australia

11:55-12:15 **Gas Surface Interaction of Carbon Ablator in a Shock Tube**

Hanseul Shim, Gisu Park

Aerospace Engineering, Korea Advanced Institute of Science and Technology, South Korea

12:15-12:35 **Evaluation of the Radiance of Shock-Heated Air in the 120–400-nm Spectral Range**

Sergei Vitalievich Stovbun¹, Nataliya Germanovna Bykova², Igor Evgenievich Zabelinskii², Anatoly Mikhailovich Tereza¹, Oleg Petrovich Shatalov², **Pavel Aleksandrovich Vlasov**^{1,3}

¹*Semenov Institute of Chemical Physics, Russian Academy of Sciences, Russia*

²*Research Institute of Mechanics of Lomonosov Moscow State University, Russia*

³*National Research Nuclear University "MEPHI", Russia*

11:35-12:35 Shock Waves in Liquids, Room C

Chair: Zbigniew Walenta

11:35-11:55 **Surface Jets produced from an Underwater Shock Wave**

Beric William Skews, Hilton Karnovsky

School of Mechanical, Industrial and Aeronautical Engineering, University of the Witwatersrand, South Africa

11:55-12:15 **Pressure sensors for hostile environments**

Hugo Fortier-Topping¹, **Martin Brouillette**¹, V. Suponitsky², D. Plant²

¹*Mechanical Engineering, Université de Sherbrooke, Canada*

²*General Fusion Inc., Canada*

12:15-12:35 **Visualization of inception, propagation and collapse process of underwater positive streamer**

Takehiko Sato¹, Ryo Kumagai¹, Tomoki Nakajima¹, Kiyonobu Ohtani¹, Atsuki Komiya¹, Toshiro Kaneko², Seiji Kanazawa³

¹*Institute of Fluid Science, Tohoku University, Japan*

²*Graduate School of Engineering, Tohoku University, Japan*

³*Faculty of Engineering, Oita University, Japan*

12:35-13:55 Poster Session (3) & Lunch, Atrium

Detonation transmission with an abrupt area change

Yao-Chung Hsu¹, Yei-Chin Chao², Kung-Ming Chung¹

¹*Aerospace Science and Technology Research Center, National Cheng Kung University, Taiwan*

²*Department of Aeronautics and Astronautics, National Cheng Kung University, Taiwan*

An Experimental Study on Transonic Swept Convex-Corner Flows

Kung-Ming Chung

Aerospace Science and Technology Research Center, National Cheng Kung University, Taiwan

Micro-Vortex Generator Controlled Shock-Boundary Layer Interactions in Supersonic Intake

Humrutha G., Mrinal Kaushik, K. P. Sinhamahapatra

Department of Aerospace Engineering, Indian Institute of Technology, Kharagpur-721302, India

Enhancement of the DDT Process with Energetic Solid Particle

Van Bo NGUYEN¹, Quoc Thien Phan¹, Jiun-Ming Li¹, Chang Juay Teo², D. Khoo Boo Cheong¹

¹*Temasek Laboratories, National University of Singapore, Singapore*

²*Department of Mechanical Engineering, National University of Singapore, Singapore*

Aerodynamic Force Measurement in a Large-Scale Shock Tunnel

Yunpeng Wang, Yunfeng Liu, Changtong Luo, Zonglin Jiang

Institute of Mechanics, University of Chinese Academy of Sciences, China

Interaction of a planar shock wave with a water surface

Vincent RODRIGUEZ¹, **Georges JOURDAN¹**, Antoine MARTY¹, A. Allou², Jean-Denis PARISSE³

¹*CNRS, IUSTI UMR 7343, Aix-Marseille Université, France*

²*CEA, DEN, Cadarache, DTN/STCP/LTRS, France*

³*French Air Force Academy, Salon de Provence, France*

Reynolds number effects on Shock-wave boundary layer interaction in a hypersonic flow

Srinath Lakshman¹, Ibrahim Mohammed¹, Sriram Rengarajan², Gopalan Jagadeesh¹,
KPJ Reddy¹

¹*Aerospace Engineering, Indian Institute of Science, India*

²*University of Glasgow, UK*

A One-dimensional Modeling of Seed-electron Generation and Electron Avalanche in Laser-supported Detonation

Rei Kawashima¹, Joseph Ampadu Ofosu², Kohei Matsui¹, Toru Shimano², Kimiya Komurasaki¹, Hiroyuki Koizumi²

¹*Department of Aeronautics and Astronautics, The University of Tokyo, Japan*

²*Department of Advanced Energy, The University of Tokyo, Japan*

Near-Field Pressure Signature over Mach 1.7 Free-Flight Bodies

Yuma Aoki, Daisuke Yoshimizu, **Akira Iwakawa**, Akihiro Sasoh
Nagoya University, Japan

Numerical Study for Interactions between Separation on Supersonic Flow and Laser-Induced Blast Wave

Masayuki Takahashi, Naofumi Ohnishi

Aerospace Engineering, Tohoku University, Japan

Heat-Flux Measurement of Flat Delta-Plate using Phosphor Thermography Technique in Gun Tunnel

Han Shuguang, Jia Guangsen, Bi Zhixian, Wen Shuai

China Academy of Aerospace Aerodynamics, China

Trial Implementation of TiN Surface Coating for a Main Piston Towards Reducing the Opening Time for a Diaphragmless Driver Section

Shinsuke Udagawa¹, Walter Garen², Tatsuro Inage³, Masanori Ota⁴, Kazuo Maeno⁵

¹*Aerospace Engineering Course, Tokyo Metropolitan College of Industrial Technology, Japan*

²*University of Applied Science Emden/Leer, Germany*

³*Faculty of Engineering, Shonan Institute of Technology, Japan*

⁴*Graduate School of Engineering, Chiba University, Japan*

⁵*National Institute of Technology, Kisarazu College, Japan*

RANS simulation of over- and under-expanded beveled nozzle jets using OpenFOAM

B. Zang, Vevek U S, T H New

School of Mechanical and Aerospace Engineering, Nanyang Technological University, Singapore

Large Scale Computation of Direct Initiation of Cylindrical Detonations

Hua Shen, Matteo Parsani

Computer, Electrical and Mathematical Sciences & Engineering, King Abdullah University of Science and Technology, Saudi Arabia

Experimental study of hypersonic shock wave / transitional boundary layer interaction

Shaofei Xie, **Feng Ji**, Dapeng Yao, Qing Shen

China Academy of Aerospace Aerodynamics, China

Hypersonic Boundary Layer Tripping to Turbulence on a Conical Body

Tarandeep Singh, **KPJ Reddy**

Department of Aerospace Engineering, Indian Institute of Science, India

Basic Experiment on Focusing Schieren PIV Method with LED Light Source

Masashi Kashitani¹, Shinichiro Nakao², Yoshiaki Miyazato²

¹*Aerospace Engineering, National Defense Academy, Japan*

²*Department of Mechanical Systems Engineering, The University of Kitakyushu, Japan*

Numerical Study of the Flow Separation in a Rocket Nozzle

Shiquan Zhu, Zhihua Chen, Chun Zheng, Huanhao Zhang, Zhengui Huang

Key Laboratory of Transient Physics, Nanjing University of Science and Technology, China

13:55-14:40 Plenary Lecture, Hall

Chair: K.P.J. Reddy

Research on Shock-Induced Aerothermodynamics for Future Planetary Explorations

Prof. Kazuhisa Fujita

Japan Aerospace Exploration Agency, Japan

- 14:50-16:30 Supersonic and Hypersonic Flows (4), Hall**
Chair: Rajesh Gopalapillai
- 14:50-15:10 **Characteristics of Self-Sustained-Shock Pulsation**
Toshiharu Mizukaki¹, Kazuhiko Yamada²
¹*Dept. of Aeronautics and Astronautics, Tokai University, Japan*
²*Institute of Space and Astronautics Science, JAXA, Japan*
- 15:10-15:30 **Numerical Simulation of Effect of Angle-of-Attack on a Supersonic Parachute System**
X. Xue¹, S. Luo¹, C.Y. Wen²
¹*School of Aeronautics and Astronautics, Central South University, China*
²*Department of Mechanical Engineering, The Hong Kong Polytechnic University, Hong Kong*
- 15:30-15:50 **Computational Study on Rigid Disk-Gap-Band Supersonic Parachute Aerodynamics**
Koki Takabayashi, **Kanta Fukumoto**, Keiichi Kitamura
Yokohama National University, Japan
- 15:50-16:10 **Modeling of 3-DOF launch dynamics in transonic and supersonic regime using Navier Stokes Equation**
Anupam Purwar, Jagadeesh Gopalan
Centre of Excellence in Hypersonics, India
- 14:50-16:10 Richtmyer-Meshkov Instability (2), Symposion**
Chair: Georges Jourdan
- 14:50-15:10 **The Evolution of Concentration and Velocity-Fluctuations in the Richtmyer-Meshkov Instability**
D. Reese, C. Noble, A. Ames, J. Oakley, D. Rothamer, **R. Bonazza**
University of Wisconsin, USA
- 15:10-15:30 **The Richtmyer-Meshkov instability of a flat interface initiated by a perturbed shock**
Mohamad A. Al-Marouf¹, Ravi Samtaney¹, Liyong Zou²
¹*Mechanical Engineering, King Abdullah University of Science and Technology, Saudi Arabia*
²*Institute of Fluid Physics, China Academy of Engineering Physics, China*
- 15:30-15:50 **Jet Formation of SF₆ Bubble Induced by Incident and Reflected Shock Waves**
Yuejin Zhu, **Lei Yu**, Jianfeng Pan
School of Energy and Power Engineering, Jiangsu University, China
- 15:50-16:10 **Investigation of the interface stretching within a reshocked mixing zone produced by the Richtmyer Meshkov Instability**

Pierre Graumer, Stephane Jamme, Yannick Bury
Institut Supérieur de l'Aéronautique et de l'Espace (ISAE-SUPAERO), Université de Toulouse, France

14:50-16:10 Shock Wave Reflection/Interaction (2), Room A

Chair: Ozer Igra

14:50-15:10 Reflection of a Planar Shock Wave over a Concave Double Wedge

M. K. Berezkina, I. V. Krassovskaya

Ioffe Institute, Russia

15:10-15:30 On InMR-TRR Transition on a Concave Cylindrical Reflector

Federico Alzamora Previtali¹, Evgeny Timofeev¹, Harald Kleine²

¹*McGill University, Canada*

²*University of New South Wales, Australia*

15:30-15:50 Analytical Prediction of Mach Stem Height for Asymmetric Wedge Reflection in 2-D Steady Flows

Shobhan Roy, Rajesh Gopalapillai (presenter: Athira C M)

Department of Aerospace Engineering, Indian Institute of Technology Madras, India

15:50-16:10 Numerical Studies on Form of Weak Shock Reflection over Wedges

K. Hatanaka¹, M. Hirota¹, T. Saito¹, K. Takayama²

¹*Muroran Institute of Technology, Japan*

²*Tohoku University, Japan*

14:50-16:10 Diagnostics/Flow Visualization (2), Room B

Chair: Toshiharu Mizukaki

14:50-15:10 Development of Sprayable Ultrafast-PSP for Unsteady Flow

Yasuhiro Egami, Yudai Sato, Yuya Shimizu, Kohei Yamashita, Ai Natsubori, Takuya Fukuzumi

Aichi Institute of Technology, Japan

15:10-15:30 Boundary-Layer Transition Detection at High Enthalpy Flow Conditions using Temperature-Sensitive Paint

H. Nagai¹, T. Nagayama¹, TH. Tanno², T. Komuro²

¹*Institute of Fluid Science, Tohoku University, Japan*

²*Japan Aerospace Exploration Agency, Japan*

15:30-15:50 High-resolution background oriented schlieren technique for a laser-induced underwater shock wave

Masaharu Kameda¹, Keisuke Hayasaka¹, Yoshiyuki Tagawa¹, Tianshu Liu²

¹*Tokyo University of Agriculture and Technology, Japan*

²*Western Michigan University, USA*

- 15:50-16:10 **Investigations of density field on a flat plate shock-boundary layer interaction at Hypersonic speeds using BOS**
Suriyanarayanan PaulPandi¹, Venkatakishnan Laxmi¹, Srinath L², **Jagadeesh Gopalan**²
¹*Experimental Aerospace Division, CSIR-National Aerospace Laboratories, India*
²*Department of Aerospace Engineering, Indian Institute of Science, India*
- 14:50-16:10 Shock Wave Interaction with Various Media (1), Room C**
Chair: Nicholas Apazidis
- 14:50-15:10 **Unsteady dynamics of particles accelerated by a shock wave**
Ankur Deep Bordoloi, Adam Martinez, **Kathy Prestridge**
Physics Division, Los Alamos National Laboratory, USA
- 15:10-15:30 **Shock-Induced Motion of a Spherical Particle Floating in Air**
Yoshitaka Sakamura, Motohiro Oshima, Katsuyuki Nakayama, Katsuya Motoyama
Department of Mechanical Systems Engineering, Toyama Prefectural University, Japan
- 15:30-15:50 **Exploring the capability of a new shock tube facility to investigate shock interaction with inert particle columns**
Marianne G. Omang¹, Knut Ove Hauge², Jan K. Trulse³
¹*Norwegian Defence Estates Agency, Postbox 405 Sentrum, 0103 Oslo, Norway, and Institute of Theoretical Astrophysics, University of Oslo, Norway*
²*Norwegian Defence Estates Agency, Norway*
³*Institute of Theoretical Astrophysics, University of Oslo, Norway*
- 15:50-16:10 **Influence of Phase Transitions Components of Mixtures on Thermodynamic Parameters of Shock Wave Loading**
K.K. Maevskii, S.A. Kinelovskii
Lavrent'ev Institute of Hydrodynamics, Russia
- 16:10-16:30 Coffee Break, Atrium**
- 16:30-17:50 Supersonic and Hypersonic Flows (5), Hall**
Chair: Joanna M. Austin
- 16:30-16:50 **DNS of Hypersonic Ramp Flow on a Supercomputer**
Igor Klioutchnikov, Herbert Olivier
Shock Wave Laboratory, RWTH Aachen University, German
- 16:50-17:10 **Free Flight Experiment Investigation of AOA Effect on Cone Boundary Layer Transition at Mach 6**
Zonghao Wang, Sen Liu, Jie Huang
China Aerodynamics Research and Development Center, China
- 17:10-17:30 **Shockwave Oscillation under Critical Starting Mach Number in Hypersonic inlet**

Peng-fei Xiong, Han-chen Bai, Xiao-fei Zhai, Jun Chen, Zhen-feng Wang
Science and Technology on Scramjet Laboratory of Hypervelocity Aerodynamics Institute, CARDC, China

17:30-17:50 **Numerical Analysis of Shockwave Diffraction (fit to presenter's window)**

Arnab Chaudhuri¹, Xiao Hong², **Gustaaf B. Jacobs**¹

¹*Department of Aerospace Engineering & Engineering Mechanics, San Diego State University, USA*

²*School of Power & Energy, Northwestern Polytechnical University, China*

16:30-17:50 Richtmyer-Meshkov Instability (3), Symposium

Chair: Kathy Prestridge

16:30-16:50 **Numerical Investigation of High-Temperature Effects in a Shock-Bubble Interaction**

Milind P Ray¹, **Bhalchandra P Puranik**², Upendra V Bhandarkar²

¹*Mechanical Engineering, Sandip Institute of Engineering and Management, India*

²*Mechanical Engineering, Indian Institute of Technology Bombay, India*

16:50-17:10 **The Imploding Cylindrical Richtmyer-Meshkov Instability with Ideal Two-Fluid Plasma Model**

Yuan Li¹, Ravi Samtaney¹, Wan Cheng¹, Vincent Wheatley², Daryl Bond³

¹*Mechanical Engineering, King Abdullah University of Science and Technology, Saudi Arabia*

²*Mechanical and Mining Engineering, The University of Queensland, Australia*

³*The University of Queensland, Australia*

17:10-17:30 **Self-generated Magnetic Fields in the Plasma Richtmyer-Meshkov Instability**

Vincent Wheatley¹, Daryl Mark Bond¹, Yuan Li², Ravi Samtaney², Dale Ian Pullin³

¹*Centre for Hypersonics, The University of Queensland, Australia*

²*Mechanical Engineering, Physical Science and Engineering Division, King Abdullah University of Science and Technology, Saudi Arabia*

³*Graduate Aerospace Laboratories, California Institute of Technology, USA*

17:30-17:50 **Electron Shock Dynamics in the Two-Fluid Plasma Richtmyer-Meshkov Instability**

Daryl M Bond¹, Vincent Wheatley¹, Ravi Samtaney², Dale Pullin³

¹*School of Mechanical and Mining Engineering, The University of Queensland, Australia*

²*Physical Sciences and Engineering Division, King Abdullah University of Science and Technology, Saudi Arabia*

³*Graduate Aerospace Laboratories, California Institute of Technology, USA*

16:30-17:50 Diagnostics/Flow Visualization (3), Room A

Chair: In-Seuck Jeung

16:30-16:50 **Three-dimensional Laser Interferometric CT density measurement of unsteady flow**

field around a cylinder induced by discharged shock wave from a cylindrical nozzle

Daigo Aoki, Sinichi Nakazawa, Ken Kurihara, Masanori Ota

Chiba University, Japan

16:50-17:10 **Three-Dimensional Measurement of the Lateral Jet/Cross Flow Interaction Field by Colored-Grid Background Oriented Schlieren (CGBOS) Technique**

Masanori Ota¹, Ken Kurihara¹, Takumi Ito², Tatsuro Inage²

¹*Chiba university, Japan*

¹*Salesian Polytechnic, Japan*

17:10-17:30 **Experimental Study on the Unsteadiness of an Axisymmetric Shock-Wave/Turbulent-Boundary-Layer Interaction with Separation**

Gaurav Chandola, Xin Huang, David Estruch Samper

Mechanical Engineering, National University of Singapore, Singapore

17:30-17:50 **Curved shock wave propagation in environmental stratosphere by laser ablation**

Duc Thuan TRAN, Chongfa Xie, Koichi Mori

Aerospace Engineering, Nagoya University, Japan

16:30-17:50 Shock Wave Interaction with Various Media (2), Room B

Chair: Martin Brouillette

16:30-16:50 **Mitigation of Blast in a Water Mist**

T. Schunck, M-O. Sturtzer, J. Mory, D. Eckenfels, J-F. Legendre

ISL, French German Research Institute of Saint Louis, France

16:50-17:10 **Some Aspects of the Numerical Modeling of Shock Wave - Dense Particles Bed Interaction Using Two-Fluid Approach**

Pavel Sergeevich Utkin

Department of the numerical methods and the turbulence, Institute for Computer Aided Design of the Russian Academy of Sciences, Russia

17:10-17:30 **Shock Focusing Effect upon Interaction of a Shock with Low-Density Dust Cloud**

Oleg G Sutyrin, Vladimir A Levin, Pavel Yu Georgievskiy

Institute for Mechanics of Moscow State University, Russia

17:30-17:50 **Shock and Blast Wave Interaction With Hard Sand Pan**

Randall Tyrone Paton, Beric William Skews

Flow Research Unit, University of the Witwatersrand, Johannesburg, South Africa

17:50-18:30 Subway Transportation from "Nagoya Daigaku" to "Nagoya"

18:30-19:30 Cocktail, Nagoya Marriott Associa Hotel

19:30-22:00 Student Award Ceremony & Banquet, Nagoya Marriott Associa Hotel

Friday, July 14, 2017

8:30-9:00 **Registration, Foyer**

9:00-10:20 **Detonation and Combustion (3), Hall**

Chair: A. Koichi Hayashi

9:00-9:20 **Design and measurement of injection gas concentration in rotating detonation engines via diode laser sensors**

Po-Hsiung Chang, **Jiun-Ming Li**, Boo Cheong Khoo, Lei Li, Jie Ming Teh, Chiang Juay Teo

National University of Singapore, Singapore

9:20-9:40 **Experimental Research on a Long Duration Operation of a Rotating Detonation Engine**

J. Nishimura¹, K. Ishihara¹, K. Goto¹, K. Matsuoka¹, J. Kasahara¹, A. Matsuo², I. Funaki³, H. Mukae⁴, K. Yasuda⁴, D. Nakata⁴, K. Higashino⁴, H. Moarai⁵

¹*Nagoya University, Japan*

²*Keio University, Japan*

³*JAXA Institute of Space and Technology, Japan*

⁴*Muroran Institute of Technology, Japan*

⁵*Mitsubishi Heavy Industries, Japan*

9:40-10:00 **Instabilities of Rotating Detonation**

Haocheng Wen, Qiaofeng Xie, Bing Wang

School of Aerospace Engineering, Tsinghua University, China

10:00-10:20 **Large Eddy Simulation of Mixing Characteristic in the Cold Rotating-Detonation Chamber**

Rui Zhou¹, Baolin Tian¹, X. P. Li², Jianping Wang³

¹*Institute of Applied Physics and Computational Mathematics, China*

²*Research Center of Heat and Mass Transfer, Institute of Engineering Thermophysics, Chinese Academy of Sciences, China*

³*Peking University, China*

9:00-10:20 **Shock/Boundary Layer Interaction (2), Symposium**

Chair: Chih-yung Wen

9:00-9:20 **A Study on Turbulent Transition of Unsteady Boundary Layer Induced by Weak-Compression Wave**

Daiki Tanikawa¹, Taiki Hashimoto¹, Shoji Sakaue¹, Takakage Arai¹, **Tokuzo Miyachi**²

¹*Aerospace Engineering, Osaka Prefecture University, Japan*

²*Railway Technical Research Institute, Japan*

9:20-9:40

MVG Control on Supersonic Compression Ramp Flow

Zhi Chen, X. P. Kong, Tengji Li, Ke Yang

China Aerodynamic Research Development Center, China

9:40-10:00

Incident shock/turbulent boundary layer interactions on concave walls

EnLai Zhang, ZhuFei Li, JiMing Yang

Department of Mordern Mechanics, University of Science and Technology of China, China

10:00-10:20

Numerical study of shock wave-boundary layer interaction in cylinder-flare configuration

Tamon NAKANO, Guillaume LEHNASC, Eric GONCALVES

D2(Fluides, Thermique, Combustion), Institut Pprime, CNRS, ISAE-ENSMA, University de Poitiers, France

9:00-10:20

Numerical Methods (1), Room A

Chair: Heuy Dong Kim

9:00-9:20

A fast mathematical modelling method for aerodynamic-heating predictions

Changtong Luo, Zonglin Jiang

Institute of Mechanics, Chinese Academy of Sciences, China

9:20-9:40

Hybrid Compact-WENO Finite Difference Schemes for Hyperbolic Conservation Laws

Wai Sun Don

School of Mathematical Sciences, Ocean University of China, China

9:40-10:00

On the Analysis of Full-Spectrum k-Distribution Databases for Thermal Radiation in Shock Waves within CO₂ Rich Atmospheres

Javier Garcia Garrido, Christian Mundt

Institute for thermodynamics, University Bundeswehr Munich, Germany

10:00-10:20

Reynolds Stress Models for Shock – Turbulence Interaction

Sebastian Karl¹, Jean Pierre Hickey ², Francis Lacombe³

¹*Institute of Aerodynamics and Flow Technology, DLR, Germany*

²*Department of Mechanical and Mechatronics Engineering, University of Waterloo, Canada*

³*Department of Mechanical Engineering, Ecole Polytechnique de Montreal, Canada*

9:00-10:20

Shock/Vortex Interaction, Room B

Chair: Beric Skews

9:00-9:20

The Influence of the High-Pressure Part Length on Shock Waves Exiting from an Open Tube

Mr. Connor Wilson, **Harald Kleine**

School of Engineering and IT, University of New South Wales, Australia

9:20-9:40

Shock Propagation in a Medium with Non-uniform Density

Daniel Livescu¹, Yieng Tian², Fathad Jaber²

¹*Los Alamos National Laboratory, USA*

²*Michigan State University, USA*

9:40-10:00

Investigations on Compressible Mixing Layers by Using Hot-wire Velocimetry

Taiki Ikeda¹, Ryosuke Fuse¹, Kazuaki Hatanaka¹, Mitsutomo Hirota¹, Tsutomu Saito¹,
Srisha M.V.Rao²

¹ *Department of Aerospace Engineering, Muroran Institute of Technology, Japan,*

²*Department of Aerospace Engineering, Indian Institute of Science, India*

10:00-10:20

Experimental Study of High-Altitude Environment Simulation for Space Launch Vehicles

Sungmin Lee, Gisu Park

Aerospace Engineering, Korea Advanced Institute of Science and Technology, South Korea

10:20-10:40

Coffee Break, Atrium

10:40-12:40

High Enthalpy Gasdynamics, Hall

Chair: Kazuhisa Fujita

10:40-11:00

Hypervelocity tests with a detonation driven expansion tube

Zongmin Hu, Kai Zhou, Jun Peng, Zonglin Jiang

State Key Laboratory of High-temperature Gas Dynamics (LHD), Institute of Mechanics, CAS, China

School of Engineering Science, University of Chinese Academy of Sciences, China

11:00-11:20

Catalytic Recombination Characteristics of Atomic Oxygen on Material Surfaces by Optical Emission Spectroscopy

Xin Lin¹, Su wang¹, Fei li¹, Shaohua zhang¹, **Xilong Yu**²

State Key Laboratory of High Temperature Gas Dynamics, Institute of Mechanics, CAS, China

School of Engineering Science, University of Chinese Academy of Sciences, China

11:20-11:40

Influence of Dual Ignition on Test Conditions of a High Enthalpy Shock Tunnel

Wei Zhao, Qiu Wang, Jinping Li, Pan Lu, Zonglin Jiang, Jiwei Li

State Key Laboratory of High Temperature Gas Dynamics, Institute of Mechanics, Chinese Academy of Sciences, China

11:40-12:00

Ablation Measurements in A Low Density Heat Shield Using Ablation Sensor Unit (ASU)

Yuuki Dantsuka¹, **Takeharu Sakai**², Kenta Iwamoto², Yuuichi Ishida³, Toshiyuki Suzuki³
Kazuhisa Fujita³

¹*Department of Aerospace Engineering, Nagoya University, Japan*

²*Department of Mechanical and Aerospace Engineering, Tottori University, Japan*

³*JAXA, Japan*

12:00-12:20 **Forced boundary layer transition experiments on a multi-wedge in a gun tunnel**

Feng Ji, Xunhua Liu, Xinguo Sha, Zhixian Bi, Qing Shen

China Academy of Aerospace Aerodynamics, China

12:20-12:40 **Measurement of Electron Density by Heterodyne Interferometer for Atmospheric Pressure Plasmas**

Takafumi Yamada, Makoto Matsui

Department of engineering, Shizuoka University, Japan

10:40-12:40 Medical Applications (invited), Symposium

Chair: Hamid Hosseini

10:40-11:00 **Biological effect of shock waves: Mechanism of blast-induced traumatic injury to medical application**

A. Nakagawa¹, T. Kawaguchi¹, T. Tominaga¹, K. Ohtani²

¹*Department of Neurosurgery, Tohoku University Graduate School of Medicine, Japan*

²*Institute of Fluid Science, Tohoku University, Japan*

11:00-11:20 **Shockwaves can cure biofilm infections in-vivo in combination with antibiotics**

Akshay Datey¹²³, DivyaPrakash Gnanadhas²³, Dipshikha Chakravorty¹², **Jagadeesh Gopalan**¹³

¹*Centre for Biosystems Science and Engineering, Indian Institute of Science, India*

²*Department of Microbiology and Cell Biology, Indian Institute of Science, India*

³*Department of Aerospace Engineering, Indian Institute of Science, India*

11:20-11:40 **Towards non-invasive insulin injection via control of the electrical breakdown in liquid**

Jack J Yoh, H. Ham, S. Yeo, **H. Jang**

Seoul National University, South Korea

11:40-12:00 **Current Trend in Cell Membrane Manipulation by Ultrasound and Underwater Shock Wave**

S. Moosavi Nejad¹ **Hamid Hosseini**²

¹*Bioelectrics Department, Institute of Pulsed Power Science, Kumamoto University, Japan*

²*Bioelectrics Department, Institute of Pulsed Power Science & Graduate School of Science and Technology, Kumamoto University, Japan*

12:00-12:20 **Analysis of Deformation Process of a Bubble in an Elastic Capsule by Shock**

Waves and Their Medical and Biological Applications

Masaaki Tamagawa¹, Toshikazu Imakado¹, Ryo Ogasahara¹

¹*Graduate School of Life Science and System Engineering , Kyushu Institute of Technology, Japan*

²*GALCIT , Caltech, USA*

12:20-12:40 A new device for crossing chronic total occlusions

Louis-Philippe Riel¹, Steven Dion¹, Manuel Charlebois-Ménard¹, **Martin Brouillette**¹, S. Bérubé², M.-A. Despatis², A. Benko², M.-É. Clavet³, M.-J. Bertrand³, P. Geoffroy³, J.-F. Tanguay³

¹*Shock Wave Laboratory , Université de Sherbrooke, Canada*

²*Sherbrooke University Hospital (CHUS), Sherbrooke, Canada*

³*Montreal Heart Institute, Montréal, Canada*

10:40-12:40 Nozzle Flow, Room A

Chair: Irina Krassovskaya

10:40-11:00 Shock System Deformation in High Mach Number Rocket Nozzles

Chloe Genin¹, Ralf Stark¹, Sebastian Karl²

¹*German Aerospace Center, DLR, Institute of Space Propulsion, Lampoldshausen, Germany*

²*German Aerospace Center, DLR, Institute of Aerodynamics and Flow Technology, Göttingen, Germany*

11:00-11:20 Experimental Study of TICTOP Nozzles

Ralf Stark, Chloé Génin

Rocket Propulsion, German Aerospace Center, German

11:20-11:40 Shock interactions in Thrust Optimized Parabolic (TOP) Nozzles during Start-Up and Shut Down

Ijaz Mohamed , **Rajesh G**

Department of Aerospace Engineering, Indian Institute of Technology Madras, India

11:40-12:00 Three-Dimensional Instability of Shock-Wave/Boundary- Layer Interaction for Rocket Engine Nozzle Applications

Andrea Sansica^{1,2}, Jean-Christophe Robinet¹ , Eric Goncalves³ , Julien Herpe²

¹*DynFluid Laboratory - Arts et Métiers/CNAM, France*

²*Centre National d'Études Spatiales (CNES)*

³*Pprime Institute - ISAE-ENSMA, France*

12:00-12:20 Hybrid RANS/LES simulation of shock-induced separated flow in truncated ideal contour nozzle

Eric Goncalves¹, Guillaume Lehnasch¹, Julien Herpe²

¹*Fluid, Thermal Science and Combustion, ENSMA, institut Pprime, France*

²*Direction des Lanceurs, CNES, France*

12:20-12:40 **Unsteady Separation Shock Dynamics in a Mach 4 Shock-Wave/
Turbulent-Boundary-Layer Interaction (fit to presenter's window)**

Xin Huang, Gaurav Chandola, David Estruch Samper

Mechanical Engineering, National University of Singapore, Singapore

10:40-12:40 Shock Waves in Rarefied Flows, Room B

Chair: Felix Sharipov

10:40-11:00 **On a Problem of Shock Wave Structure**

Akira Sakurai¹, Susumu Kobayashi²

¹*Tokyo Denki University, Japan*

²*Saitama Institute of Technology, Japan*

11:00-11:20 **A Generalized Form of the Simplified Bernoulli Trial Collision Scheme Applied to
Shock Waves**

Ehsan Roohi¹, Stefan Stefanov²

¹*High Performance Computing(HPC) Laboratory, Department of Mechanical Engineering,
Ferdowsi University of Mashhad, Iran*

²*Institute of Mechanics, Bulgarian Academy of Science, Bulgaria*

11:20-11:40 **Comparison of DSMC Chemistry Models for Shock Tube Simulations in the
Nitrogen**

Tapan K Mankodi, **Upendra V Bhandarkar**, Bhalchandra P Puranik

Department of Mechanical Engineering, Indian Institute of Technology Bombay, India

11:40-12:00 **Ab Initio Simulation of Shock Waves propagating through gaseous mixtures**

Felix Sharipov, Fernanda C Dias

Departamento de Física, Universidade Federal do Paraná, Brazil

12:00-12:20 **Study of Rarefied Flow around Rectangular Cylinder using DSMC**

Vignesh Ram Petha Sethuraman¹, Heuy Dong Kim¹, Minoru Yaga²

¹*Department of Mechanical Engineering, Andong National University, South Korea*

²*Department of Mechanical Systems Engineering, University of the Ryukyus, Japan*

12:20-12:40 **The influence of a pulsed driver on the micro shock propagation**

Walter Garen¹², **Yun Kai**¹², Ulrich Teubner²

*Institute for Laser and Optics, Hochschule Emden/Leer, University of Applied Sciences,
Germany*

Carl von Ossietzky University of Oldenburg, Institute Physics

12:40-14:00 Lunch, Atrium

14:00-14:45 Irvine Israel Glass Lecture, Hall

Chair: Gabi ben-Dor

Shock wave research: Remembrance of Professor I. I. Glass

Prof. Kazuyoshi Takayama

Tohoku University, Japan

14:55-16:55 Chemical Reacting Flows, Hall

Chair: Eric Petersen

14:55-15:15 Numerical Investigation on characteristics of mine gas explosion diffusion

Cheng Wang, Yong Yao Zhao

Beijing Institute of Technology, China

15:15-15:35 Thermochemical nonequilibrium modeling of O₂

Jaegang Kim

Aerospace System Engineering, Sejong University, South Korea

15:35-15:55 Non-uniform Ignition behind a Reflected Shock and its Influence on Ignition Delay Measured in a Shock Tube

Chengken Qi, Chengyang Huang, Zhen Chen

Mechanics and Engineering Science, Peking University, China

15:55-16:15 State-Resolved Transport Properties of Electronically Excited High-Temperature Flows behind Strong Shock Waves

Vladimir Istomin, Elena Kustova, George Oblapenko

Department of mathematics and mechanics, Saint-Petersburg State University, Russia

16:15-16:35 Experimental Investigation of Strong Shock Heated Gases Interacting with Materials in Powder form (invited)

Jayaram Vishakantaiah

Shock Induced Materials Chemistry Laboratory, SSCU, Indian Institute of Science, India

16:35-16:55 Detonation decay and flame propagation through a channel with porous walls

Grigory Yurievich Bivol, Sergey Victorovich Golovastov, Victor Vladimirovich Golub

Department of Physical Gasdynamics, Joint Institute for High Temperatures of the Russian Academy of Sciences (JIHT RAS), Russia

14:55-16:55 Medical and Biological Applications, Symposium

Chair: Masaaki Tamagawa

14:55-15:15 Computational Modeling of Recoilless Weapons Combat Training Associated Blast Exposure

Suthee Wiri¹, A. Ritter³⁴, Jason Bailie²⁵⁶, Charles Needham¹, Josh Duckworth³

¹*Applied Research Associates, U.S.A.*

²*Defense and Veterans Brain Injury Center, U.S.A.*

³*Uniformed Services University of the Health Sciences, U.S.A.*

⁴The Henry M Jackson Foundation for the Advancement of Military Medicine, Bethesda, MD, USA

⁵Naval Hospital Camp Pendleton, Camp Pendleton, CA, USA

⁶General Dynamics Health Solutions, Fairfax, VA, USA

15:15-15:35 **On the relation between the shock wave thickness in bio-materials and the threshold for blast induced neuro-trauma**

Matei Ioan Radulescu

Mechanical Engineering, University of Ottawa, Canada

15:35-15:55 **Contribution of Cavitation Generation to Shock Wave Sterilization Effects in a Narrow Water Chamber**

Jingzhu Wang¹, Akihisa Abe², Taketoshi Koita³, Mingyu Sun⁴

¹ *Key Laboratory for Mechanics in Fluid Solid Coupling Systems, Institute of Mechanics, Chinese Academy of Sciences, China*

School of Engineering Science, University of Chinese Academy of Sciences, China

²*Kobe University, Japan*

³*Saitama Institute of Technology, Japan*

⁴*Tohoku University, Japan*

15:55-16:15 **Shockwaves confer immunity against infections in mice**

Akshay Abhay Datey^{1,2,3}, Dipshikha Chakravorty^{1,2}, Jagadeesh Gopalan^{1,3}

¹*Centre for Biosystems Science and Engineering, Indian Institute of Science, India*

²*Microbiology and Cell Biology, Indian Institute of Science, India*

³*Department of Aerospace Engineering, Indian Institute of Science, India*

16:15-16:35 **Intracellular Ca²⁺ Increase Evoked by Single Acoustic Pulses**

Akira Tsukamoto¹, Toru Takahashi¹, Shigeru Tada¹, Keiichi Nakagawa²

¹*National Defense Academy, Japan*

²*The University of Tokyo, Japan*

16:35-16:55 **Development of a miniaturized focused shock wave generator for medical application**

Hiroaki Yamamoto¹, Kazuyoshi Takayama¹, Hiroaki Shimokawa¹

¹*Innovative cardiovascular medicine, Department of Cardiovascular medicine, Graduate School of Medicine, Tohoku Univ., Japan*

14:55-16:55 Numerical Methods (2), Room A

Chair: Naofumi Ohnishi

14:55-15:15 **Numerical study of shock propagation in liquid/gas media**

Nicholas Apazidis

KTH, Royal Institute of Technology Mechanics, Sweden

15:15-15:35 **Numerical investigation of a planar shock wave interacting with an acentric water**

ring

Bing Wang, Gaoming Xiang

School of Aerospace Engineering, Tsinghua University, China

15:35-15:55 **A Multi-Space Interrelation Theory for Correlating Aerodynamic Data from Hypersonic Ground Testing**

Zonglin Jiang^{1,2}, Changtong Luo¹

¹*State Key Laboratory of High Temperature Gas Dynamics, Institute of Mechanics, Chinese Academy of Sciences, Beijing, 100190, China*

²*School of Engineering Sciences, University of Chinese Academy of Sciences, Beijing, 100049, China*

15:55-16:15 **Conjugate Heat Transfer Analysis in a Hypersonic Flow**

Ravi K. Peetala¹

¹*Mechanical Engineering, VNIT Nagpur, India*

16:15-16:35 **Numerical Modelling of the Effects of Surface Roughness on Blunt Body Heat Transfer.**

Deliya Kim¹, Eldad Avital², Gisu Park¹

¹*Aerospace Engineering, Korea Advanced Institute of Science and Technology, South Korea*

²*School of Engineering and Materials Science, Queen Mary University of London, UK*

16:35-16:55 **Robust and Low-Dissipation Explicit Formulation of Improved Adaptive WCNS Scheme**

Zhao Guo-yan, **Sun Ming-bo**

Science and Technology on Scramjet Lab, National University of Defense Technology, China

14:55-16:55 Shock Waves in Internal Flows (2), Room B

Chair: Teo Chiang Juay

14:55-15:15 **Shock Induced Corner Separation in Supersonic Duct Flows**

S Vaisakh, T M Muruganandam, **A Ramprakash**

Aerospace Engineering, Indian Institute of Technology Madras, India

15:15-15:35 **Unsteadiness of Cowl Shock/Convex Corner Interaction in an Inlet**

Rong Huang, Zhufei Li, Jiming Yang

Department of Modern Mechanics, University of Science and Technology of China, China

15:35-15:55 **Experimental investigations of a diffuser start/unstart characteristics for two stream supersonic wind tunnels.**

S Manoj Prabakar, T M Muruganandam (presenter: Ramprakash Ananthapadmanaban)

Aerospace Engineering, Indian Institute of Technology Madras, India

15:55-16:15 **Experimental and Numerical Studies on Plume Structures of Micro-Nozzles**

Operating at High Vacuum Conditions

K. M. M. Rafi¹, B. A. H. Fahd¹, M Deepu¹, **G Rajesh**²

¹*Department of Aerospace Engineering, Indian Institute of Space Science and Technology, India*

²*Department of Aerospace Engineering, Indian Institute of Technology Madras, India*

16:15-16:35

Improvement of pressure recovery in a duct by repetitive laser energy depositions

Pham Hoang Son, **Myokan Manabu**, Takahiro Tamba, Akira Iwakawa, Akihiro Sasoh

Department of Aerospace Engineering, Nagoya University, Japan

16:35-16:55

Shock Wave Generation Method using High-Speed Jet

Akira Iwakawa¹, Hirokatsu Kawasaki¹, Masaya Kayumi¹, Akihiro Sasoh¹, Tetsuya Yamashita², Yoshinori Furuta²

¹*Department of Aerospace Engineering, Nagoya University, Japan*

²*Yuesuurasaki Co., Ltd., Japan*