Organized Session

[o-1-1] Interorbital and Interplanetary Transportation with EP 1

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<th>Session Date</th>
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<tr>
<td>Chairpersons</td>
<td>Masayuki Takahashi (Tohoku University, Japan)</td>
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<td></td>
<td>Hitoshi Kuninaka (JAXA, Japan)</td>
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</table>

Nuclear Electric Propulsion to EUROPA and MARS


1DLR Institute of Space Systems, Bremen, Germany, 2CNES, Paris, France, 3European Science Foundation, Strasbourg, France, 4Airbus Safran Launchers, Vernon, France, 5Sagem Defense Sécurité, Valence, France, 6Thales Alenia Space, Turino, Italy, 7Keldych Research Centre, Moscow, Russia, 8National Nuclear Laboratory, Sellafield, United Kingdom, 9Instituto de Estudos Avançados, São José dos Campos, Brazil

Return Trajectory of Martian Moons eXplorer by Way of Chemical-Electric Hybrid Propulsion

Makoto Horikawa, Kazutoshi Takemura, Takanao Saiki, Yasuhiro Kawakatsu, Hiroaki Yoshimura

1Department of Applied Mechanics, Waseda University, Tokyo, Japan, 2Department of Applied Mechanics and Aerospace Engineering, Waseda University, Tokyo, Japan, 3Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

Highlights of Electric Sail Propulsion Efforts at NASA’s Marshall Space Flight Center

Bruce M Wiegmann, Andy Heaton, Michal Bangham, Robert Hoyt

1Marshall Space Flight Center, NASA, USA, 2Tethers Unlimited, Inc., 3Bangham Engineering, Inc.
Dynamics of Single Charged Wire for Solar Wind Electric Sail
Fei Liu, Quan Hu, Jingrui Zhang, Keying Yang, Yanyan Li
School of Aerospace Engineering, Beijing Institute of Technology, China

[o-2-1] Launch Vehicle for Small Spacecrafts (1)

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<td>Kenji Fujii (JAXA, Japan)</td>
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<td>Shigeru Aso (Kyushu University, Japan)</td>
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2017-o-2-01 (9:00 – 9:20)

[Adopted Text from the document]
**Compact and High Performance Rocket Design of Epsilon and Future Prospect of Solid Propellant Launch Vehicles**

Yasuhiro Morita  
Japan Aerospace Exploration Agency (JAXA), Sagamihara/Tsukuba, Japan

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**2017-o-2-02 (9:20 – 9:40)**

**Epsilon Launch Vehicle – Second Flight and its Evolutions**

Tatsuya Kanechika¹, Yasunobu Sagawa², Kazuhiro Yagi³, Takayuki Imoto⁴

¹IHI AEROSPACE Co.Ltd.(IA), Japan, ²Institute of Space and Astronautical Science, JAXA, Japan

---

**Development and Flight Results of Solid Propulsion System for Enhanced Epsilon Launch Vehicle**

Koki Kitagawa¹, Shinichiro Tokudome¹, Keiichi Hori¹, Haruhiro Tanno², Nobuyuki Nakano²

¹Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, ²Solid Propulsion Office, Rocket Systems Department., IHI Aerospace, Tomioka, Japan

---

**Development and Flight Results of Structure Subsystem for Enhanced Epsilon Launch Vehicle**

Hiroshi Ikaida¹, Kyoichi Uii¹, Ryoma Yamashiro³, Takayuki Imoto¹, Yasuhiro Morita²

¹Tsukuba Space Center, JAXA, Tsukuba, Japan, ²Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

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**Conceptual Study of Japan’s Future Solid Rocket System**

Ryoma Yamashiro¹, Shinichiro Tokudome², Yasuhiro Saith¹, Takayuki Yamamoto², Yoshitaka Mochihara¹, Hiroki Ikaida¹

¹Tsukuba Space Center, JAXA, Tsukuba, Japan, ²Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

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**Initial Guess Generation Strategies for Spaceplane Trajectory Optimisation**

Federico Toso, Christie Maddock  
Aerospace Centre of Excellence, University of Strathclyde, Glasgow, United Kingdom

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**The Low Cost Rocket with Low Melting Temperature Thermoplastic Propellant**

Hikaru Isochi¹, Hikaru Otabe², Tsutomu Uematsu², Nobuji Kato³, Keiichi Hori³, Yasuhiro Morita⁴, Ryojiro Akiba⁴

¹Uematsu Electric Co.,Ltd., Akabira, Japan, ²Katazen Corporation, Aichi, Japan, ³The Institute of Space and Astronautical Science, Sagamihara, Japan, ⁴Hokkaido Aerospace Science and Technology Incubation Center, Sapporo, Japan
### 2017-o-3-01 (14:00 – 14:20)

**Technical and Flight Demonstrations for Reusable Launch Vehicle**

Satoshi Nonaka, Takashi Ito, Yoshifumi Inatani  
Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

### 2017-o-3-02 (14:20 – 14:40)

**Trajectory Optimization for a Reusable Sounding Rocket**

Shunsuke Sato¹, Takayuki Yamamoto¹, Takahiro Nakamura², Satoshi Nonaka²  
¹Research Unit 1, Research and development Directorate, JAXA, Sagamihara, Japan, ²Department of Space Flight Systems, Institute of Space and Astronautical Science (ISAS), JAXA, Sagamihara, Japan

### 2017-o-3-03 (14:40 – 15:00)

**Numerical Analysis on Reusable Rocket Aerodynamics with Reduced-Yaw-Force Configurations**

Ayano Inatomi¹, Keiichi Kitamura¹, Satoshi Nonaka²  
¹Yokohama National University, Yokohama, Japan, ²Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

### 2017-o-3-04 (15:00 – 15:20)

**Computational Study on Finned Reusable Rocket during Turnover**

Takuya Aogaki¹, Keiichi Kitamura¹, Satoshi Nonaka²  
¹Graduate School of Engineering, Yokohama National University, Kanagawa, Japan, ²Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

### 2017-o-3-05 (15:20 – 15:40)

**Anomaly Detection Configured as a Combination of State Observer and Mahalanobis-Taguchi Method for a Rocket Engine**

Yusuke Maru¹, Hatsuo Mori², Takashi Ogai², Noriyoshi Mizukoshi², Shinsuke Takeuchi², Takayuki Yamamoto¹, Tsuyoshi Yagishita¹, Satoshi Nonaka¹  
¹Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, ²IHI Corporation, Tokyo, Japan
2017-o-3-06 (16:00 – 16:20)

Low Cost Reusable 1st Stage Launch Services From International Spaceports

Charles J. Lauer
Rocketplane Global, Inc., USA

2017-o-3-07 (16:20 – 16:40)

Preliminary Mission Analysis of a Commercial Lunar Transportation System

Chit Hong Yam, Takeshi Hakamada, Mohamed Ragab
ispace Inc., Tokyo, Japan

2017-o-3-08 (16:40 – 17:00)

Utilizing Near Earth Asteroid as a Cycler (UNEAC) Concept: A Subsequent Study of ‘Near Earth Asteroid as an Alternative Interplanetary Manned Spaceship’ proposal

Huai-Chien Chang
Co-founder of ‘Astronautical Society of Taiwan’ and ‘The Consortium of Extreme and Space Settlements’, Member of ‘宇宙建築の会 (Uchu Kenchiku no Kai)’, Space Architecture Activist, MEng.

2017-o-3-09 (17:00 – 17:20)

Cable Dynamics and It’s Control at the Simultaneous Deployment of the Cables from GEO Station during Space Elevator Construction

Yoshiki Yamagiwa¹, Koki Tao¹, Shoji Sato¹, Kiyotoshi Otsuka², Yoji Ishikawa²
¹Shizuoka University, Hamamatsu, Japan, ²Obayashi Co., Tokyo, Japan

2017-o-3-10 (9:00 – 9:20)

Conceptual Design Investigation and Aerodynamic Study for Hypersonic Vehicle Baseline Configuration both for TSTO and HST

Takaaki Hirayama, Yasuhiro Tani, Shigeru Aso
Department of Aeronautics and Astronautics, Kyushu University, Fukuoka, Japan

2017-o-3-11 (9:20 – 9:40)

Multi-Objective Design Optimization of RBCC-Based Orbital TSTO Space Transportation Systems for Multi-Asset Deployment

George Coulloupas¹,², Hideaki Ogawa¹
¹School of Engineering, Royal Melbourne Institute of Technology, Melbourne, Victoria, Australia, ²Aerospace Systems Pty. Ltd., Prahran, Victoria, Australia
Detailed Design of Winged Rocket WIRES#015 with Liquid Methane Engine

Eiji Kamemoto, Koichi Yonemoto, Takahiro Fujikawa, Hiroshi Yamasaki, Masatomo Ichige, Yusuke Ura, Guna Surendra Gossamsetti, Takumi Ohki, Yuki Kubono, Kento Shirakata, Hiroshi Tsukamoto, Hayato Tobiyama, Yasuaki Matsuoka, Takumi Yano, Toshihiko Morito, Toshiki Kato

Kyushu Institute of Technology, Japan, Japan Aerospace Exploration Agency (JAXA), Japan

Development Status of Experimental Winged Rocket WIRES#014-3A

Hayato Tobiyama, Koichi Yonemoto, Takahiro Fujikawa, Hiroshi Yamasaki, Masatomo Ichige, Yusuke Ura, Guna Surendra Gossamsetti, Takumi Ohki, Yuki Kubono, Kento Shirakata, Hiroshi Tsukamoto, Yasuaki Matsuoka, Takumi Yano, Shinji Ishimoto, Takashi Mugitani

Kyushu Institute of Technology, Japan, Japan Aerospace Exploration Agency (JAXA), Japan

Conceptual Design Optimization of Several Types of Fully Reusable Winged Launch Vehicles

Takahiro Fujikawa, Koichi Yonemoto

Department of Mechanical and Control Engineering, Kyushu Institute of Technology, Kitakyushu, Japan

[o-4-1] Oxygen/Methane Rocket Combustion and Heat Transfer (1)

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<td>Simona Silvestri (Technical University of Munich, Germany)</td>
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<td>Michael Boerner (DLR, Germany)</td>
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Experimental and Numerical Investigation of Flow and Combustion in a Single Element Rocket Combustor using GH2/GOX and GCH4/GOX as Propellants

Christof Roth, Simona Silvestri, Nikolaos Perakis, Oskar Haidn

Technical University of Munich, Institute for Turbomachinery and Flight Propulsion, Germany

Heat Flux Estimation on a Chamber Wall of GH2/GOX and GCH4/GOX Single Element Rocket Combustors

Yu Daimon, Hideyo Negishi, Takenori Nakajima, Roman Keller, Peter M. Gerlinger

Research and Development Directorate, JAXA, Tsukuba, Japan, 2Ryoyu Systems Co., Ltd., Nagoya, Japan, 3Institute of Combustion Technology for Aerospace Engineering, University of Stuttgart, Stuttgart, Germany

Numerical Investigation of Eigenmode Damping Rates in a Single Element Rocket Combustion Chamber

Alexander Chemnitz, Nancy Kings, Moritz Schulze, Thomas Sattelmayer

Institute of Thermodynamics, Technische Universität München, Munich, Germany
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<td>Oskar Haidn (Technical University of Munich, Germany)</td>
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**2017-o-4-06 (11:00 – 11:20)**

**Subscale Firing Test for Regenerative Cooling LOX/Methane Rocket Engine**

Toshiki Kato¹, Daiki Terakado¹, Hideaki Nanri¹, Toshiki Morito¹, Idea Masuda¹, Hiroya Asakawa², Hiroyuki Sakaguchi², Yasuhiro Ishikawa³, Takuma Inoue¹, Shinji Ishihara³, Masahiro Sasaki³

¹Japan Aerospace Exploring Agency, Tukuba Japan, ²IHI Corporation, Tokyo Japan, ³IHI Aerospace, Gumma Japan

**2017-o-4-07 (11:20 – 11:40)**

**Laser Ignition of a Multi-injector LOX/methane Combustor**

Michael Börner¹, Chiara Manfletti², Justin Hardi³, Dmitry Suslov¹, Gerhard Kroupa³, Michael Oschwald¹

¹Institute of Space Propulsion, German Aerospace Center (DLR), Germany, ²European Space Agency (ESA), ³CTR Carinthian Tech Research AG, Austria

**2017-o-4-08 (11:40 – 12:00)**

**Feasibility Study on Additive Manufacturing of Liquid Rocket Combustion Chamber**

Shinichi Moriya¹, Takuma Inoue², Masahiro Sasaki², Takayuki Nakamoto³, Takahiro Kimura³, Naoyuki Nomura³, Akira Kawasaki³, Toshiki Kato⁴, Idea Masuda¹

¹Research and Development Directorate, JAXA, Japan, ²Space Systems Department, IHI Aerospace Co., Ltd., Tomioka, Japan, ³Research Division of Machining and Molding, Osaka Research Institute of Industrial Science and Technology, Izumi, Japan, ⁴Department of Materials Processing, Tohoku University, Sendai, Japan

**2017-o-4-09 (12:00 – 12:20)**

**Experimental and Numerical Investigation of a Multi-Injector GOX-GCH₄ Combustion Chamber**

Simona Silvestri¹, Christoph Kirchberger², Gregor Schlieben², Maria Palma Celano³, Oskar Haidn¹

¹Technical University of Munich, Munich, Germany, ²German Aerospace Center, Lampoldshausen, Germany

**2017-o-4-11 (12:20 – 12:40)**

**Numerical Investigation on Effects of Recess Variation upon a GCH₄/GOX Shear Coaxial Combustion Chamber**

Yu Daimon¹, Hiroshi Terashima², Hiromi Tanı³

¹Research and Development Directorate, JAXA, Tsukuba, Japan, ²Faculty of Engineering, Hokkaido University, Sapporo, Japan

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2017-o-5-01 ( 9:00 – 9:30 )

Essentially Non-explosive Propulsion Paving a Way for Fail-Safe Space Transportation

Akiyo Takahashi, Toru Shimada
Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

2017-o-5-02 ( 9:30 – 10:00 )

A Short Discussion on Performance, Safety and Environmental Aspects of Gel and Hybrid Rocket Propulsion Systems

Helmut K. Ciezki1, Karl-Wieland Naumann2, Mario Kobald1
1DLR – German Aerospace Center, Institute of Space Propulsion, Lampoldshausen, D-74239 Hardthausen, Germany, 2Bayern-Chemie GmbH, D-84544 Aschau am Inn, Germany

2017-o-5-03 ( 10:00 – 10:20 )

Combined Trajectory Simulation and Optimization for Hybrid Rockets using ASTOS and ESPSS

Christian Schmierer1,2, Mario Kobald1, Johan Steelant3, Stefan Schlechtriem1,2
1Institute of Space Propulsion, German Aerospace Center (DLR), Lampoldshausen, Germany, 2Institute of Space Systems (IRS), University of Stuttgart, Germany, 3European Space Research and Technology Centre (ESTEC), European Space Agency (ESA), Netherlands

2017-o-5-04 ( 10:20 – 10:40 )

Error Analysis for CAMUI Type Hybrid Rocket Regression Simulation

Tor Viscor, Harunori Nagata
Hokkaido University, Japan

[o-5-2] Development and Testing of Hybrid Rocket

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<td>Toru Shimada (JAXA, Japan)</td>
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2017-o-5-05 ( 11:00 – 11:30 )

Development of an Airbreathing Hybrid Rocket Booster

Yen-Sen Chen, J.W. Lin, S.S. Wei
TiSPACE Incorporated, Chunan, Taiwan

2017-o-5-06 ( 11:30 – 12:00 )

A Record Flight of the Hybrid Sounding Rocket HEROS 3

Mario Kobald1,2, Christian Schmierer1,2, Ulrich Fischer1,2, Konstantin Tomilin1,2, Anna Petrarolo1
1Institute of Space Propulsion, DLR, Hardthausen, Germany, 2Institute of Space Systems, Stuttgart University, Stuttgart, Germany

2017-o-5-07 ( 12:00 – 12:20 )

Engine Performance of a Swirling-Injection End-Burning Hybrid Rocket Engine using LOX/Paraffin-based Fuel
2017-o-5-08 ( 12:20 – 12:40 )

**Flow Visualization in Combustion Chamber of Altering-intensity Swirling-Oxidizer-Flow-Type Hybrid Rocket Engine**

Kei Obata, Toru Shimada
Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

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[o-5-3] Internal Flow Dynamics of Hybrid Rocket

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2017-o-5-09 ( 14:00 – 14:30 )

**Internal Flow Dynamics and Stability in Hybrid Rocket Combustor with Swirl**

Sulha Lee, Jung Eun Kim, Changjin Lee
Department of Aerospace Information Engineering, Konkuk University, Korea

---

2017-o-5-10 ( 14:30 – 15:00 )

**A Study on Module-Type Hybrid Rocket Engine with Multi-Section Swirl Injection Method for Optimum Combustion and Thrust Control**

Shigeru Aso¹, Yasuhiro Tani², Masato Yamashita³, Kazuya Komori³, Tomohiro Yamasaki³, Toru Shimada³
¹Department of Aeronautics and Astronautics, Kyushu University, Fukuoka, Japan, ²Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

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2017-o-5-11 ( 15:00 – 15:20 )

**Delayed Detached Eddy Simulation of Combustive Flows in a Swirling-Oxidizer-Flow-Type Hybrid Rocket**

Mikiro Motoe
Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

---

2017-o-5-12 ( 15:20 – 15:40 )

**Preliminary Study on the Interaction Between Vortex Shedding and Acoustic Oscillations in Hybrid Rockets**

Sungmin Lim¹, Yohei Deguchi¹, Yukihiro Kurosawa¹, Takakazu Morita¹, Jungpyo Lee²
¹Department of Aeronautics and Astronautics, Tokai University, Hiratsuka, Japan, ²Aerospace Engineering, University of Brasilia, Brasilia, Brazil

---

[o-5-4] Elemental Technologies for Hybrid Rocket

| Session Date | June 6 (Tue) 16:00 – 17:40 |
2017-o-5-13 (16:00 – 16:20)

**Numerical Optimization of the Torch Ignition System for the Hybrid Rocket Motor**

Olexiy Shynkarenko, Domenico Simone, Artem Andrianov
Aerospace Engineering, University of Brasilia, Brazil

2017-o-5-14 (16:20 – 16:40)

**N₂O Flow History Prediction in an Oxidizer Feed Line of Hybrid Rockets**

Daisuke Nakata¹, Kazuki Yasuda², Kugo Okada³, Kazuyuki Higashino³, Rikio Watanabe³
¹Muroran Institute of Technology, Hokkaido, Japan, ²Tokyo City University, Tokyo, Japan

2017-o-5-15 (16:40 – 17:00)

**Thermo-fluid Analysis of Hybrid Rocket with LOX Regenerative Cooling System**

Tomoki Matsuno, Toru Shimada
Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

2017-o-5-16 (17:00 – 17:20)

**Design and Experiment of a LOX Vaporization Nozzle for an A-SOFT Hybrid Rocket Engine**

Tomokazu Mizukoshi, Tatsuya Takei, Takashi Sakurai
Department of Aerospace Engineering, Tokyo Metropolitan University, Japan

2017-o-5-17 (17:20 – 17:40)

**Investigation of Throttling Response Characteristics of Axial-Injection End-Burning Hybrid Rockets**

Yuji Saito¹, Massaya Kimino¹, Ayumu Tsuji¹, Kazunobu Omura¹, Hiroyuki Yasukochi², Kentaro Soeda², Tsuyoshi Totani¹², Masashi Wakita³, Harunori Nagata³
¹Department of Space Engineering, Hokkaido University, Sapporo, Japan, ²Institute for Photon Science and Technology, The University of Tokyo, Tokyo, Japan, ³Faculty of Engineering, Hokkaido University, Sapporo, Japan

---

**[o-5-5] Fuels for Hybrid Rocket**

2017-o-5-18 (9:00 – 9:20)

**A Measurement of Melting Fuel Behavior in Boundary Layer Combustion Type Hybrid Rockets**

Ayana Banno¹, Yo Kawabata¹, Yutaka Wada¹, Nobuji Kato², Keiichi Hori³
¹Department of Mechanical Science and Engineering, Chiba Institute of Technology, Chiba, Japan, ²Katazen Corporation, Aichi, Japan, ³Institute of Space
2017-o-5-19 (9:20 – 9:40)

Thermal Behavior of Aluminized Wax-based Solid Fuel
Yui Murakami¹, Yuki Matsumoto¹, Reo Tanaka¹, Kenichi Takahashi¹, Ikkei Tanabe², Mieko Kumasaki²
¹Department of Aerospace Engineering, College of Science and Technology, Nihon University, Chiba, Japan, ²Department of Chemistry, Chemical Engineering and Bioscience, School of Engineering Science, Graduate School, Yokohama National University, Kanagawa, Japan

2017-o-5-20 (9:40 – 10:00)

Regression Rate Improvement of Hybrid Rocket Fuel by Addition of The Magnesium Powder
Akira Takatashi, Raimu Kobayashi, Takamori Yamaguchi, Yuki Komori, Kenichi Takahashi
Department of Aerospace Engineering, College of Science and Technology, Nihon University, Chiba, Japan

2017-o-5-21 (10:00 – 10:20)

Study on Wax Fuel for Hybrid Rockets
Taira Ishigaki¹, Ichiro Nakagawa²
¹Graduate School of Engineering, Tokai University, Japan, ²Department of Aeronautics and Engineering, Tokai University, Japan

2017-o-5-22 (10:20 – 10:40)

Experimental Investigate of Fuel Regression Rate in Low Melting Point Temperature Thermoplastic Fuels Hybrid Rocket Using the Altering Swirling Oxidizer Flow
Yo Kawabata¹, Ayana Banno¹, Yutaka Wada¹, Kohei Ozawa², Toru Shimada³, Nobuji Kato⁴, Keiichi Hori³, Ryo Nagase¹
¹Chiba Institute of Technology, Narashino, Japan, ²Kyushu Institute of Technology, Kitakyushu, Japan, ³Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, ⁴Katazen Corporation, Oobu, Japan

Technical Session Oral

[a-1] Liquid Propellant 1

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<tr>
<td>Chairpersons</td>
<td>Shinti Nakaya (The University of Tokyo, Japan)</td>
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<td>Oskar J. Haidn (Technical University of Munich, Germany)</td>
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2017-a-03 (11:00 – 11:20)

Research and Development Result of Cryogenic Propellant Valve for Small Thrust LOX/Methane Rocket Engine
Hiroya Asakawa¹, Hiroyuki Sakaguchi¹, Hatsuo Morii¹, Toshiki Kato², Hideaki Nanri², Toshiki Morito², Ideo Masuda²
¹IHI Corporation, Tomioka-shi, Japan, ²Japan Aerospace Exploration Agency, Tsukuba-shi, Japan

2017-a-04 (11:20 – 11:40)

Experiment Result of Turbopump for Small Thrust LOX/Methane Rocket Engine
Taiichi Motomura¹, Hiroyuki Sakaguchi¹, Toru Tsukano¹, Toshiki Kato², Hideaki Nanri², Toshiki Morito², Ideo Masuda²
¹IHI Corporation, Tokyo, Japan, ²Japan Aerospace Exploring Agency, Tsukuba, Japan
[a-2] Liquid Propellant 2

Session Date: June 7 (Wed) 16:00 – 17:00
Room: Meeting Room 6
Chairpersons: Mitsuaki Tanabe (Nihon University, Japan), Takeo Tomita (Japan Aerospace Exploration Agency, Japan)

2017-a-05 (16:00 – 16:20)

Boreas Demonstrator for Next Generation Engines
Ariane Deneuve¹, Stephanie Dreyer¹, Erwan Humbert¹, Louise Lesaunier¹, Didier Guichard¹, Alban DU Tertre¹, Vincent Leudiere², Marie Theron², Julien Herpe²
¹Airbus Safran Launchers, France, ²CNES Launcher Directorate, France

2017-a-06 (16:20 – 16:40)

Uncertainty Analysis as Applicable to a Miniature Cryogenic Test Stand for Rocket Research
Brunno Vasques, Oskar Haidn
Institute of Space Propulsion, Munich Technical University, Germany

2017-a-07 (16:40 – 17:00)

Comparative Study of Ethanol and Kerosene Propellant for Gas-generator Fed Upper Stage Application, Using EcoSimPro
Robson H. S. Hahn, Jan Deeken, Stefan Schlechtriem
German Aerospace Center DLR, Institute of Space Propulsion, Germany

[a-3] Flow Dynamics

Session Date: June 8 (Thu) 9:00 – 10:40
Room: Meeting Room 6
Chairpersons: Takehiro Himeno (The University of Tokyo, Japan), Hideyo Negishi (JAXA, Japan)

2017-a-10 (9:00 – 9:20)

Experimental Analysis of Priming in Evacuated Spacecraft Feedlines
Cristiano Bombardieri, Tobias Traudt, Michael Oschwald
Institute of Space Propulsion, German Aerospace Center (DLR), Lampoldshausen, Germany

2017-a-11 (9:20 – 9:40)

Validation of a Lattice Boltzmann Model for Transient Cryogenic Two-Phase Flow
Tobias Traudt, Stefan Schlechtriem
Institute of Space Propulsion, German Aerospace Center, DLR, Hardthausen, Germany

2017-a-12 (9:40 – 10:00)
Effect of Axial Oscillation Amplitude on Unsteady Fluid Forces Acting on an Open Impeller
Naohito Suwa¹, Toshiya Kimura¹, Satoshi Kawasaki¹, Kosei Goto¹, Masaharu Uchiumi²
¹Japan Aerospace Exploration Agency, Kakuda, Japan, ²East Japan Star Works Co., Ltd., Kakuda, Japan

2017-a-13 (10:00 – 10:20)
Study of Temperature Drift on a Capacitance Void Fraction Sensor for Cryogenic Two-Phase Flow
Shohei Tane¹, Yuki Sakamoto¹, Kota Uragaki¹, Kazuma Minote¹, Yo Nakajima¹, Atsuhiro Furuchí¹, Tetsuya Sato¹, Hiroaki Kobayashi²
¹Department of Applied Mechanics, Waseda University, Tokyo, Japan, ²Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

2017-a-14 (10:20 – 10:40)
Tubular Equivalent Regression Rate in Hybrid Rockets with Complex Geometries
Landon Kamps¹, Tor Viscor¹, Ryo Yamaguchi¹, Yuika Kiyotani¹, Kazuhoi Sakurai¹, Tsuyoshi Totani¹, Masashi Wakiya², Harunori Nagata²
¹Department of Mechanical and Space Engineering, Hokkaido University, Sapporo, Japan, ²Faculty of Engineering, Hokkaido University, Sapporo, Japan

[a-4] Combustion Instability

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<td>Chairpersons</td>
<td>Justin Steven Hardi (Institute of Space Propulsion, Germany)</td>
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<td>Daisuke Nakata (Muroran Institute of Technology, Japan)</td>
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2017-a-15 (11:00 – 11:20)
Interpretation of the Response of Cryogenic Rocket Flames to Forced Acoustics using Large Eddy Simulation
Justin Hardi¹, Youhi Mori², Scott Beinke³, Taro Shimizu³, Hideto Kawashima⁴, Michael Oschwald¹,⁵
¹Institute of Space Propulsion, DLR, Lampoldshausen, Germany, ²JEDI Center, JAXA, Kanagawa, Japan, ³School of Mechanical Engineering, The University of Adelaide, Adelaide, Australia, ⁴Space Technology Directorate I, JAXA, Tsukuba, Japan, ⁵Institute of Jet Propulsion and Turbomachinery, RWTH, Aachen, Germany

2017-a-16 (11:20 – 11:40)
Dynamics and Mixing Characteristics of a Coaxial Jet-Swirl Injector
Jinhyun Bae¹, Taesung Kim¹, Seokgyu Jeong¹, Chanyeong Jeong², Jaye Koo³, Youngbin Yoon¹,⁴
¹Department of Mechanical and Aerospace Engineering, Seoul National University, Seoul, Korea, ²Mechatronics R&D Center, Samsung Electronics Co., Ltd., Gyeonggi-do, Korea, ³School of Mechanical and Aerospace Engineering, Korean Aerospace University, Gyeonggi-do, Korea, ⁴The Institute of Advanced Aerospace Technology, Seoul National University, Seoul, Korea

2017-a-17 (11:40 – 12:00)
Combustion Oscillation Behaviors of a Pintle Injector for an Ethanol/LOX Rocket Engine Combustor
Kazuki Sakaki¹, Tomokazu Funahashi¹, Shinji Nakaya¹, Mitsuhito Tsue¹, Ryuichiro Kana¹, Kyohi Suzuki¹, Takahiro Inagawa², Tetsuo Hiraizumi³
¹Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan, ²Interstellar Technologies Inc., Kakuda, Japan, ³Kakuda Space Center, Japan Aerospace Exploration Agency, Japan
2017-a-18 (12:00 – 12:20)
Flame Visualization within a Rocket Combustion Chamber without Film Cooling System
Shougo Ozaki¹, Youhei Kino², Yoshio Nunome¹, Sadatake Tomioka¹, Takeo Tomita¹
¹Kakuda Space Center, Japan Aerospace Exploration Agency, Japan, ²Department of Aerospace Engineering, Tohoku University

2017-a-19 (12:20 – 12:40)
Reduced Dimension Analysis on Combustion Oscillation in a Model Rocket Combustor
Mitsuaki Tanabe
College of Science and Technology, Nihon University, Funabashi, Japan

[a-5] Air-breathing Engine

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<td>Kazuki Sakaki (The University of Tokyo, Japan)</td>
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2017-a-20 (14:00 – 14:20)
Squeeze Damper Improvement for Reducing Vibration in Gas Turbine Engine Testing
Ming-Chung Lo¹, Chien-Chun Hung²
¹Department of Mechanical and Aerospace Engineering Chung Cheng Institute of Technology, National Defense University, Taoyuan, Taiwan, R.O.C., ²Department of Aeronautical and Opto-Mechatronic Engineering, Vanung University, Taoyuan, Taiwan, R.O.C.

2017-a-21 (14:20 – 14:40)
Research on Fuel Mixing in a Non-reacting Situation Simulating a Dual-mode Combustor
Takuya Arakawa¹, Sadatake Tomioka²
¹Department of Aerospace Engineering, Tohoku University, Miyagi, Japan, ²Advanced Propulsion Research Group, JAXA, Miyagi, Japan

2017-a-22 (14:40 – 15:00)
On Rocket-Airbreather Combination of Propulsion System for a TSTO Launch Vehicle
Sadatake Tomioka¹, Tatsushi Isono², Kan Kobayashi¹, Masatoshi Kodera¹, Kouichiro Tan³
¹Kakuda Space Center, Japan Aerospace Exploration Agency, Japan, ²Department of Aerospace Engineering, Tohoku University

2017-a-23 (15:00 – 15:20)
Breakdown of Counter-Rotating Supersonic Streamwise Vortices Generated by Swept Ramp Injector
Shingo Shichiri, Yamato Tsukazaki, Kazuma Hashimoto, Shoji Sakaue, Takakage Arai
Department of Aerospace Engineering, Osaka Prefecture University, Sakai, Osaka, Japan

2017-a-24 (15:20 – 15:40)
Experimental Study of Ramjet Engine for High-Mach Integrated Control Experiment (HIMICO)
Akira Sato¹, Sho Wakabayashi¹, Yo Iwasaki², Hidekazu Yoshida¹, Tetsuya Sato¹, Hideyuki Taguchi², Takayuki Kojima², Yuto Masuda³, Mitsuhiro Tsue³, Shinji Nakaya³
¹Waseda University, Tokyo, Japan, ²Japan Aerospace Exploration Agency, Chofu, Japan, ³The University of Tokyo, Tokyo, Japan
### 2017-a-25 (16:00 – 16:20)

**High Density Composite Propellants for the Upper Stage Rocket Motor**

Kotaro Matsumoto\(^1\), Akihiro Iwasaki\(^2\), Hiroto Habu\(^1\)

\(^1\)Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, \(^2\)Development of Space and Astronautical Science, SOKENDAI (The Graduate University for Advanced Studies), Sagamihara, Japan

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### 2017-a-26 (16:20 – 16:40)

**Continuous Kneading of AP Composite Propellant Slurry by an Peristaltic Artificial Muscle Mixer**

Akihiro Iwasaki\(^1\), Shun Yoshihama\(^2\), Naomasa Hosomi\(^3\), Kyota Ashigaki\(^2\), Kana Otake\(^3\), Kotaro Matsumoto\(^4\), Yasuyuki Yamada\(^2\), Soichiro Yamaguchi\(^1\), Taro Nakamura\(^2\), Hiroto Habu\(^4\)

\(^1\)Department of Space and Astronautical Science, SOKENDAI, Sagamihara, Japan, \(^2\)Department of Precision Engineering, Chuo University, Bunkyo-ku, Japan, \(^3\)Department of Engineering Science, Kansai University, Suita, Japan, \(^4\)Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

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### 2017-a-27 (16:40 – 17:00)

**Study of an Automatic Material Input Method for the Continuous Production of Solid Propellant by a Peristaltic Mixer**

Kyota Ashigaki\(^1\), Shun Yoshihama\(^1\), Akihiro Iwasaki\(^2\), Kengo Tagami\(^3\), Yasuyuki Yamada\(^2\), Hiroto Habu\(^5\), Taro Nakamura\(^4\)

\(^1\)Graduate School of Science and Engineering, Chuo University, Japan, \(^2\)The Graduate University for Advanced Studies, Japan, \(^3\)PROGRESS TECHNOLOGIES Inc., Japan, \(^4\)Faculty of Science and Engineering, Chuo University, Japan, \(^5\)JAXA, Japan

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### 2017-a-28 (17:00 – 17:20)

**Active Interruption of Motor Combustion for Ammonium-Perchlorate Composite Propellant**

Yosuke Melchin, Masafumi Tanaka

National Defense Academy, Yokosuka, Japan

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### 2017-a-29 (17:20 – 17:40)

**Analyzing Dispersion of Particles and Void in AP/HTPB Composite Propellant by X-ray Computed Tomography**

Naomasa Hosomi\(^1\), Kana Otake\(^1\), Natsuyo Uegaki\(^2\), Akihiro Iwasaki\(^3\), Kotaro Matsumoto\(^4\), Hiroto Habu\(^4\), Soichiro Yamaguchi\(^2\)

\(^1\)Department of Engineering Science, Kansai University, Osaka, Japan, \(^2\)Department of Applied Physics, Kansai University, Osaka, Japan, \(^3\)Department of Space and Astronautical Science, The Graduate University for Advance Studies, Kanagawa, Japan, \(^4\)Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

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**Session Date:** June 9 (Fri) 9:00 – 10:40

**Room:** Meeting Room 6

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2017-a-30 (9:00 - 9:20)

The Experimental Investigations and Validations of an ADN-based Liquid Thruster Family

Zhaopu Yao, Wei Zhang, Meng Wang, Jun Chen, Yan Shen
Beijing Institute of Control Engineering, Beijing, China

2017-a-31 (9:20 - 9:40)

Preparation and Thermal Decomposition behavior of High Energy Ionic Liquids based on Ammonium Dinitramide and Amine Nitrates

Hiroki Matsunaga, Katsumi Katoh, Hiroto Habu, Masaru Noda, Atsumi Miyake
Department of Chemical Engineering, Fukuoka University, Fukuoka, Japan, Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, Institute of Advanced Sciences, Yokohama National University, Japan

2017-a-32 (9:40 - 10:00)

Thermal Properties of ADN based Ionic Liquid Gel Propellants

Kento Shiota, Yu-Ichiro Izato, Hiroki Matsunaga, Hiroto Habu, Atsumi Miyake
Graduate School of Environmental and Information Sciences, Yokohama National University, Yokohama, Japan, Department of Chemical Engineering, Fukuoka University, Fukuoka, Japan, Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, Institute of Advanced Sciences, Yokohama National University, Yokohama, Japan

2017-a-33 (10:00 - 10:20)

Laser Ignition and Thermal Property of Ammonium Dinitramide based Energetic Ionic Liquid Propellants by Including Chemical Dyes

Mamoru Hayata, Kento Shiota, Yu-Ichiro Izato, Hiroki Matsunaga, Hiroto Habu, Atsumi Miyake
Graduate School of Environment and Information Science, Yokohama National University, Yokohama, Japan, Research Fellow of Japan Society for the Promotion of Science, Tokyo, Japan, Department of Chemical Engineering, Fukuoka University, Fukuoka, Japan, Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, Institute of Advanced Sciences, Yokohama National University, Yokohama, Japan

2017-a-34 (10:20 - 10:40)

Investigation for Ignition of ADN-based Ionic Liquid with Visible Pulse Laser

Noboru Itouyama, Hiroto Habu
Department of Chemical System Engineering, The University of Tokyo, Tokyo, Japan, Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

[a-8] Low Toxicity

Session Date: June 9 (Fri) 11:00 – 12:40
Room: Meeting Room 6
Chairpersons: Yutaka Wada (Chiba Institute of Technology, Japan)
Kotaro Matsumoto (Japan Aerospace Exploration Agency, Japan)

2017-a-35 (11:00 - 11:20)
Investigation into Prototype of a Hydroxylammonium Nitrate (HAN)-based Micropropulsion System
Wai Siong Chai¹, Kean How Cheah¹,², Kai Seng Koh³, Jitkai Chin⁴
¹Department of Chemical and Environmental Engineering, University of Nottingham Malaysia Campus, Malaysia, ²School of Engineering and Physical Science, Heriot-Watt University Malaysia, Malaysia

2017-a-36 (11:20 – 11:40)

A Kinetic Model for Combustion of Hydroxylammonium Nitrate (HAN)-Based Propellants
Yu-Ichiro Izato¹, Mitsuo Koshi¹,², Atsumi Miyake²
¹Graduate school of Environmental and Information Sciences, Yokohama National University, Yokohama, Japan, ²Institute of Advanced Science, Yokohama National University, Yokohama, Japan

2017-a-37 (11:40 – 12:00)

Influence of Injector for Performance of N₂O/DME Bipropellant Thruster
Takamasa Asakura¹, Shouta Hayashi¹, Yasuyuki Yano¹, Akira Kakami²
¹Department of Mechanical Design Systems Engineering, University of Miyazaki, Japan, ²Technical Centers, University of Miyazaki, Japan

2017-a-38 (12:00 – 12:20)

Performance Characteristics of Low-Power DC Arcjet Thrusters with Low-Toxicity Propellants
Takefumi Mimura¹, Yuki Fukutome¹, Suguru Shiraki¹, Katsuya Shimogaito¹, Kazuyoshi Okuda¹, Hirokazu Tahara¹, Kyoko Takada¹, Ali Momozawa¹, Yuichiro Nogawa², Daisuke Nakata²
¹Department of Mechanical Engineering, Osaka Institute of Technology, Osaka, Japan, ²Department of Medical Engineering, Tokyo City University, Tokyo, Japan, ³Spilje, Ibaraki, Japan, ⁴Department of Aerospace Engineering, Muroran Institute of Technology, Hokkaido, Japan

2017-a-39 (12:20 – 12:40)

Evaluation of Laser Ignition for HAN-based Monopropellant of RCS Thruster
Masaya Furusawa, Toshiyuki Katsumi, Satoshi Kadowaki
Nagasaki University of Technology, Japan

[a-9] Space Plane, Hybrid Propellant, Detonation Engine

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<td>Masashi Wakita (Hokkaido University, Japan)</td>
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2017-a-40 (14:00 – 14:20)

Preliminary Numerical Simulation of Flow around Spaceplane for Airframe Engine Integration
Susumu Hasegawa¹, Takeshi Kanda²
¹Research Unit IV, JAXA, Kakuda, Miyagi, Japan, ²Department of Mechanical Engineering, Chubu University, Aichi, Japan

2017-a-41 (14:20 – 14:40)

Coupled Aerodynamic Characteristics of Airframe and Engine of Space Plane
Kanenori Kato¹, Kohichi Tatsukasa², Kouichi Tani², Susumu Hasegawa¹, Kazuhide Mizobata², Takeshi Kanda²
¹The Research and Development Directorate, JAXA, Miyagi, Japan, ²Muroran Institute of Technology, Hokkaido, Japan, ³Chubu University, Aichi, Japan

2017-a-42 (14:40 – 15:00)
An Experimental Study on Stability of Rotating Detonation Waves
Daisuke Ikema, Atsushi Yokota, Wataru Kurata, Kazuhiro Ishii
Department of Mechanical Engineering, Yokohama National University, Yokohama, Japan

Effect of Carbon Black Diameter on Performance for a Throttleable Solid Propellant Microthruster Using Laser Heating
Daich Haraguchi1, Shota Isakari2, Yasuyuki Yano3, Akira Kakami3
1Department of Mechanical Design Systems Engineering, University of Miyazaki, Japan, 2Department of Mechanical Systems Engineering, University of Miyazaki, Japan, 3Technical Center, University of Miyazaki, Japan

Design and Performance of 0.4 N Class Hybrid Microthruster using Powder Fuel
Takuya Watanabe1, Yoshikazu Iwao2, Yasuyuki Yano3, Akira Kakami3
1Department of Mechanical Design Systems Engineering, University of Miyazaki, Miyazaki, Japan, 2Department of Mechanical Systems Engineering, University of Miyazaki, Miyazaki, Japan, 3Technical Center, University of Miyazaki, Miyazaki, Japan

Field Emission Cathodes for an Electrodynamic Tether Experiment on the H-II Transfer Vehicle
Yasushi Ohkawa1, Teppei Okumura1, Yuuta Horikawa1, Yoshiyuki Miura1, Satomi Kawamoto2, Koichi Inoue2
1Research and Development Directorate, JAXA, Chofu, Japan, 2Research and Development Directorate, JAXA, Tsukuba, Japan, 3Space Technology Directorate, JAXA, Tsukuba, Japan

Research and Development of High Power and High Specific-Impulse Hall Thrusters for In-Space Propulsion
Kyohei Fujiwara1, Tensei Kawakami1, Yuya Takahata1, Tetsuo Kakuma1, Yusuke Furukubo1, Mitsuyoshi Kobayashi1, Hirokazu Tahara2, Kyoko Takada1, Tomoyuki Ikeda2
1Department of Mechanical Engineering, Osaka Institute of Technology, Osaka, Japan, 2Department of Aeronautics and Astronautics, Tokai University, Kanagawa, Japan

Development of Coaxial Pulsed Plasma Thruster Systems for Powered Flight Onboard the Osaka Institute of Technology 2nd PROITERES Nano-Satellite
Kosuke Enomoto1, Ryota Fujita1, Koki Ryuho1, Kohel Ono1, Naoki Morikawa1, Hirokazu Tahara2, Kyoko Takada1, Takashi Wakizono2
1Department of Mechanical Engineering, Osaka Institute of Technology, Osaka, Japan, 2High Serve Inc., Tokyo, Japan
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| June 6 (Tue)       | 16:00 – 17:20 | Hiroki Watanabe (Tokyo Metropolitan University, Japan)  
                     |             | Shigeru Yokota (University of Tsukuba, Japan) |

2017-b-06 (16:00 – 16:20)

**Numerical Simulation of High Current Hollow Cathode**

Kohei Kojima, Shigeru Yokota, Akira Osada, Junko Yamasaki, Moyuru Yonaha, Tatsuya Kimura, Yoshihiro Kawamata, Masaaki Yasui

1Mitsubishi Heavy Industries, Ltd, Nagoya, Japan, 2University of Tsukuba, Japan

2017-b-07 (16:20 – 16:40)

**Plasma Diagnosis by Langmuir Probing on High Current Hollow Cathode**

Kohei Kojima, Shigeru Yokota, Junko Yamasaki, Moyuru Yonaha, Tatsuya Kimura, Yoshihiro Kawamata, Masaaki Yasui

1Mitsubishi Heavy Industries, Ltd, Nagoya, Japan, 2University of Tsukuba, Japan

2017-b-08 (16:40 – 17:00)

**Hybrid-PIC Simulation on Thermal Characteristics of Hollow Cathode**

Kenichi Kubota, Yuya Oshio, Hiroki Watanabe, Shinata Cho, Yasushi Ohkawa, Ikkoh Funaki

1Aeronautical Technology Directorate, JAXA, Chofu, Tokyo, Japan, 2Department of Mechanical Systems Engineering, Tokyo University of Agriculture and Technology, Koganei, Tokyo, Japan, 3Faculty of System Design, Tokyo Metropolitan University, Hino, Tokyo, Japan, 4Research and Development Directorate, JAXA, Chofu, Tokyo, Japan, 5Institute of Space and Astronautical Science, JAXA, Sagamihara, Kanagawa, Japan

2017-b-09 (17:00 – 17:20)

**Experimental Investigation of LaB₆ Hollow Cathode with Radiative Heater**

Yuya Oshio, Kenichi Kubota, Hiroki Watanabe, Shinata Cho, Yasushi Ohkawa, Ikkoh Funaki

1Department of Mechanical Systems Engineering, Tokyo University of Agriculture and Technology, Tokyo, Japan, 2Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, 3Department of System Design, Tokyo Metropolitan University, Tokyo, Japan

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| June 7 (Wed)       | 9:00 – 10:00 | Holak Kim (KAIST, Korea)                        
                     |             | Masakatsu Nakano (Tokyo Metropolitan College of Industrial Technology, Japan) |

2017-b-11 (9:00 – 9:20)

**Study on Suppression Method and Reliability of Pulse Current of Hall Thruster Ignition Process**

Wenbo Li, Yingyong Yang, Tao Huang, Liqiu Wei, Daren Yu

Institute of Advanced Power, Harbin Institute of Technology, Harbin, People’s Republic of China
Performance of a 2 kW-Class Anode-Layer Thruster RAIJIN 66
Yushi Hamada, Rei Kawashima, Kimiya Komurasaki, Hiroyuki Koizumi
Department of Advanced Energy, GSFS, The University of Tokyo, Tokyo, Japan

Operating Characteristics of Anode-layer-type Hall Thruster Using Alternative Propellant
Junko Yamasaki, Shigeru Yokota, Kohei Shimamura
University of Tsukuba, Tsukuba, Japan

Effect of Indent Channel on Discharge Characteristics of a No-Wall-Loss Hall Thruster
Yongjie Ding, Hezhi Sun, Wujie Peng, Liqiu Wei
Plasma Propulsion Lab, Institute of Advanced Power, Harbin Institute of Technology, Harbin, China

Effects of the Magnetic Field Gradient on the Wall Power Deposition of Hall Thrusters
Liqiu Wei, Yongjie Ding, Peng Li, Xu Zhang, Hezhi Sun, Wujie Peng, Daren Yu
Institute for Advanced Power, Harbin Institute of Technology, China

Development of a Low Power Magnetic-field-tailored Hall Thruster
Holak Kim, Seunghun Lee, Keuntae Doh, Wonho Choe
Korea Advanced Institute of Science and Technology (KAIST), Republic of Korea

A Horizontal Pendulum-type Thrust stand for Evaluating Higher Frequency Variation by Applying Acceleration Measurement to Null-balance Method
Yusuke Yamauchi, Yasuyuki Yano, Akira Kakami
Department of Mechanical Design Systems Engineering, University of Miyazaki, Japan

Propellant Flow Analysis within Electric Propulsion Test Facility
Yoshinori Nakayama
Department of Aerospace Engineering, National Defense Academy, Yokosuka, Japan
[b-5] Ion Thruster

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2017-b-19 (16:00 – 16:20)

**Experiment and Analysis on The Neutralization of The Electron Cyclotron Resonance Ion Thruster**

Juan Yang, Yizhou Jin, Yizhi Huang, Haibo Meng, Wenbin Huang
School of Astronautic, Northwestern Polytechnical University Xi’an, China

2017-b-20 (16:20 – 16:40)

**Transient Behavior of Ion Extraction and Acceleration of Variable Thrust Ion Thruster**

Masakatsu Nakano¹, Naoji Yamamoto², Ikkoh Funaki², Yasushi Ohkawa³
¹Tokyo Metropolitan College of Industrial Technology, Tokyo, Japan, ²Kyushu University, Fukuoka, Japan, ³Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, ³Research and Development Directorate, JAXA, Chofu, Japan

2017-b-21 (16:40 – 17:00)

**Development of Thrust Variable System by Controlling Duty Ratio of Ion Beam Extraction in Ion Thrusters**

Ippei Takesue¹, Yutaro Kawahara¹, Kensuke Iijima¹, Kouichi Ushio¹, Naoji Yamamoto¹, Taichi Morita¹, Masakatsu Nakano², Yasushi Ohkawa³, Ikkoh Funaki²
¹Kyushu University, Japan, ²Tokyo Metropolitan College of Industrial Technology, Japan, ³JAXA, Japan

2017-b-23 (17:00 – 17:20)

**Numerical Analysis of a Miniature Microwave Discharge Ion Thruster Using Water as Propellant**

Kengo Nakamura¹, Hiroyuki Koizumi², Yoshinori Takao³
¹Department of Systems Integration, Yokohama National University, Yokohama, Japan, ²Department of Advanced Energy, The University of Tokyo, Tokyo, Japan, ³Division of Systems Research, Yokohama National University, Yokohama, Japan

[b-6] MPD Thruster

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<td>Akira Iwakawa (Nagoya University, Japan)</td>
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2017-b-24 (9:00 – 9:20)
Performance of 100 kW Steady State Applied-Field MPD Thruster
Adam Boxberger, Peter Jüstel, Georg Herdrich
Institute of Space Systems, University of Stuttgart, Stuttgart, Germany

Performance Characteristics of High-Power Steady-State MPD Thrusters with Cusp Field Using Permanent Magnets for Manned Mars Exploration
Shota Saito, Kengo Chino, Yoshikazu Sugiyama, Hirokazu Tahara, Kyoko Takada
Department of Mechanical Engineering, Osaka Institute Technology, Japan

The Effect of Anode Configuration on Hydrogen MPD Thruster Performance: A Numerical Study
Shitan Tauchi1, Akira Kawasaki2, Masakatsu Nakane3, Kenichi Kubota4, Ikko Funakii5
1Department of Space and Astronautical Science, SOKENDAI (The Graduate University for Advanced Studies), Sagamihara, Japan, 2Department of Aerospace Engineering, Nagoya University, Nagoya, Japan, 3Department of Aerospace Engineering, Nihon University, Funabashi, Japan, 4Aeronautical Technology Directorate, JAXA, Chofu, Japan, 5Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

Operation Characteristic of Applied-Field Magnetoplasmadynamics Thruster Using Hollow Cathode
Hayato Kasuga
Department of Aerospace Engineering, Nagoya University, Japan
A 1-D Numerical Analysis of a Laser Supported Detonation with Multiple Thermal Non-equilibrium and Precursor Radiation Heating

Hiroshi Katsurayama, Kenta Mishima, Yasuo Katoh
Graduate School of Sciences and Technology for Innovation, Yamaguchi University, Yamaguchi, Japan

Multi-objective Design Optimisation of a Small Scale Cusped Field Thruster for Micro-satellite Platforms

Angus Muffatti, Hideaki Ogawa
Aerospace Systems Pty Ltd, Melbourne, Australia, School of Engineering, Royal Melbourne Institute of Technology, Melbourne, Australia

Experimental Study for Effects of Plasma Density on the Performance in an Electrodeless Inductive Plasma Accelerator

Kazuya Yaginuma, Toshihiro Matsuguma, Hokuto Sekine, Shintarou Komatsu, Hiroyasu Kurashige, Hiroyuki Koizumi, Kimiya Komurasaki
Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan, Department of Advanced Energy, The University of Tokyo, Tokyo, Japan, Department of Creative Informatics, The University of Tokyo, Tokyo, Japan

Effect of Improvement in Neutral Depletion on Propulsion Performance in Electrodeless Thruster

Kazuki Takase, Kazunori Takahashi, Yoshinori Takao
Department of Systems Integration, Yokohama National University, Yokohama, Japan, Department of Electrical Engineering, Tohoku University, Sendai, Japan, Division of Systems Research, Yokohama National University, Yokohama, Japan

Study of Electric Propulsion using Sheet Plasma in TPD-Sheet IV

Miku Nishimura, Toshikio Takimoto, Akira Tonegawa, Hideyuki Horisawa, Kohnosuke Sato, Kazutaka Kawamura
Department of Physics, School of Science, Tokai University, Hiratsuka, Japan, Chubu Electric Power Co., Inc., Aichi, Japan

Effect of Cathode Electrode Shape on Performance of Vacuum Arc Thruster

Yayoi Murakami, Kateryna Aheieva, Kazuhiro Toyoda, Mengu Cho
Kyushu Institute of Technology, Japan
### Advanced Thruster 2

**Session Date:** June 8 (Thu) 16:00 – 17:40  
**Room:** Pearl Room B  
**Chairpersons:** Liqiu Wei (Harbin Institute of Technology, China)  
Yuya Oshio (Tokyo University of Agriculture and Technology, Japan)

#### 2017-b-39 (16:40 – 17:00)

**Multi-Coil Magnetic Sail Experiment in Laboratory**

_Kazuma Ueno_\(^1\), Yuya Oshio\(^2\), Ikkoh Funaki\(^3\), Hiroshi Yamakawa\(^4\)

\(^1\)Department of Electrical and Electronic Engineering, Chukyo University, Nagoya, Japan,  
\(^2\)Department of Mechanical Systems Engineering, Tokyo University of Agriculture and Technology, Koganei, Japan,  
\(^3\)Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan,  
\(^4\)Research Institute for Sustainable Humanosphere, Kyoto University, Uji, Japan

#### 2017-b-40 (17:00 – 17:20)

**Experimental and Numerical Investigation of Thrust Generation and Vector Control with a Magnetic Thrust Chamber**

_Taichi Morita\(^1\), Satoshi Miura\(^2\), Hideo Nagatomo\(^3\), Atsushi Sunahara\(^4\), Naoya Saito\(^5\), Yutaro Itadani\(^6\), Yoshitaka Mori\(^7\), Tomoyuki Johzaki\(^8\), Akifumi Yogo\(^9\), Hiroaki Nishimura\(^10\), Shinsuke Fujioka\(^11\), Hideki Nakashima\(^12\), Naoji Yamamoto\(^13\)

\(^1\)Faculty of Engineering Sciences, Kyushu University, Kasuga, Japan,  
\(^2\)Interdisciplinary Graduate School of Engineering Sciences, Kyushu University, Kasuga, Japan,  
\(^3\)Institute of Laser Engineering, Osaka University, Japan,  
\(^4\)Center for Materials under eXtreme Environment (CMUXE), School of Nuclear Engineering, Purdue University, Indiana, USA,  
\(^5\)The Graduate School for the Creation of New Photonics Industries, Hamamatsu, Shizuoka, Japan,  
\(^6\)Graduate School of Engineering, Hiroshima University, Higashi-Hiroshima, Hiroshima, Japan

#### 2017-o-1-09 (17:20 – 17:40)

**Thrust Measurement of a Plasma Sail with a Magnetic Nozzle Injecting a Thermal Plasma Generated by LaB\(_6\) Cathode**

_Yoshihiro Kajimura_\(^1\), Tatsumasa Hagiwara\(^2\), Yuya Oshio\(^2\), Ikkoh Funaki\(^3\)

\(^1\)Department of Electrical and Computer Engineering, Akashi National College of Technology, Akashi, Japan,  
\(^2\)Department of Mechanical System Engineering, Tokyo University of Agriculture and Technology, Koganei, Japan,  
\(^3\)Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

### Electrothermal Thruster

**Session Date:** June 9 (Fri) 9:00 – 10:20  
**Room:** Pearl Room B  
**Chairpersons:** Koichi Mori (Nagoya University, Japan)  
Hiroyuki Nishida (Tokyo University of Agriculture and Technology, Japan)

#### 2017-b-42 (9:20 – 9:40)

**Research and Development of Low-power Anode-Radiation-Cooled DC Arcjet Thruster Using Water Propellants**

_Kazuyoshi Okuda\(^1\), Yuki Fukutome\(^1\), Suguru Shiraki\(^1\), Katsuya Shimogaito\(^1\), Takefumi Mimura\(^1\), Hirokazu Tahara\(^1\), Kyoko Takada\(^1\), Ai Momozawa\(^1\), Daisuke Nakata\(^1\), Yuichiro Nogawa\(^4\)

\(^1\)Department of Electrical and Electronic Engineering, Akashi National College of Technology, Akashi, Japan,  
\(^2\)Department of Mechanical System Engineering, Tokyo University of Agriculture and Technology, Koganei, Japan,  
\(^3\)Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan,  
\(^4\)Graduate School of Engineering, Hiroshima University, Higashi-Hiroshima, Hiroshima, Japan
2017-b-43 (9:40 – 10:00)

**400-V Bus-Direct Driven High-Power Arcjet Thruster Using Dimethyl ether as Additive for Extending Lifetime**

Toshihisa Kishida¹, Hiroaki Murata², Yasuyuki Yano³, Akira Kakami¹

¹Department of Mechanical Engineering, Osaka Institute of Technology, Osaka, Japan, ²Department of Medical Engineering, Tokyo City University, Tokyo, Japan, ³Department of Aerospace Engineering, Muroran Institute of Technology, Hokkaido, Japan

2017-b-44 (10:00 – 10:20)

**Development of Chemically Augmented Electrothermal Thrusters**

Shoko Shibagaki¹, K. Wada¹, Mitsutoshi Tsuchiya², Yuka Arai², Tomoyuki Ikeda³, Hideyuki Horisawa³

¹Department of Mechanical Engineering, Graduate student, Tokai University, Kanagawa, Japan, ²Department of Aeronautics and Astronautics, Undergraduate student, Tokai University, Kanagawa, Japan, ³Department of Aeronautics and Astronautics, Associate Professor, Tokai University, Kanagawa, Japan

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[b-11] Pulsed Plasma Thruster

**Session Date June 9 (Fri) 11:00 – 12:20**

**Room** Pearl Room B

**Chairpersons** Akira Kakami (University of Miyazaki, Japan)
Hideyuki Horisawa (Tokai University, Japan)

2017-b-46 (11:20 – 11:40)

**Plasma Characteristics in the Discharge Channel of an Ablative Pulsed Plasma Thruster**

Lei Yang, Yuping Huang, Zaiping Zheng, Zhenxiang Xu, Liyuan Yan

Beijing Research Institute of Precise Mechatronics and Controls, Beijing, China

2017-b-47 (11:40 – 12:00)

**Plasma Characterization of a Short-pulse Laser-assisted Pulsed Plasma Thruster**

Kentaro Kato¹, Toshiyuki Oi¹, Hideyuki Horisawa²

¹Department of Mechanical Engineering Graduate school of Engineering, Tokai University, Japan, ²Department of Aeronautics and Astronautics, Professor Tokai University, Japan

2017-b-48 (12:00 – 12:20)

**One-Dimensional Flowfield Calculation of Coaxial Pulsed Plasma Thrusters**

Ryota Fujita¹, Tobias Haase², Keita Kanaoka³, Kohei Ono¹, Naoki Morikawa¹, Koki Ryuho³, Kosuke Enomoto¹, Hirokazu Tahara³, Kyoko Takada³, Takashi Wakizono⁴

¹Department of Mechanical Engineering, Osaka Institute of Technology, Osaka, Japan, ²Faculty of Electrical Engineering and Information Technology, University of the Federal Armed Forces Munich, Germany, ³Faculty of Intellectual Property, Osaka Institute of Technology, Osaka, Japan, ⁴Electric Propulsion R&D Section, High-Serve Inc., Tokyo, Japan

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[b-12] Low Power Thruster 1
2017-b-49 (14:00 – 14:20)
**Numerical Study on the Micro-cathode Arc Thruster**
Jinyue Geng¹, Zichang Xiong², Hai-Xing Wang²
¹Beijing Institute of Control Engineering, Beijing, China, ²Beijing University of Aeronautics and Astronautics, Beijing, China

2017-b-50 (14:20 – 14:40)
**Effect of Anode Magnetic Shield on Performance and Life in Low Power Cylindrical Hall Thruster**
Yongjie Ding¹,², Peng Li¹, Yu Xu¹, Liqiu Wei¹,²
¹Plasma Propulsion Lab, Institute of Advanced Power, Harbin Institute of Technology, Harbin, China, ²Electric Drive & Propulsion Technology Lab, Harbin Institute of Technology, Harbin, China

2017-b-51 (14:40 – 15:00)
**10 W Class Micro Hall Thruster with Anode Layer**
Seunghun Lee¹,², Holak Kim¹, Keuntae Doh³, Wonho Choe¹
¹Korea Advanced Institute of Science and Technology (KAIST), Republic of Korea, ²Korea Institute of Materials Science (KIMS), Republic of Korea

2017-b-52 (15:00 – 15:20)
**Research and Development of Low-Power Cylindrical Hall Thrusters and Magnetic-Field-Expansion Cathodes for the Osaka Institute of Technology Moon-Exploration 3rd PROITERES Nano-Satellite**
Tensei Kawakami¹, Kohei Fujiiwara¹, Mitsuyoshi Kobayashi¹, Yusuke Furukubo¹, Tetsuo Kakuma¹, Yuya Takahata¹, Hirokazu Tahara¹, Kyoko Takada¹, Tomoyuki Ikeda²
¹Department of Mechanical Engineering, Osaka Institute of Technology, Osaka, Japan, ²Department of Aeronautics and Astronautics, Tokai University, Kanagawa, Japan

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[b-13] **Laser & Microwave Thruster**

2017-b-54 (14:00 – 14:20)
**Effect of Bremsstrahlung Emission from Laser-induced Plasma on The Propagation of Ionization Wave and Shock Wave**
Ippei Yokota¹, Kohei Shimamura¹, Naoto Ozaki¹, Inoru Kiyono¹, Kohei Matsui², Shigeru Yokota¹, Kimiya Komurasaki²
¹Department of Engineering Mechanics and Energy, The University of Tsukuba, Tsukuba, Japan, ²Department of Aeronautics and Astronautics, The
2017-b-55 (14:20 – 14:40)

**Acceleration of Laser-Ablation Plasma by Alternating Electric Fields**

Haruhito Kato, Yuki Nakamura, Kaede Yano, Hideyuki Horisawa
Tokai University, Kanagawa, Japan

2017-b-56 (14:40 – 15:00)

**The Effect of Ambient Gas Species on Propagation Velocity of Laser-induced Discharge in Laser Propulsion**

Kohei Matsui¹, Toru Shimano², Joseph A. Ofosu³, Kimiya Komurasaki¹, Hiroyuki Koizumi²
¹Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan, ²Department of Advanced Energy, The University of Tokyo, Tokyo, Japan

2017-b-57 (15:00 – 15:20)

**Laser-ablation Plasma Diagnostics by Single- and Triple-probes**

Kaede Yano¹, Haruhito Kato¹, Yuki Nakamura², Akihiro Osamura², Ryo Edamura³, Hideyuki Horisawa³
¹Dept. Graduate school of engineering, Tokai University, Japan, ²Graduate student, Dept. Aeronautics & Astronautics, Tokai University, Japan, ³Professor, Dept. Aeronautics & Astronautics, Tokai University, Japan

2017-b-58 (15:20 – 15:40)

**Feasibility of Laser Ablation Propulsion using Magnetic Fluid as a Propellant**

Takuyuki Sakai, Shigeru Yokota, Kohei Shimamura
University of Tsukuba

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**[b-14] Low Power Thruster 2**

**Session Date**
June 9 (Fri) 16:00 – 17:20

**Room**
Pearl Room B

**Chairpersons**
Kazuhiro Toyoda (Kyushu Institute of Technology, Japan)
Hirokazu Tahara (Osaka Institute of Technology, Japan)

2017-b-62 (16:00 – 16:20)

**Numerical Investigation of Steady and Transient Ion Beam Extraction Mechanisms for Electrospray Thrusters**

Kazuma Emoto¹, Toshiyuki Tsuchiya², Yoshinori Takao³
¹Department of Systems Integration, Yokohama National University, Yokohama, Japan, ²Department of Micro Engineering, Kyoto University, Kyoto, Japan, ³Division of Systems Research, Yokohama National University, Yokohama, Japan

2017-b-63 (16:20 – 16:40)

**Evaluation of Ion Beam Characteristics for Ionic Liquid Electrospray Thrusters**

Naoki Inoue¹, Kaito Nakagawa¹, Toshiyuki Tsuchiya², Yoshinori Takao³
¹Department of Systems Integration, Yokohama National University, Yokohama, Japan, ²Department of Micro Engineering, Graduate School of Engineering, Kyoto University, Kyoto, Japan, ³Department of Systems Research, Yokohama National University, Yokohama, Japan

2017-b-60 (16:40 – 17:00)

**Proposal of Unified Micro-Propulsion System using Water Propellant for CubeSats**

Hiroyuki Koizumi¹, Yoshinori Takao², Masakatsu Nakano³, Ryu Funase⁴, Jun Asakawa⁵, Yuichi Nakagawa⁶, Daiki Tomita⁷, Kimiya
¹Department of Systems Integration, Yokohama National University, Yokohama, Japan, ²Department of Micro Engineering, Graduate School of Engineering, Kyoto University, Kyoto, Japan, ³Department of Systems Research, Yokohama National University, Yokohama, Japan, ⁴Department of Micro Engineering, Graduate School of Engineering, Kyoto University, Kyoto, Japan, ⁵Department of Systems Research, Yokohama National University, Yokohama, Japan, ⁶Department of Systems Integration, Yokohama National University, Yokohama, Japan, ⁷Department of Micro Engineering, Graduate School of Engineering, Kyoto University, Kyoto, Japan
Design and Test of a 100 μN-class Thrust Stand for a Miniature Water Ion Thruster with CubeSat

Yuichi Nakagawa, Daiki Tomita, Hiroyuki Koizumi, Kimiya Komurasaki

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

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

2017-b-61 ( 17:00 ‒ 17:20 )

[c-1] Reentry TPS 1

Session Date: June 6 (Tue) 9:00 ‒ 10:40

Room: Meeting Room 5

Chairpersons: Shin-ichi Takeda (JAXA, Japan), Saori Nagi (IHI Aerospace Co., Ltd., Japan)

Experimental Investigation of Material Demisability in Uncontrolled Earth Re-entries

Adam S. Pagan, Bartomeu Massuti-Ballester, Georg Herdrich, James A. Merrifield, James C. Beck, Volker Liedtke, Benoit Bonvoisin

Institute of Space Systems, University of Stuttgart, Stuttgart, Germany

Fluid Gravity Engineering Ltd., Emsworth, United Kingdom

Belstead Research Ltd., Ashford, United Kingdom

Aerospace and Advanced Composites GmbH, Wiener Neustadt, Austria

European Space Agency, European Space Research and Technology Centre (ESA-ESTEC), Noordwijk, The Netherlands

In-Situ Measurement of Thermal Deformation of CFRP Ablator at Arc-Heated Wind Tunnel Using Digital Image Correlation

Kan Sawai, Yasuhiro Fukuda, Jun Koyanagi, Yuelin Zhang, Satoru Yoneyama, Kenichi Hirai

Department of Mechanical Engineering, Aoyama Gakuin University, Sagamihara, Japan

Department of Aeronautics and Astronautics, Tokyo University of Science, Tokyo, Japan

IHI AEROSPACE Co., Ltd., Tomioka, Japan

Delamination of CFRP Ablator under Rapid Heating

Jun Koyanagi, Yasuhiro Fukuda, Takuya Aoki, Akinori Yoshimura, Saori Nagi, Ken-Ichi Hirai

Tokyo University of Science, Japan

JAXA, Japan

IHI Aerospace, Japan

Spall Fracture Mechanisms and Strength Evaluation of CFRP against High-speed Impact

Daisuke Yoshimizu

Nagoya University, Japan

Dust Erosion of the Thermal Protection System for Martian Atmospheric Entry

Takahiro Yamanaka, Jun Koyanagi

Tokyo University of Science, Japan
[c-2] Reentry TPS 2

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<td>Jun Koyanagi (Tokyo University of Science, Japan)</td>
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<td>Ken-ichi Hirai (IHI Aerospace Co., Ltd., Japan)</td>
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2017-c-06 (11:00 - 11:20)

The Ablation Performance and Dynamics of the Heat Shield Material ZURAM

Adam S. Pagan, Christian Zuber, Bartomeu Massuti-Ballester, Georg Herdrich, Hermann Hald, Stefanos Fasoulas

1Institute of Space Systems, University of Stuttgart, Stuttgart, Germany; 2Institute of Structures and Design, German Aerospace Centre (DLR), Stuttgart, Germany

2017-c-07 (11:20 - 11:40)

Development of Mid Density Carbon Phenolic Ablators for Future Re-entry Capsules

Kenichi Hirai, Akiko Nakazato, Jun Koyanagi, Kazuhiko Yamada

1IHI Aerospace Co., Ltd., Tomioka, Gunma, Japan; 2Tokyo University of Science, Tokyo, Japan; 3Institute of Space and Astronautical Science, JAXA, Sagamihara, Kanagawa, Japan

2017-c-09 (11:40 - 12:00)

Ablative Performance of High Density Carbon Phenolic after Cold Soak Exposure

Kenichi Hirai, Akiko Nakazato, Hayato Yano, Kenichi Kawazoe, Jun Koyanagi, Kazuhiko Yamada

1IHI Aerospace Co., Ltd., Tomioka, Gunma, Japan; 2Tokyo University of Science, Tokyo, Japan; 3Institute of Space and Astronautical Science, JAXA, Sagamihara, Kanagawa, Japan

[c-3] Measurement and Simulation

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<td>Yong Chan Cho (Korea Research Institute of Standards and Science, Korea)</td>
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<td>Jun Koyanagi (Tokyo University of Science, Japan)</td>
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2017-c-10 (14:00 - 14:20)

Structural Health Monitoring using Tilted FBG type Optical Fiber Sensors

Naoto Nakamura, Shin-Ich Takada, Toshio Ogasawara

1Department of Mechanical Systems engineering, Tokyo University of Agriculture and Technology, Tokyo, Japan; 2Aeronautical Technology Directorate, JAXA, Tokyo, Japan

2017-c-11 (14:20 - 14:40)
**Evaluation of Long-term Thermal Stabilities of Polyimide Resin TriA-X based Composites using FBG Sensors**

Shin-Ichi Takeda¹, Yuki Kubota¹, Takuya Aoki¹, Yuichi Ishida¹, Toshio Ogasawara²

¹Aeronautical Technology Directorate, JAXA, Tokyo, Japan; ²Department of Mechanical, systems engineering, Tokyo University of Agriculture and Technology, Tokyo, Japan

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**2017-c-13 (14:40 – 15:00)**

**Molding and Evaluation of a Polymer Monolith with a Bicontinuous Structure via the Self-Consistent Field Method**

Mayuko Takahashi, Ryosuke Matsuzaki, Jun Koyanagi

Tokyo University of Science, Chiba, Japan

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**2017-c-14 (15:00 – 15:20)**

**Dispersion Simulation of Multifunctional PANI/carbon Nanomaterials**

Michihiro Yamamoto¹, Tomohiro Yokozeki², Xiuyan Cheng³, Jun Koyanagi²

¹Department of Materials Science and Technology, Graduate School of Industrial Science and Technology, Japan; ²Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan; ³Department of Materials Science and Technology, Tokyo University of Science, Tokyo, Japan

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[c-4] **Material Characterizations**

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<td>Takashi Iwasa (Tottori University, Japan)</td>
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**2017-c-15 (16:00 – 16:20)**

**Structural Study of Extremely Supersaturated KDP and ADP Solution Droplets using Electrostatic Levitation**

Yong Chan Cho¹, Wonhyuk Jo¹,², Sooheyong Lee¹,², Geun Woo Lee¹,²

¹Frontier in Extreme Physics, Korea Research Institute of Standards and Science, Republic of Korea; ²Department of Nano Science University of Science and Technology, Republic of Korea

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**2017-c-16 (16:20 – 16:40)**

**Analysis of Material Characteristics of Magnetic Elastomer for Fluid Force Control**

Ryohei Aoki¹, Nobuyoshi Fujimatsu²

¹Graduate School of Engineering, Toyo University, Kawagoe, Japan; ²Department of Mechanical of Engineering, Toyo University, Kawagoе, Japan

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**2017-c-17 (16:40 – 17:00)**

**Parameter Identification of a Copper-Base Alloy Using Digital Image Correlation and Application to a Liquid Rocket Engine Combustion Chamber Wall**

Gordan Thiede¹, Jörg Riccius¹, Stefanie Reese²

¹Institute of Space Propulsion, DLR, Lampoldshausen, Germany; ²Institute of Applied Mechanics, RWTH Aachen University, Aachen, Germany

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**2017-c-18 (17:00 – 17:20)**

**Charging Characteristics of Spacecraft Dielectric Material at Cryogenic Temperature**

Yuki Shibuya, Rikio Watanabe, Akihiro Miyasaka

Tokyo City University, Japan
### [c-5] Structure Concept, Design and Experiment

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<td>Kosei Ishimura (Japan Aerospace Exploration Agency, Japan)&lt;br&gt;Yasutaka Satou (JAXA, Japan)</td>
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#### 2017-c-19 (9:00 – 9:20)

**An Electromagnetically Actuated, Self-Reconfigurable Space Structure**

Martin Nisser, Dario Izzo, Andreas Borggraefe  
Advanced Concepts Team, European Space Agency, Noordwijk, The Netherlands

#### 2017-c-20 (9:20 – 9:40)

**Weightless Construction of High Tower to the Stratosphere**

Ryojiro Akiba¹, Ken Higuchi², Ryuichi Mitsuhashi³, Riho Hiramoto³, Jun'Ya Sasaki³  
¹Hokkaido Aerospace Science and Technology Incubation Center, Sapporo, Japan, ²Muroran Institute of Technology, Muroran, Japan, ³Hokkaido University of Science, Sapporo, Japan

#### 2017-c-21 (9:40 – 10:00)

**Concept of Large Space Structure Using Three-Dimensional Self-Deployable Truss**

Daishi Kawarabayashi, Yasuyuki Miyazaki  
Department of Aerospace Engineering, Nihon University, Japan

#### 2017-c-22 (10:00 – 10:20)

**Preliminary Study of Deployable Structures Assembled with Scissors Members Applied for Parabolic Reflectors**

Kohtaroh Yamaguchi¹, Rikio Watanabe¹, Akihiro Miyasaka¹, Ken‘ichi Kawaguchi²  
¹Mechanical Systems Engineering, Tokyo City University, Tokyo, Japan, ²Institute of Industrial Science, The University of Tokyo, Tokyo, Japan

#### 2017-c-23 (10:20 – 10:40)

**Structural Characteristics of BCON Truss**

Momoko Fukunaga, Yasuyuki Miyazaki  
Department of Aerospace Engineering, Nihon University, Chiba, Japan

### [c-6] Satellite Structures and Subsystems

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<td>Nobukatsu Okuizumi (Japan Aerospace Exploration Agency, Japan)</td>
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Yohsuke Nambu (Osaka Prefecture University, Japan)

2017-c-26 (11:20 – 11:40)

**Study on Competitive Structure Design of Nano Satellite**

Bui Nam Duong¹, Truong Xuan Hungᵳ, Nguyen Duc Manh¹, Kei-Ichi Okuyama²

¹Vietnam National Satellite Center, Vietnam Academy of Science and Technology, Hanoi, Vietnam. ²Graduate School of Engineering, Department of Applied Science for Integrated System Engineering, Kyushu Institute of Technology, Kitakyushu, Japan

2017-c-27 (11:40 – 12:00)

**Development of CALET CALorimeter/Sensor Structure**

Takahito Amanuma¹, Daisuke Nakayama¹, Akira Kito¹, Osamu Maeda¹, Yukihiro Ueda², Kazuhiro Fujimoto², Koki Oikawa³, Tetsuya Honda³, Norio Sugii³, Shoji Torii³, Shunsuke Ozawa³, Tadahisa Tamura³, Yuki Shimizu⁵

¹Nippi Corporation, Japan, ²IHI AeroSpace, Japan, ³JAXA, Japan, ⁴Waseda University, Japan, ⁵Kanagawa University, Japan

2017-c-28 (12:00 – 12:20)

**Actuator Development Projects in the Space Exploration Innovation Hub Center**

Tomoaki Yano, Masatsugu Otsuki

Space Exploration Innovation Hub Center, JAXA, Sagamihara, Japan

[c-7] High Precise Deployable Space Structures

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<td>Rikio Watanabe (Tokyo City University, Japan)</td>
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2017-c-29 (16:00 – 16:20)

**An Improvement of NIPPI HIMAT**

Kazuhiro Abe, Manato Makita, Takahiro Yumoto, Osamu Maeda

NIPPI Corporation, Yokohama, Japan

2017-c-30 (16:20 – 16:40)

**Induced Vibration of High-Precision Extensible Optical Bench during Extension on Orbit**

Kosei Ishimura¹, Manabu Ishida¹, Taro Kawano¹, Kenji Minesugi¹, Kazuhsa Abe², Takashi Sasaki², Ryo Iizuka¹, Nobutaka Bando³

¹Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan. ²NIPPI, Kanagawa, Japan

2017-c-31 (16:40 – 17:00)

**Numerical Study on Hysteresis Properties for Local Non-linearity of Extensible Truss Structures**

Gaishun Iku, Atsuhiko Senba

Department of Vehicle and Mechanical Engineering, Meijo University, Japan

2017-c-32 (17:00 – 17:20)

**Validation of on-orbit Thermal Deformation and Finite Element Model Prediction in X-ray Astronomical Satellite HITOMI**
A Numerical Study on Shape repeatability of Pin Jointed Beam with Frictional Contact Conditions

Takeshi Akita, Keisuke Nakajima, Hiroaki Tanaka

Chiba Institute of Technology, Narashino, Japan, National Defense Academy, Yokosuka, Japan

High Precise Space Antenna and Subsystems

Session Date: June 8 (Thu) 9:00 – 10:40
Room: Meeting Room 5
Chairpersons: Atsuhiko Senba (Meijo University, Japan), Takashi Iwasa (Tottori University, Japan)

Study on Anisotropic Characteristics of a CFRP Deformable Reflector System

Hiroaki Tanaka

Department of Aerospace Engineering, National Defense Academy, Yokosuka, Japan

Evaluation of Thermal Characteristics of Thermal Expansion Actuator in a Vacuum

Takeshi Shimada, Kosei Ishimura, Hiroyuki Ogawa, Shun Okazaki

The University of Tokyo, Tokyo, Japan, Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, JAXA, Sagamihara, Japan

Suppression of Out-of-plane Thermal Deformation of CFRP Reflectors by Linear Actuators

Shun Tanaka, Tadashige Ikeda

Department of Aerospace Engineering, Nagoya University, Nagoya, Japan, Department of Mechanical Engineering, Chubu University, Kasugai, Japan

Preliminary Design Study on Tension Truss Antenna Surface for Shape Stability

Noriyasu Yasui, Yuichiro Takano, Rikio Watanabe, Akihiro Miyasaka

Tokyo City University, Japan

Fundamental Design Method of Antenna Surface Including Compression Members

Yuichirow Takano, Noriyasu Yasui, Rikio Watanabe, Akihiro Miyasaka

Tokyo City University, Japan
Session Date: June 8 (Thu) 11:00 – 12:20
Room: Meeting Room 5
Chairpersons: Takeshi Akita (Chiba Institute of Technology, Japan) and Kanjuro Makihara (Tohoku University, Japan)

2017-c-40 (11:00 – 11:20)
Winkling of a Membrane with a Curved Small Thin Film
Masanori Matsushita¹, Osamu Mori², Nobukatsu Okuizumi³, Yasutaka Satou², Takashi Iwasa³, Saburo Matunaga⁴
¹Department of Mechanical and Aerospace Engineering, Tokyo Institute of Technology, Tokyo, Japan, ²Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, ³Department of Mechanical and Aerospace Engineering, Tottori University, Tottori, Japan, ⁴Department of Mechanical Engineering, School of Engineering, Tokyo Institute of Technology, Tokyo, Japan

2017-c-42 (11:40 – 12:00)
Data Driven Model Reduction for Spin-type Membrane Space Structure
Masahiko Yamazaki
Department of Aerospace Engineering, Nihon University, Chiba, Japan

2017-c-43 (12:00 – 12:20)
Estimation Method of Missing Components for Spin Deployable Membrane Dynamics
Shoji Kawazoe, Masahiko Yamazaki, Yasuyuki Miyazaki
Department of Aerospace Engineering, Nihon University, Chiba, Japan

[c-10] Membrane Structures II

Session Date: June 8 (Thu) 14:00 – 15:00
Room: Meeting Room 5
Chairpersons: Kyoichi Nakashino (Tokai University, Japan) and Masahiko Yamazaki (Nihon University, Japan)

2017-c-44 (14:00 – 14:20)
Effect of Creases on the Stiffness of Spinning Circular Membrane
Nobukatsu Okuizumi
Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

2017-c-46 (14:20 – 14:40)
Deployment Properties of Boom-Membrane Integrated Space Structures
Hiroshi Furuya¹, Hiraku Sakamoto², Akihito Watanabe³
¹Tokyo Institute of Technology, Yokohama, Japan, ²Tokyo Institute of Technology, Tokyo, Japan, ³Sakase Adtech Co. Ltd, Fukui, Japan

2017-c-47 (14:40 – 15:00)
## [c-11] Vibration and Control

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<tr>
<td>Chairpersons</td>
<td>Yasuyuki Miyazaki (Nihon University, Japan)</td>
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<td>Naoko Kishimoto (Setsunan University, Japan)</td>
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</table>

### 2017-c-48 (16:00 - 16:20)

**Non-linear System Identification of Extensible Truss Structures Using Hilbert Transform**

Masashi Hayashi, Atsuhiko Senba, Toshio Matsumoto  
Department of Vehicle and Mechanical Engineering, Meijo University, Japan

### 2017-c-49 (16:20 - 16:40)

**Performance Evaluation of Predictive Vibration Suppression using Piezoelectric Transducer**

Kei Asahina, Masumi Ueno, Kanjuro Makihara  
Department of Aerospace Engineering, Tohoku University, Japan

### 2017-c-50 (16:40 - 17:00)

**Basic Characteristics Evaluation of the Spaceborne Cooler Launch and On-orbit Vibration Isolation System using Pseudoelastic Shape Memory Alloy**

Seong-Cheol Kwon, Young-Hyeon Jeon, Hyun-Ung Oh  
Department of Aerospace Engineering, Chosun University, Gwangju, Korea

### 2017-c-51 (17:00 - 17:20)

**Fundamental Study on Vibration Characteristics of Space Solar Power Systems**

Kengo Noguchi, Rikio Watanabe, Akihiro Miyasaka  
Tokyo City University, Japan

### 2017-c-52 (17:20 - 17:40)

**Numerical Analysis on Passive Shape Control for Two-dimensional Truss Structures Using Additional Masses**

Takato Watanabe, Atsuhiko Senba  
Department of Vehicle and Engineering, Meijo University, Japan

## [c-12] Shock

| Session Date     | June 9 (Fri) 9:00 – 10:20 |
2017-c-53 ( 9:00 ‒ 9:20 )

A study of Reusable Landing Shock Absorber System for Exploration on Planet
Shota Iwabuchi, Kenji Minesugi
Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

2017-c-55 ( 9:20 ‒ 9:40 )

Analytical Study of Landing Shock Absorber in the High-Speed Impact Test
Keisuke Nakamura¹, Tetsuya Yamada², Hideyuki Tanno³, Koichi Kitazono⁴
¹Waseda University Dept.Applied mechanics, Shinjuku, Japan, ²Division for Space Flight Engineering, ISAS/JAXA, Sagamihara, Japan, ³JAXA Kakuda Space Center, Kakuda, Japan, ⁴Tokyo Metropolitan University, Hachioji, Japan

2017-c-56 ( 9:40 ‒ 10:00 )

Shock Resistance of Piezoelectric Stack Actuators
Tadashige Ikeda¹, Hiroaki Tanaka², Hidehiro Hata³, Nozomu Kogiso⁴, Kosei Ishimura⁵, Takashi Iwasa⁶
¹Department of Mechanical Engineering, Chubu University, Kasugai, Japan, ²Department of Aerospace Engineering, National Defense Academy of Japan, Yokosuka, Japan, ³Department of Mechanical System Engineering, Kumamoto University, Kumamoto, Japan, ⁴Department of Aerospace Engineering, Osaka Prefecture University, Sakai, Japan, ⁵Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, ⁶Department of Mechanical and Aerospace Engineering, Tottori University, Tottori, Japan

2017-c-57 ( 10:00 ‒ 10:20 )

Shock Response Spectrum Analysis of Pyroshock Experiment and Finite Element Simulation
Yu-Liang Chen¹, Chin-Yu Huang², Jiu-Zhang Lu³, Meng-Chiau Wu¹, Wen-Kuan Huang¹, Chia-Wei Yeh¹
¹School of Defense Science, Chung Cheng Institute of Technology, National Defense University, Taoyuan, Taiwan, ²Dept. of Power Vehicle and Systems Engineering, Chung Cheng Institute of Technology, National Defense University, Taoyuan, Taiwan


Session Date  June 9 (Fri) 11:00 ‒ 12:40
Room  Meeting Room 5
Chairpersons  Hiraku Sakamoto (Tokyo Institute of Technology, Japan)
Tadashige Ikeda (Chubu University, Japan)

2017-c-58 ( 11:00 ‒ 11:20 )

High-Fidelity Verification of Vision-Based Sensors for Inertial and Far-Range Spaceborne Navigation
Connor Beierle, Joshua Sullivan, Simone D'Amico
Department of Aeronautics and Astronautics, Stanford University, Stanford, California, USA

2017-c-59 ( 11:20 ‒ 11:40 )

Surface Shape Measuring Method for Space Structures based on Images in Ultra-Violet Range
2017-c-60 (11:40 – 12:00)

Preliminary Investigations of Pneumatic Gravity Compensation System for Deployable Space Structures
Masato Taki, Rikio Watanabe, Akihiro Miyasaka
Tokyo City University, Japan

2017-c-61 (12:00 – 12:20)

Verification of the Side-wall Heating to Specimen Arc-heated
Takayuki Shimoda¹, Keiichi Okuyama²
¹Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, ²Department of Applied Science for Integrated System Engineering, Kyushu Institute of Technology, Kitakyushu, Japan

2017-c-62 (12:20 – 12:40)

Three-dimensional Surface Shape Measurement of Parabola Antenna Model with 1.5m diameter using Grating Projection Method
Kento Ota¹, Taku Harada², Takashi Iwasa³
¹Graduate Student, Tottori University, Tottori, Japan, ²Former Graduate student, Tottori University, Tottori, Japan, ³Department of Mechanical and Aerospace Engineering, Tottori University, Tottori, Japan

[d-1] Flight Dynamics Operations 1

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<td>Lutz Massonne (Telespazio VEGA Deutschland GmbH at ESOC Flight Dynamics, Germany)</td>
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<td>Petr Kuchynka (GMV/ESOC, Germany)</td>
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ISTS-2017-d-001/ISSFD-2017-001 (9:00 – 9:20)

Feasibility of Metop-A Mission Extension on Drifting Local Time
Pier Luigi Righetti, Richard Dyer
EUMETSAT, Darmstadt, Germany

ISTS-2017-d-003/ISSFD-2017-003 (9:20 – 9:40)

Flight Dynamics Support to extend Metop Instruments Useful Lifetime
Antimo Damiano¹, Pier Luigi Righetti², RüDiger Lang², Francisco Sancho³
¹RHEA Group at EUMETSAT, ²EUMETSAT, ³WGS at EUMETSAT

ISTS-2017-d-004/ISSFD-2017-004 (9:40 – 10:00)

Non-nominal Attitude Manoeuvres during Metop-A Extended Lifetime
Francisco Sancho¹, Jörg Fischer², Stefania Tarquini³
¹WGS Workgroup Solutions at EUMETSAT, Darmstadt, Germany, ²Jade Aerospace at EUMETSAT, Darmstadt, Germany, ³EUMETSAT, Darmstadt, Germany

ISTS-2017-d-002/ISSFD-2017-002 (10:00 – 10:20)

Metop Long Term Free-dynamics Attitude Analysis, for Improved Re-entry Prediction
[d-2] Orbit Dynamics (Martian Moon)

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<td>Osamu Mori (Japan Aerospace Exploration Agency, Japan)</td>
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<td>Laurence Lorda (CNES, France)</td>
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ISTS-2017-d-005/ISSFD-2017-005 (9:00 – 9:20)

Quasi-Satellite Orbits around Deimos and Phobos Motivated by the DePhine Mission Proposal
Sofya Spiridonova1, Kai Wickhusen2, Ralph Kahle1, Jürgen Oberst2
1German Space Operations Center, DLR, Oberpfaffenhofen, Germany, 2Institute of Planetary Research, DLR, Berlin, Germany


Trajectory Analysis for the Phobos Proximity Phase of the MMX Mission
Elisabet Canalias1, Laurence Lorda1, Thierry Martin1, Julien Laurent-Varin1,2, Jean Charles Marty1,2, Yuya Mimasu3
1CNES, French Space Agency, Toulouse, France, 2GRGS Spatial Geodesy Research Group, Toulouse, France, 3Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

ISTS-2017-d-007/ISSFD-2017-007 (9:40 – 10:00)

The Dynamical Environment for The Exploration of Phobos
Daniel Scheeres, Stefaan VAN Wal, Zubin Olikara, Nicola Baresi
Smead Department of Aerospace Engineering Sciences, The University of Colorado, Boulder, Colorado, USA

ISTS-2017-d-008/ISSFD-2017-008 (10:00 – 10:20)

Orbital Operations Strategy in the Vicinity of Phobos
Hitoshi Ikeda1, Shinji Mitani1, Yuya Mimasu2, Go Ono2, Kenichiro Nigo1, Yasuhiro Kawakatsu2
1Research and Development Directorate, JAXA, Tsukuba, Ibaraki, Japan, 2Institute of Space and Astronautical Science, JAXA, Sagamihara, Kanagawa, Japan


Quasi-Satellite Orbits around Phobos for the Sample Return Mission
Javier Martin, Simone Centuori
Deimos Space SLU, Spain

[d-3] Trajectory Design & Optimization 1

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### Orbit Dynamics (Small Body) 1

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<td>Daniel J. Scheeres (University of Colorado, USA)</td>
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### ISTS-2017-d-010/ISSFD-2017-010 (9:00 – 9:20)

**A Linear Analysis for the Flight Path Control of the Cassini Grand Finale Orbits**

Mar Vaquero, Yungsun Hahn, Duane Roth, Mau Wong  
Jet Propulsion Laboratory / California Institute of Technology, Pasadena, CA


**Uncertainty Analysis of Mars Entry Trajectories Using Stochastic Collocation**

Yuechen Huang, Haiyang Li, Yazhong Luo  
College of Aerospace Science and Engineering, National University of Defense Technology, Changsha, China

### ISTS-2017-d-012/ISSFD-2017-012 (9:40 – 10:00)

**Orbit Design for Martian Moons Explorer**

Naoko Ogawa¹, Yuichi Tsuda¹, Yuto Takei¹, Hiroka Inoue¹, Shota Takahashi², Yasuhiro Kawakatsu¹  
¹Japan Aerospace Exploration Agency, Japan, ²Keio University, Japan

### ISTS-2017-d-013/ISSFD-2017-013 (10:00 – 10:20)

**Descent Isochrones in Martian Atmosphere**

Miljan Kolcic, Dusan Marceta  
Department of Astronomy, Faculty of Mathematics, University of Belgrade, Serbia

### ISTS-2017-d-014/ISSFD-2017-014 (10:20 – 10:40)

**General Characteristics of Robust Orbit Insertion and Trajectory Design with MOI Robustness in MMX Mission**

Shota Takahashi¹, Naoko Ogawa², Yasuhiro Kawakatsu²  
¹Department of Mechanical Engineering, Keio University, Japan, ²Institute of Space and Astronautical Science, JAXA, Japan
ISTS-2017-d-019/ISSFD-2017-019 (11:40 – 12:00)

Orbital Stability Regions for Hypothetical Natural Satellites

Samantha Rieger, Daniel Scheeres

Ann and H.J. Smead Department of Aerospace Engineering Sciences, University of Colorado Boulder, Boulder, Colorado, USA

ISTS-2017-d-020/ISSFD-2017-020 (12:00 – 12:20)

Stability Analysis of Orbital Motions around Uniformly Rotating Irregular Asteroids

Xiyun Hou1, Daniel J. Scheeres2, Xiaosheng Xin1, Jinglang Feng1, Jingshi Tang1, Lin Liu1

1School of Astronomy and Space Science, Nanjing University, Nanjing, China, 2Department of Aerospace Engineering Sciences, The University of Colorado at Boulder, Boulder, USA


On the Equilibrium Points of Doubly Synchronous Binary Asteroid Systems

Xiaosheng Xin1,2, Xiyun Hou2,3, Lin Liu2,3, Guangliang Dong1

1Beijing Institute of Tracking and Telecommunication Technology, Beijing, China, 2School of Astronomy and Space Science, Nanjing University, Nanjing, China, 3Institute of Space Environment and Astrodynamics, Nanjing University, Nanjing, China

[d-6] Trajectory Design & Optimization 2

Session Date: June 6 (Tue) 11:00 – 12:40

Room: Meeting Room 3

Chairpersons:
- Naoko Ogawa (Japan Aerospace Exploration Agency, Japan)
- Mar Vaquero (NASA Jet Propulsion Laboratory, USA)


Design of High-Energy Escape Trajectories with Lunar Gravity Assist

Lorenzo Casalino, Lucio Filizola

Politecnico di Torino, Torino, Italy

ISTS-2017-d-024/ISSFD-2017-024 (11:40 – 12:00)

Matching of Patched-Hyperbolae for Gravity-Assist Trajectory Design

Yuki Kayama1, Chit Hong Yam2, Kenta Oshima3, Shuntaro Suda3, Yasuhiro Kawakatsu4

1The University of Tokyo, Japan, 2ispace, Japan, 3Waseda University, Japan, 4Hokkaido University, Japan, 5JAXA, Japan

ISTS-2017-d-179/ISSFD-2017-179 (12:00 – 12:20)

Patented Orbits Transfers and Manoeuvres Review

Christophe R Koppel

KopooS Consulting Ind., Paris, France

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ISTS-2017-d-026/ISSFD-2017-026 (14:00 – 14:20)

**Lessons Learned from Initial Sentinel-3A Maneuver Operations**

Daniel Aguilar Taboada, Pier Luigi Righetti, Rami Houdroge

1CLC Space at EUMETSAT, Germany, 2EUMETSAT, Germany, 3Serco at EUMETSAT, Germany


**Sentinel-3A Flight Dynamics LEOP Operational Experience**

Mikel Catania, Claudia Dietze, Jochen Klein

1LSE at European Space Operations Center, ESA, Darmstadt, Germany, 2CS at European Space Operations Center, ESA, Darmstadt, Germany, 3CGI at European Space Operations Center, ESA, Darmstadt, Germany

ISTS-2017-d-028/ISSFD-2017-028 (14:40 – 15:00)

**Sentinel-1A: Flight Dynamics Analysis of the August 2016 Collision Event**

Petr Kuchynka, Miguel Angel Martin Serrano, Mikel Catania, Xavier Marc, Dirk Kuijper, Vitali Braun, Holger Krag

1Flight Dynamics Division, European Space Operations Center, ESA (GMV INSYENA), Scisys GmbH (B), LSE, ESA (CS), CGI (ESAS), Darmstadt, Germany, 2Space Debris Office, European Space Operations Center, ESA (ESA a), IMS b), Darmstadt, Germany


**Sentinel-1B Flight Dynamics Operations during LEOP and Acquisition of its Reference Orbit: Achieving the Sentinel-1 Constellation**

André Vasconcelos, Miguel A. Martín Serrano, Javier Sánchez, Xavier Marc, Dirk Kuijper

1Scisys GmbH at ESA/ESOC, Darmstadt, Germany, 2GMV at ESA/ESOC, Darmstadt, Germany, 3European Satellite Operations Centre (ESOC), ESA, Darmstadt, Germany, 4CGI at ESA/ESOC, Darmstadt, Germany

[d-8] Orbit Dynamics (Small Body) 2

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<td>Yasuhiro Kawakatsu (JAXA, Japan)</td>
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<td>Eliesabet Canalias (CNES, France)</td>
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ISTS-2017-d-030/ISSFD-2017-030 (14:00 – 14:20)

**Orbit-Attitude Coupled Dynamics of Solar Sail Spacecraft around Small Bodies**

Shota Kikuchi, Yuichi Tsuda, Jun’i’chi Kawaguchi
Reliability Analysis of Ballistic Landing in Binary Asteroid 65803 (1996GT) Didymos under Uncertainty and GNC Error Considerations

Onur Celik, Ozgur Karatekin, Birgit Ritter, Joan Pau Sánchez
1Department of Space and Astronautical Science, The Graduate University for Advanced Studies (SOKENDAI), Sagamihara, Japan, 2Reference Systems and Planetology, the Royal Observatory of Belgium (ROB), Brussels, Belgium, 3Space Research Centre, School of Aerospace, Transport & Manufacturing, Cranfield University, Cranfield, United Kingdom

Mascot: Analyses of the Descent and Bouncing Trajectories to Support the Landing Site Selection

Laurence Lorda, Elisabet Canalias, Thierry Martin, Romain Garmier, Jens Biele
1CNES, Toulouse, France, 2CS Système d’Informations, Toulouse, France, 3DLR, Cologne, Germany

Small-Body Lander Simulations Using the GPU

Stefaan Van Wal, Robert Reid, Daniel Scheeres
1Colorado Center for Astrodynamics Research, University of Colorado Boulder, Boulder, Colorado, USA, 2Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California, USA

Family of Quasi-Stable Orbit around Asteroids in Strongly Perturbed Environment

Yusuke Oki, Yuichi Tsuda, Jun’Ichiro Kawaguchi
1Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan, 2Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

Recent Developments and Future Directions in CCSDS Flight Dynamics Standards

David S. Berry
California Institute of Technology, Jet Propulsion Laboratory, Pasadena, California, USA

In-flight Characterisation and Calibration of Galileo FOC Reaction Control System

Riccardo DI Corato, Pere Ramos-Bosch, Xavier Pena
1SCKCEN, Belgium, 2ESA/ESOC, Darmstadt, Germany, 3ESA/ESOC, Darmstadt, Germany, 4CNES, Toulouse, France

Flight Dynamics Operations 3

Session Date: June 6 (Tue) 16:00 – 17:40
Room: Meeting Room 1
Chairpersons: Takaya Inamori (Nagoya University, Japan), Pierluigi Righetti (EUMETSAT, Germany)
Manoeuvre Optimization in the Galileo L7 Orbit Acquisition

André Vasconcelos¹, Pere Ramos Bosch², Dave Hocken³, Javier Sánchez⁴, Gerald Ziegler⁵

¹Scisys GmbH at ESA/ESOC, Darmstadt, Germany, ²European Satellite Operations Centre (ESOC), ESA, Darmstadt, Germany, ³GMV at ESA/ESOC, Darmstadt, Germany

ysters-2017-d-038/ISSFD-2017-038 (17:00 – 17:20)

MICROSCOPE Mission: On-orbit Assessment of the Drag-Free and Attitude Control System

Pascal Prieur¹,², Thomas Lienart¹,³, Manuel Rodrigues⁴, Pierre Touboul⁵, Troelz Denver⁶, John L. Jørgensen⁶, Anastassia M. Bang⁶, Gilles Metris⁷

¹Centre National d’Etudes Spatiales, 18 av Edouard Belin F31400 Toulouse, France, ²Department of Flight Dynamics, ³Department of Propulsion, ⁴ONERA, Département ‘Physique, Instrumentation, Environnement, Espace’, Châtillon, France, ⁵ONERA, Microscope space mission Prime Investigator, Palaiseau, France, ⁶Technical University of Denmark, Lyngby, Denmark, ⁷Université de la Côte d’Azur, Observatoire de la Côte d’Azur, CNRS, Géozur, Valbonne, France


A Comparison of Fuel Gauging Methods Utilising the Experience of S/C De-orbiting Operations

Lutz Massonne

Telespazio VEGA Deutschland GmbH at ESA/ESOC, Darmstadt, Germany

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[d-10] Guidance, Navigation and Control (Small Body)

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<td>Sofya Spiridonova (German Space Operations Center, Germany)</td>
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ysters-2017-d-041/ISSFD-2017-041 (16:00 – 16:20)

Autonomous Navigation of a Formation of Spacecraft in the Proximity of a Binary Asteroid

Francesco Torre, Massimiliano Vasile, Romain Serra, Stuart Grey

Department of Mechanical and Aerospace Engineering, University of Strathclyde, Glasgow, United Kingdom


Improved Shape Determination for Autonomous State Estimation

Benjamin Bercovici, Jay Mcmahon

Department of Aerospace Engineering Sciences, University of Colorado at Boulder

ysters-2017-d-043/ISSFD-2017-043 (16:40 – 17:00)

The High-fidelity Asteroid Deflection Evaluation Software (HADIES): Assessing the Impact of Environmental and System Uncertainties on Autonomous Proximity Operations

Massimo Vetrisano, Juan L. Cano, Simone Centuori

Deimos Space S.L.U., Madrid, Spain


Range Measurement based Localization between Mothership and Lander Considering Asteroid Shape Using Particle Filter

Hirokazu Ishida¹, Yuichi Tsuda²

¹Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan, ²Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan
### [d-11] Attitude Dynamics

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<td>Yu Nakajima (Japan Aerospace Exploration Agency, Japan)</td>
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**ISTS-2017-d-046/ISSFD-2017-046 (9:00 – 9:20)**

**Dynamical Modeling for Flat-Spin Recovery Applications**

Frank Janssens\(^1\), Jozef Van Der Ha\(^2\)

\(^1\)Consultant, Noordwijk, the Netherlands, \(^2\)Satellite Mission Design & Operations, Deming, WA, USA


**Utilisation of the “Dzhanibekov’s Effect” for the Possible Future Space Missions**

Pavel M. Trivailo\(^1\), Hirohisa Kojima\(^2\)

\(^1\)School of Engineering, RMIT University, Melbourne, Australia, \(^2\)Department of Aerospace Engineering, Tokyo Metropolitan University, Hino, Japan

**ISTS-2017-d-048/ISSFD-2017-048 (9:40 – 10:00)**

**Dynamics of a Space Multi-pointing Stewart System Using the New Form of Kane’s Method**

Quan Hu, Fei Liu, Yao Zhang

School of Aerospace Engineering, Beijing Institute of Technology, Beijing, China

**ISTS-2017-d-049/ISSFD-2017-049 (10:00 – 10:20)**

**Optimal Fault-Tolerant Configurations of Thrusters**

Yasuhiro Yoshimura, Hirohisa Kojima

Aerospace Engineering, Tokyo Metropolitan University, Hino, Japan

### [d-12] Guidance, Navigation and Control (Landing) 1

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<td>Satoshi Ikari (The University of Tokyo, Japan)</td>
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**ISTS-2017-d-050/ISSFD-2017-050 (9:00 – 9:20)**

**OMOTENASHI Trajectory Analysis and Design: Landing Phase**

**Fight Control of Flying Test Bed for Future Planetary Landing**

Takehiro Higuchi, Toshiki Tamura, Seiya Ueno, Kazuhsa Fujiita, Takashi Ozawa, Hiroki Takayanagi

1Yokohama National University, Yokohama, Japan, 2Chofu Aerospace Center, JAXA, Tokyo, Japan

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ISTS-2017-d-053/ISSFD-2017-053 (9:40 – 10:00)

**A Study on Guidance Technique for Precise Lunar Landing**

Satoshi Ueda, Takahiro Ito, Shin-Ichiro Sakai

Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

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ISTS-2017-d-054/ISSFD-2017-054 (10:00 – 10:20)

**Comparative Analysis of Adaptive and Optimal Control Laws for Manned Lunar Lander**

Chengchao Bai, Jifeng Guo, Linli Guo, Hongxing Zheng

1School of Astronautics, Harbin Institute of Technology, China, 2China Academy of Space Technology (CAST)

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ISTS-2017-d-055/ISSFD-2017-055 (9:00 – 9:20)

**Harnessing the Sun’s Gravity for LEO to GEO Transfers**

Stijn De Smet, Jeffrey S. Parker, Daniel J. Scheeres

1University of Colorado at Boulder, Boulder, CO, USA, 2Advanced Space, Boulder, CO, USA

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**Systematic Study of the Dynamics about and between the Libration Points of the Sun-Earth-Moon System**

Bastien Le Bihan, Josep J. Masdemont, Gerard Gómez, Stéphanie Lizy-Destrez

1ISAE-Supaéro, Toulouse, France, 2IEEC & Departament de Matemàtiques, Universitat Politècnica de Catalunya, Barcelona, Spain, 3IEEC & Departament de Matemàtiques i Informàtica, Universitat de Barcelona, Barcelona, Spain

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ISTS-2017-d-057/ISSFD-2017-057 (9:40 – 10:00)

**Assessment of the Gaussian Covariance Approximation Over an Earth-Asteroid Encounter Period**

Daniel Mattern

Omitron, Inc., Beltsville, MD | NASA Goddard Space Flight Center, Flight Dynamics Facility, Greenbelt, MD

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ISTS-2017-d-058/ISSFD-2017-058 (10:00 – 10:20)

**Improved Reference Orbits for the Repeat-Ground-Track Missions EnMAP and Tandem-L**

Ralph Kahle, Sofya Spiridonova, Michael Kirschner
Nonlinear Uncertainty Propagation of Orbital Mechanics Subject to Stochastic Error in Atmospheric Mass Density Models

Changyong He¹,², Yang Yang¹,², Brett Carter², Han Cai¹,², Suqin Wu², Kefei Zhang²
¹Space Environment Research Centre (SERC) Limited, Australia, ²Satellite Positioning for Atmosphere, Climate and Environment (SPACE) Research Centre, School of Sciences, RMIT University, Australia

[d-14] Attitude / Orbit Dynamics & Control

An Efficient Algorithm to Compute the SRP Force and Torque on Spacecraft
Juan Manuel García¹,²
¹European Space Operations Center, ESA, Darmstadt, Germany, ²Flight Dynamics and Operations, GMV-Insyen AG, Darmstadt, Germany

Optimal Design of Advanced Reflectivity Control Device for Solar Sails Considering Polarization Properties of Liquid Crystal
Hirokazu Ishida¹, Toshihiro Chujo¹, Osamu Mori², Junichiro Kawaguchi²
¹Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan, ²Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

Optical Property Estimation by Precomputed Tensor Method for High-fidelity SRP Model
Satoshi Ikari¹, Kakeru Tokunaga¹, Takahiro Ito², Takaya Inamori³, Ryu Funase¹, Shinichi Nakasuka¹
¹Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan, ²Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, ³Department of Micro-Nano System Engineering, Nagoya University, Nagoya, Japan

Dynamics and Control of Modular and Extended Space Structures in Cislunar Environment
Andrea Colagrossi, Michèle Lavagna
Aerospace Science and Technology Department, Politecnico di Milano, Milan, Italy

Estimation of Shape and Optical Parameters of Spinning Solar Sail Equipped with Reflectivity Control Devices
Akihiro Ishikawa, Kenshiro Oguri, Satoshi Ikari, Ryu Funase, Shinichi Nakasuka
Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan
### Guidance, Navigation and Control (Landing) 2

**Session Date** June 7 (Wed) 11:00 – 12:40

**Room** Meeting Room 2

**Chairperson** Takehiro Higuchi (Yokohama National University, Japan)

**ISTS-2017-d-065/ISSFD-2017-065 (11:00 – 11:20)**

**Position and Displacement Estimation Using Crater-Based Line Segments for Pinpoint Lunar Landing**

Kazuki Kariya¹, Takayuki Ishida², Shujiro Sawai⁴, Seisuke Fukuda²,¹

¹Department of Space and Astronautical Science, SOKENDAI, Sagamihara, Japan, ²Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan


**A Study of Terrain Feature Matching for Lunar Landing Navigation**

Yasuhiro Katayama¹, Shigeo Shimizu¹, Misuzu Haruki², Shuhei Shigeto², Isao Kawano², Kazuhisa Fujita³

¹Research and Development Directorate, JAXA, Chofu, Tokyo, Japan, ²Research and Development Directorate, JAXA, Tsukuba, Ibaraki, Japan

**ISTS-2017-d-067/ISSFD-2017-067 (11:40 – 12:00)**

**The Robust Spacecraft Location Estimation Algorithm toward the Misdetection Crater and the Undetected Crater in SLIM**

Haruyuki Ishii², Keiki Takadama¹, Akinori Murata¹, Fumito Uwano¹, Takato Tatsumi¹, Yuta Umenai¹, Kazuma Matsumoto¹, Hiroyuki Kamata¹, Takayuki Ishida¹, Seisuke Fukuda⁴, Shujiro Sakai⁴, Shinichiro Sawai⁴

¹Department of Information, The University of Electro-Communication, Tokyo, Japan, ²Department of Electrical engineering, Meiji University, Tokyo, Japan, ³Institute of Space and Astronautical Science, JAXA & ISAS, Sagamihara, Japan, ⁴Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

**ISTS-2017-d-068/ISSFD-2017-068 (12:00 – 12:20)**

**Autonomous Navigation for Pinpoint Lunar Soft Landing**

Chengchao Bai¹, Jifeng Guo¹, Linli Guo², Hongxing Zheng¹

¹School of Astronautics, Harbin Institute of Technology, China, ²China Academy of Space Technology


Shunpei Morikawa¹, Hikaru Eguchi¹, Yusuke Maruyama²,³, Taro Kawano¹, Masahiro Nohmi¹, Shujiro Sawai²,³

¹Department of Engineering, Shizuoka University, Shizuoka, Japan, ²Department of Space and Astronautical Science, The Graduate University for Advanced Studies(SOKENDAI), Sagamihara, Japan, ³Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan
IST-S-2017-d-071/ISSFD-2017-071 (11:00 – 11:20)

Orbit Uncertainty Propagation around Non-Spherical Bodies Using the Dromo Formulation

Javier Hernando-Ayuso¹, Claudio Bombardelli²

¹Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan; ²Space Dynamics Groups, Technical University of Madrid, Spain


Moon Mission Lifetime Analysis of a 2U CubeSat Equipped with Pulsed Plasma Thrusters; The Aoba-VELOX IV Mission Case

Jose Rodrigo Cordova Alarcon¹, Necmi Cihan Örger¹, Sangkyun Kim¹, Tran Quang Vinh², Lim Wee Seng², Bui Tran Duy Vu², Mengu Cho¹

¹Laboratory of Spacecraft Environment Interaction Engineering, Kyushu Institute of Technology, Japan; ²Nanyang Technology Institute, Singapore

IST-S-2017-d-074/ISSFD-2017-074 (11:40 – 12:00)

A Look at the Capture Mechanisms of the “Temporarily Captured Asteroids” of the Earth

Hodei Urrutxua¹, Claudio Bombardelli²

¹Astronautics Group, University of Southampton, United Kingdom; ²Space Dynamics Group, Technical University of Madrid, Spain

[d-17] Attitude Determination

<table>
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<tr>
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<td>Takanori Iwata (JAXA, Japan)</td>
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<td>Juan Manuel Garcia (GMV GmbH, ESOC, Germany)</td>
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IST-S-2017-d-075/ISSFD-2017-075 (16:00 – 16:20)

Study on an Advanced Attitude Determination Algorithm for the ERG Spacecraft

Halil Ersin Söken, Shin-Ichiro Sakai, Kazushi Asamura, Yosuke Nakamura, Takeshi Takashima

Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan


Labelling Technique for the Fast Star Identification

Sangkyun Kim, Mengu Cho

Kyushu Institute of Technology, Japan

IST-S-2017-d-077/ISSFD-2017-077 (16:40 – 17:00)

Non-Traditional Robust UKF against Attitude Sensors Faults

Demet Cilden Guler¹, Halil Ersin Soken², Chingiz Hajiyev³

¹Department of Aeronautics and Astronautics, Istanbul Technical University, Istanbul, Turkey; ²Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan; ³Institute of Space and Astronautics, Istanbul Technical University, Istanbul, Turkey

IST-S-2017-d-078/ISSFD-2017-078 (17:00 – 17:20)

Spinning Spacecraft Attitude Filtering with Spin Parameters: Performance Evaluation with Real Data

Halil Ersin Söken¹, Jozef C. Van Der Ha², Shin-Ichiro Sakai²

¹Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan; ²Satellite Mission Design and Operations, Deming, WA, USA
**Regularized Particle Filter with Roughening for Gyros Bias and Attitude Estimation using Simulated Measurements**

William Silva¹, Roberta Garcia², Hélio Kuga¹, Maria Zanardi³

¹Technological Institute of Aeronautics, ITA, São José dos Campos, Brazil, ²São Paulo University, USP, Lorena, Brazil, ³Federal University of ABC, UFABC, Santo André, Brazil

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<td>Shinji Hokamoto (Kyushu University, Japan)</td>
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**ISTS-2017-d-080/ISSFD-2017-080 ( 16:00 – 16:20 )**

**Method of Safe Descent in Case of Off-nominal Onboard Situation on Russian Perspective manned Spacecraft “Federation”**

Alexey Yu. Kutomanov, Maxim M. Matushin, Vladimir N. Pochukaev

TSNIImash, Mission Control Centre

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**Flight Control Stability of Multi-Hierarchy Dynamic Inversion for Winged Rocket**

Hiroshi Yamasaki, Koichi Yonemoto, Takahiro Fujikawa, Kent Shirakata, Hayato Tobiyama

Department of Mechanical and Control Engineering, Kyushu Institute of Technology, Fukuoka, Japan

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**ISTS-2017-d-082/ISSFD-2017-082 ( 16:40 – 17:00 )**

**Deorbit Maneuver Strategy for the Three Themis Probes**

S. Frey¹, V. Angelopoulos², M. Bester¹

¹Space Sciences Laboratory, University of California, 7 Gauss Way, Berkeley, CA, ²ESS/IGPP, University of California, Los Angeles, 405 Hilgard Avenue, Los Angeles, CA

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**The Study on Performance of MEMS IMU for Launch Vehicle under High Vibration Environment**

Eri Shimane¹, Shuichi Matsumoto¹, Takafumi Moriguchi², Yuyo Iwai², Ryohei Uchino²

¹Japan Aerospace Exploration Agency, Tsukuba, Japan, ²Sumitomo Precision Products Co., Ltd., Amagasaki, Japan

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**[d-19] Orbit Dynamics & Control 3**

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ISTS-2017-d-085/ISSFD-2017-085 ( 16:00 ‒ 16:20 )

Study on Low-Thrust Stationkeeping on Geostationary Orbit
Toshinori Ikenaga¹, Masayoshi Utashima¹, Yu Nakajima¹, Toru Yamamoto¹, Tadahiko Sano², Noriyasu Inaba¹
¹Research and Development Directorate, JAXA, Ibaraki, Japan, ²Space Technology Directorate I, JAXA, Ibaraki, Japan


Predictive Autonomous Orbit Control Method for Low Earth Orbit Satellites
Jérôme Thomassin¹, Maxime Ecochard², Guillaume Azema²
¹Department of Flight Dynamics, CNES, Toulouse, France, ²Spaceflight Dynamics Department, Thales Services, Toulouse, France

ISTS-2017-d-087/ISSFD-2017-087 ( 16:40 ‒ 17:00 )

De-orbiting Timing for Spacecraft in Geostationary Transfer Orbits Exploiting Luni-solar Perturbations
Yue Wang¹, Pini Gurfil²
¹School of Astronautics, Beihang University, Beijing, China, ²Faculty of Aerospace Engineering, Technion-Israel Institute of Technology, Haifa, Israel

ISTS-2017-d-088/ISSFD-2017-088 ( 17:00 ‒ 17:20 )

Analysis of the Eccentricity Vector in Low Earth Orbits as Planar Rigid Body Motion
Javier Sanchez, Petr Kuchynka
GMV at ESA/ESOC, Darmstadt, Germany

[d-20] Formation Flying & Satellite Constellations 1

Session Date       June 8 (Thu) 9:00 ‒ 10:20
Room               Meeting Room 1
Chairpersons       Masayuki Ikeuchi (JAXA, Japan)
                   Jean-Sébastien Ardaens (DLR, Germany)

ISTS-2017-d-090/ISSFD-2017-090 ( 9:00 ‒ 9:20 )

Maneuver Optimization and Collision Probability Estimation Using Separated Representations
Marc Balducci¹, Brandon Jones²
¹CCAR, University of Colorado – Boulder, USA, ²University of Texas at Austin


SAOCOM-CS: Flight Dynamics Operational Approach to a Highly Demanding Formation
Itziar Barat¹, Miguel Martin Serrano², Bram de Vogeleer², Berthyl Duesmann³, Cecilia Mezzera⁵
¹Deimos-Space@ESA, ESTEC, Noordwijk, Netherlands, ²Scisys@ESA, ESOC, Darmstadt, Germany, ³Ins space consultancy@ESA, ESOC, Darmstadt, Germany, ⁴ESA, ESTEC, Noordwijk, Netherlands, ⁵ESA, ESTEC, Noordwijk, Netherlands, currently GMV, Trescantos, Spain

ISTS-2017-d-092/ISSFD-2017-092 ( 9:40 ‒ 10:00 )
Performance of Contactless Micro Vibration Isolator Using Flux Pinning Effect
Takuma Shibata¹, Shin-Ichiro Sakai²
¹Department of Aerospace and Astronautics Science, SOKENDAI, Kanagawa, Japan, ²Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

[d-21] Orbit Determination 1

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<td>Tomas Jorge Martin-Mur (California Institute of Technology, USA)</td>
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Monte for Orbit Determination
Jonathon Smith, Theodore Drain, Shyam Bhaskaran, Tomas Martin-Mur
California Institute of Technology / Jet Propulsion Laboratory, Pasadena, California

Multi-arc Orbit Determination to Determine Rosetta Trajectory and 67P Physical Parameters
Bernard Godard¹, Frank Budnik², Gabriele Bellei³, Pablo Muñoz⁴, Trevor Morley⁵
¹Telespazio VEGA Deutschland GmbH, located at ESOC, Germany, ²ESA/ESOC, Germany, ³Deimos Space, located at ESOC, Germany, ⁴GMV, located at ESOC, Germany

Shadow Navigation Support at JPL for the Rosetta Landing on Comet 67P/Churyumov-Gerasimenko
Stephen Broschart¹, Shyam Bhaskaran³, Julie Bellerose¹, Ann Dietrich¹, Dongsuk Han¹, Robert Haw¹, Nickolaos Mastrodemos¹, William Owen, Jr.¹, Brian Rush¹, David Surovik¹
¹Jet Propulsion Laboratory, California Institute of Technology, California, USA, ²University of Colorado – Boulder, Colorado, USA, ³Rutgers University, New Jersey, USA

A Quasi-Kinematic Orbit Determination Method for Deep Space Probes
Hiroshi Takeuchi¹, Tomohiro Yamaguchi², Makoto Yoshikawa¹, Tsutomu Ichikawa², Naoko Ogawa², Kazutaka Nishiyama¹, Takanao Saitō¹, Yuichi Tsuda¹, Sho Taniguchi¹, Nobuaki Fujii³, Tomoko Yagami²
¹Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, ²Technical computing solutions unit, science solutions div, Fujitsu Limited, Tokyo, Japan

Orbit Determination for Long-term Prediction of Solar Power Sail Demonstrator IKAROS
Sho Taniguchi¹, Takafumi Ohnishi¹, Osamu Mori², Hideki Kato², Hiroshi Takeuchi³, Atsushi Tomiki³, Yuya Mimasu³, Naoko Ogawa², Jun Matsumoto³, Taichi Ito³, Tsutomu Ichikawa², Makoto Yoshikawa², Shota Kikuchi³, Yosuke Kawabata³
¹Technical computing solutions unit, science solutions div, Fujitsu Limited, Tokyo, Japan, ²Institute of Space and Astronautical Science, JAXA, Sagamihara,
[d-22] Trajectory Design & Optimization 3

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<td>Hongru Chen (Chinese Academy of Sciences, China)</td>
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ISTS-2017-d-100/ISSFD-2017-100 ( 9:20 – 9:40 )

Optimised GTO-GEO Transfer Using Low-Thrust Propulsion

Marilena Di Carlo¹, Massimiliano Vasile¹, Stephen Kemble²
¹Department of Mechanical and Aerospace Engineering, University of Strathclyde, Glasgow, United Kingdom, ²Airbus Defence and Space, Stevenage, United Kingdom

ISTS-2017-d-101/ISSFD-2017-101 ( 9:40 – 10:00 )

Minimum Time Orbit Raising of Geostationary Spacecraft by Optimizing Feedback Gain of Steering-law

Kenji Kitamura¹, Katsuhiko Yamada², Takeya Shima¹
¹Advanced Technology R&D Center, Mitsubishi Electric Corporation, Amagasaki, Japan, ²Graduate School of Engineering, Osaka University, Osaka, Japan

ISTS-2017-d-102/ISSFD-2017-102 ( 10:00 – 10:20 )

Operational Concept for Orbit Raising with Low Thrust

Ferdi DE Bruijn, Francesca Letizia, Juan C. Bastante
OHB System AG, Bremen, Germany


Indirect Optimization of End-of-Life Disposal for Galileo Constellation Using Low Thrust Propulsion

Juan Luis Gonzalez¹, Francesco Toppusto², Roberto Armellin³
¹School of Aerospace Engineering – ETSIAE, Technical University of Madrid – UPM, Madrid, Spain, ²Dipartimento di Scienze e Tecnologie Aerospaziali, Politecnico di Milano, Milan, Italy, ³Surrey Space Center, University of Surrey, Guildford, UK

[d-23] Formation Flying & Satellite Constellations 2

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<td>Tatsuaki Hashimoto (Japan Aerospace Exploration Agency, Japan)</td>
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<td>Berthyl Duesmann (European Space Agency, Netherlands)</td>
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ISTS-2017-d-104/ISSFD-2017-104 ( 11:00 – 11:20 )
Optimal Configurations for Nanosatellite Formation Flying in Binary Asteroid Environment
Andrea Capannolo, Michèle Lavagna, Fabio Ferrari, Paolo Lunghi
Department of Aerospace Sciences and Technologies, Politecnico di Milano, Milan, Italy


Relative Spiral Trajectories for Low-Thrust Formation Flying
Matthew Willis¹, Simone D’Amico²
¹Department of Mechanical Engineering, Stanford University, USA, ²Department of Aeronautics and Astronautics, Stanford University, USA

ISTS-2017-d-106/ISSFD-2017-106 (11:40 – 12:00)

Optimal Trajectory Design of Formation Flying based on Attractive Sets
Motoki Yamane, Mai Bando, Shinji Hokamoto
Department of Aeronautics and Astronautics, Kyushu University, Fukuoka, Japan

[d-24] Orbit Determination 2

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ISTS-2017-d-107/ISSFD-2017-107 (11:00 – 11:20)

Radar Observations of Spacecraft in Lunar Orbit
Marina Brozović¹, Ryan S. Park¹, Joseph G. Mcmichael¹, Jon D. Giorgini¹, Martin A. Slade¹, David S. Berry¹, Joseph S. Jao¹, Frank D. Ghigo², Patrick A. Taylor³, Edgard Rivera-Valentin³
¹Jet Propulsion Laboratory/California Institute of Technology, Pasadena, California, USA, ²Green Bank Observatory, Green Bank, West Virginia, USA, ³Arecibo Observatory/Universities Space Research Association, Arecibo, Puerto Rico, USA


Orbit Determination Adaptations for the Cassini Grand Finale
Zahi Tarzi, Julie Bellerose, Duane Roth, Rodica Ionasescu, Dylan Boone, Kevin Criddle
California Institute of Technology, Jet Propulsion Laboratory, Pasadena, USA

ISTS-2017-d-109/ISSFD-2017-109 (11:40 – 12:00)

Resolution of Orbit Determination Prediction Instabilities at Titan During Cassini’s Solstice Mission
Dylan Boone, Julie Bellerose, Duane Roth
Cassini Navigation Team, Jet Propulsion Laboratory, California Institute of Technology

ISTS-2017-d-110/ISSFD-2017-110 (12:00 – 12:20)

50,000 Laps Around Mars: Navigating the Mars Reconnaissance Orbiter Through the Extended Missions (January 2009 – March 2017)
Premkumar Menon, Sean Wagner, Stuart Demcak, David Jefferson, Eric Graat, Kyong Lee, William Schulze
Jet Propulsion Laboratory, California Institute of Technology, USA

# Method for Differential Phase Delay Calculation from Radio Images and Its Experimental Verification

Huan Zhou¹, Yong Huang², Haitao Li³, Dezhen Xu⁴

¹Beijing Institute of Tracking and Telecommunications Technology, China, ²Shanghai Astronomical Observatory, Chinese Academy of Sciences

## [d-25] Trajectory Design & Optimization 4

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<td>Massimo Casasco (European Space Agency, Netherlands)</td>
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<td>Volker Maiwald (German Aerospace Center, Germany)</td>
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**ISTS-2017-d-112/ISSFD-2017-112 (11:00 – 11:20)**

**Approximate Two-Point Boundary Value Problem Solutions to Low Thrust Trajectory by Superposition**

Ming Tony Shing¹, Chit Hong Yam², Albert Wai Kit Lau¹

¹Department of Physics, Hong Kong University of Science and Technology, Hong Kong, ²ispace inc., Tokyo Japan


**Low-Thrust Trajectory Optimization with No Initial Guess**

Nathan L. Parrish, Daniel J. Scheeres

Colorado Center for Astrodynamics Research, University of Colorado, Boulder, USA

**ISTS-2017-d-114/ISSFD-2017-114 (11:40 – 12:00)**

**A Minimum-Fuel Fixed-Time Low-Thrust Rendezvous Solved with the Switching Systems Theory**

Clément Gazzino¹, Denis Arzelier², Luca Cerri², Damien Losa³, Christophe Louembe⁴, Christelle Pittet⁵

¹LAAS-CNRS, Université de Toulouse, France, ²CNES, Centre Spatial de Toulouse, France, ³Thales Alenia Space, France


**Open Source Implementation of A Fast and Precise N-body Low-Thrust Propagator**

Weichen Xiao¹, Chit Hong Yam², Wen Han Chiu¹

¹Department of Physics, The Hong Kong University of Science and Technology, Hong Kong, ²ispace inc., Tokyo, Japan


**Unified Formulation for Element-Based Indirect Trajectory Optimization**

Juan Luis Gonzalo¹, Claudio Bombardelli², Francesco Topputo²

¹School of Aerospace Engineering – ETSIAE, Technical University of Madrid – UPM, Madrid, Spain, ²Dipartimento di Scienze e Tecnologie Aerozspaiziali, Politecnico di Milano, Milan, Italy

## [d-26] Formation Flying & Satellite Constellations 3

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Session Date: June 8 (Thu) 11:00 – 12:40
Room: Meeting Room 3
Chairpersons: Massimo Casasco (European Space Agency, Netherlands), Volker Maiwald (German Aerospace Center, Germany)

**ISTS-2017-d-112/ISSFD-2017-112 (11:00 – 11:20)**

**Approximate Two-Point Boundary Value Problem Solutions to Low Thrust Trajectory by Superposition**

Ming Tony Shing¹, Chit Hong Yam², Albert Wai Kit Lau¹

¹Department of Physics, Hong Kong University of Science and Technology, Hong Kong, ²ispace inc., Tokyo Japan


**Low-Thrust Trajectory Optimization with No Initial Guess**

Nathan L. Parrish, Daniel J. Scheeres

Colorado Center for Astrodynamics Research, University of Colorado, Boulder, USA

**ISTS-2017-d-114/ISSFD-2017-114 (11:40 – 12:00)**

**A Minimum-Fuel Fixed-Time Low-Thrust Rendezvous Solved with the Switching Systems Theory**

Clément Gazzino¹, Denis Arzelier², Luca Cerri², Damien Losa³, Christophe Louembe⁴, Christelle Pittet⁵

¹LAAS-CNRS, Université de Toulouse, France, ²CNES, Centre Spatial de Toulouse, France, ³Thales Alenia Space, France


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¹School of Aerospace Engineering – ETSIAE, Technical University of Madrid – UPM, Madrid, Spain, ²Dipartimento di Scienze e Tecnologie Aerozspaiziali, Politecnico di Milano, Milan, Italy

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### Room Meeting Room 1

**Chairpersons**
- Kenji Kitamura (Mitsubishi Electric Corporation, Japan)
- Andres Ayala (GMW for European Space Agency, Netherlands)

#### ISTS-2017-d-117/ISSFD-2017-117 (14:00 – 14:20)

**Rendezvous Control of Spacecrafts via Constrained Optimal Control Using Generating Functions**

Dijian Chen¹, Kenji Fujimoto²

¹Department of Mechanical Science and Engineering, Nagoya University, Nagoya, Japan, ²Department of Aeronautics and Astronautics, Kyoto University, Kyoto, Japan


**Attitude and Orbit Coupled Tumbling Space Debris Tracking Control**

Shuquan Wang¹, Lingchao Zhu¹,²

¹Technology and Engineering Center for Space Utilization, China Academy of Sciences, Beijing, China, ²University of Chinese Academy of Sciences, Beijing, China

#### ISTS-2017-d-119/ISSFD-2017-119 (14:40 – 15:00)

**Angles-Only Relative Orbit Determination during the AVANTI Experiment**

Jean-Sébastien Ardaens, Gabriella Gaias

German Space Operations Center (DLR/GSOC), Wessling, Germany

#### ISTS-2017-d-120/ISSFD-2017-120 (15:00 – 15:20)

**Effect of Observation by Angle Only Navigation to Plan Non-Cooperative Approach for ADR**

Masayuki Ikeuchi

Safety and Mission Assurance Department, JAXA, Sagamihara, Japan

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### Room Meeting Room 2

**Chairpersons**
- Makoto Yoshikawa (Japan Aerospace Exploration Agency, Japan)
- Frank Budnik (ESA, Germany)

#### ISTS-2017-d-122/ISSFD-2017-122 (14:00 – 14:20)

**On-Board Orbit Determination for a Deep Space CubeSat**

Boris Segret¹, Daniel Hestroffer², Gary Quinsac³, Marco Agnan⁴, Jordan Vannitse⁵,²

¹Laboratory of Excellence for Exploration of Space Environments (LabEx ESEP), Paris Observatory, Paris, France, ²Institut de Mecanique Celeste et de Calcul des Ephemerides (IMCCE), Paris Observatory, Paris, France, ³Institut de Mecanique Celeste et de Calcul des Ephemerides (IMCCE), Paris Observatory, Paris, France, ⁴ODYSSEUS Space Co. Ltd., Tainan, Taiwan, ⁵Department of Aeronautics and Aerospace (DAA), National Cheng Kung University (NCKU), Tainan, Taiwan

#### ISTS-2017-d-123/ISSFD-2017-123 (14:20 – 14:40)

**A Study of the Navigation for Spacecraft by Using the Modified Estimator**

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[d-27] Orbit Determination 3

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<td>Frank Budnik (ESA, Germany)</td>
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#### [d-27] Orbit Determination 3

**On-Board Orbit Determination for a Deep Space CubeSat**

Boris Segret¹, Daniel Hestroffer², Gary Quinsac³, Marco Agnan⁴, Jordan Vannitse⁵,²

¹Laboratory of Excellence for Exploration of Space Environments (LabEx ESEP), Paris Observatory, Paris, France, ²Institut de Mecanique Celeste et de Calcul des Ephemerides (IMCCE), Paris Observatory, Paris, France, ³Institut de Mecanique Celeste et de Calcul des Ephemerides (IMCCE), Paris Observatory, Paris, France, ⁴ODYSSEUS Space Co. Ltd., Tainan, Taiwan, ⁵Department of Aeronautics and Aerospace (DAA), National Cheng Kung University (NCKU), Tainan, Taiwan

#### [d-27] Orbit Determination 3

**A Study of the Navigation for Spacecraft by Using the Modified Estimator**
The Analysis of OD Accuracy and Orbit Maintenance Strategy of Chang'E-4 Relay Satellite
Cheng Cheng, Fan Min, Chen Shaowu, Li Zan, Hao Wanhong
Beijing Institute of Tracking and Telecommunications Technology, China

Rosetta Navigation during the End of Mission Phase
Pablo Muñoz, Vicente Companys, Frank Budnik, Bernard Godard, Dario Pellegrinetti, Gabriele Bellei, Rainer Bauske, Waldemar Martens
1GMV at ESOC, Darmstadt, Germany, 2ESA/ESOC, Darmstadt, Germany, 3Telespazio Vega at ESOC, Darmstadt, Germany, 4Deimos Space at ESOC, Darmstadt, Germany, 5Thermal at ESOC, Darmstadt, Germany

A Smoothed Eclipse Model for Solar Electric Propulsion Trajectory Optimization
Jonathan D. Aziz, Daniel J. Scheeres, Jeffrey S. Parker, Jacob A. Englander
1University of Colorado Boulder, USA, 2NASA Goddard Space Flight Center, USA

Robust Differential Dynamic Programming for Low-Thrust Trajectory Design: Approach with Robust Model Predictive Control Technique
Naoya Ozaki, Stefano Campagnola, Ryu Funase
1Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan, 2Jet Propulsion Laboratory, NASA, Pasadena, California

Initial Results of a New Method for Optimizing Low-Thrust Gravity-Assist Missions
Volker Maiwald
Institute of Space Systems, German Aerospace Center (DLR), Department of System Analysis Space Segment, Germany

Design and Validation of Ultra Low Thrust Transfers to the Sun-Earth Saddle Point with Application to LISA Pathfinder Mission Extension
Francesco Topputo, Diogene Alessandro Dei Tos, Mirco Rasotto, Florian Renk
1Politecnico di Milano, Department of Aerospace Science and Technology, Milan, Italy, 2Dinamica Srl, Milan, Italy, 3European Space Operation Center (ESOC), Darmstadt, Germany

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1Politecnico di Milano, Department of Aerospace Science and Technology, Milan, Italy, 2Dinamica Srl, Milan, Italy, 3European Space Operation Center (ESOC), Darmstadt, Germany
Solar Power Sail Trajectory Design for Jovian Trojan Exploration
Takanao Saiki, Jun Matsumoto, Osamu Mori, Jun'Ichiro Kawaguchi
Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

[d-29] Formation Flying & Satellite Constellations 4

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ISTS-2017-d-131/ISSFD-2017-131 (16:00 – 16:20)
Robust and Safe N-Spacecraft Swarming in Perturbed Near-Circular Orbits
Adam W. Koenig, Simone D’Amico
Department of Aeronautics and Astronautics, Stanford University, Stanford, California, USA

Satellite Constellations for Altimetry
Alain Lamy, Josiane Costeraste
CNES – Centre National d’Etudes Spatiales, Toulouse, France

ISTS-2017-d-134/ISSFD-2017-134 (16:40 – 17:00)
Galileo Extended Slots Characterisation and Relation with the Nominal Constellation
Andrés Ayala1, Rubén Castro2, Niyaporn Sirikan3, Daniel Blonski3, Daniel Navarro3
1ESTEC, European Space Agency, GMV, Noordwijk, The Netherlands, 2ESTEC, European Space Agency, WGS, Noordwijk, The Netherlands, 3ESTEC, European Space Agency, ESA, Noordwijk, The Netherlands

[d-30] Orbit Determination 4

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ISTS-2017-d-135/ISSFD-2017-135 (16:00 – 16:20)
Deep-Space Navigation Using Optical Communications Systems
Tomas Martin-Mur, Sarah Elizabeth Mccandless, Reza Karimi
Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA
The Effectiveness of Solution Technique on the Autonomous Orbit Determination Accuracy of Lagrangian Navigation Constellation

Youtao Gao¹, Bingyu Jin¹, Tanran Zhao¹, Bo Xu²
¹College of Astronautics, Nanjing University of Aeronautics and Astronautics, Nanjing, China, ²College of Astronomy and Space Science, Nanjing University, Nanjing, China

Simplified Covariance Estimation and Target Observation Management Method for On-Board Optical Navigation of Deep Space Probe

Yosuke Kawabata¹, Takanao Saiki², Yasuhiro Kawakatsu²
¹Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan, ²Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

Autonomous Orbit Determination of Multiple Spacecraft Using Active Sensing with Satellite-to-Satellite Tracking

Kota Kakihara, Naoya Ozaki, Ryu Funase
Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan

Generalized Image Navigation & Registration Method Based on Kalman Filter

Ahmed A. Kamel¹, Handol Kim², Dochul Yang³, Chul-Min Park³, Jin Woo⁴
¹Kamel Engineering Services, Los Angeles, California, USA, ²Korea Aerospace Research Institute, Daejeon, ROK, ³Korea Aerospace Industries, ROK, ⁴Korea Meteorological Administration, Daebang-dong, ROK

Satellite Autonomous Navigation with No Ground Links for Korea Regional Navigation Satellite System

Hyungjik Oh¹, Young-Rok Kim², Chandeok Park¹, Seung-Mo Seo³
¹Department of Astronomy, Yonsei University, Seoul 03722, Republic of Korea, ²Korea Aerospace Research Institute, Daejeon, Republic of Korea, ³Agency for Defense Development, Daejeon, Republic of Korea

Dual-Satellite Geolocation: Simultaneous Ephemeris Correction and Source Localization

Jeroen L. Geeraert, Jay W. McMahon
Colorado Center for Astrodynamics Research, University of Colorado at Boulder, USA

Filter Tuning Using the Chi-squared Statistic
Generalised Polynomial Chaos Based Particle Filter for Orbit Determination

Yang Yang\textsuperscript{1,2}, Yanlong Bu\textsuperscript{3}
\textsuperscript{1}SPACE Research Centre, School of Science, RMIT University, Melbourne, Australia, \textsuperscript{2}Space Environment Research Centre, Canberra, Australia, \textsuperscript{3}Beijing Aerospace Control Centre, Beijing, China

[d-32] Mission Analysis & Design 1

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<td>Natan Eismont (Space Research Institute of the Russian Academy of Sciences, Russia)</td>
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Advanced Methods of Low Cost Mission Design for Jovian Moons Exploration

Alexey Grushevskii, Yuri Golubev, Victor Koryanov, Andrey Tuchin, Denis Tuchin
KIAM (Keldysh Institute of Applied Mathematics of RAS), Russian Federation

Solar Probe Plus: Primary and Backup Launch Windows

Yanping Guo
The Johns Hopkins University Applied Physics Laboratory, Maryland, USA

Solar Orbiter Trajectory Profile and Navigation Challenges

José Manuel Sánchez Pérez, Frank Budnik
European Space Agency, ESA, ESOC, Darmstadt, Germany

AIDA: Measuring Asteroid Binary System Parameters and DART-Impacted Deflection using the AIM Spacecraft

Julie Bellerose, Shyamkumar Bhaskaran, Steven Chesley
California Institute of Technology, Jet Propulsion Laboratory, Pasadena, USA

Guidance Navigation and Control Challenges for the ESA Asteroid Impact Mission

Massimo Casasco\textsuperscript{1}, Jesus Gil Fernandez\textsuperscript{1}, Guillermo Ortega\textsuperscript{1}, Ian Carnelli\textsuperscript{2}
\textsuperscript{1}European Space Technology Centre, Noordwijk, The Netherlands; \textsuperscript{2}European Space Agency Headquarters, Paris, France
LMI-based Mixed $H_2/H_{\infty}$ Control with Regional Constraints for Spacecraft Attitude Tracking

Takahiro Sasaki1, Takashi Shimomura1, Sayaka Kanata1
1Department of Aerospace Engineering, Osaka Prefecture University, Osaka, Japan, 2Department of Aerospace Engineering Science, University of Colorado Boulder, Colorado, USA, 3Research Fellow of Japan Society for the Promotion of Science (DC1)

Fast Slew Maneuvers for the High-Torque-Wheels BIROS Satellite

Paul Acquatella B.
DLR, German Aerospace Center, Institute of System Dynamics and Control, Oberpfaffenhofen, Germany

Single Axis Pointing for Underactuated Spacecraft with a Residual Angular Momentum

Alessandro Zavoli1, Fabrizio Giulietti2, Giulio Avanzini3, Guido de Matteis1
1Department of Mechanical and Aerospace Engineering, “Sapienza” Università di Roma, Rome, Italy, 2Department of Industrial Engineering, Università di Bologna (Forlì Campus), Forlì, Italy, 3Department of Engineering for Innovation, Università del Salento, Lecce, Italy

Model Error Compensator for Attitude Control of 2-Wheel Spacecraft with On-line FRIT based Tuning

Hiroaki Endo, Kazuma Sekiguchi, Kenichiro Nonaka
Department of Mechanical Systems Engineering, Tokyo City University, Tokyo, Japan
**[d-35] Mission Analysis & Design 2**

**Session Date**: June 9 (Fri) 16:00 – 17:40

**Room**: Meeting Room 3

**Chairpersons**: Ryu Funase (The University of Tokyo, Japan)  
Alain Lamy (CNES, France)

**ISTS-2017-d-158/ISSFD-2017-158 (16:00 – 16:20)**

**Mission Design Problems for Spectrum-Roentgen-Gamma Project**  
Ravil Nazirov, Natan Eismont, Vadim Arefiev, Andrei Pogodin, Andrei Tregubov, Alexey Ditrikh

1Space Research Institute of the Russian Academy of Sciences, Russia, 2Lavochkin Association, Russia, 3Russian Space Corporation Energia


**EQUULEUS Mission Analysis: Design of the Transfer Phase**  
Kenta Oshima, Stefano Campagnola, Chit Hong Yam, Yuki Kayama, Yasuhiro Kawakatsu, Naoya Ozaki, Quentin Verspielen, Kota Kakihara, Kenshiro Oguri, Ryu Funase

1Department of Applied Mechanics and Aerospace Engineering, Waseda University, Tokyo, Japan, 2Jet Propulsion Laboratory, California Institute of Technology, CA, USA, 3ispace inc., Tokyo, Japan, 4Department of Advanced Energy, The University of Tokyo, Tokyo, Japan, 5Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, 6Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan

**ISTS-2017-d-072/ISSFD-2017-072 (16:40 – 17:00)**

**EQUULEUS Mission Analysis: Design of the Science Orbit Phase**  
Kenshiro Oguri, Kota Kakihara, Stefano Campagnola, Naoya Ozaki, Kota Oshima, Tomohiro Yamaguchi, Ryu Funase

1Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan, 2Jet Propulsion Laboratory, California Institute of Technology, CA, USA, 3Department of Applied Mechanics and Aerospace Engineering, Waseda University, Tokyo, Japan, 4Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan


**Preliminary Mission Design and Analysis of a Lunar Far-side Positioning CubeSat Mission**  
Hongru Chen, Lei Liu, Yazhe Meng, Zhenyu Xu, Long Long, Jiangkai Liu

1Key Laboratory of Space Utilization, Technology and Engineering Center for Space Utilization, Chinese Academy of Sciences, Beijing, China, 2College of Science, National University of Defense Technology, Changsha, China, 3Beijing Aerospace Control Center, Beijing, China, 4University of Chinese Academy of Sciences, Beijing, China


**SIRIUS-DV: The New Flight Dynamics Algorithms for the Future CNES Missions**  
Iván Llamas, Yannick Tanguy, Michel Lacotte, Jean-Jacques Wasbauer

1GMV, Madrid, Spain, 2CNES, Toulouse, France
### ISTS-2017-d-162/ISSFD-2017-162 (16:00 – 16:20)

**Experimental Study on Line-of-Sight (LOS) Attitude Control Using Control Moment Gyros under Micro-Gravity Environment**

Hirohisa Kojima, Kana Hiraiwa, Yasuhiro Yoshimura, Koki Hidaka  
Department of Aerospace Engineering, Tokyo Metropolitan University, Hino, Japan


**Attitude Control using Three Control Moment Gyros**

Sho Nonomura¹, Andrew Meldrum², Katsuhiko Yamada³, Yasuhiro Shoji¹  
¹Graduate School of Engineering, Osaka University, Osaka, Japan, ²School of Engineering, Osaka University, Osaka, Japan

### ISTS-2017-d-164/ISSFD-2017-164 (16:40 – 17:00)

**Conceptual Study of 6 DOF Precision Control of Payload Using 6 Axis Hybrid Actuator**

Norimasa Yoshida¹, Seiichi Shimizu², Kazuhide Kodeki²  
¹Department of Aerospace Engineering, Osaka Prefecture University, Sakai, Japan, ²Advanced Technology R&D Center, Mitsubishi Electric Corp, Amagasaki, Japan

### ISTS-2017-d-165/ISSFD-2017-165 (17:00 – 17:20)

**Singularity Avoidance/Passage Steering Logic for a Variable-speed Double-gimbal Control Moment Gyro Based on Inverse Kinematics**

Shota Kawajiri¹, Saburo Matunaga²  
¹Department of Mechanical and Aerospace Engineering, Tokyo Institute of Technology, Tokyo, Japan, ²Department of Mechanical Engineering, Tokyo Institute of Technology, Tokyo, Japan

### ISTS-2017-d-166/ISSFD-2017-166 (17:20 – 17:40)

**Optimal Attitude Control for Spacecraft Using Two Variable-Speed Control Moment Gyros**

Daiki Higashiyama, Katsuhiko Yamada, Yasuhiro Shoji  
Graduate School of Engineering, Osaka University, Osaka, Japan

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### [e-1] Plasma Flows (1)

### Session Date

| June 7 (Wed) 11:00 – 12:00 |

### Room

| Meeting Room 15 |

### Chairpersons

| Hirotaka Otsu (Ryukoku University, Japan) |
| Hiroshi Katsurayama (Yamaguchi University, Japan) |
Study on Side Force Control for High-Angle-of-Attack Slender Body Using Plasma Actuator and Minute Bump

Rei Fujieda, Tomotaka Suzuki, Hiroyuki Nishida
Department of Mechanical Systems Engineering, Tokyo University of Agriculture and Technology, Koganei, Japan

Computational Studies of Body Force Production Process and Performance Improvement in a Dielectric-barrier-discharge Plasma Actuator

Shintaro Sato, Masayuki Takahashi, Naofumi Ohnishi
Department of Aerospace Engineering, Tohoku University, Japan

The Effect of Voltage Frequency on Thrust Production of Multi-Electrode Plasma Actuator

Takashi Matsuno¹, Ai Fukuda¹, Hiromitsu Kawazoe¹, Kumi Nakai², Hiroyuki Nishida²
¹Department of Mechanical and Aerospace Engineering, Tottori University, Tottori, Japan, ²Department of Mechanical Systems Engineering, Tokyo University of Agriculture and Technology, Japan

New Magnetic Field Setup for Electromagnetic Flow Control of Lifting Reentry Vehicle

Hirotaka Otsu
Department of Mechanical and Systems Engineering, Ryukoku University, Shiga, Japan

Experimental Investigation of the Role of an Insulating Boundary in the Electrodynamic Force Generation in a Rarefied Arc Flow

Naoki Fukuda¹, Takuma Toyodome¹, Hiroshi Katsurayama¹, Kentaro Tomita², Makoto Matsui², Yasuo Katoh³
¹Graduate School of Sciences and Technology for Innovation, Yamaguchi University, Yamaguchi, Japan, ²Interdisciplinary Graduate School of Engineering Science, Kyushu University, Fukuoka, Japan, ³Graduate School of Integrated Science and Technology, Shizuoka University, Shizuoka, Japan

Electron Density Measurement by Mach-Zehnder Interferometer Using CO₂ Laser for an Atmospheric Pressure Plasma

Takafumi Yamada, Makoto Matsui
Graduate School of Integrated Science and Technology, Department of Engineering, Shizuoka University, Hamamatsu, Japan

Temperature Estimations of SiC Ablations with Several Kinds of Narrow Band-pass Filters

Makoto Hashimoto¹, Nurul Malisa², Masato Funatsu¹, Gen Morioka³, Masahiro Ozawa⁴
2017-e-09 (10:20 – 10:40)

Numerical Estimation of Laser-Ablation Propulsion Performance In Spherical Capsule

Chongfa Xie, Thuan Duc Tran, Koichi Mori
Department of Aeronautics and Astronautics, Nagoya University, Nagoya, Japan

[e-3] Atmospheric Entry (1)

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2017-e-10 (11:00 – 11:20)

Temperature-controlled Material Probe for High-enthalpy Flows

Bartomeu Massuti-Ballester, Adam S. Pagan, Georg Herdrich
Institute of Space Systems, University of Stuttgart, Germany

2017-e-11 (11:20 – 11:40)

Development and Demonstration of Ablation Sensor Unit for Light-weight Ablator

Kazuhisa Fujita¹, Toshiyuki Suzuki², Takeharu Sakai², Yuki Danzuka², Kenta Iwamoto², Takashi Ozawa¹, Naomi Takizawa¹, Yuichi Ishida¹, Yasuhide Watanabe¹
¹Japan Aerospace Exploration Agency, Tokyo, Japan, ²Tottori University, Tottori, Japan, ³Nagoya University, Nagoya, Japan

2017-e-12 (11:40 – 12:00)

One-dimensional Ablation Analysis of Lightweight CFRP Ablators with Coking

Sumio Kato¹, Shoichi Matsuda¹, Naoyuki Shimada², Shunsuke Sakai¹, Keiichi Okuyama², Bianca Szasz², Takayuki Shimoda³
¹University of the Ryukyus, Japan, ²Asahi Kinzoku Kogyo Inc. Japan, ³Kyushu Institute of Technology, Japan, ⁴JAXA/ISAS, Japan

2017-e-13 (12:00 – 12:20)

Thermal Response Analysis Of Porous Carbon-based Non-Ablative Heatshield In An Arcjet Flow Condition

Takumi Horiuchi¹, Takeharu Sakai², Hiroki Fukui¹, Yuichi Ishida², Toshiyuki Suzuki³, Kazuhisa Fujita³
¹Department of Aerospace Engineering, Nagoya University, Nagoya, Japan, ²Department of Mechanical and Aerospace Engineering, Tottori University, Tottori, Japan, ³Japan Aerospace Exploration Agency, Chofu, Japan

[e-4] Atmospheric Entry (2)

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### 2017-e-14 (14:00 – 14:20)

**Visualization of Wake Flows of Supersonic Mars Entry Capsule with Light Gus Gun**

Satoshi Nomura, Kao Itō, Shingo Matsuyama, Kazuhisa Fujita

1. Aeronautical Technology Directorate, JAXA, Chofu, Japan, 2. Department of Systems Integration, Yokohama National University, Yokohama, Japan

### 2017-e-15 (14:20 – 14:40)

**Numerical Simulation of Flow Conditions Generated by Hyper Velocity Expansion Tube**

Tohru Yamada, Lemal Adrian, Shingo Matsuyama, Satoshi Nomura, Hiroki Takayanagi, Kazuhisa Fujita, Makoto Matsui

1. Shizuoka University, Shizuoka, Japan, 2. JAXA, Tokyo, Japan

### 2017-e-16 (14:40 – 15:00)

**Electron Temperature and Number Density Measurements Ahead of a Strong Shock Wave**

Taito Kawakami, Satoshi Nomura, Sayaka Nishimura, Kazuhisa Fujita, Makoto Matsui

1. Department of Engineering, Shizuoka University, Hamamatsu, Japan, 2. Japan Aerospace Exploration Agency, Chofu, Tokyo, Japan

### 2017-e-17 (15:00 – 15:20)

**Aerodynamic Characteristics of HYFLEX Lifting Body in Shock Tunnel HIEST**

Hideyuki Tanno, Katsuhiro Itoh, Tomoyuki Komuro, Kazuo Sato

Kakuda Space Center, JAXA, Kakuda, Miyagi, Japan

### 2017-e-18 (15:20 – 15:40)

**Simulation of Ionization and Electronic Excitation in Hypersonic Shock Tube Flows Using DSMC**

T. Ozawa, S. Nomura, T. Kawakami, A. Lemal, K. Fujita

1. Research and Development Directorate, JAXA, Chofu, Japan, 2. Shizuoka University, Hamamatsu, Japan

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### [e-5] Aerodynamic Decelerator, Balloon (1)

**Session Date**

June 8 (Thu) 16:00 – 17:20

**Room**

Meeting Room 15

**Chairpersons**

Yusuke Maru (Japan Aerospace Exploration Agency, Japan)

Katsuyoshi Fukiba (Shizuoka University, Japan)

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### 2017-e-19 (16:00 – 16:20)

**Aerothermodynamic Studies on Low-Ballistic-Coefficient Mars Aerocapture Vehicle with Drag Modulation and Ion Thruster**

Kojiro Suzuki

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

### 2017-e-20 (16:20 – 16:40)
Thermal-durability Evaluation of Inflatable Structure for a Deployable Aeroshell Using ICP Heater
Kazushige Matsumaru¹, Mayuko Tanaka², Osamu Imamura³, Kazuhiko Yamada⁴
¹Department of Mechanical Engineering, Nihon University, Chiba, Japan, ²Department of Applied Mechanics, Waseda University, Tokyo, Japan, ³Department of Sustainable Engineering, Nihon University, Chiba, Japan, ⁴The Institute of Space and Astronautical, JAXA, Sagamihara, Japan

Aeroshell Configuration for Flexible Capsule for Martian Atmospheric Entry
Yasumasa Watanabe¹, Kojiro Suzuki²
¹Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan, ²Department of Advanced Energy, The University of Tokyo, Tokyo, Japan

Coupled Analysis of Aerodynamics, Deformation and Motion for Mars Probe with Flexible Surface in Upper Atmosphere
Kakeru Tokunaga
Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan

[e-6] Aerodynamic Decelerator, Balloon (2)

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Flight Test of Supersonic Parachute Using JAXA’s Research Helicopter
Toshiyuki Suzuki¹, Hiroki Takeyanagi¹, Takashi Ozawa¹, Satoshi Nomura¹, Hiroka Inoue¹, Naomi Takizawa¹, Kazuhsisa Fujita¹, Yoshinori Minami², Hirokazu Adachi², Yoshitsuya Aoki², Toshio Fukui², Toshiaki Daibo², Takashi Mugitani², Taro Tsukamoto², Shinji Ishimoto², Takehiro Kumagai², Hirofumi Shirouzu², Koji Ohga³
¹Research Unit II, Research and Development Directorate, JAXA, Chofu, Japan, ²Research Unit IV, Research and Development Directorate, JAXA, Chofu, Japan, ³Flight Research Unit, Aeronautical Technology Directorate, JAXA, Mitaka, Japan

Wind Tunnel Tests on Pressure Oscillation in Supersonic Parachutes
Kazuki Mizuta
Shizuoka University, Hamamatsu, Japan

Analytical Study on Transient Behavior to Dive into Gliding Flight of Parafoil-type Vehicle
Takahiro Moriyoishi¹, Hiroki Kanemaru¹, Hisashi Nagano², Kazuhiro Yamada³, Hiroyuki Nishida¹
¹Department of Mechanical Systems Engineering, Tokyo University of Agriculture and Technology, TAT, Koganei, Japan, ²School of Fundamental science and Engineering, Waseda University, Tokyo, Japan, ³Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

A High-Speed Flight Experiment System with Combination of a High-Altitude Balloon and a Rocket Booster for Flight Demonstration of Technologies Needed for Spaceplane
Yusuke Maru¹, Shujiro Sawai¹, Harunori Nagata², Nobutaka Bando¹, Shin-Ichiro Sakai¹, Tetsuo Yoshimitsu¹, Ken Goto¹, Hikaru
### [e-7] Aerodynamics (1)

<table>
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<td>Chairpersons</td>
<td>Toshiyuki Suzuki (Japan Aerospace Exploration Agency, Japan)</td>
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<td>Hiroyuki Nishida (Tokyo University of Agriculture and Technology, Japan)</td>
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#### 2017-e-29 (11:00 – 11:20)

**Aerodynamic Analysis on Flight Vehicle with Protuberant Devices**

Toshiaki Harada¹, Keiichi Kitamura¹, Satoshi Nonaka²

¹Graduate School of Engineering, Yokohama National University, Kanagawa, Japan, ²Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

#### 2017-e-31 (11:20 – 11:40)

**Experimental Investigation on the Effectiveness of Micro-jets to Restrain the Base Pressure of Space Vehicles**

Musavir Bashir¹, Parvathy Rajendran¹, S. A. Khan²

¹School of Aerospace Engineering, University Sains Malaysia, Penang, Malaysia., ²Department of Mechanical Engineering, IIUM, Kuala Lumpur, Malaysia

#### 2017-e-32 (11:40 – 12:00)

**Flow Induced Vibrations of Entry Capsule Models**

Koju Hiraki¹, Kota Tanaka¹, Yuma Yanaga¹, Harald Kleine²

¹Kyushu Institute of Technology, Kitakyushu, Japan, ²Department of Aeronautics and Astronautics, The University of New South Wales, Canberra, Australia

### [e-8] Aerodynamics (2)

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<td>Nobuyuki Tsuboi (Kyushu Institute of Technology, Japan)</td>
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#### 2017-e-33 (14:00 – 14:20)

**Aeroelastic Analysis for the High Altitude Propeller by Using Fluid-Structure Interaction Method**

Zhengyu Qu, Yanchu Yang, Ying Nie

Academy of Opto-Electronics, Chinese Academy of Science, Beijing, China
Design of an Efficient Propeller for Low-Reynolds Number Application
Umunna, J. Reuben, Hiraki Koju, Kinjo Satoru
Space Dynamic laboratory, Kyushu Institute of Technology, Kitakyushu, Japan

Effect of Leading Edge Profile on the Flow Phenomenon of Delta Wing
Ramakrishna Madhira¹, Senthil Kumar C²
¹Assistant Professor, Dept. of Aeronautical Engg., Tagore Engineering College, Chennai, India, ²Assistant Professor, Dept. of Aeronautical Engg., MIT Campus, Anna University, Chrompet, Chennai, India

Mach and Reynolds Numbers Effects on Aerodynamics of Delta Wing in Mars Wind Tunnel Experiments
Daichi Ishiwaki, Taku Nonomura, Shintaro Andoh, Keisuke Asai
Department of Aerospace Engineering, Graduate School of Engineering, Tohoku University, Sendai, Miyagi, Japan

A Study on The Interaction Mechanism of Coaxial Jet Exhausted from a Body in Hypersonic Flow
Mohammad Samara¹, Yasumasa Watanabe², Kojiro Suzuki³
¹Department of Advanced Energy, Graduate School of Frontier Sciences, The University of Tokyo, Kashiwa, Japan, ²Department of Aeronautics and Astronautics, Graduate School of Engineering, The University of Tokyo, Tokyo, Japan

Improvement of the SLAU2 Scheme for a Propagating Intense Shock Wave
Yukiharu Iwamoto¹, Masakatsu Murakami², Hiromichi Toyota¹, Xia Zhu¹
¹Graduate School of Science and Engineering, Ehime University, Ehime, Japan, ²Institute of Laser Engineering, Osaka University, Osaka, Japan

On Causal Structures in Fluid Mechanics
Trevor H. Moulden
The University of Tennessee Space Institute, Tullahoma, USA

The Interfacial Nanobubbles Studied by Molecular Dynamics Simulations
Tsu-Hsu Yen
Marine Science, R.O.C Naval Academy, Taiwan
Numerical Investigation of the Radiation Transfer in a Laser Sustained Plasma Wind Tunnel with Carbon-dioxide Gas

Yutaro Ehara¹, Hiroshi Katsurayama¹, Makoto Matsui², Takeharu Sakai³, Katoh Yasuo¹

¹Graduate School of Sciences and Technology for Innovation, Yamaguchi University, Ube, Japan, ²Graduate School of Integrated Science and Technology, Shizuoka University, Shizuoka, Japan, ³Graduate School of Engineering, Tottori University, Tottori, Japan

[f-1] Mission1

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<td>Hironori Sahara (Tokyo Metropolitan University, Japan)</td>
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<td>Tsuyoshi Totani (Hokkaido University, Japan)</td>
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2017-f-001 ( 9:00 – 9:20 )

Space Scout Wasps: Concept of A Distribute Space Awareness System

Wei E¹, Cheng Wei¹, Sihang Zhang², Xinwei Wang², Yang Zhao¹

¹School of Astronautics and Aeronautics, Harbin Institute of Technology, China, ²Beihang University, China

2017-f-002 ( 9:20 – 9:40 )

Preliminary System Design for AMMEQ-1: A Step towards QKD

Eugene Kim¹, Xiaofeng Wu¹, Trevor Kwan², Robert Bedington², Xueliang Bai², Alexander Ling²

¹School of Aerospace, Mechanical and Mechatronics Engineering, The University of Sydney, Australia, ²Centre for Quantum Technologies, National University of Singapore, Singapore

2017-f-003 ( 9:40 – 10:00 )

Space Timing Reference Option for Space Applications Provided by Space Precision Atomic-clock TIming Utility Mission Satellite “SPATIUM”

Kateryna Aheieva¹, Rahmi Rahmatillah¹, Ryotaro Ninagawa¹, Hirokazu Masui¹, Takashi Yamauchi¹, Sangkyun Kim¹, Mengu Cho¹, Chow Chee Lap², Tse Man Siu², Li King Ho Holden²

¹Kyushu Institute of Technology, Japan, ²Nanyang Technological University, Singapore

[f-2] Mission2

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<td>Sangkyun Kim (Kyushu Institute of Technology, Japan)</td>
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<td>Masaaki Kawamura (University of Teikyo, Japan)</td>
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2017-f-005 ( 11:00 – 11:20 )
Development Status of The Civilian Satellite “Dream Sat 01”
Ippei Oshima1, Hideaki Kikuchi2, Hirokazu Tahara3, Ryota Hirai4, Tomoyuki Ikeda5, Ikujiro Iijima6, Shin Takeuchi7, Osamu Konno8, Taizoh Yamamoto9, Naoki Kabaya10, Gilchi Sakemi11, Kenji Ishida12, Yu Okumura13, Yuji Nishikawa13, Shouhei Minami13, Kauhito Miura12, Sooapal Hong13, AstreX Kansai Satellite Group, Dream Satellite Project Team
1Kobe University, Japan, 2AstreX, Japan, 3Osaka Institute of Technology, Japan, 4Tokai University, Japan, 5Ao System enerGy Exploration, Japan, 6KOBE ENGINEERING Co., Ltd., Japan, 7Nisiss inc., Japan, 8AMAMOTO METAL TECHNOS CO., LTD., Japan, 9FUTUREAGRI Co., Ltd., Japan, 10Fantastical AeoSpace Promotion Incorporated Association, Japan, 11JAPAN FUTE C Co., Ltd., Japan, 12Nishi System, Japan

2017-f-007 ( 11:20 ‒ 11:40 )
Nano Satellite “ITF-2” Developed by University of Tsukuba YUI Project
Atsushi Yasuda1, Akhiro Nagata2, Hiromasa Watanabe1, Toshihiro Kameda3
1Graduate School of Pure and Applied Sciences, University of Tsukuba, Japan, 2Graduate School of Systems and Information Engineering, University of Tsukuba, Japan, 3Faculty of Engineering, Information and Systems, University of Tsukuba, Japan

2017-f-008 ( 11:40 ‒ 12:00 )
Mission Definition and Preliminary Design of NanoDragon, the First Vietnamese Nanosatellite
Nguyen Dinh Chau Minh1, Vu Viet Phuong1, Le Xuan Huy1, Pham Anh Tuan1, Truong Xuan Hung1, Nguyen Truong Thanh1, Hoang The Huynh1, Pham Anh Minh1,2
1Vietnam National Satellite Center, 2Graduate School of System Design and Management, Keio University

2017-f-009 ( 12:00 ‒ 12:20 )
Software Demodulation Technique for the Store and Forward System of Vietnam’s first Micro-Satellite MicroDragon
James Harpur1, Toshinori Kuwahara1, Ngo Thanh Cong1,2, Ta Phuong Linh1,2, Nguyen Phuong Mai1,2, Tran Van Ninh1,2, Nguyen Minh Thao1,2, Kazuya Yoshida1
1Department of Aerospace Engineering, Tohoku University, Sendai, Japan, 2Vietnam National Satellite Center, Vietnam Academy of Science and Technology, Hanoi, Vietnam

[f-3] Mission3

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<td>Alim Rustem Aslan (Istanbul Technical University, Turkey)</td>
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<td>Shinichi Nakasuka (The University of Tokyo, Japan)</td>
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2017-f-010 ( 14:00 – 14:20 )
Design and Verification of Single Event Latch-up Mitigation Circuits for On-board Computer Subsystem of HORYU-IV Satellite
Mohamed Yahia Edries1, Atomu Tanaka2, Hiroshi Fukuda2, Koyo Taniwaki2, Hirokazu Masui2, Horyu-IV Project Team, Koichi Takamiya2, Mengu Cho2
1National Authority for Remote Sensing and Space Sciences (NARSS), Egypt, 2Kyushu Institute of Technology (Kyutech), Japan, 3Kyoto University Research Reactor Institute, Japan

2017-f-011 ( 14:20 – 14:40 )
System Design of Multi-purpose Space Environment Utilization Experiment Satellite “TeikyoSat-4”
Yonosuke Yamazaki1, Katsuya Shibata2, Masaaki Kawamura1
1Department of Aerospace Engineering, Faculty of Science and Engineering, Teikyo University, Tochigi, Japan, 2Division of Integrated Science and Engineering, Graduate School of Science and Engineering, Teikyo University, Tochigi, Japan
2017-f-012 (14:40 – 15:00)

CuPA – A Turnkey CubeSat Solution for Precision Agriculture in Indian Sub-Continent
Siddhesh Ravindra Naik, Siddhesh Naik
YGNSS Co-Lead, Space Generation Advisory Council, India

2017-f-013 (15:00 – 15:20)

Technology Demonstration Microsatellite “Hibari”: Variable Shape Attitude Control and Its Application to Astrometry of GravitationalWave Sources
Kyosuke Tawara1, Shohei Harita2, Yoichi Yatsu3, Saburo Matunaga1
1Department of Mechanical and Aerospace Engineering, Tokyo Institute of Technology, Tokyo, Japan, 2Department of Physics, Tokyo Institute of Technology, Tokyo, Japan, 3Department of Mechanical Engineering, Tokyo Institute of Technology, Tokyo, Japan

2017-f-014 (15:20 – 15:40)

UNISEC-Global Challenge: An approach for Contribution to Debris Mitigation – Deorbit Device Competition
Rei Kawashima1, Alim Rüstem Aslan2, Yasuyuki Miyazaki3, Mohammed Khalil Ibrahim3, Herman Steyn4
1UNISEC-Global, Tokyo, Japan, 2Istanbul Technical University, Istanbul, Turkey, 3Nihon University, Chiba, Japan, 4Stellenbosch University, Stellenbosch, South Africa

[f-4] BIRDS

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<td>Toshinori Kuwahara (Tohoku University, Japan)</td>
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2017-f-015 (16:00 – 16:20)

Overview of Joint Global Multi-Nation Birds Satellite Project
Taiwo Raphael Tejumola1, Birds Project Members2, Birds Partners3, George Maeda1, Sangkyum Kim1, Hirokazu Masui1, Mengu Cho3
1Laboratory of Spacecraft Environment Interaction Engineering, 2Kyushu Institute of Technology, Kitakyushu, Japan

2017-f-016 (16:20 – 16:40)

Design, Manufacture and Verification of CubeSat Structure for BIRDS Constellation
Ibukun Adebolu, BIRDS Project Members, BIRDS Partners, George Maeda, Sangkyum Kim, Hirokazu Masui, Mengu Cho
Laboratory of Space Environment Interaction Engineering Kyushu Institute of Technology, Kitakyushu, Japan

2017-f-017 (16:40 – 17:00)

Design and Verification of BIRDS Project Mission Data Downlink System
Maisun Ibn Monowar1, BIRDS Project Members, BIRDS Partners, George Maeda, Sangkyum Kim, Hirokazu Masui, Mengu Cho, Kaname Kojima2
1Laboratory of Spacecraft Environment Interaction Engineering, Kyushu Institute of Technology, Kitakyushu, Japan, 2Addnics Corp., Japan

2017-f-018 (17:00 – 17:20)

Challenges in the Development of the Backplane-type Bus for 1U CubeSat
Yasuhiro Tokunaga1, Mengu Cho3, Turtgtochk Tumenjargal1, Erdenebaatar Dashdondog1, Ibukun Oluwatobi Adebolu1, George Maeda1, Sangkyum Kim1, Hirokazu Masui1, Takeyuki Handa2, Shinichi Yoshida2
Atmospheric Density Modelling via Precise Satellite Tracking of Birds CubeSat constellation
Joseph Quansah, BIRDS Project Members, BIRDS Partners, George Maeda, Sangkyun Kim, Hirokazu Masui, Mengu Cho
Laboratory of Spacecraft Environment Interaction Engineering, Kyushu Institute of Technology, Japan

[f-5] Re-entry & Deployment

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<td>Kauhiko Yamada (Japan Aerospace Exploration Agency, Japan)</td>
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Re-entry Nano-Satellite with Gossamer Aeroshell and GPS/Iridium Deployed from ISS
Kazuhiko Yamada1, Takahiro Moriyoshi2, Kazushige Matsumaru3, Hiroki Kanemaru3, Takahiro Araya4, Kojiro Suzuki5, Osamu Imanuma6, Daisuke Akita7, Yasunori Nagata7, Yasuhiro Shoji7, Yusuke Takahashi7, Yasumasa Watanabe8, Takashi Abe9, MAAC group1

1Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, 2Department of Mechanical Systems Engineering, Tokyo University of Agriculture and Technology, Koganei, Japan, 3Collage of Industrial Technology, Nihon University, Narashino, Japan, 4Department of Material Science and Technology, Tokyo University of Science, Tokyo, Japan, 5Graduate School of Frontier Sciences, The University of Tokyo, Kashiwa, Japan, 6Department of International Development Engineering, Tokyo Institute of Technology, Tokyo, Japan, 7Graduate school of Natural Science and technology, Okayama University, Okayama, Japan, 8Graduate School of Engineering, Osaka University, Suita, Japan, 9Faculty of Engineering, Hokkaido University, Sapporo, Japan

SIMON, an Electric Propulsion CubeSat Test Bed for CAPE
Valentin Belser1, Jonas Burgdorf2, Manfred Ehresmann3,2, Daniel Galla1, Markus Koller1, Martin Siedorf1, Valentin Starlinger1, Sascha Wizemann1, Georg Herdrich2, Adam S. Pagan3, Christoph Montag3, René Laufer2

1Small Satellite Student Society KSAT e.V., University of Stuttgart, Germany, 2Institute of Space Systems, University of Stuttgart, Germany, 3CASPHER, Baylor University, USA, 4Space Lab, University of Cape Town, South Africa

Development of CubeSat OrigamiSat-1 for Space Demonstration of Deployable Membrane Structure Technologies
Hiraku Sakamoto1, Hiroki Nakanishi1, Hiroshi Furuya1, Masahiko Yamazaki2, Yasuyuki Miyazaki2, Akihito Watanabe3, Kazuki Watanabe4, Ayako Torisaka-Kayaba5

1Tokyo Institute of Technology, Tokyo, Japan, 2Nihon University, Chiba, Japan, 3Sakase Adtech Co., Ltd., Fukui, Japan, 4WEL Research Co., Ltd., Chiba, Japan, 5Tokyo Metropolitan University, Tokyo, Japan

Development of Internal Antenna Deployment Mechanism for a CubeSat
Raihana S. I. Antara, BIRDS Project, BIRDS Partners, George Maeda, Sangkyun Kim, Hirokazu Masui, Mengu Cho
Laboratory of Spacecraft Environment Interaction Engineering Kyushu Institute of Technology, Kitakyushu, Japan
2017-f-025 (11:00 – 11:20)

Innovative Approach to Data Gathering in Remote Areas Using Constellations of Store & Forward Communication Cubesats

Quentin Verspieren, Toshihiro Obata, Shinichi Nakasuka

Intelligent Space Systems Laboratory, The University of Tokyo, Japan

2017-f-026 (11:20 – 11:40)

Need of Small Satellite Constellation to Study Ionosphere Precursor due to Earthquake

Koh-Ichiro Oyama¹,², T. Kodama³

¹Institute of Space and Plasma Sciences, National Cheng Kung University, Tainan, Taiwan, ²International Center of Space Weather Study and Education, Fukuoka, Japan, ³CoLtd Asia Space Environment Research Consortium, Sagamihara, Japan

2017-f-027 (11:40 – 12:00)

Cubesat Constellation System for Agriculture Application in India

Muhammad Shadab Khan, Zainab Siddiqui

Space Generation Advisory Council, India

2017-f-028 (12:00 – 12:20)

Feasibility Analysis of Fractioned Cubesats Formation for Moon Observations

Diogene A. Dei Tos, Daniele Filippetto, Aureliano Rivolta, Karthik Venkatesh Mani

Politecnico di Milano, Italy

2017-f-029 (12:20 – 12:40)

The DLR Small-Satellite Constellation FireBird

Halle W., Terzibaschian Th., Bärwald W., Schultz C.

Institute of Optical Sensor Systems, Germany

[f-7] STARS-E

Session Date June 7 (Wed) 16:00 – 17:20

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Chairpersons Hiraku Sakamoto (Tokyo Institute of Technology, Japan)

Takaya Inamori (Nagoya University, Japan)
Velocity Control Applied to Tether Reel Mounted on STARS-E
Atsushi Bito, Masahiro Nohmi
The University of Shizuoka, Shizuoka, Japan

Attitude Control Method with RW and Magnetic Torque for Orbital Elevator Satellite STARS-E
Keisuke Takaya, Masahiro Nohmi
Shizuoka University, Shizuoka, Japan

Design of the Communication Antenna for the STARS-E Climber
Tomohiro Kakuta
Nihon University, Japan

A Study of the STARS-E Climber’s EPS and Electrical Components for Mission Success
Darren Raymond Coste, Shun Yokota, Tomohiro Kakuta, Yudai Kuramoto, Yoshio Aoki, Yoshiki Yamagiwa, Masahiro Nohmi, Isao Yoda
1Nihon University, Japan, 2Shizuoka University, Japan, 3Tokyo Institute of Technology, Japan

[f-8] Infrastructure

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<td>Mohammed Khalil Ibrahim (Nihon University, Japan)</td>
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<td>Kenneth Olafsson (KSAT – Kongsberg Satellite Services AS, Norway)</td>
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Integrated Ground Network Technologies – “KSAT Lite” Small Antenna Network
Kenneth Olafsson
Kongsberg Satellite Services (KSAT), Tromsø, Norway

Advantages of a Cubesat Receiving Station Located in the South of the Indian Ocean
Vincent Dinnat, Julie Hoarau, Lucas Kerdoncuff, Esteban Decline, Brice Lagarigue, Noann Mondon, Evan Piffarelly, Iannis Poquet
Lycée Bois d’Olivès, Saint-Pierre, Reunion Island

Affordable Small Satellites Launch Options Research
Elena Petrakova, Valery Panasenkov
Moscow Aviation Institute (National Research University), Moscow, Russian Federation
Aggregated Preference Value Analysis on Small Satellite Launch Opportunities
Mengying Zhang1, Qin Xu2, Qiangang Tang3, Qingbin Zhang2
1School of Mechanical, Aerospace and Civil Engineering, The University of Manchester, UK, 2Department of Aerospace Science and Technology, National University of Defense Technology, Changsha, Hunan, China

[f-9] Beyond Earth

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2017-f-038 (11:00 – 11:20 )
Thinking Outside the “Cube"
Anita Bernie, Alex da Silva Curiel, Nikki Jahn, Luis Gomes, Sir Martin Sweeting
Surrey Satellite Technology Ltd., Guildford, UK

2017-f-039 (11:20 – 11:40 )
Making Small Lunar Missions Viable
Alex da Silva Curiel1, Susan Jason1, Jonathan Friend1, Chris Saunders1, Matthew Cosby2, James Carpenter2, Andreas Borregraife3, Berhard Hufenbach1, Veronica La Regina1, Martin Sweeting2
1Surrey Satellite Technology Ltd., UK, 2Goonhilly Earth Station Ltd., 3European Space Agency

2017-f-040 (11:40 – 12:00 )
Spacecraft in the Shot: A Platform for Deep-Space Cinematography
Jessie M Kawata, Jonathon Smith
NASA Jet Propulsion Laboratory, California Institute of Technology, USA

2017-f-041 (12:00 – 12:20 )
A CubeSat Project to Observe the Beaming Structures of Jupiter’s Radio Emissions
Lkhagvadorj Sukhtsoodol1, Yusei Nakayama1, Ryunosuke Fujita1, Mizuki Ando2, Kai Tan Chiang Eric2, Kazumasa Imai1, Nobuto Hirakoso2, Taku Takada1, Kentarou Kitamura2
1National Institute of Technology, Kochi College, Japan, 2National Institute of Technology, Gunma College, Japan

2017-f-042 (12:20 – 12:40 )
Development of Binary Black Hole Observation Satellite “ORBIS”
Jun Matsushima1, Hironori Sahara1, Shogo Asano1, Masahiro Kaku1, Toshiohiro Kanda1, Mayu Banno1, Hirohisa Asano1, Yuya Kobayashi1, Natsumi Kimura1, Norio Yamashita1, Yuichiro Ezoe2, Kumi Ishikawa3, Koichi Sakakumagawa2, Masaki Numazawa2, Kazuma Takeuchi1, Masaru Terada1, Daiki Ishii1, Yusuke Noda2, Maiko Fujitani2, Naoki Isobe2, Hiroshi Nakajima2, Norihide Miyamura3
1Department of Aerospace Engineering, Tokyo Metropolitan University, Tokyo, Japan, 2Department of Physics, Tokyo Metropolitan University, Tokyo, Japan, 3Department of Space and Astronautical Science, JAXA, Sagamihara, Japan, 4Department of Earth and Space Science, Osaka University, Osaka, Japan, 5Department of Interdisciplinary Science and Engineering, Meisei University, Tokyo, Japan
### 2017-f-043 (14:00 - 14:20)

**Mission to Earth—Moon Lagrange Point by a 6U CubeSat: EQUULEUS**

Ryu Funase¹, Naoya Ozaki², Shintaro Nakajima³, Kenshiro Oguri¹, Kota Miyoshi², Stefano Campagnola⁴, Hiroyuki Koizumi¹, Yuta Kobayashi⁴, Taichi Ito⁴, Takumi Kudo⁴, Yuki Koshio³, Shunichiro Nomura¹, Akihumi Wachi³, Masashi Tomooka¹, Ichiro Yoshikawa⁵, Hajime Yano³, ShinSuke Abe⁶, Tatsuaki Hashimoto⁷, EQUULEUS Project Team ¹

¹Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan, ²Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, ³Jet Propulsion Laboratory, NASA, California, USA, ⁴Research and Development Directorate, JAXA, Tsukuba, Japan, ⁵Department of Complexity Science and Engineering, The University of Tokyo, Kashiwa, Japan, ⁶Department of Aerospace Engineering, Nihon University, Funabashi, Japan

### 2017-f-044 (14:20 - 14:40)

**Mission Analysis for EQUULEUS and OMOTENASHI**

Stefano Campagnola¹, Naoya Ozaki², Javier Hernando-Ayuso³, Kenta Oshima², Tomohiro Yamaguchi³, Kenshiro Oguri², Yusuke Ozawa³, Toshinori Ikenaga³, Kota Kikihara³, Shota Takahashi³, Ryu Funase³, Yasuhiro Kawakatsu³, Tatsuaki Hashimoto³

¹Jet Propulsion Laboratory, NASA, Pasadena, California. ²Work performed as ITYF at JAXA/ISAS, Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan, ³Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

### 2017-f-045 (14:40 - 15:00)

**Fundamental Ground Experiment of a Water Resistojet Propulsion System: AQUARIUS Installed on a 6U CubeSat: EQUULEUS**

Jun Asakawa¹, Hiroyuki Koizumi¹, Naoki Takeda¹, Keita Nishii¹, Masaya Murohara¹, Ryu Funase¹, Kimiya Komurasaki¹

¹Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan, ²Graduate School of Frontier Sciences, The University of Tokyo, Tokyo, Japan

### 2017-f-046 (15:00 - 15:20)

**Initial Design of EQUULEUS Attitude Determination and Control System: How to Design an ADCS with High Reliability for a Deep Space CubeSat**

Shunichiro Nomura, Ryoeji Takahashi, Mikihiro Ikura, Kenshiro Oguri, Toshihiro Obata, Satoshi Ikari, Ryu Funase

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

### 2017-f-047 (15:20 - 15:40)

**Thermal Design and Analysis for a 6U Deep Space CubeSat EQUULEUS under Tightly-Coupled Spacecraft Resource Constraints**

Yuki Koshio, Naoya Ozaki, Shuhai Matsushita, Akihiro Ishikawa, Ryu Funase

Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan
2017-f-048 (14:00 – 14:20)

**Development of Ceramic BGA Package for Space-use**

Koichi Shinozaki\(^1\), Toshiyuki Yamada\(^1\), Noriko Yamada\(^1\), Koichi Suzuki\(^1\), Masao Nakamura\(^2\), Yoshihiro Tokue\(^2\)

\(^1\)Japanese Aerospace Exploration Agency (JAXA), Japan, \(^2\)Nippon Avionics Co., Ltd., Japan, \(^3\)Avionics Fukushima Co., Ltd., Japan

2017-f-049 (14:20 – 14:40)

**One-chip Plasma Wave Observation System**

Takahiro Zushi\(^1\), Hirotugu Kojima\(^1\), Yoshiya Kasahara\(^1\), Tsubasa Takahashi\(^2\), Mitsunori Ozaki\(^2\), Satoshi Yagita\(^2\), Yuya Tokunaga\(^2\)

\(^1\)Research Institute for Sustainable Humanosphere, Kyoto University, Kyoto, Japan, \(^2\)Graduate School of Natural Science and Technology, Kanazawa University, Kanazawa, Japan

2017-f-050 (14:40 – 15:00)

**A Sensor Package for Space Weather Global Monitoring Based on Micro Satellite Constellation**

Tsutomu Nagatsuma\(^1\), Atsushi Kumamoto\(^2\), Mitsunori Ozaki\(^1\), Kentarou Kitamura\(^3\), Yoshifumi Saito\(^3\), Takeshi Takashima\(^3\), Masahito Nose\(^3\), Jun-Ichi Kurihara\(^3\), Hirotugu Kojima\(^3\), Keigo Ishisaka\(^3\), Ayako Matsuoka\(^3\), Reiko Nomura\(^3\), Tetsuro Ishida\(^4\), Yukhiro Takahashi\(^4\)

\(^1\)Space Environment Laboratory, NICT, Koganei, Japan, \(^2\)Department of Geophysics, Graduate School of Science, Tohoku University, Sendai, Japan, \(^3\)Institute of Space and Engineering, Kanazawa University, Kanazawa, Japan, \(^4\)Department of Mechanical & Electrical Engineering, Tokuyama College of Technology, Tokuyama, Japan, \(^5\)Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, \(^6\)Graduate School of Science, Kyoto University, Kyoto, Japan, \(^7\)Department of Cosmosciences, Graduate School of Science, Hokkaido University, Sapporo, Japan, \(^8\)Research Institute for Sustainable Humanosphere, Kyoto University, Kyoto, Japan, \(^9\)Department of Information Systems Engineering, Toyama Prefectural University, Toyama, Japan

2017-f-052 (15:20 – 15:40)

**First High Resolution High Speed CubeSat of Turkey**

A.R Aslan\(^1\), A.Y. Ozylidirim\(^2\), M. Suer\(^2\), M.E. Bas\(^2\), E. Yakut\(^2\), M.Ş. Uludağ\(^3\), B. Karabulut\(^1\), M.D. Aksulm\(^2\), E. Erdogan\(^2\), S. Türkoğlu\(^1\), M. Karataş\(^1\), C. Cenik\(^1\), O. San\(^3\)

\(^1\)Istanbul Technical University, Space Systems Design and Test Lab, \(^2\)Gumush Uzay Ltd., Istanbul, Turkey, \(^3\)ASELSAN Co., Ankara, Turkey

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[f-12] **Lunar & Deep Space Missions**

**Session Date**
June 8 (Thu) 16:00 – 17:20

**Room**
Pearl Room A

**Chairpersons**
Sabro Matunaga (Tokyo Institute of Technology, Japan)
Jessie M Kawata (NASA Jet Propulsion Laboratory / Caltech, USA)

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2017-f-053 (16:00 – 16:20)

**Nano Moon Lander: OMOTENASHI**

Tatsuki Hashimoto\(^1\), Tetsuya Yamada\(^1\), Junji Kikuchi\(^2,3\), Masatsugu Otsuki\(^1\), Toshinori Ikenaga\(^2\), OMOTENASHI Project Team\(^1\)

\(^1\)Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, \(^2\)Research and Development Directorate, JAXA, Sagamihara, Japan
OMOTENASHI Trajectory Analysis and Design: Earth-Moon Transfer Phase
Yusuke Ozawa¹, Shota Takahashi², Javier Hernando-Ayuso¹, Stefano Campagnola³, Toshinori Ikenaga⁴, Tomohiro Yamaguchi⁵, Bruno V. Sarli⁶
¹The University of Tokyo, Japan, ²Keio University, Japan, ³Jet Propulsion Laboratory, USA, ⁴Institute of Space and Astronautical Science, JAXA, Japan, ⁵Catholic University of America, USA

Development of Crushable Shock Absorption Structure for OMOTENASHI Semi-hard Impact Probes
Tetsuya Yamada¹, Hideyuki Tanno², Tatsuaki Hashimoto¹
¹Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, ²Kakuda Space Center, JAXA, Kakuda, Japan

Comparative Analysis of Control Moment Gyros and Reaction Wheels for Micro-Class Low Lunar Orbiters
Tushar Sharma, Amin Ali Mody, Arinut Sharma
SRM University, India

[f-13] Thruster

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<td>Chairpersons</td>
<td>Hirokazu Tahara (Osaka Institute of Technology, Japan)</td>
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<td>Hiroyuki Koizumi (The University of Tokyo, Japan)</td>
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Qualification Model Development of CubeSat RF Ion Propulsion System “BIT-3”
Michael Tsay, John Frongillo, Jurg Zwahlen, Joshua Model, Carl Barcroft, Charlie Feng
Busek, Co. Inc., Natick, Massachusetts, U.S.A.

The HDCGJ – A Cold Gas Propulsion System for Delivering Continuous Thrusting to Small Satellites via Supercritical Evaporation
Ralf C. Boden¹, Ryota Koyama¹, Hiroshi Igoh², Shunichi Okaya², Jun'Ichiro Kawaguchi²
¹The University of Tokyo, Japan, ²Japan Aerospace Exploration Agency (JAXA), Japan

Design and Verification of Ultrasonic Motor Based Single-Axis Attitude Control System for Nano-Satellites
Xun Sun, Yijun Huang, Eugene Kim, Xiaofeng Wu
The School of Aerospace, Mechanical, and Mechatronics Engineering, The University of Sydney, Sydney, Australia

Research and Development of the Osaka Institute of Technology 2nd PROITERES Nano-Satellite with High-Power Pulsed Plasma Thrusters for Powered Flight
Ryuta Yagi¹, Tsukasa Yamauchi¹, Hiroki Fujita¹, Kaisei Kajihara¹, Hirokazu Tahara¹, Kyoko Takada¹, Tomoyuki Ikeda²
¹Department of mechanical engineering, Osaka Institute of Technology, Osaka, Japan, ²Department of Aeronautics and Astronautics, Tokai University,
## [f-14] Attitude Determination

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<tr>
<td>Chairpersons</td>
<td>Wu Xiaofeng (University of Sydney, Australia)</td>
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<td>Hiroshi Hirayama (Akita University, Japan)</td>
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### 2017-f-065 ( 9:00 ‒ 9:20 )

**Pseudo-Linear Kalman Filter for Attitude Estimation of a Spinning Nanosatellite**

Osama Khurshid¹, Jorma Selkainaho¹, Esa Kallio¹, Arto Visala¹, Halil Ersin Söken²  
¹Aalto University, Espoo, Finland, ²Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

### 2017-f-066 ( 9:20 ‒ 9:40 )


Ariston Gonzalez, Yuiji Sakamoto, John Leur Labrador, Kazuya Yoshida, Toshinori Kuwahara  
Department of Aerospace Engineering, Tohoku University, Japan

### 2017-f-068 ( 9:40 ‒ 10:00 )

**A Sun Vector Determination with Use of Insufficient Data from Sensors**

Dmytro Faizullin, Koju Hiraki, HORYU-IV team, Mengu Cho  
Kyushu Institute of Technology, Kitakyushu, Japan

## [f-15] Design

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<td>Tran Duy Vu Bui (Nanyang Technological University, Singapore)</td>
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### 2017-f-069 ( 9:00 ‒ 9:20 )

**Application of Design Structure Matrix (DSM) to Nano-satellite Systems Design and Management**

Mohammed Khalil Ibrahim, Yasuyuki Miyazaki  
Aerospace Engineering Department, College of Science and Technology Nihon University, Funabashi, Chiba, Japan.
Systems Engineering Approach to The Wires Harness Process of Microsatellites
Nguyen Duc Manh, Takashi Hiramatsu, Shusaku Yamaura, Makoto Ioki
The Graduate school of System Design and Management, Keio University Japan

2017-f-071 (9:40 – 10:00)

Pham Anh Minh, Shusaku Yamaura, Takashi Hiramatsu, Seiko Shirasaka
Graduate School of System Design and Management, Keio University, Japan

2017-f-073 (10:00 – 10:20)

Thermal Design of Micro-satellites Deployed from Japan Experimental Module Small Satellite Orbital Deployer (J-SSOD)
Delburg Mitchao1, Tsuyoshi Totani2, Masashi Wakita2, Harunori Nagata2
1Graduate School of Engineering, Hokkaido University, Hokkaido, Japan, 2Faculty of Engineering, Hokkaido University, Hokkaido, Japan

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[f-16] Disturbance and Utilization

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<tr>
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<td>Tsuyoshi Totani (Hokkaido University, Japan)</td>
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2017-f-074 (11:00 – 11:20)

Observer-based Disturbance Estimation for a Small Satellite Inertial Pointing using Magnetic Torquers
Jongbum Kim, Hyochoong Bang, Mikaël Marin
Department of Aerospace Engineering, Korea Advanced Institute of Science and Technology, Daejeon, Korea

2017-f-076 (11:20 – 11:40)

Magnetic Torque Caused by Shape Magnetic Anisotropy in Nano-satellites
Takaya Inamori1, Mana Nagao1, Yutaka Terao2, Nobutada Sako2
1Department of Aerospace Engineering, Nagoya University, Nagoya, Japan, 2Department of Advanced Energy, The University of Tokyo, Chiba, Japan, 3Canon Electronics Inc., Tokyo, Japan

2017-f-077 (11:40 – 12:00)

Detailed Analysis of Aerodynamic Effect on Small Satellites
Kikuko Miyata1, Rei Kawashima2, Takaya Inamori2
1Department of Aeronautics and Astronautics, Nagoya University, Tokyo, Japan, 2Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan

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[f-17] Test
### The Development of Support System for Radiation Resistance Test

Akihiro Nagata¹, Atsushi Yasuda², Hiromasa Watanabe², Toshihiro Kameda³

¹Graduate School of Systems and Information Engineering, University of Tsukuba, Tsukuba, Japan, ²Graduate School of Pure and Applied Sciences, University of Tsukuba, Tsukuba, Japan, ³Faculty of Engineering, Information and Systems, University of Tsukuba, Tsukuba, Japan

### Evaluation of Structural Thermal Model of a Small Spacecraft Using CFRP

Yutaro Ogata, Takumi Iso, Takashi Hiramoto, Masaaki Kawamura

Department of Aerospace Engineering, Faculty of Science and Engineering, Teikyo University, Tochigi, Japan

### Development of Thermal Vacuum Testing Method for Multiple Nano Satellites

Naoki Nakamura, BIRDS Project Members, BIRDS Partners, George Maeda, Sangkyun Kim, Hirokazu Masui, Mengu Cho

Laboratory of Space Environment Interaction and Engineering, Kyushu Institute of Technology, Kitakyushu, Japan

### Development of Structural Thermal Model of Multipurpose Space Environment Utilization Satellite “TeikyoSat-4”

Takumi Iso, Katsunori Takahashi, Takashi Hiramoto, Masaaki Kawamura

Department of Aerospace Engineering, Teikyo University, Tochigi, Japan

### Design, Development and Testing of Structure and Thermal Subsystem of AOBA-VELOX III

Hirokazu Masui¹, Kyutech Students Satellite Project, Mengu Cho¹, Tran Quang Vinh²

¹Laboratory of Spacecraft Interaction Engineering (LaSEINE), Kyushu Institute of Technology, Kitakyushu, Japan, ²Satellite Research Centre, Nanyang Technological University, Singapore
Three-axis Active and Fully Magnetic Attitude Control Design for a 1/3U Picosat Platform
Andrea Colagrossi1, Lorenzo Bucci1, Michèle Lavagna1, Guido Parissenti2
1Aerospace Science and Technology Department, Politecnico di Milano, Milan, Italy, 2GP Advanced Projects Srls, Brescia, Italy

2017-f-084 (14:20 – 14:40)

Attitude Control for a Nanosatellite using Only Magnet Torquers
Takashi Kimoto, Katsuhiro Yamada, Yasuhiro Shoji
Department of Mechanical Engineering, Osaka University, Osaka, Japan

2017-f-085 (14:40 – 15:00)

Active Aerodynamic Pitch Control for Earth Observation Missions in Very Low Earth Orbits
Zhou Hao, Peter C.E. Roberts
School of Mechanical, Aerospace and Civil Engineering, The University of Manchester, Manchester, United Kingdom

2017-f-086 (15:00 – 15:20)

FDA-A6 – A Fluid-Dynamic Attitude Control System for TechnoSat
Daniel Noack1, Jonathan Ludwig2, Philipp Werner1, Merlin F. Barschke1, Klaus Brieß1
1Institute of Aeronautics and Astronautics, Technische Universität Berlin, Berlin, Germany, 2Magsan GmbH, Berlin, Germany

2017-f-087 (15:20 – 15:40)

Dynamics Analysis of Weather-cock like Passive Sun-oriented Control Using Solar Pressure
Hiroki Nakanishi, Ryuhei Takagi, Mitsushige Oda
Dept. of Mechanical engineering, Tokyo Institute of Technology, Tokyo, Japan

[f-19] Operation & Verification

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<td>Chairpersons</td>
<td>Keiichi Hirako (Keio University, Japan)</td>
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<td>Hirokazu Masui (Kyushu Institute of Technology, Japan)</td>
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2017-f-088 (14:00 – 14:20)

VELOX-II: Summary of One Year in Operation
1Department of Electrical and Computer Engineering, National University of Singapore, Singapore, 2School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore, 3Space System Engineering, Delft University of Technology, Netherlands

2017-f-089 (14:20 – 14:40)

Development and Flight Operations of Microsatellite Bus System for DIWATA-1
Yuji Sakamoto1, Ariston Gonzalez1, John Leur Labrador1, Gerwin Policarpio Guba1, Harold Bryan Paler1, Toshinori Kuwahara1, Kazuya Yoshida1, Tetsuo Ishida2, Junichi Kurihara2, Yukihiro Takahashi2
1Department of Aerospace Engineering, Tohoku University, Sendai, Japan, 2Department of Cosmosciences, Hokkaido University, Sapporo, Japan

2017-f-090 (14:40 – 15:00)
STARS-C Tether Deployment Mission and Quick Report of Operation Results
Takeru Kumao, Masanori Aiga, Masahito Watahiki, Masahiro Nohmi, Yoshiki Yamagiwa
The University of Shizuoka, Japan

2017-f-091 ( 15:00 – 15:20 )

Orbit Verification Result of De-orbit Mechanism Demonstration CubeSat FREEDOM
Hiroki Uto1, Toshiyuki Mogi2, Toshinori Kuwashara2
1Nagoya Technical Center, Nakashima Engineering Works, Ltd., Kasugai, Japan, 2Department of Aerospace engineering, Tohoku University, Sendai, Japan

2017-f-092 ( 15:20 – 15:40 )

System Verification of a S-Band Network of Distributed Nanosatellites
Zizung Yoon, Walter Frese, Huu Quan Vu, Klaus Briess
Institute of Aeronautics and Astronautics, Technische Universitaet Berlin, Germany

[f-20] Sensor and Actuator for Attitude Control

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<td>Masahiro Nohmi (Shizuoka University, Japan)</td>
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<td>Kikuko Miyata (Nagoya University, Japan)</td>
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2017-f-093 ( 16:00 – 16:20 )

Fault Tolerant Circuit Design for Low-cost and Multi-Functional Attitude Sensor Using Real-time Image Recognition
Yuhei Kikuya1, Masanori Matsushita2, Masaya Koga2, Kei Ohta2, Yuki Hayashi1, Takehiko Koike2, Toshiki Ozawa2, Yoichi Yatsu4, Saburo Matunaga1
1Department of Mechanical Engineering, School of Engineering, Tokyo Institute of Technology, Tokyo, Japan, 2Department of Mechanical and Aerospace Engineering, Graduate school of Engineering, Tokyo Institute of Technology, Tokyo, Japan, 3Department of Physics, School of Science, Tokyo Institute of Technology, Tokyo, Japan, 4Department of Physics, Graduate school of Science, Tokyo Institute of Technology, Tokyo, Japan

2017-f-094 ( 16:20 – 16:40 )

Design and Construction of a Reaction Wheels Assembly for the Attitude Control System of Nanosatellites 3U CubeSat
Diego F. Martínez Valdés
Laboratory of Electronic Instrumentation for Space Systems, National Autonomous University of Mexico, Mexico

2017-f-095 ( 16:40 – 17:00 )

Investigation into Star Tracker Algorithms using Smartphones with Application to High-Precision Pointing CubeSats
Joshua Critchley-Marrows, Xiaofeng Wu
School of Aeronautical, Mechanical and Mechatronic Engineering, University of Sydney, Sydney, Australia

2017-f-096 ( 17:00 – 17:20 )

Design of Magnetic Actuators and Testbench for Control Attitude System for 3U Nanosatellite
Daniel Alejandro Angulo Angeles
Engineering School, National Autonomous University of Mexico, Mexico
Star Tracker in the Loop Test Bench for Microsatellite AOCS Design and Validation

Hao-Chi Chang¹, Yu-Yung Lian¹, Kuo-Liang Wu², Hung-Yuan Chang², Chen-Tsung Lin²

¹Navigation Sensors Subsystem Department, Flight Control Division, National Space Organization, Taiwan. ²Components and Flight Test Department, Flight Control Division, National Space Organization

Evaluation Software

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<td>Shinichi Kimura (Tokyo University of Science, Japan)</td>
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<td>Hsin-Chia Lin (National Space Organization, Taiwan)</td>
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</table>

Static Closed Loop Simulation for Ground-Target Tracking Control of Microsatellite “RISESAT”

Shinya Fujita, Yuji Sato, Toshinori Kuwahara, Yuji Sakamoto, Kazuya Yoshida
Department of Aerospace Engineering, Tohoku University, Sendai, Japan

Development of an Improved Micro-Satellite Environment Simulator for Attitude Determination and Control System Verification Through DIWATA-1 Flight Data Analysis

John Leur Labrador, Ariston Gonzalez, Yuji Sakamoto, Toshinori Kuwahara, Kazuya Yoshida
Space Robotics Laboratory, Department of Aerospace Engineering, Tohoku University, Sendai, Japan

Software Development for Galassia CubeSat – Design, Implementation and In-Orbit Validation

Hassan Ali Askari, Ee Wei Han Eugene, Ajie Nayaka Nikicio, Goh Cher Hiang, Luo Sha, Liaw Hwee Choo
Department of Electrical and Computer Engineering, National University of Singapore, Singapore

Modelling and Simulation of Hardware Components to Facilitate Lean Development of Nanosatellites

Jyh-Ching Juang, Yun-Peng Tsai
Department of Electrical Engineering, National Cheng Kung University, Taiwan

Development and Ground Evaluation of Fast Tracking Algorithm for Star Trackers

Yuji Sato, Toshinori Kuwahara, Shinya Fujita, Yuji Sakamoto, Kazuya Yoshida
Department of Aerospace Engineering, Tohoku University, Sendai, Japan
Aerodynamics Caused by Rolling Rates of a Small-scale Supersonic Flight Experiment Vehicle Being Developed at Muroran Institute of Technology

Kazuhide Mizobata\textsuperscript{1}, Yukiya Ishigami\textsuperscript{2}, Masaaki Miura\textsuperscript{2}, Kazuyuki Higashino\textsuperscript{1}, Takakage Arai\textsuperscript{3}
\textsuperscript{1}Aerospace Plane Research Center, Muroran Institute of Technology, Muroran, Japan, \textsuperscript{2}Graduate student, Muroran Institute of Technology, Muroran, Japan, \textsuperscript{3}Osaka Prefecture University, Sakai, Japan

Drag Reduction on the Basis of the Area Rule of the Small-scale Supersonic Flight Experiment Vehicle Being Developed at Muroran Institute of Technology

Yuki Yamazaki\textsuperscript{1}, Kazuhide Mizobata\textsuperscript{2}, Kazuyuki Higashino\textsuperscript{2}
\textsuperscript{1}Graduate student, Muroran-IT, Japan, \textsuperscript{2}Aerospace Plane Research Center, Muroran-IT, Japan

Aerodynamic Derivatives with Respect to Pitching and Yawing Rates of a Small-scale Supersonic Flight Experiment Vehicle

Keisuke Shiono\textsuperscript{1}, Koji Shirakata\textsuperscript{1}, Yukiya Ishigami\textsuperscript{1}, Masaaki Miura\textsuperscript{1}, Kazuhide Mizobata\textsuperscript{2}, Kazuyuki Higashino\textsuperscript{2}, Takakage Arai\textsuperscript{3}
\textsuperscript{1}Graduate student, Muroran Institute of Technology, Hokkaido, Japan, \textsuperscript{2}Muroran Institute of Technology, Hokkaido, Japan, \textsuperscript{3}Osaka Prefecture University, Osaka, Japan

Design and Experiment of Guidance and Control System for Autonomous Flight toward a Small-scale Unmanned Supersonic Airplane

Masazumi Ueba, Yuuichi Takaku, Kouhei Takahashi, Tomohiro Kamata
Muroran Institute of Technology, Muroran, Japan

Reusable Launch Vehicle-Concept of Minimizing Space Transportation Cost

Nadeem Alam
Load Alleviation of Launch Vehicle Flight Using Angle of Attack Estimator

Ario Birmiawan Widyoutomo\textsuperscript{1}, Yasuhiro Morita\textsuperscript{2}

\textsuperscript{1}Department of Space and Astronautical Science, The Graduate University for Advanced Studies (SOKENDAI), Sagamihara, Japan,\textsuperscript{2}Institute of Space and Astronautical Science (ISAS), Japan Aerospace Exploration Agency (JAXA), Sagamihara, Japan

Earth-Venus Express (EVE) Concept: A Transportation Strategy for Project GIVE (Grown in Venus Enclosure)

Huai-Chien Chang\textsuperscript{1}, Akira Tsuchida\textsuperscript{2}

\textsuperscript{1}Co-founder of ‘Astronautical Society of Taiwan’, Space Architecture Activist, MEng., Taiwan,\textsuperscript{2}Vice Chair of IAA Commission IV, Space Systems Operations & Utilization, Member of IAA (International Academy of Astronautics)

Analysis of Orbital Transfer between the Earth – Mars Orbit using Electric Propulsion based on Direct Collocation Method

Akihito Toba\textsuperscript{1}, Ikkoh Funaki\textsuperscript{2}, Yoshiki Yamagiwa\textsuperscript{1}

\textsuperscript{1}Shizuoka University, Hamamatsu, Japan,\textsuperscript{2}Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

Evaluation Study on EDL Analysis in Mars Atmosphere Re-entry with High-lift Flexible Vehicle

Mayuri Sakamoto\textsuperscript{1}, Riho Takumi\textsuperscript{1}, Masaaki Kawamura\textsuperscript{2}

\textsuperscript{1}Graduate School of Science & Engineering, Teikyo University, Tochigi, Japan,\textsuperscript{2}Department of Aerospace Engineering, Teikyo University, Tochigi, Japan

Initial Study by the EDL Analysis of the “Target Marker” for Guidance in Mars Exploration

Riho Takumi\textsuperscript{1}, Mayuri Sakamoto\textsuperscript{1}, Masaaki Kawamura\textsuperscript{2}

\textsuperscript{1}Graduate School of Science & Engineering, Teikyo University, Tochigi, Japan,\textsuperscript{2}Department of Aerospace Engineering, Teikyo University

Coplanar Aerocapture Reachable Domain

Hongwei Han\textsuperscript{1}, Dong Qiao\textsuperscript{1,2}, Hongbo Chen\textsuperscript{3}

\textsuperscript{1}School of Aerospace Engineering, Beijing Institute of Technology, Beijing, China,\textsuperscript{2}Key Laboratory of Autonomous Navigation and Control for Deep Space Exploration, Ministry of Industry and Information Technology, Beijing, China,\textsuperscript{3}China Academy of Launch Vehicle Technology, Beijing, China
### Session Date
June 8 (Thu) 11:00 – 12:20

### Room
Meeting Room 14

### Chairpersons
- Tetsuhiko Kozasa (Mitsubishi Heavy Industries, Ltd., Japan)
- Takashi Ozawa (JAXA, Japan)

#### 2017-g-15 (11:00 – 11:20)
**Subsystem Development Status of the H3 Launch Vehicle**
Hironori Takeda, Yorichika Mihara, Keitaro Ishikawa, Tomoki Furusawa, Osamu Kitayama, Akihiro Satoh, Wataru Sarae, Hiroyuki Ueda, Akito Hattori, Kiyoshi Kobayashi, Hiroyuki Nagata

#### 2017-g-16 (11:20 – 11:40)
**Hot-fire Testing Plan of LE-9 Development Engine for H3 Launch Vehicle**
Tetsuya Fujiwara, Daiki Watanabe, Nobuki Negoro, Takashi Tamura, Tadaoki Onga, Hitoshi Kawashima, Teiu Kobayashi, Koichi Okita

#### 2017-g-17 (11:40 – 12:00)
**Subscale Combustion Testing of Additive Manufacturing Injector**
Akane Nagasaki, Daiki Watanabe, Takashi Tamura, Tadaoki Onga, Akira Ogawara, Norio Higuchi, Yoshio Nunome, Hitoshi Sakai

#### 2017-g-18 (12:00 – 12:20)
**Numerical Analysis of Flame Duct Flowfield affected by Rocket Engine Layout**
Seiji Tsutsumi, Wataru Sarae, Hiroyuki Ueda, Akito Hattori

### Session Date
June 8 (Thu) 14:00 – 15:40

### Room
Meeting Room 14

### Chairpersons
- Seiji Tsutsumi (JAXA, Japan)
- Toshiyuki Suzuki (Japan Aerospace Exploration Agency, Japan)

#### 2017-g-19 (14:00 – 14:20)
**System Analysis of a Scramjet External Nozzle for Space Transportation Use**
**2017-g-20 (14:20 – 14:40)**

**Plasma-assisted Aerodynamic Control with Thermoelectric Device for Space Transport**

Yasumasa Watanabe, Kojiro Suzuki

1Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan, 2Department of Advanced Energy, The University of Tokyo, Tokyo, Japan

**2017-g-21 (14:40 – 15:00)**

**A Numerical and Experimental Approaches on Aerodynamic Characteristics of Waverider with Orbiter**

Tomoki Uzaki, Tomoyuki Muta, Nobuyuki Tsuboi, Yusuke Maru, Kazuhisa Fujita

1Kyushu Institute of Technology, Kitakyushu, Japan, 2Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

**2017-g-22 (15:00 – 15:20)**

**Numerical Analysis of Aerodynamic Characteristics on Reusable Sounding Rocket**

Yoshiki Nishikawa, Nobuyuki Tsuboi, Takashi Ito, Satoshi Nonaka

1Kyushu Institute of Technology, Kitakyushu, Japan, 2Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

**2017-g-23 (15:20 – 15:40)**

**Numerical Simulation Accompanied with Shock Stand-off Prediction for Heat-flux Mitigation by MHD Flow Control on Re-entry Vehicles**

P P Upadhyay, R Tietz, G Herdrich

Institute of Space Systems, University of Stuttgart, Baden Württemberg, Germany

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**[h-1] Combustion**

**Session Date**

June 8 (Thu) 16:00 – 17:20

**Room**

Meeting Room 14

**Chairpersons**

Osamu Moriue (Kyushu University, Japan)

Takehiko Ishikawa (Japan Aerospace Exploration Agency, Japan)

**2017-h-01 (16:00 – 16:20)**

**Prediction of Limiting Oxygen Concentration of Thin Materials in Microgravity**

Shuhei Takahashi, Keisuke Maruta

Department of Mechanical Engineering, Gifu University, Gifu, Japan

**2017-h-02 (16:20 – 16:40)**

**Flame-spread Characteristics of Droplet-cloud Element with Two-droplet Interaction at High Pressure in Microgravity**

Kentaro Iwai, Yasuko Yoshida, Naoya Motomatsu, Takehiko Seo, Masato Mikami

1Graduate School of Sciences and Technology for Innovation, Yamaguchi University, Yamaguchi, Japan, 2Graduate School of Science and Engineering, Yamaguchi University, Yamaguchi, Japan
2017-h-03 (16:40 – 17:00)
**Spontaneous-Ignition Experiments of a Fuel Droplet Pair using Two Michelson Interferometers in Two Directions**
Osamu Moriue, Yuuki Takeuchi, Satoshi Takahashi, Masaoki Sugihara
Deptartment of Mechanical Engineering, Kyushu University, Japan

2017-h-04 (17:00 – 17:20)
**Effects of Ambient Pressure on Instantaneous Burning Rate of Hydrocarbon Fuel Droplet in High-Temperature Ambience under Microgravity**
Shion Ando, Yoshinari Kobayashi, Hiroaki Iida, Shinji Nakaya, Mitsuhiro Tsue
Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan

### [h-2] Fundamental Physics / Short Term Microgravity

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<tr>
<td>Chairpersons</td>
<td>Yuko Inatomi (JAXA, Japan)</td>
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<td>Takehiko Ishikawa (Japan Aerospace Exploration Agency, Japan)</td>
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</tbody>
</table>

2017-h-07 (9:40 – 10:00)
**Emulsion Dynamics under Microgravity**
Yuji Yamashita¹, Yukari Saikawa¹, Takahiro Yamazaki¹, Takeshi Endo², Kenichi Sakai², Hideki Sakai², Masahiko Abe², Makoto Natsuisaka², Kazutami Sakamoto²

¹Faculty of Pharmacy, Chiba Institute of Science, Chiba, Japan; ²Faculty of Science and Technology, Tokyo University of Science, Chiba, Japan; ³Institute of Space and Astronautical Science, JAXA, Tsukuba, Japan

2017-h-08 (10:00 – 10:20)
**Unmanned Aerial Vehicle Appliance in Microgravity Research**
Tomas Pupinis³, Domantas Brucas⁴, Matas Razgunas³,³, Marcello Valdatta⁴

³Antanas Gustaitis’ Aviation Institute, Vilnius Gediminas Technical University, Vilnius, Lithuania; ⁴Space Science and Technology Institute, Vilnius, Lithuania

2017-h-09 (10:20 – 10:40)
**An Attempt to Acquire Images of Three-Dimensional Magnetic Fields for Education Purposes Under the Microgravity Condition of Parabolic Flight**
Tomoya Atsumi, Marina Tsutsumi, Ayaka Nakajima, Yuko Watanabe
Tokyo University of Science, Japan

### [h-3] Levitation-1

<p>| Session Date | June 9 (Fri) 11:20 – 12:40 |</p>
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<td>Chairpersons</td>
<td>Masahito Watanabe (Gakushuin University, Japan)</td>
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<tr>
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<td>Paul-Francois Paradis (INO, Canada)</td>
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2017-h-11 (11:20 – 11:40)

**Thermophysical and Structural Study of Levitated Droplets using Electrostatic Levitation and Scattering Devices**

Geun Woo Lee¹²
¹¹Frontier in Extreme Physics, Korea Research Institute of Standards and Science, Korea
²Department of Nano Science, University of Science and Technology, Korea

2017-h-12 (11:40 – 12:00)

**Thermophysical Property of Supercooled-liquid Silicon**

Junpei T. Okada¹, Takehiko Ishikawa², Paul-Francois Paradis³, Yuki Watanabe⁴, Satoshi Uda⁵
¹Institute of Materials Science, Tohoku University, Sendai, Japan
²Institute of Space and Astronautical Science, JAXA, Tsukuba, Japan
³INO, Quebec, Canada
⁴A.E.S. Co. Ltd., Tsukuba, Japan

2017-h-13 (12:00 – 12:20)

**Multiple Pathways of Crystal Nucleation in an Extremely Supersaturated Aqueous Potassium Dihydrogen Phosphate (KDP) Solution Droplet**

Sooheyong Lee¹², Haeng Sub Wi¹, Wonhyuk Jo¹³, Yong Chan Cho¹, Hyun Hwi Lee¹, Se-Young Jeong⁶, Geun Woo Lee¹²
¹¹Frontier in Extreme Physics, Korea Research Institute of Standards and Science, Daejeon, Republic of Korea
¹²Department of Nano Science, University of Science and Technology, Daejeon, Republic of Korea
³Department of Physics, Soongsil University, Seoul, Republic of Korea
⁵Pohang Accelerator Laboratory, Pohang, Republic of Korea
⁶Department of Cognitive-Mechatronics Engineering, Pusan National University, Miryang, Republic of Korea

2017-h-14 (12:20 – 12:40)

**Electrostatic Levitation for Materials Science Studies on the Ground, in Reduced Gravity, and on a Lunar Outpost**

Paul-François Paradis¹, Takehiko Ishikawa², Won-Kyu Rhim³, Junpei T. Okada⁴
¹INO, Quebec City, Quebec, Canada
²JAXA, Tsukuba, Ibaraki, Japan
³Department of Physics, Caltech, Pasadena, CA, United States
⁴Tohoku University, Sendai, Miyagi, Japan

[h-4] Levitation-2

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2017-h-15 (14:00 – 14:20)

**Status and Prospects of Electrostatic Levitation Furnace (ELF) Experiment in ISS-KIBO**

Haruka Tamaru¹, Chihio Koyama¹, Hideki Saruwatari², Yasuhiro Nakamura¹, Takehiko Ishikawa², Tetsuya Takada³
¹Human Spaceflight Technology Directorate, JAXA, Tsukuba, Japan
²Institute of Space and Astronautical Science, JAXA, Tsukuba, Japan
³Space Systems Department, IHI Aerospace Co., Ltd., Tomioka, Japan
Measurements of Interfacial Tension between Molten Oxide and Steel Melt using Electrostatic Levitation Furnace (ELF) in ISS (INTERFACIAL ENERGY Project)

Masahito Watanabe¹, Toshihiro Tanaka², Takao Tsukada³, Haruka Tamaru⁴, Takehiko Ishikawa⁴

¹Department of Physics, Gakushuin University, Tokyo, Japan, ²Graduate school of Engineering, Osaka University, Suita, Japan, ³Graduate school of Engineering, Tohoku University, Sendai, Japan, ⁴Japan Aerospace Exploration Agency (JAXA), Tsukuba, Japan

Thermophysical Properties Measurements of Liquid Alloys under Oxygen Influence in ISS (OXYTHERM Project)

Masahito Watanabe¹, Shumpei Ozawa², Jürgen Brillo³

¹Department of Physics, Gakushuin University, Tokyo, Japan, ²Department of Materials Science and Engineering, Chiba Institute of Technology, Narashino, Japan, ³Institute of Materials Physics in Space, German Aerospace Center, Köln, Germany

Thermophysical Properties of Zr-O liquid Alloys Measured by Electrostatic Levitation

Yuji Ohishi¹, Toshiki Kondo¹, Takehiko Ishikawa², Jünpei T. Okada³, Yuki Watanabe³, Hiroaki Muta³, Ken Kurosaki¹, Shinsuke Yamanaka⁴

¹Graduate School of Engineering, Osaka University, Suita, Osaka, Japan, ²Japan Aerospace Exploration Agency, Tsukuba, Ibaraki, Japan, ³SOKEN-DAI (Graduate University for Advanced Studies), Sagamihara, Kanagawa, Japan, ⁴Institute for Materials Research, Tohoku University, Sendai, Miyagi, Japan

Thermophysical Property Measurements of High Temperature Melts using Electrostatic Levitation Method

Takehiko Ishikawa¹, Paul-Francois Paradis², Yuki Watanabe³, Jünpei T. Okada³

¹Institut de Recherche pour le Développement, Côte d’Ivoire, ²Montreal, Canada, ³Japan Aerospace Exploration Agency, Tsukuba, Ibaraki, Japan, ⁴Tohoku University, Sendai, Japan

Contactless Coalescence of Acoustically Levitated Droplets under Reduced Gravity Conditions

Ayumu Watanabe¹, Motonori Niwa¹, Kenji Kobayashi¹, Tomohisa Yuasa¹, Koji Hasegawa¹, Satoshi Matsumoto¹, Akiko Kaneko¹, Yutaka Abe¹

¹University of Tsukuba, Japan, ²Kogakuin University, Japan, ³JAXA, Japan

Overview of Space Experiment on Dynamic Surface Deformation Effects in Transition to Oscillatory Marangoni Flow in Liquid Bridge of High Prandtl Number Fluids

Taishi Yano¹, Koichi Nishino², Satoshi Matsumoto³, Ichiro Ueno³, Atsuki Komiya¹, Yasuhiro Kamotani³, Nobuyuki Imaishi³

¹Department of Mechanical Engineering, Yokohama National University, Yokohama, Japan, ²Human Spaceflight Technology Directorate, JAXA, Tsukuba, Japan, ³Department of Mechanical Engineering, Faculty of Science & Technology, Tokyo University of Science, Noda, Japan, ⁴Institute for Fluid Science,
Overview of Boiling Two-Phase Flow Experiment onboard Kibo
Satoshi Matsumoto¹, Haruhiko Ohta², Hitoshi Asano³, Osamu Kawanami⁴, Ryoji Imai⁵, Yasuhisa Shinmoto²
¹Human Spaceflight Technology Directorate, JAXA, Tsukuba, Japan, ²Department of Aeronautics and Astronautics, Kyushu University, Fukuoka, Japan,
³Department of Mechanical Engineering, Kobe University, Kobe, Japan, ⁴Department of Mechanical Engineering, University of Hyogo, Himeji, Japan, ⁵Course
of Aerospace Engineering, Muroran Institute of Technology, Muroran, Japan

Summary of ALLOY SEMICONDUCTOR Project
Yuko Inatomi¹,², Nirmal Kumar Velu², Mukannan Arivanandhan³, Takuya Yamamoto⁴, Xin Jin⁵, Haryo Mirsandi⁶, Yasunori Okano⁴,³,¹,³,³
¹Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, Japan, ²School of Physical Sciences, SOKENDAI, Japan, ³Research
Institute of Electronics, Shizuoka University, Japan, ⁴Department of Materials Engineering Science, Osaka University, Osaka, Japan

The Development of Hardware for the Atomization Experiment in Microgravity on Kibo
Tatsuya Taguchi¹, Yasuhiro Nakamura², Masao Kikuchi², Satoshi Matsumoto¹, Satoshi Yukizono³, Hideotsugi Nakagami³, Wataru Ono³
¹JAXA, Japan, ²Jupiter Corporation, Japan, ³Chiyoda Corporation, Japan

Numerical Investigation of MEMS-based Black Body System using the Thermoelectric Device
Bong-Geon Chae, Tae-Gyu Kim, Hyun-Ung Oh
Department of Aerospace Engineering, Chosun University, Republic of Korea

Transient Mathematical Modeling of a Loop Heat Pipe with a Thermoelectric Converter
Koki Sato¹, Hossei Nagano², Atsushi Okamoto¹, Takeshi Miyakita¹, Ryuta Hatakenaka³, Hiroyuki Sugita³
¹Department of Aerospace Engineering, Nagoya University, Nagoya, Japan, ²Department of Mechanical Engineering, Nagoya University, Nagoya, Japan,
³Research and Development Directorate, JAXA, Tsukuba, Japan

Characteristics of Thermophysical Properties Through Metal-insulation for Future Advanced Thermal Control Device
Jihoon Kim¹, Daeil Park¹, Hossei Nagano¹, Sumitaka Tachikawa²
¹Nagoya University, Nagoya, Aichi, Japan, ²Institute of Space and Astronautical Science, Kanagawa, Japan
### [i-2] Thermal Control System

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<td>Hiroki Nagai (Tohoku University, Japan)</td>
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#### 2017-i-02 (11:00 – 11:20)
**Numerical Investigation of Transient Behavior of Loop Heat Pipes**

Takuya Adachi, Hiroki Nagai

1Department of Aerospace Engineering, Tohoku University, Miyagi, Japan, 2Institute of Fluid and Science, Tohoku University, Miyagi, Japan

#### 2017-i-07 (11:20 – 11:40)
**Design of Two-Phase Mechanically Pumped Fluid Loop with Large Isothermal Evaporator using Porous Wick Structure**

Kenichi Sakamoto1, Takuya Adachi1, Takurou Daimaru1, Hiroki Nagai1, Eric Sunada2, Pradeep Bhandari2, Benjamin Furst2, Stefano Cappucci3

1Institute of Fluid Science, Tohoku University, Sendai, Japan, 2Propulsion, Thermal and Materials Engineering Section, Jet Propulsion Laboratory/California Institute of Technology, Pasadena, America, 3Aerospace Engineering, Polytechnic University of Turin, Turin, Italy

#### 2017-i-11 (11:40 – 12:00)
**A Multi-nodes Model for the Thermal Performance of Stratospheric Airship**

Qiang Liu, Yanchu Yang, Taihua Zhang, Jingjing Cai, Yanxiang Cui

Academy of Opto-Electronics, Chinese Academy of Sciences, Beijing, China

### [i-3] Thermal Design for Future Spacecraft

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<td>Hiroki Nagai (Tohoku University, Japan)</td>
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#### 2017-i-04 (14:00 – 14:20)
**Sensitivity Analysis of Thermal Performance to Flow Resistance of Check Valves in Oscillating Heat Pipe**
2017-i-10 (14:20 – 14:40)

Thermal based Path Planning using Solar Orientation for a Lunar Micro Rover

Hugo Zuliani, Takuto Oikawa, Kazuya Yoshida
Department of Aerospace Engineering, Tohoku University, Japan

2017-i-09 (14:40 – 15:00)

Toward Uncertainty Quantification in Satellite Thermal Design

Hiroshi Kato¹, Makiko Ando¹, Yasuhiro Fukuzoe²
¹Research and Development Directorate, JAXA, Tsukuba, Japan, ²Space Technology Directorate I, JAXA, Kumage, Japan

[j-1] Antennas and Stations

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<td>Tetsushi Ikehagi (Meiji University, Japan)</td>
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2017-j-01 (16:00 – 16:20)

New Receiving Ground Antenna for Satellites using Active Phased Array Antenna

Nobuyuki Kaya, Rie Nakayama
Kobe University, Japan; WaveArrays, Inc, Japan

2017-j-02 (16:20 – 16:40)

Precise Beam Formation Control for Mobile Communication Satellite Based on Onboard Measurement of Large Reflector Surface Shape

Maki Akioka¹, Amane Miura¹, Teruaki Orikasa¹, Hiroyuki Tsuji¹, Morio Toyoshima¹, Masaki Sato², Yoshiyuki Fujino¹
¹Wireless Network Research Center, National Institute of Information and Communications Technology, Koganei, Tokyo, Japan, ²Kashima Space Technology Center, Wireless Network Research Center, National Institute of Information and Communications Technology, Kashima, Ibaraki, Japan

2017-j-03 (16:40 – 17:00)

Novel Satellite Antenna Pattern Compensation Method using Two Dimensional Least Square Method and Quadratic Function

Yoshiyuki Fujino, Masaki Satoh, Amane Miura, Teruaki Orikasa, Maki Akioka
National Institute of Information and Communications Technology, Tokyo, Japan

2017-j-04 (17:00 – 17:20)

Signal Level Fluctuation Caused by Cable Wrapping System of Usuda Deep Space Center

Tomoaki Toda, Koji Yuchi, Takashi Uchimura, Kenji Numata
Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

2017-j-05 (17:20 – 17:40)

Jaxa New Deep Space Ground Station
### [j-2] Hardware Implementation and Broadcasting

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<td>Yoshiyuki Fujino (National Institute of Information and Communications Technology, Japan)</td>
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<td>Masanobu Yajima (Japan Aerospace Exploration Agency, Japan)</td>
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#### 2017-j-06 (9:00 – 9:20)

**High Power High Efficient Compact GaN Amplifier for the Solid-state Radar**

Daisuke Hayashi, Ryoko Kishikawa, Shigeo Kawasaki

1Koden Electronics Co., Ltd., Tokyo, Japan, 2SOKENDAI (The Graduate University for Advanced Studies), Sagamihara, Japan, 3Japan Aerospace Exploration Agency (JAXA), Sagamihara, Japan

#### 2017-j-07 (9:20 – 9:40)

**Newly Developed 20W Class On-board X-band GaN Solid State Power Amplifier**

Mitsuhiro Nakadai, Masanobu Yajima

Research and Development Directorate, JAXA, Ibaraki, Japan

#### 2017-j-08 (9:40 – 10:00)

**100W C-band GaN Solid State Power Amplifier with 50% PAE for Satellite Use**


Space Systems & Electronic Engineering Department, Mitsubishi Electric TOKKI Systems Corporation, Kanagawa, Japan

#### 2017-j-09 (10:00 – 10:20)

**Experimental Verification of Prototype Equalizer for Non-linear Compensation over Satellite Channel**

Masaaki Kojima, Masafumi Nagasaka, Yoichi Suzuki, Yuki Koizumi, Koichi Saito, Shoji Tanaka

NHK Science & Technology Research Laboratories, Tokyo, Japan

#### 2017-j-10 (10:20 – 10:40)

**Hardware Performance of Optical Distribution Equipment for 12-GHz Band Satellite Broadcasting using Dual-polarization**

Atsushi Iwasaki, Masafumi Nagasaka, Yuki Koizumi, Masaaki Kojima, Susumu Nakazawa, Shoji Tanaka, Kazuya Ueda

1Science & Technology Research Laboratories, Japan Broadcasting Corporation, Tokyo, Japan, 2Association of Radio Industries and Businesses, Tokyo, Japan

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### [j-3] WINDS and Next Systems

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A Study of ACM for Power and Bandwidth Limited Channel in Satellite Communication System
Mitsugu Ohkawa, Hiromitsu Wakana, Amane Miura
National Institute of Information and Communications Technology, Koganei, Tokyo, Japan

Experimental Evaluation of Non-linear Distortion Compensation Using the WINDS Satellite
Masanobu Yajima¹, Mitsuhiro Nakadai², Yoshiyuki Tashima²
¹Research and Development Directorate, JAXA, Tsukuba, Japan, ²Space Engineering Development Co., Ltd, Tsukuba, Japan

High-Speed Transmission for Ka-Band Aeronautical Satellite Communications Using WINDS
Tomoshige Kan, Takashi Takahashi, Noihiko Katayama, Toshio Asai, Kazuyoshi Kawasaki, Maki Akioka, Morio Toyoshima
Space Communications Laboratory, National Institute of Information and Communications Technology, Ibaraki, Japan

Conceptual Design for Next Engineering Test Satellite
Kentaro Nishi³, Kunitoshi Nishijo², Satoru Ozawa¹, Tadahiko Sanō², Yasushi Hatooka², Tsutomu Fukatsu²
¹Research and Development Directorate, JAXA, Tsukuba, Japan, ²Space Technology Directorate I, JAXA, Tsukuba, Japan

Research Plan of R&D of Bandwidth-on-Demand High Throughput Satellite Communications System
Amane Miura¹, Maki Akioka¹, Naoko Yoshimura¹, Kazunori Okada¹, Kenji Suzuki¹, Hiromitsu Wakana¹, Shinichi Yamamoto¹, Takashi Takahashi¹, Kazuyoshi Kawasaki¹, Tomoshibe Kan¹, Shinichi Kozono¹, Toshihiro Kubooka¹, Tetsuharu Fuse¹, Hiroo Kunimori¹, Yoshisada Koyama¹, Yasushi Munemasa¹, Hideki Takenaka¹, Kolev Dimitar¹, Alberto Carrasco-Casado¹, Morio Toyoshima¹, Kazuma Kaneko¹, Hiroki Nishiyama¹, Nei Kato², Eiichi Sakai², Terumi Sunaga², Nobuyoshi Horie², Arimasa Kanasashi², Toshitsugu Tsunoda², Yuichi Yamamoto³, Yoshifumi Goto³, Toshihiko Hayashi³, Katsumi Tsukahara³, Hisayuki Mukae³
¹NICT, Tokyo, Japan, ²Tohoku University, Miyagi, Japan, ³Mitsubishi Electric Corp., Tokyo, Japan

Precision Navigation Achieved by ASTRO-H Space-borne GPS Receiver

[j-4] Navigation and Applications

Session Date  June 7 (Wed) 16:00 – 17:40
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Chairpersons  Mitsugu Ohkawa (National Institute of Information and Communications Technology, Japan)

Yoshiyuki Fujino (National Institute of Information and Communications Technology, Japan)
Combination Design of GNSS and GIS Implemented to Disaster Management System for Early Evacuation
Akihiko Nishino, Madoka Nakajima, Naohiko Kohtake
Keio University, Yokohama, Japan

Stochastic Constellation Replenishment Planner
Federico Letterio, Gonzalo Vicario, Javier Martin, Mauro Federici, Daniel Navarro-Reyes
Deimos Space S.L.U., Spain, Deimos Space U.K., United Kingdom, ESA

Environmental-data Collection System for Satellite-to-Ground Optical Communications
Kenji Suzuki, Dimitar Kolev, Alberto Carrasco-Casado, Morio Toyoshima
National Institute of Information and Communications Technology (NICT), Japan

Differential connected element interferometry (D-CEI) by using Beidou GEO satellites
Shaowu Chen, Haitao Li
the 2nd laboratory, Beijing Institute of Tracking and Telecommunications Technology, China

Updates on the Design and Implementation of the Philippines’ Diwata-2 Amateur Radio Payload
College of Engineering, University of the Philippines, Diliman, Quezon City, Philippines, Department of Aerospace Engineering, Tohoku University, Sendai, Japan, Advanced Science and Technology Institute, Department of Science and Technology, Quezon City, Philippines

Self-Powered Beacon Development for Satellite Communication Loss Prevention
Rahmi Rahmatillah, Mengu Cho
Laboratory of Spacecraft Environment Interaction Engineering, Kyushu Institute of Technology, Kitakyushu, Japan
A Study on Laser Communication System Between Nano-Satellite and Ground Including Pointing, Acquisition and Tracking Control

Atsushi Kaji1, Koji Kumura1, Toshiki Nakamura1, Motoharu Takesu1, Tomonori Ito2, Shin Sakon1,2
1Department of Future Industry, Happy Science University, Chiba Japan, 2Hokkaido Satellite Corp. Ltd.

2017-j-24 (10:00 – 10:20)

Design of a MEMS-Mirror-based Laser Pointing Control System of Optical Transponder for Micro-satellites

Shunsuke Kawasaki1, Toshinori Kuwahara1, Masafumi Hiraoka1, Toshiyuki Mogi1, Daichi Morita1, Shota Suzuki1, Kazushi Fukuda1, Shinya Fujita1, Yuji Sato1, Lena Okajima2
1Department of Aerospace Engineering, Tohoku University, Sendai, Japan, 2ALE Co., Ltd., Tokyo, Japan

2017-j-25 (10:20 – 10:40)

Tracking Control System Design and Evaluation of a Small Mobile Optical Ground Station for Satellite-to-Ground Optical Communication

Masafumi Hiraoka1, Toshinori Kuwahara1, Yuji Sato1, Shinya Fujita1, Shunsuke Kawasaki1, Daichi Morita1, Toshiyuki Mogi2, Shouta Suzuki2, Lena Okajima2
1Department of Aerospace Engineering, Tohoku University, Sendai, Japan, 2ALE Co., Ltd., Tokyo, Japan

[k-1] ISS and Near Earth Missions

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<td>Chairpersons</td>
<td>Igor V. Sorokin (S.P. Korolev Rocket and Space Corporation Energia, Russia)</td>
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<td>Hajime Yano (JAXA/ISAS, Japan)</td>
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2017-k-01 (16:00 – 16:20)

Technology of Payloads Maintenance aboard the ISS Russian Segment

Igor V. Sorokin
S.P. Korolev Rocket and Space Corporation Energia (RSC Energia), Korolev, Moscow Region, Russia

2017-k-02 (16:20 – 16:40)

The First Year In-Orbit Operation of the Tanpopo Mission onboard the ISS and Initial Results of Its Post-Retrieval Sample Analyses for Captured Microparticles

Hajime Yano1, Satoshi Sasaki2, Jun-Ya Imani3, Daiki Horikawa4, Kazuyoshi Arai5, Masumi Higashide6, Eichi Imai7, Yukihiro Ishibashi8, Yoko Kawaguchi9, Yoko Kebukawa10, Hajime Mita11, Kyoko Okudaira12, Takashi Ozawa13, Makoto Tabata13, Naomi Takizawa14, Masaru Tomita15, Yuchi Yaguchi16, Hirofumi Hashimoto17, Kensei Kobayashi16, Akihiko Yamagishi18, The Tanpopo Initial Sample Analysis And Curation (ISAC) Team19
1JAXA/Institute of Space and Astronautical Science, Japan, 2Tokyo University of Technology, Japan, 3Tokyo University of Agriculture and Technology, Japan, 4Keio University, Japan, 5Hosei University, Japan, 6Research and Development Directorate, JAXA, Japan, 7Nagoya University of Technology, Japan, 8Kyushu University, Japan, 9Tokyo University of Pharmacy and Life Sciences, Japan, 10Yokohama National University, Japan, 11Fukuoka Institute of Technology, Japan, 12University of Aizu, Japan, 13Chiba University, Japan

2017-k-03 (16:40 – 17:00)

Results from the Tanpopo Capture Panels: Using Silica Aerogel for Retrieving Cosmic Dust from Low-Earth Orbits

Makoto Tabata1, Hirofumi Hashimoto2, Daiki Horikawa3, Eichi Imai4, Junya Imani5, Yukihiro Ishibashi6, Yoko Kawaguchi7, Yoko Kebukawa8, Kensei Kobayashi8, Hajime Mita9, Kyoko Okudaira10, Satoshi Sasaki11, Shin-Ichi Yokobori17, Hajime Yano17, Akihiko Yamagishi17
2017-k-04 (17:00 - 17:20)

Preliminary Report of Tanpopo: Astrobiology Exposure and Micrometeoroid Capture Experiments at ISS

Akihiko Yamagishi1, Hirofumi Hashimoto2, Hajime Yano2, Shin-Ichi Yokobori1, Kensei Kobayashi1, Hajime Mita4, Hikaru Yabuta5, Masumi Higashide6, Makoto Tabata7, Hideyuki Kawai7, Eiichi Imai8

1Tokyo University of Pharmacy and Life Sciences, Tokyo, Japan, 2ISAS/JAXA, Sagamihara, Japan, 3Yokohama National University, Yokohama, Japan, 4Fukuoka Institute of Technology, Fukuoka, Japan, 5Osaka University, Osaka, Japan, 6JAXA, Tokyo, Japan, 7Chiba University, Chiba, Japan, 8Nagoya University of Technology, Nagoya, Japan

2017-k-05 (17:20 - 17:40)

Experimental Verification Strategy for Navigation Involving Contact Dynamics under Microgravity

Hiroki Kato, Daichi Hirano, Tatsuhiko Saito, Mari Nishiyama, Ippei Takahashi

Research and Development Directorate, Japan Aerospace Exploration Agency (JAXA), Tsukuba, Japan

[k-2] Small Bodies and Dust Explorations (1)

Session Date: June 7 (Wed) 9:00 – 10:40
Room: Meeting Room 8
Chairpersons: Massimo Casasco (European Space Agency, Netherlands)

Tatsuki Okada (Japan Aerospace Exploration Agency, Japan)

2017-k-06 (9:00 - 9:20)

In-Flight Performance of Thermal Infrared Imager on Hayabusa2 and Its Implications to the Observations of Asteroid 162173 Ryugu

Tatsuki Okada1,2, Tetsuya Fukushima2, Satoshi Tanaka1, Makoto Taguchi1, Takehiko Arai1, Hiroki Senshu1, Hirohide Demura6, Yoshiko Ogawa5, Toru Kouyama7, Ryosuke Nakamura7, Naoya Sakatani7, Jun Takita6, Tomohiko Sekiguchi7, Sunao Hasegawa1, Tsuneo Matsunaga8, Takeshi Imamura2, Takehiko Wada1, Jorn Helbert10, Thomas G. Mueller11, Axel Hagarmann12, Solar Power Sail Science Team1

1Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, 2The University of Tokyo, Hongo, Bunkyo, Tokyo, Japan, 3Graduate School of Science, Rikkyo University, Tokyo, Japan, 4National Institute for Environmental Studies, Tsukuba, Japan, 5Planetary Exploration Research Center, Chiba Institute of Technology, Narashino, Japan, 6University of Aizu, Aizu-Wakamatsu, Japan, 7National Institute of Advanced Industrial Science and Technology, Tokyo, Japan, Graduate School of Science and Technology, Meiji University, Kawasaki, Japan, 8Hokkaido University of Education, Asahikawa, Japan, 9German Aerospace Center, Berlin, Germany, 10Max-Planck Institute for Extraterrestrial Physics, Garching, Germany, 11The Open University, Milton Keynes, UK

2017-k-07 (9:20 - 9:40)

High-Speed Mobile Optical Orbit Determination System for HAYABUSA2 Capsule Recovery

Kazuhisa Fujita1, Hiroki Takayana1, Hiroki Inoue1, Satoshi Nomura1, Toshiyuki Suzuki1, Étienne Houzé2

1Japan Aerospace Exploration Agency, Tokyo, Japan, 2École Polytechnique, Paris, France

2017-k-08 (9:40 - 10:00)

Estimation of Interior Density Distribution for Small Bodies: The Case of Asteroid Itokawa

Masanori Kanamaru, Sho Sasaki
Robust Tracking of Visual Landmarks for Estimating Asteroid Shape and Motion

Kentaro Abe
Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan

AIM: a Mission of Firsts in Deep Space

Ian Carnelli¹, Michael Kueppers², Karim Mellab³, Vasco Pesquita³, Borja Gutierrez³, Massimo Casasco³, Jesus Gil Fernandez³, Paolo Martino²
¹European Space Agency Headquarters, Paris, France, ²European Space Astronomy Centre, Madrid, Spain, ³European Space Technology Centre, Noordwijk, The Netherlands

Numerical Estimation of Gamma-ray Spectroscopy for Deep Space Microsatellite

Masayuki Naito¹, Junya Ishii¹, Daisuke Aoki¹, Hiroshi Nagaoka², Eido Shibamura², Nobuyuki Hasebe¹,²
¹School of Advanced Science and Engineering, Waseda University, Tokyo, Japan, ²Research Institute for Science and Engineering, Waseda University, Tokyo, Japan

Neutron Spectroscopy for Exploration of Near-Earth Asteroids

Junya Ishii¹, Masayuki Naito¹, Daisuke Aoki¹, Hiroshi Nagaoka², Nobuyuki Hasebe¹,²
¹School of Advanced Science and Engineering, Waseda University, Tokyo, Japan, ²Research Institute for Science and Engineering, Waseda University, Tokyo, Japan

The Cooling System of HPGe Gamma-ray Spectrometer on a Deep Space Microsatellite

Takuto Adachi, Mana Shikishima, Hiroshi Nagaoka, Masayuki Naito, Eido Shibamura, Nobuyuki Hasebe
School of Advanced Science and Engineering, Waseda University, Tokyo, Japan

DESTINY*: A Mission Proposal for Technology Demonstration and Exploration of Asteroid 3200 Phaethon

Kazutaka Nishiyama¹, Yasuhiro Kawakatsu¹, Hiroyuki Toyota¹, Ryu Funase², Tomoko Arai³, DESTINY Working Group
¹Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, ²Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan, ³Planetary Exploration Research Center, Chiba Inst. of Technology, Japan

Dust Sensor with Large Sensitive Area Using Multi-Layer Insulation and Piezoelectric Elements
2017-k-16 ( 12:20 - 12:35 )

Size and Orbital Distribution of Interplanetary Dusts by MU Radar Meteor Head Echo Observation

Shinsuke Abe\(^1\), Johan Kero\(^2\), Takiji Nakamura\(^3\), Yasunori Fujiwara\(^4\), Junichi Watanabe\(^5\), Hiroyuki Hashiguchi\(^5\)

\(^1\)Department of Aerospace Engineering, Nihon University, Funabashi, Japan, \(^2\)Swedish Institute of Space Physics, Kiruna, Sweden, \(^3\)National Institute of Polar Research, Tachikawa, Japan, \(^4\)National Astronomical Observatory of Japan, Mitaka, Japan, \(^5\)Research Institute for Sustainable Humanosphere, Kyoto University, Uji, Japan

[k-4] Exploration for Trojan Asteroids by Solar Power Sail

<table>
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<tr>
<th>Session Date</th>
<th>June 7 (Wed) 16:00 – 17:40</th>
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<td>Room</td>
<td>Meeting Room 8</td>
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<tr>
<td>Chairpersons</td>
<td>Osamu Mori (Japan Aerospace Exploration Agency, Japan)</td>
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<td>Takahiro Iwata (Japan Aerospace Exploration Agency, Japan)</td>
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2017-k-18 ( 16:00 – 16:20 )

Navigation to Jovian Trojan Asteroid using Solar Power Sail-craft and Underground Sampling using Lander

Osamu Morimoto\(^1\), Jun Matsumoto\(^2\), Toshihiro Chugo\(^3\), Hideki Kato\(^4\), Takanosu Saikai\(^5\), Yuichi Tsuda\(^6\), Naoko Ogawa\(^7\), Yuya Mimasu\(^8\), Junichiro Kawaguchi\(^9\), Koji Tanaka\(^10\), Hiroyuki Toyoda\(^11\), Nobukatsu Okuzumi\(^12\), Fuyuto Terui\(^13\), Shigeo Kawasaki\(^14\), Kazutaka Nishiyama\(^15\), Satoshi Hosoda\(^16\), Kazuhiro Yamada\(^17\), Tatsuki Okada\(^18\), Takahiro Iwata\(^19\), Ralf Boden\(^20\), Yusuhe Oki\(^21\), Yuki Takao\(^22\)

\(^1\)Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, \(^2\)Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan

2017-k-17 ( 16:20 – 16:40 )

Sampling Operation for the Jupiter Trojan Asteroid Exploration

Jun Matsumoto\(^1\), Chisato Okamoto\(^2\), Yusuhe Oki\(^3\), Takuma Nakamura\(^4\), Jun Aoki\(^5\)

\(^1\)Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, \(^2\)Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan, \(^3\)Graduate School of Science and Engineering, Aoyama Gakuin University, Kanagawa, Japan, \(^4\)Department of Physics, Osaka University, Osaka, Japan

2017-k-19 ( 16:40 – 17:00 )

Two Motors Drive Rotary Sample Conveyance Mechanism

Shuya Kashioka\(^1\), Masatsugu Otsuki\(^2\), Jun Matsumoto\(^3\), Jun Aoki\(^4\), Osamu Morimoto\(^5\)

\(^1\)The Graduate University for Advanced Studies, Japan, \(^2\)The Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, \(^3\)Osaka University

2017-k-20 ( 17:00 – 17:20 )

Science and Instrumentation for Exploring a Jupiter Trojan Asteroid in the Solar Power Sail Mission

Tatsuki Okada\(^1\), Yoko Kebukawa\(^2\), Jun Aoki\(^3\), Motoo Itô\(^4\), Masatsugu Ohtsuki\(^5\), Chisato Okamoto\(^6\), Yuusuke Oki\(^7\), Jun Matsumoto\(^8\), Hajime Yano\(^9\), Ryosuke Nakamura\(^10\), Takahiro Iwata\(^11\), Osamu Morimoto\(^12\), Jean-Pierre Bilbrin\(^13\), Stephan Ulamec\(^14\), Solar Power Sail Science Team

\(^1\)Institute of Space and Astronomical Science, JAXA, Sagamihara, Japan, \(^2\)The University of Tokyo, Hongo, Bunkyo, Tokyo, Japan, \(^3\)Faculty of Engineering, Yokohama National University, Japan, \(^4\)Graduate School of Science, Osaka University, Toyonaka, Japan, \(^5\)Kochi Core Center, Japan Agency for Marine-Earth Science and Technology, Japan, \(^6\)Faculty of Engineering, Hosei University, Tokyo, Japan, \(^7\)National Institute of Advanced Industrial Science and Technology, Tokyo, Japan, \(^8\)Institut d'Astrophysique Spatiale, Orsay, France, \(^9\)German Aerospace Center, Cologne, Germany

2017-k-21 ( 17:20 – 17:40 )

Scientific Subjects and Candidate Instruments in the Cruising Phase of the Solar Power Sail
### [k-5] Mercurial and Lunar Explorations

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<tr>
<td>Chairpersons</td>
<td>Roger Wilson (Airbus DS GmbH, Germany) &lt;br&gt; Tatsuaki Hashimoto (Japan Aerospace Exploration Agency, Japan)</td>
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</table>

**2017-k-22 ( 9:00 – 9:20 )**

**The BepiColombo Spacecraft and its Mission to Mercury**

Roger J. Wilson, Markus Schelkle  
Airbus Defence and Space, Friedrichshafen, Germany

**2017-k-23 ( 9:20 – 9:40 )**

**Japanese Lunar Polar Exploration Lander**

Tatsuaki Hashimoto1,2, Takeshi Hoshino3, Hisashi Otake1,2, Satoshi Tanaka1, Sachiko Wakabayashi1, Hitoshi Morimoto2, Koichi Masuda2, Makiko Ohtake1, Masataku Sutoh3, Takanobu Shimada2  
1Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, 2Space Exploration Innovation Hub Center, JAXA, Sagamihara, Japan, 3Faculty of Textile Science and Technology, Shinshu University, Ueda, Japan

**2017-k-24 ( 9:40 – 10:00 )**

**Skid Traveling System to Travel on Planetary Surface**

Hikaru Eguchi1,2, Yusuke Maru1,2, Masatsugu Otsuki3, Shunpei Morikawa3, Shujiro Sawai1,2  
1Department of Space and Astronautical Science, The Graduate University for Advanced Studies, Kanagawa, Japan, 2Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, 3Department of Engineering, Shizuoka University, Shizuoka, Japan

### [k-6] Lunar Science and Utilization

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<tr>
<td>Chairpersons</td>
<td>Kyeong Ja Kim (Korea Institute of Geoscience and Mineral Resources, Korea) &lt;br&gt; Hiroshi Nagaoka (Waseda University, Japan)</td>
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</table>

**2017-k-27 ( 11:00 – 11:20 )**

**Development of X-ray Generators for Active X-ray Fluorescence Spectroscopy of Future Lunar Landing Mission**
and Its Contribution to Lunar Science

Hiroshi Nagaoka1, Nobuyuki Hasebe1,2, Masayuki Naito2, Eido Shibamura1, Haruyoshi Kuno1, Miho Mizone2, Yoshiki Nabekura2, Kyeong Ja Kim3

1Research Institute for Science and Engineering, Waseda University, Japan, 2Schools of Advanced Science and Engineering, Waseda University, Japan, 3KIGAM, South Korea

Current Development Status of a Gamma-Ray Spectrometer for the Korea Pathfinder Lunar Orbiter

Kyeong Ja Kim1,2, Yire Choi1,2, Junghun Park1, Eung Seok Yi1,2, Sungsoo Lee1, Yeongwang Yeon1, Chang Wan Sun1,2, K.B. Lee4, Yongkwon Kim3, Kyungwook Min3, Kyungin Kang3, Jin Yeon Cho3, Jeong Hun Cha4, Nobuyuki Hasebe5, Richard Elphic3, Peter Englert5, Olivier Gasnault6, Eido Shibamura8, Hiroshi Nagaoka8, Lucy Lim7

1Korea Institute of Geoscience and Mineral Resources, Daejeon, Republic of Korea, 2University of Science and Technology, Daejeon, Republic of Korea, 3Chungnam National University, Daejeon, Republic of Korea, 4Korea Research Institute of Standards and Science, Daejeon, Republic of Korea, 5Nucare, Incheon, Republic of Korea, 6Korea Advanced Institute of Science and Technology, Daejeon, Republic of Korea, 7Inha University, Incheon, Republic of Korea, 8Waseda University, Tokyo, Japan, 9NASA Ames Research Center, Moffett Field, CA, USA, 10Quest University, Squamish, BC, Canada, 11IRAP, Toulouse, France, 12NASA Goddard Space Flight Center, Greenbelt, MD, USA

Concept Study of Human Lunar Exploration Precursor Programme (HLEPP) in Japan Aerospace Exploration Agency

Hirotaka Sawada1, Naoki Sato1, Markus Landgraf2, Martin Picard2, Yuya Mimasu1, Takeshi Hoshino1, Tatsuaki Hashimoto4

1ISAS, Japan Aerospace Exploration Agency, Japan, 2European Space Agency, 3Canadian Space Agency, 4Japan Aerospace Exploration Agency

Study on Sand and Volcanic Ash Solidification Technology for In-situ Resource Utilization

Takeshi Hoshino1, Masaki Ikehara2, Hiroshi Kanamori1, Satoshi Hoshoda1, Sachiko Wakabayashi2

1Japan Aerospace Exploration Agency, Japan, 2MORUTARU MAGIC Co., Ltd., Japan

Experimental Study on Vibration Compaction Method for Lunar Base Construction

Sachiko Wakabayashi1, Takeshi Hoshino1, Jun Makabe2

1Japan Aerospace Exploration Agency, Japan, 2Sakai Heavy Industries, LTD., Japan
2017-k-34 ( 14:40 – 15:00 )

**Hazard Avoidance Control Using Stochastic Optimization for Mars Safe Landing**

Ryohei Takahashi, Akifumi Wachi, Ryu Funase, Shinichi Nakasuka

The University of Tokyo, Japan

2017-k-35 ( 15:00 – 15:20 )

**Development and Demonstration of a Flying Test Bed for Planetary Landing**

Kazuhsa Fujita, Hiroki Takayanagi, Takashi Ozawa, Toshiyuki Suzuki, Satoshi Nomura, Naomi Takizawa, Seiya Ueno, Takehiro Higuchi, Toshihki Tamura, Ryuki Otani, Hiroaki Kobayashi, Nobutaka Bando

1Japan Aerospace Exploration Agency, Tokyo, Japan, 2Yokohama National University, Yokohama, Japan

2017-k-36 ( 15:20 – 15:40 )

**Planetary Exploration Spacecraft Landing Gear with Three-Dimensional Linear-Rotary-Energy-Conversion Mechanism**

Susumu Hara, Satoshi Saito, Keisuke Sugita, Takao Maeda

1Department of Aerospace Engineering, Nagoya University, Nagoya, Japan, 2Department of Electrical, Electronic, and Communication Engineering, Chuo University, Tokyo, Japan

2017-k-37 ( 16:00 – 16:20 )

**Capability of a Time-of-Flight Camera as a Hazard Detection and Avoidance Sensor for a Moon Exploration Microrover**

Kentaro Uno, Louis-Jerome Burtz, Marc Hulcelle, Kazuya Yoshida

1Department of Aerospace Engineering, Tohoku University, Sendai, Japan, 2KK ispace Inc., Tokyo, Japan, 3Ecole des Mines de Saint-Etienne, France

2017-k-38 ( 16:20 – 16:40 )

**Dynamic Locomotion of a Multi-Legged Planetary Exploration Rover with Isotropic Leg Arrangement**

Tomohito Sekiguchi, Saki Omi, Mai Bando, Shinji Hokamoto

1Kyushu University, Japan, 2Cranfield University, UK

2017-k-39 ( 16:40 – 17:00 )

**A Concept of Simple and Light Weight Mars Rover integrated with EDL System**

Ichimura Masaaki

Department of International Development Engineering, Tokyo Institute of Technology, Japan

2017-k-40 ( 17:00 – 17:20 )

[k-8] Technologies for Lunar and Planetary Explorations (2) – Rover and Sampling

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2017-k-37 ( 16:00 – 16:20 )

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[k-8] Technologies for Lunar and Planetary Explorations (2) – Rover and Sampling

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</tr>
</tbody>
</table>
Electrostatic Sampling and Transport of Water Ice in Space Environment
Hiroyuki Kawamoto
Dept. Applied Mechanics and Aerospace Engineering, Waseda University, Tokyo, Japan

2017-k-41 ( 17:20 – 17:40 )

Concept of Sample Return Mission for Mars Surface Exploration
Nadeem Alam
Department of Aeronautical Engineering, Babu Banarasi Das National Institute of Technology and Management, India

2017-k-42 ( 9:00 – 9:20 )

Flight System of Mars Airplane Balloon Experiment-1 (MABE-1)
Akira Oyama1, Hiroki Nagai2, Hiroshi Tokutake3, Koji Fujita1, Masayuki Anyoji4, Hiroyuki Toyota5, Yu Miyazaki1, Koichi Yonemoto5, Masato Okamoto6, Taku Nonomura7, Masakazu Motoda8, Shinsuke Takeuchi9, Yukio Kamata1, Masatsugu Otsuki1, Keisuke Asai9, Kozo Fuji10

1 Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, Sagamihara, Japan, 2 Institute of Fluid Science, Tohoku University, Sendai, Japan, 3 Kanazawa University, Kanazawa, Japan, 4 Kyushu University, Japan, 5 Kyushu Institute of Technology, Japan, 6 Kanazawa Institute of Technology, Japan, 7 Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, Japan, 8 Aeronautical Technology Directorate, Japan Aerospace Exploration Agency, Japan, 9 Tohoku University, Japan, 10 Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, Japan, currently Tokyo University of Science, Japan

2017-k-43 ( 9:20 – 9:40 )

Evaluation of Aerodynamic Characteristics on Mars Airplane Balloon Experiment-1 (MABE-1)
Masayuki Anyoji1, Masato Okamoto2, Koji Fujita3, Hiroki Nagai4, Akira Oyama5

1 Interdisciplinary Graduate School of Engineering Sciences, Kyushu University, Kasuga, Japan, 2 Department of Aeronautics, Kanazawa Institute of Technology, Tokyo, Japan, 3 Institute of Space Astronautical Science, JAXA, Sagamihara, Japan, 4 Institute of Fluid Science, Tohoku University, Sendai, Japan

2017-k-44 ( 9:40 – 10:00 )

Flight Control Parameter Design for Mars Airplane Balloon Experiment-1 (MABE-1) using Evolutionary Computation
Koji Fujita1, Hiroshi Tokutake2, Hiroki Nagai3, Akira Oyama1

1 Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, 2 Kanazawa University, Kanazawa, Japan, 3 Institute of Fluid Science, Tohoku University, Sendai, Japan

2017-k-45 ( 10:00 – 10:20 )

Attitude Estimation using Thermopile Sensors on Mars Airplane Balloon Experiment-1 (MABE-1)
Hiroshi Tokutake1, Koji Fujita2, Akira Oyama3

1 Kanazawa University, Japan, 2 Institute of Space and Astronautical Science, JAXA, Japan, 3 Institute of Fluid Science, Tohoku University, Japan

2017-k-46 ( 10:20 – 10:40 )

Comparison of Thermal Analysis and Flight Test Results on Mars Airplane Balloon Experiment-1 (MABE-1)
[k-10] New Views of Our Solar System and Knowledges to Support them

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<td>Huai-Chien Chang (Consortium of Extreme and Space Settlements, Astronautical Society of Taiwan, Taiwan)</td>
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<td>Kojiro Suzuki (The University of Tokyo, Japan)</td>
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2017-k-47 (11:00 – 11:20)

**Numerical Simulation of High-Speed Impact on Regolith Using Compressible and Non-Expanding Fluid Model**

Kojiro Suzuki

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

2017-k-48 (11:20 – 11:40)

**Space Weathering Simulation with Sulfur**

Sho Sasaki1, Hirokazu Tanaka1, Yasunori Kanamaru1, Mizuki Okazaki1,2, Takahiro Hiroi2, Akira Miyake3, Tohru Matsumoto1, Akira Tsuchiyama3

1Department of Earth and Space Science, Osaka University, Toyonaka, Japan, 2Department of Earth, Environmental and Planetary Sciences, Brown University, Providence, USA, 3Department of Earth and Planetary Sciences, Kyoto University, Kyoto, Japan, 4Now at Benesse Corp., Japan

2017-k-49 (11:40 – 12:00)

**LDM (Life Detection Microscope): In Situ Imaging of Living Cells on Surface of Mars**

Akihiko Yamagishi1, Takehiko Satoh2, Atsuo Miyakawa3, Yoshitaka Yoshimura3, Satoshi Sasaki4, Kensei Kobayashi5, Yoko Kebukawa6, Hikaru Yabuta6, Hajime Mitani, Eichi Imai7, Takeshi Naganuma8, Kazuhiisa Fujita9, Tomohiro Usui10

1Tokyo University of Pharmacy and Life Science, Tokyo, Japan, 2JAXA, Sagamihara, Japan, 3Tamagawa University, Tokyo, Japan, 4Tokyo University of Technology, Tokyo, Japan, 5Yokohama National University, Yokohama, Japan, 6Hiroshima University, Hiroshima, Japan, 7Fukuoika Institute of Technology, Fukuoka, Japan, 8Nagasaki University of Technology, Nagaoka, Japan, 9Hiroshima University, Hiroshima, Japan, 10Tokyo Institute of Technology, Tokyo, Japan

2017-k-50 (12:00 – 12:20)

**Flowing Water on Mars – Extracting The Sign of Life on Mars**

Nadeem Alam

Department of Aeronautical Engineering, Babu Banarasi Das National Institute of Technology and Management, India

2017-k-51 (12:20 – 12:40)

**Designing a Titan Gas and Energy Relay Station (TiGERS): A Concept for Sustaining Deep Space Interplanetary Mission and Beyond**

Huai-Chien Chang1, Chun-Chieh Wang2

1Co-founder of 'Astronautical Society of Taiwan', Space Architecture Activist, MEng., Taiwan, 2Research Assistant, Geomatics Laboratory of National Taipei University of Technology, Taiwan

[k-11] Explorations for Mars and its Moons
### 2017-k-52 (14:00 - 14:20)

**Martian Moons eXploration (MMX) Conceptual Study Results**

Yasuhiro Kawakatsu, Kiyoshi Kuramoto, Masaki Fujimoto

1. Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan
2. Department of Earth and Planetary Sciences, School of Science, Hokkaido University, Sapporo, Japan

### 2017-k-53 (14:20 - 14:35)

**Development of Near-infrared Spectrometer MacrOmega for the Martian Moon's Sample Return Mission MMX**

Takeshi Sakano, Takahiro Iwata, Hiromu Nakagawa, Jean-Pierre Blaizot, Vincent Hamm, Cedric Pilorget, Tomoki Nakamura, Shohei Aoki, Takao M. Sato, Yasumasa Kasaba

1. Department of Geophysics, Tohoku University, Japan
2. Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan
3. Institut d'Astrophysique Spatiale, Université Paris-Sud, France
4. Department of Earth Science, Tohoku University, Japan
5. Institut d'Aéronomie Spatiale de Belgique (IASB), Bruxelles, Belgium

### 2017-k-54 (14:35 - 14:50)

**Nuclear Spectroscopy for Unveiling the Origin of the Martian Moons**

Nobuyuki Hasebe, Hiroshi Nagaoka, Masayuki Naito, Eido Shibamura, Haruyoshi Kuno, Sota Shimizu, Kyeong Ja Kim, Valery V. Dmitrenko, Tomoki Nakamura, Hisashi Otake

1. Department of Physics, School of Advanced Science and Engineering, Waseda University, Japan
2. Graduate School of Science and Technology, Keio University, Japan
3. Planetary Geology Department, Geological Research Division, Korean Institute of Geoscience and Mineral Resources, Republic of Korea
4. National Research Nuclear University, Moscow Engineering Physics Institute (IMEPhI), Russia
5. Division of Earth and Planetary Materials Science, Tohoku University, Japan
6. Japan Aerospace Exploration Agency (JAXA), Japan

### 2017-k-55 (14:50 - 15:05)

**An Ion Mass Spectrometer for Observation of Secondary Ions from Small Bodies**

Shoichiro Yokota, Ayako Matsuoka, Reiko Nomura, Yoshifumi Saito

1. Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan
2. Tsukuba Space Center, JAXA, Tsukuba, Japan

### 2017-k-56 (15:05 - 15:20)

**NASA Mars 2020 Landed Mission Development**

Michael Wilson, Jennifer Trosper, Fernando Abilleira

Jet Propulsion Laboratory, California Institute of Technology, USA

### 2017-k-57 (15:20 - 15:35)

**Concept of Increasing The Amount of Oxygen on Mars with Help of Ultraviolet Light**

Nadeem Alam

Department of Aeronautical Engineering, Babu Banarasi Das National Institute of Technology and Management, India

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[k-12] Explorations for Sun, Planets, and Exo-planets

Session Date: June 9 (Fri) 16:00 – 17:40
2017-k-58 (16:00 – 16:20)

**Experiment SIGNAL Onboard the Interhelioprobe Spacecraft**

Valery V. Dmitrenko¹, Sergey E. Ulin², Nobuyuki Hasebe²,³

¹National Research Nuclear University, Moscow Engineering Physics Institute (MEPhI), Moscow, Russia, ²Department of Physics, School of Advanced Science and Engineering, Waseda University, Tokyo, Japan, ³Research Institute for Science and Engineering, Waseda University, Tokyo, Japan

2017-k-59 (16:20 – 16:40)

**Project GIVE (Grown in Venus Enclosure): An Alternative Solution for Sustaining Spacefaring Civilization**

Huai-Chien Chang¹, Chun-Chieh Wang²

¹Co-founder of ‘Astronautical Society of Taiwan’, Space Architecture Activist, MEng., Taiwan, ²Research Assistant, Geomatics Laboratory of National Taiwan University of Technology, Taiwan

2017-k-60 (16:40 – 17:00)

**The Ganymede Laser Altimeter (GALA) for ESA’s Jupiter Icy Moons Explorer**

Hauke Hussmann¹, Keigo Enya², Reinald Kallenbach¹, Jun Kimura³, Masanori Kobayashi³, Luisa Lara³, Kay Lingenauber³, Noriyuki Namiki², Sho Sasaki², Nicolas Thomas², Christian Althaus³, Thomas Behnke³, Belinda Borgs³, Judit Jänchen³, Horst-Georg Lötzke³, Karsten Seiferlin³, Alexander Stark³, Gregor Steinbrügge³, Simone del Togno³, Toshihiko Yamawaki²

¹DLR Institute of Planetary Research, Berlin, Germany, ²ISAS/JAXA, Japan, ³Osaka University, Japan, ⁴Chiba Institute of Technology, Chiba, Japan, ⁵IAA-CSIC Granada, Spain, ⁶National Astronomical Observatory of Japan (NAOJ), ⁷Physikalisches Institut, University of Bern, Switzerland

2017-k-61 (17:00 – 17:20)

**Overview of SPRITE: Saturn PRobe Interior and aTmosphere Explorer Concept**

Marcus Lobbia¹, Amy Simon², Rolf Danner², David Atkinson², Cavan Cuddy³

¹NASA Jet Propulsion Laboratory, California Institute of Technology, USA, ²NASA Goddard Space Flight Center, USA, ³Lockheed Martin Space Systems, USA

2017-k-62 (17:20 – 17:40)

**Twinkle – A New Idea for a Commercial Astrophysics Mission**

Alex da Silva Curiel¹, Susan Jason², Marcell Tessenyi², Giovanna Tinetti², Giorgio Savini², Jonathan Tennyson², Enzo Pascale³, Sean Lindsay³, Neil Bowles⁴

¹Surrey Satellite Technology Ltd., United Kingdom, ²Blue Skies Space Ltd. & University College London, United Kingdom, ³Sapienza Università di Roma, Italy, ⁴Department of Physics, University of Oxford, United Kingdom

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**[m-1] Astrophysics using Balloon and Sounding Rocket**

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<td>Chairpersons</td>
<td>Yidong Gu (Chinse Academy of Sciences, China)</td>
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<td>Shigeto Watanabe (Hokkaido Information University, Japan)</td>
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</tbody>
</table>
GRAINE Project: Analysis Status of Balloon Experiment in 2015

Fukashi Mizutani1, Shigeki Aoki1, Kaname Hamada2, Toshio Harasawa3, Atsushi Iyonosato4, Hiroaki Kawahara5, Koichi Kodama6, Ryosuke Komatsu7, Masahiro Komatsu8, Kenji Kuretsubo1, Toshitugu Marushima1, Haruka Matsumoto1, Motoaki Miyas1, Kunihiro Morishima1, Misaki Morishita1, Naotaka Naganawa1, Mitsuhiro Nakamura1, Toshiyuki Nakano1, Akira Nishio1, Kimio Niwa1, Naoto Otsuka1, Keita Ozaki1, Hiroki Rokudo1, Osamu Sato1, Emi Shibayama1, Atsumu Suzuki1, Satoru Takahashi1, Yurie Tateishi1, Misato Yabu1, Kyohel Yamada1, Saya Yamamoto5, Masahiro Yoshimoto1

1Department of Human Development, Kobe University, Kobe, Japan, 2Department of Science, Kobe University, Kobe, Japan, 3Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, 4Department of Science, Nagaoya University, Nagaoya, Japan, 5Department of Science, Okayama University of Education, Okayama, Japan

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MeV Gamma-Ray Observation Based on the Ray-Tracing Cameras Loaded on Balloons

Atsushi Takada4, Toru Tanimori1, Tetsuya Mizumoto1, Yoshitaka Mizumura1, Shotaro Komura1, Tetsuro Kishimoto1, Taito Takemura1, Yuma Nakamasu2, Kei Yoshikawa2, Tomoyuki Taniguchi1, Yuta Nakamura1, Shunsuke Kurosawa2

1Graduate School of Science, Kyoto University, Kyoto, Japan, 2New Industry Creation Hatchery Center, Tohoku University, Sendai, Japan

---

PoGO+ Stratospheric Balloon Mission from Esrange, Sweden, to Victoria Island, Canada

Mattias Abrahamsson1, Christian Lockowandt2

1Science Services Division, SSC, Esrange Space Center, Sweden, 2Science Services Division, SSC, Solna, Sweden

---

Cryogenic 32 × 32 CTIA Multiplexer for Far-Infrared Astronomy

Shunsuke Baba1, Koichi Nagase2, Takehiko Wada2, Hirokazu Ikeda2, Yasuo Arai3, Morifumi Ohno4, Takahiro Ishimaru2

1Department of Physics, The University of Tokyo, Tokyo, Japan, 2Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency (JAXA), Sagamihara, Japan, 3High Energy Accelerator Research Organization (KEK), Tsukuba, Japan, 4National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Japan

---

Microgravity Experiments to Understand Cosmic Dust Formation in the Gas Outflow from Oxygen-Rich Stars

Yuki Kimura5, Shinnosuke Ishizuka1, Itsuki Sakon1, Tomoya Yamazaki1, Kyoko K. Tanaka1, Shinsuke Takeuchi3, Yuko Inatomi3,4

1Institute of Low Temperature Science, Hokkaido University, Sapporo, Japan, 2Department of Astronomy, School of Science, University of Tokyo, Tokyo, Japan, 3Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, Sagamihara, Kanagawa, Japan, 4School of Physical Sciences, SOKENDAI (The Graduate University for Advanced Studies), Sagamihara, Kanagawa, Japan

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[m-2] Engineering of Scientific Balloon and Sounding Rocket System

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<td>Daisuke Akita (Tokyo Institute of Technology, Japan)</td>
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Characteristics Evaluation and Performance Improvement Method of Balloon-Borne Telescope Pointing Control System

Toshihiko Nakano1, Makoto Taguchi2, Yasuhiro Shoji3, Mao Takamura2, Daiki Sunaguchi2, Masataka Imai4, Makoto Watanabe5, Yukihiro Takahashi1, Yuji Sakamoto5, Kazuya Yoshida6

1Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, 2Department of Science, Nagaoya University, Nagaoya, Japan, 3School of Science, Okayama University of Education, Okayama, Japan, 4Department of Science, Kobe University, Kobe, Japan, 5Department of Science, Tohoku University, Sendai, Japan, 6Science Services Division, SSC, Esrange Space Center, Sweden.
2017-m-07 (11:20 – 11:40)

A Low Cost Azimuthal Control Method for Stratospheric Balloon Gondolas

Yasuhiro Shoji
Graduate School of Engineering, Osaka University, Suita, Japan

2017-m-09 (12:00 – 12:20)

Post Flight Analysis of Sounding Rocket S-310

Takayuki Yamamoto, Satoshi Nonaka, Shunsuke Sato, Nobuaki Ishii
Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

[m-3] Atmospheric Science using Sounding Rocket

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2017-m-11 (14:00 – 14:20)

Recent Activity of Japanese Sounding Rocket Experiments for the Thermospheric and Ionospheric Study

Takumi Abe1, Shigeto Watanabe2, Mamoru Yamamoto3, Masa-Yuki Yamamoto2
1Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, 2Hokkaido Information University, Ebetsu, Japan, 3Research Institute for Sustainable Humanosphere, Kyoto University, Uji, Japan, 4Kochi University of Technology, Kochi, Japan

2017-m-12 (14:20 – 14:40)

DC Electric Field Measurements near the Sq Current System by S-310-44 Sounding Rocket

Keigo Ishisaka4, Takumi Abe5, Atsushi Kumamoto6, Makoto Tanaka1, Akimasa Yoshikawa5, Hiroki Matsushita5
4Toyama Prefectural University, Toyama, Japan, 5Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, 6Tohoku University, Sendai, Japan

2017-m-13 (14:40 – 15:00)

Neutral Wind Measurements by Sounding Rockets

S. Watanabe1, T. Abe2, H. Habu3, Y. Kakinami3, M-Y. Yamamoto4
1Hokkaido Information University / Hokkaido University, Japan, 2JAXA/ISAS, Japan, 3National Institute of Technology, Tomakomai College, Japan, 4Kochi University of Engineering, Japan

[m-4] Next Generation Balloon and Payload System

| Session Date | June 9 (Fri) 16:00 – 17:40 |
2017-m-14 (16:00 – 16:20)

**A Trial of Developing Unique Payload System for Small Student Balloons**

Masa-Yuki Yamamoto, Takamasa Hiratsuka, Hiroaki Fujitsu
School of Systems Engineering, Kochi University of Technology, Kami, Kochi, Japan

2017-m-15 (16:20 – 16:40)

**Small Satellite Launch System by Aerial Launch Platform**

Ting Ting Qiu¹, Hiroki Yanagida¹, Yuto Ikeda², Shin Satori², Ryuichi Mitsuhashi², Kazuhisa Chiba³, Tomonori Ito³
¹ Happy Science University, ²Hokkaido University of Science, ³The University of Electro-Communications, ⁴Hokkaido Satellite Co., Ltd.

2017-m-16 (16:40 – 17:00)

**Study of Designing for Combined Shape Balloon in Stratosphere**

Yanchu Yang, Sheng Wang, Luhua Jiang, Jinggang Miao, Donghui Zhang
Academy of Opto-Electronics, Chinese Academy of Science, Beijing, China

2017-m-17 (17:00 – 17:20)

**Design and Ground Test of a 6 Meters Pumpkin Super-pressure Balloon**

Zhu Rongchen¹,², Wang Sheng¹, Yang Yanchu², Liu Qiang³
¹Academy of Opti-electronics, Chinese Academy of Sciences, Beijing, China; ²University of Chinese Academy of Sciences, Beijing, China

2017-m-18 (17:20 – 17:40)

**Development of a New Super-Pressure Balloon with a Net for High-Altitude and Long-duration Flights**

Daisuke Akita¹, Yoshitaka Saito², Ken Goto², Kyoichi Nakashino³, Takuma Matsuo⁴, Kiyohi Matsushima⁵, Hiroyuki Hashimoto⁵, Shigeuyuki Shimadu⁶
¹Department of Transdisciplinary Science and Engineering, Tokyo Institute of Technology, Tokyo, Japan, ²Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan, ³Department of Aeronautics and Astronautics, Tokai University, Kanagawa, Japan, ⁴Department of Mechanical Engineering, Meiji University, Kanagawa, Japan, ⁵Fujikura Parachute Company Ltd, Fukushima, Japan, ⁶Nakada Industrial Company, Shizuoka, Japan

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**[n-1] Earth Observation: Advances in Operations and Data Application**

**Session Date**
June 7 (Wed) 16:00 – 17:40

**Room**
Meeting Room 15

**Chairpersons**
Akihiko Kuze (Japan Aerospace Exploration Agency, Japan)
Tamotsu Igarashi (Remote Sensing Technology Center of Japan, Japan)

2017-n-01 (16:00 – 16:20)

**Ant-colony-based Track Coordination for the Planning of Earth Observation Missions**

Yi-Yao Yeh¹, Sheng-Yi Li², Feng-Tai Hwang⁵
¹Earth Observation and Application Center of National Space Organization, Japan; ²Space Fusion Corporation; ⁵University of Chinese Academy of Sciences, Beijing, China
2017-n-02 (16:20 – 16:40)
Heuristic Algorithm for Simultaneous Nadir Overpasses Estimation during Metop-A End of Life Phase
Carlos Vera¹, Pier-Luigi Righetti²
¹Telespazio VEGA Deutschland at EUMETSAT, Darmstadt, Germany, ²EUMETSAT, Darmstadt, Germany

2017-n-03 (16:40 – 17:00)
A Graph-Theoretic Approach to Optimal Planning of Satellite Downlink Operation
Kazunori Someya¹, Takuto Ishimatsu², Yosuke Nakamura³, Yuya Kakehashi³, Naoki Ishihama¹
¹Research and Development Directorate, Research Unit III, JAXA, Tsukuba, Japan, ²The University of Tokyo, Tokyo, Japan, ³ERG project Team, JAXA, Sagamihara, Japan

2017-n-04 (17:00 – 17:20)
The Importance of Earth Observations and Data Collaboration within Environmental Intelligence Supporting Arctic Research
Joseph Casas
NASA Marshall Space Flight Center, Huntsville, Alabama, USA

2017-n-05 (17:20 – 17:40)
A Comprehensive Study of Dengue Fever Outbreaks in Taiwan Using Remote Sensing, Unmanned Aerial Vehicles, Big Data, and Open Data
Sumiko Anno¹, Ming-An Lee², Kuan-Tsung Chang³, Yi Chang³, Takeo Tadono³, Kei Oyoshi³, Hiroki Kai³, Yusuke Kobayashi³, Tamotsu Igarashi⁴
¹Shibaura Institute of Technology, Tokyo, Japan, ²National Taiwan Ocean University, Keelung, Taiwan, ³Minghsin University of Science and Technology, Hsinchu, Taiwan, ⁴National Cheng- Kung University, Tainan, Taiwan, ³Japan Aerospace Exploration Agency (JAXA), Ibaraki, Japan, ⁴Remote Sensing Technology Center of Japan (RESTEC), Tokyo, Japan

[n-2] Earth Observation: Advances in Optical Imagers and Radiometers (1)

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<td>Kei Shiomi (Japan Aerospace Exploration Agency, Japan)</td>
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2017-n-06 (9:20 – 9:40)
Similarity of the Characteristic Terrain by Various Geospatial Information- Risk of Disaster in Tokyo –
Toshiro Sugimura¹, Kuniski Isobe², Tetsuji Yamamoto²
¹College of Industrial Technology, Nihon University, Chiba, Japan, ²Think Earth Science, Tokyo, Japan

2017-n-07 (9:40 – 10:00)
Urban Change Monitoring in Developing Countries Based on Deep Learning Technique by Utilizing Time Series Imageries of the SAR and Optical Satellites
Shota Iino, Riho Ito, Tomoyuki Imaizumi, Shuhei Hikosaka
Satellite Business Division, PASCO CORPORATION, Tokyo, Japan
### SLATS and Future Prospect -New Viewpoints for Earth Observation-

Hirokazu Hoshino, Yutaka Kaneko, Masanori Sasaki

Space Technology Directorate I, JAXA, Tsukuba, Japan

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### On-board Satellite Imagery Classification using Convolutional Neural Network

Kei Ohta\(^1\), Takehiko Koike\(^1\), Yoichi Yatsu\(^2\), Saburo Matunaga\(^3\)

\(^1\)Department of Mechanical and Aerospace Engineering, Tokyo Institute of Technology, Tokyo, Japan, \(^2\)School of Engineering Department of Mechanical Engineering, Tokyo Institute of Technology, Tokyo, Japan, \(^3\)School of Science Department of Physics, Tokyo Institute of Technology, Tokyo, Japan

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### [n-3] Earth Observation: Advances in Optical Imagers and Radiometers (2)

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<td>Tamotsu Igarashi (Remote Sensing Technology Center of Japan, Japan)</td>
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<td>Keiji Imaoka (Yamaguchi University, Japan)</td>
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### New Technique to Take a High-resolution Night View of the Earth from a Micro Satellite

Dat Quoc Dao, Shinichiro Haruyama

Keio University, Viet Nam

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### Research and Simulation Experiment on Space Based Digital TDI Imaging Technique

Zhuang Xu Xia, Ruan Ning juan, He Jin ping, Liu Yu chen

BISME, BISME, China

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### Wavefront Correction Using Deformable Mirror for Extended Scene: Experimental Results

Norihide Miyamura\(^1\), Nobutada Sako\(^2\)

\(^1\)Department of Interdisciplinary Science and Engineering, Meisei University, Tokyo, Japan, \(^2\)Canon Electronics Inc., Tokyo, Japan

---

### Aperture Partitioning for Bispectrum Speckle Imaging

Lauren Hayley Schatz\(^1\), Thomas R Swindle\(^3\), Brandoch Calef\(^2\), Steve Jefferies\(^2\)

\(^1\)Optical Science, University of Arizona, USA, \(^2\)Boeing Company, \(^3\)Airforce Maui Optical and Supercomputing Laboratory

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### Overview of Advanced Optical Satellite

Haruyoshi Katayama, Eri Kato, Tomoya Niwa, Hidenori Watarai, Masakazu Sagisaka

Advanced Optical Satellite Project Team, JAXA, Tsukuba, Japan
Session Date: June 8 (Thu) 14:00 – 15:40
Room: Meeting Room 11
Chairpersons: Keiji Imaoka (Yamaguchi University, Japan) Takeo Tadono (JAXA, Japan)

2017-n-16 (14:00 – 14:20)

Simulated Image Generation for the Advanced Optical Satellite
Takeo Tadono, Ayano Oka, Hidenori Watarai, Masakazu Sagihara
JAXA, Japan

2017-n-17 (14:20 – 14:40)

Analysis of The Land Surface Temperature Characteristics in Tokyo by LANDSAT and High-Resolution Satellite Data
Yasunori Nakayama, Hideki Hashiba
Department of Earth and Environmental Science, College of Humanities and Sciences, Nihon University, Tokyo, Japan, Department of Civil Engineering, College of Science and Technology, Nihon University, Tokyo, Japan

2017-n-18 (14:40 – 15:00)

Mission Planning and System Design for HISA: A Hyperspectral Imaging Satellite for Australia
Eugene Kim, Xiaofeng Wu, Warwick Holmes
School of Aerospace, Mechanical and Mechatronics Engineering, The University of Sydney, Australia

2017-n-19 (15:00 – 15:20)

Development of Land Products Using SGLI Data
Toshiyuki Kobayashi, Hiroshi Murakami, Yoshiaki Honda, Koji Kajiwara, Yuhsaku Ono, Masao Moriyama, Hideki Kobayashi, Kenlo Nasahara, Risa Miyazaki, Masahiro Hori
Earth Observation Research Center (EORC), JAXA, Tsukuba, Japan, Center for Environmental Remote Sensing, Chiba University, Chiba, Japan, Nagasaki University, Nagasaki, Japan, Department of Environmental Geochemical Cycle Research, JAMSTEC, Yokohama, Japan, The University of Tsukuba, Tsukuba, Japan

2017-n-20 (15:20 – 15:40)

GCOM-C Data Validation Plan for Land, Atmosphere, Ocean, and Cryosphere
Masahiro Hori, Hiroshi Murakami, Risa Miyazaki, Yoshiaki Honda, Kenlo Nasahara, Koji Kajiwara, Takashi Y. Nakajima, Hitoshi Irie, Mitsuhito Toratani, Toru Hirawake, Teruo Aoki
Earth Observation Research Center, JAXA, Tsukuba, Japan, Center for Environmental Remote Sensing, Chiba University, Chiba, Japan, Graduate School of Life and Environmental Science, The University of Tsukuba, Tsukuba, Japan, Department of Human and Information Science, Tokai University, Hiratsuka, Japan, Department of Optical and Imaging Science and Technology, Tokai University, Hiratsuka, Japan, Graduate School of Fisheries Sciences, Hokkaido University, Hakodate, Japan, Graduate School of Natural Science and Technology, Okayama University, Okayama, Japan, Climate Research Department, Meteorological Research Institute, Tsukuba, Japan

Session Date: June 8 (Thu) 16:00 – 17:40
Room: Meeting Room 11
Chairpersons: Keiji Imaoka (Yamaguchi University, Japan) Takeo Tadono (JAXA, Japan)
2017-n-21 (16:00 – 16:20)

Current On-orbit Status of the Compact Infrared Camera (CIRC) onboard CALET
Ayaka Kumeta¹, Michito Sakai¹, Koji Nakau², Yukinori Nakajima¹, Toshiyoshi Kimura¹
¹Research and Development Directorate, JAXA, Tsukuba, Japan, ²Space Technology Directorate I, JAXA, Tsukuba, Japan

2017-n-22 (16:20 – 16:40)

Application Demonstration through System and Algorithm Development for Wildfire Monitoring Utilizing CIRC (Compact Infrared Camera)
Koji Nakau
Satellite Applications and Operations Center (SAOC), JAXA, Tsukuba, Japan

2017-n-23 (16:40 – 17:00)

Deforestation detection using ALOS-2/PALSAR-2 Imagery in “JICA-JAXA Forest Early Warning System in the Tropics (JJ-FAST)”
Masato Hayashi¹, Tomohiro Watanabe¹, Yutaka Kaneko¹, Manabu Watanabe², Christian Koyama², Masanobu Shimada², Takashi Ogawa³, Keiko Ishii³, Tomohiko Higashiwatoko³, Mari Miura³, Hiroaki Ono³, Kenichi Shishido⁴
¹Japan Aerospace Exploration Agency (JAXA), Tsukuba, Japan, ²Tokyo Denki University, Hatoyama, Japan, ³Remote Sensing Technology Center of Japan (RESTEC), Tokyo, Japan, ⁴Japan International Cooperation Agency (JICA), Tokyo, Japan

2017-n-24 (17:00 – 17:20)

ALOS/PALSAR Analysis of Surface Deformation in Chiba Prefecture, Japan
Tomohito Asaka¹, Takashi Nonaka¹, Hideki Hashiba², Keishi Iwashita¹, Toshiro Sugimura¹
¹College of Industrial Technology, Nihon University, Japan, ²College of Science and Technology, Nihon University, Japan

2017-n-25 (17:20 – 17:40)

Robust Approach for Correlated Baseline Data of ALOS Time-series Interferometry
Takuma Anahara
Earth Observation Research Center, JAXA, Tsukuba, Japan

[n-6] Earth Observation: Advances in Meteorological Instruments

Session Date       June 9 (Fri) 9:00 – 10:40
Room               Meeting Room 11
Chairpersons       Masahiro Hori (Japan Aerospace Exploration Agency, Japan)
                                 Takuji Kubota (Japan Aerospace Exploration Agency, Japan)

2017-n-26 (9:00 – 9:20)

Prime Mission Results of the Dual-frequency Precipitation Radar on the Global Precipitation Measurement
2017-n-27 ( 9:20 – 9:40 )

Drop Size Distribution Observed by Dual-frequency Precipitation Radar Onboard Global Precipitation Measurement Core Satellite

Moeka Yamaji1, Takuji Kubota1, Atsushi Hamada2, Yukari N. Takayabu2, Riko Oki1

1Earth Observation Research Center, JAXA, Tsukuba, Japan, 2Atmosphere and Ocean Research Institute, The University of Tokyo, Kashiwa, Japan

2017-n-28 ( 9:40 – 10:00 )

Quasi-realtime Version of the Global Satellite Mapping of Precipitation (GSMaP_NOW) Over the Himawari-8 Region

Takuji Kubota1, Misako Kachi2, Yoriko Arai2, Moeka Yamaji1, Riko Oki1

1Earth Observation Research Center, Japan Aerospace Exploration Agency, Tsukuba, Ibaraki, Japan, 2Remote Sensing Technology Center of Japan, Tsukuba, Ibaraki, Japan.

2017-n-29 ( 10:00 – 10:20 )

JAXA Himawari Monitor and its Synergies to the Earth Observation Satellites

Misako Kachi1, Maki Kikuchi1, Mayumi Yoshida1, Takashi Nagao1, Yukio Kurihara2, Hiroshi Murakami2, Masahiro Hori1

1Japan Aerospace Exploration Agency, Tsukuba, Japan, 2Japan Meteorological Agency, Japan

2017-n-30 ( 10:20 – 10:40 )

Multi Frame Image Processing of Himawari-8/AHI Data

Toshiro Sugimura, Yuuki Uchida, Sadayoshi Aoyama, Tomohito Asaka, Keishi Iwashita

College of Industrial Technology, Nihon University, Chiba, Japan

[n-7] Earth Observation: Advances in Microwave Radiometers

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2017-n-31 ( 11:00 – 11:20 )

Overview and Updates of GCOM-W and AMSR2 for Climate and Water Studies

Misako Kachi1, Takashi Maeda1, Hiroyuki Tsutsui1, Nodoka Ono1, Taikan Oki1,2

1Japan Aerospace Exploration Agency, Tsukuba, Japan, 2The University of Tokyo, Japan

2017-n-32 ( 11:20 – 11:40 )

Precipitable Water Vapor Retrieval over Land from GCOM-W/AMSR2

Masahiro Kazumori

Numerical Prediction Division, Forecast Department, JMA, Tokyo, Japan

2017-n-33 ( 11:40 – 12:00 )
Current Status of the AMSR2 Standard Product for Soil Moisture Content and Snow Depth

Hiroyuki Tsutsui, Misako Kachi, Takeshi Maeda
Earth Observation Research Center, JAXA, Tsukuba, Japan

2017-n-35 (12:00 ‒ 12:20)

Study on Constructing Consistent Dataset from Multiple Space-Based Microwave Radiometers

Keiji Imaoka1, Misako Kachi2
1Media and Information Technology Center, Yamaguchi University, Ube, Japan, 2Earth Observation Research Center, JAXA, Tsukuba, Japan

[n-8] Earth Observation: Advances in Spectrometers and Lidars (1)

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<td>Kei Shiomi (Japan Aerospace Exploration Agency, Japan)</td>
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<td>Akihiko Kuze (Japan Aerospace Exploration Agency, Japan)</td>
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</table>

The Overview and Status of Vegetation Lidar Mission ‘MOLI’

Rei Mitsuhashi1, Jumpei Murooka1, Daisuke Sakaizawa1, Tadashi Inoue1, Toshiyoshi Kimura2, Kazuhiro Asai2
1JAXA, Japan, 2Tohoku Institute of Technology, Japan

Imaging Spectrometer with an Agile Pointing System to Monitor Global and Regional Greenhouse Gas Fluxes and Target Local Emission

Akihiko Kuze, Hiroshi Suto
JAXA, Sagamihara, Japan

Development of GOSAT Air Pollution Watch

Yoshito Sawada1, Yu Oishi2, Akihide Kamei1, Akihiro Uchiyama1, Tsuneo Matsunaga1
1National Institute for Environmental Studies, Tsukuba, Japan, 2AIST Tokyo Waterfront, Tokyo, Japan

Multi-layer Retrievals of Greenhouse Gases from a Combined Use of TANSO-FTS SWIR and TIR

Nobuhiro Kikuchi1, Akihiko Kuze1, Fumie Kataoka2, Kei Shiomi1, Makiko Hashimoto1, Hiroshi Suto1, Robert Knuteson2, Laura Iraci3, Emma Yates2, Warren Gore1, Tomaaki Tanaka4
1Japan Aerospace Exploration Agency, Tsukuba, Japan, 2Remote Sensing Technology Center of Japan, Tsukuba, Japan, 3University of Wisconsin, Madison, USA, 4NASA Ames Research Center, Moffett Field, USA

Investigation of the Long-term Change of the TANSO-FTS Pointing Characteristics for a Future Agile Pointing Mechanism

Jun Yoshida1, Nobuo Kanmochi1, Hiroshi Sugita2, Yoshifumi Nomomi1, Shingo Obara2, Akira Sasaki2, Akihiko Kuze2
1NEC Corporation, Fuchu, Tokyo, Japan, 2Japan Aerospace Exploration Agency, Tsukuba, Ibaraki, Japan
**Earth Observation: Advances in Spectrometers and Lidars (2)**

**Session Date**
June 9 (Fri) 16:00 – 16:40

**Room**
Meeting Room 11

**Chairpersons**
Kei Shiomi (Japan Aerospace Exploration Agency, Japan)
Akihiko Kuze (Japan Aerospace Exploration Agency, Japan)

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**2017-n-41 (16:00 – 16:20)**

**Characterizing On-orbit Electrical Performance of TANSO Onboard GOSAT using its Engineering Model in the Laboratory**

Hiroshi Suto, Jun Yoshida, Takahiro Kawashima, Kei Shiomi, Akihiko Kuze

1Japan Aerospace Exploration Agency, Tsukuba, Ibaraki, Japan, 2NEC Corporation, Fuchu, Tokyo, Japan

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**2017-n-42 (16:20 – 16:40)**

**Calibration and Validation Activities for GOSAT Collaborated with OCO-2**

Kei Shiomi, Akihiko Kuze, Nobuhiro Kikuchi, Makiko Hashimoto, Hiroshi Suto, Fumie Kataoka, Takahito Igarashi, Shuji Kawakami

1JAXA, Tsukuba, Ibaraki, Japan, 2RESTEC, Tsukuba, Ibaraki, Japan

---

**Space Life Science (1)**

**Session Date**
June 6 (Tue) 9:00 – 10:40

**Room**
Meeting Room 12

**Chairpersons**
Kunihiko Tanaka (Gifu University of Medical Science, Japan)
Masayuki Omoto (University of Kurume, Japan)

---

**2017-p-01 (9:00 – 9:25)**

**Voluntary-Vaporization Enhances Cooling Effects for Extravehicular Activity**

Kunihiko Tanaka, Daiki Nagao, Kosuke Okada, Koji Nakamura

1Graduate School of Health and Medicine, Gifu University of Medical Science, Gifu, Japan, 2Department of Radiological Technology, Gifu University of Medical Science, Gifu, Japan

---

**2017-p-02 (9:25 – 9:50)**

**Oxygen Uptake and Muscle Strength is Improved by Electrical Stimulation of the Antagonist Muscle Added to Cycling Exercise Interval Training**

Masayuki Omoto, Ryuuki Hashida, Yoshio Takano, Hiroo Matsuse, Masafumi Bekki, Yoshihiko Tagawa, Naoto Siba

1Division of Rehabilitation, Kurume University Hospital, Kurume, Japan, 2Department of Physical Therapy School of Health Sciences at Fukuoka, International University Health and Welfare, Enokizu, Okawa, Japan

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**2017-p-03 (9:50 – 10:15)**

**Trial of the Stress-related Index Measurement under the Confinement Environmental Stress**
2017-p-04 (10:15 – 10:40)

**Development of Mouse Habitat Unit for Individual Housing Used in International Space Station**

Hiroyasu Mizuno1, Yusuke Hagiwara2, Hirochika Murase2, Hiroaki Kodama2, Makoto Ohira2, Toshimasa Ochiai2

1Human Spaceflight Technology Directorate, JAXA, Tsukuba, Japan, 2Space Systems Department, Mitsubishi Heavy Industries, Ltd., Nagoya, Japan

2017-p-06 (11:00 – 11:25)

**Medical Mycology in Space**

Koichi Makimura1,2,3

1General Medical Education and Research Center, 2Graduate School of Medicine, Teikyo University, Tokyo, Japan, 3Teikyo University Institute of Medical Mycology, Tokyo, Japan

2017-p-07 (11:25 – 11:50)

**Is Virulence Factor of Skin Microbiota, Malassezia Changed in a Microgravity Environment? - Malassezia is Predominant Fungal Microbiota in Skin of Astronauts Staying the ISS –**

Takashi Sugita1, Ayumi Watanabe1, Otomi Cho1, Noriaki Ishioka2

1Meiji Pharmaceutical University, Tokyo, Japan, 2JAXA, Tokyo, Japan

2017-p-08 (11:50 – 12:15)

**Bacterial Horizontal Gene Transfer Frequencies under Simulated Microgravity**

Tomoaki Ichijo1, Takehiko Kenzaka2, Masao Nasu1,2, Katsuji Tani2

1Graduate School of Pharmaceutical Sciences, Osaka University, Suita, Japan, 2Faculty of Pharmacy, Osaka Ohtani University, Tondabayashi, Japan

[p-2] Space Life Science (2)

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[p-3] Space Life Science (3)

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<tr>
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<td>Akihisa Takahashi (Gunma University Heavy Ion Medical Center, Japan)</td>
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Performance Evaluation of New Devices to Synchronize Heavy-Ion or X-ray Irradiation and Simulated Microgravity for Space Radiation Research – Improvement of a Control Stage –

Akihisa Takahashi1, Hiroko Ikeda2, Hikaru Souda3, Anggraeni Puspitasari2, Kathryn D. Held2,3, Jun Hidema4, Takeshi Nikawa5, Yukari Yoshida1, Tatsuaki Kanai1

1Gunma University Heavy Ion Medical Center, Maebashi, Japan, 2Gunma University Initiative for Advanced Research, Maebashi, Japan, 3Massachusetts General Hospital/Harvard Medical School, Boston, USA, 4Graduate School of Life Sciences, Tohoku University, Sendai, Japan, 5Institute of Medical Nutrition, Tokushima University Graduate School, Tokushima, Japan

Research on the Effects of Simulated Microgravity on UV Sensitivity of plant

Jun Hidema1, Mika Teranishi1, Masanori Izumi1, Sakuya Nakamura1, Akihisa Takahashi2

1Graduate School of Life Sciences, Tohoku University, Japan, 2Gunma University Heavy Ion Medical Center, Japan

Stress-Induced Mitochondrial Fragmentation Impaired Movement in C. elegans

Kenta Momma, Surabhi Sudevan, Rui Isaka, Atsushi Higashitani

Graduate School of Life Sciences, Tohoku University, Sendai, Japan

Gravity-induced Re-localization of CsPIN1 for Gravimorphogenesis in Cucumber Seedlings

Chiaki Yamazaki1,5, Nobuharu Fujii1, Yutaka Miyazawa2, Motoshi Kamada3, Haruo Kasahara4, Ikuko Osada4, Toru Shimazu5,6, Yasuo Fusejima5, Akira Higashibata6, Takashi Yamazaki7, Noriaki Ishikawa5, Hideyuki Takahashi1

1Graduate School of Life Sciences, Tohoku University, Sendai, Japan, 2Faculty of Science, Yamagata University, Yamagata, Japan, 3Advanced Engineering Services, Tsukuba, Japan, 4Japan Manned Space Systems Co., Tsuchiura, Japan, 5Japan Space Forum, Tokyo, Japan, 6Japan Aerospace Exploration Agency, Tsukuba, Japan, 7Teikyo University, Tokyo, Japan

Water Status of Plants under Low Gravity Conditions

Yoshiaki Kitaya1, Hiroaki Hirai2, Ayako Tokuda1, Sachiko Yano2

1Graduate School of Life and Environmental Sciences, Osaka Prefecture University, Osaka, Japan, 2Japan Aerospace Exploration Agency, Ibaraki, Japan

Evaluation of Growth Performance of Super-Dwarf Rice in Space Agriculture

Hiroaki Hirai, Yoshiaki Kitaya

Graduate School of Life and Environmental Sciences, Osaka Prefecture University, Japan
Application to Space Foods of the Disaster Food

Naomi Katayama¹,², Yukimi Okano³, Shoko Kondo², Yui Nakayama²

¹Department of Food science and Nutrition, Nagoya Women's University, Nagoya, Japan, ²Division of Food Science and Nutrition, Graduate School of Nagoya Women's University, Nagoya, Japan

Sensuality Test Result for Application to Space Foods of the Disaster Food

Naomi Katayama¹,², Shoko Kondo³, Yukimi Okano²

¹Division of Food Science and Nutrition, Graduate School of Nagoya Women's University, Nagoya, Japan, ²Department of Food science and Nutrition, Nagoya Women's University, Nagoya, Japan

[q-1] Space Solar Power System

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Current Research on Laser Wireless Power Transmission Technology

Hiroaki Suzuki, Kazuhisa Kitakura
Research and Development Directorate, Japan Aerospace Exploration Agency (JAXA), Tsukuba, Japan

A Technology for Mass-Produced Array Antennas: Realization of an Arbitrary Field Distribution with Uniform Element Excitation

Tadashi Takano, Toshihiro Naganawa, Kuniaki Shibata, Kenji Saegusa
Department of Electronics Engineering, Nihon University, Funabashi, Japan


Mudassir Raza¹, Koji Tanaka², Koji Takeda², Misato Yoneyama³, Shotaro Katano¹
¹The Graduate University for advanced Studies (SOKENDAI), Sagamihara, Japan, ²Institute of Space and Astronautical Science, Sagamihara, Japan, ³Delft University of Technology, Netherlands, ⁴Tokyo University of Science, Suwa, Japan

Wireless Power Transmission for Space-based Solar Power with Distributed Electric Grid

Frank E. Little
Texas A&M University, USA
### Session Date June 9 (Fri) 14:00 – 15:00
### Room Meeting Room 13
### Chairperson Koji Tanaka (JAXA, Japan)

**2017-q-08 (14:00 – 14:20)**

**Applications of Linear Programming Techniques to Satellite Power Management and Scheduling**

Joshua Critchley-Marrows, Martin Isacsson, Agnes Gårdebäck

KTH Royal Technology Institute, Sweden

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**2017-q-09 (14:20 – 14:40)**

**Sensor-Less Control for Switch-Regulated Energy Harvester using Alternate State-Estimators**

Yuta Yamamoto, Yushin Hara, Kanjuro Makihara

Department of Aerospace Engineering, Tohoku University, Sendai, Japan

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**2017-q-10 (14:40 – 15:00)**

**Dynamic Solar Simulator for Small Satellite Simulations**

Marco Antonio Saavedra Lautensach

Department of electrical engineering, School of Engineering, National Autonomous University of Mexico, Mexico

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### [q-3] Space Power System II

### Session Date June 9 (Fri) 16:00 – 17:20
### Room Meeting Room 13
### Chairperson Koji Tanaka (JAXA, Japan)

**2017-q-11 (16:00 – 16:20)**

**Design and Implementation of a High Powered Electrical Power Subsystem for AMMEQ-1, a 3U CubeSat**

Trevor Kwan¹, Xiaofeng Wu¹, Eugene Kim², Robert Bedington², Xueliang Bai², Alex Ling²

¹The University of Sydney, Australia, ²Centre for Quantum Technologies, Singapore

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**2017-q-12 (16:20 – 16:40)**

**Evaluation of Orbit Data of Electrical Power System of Deep Space Probe Shinen2**

Jesus Gonzalez-Llorente¹, Kei-Ichi Okuyama¹, Isai Fajardo Tapia¹, Blanca Szasz¹, Sidi Bendoukha¹, Masanori Nishio²

¹Department of Applied Science for Integrated Systems Engineering, Kyushu Institute of Technology, Kitakyushu, Japan, ²Aichi University of Technology, Sagamihara, Japan

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**2017-q-13 (16:40 – 17:00)**

**Power Resource Allocation in Electrically Closed System using Hybrid Control under Multi-agent System**

Sho Ohtani¹, Osamu Mori²

¹Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan, ²Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

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**2017-q-14 (17:00 – 17:20)**
The Failure Rate Calculation Method for High Power Devices in Low Earth Orbit
Erdenebaatar Dashdondog, Shohei Harada, Yuji Shiba, Masaki Sudo, Ichiro Omura
Kyushu Institute of Technology, Kitakyushu, Japan

[r-1] Space Environment (Radiation)

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<td>Masao Nakamura (Osaka Prefecture University, Japan)</td>
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<td>Kiyokazu Koga (Japan Aerospace Exploration Agency, Japan)</td>
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2017-r-01 (9:00 – 9:20)

Space Radiation Measurements Using a Small Deep Space Probe in the Sun-Earth Environment
Isai Fajardo Tapia¹, Kei-Ichi Okuyama¹, Bianca Adina Szasz², Sidi Ahmed Bendoukha¹, Jesús Gonzalez-Llorente¹, Doug Holland², Prem-Kumar Saganti³
¹Department of Applied Sciences for Integrated Systems Engineering, Kyushu Institute of Technology, Fukuoka, Japan, ²NASA Johnson Space Center, Houston, USA, ³Prairie View A&M University, Prairie View, Texas, USA

2017-r-02 (9:20 – 9:40)

Using Electromagnetic Protection in the Van Allen Radiation Belt Compared with Material Protection
Shingo Motodani
Mechanical and Aerospace Engineering, University of Kyushu, Japan

2017-r-03 (9:40 – 10:00)

PHITS Simulations for Development of Space Radiation Shielding Materials
Aki Goto, Kazunori Shimazaki, Yugo Kimoto, Haruhsia Matsumoto, Aiko Nagamatsu
Japan Aerospace Exploration Agency, JAXA, Tsukuba, Japan

2017-r-04 (10:00 – 10:20)

The Status of the Heavy Ion Telescope on the ISS/JEM-EF
Haruka Ueno, Haruhsia Matsumoto, Kiyokazu Koga
Aerospace Research and Development Directorate, JAXA, Ibaraki, Japan

2017-r-05 (10:20 – 10:40)

A Pulsed Supersonic Valve System Aimed for Martian Atmospheric Simulation
Ryota Okura¹, Minoru Iwata², Sze Keat Chee³, Kumiko Yokota¹, Masahito Tagawa¹
¹Kobe University, Kobe, Japan; ²Kyushu Institute of Technology, Kita-Kyusyu, Japan; ³Mechano Transformer Corp., Tokyo, Japan

[r-2] Space Environment (Charging 1)

| Session Date | June 6 (Tue) 11:00 – 12:40 |
Mission Results of Arc Event Generator and Investigation Satellite “HORYU-IV” and Impact of Harness Self-inductance to the Discharge Current.

Hiroshi Fukuda¹, Horyu-Iv Member ², Kazuhiro Toyoda³, Mengu Cho²

¹Laboratory of Spacecraft Environment Interaction Engineering, Kyushu Institute of Technology, Japan, ²Department of engineering (Electrical and Electronics), Kyushu Institute of Technology, Japan

Simulation of Lunar Surface Charging, Electric Field and Dust Lofting with Attitude Control of a CubeSat Mission

Necmi Cihan Örger, J. Rodrigo Cordova Alarcon, Kazuhiro Toyoda, Mengu Cho

Kyushu Institute of Technology, Kitakyushu, Japan

Assessment of Spacecraft Surface Charging in Worst GEO Environmental Conditions

Shinya Nakamura¹, Ryota Kawachi¹, Masao Nakamura¹, Kazuhiro Toyoda⁵

¹Department of Aerospace Engineering, Osaka Prefecture University, Sakai, Japan, ²Department of Electrical Engineering, Kitakyushu, Kitakyushu, Japan

Comparison Between Surface Charging Event from Michibiki (QZS) Satellite and Space Environment Data from Global MHD Simulation

Tsutomu Nagatsuma¹, Haruhiroa Matsumoto², Yasubumi Kubota¹, Aoi Nakamizo¹, Kiyokazu Koga²

¹Space Environment Laboratory, NICT, Koganei, Japan, ²Research and Department Directorate, JAXA, Tsukuba, Japan

An Experimental Process to Measure the I-V Characteristics Using Arc Jet Plasma Wind Tunnel of Space Probe Reentry having Thermal Shield made by LATS

Sidi Ahmed Bendoukha¹, Kei-Ichi Okuyama¹, Szasz Bianca¹, Shimoda Takayuki²

¹Graduate School of Engineering, Department of Applied Science for Integrated System Engineering, Kyushu Institute of Technology, Japan, ²Institute of Space and Aeronautical Sciences ISAS, Kanagawa, Japan
### Materials Session

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<td>Aki Goto (Japan Aerospace Exploration Agency, Japan)</td>
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#### 2017-r-15 (16:00 – 16:20)

**Accelerating Effect of Atomic Oxygen-induced Polyimide Degradation due to Simultaneous Collision of Chemically Inert Molecules**

Kazuki Kita¹, Yusuke Fujimoto¹, Yuki Yamasaki², Minoru Iwata², Kumiko Yokota¹, Masahito Tagawa¹  
¹Kobe University, Kobe, Japan, ²Kyushu Institute of Technology, Kita-kyushu, Japan

#### 2017-r-16 (16:20 – 16:40)

**Mass-loss of FEP/Ag Films in Sub-Low Earth Orbit Space Environment**

Yusuke Fujimoto¹, Kazuki Kita¹, Yasuko Koshiba¹, Kenji Ishida¹, Minoru Iwata², Kumiko Yokota¹, Masahito Tagawa¹  
¹Kobe University, Kobe, Japan, ²Kyushu Institute of Technology, Kita-kyushu, Japan

#### 2017-r-17 (16:40 – 17:00)

**Surface Analysis Results of Atomic Oxygen Protective Coating Film**

Miyuki Waki, Yugo Kimoto  
Research and Development Directorate, JAXA, Tsukuba, Japan
Relationship between Electron Beam Irradiation Dose and Photoelectron Emission Characteristics of Electron Beam Irradiated Insulating Materials
Kotaro Suzuki1, Hiroaki Miyake1, Yasuhiro Tanaka1, Teppei Okumura2, Shiro Kawakita2, Masato Takahashi2, Kiyokazu Koga2
1The Measurement and Electric Machine Control Laboratory, Tokyo City University, Tokyo, Japan, 2Research and Development Directorate, JAXA, Tsukuba, Japan

Recovery of Solar Absorptance Change by the Ultraviolet Rays in the Atmosphere Storage
Kazuyuki Mori, Yugo Kimoto
Research and Development Directorate, JAXA, Tsukuba, Japan

[r-5] Space Debris (Observation)

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<td>Matthew D Hejduk (Astrorum Consulting, USA)</td>
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Effective Search Strategy Applicable for Narrow Field-of-view Telescope
Yuki Itaya1, Koki Fujita2, Toshiya Hanada3
1Department of Aeronautics and Astronautics, Kyushu University, Fukuoka, Japan, 2Department of Aerospace Engineering, Nippon Bunri University, Oita, Japan

Detection of LEO Objects Using Large CMOS Sensor
Toshifumi Yanagisawa, Hirohisa Kurosaki
Chofu Aerospace Center, JAXA, Tokyo, Japan

A New Method for the Identification of Objects Detected in Beam-park Experiments
Hai Jiang1,2, Jing Liu1,2, Yang Li1, Yao Zhang1,2, Haowen Cheng1
1National Astronomical Observatory, Chinese Academy of Sciences, China, 2University of Chinese Academy of Sciences, China

[r-6] Space Debris (Observation, Rotation, In-situ Measurement)

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2017-r-25 (11:00 – 11:20)

Application of Image Restoration in Optical Space Debris Observations

Rongyu Sun
Purple Mountain Observatory, Chinese Academy of Sciences, Nanjing, China

2017-r-26 (11:20 – 11:40)

The YORP Effect on Defunct Earth Orbiting Satellites

Daniel Scheeres
Smead Department of Aerospace Engineering Sciences, The University of Colorado Boulder, USA

2017-r-28 (12:00 – 12:20)

Measurement of Momentum to Move with Hypervelocity Impacts of Projectile

Masahiro Nishida1, Koichi Hayashi2, Hirohisa Kurosaki3, Toshifumi Yanagisawa3, Masumi Higashide3
1Nagoya Institute of Technology, Nagoya, Japan, 2National Institute of Technology, Toba College, Toba, Japan, 3JAXA/ARD, Chofu, Japan

2017-r-29 (12:20 – 12:40)

Estimation of Orbital Parameters of Broken-up Objects from In-situ Debris Measurements

Yutaka Kodama1, Koki Fujita2, Toshiya Hanada1
1Department of Aeronautics and Astronautics, Kyushu University, Fukuoka, Japan, 2Aerospace Engineering, Nippon Bunri University, Oita, Japan

[r-7] Space Debris (Modelling)

Session Date June 7 (Wed) 16:00 – 17:40

Room Meeting Room 13

Chairpersons J.-C. Liou (National Aeronautics and Space Administration, USA)

Takayuki Hirai (Japan Aerospace Exploration Agency, Japan)

2017-r-30 (16:00 – 16:20)

Environmental Estimation on Sub-millimeter-size Debris Using In-situ Measurement Data

Masahiro Furumoto1, Shin’ya Nakano2, Koki Fujita3, Toshiya Hanada1
1Department of Aeronautics and Astronautics, Kyushu University, Fukuoka, Japan, 2Institute of Statistical Mathematics, Research Organization of Information and Systems, Tachikawa, Japan, 3Department of Aerospace Engineering, Nippon Bunri University, Oita, Japan

2017-r-31 (16:20 – 16:40)

Evaluation of Space Debris Mitigation Measures Using a Debris Evolutionary Model

Satomi Kawamoto1, Takayuki Hirai2, Shiki Kitajima2, Shuji Abe2, Toshiya Hanada2
1Research and Development Directorate, JAXA, Chofu, Japan, 2Kyushu University, Fukuoka, Japan

2017-r-32 (16:40 – 17:00)
Spacecraft Break-up Models for the Atmospheric Re-entry from Highly Eccentric and Interplanetary Trajectories
Stijn Lemmens¹, Jan Siminski², Francesca Letizia³, Quirin Funke¹, Klaus Merz¹
¹Space Debris Office, European Space Agency, Darmstadt, Germany, ²Astronautics Research Group, University of Southampton, Southampton, United Kingdom

2017-r-33 (17:00 – 17:20)

Development of an Orbital Model for Small-Sized Space Debris Considering Electromagnetic Fields around the Earth
Keisuke Akari¹, Hiroshi Yamakawa³, Toshiya Hanada², Koki Fujita³
¹Research Institute for Sustainable Humanosphere, Kyoto University, Kyoto, Japan, ²Faculty of Engineering, Kyushu University, Fukuoka, Japan, ³Department of Aerospace Engineering, Nippon Bunri University, Oita, Japan

2017-r-34 (17:20 – 17:40)

Crater Shape and Ejecta Size from Pure Aluminum Due to Hypervelocity Impact
Yushiro Mozaki¹, Masahiro Nishida¹, Hiroyuki Yamada²
¹Nagoya Institute of Technology, Japan, ²National Defense Academy of Japan, Japan

[r-8] Space Debris (Protection)

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2017-r-35 (9:00 – 9:20)

Ballistic Experiment of LPSO-type Magnesium Plate Target
Masahiro Nishida¹, Fumiya Kodama¹, Kaito Ishida¹, Koichi Hayashi², Yasuhiro Akahoshi³, Kazuyuki Hokamoto¹, Tsuyoshi Mayama⁴, Michiaki Yamasaki¹, Yoshihito Kawamura⁴
¹Nagoya Institute of Technology, Japan, ²National Institute of Technology, Toba College, Japan, ³Kyushu Institute of Technology, Japan, ⁴Kumamoto University, Japan

2017-r-36 (9:20 – 9:40)

Effects of Impact Angles on Ballistic Limit of Ultra-High-Molecular-Weight Polyethylene Fiber Fabrics
Junya Fuchita¹, Masahiro Nishida², Masumi Higashide²
¹Nagoya Institute of Technology, Nagoya, Japan, ²JAXA/ARD, Chofu, Japan

2017-r-37 (9:40 – 10:00)

Possibility of Sustained Discharge on Satellite’s Power Harness Behind the Solar Array Paddle Caused by Hypervelocity Impacts
Takayuki Hirai¹, Masumi Higashide¹, Hirohsisa Kurosaki¹, Shirou Kawakita², Sunao Hasegawa³, Yuki Mando⁴, Shota Yamaguchi⁵, Koji Tanaka⁶
¹Research and Development Directorate, JAXA, Tokyo, Japan, ²Space Technology Directorate I, JAXA, Ibaraki, Japan, ³Institute of Space and Astronautical Science, JAXA, Kanagawa, Japan, ⁴Department of Space and Astronautical Science, The Graduate University for Advanced Studies (SOKENDAI), Kanagawa, Japan, ⁵Graduate School of Engineering, Tokai University, Kanagawa, Japan

2017-r-38 (10:00 – 10:20)
Hypervelocity Impact Damage Pattern Recognition in Aluminum Alloy Plates based on D-S Evidence Theory and BP Neural Network

Cao Wuxiong, Pang Baojun
School of Aeronautics, Harbin Institute of Technology, China

[r-9] Space Debris (Active Debris Removal 1)

Session Date: June 8 (Thu) 11:00 – 12:20
Room: Meeting Room 13
Chairpersons: Satomi Kawamoto (Japan Aerospace Exploration Agency, Japan), Toshiya Hanada (Kyushu University, Japan)

2017-r-39 (11:00 – 11:20)
Research and Development of the Osaka Institute of Technology PROITERES 4th Nano-Satellite for Debris Removing by Electric Propulsion
Kaisei Kajihara, Hiroki Fujita, Hirokazu Tahara, Kyoko Takada
Department of Mechanical Engineering, Osaka Institute of Technology, Japan

2017-r-40 (11:20 – 11:40)
Quick Report on On-Board Demonstration Experiment for Autonomous-Visual-Guidance Camera System for Space Debris Removal
Shinichi Kimura1, Yuta Horikawa2, Yasuhiro Katayama2
1Department of Electrical Engineering, Tokyo University of Science, Chiba, Japan, 2JAXA, Tsukuba, Japan

2017-r-41 (11:40 – 12:00)
An Optimal Rendezvous with Multiple Space Debris Utilizing Nodal Regressions for Low Earth Orbits
Koki Fujita1, Ryusuke Harada2, Toshiya Hanada3
1Department of Aerospace Engineering, Nippon Bunko University, Oita, Japan, 2Department of Aeronautics and Astronautics, Graduate School of Kyushu University, Fukuoka, Japan, 3Department of Aeronautics and Astronautics, Kyushu University, Fukuoka, Japan

2017-r-42 (12:00 – 12:20)
Ant Colony Optimization Based Design of Multiple-target Active Debris Removal Mission
Tianjiao Zhang, Hoxin Shen, Hengnian Li, Jisheng Li
State Key Laboratory of Astronautic Dynamics, Xi'an Satellite Control Center, China

[r-10] Space Debris (Active Debris Removal 2)

Session Date: June 8 (Thu) 14:00 – 14:40
Room: Meeting Room 13
Chairpersons: Shinichi Kimura (Tokyo University of Science, Japan)
2017-r-43 (14:00 – 14:20)

**Determination of Fracture Toughness of Hollow Cylindrical Tether at Space Debris Impact**

Kazumasa Sasahara, Shu Kondo, Yoshiyuki Uwamino, Sunao Hasegawa, Kajuro Makihara

1Department of Aerospace Engineering, Tohoku University, Sendai, Japan, 2Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, Sagamihara, Japan

2017-r-44 (14:20 – 14:40)

**Numerical Simulation of Tape Tether Deployment from Storage Container**

Hirohisa Kojima, Pavel Trivailo, Takeo Watanabe, Hironori Fujii

1Department of Aerospace Engineering, Tokyo Metropolitan University, Hino, Japan, 2School of Engineering, RMIT University, Melbourne, Australia, 3Department of Aerospace Engineering, Kanagawa Institute of Technology, Atsugi, Japan, 4TMIT, Tokyo, Japan

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**[r-11] Space Debris (Active Debris Removal 3)**

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<td>J.-C. Liou (National Aeronautics and Space Administration, USA)</td>
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<td>Masahiro Furumoto (Kyushu University, Japan)</td>
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2017-r-46 (16:00 – 16:20)

**Deorbiting of Space Debris by Laser Ablation**

Toshikazu Ebisuzaki, Yoshiyuki Takizawa, Satoshi Wada

RIKEN, Wako, Japan

2017-r-47 (16:20 – 16:40)

**Study on Orbital Remediation Sequence of Space Debris using Laser Ablation**

Yuta Kobayashi, Hiroshi Yamakawa, Toshikazu Ebisuzaki

1Graduate School of Engineering, Research Institute for Sustainable Humanosphere, Kyoto University, Kyoto, Japan, 2RIKEN, Japan

2017-r-48 (16:40 – 17:00)

**Measurement and Reduction of Recoil Load in Debris Capture Gun**

Keno Yoshida, Yasuhiro Akahoshi, Takao Kourea, Takahiko Matakai, Megumi Kageyama, Yukihiro Kitazawa, Taku Izumiya, Satomi Kawamoto, Hiroyuki Okamoto

1Department of mechanical and control engineering, Kyushu Institute of Technology, Fukuoka, Japan, 2HI Corporation, Tokyo, Japan, 3Research and Development Directorate, JAXA, Chofu, Japan

2017-r-49 (17:00 – 17:20)

**Application of the Spherical Dartboard Method to Active Debris Removal**

Ahmed M. Hussein, Mohammed K. Ibrahim

Department of Aerospace Engineering, Cairo University, Egypt, Egypt
### [r-12] Space Debris (Mitigation, Modelling, Near Earth Objects)

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<td>Toshifumi Yanagisawa (Japan Aerospace Exploration Agency, Japan)</td>
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2017-r-50 (9:00 – 9:20)

**Accurate Aerodynamic Model for Membranes in Free-Molecular Flow to be Used for Deorbit Device Design**

Nobuhiro Funabiki, Satoshi Ikari, Shinichi Nakasuka, Ryu Funase, Akihiro Ishikawa
Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan

2017-r-52 (9:20 – 9:40)

**Study of the Effects of the Lorentz Force on Space Objects with High Area-to-mass Ratio**

Kento Hoshi¹, Romain Serra², Massimiliano Vasile³, Hiroshi Yamakawa⁴
¹Research Institute for Sustainable Humanosphere, The University of Kyoto, Kyoto, Japan; ²Department of Mechanical and Aerospace Engineering, The University of Strathclyde, Glasgow, UK

2017-r-53 (9:40 – 10:00)

**Magnetic Field Effects on Sub-millimeter-size Debris**

Makoto Hanada¹, Koki Fujita², Toshiya Hanada³, Hiroshi Yamakawa⁴
¹Department of aeronautics and astronautics, Kyushu University, Fukuoka, Japan; ²Aerospace Engineering, Nippon Bunri University, Oita, Japan; ³Kyoto University, Kyoto, Japan

2017-r-54 (10:00 – 10:20)

**Rotational Changes of the NEA (Near-Earth-Asteroid) 99942 Apophis During the 2029 Close Encounter with the Earth**

Jean Souchay¹, Christoph Lhotka², Marta Folgueira³, Victor Puente³
¹SYRTE, Observatoire de Paris, PSL Research University, CNRS, Sorbonne Universités, UPMC Univ. Paris, France; ²Space Research Institute, Austrian Academy of Sciences, Austria; ³Sección departamental de Astronomia y Geodesia, Facultad de Ciencias Mathematicas, Universidad Complutense Madrid, Spain

### [r-13] Space Debris (Legal Issue, Collision Avoidance, Operation)

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<td>Toshikazu Ebisuzaki (RIKEN, Japan)</td>
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2017-r-55 (11:00 – 11:20)

**Political and Legal Challenges for Active Space Debris Removal-Possible International Steps-**
2017-r-56 ( 11:20 – 11:40 )

French Contribution to EU SST CA Service
François Laporte, Monique Moury
Centre National d’Études Spatiales, CNES, Toulouse, France

2017-r-58 ( 11:40 – 12:00 )

Consideration of Collision “Consequence” in Satellite Conjunction Assessment and Risk Analysis
M. Hejduk¹, F. Laporte², M. Moury³, L. Newman³, R. Shepperd⁴
¹Astrorum Consulting LLC, Woodway, TX USA, ²Centre Nationale d’Études Spatiales, Toulouse, France, ³NASA Goddard Space Flight Center, Greenbelt Maryland USA, ⁴The Boeing Company, contractor to Iridium Communications, Inc.; Leesburg, Virginia USA

[t-1] Microsatellite and Software

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<td>Naohiko Kohtake (Keio University, Japan)</td>
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<td>Yohsuke Nambu (Osaka Prefecture University, Japan)</td>
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2017-t-02 ( 14:00 – 14:20 )

Space System Launch Cost Analysis: A Value-Centric Architecture Based on System Characteristic Space
Qin Xu, Peter Hollingsworth, Katharine Smith
School of Mechanical, Aerospace and Civil Engineering, The University of Manchester, Manchester, United Kingdom

2017-t-04 ( 14:20 – 14:40 )

An Implementation of Bus-Type Architecture with Common Subsystem to Microsatellite ORBIS
Hirohisa Asano, Hironori Sahara
Department of Aerospace Engineering, Tokyo Metropolitan University, Tokyo, Japan

2017-t-05 ( 14:40 – 15:00 )

Satellite Control System Utilizing Orbit Calculation Package Software ORBITER FORCE
Yoshiyuki Takasugi, Keiko Takahashi, Shinichi Kawazoe, Takafumi Ohnishi, Masaya Kameyama
Fujitsu Limited, Japan

[t-2] Value Creation and Innovation

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A Methodology to Create Innovative Space Application Services

Makoto Ioki¹, Tsuyoshi Hirose¹, Shoji Yoshikawa², Naoki Imamura³, Kazuhide Kodeki², Seichi Shimizu³, Osamu Takahara², Eiji Yokoyama²

¹Graduate School of System Design and Management, Keio University, Kanagawa, Japan, ²Advanced Technology R&D Center, Mitsubishi Electric Corporation., Hyogo, Japan

A Value-Centric Design and Certification Architecture for Innovative Space Systems

Qin Xu, Peter Hollingsworth, Katharine Smith

School of Mechanical, Aerospace and Civil Engineering, The University of Manchester, Manchester, United Kingdom

A Concept Design of GSN-based Framework for Managing Satellite Service Creation

Megumi Yamamoto, Naohiko Kohtake

Graduate School of System Design and Management, Keio University, Japan

Systems Evaluation Framework for a Futuristic Aerospace Project

Nobuaki Minato

Graduate School of Technology Management, Ritsumeikan University, Kyoto, Japan

Value-Centric/Driven Design – A Framework

Lavanan Vengadasalam, Abdullah Desai, Peter Hollingsworth, Katharine Smith

School of Mechanical, Aerospace and Civil Engineering, The University of Manchester, Manchester, United Kingdom

Space Mission Architecture Design Philosophies and Methodologies – A Review

Lavanan Vengadasalam, Peter Hollingsworth, Katharine Smith

School of Mechanical, Aerospace and Civil Engineering, The University of Manchester, Manchester, United Kingdom
2017-t-13 ( 9:40 – 10:00 )

Automated Sensitivity Analysis of Interplanetary Trajectories for Optimal Mission Design

Jeremy Knittel1, Kyle Hughes2, Jacob Englander3, Bruno Sarli2

1NASA Goddard Space Flight Center, USA, 2Catholic University of America, USA

2017-t-14 ( 10:00 – 10:20 )

Competency Evaluation Applied to Human Resource Development Program Designed to Solve Social Issues using Space Applications

Aria Iwasawa1, Masahiro Fukuhara2, Fabien Roudier2, Naohiko Kohtake1

1Graduate School of System Design and Management, Keio University, Japan, 2Institution for a Global Society

2017-t-15 ( 10:20 – 10:40 )

Study on Highly Accurate and Responsive Tracking Antenna Control System for Simultaneous Observations by Unmanned Air Vehicles

Masazumi Ueba, Yuuichi Takaku, Shoichi Kitazawa, Ken Higuchi
Muroran Institute of Technology, Muroran, Japan

[t-4] Systems Approach

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2017-t-16 ( 11:00 – 11:20 )

Modular Platform for Hardware-in-the-Loop Testing of Autonomous Flight Algorithms

Mar Cols-Margenet1, Hanspeter Schaub1, Scott Piggott2

1Autonomous Vehicle Systems Laboratory, University of Colorado Boulder, Boulder, Colorado, United States, 2Laboratory for Atmospheric and Space Physics, Boulder, Colorado, United States

2017-t-17 ( 11:20 – 11:40 )

Probability Inference Approach for Stochastic Robust Flight Control Design

Taro Tsukamoto
The Japan Aerospace Exploration Agency, Tokyo, Japan

2017-t-18 ( 11:40 – 12:00 )

Updates on the Development of the Support Software System for the Philippines’ Microsatellite Operations

Mark Edwin Tupas1, Romer Kristi Aranas1, Benjamin Joseph Jiao1, Kaye Kristine Vergel2,3, Francisco Miguel Felcio2, Gay Jane Perez2, Marc Caesar Talampas1, Mary Ann Constante1, Orville Labbao1, John Leur Labrador1,4, Harold Bryan Paler5, Joel Joseph Marciano, Jr.1,5

1College of Engineering, University of the Philippines Diliman, Quezon City, Philippines, 2College of Science, University of the Philippines Diliman, Quezon City, Philippines, 3Department of Cosmosciences, Hokkaido University, Sapporo, Japan, 4Department of Aerospace Engineering, Tohoku University, Sendai,
2017-t-19 (12:00 – 12:20)

Fatigue Life Estimation of Spaceborne Electronic by Integrated Life Prediction Tools of Sherlock

Tae-Yong Park1, Young-Hyeon Jeon1, Jong-Chan Park2, Hyeong-Ahn Kwon2, Hyun-Ung Oh1

1Department of Aerospace Engineering, Chosun University, Republic of Korea, 2Korea Aerospace Research Institute (KARI), Republic of Korea

[t-5] Positioning System

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2017-t-20 (16:00 – 16:20)

Spot-based RTK Positioning for Improvement of Oil Palm Replanting Processes

Akira Kodaka1, Tomoaki Masuma2, Mohd Najib Bin Abd Rasid1, Haryati Abidin3, Mohd Na’Aim Bin Samad3, Ko Hamamoto4, Naohiko Kohtake5

1Graduate School of System Design and Management, Keio University, Yokohama, Japan, 2Advanced Services, Cisco Systems G.K., Tokyo, Japan, 3FGV R&D and Agri Services Cluster, Kuala Lumpur, Malaysia, 4Department of Aeronautics and Astronautics, JAXA, Tokyo, Japan

2017-t-21 (16:20 – 16:40)

Design of GNSS-Based Multi-Hazard Early Warning System for Multiple Countries: Case of Tsunamis and Bushfires in Asia and Oceania Regions

Shota Iino1, Daisuke Iwaizumi2, Tomohiko Hatori3, Naohiko Kohtake3

1PASCO CORPORATION, Japan, 2Acquisition, Technology & Logistics Agency, Japan, 3Keio University, Japan

2017-t-22 (16:40 – 17:00)

Concept Design of Seamless Location Based Emergency Warning System with GNSS-Based Signals

Akihiro Sato, Madoka Nakajima, Naohiko Kohtake

Graduate School of System Design and Management, Keio University, Japan

2017-t-23 (17:00 – 17:20)

Process Optimization Method for the Simplification of Developing Indoor-Outdoor Seamless Positioning Environment

Kenichi Tabata1,2, Madoka Nakajima1,2, Naohiko Kohtake1

1Graduate School of System Design and Management, Keio University, Yokohama, Japan, 2Kokusai Kogyo Co., Ltd, Tokyo, Japan

2017-t-24 (17:20 – 17:40)

A Simulation for GNSS Utilization and DEM Construction in Urban

Masahiko Nagai1, Sakpod Tongleannak2, Zahid Wani2

1Center for Research and Application for Satellite Remote Sensing, Yamaguchi University, Japan, 2Asian Institute of Technology, Thailand
**[t-6] Modeling and Simulation**

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<td>Masahiko Nagai (Yamaguchi University, Japan)</td>
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2017-t-25 (11:00 – 11:20)

**Development of Open Model-based Collaboration Tool and Application on Nano-satellite Project**

Yohsuke Nambu, Masashi Miura, Ryosuke Yoshizawa, Toshishige Hagihara, Shunsuke Kimura, Akira Yumiyama, Satoru Igarashi

Osaka Prefecture University, Osaka, Japan, Tottori University, Tottori, Japan, levii Inc., Tokyo, Japan

2017-t-26 (11:20 – 11:40)

**SIRIUS Model-Driven Software Product Line for Flight Dynamics Systems**

Pâmini Annat, Romain Bernard, Jesús Esteban Dones

Centre National d’Etudes Spatiales, CNES, Toulouse, France, EXM S, France, Thalès Services, Toulouse, France

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**[u-1] Space Education for Children and General Public**

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<td>Kaori Sasaki (Japan Aerospace Exploration Agency, Japan)</td>
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2017-u-01 (9:00 – 9:20)

**Space Education Method to Influence School Teachers**

Osamu Matsubara
Space Education Center, JAXA, Sagamihara, Japan

2017-u-02 (9:20 – 9:40)

**JAXA Space Education Program for Informal Education- The Process of Reorganizing “Aerospace School”**

Keiko Miyata
Japan Aerospace Exploration Agency (JAXA) Space Education Center

2017-u-03 (9:40 – 10:00)

**Outreach and Public Relations of Hayabusa2 Project**

Makoto Yoshikawa, Eri Koyama, Satoshi Hosoda, Yuto Takei, Satoru Nakazawa, Yuichi Tsuda, Azusa Yabe, Takuya Ohkawa
Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

2017-u-04 (10:00 – 10:20)

**Space Development Board Game for Learning Public Engagement in Science and Technology**
Space Education Program Based on High-Altitude Aerial Shooting from Stratosphere Using Space Balloon and Virtual Reality Technique

Ryuya Yokoo1, Yusuke Teshima1, Haruya Uchida1, Koya Kuwamura2, Susumu Hara3
1Department of Mechanical and Aerospace Engineering, School of Engineering, Nagoya University, Japan, 2Department of Aerospace Engineering, Graduate School of Engineering, Nagoya University, Japan

[u-2] Space Education for Students of Engineering

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<td>Alim Rustem Aslan (Istanbul Technical University, Turkey)</td>
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Implementation Report of KOSEN Space Camp

Makoto Wakabayashi1, Taku Takada2, Kazumasa Imai2, Yoshihiro Kajimura3, Jun Nakaya4, Kentarou Kitamura4, Yukikazu Murakami5, Fumio Asai6, Masahiro Tokumitsu6, Manabu Shinohara6, Kazuo Shimada7
1National Institute of Technology (NIT), Nihama College, Japan, 2NIT, Kochi College, Japan, 3NIT, Akashi College, Japan, 4NIT, Gunma College, Japan, 5NIT, Tokuyama College, Japan, 6NIT, Kagawa College, Japan, 7NIT, Nara College, Japan, 8NIT, Yonago College, Japan, 9NIT, Kagoshima College, Japan, 10Human Network KOSEN, Japan

Three-years Results of Space Technology Education Project from a Collaboration with National Technical Colleges for Small Spacecraft Development

Taku Takada1, Kazumasa Imai2, Kentarou Kitamura2, Yukikazu Murakami3, Fumio Asai4, Makoto Wakabayashi5, Yoshihiro Kajimura6, Nobuto Hirakoso7, Manabu Shinohara8, Jun Nakaya9, Masahiro Tokumitsu10, Kazuo Shimada11
1National Institute of Technology (NIT), Kochi College, Nankoku, Japan, 2NIT, Kochi College, Japan, 3NIT, Akashi College, Japan, 4NIT, Gunma College, Japan, 5NIT, Tokuyama College, Japan, 6NIT, Kagawa College, Japan, 7NIT, Nara College, Japan, 8NIT, Yonago College, Japan, 9NIT, Kagoshima College, Japan, 10Human Network KOSEN, Tokyo, Japan

An Engineering Design Education Program as an Inheritance of Space Technology Education Project

Kentaro Kitamura1, Itsuo Sakuramoto1, Mitsumasa Ikeda1, Taku Takada2, Kazumasa Imai2, Makoto Wakabayashi3, Kosen Space Collaboration Group1
1National Institute of Technology, Tokuyama College, Yamaguchi, Japan, 2National Institute of Technology, Kochi College, Yamaguchi, Japan, 3National Institute of Technology, Nihama College, Yamaguchi, Japan

Case Study of University of Tsukuba for Global Space Exploration Engineering Education

Toshihiro Kameda1, Akihiro Nagata2, Atsushi Yasuda2, Hiromasa Watanabe2
1Faculty of Engineering, Information and Systems, University of Tsukuba, Tsukuba, Japan, 2Graduate School of Systems and Information Engineering, University of Tsukuba, Tsukuba, Japan

Human Network KOSEN, Tokyo, Japan, 3Graduate School of Pure and Applied Sciences, University of Tsukuba, Tsukuba, Japan
[u-3] Satellites for Space Education

Session Date: June 6 (Tue) 14:00 – 15:40
Room: Meeting Room 11
Chairpersons: Hironori Sahara (Tokyo Metropolitan University, Japan), Mohammed Khalil Ibrahim (Nihon University, Japan)

2017-u-11 (14:00 – 14:20)
Introducing CanSat for Project Based Learning (PBL) of Space Science and Engineering in Nepal
Rakesh Chandra Prajapati1, Abinish Kumar Dutta1,2, Sanjeeb Humagain1,2, Saurav Paudel2, Jiten Thapa2, Safal Shrestha2
1Pico/Nano-Satellite Research and Development Lab, ORION Space, Kathmandu, Nepal, 2Department of Electrical and Electronics Engineering, Kathmandu University, Duhlikhel, Nepal

2017-u-12 (14:20 – 14:40)
Capacity Building in Space Technology in the Philippines through the PHL-Microsat Program
Mary Ann Constante1, Paula Jean Cansino1, Izrael Zenar Bautista1, Gladys Bajaro1
1College of Engineering, University of the Philippines Diliman, Quezon City, Philippines, 2Advanced Science and Technology Institute, Department of Science and Technology, Quezon City, Philippines

2017-u-13 (14:40 – 15:00)
Developing a MicroSat Kit for Space Systems Engineering Education
Nguyen Huu Diep, Nguyen Dinh Chau Minh, Pham Van Phap, Nguyen Tien Su, Cao Xuan Hiep, Pham Anh Minh, Tran Cong Duong, Nguyen Truong Thanh, Hoang The Huynh, Le Xuan Huy
Vietnam National Satellite Center (VNSC), Vietnam

2017-u-14 (15:00 – 15:20)
Scalable Nano-Satellite Platform for Low-Cost Space Education
Toshinori Kuwahara, James Harpur, Shinya Fujita, Yuji Sato, Ta Phuong Linh, Ngo Thanh Cong, Tran Van Ninh, Nguyen Minh Thao, Pasith Tangdhanakanond
Department of Aerospace Engineering, Tohoku University, Sendai, Japan

Unified Dissemination System of Multiple Satellite Image Data
Toshiaki Iwata, Ryosuke Nakamura, Toru Koyama, Soushi Kato, Atsushi Oda
National Institute of Advanced Industrial Science and Technology (AIST), Tokyo, Japan

[u-4] Competitions and Culture
### 2017-u-16 (16:00 – 16:20)

**Satellite Design Contest in Japan – Present and Future**

Koichiro Oyama¹, Takeshi Ori²  
¹Institute of Space and Plasma Sciences, National Cheng Kung University, Taiwan, ²Japan Space Forum

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### 2017-u-17 (16:20 – 16:40)

**Space Architecture Competitions, Which Drive STEAM for NewSpace**

Misuzu Onuki¹, Akito Sogame², Yozan Takahashi²  
¹Space Frontier Foundation, Japan, ²Tokai University

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### 2017-u-18 (16:40 – 17:00)

**KOSMOS, an Artistic Model of the Solar System with Same Scale for Size and Distance**

Xavier Daniel¹, Guy Pignolet²  
¹Artist, Reunion Island, ²Reunion Island Space Initiative

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### 2017-u-19 (17:00 – 17:20)

**Inter-networking Space Technology and Science :from “National” to “Global-Local”**

Guy Pignolet¹, Edmond Lauret², Ryojiro Akiba³  
¹Reunion Island Space Initiative, Reunion, ²Professional Dreamer, Reunion, ³HASTIC, Japan

---

### [u-5] Rockets for Space Education

### 2017-u-20 (9:00 – 9:20)

**A Study on Development of a Small Hybrid Rocket as an Educational Material**

Masaya Nakahara¹, Ryuichi Tokigawa¹, Keisuke Watada¹, Kohki Banden¹, Fumiaki Abe³, Kenichi Tokunaga¹, Atsushi Ishihara²  
¹Department of Mechanical Engineering, Ehime University, Matsuyama, Japan, ²Department of Mechanical Engineering, Saitama Institute of Technology, Fukaya, Japan

---

### 2017-u-21 (9:20 – 9:40)

**A Hybrid Rocket for Usual Science Classes in a Public Junior High School**
EspaceLab: Fab Lab Aimed Towards Teaching and Community Projects in the Fields of Aerospace, Robotics, and Environmental Sciences

Paul-François Paradis, Benoît Debaque, Simon Lambert Girard, Margarida Romero
EspaceLab, Quebec, Canada, Laval University, Teaching and Learning Dept., Quebec, Canada

A Development of Candy Hybrid Rocket Motor for Undergraduate Space Education

Yutaka Wada, Yo Kawabata, Kenji Ogimoto, Hiroaki Akiyama, Takao Yanagi, Seiichi Sakamoto
Chiba Institute of Technology, Japan, SOUKI Systems Co. Ltd., Japan, Wakayama University, Japan, Hakuhodo DY media partners Inc., Japan, NAOJ, Japan

[v-1] Law and Policy for Space Development

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<td>Yasuaki Hashimoto (The National Institute for Defense Studies, Japan)</td>
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<tr>
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<td>Hirotaka Watanabe (Osaka University, Japan)</td>
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</table>

The Legal Status of the Hosted Payload

Akiko Watanabe
Independent Researcher, Tokyo, Japan

The Legality of an International Regime for Space Traffic Management (STM) – Placing the co-existence of military and civil STM systems –

Yu Takeuchi
Management and Integration Department, Space Technology Directorate I, JAXA, Tsukuba, Japan

The Space Policy of the Carter Administration: A Reconstruction of National Space Policy in the Cold War

Hirotaka Watanabe
Osaka University, Japan

Crafting the Philippines Space Development and Utilization Policy and Creating the Philippine Space Agency: Challenges and Opportunities

Rogel Mari Dionisio Sese
National SPACE Development Program, Philippines
### Policy for Space Development

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<td>Room</td>
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</table>
| Chairpersons| Motoko Uchitomi (The University of Tokyo, Japan)  
             | Yasuaki Hashimoto (The National Institute for Defense Studies, Japan) |

#### 2017-v-06 (11:00 – 11:20)

**Earthquake Prediction Research as a National Space Project**

Tetsuya Kodama  
Research and Development Directorate, JAXA, Tsukuba, Japan

#### 2017-v-08 (11:20 – 11:40)

**The Implication of Remote Sensing to the Asian Regional Security**

Yasuaki Hashimoto  
Policy Studies Department, The National Institute for Defense Studies, Tokyo, Japan

#### 2017-v-09 (11:40 – 12:00)

**Space Development Models and Paths Analysis of Asian and African Countries**

Feng-Tai Hwang  
National Space Organization, Hsinchu City, Taiwan

#### 2017-v-10 (12:00 – 12:20)

**The Use of Space Applications in a context of Terrorist Threats**

Anne-Sophie Martin  
Political Science, University of Rome “La Sapienza”, Italy

### Economy for Space Development

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<tbody>
<tr>
<td>Room</td>
<td>Meeting Room 15</td>
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</tbody>
</table>
| Chairpersons| Hirotaka Watanabe (Osaka University, Japan)  
             | Hiroshi Yoshida (Excalibur K.K, Japan) |

#### 2017-v-11 (14:00 – 14:20)

**NewSpace Innovation Creating the Next-gen Space Economy**

Misuzu Onuki  
Space Frontier Foundation, Japan

#### 2017-v-12 (14:20 – 14:40)
## [w-1] Safety and Mission Assurance (EEE Parts)

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<tr>
<td>Chairpersons</td>
<td>Katsuhito Goto (JAMSS, Japan)</td>
</tr>
<tr>
<td></td>
<td>Ryoji Kobayashi (Japan Aerospace Exploration Agency, Japan)</td>
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</tbody>
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**2017-w-01 ( 9:00 – 9:20 )**

### SEE Sensitivity Evaluation Results of Atom Switch ROM/FPGA

Kozo Takeuchi¹, Munehiro Tada², Toshitsugu Sakamoto², Hiroyuki Shindo¹, Satoshi Kuboyama¹, Akinori Takeyama², Takeshi Ohshima³, Koichi Suzuki³

¹Research and Development Directorate, JAXA, Tsukuba, Japan, ²System Platform Research Laboratories, NEC Corp., Tsukuba, Japan, ³Quantum Beam Science Research Directorate, QST, Takasaki, Japan

**2017-w-02 ( 9:20 – 9:40 )**

### Development of Rad-Hard Super-Junction Power MOSFETs

Eiichi Mizuta¹, Yuki Nakada², Satoshi Kuboyama¹, Masanori Inoue², Yuji Kumagai², Koichi Suzuki¹

¹Research and Development Directorate, JAXA, Tsukuba, Japan, ²Fujitsu Electric Co., Ltd., Matsumoto, Japan

**2017-w-03 ( 9:40 – 10:00 )**

### Approach to High Thermal Conductive Substrate for Electronic Components

Kazunori Shimazaki, Yuji Yamada, Koichi Suzuki

Research and Development Directorate, JAXA, Tsukuba, Japan

**2017-w-04 ( 10:00 – 10:20 )**

### Construction of the Measurement Equipment and Preliminary Evaluation for Near-magnetic-field Effects of High Performance Space LSIs

Keita Sakamoto, Hiroyuki Shindou, Satoshi Kuboyama, Koichi Suzuki

Japan Aerospace Exploration Agency, JAXA, Japan

**2017-w-05 ( 10:20 – 10:40 )**

### A Proposal for Guideline to use the COTS EEE parts for The Scientific Satellites

Kazuhide Noguchi

Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

## [w-2] Safety and Mission Assurance (Assurance Technology)

| Session Date       | June 6 (Tue) 11:00 – 12:20 |
2017-w-06 (11:00 – 11:20)

**Preliminary Evaluation of 6 MV Tandem Accelerator in Tsukuba University for Single Event Testing**

Akifumi Maru, Hiroyuki Shindou, Koichi Suzuki

JAXA, Japan

2017-w-07 (11:20 – 11:40)

**Preliminary Radiation Test Result for Space-Ready Qualification of Lunar Micro Rover**

Takuto Oikawa¹, Toshiki Tanaka², Yuto Suebe³, Kentaro Uno¹, Hugo Zuliani⁴, Louis J. Burtz⁵, Kazuya Yoshida¹

¹Department of Aerospace Engineering, Tohoku University, Sendai, Japan, ²K.K. i-space inc., Tokyo, Japan

2017-w-08 (11:40 – 12:00)

**Improving Activity of Clean Room for Scientific Spacecraft**

Matsushi Miura, Fuminari Ito, Ryoji Kobayashi

Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

2017-w-09 (12:00 – 12:20)

**Lessons Learned from NASA Space Launch System (SLS) Exploration Mission 1 (EM-1) Payload Safety Review Panel (PSRP) for Secondary Payloads**

Takashi Goto¹, Masami Mikì¹, Masako Kikuchi², Koji Oga¹, Teruhiko Tabuchi², Toshinori Ikenaga³, Ryu Funase³, Tatsuki Hashimoto⁴

¹Japan Manned Space Systems Corporation (JAMSS), Tsukuba, Japan; ²JAXA, Tsukuba, Japan; ³University of Tokyo, Tokyo, Japan; ⁴Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan;

[w-3] Safety and Mission Assurance (Principles and Standards)

**Session Date** | June 6 (Tue) 14:00 – 15:40
---|---
**Room** | Meeting Room 14
**Chairpersons** | Koichi Suzuki (Japan Aerospace Exploration Agency, Japan)

Ryoji Kobayashi

Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

2017-w-11 (14:00 – 14:20)

**Principles to Develop and Operate Resilient Spacecraft**

Ryoji Kobayashi

Institute of Space and Astronautical Science, JAXA, Sagamihara, Japan

2017-w-12 (14:20 – 14:40)

**The Utilization of the Metrics of Scale of “Severity” and “Probability” in a Qualitative Risk Matrix**

Yasushi Mori
2017-w-13 ( 14:40 – 15:00 )

Quality Leadership Communication: International Cooperation in IAQG/IAQG
Hiroki Yanagawa
Mitsubishi Heavy Industries, Ltd., Japan

2017-w-14 ( 15:00 – 15:20 )

Lessons Learned from ESA/NASA/JAXA Trilateral Efforts for Mutual Recognition of S&MA Standards
Masami Mitsui1, Shuji Araki2, Mieko Matsuda2, Shunsuke Sasaki1, Rafael Prades4, Frank Groen3
1JAMSS, Japan, 2JAXA, 3NASA, 4ESA

2017-w-15 ( 15:20 – 15:40 )

JAXA Design Standards for Space Project
Yuji Kado1, Shuji Araki1, Mieko Matsuda2, Masayuki Ikeuchi2
1Japan Aerospace Exploration Agency, Tsukuba, Japan, 2Japan Aerospace Exploration Agency, Kanagawa, Japan

[w-4] Safety and Mission Assurance (Software Assurance)

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<td>Shuji Araki (Japan Aerospace Exploration Agency, Japan)</td>
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<tr>
<td></td>
<td>Koichi Suzuki (Japan Aerospace Exploration Agency, Japan)</td>
</tr>
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</table>

2017-w-16 ( 16:00 – 16:20 )

A New Software IV&V Approach Based on CAST and Safety-Driven Design
Keita Sakemi1, Michihiro Matsumoto2, Nobuyuki Hoshino1, Hideki Nomoto1, Rihiho Aman2, Yamato Fukuta2, Satoru Kitamura2, Takashi Kunifi2
1Japan Manned Space Systems Corporation, Japan, 2East Japan Railway Company

2017-w-17 ( 16:20 – 16:40 )

A study of Applying Past Accident Cases to Software Design Across Domains using Control Structuring Diagram
Kazuki Kakimoto1, Shigeo Yoshikawa2, Hideki Nomoto2
1JAXA: Japan Aerospace Exploration Agency, Tsukuba Japan, 2JAMSS: Japan Manned Space Systems Corporation, Japan

2017-w-18 ( 16:40 – 17:00 )

Transition of Independent Verification and Validation Activity and Refined Concept at the Mature Age
Naoko Okubo, Hiroki Umeda, Shinji Kawaguchi, Taisuke Kanbe, Yasushi Ueda
Research Unit III, Research and Development Directorate, JAXA, Tsukuba, Japan

2017-w-19 ( 17:00 – 17:20 )

Improvement of SA Activities in Spacecraft Software Development by Value Propagation of Standard Process
Tomohito Yamada, Masafumi Katahira
Finalist Student Session

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<td>Chairpersons</td>
<td>Hironori Sahara (Tokyo Metropolitan University, Japan)</td>
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<tr>
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<td>Akira Kakami (University of Miyazaki, Japan)</td>
</tr>
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2017-s-01-a ( 9:00 – 9:20 )

Analysis of Alternative Liquid Propellants and Propulsion Systems for Micro Launch Vehicles

Francesco Iervese
Politecnico di Milano, Milano, Italy

2017-s-02-b ( 9:20 – 9:40 )

Parameter Survey on Rotating Magnetic Field Acceleration Method

Takeru Furukawa
Graduate School of Engineering, Tokyo University of Agriculture and Technology, Tokyo, Japan

2017-s-03-b ( 9:40 – 10:00 )

Power Matching between Plasma Source and Electrostatic Acceleration in Helicon Electrostatic Thruster

Yoshiya Nakagawa
Department of Aerospace Engineering, Nagoya University, Nagoya, Japan

2017-s-04-c ( 10:00 – 10:20 )

Electromagnetic Deployment of a Space Membrane Structure using the Geomagnetic Field in LEO

Yuki Yamada
Department of Aerospace Engineering, Nagoya University, Japan

2017-s-05-d ( 10:20 – 10:40 )

Low-Thrust Trajectory Design to Improve Overall Mission Success Probability Incorporating Target Changes in Case of Engine Failures

Akifumi Wachi
Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan

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| Session Date | June 8 (Thu) 11:00 – 12:40 |
2017-s-06-d (11:00 – 11:20)

An Analytical Solution for Multi-revolution Transfer Trajectory with Periodic Thrust and Non-Singular Elements

Yusuke Ozawa
Department of Advanced Energy, The University of Tokyo, Kashiwa, Japan

2017-s-07-d (11:20 – 11:40)

Attitude and Orbit Control of a Spinning Solar Sail by the Vibrational Input on the Sail Membrane

Yuki Takao
Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan

2017-s-08-d (11:40 – 12:00)

Estimation Algorithm of Relative Position and Attitude during Proximity Rendezvous and Docking Using Multiple Ultra-Wide-Band Devices

Mikihiro Ikura
Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan

2017-s-09-e (12:00 – 12:20)

Development of Engineering Model Providing Body Force Distribution of Tri-electrode Plasma Actuator

Kumi Nakai
Department of Mechanical Systems Engineering, Tokyo University of Agriculture and Technology, Tokyo, Japan

2017-s-10-e (12:20 – 12:40)

Ballistic Range Experiment of Sphere in Dusty Atmosphere

Chihiro Masaki
Department of Advanced Energy, The University of Tokyo, Chiba, Japan

2017-s-11-f (14:00 – 14:20)

Magnetic Plasma Deorbit for Nano-Satellites Using Plasma Drag Force

Shinji Matsuzawa
Department of Aerospace Engineering, Nagoya University, Japan
Design and Development of the STARS-E Climber’s Roller
Daichi Murakami
Department of Precision Machinery Engineering, Nihon University, Chiba, Japan

Analysis of Expander-Cycle Rocket Engine Performance at Varying Mixture Ratios
Matthew Richardson
Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan

Laser-induced Spark Ignition for DME-Air Mixtures under Microgravity
Yoshinari Kobayashi
Department of Aeronautics and Astronautics, University of Tokyo, Tokyo, Japan

The Study of the Space-based Observation of Lunar Impact Flashes
Ryota Fuse
Department of Aerospace Engineering, Nihon University, Chiba, Japan

Session Date June 8 (Thu) 16:00 – 17:40
Room Sub-Hall
Chairpersons Hirokazu Masui (Kyushu Institute of Technology, Japan)
Hideto Mashidori (Tokyo Metropolitan College of Industrial Technology, Japan)

Study of Heater Electric Power Control with Autonomous Distributed System
Keisuke Umeda
Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan

Dynamics and Control of Double-tethered Space-Tug System after Tether Rupture
Keying Yang
Beijing Institute of Technology, Beijing, China

Analysis for the Amount of Electron-Hole Pair in Floride Polymer Irradiated by Electron Beam
Shugo Yoshida
Electric Measurement and Machine Control Laboratory, Tokyo City University, Tokyo, Japan

Construction of the Carrier Mobilities Measurement System by Time of Flight Method
Visualization Methods for Spacecraft Telemetry Data Using Change-point Detection and Dimensionality Reduction

Ryo Sakagami
Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan

Technical Session Poster

[Poster Session]

Session Date: June 7 (Wed) 14:00 – 15:50
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2017-a-45p
Super High Efficiency Slotless 3-phase Brushless Motor- Deploying This Motors to Aerospace –
Yukio Fukushima1, Toyohiko Ota1, Kouichi Watanabe2
1Advanced science & intelligence research institute, inc, ASIRI, Japan, 2Fine motion laboratory, FM, Japan

2017-b-22p
Performance of Variable Magnetic Field Ion Engine of Microwave Discharge Type
Yoshiyuki Takao, Yuki Motokawa, Kaka Haku
Department of Integrated System Engineering, Nishinippon Institute of Technology, Fukuoka, Japan

2017-b-64p
Thrust-performance Maximization of Microwave Rocket Sustained by Resonant Magnetic Field
Masayuki Takahashi, Naofumi Ohnishi
Department of Aerospace Engineering, Tohoku University, Sendai, Japan

2017-b-65p
Thermal Analysis of Steady-State Fully Radiation-Cooled MPD Thrusters Using Permanent Magnets for Manned Mars Exploration
Kengo Chino1, Shota Saito1, Yoshikazu Sugiyama1, Hirokazu Tahara1, Kyoko Takada2
1Department of Mechanical Engineering, Osaka Institute of Technology, Osaka, Japan, 2Department of Intellectual Property, Osaka Institute of Technology, Osaka, Japan

2017-b-66p
Research and Development of Osaka Institute of Technology PROITERES Series Nano-Satellites with Electric Propulsion
Ryota Fujita1, Hiroki Fujita1, Tsubasa Yamauchi1, Kaisei Kajihara1, Ryuta Yagi1, Hirokazu Tahara1, Kyoko Takada2, Tomoyuki Ikeda3
1Department of mechanical engineering, Osaka Institute of Technology, Osaka, Japan, 2Department of Intellectual Property, Osaka Institute of Technology, Osaka, Japan, 3Department of Aeronautics and Astronautics, Tokai University, Kanagawa, Japan

2017-b-67p
Impulse performance of Donut-Spherical Laser Launch System in Stratosphere Air-Pressure Conditions
Duc Thuan Tran, Chongfa Xie, Koichi Mori
Department Engineering, Nagoya University, Nagoya, Japan

2017-b-68p

The Micro-Cathode Arc Thruster for CubeSats
Yong Cao, Zhi Yang, Liang Zheng
Harbin Institute of Technology (Shenzhen)

2017-b-69p

Chemically Augmented Arcjet Thrusters
Yuka Arai, Shoko Shaibagaki, Kai Wada, Mitsutoshi Tsuchiya, Tomoyuki Ikeda, Hideyuki Horisawa
Tokai University, Japan

2017-b-70p

Feasibility Study on Rarefied Propellant Flow Measurement
Yoshinori Nakayama
Department of Aerospace Engineering, National Defense Academy, Yokosuka, Japan

2017-b-71p

Characteristics of Helicon Plasma Thruster using Advanced Acceleration Methods
Daisuke Kuwahara1, Shuichi Nishimura2, Takeru Furukawa1, Tomoya Yamase1, Daisuke Arai2, Kosuke Amma2, Yuichi Ishigami2, Hirotaka Horita2, Shunjiro Shinohara1
1Institute of Engineering, Tokyo University of Agriculture and Technology, Koganei, Tokyo, Japan, 2Graduate School of Engineering, Tokyo University of Agriculture and Technology, Koganei, Tokyo, Japan

2017-b-72p

Postural Control for Beam-Riding Flight of a Microwave Rocket Using an External Magnetic Field
Masayuki Takahashi, Naofumi Ohnishi
Department of Aerospace Engineering, Tohoku University, Sendai, Japan

2017-b-73p

Short-Pulse Operation of a Laser-Assisted Pulsed Plasma Thruster
Hiroaki Kamezaki1, Kota Matsubara2, Kentaro Kato3, Yuji Oigawa2, Hideyuki Horisawa3
1Undergraduate student, Department of Aeronautics and astronautics, Tokai University, Japan, 2Graduate student, Department of Aeronautics and astronautics, Tokai University, Japan, 3Professor, Department of Aeronautics and astronautics, Tokai University, Japan

2017-b-74p

Chemically Augmented Laser-thermal Thrusters
Mitsutoshi Tsuchiya1, Yuka Arai1, Kai Wada1, Miya Isoda1, Shoko Shibagaki1, Tomoyuki Ikeda2, Hideyuki Horisawa3
1Graduate student of Mechanical Engineering, Tokai University, Japan, 2Department of Aerospace and Astronautics Engineering, Associate Professor Tokai University, Japan, 3Department of Aerospace and Astronautics Engineering, Professor, Tokai University, Japan

2017-b-76p

Preliminary Experiment of Electric Field Measurement in Applied Magnetic Field Plasma by Laser Induced Fluorescence Dip Spectroscopy
Makoto Matsui, Arata Kishida
Department of Mechanical Engineering, Shizuoka University, Hamamatsu, Japan

2017-b-77p

Magnetic Field Measurement of Laser-Electromagnetic Hybrid Thrusters
Yuki Murayama1, Toshiaki Ohi1, Kentaro Kato1, Haruhito Kato1, Nao Akashi1, Hideyuki Horisawa2
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<th>Institutions</th>
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<td>2017-b-78p</td>
<td>Three-Dimensional Full Particle in Cell (PIC) Analyses of Three-Grid Ion Engine Operations</td>
<td>Takatsugu Honda, Takeshi Miyasaka, Ryo Kawamura, Takeshi Hasegawa, Makoto Asahara</td>
<td>Gifu University, Japan</td>
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<td>2017-b-79p</td>
<td>Evaluations of Unsteady Ablation and Exhaust Phenomena on Coaxial Pulsed Plasma Thrusters</td>
<td>Takaaki Goto, Takeshi Miyasaka, Takahiro Kajiwara, Yuki Goto, Koji Nishigaki, Yoshimasa Matsu, Makoto Asahara</td>
<td>Gifu University, Japan</td>
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<td>2017-b-80p</td>
<td>Plasma Profiles in a Two-dimensional Anode-layer-type Hall Thruster</td>
<td>Shigeru Yokota¹, Hiroki Narimoto², Wataru Shimizu³, Junko Yamasaki², Kohei Shimamura¹</td>
<td>¹Division of Structure and Energy, University of Tsukuba, Ibaraki, Japan, ²Department of Structure and Energy, University of Tsukuba, Ibaraki, Japan</td>
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<td>2017-b-81p</td>
<td>Two-dimensional Hollow Cathode</td>
<td>Moyuru Yonaha¹, Junko Yamasaki², Shigeru Yokota², Kohei Shimamura²</td>
<td>¹Department of Structure and Energy, University of Tsukuba, Ibaraki, Japan, ²Division of Structure and Energy, University of Tsukuba, Ibaraki, Japan</td>
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<td>2017-b-83p</td>
<td>Development of 1mN-class Hall Thruster for Small Satellites</td>
<td>Shigeru Yokota¹, Yamato Adachi², Junko Yamasaki², Kohei Shimamura¹</td>
<td>¹Division of Engineering Mechanics and Energy, University of Tsukuba, Japan, ²Department of Engineering Mechanics and Energy, University of Tsukuba</td>
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<td>2017-b-84p</td>
<td>Cathode Position Effect on Hall Thruster Performance</td>
<td>Shigeru Yokota¹, Ken Nakatani¹, Junko Yamasaki², Kohei Shimamura²</td>
<td>¹Division of Engineering Mechanics and Energy, University of Tsukuba, Tsukuba, Japan, ²Department of Engineering Mechanics and Energy, University of Tsukuba, Tsukuba, Japan</td>
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<td>2017-c-63p</td>
<td>3D Periodic Auxetic Cellular Structures</td>
<td>Li Ma</td>
<td>Center for Composite Materials, Harbin Institute of Technology, China</td>
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<td>Formation Flying in Space-Borne Artificial Magnetic Dipole Field</td>
<td>Yu Cheng¹,², Gerard Gómez¹,², Josep J. Masdemont¹, Jianping Yuan¹</td>
<td>¹School of Astronautics, Northwestern Polytechnical University, Xi'an, China, ²IEEC &amp; Departement de Matemàtiques i Informàtica, Universitat de Barcelona, Barcelona, Spain</td>
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<td>ISTS-2017-d-168p/ISSFD-2017-168p</td>
<td>Reducing the Lunisolar Numerical Ephemerides for Onboard Applications</td>
<td>Jingshi Tang¹,², Haishuo Wang¹, Hanyang Liu¹, Guanshan Pu¹, Lin Liu¹,²</td>
<td>¹School of Astronomy and Space Science, Nanjing University, China, ²Institute of Space Environment and Astrodynamics, Nanjing University, China</td>
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<td>ISTS-2017-d-171p/ISSFD-2017-171p</td>
<td>The Orbit Maneuvers for Full-Parameter Reentry of Spacecraft</td>
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Dynamics and Mission Design for Space Debris Mitigation in the Geostationary Orbits

William Silva¹, Maisa Terra¹, Claudia Celestino², Cristiano Melo³
¹Technological Institute of Aeronautics, ITA, São José dos Campos, Brazil, ²Federal University of ABC, UFABC, Santo André, Brazil, ³Federal University of Minas Gerais, UFMG, Belo Horizonte, Brazil

Altitude and Motion Estimation for Autonomous Vehicles through Wide-Field-Integration of Optic Flow

Ryusuke Nakata, Naoto Kobayashi, Mai Bando, Shinji Hokamoto
Department of Aeronautics and Astronautics, Kyushu University, Fukuoka, Japan

Theoretical Analysis on Zero Propellant Maneuver Existent Conditions

Mo-Yao Yu, Ya-Zhong Luo¹,², Hai-Yang Li²
¹College of Aerospace Science and Engineering, National University of Defense Technology, Changsha, China

Autonomous Orbit Determination of Satellites around Triangular Libration Points in the Earth-Moon System

Bin Liu, Xinyun Hou, Jingshi Tang, Lin Liu
School of Astronomy and Space Science, Nanjing University, China

SAOCOM-CS: Definition of Orbital Requirements for Tomographic Phase

Cecilia Mezzera¹, Itzizar Barati¹, Berthyl Duesmann¹, Stefano Tebaldini², Mario Azcueta³, Bram de Vogeleer⁴
¹European Space Agency, Netherlands, ²Deimos-Space@ESA, ³Politecnico di Milano, ⁴ImS space consultancy @ESA

Spectroscopic Measurement of the Temperature Field Modulated by Energy Deposition Method

Kenji Okada¹, Shinji Koizumi², Kohei Suwata³, Takuiro Kito³, Atsushi Matsuda³
¹Meijo University Graduate School, Japan, ²DENS TECHNO Co., Japan, ³Meijo University, Japan

Aerodynamic Analysis of Body-Flap in Hypersonic Flow

Lin Huo, Tao Yang
National University of Defence Technology, Changsha, China

Preliminary Study of Reduction of Metallic Oxide in Moon and Other Planets by Laser and Inductively Coupled Plasmas

Yasuaki Aiba¹, Akira Kuwahara¹, Ryo Myoen¹, Makoto Matsui¹
¹Department of Engineering, Shizuoka University, Hamamatsu, Japan, ²Japan Atomic Energy Agency, Tokai, Japan

Temperature Measurement by Bremsstrahlung Radiation from Laser Sustained Plasma using Diode Laser

Takahiro Ono, Koji Nishimoto, Makoto Matsui
Graduate school of Integrated Science and Technology, Department Engineering, Shizuoka University, Hamamatsu, Japan
Modeling of Explosive Detonation by Flyer Impact in Microscale Exploding Foil Initiator System
Kyoungjin Kim, Kyu-Hyoung Kim, Seung-Gyo Jang
1Kumoh National Institute of Technology, Gumi, Republic of Korea, 2Hanwha Corporation, Daejeon, Republic of Korea, 3Agency for Defense Development, Daejeon, Republic of Korea

2017-f-103p

Design and Implementation of Single Event Latch-up Measurement and Self-Recovery System for BIRDS CubeSat
Abdulla H. Kafi, BIRDS Project Members, BIRDS Partners, George Maeda, Sangkyun Kim, Hirokazu Masui, Meng Cho
Laboratory of Spacecraft Environment Interaction Engineering, Kyushu Institute of Technology, Japan

2017-f-104p

Design of Reel-Type Tether-Deployment Mechanism in the Satellite STARS-E for Verifying Space Elevator Technology
Kenji Nakashima, Yoshiki Yamagiwa, Masahiro Nohmi, Yoshio Aoki, Atsushi Bito
1The University of Shizuoka, Japan, 2Nihon University, Japan

2017-h-25p

Spectral Emissivity Measurements of Molten Metals with an Electrostatic Levitation Furnace
Yuki Watanabe, Haruka Tamaru, Junpei T Okada, Takehiko Ishikawa
1Advanced Engineering Services Co. Ltd., Tsukuba, Japan, 2Human Spaceflight Technology Directorate, Japan Aerospace Exploration Agency, Tsukuba, Japan, 3Institute for Materials Science, Tohoku University, Sendai, Japan, 4Institute of Space and Astronautical Science, JAXA, Tsukuba, Japan, 5SOKENDAI, Japan

2017-j-26p

Concept of Continuous Space Communication Using Relay Station
Nadeem Alam
Department of Aeronautical Engineering, Babu Banarasi Das National Institute of Technology and Management, India

2017-j-27p

A Studies on Beam Propagation Simulations for Optical Systems of Free Space Optical Channel
Hiroki Yamashita, Yoshihisa Takayama
Tokai University, Japan

2017-j-28p

Estimation of Data Transmission Quality under Atmospheric Effects in Free-space Laser Communication
Eiji Taira, Hiroki Yamashita, Yoshihisa Takayama
The University of Tokai, Japan

2017-j-29p

Studies on Optical Link Establishment by using Retro-reflector in Free-space Optical Communications
Keiji Oda, Yoshihisa Takayama
Tokai University, Japan

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Performance Model Simulation of Ganymede Laser Altimeter (GALA) for the JUICE Mission

Hiroshi Araki1, Ko Ishibashi2, Noriyuki Namiki3, Hirotomo Noda4, Masanori Kobayashi2, Keigo Enya5, Masanobu Ozaki5, Takahide Mizo4, Yoshihisa Saito5, Kazuyuki Touhara6, Shoko Oshigami7, Shingo Kashima8, Jun Kimura9, Shingo Kobayashi9, Gregor Steinbruegge10, Alexander Stark11, Christian Althaus12, Simone Del Togno13, Kay Lingenauber14, Hauke Hussmann15

1National Astronomical Observatory of Japan, Tokyo, Japan, 2Planetary Exploration Research Center, Chiba Institute of Technology, Chiba, Japan, 3Institute of Space and Astronomical Science, JAXA, Sagamihara, Japan, 4Osaka University, Osaka, Japan, 5National Institute of Radiological Science, Chiba, Japan, 6German Aerospace Center (DLR), Berlin, Germany

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Science Objectives of the Ganymede Laser Altimeter (GALA) for the JUICE Mission

Jun Kimura1, Shunichi Kamata1, Koji Matsumoto1, Shoko Oshigami1, Noriyuki Namiki5, Kiyoshi Kuramoto5, Sho Sasaki1, Keigo Enya5, Hauke Hussmann9, Kay Lingenauber8

1Department of Earth and Space Science, Osaka University, Osaka, Japan, 2Creative Research Institution, Hokkaido University, Hokkaido, Japan, 3RISE Project Office, National Astronomical Observatory of Japan, Iwate, Japan, 4Center for Computational Astrophysics, National Astronomical Observatory of Japan, Tokyo, Japan, 5RISE Project Office, National Astronomical Observatory of Japan, Tokyo, Japan, 6Department of Cosmosciences, Hokkaido University, Hokkaido, Japan, 7Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, Kanagawa, Japan, 8Institute of Planetary Research, DLR, Berlin, Germany

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Optical/Mechanical Design for the Focal Plane Receiver of the Ganymede Laser Altimeter (GALA) for the Jupiter Icy Moon Explorer (JUICE) Mission

Keigo Enya1,2, Masanori Kobayashi2, Ko Ishibashi1, Shingo Kobayashi1, Noriyuki Namiki2,5, Hiroshi Araki2,5, Hirotomo Noda2,5, Shoko Oshigami1, Jun Kimura1, Satoru Iwamura5, Naofumi Fujishiro9, Teruhito Iida19, Hiroyuki Nakagawa11, Okiharu Kirino11, Chihiro Hatakeyama12, Takeshi Yokozawa12, Naoki Matsui12, Masayuki Fuji12, Toshihiko Yamakawa2, Kazuyuki Touhara1, Christian Althaus13, Simone Del Togno15, Judit Janch31, Belinda Borgs13, Thomas Behnke13, Kay Lingenauber13, Reinald Kallenbach13, Hauke Hussmann13

1Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, Kanagawa, Japan, 2The Graduate University for Advanced Studies, Japan, 3Planetary Exploration Research Center, Chiba Institute of Technology, Chiba, Japan, 4National Institute of Radiological Science;National Institutes for Quantum and Radiological Science and Technology, Chiba, Japan, 5RISE Project Office, National Astronomical Observatory of Japan, Tokyo, Japan, 6Center for Computational Astrophysics, National Astronomical Observatory, Tokyo, Japan, 7Department of Earth and Space Science, Osaka University, Osaka, Japan, 8MRI, Kanagawa, Japan, 9Astro-Opt, Tokyo, Japan, 10PITI CO., LTD, 11Crystal Optics Inc., 12MEISEI ELECTRIC CO., LTD, 13DLR; Institute of Planetary Research, Berlin, Germany

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Atsushi Yamamoto

Department of information system engineering, Toyama Prefectural University, Japan

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Oka Daiki

Department of information system engineering, Toyama prefectural university, Japan

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Aerosol Retrieval From ADEOS-2 to GCOM/SGLI

Masayoshi Yasumoto1, Itaru Sano2, Makiko Nakata1, Sonoyo Mukai3

1Faculty of Applied Sociology, Kindai University, 2The Kyoto College of Graduate Studies for Informatics, Japan, 3Faculty of Science and Engineering, Kindai University

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Evaluation of Availability of Measurements for Rice Paddy Using RedEdge Band

Mitsunori Ishihara1, Kenlo Nasahara2, Takeo Tadono2

1Earth Observation Research Center, JAXA, Tsukuba, Japan, 2Faculty of Life and Environmental Sciences, University of Tsukuba, Tsukuba, Japan
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<td>¹Research and Development Directorate, Tsukuba, Japan, ²GS Yuasa Technology Ltd, Kyoto, Japan</td>
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<td>¹Toyohashi University of Technology, Toyohashi, Japan, ²Tokyo Metropolitan College of Industrial Technology, Tokyo, Japan</td>
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<td>¹Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan, ²Department of Engineering Mechanics and Energy, University of Tsukuba, Ibaraki, Japan, ³Department of Electrical Engineering and Information Systems, the University of Tokyo, Tokyo, Japan, ⁴VLSI Design and Education Center (VDEC), the University of Tokyo, Tokyo, Japan</td>
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<td>¹Department of Aeronautics and Astronautics, The University of Tokyo, Tokyo, Japan, ²Department of Electrical Engineering and Information Systems, the University of Tokyo, Tokyo, Japan</td>
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Keisuke Taga, Hiroki Nakanishi, Mitsushige Oda

Dept. of Mechanical engineering, Tokyo Institute of Technology, Tokyo, Japan

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Pavel M. Trivallo\(^1\), Hirohisa Kojima\(^2\)

\(^1\)School of Engineering, RMIT University, Melbourne, Australia, \(^2\)Department of Aerospace Engineering, Tokyo Metropolitan University, Hino, Japan

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Kouki Fukui\(^1\), Daiki Tanaka\(^2\), Yoshihiro Kajimura\(^2\)

\(^1\)National Institute of Technology Akashi College, Advanced Course Department of Mechanical and Electrical System Engineering, Japan, \(^2\)Department of Electrical and Computer Engineering, National Institute of Technology Akashi College, Japan

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Alejandro Macario Rojas, Katharine Lucy Smith

School of Mechanical, Aerospace and Civil Engineering, University of Manchester, UK

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Essien Ewang\(^1\), Horyu IV Team\(^1\), Kazuhiro Toyoda\(^1\), Mengu Cho\(^1\)

\(^1\)Laboratory of Spacecraft Environment Interaction Engineering (La SEINE), Kyushu Institute of Technology, Japan, \(^2\)Department of Research and Development, ARCSSTE-E, O.A.U. Campus Ille-Ife, Osun, Nigeria

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\(^1\)The Graduate University for Advanced Studies, Sagamihara, Kanagawa, Japan, \(^2\)Hosei University, Koganei, Tokyo, Japan, \(^3\)The Institute of Space and Astronautical Science, JAXA, Sagamihara, Kanagawa, Japan, \(^4\)Kogakuin University, Hachioji, Tokyo, Japan, \(^5\)JAXA, Chofu, Tokyo, Japan, \(^6\)Shizuoka University, Hamamatsu, Shizuoka, Japan, \(^7\)Tokushima University, Tokushima, Tokushima, Japan

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Takashi Yamauchi, Daiki Yamaguchi, Sangkyun Kim, Hirokazu Masui, Mengu Cho

Department of Laboratory of Spacecraft Environment Interaction Engineering, Kyushu Institute of Technology, Japan

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Chao-Hui Huang\(^1\), Chun-Ho Wang\(^2\), Yo-Yang Lin\(^3\)

\(^1\)R.O.C. Naval Academy, Taiwan, \(^2\)CCIT, National Defense University, Taiwan, \(^3\)National Chung-Shan Institute of Science and Technology, Taiwan