

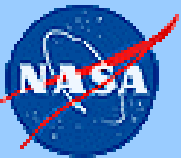


ICPMSE-9

Conference Program



9th International Conference on "Protection of
Materials and Structures from Space Environment"
May 20 -23, 2008, Toronto - Canada
University of Toronto Institute for Aerospace Studies



Conference Program

9th International Conference on “Protection of Materials and Structures from Space Environment”
ICPMSE-9

May 20-23, 2008

University of Toronto Institute for Aerospace Studies (UTIAS), Toronto, Canada

Chairperson:

Jacob Kleiman, ITL Inc./UTIAS, Canada

ORGANIZING COMMITTEE:

Banks, B.A., NASA, Cleveland, USA
Dinguirard, M., ONERA/DESP, France
Edwards, D.L., NASA, Huntsville, USA
Iskanderova, Z., ITL Inc./UTIAS, Toronto, Canada
Minton, T., Montana State University, USA
Nikanpour, D., Canadian Space Agency, Canada
Novikov, L. S., Moscow State University, Russia
Tykhy, V., Design Bureau “Yuzhnoe”, Ukraine
Tagawa, M., Kobe University, Japan
Van Eesbeek, M., ESA, Noordwijk, The Netherlands
Werling, E., CNES, France
Yang, D., Harbin Institute of Technology, China

PROGRAM COMMITTEE

Golden, J., Boeing, Houston, USA
Grigorievsky, A. V., JSC Kompozit, Moscow, Russia
Grossman, E., Soreq NRC, Israel
Finkenor, M., NASA, Huntsville, USA
Koontz, S., NASA, Houston, USA
Pippin, G., Boeing, Seattle, USA
Weiquan Feng, Beijing Institute of Satellite Environment Engineering, Beijing, China
Yunlong Lin, Space Engineering Department, York University, Toronto, Canada



GOALS AND SCOPE OF THE CONFERENCE

The 9th International Space Conference on “Protection of Materials and Structures from Space Environment” ICPMSE-9 is organised by ITL Inc. (Integrity Testing Laboratory). The Conference is to be held from May 20-23, 2008 at the University of Toronto Institute for Aerospace Studies in Toronto, Canada. The Conference is being advocated and sponsored by a number of Canadian and International organizations and institutions (see front page). The goals of this meeting, as in the past years, are to facilitate exchanges between members of the various engineering and science disciplines involved in the development of space materials, including aspects of space environment of LEO, GEO and Deep Space, ground-based qualification, and in-flight experiments and lessons learned from operational vehicles that are closely interrelated to disciplines of atmospheric sciences, solar-terrestrial interactions and space life sciences.

A thorough knowledge of space environment around Earth, Mars, Venus and other possible candidates for manned and unmanned landing became an important issue in light of the renewed interest of the international space community and the humanity to further exploration and eventual colonization of space. Protection of spacecraft, the scientific equipment and the human life from the factors of the space environment is gaining also new meaning with the fast development of the nano-structured materials and coatings with new and unusual properties they can provide.

In light of all these developments, the ICPMSE series of meetings became an important source of knowledge to the space environment community and the scientific community in general. Since the first meeting in 1992, the conference has grown steadily, attracting a large number of engineers, scientists, researchers and managers from industrial companies, scientific institutions and government agencies in Canada, U.S.A., Asia, and Europe, thus becoming a true international event.

With the space weather topics overlapping closely in many instances the space environment issues, the ICPMSE-9 meeting is gaining even stronger importance, attracting a large interest in interdisciplinary areas of science and space exploration of LEO, GEO and Deep Space. To reflect on all new developments, the program of the meeting, in addition to the traditional topics of protection of materials and structures from the atomic oxygen, VUV, and particle irradiation and thermal effects includes also such topics as micrometeoroids, space weather and relevant protection issues for travel to Moon, Mars, other planets, and Deep Space exploration.

Taking a retrospective look backwards from the onset of space exploration that started over 50 years ago with the launch of the first Sputnik to the new course in space exploration that will take humans back to the Moon, and eventually to Mars and beyond, the space environment community, being at the forefront of the space exploration issues, should also consider a new and bold look into the next 50 years. Such a move implies questions to be answered: “Are we ready to tackle the planetary environment issues from the materials perspective? Did the experiments carried out so far (LDEF, MEEP, SARE, MISSE, AOP, DSPSE, ESEM, EURECA, HST, MDIM, MIS, MPID), to name some, provided all the answers needed for safe travel in the cosmos? Two generations of scientists in the last 50 years were methodically studying the space environment and its effects on the materials. The coming generations of scientists will have to continue this work and tackle new challenges, continuing to build the wall of confidence allowing humans to continue the colonization of space. And we hope that ICPMSE-9 will be a small stone in that wall.

VENUE

The Conference will be held, as in the past years, at the University of Toronto Institute for Aerospace Studies (UTIAS) located at 4925 Dufferin Street, Downsview, Canada, M3H 5T6. The UTIAS is easily accessible from downtown by subway and bus; a one-way trip takes about 45 minutes during peak hours, and about 30 minutes during off-peak. Please, refer to the link for more information on UTIAS and its location (<http://www.utias.utoronto.ca/Page58.aspx>).

FORMAT

The Conference will include:

- An opening session with a number of keynote lectures
- Oral sessions
- Poster sessions that will be combined with a technical exhibition.
- A technical exhibit is planned as well

DISPLAY SPACE

Posters will be displayed throughout the Conference, in the cafeteria and staff lounge. A poster session is planned every afternoon and during the coffee breaks to stimulate discussion and exchanges between participants and presenting authors. Authors will have the possibility to set up their posters during the morning registration time on Tuesday, May 20 from 7:30 am.

TECHNICAL EXHIBITION

A technical exhibition is being planned during the Conference that will be held in the cafeteria and/or staff lounge, to enable the participating companies to present the latest developments and know-how. Exhibition folders will be provided on request (see last page for details).

PUBLICATIONS

All notified authors preparing contributions (to be given orally or as a poster) are invited to submit a paper for the proceedings of the Conference that will be published by the Springer Publishers in the series Space Technologies shortly after the Conference. The Abstract Proceedings containing presentation abstracts will be distributed with the registration package at the Conference.

The papers should be prepared in a free format and are due on April 30, 2008. Articles received after this date are not guaranteed the inclusion in the proceedings.

WORKING LANGUAGE

The working language will be English.

IMPORTANT DATES TO REMEMBER

Event	Date
Deadline for abstract submission	January 18, 2008
Paper acceptance announcement	By January 30, 2008
Second Announcement	February 20, 2008
Final Announcement and Program	April 5, 2008
Deadline for manuscripts	April 30, 2008
Conference	May 20 - 23, 2008
Estimated publishing date of the Proceedings	Tentatively December, 2008

Program at a Glance (Times are shown approximately) (101 papers total)

	Tuesday, 20 May	Wednesday, 21 May	Thursday, 22 May	Friday, 23 May
7:30 am	Registration-Coffee	Registration-Coffee	Registration-Coffee	Registration-Coffee
8:00am		Session D1: MISSE Moderators: I. Palusinski and G. Thayer 6 oral papers	Session E : Planetary Environments Moderators: N.Ghafoor and C.Sempromonching 5 oral papers	Session K: Charging effects-Mitigation of Charging Moderators: L.Novikov and M. van Eesbeek 4 oral + 1 poster papers
9:00 am	Opening Session O Moderator: J. Kleiman 3 oral papers		Session F1: Processes& Facilities Moderators: I.Gouzman and B. Banks 4 oral papers	
10:00am			Session F2: Processes & Facilities Moderators: K. de Groh and G. Roberts 5 oral +2 poster papers	Concluding Remarks
11:00 am	Session A: Environmental Effects: AO-VUV- Charging Moderators: R. Tennyson and E.Grosman 6 oral +6 poster papers			
12:00 pm	Lunch	Lunch	Lunch	Lunch
13:00 pm		Session D2: MISSE Moderator: I. Palusinski and G. Thyer 7 oral papers	SessionG: Materials Moderators: Z. Iskanderova and W. Feng 5 oral + 9 poster papers	End of Conference
14:00 pm	Session A: Env. Effects: AO-VUV - Charging (continued)		Session I: Micrometeoroids: Moderator D. Edwards and B.Cooke 7 oral papers + 3 Poster papers	
15:00 pm	Session B: Environmental Effects: AO-UV Moderators: T. Minton and M. Tagawa 8 oral papers			
1600 pm	Session C: Flight Data Moderator: S. Naumov and Y. Kimoto 4 oral papers	Tour of UTIAS		
17:00 pm		Cocktails Conference Dinner	Poster Session	
18:00 pm	Poster Session Cheese and Wine Reception			
19:00 pm				
20:00pm				

PROGRAM

Tuesday May 20th

07:30 – 08:45 **Registration and welcome coffee**
Poster set up,
Exhibits set-up

08:45 – 09:00 **Welcome Address**
D. Zingg, Director, UTIAS
J. Kleiman, ITL Inc., Chairman/ICPMSE-9

Opening session

Moderators: Jacob Kleiman-ITL Inc./UTIAS, Canada

O-1 09:00 – 9:35 Protection of Materials From the Space Environment – An Overview of CSA's Related S&T Programs.
George Vukovich and Darius Nikanpour
John Chapman Space Center
Space Technologies
6767 Route de l'Aéroport, Saint. Hubert, Que. J3Y 8Y9, Canada

O-2 9:35– 10:10 Spacecraft Materials in the Space Flight Environment:
International Space Station - May 2002 to May 2007
Johnny L. Golden^{(2)*}, Mary J. Lorenz⁽²⁾, John Alred⁽¹⁾, Steven L. Koontz⁽¹⁾, Michael D. Pedley⁽¹⁾, Eric Christiansen⁽³⁾,
(1)Structural Engineering Division, NASA Johnson Space Center, Houston, TX ,USA
(2) ISS Materials & Processes, Houston, TX, USA
(3) Solar System Exploration Division, NASA Johnson Space Center, Houston, TX, USA

10:10 - 10: 30 Coffee Break

O-3 10:30 – 11:05 The Investigation of External Materials and Covers of Space Vehicles in Space Conditions on MIR, Salyut and ISS (1990 – 2008)
S.F. Naumov¹, V.A. Borisov¹, A.A. Gorodetsky¹, S.P. Sokolova¹, T.I. Gerasimova¹, A.O. Kurilyonok¹ and L. S. Novikov²
¹- RSC Energia, Lenina str., 4a, Korolev, Moscow region, 141070, Russia, ² - Skobeltsyn Institute of Nuclear Physics Moscow State University, 119992, Moscow, Russia

*Tuesday May 20th***Session A: Space Environmental Effects: AO, Charging and UV effects****Moderators: Rod Tennyson and Eitan Grossman**

- A-1 11:10 – 11:25 Predicting Material Performance in the Space Environment from Laboratory Test Data, Static Design Environments, and Space Weather Models
Joseph I. Minow and David L. Edwards
NASA, Marshall Space Flight Center, Huntsville, Alabama, USA
- A-2 11:25 – 11:40 Ground-Laboratory to In-Space Atomic Oxygen Correlation for the PEACE Polymers
Arielle H. Stambler, Lily M. Roberts, **Karen E. Inoshita** and **Claire E. Barbagallo**, Hathaway Brown School, Shaker Heights, OH, USA
Kim K. de Groh, NASA Glenn Research Center, Cleveland, OH, USA
Bruce A. Banks, Consultant to Alphaport, Inc. at NASA Glenn Research Center, Cleveland, OH, USA 44135
- A-3 11:40 – 11:55 Degradation of Silicon Carbide Reflective Surfaces in the LEO Environment
Sandro Mileti, Plinio Coluzzi, Mario Marchetti,
Sapienza University of Rome, Department of Aerospace and Astronautics Engineering, Via Eudossiana 18, 00184 Roma, Italy, Rome, Italy
- A-4 11:55 – 12:10 The Effects of Simulated Atomic Oxygen and VUV Radiation on the Mechanical Performance of Candidate Thin Film Materials for Membrane SAR Antenna Applications
Xin Xiang Jiang and Darius Nikanpour, Advanced Materials & Thermal Group Spacecraft Engineering, Space Technologies, Canadian Space Agency
- 12:10 – 13:30 Lunch
- A-5 13:30 – 13:45 Effects of Atomic Oxygen on Mechanical Properties of Polyimide Films
Hiroyuki Shimamura¹ and Takashi Nakamura²
¹Electronic, Mechanical Components and Materials Engineering Group, Institute of Aerospace Technology, Japan Aerospace Exploration Agency (JAXA); ²Division of Mechanical and Space Engineering, Graduate School of Engineering, Hokkaido University, Japan
- A-6 13:45 – 14:00 Space Atomic Oxygen Erosion Effects on Epoxy and Silicone Adhesives Used in LEO Spacecraft
Li Tao, Jiang Lixiang, Feng Weiquan, Liu Xiangpeng,
Beijing Institute of Spacecraft Environment Engineering, Beijing, P.R. of China
- 14:00 – 14:20 Coffee Break

Session PO-A: Space Environmental Effects: AO, Charging and UV effects**Moderators: Rod Tennyson and Eitan Grossman****POSTER SESSION**

- PO-A1 Atomic Oxygen Testing of Surface Modified Space Polymers and Comparison with LEO Space Flight Results.
Z. Iskanderova, J. Kleiman, V. Issouпов, J. Godfrey
Integrity Testing Laboratory Inc., Markham, ON, Canada
- PO-A2 Numerical Simulation of Atomic Oxygen Flux and Fluence Distribution on Spacecraft Surface in Low Earth Orbit Space Environment
Liu Yang¹, Jiang Li-xiang², Li Tao²
¹ - Department of Engineering Mechanics, Tsinghua University, Beijing, China, 10084; ² - Beijing Institute of Spacecraft Environment Engineering, Beijing, China, 10096
- PO-A3 A Study on the Resistance Performance of Epoxy Nano-composites Under the Vacuum Ultraviolet Irradiation
Jiang Li-xiang¹, Li Guo-hui², Liu Yang³, Li Tao¹
¹Beijing Institute of Spacecraft Environment Engineering, Beijing, P.R. China; ²School of Electronic and Information Engineering, Dalian JiaoTong University, Dalian, China 116021; ³Department of Engineering Mechanics, Tsinghua University, Beijing, P.R. China.
- PO-A4 Ground-based Atomic Oxygen Tests of Polymeric Threads
V.N. Chernik¹, **L.S. Novikov**¹, T.N. Smirnova²
¹Skobeltsyn Institute of Nuclear Physics Moscow State University, 119992 Moscow, Russia; ²Khrunichev State Space Scientific Production Center, Moscow, Russia
- PO-A5 An Improved Formulation for Calorimetric Emittance Testing of Spacecraft Thermal Control Coatings
Lonny Kauder
Contamination and Coatings Engineering Branch
Goddard Space Flight Center, Greenbelt, Maryland, USA
- PO-A6 The Behavior of Teflon PTFE and Teflon FEP Films on Spacecraft Surfaces in LEO Conditions From the Point of View of Evaporative Model of Solar VUV Photolysis
V. E. Skurat,
Institute of Energy Problems of Chemical Physics, Russian Academy of Sciences, Moscow, Russia

Tuesday May 20th

Session B: Space Environmental Effects: AO/VUV/TC

Moderators: Tim Minton and Masahito Tagawa

- B-1 14:20 – 14:35 Effects of LEO Environment on Tensile Properties of PEEK Films
T. Nakamura¹, H.Nakamura¹, H.Shimamura²
¹ Division of Mechanical and Space Engineering, Graduate School of Engineering, Hokkaido University, Sapporo, Japan; ² Electronic, Mechanical Components and Materials Engineering Group, Institute of Aerospace Technology, Japan Aerospace Exploration Agency (JAXA)
- B-2 14:35 – 14:50 Comparison Study of Combined and Single Space Environmental Degradation Effects on Thermal Control Materials
Weiquan Feng, Yigang Ding, Dekui Yan, Xuechao Liu, Wei Wang and Dongmei Li; Beijing Institute of Spacecraft Environment Engineering, Beijing, P.R. China
- B-3 14:50 – 15:05 Tribological Characteristics of Bonded MoS₂ Film Exposed to AO, UV and Real LEO Environment by SM/SEED Experiment
Koji Matsumoto¹, Masahito Tagawa² and Masao Akiyama³
¹Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology, ²Kobe University, Department of Mechanical Engineering, Japan, ³IHI Aerospace Co., Ltd., Space Systems Department, Japan
- B-4 15:05 – 15:20 Studies of the Individual and Combined Effects of VUV Radiation and Hyperthermal O or Ar Atoms on FEP Teflon and PMMA Surfaces
Jianming Zhang, Ned F. Lindholm, Amy L. Brunsvold, Hari P. Upadhyaya, and Timothy K. Minton, Department of Chemistry and Biochemistry Montana State University, Bozeman, Montana, USA
- B-5 15:20 – 15:35 Synergistic Effect of EUV From the Laser-sustained Oxygen Plasma in the Ground-based Atomic Oxygen Simulation of Fluorinated Polymers
Masahito Tagawa, Shingo Abe, Kazuhiro Kishida, Hidehiro Yasuda and Kumiko Yokota, Kobe University, Japan
 Akio Okamoto, Technology Research Institute of Osaka Prefecture, Japan
- B-6 15:35 – 15:50 Contamination of Optical Surfaces Under Irradiation by Outgassed Volatile Products
 R.H. Khasanshin¹, **A.V. Grigorevskiy**¹, A.N. Galygin¹, N.G. Alexandrov²
¹Joint-stock company “Kompozit”4, Korolev, Moscow region, Russia, ²Krunichev State Research and Production Space Center, Russia
- B-7 15:50 – 16:05 Preparing Space Experiments «Material-Friction» and «Pipe» for Study of Antifriction Materials and Heating Pipes
 V.V. Skorohod¹, A.G. Kostornov¹, A.M. Potapov², M.N. Surdy³, Yu. A. Elansky², G.D.Gamulya⁴, **V.G. Tykhyy**², G.A. Frolov¹
¹Institute of Materials Problems, Kyiv, Ukraine
²Design Office Yuzhnoye, Dnepropetrovsk, Ukraine; ³Institute of Precise Measurements, Kyiv, Ukraine; ⁴Institute of Low Temperatures, Kharkov, Ukraine

Tuesday May 20th**Session C: Flight Data****Moderators: Stanislav Naumov and Yugo Kimoto**

- C-1 16:05 – 16:50 Preliminary Flight Data From the Materials Exposure and Degradation Experiment (MEDET);
S. Duzellier¹, M. Dinguirard¹, D.Falguere¹, C.Pons¹, V. Inguibert¹, A.P. Tighe², M. van Eesbeek², C. Durin³, S. Gabriel⁴ and D.Goulty⁴
¹ONERA, Toulouse, France ; ²-ESA/ESTEC, The Netherlands; ³-CNES, Toulouse, France; ⁴-University of Southampton, Highfield, UK
- C-2 16:20 – 16:35 Space Environmental Effects on Materials of Different Position and Operational Period of ISS
Yugo Kimoto, Shohichi Ichikawa, Eiji Miyazaki, Kiyooki Kubo, Keiichi Yano, Koji Matsumoto, Junichiro Ishizawa, Hiroyuki Shimamura, Riyo Yamanaka and Mineo Suzuki
 Japan Aerospace Exploration Agency (JAXA), Tsukuba City, Japan
- C-3 16:35 – 16:50 Studies of Materials From External Surfaces of International Space Station (ISS) Russian Segment (RS) Using Removable Cassette- Containers (SKK)
S. F. Naumov¹, V. A. Borisov¹, A.D.Plotnikov¹, S. P. Sokolova¹, A. O. Kurilyonok¹, V. E. Skurat², I. O. Leipunsky², P. A. Pshechenkov², N. G. Beryoskina², and I. O. Volkov²
¹-RSC Energia, Korolev, Moscow region, Russia; ²-Institute of Energy Problems of Chemical Physics, Russian Academy of Sciences, Moscow, Russia
- C-4 16:50 – 17:05 Testing of Polymer Materials on “MIR” Space Station and on International Space Station.
 Yu.O. Bakhvalov¹, N.G. Alexandrov¹, T.N. Smirnova¹;
 V.K. Milinchuk², E.R. Klinshpont², O.A. Ananjeva², O.F. Pasevich²;
L.S. Novikov³ and V.N. Chernik³
¹Khrunichev State Space Scientific Production Center, Moscow, Russia;
²Obninsk State Technical University for Nuclear Power Engineering
³Skobeltsyn Institute of Nuclear Physics Moscow State University, 119992 Moscow, Russia

17: 05 – 19:30

Posters session combined with the Cheese & Wine Reception

Wednesday, May 21st

07:30 – 08:10 **Registration and welcome coffee**

Session D1: MISSE

Moderators: *Iwonka Palusinski and Gayle Thayer*

- D1-1 08:10 – 08:50 The MISSE Project Strategies, Design Features and Environmental Conditions
Gary Pippin,
The Boeing Company, Seattle, USA
- D1-2 08:50 – 09:30 MISSE Thermal Control Materials with Comparison to Previous Flight Experiments
Miria Finckenor,
Marshall Space Flight Centre, AL 35812 USA
- 09:30 – 9:50 Coffee Break
- D1-3 9:50 – 10:20 Materials International Space Station Experiment (MISSE) Polymers Degradation
Kim K. de Groh¹, Bruce A. Banks²,
¹NASA Glenn Research Center, Cleveland, OH, USA; ²Consultant to Alphaport, Inc. at NASA Glenn Research Center, Cleveland, OH, USA 44135
- D1-4 10:20 – 10:40 Single Event Upset Xilinx-Sandia Experiment (SEUXSE) AND Sandia Passive ISS Research Experiment (SPIRE)
Gayle Echo Thayer
Sandia National Laboratories, USA
- D1-5 10:40 – 11:10 AFRL Update on MISSE: Results and Current Status
Shane Juhl,
Air Force Research Laboratory, WPAFB OH, USA
- D1-6 11:10 – 11:50 Optical Reflector Materials Experiment-I (ORMatE-I) and ORMatE-II on Board MISSE
Iwona A. Palusinski¹, Robert J. Walters², Phillip Jenkins², Larry E. Matson³, Peter D. Fuqua¹, James D. Barrie¹, Michael J. Meshishnek¹, Scott R. Messenger⁴, Jason M. Geis¹, Eric Jackson⁴ and Justin R. Lorentzen⁴
¹The Aerospace Corporation, El Segundo, CA; ²Naval Research Laboratory Wash, DC; ³AFRL/ML Dayton, OH; ⁴SSA Inc., Largo, MD
- 12:00 – 13:30 Lunch

Wednesday, May 21st

Session D2: MISSE

Moderators: Iwonka Palusinski and Gayle Thayer

- D2-1 13:30 – 14:00 MISSE-7: Building a Permanent Environmental Testbed for the International Space Station
Phillip P. Jenkins¹, Robert J. Walters¹, Michael J. Krasowski², John J. Chapman³, Perry G. Ballard⁴, John A. Vasquez⁵, Denis R. Mahony⁶, Susie N. LaCava¹, William R. Braun¹, Norman F. Prokop², Joseph M. Flatico⁷, Lawrence C. Greer², Karen B. Gibson³, William H. Kinard³ and H. Gary Pippin⁸,
¹-US Naval Research Laboratory, Washington, DC, USA; ²-NASA Glenn Research Center, Cleveland, Ohio USA; ³-NASA Langley Research Center, Hampton, VA, USA; ⁴NASA Johnson Space Center, Space Test Program, Houston, TX, USA; ⁵US Naval Research Laboratory, Washington, DC, USA; ⁶-Praxis Inc. Alexandria, VA, USA; ⁷-Ohio Aerospace Institute, Brook Park, OH, USA; ⁸-Boeing Phantom Works, Seattle, WA, USA
- D2-2 14:10 – 14:40 MISSE Results Used for RF Plasma Ground Testing to Space Exposure Correlation for Coated Kapton
Sharon K.R. Miller¹, Bruce A. Banks², and Greg Tollis³
¹NASA Glenn Research Center, Cleveland, Ohio, USA
²Consultant to Alhport supporting NASA Glenn Research Center
³Cleveland State University, Cleveland, Ohio, USA
- 14:40 – 15:00 Coffee Break
- D2-3 15:00 – 15:20 Effect of LEO Exposure on Aromatic Polymers Containing Nylphosphine Oxide Groups
K.A. Watson¹, S. Ghose¹, P.T. Lillehei², J.G. Smith, Jr.², and J.W. Connell^{2*}
¹National Institute of Aerospace, Hampton, VA, USA; ²National Aeronautics and Space Administration, Langley Research Center, Hampton VA, USA
- D2-4 15:20 – 15:40 Changes in Optical Properties of the MISSE 2 PEACE Polymers After Four Years on the International Space Station
Deborah L. Waters¹, Kim K. de Groh², Bruce A. Banks³
¹- Arctic Slope Regional Corporation Aerospace (ASRCA)
²-NASA Glenn Research Center; ³- Consultant to Alhport supporting NASA Glenn Research Center
- D2-5 15:40 – 16:00 Pristine and Surface-modified Polymers in LOE Space Environment: MISSE Results Versus Predictive Models
Z. Iskanderova^{1,2}, J. Kleiman^{1,2} and R.C. Tennyson²
¹-Integrity Testing Laboratory Inc., Markham, Ontario, Canada
²-University of Toronto Institute for Aerospace Studies, 4925 Dufferin Street, Downsview, M3H 5T6, Canada

D2-6 16:00 – 16:20 On the Mechanisms of Hyperthermal O(³P) Reactions

Timothy K. Minton

Department of Chemistry and Biochemistry, Montana State University,
Bozeman, MT, USA

D2-7 16:20 – 17:00 Lessons Learned from MISSE Atomic Oxygen Interaction with
Materials Experiments

Bruce A. Banks¹, Kim K. de Groh², Sharon K. Miller², Deborah L. Waters³

¹-Consultant to Alphaport supporting NASA Glenn Research Center

²-NASA Glenn Research Center, Cleveland, Ohio, USA

³-Arctic Slope Regional Corporation (ASRC), USA

17:00 – 18:00 Tour of UTIAS

19:00 – 20:00 **Cocktail Reception**

20:00 – 21:00 **Dinner**

21:00 – 21:45 **After-Dinner Speakers: Celebrating Knowledge**

Bruce Banks, Earthly Applications of Space Atomic Oxygen

Rod Tennyson, UTIAS Space Environment Research

*Thursday May 22nd*07:30 – 08:10 **Registration and welcome coffee****Session E: Planetary Environments****Moderators: Nadeem Ghafoor and Chris Sempromonching**

- E-1 8:10 – 8:25 Preparing Robotics for Moon, Mars & NEO Exploration
N. Ghafoor¹, M. Daly¹, F. Teti¹ and R. Richards²
¹-MDA, Toronto, Canada; ²-Optech, Toronto, Canada
- E-2 8:25 – 8:40 Materials for Moon Structure Settlements Additionally Cured Due to Space Environment Factors
V.P Laricheva., G.V. Kalgashkina, A.F. Korotkiy and Yu.Ya. Shavarin
Branch of FSUE “Karpov Institute of Physical Chemistry”, Obninsk, Kaluga Region, Russia
- E-3 8:40 – 8:55 An Investigation Into Suitable High Temperature Spacers for the BC (BepiColombo) Mission
C.O.A. Semprimoschnig and L. Levan
Materials Physics and Chemistry Section, European Space Research and Technology Centre (ESTEC), European Space Agency (ESA), Keplerlaan 1, 2200 AG Noordwijk, The Netherlands
- E-4 8:55 – 9:10 Investigations of Advanced Paint Thermal Control Coatings
A.V. Grigorevskiy, L.V. Kiseleva and N.G. Aleksandrov
JSC «Composite», 141070, t. Korolev, Moscow region,
- E-5 9:10 – 9:25 Exploring Abrasive Wear Prediction, Monitoring and Correction in Lunar Mobility Applications
Peter Radziszewski^{1,2}, Erick Dupuis¹, Sudarshan Martins², David Hewitt², Leanne Sigurdson³ and Dale Boucher³
¹Canadian Space Agency – Space Technology Group, Montreal, Canada
² Department of Mechanical Engineering, McGill University, Montreal, Canada; ³ NORCAT Inc., Canada
- 9:25 – 9:45 Coffee Break

Thursday May 22nd

Session F-1: Processes and Facilities

Moderators: Irina Gouzman and Bruce Banks

- F1-1 9:45 – 10:00 Plasma Immersion Ion Implantation with Solid Targets for Space and Aerospace Applications
R. M. Oliveira¹, J. A. N. Gonçalves¹, M. Ueda¹, G. G. Silva¹, K. Baba²
¹National Institute for Space Research, São José dos Campos, São Paulo, Brazil; ² Industrial Technology Center of Nagasaki, Nagasaki, Japan
- F1-2 10:00 – 10:15 Protection of Diamond-like Carbon Films From an Energetic Atomic Oxygen Bombardment With Si-doping Technology
Kumiko Yokota¹, Masahito Tagawa¹, Akira Kitamura¹, Koji Matsumoto², Akitaka Yoshigoe³, Yuden Teraoka³, Julien Fontaine⁴ and Michel Belin⁴
¹Kobe University, Japan; ²Japan Aerospace Exploration Agency, Japan
³Japan Atomic Energy Agency, Japan; ⁴Ecole Centrale de Lyon, France
- F1-3 10:15 – 10:30 Study on Tribological Properties of MoS₂+Graphite Sputtering Composite Coatings under various Environment Pressures
Yong Liu, Chongtai Luo, Zhuyu Ye, Jianqun Yang, Dezhuang Yang, Shiyu He
Space Materials and Environment Engineering Lab, School of Materials Science and Engineering, Harbin Institute of Technology, Harbin, P.R. China
- F1-4 10:30 – 10:45 Novel Approach to Space-survivable Polyimides: Liquid Phase Deposition of Titania Coating on Kapton
Olga Gershevitz¹, Chaim N. Sukenik¹, **Irina Gouzman**², Eitan Grossman² and Noam Eliaz³
¹Department of Chemistry and Institute for Nanotechnology and Advanced Materials, Bar-Ilan, Israel; ²Space Environment Section, Soreq NRC, Yavne, Israel; ³School of Mechanical Engineering and the Materials Science and Engineering Program, Tel-Aviv University, Tel-Aviv, Israel

Session F2: Processes & Facilities**Moderators: Kim de Groh and Graham Roberts**

- F2-1 10:45 – 11:00 Protection of Polymers from the Space Environment by Atomic Layer Deposition
Ned F. Lindholm¹, Jianming Zhang¹, and Timothy K. Minton¹, Jennifer O’Patchen² and Steven M. George², Markus D. Groner³
¹Department of Chemistry and Biochemistry, Montana State University, Bozeman, USA; ²Department of Chemistry and Biochemistry, University of Colorado, Boulder, CO, USA; ³ALD NanoSolutions, Broomfield, CO, USA
- F2-2 11:00 – 11:15 LEO Atomic Oxygen Measurements: Experiment Design and Preliminary Results
G.T. Roberts, A.R. Chambers and C.B. White
School of Engineering Sciences, University of Southampton, UK.
- F2-3 11:15 – 11:30 Removal of Low Molecular Compounds from Silicone Binder for Space Application
Yibing Zeng and Bien Tan
Aerospace Research Institute of Materials and Processing Technology (ARIMPT), Beijing, P.R.China,
- F2-4 11:30 – 11:45 ESTEC’s VTGA Facility – a New Facility for Space Environmental Analysis.
L. Levan, A.W. Polsak, M.R.J. van Eesbeek, S. Heltzel and C.O.A. Semprimoschnig
Materials Physics and Chemistry Section, European Space Research and Technology Centre (ESTEC), European Space Agency (ESA), Keplerlaan 1, 2200 AG Noordwijk, The Netherlands
- F2-5 11:45 – 12:00 **J. Kleiman**, S. Horodetsky, V. Issouпов, Z. Iskanderova
A New Concept in Design of Interplanetary Environment Accelerated Testing Facilities
Integrity Testing Laboratory, Inc. Markham, Ontario, Canada
- 12:00 – 13:30 Lunch

Poster Session PO-F

Session F-1: Processes and Facilities**Moderators: Irina Gouzman and Bruce Banks**

- PO-F1 Nano ZnO films Prepared by Pulse Laser Deposition and the Atomic Oxygen (AO) Sensing Characteristics
Wang Yunfei, Chen Xuekang, Li Zhonghua, Zheng Kuohai, Wang Lanxi, Feng Zhanzu and Yang Shengsheng
National Key Laboratory of Vacuum & Cryogenics Technology and Physics, Lanzhou Institute of Physics, Lanzhou 730000, China
- PO-F2 Innovative embedded fiber sensor system for spacecraft in situ health monitoring
E. Haddad¹, R. Kruzelecky¹, J. Zou¹, B. Wong¹, N. Mohammad¹, G. Thatte¹, W. Jamroz¹, M.-J. Potvin², D. Nikanpour², and S. Riendeau³.
¹MPB Communications, Pointe-Claire, Quebec; ²Canadian Space Agency, St-Hubert, Quebec; ³MDA Corporation, Ste-Anne-de-Bellevue, Quebec.

Thursday, May 22nd**Session G: Materials****Moderators: Zelina Iskanderova and Weiquan Feng**

- G-1 13:30 – 13:45 Development of a Flexible Solar Reflector for Geostationary Spacecraft
J. Beigbeder¹, P. Demont, S. Remaury², P. Nabarra² and C. Lacabanne¹
Laboratoire de Physique des Polymères - CIRIMAT –Institut Carnot
¹Université Paul Sabatier ,Toulouse France ; ²Centre National d’Etudes Spatiales (CNES), Toulouse, France
- G-2 13:45 – 14:00 The Investigation of Thermo-optical Characteristics of Thermo-regulating Covers on Geostationary Orbit.
A.A. Gorodetsky, S.F. Naumov, V.A. Borisov and S.P. Sokolova,
RSC Energia, Korolev, Moscow Region, Russia
- G-3 14:00 – 14:15 Optical Properties and Environment Stability of Black Thermal Control Coatings Prepared by Micro-plasma Oxidation Method
Wu Xiaohong and Jiang Zhaohua
Department of Applied Chemistry, Harbin Institute of Technology, Harbin, 150001, China
- G-4 14:15 – 14:30 Durability of structural assemblies for space applications under hydrothermal ageing conditions
M. Chevalier^{1,2,3}, E. Dantras¹, C. Tonon², P. Guigue³, C. Lacabanne¹, C. Puig², C. Durin³
¹ Laboratoire de Physique des Polymères, Institut Carnot / CIRIMAT, Université Paul Sabatier, Toulouse, France ; ² Astrium, Toulouse, France
³ Centre National d’Etudes Spatiales (CNES), Toulouse, France
- G-5 14:30 – 14:45 Space-Survivability of Main-Chain and Side-Chain POSS-Kapton[®] Polyimides
Sandra J. Tomczak¹, **Timothy K. Minton**³, Amy L. Brunsvold³, Vandana Vij², Michael E. Wright⁴, Brian J. Petteys⁴, Andrew J. Guenther⁴, Gregory R. Yandek¹, Laura M. McGrath² and Joseph M. Mabry¹,
¹ AFRL/PRSM, Materials Applications Branch, Air Force Research Laboratory, Edwards AFB, USA; ² ERC Incorporated, Materials Applications Branch, Air Force Research Lab, 1, Edwards AFB, CA,USA;
³ Department of Chemistry and Biochemistry, Montana State University, Bozeman, MT, USA ; ⁴ Research & Engineering Sciences Department, Chemistry Division, NAVAIR-US NAVY, China Lake, California, USA

14:45 – 15:10 Coffee Break

Thursday, May 22nd – Poster Session**Session PO-G: Materials****Moderators: Zelina Iskanderova and Weiquan Feng**

- PO- G1 Degradation of Optical-properties of Thermal Control Coatings Under Irradiation with Space Low Energy Electrons
Ding Yigang, Feng Weiquan, Yan Dekui
Beijing Institute of Spacecraft Environment Engineering, Beijing, China,
- PO- G2 New Composite Polymer Materials for Application Under Extreme Conditions
V.P. Laricheva¹, N.P. Chelnakov¹, V.G. Ostapets¹, N.V. Vymorkov², V.V. Vikulin²
¹Branch of FSUE “Karpov Institute of Physical Chemistry”
²SRC RF SPO «Tekhnologiya».
- PO-G3 The stability of a high temperature embossed polyimide
C. Mooney, S. Heltzel, C.O.A. Semprimoschnig
Materials Physics and Chemistry Section
European Space Research and Technology Centre (ESTEC)
European Space Agency (ESA), AG Noordwijk, The Netherlands
- PO- G4 Study on Friction and Wear Properties in Vacuum for γ -Ray Irradiated PTFE Coatings
Yong Liu, Zhongtai Luo, Zhuyu Ye, Xingdong Yuan, Dezhuang Yang
¹School of Materials Science and Engineering, Shandong Jianzhu University, Jinan, China
²Space Material and Environment Engineering Lab. Harbin Institute of Technology, Harbin, China
- PO- G5 A Study on Thermophysical Analysis of High Modulus Composite Materials for Space Vehicles
Ho-Sung Lee
Korea Aerospace Research Institute, Daejeon, KOREA
- PO-G6 Fatigue Properties of Ti-6Al-4V Alloy in Vacuum at Cryogenic Temperature
S.L. Dong¹, G. Lu¹, L.Q. Zhang¹, D. Z. Yang¹, S.Y. He¹, E. H. Han²,
¹School of Materials Science and Engineering, Harbin Institute of Technology, Harbin 150001, China
²Institute of Metal Research, Chinese Academy of Sciences, Shenyang, China
- PO-G7 Measurement of Photoelectron Emission Characteristic by Vacuum Ultraviolet Ray Irradiation
Shugo Okamura¹, Toru Iwao¹, Motoshige Yumoto¹, Hiroaki Miyake², Kumi Nitta²
¹Musashi Institute of Technology, ²Japan Aerospace Exploration Agency (JAXA), Japan;

- PO-G8 Modeling and Testing of Nanomaterials for Space Applications
L.S. Novikov, V.N. Mileev, **E.N. Voronina**
Skobeltsyn Institute of Nuclear Physics Moscow State University, Moscow,
Russia
- PO-G9 Development of an ITAR FREE silicone adhesive for space use: MAPSIL
QS 1123
O. Guillaumon¹, P. Guigue-Joguet², S. Remaury² and P. Nabarra²
¹-MAP, ZI – Rue Clément Ader-09100 PAMIERS, France,
²- Centre National d'Etudes Spatiales (CNES)
18 av Edouard Belin 31401 Toulouse Cedex 04 (France)
- PO – G10 New Generation of PTFE Materials: Radiation Modified
Polytetrafluoroethylene
S. A. Khatipov
Karpov Institute of Physical Chemistry
Laboratory of Radiation Resistance of Polymer Materials,
Vorontsovo Pole St., 10, Moscow, 105064, Russia
- PO –G11 Surface Modification and Ground-based Testing of an Advanced
Space-related Organosilicone Lacquer
Z. Iskanderova¹, J. Kleiman¹, V. Mironov¹, V. Issoupov¹ and S. Remaury²
¹-Integrity Testing Laboratory Inc., 80 Esna Park Drive, # 7-9, Markham,
Ontario, Canada
²-Centre National d'Etudes Spatiales (CNES), 18 av Edouard Belin 31401
Toulouse Cedex 04

Thursday, May 22nd**Session I: Micrometeoroids, Space Dust****Moderator: David Edwards and Bill Cooke**

- I-1 15:10 – 15:25 The Velocity Distribution of Meteoroids at the Earth: A Critical Component in Meteoroid Environment Models
Peter Brown, Margaret Campbell-Brown and Robert J. Weryk
Dept. of Physics and Astronomy, UWO, London, Canada
- I-2 15:25 – 15:40 Analysis of Regolith Simulant Ejecta Distributions from Normal Incident Hypervelocity Impact
David L. Edwards¹ William Cooke², Rob Suggs³
NASA/George C. Marshall Space Flight Center,
Danielle E. Moser⁴, Stanley /MSFC, AL 35812 USA
- I-3 15:40 – 15:55 The Sporadic Meteoroid Complex and Spacecraft Risk
P. Wiegert¹ and J. Vaubaillon²
¹- Department of Physics and Astronomy, UWO, London, Canada
²- Spitzer Science Center, California Institute of Technology
Pasadena, USA
- I-4 15:55 – 16:10 Physical Effects During Micrometeoroid Particle High-velocity Impact on the Metal-dielectric-metal Film Structures
N.D. Semkin¹, L.S. Novikov², K.E. Voronov¹ and R.A. Pomelnikov¹
¹ Samara State Aerospace University, Samara, Russia; ² Nuclear Physics Research Institute, Moscow, Russia.
- I-5 16:10 – 16:25 POSS-Polyimide Durability to Ultrahigh Velocity Impact and Atomic-Oxygen Irradiation at Elevated Temperatures
Ronen Verker^{1,2}, **Eitan Grossman**¹, Irina Gouzman¹, Noam Eliaz²
¹ Space Environment Section, Soreq NRC, Yavne, Israel
² School of Mechanical Engineering & Materials Science and Engineering Program, Tel-Aviv University, Tel-Aviv, Israel
- I-6 16:25 – 16:40 High Resolution Radiant Distribution of Sporadic Meteoroids
M. Campbell-Brown
Department of Physics and Astronomy, University of Western Ontario,
London ON Canada
- 16:45 - 18:30 Poster Sessions / Cheese + Wine

Session PO- I: Micrometeoroids, Space Dust**Moderator: David Edwards and Bill Cooke****Poster Session PO-I**

- PO –11 Cyclic Dust Particles Accelerator
N.D. Semkin, A.V. Pijakov and A.P. Pogodin
Samara State Aerospace University, Samara, Russia
- PO – I2 A Linear Accelerator for Simulating Micrometeorites
N. D. Semkin, A. V. Piyakov, K. E. Voronov, A.P. Pogodin, and
A.B. Andrushchenko
Samara State Aerospace University, Samara, Russia.
- PO-I3 Aspects of Protection Development of ISS FGB Power Module From
Debris and Meteors' Effects
E.F. Nikishin and V.N. Melnikov .
M.V. Khrunichev State Research and Production Space Centre “Salyut”
Design Bureau, , Moscow, Russia

Poster discussions/Technical exhibit (cheese and wine will be served)

Friday, May 23rd

07:30 – 08:15

Registration and welcome coffee**Session K: Charging Effects and Mitigation of Space Charges****Moderators: Lev Novikov and Marc van Eesbeek**

- K-1 08:15 – 8:30 Material Property Measurements Related to Engineering Design Optimization Guidelines and Spacecraft Charging
Kumi Nitta, Hiroaki Miyake, Masato Takahashi, Japan Aerospace Exploration Agency (JAXA), Space Power Engineering Group, Institute of Aerospace Technology (IAT), Tsukuba Space Center, Ibaraki, JAPAN
- K-2 08:30 – 8:45 Carbosurf™ Surface Modification Technology for Charge Dissipative and Radio-transparent GEO Durable Space Polymers
Z. Iskanderova¹, J. Kleiman¹, V. Issoupov¹ and F. Bussieres²
¹Integrity Testing Laboratory Inc., Markham, Canada
²MDA, Ste-Anne-De-Bellevue, Québec, Canada
- K-3 08:45 – 09:00 Radiation-Induced Conductivity Based Surface Charging Model of Polyimide
Ji Wang, Xiaogang Qin, Qing Liu, Jiawen Qiu
Lanzhou Institute of Physics, National Key Lab. of Vacuum & Cryogenics Technology and Physics, Lanzhou, P.R. China
- K-4 09:00 – 09:15 The Results of Ground-based and In-flight Testing of Charge-dissipative EKOM Thermal Control Paints
S.F. Naumov¹, S.P. Sokolova¹, A.O. Kurilenok¹, L.V. Kiseleva², A.V. Grigorevskiy², **Z. Iskanderova**³, J. Kleiman³, V. Issoupov³ and M. Finckenor⁴
¹RSC « Energia », Korolev, Moscow region, Russia
²JSC « Kompozit », Obninsk, Moscow region, Russia
³Integrity Testing Laboratory Inc., Toronto, ON, Canada,
⁴NASA Marshall Space Flight Center, Huntsville, AL, USA
- 09:15 – 09:35 Coffee Break

POSTER SESSION

Session K: Charging Effects and Mitigation of Space Charges

Moderators: Lev Novikov and Marc van Eesbeek

PO-K

Computer Simulation of Internal Charging Of GEO Satellites

Zhong Yi, Xiaojin Tang, Chao Zhang, Lifei Meng

Beijing Institute of Spacecrafts Environment Engineering, Beijing, 100094, China

Friday, May 23rd

Session L: Environmental Effects: Radiation and Charged Particles

Moderators: Dangming Li and Sergei Khatipov

This session is devoted to the memory of Dr. Boris Briksman

- L-1 09:35 – 09:50 Development of Research and Testing in the Field of Radiation and Space Materials Technology in Russia. Role of the Branch of Karpov Institute of Physical Chemistry.
V.G. Kosushkin, V.G. Ostapets, Yu.Ya. Shavarin
Branch of Karpov Institute of Physical Chemistry, Obninsk 249033 Kaluga Region, Russia
- L-2 09:50 – 10:05 Degradation of Optical Characteristics of a ZnO Organic White Paint by Electron Irradiation
Danming Li
National Laboratory of Vacuum & Cryogenics Technology and Physics, Lanzhou, 730000, China
- L-3 10:05 – 10:20 Investigation on Method of Ground-Simulating Proton Spectrum in Space
Hai Liu¹, Minchao Guan¹, Shiyu He¹, Dezhuang Yang¹, Huaiyi Wang²
¹Space Materials and Environment Engineering Lab Harbin Institute of Technology, Harbin, P.R. China, ²The 508 Institute of Space Technology Academy of China, Beijing, P.R. China
- L-4 10:20 – 10:35 Space Model - A New Russian Handbook on Spacecraft/Environment Interaction
L.S. Novikov, M.I. Panasyuk, **E.N. Voronina**
Skobeltsyn Institute of Nuclear Physics Moscow State University, Moscow, Russia
- L-5 10:35 – 10:50 On Some Physical Mechanisms of Improving Irradiation Resistance of Optical and Laser Materials.
A. Dudelzak, Canadian Space Agency, Montreal, Canada
- 11:00 -11:45 Concluding Remarks
12:00 - 13:30 Lunch

Poster session

Session L: Environmental Effects: Radiation and Charged Particles

Moderators: Dangming Li and Sergei Khatipov

This session is devoted to the memory of Dr. Boris Briksman

- PO- L1 Damage Effects of GD414 Silicon Rubber Induced by Proton Irradiation
Qin Wei, Li Li, He Shiyu, Yang Dezhuang
Space Materials and Environment Engineering Lab.,
Harbin Institute of Technology, Harbin, P.R. China
- PO-L2 A study on the electric properties of single-junction GaAs solar cells under the combined radiation of low-energy protons and electrons
Zhao Huijie¹, Xiao Jingdong¹, He Shiyu¹ and Yang Dezhuang¹, Sun Yanzheng², Sun Qiang², Lv Wei², Xiao ZhiBin², Huang Caiyong²
¹School of Materials Science and Engineering, Harbin Institute of Technology, Harbin, P.R. China
²Tianjin Institute of Power Sources, Tianjin, P.R. China
- PO- L3 Surface Morphology Characterization of Aluminum Film Reflectors Induced by Proton Radiation
Wei Qiang¹, Liu Hai², He Shi-Yu², Yang Xian-Jin¹
¹Tianjin Key Laboratory of Composite and Functional Materials, School of Materials Science and Engineering, Tianjin University, Tianjin, P.R. China;
² National Key Lab for Defense Science & Technology in Materials Behavior & Evaluation under Space Environment, Harbin Institute of Technology, Harbin, P.R. China
- PO-L4 Effects of Low-energy Proton Irradiation on Spectral Response of GaAs/Ge Solar Cells
Zhao Huijie¹, Wu Yiyong¹, Xiao Jingdong¹, He Shiyu¹ and Yang Dezhuang¹, Sun Yanzheng², Sun Qiang², Lv Wei², Xiao ZhiBin², Huang Caiyong²
¹School of Materials Science and Engineering, Harbin Institute of Technology, Harbin, P.R. China
²Tianjin Institute of Power Sources, Tianjin, P.R. China
- PO-L5 Measurement of Space Charge of Dielectric Materials by Pulse Electro-acoustic Method After Irradiation by High-energy Electron Beam
Qin Xiaogang¹, Li Kai¹, Mayali¹, Zheng Xiaoquan², Liu Xiaodong²
1. Lanzhou Institute of Physics, National Key Laboratory of Vacuum & Cryogenics Technology and Physics, Lanzhou, P.R. China
2. National Key laboratory of Power Equipment and Electrical Insulation, Xi'an Jiaotong Univ. Shaan Xi, Xi'an, P.R. China
- PO-L6 Influence of Space Radiation on Outgassing Rate of a Pattern Polymeric Composite in Vacuum
R.H. Khasanshin¹, A.N. Timofeev¹, M.F. Ivanov²
¹Joint-stock company "Kompozit", Korolev, Moscow region, Russia,

²Joint Institute for High Temperatures of Russian Academy of Sciences, Moscow, Russia,

PO-L7

Secondary Electron Emission as a Measure of Sample Degradation Irradiated with Electrons and UV

Hiroaki Miyake¹, Kumi Nitta¹, Shinichiro Michizono², and Yoshio Saito²

¹Institute of Aerospace Technology, Japan Aerospace Exploration Agency (JAXA); Tsukuba-shi, Ibaraki, JAPAN

²High-Energy Accelerator Research Organization (KEK), Tsukuba-shi, Ibaraki, JAPAN

PO-L8

Influence of MeV Protons on Electrical and Thermal Optical Properties of SWCNT-coated Kapton

Dae-Won Kim¹, Seung-Min Lee¹, Wal-Jun Kim¹, Tae-Keun Yang², Yu-Seok Kim², and Kye-Ryong Kim³ J. Kleiman⁴, Z. Iskanderova⁴, V. Mironov⁴

¹School of Mechanical and Aerospace Engineering, Seoul National University, Seoul, Korea; ²Division of Accelerator Development and IR Application, Korea Institute of Radiological and Medical Sciences, Seoul, Korea; ³Proton Engineering Frontier Project Team, Korea Atomic Energy Research Institute, Daejeon, Korea; ⁴Integrity Testing Laboratory Inc. Markham, Canada

PO-L9

Effects of proton irradiation on the optical properties of Cover Glass for Solar Cells

Wu Yiyong¹, Sun Chengyue¹, Xiao Jingdong¹, He Shiyu¹, Yang Dezhuang¹, Zhang Zhongwei², Wang Xunchun², Qian Yong² and Ren Xianwu³,

¹School of Materials Science & Engineering, Harbin Institute of Technology, Harbin, P.R. China

²Shanghai Institute of Space Power Sources, Shanghai, P.R. China

³No. 49 Research Institute of China Electronics Technology Group Cooperation, Harbin, China

PO-L10

Surface Protection and Improved Performance of Satellite Components as Well as Mitigation of Space Environmental Pollution by Plasma Ion Implantation

M.Ueda¹, W.K.Takahashi¹, A.R. Marcondes¹, I.H.Tan¹, G.Silva^{1,2}

¹National Institute for Space Research, São José dos Campos, S.Paulo, Brazil;

²Technological Institute of Aeronautics, São José dos Campos, S.Paulo, Brazil

PO-L11

Radiation Stability of Zinc Oxide Pigment Modified by Zirconium Oxide and Aluminum Oxide Nanopowders.

Mikhailov M.M.^{1,3}, Neshchimenko V.V.², Li Chundong³

¹Tomsk University of Control Systems and Radio-electronics, Russia,

²Amur State University (Russia),

³Harbin Institute of Technology, Harbin, P. R. China

End of Conference

GENERAL INFORMATION

VENUE

The conference will be held in Toronto, Canada, at the University of Toronto Institute for Aerospace Studies (UTIAS) that is about 30 minutes north of downtown Toronto by car:

University of Toronto Institute for Aerospace Studies (UTIAS)
4925 Dufferin Street, Downsview, M3H 5T6
Telephone: 905-415-2207
E-mail: jkleiman@itlinc.com or ekleiman@itlinc.com
Internet Site: http://www.itlinc.com/icpmse_9.html

TRANSPORT FACILITIES

Y By air: Toronto Airport (Pearson International): approximately 20-25 minutes to conference facilities.

Y By car: For driving directions, please use the MapQuest, Google-Map or any other available program to get directions (please use the address: 4925 Dufferin Street, Downsview, M3H 5T6)

REGISTRATION AND ORIENTATION

Registration and orientation (handing out of badges and conference proceedings) will take place on Tuesday, May 20 from 07:30 to 09:30. For latecomers registration will be possible on the morning of each day or during the breaks.

REGISTRATION FEES

The registration fees for the full Conference are \$875 U.S. for 4 days. The registration fees include access to the conference and poster and exhibition rooms for all 4 days, welcome reception, 4 lunches, all coffee breaks and the conference abstract proceedings. One day attendance fee is \$350 U.S. and will include all coffee breaks and lunch on that day and the conference abstract proceedings. A special rate for students will be \$175 U.S. for the 4 day attendance and \$100 U.S. for any one day. For registration after 20 April, 2008 and extra charge of \$25 will apply to all registrations.

CATERING

Lunches will be held everyday during the conference at different restaurants located approximately ½ km (5-10 minute walk) from the conference facilities. All coffee breaks will be served in the exhibition and poster areas.

A cheese and wine reception will take place on Tuesday, May 20, 2008 from 17:30 to 18:30 that will be combined with the poster session time.

There will be **a conference dinner** held on Wednesday, May 21 with an invited after-dinner speaker. The cost of the dinner is \$65 U.S.. You must register for the dinner by the morning of May 20. The location of the dinner place will be announced at the meeting.

TELEPHONE/FAX/INTERNET ACCESS//BANK

Messages can be sent to participants at the reception area of the conference by fax 416-667-7799. In case of an emergency you may call 416-667-7701 and leave a message for your party (just mention they are a participant in the ICPMSE-9 conference. An effort will be made to provide the participants with access to a computer connected to the internet.

Bank/Cash machines are available near the conference facilities.

ACCOMMODATION

There are a number of hotels in the area around the UTIAS. With the Internet at your fingertips, you probably will do better than us in securing the best rate and location. In case of any complication, let us know and we shall assist. Among the hotels used in past by the attendees, a few are given below:

1. **Holiday Inn Yorkdale**, Downsview, 416-675-9636 or 1-800-524-8436. http://travel.yahoo.com/p-hotel-346709-holiday_inn_toronto_yorkdale-i
2. **Travelodge Hotel Toronto Yorkdale**, 2733 Keele Street (Keele & Highway 401) 416-636-4656 or 1-888-636-4656. <http://www.worldexecutive.com/directory/canada/toronto/hotels/02694.html>
3. **Howard-Johnson Hotel, Markham**, \$74/\$79/night (single/double). 1-877-703-4656 or 905-479-5000,
<http://www.google.ca/search?hl=en&q=Howard-Johnson+Hotel%2C+Markham%2C&btnG=Search&meta=e-mail:info@hojomarkham.com>
4. **The Novotel Toronto North York** is a 3 star hotel located in uptown Toronto with easy access from major highways. **Hotel code** : 0910, 3 Park Home Avenue, North York, Toronto, **Tel** :1-416-733-2929; **Fax** :1-416-733-3403; **E-mail** : H0910@accor-hotels.com
http://www.novotel.com/novotel/fichehotel/gb/nov/0910/fiche_hotel.shtml

Participants are asked to call the Hotel directly and make the required reservations **OR** contact Mr. Ely Kleiman by e-mail (ekleiman@itlinc.com) and pass all required reservation information to him. A reservation will be made on your behalf and a confirmation will be sent to you by e-mail. Please specify check-in and check-out dates as well as the number of rooms and names that reservation is to be held under. Please indicate smoking or non-smoking preference.

FURTHER INFORMATION

Further information may be obtained from:

Jacob Kleiman - ITL Inc./UTIAS
80 Esna Park Drive, Units #7-9
Markham, Ontario, L3R 2R6
Phone: 905-415-2207 - Fax: 905-415-3633
Email: jkleiman@itlinc.com

OR

Ely Kleiman - ITL Inc.
80 Esna Park Drive, Units #7-9
Markham, Ontario, L3R 2R6
Phone: 905-415-2207 - Fax: 905-415-3633
Email: ekleiman@itlinc.com

9-th INTERNATIONAL CONFERENCE
“PROTECTION OF MATERIALS AND STRUCTURES
FROM THE SPACE ENVIRONMENT”

ICPMSE-9
TORONTO, CANADA
MAY 20-23, 2008

ORDER FORM FOR HARD COVER FULL PROCEEDINGS
OF THE PAST ICPMSE MEETINGS AND THE ICPMSE-9 MEETING

	Total
9 Yes, I want to order _____ copies of the hard cover volume of full proceedings of the ICPMSE-3 meeting at the price of \$75/ea. U.S.	_____
9 Yes, I want to order _____ copies of the hard cover volume of full proceedings of the ICPMSE-4 meeting at the price of \$75/ea. U.S.	_____
9 Yes, I want to order _____ copies of the hard cover volume of full proceedings of the ICPMSE-6 meeting at the price of \$105/ea. U.S.	_____
9 Yes, I want to order _____ copies of the hard cover volume of full proceedings of the ICPMSE-7 meeting at the price of \$125/ea. U.S.	_____
9 Yes, I want to order _____ copies of the hard cover volume of full proceedings of the ICPMSE-9 meeting at the prepublication price of \$145/ea. U.S.	_____
9 Shipping and Handling: \$15 per book U.S.	_____
Grand Total:	_____

Make all cheques payable to: Integrity Testing Laboratory Inc.

Integrity Testing Laboratory Inc. (ITL) CUniversity of Toronto Institute for Aerospace Studies (UTIAS) C
C80 Esna Park Drive, Units 7-9 CMarkham COntario CCanada CL3R 2R7 C
CTel: (905) 415-2207 CFax: (905) 415-3633 Ce-mail: jkleiman@itlinc.com or ekleiman@itlinc.com C

**9th International Conference on “Protection of
Materials and Structures from Space
Environment”
ICPMSE-9
May 20-23, 2008, Toronto, Canada**

REGISTRATION FORM

Surname:.....First Name:.....

Title:.....

Organization:.....

Zip Code:.....City:.....Country:.....

Phone:.....Fax:.....
(country-area-number) (country-area-number)

E-mail:.....
(IMPORTANT)

**PLEASE CHECK OFF ALL THAT APPLY
(applicable to registrations made after 20 April, 2008)**

- 4 Days - \$900 U.S.
- 1 Day- \$375 U.S./Day ; 2 Days -\$575 3 Days - \$675;
- May 20 May 21 May 22 May 23
- Student – 4 Days - \$200 U.S.
- Student – 1 Day - \$125U.S.
- Dinner (May 21) - \$65 U.S. No. of people :...
- I am presenting a paper and will attend the days marked
- I am not presenting but will attend as a participant

EXHIBITS

We have a limited number of industrial and technical exhibit spaces which will be available on a first come first served basis. Exhibits will be in the same room as the posters for the poster sessions.

- I would like to set-up a manned exhibit (includes 4'x2' table + chair for 4 days) - \$995 U.S. –
Includes Registration Cost for one person for 4 days.
- I would like to set-up an unmanned exhibit (includes table only) \$275 U.S. - **DOES NOT** include Registration Costs.

**9th International Conference on “Protection of
Materials and Structures From Space Environment”
ICPMSE-9
May 20-23, 2008, Toronto, Canada**

REGISTRATION FORM

PLEASE CHECK OFF ALL THAT APPLY

ADVERTISING

- 9** I would like to have a ½ page B&W advertisement in the Abstract Proceedings- \$75 U.S.
- 9** I would like to have a ½ page Color advertisement in the Abstract Proceedings - \$115 U.S.
- 9** I would like to have a full page B&W advertisement in the Abstract Proceedings - \$100 U.S.
- 9** I would like to have a full page Color advertisement in the Abstract Proceedings - \$175 U.S.
- 9** I would like to purchase the complete participant list for a one-time use fee of \$150 U.S.

Total Amount Enclosed: \$.....

All prices include GST.
Please make cheque payable to: Integrity Testing Laboratory Inc.

Please complete, detach and e-mail or fax this form as soon as possible to:

Integrity Testing Laboratory Inc./ICPMSE-9
80 Esna Park Drive, Units #7-9
Markham, Ontario, L3R 2R7, Canada
Fax: 905-415-3633 - E-mail: ekleiman@itlinc.com
