Final Program

International Academy of Astronautics
12th IAA Symposium on Small Satellites for Earth Observation
06-10 May 2019 - Berlin, Germany

Supported and hosted by

International Academy of Astronautics

Deutsches Zentrum für Luft- und Raumfahrt e.V.

TU Berlin
We wish to thank the following for their contribution to the success of this conference (in alphabetical order):

arianeGroup
Astro- und Feinwerktechnik Adlershof GmbH
IBST
Berlin Space Technologies
eesa
European Space Agency
GeFaN
Oakman Aerospace, Inc.
OHB
Sinclair Interplanetary
Surrey Satellite Technology Ltd
**HONORARY CHAIRWOMAN**

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Chair of the Executive Board of DLR

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Chairman  
IAA Technical Director, Satellite and Space Applications (Germany)

Klaus Brieß  
Head Chair of Space Technology  
Technical University of Berlin (Germany)

Eberhard Gill  
Head Department of Space Engineering (SpE)  
Delft University of Technology (The Netherlands)

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S. Mostert (SCS Space, South Africa)  
S. Nakasuka (Univ. of Tokyo, Japan)  
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F. Ongaro (ESA/ESTEC)  
M. Ovchinnikov (KIAM, Russia)  
P. Patterson (USU/SDL, USA)  
L. Paxton (JHU/APL, USA)  
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Sir Martin Sweeting (SSTL, UK)  
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Y. Zhu (CAST, Beijing, China)

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R. Laufer (Baylor University, USA)  
K.-S. Low (NUS, Singapore)  
M. Ovchinnikov (KIAM, Russia)  
R. Sandau (IAA, France/Germany)  
W.H. Steyn (Stellenbosch, South Africa)  
J. Torley (University of Colorado, USA)  
C. Underwood (Surrey Space Centre, UK)
Message
from the Governing Mayor of Berlin, Michael Müller,
for the 12th Symposium on Small Satellites for Earth Observation
Welcome to Berlin for the 12th Symposium on Small Satellites of the International Academy of Astronautics (IAA)!

Berlin is an ideal setting for your symposium. The capital city region, where Otto Lilienthal caused a sensation with his first glider flights, is the birthplace of German aviation. Today, too, Berlin is again having an impact on developments in aviation. The aerospace industry is represented here by prominent companies. The Berlin-Adlershof location of DLR, Germany’s national aeronautics and space research center, is one of the capital’s outstanding research institutes and is involved in many different high-profile space missions. And the fact that Technische Universität Berlin, whose TUBSAT program is actively involved in developing small satellites, is one of the symposium hosts gives us another indication of the sector’s broad base in Berlin.

My sincere thanks go also to the Berlin-Brandenburg Academy of Sciences and Humanities, which has given the symposium its venue. I would like to wish all of the participants an illuminating and productive program, many thought-provoking discussions with international colleagues, and a very pleasant stay in Berlin.

Michael Müller
Governing Mayor of Berlin
FROM THE CHAIRMEN

It is a pleasure for the three General Chairmen to invite the international community to the 12th IAA Symposium on Small Satellites for Earth Observation. The symposium will be hosted by the German Aerospace Center (DLR) and the Technical University of Berlin and be held in Berlin from May 06th-10th, 2019. The successes of preceding IAA Symposia were shown by the high interest in the use of small satellites for dedicated missions applied to Earth observation, from scientific Earth observation to technology demonstration missions. In all of these IAA symposia, authors from about 35 countries, representing space agencies, industries, knowledge institutes, and academia confirmed in their oral and poster contributions that these types of missions can be conducted efficiently, provide increased opportunity for access to space and even realize new functionalities and services. The spacecraft bus and its payloads can be based either on optimized off-the-shelf systems, with little or no requirements for new technology, or on new high-technology systems. Thus a new class of advanced small satellites, including autonomously-operating „intelligent“ satellites can be created, opening new fields of application for science and the public. Distributed Space Systems, such as constellations and formations, based on small satellites lead to a new economy in space.

This symposium again offers many opportunities for exchanging information, exploring new concepts, encouraging international cooperation in mission planning, and developing new collaborative relationships among individuals and institutions. We included again the Student Prize Paper Competition. The student papers have been evaluated by distinguished judges selected from academia, industry and government, coming from different continents. The prizes are funded by different organizations (industry and institutions). The IAA is pleased to serve as the principal sponsor of this symposium because its objectives complement and reinforce the purpose of the Academy.

It is a pleasure for the German Aerospace Center (DLR) in Berlin-Adlershof to be the host of this symposium. DLR’s site Berlin-Adlershof has been successfully involved in space research for many years. Together with other relevant institutes of the DLR, it is now involved in many international and national projects for Earth observations, planetary sciences, technology development and in-orbit verification. The Technische Universität Berlin is pleased to be the co-host of the 12th symposium. The TU Berlin has already brought into orbit 16 own satellites for Earth observation and satellite communication. They are designed, built and operated with students.

Last but not least, Berlin provides a good environment because this city continuously pursues new architectural approaches in urban development after the reunification of Germany. We believe that Berlin is a bridge between the West and East as well as the North and South. As in the previous symposia, Berlin may serve symbolically as a meeting place for information exchange and collaborative development between the two hemispheres, as well as a bridge between the classical space missions and innovative approaches using smaller and smaller satellites for dedicated objectives.

We are looking forward to meeting you in Berlin in May 2019.

Rainer Sandau
Klaus Briess
Eberhard Gill
GENERAL INFORMATION

Symposium Coordinator
Dr. Matthias Hetscher
DLR Adlershof
Rutherfordstrasse 12
12894 Berlin
phone: +49-30 67055646
e-Mail: iaa.symp@iaamail.org
www.dlr.de

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e-Mail: iaa.symp@iaamail.org
www.space.tu-berlin.de

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fax: +49-30 2096 2133
e-Mail: contour.berlin@t-online.de
www.contour-berlin.de

Exhibition Organizer
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Berlin Space Technologies GmbH
Max-Planck-Strasse 3
12489 Berlin
phone: +49-30 6098 124-23
fax: +49-30 6392 802-88
e-Mail: segert@berlin-space-tech.com
www.berlin-space-tech.com

The Symposium Venue:
Berlin-Brandenburgische Akademie der Wissenschaften (BBAW)

The Berlin Brandenburg Academy of Sciences and Humanities, founded by Gottfried Wilhelm von Leibniz in 1700, stands for 300 years of support for research activities. It attained worldwide reputation and recognition as the Prussian Academy of Sciences. Its members have included the Brothers Grimm, Alexander von Humboldt, Max Planck, Lise Meitner and Albert Einstein. Throughout its history the Society could rank 78 Nobel Laureates among its members. There are bilateral agreements on scientific co-operation with about 20 Academies from around the world.

For further information please visit www.bbaw.de

On-site Registration

The Registration Desk will be set up in the symposium room foyer of the BBAW. It will be open:
May 05, Sunday 16:00-20:00
May 06, Monday – May 09, Thursday 08:00-18:00
Name Badges

Name badges must be worn at all times in order to be admitted to the sessions and the social events. The following colors have been assigned:

- Participants: White
- Students: White
- Press: Yellow
- Accompanying persons: Blue
- Organization: Green

Language

The official language of the symposium is English.

Offices

- The symposium office will be co-located with the registration desk in the symposium room foyer of the BBAW
- Chairpersons' meeting room (if needed): room 226 (2nd floor)
- Authors are requested to arrive at the session room 10 minutes before the start of the session in order to meet the session chairperson for final preparations.

Publication of Papers

The proceedings will be published after the symposium.

Lunch, Coffee Breaks

The registration fee of the participants covers the coffee breaks and the lunch buffet. Accompanying persons who want to take part in the lunch buffet may purchase a voucher at the registration desk (€ 15.00/day).

Awards

The authors/presenters of the best student papers will be awarded prizes funded by various organizations (industry and institutions) at the IAA Dinner on Tuesday night (May 7, 2019). The two best oral presentations and the two best poster presentations will receive awards at the end of the Symposium.
## SYMPOSIUM SCHEDULE

### Sunday, May 05, 2019

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>16:00-20:00</td>
<td>Registration</td>
</tr>
<tr>
<td>19:00-20:00</td>
<td>Get-Together</td>
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### Monday, May 06, 2019

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>08:00-09:00</td>
<td>Registration, BBAW</td>
</tr>
<tr>
<td>09:00-09:15</td>
<td>Welcome:</td>
</tr>
<tr>
<td></td>
<td>S. Krach, Secretary of State for Science and Research Government of Berlin</td>
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<td></td>
<td>J.-M. Contant, Secretary General IAA</td>
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<td></td>
<td>P. Ehrenfreund, Chair of Executive Board of DLR</td>
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<tr>
<td>09:15-10:00</td>
<td>Keynote Address:</td>
</tr>
<tr>
<td></td>
<td>ESA smallsat approach and programmes</td>
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<tr>
<td></td>
<td>F. Teston</td>
</tr>
<tr>
<td></td>
<td>Head of Systems Department at ESA/ESTEC</td>
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<tr>
<td>10:00-10:40</td>
<td>BREAK</td>
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<tr>
<td>10:40-12:20</td>
<td>Session 01: Programmatic</td>
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<tr>
<td></td>
<td>Chairs:</td>
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<tr>
<td></td>
<td>F. Teston, ESA, NL</td>
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<td></td>
<td>P. Patterson, USU(SDL), USA</td>
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<tr>
<td>12:20-13:30</td>
<td>LUNCH</td>
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<tr>
<td>13:30-15:00</td>
<td>Session 02: Missions I</td>
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<td></td>
<td>Chairs:</td>
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<tr>
<td></td>
<td>A. da Silva Curiel, SSTL, UK</td>
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<td></td>
<td>GP Sandhoo, US NRL, USA</td>
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<tr>
<td>15:00-15:20</td>
<td>BREAK</td>
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<tr>
<td>15:20-16:40</td>
<td>Session 03: Sensor Systems</td>
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<td>Chairs:</td>
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<tr>
<td></td>
<td>S. Neeck, NASA/HQ, USA</td>
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<td>C. Underwood, SSC, UK</td>
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</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>16:40-17:40</td>
<td>Round Table:</td>
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<tr>
<td></td>
<td>Who rules space-based EO: Business or Governments?</td>
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<td></td>
<td>Chair:</td>
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<tr>
<td></td>
<td>N. Frischauf, SpaceTec Partners, DE</td>
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### Tuesday, May 07, 2019

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>09:00-10:30</td>
<td>Session 04: Constellations/ Formations</td>
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<td>Chairs:</td>
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<tr>
<td></td>
<td>O. Koudelka, TU Graz, AUT</td>
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<td></td>
<td>K. Schilling, JMU Würzburg, DE</td>
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<tr>
<td>10:30-10:50</td>
<td>BREAK</td>
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<tr>
<td>10:50-12:10</td>
<td>Session 05: Integrated Applications</td>
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<td>Chairs:</td>
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<td>A. Court, TNO, NL</td>
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<td>S. Mostert, SCS, ZAF</td>
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<tr>
<td>12:10-13:30</td>
<td>LUNCH</td>
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<tr>
<td>13:30-15:00</td>
<td>Session 06: Student Conference</td>
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<td>Chairs:</td>
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<td></td>
<td>S. Kennedy, OAI, USA</td>
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<td>L. Paxton, JHU/APL, USA</td>
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<tr>
<td>15:00-15:20</td>
<td>BREAK</td>
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<tr>
<td>15:20-16:40</td>
<td>Session 07: AOCS</td>
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<td>Chairs:</td>
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<td></td>
<td>W.H. Steyn, SUN, ZAF</td>
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<td>T. Terzibaschian, DLR, DE</td>
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<tr>
<td>16:40-17:40</td>
<td>POSTER SESSION I</td>
</tr>
</tbody>
</table>
**Wednesday, May 08, 2019**

09:00-10:30  **Session 08:**
LESSONS LEARNED
*Chairs:*
R. Kawashima, UNISEC, JP
A. Zuccaro Marchi, ESA, NL

10:30-10:50  **BREAK**

10:50-12:10  **Session 09:**
ON-BOARD PROCESSING
*Chairs:*
M. Barschke, TU Berlin, DE
A. Rogers, Maxar, USA

12:10-13:30  **LUNCH**

13:30-15:00  **Session 10:**
NEW PLATFORMS
*Chairs:*
M. Hetscher, DLR, DE
H. Kuiper, TU Delft, NL

15:00-15:20  **BREAK**

15:20-16:40  **Session 11:**
INFRARED MISSIONS
*Chairs:*
L. Gratton, Colomb Inst., ARG
W. Halle, DLR, DE

16:40-17:40  **POSTER SESSION II**

**Thursday, May 09, 2019**

09:00-10:30  **Session 12:**
COMMUNICATIONS
*Chairs:*
S. Klinkner, IRS Stuttgart, DE
Z. Yoon, TU Berlin, DE

10:30-10:50  **BREAK**

10:50-12:10  **Session 13:**
GROUND SEGMENT
*Chairs:*
J.-N. Bricout, CNES, FR
E. Gill, TU Delft, NL

12:10-13:30  **LUNCH**

13:30-15:00  **Session 14:**
SPECIAL ASPECTS
*Chairs:*
R. Laufer, Baylor, USA
M. Saandar, MSPRS, MON

15:00-15:20  **BREAK**

15:20-16:40  **Session 15:**
DISTRIBUTED SYSTEMS
*Chairs:*
I. Belokonov, SSAU, RUS
S. Roemer, Antwerp Space, BEL

16:40-17:40  **Symposium Summary**
*Chairs:*
K. Brieß, TU Berlin, DE
R. Sandau, IAA, FR
E. Gill, TU Delft, NL
*Chief Rapporteur:*
A. Rogers, Maxar, USA

**AWARDS**

*Best Paper Presentation*
*Best Poster Presentation*

**Friday, May 10, 2019**

09:00-13:00  **Excursion to:**
DLR Adlershof
<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Event</th>
<th>Venue</th>
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<tbody>
<tr>
<td><strong>May 05, Sunday</strong></td>
<td>Get-Together</td>
<td>Berlin-Brandenburgische Akademie der Wissenschaften (BBAW)</td>
</tr>
<tr>
<td>19:00 – 20:00</td>
<td>(included in the registration fee)</td>
<td><a href="http://www.bbaw.de">www.bbaw.de</a></td>
</tr>
<tr>
<td><strong>May 06, Monday</strong></td>
<td>Reception</td>
<td>Ship Tour through Berlin City</td>
</tr>
<tr>
<td>18:30 – 22:30</td>
<td>(included in the registration fee)</td>
<td>including dinner buffet start: Maerkisches Ufer <a href="http://www.sternundkreis.de">www.sternundkreis.de</a></td>
</tr>
<tr>
<td><strong>May 07, Tuesday</strong></td>
<td>IAA-Dinner</td>
<td>The Regent Hotel Berlin</td>
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<tr>
<td>19:00 – 22:00</td>
<td>€ 120.00 / person</td>
<td>Charlottenstraße 49 10117 Berlin <a href="http://www.regenthotels.com/berlin">www.regenthotels.com/berlin</a></td>
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<tr>
<td><strong>May 08, Wednesday</strong></td>
<td>free evening</td>
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<tr>
<td><strong>May 09, Thursday</strong></td>
<td>Concert:</td>
<td>Philharmonie Berlin</td>
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<tr>
<td>20:00 – 22:00</td>
<td>Wolfgang Amadeus Mozart</td>
<td>Herbert-von-Karajan Str. 1 10785 Berlin <a href="http://www.berliner-philharmoniker.de">www.berliner-philharmoniker.de</a></td>
</tr>
<tr>
<td></td>
<td>Anton Bruckner</td>
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<tr>
<td><strong>May 10, Friday</strong></td>
<td>Excursion</td>
<td>DLR - German Aerospace Center</td>
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<tr>
<td>09:00 – 13:00</td>
<td></td>
<td>Adlershof <a href="http://www.dlr.de">www.dlr.de</a></td>
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</tbody>
</table>
Detailed technical program

Monday, May 06, 2019

08:00-09:00   Registration, BBAW
09:00-09:15   Welcome:
               S. Krach, Secretary of State for Science and Research Government of Berlin
               J.-M. Contant, Secretary General IAA
               P. Ehrenfreund, Chair of Executive Board of DLR

09:15-10:00   Keynote speech:
               ESA smallsat approach and programmes
               F. Teston, Head of Systems Department at ESA/ESTEC

10:00-10:40   BREAK

Session 1: Programmatic

Chairs: F. Teston, ESA, NL   P. Patterson, USU/SDL, USA

Small Satellites and NASA Earth Science (IAA-B12-0101)
Steven P. Neeck (NASA, USA)

Advancing space technology in Africa - the transition from national programs to sustainable space programs (IAA-B12-0102)
Sias Mostert (SCS Space, South Africa)

Aspects of Small Satellite Programmatic of TU Berlin (IAA-B12-0103)
Klaus Brieß (TU Berlin, Germany)

Practical debris mitigation manual for developers of microsatellites and smaller satellites (IAA-B12-0104)
Darren McKnight, Christophe Bonnal, Peter Martinez, Toshiya Hanada, Rei Kawashima, Rene Laufer, Rainer Sandau, Alex da Silva Curiel (IAA)

12:20-13:30   LUNCH
Session 2: Missions  
13:30-15:00  
Chairs: A. da Silva Curiel, SSTL, UK  
GP Sandhoo, US NRL, USA

Technologies for Small Optical Systems leading to Disruptive Innovations for Remote Sensing (IAA-B12-0201)
Alessandro Zuccaro Marchi, Luca Maresi (ESA ESTEC, Netherlands)

On-Orbit Greenhouse Gas Emissions Monitoring with the GHGSat Constellation (IAA-B12-0202)
Laura M. Bradbury, Michael Ligori, Robert Spina, Robert E. Zee (University of Toronto, Canada), Stephane Germain (GHGSat Inc, Canada)

PRETTY- A Passive Reflectometry and Dosimetry Mission Using a 3U CubeSat (IAA-B12-0203)
O. Koudelka, M. Wenger, A. Hörmer, R. Zeif (Graz University of Technology, Austria), H. Fragner, A. Dielacher, M. Moritsch (RUAG Space, Austria), P. Beck, C. Tscherne, M. Wind (Seibersdorf Laboratories, Austria), R. Walker, M. Martin-Neira (ESA ESTEC, Netherlands)

Measuring Earth’s Energy Budget from a CubeSat (IAA-B12-0204)
William H. Swartz, Philip M. Huang (JHU APL, USA), Steven R. Lorentz (L-1 Standards and Technology, USA)

15:00-15:20  BREAK  

Session 3: Sensor Systems  
15:20-16:40  
Chairs: S. Neeck, NASA/HQ, USA  
C. Underwood, SSC, UK

SHACS: Spatial Heterodyne Atmospheric Carbon-Dioxide Spectrometer (IAA-B12-0301)
Ikpaya Ikpaya, Craig Underwood (Surrey Space Center, UK)

High Performance EO Payload for Smallsats (IAA-B12-0302)
Roland Geyl, Daniel Farina (Safran Reosc, France), Jean-Philippe Girault (Safran Electronics & Defense, France)

Multispectral Time Delay Integration image sensor for high resolution earth observation (IAA-B12-0303)
Piet De Moor (imec, Belgium)

DESIS – DLR Earth Sensing Imaging Spectrometer (IAA-B12-0304)
David Krutz, Ilse Sebastian, Ingo Walter, Burghardt Günther, Holger Venus, Michael Neidhardt, Bernd Zender, Simone Arloth, Matthias Lieder, Ute Grote, Andreas Wojtkowiak, Friedrich Schrandt (DLR Berlin, Germany), Ralf Reulke (Humboldt Universität, Germany), Rupert Müller (DLR Wessling, Germany)
Round Table: Who rules space-based EO - Business or Governments? 16:40-17:40
Chair: N. Frischauf, SpaceTec Partners, DE

Panelists:  Josef ASCHBACHER, ESA
            Massimiliano VITALE, Planet
            Rainer HORN, SpaceTec Partners
            Gunter SCHREIER, DLR
            Sias MOSTERT, SCS Space
Tuesday, May 07, 2019

Session 4: Constellations/ Formations  09:00-10:30

Chairs: O. Koudelka, TU Graz, AUT       K. Schilling, JMU Würzburg, DE

Constellation of Small SAR Satellites with Deployable Planar Antenna for Commercial Use (IAA-B12-0401)
Toshihiro Obata, Shinichi Nakasuka (University of Tokyo, Japan), Hiromichi Saito, Koji Tanaka, Makoto Mita (JAXA, Japan), Seiko Shirasaka, Keiichi Hirako (Keio University, Japan)

Novel Nanosatellite Cluster Deployment Strategy by Precise Orbit Insertion – Design, Verification and Flight Results (IAA-B12-0402)
Zizung Yoon, Walter Frese, Klaus Brieff (Technical University Berlin, Germany), Siegfried Voigt (DLR, Germany)

Stanley O. Kennedy, Jr., Alexander Dunn (Oakman Aerospace, USA)

CloudCT – Computed Tomography of Clouds by a Small Satellite Formation (IAA-B12-1502)
Klaus Schilling (Zentrum für Telematik, Würzburg, Germany), Yoav Y. Schechner (Technion – Israel Institute of Technology, Haifa, Israel), Ilan Koren (Weizmann Institute of Science, Rehovot, Israel)

10:30-10:50  BREAK

Session 5: Integrated Applications  10:50-12:10

Chairs: A. Court, TNO, NL       S. Mostert, SCS, ZAF

Integrated Applications: an overview from Space to Earth (IAA-B12-0501)
Andrew Court (TNO, Delft, Netherlands)

ESA ARTES and Integrated Applications (IAA-B12-0502)
Roberta Muggelesi Dow (ESA/ECSAT, Didcot, UK)

Small satellites and Integrated Applications (IAA-B12-0503)
Larry Paxton (Johns Hopkins University Applied Physics Laboratory, Maryland, USA)

Jaime Esper, Dong Wu, Brian Abresch, Brooks Flaherty, Chris Purdy, John Hudeck, Juan Rodriguez, Ted Daisey, Scott Heatwole, Robert Stancil, Thomas Johnson, Alexander Coleman, Negar Ehsan, Kevin Horgan, Jeffrey Piepmeier (NASA Goddard Space Flight Center, Greenbelt, USA); presented by Steven P. Neeck

12:10-13:30  LUNCH
Session 6: Student Conference 13:30-15:00
Chairs: S. Kennedy, OAI, USA L. Paxton, JHU/APL, USA

An architecture for efficient processing and visualization of data from a space mission: MarconISSta case study (IAA-B12-0601)
José Manuel Díez, Fynn Boyer, Alexander Maximilian Bauer, Tim Malte Gräfje, Martin Buscher (TU Berlin, Germany)

Moon Cubesat Hazard Assessment (MOOCHA) – An International Earth-Moon Small Satellite Constellation (IAA-B12-0602)
Alexandros Binios\textsuperscript{a,b}, Janis Dalbins\textsuperscript{c}, Sean Haslam\textsuperscript{d}, Rusnė Ivaškevičiūtė\textsuperscript{e}, Ayush Jain\textsuperscript{c}, Maarit Kinnari\textsuperscript{a}, Joosep Kivistik\textsuperscript{c}, Fiona Leverone\textsuperscript{f}, Juuso Mikkola\textsuperscript{a}, Ervin Oro\textsuperscript{c}, Laura Ruusmann\textsuperscript{c}, Janis Sate\textsuperscript{g}, Hector-Andreas Stavrarakis\textsuperscript{h}, Nandinbaatar Tsog\textsuperscript{i}, Karin Pai\textsuperscript{j}, Jaan Praks\textsuperscript{k}, René Laufer\textsuperscript{a,k} (\textsuperscript{a}Aalto University, Espoo, Finland; \textsuperscript{b}University of Helsinki, Helsinki, Finland; \textsuperscript{c}University of Tartu, Tartu, Estonia; \textsuperscript{d}Metropolia University of Applied Sciences, Helsinki, Finland; \textsuperscript{e}Vilnius University, Lithuania; \textsuperscript{f}Delft University of Technology, Delft, The Netherlands; \textsuperscript{g}University of Latvia, Riga, Latvia; \textsuperscript{h}National Technical University of Athens, Greece; \textsuperscript{i}Mälardalen University, Västerås, Sweden; \textsuperscript{j}Baylor University, Waco, Texas, USA; \textsuperscript{k}University of Cape Town, Rondebosch, South Africa)

Observing the Impact of Air Pollution in Dhaka City using APOSat (IAA-B12-0604)
Masrur Khan, Monirul Islam Pavel, Mustafa Jamil, Md. Tausif Rahman (BRAC University, Dhaka, Bangladesh)

Attitude and orbital dynamics fine coupling for high area-to-mass ratio satellites (IAA-B12-0605)
Cristiano Contini, Camilla Colombo (Department of Aerospace Science and Technology, Politecnico di Milano, Italy)

PCB design and layout for future TUPEX missions optimized for manufacture and verification (IAA-B12-0606)
Brian Treacy (TU Berlin, Berlin, Germany)

15:00-15:20 BREAK

Session 7: AOCS 15:20-16:40
Chairs: W.H. Steyn, SUN, ZAF T. Terzibaschian, DLR, DE

Semi-Passive Three Axis Attitude Stabilization for Earth Observation Satellites using the Drag Maneuvering Device (IAA-B12-0701)
Sanny Omar, Camilo Riano Rios, Riccardo Bevilacqua (University of Florida, Gainesville, USA)

The ALSAT-2B Gyrostellar Estimator: 2 years In-Orbit Performance (IAA-B12-0702)
Haider Benzeniar (Algerian Space Agency, Algeria)

Approach for estimation of nanosatellite’s motion concerning of mass centre by trajectory measurements (IAA-B12-0703)
Igor Belokonov, Ivan Timbai, Petr Nikolaev (Samara National Research University, Russia)

FDIR Handling in Eu:CROPIS ACS (IAA-B12-0704)
Olaf Maibaum, Ansgar Heidecker, Fabian Greif, Markus Schlotterer, Andreas Gerndt (German Aerospace Center - DLR, Germany)
CHAFF: CubeSat Hyperspectral Applications For Farming (IAA-B12-0205P)
Callum Middleton, Craig Underwood, Chris Bridges (SSC, UK), Emma Woolliams, Nigel Fox (NPL, UK)

Design and test of a COTS based imaging system for stereo-scopeic meteor observations (IAA-B12-0207P)
Jona Petri, Alexander Schmidt, Julia Zink, Sabine Klinkner (Institute of Space Systems, Germany)

NExSat-1, a resource monitoring satellite made in Egypt (IAA-B12-0208P)
Abou Bakr Elhady (National Authority for Remote Sensing and Space Sciences, Egypt), Björn Danziger (Berlin Space Technogies, Germany)

Lagarí, a high resolution satellite for environmental monitoring and disaster relief (IAA-B12-0209P)
Başak Hassoy, Elif Dirgin (STM, Turkey), Matthias Buhl (Berlin Space Technologies, Germany)

Maximizing CubeSat Payload Volume in Milli-gravity to Improve CubeSat Earth Observation from Space (IAA-B12-0210P)
Maharshi Bhattacharya, José Díez, Brennan Lutkewitte, Hugh MacLellan, Sebastián Ospina, Nicholas Smith, David Thorne, Sebastian Grau, Martin Buscher, Jens Großhans (TU Berlin, Germany)

iSIM 170 QM and qualification test campaign (IAA-B12-0306P)
Rafael Guzmán Llorente, Eider Ocerín Martínez, Aitor Conde Rodríguez, María Dasí Espuig (Satlantis Microsats SL, Spain)

TDI CMOS Image Sensors for Earth Observation (IAA-B12-0308P)
Philip Brown, Charles Woffinden, Paul Jerram (Teledyne-e2v, Chelmsford, UK)

Feasibility Analysis of Low Earth Orbit Nanosatellite Formations with Limited Delta-V Budget (IAA-B12-0406P)
Debdeep Roychowdhury, Yeerang Lim, Sascha Weiß (TU Berlin, Germany)

CubeSat Formation Flying using Low Power Inter-Satellite Communication in Earth Observation Missions (IAA-B12-0407P)
Roland Haber, Iurii Motroniuk (Center for Telematics, Germany), Klaus Schilling (Julius-Maximilians-University Wuerzburg, Germany)

Single Nanosatellite Launcher SNL – High Precision Launch Container for Nanosatellite Networks (IAA-B12-0408P)
Thomas Hellwig, Roy Bertfeld, Antje Deckert, Sebastian Scheiding (Astrofein, Germany)

To boldly go where no Sunsensor has gone before (IAA-B12-0705P)
Johan Leijtens, Dick Broekmans, Stefan Schmidt, Johan Uittenhout (Lens R&D, Noordwijk, the Netherlands)

Debunking Sunsensor specifications (IAA-B12-0706P)
Johan Leijtens (Lens R&D, Noordwijk, the Netherlands)

Cognitive Navigation (IAA-B12-0707P)
Adam Yingling, Evan Ward, Trey Morris (Naval Research Laboratory, Washington DC, USA)
Magnetic Attitude Control of a Spinning Spacecraft Flight Results and Lessons Learned from DLR’s Compact Satellite Eu: CROPIS (IAA-B12-0708P)
Ansgar Heidecker, Markus Schlotterer, Olaf Maibaum, Elisabeth Panzenboeck, Sebastian Löw, Markus Markgraf (German Aerospace Center – DLR, Germany)

In-orbit differential drag control experiment on nanosatellite cluster: analysis and flight results (IAA-B12-0805P)
Yeerang Lim, Zizung Yoon, Walter Frese (Technical University Berlin, Germany)

About Ecoinformatics tools and GIMS-technology in the water quality monitoring (IAA-B12-0806P)
Dao Van Tuyet (Vietnam National Space Center, Vietnam Academy of Science and Technology, Hanoi, Vietnam), Ngo Hoang Huy (Electric Power University, Hanoi, Vietnam), Vladimir F. Krapivin, Ferdenant A. Mkrtchyan, Vladimir V. Klimov, Vladimir Yu. Soldatov (Kotelnikov Institute of Radioengineering and Electronics, Russian Academy of Sciences, Moscow, Russia)

Teledyne’s HighPerformance Infrared Detectors for Space Missions (IAA-B12-1105P)
Paul Jerram (Teledyne-e2v, Chelmsford, UK)

Phase A Study for the Earth Observation and Technology Demonstration Cubesat SOURCE (IAA-B12-1008P)
Robin Schweigert, Annika Stier (Small Satellite Student Society of the University of Stuttgart (KSat e.V.), Stuttgart, Germany), Dr. Michael Lengowski, Daniel Galla, Prof. Sabine Klinkner (Institute of Space Systems, Stuttgart, Germany)

SALSAT: Distributed software architecture for a Spectrum AnaLysis SATellite with modular payload capabilities (IAA-B12-0907P)
Philipp Wüstenberg, Jens Großhans, Alexander Balke, Huu Quan Vu, Michael Pust, Klaus Brieß Barschke (Technische Universität Berlin, Berlin, Germany)

On-Orbit Verification of a Modular Propulsion System MICROJET 2000 in the framework of BIROS and BEESAT-4 Small Satellite Formation Flying Demonstration AVANTI (IAA-B12-1414P)
Dr. Harry Adirim¹, Dr. Winfried Halle², Matthias Kreit¹, Michael Kron¹, Matthias Lieder², Thomas Terzibaschian², Sascha Weiβ³ (¹Aerospace Innovation GmbH, Berlin, Germany, ²DLR, Berlin, Germany, ³TU Berlin, Berlin, Germany)
Wednesday, May 08, 2019

Session 8: Lessons Learned 09:00-10:30

Chairs: R. Kawashima, UNISEC-Global, JP  A. Zuccaro Marchi, ESA, NL

Lessons Learned from Integrating the Dual-band Optical Transient Camera to Microsatellite RISESAT (IAA-B12-0802)
Hannah Tomio, Morokot Sakal, Toshinori Kuwahara (Tohoku University, Aramaki Aza, Sendai, Japan), Alfred Bing-Chih Chen, Ted Wei-Tai Liu, Mike Chih-Chen Tsai (Institute of Space and Plasma Sciences, National Cheng Kung University, Tainan City, Taiwan)

TechnoSat - Results from the first 18 months of operation (IAA-B12-0803)
Merlin F. Barschke, Julian Bartholomäus, Juan M. Haces Crespo, Clément Jonglez, Philip von Keiser, Danilo Költzsch, Julius Leglise, Marc Lehmann, Christian Meumann, Steffen Reinert, Sven Rotter, Mario Starke, Philipp Werner, Lars Zander (Technische Universität Berlin, Germany), Karsten Gordon (Spacegramming, Bad Wiessee, Germany)

InflateSail De-Orbit Flight Demonstration – Observed Re-Entry Attitude and Orbit Dynamics (IAA-B12-0804)
Craig Underwood, Ben Taylor, Richard Duke, Brian Stewart, Chris Bridges, Andrew Viquerat (Surrey Space Centre, University of Surrey, UK), Herman Steyn (Electrical & Electronic Engineering, Stellenbosch University, South Africa), Davide Masutti, Amandine Denis (Von Karman Institute for Fluid Dynamics, Sint-Genesius-Rode, Belgium)

Magnetic Attitude Control of a Spinning Spacecraft Flight Results and Lessons Learned from DLR’s Compact Satellite Eu: CROPIS (IAA-B12-0708P)
Ansgar Heidecker, Markus Schlotterer, Olaf Maibaum, Elisabeth Panzenboeck, Sebastian Löw, Markus Markgraf (German Aerospace Center – DLR, Germany)

10:30-10:50  BREAK

Session 9: On-Board Processing 10:50-12:10

Chairs: M. Barschke, TU Berlin, DE  A. Rogers, Maxar, USA

Nandinbaatar Tsog, Mikael Sjödin (Mälardalen University, Västerås, Sweden), Fredrik Bruhn (Mälardalen University, Västerås, Sweden and Unibap AB Uppsala, Sweden)

3U satellite bus SONATE for technology demonstration of autonomous payloads (IAA-B12-0902)
Oleksii Balagurin, Tom Baumann, Tobias Greiner, Hakan Kayal, Andreas Maurer, Thomas Rapp, Tobias Schwarz (University of Würzburg, Germany)

Realtime Dynamic Target Pointing using Onboard Image Processing of Cloud Cover for Earth Observation Microsatellites (IAA-B12-0903)
Julie Ann Banatao, John Leur Labrador, Yuji Sakamoto, Kazuya Yoshida (Tohoku University, Sendai, Japan)

Multi-Mission Software Development for Small Spacecraft
Karsten Gordon (Spacegramming, Bad Wiessee, Germany), Mario Starke, Philip von Keiser, Merlin F. Barschke (Technische Universität Berlin, Germany)
Session 10: New Platforms  13:30-15:00

Chairs: M. Hetscher, DLR, DE

Development of on-demand compact SAR satellite (IAA-B12-1001)
Hirobumi Saito (JAXA, Japan), Kei-ichi Hirako, Seiko Shirasaka (Keio University, Yokohama, Japan), Toshihiro Obata, Shin-ichi Nakasuka (the University of Tokyo, Tokyo, Japan), Shinobu Nakamura, Takeshi Tohara (Japan Science and Technology Agency, Tokyo, Japan)

Synthetic Aperture Radar on a nanosatellite - is it possible? (IAA-B12-1002)
Alex da Silva Curiel, Phil Whittaker, Rachel Bird, Andrew Haslehurst, Victoria Irwin, Andrew Cawthorne, Luis Gomes (Surrey Satellite Technology Ltd., Guildford, UK), Craig Underwood, Guglielmo Aglietti, Martin Sweeting (Surrey Space Centre, University of Surrey, Guildford, UK)

Stuttgart University’s reliable, high-performance small satellite platform on its first mission "Flying Laptop" (IAA-B12-1009)
Sabine Klinkner, Steffen Gaisser, Jonas Keim, Kai-Sören Klemich, Michael Lengowski, Ulrich Mohr (Institute of Space Systems, University of Stuttgart, Germany)

STRATOS - A payload for 3U CubeSats that collects thousands of neutral atmospheric soundings per day (IAA-B12-1004)
O. Nogués-Correig¹, L. Tan², T. Yuasa², R. Marshall¹, J. Ringer², A. Warzyński¹, V. Irisov³, V. Nguyen¹, T. Duly³, S. Esteyhüzen¹, D. Masters³, D. Ector³, J. Spark¹, J. Cappaert¹, P. Platzer⁴
¹Spire Global UK Ltd., Glasgow, UK,
²Spire Global Singapore PTE Ltd., Singapore,
³Spire Global Inc., Boulder, USA,
⁴Spire Global Luxembourg S.a.r.l., Luxembourg

15:00-15:20  BREAK

Session 11: Infrared Missions  15:20-16:40

Chairs: L. Gratton, Colomb Inst., ARG

The TUBIN mission within the context of present and future satellite-based fire detection systems (IAA-B12-1101)
Julian Bartholomäus, Marc Lehmann, Merlin F. Barschke (TU Berlin, Germany)

CHAFF: CubeSat Hyperspectral Applications For Farming (IAA-B12-0205P)
Callum Middleton, Craig Underwood, Chris Bridges (SSC, UK), Emma Woolliams, Nigel Fox (NPL, UK)

Infrared Remote-Sensing and Results of the DLR FireBIRD Mission (IAA-B12-1103)

Nanosat-based detection and tracking of launch vehicles (IAA-B12-1104)
Caroline Schweitzer, Norbert Scherer-Negenborn, Norbert Wendelstein, Karin Stein (Fraunhofer IOSB, Ettlingen, Germany), Clemens Horch, Max Gulde (Fraunhofer EMI, Freiburg, Germany)
cPCI Serial Space Compliant Mass Memory Board with Integrated Data Processing Capabilities (IAA-B12-0906P)
Harald Michalik (DSI Aerospace Technology, Bremen, Germany and IDA TU Braunschweig, Germany), Dietmar Walter, Gang Zhou, Rainer Preuss, Christian Dierker, Ole Bischoff, Elias Hashem (DSI Aerospace Technology, Bremen, Germany)

Test of the Autonomous Diagnostic System ADIA-Light aboard the Nanosatellite Mission SONATE (IAA-B12-0908P)
Gerhard Fellinger, Timo Burger, Kirill Djebko, Eric Jäger (University of Würzburg, Würzburg, Germany)

Design of the first Ukrainian PlantSat nanosatellite (IAA-B12-1005P)
Vasyl Brykov, Elizabeth Kordyum (M.G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine, Kyiv, Ukraine), Boris Rassamakin (National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Ukraine), Natalia Zaimenko (M.M. Gryshko National Botanical Garden, National Academy of Sciences of Ukraine, Kyiv, Ukraine)

A modular platform architecture to enable system level scalability (IAA-B12-1006P)
Merlin F. Barschke (Technische Universität Berlin, Institute of Aeronautics and Astronautics, Berlin, Germany)

TIM: An International Formation for Earth Observation with CubeSats (IAA-B12-1007P)
Alexander Kleinschrodt¹, Iurii Motroniuk², Anna Aumann², Ilham Mammadov², Maros Hladky¹, Mohd Bilal¹, Andreas Freimann¹, Liu Minshi³, Jiang Lianxiang³, Francois Malan⁴, Hendrik Burger⁵, Giovanni Beltrame⁶ and Klaus Schilling¹,². ¹University of Würzburg, Lehrstuhl für Informatik VII (Robotik und Telematik), Würzburg, Germany; ²Zentrum für Telematik e. V., Würzburg, Germany; ³Shandong Institute of Space Electronic Technology, Shandong, China; ⁴Space Advisory Company, Somerset West, Cape Town, South Africa; ⁵SCS Space, Somerset West, Cape Town, South Africa, and ⁶École Polytechnique de Montreal, Montreal, Canada.

Design and analysis of the offset Parabolic Antenna to be used in C band Communication Satellites (IAA-B12-1205P)
Abdelaziz Himeur, Ali Kara-Omar, Lahcène Hadj-Abderrahmane (Satellite Development Center, Oran, Algeria)

Wireless intra-spacecraft communication with inspaWSN protocol stack based on IR-UWB (IAA-B12-1207P)
Martin Drobczyk, Andre Lübken (German Aerospace Center, Institute of Space Systems, Avionics Systems Department, Bremen, Germany)

High-speed X-band Transmitter Development (IAA-B12-1209P)
Hyeun-pil Jin, Young-jin Joo, Jae-hoon Lee, Sung-min Park, Young-wook Sirl (Satrec Initiative Co., Ltd., Daejeon, the Republic of Korea), Jae Min Ahn (Chungnam National University, Daejeon, the Republic of Korea)
Urban green space, public health, and environment margin: thinking about management the
greenness in making comfortable living city in the context of climate change (IAA-B12-1305P)
Anh Kim Nguyen¹,²,³ and Yuei-An Liou¹ (¹Center for Space and Remote Sensing Research, National
Central University, Taoyuan City, Taiwan, R.O.C., ²Taiwan Group on Earth Observations, Hsinchu,
Taiwan, ROC, ³Institute of Geography, Vietnam Academy of Science and Technology, Hanoi,
Vietnam)

OPS-SAT – opening a satellite to the internet (IAA-B12-1307P)
Dominik Marszk¹, José Luís Feiteirinha², Benjamin Fischer³, Daniela Taubert⁴, Thorsten Graber⁵,
André Lofaldli³, Mehran Sarkarati³, David Evans⁵, Mario Merri³, ¹IMS Space Consultancy GmbH,
Darmstadt, Germany, ²Serco GmbH, Darmstadt, Germany, ³European Space Operations Centre,
Darmstadt, Germany, ⁴LSE Space GmbH, Darmstadt, Germany, ⁵Solenix Deutschland GmbH,
Darmstadt, Germany

Effective thermal testing and design solutions for PocketQube subsystems (IAA-B12-1405P)
Timo Rühl, Jasper Bouwmeester, Eberhard Gill (Faculty of Aerospace Engineering, Delft University of
Technology, Delft, Netherlands)

ELSA-CS, a high-performance solar array for 6U CubeSats (IAA-B12-1406P)
J. Watzinger, S. Masante, A. Lourenço (Space Structures GmbH, Berlin, Germany), G. van Ginkel
(German Orbital Systems GmbH, Berlin, Germany)

Delivery of Multiple Small Satellites via Soyuz-2 and Fregat (IAA-B12-1407P)
Mila Savelyeva, Valeriya Barashkova (GK Launch Services, Moscow, Russia)

Stratospheric Balloons: low-cost platforms for science and technology development (IAA-B12-
1408P)
Felix Friedl-Vallon (Karlsruher Institut für Technologie, Karlsruhe, Germany), Kristine Dannenberg
(Rymdstyrelsen, Solna, Sweden), Philippe Raizonville, AndreVargas (CNES, Toulouse, France)

Global launch booking system: why it is time to go online (IAA-B12-1409P)
Ksenia Lisitsyna (Precious Payload Inc., Wilmington, USA), Andrey Maksimov (Precious Payload
Inc., Dubai, UAE)

Make Testing Simple Again (IAA-B12-1410P)
Stefan Schmidt (TriasRnD, Noordwijk, the Netherlands)

PAPELL: Mechanic-free Mechanisms by Ferrofluids (IAA-B12-1411P)
Manfred Ehresmann, Georg Herdrich (Institute of Space Systems University of Stuttgart, Stuttgart,
Germany) Franziska Hild, Kira Grunwald, Christopher Behrmann, Robin Schweigert, Adrian Causevic,
Saskia Sütterlin, Nicolas Heinz (Small Satellite Student Society University of Stuttgart, Stuttgart,
Germany)

GUSDON (Global University Space Debris Observation Net-work): improvements in space
debris optical monitoring offered by a global University network (IAA-B12-1412P)
Fabio Santoni¹, Fabrizio Piergentili¹, Rei Kawashima², Paolo Marzioli¹, Marco Acernese¹ (¹Sapienza
University of Rome, Rome, Italy, ²UNISEC-Global, Tokyo, Japan)

IAA-GLOCECOHADIM AFRICA LIONSAT-1 PROJECT IN CAMEROON, AFRICA (IAA-
B12-1413P)
Tomukum Chia¹, Nang Lamberth Toh², Jayakumar Venkatesan³ (¹International Academy of
Astronautics, France, ²Global Centre for Compliance, Hazards and Disaster Management,
GLOCECOHADIM-Africa, Cameroon, ³Valles Marineris International Private Limited, India)
Thursday, May 09, 2019

Session 12: Communications 09:00-10:30

Chairs: S. Klinkner, IRS Stuttgart, DE Z. Yoon, TU Berlin, DE

Flight Results of MarconISSta: Monitoring and Analysis of Radio Frequency Use from Low Earth Orbit (IAA-B12-1201)
Martin Buscher, Max Kramer, Robert Marx, Alex Sullivan, Brian Treacy, Klaus Brieß (Technische Universität Berlin, Department of Aeronautics & Astronautics, Berlin, Germany)

Solving the chicken-and-egg problem for optical downlinks - a report on End-2-End approach (IAA-B12-1202)
Philipp Biller, Herwig Zech, Matthias Motzigemba (Tesat Spacecom, Backnang, Germany), Christopher Schmidt, Christian Fuchs (German Aerospace Center (DLR), Institute of Communications and Navigation, Wessling, Germany) ; Presented by Philipp Wertz (Tesat)

Novel Embedded Antenna Design for CubeSat and Small Satellite Platforms (IAA-B12-1203)
Manohar Deshpande (NASA Goddard Space Flight Center, Greenbelt, USA)

S-Net First Year in Orbit: Verification of a Nanosatellite Network in S Band (IAA-B12-1204)
Walter Frese, Zizung Yoon, Klaus Brieß (Department of Aeronautics and Astronautics, Technische Universität Berlin, Berlin, Germany), Siegfried Voigt (German Space Administration (DLR Raumfahrtmanagement), Bonn, Germany)

10:30-10:50 BREAK

Session 13: Ground Segment 10:50-12:10

Chairs: J.-N. Bricout, CNES, FR E. Gill, TU Delft, NL

An Experience of Satellite UHF - Ground Stations as the Basis for Academic Cooperation (IAA-B12-1301)
Livio Gratton, Claus Rosito (Instituto Colomb, San Martín, Argentina), Martin Buscher, Sascha Kapitola (Technische Universität Berlin, Berlin, Germany), Apiwat Jirawattanaphol (Kyushu Institute of Technology, Fukuoka, Japan), Sebastián Marinsek (Instituto Antártico Argentino, San Martín, Argentina)

Payload Data Handling for a University Small Satellite Ground Segment (IAA-B12-1302)
Sebastian Wenzel, Jonas Keim, Sabine Klinkner (Institute of Space Systems (IRS), University of Stuttgart, Stuttgart, Germany)

Automatic Operation System with Reliability and Accessibility Design for Precursory Electric Field Observation CubeSat Demonstrator Prelude (IAA-B12-1303)
Ryo Futamata, Masahiko Yamazaki (Nihon University, Chiba, Japan), Masashi Kamogawa (Tokyo Gakugei University, Tokyo, Japan)

Automated Operations of BEESAT-9: A CubeSat with a Fluid-Dynamic Actuator and GPS receiver (IAA-B12-1304)
Sascha Kapitola, Sebastian Grau, Sascha Weiß (Technische Universität Berlin, Germany)

12:10-13:30 LUNCH
Session 14: Special Aspects 13:30-15:00

Chairs: R. Laufer, Baylor, USA  M. Saandar, MSPRS, MON

The UN COPUOS space sustainability guidelines in the context of small satellites (IAA-B12-1401)
Peter Martinez (Secure World Foundation (SWF), Broomfield, USA)

The Sunsensor of the future. Bragging spree or reality? (IAA-B12-1402)
Johan Leijtens, Dick Broekmans, Stefan Schmidt, Johan Uittenhout (Lens R&D, Noordwijk, the Netherlands)

Hybrid Propulsion for Low-cost Access to Space (IAA-B12-1403)
Mario Kobald, Christian Schmierer (HyImpulse Technologies GmbH, Hardhausen, Germany)

Peter Martinez (Secure World Foundation (SWF), Broomfield, USA)

15:00-15:20  BREAK

Session 15: Distributed Systems 15:20-16:40

Chairs: I. Belokonov, SSAU, RUS  S. Roemer, Antwerp Space, BEL

PASSAT: Passive Bi-Static SAR Constellation – Progress and Trial Results (IAA-B12-1501)
Craig Underwood, Alex Dyer (Surrey Space Centre, University of Surrey, Guildford, UK), George Atkinson, Alp Sayin, Mike Cherniakov, Michail Antoniou (Department of Electronic, Electrical and Systems Engineering, University of Birmingham, Birmingham, UK)

Feasibility Analysis of Low Earth Orbit Nanosatellite Formations with Limited Delta-V Budget (IAA-B12-0406P)
Debdeep Roychowdhury, Yeerang Lim, Sascha Weiß (TU Berlin, Germany)

Global Digital Elevation Model from a Formation of Small Synthetic Aperture Radar Satellites-Requirements and Opportunities of MirrorSAR (IAA-B12-1503)
Josef Mittermayer, Gerhard Krieger (German Aerospace Center (DLR), Microwaves and Radar Institute, Wessling, Germany)

A Cubesat Based GNSS Constellation For Planetary & Earth System Exploration (IAA-B12-1504)
Norbert Frischauf, Manfred Wittig (SpaceTec Capital Partners, Munich, Germany), Otto Koudelka (Graz University of Technology, Graz, Austria)

Symposium Summary 16:40-17:40

Chairs:
K. Brieß, TU Berlin, DE
R. Sandau, IAA, FR
E. Gill, TU Delft, NL

Chief Rapporteur:
A. Rogers, Maxar, USA

AWARDS
Best Presentation Award
Best Poster Award
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<td>Missions</td>
<td>Student Conference</td>
<td>New Platforms</td>
<td>Special Aspects</td>
</tr>
<tr>
<td>15:00 - 15:20</td>
<td>Coffee Break</td>
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<tr>
<td>15:20 - 16:40</td>
<td>Papers</td>
<td>Session 03</td>
<td>Session 07</td>
<td>Session 11</td>
<td>Session 15</td>
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<td></td>
<td></td>
<td>Sensor Systems</td>
<td>AOCS</td>
<td>Infrared Missions</td>
<td>Distributed Systems</td>
</tr>
<tr>
<td>16:40 - 17:40</td>
<td>Round Table</td>
<td>Poster Session I</td>
<td>Poster Session II</td>
<td>Symposium Summary</td>
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<td>Awards</td>
<td></td>
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<tr>
<td>SUNDAY, May 05, 2019</td>
<td>Reception (18:30-22:30)</td>
<td>IAA Dinner (19:00-22:00)</td>
<td>No event</td>
<td>Concert (20:00-22:00)</td>
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<tr>
<td>Get-Together (19:00 - 20:00), BBAW</td>
<td>Ship Tour</td>
<td>The Regent Hotel</td>
<td></td>
<td>Konzerthaus Berlin</td>
<td></td>
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Excursion: DLR Adlershof 09:00 - 13:00