



26TH
APRSAF
ASIA-PACIFIC REGIONAL
SPACE AGENCY FORUM
JAPAN

WORKING GROUP SUMMARY REPORT

SPACE ENVIRONMENT UTILIZATION



Session Co-Chairs:

Dr. Damrongrit Niammuad (GISTDA/Thailand)

Ms. OGAWA Shiho (JAXA/Japan)



PARTICIPANTS OF SEUWG

98 participants from
14 countries and region, **44** organizations

Country	participants	Institutes
Australia	4	Australian National University, Sydney University
Indonesia	6	LAPAN
Japan	52	JAXA, JSF, JAMSS, AES, MEXT, Kyushu Institute of Technology, University of Tokyo, Keio University, Nagoya city university, Intercore, Space BD, Astrocean, Human Spaceflight Technology Directorate, Mitsui Bussan Aerospace, SPACETIDE, Ministry of Education, APRSAF Secretariat
Malaysia	6	Malaysian Space Agency, Universiti Sains Malaysia
Nepal	1	NESARC
New Zealand	2	NZSA, ISIS
Philippines	5	Philippine Council for Industry, Air Link International Aviation College
Singapore	2	SSTA, Zenith Intellutions
Taiwan	1	Gran Systems
Thailand	10	GISTDA, NSTDA, Astroberry Limited, MOBILIFE INTERNATIONAL, Space Zab Company, Defence Technology Institute, Others
Turkey	2	Istanbul Technical University, Belpico Havacilik ve Uzay Teknolojileri ARGE
UAE	2	MBRSC
USA	3	NASA, Space Generation Advisory Council
Vietnam	1	VAST
---	1	UNOOSA
Total	98	

SEUWG : COUNTRY REPORTS

- Space activities and future plans about Space Environment Utilization were reported from eight countries

(Australia, Indonesia, Japan, Malaysia, New Zealand, Singapore, Thailand and United Arab Emirates).

- Space program
- CubeSat development through J-SSOD
- Material exposure experiments
- “Kibo Robot Programming Challenge” of Kibo-ABC initiative
- Conferences, Workshops, and Space science festivals
- Commercialization and new projects



Meeting between NZSA and JAXA in March, 2019

New Zealand Space Agency and **Australian Space Agency** participated in KIBO-ABC in September and October, 2019



Meeting between ASA and JAXA in March, 2019

“Kibo” Utilization / CubeSat

< Achievement in 2019 >

- BIRDS-3 project in 2019
 - NepaliSat-1 (the first Nepal satellite) and Raavana-1 (the first Sri Lanka satellite) were deployed from Kibo using J-SSOD in June, 2019.
- Singapore satellite (SSTA and JAXA collaboration)
 - SpooQy-1 of Singapore (NUS) was deployed from Kibo using J-SSOD in June, 2019.



CubeSat deployment



Congratulating from JAXA's MCR

“Kibo” Utilization / Exposed Facility

< Achievement in 2019 >

- **ExHAM** experiments

(ExHAM: Exposed Experiment Handrail Attachment Mechanism)

- The second experiment of the collaboration mission between **Turkey** and Japan has been completed.

- **Malaysian** Smart Optical Fibres for Passive Dosimetry in Space, SOFPADS (proposed by Universiti Putra Malaysia), has started.

- ✓ E-SOFPADS experiment on ExHAM
- ✓ I-SOFPADS experiment in Kibo Pressurized Module

- **i-SEEP** experiments

(i-SEEP: IVA-replaceable Small Exposed Experiment Platform)

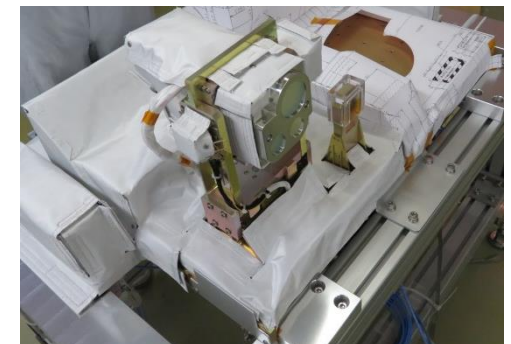
- JAXA shared the potential usage of the i-SEEP with Asian Pacific partners as the external technical demonstration test bed, i.e. the optical communication device for future mega-constellation and for future space exploration.



Istanbul Technical University and JAXA



I-SOFPADS in Kibo



Optical Communication Device (SOLISS)

“Kibo” Utilization / Microgravity Experiment

< Achievement in 2019 >

- **GISTDA/Thailand** and JAXA signed an agreement to conduct Thailand's first space experiment: PROTEIN CRYSTALLIZATION EXPERIMENT IN SPACE on 17th June 2019.
 - ✓ PCG sample was launched on 25th July 2019, and experiment was carried out for one month.
 - ✓ The result was different from expectation, so JAXA and GISTDA decided to try new approach.
- The first astronaut from **United Arab Emirates** had an educational mission using JAXA's Int-Ball. In UAE, many students attended the public viewing event.



Thailand's Protein sample in Kibo



Astronaut Hazzaa with Int-Ball



Public viewing in UAE

Kibo-Robot Programming Challenge

new program of the Kibo-ABC initiative

- **JAXA** and **NASA** host a Robot Programming Competition on-board the ISS/Kibo under the Japan-US Open Platform Partnership Program (**JP-US OP3**).
- JAXA's **Int-Ball** and NASA's **Astrobee** will be used.
- Asian students of Kibo-ABC member countries are encouraged to participate.
 - ✓ **Indonesia, Japan, Singapore and Thailand** space agencies join as of now.
 - ✓ Individual inquiry from Australia, Sri Lanka, and UAE students were received by JAXA.
- **Preliminary Round** will be held in April to June 2020 **in each country**.
- **Final Round** will be held in September 2020 (Planned).



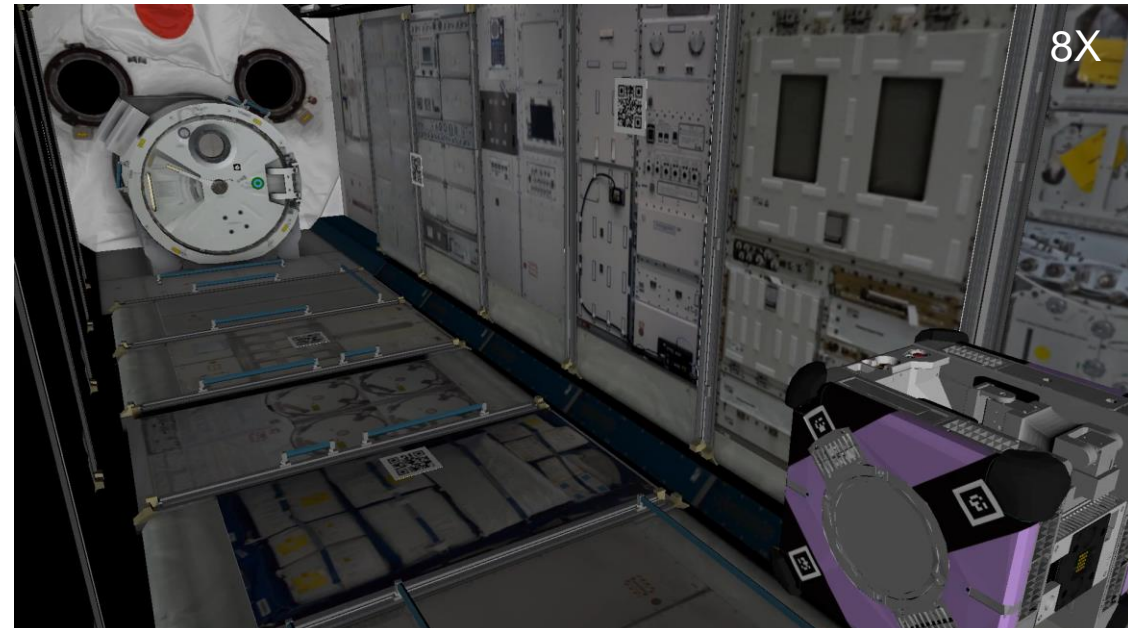
Int-Ball

Lots of Fun!

Let's Join us!!



Astrobee



ISS as a technical demonstration platform toward Moon and Mars exploration

- JAXA shared the activities of the **Space Exploration Innovation Hub** to bridge between the space exploration and the industries on the ground including the economical aspect ,and introduced Japan's future space exploration plan.
- **JAXA's Kibo activities as the platform toward Moon and Mars.**
 - Effect of partial gravity on human body is being investigated with Mice Experiment. Sample sharing of the experiments is proposed.
 - Investigation of the behavior of particles on partial gravity with hourglass type equipment is underway.
- **Space food** development for manned space activities
 - Importance of phycological effect by herb on human exploration of planets is acknowledged.
 - Experience of space food from Asian Pacific countries is shared.
 - JAXA proposed JAXA's space food certification to Asian Pacific countries.



Further Collaborations

- **UNOOSA** presented its multiple projects in providing opportunities for all UN Member States to benefit from the utilization of space-based and ground-based facilities. The success of the **UN/Japan KiboCUBE** program was emphasized and laid the foundation for expanding cooperation in this regard
- **Joint Session between SEUWG and SEWG** was held for the first time.
It was recommended that both Working Groups should collaborate with each other in the space education program, including ISS/Kibo utilization.



First Joint Session between SEUWG and SEWG

Summary and Next Steps

- We welcome the new capacity building program under the Kibo-ABC initiative, and advancement in bilateral cooperation of micro-g experiments, which will further promote the utilization of Kibo in the Asia-Pacific region.
 - Thailand and Japan agreed to try the next protein crystal growth experiment.
 - New program of Kibo-ABC, Kibo-Robot Programming Challenge will be conducted in 2020.
- All countries confirmed to continuously explore the utilization of space environment through the discussions on potential applications introduced from participants.
- JAXA introduced the future space exploration plan and on-going several technical demonstrations in Kibo towards Moon and Mars.

SEUWG SUMMARY REPORT APPENDIX

“Kibo” Utilization / Service providers

● Introduction of Mitsui’s Business Activities of Accelerate the Space Utilization

Mitsui & co. provides various Space Mobility Services (e.g., Rideshare of satellites on launching rockets, In-Orbit Service) and big data analysis.



● Commercialization of the “Access to Space”

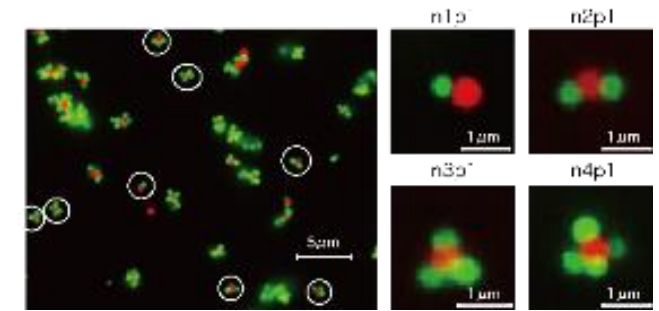
Space BD has taken over the role of commercialization of Satellite Deployment and External Platform from JAXA.



“Kibo” Utilization / Microgravity Experiment

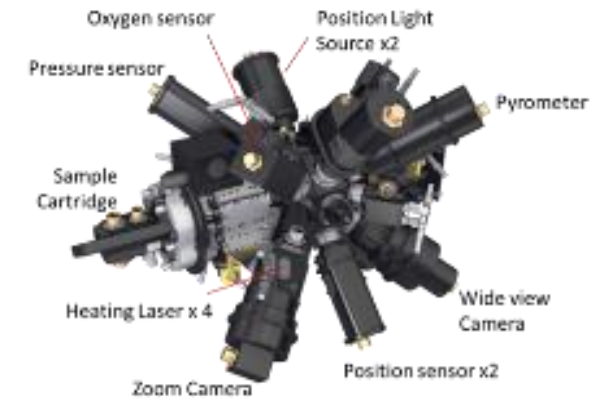
- Clustering of Oppositely Charged Colloidal Particles

It was expected to obtain an **equilibrium phase diagram** of the clusters formed by oppositely charged particles of PS, silica, **titania** (about 1 micrometer) thorough the experiment in ISS.



- Electrostatic Levitation Furnace (ELF)

ELF can levitate, melt and solidify sample without container. It can measure **density**, **surface tension** and **viscosity** of high melting point materials with ELF. JAXA offer participants to be the new ELF users .



- Parabolic Flight Activity in Space Development

History and future plan on the parabolic flight activity in Asia Pacific region was shown.

