





Working group summary report

Space Frontier Working Group



Co-Chairs: Dr. Doan Minh Chung (VAST-STI) Ms. OGAWA Shiho (JAXA) Day 1: *94* participants Day 2: *79* participants Total : *129* participants



Participants of SFWG 129participants from 20 countries and regions, 53 organizations

Country/Region	Participants	Institutions	Country/Region	participants	Institutes
Australia	5	ASA, Australian Embassy Tokyo, OGL, CSIRO	Nepal	1	NASARC
Austria	1	UNOOSA	New Zealand	1	NZSA
Bangladesh	2	BNMST, NYSPI	Pakistan	2	SUPARCO
Cambodia	1	Ministry of Water Resource and Meteorology	Philippines	13	PhilSA, Embassy in Tokyo, UPD, RTU
Fiji	1	Pacific Earth Observation Council	Singapore	3	SSTL, Zenith Intellutions, OSTIn
Hungary	1	JKIC	Taiwan	12	NSPO, Shay & Partners law firm, Richseen.com., NARLAB, 中興大, Gran System, China Medical Univ.
Indonesia	13	LAPAN, Surya Univ., PT Dahana (Persero)	Thailand	5	GISTDA, NSTDA, Mahidol University
Japan	45	JAXA, MEXT, CAO, AES, IPSTAR Japan Co., JAMSS, NEC, SEC, SpaceBD, MBA, NEC, NIKKEI	Turkey	1	BELpico Havacılık ve Uzay Teknolojileri ARGE Ltd. Şti.
Korea	1	KARI	UAE	1	Khalifa University
Malaysia	17	MYSA, MARDI, UPM, Department of Agriculture Technology	Vietnam	2	VAST

Activity and future plan in each country/region

 Space activities and future plans about Space Environment Utilization were reported from 13 countries and regions.

(Australia, Bangladesh, Indonesia, Japan, Malaysia, Nepal, New Zealand, Philippines, Singapore, Taiwan, Thailand, United Arab Emirates, and Vietnam).

- Space programs
- CubeSat development and deployment through J-SSOD
- Asian Herb in Space (AHiS)
- "Kibo Robot Programming Challenge" of Kibo-ABC initiative
- Conferences, Workshops, and Space science festivals
- Commercialization and new projects



UAESA, MBRSC (UAE), NSPO (Taiwan), NMST (Bangladesh), NESARC (Nepal), NZAN (New Zealand), and PhilSA (Philippines) joined in Kibo-ABC in 2020-2021.



Kibo Utilization < Achievement in 2020 - 2021 >

Protein crystal growth experiment for antimalaria drug design

The first Thai experiments in Kibo were conducted twice in 2019 and 2020. The data analysis is ongoing in Thailand.

GISTDA/NSTDA, Thailand

New radiation dosimeters experiment

New dosimeters were exposed inside and outside Kibo to measure the radiation in 2019-2021. The data analysis is ongoing in Malaysia.





Life science space experiment

ISS as a technical demonstration platform toward Moon and Mars exploration

- Asian Herb in Space is ongoing with the participation of 12 organizations.
 - The on-orbit experiment was conducted in Feb.-Mar. 2021 by Astronaut Soichi Noguchi.
 - Malaysia and Japan are planning an analysis of odor, cell walls gene expressions, etc., with grown herb samples.
- The plastic culture bag technology was demonstrated in ISS/Kibo in 2021.
- A joint experiment with Taiwan and Thailand is going on for the potential use of ISS/Kibo.









Kibo Utilization Opportunity - Exposed Facility

ISS as a technical demonstration platform toward Moon and Mars exploration

- Maya Satellites (BIRDS) by University of the Philippines Diliman, Philippines
 - Series of Maya Nanosatellites have been and will be launched and deployed from Kibo/ISS
- Light-1 CubeSat by Khalifa University, UAE
 - Will be launched in late December 2021 and deployed from Kibo/ISS.
- SuryaSat (KiboCUBE) by Surya University, Indonesia
 - Verification tests were conducted. Safety review and shipment are planned for next year.







Light-1



International Space Exploration

- Panelists from space agencies shared their latest status of space exploration activities and their contribution to the development in the Asia-Pacific region.
- Multi-faced approaches to space exploration missions are ongoing. ISECG is one of the options to join space exploration.

JAXA

- > Reported JAXA's exploration scenario, and ongoing/planned missions to the Gateway and lunar surface exploration.
- > Introduced JAXA's role in promoting dual utilization for contribution to exploration missions and industry activities.

GISTDA

- > Reported the progress toward exploration including the launch plan of a spacecraft to orbit the moon in the next few years.
- > Delivered the plan to build a Spaceport Thailand and to facilitate space industry.

KARI

- Scheduling to launch the "Korea Pathfinder Lunar Orbiter (KPLO)" in 2022 and the "Korea Lunar Lander and Rover" mission targeting 2030 launch.
- Preparing for future exploration with advanced technology development, upgrade of launch mission, and asteroid mission concept design, etc.

ASA/CSIRO

- > Emphasized importance of having multifaceted and international view to discuss exploration at the ISECG.
- > Aiming to triple the size of the Australian space economy and create additional 20,000 space jobs by 2030.
- > Providing industry an important base for international space activities through programs, major facilities and future science platform.



Summary (Recommendations)

- SFWG has encouraged many young researchers, engineers, and youth to participate in the activities of the Kibo-ABC initiative, such as the Kibo Robot Programming Challenge and Asian Herb in Space, contributing to human resource development in the region.
- SFWG recognizes the importance of the following.
 - Increasing in the use of "Kibo" and growing its expectations in the region
 - Contributing to the development of science and technology and the achievement of the SDGs, while maximizing the appeal of the ISS where humans have continuously been staying.
 - Exchanging information on international space exploration activities that will contribute to the development of the region.
- A number of experiments have been conducted in the Asia-Pacific region. It is expected to increase in utilizing "Kibo" for future space exploration towards Moon and Mars.

Appendix



"Kibo" Utilization / Other Topics

Tips for space experiment design and operation

AES and JAMSS explained some tips for potential users regarding experiment planning and operational tips based on their experience.

Access to Space for All Initiatives

UNOOSA is providing opportunities for UN member states to access space, including tracks like Hypergravity/Microgravity, Satellite Development and Exploration. It also provides educational opportunities through KiboCUBE.



Experiment Prep Flow





 Commercialization of the "Access to Space" Space BD, a selected service provider of Kibo utilization by JAXA, is providing opportunities of satellite deployment, i-SEEP utilization, and

protein crystal growth experiments to users across the region.

Utilization of Kibo Facility and post ISS

Mitsui Bussan Aerospace, a selected service provider of Kibo utilization by JAXA, is providing opportunities of satellite deployment, supporting additional ISS module by US commercial company, and started B to C business of delivery service to space. Satellite Deployment from ISS Kibo





Please watch the video clip





Asian Beneficial Collaboration through