UNISEC-Global The 47th Virtual Meeting

August 17th, 2024, 22:00-24:00
(Standard Japan time GMT +9)

The following report was prepared by UNISEC-Global Secretariat
August 17, 2024
Japan

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1. ITU Radio Frequency Coordination – What should be done before launching?

Dr. Naomi Kurahara, Co-Founder & CEO at Infostellar

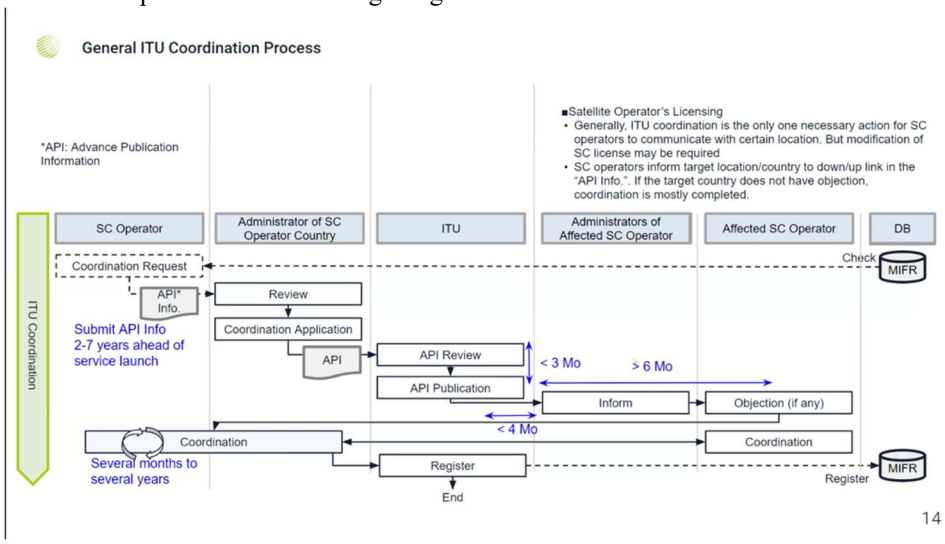
Naomi Kurahara is the Founder & Chief Executive Officer at Infostellar based in Tokyo, Japan. She has over a decade of experience in the Space industry. She holds a PhD in Electrical Engineering from the Kyushu Institute of Technology, where she conducted ion engine and space plasma environment research with JAXA. She also worked as a Researcher and Satellite Ground Systems (GS) Engineer and was a postdoctoral fellow at the University of Tokyo, where she led development of satellite operations and ground systems for the Hodoyoshi Project.

Pictured: Dr. Kurahara presenting about Frequency Coordination

Highlights:

- Started off with a survey if audience is planning to launch satellite in the next two years
    - 2 responded affirmatively
- Timeline of Launch
    - 3 months required for Domestic coordination, Preparing API filling etc.
    - Next 12 months for ITU Frequency Coordination
    - Next 6 months for Earth Station Radio License
    - Next 3 months Launch, so entire prep takes about 2 years
- API filing requires information like Frequency, Service Area, RF specifications, Bandwidth Modulation, GS
- Wider the frequency range, greater the number of countries required for coordination
- If ITU filing does not include a GS, Earth Station Licensing process may not be started
- Any country must be included if their GS could get used, more countries can make coordination difficult
- International frequency coordination works based on Interference Control Mechanism
- ITU defines the allocation; which range of frequency can be used for which type of service
- Also defines regulatory protection and power limits
- Services that do not fall in predefined categories are subject to rejection even before coordination
- Services for instance Satellite communication, Earth observation and others
- Geostationary satellite is given priority over non-geostationary satellite provided it does not create interference
- Domestic Radio License is country specific, be aware of your country's rules and regulations
- Infostellar provides numerous services in the processes for GS License, ITU Coordination

- Infostellar also provides services for getting Satellite License



Pictured: Dr. Kurahara presenting about General ITU Coordination Process

Q/Ans:

Q: Andie Wang: Hi Naomi San, this is Andie from Taiwan. Thank you for your presentation. I am rather new to the whole concept, so maybe this is rather a simple question. You raised Japan as a case for the whole regulation, and you mentioned this is also by case. Would you mind going back to that slide? Okay. I wonder what part of the globe has a rather strict licensing regulation, is Japan one of the most strict in this one? Or is it rather quite the same?

A: Dr. Naomi Kurahara: *Thank you for the question. And yes, Japan is one of the most difficult countries. The US, Japan, Australia, and European countries like the UK, France, Germany. These countries are equally difficult. Then there is another level of the network, some countries are a bit easier. There are also countries including some uncertainties because their regulations for satellite frequency coordination and licensing are not well defined. Not many countries have enough experience of LEO Satellite Radio Licensing, especially LEO constellations. And those countries therefore do not have very defined rules and regulations. So those countries are sometimes easier, but sometimes difficult.*

2. Making Ground Segment Simple – Infostellar's approach

Dr. Naomi Kurahara, Co-Founder & CEO at Infostellar

Highlights:

- Uses a self-developed software application - StellarStation
- Flexible, scalable, satellite ground station sharing platform
- Sort of a middleware for connecting service providers with service seekers
- Global partners with antennas where your need them
- Aims to make ground station process standardized and accessible
- Provides API and GUI to use the ground station network
- Currently are partners with 7 companies and 28 Ground Stations
    - 28 S-Band Up/Down
    - 28 X-Band Down
    - 6 Ka-Band Down

- Aim is to do Satellite mission data delivery in 15 minutes from acquisition
- Good global coverage
- Helps ground station network design and onboarding because of their knowledge and experience
- Helps in license and frequency coordination and system Integration
- Software and ground station is pre-integrated, so just need to integrate mission control system to their platform
- User friendly interferences with proper management

3. Frequency Allocation on Remote Sensing

Mr. Yoshihiro Ota, CSO of Axelspace

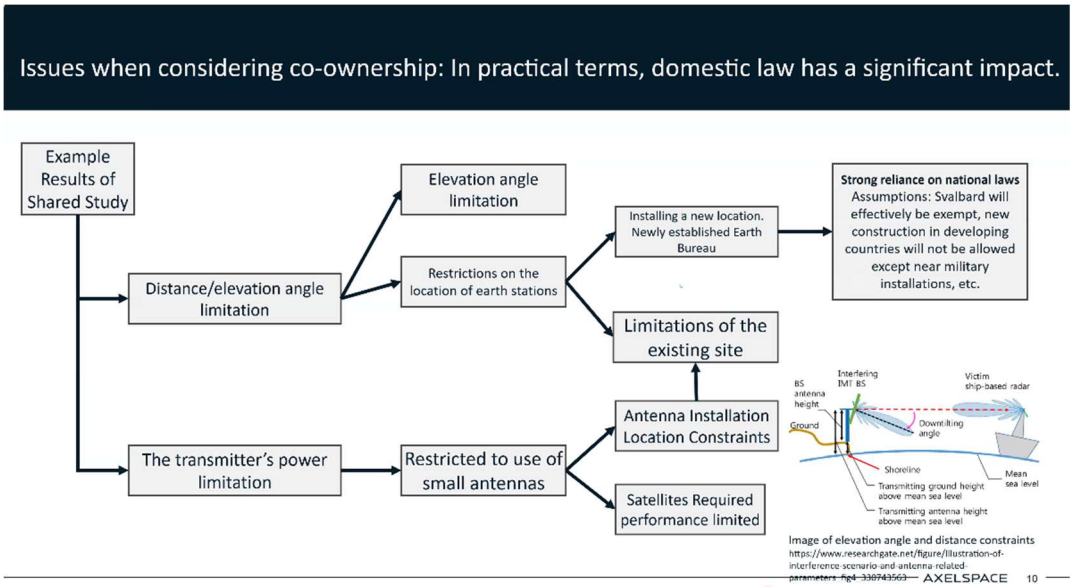
Mr. Yoshihiro Ota is the Executive Officer and Chief Strategy Office at Axelspace Holdings in Japan. He covers corporate strategy, business strategy in space. Previously he worked at investment banking (equity structuring) and got a Master of Science on the subject of earth and planetary science.

Pictured: Mr. Ota presenting about Frequency Allocation on Remote Sensing

Highlights:

- Axelspace founded in 2008, currently 160+ members, Tokyo based, launched 11 satellites so far
    - Launched experimental satellites for multiple enterprise companies and universities
    - Has a 5-satellite constellation, provides earth observation platform service (AxelGlobe)
    - Provides a platform to demonstrate customers missions in space (AxelLiner)
- Radio frequency allocated by International Telecommunication Union (ITU)
- Only 4 types of RF bands can be used regarding satellite remote sensing communication or EESS
- EESS- Earth Exploration Satellite-Service
    - UHF (401-403MHz)
    - S (2025-2110, 2200-2290MHz) (most-popular for TT&C)
    - X (7190-7250, 8025-8400MHz) (Lower band utilized for TC, Upper band utilized for data downlink)
    - Ka (25.5-27GHz) (affected by weather)
- S-band is crowded so difficult to get white band (=low speed comms)
- X-band is the single most significant spectrum for downlink, no alternative exists
    - It is not weather dependent; for instance, Ka band's quality is affected by rain
- Globally many X-band antennas and ground stations already exist so wide accessibility
- Lack of available, protected, large enough bandwidth in other frequency ranges
- WRC's new agenda seeks opportunity to integrate 6G in 7125-8400 MHz band (X-band)

- Studies to follow up within the ITU to share frequencies between 6G and satellite remote sensing data
- Global issue between Space industry (Remote Sensing) and mobile communication
    - Both wanting the same bandwidth
- In case of co-ownership, it brings multiple limitations for remote sensing
    - Significantly impacted by domestic laws
    - Distance/elevation angle limitation
    - Transmitter's power limitation
    - Restrictions on location of earth stations
- Radio resource is common for all humankind so each industry should aim to expand their right
- Need to work towards securing X-band for remote sensing



Pictured: Mr. Ota presenting about impacts of co-ownership of X-band on remote sensing

Q/Ans:

Q: Masanobu Tsuji: Thank you for the interesting talk about WRC27 agenda item 1.7. What is your plan to approach ITU WP-7B (Space operation, Space study and Earth exploration EESS)? Also, I am interested in the current stance of WP- 5D (IMT, mobile phones) and Japanese telephone companies. I think some kind of conversation would be necessary between space operation side and telephone companies before submitting Japan's paper from MIC.

A: Mr. Yoshihiro Ota: *At this moment, we have made several contacts through Airbus and Leaf space. They are preparing some documents to propose to the party. How to co-use and what is the current satellite systems technical specifications. And I already did some co-work with Kurahara-san to share the situations. The MIC is also making a study group and some members are joining such discussions. This is a very sensitive one, and the competition is a huge one.*

4. SSC Connect – Global Ground Station Network Services – Optimizing your ground stations for your operations

Mr. Ravit Sachasiri, Business Development Director - APAC, SSC Connect

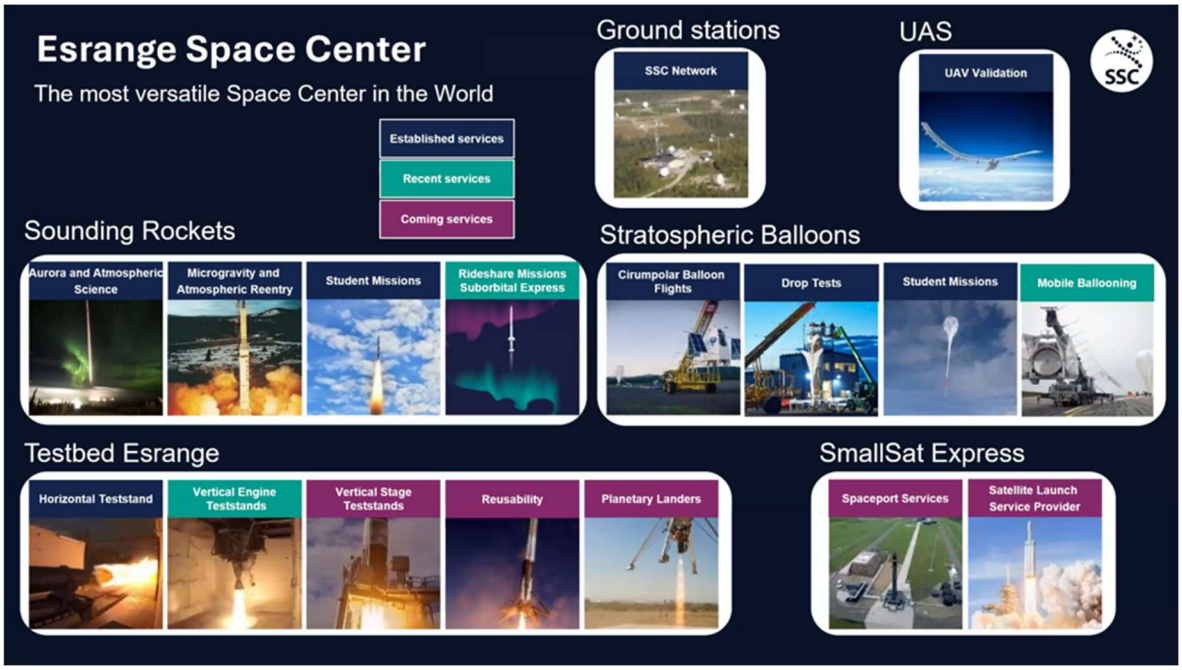
Ravit Sachasiri is the Business Development Director of Swedish Space Corporation for the Asia Pacific Region. He was born in Bangkok and spent almost 15 years in India. Now he lives in Kiruna. Ravit graduated in Telecommunication Engineering in India before completing his Masters in Space Communication Systems at ISAE-SUPAERO in France. He worked for a mobile telecommunication company and Internet Service Provider in Thailand before joining Thailand's National Space Agency, GISTDA in 2009, where he worked for 10 years in various positions before he came to SSC. His experience includes Satellite operations, Ground operation, Spacecraft engineering, Software System Administration for Ground system, Project and Contract Management for satellite development project, and Business Development.

Pictured: Mr. Sachasiri presenting about SSC connect

Highlights:

- SSC fully owned by Swedish Government, works as a cooperation and a service provider
- SSC Connect - Ground Station Services is the core service; looking to expand globally
    - Launch site in Sweden, first orbital launch next year
    - Also provides rocket testing facilities like burn test, engine test and stage test; part of launch services
    - Provides operational customer service like consultancy and manpower
- Service for Space Safety (SSA); providing tracking of objects in space
    - Currently using optical station in Australia and Chile
- Partnered with major space companies
- SSC Connect - Operating Ground Station over 10 sites all across globe
    - Fully owned, 8 other partner stations
- Looking to provide reliable service
- Operating mostly on S and X bands, has a few Ka and Ku bands too
- Most of sites operates antennas of size ranging from 7 to 13 meters
    - Also has small antennas
- Expanding on Deep Space and Lunar services on 4 of their stations
    - Using larger antennas for larger capabilities
- Also expanding on small antennas in existing antennas sites for constellations
- Ka-Band antennas expanded on existing 5 sites
- Also developing optical ground communication

- moving towards testing and commercialization
- NODES is the name of the optical comm project
    - Supported by ESA's Scylight, service validation will start around Q1 2025 with two optical GS
- Two stations Inuvik and Esrange Provides Polar coverage as well in north pole
    - Provides 30 minutes continuous communication per orbit or backup station in each pass
- Designers should be certain about their requirement of
    - Aperture Size
    - GS Digitalization
    - Geographic Coverage
    - Frequencies etc. before designing a satellite
- Antenna aperture sizes and capabilities
    - LUNAR+: 20m
    - LEOPs and Critical Missions & Lunar: 13.5m
    - Route Missions: 7.5m
    - Small Sats: 3.7m
- Looking to integrate Software using API and web sockets
- SSC assists in RF licensing
    - however, satellite owner must file its ITU publication through its national authority
- Licensing requires a long time so need to plan and start early



Pictured: Mr. Sachasiri presenting about services provided by SSC

5. Remote Sensing and Remote Activities

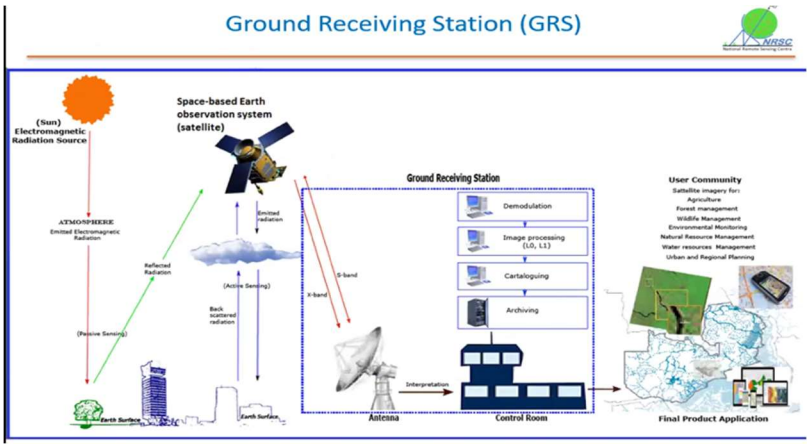
Dr. Faustin A.S. Banda, Director, National Remote Sensing Centre (NRSC), Zambia

Dr. Faustin A.S. Banda is the Executive Director of National Remote Sensing Centre (NSRC). He is a Geomatic Engineer and an avid scientist with over 15 years of experience in Engineering coupled with over 10 years of IT and Image Processing programming experience. He has worked both in the public sector and private sector with a business acumen gained from working as Assistant Vice President at JPMorgan-Chase. Dr. Banda is also a licensed drone pilot having worked on topographic surveys including volume computation using drone imagery for mining companies.

Pictured: Dr. Banda during his presentation

Highlights:

- National Remote Sensing Centre (NSRC) created in 1999
    - Derived from The Science and Technology Act No. 26 of 1997
    - Mandate is to advise government on the policy framework
    - Develop long-term strategies relating to Space Technology and Remote Sensing Data
    - About 25 staff, technical staff of about 15
- Passive Remote Sensing
    - depends on reflected radiation of sun from the surface of earth which lands on sensors in satellite
- Sensor receives data at satellite and sends to GS
- NRSC's interests vested on
    - Forestry and Urban Planning
    - Land Management, Water Resource Management
    - Hazard and Disasters
    - Remote Sensing and GIS Training
    - Linkages to Local and International Organizations
    - Gives Data to Government to specific ministries for Planning and Decision Making
- Showed examples of Urban Development Monitoring and Forest Depreciation Maps
- Showed example of a map showing Ndola City land cover change
- Also involved in Natural Capital Accounting
- Looks at rivers, forests, lakes, which are visualized to analyze depreciation and proper utilization
- Changing in water resource over seasons gives data to hydro-stations to take necessary actions
- Uses sentinel data and land sat data in terms of looking at soil suitability
- Flood susceptibility mapping for monitoring disasters and taking precautions
- Nowadays developing Ground Receiving Stations (GRS)



Pictured: Dr. Banda presenting about Ground Receiving Station (GRS)

6. KSAT – KONGSBERG SATELLITE SERVICES

Kenneth Olafsson, Head, KSAT Asia; Representative Director, KSAT Japan

Mr. Kenneth Olafsson heads the Asia operations and commercial activities and is newly appointment Representative Director of KSAT's new Asia office in Tokyo (KSAT Japan). He has been working in the space industry for 14 years and has a long experience of more than 20 years in Asia, while taking his business degree in Singapore, Malaysia and in Norway. Previously he worked in the ICT sector and in process analytics modelling before entering the space ecosystem.

Pictured: Mr. Kenneth Olafsson presenting about KSAT

<u>Highlights:</u>

- KSAT been operating Ground Stations since 1967, with first HQ in Norway and a single GS
  - 450 employees, 350 antennas, 1.5M satellite contacts per year
  - Primary service is Ground Station
  - Also has ventures in usage of satellite data through earth observation services
  - Aiming to minimize latency and time to receive and process the data

- Ventures
    - Supports Launch Vehicles & LEOP
    - Traditional Large dish antennas services
    - KSATlite services - tailored to small satellites and constellations
    - Supporting future KSAT Lunar missions by building separate ground stations
- KSATlite
    - Standardized Smaller Antennas Network
    - Flexible M2M scheduling through their API
    - Providing Redundancy and Scalability with Low Latency
    - All stations are automated and standardized
    - So effortless way to connect your satellite to ground station regardless of location
- Making process seamless till satellite goes into orbit
    - After that it goes into operation mode
- Multi mission antennas and dedicated antennas all over globe
- Recent collaboration with JSAT to integrate their antennas in Japan as well
- Licensing
    - Early-stage assessment on what you actually need in term of frequency,
    - Assessment on-board and ground station critical in licensing
    - Need coordination with local government side on license approvals
    - How long it takes depends on the country itself, for Norway, it does not take more than 3 months
    - Networks in KSAT mostly on S and X band, easy to build GS in these bands
    - Recent 6G advancement posing threat on securing S and X bands
    - Start early for licensing and take each step seriously
    - Filing a good network of GS providers gives you good synergy and redundancy
- Bands
    - UHF: cheap and easy to implement on space segment, has interference and radiation issues
    - S/X-Band - most commonly used, crowded
    - Ka-Band - slowly being implemented, suitable for dry areas because affected by weather
    - Optical: lots of buss, but challenging technology space to ground
    - 6G a concern for interference in X-band
    - Mobile industry has high stakes into space industry and growing

Pictured: Mr. Olafsson presenting about General Licensing Overview

7. Announcement: The 1st UNISEC Deep Space Workshop

Hirotaka Sekine, University of Tokyo

Hirotaka Sekine is a Ph.D. student at the University of Tokyo who visited the Oguri Research Group for one month in September 2023. He received his BS and MS degrees in Aeronautics and Astronautics from the University of Tokyo in 2022 and 2024, respectively. His work at Purdue University involved trajectory control and design for formation flying missions in the CRTBP.

Pictured: Hirotaka Sekine takling about UNISEC Deep Space Workshop

Highlights:

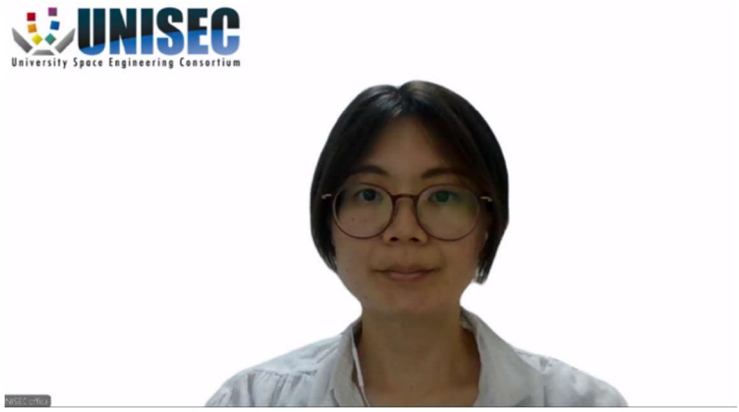
- **1st UNISEC Deep Space Workshop**
  - Date: 9th November 2024, 13:00 - 17:00 (JST)
  - Venue: Arcrea Himeji (143-2, Kamiyacho, Himeji-city, Hyogo, Japan) & Online
  - Registration Fee: Free, 150 people and will be in english
  - Eligibility: Anyone interested in Deep Space Exploration,
  - Information and registration at https://unisec.jp/deepspaceworkshop/

Q/Ans:

Q: Kenneth Olafsson: Deep space, you are considering everyone beyond the moon?
A: Hirotaka Sekine: *Both around the moon and beyond the moon.*

8. Announcement and Acknowledgement

Haruka Yasuda, UNISEC-Global



Pictured: Yasuda-San announcing the latest updates from UNISEC-Global

Highlights:

- **CLTP13 (CubeSat Leader training Program)**
  - Date: August 19-29, 2024
  - Venue: Nihon University, Chiba, Japan
  - 10 participants will get together from 6 countries
  - CLTP Website: http://cltp.info/index.html

- **The 9th Mission Idea Contest (Preliminary Workshop)**
  - The MIC9 theme is "Lunar Mission"
  - Category A: Lunar Orbit CubeSat Mission (LOCM)
  - Category B: Lunar Surface Rover Mission (LSRM)
  - Website: https://www.spacemic.net/
  - Important Dates:
    - Abstract Submission Due: July 24,2024 (received 24 abstracts from 14 countries)
    - Notification: September 10, 2024
    - Final Presentation: November 27, 2024 (South Africa)
  - Contact: info@spacemic.net

- **13th Nano- Satellite Symposium**
  - Date: November 25-27, 2024
  - Venue: Protea Hotel Technopark, Stellenbosch, South Africa
  - Notification to authors: August 23, 2024, early bird registration: August 30, 2024
  - https://www0.sun.ac.za/UNISEC-SAR/nanosat13/call_for_papers/

- **Launch Opportunity: J-Cube**
  - Special Discounted opportunities
  - 1U, 2U, 3U, deployment from International Space Station
  - Collaborate with UNISEC-Japan's University
  - Technical support will be provided
  - Contact: info-jcube@unisec.jp, http://unisec.jp/serviceen/j-cube

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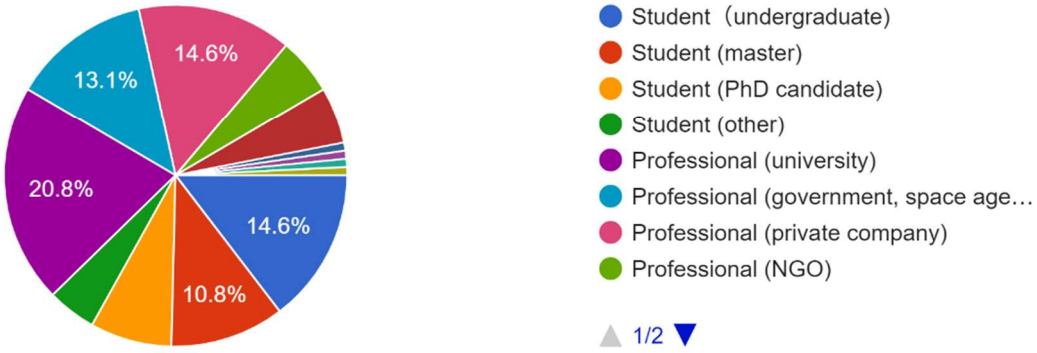
9. Participant Statistics

130 registered participants from **39** countries and regions for the 47th Virtual UNISEC-Global Meeting.

Registrants			
Country	**Registrants**	**Country**	**Registrants**
Algeria	2	Nepal	5
Argentine	1	Nigeria	1
Bangladesh	1	Norway	2
Bhutan	1	Pakistan	1
Bulgaria	5	Paraguay	2
Burkina Faso	5	Peru	3
Chile	1	Philippines	5
Colombia	1	Portugal	1
Dominican Republic	2	Russia	1
Egypt	3	Singapore	1
Finland	2	Sweden	2
Germany	2	Taiwan	7
India	16	Thailand	2
Indonesia	2	Tunisia	1
Israel	1	Turkey	3
Japan	27	UAE	1
Malaysia	5	UK	5
Mexico	1	US	3
Namibia	1	Zambia	3
		Zimbabwe	2

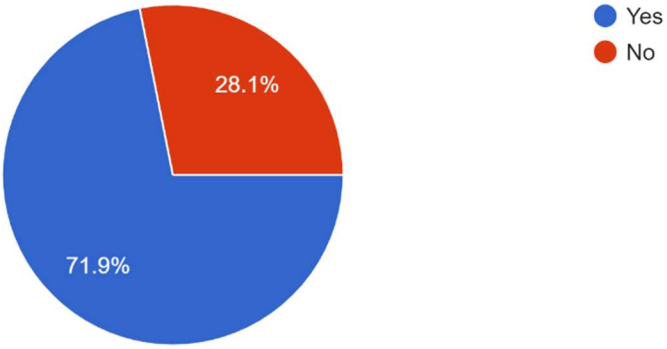
Student or professional?

130 responses



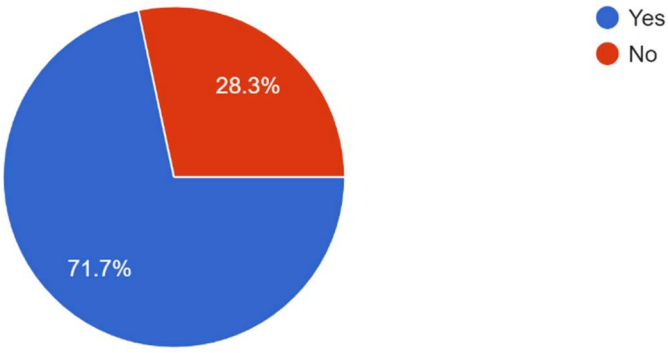
Have you participated in the UNISEC-Global Meeting previously?

128 responses



Are you familiar with frequency coordination or ground station?

127 responses

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6
UNISEC GLOBAL

Thank you