

# UNISEC-Global The 43<sup>rd</sup> Virtual Meeting

April 20, 2024, 22:00-24:00  
(Standard Japan time GMT +9)



**43rd Virtual UNISEC-Global Meeting**

**Theme: Nano-Satellite Activities in Mexico**

**UNISEC GLOBAL**  
University Space Engineering Consortium

**UNISEC MÉXICO**  
University Space Engineering Consortium

**Jorge Alfredo Ferrer Pérez,**  
National University  
Autonomous of Mexico

Space facilities to develop space systems in  
México: National Laboratory of Space  
and Automotive Engineering (LN-INGEA)

**Hermes Moreno Álvarez,**  
Universidad Autónoma de  
Chihuahua

Experiences about the development of the  
orientation system for the student  
nanosatellite named AzTechSat-1

**Barbara Bermudez  
Reyes,**  
Universidad Autonoma  
de Mexico

**MODERATOR**

**Rafael Guadalupe Chávez  
Moreno,**  
Unidad de Alta Tecnología - UNAM

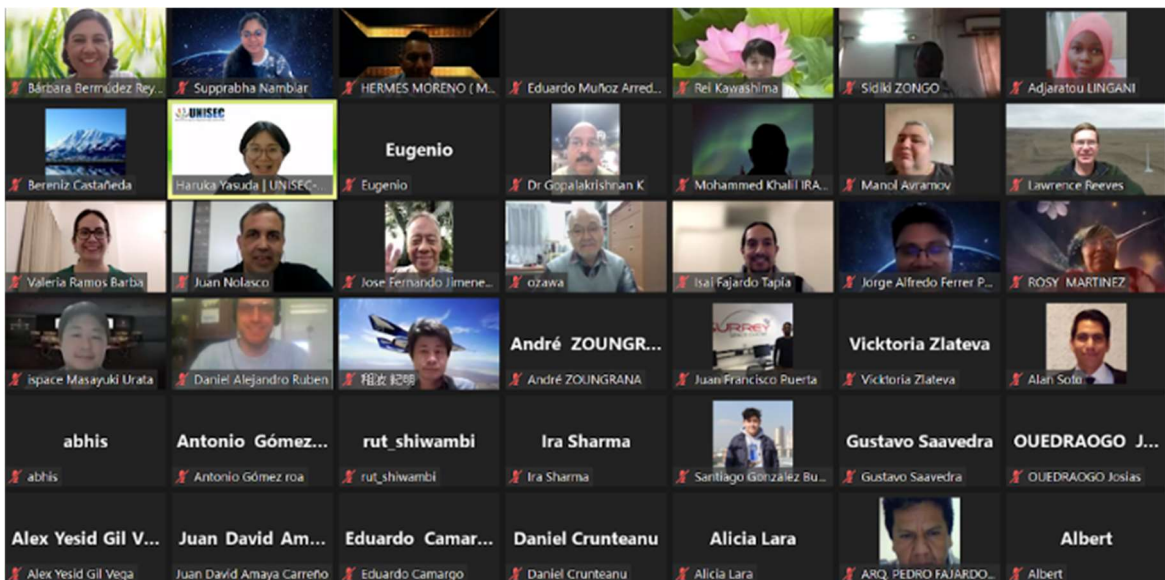
Nanosatellite K'-OTO

**Valeria Ramos Barba,**  
Space Lawyer

An overview of the current state of national  
legislation, policy, and regulation in Mexico

**Host: UNISEC-Mexico**  
**Time: 22:00-24:00(JST)**  
**Date: APRIL 20, 2024**

<https://www.unisec-global.org/virtual-meeting.html>



The following report was prepared by UNISEC-Global Secretariat  
April 20, 2024  
Japan

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## 1. Opening Remarks

Jorge Alfredo Ferrer Pérez, National University Autonomous of Mexico

Dr. Jorge Ferrer-Pérez is an Associate Professor of the National University Autonomous of Mexico-School of Engineering. He received his Ph.D. in Aerospace and Mechanical Engineering from the University of Notre Dame, South Bend in United States. He is part of the Advance Technology Unit-Aerospace Engineering Department and responsible of the Space Propulsion and Thermo-Vacuum lab. This facility belongs to the National Laboratory of Space and Automotive Engineering (LN-INGEA) at Juriquilla, Querétaro. His current research areas are nano-heat transfer in solid state devices, thermal control, space propulsion, certification test for space systems and development of small satellites.

He has been involved in several collaborative project to foster space sector in México such as microsatellite Quetzal to monitor pollution in big cities, nanosatellite K'-OTO to perform remote sensing, establishment of state-of-the-art facilities to design, fabricate, integrate, test and operate space systems. Likewise, he is part of the Committee to establish national norms for space systems in the nation, Finally, he has been involved in the creation of new undergraduate program in Aerospace Engineering in México.



*Pictured: Dr. Jorge Ferrer-Pérez while giving the opening remarks*

### Highlights:

- Warm welcome to everyone in the meeting
- Expressed honor and pleasure to get this opportunity to share the space activities of Mexico
- Aims to let the audience know the complexity and challenges of the sector
- The aim has been to keep improving to create their own technologies

## 2. Presentation on “Space facilities to develop space systems in México: National Laboratory of Space and Automotive Engineering (LN-INGEA)”

Jorge Alfredo Ferrer Pérez, National University Autonomous of Mexico

Dr. Jorge Ferrer-Pérez is associate professor of the National University Autonomous of Mexico-School of Engineering. He received his Ph.D. in Aerospace and Mechanical Engineering from the University of Notre Dame, South Bend in United States. He is part of the Advance Technology Unit-Aerospace Engineering Department and responsible of the Space Propulsion and Thermo-vacuum lab. This facility belongs to the National Laboratory of Space and Automotive Engineering (LN-INGEA)

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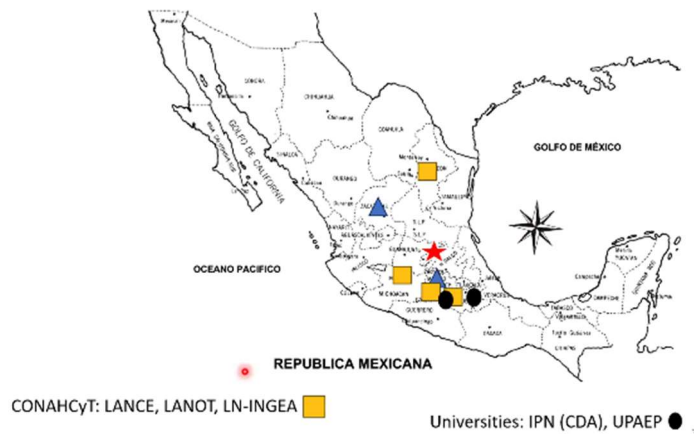
He has been involved in several collaborative project to foster space sector in México such as microsatellite Quetzal to monitor pollution in big cities, nanosatellite K'-OTO to perform remote sensing, establishment of state-of-the-art facilities to design, fabricate, integrate, test and operate space systems. Likewise, he is part of the Committee to establish national norms for space systems in the nation, Finally, he has been involved in the creation of new undergraduate program in Aerospace Engineering in México.



*Pictured: Dr. Jorge Ferrer-Pérez during his presentation*

### Highlights:

- Aims to share the information about the current facilities available in Mexico
- Mexico's satellite history began dates back to 1994
- Has launched 5 Nanosats since 2019; 2 used by Military
- Beginning with, Mexican Government bought the satellites
- Recent satellites have had some percentage of bus and subsystems designed/ manufactured by students
- Currently, 4 satellites are operating which are all based for communications
- They do not have remote sensing satellites
- Even as a big country, Mexico does not have lot of nano satellite launch
  - Lack of human resources in the space sector
  - Economic reasons
  - Difficult to make parties believe space can improve lives
- Upcoming projects include partnerships with universities, NASA and Mexican Space Agency
- Currently, Mexico has 2 MSA regional centers, 4 CONAHCyT centres and 2 University facilities
- CONAHCyT facility includes
  - LANCE (focuses on space weather), LANOT (focuses on remote sensing) and LN-INGEA
- Although resources are limited, Mexico has some built-in facilities to empower and create
- National University Autonomous of Mexico (FI- UNAM) is the oldest University



Pictured: Jorge Alfredo Ferrer Pérez introducing laboratory locations in Mexico

Q/Ans:

**Q: Marian Duval:** What's the biggest challenge that Mexicans have faced for the development of CubeSats programs in regards to government support?

**A: Jorge Alfredo Ferrer Pérez:** *Wow, it is really an interesting question. I think it is quite difficult but I will try my best to answer the question. I think that the first thing to understand is that The Government of Mexico, so far, is being so difficult that they buy the idea that we need to develop the technologies for national security and to solve national problems, etc. So, they want to solve our problems as soon as possible. So, they basically buy the solutions from outside and bring the solutions, but they do not seem interested in developing our own technologies due to the time and political issues. However, we need to try to convince the government and the key players that the sector is important, for us and for the nation. To develop our nano satellite, geo-satellite, etc. For example, the government of Querétaro are aware the importance of the sector and that is why they are funding the K'OTO Project. So, it depends on the way that the decision makers have in their minds the importance of why and how these technologies will help the Mexican people. If we can continue the efforts of convincement, we are really confident that the space sector in Mexico will evolve for a bigger and more established sector. However, it will take time. That is one of the main challenges that we face. If anyone wants to add anything, you can.*

**A: Valeria Ramos Barba:** *Yes, as I exposed before, the initiative to reform the constitution is a very big effort to try to enforce the government to achieve outer space activities in Mexico and I think it could be possible soon. Maybe this year or next year. Because the proposal approval is a long procedure, it has been partially approved and we are expecting maybe during this year or next year. Because as Mexicans know, we are in election year now, it is difficult. It is a transition time but I hope we can achieve this reform and also Latin American Collaboration is very important. The space is not about one action. We need international collaboration to succeed in space activities now.*

### 3. Presentation on “Experiences about the development of the orientation system for the student nanosatellite named AzTechSat-1” Hermes Moreno Álvarez, Universidad Autónoma de Chihuahua

Dr. Hermes Moreno Álvarez is the secretary of UNISEC-Mexico. He completed postgraduate studies at the Autonomous University of Puebla and the Moscow State University, with specialization in Satellite Systems, and has participated as an associate professor in different universities in Latin America. Currently, he works at the State University of Chihuahua as a full-time research Professor. He is a specialist from the Moscow Aviation Institute in Satellite Systems Ballistics Control and Analysis of efficiency Guidance, and Control of Microsatellites. He has been certified by Scottish Center of excellence in satellite application NANOBED Missions Laboratory. Furthermore, he has been recognized by the National Aeronautics and Space Administration (NASA) for his participation in the AzTechSat-1 nanosatellite. In the field of research, he worked in the development group of the



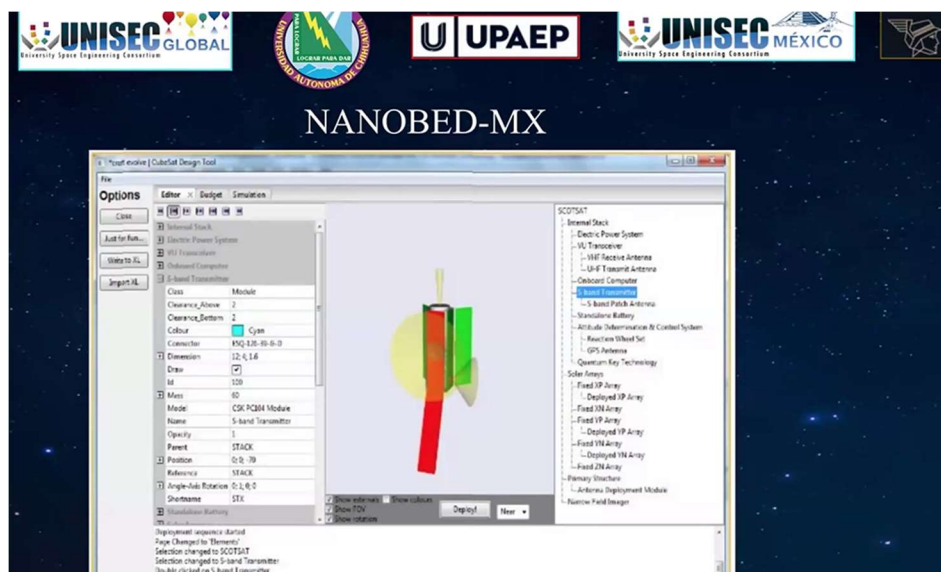
stabilization system of the Satex 2 microsatellite model, as well as in the orbit determination group of the same satellite.



*Pictured: Dr. Hermes presenting about AzTechSat- 1*

**Highlights:**

- AZTECH SAT -1 is an acronym meaning AzTec Technology- 1
- State University of Chihuahua and UNISEC – Mexico collaborates frequently
- Courses on CanSat model, orbital mechanics, and satellite engineering
- 5 Innovation and technology centers
- 9+ University with engineering programs related to cosmonautic industry
- 45+ Manufacturing and business unit
- The current capabilities lie in aerostructures, machining, harnesses, interiors, and composite materials
- Also focuses on laboratory implementation of satellite subsystems
  - Also focus on Aztech Sat-1 Nanosatellite guidance systems
- Assembly of a jet-type aircraft (in process)
- Mexico Nanosatellite Missions Laboratory (NANOBED-MX)
- NANOBED-MX allows manipulation of different satellites subsystems
- The setup is comparatively simpler than a normal satellite where everything is tightly integrated
- Main focus is towards rapid integration by characterizing the platform payloads
- Demonstrates emerging low-cost technologies as novel/emerging technologies
- Collaborates with organizations of site network from UK and across the world



*Pictured: Dr. Hermes demonstrating the simulator of satellite position and subsystems position with the structure*

- Aztec Sat -1: A 1U CubeSat designed and built by students in Mexico
- Collaborative initiative between
  - NASA-Ames, UPAEP, University of Chihuahua and Mexican Space Agency
- Follows The NASA Procedural requirements (NPR)
- Focused on SRR Review: examining the performance requirement
- Aztech Sat has had the approval of The NASA Systems Requirement Review (SRR)
- The main mission is to relay communication with The Global Star Constellation
- Project duration was 2017 – 2019
- Launched on December 5, 2019
- Great opportunity to test methodologies and technological developments for the aerospace industry
- Successive Results - signals were received within 15 minutes after deployment from ISS

#### 4. Presentations on “Nanosatellite K'-OTO”

Rafael Guadalupe Chávez Moreno, Unidad de Alta Tecnología - UNAM

Dr. Rafael Guadalupe Chávez Moreno is a member of UNISEC-Mexico and a Professor at The National Autonomous University of Mexico. He graduated with a degree of engineering in instrumentation and process control. He completed his doctoral studies at The UNAM Faculty of Engineering in the area of orientation control system for satellites. He is currently a full-time professor at Engineering Faculty UNAM in The Iris Space Department of The High Technology Unit. He was also involved in creating the bachelor's in aerospace engineering at UNAM. He is also the technical Manager of The K'OTO Satellite Project which consists of the development, integration, testing and launch of the Satellite, and a member of The Technical Committee for NSS focusing in the creation of Mexico Standards for the Space Industry. Currently, he is the head of The Iris Space Department in High Technology Unit of The Faculty of Engineering of National Autonomous University of Mexico.



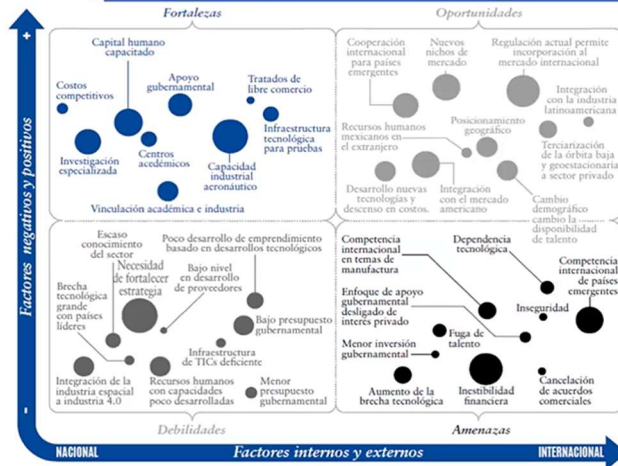
*Pictured: Dr. Moreno presenting about K'OTO Satellite Project  
(file photo: <https://www.ingenieria.unam.mx/uat/funcionarios.php>)*

#### Highlights:

- K'OTO is a Nanosatellite part of National Laboratory located in Querétaro
- Facilities provided by the laboratory
- The state of Querétaro is a leading player in the aerospace industry
- Conducts projects in the aeronautics industry
- Aims to contribute to the development of the space sector and promote private investment
- Aims to create opportunity for young students and economic community
- Widely dependent on other countries regarding the advanced technology and equipment
- Most of the capable Mexican students have been moving abroad: talent drain
- Comparatively less people working in the space industry in the Mexican space industry

- However, Mexican's geographical positioning can be an opportunity to promote "nearshoring"
- Connect with industrial market in United States/Latin America to improve
- Collaborations across the world to expand network and work on small projects
- Focus on Manufacturing base -> new market niche

## NATIONAL NEEDS ANALYSIS (SWOT MATRIX)



### Threats:

- Technological dependency
- Talent Drain
- Increase in the technological gap.

### Opportunities:

- Geographic positioning.
- New market niches
- Integration with the Latin American industry.
- Development of new technologies and cost reduction

Fuente: Plan de órbita 2.0 (PROMEXICO)

*Pictured: Slide consisting of SWOT Analysis*

- K'OTO Project is an initiative between LN-INGEA, UAT FI-UNAM and support of SEDESU
- K'OTO's literal meaning is a grasshopper hence named to signify as a leap for space
- Main aim to develop remote sensing capabilities and technology advancements
- 2 bands: S-Band and UHF-Band and test for ADCS Board
- S-Band: subsystem information and photographs
- UHF-Band: Morse Code Beacon, Operation Status and Command
- Focus of developing human capital
- Ultimately, strengthen the nation's space sector
- Payloads: Camera: Main and Backup Camera: Visible Light Spectrum
- Weight < 1.33 kg' Dimensions: 10 cm x 10cm x 13.5 cm
- Is going to be launched by Japan - JAXA
- 80% of the total satellite – developed in Mexico
- Working basis on the NASA NPR Handbook and JEM payload accommodation handbook JAXA
- Ansys, MATLAB and STK used for Software Simulation
- Simultaneously, national and global programs are also being organized
  - collaboratively with Mexican Space Agency
- Programs focusing on SDGs
- ADCS Board has GPS, 6 Sun Sensor, 1 Magnetometer and 5 magnetorquers



# K'OTO Subsystems developed in House



### Structure

- Aluminium 6061-T6
- Hard Anodized
- Three deployment switches

### Backup OBC

- Raspberry Zero
- Iridium Module

### ADCS

- Microcontroller
- GPS system
- Sun sensor
- Magnetometer
- Acelerometer
- Magnetorquers

### Payload

- Visual-light Cameras
  - 8 Mpx
  - 5 Mpx

**80% of the total satellite is developing in México**

*Pictured: Slide consisting information about the K'OTO Subsystems*

## **5. Presentation on “An overview of the current state of national legislation, policy, and regulation in Mexico”**

Valeria Ramos Barba, Space Lawyer

Valeria Ramos Barba is a Space lawyer. She has an international studies diploma from Institute of Developing Economies (IDEAS) from The Japan External Trade Organization (IDE-JETRO), Japan, a bachelor's degree in law from Autonomous University of Coahuila, Mexico and a Masters Degree in Law from University of Granada, Spain. She has work experiences at Japan Chapter-Mexican Professionals Network and Federal Telecommunications Institute, Mexico. She also worked at Nihon University in Japan for a Nano Satellite Laboratory. Valeria has had work experience at Saltillo Water Service and Mexican Space Agency (AEM), Mexico.



*Pictured: Valeria Ramos Barba's Presentation on Space Legislation and Policies*

### Highlights:

- Valeria Ramos Barba started off with her introduction and work experience

- Briefly, noted down nanosatellites that are completely or partially developed and launched:
  - Painani-1: 3U CubeSat - SEDENA, CICESE and AEM
  - AzTechSat-1: 1U CubeSat- UPAEP, AEM and NASA-AMES
  - Nano Connect- 2: 2U CubeSat- LINX-UNAM, CITNOVA Hidalgo and SME's
  - Painani-2: 3U CubeSat- SEDENA, CDA-IN, PEU-UNAM, FI-UNAM
  - K'OTO, PAKAL, IKAYA, XGIBA are current projects
- **AztechSat Constellation – Future collaboration between 5 Mexican Universities, AEM and NASA**
- Mexico has space policy
  - **Yet lacks legal framework to regulate the country's space activities**
- Legal framework includes space policy, national space law, rules, procedures and technical standards
- The framework ensures smoothness in collaborations, business, investment and R&D
- The National Constitution includes satellite comm. as a priority area.
- Proposed amendments:
  - Include space activities as a priority area
  - Legislate on "Outer Space Areas" for national development
  - Generate National Law on Space Activities and regulation policies
- The current policies include:
  - General guidelines (LGPEM)
    - **9 Strategic objectives and 13 general aspects of Mexican Space Policy**
  - National Space Activities Plan (PNAE): Aligns with National Development Plan 2019-24
  - **Federal Government's Satellite Policy (PSGF):**
    - Only considers Communications, transportation, Infrastructure.
    - Does not refer to LGPEM and PNAE
    - AEM is considered as a national entity to develop space technology
    - Does not give it a charge of outer space
- Federal Metrology and Standardization law to regulate process, service and laboratory tests
- Replaced with quality infrastructure law to establish new basis for the industrial policy
- The new law promotes economic development and quality of products

With the support of the General Directorate of Standards of the Ministry of Economy (SE-DGN), on March 22, 2016, the **Technical Committee for National Space Standardization (COTENNE)** was created. It has the purpose of developing **Mexican Standards (NMX)** for materials, component and equipment for the development and operation of aircrafts and space vehicles.

So far, 3 Mexican standards have been published in the space sector:

Designation	Standard name
NMX-AE-001-SCFI-2018	Space systems – CubeSat design, requirements and classification
NMX-AE-002-SCFI-2019	Space systems – Risk management
NMX-AE-003-SCFI-2021	Space Systems – Electromagnetic compatibility requirements

*Pictured: Description of Mexican Standards (NMX)*

- 5 drafts of NMX are currently being drafted and reviewed
- National Constitutional reform is essential to be approved
- National Law on Outer Space Activities is crucial to be regulated timely
- These laws help ensure quality, innovation and development
- Eventually, allows quality services to step up in international trade

## 6. Announcement and Acknowledgment

Haruka Yasuda, UNISEC-Global



*Pictured: Yasuda-san announcing the latest updates from UNISEC-Global*

### Highlights:

- **Introduction of New Point of Contact:**
  - UNISEC- Portugal: Juan Nolasco
  - UNISEC- Philippines: Charleston Dale M. Ambatali
- **CLTP13 (CubeSat Leader training Program)**
  - Date: August 19-29, 2024
  - Venue: Nihon University, Chiba, Japan
  - Application Submission Due: May 20, 2024
  - Notification of Acceptance: June 13, 2024
  - CLTP Website: <http://cltp.info/index.html>
- **9<sup>th</sup> Mission Idea Contest**
  - The MIC9 theme is “Lunar Mission”
    - Category A: Lunar Orbit CubeSat Mission (LOCM)
    - Category B: Lunar Surface Rover Mission (LSRM)
  - Requirements can be downloaded at PreMIC9
  - Website: <https://www.spacemic.net/>
  - Important Dates:
    - Abstract Submission Due: July 24,2024
    - Notification: September 10, 2024
    - Final Presentation: November 27, 2024 (South Africa)
  - Contact: [info@spacemic.net](mailto:info@spacemic.net)
- **13<sup>th</sup> Nano- Satellite Symposium**
  - Date: November 25-27, 2024
  - Venue: Protea Hotel Technopark, Stellenbosch, South Africa
  - Abstract Submission: July 7, 2024
  - Early Bird Registration: August 23, 2024
- **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](mailto:info-jcube@unisec.jp) , <http://unisec.jp/serviceen/j-cube>
- **Next Virtual Meeting**
  - Date: May 18, 2024

- Theme: Go to Moon
- Host: UNISEC-Global

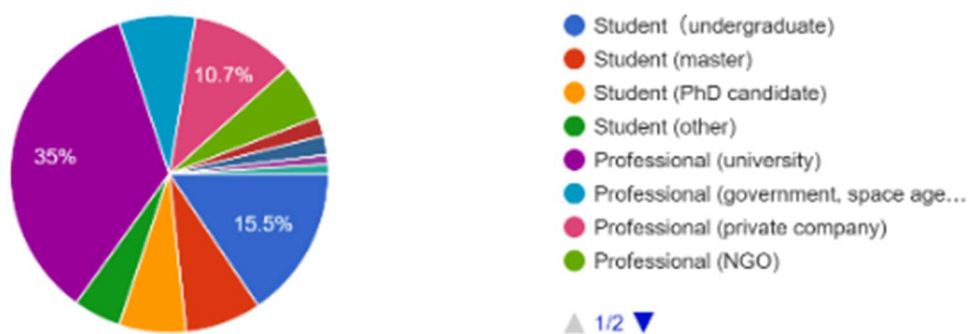
## 7. Participant Statistics

103 participants registered from 32 countries and regions for the 43<sup>rd</sup> Virtual UNISEC-Global Meeting.

Country/Region	Number of registrations	Country/Region	Number of registrations
Argentina	1	Mexico	17
Australia	1	Namibia	1
Bangladesh	2	Nepal	1
Bulgaria	2	Nigeria	1
Burkina Faso	7	Paraguay	1
Canada	1	Peru	2
Chile	2	Portugal	1
Colombia	10	Romania	1
Dominican Republic	1	Russia	1
Egypt	3	Taiwan	2
France	1	Tanzania	1
Guatemala	1	Thailand	1
India	19	Tunisia	1
Indonesia	2	Turkey	1
Japan	15	UK	1
Kenya	1		
Lebanon	1		

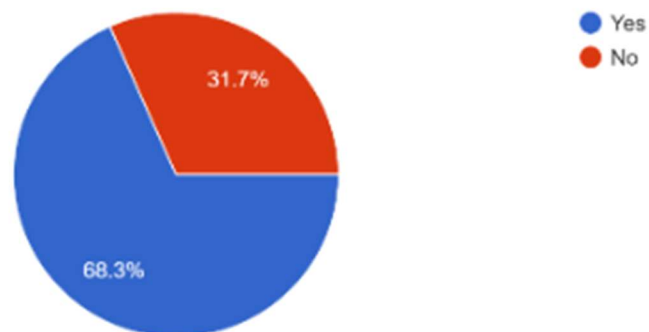
### Student or professional?

103 responses



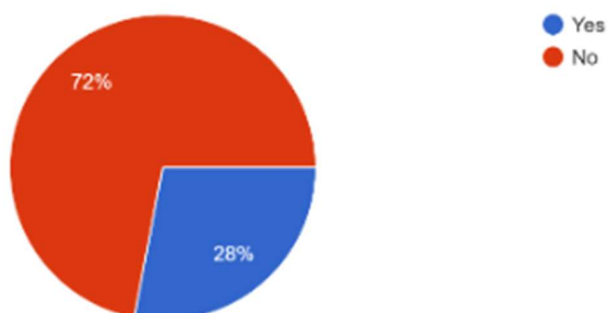
### Have you participated in the UNISEC-Global Meeting previously?

101 responses



### Are you familiar with space projects in Mexico ?

100 responses





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Thank you