UNISEC-Global The 32nd Virtual Meeting

April 15, 2023, 22:00-24:00
(Standard Japan time GMT +9)

The following report was prepared by UNISEC-Global Secretariat
April 15, 2023
Japan

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1. Presentation on “TunEd’CubeSat1: Training Project Based on Experimental Launches

Imen Titouhi, Tunis Science City

Imen Titouhi is Chief Scientific Moderator at The Tunis Science City. The institution officially opened in 2002 and is in charge of making science an inspiring and exciting experience for people of all ages. The main aim is to spark an interest in science and technology. Tunis Science City covers a large area and includes four exhibition halls, a planetarium, a multimedia library, a congress center, a restaurant and a guest house. The city attracts an average of 150,000 visitors a year.

Pictured: Imen Titouhi showing some of the work done at Tunis Science City

Highlights:

- Tunis Science City mission is to inspire, understand and disseminate scientific knowledge
- Expands over 6 hectors of space, built around historic basin of Abou Fehr basin
- Science City has exhibition halls, multimedia library, congress center, antennas
- Exhibition halls include temporary exhibitions, life, universe pavilions, digital planetarium
- Planetarium has astronomical shows, guided tours, astronomical evenings, lectures
- Celebrate World Space Week, invite prominent speakers working in the field of space
- Teachers and students from Science City build and balloon launch TunEd'CubeSat1
- The CubeSat is an educational tool with no commercial purpose, reusable after each launch
- The Ministry of Higher Education in collaboration with Arab League involved
- Donation by Chinese COMMSAT and China Children & Youth Science Center
- China provided 2 kits of sounding CubeSats, 8 sets of tethered satellites
- Provide training online session, sounding satellite assembly guide and exploring Q&A
- Provide basic scientific understanding of satellites, development history and application
- Sounding Satellite Box contains sensors such as humidity, temperature, pressure, gyroscope
- Tethered Satellite Box contains same sensors but with FPV cam, screen
- Tethered satellite is placed in troposphere and weighs about 200g
- Sounding balloons (3m diameter) and spool for tethered deployment
- Software also provided such as Satellite Data Receiver
- Training for teachers at Science City and students from different universities of Tunisia
- First training occurred during 30th Anniversary of Science City (Dec 21, 2022)
- Second training on Dec 28, 2022 and third recently on Feb 19, 2023
- Tethered satellite was launched on March 17, 2023
- Coming days conduct more training for engineering students, deploy the satellite up to 30km
- Authorization, launch site and route calculation are already done

2. Presentation on “Advancement of ESPITA in the KiboCube Project”

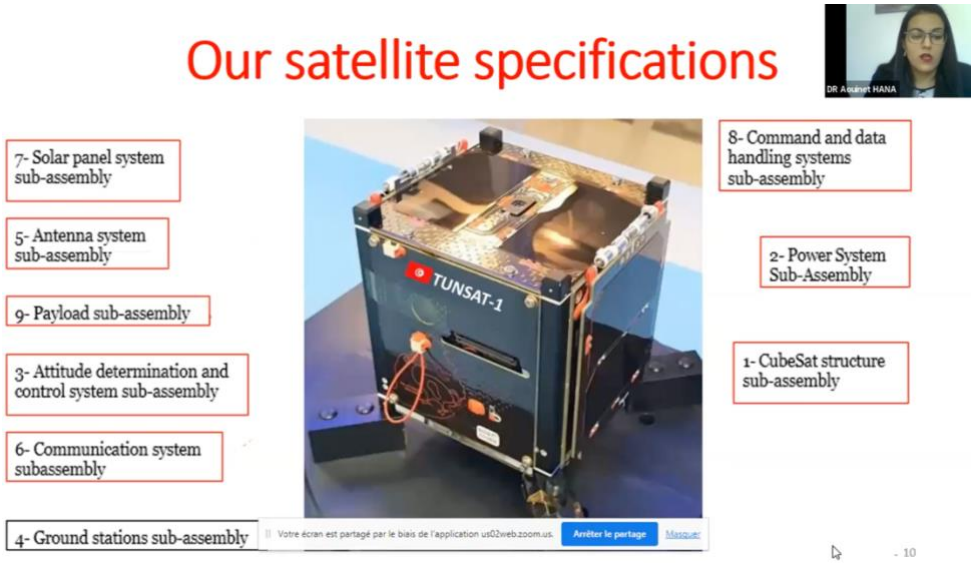
Hana Dhahri Aouinet, ESPITA University Sousse

Dr. Hana Dhahri Aouinet completed her Mechanical Engineering diploma in 2010 and a Master's degree in Numerical Modelling in 2011 from the National Engineering School of Tunis (ENIT). In 2016, Dr. Aouinet received a PhD in Fluid Mechanics from the National Institute of Applied Sciences of Toulouse (INSA) and a second PhD in Hydraulic Engineering from ENIT. In 2020, she became the General Director of the engineering school ESPITA. In 2022, she founded the first center in Tunisia, the Aerospace, AI and Digital Center which is attached to ESPITA. Dr. Aouinet is the project Manager of TUNSAT-1, awardee of KiboCUBE‘s 6th Round organized by JAXA and UNOOSA. TUNSAT-1 will be the first academic satellite in Tunisia.

Pictured: Dr Aouinet providing information about TUNSAT-1

Highlights:

- ESPITA provides engineering degrees in the different fields including mechanical, electrical
- Graduates acquire both technical and managerial skills
- Space sector has been growing in Tunisia, especially through education and research
- JAXA's KiboCUBE opportunity for ESPITA to develop and launch satellite
- 20-member expert team formed and applied for KiboCUBE with the technical support of Egypt
- Accepted for KiboCUBE on 16th February, 2023 and ESPITA expresses gratitude to UNOOSA
- TUNSAT-1's objectives are
    - 30% of the satellite components will be manufactured locally in Tunisia
    - Take Tunisian selfie
    - Create framework and impetus for space activities
    - Use mission as an example to teach young Tunisians about satellite development process
- Planning to open up industries to create job opportunities for Tunisians
- Safety review next step for TUNSAT-1
- Tunisia wants to be become the leading hub for space technology in Africa, TUNSAT-1 catalyst
- Launch date is set for 2024, likely
- On July 2022, ESPITA inaugurated Aerospace, AI and Digital Center
- Participated in a number of international conferences including NewSpace Africa Conference
- Also participated at Africa-Japan CubeSat Cooperation collaboration
- Research activities
    - Modelling and Numerical Engineering Laboratory
    - Application of research and know-how to practical fields
    - Papers regarding hexagonal solar panel system for 1U CubeSat
    - Design and verification of a 3U CubeSat structure
    - Aerodynamic analysis of a subsonic missile using computational fluid dynamics
- Participating in the Kyutech/JAXA BIRDS-X APRS payload competition, passed Phase I



Pictured: TUNISAT-1 satellite specifications

3. Presentation on "ESAT-GRSS Tunisa: A Consortium for Capacity Building in CubeSats"

Riadh Abdelfattah, University of Carthage - Tunisia

Dr. Riadh Abdelfattah received his engineer degree from the "Ecole Supérieure des Postes et des Télécommunications" (Higher School of Communications) from Tunis, Tunisia in 1995, his M.S. Degree and Ph.D degree in Electrical Engineering from the "Ecole Nationale Ingénieurs de Tunis" in 1995 and 2000 respectively. He received "le Diplôme de l'Habilitation Universitaire (HDR)" from the Higher School of Communications (SUP'COM) at the University of Carthage in Tunisia where he currently works at the Applied Mathematics and Communication Systems as a faculty.

Pictured: Dr Abdelfattah presenting about CubeSat related capacity building through his institution

Highlights:

- Since 2013, Ambassador for Geoscience and Remote Sensing Society (GRSS)
- Local chapter opened in Tunisia in 2019
- 142 active GRSS members among which 137 are students
- IEEE Mediterranean and Middle-East Geoscience and Remote Sensing Symposium (M2GARSS)
    - M2GARSS organized on March 9-11, 2020
    - Took place at Tunis, Tunisia just when the COVID-19 pandemic began
- Tunisian chapter received the "Best Chapter Excellence Award 2021"
- 2021 IEEE GRSS Regional Leader Award: the chair of the Tunisia chapter

- Pilot initiatives by IEEE GRSS Tunisia local chapter
    - Grants of $5k-$20k per proposal
    - Lead should be a member, must be of good standing
    - Only VPs, directors, presidents, CFO, EVP and past presidents can apply
- Objective is for all chapters to work together towards a collaborative goal
- For long term project, collaboratively develop a constellation of satellites
- For medium term, develop IEEE GRSS "Open PocketQube Kit"
- For short term, the acquisition and training of educational nanosatellite simulations
- The Tunisian consortium will include GRSS members from
    - Higher School of Communications of Tunis (SUP'COM) and the faculty of Sciences of Bizerte, and two departments from the University of Catharge
    - The faculty of Sciences of Monastir, University of Monastir
    - Research Center on Microelectronics and Nanotechnologies of Sousse
    - SCIENCIA, a startup company
- ESAT-kit (Educational Satellites) costing $20k for learning about CubeSat
- Acquisition of additional 3 more ESAT for the MENA Region
- Providing students opportunity to experience different subsystems and interaction between them
- GRSS initiative for hands-on training for space engineering

Pictured: $20k ESAT kit being used for learning about CubeSat systems in Tunisa

4. Presentation on “Space Weather Activities in Tunisia”

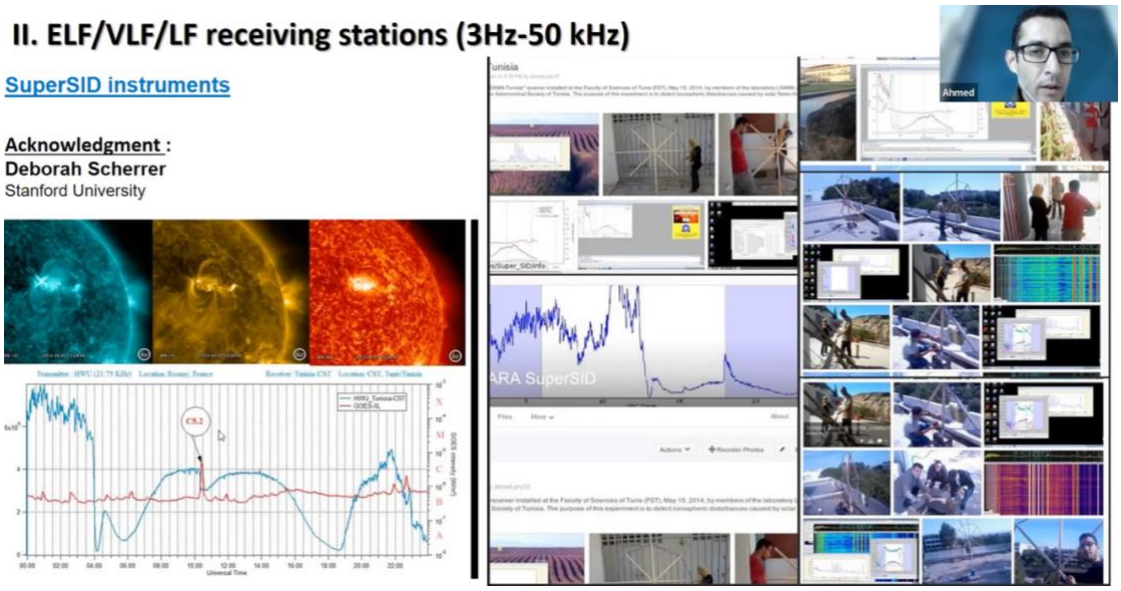
Ahmed Ammar, University El Manar Tunis

Dr. Ahmed Ammar has a doctorate in Physics from the University of Tunis El Manar. His research focuses on space physics and space weather and he teaches Computational Physics to undergraduate and graduate students. In addition, he works in many extension programs in astronomy and optics.

Pictured: Dr Ammar presenting about Tunisia’s space weather research

Highlights:

- Space weather is the activity that occurs between the Sun and the Earth
- Space technology is exposed to space weather problems
- GPS, communication and human space exploration are all affected by space weather
- There are international space organizations and agencies such as UNOOSA, COSPAR for study
- International Space Weather Initiative (ISWI) has a coordinator for Tunisia
- Uses ground instruments to monitor ionosphere, magnetosphere
- AWESOME (Atmospheric Weather Electromagnetic System for Observation Modeling and Ediucation), key personnel is Dr. Morris Cohen of Georgia Tech
- ELF/VLF/IF receiving stations (3Hz-50 KHz)
- There are both AWESOME and SID ground network all around the world
- Two SuperSID stations at Tunisia for observation of space weather; students, faculties involved
- VLF transmitter and receiver, the signal detects ionospheric, atmospheric disturbances
- Solar flares detected by Tunisia, studied the effect of solar flare on terrestrial ionosphere
- Both satellite (GOES satellite) and ground truth data (VLF-LSAMA) comparisons can be made
- Signals from two transmitters, NAA-NS (US) and TBB-NS (Tunisia) showed same results
- Modelling and simulations are done through open source software SuperLWPC
- The Tunisian developed open-source software link: https://github.com/lwpc-gui/SuperLWPC
- Long Wave Propagation Capability was used to model D region ionosphere during flares
- Used empirical model of Wait (Wait and Spies, 1964) for the electron density profile
- Useful to know such information for disturbances that can occur in telecommunication serv

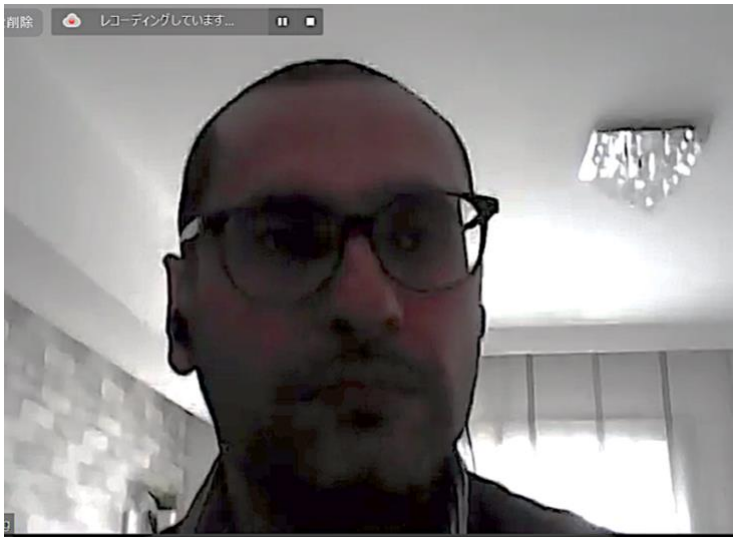


Pictured: Outline of SuperSID instrumentation activities done through ELF/VLF/LF receiving stations

5. Presentation on "Benefits and Challenges of Multi-GNSS for Africa"

Nissen Lazreg, CRMN Sousse Technopole

Dr. Nissen Lazreg did his PhD in 2018 from University of Monastir, Tunisia. His research focused on the develioment of construction techniques of 3D images. The techniques were based on a new technology relating to satellites. He did his Masters in Micro-Nano Electronic from University of Monastir. Dr. Lazreg currently works at the Centre for Research on Microelectronic & Nanotechnology (CRMN), Sousse Technopole in Tunisia. He is involved in space technology through design and development of nanosatellite missions and their applications.



Pictured: Dr Lazreg's presents about importance of GNSS for Africa

Highlights:

- Global Navigation Satellite Systems (GNSS), umbrella term at includes any satellite navigation
- GNSS examples are GPS (US), GLONASS (Russia), Galileo (EU) and Beidou (China)
- Africa has 54 nations, 300 billion sq.km, 1.4 billion people (2022 data), high linguistic diversity
- Different regions have different Satellite Based Augmentation System (SBAS)
- Augmented NaviGation for Africa (ANGA) as SBAS GNSS system for Africa is in development
- SBAS is a cost-effective solution to complement Instrument Landing System (ILS)
- Precise Point Position (PPP) ground reference points are mostly, mid and south coastal regions
- Implementation of SBAS is an on-going work in Africa, half of African Union (AU) involved
    - Agency for Air Navigation Safety in Africa and Madagascar (ASECNA)
    - Arab Civil Aviation Organization (ACAO)
- In partnership with EU, EGNOS in Africa Support Program" is championing GNSS application
- EGNOS is Geostationary Navigation Overlay Service
- NIGCOMSAT-1R, a hybrid satellite with a navigation band (L-band) for SBAS
- 7th Framework Programme (7FP) include R&D projects regarding:
    - SIRAJ: SBAS Implementation in the Regions of ACAC and ASECNA
    - ESESA: EGNOS Service Extension in South Africa
    - Awareness in Africa
    - SATSA: SBAS Awareness and Training in South Africa
- Why GNSS
    - Navigation, surveying, geodesy (science of size and shape of earth)
    - Understand changes and complex dynamic processes of our home planet
    - Future of IoT infrastructure
    - Aviation, maritime transport, civil protection and agriculture, wildlife conservation
    - Mapping of wells and water resources
- Global Geodic Observing System (GGOS)
    - GNSS combines with other space geodic techniques, VLBI, SLR, DORIS, InSAR
- Remote sensing by multi "reflected" called GNSS-R
    - Allows monitoring of water levels, different properties of oceans
    - Reception by nanosatellites or tower
    - Measurement of snow depth and vegetation growth
- Climate change, seismic studies, atmospheric delays can be studied through GNSS
- Social impact of GNSS is increasing, impact of disasters, land administration, food security, boundary mapping, defense, positioning services
- Important to increase complimentary infrastructures for GNSS
- Improve internet connectivity and access to energy
- GNSS scientific observations and understanding can inspire actions for better tomorrow
- SBAS adoption aligns with Single African Air Transport Market (SAATM) agenda of AU
- SAATM: Flagship project of AU agenda 2063 to liberalize civil aviation for economic gain

6. Presentation on "TELNET Smart Use Case Applications Involving the New Space for IoT: Opportunities and Challenges"

Anis Youssef, Telnet Company Tunisia

Dr. Anis Youssef received his engineering degree from the National School of Engineers of Monastir (ENIM) in 2000 and Master's degree from the University Henri Poincaré of Nancy in 2001. He received his PhD in Computer Science from Institut National Polytechnique de Toulouse in 2005. Dr. Youssef is currently Research and Innovation Activities Director at TELNET.

Pictured: Dr Youssef presenting about some of the work TELNET has done in Tunisia

Highlights:

- Telnet holdings was established in 1994, 10 offices in countries including USA, Germany, Japan
- Three key pillars
    - R&D Software and Product
    - Network Integration and Telecom
    - PLM Services and Mechanical Studies
- Expertise in embedded and space systems
- Working in E-payment, media and telecom as well
- Customers and R&D partners from all over the world
- Telnet focuses on CubeSats in low earth orbit
- Global CubeSat market is projected to be $491.3 million by 2027
- Space applications include communication, science missions, earth observation, location
- Challenge One was the first Tunisian satellite from design to production, successful launch
- Use case applications topics include disasters, environment, energy, defense, infrastructure
- Space capacity building plan 1) build CubeSat in Tunisia 2) build space lab 3) show use case

Pictured: TELNET's involvment in wide ranging activities including space and telecom

7. Announcement and Acknowledgement

Haruka Yasuda, UNISEC-Global

Pictured: Yasuda-san announcing the latest updates from UNISEC

- **9th UNISEC-Global Meeting**
  - Venue: Tokyo, Japan, in-person event
  - November 27 – December 1, 2023
  - Details: to be announced
  - J-Cube Workshop during the same time
  - Same time as 8th Mission Idea Contest final presentation, will be held during meeting

- **MIC 8 Overview**
  - Theme: "Missions by multiple nano-satellites"
  - Constellation mission or formation flying, constellation should be 6U or smaller
  - Clear benefits of having each satellite
  - Abstract submission due: **June 30, 2023**
  - Notification: August 8, 2023
  - Full Paper submission due: October 3, 2023
  - Final presentation: TBD (Nov or Dec, 2023, in Japan) at 9th UNISEC-Global Meeting
  - Full information: http://www.spacemic.net
  - Local competitions can be held in their own topics as well

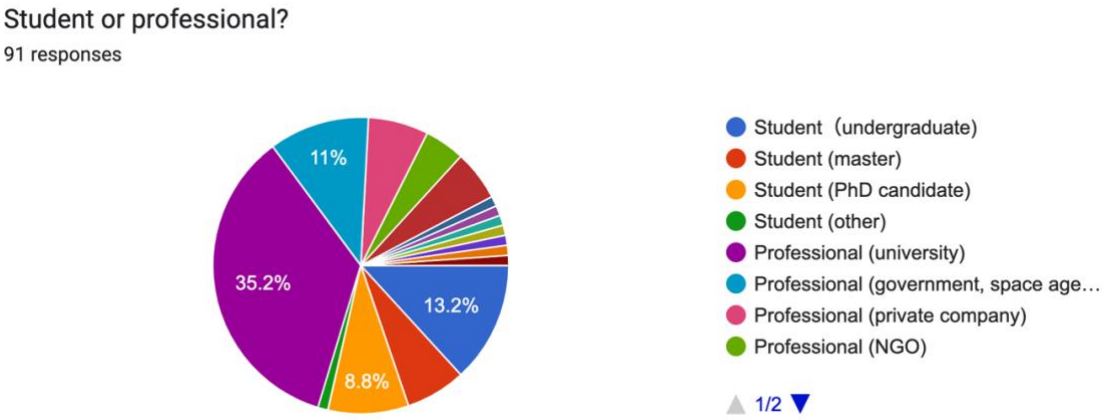
- **J-CUBE**
  - Special discount launch opportunities for 1U-3U (almost 1/3rd discount)
  - Need to collaborate with UNISEC-Japan's university
  - Technical support will be provided
  - Full information: http://unisec.jp/services/j-cube
  - Contact: info-jcube@unisec.jp

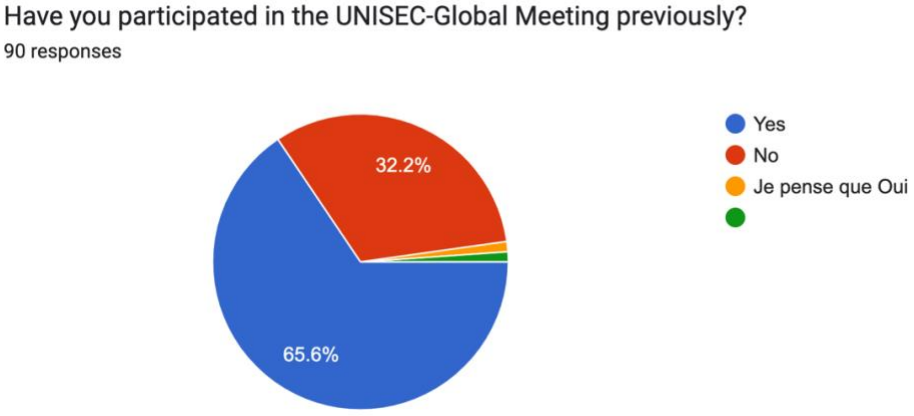
- **33rd Virtual Meeting**
  - Date: May 20, 2023 22:00 – 24:00 (JST)
  - Theme: TBD
  - Host: TBD
  - Virtual UNISEC-Global Meetings takes place third Saturday of almost every month of 2023
  - Seeking local chapters for May 20, June 17, July 15

8. Participant Statistics

93 registered participants from **27** countries and regions for the 32nd Virtual UNISEC-Global Meeting.

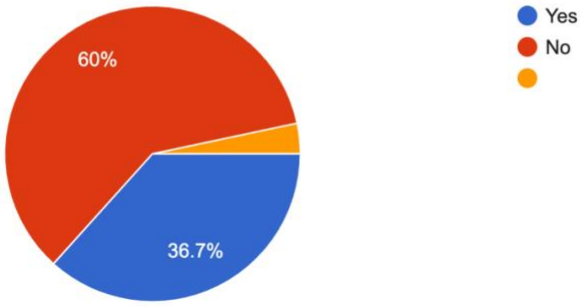
Country/Region	Number of registrations	Country/Region	Number of registrations
Algeria	1	New Zealand	1
Australia	1	Philippines	6
Bangladesh	7	Romania	1
Bhutan	1	Rwanda	2
Bulgaria	1	South Africa	5
Colombia	1	Sudan	1
Egypt	5	Switzerland	1
France	1	Mexico	1
Germany	1	Tunisia	25
India	3	Turkey	3
Japan	16	UAE	1
Kazakhstan	3	Uganda	1
Kenya	1	USA	2
Namibia	1		





Are you familiar with Tunisian space projects?

90 responses



Thank you