University Space Engineering Consortium TUNISIA
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Local Chapter Activity Report 2025

Prof. Kamel BESBES , Unisec Tunisia

January 17, 2026

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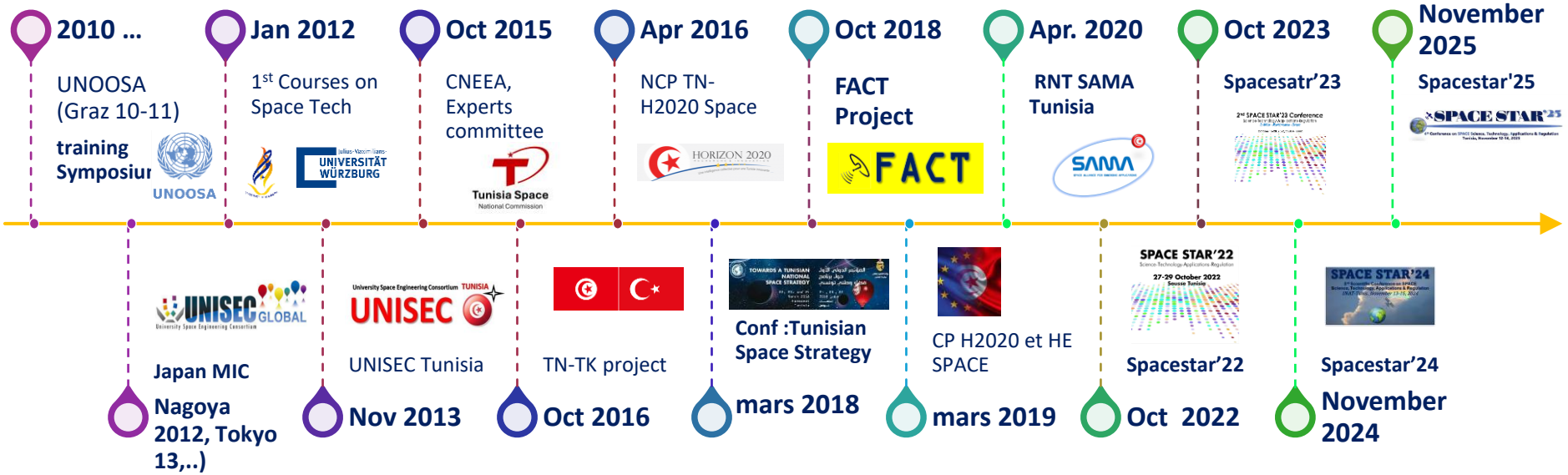
Unisec Tunisia is driving a mobilizing strategy



Actions; Governance, Networking, Events, Exhibitions, Conferences, Studies, Training, Research, Startups, Legislation, Major Projects, International Cooperation, Resources, ...

Network of Tunisian partners: CNEEA, CRM, CNCT, INAT, IRESA, CRMN Enova robotics, Avionav, …
Network of International Partners: HE, IAF, CAST, JAXA, ISRO, UNOOSA, AICTO, AfSA, …
Tokyo U., Samar Univ., ITU Turkey, Wurzburg U., UVSQ, Vigo U.,

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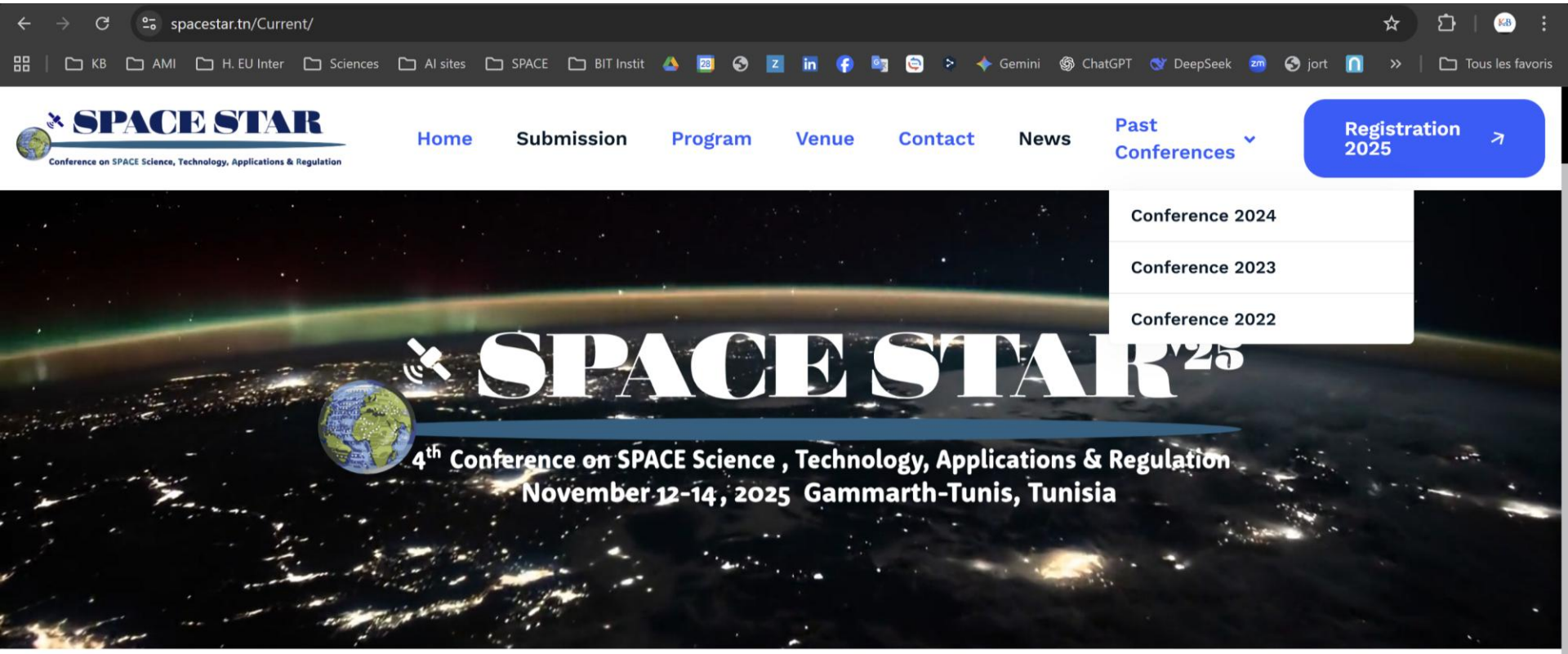
1-Conferences and training organisation



Aim of the conference 2025

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SPACE STAR'25

4th Conference on SPACE Science, Technology, Applications & Regulation
November 12-14, 2025 Gammarth-Tunis, Tunisia

Wednesday, November 12, 2025			
8:30 to 9:00	*Registration*		
9:00 to 9:30	Opening Ceremony, Officials,		
Space Science and Technology, conference co-Chair : Prof Kamel BESBES			
9:30 -10:00	1-1 Conference Session: COSPAR's activities and strategy with emerging countries. Niklas Hedman, COSPAR General Counsel, former Acting Director UNOOSA		
10:00 - 11:00	Oral Communication: Navigation Chair : Prof Hedia Chakroun, ENIT Tunis El Manar University, Tunisia		
	111	K Anaghim, M A Mahjoub LATIS laboratory, ENISo Tunisia	Robust Short-Term Collision Risk Prediction for Earth-Orbiting Satellites
	112	K Barkaoui, A Frihida Beit al Hikma Carthage & Cedric-Cnam Paris, Tunisia	From GeoINT to GeoAI
	113	A Wanda SATNAV Africa JPO, Senegal	Characterization of GNSS RFI on the African Continent – The need for SBAS Authentication
11:00 to 11:30	Coffee Break + Networking		
11:30 to 12:30	Oral Communication 1-2: Astronomy and deep space Chair: Prof Samia Charfi Gaddour, FST, Tunis El Manar University, Tunisia		
	121	M Abdelhak, M A Mahjoub LATIS lab ENISo-Sousse Univ-Tunisia	Bayesian Deep Ensembles for Classifying Main-Belt Asteroid Families from Proper Elements with Uncertainty-Aware Screening
	122	M Ben Hassine, M A Mahjoub LATIS lab ENISo-Sousse Univ-Tunisia	Assessment of Future Stability and Identification of "Escape Candidates" in the Kuiper Belt Using Bayesian Neural Networks
	123	M A Mahjoub LATIS lab ENISo-Sousse Univ-Tunisia	Artificial Intelligence for Exploring Small Bodies and Exoplanets in Astrophysics: State-of-the-Art, Challenges, and Prospects
12:30 to 13:00	1-2 Conference Session: Deep Space Exploration programs benefits for Emerging Nations and the Next Generation, Ing Rania Toukebri, Space Generation Advisory Council (SGAC), AKKODIS Co, Germany		
13:00 to 14:30	Lunch		
14:30 -15:00	1-3 Conference Session : Trends on Quantum space communication Dr Sana AMARI PYKA, Lead Scientist, Technology Innovation Institute, Abu Dabi, Emirates Arab Unis		
15:00 to 15:40	Oral Communication: Space emerging technologies Chair: Prof Mounir Mansour, AM Foundek Jedid, Tunisia		
	131	F Rziga Ouaja, K Besbes µEi Lab, FSMonastir Univ-CRMN Sousse, Tunisia	Climate Change and Quantum Technology: Towards a Synergy for a Sustainable Future
	132	K E Arthur, E Tachie-Menson, C Martey, F A K Bekoe Pharmfield Pharmaceuticals, Arthur Mensons Labs, Ghana Air Force- Ghana	Dynamic Foot Pump Assessment System (DFPAS) for Astronaut Circulatory Health in Microgravity

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15:40-16:10	Coffee Break + Poster Tour		
1-4 Poster Tour (5mn/P)	141	Z Ben Amira, Y Fekih, K Hmaied TSA Association - Tunisia	Mini and Experimental Rocket Design: Microelectronics, Microcontrollers, PCB and Mechanics Integration
	142	F El Kamel, A Benmanaa, A Rouis, A Sakly ENIM-Monastir Tunisia	AI-Based Celestial Navigation for Aerial and Spacecraft Platforms: A CNN–LSTM Hybrid Approach
	143	Dorsaf Aguir, Mohsen Machhout EuE Lab, FS Univ of Monastir Tunisia	Effects of Total Ionizing Dose Radiation on n-MOSFET Device Performance
	144	R Boughammoura ISIM Mahdia, University of Monastir	Use of Orthogonal Range Searching and Layering Technique against Climate Change Sea Level Rising Problem in Coast of Tunisia
	145	I Skima, A Ben Ismail CNSTN Tunisia	Study of a Numerical Model for Predicting In-Flight Exposure to Cosmic Radiation
16:10 to 17:10	Oral Communication 1-5: Space Technology Chair: Prof. Ahmed Siala, DG Military research center - Tunisia		
	151	B Ennejah, S Lahouar, K Besbes, µEi Lab, FSMonastir Univ-CRMN Sousse, Tunisia	Architectures and Constraints Of Cubesat-Based IoT Spatial Communication
	152	Iheb Bourbia, S Lahouar, K Besbes µEi Lab, FSMonastir Univ-CRMN Sousse, Tunisia	IoT Spatial Communication Based on an SDR Bridge
	153	S Lahouar, K Besbes µEi Lab, FSMonastir Univ-CRMN Sousse, Tunisia	Development of a Vacuum–Thermal Environment controlled Platform for LEO Device, System testing and Mission Qualification

2

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SPACE STAR'25

4th Conference on SPACE Science, Technology, Applications & Regulation
November 12-14, 2025 Gammarth-Tunis, Tunisia

Thursday, November 13, 2025

Space Applications and EO, Conference co-Chair: Prof. Zohra LILI CHABAANE

9:00 to 9:30	**2-1 Conference Sessions: Earth Observation applications and Benefits in Gabon** **Dr Aboubakar Mambimba Ndjoungui,** **Director General of the Gabonese Agency for Space Studies and Observations (AGEOS)**		
9:30 to 10:30	**Oral Communication 2-1 : Environment quality control** **Chair: Prof Mehdi Ben Mimoun, INAT, GreenTeam Lab, Tunisia**		
	211	S Ben Mahmoud, O Charfi **ENIG, Gabes Univ. Tunisia**	Operational Soil Moisture Monitoring Using Deep Learning and Sentinel-1 for Optimized Irrigation
	212	M Gallas, S Lahouar, K Besbes **EPISo, UEI Lab, FSM Monastir Univ. CRMN SousseTunisia**	Geospatial Data Analysis for Environmental Impact Assessment: Case Study of Wildfires
	213	N Habbachi, A Guesmi, K Besbes **UEI Lab, FSM Monastir Univ. CRMN SousseTunisia**	VLMs on the Edge: Towards Real-Time Fire Detection and Spread Prediction based on space observation
10:30 to 11:00	**Coffee Break + Networking**		
11h00 to 11:30	**2-2 Conference Sessions: AI supporting EO for climate change and environment analysis** **Prof. Imed Riadh Farah, Director of Manouba National School of Engineering (MSE)** **RIADI Lab, University of Manouba, Tunisia**		
11:30 to 12:30	**Oral Communication 2-2: Climate Models** **Chair : Prof. Sihem Benabdallah, Certn Borj Cedria, Tunisia**		
	221	R Ben Romdhane **Nat. Inst. of Meteorology Tunisia**	Use of Satellite Data at the National Institute of Meteorology
	222	K Khemiri, A Chekirbane, D Penna, C Massari **Dept of Rural Eng., Water and Forests, INAT, U. of Carthage**	Machine Learning-Driven Bias correction of satellite-based climate models to improve regional climate assessments in Tunisia
	223	G Graja, O Besbes, T Abdellatif **MRC, ISSATSo, ENISo, U Sousse, SERCOM Lab., EPT, U Carthage**	Cross-View Change Detection via Self-Supervised Contrastive Learning
12:30 to 14:00	**Lunch**		
14:00 to 14:30	**2-3 Conference Session: Detection and Classification of Olive Leaves Diseases** **Prof Abdelaziz Kallel, Centre on Digital Research, Sfax technopole, Tunisia**		
14:30 to 15:30	**Oral Communication 2-3: Water and Agriculture** **Chair : Prof. Fatma Trabelsi, Esim Medjez ElBeb, Tunisia**		
	231	J Aouissi, S Zakraoui, Z Lili Chabaane, Z Kassouk, K Chokmani, H Agili, F Msallem **LR GREEN-TEAM, INAT, U. Carthage, Tunisia**	Understanding the impact of Digital Elevation Model resolution in flood modelling using HECRAS model and Sentinel-1 image at the Medjerda Wadi
	232	Z Kassouk, S Sayeh, J C Loubier, J Aouissi, A Chahbi, I Saied, Z Lili Chabaane **LR GREEN-TEAM, INAT, U. Carthage, Tunisia**	High-Resolution LiDAR and Drone Imagery for Urban Flood Risk Assessment using Bluespot Modeling in Nabeul, Tunisia

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4th Conference on SPACE Science, Technology, Applications & Regulation
November 12-14, 2025 Gammarth-Tunis, Tunisia

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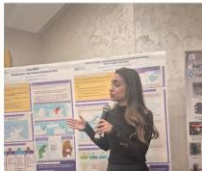
	233	M Khlif, A Chahbi Bellakanji, H Habaieb, Z Lili Chabaane **LR GREEN-TEAM, INAT, Carthage Univ. Tunisia**	From Space to Field: Artificial Intelligence-Powered Early Classification of Cereal Crops in Tunisia Using Sentinel-1 and Sentinel-2
15:30 to 16:00	**Coffee Break + Poster Tour**		
2-4 Poster Tour (5mn/P)	241	B Selmi **MSB, Manouba Univ – Tunisia**	HydroTwin: AI-Powered Digital Twin for Urban Rainflow Simulation and Rainwater Reuse
	242	W Abdaoui, A Ben Abbes **MSB, Manouba Univ – Tunisia**	Assessing the quality of hydrological resources in the North and Center of Tunisia using remote sensing data
	243	M Rihani **ISAMM Manouba Univ, Tunisia**	Privacy-preserving land cover classification using federated learning for satellite imagery
	244	M Zaghdoudi, R Selmi **MSB, Manouba Univ – Tunisia**	Water quality monitoring using remote sensing
	245	F Ben Thameur **Manouba School of Engineering, Tunisia**	FarmWeb: Sustainable Agriculture Resource Hub
16:00 to 17:30	**2-5 Round Table on: The Future of GNSS R&D in Africa: Challenges, Strategic Vision, and Implementation** **Chair: Dr Aicha Alou, SATNAV JPO, Co-chair : Prof Kamel Besbes, CRMN Tunisia** **JPO, AGEOS, CRM, Aviation School BA, MES, CNCT, IRESA, OTC, OACA, AICTO, Novation City, …**		

Conferences and Communications Day 2

Poster sessions Day 1 & 2



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SPACE STAR'25

4th Conference on SPACE Science, Technology, Applications & Regulation
November 12-14, 2025 Gammarth-Tunis, Tunisia

Friday, November 14, 2025	
Space Regulations and policies, *Conference co-Chair: Prof. Refaat Chaabouni*	
	Panel 1: Space Law: Experiences and Challenges for Emerging Countries Chair : Prof. Refaat Chaabouni
09:00 to 9:30	Key note 1-1: The challenges of establishing space law for emerging countries in light of the current evolution of the global space domain. Niklas HEDMAN, COSPAR General Counsel, former Acting Director UNOOSA
9h30 – 10:00	Key Note 1-2: "Space Law for Emergent Countries" Rosanna HOFFMANN, leader of Global Space Law Project, UNOOSA
10:00-10:30	What future space law for Tunisia, main recommendations Debate : CNEEA representative (PG, MESRS, CNCT, MAE, MTIC ....) COSPAR, UNOOSA
10:30 to 11:00	Coffee Break + Networking
	Panel 2: Space sustainable economy Chair : Prof Nesrine Chehata Laroui, AGEOS Association, Univ Bordeaux, France
11:00 to 12:00	Key Note 2-1: Earth observation and economy impact for emerging countries Dr Aboubakar Mambimba Ndjoungui, Director General of the Gabonese Agency for Space Studies and Observations (AGEOS) Key Note 2-2: Road map on R&D and innovation for GNSS in Africa and economic impact expected, Dr Aicha Alou, SatNav Africa JPO Key Note 2-3 : 2027 Solar Eclipse in Tunisia, The Scientific, Cultural and Touristic event Prof Samia Charfi, Faculty of Science, Tunis El-Manar University – Tunisia Dr. Nour Rawafi, Astrophysicist and the project scientist for NASA's Parker Solar Probe mission
	Panel 3 : NewSpace market development and benefits for emerging countries Chair: Dr Michel BOSCO, MAM Int Consulting
12:00 – 13:00	Key Note 3: Introduction: Prospects for future European Space Initiatives 2028-2034 Dr Michel BOSCO, MAM Int Consulting
	Debate : Startups, Mechatronic Cluster, INM, OSS, APAL, CNCT, MAMIC, ...
	Closing Ceremony (Officials) Pr Refaat Chaabouni + Moderators
13:15	Closing Lunch
Social Events : Carthage sites and museum/ Beidou Centre Tunisia	

Conferences and Panels Day 3


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4th Conference on SPACE Science, Technology, Applications & Regulation
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2- participation on conferences

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1- Conference & Events 2025

During 2025, the activity focused on the promotion and development **of space, digital, and quantum technologies, with particular attention to emerging economies and international cooperation**.

A strong interest was placed on **satellite navigation and Earth observation technologies, notably GNSS and multi-GNSS systems**, for resilience, early warning, seismic alerts, and disaster risk reduction, with **a focus on Africa and MENA regions**.

These activities highlighted the importance of **cooperation between academia, industry, and public institutions**, as well as the strategic role of space technologies in supporting **sustainable development, security, and technological sovereignty in a rapidly evolving global environment.**

Partners : UNISEC, UNOOSA, IAF, AfSa, EgSa, JPO, ..

- **A call for action from Tunisia on international regulatory frameworks,**
- **Enhancing Tunisia's space sector: technologies, applications and regulatory considerations,**

62nd Scientific and Technical Subcommittee, February 11, 2025 Copuos 2025

- **Participation to Newspace Africa** Cairo April 2025
- **Quantum Communication: Fundamentals and Technology Trends,**

International Conference on Emerging Technologies and Computing (ICETC 2025)

June 23-26, 2025 at University of Brest – France

- **Emerging Quantum Technologies,**

Master Class en technologies quantiques, Lab. Microélectronique et Instrumentation, FSM, 30 Juin 2025, Prof. Kamel BESBES

- **Private sector and academic cooperation for early warning through GNSS applications**

Africa Satellite Navigation Conference High-Level Pre-event "Leveraging GNSS Technology for Enhanced Multi-Hazard Early Warning Systems in Africa." Praia, Cabo Verde 16th - 17th July 2025

- **Multi-GNSS & GNSS-R for Resilience, Earth Observation & Seismic Alerts**

Fifth China – Arab BDS Cooperation Forum, 24-25 September 2025, China

- **Quantum materials, technologies and key applications,**

7th International Symposium on Materials, Electrochemistry and Environment, CIMEE25, 25-27 September 2025, Tripoli, Lebanon.

- **Space for emerging economies in changing world,**

7th International Space Forum at Ministerial Level 2025 The Southeast Asian Chapter , December 4, 2025, Manila, The Philippines

3 R&D projects

Closing the project FACT
December 31, 2025
Financed by Ministry of Higher Education and Scientific Research in Tunisia

Category	Field of studies	Number
Researcher	Electrical engineering	2
	Microelectronics	3
Early-Stage Researcher	Telecommunication	1
	Microelectronics	3
Engineer	Mechanical	1
	Geomatics	2
Graduate Student	Microelectronics	3
	Computer Engineering	1
	Electrical Engineering	3
	Information and Communication Technologies	2
	Electromechanical Engineering	1
Undergraduate Student	Electrical Engineering	4
	Computer Engineering	2
	Electromechanical Engineering	5

- Researchers: 10
- Engineers: 5
- Grad Students: 15
- Undergrad Students: 15

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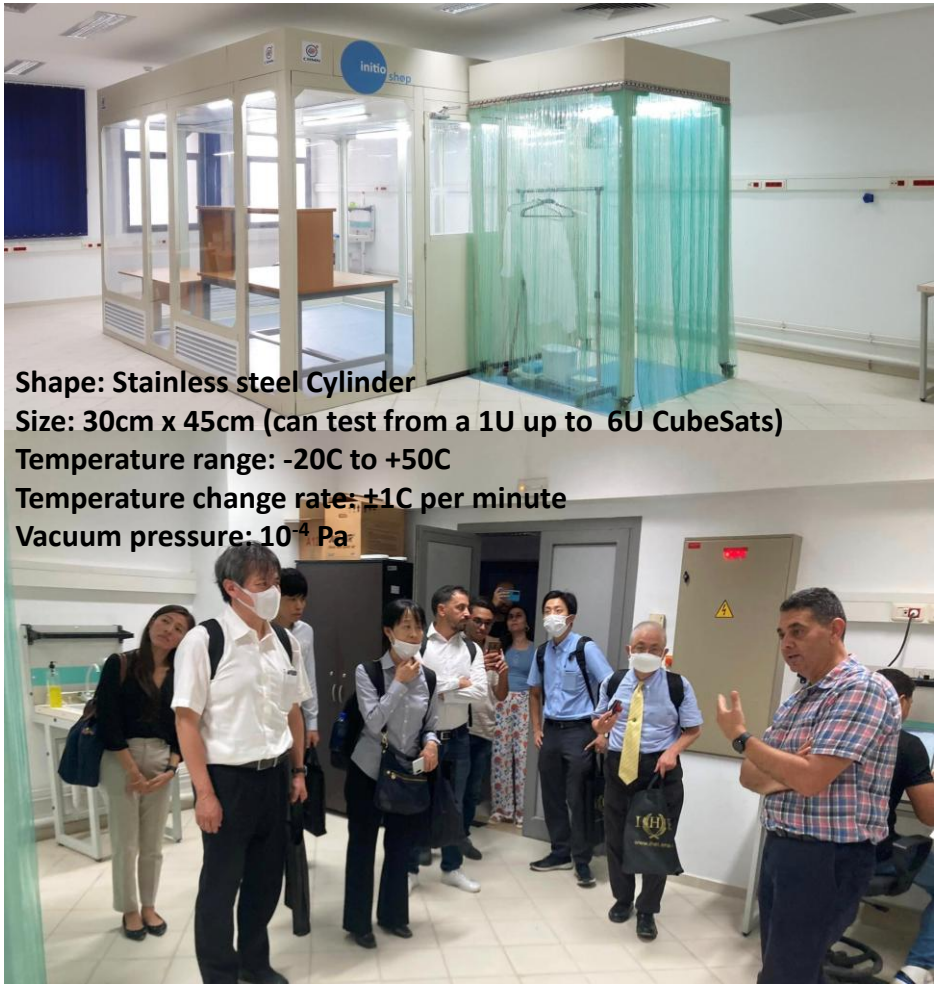
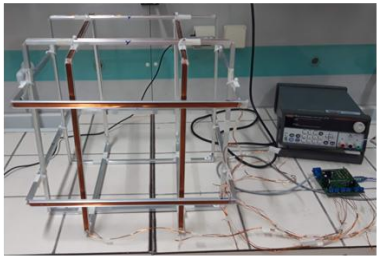
3- CubeSat Mounting Facility: Cleanroom



Shape: Stainless steel Cylinder
Size: 30cm x 45cm (can test from a 1U up to 6U CubeSats)
Temperature range: -20C to +50C
Temperature change rate: ±1C per minute
Vacuum pressure: 10^{-4} Pa

- Helmholtz Cage: Earth magnetic field emulation
  - Dimensions: 45cm x 45cm x 45cm: 1U CubeSat testing
  - Aluminum frame
  - Magnetic field strength: ±100µT on each axis
  - Precise magnetic field control through the GUI



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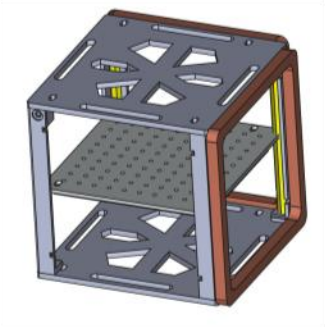
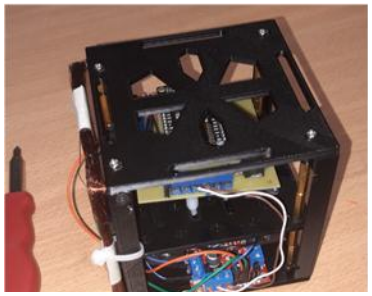
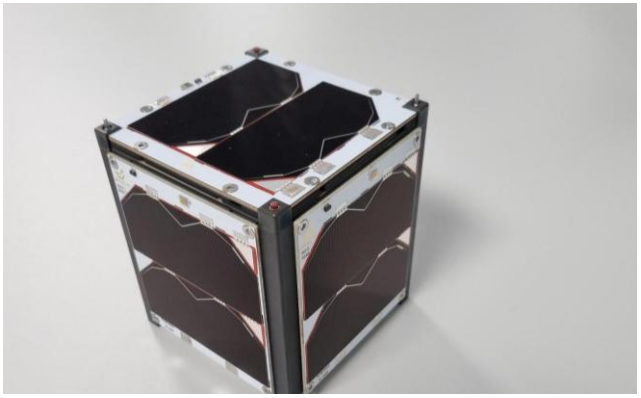
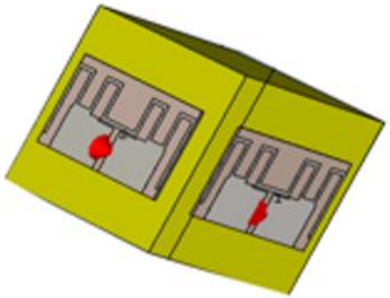
Cubesat development









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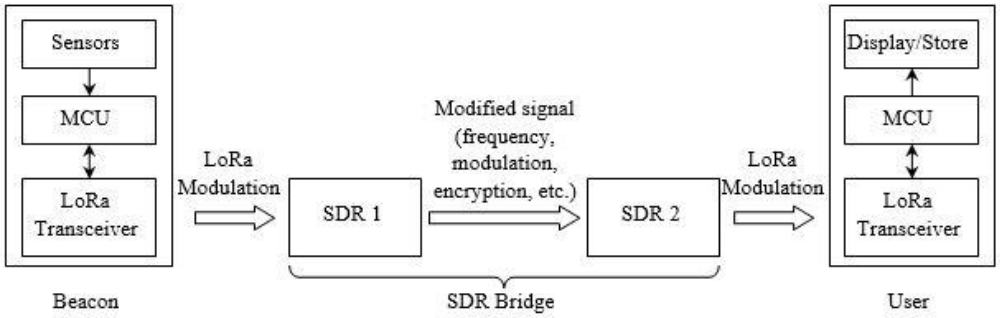
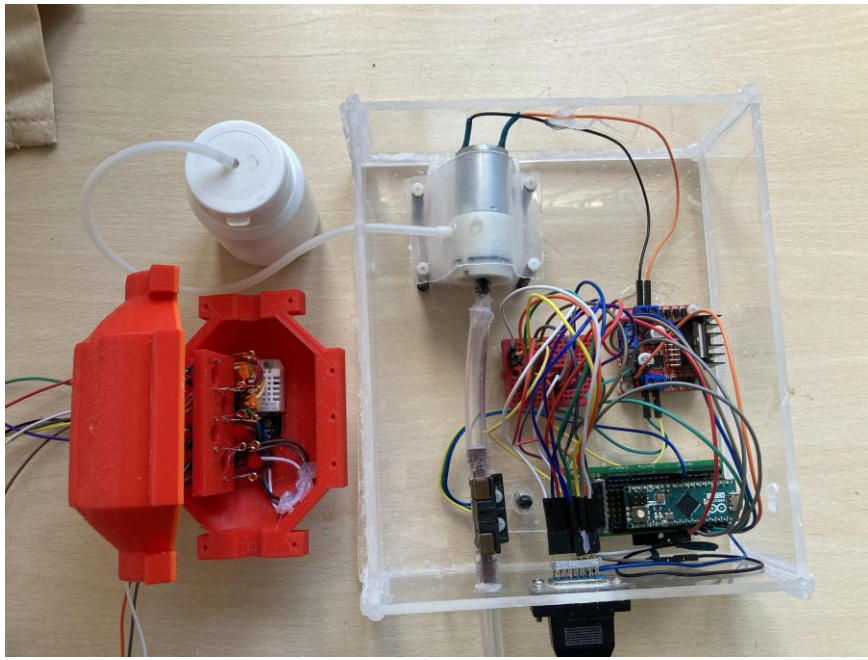
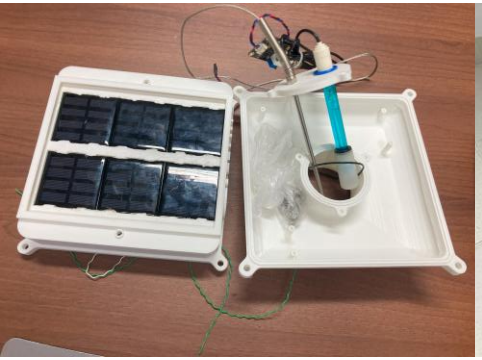
Ground Segment for Space IoT :

Gases and Water quality ,
Earth Observation,
MultiGNSS







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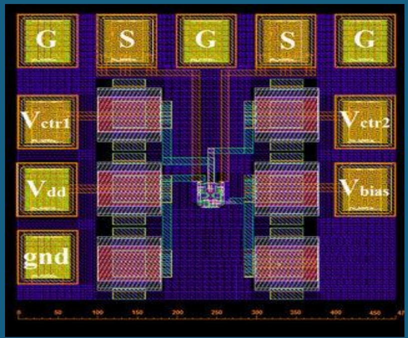


Journal of Circuits, Systems and Computers | Vol. 26, No. 04, 1750055 (2017)

An Enhanced Design of Multi-Band RF Band Pass Filter Based on Tunable High-Q Active Inductor for Nano-Satellite Applications

Aymen Ben Hammadi, Mongia Mhiri, Fayrouz Haddad, Sehmi Saad and Kamel Besbes

DOI: 10.1109/IDT.2016.7843051 • Corpus ID: 23242997

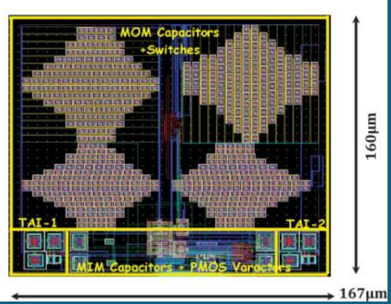
An L, S and S2 bands, compliant LC-based DCO for amateur Nano-satellite applications

S. Saad, M. Mhiri, +1 author, K. Besbes • Published 2016 • Materials Science, Computer Science • 2016 11th International Design & Test Symposium (IDT)

This paper presents a LC-based digitally controlled oscillator (DCO) with an enhanced frequency resolution and an extended linear frequency tuning range. It generates frequencies between 1.22 and 3.52 GHz that covers three main bands defined for amateur Nano-satellite applications (L, S and S2). The DCO exploits a new tunable active inductor (TAI) that achieves a high Q-factor with a maximum value of 98 over a frequency range of 1770 MHz. It tunes from 3.55 nH to 15.2 nH. Furthermore, a tuning circuitry based on a capacitive degeneration network formed by a capacitance with an additional resistance, is employed to achieve a low frequency resolution without any dithering. The achieved frequency resolution is approximately between 3 and 16 kHz. The DCO exhibits a phase noise of −105.8 dBc/Hz at 1MHz frequency offset and an FoM of −175 dBc/Hz. Finally, the circuit consumes 5.2 mA current when is designed in a 90-nm nine-metal CMOS technology with an operating supply voltage of 1.0 V.

A 160-µW, Ring Digitally Controlled Oscillator for UHF/VHF Nano-satellites Broadcasting Tuners in 90nm CMOS Process

Authors: Sehmi Saad, Mongia Mhiri, Aymen Ben Hammadi, Kamel Besbes
Microelectronic and Instrumentation Lab, LR-13ES12, FSM, University of Monastir, Tunisia
Emails: Sehmi.Saad@fsm.rnu.tn, Mongia.Mhiri@fsm.rnu.tn, Aymen.Benhammadi@fsm.rnu.tn, Kamel.Besbes@fsm.rnu.tn



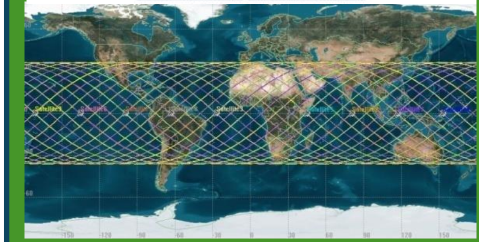
2016 11th International Design & Test Symposium (IDT)

An L, S and S2 bands, compliant LC-based DCO for Amateur Nano-Satellite Applications

Sehmi Saad[1], Mongia Mhiri[1], Aymen Ben Hammadi[1] and Kamel Besbes[1,2]
[1]Microelectronic and Instrumentation Laboratory, LR-13ES12, University of Monastir, Tunisia
[2]Center for Research in Microelectronics and Nanotechnology (CRMN), Techno-park of Sousse, Tunisia
sehmi.saad@fsm.rnu.tn, mongia.mhiri@fsm.rnu.tn, aymen.benhammadi@fsm.rnu.tn, kamel.besbes@fsm.rnu.tn

Constellation of Pico-Satellites for 3D Earth observation

NissenLAZREG[1], Kamel BESBES[1,2]
[1]Microelectronics & Instrumentation Lab; Faculty of Sciences of Monastir; University of Monastir, Tunisia
[2]Centre for Research in Microelectronic & Nanotechnology (CRMN), Technopark Sousse, Tunisia
lazreg.nissen@yahoo.fr, kamel.besbes@fsm.rnu.tn



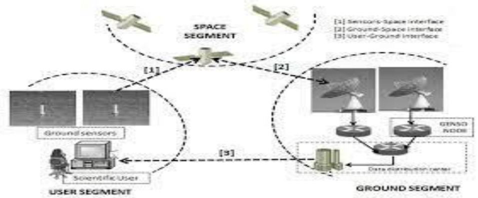
ELSEVIER
Advances in Space Research
Volume 61, Issue 4, 15 February 2018, Pages 1017-1024

Analysis and design of Cubesat constellation for the Mediterranean south costal monitoring against illegal immigration

Nissen Lazreg [a], Omar Ben Bahri [a], Kamel Besbes [a, b]

Small Satellite and Multi-Sensor Network for Real Time Control and Analysis of Lakes Surface Waters

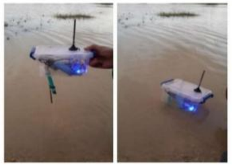
Nader Gallah, Microelectronics & Instrumentation Lab, University of Monastir, Monastir, Tunisia
Kamel Besbes, Microelectronics & Instrumentation Lab, University of Monastir, Monastir, Tunisia, kamel.besbes@fsm.rnu.tn



(IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 8, No. 3, 2017

Water Quality Monitoring based on Small Satellite Technology

N. Gallah[1], O. b. Bahri[1], N. Lazreg[1], A. Chaouch[1]
[1]Microelectronic and Instrumentation Lab
[1]Faculty of sciences, University of Monastir
Monastir, Tunisia
Kamel Besbes[1,2]
[2]Center for Research on Microelectronics and Nanotechnology, CRMN
Sousse, Tunisia



Prototype of the system with microcontroller board, sensors and SDR module

Fig. 1. Satellite earth observation. (a) NASA project (Courtesy of NASA[1]). (b) ESA project (image by ESA/ATG medialab[2]).

However, the satellite earth observation systems present always gaps. The earth observation methods used for water quality monitoring are based on sensors resolution. Indeed,

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Didactic satellite based on Android platform for space operation demonstration and development

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Smartphone-Based Telemedicine Supported by Pico-Satellite Constellation

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ABSTRACT

Many people in developing countries are required to travel for several hours to see a doctor. The concept of so called telemedicine accompanied with developments in the field of wireless communications may improve the health care. Here presented telemedicine system is for a distance consultation. It is based on a pocket smartphone using its camera to develop a video broadcasting mission for a real-time consultation. However, developing countries in the Middle East and North Africa suffer network coverage in most areas. To overcome this issue, the system includes a software defined radio in order to integrate the small satellite technology in the telemedicine routine. The proposed pico-satellite constellation can provide an interesting solution for near real-time transmission, which will significantly improve the health care in remote areas.

KEYWORDS: Constellation, MENA, Pico-satellite, SDR, Smart system, Telemedicine

ICEMIS2017, Monastir, Tunisia

Registration and correction techniques in Cubesat remote sensing images

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Autonomous and In-situ Water Quality Monitoring System for Real-World Applications

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I. INTRODUCTION

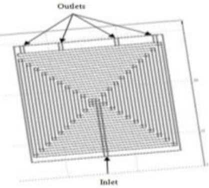

Fig. 1. Schematic of the channel designed

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mission focused on advancing environmental monitoring through space-based multi constellation IoT communications.

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4- Support Tunisian submission to Kibocube call 2025

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KiboCUBE in partnership with Japan Aerospace Exploration Agency provides the opportunity to develop a cube satellite (CubeSat) and have it deployed from the International Space Station Japanese module “Kibo”.

KiboCUBE enables access to space promoting the sustainability of future space activities.

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SPACE STAR

Conference on SPACE Science, Technology, Applications & Regulation

4- Annoucement :

5th Spacestar conference in November 2026 at Tunis

Thank you
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