

# Activity Report

UNISEC-Italy  
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**UNISEC/UNISON Italy activities** in the space field at Sapienza University of Rome are carried on in cooperation with the Sapienza Space Systems and Space Surveillance Laboratory (S5Lab), with the support of the UNISEC Italy Point of Contact (Prof. Fabio Santoni) and Prof. Fabrizio Piergentili, responsible for the S5Lab.

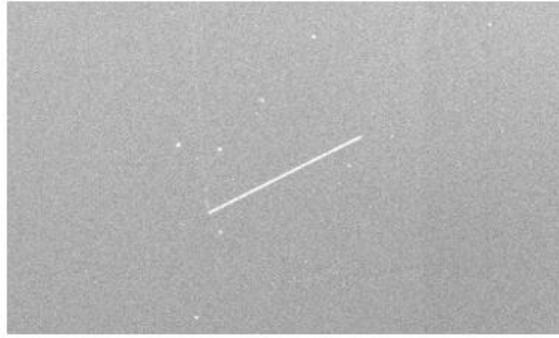
During 2017, UNISEC Italy supported the organization of the **5<sup>th</sup> UNISEC Global Meeting** and the event was hosted at the Sapienza's Engineering Faculty in Rome, Italy (See below for a detailed description).

Starting from January 2018, a **cooperation with University of Rome Tor Vergata** allowed to include the 2<sup>nd</sup> university of Rome in the UNISEC Italy consortium.

In the **Space Debris field**, the UNISON students in cooperation with S5Lab developed and consolidated in the last year a **network of observatories** in the area nearby Rome (Italy) and two additional observatories at the Broglio Space Center (BSC) in Malindi (Kenya) **for space debris monitoring** (see figure below).



Moreover, the cooperation with the Astronomy Department of the University of Michigan (US), the Astronomy Institute of University of Bern (Switzerland) and the International Scientific Optical Network (ISON), managed by the Keldysh Institute for Applied Mathematics (Russia), is currently allowing the integration of a huge amount of data, coming from observatories located worldwide to be used to improve orbital parameters estimate of observed uncooperative objects. In particular, the UNISON students took part at the observing campaign for the **re-entry of the Chinese Space Station "Tiangong-1"** and the acquired images have been used to track the spacecraft and test some additional innovative techniques for reconstructing the vehicle attitude and angular rotation (see the figure below for an example of acquired image).



For what concern the spacecraft design and development, **1KUNS- PF** (1<sup>st</sup> Kenyan University NanoSatellite-Precursor Flight) was launched by the International Space Station on the 11<sup>th</sup> of May 2018. This 1U CubeSat is the first satellite developed by Republic of Kenya by students from University of Nairobi (Kenya) with the support of Sapienza University of Rome (Italy), deployed in orbit thanks to the dedicated cooperation between the United Nations Office for Outer Space Affairs (UNOOSA) and the Japanese Aerospace Exploration Agency (JAXA) from the Japanese Experiment Module "KiboCUBE". The spacecraft is currently operative and the images acquired from its Low Earth Orbit (LEO) are currently used for educational purposes and input data for several student theses (figure below illustrates one of the 1KUNS-PF acquired pictures).



Moreover, **LEDSAT** (LED-based small Satellite) is currently under development in the framework of the ESA's "Fly Your Satellite!" Educational Programme and it will be launched within 2020. The students part of the LEDSAT Team passed the Critical Design Review in May 2018 and they are currently working to improve the LEDSAT ground segment and within the end of the year they are testing part of the Flight Model components before the Integration Phase.

Student's activities are on-going in terms of participation at International contests and educational programs in the space field. In particular, the HEMERA Team has been selected to take part at the 5<sup>th</sup> Mission Idea Contest and they are presenting their innovative constellation of passive SAR-based micro-satellites for a Master/Slave configuration at the 6<sup>th</sup> UNISEC Global Meeting (19-21 November 2018 in Strasburg, France). Furthermore, the TARDIS (Tracking and Attitude Radio-based Determination In Stratosphere) Team has been invited to present their experiment at the SNSA/ESA Selection Workshop (27-29 November 2018) at ESA's Space Research and Technology

Centre (ESTEC) in Noordwijk (The Netherlands). The TARDIS project aims at an In-flight attitude and position determination via Very High Frequency Omni-Directional Range (VOR) system, tracking a fixed ground target through a steerable antenna and testing during the flight in Stratosphere Shape Memory Alloys (SMA) materials as actuators.

## Fifth UNISEC-Global Meeting

### Overview

The Fifth UNISEC-Global Meeting was held between the 2<sup>nd</sup> and the 4<sup>th</sup> of December 2017 at Engineering Faculty of Sapienza – University of Rome (Via Eudossiana 18, 00184, Rome, Italy). The event was organized to follow up the successful outcomes made at the 4<sup>th</sup> UNISEC-Global meeting in Kamchia (Bulgaria) (October 18-23, 2016).

### Date and Venue

Announcement Date January 2017  
Event Date 2-4 December 2017  
Venue Sapienza's Engineering Faculty (Rome – Italy)

### Participation

Total number of participants About 120  
Category of Participants  Students  Engineers/Instructors  Both  
International Participants  No  Yes  
If yes, how many international participants were attended the activity? Around 80

### Sponsors

- GomSpace ApS (Denmark)
- Hyperion Technologies N.L. (The Netherlands)
- NPC Space Mind (Italy)
- QubeSpace (South Africa)
- WaveArrays, Inc. (Japan)
- Infostellar (Japan)
- UNISEC (Japan)
- WIA Europe
- CANON Electronics inc.
- Mitsubishi Electric

### Participants Group Photo



## **Results and Conclusion**

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Around 120 people, UNISEC international representatives, experts, sponsors and mainly students attended the 5<sup>th</sup> UNISEC Global Meeting and spent three days exchanging experiences and knowledge in different space topics. Moreover, the event allowed to review the on-going activities of the new local chapters, to acknowledge new applications for the UNISEC-local chapters, to host the Pre-5th MIC (Mission Idea Contest) and to provide a forum for the UNISON-Global (student organization) to exchange their opinions about research activities and issues they face for closer cooperation at a student level around the world.