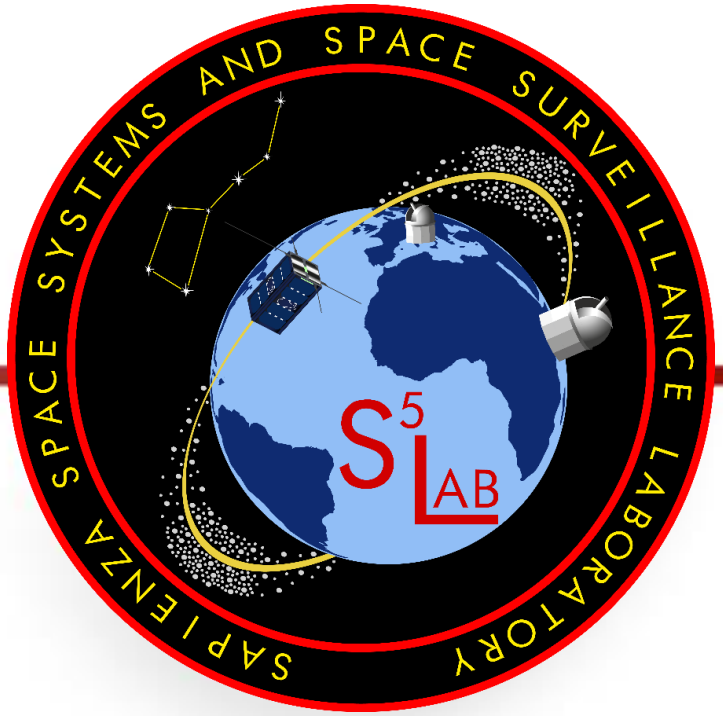


Sapienza Space Systems & Space Surveillance Laboratory

Fabio Santoni - Fabrizio Piergentili

Sapienza
Università di Roma

MAIN RESEARCH ACTIVITIES

❖ Satellite systems design

- Mission analysis
- On-board systems/sub-system
- Ground station operations
- Data handling and processing

❖ Space surveillance systems

- Optical observation systems
- Data analysis
- Orbit determination
- Active debris removal systems

UNIVERSITY SATELLITE

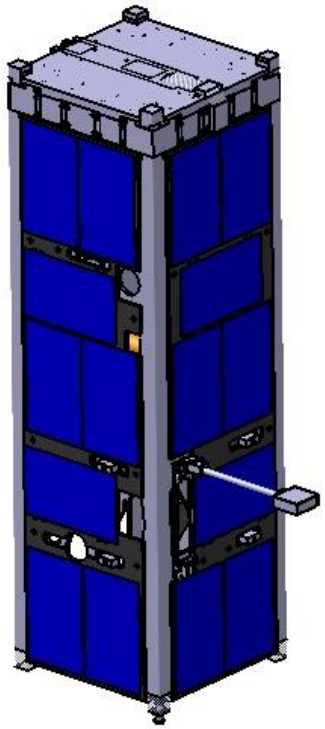
- It is a **functional spacecraft**, rather than a payload instrument or component. To fit the definition, the device **must operate in space with its own independent means of communications and command**

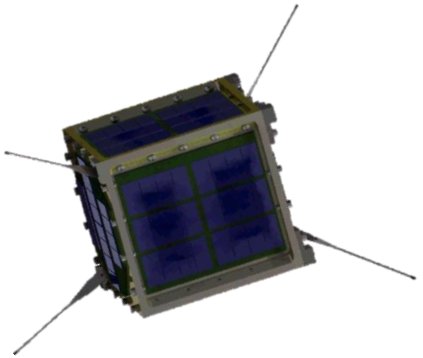
- **Untrained personnel** (i.e. students) performed a significant fraction of key design decisions, integration & testing, and flight operations

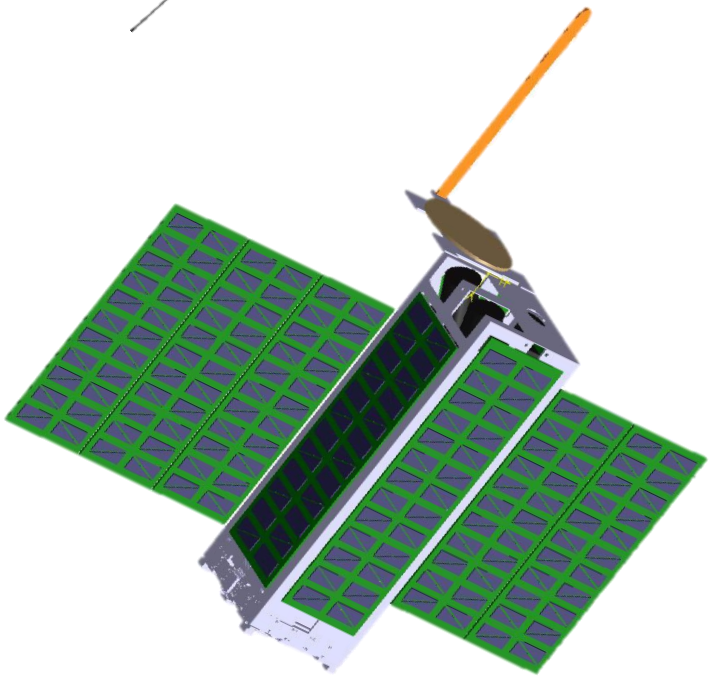
- **The training of these people was as important as** (if not more important) **the nominal "mission"** of the spacecraft itself

CUBESAT DEVELOPMENT

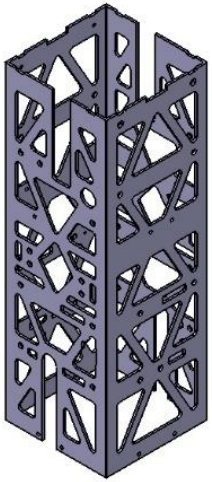
- Design
- Building
- Testing
- Operations

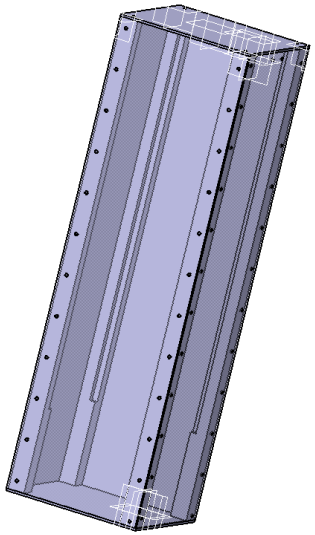


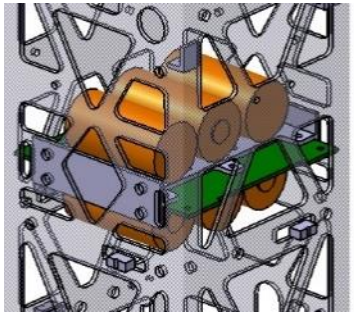


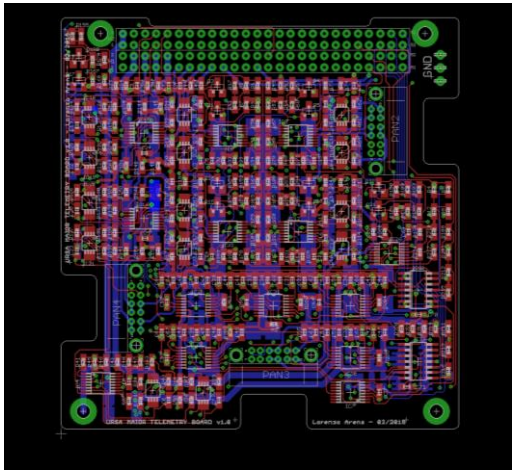


DESIGN

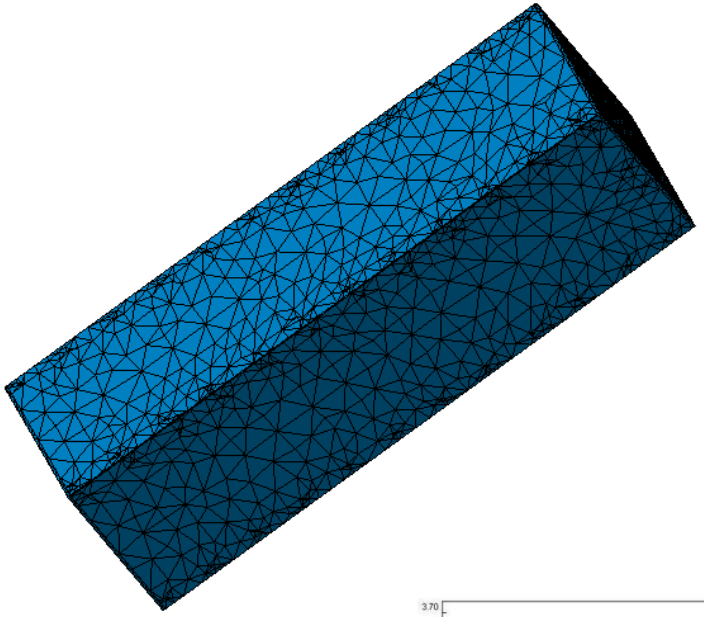


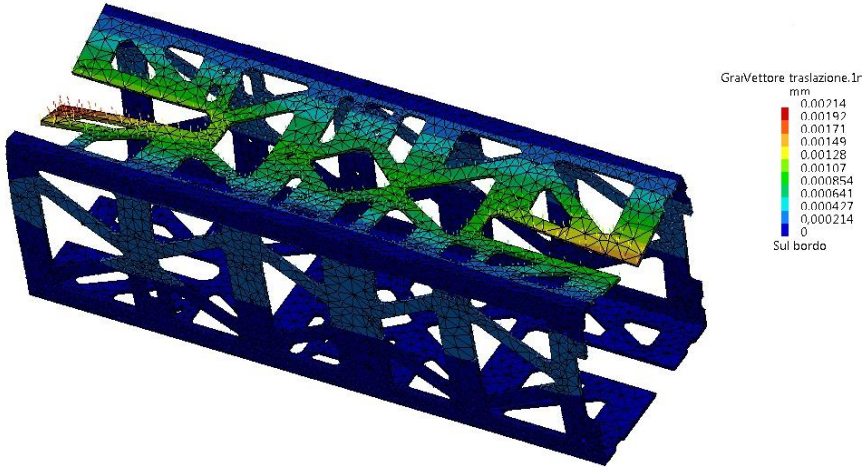


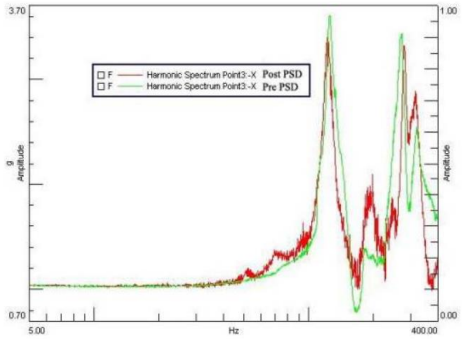




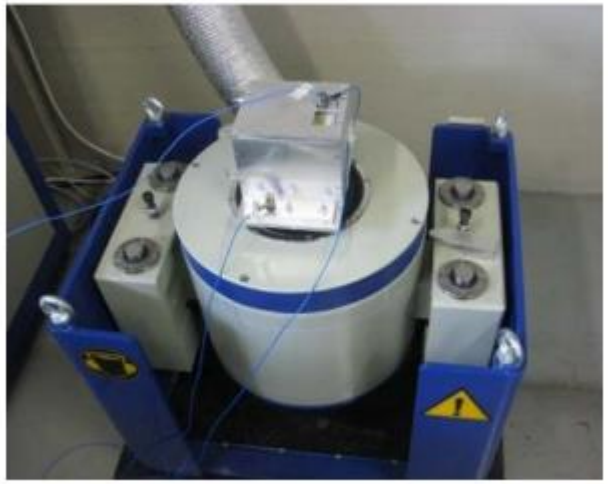
TESTING



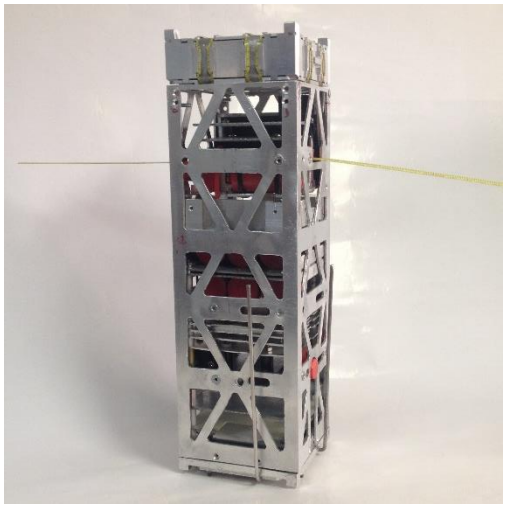


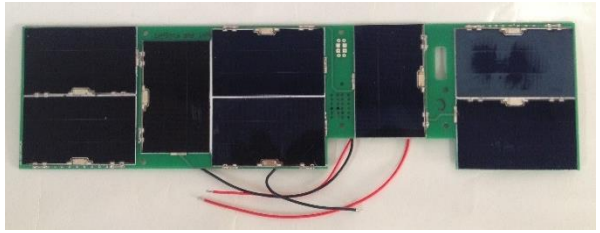


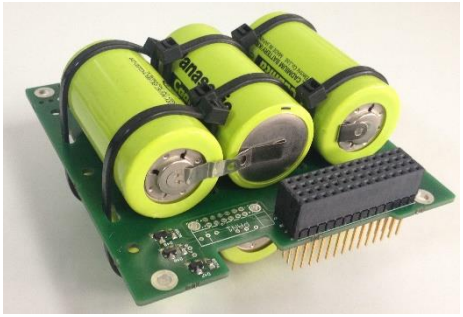
1U Cubesat structure vibration test results

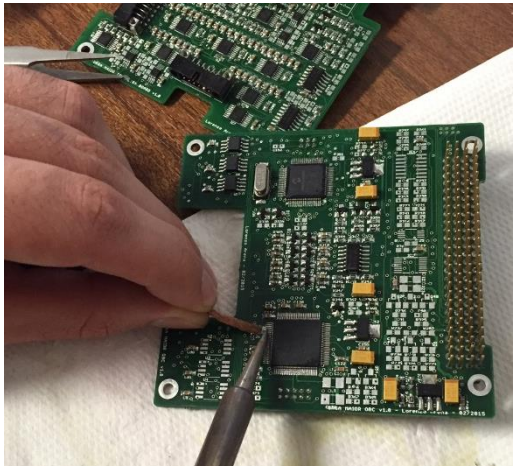


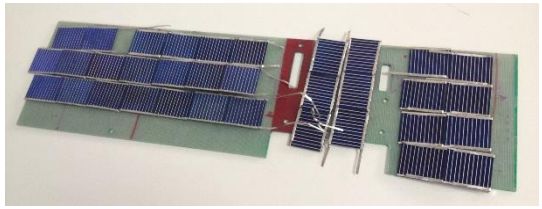
BUILDING







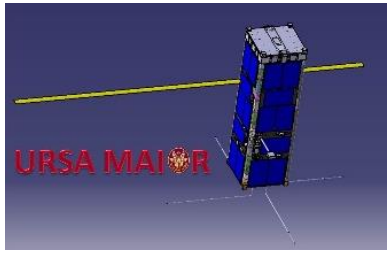




OPERATIONS

ON-GOING SPACE PROJECTS

❖Research programs

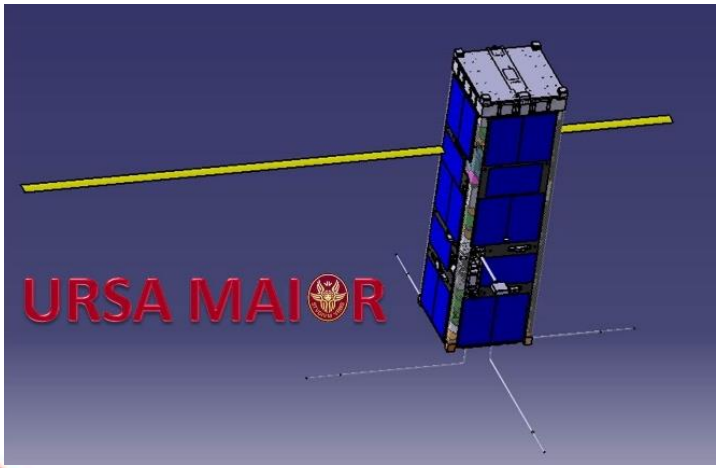


❖Education programs & International contests/competitions

URSA MAIOR

QB50 PROJECT

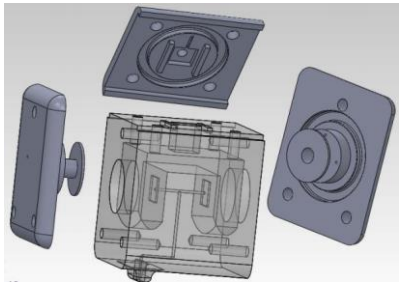
QB50 has the scientific objective to study in situ the temporal and spatial variations of a number of key constituents and parameters in the lower thermosphere (90-320 km) with a network of 50 double CubeSats



URSA MAIOR PAYLOADS

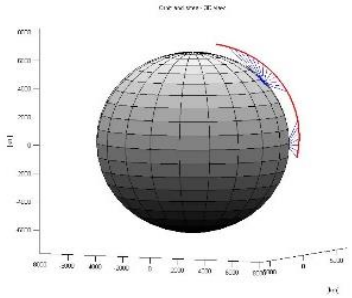
1. A de-orbiting system experiment

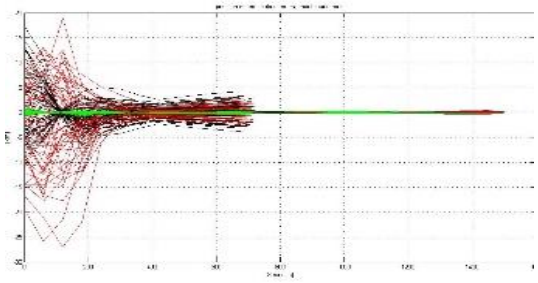
2. MEMS MicroThruster Experiment (MEMIT)



EQUO
Equatorial Observatory for Space Debris

Continuous tracking of LEO objects from Italy and Kenya

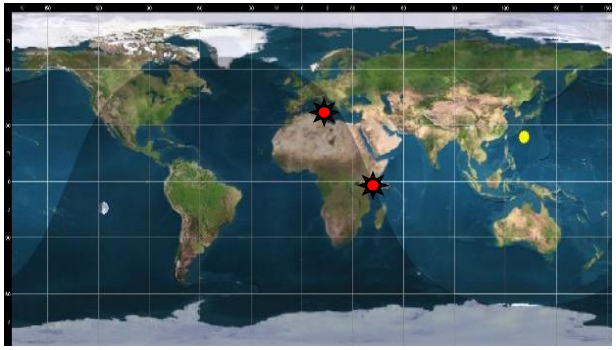


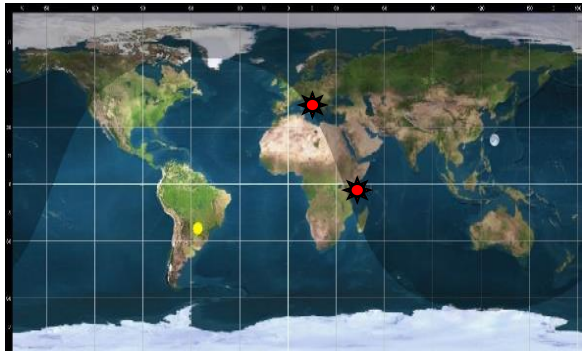


ALMASCOPE: 2010 Equatorial test campaign

- Telescope - 25 cm f/4 in newtonian configuration
- CCD Kaf1600E sensor , 1024x1536 pixels, each pixel is 9x9 micron (total chipsize 9.2x13.8 mm)
- Mount German equatorial
- The field of view is of about 1 degree

LEO High Inclination tracking from Italy and Kenya (Terminator Shape)





IRIDIUM

Investigating Radiation Impact and Damages In UV-sensitive Materials

SCIENTIFIC GOAL: analyse material degradation after UV exposure and Investigate **damages** by **synergic** effects in the **stratosphere environment**

TECHNICAL GOAL: develop and test a **rotating tubular beam**, fastening the samples holder, able to maintain the **optimal exposition to sunlight** during the BEXUS flight

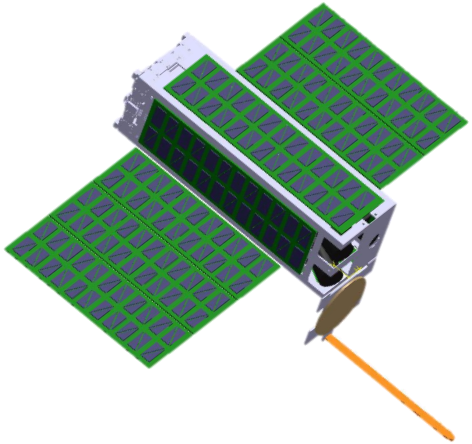
HORUS CAST

The celestial constellation

HORUS cast combine a nadir-pointing camera to off-set nadir optical sensors in order to provide a multiple angle capability for sampling

This architecture scheme is similar to the MISR sensor (Multi-angle Imaging SpectroRadiometer), successfully tested on NASA EOS Terra satellite (total mass 5,190 kg)

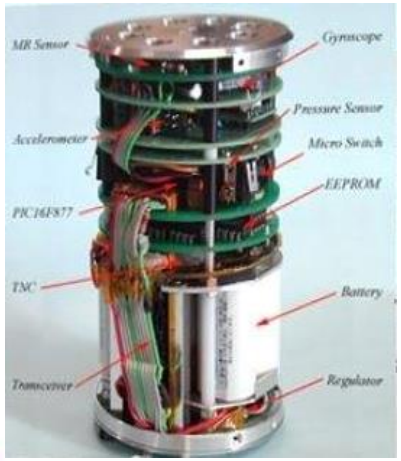
The Pre 4th Mission Idea Contest



CANSAT competition

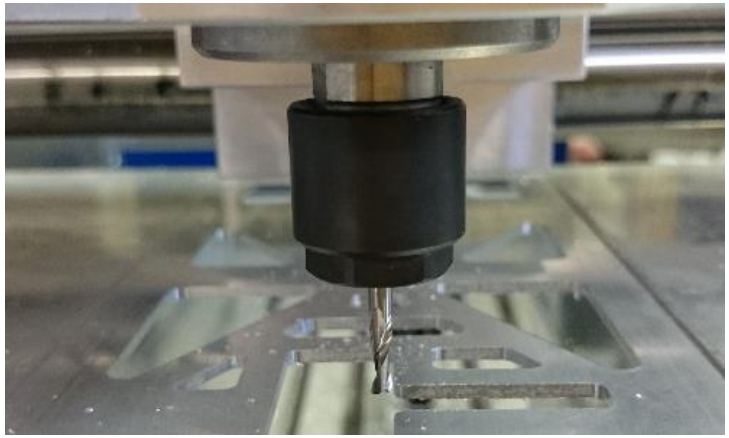
CanSat Competition is an annual student design-build-launch competition for space-related topics, organized by The American Astronautical Society (AAS) and American Institute of Aeronautics and Astronautics (AIAA)

Students by **S5Lab** participate to this competition with the Sapienza Space Team, supported by SASA Sapienza Aerospace Student Association. The 2015 mission simulates a Science Vehicle traveling through a planetary atmosphere sampling the atmospheric composition during descent.



LABORATORY FACILITIES

Electronics development facility



Laboratory milling machine

Laboratory low-vacuum chamber

Workshop

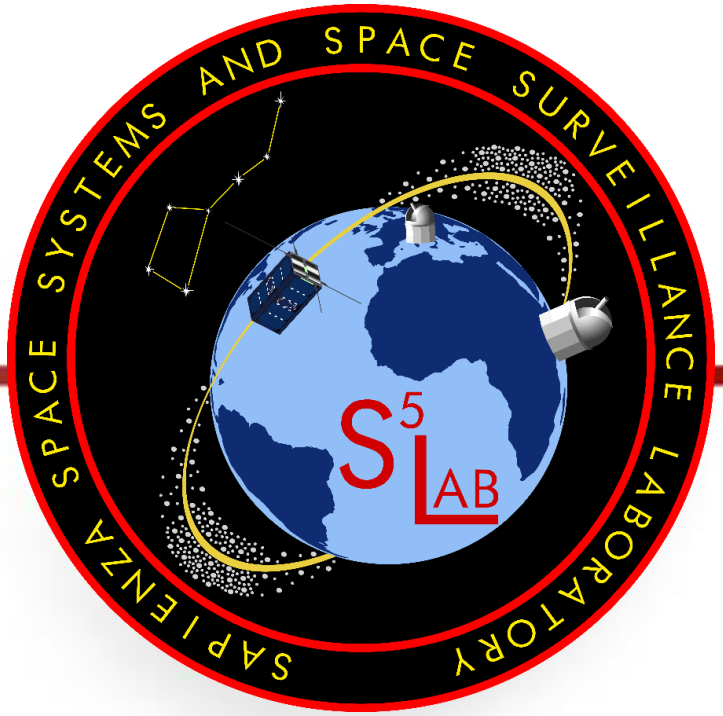
S5Lab Team

➢**MSc and BSc students**:

- Federica Angeletti
- Quirino Bellini
- Salvatore Buonomo
- Saverio Cambioni
- Andrea Chiovini
- Federico Curianò
- Michele Gaeta
- Alessandro Gallo
- Armando Grossi
- Paolo Marzioli
- Paolo Panicucci
- Alice Pellegrino
- Tullio Petruzziello
- Vito Lamarca
- Veronica Vilona
- Federica Zaccardi
- Giulia Zaccari

➢**PhD students**:

- Lorenzo Arena
- Tommaso Cardona
- Francesco Diprima
- Gioacchino Scirè



THANKS FOR LISTENING!

SAPIENZA
UNIVERSITÀ DI ROMA