
ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

# SPACE COMPONENTS AND SYSTEMS

*Space Components and Systems for reliable space probes.*

The University of Bologna is deeply involved in research activities dealing with space components such as microwave and RF circuits, high efficiency power supplies, high-speed ADC systems. Moreover, there is a wide expertise in space system engineering, including the design, assembly, and in-orbit operations of small satellites.

The research of the University of Bologna covers a wide range of topics:

- Design, characterization and modeling of Microwave Monolithic Integrated Circuits (MMIC) and Hybrid Circuits in GaAs, GaN and Silicon technologies for radar, telecom, remote sensing and TT&C applications
- Characterization and behavioral non-linear dynamic modelling of high-speed, broad-band A/D acquisition channels for RF receiver architectures
- Design of switching power supplies exploiting power devices in GaN on Si technology and FPGA based control strategies
- Design and development of accurate models and innovative testing and fault tolerance techniques for the most likely faults affecting digital circuits implemented in scaled (nanometer) Silicon technologies, emergent (non-Silicon) technologies, and photovoltaic systems
- Design and development of COTS-based GNSS receivers for small satellites navigation applications
- Spacecraft Attitude Determination and Control System (ADCS) studies for micro-/nano-satellites, including numerical and experimental test platforms
- Spacecraft Subsystems & Technologies: design, development and testing
- Spacecraft Platforms & Missions design
- Design and Assembly of Spacecraft Mission Control Centers and Ground Antenna Tracking Systems

## HIGHLIGHTS

**Participation in space missions and experiments of the University of Bologna:**

- 2012: Launch of **ALMASat-1**, the first microsatellite of the University of Bologna
- 2018: Launch of **ESEO** (European Student Earth Orbiter) and ESA Educational spacecraft with an University of Bologna's on-board payload dedicated to autonomous GPS-based orbit determination
- 2020-21: Participation in the Phase A study of the **INFINITY** project for amateur astronomy observations
- 2021-2022 (TBC): Launch of **uHETSat** and **STRIVING** satellite missions, where UNIBO developed the Ground Mission Control Center

**Infrastructures**:

- **Alma Mater Ground Station**: a Spacecraft Mission Control Center and Antenna Tracking System fully operational for Low-Earth Orbiting satellites since 2004
- **Microsatellite and Space Microsystems Laboratory** with cutting-edge research facilities, including a Spacecraft Attitude Determination and Control System test-bed

Different research groups have established an **extensive network of collaborations** with primary European companies operating in the space sector as well as with several institutions, universities and research centers such as: ASI (Italian Space Agency), ESA, NASA.