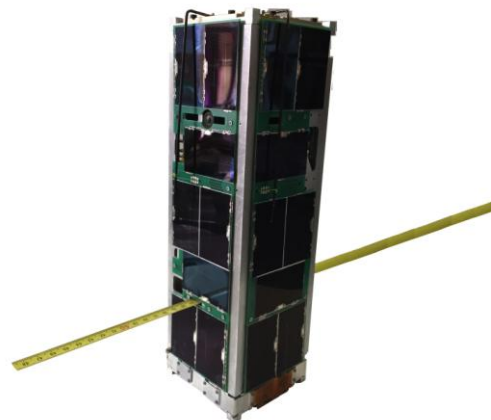


Aerospace Systems Lab

Development of techniques for the analysis of optical measurements of Earth orbiting objects. In particular, the activity aims at the dynamical (trajectory and attitude motion) and physical (material, colour, shape, area-to-mass ratio) characterization of space debris.

To achieve space debris optical measurements the laboratory produces and operates observatories dedicated to space debris measurements. Astrometry and photometry is accomplished by exploiting a network of small observatories deployed all over Italy, multicolour photometry and spectroscopy is performed from the Loiano observatory in Bologna and in collaboration with the Cerro Tololo observatory of the University of Michigan.

Moreover, the laboratory of Aerospace-systems design, manufactures and tests components and subsystems for aircraft and spacecraft. In particular the activities in this field involve a system for supporting landing of airplanes, helicopters, and drones based on optical tracing of the target and systems for testing microsatellite components as vacuum chamber and Helmholtz coils for simulating variable magnetic fields.



Radio Science Lab

The Radio Science Lab is active in radio science experiments, precision tracking systems, planetary geodesy, and orbit determination. The laboratory hosts a network of high-power computers for the processing of tracking data used both for scientific investigations and deep-space navigation. In the period 2011-2013 twelve people (graduate students, postdocs, and research assistants) worked in the lab. The team has joined flagship missions of NASA and ESA planetary exploration program, such as Cassini (ongoing, in orbit around Saturn), Juno (now in cruise to Jupiter), BepiColombo (to Mercury, launch in 2016), and JUICE (to the Jovian satellites, launch 2022). The lab participates in these missions with flight hardware and data processing of radio science and planetary geodesy investigations. These activities are carried out in an international context, with extensive collaborations with academic and scientific institutions, and aerospace industries.

Over the past years the Radio Science Lab took part in industrial studies (often with the role of prime contractor), with the participation of prominent European aerospace industries (such as BAE Systems and Thales Alenia Space). Of special relevance was the development of the Delta-Differential One-way Ranging (DDOR) correlator, a crucial asset for Europe's access to deep space. This operational tool for the navigation of ESA's planetary probes was entirely developed by the lab's personnel.