

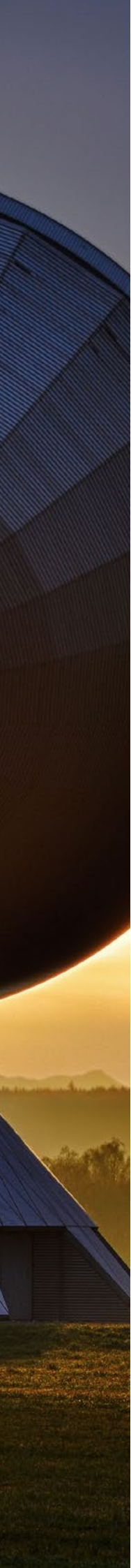


ALMA MATER STUDIORUM  
UNIVERSITÀ DI BOLOGNA

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## **SPACE AND COMMUNICATION SYSTEMS AND NETWORKS**

*The communication system is a key and critical element for space applications, as satellites are built to gather data through sensors or to serve as relay for users in a network.*



The University of Bologna is active in research activities on space communication regarding the design and performance assessment of SatCom systems and architectures, digital mo-demodulation and coding schemes, multiple access and network protocols, signal processing for GNSS, UWB signal design for on-board objects localization and tracking.

The research of the University of Bologna covers: Shannon Information Theory and Capacity Assessment for Space Communication; Error Correcting Coding; Post-quantum cryptography; Uncoordinated multiple access based on codes on graphs; On board Ultrawideband (UWB) localization systems and multistatic Radar for objects tagging and tracking with centimeter accuracy; Advanced Signal Processing and Spread Spectrum techniques for GNSS; Bandwidth/Power Efficient Digital Modulation techniques for Communication; Synchronization and Channel Estimation; Spectrum Sensing and Cognitive Radio; Simulation of Communication Systems; Interference management (Suppression, Cancellation, Multiuser Detection), diversity techniques (multiple antenna communications, beamforming, cooperative diversity); Satellite Communication systems and architectures for broadband and broadcast services; Satellite communication networks for 5G; Satellite networks based on micro-mini satellites; InterPlanetary Internet (IPN) Protocols and Architectures; M2M Communications for SatCom; Mobile Edge Computing and Caching for SatCom; Wireless Power Transfer RF and Antenna technologies; Software/firmware for FPGA/DSP implementation of space communication transceivers.

## HIGHLIGHTS

### **The University of Bologna participates in:**

- The University of Bologna coordinates the H2020 project "DYNASAT - Dynamic Spectrum Sharing and Bandwidth-Efficient Techniques for High-Throughput MIMO Satellite Systems"
- DVB SatCom standardization process for broadband and broadcast future system (ESA projects)
- 3GPP SatCom component development through the SatCom working group of Networld2020
- Multiple ESA initiatives toward development of future SatCom technologies, including several ESA-funded projects addressing both near-Earth and deep-space communications"
- CCSDS (Consultative Committee for Space Data Systems) definition of international standards for Synchronization and Channel Coding, designed for space communications links primarily between spacecraft and ground elements (with the main international space agencies)

Different research groups have established an **extensive network of collaborations** with several institutions and research centers at national and international level, such as: ASI (Italian Space Agency), DLR (German Aerospace Center), ESA, JPL (Jet Propulsion Laboratory), NASA.