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# A SMALL SATELLITE MISSION SUPPORTING PASSIVE ALTIMETRY USING GNSS SIGNALS

**Abstract**

GNSS systems such as GPS or Galileo transmit well-defined L-band signals in a frequency range between 1.176 and 1.575 GHz. Passive reflectometry is based on the measurement of GNSS signals reflected from Earth or ocean surface for Earth Observation purposes. Satellites in low Earth orbits, equipped with a GNSS reflectometer measurement system can be used for observations of oceanic variability and eddies kinetic energy at the sub-mesoscale (10 km). For such a passive bistatic radar approach, the satellite does not require an expensive and power-consuming radar transmitter. Such passive bistatic radars are usually built by using local code replicas to correlate them with the signals reflected on the earth surface. Alternatively an interferometric approach that allows to exploit more generic types of reflected signals - even if the data modulation is unknown - can be used. A passive interferometric reflectometry payload for a CubeSat mission has been elaborated and tested in a laboratory environment by TU Graz and RUAG which focuses on altimetry and profits from previous ESA and national activities. Within several previous ESA projects (PARIS and GEROS) the development of a passive reflectometry instrument was fostered by performing studies and conducting airborne demonstration campaigns verifying the viability of the concept. The reflectometry payload consists of a software-defined radio front-end, a GPS antenna with 15 dBi gain and a powerful signal processor unit (based on a system-on-chip with a large FPGA and dual-core ARM-9 processors). This processor incorporates the correlating receiver. The payload was designed such that it fits into a 3U CubeSat and meets the power constraints of such a small spacecraft. The paper presents the high-level system design of the passive reflectometry payload and outlines the design and requirements of the satellite bus (3 U CubeSat with deployable solar panels to generate 30 W of peak power). The antenna design fitting onto the CubeSat is also outlined.