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## URSAMAIOR: A 3U NANO-SATELLITE FOR SCIENTIFIC AND TECHNOLOGICAL RESEARCH

**Abstract**

This paper describes the development and the mission scenario of URSAMAIOR – a 3-units CubeSat for scientific and technological research purposes – designed, manufactured and tested at Sapienza University of Rome, Italy. The CubeSat has been developed at S5LAB (Sapienza Space Systems and Space Surveillance Laboratory) by PhD and Master students, supported by a staff of professors. URSAMAIOR, whose acronym stands for University of Rome la SAPIENZA Micro Attitude In ORbit testing, is one of the nano-satellite of QB50 mission, an FP7 Project led by the Von Karman Institute for Fluid Dynamics, with the aim to perform multi-point and in-situ measurements in the lower thermosphere (200-380 km), which is at present the least explored layer of the atmosphere. The QB50 constellation will be operative from Q1, 2017, when the first 28 CubeSats will be deployed from the ISS. Afterwards, 8 CubeSats – among which URSAMAIOR is included – will be launched on a 500 km of altitude sun-synchronous orbit by the PSLV Indian launch vehicle. For what concerning QB50 mission, the nano-satellite carries on-board as the main scientific payload the multi-Needle Langmuir Probes (mNLP) science unit, provided by University of Oslo. It consists of four fixed-bias Langmuir needle probes, with which the plasma electron density can be derived with high time resolution without the need to know the electron temperature and the spacecraft potential. URSAMAIOR carries on-board, as secondary payloads, a cold-gas micro thruster experiment for nano-satellite attitude control, a deorbiting system based on a polymeric drag sail, two micro-cameras to take picture from orbit and an innovative system based on light emission diodes (LEDs), that will be used for ground-based optical tracking of orbit and attitude estimation. The nano-satellite is equipped with an in-house developed fail-safe distributed on-board computing architecture, whose reliability has been proven on-ground and that will be evaluated on-orbit for the first time.