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DESIGN, MANUFACTURING AND TEST OF THE CUBESAT URSA MAIOR

Abstract

URSA MAIOR (University of Rome la SApienza Micro Attitude In Orbit testing) is a 3U CubeSat realized for the QB50 Project. The QB50 Project is an educational project intended for those universities students who want to deal with the complete realization of a Cubesat, in order to gain experience and become confident with the problems related to a real project. Several students in PhD and at the Master of Space Engineering are working on the Cubesat, supported by a staff of expert professors at the Space Systems Laboratory of University of Rome "La Sapienza". The main objective of QB50 mission is to carry out a multi-point, in-situ and long-duration exploration atmospheric research in the lower thermosphere. For this reason, the URSA MAIOR Cubesat carries the science sensor multi-Needle Langmuir Probe (m-NLP) and operates it for few months. The project is a platform for technology demonstration: the system includes two other payloads. The Deorbiting System Experiment, realized by a team of students from "Alma Mater Studiorum", University of Bologna, aims to test a polymeric drag sail for Cubesat deorbiting. The MEMS Micro Thruster Experiment (MEMIT) has the main goal to design and test a new integrated MEMS (Micro Electro Mechanical System) valve-nozzle system and it is developed at the CRAS aerospace research center of Sapienza University of Rome. Taking care of the educational goal, almost all the subsystem are developed in-house, such as the structure, the OBDH/OBC, UHF and VHF antennas. All the required tests (vibration tests, environmental tests) are performed in the local facilities. For example, young engineers gain hands-on experience developing an optimized structure, able to carry all the different payloads fulfilling all the requirements. The ADCS is provided by Surrey Space Center. It uses a combination of MEMS rate sensor, a magnetometer, sun and nadir sensor to discover the attitude. A single reaction wheel and magnetorquers are devoted to the attitude control of the satellite. The paper describes the design, manufacturing and test of the Ursa Maior Cubesat discussing the satellite subsystems architecture and highlighting on-ground test results.