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Author: Dr. Fabrizio Piergentili
University of Rome "La Sapienza", Italy, fabrizio.piergentili@uniroma1.it

Dr. Lorenzo Arena
University of Rome "La Sapienza", Italy, lorenzo.arena@uniroma1.it

Dr. Tommaso Cardona
University of Rome "La Sapienza", Italy, tommaso.cardona@gmail.com

Dr. Gioacchino Scire
University of Rome "La Sapienza", Italy, scire.gio@gmail.com

Ms. Federica Angeletti
Sapienza University of Rome, Italy, fe.angeletti@gmail.com

Mr. Federico Curiano
University of Rome "La Sapienza", Italy, fcuriano@gmail.com

Mr. Gianluca De Zanet
University of Roma La Sapienza, Italy, gianluca.dezanet@live.com

Mr. Michele Gaeta
University of Rome "La Sapienza", Italy, michele.gaeta.90@gmail.com

Mr. Vito Lamarca
Sapienza - University of Rome, Italy, lamarca.vito92@gmail.com

Mr. Paolo Panicucci
University of Rome "La Sapienza", Italy, panicucci.paolo@gmail.com

Ms. Alice Pellegrino
University of Rome "La Sapienza", Italy, alicepellegrino@inwind.it

Ms. Veronica Vilona
Univ. Roma La Sapienza, Italy, veronica.vilona@gmail.com

Ms. Barbara Betti
University of Rome "La Sapienza", Italy, barbara.betti@uniroma1.it

Ms. Melissa Arras
University of Rome "La Sapienza", Italy, melissa.arras@uniroma1.it

Dr. Matteo Piccione
Italy, matteo.piccione@hotmail.it

Dr. Giuliano Coppotelli
University of Rome "La Sapienza", Italy, giuliano.coppotelli@uniroma1.it

Prof. Marco Balucani
University of Rome "La Sapienza", Italy, balucani@die.uniroma1.it

Prof. Francesco Nasuti
University of Rome "La Sapienza", Italy, francesco.nasuti@uniroma1.it

Prof. Fabio Santoni
University of Rome "La Sapienza", Italy, fabio.santoni@uniroma1.it

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.