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ALBASAT: AN EDUCATIONAL SATELLITE FOR A MULTI-OBJECTIVES MISSION IN LEO

**Abstract**

Alba CubeSat UniPD is a student team of the University of Padova that aims at launching in space a CubeSat made by students. The main objective of the team is educational: it was funded in 2019 to allow

students to perform a hands-on activity during their studies. The students involved in the project have different backgrounds and academic levels. The team is participating in the Fly Your Satellite!-Design Booster programme of the ESA Education Office.

The proposed mission has four independent objectives: (1) to collect in-situ measurements of the sub-mm space debris environment in LEO, (2) to study the micro-vibration environment on the satellite throughout different mission phases, (3) to do precise orbit determination through laser ranging; (4) to investigate alternative systems for possible Satellite Quantum Communications on nanosatellites. The data collected by these technical experiments will enrich the current knowledge of the space environment and will support the research activities currently carried out within our university.

The team is developing AlbaSat, a 2U CubeSat equipped with four payloads. The first payload is an impact sensor that is able to count the number of debris impacting on the satellite. It will be placed on the outer face that points towards the motion direction. The second payload is a sensor that measures the micro-vibrations on board the satellite throughout different mission phases. The third consists of a number of Corner Cube Retroreflectors (CCRs) that are placed on different CubeSat faces. They will be employed to precisely evaluate the position of AlbaSat using Satellite Laser Ranging techniques. The fourth payload is a Modulating Retro Reflector. It consists of a CCR where one of the mirrors is a MEMS Grating Modulator. As it deforms, it changes the angle of reflection of a laser beam coming from the ground, thus obtaining an intensity modulation. COTS components will be extensively used for the 2U platform, which include all the required subsystems.

The team defined the mission phases, the main operational modes and the mission requirements. In addition, preliminary studies of the mission have been performed, executing numerical analyses to select the COTS components and dimension the payloads. The preliminary system budgets have been evaluated.

This paper presents the mission and reports the results of the analyses performed and provides information on the satellite design.