30th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Generic Technologies for Nano/Pico Platforms (6B)

Author: Mr. Luca Prudenzi
Politecnico di Milano, Italy

Mr. Alessio Prosperi
Politecnico di Milano, Italy
Mr. Fernando Aranda Romero
Politecnico di Milano, Italy
Mr. Etienne Beier
Germany
Mrs. Chiara Pasquariello
Politecnico di Milano, Italy
Mr. Marco Giugliarelli
Politecnico di Milano, Italy
Mr. Kotish Grover
Politecnico di Milano, Italy
Dr. Felix Lang
Germany

LONG-TERM IN-ORBIT TESTING OF PEROVSKITE SOLAR CELLS ON A 1U CUBESAT: AN OPEN-SOURCE DESIGN APPROACH

Abstract

The 6S project is a 1U CubeSat mission which aims to test Perovskite solar cells and structural batteries in a long-term space mission. The mission is designed by PoliSpace, a Politecnico of Milan student association. The secondary objective of the project is to create a reliable, affordable, effective, and open-source design of a solar panels in-orbit testing platform. The rigour of the design is supported by the 6S latest achievement; it has been accepted by ESA in its Fly Your Satellite - Design Booster program.

The main scientific interest of the mission lies in Perovskite solar cells, which are provided by Potsdam's University. Perovskites show promise in enhancing solar panel efficiency, and present different peculiar properties, that could be highly beneficial for space applications. In particular, the characteristics studied will be their performance in space, degradation process and regenerative potential, acquired in different conditions. The other scientific goal of the mission is to examine the behaviour in space of a structural battery provided by Volta Structural Energy. It offers weight-saving benefits, a crucial feature for satellites. The device in charge of testing the two payloads will be the PESCA board, housing appropriate circuitry to collect data from the payloads testing.

After a brief overview of the payloads properties and testing needs, the paper describes all the circuitry and the components selected, together with the design practices and the trade-offs that allowed the achieved performances.

Subsequently, the paper unfolds the in-house manufacturing procedure of the external panels, which include two 3G30A Solar Cells Assemblies by Azur Space and the Perovskites Solar cells. The focus then switches to the main aspects of the testing phase, including a discussion related to the performance and results expected before the final integration. Finally, the paper concludes with an analysis of the educa-

tional benefits of Cubesat development for students and the 6S project gave students practical experience in space systems engineering, imparting valuable skills in project management, system integration, and test and validation processes.