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Author: Mr. Marco Giugliarelli
Politecnico di Milano, Italy, marcogiuglia98@gmail.com

Mr. Ciro Salvi
Politecnico di Milano, Italy, ciro.salvi23@gmail.com
Mr. Luca Daidone
Politecnico di Milano, Italy, luca.daidone@mail.polimi.it
Mr. Angelo Boceda
Politecnico di Milano, Italy, angelo.boceda@mail.polimi.it
Mr. Maurice Pepellin
Politecnico di Milano, Italy, maurice.pepellin@mail.polimi.it
Mr. Finn Vehlhaber
Politecnico di Milano, Germany, vehlhaber.finn@mail.polimi.it
Dr. Felix Lang
Germany, lang1@uni-potsdam.de

STRATEGY FOR THE COST-EFFECTIVE IN-ORBIT CHARACTERIZATION OF A SET OF DIFFERENT PEROVSKITE SOLAR CELLS

Abstract

In recent years, Perovskite Solar Cells (PSCs) emerged quickly as promising candidates to improve the efficiency of the power technology while being relatively low cost, together with very high power to mass ratio. These characteristics make them an attractive choice for space applications, where they could revolutionize energy harvesting, especially for small satellites. The PoliSpace 6S CubeSat will be the first nanosatellite to test a set of 4 different kinds of these novel solar cells in space provided by the University of Potsdam and University of Cambridge, on a very cost-effective mission. Quantities such as the open-circuit voltage (V_{oc}), the short-circuit current (I_{sc}) and the complete I-V curve will be measured. For the latter, an I-V curve tracer will be implemented onboard.

For this scope, the 6S Cubesat team performed an extensive review of some state-of-the-art solutions comparing them with some innovative ones. This paper presents a critical analysis of such techniques and the trade-offs conducted during Phase 0/A of the project, which led to the selection of the final strategy, highlighting its benefits. Combined with inclination and orbit data, the cells' performance can be measured and compared to laboratory results. Finally, by conducting these measurements regularly throughout the lifetime of the mission, the Perovskite degradation can be monitored, and potential self-healing properties can be verified.