SPACE POWER SYMPOSIUM (C3)
Small and Very Small Advanced Space Power Systems (4)

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# DESING AND REALIZATION OF AN INNOVATIVE DEPLOYABLE SOLAR PANEL SYSTEM FOR CUBESATS

**Abstract**

One of the main Cubesat bus limitations is the available on-board power. The maximum power obtained using body mounted solar panels and advanced triple junction solar cells on a triple unit Cubesat is typically less than 8W. The Cubesat performance and the mission scenario opened to these small satellite systems could be greatly enhanced by an increase of the available power. This paper describes the design and realization of a deployable solar panel system for Cubesats. The system has been developed in the framework of a cooperation established between the Space Systems Laboratory of the Department of Astronautics, Electrical and Energetics Engineering (DIAEE) of the University of Rome "la Sapienza" and the company IMT srl, Ingegneria Marketing Tecnologia. The design has been focused on the system modularity, consisting of a modular hinge and spring system that can be potentially used on-board single unit (1U), double unit (2U) and triple unit (3U) Cubesats. A prototype of the system has been realized for a 3U Cubesat. At present it consists of two deployable solar panel systems, made of three solar panels each, for a total of six deployed solar panels. The size of each solar panels is the size of a lateral Cubesat surface. Therefore the available power is enhanced potentially by a factor of six with respect to the body mounted solar panels. The system developed is the basis for a SADA (Solar Array Drive Assembly), in which a maneuvering capability is added to the deployed solar array in order to follow the apparent motion of the sun. The system design trade-off is discussed in the paper, comparing different deployment concepts and architectures, leading to the final selection for the modular design. The deployment system is based on a plastic fiber wire and thermal cutters, guaranteeing a suitable level of reliability. A test-bed for the solar panel deployment testing has been developed, supporting the solar array during deployment reproducing the dynamical situation in orbit. The results of the deployment system testing are discussed, including the design and realization of the test-bed, the mechanical stress given to the solar cells by the deployment accelerations and the overall system performance. The maximum power delivered by the system is about 50.4W BOL, greatly enhancing the present Cubesat solar array performance.