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DMSA: FIRST CUBESAT DEPLOYABLE SOLAR ARRAY WITH EMBEDDED ANTENNAS AND
MAGNETORQUERS

Abstract

The Deployable Multi-function Solar Array is a redesign from the ground up of the old DSA flown in multiple cubesat missions since 2013, which now has been upgraded to be a versatile, multi-function satellite component that can adapt to various missions and purposes. It is the newest iteration of the deployable solar array designed for Ecuador's first satellite NEE-01 PEGASUS launched in 2013 and also flown in the country's second satellite. NEE-02 KRYSOR. Its direct predecessor has flight heritage on IRVINE01 and IRVINE02. The DMSA is the first cubesat solar array in the world in featuring embedded frequency customizable antennas, as well as an embedded magnetorquer and a smooth hybrid deployment system based in heritage artificial muscles that allows great flexibility in ground testing while ensuring correct release and deployment in orbit. It can have up to 3 panels with each side harvesting up to 16W. It includes its own controller board which automatically operates the release and deploy functions without user intervention and features ultra-thin panels 1.5mm thick each (cells included) with a maximum total folded thickness of 6.3 mm for the 3 panels version and only 2 mm for the one panel version, also includes sun and temperature sensors, as well as contact sensors that report release/deploy status. Although not yet designed, each panel can theoretically serve a different purpose, such as patch antenna mounting. The DMSA is part of the new Kratos class spacecraft bus and has been designed with ease and speed of manufacturing in mind, enabling very low lead times and a high degree of production automation, paving the way for large batch quantities and small-scale mass manufacturing for increasing market needs. The upcoming K'OTO cubesat from Universidad Nacional Autonoma de Mexico will be flying this new DMSA alongside with the Kratos SCB. This paper will explain and detail the key aspects of this hardware, as well as its performance and applications, and its potential for scalability both in size and in.