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ARGOTEC VOLTA POWER CONVERSION AND DISTRIBUTION UNIT: ENABLING ADVANCED DEEP-SPACE MICRO-SATELLITE MISSIONS

Abstract

The opportunity to perform deep-space missions using microsatellite-class platforms boosted the development of new technologies, leading the world of small satellites to a significant increase in terms of platform capability. In this frame, Argotec, an Italian aerospace company with headquarter in Turin, designed and developed rad-hard, high-reliability avionics product line targeting deep-space micro-satellites. This product line includes Argotec VOLTA power conversion and distribution unit (PCDU). This avionics system has been conceived and designed following completely different drivers with respect to conventional CubeSats subsystems. It is targeted for deep space missions and mission critical applications, without renouncing to performances and keeping dimensions and mass compatible with microsatellite platforms. VOLTA PCDU provides high-efficiency, high-reliability and a comprehensive digital on-board control in a small footprint (only 0.6U volume and weight lower than 1 kg). Maximum power point tracking and battery charging regulation algorithms are implemented to manage both solar panels and a battery pack. Being able to convert up to 80W electrical power with ¿75The high-reliability of the subsystem is not only assured by the usage of space-grade components (with total ionizing dose resistance up to 300krad), but also by leveraging design techniques capable of protecting satellite's subsystems connected to the PCDU in case of single event effects (e.g. latch-ups). The purpose of this paper is to provide a detailed description of the innovative VOLTA PCDU. A comprehensive comparison analysis between Argotec solution and what is currently offered by the market will be presented, together with the description of the utilization of VOLTA PCDU within the context of two deep-space NASA missions showing why it can represent an enabler technology for deep-space CubeSats missions.