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DEVELOPMENT OF CUBESAT BATTERY-PACK DESIGNED FOR SPACE APPLICATION AND INTEGRATED IN PEDAGO-SAT MISSION

Abstract

PEDAGO-SAT is a new kind of Satellite mission proposed by an engineers searchers of the Algerian Space Agency (ASAL) and to attract the Algerian universities to participate in the space development. The adopted approach consists on the development of an engineering training Nano-satellite platform which will be open source academic platform. The preparation of functional and practical tests will be also done. Main Goal through such as project is to open to a students and trainees an era for space exploration and allow them to access various knowledge related to satellite development and tests. In this work we focus to the development a battery-pack in 4SnP configuration which will be integrated, tested and qualified in PEDAGO-SAT mission to the space applications. The battery technology mastered and frequently use in nanosatellites is the lithium-ion (Li-Ion) with geometric cell standard of 18650. For more current drainage, and without having to multiply the parallel assembling the Lithium-Polymer (Li-PO) technology can also be used; it offers the advantage of being easily customizable in terms of geometry, thus being able to adapt to any layout constraint; however, they are less thermally stable at these high discharge currents. In PEDAGO-SAT, the need for electrical storage (battery module) is limited to emulating functional tests related to the interaction between equipment of the power subsystem in orbit (battery cycling, charging mode, discharging mode, voltage monitoring, SOC, DOD... etc). The educational nano-satellite is often connected to a stabilized power source. Consequently, the battery module is not part of its 1st power supply chain during daily use in the AIT phase and/or in the laboratory operating phase. The lifespan of the mission is not a subject to be treated for this Pedago-Sat. As pointed out above the effect of the mission lifetime is not relevant in the exploitation of this product, so it is not necessary to direct to increase the assembly in parallel cells to ensure minimal DOD.

The illustrate work will cover: the power budget sizing, mechanical design, the specification of the battery management system (BMS), the thermal control need, the COMSOL modelization, prototype realization and the proposed technics in manufacturing, cell welding processes, and qualification tests.