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DEVELOPMENT AND QUALIFICATION OF A SCALABLE COTS-BASED LI-ION BATTERY  
SYSTEM FOR SATELLITES IN LOW EARTH ORBIT

**Abstract**

This paper introduces a COTS-based (Commercial of-the-shelf) lithium ion battery system for satellites in LEO (Low Earth Orbit). The COTS battery system is developed to reduce the price of future satellites. Development and testing of the battery system is supported by fundamental knowledge of Lithium-Ion battery cells. The battery cells are both modelled and cycled for better understanding of their behaviour and degradation. The approach of using only or mostly COTS components including the battery cells has an influence on system architecture, electronic design, software and the qualification process. In this paper the challenges during the development of such a battery system are described. The battery system has the ability to measure temperature, voltage and current of each battery cell. This allows for further functions like cell balancing, state of charge and state of health estimation. The fundamental building block of the battery system is a cell module that consists of eight battery cells. During the development various commercial battery cells were investigated and tested for reliability and life expectancy. A crucial part of the success of the battery system is the durability of the battery cells. Studies of the influences of temperature, current, SOC (state of charge) and DOD (depth of discharge) on cell durability were conducted. Furthermore, testing and qualification of the finalized battery system are important to verify that all components are able to withstand the space conditions and to stay operable during a LEO mission . First tests on a prototype were conducted before continuing the development.