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ROBISAT MISSION: DOUBLE UNIT CUBESAT THERMAL ANALYSIS IN CONTEXT OF QB50
MISSION

Abstract

The paper presents the thermal analysis performed on RO 01 and RO 02 satellites, in context of QB50 CubeSat mission. Satellites RO 01 and RO 02 forming RoBiSAT space mission are part of QB50 - the most challenging and ambitious international small satellites collaboration. In addition to the QB50 mission objectives RoBiSat's goal is to test bidirectional inter satellite communication as a prerequisite for developing future formation flying missions. We present the concept of the two identical satellites that are going to be built and operated in order to achieve these goals. To speed up the development, the flight bus consists of two identical 2U CubeSats built using both existing commercial and in house developed subsystems. The payload includes the QB50 Science unit and the inter-satellite communications unit. The paper elaborates on the satellite configuration designed to meet both the QB50 system requirements and the specific RoBiSat mission requirements. A special attention is paid to the thermal analysis as baseline for the satellites configuration. The thermal analysis performed by the use of SolidWorks Simulation SW platform is detailed starting from the initial orbit assumption, outer skin material properties and generated power inside the satellite during operation. Thermal conductivity of the material and contact resistance are considered for a proper estimation of the temperature in critical points inside the satellite. Moreover, the orbit parameters and the satellite attitude control are taken into consideration in the simulation. The best case and respectively worst case scenarios are presented for both hot and cold orbit phases. Finally, the impact of thermal analysis to the satellite design/configuration is detailed together with the recommendations erased from the simulation.