Paper ID: 16729
student

SPACE SYSTEMS SYMPOSIUM (D1)
Poster Session (P)

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THERMAL ARCHITECTURES AND INTERFACE IDEAS FOR MODULAR SERVICEABLE SATELLITES

Abstract

On-Orbit Servicing (OOS) offers a highly attractive solution to maintain a space system in orbit, to replace or implement new payloads and components and to remove space debris. This leads to an extension of spacecraft lifetime, an improvement of the satellite performance and the realization of new mission scenarios. The iBOSS (intelligent Building Blocks for On-Orbit Servicing of Satellites) concept, which was developed in cooperation of the Technische Universität Berlin (TU Berlin) with its German partner institutions FZI Karlsruhe and RWTH Aachen, offers a novel approach for a modular serviceable satellite consisting of single building blocks. Each block contains one or more components of a typical satellite subsystem. It is also equipped with standardized interfaces for mechanical, electrical, data and thermal interconnection. The demand for removability and of the interfaces combined with the approach of a modular satellite leads to new requirements and constraints for the data distribution system, the attitude and control system and the thermal concept to only name a few. To manage the temperatures of a fractionized satellite as well as of single building blocks and components, different thermal architectures are applicable. This can be done with and without an additional thermal conductive interface between the blocks. The developed thermal concepts are the focus of the presented research work. Several different architectures were investigated and compared by newly developed software. Based on this possible interface alternatives are compared. For this purpose state-of-the-art thermal components have been analyzed with respect to fit the existing requirements and constraints. Also the development of novel interface options has been taken into account. A tailored test bed to investigate the parameters of the developed thermal interfaces is currently under development. A short presentation of this test bed and the next steps toward the development of a laboratory model will complete the paper.