

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Structures I - Development and Verification (Space Vehicles and Components) (1)

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DESIGN AND QUALIFICATION OF A LIGHTWEIGHT PAYLOAD MODULE OPTIMIZED FOR
PAYLOAD AND AIT FLEXIBILITY

Abstract

Space mission costs have been reduced by the CubeSat format drastically and nowadays making satellites affordable and feasible for small companies, research institutions and universities. This results in a worldwide development of an unprecedented variety of different payloads for both research and commercial purposes. Beside the rise of the CubeSat 1U format, commercial companies like SpaceX, Amazon and OneWeb have reshaped the small satellite market significantly by initiating mega constellations. These endeavors shift the focus from one of a kind satellite prototypes or small series designs to the level of large-scale production with thousands of satellites manufactured identically, launched and operated in Earth orbit. This development demands rethinking the established satellites designs to offer real series manufacturing readiness.

SLOT4.0 is a joint project by German Orbital Systems (GOS), HOSTmi and RWTH Aachen University, funded by the German Federal Ministry for Economic Affairs and Energy and administrated by the German Aerospace Center DLR Space Administration. It aims to develop and test a flexible payload module (P/M). In the course of SLOT4.0, this newly developed 8U sized P/M is connected to a standard satellite bus (S/B) developed by GOS. Both S/B and P/M are connected to each other via the intelligent Space System Interface (iSSI), a patented multi-functional coupling device by iBOSS, transferring mechanical loads, electrical power and data and allowing for coupling and de-coupling of the payload module both on ground and in space. Such functional separation enabled by the defined standards allow for independent AIT of either payload and satellite bus. This leads to increased mission and commercial

flexibility regarding late loading issues or payload replacement needs.

This paper introduces and describes the newly developed system architecture. It focuses on the P/M and its structural mechanical requirements based on compatibility needs with most common launchers and individual load spectrums as well as diverse payload requirements reflecting the needs of a variety of commercial and scientific users, captured, digitalized and made up by project partner HOSTmi. The structure satisfies lightweight targets and is integration-friendly regarding working space, offers predefined mounting points and solutions for harness issues. It meets current and future economic demands and aims to be optimized for large-scale production endeavors. Moreover, the paper elaborates on qualification tests performed including vibration, shock and thermal vacuum test. Eventually, applications of the SLOT4.0 solution in the context of next-gen modular space infrastructure and associated use cases are discussed.