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INITIAL ORBIT RESULTS FROM THE TUBIX20 PLATFORM

Abstract

In recent years, small satellites have been considered for a variety of challenging applications. In order to keep up with the demanded short development cycles for such spacecraft, platform concepts are customarily implemented which allow for tailoring certain parameters to a mission's specific needs.

Technische Universität Berlin has been active in the field of small satellites for more than 25 years and has successfully developed, built and operated sixteen satellites to date. One of the recent developments of the university is TUBiX20, a highly modular small satellite platform targeting at science, technology demonstration and Earth observation missions of roughly 20 kg. The platform is based on a network of cold redundantly implemented computational nodes, which interface to a central power and data bus system. These nodes provide the computational resources to run the satellite's software and furthermore link external components like sensors and actuators to the platform. Redundancy control of the nodes as well as the power and data busses is performed by the electrical power system's node, which is operated in warm redundancy.

The first mission based on TUBiX20 is TechnoSat, an in-orbit demonstration mission carrying seven technology payloads. These payloads range from a newly developed reaction wheel system over an S band transmitter to fourteen commercial retro reflectors for ground-based laser ranging. Additionally, a fluid dynamic actuator that stores momentum by means of electromagnetically actuated liquid metal moving in a circular tube is part of the payloads. Along with 71 other small satellites, TechnoSat has been launched on a Soyuz launcher with a Fregat upper stage into a 600 km SSO on the 14th of July, 2017. Within the on-going mission platform and payloads were subject to numerous experiments on a regular basis for more than six months.

The evolution of the experiments towards increasing complexity from the commissioning phase into maneuvers that combine multiple payloads underlines the platform‘s versatility. It is shown that by exploiting the described architecture, a quick adaption of payloads like the S band transmitter and the reaction wheel system into regular operations is possible.