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SALSAT: FIRST YEAR IN ORBIT – PRELIMINARY ASSESSMENT OF THE NANOSATELLITE
BUS, SUBSYSTEMS, AND THE PAYLOADS

Abstract

The number of small satellite launches has increased continuously throughout the past years. The resulting intensification of radio communication and number of users inherits a continued increase in the probability of an interferences. This can compromise reliable satellite operation in the utilized frequency bands. Therefore, the nanosatellite mission SALSAT (Spectrum AnaLysis SATellite) carried out by the Technische Universität Berlin (TU Berlin) investigates the global RF spectrum usage in VHF and UHF amateur radio bands as well as the S band. The SALSAT satellite is equipped with the spectrum analyzer payload SALSA, which is based on a Software Defined Radio (SDR) and FPGA. A preparatory study using the COTS device LimeSDR has been successfully performed aboard the ISS during the MarconIS-Sta experiment. The experiment revealed first insights into the spectrum usage in regions overflown by the ISS. Due to its highly inclined, sun-synchronous orbit the SALSAT mission will achieve global coverage.

On September 28th, 2020 at 11:20 UTC the Technische Universität Berlin (TU Berlin) successfully launched the nanosatellite mission SALSAT (Spectrum AnaLysis SATellite). The satellite is operating in a sun-synchronous orbit at 575 km. On September the 28th at 23:10 UTC the project team successfully initiated contact with the satellite during its first pass over the ground station of the TU Berlin.

As of Q1/2021 the LEOP phase is completed and the Commissioning phase of the nanosatellite is about to be completed. The relevant subsystems of the satellite bus have shown no faults or defects so far. The mission is on track as SALSAT is currently collecting RF spectrum samples. This will enable the performance evaluation of the developed SALSA spectrum analyzer. The testing of the novel secondary payloads, such as the on-board Linux computing system and Fluid Dynamic Actuator will be completed thereafter (approx. Q2/2021).

This paper will give an overview of the LEOP and commissioning phases of SALSAT. An evaluation of the developed bus components and subsystems will be outlined. The focus of this paper is the satellite bus together with the newly developed secondary payloads and corresponding software solutions. The satellite software features an experimental neuronal network for on-board spectrum analysis. The novel Linux based image computing system will be explained, and the first images will be shown as they become available.