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SALSAT: FIRST FLIGHT RESULTS – THE GLOBAL RF SPECTRUM UTILIZATION IN THE VHF,  
UHF AND S BAND MEASURED BY THE SPECTRUM ANALYSIS SATELLITE

**Abstract**

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. The mission aims to investigate the global RF spectrum in bands which are often used for small satellite communications. To accomplish this, SALSAT is equipped with the spectrum analyzer SALSA as its primary payload. SALSA is based on a SDR that is fully reconfigurable in-flight. Due to its highly inclined, sun-synchronous orbit the mission will achieve global coverage. The collected mission data shall be used for further studies and concepts to improve the utilization of the available communication spectrum. The spectrum data can either be processed via an FFT by the on-board FPGA for further evaluation on the ground or it can be evaluated, converted, and compressed by the Linux system aboard SALSAT before being transmitted to the ground station. Consequently, SALSAT is an advanced in-orbit testbed to collect and analyze the spectrum usage and perform in-situ measurements.

Following the successful LEOP phase in Q3/2020, the SALSAT team is currently performing the commissioning phase of all payloads. Being the primary payload, the SALSA spectrum analyzer has been tested and is functioning as designed as of Q1/2021. The mission is currently collecting spectrum samples in the VHF and UHF amateur radio bands as well as in the S band utilized for space research over Europe. In the months to come the evaluation will be expanded for global coverage. Furthermore, tests to analyze and optimize the uplink parameters of ground stations will be performed in the months to come.

This paper will introduce the preliminary flight results of the first mission phase with respect to the primary payload. An overview of the flight configuration, launch as well as the LEOP and commission

phase will be given. Depending on availability first findings concerning the global RF spectrum utilization will be shared. SALSAT will generate a heatmap for the global frequency usage in the spectrum bands within the coming months. All data samples collected throughout the mission duration will be made freely available to the public through a web application, which will also be introduced within this paper.