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IN SPACE VERIFICATION OF THE PICO-SATELLITE S-BAND TRANSMITTER "HISPICO" ON A
SOUNDING ROCKET

Abstract

Because of their high cost effectiveness and their variability pico-satellites become more attractive for future space missions. These high integrated satellites with a mass up to 1kg gain more importance for several space missions such as security, disaster monitoring, earth observation and communication.

With the increasing importance of these systems, the need for high integrated and efficient subsystems increase too. By now 80 international universities work and study for novel and modern technologies for performance enhancement of the pico-satellite subsystems. The communication subsystem receives a special attention. It must be able to transfer the telemetry and the payload data – for example instrument data with a high data rate - to the ground station during a short satellite pass with a minimum usage of satellite resources.

One of the main focuses of the technology research at the Berlin Institute of Technology (TU Berlin) is the development of pico-satellites and their subsystems by involving students. A High Integrated S-Band Transmitter for Pico-Satellites –HISPICO - was developed by TU Berlin and the company IQ wireless GmbH. HISPICO achieves 1Mbps data rate with a transmission power of 27dBm and power consumption of 5W. These technical parameters can only be reached by the use of modern channel coding algorithms – especially Turbo-code. Turbo-code is suitable for deep-space and large satellite missions. The communication of nearly all launched pico-satellites is UHF based.

In October 2008 HISPICO was verified in space on the sounding rocket REXUS-4. The REXUS program is a joint project between the Swedish Space Corporation SSC, ESRANGE, and the Mobile Rocket Base (MoRaBa) of the German Aerospace Center DLR, conducted by EUROLAUNCH. During 10 minutes rocket flight to an attitude of 175 km the HISPICO system transmitted image data via S-band to the ground station. Also after landing HISPICO operated faultlessly. With this experiment the technical parameters of HISPICO were proved. Due to the successful data link the resistance of HISPICO against launch loads and high relative motion, caused by the rocket, were demonstrated. Furthermore the system design was already qualified before on ground by a dedicated space qualification programme. The REXUS-4 experiment is a step toward the first on orbit verification of HISPICO.

During the flight several measurements were taken. Out of these data information concerning channel quality, channel coding and thermal characteristics are derived. This paper presents the results of these measurements.