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X BAND TELEMETRY SOLUTION FOR CUBE AND NANO SATELLITE

Abstract

Six years ago, CNES started RD studies related to telemetry in X band, with the goal of providing to micro satellite platform manufacturers a low cost but high performances X band transmitter. The promising results achieved have led to the decision to develop a transmitter for ESA PROBA-V spacecraft to be launched in 2013. The first flight models have been designed in only 18 months and have been delivered to ESA. In the same way, CNES is now studying a solution to download telemetry in X band for cube and nano satellites. The aim is to provide a high data rate subsystem for missions with high telemetry needs such as Space Spectrum Survey, Automatic Identification System by satellite, Earth Observation, etc.... In the first part, the paper presents the miniaturized transmitter in development, specially designed to cope with the restricted space and energy of very small platforms. The footprint and volume are specially designed to fit with cubesat dimensions. The consumption is also optimized with 10W for 32 to 34 dBm RF output power. Critical or innovating functions such as flexible bit rate section, data interface, high efficiency power amplifier are described. The second part of the paper is dedicated to the antenna. The design is based on a simple patch antenna realized on standard substrate. The performances of a prototype has been measured in CNES antenna facilities and compared with simulations. Finally, link budgets are presented with 3.4 or 5 m diameter antenna ground stations and data rates up to 50 Mbps, to demonstrate the capacity of this solution to download several gigabytes per day.