

Thermal Vacuum Chamber Test Result for CubeSat Transmitter

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Abstract : CubeSat in low earth orbit (LEO) mainly uses ultra high frequency (UHF) transmitter with fixed radio frequency (RF) output power to download the telemetry and the payload data. The transmitter consumes large amount of electrical energy during the transmission considering the limited satellite size of a CubeSat. A transmitter with power control ability is designed to achieve optimize the signal to noise ratio (SNR) and efficient power consumption. In this paper, the thermal vacuum chamber (TVAC) test is performed to validate the performance of the UHF band transmitter with power control capability. The TVAC is used to simulate the satellite condition in the outer space environment. The TVAC test was conducted at the Laboratory of Spacecraft Environment Interaction Engineering, Kyushu Institute of Technology, Japan. The TVAC test used 4 thermal cycles starting from +60°C to -20°C for the temperature setting. The pressure condition inside chamber was less than 10-5Pa. During the test, the UHF transmitter is integrated in a CubeSat configuration with other CubeSat subsystem such as on board computer (OBC), power module, and satellite structure. The system is validated and verified through its performance in terms of its frequency stability and the RF output power. The UHF band transmitter output power is tested from 0.5W to 2W according the satellite mode of operations and the satellite power limitations. The frequency stability is measured and the performance obtained is less than 2 ppm in the tested operating temperature range. The test demonstrates the RF output power is adjustable in a thermal vacuum condition.

Keywords : communication system, CubeSat, SNR, UHF transmitter

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