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ENABLING COST-EFFICIENT CUBESAT EARTH OBSERVATION MISSION SUCCESS BY THOROUGH REFLECTOMETER ANTENNA CHARACTERISATIONS

Abstract

CubeSats are low-cost nanosatellites which are mostly developed for space research and exploration. PRETTY is a 3U CubeSat Earth observation mission performing height measurements of the Earth's surface especially in polar regions incorporating reflected GPS signals. For these measurements, a high-gain patch antenna array with a specific antenna radiation pattern is required. Numerous parameters influence this pattern, in particular the varying phase delay and gain of different LNAs, manufacturing tolerances in the PCB RF combiners and manufacturing tolerances of the ceramic antenna patches. Due to the reception of reflected signals strength below the noise floor, measurement outputs are highly dependent on the overall system performance. Therefore, an accurate characterisation of the reflectometer patch antenna array is essential for maximising mission result outputs.

In this paper, the characterisation process of the PRETTY reflectometer antenna array is described. Measurement results regarding various antenna properties at different temperatures are compared. Besides, performance changes during the environmental test campaign, including vacuum and vibration tests, are monitored, analysed and described