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ANALYSE AND DESIGN OF ANTENNAS FOR GNSS-REFLECTOMETRY EMBEDDED ON A 6U-CUBESAT

Abstract

Since the beginning of the 2000, Global Navigation Satellite System Reflectometry (GNSS-R) has been developed as a novel remote sensing technique. With this method, a satellite in low-earth-orbit can observe and analyse reflected GNSS signals from the Earth surface. It allowed to measure parameters such as wind speeds, ice thickness and soil moisture. Alongside, the apparition of NewSpace at the beginning of the XXIth century has streamlined the access to space. A symbol of this are the CubeSats, which are small and scalable satellites based on "cubic" modules. Our project was born from the merge of these two trends. We aim to construct a 6U GNSS-R CubeSat and study how it can be used for detection of elements of interest in the marine environment, like artificial floating structures or oil spills. A satellite being a complex system it is composed of numerous sub-systems; this report focuses on the satellite's antenna development. This new design is innovative compared to the state-of-art, due to the dual-polarized antenna. Due to the constraints of our project, we have decided to create a patch array antenna. One of the critical points of this antenna is the feeding system, which must be able to recover both polarizations independently. We have studied the probe feeding and the aperture coupling, and we have analysed and compared three different feeding configurations. Two for linear polarization and one for circular polarization. We present the initial studies and trade-offs for deciding the possible antennas designs for this project, followed by simulations by CAD software.