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DEVELOPMENT OF AN S-BAND PATCH ANTENNA FOR CUBESAT STUDENT MISSIONS

Abstract

In the current context, where CubeSats communications are being optimised through the transition from UHF to S-band, the development of a patch antenna specifically for CubeSat applications stands out. This advancement, framed within the BIXO mission by the student team of UVigo SpaceLab at the University of Vigo, addresses the need for an advanced communication system for the efficient transmission of images, particularly in projects that house payloads such as cameras utilising software-defined radios in S-band.

The educational significance of this project lies in the opportunity it offers students to engage in technological design and development processes, applying their theoretical knowledge in a practical context and gaining experience in the field of space engineering. This training focuses primarily on the design of the antenna and the planning and execution of the necessary tests to validate the antenna.

The testing methodology adopted for the patch antenna was meticulously designed to ensure its optimal performance under specific operational conditions in space. This antenna testing model planned various tests in an anechoic chamber to evaluate the radiation pattern and the impedance of the antenna,

ensuring its compatibility with the requirements of the BIXO mission.

The antenna design was carried out using advanced electromagnetic simulation software, which allowed for the optimisation of its shape and dimensions to maximise performance in the S-band. Factors such as weight, size, and resistance to the space environment were considered to develop an antenna that not only met the technical specifications but also adapted to the physical limitations of CubeSats.

This comprehensive approach, covering both the design phase and the validation through testing, reflects the technical depth of the project and its contribution to the advancement of satellite communications. Although student participation remains an essential component, the emphasis shifts towards technical rigour and innovation in the development of space communication solutions. This project not only demonstrates the viability of S-band patch antennas for CubeSats but also establishes a precedent in the application of exhaustive testing methodologies to ensure their functionality and reliability in educational space missions.