

ABSTRACT

The development of miniaturized satellite technology such as CubeSats has been rapidly advancing due to the increasing demand for compact and efficient space communication systems. One of the main components in these communication systems is the antenna. Deployable antennas are commonly used, but they carry the risk of malfunction due to complex folding and unfolding mechanisms. Therefore, there is a need for non-deployable antenna alternatives that are simpler and more reliable, although the main challenge is maintaining radiation performance within limited dimensions.

The solution offered in this research is the design and implementation of a PCB-based non-deployable antenna for a 1U CubeSat. The antenna was designed considering UHF communication requirements for low Earth orbit (LEO), using design methods through electromagnetic simulation software, fabrication using FR-4 substrate, and antenna parameter testing. Testing was conducted to evaluate VSWR, return loss, bandwidth, polarization, radiation pattern, and gain, both through simulation and physical realization.

The research results show that the designed non-deployable antenna has a VSWR value of 1.33 and return loss of -16.83 dB, indicating good impedance matching and power transfer efficiency. The antenna also successfully produces circular polarization with an omnidirectional radiation pattern according to CubeSat communication requirements. However, the obtained bandwidth was only ± 40 MHz and the gain value was -29.754 dB, showing limitations in radiation performance. Overall, the antenna has met most of the key parameters, but bandwidth and gain aspects need to be optimized to support CubeSat communication systems more effectively.

Keywords : Non-deployable antenna, CubeSat, UHF, Satellite Communication, PCB