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# DESIGN OF COST EFFECTIVE AND POWER EFFICIENT COMMUNICATION SYSTEM FOR EXPERIMENTAL SOUNDING ROCKETS

**Abstract**

Experimental sounding rockets are the emerging field of interest to scientists and space enthusiasts which aid in the conduction of a variety of experiments at various levels of the atmosphere. The results of the experiments obtained, extensively serve as a prototype to develop further space missions. Since sounding rockets have limited resources and there is a dire necessity for real-time data, a highly power-efficient communication system is the need of the hour. This paper proposes a communication system for a sounding rocket, namely ReSOLV Mk-1. Majority of Sounding Rockets utilize GPS trackers with monopole antennae which operate at 900MHz or 433MHz. Since 2.4GHz is an unlicensed ISM band and monopole at 2.4GHz is not realizable for long-distance communication, the existing communication system becomes ineffective. The proposed solution for the communication system involves the usage of folded dipole PCB antenna onboard and 2x2 patch array antenna for the ground station operating in the 2.4Ghz bandwidth. The 2x2 rectangular patch array antenna consists of four radiating patch elements that are interconnected using feeds of varying impedance of 100 Ω,75 Ω,50 Ω. The design is made on FR-4 as the dielectric material and copper as the radiating element. The folded PCB antenna is easily embedded with the on-board RF module, achieving space optimization and hence making it more resistant to vibrations. These are easily driven by low power RF modules like xbee. Hence, the PCB antennae owe to the efficient management of power and space in the avionics bay. Antennae have been designed at 2.4GHz using the simulation software HFSS, MATLAB and CST. The results obtained prove that antennas can be efficiently incorporated into the design of a communication system. The designed communication system serves as the benchmark for future experimental sounding rockets.