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Author: Mr. Avaneeth Anil
India, avaneethanil302001@gmail.com

Ms. Prerana M
R V College of Engineering, Bengaluru, India, preranam.te19@rvce.edu.in
Mr. Tejus Sankar
R V College of Engineering, Bengaluru, India, tejussankar.ee19@rvce.edu.in

COMPARISON OF 2X2 PATCH ANTENNAS AS DESIGN EFFICIENT COMMUNICATION SYSTEM FOR EXPERIMENTAL SOUNDING ROCKETS

Abstract

Experimental Sounding Rockets are a trending area of research to scientists and space enthusiasts alike. Sounding Rockets help to study various levels of the atmosphere and the data obtained as results, pave the way for future space missions. Sounding rockets try to achieve maximum efficiency with minimal expenditure of resources. Hence obtaining real-time data is of prime importance. This is why an efficient communication system is quite essential for any sounding rocket.

The idea cut out through this paper is to use a 2x2 Patch Antenna as the antenna at the Ground Station operating at a frequency of 2.4GHz. 2.4GHz is an unlicensed ISM band and can cause high attenuation. This makes it unreliable for long distance communications. The idea presented through the paper is a 2x2 Patch Array. The paper demonstrates how different patch shapes can influence the overall efficiency of the communication system. Since the antenna is placed on the Ground Station, sufficient power will be available and the whole efficiency will rely on how good the design. This paper demonstrates the variance in the efficiency of antennas when their patches are circular, elliptical, rectangular, square, pentagonal and hexagonal. The whole simulation is done on a common software which is Ansys HFSS to ensure that all the different antenna designs are subject to the same environment. After simulation, the S-parameter, VSWR, Z-parameter, farfields and other parameters are compared and the antenna with the best results is proposed as the most efficient communication system for the Ground Station. This paper also illustrates how different patch topologies affect the overall efficiency of the antenna.

The results obtained can be efficiently and effectively induced into the design of the communication system of a Sounding Rocket. Hopefully, these design modifications would also serve as a benchmark for future Experimental Sounding Rockets.