Paper ID: 67266
student

IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Interactive Presentations - IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (IP)

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COMPARISON OF 2X2 PATCH ANTENNA DUE TO TEMPERATURE VARIATION IN EXPERIMENTAL SOUNDING ROCKETS

Abstract

Scientists and space fanatics note the popularity in the research of Experimental Sounding Rockets. Sounding Rockets aid in studying various levels of the atmosphere through experiments performed. Therefore, obtaining real-time data which is of prime importance in the relevant field. The outcome, which is a culmination of the data obtained as results of the experiments precede a path for future space missions. They should be structured and designed to achieve maximum efficiency with controlled outlay of capital, time and energy resources. A sound and efficient communication system is a prime prerequisite to configure an effective and worthy rocket. The idea presented through the paper is to use the 2X2 patch array antenna at the ground station operating at the frequency of 2.4GHz kept at the room temperature of 21C. This range of frequency can cause attenuation during long distance communication because it's an unlicensed ISM band. In this paper, the effect of temperature variation due to the atmospheric conditions is observed on different substrate materials such as FR4 Epoxy, Quartz, Roger, Bakelite, Teflon and silica. In addition, based on this variation in temperature, a brief comparative study of the different patch shapes with different substrate material is studied. The efficient productivity of the communication system is significantly impacted by designing different patch shapes. Varied shapes- circular, elliptical, rectangle, pentagonal and hexagonal are simulated under the aforementioned conditions. Simulation for all the antennas are carried out in the HFSS and CST software. The change in frequency, VSWR, return loss, impedance and other parameters are compared. Their influence on the communication system's efficiency is portrayed. The most suited shape with the substrate material invariant to temperature differences at 2.4 GHz is rendered as the ultimate result. This can effectively and efficiently be employed into the design of the communication system for the ground station. Further, this structured prototype shall serve as a touchstone for future experimental Sounding Rocket.