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DESIGN AND ANALYSIS OF MULTI-BAND PATCH FRACTAL ARRAY WITH OPTIMIZED FEED NETWORK FOR X BAND APPLICATIONS.

Abstract

Miniaturization of satellite systems demands development of optimized miniature electronic components. Use of simplistic multiband antennas is becoming a pressing issue. Microstrip patch antennas are quote commonly used for their low structural profile, robust features and ease of production. However, very often patch antennas face narrow bandwidth and low power handling. The presented research is a continuation of paper presented in IAC 2015 Jerusalem; and builds on the findings of the last research. This paper, aims at developing a multiband patch antenna array; using antenna presented in IAC15.B2.5.1 as the unit cell. The model uses, teflon (dielectric constant = 2.1) for substrate and metallize using perfect electric conductor for simulation purposes. In the base antenna resonance is achieved at 8GHz, while in the first iteration of fractal progression, two resonances at 7.966 GHz and 9.002 GHz are achieved. These multiple frequencies have been retained in the array setting while improving the broadside radiation pattern. Broadside radiation pattern is not the same as base antenna, however this problem can be solved employing an array configuration. For 7.966 GHz mainlobe magnitude improves from 2.1dBi to 8.94 dBi; with a 3dB bandwidth improving from 92.3 deg to 46.5 deg. For 9.002 GHz mainlobe magnitude improves from 5.34 dBi to 10.9 dBi; with a 3dB bandwidth improving from 126.8 deg to 39.3 deg. The paper employs a novel technique to feed the array with the aim of control inter element coupling and reduce effect of feed network over radiation of the system. The paper provides a solution in simulation domain which can manufactured and tested in the stages to follow. Achieving narrow beam broadside pattern with two operating frequencies was the aim of this project which has been successfully attained and presented in this paper.