Dual – Feed Rectangular Patch Antenna for Satellite Applications with Increased Bandwidth Requirements

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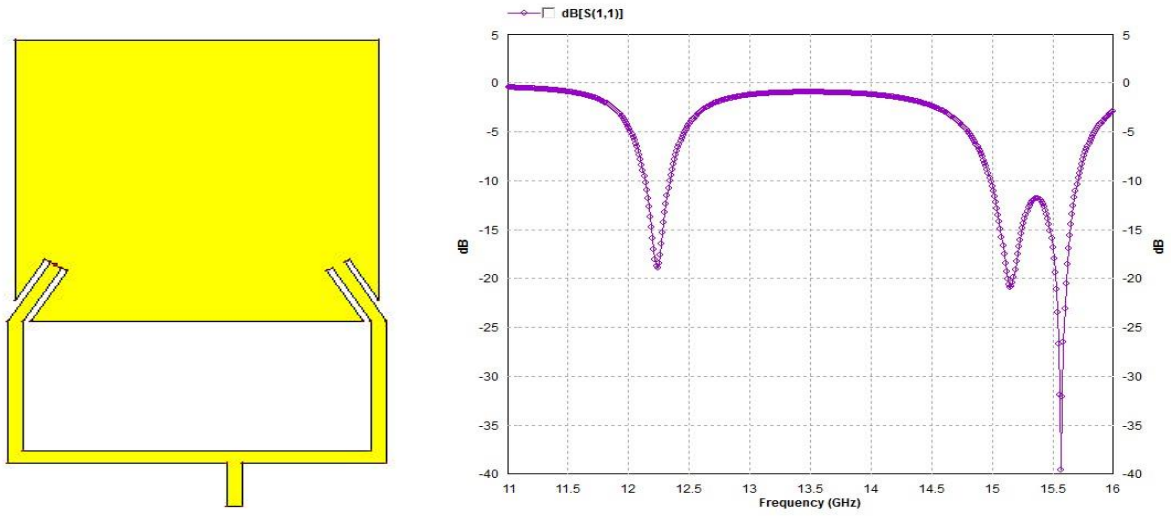
A feeding mechanism for a rectangular patch is proposed, leading to significant bandwidth augmentation. The bands where resonances are observed are allocated for fixed, mobile and satellite communications as well as radio astronomy and space research, according to European and U.S. frequency allocation charts.

The patch dimensions are 6.8 x 6.54 mm, and the feeding network sizes 3.3 x 7.09 mm. The patch is printed on a 0.508 mm substrate with ε_r=2.2. This configuration gives rise to three separate resonances, relative to the patch dimensions and the corresponding mode excitations. The lower one exhibits fractional bandwidth of 1.67% around 12.23 GHz and horizontal polarization. Regarding the two higher resonances, the particular position of the common feeding point was examined in order to introduce an appropriate phase shift, so that the resonances form a single envelope. The common feed is thus placed closer to one of the feeding points, introducing a phase shift of $\pi/2$ between the symmetrically placed inset feeding points. Now, the pair of the higher resonances demonstrates a significant overall fractional bandwidth of 4.68% around 15.35 GHz. This is also convenient in terms of polarization, as simulated results show vertical polarization at 15.15 GHz and horizontal polarization at 15.5 GHz. Simulations in previous work (M. Wang, W. Wu and D.-G. Fang, "Uniplanar Single Corner-Fed Dual-Band Dual-Polarization Patch Antenna Array", *Progress in Electromagnetic Research Letters*, Vol. **30**, 41-48, 2012) show off a bandwidth of 1.7% and 2.1% at 12.5 (horizontal polarization) and 14.25 (vertical polarization) GHz respectively.

Simulations regarding current distribution, impedance, antenna gain and efficiency and radiation patterns are also available and demonstrate good behaviour of the antenna. Furthermore, changes in the configuration (e.g. folding the feeding network in order to reduce size), as well as an array consisting of proposed elements will be examined.



Antenna configuration and Return Loss simulation results.