

Compact 3-D Co-Planar Waveguide Fed Dual-Port Ultrawideband-Multiple-Input and Multiple-Output Antenna with WLAN Band-Notched Characteristics

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Abstract : A miniaturized three dimensional co-planar waveguide (CPW) two-port MIMO antenna, exhibiting high isolation and WLAN band-notched characteristics is presented in this paper for ultrawideband (UWB) communication applications. The microstrip patch antenna operates as a single UWB antenna element. The proposed design is a cuboid-shaped structure having compact size of 35 x 27 x 45 mm³. Radiating as well as decoupling structure is placed around cuboidal polystyrene sheet. The radiators are 27 mm apart, placed Face-to-Face in vertical direction. Decoupling structure is placed on the side walls of polystyrene. The proposed antenna consists of an oval shaped radiating patch. A rectangular structure with fillet edges is placed on ground plan to enhance the bandwidth. The proposed antenna exhibits a good impedance match ($S_{11} \leq -10$ dB) over frequency band of 2 GHz - 10.6 GHz. A circular slotted structure is employed as a decoupling structure on substrate, and it is placed on the side walls of polystyrene to enhance the isolation between antenna elements. Moreover, to achieve immunity from WLAN band distortion, a modified, inverted crescent shaped slotted structure is etched on radiating patches to achieve band-rejection characteristics at WLAN frequency band 4.8 GHz - 5.2 GHz. The suggested decoupling structure provides isolation better than 15 dB over the desired UWB spectrum. The envelope correlation coefficient (ECC) and gain for the MIMO antenna are analyzed as well. Finite Element Method (FEM) simulations are carried out in Ansys High Frequency Structural Simulator (HFSS) for the proposed design. The antenna is realized on a Rogers RT/duroid 5880 with thickness 1 mm, relative permittivity $\epsilon_r = 2.2$. The proposed antenna achieves a stable omni-directional radiation patterns as well, while providing rejection at desired WLAN band. The S-parameters as well as MIMO parameters like ECC are analyzed and the results show conclusively that the design is suitable for portable MIMO-UWB applications.

Keywords : 3-D antenna, band-notch, MIMO, UWB

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