

Dual- Band Antenna for Wi-Fi and 5G Applications

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Abstract: In this communication, a circular patch antenna is reported for dual-band operation based on VIAs. Initially the patch is resonating at single band with Linear Polarization (LP), and the Circular Polarization (CP) is obtained by inserting semi circular cuts at the edges of circular patch. The second band is achieved by loading the vertical metallic VIAs along the circumference of the patch antenna. The reported antenna is working at 2.4 GHz (Wi-Fi) and 3.5 GHz (5G) bands with Return Loss Band Width (RLBW) of 4.83% and 10.37% respectively. The Axial Ratio (AR) bandwidth at 5G band is 2.38% (3.31- 3.39 GHz).

Keywords: circular patch, Metamaterials, VIAs, CP, Axial Ratio

I. INTRODUCTION

The patch antennas are useful in wireless communications because of their low weight, low cost and easy fabrication characteristics [1]. The patch antenna which can resonate at multiple frequencies is the very much useful component for modern electronic gadgets. The dual-band antenna with good impedance bandwidth and good gain is achieved by using metamaterials [2]. The dual-band patch antennas are designed based on CSRR, Mushroom Unit cell and VIAs [3-7], which are suffering from bandwidth and gain. The impedance bandwidth at both the bands is improved in this design. In this article, a circular patch antenna is demonstrated. The two bands are obtained by loading VIAs. The cp at higher band is obtained by removing the sides of the circular patch. The reported structure is simulated in HFSS software

II. STRUCTURE OF WI-FI AND 5G ANTENNA

The structure is reported in figure 1. Rogers RT/Duroid with permittivity 2.2, thickness 3.2 mm is used. semi circular cuts are inserted at the edges of the patch for cp at patch mode band and the vertical VIAs are inserted for second band.

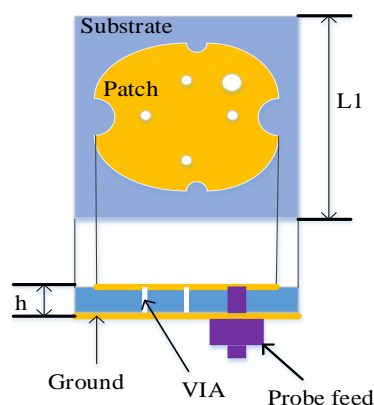


Figure 1 structure of the antenna

The design procedure is shown in figure2 and is as follows. Initially circular patch antenna Ante1 is working at 2.8 GHz with LP. Later the edges are loaded with semi circular curves for cp to obtain Ante2. Ante3 is occurred by loading VIAs into Ante2 for dual band operation with LP at both the bands. Finally, proposed antenna Ante4 is achieved by replacing the edges of Ante3 with semi circular curves.

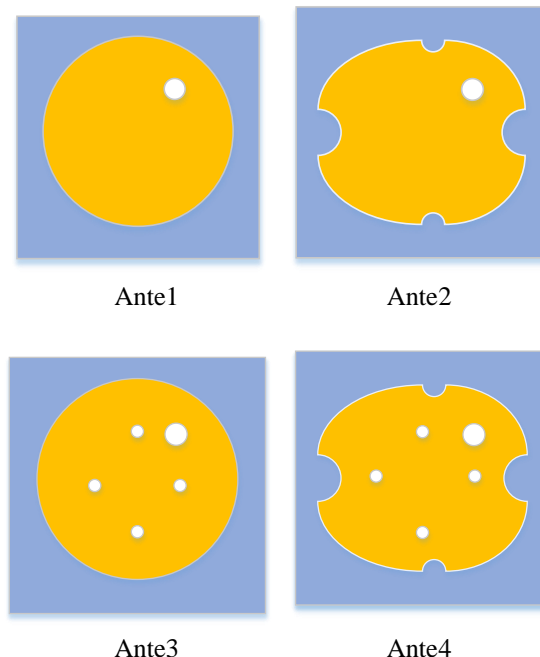


Figure2 Design procedure

III. RESULT DESCRIPTION

The simulated RL characteristics of four antennas are given in figure3. The AR graph is shown in figure4. Radiation patterns at both the bands are displayed in figure 5. Gain plot is drawn in figure 6.

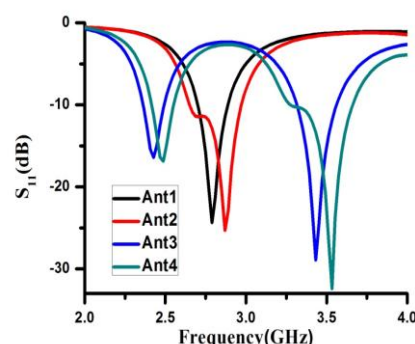


Figure 3 RL characteristics of the antennas

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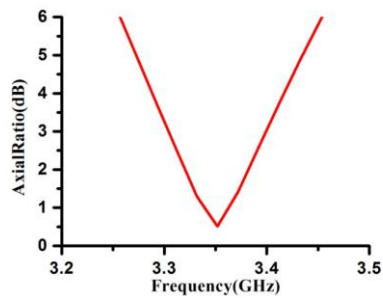


Figure 4 AR characteristics

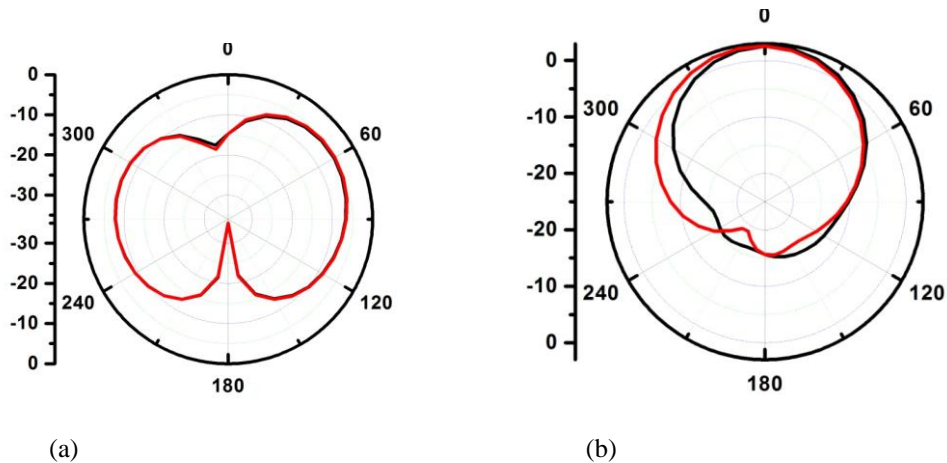


Figure 5 radiation patterns at (a) Wi-Fi (b) 5G

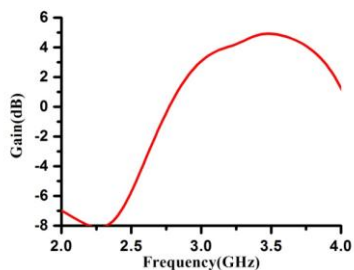


Figure 6 Gain plot

IV. CONCLUSIONS

In this article, patch antenna is described for Wi-Fi and 5G applications. The vertical VIAs are loaded along the circumference of the circular patch. The RL bandwidth is 4.83% (2.42- 2.54 GHz) at lower band and is 10.37% at upper band respectively. The AR bandwidth is 2.38% (3.31-3.39 GHz) at 5G band.

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