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A Compact Microstrip Slot Antenna for C-Band Application

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ABSTRACT
In this paper author presents a compact microstrip slot antenna for C band application .The antenna is designed on Roger RT Duroid 5880 (1.5mm) substrate with permittivity 2.2 and dimension of ground plane 20x24 mm^2. The patch has a dimension of 12x14 mm^2 on which slots are been made .The proposed antenna is able to achieve impedance bandwidth of 200MHz from 6.11GHz to 6.31 GHz and has a maximum gain of 4.9dBi at resonant frequency. Return loss, Electric field distribution, Polar plot, Radiation pattern and directivity of the proposed antenna is obtained and studied in this paper. All simulations are done on HFSS software.
***Keywords* -** coaxial feed, permittivity, return loss, slot antenna

I. INTRODUCTION

In the growing era of wireless and mobile communication, the popularity of patch antenna is increasing day by day. The main reason behind their popularity are the various advantage offered by them such as low cost, ease of fabrication, easy integration with other circuit .Today, microstrip patch antenna's found their application in biomedical, broadcasting ,mobile communication, space communication[1], geotextile based wearable antenna's [2]etc. As the size of communication devices are shrinking day by day so there is an urgent need to devise a compact antenna so as to meet the present day demand. Various research have been done in past over microstrip patch antenna so as to meet the present day demand. Various techniques like stacking of substrate [3], slot in ground or in patch [4], use of parasitic elements with patch, patch array [5] had been successfully employed to increase the performance of patch antenna [6]. One such work is presented in this paper in which a compact microstrip slot antenna is proposed for C band application.
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II. ANTENNA CONFIGURATION

Fig.1 depicts the geometry and cross sectional view of the proposed antenna consisting of rectangular patch with slots and a ground plane which is printed on Roger RT Duroid 5880 substrate with thickness1.5mm .The complete description of the proposed antenna is shown in Table 1.
*All units are in mm.

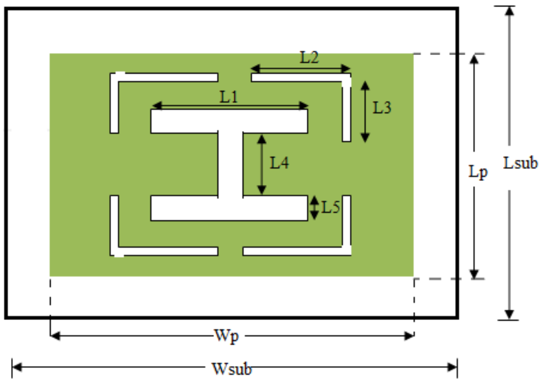


Fig.1: Geometry of proposed antenna

Lsub	Wsub	Lp	Wp	L1	L2	L3	L4	L5
20	24	12	14	8	5	3	2	1

Table.1

III. RESULTS AND DISCUSSION

Simulation is done several times on HFSS software which is based on FEM in order to get the best response in terms of antenna parameters. The return loss and VSWR of the proposed antenna is depicted in Fig.2 (a) & 2(b) respectively, which clearly shows that the proposed antenna resonates at 6.2 GHz and has an impedance bandwidth of 200MHz for return loss less than -10 dB(VSWR<2).

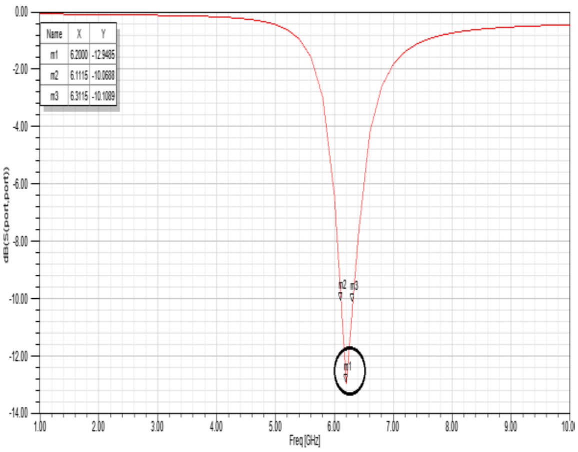
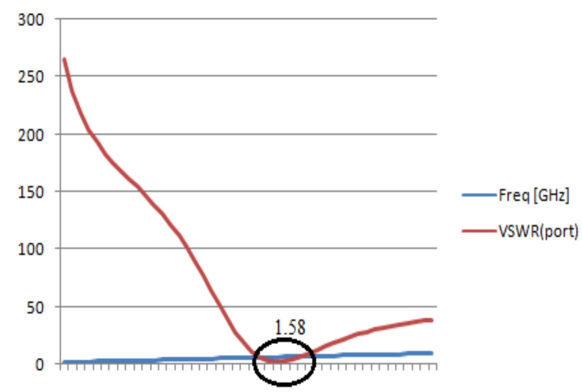


Fig2- (a) Return loss of proposed antenna



(b) VSWR of proposed antenna

The simulated results in terms of radiation pattern is also been studied .It has been found that the proposed antenna is able to achieve maximum gain of 4.9 dBi in azimuth plane and in elevation plane which is clear from the Fig.3. For calculating radiation pattern in elevation plane phi is set to 0 for all values of theta. While, in order to calculate gain$_{phi,}$ theta is set to 0 for all values of phi.

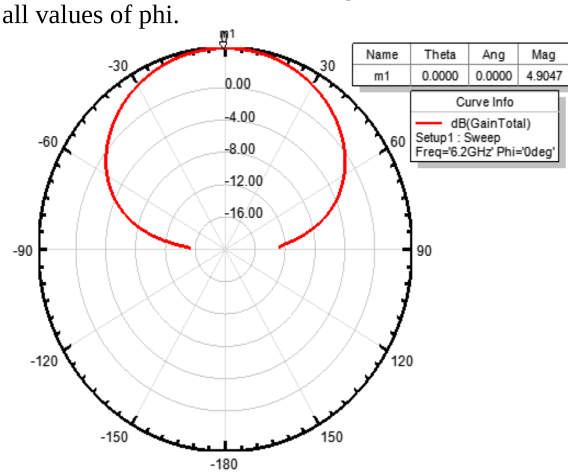
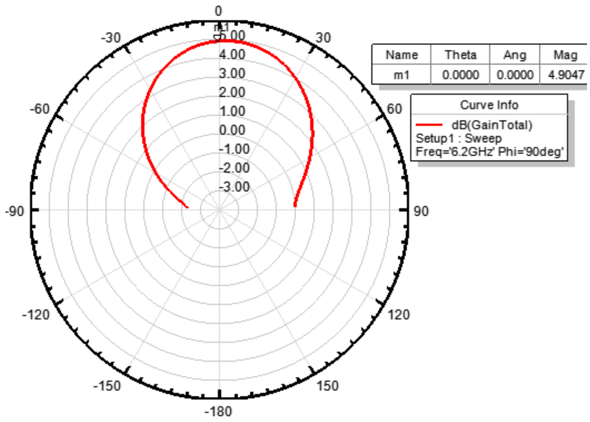
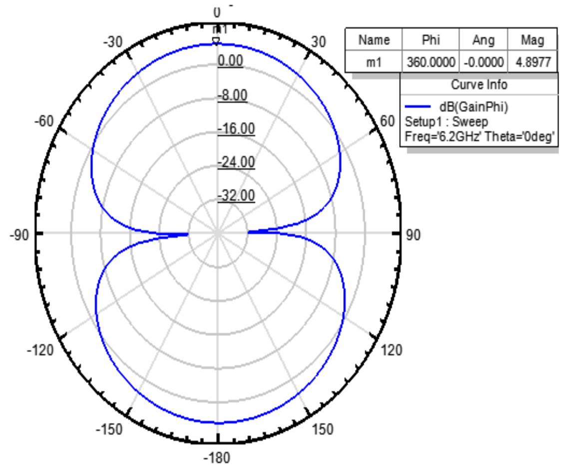


Fig3 (a) Elevation Plane □=0



(b)Elevation Plane at phi$_{90}$^{o}



(c) Azimuth plane □=0

Fig.4 shows the polar plot of the proposed antenna at resonant frequency. The directivity of the proposed antenna is found to be 5dBi which is evident from Fig. 5.Electric field distribution of the proposed antenna is also obtained and is shown in Fig.6

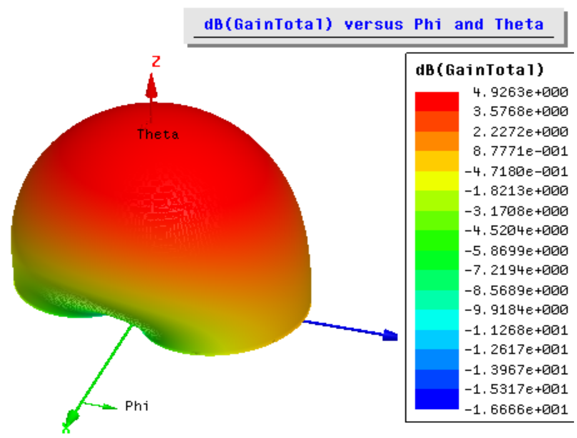


Fig.4- Polar plot at 6.2 GHz

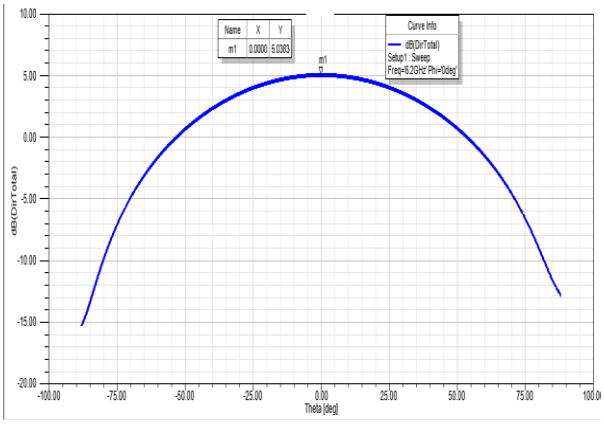


Fig.5- Directivity of the proposed antenna

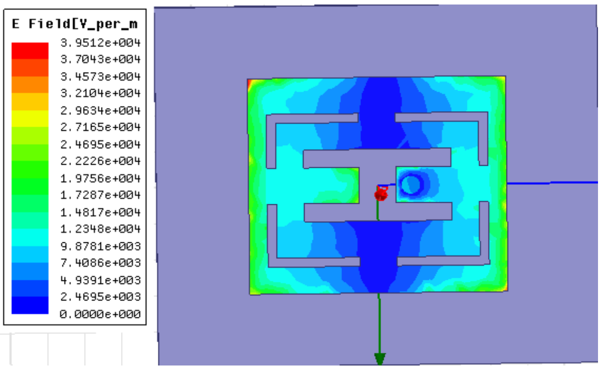


Fig.6-E field distribution of proposed antenna

IV. CONCLUSION

Microstrip slot antenna is successfully designed, simulated and studied. The proposed antenna has achieved a bandwidth of 200MHz and a maximum gain of 4.9 dB which is clearly indicated in Fig.2. Further, the structure is excited using coaxial feed as it provides good matching when compared to other feeding techniques. The future work would be to design an antenna on cheaper substrate and to increase the gain and directivity of antenna without compromising much in terms of other antenna parameters. Further attempts could be made to make an antenna array so as to increase the gain and directivity of the antenna.

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