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Review Article

DUAL I AND F SLOT MICROSTRIP PATCH ANTENNA FOR MULTIBAND APPLICATION

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ABSTRACT

This paper present a design of Dual I and F slot microstrip patch antenna which operates at frequency of 2.45GHz. FR4_epoxy is used as substrate material for the design of proposed antenna with 4.4 dielectric constant and 1.6mm thickness. Proposed antenna is simulating by the HFSS (high frequency structure simulate) Software. VSWR, Return loss and Radiation pattern are calculated and presented in this paper. This antenna can be used for Wireless Communication services, Radio Services and Wi-Fi application.

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INTRODUCTION

In Wireless Communication information is transfer from one place to other place [1]. In Wireless Communication System antennas are very useful part [2]. A Microstrip patch antenna consists of radiating patch on upper side of a dielectric substrate and ground plane on the lower side. The patch is generally made of copper and gold material [3]. For wireless communication application microstrip patch antenna is preferred. Microstrip patch antenna has W width of rectangular patch, L length of patch, h height of dielectric substrate [4]. Microstrip Patch antennas have many advantages like low weight, low profile, small volume, easy fabrication [5]. But in general microstrip patch antenna consist disadvantages such as narrow bandwidth etc. [6]. For improving bandwidth, gain and size reducing slotting is used. The shape of slot may be rectangular, triangular, U-shaped, H-shaped, square, circular, E-shaped, diamond shaped [7]. The performance of antenna can be improved by using thick substrate. When size of microstrip patch antenna is changed then gain and bandwidth of antenna is effected [8]. Microstrip patch antennas are used in satellite communication, radars, aerospace and biomedical [9].

Antenna Design

The schematic diagram of the conventional rectangular microstrip patch antenna is shown in figure 1(a).The substrate material is FR4_epoxy with 4.4 dielectric constant and 1.6mm thickness. Dimensions of the rectangular microstrip patch antenna is 50×40×1.6. In the proposed antenna rectangle patch is used. The ground of proposed antenna is defected. The dimension of ground plane is 42.9mm length and 32mm width. The patch is having dual I and F Slot. Both I slots have length 26mm and width 2mm. The vertical slot of F has length 26mm and width 2mm. The upper horizontal slot of F has length 10mm and width 2mm. The lower horizontal slot of F has length 7mm and width 2mm. The geometry of proposed antenna is as shown in figure 1(b).

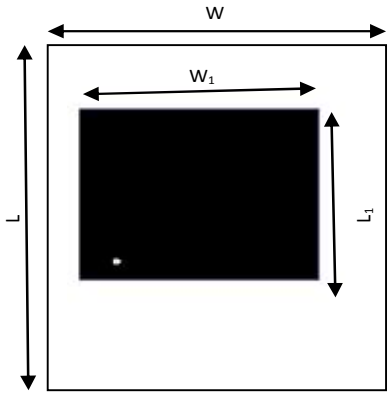

Fig.1 (a) Geometry of conventional antenna

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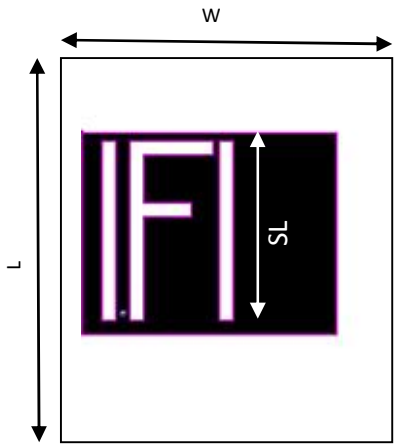

Fig.1 (b) Geometry of proposed antenna

Table.1 Design specifications for proposed antenna

Parameters	Value
Length of patch	29mm
Width of patch	37mm
Dielectric constant	4.4
Resonant frequency	2.45GHz
Length of substrate	50mm
Width of substrate	40mm
Thickness of substrate	1.6mm
Width of slot I	2mm
Lenght of slot I	26mm
Width of upper horizontal slot F	10mm
Width of lower horizontal slot F	7mm
Length of ground	42.9mm
Width of ground	32mm

RESULTS

The Dual I and F Slot microstrip patch antenna has been analyzed by HFSS (high frequency structure simulate) software. By simulation three parameters are obtained in Dual I and F Slot microstrip patch antenna which are return loss, VSWR and radiation pattern.

Return loss

The first parameter is return loss as shown in figure 2. Conventional microstrip patch antenna has return loss -11.0dB at resonant frequency 2.4GHz where as proposed antenna has return loss -14.2dB at 2.3 GHz. By cutting the Dual I and F slot the resonant frequency of proposed antenna is shifted toward lower side which reduce the size of antenna by 13.5% from the conventional antenna.

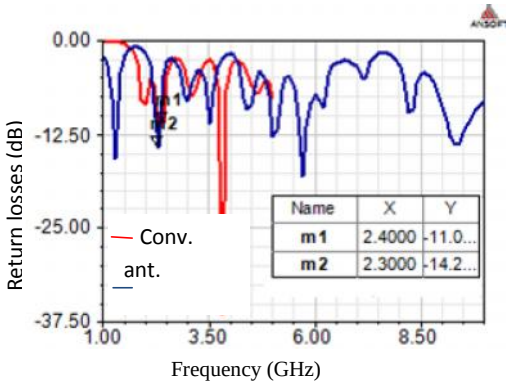

Fig.2 Plot of return loss v/s Frequency

VSWR

VSWR verse frequency plot shown in figure 3. VSWR of proposed antenna is 1.4 at resonant frequency 2.3GHz and conventional antenna is 1.7 at resonant frequency 2.4GHz.

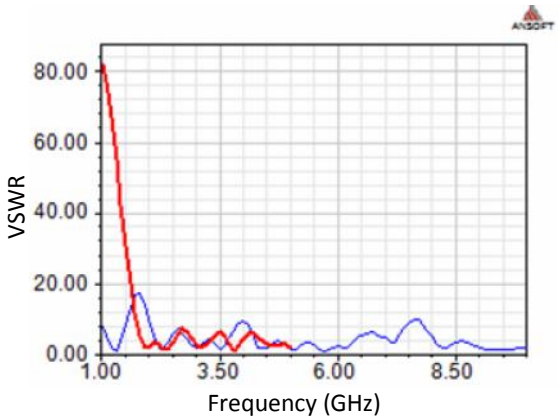

Fig.3.plot of VSWR v/s frequency

Radiation pattesrn

The radiation pattern of conventional antenna and proposed antenna is as shown in figure 4. A radiation pattern defines the variation of the power radiated by an antenna as a function of the direction away from the antenna [3].

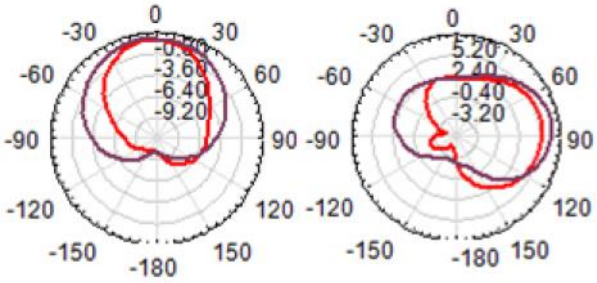

Fig.4.(a) Two dimensional Radiation pattern of Conventional antenna (b) Proposed antenna

Gain

Figure 5 shows the gain of this antenna. The gain of this proposed antenna is 5.8dB at the resonant frequency 3GHz

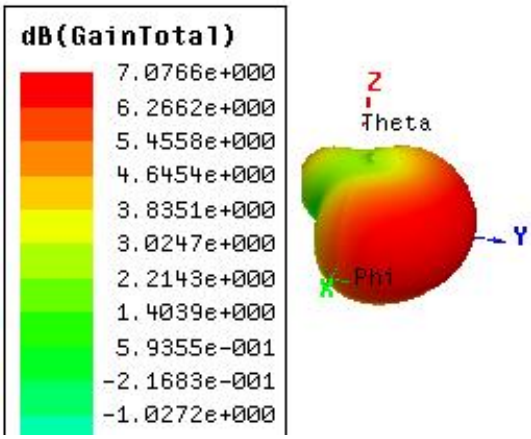

Fig. 5 Gain of Proposed Antenna

These results are also shown in table 2.

Table.2 Results of proposed antenna

Parameters	Value
Return loss	-14.2dB
VSWR	1.4
Gain	7dB

CONCLUSION

The proposed Dual I and F Slot microstrip patch antenna for Multiband application is successfully presented in this paper. This antenna is operates at frequency 2.3GHz. Three dimensional radiation plot is also shown in this paper. The simple feeding technique used for the design of Dual I and F slot microstrip patch antenna which make this antenna a good choice in communication system. The design of proposed antenna is used in Wireless Communication Services, Radio Services and Wi-Fi application

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