A Review Paper On Design of Microstrip Antenna Performances For X-Band Application

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Abstract- *A redesign of compact microstrip feed monopole patch antenna for x-band (8-12 GHz) application is suggested. The basic antenna structure consist of rectangular patch with circular edges of corner on one side and square shape partial ground place at other side of substrate. The patch is etched on the center to provide batter radiation pattern and impedance bandwidth. The antenna operated frequency 9.9 – 10.5 GHz and resonates at 10.20 GHz for X-band application. The proposed antenna was simulated using HFSS (high frequency structural simulator).*

Keywords- Monopole antenna, Microstrip,X-band, patch antenna

I. INTRODUCTION

Antenna use for radiate electromagnet waves in different or various frequency or bandwidth. The role of antenna is very important for the wireless communications. In the recent year, field of antenna in modern communication systems interest is attached on microstrip antennas. The reason behind use of microstrip antenna is their significant characteristics - small size, light weight, low cost, thin profile, conformal to a shaped surface. The characteristics of microstrip antenna is made applicable for aircraft, satellite and wireless communication. Microstrip antenna also compatible with wireless communication integrated circuitry by simple feed methods, especially microstrip-line and coplanar waveguide feeds. The most serious problems of microstrip antenna is its narrow bandwidth and tuning for a particular resonant frequency for maximum gain. So Many works have been done on microstrip antenna and various methods are used to increase the bandwidth and gain of microstrip antenna.
In latest communication system X-band system has been considered and due to high speed connectivity almost recommended for applications in wireless communication. The X-band system frequency range is 8-12 GHz. By using band notched characteristics in X-band system interface problem is reduced.

Here a new design of reconfigurable microstrip monopole antenna is presented to operate in x-band applications. In the proposed microstrip monopole antenna element in order to achieve smaller size and highest gain in resonant frequency of signal band operation.

II. ANTENNA DESIGN AND CONFIGURATION

The proposed reconfigurable microstrip monopole antenna structure with its design is shown in Fig. 1 and its final modified design parameter values are presented in Table 1. The designed antenna is printed on an FR4 substrate with a thickness of 1.6 mm, permittivity of 4.4 and loss tangent of 0.018. The antenna structure consists of a rectangular ground plane other side of substrate. A microstrip feed-line and a radiating patch which itself consist of four circle arranged in square manner and microstrip feed-line is placed in center of the patch. The source is connected to center of feed-line for signal transmission,as can be observed in Fig.1.

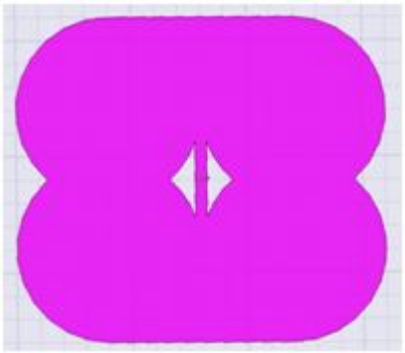

Fig. 1- microstrip monopole antenna structure.

Table 1- final modified design parameter values

No	Element	Parameters	Mm
1	Ground	L	45
		W	45
2	Substrate	L	45
		W	45
		H	1.6
3	Patch	L	15.5
		W	15.5
4	Feed line	L	0.5
		W	3.5

In the proposed antenna structure in order to design a single band antenna, instead of usingconventional rectangular or circular shaped patches a combination of four square manner arranged circles with a microstrip centered feed-line. Using this structure leads to surface current paths which results a particularresonance frequency. The initial radius of circles are chosen corresponding to the X-band frequency (lg/4 at center frequency band 10.2 GHZ) where lg is guided wavelength. To give more clear view about the design step of proposed antenna, various structure used in simulation are shown in Fig. 2.

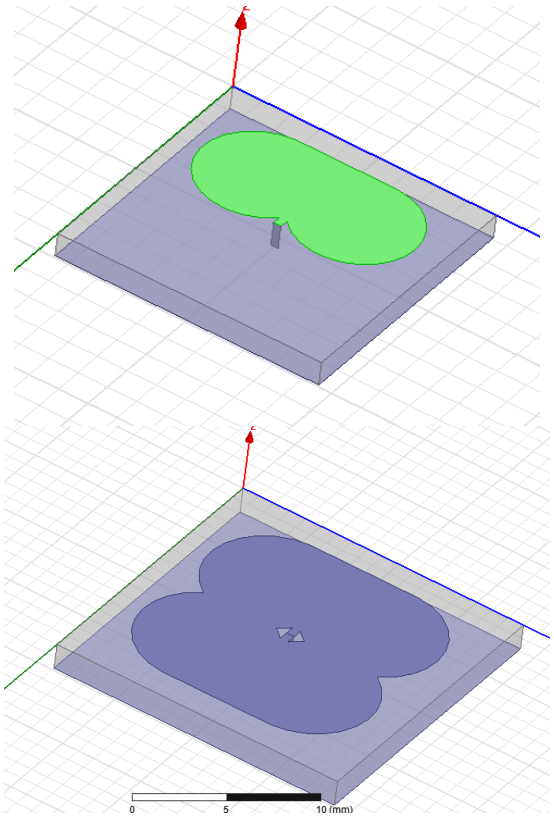

Fig. 2- Design step of proposed antenna

III. SIMULATIONS AND RESULTS

In proposed reconfigurable microstrip monopole antenna design, radiation patterns were simulated using Ansoft HFSS software. Among all the patch antenna design simulation and antenna combination analyzed, only one design were suitable for the Proposed X-band application: one featuring a single monopole. the simulatedDirectivity for the above design model are given as follows.

A. Return Loss

The patch design model graph plot of reflection coefficient (dB) vs frequency (GHz) for the depicted model is given as follows. From the Fig., it is designed that the proposed antenna resonates under one frequency 10.2 GHz with -34db return loss.At resonant frequency the bandwidth is 170 MHz .

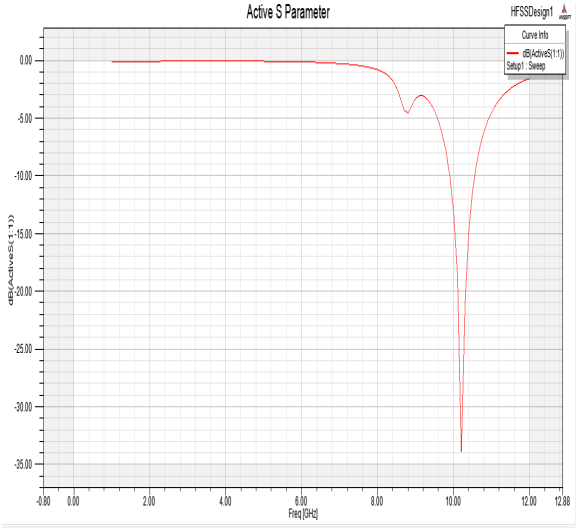

Fig. 3- S Parameter for proposed patch model.

B. Gain

The proposed antenna 3D polar plot for total gain calculation is given Fig.4a and Fig.4b. The gain is defined as the total power radiated in a particular direction for the transmitting antenna and is the total power received by the receiving antenna from a particular direction. At resonant frequency the total gain is given in Fig. 4a. By the simulated 3D polar plot the maximum value is 2.24 dB at resonant frequency.

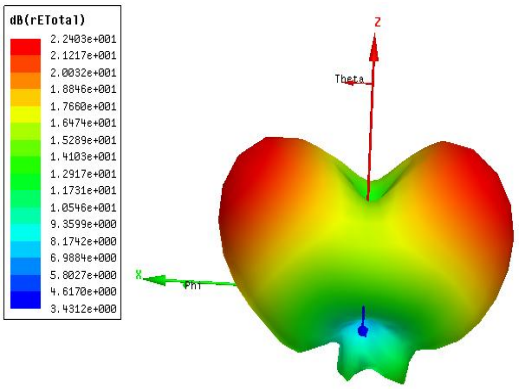

Fig. 4a- Antenna gain pattern

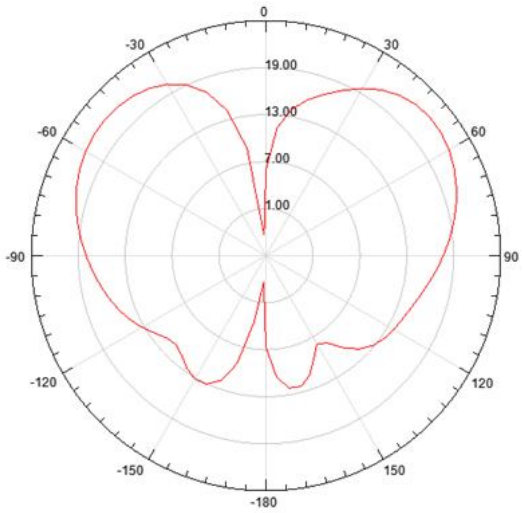

Fig. 4b- Antenna radiation pattern

IV. CONCLUSION

Microstrip patch antenna has rapidly growing wide area of research because of their light weight, low cost, smaller in size, easy to manufacturing and also an important thing is tune in any frequency by the design of antenna. In this paper, a compact microstrip patch antenna for X-band application is reported. The antenna has been designed and simulated using high frequency structural simulator (HFSS) software. The designing has been done reduced size of antenna and good directivity. The antenna is very thin and compact with the low dielectric constant substrate material. There feature are useful for high speed communication and due to small in size worldwide portability of wireless communication system.

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