Rectangle Shape Patch Antenna for Wireless Application

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Abstract

In this paper, a rectangular microstrip patch antenna is designed using HFSS software. The designed antenna has a resonating frequency of 10.58 GHz which is applicable to Wireless application. This paper shows the design considerations of the proposed antenna as well as the simulated results of the same. The design is made on FR-4 Epoxy material used as a dielectric material with its dielectric constant = 4.4 and thickness of 1.6mm

Key Words—*Micro Strip Antenna (MSA), return loss, Rectangle-slot*

I. INTRODUCTION

With the wide spread proliferation of wireless communication technology in recent years, the demand for compact, low profile and broadband antennas has increased significantly. To meet the requirement, the microstrip patch antenna has been a solution because of its low profile, light weight and low cost [1]. Microstrip patch antennas which are operating at millimeter-wave range are becoming more common to enter new niches of technologies in Bluetooth [2], Wi-Fi [3], WLAN [4] and many other wireless communication applications [5]. However, conventional microstrip patch antenna suffers from less radiation efficiency, narrow bandwidth, low directivity and gain due to surface wave loss and large and thicker substrate size configuration [2]. This poses a design challenge for the microstrip patch antenna designer to meet the broadband techniques [6]. Several techniques have been proposed to enhance the radiation efficiency in the state-of-the-art antenna research. The use of thick substrate, low dielectric substrate, multi-resonator stack configurations, impedance matching, slot antenna geometry and cutting a resonant slot inside the patch are the recently reported methods to increase the radiation efficiency and the directivity of patch antennas [7, 8]. There are many methods of microstrip antenna feeding have been demonstrated including co-axial feed, aperture coupling, proximity coupling. Among the methods, microstrip line feeding is an efficient feeding scheme because of its simple fabrication, easy connection to dielectric substrate and impedance matching property [9]. However, the thickness of the dielectric substrate deteriorates the antenna bandwidth efficiency by increasing surface wave and spurious feed radiation along with line feeding. Consequently, an undesired cross polarized radiation is led by feed radiation effects [10, 11]. Therefore, it is addressing from the wireless communication industry to optimizing the design of the microstrip patch antenna for achieving the maximum radiation efficiency

II. ANTENNA GEOMETRY AND DESIGN

Fig.1 shows the proposed antenna geometry consisting of dielectric substrate, patch as well as microstrip feed line. The rectangular patch is separated from the ground plane with FR-4 Dielectric substrate with the above shown dimensions. This antenna is designed to operate at around 10.58 GHz.. Designing and simulation is performed by using high frequency simulation software (HFSS).

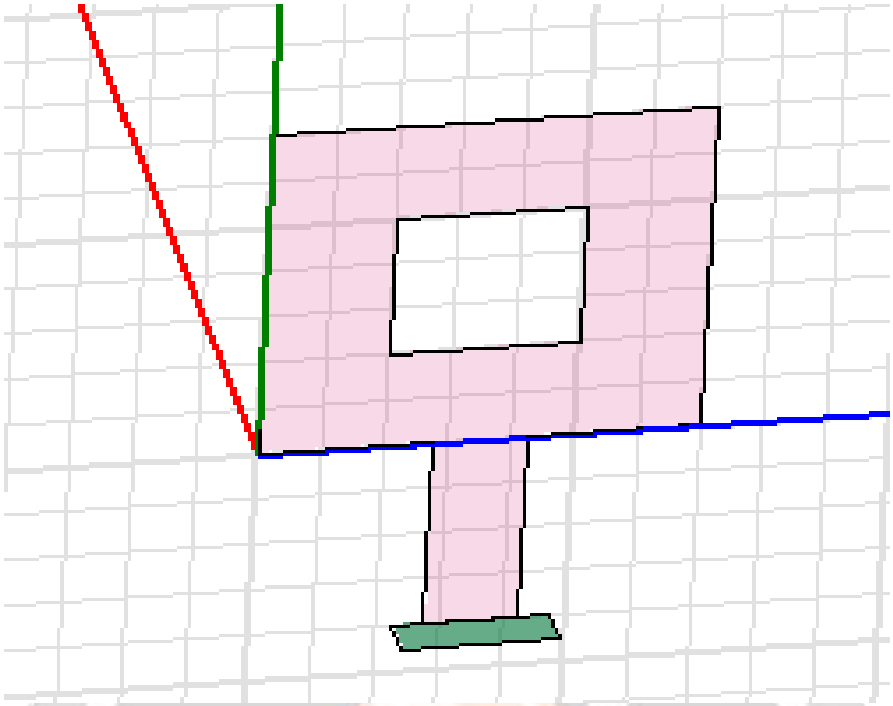

Fig. 1 Geometry of the antenna

III. SIMULATION RESULT

The simulation is carried out by using an Ansoft HFSS software. The antenna resonance frequency is 10.58 GHz with the size of the patch is 14 mm X 14 mm The area of ground plane is 25 mm X 25 mm. Fig 2. Shows the return loss of antenna and fig 3 shows the vswr of the antenna.

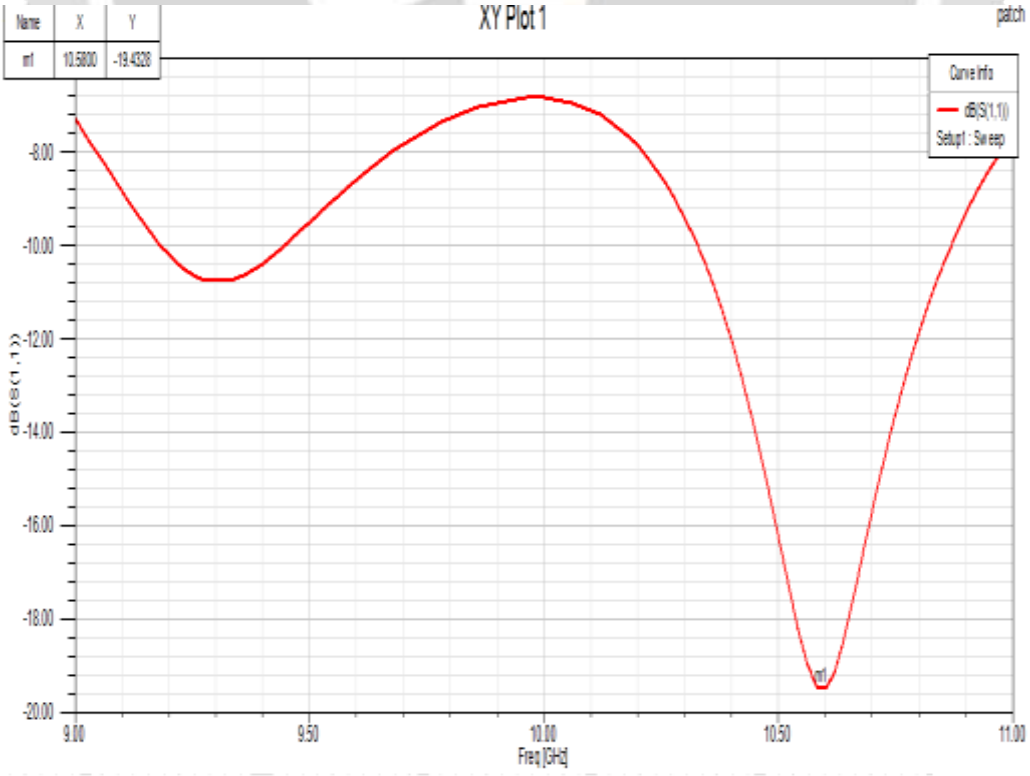

Fig. 2 Return Loss

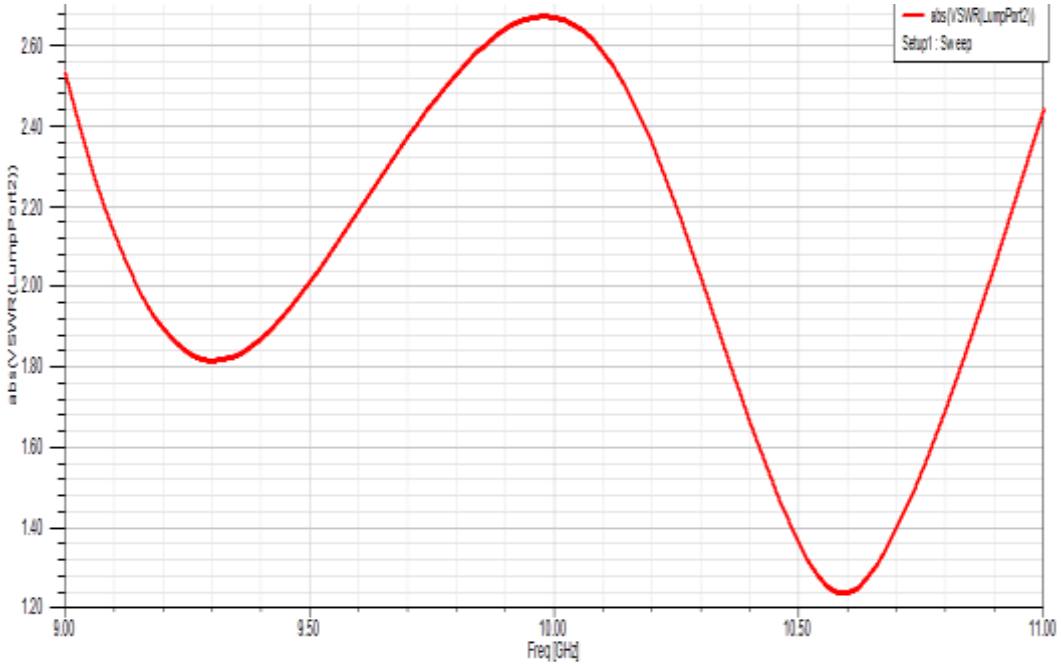

Fig. 3 VSWR

IV CONCLUSION

The proposed antenna is having the return loss of -19.5328 dB at 10.58 GHz. The designed MSA has been simulated on HFSS simulation software. Also for this antenna a sufficient bandwidth is introduced via the microstrip feed line at the desired resonant frequency of 10.58 GHz is achieved.

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