Design and Analysis of Rectangular Microstrip Patch Antenna for WLAN Applications

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Abstract : **The proposed design is analysis at dual frequency 5.4GHz and 7GHz with the good return loss -19.42dB and -14.93dB. The proposed design will be fabricated on FR-4 substrate which is low cost as well as substrate with 4.3 permittivity and 1.676mm thickness. The width and length of the proposed design was 30mm and 30mm, respectively, with simulated by using the CST software, improved the VSWR with 1.99 and 1.40 and fullfill the VSWR condition.**

Keywords : ***Rectangular microstrip patch antenna, return loss, polar plot***

I. INTRODUCTION

The patch antenna has been rapidly used in various fields like space technology, aircrafts, missiles, mobile communication, GPS system, and broadcasting [1]. Patch antennas are light in weight, small size, low cost, simplicity of manufacture and easy integration to circuits [2]. Recently, Microstrip antenna has widely used in communication system, industrial area, etc [3]. The Co-axial feed technique is used in the proposed design, due to low spurious feed radiation in this technique as well as supply the signal source in the microstrip patch antenna [4]. In microstrip patch antenna, there are many factors which is affect the performances of antenna such as size of the antenna, shape, room temperature, feed techniques, fabrication, etc [5]. The dielectric properties of the material provides valuable information about the storage and dissipation of electric and magnetic fields in materials and also provides insight into the feasibility of using the material in potential applications [6]. Dielectric loss (loss tangent or tan δ) quantifies a dielectric material's inherent dissipation of electromagnetic energy [7]. Dielectric losses depend on frequency and the dielectric material [8]. The ionic conductivity of materials will contribute to the dielectric loss Microwave techniques and instrumentation can be utilized in agriculture to improve the efficiency of the crop production, handling and processing, and improve the quality of the products [9-11].

II ANTENNA DESIGN

The proposed rectangular microstrip patch antenna (RMPA) is simulated with the help of CST software and the sensor is designed on a FR4 substrate with 1.676 thicknesses, which has a relative permittivity of 4.3 and loss tangent of 0.001, to obtain the 50Ω characteristics input impedance[12-14]. The geometry of microstrip patch antenna as shown in table 1.

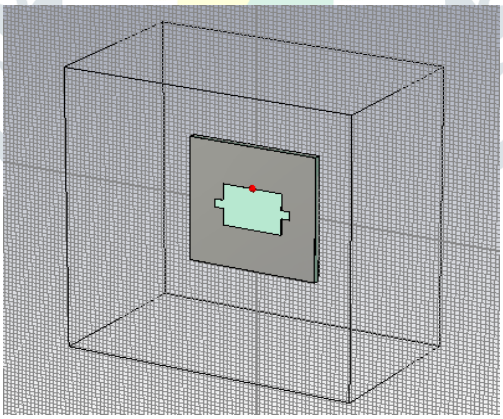

Fig.1. Microstrip patch antenna

TABLE 1. Geometrical parameters of the proposed antenna

Parameters	Design measurement
Length of ground (L_g)	30mm
Width of ground (W_g)	30mm
Substrate Relative permittivity (ε_r)	4.4
Substrate Length (mm)	30mm
Substrate Width (mm)	30mm
Substrate Height (mm)	1.676mm

III RESULTS AND DISCUSSION

The microstrip patch antenna designed at dual frequency 5.4GHz and 7GHz with the good return loss -19.42dB and -14.93dB as shown in figure 2, to illustrate the simulated result attributed to the effect on return loss and discussed the other parameters such as magnitude, phase and polar plot of proposed antenna as shown in figure 3, 4 and 5.

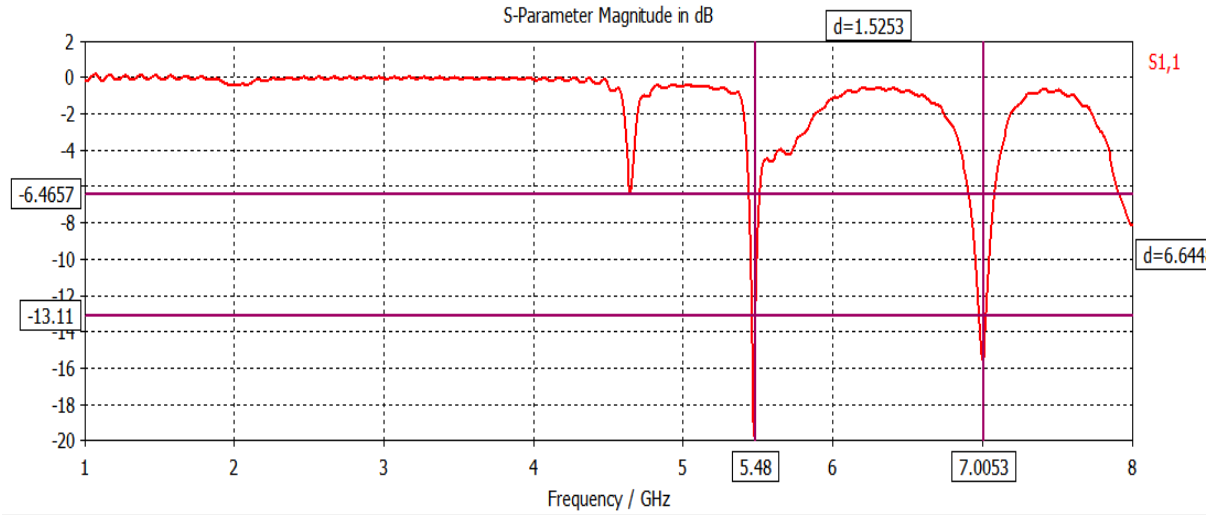

Fig 2. Return Loss of microstrip patch antenna

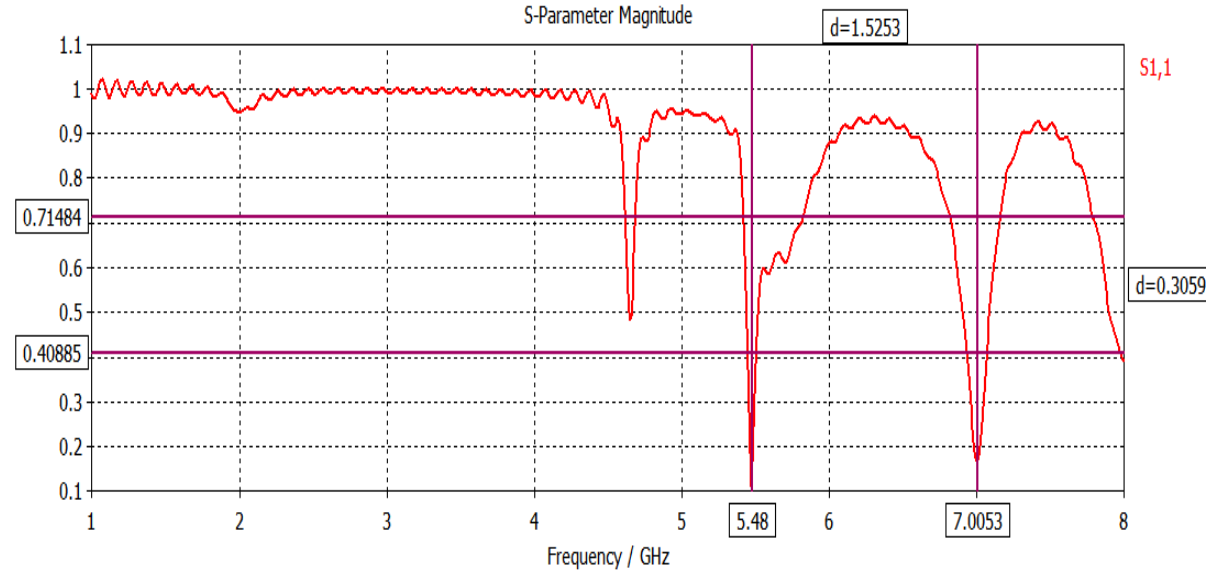

Fig.3. Magnitude of microstrip patch antenna

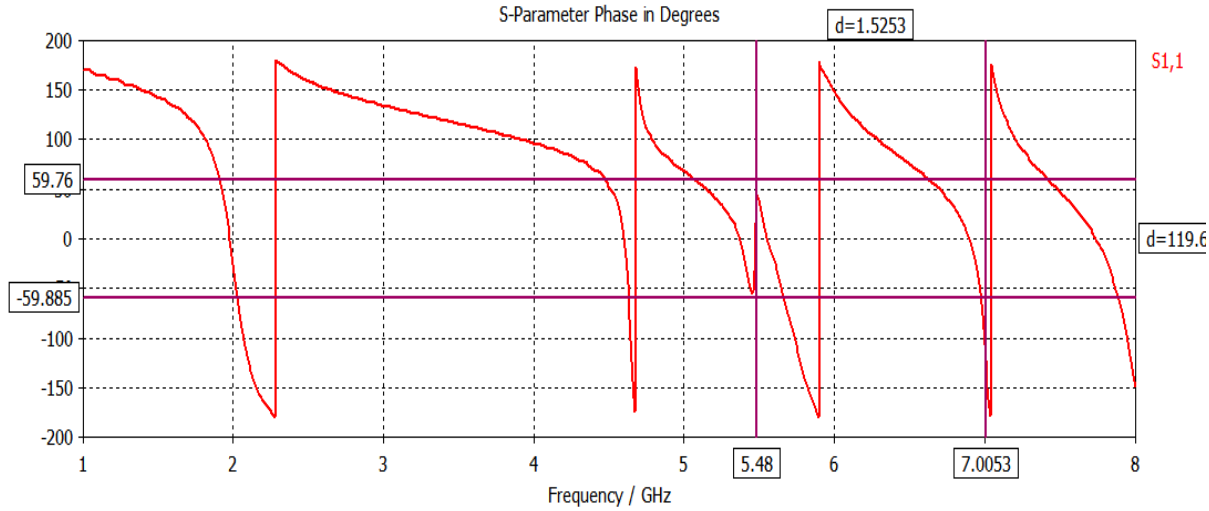

Fig..4. Phase of microstrip patch antenna

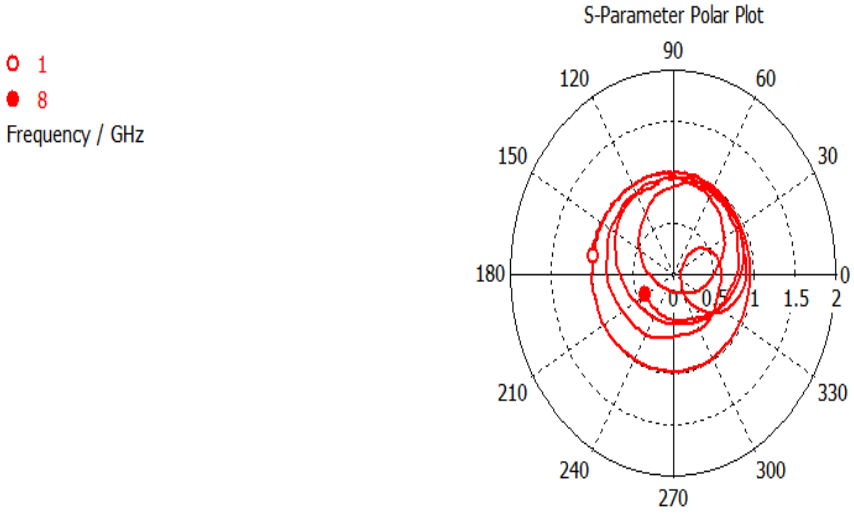

Fig..5. Polar plot of microstrip patch antenna

IV. CONCLUSIONS

The rectangular microstrip patch antenna (RMPA) for WLAN applications with the better results such as return loss, VSWR, magnitude, phase and polar plot discussed in this paper. The proposed antenna is designed with compact size, simple topology, low insertion loss and able to achieve the high sensitivity.

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