Linearly Polarised Microstrip Antenna for WLAN Applications

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Abstract

A novel compact linearly –polarized square microstrip antenna with four slits and rectangle notches at four corners is proposed . The center frequency of the microstrip antenna operates at 6GHz and it has about 4% bandwidth with VSWR<2. The design and performance of a linearly polarized microstrip patch antenna, for the application in Wireless Local Area Network, are reported here. The aim is to design and fabricate an inset fed rectangular Microstrip Antenna and study the effect of antenna dimensions length,, width and relative dielectric constant, substrate thickness on radiation parameters of band width.

1. Introduction

The well-known method of producing a single-feed linearly polarization operation of the square microstrip antenna with four slits and rectangle notches at four corners is widely used in single-patch and array designs. In this paper we demonstrate that such a method can also be applied to a modified square microstrip patch with four inserted slits of equal lengths to achieve a compact LP operation with relaxed manufacturing tolerances. The compactness of the proposed LP design is achieved due to the inserted slits at the centre of the square patch. These inserted slits can result in meandering of the excited fundamental-mode patch surface current path, which effectively lowers the resonant frequency of the modified square patch, similar to the design using four inserted slits of different lengths at the boundary of a square patch. Instead of using different slit lengths for LP excitation which usually requires a very small slit-length difference for the case of large antenna-size reduction, the present design uses the perturbation of four rectangular notches at patch corners, with the inserted slits to be of equal lengths. This behaviour gives the present design a relaxed manufacturing tolerance for achieving a compact linearly polarized microstrip antenna. Details of the proposed compact LP design are described, and typical experimental results are presented and discussed[3].The need for wireless broadband communications has increased rapidly in recent years demanding quality of service, security, handover, and increased throughput for the Wireless Local Area Networks (WLAN).. In the paper, new designs of using a single-layer slit and four rectangular notches corners square microstrip antenna for achieving reduced-size dual band LP radiation has been proposed.

2. Antenna Design

The proposed antenna is shown in Fig. 1. The antenna parameters are also given . The antenna is mounted on a air substrate and fed by a coaxial transmission line. Convergence was tested for each case separately in terms of evaluating S11 (dB) at a dual frequency for a number of times. Once convergence was obtained, simulations were conducted in order to obtain swept frequency response extending from 5 to 10 GHz. The swept response gave us the S11, which was used to calculate the VSWR referred to a 50 Ω transmission line. After that radiation pattern was computed [5].

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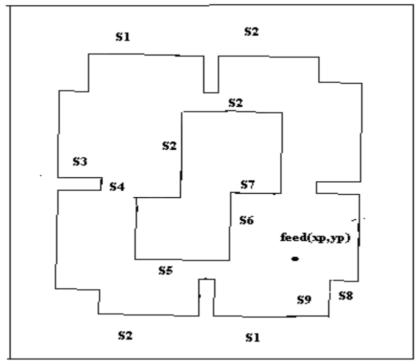

Fig.1 Antenna geometrical configurations parameters are:s1=8mm,s2=7mm,s3=3mm, s4=1mm,s5=6.5mm,,s6=5.5mm,s7=3.5mm,feed location (xp,yp)=(6.7,6))

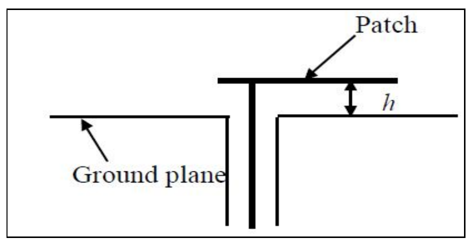

Fig.2 feed position h=2.5 mm, εr=1.0.

3. Result and Discussion

3.1 VSWR

The BW is usually specified as frequency range over which VSWR is less than 2.

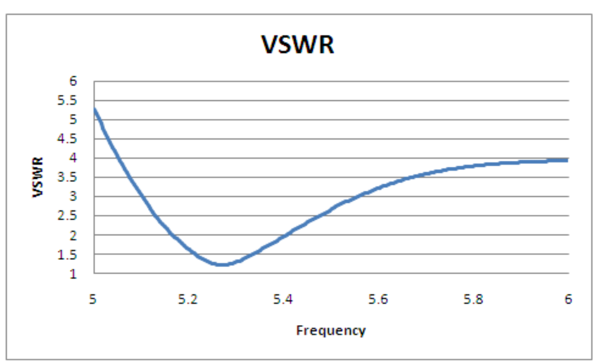

Fig.3 VSWR verses frequency

The fig.3 shows the graph of frequency verses VSWR it shows that the antenna has VSWR less than 2 in the frequency range of 5--6GHz which is required.

3.2 Return loss

The return loss and the isolation at the inputs of the antenna are shown in Fig.4 and indicate an operational range between 5 to 6 GHz we get BW 4% (VSWR < 2). At the frequency of 5.27 GHz VSWR is around 1.21 and return loss is -20.2 dB

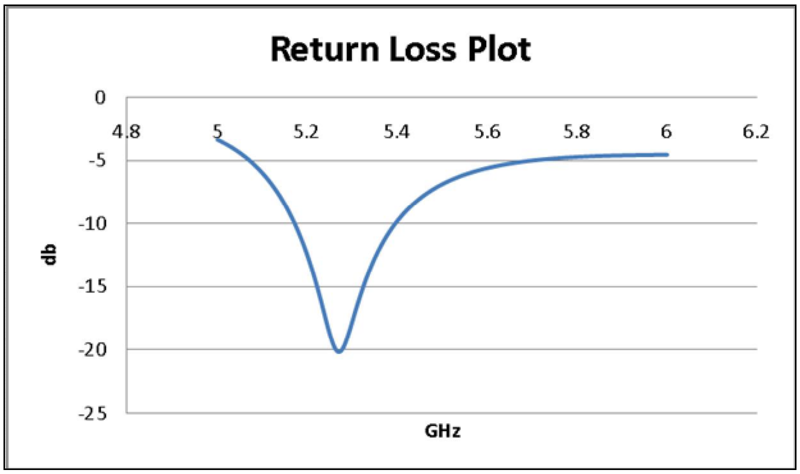

Fig.4 Return loss plot

3.3 Radiation Pattern

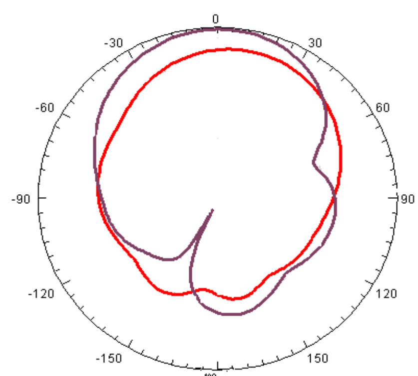

Fig.5 Radiation Pattern

Fig. 5 gives the radiation pattern of the designed antenna The above antenna geometry will allow one to obtain linear polarization of the radiated field with increased bandwidth by appropriately driving input port at the diagonal. Fairly low cross-polarization levels are obtained by virtue of the symmetrical arrangement devised for the antenna,.

4. Conclusion

The principles of design of a dual band linearly polarized microstrip antenna for the application in WLAN is described. The variation of performances of the antenna with the change of stub length dimension and corner truncation dimension are also reported here which are important information for proper design of the antenna. The simulated and experimental results on proposed linearly polarized microstrip antenna show that return loss bandwidth at the centre frequency 5.25 GHz WLAN band.

5. References

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