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Linearly polarized wide-band microstrip antenna

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Abstract A new patch geometry, originally proposed for compact microstrip patch antenna, has been investigated experimentally and through computer simulation for broadband operation It has been found that for a given feed position the antenna offers a 2 . 1 VSWR bandwidth of 6 76%, which is greater than three times the bandwidth of a conventional rectangular microstrip patch antenna The antenna is linearly polarized with 3 dB beamwidth ~75°.

Keywords . Microstrip antenna, VSWR bandwidth, computer simulation

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1. Introduction

In a recent communication [1], a compact microstrip antenna has been reported. In the said paper the authors used a patch geometry which gave the conventional rectangular microstrip antenna characteristics with a patch dimensions much smaller (~35%) than that used for rectangular microstrip antenna of the same resonant frequency. The same geometry has been utilized here to realize broadband characteristic by a simple coaxial feed connected at a suitable location.

2. Antenna configuration and design

The details of the design of the proposed antenna is as described :

Initially a rectangular patch of sides (W = 2.26 cm, L = 2 cm, resonant frequency = 5 GHz) is taken [2]. From the patch are removed two isosceles right angled triangle (AEC and BFD) of dimensions base = L, height = $L/2$ as ahown in Figure 1. The patch is fed at a distance of 2/3 of any of the sides AE, CE, BF or DF from the respective corners *i.e.* A, B, C and D. The substrate thickness is h = 0.1524 cm and relative dielectric constant ε_r = 2.5.

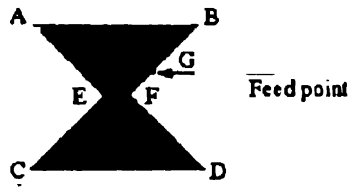

Figure 1. Geometry of the proposed linearly polarised wideband microstrip antenna Resonent frequency (Fr.) = 5.0 GHz, ε_r = 2 50, substrate thickness (h) = 0 1524 cm. AB = CD = 2.3 cm, AC = BD = 2 cm.

3. Experimental measurement

The impedance pattern of the antenna has been measured using HP 8410B -- network analyzer. The impedance is shown in Figure 2. The 2 : 1 VSWR bandwidth is seen to

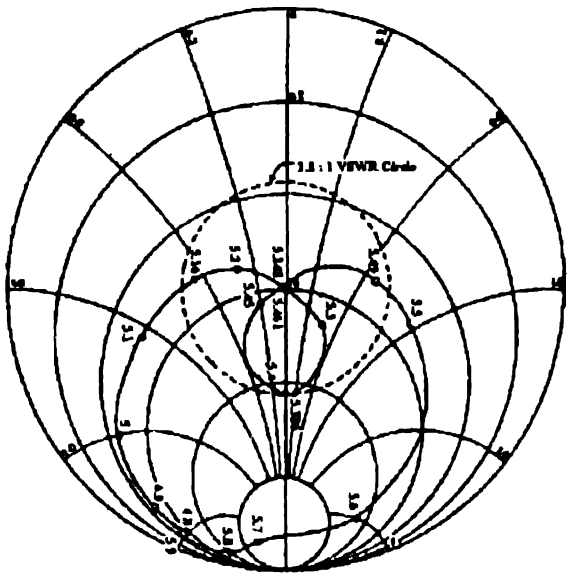

Figure 2. Impedance pattern of the antenna.

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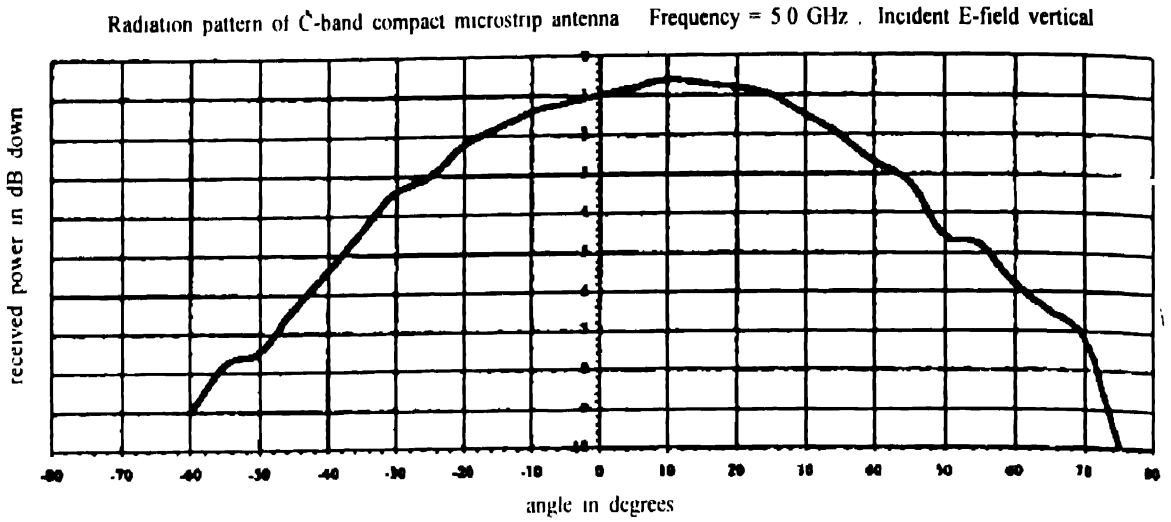

Figure 3. Radiation pattern of the antenna

be 6.76% of the centre frequency and the same is achieved without any matching network. The radiation characteristics of the antenna have also been measured. The co-polar pattern is shown in Figure 3. From the Figure 3, it can be seen that the co-polar radiation pattern is broad having 3 dB beamwidth of 75°. The cross-polar component is down by >10 dB in the broad side.

4. Simulation results

The said antenna radiation characteristics have been simulated using HFSS from ANSOFT Corporation The geometry used for performing the simulation is as shown in Figure 4 The

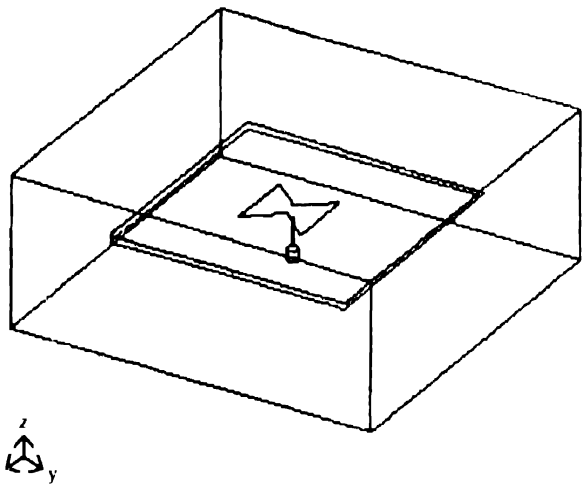

Figure 4. Geometry used to perform the Simulation

simulated far field patterns are shown in Figure 5. It can be seen that the simulation results matches with the measured co-polar pattern.

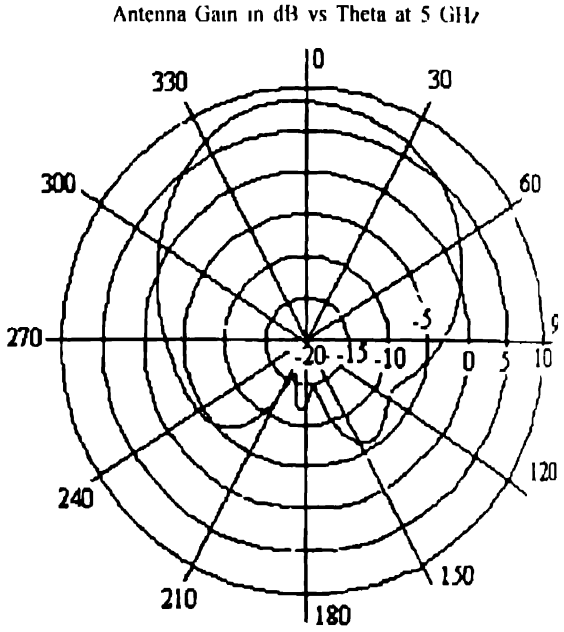

Figure 5. Simulated for field pattern

5. Conclusions

The proposed antenna can be used as a broadband linearly polarized antenna. By modification of patch geometry suitable location of feed, the antenna gives relatively large 2 : 1 VSWR bandwidth without any additional matching network.

References

[1] Jacob George, C K Anandan, P Mohanan and K G Nair *IEEE Trans Antennas Propagat* **46** 1712 (1998)

[2] I J Bhal and P Bhartia *Microstrip Antennas* (Derham Artech House) (1981)