ENHENCE BANDWIDTH OF IRREGULAR PENTAGONAL SLOTTED PATCH ANTENNA FOR WIRELESS APPLICATION

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Abstract –In This paper simulations of an irregular pentagonal slotted microstrip patch and measurements of their characteristic. Microstrip Antenna works at various frequencies, this paper has a very important role to development of Microstrip Antenna because the simulation has been done at a frequency on which many important communication devices are working i.e. 2.0 GHz, wireless communication and many other communication devices are working on 2.0 GHz frequency, the proposed microstrip antenna has a bandwidth of 54.5%, the VSWR is less than 2 and antenna gain is 3 to 4dBi.

Keywords: Pentagonal, slotted, wireless communication, IE3D software,

Introduction- Microstrip patch antennas are most preferred antennas because they can be printed directly onto a circuit board. Microstrip antennas are becoming very popular within the wireless communication. Patch antennas are low cost, have a low profile and are easily fabricated. Many types of antennas exist today, each one having its special characteristics and benefits. Our research is on Irregular pentagonal Microstrip Patch Antenna. Microstrip patch consists of a radiating patch of any planar geometry on one side of a dielectric material substrate and the other side is ground plane .In this paper, an irregular pentagonal slotted patch antenna is proposed with enhanced bandwidth. The antenna resonates at 2.0 GHz frequency with an enhanced bandwidth of 54.5 % and the maximum return loss is -25 db.

This irregular polygon has been designed to achieve more and more bandwidth for 2.0 GHz of frequency.

To increase the bandwidth, traditional technique is slot cutting has been used and then dig a slot of 2mm. by 5 mm., on X=22.5mm, Y=42mm respectively

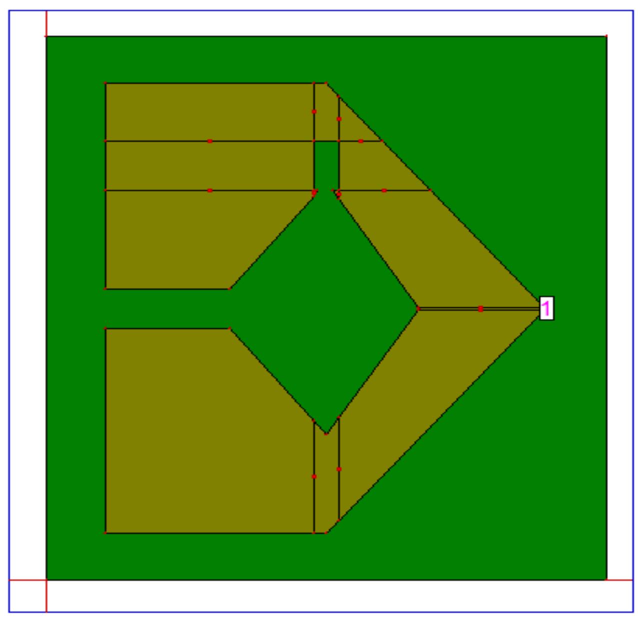

Fig. 1. Geometry of Proposed Antenna

Antenna designing- Microstrip antenna has a fixed and sophisticated procedure of designing, in which first step is to calculate the width and length of the resonating patch[5] and then the calculation of the Width and Length of the ground plate is to be done, values of W and L of the radiating patch for 1 GHz is

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91.27 mm. and 71.31 mm. respectively and then *Wg* and *Lg* can be calculated with the formulas.

$$W = \frac{c}{f_r\sqrt{\frac{\varepsilon_r + 1}{2}}}$$

W=45.6 mm.

Where ε_{eff} = effective dielectric constant and Δl = line extension which is given as:

$$\varepsilon_{eff} = \frac{(\varepsilon_r + 1)}{2} + \frac{(\varepsilon_r + 1)}{2}\left[1 + 12\frac{h}{W}\right]^{-\frac{1}{2}}$$

$$\frac{\Delta l}{h} = 0.412\frac{(\varepsilon_{eff} + 0.3)\left(\frac{W}{h} + 0.264\right)}{(\varepsilon_{eff} - 0.258)\left(\frac{W}{h} + 0.8\right)}$$

$$L = \frac{c}{2 f_r \sqrt{\varepsilon_{eff}}} - 2\Delta l$$

L = 35.4 mm.

$Wg = W + 6(h) = 45.6 + 6(1.6) = 55.2$ mm.

$Lg = L + 6h = 35.4 + 6(1.6) = 45$ mm.

IE3D Simulation Results

Zelands simulation Software's IE3D is a platform where we can find out the performance of the antenna few important parameters of the proposed design are calculated and find as below

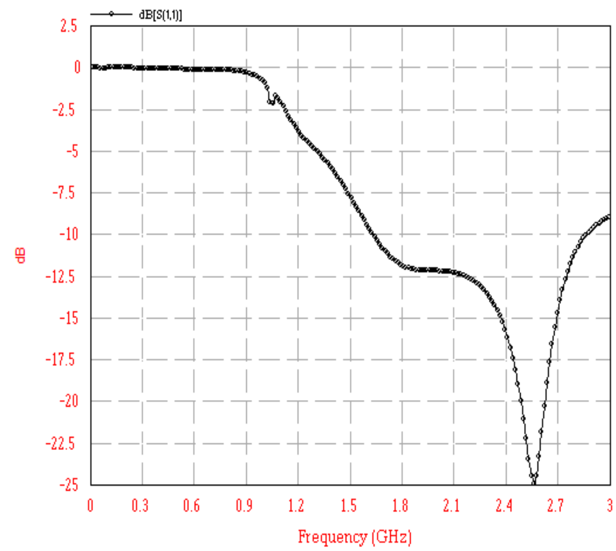

Fig.2. Return Loss vs Frequency

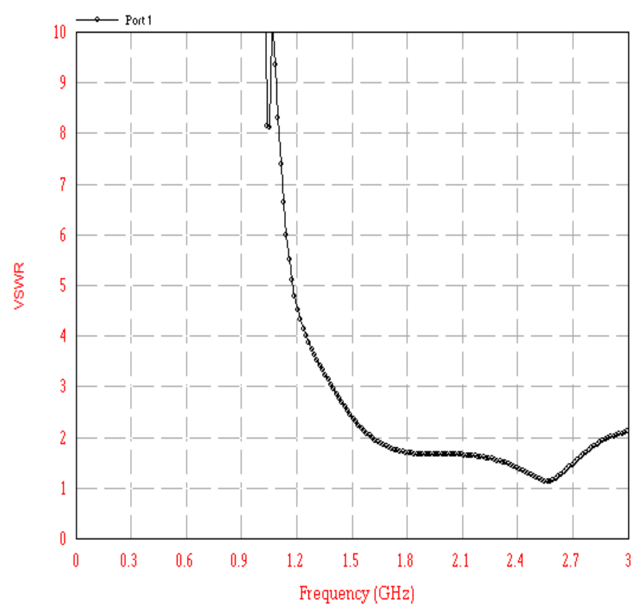

Fig.3. VSWR Vs.Frequency

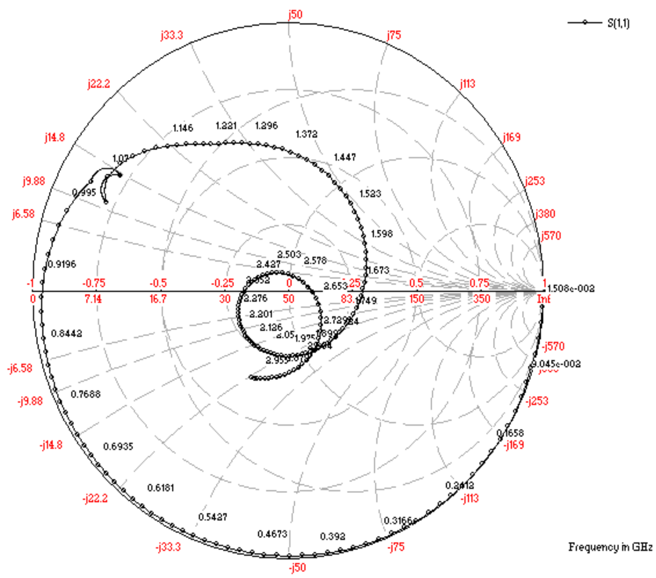

Fig.4. Smith Chart of Proposed antenna

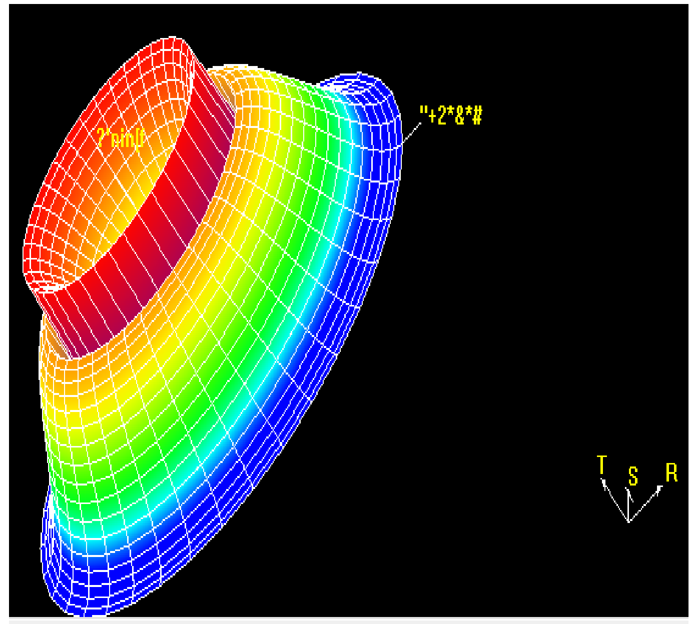

Fig.6. 3D Radiation Pattern of Proposed Antenna

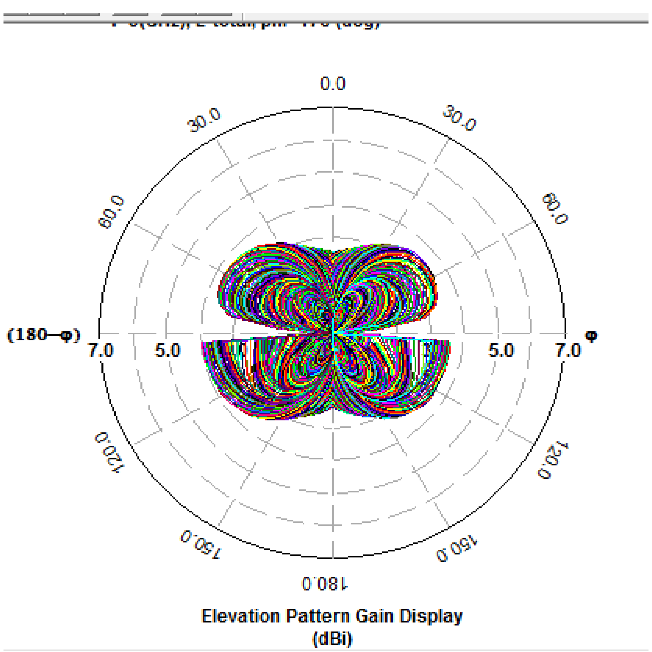

Fig.5. 2D radiation Pattern

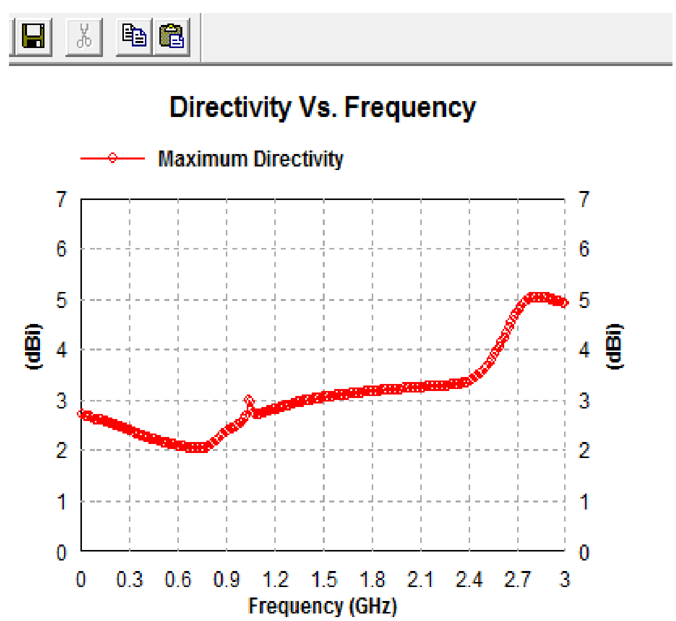

Fig.7. Directivity Vs. Frequency Graph

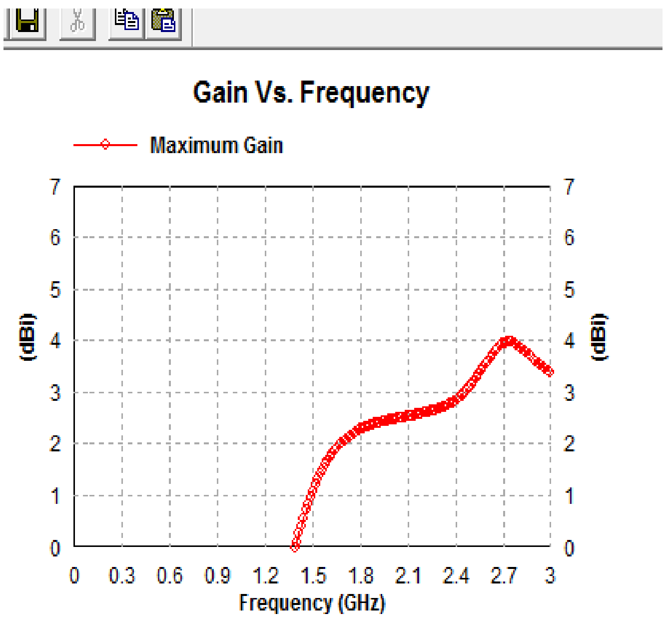

Fig.8. Gain vs. Frequency graph

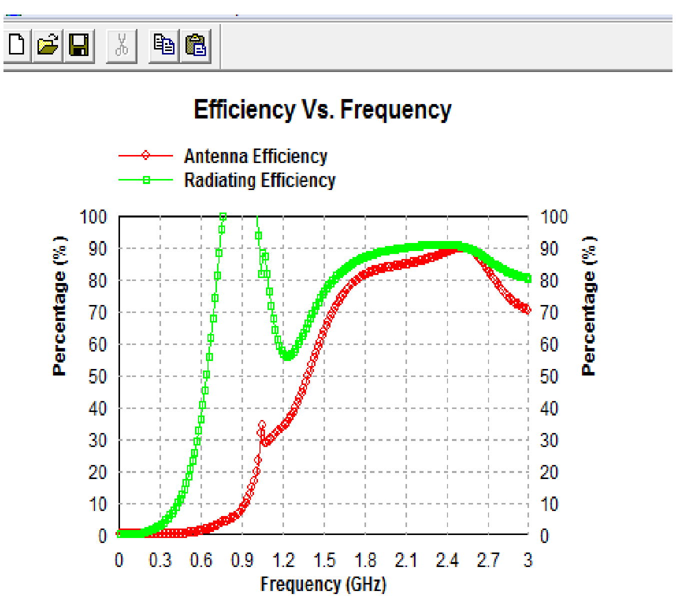

Fig.9. Efficiencies Vs. Frequency Graph

Conclusion – This paper has designed a microstrip irregular pentagonal slotted antenna for 2.0 Ghz applications, the band gap frequencies F_l = 1.62 Ghz and F_h = 2.87 Ghz and the total bandgap of 1.25 Ghz (54.5 %) The slotting can increase the impedance bandwidth .The maximum value of the return loss is -20.64dB and at 1 Ghz the value of return loss is -25.5 and the VSWR is less than 2 and the antenna is linearly polarized .

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