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DESIGN OF PENTAGONAL SHAPED MICROSTRIP PATCH ANTENNA WITH SLOT

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ABSTRACT

Development of pentagon microstrip patch antenna is discussed in this article. There is presently a very significant demand from the end user for wide-bandwidth integrated wireless devices. The antenna suggested is for multiband applications. More frequency bands are required to satisfy the wireless devices' service requirements. As a result, more competition for multiband antennas continuously emerged day-bay day. For eg, GSM, WLAN, GPRS, UMTS are typically wireless communication devices with dual band or multiband standards. The pentagon slot is added in our proposed antenna to achieve more bands for multiband applications, and gain can be increased. Because of their simple planar configuration and compact construction these antennas are fairly easy to produce. These are light in weight and can combine with other microwave circuits. It has a radiating patch on one side of a dielectric substrate and on the other side a ground layer. The patch is usually made of material such as copper or gold, and may take any shape. Microstrip patch antennas are growing in popularity due to their low-profile structure for use in wireless applications.

INTRODUCTION

Microstrip patch antennas are becoming increasingly useful because they can be directly printed on the circuit board. Within the mobile market, microstrip antennas are becoming very popular. Patch antennas are low priced, have low profile and are easy to produce.The patch antenna, microstrip transmission line, ground plane is made of material with a high conductivity. The patch measurements shall be selected according to the criteria for frequency and radiation characteristics. The height H is usually lower than the operating wavelength, but should not be less than 0.025 of a wavelength, or antenna performance would be reduced.

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LITERATURE SURVEY

Literature review on microstrip patch antenna It provides clearer linearly polarized microstrip patch array antenna with resonant frequencies at 28.9 and 29.4 with the aid of this literature review. State-of-the-art antenna technology displayed all over the country. For vehicle applications, L.Economou et al. present circular microstrip patch antennas on glass[1]. The literature review covers three main fields of reading. What are antenna architecture, methods to boost microstrip patch antenna efficiency and Research Paper on: "A novel stacked wideband microstrip patch antenna with u-shaped parasites"[2]. A novel wideband microstrip literature review A rectangular microstrip patch antenna that exceeds The output of an elliptical patch antenna in this paper is. Printed radiators for the microstrip were first suggested as early as 1953.

Using microstrip structures to radiate electromagnetic waves Feb 22, 2015, review of the literature. Alsath et al.[1] have suggested an approach for improving isolation in antenna arrays of microstrip patches. It's a flaw. Index words — Microstrip patch antenna, Ultra Wideband, Operating frequency, Themicrostrip literature survey of antennas is listed in this portion.

The most recent work in printed reception apparatus innovation focuses to the advancement of radio wires that address the issue for smaller correspondence contraptions with low profile. Around the globe, reception apparatus fashioners center around creating lightweight recieving wires with successful radiation qualities. The accompanying modules incorporate a point by point diagram of advancements around the globe in best in class, printed radio wire innovation.

Waterhouse et al. present structure and productivity of Small Printed Antennas in [5]. In this paper, widely explore electrically little microstrip patches which coordinate shorting posts. These reception apparatuses are perfect for handsets with versatile interchanges where the little recieving wire size is a premium. Strategies are introduced to improve the transmission capacity of these reception apparatuses, and drifts in execution are recognized. From these patterns is given important understanding into the ideal plan, to be specific wide transmission capacity, little size, and simplicity of creation.

Colburn et al.[9] present fix radio wires on remotely punctured high-dielectric steady substrates[9]. This paper presented the idea of outside foundation puncturing and applied it to a fix recieving wire to help reduce the drawbacks of thick, high dielectric steady substrates without trading off the scaling down or transmission capacity of the fix segments. The expansion of the outer aperture upgraded a fix reception apparatus' far-field radiation design on a genuinely thick foundation with no lessening in data transmission or increment in fix size. The creators found that due to bordering fields the aperture must not be excessively near the surface, or the full recurrence will climb. It was additionally indicated that the area wherein the aperture starts or closures has

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some impact on the example of radiation in the far-field.

Martinez-Vazquez M et al present coordinated planar multiband radio wires for individual correspondences handsets. Triple band activity was cultivated by consolidating prod line methods with parasitic patches, while the utilization of an extra opening presents the fourth reverberation with sensible yield without raising reception apparatus volume so a quad-band recieving wire is acquired A straightforward impedance coordinating system is proposed by Jeen-sheen Row for fix radio wires took care of by coplanar microstrip-line. The thunderous info opposition of the edge-took care of fix reception apparatus can be effortlessly tuned to 50 pieces by embeddings a shorting through the opening at a reasonable area. From the determined outcomes clearly the area of the through gap is particularly connected with the length of the fix radio wire's emanating edge. The proposed method is more flexible than the supplement microstrip line feed for structuring the fix recieving wire at a restricted territory. What's more, the size required is more conservative than utilizing the quarter frequency transformer or the line of shunt stub.

Application Technique There is currently an extremely noteworthy interest by the end buyer for low-volume, wide transfer speed upgraded remote information. Pentagon microstrip fix radio wires are picked for those standards. Pentagon fix radio wires are considered for multiband applications in this examination.

Model PARAMETERS OF PENTAGON PATCH ANTENNA A fix radio wire for the pentagon is recreated. A plane geometry of the conventional fix span Rp (fix sweep) = 13 mm is imprinted on the base of the dielectric material FR-4 with l/w (length/width) = 52 mm/46 mm and thickness (h) = 1.6 mm. The dielectric steady for the base is γr = 4.4 and has a digression loss of 0.002. The radio wire is energized by the microstrip feed line L (length) = 25 mm and w (width) = 2.8 mm. Figure.4.1 delineates how a pentagon fix reception apparatus is constructed.

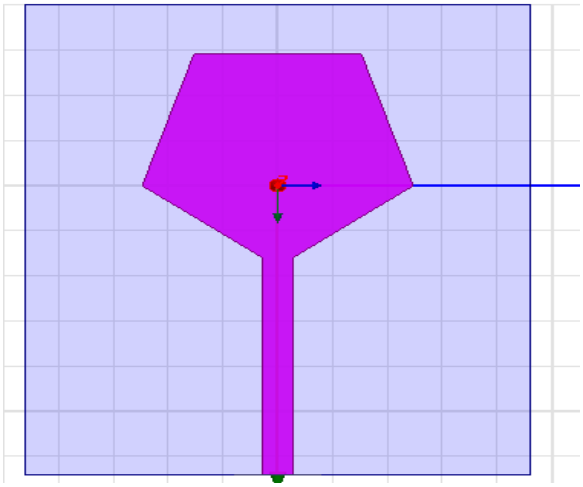

Fig.1 Structure of Basic Pentagon Patch Antenna

DESIGN EQUATIONS

To design a microstrip patch antenna, we have to choose the resonant frequency and a dielectric medium to design antenna for. The measurement parameters are as follows.

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The patch width is determined using the equation below

$$W = \frac{v_o}{2f_r}\sqrt{\frac{2}{\varepsilon_r + 1}} \quad (1)$$

One important parameter in the design procedure of a microstrip patch antenna is the effective refractive index value of a patch.

The effective dielectric constant is determined by means of the following equation.

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

The length (L) of the patch is now to be calculated using the below-mentioned equation

Δl=0.412h((ε_{eff}+0.3)[W/h+0.262])/((ε_{eff*}0.258)[W/h+0.813]) (3)

L=L_{eff}−2Δl (4)

Where,

L_{eff}=c/(2f_o √(ε_{eff})) (5)

Δl =fringing field

ε_{eff}=effective dielectric constant

RESULTS

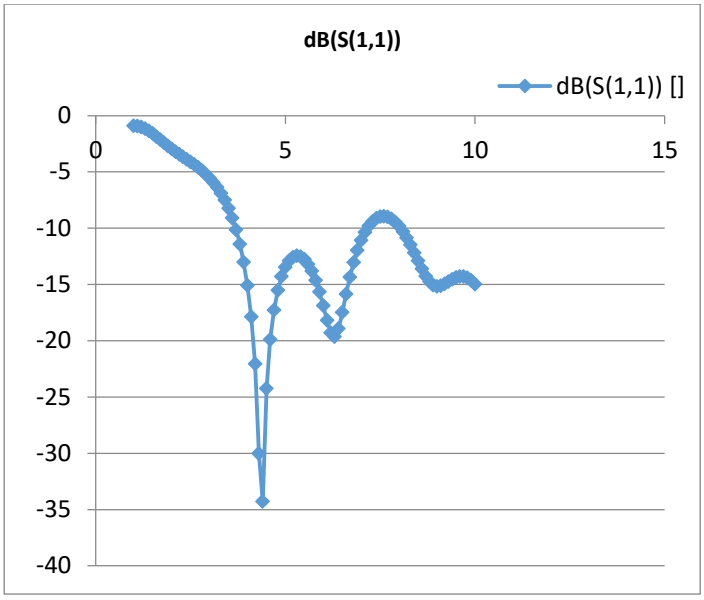

Fig.2 Return Loss (Before Optimization)

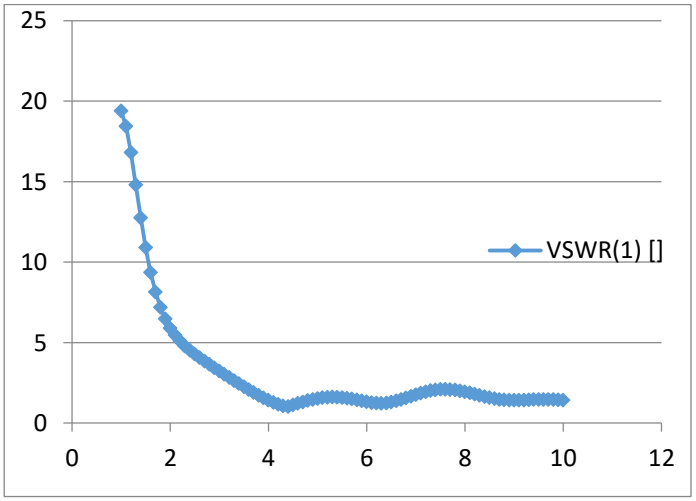

Fig.3 VSWR (Before Optimization)

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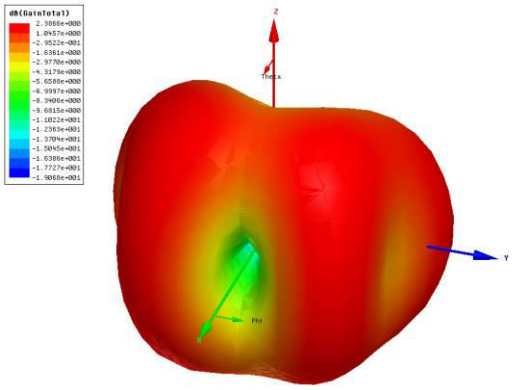

Fig.4 Gain (Before Optimization)

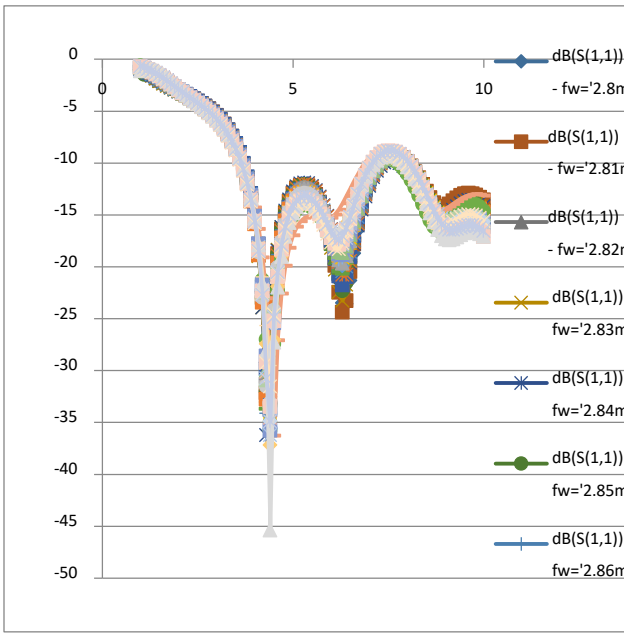

Fig.5 Return Loss (Optimized)

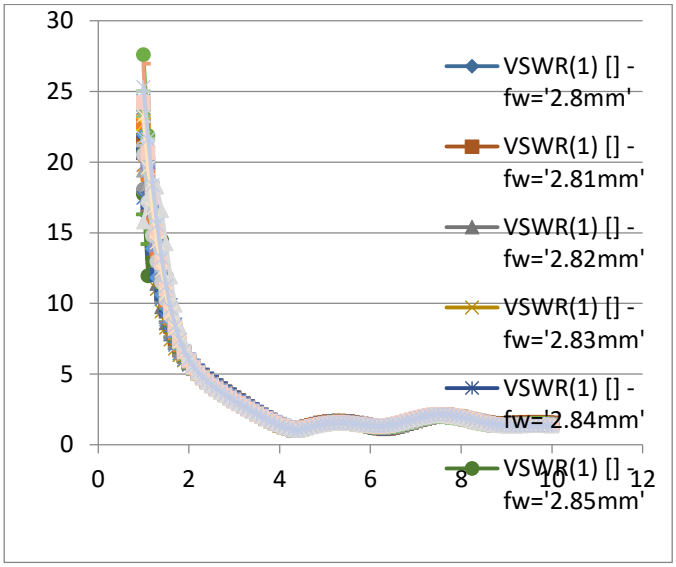

Fig.6 VSWR (Optimized)

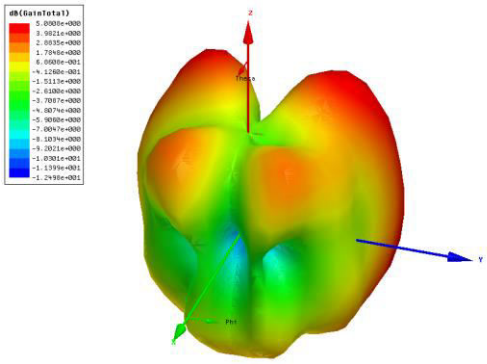

Fig.7Gain (Optimized)

CONCLUSION

In this paper it is called the Pentagon patch antenna. Pentagon patch with slots has been planned and tested to boost performance characteristics.Basic pentagon patch antenna has a 4.43dB gain, and VSWR bandwidth below 2 for this antenna is 2-5.6GHz, 7.8-10GHz, 11-11.8 GHz. Pentagon slot antenna gains 4.5 dB and VSWR<2 bandwidth is 2.5-8 GHz, 6.4-9 GHz, 10.2-11.1 GHz, respectively.

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Here the Pentagon patch antenna is tested with different feeding and grounding techniques. It is evident from the results that a Pentagon patch antenna with center feed and partial ground performs better than other designs presented in the paper.

Pentagon patch antenna with a 'pentagon' shaped slot covers four frequency bands. It can also be used for Multi-Band applications.

RESERVIES 1. Section three. Radiation and Antennas-Antennas and Wave ... "https:/www.safaribooksonline.com/view/antennas-and-wave/9789332508163/x....N.p., n.d. Web. 05 Apr. 2017 < https:/www.safaribooksonline.com / library / view / antennas-and-wave/9789332508163/x>. answers / follow-represents-ma>. 2. https:/www.scribd.com/doc/22406184/Antenna-definition" Antenna Definition Antenna (Radio). Apr 05 2017 < http:/www.iosrjournals.org / iosr-jap / papers / Vol6-issue3/Version-3/C06332438.pdf>.

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