DESIGN AND SIMULATION OF ULTRA WIDE AND NARROW BAND ANTENNA FOR C-BAND AND X-BAND APPLICATIONS

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ABSTRACT: *In this design we are using wide and narrow band antennas. Here same substrate is used for wide band spectrum sensing and narrow band for communication. The range of UWB is 3.1 GHZ to 10.6 GHZ which is approved by FCC. We are changing the different patches like elliptical, circular, and hexagonal. In both circular and hexagonal patches, it acts as ultra-wide band antenna but in elliptical patch it acts as narrow band antenna. The antenna design is simulated on CST MWS. The FR4 material is used as substrate with a dimension of 42mmx50mmx1.6mm. On the basis of S-Parameters and Radiation pattern of the antennas, the designed antennas are envisioned to be established for the following applications; C-Band and X-Band applications.*

***KEYWORDS**: Circular patch, Hexagonal patch, Elliptical patch Micro strip antenna, Return loss, UWB and NWB antennas, CST Software.*

1. INTRODUCTION:

In this era of modern world with the blooming of modern wireless communication technologies where communication has been absolutely requisite, antennas are rightly to be side as electronic eyes of the world due to their undeniable role-playing place in the communication technology. With this fast-growing development in antenna engineering Microstrip Patch Antennas are keeping a vital role in application of mobile radio, wireless communication, high-performance aircraft, satellite, missile and spacecraft because of there light weight, low profile, simplicity and low cost. Rectangular, circular, elliptical these are some common patch shapes that have a good demand and fame for their feed line feed line flexibility and multiple frequency operation.

There are several methods available in literature to feed or transmit electromagnetic energy to a microstrip patch antenna. The most famous techniques are the microstrip transmission line, coaxial probe feed, aperture coupling and proximity coupling. The simplest feeding methods to realize are those of the microstrip transmission line and coaxial probe. Both the methods utilize direct contact with the patch to induce excitation. The point of excitation is adjustable, enabling the designer to control the impedance matching between feed and antenna polarization, mode of operation and excitation frequency.

The antenna is one of the critical components in any wireless communication system. A microstrip patch antenna (MPA) consists of a conducting patch of any planar or non-planar geometric on one side of the dielectric substrate with a ground plane present on other side. Feeding can be done by using any one of the methods such as co-axial feed, line feed, inset feed, proximity coupling or aperture coupling. Some advantages of the microstrip antennas are its small size, low profile, and that it is light weight. One of the most popular feeding techniques used for designing the UWB antennas is the microstrip feedline.

ANTENNA DESIGN:

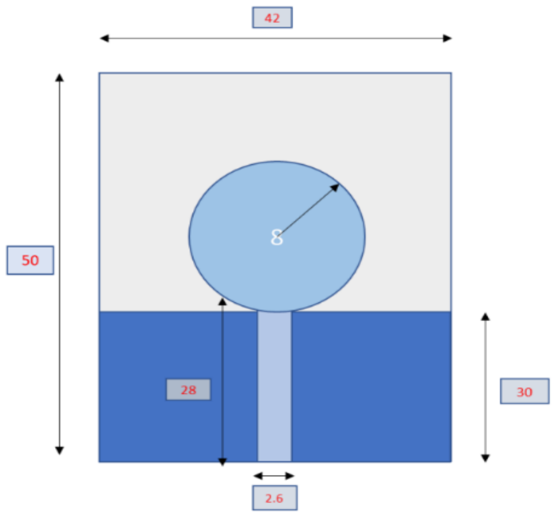
The proposed design is shown in Fig. 1. The proposed antenna uses Flexible FR4 lossy as a substrate. The dielectric constant of the substrate is 4.3. The thickness of the substrate is 1.6 mm. The proposed antenna has a compact size of 42 mm x 50 mm.The antenna is fed by a 50 Ω micro strip line. The patch is in the form of circle, hexagonal on the circle elliptical where the radius of the radiating elements can be obtained through the equation (1.1) for calculating circular patch.

$$a = \frac{F}{\left\{1 + \frac{2h}{\pi \varepsilon_r F}\left[\ln\left(\frac{\pi F}{2h}\right) + 1.7726\right]\right\}^{1/2}} \quad ....(1.1)$$

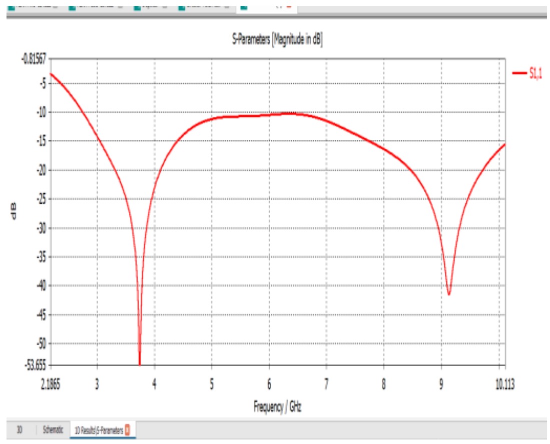
Where, a= Circular radius dimension (mm)
h= Thickness of Substrate (mm)

ε_r = Relative dielectric permittivity of substrate (F/m)

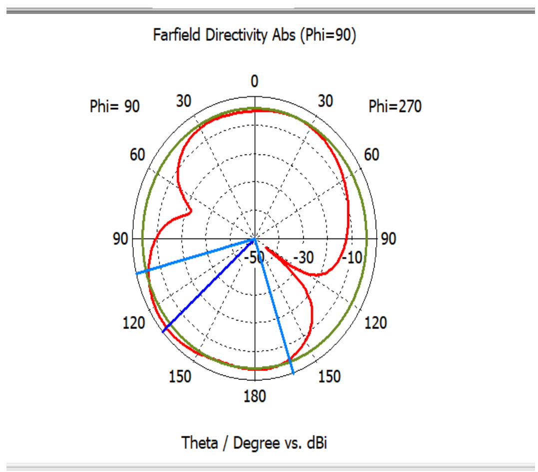
F = logarithmic function (F) of radiating element.



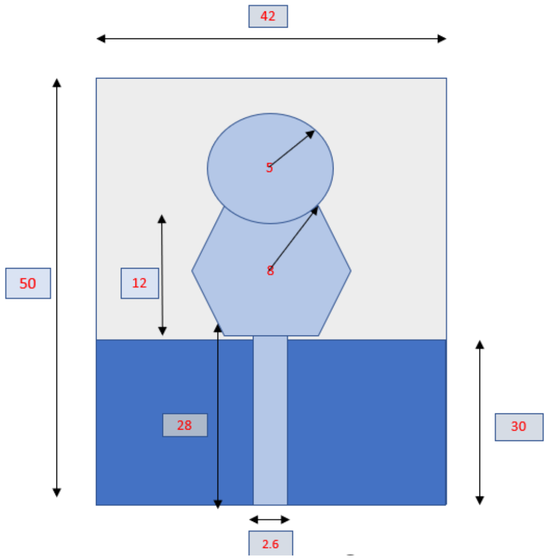
Fig(a): - Circular Patch



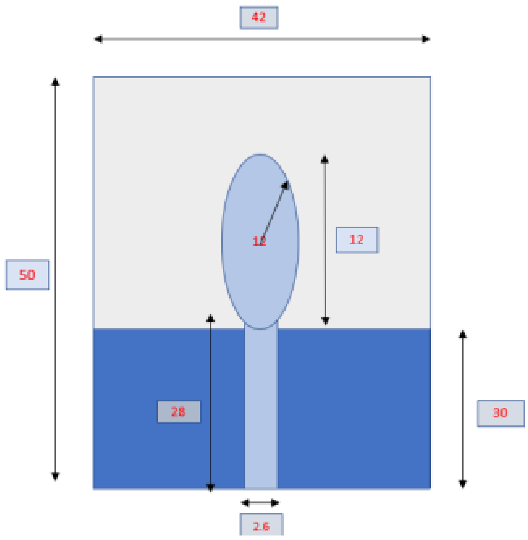
Fig(b): - S-parameter of Circular Patch



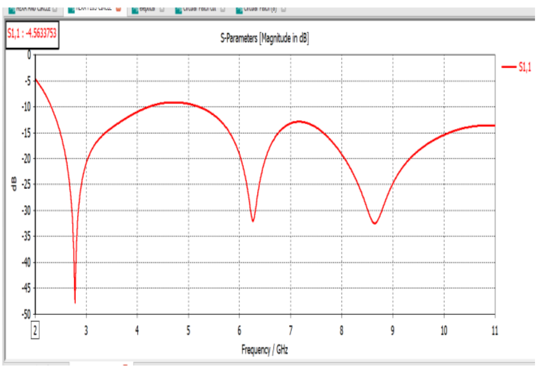
Fig(c): Radiation pattern of Circular patch



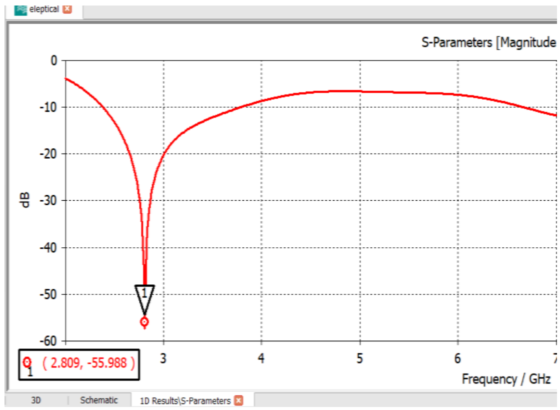
Fig(d): - Hexagonal on the Circular patch



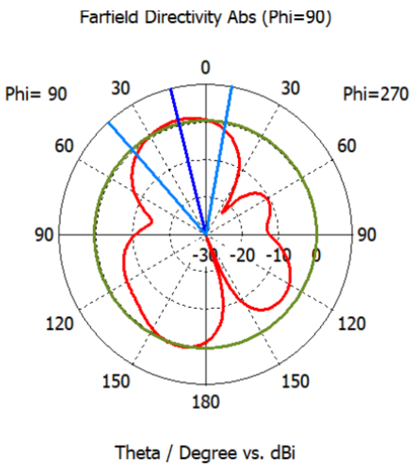
Fig(g): - Elliptical patch



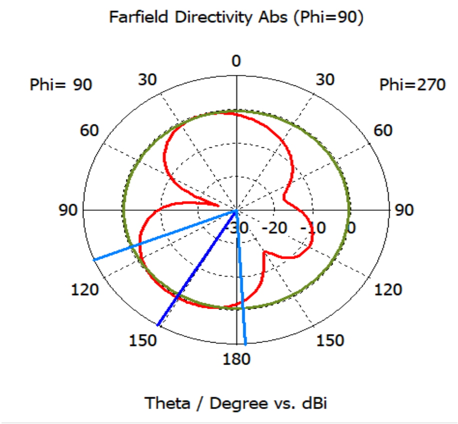
Fig(e): - S-parameter of Hexagonal on the Circular patch



Fig(h): - S-parameter of Elliptical patch



Fig(f): - Radiation pattern of Hexagonal on the Circular patch



Fig(i): - Radiation pattern of Elliptical patch

RESULTS AND DISCUSSIONS:

In the circular patch antenna, it can operate at two frequency bands one is at 3.1GHZ and another one is at 9.1 GHZ. In hexagonal on the circular patch it can operate at three frequency bands at 2.7 GHZ, 6.2 GHZ and 8.6 GHZ. In elliptical it can operate at one frequency band is at 2.8GHZ and it is act as narrow band. In both circular and hexagonal on the circular patch it acts as a ultra-wide band antenna but in elliptical patch it can acts as a narrow-band.

CONCLUSION

The design and simulation of ultra-wide and narrow-band antenna for c-band and x-band applications is proposed. The effective electrical length of the antenna is changed by applying different patches that provide the wide tunability of the operating bands. The antenna operates effectually at desired bands and has good gain. Simplicity, compactness and flexibility are some features that make it promising for wireless applications.

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