Wideband, Planar Antenna of I Shape with Outer Slit for ISM Application

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Abstract— Wideband, planar antenna of I shaped with outer slit for ISM application In our work, we presented a concept of designing antenna for 2.4GHZ. The special shaped patch antenna is used to attain ISM bands. It is an I shaped antenna, along with a tilted and inverted two u shaped antenna patched over it. One thick inverted U shaped antenna, tilted with 450 and another is of thin inverted u shaped antenna that tilted 900 in accordance with a previous tilted patch, that is about 450 to I shaped antenna but on opposite side of thick patch. It is connected to thick U shaped patch not with an I shaped patch. All rotation and tilting are done in horizontal axis. A 6*6 square metallic patch antenna was designed in back for simple frequency selecting purpose.

Index Terms-wideband,planar antenna,ISM band,CST.

I. INTRODUCTION

Wireless applications are going to rule the communication systems of next generations, hence a lot of research and development is going on in the wireless communication systems, concentrating on multi bandwidth and multi-functional antenna systems. In this antenna a multiple band, say six bands are identified for primary use.Since the linearly polarized (LP) antennas have their own drawbacks, circularly polarized (CP) antennas took its place over time, in the modern wireless communication systems. There available a multiple patch antenna separately for each frequency application but not on a single antenna. So we are here to deal with a single patch antenna, that can handle all

threads over distinguished different frequency simultaneously.In our work, we presented a concept of designing antenna that can work simultaneously 2.4 for wireless Network applications. These multiple bands are attained by using and special shaped patch antenna. It is an I shaped antenna, along with a tilted and inverted two u shaped antenna patched over it. One thick inverted U shaped antenna, tilted with 450 and another is of thin inverted u shaped antenna that tilted 900 in accordance with a previous tilted patch, that is about 450 to I shaped antenna but on opposite side of thick patch. It is connected to thick U shaped patch not with an I shaped patch. All rotation and tilting are done in horizontal axis. The 6*6 square metallic patch antenna was designed in back for simple frequency selecting purpose. Those Metallic patch surface behave as a simple frequency select. Antennas has designed in such a way that it must efficient enough for the practical applications. So the design must be smaller and less complicated, which tend to be the motive of our design.

II. DESIGNING OF ANTENNA

The proposed antenna's design could be carried out a three step procedure, where Preperm 1000 lossy of 1.53 mm thickness and a dielectric constant of 10. On which the multi-band CP antenna is suspended. The Preperm 1000 lossy is selected mainly for its variable dielectric constant property. The next step is designing the metallic Frequency Selecting surface, which is carried out by referring the reflection phase characteristics. Tri band patch antenna design is shown in the final stage is designing a patch antenna which is to be held at a height h above the FSS. The Frequency selecting surface composed designed in a layout each is of square shaped that overall comprises of 36 unit cells. It is designed on a Taconic RF-35 substrate. Its thickness is 1.53 mm; dielectric constant is 3.4 and a loss tangent of 0.002. Consider L to be the horizontal (xplane) distance between the bottom edge of antenna substrate and FSS substrate. The Frequency Selecting Surface in an antenna is shown in Fig.2 which is simulated by using CST Studio Suite.

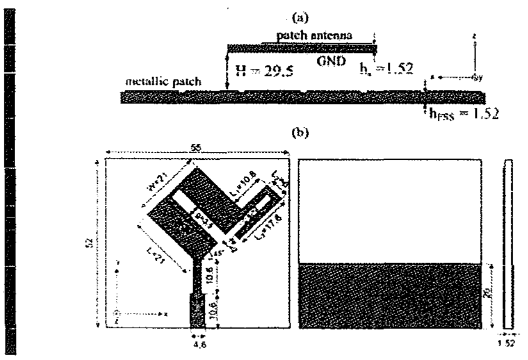


Figure 1. Tri band Patch antenna design

A. Tri Band Patch Antenna Design

The frequency bands that are attained by using and special shaped patch antenna. It is an I shaped antenna, along with a tilted and inverted two u shaped antenna patched over it. One thick inverted U shaped antenna, tilted with 450 and another is of thin inverted U shaped antenna that tilted 900 in accordance with a previous tilted patch, that is about 450 to I shaped antenna but on opposite side of thick patch. It is connected to thick U shaped patch not with an I shaped patch. Fig.1 shows the structure of Tri-band patch antenna. All rotation and tilting are done in horizontal axis. The final optimized geometrical structure of the tri-band CP patch antenna was obtained through simulations with CST Studio Suite.

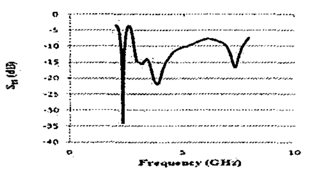
B. Finalizing Antenna Design

The multi-band circularly polarized patch antenna is first suspended at an altitude of 28.2 mm from the center of selecting surface. The characteristics of antenna for various unit cells of different number and character were studied. 6 × 6 metal patches were inferred along horizontal (x axis) and vertical axis (y axis) to have a better output. Finally, the necessary alterations and changes are made in position and dimensions antenna are made to get the best results at the required frequencies 2.8 frequency.

III. Analysis Of Designed Antenna

S-parameter, Efficiency and VSWR (Voltage Standing Wave Ratio) is co The remaining power is accepted by antenna itself, so it is neither absorbed nor radiated by the antenna. Practically most of the considered as the most important parameter of the antenna. The S-parameter and Efficiency are shown in Fig.3 and Fig.4 respectively

Return Loss (dB) Vs Frequency (GHz)



The fig.3 shows that the radiation of antenna is best at implied frequencies: 2.8 The Fig.4 shows the maximum gain of the antenna on all frequencies. It is to be noted that the gain is high on desired frequency than other frequencies.The relationship between the output and the input terminals or ports can be analysed and described by an S-parameter. In antenna design return loss is a highly considerable parameter, which gives the magnitude of the reflected power from the antenna, if the parameter hits 0dB then all the power is reflected and no sign of power radiation.The remaining power is accepted by antenna itself, so it is neither absorbed nor radiated by the antenna. Practically most of the power delivered to the antenna gets radiated hence VSWR directly impacts on the return loss of the antenna. The theoretical (simulated) and the practical return loss is shown in Fig. 3. the theoretical and measured results comes nearly close together, with some inevitable refinements with corresponding boundary conditions in the simulation environment. VNA (Vector Network Analyser) is used to measure return loss and by using that we can plot S11. power delivered to the antenna gets radiated hence VSWR directly impacts on the return loss of the antenna. The theoretical (simulated) and the practical return loss is shown in Fig. 3. the theoretical and measured results comes nearly close together, with some inevitable refinements with corresponding boundary conditions in the simulation environment. VNA (Vector Network Analyser) is used to measure return loss and by using that we can plot S_{11}.

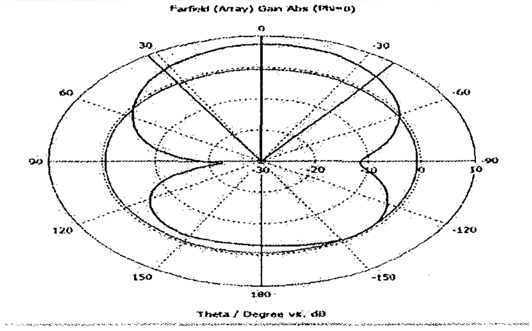
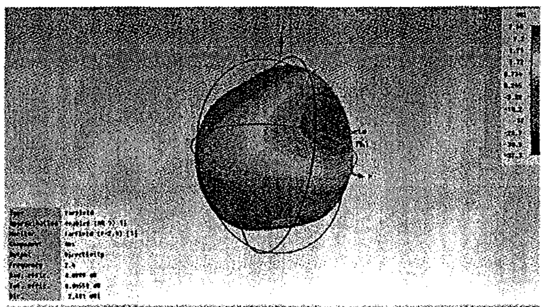


Figure 2. Farfield directivity plot

The radiation pattern of an antenna for different frequencies are shown below in 3D model diagram. These 3D models are shown below.



IV. Conclusion:

Wideband planar antenna for I shaped with outer slit for ISM applications was designed ,fabricated and characterized.The same is simulated using a simulation tool named CST Studio suite. The performance properties of the proposed antenna are analysed for the optimized dimensions and the proposed antenna was designed successfully.

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