DESIGN AND SIMULATION OF M-SHAPED MICROSTRIP ANTENNA USING CST STUDIO

Design of 2GHz Patch Antenna

Mahmut Şatır Electric-Electronic Engineer .May 2021

INTRODUCTION

Trainings through knowledge of patch antennas, training training, small gain and brief introduction of training training. These systems are an example of a laterally open resonator. MIC may be suitable for integrated circuits. Integrated images' prices. Analysis work in progress; a suitable patch antenna was designed and made to the model.

Fistly I prefered S-BAND antenna.In this frequency band from 2 to 4 GHz, the atmospheric attenuation effect is somewhat greater in the D-band. Radars rely on very high transmitting power to reach great ranges. For example, military Medium Power Radar (Medium Power Radar, MPR) requires a power of up to 20 MW. The negative effects of atmospheric events start in this frequency band. However, it was predominantly used in the first rain radars written down tropical and tropical, as it provides a middle ground between luminance and transition-attenuation. The Airport Surveillance Radar (Airport Surveillance Radar, ASR) with a medium range of up to 100 km, used as a flight safety search radar for observing special zones at an airport, provides this information to flight controllers. The letter S– is reminiscent of a smaller antenna and shorter range. In this antenna design, it was preferred to use the CST program for simulation and analysis.

For a microstript antenna ;

- Low profile, low volume
- Fabrication cost is low
- Mass production
- Simple feed can provide easy linear and circular polarization
- Integration of MIC is easy

CALCULATIONS

İn this part we will use 2 GHZ resonance frequency.

The geometry of the proposed rectangular feed patch antenna fort he calculatıons then I restorated to make M type an antenna.

The width and length of the patch antenna is calculated as

$$W = L = \frac{c}{2f\sqrt{\varepsilon r}}$$

The feed depth into the patch is given by,

$C = 0.822 * \frac{L}{2}$

For calculating the width,

$$W = \frac{c}{2f} \sqrt{\frac{2}{\varepsilon r+1}}$$

I found my widh 46.021 mm.

But it will change after I cut the shape to occurs an M shape antenna .

The effective dielectric constant is calculated as,

$$\frac{\varepsilon r + 1}{2} + \frac{\varepsilon r - 1}{2}\left[1 + 12\frac{h}{w}\right]^{-1/2}$$

The extended incremental length of the patch is given by,

$$\Delta L = 0.412h \ \frac{\varepsilon reff+0.3[\frac{W}{h}+0.264]}{\varepsilon reff+0.258[\frac{W}{h}+0.8]}$$

Effective length of the patch is,

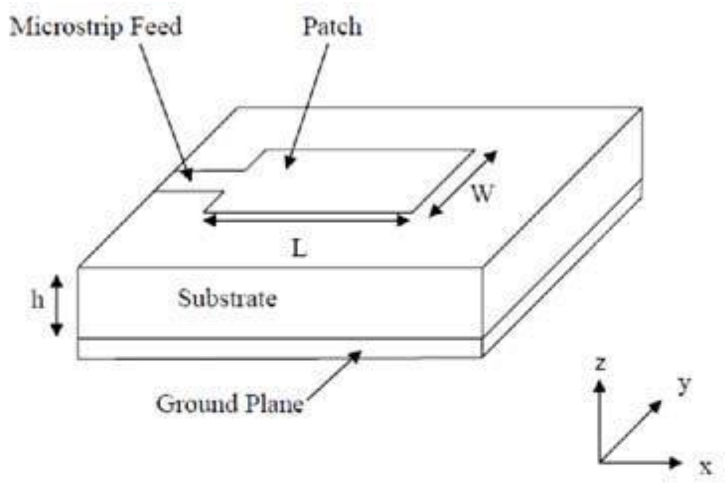
$$Leff = \frac{c}{2f\sqrt{\varepsilon reff}}$$

$$L = Leff - 2\Delta L$$

$$L = \frac{1}{2f\sqrt{\varepsilon reff}\sqrt{\mu o \varepsilon o}} - 2\Delta L$$

After that I found my Length of antenna 37.70481 mm.

We got a shape like the bottom at the and ,



F= 2 GHZ

W= 46 mm

L= 37.7 mm

εr = 4.3 (dielectric constant)

h = 1.6 mm

Ground= 100*100*1.6 mm

Substrate= 100*100*0.035 mm

Antenne thickness = 0.035 mm

Figure 1.

DESİGNİN İN CST STUDİO

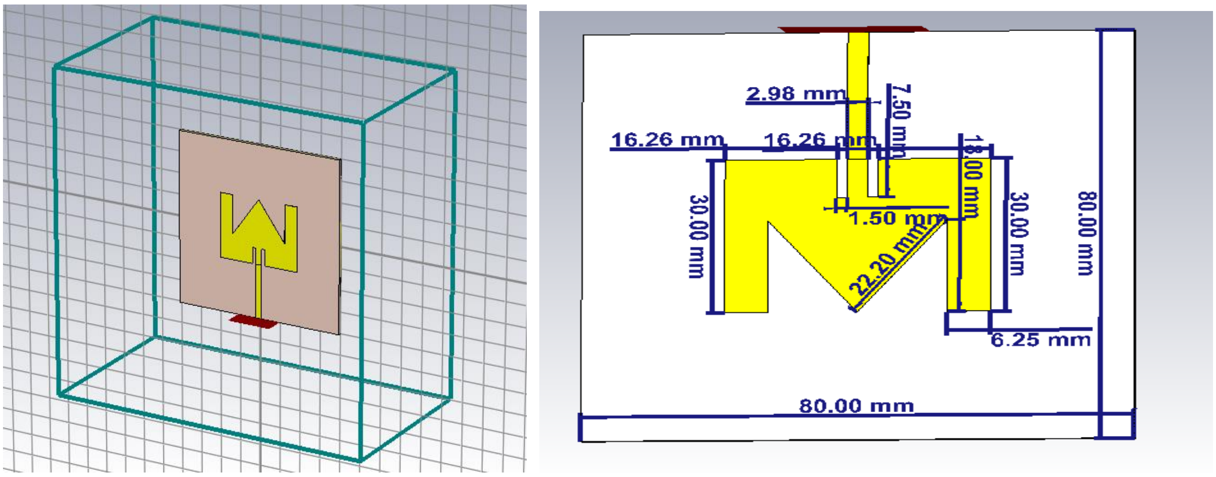


Figure 2

Microstrip (Offset Microstrip) Line Feed

This tip is a strip on the conductor at the feed. pertaining directly to microstrip mourning. Conductor in better condition will be met with the patch. this kind of bait regulations have mountains of feding on the same substrate to create a planar structure. an appendix hack can be included in the patch to get

Firstly I used components of the given in the cst studio. And we are using modelling to places. I prepared a ground which has the Y coordinates of -0.035 to 0. And same length and width substrate type. İt has 1.6 mm thickness. Then drawed my antennas places. While we are using the materials for this parts I took fr-4 as references. (copper and substrate field)

WHAT İS THE ALGORİTHM OF THE MİCROSTRİP PATCH ANTENNA

As you know, In the microstrip patch antenna, with the excitation of the conductive patch, there is an electromagnetic wave movement from the edges of the patch towards the ground plane. Reflected waves from the ground plane propagate into space. ... The radiation of the antenna depends on the fringing event.

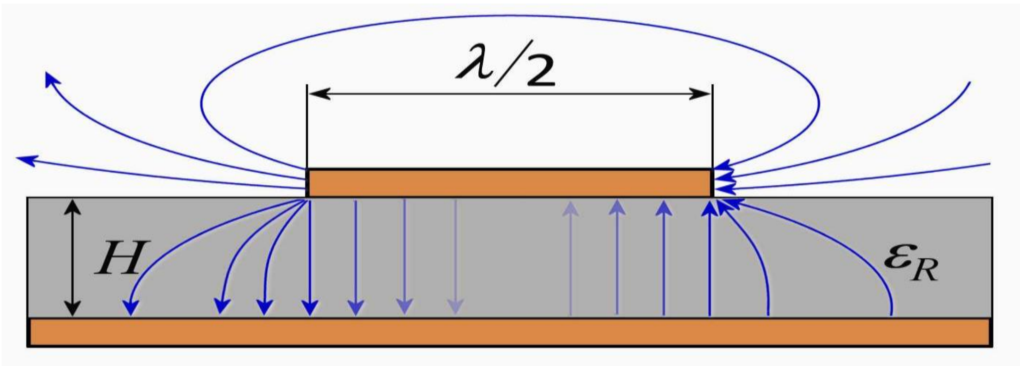


Figure - 3

RESULTS AND DISCUSSION

To investigate the proposed antenna, the following parameters are necessary:

- Return loss
- Radiation pattern.

  Firstly let's look my port signals

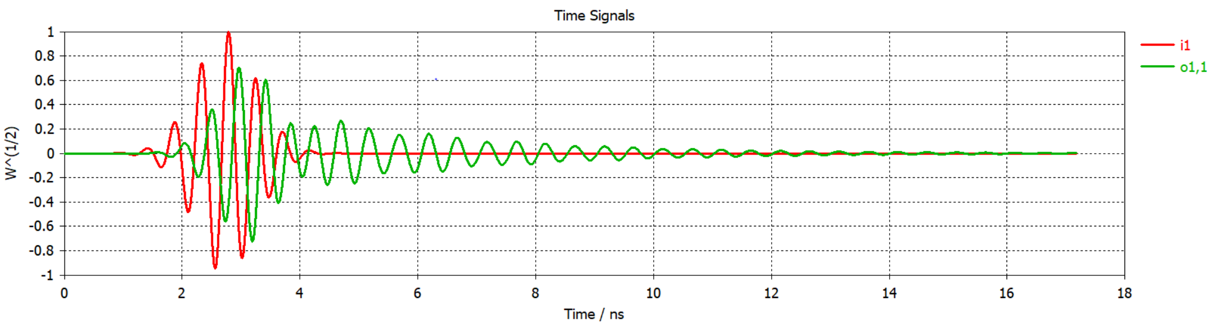


Figure – 4

S-Parameter

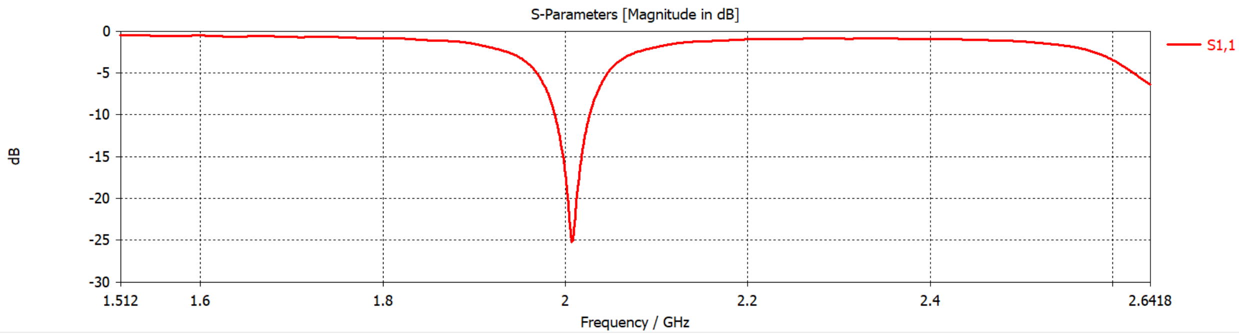


Figure – 5

BANDWITH OF THE ANTENNA

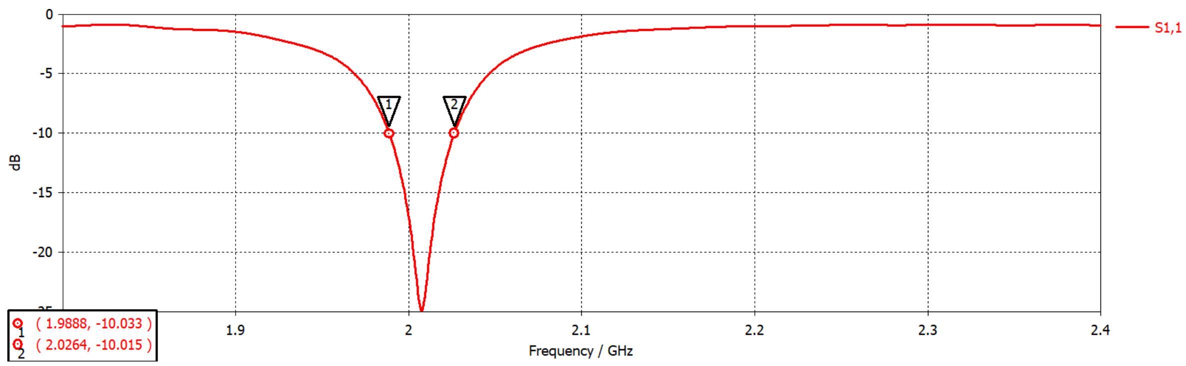


Figure – 6

By looking at the s-parameter (figure-5) of an antenna, we can obtain information about the radiation point and range of the antenna. In order for an antenna to start radiating, it must reach a return loss of -10 db. It starts to glow at the point where it reaches -10 dB and cuts this point twice. The center point between these two points gives information about the operating frequency of our antenna, that is, our center point. And the distance between these two points represents the operating frequency range of our antenna (figure-6), that is, our bandwidth. For the calculation of the bandwidth, when we take the -10 db points in the s-parameter as marked, we see that our antenna has a bandwidth of 0.0376 GHz.

fL= 1.98 Ghz

f0 = 2.007 Ghz

fh = 2.0264 Ghz

Bandwidth = 376 Mhz

$$BWF = \frac{\Delta f}{fc}$$

BWF = %1.8

ReturnLoss= -24.916 DB

VSWR – Voltage Standing Wave Ratio

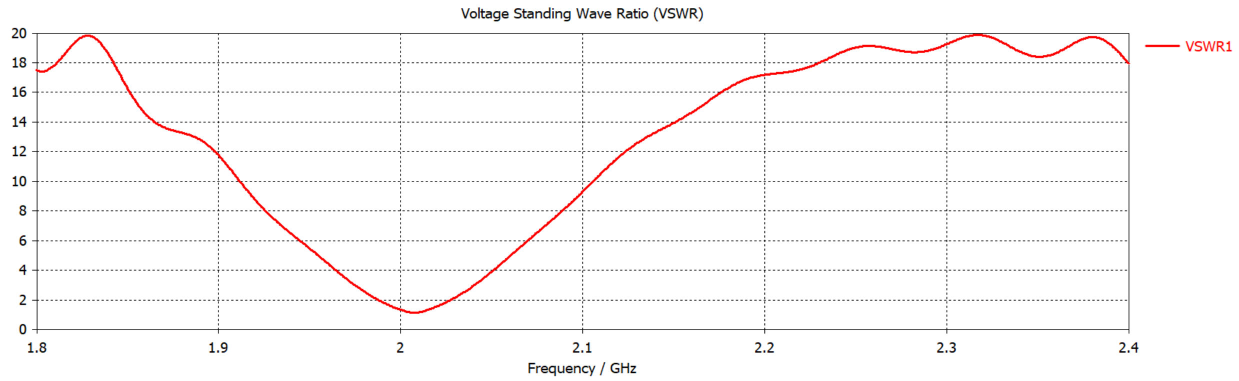


Figure-7

Y-Admintance Parameter

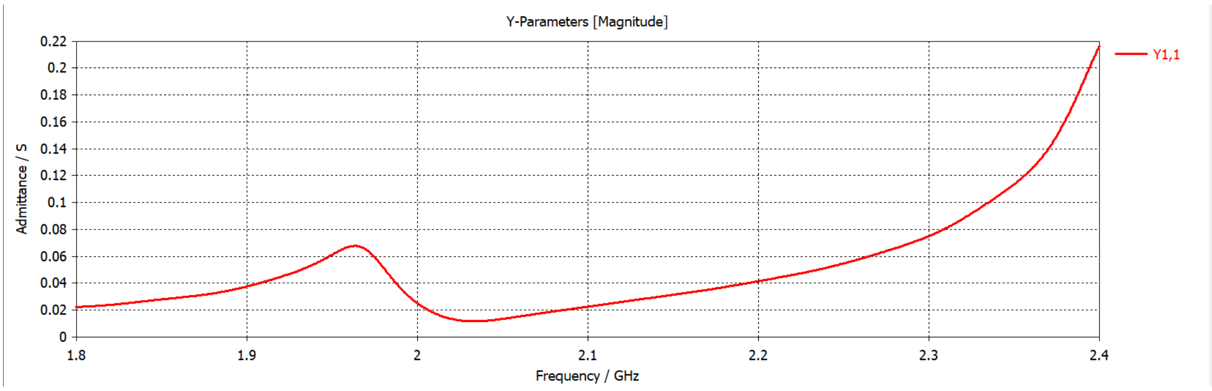


Figure-8

Z- Impedence Parameter

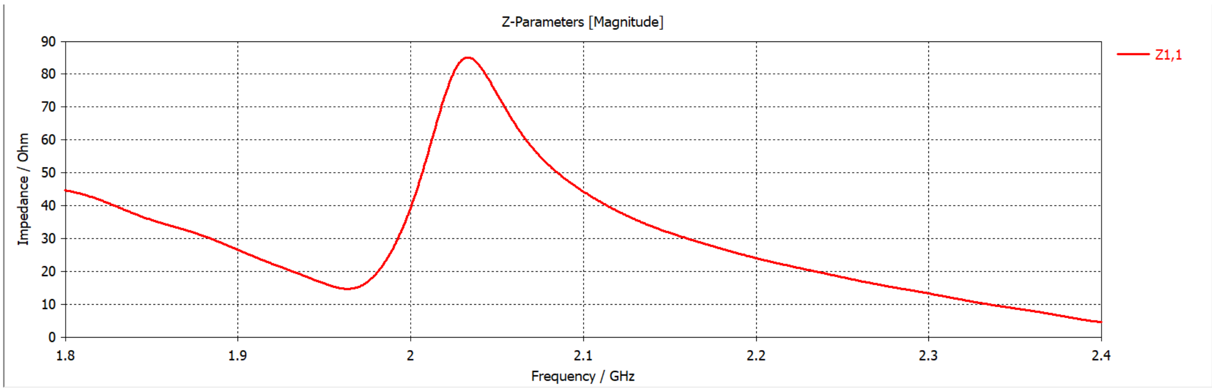


Figure-9

Smith scheme useful for the designed antenna. The radiation pattern is represented as: coordinated coordinate systems and the region listed below. The radiation pattern shows how the antenna is propagated in a specific direction. The figures of the Smith chart show the result of the Antenna radiation pattern.

E-Field

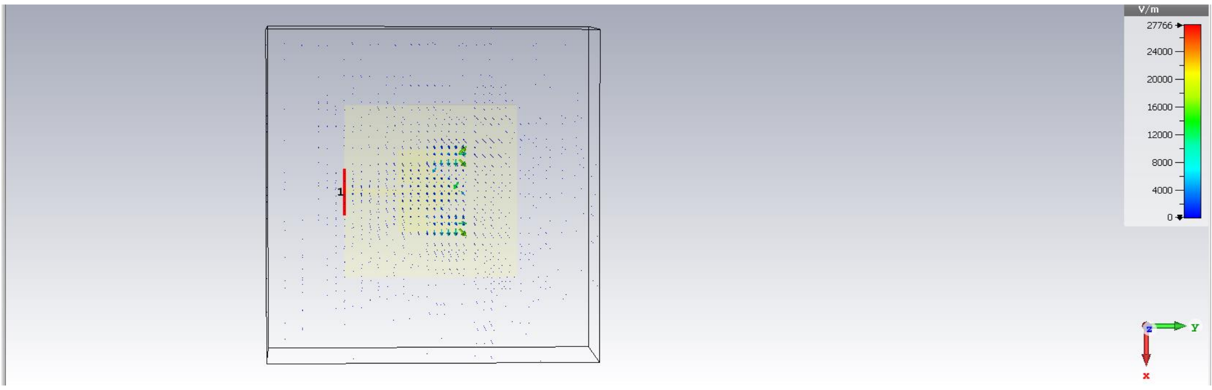


Figure-10

Farfield at 2 GHz (ABS)

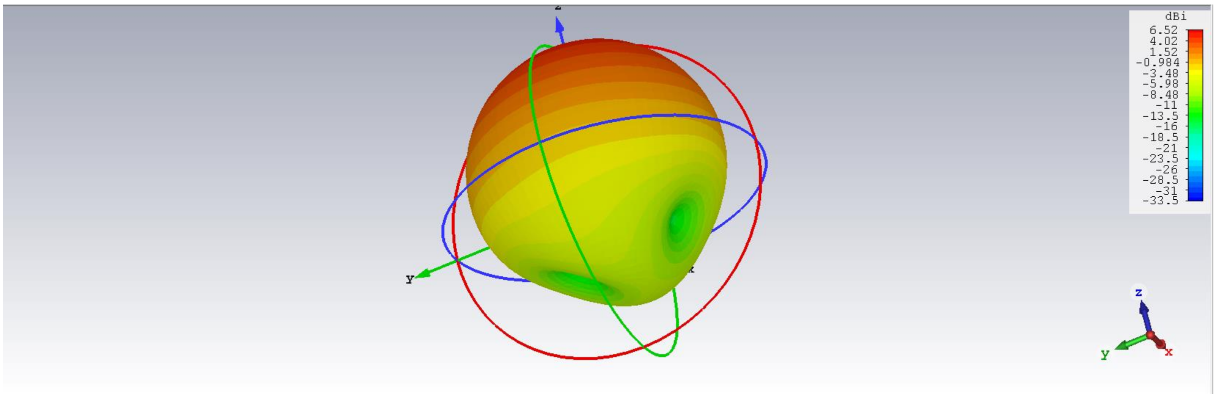


Figure-11

Directivity is a measure of directive gain at a particular

direction. And generally the gain is directly proportional to the

directivity which is also lesser than the directivity. The result of directivity is 6.52dBi.

Farfield at 2 GHz (THETA)

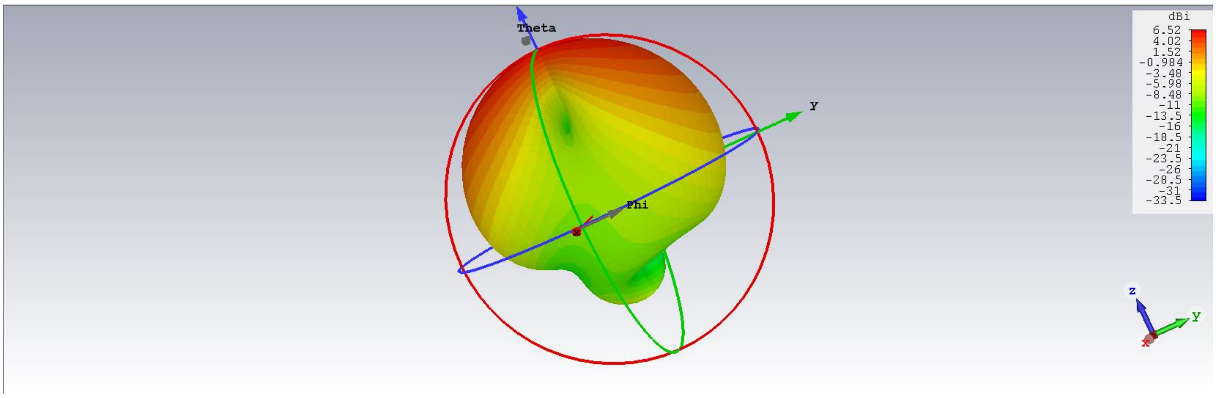


Figure-12

Farfield at 2 GHz (PHİ)

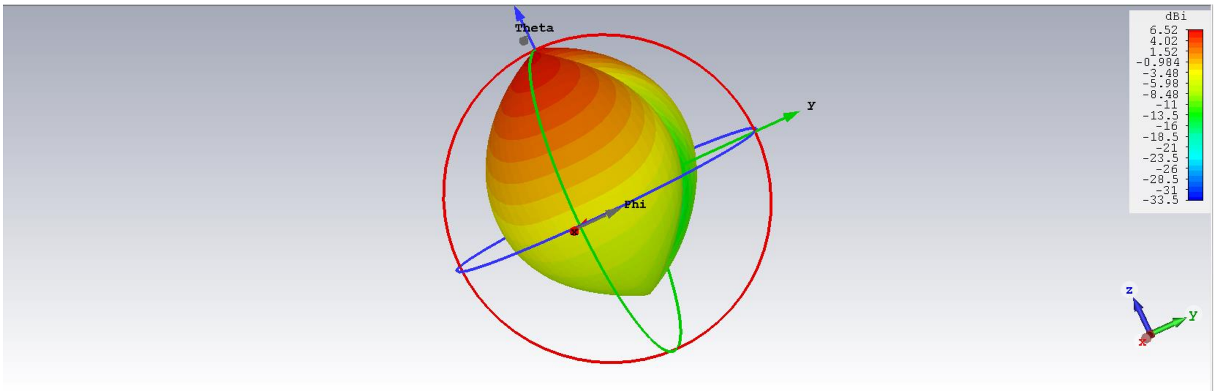


Figure-13

REFERENCES

1) *Schaubert, D.H., "Printed Circuit Antenna Technolo gy" Microwave Antennas for Avionics Agard Lecture Ser ies 151, s. 8.18.15, Nisan 1987.*
2) *Doç. Dr. Erdem YAZGAN, Hacettepe University. Electric Electronic Engineering, Beytepe , ANKARA, Mikroşerit Antenler.*
3) *Sourabh Bisht[1] , Shweta Saini[2] , Dr Ved Prakash[3] , Bhaskar Nautiyal[4] , [1,2,4]Dept. of Electronics and Communication Engg, Graphic Era University, Dehradun, India, [3]Dept. of Electronics and Communication Engg, Graphic Era Hill University, Dehradun, India . Study The Various Feeding Techniques of Microstrip Antenna Using Design and Simulation Using CST Microwave Studio, September 2014.*