



**KALINGA INSTITUTE  
OF INDUSTRIAL TECHNOLOGY**

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# **Microwave and Antenna Laboratory**

**(5<sup>th</sup> Semester)**

**Lab Report 3**

**Aim of the Experiment:** To design Yagi-Uda Array antenna and to find the directivity and Half power beam width from the radiation patterns.

**Design Problem:** Design a three element Yagi-Uda Array for operation in 1 GHz. Obtain the radiation patterns and hence find the half power beam widths.

**Software to be used:** CST studio suite 2019 (Student edition)

#### ▪ Mathematical Calculation:

Initial dimensions:

length of the feeder=  $0.47\lambda$

length of the director= $0.5\lambda$

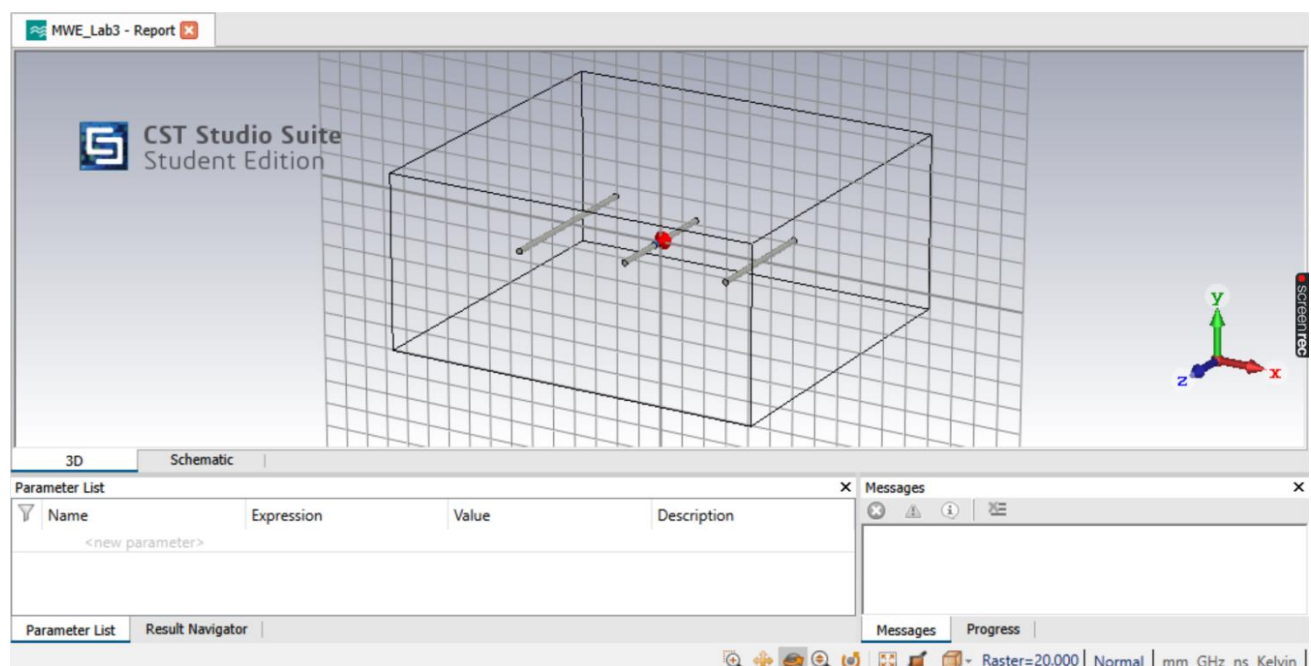
length of the director= $0.406\lambda$

spacing between reflector and feeder= $0.25\lambda$

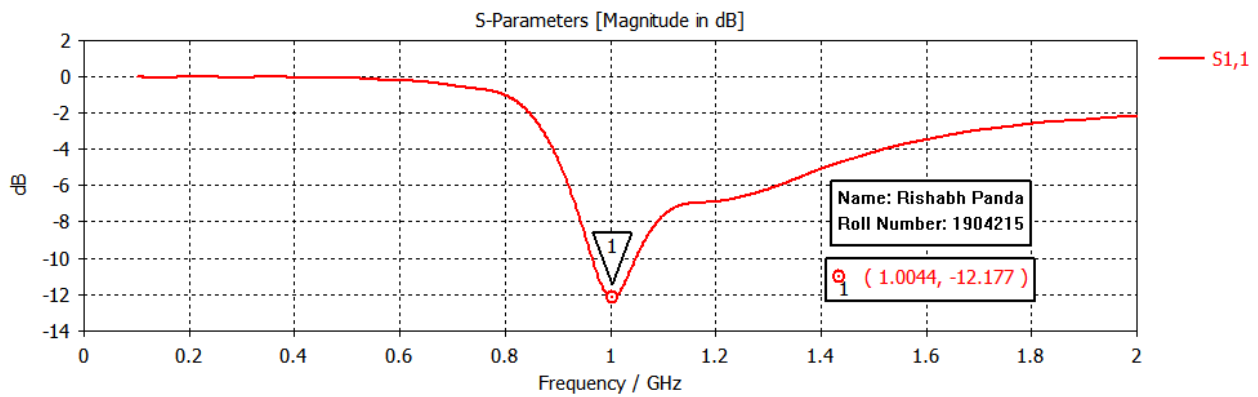
spacing between feeder and director= $0.34\lambda$

$$\text{Length of dipole antenna} = \frac{\lambda}{2} = \frac{c}{2f} = \frac{3 \times 10^8}{2 \times (10^9)} = 150 \text{ mm}$$

#### ▪ Design of 3 element Yagi-Uda array

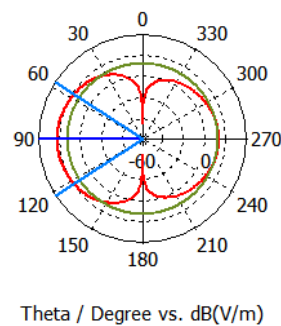


## ▪ S11 Characteristics



## ▪ Radiation pattern and half power beam width

Farfield E-Field(r=1m) Abs (Phi=0)



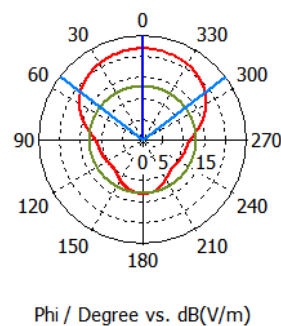
— farfield (f=1) [1]

Name: Rishabh Panda  
Roll Number: 1904215

Frequency = 1 GHz  
Main lobe magnitude = 21.8 dB(V/m)  
Main lobe direction = 90.0 deg.  
Angular width (3 dB) = 66.4 deg.  
Side lobe level = -8.9 dB

Half power beam width is 66.4 deg.

Farfield E-Field(r=1m) Abs (Theta=90)



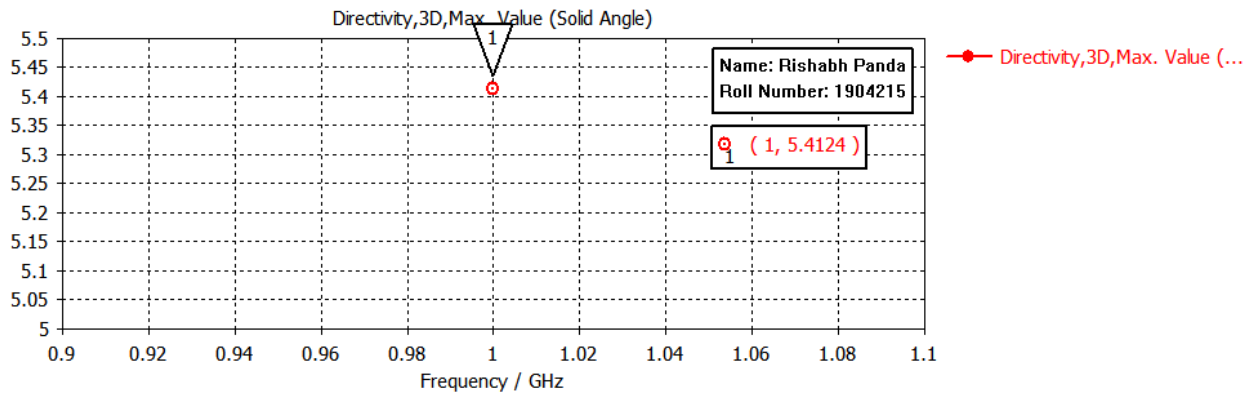
— farfield (f=1) [1]

Name: Rishabh Panda  
Roll Number: 1904215

Frequency = 1 GHz  
Main lobe magnitude = 21.8 dB(V/m)  
Main lobe direction = 0.0 deg.  
Angular width (3 dB) = 104.9 deg.  
Side lobe level = -8.9 dB

Half power beam width is 104.9 deg.

## ▪ Directive Gain



## Conclusion

The design of a Yagi-Uda array antenna operating at 1 GHz was done successfully. The computed result for directive gain was found to be 5.4124 with the half power beam width equal to 66.4 degrees and 104.9 degrees for E-field and H-field pattern respectively.

The S11 characteristics was plotted in which it was found that the dipole was resonating at 1 GHz frequency.

**Name: Rishabh Panda**

**Roll Number: 1904215**

**Section: ETC-3**