

## CHAPTER IV

## DESIGN AND SIMULATION

**4.1 Design using MATLAB**

This design done using MATLAB 2020a . Open MATLAB then apps , select antenna array designer .

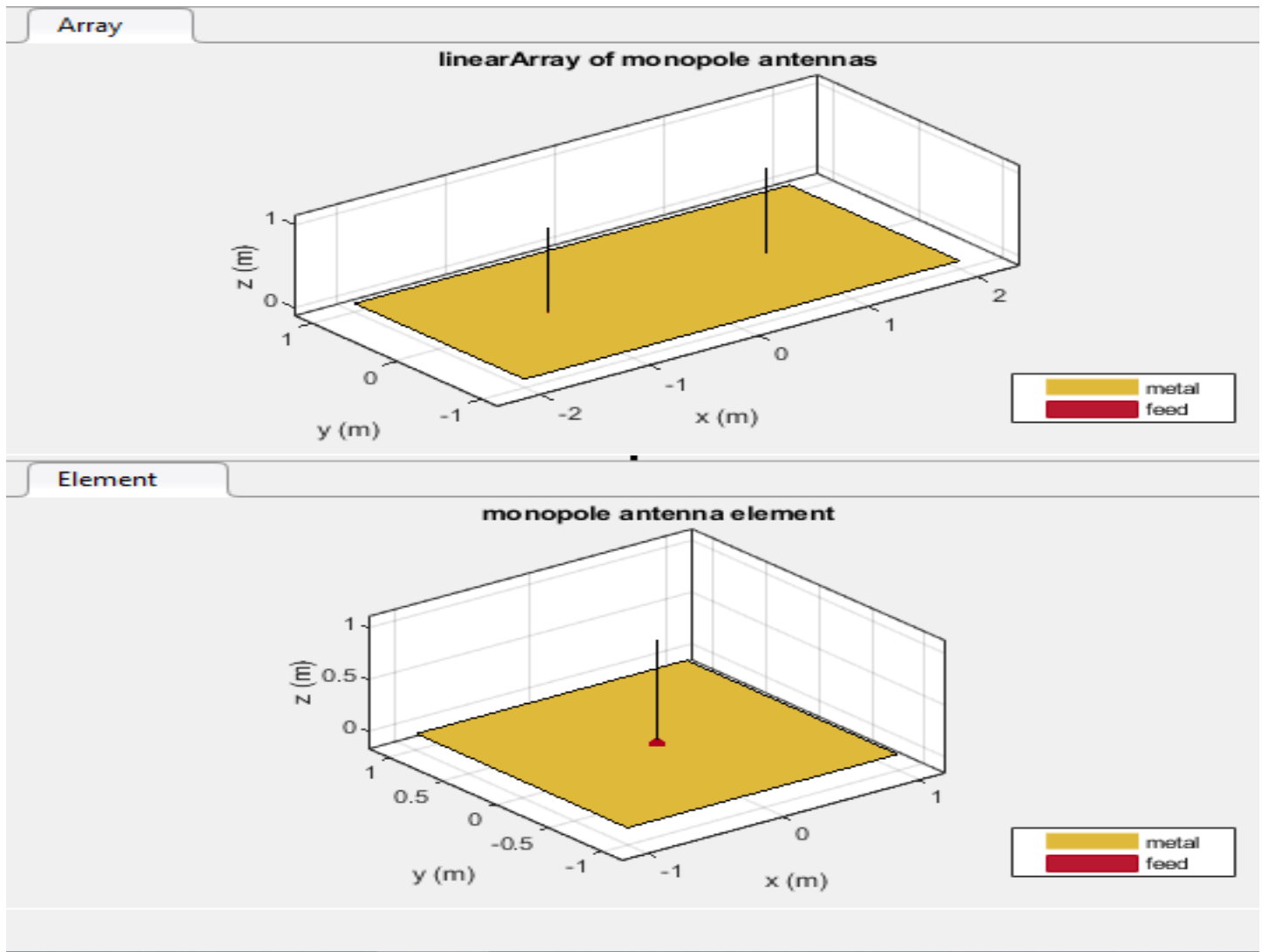


Figure 1: Monopole antenna structure.

## 4.2 Design and Simulation an 2.5GHz monopole antenna using CST software

This work done using CST studio 2019 student edition .

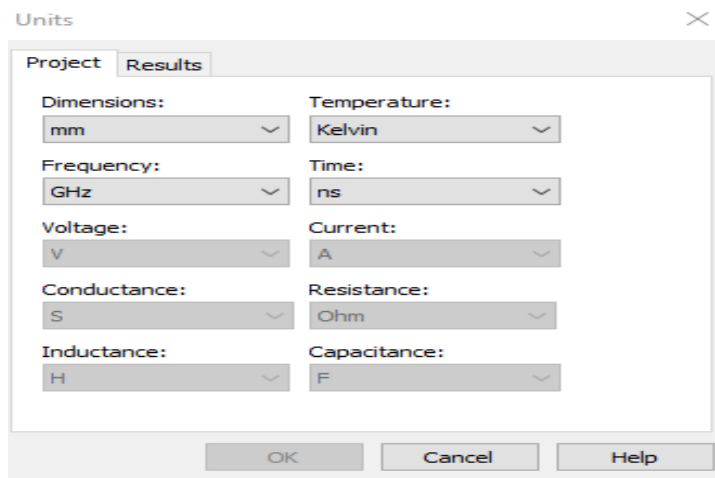


Figure 2: Standard units.

### 4.2.1 Define the parameters

Name	Value
Gap	2
Lambda	119.92
R	Lambda/1000
WL	Lambda/4

Table 1 : Parameters list.

### 4.2.2 Design the structure of quarter wave monopole antenna

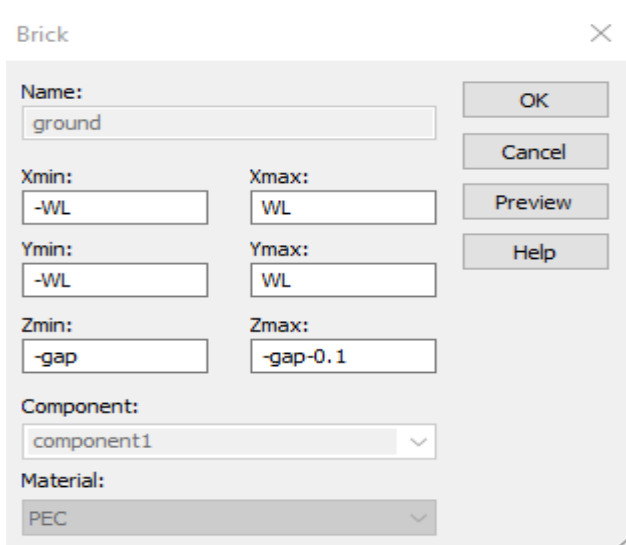


Figure 3: ground properties.

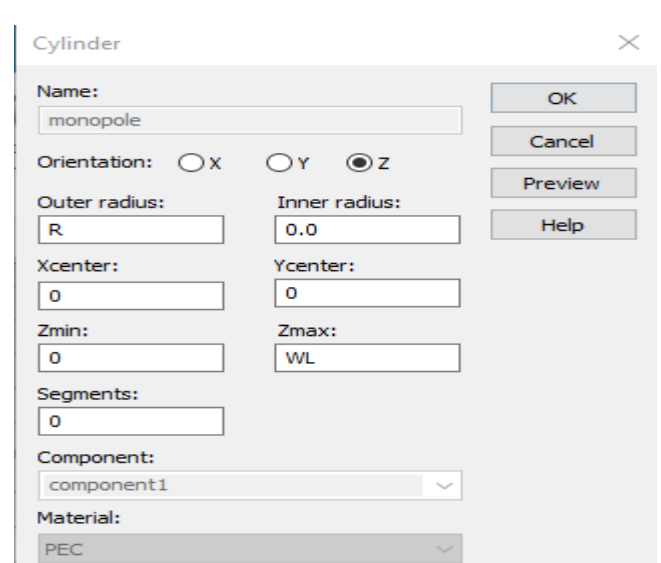


Figure 4: cylinder properties.

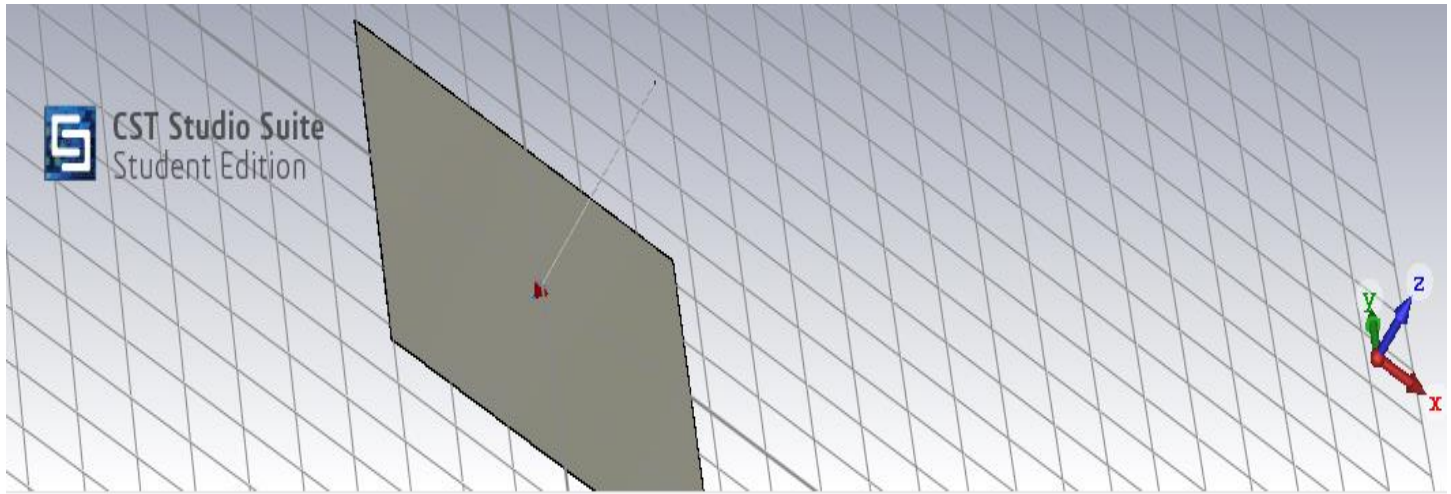


Figure 5: Monopole antenna structure and feeding in the center.

### 4.2.3 Output of simulation

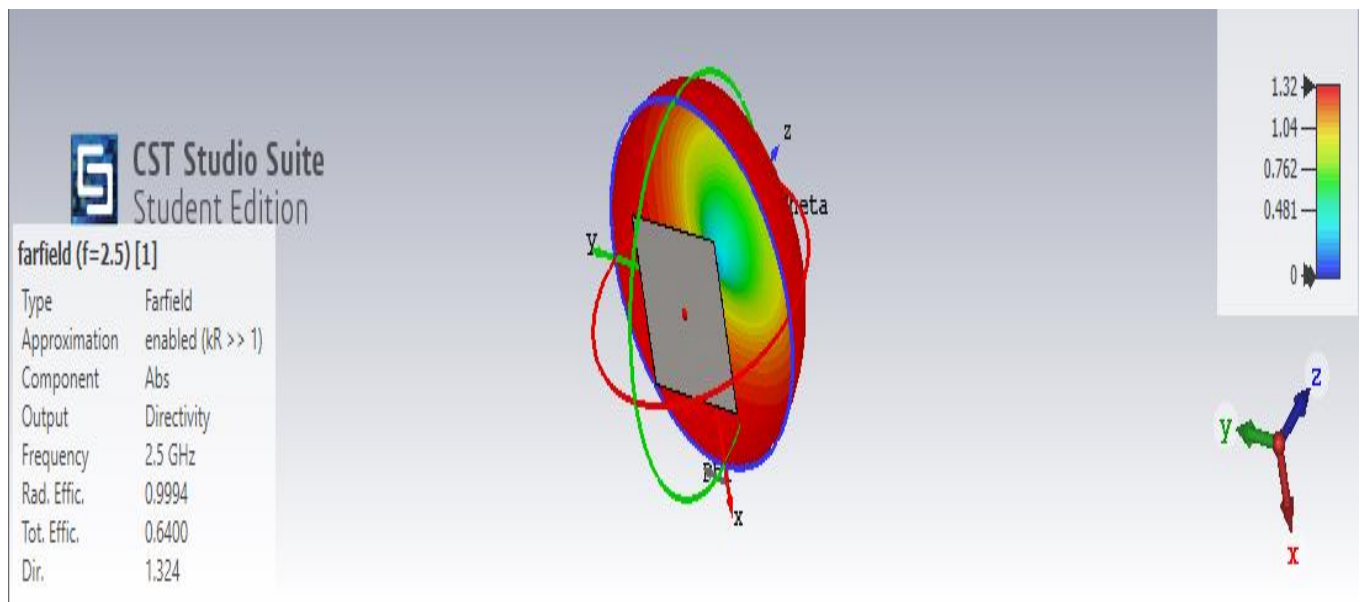
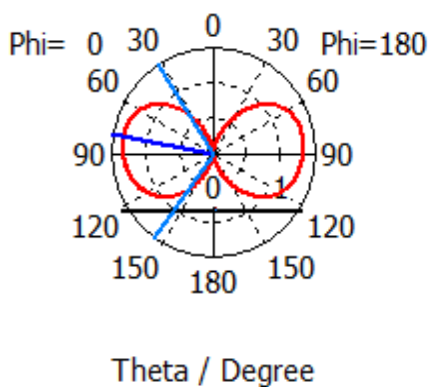


Figure 6: Far field Radiation pattern.

### Farfield Directivity Abs (Phi=0)



— farfield (f=2.5) [1]

Frequency = 2.5 GHz  
Main lobe magnitude = 1.32  
Main lobe direction = 79.0 deg.  
Angular width (3 dB) = 110.4 deg.

Figure 7: Far field Directivity in polar domain

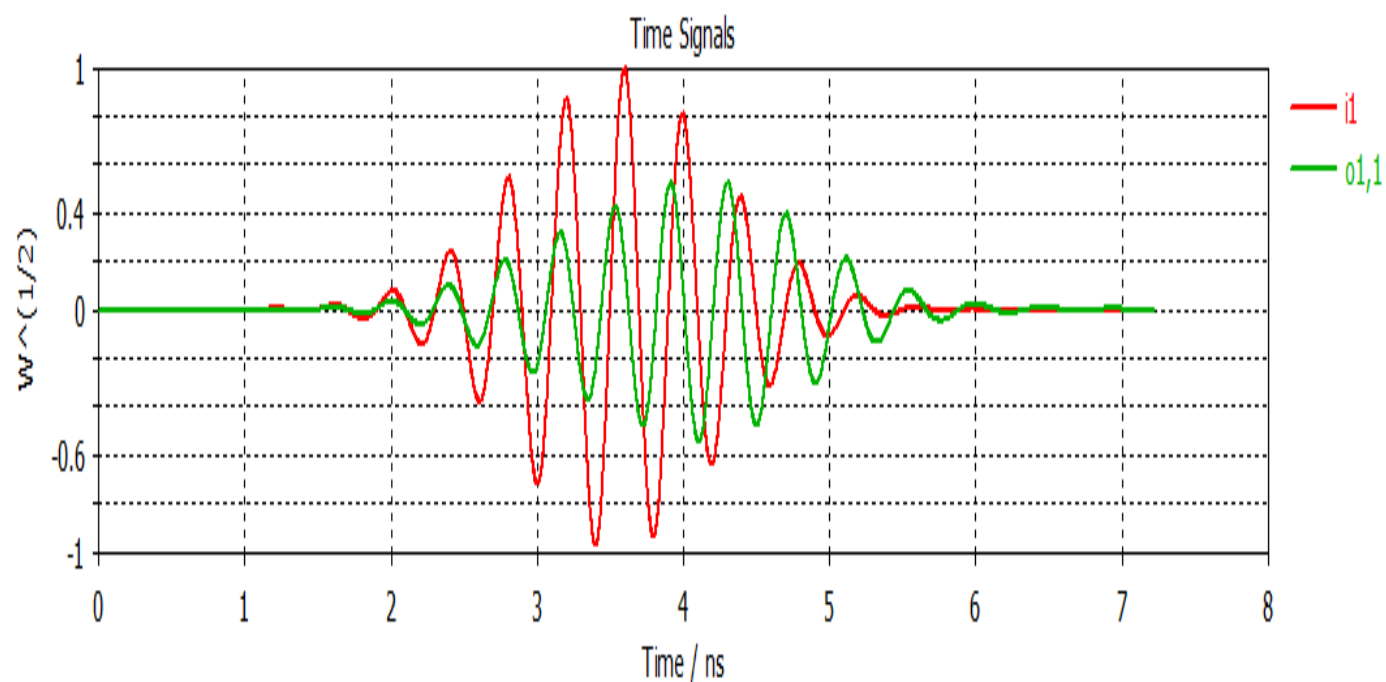


Figure 8: Port signals.

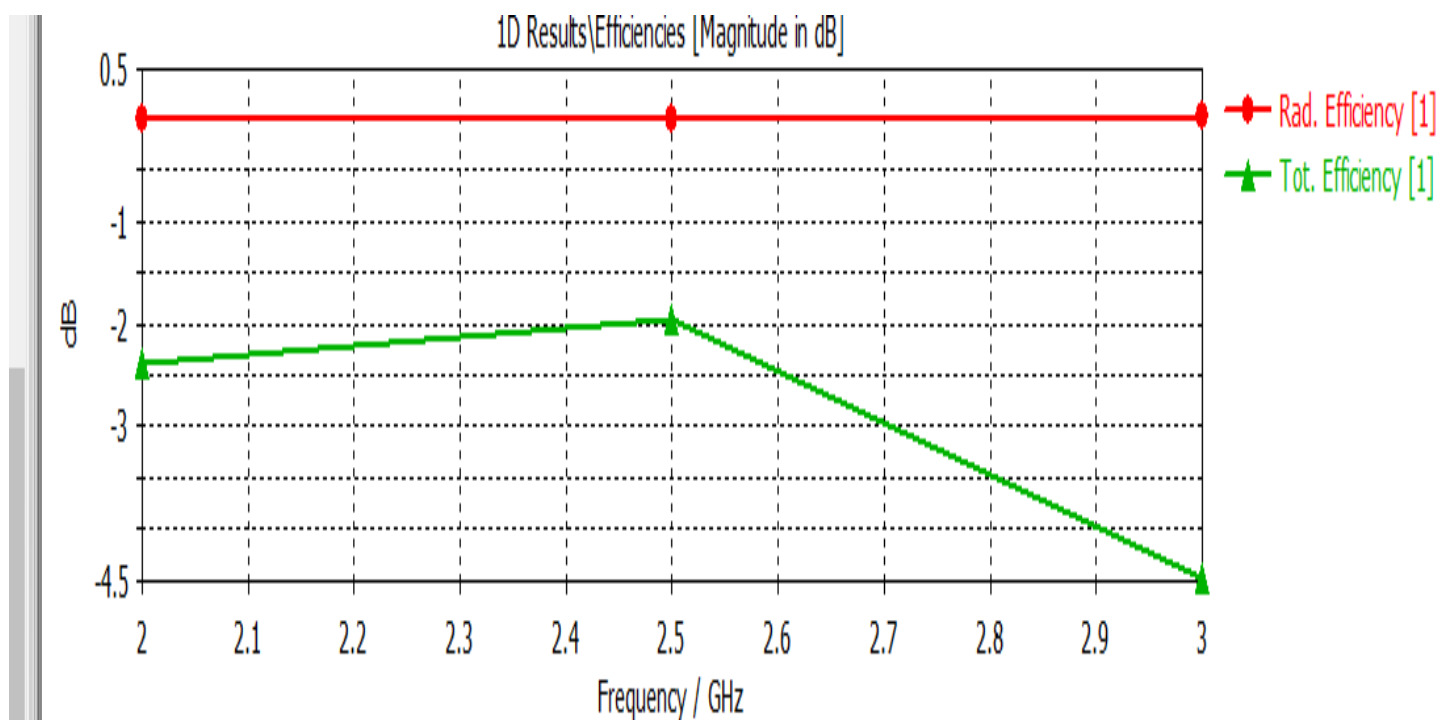


Figure 9: efficiency vs frequency.

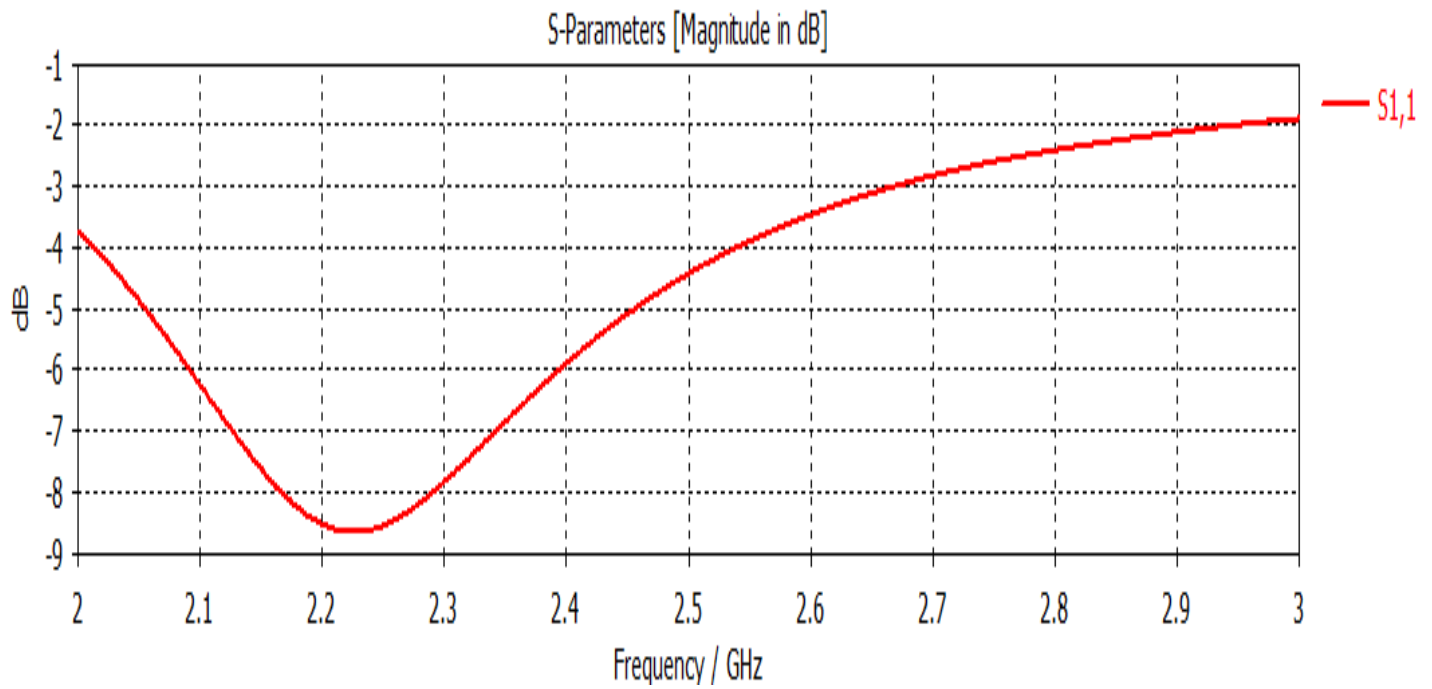


Figure 10:  $S_{1,1}$  vs frequency in dB scale .

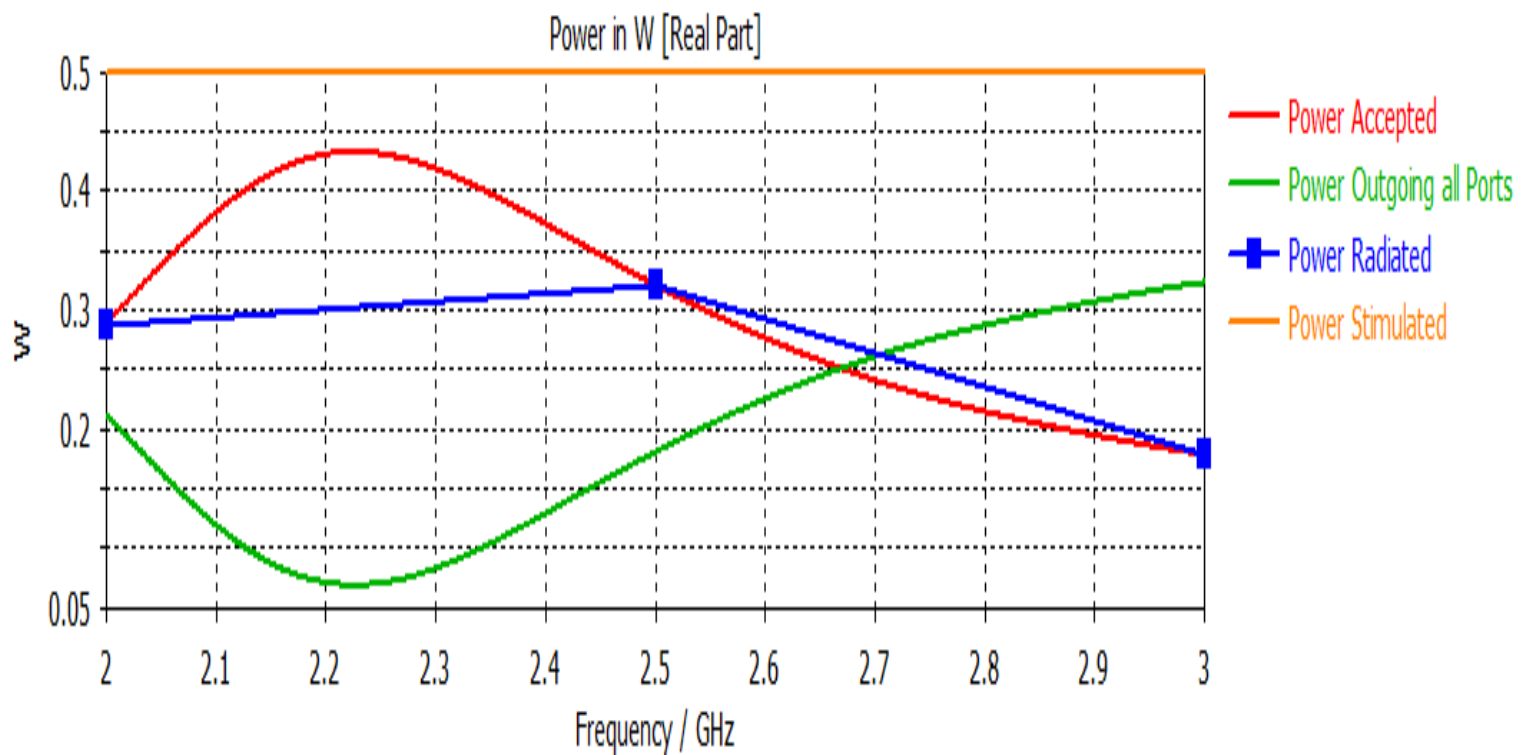


Figure 11: Powers VS frequency.

#### 4.2.4 Improvement the Design

The previous design was chosen to operate at 2.5 GHz, but as seen in S1,1 parameter the reflection is very high at 2.5 GHz.

We are going to change the lambda coefficient and test its effect on the design.

Parameter	Value
Lambda 1	119.92
Lambda 2	99.5336
Lambda 3	105.53

Table 2: Lambda values.

#### 4.2.5 Simulation and comparison

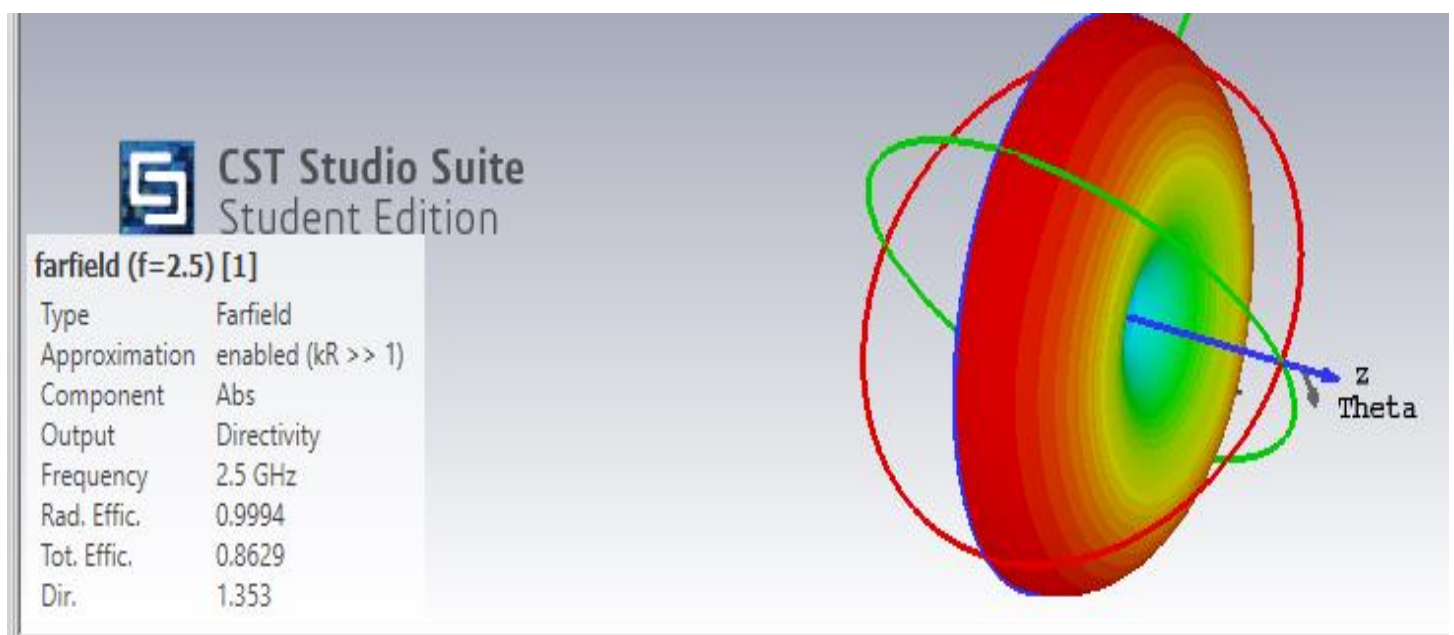
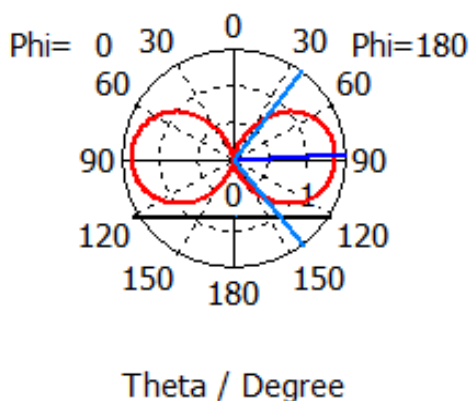


Figure 12: Far field radiation pattern.

#### Farfield Directivity Abs (Phi=0)



— farfield (f=2.5) [1]

Frequency = 2.5 GHz

Main lobe magnitude = 1.35

Main lobe direction = 87.0 deg.

Angular width (3 dB) = 104.7 deg.

Figure 13: Directivity in polar domain.

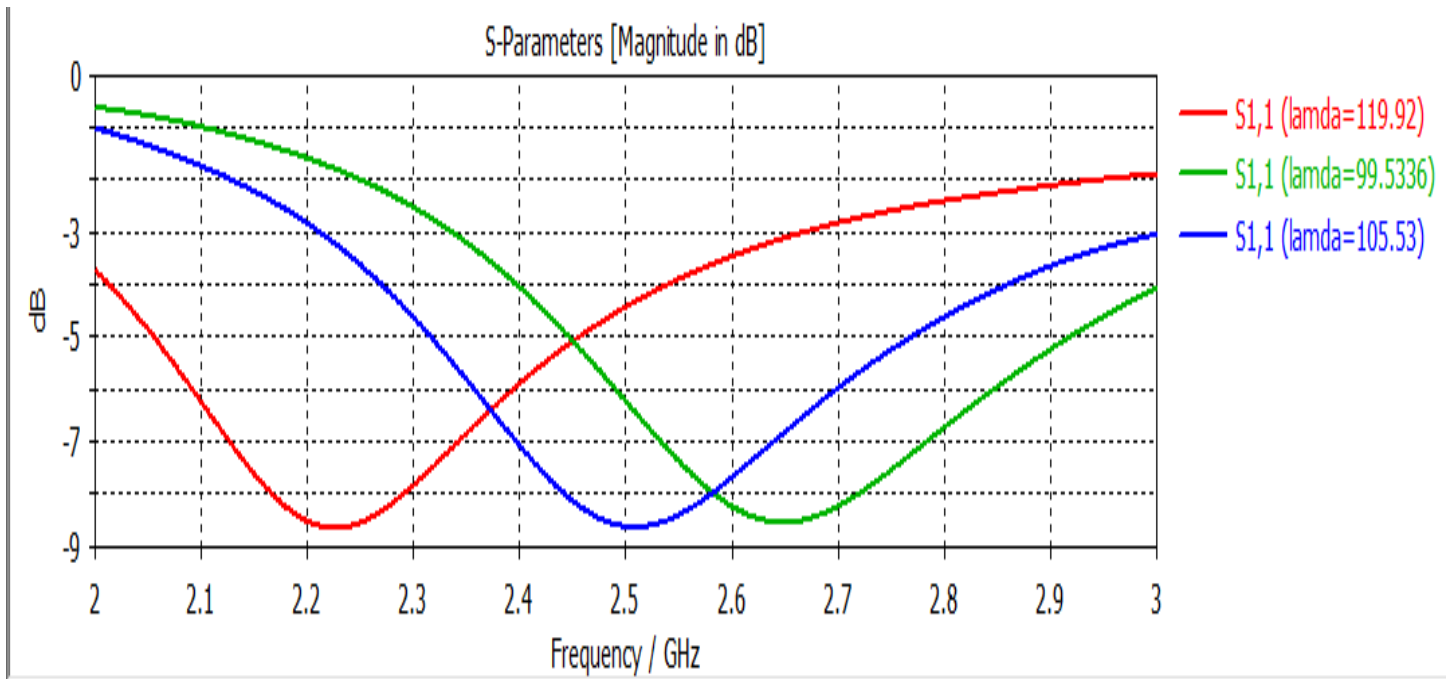


Figure 14:  $S_{1,1}$ 's plots for 3 values of  $\lambda$ bdas.

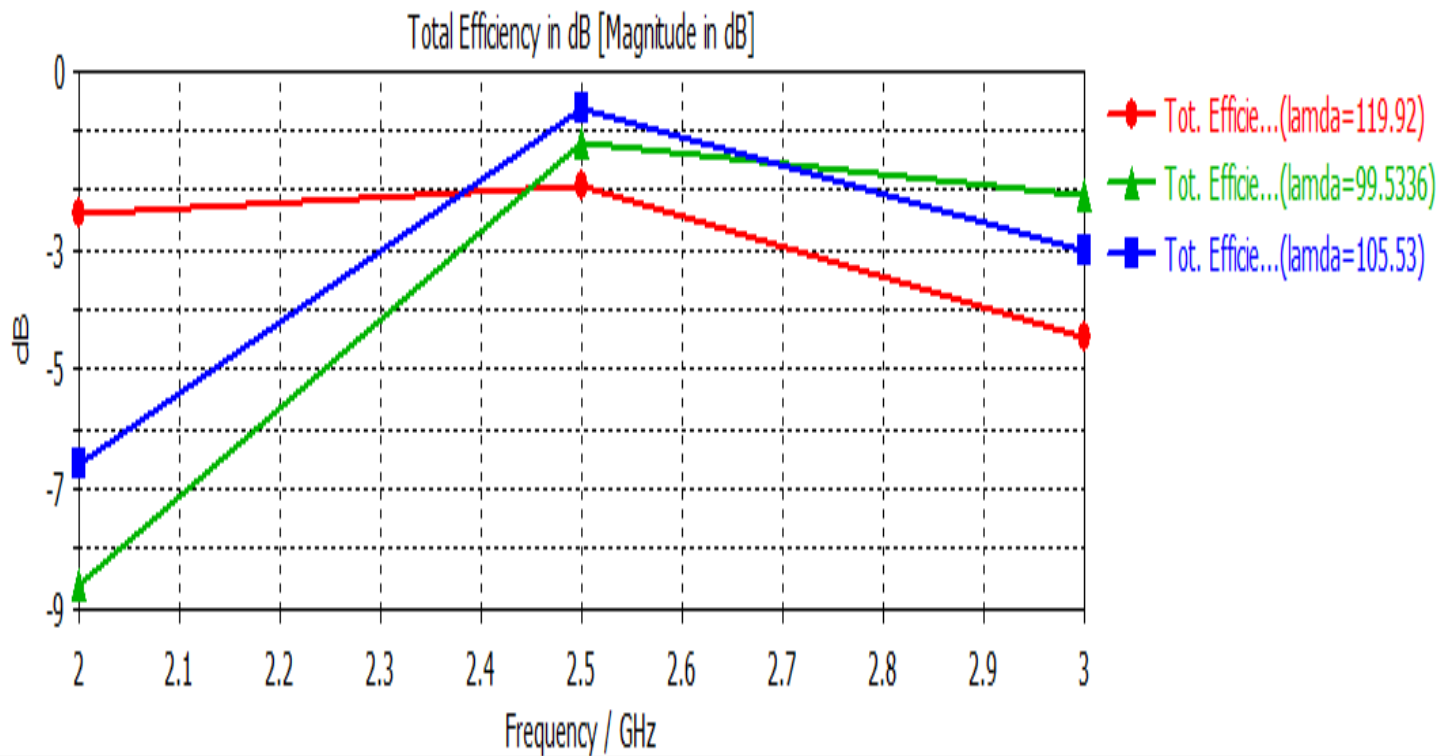


Figure 15: Efficiency's plots for 3 values of  $\lambda$ bdas.

Lambda	S1,1 (dB)	Efficiency
99.5336	-6.22	76%
119.92	-4.14	64%
105.53	-8.64	86%

Table 3: