

EE609 Radiating Systems PROJECT REPORT

Problem Statement: Design and Simulate a half wave dipole antenna operating at a resonant frequency of 6.6 GHz. Calculate the appropriate length, radius and gap length.

Submitted By

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Antenna Geometry

Operating Frequency – 6.6 GHz
Length of Antenna – 21.67 mm
Feed Gap poles - 0.1083 mm
Radius of Antenna - 0.04545 mm
Material of Antenna - PEC

Resonant Frequency

[1 + Group. No*0.4] GHz
 $1+14*0.4 = 6.6\text{GHz}$

Wave length

$\lambda = c/f$
 $\lambda = 3 \times 10^8 / 6.6 \times 10^9 \text{ cm}$
 $\lambda = 45.45 \text{ mm}$

Length of Antenna ($L=\lambda/2$)

In practical we can consider it smaller than that to eliminate the imaginary part of Radiation resistance

$$143/f(\text{MHz}) = 21.67 \text{ mm}$$

Dipole Radius(R)

$$\lambda/1000 = 0.045\text{mm}$$

Feed Gap(g)

$$L/200 = 0.108\text{mm}$$

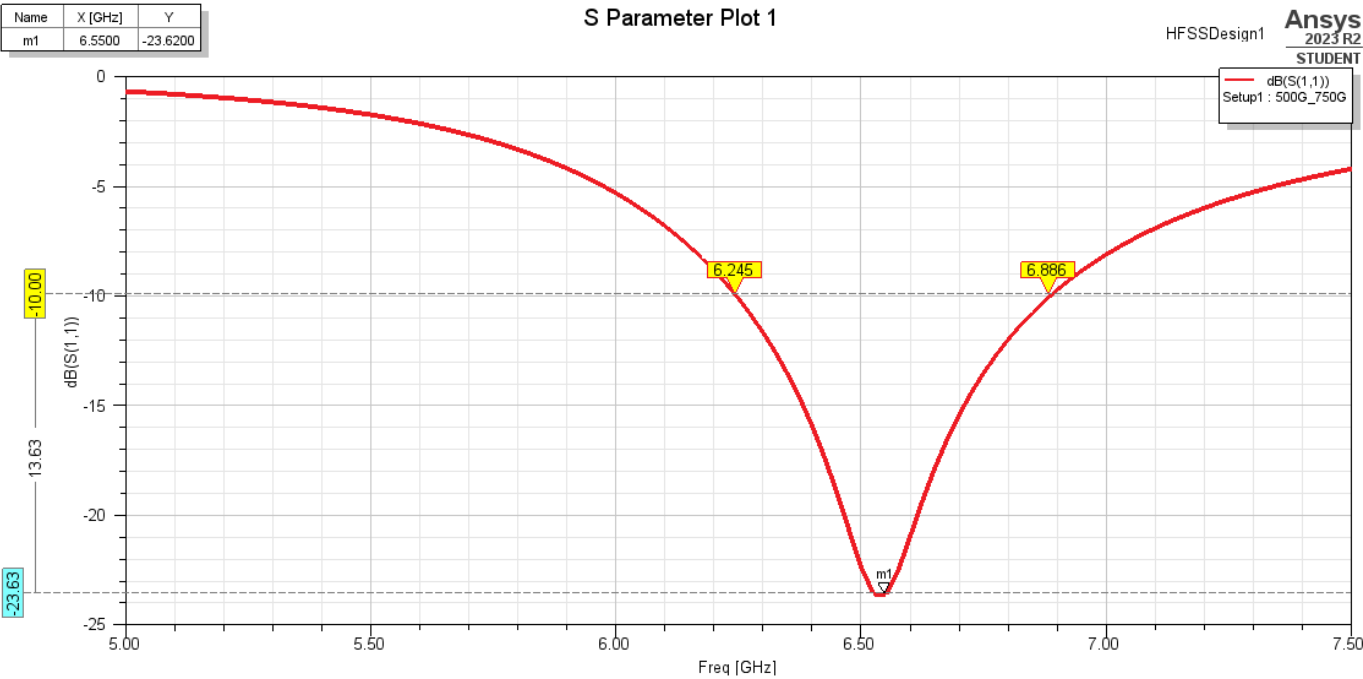
Matching Impedance (Z0)

$$73\text{ohm}$$

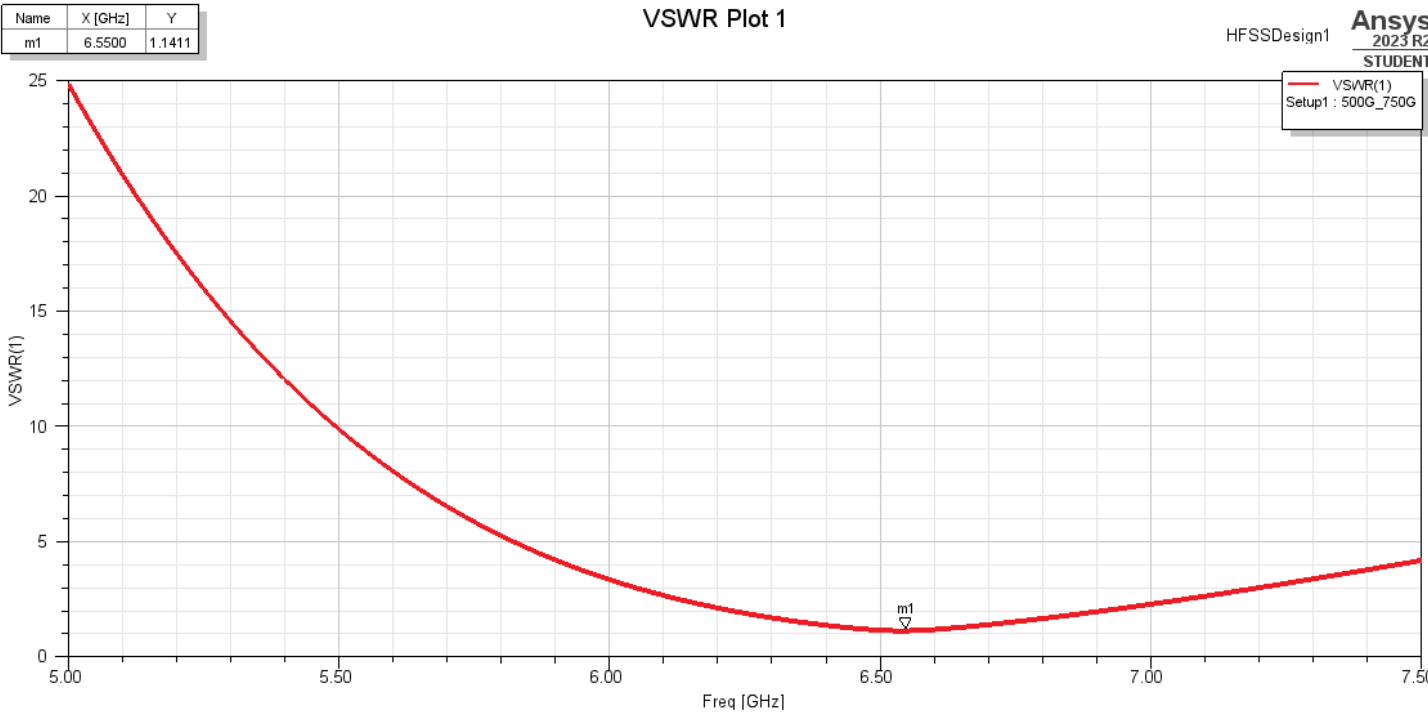
Element	Shape	X mm	Y mm	Z mm	Pos(x,y,z) mm	Radius(mm)	Axis	Material
Dipole	Cylinder	0	0	21.67	(0, 0, -10.83)	0.04545	Z-axis	PEC
Feed Gap	Cylinder	0	0	0.1083	(0,0,-0.0541)	0.04545	Z-axis	Vaccum
Excitation	Rectangular Sheet	Lumped port, Impedance-75 ohm					YZ-plane	-
Radiation Boundary	Box	40	40	40	(-20,-20,-20)	-	-	Air

Plot results

1. S11(dB) Vs Freq(GHz)

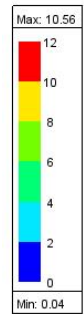


2. VSWR(dB) Vs Freq(GHz)

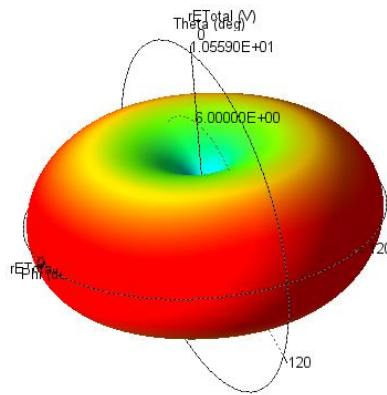


3. 3D radiation pattern

Ansys Inc.



RAD_PATTERN



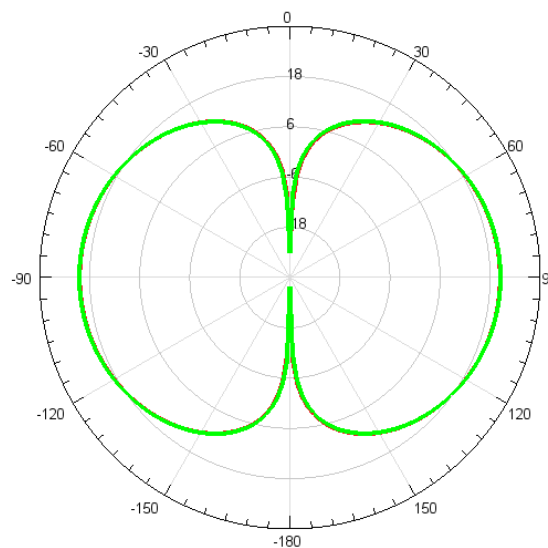
Ansys
2023 R2
STUDENT

4. E-plane and H-plane radiation pattern

E-PLANE – π - 0 deg

H-PLANE – π - 90 deg

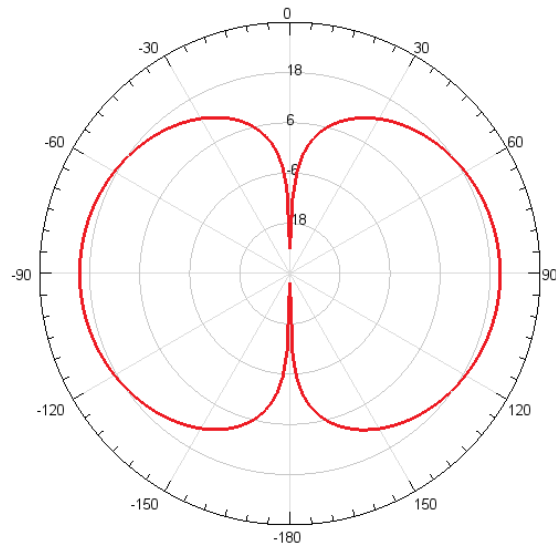
E_H PLANE



HFSSDesign1
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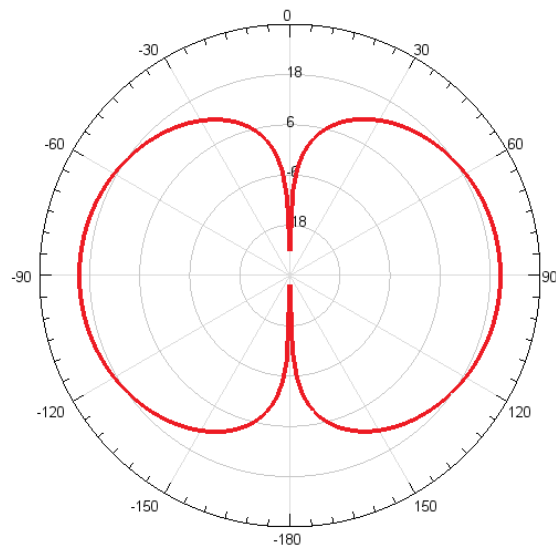
— dB(rETotal)
Setup1 : LastAdaptive
Freq=6.5GHz' Phi=0deg'
— dB(rETotal)
Setup1 : LastAdaptive
Freq=6.5GHz' Phi=90deg'

E PLANE



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dB(rETotal)
Setup1 : LastAdaptive
Freq=6.6GHz' Phi=0deg'

H PLANE



HFSSDesign1
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dB(rETotal)
Setup1 : LastAdaptive
Freq=6.6GHz' Phi=90deg'

5. Gain(dB) vs Frequency

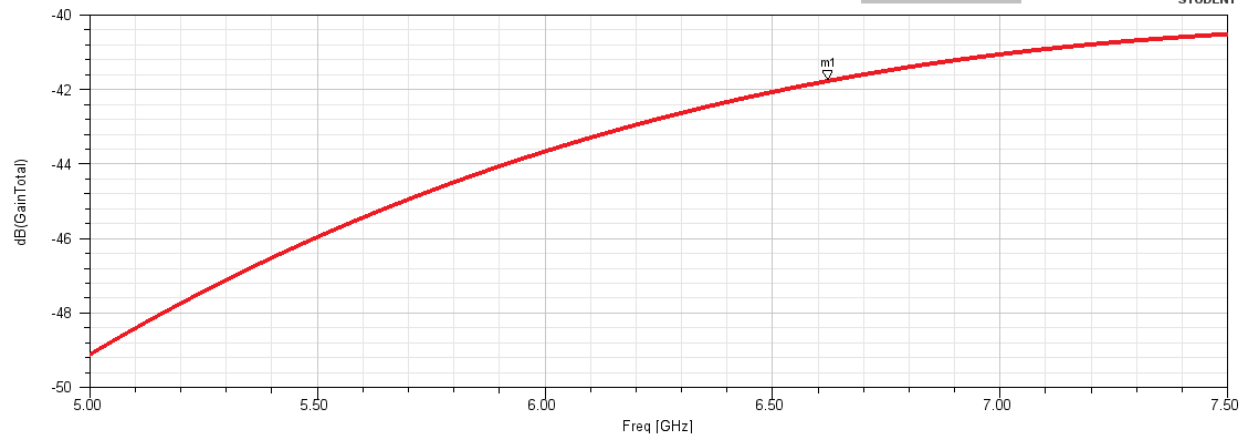
Name	X [GHz]	Y
m1	6.6250	-41.7699

GainVs freq

dB(GainTotal)
Setup2_FREQ : Sweep_freq
Phi=0deg Theta=0deg

HFSSDesign1

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6. Directivity(dB) vs Freq

Name	X [GHz]	Y
m1	6.6250	-41.8829

Directivity vs freq

dB(DirTotal)
Setup2_FREQ : Sweep_freq
Phi=0deg Theta=0deg

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