Abdelhady Mahmoud
Antenna Researcher

Ka- band Dual modes Using OMT horn (Verification)

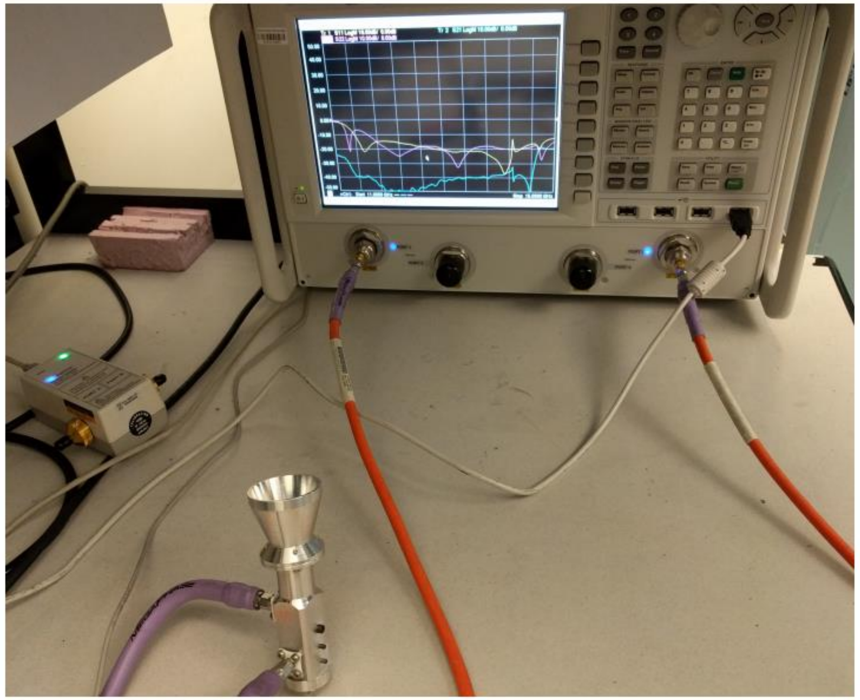
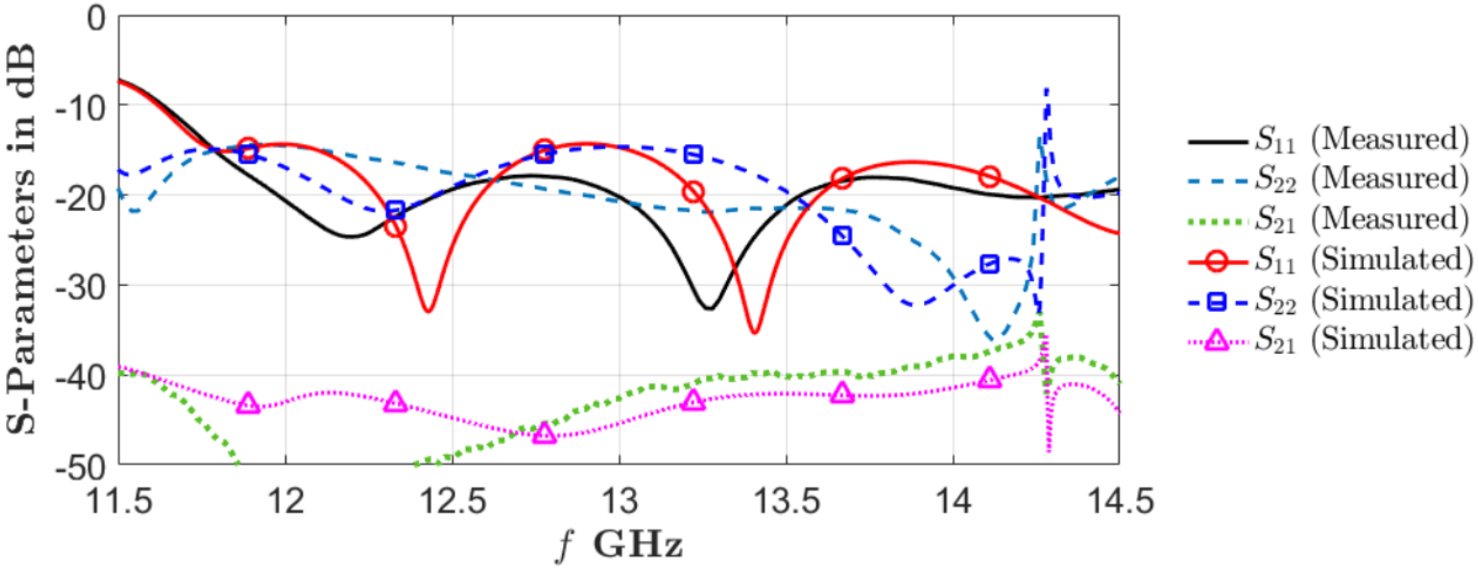


Fig. 10. The measured prototype of the dual polarized conical horn antenna using the proposed OMT.



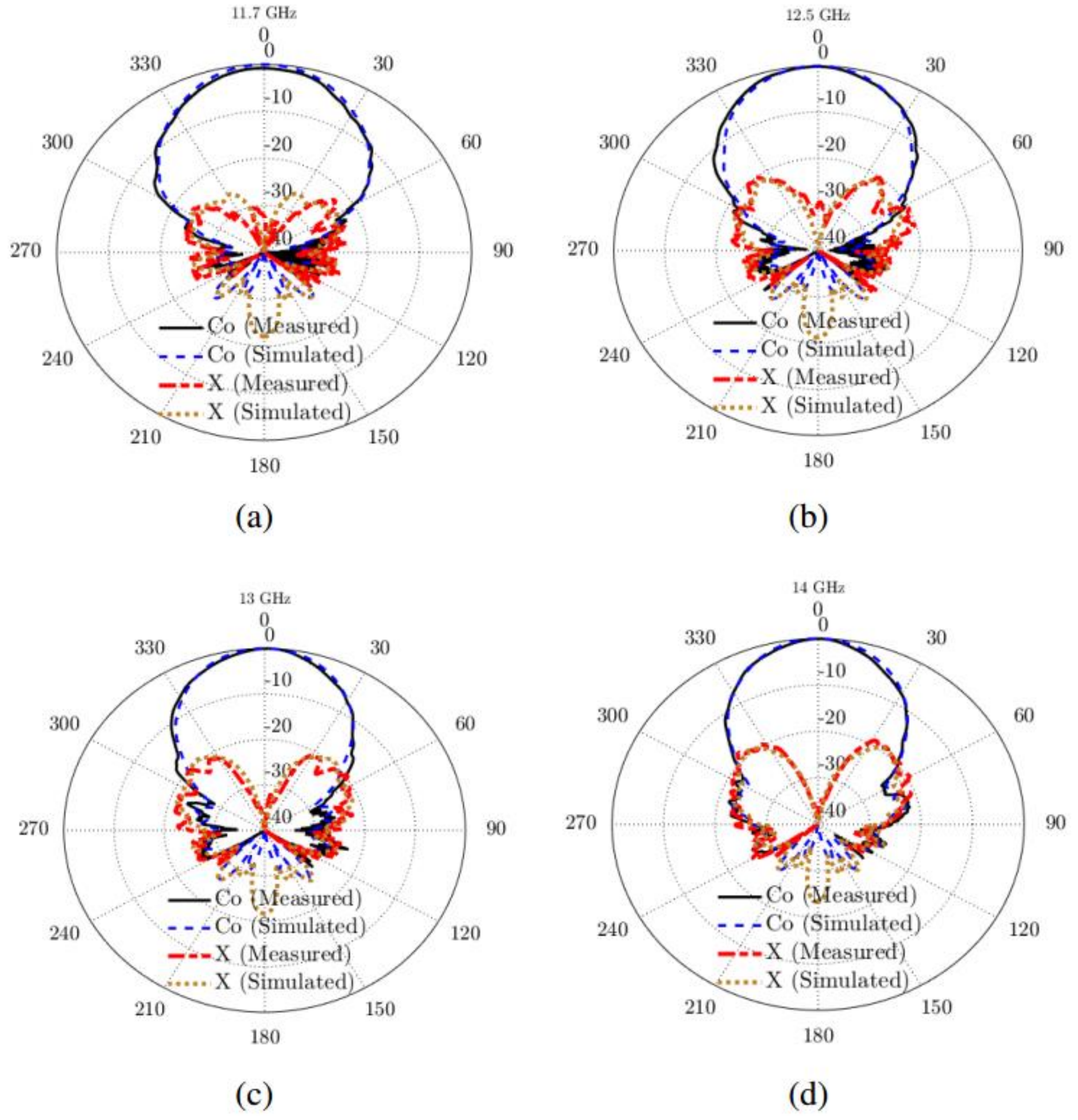
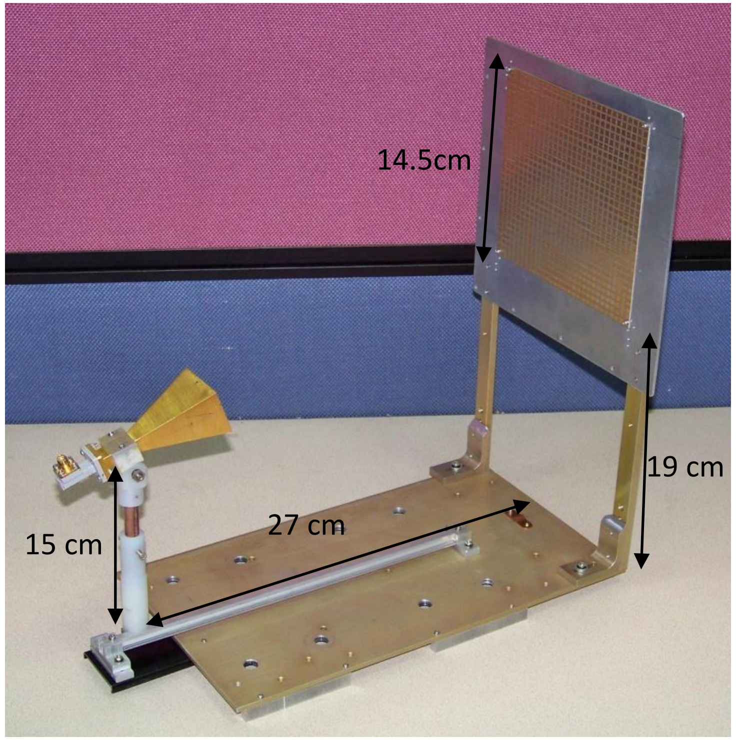


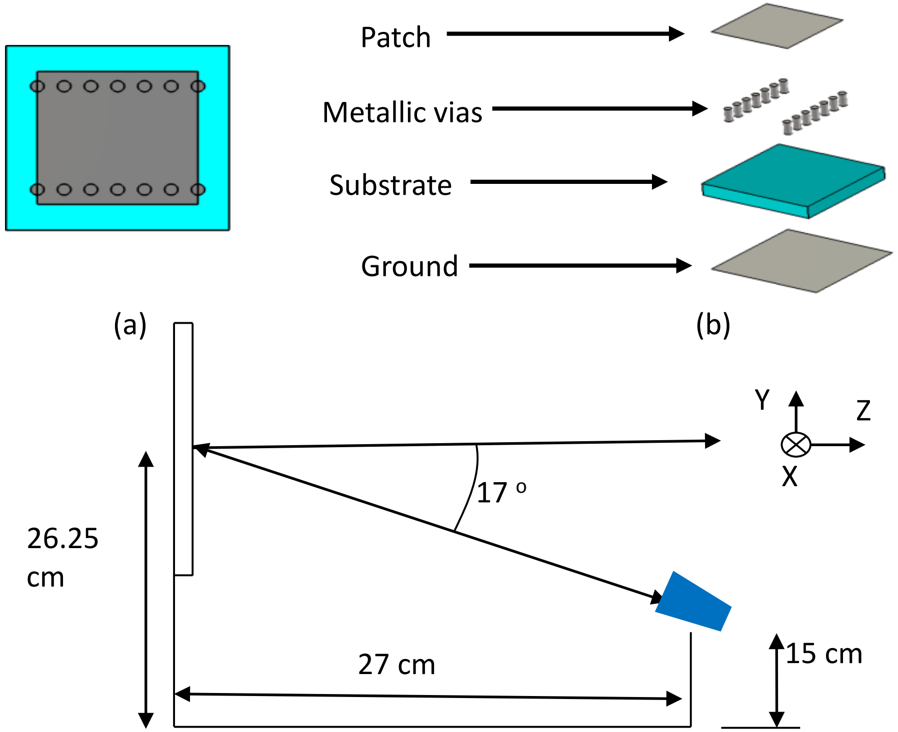
Fig. 12. The measured and simulated radiation patterns at the 45° plane of the dual polarized antenna using the excitation of Port 1 and a matched termination for Port 2 at different frequency points. (a) 11.7 GHz. (b) 12.5 GHz. (c) 13 GHz. (d) 14 GHz.

Ka-band LP Reflectarray

Dr. Abdelhady Mahmoud

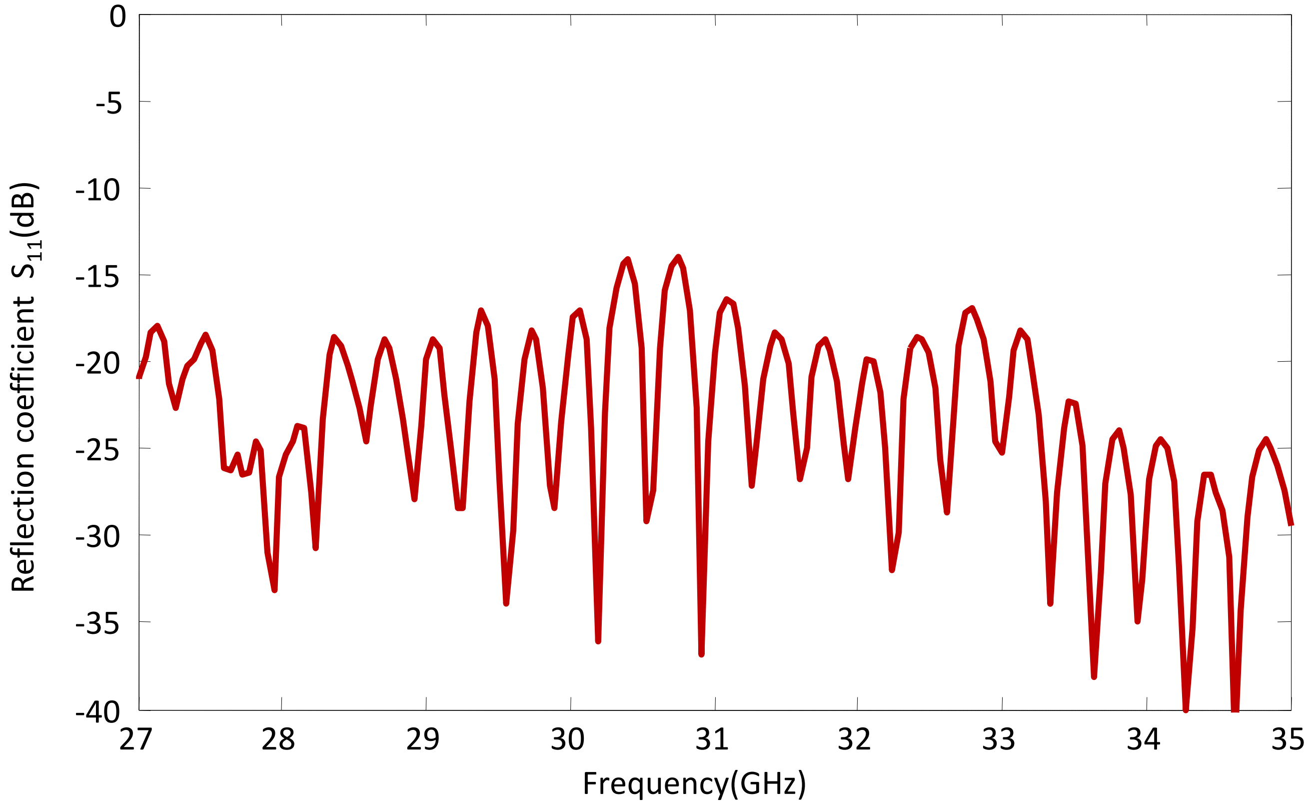
30 GHz Metallic Vias Reflectarray



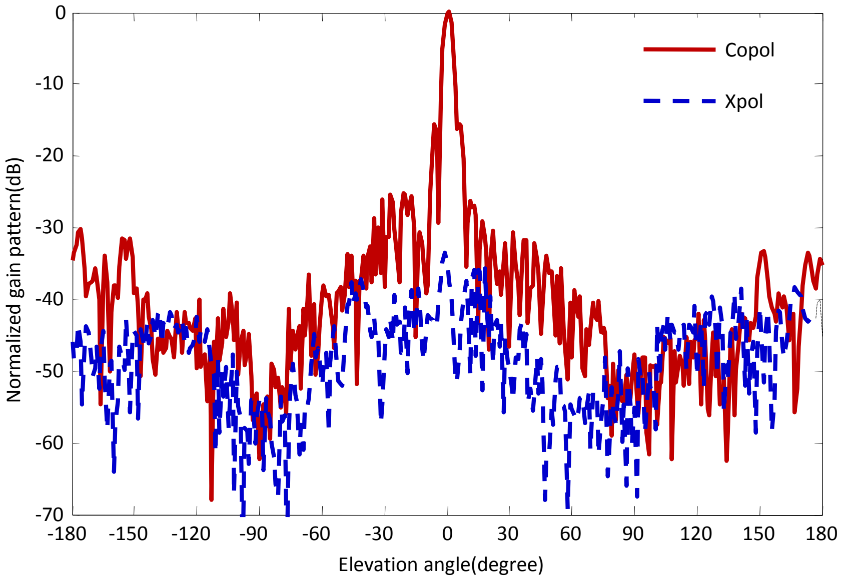


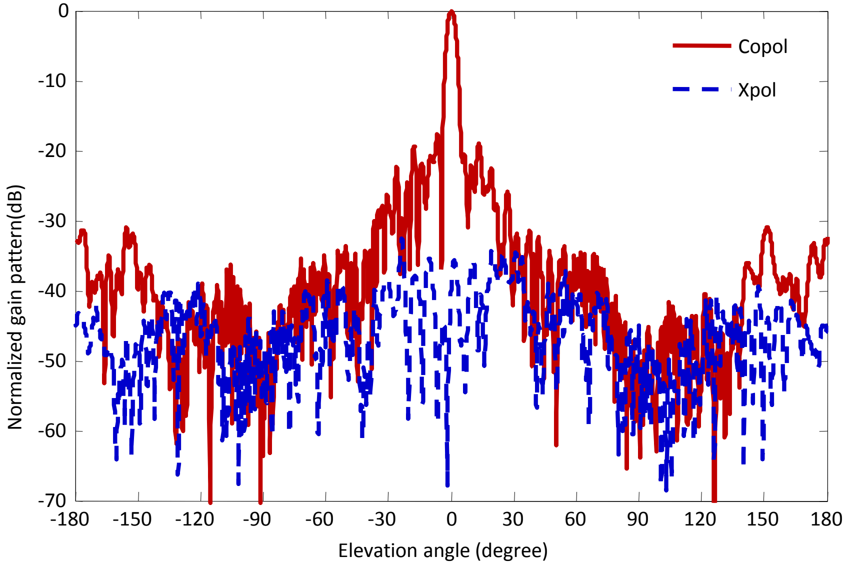
Schematic metallic vias reflectarray

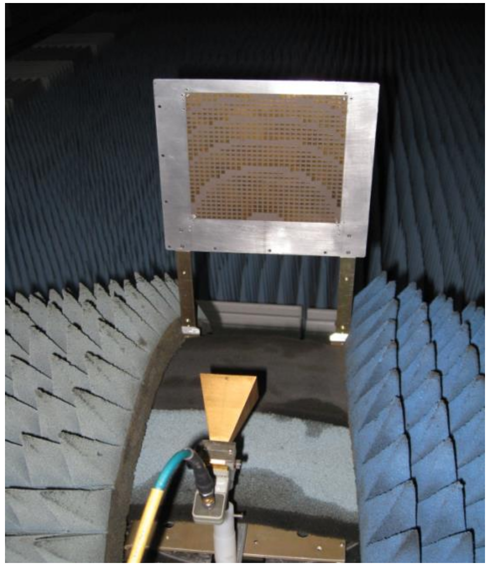
Aperture coupled DRA reflectarray layout at 30 GHz

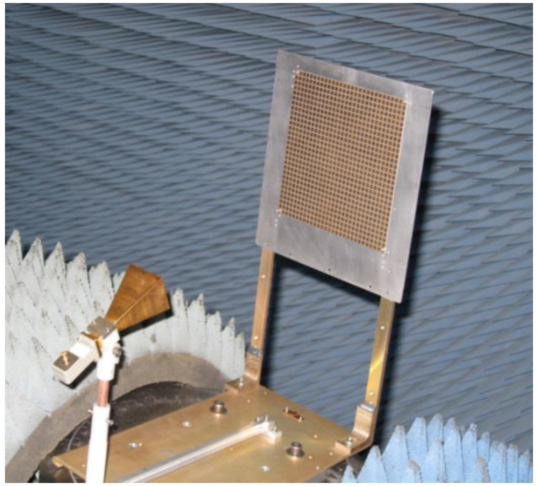


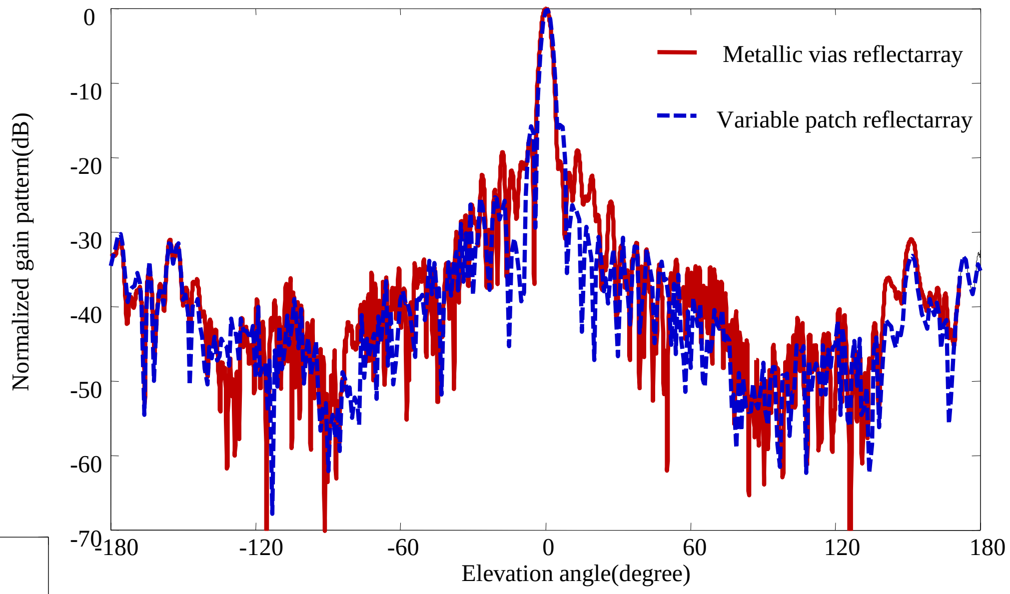
Reflection coefficient S_{11} of the feeder


Copol
Xpol
Normalized gain pattern(dB)
Elevation angle(degree)
0
-10
-20
-30
-40
-50
-60
-70
-180 -150 -120 -90 -60 -30 0 30 60 90 120 150 180

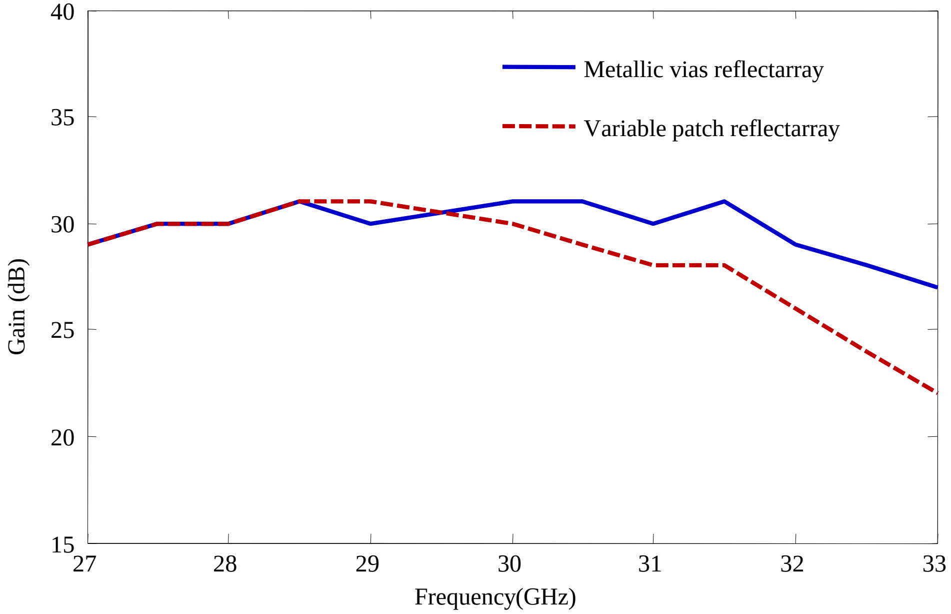

Copol
Xpol
Normalized gain pattern(dB)
Elevation angle (degree)
0
-10
-20
-30
-40
-50
-60
-70
-180 -150 -120 -90 -60 -30 0 30 60 90 120 150 180





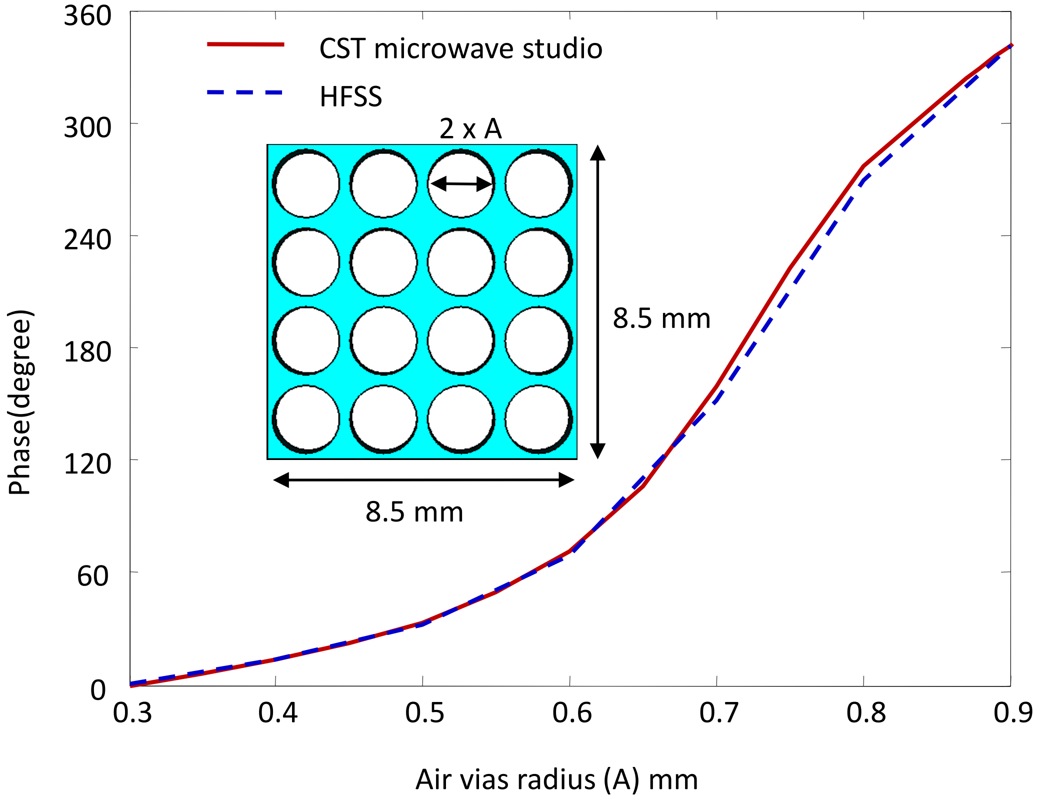


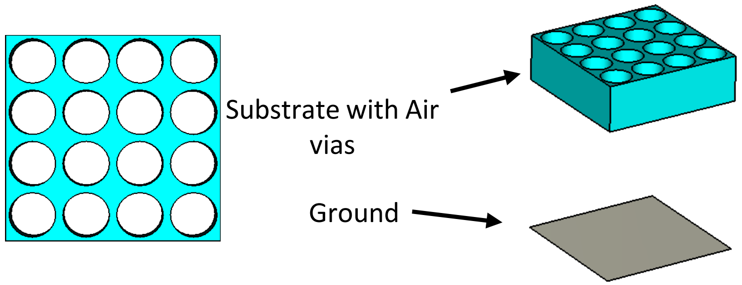
0
-10
-20
-30
-40
-50
-60
-70
Normalized gain pattern(dB)
-180
-120
-60
0
60
120
180
Elevation angle(degree)
Metallic vias reflectarray
Variable patch reflectarray

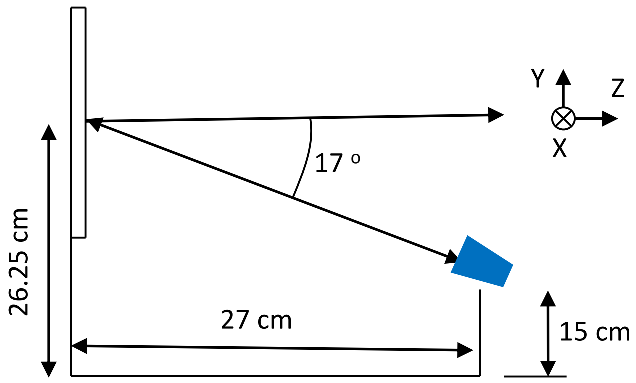


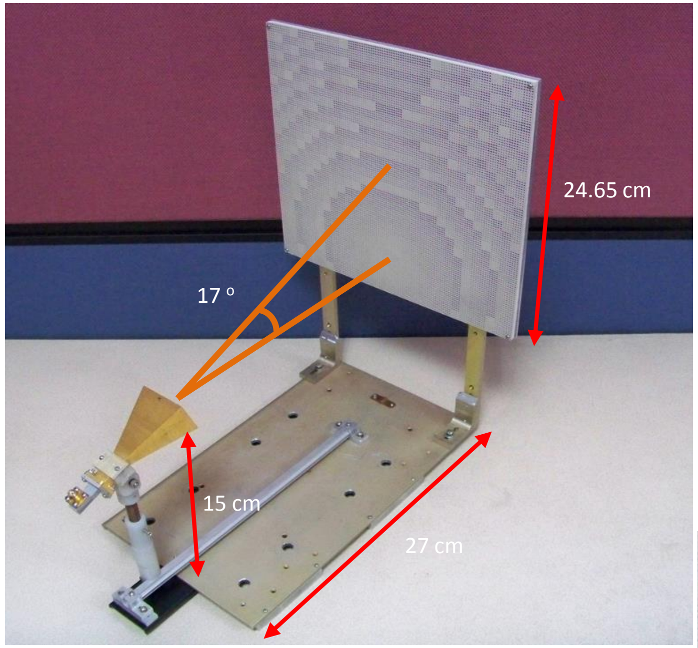
40
35
30
25
20
15
Gain (dB)
27
28
29
30
31
32
33
Frequency(GHz)
Metallic vias reflectarray
Variable patch reflectarray

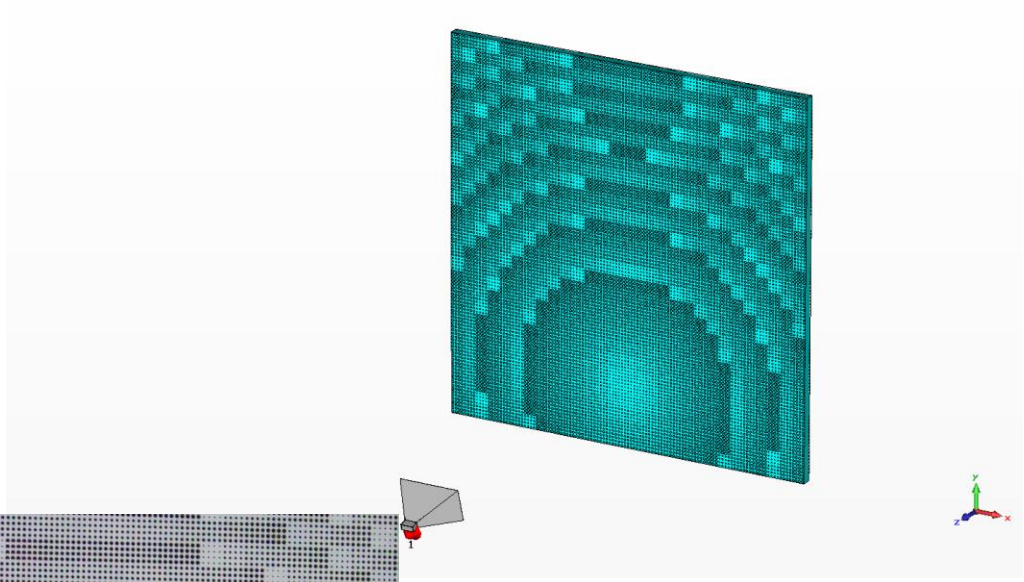
30 GHz Linear Polarized Air Vias Reflectarray

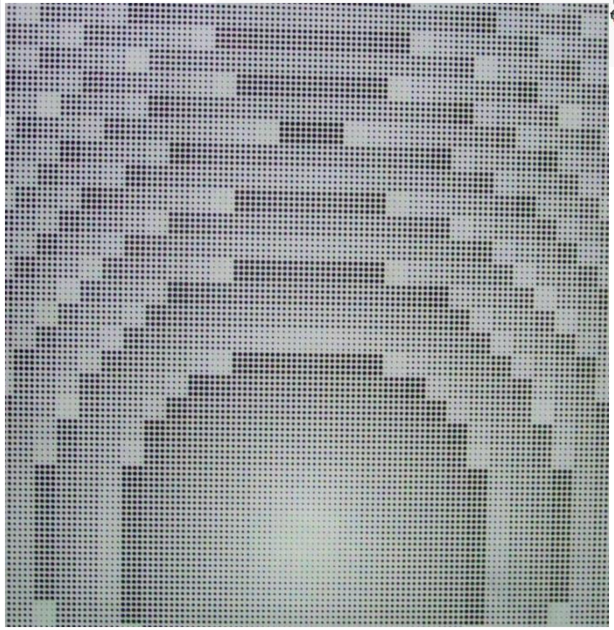


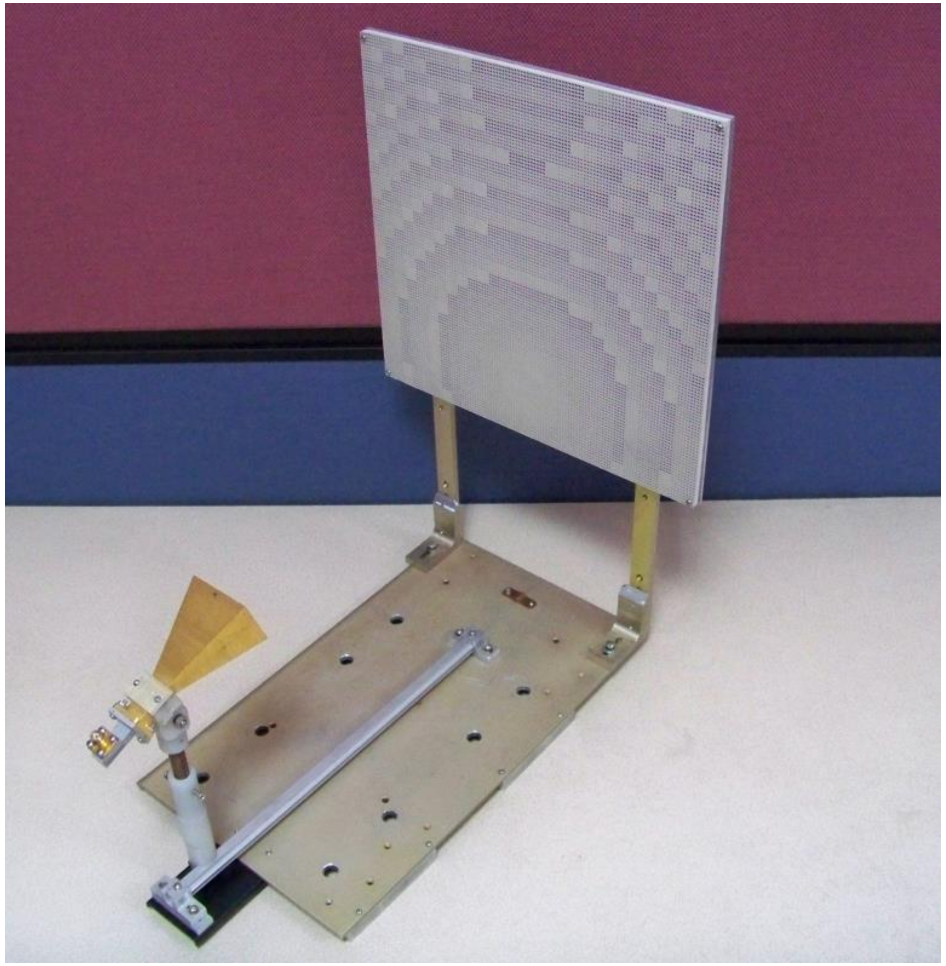


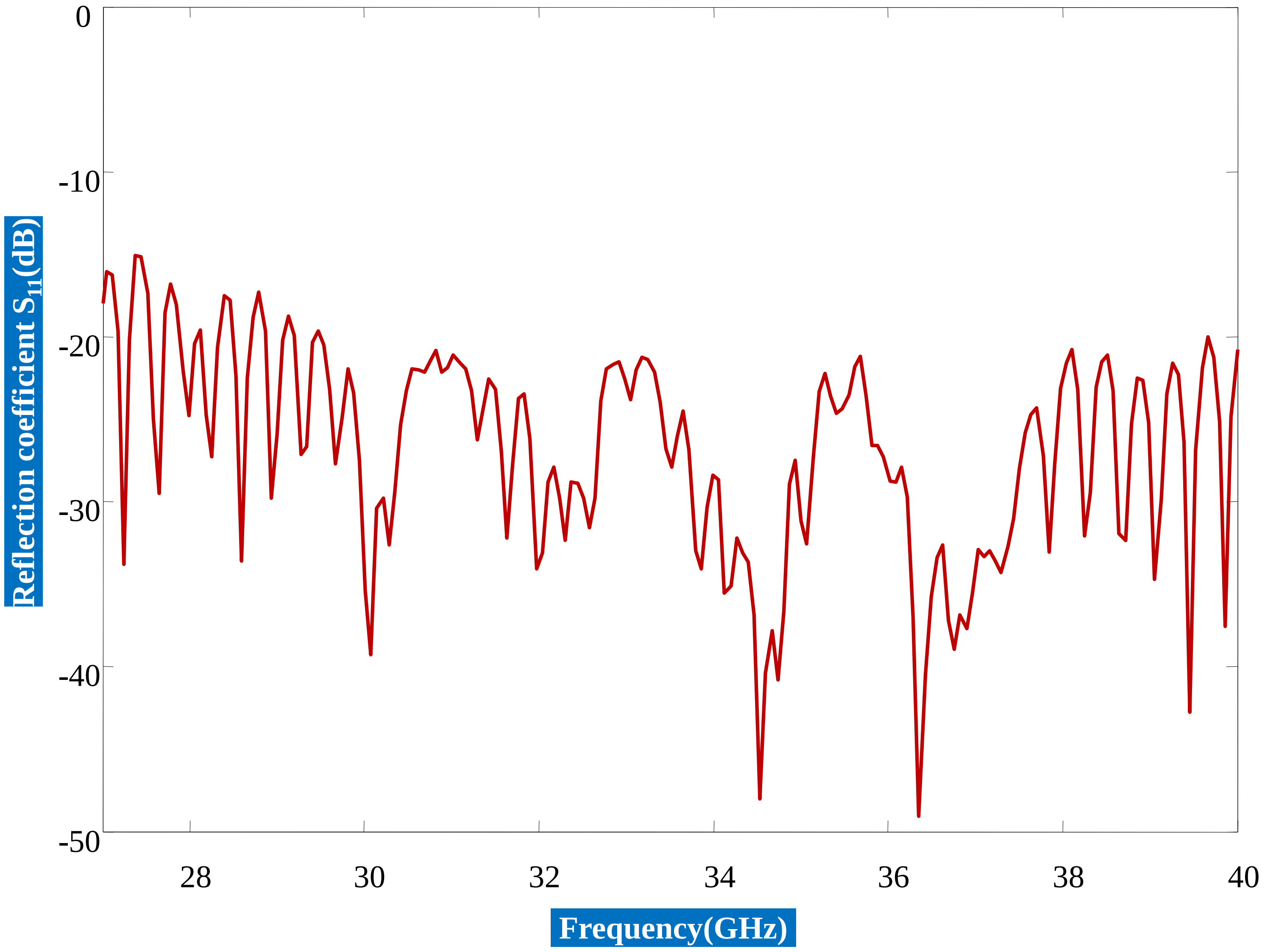



24.65 cm
17 º
15 cm
27 cm

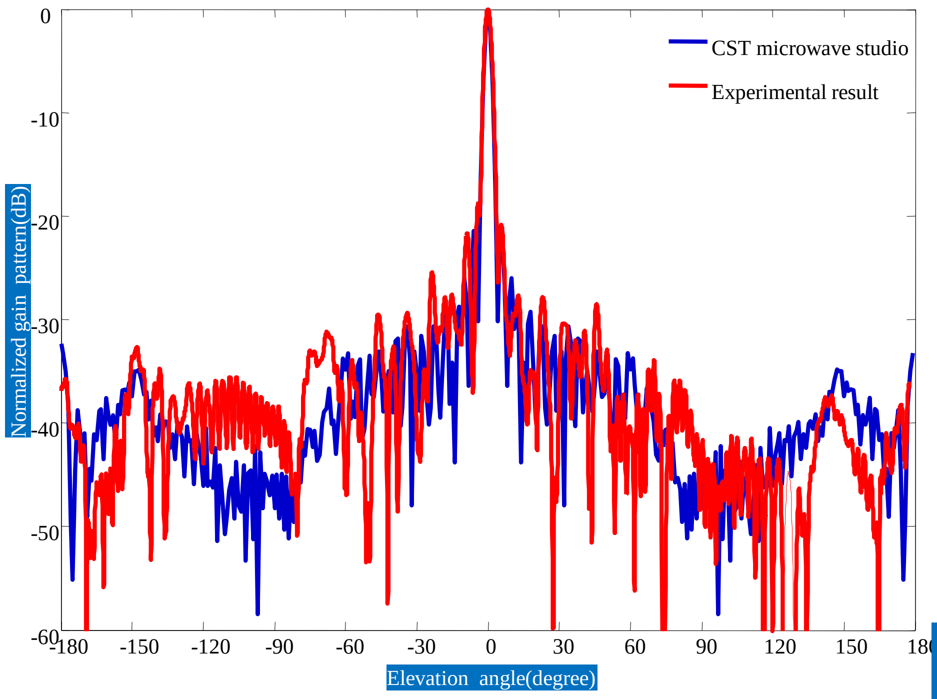




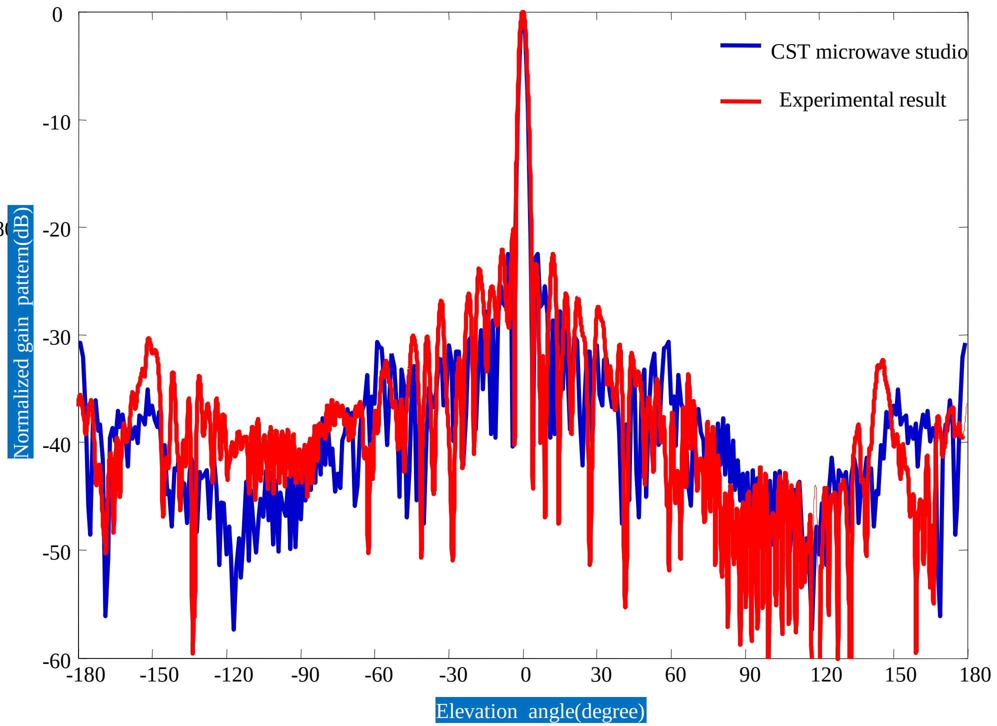




Reflection coefficient S_{11}(dB)
0
-10
-20
-30
-40
-50
28
30
32
34
36
38
40
Frequency(GHz)



CST microwave studio
Experimental result
Normalized gain pattern(dB)
Elevation angle(degree)
0
-10
-20
-30
-40
-50
-60
-180 -150 -120 -90 -60 -30 0 30 60 90 120 150 180



CST microwave studio
Experimental result
Normalized gain pattern(dB)
Elevation angle(degree)
0
-10
-20
-30
-40
-50
-60
-180 -150 -120 -90 -60 -30 0 30 60 90 120 150 180

Ka-band CP Reflectarray

Dr. Abdelhady Mahmoud

Ka- band Circularly Polarized Dual modes Horn (Verification)

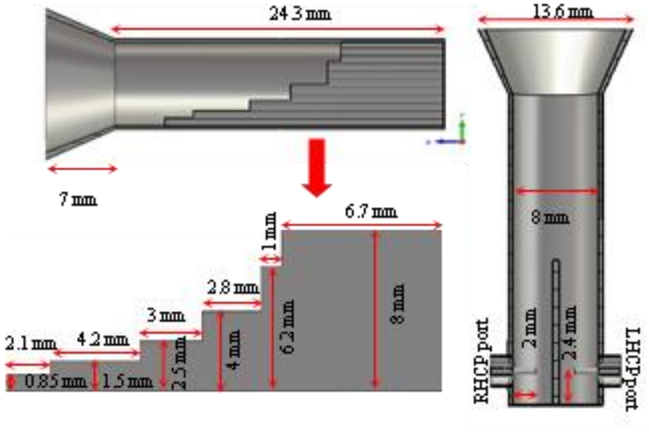


Fig.8. *Geometry of the dual mode CP horn.*

Fig. 9. *Photo of the dual mode circularly polarized horn.*

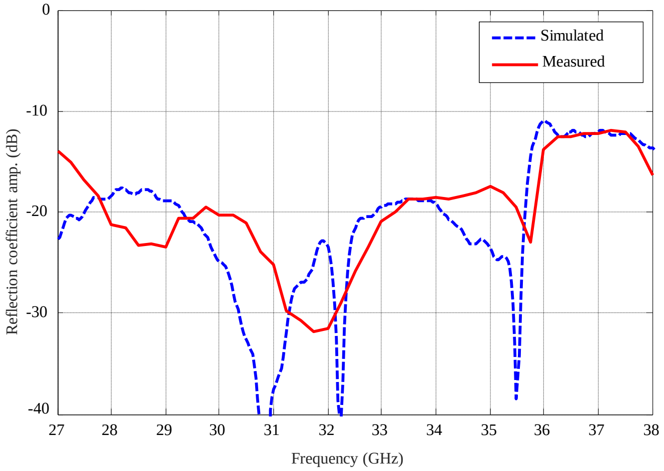


Fig. 10. *Dual mode circularly polarized horn reflection coefficient.*

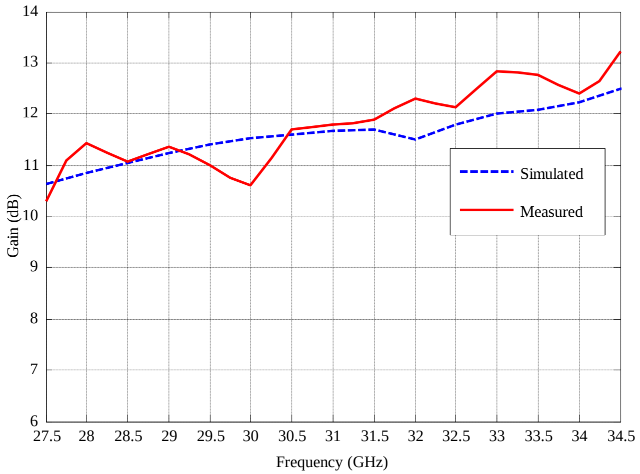


Fig. 13. *Dual mode circularly polarized horn gain.*

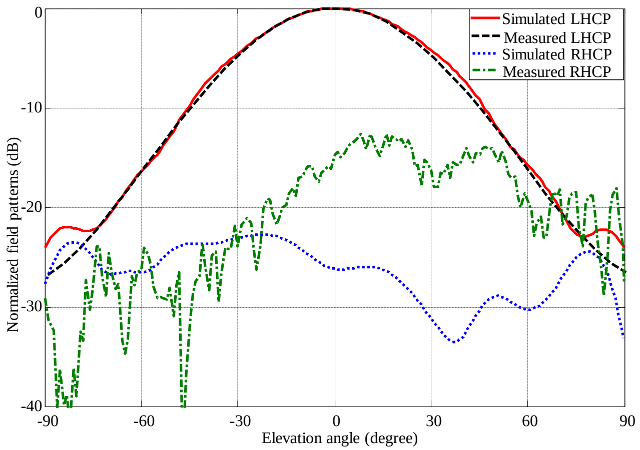


Fig.11. *X-Z plane simulated and measured horn radiation patterns at 30 GHz.*

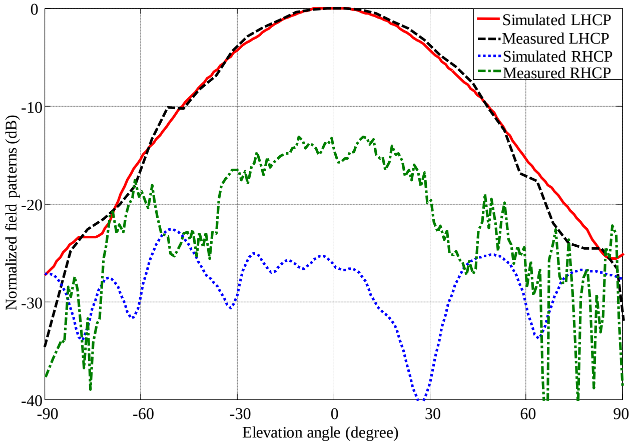


Fig.12. *Y-Z plane simulated and measured horn radiation patterns at 30 GHz.*

Ka- band Circularly Polarized Reflectarray (Verification)

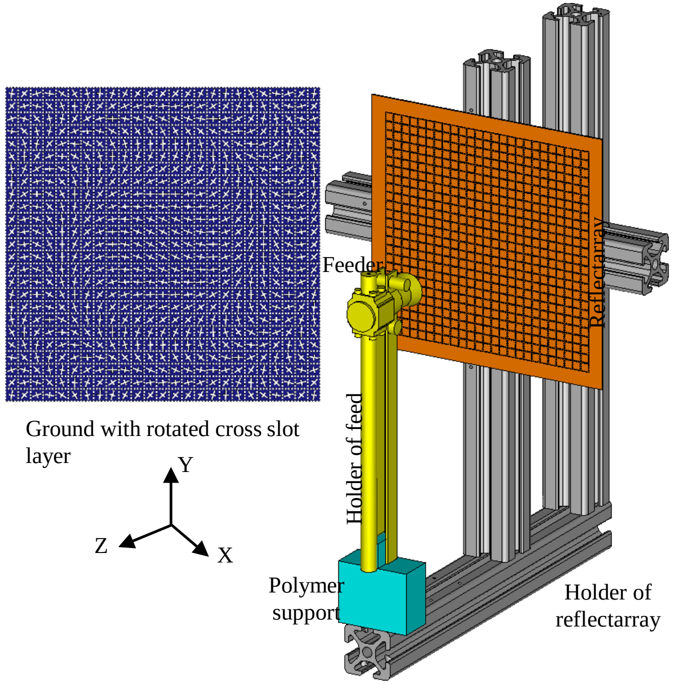


Fig. 14. *Sketch for the reflect array layout and the constructed support and feed.*

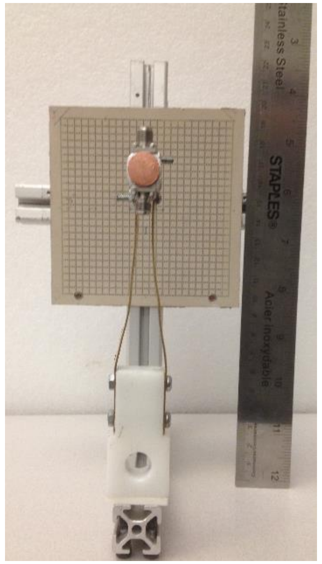
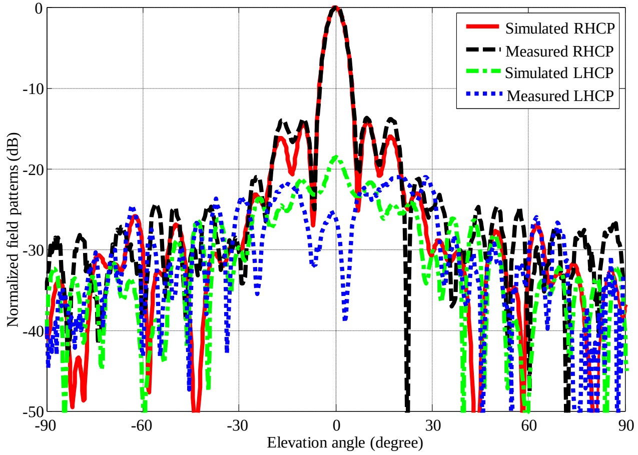
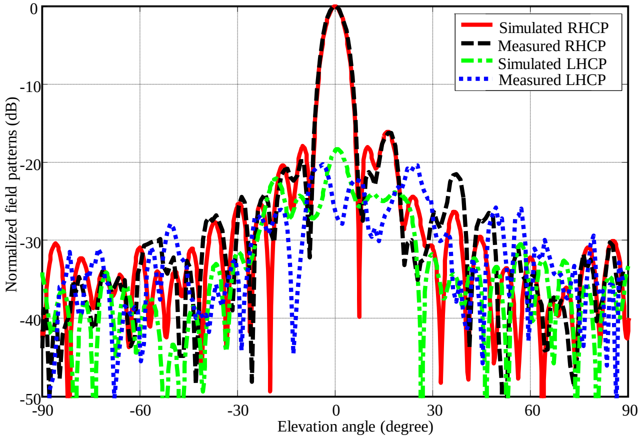


Fig. 15. *Photos for the circularly polarized reflectarray.*



(a) X-Z Plane



(b) Y-Z Plane

Fig.19. *Simulated and measured radiation patterns at 30 GHz.*

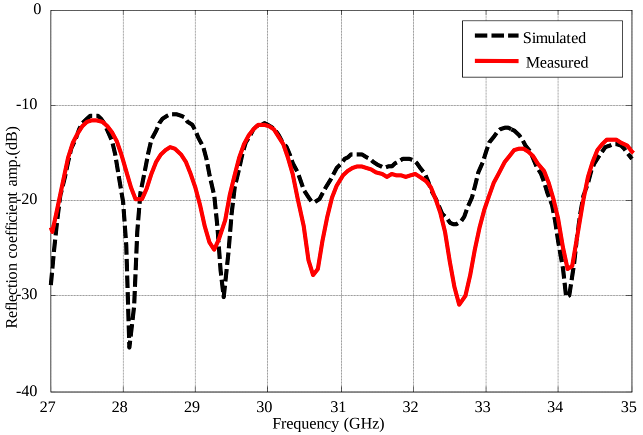


Fig. 18. *Simulated and measured reflection coefficients with the reflectarray.*

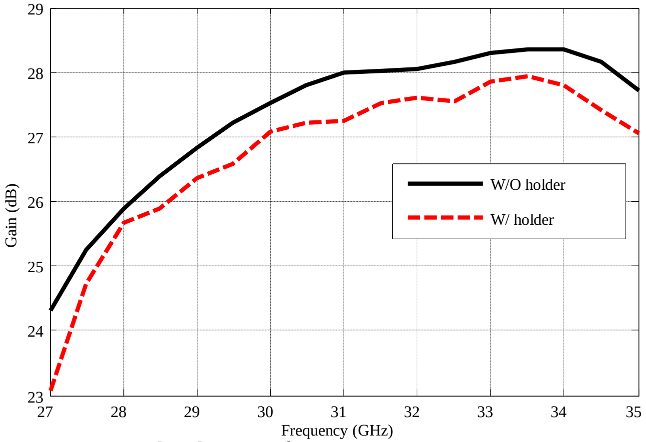


Fig.17. *Simulated Gain vs frequency.*

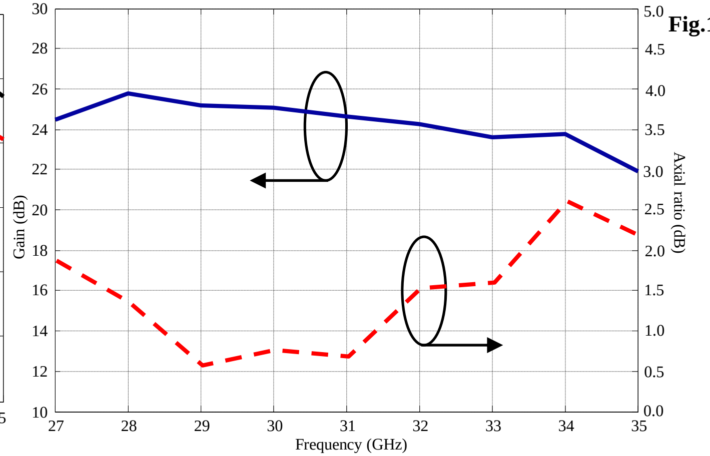
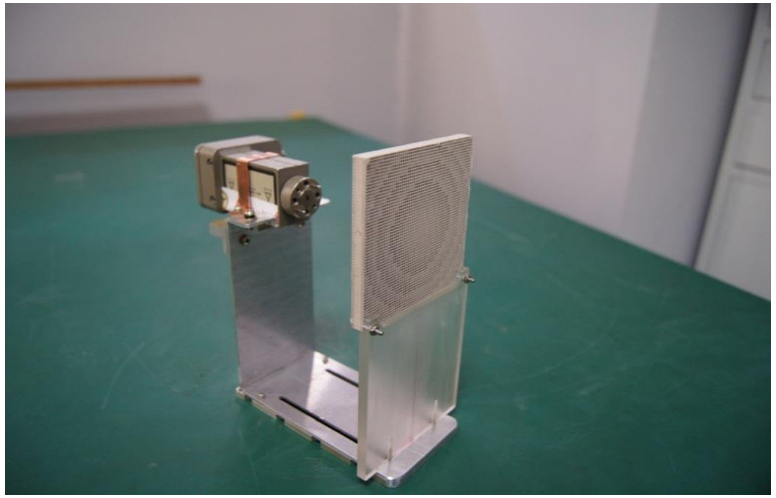


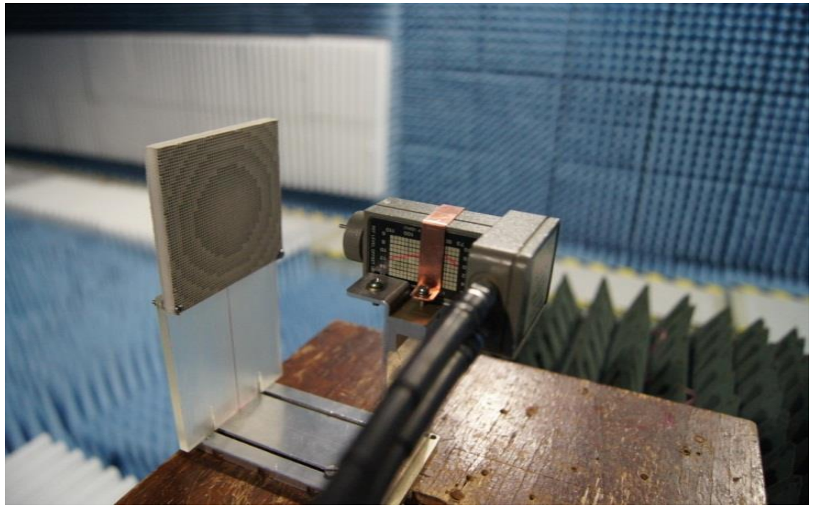
Fig.20. *Measured gain and axial ratio versus frequency.*

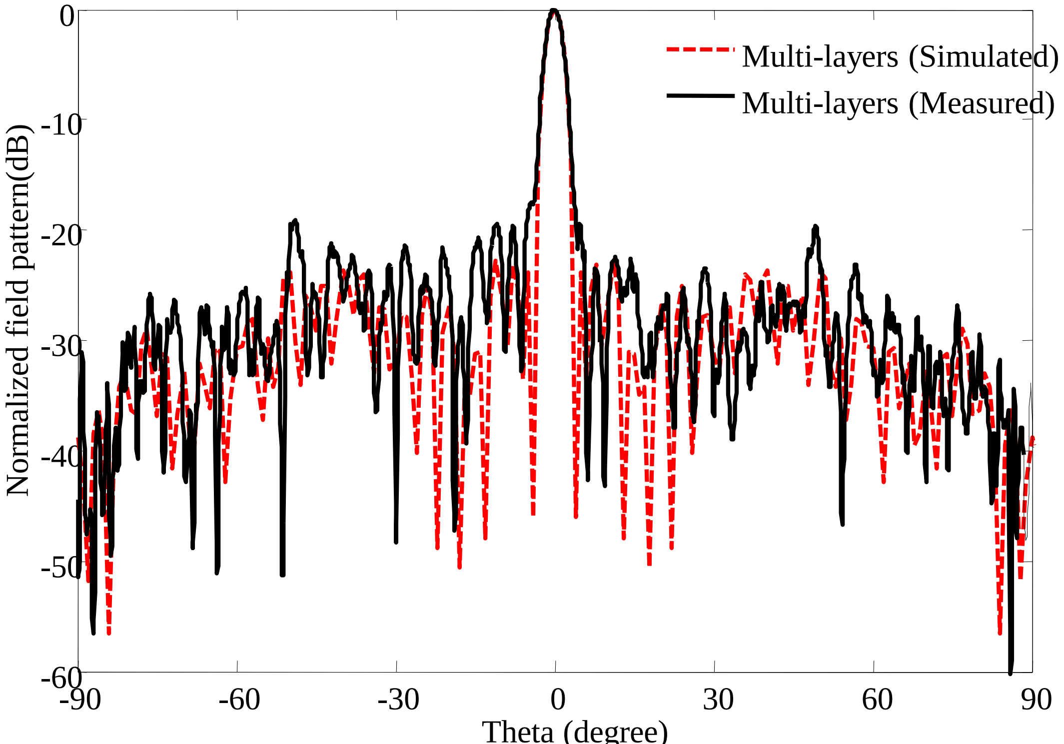
W-band Lens Antenna

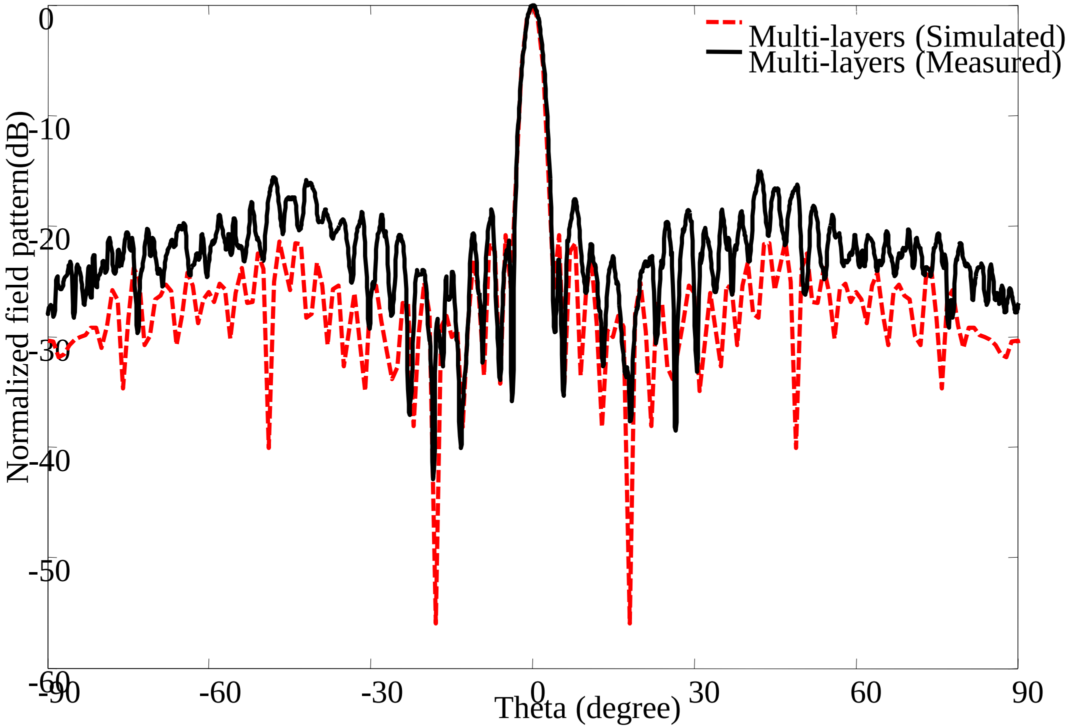
Dr. Abdelhady Mahmoud

94 GHz Multi-layer Len Antenna

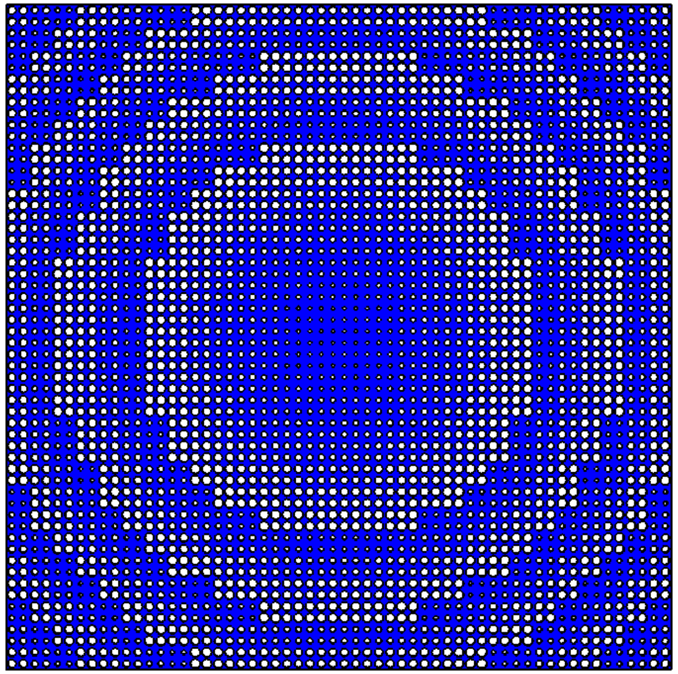




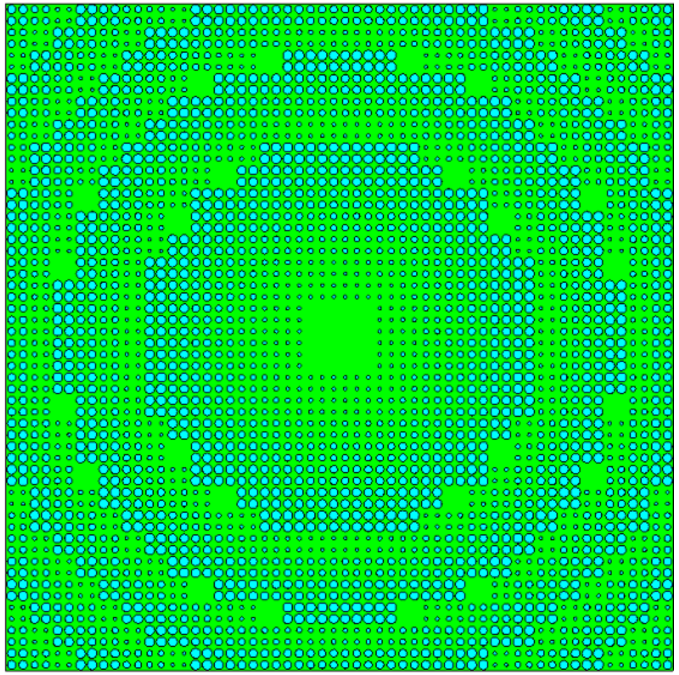




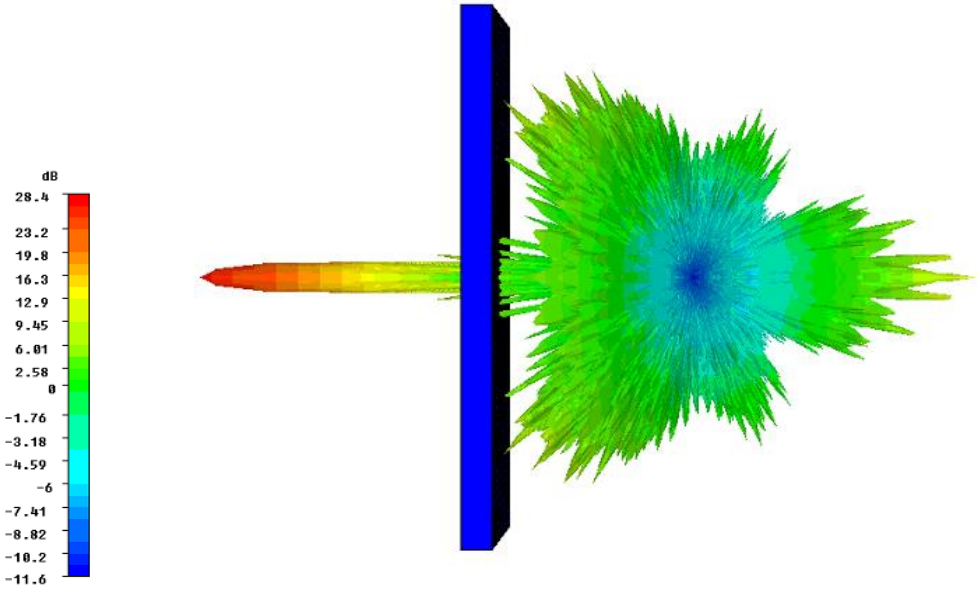
94 GHz Artificial Lens

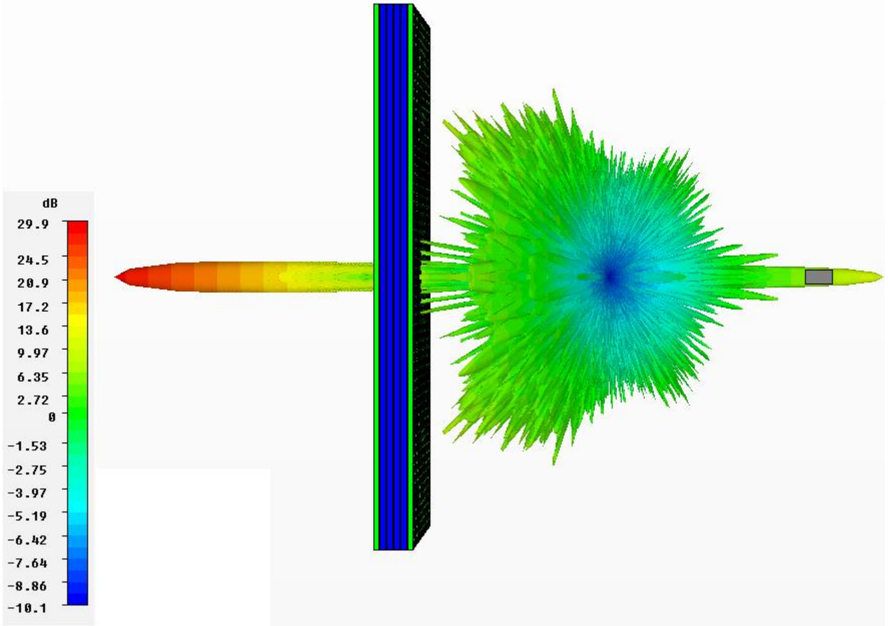


Single layer Len

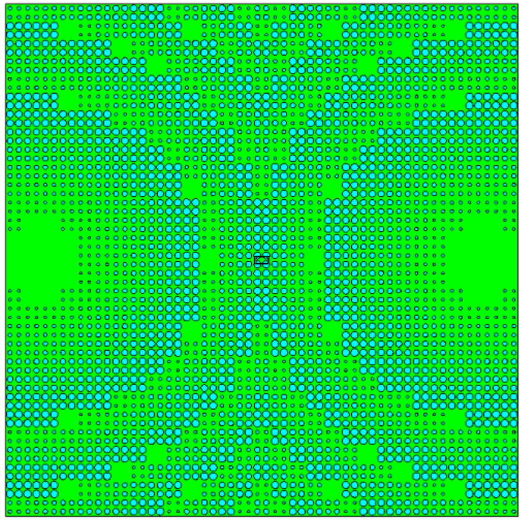


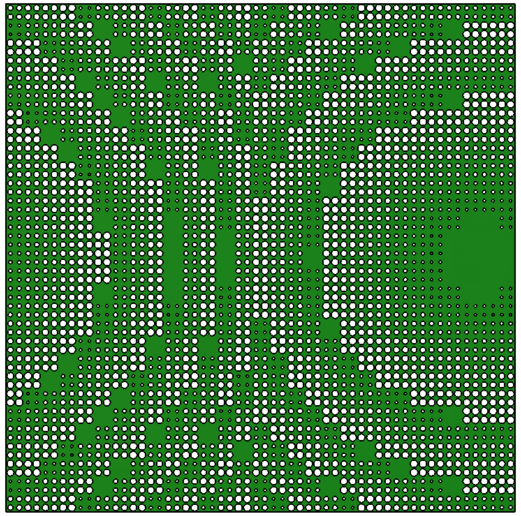
Multi-layers Len

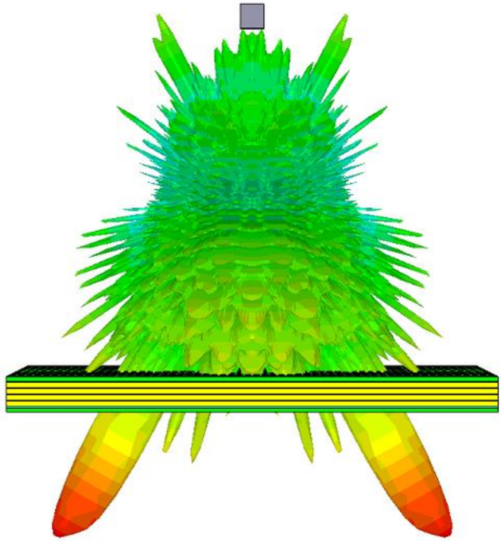


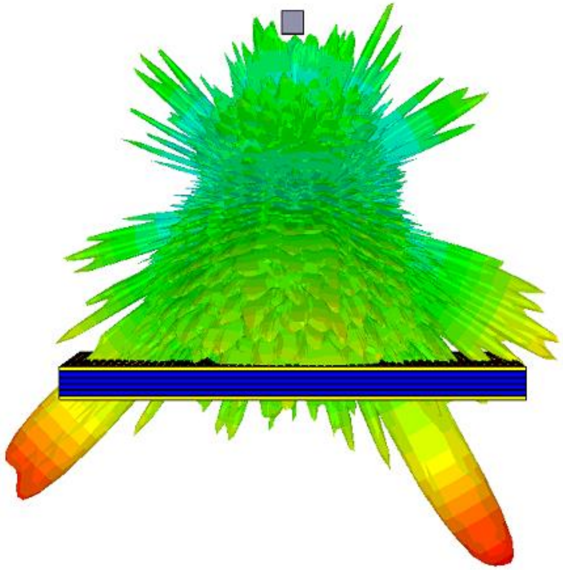


Multi-layers Len Single Feed Dual Beam



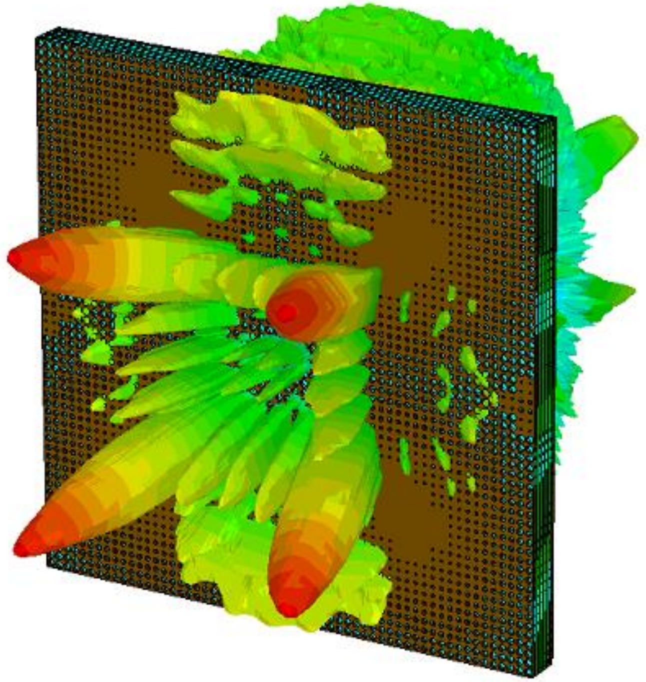


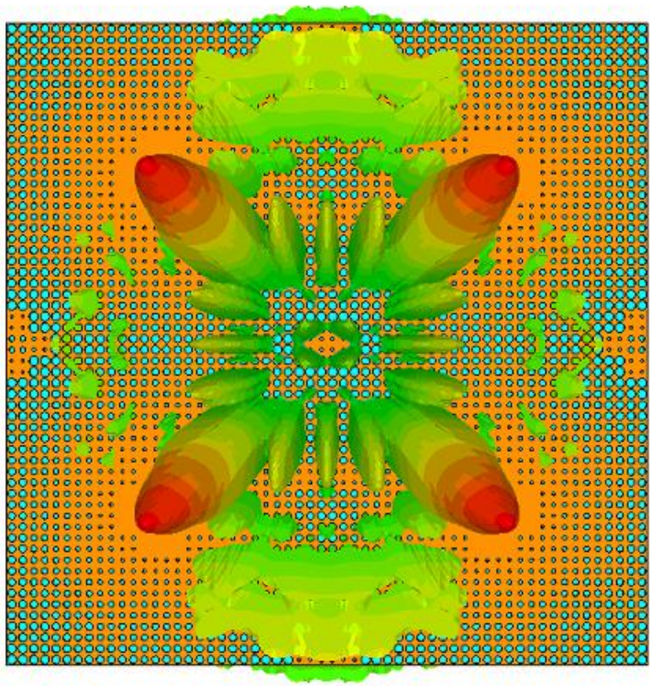


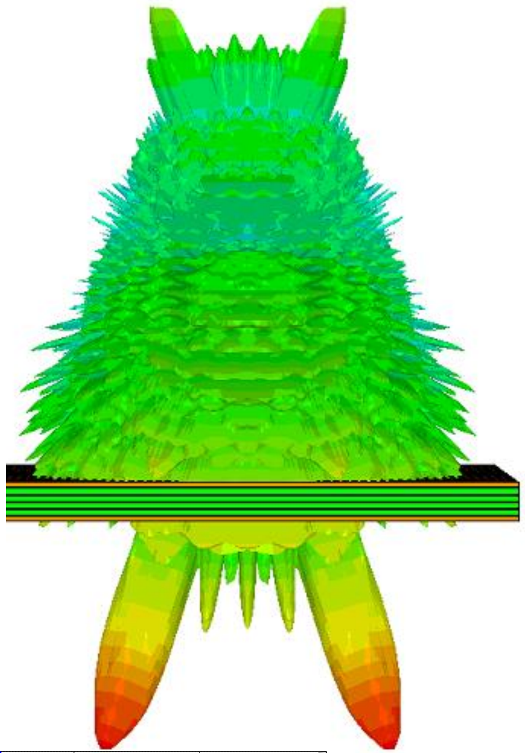


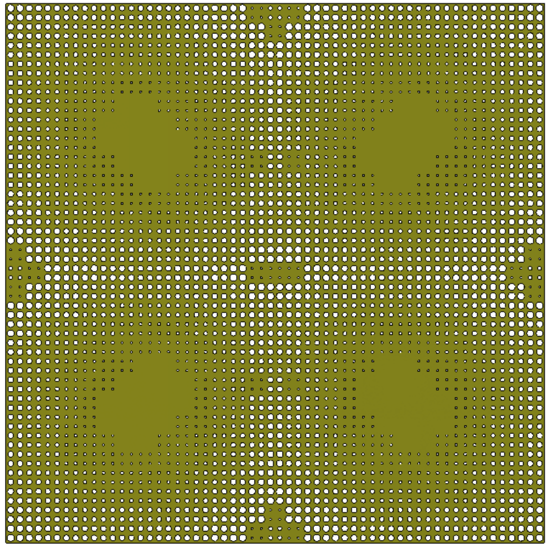
3 D Multi-layers Len Single Feed Dual Beam

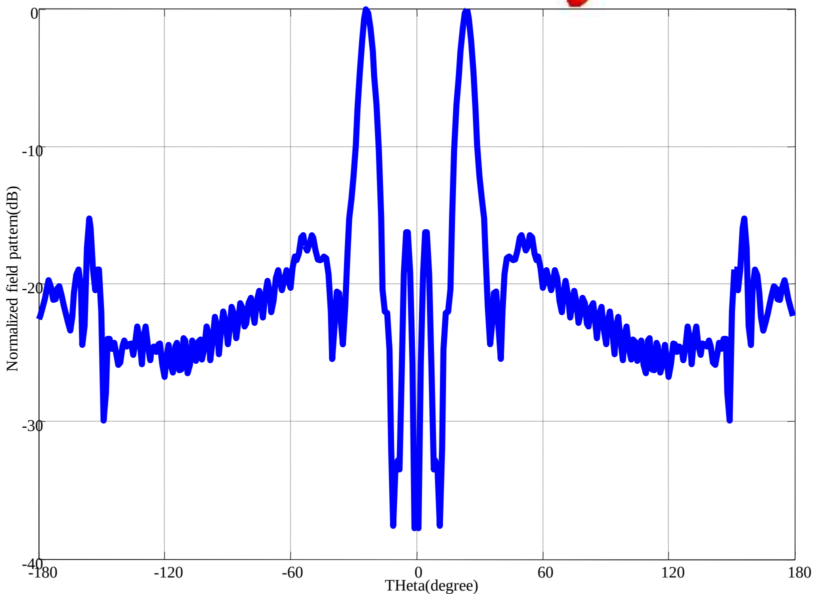
Multi-layers Len Single Feed Quad Beam



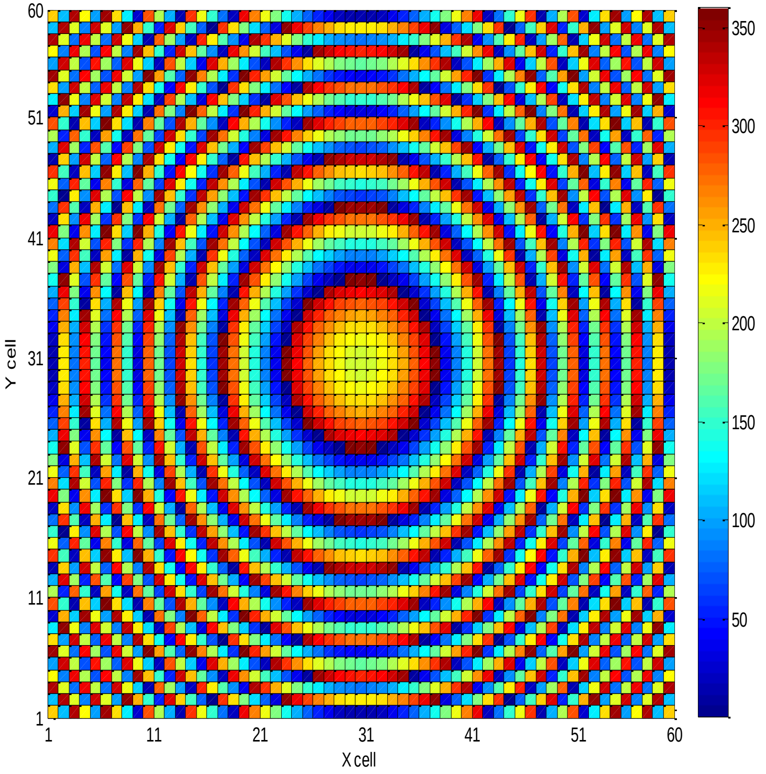


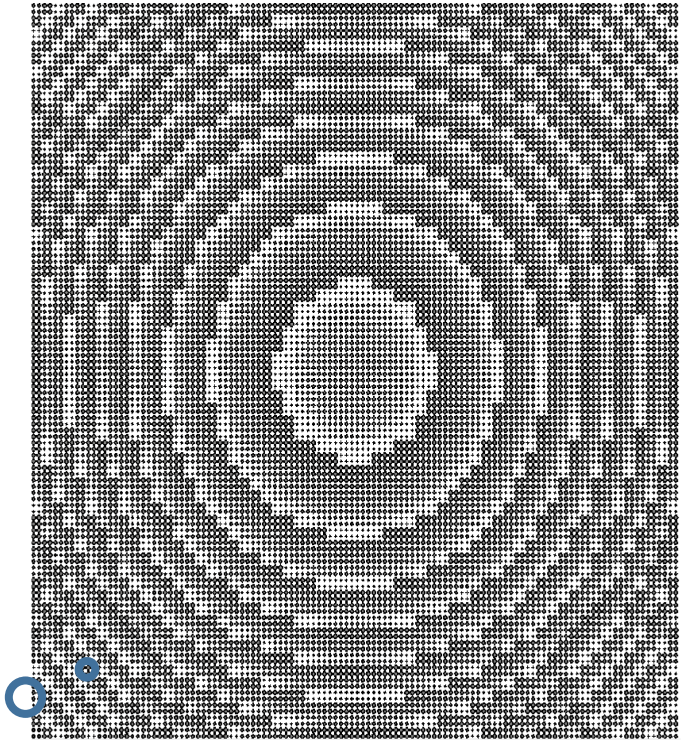


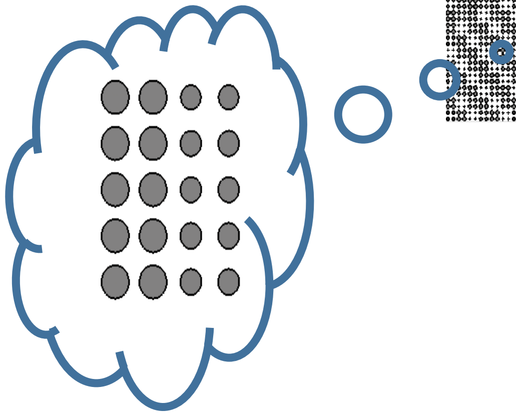




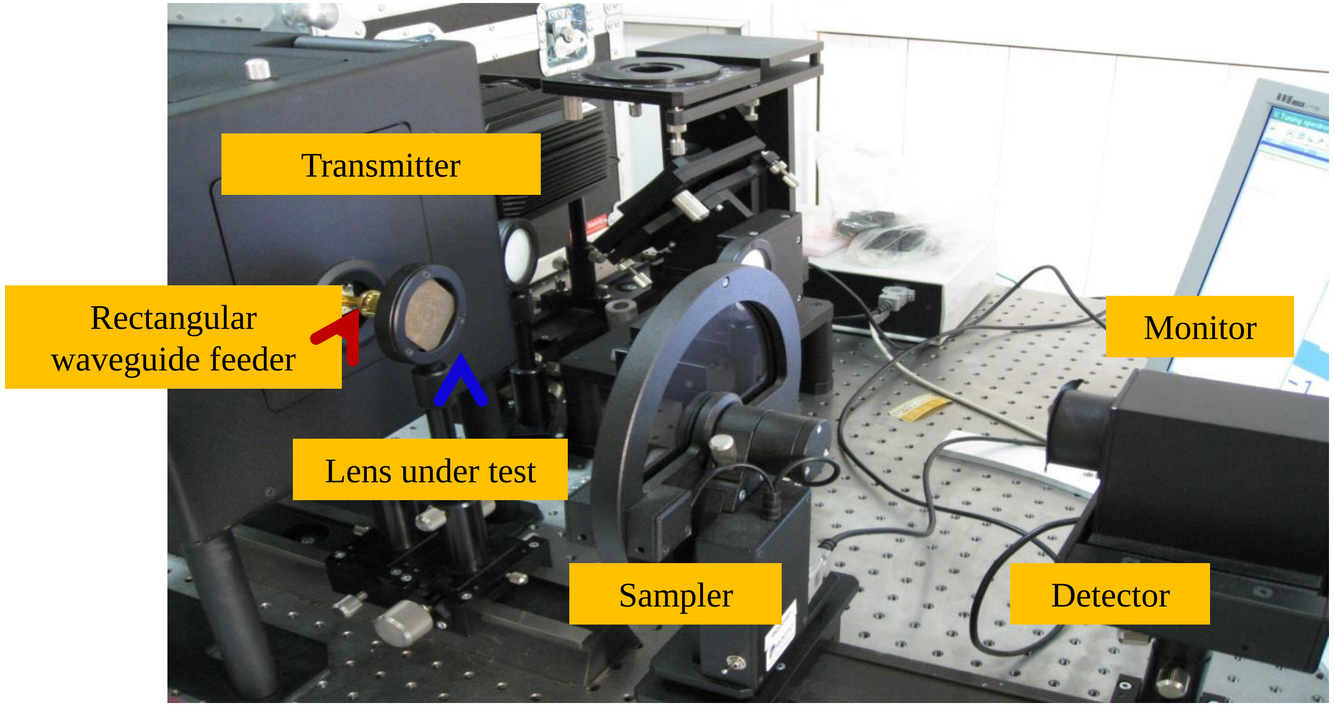
330 GHz Lens Antenna (Verification)



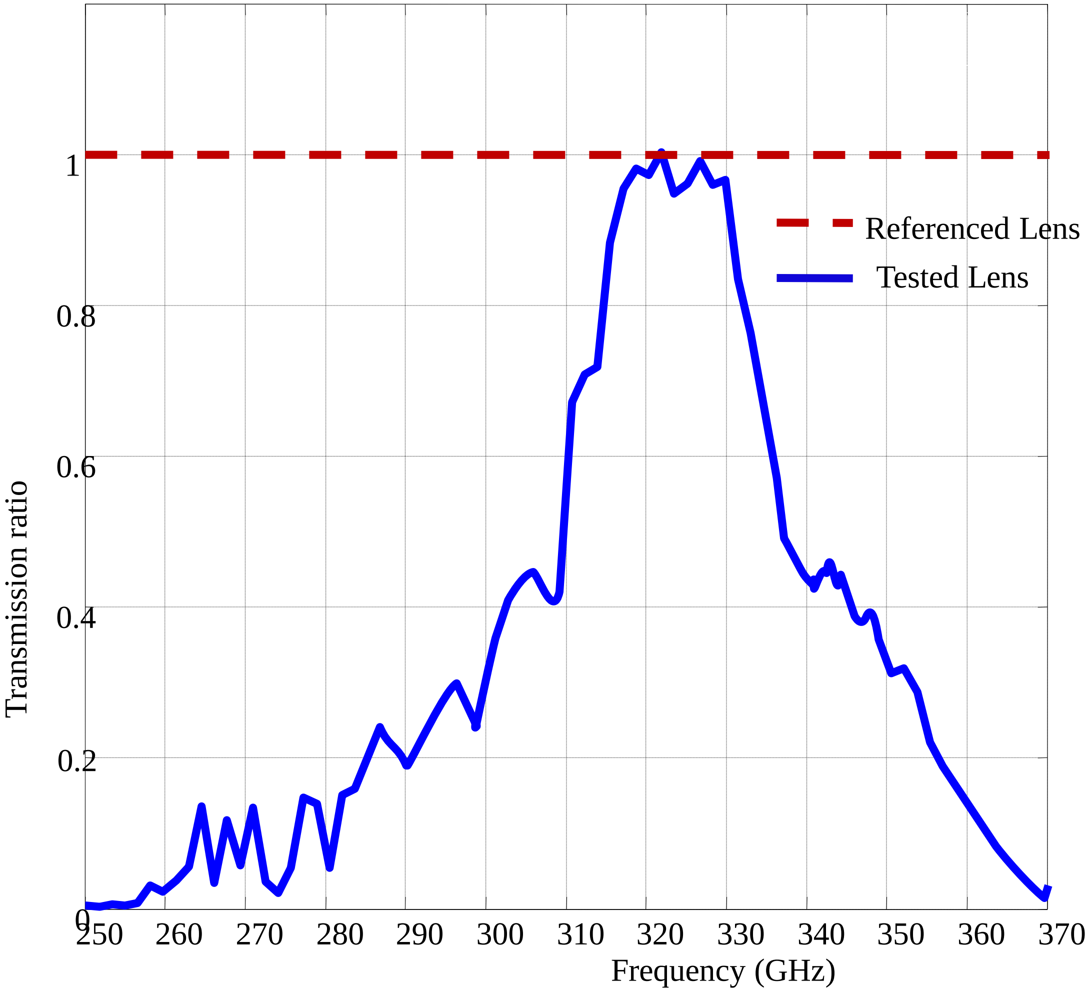




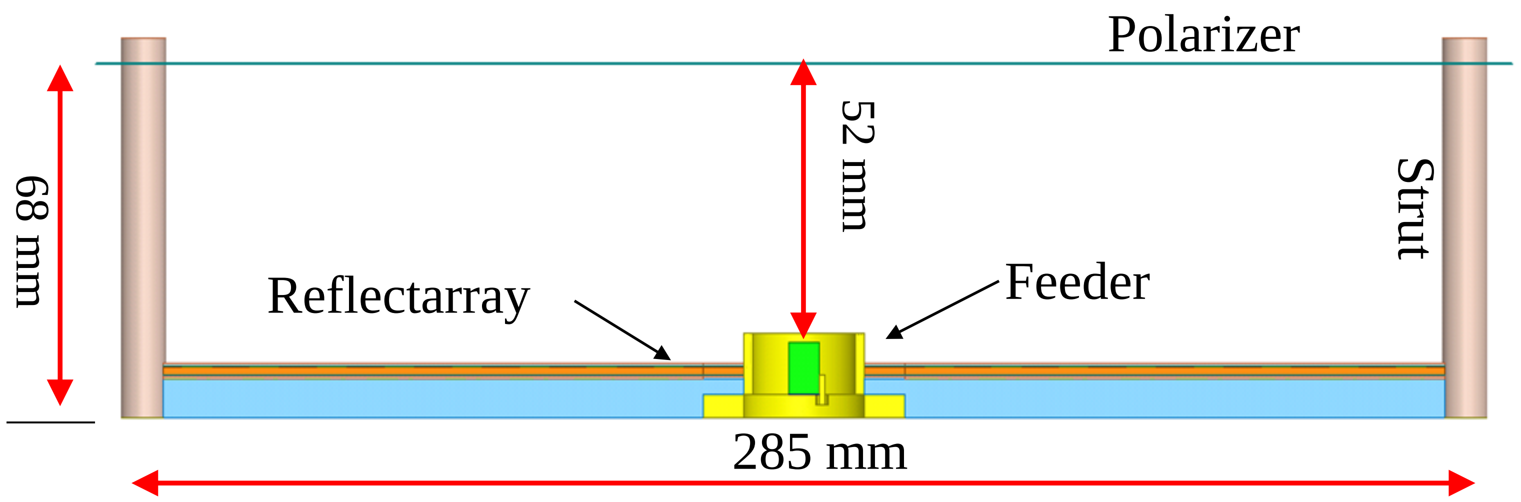
330 GHz Planar Len Test

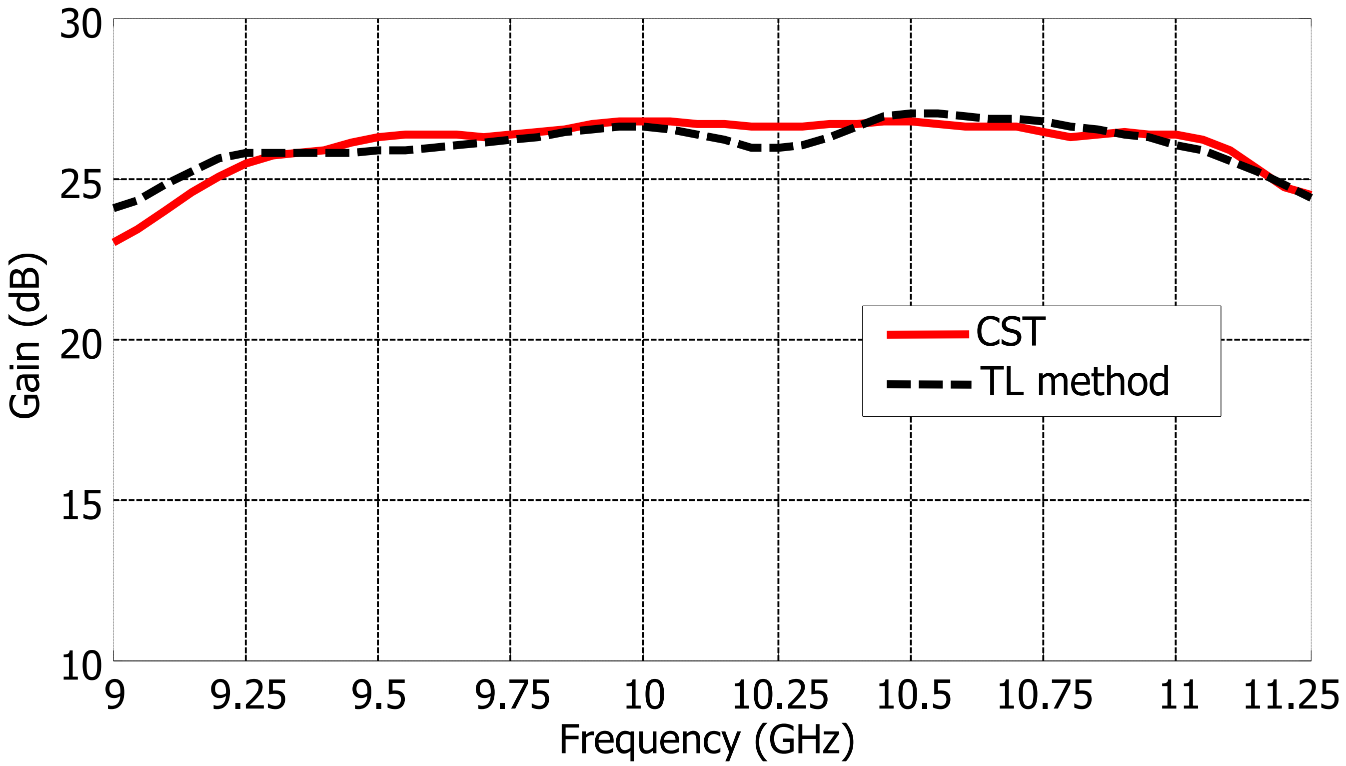


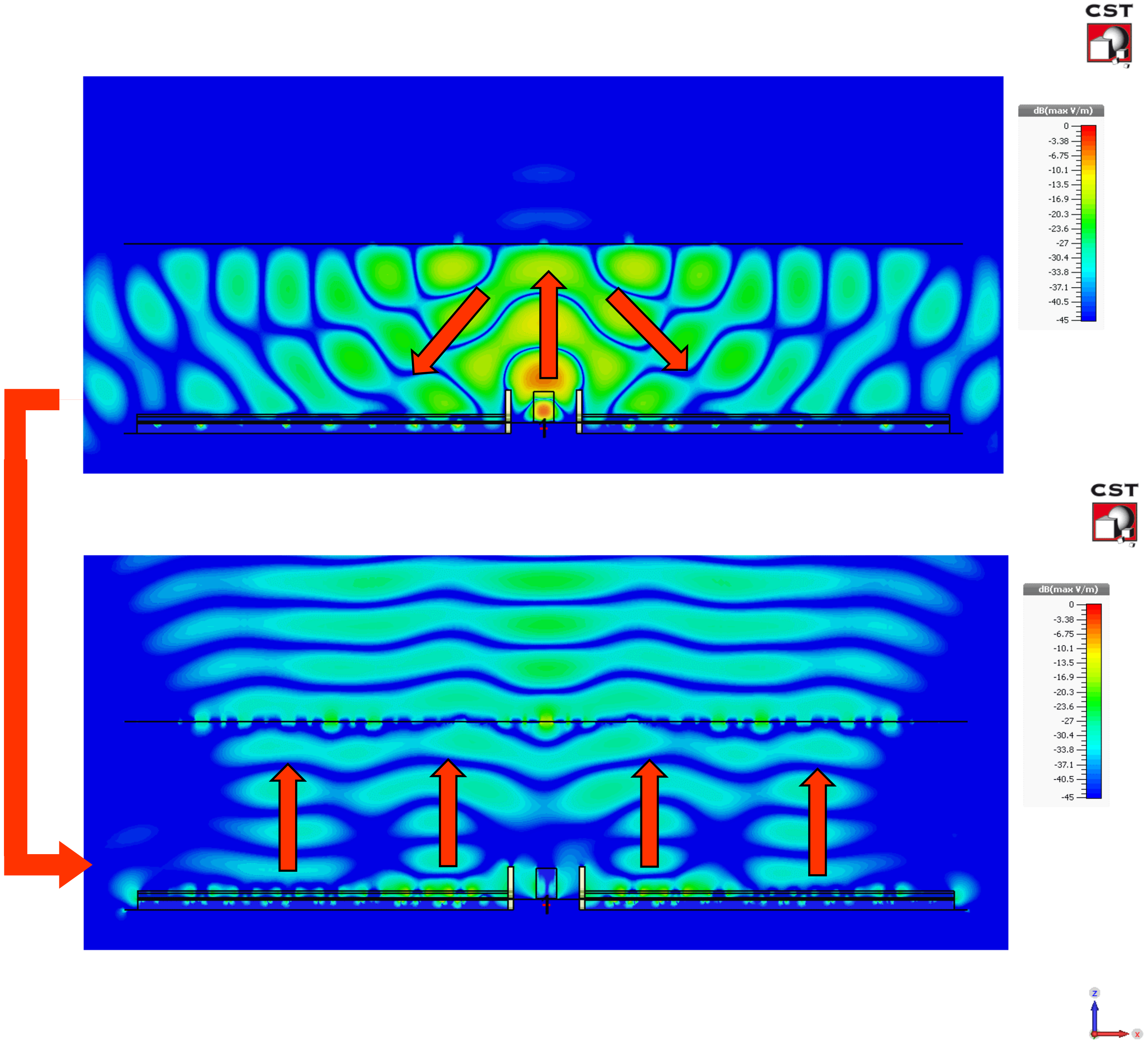
THz Spectrograph test



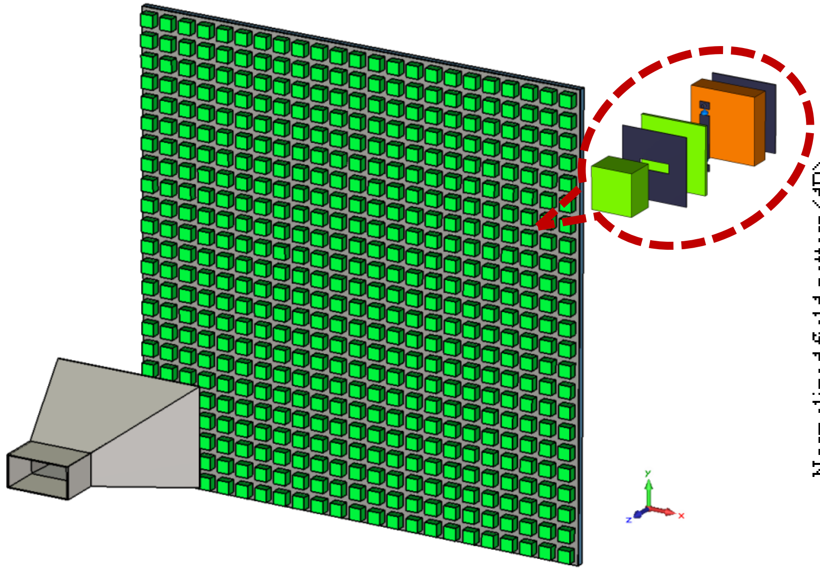
Folded Reflectarray

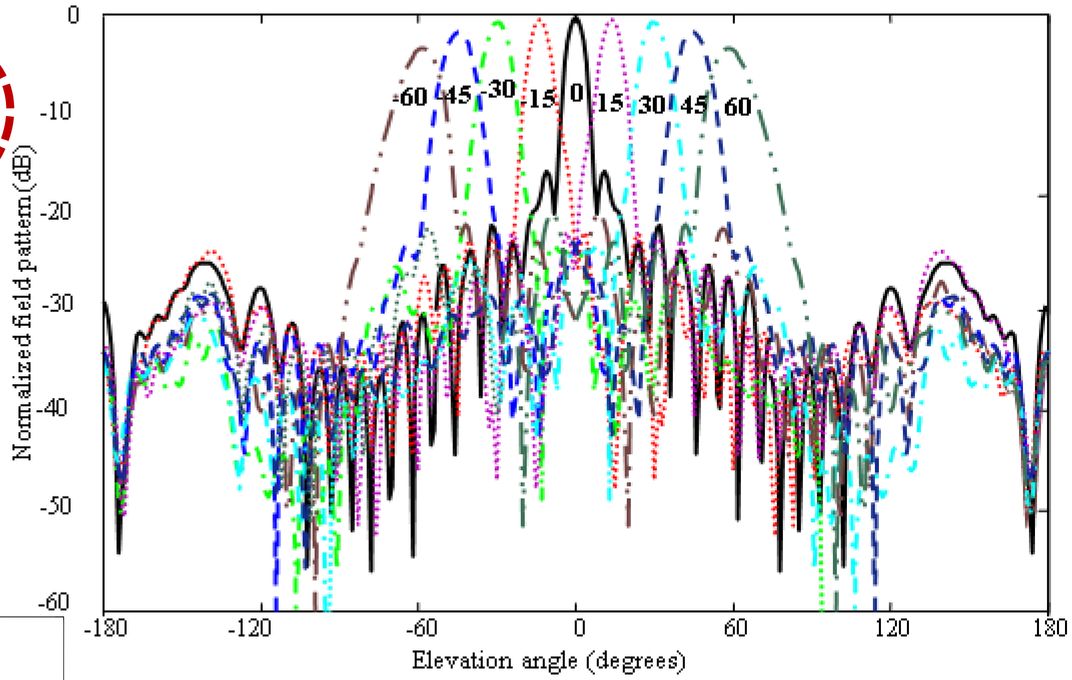


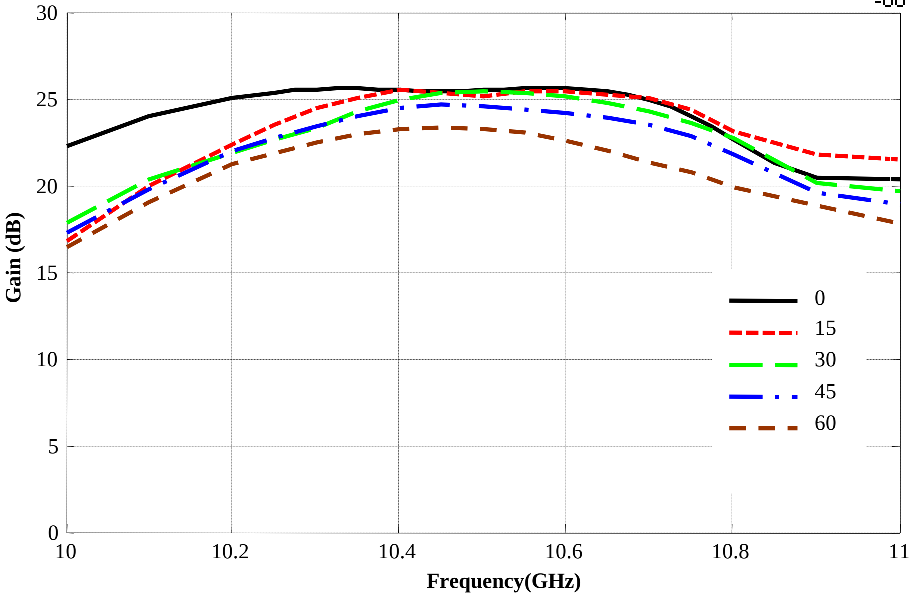



CST
dB(max V/m)
0
-3.38
-6.75
-10.1
-13.5
-16.9
-20.3
-23.6
-27
-30.4
-33.8
-37.1
-40.5
-45
CST
dB(max V/m)
0
-3.38
-6.75
-10.1
-13.5
-16.9
-20.3
-23.6
-27
-30.4
-33.8
-37.1
-40.5
-45
z
x

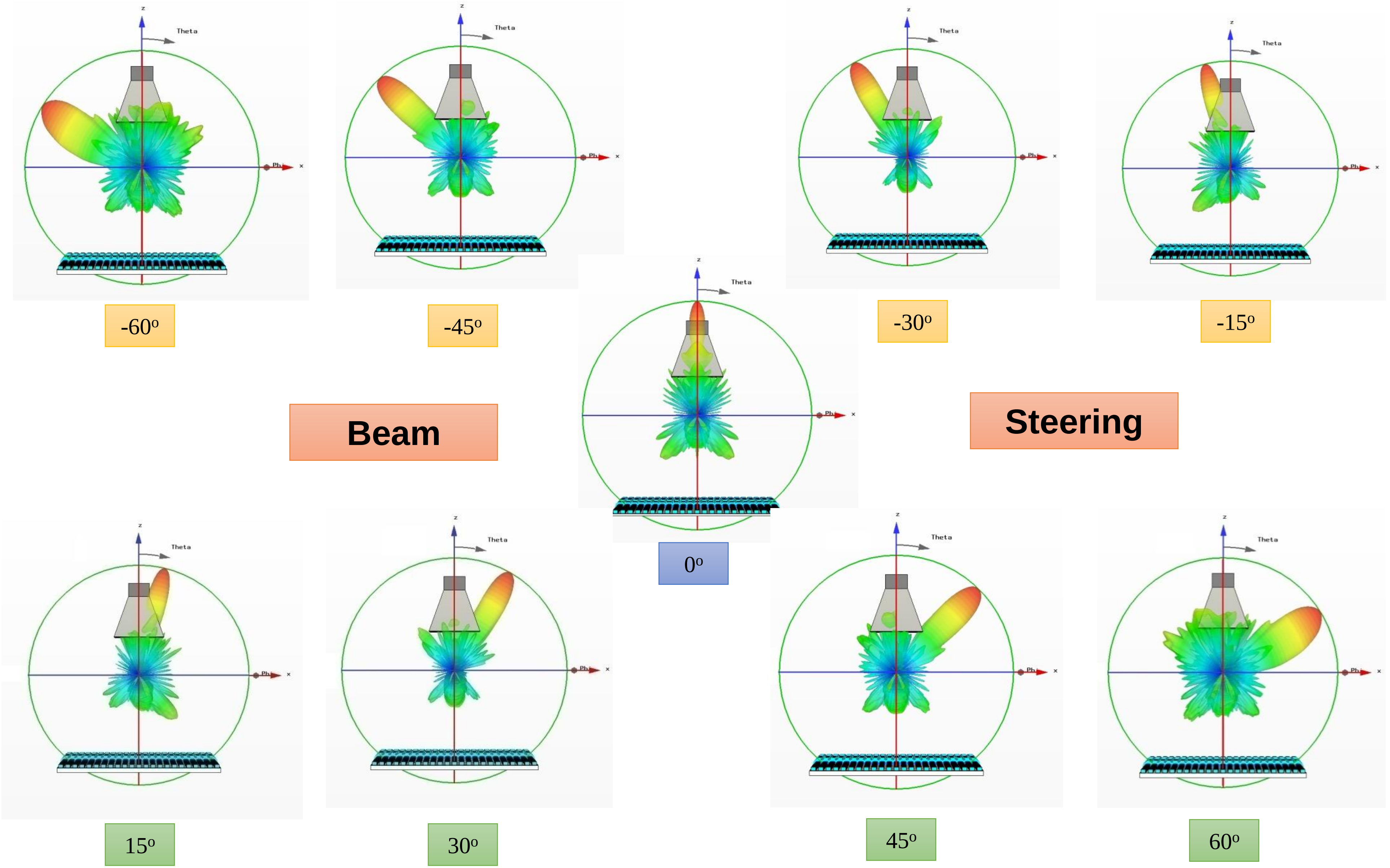
Scanning array



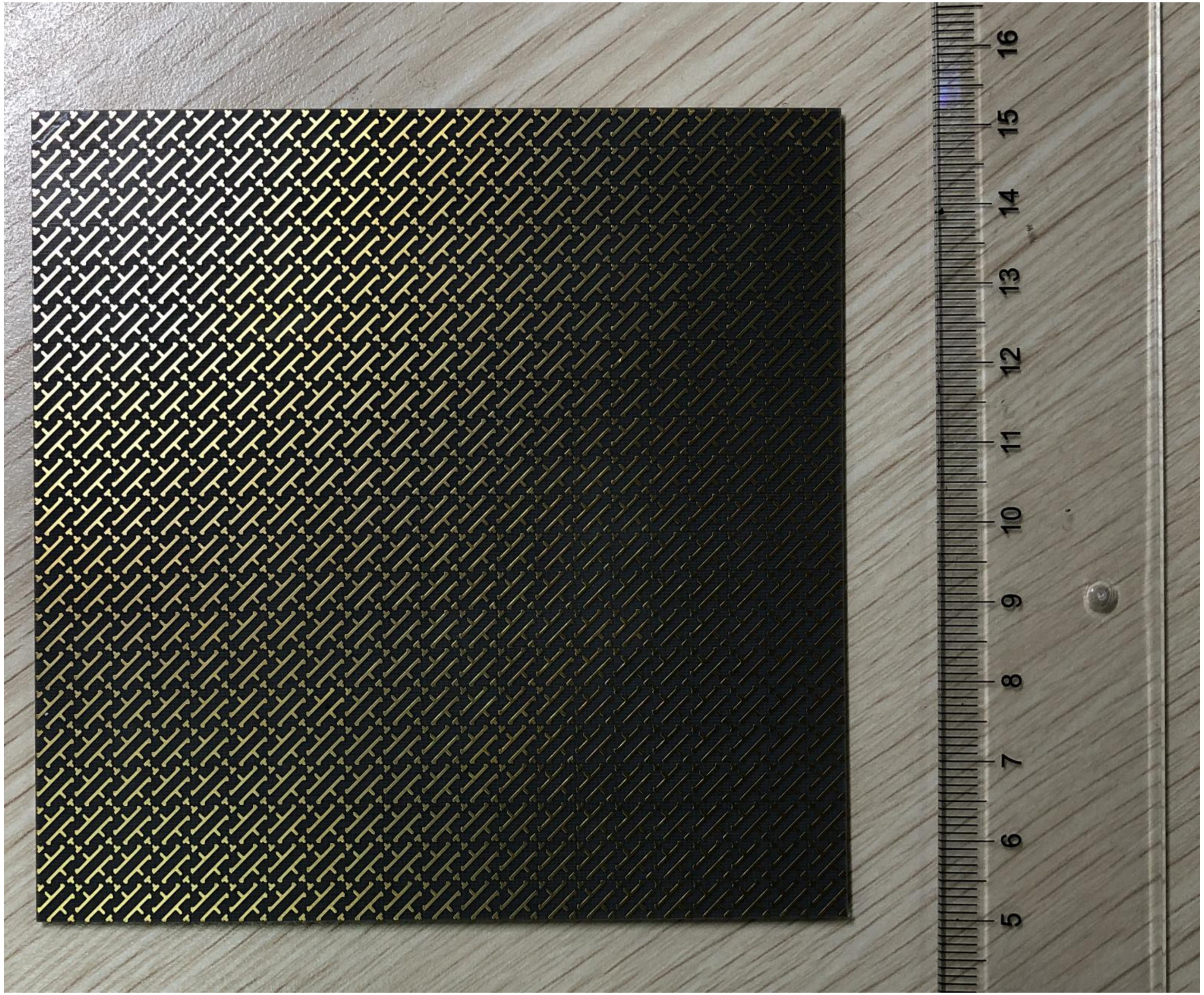




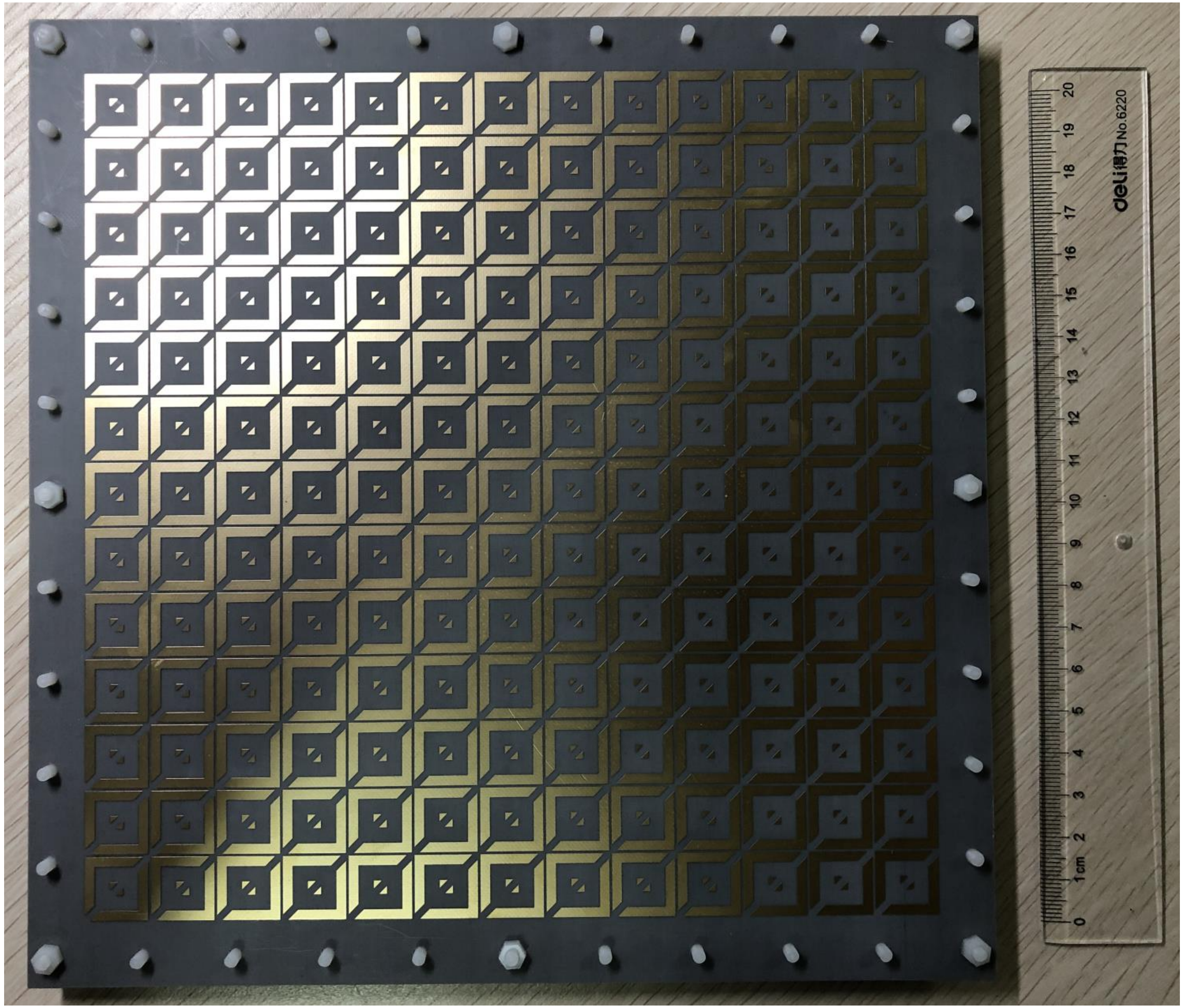
- Wide scanning angle from -60º to 60º.
- Variation of radiated field level around scanning range at 10.6 GHz is about 2.5 dB.
- Max gain at 10.6 GHz=26.5 dB..
- Accepted side lob level (-18 dB) at broadside.
- Aperture efficiency=54% at 10.6 GHz.


-60º
-45º
-30º
-15º
Beam
0º
Steering
15º
30º
45º
60º

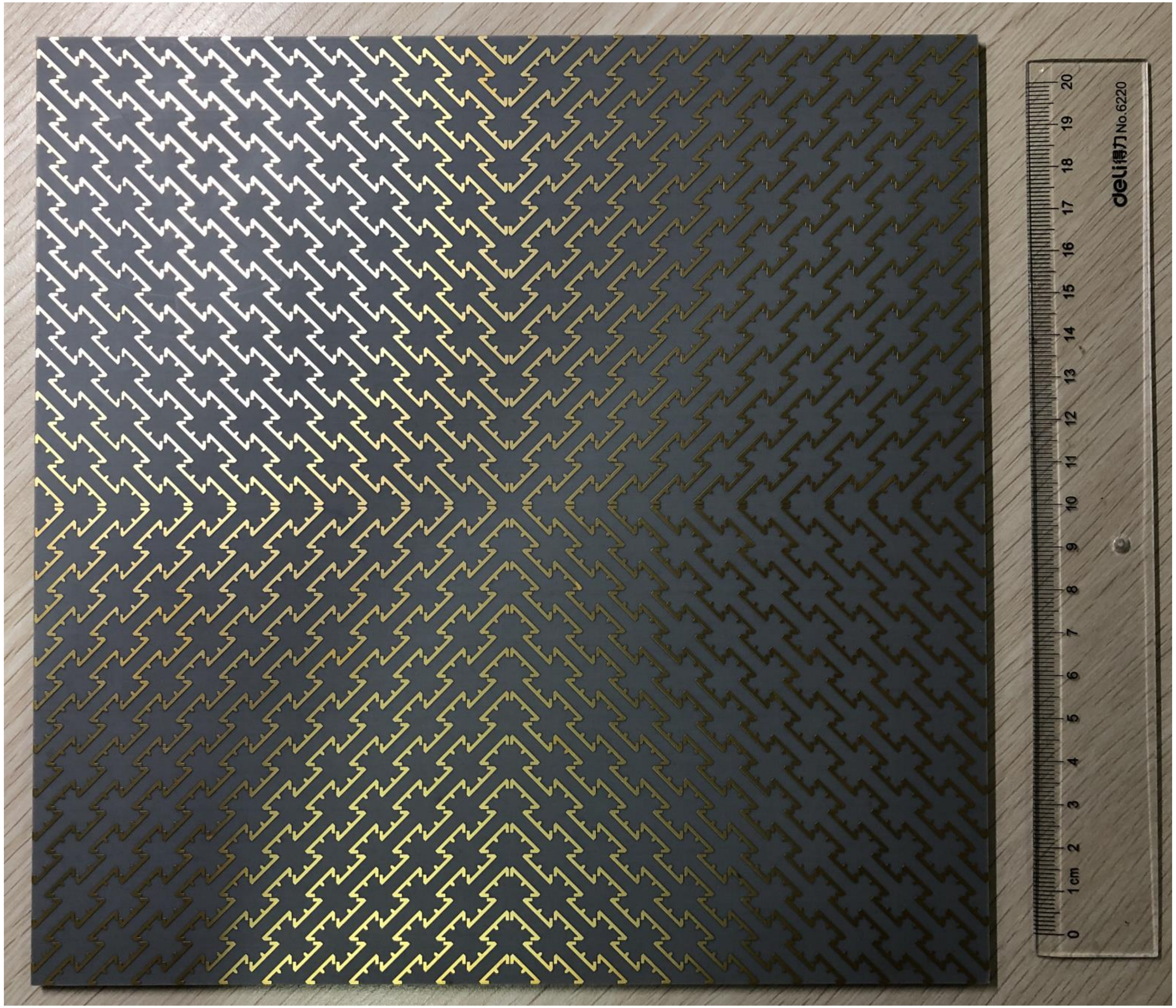
Horizontal to Vertical Polarization Conversion Transparent Metasurface



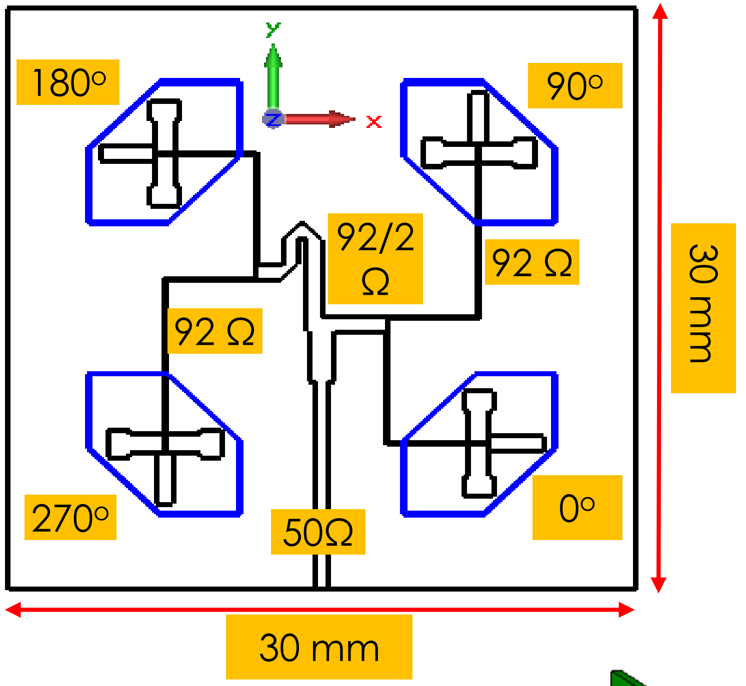
Linear to Circular Reflective Polarization Conversion Transparent Metasurface X and Ku-band

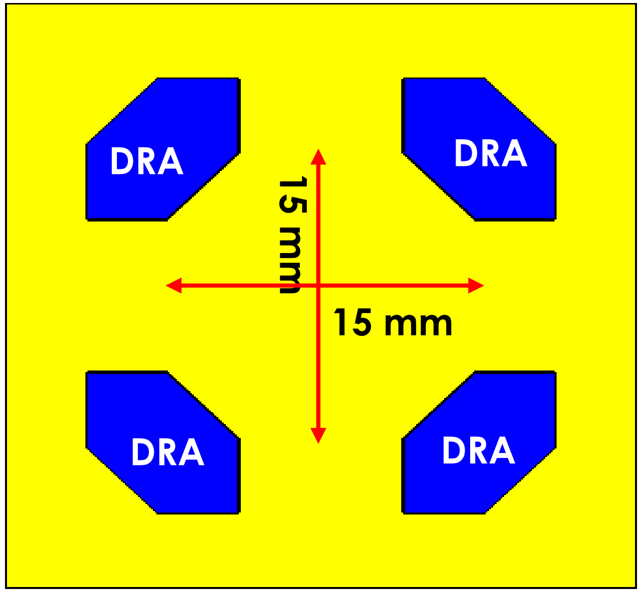

deli得力 No.6220
1cm

UWB Polarization Conversion Metasurface for RCS

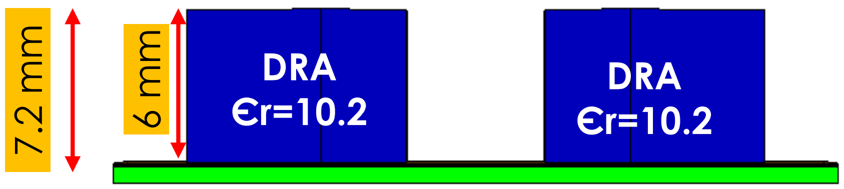

deli得力 No.6220

2 x 2 Chamfer-shaped CP DRA Array

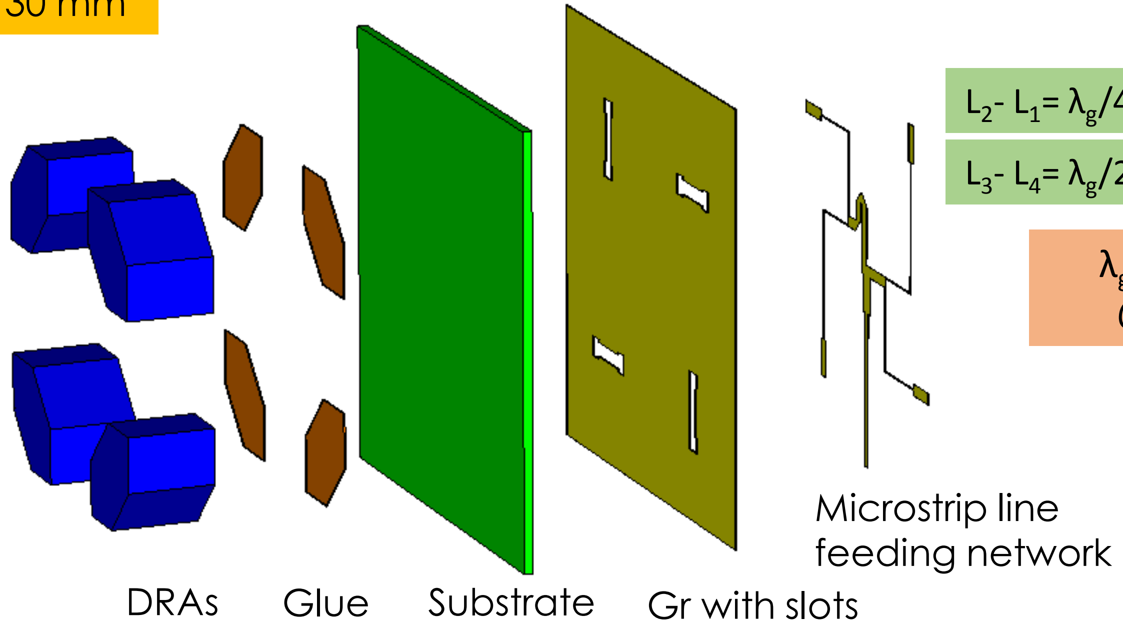


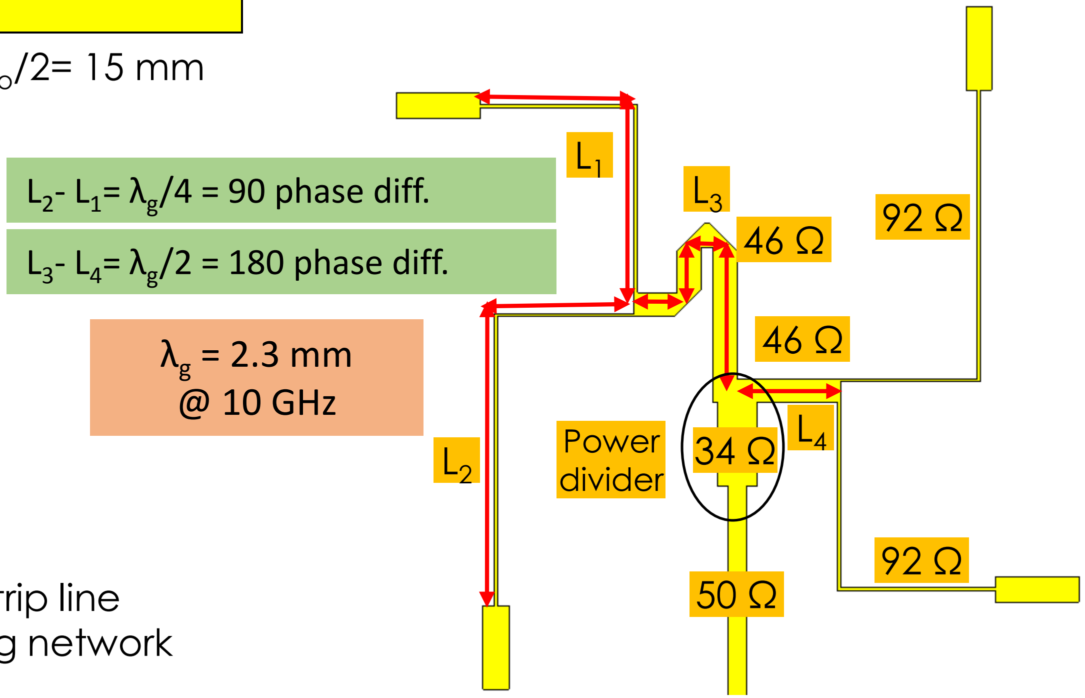


Element spacing $\lambda_o/2$= 15 mm

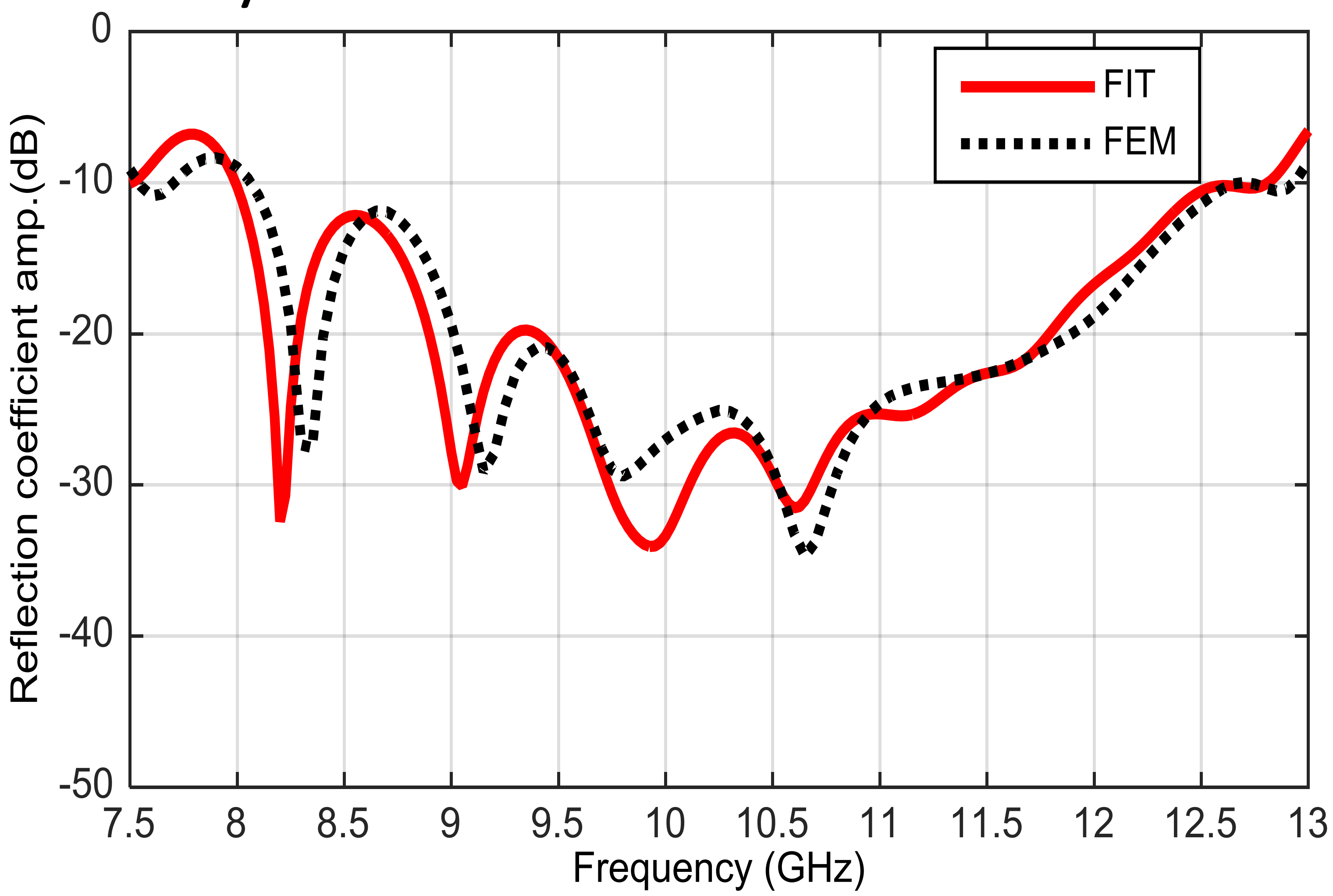


Rogers 6010
Єr=10.2,h=0.635
mm



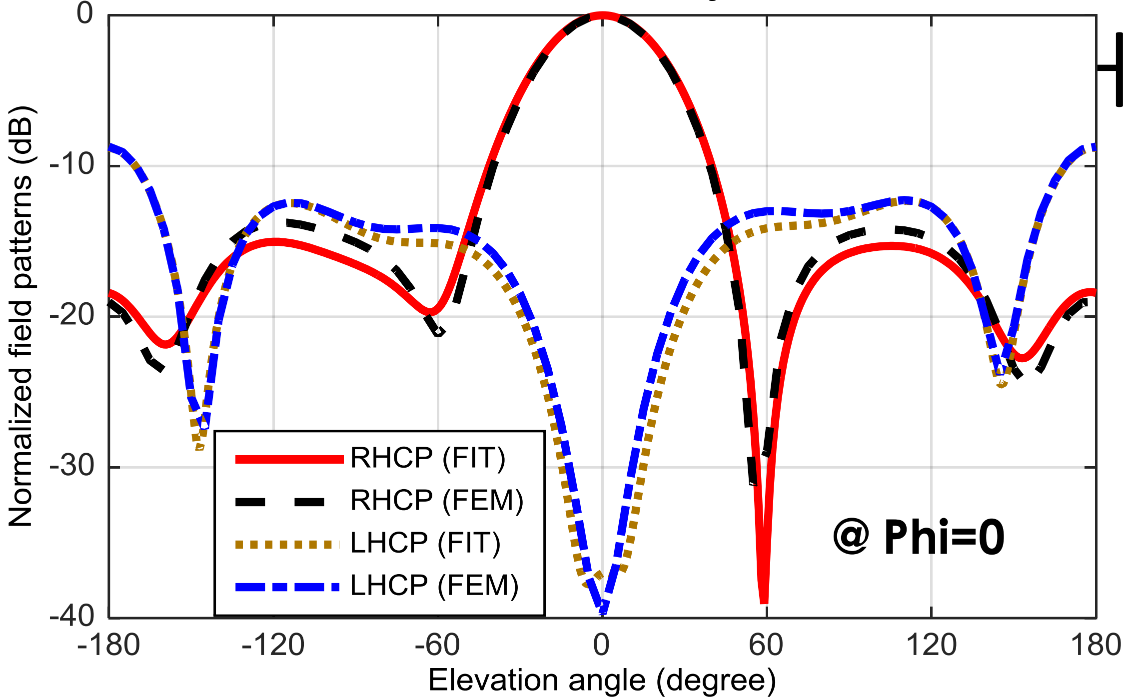


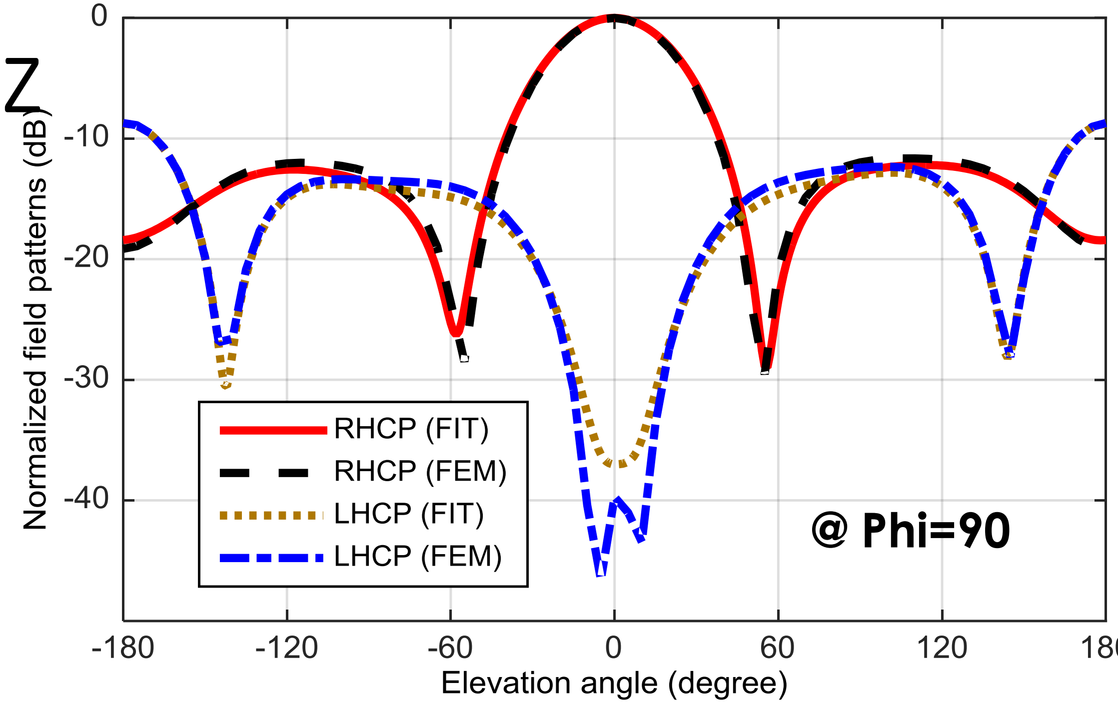
Array reflection coefficient S11

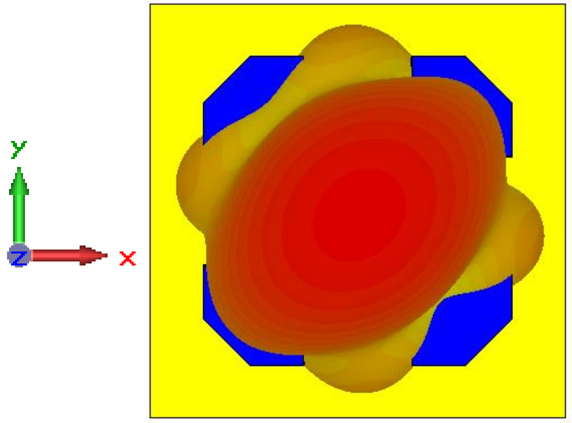


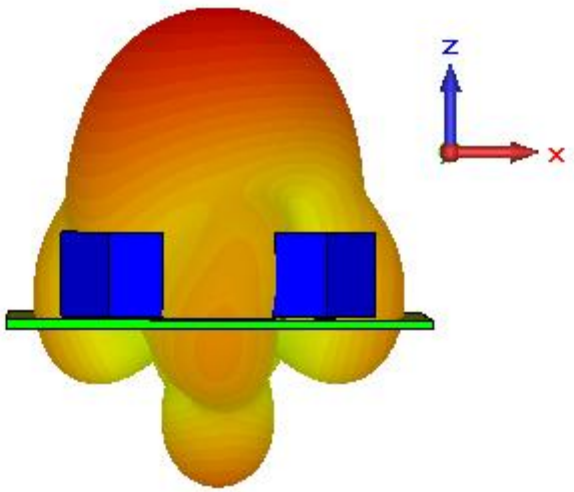
	FIT	FEM
Matching bandwidth	**47.5 % (8 to 12.75 GHz)**	**48 % (8.1 to 12.9 GHz)**

Array radiated field @ 10 Hz



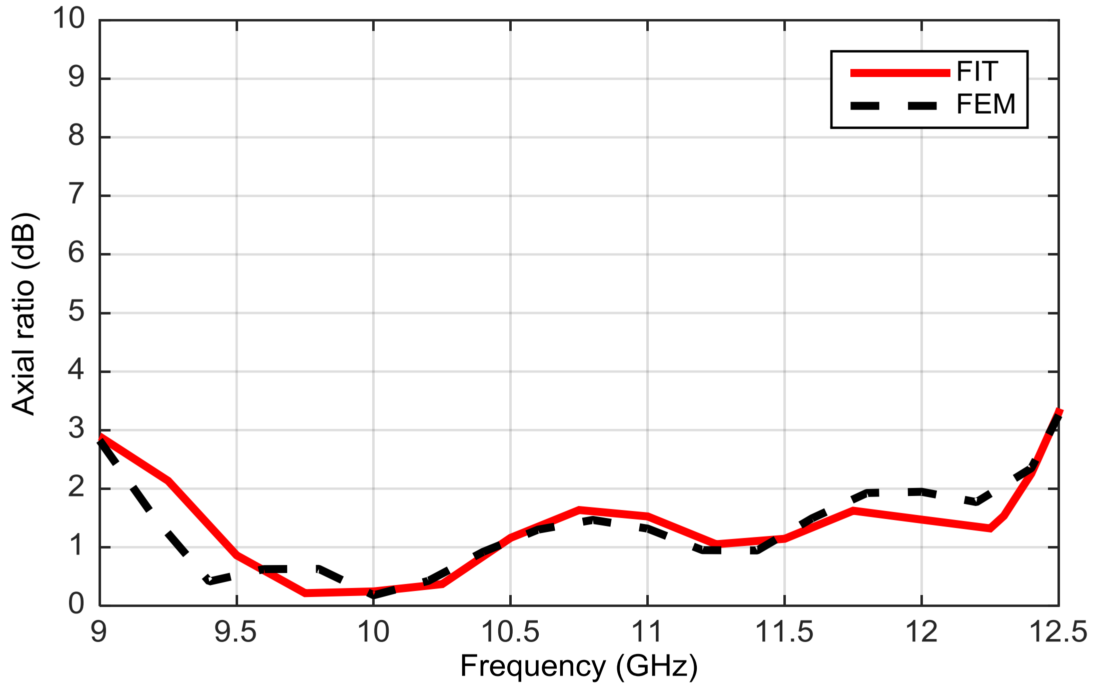




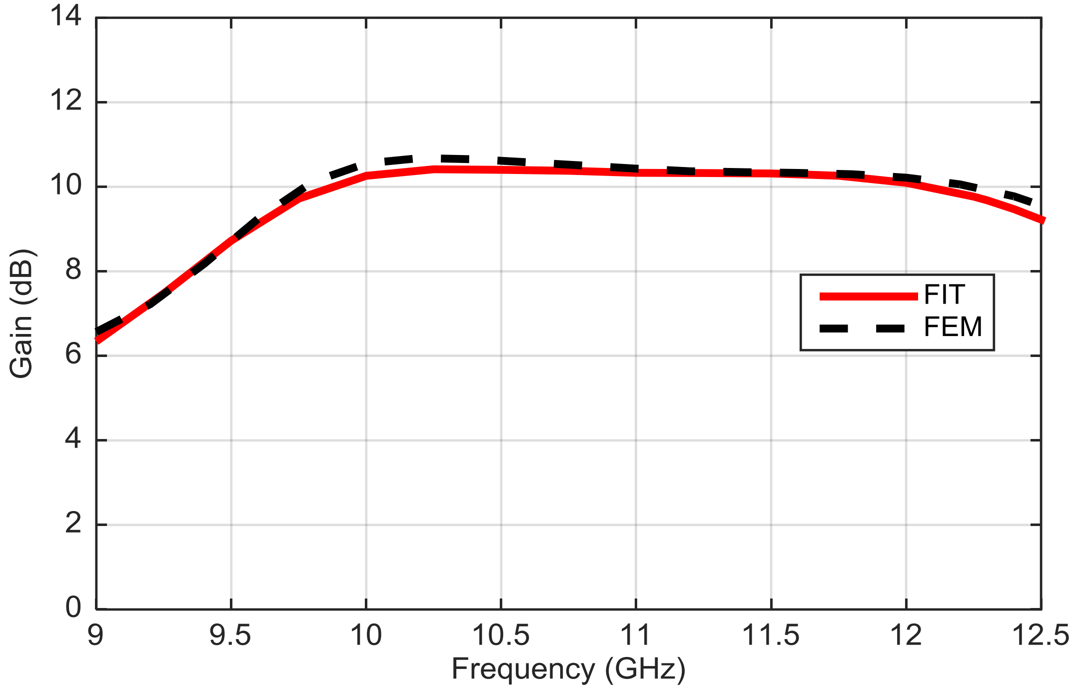


- **Broad-side patterns.**
- **SLL around -15 dBi.**
- **F/B ratio -19 dBi.**
- **X-pol ratio -40 dBi at boresight direction.**

Array Axial Ratio



Array gain

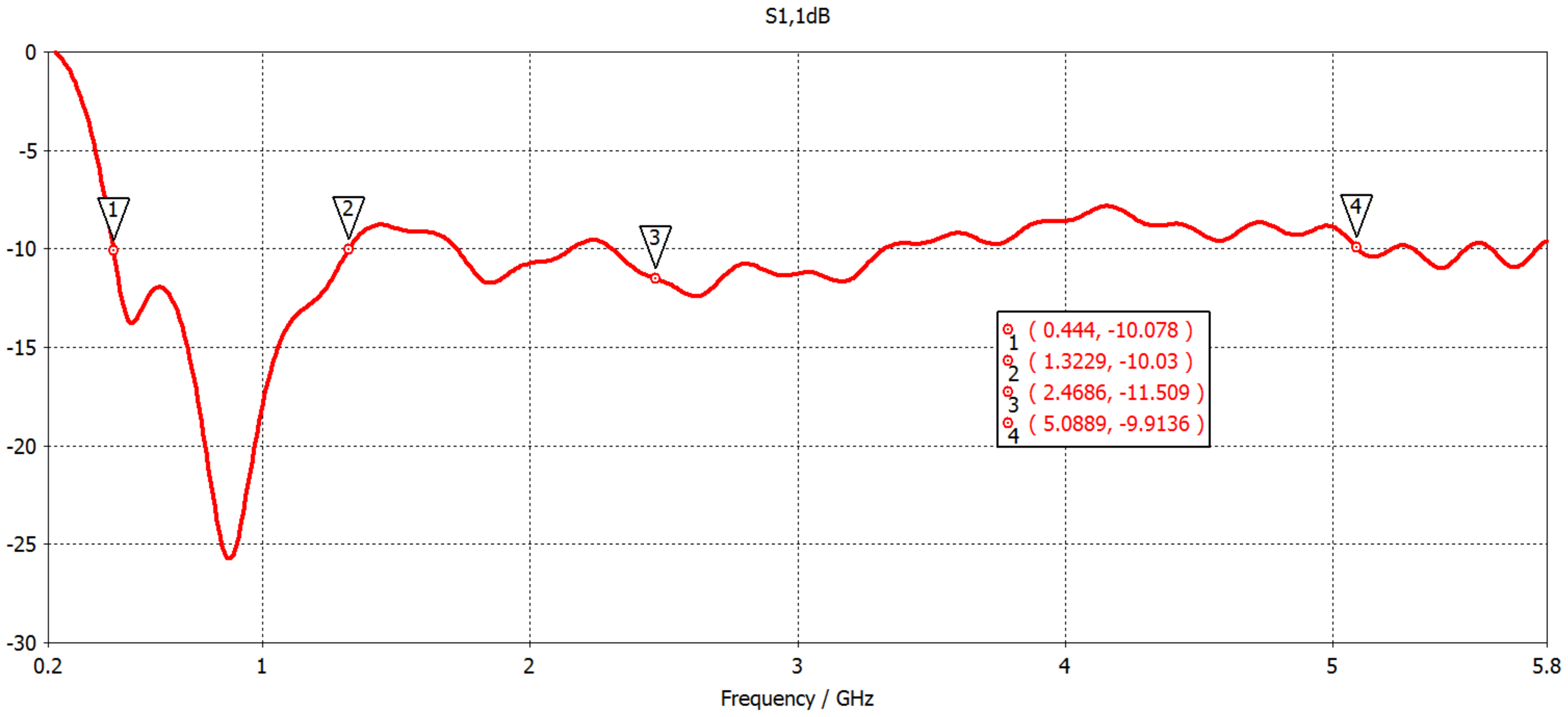


	FIT	FEM
3 dB AR bandwidth	**35 % (9 to 12.5 GHz)**	**35 % (9 to 12.5 GHz)**
1.5 dB gain BW	**30 %**	**30 %**
Efficiency at 10 GHz	**83.5 %**	**87.5 %**

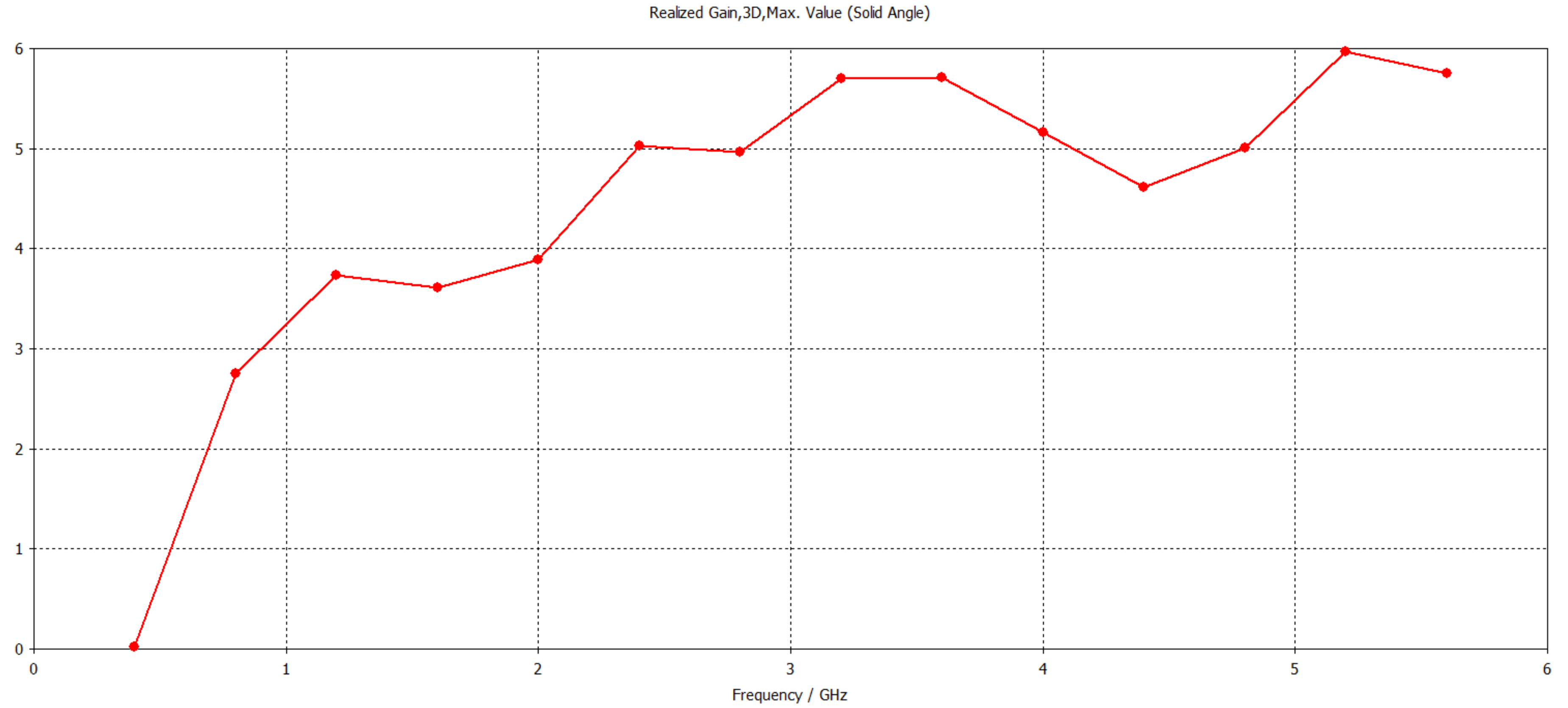
Horizontal to Circular Polarized Conversion Transparent Metasurface

TV broadcasting Antenna

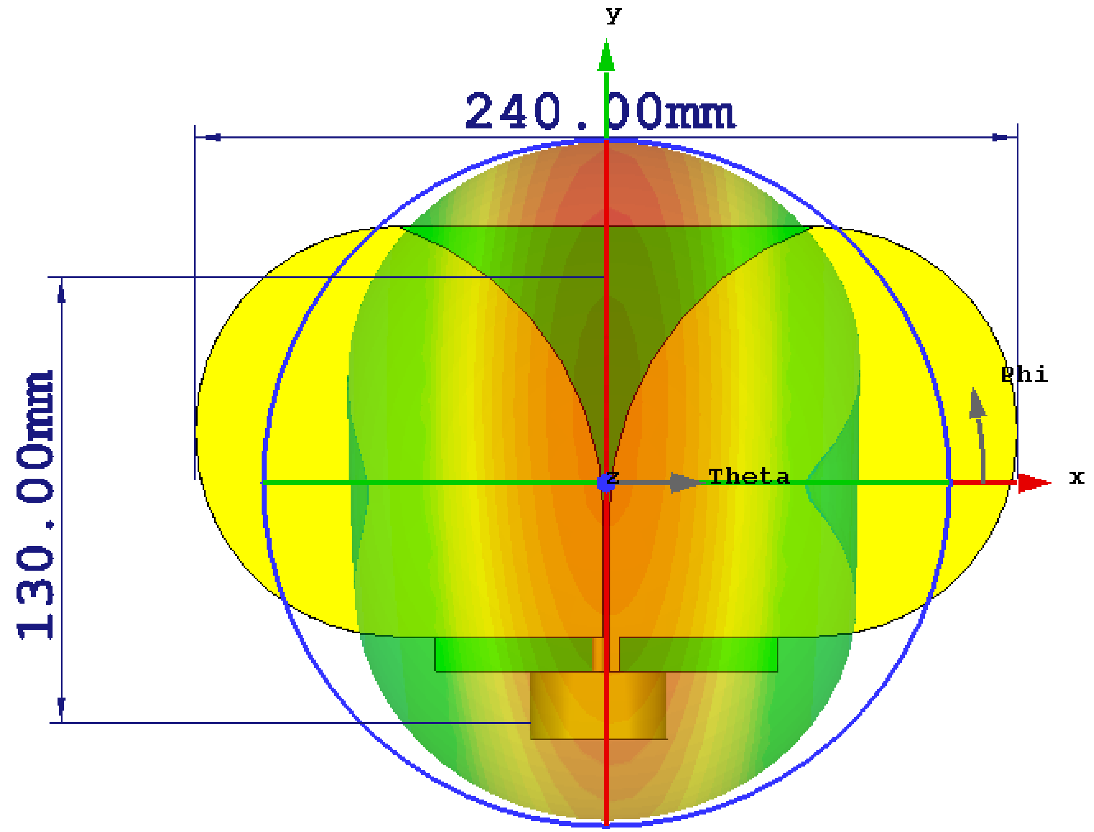
Dr. Abdelhady


S1,1dB
0
-5
-10
-15
-20
-25
-30
0.2
1
2
3
4
5
5.8
Frequency / GHz
1
2
3
4
1 (0.444, -10.078)
2 (1.3229, -10.03)
3 (2.4686, -11.509)
4 (5.0889, -9.9136)

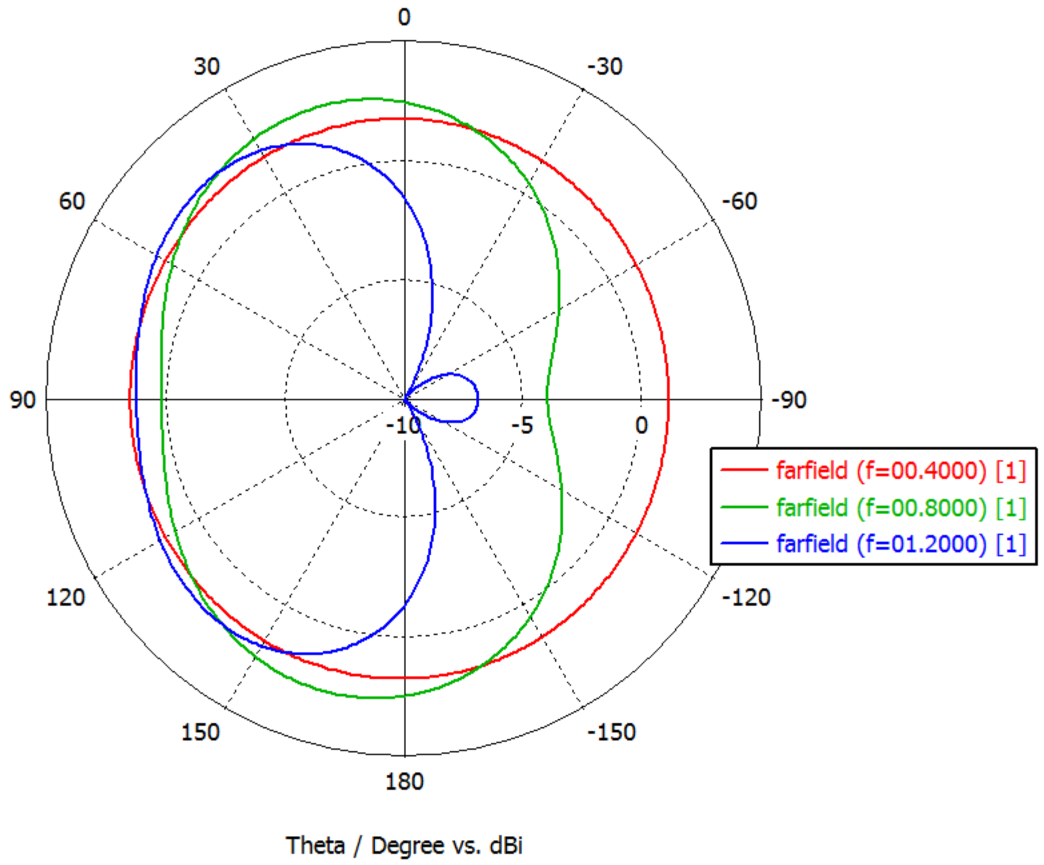
Realized gain



Patterns



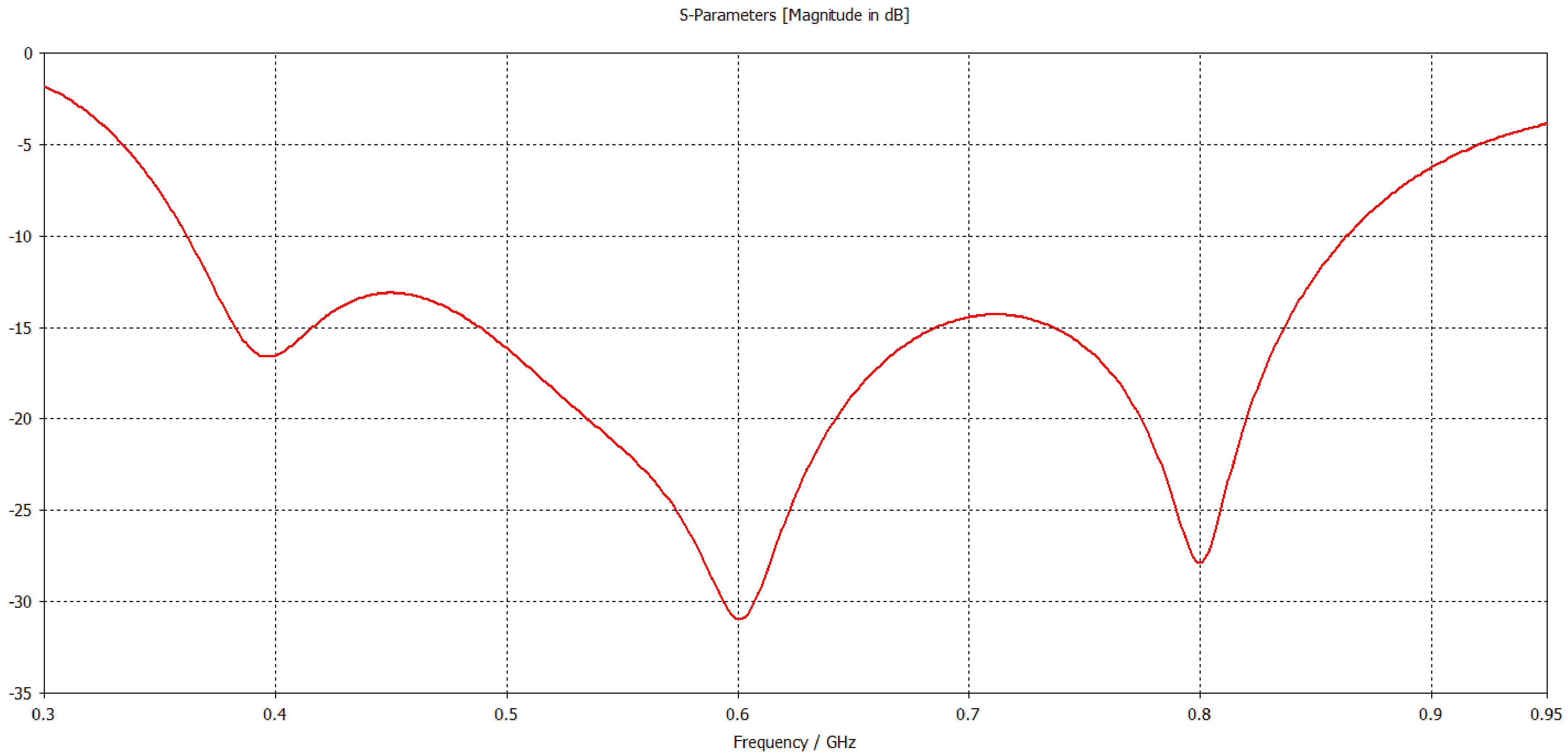
y
240.00mm
130.00mm
Phi
z
Theta
x



0
30
-30
60
-60
90
-90
120
-120
150
-150
180
-10
-5
0
farfield (f=00.4000) [1]
farfield (f=00.8000) [1]
farfield (f=01.2000) [1]
Theta / Degree vs. dBi

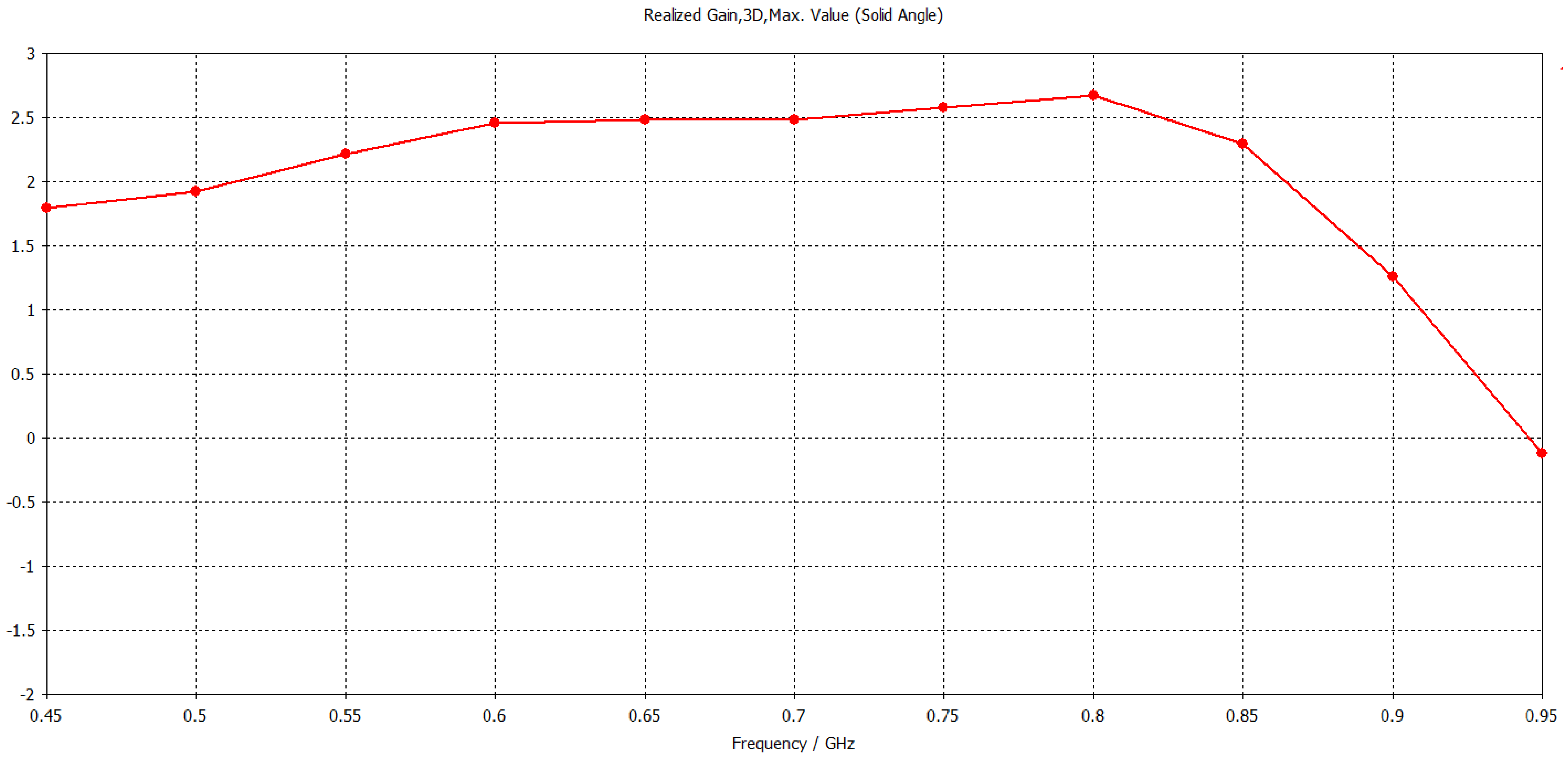
TV Antenna with BPF

S11

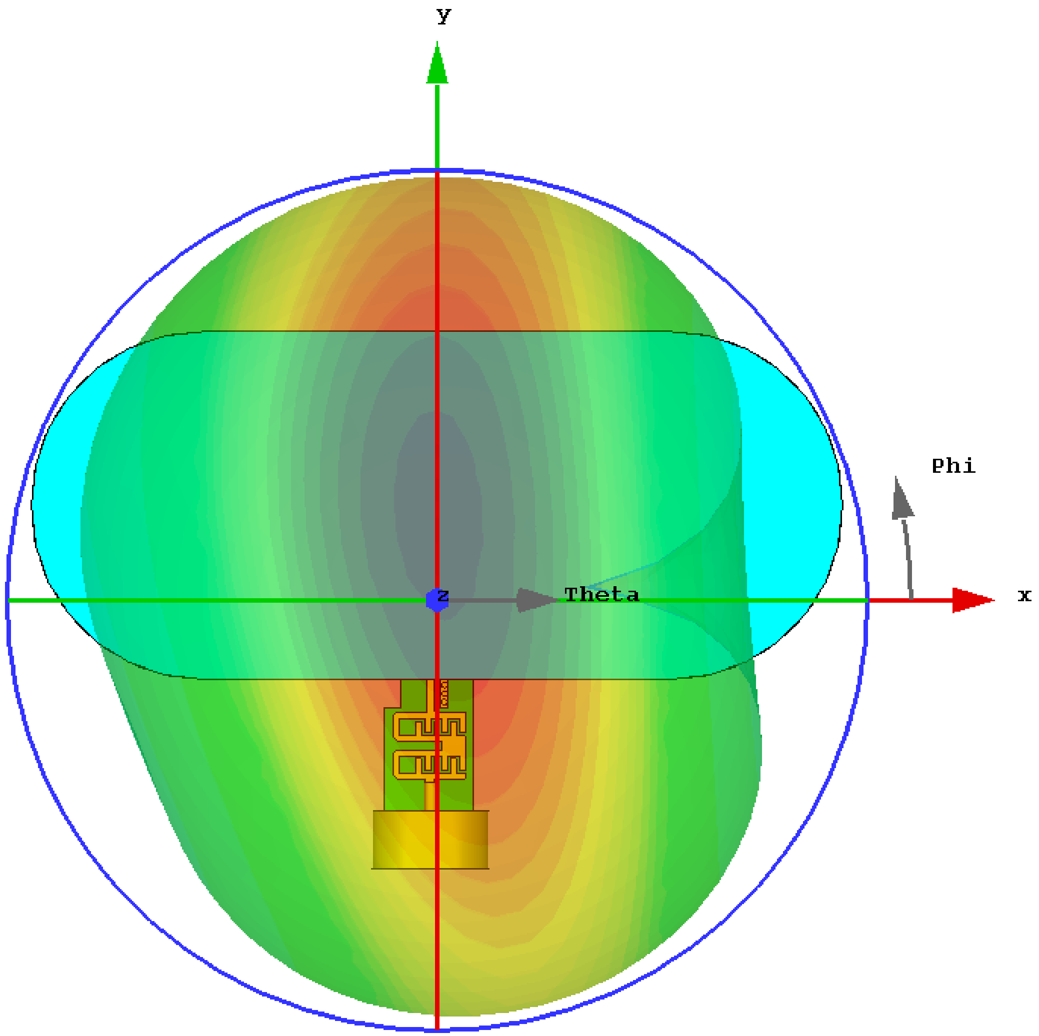


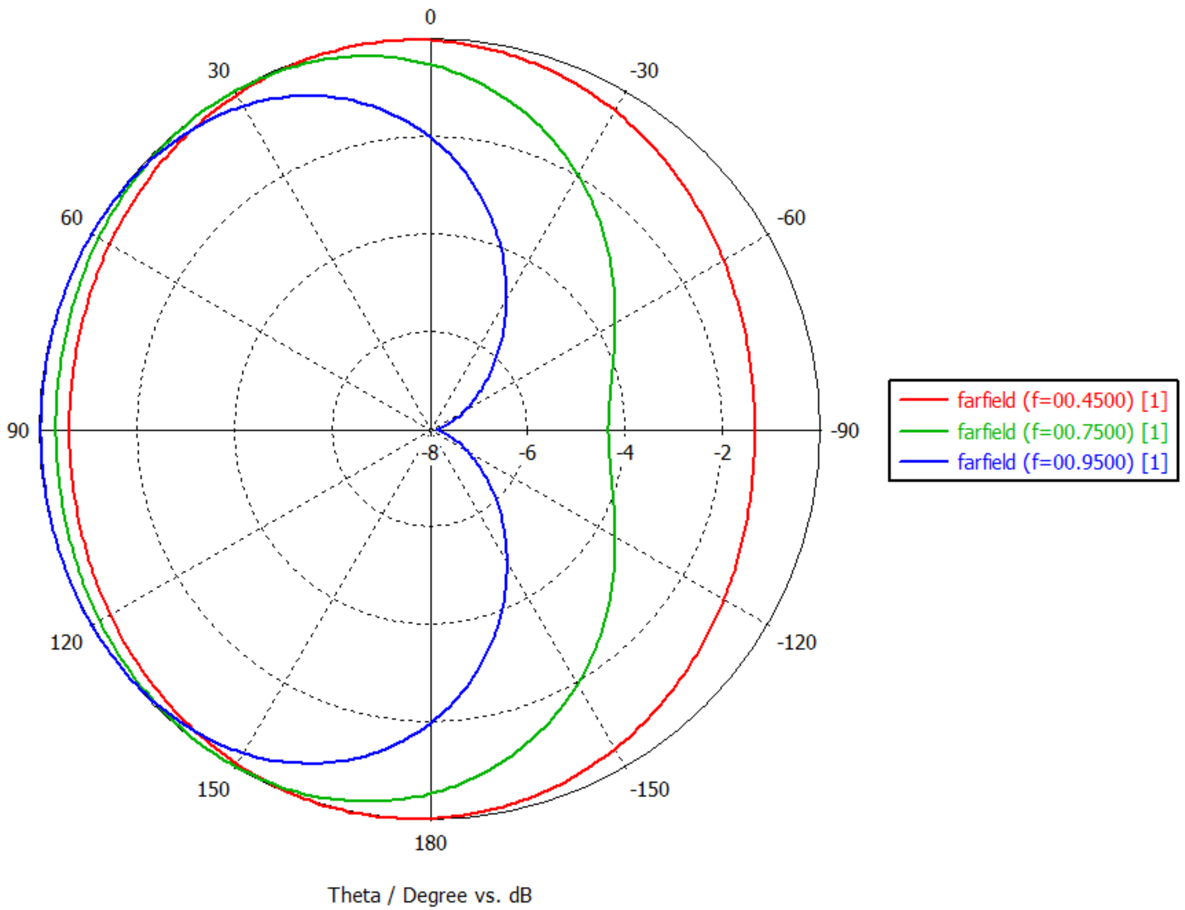
S-Parameters [Magnitude in dB]
0
-5
-10
-15
-20
-25
-30
-35
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0.95
Frequency / GHz

Realized gain

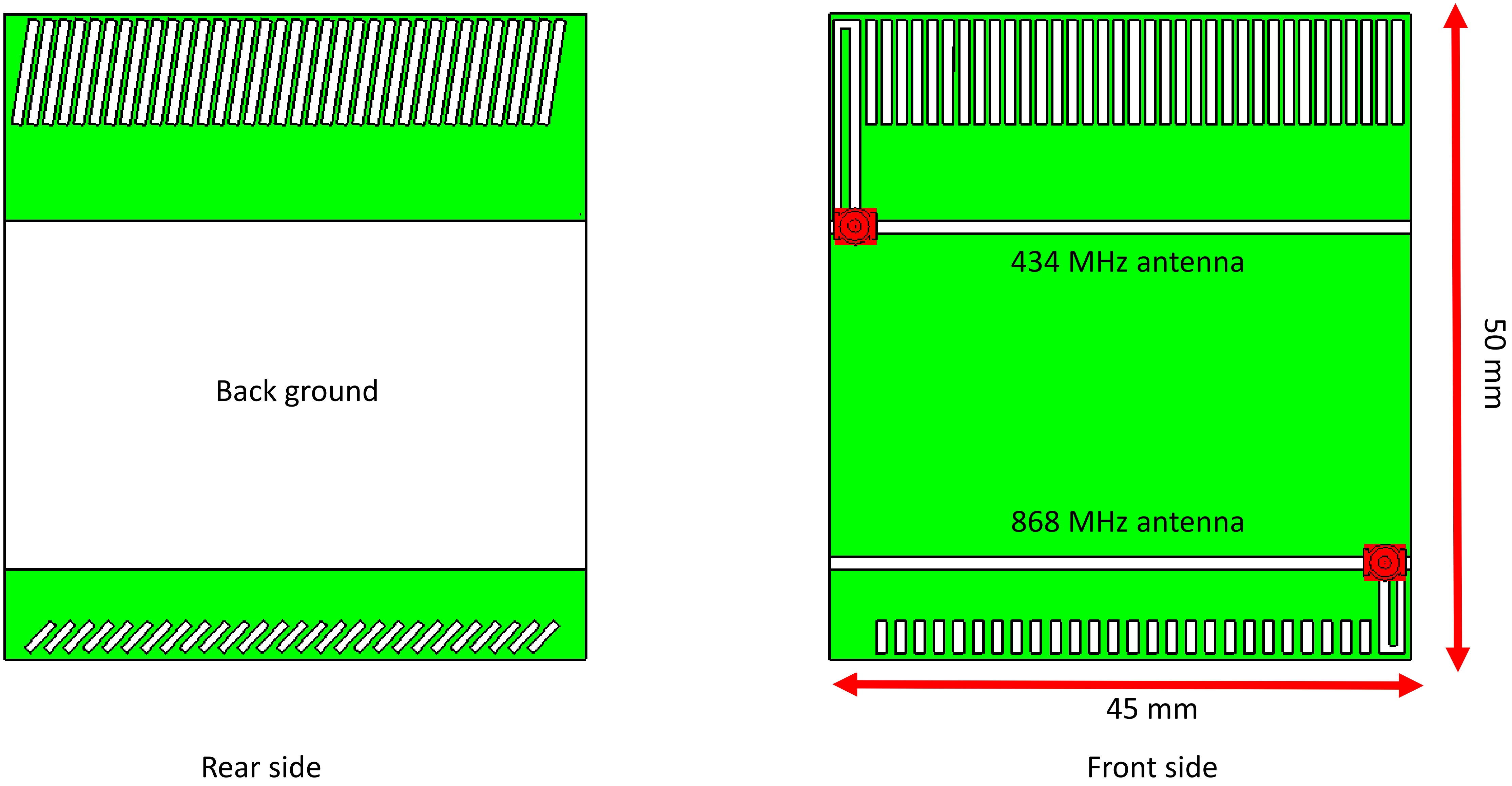


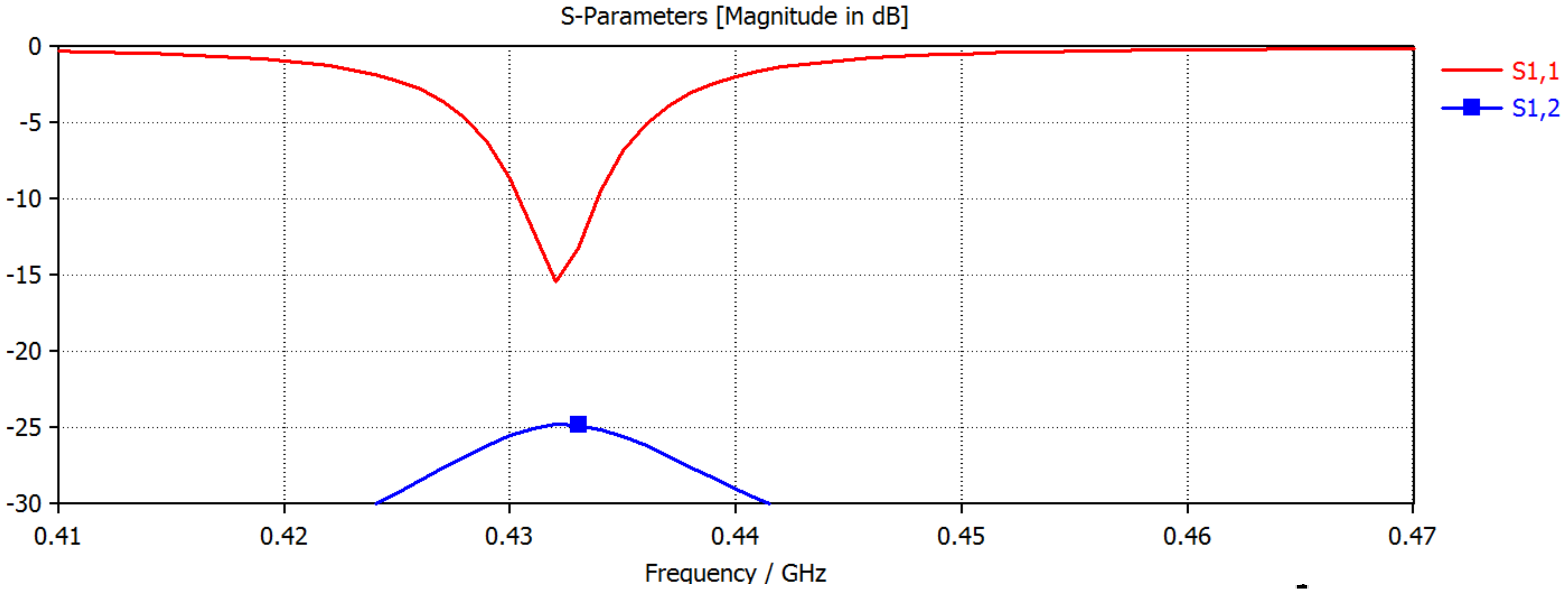
Patterns

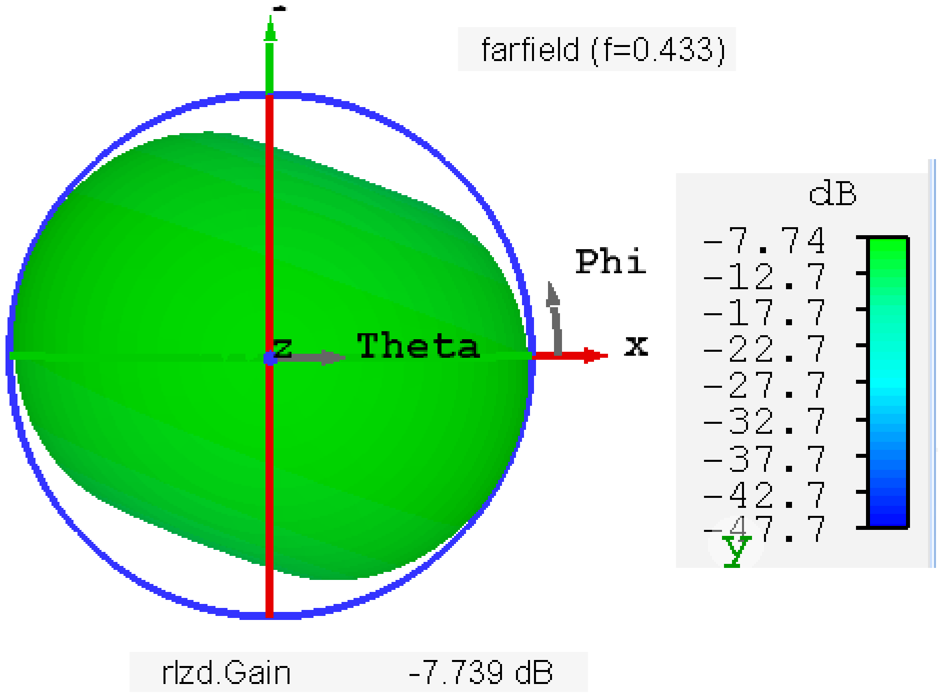

y
z
Theta
Phi
x

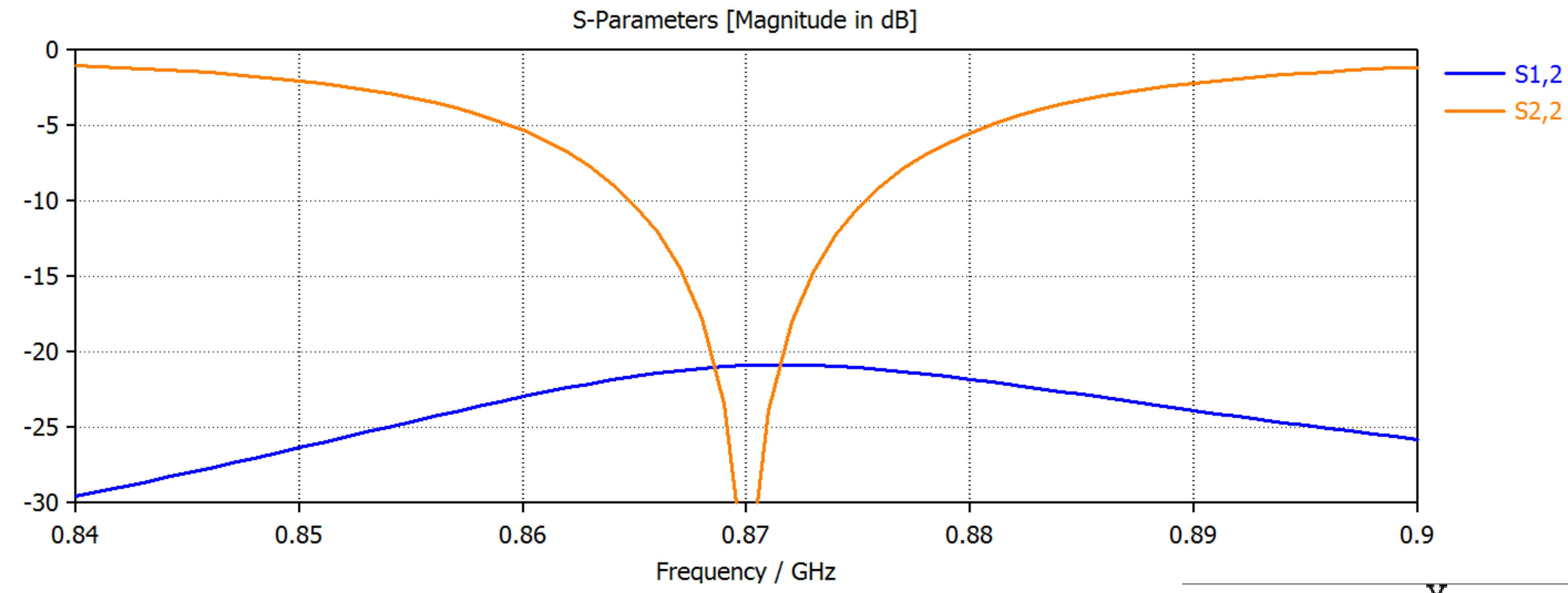

0
30
-30
60
-60
90
-90
120
-120
150
-150
180
-8
-6
-4
-2
farfield (f=00.4500) [1]
farfield (f=00.7500) [1]
farfield (f=00.9500) [1]
Theta / Degree vs. dB

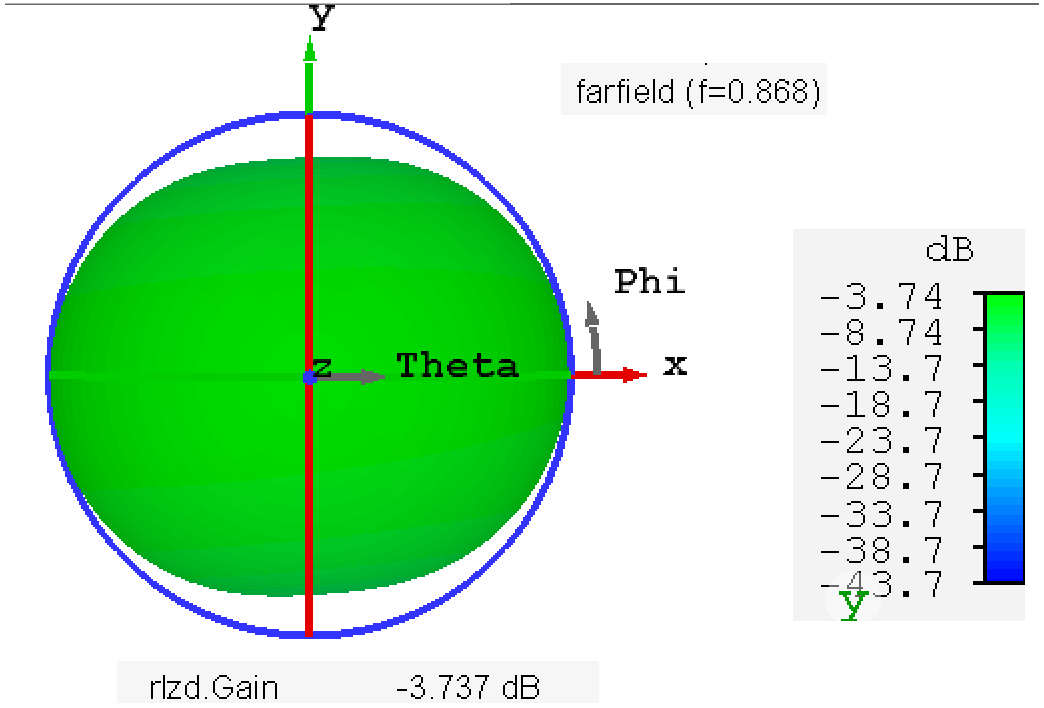
Dual band 433 MHz and 868 MHz Antenna
EU standard
Dr. Abdelhady Mahmoud


Back ground
434 MHz antenna
868 MHz antenna
50 mm
45 mm
Rear side
Front side


S-Parameters [Magnitude in dB]
0
-5
-10
-15
-20
-25
-30
0.41
0.42
0.43
0.44
0.45
0.46
0.47
Frequency / GHz
S1,1
S1,2


farfield (f=0.433)
z
Theta
Phi
x
y
dB
-7.74
-12.7
-17.7
-22.7
-27.7
-32.7
-37.7
-42.7
-47.7
rlzd.Gain -7.739 dB

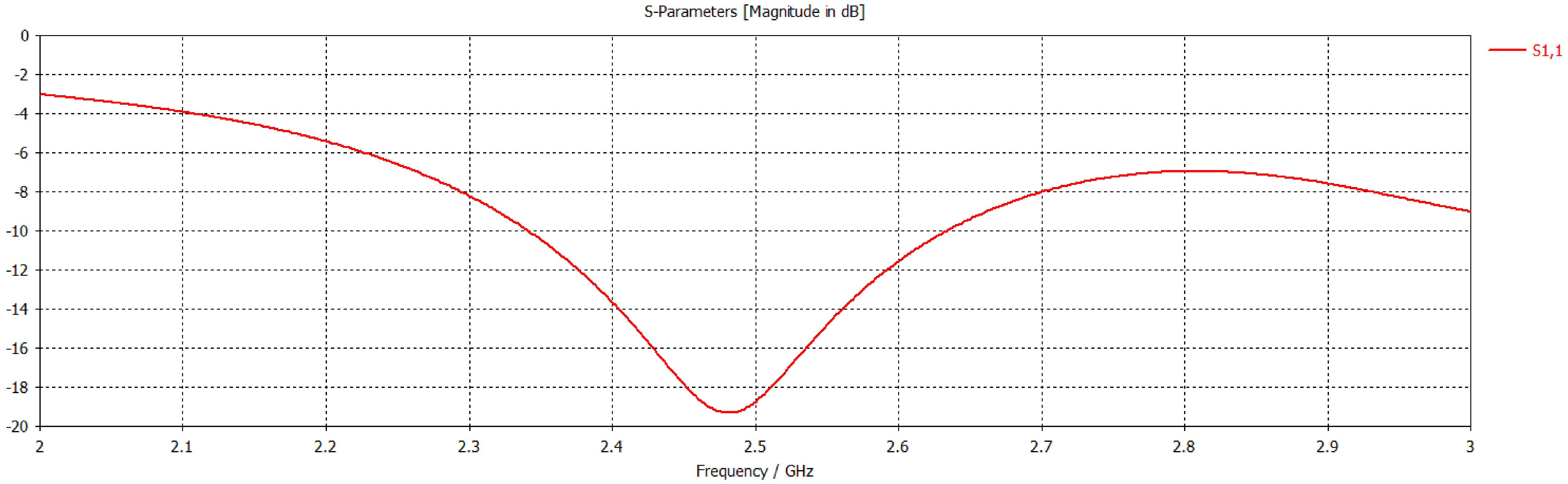

S-Parameters [Magnitude in dB]
0
-5
-10
-15
-20
-25
-30
0.84
0.85
0.86
0.87
0.88
0.89
0.9
Frequency / GHz
S1,2
S2,2


y
farfield (f=0.868)
Phi
z
Theta
x
dB
-3.74
-8.74
-13.7
-18.7
-23.7
-28.7
-33.7
-38.7
-43.7
y
rlzd.Gain
-3.737 dB

2.4GHz Quasi yagi

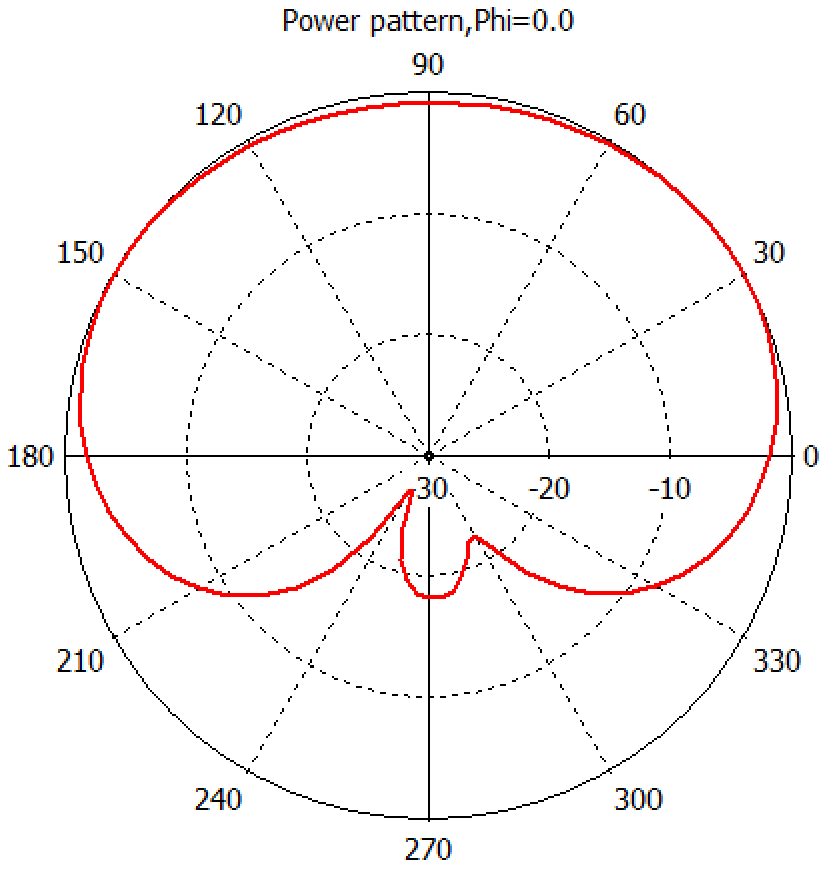
Dr. Abdelhady Mahmoud

S11

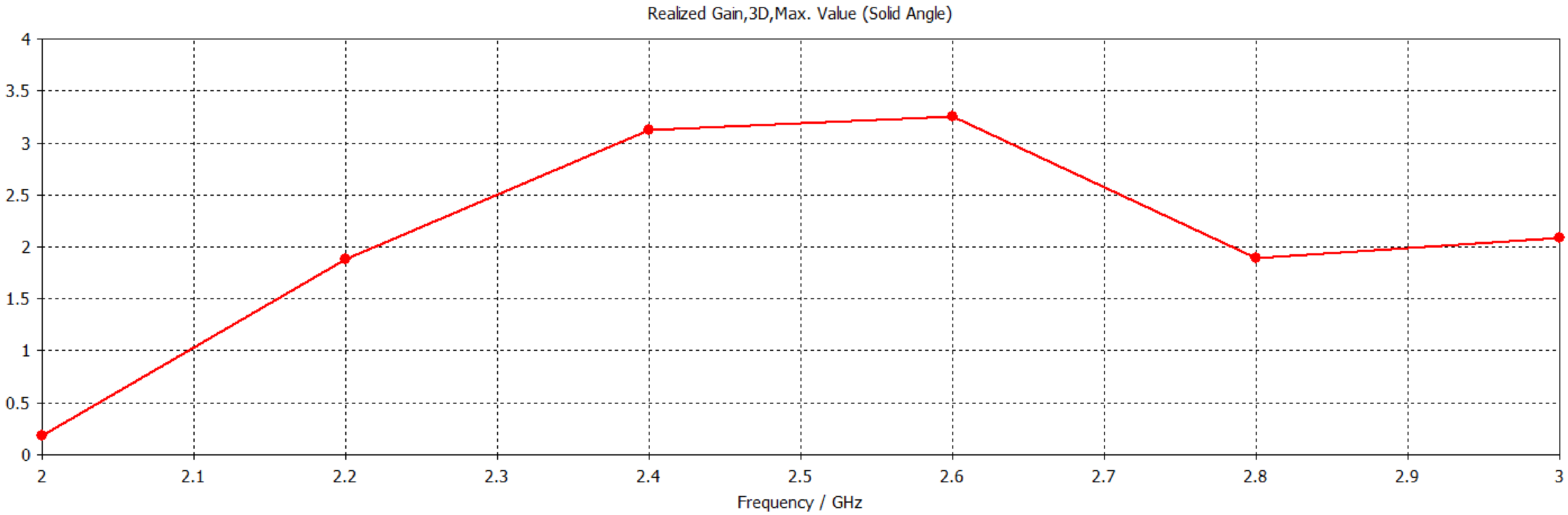


S-Parameters [Magnitude in dB]
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
2
2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.8
2.9
3
Frequency / GHz
S1,1

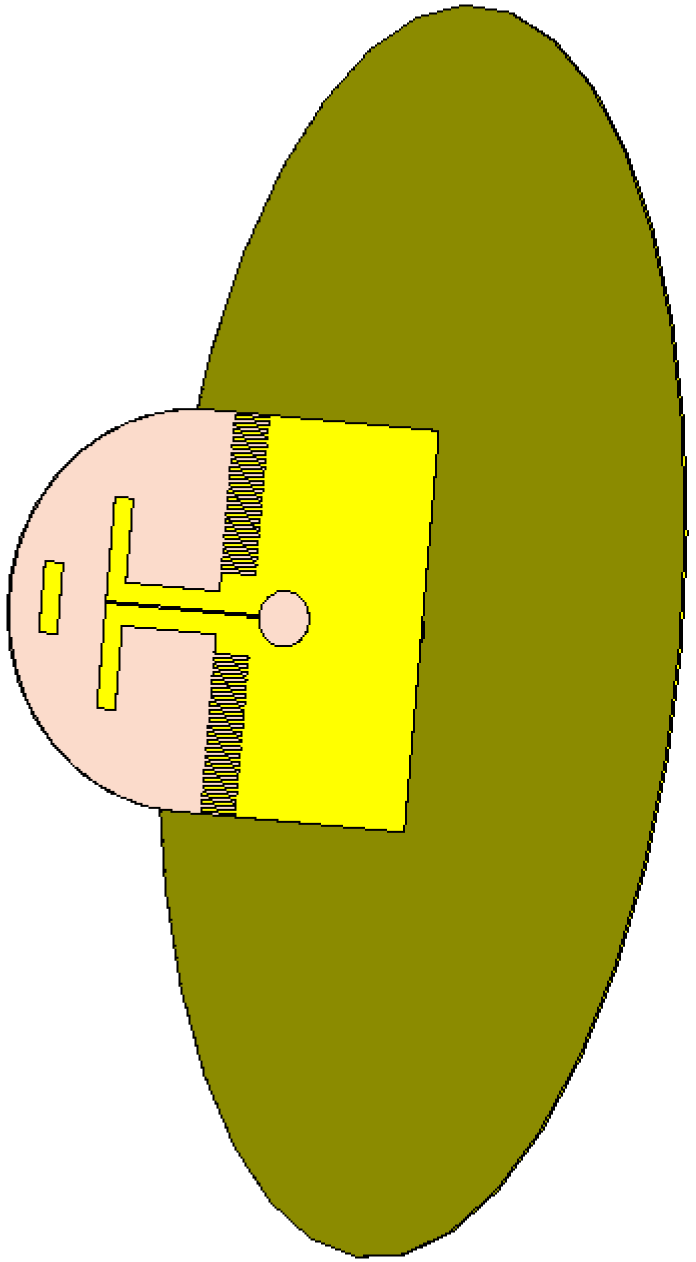
Pattern @ 2.4 GHz



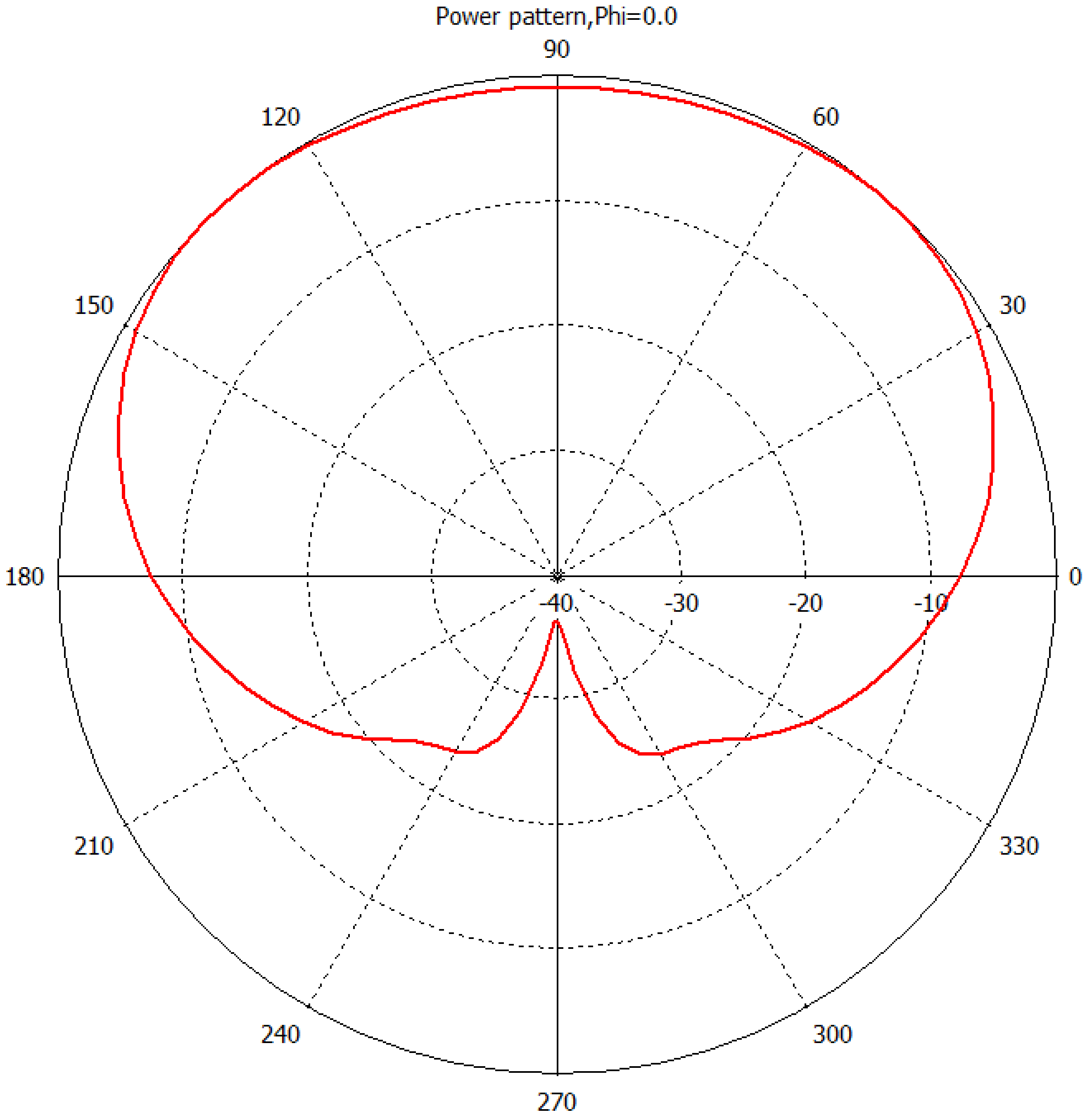
Realized gain



Updated 6th FEB 2022

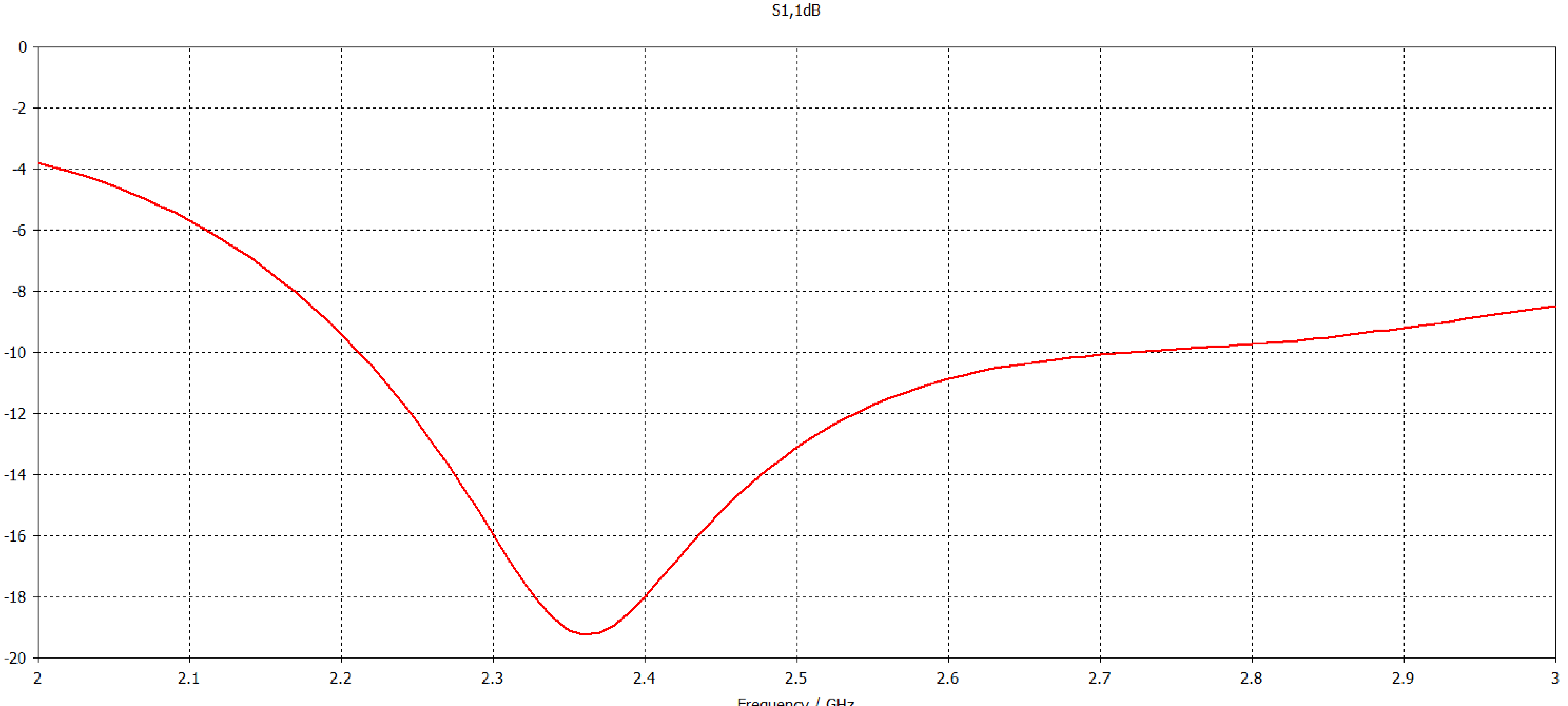


FBR -36 dB

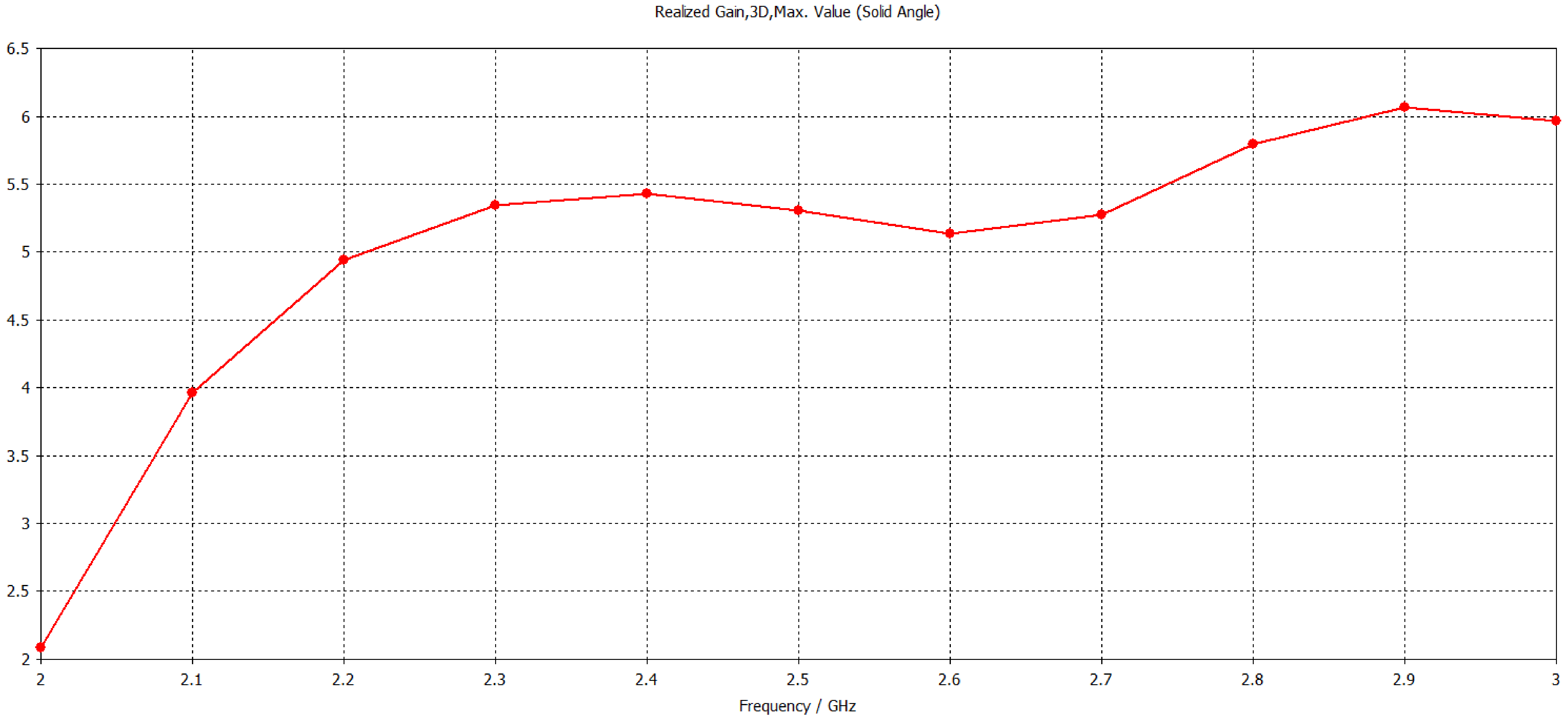


Power pattern,Phi=0.0
90
120
60
150
30
180
0
-40
-30
-20
-10
210
330
240
300
270

S11



S1,1dB
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
2
2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.8
2.9
3
Frequency / GHz

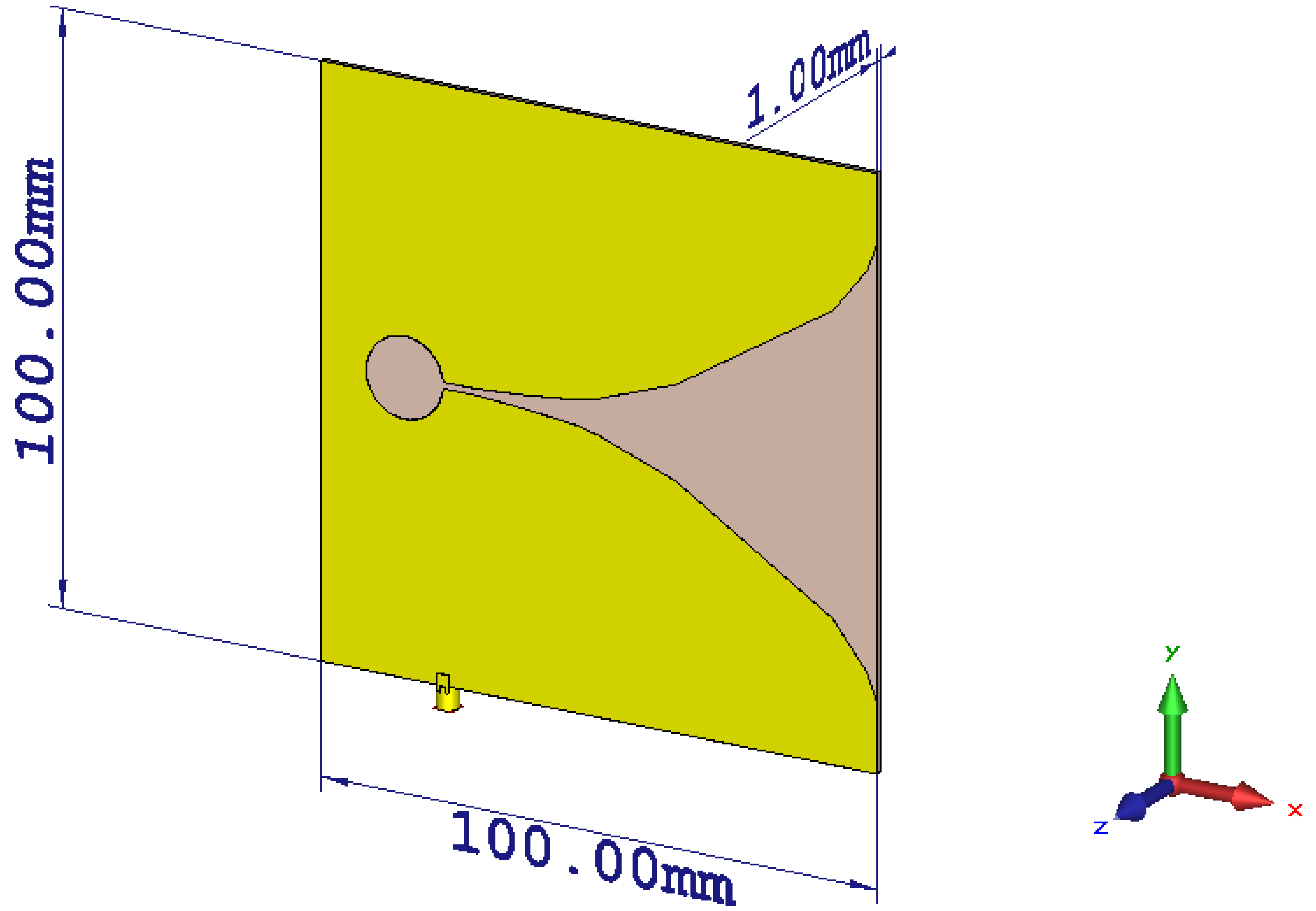


Realized Gain,3D,Max. Value (Solid Angle)
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
2
2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.8
2.9
3
Frequency / GHz

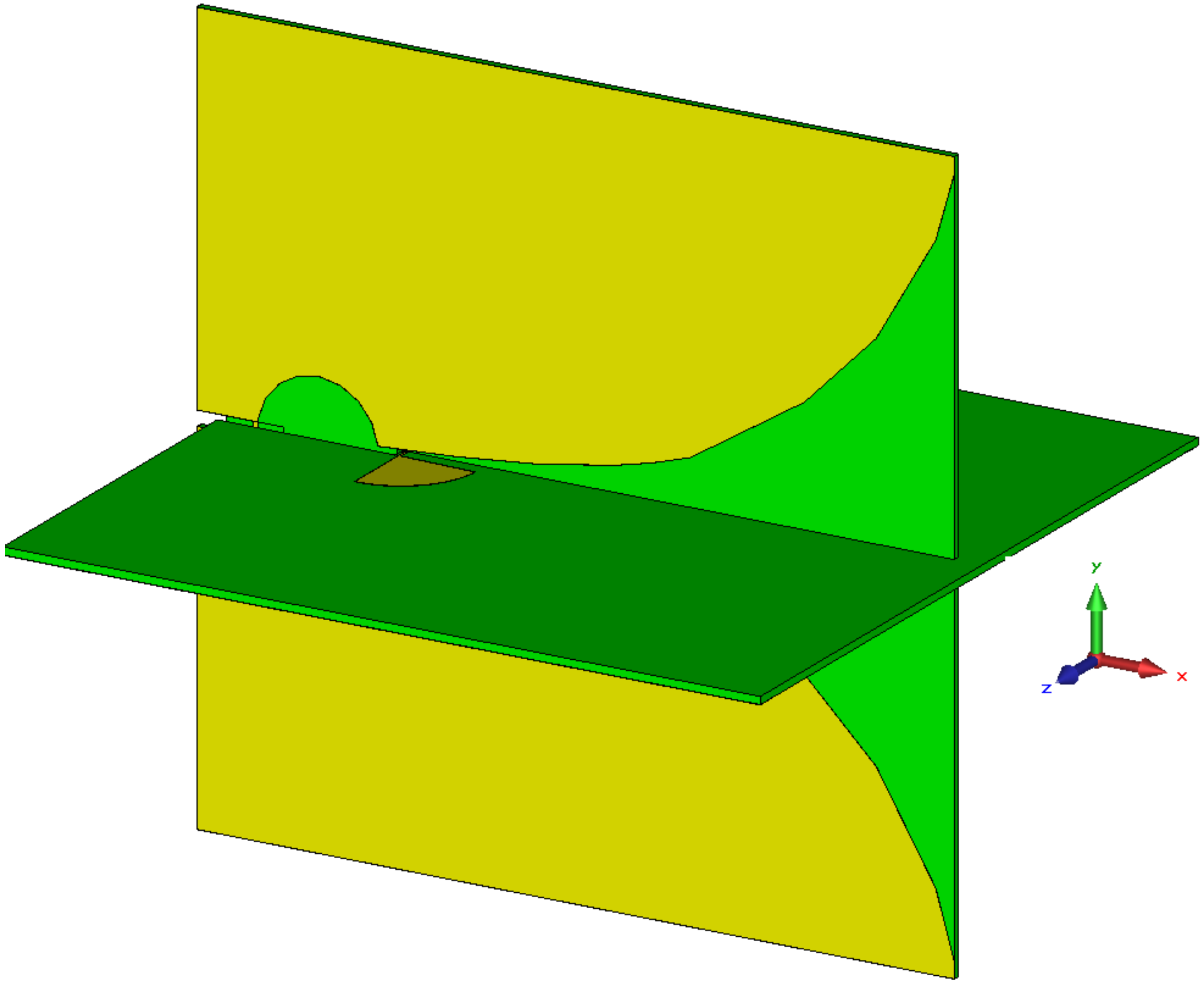
Dual Ports Printed Vivaldi Tapered Antenna 1.5 to 6.5 GHz

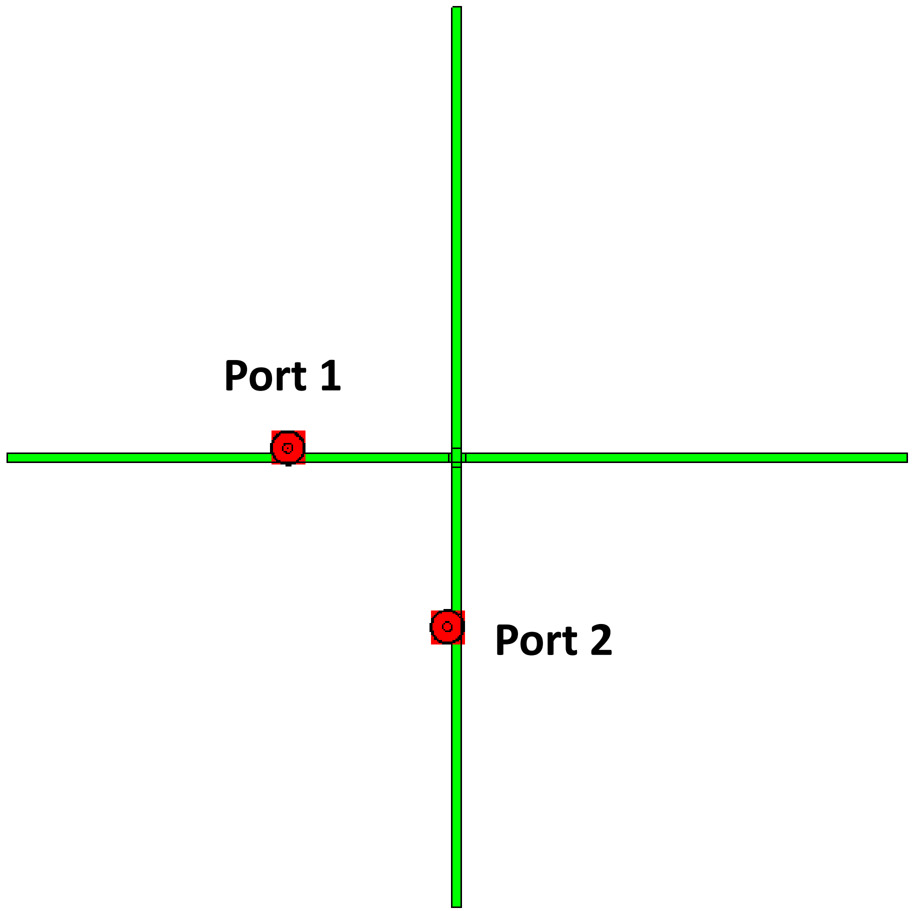
Dr. Abdelhady Mahmoud

Perspective view of single port antenna

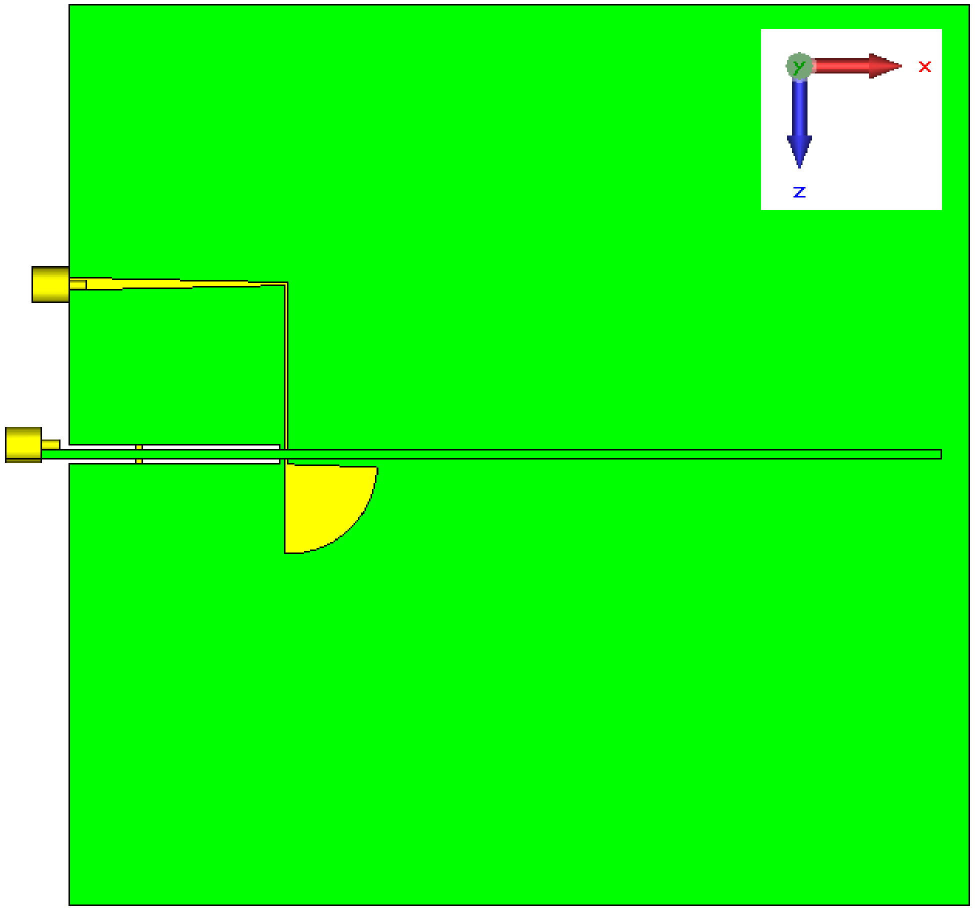


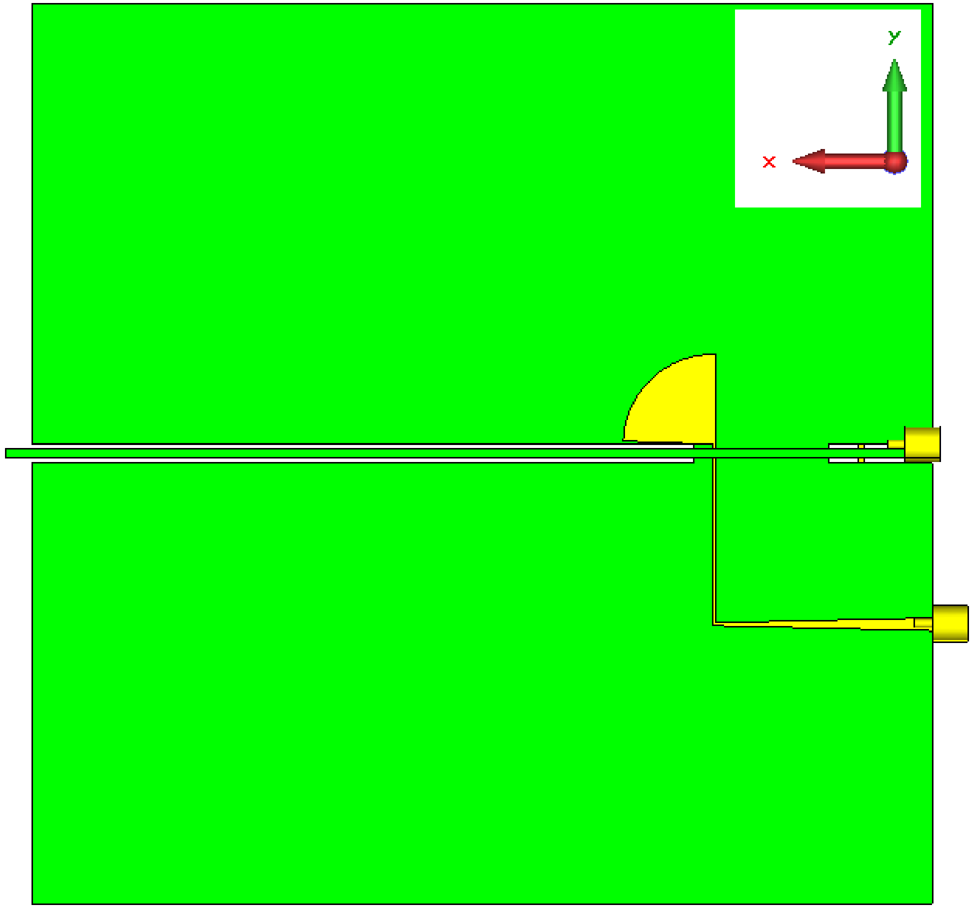
Perspective view of dual ports antenna



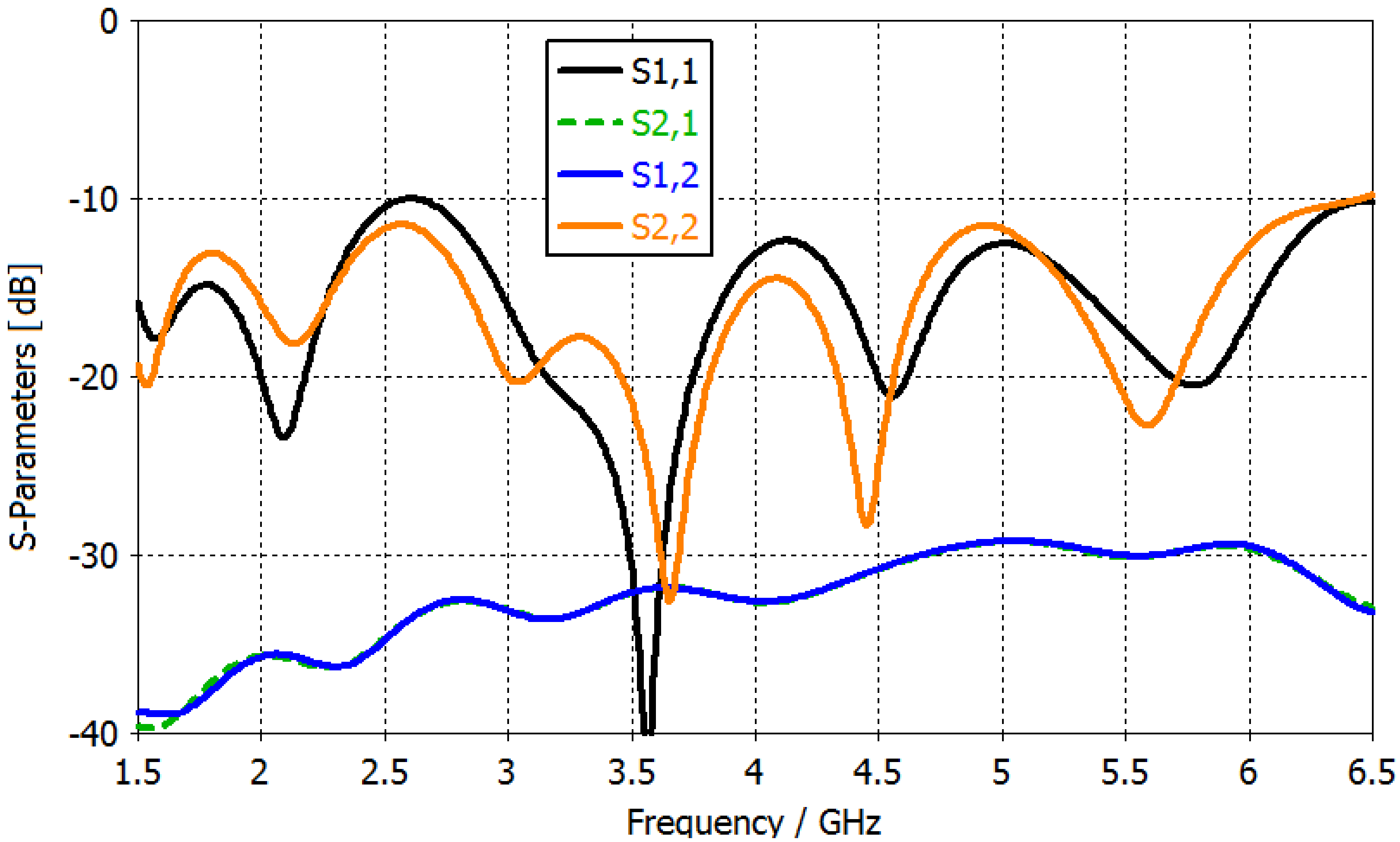


Cont.,

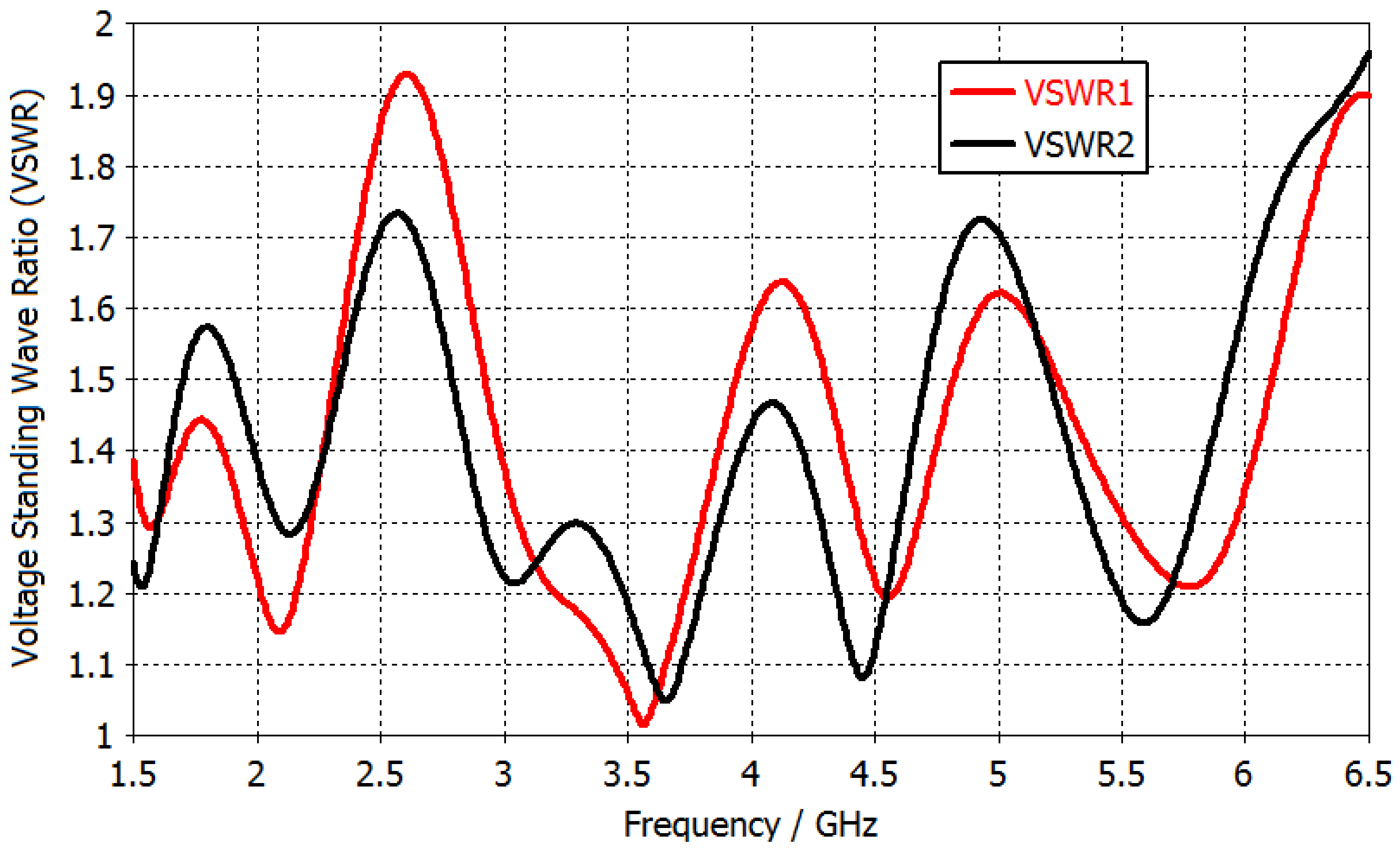




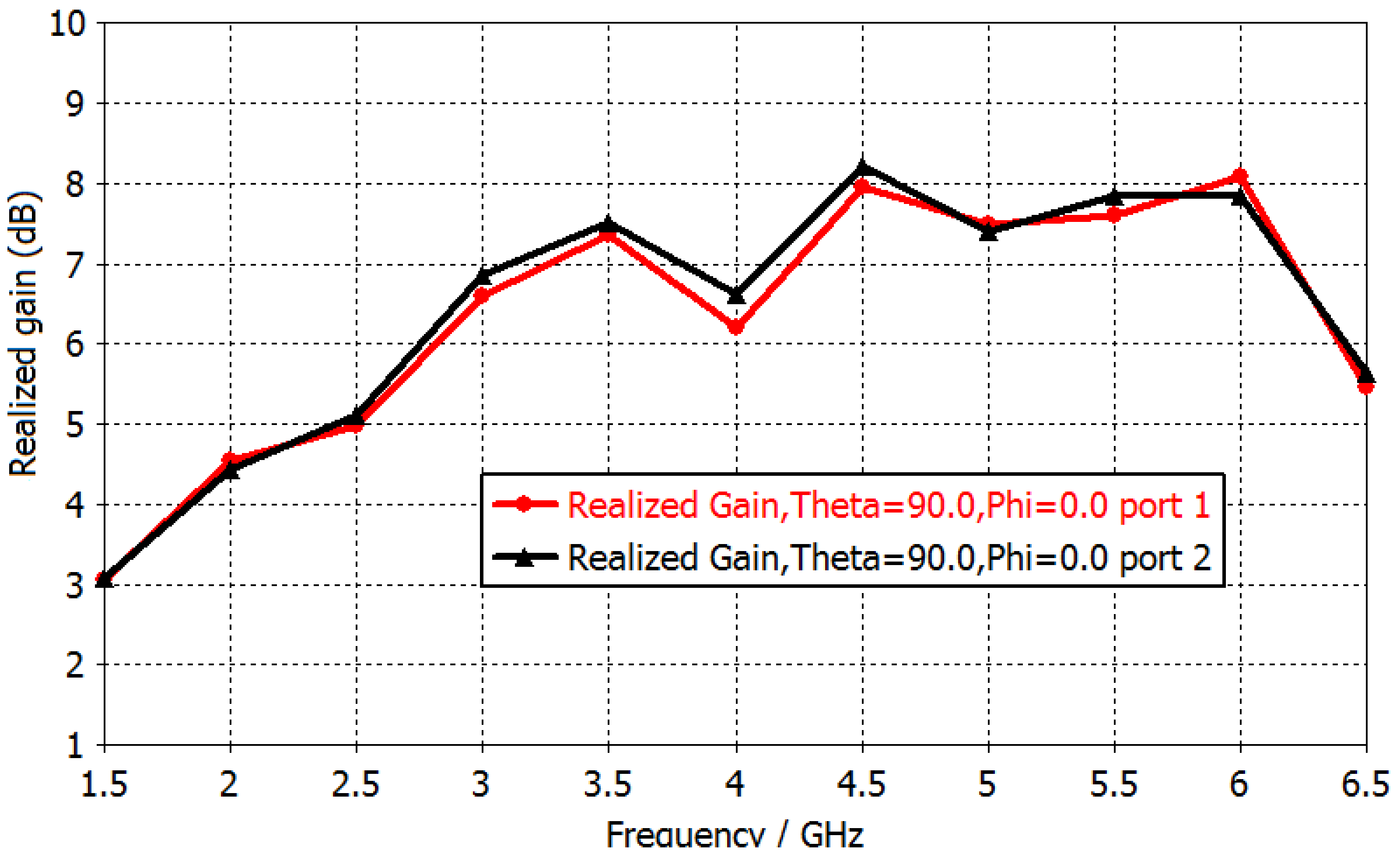
Scattering parameters of dual ports



VSWR


VSWR1
VSWR2
Voltage Standing Wave Ratio (VSWR)
Frequency / GHz
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5

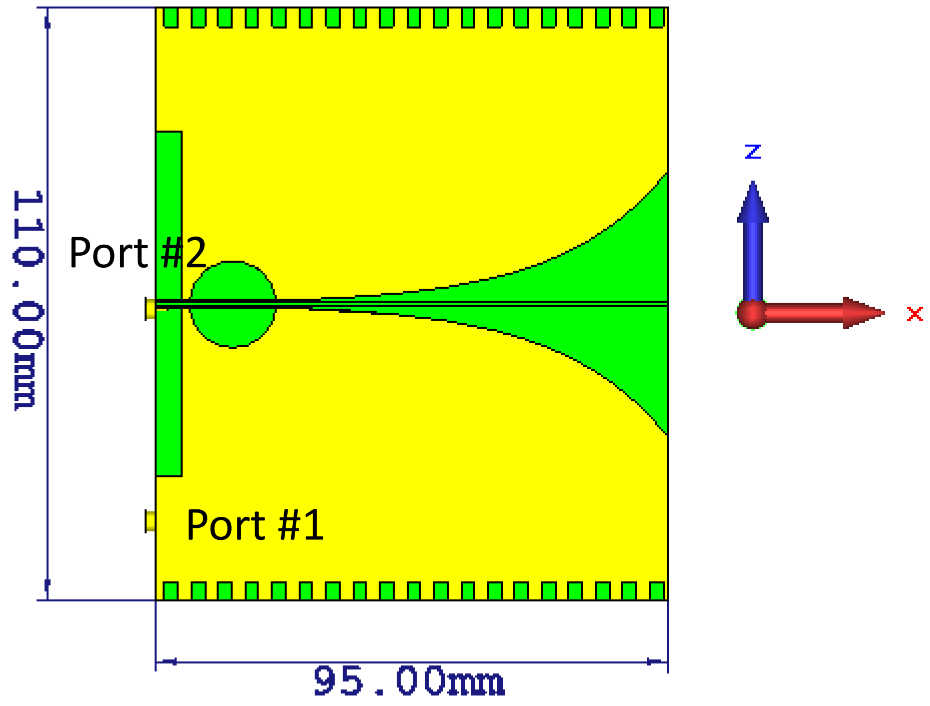
Realized Gain

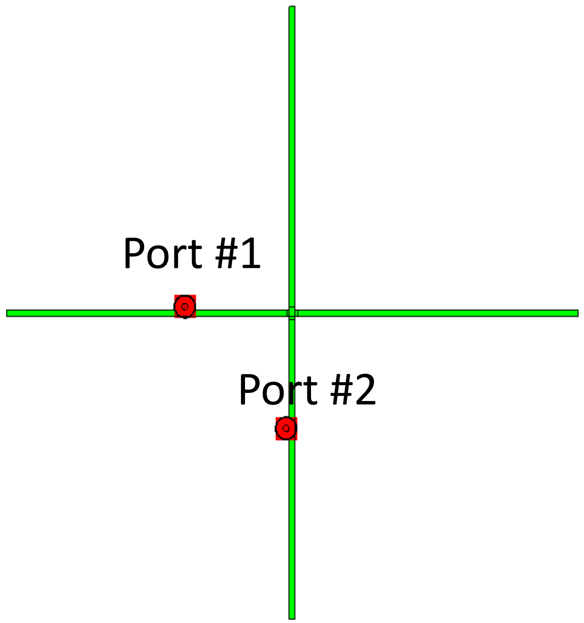


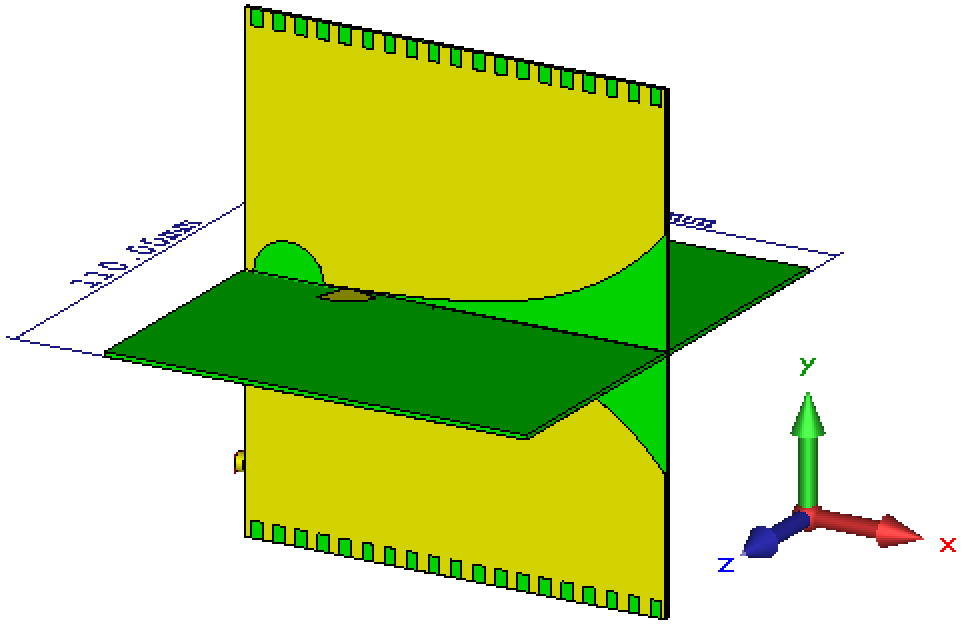
Dual Polarized Printed Vivaldi Tapered Antenna 1 to 13 GHz

Dr. Abdelhady Mahmoud

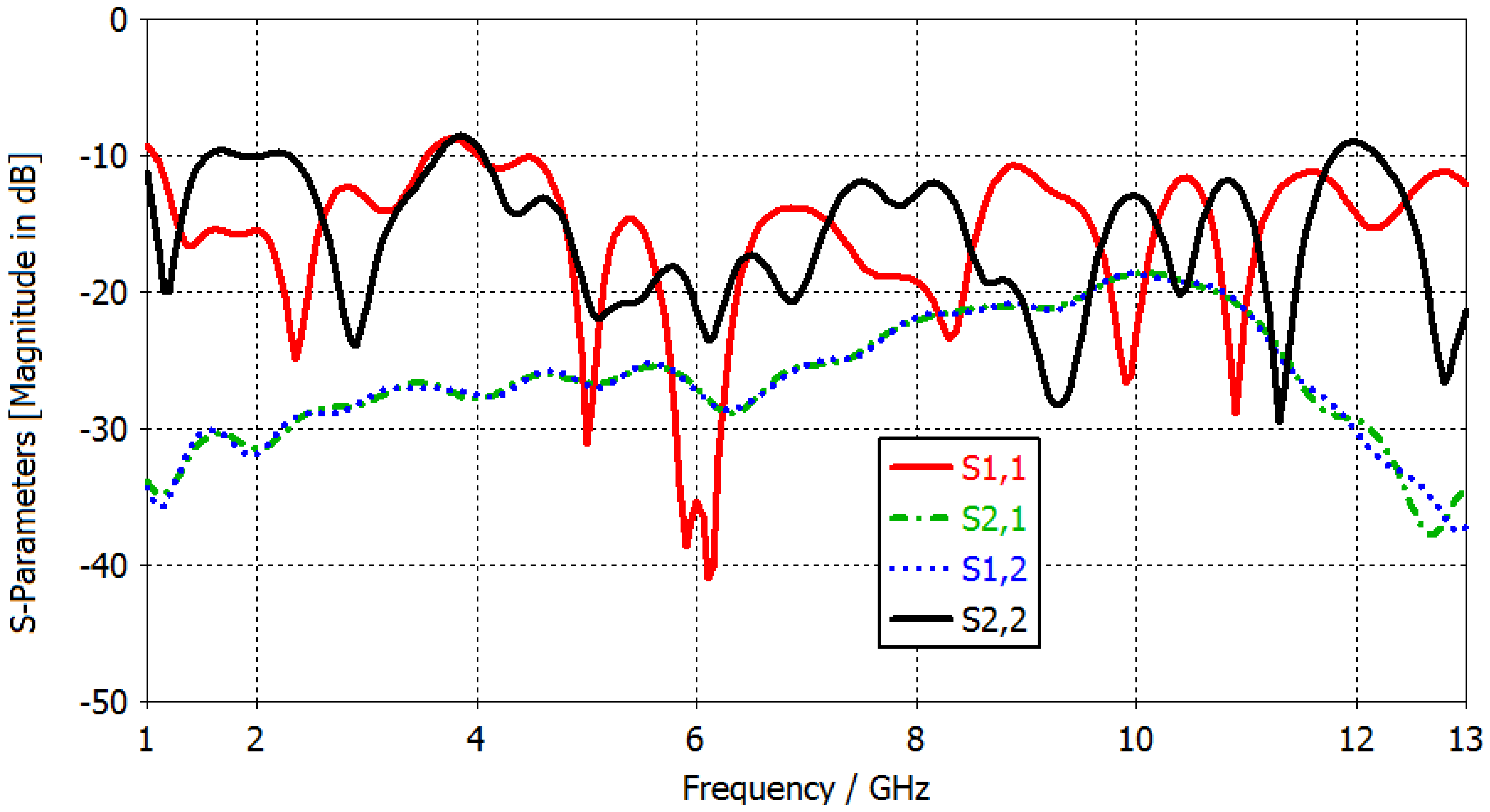
Perspective view of dual ports antenna
FR-4 substrate with thickness 1 mm



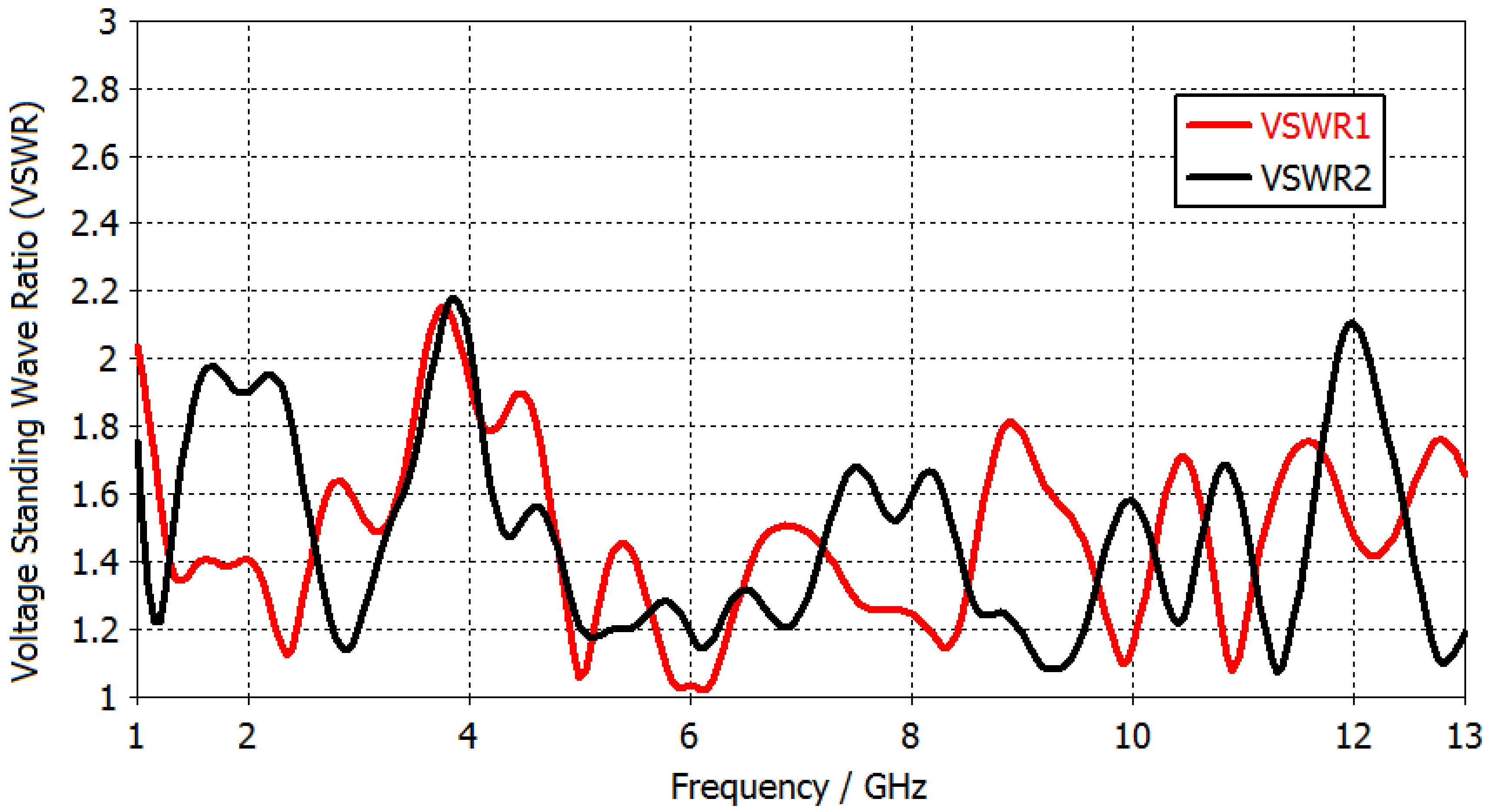




Scattering parameters

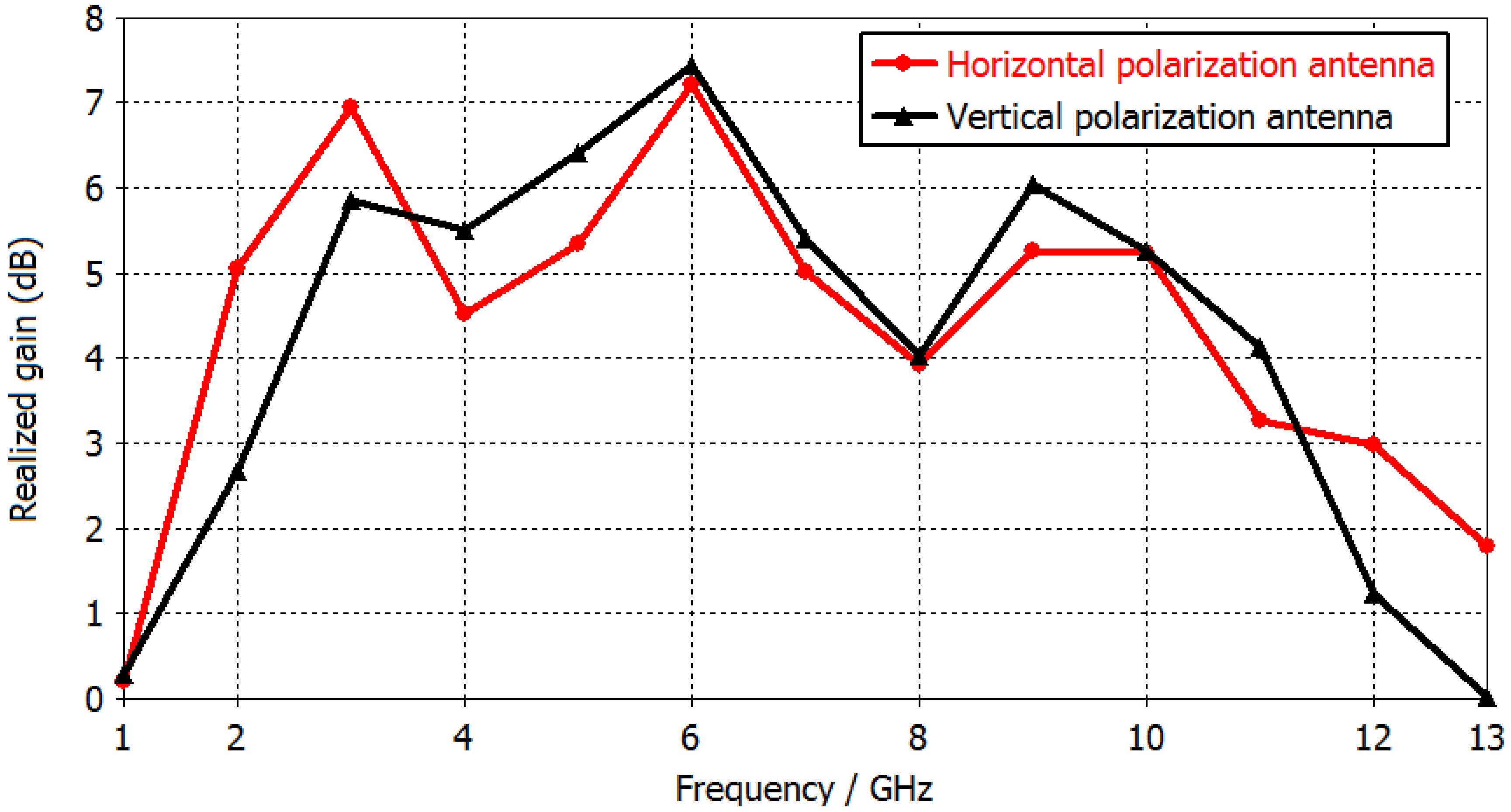


VSWR

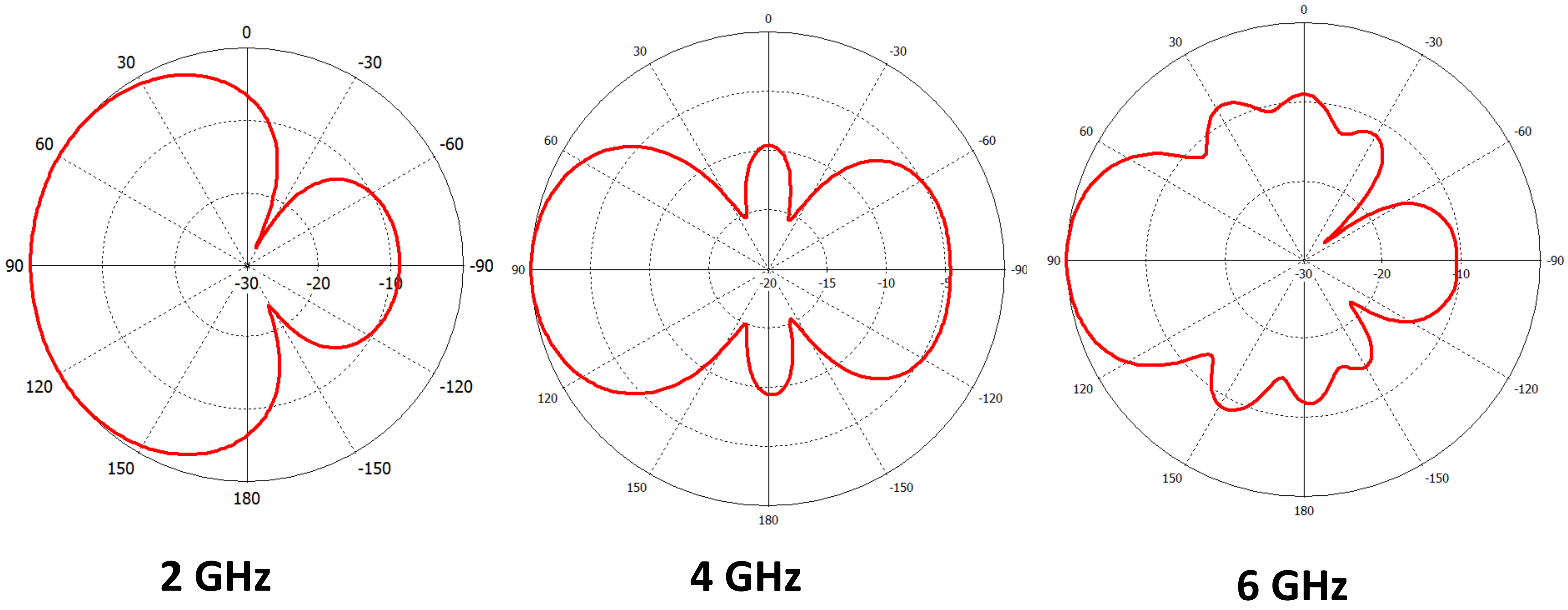


VSWR1
VSWR2
Voltage Standing Wave Ratio (VSWR)
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
1
2
4
6
8
10
12
13
Frequency / GHz

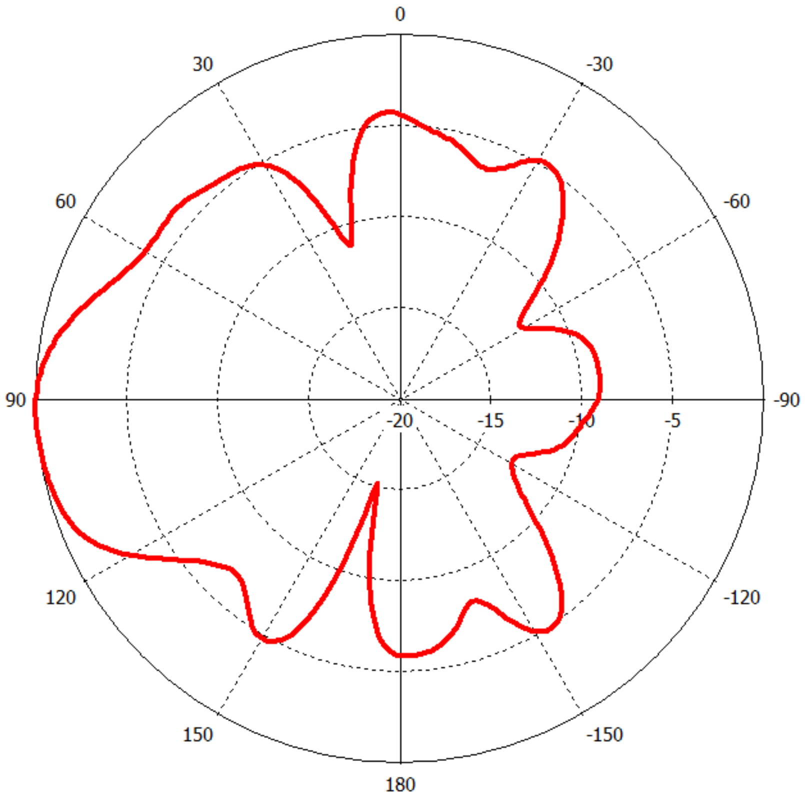
Realized gain



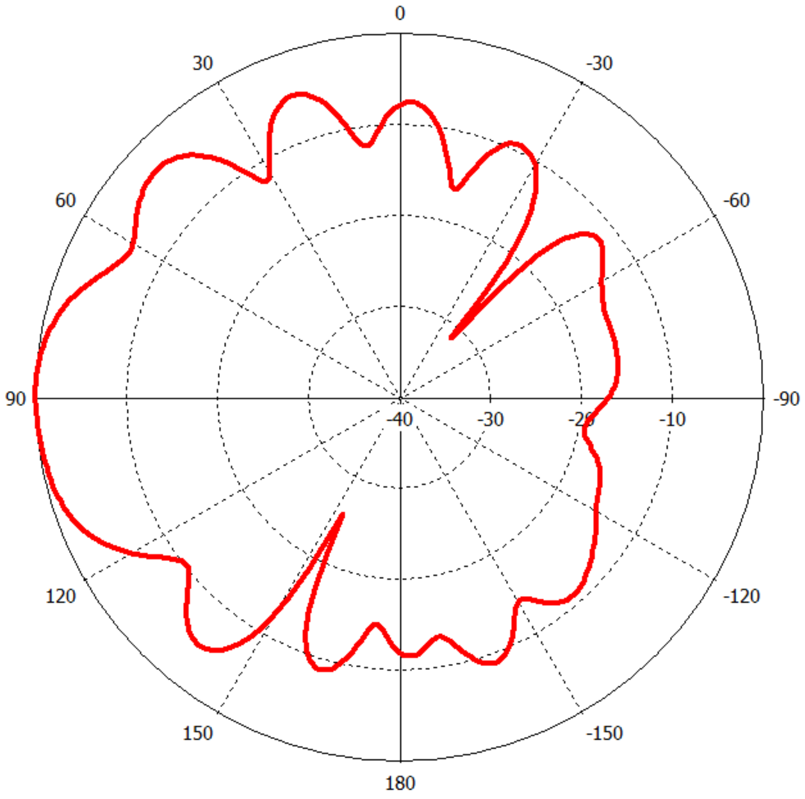
Port 1 (Horizontal) antenna patterns



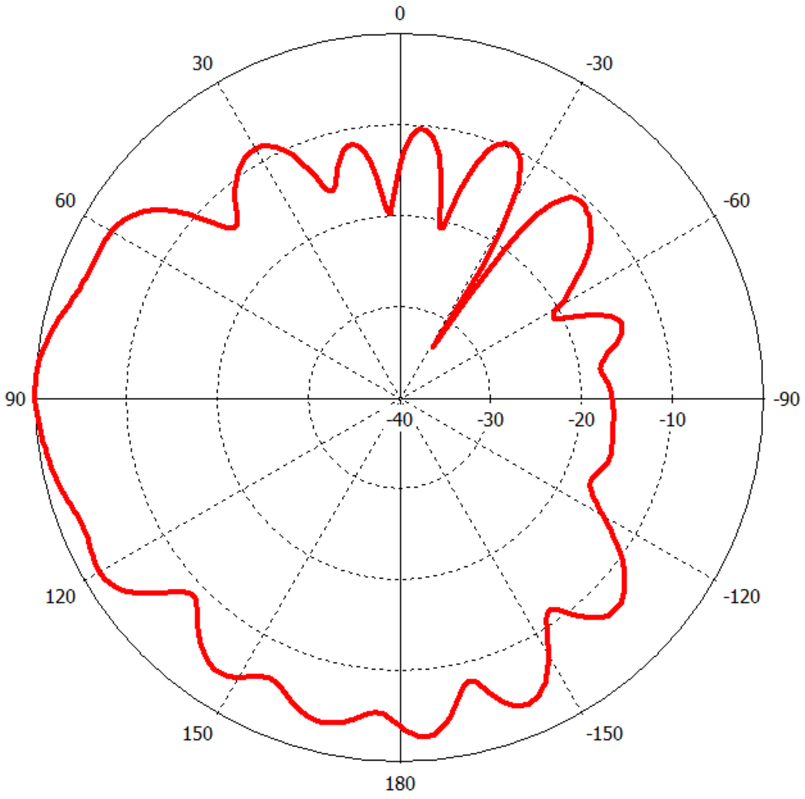
Cont.,



8 GHz

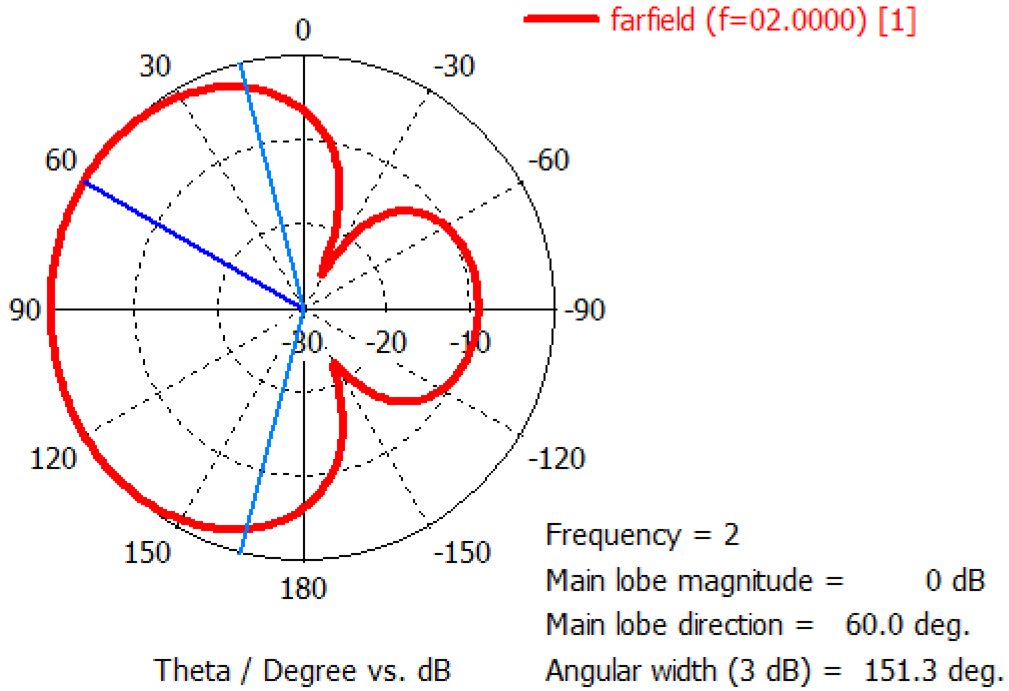


10 GHz



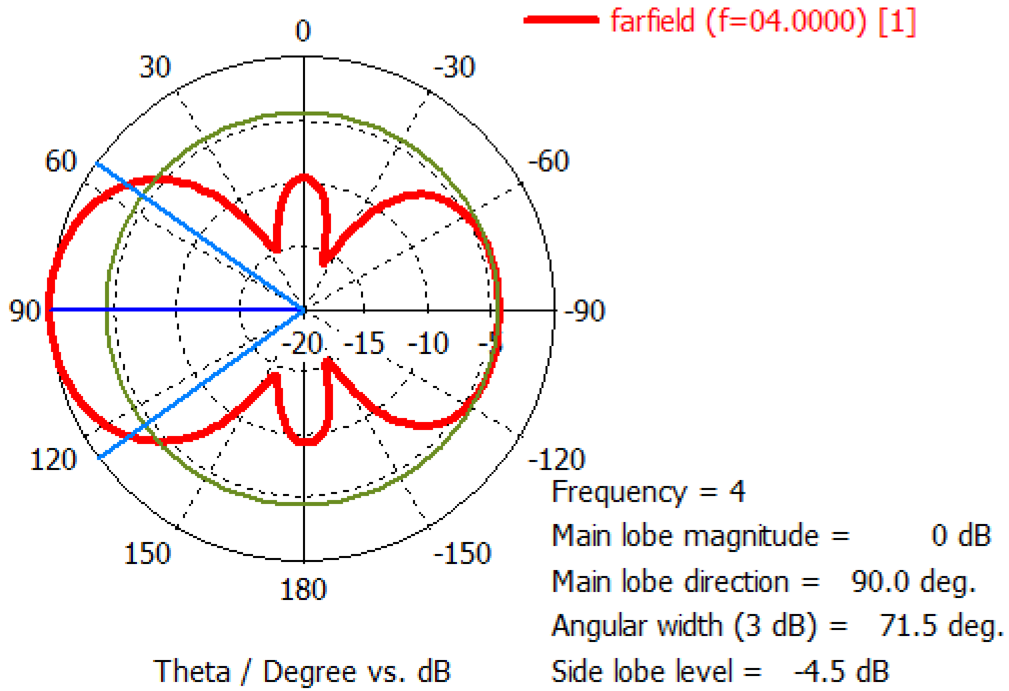
12 GHz

2 GHz



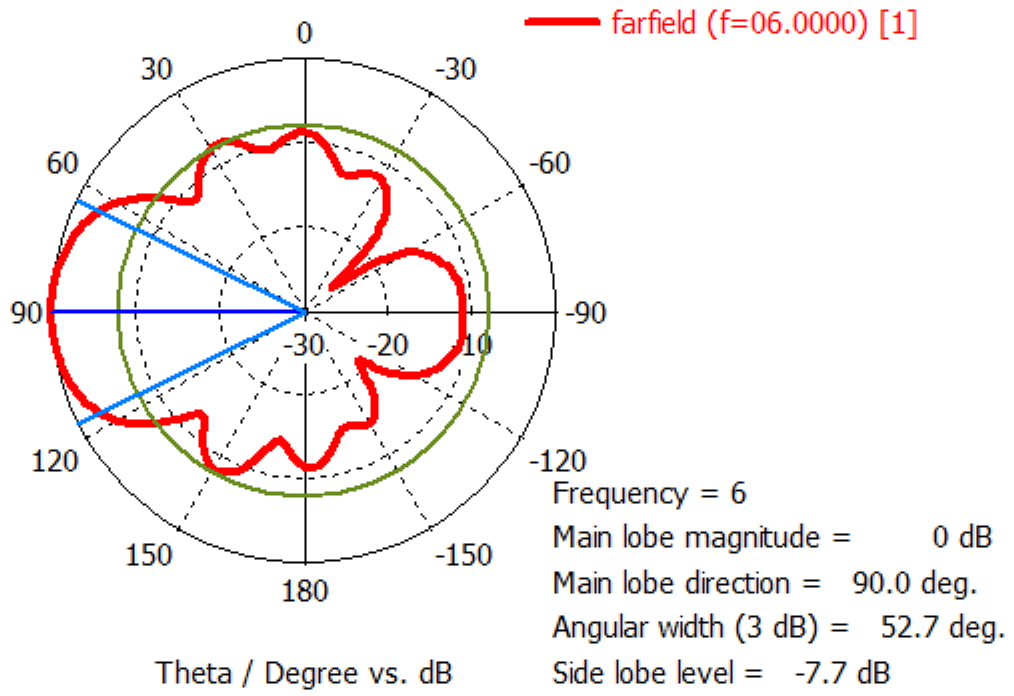
farfield (f=02.0000) [1]
0
30
-30
60
-60
90
-90
-30
-20
-10
120
-120
150
-150
180
Theta / Degree vs. dB
Frequency = 2
Main lobe magnitude = 0 dB
Main lobe direction = 60.0 deg.
Angular width (3 dB) = 151.3 deg.

4 GHz

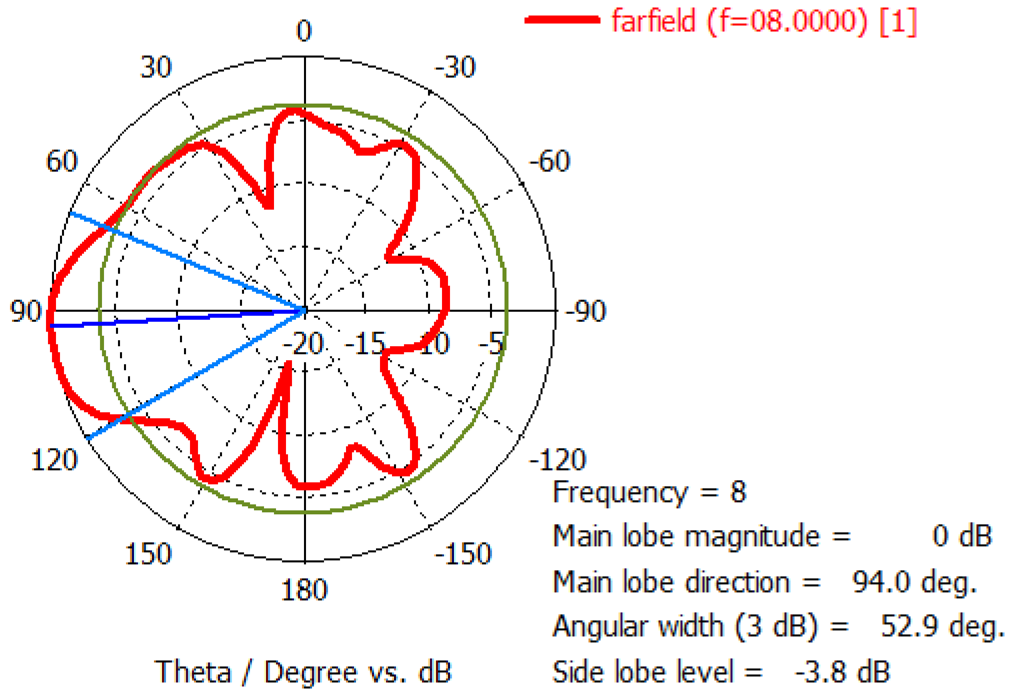


farfield (f=04.0000) [1]
0
30
-30
60
-60
90
-90
-20
-15
-10
120
-120
150
-150
180
Theta / Degree vs. dB
Frequency = 4
Main lobe magnitude = 0 dB
Main lobe direction = 90.0 deg.
Angular width (3 dB) = 71.5 deg.
Side lobe level = -4.5 dB

6 GHz

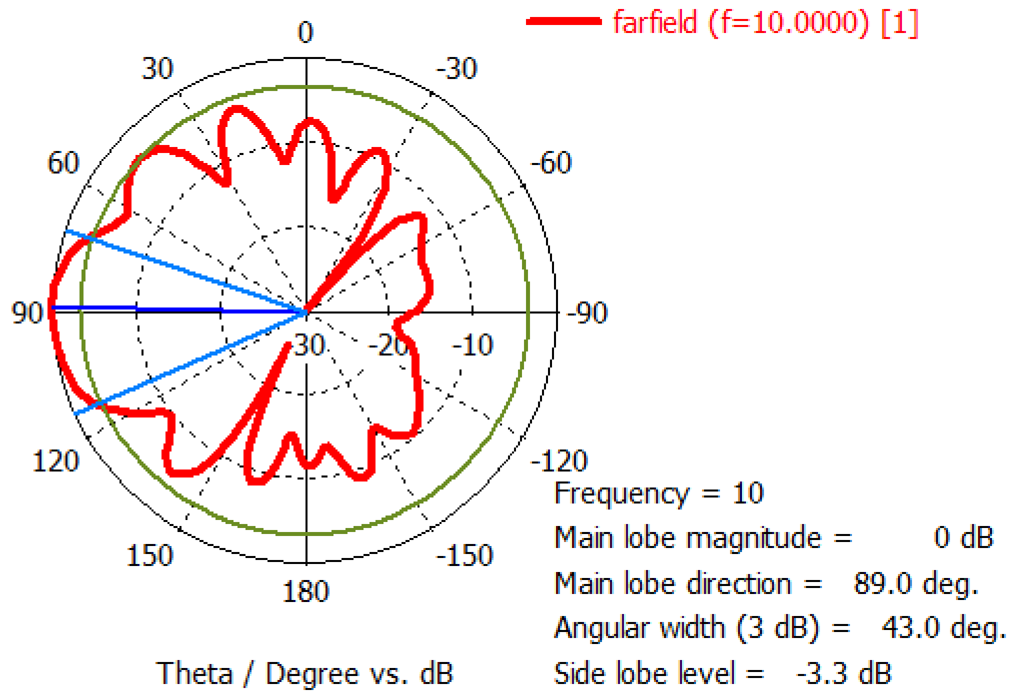

farfield (f=06.0000) [1]
0
30
-30
60
-60
90
-90
120
-120
150
-150
180
-30
-20
-10
Frequency = 6
Main lobe magnitude = 0 dB
Main lobe direction = 90.0 deg.
Angular width (3 dB) = 52.7 deg.
Side lobe level = -7.7 dB
Theta / Degree vs. dB

8 GHz

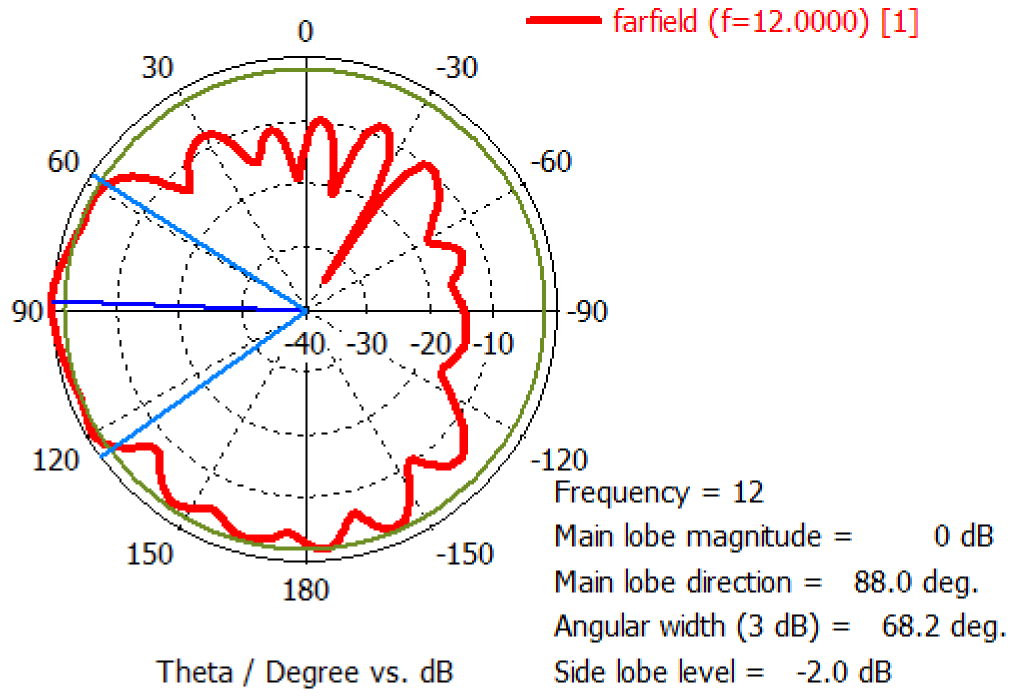

farfield (f=08.0000) [1]
0
30
-30
60
-60
90
-90
120
-120
150
-150
180
-20
-15
-10
-5
Frequency = 8
Main lobe magnitude = 0 dB
Main lobe direction = 94.0 deg.
Angular width (3 dB) = 52.9 deg.
Side lobe level = -3.8 dB
Theta / Degree vs. dB

10 GHz

12 GHz



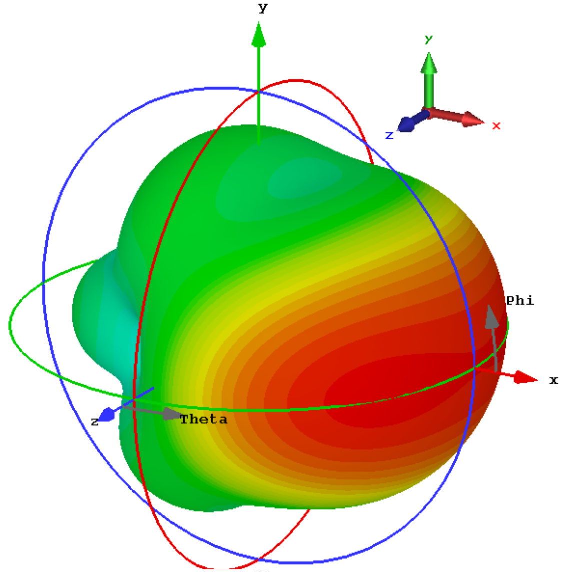
farfield (f=10.0000) [1]
0
30
-30
60
-60
90
-90
120
-120
150
-150
180
-30
-20
-10
Frequency = 10
Main lobe magnitude = 0 dB
Main lobe direction = 89.0 deg.
Angular width (3 dB) = 43.0 deg.
Side lobe level = -3.3 dB
Theta / Degree vs. dB



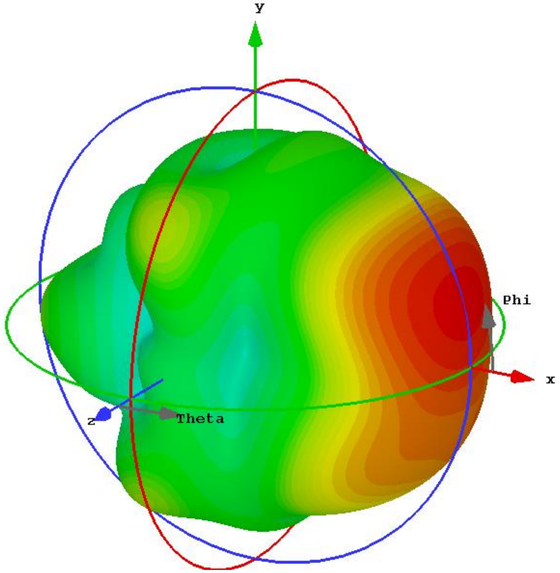
farfield (f=12.0000) [1]
0
30
-30
60
-60
90
-90
120
-120
150
-150
180
-40
-30
-20
-10
Frequency = 12
Main lobe magnitude = 0 dB
Main lobe direction = 88.0 deg.
Angular width (3 dB) = 68.2 deg.
Side lobe level = -2.0 dB
Theta / Degree vs. dB

3D patterns for horizontal polarization

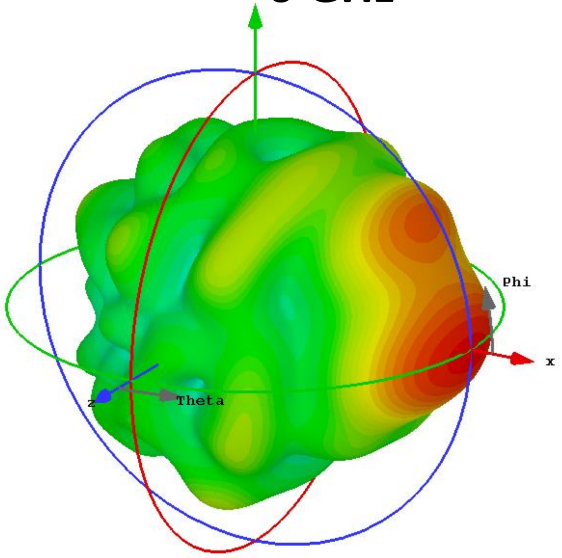
2 GHz

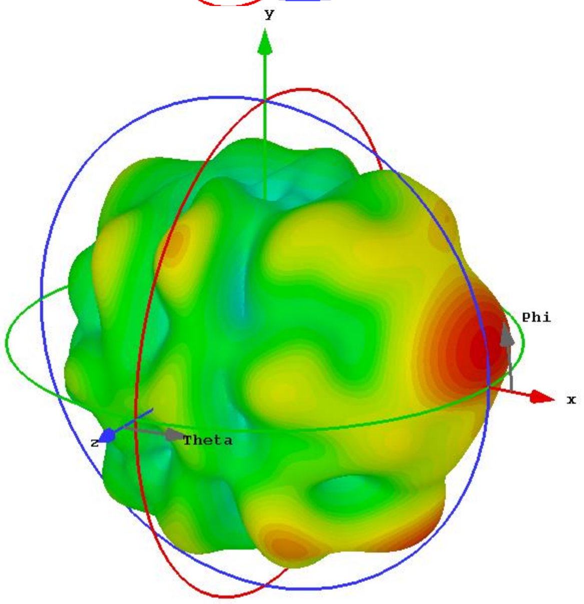


4 GHz

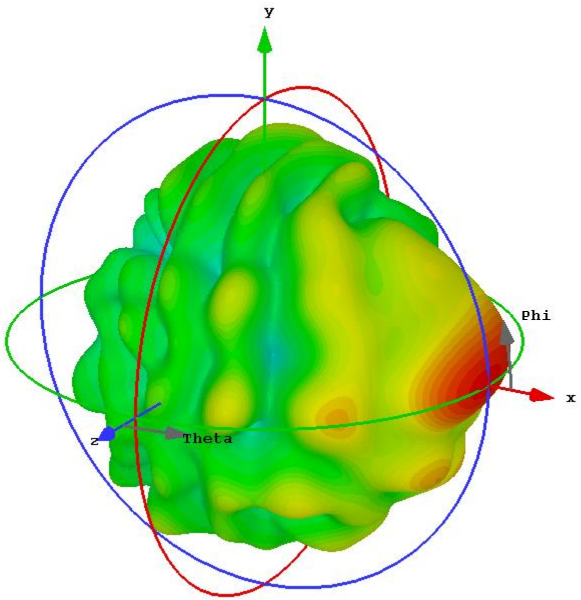


6 GHz

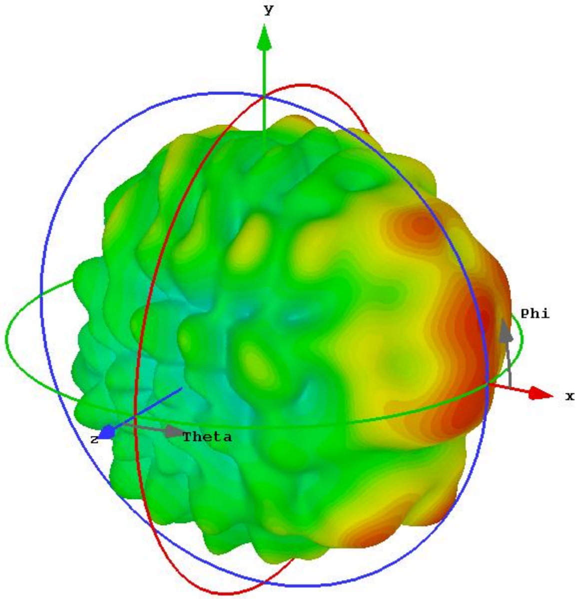




8 GHz

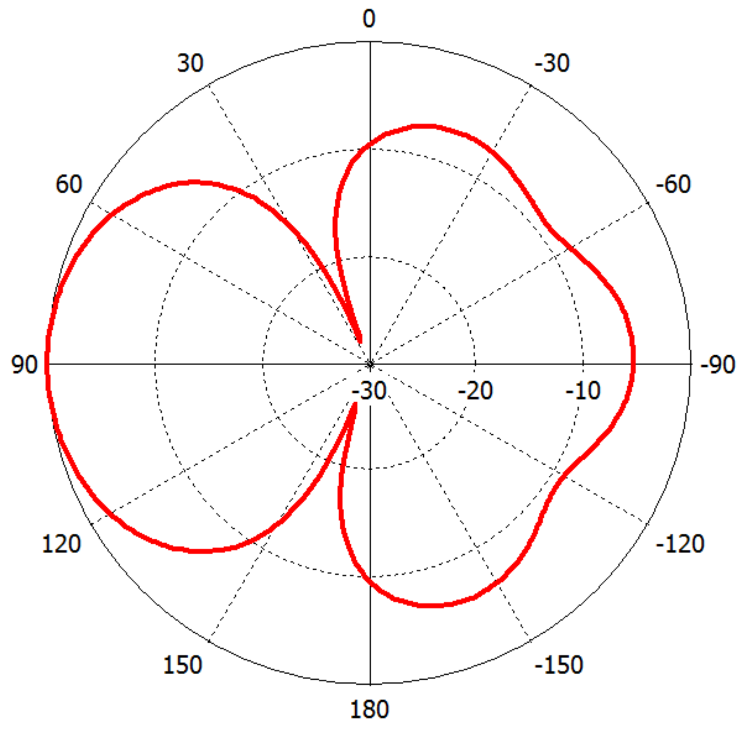


10 GHz

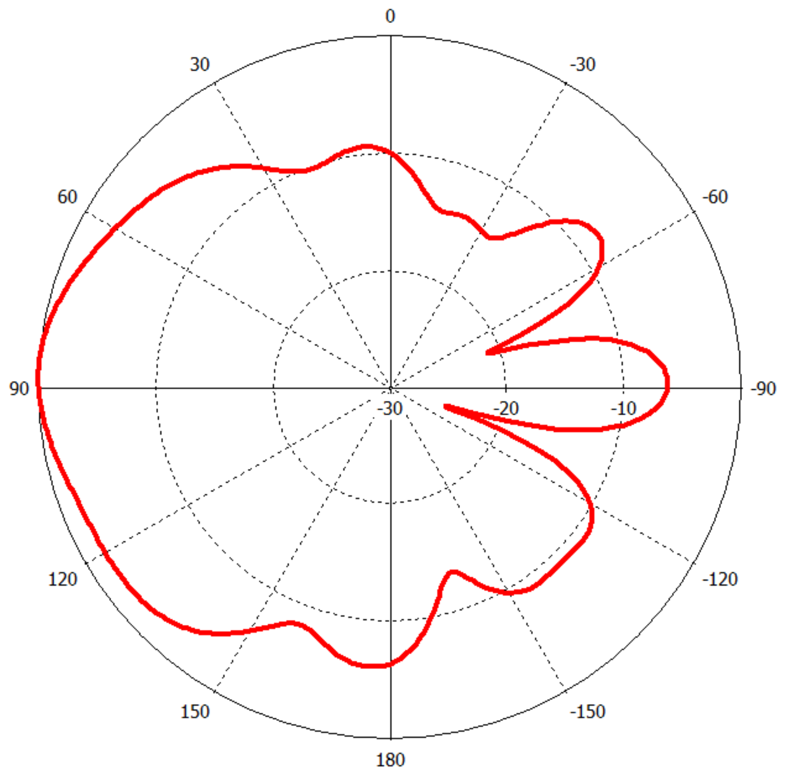


12 GHz

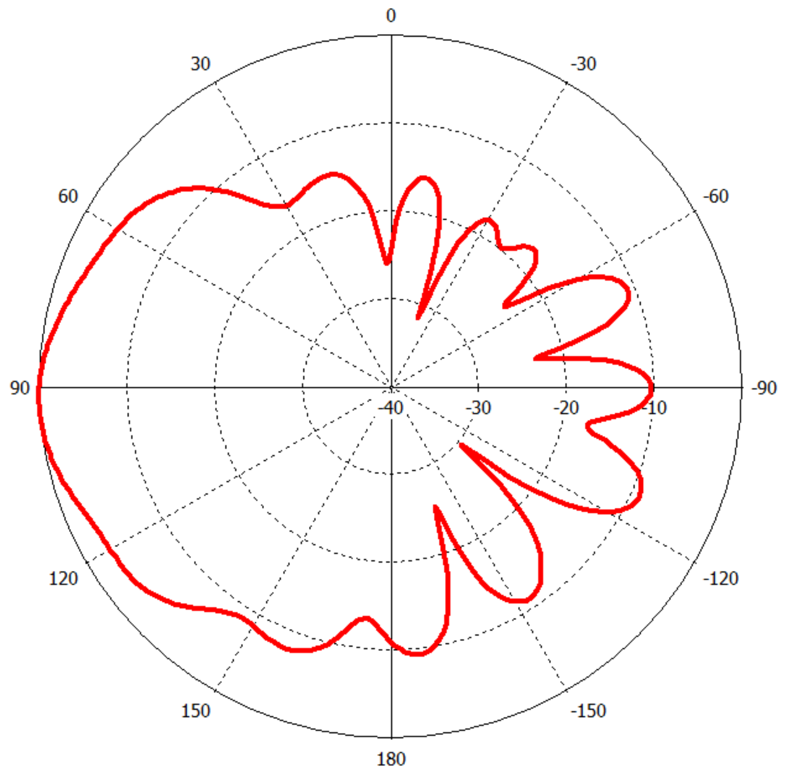
Port 2 (Vertical) antenna patterns



2 GHz

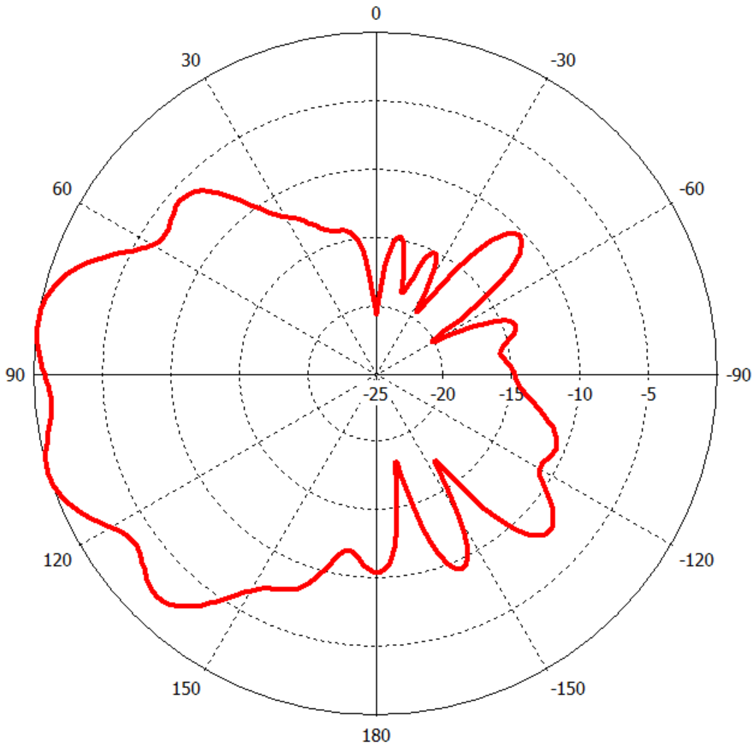


4 GHz

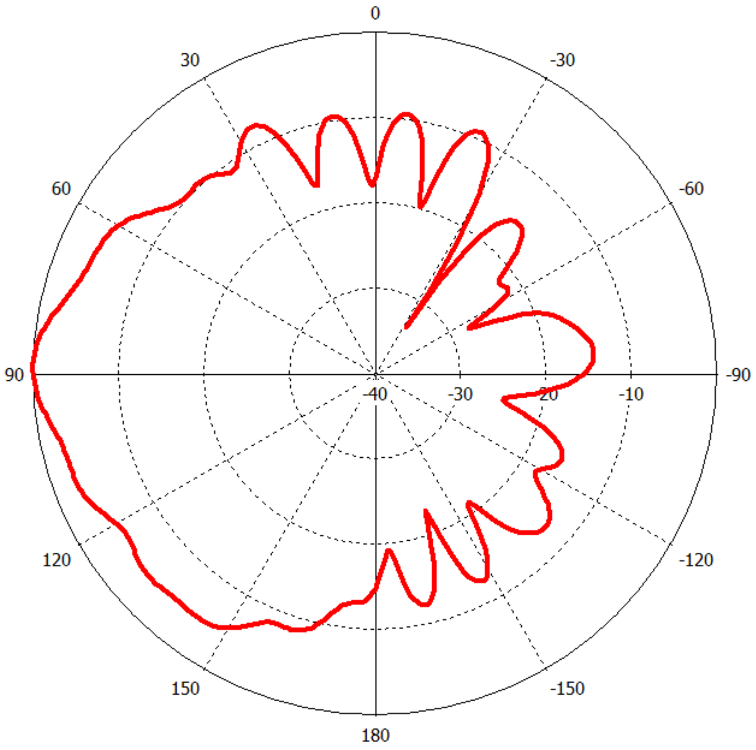


6 GHz

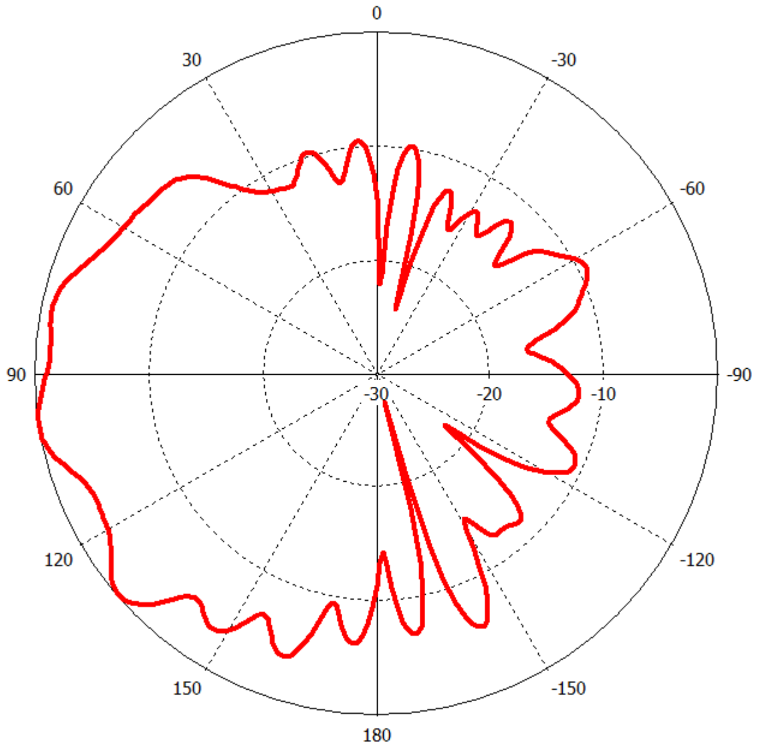
Cont.,



8 GHz

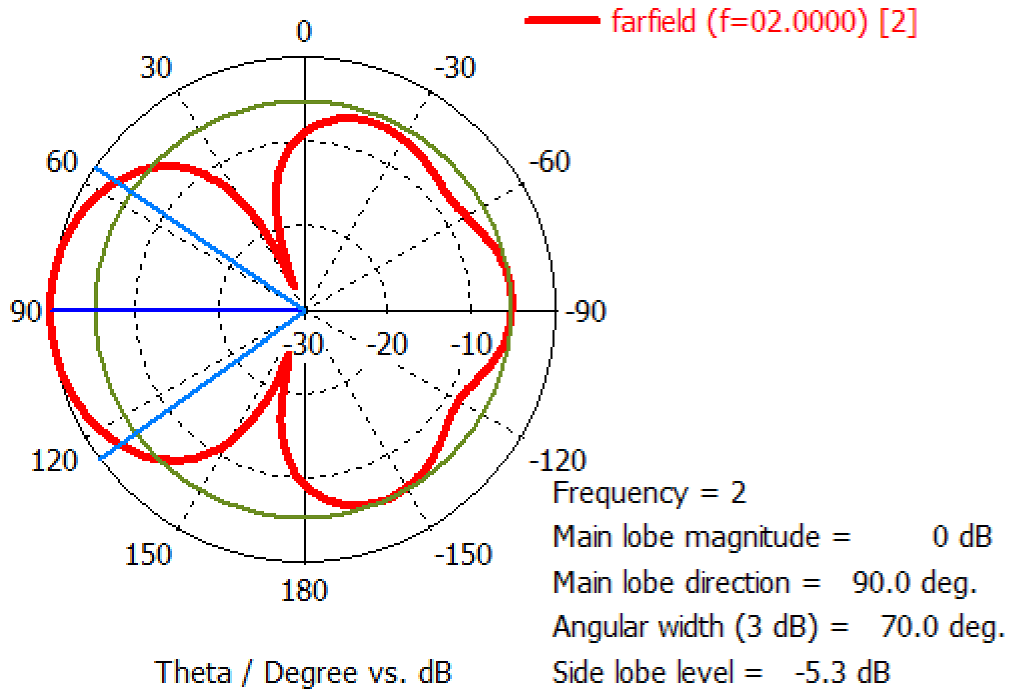


10 GHz



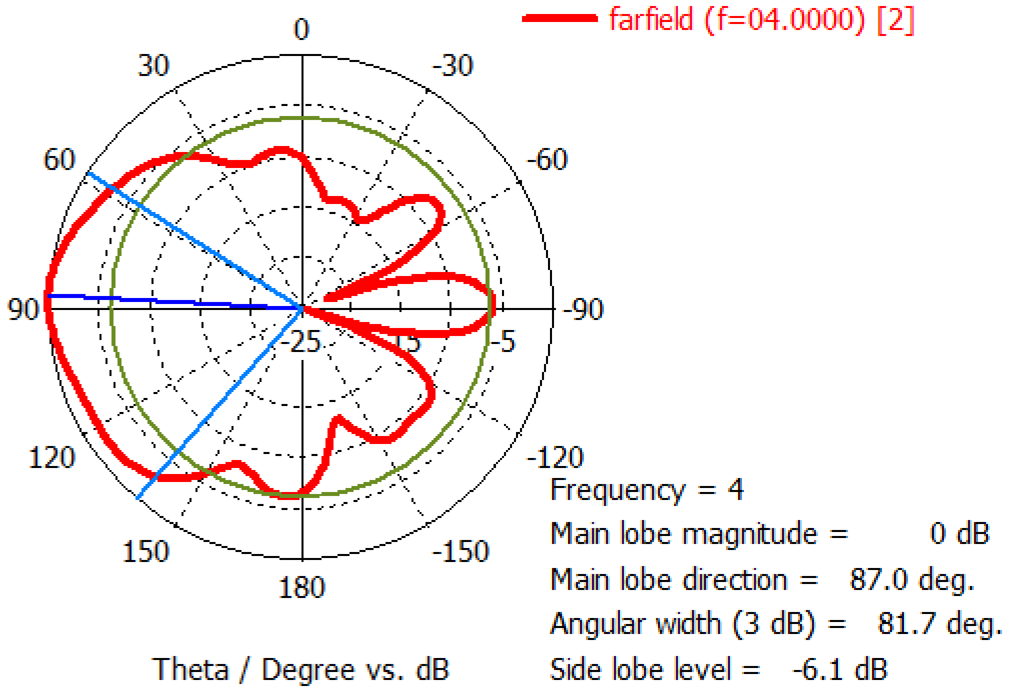
12 GHz

2 GHz



farfield (f=02.0000) [2]
0
30
-30
60
-60
90
-90
120
-120
150
-150
180
-30
-20
-10
Theta / Degree vs. dB
Frequency = 2
Main lobe magnitude = 0 dB
Main lobe direction = 90.0 deg.
Angular width (3 dB) = 70.0 deg.
Side lobe level = -5.3 dB

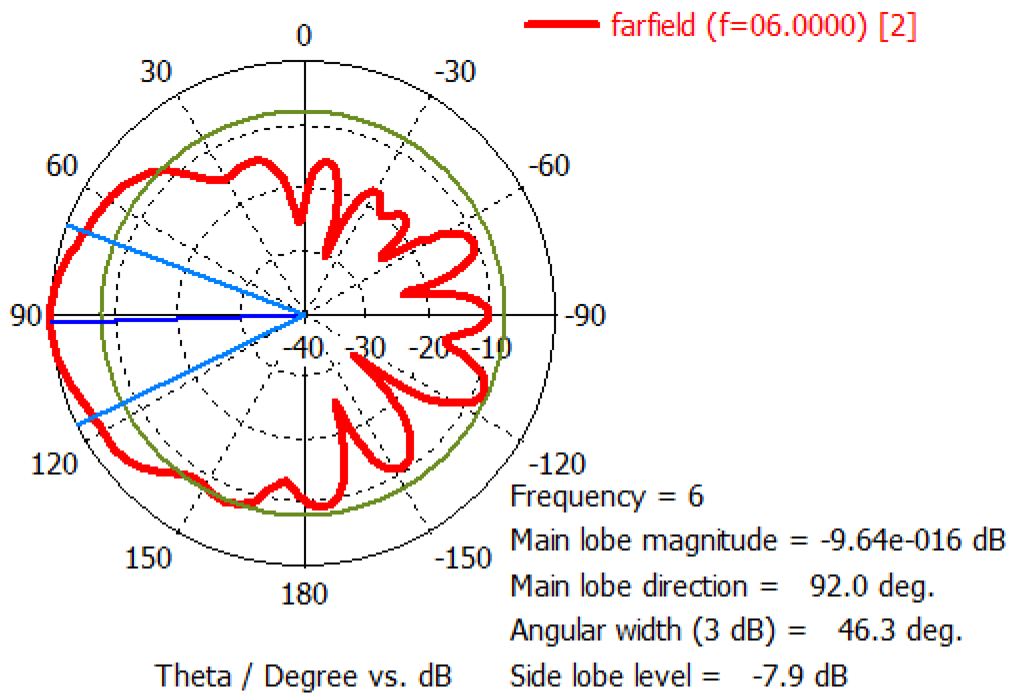
4 GHz

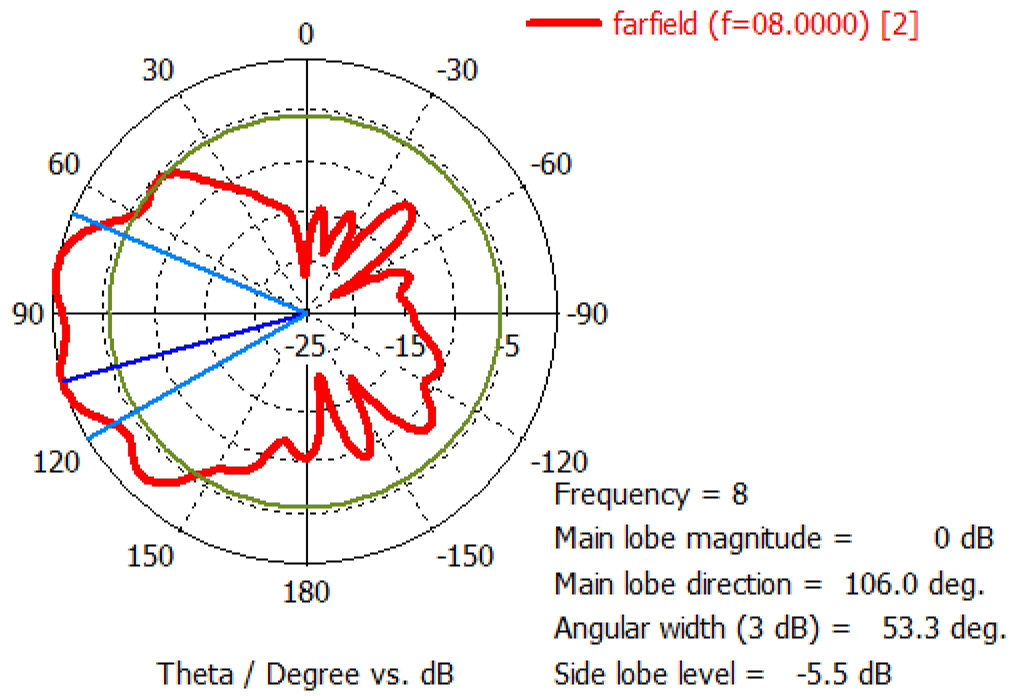


farfield (f=04.0000) [2]
0
30
-30
60
-60
90
-90
120
-120
150
-150
180
-25
-5
Theta / Degree vs. dB
Frequency = 4
Main lobe magnitude = 0 dB
Main lobe direction = 87.0 deg.
Angular width (3 dB) = 81.7 deg.
Side lobe level = -6.1 dB

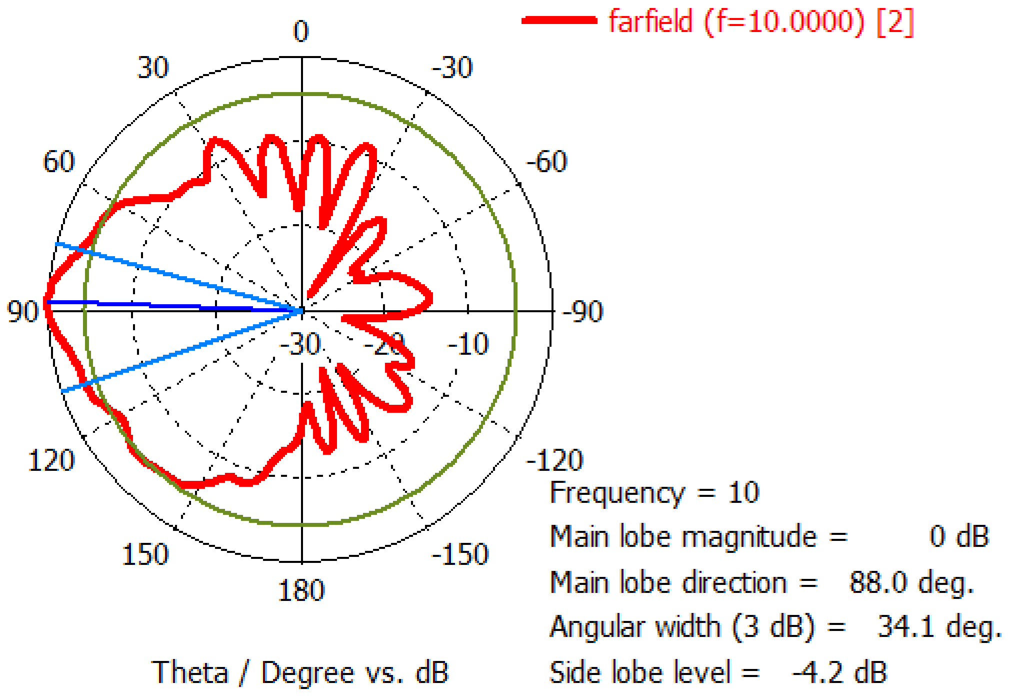
6 GHz

8 GHz

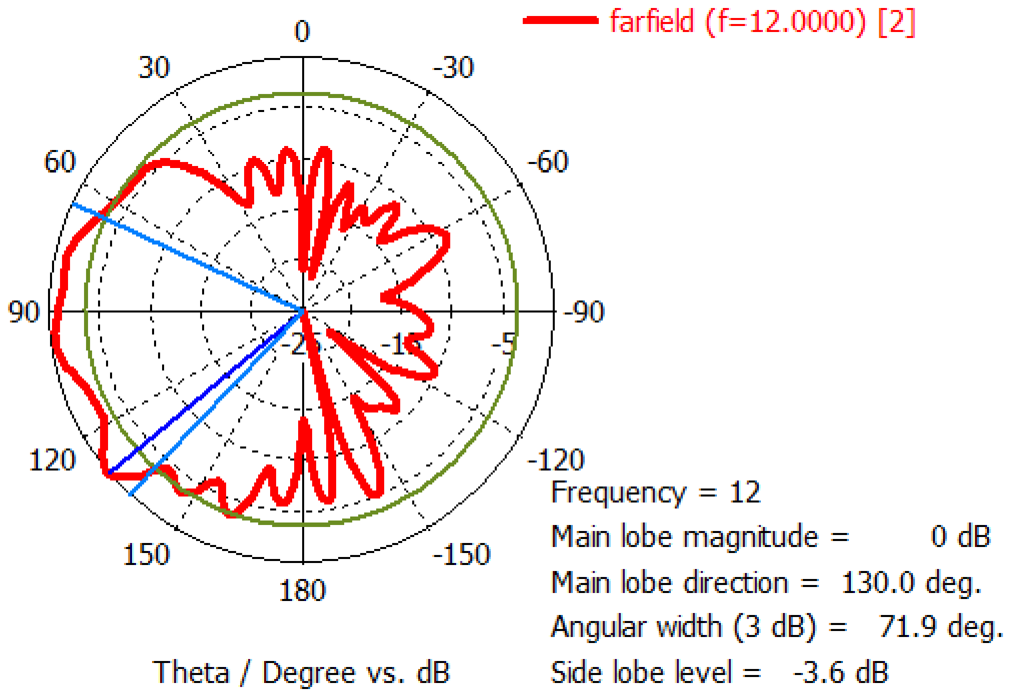

farfield (f=06.0000) [2]
0
30
-30
60
-60
90
-90
-40
-30
-20
-10
120
-120
150
-150
180
Theta / Degree vs. dB
Frequency = 6
Main lobe magnitude = -9.64e-016 dB
Main lobe direction = 92.0 deg.
Angular width (3 dB) = 46.3 deg.
Side lobe level = -7.9 dB


farfield (f=08.0000) [2]
0
30
-30
60
-60
90
-90
-25
-15
-5
120
-120
150
-150
180
Theta / Degree vs. dB
Frequency = 8
Main lobe magnitude = 0 dB
Main lobe direction = 106.0 deg.
Angular width (3 dB) = 53.3 deg.
Side lobe level = -5.5 dB

10 GHz

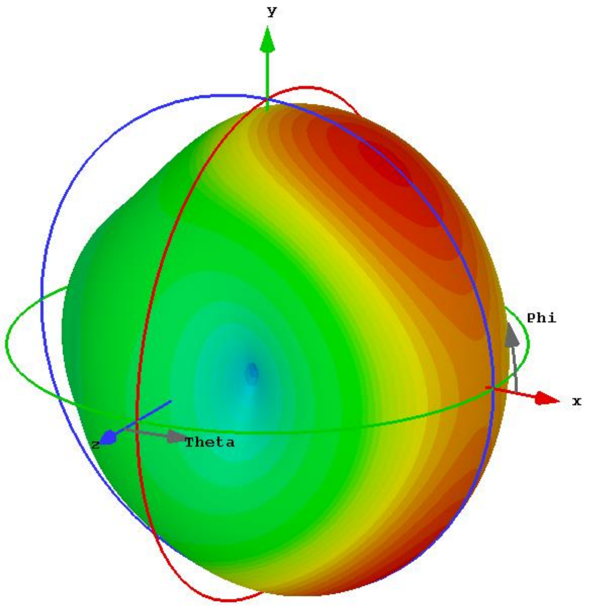

farfield (f=10.0000) [2]
0
30
-30
60
-60
90
-90
120
-120
150
-150
180
-30
-20
-10
Frequency = 10
Main lobe magnitude = 0 dB
Main lobe direction = 88.0 deg.
Angular width (3 dB) = 34.1 deg.
Side lobe level = -4.2 dB
Theta / Degree vs. dB

12 GHz

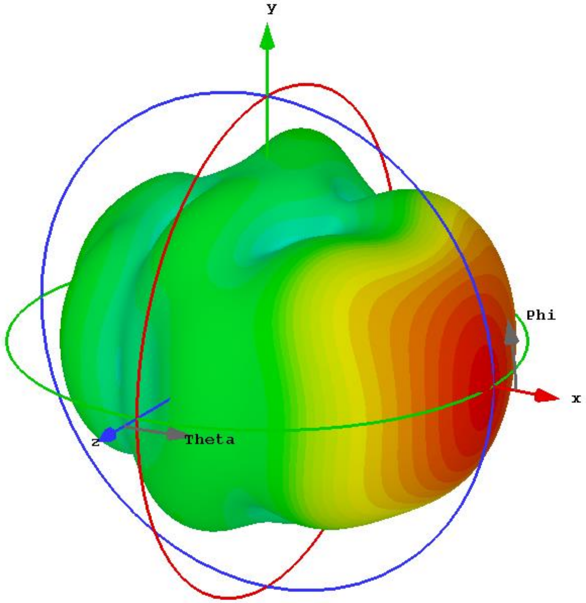

farfield (f=12.0000) [2]
0
30
-30
60
-60
90
-90
120
-120
150
-150
180
-5
Frequency = 12
Main lobe magnitude = 0 dB
Main lobe direction = 130.0 deg.
Angular width (3 dB) = 71.9 deg.
Side lobe level = -3.6 dB
Theta / Degree vs. dB

3D patterns for horizontal polarization

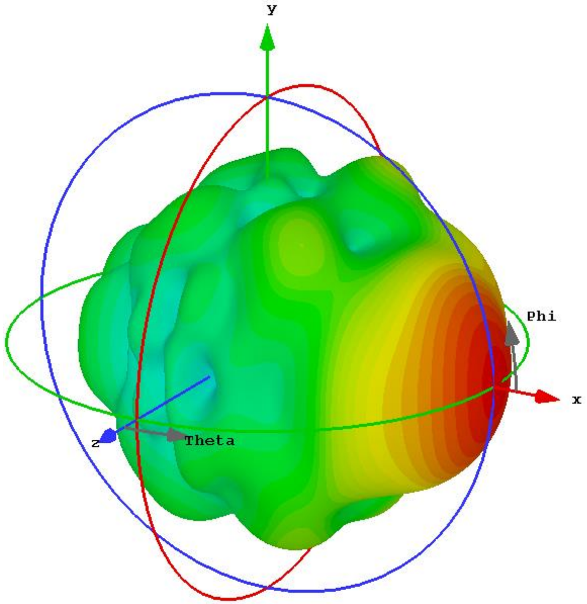
2 GHz

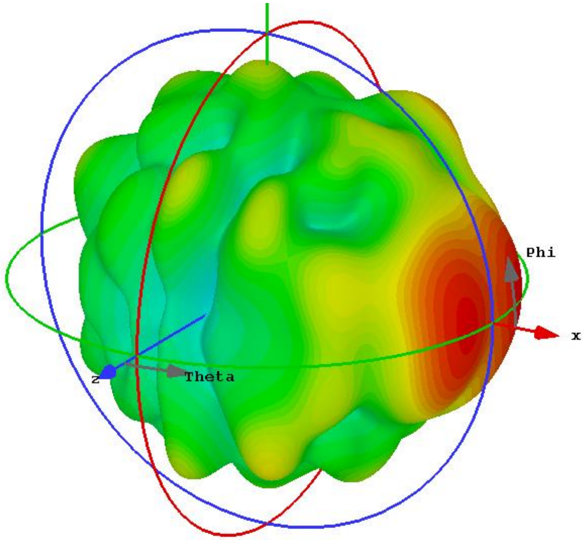


4 GHz

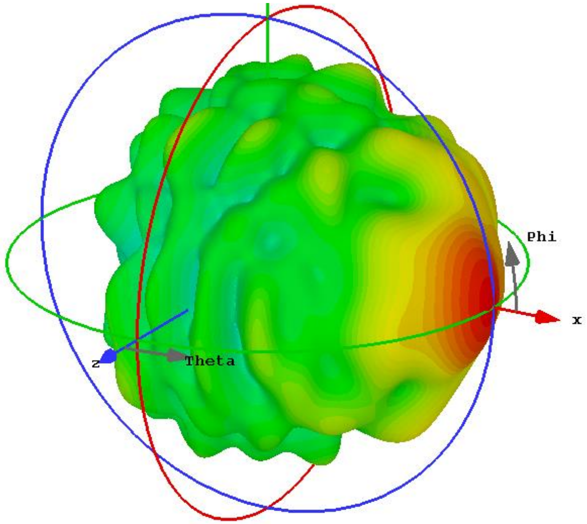


6 GHz

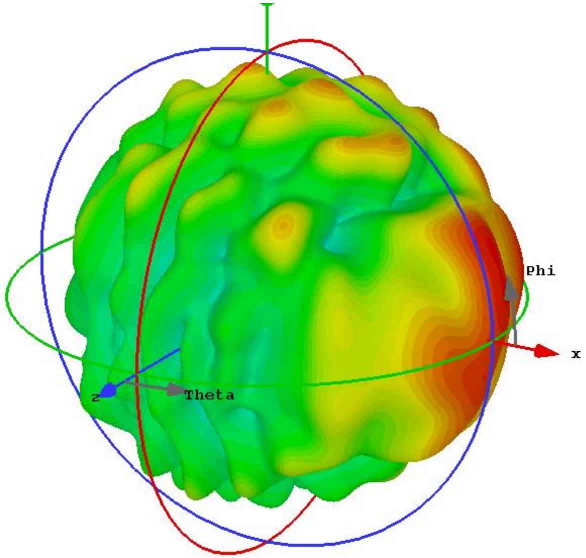




8 GHz

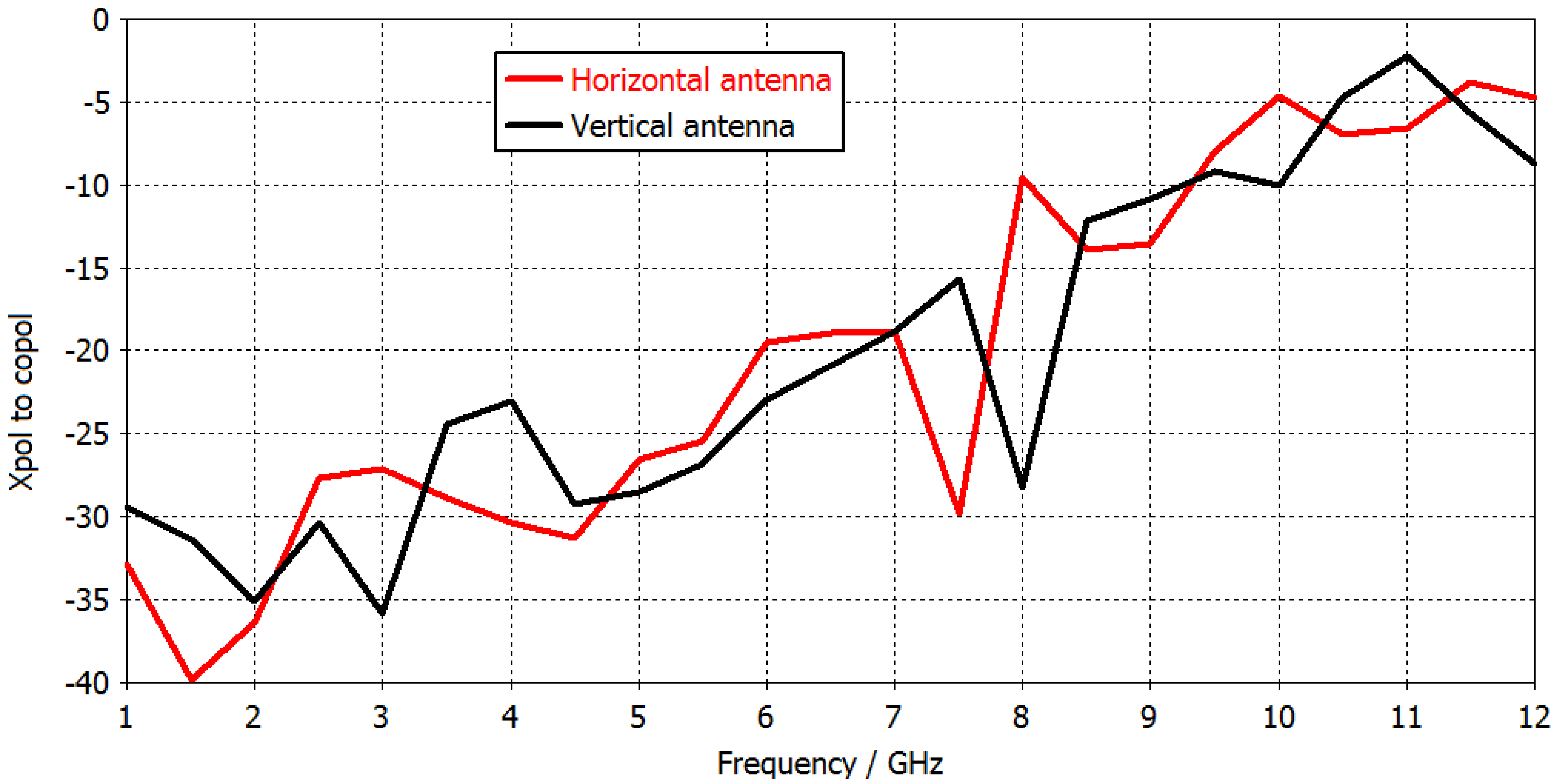


10 GHz

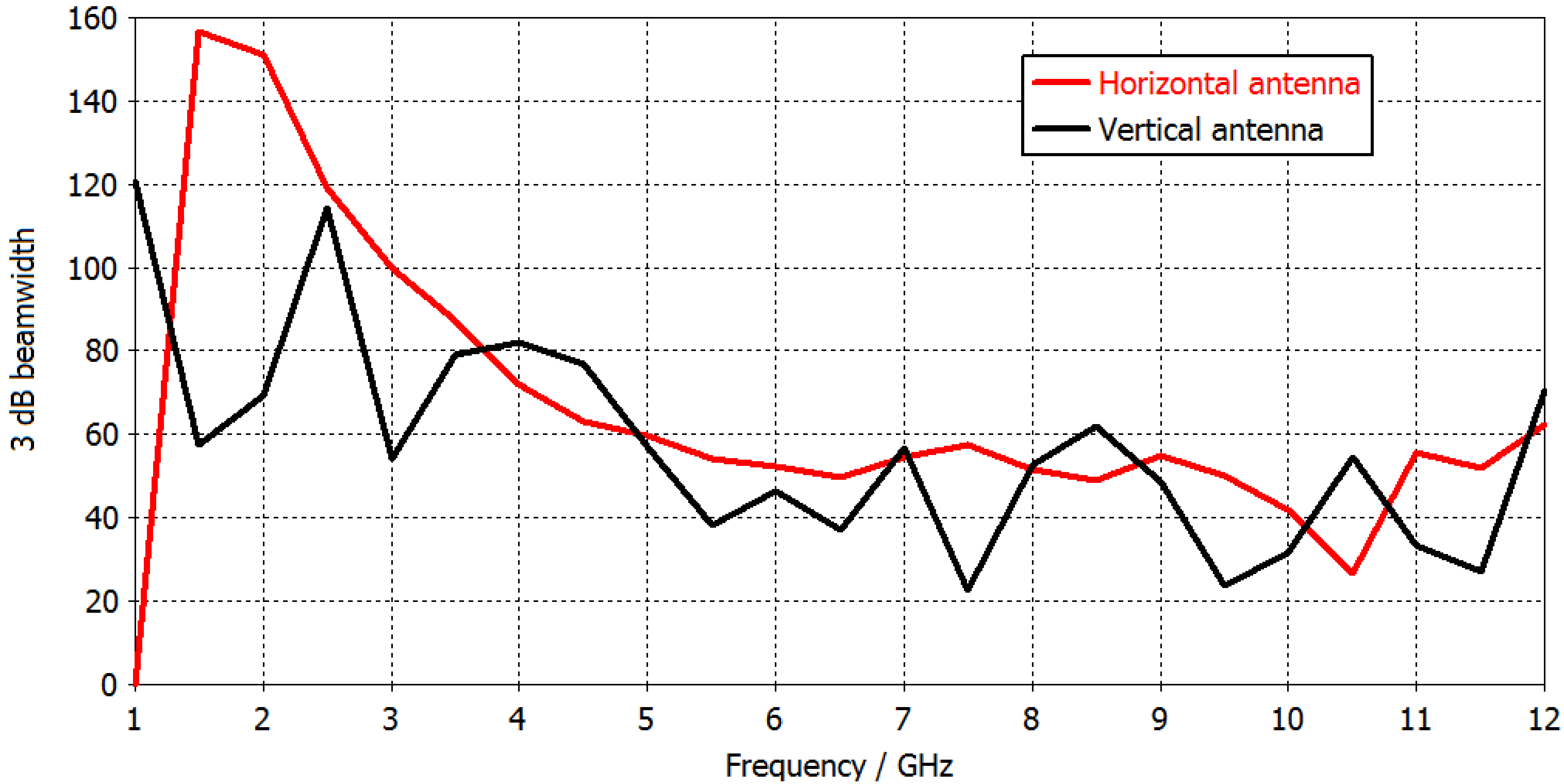


12 GHz

X-pol to Co-pol ratio (dB)

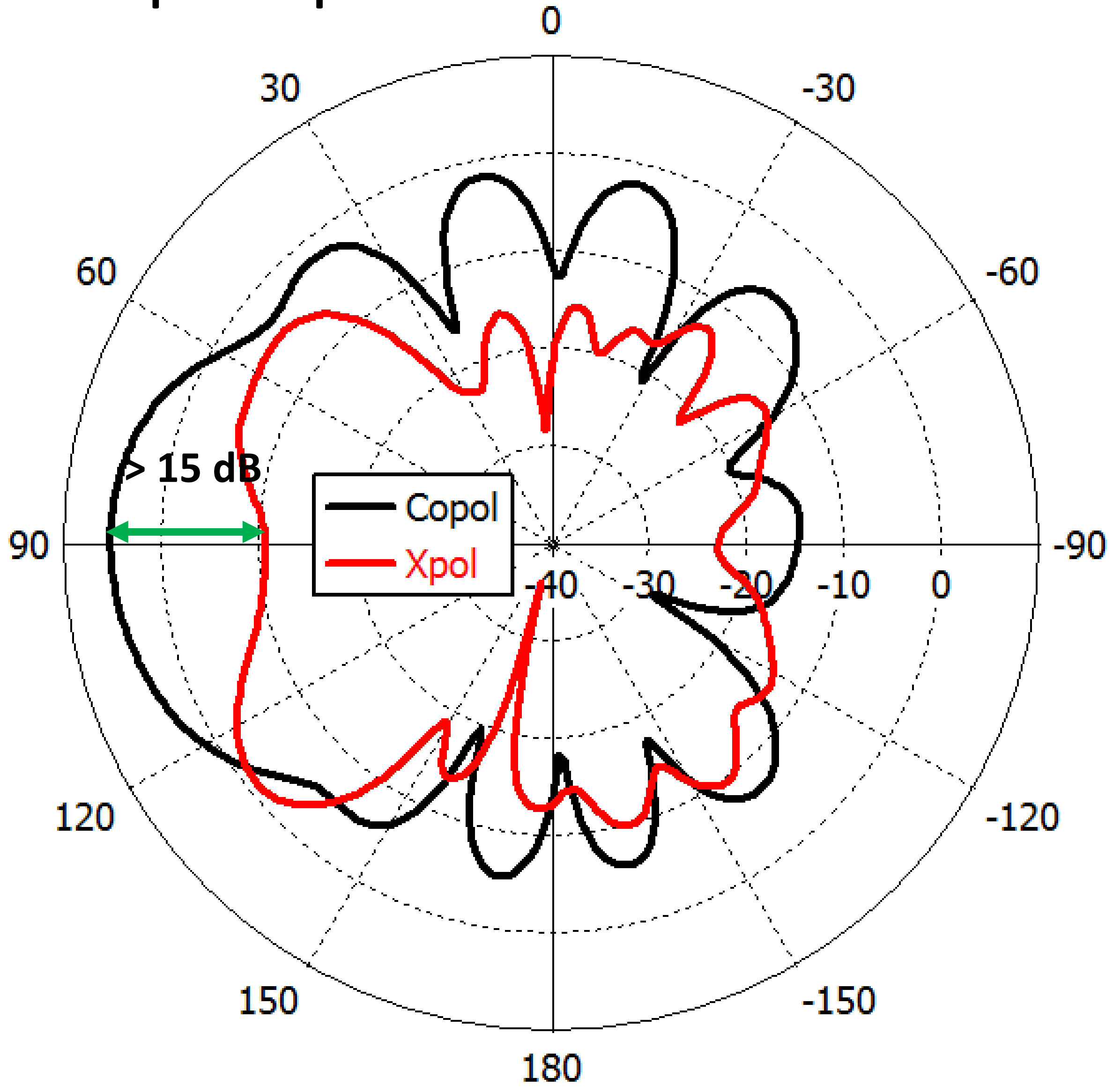


3 dB BW



Horizontal antenna
Vertical antenna
3 dB beamwidth
Frequency / GHz
0
20
40
60
80
100
120
140
160
1
2
3
4
5
6
7
8
9
10
11
12

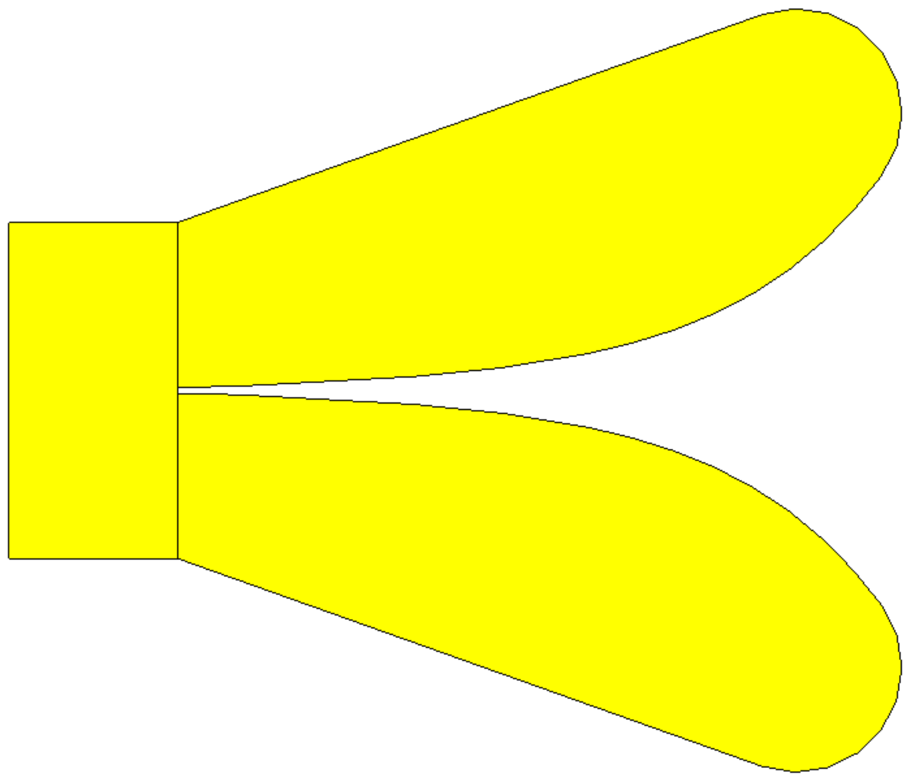
9 GHz co- and x-pol patterns

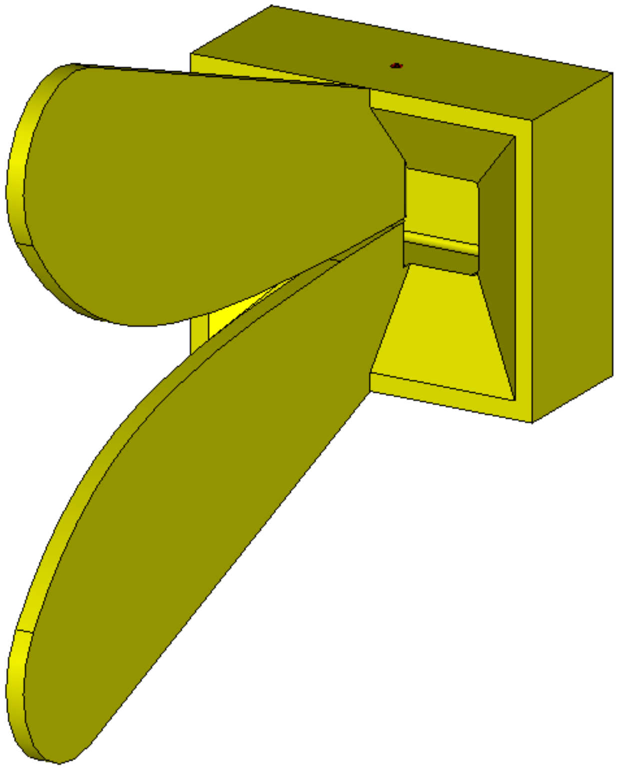


Innovated Ridged-Gap Horn

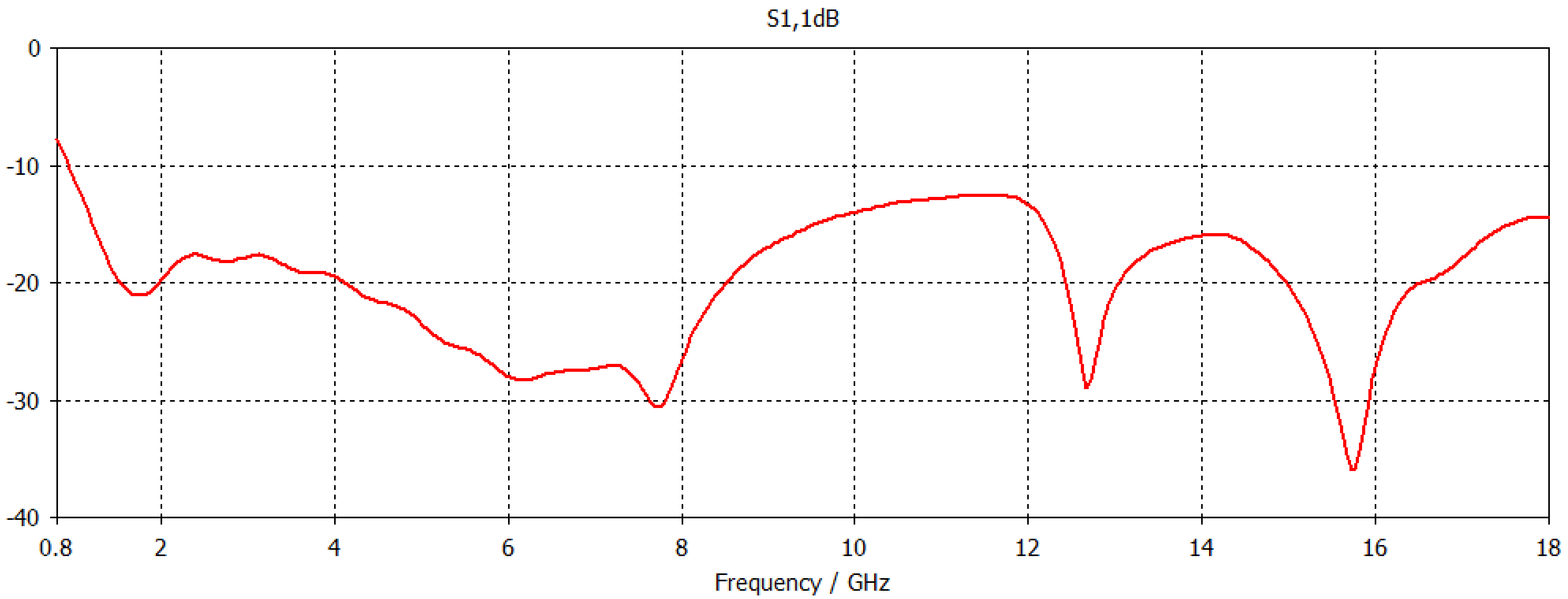
Dr. Abdelhady Mahmoud

Structure

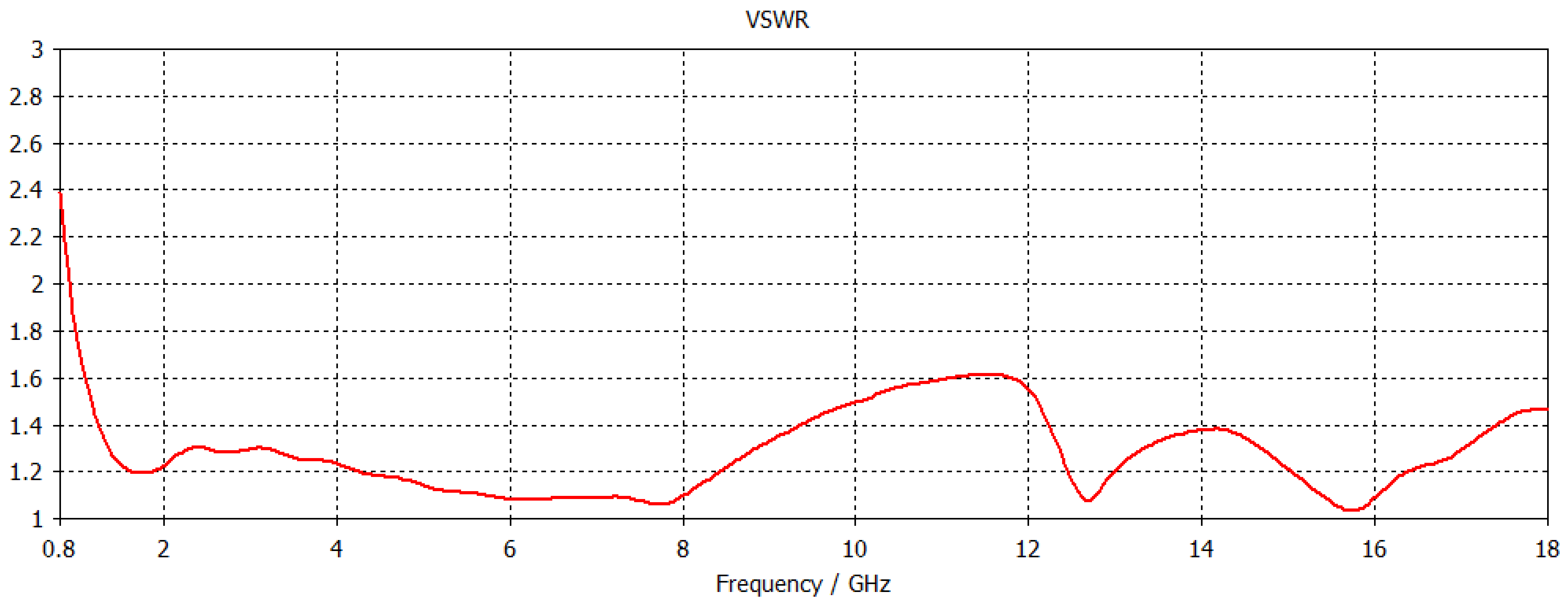




S11

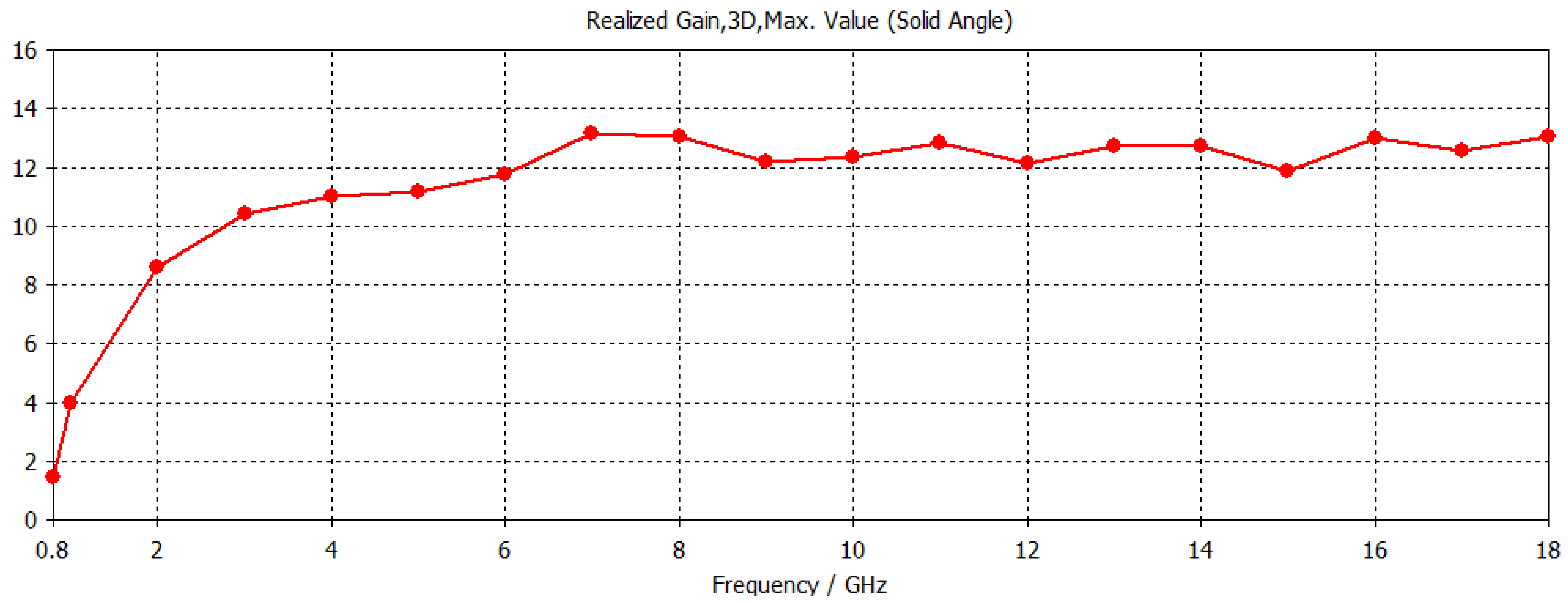


VSWR

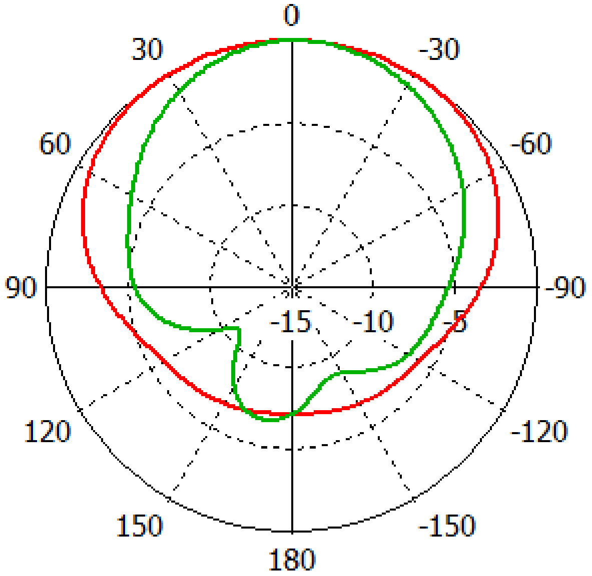


VSWR
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
2
4
6
8
10
12
14
16
18
Frequency / GHz

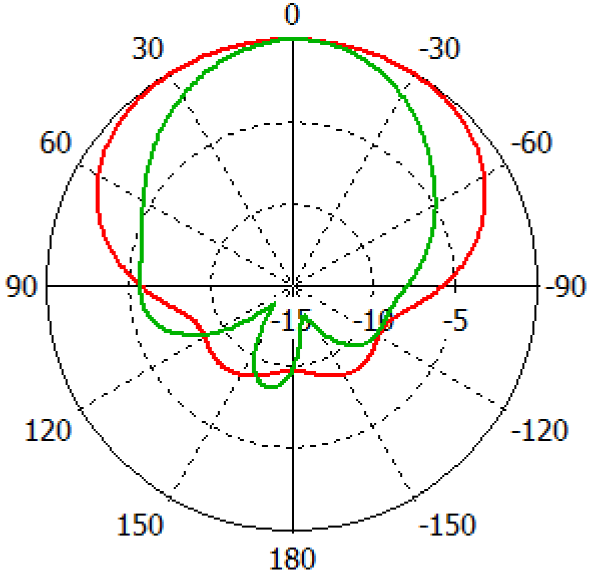
Realized Gain



Patterns

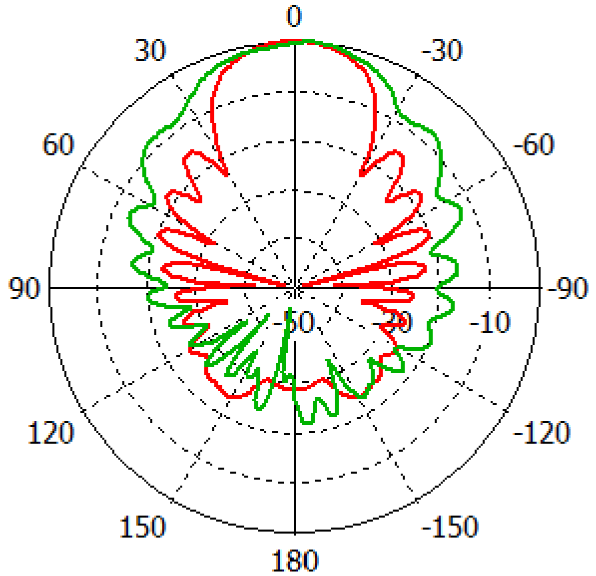


0.8 GHz

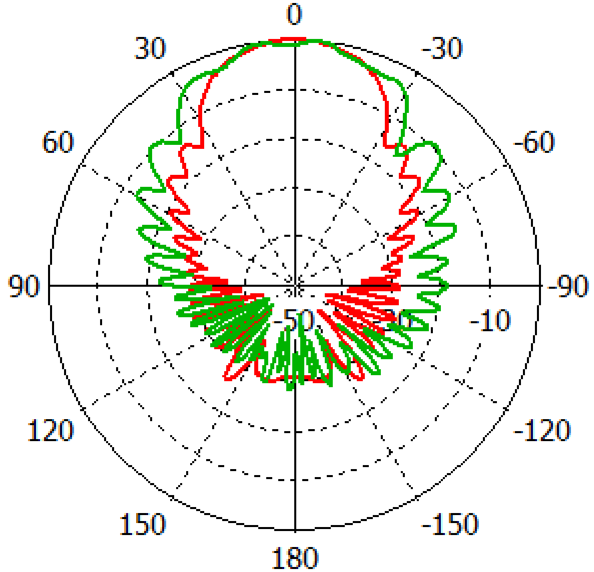


Theta / Degree vs. dB

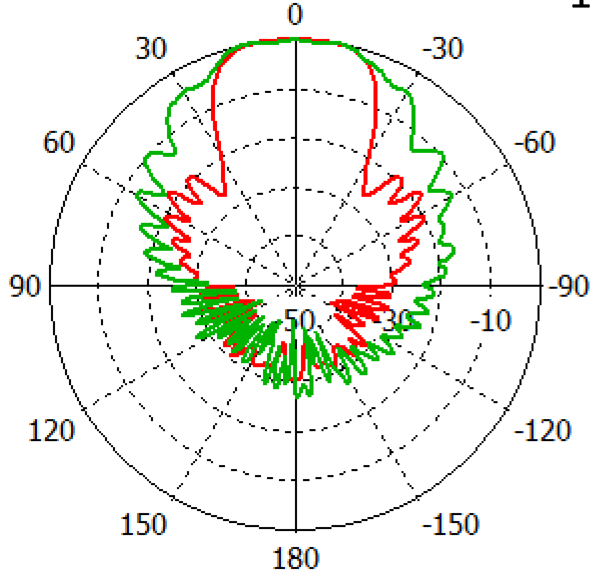
1 GHz



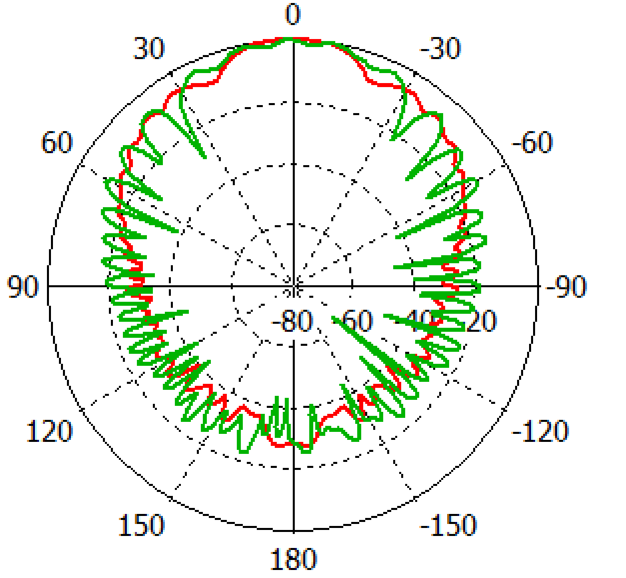
7 GHz



11 GHz

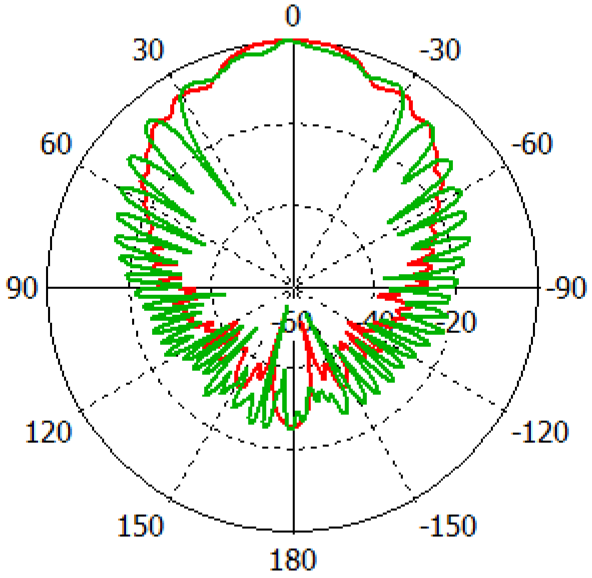


13 GHz

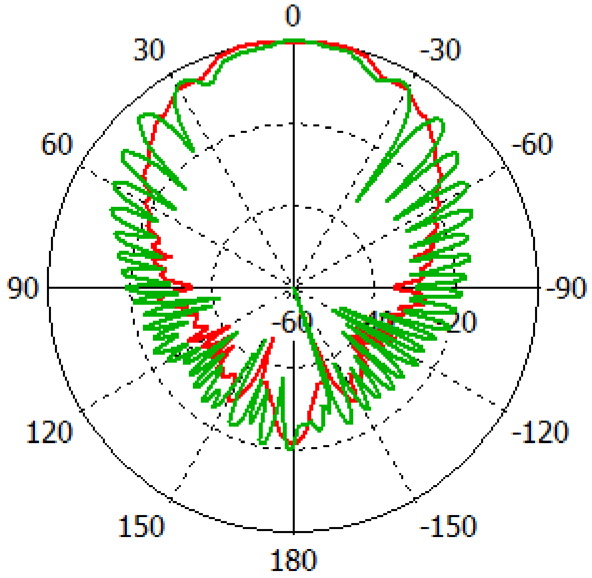


15 GHz

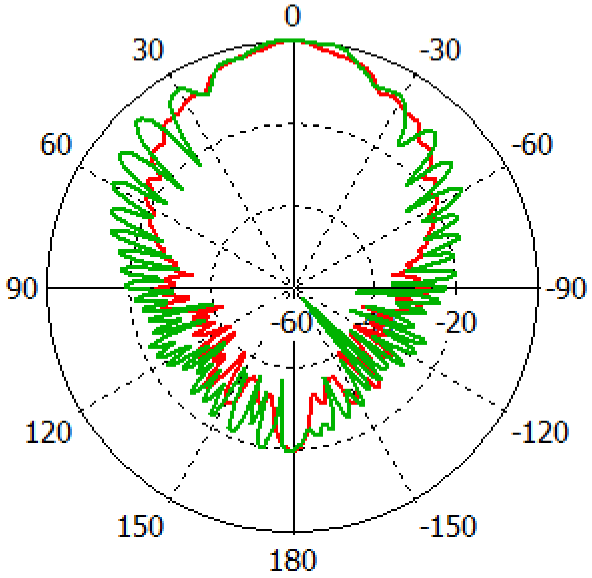
Patterns



16 GHz



17 GHz

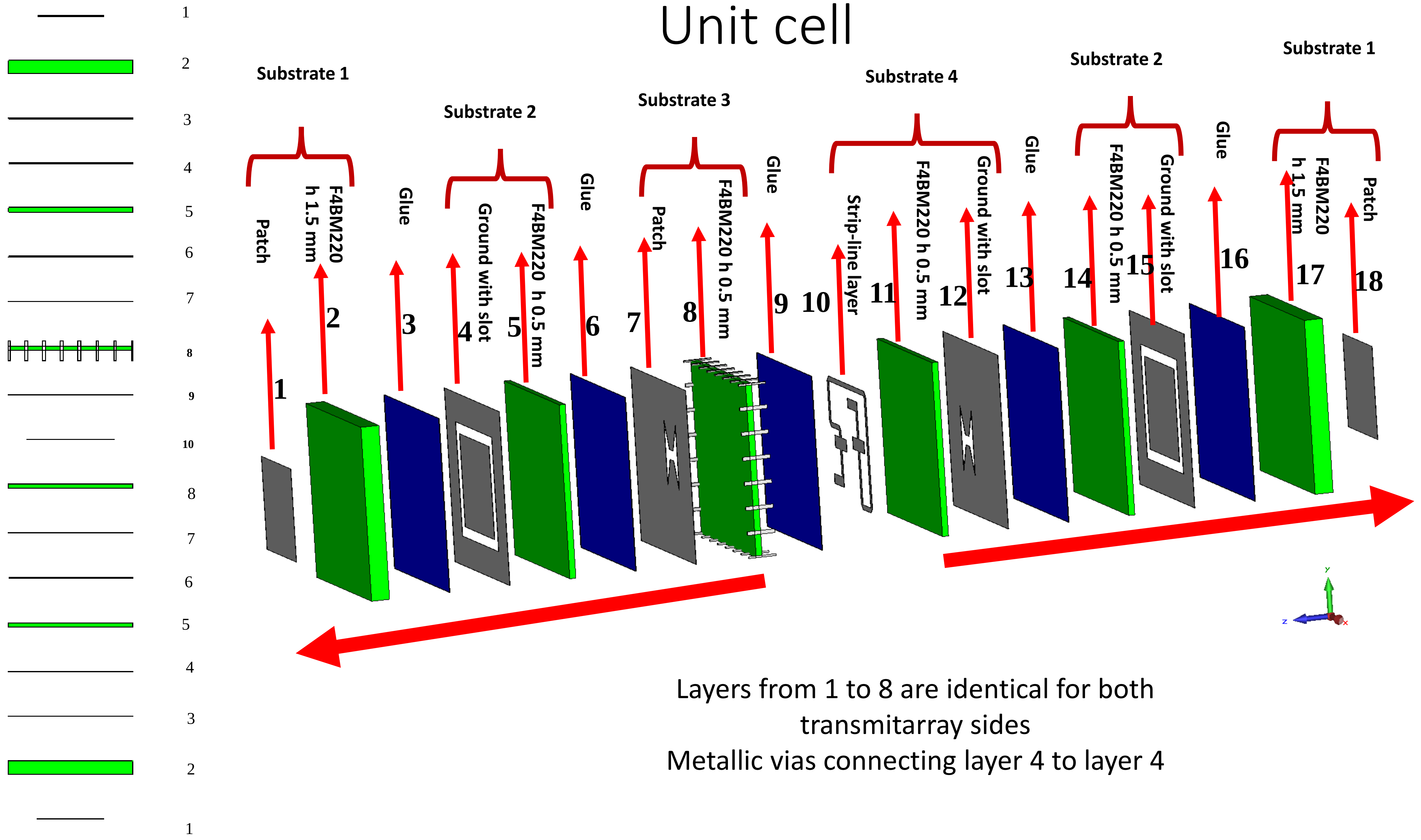


18 GHz

X-band High performance multi-layers trasnmitrray

Dr. Abdelhady Mohamed

Unit cell



Layers from 1 to 8 are identical for both transmitarray sides

Metallic vias connecting layer 4 to layer 4

Feeder with Screw Pin Vs without Screw Pin Adjustment