Antenna review

2.4GHz inverted F antenna on a 1.6mm FR4 PCB

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General

Orginal source of the antenna:

https://github.com/sad-electronics/wch-kicad-lbr/blob/main/footprints/wch-antenna.pretty/ANT-F-1-2.4G-1.6MM-FR4-WCH.kicad_mod

Modified by Xdevelop: No

Simulation software: Dassault Systems CST Studio Suite® 2023

Number of tetrahedrons: 37,419

Matched: No

If you have any questions, contact

Bernhard Wörndl-Aichriedler

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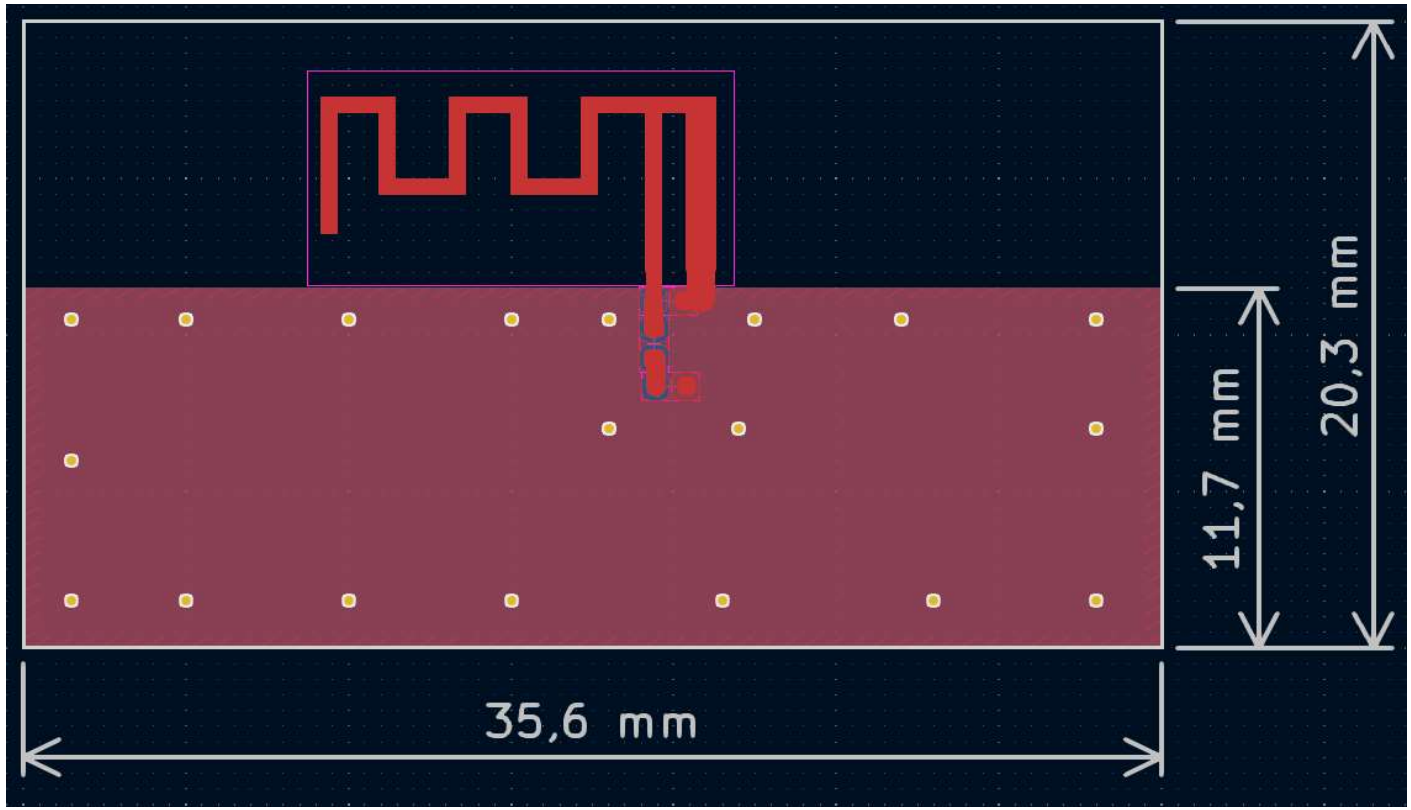
PCB data

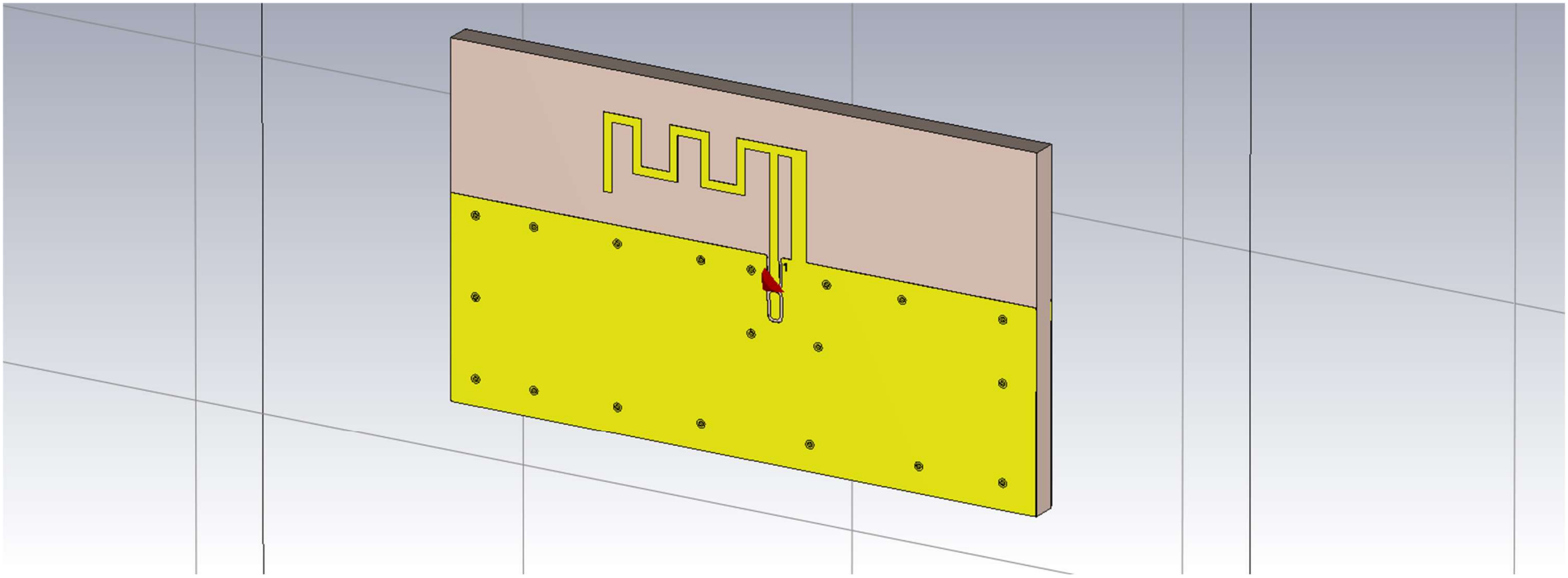
Stackup:

Layer	Thickness	Material	Dielectric constant ε_r
Top	35µm	Copper	Not relevant
Core	1.53mm	FR4 (epoxy resin + fiberglass)	4.3
Bottom	35µm	Copper	Not relevant

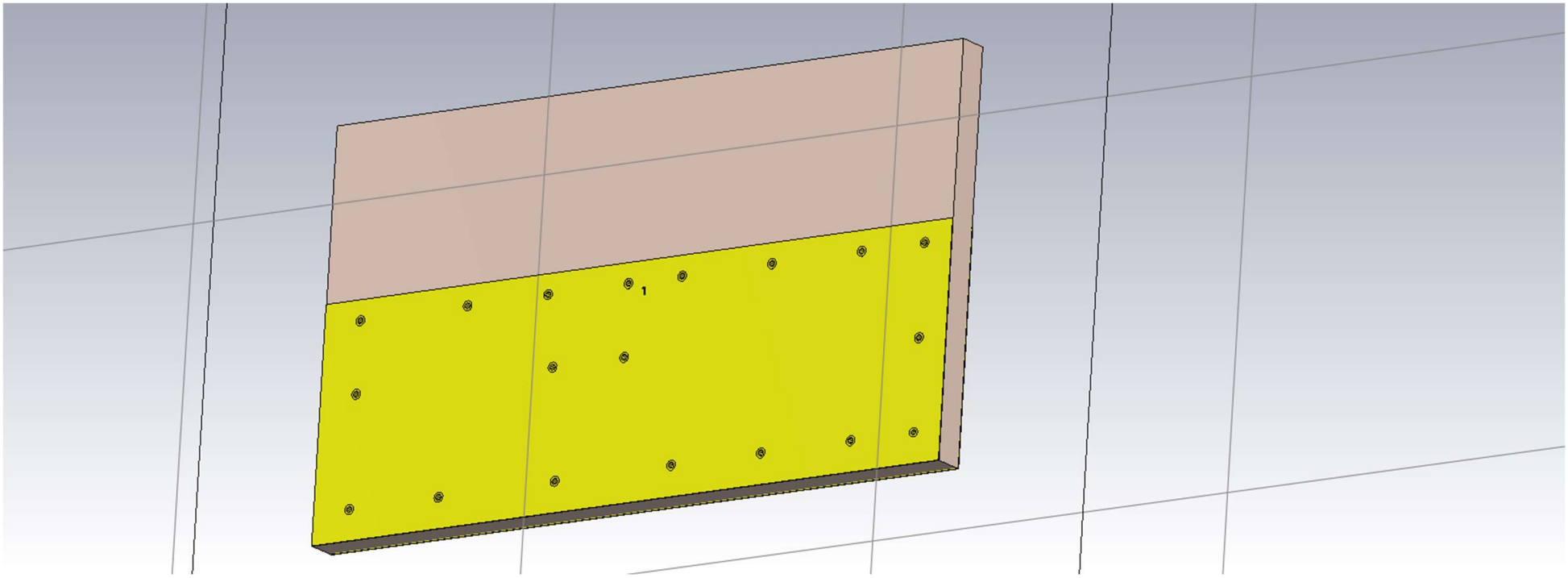
PCB dimensions & layout



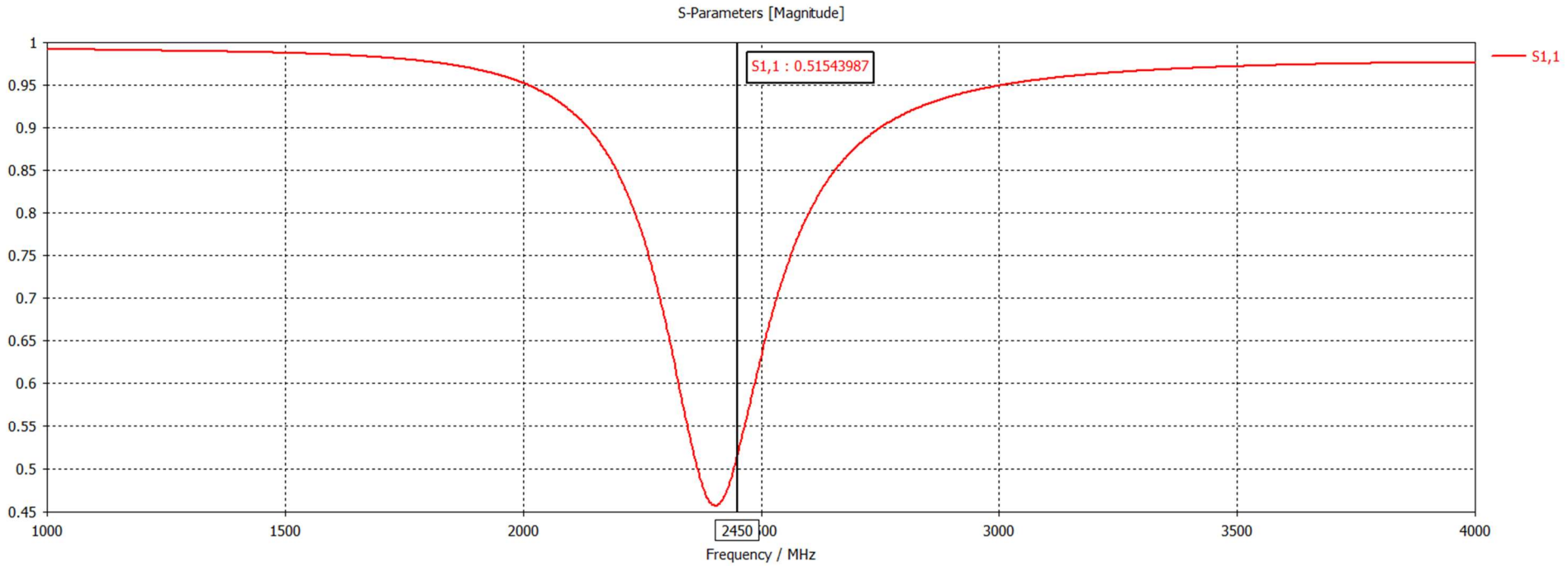
3D model of the PCB from the front



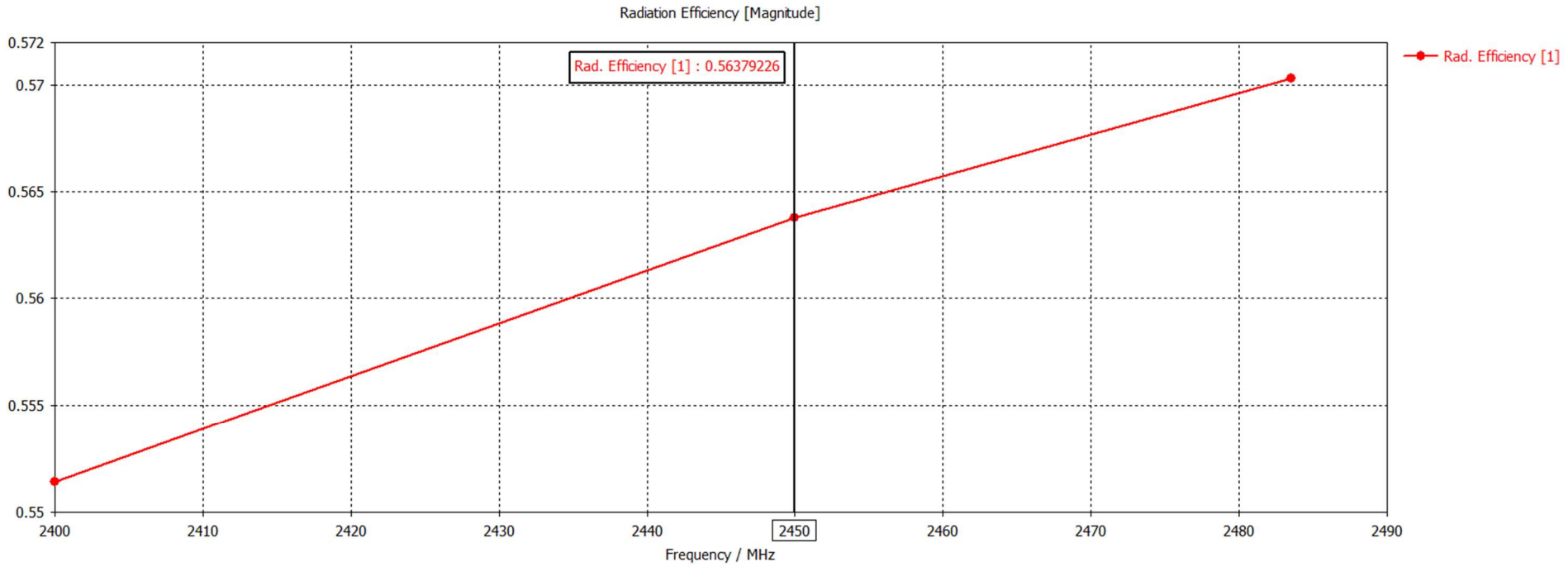
3D model of the PCB from the back



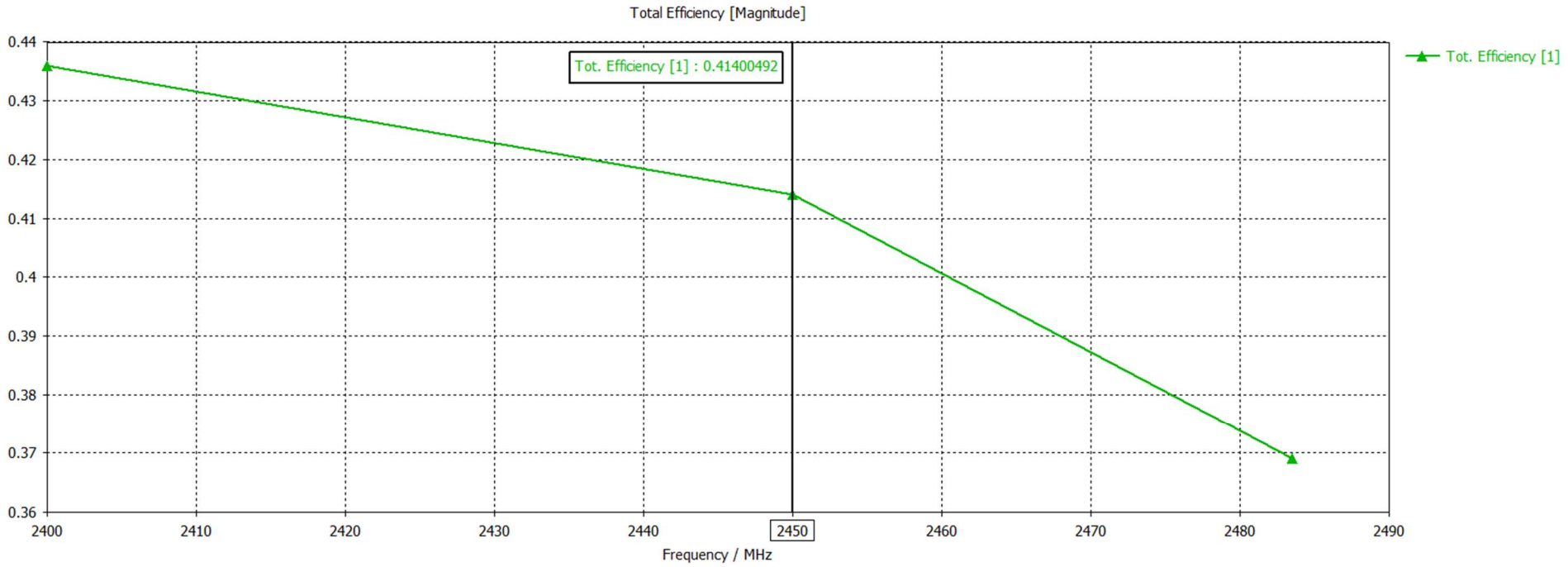
S-parameter


S-Parameters [Magnitude]
S1,1 : 0.51543987
S1,1
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0.55
0.5
0.45
1000
1500
2000
2450
3000
3500
4000
Frequency / MHz

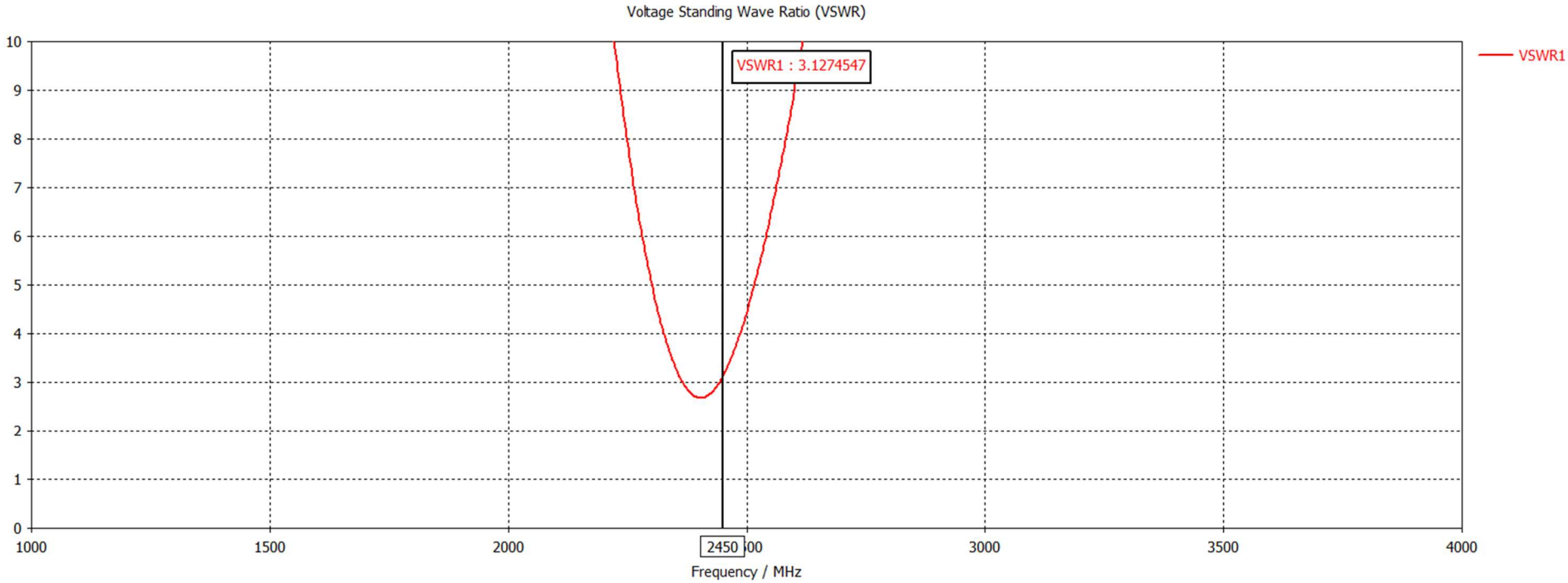
Radiation efficiency



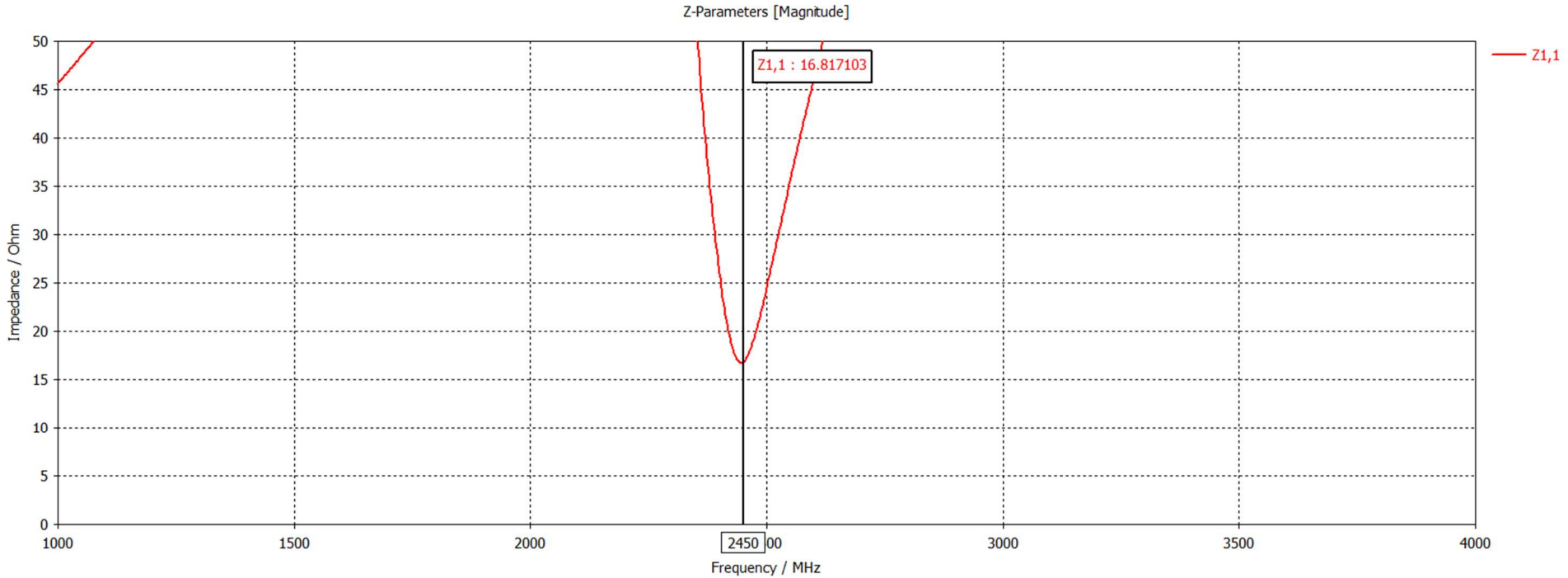
Total efficiency



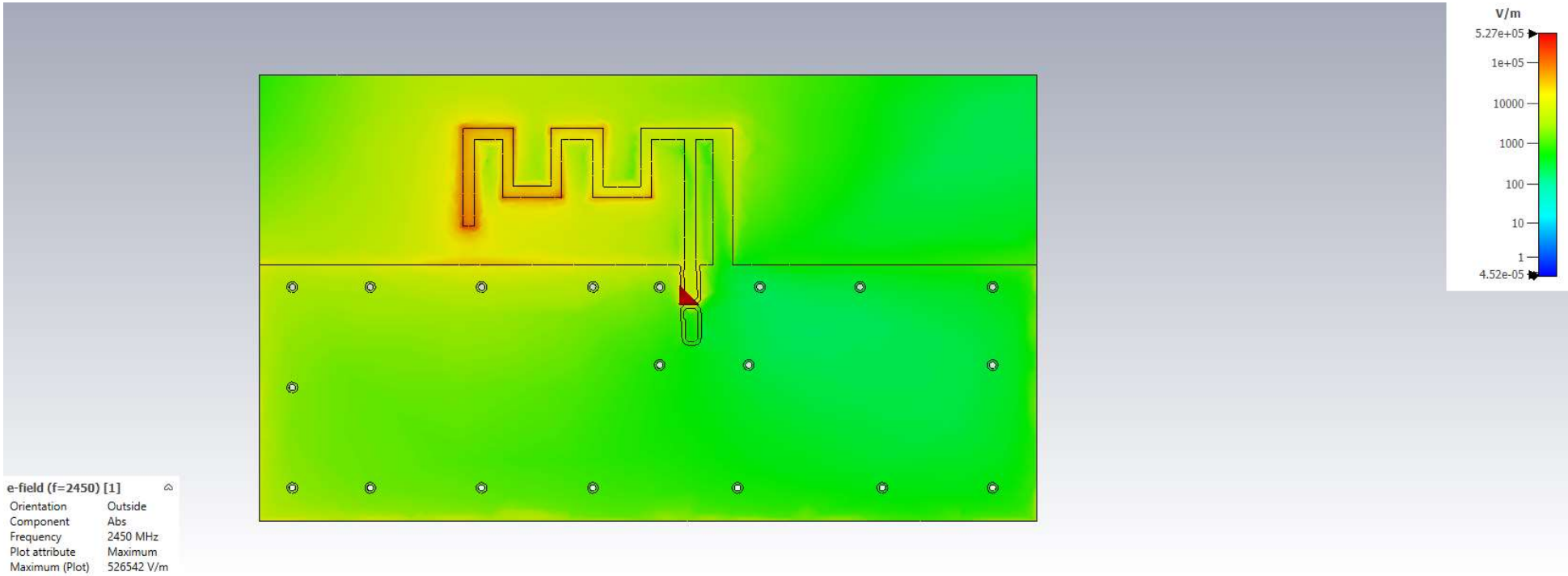
VSWR


Voltage Standing Wave Ratio (VSWR)
VSWR1 : 3.1274547
VSWR1
10
9
8
7
6
5
4
3
2
1
0
1000
1500
2000
2450
3000
3500
4000
Frequency / MHz

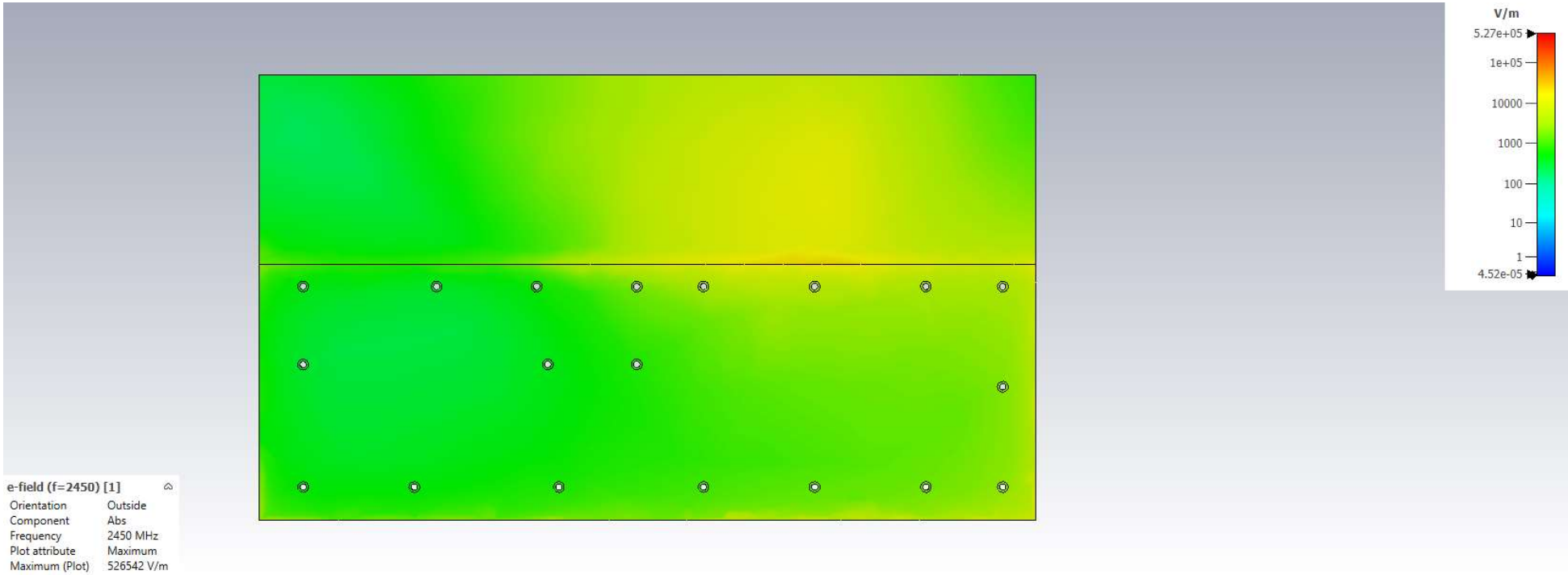
Impedance Z


Z-Parameters [Magnitude]
Z1,1 : 16.817103
Z1,1
Impedance / Ohm
50
45
40
35
30
25
20
15
10
5
0
1000
1500
2000
2450 00
3000
3500
4000
Frequency / MHz

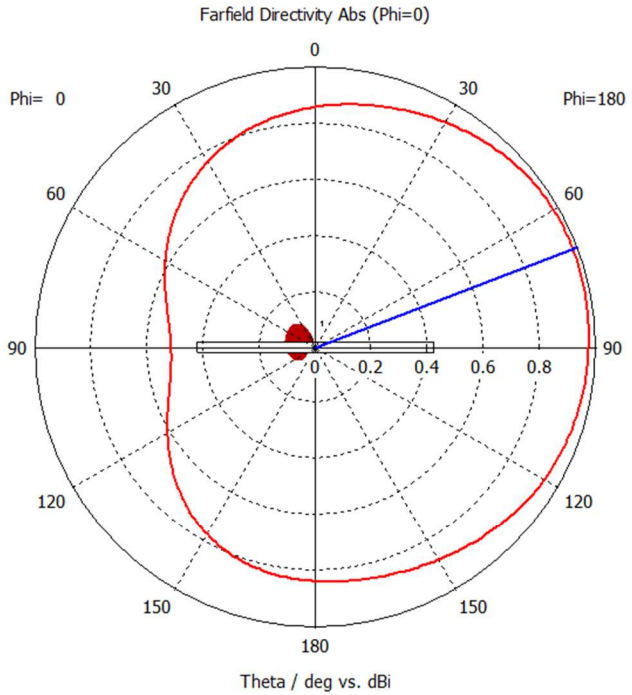
Maximum E-field (front)



Maximum E-field (back)

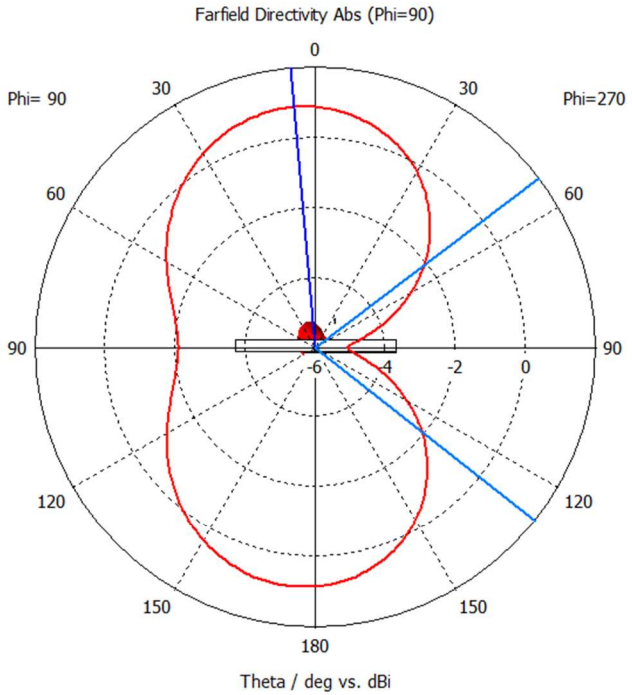


Farfield viewed from the upper edge (-y) of the PCB



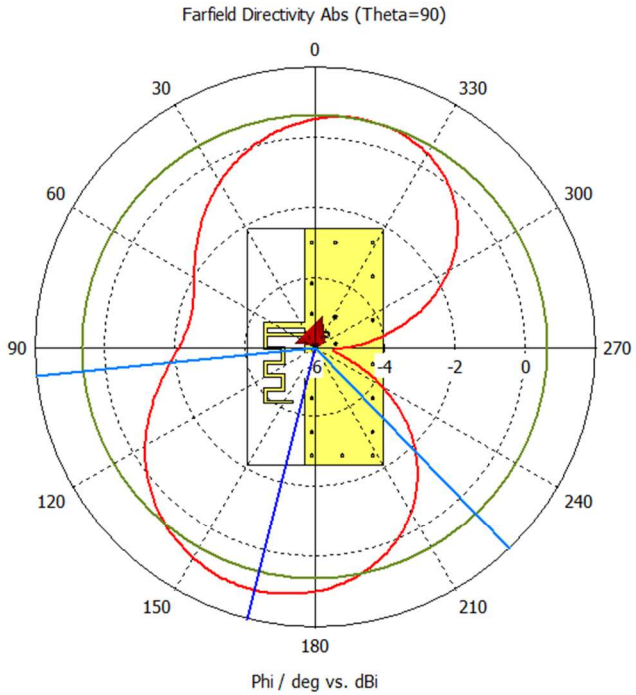
Frequency = 2450 MHz
Main lobe magnitude = 0.984 dBi
Main lobe direction = 69.0 deg.

Farfield viewed from the right edge (-x) of the PCB



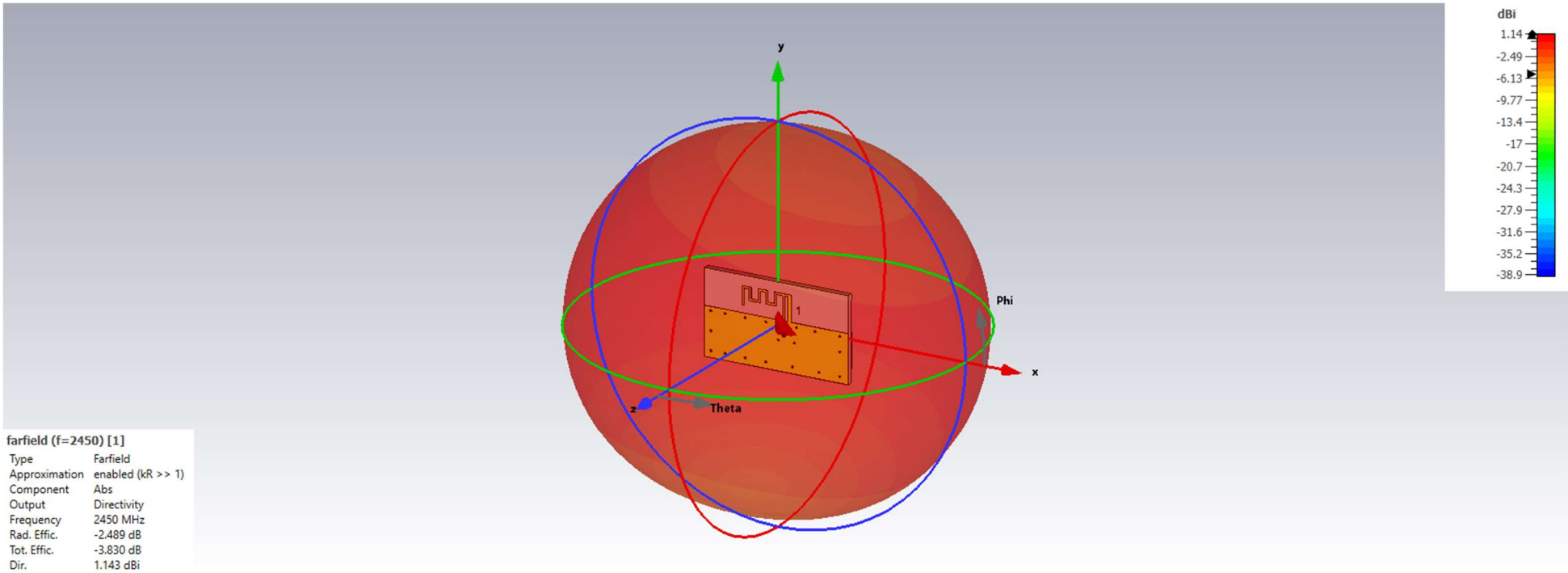
Frequency = 2450 MHz
Main lobe magnitude = 0.878 dBi
Main lobe direction = 5.0 deg.
Angular width (3 dB) = 284.7 deg.

Farfield viewed from the top (-z) of the PCB



Frequency = 2450 MHz
Main lobe magnitude = 1.14 dBi
Main lobe direction = 166.0 deg.
Angular width (3 dB) = 128.0 deg.
Side lobe level = -0.5 dB

3D-Farfield (perspective)



3D-Farfield (perspective)