ECE 6370 Homework 9
Caitlyn Caggia
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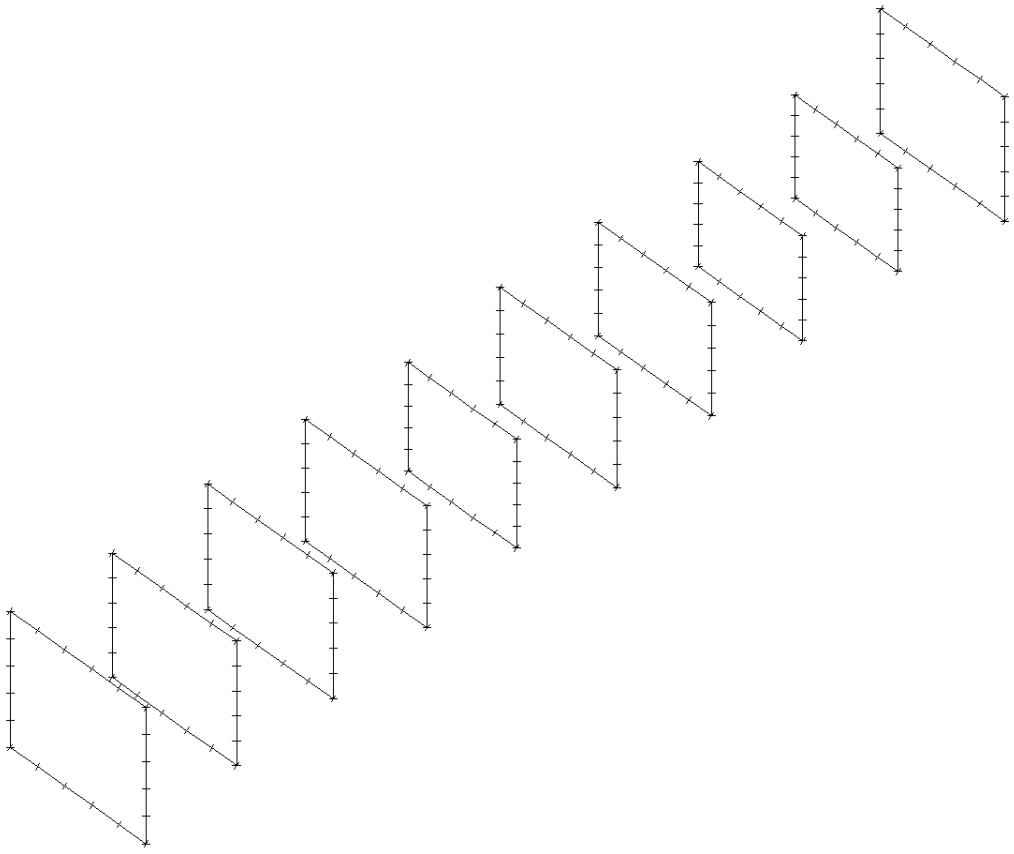
Part A
Best realized gain: 13.9593 dB

Part B
I chose to use the Gordy algorithm. Matlab's built-in genetic algorithm is set up to minimize functions, while Gordy's algorithm is already configured to maximize functions. I optimized the perimeter and diameter of the elements, while holding aspect ratio and spacing steady at the midpoint of the provided limits. Ideally, an even better antenna would also optimize aspect ratio and spacing, but these simulations would take much longer to run.

Part C
A scale drawing was generated using NECPlot:



Part D

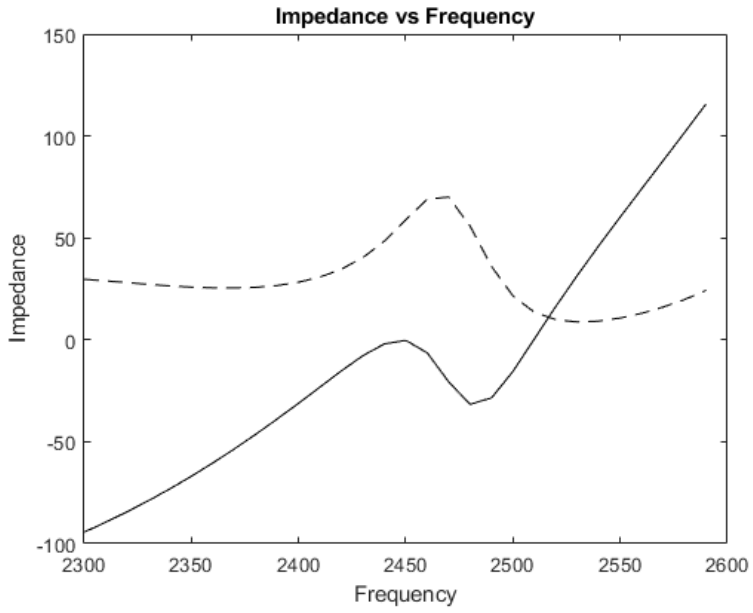
All antenna parameters are listed below in meters:

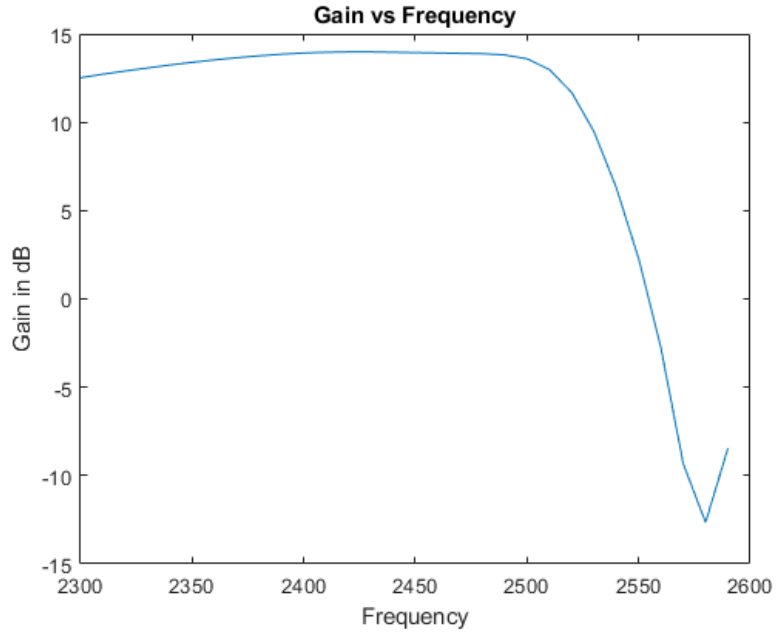
Element (n)	Perimeters (P_n)	Aspect Ratios (A_n)	Spacing (S_n)	Diameters (d_n)
1	0.138899674	1	0.024570025	0.001552247
2	0.126905042	1	0.024570025	0.002566789
3	0.128961097	1	0.024570025	0.002367595
4	0.124517236	1	0.024570025	0.002483629
5	0.111063207	1	0.024570025	0.002984117
6	0.120022481	1	0.024570025	0.000389445
7	0.115636926	1	0.024570025	0.000693917
8	0.106887967	1	0.024570025	0.001493936
9	0.105948409	1	0.024570025	0.002741622
10	0.127544034	1	0.024570025	0.002829877

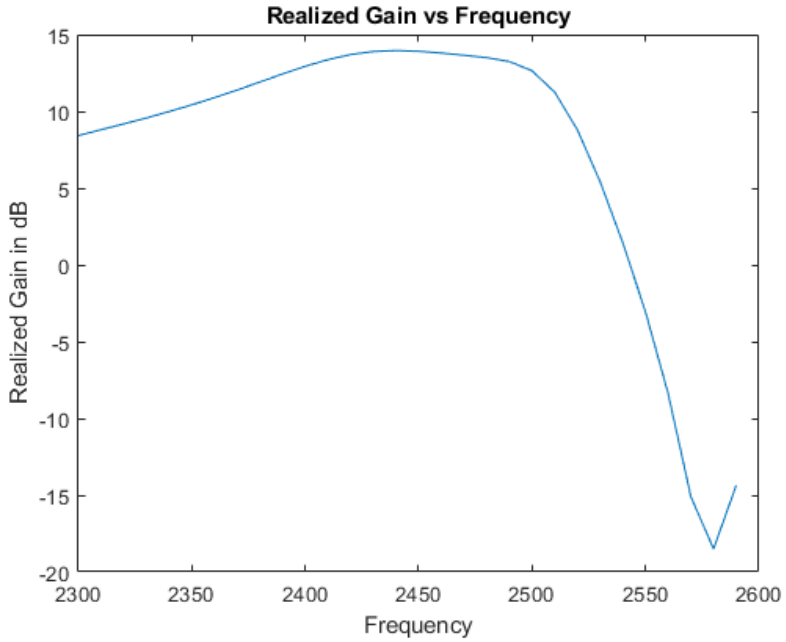
Part E

Relevant changes to the NEC input file are shown below:

```
46    EX   0   5   3   0   1.0000   0.0000
47    FR   0   300   0   0 2300.0000   1.0000
48    RP   0   1   1 1000  90.0000   0.0000   0.0000   0.0000
49    EN
```




Gain vs Frequency
Gain in dB
Frequency
15
10
5
0
-5
-10
-15
2300
2350
2400
2450
2500
2550
2600


Realized Gain vs Frequency
Realized Gain in dB
Frequency
15
10
5
0
-5
-10
-15
-20
2300
2350
2400
2450
2500
2550
2600

Part F

Relevant changes to the NEC input file are shown below for 2.4 GHz. Similar changes were made for 2.484 GHz.

```
46    EX   0   5   3   0   1.0000   0.0000
47    FR   0   1   0   0 2400.0000   0.0000
48    RP   0   1   1 1000  90.0000   0.0000   0.0000   0.0000
49    EN
```

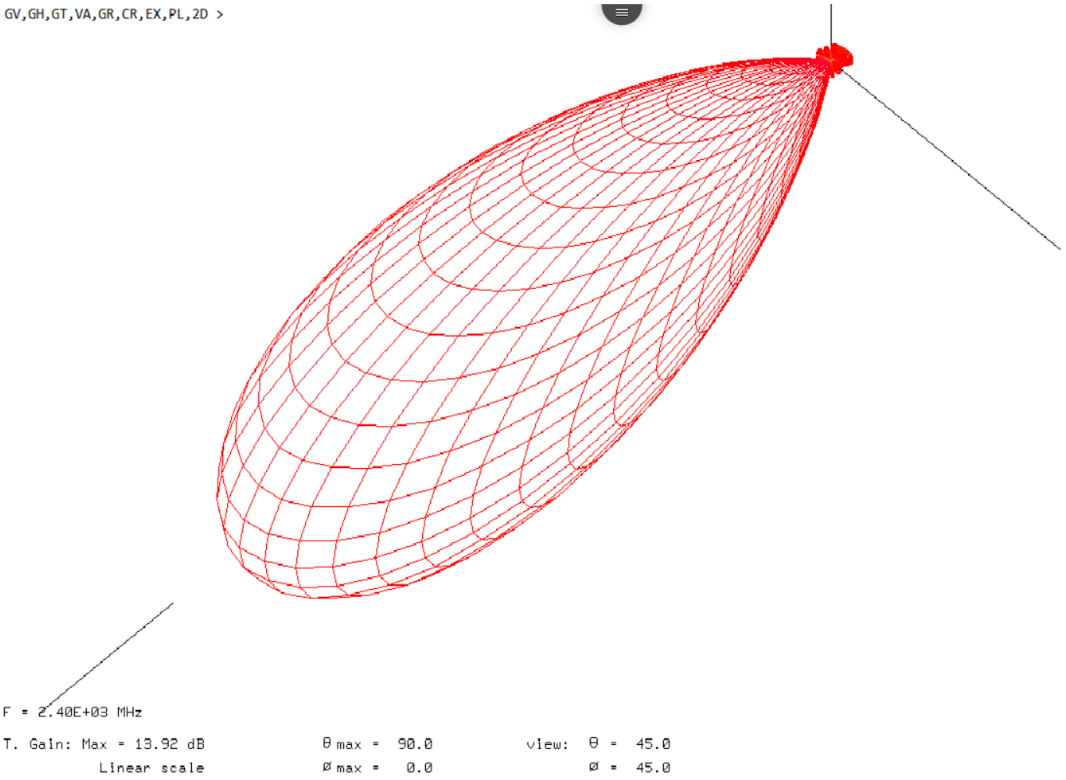
Frequency (GHz)	Impedance (Ohms)	Gain (dB)	Realized Gain (dB)
2.4	28.2477	13.92	12.93436968
2.442	50.37	13.96	13.95928772
2.484	47.635	13.86	13.41222586

Part G

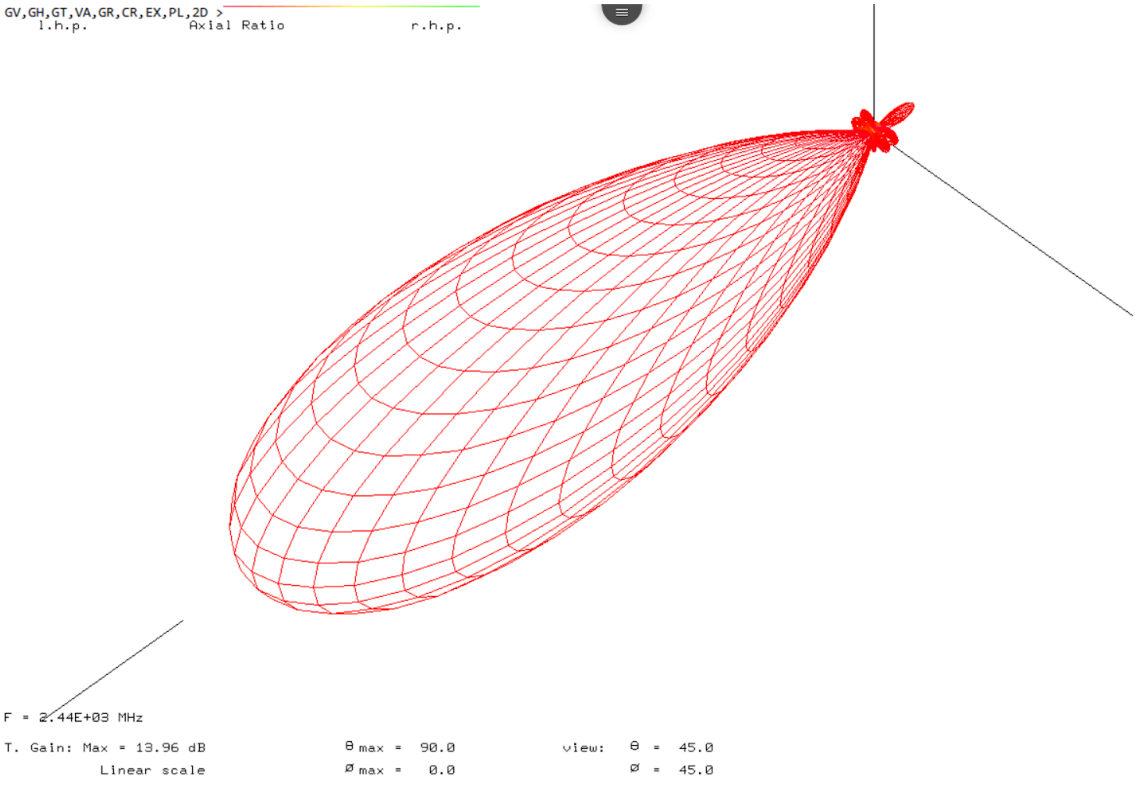
Relevant changes to the NEC input file are shown below for 2.4 GHz. Similar changes were made for 2.442 and 2.484 GHz.

```
46    EX   0   5   3   0   1.0000   0.0000
47    FR   0   1   0   0 2400.0000   0.0000
48    RP 0  181  91  1000  0.  0.  2  2
49    EN
```

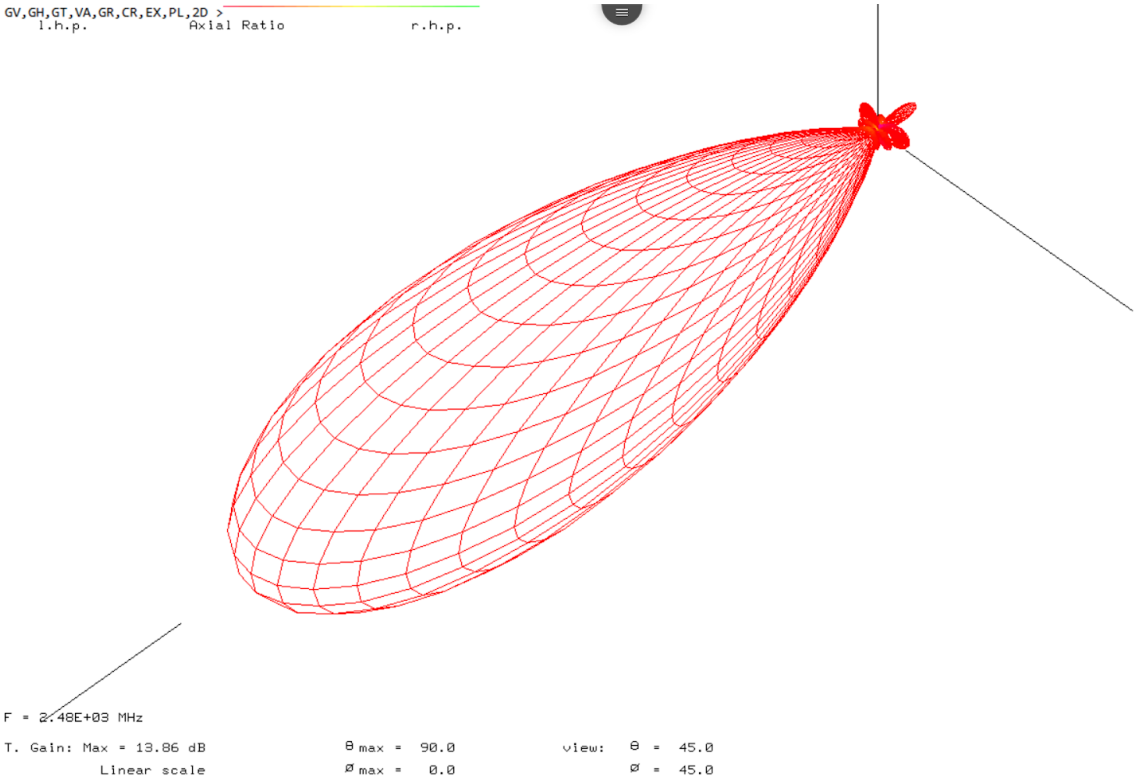
2.4 GHz



2.442 GHz



2.484 GHz



F = 2.48E+03 MHz

T. Gain: Max = 13.86 dB
Linear scale

θ max = 90.0
ø max = 0.0

view: θ = 45.0
ø = 45.0