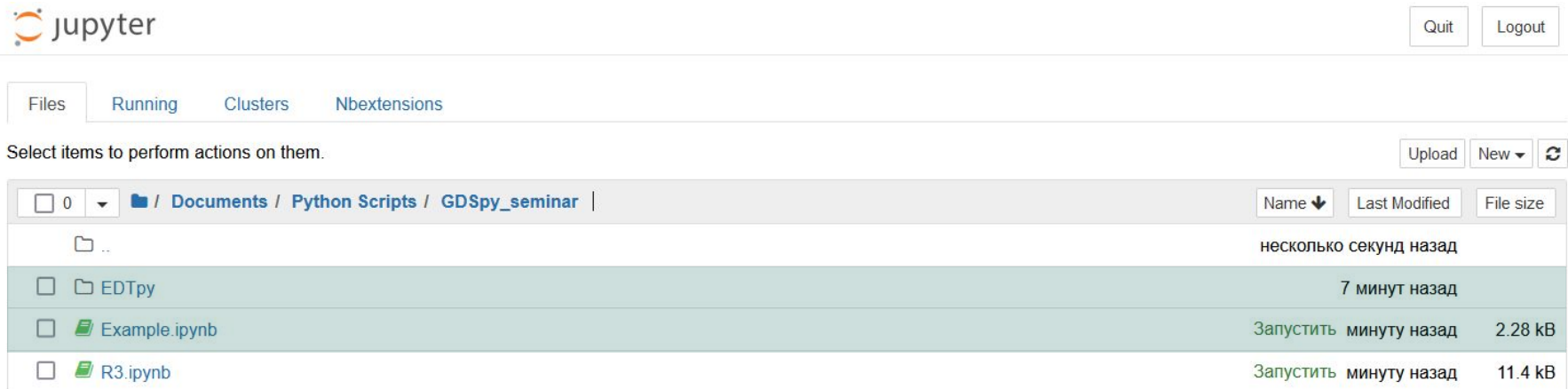


2D chip designs using
GDSPy

Setting things up

1. Install KLayout
2. Open pre installed with anaconda Jupyter Notebook



The screenshot shows the Jupyter Notebook interface. At the top left is the Jupyter logo. To the right are 'Quit' and 'Logout' buttons. Below the header is a navigation bar with 'Files', 'Running', 'Clusters', and 'Nbextensions' tabs. The 'Files' tab is active, showing a file browser. The breadcrumb path is '/ Documents / Python Scripts / GDSPy_seminar'. Below the path is a table of files and folders. The table has columns for 'Name', 'Last Modified', and 'File size'. The files listed are 'EDTpy', 'Example.ipynb', and 'R3.ipynb'. 'Example.ipynb' and 'R3.ipynb' have a green 'Запустить' (Run) button next to their names.

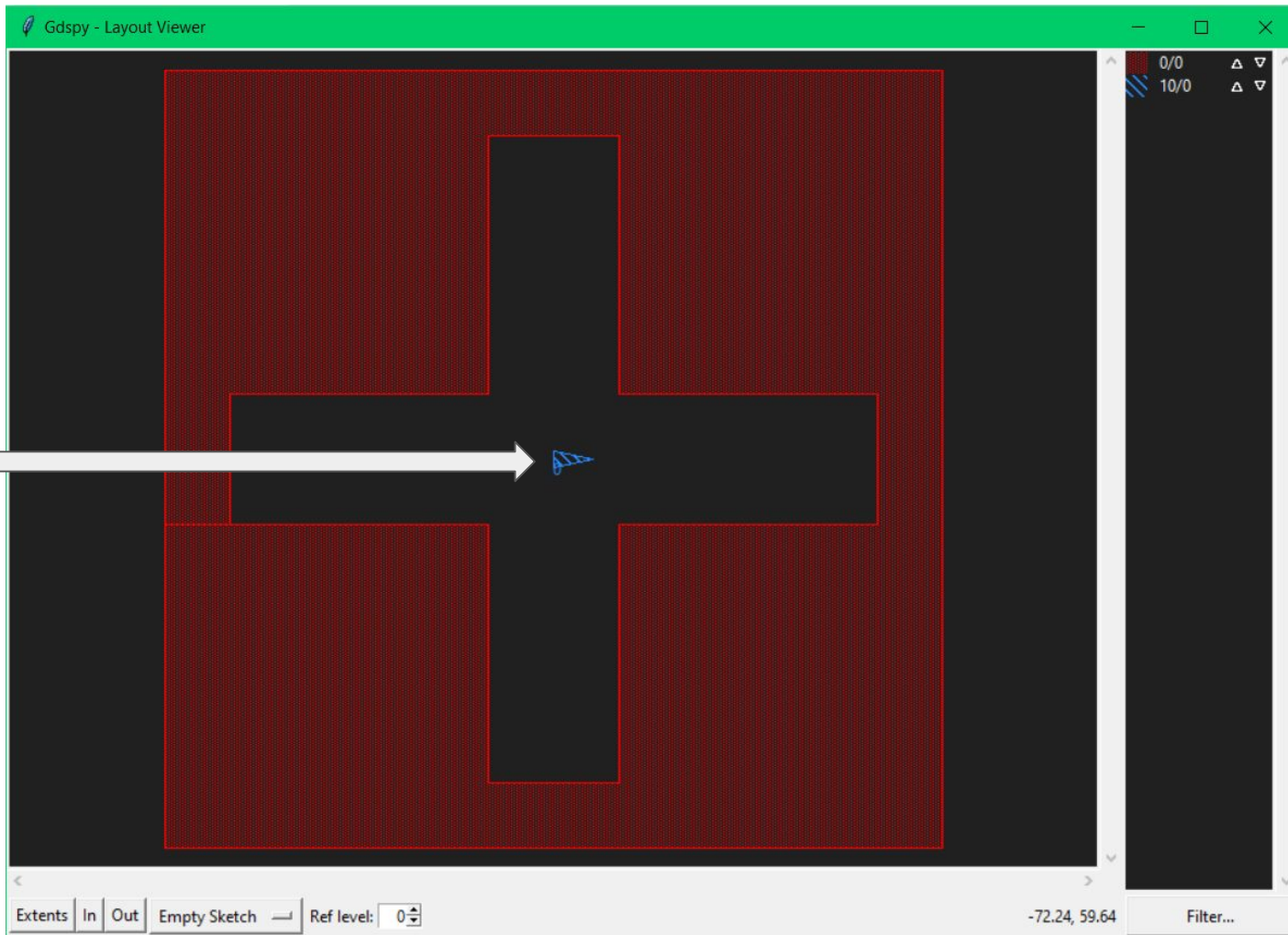
	Name	Last Modified	File size
<input type="checkbox"/>	..	несколько секунд назад	
<input type="checkbox"/>	EDTpy	7 минут назад	
<input type="checkbox"/>	Example.ipynb	Запустить минуту назад	2.28 kB
<input type="checkbox"/>	R3.ipynb	Запустить минуту назад	11.4 kB

3. %pip install **gdspy** - sell magic
4. Make sure all imports from the Example.ipynb work

Structure

```
B [3]: ▶ 1 class Marker(EmptyGeometry):
2     default_values = {
3         "a": 20,
4         "b": 100,
5         "layer": 0,
6     }
7
8     def _drawing(self, values):
9         self.name = "Marker"
10
11         a = values['a']
12         b = values['b']
13         layer = values['layer']
14
15         self + gdspy.Rectangle([-b/2-b/10, -b/2-b/10],
16                                [b/2+b/10, b/2+b/10], layer = 0)
17
18         mark = gdspy.boolean(gdspy.Rectangle([-b/2, -a/2],[b/2, a/2]), gdspy.Rectangle([-a/2, -b/2],
19                                                [a/2, b/2]), 'or', layer = 0)
20         self - mark
21         self.add_port([0, 0], 0)
```

Port, that we just
designed

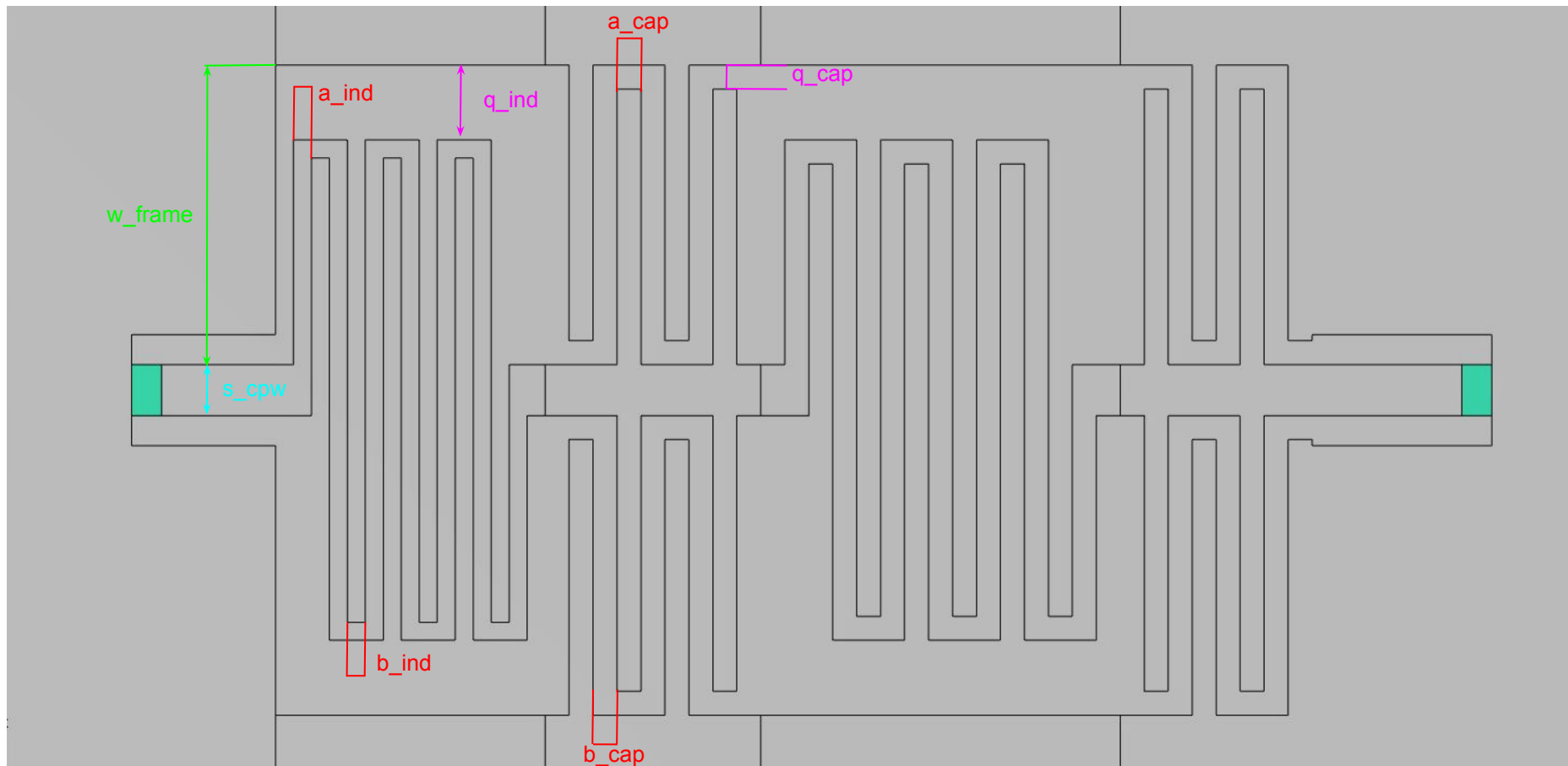


```
B [7]: ▶ 1 class Marker(EmptyGeometry):
2     default_values = {
3         "a": 20,
4         "b": 100,|
5         "layer": 0,
6     }
7
8     def _drawing(self, values):
9         self.name = "Marker"
10
11         a = values['a']
12         b = values['b']
13         layer = values['layer']
14
15         self + gdspy.Rectangle([-b/2-b/10, -b/2-b/10],
16                                [b/2+b/10, b/2+b/10], layer = 0)
17
18         mark = gdspy.boolean(gdspy.Rectangle([-b/2, -a/2],[b/2, a/2]), gdspy.Rectangle([-a/2, -b/2],
19                                                [a/2, b/2]), 'or', layer = 0)
20         self - mark
21         self.add_port([0, 0], 180)
```

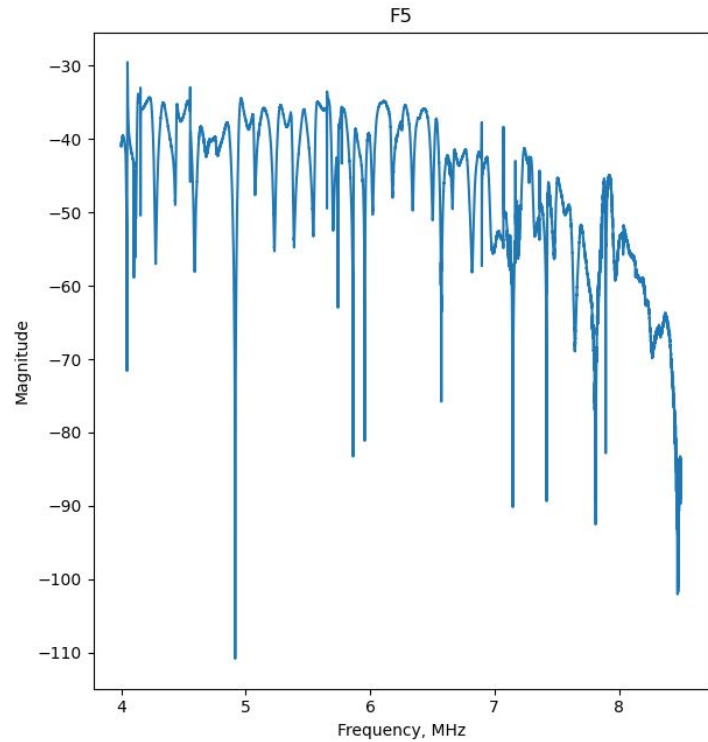
Port is now
rotated by 180°



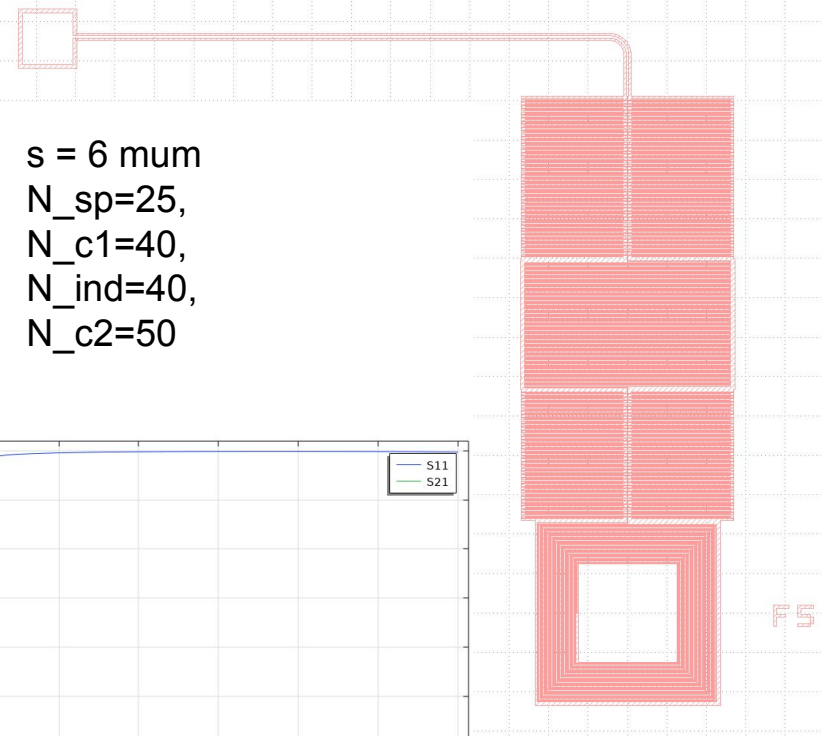
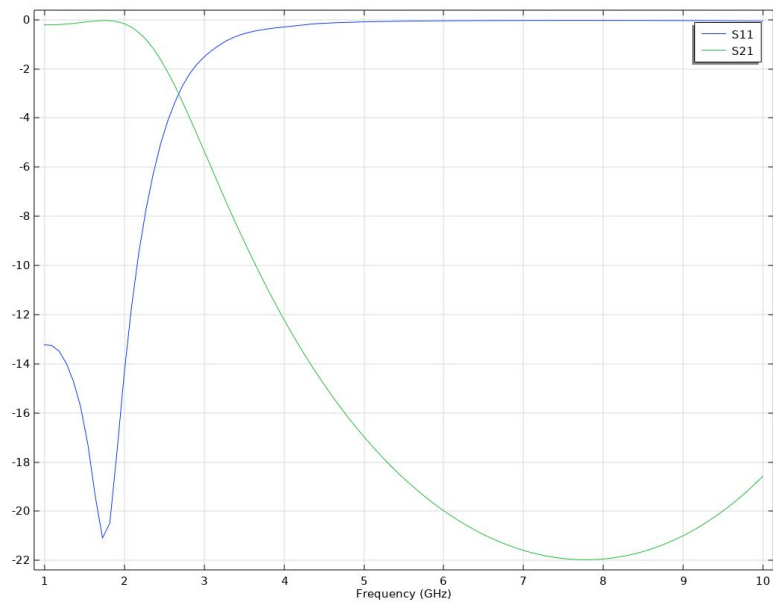
Filters



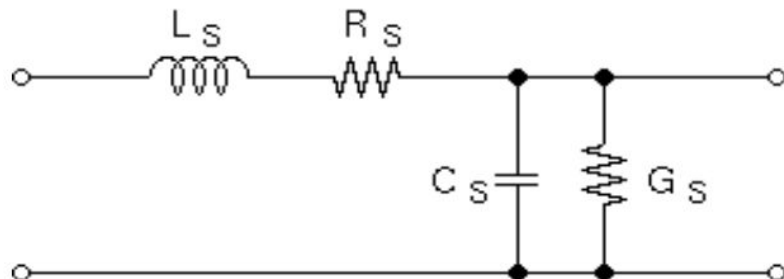
Tested filters



$s = 6 \text{ mm}$
 $N_{\text{sp}}=25,$
 $N_{\text{c1}}=40,$
 $N_{\text{ind}}=40,$
 $N_{\text{c2}}=50$

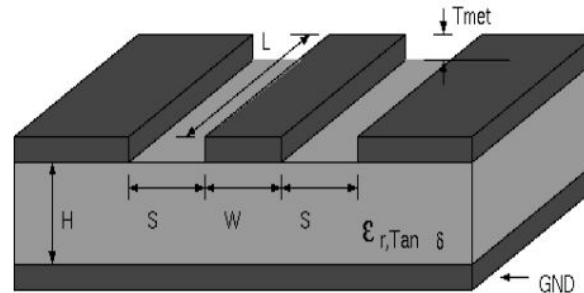


CPW resonator parameters



Values In Sync

$L_s =$ 4.14368e-10 H / mm
 $R_s =$ 211667 mOhm / inch
 $C_s =$ 4.28206 pF / inch
 $G_s =$ 2711.97 uMho / inch
 $Z_0 =$ 49.5774 + j 0 [ohm]
 $Loss =$ 3.39212 dB
 $Loss/len =$ 19.3923 dB / inch
 $Skin\ depth =$ 0.0443069 mil
 $Delay =$ 0.0371346 ns
 $End\ correction =$ 0 inch
 $Corrected\ length =$ 4443 um



Metal width (W)	18	um	calc
Metal spacing (S)	11	um	calc
Trace length (L)	4443	um	
Metal thickness (Tmet)	0.2	um	
Metal resistivity (RHO)	3e-08	Ohm - m	
Metal surface roughness (RGH)	0.001	mil -rms	
Substrate thickness (H)	670	um	calc
Substrate relative dielectric constant (Er)	11.45		calc
Substrate loss tangent (tand)	0.01		
Frequency	6	GHz	
<input type="checkbox"/> Include bottom side ground			
Characteristic Impedance	49.5774	[ohms]	
Electrical Length	80.2108	[degrees]	

Also one can use TXline

TXLINE 2003 - Microstrip

Microstrip | Stripline | CPW | CPW Ground | Round Coaxial | Slotline | Coupled MSLine | Coupled Stripline

Material Parameters

Dielectric: GaAs
Dielectric Constant: 11.45
Loss Tangent: 0.002

Conductor: Silver
Conductivity: 5.88×10^7 S/m

AWR

Physical Diagram: A cross-sectional diagram of a microstrip line. It shows a yellow conductive layer of thickness T on a dielectric substrate of height H and dielectric constant ϵ_r . The width of the conductive layer is labeled W .

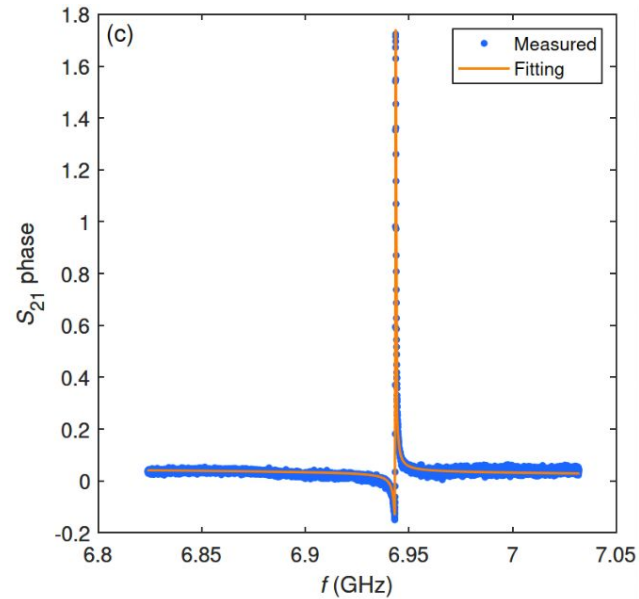
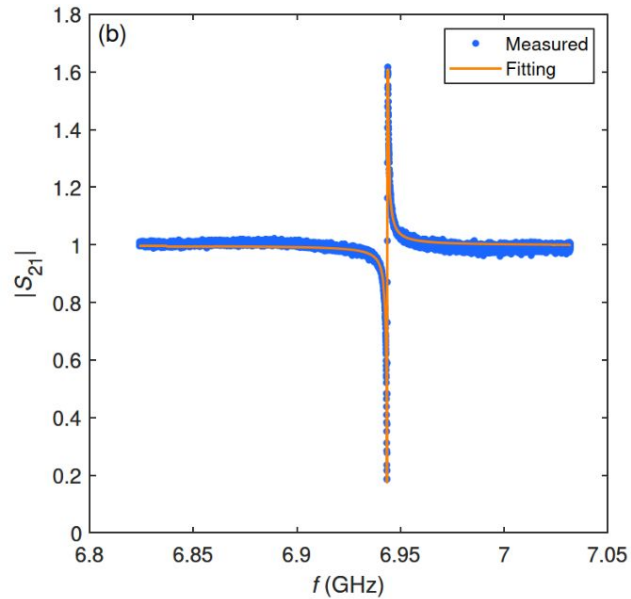
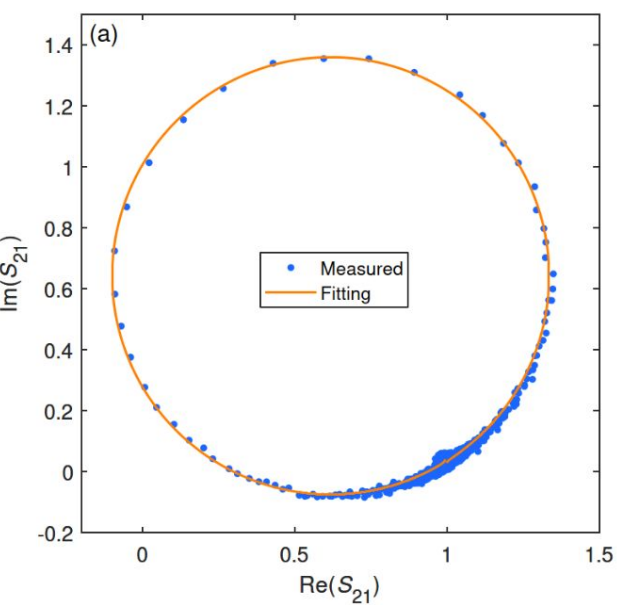
Electrical Characteristics

Impedance: 50 Ohms
Frequency: 10 GHz
Electrical Length: 90 deg
Phase Constant: 180 deg/m
Effective Dielectric Constant: 10
Loss: 10 dB/m

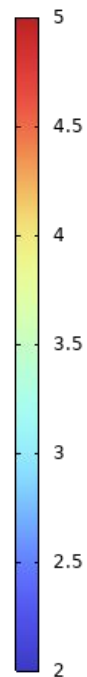
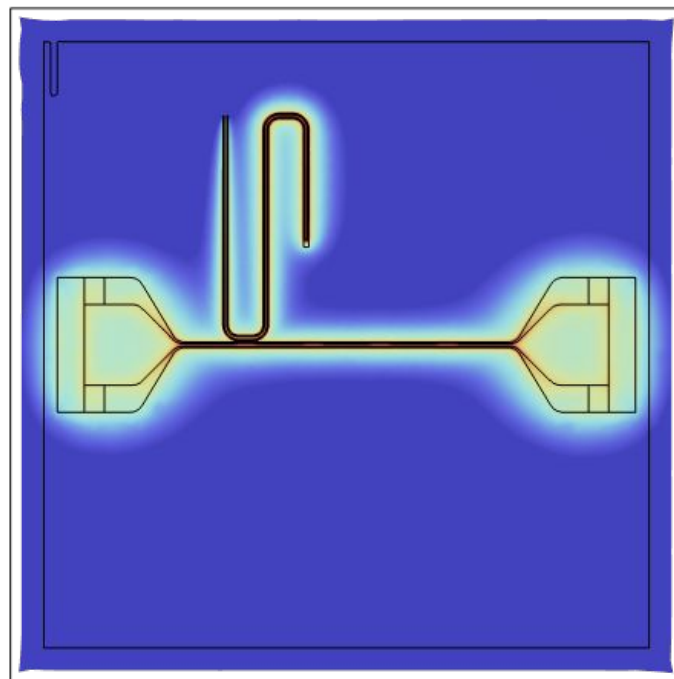
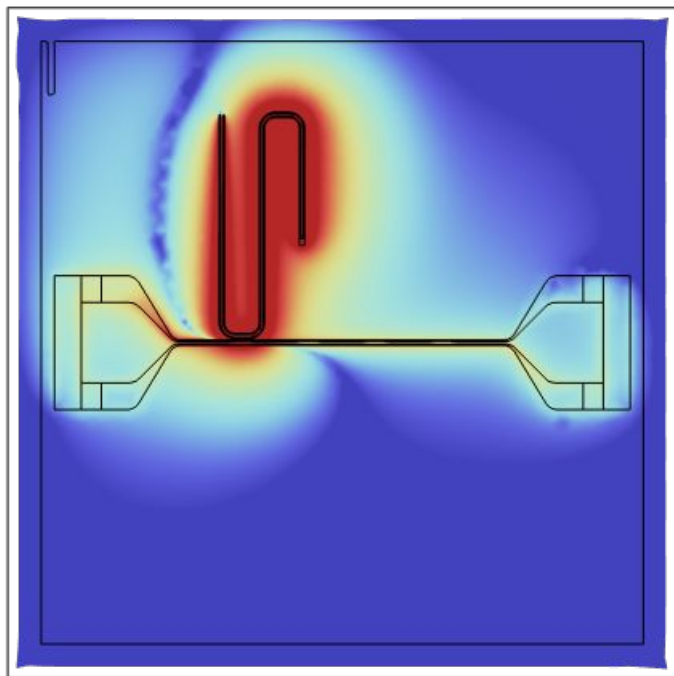
Physical Characteristic

Physical Length (L): 7487.18 um
Width (w): 1246.9 um
Height (H): 10 mil
Thickness (T): 1 um

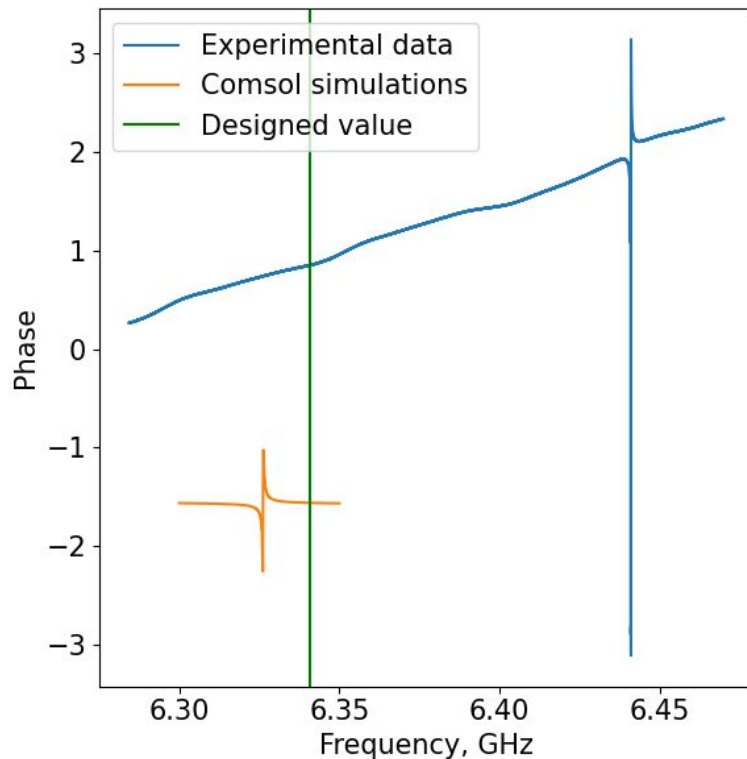
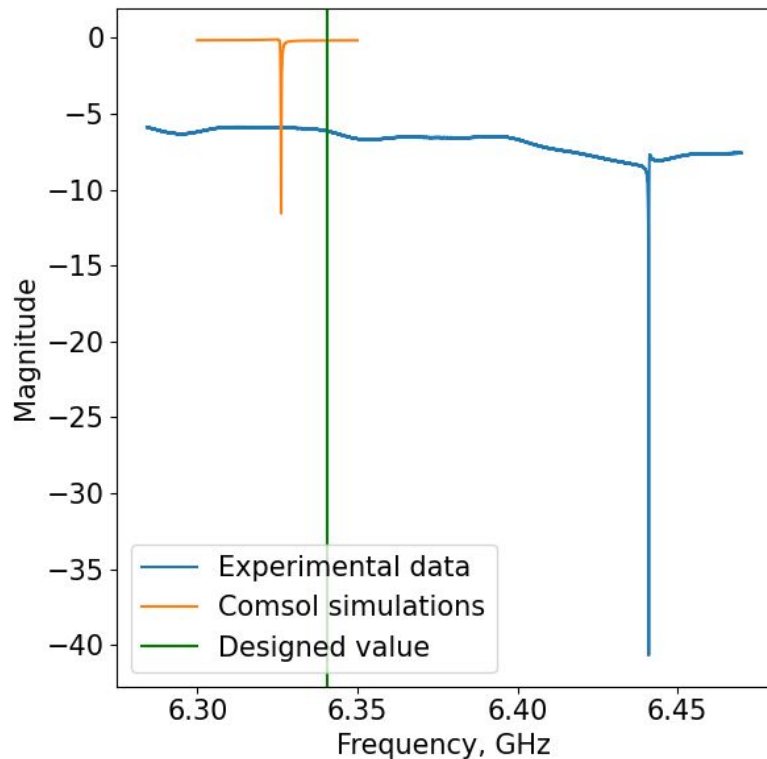
Fitting notch-type resonator



Field distribution in log scale



Notch-type resonator



Sweep distance to GND from central line - d

