

# Hybrid

November 10, 2024

```
[1]: import skrf
import numpy as np
from matplotlib import pyplot as plt
%matplotlib inline

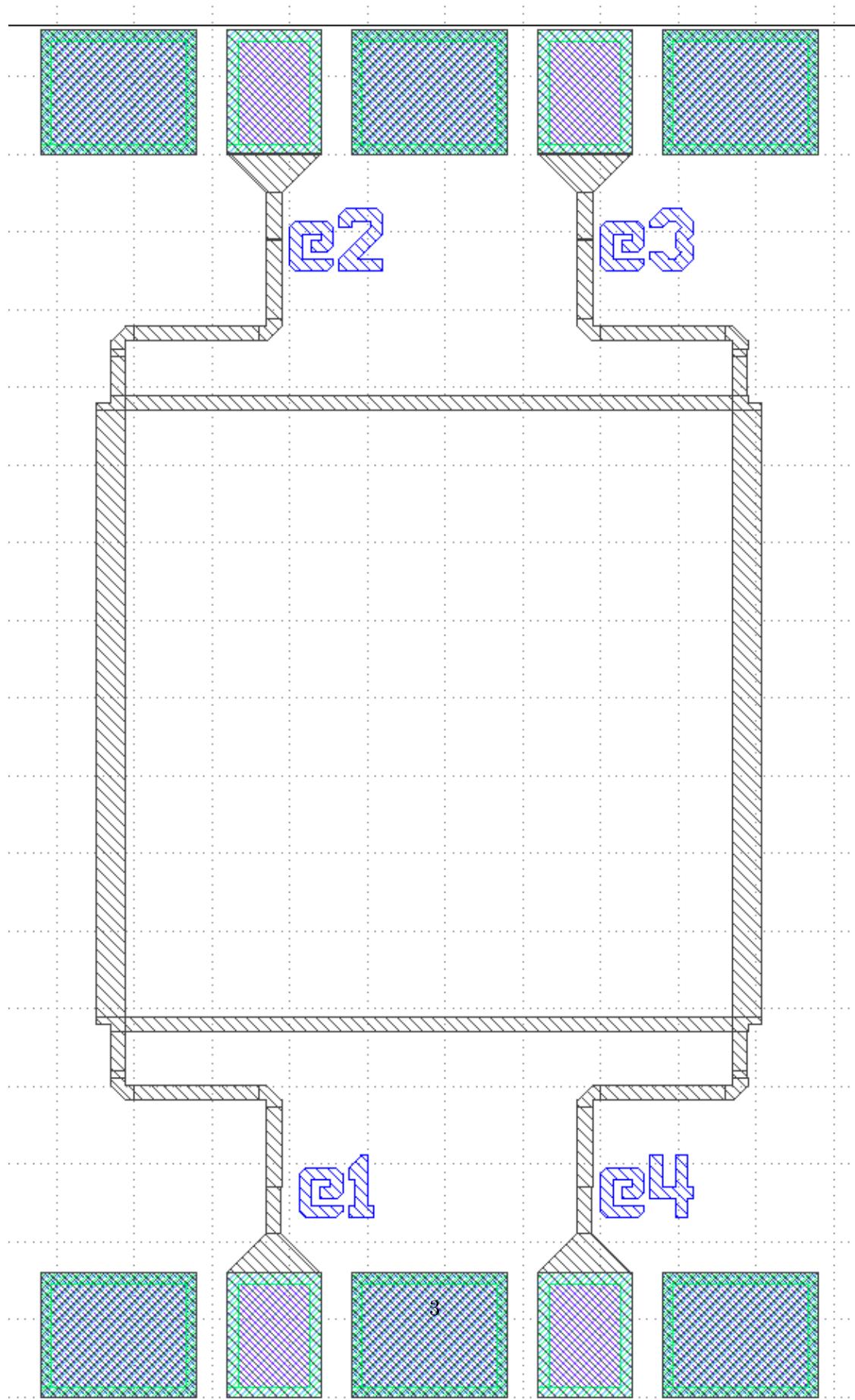
import warnings
import glob

warnings.filterwarnings("ignore", category=RuntimeWarning)

plt.rcParams["figure.figsize"] = [12,10]
```



## 1 Hybrid Port Labels



## 2 Hybrid IO

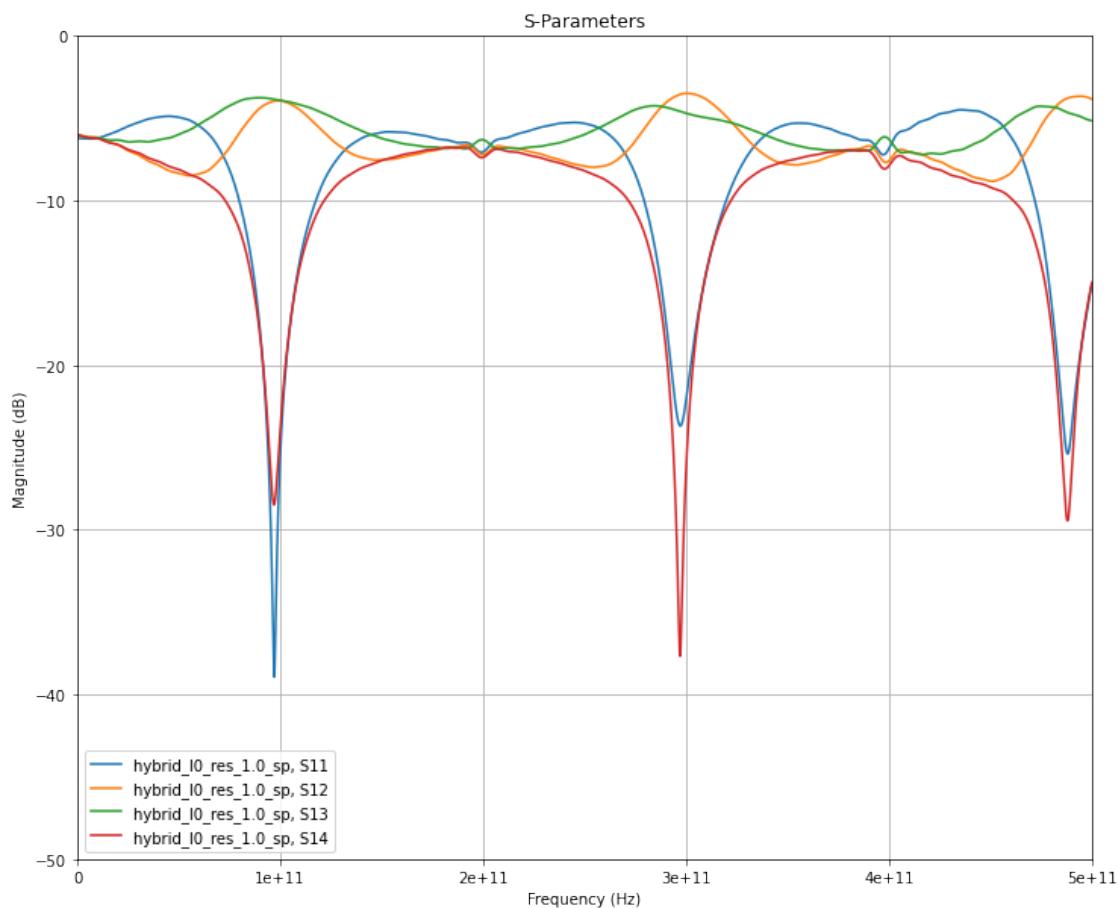
- branch\_length = 400

```
[2]: net = skrf.Network("hybrid_IO_res_1.0_sp.s4p")
```

```
[3]: print(net)
```

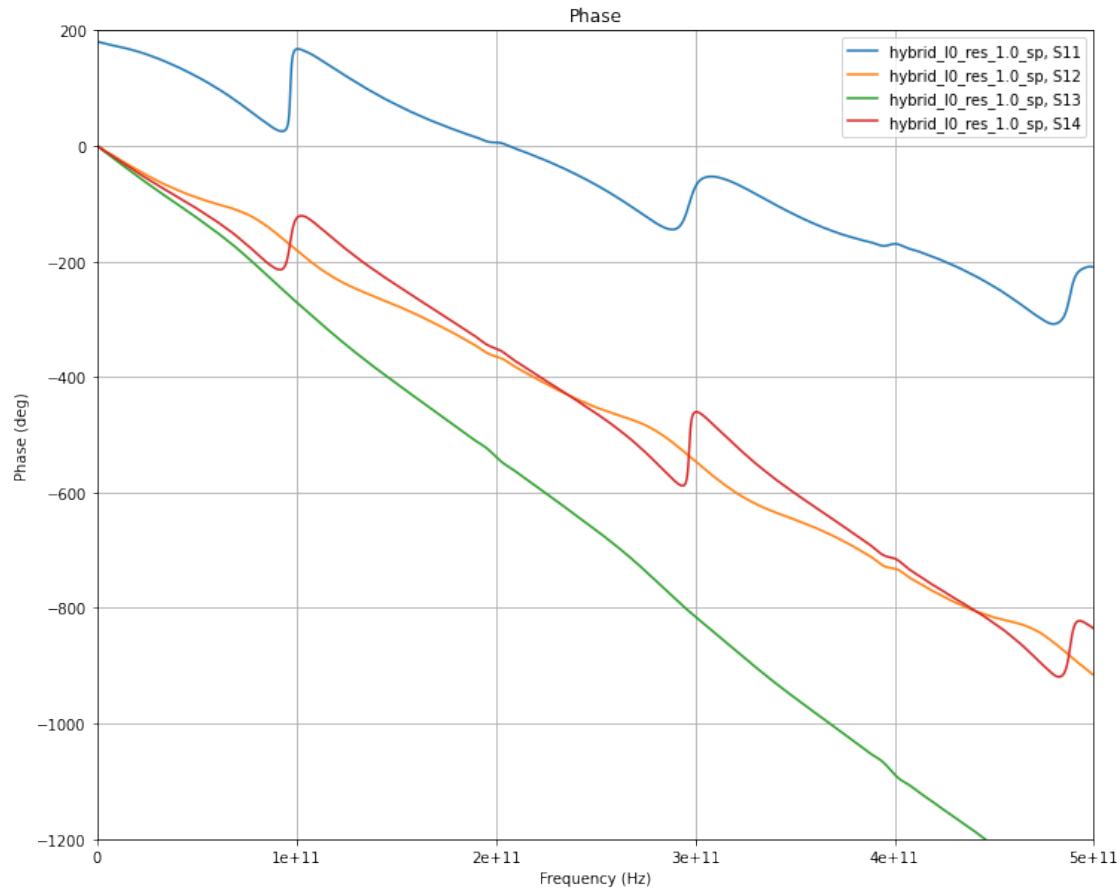
```
4-Port Network: 'hybrid_IO_res_1.0_sp', 0.0-500000000000.0 Hz, 20000 pts,  
z0=[50.+0.j 50.+0.j 50.+0.j 50.+0.j]
```

```
[4]: net.plot_s_db(m=0)  
plt.grid()  
plt.ylim(top=0, bottom=-50)  
plt.title("S-Parameters")  
plt.show()
```



```
[5]: net.plot_s_deg_unwrap(m=0)  
plt.grid()
```

```
plt.ylim(top=200, bottom=-1200)
plt.title("Phase")
plt.show()
```



```
[6]: x = net.f
y = net.s_deg_unwrap[:,0,1]-net.s_deg_unwrap[:,0,2]
x1 = net.f
y1 = np.full(len(x1),90)
plt.plot(x,y,x1,y1)
plt.ylim(bottom=0, top=180)
plt.grid()
plt.xticks(np.arange(0,5e11,20e9))
plt.title("Phase Difference")
plt.show()
```

