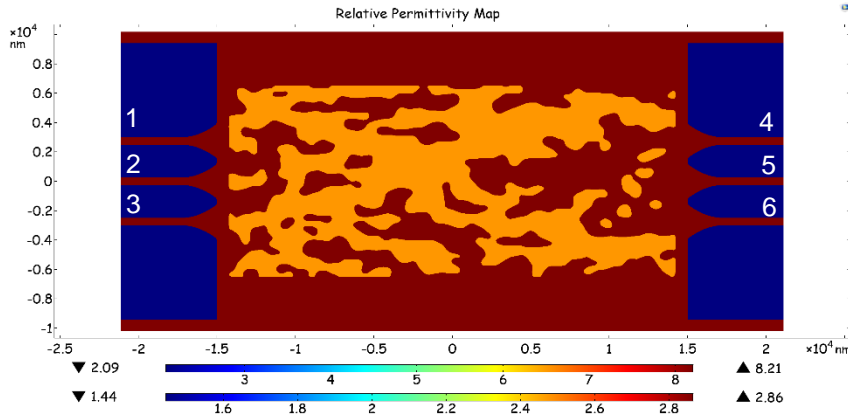


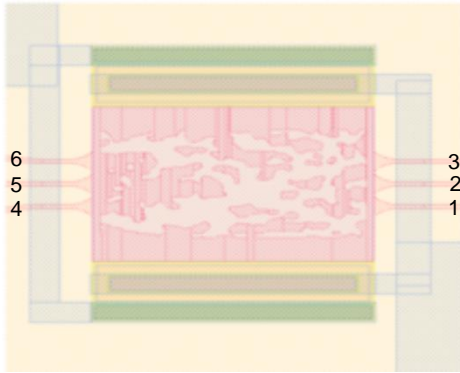
K1

Original Design for K1



Tap out For K1

(180 degree Rotated with respect to the original design)

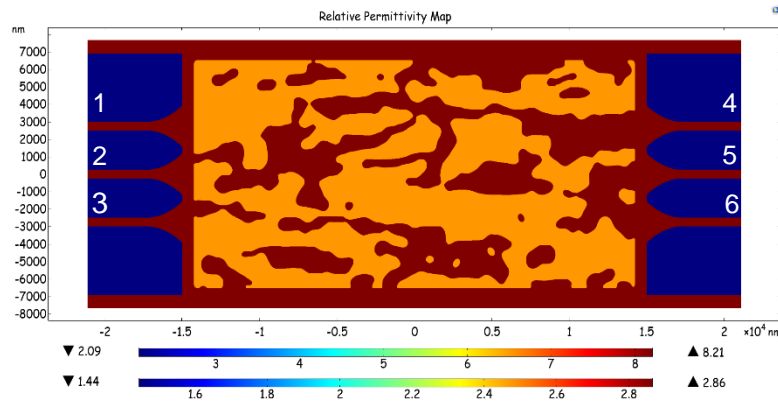


$$\bar{S}_{[TARGET]}^T = \begin{pmatrix} t_{11} & t_{12} & t_{13} \\ t_{21} & t_{22} & t_{23} \\ t_{31} & t_{32} & t_{33} \end{pmatrix} = \begin{pmatrix} 0.400 e^{j0.00^\circ} & 0.311 e^{j40.00^\circ} & 0.222 e^{j80.00^\circ} \\ 0.400 e^{j120.00^\circ} & 0.311 e^{j160.00^\circ} & 0.222 e^{j-160.00^\circ} \\ 0.400 e^{j-120.00^\circ} & 0.311 e^{j-80.00^\circ} & 0.222 e^{j-40.00^\circ} \end{pmatrix}$$

$$\bar{S}_{[OPT]}^T = \begin{pmatrix} S_{11} & S_{12} & S_{13} \\ S_{21} & S_{22} & S_{23} \\ S_{31} & S_{32} & S_{33} \end{pmatrix} = \begin{pmatrix} 0.362 e^{j0.700^\circ} & 0.271 e^{j39.68^\circ} & 0.192 e^{j80.36^\circ} \\ 0.375 e^{j118.59^\circ} & 0.284 e^{j158.54^\circ} & 0.206 e^{j-159.11^\circ} \\ 0.368 e^{j-119.04^\circ} & 0.284 e^{j-78.52^\circ} & 0.201 e^{j-39.52^\circ} \end{pmatrix}$$

K2

Original Design for K2



Tap out For K2

(180 degree Rotated with respect to the original design)

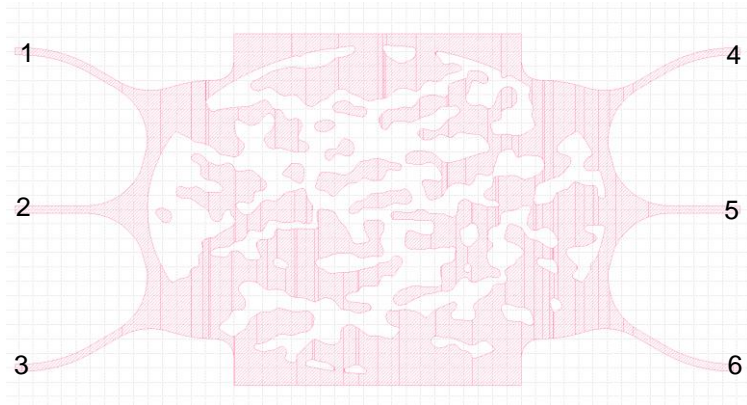


$$\bar{\bar{S}}_{[TARGET]}^T = \begin{pmatrix} t_{11} & t_{12} & t_{13} \\ t_{21} & t_{22} & t_{23} \\ t_{31} & t_{32} & t_{33} \end{pmatrix} = 0.85 U_{3 \times 3} = \begin{pmatrix} 0.467 e^{j26.34^\circ} & 0.585 e^{j140.39^\circ} & 0.402 e^{-j19.92^\circ} \\ 0.614 e^{j34.34^\circ} & 0.425 e^{-j66.30^\circ} & 0.407 e^{-j131.93^\circ} \\ 0.358 e^{j14.63^\circ} & 0.446 e^{j17.06^\circ} & 0.629 e^{j74.63^\circ} \end{pmatrix}$$

$$\bar{\bar{S}}_{[OPT]}^T = \begin{pmatrix} S_{11} & S_{12} & S_{13} \\ S_{21} & S_{22} & S_{23} \\ S_{31} & S_{32} & S_{33} \end{pmatrix} = 0.85 U_{3 \times 3} = \begin{pmatrix} 0.431 e^{j21.05^\circ} & 0.547 e^{j133.69^\circ} & 0.351 e^{-j24.73^\circ} \\ 0.566 e^{j28.99^\circ} & 0.405 e^{-j69.82^\circ} & 0.368 e^{-j135.41^\circ} \\ 0.309 e^{j10.83^\circ} & 0.407 e^{j10.13^\circ} & 0.595 e^{j69.97^\circ} \end{pmatrix}$$

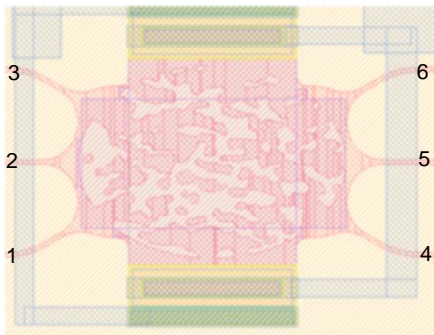
K3

Original Design for K3



Tap out For K3

(Vertically Flipped)



Magnitude of the transmission matrix

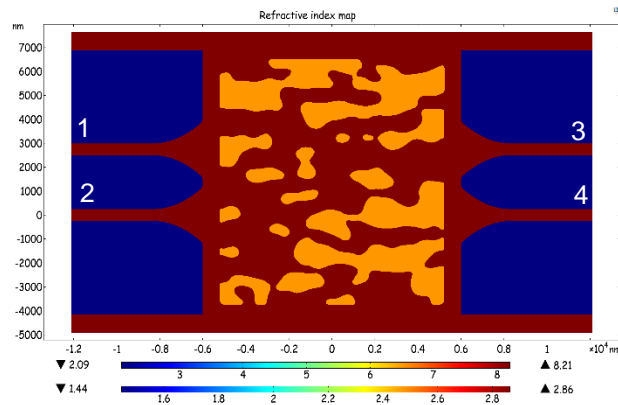
0.5494	0.6882	0.4729
0.7224	0.5000	0.4788
0.4212	0.5247	0.7400

Phase of the transmission matrix [deg]

26.3400	140.3900	-19.9200
34.3400	-66.3000	-131.9300
14.6300	17.0600	74.6300

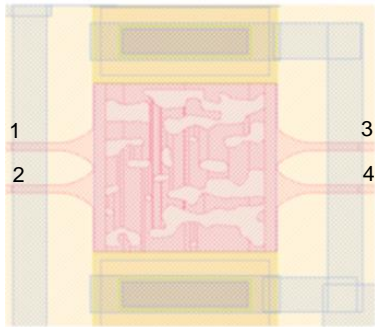
K4

Original Design for K4



Tap out For K4

(Identical to the original design)



$$\bar{\bar{S}}_{[TARGET]}^T = \begin{pmatrix} t_{11} & t_{12} \\ t_{21} & t_{22} \end{pmatrix} = 0.775 U_{3 \times 3} = \begin{pmatrix} 0.606 e^{j44.99^\circ} & 0.483 e^{j165.15^\circ} \\ 0.483 e^{j26.71^\circ} & 0.606 e^{-j33.13^\circ} \end{pmatrix}$$

$$\bar{\bar{S}}_{[OPT]}^T = \begin{pmatrix} S_{11} & S_{12} \\ S_{21} & S_{22} \end{pmatrix} = \begin{pmatrix} 0.590 e^{j45.72^\circ} & 0.463 e^{j164.32^\circ} \\ 0.464 e^{j27.04^\circ} & 0.596 e^{-j33.80^\circ} \end{pmatrix}$$