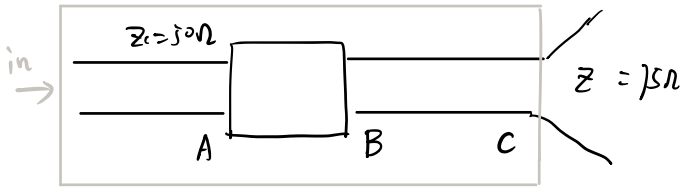
设计：射频功放的输入、输出匹配电路

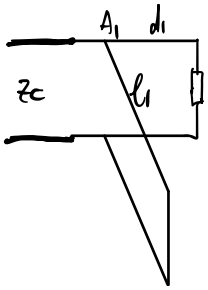


取传输线特征阻抗 $Z_c=50\Omega$

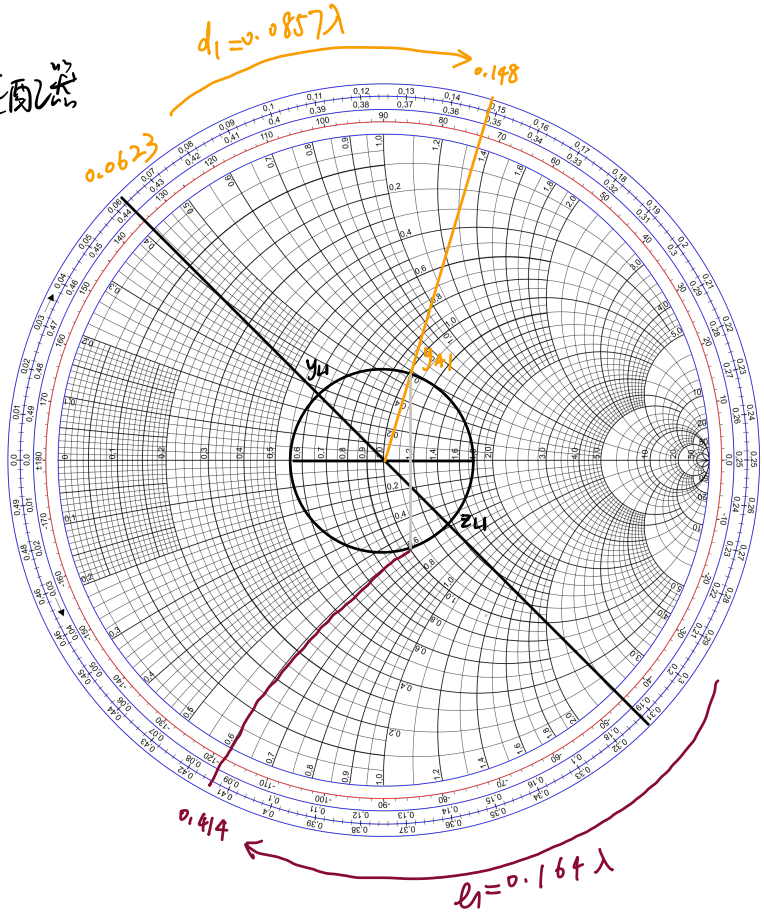
源与传输线已经完成了匹配（$Z_c=50\Omega$）下面分别设计A、B、C处的匹配

（以下设计均只取1组解）

A. 等效为下图：用单枝变电纳匹配器

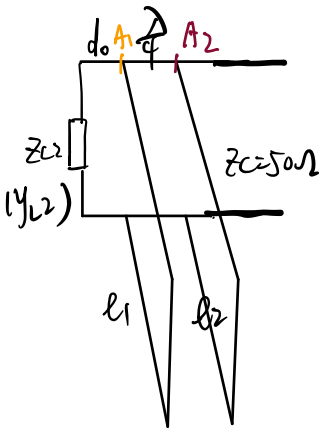


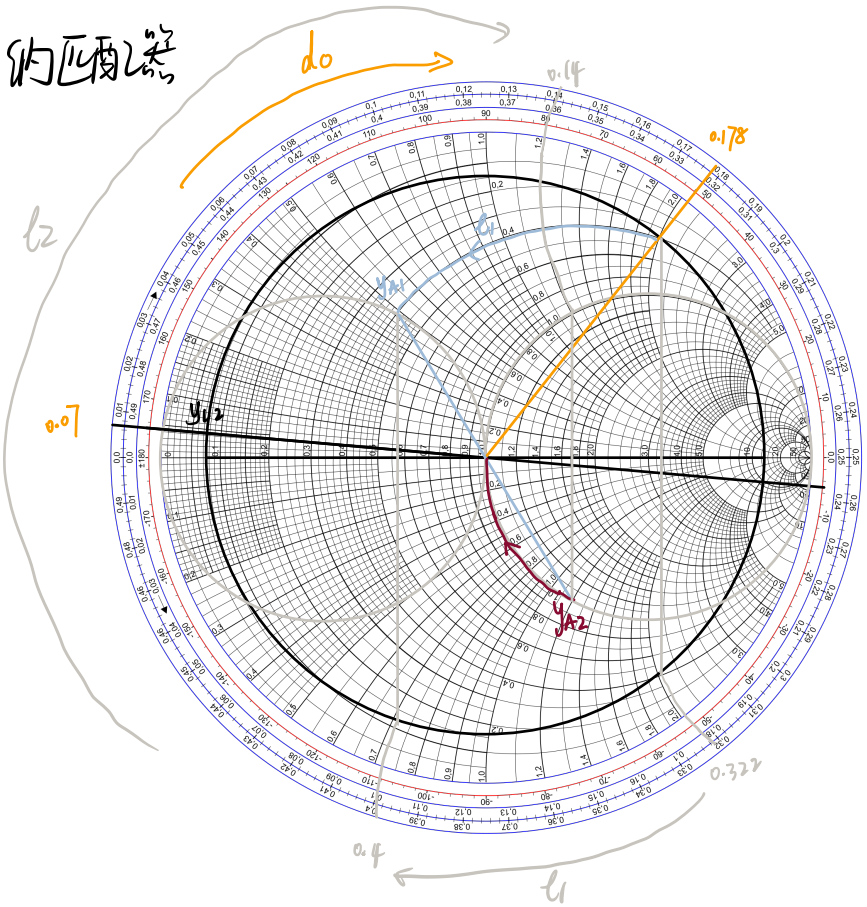
$$\rho=\frac{1+|\Gamma|}{1-|\Gamma|}=1.78$$



$$\begin{cases} d_1=0.057\lambda \\ l_1=0.164\lambda \end{cases}$$

B. 等效↓ 用双可变电纳匹配器

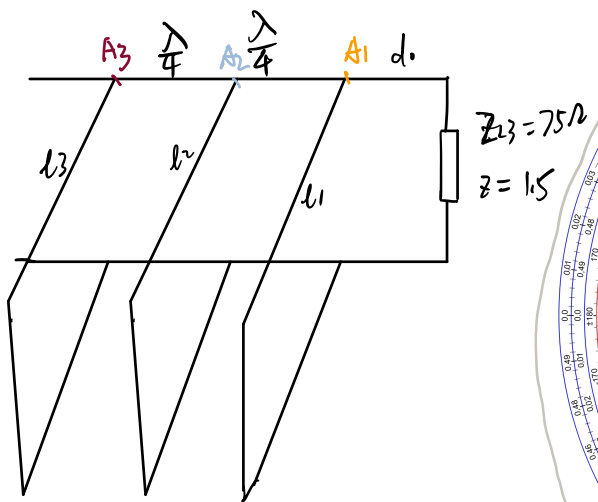


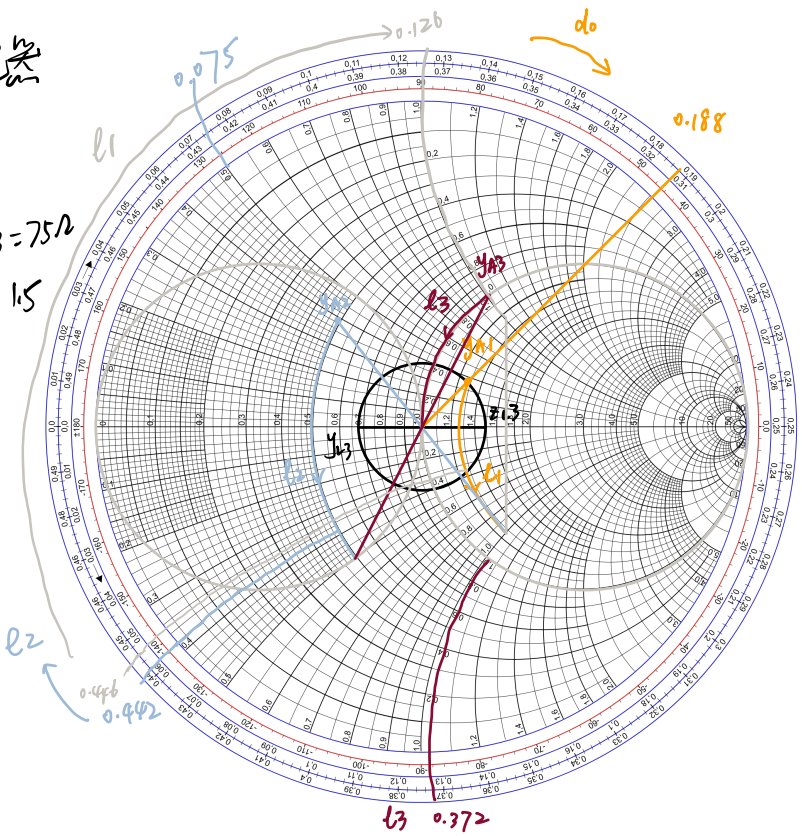


$\Gamma = 0.88\angle -5^\circ \Rightarrow \rho = 15.67$

取 $\begin{cases} d_0 = 0.108\lambda \\ l_1 = 0.078\lambda \\ l_2 = 0.39\lambda \end{cases}$

C. 等效↓ 用三可变电纳匹配器





取 $\begin{cases} d_0 = 0.188\lambda \\ l_1 = 0.18\lambda \\ l_2 = 0.133\lambda \\ l_3 = 0.122\lambda \end{cases}$

以上是三个阻抗匹配器设计.

下面设计 $Z_c=50\Omega$ 的微带线.

选择 0.76mm 基板

工作频率 10GHz，损耗因子尽量小，同时保证介电常数不太小：TSM-30 微带线.

其 $\varepsilon_r=0.0015$

在准TEM模近似下. 设 $\frac{w}{h}\geq 1$.

则 $Z_e=\frac{\eta_0}{\sqrt{\varepsilon_{re}}}\left(\frac{w}{h}+1.393+0.667\ln\left(\frac{w}{h}+1.444\right)\right)^{-1}=50\Omega$

$$\varepsilon_{re}=\frac{\varepsilon_r+1}{2}+\frac{\varepsilon_r-1}{2}\cdot\left(1+12\frac{h}{w}\right)^{-\frac{1}{2}}$$

$\Rightarrow \quad w/h=8.31 \quad , \quad \varepsilon_{re}=0.18$

由 $h=0.76mm$

$\Rightarrow \quad w=6.32mm$

综上，微带线用 0.76mm 基板，型号是 TSM-30，导带宽度 $w=6.32mm$，

介质片厚度 0.76mm.

最后，分别计算 A、B、C 处阻抗匹配器传输线的具体长度

由于 $K = \omega\sqrt{\varepsilon_r\varepsilon_0\mu_0}$ ， $f = 10GHz$

$\therefore K = 89.26$

$$\lambda = \frac{2\pi}{K} = 0.0704m$$

A处 $\begin{cases} d_1 = 0.085\lambda = 0.006m \\ l_1 = 0.164\lambda = 0.012m \end{cases}$

B处 $\begin{cases} d_0 = 0.108\lambda = 0.0076m \\ l_1 = 0.078\lambda = 0.0055m \\ l_2 = 0.39\lambda = 0.027m \end{cases}$

C处 $\begin{cases} d_0 = 0.188\lambda = 0.013m \\ l_1 = 0.18\lambda = 0.013m \\ l_2 = 0.133\lambda = 0.0094m \\ l_3 = 0.122\lambda = 0.0086m \end{cases}$

以上就是传输线阻抗匹配的设计内容。