

## Cook book and examples for single stub

Type 1 Series stub with same 50 ohm line

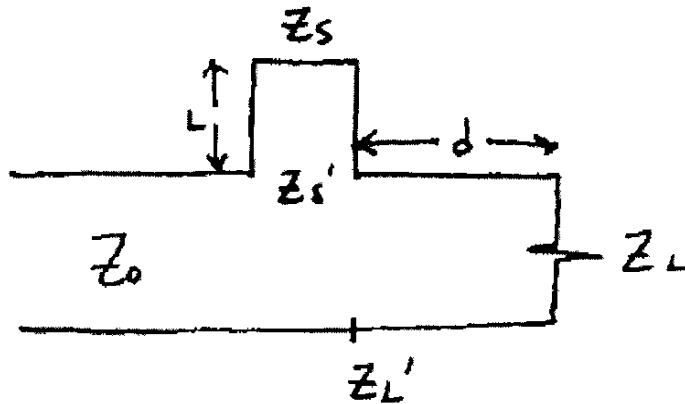
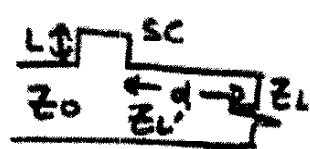


Fig:1 Series stub

- 1) Plot  $z_L$  ( $z_L = Z_L/Z_0$ , normalized)
- 2) Rotate  $z_L$  towards the generator until it reaches  $r_L = 1.0$  circle (there will be two points, choose the closest one). This is the length ( $d$ ) between the load and the stub.
- 3) Read the value of  $x_L$  at that point
- 4) Impedance of the stub  $x_s = -x_L$
- 5) Plot  $x_s$  on the smith chart and calculate the length of the stub using one of the following two methods.
  - a) If you need a short circuited stub, distance ( $l$ ) is measured from the short circuit point ( $Z_{sc}$ ) towards generator to  $x_s$ .
  - b) If you need a open circuited stub, distance ( $l$ ) is measured from the open circuit point ( $Z_{oc}$ ) towards generator to  $x_s$ .
- 6) The new  $z_{in} = 1 + j0$  (bull's-eye)

$Z_L = 100 + j100 \Omega$   
 $Z_0 = 200 \Omega$   
 $Z_L = \frac{1}{2} + j\frac{1}{2}$

**SERIES STUB MATCH**  
 The Complete Smith Chart  
 Black Magic Design



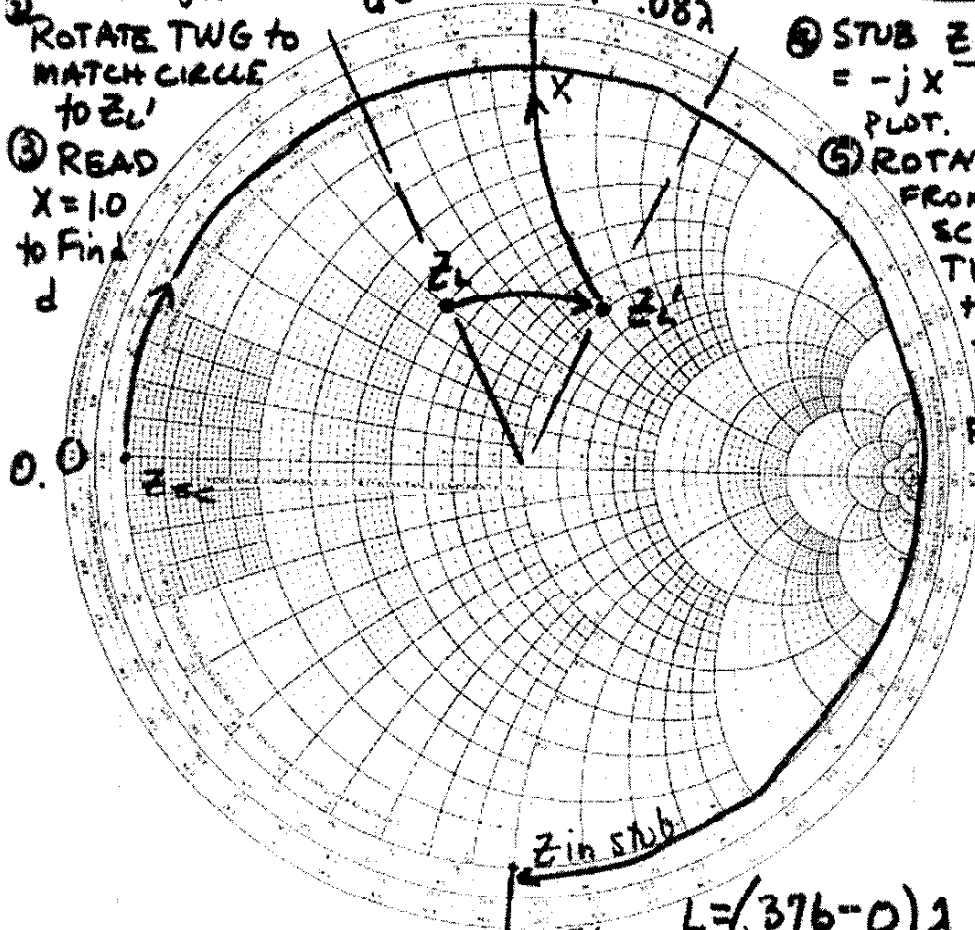
$d = .161 - .081 = .08\lambda$

② ROTATE TWG TO MATCH CIRCLE TO  $Z_L'$

③ READ  $X = 1.0$  TO FIND  $d$

④ STUB  $Z_{in}$   
 $= -jX$   
 PLOT.

⑤ ROTATE FROM SC. TWG TO  $Z_{in}$  TO FIND  $L$



$L = (0.376 - 0)\lambda = 0.376\lambda$

Type 2 Shunt stub with same 50 ohm line

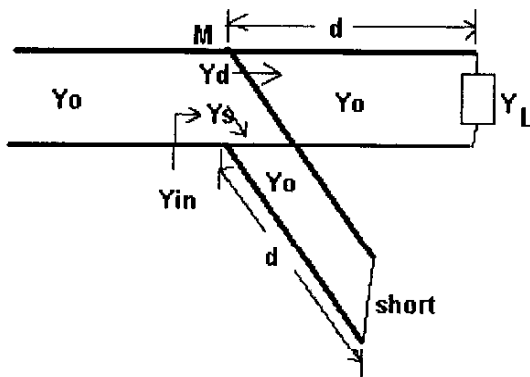


Fig:1 Shunt stub

1. Plot  $z_L$ . ( $z_L = Z_L/Z_0$ , normalized )
2. Reflect it through the origin to find  $y_L$
3. Rotate  $y_L$  towards the generator until it reaches  $r_L = 1.0$  circle (there will be two points, choose the closest one). This is the length (d) between the load and the stub.
4. Read the value of  $x_L$
5. Impedance of the stub  $x_s = -x_L$
6. Plot  $x_s$  on the smith chart and calculate the length of the stub using one of the following two methods.
  - a) If you need a short circuited stub, distance (l) is measured from the short circuit point ( $Y_{sc}$  not  $Z_{sc}$ ) towards generator to  $x_s$ .
  - b) If you need a open circuited stub, distance (l) is measured from the open circuit point ( $Y_{oc}$  not  $Z_{oc}$ ) towards generator to  $x_s$ .
7. The new  $y_{in} = 1 + j0$  (bull's-eye)

Q)  $Z_L = 75 - j20$   
 $Z_0 = 50$

### SHUNT STUB

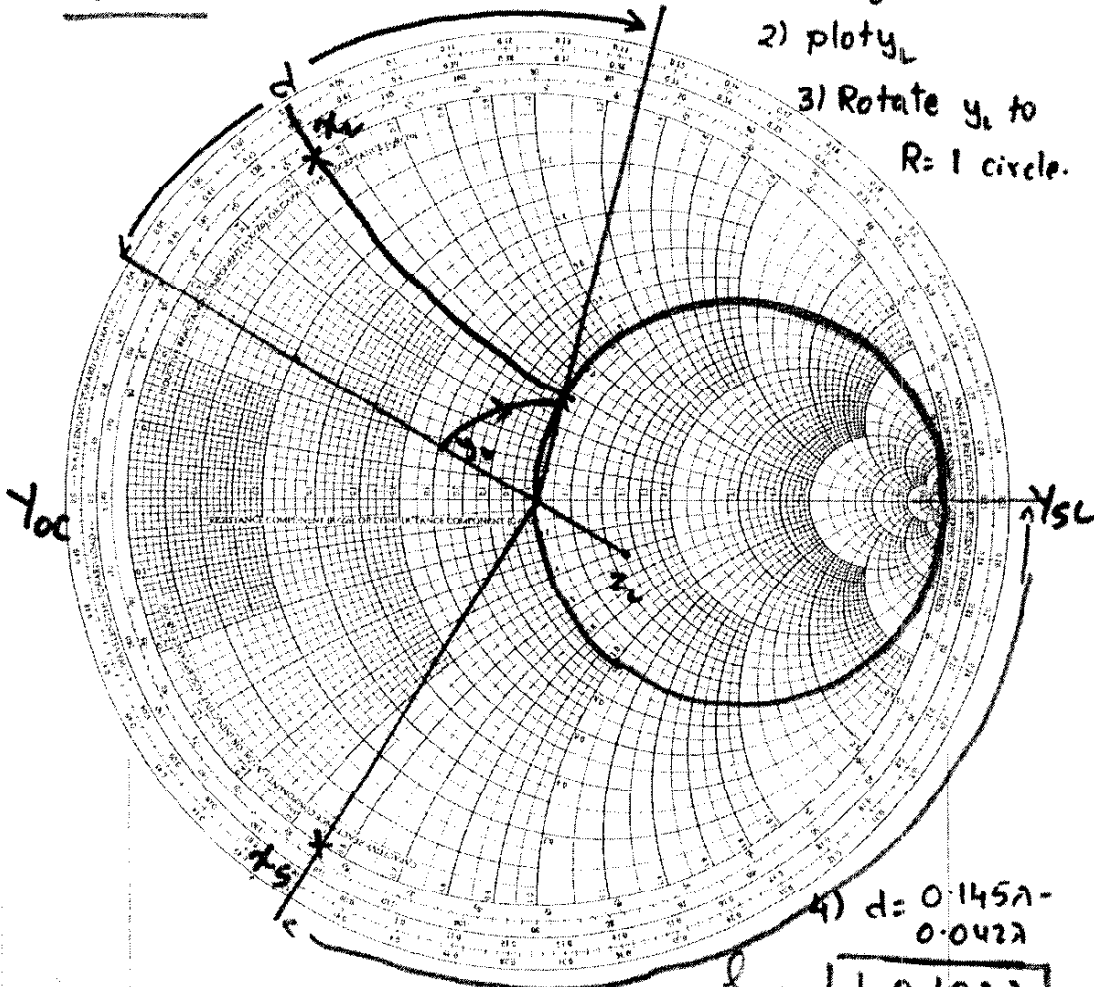
The Complete Smith Chart  
 Black Magic Design

Steps

1)  $z_L = \frac{Z_L}{Z_0} = 1.5 - j0.4$

2) plot  $y_L$

3) Rotate  $y_L$  to  
 $R = 1$  circle.



4)  $d = 0.145\lambda - 0.042\lambda$

$d = 0.103\lambda$

5) Find  $x_L = 0.55$

6)  $x_S = -0.55$

7) length of sc stub

$l_{sc} = 0.42\lambda - 0.25\lambda = 0.17\lambda$