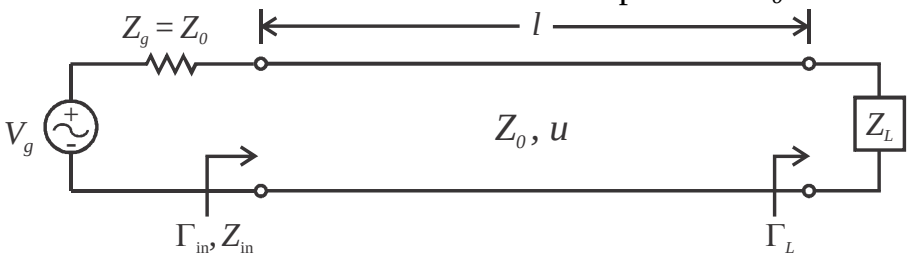
Matching load using a single-stub tuner

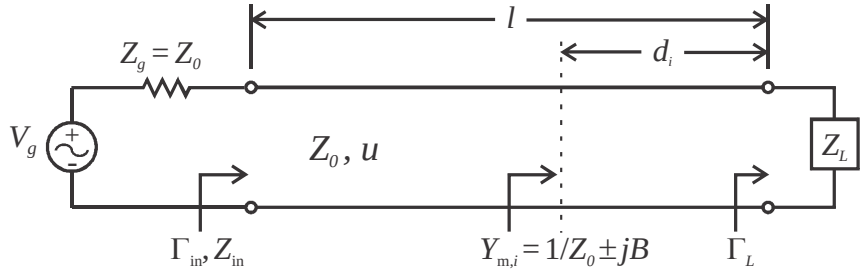
- Assume we have a source matched to characteristic impedance Z_0 of the transmission line.



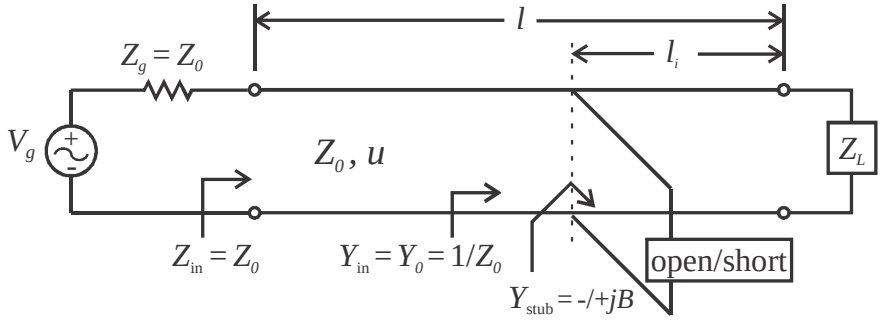
- Therefore, we are seeking to match the load Z_L to Z_0 as well, i.e., we want $Z_{in} = Z_0$.
- To avoid power losses, we will only use purely reactive components for matching.

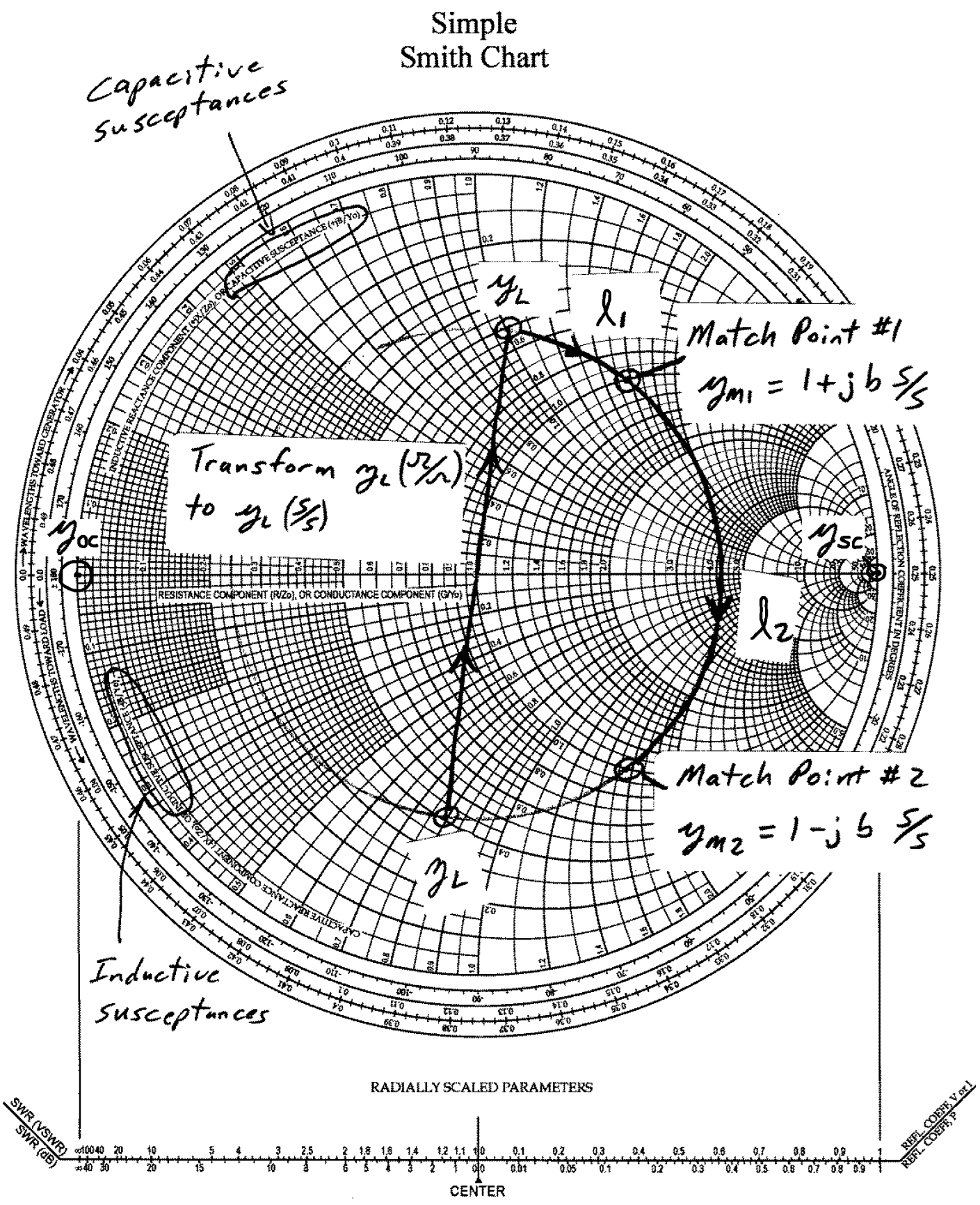
Steps

1) Calculate $z_L = Z_L/Z_0$ and plot on Smith chart.
2) Draw circle, centered on Smith chart, through z_L point. This circle of constant $|\Gamma|$ includes the locus of all possible z_{in} (and y_{in}) along the transmission line with this load.
3) Go $\lambda/4$ around the circle of constant $|\Gamma|$ from z_L point to y_L point.
4) There are two points (i.e., match point points) on the circle of constant $|\Gamma|$ that intersect the circle where the normalized conductance g is equal to one, i.e., $y_{m,i} = 1 \pm jb$. In terms of input admittance this is where $Y_{m,i} = y_{m,i}/Z_0 = 1/Z_0 \pm jB$.
5) Find the distance l_i from y_L to the match points using the "WAVELENGTHS TOWARD GENERATOR" scale.



6) Find length d of a short or open circuit terminated stub (use same transmission line) that will yield a normalized susceptance of $y_{stub} = \mp jb$ by starting at either $y_{SC} = \infty$ or $y_{OC} = 0$ and moving distance d "WAVELENGTHS TOWARD GENERATOR" to $\mp jb$ point.
7) Select one of the match points and the appropriate a short or open circuit terminated stub.
8) Now, everywhere toward the generator from this location will see a normalized input admittance of $y_{in} = y_{m,i} + y_{stub} = (1 \pm jb) \mp jb = 1$ or normalized input impedance $z_{in} = 1$, i.e., $Y_{in} = Y_0$ and/or $Z_{in} = Z_0$.




Simple
Smith Chart
Capacitive susceptances
Transform y_L (S/A) to y_L (S/S)
y_L
l_1
Match Point #1
$y_{m1} = 1 + j\,b$ S/S
y_{OC}
y_{SC}
l_2
Match Point #2
$y_{m2} = 1 - j\,b$ S/S
y_L
Inductive susceptances
RESISTANCE COMPONENT (R/Zo), OR CONDUCTANCE COMPONENT (G/Yo)
INDUCTIVE REACTANCE COMPONENT (+jX/Zo), OR CAPACITIVE SUSCEPTANCE (+jB/Yo)
CAPACITIVE REACTANCE COMPONENT (-jX/Zo), OR INDUCTIVE SUSCEPTANCE (-jB/Yo)
WAVELENGTHS TOWARD GENERATOR
WAVELENGTHS TOWARD LOAD
ANGLE OF REFLECTION COEFFICIENT IN DEGREES
RADIALLY SCALED PARAMETERS
SWR (VSWR)
SWR (dB)
REFL. COEFF. V or I
REFL. COEFF. P
CENTER