Matching load using a shorted single stub

Match a load of $Z_L = 30 - j\,75\ \Omega$ connected to a $75\ \Omega$ generator operating at 900 MHz using a lossless transmission line ($u = 2.1 \times 10^8$ m/s, $75\ \Omega$) and a **short circuit** single-stub tuner made of the same transmission line.

$\lambda = u/f = 23.\overline{3}$ cm

$z_L = \frac{30 - j75}{75} = 0.4 - j1 \quad \Omega/\Omega$

$\Rightarrow$ Plot on Smith Chart

$\Rightarrow$ Rotate 180° to get z_L

or use $y_L = \frac{1}{z_L} = 0.344 + j0.862 \quad S/S$

$\Rightarrow$ Draw circle through z_L & y_L

$\Rightarrow$ Read off match points

$y_{m1} = 1 + j1.85 \quad S/S \qquad y_{m2} = 1 - j1.85 \quad S/S$

$\Rightarrow$ Selecting $y_{m1} \qquad l_1 = 0.1835\lambda - 0.1195\lambda$

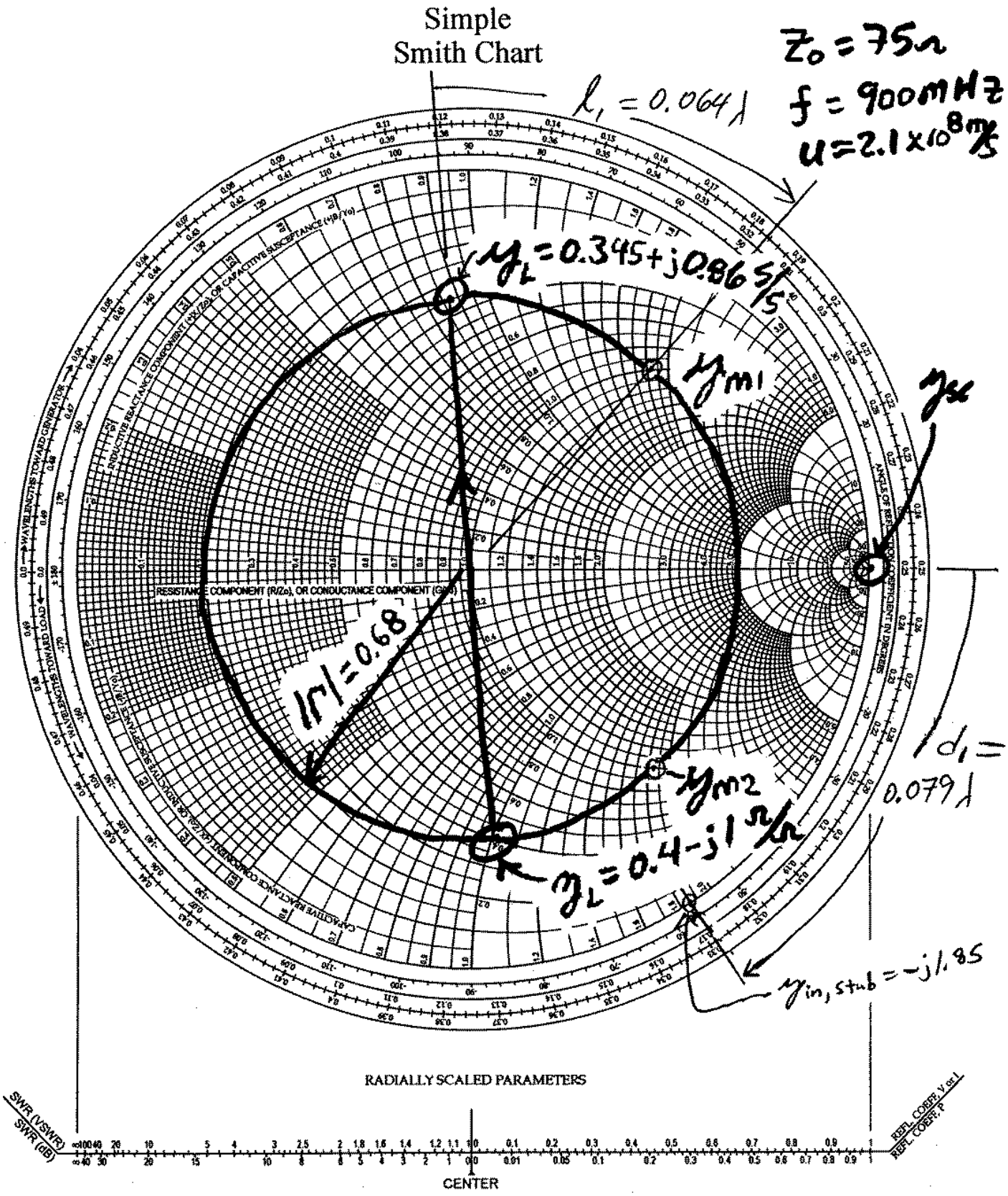
$\underline{l_1 = 0.064\lambda}$

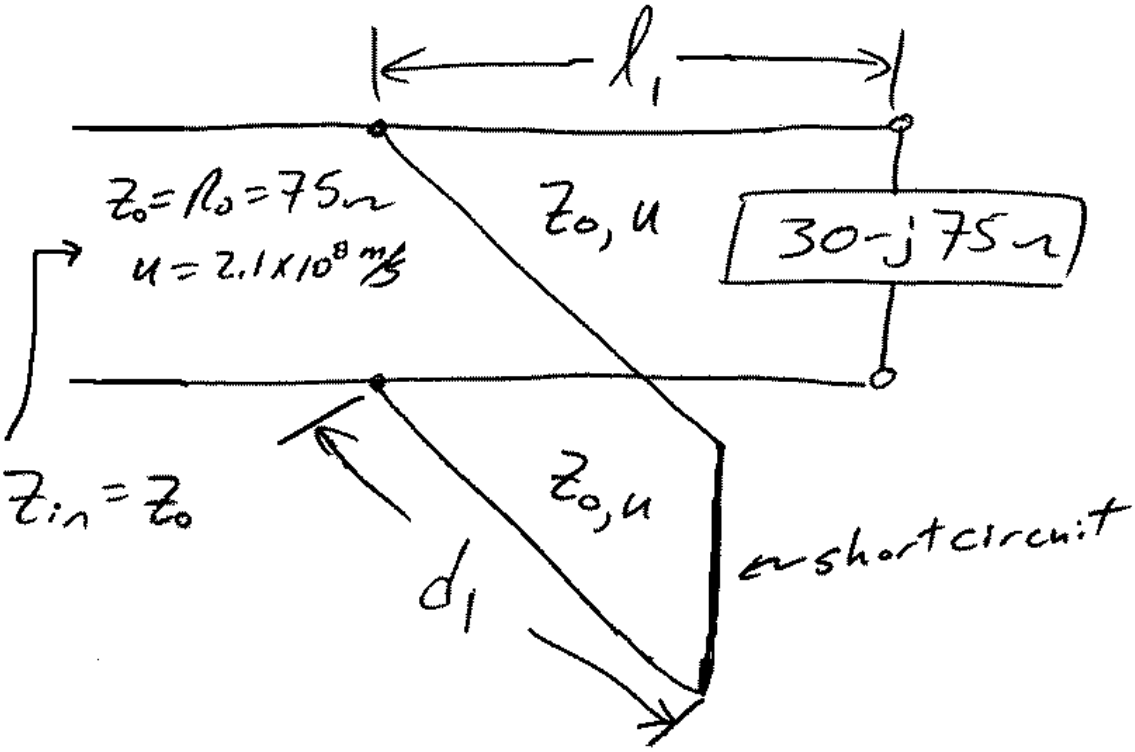
$\Rightarrow$ Use short circuit terminated stub of length

$y_{sc} = \infty \qquad y_{in,stub} = -j1.85 \quad S/S$

$d_1 = 0.329\lambda - 0.25\lambda$

$\underline{d_1 = 0.079\lambda}$


Simple
Smith Chart
$Z_0 = 75\Omega$
$f = 900\,MHz$
$u = 2.1 \times 10^8\,m/s$
$l_1 = 0.064\lambda$
$y_L = 0.345 + j0.865\,S$
y_{m1}
y_{sc}
$|\Gamma| = 0.68$
y_{m2}
$z_L = 0.4 - j1\,\Omega$
$d_1 = 0.079\lambda$
$y_{in,stub} = -j1.85$
RESISTANCE COMPONENT (R/Z0), OR CONDUCTANCE COMPONENT (G/Y0)
INDUCTIVE REACTANCE COMPONENT (+jB/Y0), OR CAPACITIVE SUSCEPTANCE
CAPACITIVE REACTANCE COMPONENT (-jX/Z0), OR INDUCTIVE SUSCEPTANCE
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



where

$$l_1 = 0.064\lambda = \underline{1.49\overline{3}\ \text{cm}}$$

or

$$l_1 = 0.064\lambda + n\,\lambda/2 = \underline{1.49\overline{33} + n\,11.\overline{66}\ \text{cm}}$$

$$d_1 = 0.079\lambda = \underline{1.84\overline{3}\ \text{cm}}$$

or

$$d_1 = 0.079\lambda + n\,\lambda/2 = \underline{1.84\overline{3} + n\,11.\overline{66}\ \text{cm}}$$