For a circuit operating at 100 MHz, design and sketch a single series inductor matching network for a load $Z_L = 100 + j150\ \Omega$ connected to a lossless transmission line ($250\ \Omega$, 2×10^8 m/s). Use Smith chart solution method.

→ Calculate $y_L = \frac{Z_L}{Z_0} = \frac{100+j150}{250} = 0.4 + j0.6$ S

and plot on Smith chart.

→ Draw circle of $|\Gamma| = 0.56$ through y_L

→ Note intersections of $|\Gamma| = 0.56$ circle w/ $r = 1$ circle as

$y_{m1} = 1 + j1.35$ S

capacitive → $y_{m2} = 1 - j1.35$ S

→ Determine distance to y_{m2} to be

$d_{m2} = 0.3281\lambda - 0.0944\lambda = 0.2337\lambda$

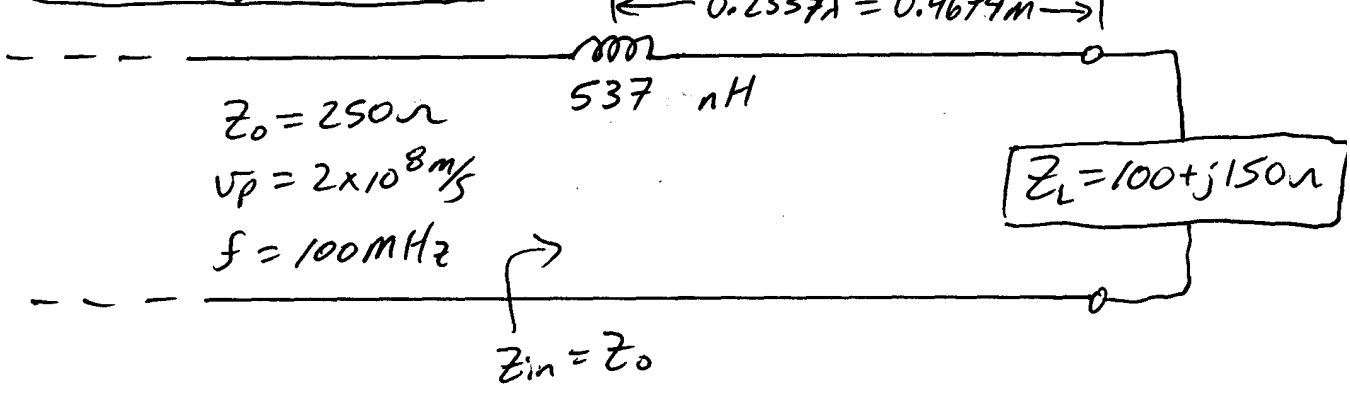
→ Determine series inductor required for match

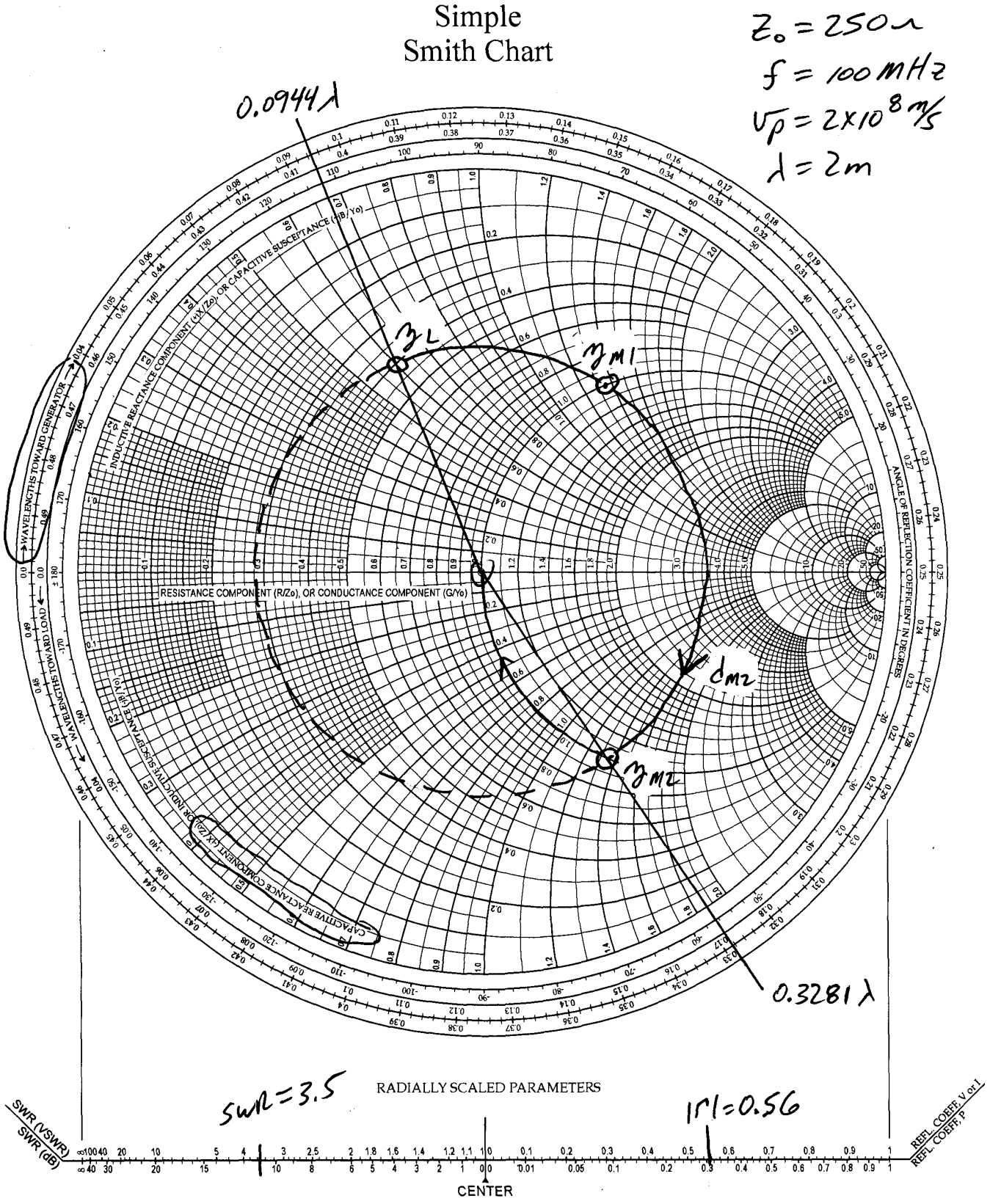
$j\omega L + (-j1.35)250 = 0 \Rightarrow L = \frac{1.35(250)}{2\pi(100 \times 10^6)}$

$L = 5.3715 \times 10^{-7}\ H = 537.15\ nH$

→ Find wavelength $\lambda = v_p/f = \frac{2\times10^8}{100\times10^6} = 2m$

Matching Network




Simple
Smith Chart
$Z_o = 250\Omega$
$f = 100\,MHz$
$v_p = 2\times10^8\,m/s$
$\lambda = 2m$
0.0944λ
0.3281λ
z_L
z_{M1}
z_{M2}
d_{M2}
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
SWR = 3.5
|Γ| = 0.56
RADIALLY SCALED PARAMETERS
SWR (VSWR)
SWR (dB)
REFL. COEFF. V or I
REFL. COEFF. P
CENTER