For a circuit operating at 2.5 GHz, design and sketch a single parallel capacitor matching network for a load $Z_L = 100 - j50\,\Omega$ connected to a lossless transmission line ($25\,\Omega$, $2 \times 10^8$ m/s). Use Smith chart solution method.

→ Calculate $y_L = \frac{Z_L}{Z_0} = \frac{100-j50}{25} = 4 - j2\ \Omega/\Omega$ and plot on Smith Chart.

→ Draw circle of $|\Gamma| = 0.67$ on Smith chart through $y_L$

→ Go $\lambda/4$ around circle to $y_L = 0.2 + j0.1$ S/S

→ Note match points where circle of $|\Gamma| = 0.67$ intersects circle of $g = 1$

$$y_{m1} = 1 + j1.8 \text{ S/S}$$

Inductive → $y_{m2} = 1 - j1.8$ S/S ⇐ select

→ Find distance from $y_L$ to $y_{m2}$

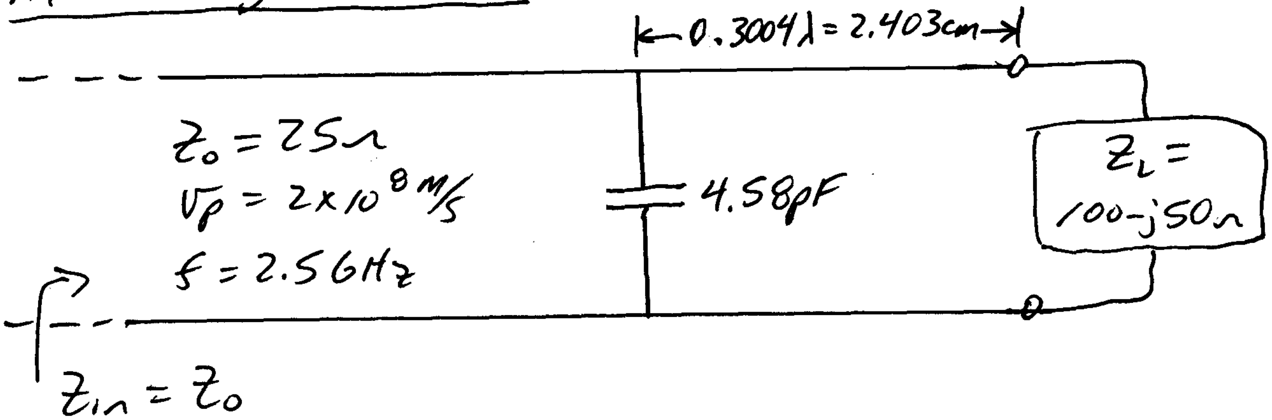
$$d_{m2} = 0.317\lambda - 0.0166\lambda = 0.3004\lambda$$

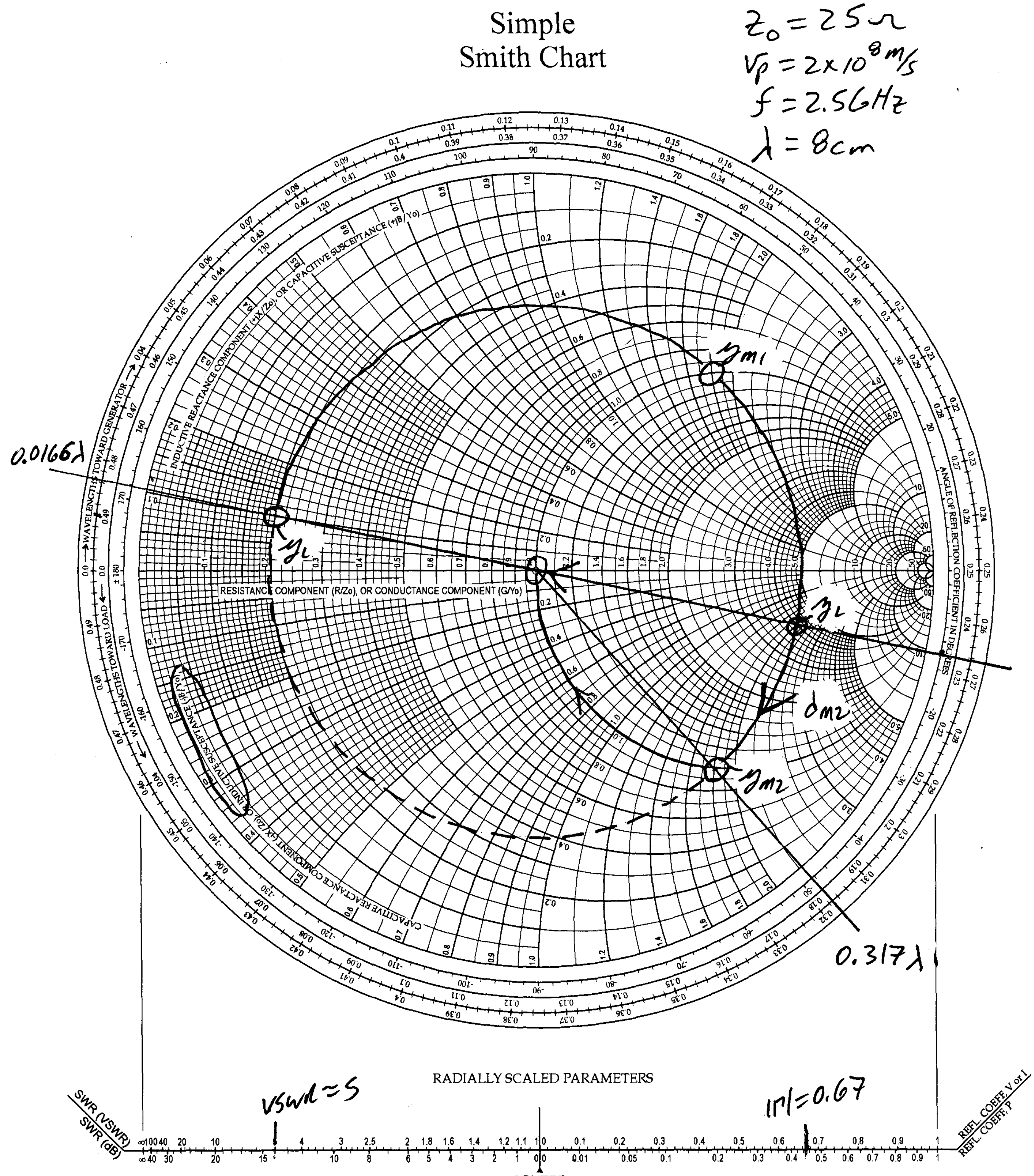
→ Calculate parallel capacitance $\omega C - \frac{1.8}{Z_0} = 0$

$$C = \frac{1.8/25}{2\pi(2.5\times10^9)} = 4.584\times10^{-12}\,F = 4.58\,pF$$

→ Find wavelength $\lambda = \frac{v_p}{f} = \frac{2\times10^8}{2.5\times10^9} = 0.08\,m = 8\,cm$

## Matching Network




Simple
Smith Chart
Z0 = 25Ω
vp = 2x10^8 m/s
f = 2.5GHz
λ = 8cm
0.0166λ
yL
zL
ym1
ym2
0.317λ
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
VSWR ≈ 5
|Γ| = 0.67
SWR (VSWR)
SWR (dB)
REFL. COEFF. V or I
REFL. COEFF. P
CENTER