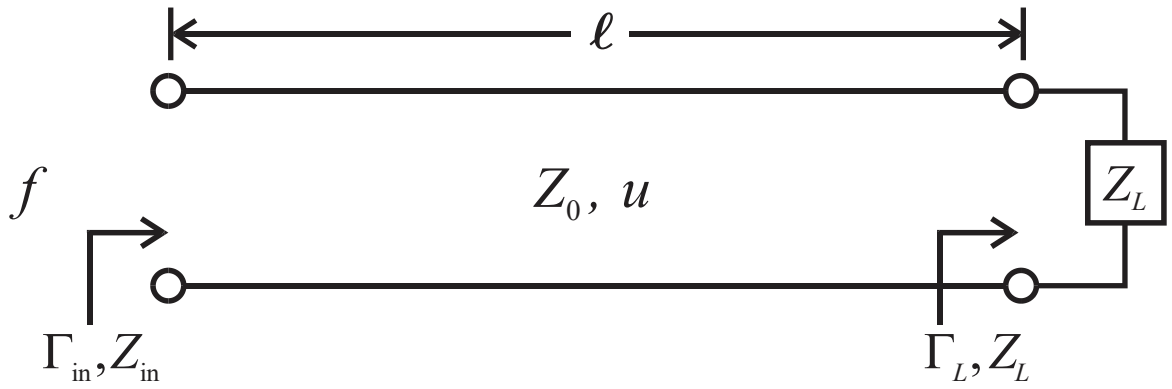


For the lossless transmission line circuit shown, $f = 500\,\text{MHz}$, $u = 2\times10^8\,\text{m/s}$, $\ell = 1.242\,\text{m}$, $Z_0 = 75\,\Omega$, and $\Gamma_{in} = 0.8\angle\text{-}117.5°$.

1) Plot input reflection coefficient and find VSWR

- Use a straight edge to draw radial line from the center of the Smith chart through the -117.5° mark on the "ANGLE OF REFLECTION COEFFCIENT IN DEGREES" scale.
- Use "REFL. COEFF. V or I" scale at bottom right to set compass to $|\Gamma| = 0.8$, and draw arc, centered on the Smith chart, through the -117.5° radial line.
- The intersection of radial line & arc marks $\Gamma_{in} = 0.8\angle\text{-}117.5°$.
- Use compass to draw $|\Gamma| = 0.8$ arc, centered on Smith chart scales, through SWR (VSWR) scale (located below on the left side). Read **VSWR = 9**.

2) Find input impedance

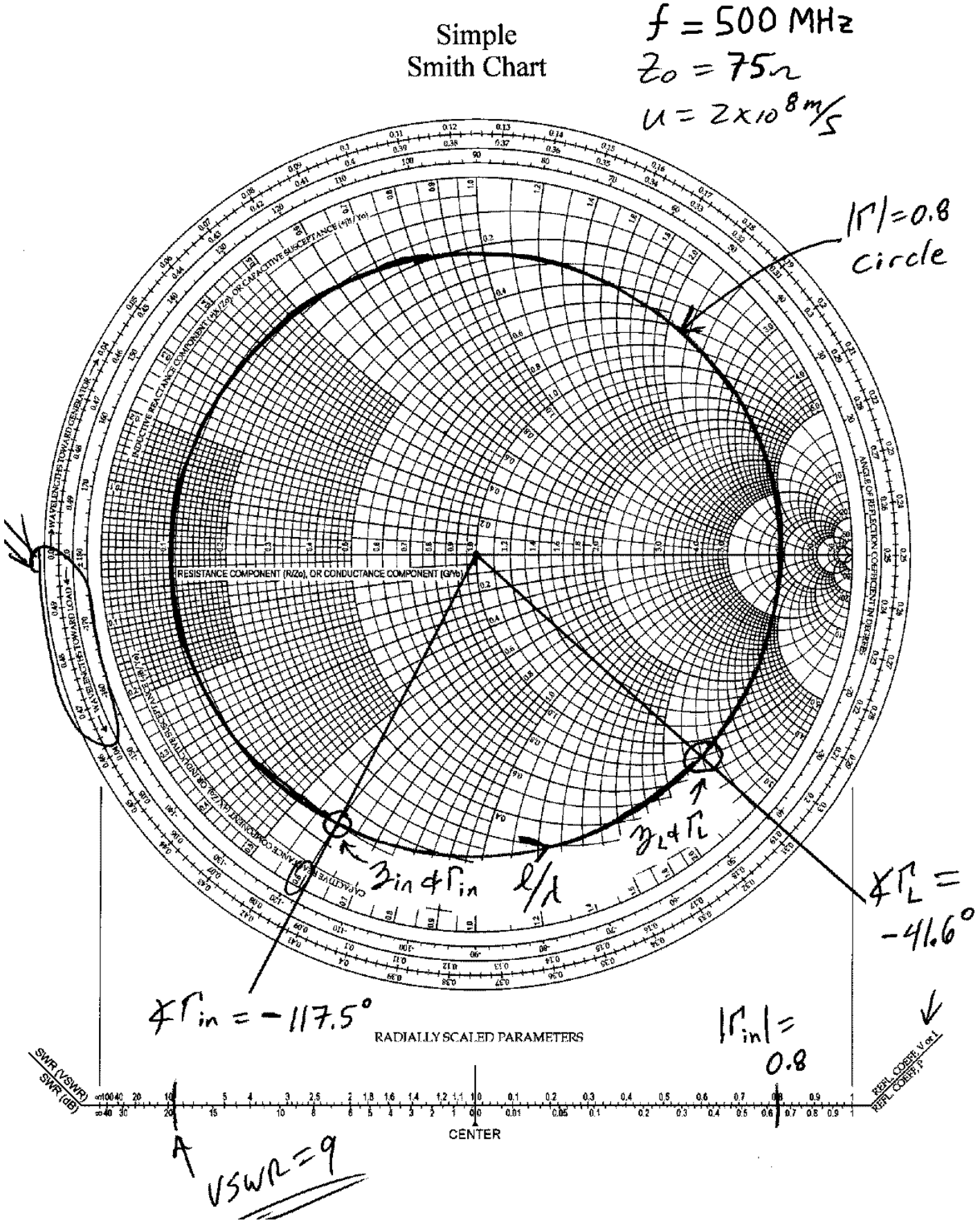
- At $\Gamma_{in} = 0.8\angle\text{-}117.5°$ point, locate and read/interpolate value of appropriate "*r*" circle as $r_{in} = 0.15$.
- At $\Gamma_{in} = 0.8\angle\text{-}117.5°$ point, locate and read/interpolate value of appropriate "*x*" arc as $x_{in} = \text{-}0.60$.
- Put together to get normalized input impedance $\boldsymbol{z_{in} = 0.15 - j0.60\ \Omega/\Omega}$.
- Find input impedance by multiplying z_{in} w/ characteristic impedance to get $Z_{in} = Z_0 z_{in} = 75(0.15 - j0.60) \Rightarrow \boldsymbol{Z_{in} = 11.25 - j45\ \Omega}$.

3) Find load reflection coefficient

- Calculate $\ell/\lambda = \ell f/u = 1.242(500\times10^6)/\,2\times10^8 = 3.105$. Subtract $6(0.5) = 3$ (i.e., remove integer multiples of $n\lambda/2$) to get $\Rightarrow$ $\ell/\lambda = 0.105$.
- Leave compass set to $|\Gamma| = 0.8$ and draw circle centered on the Smith chart.
- Using radial line for $\angle\Gamma_{in} = -117.5°$, read 0.087 on the "WAVELENGTHS TOWARD LOAD" scale. Add $0.087 + \ell/\lambda = 0.087 + 0.105$ to get 0.192 and draw a radial line from the center of the Smith chart through this point on the "WAVELENGTHS TOWARD LOAD" scale. The intersection of this radial line and the $|\Gamma| = 0.8$ circle is the Γ_L point.
- Use "ANGLE OF REFLECTION COEFFCIENT IN DEGREES" scale to read $\angle\,\Gamma_L = -41.6°$.
- Put magnitude and angle together to get **$\Gamma_L = 0.8\angle{-41.6°}$**.

4) Find load impedance

- At the $\Gamma_L = 0.8\angle{-41.6°}$ point, locate and read/interpolate value of appropriate "r" circle as $r_L = 0.8$.
- At the $\Gamma_L = 0.8\angle{-41.6°}$ point, locate and read/interpolate value of appropriate "x" arc as $x_L = -2.4$.
- Put together to get normalized load impedance **$z_L = 0.8 - j2.4\ \Omega/\Omega$.**
- Find load impedance by multiplying z_L with the characteristic impedance to get $Z_L = Z_0\,z_L = 75(0.8 - j2.4) \Rightarrow$ **$Z_L = 60 - j180\ \Omega$**.


Simple
Smith Chart
f = 500 MHz
Z0 = 75Ω
u = 2x10^8 m/s
|Γ| = 0.8
circle
RESISTANCE COMPONENT (R/Z0), OR CONDUCTANCE COMPONENT (G/Y0)
Zin & Γin
l/λ
ZL & ΓL
∠ΓL = -41.6°
∠Γin = -117.5°
|Γin| = 0.8
RADIALLY SCALED PARAMETERS
SWR (VSWR)
SWR (dB)
REFL. COEFF. V or I
REFL. COEFF. P
CENTER
A
VSWR = 9