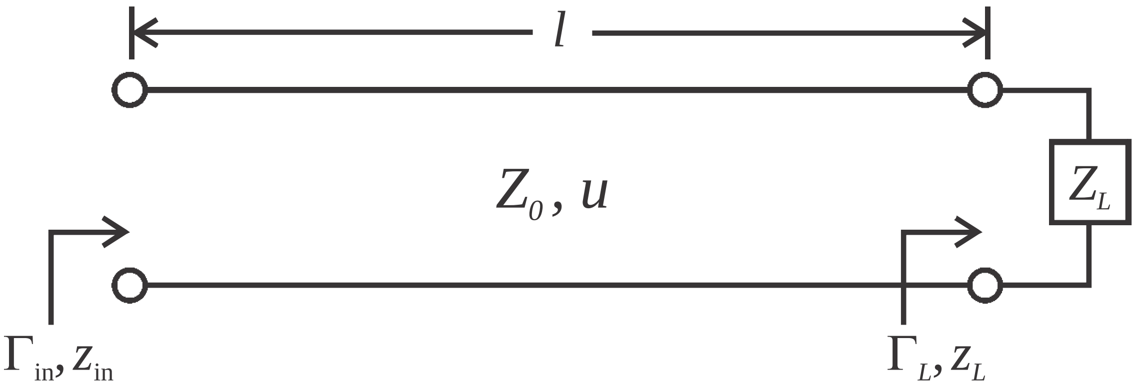


For the lossless transmission line circuit shown: $f = 500$ MHz, $u = 2\times10^{8}$ m/s, $l = 1.242$ m, $Z_0 = 75\,\Omega$, and $\Gamma_{in} = 0.8\angle\text{-}117.5°$.

1) Plot input reflection coefficient and find VSWR

- Use straight edge to draw radial line from center of 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 Smith chart, through -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 on bottom left. Read **VSWR = 9** .

2) Find input impedance

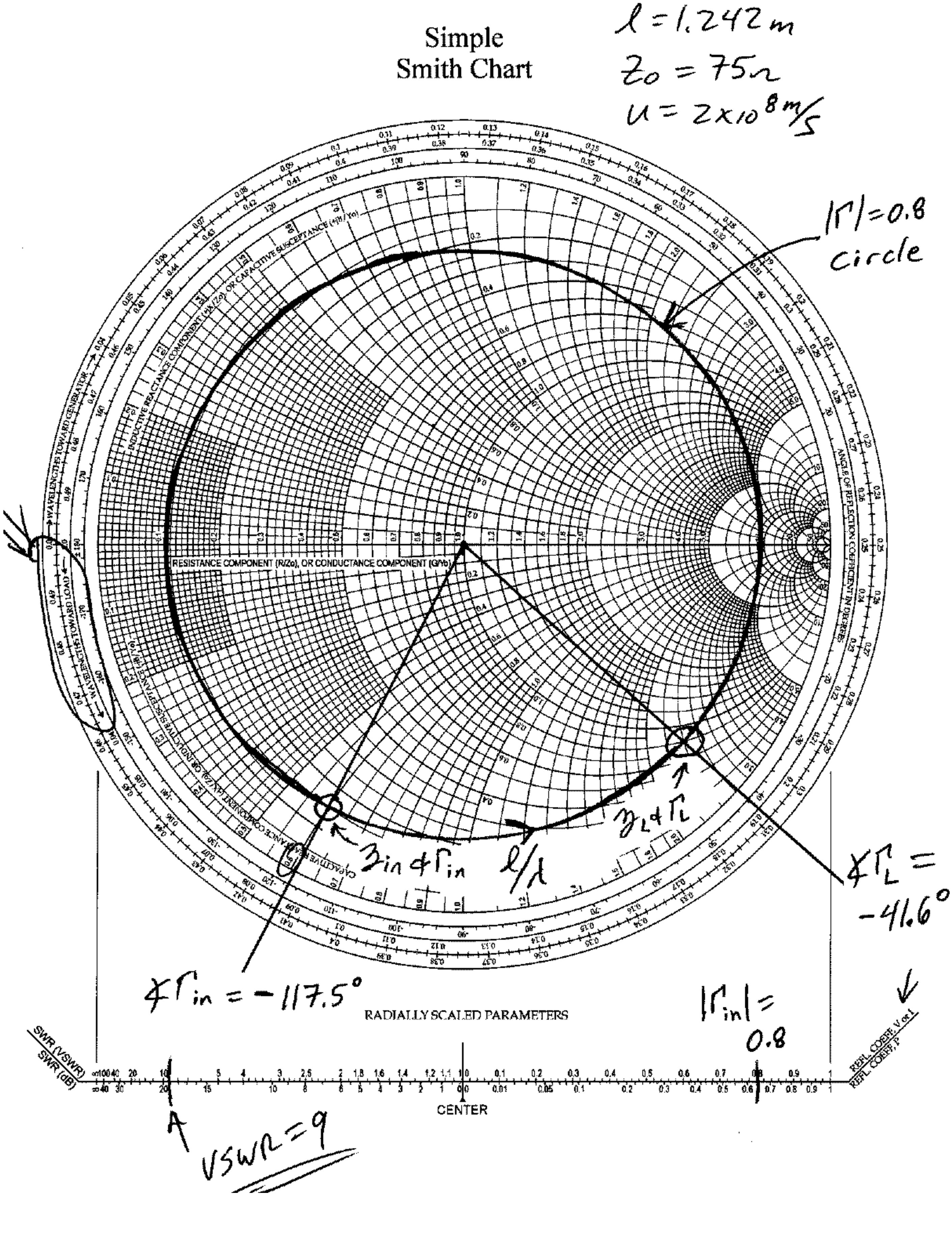
- At $\Gamma_{in} = 0.8\angle\text{-}117.5°$ point, locate and read/interpolate value of appropriate "r" circle as $r_{in} = 0.15$.
- At $\Gamma_{in} = 0.8\angle\text{-}117.5°$ point, locate and read/interpolate value of appropriate "x" arc as $x_{in} = -0.60$.
- Put together to get normalized input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

3) Find load reflection coefficient

- Calculate $l/\lambda = l\,f/u = 1.242(500 \times 10^6)/\ 2 \times 10^8 = 3.105$. Subtract 6(0.5) = 3 (i.e., remove integer multiples of $n\lambda/2$) to get $\Rightarrow$ $\underline{l/\lambda = 0.105}$.
- Leave compass set to $|\Gamma| = 0.8$ and draw circle centered on Smith chart.
- Using radial line for $\angle\Gamma_{in} = -117.5°$, read 0.087 on the "WAVELENGTHS TOWARD LOAD" scale. Add 0.087 + l/λ to get 0.192 and draw a radial line from the center of the Smith chart through this point on the scale.
- Use "ANGLE OF REFLECTION COEFFCIENT IN DEGREES" scale to read $\underline{\angle\,\Gamma_L = -41.6°}$.
- Put magnitude and angle together to get $\underline{\boldsymbol{\Gamma_L = 0.8\angle\text{-}41.6°}}$.

4) Find load impedance

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


Simple
Smith Chart
l = 1.242 m
Zo = 75 Ω
u = 2x10^8 m/s
|Γ| = 0.8
circle
RESISTANCE COMPONENT (R/Zo), OR CONDUCTANCE COMPONENT (G/Yo)
zL & ΓL
zin & Γin
l/λ
∡ΓL =
-41.6°
∡Γin = -117.5°
RADIALLY SCALED PARAMETERS
|Γin| =
0.8
SWR (VSWR)
SWR (dB)
CENTER
REFL. COEFF. V or I
REFL. COEFF. P
A
VSWR = 9