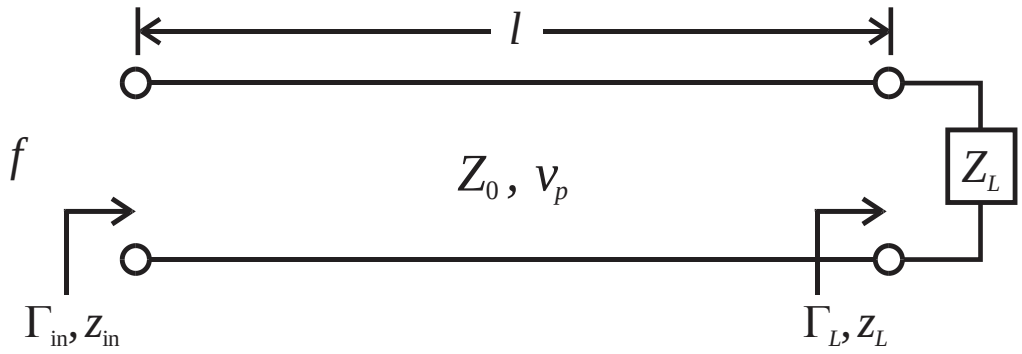


For the lossless transmission line circuit shown: $f = 500\,\text{MHz}$, $v_p = 2\times10^8\,\text{m/s}$, $l = 1.242\,\text{m}$, $Z_0 = 75\,\Omega$, and $\Gamma_{in} = 0.8\angle{-117.5°}$.

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 $\underline{\Gamma_{in} = 0.8\angle{-117.5°}}$.
- Use compass to draw $|\Gamma| = 0.8$ arc, centered on Smith chart scales, through SWR (VSWR) scale on bottom left. Read **$\underline{\text{VSWR} = 9}$.**

2) Find input impedance

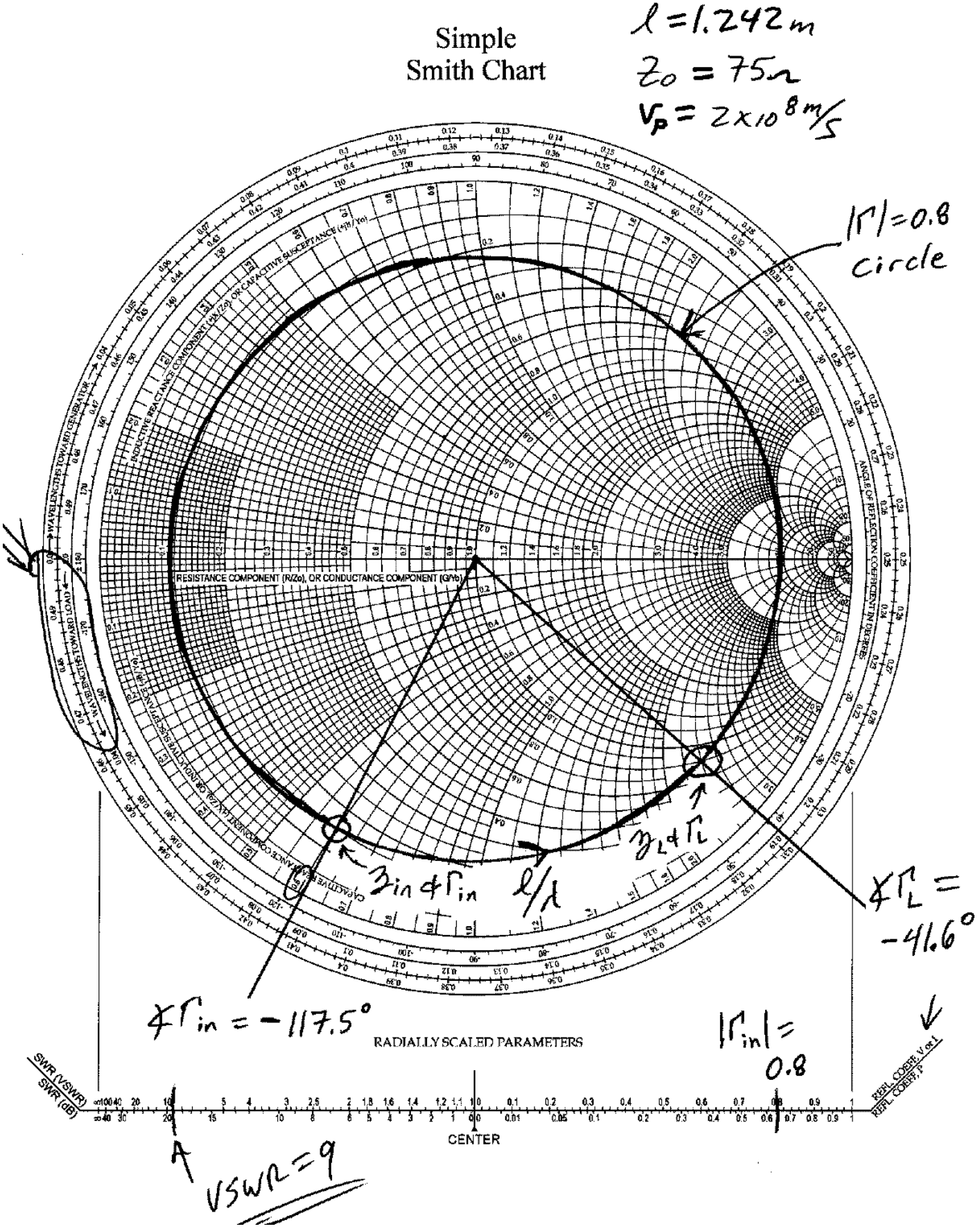
- At $\Gamma_{in} = 0.8\angle{-117.5°}$ point, locate and read/interpolate value of appropriate "*r*" circle as $\underline{r_{in} = 0.15}$.
- At $\Gamma_{in} = 0.8\angle{-117.5°}$ point, locate and read/interpolate value of appropriate "*x*" arc as $\underline{x_{in} = -0.60}$.
- Put together to get <u>normalized</u> input impedance **$\underline{\boldsymbol{z}_{in} = 0.15 - j\,0.60\ \Omega/\Omega}$.**
- Find input impedance by multiplying z_{in} w/ characteristic impedance to get $Z_{in} = Z_0\, z_{in} = 75(0.15 - j\,0.60) \Rightarrow \underline{\boldsymbol{Z_{in} = 11.25 - j\,45\ \Omega}}$.

3) Find load reflection coefficient

- Calculate $l/\lambda = l\,f\,/\,v_p = 1.242(500\times10^6)/\,2\times10^8 = 3.105$. Subtract 6(0.5) = 3 (i.e., remove integer multiples of $n\lambda/2$) to get $\Rightarrow$ $\underline{l/\lambda = 0.105}$.
- 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 $\mathbf{\underline{\Gamma_L = 0.8\angle -41.6°}}$.

4) Find load impedance

- At $\Gamma_L = 0.8\angle -41.6°$ point, locate and read/interpolate value of appropriate "*r*" circle as $\underline{r_L = 0.8}$.
- At $\Gamma_L = 0.8\angle -41.6°$ 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 $\mathbf{\underline{z_L = 0.8 - j\,2.4\ \Omega/\Omega}}$**.**
- Find load impedance by multiplying z_L w/ characteristic impedance to get $Z_L = Z_0\,z_L = 75(0.8 - j2.4) \Rightarrow \mathbf{\underline{Z_L = 60 - j\,180\ \Omega}}$.


Simple
Smith Chart
$\ell = 1.242\,m$
$Z_0 = 75\Omega$
$V_p = 2\times10^8\,m/s$
$|\Gamma| = 0.8$ circle
$\angle\Gamma_L = -41.6°$
$Z_{in}\ \&\ \Gamma_{in}$
ℓ/λ
$Z_L\ \&\ \Gamma_L$
$\angle\Gamma_{in} = -117.5°$
$|\Gamma_{in}| = 0.8$
RESISTANCE COMPONENT (R/Zo), OR CONDUCTANCE COMPONENT (G/Yo)
RADIALLY SCALED PARAMETERS
SWR (VSWR)
SWR (dB)
REFL COEFF. V or I
REFL COEFF. P
CENTER
A
VSWR = 9