11.41 A lossless 100 Ω transmission line is terminated in an unknown impedance Z_L. The standing wave ratio is 2.4, and the nearest voltage minimum is 0.2 λ from the load. Find Z_L and Γ.

- Use Smith chart. Also, find Z_{min}.

1) Using the "SWR (VSWR)" scale, set compass to 2.4. Then, use compass to draw a circle, centered on Smith chart.

2) Read r_{min} = 0.417 where the circle intersects the real axis to left of center. Unnormalize to get $Z_{min} = z_{min} Z_0 = (0.417)100 \Rightarrow \boxed{\boldsymbol{Z_{min} = 41.7\ \Omega}}$.

3) Next, use compass to mark the "REFL. COEFF. V or I" scale below Smith chart on right side to find $|\Gamma| = |\Gamma| = 0.41$.

4) Use a straight edge to draw radial line from center of Smith chart through r_{min} and outer rings of Smith chart at **0** on "WAVELENGTHS TOWARD LOAD" scale. Use a straight edge to draw radial line from center of Smith chart through 0.2 on "WAVELENGTHS TOWARD LOAD" scale.

5) At intersection of this radial line and the $|\Gamma| = 0.41$ circle, read normalized load impedance to be $z_L = 1.65 - j0.96\ \Omega/\Omega$. Calculate load impedance to be $Z_L = z_L Z_0 = (1.65 - j0.96)100 \Rightarrow \boxed{\boldsymbol{Z_L = 165 - j96\ \Omega}}$.

6) Use the "ANGLE OF REFLECTION COEFFICIENT IN DEGREES" scale to read $\angle \Gamma_L = -36°$. Put magnitude and angle of the load reflection coefficient together to get $\Rightarrow \boxed{\boldsymbol{\Gamma = \Gamma_L = 0.41\angle -36°}}$.

Simple Smith Chart