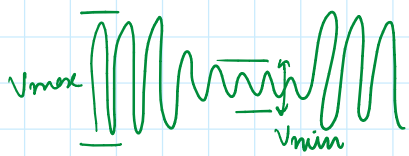
Lec-22

Wednesday, March 11, 2020 8:58 AM

$$VSWR = \frac{|V_{max}|}{|V_{min}|}$$



Example 2: $Z_L = 65 - j75\ \Omega$

$Z_0 = 50\Omega$

Calculate Γ_L, ϕ_L

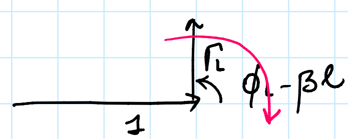
Step 1: $\bar{Z}_L = \frac{65 - j75}{50} = 1.3 - j1.5$

Step 2: Draw constant VSWR circle

Step 3: Measure the radius of the VSWR circle : 4.6 cm

Step 4: Measure the radius of the Smith Chart : 8.3 cm

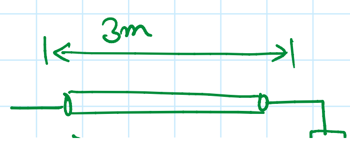
Step 5: Calculate $\Gamma_L = \frac{4.6\ cm}{8.3\ cm} = 0.55$

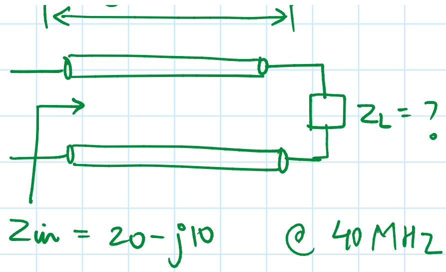


Example 3: $Z_0 = 50\Omega$

$\epsilon_r = 2.25$

$l = 3m$ (Transmission line length)





1. $Z_L = ?$

2. Position of Vmin in meters from the load.

Steps 1: Normalize the Zin → $\bar{Z}_{in} = \frac{20-j10}{50} = 0.4 - j0.2$

Step 2: $\lambda = \frac{c}{\sqrt{\epsilon_r}} \frac{1}{f}$

$$\lambda = \frac{3\times10^8}{\sqrt{2.25}} \cdot \frac{1}{40\times10^6} = 5m$$

$$l\ (\text{in } \lambda) = \frac{3m}{5m} = 0.6\lambda$$

Step 3: Go towards the load → Counter clockwise rotation → 0.6λ

$$l = 0.5\lambda + 0.1\lambda$$

$$2\beta l = 2\pi$$

$$2 \cdot \frac{2\pi}{\lambda} \cdot l = 2\pi$$

$$l = \lambda/2$$

Step 4: Draw a line & measure λ at $\bar{Z}_{in}$: λ = 0.036 (line A)

Step 5: Find a point on the dial (towards load) at λ = 0.136

Step 6: Draw a line from centre to λ = 0.136 — line - B

Step 7 : Draw a constant VSWR circle intersect line B and read out

$\bar{Z}_L = 0.73 - j0.82$

Step 8 : $Z_L = 50(0.73 - j0.82)\ \Omega$

$$Z_L = 36.5 - j41\ \Omega$$

Maxima & Minima of Voltage

$V_{max} = V^+(1 + |\Gamma_L|)$

$V_{min} = V^+(1 - |\Gamma_L|)$

Step 1: Identify the position of V_{min} → Intersection of VSWR circle & the horizontal line (left side)

Step 2: Measure the distance b/w $\bar{Z}_L$ & V_{min} point in terms of λ

$\lambda = 0.136$ $\{\lambda = 5m\}$

Distance of V_{min} from load $= 5m \times 0.136 = 0.68m$ from load.