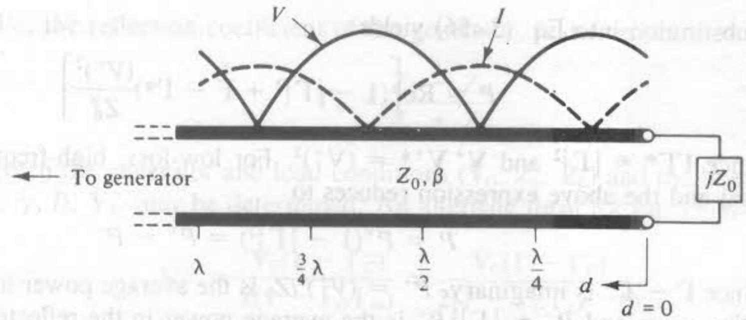

Figure 3–12 Standing-wave patterns for a reactively terminated line with $Z_L = +jZ_0$. ($\alpha = 0$.)

reflections occur. For $R_L > Z_0$, Γ_L is positive and a voltage maximum (current minimum) exists at the load. In this case,

$$\text{SWR} = \frac{R_L}{Z_0} \quad \text{since} \quad |\Gamma_L| = \frac{R_L - Z_0}{R_L + Z_0}$$

For $R_L < Z_0$, Γ_L is negative and a voltage minimum (current maximum) exists at the load. In this case,

$$\text{SWR} = \frac{Z_0}{R_L} \quad \text{since} \quad |\Gamma_L| = \frac{Z_0 - R_L}{Z_0 + R_L}$$

Thus if Z_L is *purely resistive*,

$$\text{SWR} = \frac{R_L}{Z_0} \quad \text{or} \quad \frac{Z_0}{R_L} \quad \text{whichever is greater than unity.} \tag{3–55}$$

For any finite value of R_L, SWR is finite and $|\Gamma_L| < 1$. This means that some of the incident power is absorbed by the load.

3–4c Power Flow Along Terminated Lines

The general problem of power flow along a terminated transmission line will now be discussed. Figure 3–10 shows a line of length l driven by an ac source and terminated in a load Z_L. $\mathbf{V}_G$ is the open-circuit voltage of the generator and Z_G is its internal impedance. From ac theory, the average power flow into an impedance Z is given by

$$P = \text{Re}\,(\mathbf{VI}^*) = VI\cos\theta_{\text{pf}} \tag{3–56}$$

where V and I are rms values, θ_{pf} is the power-factor angle and * denotes the complex conjugate. This equation also applies to the average power flow at any point along a transmission line, the direction of flow being from the generator toward the load. The voltage and current on the line are given by Eqs. (3–14) and (3–16). With $\mathbf{V}^+ = \mathbf{I}^+ Z_0$ and $\mathbf{V}^- = \Gamma\mathbf{V}^+$, they may be rewritten as

$$\mathbf{V} = \mathbf{V}^+(1 + \Gamma) \quad \text{and} \quad \mathbf{I} = \frac{\mathbf{V}^+}{Z_0}(1 - \Gamma) \tag{3–57}$$