

Problem 2.25 Apply CD Module 2.4 to generate plots of the voltage standing-wave pattern for a $50\text{-}\Omega$ line terminated in a load impedance $Z_L = (100 - j50)\text{ }\Omega$. Set $V_g = 1\text{ V}$, $Z_g = 50\text{ }\Omega$, $\epsilon_r = 2.25$, $l = 40\text{ cm}$, and $f = 1\text{ GHz}$. Also determine S , d_{\max} , and d_{\min} .

Solution:

Module 2.4

Transmission Line Simulator

Options: Set Input / Output

d =

λ

Z_g

V_g

$Z_g = 50.0 + j\,0.0\text{ }\Omega$
 $V_g = 1.0 + j\,0.0\text{ V}$

$d = 0.0\lambda = 0.0\text{ m}$

$Z_0 = 50.0 + j\,0.0\text{ }\Omega$
 $\epsilon_r = 2.25$

$f = 1.0\text{ GHz}$
 $\lambda = 200.0\text{ mm}$

$Z_L = 100.0 - j\,50.0\text{ }\Omega$

$d = 2.0\lambda = 400.0\text{ mm}$

$d = 0$

Set Line

Length units: ☐ $[\lambda]$ ☒ $[\text{m}]$

Low Loss Approximation

Characteristic Impedance $Z_0 = 50\text{ }\Omega$

Frequency $f = 1\text{E}9\text{ Hz}$

Relative Permittivity $\epsilon_r = 2.25$

Line Length $l = 0.4\text{ [m]}$

Update

$Z_L = 100 + j\, -50\text{ }\Omega$
☒ Impedance ☐ Admittance

Update

Set Generator

$V_g = 1 + j\, 0\text{ V}$
 $Z_g = 50 + j\, 0.0\text{ }\Omega$

Update

Output

Transmission Line Data 2

SWR = 2.618 (load)

Amplitude of Incident Voltage Wave [V]

 $V_0^+ = 0.5 + j\,0.0$
 $= 0.5\text{ } \angle 0.0\text{ rad}$

Location of First Voltage Maximum & Minimum

 $d(\text{max}) = 0.4631\lambda = 92.6208\text{ mm}$
 $d(\text{min}) = 0.2131\lambda = 42.6208\text{ mm}$

TIME-AVERAGE POWER

 $P(\text{abs}) = 2.0\text{ [mW]}$
 $P(Z_g) = 1000.0\text{ [}\mu\text{W]}$

Absorbed by load

Absorbed by Z_g

