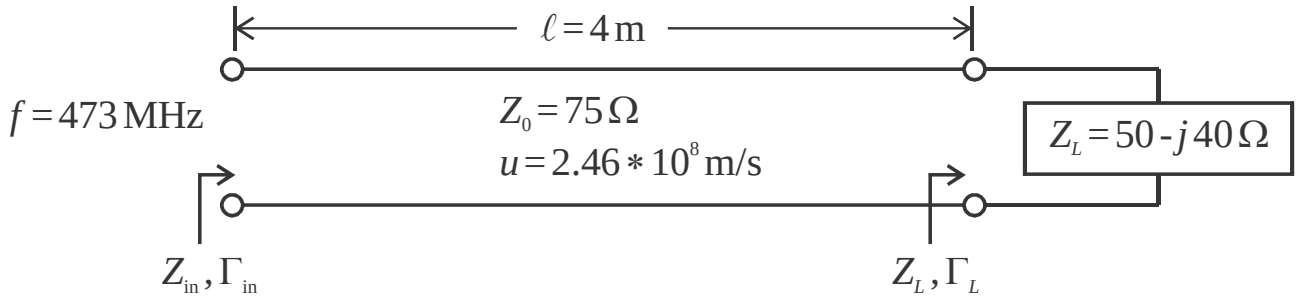
At 473 MHz, a load has an impedance of 50 - *j* 40 Ohms. If it is attached to a lossless transmission line (similar to RG-6) where Z_0 = 75 Ohms, *u* = 2.46 x 10^8 m/s, & *l* = 4 m, calculate phase constant, wavelength, electrical length, reflection coefficients at the input and load ends of the transmission line, input impedance, and standing wave ratio.



Given: f := 473 · 10^6 Hz L := 4 m u := 2.46 · 10^8 m/s

Z0 := 75 Ω ZL := 50 − j · 40 Ω

Phase constant, wavelength, and electrical length:

$\beta := \frac{2 \cdot \pi \cdot f}{u}$ $\beta = 12.081$ rad/m

$\lambda := \frac{u}{f}$ $\lambda = 0.5201$ m

$\beta L := \beta \cdot L$ $\beta L = 48.324$ rad $\beta L \cdot \frac{180}{\pi} = 2768.8$ deg $\frac{\beta L}{2 \cdot \pi} = 7.691$ λ

Reflection coefficients:

$\Gamma L := \frac{ZL - Z0}{ZL + Z0}$ $|\Gamma L| = 0.3594$ $\arg(\Gamma L) \cdot \frac{180}{\pi} = -104.261$ deg

$\Gamma 0 := \Gamma L \cdot e^{-j \cdot 2 \cdot \beta L}$ $|\Gamma 0| = 0.3594$ $\arg(\Gamma 0) \cdot \frac{180}{\pi} = 118.178$ deg

Input impedance and standing wave ratio:

$Zin := Z0 \cdot \frac{(1 + \Gamma 0)}{1 - \Gamma 0}$ $Zin = 44.472 + 32.358i$ Ω

$S := \frac{(1 + |\Gamma 0|)}{(1 - |\Gamma 0|)}$ $S = 2.122$