

1. Write a code to simulate the response of a lossy twisted-pair 100-meter cable terminated with linear resistive loads. Test your program using the example shown below. Use $Z_1 = 50 \Omega$ and $Z_2 = 10 \text{ k}\Omega$.

The characteristic impedance of the lossy line is given by $Z_o(f) = \sqrt{\frac{Z(f)}{Y(f)}} = \sqrt{\frac{R + j\omega L}{G + j\omega C}}$

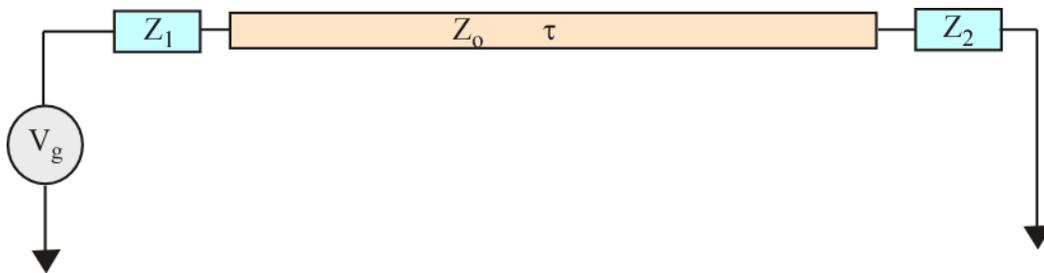
The propagation constant is $\gamma = \sqrt{Z(f)Y(f)} = \sqrt{(R + j\omega L)(G + j\omega C)} = \alpha + j\beta$

The parameters of the cable are $L = 145 \text{ nH/m}$, $C = 14 \text{ pf/m}$. Ignore the dielectric loss ($G = 0$). The skin effect resistance is: $R_o = 5.0 \Omega / m - \sqrt{\text{GHz}}$. Show near and far end plots for two different loss models:

(a) $Z(f) = R_o \sqrt{f} + jL\omega$

(b) $Z(f) = R_o \sqrt{f} + jR_o \sqrt{f} + jL\omega$

Which model is correct? Why?



The pulse characteristics for $V_g(t)$ are as shown in the figure below, with time delay: $t_d = 5 \text{ ns}$, rise time: $t_r = 2 \text{ ns}$, fall time: $t_f = 2 \text{ ns}$, pulse width: $t_w = 20 \text{ ns}$, pulse amplitude: $V_{\text{max}} = 1 \text{ volt}$

