

Pipe info

L:= 1.5 m ' estimating short is conservative

D:= 0.1 m ' estimating too big is conservative

$$A:= \frac{3.14 \cdot D^2}{4}$$

$$A= 0.0078 \text{ m}^2$$

assume two pipes in parallel

Calculate resistance

$$\text{sigma}:= 6 \frac{\text{farad}}{\text{sec m}} \quad \text{same_as} \left(\frac{\text{ohm}}{\text{m}} \right) \cdot \blacksquare$$

$$R_{\text{pipe}}:= \frac{L}{\text{sigma} \cdot A}$$

$$R_{\text{pipe}}= 31.8471 \Omega$$

$$R_{\text{total}}:= \frac{R_{\text{pipe}}}{2} \quad \text{' assume two pipes in parallel}$$

$$R_{\text{total}}= 15.9236 \Omega$$

Calculate Capacitance

$$\text{epsilon}_0:= 8.854 \cdot 10^{-12} \frac{F}{m}$$

$$\text{epsilon}_R:= 80$$

$$C:= \text{epsilon}_0 \cdot \text{epsilon}_R \cdot \frac{A}{L}$$

$$C= 3.7069 \cdot 10^{-12} F$$

$$C_{\text{total}}:= 2 \cdot C \quad \text{' two pipes in parallel}$$

$$C_{\text{total}}= 7.4137 \cdot 10^{-12} F$$

$$\text{Tau}:= R_{\text{total}} \cdot C_{\text{total}}$$

$$\text{Tau}= 1.1805 \cdot 10^{-10} s$$

' tau is much smaller than the period of credible frequency of interest.
 ' so the conduction is primarily in the resistance, not the capacitance