Transmission Line Modeling

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Transmission Line

**Figure 4-1** Transmission line.
Transmission Line Facts

- Transmission lines are
  - Symmetric
  - Can be represented by an equivalent model on a “per-phase” basis

- There are three types of transmission lines. We need to model them differently.
  - Long transmission line (> 150 miles): Distributed components
  - Medium transmission line (50 – 150 miles): Lumped Components
  - Short transmission line (< 50 miles): Lumped components
Long Transmission Line

- Read page 91 and 92
- \( dV = Izdx, \ dI = (V + dV) \cdot ydx = Vydx \)
- \( \gamma^2 = yz, \ \gamma = (yz)^{0.5} \), \( \gamma = \text{Propagation constant of the line} \)
- \( Zc = (z/y)^{0.5} = \text{Characteristic impedance of the line} \)
Long Transmission Line (Cont.)

- \( V_1 = V_2 \cosh(\gamma l) + Z_c I_2 \sinh(\gamma l) \)
- \( I_1 = I_2 \cosh(\gamma l) + (V_2 / Z_c) \sinh(\gamma l) \)

Do example 4.1 and 4.2