2.7 – Lossy Transmission Lines

Reading Assignment: *pp. 79-82*

Recall that we have been **approximating** low-loss transmission lines as lossless ($R = G = 0$):

$$\alpha = 0 \qquad \beta = \omega\sqrt{LC}$$

But, **long** low-loss lines require a **better** approximation:

$$\alpha = \frac{1}{2}\left(\frac{R}{Z_0} + GZ_0\right) \qquad \beta = \omega\sqrt{LC}$$

Now, if we have **really long** transmission lines (e.g., long distance communications), we can apply **no** approximations at all:

$$\alpha = Re\{\gamma\} \qquad \beta = Im\{\gamma\}$$

For these **very** long transmission lines, we find that $\beta = Im\{\gamma\}$ is a **function** of signal **frequency** ω. This results in an extremely serious problem—signal **dispersion**.

HO: The Distortionless Line