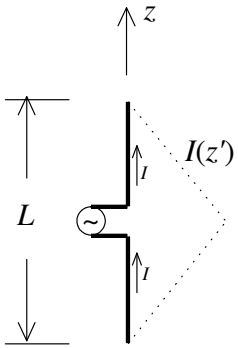


1. For a short dipole antenna of length L (not a Hertzian dipole) the current distribution may be regarded to be triangular as shown. Take the current at the feed gap to be I_0 and assume that the dipole is directed along the z axis. (a) Determine the expression for the current $I(z')$ along the antenna. (b) The effective length L_{eff} of the antenna is defined as the length of a corresponding antenna which carries a uniform current I_0 over its entire length and which produces the same far-field electric field as the antenna in (a). Mathematically,

$$L_{\text{eff}} = \frac{1}{I_0} \int_{-L/2}^{L/2} I(z') dz' .$$

Determine the effective length of the short dipole in (a).

- (c) Determine the vector potential A_z for the antenna in part (a) assuming $|\vec{r} - \vec{r}'|$ may be approximated as r in both magnitude and phase.



2. Show that when $E_{x_0} = E_{y_0} = E_0$ and $\phi_b - \phi_a = \pm \frac{\pi}{2}$ that the following wave is circularly polarized:

$$\vec{E} = E_{x_0} \cos(\omega t - kz + \phi_a) \hat{x} + E_{y_0} \cos(\omega t - kz + \phi_b) \hat{y} .$$

What additional the condition must be stipulated for LHC or RHC polarization?

3. Determine that the following wave is RHC polarized.

$$\vec{E} = [(1 + j)\hat{x} + (1 - j)\hat{y}]e^{-jkz}$$