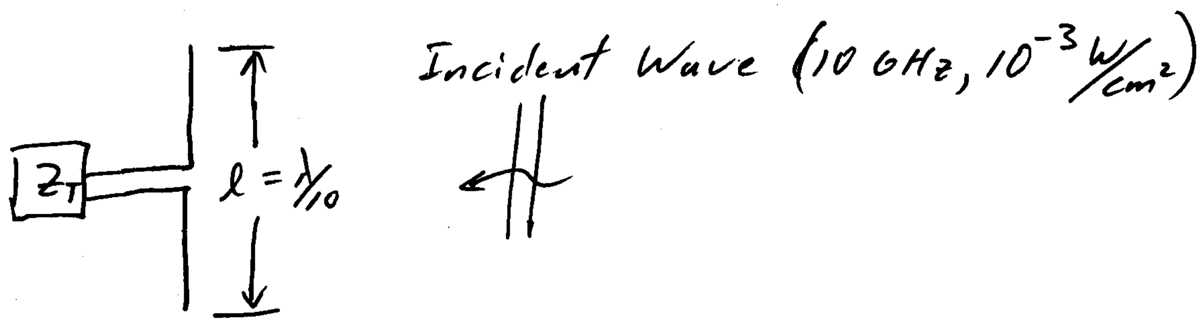
2.72 Repeat Problem 2.71 for a small dipole with triangular current distribution and length $l = \lambda/10$. See Example 2.14.

2.71 A uniform plane wave, of 10^{-3}watts/cm^2 power density, is incident upon an infinitesimal dipole of length $l = \lambda/50$ and uniform current distribution, as shown in Figure 2.29(a). For a frequency of 10 GHz, determine the maximum open-circuited voltage at the terminals of the antenna. See Problem 2.69.



$$l = \lambda/10 = \frac{1}{10}\frac{2.9979\times10^8}{10\times10^9} = 0.0029979 \text{ m}$$

From Example 2.14, $\bar{l}_e = -\hat{a}_\theta \frac{l}{2}\sin\theta$ for a small dipole.

From notes, $W_{inc} = \frac{|\bar{E}^i|^2}{2\eta} = 10^{-3}\frac{W}{cm^2}\frac{100^2 cm^2}{1^2 m^2}$

$$|\bar{E}^i| = \sqrt{2\eta 10} = \sqrt{2(376.7303)10} = 86.80211 \text{ V/m}$$

Per (2-93), $V_{oc} = \bar{E}^i \cdot \bar{l}_e$

For <u>maximum</u> V_{oc}, assume $\bar{E}^i$ in $-\hat{a}_\theta$ direction and arriving at broadside ($\theta = 90^\circ$).

$$V_{oc} = -\hat{a}_\theta 86.80211 \text{ V/m} \cdot -\hat{a}_\theta \frac{0.0029979}{2}\sin 90^\circ$$

$$\underline{V_{oc} = 0.1301 \text{ V}}$$