EEE 452/552 Due 19/03/2008

Homework #5

(1) Consider a Hertzian dipole located at the origin and is x-directed. Its current density is given by

$$\bar{J}(x',y',z') = \hat{a}_x I_o \delta(z')\delta(y')\left[U(x'+l/2) - U(x'-l/2)\right] \quad A/m^2$$

where $l \ll r$; $l \ll \lambda$, $r \gg \lambda$

(a) Find the vector potential $\bar{A}(x,y,z)$ in spherical coordinates

(b) Find the $\bar{H}$-field components

(c) Find the $\bar{E}$-field components

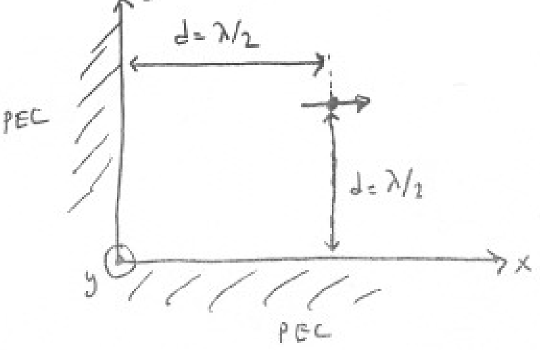
(d) Write down the dominant $\bar{E}$ and $\bar{H}$-field expressions in the far-zone.

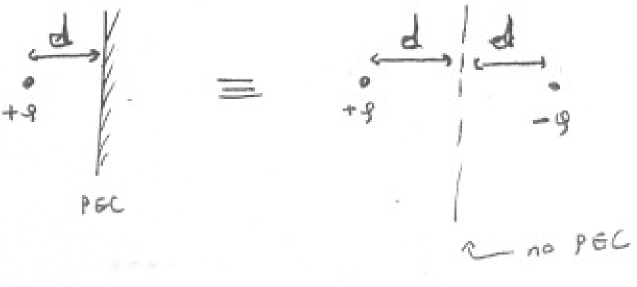
(2) Repeat question #1 for a y-directed Hertzian dipole whose current density is given by

$$\bar{J}(x',y',z') = \hat{a}_y I_o \delta(z')\delta(x')\left[U(y'+l/2) - U(y'-l/2)\right] \quad A/m^2$$

(3) Consider Figure 1 where an $\hat{a}_x$-oriented Hertzian dipole is located near a corner reflector (a perfect electric conductor reflector). Dipole on the x-z plane and $\frac{\lambda}{2}$ away from the xy and zy planes. The corner reflector is infinitely large along the y-axis. Calculate $\bar{A}(x,y,z)$ in spherical coordinates and clearly indicate all distances.

Hint: You may need to use image theory





Note that let I_o be the amplitude of the current on the Hertzian dipole and l be the length of the Hertzian dipole