PROBLEM 4 (Dipoles – 4 points):

A point dipole with $p_0 = 10^{-12}$ [C m] is fixed at the origin of a Cartesian coordinate system and points up. Four, $N = 4$, little dipoles with $p = 10^{-15}$ [C m] each and pointing radially away from p_0 are uniformly distributed on a horizontal circle of radius $R = 1$ [cm] as shown in the Figure below. The little dipoles are allowed to rotate until they assume the equilibrium orientation. During this process each little dipole emits a photon. Your task is to determine:

a) The initial and final dipole moments $\vec{p}_A^{\text{before}}$ and $\vec{p}_A^{\text{after}}$ of the little dipole at location A.
b) The frequency, f, of each of the emitted photons.
c) The total emitted energy, $\mathcal{E}_{\text{total}}$.