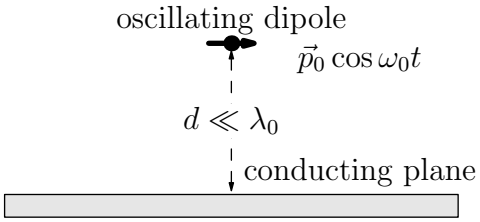
J10E.1 - Oscillating Dipole Near a Conducting Plane

Problem



An electric dipole is forced to oscillate with frequency ω_0 and amplitude $\vec{p}_0$, so $\vec{p}(t) = \vec{p}_0 \cos \omega t$. It is placed in vacuum at a distnace $d \ll c/\omega_0 = \lambda_0$ away from an infinite perfectly-conducting plane, with $\vec{p}_0$ parallel to the plane. The physical dimensions of the dipole are infinitesimal compared to compared to d, and it can be treated as a point dipole.

At distances from the dipole that are large compared to λ_0:

a) Find the steady-state electromagnetic fields $\vec{E}(\vec{r}, t)$ and $\vec{B}(\vec{r}, t)$.

b) Find the angular distribution of the radiated power of the emitted radiation.