

[lex114] Magnetic radiation field of electric dipole

Given the asymptotic vector potential,

$$\Rightarrow \mathbf{A}(\mathbf{x}, t)_{\text{as}} = \frac{\mu_0}{4\pi r} \left. \frac{d\mathbf{p}}{dt} \right|_{t_r}, \quad t_r \doteq t - \frac{r}{c},$$

generated by a time-dependent electric dipole $\mathbf{p}(t)$, show that the magnetic radiation field is

$$\mathbf{B}(\mathbf{x}, t)_{\text{rad}} = -\frac{\mu_0}{4\pi r c} \hat{\mathbf{r}} \times \left. \frac{d^2\mathbf{p}}{dt^2} \right|_{t_r}.$$

Solution: