

**Problem 1.**

The electric field for the simplest possible spherical wave (in the vacuum) has the form:

$$\vec{E}(\vec{r}, t) = A \frac{\sin \theta}{r} \left( \cos u - \frac{\sin u}{kr} \right) \hat{\phi}$$

where  $u = kr - \omega t$ . Find the associated magnetic field.

**Problem 2**

Find the reflection coefficient for the circularly polarized electromagnetic wave incident on a plane between two linear media at Brewster's angle. (For simplicity, take  $\mu' = \mu$ ).

**Problem 3.**

Problem 9.36a,b from *Griffiths* 5th ed.

**Problem 4.**

A magnetic dipole  $m$  is rotating around the axis orthogonal to  $\vec{m}$  with angular velocity  $\omega$ . Find the radiated power.

**Problem 5.**

A  $\pi^+$  meson with mass 139.6 MeV decays into  $\mu^+$ -meson with mass 105.7 MeV and massless  $\nu_\mu$  neutrino. What is the velocity (in units of  $c$ ) of  $\mu^+$ -meson in the c.m. frame of  $\mu^+$  and  $\nu_\mu$ ?

**Problem 6.**

Is it possible for  $\vec{E}$  and  $\vec{B}$  at some point to be parallel in one frame and antiparallel in some other frame?