ELECTRODYNAMICS

PROBLEM SET 13- THE LAST ONE

due May4th, before class

I. SCATTERING OF LONG WAVES FROM A DIELECTRIC SPHERE

Compute the (differential) scattering cross section of a dielectric sphere with dielectric constant ϵ and radius R. Assume the wavelength of the incoming wave λ is much larger than R. Hint: The incoming wave will polarize the sphere and its magnetic moment will radiate.

II. EMISSION PATTERN OF A PARTICLE MOVING AROUND A CIRCLE

Consider a relativistic particle moving around a circle of radius a with angular frequency ω. Compute the power emitted averaged over cycles as a function of the angle between the direction of emission and the axis going through the loop. Hint: We computed the emission when the velocity and the acceleration are orthogonal in class already. All you have to do is to average over a full turn. It should be possible although I have never done it.

III. CLASSICAL ATOMS ARE UNSTABLE

The classical model of an atom has an electron in a circular orbit around the nucleus. Classically, the electron should radiate, loose energy and fall into the nucleus. *Estimate* how long it would take for an electron to fall into a nucleus.