PHYS542: Homework 10

1. Scattering from a Bound Electron Find the total scattering cross section when a circularly polarized wave scatters from an electron bound to a point in space by a spring with a spring constant κ. Assume that the amplitude of the incident wave is not large.

2. Scattering and Absorption by an Ohmic Sphere A *low frequency*, plane electromagnetic wave Rayleigh scatters from a sphere of radius a and conductivity σ. Assume that the skin depth $\delta >> a$.

(a) Find the electric dipole moment induced in the sphere by the incident wave.

(b) Calculate the absorption cross section of the sphere

(c) Show that the optical theorem is satisfied by the absorption cross section (alone) and the electric dipole scattering amplitude

(d) The optical theroem is supposed to apply to the total cross section, not just the absorption cross section, why was it safe to equate the absorption and total cross sections in part (c) above.