

EM Scattering

Homework assignment 4

Problem 1:

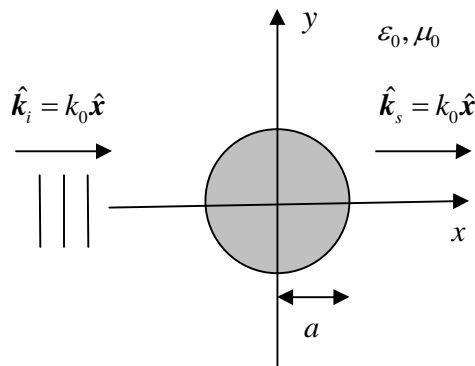
Use the Rayleigh approximation (small particle approximation) and calculate the scattering cross section of a small dielectric sphere with the dielectric constant ϵ_d and radius a (a is much smaller than the wavelength in vacuum). Where possible, approximate the resulting integrals.

Problem 2:

A plane wave which is propagating in vacuum along the x -axis (wave number k_0) is normally incident on an infinitely long, perfectly conducting cylinder of radius a whose axis is along z . The electric field of the incident wave is linearly polarized along the z -axis and has an amplitude of E_0 . We would like to use the approximation of physical optics to analyze this problem.

- (i) Find the electric surface current induced on the cylinder using this approximation.
- (ii) Find the amplitude of the far-zone electric field scattered in the x direction (the forward scattered wave).

Hint: use the expression for the far-zone field of 2D objects discussed in lecture 7 (integral equations).



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