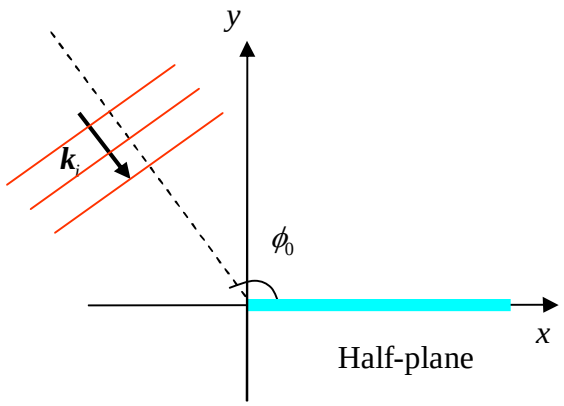
EM Scattering

Homework assignment 4

Problem 1:

A uniform TM^z plane wave (electric field along the z-direction) is normally incident on a perfectly conducting half-plane at an angle ϕ_0. The amplitude of the incident wave is E_0. Calculate the current density on the top and bottom surfaces of the half plane. The dielectric constant and permeability of the surrounding medium are ε_0, μ_0.



Problem 2:

Repeat the above problem now for a uniform TE^z plane wave (magnetic field along the z-direction). Take the amplitude of the incident plane magnetic field wave to be H_0.

Problem 3:

Consider the structure shown below which consists of a perfectly conducting half-plane terminated by an infinitely long, perfectly conducting cylinder of radius a whose axis coincides with the z-axis. An incident TM wave with the electric field vector in the z-direction and a wave vector parallel to the x-y plane propagates along a line which makes an angle ϕ_0 with the x-axis (see figure) and is scattered by structure. Find the total electric field in this 2D scattering problem by using the line-source method. The background medium is vacuum.