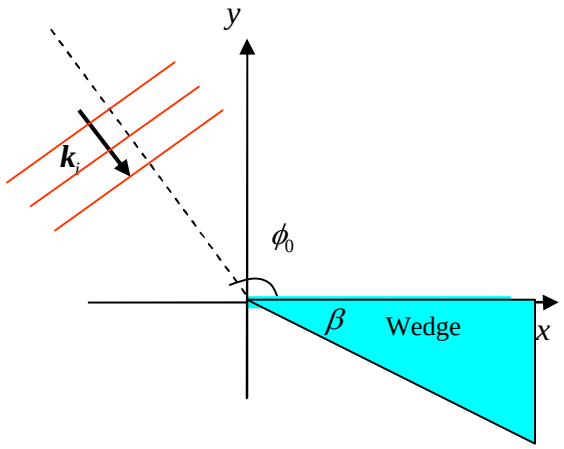
EM Scattering

Homework assignment 3

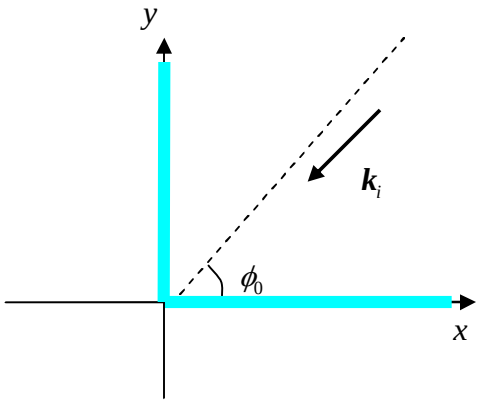
Problem 1:

A uniform TM^z plane wave (electric field along the z-direction) is normally incident on a perfectly conducting wedge with $\beta = 30\,\text{deg}$ 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. Plus the current density on these two surfaces for $\phi_0 = 45, 90, 180\,\text{deg}$. The dielectric constant and permeability of the surrounding medium are ε_0, μ_0.



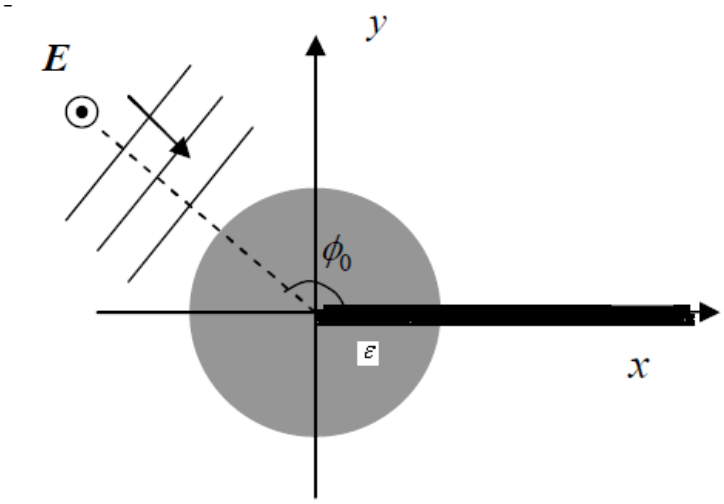
Problem 2:

A uniform TM^z plane wave (electric field along the z-direction) is normally incident on a perfectly conducting right-angled corner at an angle $\phi_0 < 90\,\text{deg}$. The amplitude of the incident wave is E_0. Calculate the scattered field.



Problem 3:

Consider an infinitely long, dielectric circular cylinder whose axis coincides with the *z*-axis and has a relative dielectric constant of ε_d, and a radius of a. A perfectly conducting half infinite-plane protrudes the cylinder up to its axis as shown in the figure. A plane wave with the wave vector $k_i = (k_{ix}, k_{iy}, 0)$ is normally incident on the cylinder. The electric field of the incident wave is polarized along the z-direction. Compute the scattered in the far-zone.


E
y
ϕ_0
ε
x