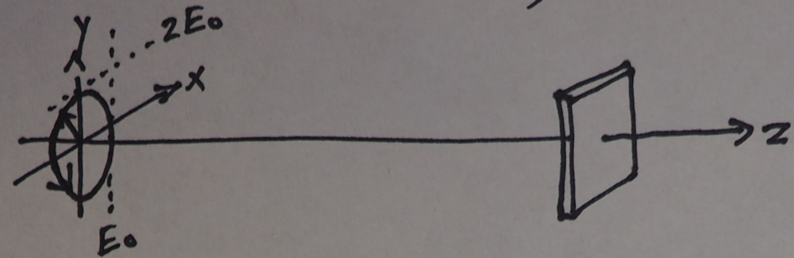
B.B. 5.1

Consider elliptically polarized light of frequency ω & wave number k traveling in the +z direction & incident on a sheet of perfectly conducting metal & z=0



The x-component of the incident wave is

$$\boxed{\bar{E}_{i,x} = E_0 \cos(\omega t - kz)\hat{x}}$$

a) • Find $\bar{E}_{r,x}$ & $\bar{E}_{r,y}$

• First, $\bar{E}_{r,x} = E_{0r} \cos(\omega t + kz)\hat{x}$

$\bar{E}_{TOT,x}(z=0) = 0$ (this is the boundary condition at z=0)

$$\bar{E}_{TOT,x}(z=0) = \bar{E}_{ix} + \bar{E}_{r,x}$$
$$= E_0 \cos(\omega t - 0)\hat{x} + E_{0r}\cos(\omega t + 0)\hat{x}$$
$$= 0 \text{ if } E_{0r} = -E_0$$

So $\boxed{\bar{E}_{r,x} = -E_0 \cos(\omega t + kz)\hat{x}}$

• Now, if the incident wave is elliptically polarized, then $\bar{E}_i = \hat{x} E_{0x}\cos(\omega t - kz + \phi_x) + \hat{y} E_{0y} \cos(\omega t - kz + \phi_y)$

• Using our known parameters for the incident wave's x-component: $\phi_x = 0$, $E_{0x} = E_0$ we can know that