

722.

Problem 49.59 (RHK)

We have to find the maximum wavelength shift for a Compton collision between a photon and a free electron.

Solution:

The wavelength shift in scattering of a photon from a free electron is given by the Compton scattering equation

$$\lambda' - \lambda = \frac{h}{mc}(1 - \cos \phi),$$

where ϕ is the angle from the incident photon direction in which the scattered photon wavelength is λ' .

Therefore, the maximum wavelength shift will be when the photon is back scattered. That is $\phi = \pi$ rad. The maximum change in wavelength of photon in Compton scattering is

$$\Delta\lambda = \frac{2h}{mc}.$$