

Practice Problems Related to Compton Scattering

1. Suppose that a photon is confined to a one-dimensional tube, in a converging flow of electrons of a single speed, $v = \beta c$, where c is the speed of light. The photon goes in one direction, has a head-on collision with an electron and bounces straight back, has a head-on collision with another electron and bounces straight back, an unlimited number of times. Compute the energy E_{equil} of a photon such that after a given bounce its energy is unchanged, as a function of β (in general, i.e., you should not restrict β to be much less than 1).
2. What if we do the same thing as in problem 1, but each collision is tail-on (i.e., each time there is a scattering, the photon hits a receding electron and then bounces straight back)?