Compton's effect

To understand the compton's effect is necessary to understand the Compton scattering, once these two phenomenons are deeply connected.

Compton scatterin gis an inelastic scattering because the wavelength of scattered light differs from the incident radiation for instance photon from gama and x-radiation or any other radiation with high energy. Nuclear Compton scattering exists in rare cases when the radiation interacts with the nucleus of the atom, but usually Compton scattering refers to the interaction between the electrons of an atom and the incident radiation, more commonly visible with the valence electrons of the atom once they are further from the nucleus they are less attracted to it so its easier for this electrons to be scattered. After the electron and radiation interact, the radiation is reflected with a different wave length, this changed wavelength is called the Compton shift. Part of the energy of the photon is transferred to the scattering electron, which results in a decrease in photon's energy, and there fore, as the energy is proportional to the frequency and wave length, this exchange of energy is the cause of the different wave length. This process is called the Compton effect. Inverse Compton scattering may also occur when electron transfers part of its energy to a photon.

It was observed in the early 20th century, that when X-rays with known wavelength interact with atoms, the X-rays are scattered through an angle and emerge with a different wavelength.However, according to the classic electromagnetism that predicts that radiation behave simply as a wave this different wave length would not exist, this is , if an incident radiation with wave length of, for instance, θ was reflected after electron interaction, it would have θ as wave length, but it doesn't happen. In fact the scattered x-ray photon has less energy, it has a longer wavelength and less penetrating than the incident photon.

Compton's effect is important because demonstrates that light cannot be explained purely as a wave phenomenon. The classical theory of an electromagnetic wave cannot explain low intensity shifts in wavelength for that radiation must behave as particles to explain low-intensity Compton scattering. as it was demonstrated in experiences.

Energy and momentum are conserved in this process so it is not generally possible for the electron simply to move in the direction of the incident photon. The interaction between electrons and high-energy photons results in the electrons being given part of the energy which allows them to change their direction. If the scattered photon still has enough energy, the process may be repeated, but as it was said before the penetrating energy of this same photon is much smaller and process may repeat itself until the photon lose its penetrating energy.

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