



Chap 3

Interaction of Electromagnetic Radiation with Matter in Medical Imaging



EM Radiation and Imaging

- Wave concept of EM radiation explains why it may be reflected, refracted, diffracted, and polarized.
- Short EM waves, such as x-rays may react with matter as if they were particles rather than waves.
- These particles are actually discrete bundles of energy.
- Each bundle of energy is called a quantum or a photon.
- Photons travel at the speed of light.
- The amount of energy carried by a photon depends on the frequency of the radiation (I.e. number of vibrations per second).
 - $E = h\nu$
- E is the photon energy; h is the Planck's constant = 4.13×10^{-18} keV sec and ν is frequency.
- The particle behavior of photon leads to photoelectric effect and Compton scatter.

EM Radiation

- $c = \lambda \nu$ or $\nu = c/\lambda$
- Thus, $E = hc/\lambda$
- where c is velocity of light; $hc = 12.4$; E is in keV and ν is in Å.
- $E = 12.4/\lambda$ keV

