

Excess risk

Observed cases – expected cases

If population is exposed to radiation, the excess cancers observed are attributed to the radiation received

Relative risk

Observed effect/expected effect

Predicts a percentage

Absolute risk

Expressed as x% per Sv

ALARA and ALARP

As low as reasonably achievable – ideally everyone should have zero exposure

As low as reasonably practicable – has now superseded ALARA, minimise exposure but still achieve goal

- Time
- Distance – inverse square law
- Shielding

LNT revisited

There is some evidence that this model overestimates risk at low doses

Perhaps there is a threshold, say around 100mSv; the linear quadratic model could be the correct one

Limited scientific support for Hormesis

Background radiation levels

Vary significantly from place to place

The incidence of cancer varies from place to place

Cancer incidence is low in regions where background radiation levels are high

Thus, background radiation levels can not be major players in the incidence of cancer even if they are implicated

Contradictory evidence

LNT has the potential to exaggerate the seriousness of radiation effects at lower dose levels from low LET radiation.

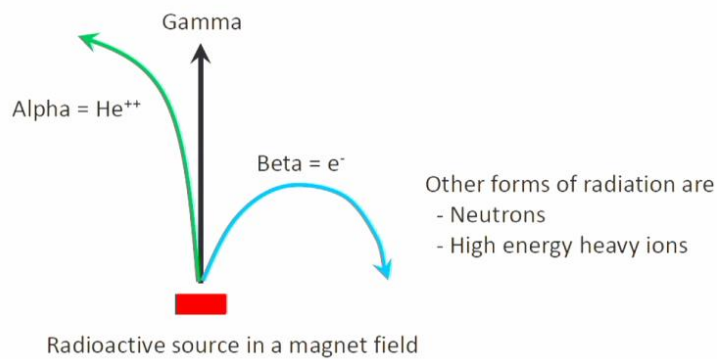
Iran – 55 – 200x more radiation no increase in cancer

Ramsar – highest levels of radiation in the world, radium 226 & its decay brought to the surface by hot springs. Over 2000 people are exposed to radiation doses up to 260mSv per year

PHYS1250 – PHYSICS AND RADIATION PROTECTION

LECTURE 1

Sources of Radiation



Gamma = photon

How do we express energy

Charge x voltage

1.5V = 1.5eV

Sources of X rays

Bremsstrahlung

Breaking radiation

Slows down and emits radiation

Fast moving electrons come close to the nucleus, and are slowed down by the attractive coulomb force of the nucleus

Closer to the nucleus → greater energy photon

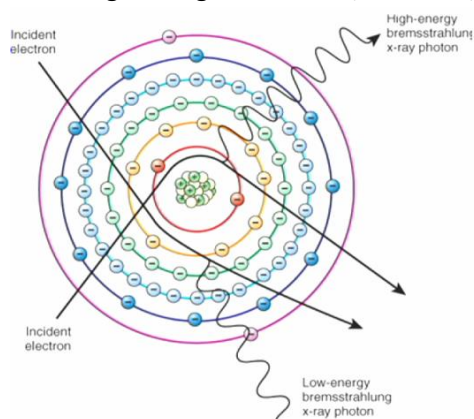
Bulk of the energy is converted into lower energy photons

Max photon energy = kinetic energy of projectile electron

kVp determines max kEv

99% appear as heat

Incoming homogenous beam, however, Bremsstrahlung beam is heterogeneous



Characteristic

Electron interacts with inner most electron and removes it