

Imaging Technology 2

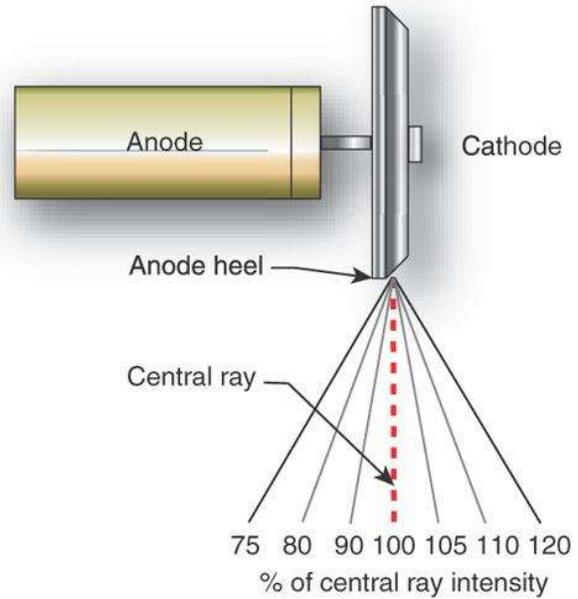
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Mammography

Line Focus Principle: the angulation of the anode disc allows a larger area to be irradiated while maintaining a smaller effective focal spot size

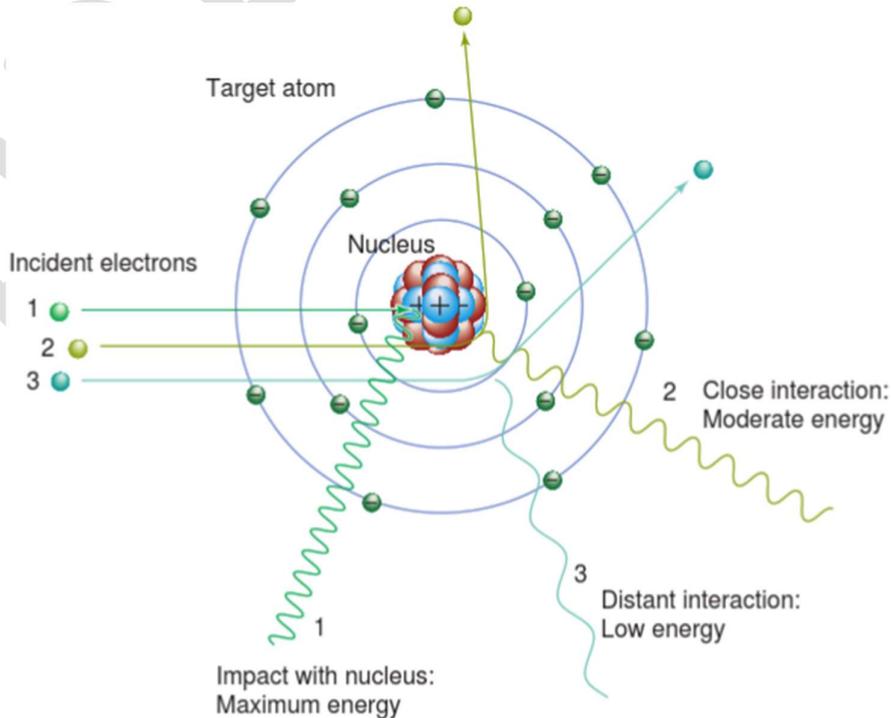
Anode Heel Effect: due to the angulation of the anode disc, exiting photons towards the tangential disc will travel through more anode material before exiting. This causes a variation in beam energy where the photons towards the anode have less energy



Bremsstrahlung (Braking) Radiation

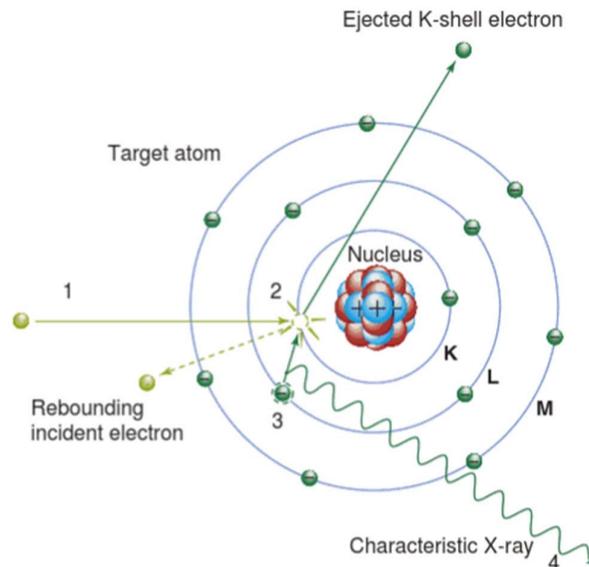
- The positive nucleus attracts the electron causing it to decelerate and redirect towards the centre. The change in direction results in the release of a photon.
- The closer the electron travelled to the atom the higher the photon energy

1. Impacting with the nucleus produces maximum energy photon
 - All keV from the electron is released as a photon



Characteristic Radiation

- Electron interact with an inner shell electron transferring energy matching the shell edge and ejecting the electron. A outer shell electron then fills in the gap releasing a photon with the energy equal to difference between the two shell voltage.



Calcifications: deposits of calcium in the tissue, appear as small white regions on the mammogram

- Microcalcifications < 0.5 mm
 - Cluster: group of microcalcifications in one area and may indicate small cancer
- Macrocalcification > 0.5 mm
 - Associated with benign conditions

Masses: group of cells clustered together more densely than surrounding tissue

- Can suggest benign or malignancy

Contrast: difference between two areas allowing them to be differentiated

Resolution: the ability to differentiate fine details

Noise:

- Quantum noise: arises from variation in the number of x-ray photons, produced by the tube, absorbed by the patient and captured by the detector
- Electronic Noise: arise from variation in the number of electrons generated and recorded after the capture of a photon by the detector

Describe the components of mammography equipment.

Image Receptors

- Computed Radiography (CR)
 - X-ray photons strike the cassette and the energy is stored
 - Protective layer
 - Storage Phosphor: made of photostimulable crystals
 - ☑ Phosphorescence properties: stores photons then emits light when stimulated
 - ☑ Material: Barium fluoride with iodine, bromide or chloride halogenides doped with europium
 - Anti-halo layer (Reflective layer)