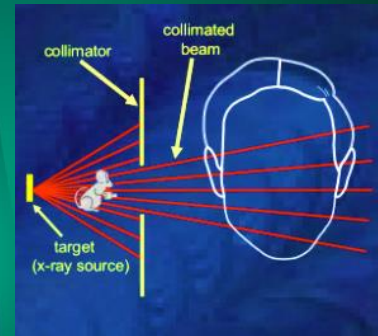


FILTRATION AND COLLIMATION

COLLIMATION

- A collimator is a metallic barrier with an aperture in the middle used to reduce the size of the x-ray beam and thereby the volume of irradiated tissue.
- Round and rectangular collimators are most frequently used in dentistry
- Dental x-ray beams are usually collimated to a circle 2 three fourth inches (7 cm) in diameter

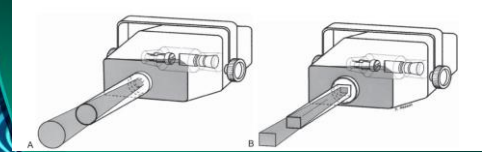
- A round collimator is a thick plate of radiopaque material (usually lead) with a circular opening centered over the port in the x-ray head through which the x-ray beam emerges.
- Typically, round collimators are built into open-ended aiming cylinders.



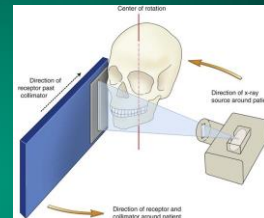
- Rectangular collimators further limit the size of the beam to just larger than the x-ray film, thereby further reducing patient exposure.
- Some types of film-holding instruments also provide rectangular collimation of the x-ray beam.
- Use of collimation also improves image quality.

When an x-ray beam is directed at a patient, the hard and soft tissues absorb about 90% of the photons and about 10% pass through the patient and reach the film.

- These scattered photons travel in all directions, and some reach the film and degrade image quality.
- Collimating the x-ray beam thus reduces the exposure area and thus the number of scattered photons reaching the film.



A: Circular Collimator
B: Rectangular Collimator



Slit collimator used in OPG

FILTRATION

- Although an x-ray beam consists of a spectrum of x-ray photons of different energies, only photons with sufficient energy to penetrate through anatomic structures and reach the image receptor (film or digital) are useful for diagnostic radiology.

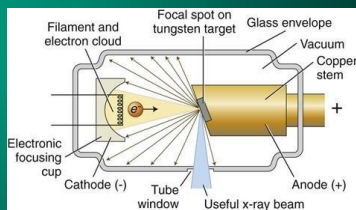
- Photons that are of such low energy that they cannot reach the receptor contribute to patient exposure (risk) but do not offer any benefit.

- Consequently, to reduce patient dose, such low-energy photons should be removed from the beam.
- This can be accomplished, in part, by placing an aluminum filter in the path of the beam.
- An aluminum filter preferentially removes many of the lower-energy photons with lesser effect on the higher-energy photons that are able to contribute to making an image.

Inherent filtration consists of the materials that x-ray photons encounter as they travel from the focal spot on the target to form the usable beam outside the tube enclosure.

Inherent Filtration

1. Glass Envelope
2. Insulation Oil Surrounding the tube
3. Window in the tube housing



- The inherent filtration of most x-ray machines ranges from the equivalent of 0.5 to 2 mm of aluminum.
- Total filtration is the sum of the inherent filtration plus any added external filtration supplied in the form of aluminum disks placed over the port in the head of the x-ray machine.

- Governmental regulations require the total filtration in the path of a dental x-ray beam to be equal to the equivalent of 1.5 mm of aluminum up to 70 kVp and 2.5 mm of aluminum for all higher voltages.

