Ideal radiograph

By
Dr Darshan R.Prasad Hiremutt

Ideal radiograph (H M Worth)

- Ideal radiograph is one which has
  - Desired density,
  - Overall blackness and
  - Which shows part completely, without distortion and
  - With maximum details and
  - Has right amount of contrast to make object fully apparent.

Ideal radiograph (Wuerhrmann)

- Ideal radiograph is one on which,
  - Image shadow will be most informative,
  - Image should be sharp,
  - An image that is shaped like the object, and
  - An image that is of the same size as the object.

Ideal radiograph

- 2 D picture of 3 D object
- Radiolucent
- Radiopaque

Characteristics of ideal radiograph

- Visual characteristics
  - Density
  - Contrast
- Geometric characteristics
  - Sharpness or detail, resolution or definition
  - Magnification
  - Distortion
- Anatomical accuracy of radiographic image
- Adequate coverage of area of interest

Density

- Is the overall blackness of the dental radiograph

There is a radiopacity below the apices of first permanent molar root tips. It is arose from the inflammatory reaction at the apex of this obviously non-vital tooth.

Density

Density is due to silver blackening

Density

- Density too dark

There is a radiopacity below the apices of first permanent molar root tips. It is arose from the inflammatory reaction at the apex of this obviously non-vital tooth.

- Density too less

There is a radiopacity below the apices of first permanent molar root tips. It is arose from the inflammatory reaction at the apex of this obviously non-vital tooth.

Density

- **Factors affecting density**
  - 1st degree factors
    - mA
    - Exposure time
    - kvP
    - Source film distance

Density

- **Factors affecting density**
  - 2nd degree factors
    - Subject thickness
    - Type of film
    - Film
    - Latitude
    - Radiographic noise
    - Screens
    - Filtration
    - Fog

Density

- Optical density = log 10 I_o/I_t
- Io is intensity of incident light
- I_t is intensity of light transmitted by film
  - D0 = 100% light transmitted
  - D1 = 10% light transmitted
  - D2 = 1% light transmitted
- Useful density 0.3 to 2

Contrast

- Difference in the degree of blackness between adjacent areas on a film
- Very dark and very light area – high contrast
- No “very dark areas and light areas” (many shades of gray) – low density

Contrast

- Film properties
  - Fast films
  - Double coated film
  - Processing
- Subject properties
  - Thickness
  - Density
  - Composition
- KvP
- Exposure time

Factors affecting ideal radiograph

Projection Geometry

- Source of radiation should be as small as possible.
- Tube object distance should be as great as possible.
- Object film distance should be as small as possible.
- Film should be parallel to the object.
- Central ray of the beam of radiation should be perpendicular to the film.

Projection Geometry

- Importance of these principle in shadow casting
- To maximize image clarity,
- To minimize distortion, and
- Localize objects in the image field.

Projection Geometry

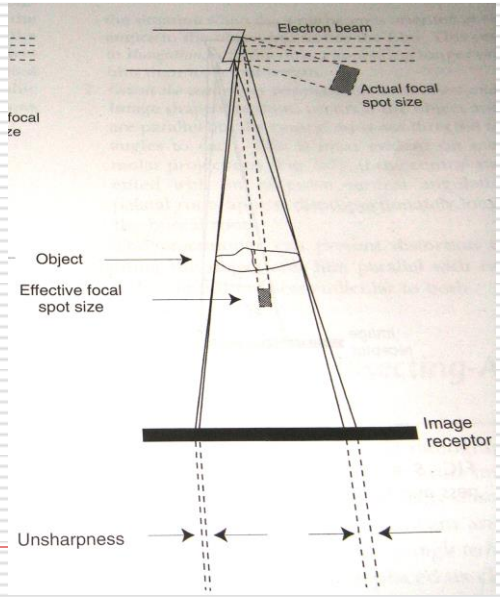
- 1st three principles deals with the production of image sharpness.
- The other two require the alignment of the x-ray beam, object, and film in such a manner that the radiographic image of the object can be easily identified and easily evaluated.

Source of radiation should be as small as possible.

- Use as small an effective focal spot as practical.
- Dental x-ray machine- 1mm or less.
- Extra-oral machines- 0.3mm,(more clarity)

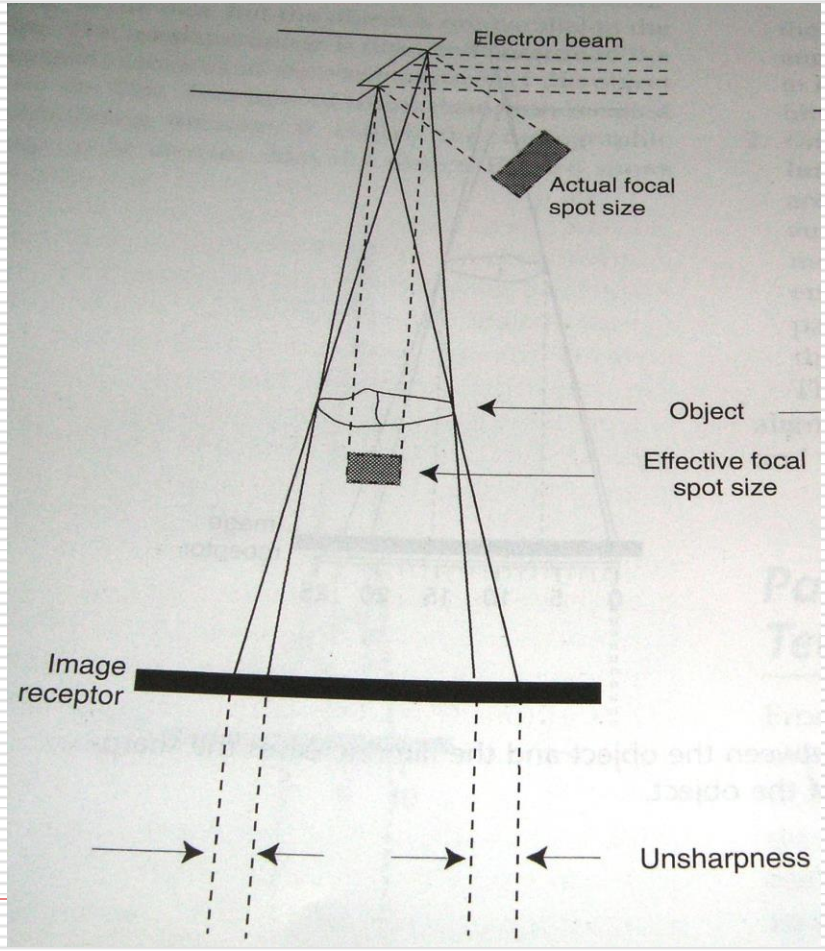
Source of radiation should be as small as possible.

- **EFFECTIVE FOCAL SPOT-**
  - as small as possible and
  - also it should dissipate sufficient amount of heat produced.
  - Effective focal spot is a function of angle of the target with respect to the long axis of the electron beam.



Source of radiation should be as small as possible

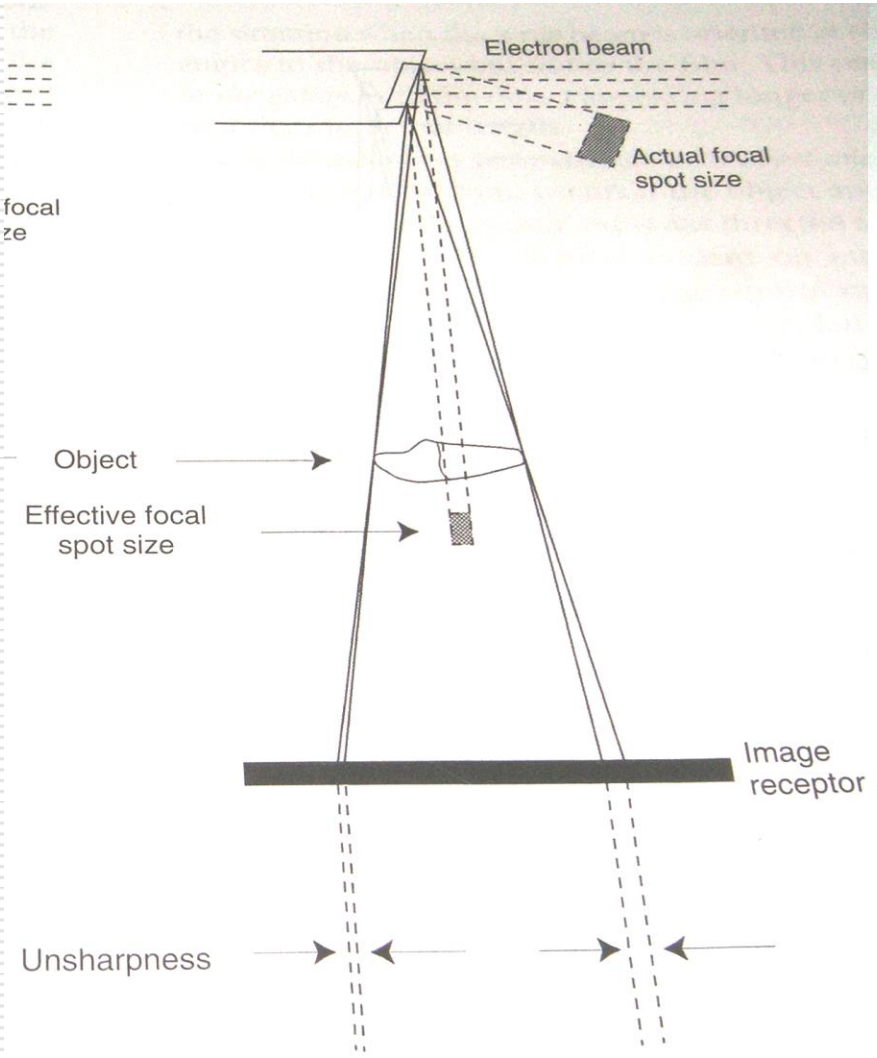
- **EFFECTIVE FOCAL SPOT-**
  - **LARGE ANGLE OF TARGET**
  - large surface area,
  - Decreases the heat generated per unit of target area,
  - Prolonged tube life.
  - Loss of image clarity.

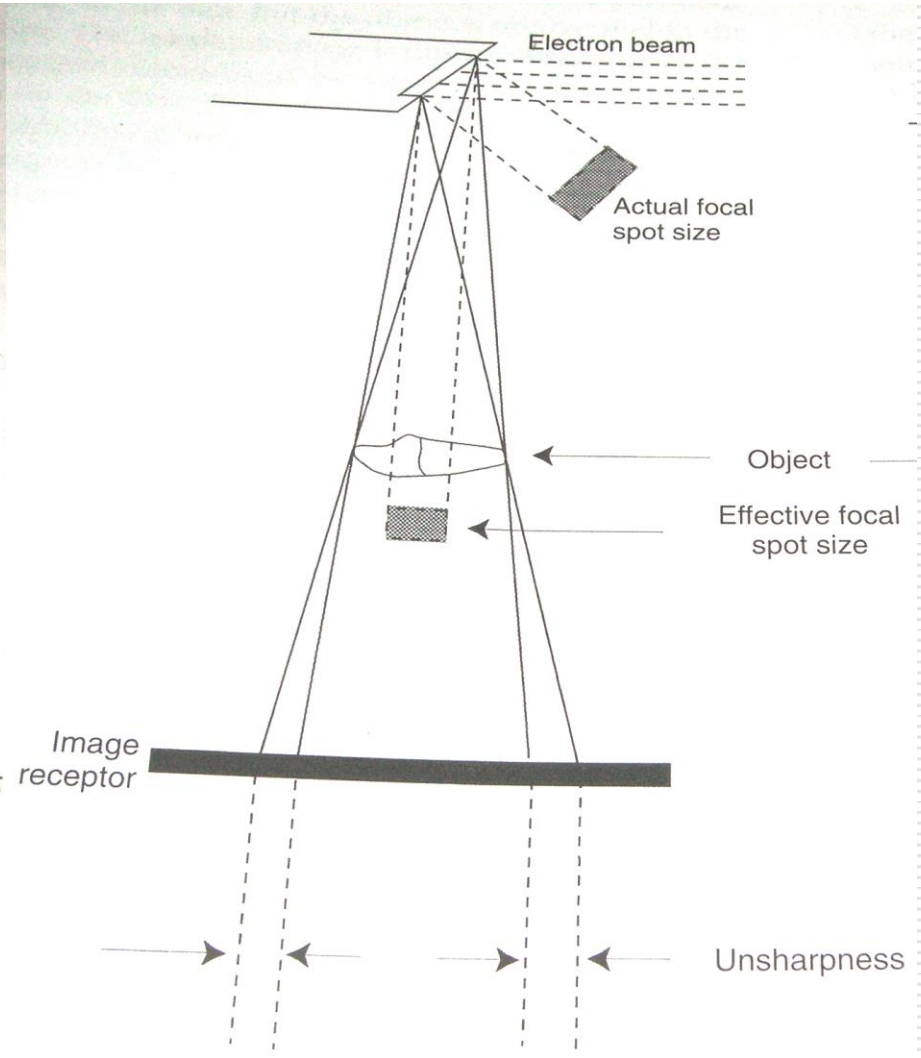


Source of radiation should be as small as possible

- **EFFECTIVE FOCAL SPOT**
- **SMALL ANGLE OF TARGET**
  - Greater wearing effect on target,
  - Small effective focal spot,
  - Decreased unsharpness,
  - Increased image sharpness and resolution.
- Effective focal spot angle – 10- 20 degree.

Focal spot size

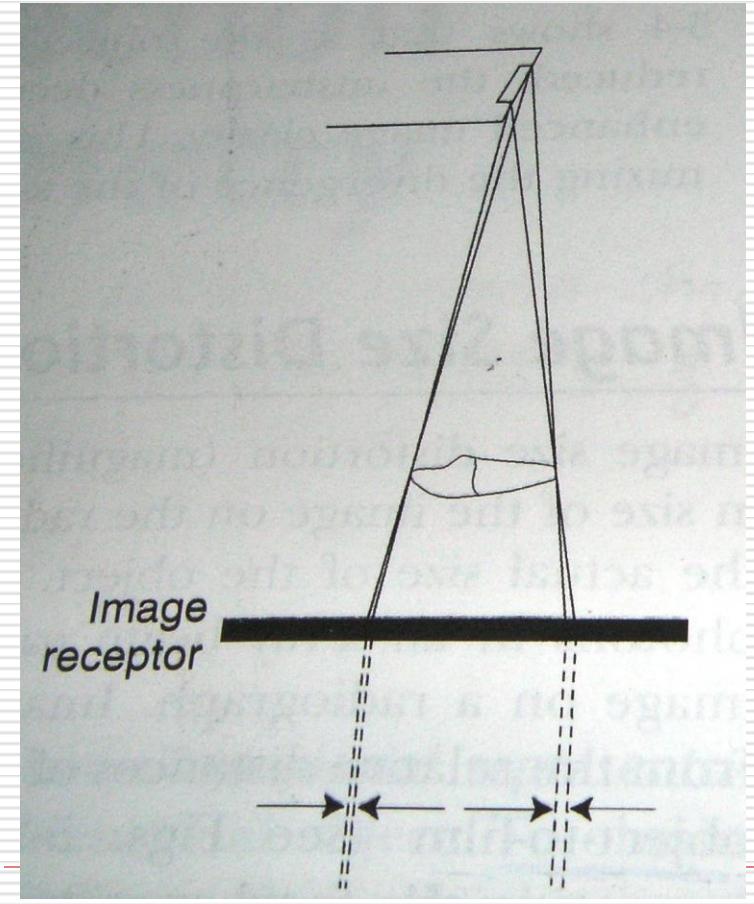


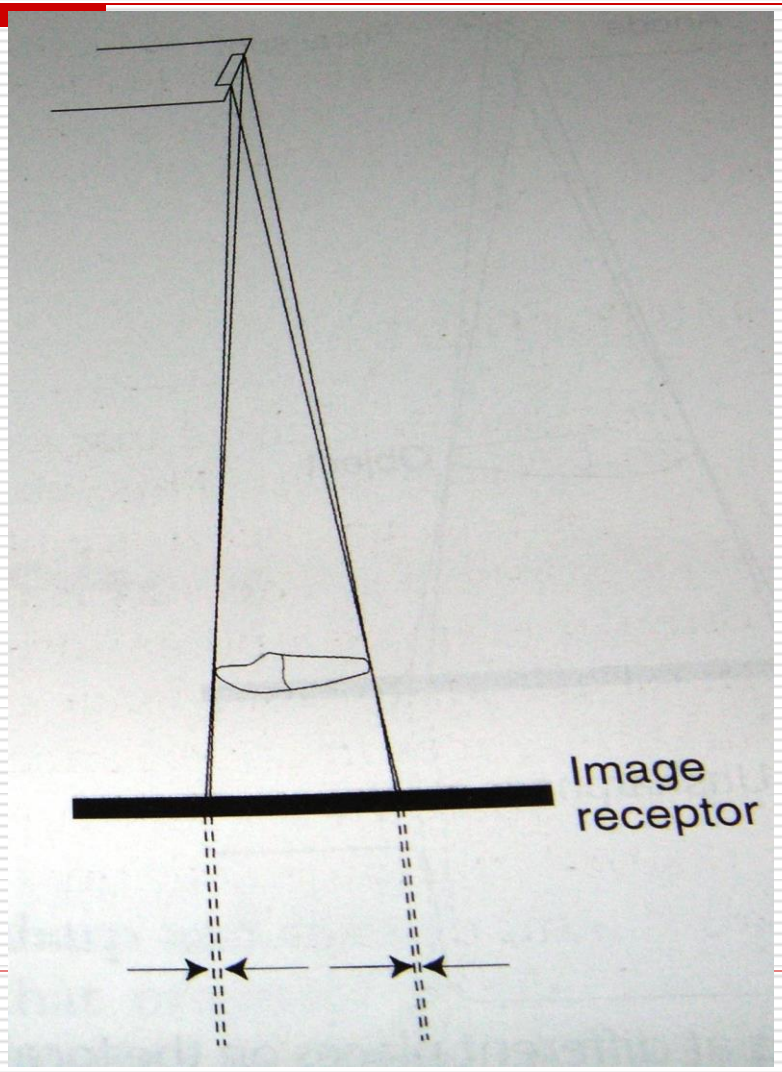


Tube object distance should be as great as possible

- Increase the distance between the focal spot and the object by using a long, open-ended cylinder.
- Increase in focal spot-object distance reduces image blurring by reducing the divergence of the x-ray beam.
- Long open ended cylinder as an aiming devices are used.

Tube object distance should be as great as possible

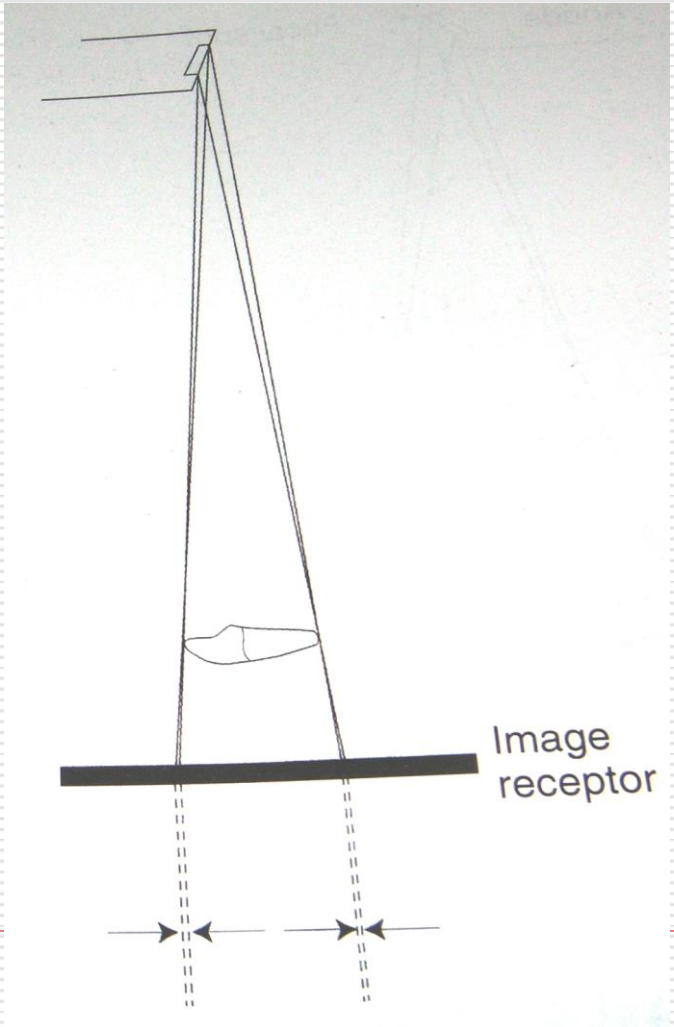


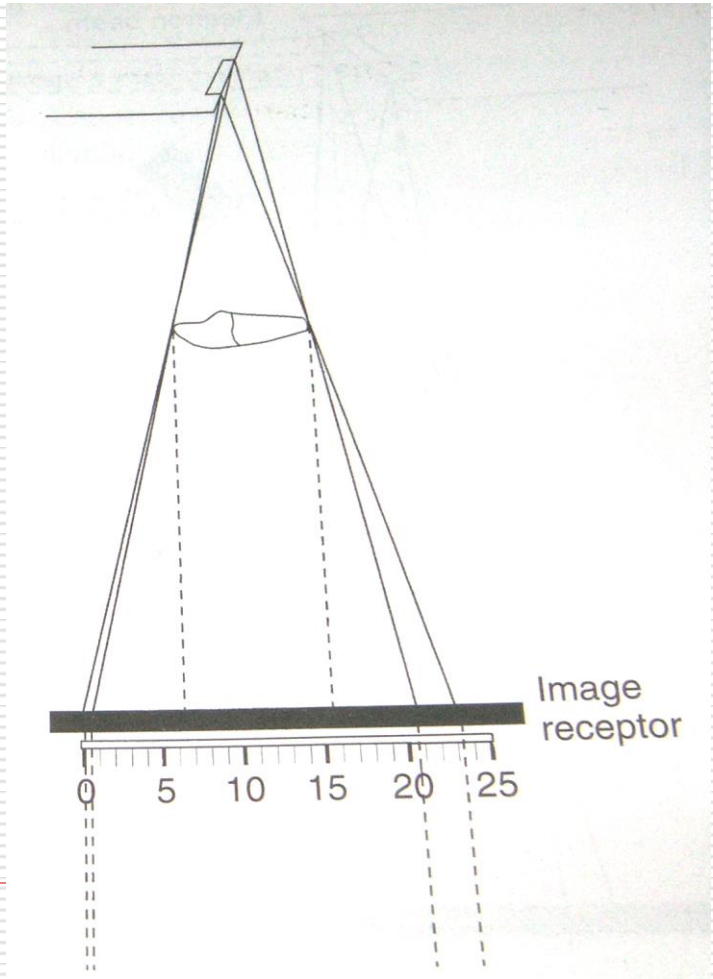


Object film distance should be as small as possible

- Unsharpness decreases,
- Enhanced image clarity.
- Also prevent the distortion of image.

Object film distance should be as small as possible





Film should be parallel to the object

- Affects image shape,
- Image shape distortion-is the result of unequal magnification of different parts of the same object.
- This happens when not all the parts of an object are at same focal-spot-to-object distance.
- To minimize shape distortion, make an effort to align the tube, object, and film carefully.

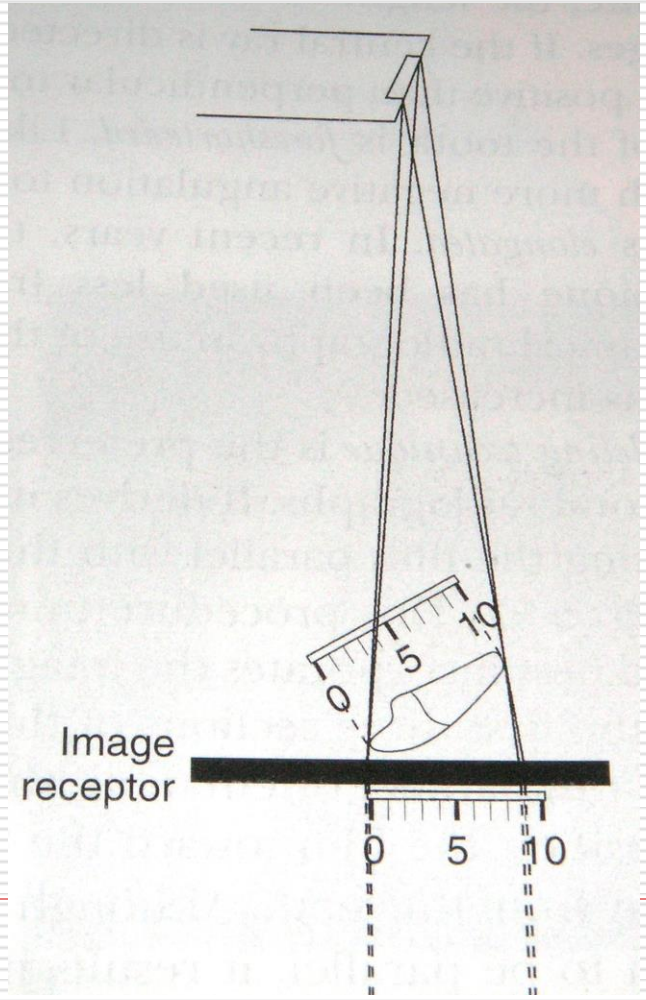
Film should be parallel to the object

- Mainly affects image size distortion and not the sharpness,
- What is image size distortion (magnification)??
- Is the increase in size of the image on the radiograph compared with the actual size of the object.

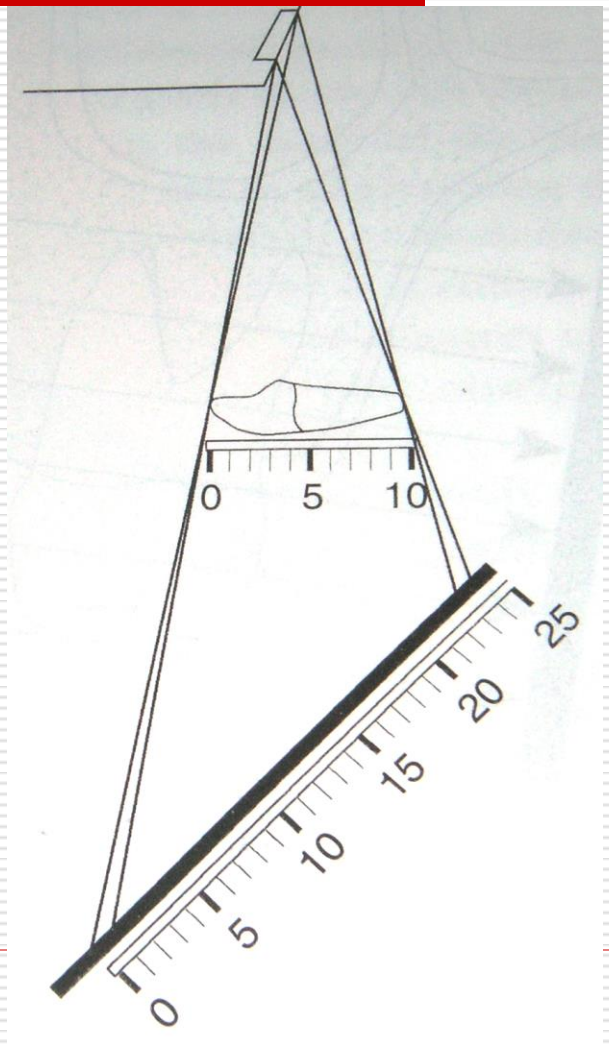
Film should be parallel to the object

- Image shape distortion is minimum when the long axes of the film and tooth are parallel.
- Foreshortening- radiographic image to be shorter than the object.
- Elongation- the object appearing longer on the film than its actual length.

Foreshortening- radiographic image to be shorter than the object



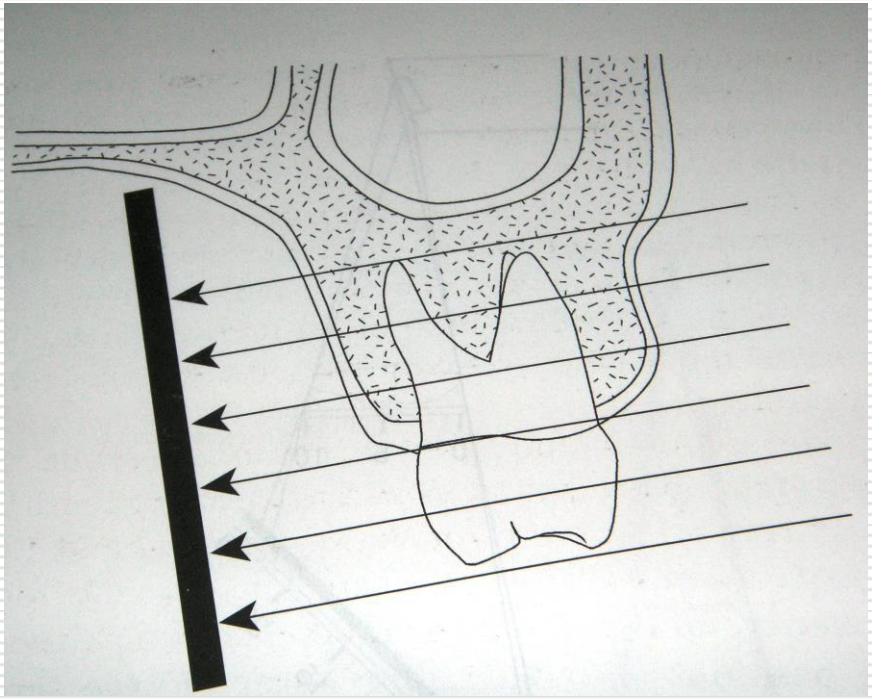
Elongation- the object appearing longer on the film than its actual length

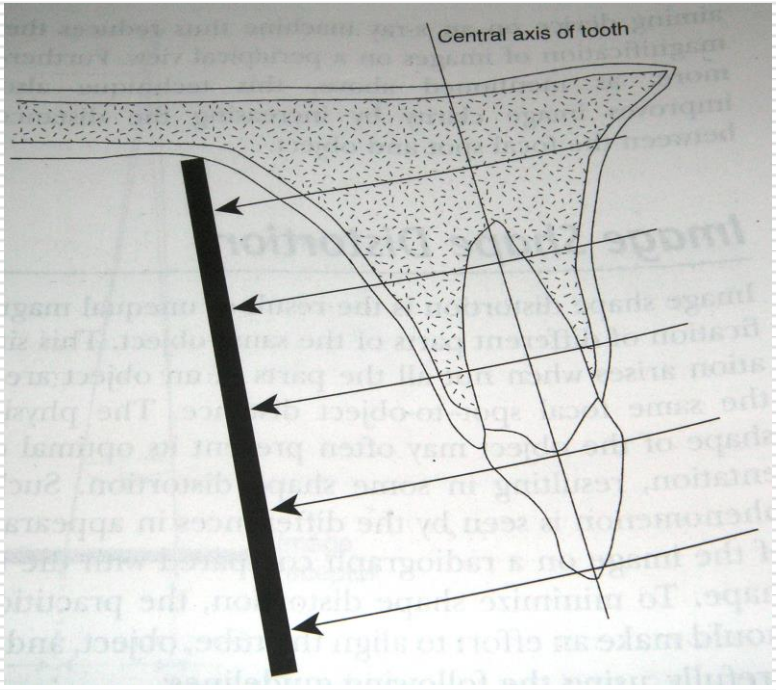


Central ray of the beam of radiation should be perpendicular to the film

- Causes image shape distortion,
- If your film and object is aligned parallel to each other and your central rays are not directed perpendicular to the object and film.
- Maxillary molars,
- To prevent such errors, align object and film parallel to each other and central ray perpendicular to both object and film.

Central ray of the beam of radiation should be perpendicular to the film





FILTRATION

- Polychromatic beam –

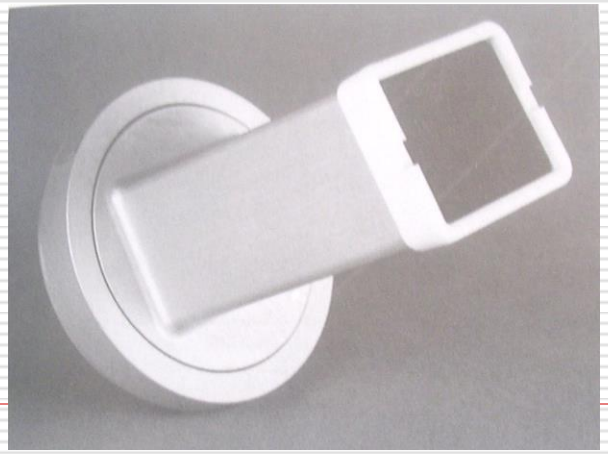
- Filtration –
- Harden the x-ray beam,
- Removes photons with short wavelength,
- Reduces patient exposure,

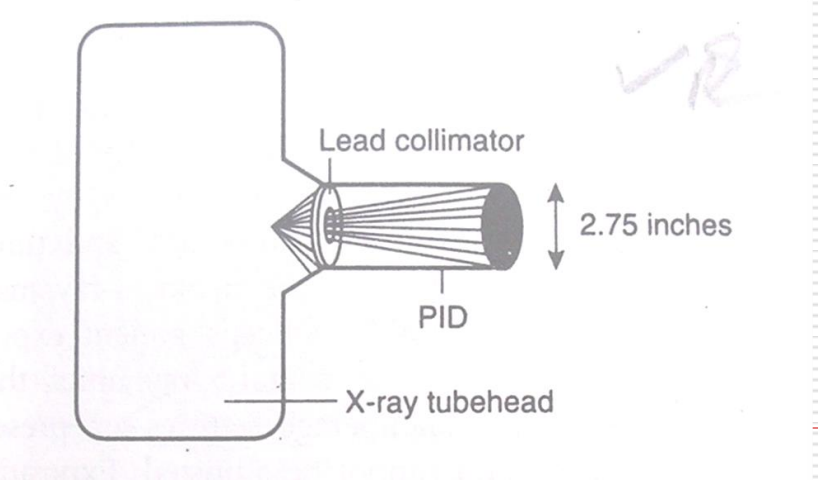
FILTRATION

- Increase in the scale of contrast,
- Density is affected because increased filtration also results in absorption of some of the useful penetrating x-rays.
- Increase in filtration may require increase in exposure time.

COLLIMATION

- Collimation- reduction in size and shaping of x-ray beam.
  - Circular,
  - Round,
  - Rectangular.





COLLIMATION

- When the x-ray beam size is restricted to the smallest possible dimensions, the amount of tissue being irradiated can be held to a minimum.
- Also, the production of secondary radiation FOG is minimized, and radiograph with little fog density is produced.

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Thank you