

# Biomedical instrumentation



المرحلة الرابعة فيزياء طبية

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# **X- Ray Protection**

- *Operators Protection*
- *Patient Protection*
- *Ambient protection*

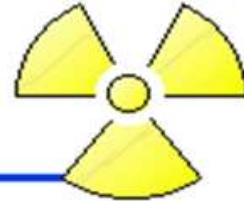
# Operators Protection

- **Avoiding the primary beam:** It is the most important principle where the radiographic imager must not fall within the field of the beam of rays and not directly face the beam.
- **Distance:** The radiographer should stay away from the source of radiation as much as possible, and he should also stay away from other secondary sources of radiation, especially the head of the patient in the case of dental rays, where he is at least (6) feet away.
- **Shields:** The radiographer must stand behind a protective barrier made of lead to absorb the scattered rays. This enables the doctor to observe the patient through a window made of glass mixed with lead.

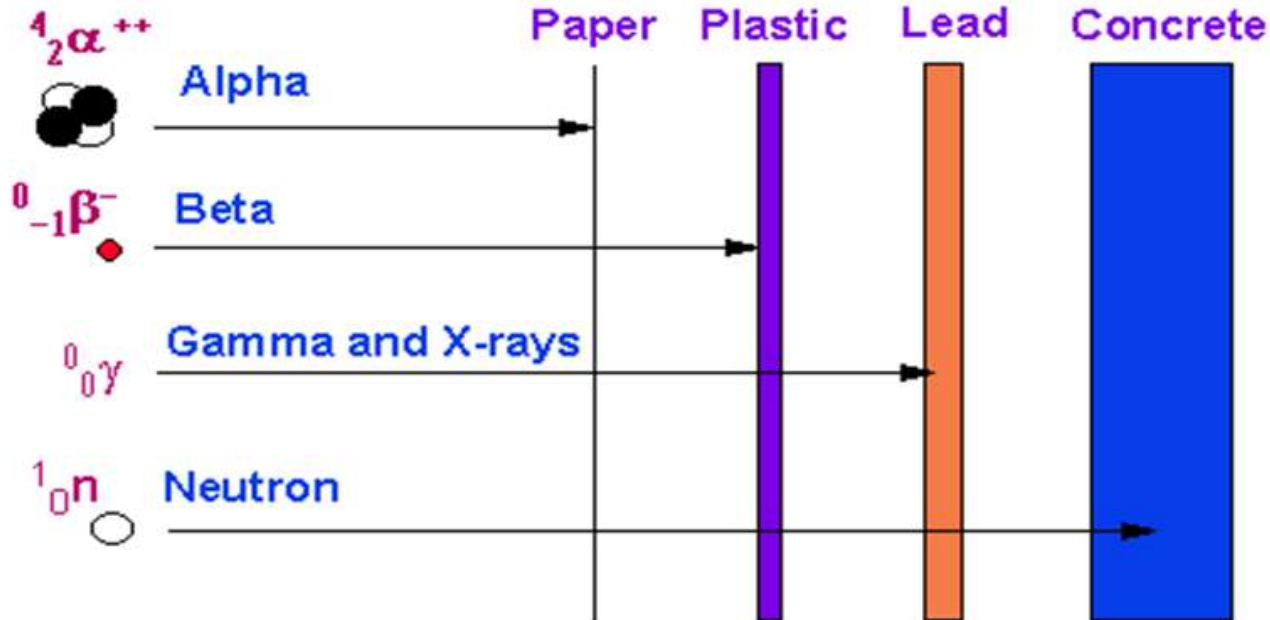


# Radiation Shielding

*x-rays compared to other ionizing radiation*



## Penetrating Distances



- **Location:** A place must be chosen so that it forms a right angle with the radiation source and behind the patient, and in this position the radiographer is not exposed to radiation.
- **Stay away from the head of the device:** The X-ray tube should not be held in order to fix it and prevent it from moving, as all devices leak part of the X-ray.
- Pregnant workers are not allowed to work in the radiology department during pregnancy.
- The radiation in the body must be monitored and a break should be taken when it exceeds the prescribed limit.

# Professional dosage limits

- Occupational exposure to any radioactive worker is monitored so that it does not exceed the following limits:
- 1- An effective dose of (20 mSv) per year for five years consecutive .
- 2- An effective dose of (50 mSv) in any one year.
- 3- An equivalent dose received by the lens of the eye of (150 mSv per year).
- 4- An equivalent dose to the extremities (hands and feet) or the skin of (500 mSv) in the year.

# patient protection

The principle is to reduce the amount of radiation as much as possible, as follows:

- 1. Using fast films: Old films required a time of up to four seconds, but today only 0.75 seconds can be used due to the quality of the devices and the high sensitivity of films to radiation, and thus their speed.
- 2. Good filtration: The weak rays that do not reach the film must be eliminated through filtration.
- 3. Use of genital protectors (condoms).

- 4. Good treatment and filming: Treating a bad film means returning it and thus increasing the patient's exposure to radiation, and bad exposure to the film when filming means re-shooting.
- 5. Use of open-ended cones: they contribute to non-dissemination of radiation and thus reduce the patient's exposure to radiation. (in the case of dental x-rays)
- 6. The radiation value should not exceed the permissible or required limit.
- 7. X-rays should not be taken during pregnancy



# Ambient protection

- 1. The beam of radiation should be directed only at the patient and then hit the wall without passing or exiting a door or window to irradiate another place.
- 2. It is preferable to place the radiology department on the basement floor to reduce the exposure of the surrounding area to radiation.
- 3. Use of walls containing lead plates.
- 4. Commitment to the principles of protecting workers and patients and minimizing errors in filming and film processing as much as possible.