

Proper way of Using TLDs in Diagnostic Radiology

The mission of AERB is to ensure that the use of ionizing radiation and nuclear energy in India does not cause undue risk to health of people and the environment.



Issued by :
Atomic Energy Regulatory Board

Niyamak Bhavan, Anushaktinagar,
Mumbai - 400094. (Maharashtra)



Use TLDs - Why?

What is TLD badge



TLD Badge is a radiation dose measuring device. This enables us to know whether we are working within the safe dose limits prescribed by AERB.

Dose limits of Occupational Exposure (AERB Directive)

Effective Dose 20 mSv in a year averaged over a period of 5 years

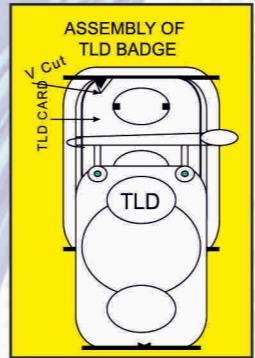
Annual equivalent dose in the

| | |
|-----------------|---------|
| Lens of the eye | 150 mSv |
| Skin | 500 mSv |
| Hands and feet | 500 mSv |

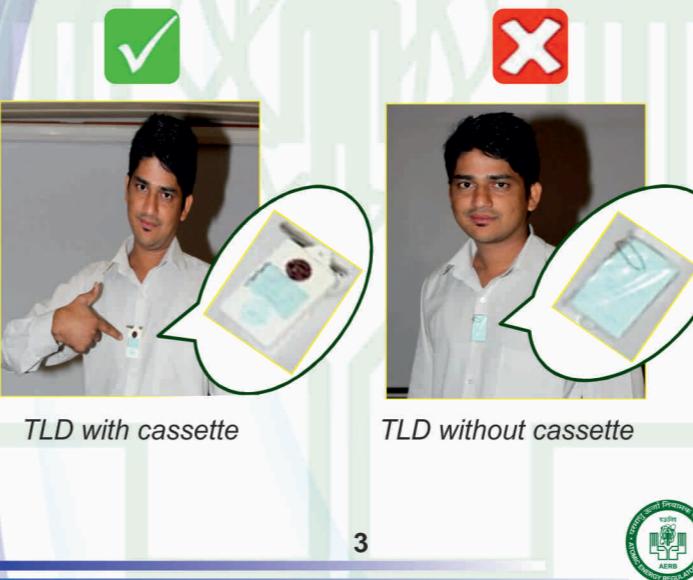
2



Use TLD with cassette!



Loading TLD card in the cassette



TLD with cassette

TLD without cassette

3



Store TLD - Where?

Personnel TLD is to be properly stored when not working with radiation



Never store/ leave TLD badges inside X-ray Room/Radiation Area.



Change your TLD cards every monitoring period (eg. Quarterly) and return used TLD cards to Laboratory for dose assessment.

- Store control TLD badge in radiation free area all the time.

- Store personnel TLD badge in radiation free area when not in use, along with control TLD badge. (e.g., office room)



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Any suspected excessive exposure to personnel should immediately be reported to AERB

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List of Laboratories Accredited to provide TLD services

Name of Accredited Laboratory

State

Avantec Lab. Private Limited

Plot # 17, Arignar Anna Industrial Estate, Mettukuppam, Vanagaram, Chennai - 600095
Tel: 044-23862024/25

Andhra Pradesh, Telangana, Tamil Nadu, Karnataka, Kerala, Puducherry, Andaman and Nicobar and Lakshdeep (Southern Region)

Renentech Lab. Private Limited

C-106, Synthofine Industrial Estate, Off Aarey Road, Goregaon (E), Mumbai, Maharashtra Pin- 490063
Tel.: 022-40037476

Maharashtra, Gujarat, Rajasthan, Goa, Dadra and Nagar Haveli and Diu (Western Region)

Ultratech Lab. Private Limited

Cloth Market, G.E. Road, Kumhari, Bhilai, Durg, Chhattisgarh Pin- 490042
Tel.: 0788-3295166, 09981212431

All other states in the Central, Northern and North Eastern parts of the country

Defence Laboratory, Jodhpur

All Defence institutions of country



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Wear TLDs below Lead Apron!



TLD below apron

TLD above apron

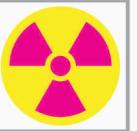
4



Radiation Symbols



Radiation Generating Equipment



Radioactive Source

FOR DETAILS CONTACT :

The Head,
Radiological Safety Division Atomic Energy
Regulatory Board, Niyamak Bhavan,
Anushaktinagar Mumbai - 400 094.
Ph : 022 - 2599 0656 Fax : 022 - 2599 0650

Applications to AERB can now be submitted online through
<http://www.aerb.gov.in/AERBPortal/eLORA.htm>

* Above information is for quick reference only. For details visit www.aerb.gov.in Credits : jvksunil & team

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RADIATION SAFETY AWARENESS FOR DIAGNOSTIC RADIOLOGY

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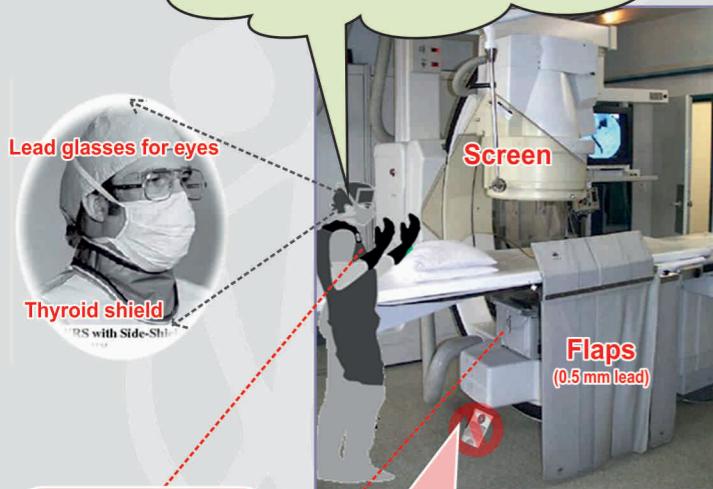
Atomic Energy Regulatory Board

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Interventional Radiology (IR)

Use Ceiling Suspended screen, couch hanging flaps and Lead Apron, Lead glasses , Thyroid shield..



Always use TLD at the chest level, inside lead apron

Never leave TLD badge near the X-ray equipment / inside X-ray room

Keep X ray tube under the patient table and not over it

5

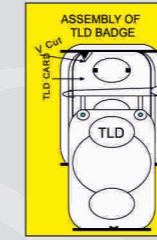
Display Radiation warning sign on the entrance door



2

Use of TLDs!!!

Use TLD with the cassette Wear TLD below apron, at the Chest Level



Loading TLD cards in the cassette



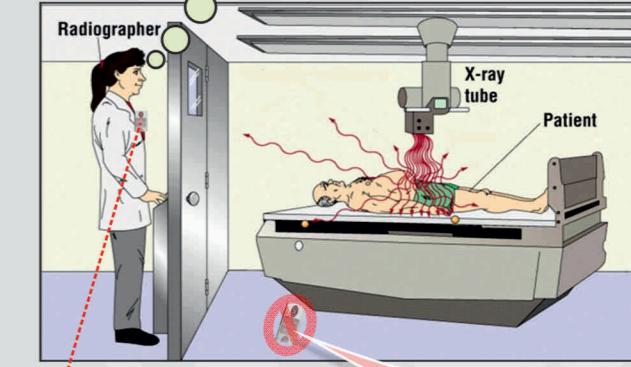
Never store/ leave TLD badge in the X-ray room



3

Radiography

Always work behind a protective barrier (min. 1.5 mm lead)



Wear TLD badge at the chest level

Never leave TLD badge near the X-ray equipment/ inside X-ray room



4

Mobile X-ray / Dental X-ray

Operate the mobile X-ray/ Dental X-ray machine from a distance, Use Lead Apron



Always use TLD at the chest level, inside lead apron

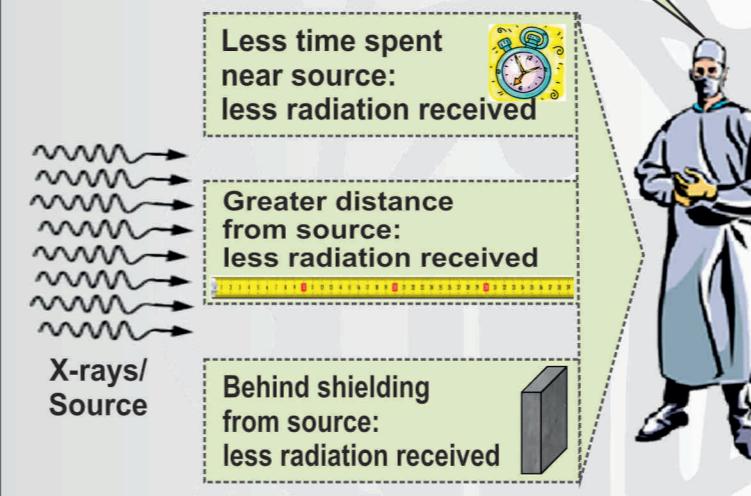
Extendable Control Cable for operating from a distance

Use lead Cones for Collimation

6

TDS Principle!!!

Make good use of Time-Distance-Shielding (TDS) Principle to reduce radiation Exposure



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Radiation Safety in Fluroscopy

WAYS TO REDUCE RADIATION DOSE
TO PATIENT AND STAFF

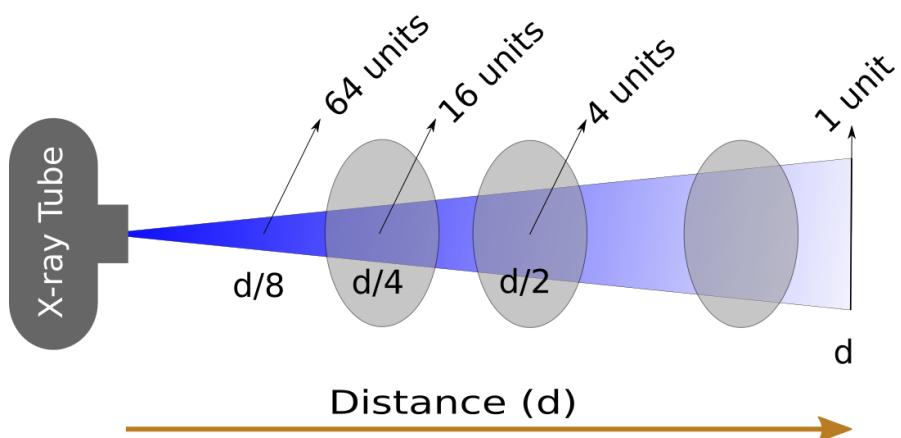
“Reducing patient dose also results in staff dose reduction”



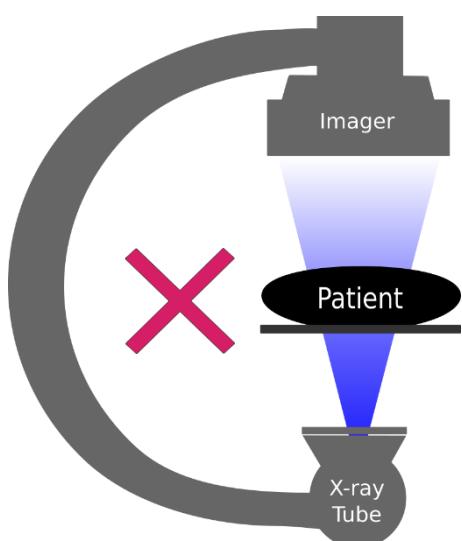
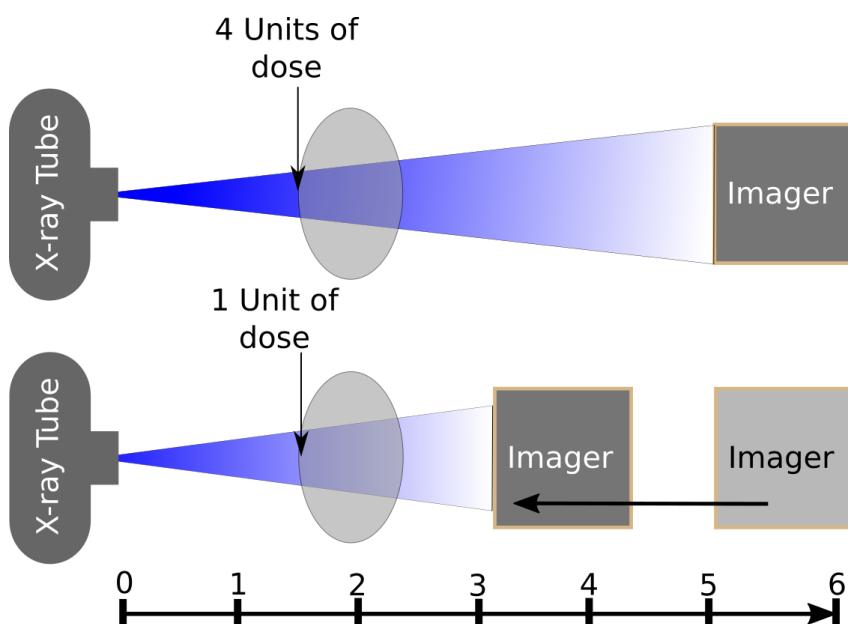
Atomic Energy Regulatory Board
(Government of India)
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Mumbai - 400094

www.aerb.gov.in

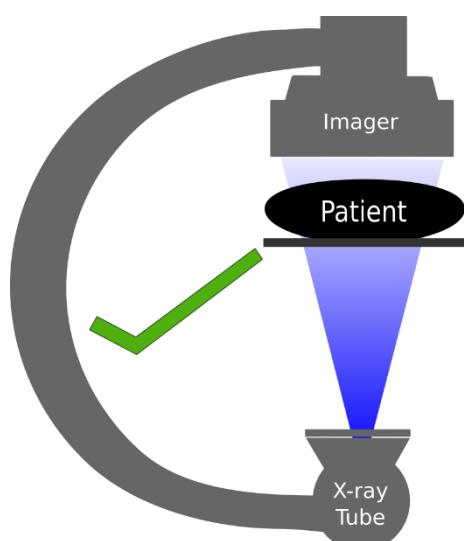
Maximise distance between the X-ray tube and the patient to the extent possible.



Minimise distance between the patient and the imager.

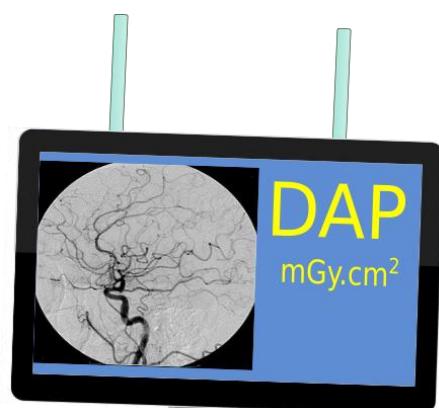


Tube close and imager away from patient



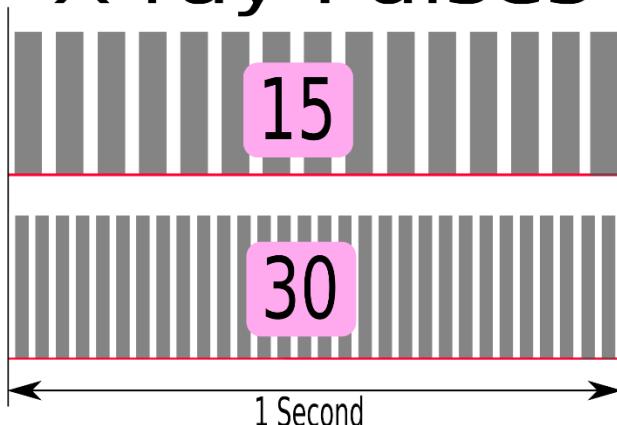
Tube away and imager close to patient

Minimise fluoroscopy time and monitor DAP values. Step on the pedal only while looking at the screen. Employ last image hold to review findings.



Minimise number of frames and cine run to clinically acceptable level.

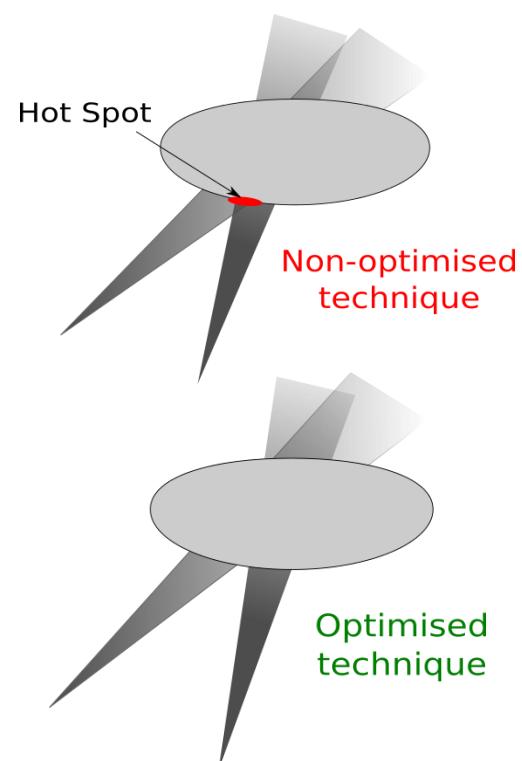
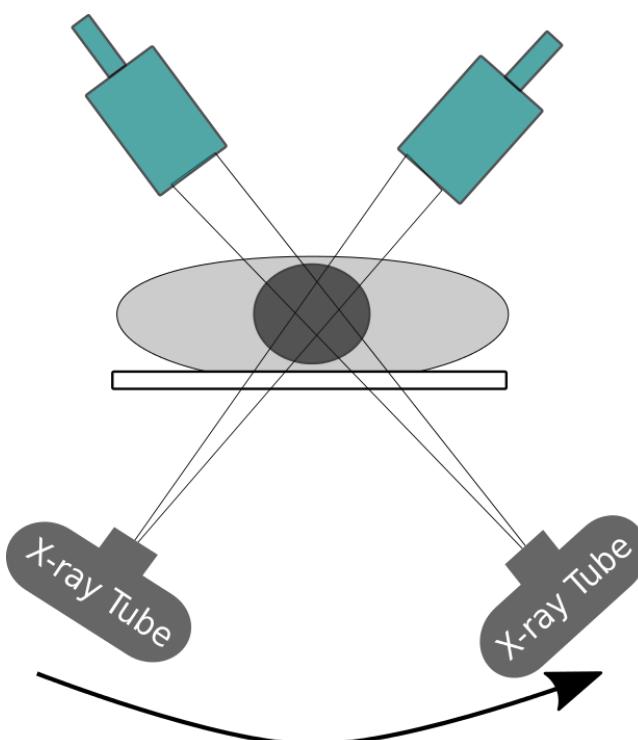
X-ray Pulses



Lower frame rate - Less dose to patient

Higher frame rate - Higher dose to patient

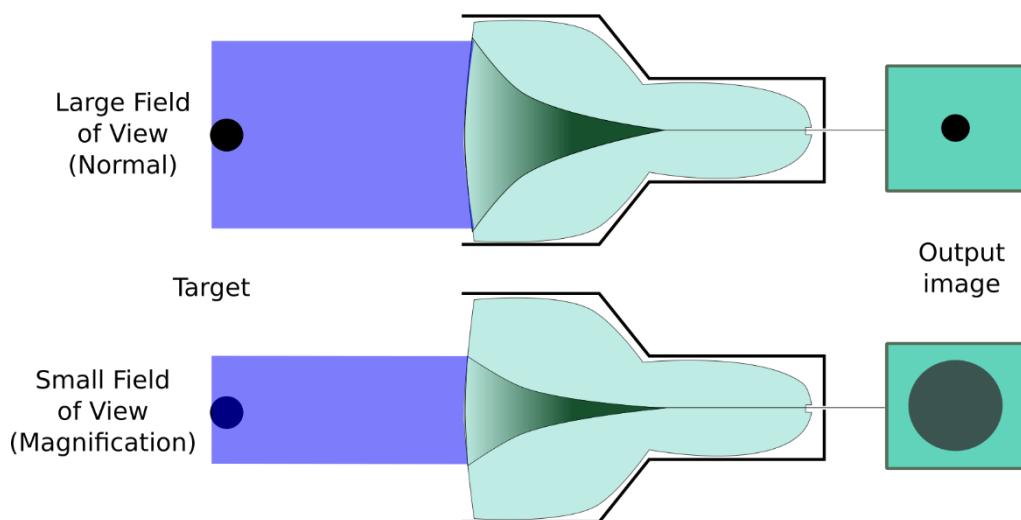
Spread the dose by rotating X-ray tube around the patient to avoid high Entrance Skin Dose (ESD).



Exposing the same area in different projections may lead to skin injuries

Magnification mode results in higher patient dose

More beam condensed to image intensifier output results in brighter image



Less beam condensed to image intensifier output results in dimmer image.
This increases dose rate and results in higher patient dose.

Collimate the X-ray beam to the area of interest. Collimation reduces the scattered dose and improve image contrast.

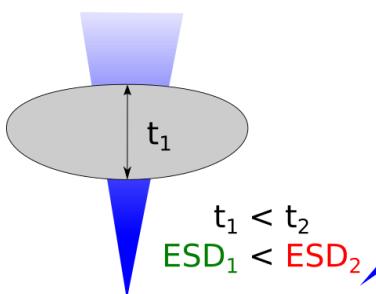


Bad Collimation



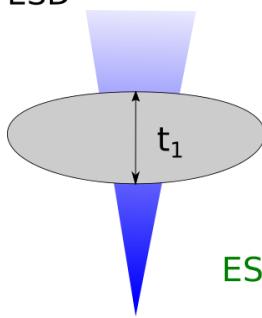
Well Collimation

Be aware that oblique projections and Thicker body parts increases ESD



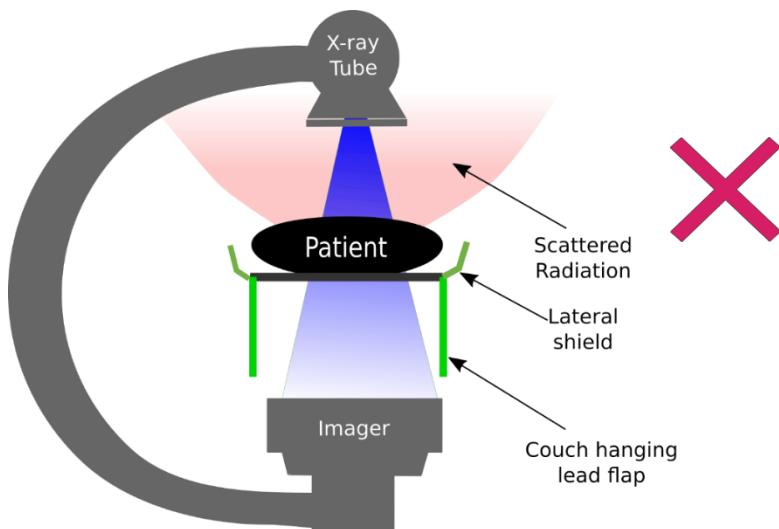
Oblique projections increases ESD

Thicker Body Parts



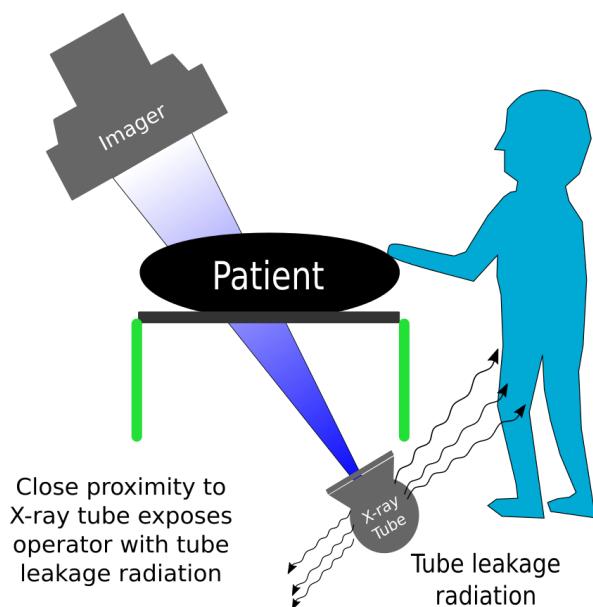
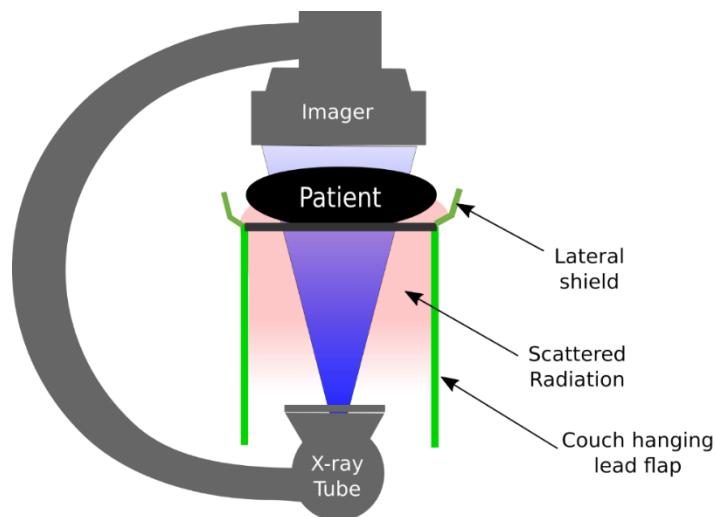
Thicker body parts increases ESD

Staff dose increases with inappropriate positioning

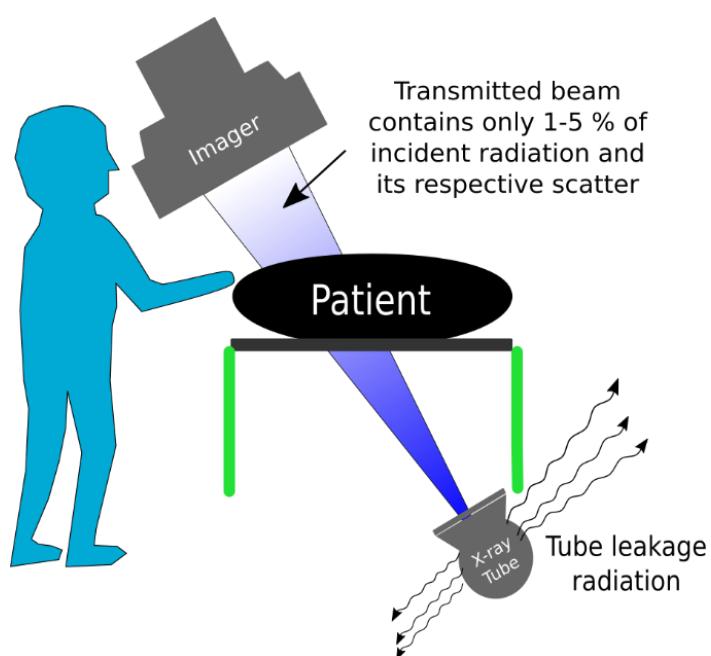


Do not keep X-ray tube above the couch.

✓ Keep X-ray tube under the couch.
Under couch system provides better protection from scattered radiation

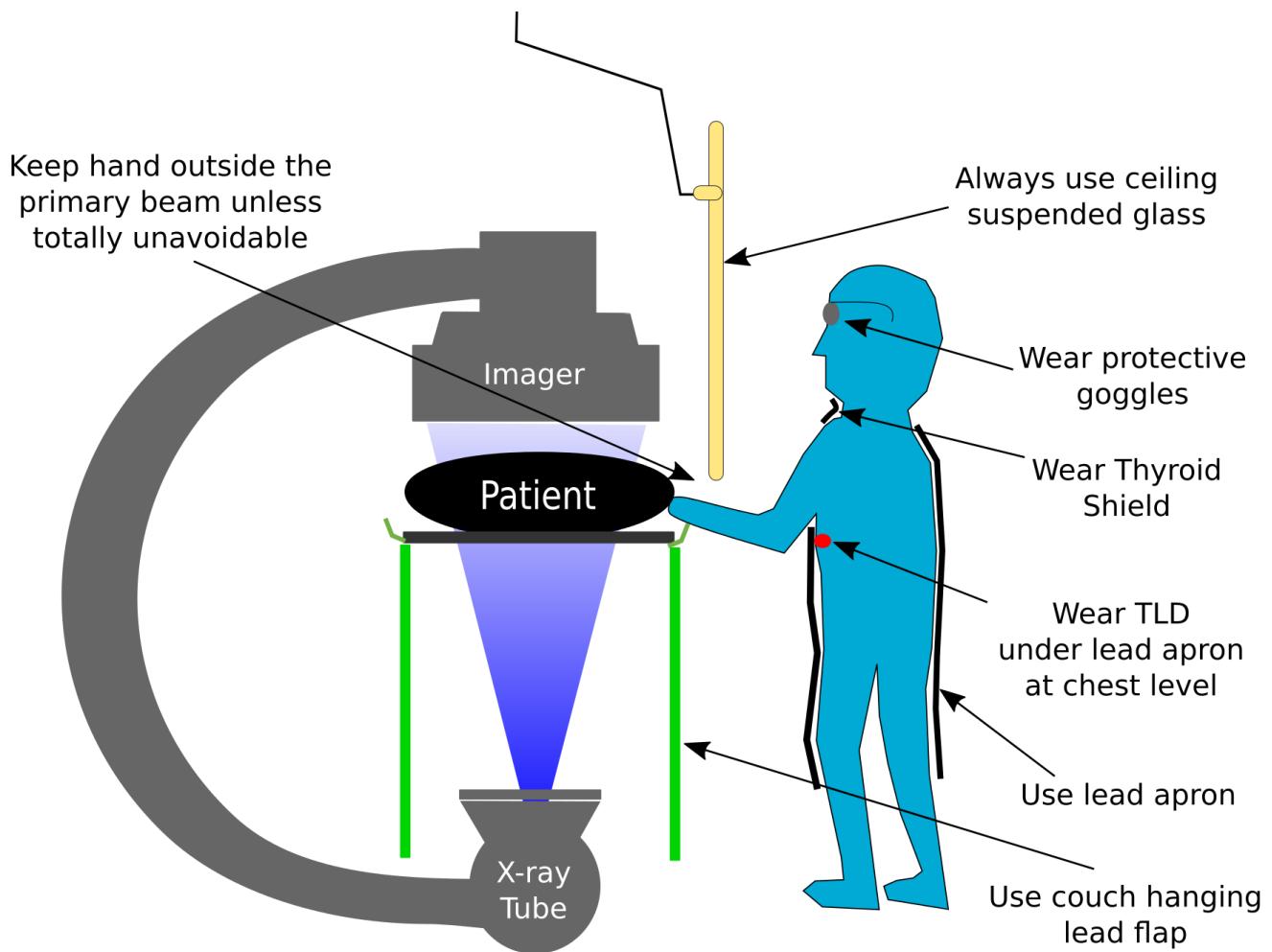


✗ Avoid standing on tube side for oblique and horizontal X-ray beam



✓ Stand on the side of the transmitted beam i.e. stand on the side of imager

Radiation Protection of Staff



- Always wear protective accessories such as lead apron, thyroid shield and protective goggles.
- Always wear TLD badge (at chest level and below lead apron).
- Make use of ceiling suspended glass, couch hanging lead flaps and lateral shields.
- Make good use of Time, Distance and Shielding.
 - Minimise the time of exposure and cine runs.
 - Maximise the distance between patient and operating personnel.
 - Use protective accessories for shielding.
- Ancillary staff should make use of mobile protective barrier.
- Ensure that your equipment is Licensed by AERB for its operation and periodic Quality Assurance (QA) is carried out.