

THERMO LUMINESCENT DOSIMETERS (TLD)

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INTRODUCTION

- ❖ **Monitoring the personnel is essential to ensure that occupational radiation exposure levels are kept well below the annual dose equivalent limit.**
- ❖ **Monitoring device provides some indication of the working habits and working conditions of Diagnostic Radiology Personnel.**

By measuring the quantity of ionizing radiation to which Personnel Monitoring Device (PMD) has been exposed over a period of time, it indicates occupational exposure.

Because the personnel monitoring device records only the exposure received in the area in which it is worn, it should be anatomically located so that it will provide an indication of the exposure received by the body of occupationally exposed persons.

A record of exposure recorded by personnel monitoring devices should become part of the employment record of all diagnostic radiology personnel which gives occupational exposure values for a typical year.

**THIS MONITORING DEVICE DOES
NOT PROTECT THE WEARER
FROM EXPOSURE.**

CHARACTERISTICS OF PMD

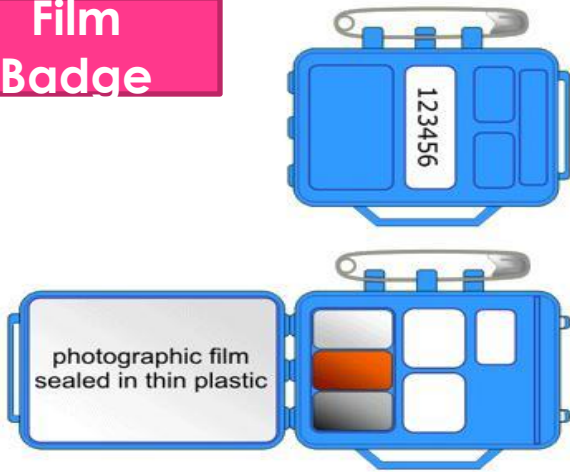
- ❖ Must be lightweight and easy to carry.
- ❖ Made of materials durable enough to tolerate normal daily use.
- ❖ Able to detect and record small and large exposures in a consistent & reliable manner
- ❖ The Heat, humidity and mechanical shock should not affect the performance of the device
- ❖ Should be reasonably low in cost

TYPES OF PMD



Pocket dosimeter

Film Badge



THERMOLUMINENCE

Thermo Luminescence is a phenomenon where in certain materials emit visible radiation during or after radiation by X-Ray, only if heated to a few hundred degree Celsius.

Thermoluminescent materials such as lithium fluoride (LiF) or calcium Sulphate (CaSO₄), provide a simple inexpensive method of measuring radiation dose over an extended period of time.

TLD BADGE

- ❖ TLD is used to measure external individual doses from Xray, beta and gamma radiations
- ❖ It is based on the phenomenon of thermoluminescence

PARTS OF TLD BADGE



- TLD CARD
- CASSETTE
- FILTERS

TLD CARD

- A TLD card consist of three CaSO_4 : Dy-Teflon
- V cut provided – to ensure a fixed orientation of card in the TLD cassette
- A thin paper wrapper – provides personal data and period to use
- To protect the Disc from dust and mishandling it is sealed with polythene pouch

TLD CASSETTE AND FILTERS

- Card holder made up of high impact plastic
- Disc 1 : sandwiched between a pair of filter of 1-mm aluminum & 0.9-mm Cu
- Disc 2 : sandwiched between a pair of 1.5-mm thick plastic filters
- Disc 3 : Positioned under a circular open window

TYPES OF TLD BADGES

WRIST DOSIMETER

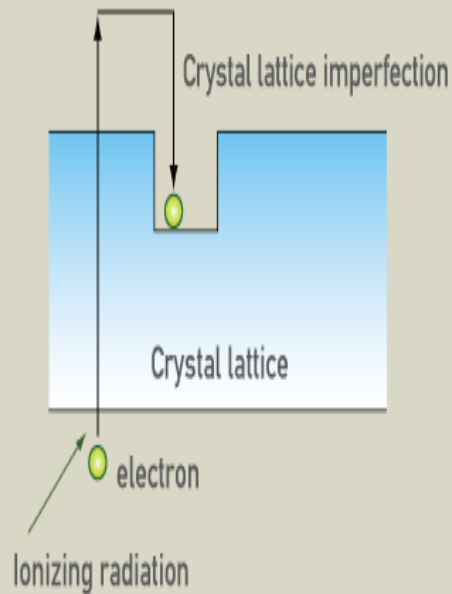


CHEST DOSIMETER

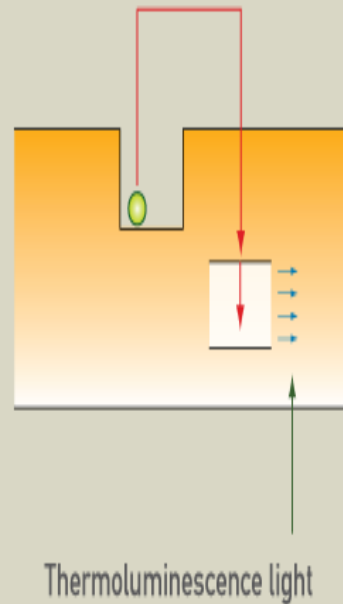


HOW TLD WORKS

Electron's Trapping



Heating



IRRADIATION

LOCAL IONIZING RADIATION INTRODUCES ELECTRONS TO THE CRYSTAL LATTICE, SOME OF WHICH ARE TRAPPED AT IMPERFECTIONS AND 'STORED'. **CASO4:Dy**

STORAGE

SOME ELECTRONS ARE 'TRAPPED', AS THEY LACK SUFFICIENT ENERGY TO ESCAPE THE LATTICE.

EVICION

ELECTRONS ARE PROVIDED THE MEANS TO ESCAPE FROM AN OUTSIDE STIMULUS (EG. UV WAVELENGTHS OR HEAT).

THE AMOUNT OF THERMOLUMINESCENCE FROM A HEATED SAMPLE IS USED TO DETERMINE THE NUMBER OF TRAPPED ELECTRONS RESULTING FROM THE ABSORPTION OF **IR** RADIATION.

ADVANTAGES

- ❖ Tissue Equivalent , better accuracy
- ❖ Not affected by temperature and humidity
- ❖ Can be worn up to 3 months
- ❖ Card can be reused

LIMITATIONS

- No permanent record
- Calibration of Dosimeters required with each group of TLDs.

DO'S

- ❑ TLD badges should be worn at the chest/wrist position as per instruction
- ❑ Upon using Lead apron, TLD should be worn inside the Apron
- ❑ The TLD badge should be stored away from light, radiation and dust when it is not used.
- ❑ TLDs are changed every three months
- ❑ Do request a replacement immediately if a badge is damaged or contaminated by radioactivity during the wear period

DO NOT'S

- ⦿ Do not subject the dosimeters to wet or chemical environments
- ⦿ Do not take dosimeters home.
- ⦿ Do not intentionally expose the dosimeter to radiation or leave your dosimeter next to a source of ionizing radiation
- ⦿ Do not lend your dosimeter to another individual
- ⦿ Do not use your dosimeter to monitor personal medical procedures such as your x-rays.