Public Health England

Body Thermoluminescence Dosemeter (TLD)

The Personal Dosimetry Service of Public Health England provides standard dosimetry for photon (X- and gamma) and beta radiations by means of thermoluminescence dosemeters (TLDs). The dosemeters measure doses to the whole body and to the skin in terms of the radiation quantities $H_p(10)$ and $H_p(0.07)$ as required by the Health & Safety Executive (HSE). They are also capable of assessing the dose to the lens of the eye from photons, in terms of the quantity $H_p(3)$.

The PHE TLD dosimetry service is approved by the HSE under Regulation 36 of the Ionising Radiations Regulations 2017.

The body TLD comprises a TLD card, wrapper and holder, as shown below.

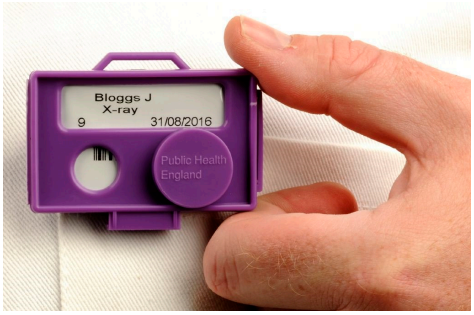
The TLD card is of Harshaw™ design and contains two pellets of specially-doped lithium fluoride (LiF:Mg,Cu,P). The thicker element is used for the assessment of the dose from strongly-penetrating radiation and the thinner one for the assessment of the dose from both weakly- and strongly-penetrating radiation. These are covered front and back with a thin retaining layer of PTFE. The cards are individually bar coded.

The wrapper protects the dosemeter from contamination by chemicals, dirt or radioactive materials, and is of aluminised polyester. It carries printed wearer and identifier information, in text and bar-code formats.

The holder is of PHE design and comprises a polypropylene case with:

- a thick filter of PTFE and polypropylene – this covers the thick TLD element, for the assessment of $H_p(10)$

Components of the TLD



Assembled TLD

- a circular open window – this is positioned over the thin TLD element, which is therefore only covered by the retaining layer of PTFE and the thin wrapper, for the assessment of $H_p(0.07)$
- a rectangular open window for viewing the wearer information text

The printed wearer information includes the wearer's name (or, if desired, a serial number), the customer identifier, the change date, and an optional personal identifier (eg department name or a works number).

TLDs operate by storing the energy they receive from ionising radiation until they are heated – in this case to about 250°C – when the energy is released in the form of light. The light is collected and measured, the amount of light being proportional to the radiation dose. These operations are performed in an automated TLD reader which also identifies the dosemeter card and feeds the results to our dose reporting system.

Dosemeters are re-usable: on completion of the read process, the stored signal is 'cleared' and the TLD can be issued again.

The body thermoluminescence dosemeter service is just one of the approved dosimetry services offered by Public Health England and can be linked to our dose record keeping service via an automated system. The processing laboratory is based at our centre at Chilton. For further information or to place an order please contact us on the numbers below.

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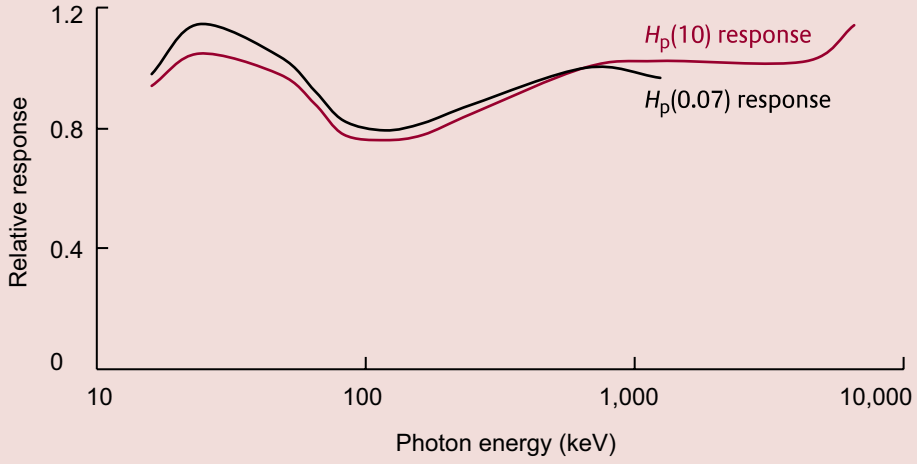
Technical Specification

Material	^{7}LiF (Mg,Cu,P)
Dose range	0.02 mSv to 10 Sv
Change interval	Standard periods of 1, 2 or 3 months Periods of 2, 4, 8 or 13 weeks also available

Energy response

	Energy ranges (keV)			
	Photons		Betas (E_{max})	
Dose quantity	**from**	**to**	from	to
$H_p(10)$	16	6610	—	—
$H_p(0.07)$	16	1250	690	2280
$H_p(3)$	16	1250	—	—

The response per unit dose varies smoothly with radiation energy.



Variation of TLD response with photon energy

Measurement uncertainties

The thermoluminescence dosemeters are subject to measurement uncertainties which comply with the recommendations given in European Commission report *Radiation Protection 160: Technical Recommendations for Monitoring Individuals Occupationally Exposed to External Radiation*.

In HSE performance tests, the overall relative standard deviation and overall bias are typically 5% (allowed values: 10% and 20%, respectively).

Special Features

Detection limit

The detection limit for the dosemeter, under laboratory conditions, is less than 10 microsieverts (μSv), a figure unsurpassed by any other passive dosemeter. However, owing to uncertainties arising from natural background, the minimum reporting level for monthly issue is 20 μSv.

Tissue equivalence

The detectors absorb radiation energy in the same way and to the same extent as human tissue, as does the holder material. This allows us to evaluate doses from complex mixtures of radiations in a simple manner, thus keeping uncertainties to a minimum.

Life span

The dosemeter is capable of retaining the stored dose information for extended periods before assessment, with no measurable changes in response over at least six months. The dosemeter can also withstand exposure to high temperature (40°C) and relative humidity (over 90%) for continuous periods of over 48 hours. Issue periods of up to 13 weeks can be offered, thus keeping the cost of monitoring low.

Re-assessment of TLD

Thermoluminescence glow curves of all dosemeter readings are kept for at least five years. This allows retrospective investigation in the event of a customer query. The glow curves for dosemeters with assessments in excess of 15 mSv are all checked. For higher doses, it is possible to verify the original assessment by examining the small amount of signal remaining after read-out.

March 2018