

Extremity Dosimeters



The Personal Dosimetry Service of the Health Protection Agency provides extremity dosimetry based on alternative forms of thermoluminescence dosimeter (TLD): the finger stall and the ring. The dosimeters are designed to measure doses from X-, beta and gamma radiations to the skin of the extremities (ie the hands and feet) in terms of the radiation quantity $H_p(0.07)$, the dose equivalent at a depth of 0.07 mm, as required by the Health and Safety Executive (HSE).

The dosimeters are issued as part of the HPA TLD dosimetry service, which is approved by the HSE under Regulation 35 of the Ionising Radiations Regulations 1999. The performance of the two types is very similar, with the finger stall being preferred where low energy radiations are used. The dosimeter elements are produced by Harshaw TLD™, part of the Thermo Electron Corporation, and are individually bar-coded.

Finger stalls are available in two sizes, to suit maximum finger diameters up to 20 mm (small size) and 24 mm (large size). The dosimeter element is of the Harshaw EXTRAD™ type, and is a small strip of Kapton™ foil containing a thin layer of sensitive lithium fluoride powder at one end. The sensitive area is covered by an aluminised plastic patch which is very thin and which allows very low energy radiations to penetrate.

Plastic **rings** are provided in a single, adjustable format which will accommodate finger diameters up to 29 mm. The dosimeter element is of the Harshaw DXTRAD™ type, and is a small metal annulus, backed with Kapton™ and containing a thin layer of sensitive lithium fluoride powder. The element is covered by a flattened plastic dome with a thin aluminised window.

Thermoluminescent materials store the energy they absorb from ionising radiation until they are heated (in this case to about 250°C), when the energy is released as light. The amount of light released is proportional to the radiation dose. When the dosimeters are returned for processing, the sensitive elements are removed and placed in special carriage cards. The cards are then fed into an automated TLD reader which identifies the dosimeter, heats it to the required temperature, and measures the light output.

The dosimeters must be used with the sensitive elements facing the predominant direction of the radiation – in the case of the finger stall, the aluminised side should face the source, and, in the case of the finger ring, the domed dosimeter housing should face the source.



Finger stall



Ring

The extremity dosimeter service is just one of the approved dosimetry services offered by the Health Protection Agency 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.

Personal Dosimetry Service
 Centre for Radiation, Chemical and Environmental Hazards
 Health Protection Agency
 Chilton, Didcot, Oxon OX11 0RQ

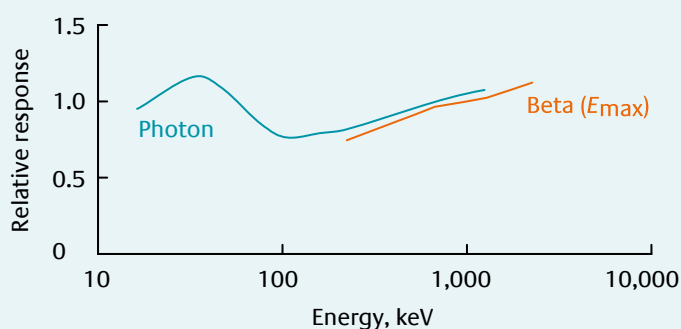
Email personaldosimetry@hpa.org.uk
 Tel (+44) (0)1235 822726
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Technical Specification

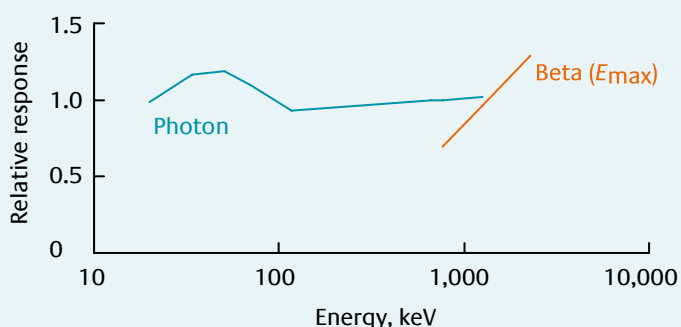
Material	^7LiF (Mg,Cu,P)
Dose range	0.15 mSv to 10 Sv
Change interval	Standard periods of 2, 4, 8 or 13 weeks Periods of 1, 2 or 3 months also available

Energy dependence of response

Finger stall -25% to +15% for photon radiations from 16 keV to 1250 keV and for beta radiations of E_{max} from 224 keV to 2280 keV



Ring -10% to +20% for photon radiations from 20 keV to 1250 keV and $\pm 30\%$ for beta radiations of E_{max} from 760 keV to 2280 keV



Angle dependence of response

Finger stall	Within $\pm 10\%$ up to 90° for photon radiations and $\pm 20\%$ up to 60° for beta radiations
Ring	Within $\pm 25\%$ up to 60° for photon radiations and $\pm 45\%$ up to 60° for beta radiations

Measurement uncertainties

The extremity dosimeters 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 10% (allowed values: 15% and 20% respectively).

Special Features

Energy threshold

The finger stall dosimeter has an exceptionally low beta energy detection threshold of 224 keV (E_{max}).

Environmental effects

The dosimeters may be worn in all normally encountered environments. In tests, no effect was found for 48 hours exposure at 40°C and 90% relative humidity. Prolonged exposure to strong ultraviolet light (including sunlight) should be avoided.

Styles to suit all

The extremity dosimeter is available in a wide range of styles to suit everyone. The finger stall is available in small and large sizes, whilst the ring dosimeter is adjustable.