

Accurate.
Durable.
Essential.



Thermo Scientific Harshaw TLD Materials and Dosimeters

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Thermo Scientific™ Harshaw™ TLD Materials are available in a wide range of formats to **meet any dosimetry need**, from research, clinical and industrial applications to personnel and environmental monitoring. Harshaw Lithium Fluoride based materials can be used for gamma, beta and neutron monitoring, with an available **high sensitivity, no-fade**, Mg, Cu, P option for low dose or long-wear applications. Additional materials are available for extended dose range coverage.

Harshaw TLD Dosimeters are available in un-mounted forms (rods, chips, powders, micro-cubes and pelletized disks), as well as fixed into multi-element aluminum cards, extremity dosimeters or mounted singly on a Kapton substrate, to meet your exact application need.

A Proven History

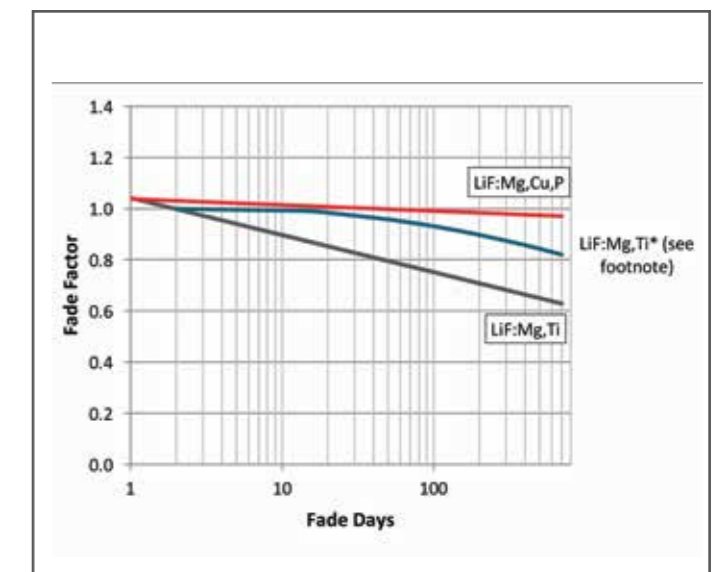
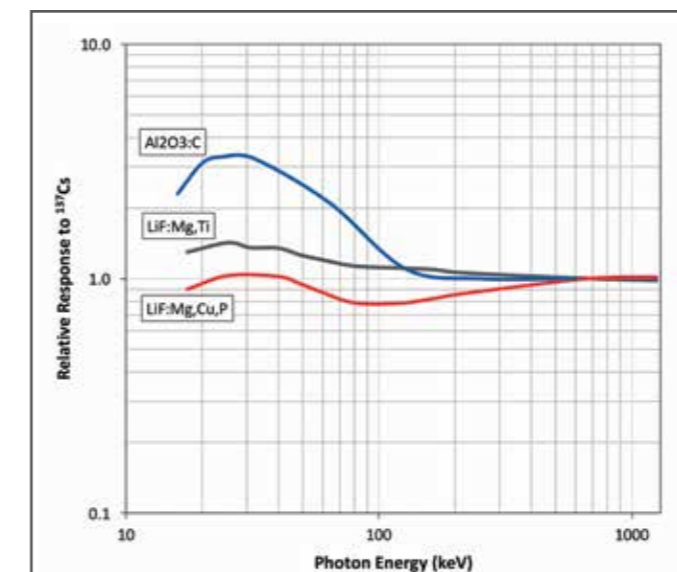
- Manufactured in ISO9001 Certified factory for over 40 years
- Strictly controlled material quality and performance
- 100% quality controlled in a multi-step QC process
- Proven to last, with cards warranted up to 500 reads, reducing the total cost of ownership of a dosimetry system.

Lithium Fluoride based TLD materials are **near tissue-equivalent** and provide excellent energy response, eliminating the need for extensive mathematical computations to determine dose, improving overall accuracy and reducing the potential for costly errors. Additionally, Lithium Fluoride based materials are **not sensitive to light**, enabling added flexibility in dosimeter handling and processing for **improved productivity** and process efficiency.

| Material | Type | Dosimetry Application | Linear Range | Fading | Available Forms* |
|---|----------------------------|--|------------------|---|---|
| Lithium Fluoride LiF:Mg,Ti | TLD-100 (Li natural) | Research, Clinical | 10 µGy - 1 Gy | <20% in 3 months <5% in 3 months corrected | Chips, MicroCube, Square Rod, Rod, Unsorted Chips, Powder, Pelletized Chip, Pelletized Disk |
| | TLD-600 (Li-6 isotope) | Neutron | | | |
| | TLD-700 (Li-7 isotope) | Gamma, Beta | | | |
| Lithium Fluoride LiF:Mg,Cu,P | TLD-100H (Li natural) | Environmental, Personnel, Extremity | 1 µGy - 10 Gy | Negligible in 3 months <5% up to 2 years | Pelletized Chip, Pelletized Disk, Powder |
| | TLD-600H (Li-6 isotope) | Neutron | | | |
| | TLD-700H (Li-7 isotope) | Gamma, Beta, Environmental | | | |
| Calcium Fluoride Dysprosium, CaF ₂ :Dy | TLD-200 | Environmental | 0.1 µGy - 10 Gy | 10% in 1st 24 hr 16% total in 2 weeks | Chip |
| Calcium Fluoride Manganese, CaF ₂ :Mn | TLD-400 | Environmental and High Dose | 0.1 µGy - 100 Gy | 8% in 1st 24 hr 12% total in 2 weeks | Chip |

*Visit thermofisher.com or contact customer service for exact specifications and ordering information for available material forms.

Response Curves (tissue equivalency for LiF, competing material).



* LiF:Mg,Ti, Main dosimetric peaks (4+5), all fade normalized to 2 days





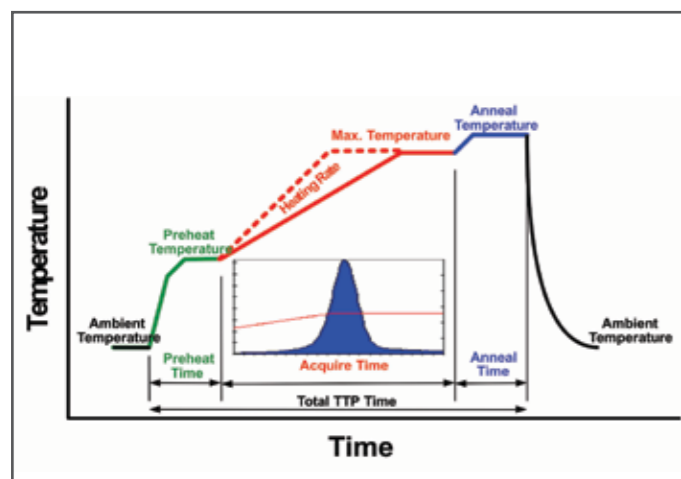
Multi-element Card Dosimeters for Personnel and Environmental Monitoring

Harshaw TLD Multi-element card dosimeters are available in a variety of configurations for personnel or environmental monitoring of shallow (Hp(0.07)), deep (Hp(10)) and lens of eye (Hp(3)) dose.

Materials in the form of chips or pelletized disks are encapsulated in Teflon and mounted in an aluminum card for extended durability. Different materials are available for gamma, beta and neutron monitoring. Each card is uniquely barcoded and available in different colors as an aid to recognition and categorization of issuance or wear periods. Multiple tamper-resistant holders are offered containing optimized filtration for energy discrimination appropriate for each card configuration, with attachments to the lapel and/or belt to meet the wearer needs.

Dose algorithms are also available for our most common multi-element card/holder configurations for use in calculating dose from a card readout. Harshaw dose algorithms were developed by irradiating hundreds of dosimeters to a wide variety of radiation types and energies, simulating hundreds or thousands of mixed fields, and using a neural network technique, to produce intelligent algorithms ensuring accurate calculation of dose. Neural network algorithms are more reliable than competing branching algorithms which have the potential for costly mathematical errors incorrectly assigning dose.

Time, Temperature Profile



Typical TLD Card Configuration

Position/Element 1:

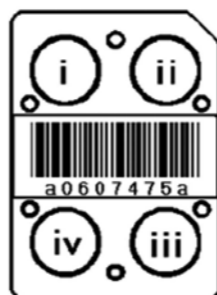
Low Energy Photon
Discrimination and Lens
dose (Hp(3))

- ~300 mg/cm² filtration

Position/Element 4:

Mid-Energy Photon
Discrimination and
Neutron dose

- Li-6 isotope
- Various filtration



Position/Element 2:

Deep dose (Hp(10))

- 1000 mg/cm² filtration

Position/Element 3:

Shallow dose
(Hp(0.07))

- ~17 mg/cm² filtration

Harshaw TLD offers extremity dosimeters in two different formats

ThermoScientific™ EXT-RAD™ Extremity Dosimeter

- Available in single or double element chipstrates with an attached barcode
- Can be worn in a ring, finger cot, wristband or headband for eye dosimetry, depending on need.

Thermo Scientific™ DXT-RAD™ Extremity Dosimeter

- Disk dosimeter, containing an integrated circular barcode to ensure unbroken chain of custody,
- More durable, smaller and easier to wear than available alternatives
- Can be worn in comfortable, adjustable, disposable finger rings, wrist bands or headbands for eye dosimetry.

Extremity Monitoring

Harshaw TLD extremity dosimeters are available in a variety of materials and with a multiple filtration alternatives, enabling monitoring for gamma, beta or neutrons as needed. Harshaw TLD extremity dosimeters can be worn on the fingers, wrists, or head for monitoring dose to the lens of eye. They are sterilizable for maintaining hygienic conditions and uniquely barcoded for chain of custody and data integrity.

Harshaw TLD extremity dosimeters can be processed using any Harshaw hot gas TLD card reader (Models 4500, 6600 Plus and 8800 Plus) using available extremity dosimeter carrier cards. Automatic card readers equipped with an optional integrated barcode reader will automatically associate the TL response from the individually barcoded extremity dosimeters for maintaining an unbroken chain of custody and ensuring complete dosimeter data tracking.



Specification/Ordering Information Not all models are shown, refer to thermofisher.com or contact customer service for a complete model listing.

Multi-Element TLD Cards

Personnel Dosimeters

| Model Holder | Radiation Types Measured | | | Obtainable Dose Equivalent Measurements | | | | TLD Card Material | | Algorithm |
|--------------|--------------------------|------|---------|---|------------------|------|---------------------|--|--|-----------|
| | Gamma, X-Ray (Photons) | Beta | Neutron | Deep Hp(10) | Shallow Hp(0.07) | Lens | Neutron Deep | LiF:Mg,Ti Card Short Description/ Series Part Number | LiF:Mg,Cu,P Card Short Description/ Series Part Number | |
| 8806 | X | | X | X | | | X | 6776 / TLDCARD-43C | | 28103 |
| 8814 | X | X | | X | X | | | 0110 / TLDCARD-21C | | |
| | | | X | | | X | 7776 / TLDCARD-43C | | 28463 | |
| 8825 | X | X | | X | X | | | 0110 / TLDCARD-21C | | |
| | | | X | | | X | 7776 / TLDCARD-43C | | 28464 | |
| 8840 | X | X | | X | X | | | 0110H / TLDCARD-25P | | |
| | | | X | | | X | 7776H / TLDCARD-47P | | 28132 | |
| 8850 | X | X | | X | X | | | 0110H / TLDCARD-25P | | |
| | | | X | | | X | 7776H / TLDCARD-47P | | COMS000191 | |

Environmental Dosimeters

| Model Holder | Radiation Types Measured | | | Obtainable Dose Equivalent Measurements | | TLD Card Material | Algorithm | Comments |
|--------------|--------------------------|------|---------|---|-------------|--|-----------|--------------------------------|
| | Gamma, X-Ray (Photons) | Beta | Neutron | Ambient | Directional | LiF:Mg,Cu,P Card Short Description/ Series Part Number | | |
| 8855 | X | X | | X | X | 0110H / TLDCARD-25P | | |
| | | | | | | 0770H / TLDCARD-27P | | For environments with neutrons |
| | | | | | | 1111H / TLDCARD-45P | 28547 | |
| | | | | | | 7777H / TLDCARD-47P | 28547 | For environments with neutrons |

Extremity Dosimeters

EXT-RAD Specifications and Ordering Information

| EXT-RAD Dosimeter Model | Part Number | Mass Density (mg/cm ²) | TLD Material Type | Application | Useful Range |
|-------------------------|-------------|------------------------------------|--|--|--|
| XD-107H | 26975 | 7 | TLD-100H LiF:Mg,Cu,P (Natural Lithium Fluoride) | Photon, Beta Neutron-Free Environment | 0.20 mSv – 10 Sv (20 mrem - 1000 rem) |
| XD-707H | 26978 | 7 | TLD-700H LiF:Mg,Cu,P (Lithium-7 Fluoride) | Photon, Beta Neutron Environment | 0.20 mSv – 10 Sv (20 mrem - 1000 rem) |
| XD-100 | 26974 | 100 | TLD-100 LiF:Mg,Ti (Natural Lithium Fluoride) | Photon Neutron-Free Environment | 0.20 mSv – 1 Sv (20 mrem - 100 rem) |

DXT-RAD Specifications and Ordering Information

| DXT-RAD Dosimeter Model | Part Number | Mass Density | TLD Material Type | Application | Useful Range | Fading |
|-------------------------|-------------|------------------------|--|--|--|----------------------------|
| DXT-107H | 26995 | 7 mg/cm ² | TLD-100H LiF:Mg,Cu,P (Natural Lithium Fluoride) | Photon, Beta (3.3 mg/cm ² cap) Neutron-Free Environment | 0.20 mSv – 10 Sv (20 mrem - 1000 rem) | Negligible |
| DXT-707H | 26998 | 7 mg/cm ² | TLD-700H LiF:Mg,Cu,P (Lithium-7 Fluoride) | Photon, Beta (3.3 mg/cm ² cap) Neutron Environment | 0.20 mSv – 10 Sv (20 mrem - 1000 rem) | Negligible |
| DXT-100 | 26994 | 100 mg/cm ² | TLD-100 LiF:Mg,Ti (Natural Lithium Fluoride) | Photon Neutron-Free Environment | 0.20 mSv – 10 Sv (20 mrem - 1000 rem) | 5%/yr at 20 °C with anneal |
| DXT-600 | 26996 | 100 mg/cm ² | TLD-600 LiF:Mg,Ti (Lithium-6 Fluoride) | Photon, Neutron Used with DXT-700 For Neutron Measurements | 0.20 mSv – 10 Sv (20 mrem - 1000 rem) | 5%/yr at 20 °C with anneal |
| DXT-700 | 26997 | 100 mg/cm ² | TLD-700 LiF:Mg,Ti (Lithium-7 Fluoride) | Photon Neutron Environment | 0.20 mSv – 10 Sv (20 mrem - 1000 rem) | 5%/yr at 20 °C with anneal |

Caps for the DXT-RAD Extremity Dosimeter

| Part Number | Filtration | Application |
|-------------|------------------------|--|
| 28573 | 3.3 mg/cm ² | Photon, Beta, Neutron |
| 28908 | 3.3 mg/cm ² | Photon, Beta, Neutron (designed for use with DXT-707H-2 dosimeter) |
| 500597 | 42 mg/cm ² | Photon, Neutron |

Options and Accessories

- Etched Barcodes (available on Multi-Element Cards)
- Manual Filter-Holder Openers
- Model 8866 Automatic Holder Opener
- Carrier Cards (EXT-RAD, DXT-RAD)
- DXT-RAD Ring and Cap Manual Loader/Unloader Station
- Manual DXT-RAD Carrier Card Loader/Unloader
- Vacuum Tweezers (115 VAC/220 VAC)
- External Ringlet Bar Code Reader and Software for DXT-RAD
- EXT-RAD Pouch Impulse Heat Sealer Assembly



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