Orion: Target diagnostic

Thermoluminescent Detector (TLD)

The Orion laser facility at AWE Aldermaston, one of the largest scientific capital investments in the UK, houses a large neodymium glass laser system and a target chamber in which the high energy density physics experiments are performed. This is necessary to support certification of performance and safety of the UK deterrent.

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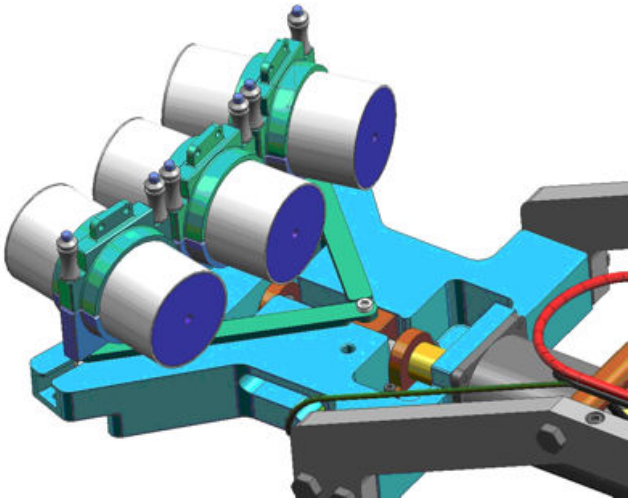
The Orion Thermoluminescent Detector (TLD) measures bremsstrahlung radiation dose levels generated in a laser-plasma interaction, within an energy range of ~0.1 - 20 MeV. In the Orion diagnostic suite, the TLD array complements the CR39 and radiochromic film detectors, used for proton dosimetry, and hot electron temperature measurements ~0.1 – 2 MeV from the Hard X-ray Spectrometer.

The TLD array consists of several collimators which contain thermoluminescent detector material (lithium fluoride powder) and metal filters. In each collimator, the thermoluminescent detector and filter characteristics are chosen to produce the desired spectral response.



Specification

Spectral range:	0.1 - 20 MeV
Detector material:	Lithium Fluoride powder

Angular displacement of the TLD collimators enable measurement of the anisotropy of bremsstrahlung radiation produced by short-pulse laser-target interactions, which becomes prevalent at photon energies exceeding ~1 MeV owing to Compton scattering. Ten-Inch Manipulators (TIMs) provide a practical means of deploying sets of collimators over a total angular range of ±60° with respect to the laser axis, within the target chamber and at an equidistant location from the target, without needing to vent the target chamber.

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