Orion: Target diagnostic

Dante

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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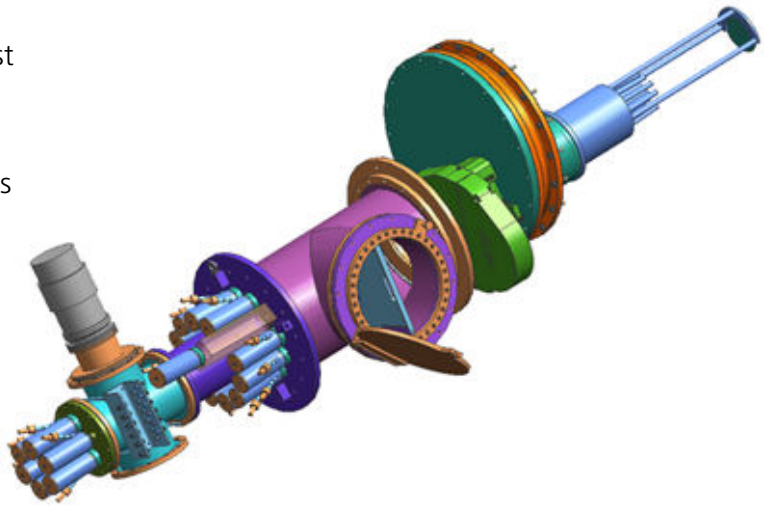
The Dante measures the absolute X-ray energy emitted from a laser-target interaction to enable a calculation of the target temperature to be achieved. This is the primary diagnostic of most high-power laser facilities since the purpose of the laser in all experiments is to heat the target. The laser-heated target typically reaches temperatures of >100 eV, and therefore emits an approximately black-body spectrum in the X-ray region of the electromagnetic spectrum.



Specification

Number of channels:	10
Spectral range:	0.1 – 5 keV
Resolution:	Better then 200 ps

The Dante diagnostic provides a relatively simple design principle that can be thoroughly calibrated to reliably measure the soft X-ray emission (0.1 – 5 keV). The principle behind the Dante X-ray flux measurement is to run a number of detectors in parallel, but filter the X-ray emission they measure, so that they are sensitive to different regions of the emitted spectrum. A mathematical unfold process is then used to estimate the signals measured by each detector for a given spectrum, and then iterate closer to the measured signal level. In this way it is possible to measure the spectrum and temperature of the X-ray source.

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