

**Diagnosis of Edge Localized Mode (ELM) Evolution in DIII–D Using Fast-Gated CID and Infrared Cameras\***

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The tangentially viewing visible television system at DIII–D measures routinely the emission of neutral deuterium and partially ionised carbon at frame rates of 60 Hz. An upgrade of the existing CID-based imager with MCP intensifier has significantly improved the time resolution of this system, enabling emission profile measurements with frame exposure time as short as 1  $\mu$ s at 60 Hz. Preliminary 2-D reconstructions of the deuterium- $\alpha$  (653 nm) and Carbon-III (465 nm) show a dramatic spatial broadening of the emission profiles during large, type-I ELMs. To systematically measure the time evolution of ELMs, the gated, intensified camera was controlled by a triggering device that managed the gate onset times during DIII–D discharges. The broadening of the target heat flux profile was measured by an infrared camera with 10 kHz sampling rate. Finally, the DIII–D data acquisition system for the visible and infrared cameras was significantly upgraded, using PC-based frame grabbing hardware and LabView software routines, to allow automatic storage of the video images, gate times, camera setup data and calibration files on a dedicated MDSPlus data server at DIII–D. These measurements provide an entirely new input to validate comprehensive 2-D modelling using the multifluid edge plasma model UEDGE and increase confidence in its predictive capability for divertor design in future fusion devices.

Suggested Category: 8. Optical (IR, Visible, UV) or 6. Engineering, Data Acquisition, Analysis

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