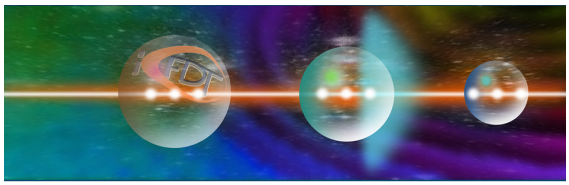

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Thomson Scattering for the DIII-D Tokamak Divertor

Wednesday, 23 October 2024 11:00 (20 minutes)

Thomson scattering has been utilized as a diagnostic technique for measuring electron temperatures and densities in DIII-D divertor regions since 1995. Together with a range of other divertor-focused diagnostics, Divertor Thomson Scattering system (DTS) has advanced knowledge of divertor detachment, surface material erosion yield and heat fluxes, and enabled validation of boundary codes. Recently, DTS has been expanded to include the lower divertor floor region used in high-triangularity plasmas, through eight, rapidly-selectable laser beam paths within a single poloidal plane. The system can redirect a ~1J Nd:YAG 10 ns laser pulse, via an ex-vessel fast-steering mirror, to a new beam path within 20 ms, continuously scanning through all eight positions each 160ms period during a plasma shot. In-vessel optical components mounted underneath the vessel tiles complete the beam redirection. Up to twelve measurement locations are available at each laser beam position by dynamically refocusing the ex-vessel collection fiber array using a high-speed linear stage. A fixed, in-vessel mirror with a centered hole allows the laser to pass through, retaining current measurement locations above the nearby divertor shelf. Initial results from this new system capability (named DTS-2D) provide a two-dimensional map of electron temperature without needing the previous technique of sweeping a diverted plasma across a single laser beam position.

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