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6.28 Development of a HELIOS Diagnostic using a Fast Piezoelectric Valve for the Prototype Material Plasma Exposure eXperiment

Tuesday, 17 April 2018 10:31 (120)

A new helium line-ratio spectral monitoring (HELIOS) diagnostic, using a piezoelectric valve with high duty cycles (on/off times $\boxtimes 0.5$ ms), allowing for good background correction, and measured particle flowrates on the order of ~1020 particles/second is being implemented on Oak Ridge National Laboratory's (ORNL) Prototype Material Plasma Exposure eXperiment (Proto-MPEX). The HELIOS diagnostic is constructed so that the nozzle sits as close to the plasma column as possible, injecting helium directly into the plasma during operations. Fiber optics transfer the light emission from the plasma at the time of the helium puff(s) to a Filterscope system where intensity is measured at 100 kHz for three separate helium lines: 667.9 nm, 706.53 nm, and 728.0 nm. The open magnetic geometry of Proto-MPEX is ideal for testing and characterizing a HELIOS diagnostic system, comparing the derived ne and Te values to nearby double Langmuir probes and Thomson scattering measurements. Preliminary results imply a temperature and density range of 30-5 eV and 1x10⁻¹⁹ m-3 – 1x10⁻²⁰ m-3, respectively, in the helicon region of Proto-MPEX. This work was supported by the US. D.O.E. contract DE-AC05-00OR22725 and DE-SC00013911.

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