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4.44 Extreme Ultraviolet Spectroscopy in the Divertor of DIII-D

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Extreme ultraviolet (EUV) spectroscopy has been added to the DIII-D divertor to measure dominant resonance-line radiators for low-Z elements, allowing determination of emissions and radiated power from constituent plasma species. This added spectroscopy enables detailed comparison and validation with 2D fluid boundary codes at conditions throughout the transition to divertor detachment. The spectrometer is a SPRED (Survey, Poor Resolution, Extended Domain) McPherson Model 251 with gratings to observe the 110-1700Å region with up to 2Å optical resolution. The broader grating provides views of C II-IV emission lines (especially C IV, 1550Å) as well as the D Lyman-α line, 1215Å, which together radiate >80% of the total power in the divertor. Divertor SPRED (or DivSPRED) is mounted on top of DIII-D with a direct vertical line of sight into the machine coincident with other boundary diagnostics. This position on the machine introduces challenges including radiation and magnetic sensitivity for vacuum pumps and detectors. The system and a discussion of engineering issues overcome are presented. *This work was supported in part under the auspices of the US Department of Energy (US DOE) by LLNL under DE-AC52-07N27344 and by the US DOE under DE-AC05-00OR22725, and DE-FC02-04ER54698.

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