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8.44 Micro Ion Spectrometer for Fusion Plasma Boundary Measurements

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As magnetically confined plasmas progress towards ignition and very long pulse experiments, the physics of the pedestal and diverter regions has become increasingly important. In particular, measurements of the ions in the scrape-off layer are needed. The energy spectra of the ions determines the rates of sputtering and erosion of the plasma facing surfaces. The ion spectra in the edge are not easily determined spectroscopically and must be measured in situ since the ions are confined by the strong magnetic fields of the tokamak. Conventional energy analyzers are too large and expensive to install in multiple locations around the torus. Thus, we are developing in situ probes to make direct, spatially resolved measurements of the ion energy spectra in the edge of tokamak plasmas that are easily replaced and require minimal resources. The probes are compact, low cost, and small enough to be placed inside of specially prepared wall tiles – essentially creating a “smart” plasma facing surface in a tokamak. Details of the prototype micro ion spectrometer and initial tests will be presented. Work supported by US DOE

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