TRANSMISSION GRATING BASED XUV/VUV DIAGNOSTIC FOR COLD PLASMAS

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A transmission grating based imaging spectrometer is being developed for diagnosing cold plasmas (T_e ~ 1-100 eV) such as the edge of fusion devices or industrial and some types of medical plasmas. The emission from such plasmas in the XUV to VUV range can be used to measure the electron density and temperature (including the effect of non- Maxwellian electrons).

The spectrometer uses a free standing transmission grating dispersive element having 200 nm for the XUV range and/or 1000 nm for VUV range. A system of imaging slits together with a 2-D XUV/VUV detector provide spectrally resolved images of the plasma. As a high sensitivity broadband 2-D detector we use either a CsI coated MCP intensifier or a direct-detection X-ray CCD. The spectrometer will be calibrated on a synchrotron to enable direct comparison between measured and computed spectra. A spectral simulation package is also being developed to predict the expected XUV/VUV spectra from thermal and non-thermal electron distribution function in plasmas.

An earlier version of such a spectrometer has been used for spatially resolved impurity detection in XUV range in the National Spherical Torus Experiment (NSTX) at Princeton and on a small laboratory reflex discharge. Results from analysis of the XUV spectra from NSTX and the XUV/VUV spectra from the reflex discharge will be presented.

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