

CXRS Diagnostics on MAST

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Charge eXchange Recombination Spectroscopy (CXRS) is a well known, mature diagnostic used on many fusion devices. It is used primarily for measuring ion density, temperature and velocity profiles on fusion plasmas [1-4]. Injected neutral beam atoms undergo CX with the bulk plasma ions providing a source of excited C^{5+} impurity atoms. The Doppler shift and broadening of the excited spectral lines can be used to calculate the velocity and temperature profiles respectively. The MAST system has 60 spatial viewing chords with ~ 1 cm spatial resolution. CXRS measurements can in principle measure all the required parameters for calculating force balance through the radial electric field. These calculations have been applied to plasmas with Resonant Magnetic Perturbations (RMPs) for the purpose of studying ELM mitigation [5]. CXRS measurements have shown that the radial electric field well decreases for increasing RMP intensity. These measurements are consistent with measurements on other devices, such as ASDEX and NSTX.

In addition, a thermal He gas puff diagnostic has been implemented with the aim of measuring radial electric fields in the pedestal region [6-9]. The emission region is localised to the pedestal due to poor plasma penetration of low temperature thermal neutrals. The system has 64 spatial viewing chords with 1.5mm spatial resolution. The system is currently configured to observe the singly ionized HeII ($4 \rightarrow 3$) $\lambda = 468.57$ nm line. The hardware configuration of the diagnostic will be described.

References

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