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Design of Charge Exchange Recombination Spectroscopy (CXRS) on SST-1 Tokamak

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SST-1 [1] is a medium sized tokamak with a minor radius of 0.2m, magnetic field of 1.5T and is equipped with heating hydrogen neutral beam capable of delivering 0.5 - 1.7 MW with a variable beam energy of 30-55 keV [2]. The beam parameters provide good candidate for CXRS on SST-1. Using this neutral beam, Charge Exchange Recombination Spectroscopy (CXRS) [3, 4] is proposed for SST-1 Tokamak to obtain spatially and temporally resolved measurements of C VI line emission at 529 nm (n= 8⊠7). The diagnostic is designed to provide profiles of impurity ion temperature, toroidal and poloidal plasma rotation using Doppler broadening and shift of charge-exchanged C VI spectral line respectively.
This diagnostic is designed to measure toroidal and poloidal rotation and impurity ion temperature with high temporal (˜5 ms) and spatial resolution (˜0.5 cm near the edge, ˜ few cm near core). The diagnostic design comprises of a high resolution f/8.7, 1 m Czerny-turner Spectrometer along with a 2-dimensional fast ANDOR 1024 x 256 CCD. Line emission from plasma to spectrometer will be coupled using an array of fibres. This paper presents detailed design of the diagnostic including photon budget along with etendue budget for the spectrometer and CCD system. The paper also describes details of collection optics proposed for the diagnostic.

References
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