

Development of Multipurpose Soft X-Ray Tomography System for ADITYA-U.

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Study of soft x-ray(SXR) radiation emitted during plasma discharge gives valuable informations on magneto hydrodynamic(MHD) activities, e.g. nature of minor and major disruptions, mode structure, magnetic island, plasma shape, plasma position and chord average electron temperature in tokamak. Intensity of SXR radiation depends mainly on electron temperature, plasma density as well as on impurity in plasma; and is routinely measured with SXR photodiode/diode array. SXR tomography is a powerful diagnostic tool that uses line integrated measurements of SXR radiation and reconstruct two dimensional SXR emissivity profile. For this purpose SXR cameras having array of photodiode detectors are required to mount suitably around poloidal plane of the tokamak. Multipurpose SXR tomography (SXRT) system is designed and developed using 16 channel absolute XUV detector array for ADITYA-U to perform above measurements. In this report, discussions are centered on (1) the determination of minimum number of SXR cameras and detectors to reconstruct emissivity profile for $m=2$ mode structure which plays a major role for total disruption of plasma, (2) Fourier-Bessel expansion techniques used in SXR tomography software for the reconstruction of two dimensional SXR emission profile, (3) SXRT camera design, electronics and data acquisition system, and (4) first results of experimental campaigns in ADITYA-U.

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