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## 12.52 Design of tangential x-ray crystal spectrometer for ADITYA-U Tokamak

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A tangential soft x-ray crystal spectrometer (XCS) has been designed for ADITYA-U Tokamak to measure plasma toroidal rotation velocity using Doppler shift of the spectral line radiation emitted from the plasma. The electron temperature can also be derived from the intensity ratio of a dielectronic satellite line to the resonance line. For this purpose, X-ray spectral line at 3.945 Å from He-like Argon ion, Ar16+ is considered. The spectrometer consists of a cylindrically bent Silicon (111) crystal and a CCD detector to measure resonance spectral and its satellite lines in the wavelength region of 3.94 -4.0 Å, viewing the plasma tangentially at an angle of 26° with respect to the toroidal direction in the magnetic axis. Considering the relatively lower line averaged electron density ( $1-3.5 \times 10^{19} \text{ m}^{-3}$ ), central electron temperature (300 to 750 eV) and geometrical constraints of Aditya-U tokamak, the plasma to crystal and crystal to detector distance has been kept 1.4 and 0.5 m, respectively, to get sufficient signal intensity for study of the tokamak plasma and atomic physics. The design has been optimized after adequately addressing issues related to port geometry, machine accessibility etc. The engineering design of the crystal spectrometer together with ray-tracing is presented.

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