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MULTI-ANGLE VIEWING SYSTEM OF SOFT X-RAY RADIATION MEASUREMENT ON THE T-15MD TOKAMAK ^{*)}

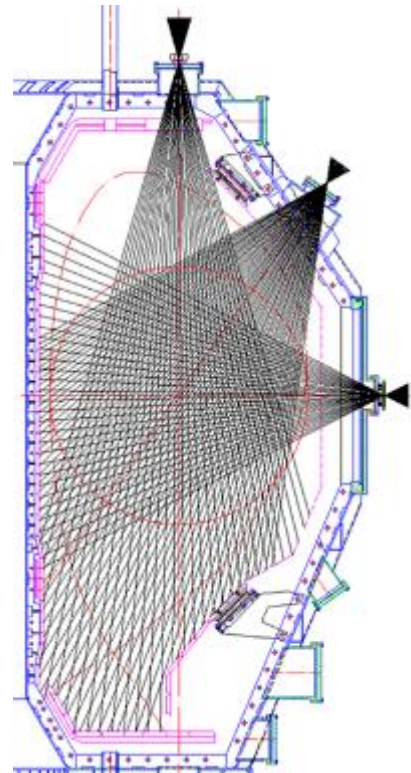
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Multi-angle viewing system of the intensity of soft X-ray radiation (SXR) of plasma are an integral part of modern tokamak diagnostics. Measurements of the radial distribution of the intensity of plasma SXR allows to determine the position of the central ("hot") region of the plasma column along R and Z, the period and radius of the phase reversal r_s of sawtooth oscillations, and to identify the grow up and localization of magnetohydrodynamic (MHD) instabilities.

The T-15MD tokamak is planned to use up to six viewing angles for the SXR measurements. In the autumn experimental campaign of 2024, three pinhole cameras with multi-wire proportional SXR detectors [1,2,3] were installed on the T-15 MD tokamak - on the vertical, 55-degree and horizontal diagnostic ports, respectively. The detectors on the vertical and horizontal ports provided SXR measurements along 32 chords each with a spatial resolution of about 3 cm, and the detector installed on the 55-degree port measured SXR along 64 chords with a spatial resolution of about 2 cm. The diagram of the detector channels observation lines is shown in the figure. The detector signals were digitized by multichannel ADCs with simultaneous sampling at a frequency of 100 kHz (the detector bandwidth was limited by the preamplifier at 30 kHz).

The experiments showed that this diagnostics allows reliable determination of the plasma position by R and Z at a plasma current of more than 50 kA. At a plasma current of more than 100 kA, the diagnostics allows identifying the moment of grow up and localization of MHD instabilities, determining the phase reversal radius r_s and the period of sawtooth oscillations. In the future, it is planned to increase the number of measurement chords to 64, for each viewing angle, as well as to increase the bandwidth of the preamplifiers to ensure reliable registration of MHD instabilities with a frequency of up to 100 kHz.



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References

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^{*)} [abstracts of this report in Russian](#)