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Imaging diagnostics of soft X-ray emission from KSTAR plasmas with multi-channel photodiode array detector

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The soft X-ray tomography is one of powerful tokamak diagnostics to investigate plasma shape or physical activities in the core region. It is possible to detect the core plasma behavior transparently, since the optical thickness of soft X-ray is thin. Therefore, the magnetohydrodynamic(MHD) instability and transport phenomena in the core plasma can be observed clearly. According to the bremsstrahlung radiation of the soft X-ray, the soft X-ray emission power is strongly correlated with the magnetic flux surface, therefore, the time evolution of the shape of plasmas can be visualized as well. The photodiode array detector is useful due to the cost-effective feature with high time resolution of ~ 0.5 us. It is enough to inquiry the Alfven eigen mode, which has the time scale of 5 us in KSTAR. In this research, the beryllium filter with thickness of 50 um was applied to the detector equipment, and the tomography reconstruction was performed with Cormack method and Phillips-Tikhonov method. The 2-D reconstruction results visualized the time evolution of the sawtooth oscillations, which has the period of 33 ms and collapse time of 3 ms.

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