



## Development of X-ray tomography diagnostic for TS-6 Tokamak

### Merging Experiments

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Plasma merging experiments on the TS-3 device had been carried out since 1986 [1]. As upgrade of the TS-3, the TS-6 has been in operation since 2017 [2]. Ion heading mechanisms have been investigated by ion Doppler tomography diagnostic [3], while electron heating mechanism has not been well understood yet.

In the merging experiments, it is expected that electrons are effectively accelerated near the reconnection point, where the reconnection electric field almost parallel to the magnetic field [4]. This electron parallel acceleration will contribute to electron heating during merging start-up. For the purpose of understanding the electron heating mechanism, the soft X-ray fast imaging system has been developed in the TS-6 device to obtain the temporal and spatial distribution of the generated energetic electrons.

This soft X-ray diagnostic system mainly consists of a micro-channel plate (MCP) and a fast camera. The MCP together with phosphor is able to transfer the X-ray to visible light, whose image can be recorder by the fast camera directly. As the measured images are obtained from line-integrals of the local X-ray emission, a proper reconstruction of the former profile is necessary to obtain the latter profile. Thus, we developed tomography technique to reconstruct the spatial

distribution of the energetic electrons. The Phillips-Tikhonov regularization with the generalized cross validation is employed to solve the ill-posed problem arising from the reconstruction process [5]. Phantom tests show that this tomography technique is able to reconstruct the distribution of energetic electrons effectively.

#### Reference:

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