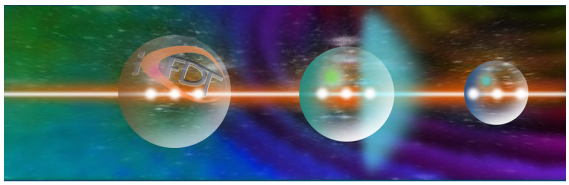

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Preliminary Results and Analysis of a Tangential TV Thomson Scattering Diagnostic System on EAST

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High spatial resolution edge Thomson scattering diagnostic is important for fusion research. The electron temperature and density profiles of plasma are basic parameters in the study of Tokamak plasma physics, so the development of high spatiotemporal resolution edge Thomson scattering diagnostic has been carried out in many major tokamak devices, such as DIII-D[1], JT-60U[2], JET[3], EAST[4], ITER[5]. However, because of the optical coating and detection efficiency, it is difficult to further improve the spatial resolution of the traditional Thomson scattering diagnostic based on the filter splitting technology. TVTS might be a good solution.
Recently, we completed the development of a tangential TVTS (Television Thomson scattering) system in EAST. We developed a high-power, high-frequency 532nm laser as a diagnostic laser source. The laser can generate a 3.5J laser pulse at a frequency of 10Hz. The laser can work continuously for more than 1000 seconds with an energy deviation of less than 5%. For this laser wavelength, we adopted a transmission grating spectrometer design scheme, the average transmittance of 100nm around the central wavelength (532nm) is more than 50%. At the same time, we adopt double MCP coupled ICCD technology, so that the detection efficiency of the system can reach 3000 counts/photon. The TVTS system's light path, which follows a tangential optical path, primarily covers the plasma region from $\rho = 0.85$ to 1.1, the spatial resolution of the system is about 3mm, and the measurable electron temperature range is 50eV-2keV, with the accuracy expected to about 10%.
This system has been applied on EAST. Based on relative calibration, reliable 6-point edge measurement data have been obtained. The data are compared with the measurement results of the filter Thomson scattering diagnostic system, which proves that the temperature measurement has high reliability. In the next phase, we will continue to complete the density calibration study.

[1] C.M.Greenfield, et al. Realtime digital control, data acquisition, and analysis system for the DIII-D multipulse Thomson Scattering diagnostic. Rev. Sci. Instrum. 61(10),1990.
[2] H.Yoshida, et al. Multilaser and high spatially resolved multipoint Thomson scattering system for the JT-60U tokamak. Rev. Sci. Instrum. 70(1),1999.
[3] P. Nielsen, et al. Thomson scattering in the JET edge plasma, 26th EPS Conf. on Contr. Fusion and Plasma Physics, Maastricht, 1999.
[4] Yang Li, et al. Design of Thomson Scattering Diagnostic System on EAST. Plasma Science and Technology. 12(03), 2010.
[5] T. Hatae, M. Nakatsuka, et al. Progress in Development of Edge Thomson Scattering System for ITER. Fusion Science and Technology. 51:2T, 58-61.

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