

Assessments of Collective Thomson Scattering Diagnostic for Parallel and Perpendicular velocity components in the Large Helical Device

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In fusion plasmas collective Thomson scattering (CTS) diagnostics can measure the particle velocity distribution functions along with the wave vector \mathbf{k}^s , which is equal to $\mathbf{k}^s - \mathbf{k}^i$. \mathbf{k}^s and \mathbf{k}^i are the scattered and the incident wave vectors, respectively. The Large Helical Device (LHD) has unique neutral beam (NB) heating systems, which provide the perpendicular neutral beams with the energy of 40 keV and the parallel neutral beams with that of 180 keV. These energetic particle sources become a good confirmation in view of theoretical and experimental aspects. In the last campaign of 2008, we have had the initial result of the scattered spectra measured by CTS diagnostic. Then the probe beam is provided by the 77 GHz gyrotron with ~ 500 kW. The scattered radiation is resolved into 8 channels at the receiver system. For more accurate velocity distribution functions, the number of channels are increased from 8 to 16/30 channels. From the theoretical CTS spectra, the detector signals are estimated through the inserted filters at the receiver system. The spatial distribution with perpendicular and parallel NBs in the LHD is assessed with realistic plasma parameters. Under these conditions experimental results will be presented and be discussed.

[1] M. Nishiura, K. Tanaka, S. Kubo, T. Saito, Y. Tatematsu, T. Notake, K. Kawahata, T. Shimozuma, T. Mutoh, *Rev. Sci. Instrum.* **79**, 10E731 (2008).

[2] S. Kubo, M. Nishiura, K. Tanaka, T. Shimozuma, Y. Tatematsu, T. Notake, T. Saito, Y. Yoshimura, H. Igami, N. Tamura, accepted for publication, *Plasma Fusion Res.* in 2009.