Development of correlation ECE system for electron temperature fluctuation measurement in LHD

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Correlation-ECE (C-ECE) is a standard method for investigating turbulence driven transport. This method allows electron temperature fluctuations that contain information on turbulent transport and independent thermal noise. The turbulence feature is extracted from a correlation analysis from two close locations. The A C-ECE system is utilized on the large helical device (LHD) to measure emission within the frequency range of 74-79.6 GHz. This system employs the spectral decorrelation method and serves as a collective Thomson scattering diagnostic receiver in the LHD [2]. The C-ECE receiver system is comprised of a filter bank system with 32 band-pass filters and a fast digitizer system operating at a sampling rate of 12.5 GHz in the intermediate frequency (IF) stage. This study presents initial experimental results on temperature fluctuation spectra in the LHD, obtained through the C-ECE system using a coherency-based analysis method [3]. An MHD mode at 5 kHz is excited from the onset of neutral beam injection in a magnetic probe, and coherence spectra are obtained from two C-ECE receiver systems. The temperature fluctuation results are derived from the coherence spectrum after bias removal and indicate a level of approximately 3% in the frequency range of 0 to 400 kHz. Further investigations will be conducted to explore drift wave turbulence activities and reconstruct the radial profile of temperature fluctuation in the LHD using the C-ECE receiver systems.

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