

Application of multichannel Doppler reflectometer for fluctuation measurements in GAMMA 10/PDX anchor heating experiment

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A Ku-band (12–18 GHz) multichannel Doppler reflectometer (DR) [1] has been developed and installed in the central cell (the main confinement region) of GAMMA 10/PDX tandem mirror device to investigate electron density turbulent (or coherent) fluctuations including turbulent flows.

In GAMMA 10/PDX during discharges with additional RF heating in the anchor cells large increases have been observed in the space potential of the core region and the floating potential of the central-cell limiter, which indicates some changes in potential profile. By using the multichannel DR, Doppler frequency shifts were simultaneously observed in a single discharge at different cutoff layers during additional RF heating. Density fluctuation flow velocity V_p observed by DR is in the electron diamagnetic drift direction and the flow profile shows radially sheared structure in the peripheral region ($r/a > 0.5$, a is the limiter radius 18 cm). Here, a ray tracing simulation is used to estimate density turbulent wavenumber and scattering positions. Space potentials in the edge region ($r > 10$ cm) are estimated by floating potentials observed by a fast reciprocating probe and a gold neutral beam probe (GNBP) was used to measure potential in the core region. Potential profile shows well-type shape with negative E_r indicating V_{ExB} with the electron diamagnetic drift direction. Both V_p and V_{ExB} profiles show similar shape with flow peaks at edge region (16~18 cm), which represents the dominant influence of E_r on the edge plasma flow.

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