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Asymmetry Velocity Distribution Function and Its Higher Order Moments in an Inhomogeneous ECR Plasma[1] KENICHIRO TERASAKA, Kyushu University, SHINJI YOSHIMURA, National Institute for Fusion Science, MITSUTOSHI ARAMAKI, Nihon University, MASAYOSHI Y. TANAKA, Kyushu University — Laser induced fluorescence spectroscopy (LIF) has been recognized to be a powerful diagnostic tool to directly obtain velocity distribution function. A neutral depletion structure with strong inhomogeneity of density has been observed in an ECR plasma of the HYPER-I device at NIFS. A high-resolution LIF system, which consists of an external cavity diode laser, has been used to measure the LIF spectrum (velocity distribution function) with velocity component parallel and perpendicular to the density gradient. It is found that the distribution function of the radial velocity (parallel to the density gradient) is asymmetry in the inhomogeneous density region. To quantitatively characterize the asymmetry of distribution function, the higher order velocity moments, i.e., skewness (third order moment) and kurtosis (fourth order moment), are evaluated. It is found that the skewness of distribution function is proportional to the inhomogeneity induced flow, and a simple relation between the skewness and the normalized flow velocity, u_{flow}/v_{th}=-S/3, is obtained [K. Terasaka *et al.*, Phys. Plasmas **23**, 112120 (2016)]. The experimental results indicate the skewness has is a fundamental quantity to characterize the flow induced by inhomogeneity of system.

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