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Experimental Study on Swirl Flow in an ECR Plasma[1]
KENICHIRO TERASAKA, Kyushu University, SHINJI YOSHIMURA, National Institute for Fusion Science, KANSHI FURUTA, TAKUYA YAMADA, MASAYOSHI TANAKA, Kyushu University — Swirl plasma flow plays an important role to clarify astrophysical phenomena, such as astrophysical jets and solar dynamo, and in the development of plasma propulsion systems. We have studied the effect of plasma rotation on flow structure formation in a cylindrical ECR plasma with the HYPER-II device at Kyushu University, Japan. The HYPER-II device consists of two cylindrical chambers with different diameters: one is the plasma production chamber with 0.3 m in diameter and 0.95 m in axial length, and the other is the diffusion chamber with 0.76 m in diameter and 1.3 m in axial length. An electron cyclotron resonance (ECR) plasma is produced by a 2.45 GHz microwave in the magnetic beach configuration. The azimuthal plasma rotation due to $\mathbf{E} \times \mathbf{B}$ drift is generated by a set of cylindrical electrodes, and the swirl plasma flow with various kinetic helicity is produced in a diverging magnetic field. An axially revers flow structure has been found near the center axis, in which the radial density profile exhibits a density build-up in the flow reversal region. The axial flow structure of rotating plasma shows an interesting behavior compared with non-rotating plasmas.

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