IAEA FEC 2014

Contribution ID: **306**

Type: **Poster**

Parallel Flow Dynamics and Comparison with Neoclassical Transport Analysis in NBI Plasmas of Heliotron J

Wednesday 15 October 2014 14:00 (4h 45m)

This paper describes the parallel flow dynamics experimentally obtained in NBI plasmas of Heliotron J and its comparison with neoclassical transport analysis. In this study, two magnetic configurations with different magnetic ripple strength (gamma), core gamma of 0.031 m^-1 for the standard and 0.073 m^-1 for the high ripple configurations, have been adopted to investigate the effect of gamma on the parallel flow velocity. The experiments were carried out in the plateau regime. In the configuration having a high gamma strength, the parallel flow velocity of carbon at the core region is measured to be 2-3 times smaller than that in the standard ripple case. The dependence of the flow velocity on gamma shows that the damping force by the neoclassical (NC) parallel viscosity is much higher in the high gamma case. On the other hand, in the region of r/a > 0.6, the flow velocity was measured to be around 2-4km/s for both the co- and counter-NBI plasmas. It was also observed that the flow velocity of r/a > 0.6 was not so sensitive to gamma. Since a Fokker-Planck analysis expects that the external torque is small in the region of r/a > 0.6, the insensitivity of parallel flow both to the NBI direction and gamma implies a spontaneous flow. The measurement results are compared with a NC transport calculation based on the Sugama-Nishimura method with taking the external NBI force into account. The numerical analysis estimates the flow velocity by solving the parallel force balance for multi-species (electron, deuterium and carbon ions) which includes the collisional interactions between the species. The experimentally observed flow velocity in the core region is consistent with that predicted based on the NC prediction. However, some discrepancy is seen between the two outside the core region. The deviation of the effective parallel viscosity calculated by the experimental result from the NC prediction increases with radius. This indicates some damping mechanisms, viscosity by turbulence or neutral, should be taken into account to interpret the deviation.

Paper Number

EX/P4-28

Country or International Organisation

Japan

Author: Dr KOBAYASHI, Shinji (IAE, Kyoto Univ.)

Co-authors: Prof. SANO, Fumimichi (Institute of Advanced Energy, Kyoto University); Dr OKADA, Hiroyuki (Institute of Advanced Energy, Kyoto University); Dr LEE, Hyunyong (Korea Advanced Institute of Science and Technology); Prof. NAGASAKI, Kazunobu (Institute of Advanced Energy, Kyoto University); Mr NISHIOKA, Kenji (Graduate School of Energy Science, Kyoto University); Prof. WATANABE, Kiyomasa (National Institute for Fusion Science); Dr YOKOYAMA, MASAYUKI (National Institute for Fusion Science); Mr KENMOCHI, Naoki (Graduate

School of Energy Science, Kyoto University); Dr MURAKAMI, Sadayoshi (Departement Nuclear Engineering, Kyoto University); Dr YAMAMOTO, Satoshi (Institute of Advanced Energy, Kyoto University); Dr KONOSHIMA, Shigeru (Institute of Advanced Energy, Kyoto University); Dr NISHIMURA, Shin (National Institute for Fusion Science); Dr OHSHIMA, Shinsuke (Kyoto University); Dr MINAMI, Takashi (Institute of Advanced Energy, Kyoto University); Dr MIZUUCHI, Tohru (Institute of Advanced Energy, Kyoto University); Prof. NAKAMURA, Yuji (Graduate School of Energy Science, Kyoto University); Dr SEKI, ryohsuke (National Institute for Fusion Science); Dr KADO, shinichiro (Institute of Advanced Energy, Kyoto University)

Presenter: Dr KOBAYASHI, Shinji (IAE, Kyoto Univ.)

Session Classification: Poster 4