Category Number and Subject: 5.6.2 DIII-D Tokamak

[ ] Theory   [x] Experiment

Polarization Dependence of Electron Cyclotron Current Drive Efficiency,[*] Y.L. Lin-Liu, *National Dong Hwa University,* R. Prater *General Atomics* – Electron cyclotron current drive (ECCD) is widely used for control of the current profile due to its ability to drive localized off-axis current. For modeling the ECCD, relativistic effects can be self-consistently taken into account in evaluating the current drive by using the Green's function technique [1,2]. However, in the previous theoretical treatments the polarization dependence of the ECCD efficiency is neglected by invoking the small gyroradius expansion. This approximation is essentially non-relativistic in nature. In this work we consider the polarization dependence of the ECCD efficiency using the relativistic generalization of the local Kennel-Engelmann rf diffusion operator in velocity space, which depends explicitly on the polarization of the wave. The evaluation of the ECCD including the polarization effects is implemented in the current drive module of the ray-tracing code TORAY-GA. The polarization dependence of the ECCD efficiency for the 2nd harmonic X-mode will be examined for the database of the DIII-D ECCD experiments and for the fundamental O-mode for ITER.

[1] R.H. Cohen, Phys. Fluids **30**, 2442 (1987).
[2] Y.R. Lin-Liu, V.S. Chan, and R. Prater, Phys. Plasmas **10**, 4064 (2003).