

Modeling of Time-dependent Radial Transport of Electron Distribution Perturbations Caused by ECCD in DIII-D*

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Application is made of a new capability in the CQL3D bounce-averaged Fokker-Planck collisional-rf quasilinear code[1]. Fully-implicit solutions of the time-dependent, coupled 3D Fokker-Planck equation and the Ampere-Faraday Law equation are obtained for the electron distribution, $f(u, \theta, \rho, t)$, and the toroidal electric potential, $V_{loop}(\rho, t)$. A time-implicit solution of the 3D FP equation in the manner of [2] is coupled to an iterative toroidal electric field solve. In highly driven experiments, radial transport can be crucial for radial spreading of otherwise localized electron cyclotron current drive[3]. The DIII-D experiment is in intermediate driven regime with $\tau_{transport} \sim \tau_{slowing}$, for the EC driven electrons. Here, the transport time is a fraction of the energy confinement time depending on the normalized radial width of the ECCD, $\tau_{transport} \sim (\delta r/a)^2 \tau_E$, and the slowing down time is evaluated for the resonant electrons. Results will be reported for the time-dependent radial profiles of current density, fast electrons, and toroidal loop voltage.

[1] R.W. Harvey and M.G. McCoy, IAEA TCM on Advances in Simulation and Modeling of Thermonuclear Plasmas, Montreal, 1992; USDOC NTIS No. 93002962.

[2] Y. Peysson *et al.*, Radio Frequency Power in Plasmas, 15th Topical Conference, Moran, Wyoming (2003).

[3] R.W. Harvey *et al.*, Phys. Rev. Lett. 88, 205001 (2002).

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