

Simulation of Fast Alfvén Wave Interaction with Beam Ions over a Range of Cyclotron Harmonics in DIII-D Tokamak

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Abstract. To study fast Alfvén wave damping on fast ions, a Monte-Carlo code ORBIT-RF has been coupled with a 2D full wave code TORIC4. The ORBIT-RF/TORIC4 combination has been applied to DIII-D experimental conditions to investigate Fast Wave (FW) heating of injected beam ions over a range of ion cyclotron harmonics. ORBIT-RF using a single dominant toroidal and poloidal Fourier wave number qualitatively reproduces the strong FW-beam interaction at 60MHz ($4\Omega_D$ and $5\Omega_D$) and the much weaker interaction at 116MHz ($8\Omega_D$) in DIII-D L-mode plasmas, consistent with experimental observations. The result at $8\Omega_D$ differs from linear theory prediction using a Maxwellian to model the fast ion distribution function, suggesting the importance of finite orbit effect, Coulomb collisions for transport across flux surfaces and the details of the non-Maxwellian fast ion distribution.