Iterated finite-orbit Monte-Carlo simulations with full-wave fields for modeling tokamak ICRF wave heating experiments

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Abstract. The 5-D finite-orbit Monte-Carlo code ORBIT-RF [M. Choi, et al., Phys. Plasmas **12**, 1 (2005)] is successfully coupled with the 2-D full-wave code All-ORders Spectral Algorithm (AORSA) [E.F. Jaeger, et al., Phys. Plasmas **13**, 056101 (2006)] in a self-consistent way to achieve improved predictive modeling for ion cyclotron resonance frequency (ICRF) wave heating experiments in present fusion devices and future ITER [R. Aymar, et al., Nucl. Fusion **41**, 1301 (2001)]. The ORBIT-RF/AORSA simulations reproduce fast-ion spectra and spatial profiles qualitatively consistent with Fast Ion D-Alpha (FIDA) [W.W. Heidbrink, et al., Plasma Phys. Control. Fusion **49**, 1457 (2007)] spectroscopic data in both DIII-D [J.L. Luxon, Nucl. Fusion **42**, 614 (2002)] and National Spherical Torus Experiment (NSTX) [M. Ono, et al., Nucl. Fusion **41**, 1435 (2001)] high harmonic ICRF heating experiments. This work verifies that both finite-orbit width effect of fast-ion due to its drift motion along the torus and iterations between fast-ion distribution and wave fields are important in modeling ICRF heating experiments.

Keywords: Ion cyclotron heating, high harmonics.

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