Finite orbit Monte-Carlo simulations of ion cyclotron resonant heating (ICRH) scenarios in DIII-D, NSTX and ITER

M. Choi,[1] D.L. Green,[2] V.S. Chan,[1] W.W. Heidbrink,[3] D. Liu,[4] E.F. Jaeger,[5] R.I. Harvey,[6] C.M. Muscatello,[3] L.L. Lao,[1] R.I. Pinsker,[1] and RF-SciDAC Team

[1]General Atomics, P.O. Box 85608, San Diego, California 92186-5608, USA
[2]Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831-6169, USA
[3]University of California-Irvine, Irvine, California 92697, USA
[4]University of Wisconsin-Madison, Wisconsin, 53706, USA
[5]XCEL Engineering Inc., Oak Ridge, Tennessee 37830, USA
[6]CompX, Del Mar, California 92014-5672, USA

Abstract

Iterative simulation results of 5-D finite-orbit Monte-Carlo code ORBIT-RF coupled with 2-D linear full-wave code All-ORders Spectral Algorithm AORSA are presented. The simulations include quasi-linear and collisional orbit diffusion and reproduce qualitatively experimental observations in spectra and outward spatial shifts of fast-ion D_α radiation signals in DIII-D and NSTX ICRH experiments with neutral-beam injection. This outward shift comes from large orbit drifts of fast ion tails across the magnetic surfaces, which cannot be reproduced when finite drift orbit effect is ignored. Preliminary ORBIT-RF/AORSA simulation for ICRH scenario in ITER appears to average out anisotropic distribution obtained with zero-orbit width. The results suggest that finite-orbit width effect may also be important in modeling ICRH scenario in ITER.

PACS numbers: 52.55.Qt, 52.50.Gj, 52.55.Fa