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Threshold Wave Amplitude Required for Non-adiabatic Wave-Particle Interaction[1] M. CHOI, V.S. CHAN, General Atomics, AND RF SCIDAC TEAM — Non-adiabatic interactions between wave and ion in radiofrequency heating have typically been modeled as a quasi-linear diffusive process in velocity space. It assumes strong decorrelation in the relative phase difference between wave and ion through successive kicks. Since decorrelation depends strongly on the combination of applied wave amplitude, wave frequency, the magnetic field inhomogeneity and the energy of resonant ion, this assumption may not always be valid. We extend the previous work on threshold wave amplitude [Whang, *et al.*, Nucl. Fusion **23**, 481 (1983)], which is only valid for the fundamental harmonic, using standard linear mapping theory, and obtain more generalized expressions for arbitrary harmonic number with finite $k_{||}$ and ion finite Larmor radius effects. Analytical results for the stochasticity onset will be compared with numerical results evaluated from the code ORBIT-RF. We apply this formula to elucidate the validity of quasilinear diffusion for C-Mod minority ion fundamental harmonic as well as DIII-D energetic beam ion high harmonic heating regimes.

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