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Resonance frequency broadening of wave-particle interaction in tokamaks due to collision and microturbulence G. MENG, PPPL, PKU, N. N. GORELENKOV, V. N. DUARTE, R. B. WHITE, A. BHATTACHARJEE, PPPL — The resonance width of energetic particles (EPs) and waves is crucial for the understanding and modelling for EP transport. In this work, we use ORBIT to study the broadening of resonance for DIIID shot 159243 and the parametric dependencies of the broadening width on bounce frequency, growth rate and scattering rate. With only perturbation applied, the broadening is inferred from kinetic Poincare plot. With additional scattering, the broadening width is obtained by studying particle redistribution. It is found that scattering leads to particle diffusion in phase space and increases resonance broadening significantly. With perturbation, scattering broadens resonance not only by kicking particles in and out the primary resonance island but also kicking particle across the adjacent secondary resonance island region. The redistribution process by mode trapping is much faster than scattering. The diffusion coefficient is larger at resonance island center than at the edge when perturbation is small. For DIIID, anomalous stochasticity has more important effect on the broadening compared to the collisional scattering. Comparison with RBQ and NOVA-K is in progress. This work will improve the modelling of the nonlinear process and EP transport by providing analyses for synergistic effects due to different mechanisms.

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