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M3D-K simulations of wave-particle interaction with realistic fast ion distribution D. LIU, W.W. HEIDBRINK, UC Irvine, G.Y. FU, J.A. BRESLAU, M. PODESTA, PPPL, F. WANG, DUT, N.A. CROCKER, S. KUBOTA, UCLA — The stability properties of MHD modes in the presence of fast ions are often studied with kinetic/MHD hybrid codes such as M3D-K or NOVA-K, which employs the ideal MHD description for the background plasmas and kinetic model for the fast ion kinetic response. In these codes, a simple analytic energetic particle distribution is typically used to specify the initial fast ion distribution. But this could limit the simulation accuracy especially in the cases when the analytic distribution is a poor fit to the actual fast ion distribution. In this work, an interface between the output of the tokamak fast ion Monte Carlo modeling code NUBEAM and M3D-K is developed. The realistic fast ion distribution in (R, Z, λ, E) from NUBEAM output is converted to a set of continuously and differentiable 2D cubic B-splines in the (P_ϕ, E) directions with a set of discrete bins in μ direction, and then used as an input for the unperturbed fast ion distribution in M3D-K code. Initial M3D-K simulations of non-resonant kink mode in NSTX with NUBEAM fast ion distribution shows that fast ions from NBI have a weakly stabilizing effect on the mode. M3D-K simulations of TAE on NSTX with NUBEAM fast ion distribution will also be performed to study the effects of fast ion distribution on TAE growth rate, frequency and mode structure and compare with experimental data. Examples will illustrate the quality of the spline fit to the NUBEAM fast ion distribution and benefits of using the more accurate fast ion distribution. *Work supported by US DOE

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