

M3D-K Simulations of Beam-driven Alfvén Modes in NSTX

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We report initial results of Kinetic/MHD hybrid simulations of beam-driven Alfvén modes in NSTX plasmas using the M3D-K code. Recent NSTX experiments have been carried out for beam-driven Alfvén modes with multiple reflectometer channels for high resolution measurement of the density fluctuation. The purpose of the experiment was validation of energetic particle simulation codes such as M3D-K with respect to mode structure and saturation level of beam-driven Alfvén modes. The experiment was successful in producing the expected unstable TAE modes in beam-heated L-mode plasmas with toroidal mode number ranging from $n=2$ to $n=5$. Good reflectometer data was obtained showing the TAE-like modes peak in the plasma core. We have carried out M3D-K simulations of beam-driven Alfvén modes for parameters and profiles corresponding to NSTX shot #141711 at $t=0.47$ sec. The effects of plasma rotation are included in the simulations. The initial results show an unstable $n=3$ TAE with calculated mode frequency and mode structure consistent with the measurement. The simulation results also reveal significant radial phase variation possibly due to energetic particle effects. Details of the simulation results and comparison with experimental observation will be presented.