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M3D-K Simulations of Beam-Driven Fishbone Instability in DIII-D GUOYONG FU, BENJAMIN TOBIAS, Princeton Plasma Physics Laboratory, MICHAEL VAN ZEELAND, General Atomics — Fishbone instability is often observed between sawtooth crashes in DIII-D with sufficient on-axis neutral beam power. In this work, hybrid simulations with the global kinetic/MHD hybrid code M3D-K [1] have been carried out to investigate the linear stability and nonlinear dynamics of n=1 mode with effects of energetic beam ions for parameters and profiles of a DIII-D discharge. The results show that the n=1 internal kink mode is unstable in MHD limit. However, with kinetic effects of beam ions, a fishbone-like mode is found to be unstable with mode frequency about a few kHz, consistent with experimental observation. Nonlinear simulations are being performed to investigate mode saturation, frequency chirping as well as energetic particle transport. Numerical results will be compared with the experimental data from DIII-D.

[1] G.-Y. Fu et al., Phys. Plasmas 13, 052517 (2006).

Guoyong Fu
Princeton Plasma Physics Laboratory

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