Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Dependence of compressional Alfvén eigenmode instability on fast-ion density and phase space distribution on DIII-D[1] SHAWN X TANG, N.A. CROCKER, T.A. CARTER, University of California, Los Angeles, K.E. THOME, R.I. PINKSER, General Atomics, W.W. HEIDBRINK, University of California, Irvine — Instability of compressional Alfvén eigenmodes (CAEs), driven through Doppler-shifted cyclotron resonance with beam ions, is studied in an experiment on DIII-D that varies beam current at constant beam voltage. A mode excited by an off-axis co-I_P injected beam is observed with a pair of toroidally separated magnetic field sensing loops to be propagating counter to the beam direction with n=-5 and f ˜0.57f_c. The mode is unstable at high beam current and observed to stabilize as the current drops below a threshold. This would seem consistent with a simple theoretical expectation for CAEs to be unstable at beam densities above a dissipation-based threshold [Belova 2017]. However, TRANSP modeling shows that the fast-ion phase space distribution changes in a complex way over the lifetime of the mode. The initial destabilization of the mode is observed to be delayed ˜10ms after beam turn-on. The complicated evolution of mode stability during the beam current scan motivates an in-depth analysis of the changing fast-ion distribution to determine the exact features controlling the instability. Analysis is underway to compare mode stability with expectations from the orbit-averaged resonance equation evaluated for particles in the fast-ion population.

[1]Work supported by US DOE grants DE-FG02-99ER54527, DE-FC02-04ER54698, and DE-SC0011810

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Date submitted: 03 Jul 2019

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