Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Stabilization of Beam-Driven Modes by Ionization-Induced Velocity Spread BRADLEY NICKS , ALES NECAS , TOSHIKI TAJIMA , Tri Alpha Energy, TRI ALPHA ENERGY TEAM — Using the implicit PIC code LSP, the stabilization of beam-driven modes by ionization-induced velocity-space broadening in 2D is analyzed. A neutral beam of hydrogen with variable temperature and energy is injected into a high-β background plasma of deuterium and electrons, and a model of ionization creates fast ions from the neutrals. The plasma is then examined for instabilities. Micro-instabilities manifest as periodic nodes in velocity space (chiefly with long wavelength, such as Bernstein or AIC modes), while macro-instabilities additionally create periodic structures in real space, such as a cyclotron theta mode on the beam ions. For this study, the background plasma is first taken to have uniform density and B_z, and second, an FRC profile. In previous 1D studies without ionization-induced effects, many unstable beam-driven modes were found. With the injection of a neutral beam into a 2D geometry however, many of these modes are stabilized by the broadening of the beam velocity-space distribution. The broadening is strongest for $v_\perp$, spanning several multiples of the original neutral beam drift speed. Similarly, real-space spreading stabilizes macro-instabilities. Criteria for stability based on the degree of velocity-space and real-space spreading are found and are compared with the 1D case. [1] *Tri Alpha Energy, Inc., Rancho Santa Margarita, CA 92688, USA.* [2] *University of California Irvine, Irvine, CA 92697, USA.*

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Date submitted: 18 Jul 2017 Electronic form version 1.4