Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Phenomenology of beam driven modes in the field reversed configuration RICHARD MAGEE, NATHAN BOLTE, RYAN CLARY, ALES NECAS, SERGEY KOREPANOV, ARTEM SMIRNOV, MATTHEW THOMPSON, TOSHIKI TAJIMA, THE TAE TEAM, Tri Alpha Energy, Inc. — The C-2U experiment offers a unique plasma environment combining a high beta field reversed configuration (FRC) embedded in a low beta magnetic mirror with high power neutral beam injection. The beams are injected tangentially into a modest magnetic field so that the orbits of the resulting fast ions encircle the entire plasma. These large orbit particles sustain[1] and stabilize[2] the plasma and suppress turbulence. Measurements of magnetic fluctuations at the edge of the plasma reveal the presence of three coherent beam driven modes: a low frequency, chirping mode, a mode near the ion cyclotron frequency, and a high frequency compressional Alfven mode. Remarkably, none of these modes are observed to have a deleterious effect on global plasma confinement. In fact, the cyclotron mode has the beneficial effect of dramatically enhancing the DD fusion reaction rate by drawing a trail from the plasma ion energy distribution on a sub-collisional timescale. In this presentation, we experimentally characterize the beam driven modes in the C-2U FRC with data from multiple diagnostics including magnetics, spectroscopy, neutral particle analyzers and fusion product diagnostics. Results are compared to a particle-in-cell simulation in a simplified geometry. [1] M. W. Binderbauer, et. al., AIP Conference Proceedings 1721, 030003 (2016) [2] M. Tuszewski et. al, Phys. Rev. Lett 108, 255008 (2012)

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Date submitted: 14 Jul 2016 Electronic form version 1.4