Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Suppressed Ion-scale Turbulence and Critical Density Gradient in the C-2 Field Reversed Configuration. LOTHAR SCHMITZ, UCLA, Los Angeles, CA, D. FULTON, C. LAU, I. HOLOD, Z. LIN, E. RUSKOV, UCI, Irvine, CA, B. DENG, H. GOTA, T. TAJIMA, M. BINDERBAUER, D. GUPTA, J. DOUGLASS, Tri Alpha Energy, Inc., Rancho Santa Margarita, CA, THE TAE TEAM —
In the core of the C-2 advanced beam-driven Field-Reversed Configuration (FRC), ion-scale turbulence is absent, leading to near-classical thermal ion confinement. Only electron-scale modes ($0.5 \leq k_\theta \rho_s \leq 40$, where ρ_s is the ion sound gyro-radius) have been detected via multi-channel Doppler Backscattering. Linear gyrokinetic simulations confirm that ion modes are stable, and show unstable electron interchange modes driven by the electron temperature gradient in the outer FRC core. Core turbulence observations are qualitatively consistent with quenching of long wavelength ion modes via Finite Larmor radius effects, as evidenced by an inverted toroidal wavenumber spectrum. In contrast, ion-scale modes driven unstable primarily by the density gradient are predicted (and observed) in the FRC scrape-off layer (SOL). Density fluctuation levels $\tilde{n}/n$ near the separatrix and in the SOL increase beyond a critical density gradient roughly in agreement with the predicted linear stability threshold. Strong $E \times B$ velocity shear develops $\sim$1 ms after FRC initiation, and is observed to increase the SOL critical density gradient.

Lothar Schmitz
UCLA, Los Angeles, CA

Date submitted: 24 Jul 2015 Electronic form version 1.4