Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Measurements of fast ion spatial dynamics during magnetic activity in the RFP[1] J.A. GOETZ, J.K. ANDERSON, P. BONOFIGLO, J. KIM, R. MCCONNELL, UW - Madison, R.M. MAGEE, TriAlpha Energy, Inc. — Fast ions in the RFP are only weakly affected by a stochastic magnetic field and behave nearly classically in concentration too low to excite Alfvenic activity. At high fast ion concentration sourced by H-NBI in 300kA RFP discharges, a substantial drop in core-localized high pitch fast ions is observed during bursts of coupled EPM and IAE (magnetic island-induced Alfven eigenmode) activity (100-200kHz) through neutral particle analysis. Sourcing instead fast deuterium with NBI, the DD fusion products can measure the dynamics of the fast ion density profile. Both a collimated neutron detector and a new 3MeV fusion proton detector loaned by TriAlpha Energy measure the fast ion density profile with ˜5cm spatial resolution and 100μs temporal resolution. In D-NBI, the bursting EPM is excited at slightly lower frequency and the IAE activity is nearly absent, likely due to an isotope effect and loss of wave-particle interaction. In these cases, neutral particle analysis shows little change in the core-localized high pitch fast ion content, and the fusion product profile indicates little change in the fast ion density profile, leaving unexplained the mechanism removing EPM drive. We measure a substantial redistribution of the fast ion profile due to strong lower-frequency (˜30kHz) MHD activity that accompanies the current profile relaxation in the RFP. Profile flattening is strongest in low bulk density discharges, which often occur with a total increase in global neutron flux from acceleration of the beam ions.

[1]Work supported by US DoE

John Goetz
University of Wisconsin - Madison

Date submitted: 13 Jul 2017 Electronic form version 1.4