Abstract Submitted
for the APR12 Meeting of
The American Physical Society

Gyrokinetic particle simulations of reversed shear Alfvén eigenmodes in DIII-D tokamak[1] WENJUN DENG, University of California, Irvine — Linear and nonlinear properties of reversed shear Alfvén eigenmodes (RSAEs) driven by density gradient of neutral beam injected fast ions in a well-diagnosed DIII-D experiment (discharge #142111) are studied by simulations using the gyrokinetic toroidal code (GTC). Various RSAE damping mechanisms are identified and measured in the simulations, which shows that accurate damping and growth rate calculation requires true mode structure from non-perturbative, fully self-consistent simulation. The mode structure has no up-down symmetry mainly due to the radial symmetry breaking by the radial variation of fast ion density gradient, as measured in the experiment by electron cyclotron emission imaging. The RSAE frequency up-sweeping and the mode transition from RSAE to toroidal Alfvén eigenmode are in good agreement with the experimental results when scanning the values of the minimum safety factor $q_{\min}$ in simulations. Good agreements in frequencies, growth rates, and mode structures are obtained among simulations of gyrokinetic codes GTC and GYRO, and an MHD-hybrid code TAEFL. In the nonlinear stage, the RSAE saturates at the level of $\delta B/B_0 \sim 10^{-3}$, which qualitatively agrees with the experimental measurement.

[1]This work is in collaboration with Z. Lin, I. Holod, Z. Wang, Y. Xiao, H. Zhang, E. Bass, D. Spong, W. Heidbrink, B. Tobias and M. Van Zeeland, and is supported by SciDAC GSEP Center.

Wenjun Deng
University of California, Irvine

Date submitted: 06 Jan 2012 Electronic form version 1.4