Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

BOUT++ Simulations of ELMs with Four-Field Model
TONGNYEOL RHEE, G.Y. PARK, H.G. JHANG, S.S. KIM, P.H. DIAMOND[1], WCI Center for Fusion Theory, NFRI, Korea, X.Q. XU, LLNL, Livermore, CA, USA — Filamentary edge localized modes (ELM) structures has been often observed in numerous tokamak H-mode discharges. To understand/interpret these observations, we study linear and nonlinear ELM phenomena and the associated dynamics using the BOUT++ code. In this work, we perform ELM simulations using a four-field model [1]. This model improves the previous three-field equations by including additional physics such as parallel compressibility, electron Hall, and finite Larmor radius effects, which are all important in a steep gradient pedestal region [2]. Preliminary linear simulation results with the four-field model show the qualitative agreement with those from the three-field equations. Furthermore, we study the coupled effects of Alfven, drift, and ion sound waves on linear growth of the pedestal instability showing a significant modification of the linear results of ideal peeling-ballooning mode theory. On-going works include the study of ELM responses to the soft edge pedestal perturbations and the application of resonant magnetic perturbations (RMP) shown to have significant impact on ELM characteristics. We implemented the RMP boundary condition into the BOUT++ code to understand how ELM filamentary structure changes when RMP is applied. Details of the implementation of the four-field model and physics results will be presented.

[1] R.D. Hazeltine and J.D. Meiss, Phys. Rep., 121, 1 (1985).
[2] X.Q. Xu et al., Phys. Rev. Lett., 105, 175005 (2010)

[1]CMTFO and CASS, UCSD, USA

Tongnyeol Rhee
WCI Center for Fusion Theory, NFRI, DaeJeon, Korea

Date submitted: 18 Jul 2012 Electronic form version 1.4