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Category Number and Subject: 5.6.2. DIII-D Tokamak

[ ] Theory [X] Experiment

**Validation of BOUT++ Nonlinear ELM Simulations Using Fast Measurements from DIII-D,*** M.E. Fenstermacher, X. Xu, I. Joseph, C.J. Lasnier, W.H. Meyer, *Lawrence Livermore National Laboratory*; B.J. Tobias, *Princeton Plasma Physics Laboratory*; L. Zeng, *University of California-Los Angeles* — Nonlinear edge localized mode (ELM) simulations have now been carried out with BOUT++ [1] at low experimental collisionality using a hyper-resistivity model to allow reconnection and ELM crash without formation of unphysically thin current sheets. Multiple fast diagnostic measurements of ELM dynamics are available from DIII-D [2,3] to validate these BOUT++ simulations. Using kinetic plasma and $E_r$ profiles averaged over the last 20% of multiple ELM cycles, BOUT++ linear and nonlinear simulations of a large Type-I ELM in DIII-D were performed. Multiple synthetic diagnostics applied to the BOUT++ output (e.g. ELM energy loss, pedestal pressure drop, target heat flux, ECE imaging etc.) will be compared with fast magnetics, Thomson scattering, IRTV, ECE-I and other measurements of the ELM dynamics.

[1] X. Xu *et al.*, Nucl. Fusion **51**, 103040 (2011).
[2] M.E. Fenstermacher *et al.*, J. Nucl. Mater. (2012) in press.
[3] M.E. Fenstermacher *et al.*, Plasma Phys. Controlled Fusion **45,** 1597 (2003).

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