Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Modeling of local edge plasma perturbations induced by a biased probe[1] M.V. UMANSKY, LLNL, D. BRUNNER, B. LABOMBARD, M.I.T., T.D. ROGNLIEN, LLNL — In tokamak edge plasma experiments, a so-called "death-ray" regime is found where the downstream electron pressure measured by Langmuir probes at the divertor plate exceeds the upstream values by a factor of $\sim$2 over a narrow radial region at the strike point [1,2]. However, recent studies on Alcator C-Mod indicate that the death-ray over-pressure may be a result of local plasma perturbations by the probe [3]. We investigate the effects of probe plasma perturbation using the tokamak edge fluid code UEDGE. The code models a 2D slab-like configuration roughly matching the basic dimensions and characteristics of edge plasma in Alcator C-Mod near detachment, where the death-ray is often observed. It is observed in the numerical solutions that at sufficiently negative bias voltage, the probe substantially modifies the local plasma parameters. Several characteristics appear to be similar to experimental observations of the death-ray regime, pointing to the interplay of perpendicular plasma viscosity, ion-neutral interaction, and the electron sheath heat flux.
[1] LaBombard et al., J. Nucl. Mater., 241-243, p. 149 (1997); [2] Loarte et al., Nucl. Fusion 38 (1998) 331; [3] Brunner et al., APS DPP 2010, poster TP9.00069.

[1]Work performed for U.S. DoE by LLNL under Contract DE-AC52-07NA27344

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Date submitted: 13 Jul 2011 Electronic form version 1.4