(PI: Stephen C. Jardin,PPPL) and the APDEC SciDAC Project (PI: Phillip Colella, LBNL).

Abstract Submitted
for the APR06 Meeting of
The American Physical Society

Simulations of Edge Localized Modes and Pellet Injection RAVI SAMTANEY, Princeton Plasma Physics Laboratory — We present preliminary results of 3D adaptive mesh refinement (AMR) simulations of edge localized modes (ELMs) and pellet injection, both of which are critical for ITER. It is widely accepted that the most like fueling technique for ITER will be via pellet injection; and that the high confinement mode (H-mode) operation of ITER will be accompanied by ELMs. The two application discussed above are related because pellets have been utilized to control the ELM frequency. Furthermore it is known that pellets can be associated with transitions from the low confinement mode to H-mode, as well as the occurrence of neoclassical tearing modes. In this presentation, we discuss the planned development of an AMR code which will be utilized for pellet injection and the simulations of ELMs. Both phenomena entail extremely fine resolution in the regions of interest, which necessitates the use of AMR meshing technologies. For ELM simulations, a semi-implicit approach is developed to model the vacuum region as a high-resistivity low-temperature plasma. The pellet injection problem poses interesting numerical challenges which stem from the large density gradients in the vicinity of the pellet, the large disparity between the pellet and device size, and the non-local electron heat transport. Generalized upwinding techniques are employed to deal with sharp gradients while the electron heat transport is modeled by a semi-analytical kinetic treatment [1]. Preliminary simulation results of both pellet injection and ELMs will be presented along with a discussion of the planned future work in this areas. [1] R. Ishizaki et al. Phys. Plasmas, 11:4064–4080, 2004.

Ravi Samtaney
Princeton Plasma Physics Laboratory

Date submitted: 24 Feb 2006 Electronic form version 1.4