Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

On a Primal Coarse Projective Integration Method for Multi-scale Simulations MILOS SKORIC, SEIJI ISHIGURO, National Institute for Fusion Science, Japan, SANDRA MALUCKOV, University of Nis, Serbia — A novel simulation framework called Equation-Free Projective Integration (EFPI) was recently applied to nonlinear plasmas by M. Shay [1] to study propagation and steepening of a 1D ion sound (IS) with a PIC code as a microscopic simulator. To initialize, macro plasma variables are "lifted" to a fine micro-representation. PIC code is stepped forward for a short time, and the results are "restricted" or smoothed back to macro space. By extrapolation, time derivative is estimated and projected with a large step; the process is repeated. As a simple alternative, we propose a sort of a primal EPFI scheme to simulate nonlinear plasmas including kinetic effects. The micro-simulator is a standard 1D ES PIC code. Ions are assumed inherently coarse grained or "smoothed" and tracked to extrapolate in time and project. The potential is averaged over the electron plasma period to extrapolate and project. No adiabatic approximation for electrons is used [2], instead, self-consistently find the non-uniform electron distribution from the Poisson equation and ion density. Preliminary results for nonlinear IS as well as for the IS double layer paradigm are presented and some limitations on the EPFI discussed. [1] M. Shay, J. Drake, W. Dorland, J. of Comp. Phys (APS DPP 2005) [2] G. Stanchev, A. Maluckov et al., in EPS Fusion (Rome, 2006).

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Date submitted: 22 Jul 2006 Electronic form version 1.4