Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Integration of Full-Orbit and Gyro-Center Methods for Multi-Scale Modeling of Edge Plasmas Including Sheath Effects SONATA VALAITIS, DAVIDE CURRELI, University of Illinois at Urbana-Champaign, JONG CHOI, SCOTT KLASKY, Oak Ridge National Laboratory, MICHAEL CHURCHILL, C.S. CHANG, Princeton Plasma Physics Laboratory — Simulation of the edge region of a magnetically-confined plasma and its interaction with surface materials is a multi-scale physics problem which is essential to the development of a viable commercial fusion reactor. Correct modeling of this system requires the integration of a gyrokinetic approach capable of modeling the larger-scale regions of the edge plasma with a full-orbit description of the magnetic presheath and plasma sheath at the boundary of the plasma region. In order to accomplish this goal, we have coupled two plasma edge simulation codes with extensive use on DOE Leadership Class computers: hPIC and XGC. hPIC is a full-orbit electrostatic particle-in-cell code specifically targeting plasma presheath and sheath, plasma–surface interaction problems including surface erosion and material composition changes. XGC is a gyrokinetic particle-in-cell code exploring the remainder of the edge region. Code coupling is achieved using the ADIOS-2 input/output framework for in-memory communication on HPC systems. Material impurities released by plasma-facing components are characterized and their effects on the XGC edge plasma are analyzed using this novel approach.

Sonata Valaitis
University of Illinois at Urbana-Champaign

Date submitted: 03 Jul 2019 Electronic form version 1.4