

Abstract Submitted
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PIC Simulation of RF Plasma Sheath Formation and Initial Validation of Optical Diagnostics using HPC Resources¹ CASEY ICENHOUR, ASHE EXUM, North Carolina State University, ELIJAH MARTIN, DAVID GREEN, Oak Ridge National Laboratory, DAVID SMITHE, Tech-X Corporation, STEVEN SHANNON, North Carolina State University — The coupling of experiment and simulation to elucidate near field physics above ICRF antennae presents challenges on both the experimental and computational side. In order to analyze this region, a new optical diagnostic utilizing active and passive spectroscopy is used to determine the structure of the electric fields within the sheath region. Parallel and perpendicular magnetic fields with respect to the sheath electric field have been presented. This work focuses on the validation of these measurements utilizing the Particle-in-Cell (PIC) simulation method in conjunction with High Performance Computing (HPC) resources on the Titan supercomputer at Oak Ridge National Laboratory (ORNL). Plasma parameters of interest include electron density, electron temperature, plasma potentials, and RF plasma sheath voltages and thicknesses. The plasma is modeled utilizing the VSim plasma simulation tool, developed by the Tech-X Corporation. The implementation used here is a two-dimensional electromagnetic model of the experimental setup. The overall goal of this study is to develop models for complex RF plasma systems and to help outline the physics of RF sheath formation and subsequent power loss on ICRF antennas in systems such as ITER.

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