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High-Performance Computational Modeling of ICRF Physics and Plasma-Surface Interactions in Alcator C-Mod[1] THOMAS JENKINS, DAVID SMITHE, Tech-X Corporation — Inefficiencies and detrimental physical effects may arise in conjunction with ICRF heating of tokamak plasmas. Large wall potential drops, associated with sheath formation near plasma-facing antenna hardware, give rise to high-Z impurity sputtering from plasma-facing components and subsequent radiative cooling. Linear and nonlinear wave excitations in the plasma edge/SOL also dissipate injected RF power and reduce overall antenna efficiency. Recent advances in finite-difference time-domain (FDTD) modeling techniques [Jenkins & Smithe, PSST **24**, 015020 (2015)] allow the physics of localized sheath potentials, and associated sputtering events, to be modeled concurrently with the physics of antenna near- and far-field behavior and RF power flow. The new methods enable time-domain modeling of plasma-surface interactions and ICRF physics in realistic experimental configurations at unprecedented spatial resolution. We present results/animations from high-performance (10k-100k core) FDTD/PIC simulations spanning half of Alcator C-Mod at mm-scale resolution, exploring impurity production due to localized sputtering (in response to self-consistent sheath potentials at antenna surfaces) and the physics of parasitic slow wave excitation near the antenna hardware and SOL.

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