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Benchmarking and application of integrated 3D time-domain RF sheath and plasma model DAVID SMITHE, Tech-X Corporation, DANIEL D'IPPOLITO, JAMES MYRA, Lodestar Corporation, RF SCIDAC (CSWPI) COLLABORATION — Significant efforts have been made to quantitatively benchmark the sheath sub-grid model used in our time-domain simulations of plasma-immersed antenna and conducting wall near fields. These simulations include applications to highly detailed three-dimensional geometry, the presence of both fast and slow cold plasma waves, and the non-linear evolution of the sheath potential [1]. An important result from our benchmarking efforts is to highlight the importance and necessity of including the sheath plasma wave in these calculations. We present these detailed benchmarking cases in low-dimensionality, for comparison to analytic and simplified models [2]. These benchmarks also provides confidence in how we evolve the sheath's physical parameters. We present applications of the model to ICRF antennas in ITER and CMod tokamaks, as well as application to industrial plasmas. Finally, we discuss efforts to generalize the model to include plasma in contact with dielectric materials, as well as metallic materials. This work is supported by DOE grants DE-FC02-08ER54953, DE-FG02-09ER55006, and DE-FC02-05ER54823.

[1] D. N. Smithe, "Finite-difference time-domain simulation of fusion plasmas at radiofrequency time scales," Physics of Plasmas 14, 056104 (2007).
[2] D. A. D'Ippolito, J. R. Myra, E. F. Jaeger, and L. A. Berry, "Far Field Sheaths Due to Fast Waves Incident on Material Boundaries," Physics of Plasmas 15, 102501 (2008).

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