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Development of a scalable 3D full wave RF simulation (2): Applications to NSTX-U/LAPD/C-Mod/DIII-D[1] N. BERTELLI, PPPL, S. SHIRAIWA, MIT, E.H. KIM, G.J. KRAMER, PPPL, C. LAU, ORNL, A. SELTZMAN, MIT, B. VAN COMPERNOLLE, UCLA, J.C. WRIGHT, S. WUKITCH, MIT, X. YANG, TAE, RF SCIDAC TEAM — In this paper we report on the main applications of Petra-M, a recently developed open source code, based on the scalable MFEM C++ finite element library (see previous paper), on different experiments, such as NSTX-U, LAPD, Alcator C-Mod, and DIII-D. The first full torus 3D HHFW simulations for NSTX-U plasmas including the SOL region with realistic antenna geometry and core plasma is presented. A scan of the antenna phasing is performed showing a strong interaction between FWs and the SOL plasma for lower antenna phasing. A first attempt to couple the 3D RF solver with the full-orbit following particle code SPIRAL will be discussed with the aim to show the impact of the effect of the 3D wave field on the fast ion population from NBI beams in NSTX-U. An initial comparison between Petra-M simulations for a HHFW 4-strap antenna mounted on LAPD and its RF wave field measurements for LAPD plasma shows a qualitative agreement in the magnetic wave field pattern. The integration of TORIC hot core wave physics model with Petra-M was demonstrated using the Alcator C-Mod field-aligned ICRF antenna, showing the toroidal mode coupling. Petra-M models DIII-D HFS launcher to verify the RF antenna design based on smaller simplified models computed using COMSOL.

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