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3D HHFW full wave simulations with realistic antenna geometry and SOL plasma in NSTX-U

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In this paper we report an application of the Petra-M on NSTX-U. Petra-M, is a recent developed and open source code, which is based on the scalable MFEM C++ finite element library and allows for FEM analysis from geometry/mesh generation, FEM assembly, FEM system equation solution, and visualization in one platform [1, 2]. The first full torus 3D high harmonic fast wave (HHFW) simulations for NSTX-U plasmas including the scrape-off-layer (SOL) region with realistic antenna geometry and core plasma will be presented. A scan of the antenna phasing is performed showing a strong interaction between FWs and the SOL plasma for lower antenna phasing, which is consistent with previous NSTX HHFW observations. The antenna spectrum for different antenna phasing will be also shown. A first attempt to couple the 3D RF solver with the full-orbit following particle code SPIRAL [3] 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.

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[1] S. Shiraiwa et al., EPJ Web of Conferences 157 (2017) 03048.

[2] S. Shiraiwa et al., Nucl. Fusion, in preparation (2019).

[3] G. J. Kramer et al., Plasma Phys. Control. Fusion 55 (2013) 025013.

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