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**3D Full Wave Modeling of ECRH RF Beams in Fusion Devices**[1]

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High resolution solution of wave equations in frequency domain in the electron cyclotron frequency range for realistic fusion plasma parameters became feasible with the use of recently formulated hybrid iterative approach [Svidzinski et al, PoP 2018] for solving discretized wave equations. This approach combines time evolution and iterative relaxation techniques into iteration cycles. 3D iterative RF beams simulation tool, implementing this algorithm, is being developed. Dynamic grid adaptation is applied to cover only the part of the volume where the beam is localized. Initial results of full wave 3D RF beam simulations in DIII-D in the cold plasma model have demonstrated the capability of this algorithm to model the entire ECRH RF beams in fusion devices on modern supercomputers. Resolution with 100 B degrees of freedom is demonstrated at NERSC. The new tool allows to address RF beams physics not covered by paraxial approximation: diffraction, scattering, mode conversion, interference between modes, propagation in evanescent layers, beam splitting, and evolution of beam section in anisotropic plasma. Details of the algorithm, of the grid adaptation approach, the details of numerical implementation and initial results of modeling of 3D RF beams in DIII-D will be presented.

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