

Abstract Submitted  
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**RF Wave Simulation Using the MFEM Open Source FEM Package**<sup>1</sup> J. STILLERMAN, S. SHIRAIWA, P. T. BONOLI, J. C. WRIGHT, PSFC, MIT, D. L. GREEN, ORNL, T. KOLEV, LLNL — A new plasma wave simulation environment based on the finite element method is presented. MFEM[1], a scalable open-source FEM library, is used as the basis for this capability. MFEM allows for assembling an FEM matrix of arbitrarily high order in a parallel computing environment. A 3D frequency domain RF physics layer was implemented using a python wrapper for MFEM and a cold collisional plasma model was ported. This physics layer allows for defining the plasma RF wave simulation model without user knowledge of the FEM weak-form formulation. A graphical user interface is built on  $\pi$ Scope, a python-based scientific workbench [2], such that a user can build a model definition file interactively. Benchmark cases have been ported to this new environment, with results being consistent with those obtained using COMSOL multiphysics, GENRAY, and TORIC/TORLH spectral solvers. This work is a first step in bringing to bear the sophisticated computational tool suite that MFEM provides (e.g., adaptive mesh refinement, solver suite, element types) to the linear plasma-wave interaction problem, and within more complicated integrated workflows, such as coupling with core spectral solver, or incorporating additional physics such as an RF sheath potential model or kinetic effects. [1] <http://www.mfem.org> [2] <http://piscope.psfc.mit.edu>

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