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Development of Impedance Sheath Boundary Conditions in Finite Element RF Codes[1] CHRISTINA MIGLIORE, JOHN WRIGHT, Massachusetts Institute of Technology, MARK STOWELL, Lawrence Livermore National Laboratory, PAUL BONOLI, Massachusetts Institute of Technology — Ion cyclotron radio frequency range (ICRF) power plays an important role in heating and current drive drives in fusion devices. Experiments show that in under the ICRF regime there is a formation of a radio frequency (RF) sheath at the material and antenna boundaries that influences sputtering and power dissipation. Given the size of the sheath relative to the scale of the device, it can be approximated as a boundary condition (BC). RF codes, like the MFEM-based [http://mfem.org] finite element code Petra-M (Physics Equation Translator for MFEM) [2], implement a conducting wall as this BC, however the use of a finite impedance sheath BC based on the work of J. Myra 2015 [3] provides a more accurate representation of the RF sheath. This research will discuss the results from the development of a parallelized cold-plasma wave equation solver that implements this sheath impedance BC through the method of finite elements in pseudo-1D and pseudo-2D using the MFEM library with the eventual aim to incorporate the same BC into Petra-M.

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[2]S. Shiraiwa et al., EPJ Web of Conference Services 157, 03048 (2017)
[3]J. Myra et al., Phys. Plasmas 22, 062507 (2015)

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