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Simulating Heat Loads onto 3D PFC Geometries in NSTX-U[1]
THOMAS LOOBY, University of Tennessee, MATTHEW REINKE, ANDREAS WINGEN, Oak Ridge National Laboratory, DAVID DONOVAN, University of Tennessee, MIKE MESSINEO, JONATHAN KLABACHA, Princeton Plasma Physics Laboratory — High power operation of future NSTX-U scenarios may be constrained by plasma facing component engineering limits. These constraints motivated the development of a comprehensive software package to couple 3D plasma effects to 3D PFC geometries for the goals of pre-shot heat flux prediction, post-shot heat flux validation, and design optimization. Axisymmetric heat flux assumptions are violated when 3D plasma effects (RMP lobes, error fields, gyro orbits, etc.) load PFCs non-uniformly in the toroidal direction, or when the PFCs are designed with inherent 3D geometries (fish-scaling, chamfering, castellations, etc.). The software development roadmap is presented with requirements for interfacing directly to multiphysics and engineering toolkits to enable CAD importation and thermal / stress analysis, and for including synthetic diagnostic tools to enable validation. The present capabilities are outlined, with results demonstrating axisymmetric plasma effects applied to 3D PFCs.

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