Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

DIVIMP-WallDYN predictions of tungsten migration and transport in slot versus V-shaped divertors[1] J.H. NICHOLS, UTK, H. DU, SWIP, J.D. ELDER, UTIAS, T. ABRAMS, H.Y. GUO, GA, D.C. DONOVAN, UTK, P.C. STANGEBY, UTIAS — Time-dependent, mixed-material DIVIMP-WallDYN modeling is presented that predicts favorable tungsten (W) erosion and leakage properties from a V-shaped divertor, versus a comparable slot divertor. Plasma backgrounds are obtained from SOLPS 5.1 with drifts, assuming identical upstream conditions but differing in outer divertor geometry: a small-angle slot (similar to the current SAS in DIII-D), and a V-shape (similar to the proposed SAS-V in DIII-D). Material migration simulations are performed for a toroidally-symmetric W tile in the outer divertor of an otherwise carbon (C) machine, similar in setup to the planned SAS1-VW experiment in DIII-D. For favorable ion grad-B drift direction, in both cases the initial W surface reaches a mixed W/C equilibrium within 10 seconds, remaining at least 60% W throughout the common flux region. Both gross and net erosion of W are markedly lower in the V-shaped case, primarily due to the lower electron temperature near the strike point. Furthermore, a lower fraction of the eroded W leaks out of the divertor in the V-shaped case, primarily due to stronger near-target deuterium flows. The poloidal extent of the W tile is shown to not be a major driver of W migration behavior. In both geometries, simulations show these W migration patterns are largely recovered even when W is initially covered by incidentally-deposited C layers.

[1]Work supported by US DOE under DE-FC02-04ER54698, DE-SC0019256, and the FES Postdoctoral Research Program.

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Date submitted: 26 Jun 2020 Electronic form version 1.4