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Simulation of Sub-Scale Ion Optics on a Parallel Cluster RAED KAFAFY, International Islamic Unviersity Malaysia, JOSEPH WANG, Virginia Polytechnic Institute and State Unviersity — Accurate prediction of the cross-over and perveance impingement limits of an ion optics system is very important to determine the feasible operational envelope of an ion thruster. Impingement of beamlet ions on the acceleration grid at either limit results in excessive sputter erosion of the acceleration grid, which is one of the major failure mechanisms. We developed the streamline hybrid-grid immersed-finite-element particle-in-cell (HG-IFE-PIC) model for three-dimensional simulations of plasma flow in ion optics. The model is designed to handle the boundary conditions at grid surfaces accurately while maintaining the computational speed of a standard PIC code. Direct three-dimensional simulations of quarter-subscale gridlets of seven apertures could be performed routinely even using powerful PCs. However, larger subscale gridlets having more apertures were out of reach of a single machine. In this paper, we parallelize the hybrid-grid immersed-finite-element (HG-IFE-IFE) using two-dimensional decomposition of the PIC and IFE physical domains to allow for the direct three-dimensional simulation of subscale gridlets including as many apertures as limited by the number of available computing nodes. Results will be compared against experimental measurements taken for a set of subscale gridlets with 7, 19, and 37 apertures.

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