Abstract Submitted
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2D and 3D PIC-MCC simulations of a low temperature magnetized plasma on CPU and GPU[1] JONATHAN CLAUSTRE, BHASKAR CHAUDHURY, GWENAEL FUBIANI, JEAN-PIERRE BOEUF, LAPLACE, Universite de Toulouse, France — A Particle-In-Cell Monte Carlo Collisions model is used to described plasma transport in a low temperature magnetized plasma under conditions similar to those of the negative ion source for the neutral beam injector of ITER. A large diamagnetic electron current is present in the plasma because of the electron pressure gradient between the ICP driver of the source and the entrance of the magnetic filter, and is directed toward the chamber walls. The plasma potential adjusts to limit the diamagnetic electron current to the wall, leading to large electron current flow through the filter, and to a non uniform plasma density in the region between magnetic filter and extracting grids. On the basis of the PIC-MCC simulation results, we describe the plasma properties and electron current density distributions through the filter in 2D and 3D situations and use these models to better understand plasma transport across the filter in these conditions. We also present comparisons between computation times of two PIC-MCC simulation codes that have been developed for operations on standard CPU (Central Processing Units, code in Fortran) and on GPU (Graphics Processing Units, code in CUDA). The results show that the GPU simulation is about 25 times faster than the CPU one for a 2D domain with 512x512 grid points. The computation time ratio increases with the number of grid points.

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