Choice of poisson solver for axisymmetric PIC model for Hall Effect Thruster

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Today, numerical simulation plays a crucial role in studying plasma behavior in Hall-Effect Thrusters. Commonly used methods include fluid, hybrid and kinetic models. While the first two methods require less computational resources, their application is limited because plasma is non-Maxwellian in Hall Thrusters.
Axisymmetric numerical models are widely used in calculations. In most models, only the plasma region is considered that leads to the following problem: it is necessary to use either a uniform rectilinear grid and trivial geometry of a thruster or non-uniform curvilinear grids. The first approach sacrifices accuracy of simulation, and the second one complicates particle and force weighting and the solution of the Poisson equation for electric potential. Moreover, distribution of electric field inside thruster's dielectric walls is usually neglected. The authors developed an axisymmetric PIC-model with a uniform rectilinear grid, which computational domain includes both plasma region and thruster's walls. Operating speed and effectiveness of parallelization of several Poisson equation solvers using a multiprocessor computational cluster were studied in this work.