A New Poisson Solver PIC Simulations on Arbitrary Unstructured Tetrahedral Meshes[1] SERGEY AVERKIN, NIKOLAOS GATSONIS, Worcester Polytechnic Institute — A new node-based algorithm is developed for the solution of Poisson's equation in PIC simulations on arbitrary unstructured tetrahedral meshes. The algorithm is derived by applying the integral form of the Gauss law to the indirect dual mesh constructed by connecting the centroids of edges to the centroids of faces and centroids of faces with the centroids of tetrahedral cells for each tetrahedron. The potential variation is assumed linear inside every cell and allows to estimate the potential gradient in each cell from the nodal values. The obtained sparse linear system is solved with the GMRES solver combined with the ILU(0) preconditioner. The new algorithm is verified with the simulation of the current collection by cylindrical Langmuire probes in the collisionless regime for a wide range of probe to Debye length ratios. The computed electron and ion number density variations as well as electric potential and collected currents compare well with the simulation results of Laframboise.

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