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A Parallelized 3D Particle-In-Cell Method With Magnetostatic Field Solver And Its Applications KUO-HSIEN HSU, YEN-SEN CHEN, National Space Organization, Taiwan, MEN-ZAN BILL WU, JONG-SHINN WU, National Chiao-Tung University, Taiwan — A parallelized 3D self-consistent electrostatic particle-in-cell finite element (PIC-FEM) code using an unstructured tetrahedral mesh was developed. For simulating some applications with external permanent magnet set, the distribution of the magnetostatic field usually also need to be considered and determined accurately. In this paper, we will firstly present the development of a 3D magnetostatic field solver with an unstructured mesh for the flexibility of modeling objects with complex geometry. The vector Poisson equation for magnetostatic field is formulated using the Galerkin nodal finite element method and the resulting matrix is solved by parallel conjugate gradient method. A parallel adaptive mesh refinement module is coupled to this solver for better resolution. Completed solver is then verified by simulating a permanent magnet array with results comparable to previous experimental observations and simulations. By taking the advantage of the same unstructured grid format of this solver, the developed PIC-FEM code could directly and easily read the magnetostatic field for particle simulation. In the upcoming conference, magnetron is simulated and presented for demonstrating the capability of this code.

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