Numerical study of the ionization characteristics in ECR ion sources using PIC/MCC method.[1] TAO HUANG, LI LEI, XIAOLIN JIN, BIN LI, University of Electronic Science and Technology of China — An improved computational model has been present to simulate the formation of ECR ion sources, which includes a time-dependent description of the electromagnetic fields and a self-consistent analysis of the charged particles. A method of the waveguide modal representation proposed by MAGY is used in the calculations of the electromagnetic fields. As the full solution of Maxwell's equations is reduced to one of a relatively small number of coupled partial differential equations for the amplitudes of the modes, there is a significant savings of computation time. The dynamics of the charged particle is governed by the relativistic equations of motions, and the interaction between the charged particles and microwave fields is described by particle-in-cell (PIC) method. Therefore, at each time step, a set of velocities and locations of the charged particles are calculated and used as current sources for the fields. Furthermore, the collision between charged particle and neutral particle is described by Monte Carlo Collision (MCC) method. The ionization characteristics in ECR ion sources are studied, and the effects of neutral pressure and external magnetic distribution on the ionization characteristics are also discussed.

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