Modeling of Negative Ion Transport in Cesium-Seeded Volume Negative Ion Sources

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Trajectories of H⁻ ions are calculated numerically by solving the 3D motion equation, including effects of collisional destruction, elastic collisions and charge exchange collisions. According to these trajectories, extraction probability of H⁻ ions produced at any location inside the source and energy of extracted H⁻ ions are discussed as a function of gas pressure. Effects of production zone and filter magnetic field on extraction probability are also discussed. The probability for surface produced H⁻ ions keeps nearly the constant value, and that for volume produced H⁻ ions decreases with gas pressure. The kinetic energy of extracted H⁻ ions is reduced mainly by charge exchange collision.

In the present study, we also discuss the characteristics of extracted negative ion current combining the present numerical results and the results of the model calculation with the zero-dimensional code.