Experimental Studies on The Roles of Space Charge Neutralization in a Ring Cusp Ion Source

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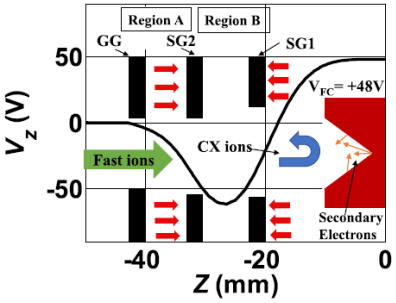
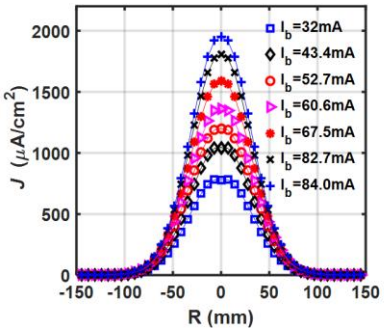
Experimental setup for ring cusp ion source and ion beam

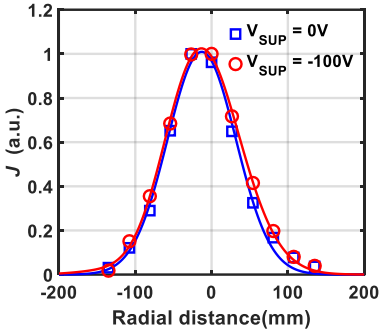
Ion Beam



Schematic of Faraday cup with filleting electrodes



Radial profiles of ion current density for different Beam currents



Radial profiles of ion current (V_{SUP} = −100 V) and electron current (V_{SUP} = 0 V) in the beam

Experimental studies in a ring cusp ion source are performed for investigating the role of space charge neutralization by measuring ion beam profiles, and distribution of ion beam neutralizing electrons. A Faraday cup array (FCA) is developed and utilized for measuring the ion beam profiles by filtering out the neutralizing electrons and slow-moving charge exchange ions from the ion beam. The FCA is further utilized for measuring the distribution profiles of neutralizing electrons in the ion beam by biasing its filtering electrodes and Faraday cups (FCs) at appropriate potentials.

The radial distribution of neutralizing electrons in the ion beam are found Gaussian as similar to that of the beam ions suggesting an evenly distributed space charge neutralization.

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