Title

Electron and gas effects on intense, space-charged dominated ion beams in magnetic quadrupoles: Comparison of experiments and simulations

Author

Vay, J.-L.

Publication Date

2005

LBNL-56870 Abs
HIFAN 1381a

Electron and Gas Effects on Intense, Space-Charge Dominated Ion Beams in Magnetic Quadrupoles: Comparison of Experiments and Simulations*

P.A. Seidl, D. Baca, F. Bieniosek, R. Cohen, A. Friedman, D. Grote, M. Kireeff Covo, S.M. Lund, A.W. Molvik, and J.-L. Vay

Accelerators for inertial fusion energy, high-energy density physics and other high intensity applications have an economic incentive to minimize the clearance between the beam edge and the aperture wall. This increases the risk from electron clouds and gas desorbed from walls. Using the High Current Experiment at LBNL, we have measured the beam (0.18 A, 1 MeV K^+) distribution upstream and downstream of a short lattice of magnetic quadrupoles where the 2•rms beam size is ≥50% of the quadrupole aperture, and the generalized perveance is $\approx 10^{-3}$. Between magnets, the transverse beam distribution is also imaged. The beam potential is 1-2 kV, large enough to trap electrons produced by, for example, K^+ - gas collisions. Gas and electron effects are intentionally induced by varying gas pressure and the bias of e^- controlling electrodes [1]. The measurements are compared to WARP PIC simulations that include the self-consistent tracking of electrons and ions [2].

[1] A. W. Molvik et al., this conference.
[2] J-L Vay et al., this conference.

* This work was performed under the auspices of the U.S. Department of Energy by University of California, LLNL and LBNL under contracts W-7405-Eng-48, and DE-AC03-76F00098.