BEAM HALOS IN THE HIGH CURRENT EXPERIMENT*

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Abstract

The High Current Experiment (HCX) at Lawrence Berkeley National Laboratory is part of the US program to explore heavy-ion beam transport at a scale representative of the low-energy end of an induction linac driver for fusion energy production. The primary mission of this experiment is to investigate aperture filling factors acceptable for the transport of space-charge-dominated heavy-ion beams at high space-charge intensity (line charge density up to ~ 0.2 μC/m) over long pulse durations (>4 μs) in alternating gradient electrostatic and magnetic quadrupoles. Beam halo will have an impact on the transportable current and fill factor, due to particle loss to the aperture wall. The associated particle loss causes desorption of neutral atoms, as well as emission of secondary electrons, which may perturb the dynamics of the core beam. The halo may be formed due to nonlinear optics in the injector and the applied fields, and will also be pumped from nonlinear space-charge effects and collective modes Experimental measurements of the halo will be presented from various diagnostics in the HCX beam, as a function of time through the beam pulse, and at different lattice locations.

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