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Explorations of Electron Cloud Effects and the consequences for Heavy-Ion Drivers for HEDP and Inertial Fusion Energy*

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In order to satisfy the requirements of focusing high-power density for high-energy-density physics and inertial-fusion targets, we should be able to transport high-current, high-energy beams with low emittance growth. With this aim the US Heavy Ion Fusion program built the High Current Experiment (HCX), a driver scale single beam injector, with an electrostatic matching section and electrostatic and magnetic quadrupole transport sections, that provides a K^+ ion beam current of 0.2-0.5 A for 5 μ s. It constitutes a unique facility to study the maximum fill factor (ratio of beam radius to tube radius) allowable, keeping the cost of a power plant competitive, without degrading the beam quality.

A deleterious effect when we increase the fill factor is the electron cloud effect, a recognized problem that limits the current and emittance on many large accelerators. Our goal here is to understand and mitigate this effect using new diagnostics that we developed coupled with state-of-the-art simulations.

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