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Electrostatic Beams Formed from Single-Component Plasmas[1]
N.C. HURST, J.R. DANIELSON, T.R. WEBER, C.M. SURKO, University of California, San Diego — Research on novel plasma manipulation techniques is enabling a new class of positron (anti-electron) beams for a variety of applications. Desirable characteristics include narrow energy spreads and finely focused beams (i.e., beams with small transverse spatial extent). Previously, we demonstrated that such beams can be extracted by carefully lowering the confining potential of a plasma in a Penning-Malmberg trap.[2] While useful, these beams are necessarily in a region of high magnetic field. Recently, we have used test electron plasmas to show that these beams can be efficiently extracted from a 4.8 T magnetic field into a magnetic field-free region using a combination of adiabatic and non-adiabatic field changes. These beams were subsequently focused using an electrostatic (einzel) lens.[3] The inclusion of a "spider" of highly permeable material is being explored as a way to minimize the momentum "kicks" due to the nonadiabatic transition, and hence to create high-quality, magnetic-field free beams. These beams are expected to be useful, for example, in positron microscopy and for a range of other matter-an

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[2]Weber, Danielson, and Surko, *Phys. Plasmas* **16**, 057105 (2009).
[3]Weber, Danielson, and Surko, *Rev. Sci. Inst.* **82**, 016104 (2011).

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