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Tailored Particle Beams From Single-Component Plasmas[1] T.R. WEBER, J.R. DANIELSON, C.M. SURKO, University of California, San Diego — A non-destructive technique was developed recently to create narrow beams of electrons (or positrons) of adjustable width and brightness from single-component plasmas confined in a Penning-Malmberg trap.[2] The limits of beam formation have been investigated over a broad range of plasma temperatures ($0.05 \leq T \leq 2$ eV) and densities ($0.06 \leq n \leq 2 \times 10^{10}$). A simple model for beam extraction predicts narrow Gaussian beam profiles, with widths dependent on the number of particles in the beam. An equation for the beam energy distribution is derived for arbitrary sized beams. For small beams, it reduces to the tail of a Maxwellian. The predictions of the theory are confirmed using electron plasmas. Extraction of over 50% of a trapped plasma into a train of nearly identical beams has been demonstrated.[2] The possibility of creating high quality, electrostatic beams by extraction from the confining magnetic field is discussed, as well as use of the techniques described here for a range of potential applications.

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[2]T. R. Weber *et al., Phys. Plasmas* **15, 012106 (2008).**

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