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Ferroelectric Plasma Sources for Ion Beam Neutralization A. STEPANOV, E.P. GILSON, L.R. GRISHAM, R.C. DAVIDSON, PPPL — A 40 keV Ar^+ beam with a dimensionless perveance of 4×10^{-4} is propagated through a Ferroelectric Plasma Source (FEPS) to determine the effects of charge neutralization on the transverse beam profile. Neutralization is established 5 μs after the FEPS is triggered, and lasts between 10 and 35 μs. When the beam is fully neutralized, the profile has a Gaussian shape with a half-angle divergence of 0.87°, which is attributed to ion optics. The effects of the resistance and capacitance in the pulser circuit on the FEPS discharge are studied. The electron current emitted by the FEPS is calculated from measurements of the forward and return currents in the circuit. Electron emission typically begins 0.5 μs after the driving pulse, lasting for tens of μs, which is similar to the duration of ion beam neutralization. The total emitted charge does not depend significantly on the resistance, but depends strongly on the storage capacitance. Lowering the capacitance from 141 nF to 47 nF results in a near-complete shut-off of charge emission, although the amplitude of the applied voltage pulse is as high as when high-density plasma is produced. Overall, the data suggest that ferroelectric effects are significant in the physics of the FEPS discharge.

Anton Stepanov
Princeton Plasma Phys Lab

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