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Particle-in-Cell WARP simulation studies of positron plasmas in micro-Penning-Malmberg traps[1] ALIREZA NARIMANNEZHAD, MARC H. WEBER, KELVIN G. LYNN, Center for Materials Research, Washington State University — The charged particles storage capacity of microtraps with large length to radius aspect ratios and radii of the order of tens of microns was explored using particle-in-cell WARP code. The new design of the trap consisted of an array of microtraps with substantially lower end electrodes potential than conventional Penning-Malmberg traps, which makes this trap quite portable. It was shown that each microtrap with 50 μm radius immersed in a 7 T uniform, axial magnetic field, stored positrons with a density (1.6E11 cm^{-3}) even higher than that in conventional Penning-Malmberg traps ($\approx$ 1E11 cm^{-3}) while the confinement voltage was only 10 V. The trapped density scaled as r^{-2} down to 3 μm radius. It was presented in this work how to evaluate and lower the numerical noise by controlling the modeling parameters so the simulated plasma can evolve toward computational equilibrium. The local equilibrium distribution was attained in time scales of the simulation for plasmas initialized with a uniform density and Boltzmann energy distribution. The charge clouds developed the expected radial soft edge density distribution and rigid rotation evolved to some extent. To reach global equilibrium (i.e. rigid rotation) longer runs are required. The plasma confinement time and its thermalization were independent of the length.

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