Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

Simulation studies of the behavior of positrons in a microtrap with long aspect ratio[1] ALIREZA NARIMANNEZHAD, JIA XU, CHRISTOPHER J. BAKER, MARC H. WEBER, KELVIN G. LYNN, Center for Materials Research, Washington State University, Pullman, WA 99164-2711 — The capacity to store charged particles in microtraps (micro-Penning-Malmberg traps) with large length to radius aspect ratios and with radii of the order of microns is explored. This paper presents how to reduce simulation noises by changing modeling parameters to achieve a nearly computational equilibrium distribution. Simulation studies of the motions of charged particles were conducted with the Charged Particle Optics (CPO) program and particle-in-cell plasma code WARP. Individual microtraps have radii of 50 μm and 10 cm length and are immersed in a uniform 7 Tesla magnetic field. The new design of the trap consists of an array of microtraps with confinement voltages of 10 V. It has been computationally shown that each microtrap stores positrons with higher density ($\sim$4.8E11 cm^{-3}) compared to a conventional Penning-Malmberg trap ($<$1.0E11 cm^{-3}). The results of the simulation of a plasma initialized with a uniform density and Boltzmann energy distributions showed that the plasma tends to transform to a soft edge distribution in radial direction as it approaches the equilibrium. Theoretically, more than hundred million positrons can be trapped in one microtrap with the present geometry.

[1]The authors would also like to thank the Army Research Laboratory who provides funding under contract W9113M-09-C-0075, and the Office of Naval Research who provides funding under award #N00014-10-1-0543.

Alireza Narimannezhad
Center for Materials Research, Washington State University,
Pullman, WA 99164-2711

Date submitted: 17 Jul 2012 Electronic form version 1.4