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Progress Towards a Microtrap Array for Positron Storage[1]
ALIREZA NARIMANNEZHAD, MARC H. WEBER, JOSHAH JENNINGS, CHANDRASEKAR MINNAL, KELVIN G. LYNN, Center for Materials Research, Washington State University — The storage of positrons has been a key for antimatter research and applications. One important goal is the attempt to reach higher densities of confined antimatter particles. Progress in this area is explored through a novel microtrap array with large length to radius aspect ratios and radii of the order of tens of microns. The proposed design consists of microtraps with substantially lower barrier potentials than conventional Penning-Malmberg traps arranged in parallel within a single magnet. Simulations showed positron plasma with 1E10 cm^{-3} density evolves toward a rigid-rotation phase in each microtrap while 10 V barriers confined the plasma axially. A trap of 4 cm length including more than 20,000 microtubes with 50 micron radii was fabricated and tested. Experiments conducted with electrons in a test structure addressing each microtube with a narrow beam will be described. This will explore the basic physics of the microtraps. Observed results were promising and they open a new avenue for manipulating high-density non-neutral plasmas.

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