Progress Towards a Practical Multicell Positron Trap\textsuperscript{1}

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The physics and technology of positron confinement is central to a range of applications at the forefront of antimatter science. Progress in this area has been driven by the development of a suite of novel non-neutral plasma techniques whereby up to $4 \times 10^9$ positrons have now been trapped and stored.\textsuperscript{2} However the next generation of experiments will require orders of magnitude more positrons. This talk describes techniques to increase storage capacity to $\geq 10^{12}$ using a novel multi-cell trap architecture.\textsuperscript{3,4} Plasmas will be stored in separate Penning-Malmberg traps (“cells”) arranged in parallel off the magnetic axis to maximize use of the magnetic field volume while minimizing the required confinement voltages. Experiments with electrons in a test structure will be described to explore the basic physics and technology of the multicell concept and to set the design of a 21-cell trap for $10^{12}$ positrons. Over 50\% of a trapped plasma has been injected into an off-axis cell, and hour-long confinement of $2 \times 10^8$ particles has been achieved using rotating electric fields. Experiments are under way to identify the limits of the injection process and demonstrate confinement $> 10^{10}$ particles in a single off-axis cell using kilovolt confinement potentials.

\textsuperscript{1}In collaboration with N. C. Hurst, C. J. Baker, and C. M. Surko. This work is supported by U.S. DTRA and the U.S. DOE/NSF plasma partnership.

