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Progress toward and future plans for creating an electron positron plasma in a levitated dipole and in a stellarator[1] M.R. STONEKING[2], T. SUNN PEDERSEN, E.V. STENSON, J. HORN-STANJA, U. HERGENHAHN, A. DELLER, S. NIßL, M. SINGER, A. CARD, P. STEINBRUNNER, Max Planck Institute for Plasma Physics, C. HUGENSCHMIDT, M. SINGER, Technische Universität München, S. KÖNIG, L. SCHWEIKHARD, University of Greifswald, C.M. SURKO, J.R. DANIELSON, University of California San Diego, H. SAITOH, University of Tokyo — Creation of a magnetically confined short-Debye-length electron-positron plasma would open a new frontier in experimental plasma physics. We report on progress toward achieving this goal. 10^{10} positrons are required for a 10 liter plasma with 10 Debye lengths in the system ($n \approx 10^{12}$ m^{-3} and $T \approx 1$ eV). Positrons from the NEPOMUC positron source will be trapped, cooled, and accumulated in a buffer-gas-trap, transferred to a high capacity multi-cell trap (using a 5-T magnet), and then delivered to a levitated dipole trap or a stellarator in a series of pulses. The dipole field ($B_{max} \approx$ 1-T) is produced by a light (< 2 kg), magnetically levitated superconducting coil ($I > 30$ kA-t). Hour long levitation using feedback is anticipated. Annihilation gammas will be detected with 48 scintillator detectors. Recent experiments successfully injected positrons into an electron space charge (-58 V) in a prototype trap. First experiments with a levitated dipole will be in 2021. Stellarator design is underway.

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[2]second affiliation: Lawrence University

Matthew Stoneking
Lawrence University

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