Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Plasma Compression in the Periodically Oscillating Plasma Sphere R.A. NEBEL, L. CHACON, E. EVSTATIEV, A. MAROCCHINO, G. LAPENTA, J. PARK, Los Alamos National Laboratory — Theoretical studies $P^{1,2P}$ have suggested that a tiny oscillating ion cloud immersed in a uniform electron background may undergo a self-similar collapse that can result in the periodic and simultaneous attainment of ultra-high densities and temperatures. The oscillating ion cloud (referred to as the Periodically Oscillating Plasma Sphere or POPS) is in local thermodynamic equilibrium at all times independent of the collisionality of the plasma (i.e. these self-similar solutions are exact solutions of the Vlasov equation). Recent experimental work has demonstrated the existence of the POPS resonance. $P^{3,4P}$ However, the effect of space charge neutralization on the plasma compression remains a significant issue. An analytic formalism has shown that it is possible to program the distribution function of the injected electrons to completely mitigate space charge effects during the ion cloud collapse. If this can be achieved, the required compression ratios for POPS can be reduced and the requirement that the average electron density must be much greater than the average ion density may be elimintaed. This new formalism has been incorporated into the 1-D particle simulation code. P^P Results will be presented. 1. R. A. Nebel, D. C. Barnes, Fusion Technology 34, 28 (1998). 2. D. C. Barnes, R. A. Nebel, Physics of Plasmas 5, 2498 (1998). 3. J. Park, R. A. Nebel, S. Stange, S. K. Murali, Physics of Plasmas 12, 056315 (2005). 4. J. Park, R. A. Nebel, S. Stange, S. K. Murali, accepted for publication in Phys. Rev Lett.

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Date submitted: 20 Jul 2005 Electronic form version 1.4