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Space Charge Neutralization and Plasma Compression in the Periodically Oscillating Plasma Sphere (POPS) RICHARD NEBEL, EVSTATI EVSTATIEV, LUIS CHACON, GIOVANNI LAPENTA, JAEYOUNG PARK, LANL — Theoretical works by Barnes and Nebel [R. A. Nebel, D. C. Barnes, Fusion Technology **38**, 28 (1998)] [D. C. Barnes, R. A. Nebel, Phys. Plasmas **5**, 2498 (1998)] have suggested that a tiny oscillating ion cloud may undergo a self-similar collapse in a harmonic oscillator potential formed by a uniform electron background. One issue for this concept is how much plasma compression can be achieved by the POPS oscillations. Recent work has shown that by properly programming the distribution function of the injected electrons it is possible to significantly improve the space charge neutralization and the plasma compression. This paper extends that previous work in a systematic fashion by developing a formalism that determines the required velocity distribution of the injected electrons so space charge neutralization can be achieved. This formalism is then included as a boundary condition in a griddles particle code. Results indicate that although the formalism works well during the early phases of compression, when the compression gets large the solution bifurcates and becomes unphysical. Two-dimensional simulations with the PIC code CELESTE2D [G. Lapenta, Phys. Plasmas **6**, 1442 (1996)] will be presented.

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