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Rotating wall compression of positron swarm in a harmonic potential: a Monte Carlo simulation SRDJAN MARJANOVIC, ANA BANKOVIC, MILOVAN SUVAKOV, Institute of Physics Belgrade, University of Belgrade, Pregrevica 118, 11080 Zemun, Serbia, C. ALED ISAAC, DIRK PETER VAN DER WERF, MICHAEL CHARLTON, Department of Physics, College of Science, Swansea University, Singleton Park, Swansea SA2 8PP, United Kingdom, ZORAN LJ. PETROVIC, Institute of Physics Belgrade, University of Belgrade, Pregrevica 118, 11080 Zemun, Serbia — Several experiments have demonstrated successful application of rotating wall technique for compressing positron beams in a single particle regime. While the basic mechanism of compression is understood, the role of the cooling gases which have to be used is poorly explained. Thus, we have simulated behavior of a swarm of particles (electrons or positrons) in an anti-symmetric dipole rotating field inside a buffer gas trap. We have used our existing Monte Carlo code for the simulation, as the single particle conditions are inherently assumed. Varying mixtures of CF_4 and N_2 are used as the buffer gas in order to mimic the operating conditions of Surko trap, and to pinpoint the collisions responsible for compression. For a given parameter range, the simulation shows significant compression and axialization of positron swarm. We have investigated the change of swarm behavior by varying the applied rotating wall potential and frequency, strength of axial magnetic field, and background gas composition and pressure. The results show fast initial heating of the swarm, and subsequent cooling to the thermal temperature, as the radius of the cloud compresses, demonstrating that it is possible to compress the beam of charged particles in a single particle regime.

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