Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Magnetic moment (non-)conservation for a pair plasma trap ANNIKA ZETTL, Colorado College, Max Planck Institute for Plasma Physics, STEFAN NIßL, E. V. STENSON, Max Planck Institute for Plasma Physics — Confining pair plasma is key to experimental investigations of its properties. In order to optimize traps, it is essential to understand single-particle orbits by which electrons/positrons escape, or in the case of a levitated dipole, pass the floating coil center. This project will explore the influence of "μ-breaking" on those orbits. "μ-breaking" refers to the non-conservation of the magnetic moment $\mu \equiv mv_\perp^2/(2B)$ when its adiabatic invariance does not fully hold, and some particles that would be expected to magnetically mirror do not and vice versa. At any position in a trap, a "loss cone" can be defined containing all perpendicular-parallel velocity combinations for which particles stream along the field instead of mirroring. When the magnetic field relative to the particle motion is adiabatically invariant, the loss cone is determined by the pitch angle at which the particle is launched. Without adiabatic invariance, a shift of the loss cone can be observed: an additional dependence on the initial phase angle appears. The magnitude of this effect in a dipole trap will be investigated using particle trajectory simulations at conditions relevant for pair plasma. The results will help with the considerations to design effective future plasma traps.

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Date submitted: 01 Jul 2020 Electronic form version 1.4