Abstract Submitted
for the DPP18 Meeting of
The American Physical Society

Sorting Category: 1.2.6 (Experimental)

Observation of a large banana orbit due to a background asymmetry in a coaxial Malmberg-Penning trap D.L. EGGLESTON, Occidental College — In our coaxial Malmberg-Penning trap, electrons are injected off-axis from a small electron gun.[1] We expect the zeroth order azimuthal drift of the resulting electron column to be set by the center wire potential, the induced image charges, and the end potentials. However, when the wire potential is adjusted to minimize the drift, the phosphor screen images of the dumped column trace out (with increasing dump time) a large banana-shaped orbit in the $r-\theta$ plane, apparently in response to a background construction asymmetry. Wall probe signals are also consistent with such an orbit. We can directly measure the orbit period ($T \approx 300\mu s$) and the radial thickness of the banana ($\Delta r/R_{wall} \approx 0.25$) and then deduce from $\Delta r \approx v_r/\omega_T$ the size and radial dependence of the asymmetry. Assuming an electrostatic asymmetry of the form $\phi_1(r)\cos m(\theta-\theta_0)$, we find $\phi_1(\mathrm{V}) \approx 0.3r/R_{wall}$ with $m \approx 1$ and $\theta_0 \approx -60°$. The source of the asymmetry has not yet been positively identified, but we suspect a small offset in the center wire position. The characterization of this background asymmetry may help resolve discrepancies with theory in our experiments with *applied* asymmetries.[2]

[1]See, for example, D.L. Eggleston, Phys. Plasmas **1**, 3850 (1994).
[2]D.L. Eggleston and B. Carrillo, Phys. Plasmas, **10**, 1308, (2003).

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Dennis L. Eggleston
dleggles@oxy.edu
Occidental College

Date submitted: July 10, 2018 Electronic form version 1.4