Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Levy Dynamics of Single Laser-Cooled Atoms[1] WESLEY ERICKSON, DANIEL STECK, University of Oregon — The study of Levy flights of laser-cooled atoms dates back to the early days of laser cooling and trapping. The theory of Levy processes has advanced considerably since then, however, and new aspects of Levy processes can be studied in laser-cooling experiments with a single trapped atom. Through simulations we show that boundary-crossing statistics of a single atom are sensitive to the onset of anomalous diffusion. We find that distributions of first-passage times develop peaks corresponding to Levy flights. We also discuss the implications of the leapover phenomenon of Levy flights in physical experiments. Our results hint at a rich diversity of phenomena in laser-cooling dynamics beyond the studies of power-law tails in the densities of the early experiments.

[1]This work was supported by the NSF and NVIDIA.

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Date submitted: 31 Jan 2020 Electronic form version 1.4