

Abstract Submitted
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Coherence properties of an ultracold atom beam in a circular waveguide KEVIN MOORE, SUBHADEEP GUPTA, KATER MURCH, DAN STAMPER-KURN — We present a theoretical exploration and an experimental implementation of superradiant pump-probe spectroscopy to study the coherence properties of quantum degenerate atoms propagating in a circular waveguide. Superradiant Rayleigh scattering in the context of a coherent, rotating, and expanding atom pulse exhibits strong geometric dependencies which connect to tomographic measurements of the Wigner function and can aid the characterization of pulsed atom beams propagating in waveguides. The atomic beam propagating in our circular waveguide exhibits mean-field limited single-mode propagation, maintains long-range coherence after multiple orbits, and can be coherently split into momentum states which simultaneously orbit the storage ring in opposite directions.

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