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Evidence for Phase Variance Oscillations in a Bose-Einstein Condensate and Applications to Precision Interferometry ARI TUCHMAN, Stanford, CHAD ORZEL, Union college, ANATOLI POLKOVNIKOV, Harvard University, MARK KASEVICH, Stanford University — We report the dynamic restoration of phase coherence after generating an array of highly squeezed number states loaded from a Bose-Einstein Condensate (BEC) into an optical lattice. We induce oscillations in the phase variance of the array by rapidly reducing the intensity of the lattice. This sequence projects the number squeezed array onto a superfluid groundstate, inducing phase variance oscillations as the quantum state evolves. It is critical to recognize that the experimental signature, of oscillations in the interference contrast, can be nearly reproduced by driving semiclassical excitations. However, by comparing data both with the semiclassical GPE where a coherent state array with identical initial phases is time evolved and with a model which accounts for an initial state with large quantum fluctuations, we find evidence supporting the quantum mechanical nature of these oscillations. We further discuss applications of these phase variance oscillations to precision interferometry.

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