Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Observation of quantum spin squeezing in a spin-1 thermal gas MADISON ANDERSON, DON FAHEY, ZHIFAN ZHOU, PAUL LETT, Joint Quantum Institute, NIST and the University of Maryland — The realization of squeezed states has enabled quantum measurements with signal-to-noise ratio enhanced beyond the standard quantum limit. Squeezed light can now be generated through parametric amplification relying on nonlinear optical processes such as four wave mixing. More recently, atomic collisions have been used as nonlinear interactions to prepare spin squeezed states in Bose-Einstein condensates (BECs) and demonstrate quantum-enhanced measurements. Here, we report the observation of quantum spin squeezing in a spin-1 thermal gas, which is the atomic analogue of optical intensity-difference squeezing. The degree of squeezing is characterized as a function of temperature and trapping parameters. With increased number afforded by a thermal gas, our observation opens the possibility for further enhancement of sensitivity in squeezed quantum measurements, and could even be extended to BEC-thermal mixtures.

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Date submitted: 30 Jan 2020 Electronic form version 1.4