Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

Approaching the Heisenberg Limit Without Single-Particle Detection[1] GREGORY BENTSEN, EMILY DAVIS, MONIKA SCHLEIER-SMITH, Stanford University — Achieving Heisenberg-limited measurements with ensembles of more than a few particles remains a major outstanding challenge. The problem is two-fold: one must not only prepare a sufficiently sensitive state, but also be able to detect it. While it is commonly assumed that Heisenberg-limited measurement demands single-particle-resolved detection, we propose an alternative approach that bypasses this requirement. We show that the one-axis twisting interaction, well known for generating spin squeezing in atomic ensembles, can also amplify the output signal of an entanglement-enhanced interferometer to facilitate readout [1]. Even in the presence of dissipation, the protocol significantly relaxes the detection resolution required for spectroscopy beyond the standard quantum limit, and achieves near-Heisenberg-limited precision in a $\sqrt{N}$-times shorter evolution than is required to reach the GHZ state.

[1] E. Davis, G. Bentsen, M. Schleier-Smith, arXiv:1508.04110 (2015)

[1]AFOSR, NSF

Gregory Bentsen
Stanford University

Date submitted: 29 Jan 2016 Electronic form version 1.4