Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

**A fundamental limit in the capability of Gaussian systems in quantum metrology**[1] ANIMESH DATTA, DOMINIC BRANFORD, CHRISTOS GAGATSOS, University of Warwick — For a fixed average energy, the simultaneous estimation of multiple phases provides a better total precision than estimating them individually. We show that for a multimode passive interferometer with a phase in each mode and Gaussian inputs, this improvement is no more than a factor of 2. This suggests a fundamental limitation in the performance of Gaussian states. While such limitations are well known in quantum computation and communication, ours is the first such instance in the field of quantum metrology. While our proof of this limitation assumes equal squeezing magnitudes and an orthogonal transformation, that this factor-of-two is indeed a fundamental property of Gaussian states is supported by numerics on completely general systems. Since this limitation does not exist for a single-phase estimation problem, our work shows the richness of quantum-limited multiparameter estimation. The strength of our work lies in its generality. It considers an arbitrary number of parameters, and applies to quantum-limited imaging and possibly future gravitational wave detection. It also makes no assumption of stationarity in time, a common feature in waveform estimation. It can thus be applied to emerging areas such as pulsed optomechanics.

[1]EPSRC, UK National Quantum Technology Programme

Animesh Datta
University of Warwick

Date submitted: 17 Nov 2016 Electronic form version 1.4