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Quantum-limited estimation of coherence under thermal noise in photon-starved states[1] ZI CHUA, Wellesley College, JONATHAN HABIF, FEDERICO SPEDALIERI, USC Information Sciences Institute — To most efficiently estimate a parameter of a quantum system, one needs to choose the optimal measurement that creates the conditions for the most efficient estimator to act. Specifically, one needs to implement the measurement that achieves the quantum Fisher information (qFi) for that particular estimation task. In this work, we search for an optimal measurement for estimating the coherence, parameterised as η, of a mixed state composed of coherent light and thermal (incoherent) light. Our search is limited to photon-starved signals, with signal strength of n_bar<<1. We found that the classical choice of measurement, direct detection was suboptimal, whereas homodyne detection approached the qFi for estimating coherence for the low coherence ($\eta\sim 0$) range.

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