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Precision measurements with a single quantum system KLAUS MOLMER, ALEXANDER KIILERICH, PINJA HAIKKA, Department of Physics and Astronomy, Aarhus University — Continuous probing of a single quantum system provides information about physical parameters that govern its evolution. The stochastic character of the quantum measurement process and the back action on the system accompanying different outcomes makes the extraction of precision information a dynamical process. Quantum trajectory theory of light emitting systems yields an efficient Bayesian estimation, and full photodetection records reveal much more information than integrated signals [1,2]. We present an analysis of the Cramer-Rao bound, quantifying the asymptotic scaling of the estimation error after long time probing of light from a single emitter [2]. The choice of measurement strategy significantly influences the estimation sensitivity of different parameters, but for Markovian decay, a deterministic equation provides the maximally possible estimation sensitivity by any measurement on the system and its emitted radiation [3]. 1. S Gammelmark and K Molmer, *Bayesian parameter inference from continuously monitored quantum systems*; Phys. Rev. A **87**, 032115 (2013). 2. A. H. Kiilerich and K. Molmer, *Estimation of atomic interaction parameters by photon counting*, Phys. Rev. A **89**, 052110 (2014). 3. K. Molmer, Hypothesis testing with open quantum systems; arXiv:1408.4568

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