Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Noise-resilient quantum metrology for single-molecule spectroscopy with low light levels FELIPE HERRERA[1], ALAN ASPURU-GUZIK, Department of Chemistry and Chemical Biology, Harvard University — Continuous observation of biological processes over long timescales exceeding seconds is challenging using standard fluorescence techniques due to technical issues such as photodamage. Current photonic technology can be exploited to overcome those challenges while preserving sensitivity at the single molecule level. We show that using a simple quantum metrology scheme involving periodic driving for optical state preparation, it is possible to perform spectroscopy of a single chiral molecule in a condensed phase environment, with low photon fluxes. We show that for certain non-classical optical probes and measurement settings, it is possible to exceed the standard quantum limit of precision for a range of driving parameters, even in the presence of high transmission losses due to background absorption. We compare the proposed scheme with fluorescence spectroscopy for single molecule detection, and discuss possible applications of quantum metrology in systems biology.

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Date submitted: 14 Nov 2014 Electronic form version 1.4