Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Critical exponents describing non-stationary $1/f$ noise for intermittent quantum dots SANAZ SADEGH, Colorado State University, ELI BARKAI, Bar Ilan University, DIEGO KRAPF, Colorado State University — Semiconductor quantum dots (QDs) exhibit bright fluorescence, but this emission switches randomly between "on" and "off" states that are distributed according to universal power laws. This scale-free dynamics is responsible for weak ergodicity breaking and non-stationarity. Such stochastic processes yield a power spectrum of the form $S(f) = A/f^{\beta}$. Power spectrum analysis is a superior method for studying the properties of QD emission because it does not depend on the arbitrary determination of a threshold, typically used in the discrimination between "on" and "off" states. Recently, intriguing predictions have been made about the power spectrum aging properties and the role of finite measurement time. To test these predictions, we study the emission power spectra from 1200 QDs at room temperature. We find that five exponents are needed to describe the power spectrum properties, namely spectral exponent, power spectrum aging, cutoff frequency, zero frequency spectrum, and total power. We also compare our results with numerical simulations and explain observed discrepancies based on the combined action of Gaussian noise and the truncation of the "on"-time distribution.

Sanaz Sadegh
Colorado State University

Date submitted: 15 Nov 2013 Electronic form version 1.4