Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Continuous measurements of electron tunneling through a quantum dot by a quantum point contact HSI-SHENG GOAN, National Taiwan University — The time-resolved charge detection through a quantum dot (QD) by a nearby quantum point contact (QPC) detector, each coupled to its own independent electrodes and gates, has been demonstrated. The conditional counting statistics of electron transport in this QD-OPC system has also been measured [1]. The conditional counting statistics that is the statistical current fluctuations of one system given the observation of a particular current in the other system could be substantially different from their unconditional counterparts. We provide a thorough analysis on the QD-QPC system. We use the stochastic master equation (or quantum trajectory) approach to describe the conditional dynamics of the QD under continuous measurements by a QPC. We simulate in each single experimental realization the observed QPC current which reveals the real time information of single-electron tunneling events through the QD. We then use the n-resolved master equation approach to calculate the conditional counting statistics through the QD (QPC) conditioned on the observed current in QPC (QD). Our investigation goes beyond the analysis presented in Ref.[1] in which they neglected, in the noise power(second cumulant) of the QPC, the QPC shot noise as compared to the telegraph noise contribution induced by the single-electron tunneling events through the QD.

[1] E.V.Sukhorukov et. al, Nature Physics, **3**, 243 (2007).

Hsi-Sheng Goan
National Taiwan University

Date submitted: 26 Nov 2010 Electronic form version 1.4