Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Analysis of current and shot noise correlations in a double dot interferometer coupled to a quantized bosonic field BRANDON LANGLEY, MARKO ZIVKOVIC, IVANA DJURIC, CHRISTOPHER SEARCH, Stevens Institute of Technology — We examine a ballistic electron Aharonov-Bohm interferometer with a single dot embedded in each of two arms that are connected in parallel to leads allowing the flow of current by sequential tunneling of electrons through the dots. We focus on the effect that correlations between dots due to the inter-dot spin-spin interactions have on the current-voltage(I-V) and frequency dependent current shot noise. The inter-dot spin-spin interaction is created by embedding the interferometer in an optical microcavity whose modes are far off-resonant with the intra-dot transitions and allows for a cavity mediated exchange of virtual photons between dots. With proper AB phase, inter-dot Coulomb repulsion, and inter-dot cavity mediated coupling, we can control the probability amplitudes for different tunneling paths of the interferometer and the probability of formation of inter-dot entangled spin triplet/singlet states. We analyze the dual effects of inter-dot cavity coupling and two-path interference on the I-V characteristics and shot noise correlations for charge and spin resolved currents in order to determine the conditions for optimal spin triplet/singlet state formation and how they are revealed in the current and noise. We also quantify the level of entanglement between the dots and investigate correlation of shot noise with entanglement measures.

Brandon Langley
Stevens Institute of Technology

Date submitted: 28 Nov 2009 Electronic form version 1.4