Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Analysis of spin current shot noise from a quantum dot coupled to a quantized bosonic field MARKO ZIVKOVIC, IVANA DJURIC, CHRISTOPHER SEARCH, Department of Physics and Engineering Physics, Stevens Institute of Technology, Castle Point on Hudson, Hoboken, NJ 07030 — We examine spin current generated by quantum dots coupled to quantized bosonic field. The dots are connected to normal leads at zero bias voltage across the dot. We model the dot as a two level spin system with one of the spin states lying below the Fermi level of the leads and the other above. Spin flips followed by subsequent tunnelling out into the leads generate a pure spin current in the absence of any charge current. The dot is coupled to a quantized bosonic field that influences the generation of spin current in one of two possible scenarios. First, we consider spin flips induced via Raman transitions in optical microcavity. Secondly, electron spin resonance via classical magnetic field induces spin flips in the presence of a quantized phonon field that modulates the energy levels of the dot. In the limit of strong Coulomb blockade our model is analogous to the Jaynes-Cummings model in quantum optics. In the case of optical cavity mediated spin flips, we show that the spin current is bistable for a coherently driven cavity and this bistability is clearly visible in the spin current shot noise. A comparison of spin current and shot noise for interactions with different bosonic fields is presented.

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Date submitted: 30 Nov 2007 Electronic form version 1.4