

Abstract Submitted
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Quantum-mechanical description of Faraday rotation in a single quantum dot YANJUN MA, JEREMY LEVY — Faraday rotation is one way to realize quantum non-demolition (QND) measurement of electron spin in a quantum dot. In the literature, it has been semiclassically modeled based on quantized electron spin states and classical electromagnetic fields. We have developed a fully quantum-mechanical model to describe Faraday rotation in single quantum dots, using an extension of the Jaynes-Cummings model which includes quantum Stokes operators. The intrinsic noise of Faraday rotation that results from the interaction between photon and electron is quantified under this model. Some effects, such as hyperfine interactions and transitions between off-resonant states such as light hole and conduction band electron states, and have not been included in our calculation. It is believed that these effects will affect the dynamics of spin and based on the current model, our calculation could be extended to examine the behavior of Faraday rotation with these effects included. This work was supported by NSF-DMR-0602846.

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