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Decoherence of an electron spin qubit in an optically active quantum dot FUXIANG LI, Theoretical Division and CNLS, LANL, ALEXANDER BECHTOLD, DOMINIK RAUCH, TOBIAS SIMMET, PER-LENNART ARDELT, ARMIN REGLER, KAI MULLER, Walter Schottky Institut, Technische Universitat Munchen, 85748 Garching, Germany, NIKOLAI SINITSYN, Theoretical Division, Los Alamos National Laboratory, Los Alamos, New Mexico 87545, USA, JONATHAN FINLEY, Walter Schottky Institut, Technische Universitat Munchen, 85748 Garching, Germany — Understanding the spin dynamics in quantum dot, especially its detailed decoherence and relaxation is not only of theoretical interests, but also a crucial problem towards the application of quantum dot as a solid-state quantum qubit. From the phenomenological models of decoherence developed more than a decade ago, it has been now fairly accepted that the spin dynamics undergoes two stages, first a fast ensemble dephasing due to the coherent precession of spin qubit around nearly static but randomly distributed hyperfine fields (2 ns) and then a much slower relaxation process ($> 1\mu$ s) due to dynamics of the nuclear spin bath induced by complex many-body interaction effects. However, this characteristics has never been verified in the experiment, until the recent experiment breakthrough I'm going to talk about. Whats more interesting is that, the experiment unambiguously shows a more complex picture, in which two dips rather than one, develops, which can be attributed to the effect of the comparatively strong quadruple field.

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