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New Method for the Calculation of Qubit Decoherence in the Presence of 1/f Noise[1] DONG ZHOU, ROBERT JOYNT, Physics Department, University of Wisconsin-Madison — We present a new mathematical method for the calculation of qubit decoherence subject to classical noise coming from an ensemble of two-level fluctuators. The time evolution of the qubit density matrix is governed by a non-Hermitian quasi-Hamiltonian, mapping the problem onto a system consisting of a spin-1 particle (the qubit) coupled to spin-1/2 particles (the fluctuators). The method gives non-perturbative results for the energy relaxation, free induction decay (FID) and spin echo pulse measurements. This extends the range of known results to strong coupling, beyond the range of validity of Redfield theory and the commonly-used Gaussian approximation. New functional forms are suggested to explain the recent experiments by Kakuyanagi [PRL 98, 047004 (2007)] and Yoshihara [PRL 97, 167001 (2006)] on qubit decoherence with 1/f noise.

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