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Environmentally-Induced Rabi Oscillations and Decoherence in Phase Qubits[1] KAUSHIK MITRA, CARLOS SA DE MELO, CHRISTOPHER LOBB, University of Maryland — We study decoherence effects in a dc SQUID phase qubit caused by an isolation circuit with a resonant frequency. The coupling between the SQUID phase qubit and its environment is modeled via the Caldeira-Leggett formulation of quantum dissipation/coherence, where the spectral density of the environment is related to the admittance of the isolation circuit. When the frequency of the qubit is at least two times larger than the resonance frequency of the isolation circuit, we find that the decoherence time of the qubit is two orders of magnitude larger than the typical ohmic regime, where the frequency of the qubit is much smaller than the resonance frequency of the isolation circuit. Lastly, we show that when the qubit frequency is on resonance with the isolation circuit, an oscillatory non-Markovian decay emerges, as the dc SQUID phase qubit and its environment self-generate Rabi oscillations of characteristic time scales shorter than the decoherence time.

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