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Qubit freezing under strong 1/f low frequency noise FEDIR VASKO, SGT Inc., NASA Ames Research Center, Moffett Field, CA 94035, KOSTYANTYN KECHEDZHI, QuAIL, NASA Ames Research Center, Mail Stop 269-3, Moffett Field, CA 94035 and USRA RIACS, 615 National ave, Mountain View CA 94043, VADIM SMELYANSKIY, QuAIL, NASA Ames Research Center, Mail Stop 269-3, Moffett Field, CA 94035 — We consider an adiabatic sweep of the effective Zeeman field applied to a single qubit in presence of the noise unavoidable in real life superconduting qubits. Motivated by detailed experiments on flux qubits we consider a model including two types of noise: strong low frequency 1/f noise, and weakly coupled high frequency ohmic or subohmic noise. Noise components with frequencies higher than the qubit tunneling element result in excitation-relaxation dynamics of the qubit. At the same time the low frequency noise (with frequency lower than the qubit tunneling splitting) causes strong modulation of the level splitting between the ground and excited states. We show that the combined effect of the low and high frequency components of the noise results in the qubit freezing in the excited state with a sizable probability. This mechanism may set an upper bound on the quantum annealing computation time.

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