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Phonon-induced decoherence of Andreev level qubit ALEXANDER ZAZUNOV, VITALY S. SHUMEIKO, GORAN WENDIN, MC2, Chalmers Univ of Technology, Gothenburg, Sweden, EKATERINA N. BRATUS', B. Verkin Institute for Low Temperature Physics and Engineering, Kharkov, Ukraine — We use the kinetic equation for the density matrix to investigate the decoherence of the Andreev level qubit [1] due to coupling to soft acoustic modes in the quantum point contact (QPC) electrodes [2], in the light of recent results concering intrinsic sources of decoherence of superconducting qubits caused by microscopic modes and losses within the Josephson Phonon-induced decoherence of Andreev level qubit junctions [3]. We find a result different from the conventional Bloch-Redfield equation describing decoherence of macroscopic superconducting qubits. Suppression of the interlevel transitions by the many body effects results non-exponential decay, and in dramatic reduction of the qubit decoherence rate at low temperature due to strong reduction of the relevant phonon phase space. Furthermore, the rate of phonon-induced transitions between the Andreev levels is found to be significantly smaller than the bulk transition rate. \|1] A. Zazunov, et al., Phys. Rev. Lett. 90, 087003 (2003).2] A. Zazunov, et al., cond-mat/0404656.3] R. W. Simmonds, et al., Phys. Rev. Lett. 93, 077003 (2004); L. B. Ioffe, et al., Phys. Rev. Lett. 93, 057001 (2004)

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