

Abstract Submitted
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Experiments on Interaction of Quasiparticles with Two-Level-Systems in a Superconducting Phase Qubit ALEXANDER BILMES, JÜRGEN LISENFELD, ANDREAS HEIMES, SEBASTIAN ZANKER, GERD SCHÖN, ALEXEY USTINOV, Karlsruhe Inst of Tech (KIT), PI TEAM¹, FTP TEAM² — Two-Level-Systems (TLS) are one of the main sources of decoherence in superconducting qubits. Some individual and coherent TLS, present in the tunnel barrier of the qubit's Josephson junction, can be coherently operated via the qubit. In the past, experiments on superconducting glasses indicated that quasiparticles may give rise to TLS energy loss similar to Korringa relaxation [1]. We will present experiments in which we use a phase qubit to explore the interaction of single TLS with non-equilibrium quasiparticles. We have implemented in-situ quasiparticle injection by using an on-chip dc-SQUID that is pulse-biased beyond its critical current. The quasiparticle density is calibrated by measuring associated characteristic changes to the qubit resonance frequency and energy relaxation rate [2]. The coherence times of individual TLS is measured in dependence of the non-equilibrium quasiparticle density and compared to thermally generated quasiparticles.

[1] J. L. Black, Low Energy Excitations in Metallic Glasses, Springer, 1981

[2] M. Lenander, H. Wang, Radoslaw C. Bialczak et al., Phys.Rev.Lett B 84, 024501 (2011)

¹PI, KIT, Wolfgang-Gaede-Strasse 1, 76131 Karlsruhe, Germany

²TFP, KIT, Wolfgang-Gaede-Strasse 1, 76131 Karlsruhe, Germany

Alexander Bilmes
Karlsruhe Inst of Tech

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