NOISE AND DECOHERENCE IN SUPERCONDUCTING DEVISES AND "HIDDEN MAGNETIZM"

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Increasing sensitivity of SQUIDs, superconducting bolometers and other sensors, or increasing coherence time of superconducting Q-bits are important technical and scientific goals. It is commonly accepted that low-temperature noise of superconducting devises is due to existence of two-level systems, or fluctuators-objects capable of changing state at low temperatures. There is growing evidence that interactions in between fluctuators are important and are necessary to explain observed properties of glasses and noise in superconducting devises.

There is certain population of magnetic moment (spins) inside superconductor, like paramagnetic impurities, spins of localized electrons on the metal – dielectric boundary [1] or metal-natural oxide layer and, the most numerous subsystem are magnetic nuclei. Those magnetic moments can interact through conductivity electrons system or through lattice deformations, and, at certain conditions magnetic ordering in those systems can co-exist with superconductivity at low temperatures. [2] This poses a question about the role of fluctuations in the system of those magnetic moments in noise and decoherence of superconducting devises.

We will discuss possible experiments, like measurements of magnetic susceptibility in a range of fields and temperatures, which can help to shed some light on existence and properties of those magnetic systems.

[1] SangKook Choi, Dung-Hai Lee, Steven G. Louie and John Clarke, PRL **103**, 197001 (2009).
[2] Thomas Hermansdorfer and Frank Pobell, Bulgarian Journal of Physics, **27**, pp. 20-36 (2000).

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