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Toward strong coupling of a single NV center in diamond to a superconducting circuit PHILIPPE CAMPAGNE-IBARCQ, SEBASTIAN PROBST, PIERRE JAMONNEAU, YUIMARU KUBO, AUDREY BIENFAIT, Quantronics group, SPEC, IRAMIS, DSM, CEA Saclay, 91191 Gif-sur-Yvette, France, SBASTIEN PEZZAGNA, Department of Nuclear Solid State Physics, Institute for Experimental Physics II, Universitat Leipzig, Linnstr. 5, 04103 Leipzig, Germany, PATRICE BERTET, Quantronics group, SPEC, IRAMIS, DSM, CEA Saclay, 91191 Gif-sur-Yvette, France — Electronic spins interact with microwave fields. However, this interaction is very weak so that only large ensembles of spins have been detected in this way so far. In circuit quantum electrodynamics (cQED) on the other hand, artificial superconducting atoms are made to interact strongly with microwave fields at the single photon level, and quantum-limited detection of few-photon microwave signals has been developed. In this project, we apply the concepts and techniques of cQED to the detection and manipulation of NV centers in diamond, in order to reach a novel regime in which a single electronic spin strongly interacts with a single microwave photon. The enhanced sensitivity is expected to allow single spin detection in less than a millisecond. Moreover, superconducting circuits could be used as quantum buses to allow entanglement of distant, on chip, NV centers. The long lifetimes of the electron and nuclear spins of these centers would then offer a promising quantum information processing platform. In this talk, advances toward the detection of a spin echo signal from a single spin will be presented.

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