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Coherent coupling of a single spin to microwave cavity photons JEREMIE VIENNOT, MATTHIEU DARTIAILH, AUDREY COTTET, TAKIS KONTOS, Laboratoire Pierre Aigrain, Ecole Normale Supérieure, CNRS, Paris, HQC TEAM — The main goal in the recent development of hybrid circuit quantum electrodynamics with quantum dots is to find efficient means to couple single spins to cavity photons. So far though, only the coupling of photons to the charge degree of freedom could be demonstrated. Here, we demonstrate a large and coherent spin photon coupling in a cQED architecture at the single spin level. Our scheme relies on the use of a non collinear spin valve which realizes an artificial spin orbit interaction. Thanks to that interaction we are able to couple electronic states which are sensitive to the external magnetic field to cavity photons. We observe a hysteretic evolution of the phase of the microwave signal as a function of the external magnetic field, stemming from the spin valve behavior of the device. This demonstrates an efficient spin/photon coupling and illustrates a new method for manipulating the quantum mechanical spin degree of freedom. Our findings can be used to scale up spin quantum bit architectures.

Jeremie Viennot
Laboratoire Pierre Aigrain, Ecole Normale Supérieure, CNRS, Paris

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