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Observation of Larmor precession of a single spin in a semiconductor quantum dot

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In semiconductor quantum dots, the spin of a confined charge carrier, whether electron or hole, attracted a lot of interest since spin-polarized optical transitions enable the efficient generation of spin-photon and photon-photon entanglement. This could be extended to generate multi-photon entangled states, which are building blocks for quantum technologies such as measurement-based quantum computing. In this work, we exploit a phonon-assisted, off-resonant excitation scheme that enables access to the polarization degree of freedom to probe the spin dynamics, whilst maintaining efficient single-photon generation and high purity. We demonstrate that we can address the spin-selective transitions, observing the Larmor precession of a single-hole spin around an in-plane magnetic field, opening the route towards an efficient generation of polarization-encoded multi-photon entangled states.

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