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Probing an NV Center's Nuclear Spin Environment with Coherent Population Trapping DAVID LEVONIAN, MICHAEL GOLDMAN, Department of Physics, Harvard University, Cambridge, Massachusetts 02138, USA, SWATI SINGH, ITAMP, Harvard-Smithsonian Center for Astrophysics, Cambridge, MA 02138, USA, MATTHEW MARKHAM, DANIEL TWITCHEN, Element Six Ltd, Kings Ride Park, Ascot SL5 8BP, United Kingdom, MIKHAIL LUKIN, Department of Physics, Harvard University, Cambridge, Massachusetts 02138, USA — Nitrogen-vacancy (NV) centers in diamond have emerged as a versatile atom-like system, finding diverse applications in metrology and quantum information science, but interaction between the NV centers electronic spin and its nuclear spin environment represent a major source of decoherence. We use optical techniques to monitor and control the nuclear bath surrounding an NV center. Specifically, we create an optical Λ-system using the $|\pm 1\rangle$ components of the NV centers spin-triplet ground state. When the Zeeman splitting between the two states is equal to the two-photon detuning between the lasers, population is trapped in the resulting dark state. Measuring the rate at which the NV center escapes from the dark state therefore gives information on how spin bath dynamics change the effective magnetic field experienced by the NV center. By monitoring statistics of the emitted photons, we plan to probe non-equilibrium dynamics of the bath.

Michael Goldman
Department of Physics, Harvard University, Cambridge, Massachusetts 02138, USA

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