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Spins in two dimensions for quantum sensing and simulation[1]
ELANA URBACH, ERIC PETERSON, TAMARA SUMARAC, BO DWYER, NABEEL ASLAM, Harvard University, HELENA KNOWLES, University of Cambridge, MIKHAIL LUKIN, Harvard University — Nitrogen vacancy (NV) centers in diamond can act as nanoscale sensors capable of measuring the magnetic field created by only a few nuclear spins. This makes the NV center an ideal local probe for studying nuclear spin dynamics in two dimensions. In this experiment we use an NV center combined with an external radio frequency field to locally initialize, control and readout nuclear spins inside hexagonal boron nitride (hBN). To achieve even more localized control, we further use electronic defects that are only angstroms away from the boron spins and are passivated beneath the hBN flake. The NV center provides optical access to these reporter spins and allows the detection of nuclear spins through dipolar coupling at distances an order of magnitude smaller than is possible with NV centers alone. These techniques open the door to room temperature studies of spin dynamics in many-body systems.

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