

Abstract Submitted
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High-Spectral-Resolution NMR Using NV Centers in Diamond

DOMINIK BUCHER, DAVID GLENN, RONALD WALSWORTH, Harvard University — Nitrogen-vacancy centers grown or implanted at the surface of a diamond chip can be used to detect nuclear magnetic resonance (NMR) signals from molecules in a small volume [$<(10\text{ nm})^3 - (10\text{ }\mu\text{m})^3$] above the surface. A key outstanding challenge in the field is to achieve sufficient spectral resolution (~ 1 ppm of the nuclear Larmor frequency) to distinguish features such as chemical shifts and J-couplings in the NMR spectra. We have developed a synchronized readout technique that satisfies this criterion for sample volumes on the order of ~ 1 pL. We show that this technique can provide mHz spectral resolution in the detection of an oscillating magnetic field (with carrier frequency $f = 4$ MHz) produced by a nearby coil, and demonstrate progress towards the detection of molecular NMR spectra with resolved chemical shifts.

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