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Electrical Control of the high spin system Mn2+ in ZnO
RICHARD GEORGE, JOHN MORTON, ARZHANG ARDAVAN, University of Oxford, JAMES EDWARDS, University of Cambridge — We examine the high spin impurity Mn^{2+} in single crystal ZnO (S=5/2, I=5/2), and report a strong linear coupling (K = 52.3 rad/V/m) of the manganese electrical and magnetic moments that preserves quantum coherence. We combine pulsed EPR and electric field techniques to manipulate the Mn states and study electron spin lifetimes, finding T_{2e} and T_{1e} times of 0.8ms and 100ms at 2K in the natural material. We investigate the 'forbidden' transitions that become allowed in the low symmetry environment and use these to manipulate the nuclear spin state on a sub-microsecond timescale that is inaccessible via ENDOR and RF techniques. Finally, we explore the existence of subspaces that are robust against strain-induced decoherence and the application of this material as an entanglement-based field sensor.

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