Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Probing and controlling dimensionality of strongly interacting spin ensembles THOMAS MITTIGA, CHONG ZU, University of California, Berkeley, SIMON MEYNELL, University of California, Santa Barbara, BING-TIAN YE, FRANCISCO MACHADO, SATCHER HSIEH, PRABUDHYA BHATTACHARYYA, SOONWON CHOI, University of California, Berkeley, ANIA JAYICH, University of California, Santa Barbara, NORMAN YAO, University of California, Berkeley — Understanding the decoherence of a strongly interacting spin ensemble remains an important challenge at the interface of basic science and quantum technology. Here, we experimentally investigate the electronic spin coherence of nitrogen-vacancy (NV) centers in a nitrogen-14 enriched delta-doped diamond. In this sample, the average spin-spin spacing (˜5 nm) is close to the thickness of the delta-doped layer, leading to a quasi-two dimensional spin system. Compared to conventional 3D samples, we observe an improvement of NV coherence times with a distinct temporal profile. We provide a theoretical model for the observed spin coherent dynamics as a function of dimension. Our work provides new opportunities for exploring novel non-equilibrium physics.

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Date submitted: 31 Jan 2020 Electronic form version 1.4