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Slow thermalization in disordered dipolar spin systems JOONHEE CHOI, GEORG KUCSKO, SOONWON CHOI, Harvard Univ, PETER MAURER, Stanford Univ, NATHALIE DE LEON, Harvard Univ, NORMAN YAO, UC Berkeley, FEDOR JELEZKO, Ulm Univ, JUNICHI ISOYA, Univ of Tsukuba, MIKHAIL LUKIN, Harvard Univ — Ensembles of strongly interacting spins offer an attractive platform for the study of many-body quantum dynamics. We present a detailed study of the electronic spin dynamics within a diamond sample with high nitrogen vacancy (NV) concentration (~ 40 ppm). Due to the small distance between neighboring NV centers (~ 5 nm), the spin-spin interactions dominate over decoherence. In particular, we investigate the interplay between interactions and disorder in such a system. By utilizing coherent resonance phenomena under a spin-locking pulse sequence, we observe and study slow thermalization corresponding to the critical regime of interacting many-body system at various disorder strengths.

Joonhee Choi
Harvard Univ

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