

Abstract Submitted  
for the DAMOP20 Meeting of  
The American Physical Society

**Slow spin dynamics in a 2D dipolar spin ensemble on the surface of diamond** ALEXANDER SUSHKOV, Boston University, KRISTINE REZAI, Harvard University, SOONWON CHOI, University of California, Berkeley, PHILLIP WEINBERG, Boston University, TIMO GRAESSER, GOTZ UHRIG, Technische Universitt Dortmund, MIKHAIL LUKIN, Harvard University — We observe remarkably slow local spin dynamics in a two-dimensional disordered many-body dipolar spin system, formed by naturally-occurring electronic spins on the surface of a diamond crystal. Shallow NV centers are used to access individual spins, or small spin sub-ensembles. We characterize and control the strength of disorder and dipolar interactions among the surface electronic spins, and measure spin transport at the level of single-spin correlation functions. We model the observed spin relaxation dynamics with a combination of exact dynamics simulation for nearest-neighbor spins, and a dynamical mean-field treatment of the rest of the spin ensemble.

Alexander Sushkov  
Boston University

Date submitted: 02 Feb 2020

Electronic form version 1.4