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Exploring the Nitrogen-Vacancy center as a high resolution magnetometer[1] ABDELGHANI LARAOUI, CARLOS MERILES, Department of Physics, City College of New York - CUNY — New schemes that exploit the unique properties of NV centers in diamond are presently being explored as a platform to high resolution magnetic sensing [1, 2]. First we focus on the ability of a NV center to monitor a set of adjacent nuclear spins. For this purpose, we conduct comparative experiments where the NV spin evolves under the influence of surrounding ^{13}C nuclei or, alternatively, in the presence of asynchronous AC fields engineered to emulate bath fluctuations [3]. Our study reveals substantial differences that underscore the limitations of the semi-classical picture when interpreting and predicting the outcome of experiments designed to probe small nuclear spin ensembles. In particular, our study sheds light on the role of bath fluctuations in the response of NV centers to common pulse sequences, and explores a detection protocol designed to probe time correlations within the random nuclear spin dynamics. Further, we show that the presence of macroscopic nuclear spin order is key to the emergence of traditional spin magnetometry. [1] J. R. Maze, et al., Nature 455, 644 (2008). [2] A. Laraoui, J.S. Hodges, C.A. Meriles, Appl. Phys. Lett. 97, 143104 (2010). [3] A. Laraoui, J. S. Hodges, C. A. Ryan, and C. A. Meriles, Phys. Rev.B 84, 104301 (2011).

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