

Abstract Submitted  
for the MAR15 Meeting of  
The American Physical Society

**High-fidelity quantum memory utilizing inhomogeneous nuclear polarization in a quantum dot**<sup>1</sup> WENKUI DING, ANQI SHI, Wuhan University, JIANQIANG YOU, Beijing Computational Science Research Center, WENXIAN ZHANG, Wuhan University — We numerically investigate the encoding and retrieval processes for a quantum memory realized in a semiconductor quantum dot, by focusing on the effect of inhomogeneously polarized nuclear spins whose polarization depends on the local hyperfine coupling strength. We find that the performance of the quantum memory is significantly improved by the inhomogeneous nuclear polarization, as compared to the homogeneous one. Moreover, the narrower the nuclear polarization distribution is, the better the performance of the quantum memory is. We ascribe the performance improvement to the full harnessing of the highly polarized and strongly coupled nuclear spins, by carefully studying the entropy change of individual nuclear spins during encoding process. Our results shed new light on the implementation of a quantum memory in a quantum dot.

1. Wenkui Ding, Anqi Shi, J. Q. You and Wenxian Zhang. arXiv:1407.7242 [cond-mat.mes-hall]

<sup>1</sup>The National Basic Research Program of China (Grant No. 2013CB922003 and 2014CB921401), the National Natural Science Foundation of China under Grant No. 11275139 and 91121015, the NSAF Grant No. U1330201.

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Date submitted: 16 Nov 2014

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