Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

Freezing motion-induced dephasing for single spin-state stored in atomic ensemble YAN JIANG, RUI JUN, XIAO-HUI BAO, JIAN-WEI PAN, Hefei National Laboratory for Physical Sciences at Microscale and Department of Modern Physics, Univ of Sci Tech of China — Atomic-ensemble quantum memories are well considered as a promising approach of long-distance quantum communication and computation for strong light-matter interaction. While the storage lifetime is limited by the motion-induced dephasing. Spin-echo technique, increasing wavelength of spin-wave, as well as optical lattice are used commonly to overcome this dephasing process. However, these techniques either need extremely high fidelity of echo pulse or put high restriction on filter and experimental complexity. In this poster, we demonstrate a convenient technique to freeze the motion-induced dephasing without population inversion and can be used in large storage angles. Combined with "clock states", the lifetime is extended by one order of magnitude to the limit of the thermal expansion. What's more, high non-classical correlation above 20 has been achieved to guarantee the memory in quantum regime.By making the advance from passive engineering to coherent manipulation of single spin-wave states, our work enriches the experimental toolbox of harnessing atomic ensembles for high-performance quantum memories, especially for holographic quantum memories where many spin-waves with different wave-vectors are used.

Yan Jiang
Univ of Sci
Tech of China

Date submitted: 29 Jan 2016 Electronic form version 1.4