

Highly efficient optical quantum memory with long coherence time in cold atoms

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Coherent optical quantum memory is an crucial element for quantum repeater [1], thereby for long-distance quantum communication. Over the decade, extensive works have been proposed and demonstrated with various quantum memory schemes [2-4] to achieve high efficiency and long storage time. Until now, however, the efficiency and the storage time are still insufficient to use the quantum memory for a certain practical use.

In this presentation, we report the result of highly efficient quantum memory using gradient echo memory (GEM) technique in a cold atomic system. [5] The storage efficiency is as high as 87%, and the 1/e storage time is 1 ms. We also verify the quantum storage ability using heterodyne tomography of small coherent state.

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[3] M. Hosseini *et al.*, *Nature* **461**, 241 (2009)

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