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A Lattice-Trapped and Cavity-Enhanced High-Quality Quantum Memory SHENG-JUN YANG, XU-JIE WANG, XIAO-HUI BAO, JIAN-WEI PAN, Hefei National Laboratory for Physical Sciences at Microscale and Department of Modern Physics, University of Science and Technology of China, Hefei, — Quantum memory plays an increasing essential part in many applications of quantum information science. Currently, the intense research and crucial challenge is that integration of a full functional quantum memory with various high-performance properties in a single system. Storage lifetime and retrieval efficiency are the two most important qualities of quantum memory, especially indispensable for quantum repeater and long-distance quantum communication. Here based on techniques of magic optical lattice trap and ring cavity enhancement, we experimentally achieved a high-quality cold atom quantum memory. The initial intrinsic retrieval efficiency is up to 77(5)%, with an e^{-1}-storage lifetime about 0.25 sec for the first time. Such high effective and long-lived quantum memory should be significantly important for quantum communication and cryptography, and would truly stimulate a first practical demonstration of long distance quantum repeaters in the near future.

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