

Abstract Submitted
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Long coherence time of an ion memory in a hybrid ion trap¹ YE WANG, DAHYUN YUM, MING LYU, SHUOMING AN, MARK UM, JUNHUA ZHANG, LUMING DUAN, KIHWAN KIM, Center for Quantum Information, IIIS, Tsinghua University, Beijing, P. R. China — For an ensemble of qubits, there have reports of hours-long coherence time in both trapped ions [1] and solid state systems [2]. For a single qubit, however, the longest reported coherence time is about tens of seconds [3], which is mainly limited by the heating of the ion. We have performed an experiment to increase the coherence time of an ion qubit to a few minutes through dynamical decoupling. Our experiment is done in a hybrid ion trap, with $^{171}\text{Yb}^+$ as the memory ion qubit and $^{138}\text{Ba}^+$ as the cooling ion. Both of the ions are kept near their motional ground state through sympathetic cooling. The coherence time in our system is mainly limited by the gate fidelity for the dynamical decoupling pulses and the low frequency noise. [1] J. J. Bollinger, et al., *IEEE Trans. Instrum. Meas.* 40, 126 (1991). [2] Manjin Zhong, et al., *Nature* 517, 177 (2015). [3] T. P. Harty, et al., *Phys. Rev. Lett.* 113, 220501 (2014).

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