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Single ion-qubit with coherence time over an hour PENGFEI WANG, CHUNYANG LUAN, MU QIAO, MARK UM, JUNHUA ZHANG, YE WANG, XIAO YUAN, MILE GU, JINGNING ZHANG, KIHWAN KIM, Tsinghua University, CQI, IIIS COLLABORATION — The coherence time of a single $^{171}Yb^{+}$ ion-qubit over 600 s has been reported with sympathetic cooling by a $^{138}Ba^{+}$ ion and optimized dynamical decoupling-pulses in an ambient magnetic field condition [1]. However, it was not clear what prohibits further enhancement. Here, we identify the limiting factors as ambient magnetic-field noise, phase noise and leakage of the microwave oscillator. With the experimental improvements, we observe over one hour of the coherence time for $^{171}Yb^{+}$ ion-qubit. In the experimental study, we adopt recently developed theories of coherence and use the best quantifier of the coherence and investigate the process of decoherence systemically. [1] Wang, Ye, et al. , Nature Photonics 11.10 (2017): 646-650. This work was supported by the National Key Research and Development Program of China under Grants No. 2016YFA0301900 and No. 2016YFA0301901 and the National Natural Science Foundation of China Grants No. 11374178, No. 11574002, and No. 11974200.

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