

Abstract Submitted
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Experimental Test of Quantum Jarzynski Equality with a Trapped Ion¹ SHUOMING AN, MARK UM, DINGSHUN LV, YAO LU, JUNHUA ZHANG, Tsinghua University, HAITAO QUAN, Peking University, ZHANGQI YIN, JING-NING ZHANG, KIHWAN KIM, Tsinghua University — We report an experimental test of the Quantum Jarzynski Equality with a single trapped Yb171+ ion. The Jarzynski Equality connects work done on the system even through a non-equilibrium process to the free energy difference of the corresponding equilibrium states before and after the process [1]. While many experimental tests of Jarzynski equality have been performed in classical regime, the verification of the quantum version has not yet been fully demonstrated due to experimental challenges required for the test [2]. In our experiment, we apply a laser induced force on a single Yb171+ ion trapped in harmonic potential. The Hamiltonian in our realization is same to that of a stretched rubber ring which has been used for the test of classical Jarzynski equality. We vary the speed of this force from adiabatic to far from equilibrium way, and observe the experimental results are in agreement with the expectations from the equality.

[1] C. Jarzynski, Phys. Rev. Lett. 78, 2690 (1997).

[2] G. Huber, F. Schmidt-Kaler, S. Deffner and E. Lutz, Phys. Rev. Lett. 101, 070403 (2008).

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Shuoming An
Tsinghua Univ

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