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Laser ablation loading of Ba ions in a blade trap CHUNYANG LUAN, PENGFEI WANG, ZHENGYANG CAI, MU QIAO, KIHWAN KIM, Tsinghua University, CQI, IIS COLLABORATION — Ba ions are good candidates for using as qubits in trapped ion quantum computers or quantum simulators. The basic manipulation of Ba ions including Doppler cooling, optical pumping and detection is realized by visible laser beams. Quantum operations of Ba ions can be performed by applying 532 nm laser beams with the shelving capability to long-lived metastable $5D_{5/2}$ states. However, Ba ions are not popularly used mainly due to the difficulty in loading. Ba atoms are easily oxidized and often need to be heated to high temperature to break the oxidation layer and produce atomic beams. Laser ablation loading can be a solution for the loading problem with the high loading efficiency and negligible thermal effect[1,2]. In our blade trap, the laser ablation loading of Ba ions has been investigated with nitrogen laser pulses. Isotope selectivity of Ba ions can be also realized via resonant photo-ionization method. [1] Zimmermann, K., et al., Applied Physics B 107.4 (2012): 883-889. [2] Olmschenk, S., and P. Becker., Applied Physics B 123.4 (2017): 99. This work was supported by the National Key Research and Development Program of China under Grants No. 2016YFA0301900 and the National Natural Science Foundation of China Grants No. 11974200.

Chunyang Luan
Tsinghua University

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