Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Microfabrication of Surface Ion Trap Chip and State Manipulation of Single 171Yb+ Qubit SEOKJUN HONG, MINJAE LEE, HONGJIN CHEON, ASRI/ISRC and Department of Electrical and Computer Engineering, Seoul National University, JUN SIK AHN, TAEHYUN KIM, Quantum Tech. Lab., SK Telecom, DONG-IL "DAN" CHO, ASRI/ISRC and Department of Electrical and Computer Engineering, Seoul National University, ASRI/ISRC AND DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING, SEOUL NATIONAL UNIVERSITY TEAM, QUANTUM TECH. LAB., SK TELECOM TEAM — Ion traps are one of the promising physical implementations of quantum information processing. This paper presents new ion trap chips using a copper sacrificial layer. Boundary element method (BEM) simulation results show that the fabricated ion trap chip has a trap depth of 0.063 eV at 81 um above the top electrodes and radial secular frequencies of 1.52 and 1.6 MHz. Up to six 174Yb+ ions and three 171Yb+ ions have been successfully trapped. This paper also demonstrates the state manipulation of single 171Yb+ qubit through Rabi oscillation induced by microwave with frequency of 12.628 GHz. Using the new copper sacrificial method, accurate overhang dimensions that can effectively shield stray electric fields from dielectric layers, which in turn can reduce the micromotion of trapped ions, can be achieved. Acknowledgement: This work was partially supported by ICT R&D program of MSIP/IITP. [10043464 , Development of quantum repeater technology for the application to communication systems]

Taehyun Kim
SK Telecom

Date submitted: 30 Jan 2015 Electronic form version 1.4