Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Characterization of a Compact Cryogenic Package Approach to Ion Trap Quantum Comuting ROBERT SPIVEY, Duke University, GEERT VRIJSEN, BYEONG-HYEON AHN, Duke Univeristy, KAI HUDEK, University of Maryland at College Park, STEPHEN CRAIN, ANDRE VAN RYNBACH, NOEK RACHEL, JUNGSANG KIM, Duke Univeristy — One challenge for the expansion of trapped ion systems to a large scale is the lack of repeatable integration technology to realize compact and stable operating environment. In this work, we present a novel ion trapping environment where conventional ultra-high vacuum (UHV) chambers are replaced with a sealed ceramic package operating in a cryogenic environment. A microfabricated surface ion trap mounted on a 100-pin ceramic pin grid array (CPGA) package is placed in a UHV environment. A titanium lid with windows for optical access is then attached to the CPGA via an indium seal which maintains the UHV conditions for the ion trap. The trap package assembly is operated at cryogenic temperatures (5K) in order to freeze out most of the residual background gas. Activated charcoal is used to pump remaining helium and hydrogen molecules. Metallic Yb ablated using a Q-switched Nd:YAG laser at 1,064 nm is used as the atomic source. A compact radio frequency resonant circuit is used to create the RF potential for trapping. A low output impedance amplifier drives a superconducting inductor of value 2 uH in series with the trap capacitance in order to produce 200V at 26 MHz with low heating at 5K. We present the experimental progress towards trapping ions in this compact cryogenic setup.

Robert Spivey
Duke University

Date submitted: 16 Nov 2016 Electronic form version 1.4