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Characterization of a Compact Cryogenic Package Approach to Ion Trapping ROBERT SPIVEY, Department of Electrical Engineering, Duke University, ZHUBING JIA, Department of Physics, Duke University, ISMAIL INLEK, Department of Electrical Engineering, Duke University, KE SUN, Department of Physics, Duke University, STEPHEN CRAIN, RACHEL NOEK, KENNETH BROWN, JUNGSANG KIM, Department of Electrical Engineering, Duke University, EURIQA/LOGIQ TEAM — We present a novel ion trapping environment where conventional ultra-high vacuum (UHV) chambers are replaced with a compact enclosure sealed to a ceramic package operating in a cryogenic environment. A microfabricated surface ion trap mounted on a modified ceramic pin grid array (CPGA) package is covered with a copper lid containing the vacuum environment. The small environment is differentially pumped via cryogenic pumping at 7K, where UHV pressures are reached. To load the ions, metallic ytterbium (Yb) is ablated using a Q-switched Nd:YAG laser at 532 nm. Heating rates of 90 quanta/s are measured in a Sandia HOA trap. Single qubit and two qubit Mølmer–Sørensen gates are demonstrated using a stable and compact Raman beam delivery system. We present an estimation of internal pressure calculated from zig-zag phase changes in ion chains.

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