Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

Towards quantum information transport through a classical conductor DA AN, HARTMUT HAEFFNER, MAYA LEWIN-BERLIN, ERIK URBAN, Univ of California - Berkeley — Establishing quantum links between separately trapped ions is a significant step towards scalable trapped ion quantum computation. Here, we present our design, simulation, and ongoing implementation of a novel surface ion trap for studying quantum correlations between separate trapping sights through an ordinary conducting wire. This is a challenging task since the thermal noise in the wire is much greater than the motional ion energy, but as long as the decoherence sources are minimized, we can achieve quantum coupling through the wire. We also include intermediate steps towards this goal, such as characterizing the stability of our novel trap, which has variable trapping height, and establishing a classical link through the wire. This technology may lead to quantum computation with mixed ion species, sympathetic cooling of ion species that cannot be co-trapped, and hybrid quantum devices that couple ion based qubits with superconducting qubits.

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Date submitted: 28 Jan 2017 Electronic form version 1.4