Abstract Submitted
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Modeling non-adiabatic transport of a trapped ion through a single mode optical cavity WANCE WANG, ANDREW LAUGHARN, [A] University of Maryland, College Park, JOSEPH W. BRITTON, [A] University of Maryland, College Park; [B] Army Research Lab — The cavity QED strong coupling limit has long been accessible to neutral atoms, solid state qubits and trapped ion ensembles but was only recently accessed using a single trapped ion [1]. A leading challenge for ions is perturbation of the trap potential due to stray charges attached to the dielectric cavity mirrors, a problem exacerbated by the drive to small mode volume cavities. This poster explores an alternate approach. We model the non-adiabatic transport of laser-cooled ions ejected from an ion trap and guided through the waist of an optical cavity. Shielding excludes RF potentials and stray laser light from the cavity. An uncertainty analysis identifies design constraints compatible with interactions in Lamb Dicke limit. We also consider ion beam interactions with the near-field of high-Q photonic structures and prospects for deceleration, sympathetic cooling and recapture of ions in a secondary ion trap. This approach is informed by recent demonstrations of transport gates [2,3] and focusing of laser-cooled ion beams [4].

[1] H. Takahashi, et al, arXiv 180804031 (2018), [2] L.E. de Cerc, et al, PRL 116 (2016), [3] D. Leibfried, et al, PRA 76, 032324 (2007), [4] G. Jacob, et al, PRL 117, 043001 (2016)

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