Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Electron field noise sensing with a scanning ion ZACHARY FISHER, MICHAEL GUTIERREZ, MOLU SHI, DANIEL LI, YUFEI GE, PETER HERSKIND, ISAAC CHUANG, Research Laboratory of Electronics, Massachusetts Institute of Technology — Controlled shuttling of ions in a planar ion trap can serve as highly sensitive method for probing the electric field.[1] We apply this idea to the measurement of field noise effects on a microfabricated planar trap as a function of ion position. In particular, by shuttling an ion between different trapping zones, the field noise can be determined near different material surfaces, in particular dielectric materials. Surface effects on these materials are suspected to cause field fluctuations that decohere the motional state of trapped ions. By shuttling the ion to a determined location and measuring the electric field noise, a measure of the electric field noise can be determined as a function of proximity to dielectrics. A systematic examination of field noise due to dielectric versus metallic surfaces is valuable in, for example, a trapped-ion cavity QED system, where the high-reflectivity mirrors used in the optical cavities are large, exposed dielectric regions.[2]

[1]G. Huber et al. A trapped-ion local field probe. *Appl Phys B* **100**, 725-730 (2010).
[2]P. Herskind, S. Wang, M. Shi, Y. Ge, M. Cetina and I. Chuang, *Optics Letters*, Vol. 36, Issue 16, 3045-3047 (2011).

Zachary Fisher
Research Laboratory of Electronics, Massachusetts Institute of Technology

Date submitted: 09 Dec 2011 Electronic form version 1.4