Abstract Submitted
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An ab-initio model of anomalous heating in planar ion traps ARGHAVAN SAFAVI-NAINI, Harvard/MIT CUA, PETER RABL, IQOQI, PHILIPPE WECK, UNLV, HOSSEIN SADEGHPOUR, Harvard Smithsonian ITAMP — Anomalous heating of trapped ions imposes a limit on the scalability of the planar trap architecture for quantum computation. Measurements of the electric field noise present in ion traps have determined the frequency scaling of this noise and its scaling with the distance from the ion to the trap surface [1,2]. These measurements suggest that a thermally activated random process is at work. We present a model that accounts for the noise due to oscillating dipoles on the trap electrode surface [3]. The dipoles are formed when atoms are adsorbed on the trap surface. We present calculations for the spectral noise density and its distance and frequency scaling. We go beyond independent dipoles and consider the effect of correlation between dipoles, presence of a monolayer on the trap surface and multi-phonon processes on the spectral density.

[1] Q. A. Turchette et. al., Phys. Rev. A. 61, 63418 (2000).

[2] D. A. Hite et. al., arXiv:1112.5419v1.

[3] A. Safavi-Naini, P. Rabl, P. F. Weck, H. R. Sadeghpour, Phys. Rev. A. 84, 023412 (2011).

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