Abstract Submitted
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Measurement of time-varying electric fields near an atom chip using cold Rydberg atoms[1] J.D. CARTER, Department of Physics and Astronomy, University of Waterloo, J.D.D. MARTIN, Department of Physics and Astronomy and Institute for Quantum Computing, University of Waterloo — Inhomogeneous fluctuating electric fields near metal surfaces cause undesired heating or decoherence in devices which confine atoms or ions near such a surface (microfabricated ion traps or proposed gas-phase atom/solid-state hybrid quantum systems, for example). Heating of the motion of trapped ions has been used to measure the noise spectral density of these fields but the microscopic mechanism responsible is unknown. We have implemented a complementary measurement technique using cold atoms released from an atom chip and excited to Rydberg states. The dephasing of a coherent superposition of two Rydberg states is used to measure the inhomogeneous electric field, and spin-echo techniques are used to constrain the frequency scaling of the noise spectral density. Compared to ion trap measurements, this technique has the advantage of flexibility in varying parameters such as atom-surface distance since the atoms do not need to be trapped. Field noise at levels typical for room temperature ion traps is detectable in principle, though the frequency resolution and ultimate sensitivity are inferior to ion traps.

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J. D. Carter
Department of Physics and Astronomy, University of Waterloo

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