Abstract Submitted
for the DAMOP14 Meeting of
The American Physical Society

Nonlinear Single Spin Spectrum Analyzer SHLOMI KOTLER[1], NITZAN AKERMAN, YINNON GLICKMAN, ROEE OZERI, Weizmann Institute of Science — Qubits are excellent probes of their environment. When operating in the linear regime, they can be used as linear spectrum analyzers of the noise processes surrounding them. These methods fail for strong non-Gaussian noise where the qubit response is no longer linear. Here we solve the problem of nonlinear spectral analysis, required for strongly coupled environments. Our non-perturbative analytic model shows a nonlinear signal dependence on noise power, resulting in a spectral resolution *beyond the Fourier limit* as well as frequency mixing. We developed a noise characterization scheme adapted to this non-linearity. We then applied it using a single trapped $^{88}Sr^{+}$ ion as the a sensitive probe of strong, non-Gaussian, discrete magnetic field noise. With this method, we attained a ten fold improvement over the standard Fourier limit. Finally, we experimentally compared the performance of equidistant vs. Uhrig modulation schemes for spectral analysis. Phys.Rev.Lett. 110, 110503 (2013), Synopsis at http://physics.aps.org/synopsis-for/10.1103/PhysRevLett.110.110503

[1]Current position: National Institute of Standards and Tehcnology, Boulder, CO.

Shlomi Kotler
National Institute of Standards and Technology

Date submitted: 27 Jan 2014 Electronic form version 1.4