Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Correlation functions of the electric and magnetic fields in the vicinity of a metal surface[1] LUKE LANGSJOEN, ROBERT JOYNT, MAXIM VAVILOV, AMRIT POUDEL, University of Wisconsin - Madison — The Johnson noise-induced relaxation rate of a charge or spin qubit for a transition at a particular frequency in the vicinity of a metal boundary is proportional to the temporal Fourier component at that frequency of the electric or magnetic correlation function evaluated at the position of the qubit. These correlation functions are shown to be greatly enhanced compared to the blackbody result in the near vicinity of the metal due to the contribution of evanescent waves. As such, we expect a measurable enhancement of qubit decoherence due to the contribution of evanescent waves. We use a Green's dyadic approach to calculate the correlation functions of the fluctuating electric and magnetic fields in the vicinity of a conducting surface. In a local treatment of the dielectric properties of the metal this enhancement diverges as the inverse cube of the distance from the boundary, and for distances less than the order of the Fermi wavelength of the metal a nonlocal treatment is necessary to obtain an accurate result. We present a calculation of the correlation function for the full range of distances.

[1]DOD, ARMY W911NF-11-1-0030

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Date submitted: 10 Nov 2011 Electronic form version 1.4