

Abstract Submitted  
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**Noise Analyses of NV Center Diamonds due to Bulk and Surface Effects**<sup>1</sup> MATTHEW MOORE, DEBORAH SANTAMORE, YAHUI XIAO, DU WANG, SHAMIA PAMPLIN, Delaware State Univ — Nitrogen-vacancy (NV) center diamonds have seen tremendous applications in emergent quantum technologies including ultra-high resolution magnetic field sensors. However, coherence time and sensitivity of NV-based devices are limited by noise that causes decoherence and line broadening. We theoretically investigate the noise caused by the electric field and thermal fluctuations, which can be present naturally or in the presence of a laser. We examine the effects of charge fluctuations on the surface as well as strains caused by impurity contaminations in bulk diamond and surface contaminations, which can be present from the synthesis of NV centers and surface interactions with the environment. We derive the stochastic master equation from the Hamiltonian and analyze the noise spectrum for each cause. We also quantify thermal noise and its effect using the fluctuation-dissipation theorem.

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