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Electric-field noise from carbon-adatom diusion on a Au(110) surface: first-principles calculations and experiments HOSSEIN SADEGHPOUR, ITAMP, Harvard-Smithsonian CFA, EUNJA KIM , UNLV, ARGHAVAN SAFAVI-NAINI, Univ of Colorado - Boulder, PHILIPPE WECK, Sandia National Labs, DUSTIN HITE, KYLE MCKAY, DAVID PAPPAS, NIST-Boulder — The decoherence of trapped-ion quantum gates due to heating of their motional modes is a fundamental science and engineering challenge. Mitigating this noise, is fundamental to efficient and scalable operations in ion microtraps. To understand heating at the trap-electrode surfaces, we investigate the possible source of noise by focusing on the diffusion of carbon-containing adsorbates onto the Au(110) surface. Using density functional theory and detailed scanning probe microscopy, we show that the diffusive motion of carbon adatom on gold surface significantly affect the energy landscape and adatom dipole moment variation. A model for the diffusion noise, which varies quadratically with the variation of the dipole moment, qualitatively reproduces the measured noise spectrum, and the estimate of the noise spectral density is in accord with measured values.

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