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Probing magnetic noise near a conductor with a single spin qubit SHIMON KOLKOWITZ, QUIRIN UNTERREITHMEIER, VLADIMIR MANUCHARYAN, ARTHUR SAFIRA, STEVEN BENNETT, ALEXANDER ZIBROV, MIKHAIL LUKIN, Harvard Physics Department — Noise emanating from conductors and their surfaces can limit the coherence times and relaxation rates of many promising quantum information systems, ranging from superconducting qubits and gate-defined quantum dots to atoms and ions on chips. In many systems, the physical mechanism behind this noise is not fully understood, particularly at low frequencies. Here we present experimental progress towards the use of single electronic spin qubits in diamond to probe the spectral, spatial, and temperature dependent properties of magnetic noise near conductors and superconductors. Using nitrogen vacancy centers implanted at shallow depths we investigate the spectral properties of the magnetic noise at distances down to 10 nm from the metal surface, a length scale not currently achievable in other systems, over a wide range of temperatures, from 6 to 300 K.

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