Magnetic Noise in SiGe Isotopically Enhanced Triple-Dot Qubits

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Triple-dot qubits offer promise of exchange-only spin-qubit control, but employ an encoding that depends on homogeneous magnetic fields [1]. Inhomogeneous magnetic fields lead to leakage errors [2]. In this talk, I will discuss the sources of inhomogeneous magnetic fields in isotopically purified triple quantum dots in Si/SiGe heterostructures as probed by singlet-triplet oscillation experiments and noise spectroscopy via multiple exchange echoes [3,4]. We find that magnetic noise sources remain dominated by nuclear effects, but there are some notable surprises, including Meissner screening from superconducting gates, interface spin-orbit effects, $1/f$ noise due to spin-glass-like ^{29}Si dynamics, and structure in the high-frequency noise spectrum due to ^{73}Ge quadrupole dynamics. Unravelling the noise spectrum from these effects may provide insight into more complex triple-dot characterization experiments such as randomized benchmarking.

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