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Spatial correlations of magnetic fluctuations in DC SQUIDS

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UW-Madison Department of Physics — Recent experiments indicate that there is a high density of unpaired spins residing on the surfaces of superconducting thin films used to implement SQUIDS and superconducting qubits. Fluctuations of these spins give rise to low frequency flux noise and dephasing of the qubit state. Realization of phase and flux qubits with improved dephasing times will require a deeper understanding of the microscopic physics that governs fluctuations of the surface spins. Here we describe experiments to probe the spatial correlation of magnetic fluctuators in a SQUID circuit. The SQUID loop incorporates multiple current taps, enabling one to locally address magnetic fluctuators. Preliminary data reveal correlated fluctuations on a length scale of order $10\ \mu\text{m}$. We discuss implications for qubit dephasing.

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