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Geometry and temperature dependence of low-frequency flux noise in dc SQUIDs[1] S.M. ANTON, J.S. BIRENBAUM, S.R. O'KELLEY, UC Berkeley, D.S. GOLUBEV, G.C. HILTON, H.-M. CHO, K.D. IRWIN, NIST, Boulder, V. BOLKHOVSKY, D.A. BRAJE, G. FITCH, M. NEELEY, R.C. JOHNSON, W.D. OLIVER, MIT Lincoln Laboratory, F.C. WELLSTOOD, Univ of Maryland, JOHN CLARKE, UC Berkeley — Measurements on dc SQUIDs reveal a flux noise spectral density $S_\Phi(f) = A^2/(f/1\ Hz)^\alpha$. An analytic model assuming non-interacting spins localized at the surface of the SQUID loop predicts that the mean square noise scales as R/W—the radius and width of the loop, respectively. However, there are no established theories for the scaling of α with geometry or the dependences of A and α on temperature T. To test the predicted geometric scaling of this model experimentally, we measured flux noise in ten SQUIDs with systematically varying geometries. We find that, at fixed T, A^2 scales approximately as R. From the measured values of A and α, we estimate the mean square flux noise, which does not scale with R. As T is lowered, α increases significantly and in such a way that the spectra "pivot" about an approximately fixed frequency. This phenomenon implies that the mean square noise is temperature-dependent, an effect not predicted by the analytic model. We discuss our attempts to reconcile these discrepancies by considering the locking together of spins to form clusters.

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