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High-sensitivity SQUIDs with dispersive readout for scanning microscopy[1] J.M. MOL, F. FOROUGHI, J. ARPS, E. KAMMERLOHER, P. BETHKE, RWTH Aachen University, G.W. GIBSON, JR., Y.K.K. FUNG, IBM Research Division, T.J. Watson Research Center, B. KLOPFER, K. NOWACK, P.A. KRATZ, Stanford University, M.E. HUBER, University of Colorado Denver, K.A. MOLER, J.R. KIRTLEY, Stanford University, H. BLUHM, RWTH Aachen University — In a scanning SQUID microscope, the high magnetic flux sensitivity is utilized to image magnetic properties of sample surfaces. As an alternative to the widely used DC SQUIDs, we present Nb SQUIDs for scanning with dispersive microwave readout, featuring significantly higher bandwidth and sensitivity. An on-chip shunt capacitor in parallel with the junction and flux pickup loops forms an LC resonator whose resonance depends on the flux in the SQUID. The readout utilizes a phase-sensitive detection of the reflected drive signal at the SQUID's resonance frequency. Highest sensitivities are achieved by making use of the inherent nonlinearity of the device at high excitation powers. We present a study of the characteristics and noise measurements of our sensors at 4 K. Extrapolations from our results to 300 mK indicate that flux sensitivities as low as 50 $n\Phi_0 Hz^{-1/2}$ could be possible. Using high-resolution lithography, our sensors promise sub-micron spatial resolution. Integrated into a scanning microscope, they will provide a powerful tool for the study of weak magnetic effects and quantum coherent phenomena.

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