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Susceptibility of Magnetic Surface States in Superconducting Circuits. STEVEN SENDELBACH, DAVID HOVER, ROBERT MCDERMOTT, UW-Madison Department of Physics, MICHAEL MUECK, Institut für Angewandte Physik, Justus-Leibig-Universität Gießen — 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 that probe the ac spin susceptibility of the surface magnetic states. The detector is a dc SQUID-based susceptometer optimized for the study of surface spins. We discuss the temperature and frequency dependence of the spin susceptibility, and relate these to interactions between spins, the distribution of spin relaxation times, and possible spin-glass freezing.

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