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**Novel Surface Treatments of Superconducting Thin Film Devices for Reduced Flux Noise** U. PATEL, S. SENDELBACH, Department of Physics, University of Wisconsin, Madison, Wisconsin 53706, USA, J. KLINE, D.P. PAPPAS, National Institute of Standards and Technology, 325 Broadway, Boulder, Colorado 80305-3328, USA, M. WEIDES, J.M. MARTINIS, Department of Physics, University of California, Santa Barbara, California 93106, USA, R. MCDERMOTT, Department of Physics, University of Wisconsin, Madison, Wisconsin 53706, USA — Low frequency magnetic flux noise is a dominant source of dephasing in Josephson phase and flux qubits. Recent experiments indicate that the noise is due to a high density of unpaired electron spins on the surfaces of the superconducting thin films and suggest that appropriate surface treatments could be used to reduce levels of flux noise. Here we describe two approaches to the realization of improved, low-noise devices: (1) surface passivation to reduce the density of unpaired spins at the metal-insulator interface and (2) treatment of the superconducting thin films with ferromagnetic or antiferromagnetic impurities in order to saturate dominant fluctuators. We discuss fabrication issues and present data on the flux and inductance noise of SQUID devices incorporating the novel surface treatments.

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