Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Analytical Calculation of Gain and Noise of DC Squid Microwave Amplifier ARCHANA KAMAL, MICHEL DEVORET, Departments of Physics and Applied Physics, Yale University, JOHN CLARKE, Department of Physics, University of California, Berkeley —
The dc SQUID microwave amplifier, based on Josephson junctions, is employed in a wide spectrum of applications ranging from dark matter detection to the readout of superconducting qubits. A crucial advantage offered by this device is the separation of input and output channels, unlike conventional Josephson parametric amplifiers, so that it does not require a nonreciprocal device such as a circulator for its operation. The mechanism underlying the directional gain in the SQUID microwave amplifier, however, has so far remained elusive. We present a first principles, analytical calculation, based on scattering theory, of a practical SQUID amplifier which elucidates the underlying nonlinear mode mixing responsible for the directional operation of the device. The gain and quantum noise characteristics of a SQUID operated as a microwave voltage amplifier are discussed. Work supported by IARPA and ARO (AK, MHD and JC) and NSF (AK and MHD).

Archana Kamal
Yale University

Date submitted: 16 Nov 2011 Electronic form version 1.4