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Nonlinear dissipative filters for measurement protection on superconducting qubits[1] POL FORN-DIAZ, RAYMOND SCHOUTEN, KEES HARMANS, HANS MOOIJ, TU Delft. Kavli Institute of Nanoscience — Measurements on superconducting qubits require the system to be well isolated from noise sources if its quantum state is not being accessed. This ensures that decoherence induced by the measurement apparatus is minimized. The need to have slow (sub-GHz) and fast (GHz) lines to measure and control the state of the qubit is difficult to combine with the requirement to attenuate the noise over a broad spectral range. To overcome this problem, we have built a new type of non-linear coaxial copper powder filter with a Josephson junction in its inside. The junction in the filter acts as a shorting switch. For low frequencies, the junction acts as a shortcut to ground, and high frequencies are absorbed in the metallic powder. The Josephson junction critical current is taken such that when sending a pulse to probe the measurement device (a DC SQUID in our case), the junction in the filter switches to the voltage state, thus reaching the SQUID to perform the measurement. A minimum noise suppression of 40 dB is obtained, while allowing ns pulses to be transported.

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