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Frequency-dependent admittance of a short superconducting weak link FILIP KOS, SIMON NIGG, LEONID GLAZMAN, Department of Physics, Yale University — We consider the electromagnetic response of a nanowire connecting two bulk superconductors. Andreev states appearing at a finite phase bias substantially affect the finite-frequency admittance of such wire junction. We evaluate the complex admittance analytically at arbitrary frequency and arbitrary, possibly non-equilibrium, occupation of Andreev levels. Special care is given to the limits of a single-channel contact and a disordered metallic weak link. We also evaluate the quasi-static fluctuations of admittance induced by fluctuations of the occupation factors of Andreev levels. In view of possible qubit applications, we compare properties of a weak link with those of a tunnel Josephson junction of the same normal conductance. Compared to the latter, weak link has smaller low-frequency dissipation. However, because of the deeper Andreev levels, quasi-static fluctuations of the complex admittance in a weak link are exponentially larger than in a tunnel junction. These fluctuations limit the applicability of nanowire junctions in superconducting qubits.

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