

Abstract

Transmon Qubit

Short dephasing times of the Cooper-Pair box qubit present a challenge for its use in quantum information processing. Another type of superconducting qubit called “transmon” overcomes this problem. It is designed to operate in a regime of significantly increased ratio of Josephson energy and charging energy E_J/E_C . The transmon benefits from the fact that its charge dispersion decreases exponentially with E_J/E_C , while its loss in anharmonicity in the level splittings is described by a weak power law. As a result the sensitivity to charge noise relative to the Cooper pair box is significantly reduced while maintaining sufficient anharmonicity for selective qubit control. Embedding the qubit in a transmission line allows control and readout of the qubit state as well as performing circuit QED experiments in the strong coupling regime.