

Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Kinetics of quasiparticle trapping in a Cooper-pair box. ROMAN LUTCHYN, LEONID GLAZMAN, University of Minnesota — We study the kinetics of the quasiparticle capture and emission process in a small superconducting island (Cooper-pair box) connected by a tunnel junction to a massive superconducting lead. At low temperatures, the charge on the box fluctuates between two states, even and odd in the number of electrons. Assuming that the odd-electron state has the lowest energy, we evaluate the distribution of lifetimes of the even- and odd-electron states of the Cooper-pair box. The lifetime in the even-electron state is an exponentially distributed random variable corresponding to a homogenous Poisson process of “poisoning” the island with a quasiparticle. The distribution of lifetimes of the odd- electron state may deviate from the exponential one. The deviations come from two sources - the peculiarity of the quasiparticle density of states in a superconductor, and the possibility of quasiparticle energy relaxation via phonon emission. In addition to the lifetime distribution, we also find spectral density of charge fluctuations generated by capture and emission processes. The complex statistics of the quasiparticle dwell times in the Cooper-pair box may result in strong deviations of the noise spectrum from the Lorentzian form.

Roman Lutchyn
University of Minnesota

Date submitted: 20 Nov 2006

Electronic form version 1.4