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Quantum kinetics of a Josephson phase qubit continuously monitored for escape. LEONID P. PRYADKO, ALEXANDER N. KOROTKOV, University of California, Riverside — Inspired by recent experiment [1] on partial measurement of a Josephson phase qubit, we consider evolution of a qubit in a metastable potential being continuosly monitored for escape. Assuming that the continuous measurement may induce incoherence both in the tunneling reservoir and in the tunneling matrix elements but not in the qubit itself, we discuss the conditions for the qubit to retain coherence. We argue that qubit state remains pure as long as the tunneling event is never reverted, that is, the tunneling from the reservoir back to qubit state is suppressed. Such a suppression may happen due to the choice of system parameters (e.g., for nearly continuous spectrum in the tunneling reservoir), or dynamically due to the properties of coherent or incoherent evolution in the reservoir. We illustrate these scenarios by numerical simulations and with an analytical model where the exact solution of the master equation gives no decoherence of the qubit over a finite time interval.

[1] N. Katz *et al.*, Science **312**, 1498 (2006).

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