Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Analysis of Bell inequality violation in superconducting phase qubits[1] ABRAHAM G. KOFMAN, ALEXANDER N. KOROTKOV, University of California, Riverside — We analyze conditions for violation of the Bell inequalities, focusing on experiments with Josephson phase qubits. In the ideal case we discuss all possible situations of maximum violation, but mainly focus on two important types of optimal qubit-measurement directions in the pseudospin space, lying within either horizontal or vertical planes. Only the vertical type remains optimal in presence of local measurement errors, while in the case of local decoherence of qubits either the horizontal or vertical configuration is optimal. Besides local measurement errors and decoherence, we also discuss the effect of measurement crosstalk, which affects both the classical inequality and the quantum result. In particular, we propose a version of the Bell inequality which is insensitive to the crosstalk.

[1]supported by the DTO/ARO grant

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Date submitted: 26 Nov 2007 Electronic form version 1.4