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Effect of correlated noise on a fault-tolerant quantum error correction protocol[1] JAMES CLEMENS, Miami University, JULIO GEA-BANACLOCHE, University of Arkansas — We consider the effect of correlated noise in the context of a fault-tolerant quantum error correction protocol. The noise is represented by a set of classical fluctuating fields with partial spatial and temporal correlations. We explicitly account for the propagation of errors in the implementation of quantum circuits for ancilla verification and syndrome extraction. Errors arising from single-bit and two-bit gates are considered separately. The performance of the error correction protocol is characterized by means of the probability for an uncorrected error to occur calculated from numerical simulations of the error propagation. For single-bit gates we find that in the limit of strong correlations the crash probability is enhanced be an order of magnitude. For two-bit gates we find that the effect of correlated noise can be minimized by choosing an appropriate sequence of operations which takes advantage of the correlations.

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