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Optimizing the frequency of post-selected quantum error correction in the [[7,1,3]] Steane code ALI ABU-NADA, BEN FORTESCUE, MARK BYRD, Southern Illinois University Carbondale, SOUTHERN ILLINOIS UNIVERSITY CARBONDALE TEAM — A common assumption in analyses of error thresholds and quantum computing in general is that one applies fault-tolerant quantum error correction (FTQEC) after every logical gate. This, however, is known not to always be optimal if the FTQEC procedure itself can introduce errors. We investigate the effect of varying the number of logical gates between FTQEC operations, and in particular the case where failure of a postselection condition in FTQEC may cause FTQEC to be skipped with high probability. By using a simplified model of errors induced in FTQEC, we derive an expression for the logical error rate as a function of error-correction frequency, and show that in this model the optimal frequency is insensitive to postselection failure probability for a large range of such probabilities. We compare the model to data derived from Monte Carlo simulation for the [[7,1,3]] Steane code.

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