Abstract Submitted
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**Modeling Quantum Noise for efficient testing of fault-tolerant circuits** DANIEL PUZZUOLI, University of Waterloo, Institute for Quantum Computing, EASWAR MAGESAN, Research Laboratory of Electronics, Massachusetts Institute of Technology, CHRISTOPHER GRANADE, DAVID CORY, University of Waterloo, Institute for Quantum Computing — Experimental implementations of quantum logic gates are affected by noise. For simple noise models and encoding schemes, threshold theorems exist which place bounds on the acceptable strength of the noise. In general, finding threshold values for an encoding scheme is a difficult task. Therefore it is desirable to simulate the performance of large encoded circuits to numerically estimate threshold values. For general circuits and noise models, these simulations quickly become intractable in the size of the encoded circuit. We introduce methods for approximating a noise process by one which allows for efficient Monte Carlo simulation of properties of encoded circuits [1]. The approximations are as close to the original process as possible without overestimating their ability to preserve quantum information, a key property for obtaining more honest estimates of threshold values.

[1] Phys. Rev. A 87, 012324 (2013).

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