Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Hard decoding algorithm for optimizing thresholds under general Markovian noise CHRISTOPHER CHAMBERLAND, JOEL WALLMAN, STEFANIE BEALE, RAYMOND LAFLAMME, Univ of Waterloo — With the advent of small scale quantum devices, studying the performance of quantum error correcting code's for realistic noise models is becoming increasingly important. In this work, we present an efficient hard decoding algorithm for optimizing thresholds of an error correcting code under general completely positive and trace-preserving (i.e., Markovian) noise. Using our hard-decoding algorithm, we compute threshold values and error rates for a variety of error correcting code's. We show that thresholds for coherent noise can be significantly improved by exploiting transversal non-Pauli gates. Furthermore, the application of our hard decoding algorithm to coherent errors leads to better thresholds than if applied to the channel's Pauli-twirled counterpart. Lastly, we show that our optimized decoder is robust to perturbations about a noise model. Consequently, our decoder leads to reduced error rates even when applied to imperfectly characterized experimental noise.

Christopher Chamberland
Univ of Waterloo

Date submitted: 10 Nov 2016 Electronic form version 1.4