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Towards Fault-Tolerant Dynamical Decoupling GREGORY QUIROZ, DANIEL LIDAR, University of Southern California — Dynamical Decoupling (DD) is a error suppression technique which combats decoherence by applying strong and fast pulses to a quantum system to effectively average system-environment interactions. Although many DD constructions have been designed which exhibit suppression of interactions to high orders in time-dependent perturbation theory, this result is predominately in the ideal pulse limit as DD effectiveness degrades significantly in the presence of additional errors generated by faulty pulses. Here, we present a decoupling scheme which provides robustness to certain forms of pulse errors and utilizes concatenation to attain high order error suppression. Using numerical simulations, we convey the advantages of this scheme over additional robust DD constructions and provide evidence for the possibility of arbitrary order error suppression in the presence of pulse errors.

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