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**Noise Estimation and Adaptive Encoding for Asymmetric Quantum Error Correcting Codes**[1] JAN FLORJANCZYK, TODD BRUN, Univ of Southern California, CENTER FOR QUANTUM INFORMATION SCIENCE AND TECHNOLOGY TEAM — We present a technique that improves the performance of asymmetric quantum error correcting codes in the presence of biased qubit noise channels. Our study is motivated by considering what useful information can be learned from the statistics of syndrome measurements in stabilizer quantum error correcting codes (QECC). We consider the case of a qubit dephasing channel where the dephasing axis is unknown and time-varying. We are able to estimate the dephasing angle from the statistics of the standard syndrome measurements used in stabilizer QECC's. We use this estimate to rotate the computational basis of the code in such a way that the most likely type of error is covered by the highest distance of the asymmetric code. In particular, we use the $[[15, 1, 3]]$ shortened Reed-Muller code which can correct one phase-flip error but up to three bit-flip errors. In our simulations, we tune the computational basis to match the estimated dephasing axis which in turn leads to a decrease in the probability of a phase-flip error. With a sufficiently accurate estimate of the dephasing axis, our memory's effective error is dominated by the much lower probability of four bit-flips.

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