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Robustness of operator quantum error correction against imperfect initialization OGNYAN ORESHKOV, University of Southern California — It is known that perfect unitary evolution inside decoherence-free subspaces and subsystems (DFSs) requires more restrictive conditions if one allows imperfect initialization of the state. It was believed that these conditions are necessary if DFSs are to be able to protect imperfectly encoded states from subsequent errors. By a similar argument, general operator quantum error-correcting (OQEC) codes would also require more restrictive error-correction conditions for the case of imperfect initialization. In this study, we examine this requirement by looking at the errors on the encoded state. In order to quantitatively analyze the errors in an OQEC code, we introduce a measure of the fidelity between the encoded information in two states for the case of subsystem encoding. In contrast to what was previously believed, we obtain that more restrictive conditions are not necessary neither for DFSs nor for general OQEC codes. This is because the effective noise that can arise inside the code as a result of imperfect initialization is such that it can only increase the fidelity of an imperfectly encoded state with a perfectly encoded one. Some implications of this result in the context of fault-tolerant information processing are discussed.

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