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Decoder for 3-D color codes KUNG-CHUAN HSU, TODD BRUN, University of Southern California — Transversal circuits are important components of fault-tolerant quantum computation. Several classes of quantum error-correcting codes are known to have transversal implementations of any logical Clifford operation. However, to achieve universal quantum computation, it would be helpful to have high-performance error-correcting codes that have a transversal implementation of some logical non-Clifford operation. The 3-D color codes [1] are a class of topological codes that permit transversal implementation of the logical $\pi/8$-gate. The decoding problem of a 3-D color code can be understood as a graph-matching problem on a three-dimensional lattice. Whether this class of codes will be useful in terms of performance is still an open question. We investigate the decoding problem of 3-D color codes and analyze the performance of some possible decoders.

[1]H. Bombín, New J. Phys. **17**, 083002 (2015).

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