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Overcoming erasure errors in quantum memories with multilevel systems SRERAMAN MURALIDHARAN, Department of Electrical Engineering, Yale University, JIANMING WEN, LINSHU LI, LIANG JIANG, Department of Applied Physics, Yale University — We propose the usage of highly efficient error correcting codes of multilevel systems to encode quantum memories that suffer from erasure errors and introduce efficient hardware to repetitively correct these errors. Our scheme makes use of quantum polynomial codes to encode a quantum memory and generalized one-bit teleportation circuits for multilevel systems to repetitively correct photon erasure errors and operation errors in a fault-tolerant manner. We compare our scheme with earlier known schemes to encode quantum memories that use quantum parity codes and surface codes respectively and discuss the application of our encoded quantum memories for one-way quantum repeaters and show that they achieve a superior performance.

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