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Balades Quantiques de le LPENS

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Domaines : cond-mat

Titre : *Error Threshold of SYK Codes from Strong-to-Weak Parity Symmetry Breaking*

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Résumé : *Quantum error correction (QEC) codes fundamentally link to quantum phases of matter ; the degenerate ground state manifold corresponds to the code space, while topological excitations represent error syndromes. Extending this idea, the Sachdev-Ye-Kitaev (SYK) model, characterized by its extensive quasi- ground state degeneracy, serves as a constant rate approximate QEC code. In this work, we study the impacts of decoherence on the information-theoretic capacity of SYK models and their variants. We calculate the coherent information in the maximally entangled quasi-ground state space of the SYK models under the quasiparticle parity breaking and parity conserving noise. Interestingly, we found that under the strong fermion parity symmetric noise, the mixed state undergoes the strong to weak spontaneous symmetry breaking of fermion parity, which also corresponds to the information-theoretic transition. Our results provide critical insights into the behavior of approximate constant-rate QEC codes under decoherence.*