Quantum Physics

New Phase Transitions in Optimal States for Memory Channels

Vahid Karimipour, Zohreh Meghdadi, Laleh Memarzadeh

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We investigate the question of optimal input ensembles for memory channels and construct a rather large class of Pauli channels with correlated noise which can be studied analytically with regard to the entanglement of their optimal input ensembles. In a more detailed study of a subclass of these channels, the complete phase diagram of the two-qubit channel, which shows three distinct phases is obtained. While increasing the correlation generally changes the optimal state from separable to maximally entangled states, this is done via an intermediate region where both separable and maximally entangled states are optimal. A more concrete model, based on random rotations of the error operators which mimic the behavior of this subclass of channels is also presented.

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