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Some properties of generalized quantum operations. (English) Zbl 1270.81045

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Summary: Let $\mathcal{B}(\mathcal{H})$ be the set of all bounded linear operators on the separable Hilbert space \mathcal{H} . A (generalized) quantum operation is a bounded linear operator defined on $\mathcal{B}(\mathcal{H})$, which has the form $\Phi_{\mathcal{A}}(X) = \sum_{i=1}^{\infty} A_i X A_i^*$, where $A_i \in \mathcal{B}(\mathcal{H})$ ($i = 1, 2, \dots$) satisfy $\sum_{i=1}^{\infty} A_i A_i^* \leq I$ in the strong operator topology. In this paper, we establish the relationship between the (generalized) quantum operation $\Phi_{\mathcal{A}}$ and its dual $\Phi_{\mathcal{A}}^{\dagger}$ with respect to the set of fixed points and the noiseless subspace. In particular, we also partially characterize the extreme points of the set of all (generalized) quantum operations and give some equivalent conditions for the correctable quantum channel.

MSC:

81P45 Quantum information, communication, networks (quantum-theoretic aspects) Cited in 2 Documents

81R15 Operator algebra methods applied to problems in quantum theory

Keywords:

quantum operation; fixed point; noiseless subspace

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