

# Quantum maps with applications in quantum communication and information processing

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Each quantum process can be described by a mapping that transforms input states into output states. It does not matter whether the system evolves with constant changes or discrete jumps. Such mapping is called a quantum channel. Quantum channels play an important role in quantum communication and information processing. They are often used to characterize quantum protocols, such as quantum teleportation and quantum cryptography.

The goal of this project is to analyze quantum maps, their properties and applications in quantum communication and information processing. An important task in quantum data transfer is understanding how to transfer quantum information through a noisy channel and how much information can be preserved. In quantum information processing, the goal is to eliminate the influence of noise on the transmitted information. Error correction methods allow for noise reduction and protection of information transmitted through a quantum channel. Entanglement is an extremely important resource in quantum protocols. This is a type of correlations between parts of a quantum system that has no classical counterpart. Applications of entangled states include secure connections between quantum computers on a global scale.

Quantum communication and information processing is an interdisciplinary field that combines physics, mathematics, computer science, and material engineering. The development of this field may revolutionize science and technology. Its computational methods are used to construct quantum computers, whose computing power is beyond the reach of classical computers. Connections between computers are accomplished through quantum communication using entangled states, quantum teleportation, and quantum cryptography. This allows for completely secure protocols and encryption systems.

During our research, we plan to use advanced methods of theoretical and mathematical physics. We expect the opening of new research directions, the formulation of new theorems and hypotheses. We also intend to propose possible experimental applications of the obtained results.