

## Quantum Physics

# Quantum teleportation scheme by selecting one of multiple output ports

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*(Submitted on 20 Jan 2009 (v1), last revised 6 Apr 2009 (this version, v2))*

The scheme of quantum teleportation, where Bob has multiple ( $N$ ) output ports and obtains the teleported state by simply selecting one of the  $N$  ports, is thoroughly studied. We consider both deterministic version and probabilistic version of the teleportation scheme aiming to teleport an unknown state of a qubit. Moreover, we consider two cases for each version: (i) the state employed for the teleportation is fixed to a maximally entangled state, and (ii) the state is also optimized as well as Alice's measurement. We analytically determine the optimal protocols for all the four cases, and show the corresponding optimal fidelity or optimal success probability. All these protocols can achieve the perfect teleportation in the asymptotic limit of  $N \rightarrow \infty$ . The entanglement properties of the teleportation scheme are also discussed.

Comments: 14 pages, 4 figures

Subjects: **Quantum Physics (quant-ph)**

Journal reference: Phys. Rev. A 79, 042306 (2009)

DOI: [10.1103/PhysRevA.79.042306](https://doi.org/10.1103/PhysRevA.79.042306)Cite as: [arXiv:0901.2975v2](https://arxiv.org/abs/0901.2975v2) [quant-ph]

## Submission history

From: Satoshi Ishizaka [[view email](#)]**[v1]** Tue, 20 Jan 2009 03:19:21 GMT (36kb)**[v2]** Mon, 6 Apr 2009 00:27:57 GMT (37kb)*[Which authors of this paper are endorsers?](#)*

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