2005 Vol.43 No.6 pp.1003-1008 DOI:

Controlled Implementation of Non-local CNOT Operation Using Three-Qubit Entanglement

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(Received: 2004-9-10; Revised: 2004-11-29)

Abstract: We investigate the controlled implementation of a non-local CNOT operation using a three-qubit entangled state. Firstly, we show how the non-local CNOT operation can be implemented with unit fidelity and unit probability by using a maximally entangled GHZ state as controlled quantum channel. Then, we put forward two schemes for conclusively implementing the non-local operation with unit fidelity by employing a partially entangled pure GHZ state as quantum channel. The feature of these schemes is that a third side is included, who may participate the process of quantum non-local implementation as a supervisor. Furthermore, when the quantum channel is partially entangled, the third one can rectify the state distorted by imperfect quantum channel. In addition to the GHZ class state, the W class state can also be used to implement the same non-local operation probabilistically. The probability of successful implementation using the W class state is always less than that using the GHZ class state.

PACS: 03.65.Bz, 42.50.-p
Key words: non-local CNOT operation, implementation, GHZ class state, W class state

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