Probabilistic Teleportation of an Unknown One-Particle State by a Three-Particle General W State

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Abstract: Two schemes for teleporting an unknown one-particle state are proposed when a general W state is utilized as quantum channel. In the first scheme, after the sender (Alice) makes a Bell-state measurement on her particles, the recipient (Bob) performs a Von Neumann measurement and introduces an auxiliary particle, and carries out a unitary transformation on his particle and the auxiliary particle, and performs a Von Neumann measurement on the auxiliary particle to confirm whether the teleportation succeeds or not. In the second scheme, the recipient (Bob) does not need to perform the first Von Neumann measurement or introduce the auxiliary particle, which is necessary in the first scheme. It is shown that the maximal probabilities of successful teleportation of the two schemes are identical if the recipient (Bob) performs an appropriate unitary transformation and adopts a proper particle on which he recovers the quantum information of state to be teleported.

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