

Verifying Atom Entanglement Schemes by Testing Bell's Inequality

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Recent experiments to test Bell's inequality using entangled photons and ions aimed at tests of basic quantum mechanical principles. Interesting results have been obtained and many loopholes could be closed. In this paper we want to point out that tests of Bell's inequality also play an important role in verifying atom entanglement schemes. We describe as an example a scheme to prepare arbitrary entangled states of N two-level atoms using a leaky optical cavity and a scheme to entangle atoms inside a photonic crystal. During the state preparation no photons are emitted, and observing a violation of Bell's inequality is the only way to test whether a scheme works with a high precision or not.

Key words: Bell Inequality Tests; Atom Entanglement Schemes; Quantum Computing;
Manipulation of Decoherence-free States.