Quantum Physics

Scheme for proving the bosonic commutation relation using single-photon interference

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We propose an experiment to directly prove the commutation relation between bosonic annihilation and creation operators, based on the recent experimental success in single-photon subtraction and addition. We devise a single-photon interferometer to realize coherent superpositions of two sequences of photon addition and subtraction. Depending on the interference outcome, the commutation relation is directly proven or a highly nonclassical state is produced. Experimental imperfections are assessed to show that the realization of the scheme is highly feasible.

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