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[413] Entanglement-induced collective multiparticle interference

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Multiparticle interference phenomena have been crucial to the understanding of quantum physics. In twoparticle systems, Hong, Ou, and Mandel showed how particles'indistinguishability forbids retrieving information about the pairwise exchange process, playing a key role in witnessing interference. Contrarily, in systems of $N \ge 3$ partially distinguishable particles, multiple interference terms originate from the different exchange processes, enabling the observation of genuine N-particle interference that is no longer fully determined by pairwise indistinguishability. Here, we introduce yet another fundamental feature of quantum physics, i.e., quantum entanglement, to demonstrate the genuine four-particle interference of photons which, however, only interfere in pairs at two separate and independent beamsplitters, thus suggesting a nonlocal collective interference.

Theoretical Work

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