Behavior of bosons composed of entangled fermions

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Two bound, entangled fermions form a composite boson, which can be treated as an elementary boson as long as the Pauli principle remains irrelevant. From ultracold molecules to hadrons at the highest energies, the bosonic character of composites is intimately linked to the entanglement of the constituent fermions: Large entanglement implies good bosonic properties [1].

The deviation from perfect bosonic behavior manifests itself in the statistical properties of the composites and in their collective interference. As a consequence, the counting statistics exhibited by composites allow one to infer the form of the two-fermion wave-function [2]. Bosonic behavior can thus be used as a probe for the underlying structure of composite particles without directly accessing their constituents, as exemplified with a scheme for the interference of artificial composite bosons in coupled optical lattices.

[1] M.C. Tichy, P.A. Bouvrie, K. Mølmer, Phys. Rev. A **86**, 042317 (2012).

[2] M.C. Tichy, P.A. Bouvrie, K. Mølmer, Phys. Rev. Lett. **109**, 260403 (2012).