Topological vacuum bubbles of anyons

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Abstract

According to the linked cluster theorem of fermionic and bosonic many-body physics, physical observables are not affected by vacuum bubbles, which represent virtual particles created from vacuum and self-annihilating without interacting with real particles. In this talk, we show that this conventional knowledge must be revised for anyons. We find that a certain class of vacuum bubbles of anyons, involving topological braiding of virtually excited anyons around real anyonic excitations, affects physical observables. We develop a theory of such topological vacuum bubbles for both of Abelian anyons [1] and non-Abelian anyons [2]. These topological vacuum bubbles can be detected in a fractional quantum Hall system accessible in current experiments, providing a tool for observation of elusive fractional Abelian/non-Abelian exchange statistics.

C. Han et al., Nat. Commun. 7: 11131 (2016).

C. Han and H.-S. Sim, preprint (2017).

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