Disorder in strongly correlated systems: two examples from quantum magnetism and cold atom gases

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Résumé

The effect of disorder in one-dimensional strongly correlated systems will be illustrated through two recent examples taken from a priori disconnected topics: quantum frustrated magnetism and cold atoms. The first one will study the interplay of randomness and frustration in a spin-1/2 chain [1]. We show that the fate of the ground-state and elementary fractional excitations is captured by two localization mechanisms: an unusual Anderson localization and a random confinement interaction. Second, the physics of the bichromatic Bose-Hubbard model [2,3] will be presented from an experimental perspective. We will show to which extent cold atom experiments allow one to access the disorder vs interaction phase diagram by comparing numerical calculations with observations [4]. Based on these examples, we will try to single out some common challenges and specific issues of both physical systems. [1] Arthur Lavarélo and Guillaume Roux, Phys. Rev. Lett. 110, 087204 (2013)

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