Many-body localization in disordered spin and Hubbard chains

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Abstract

The many-body localization (MBL) is the quantum phenomenon involving the interplay of disorder and particle interaction, characterized mainly by the nonergodic behaviour. Recently it is intensively investigated theoretically within one-dimensional many-body models, and experimentally in optical lattices of cold atoms, but might be relevant also for materials with spin chains. In the talk the evidence for the transition to the MBL will be presented as it emerges from numerical investigations on the one-dimensional disordered spin and Hubbard models. It will be shown that within a random-eld spin chain dynamical staggered correlations, which are frequently used as the order parameter for the MBL phase, are closely related to the uniform dynamical spin conductivity and d.c. transport, whereby the transition is best characterized by the universal critical dynamics. On the other hand, an analogous numerical investigation of the disordered Hubbard chain indicates that disordered potential does not induce full MBL, but only charge localization while spin correlations vanish for large times.

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