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Dynamical formation of a magnetic polaron in a two-dimensional quantum antiferromagnet (ONLINE presentation)

lundi 13 septembre 2021 14:00 (1 heure)

The phase diagram of the two-dimensional Fermi-Hubbard model and its connection to high-temperature superconductivity have been the subject of a vast amount of theoretical and experimental studies in the past decades. Here, we present recent results motivated by the new perspective quantum gas microscopes provide. By developing matrix product state based algorithms, we study the dynamics of a single hole in the anti-ferromagnetic background and identify the relevant scales both at low and high temperatures [1]. The effective dynamics can be well captured by a doped hole moving in an anti-ferromagnetic environment as a bound state of spinons and chargons. We furthermore compare this simple effective picture in the finite temperature and finite doping regime of a cold atom experiment and find remarkable agreement [2]. For an unbiased comparison of theories and experiment, we develop a machine learning approach to classify experimental data at finite doping into different theoretical categories in order to determine which among a set of theories captures the physics best [3]. Furthermore, we will discuss how these concepts can be extended to more exotic quantum magnets.

[1] A. Bohrdt, F. Grusdt, MK, New J Phys 22 (2020)
[2] C. Chiu, et al. Science 365, 6450 (2019)
[3] A. Bohrdt, et al. Nature Phys. (2019)

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