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On the condensed matter analog of baryon chiral perturbation theory

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Abstract content

It is shown that baryon chiral perturbation theory, i.e., the low-energy effective theory for pions and nucleons in QCD, has its condensed matter analog: A low-energy effective theory describing magnons as well as holes (or electrons) doped into antiferromagnets. We briefly present a symmetry analysis of the Hubbard and $t-J$-type models, and review the construction of the leading terms in the effective Lagrangian. As a nontrivial application we study different phases of hole- and electron-doped antiferromagnets - in particular, we investigate whether a so-called spiral phase with an inhomogeneous staggered magnetization (order parameter) may be stable. We would like to emphasize that the effective theory is universal and makes model-independent predictions for a large class of systems, whereas the material-specific properties enter the effective theory only through the numerical values of a few low-energy parameters.

Summary

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