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Interacting Fermions in Optical Lattices: Entropy and Temperature[1]

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The challenge for the research field of quantum gases is to gain distinctive and new insights into quantum many-body physics - and, if possible, to answer long-standing questions of an underlying model. The combination of quantum degenerate Fermi gases with optical lattice potentials allows the study of a centerpiece of condensed matter physics, the Fermi-Hubbard model, and thereby provides a new route to open questions in quantum magnetism. The talk will report on quantitative experiments with an interacting Fermi gas of potassium atoms inside an optical lattice. From a direct comparison between measurements and theoretical calculations we quantify the entropy and temperature in the approach to magnetic order. Furthermore, a new method will be presented in which the linear response to a periodic perturbation is used for thermometry of the Fermi gas inside the optical lattice.

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