

Spin-resolved microscopy of strontium SU(N) Fermi-Hubbard systems

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Quantum-gas microscopes provide direct access to the phases of the Hubbard model, bringing microscopic insight into the complex competition between interactions, SU(2) magnetism, and doping. Alkaline-earth(-like) fermions extend this spin-1/2 paradigm by realizing higher symmetries and giving access to SU(N) Hubbard models, with rich phase diagrams to be unveiled. Despite its fundamental interest, a microscopic exploration of SU(N) quantum systems has remained elusive.

In my talk, I will report our recent realization of a quantum-gas microscope for fermionic strontium ^{87}Sr [1]. Our imaging scheme, based on cooling and fluorescence on the narrow intercombination line at 689 nm, enables spin-resolved single-atom detection. By implementing a spin-selective optical pumping protocol, we determine the occupation of each of the 10 spin states in a single experimental realization, a crucial capability for probing site-resolved magnetic correlations. We benchmark our method by observing single-particle Larmor precession across the full spin-9/2 ground-state manifold.

These results establish fermionic strontium quantum-gas microscopy as a powerful approach to study exotic magnetism in the SU(N) Fermi-Hubbard model, and provide a new detection tool for studies in quantum simulation, computation, and metrology.

References

- [1] C. Gas-Ferrer*, A. Rubio-Abadal*, S. Buob, L. Bezzo, J. Hörschle, and L. Tarruell, arXiv:2603.05478.
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Figures

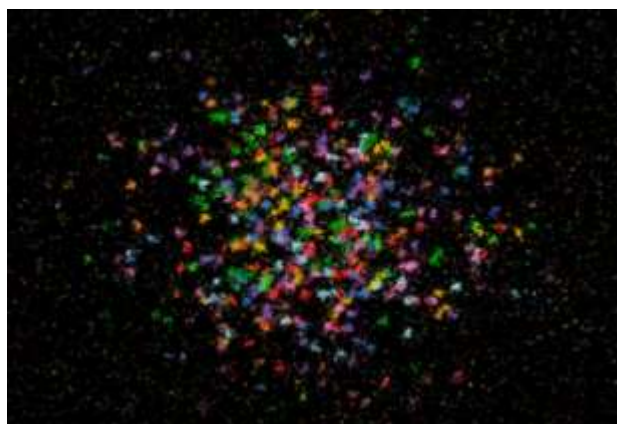


Figure 1: Single-site-resolved fluorescence image of a strontium SU(10) Fermi-Hubbard system, acquired in a single experimental realization. Each of the colours represent a different spin state.
