

High-repetition-rate fermionic quantum gas microscope for quantum simulation

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Fermionic quantum simulators provide a powerful platform for exploring high-temperature superconductivity, topological phases, and many-body dynamics-challenges that persist even with the advent of qubit-based quantum computing. Here, we present recent results from our high-repetition-rate fermionic quantum gas microscope optimized for rapid data acquisition. Fast cycle times are achieved through high-power optical traps, rapid evaporative cooling, and efficient spin-resolved fluorescence imaging. Our system will feature stable bichromatic optical lattices for implementing two-fermion gates and single-particle addressing for precise single-qubit control, enabling the exploration of quantum information processing schemes.