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Fermi Gas Microscope FLORIAN HUBER, MAXWELL F. PARSONS, ANTON MAZURENKO, CHRISTIE S. CHIU, SEBASTIAN BLATT, MARKUS GREINER, Harvard University — Site-resolved imaging and control of bosonic 87-Rb atoms in optical lattices have enabled ground-breaking quantum simulations of magnetic and relativistic Hamiltonians. However, many open questions in condensed matter physics arise in strongly correlated many-body systems of fermions. Ultracold Fermi gases of 6-Li are an ideal platform to study these problems because the light atomic mass leads to fast lattice dynamics. We have successfully loaded 6-Li atoms into an optical lattice in the image plane of a microscope with 0.85 numerical aperture. High-fidelity fluorescence imaging inside this trap requires continuous laser cooling. We report on our progress toward using Raman sideband cooling to perform site-resolved imaging in the Hubbard regime and report on the first demonstration of sideband transitions in deep optical lattices with trap frequencies up to 1 MHz.

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