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Towards site-resolved imaging of fermionic lithium in a two-dimensional optical lattice SEBASTIAN BLATT, FLORIAN HUBER, MAXWELL F. PARSONS, ANTON MAZURENKO, MARKUS GREINER, Harvard University — Recent successes in site-resolved imaging and control of bosonic ^{87}Rb atoms trapped in optical lattices enable new possibilities for studying strongly-correlated quantum systems with ultracold atoms. We aim to extend this technique to fermionic atoms, where quantum magnetism arises naturally due to fermionic statistics. We plan to load ultracold ^{6}Li atoms into a two-dimensional square lattice 10 μm below a high-resolution microscope objective. The light mass of ^{6}Li leads to system dynamics on fast timescales, and its broad Feshbach resonances give us control over the atomic interaction strength. A major challenge with ^{6}Li is cooling the atoms during imaging. The hyperfine structure of ^{6}Li's excited 2P electronic state is not resolved, and cooling techniques are limited. In addition, ^{6}Li has a large recoil energy of 75 kHz. We expect that these difficulties may be solved by combining Raman sideband cooling with a deep optical lattice, and we report our progress on this front.

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