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Toward Microscopy of a Degenerate Bose Gas of Polar Molecules[1] JASON ROSENBERG, LYSANDER CHRISTAKIS, GEOFFREY ZHENG, WASEEM BAKR, Princeton University — Recent years have seen rapid progress in creating and studying ultracold gases of polar molecules. These molecules are attractive candidates for quantum simulation of many-body systems, such as the XXZ model of quantum magnetism, due to their long-range anisotropic interactions and rich internal structure. Here we present our progress toward a new apparatus to perform site-resolved microscopy of a degenerate Bose gas of polar $^{23}Na^{87}Rb$ molecules confined within a 2D optical lattice. We have constructed a rubidium quantum gas microscope, and we are currently working toward the production of ground-state NaRb molecules. We plan to overlap dual 2D Mott insulators of sodium and rubidium atoms before adiabatically sweeping across the Feshbach resonance to form weakly-bound molecules. Following STIRAP to the molecular ground state, evaporation can then proceed using in-vacuum electrodes to generate a strong electric field orthogonal to the lattice plane, suppressing inelastic collisions. These electrodes also allow us to tune the interactions between the molecules. We will perform quantum gas microscopy by dissociating the molecules and performing site-resolved fluorescence imaging of the constituent atoms.

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