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All-optical experiments with ultracold strontium¹ YENNY NATALI MARTINEZ, PASCAL G. MICKELSON, SARAH B. NAGEL, THOMAS C. KILLIAN, Rice University and Rice Quantum Institute — We describe ongoing studies of ultracold atomic strontium using standard laser cooling and trapping techniques. An improved ultra-high vacuum system has been constructed, and magneto-optical trapping on both the dipole-allowed transition at 461 nm (blue) and the intercombination line at 689 nm (red) is performed. The transfer efficiency from the blue to the red MOT is over 50%, resulting in a sample with a temperature less than 2 μK . We have designed a far-off-resonance optical dipole trap (FORT) such that the Stark shift of the upper and lower states of the narrow $^1\text{S}_0-^3\text{P}_1$ transition are comparable, allowing simultaneous Doppler cooling in the FORT. Planned experiments in the FORT include cold collision studies as well as evaporative cooling to quantum degeneracy. We present models and preliminary results.

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