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Enhanced Magnetic Trap Loading and Coupled Optical Resonance Spectroscopy in Strontium DANIEL S. BARKER, BENJAMIN J. RESCHOVSKY, NEAL C. PISENTI, GRETCHEN K. CAMPBELL, JQI, University of Maryland and NIST, College Park, MD 20742 — We investigate a technique to improve the loading of atomic strontium into a magnetic trap using a 688 nm de-pump laser on the $^3P_1$ - $^3S_1$ transition. Strontium degenerate gas experiments typically use a magnetic trap continuously loaded from a Magneto-Optical Trap (MOT) operating on the 461 nm line. A slow ($\approx$1:50,000) leak from the MOT transition populates the magnetically trapped $^3P_2$ state and the $^3P_1$ state in a 1:2 ratio. Pumping $^3P_1$ atoms into $^3P_2$ accelerates magnetic trap loading. For this purpose, we stabilize a 688 nm laser using Coupled Optical Resonance Laser Locking (COReLL [1]) to the 679 nm, 688 nm, and 707 nm lines. The technique allows us to lock multiple lasers while only detecting absorption on the 707 nm transition. Error signals are generated with incommensurate frequency modulation of the pump beams. Preliminary application of the 688 nm laser to our ^{88}Sr MOT results in 20% enhancement of magnetic trap atom number. We discuss the limitations of the loading rate enhancement and the potential for loading enhancement with other repumping strategies.

[1] S C Burd, P J W du Toit, and H Uys. Coupled optical resonance laser locking. *Optics express*, 22(21):740-743, 2014.

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