Enhanced apparatus for AC Zeeman experiments with ultracold potassium\textsuperscript{1} ANDREW ROTUNNO, SHUANGLI DU, CHARLES FANCHER, ANDREW PYLE, SETH AUBIN, William Mary Coll — Ultracold atomic potassium is an excellent candidate for studies of the AC Zeeman force, due to small hyperfine splittings. These experiments require a sufficient sample of potassium near an atom chip supporting RF currents, and an RF source which can make rapid phase-continuous frequency sweeps for fast manipulation of spin states. We present progress on the construction of laser amplifier system for improved laser cooling and trapping of potassium, development of a frequency-agile RF source, and research on RF-capable atom chips. The laser amplifier system consists of two tapered amplifiers for producing 0.4 W of 767 nm light, with a goal of collecting $10^7$ potassium atoms at 100 $\mu$K, which will then be cooled sympathetically with ultracold rubidium. We have constructed a direct digital synthesizer (DDS) to produce 1-400 MHz with Hz-level linewidth and noise level below -60dBc, and the ability to produce fast 100$\mu$s frequency sweeps. We are investigating atom chip designs for supporting large RF currents. Immediate applications include AC Zeeman potentials and traps for atom interferometry, and quantum many-body physics.

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Andrew Rotunno  
William  
Mary Coll

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