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Intra-Hyperfine AC Zeeman Force on an Atom Chip ANDREW ROTUNNO, SHUANGLI DU, SETH AUBIN, College of William and Mary — The AC Zeeman (ACZ) force is a resonant, bipolar, spin state-dependent force for neutral atoms, making it a key ingredient for spin-specific trapping and spin-dependent trapped atom interferometry. Trapped atom interferometers allow for long interrogation times, spatially localized measurements, and offer the possibility of investigating both sub-mm gravity and surface forces (Casimir-Polder), as well as inertial forces. Our current experimental work demonstrates the ACZ force generated by an atom chip's magnetic near-field using RF of a few MHz, driving hyperfine intra-manifold transitions in rubidium. We achieve forces up to 3 times gravity with only 20 mW of RF power. In principle, typically anti-trapped (DC Zeeman) states can be held in an AC Zeeman trap, since the ACZ force is bipolar and can turn any spin state into a strong- or weak-field seeker. Trapping via the ACZ force requires multiple chip wires, where tuning relative phases and power allows positional control over separate spin states, creating separate state-dependent traps with the same RF field. With an eye toward the eventual development of ACZ force traps, we investigate eigenstate mixing over time as a function of power, detuning, and initial state.

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