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Effect of Transverse Magnetic Fields on Cold-Atom Nonlinear Magneto-Optical Rotation DAVID MEYER, University of Maryland–College Park, U.S. Army Research Laboratory, PAUL KUNZ, FREDRIK FATEMI, QUDSIA QURAISHI, U.S. Army Research Laboratory — We investigate nonlinear magneto-optical rotation (NMOR) in cold atoms in the presence of a transverse magnetic field where alignment-to-orientation conversion (AOC) dominates. The AOC mechanism, which relies on AC-Stark shifts generated by a strong, off-resonant probe beam, significantly alters the NMOR resonance. When an additional magnetic field is present, parallel to the electric field of the light, a nested feature within this NMOR resonance manifests. Unlike similar features observed with lower optical power in warm vapors, attributed to optical pumping through nearby hyperfine levels, this feature is due solely to the AOC mechanism. Using numerical simulations, a perturbative solution, and experimental observations we characterize the feature with respect to optical power, optical polarization, magnetic field strength, and magnetic field direction. These results shed further light on the AOC mechanism common to NMOR-based experiments and we demonstrate a potential application to measure transverse DC magnetic fields and spatial gradients.

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