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Measurement of small vector light shifts for an eEDM search NEAL SOLMEYER, KUNYAN ZHU, CHENG TANG, DAVID S. WEISS, The Pennsylvania State University — Optical lattices are an important tool for precision measurements, but the associated vector light shifts can compromise those measurements. As part of an electron electric dipole moment (eEDM) search, we have measured the vector light shift due to a cavity built-up optical lattice using a variation of the Hanle effect on trapped spin-polarized Cs atoms. The measurement is linearly sensitive to the electric field of the non-linearly polarized light, which allows unprecedentedly accurate measurements of the absolute linear polarization quality, to the level of 10^{-9} in fractional intensity. This has in turn allowed us to demonstrably linearly polarize the optical lattice beams to within 2 x 10^{-8}. A 50 μK deep 1.064 μm optical lattice with this polarization gives a 6 Hz vector light shift in Cs. Our approach to improving linear polarization may also find applications in optical lattice clocks, magnetometery and quantum computing.

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