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Measurements of light shifts in cold atoms using Raman pump-probe spectroscopy[1] SAMIR BALI, NATHAN SOUTHER, RICHARD WAGNER[2], PETER HARNISH, MATTHEW BRIEL[3], Dept. of Physics, Miami University — We have measured light shifts, also known as AC Stark shifts, as a function of laser intensity in cold Rubidium atoms by observing sub-natural linewidth gain and loss features in the transmission spectrum of a weak probe beam passing through the atomic sample. The observed energy-level shifts for atoms in a magneto-optical trap (MOT) are found to be consistently higher than that obtained in optical molasses (i.e., when the magnetic field gradient in the MOT is turned off) . Using a simple model of a multilevel Rubidium atom interacting with pump and probe beams, we have calculated the theoretical light shift as a function of intensity. A comparison of these calculated values with the light shift data obtained for molasses reveals good agreement between experiment and theory. Further, our model elucidates the role of the Zeeman shifts arising from the magnetic field gradient in the observed probe transmission spectrum for the MOT.

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