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Model-Free Measurement of the Excited-State Fraction in a ^{85}Rb Magneto-Optical Trap HAI NGUYEN, University of Mary Washington, GOGA VESHAPEDZE, Ilia State University, CHRIS VERZANI, University of Wisconsin Stevens Point, CHARLES FEHRENBACH, JENG BANG, BRETT DEPAOLA, Kansas State University — In many experiments involving magneto-optical traps (MOTs), it is imperative to know the fraction of atoms left in an excited state by the cooling and trapping lasers. In most cases, researchers have used formulas that were derived for simple 2-level systems interacting with a single beam of light having a well-defined polarization, and in the absence of magnetic or electric fields. However a MOT environment is much more complex than this. Here we directly measure the excited fraction in a MOT of ^{85}Rb atoms in a model-independent manner for a wide range of trapping conditions. We then fit our measured fractions to an ansatz based on a simple model. Knowing only the trapping laser's total intensity and detuning from resonance, one can then use this ansatz to accurately predict the excited fraction. The work is a companion piece to similar measurements on a MOT of ^{87}Rb.

Hai Nguyen
University of Mary Washington

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