^{6}Li atom trap for few-body experiments

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A near-resonant all-optical [1] SACHIN SHARMA, B. P. ACHARYA, A. H. N. C DE SILVA, N. W. PARRIS, B. J. RAMSEY, KEVIN. L. ROMANS, Missouri University of Science Technology, A. DORN, Max Planck Institute for Nuclear Physics, Heidelberg, Germany, DANIEL FISCHER, Missouri University of Science Technology — Momentum-resolved scattering experiments with laser cooled targets have been performed with MOTRIMS (Magneto-Optical Trap – Recoil Ion Momentum Spectroscopy) for the last two decades. However, the inhomogeneous magnetic field in a MOT impairs the electron momentum measurement limiting MOTRIMS to ion detection only. The development of MOTReMi (Magneto-Optical Trap Reaction Microscope) made it possible to achieve coincident e^--ion detection by pulsing the inhomogeneous magnetic field. Nevertheless, using this approach comes at the cost of measurement efficiency and a loss of target density. Here we report on the first realization of a near-resonant all-optical ^{6}Li atom trap which does not require an inhomogeneous magnetic field. The temperature and density of the atom cloud were found to be approximately 2 mK and 10^9 atoms/cm^3 respectively, making it ideal for momentum-resolved e^--ion coincidence experiments. Moreover, this technique only requires minor adjustments to the polarization and geometry of the laser beams, with respect to a conventional MOT configuration, making it applicable in existing MOTRIMS experiments.

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