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Photo-ionization of polarized lithium atoms out of an all-optical atom trap: A complete experiment[1] BISHNU ACHARYA, KEVIN ROMANS, NISHSHANKA DE SILVA, KATRINA COMPTON, KYLE FOSTER, COLE RISCHBIETER, ONYX RUSS, SACHIN SHARMA, FATHIYA THINI, SANTWANA DUBEY, DANIEL FISCHER, Missouri University of Science and Technology — We report on a new experiment studying light-atom interactions, where an all-optical, near-resonant laser atom trap is used to prepare an electronically excited and polarized gas target at mK-temperature for complete photo-ionization studies. As a proof-of-principal experiment, lithium atoms in the 2p (m_l=+1) state are ionized by a 266 nm laser source, and emitted electrons and Li^+ ions are momentum analyzed in a COLTRIMS spectrometer. The excellent resolution achieved in the present experiment allows not only to extract the relative phase and amplitude of all partial waves contributing to the final state, but also to characterize the experiment regarding target and spectrometer properties. Photo-electron angular distributions are measured for five different laser polarizations and described in a one-electron approximation with excellent agreement. The study shows that the all-optical trap along with the momentum spectrometer allow to obtain high-resolution and high-quality data providing insights into detailed structures of the final momentum space, which can be used in future measurements where multiphoton or strong-field ionization of polarized lithium atoms, molecules, or ultra-cold atomic samples will be investigated.

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