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Formation of a gas of ultracold LiCs molecules J. DEIGLMAYR, J. LANGE, S.D. KRAFT, A. GROCHOLA, R. WESTER, M. WEIDEMÜLLER, Albert-Ludwigs-University Freiburg, Germany, M. AYMAR, O. DULIEU, Laboratoire Aime Cotton, Orsay, France — Ultracold polar molecules offer intriguing perspectives for the study of many-body effects in strongly interacting gases and the manipulation by external fields. A promising approach to the creation of a large ensemble of ultracold polar molecules in the absolute translational and electronic ground state is the direct formation of ultracold molecules through photoassociation of ultracold atoms. We recently observed the spontaneous formation of ultracold LiCs molecules in a double species magneto optical trap. After spontaneous decay into the electronic ground state, the molecules were ionized by one-color two-photon ionization and detected with a high-resolution time-of-flight mass spectrometer [1]. Here we present the active photoassociation of ultracold LiCs molecules and discuss the state distribution of the produced ground state molecules. Precise knowledge of the molecular structure is required to find the most efficient route for the creation of molecules. We present ab-initio calculations of excited molecular states of LiCs including spin-orbit coupling and study the alignment and orientation of bialkali molecules in combinations of static electric fields and strong laser fields. The perspectives for the production of molecules in the absolute ground state are evaluated.
[1] S. D. Kraft *et al.*, J. Phys. B **39**, S993

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