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Coherent control on cold alkali systems ALBRECHT LINDINGER, FU Berlin — Optimal control of photo-induced molecular processes has attained considerable success in recent years. An important issue in this regard is the information coded in the optimized laser pulse shape which supplies insight about the underlying processes. Small alkali systems are suitable since they exhibit bound states available for resonant transitions with weak fields which aids the theoretical description and thus the interpretation. New control methods are presented to extract the most relevant information from the optimized laser field. Moreover, novel pulse shaper schemes for simultaneous phase, amplitude, and polarization pulse control were designed and applied to alkali dimers, even in a parametric encoding. The results demonstrate the perspectives of adding the polarization and hence all properties of the light field in the pulse modulation. Currently, coherent control was applied to ultracold ensembles motivated by the perspective to perform photoassociation and photostabilization of alkali systems. First results are received regarding optimized multi-photonic excitation to molecular ions and pump-probe experiments exposing signal oscillations. They provide indications for photoassociation and open the perspective for transitions to lower vibrational levels in the electronic ground state, which would be a first step to an internally cold molecular Bose Einstein condensate.

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