SFB/TRR 21 - Seminar

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The penultimate step to the realization of lattice physics with dipolar molecules

Ultracold dipolar systems are of high interest for quantum chemistry, precision spectroscopy, quantum many-body physics, and quantum simulation. The goal of our project is to prepare an ultracold sample of dipolar RbCs ground-state molecules in an optical lattice with a high filling factor. To this end, atomic Rb and Cs samples are mixed in an optical lattice to efficiently form Rb-Cs atom pairs as precursors to ground-state molecules. The basic idea is to go through the superfluid-to-Mott-insulator phase transition twice, first for Cs to create a sample with single-site occupancy, then for Rb on top of Cs to create a homogenous distribution of atom pairs. We investigate the transport properties of superfluid Rb samples while they are moved on top of a strongly interacting sample of Cs atoms. Overlapping is realized in the vicinity of a Feshbach-resonance zero crossing to tune the interspecies interactions. Our experiments show that atom-pair formation is optimized for nulled interactions. We estimate the filling fraction to be 30\% in the center of our trap.

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