SFB/TRR 21 - Seminar

25. April 2013, Ulm

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Dipolar Gases in one-dimensional optical lattices

In the first part of the present talk I consider dipolar Bose gases in 1D optical lattices. I start describing the effect of Dipolar-Induced-Resonance (DIR) on the lowest-energy states of two particles in a harmonic trap. The results are used within a tight binding approach to build an atom-dimer extended Bose-Hubbard model to describe the many body system. In particular, with respect to the usual nearest neighbor extended Hubbard model (EHM) the resonance strongly modifies the range of parameters for which a mass density wave should occur.
In the second part I instead consider dipolar Fermi gases in 1D optical lattice. By combining analytical and numerical methods, I show how the long range nature of the dipolar interaction favors the spontaneously dimerized phase characterized by bond-ordering. This genuine quantum order is sharply distinguished from Mott and spin-density wave phases, and can be unambiguously probed by measuring non local order parameters in-situ imaging techniques.

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