SFB/TRR 21 - Colloquium

26. April 2013, Stuttgart

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Many-body dynamics in strongly interacting Rydberg gases

In this talk, I will briefly introduce and contrast our two main computational approaches for the dynamics of strongly interacting Rydberg gases, and then present applications for each of the methods. First, based on techniques relying on an expansion in the many-body correlations, I will discuss light propagation in EIT configuration in a strongly interacting Rydberg gas, with the emphasis on the Rydberg excitations. Our results are compared to experimental results obtained in the group of M. Weidemüller. Second, based on a purely Hamiltonian dynamics on a truncated Hilbert space, I will discuss the formation of regular excitation structures at off-resonant laser driving, and show that these structures have very different properties from the well-known ground-state crystals. In particular, asymmetric structures can be ßelf-assembledöut of a homogeneous cloud in such a way that automatically the optimum geometry, e.g., for a gate operation is achieved. Finally, I will present first results on our recent efforts to achieve time-dependent modelling including both many-body correlations as well as dissipation and dephasing in a single approach, avoiding drawbacks of the presently established computational techniques. This enables us to study in detail the role of incoherent processes on the many-body dynamics.

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