SFB/TRR 21 - Seminar

9. November 2016, Ulm

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De-excitation spectroscopy of an interacting Rydberg gas

Atoms in highly excited states, known as Rydberg atoms, have strong dipolar interactions that make them ideal candidates for simulators of many-body physics. Experimentally Rydberg atoms are typically created starting from a gas of ground state atoms. However during the excitation, the dynamics involves both the ground state atoms (typically in the millions) and those in Rydberg states (typically tens to hundreds). We observed that a stimulated de-excitation of the Rydberg atoms, at the end of the excitation dynamics, can be used to induce a dynamics that only involves the interacting Rydberg atoms. Through the study of this dynamics, we were able to highlight the effects of the interactions and observe the distribution in energy of the Rydberg atoms in an interacting sample. Furthermore we applied the de-excitation technique to the study of multi-level effects, such as those due to the population of nearby Rydberg levels by black body radiation and we measured the experimental lifetime of the 70S state of 87Rb. The technique used in these experiments could also be used to implement a controlled dissipative process in quasi-classical simulations.

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