SFB/TRR 21 - Seminar

20. Oktober 2016, Stuttgart

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Tailoring long-range interactions via Rydberg dressing

Rydberg atoms offer the possibility to study long range interacting systems of ultracold atoms due to their strong van der Waals interactions. Admixture of a Rydberg state to a ground state, known as Rydberg dressing, allows for increased experimental tunability of these interactions and promises to study novel phases of matter. Here we report on our results of the realization of Rydberg dressing in a many-body spin system. Starting from a two-dimensional spin-polarized Mott insulator of an ultracold gas of rubidium-87, we optically couple one spin component to a Rydberg p-state on a single photon ultra-violet transition at 297 nm. Using microwave Ramsey interferometry in the ground state manifold, we measure the spin-spin correlations emerging due to the admixture of long range interactions to the ground state. We furthermore discuss loss processes affecting our dressed ensembles and present initial indications of improved lifetimes in our system. Our results constitute an important step towards the realization of novel spin models with Rydberg dressed interactions.

20. Oktober 2016, 16:00 Uhr

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