PHYSIKALISCHES KOLLOQUIUM

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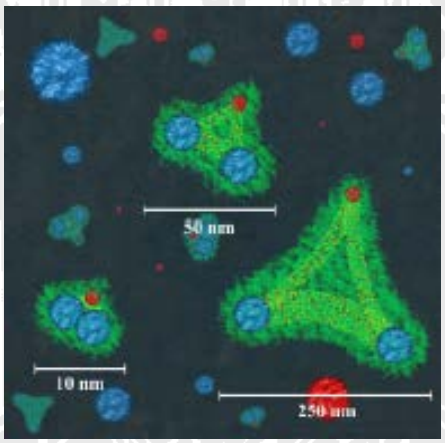
IM GROßEN HÖRSAAL



TWO HEAVY AND ONE LIGHT ATOM – A FRESH VIEW ON AN OLD QUANTUM-MECHANICAL THREE-BODY PROBLEM

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Almost half a century ago, Vitaly Efimov predicted that three interacting identical particles can form bound states even if the pair-wise interaction is too weak to actually bind them. Even more counterintuitive, there is an infinite series of such bound trimer states with the binding energy following a simple geometrical scaling independent of the actual interaction between the particles, which could be of short-range or long-range nature. This universal Efimov scenario, long been sought for in systems ranging from halo nuclei to van-der-Waals molecules, turned out to be rather elusive, until, in 2005, first evidence for the existence of Efimov states was found in experiments on ultracold atomic gases. These experiments made use of tunable scattering resonances (Feshbach resonances) to approach the regime of the Efimov scenario. In a recent serious of experiments, we have extended the Efimov scenario to a system of two different atomic species with large mass imbalance, allowing us, for the first time, to observe an entire series of Efimov resonances. Our experiments reveal the subtle interplay between the universal Efimov scenario and the underlying microscopic details of the interaction.

In my talk, I will give an introduction into the Efimov scenario and its history, and I will discuss the most recent findings.