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New results on Efimov physics and the creation of RbCs molecules

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I will present new results from two different experiments on ultracold gases, both based on scattering length tunability near Feshbach resonances. In a first experiment, we investigate universal few-body physics with ultracold cesium atoms. We detect various Efimov states in a magnetic field range up to 1000G by measuring loss resonances in three-body recombination processes [1]. We find in total five distinct Efimov resonances in the same spin channel, all resulting from different Feshbach resonances. Surprisingly, all Efimov resonances occur at the same value of the scattering length, which points to universality across all Feshbach resonances and rules out a significant variation of the three-body parameter. In a second experiment, we produce a degenerate or near-degenerate ultracold mixture of ^{87}Rb and ^{133}Cs atoms [2]. We investigate the interspecies scattering properties by Feshbach spectroscopy and we determine the background inter-species scattering length to be unusually large and positive. Starting with magneto-associated Feshbach molecules, we perform spectroscopic measurements on the two-photon optical transition that will serve to transfer RbCs molecules to the rovibronic ground state via a STIRAP transfer scheme [3]. This work constitutes a first step towards the production of a quantum gas of ground-state polar molecules.

[1] M. Berninger, A. Zenesini, B. Huang, H.-C. Nägerl, F. Ferlaino, R. Grimm, P. Julienne, J. Hutson, to be published.
[2] A. D. Lercher, T. Takekoshi, M. Debatin, B. Schuster, R. Rameshan, F. Ferlaino, R. Grimm, H.-C. Nägerl, arXiv:1101.1409.
[3] M. Debatin, T. Takekoshi, R. Rameshan, L. Reichsöllner, F. Ferlaino, R. Grimm, H.-C. Nägerl, to be published.