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OBERSEMINAR IM INSTITUT FÜR ANGEWANDTE ANALYSIS Wintersemester 2024/25

Im Rahmen des Oberseminars findet am Montag, den **03. Februar 2025** folgender Vortrag statt:

MAXIM EFREMOV

DLR und Universität Ulm

Universality in low-dimensional three-body systems

We study a quantum three-particle system confined to one or two spatial dimensions. The system consists of two identical heavy particles and one distinguishable particle. It is assumed that there is no interaction between the two heavy bosons, while the mass-unbalanced heavy light subsystems can be tuned to be either bound or unbound. We demonstrate that as the heavy light ground-state energy approaches zero, the three-particle bound states exhibit a universal behavior, independent of the shape of the interaction potential [2, 1, 4]. Furthermore, we show that in this limit the three-particle binding energies and the corresponding wave functions converge to those ones found in the case of the zero-range interaction.

In addition, we study the regime where the heavy–light subsystems have a weakly bound excited state [3]. The associated heavy–light system is characterized by (i) the structure of the weakly bound excited heavy–light state and (ii) the presence of deeply bound heavy–light states. The consequences of these aspects for the behavior of the three-body system are analyzed. We find strong evidence for universal behavior of both the three-body binding energies and the wave functions for different weakly bound excited states in the heavy–light subsystems.

- [1] L. Happ and M. Efremov. Proof of universality in one-dimensional few-body systems including anisotropic interactions. *J. Phys. B: At. Mol. Opt. Phys.* 54, 21LT01, 2021.
- [2] L. Happ, M. Zimmermann, S. Betelu, W. Schleich, and M. Efremov. Universality in a one dimensional three-body system. *Phys. Rev. A.* 100, 012709, 2019.
- [3] L. Happ, M. Zimmermann, and M. Efremov. Universality of excited three-body bound states in one dimension. *J. Phys. B: At. Mol. Opt. Phys.* 55, 015301, 2022.
- [4] J. Thies, M. Hof, M. Zimmermann, and M. Efremov. Tensor product scheme for computing bound states of the quantum mechanical three-body problem. *Journal of Computational Science* 64, 101859, 2022.

Der Vortrag findet in **Raum E20, Helmholtzstr. 18** statt.
Beginn: 16 Uhr (c.t.). Alle Interessierten sind herzlich eingeladen.

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