physikalisches Kolloquium

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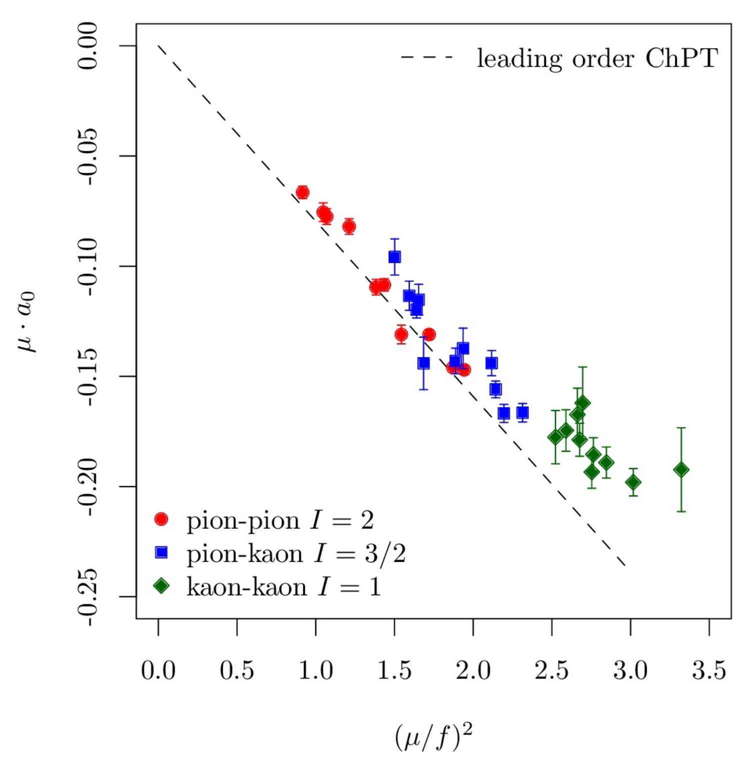
From driven harmonic oscillators to the interaction of Golstone Bosons in QCD

Mo. 23.04.18
16:00 Uhr
Ort: H34

Spontaneous breaking of chiral symmetry in Quantum Chromodynamics (QCD) gives rise to a set of mass-less particles, so-called Goldstone Bosons (GB). In the presence of final quark masses, the Goldstone Bosons acquire a small mass as well, depending on the values of the quark masses. Chiral symmetry also dictates most of the dynamics in QCD at low energies, which lead to the very successful low energy effective theory of QCD known as chiral perturbation theory.

The understanding of the interaction strength between two (or more) GB is of interest for various reasons: for instance theoretically to shed light on the convergence of chiral perturbation theory. But also experimentally, because those interactions play a large role for instance as background in the LHC experiments.

Starting with the example of a simple driven oscillator we will introduce phase shift and scattering length for two particle scattering. Next, we will discuss how determine those quantities in lattice QCD, a discretised regularisation of QCD. Finally, we will present results for various two-GB systems and discuss the applicability of chiral perturbation theory.



Reduced mass times the s-wave scattering length as a function of the squared ratio of reduced mass over meson decay constant for three systems at maximal isospin: pion-pion, pion-kaon and kaon-kaon.
The dashed line represents the leading order prediction of chiral perturbation theory. Significant deviation become visible for the kaon-kaon system.

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