HK 32: Hadron Structure and Spectroscopy VI

Time: Tuesday 16:00–17:30 Location: HK-H9

Group Report HK 32.1 Tue 16:00 HK-H9

The ComPWA project: amplitude analysis with symbolic expressions and multiple computational backends — •Remco de Boer[1], Miriam Fritsch[1], Klaus Götzen[3], Wolfgang Gradl[2], Sebastian Jäger[1], Mathias Michel[2], Klaus Peters[3], Stefan Pflüger[1], Peter Weidenkaff[2], and Leonard Wollenberg[1] — [1]Ruhr-Universität Bochum — [2]Johannes Gutenberg Universität Mainz — [3]GSI Helmholtzzentrum Darmstadt

The search for conventional and exotic hadronic states is a challenging endeavour that has seen significant progress in the past decade. One of the most important techniques for identifying and classifying these states is Partial Wave Analysis. PWA is, however, notoriously difficult, as it requires a thorough understanding of several aspects in particle physics, as well as High Performance Computing. The ComPWA project makes PWA easier to understand and implement with a collection of modern Python libraries. One of the highlights of the project is the ability to express amplitude models as symbolic mathematical formulas that can be inspected and adapted to the specific requirements of an analysis. These expressions not only offer a comprehensible experience of analysing a particle reaction, but also serve as templates to computational backends like TensorFlow that can efficiently fit the model to large data samples.

HK 32.2 Tue 16:30 HK-H9

Quenched glueball spectrum from functional equations — •Markus Huber[1], Christian Fischer[1,2], and Helios Sanchis-Alepuz[3] — [1]Institut für Theoretische Physik, Justus-Liebig-Universität Giessen, Heinrich-Buff-Ring 16, 35392 Giessen, Germany — [2]Helmholtz Forschungsakademie Hessen für FAIR (HFHF), GSI Helmholtzzentrum für Schwerionen- forschung, Campus Gießen, 35392 Gießen, Germany — [3]Silicon Austria Labs GmbH, Inffeldgasse 33, 8010 Graz, Austria

We give an overview of results for the quenched glueball spectrum from two-body bound state equations based on the 3PI effective action. The setup, which uses self-consistently calculated two- and three-point functions as input, is completely self-contained and does not have any free parameters except for the coupling. The results for $J^{PC} = 0^{\pm+}, 2^{\pm+}, 3^{\pm+}, 4^{\pm+}$ are in good agreement with recent lattice results where available.

HK 32.3 Tue 16:45 HK-H9

Chiral EFT of nucleons and pions in the presence of external gravitational field — •Herzallah Alharazin, Dalibo Djukanovic, Jambul Gegelia, and Maxim Polyakov — Ruhr-University Bochum

Effective chiral Lagrangian of nucleons and pions in external gravitational field and the corresponding energy-momentum tensor will be considered. Gravitational form factors of the nucleon and their relation to internal forces will be discussed.

HK 32.4 Tue 17:00 HK-H9

Electromagnetic form factors of the nucleon in $N_f = 2 + 1$ lattice QCD — Dalibor Djukanovic[1,2], Georg von Hippel[3], Harvey B. Meyer[1,2,3], Konstantin Ottnad[3], •Miguel Salg[3], Jonas Wilhelm[3], and Hartmut Wittig[1,2,3] — [1]Helmholtz Institute Mainz, Staudingerweg 18, 55128 Mainz, Germany — [2]GSI Helmholtzzentrum für Schwerionenforschung, 64291 Darmstadt, Germany — [3]PRISMA$^+$ Cluster of Excellence and Institute for Nuclear Physics, Johannes Gutenberg University of Mainz, Johann-Joachim-Becher-Weg 45, 55128 Mainz, Germany

We present results for the electromagnetic form factors of the nucleon computed on the Coordinated Lattice Simulations (CLS) ensembles with $N_f = 2 + 1$ flavors of $\mathcal{O}(a)$-improved Wilson fermions and an $\mathcal{O}(a)$-improved conserved vector current. From the Q^2-dependence of the form factors, we determine the electric and magnetic charge radii and the magnetic moment of the proton. In order to estimate the excited-state contamination, we employ several source-sink separations and apply the summation method. The quark-disconnected diagrams entering into the isoscalar quantities are computed explicitly. For this purpose, a stochastic estimation based on the one-end trick is performed, in combination with a frequency-splitting technique and the hopping parameter expansion. By these means, we obtain a clear signal for the form factors including the quark-disconnected contributions, which have a statistically significant effect on our results.

HK 32.5 Tue 17:15 HK-H9

Lower-order contributions in three-particle femtoscopic correlation functions — •Philipp Schulze-Hagen — TUM, Munich, Germany

In recent years, the femtoscopy technique has been used by the ALICE Collaboration in small colliding systems at the LHC to investigate the strong interaction between hadron pairs. The extension of this experimental technique to the three-particle case aims to deliver the first measurements of genuine three-hadron interactions in the next years. To this end, the two-body effects in the three-particle correlation functions have to be properly accounted for. A recently introduced approach, known as the projector method, combined with the cumulant expansion rule, allows the calculations of such lower-order contributions by projecting known two-particle correlation functions on the three-body phase space. In this work, the relativistic generalization of the projector method will be presented and discussed in the specific case of p–p–π^- and p–p–π^+. It will be shown, in particular, that such method provides significantly smaller uncertainties with respect to the standard data-driven approaches in the extraction of the signal due to the genuine three-particle correlations.