# HK 63: Hadron Structure and Spectroscopy XI

Time: Thursday 14:00–15:30 Location: HK-H8

**Group Report** HK 63.1 Thu 14:00 HK-H8

**The search for dibaryons in coherent photoproduction off the deuteron at the BGOOD experiment** — •Thomas Jude for the BGOOD-Collaboration — Physikalisches Institut, Universität Bonn

The discovery of the $d^*(2380)$ hexaquark, first identified in the fusion reaction $pn \to d\pi^0\pi^0$ has sparked renewed interest in dibaryon searches in the non-strange sector. Evidence of the $d^*(2380)$, with $IJ^P = 03^+$, has been observed in a multitude of final states and observables. Conversely, recent models benefiting from high precision experimental data and theoretical developments have described the $d^*(2380)$ via triangle singularity mechanisms.

The BGOOD experiment at ELSA provides a unique approach to measure such mechanisms via the coherent reaction, $\gamma d \to \pi^0\pi^0 d$. The presented results are from a full kinematic reconstruction, with final state deuterons identified in the forward spectrometer and $\pi^0$ electromagnetic decays in the central BGO Rugby Ball. The strength of the measured differential cross section exceeds what can be described by models of coherent photoproduction and instead is consistent with the three isoscalar dibaryon candidates reported by the ELPH collaboration at 2.38, 2.47 and 2.63 $\mathrm{GeV/c^2}$. A low mass enhancement in the $\pi^0\pi^0$ invariant mass is also observed at the $d^*(2380)$ centre-of-mass energy. At higher centre-of-mass energies, a narrow peak in the $\pi^0 d$ invariant mass at 2114 $\mathrm{MeV/c^2}$ with a width of 20 $\mathrm{MeV/c^2}$ supports a sequential two-dibaryon decay mechanism.

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HK 63.2 Thu 14:30 HK-H8

**Study of Diffractively Produced $K^0_S\pi^-$, $K^0_S K^-$, and $\Lambda\bar{p}$ Final States at COMPASS** — •Julien Beckers — Physik-Department E18, Technische Universität München

The COMPASS experiment is a multi-purpose two-stage spectrometer at the CERN SPS. One of its main goals is to probe the strong interaction at low energies by studying the excitation spectrum of light mesons. This is done by decomposing the data into partial-wave amplitudes with well-defined quantum numbers and searching for resonances in these amplitudes. However, before we can perform such a partial-wave analysis, we have to select the events that correspond to the processes of interest and separate them from background contributions with high purity.

We will present the analysis of three diffractive reactions: $\pi^- + p \to K^0_S K^- + p$, $K^- + p \to K^0_S\pi^- + p$, and $K^- + p \to \Lambda\bar{p} + p$. They have in common that the produced final states contain long-lived neutral particles, that are identified in the spectrometer via their secondary decay vertices. The $K^0_S K^-$ final state, allows us to study $a_J$- and $\pi_J$-like resonances with spin $J$ and complements the $\pi^-\eta$, $\pi^-\eta'$ and $\pi^-\pi^-\pi^+$ final states that have already been studied at COMPASS. The $K^0_S\pi^-$ and $\Lambda\bar{p}$ final states allow us to study excited strange mesons over a wide mass range. We will present the event selection and discuss kinematic distributions, in which first resonance signals are observed. The high precision of our data will allow us to perform detailed searches for new resonances as well as improve parameters of known states.

HK 63.3 Thu 14:45 HK-H8

**Search for the X17 boson at the BESIII experiment** — •Saskia Plura, Achim Denig und Christoph Florian Redmer für die BESIII-Kollaboration — Institut für Kernphysik, Johannes Gutenberg-Universität Mainz, Deutschland

In 2016, the ATOMKI collaboration proposed the existence of a new neutral boson with a mass of 17 MeV to explain their observation of a significant enhancement in the angular correlations of $e^+e^-$ pairs in nuclear transitions of $^8$Be and $^4$He. This new particle, referred to as the X17 boson, sparked interest in the particle physics community.

As the X17 should couple to nucleons, we developed a Monte Carlo generator to evaluate the possibility to search for the X17 boson in $J/\psi \to p\bar{p}\,e^+e^-$ decays, where the (anti-)proton emits an X17 which subsequently decays to an $e^+e^-$ pair. $J/\psi$ decays provide a clean source of nucleon-antinucleon pairs at $e^+e^-$ colliders. We considered both possibilities of the X17 being either a pseudoscalar or an axial vector particle, as well as the QED background.

In this talk, we discuss the feasibility of searching for the X17 at the BESIII experiment, located at the BEPCII collider in Beijing, China, using the available data sample of $10^{10}$ $J/\psi$ events.

HK 63.4 Thu 15:00 HK-H8

**Investigating the ΛK interaction using the femtoscopic technique with ALICE at LHC** — •Rossana Facen for the ALICE-Collaboration — Technische Universität München, München, Germany

Traditionally, the strong interaction among hadrons has been studied through scattering experiments. However, this experimental technique becomes very challenging when unstable particles are taken into account. For this reason, a new experimental method, femtoscopy, has been developed to achieve further understanding in the field of Quantum Chromodynamics (QCD): femtoscopy represents a valid method to investigate the interactions between strong interacting particles.

Recent femtoscopic measurements performed by the ALICE collaboration in Pb-Pb collisions were able to provide the scattering parameters of the interaction between Λ hadrons and charged K mesons, predicting an attractive force between Λ and antikaons and a repulsive potential between Λ and kaons.

In this talk we will present the results on the measured correlation functions of $\Lambda\mathrm{K}^+ \oplus \bar{\Lambda}\mathrm{K}^-$ and $\Lambda\mathrm{K}^- \oplus \bar{\Lambda}\mathrm{K}^+$ pairs obtained in high-multiplicity pp collision at $\sqrt{s} = 13$ TeV, recorded by the ALICE Collaboration. The small emitting source size achieved in such collisions, of the order of 1 fm, provides direct access to the underlying strong interaction between these hadrons. The scattering parameters extracted from the experimental data will be discussed in detail, compared to the findings obtained in Pb-Pb collisions as well as to the available theoretical chiral models.

HK 63.5 Thu 15:15 HK-H8

**Precision studies of the strongly interacting NΛ–NΣ coupled system at the LHC** — •Dimitar Mihaylov — TUM, Physics Department, James-Franck-Straße, 85748 Garching

The study of the strong interaction among stable and unstable hadrons is a fundamental question in nuclear physics and it is a key ingredient for the description of the Equation of State, and the understanding of the structure of dense stellar objects, such as neutron stars. Traditional measurements, including scattering and hypernuclei experiments, are insufficient to provide strong constraints to the theoretical modeling of the interaction between hadrons containing strangeness.

Two particle correlation measurements are a prominent tool to probe the strong interaction with high precision even in the multi-strangeness sector. The ALICE collaboration has demonstrated that high-multiplicity pp collisions are particularly well suited due to the enhanced production of strangeness. Combined with the excellent tracking and particle identification capabilities of the ALICE detector, precision studies of the strong interaction among strange hadrons is possible. The present contribution will discuss the latest ALICE results on the study of the NΛ–NΣ coupled system through measurement of the pΛ correlation function.