# HK 35: Hadron Structure and Spectroscopy V

Time: Tuesday 17:30–19:00 Location: HBR 62: EG 19

**Group Report** HK 35.1 Tue 17:30 HBR 62: EG 19

**The study of unconventional baryon structure in the light quark sector with the BGOOD experiment** — •Thomas Jude for the BGOOD-Collaboration — Physikalisches Institut, Universität Bonn

The existence of exotic multi-quark states beyond the conventional valence three quark and quark-antiquark systems has been unambiguously confirmed in the heavy quark sectors and equivalent structures may be evidenced in the light, *uds* sector. The BGOOD photoproduction experiment at ELSA is ideal to study spatially extended, molecular-like structure which may manifest in reaction mechanisms. BGOOD is comprised of a central calorimeter for neutral meson momentum reconstruction and complemented by a magnetic spectrometer in forward directions for charged particle identification.

Our published results in the strangeness sector may suggest a dominant role of meson-baryon dynamics which has an equivalence to the $P_C$ states in the charmed sector. This includes structure in $K^0\Sigma^0$ and $K^+(\Lambda(1405) \to \pi^0\Sigma^0)$ photoproduction at the $K^*Y$ thresholds.

In the non-strange baryon-baryon sector, coherent meson photoproduction off the deuteron enables access to proposed dibaryon states, including the recently discovered $d^*(2380)$. Our measured differential cross sections at forward angles challenge conventional descriptions of coherent photoproduction, which should be suppressed due to the large momentum transferred to the deuteron.

Supported by DFG projects 388979758/405882627 and the European Union's Horizon 2020 programme, grant 824093.

HK 35.2 Tue 18:00 HBR 62: EG 19

**Search for stable sexaquarks at the LHCb experiment** — •Ellinor Eckstein — HISKP, Bonn University

One of the most prominent questions in the astrophysics and particle physics communities is the nature of dark matter (DM).

This talk will give an introduction to the sexaquark ($S$), a hypothetical particle with *uuddss* quark content, first proposed by Glennys R. Farrar. In contrast to the so called H-dibaryon, sharing the same quark content, the $S$ is assumed to be a tightly bound state. Its unique symmetry structure implies strong binding, thus, a state so low in mass that it is stable on cosmological scales could be possible. Experimental searches to date are not able to rule out such a long lived state. In addition to the $S$ being an excellent DM candidate, it could also shed some light into the $(g-2)$ muon puzzle. As a missing hadronic final state in $R$ measurements, it would narrow the gap between standard model prediction and the experimental value of the anomalous magnetic moment of the muon.

The various predictions regarding requirements the $S$ has to fulfil to be eligible as DM candidate as well as constraints on $S$ DM from astronomical observations and particle physics experiments will be discussed. Further, discovery strategies of the $S$ at the LHCb experiment will be explored, with emphasis on its production in heavy flavoured baryon decays.

HK 35.3 Tue 18:15 HBR 62: EG 19

**Hyperon-production in proton-proton collisions at 4.5 GeV with HADES** — •Snehankit Pattnaik[1], Johan Messchendorp[1], and James Ritman[1,2] for the HADES-Collaboration — [1]GSI, Darmstadt, Germany — [2]Ruhr-Universität Bochum, Germany

This work presents a preliminary analysis of the $\Lambda + K^0_S + p + \pi^+$ final state in proton-proton scattering using data collected at T = 4.5 GeV with HADES at GSI in Darmstadt, Germany. The production of hyperons is of particular interest since it provides information about the role of N* resonances in strangeness production in NN interactions. Furthermore, this study could be relevant in describing the dynamics of high-density matter such as that located at the core of neutron stars.

This talk will introduce some of the data-driven analysis procedures that have been developed to select the final-state of interest. In particular, a kinematic fitter has been used to efficiently select the signal for this exclusive state. Additionally, the efficiency-corrected Dalitz plot will be discussed.

HK 35.4 Tue 18:30 HBR 62: EG 19

**Investigation of the coherent $\gamma d \to 3\pi^0 d$ photoproduction for hints of dibaryon states** — •Richard Volk for the BGOOD-Collaboration — Physikalisches Institut, Universität Bonn

The existence of dibaryon states beyond the deuteron was proposed shortly after the development of the quark model. The recently discovered $d^*(2380)$ in the non-strange sector is a candidate and can possibly be accessed via coherent meson photoproduction off a deuteron, such as $\gamma d \to 2\pi^0 d$ or $\gamma d \to 3\pi^0 d$.

The $\gamma d \to 3\pi^0 d$ channel was measured using the BGOOD photoproduction experiment at ELSA. BGOOD is comprised of a central calorimeter for neutral particle reconstruction and complemented by a magnetic spectrometer in forward directions for charged particle identification.

The $\gamma d \to 3\pi^0 d$ coherent reaction could be sensitive to intermediate isovector & isoscalar dibaryon candidates. If present, this may be most apparent at forward angles where conventional coherent reaction mechanisms are suppressed due to the large momentum transfer to the deuteron. Using data from BGOOD the reaction is reconstructed using identification techniques for the deuteron in the forward spectrometer and $\pi^0$ decays in the central calorimeter.

Supported by DFG projects 388979758/405882627 and the European Union's Horizon 2020 programme, grant 824093.

HK 35.5 Tue 18:45 HBR 62: EG 19

**Photoproduction of $\Sigma^+K^0$ off the proton with the CBELSA/TAPS experiment** — •Nicolas Kolanus for the CBELSA/TAPS-Collaboration — Helmholtz-Institut für Strahlen- und Kernphysik, Universität Bonn, Nussallee 14-16, 53115 Bonn

The CBELSA/TAPS experiment is especially well suited to measure photons from neutral meson decays to study $N^*$- and $\Delta^*$-resonances which are created via photoproduction. By looking at triple neutral pion photoproduction it is also possible to investigate the kaon-hyperon final state, $\Sigma^+K^0$. Data in the strange sector is of specific interest not only to investigate strange decays of non-strange baryons but also for coupled-channel partial wave analyses used to extract the resonances from the data.

Investigating the photoproduction of $\Sigma^+K^0$ poses some challenges since its cross section is significantly lower than the cross section for many non-strange final states while the number of particles to be measured is relatively high. As the particles containing strangeness are detected in the $p3\pi^0$-final state, the signal of interest needs to be carefully separated from the background of other triple neutral pion events.

This talk will focus on the selection of $\gamma p \to \Sigma^+K^0 \to p3\pi^0$ events and discuss preliminary results on the differential cross section as well as on polarisation observables.