# HK 23: Hadron Structure and Spectroscopy VI

Time: Wednesday 14:00–15:45 Location: J-HS M

**Group Report** HK 23.1 Wed 14:00 J-HS M

**Study of neutral pion-pair production in two-photon scattering at BESIII** — •Max Lellmann and Achim Denig for the BESIII-Collaboration — Institut für Kernphysik, Johannes Gutenberg-Universität Mainz

The anomalous magnetic moment of the muon $a_\mu$ is one of the most precisely measured observables of the Standard Model, yet it shows a discrepancy of 3-4$\sigma$ between Standard Model prediction and direct measurement. It is still under discussion whether this discrepancy is a hint for New Physics or caused by the limited understanding of the strong interaction at small energies.

Information on the production of pion pairs in two-photon fusion processes plays an important role in the calculation of the hadronic light-by-light scattering contribution to $a_\mu$.

The BESIII experiment, a $\tau$-charm-factory located at the institute of high energy physics in Beijing, China, offers a perfect testbed for the investigation of two-photon processes at small momentum transfers. The processes $\gamma\gamma \to \pi^0\pi^0$ and $\gamma\gamma^* \to \pi^0\pi^0$ are investigated in the channel $e^+e^- \to e^+e^+\pi^0\pi^0$ using the BESIII experiment. This presentation will discuss the current status of the analysis.

Supported by DFG (SFB1044)

**Group Report** HK 23.2 Wed 14:30 J-HS M

**Meson transition form factor measurements with A2 at MAMI** — Achim Denig[1], Lena Heijkenskjöld[1], Sergey Prakhov[2], and •Sascha Wagner[1] — [1]Johannes Gutenberg-Universität, Mainz, Germany — [2]University of California Los Angeles, USA

A meson transition form factor (TFF) describes the interaction between photons and mesons and hence provides an important probe of the intrinsic electromagnetic structure of mesons. Studies of how the TFF depends on the momentum transfer of the photons, $q^2$, provide a deeper understanding of the dynamics involved. However, only certain $q^2$-regions are accessible experimentally. Within the time-like region ($q^2 > 0$), the TFFs of pseudoscalar mesons can be accessed in decays of $\pi^0$, $\eta$, $\omega$ and $\eta'$ mesons.

The A2 experiment at the Mainz Microtron (MAMI) provides a high yield of light mesons produced by photo-induced reactions on protons, which makes the experiment ideal for precision measurements of meson TFFs. Both completed and upcoming contributions to such measurements by the A2 collaboration will be presented.

Supported by DFG under contract SFB1044.

HK 23.3 Wed 15:00 J-HS M

**A FAIR Phase-0 Project at MAMI** — L. Capozza[1], A. Dbeyssi[1], A. Greiner[1], S. Katilmis[1], F. Maas[1,2,3], J. Moik[1], O. Noll[1,2], D. Rodriguez Pineiro[1], P. Schöner[1], and •S. Wolff[1] — [1]Helmholtz-Institut Mainz, Mainz, Germany — [2]Institute of Nuclear Physics, Mainz, Germany — [3]PRISMA Cluster of Excellence, Mainz, Germany

Within the FAIR phase-0 project, the use of FAIR equipment at other facilities before the completion of the civil construction is envisaged. The PANDA EMC is a good candidate for FAIR Phase-0, due to the advanced state of its development. In particular, the backward endcap (BWEC) of the PANDA EMC, which is developed and built at HIM in Mainz, could be ready by 2021, three years before its foreseen installation. Therefore, an experiment at the MAMI electron beam facility making use of the BWEC is envisaged.

The $\pi_0$ electromagnetic transition form factor via the electroproduction on a nuclear Coulomb field will be quantified. To select this channel, the momentum distribution of the $\pi_0$ needs to be measured by detecting the decay $\gamma$ particles and the scattered electron in the EMC. Monte Carlo simulations on the detection efficiency are ongoing. These will help to set the final geometry of the calorimeter for the FAIR Phase-0 project. Furtheremore, an event generator with realistic signal and background events will be implemented. The talk will address the current status of the simulation for FAIR Phase-0 at MAMI.

HK 23.4 Wed 15:15 J-HS M

**Feasibility Studies of Axial and Tensor Meson Production in Two-Photon Fusion Processes at BESIII** — •Nick Effenberger, Achim Denig, and Christoph Florian Redmer for the BESIII-Collaboration — Institut für Kernphysik ,Johannes Gutenberg-Universität, Mainz, Deutschland

The precision of the Standard Model prediction of the anomalous magnetic moment of the muon, $a_\mu$, is completely limited by the knowledge of the hadronic contributions. Data driven approaches have been developed to improve the calculations. Recent calculations demonstrate the importance of axial and tensor mesons with masses larger than 1 GeV for the hadronic Light-by-Light scattering contribution to $a_\mu$.

The BESIII experiment, located at the BEPCII collider in Beijing, China, has collected data with center-of-mass energies residing in the $\tau$-charm region. These can be used to study the production of axial and tensor mesons in two-photon fusion processes with quasi-real or virtual photons. In this presentation, we discuss the prospects of studying axial and tensor mesons decaying into three or four pion final states. — Supported by DFG SFB1044.

HK 23.5 Wed 15:30 J-HS M

**Towards a Measurement of the Hadronic R Value Using Initial State Radiation at BESIII** — •Thomas Lenz, Achim Denig, and Christoph Florian Redmer for the BESIII-Collaboration — Institut für Kernphysik, Johannes Gutenberg-Universität Mainz, Deutschland

The hadronic vacuum polarization is an important contribution to the running QED coupling constant at the $Z$ pole, $\alpha_{\mathrm{QED}}(M_Z^2)$, and the anomalous magnetic moment of the muon $a_\mu = (g_\mu - 2)/2$. Both quantities allow for crucial precision tests of the Standard Model and their theoretical uncertainties are dominated by hadronic contributions. Experimental inputs, like the hadronic R value $R_{\mathrm{had}} = \sigma(e^+e^- \to \mathrm{hadrons})/\sigma(e^+e^- \to \mu^+\mu^-)$, are used in dispersive approaches to calculate these quantities.

The large data sets collected at the BESIII experiment at the $e^+e^-$ collider BEPCII in Beijing, China, offer an excellent environment for initial state radiation (ISR) measurements. This presentation discusses the feasibility of using the ISR technique to measure $R_{\mathrm{had}}$ in a continuous spectrum.

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