

HK 3: Hadron Structure and Spectroscopy I

Zeit: Montag 14:00–16:00

Raum: HS 13

Gruppenbericht

HK 3.1 Mo 14:00 HS 13

Meson transition form factor measurements with A2 — ●LENA HELJKENSKJÖLD for the A2-Collaboration — Johannes Gutenberg-Universität, Mainz, Germany

A meson transition form factor (TFF) describes the dynamics of the transition between photons and mesons and hence provide an important probe of the intrinsic structure of mesons. High statistics measurements of pseudoscalar TFFs also play a role for the precision frontier of the Standard Model (SM) as they are needed to describe the hadronic Light-by-Light scattering contribution to the SM calculation of the anomalous magnetic moment of the muon. Within the time-like region, the pseudoscalar TFFs can be accessed in decays of π^0 , η , ω or η' mesons.

The A2 experiment at the Mainz Microtron 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.

Gruppenbericht

HK 3.2 Mo 14:30 HS 13

Measurement of the space-like transition form factor and study of direct production of χ_{c1} at BESIII — ACHIM DENIG, TONG LIU, ●YUPING GUO, and CHRISTOPH FLORIAN REDMER for the BESIII-Collaboration — Institut für Kernphysik, Johannes Gutenberg-Universität Mainz, Mainz, Germany

The transition form factors (TFF) of mesons are important experimental inputs to the calculation of the hadronic light-by-light (HLbL) contribution of muon anomaly, a_μ . The HLbL contribution is one of the two limitations of the accuracy of the theoretical calculation. The TFFs can be measured in space-like regime through two-photon process at e^+e^- collision machine, such as BESIII. The advantage of the measurement at BESIII is that the working center-of-mass (CM) energy allows measurement of the TFF in relative low Q^2 region, which is the relevant kinematic region for the calculation. The measurements of the TFF of π^0 as a function of Q^2 from 0.3 to 3.0 GeV² and the amplitude of $\pi^+\pi^-$ with Q^2 from 0.1 to 4.0 GeV² will be presented.

In gamma-gamma interactions, a direct production of non-vector resonances becomes possible at e^+e^- accelerators. Currently, only the direct production of vector meson with $J^{PC} = 1^{--}$ has been observed, mesons with other quantum numbers are produced through the decays of the vector mesons. With a dedicated set of four data samples collected at CM energies around the χ_{c1} mass, the direct production of χ_{c1} in e^+e^- machine has been studied. The status of the analysis will be presented.

HK 3.3 Mo 15:00 HS 13

Measurement of the Hadronic R Value at BESIII — ●THOMAS LENZ, ACHIM DENIG, and CHRISTOPH FLORIAN REDMER for the BESIII-Collaboration — Institut für Kernphysik, Johannes Gutenberg-Universität Mainz, Deutschland

The running QED coupling constant at the Z pole $\alpha_{\text{QED}}(M_Z^2)$ provides, alongside the anomalous magnetic moment of the muon $a_\mu = (g_\mu - 2)/2$, an important precision test of the Standard Model. Their theoretical uncertainties are dominated by the hadronic vacuum polarization. Precise experimental measurements of the hadronic R value $R_{\text{had}} = \sigma(e^+e^- \rightarrow \text{Hadrons})/\sigma(e^+e^- \rightarrow \mu^+\mu^-)$ are used to reduce these uncertainties.

The BESIII experiment at the e^+e^- collider BEPCII in Beijing has collected data at 130 different energies between 2.0 GeV and 4.6 GeV

for measuring the hadronic R value with at least 10^5 hadronic events at each data point. This presentation gives an overview about the current status of that analysis and also discusses the feasibility of using the initial state radiation technique to measure the R value in a continuous spectrum.

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HK 3.4 Mo 15:15 HS 13

Measurement of the π^0 transition form factor at MAMI — ●LUIGI CAPOZZA^{1,2,3}, ALAA DBEYSSI¹, FRANK MAAS^{1,2,3}, OLIVER NOLL^{1,2}, DAVID RODRÍGUEZ PIÑEIRO¹, SAHRA WOLFF^{1,2}, and MANUEL ZAMBRANA^{1,2} — ¹Helmholtz-Institut Mainz, Mainz, Germany — ²Institute of Nuclear Physics, Mainz, Germany — ³PRISMA Cluster of Excellence, Mainz, Germany

An important uncertainty on the hadronic corrections to the anomalous magnetic moment of the muon comes from the so-called “light-by-light scattering” contributions. To estimate such contributions, data on the π^0 transition form factor, parametrising the effective coupling of the neutral pion with the electromagnetic field, are useful. One way to access this form factor is measuring the π^0 electroproduction cross section in the Primakoff kinematical regime. Feasibility studies for this measurement by upgrading the A1 facility at MAMI with the PANDA backward calorimeter within the framework of the phase 0 of the FAIR project will be reported.

HK 3.5 Mo 15:30 HS 13

Electromagnetic Transition Form Factors of the η and ω Mesons — ●SUSAN SCHADMAND — Forschungszentrum Jülich

Electromagnetic transition form factors are determined via meson decays into final states with dileptons. Form factors are evaluated as a function of the momentum transfer which is identical to the invariant mass of the dileptons. The results provide basic knowledge of the structure of hadrons and address the validity of vector meson dominance. The transition form factors are of special interest on account of the impact on the interpretation of the $g-2$ measurements. Here, light-by-light scattering is an important factor. The talk will include experimental results from the experiments WASA at COSY and CLAS at Jefferson Lab.

HK 3.6 Mo 15:45 HS 13

Measurement of the η space-like transition form factor at BESIII — ●THEODOROS MANOUSSOS, ACHIM DENIG, and CHRISTOPH FLORIAN REDMER for the BESIII-Collaboration — Institut für Kernphysik, Johannes Gutenberg-Universität Mainz, Deutschland

Transition form factors (TFF) of light pseudoscalar mesons play an essential role in the calculation of the hadronic light-by-light contributions of the anomalous magnetic moment of the muon, a_μ . To increase the accuracy of its Standard Model prediction to the level of the expected accuracy of the new direct measurements of a_μ , especially the contribution due to the TFF of the η meson must be well understood. Based on data collected by the BESIII experiment at the Beijing Electron Positron Collider II (BEPCII), at center of mass energies at 4.178 GeV, the η meson production in photon photon collisions is studied. The analysis aims at the determination of the space-like η transition form factor in the region of momentum transfer below 3 GeV². In this presentation an overview of the current status of the analysis will be reported.

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