

$N\pi$ electroproduction in the resonance region in 12 GeV era

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Studies of single pion electroproduction off protons is the major source of information on the spectrum and structure of nucleon resonances (N) located in the mass range of $W < 2.0$ GeV which decay preferentially to the $N\pi$ final states [1]. Experimental data from CLAS on the exclusive $p\pi^0$, $n\pi^+$ electroproduction channels already provided unique information on N electroexcitation amplitudes at photon virtualities $Q^2 < 5.0$ GeV² [2]. The analysis of the electroexcitation amplitudes of $\Delta(1232)3/2^+$, $N(1440)1/2^+$, and $\Delta(1600)3/2^+$ resonances within the framework of Dyson-Schwinger equation approach (DSE) demonstrated the possibility of gaining insight into emergence of hadron mass (EHM) [3].

The new CLAS12 [3] detector is only available in the world facility capable of extending the knowledge on N^* electroexcitation amplitudes in the mass range up to $W < 3.0$ GeV and at still almost unexplored range of highest Q^2 ever achieved up to 10 GeV². The first results on $\pi^0 p$ electroproduction studies with the CLAS12 detector will be presented in the talk. The expected results on unpolarized differential cross sections as well as on beam spin asymmetries will provide the important information needed for extraction of the transition helicity amplitudes for most prominent in $\pi^0 p$ channel excited states of the nucleon at $Q^2 < 10$ GeV². Analysis of these results within DSE will allow us to map out momentum dependence of dressed quark mass within the essential range of distances where the dominant part of hadron mass is expected to be generated shedding light on one of the most challenging and still open problem of the Standard Model on emergence of hadron mass and quark gluon confinement from QCD.

1 I.G. Aznauryan and V. D. Burkert, Prog. Part. Nucl. Phys. 67, 1 (2012).

2. D.S. Carman, K. Joo, and V.I. Mokeev, Few Body Syst. 61, 29 (2020).

3.S.J. Brodsky et al, Int. J. of Mod. Phys. E29 203006 (2020)

4. V.D. Burkert, L. Elouadrhiri, K.P. Adhikari et al. Nuclear Inst. and Methods in Physics Research, A 959, 163419 (2020).

The speaker is a student or young scientist

Yes

Section

1. Intermediate and high energies, heavy ion collisions

Primary authors: GOLUBENKO, Anna (Skobeltsyn Institute of Nuclear Physics (SINP MSU)); ISUPOV, Evgeny (Moscow State University, Skobeltsyn Institute of Nuclear Physics); Dr MOKEEV, Victor (JLAB)

Presenter: GOLUBENKO, Anna (Skobeltsyn Institute of Nuclear Physics (SINP MSU))

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