

# Electroproduction of the $pp\pi^-$ System off the Deuteron

## Beyond the Quasifree Region

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### Summary

The proposed research aims at the experimental investigation of the exclusive reaction  $ed \rightarrow e'pp\pi^-$  not far above threshold, as well as in  $\Delta$ -region, and at momentum transfer  $Q^2 \geq 1 \text{ GeV}^2$ . In this kinematical region the reaction is known to be extremely sensitive to short-range correlations in the deuteron. In particular, we propose to perform the experimental measurements: – at  $Q^2 > 1 \text{ GeV}^2$ , – at  $\Delta M = M_{pp\pi^-} - (m_p + m_p + m_{\pi^-}) < 600 \text{ MeV}$ , – with constraints on proton momenta  $p_p > 300 \text{ MeV}/c$ .

The CEBAF CLAS detector fits these conditions perfectly for experimental measurements of the  $ed \rightarrow e'pp\pi^-$  reaction with four charged particles in the final state. The main motivation for this experiment is, of course, the following: **the short distances in the deuteron will contribute significantly to the cross section with the kinematical constraints outlined above.**

The main issues of the proposed experiment are :

– Exclusive measurements of the reaction  $ed \rightarrow e'pp\pi^-$  will permit study of the "simplest" reaction mechanisms when the **proton momenta are large** ( $p > 300 \text{ MeV}/c$ ) **compared to the typical momentum of a nucleon in the deuteron** ( $p < 100 \div 150 \text{ MeV}/c$ ). This could allow in turn to draw conclusions about the possible **contribution of more exotic states in the deuteron** (short-range correlations,  $6q$  states,  $\Delta\Delta$  admixture in deuteron, etc.).

– Detailed investigation of the  $pp$  final state interaction (FSI) in a wide range of  $Q^2$  and  $M_{pp\pi^-}$ . It will provide information about the **size of the proton emission source** in this reaction, and about the dynamics of the reaction which mainly relies on the short distances in the deuteron.

– Detailed investigation of the  $p\pi^-$  invariant mass distribution will allow to study the contribution and the dynamical features of the diagrams with  $\Delta$ -isobar in intermediate and final states. Valuable experimental information could be obtained for understanding the **influence of the nuclear medium on the dynamical features of  $\Delta$ -isobar production in nuclei.**

– Detailed investigation of the  $pp\pi^-$  invariant mass distribution in the region close to the threshold of  $\pi^-$ -production off the deuteron will make it possible **to clarify the situation with regard to the existence of a narrow  $NN$ -decoupled dibaryon resonance.**

– Detailed investigation of the  $pp\pi^-$ -system in the kinematical region close to the  $\Delta$ -region ( $\Delta M > 200 \text{ MeV}$ ) will **test theoretical predictions which concern basic and specific features of the triangle diagrams.**