

# Investigation of the Nucleon-Resonance Structure in Exclusive Reactions of Pion-Pair Production on a Proton by Real and Virtual Photons

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**Abstract**—A phenomenological approach to describing the photo- and electroproduction of pion pairs on a proton has been discussed. Basic quasi-two-particle reactions,  $\gamma_{r,v}p \rightarrow \pi \Delta^{++}$  and  $\gamma_{r,v}p \rightarrow \rho p$ , have been considered. Relevant calculations have been performed with allowance for all known nucleon resonance states with masses less than 2 GeV. A strong  $\pi p \Delta$  form factor have been introduced to compute the contribution of nonresonance mechanisms. The effects of absorption in the initial and final states have been analyzed. The results of the present calculations have been compared with available experimental data.