EXOTIC $\rho^{\pm}\rho^{0}$ STATE PHOTOPRODUCTION AT JLAB FACILITY

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Abstract

It is shown that the list of unusual mesons planned for a careful study with the photon facility at JLAB can be extended by the exotic states $X^{\pm}(1600)$ with $I^G(J^{PC}) = 2^+(2^{++})$ which should be looked for in the $\rho^{\pm}\rho^0$ decay channels in the reactions $\gamma N \to \rho^{\pm}\rho^0 N$ and $\gamma N \to \rho^{\pm}\rho^0\Delta$. The full classification of the $\rho^{\pm}\rho^0$ states by their quantum numbers is presented. A simple model for the spin structure of the $\gamma p \to f_2(1270)p$, $\gamma p \to a_2^0(1320)p$ and $\gamma N \to X^{\pm}(N, \Delta)$ reaction amplitudes is formulated and the tentative estimates of the corresponding cross sections at the incident photon energy $E_\gamma \approx 6$ GeV are obtained: $\sigma(\gamma p \to f_2(1270)p) \approx 0.12$ μb, $\sigma(\gamma p \to a_2^0(1320)p) \approx 0.25$ μb, $\sigma(\gamma N \to X^{\pm}N \to \rho^{\pm}\rho^0 N) \approx 0.018$ μb and $\sigma(\gamma p \to X^-\Delta^{++} \to \rho^-\rho^0\Delta^{++}) \approx 0.031$ μb. The problem of the $X^{\pm}$ signal extraction from the natural background due to the other $\pi^{\pm}\pi^0\pi^+\pi^-$ production channels is discussed. In particular the estimates are presented for the $\gamma p \to h_1(1170)\pi^+ n$, $\gamma p \to \rho'^+ n \to \pi^+\pi^0\pi^+\pi^- n$, and $\gamma p \to \omega\rho^0 p$ reaction cross sections. Our main conclusion is that the search for the exotic $X^{\pm}(2^+(2^{++}))$ states is quite feasible at JLAB facility. The expected yield of the $\gamma N \to X^{\pm}N \to \rho^{\pm}\rho^0 N$ events in a 30-day run at the 100% detection efficiency approximates 2.8×10^6 events.