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Nucleon resonances in the photoproduction gamma p –> Lambda K*

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The high-precision cross-section data for the reaction $\gamma p \to K^{*+}\Lambda$ reported by the CLAS Collaboration at the Jefferson Laboratory have been analysed based on an effective Lagrangian approach in the tree-level Born approximation. Apart from the t-channel K, κ, K^* exchanges, the s-channel nucleon (N) exchange, the u-channel Λ, Σ, $\Sigma^*(1385)$ exchanges, and the generalized contact term, the contributions from the near-threshold nucleon resonances in the s-channel are also taken into account in constructing the reaction amplitudes. It is found that to get a satisfactory description of the differential cross section data, at least two nucleon resonances should be included in the s-channel interaction diagrams. By including the $N(2060)5/2^-$ resonance, which is responsible for the shape of the angular distribution near the $K^*\Lambda$ threshold, and one of the $N(2000)5/2^+$, $N(2040)3/2^+$, $N(2100)1/2^+$, $N(2120)3/2^-$ and $N(2190)7/2^-$ resonances, one gets fits that describe the cross-section data quite well, with the fitted resonance masses and widths compatible with those advocated by the Particle Data Group (PDG). The resulted predictions of the beam, target, and recoil asymmetries are found to be quite different from various fits, indicting the necessity of data on those spin observables for $\gamma p \to K^{*+}\Lambda$ to further pin down the resonance contents and parameters in this reaction.

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