Spin 3/2 Nucleon Resonances in Kaon Photoproduction

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We have studied and compared different formulations of spin 3/2 nucleon resonances by means of kaon photoproduction on the proton $\gamma p \to K^+\Lambda$. The consistent formulation for spin 3/2 nucleon resonances proposed by Pascalutsa (Model A) [1] and the previous one proposed by Adelseck *et al.* [2] have been used in deriving the scattering amplitudes. The amplitudes are calculated by means of the relevant Feynman diagrams for the process. The number of possible diagrams is enormous. Therefore, in this study we only focus on the s-channel nucleon resonance contribution. All nucleon resonances with spin up to 3/2 listed by the Particle Data Group are included in this study. The unknown parameters in both formulations are extracted fitting the available experimental data, including differential and total cross section, as well as polarization observables. We found that the gauge-invariant formulation of the spin 3/2 resonances (Model A) leads to a better agreement with experimental data. Comparison between the result of present study and that of the previous calculations [3,4] are shown in Fig. 1.

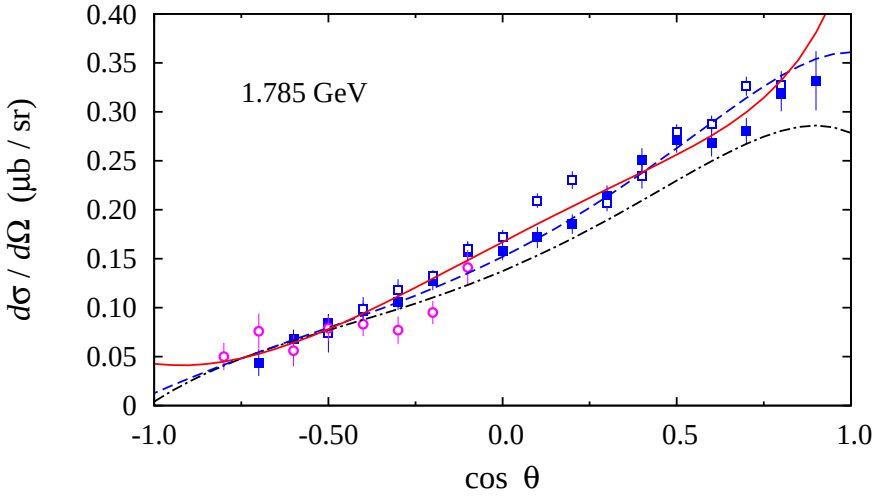

Figure 1: Calculated differential cross sections obtained from Kaon-Maid [3] (dash-dotted line), model A (dashed line) and Ref. [4] (solid line). Experimental data are from the CLAS collaboration (solid squares [5] and open squares [6]) and Crystal Ball collaboration [7] (open circles).

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