Comment on "Mass and $K\Lambda$ Coupling of the N^* (1535)"

Recently it has been argued that the effective coupling of the $N^*(1535)$ to $K\Lambda$ is even larger than its coupling to the ηN channel [1] from an analysis of data on the $J/\psi \to \bar{p}\Lambda K$ and $J/\psi \to \bar{p}p\eta$ decays within a resonance isobar model. Based on those couplings of $N^*(1535)$ to the ηN and $K\Lambda$ (and the πN) states new properties of the resonance have been derived, namely, a mass of 1400 MeV and a width of 270 MeV, that differ radically from the standard values.

As additional if not decisive argument in favor of the strong $N^*(1535)$ coupling to the $K\Lambda$ channel the authors of Ref. [1] claimed that the low-energy cross section data on the reaction $pp \to pK^+\Lambda$ are compatible with a large contribution from the $N^*(1535)$ resonance and that it is, in fact, needed to reproduce the experimental result. In their calculation based on tree-level Feynman diagrams the final-state interaction (FSI) between the proton and the Λ was neglected and it was concluded that the $N^*(1535)$ dominates the reaction at low energies. However, this explanation is in contradiction with all other interpretations of the $pp \to pK^+\Lambda$ cross section where the enhancement at low energies is due to the Λp FSI rather than the $N^*(1535)$ resonance [2–4]. The result in Ref. [1] is also in disagreement with the experimental Dalitz plot [5] which strongly suggests that at low energies the $pp \to pK^+\Lambda$ reaction is dominated by the contribution from the $N^*(1650)$ resonance.

In Ref. [4] we proposed to study the role of the FSI in the $pp \to pK^+\Lambda$ reaction by analyzing differential observables, namely, the Dalitz plot distribution. By making cuts on the $K^+\Lambda$ invariant mass one can isolate the contribution from N^* resonances and project the Dalitz plot on the Λp axis. In that case an enhancement at low Λp masses would manifest the presence of a FSI. On the other hand [4], N^* resonances that couple to the $K^+\Lambda$ system can never produce such an enhancement.

Recently the COSY-TOF Collaboration [5] measured the Dalitz plot distribution and presented the projections on the Λp invariant mass with different cuts on the $K^+\Lambda$ masses. The Λp spectra are shown in Ref. [5] in terms of the angular distributions of the Λ in reference to the proton direction in the $K^+\Lambda$ cm system, i.e., as a function of the Λp helicity angle θ_H. The relation between θ_H and the Λp invariant mass is given by Eq. (8) of our paper [4]. Figure 1 shows experimental results for the cut on the $K^+\Lambda$ mass chosen in order to isolate the contribution from low lying

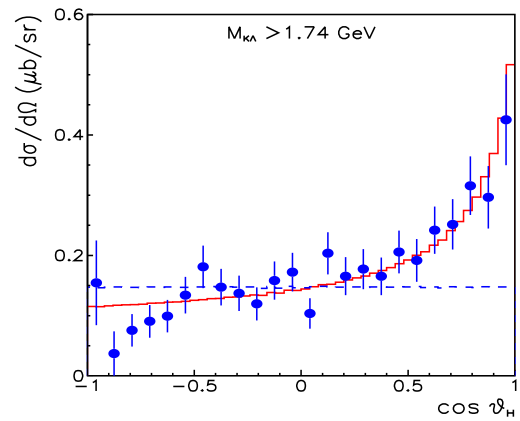

FIG. 1 (color online). The Λp helicity angle spectra for $K^+\Lambda$ masses $M_{K\Lambda} > 1.74$ GeV for the reaction $pp \to pK^+\Lambda$ at $p_{\rm beam} = 2.85$ GeV$/c$. The solid histogram is our calculation including the Λp FSI, while the dashed line is obtained without FSI but with the $N^*(1535)$ parameters from Ref. [1]. The data are from Ref. [5].

N^* resonances (with the convention $-\theta_H$ applied in the experiment [5] so that the lowest Λp masses corresponds to $\cos\theta_H = 1$). The data indicate a strong θ_H asymmetry. The solid histogram is our result obtained with inclusion of the Λp FSI. The dashed line shows a calculation employing the $N^*(1535)$ parameters claimed in Ref. [1] but without FSI. It is obvious that the latter scenario is in disagreement with the experiment.

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