1 - 23 Production of Hidden Charm Baryon $N^*(4261)$ from $\pi^- p \to \eta_c n$ Reaction

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In the classical constituent quark model (CQM), all baryons can be described as three-quark (qqq) states. However, many difficulties and deviations have emerged in explaining the mass spectra and decay properties of some baryons by using the CQM, such as the strong coupling of $N^*(1535)$ to the final states with strangeness and the mass inverse problem between $N^*(1535)$ and $N^*(1440)$. In order to solve the above problems, pentaquark ($qqqq\bar{q}$) models for some excited baryons are introduced by researchers. However, since many conventional quark models have adjustable ingredients, it will be difficult to distinguish the $N^*(1535)$ and many other proposed dynamical generated states from those generated states (qqq for baryons and $q\bar{q}$ for mesons) in these classical quark models. This difficult can be avoid if we can find the hidden charm baryons composed by $qqqc\bar{c}$ quarks.

Recently, in Refs. [1, 2] the meson-baryon coupled channel unitary approach has been used to predict several narrow hidden charm N^* and Λ^* resonances with masses above 4 GeV and widths smaller than 100 MeV, which are dynamically generated in the PB and VB channels. Here, P and V stand for the pseudoscalar and vector mesons, respectively. These hidden charm baryons, if observed in experiment, could be easily distinguished from those three-quark states defined by conventional constituent quark models.

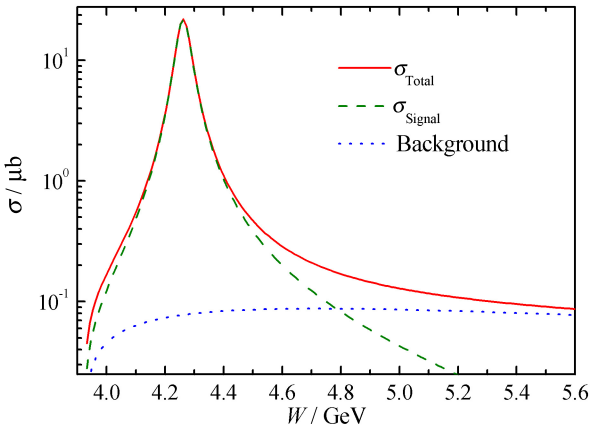

Fig. 1 (color online) The energy dependence of the total cross section for the $\pi^- p \to \eta_c n$ reaction.

In this work[3], we study the possibility for searching the hidden charm $N^*(4261)$ in $\pi^- p \to \eta_c n$ reaction in the frame of the effective Lagrangian approach and isobar model. The relevant total and differential cross sections for this reaction by considering the contributions from the $N^*(4261)$ resonance and the nucleon pole are calculated. As shown in Fig. 1, the results show that there exist a significant enhancement for the $N^*(4261)$ production near its threshold. Moreover, it is found that the contributions from the s-channel $N^*(4261)$ resonance are absolutely dominant. Besides, it should be noted that the effect of background on the differential cross section at backward angles is so pronounced that the contribution from background cannot be ignored.

References

[1] J. J. Wu, R. Molina, E. Oset, B. S. Zou, Phys. Rev. Lett, 105(2010)232001.

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[3] X. Y. Wang, X. R. Chen, Europhys Lett, 109(2015)41001.