

Recent progress and prospectives on hadron physics study from the Lanzhou Research Group

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Collaboration

Abstract content

Charmed baryons are expected to exhibit a rich spectrum of states. However, only a few of these states have been confirmed and there must be many more excited states need to be found. Being one of them, the charmed baryon $\Lambda_c(2880)^+$ was observed by CLEO collaboration, BaBar collaboration and Belle collaboration, respectively. Now, more studies should still be required to enrich our understanding of $\Lambda_c(2880)$. Exploring the production of $\Lambda_c(2880)$ is helpful to reveal the inner structure of $\Lambda_c(2880)$ as well as studying the decay behavior of $\Lambda_c(2880)$. Therefore, we calculate the total and differential cross sections of $p\bar{p} \rightarrow \Lambda_c^- \Lambda_c(2880)^+$ by the effective Lagrangian approach under a D meson exchanged mechanism. The numerical results indicate that $p\bar{p} \rightarrow \Lambda_c^- \Lambda_c(2880)^+$ is a suitable process to explore the $\Lambda_c(2880)^+$ production at \overline{P} ANDA. Considering the designed luminosity of \overline{P} ANDA ($2 \times 10^{32} \text{ cm}^{-2} \text{ s}^{-1}$) and an overall efficiency of 10%, we can estimate that there are about $10^8 \Lambda_c(2880)^+$ events accumulated per day. Based on the theoretical calculation, we suggest future \overline{P} ANDA experiment to perform the search for the charmed baryon $\Lambda_c(2880)^+$. This experimental study can not only further confirm $\Lambda_c(2880)^+$ by different processes, but also provide more abundant information to $\Lambda_c(2880)^+$, which will be valuable to reveal the underlying structure of $\Lambda_c(2880)^+$. As a new scientific project HIAF(High Intensity Heavy-Ion Accelerator Facility) is being planned to be built in the near future, the proton beam with intensity of 3.0×10^{12} and energy of 12 GeV/c will be achieved. The possibilities for more hadron physics research will be also discussed in the talk.

Primary author(s) : YUAN, Xiao-Hua (Institute of Modern Physics CAS); LIN, Qing-Yong (Institute of Modern Physics CAS); LIU, Xiang (Lanzhou University)

Co-author(s) : XU, Hu-Shan (Institute of Modern Physics CAS); RONG, Xin-Juan (Institute of Modern Physics CAS); LI, Zhan-Kui (Institute of Modern Physics CAS)

Presenter(s) : YUAN, Xiao-Hua (Institute of Modern Physics CAS)

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