

Electromagnetic transitions of doubly charmed baryons of $J^P = 3/2^+$

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In 2002 the SELEX experiment collaboration reported the evidence of the doubly charmed baryon $\Xi_{cc}^+(3519)$ in the process of $\Xi_{cc}^+ \rightarrow \Lambda_c^+ K^- \pi^+$. Recently, the LHCb collaboration discovered a new state $\Xi_{cc}^{++}(3621)$, which is considered to be a new doubly charmed baryon, in the $\Lambda_c^+ K^- \pi^+ \pi^+$ mass spectrum. Many theoretical methods and models, such as the bag model, various quark models, QCD sum rules and lattice QCD, etc, were applied to study these two states and related doubly and triply heavy baryons.

The method of light-cone QCD sum rules has been widely applied to study the decay properties of hadrons. In this work, we employ this powerful method to study the electromagnetic transition of the Ξ_{cc}^{*++} into $\Xi_{cc}^{++}\gamma$, whose decay width is estimated to be $13.7_{-7.9}^{+17.7}$ keV. The results are slightly larger than those obtained using the bag model, but quite comparable with those obtained using some other methods and models. We note that the electromagnetic transition of $\Xi_{cc}^{*++} \rightarrow \Xi_{cc}^{++}\gamma$ is probably the main decay mode of the Ξ_{cc}^{*++} , and its decay width is large enough for the Ξ_{cc}^{*++} to be observed in the $\Xi_{cc}^{++}\gamma$ channel. We propose to continually search for it in future LHCb and BelleII experiments. Similarly, we have also investigated electromagnetic transitions of some other doubly charmed and bottom baryons, including $\Xi_{cc}^{*+} \rightarrow \Xi_{cc}^+\gamma$, $\Omega_{cc}^{*+} \rightarrow \Omega_{cc}^+\gamma$, $\Xi_{bb}^{*0} \rightarrow \Xi_{bb}^0\gamma$, $\Xi_{bb}^{*-} \rightarrow \Xi_{bb}^-\gamma$, and $\Omega_{bb}^{*-} \rightarrow \Omega_{bb}^-\gamma$. In the end, we may present our preliminary results of the pion decays of doubly charmed and bottom baryons.

Type

Parallel talk

Sessions (parallel only)

QCD

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