

1 Supplementary material for LHCb-PAPER-2023-044

This appendix contains supplementary material that will be posted on the public CDS record but will not appear in the paper.

The two-dimensional distributions in Fig. 1 illustrate the distribution of candidates in the $(m_{\Sigma_c^{++}K^-}, m_{\Sigma_c^{++}D^{(*)-}})$ plane within the Λ_b^0 and Σ_c^{++} mass windows. Figure 2 presents the 1D projections in $m_{\Sigma_c^{++}K^-}$ and $m_{\Sigma_c^{++}D^{(*)-}}$ for the $\Lambda_b^0 \rightarrow \Lambda_c^+ D^- \pi^+ K^-$ candidate decays. These plots reveal the observation of excited Ξ_c^+ resonances (e.g., $\Xi_c(3080)^+$) decaying into Σ_c^{++} and K^- within the $\Sigma_c^{++}K^-$ system. Regarding the structures indicated in the $\Sigma_c^{++}D^{(*)-}$ spectrum, particularly the indications around $m_{\Lambda_c^+ \pi^+ D^-} = 4440$ MeV in $\Lambda_b^0 \rightarrow \Sigma_c^{++} D^- K^-$ decay candidates, a definitive conclusion cannot be reached due to the limited size of the dataset.

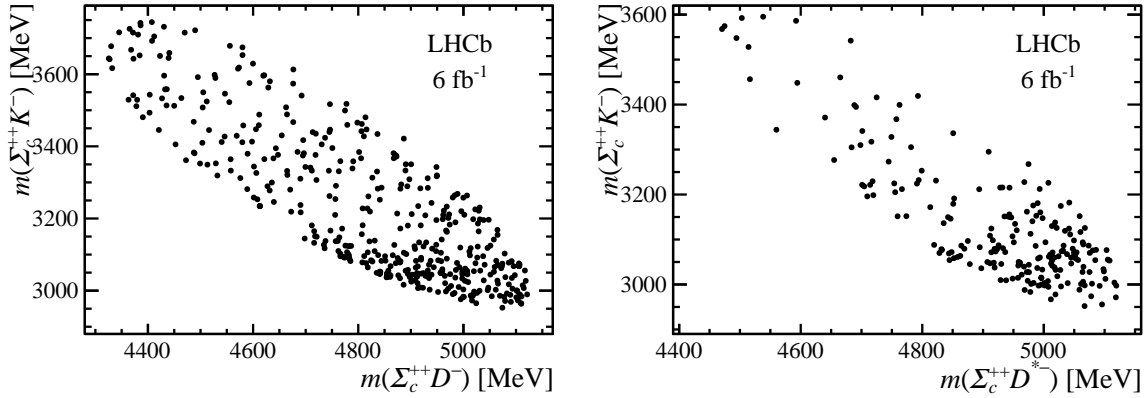


Figure 1: The two-dimensional distributions of $(m_{\Sigma_c^{++}K^-}, m_{\Sigma_c^{++}D^{(*)-}})$ within the Λ_b^0 and Σ_c^{++} mass windows for real data of (left) $\Lambda_b^0 \rightarrow \Lambda_c^+ D^- \pi^+ K^-$ decays and (right) $\Lambda_b^0 \rightarrow \Lambda_c^+ D^{*-} \pi^+ K^-$ decays.

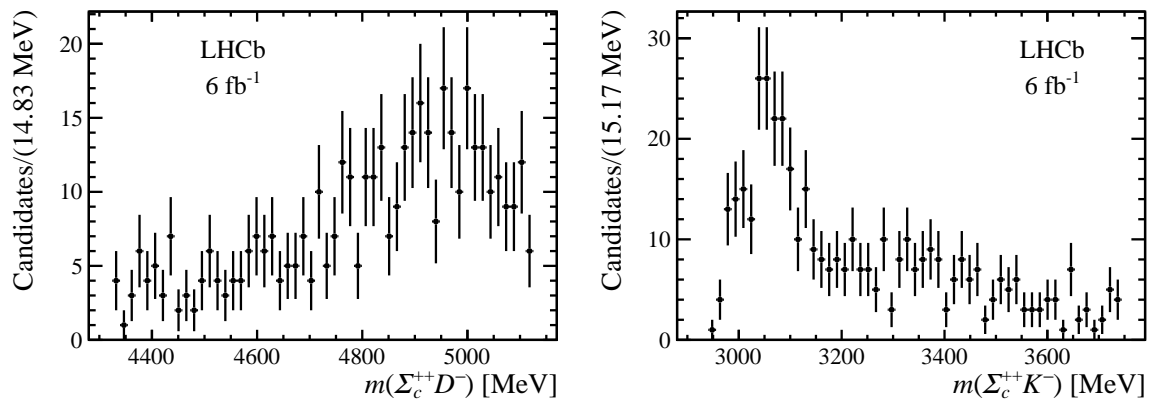


Figure 2: The (left) $m(\Sigma_c^{++} D^-)$ and (right) $m(\Sigma_c^{++} K^-)$ mass distributions of $\Lambda_b^0 \rightarrow \Lambda_c^+ D^- \pi^+ K^-$ candidate decays within the Λ_b^0 and Σ_c^{++} mass windows.

13 **References**

14 .