

1 Supplementary material for LHCb-PAPER-2018-022

2 Ratios of branching fractions of b-hadron decays into two-body and quasi-two-body
 3 $\psi(2S)X$ and $J/\psi X$ final states provide useful information on the production of charmonia
 4 in b-hadron decays, *e.g.*, these ratios can be used to test factorization. The ratios are
 5 defined as

$$R_\psi \equiv \frac{\mathcal{B}(X_b \rightarrow \psi(2S)X)}{\mathcal{B}(X_b \rightarrow J/\psi X)},$$

6 where X_b denotes a b hadron. These ratios for selected decays of Λ_b^0 , B_c^+ , B^+ , B^0 and B_s^0
 7 hadrons are shown in Fig. 1 (left). The corresponding phase-space-corrected ratios R_ψ^{cor}
 8 are defined as

$$R_\psi^{\text{cor}} \equiv \frac{\mathcal{B}(X_b \rightarrow \psi(2S)X)}{\mathcal{B}(X_b \rightarrow J/\psi X)} \frac{\Phi(X_b \rightarrow J/\psi X)}{\Phi(X_b \rightarrow \psi(2S)X)},$$

9 where Φ denotes the full two-body or three-body phase-space. For three-body decays,
 10 the resonance structure is neglected. These ratios are shown in Fig. 1 (right).

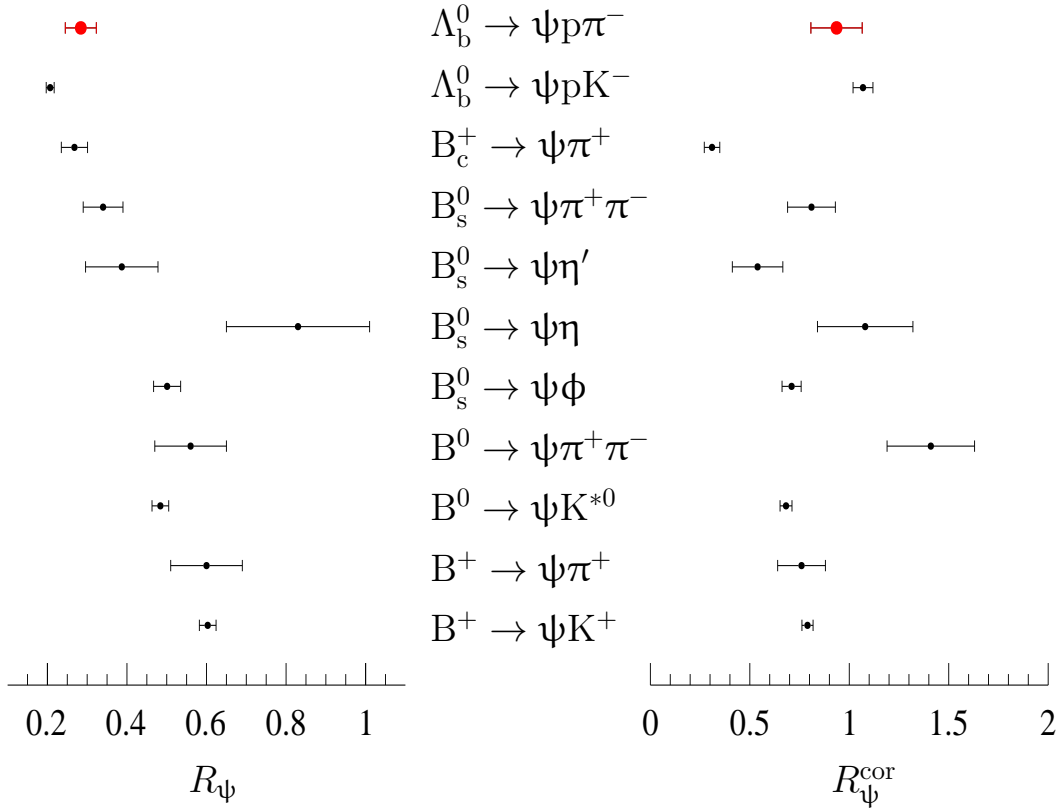


Figure 1: The ratios (left) R_ψ and (right) R_ψ^{cor} for selected three-body and two-body decays of beauty hadrons [1–6].

11 An alternative layout of Figure 1(right)

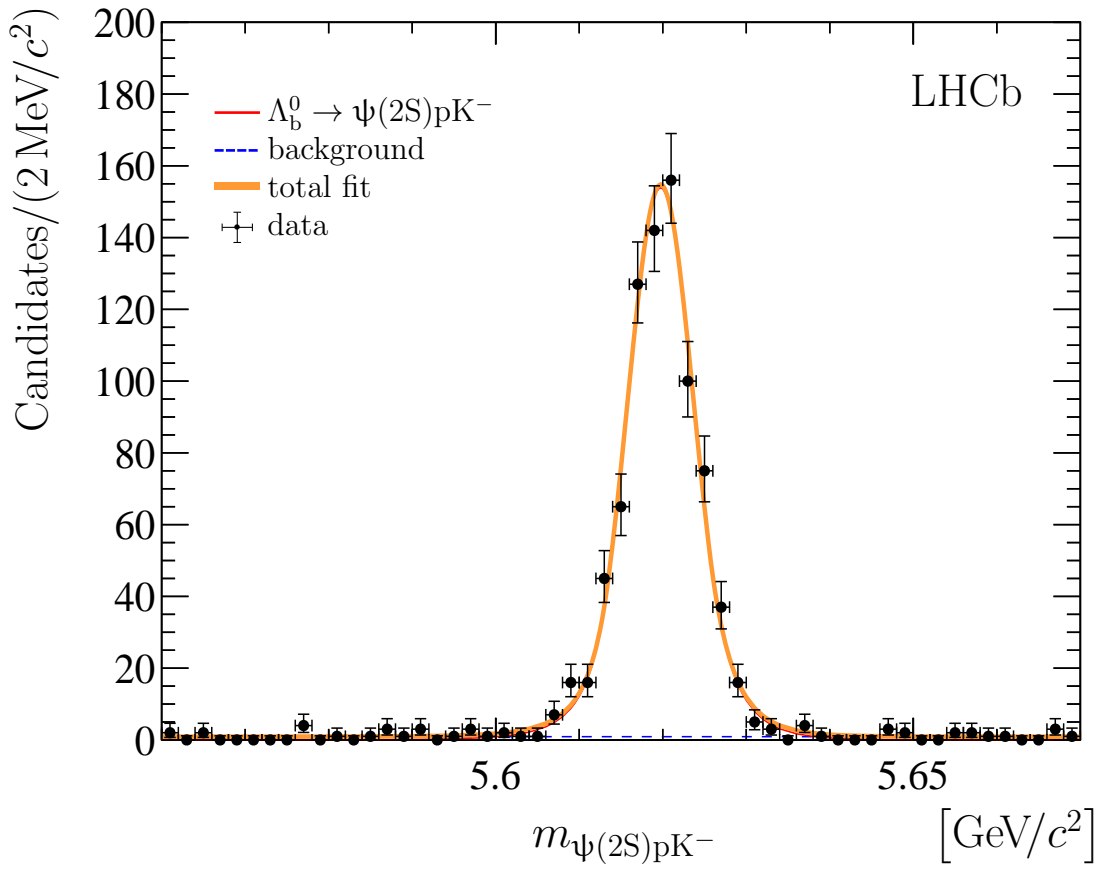


Figure 2: Mass distribution of the $\Lambda_b^0 \rightarrow \psi(2S)pK^-$ candidates.

References

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