

# Supplementary material for LHCb-PAPER-2022-040

## 1 Angular distributions

The distributions of the five angular variables  $\vec{\Omega}$  in the  $B^+ \rightarrow J/\psi\phi K^+$  decay and the  $B^0 \rightarrow J/\psi\phi K_S^0$  decay are shown in Fig. 4 and Fig. 5, respectively. The corresponding fit projections are overlaid on the data. The results are consistent with those in Ref. 9.

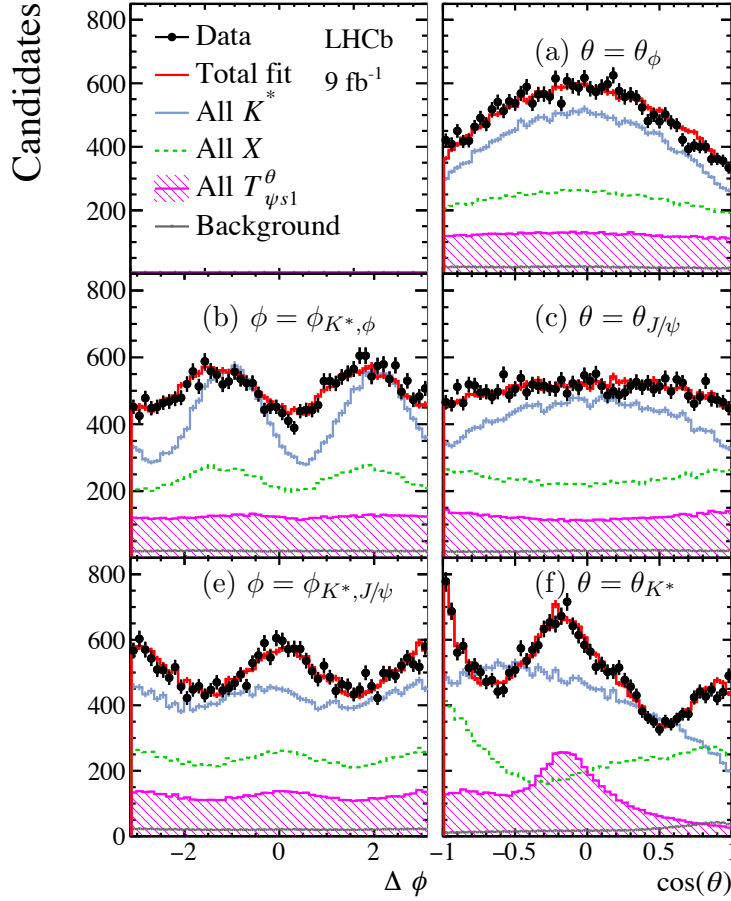


Figure 4: Fit projections of angular observables  $\vec{\Omega}$  of the  $B^+ \rightarrow J/\psi\phi K^+$  decay.

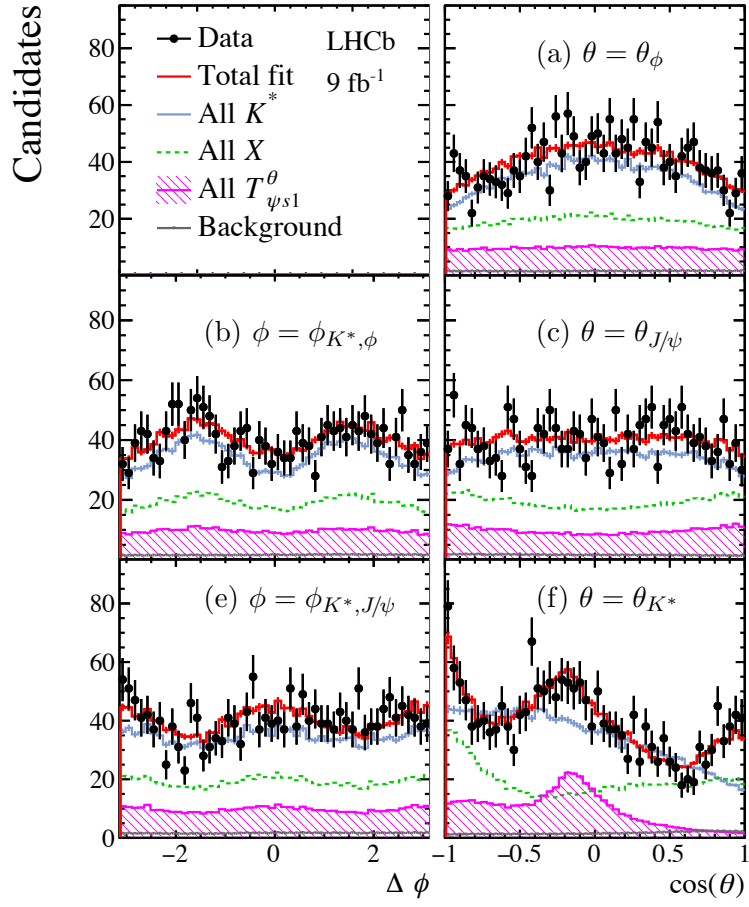


Figure 5: Fit projections of angular observables  $\vec{\Omega}$  of the  $B^0 \rightarrow J/\psi\phi K_S^0$  decay.

## 2 Intermediate states in the default model

The intermediate states considered in the default model are summarised in Table [3](#).

Table 3: Intermediate states considered in the default model.

$K^*$ contributions		$X$ contributions	$T_{\psi s_1}$ contributions
$2^1P_1$	$K(1^+)$	$\eta_{c2}(4150)$	$T_{\psi s_1}^\theta(4000)$
$2^1P'_1$	$K'(1^+)$	$T_{\psi\phi_1}^\eta(4630)$	$T_{\psi s_1}(4220)$
$1^1P'_1$	$K_1(1400)$	$\chi_{c0}(4500)$	
$1^1D_2$	$K_2(1770)$	$\chi_{c0}(4700)$	
$1^3D_2$	$K_2(1820)$	$NR_{J/\psi\phi}$	
$1^3D_1$	$K^*(1680)$	$\chi_{c1}(4140)$	
$2^3S_1$	$K^*(1410)$	$\chi_{c1}(4274)$	
$2^3P_2$	$K_2^*(1980)$	$\chi_{c1}(4685)$	
$2^1S_0$	$K(1460)$		

### 3 Figure 3 drawn separately

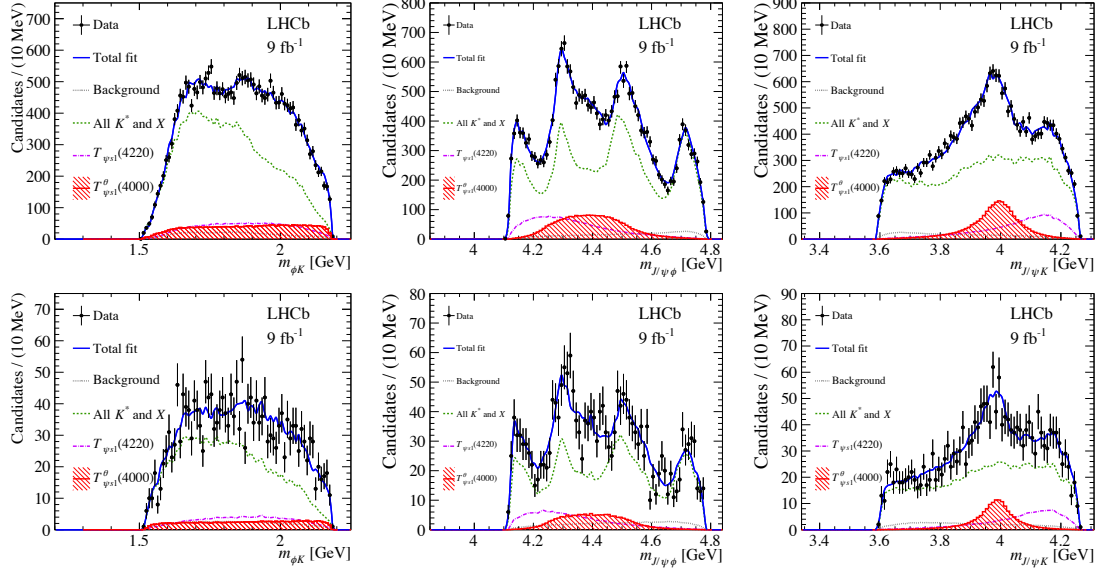


Figure 6: Distributions of (left)  $m_{\phi K}$ , (middle)  $m_{J/\psi \phi}$ , and (right)  $m_{J/\psi K}$ , overlaid with the corresponding projections of the default fit model. The upper and lower rows correspond to the  $B^+ \rightarrow J/\psi \phi K^+$  and  $B^0 \rightarrow J/\psi \phi K_S^0$  decays, respectively.