

Supplementary material for LHCb-PAPER-2016-013

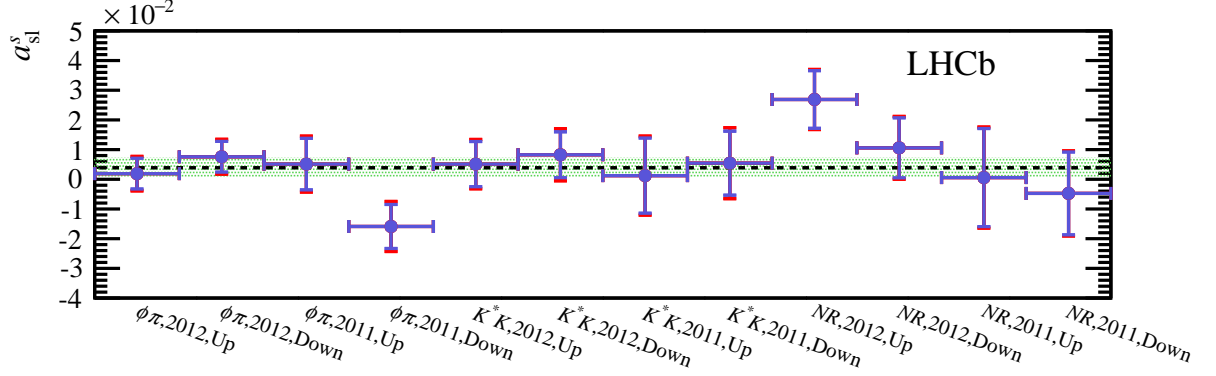


Figure 1: Measured values of a_{sl}^s for the twelve individual data sets, with all corrections applied. The blue error bars represent the statistical uncertainties. The red error bars represent the statistical and systematic uncertainties, added in quadrature. The uncertainties are partially correlated between the three regions ($\phi\pi$, K^*K , and NR) mainly due to the corrections for the detection asymmetries. The dashed line and the green horizontal band represent the average value of a_{sl}^s and its uncertainty.

Table 1: Branching fractions (\mathcal{B}), efficiency ratios ($\varepsilon_{\text{sig}}/\varepsilon_{\text{bkg}}$), background-over-signal ratio ($f_{\text{bkg}}/f_{\text{sig}}$) and effective asymmetries for the different background sources. The branching fractions are obtained from the PDG [1]. The signal branching fraction is $\mathcal{B} = (7.9 \pm 2.4)\%$. The b -hadron fractions from the pp collision are $f_u/f_s = f_d/f_s = (3.86 \pm 0.22)$ [2] and $f_{A_b^0}/f_s = (2.34 \pm 0.31)$ [3].

Mode	\mathcal{B} [%]	$\mathcal{B}(c \rightarrow \mu)$ [%]	$\varepsilon_{\text{sig}}/\varepsilon_{\text{bkg}}$	$f_{\text{bkg}}/f_{\text{sig}}$ [%]	A_{bkg} [%]
$B^+ \rightarrow D^{(*)0} D_s^{(*)+} X$	7.9 ± 1.4	6.5 ± 0.1	4.34	5.8 ± 1.1	-0.6 ± 0.6
$B^0 \rightarrow D^0 D_s^{(*)+} X$	5.7 ± 1.2	6.5 ± 0.1	4.08	4.4 ± 1.0	-0.18 ± 0.13
$B^0 \rightarrow D^- D_s^{(*)+} X$	4.6 ± 1.2	16.1 ± 0.3	6.41	5.6 ± 1.5	-0.18 ± 0.13
$B_s^0 \rightarrow D_s^{(*)-} D_s^{(*)+}$	4.5 ± 1.4	8.1 ± 0.4	3.68	1.0 ± 0.3	–
$A_b^0 \rightarrow A_c^+ D_s^{(*)+} X$	$10.3_{-1.8}^{+2.1}$	4.5 ± 1.7	4.51	3.0 ± 1.4	$+0.5 \pm 0.8$
$B^- \rightarrow D_s^+ K^- \mu^- \nu X$	0.061 ± 0.010	–	2.43	1.3 ± 0.2	0.6 ± 0.6
$\bar{B}^0 \rightarrow D_s^+ K_S^0 \mu^- \nu X$	0.061 ± 0.010	–	2.89	1.1 ± 0.2	0.18 ± 0.13

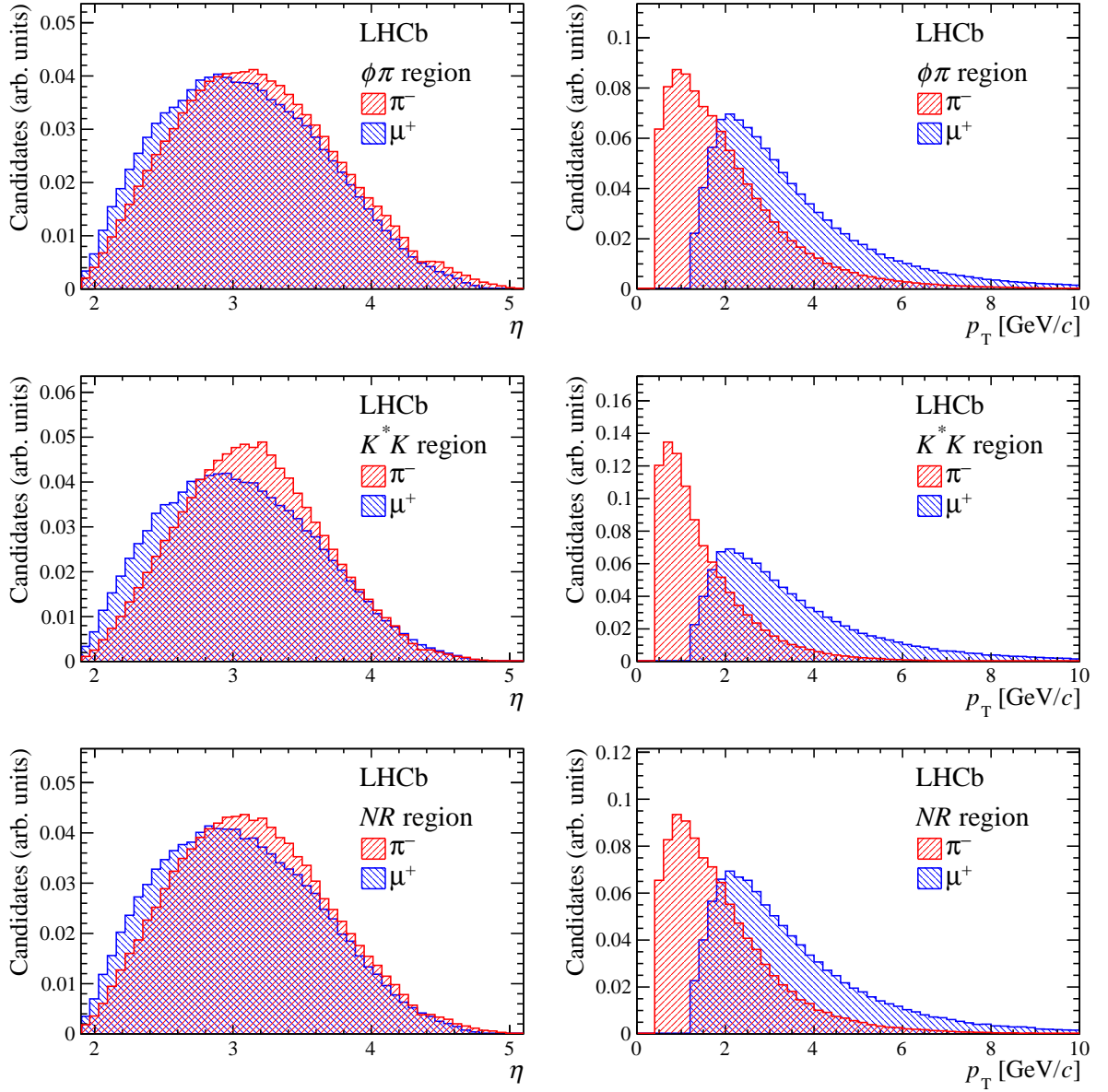


Figure 2: Background-subtracted p_T and η distributions of the final-state pion and muon. For these histograms both data-taking periods and both magnet polarities are combined.

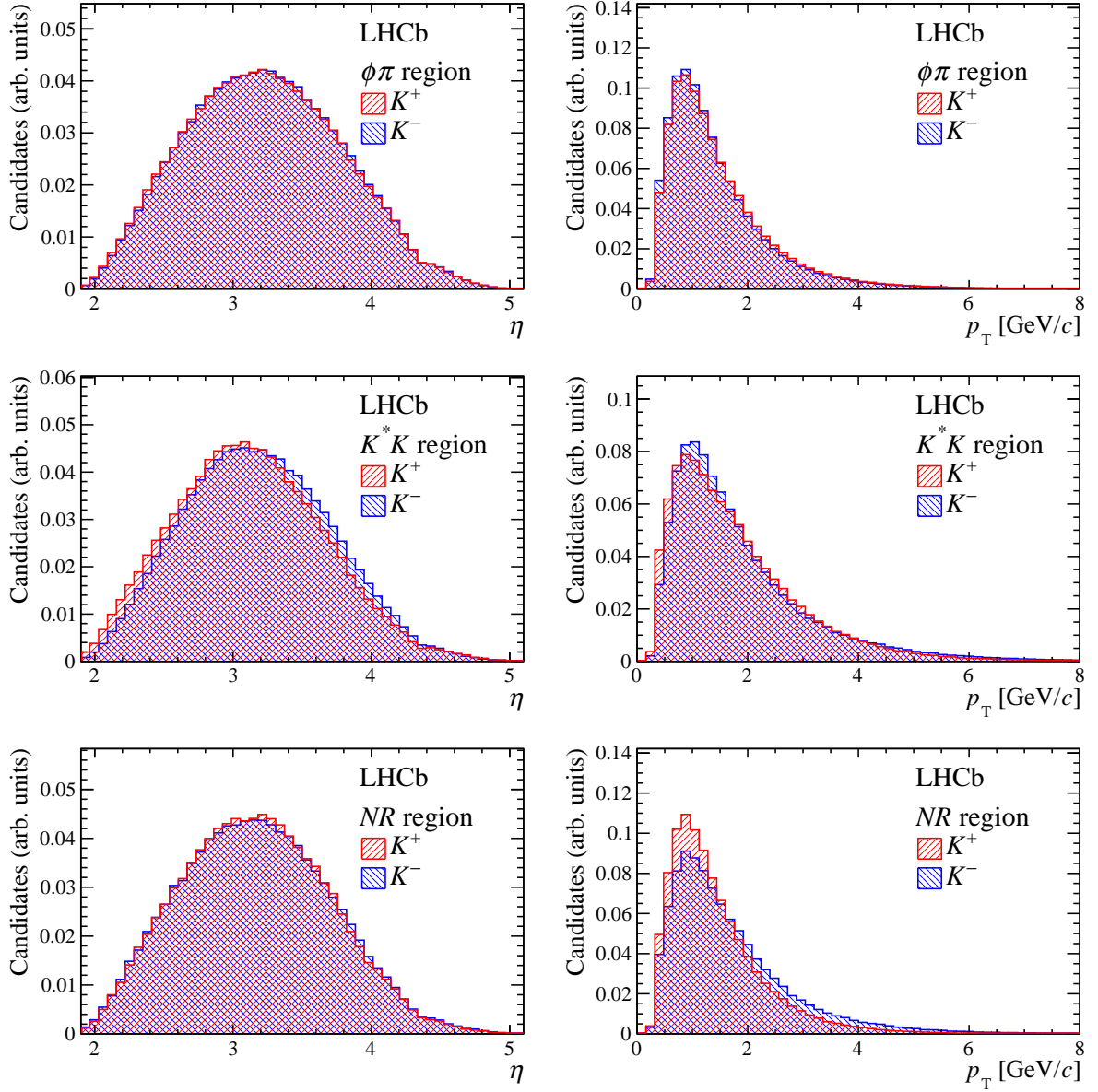


Figure 3: Background-subtracted p_T and η distributions of the final-state kaons. The K^+ meson is defined as the kaon with same charge as the muon, and the K^- as the kaon with the opposite charge. For these histograms both data-taking periods and both magnet polarities are combined.

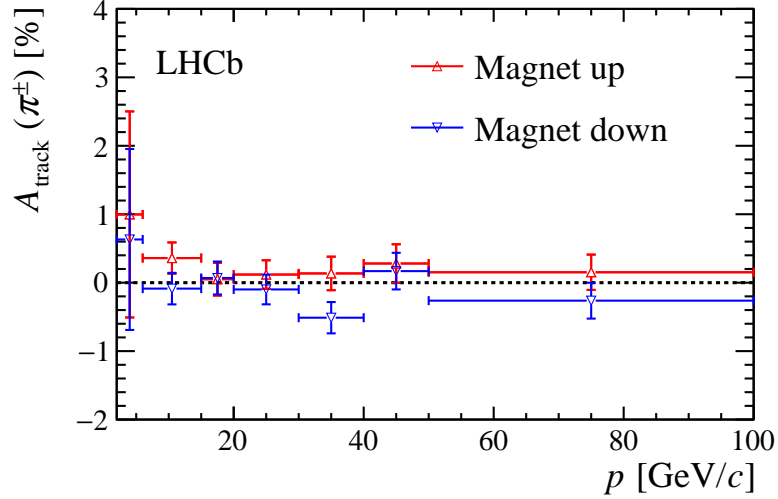


Figure 4: Tracking asymmetry as function of momentum p . The weighted average of both methods described in the text is shown in each bin with its statistical uncertainty.

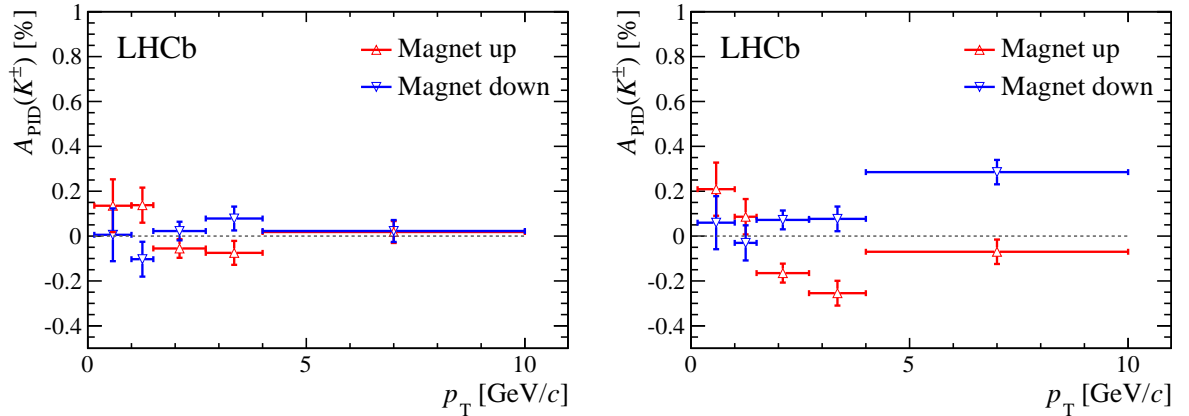


Figure 5: Asymmetry of the PID requirements on the kaon as a function of transverse momentum, p_T , for (left) the $\phi\pi$ region, and (right) the K^*K and NR regions. The asymmetry is measured from a large sample of $D^{*+} \rightarrow D^0(K^-\pi^+)\pi^+$ decays selected without PID requirements.

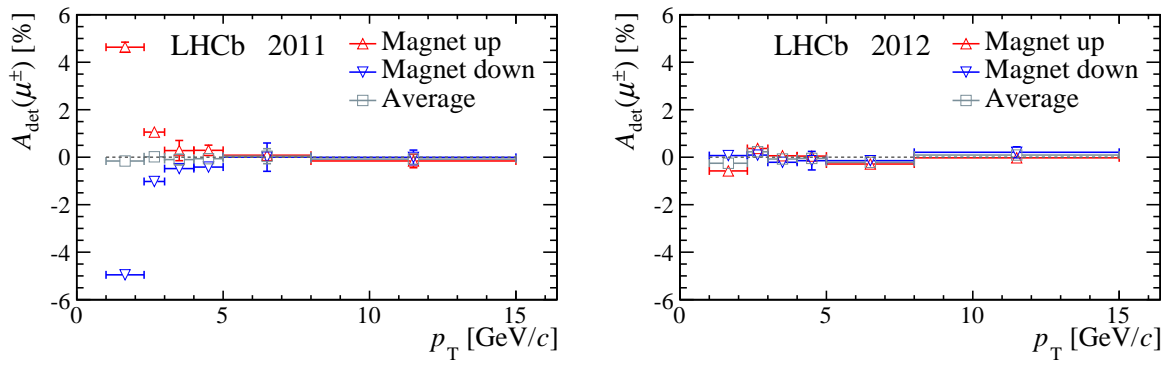


Figure 6: Combined muon PID and hardware trigger asymmetry as a function of muon transverse momentum, p_T , for (left) 2011 data and (right) 2012 data. The asymmetry is measured with a tag-and-probe method using a sample of $J/\psi \rightarrow \mu^+ \mu^-$ decays. The asymmetry for each magnet polarity is larger in the 2011 data at low p_T due to a misalignment of the muon stations, which is corrected in the 2012 data.

References

- [1] Particle Data Group, K. A. Olive *et al.*, *Review of particle physics*, Chin. Phys. **C38** (2014) 090001, and 2015 update.
- [2] LHCb collaboration, R. Aaij *et al.*, *Measurement of the fragmentation fraction ratio f_s/f_d and its dependence on B meson kinematics*, JHEP **04** (2013) 001, [arXiv:1301.5286](#), f_s/f_d value updated in LHCb-CONF-2013-011.
- [3] LHCb collaboration, R. Aaij *et al.*, *Measurement of b hadron production fractions in 7 TeV pp collisions*, Phys. Rev. **D85** (2012) 032008, [arXiv:1111.2357](#).