1 Supplementary material for LHCb-PAPER-2020-043

The energy distribution of the data classified in centrality intervals and the centrality percentile distribution in intervals of N_c are shown in Fig. 1 and Fig. 2, respectively. The distribution of the $N_{\rm part}$ variable within the different N_c is shown in Fig. 3.

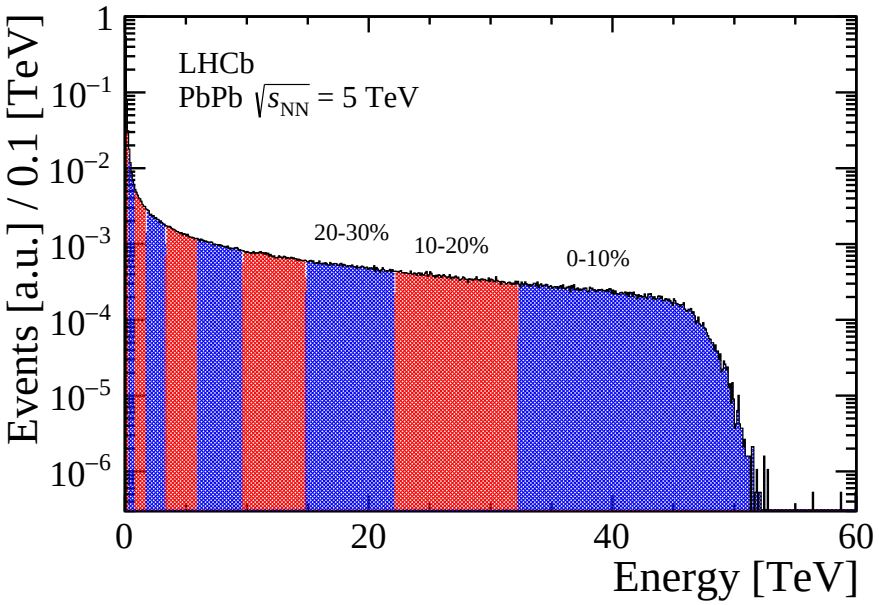

Figure 1: Distribution of the PbPb minimum bias events as a function of the total energy deposit in the electromagnetic calorimeter. The events are assigned to the defined centrality classes, 0-10% representing the 10% most central collisions (low impact parameter).

The differential J/ψ photo-production yield as a function of the rapidity for $\langle \mathrm{N_{part}} \rangle = 19.7 \pm 9.2$ is shown in Table 1. Analogously, the double-differential J/ψ photo-production yield versus the transverse momentum is shown in Table 2 for the same range of $\langle \mathrm{N_{part}} \rangle$. The differential J/ψ photo-production yields integrated over rapidity and transverse momentum versus $\langle \mathrm{N_{part}} \rangle$ are shown in Table 3.

Table 1: Differential yields of coherently produced J/ψ mesons as a function of y for $\langle \mathrm{N_{part}} \rangle = 19.7 \pm 9.2$, corresponding to the N_c range [1000,10000]. The first uncertainty is statistical and the second systematic.

y	$\frac{\mathrm{d}Y_{J/\psi}}{\mathrm{d}y}$
[2.00, 2.83]	$(2.39 \pm 0.16 \pm 0.46) \cdot 10^{-4}$
[2.83, 3.66]	$(1.38 \pm 0.06 \pm 0.14) \cdot 10^{-4}$
[3.66, 4.50]	$(0.53 \pm 0.06 \pm 0.08) \cdot 10^{-4}$

All systematic uncertainties are summarised in Table 4.

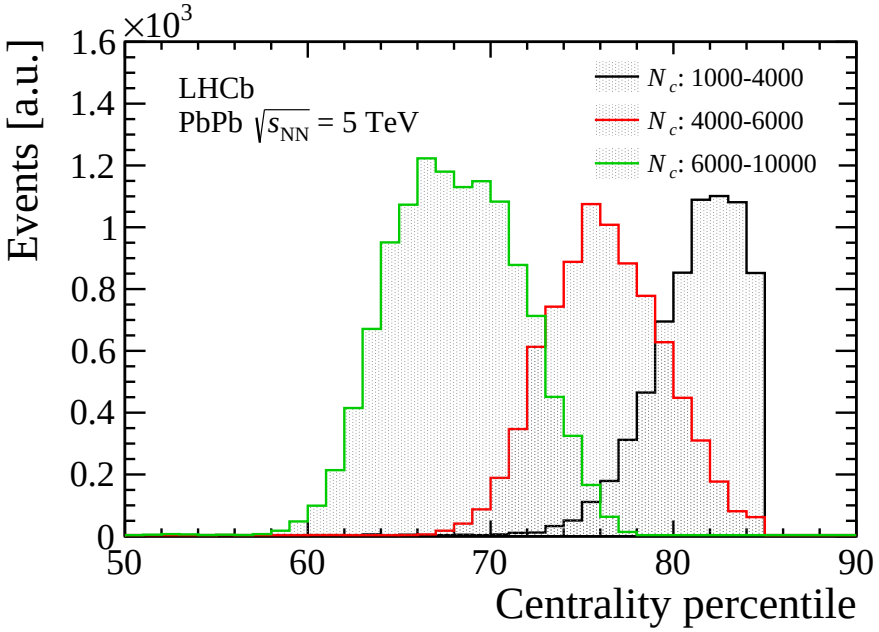

Figure 2: Distribution of the centrality percentiles in three N_c intervals of the minimum bias events.

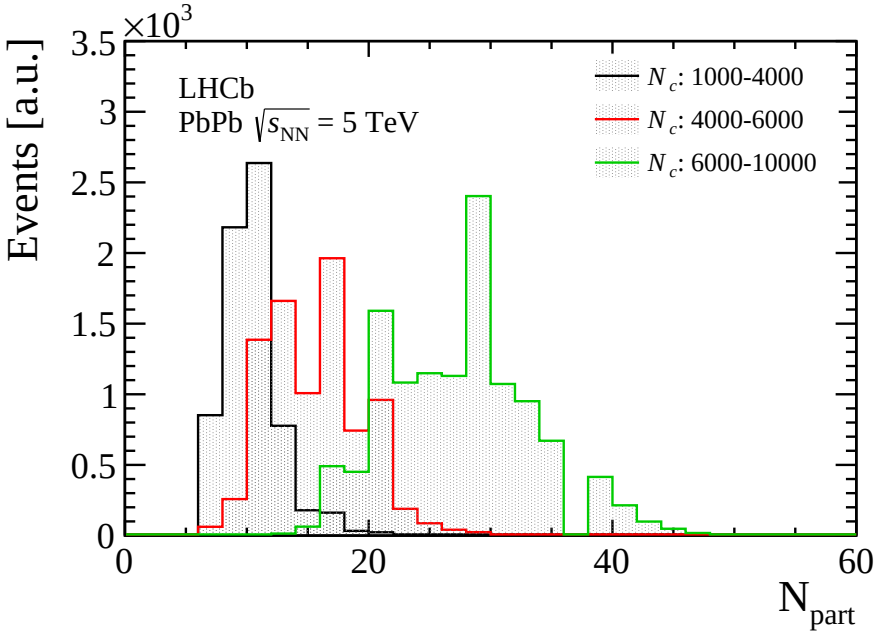

Figure 3: Distribution of $N_{\rm part}$ in three N_c intervals of the minimum bias events.

Table 2: Differential yields of coherently produced J/ψ mesons as a function of $p_{\rm T}$ for $\langle {\rm N_{part}} \rangle = 19.7 \pm 9.2$, corresponding to the N_c range [1000,10000]. The first uncertainty is statistical and the second systematic.

$p_{\rm T}$[GeV/c]	$\frac{{\rm d}^2 Y_{J/\psi}}{{\rm d}p_{\rm T}{\rm d}y}$[(GeV/$c$)$^{-1}$]
0.00 – 0.02	$(3.48 \pm 0.58 \pm 0.33) \cdot 10^{-4}$
0.02 – 0.04	$(12.10 \pm 1.10 \pm 1.13) \cdot 10^{-4}$
0.04 – 0.06	$(20.23 \pm 1.40 \pm 1.89) \cdot 10^{-4}$
0.06 – 0.08	$(21.60 \pm 1.47 \pm 2.02) \cdot 10^{-4}$
0.08 – 0.10	$(9.09 \pm 0.95 \pm 0.85) \cdot 10^{-4}$
0.10 – 0.12	$(3.60 \pm 0.58 \pm 0.34) \cdot 10^{-4}$
0.12 – 0.14	$(2.04 \pm 0.44 \pm 0.20) \cdot 10^{-4}$
0.14 – 0.16	$(1.60 \pm 0.29 \pm 0.16) \cdot 10^{-4}$
0.16 – 0.18	$(0.51 \pm 0.15 \pm 0.05) \cdot 10^{-4}$
0.18 – 0.20	$(0.21 \pm 0.14 \pm 0.02) \cdot 10^{-4}$

Table 3: Differential yield of the coherent J/ψ candidates in the three $\langle {\rm N_{part}} \rangle$ intervals integrated in the range $2.0 < y < 4.5$. The first uncertainty is statistical and the second systematic.

$\langle {\rm N_{part}} \rangle$	$\frac{{\rm d}Y^i_{J/\psi}}{{\rm d}y}$
10.6 ± 2.9	$(1.43 \pm 0.10 \pm 0.17) \cdot 10^{-4}$
15.7 ± 4.1	$(1.65 \pm 0.10 \pm 0.27) \cdot 10^{-4}$
27.8 ± 7.2	$(1.25 \pm 0.08 \pm 0.24) \cdot 10^{-4}$

Table 4: Correlated (corr) and uncorrelated (uncorr) systematic uncertainties versus the variables ${\rm N_c}$, $p_{\rm T}$ and y. With "MC" the uncertainty due to the size of the simulation sample is indicated, while "extr" indicates the uncertainty on the extrapolation procedure. The correlated and uncorrelated uncertainty are adding in quadrature to obtain the total systematic uncertainty.

Source	Systematic uncertainties					
	N_c		p_T ($\rm N_c$ integrated)		y ($\rm N_c$ integrated)	
	uncorr	corr	uncorr	corr	uncorr	corr
signal	0.4-4.8%	-	-	2.3%	-	2.3%
$\epsilon_{\rm rec\&sel}$	3.5−11.8% (k factor) 7−10% (MC stat.)	2% (reweighting) 1% (tracking)	5% (MC stat.)	4.7% (k factor) 2% (reweighting) 1% (tracking)	5−14% (MC)	4.7% (k factor) 2% (reweighting) 1% (tracking)
$\epsilon_{\rm PID}$	6-10% (MC,extr.)	-	4% (MC,extr.)	-	6−10% (MC,extr.)	-
$\epsilon_{\rm trigger}$	-	3%	-	3%	-	3%
$N_{\rm MB}$	< 1%	-	-	< 1%	-	< 1%
Total	10.5−17.1%		9.1%		10.1−18.4%	