

Supplementary material for LHCb-PAPER-2014-057

A Further material on the extrapolation uncertainty

Figure 3 shows the results from the Monte Carlo approach used in the determination of the uncertainty of the extrapolation factor. The left hand plot shows the distribution of the extrapolation factors which satisfy the constraint on the LHCb multiplicity, $n_{\text{LHCb}} = 10.93 \pm 0.50$. Fixing the constraint to 10.93 would result in an rms width of 0.056. The right hand plot is the distribution of the central values of the fractions of the interaction types for each combination of multiplicities and visibilities. Detailed information about the characteristics of the tunes considered in the study of the extrapolation factor and the allowed ranges, when requiring an average multiplicity $n = 10.93$ of prompt long-lived charged particles in the kinematic acceptance, are given in Tables 4 and 5, respectively.

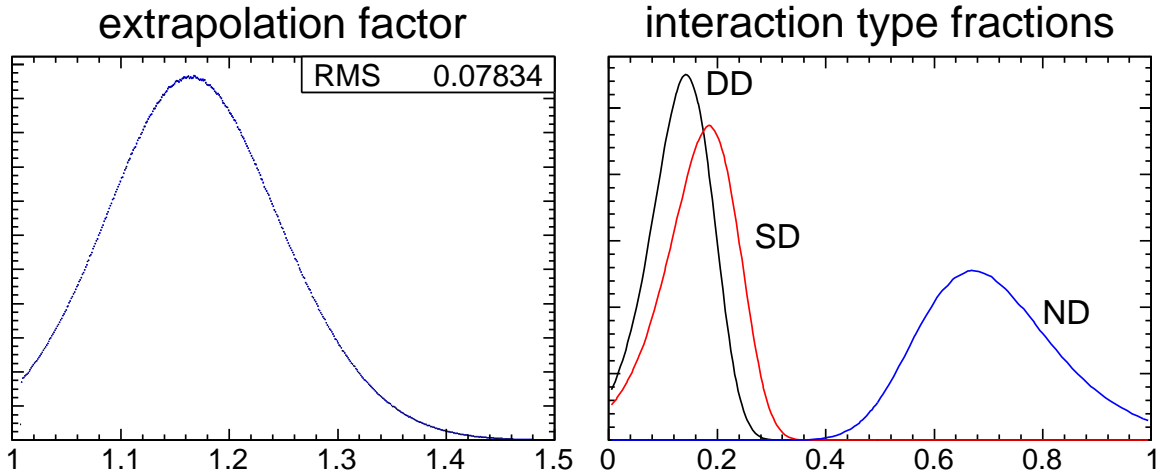


Figure 3: Extrapolation factors and fractions for the different interaction types obtained from the Monte Carlo approach for the determination of the uncertainty of the extrapolation factor. The interaction type fractions are shown for non-diffractive (ND), single-diffractive (SD) and double-diffractive (DD) interactions.

Table 4: Mean multiplicities of prompt long-lived charged particles and visibilities for non-diffractive (ND), single-diffractive (SD) and double-diffractive (DD) interactions in the tunes considered in the determination of the extrapolation uncertainty.

tune	n_{ND}	n_{SD}	n_{DD}	v_{ND}	v_{SD}	v_{DD}
4Cx	12.03	5.49	4.62	0.9925	0.5004	0.5794
A2-CTEQ6L1	11.98	5.92	4.72	0.9920	0.5019	0.5918
A2-MSTW2008LO	12.47	6.20	4.93	0.9925	0.5069	0.5704
AU2-CTEQ6L1	12.28	5.86	4.70	0.9930	0.5014	0.5823
AU2-MSTW2008LO	12.84	6.37	5.10	0.9925	0.5084	0.5836
Monash 2013	12.64	5.98	4.69	0.9925	0.5152	0.5827
CUETP8S1-CTEQ6L1	11.33	5.73	4.67	0.9920	0.5064	0.5815

Table 5: Fractions of interaction types for non-diffractive (ND), single-diffractive (SD) and double-diffractive (DD) interactions satisfying the constraint that the combined sample has an average multiplicity $n = 10.93$ of prompt long-lived charged particles in the kinematic acceptance, and the corresponding ranges of the extrapolation factor.

tune	f_{ND}	f_{SD}	f_{DD}	s_{extr}
4Cx	0.770 – 0.714	0 – 0.286	0.230 – 0	1.114 – 1.174
A2-CTEQ6L1	0.779 – 0.707	0 – 0.293	0.221 – 0	1.107 – 1.179
A2-MSTW2008LO	0.691 – 0.611	0 – 0.389	0.309 – 0	1.160 – 1.245
AU2-CTEQ6L1	0.730 – 0.655	0 – 0.345	0.270 – 0	1.134 – 1.215
AU2-MSTW2008LO	0.642 – 0.550	0 – 0.450	0.358 – 0	1.182 – 1.291
Monash 2013	0.682 – 0.600	0 – 0.400	0.318 – 0	1.160 – 1.247
CUETP8S1-CTEQ6L1	0.902 – 0.869	0 – 0.131	0.098 – 0	1.051 – 1.077

B Separated plots of cross-section results

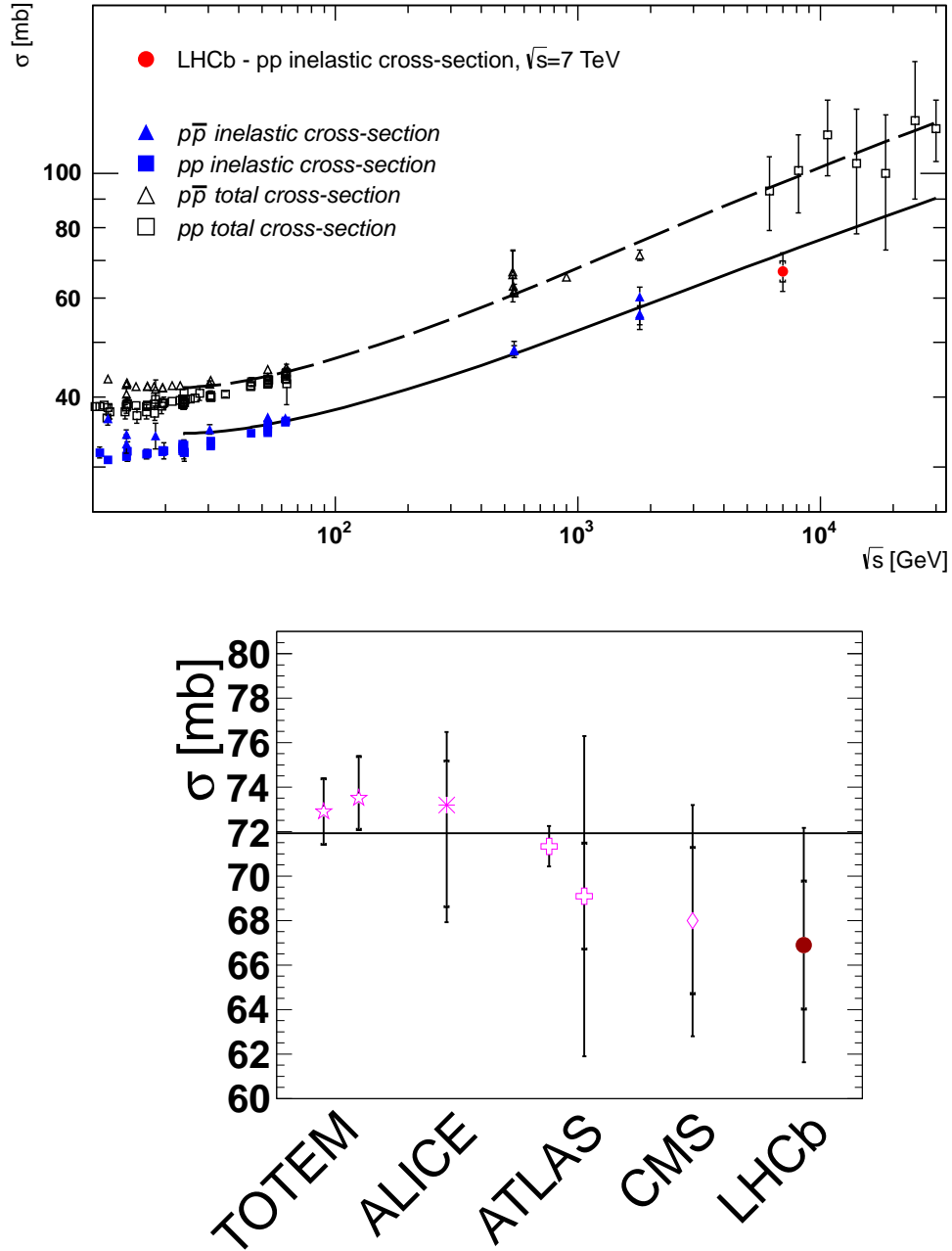


Figure 4: (top) Energy dependence of the total and inelastic cross-section with the LHCb measurement, and (bottom) comparison of the pp cross-section measurements at $\sqrt{s} = 7$ TeV by the LHC experiments.