

Weekly Report

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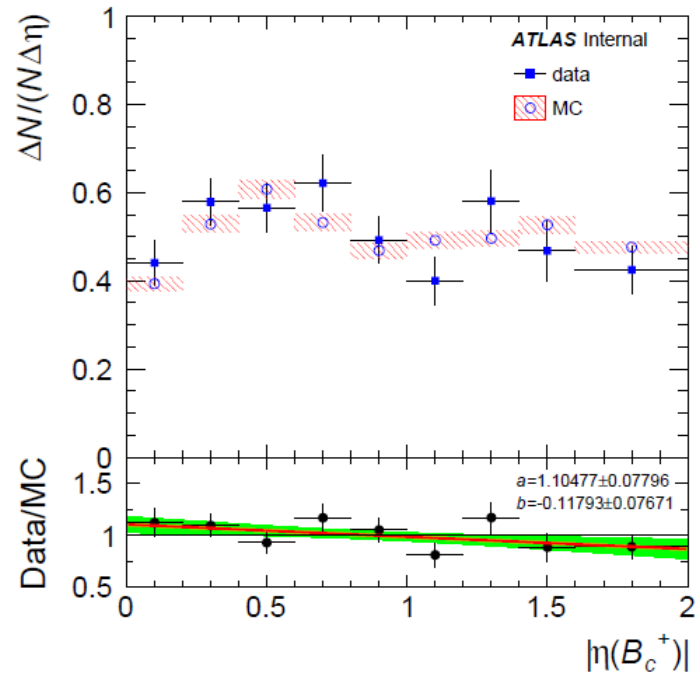
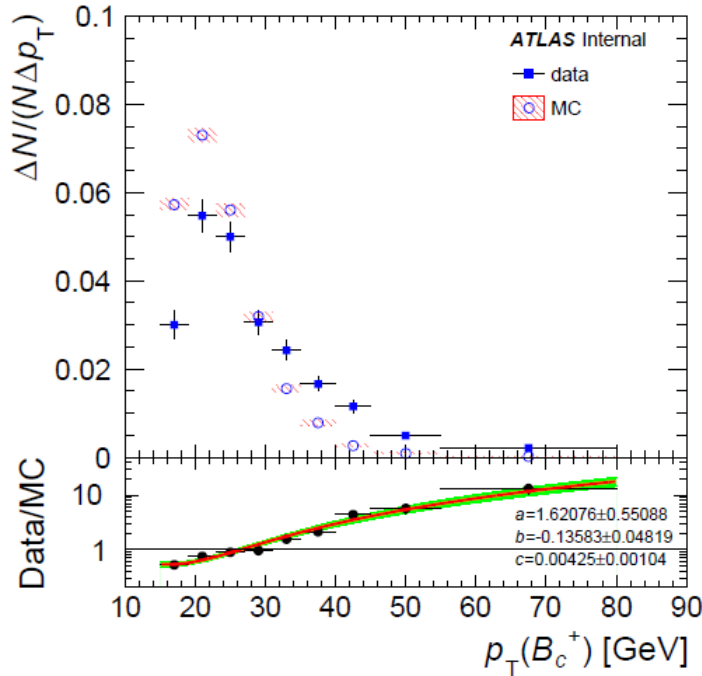
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Outline

- MC reweighting
- Systematic uncertainties

MC reweighting

- p_T and $|\eta|$ of B_c^+ meson



- Observe large discrepancy in p_T spectra
- Need to further check

MC reweighting

- B_c^+ and D_s^+ lifetimes

The proper lifetime of B_c^+ and D_s^+ mesons in the MC generation are defined by the settings in the EVTGEN particle data table file. Those values are slightly different from the current world averages [15]. To avoid the effect of this disagreement on the acceptances for each decay mode calculated from the MC, additional weights are introduced to correct the proper lifetime distributions. The weight for correction on B_c^+ (D_s^+) lifetime is given by

$$w = \frac{\tau_{\text{MC}}}{\tau_{\text{PDG}}} \exp \left(-t \left(\frac{1}{\tau_{\text{PDG}}} - \frac{1}{\tau_{\text{MC}}} \right) \right), \quad (7)$$

where t is the actual proper lifetime of the truth B_c^+ (D_s^+) in the MC simulated events, τ_{MC} and τ_{PDG} are the average proper lifetime of B_c^+ (D_s^+) meson set in the generator and that from PDG, respectively.

Systematic uncertainties

Table 7: Relative systematic uncertainties for the ratio of branching fractions of $B_c^+ \rightarrow J/\psi D_s^{(*)+}$ and $B_c^+ \rightarrow J/\psi \pi^+$.

| Source | Uncertainty [%] | |
|--|-----------------|----------------|
| | $R_{D_s^+}$ | $R_{D_s^{*+}}$ |
| Simulated $p_T(B_c^+)$ spectrum | 0.7 | 0.1 |
| Simulated $ \eta(B_c^+) $ spectrum | 0.4 | 0.4 |
| B_c^+ lifetime | 0.2 | 0.1 |
| D_s^+ lifetime | 0.2 | 0.1 |
| Material uncertainty | TO BE DONE | |
| $B_c^+ \rightarrow J/\psi D_s^{(*)+}$ signal fit | | |
| – $B_c^+ \rightarrow J/\psi D_s^+$ signal shape | 0.9 | 0.1 |
| – $B_c^+ \rightarrow J/\psi D_s^{*+}$ signal shape | 0.6 | 1.5 |
| – Background shape | 1.2 | 2.3 |
| $B_c^+ \rightarrow J/\psi \pi^+$ signal fit | | |
| – $B_c^+ \rightarrow J/\psi \pi^+$ signal shape | 2.3 | 2.3 |
| – Background shape | 3.5 | 3.5 |
| MC statistics | 4.9 | 4.7 |
| $\mathcal{B}(D_s^+ \rightarrow \phi(K^+K^-)\pi^+)$ | 3.5 | 3.5 |
| Total | | |

Next to do

- Check the difference in B_c^+ pT spectra between data and MC simulation
- Finish the systematic uncertainty related to material interaction and tracking efficiency
- Update the analysis once the mc16d and mc16e samples are ready