

Recent Heavy Flavour results from ATLAS*

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Abstract

A wide programme of heavy flavour production studies are performed with the ATLAS detector[1]. This paper covers recent results in measurements of J/ψ and $\psi(2S)$ production at high p_T at 13 TeV, studies on the production of B_c^\pm/B^\pm production cross-section and pentaquark searches in $\Lambda_b^0 \rightarrow J/\psi p K^-$ are presented as well.

Keywords: Heavy-Flavour

I. INTRODUCTION

Studies of heavy flavour production in pp -collisions at the LHC provide the means for both verifying predictions of perturbative quantum chromodynamics (pQCD) and Monte-Carlo (MC) models tuning. Understanding the mechanisms of heavy flavour production is also crucial for accurate description of background channels in Standard Model (SM) measurements and new physics searches. This paper briefly covers several results in this area obtained by the ATLAS experiment [1] in pp collisions at $\sqrt{s} = 8$ TeV and $\sqrt{s} = 13$ TeV. These results primarily make use of the Inner Detector and Muon Spectrometer.

II. J/ψ AND $\psi(2S)$ PRODUCTION AT HIGH p_T AT 13 TEV

Measurements of inclusive non-prompt cross sections of J/ψ and $J/\psi(2S)$ [2] show good agreement with FONLL model at low p_T , while certain discrepancies are seen at high p_T , see Figure 1.

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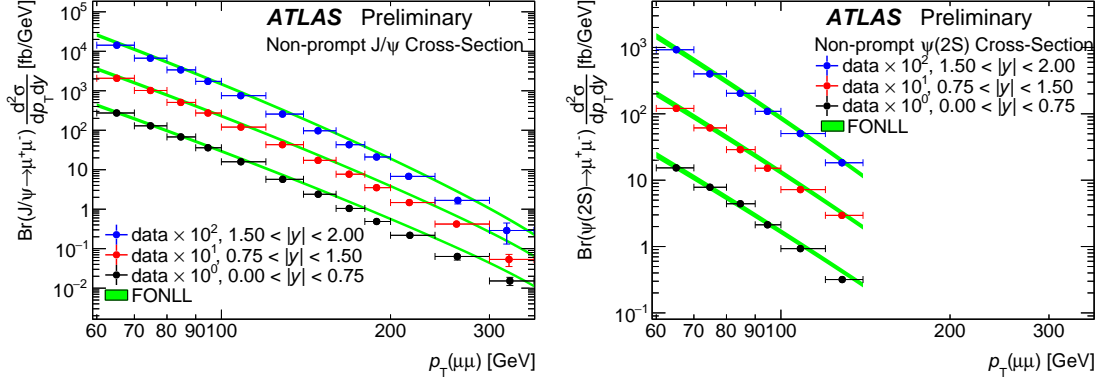


FIG. 1. The non-prompt differential cross-section overlaid with FONLL predictions are shown for (a) J/ψ mesons, and (b) $\psi(2S)$ mesons. [2]

III. B_c^\pm/B^\pm PRODUCTION CROSS-SECTION

A ratio of the two decay branches are given. The results complement both LHCb and CMS, with no evident rapidity dependence. B_c^\pm cross-section decreases faster with p_T than B^\pm cross-section. The measurement results are in very good agreement with FONLL predictions, see Figure 2.

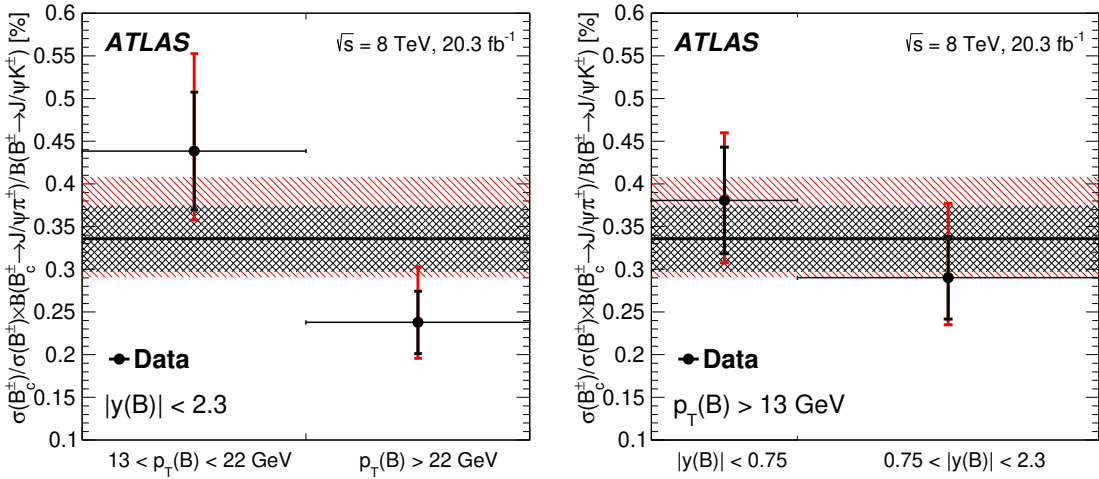


FIG. 2. Summary of the cross-section measurement presented in this article. The left figure shows the production cross section for the B_c^\pm relative to the B^\pm (times the corresponding branching fractions) for two bins in p_T (black data points) and for the inclusive bin (horizontal band). [3]

IV. PENTAQUARK SEARCH IN $\Lambda_b^0 \rightarrow J/\psi p K^-$

The search for pentaquarks in $J/\psi p$ mass spectrum of $\Lambda_b^0 \rightarrow J/\psi p K^-$ decays confirms the LHCb observations of states $Pc(4312)^+$, $Pc(4380)^+$, $Pc(4440)^+$ and $Pc(4457)^+$. Plots are shown in Figure 3.

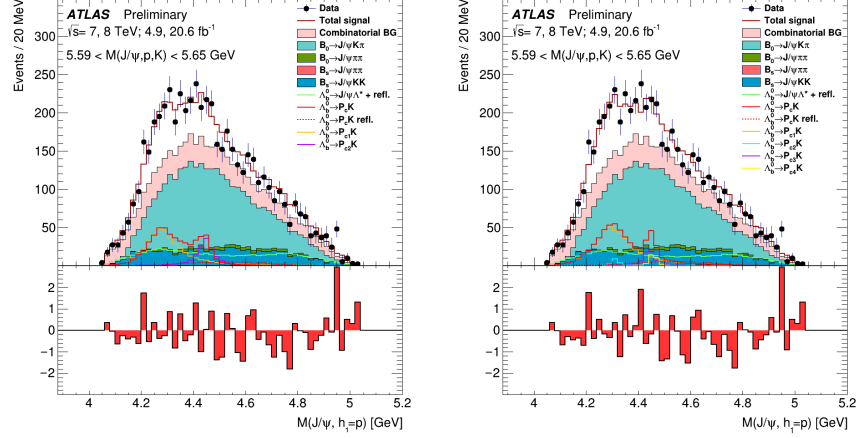


FIG. 3. Distributions of $M(J/\psi, p)$ together with difference between data and background divided by statistical uncertainty in each bin. Results of $M(J/\psi, p)$ χ^2 fits in the hypotheses of two pentaquarks (top left), four pentaquarks (top right). [4]

V. CONCLUSION

ATLAS has published a variety of heavy flavour results and only some are presented here. ATLAS is well prepared to produce further results going into Run 3.

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- [1] ATLAS Collaboration, 2008 JINST 3 S08003.
 - [2] ATLAS Collaboration, Measurement of the production cross-section of J/ψ and $\psi(2S)$ mesons at high transverse momentum in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector, ATLAS-CONF-2019-047
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 - [4] ATLAS Collaboration, Study of $J/\psi p$ resonances in the $\Lambda_b^0 \rightarrow J/\psi p K^-$ decays in pp collisions at $\sqrt{s} = 7$ and 8 TeV with the ATLAS detector, ATLAS-CONF-2019-048