

Table of Contents

Reference pp cross-sections for J/ψ studies in proton-lead collisions at $\sqrt{s_{NN}} = 5.02$ and comparisons between ALICE and LHCb results.....	1
Abstract.....	1
Figures.....	1

Reference J/ψ cross-sections for J/ψ studies in proton-lead collisions at $\sqrt{s_{NN}} = 5.02$ and comparisons between ALICE and LHCb results

The paper is available here [↗](#).

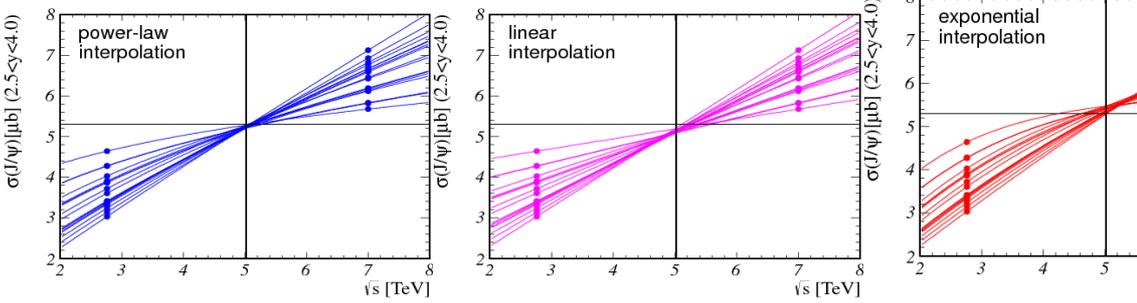
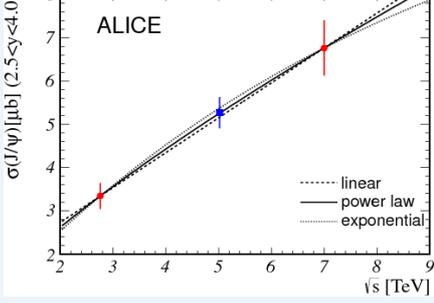
LHCb-CONF-2013-013

Abstract

The ALICE and LHCb collaborations have studied J/ψ production at forward rapidities in proton-lead collisions at $\sqrt{s} = 5.02$ TeV using the dimuon channel. The evaluation of cold nuclear matter effects requires the knowledge of the corresponding J/ψ cross-section in pp collisions at the same centre-of-mass energy and in the same kinematic range. In this note the interpolation procedure used to determine this quantity and the related consistency checks are described. Finally, the results from the two experiments on nuclear modification factors are shortly summarized and found to be in good agreement.

Figures

(pdf and eps versions are available under attachments).

Caption	Figure
<p>Figure 1: Comparison of power-law (top left), linear (top right) and exponential (bottom) interpolations for the energy dependence of the J/ψ production cross-sections for the theoretical predictions given in Tab. 2. Ideally all curves should go through $(\sqrt{s} = 5.02 \text{ TeV}) = 5.3 \mu\text{b}$.</p>	 <p>Figure 1 consists of three side-by-side plots. Each plot shows the cross-section $\sigma(J/\psi)$ in μb on the y-axis (ranging from 2 to 8) versus the center-of-mass energy \sqrt{s} in TeV on the x-axis (ranging from 2 to 8). A vertical line is drawn at $\sqrt{s} = 5.02$ TeV, where the cross-section is approximately 5.3 μb. The top-left plot is labeled 'power-law interpolation' and shows several blue lines diverging from the point at $\sqrt{s} = 5.02$. The top-right plot is labeled 'linear interpolation' and shows several magenta lines diverging from the same point. The bottom plot is labeled 'exponential interpolation' and shows several red lines diverging from the same point.</p>
<p>Figure 2: Cross-section interpolation for the ALICE data. The point at $\sqrt{s} = 5.02$ TeV is the result of the interpolation procedure, the error</p>	 <p>Figure 2 is a plot titled 'ALICE' showing the cross-section $\sigma(J/\psi)$ in μb on the y-axis (ranging from 2 to 8) versus \sqrt{s} in TeV on the x-axis (ranging from 2 to 9). Three data points with error bars are shown: one at $\sqrt{s} \approx 2.76$ TeV (red), one at $\sqrt{s} = 5.02$ TeV (blue), and one at $\sqrt{s} \approx 7.0$ TeV (red). Three theoretical curves are plotted: a dotted line for 'linear', a solid line for 'power law', and a dashed line for 'exponential'. The curves are very close to each other and pass through the data points.</p>

bar shows the result from error propagation of the experimental uncertainties of the measurements at $\sqrt{s} = 2.76$ and 7 TeV.

Figure 3: Cross-section interpolation by fitting theoretical predictions to the ALICE data points.

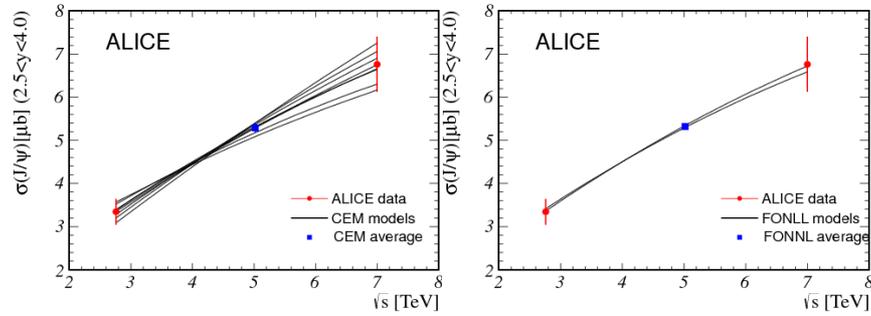


Figure 4: Cross-section interpolation for the LHCb data using three phenomenological models. The upper row shows the results for prompt J/ψ production (top left) and for J/ψ mesons from b-hadron decays (top right). The bottom row plot shows the interpolation for inclusive J/ψ production. The points at $\sqrt{s} = 5.02$ TeV are the nominal results of the interpolation procedure, the error bar is the result from error propagation of the experimental uncertainties of the measurements at $\sqrt{s} = 2.76, 7$ and 8 TeV.

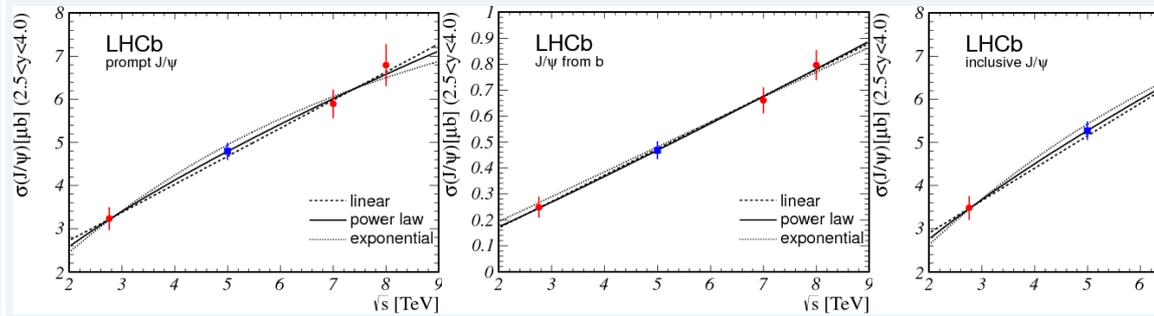


Figure 5:
 Differential cross-sections $d^2N/dy dp_T$ at $\sqrt{s} = 2.76$ and 7 TeV, as measured by ALICE. On the left hand plot the calculated values at $\sqrt{s} = 5.02$ TeV are separately shown for each interpolation function (linear, power law and exponential), together with their weighted average. The right hand figure shows fits to the interpolated $d^2N/dy dp_T$ values at $\sqrt{s} = 5.02$ TeV. See text for details.

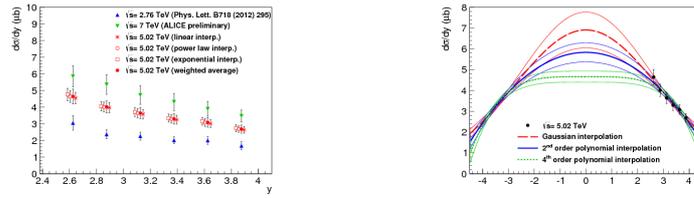


Figure 6:
 Differential cross-section for inclusive J/ψ production in pPb collisions as a function of rapidity y (left) and transverse momentum p_T (right).

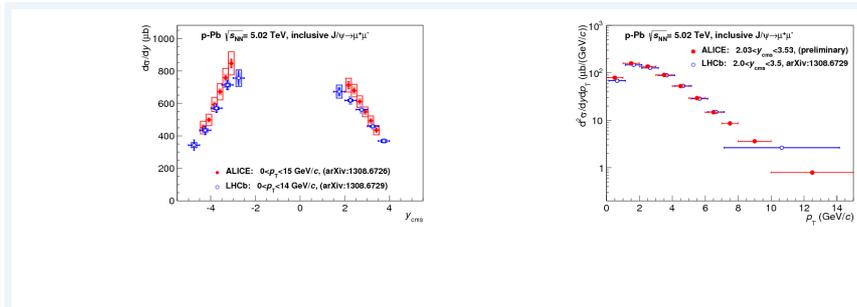


Figure 7: Nuclear modification factor as a function of rapidity. The left hand plot shows the measurements integrated over the accessible kinematic range of both experiments, the right hand plot displays the differential measurement by the ALICE collaboration.

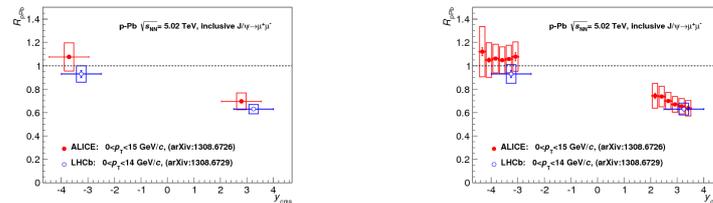
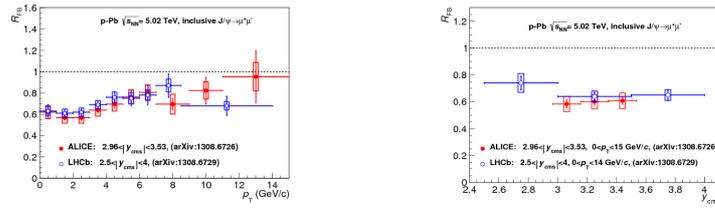


Figure 8:
Forward-backward
production ratio for
inclusive J/ψ
production in pPb
collisions as a
function of p_T (left)
and as a function of
rapidity (right), for
both experiments.



-- KatharinaMueller - 16 Jan 2014

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