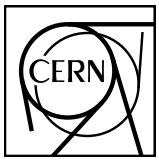
EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH



ALICE-PUBLIC-2017-004

Addendum: Centrality dependence of high-p_{T} D-meson suppression in Pb–Pb collisions at $\sqrt{s_{\mathrm{NN}}} = 2.76$ TeV

ALICE Collaboration*

Abstract

This is an Addendum to the article JHEP **11** (2015) 205 [1]. The figures 3 (right), 4 (right) and 5 are updated with published results on non-prompt J/ψ-meson production from the CMS Collaboration [2].

*The list of collaboration members is the same as for [1].

In [1] the average nuclear modification factor $R_{\rm AA}$ of $\rm D^0$, $\rm D^+$ and $\rm D^{*+}$ mesons in Pb–Pb collisions at $\sqrt{s_{\rm NN}} = 2.76$ TeV measured by ALICE was compared with that of non-prompt J/ψ mesons from B-meson decays measured by the CMS Collaboration using 2010 data (7.28 $\mu\rm b^{-1}$) [3]. A higher-precision measurement based on 2011 data (152 $\mu\rm b^{-1}$) was recently published by the CMS Collaboration [2]. The measurement for the $p_{\rm T}$ interval 6.5–30 GeV/c is carried out in three rapidity intervals, including $|y| < 1.2$, which is more similar to that of D mesons ($|y| < 0.5$).

Figure 1 shows the average of the $\rm D^0$, $\rm D^+$ and $\rm D^{*+}$ nuclear modification factors as a function of centrality in $8 < p_{\rm T} < 16$ GeV/c, compared with the $R_{\rm AA}$ of non-prompt J/ψ mesons with $6.5 < p_{\rm T} < 30$ GeV/c [2]. The latter is significantly higher than that of the D mesons in the five centrality intervals from 0–10% to 40–50%. For example, the average difference of the $R_{\rm AA}$ values of D mesons and non-prompt J/ψ mesons in the 0–10% and 10–20% centrality classes is larger than zero with a significance of 3.4 σ, obtained including the systematic uncertainties, and taking into account their correlation between the two centrality classes. In Figs. 2 and 3 these measurements are compared with model calculations [4–6], as originally done in [1].

The conclusions of the original publication [1] are confirmed by the comparisons that consider the new J/ψ-meson measurements. In particular, the comparison of the D-meson $R_{\rm AA}$ with the non-prompt J/ψ-meson $R_{\rm AA}$ shows a difference in the suppression of particles originating from c and b quarks in the most central collisions. This observation is described by theoretical calculations in which in-medium parton energy loss decreases with increasing quark mass.

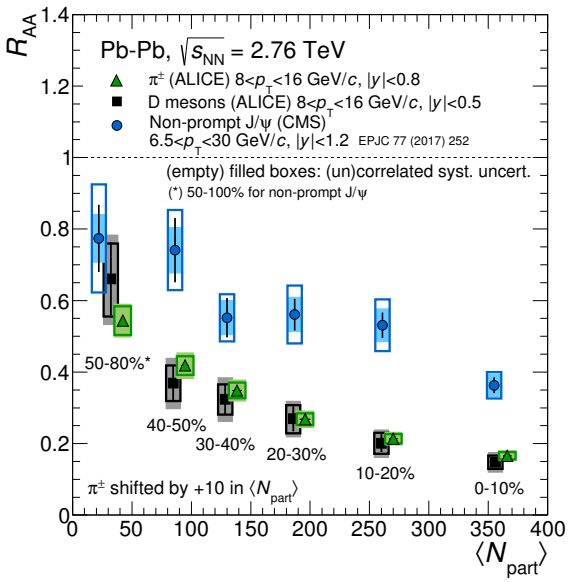


Fig. 1: Comparison of the D meson $R_{\rm AA}$ (average of $\rm D^0$, $\rm D^+$ and $\rm D^{*+}$) in $8 < p_{\rm T} < 16$ GeV/c [1] and of the $R_{\rm AA}$ of non-prompt J/ψ mesons in $6.5 < p_{\rm T} < 30$ GeV/c measured by the CMS Collaboration [2]. The vertical bars represent the statistical uncertainties, while the filled (empty) boxes represent the systematic uncertainties that are correlated (uncorrelated) among centrality intervals. This figure updates Fig. 3 (right) of [1].

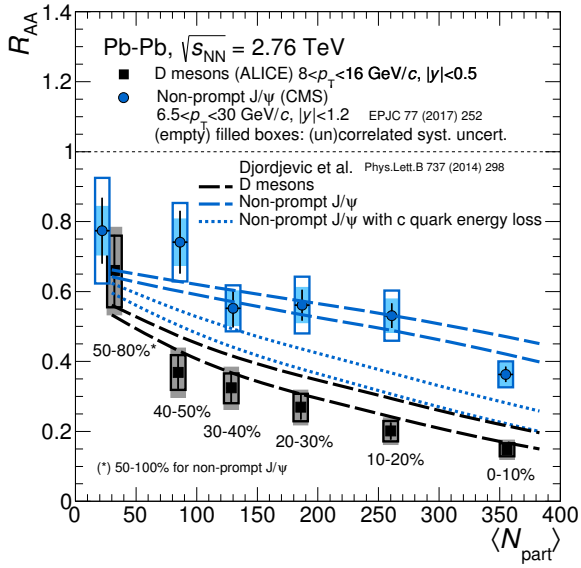


Fig. 2: Comparison of the R_{AA} measurements with the calculations by *Djordjevic et al.* [4] including radiative and collisional energy loss. Lines of the same style enclose a band representing the theoretical uncertainty. For non-prompt J/ψ mesons in $6.5 < p_{\mathrm{T}} < 30$ GeV/c [2] the model results for the case in which the b quark interactions are calculated using the c quark mass are shown as well [7]. This figure updates Fig. 4 (right) of [1].

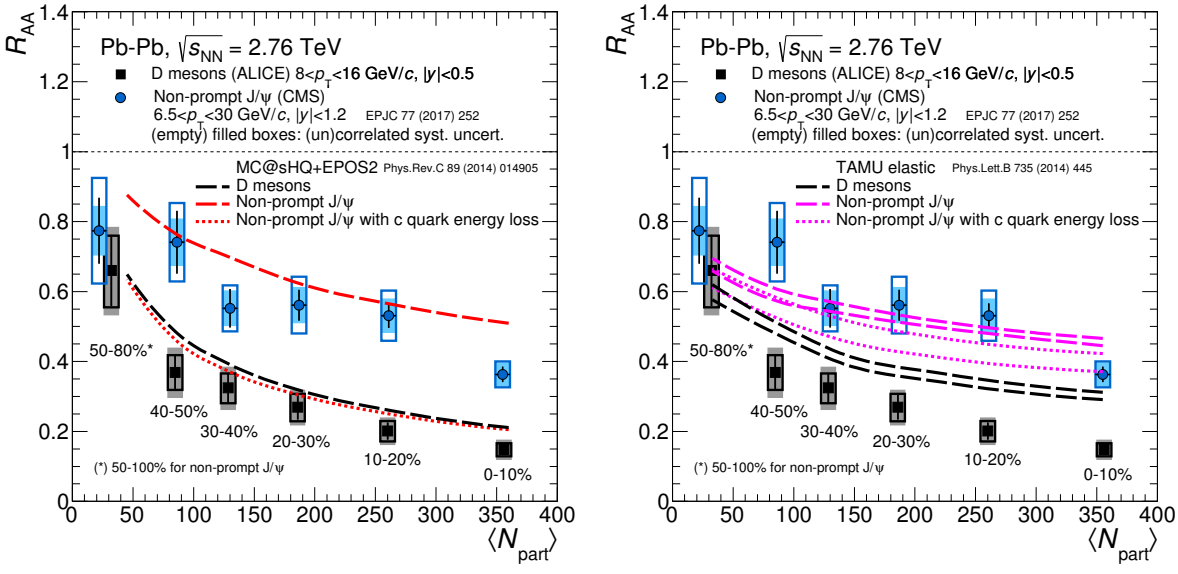


Fig. 3: Comparison of the R_{AA} measurements with the *MC@sHQ+EPOS2* model [5] including radiative and collisional interactions (left) and with the *TAMU elastic* model [6] including collisional interactions via in-medium resonance formation. For both models, results for the case in which the b quark interactions are calculated using the c quark mass are shown as well [7]. In the right-hand panel, the band between lines with the same style represents the theoretical uncertainty. This figure updates Fig. 5 of [1].

References

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