EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

Supplemental figures for
ϕ-meson production at forward rapidity in p-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV and in pp collisions at $\sqrt{s} = 2.76$ TeV

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Abstract

This note contains additional figures for the analysis of ϕ-meson production in p-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV and in pp collisions at $\sqrt{s} = 2.76$ TeV. The added material focuses on the comparison between the measured, raw opposite-sign dimuon mass distributions and the estimated mixed-event background distribution, here shown for each specific p_T interval considered in the differential analysis.

[*]The author list is given in arXiv:1506.09206.

1   Introduction

The subtraction of the combinatorial background represents an important step for any analysis of low-mass dimuon production in ALICE. Since the robustness and the stability of the signal extraction depends both on the statistics in the raw dimuon sample and the ratio of signal to combinatorial background, one has to pay attention to the interplay of these two elements in each of the sub-samples in which the analysis is performed.

In the figures reported in the following sections, we show the comparison between the raw opposite-sign dimuon mass spectrum and the combinatorial background, for both the pp and the p-Pb data discussed in [1], in each of the p_T intervals considered for the differential analysis. Two general features can be observed, common to the pp and the p-Pb cases: (i) the contribution of the combinatorial background, relative to the raw dimuon spectrum, decreases with increasing p_T; (ii) the statistical uncertainties of the raw dimuon sample increase with increasing p_T.

As a result of the combination of these two effects, the impact of the background subtraction on the final uncertainty does not show any dramatic evolution as a function of p_T, when isolating the ϕ-meson signal. In fact, as one can easily judge from the figures: at low p_T, a relatively large combinatorial background is subtracted from a large-statistics event sample, which assures the stability and the statistical significance of the isolated signal; conversely, at high-p_T, the extraction of the signal from a lower-statistics event sample is not perturbed by the subtraction of a negligible amount of background.

2   Additional figures for the ϕ-meson analysis in pp collisions at $\sqrt{s} = 2.76$ TeV

The differential analysis of the ϕ-meson production in pp collisions at $\sqrt{s} = 2.76$ TeV has been performed in 7 intervals of p_T, see Table 1 of [1]. The comparison between the raw opposite-sign dimuon mass spectrum and the combinatorial background for each of the considered p_T intervals is shown in the plots of Figs. 1 and 2.

3   Additional figures for the ϕ-meson analysis in p-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV

The differential analysis of the ϕ-meson production in p-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV has been performed in 10 intervals of p_T, separately for the forward- and backward-rapidity regions accessed by the apparatus ($2.03 < y < 3.53$ and $-4.46 < y < -2.96$, respectively, in the nucleon-nucleon center of mass), see Table 3 of [1]. The comparison between the raw opposite-sign dimuon mass spectrum and the combinatorial background for each of the considered p_T intervals is shown in the plots of Figs. 3 and 4 for the forward-rapidity event sample, and in the plots of Figs. 5 and 6 for the backward-rapidity event sample.

References

[1] **ALICE** Collaboration, J. Adam *et al.*, "ϕ-meson production at forward rapidity in p-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV and in pp collisions at $\sqrt{s} = 2.76$ TeV," `arXiv:1506.09206 [nucl-ex]`.
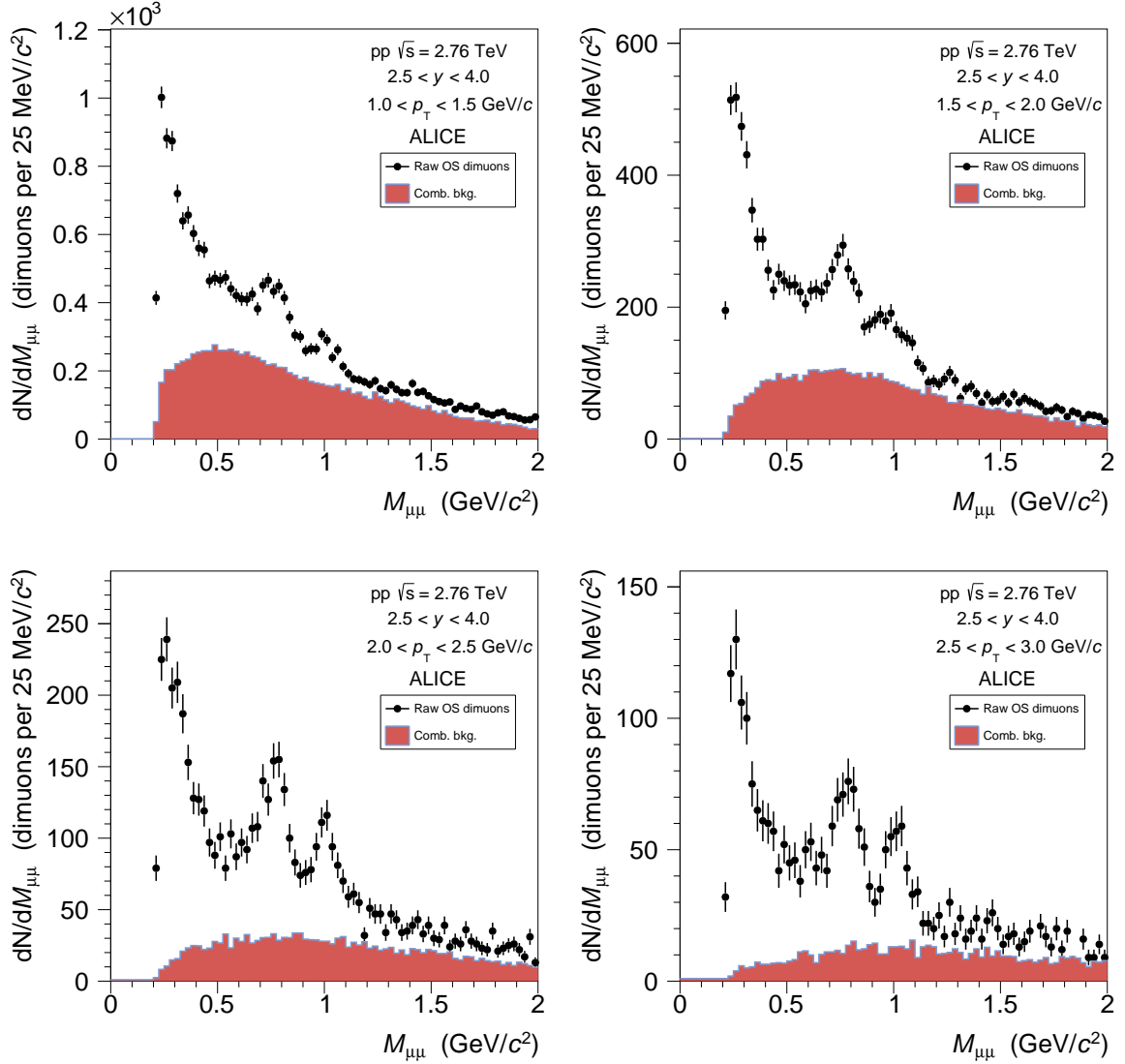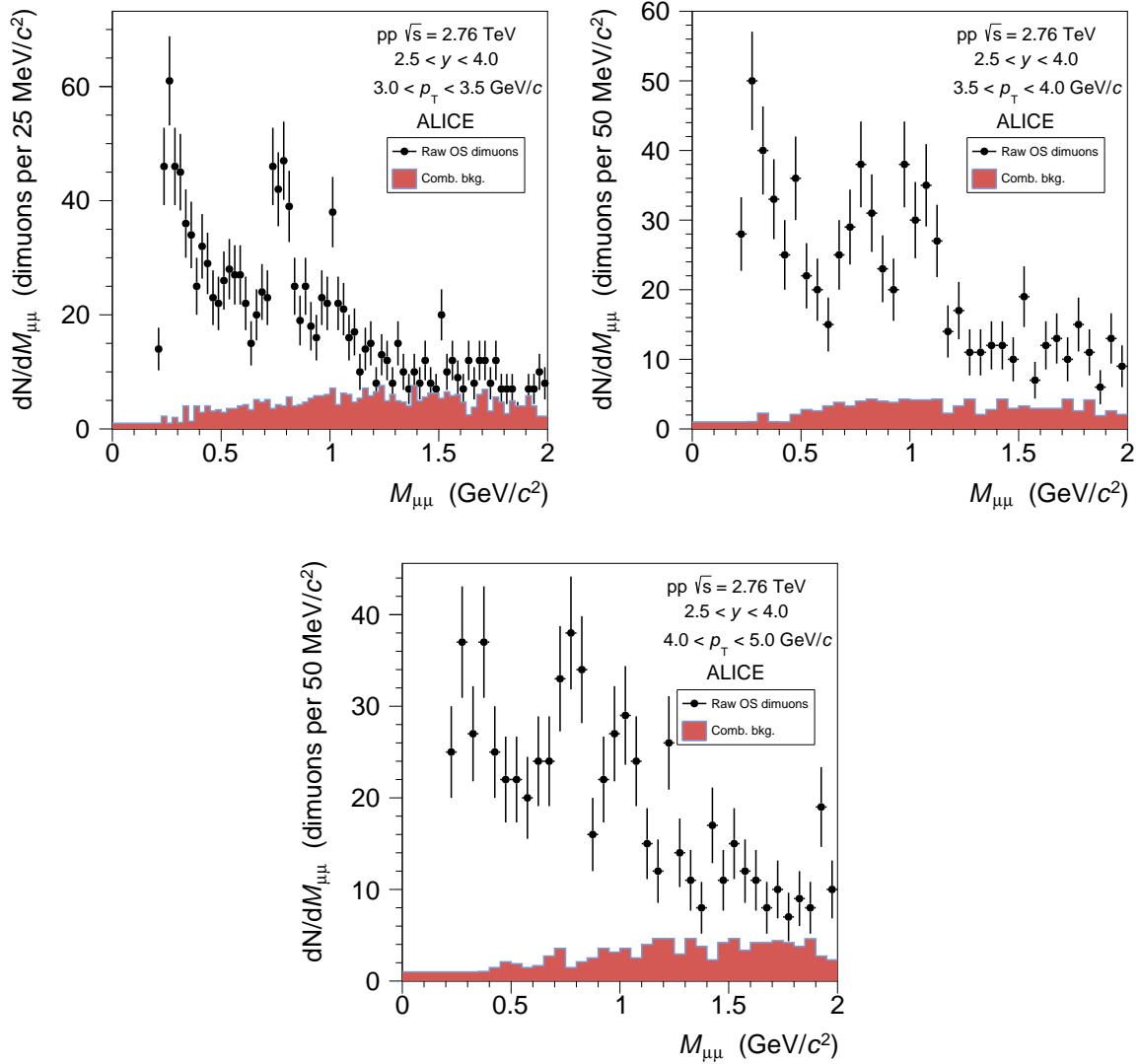
Fig. 1: Comparison between the raw opposite-sign dimuon mass spectrum and the combinatorial background, for each of the p_T intervals considered in the analysis of ϕ-meson production in pp collisions at $\sqrt{s} = 2.76$ TeV (part 1).
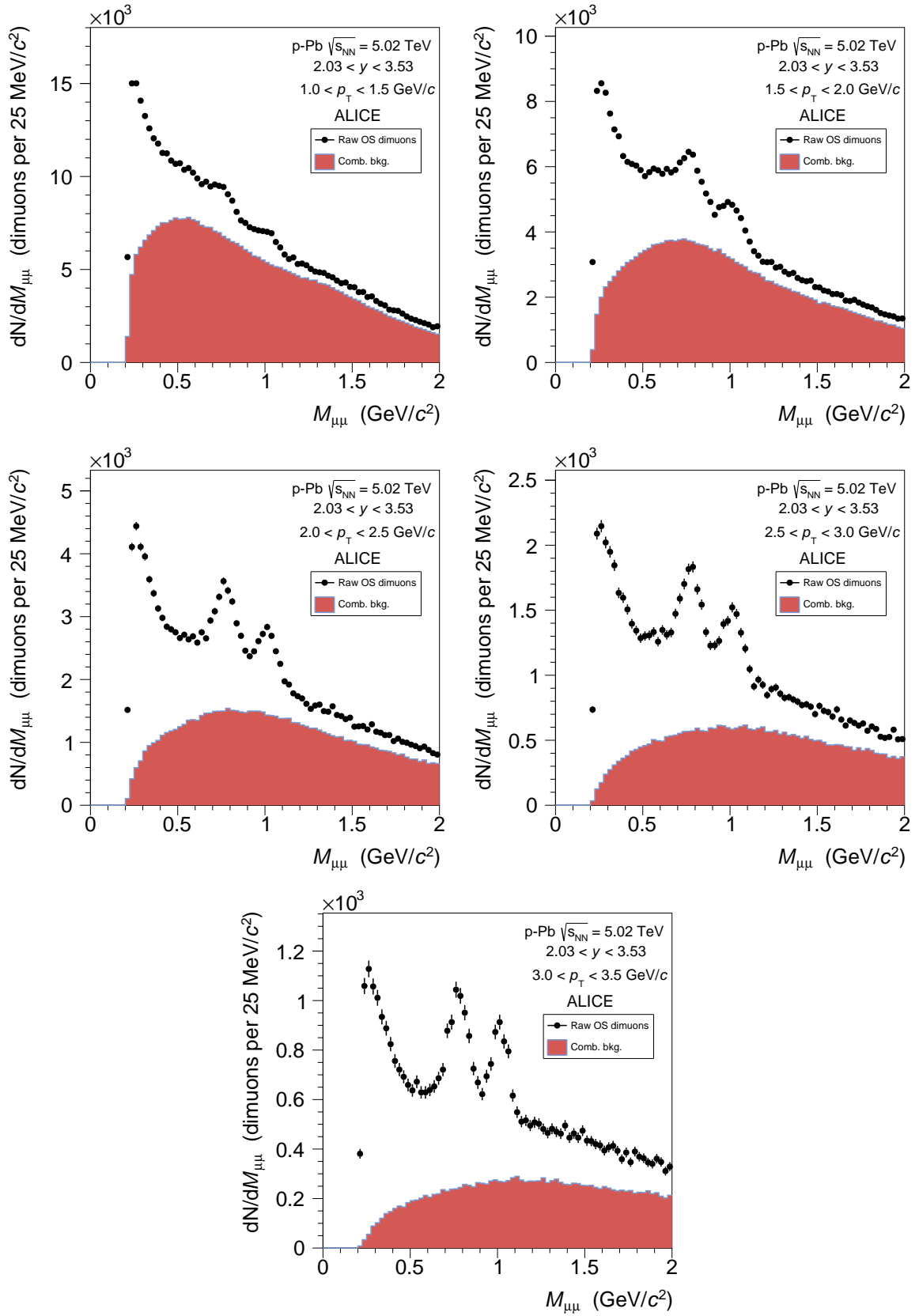
Fig. 2: Comparison between the raw opposite-sign dimuon mass spectrum and the combinatorial background, for each of the p_T intervals considered in the analysis of ϕ-meson production in pp collisions at $\sqrt{s} = 2.76$ TeV (part 2).
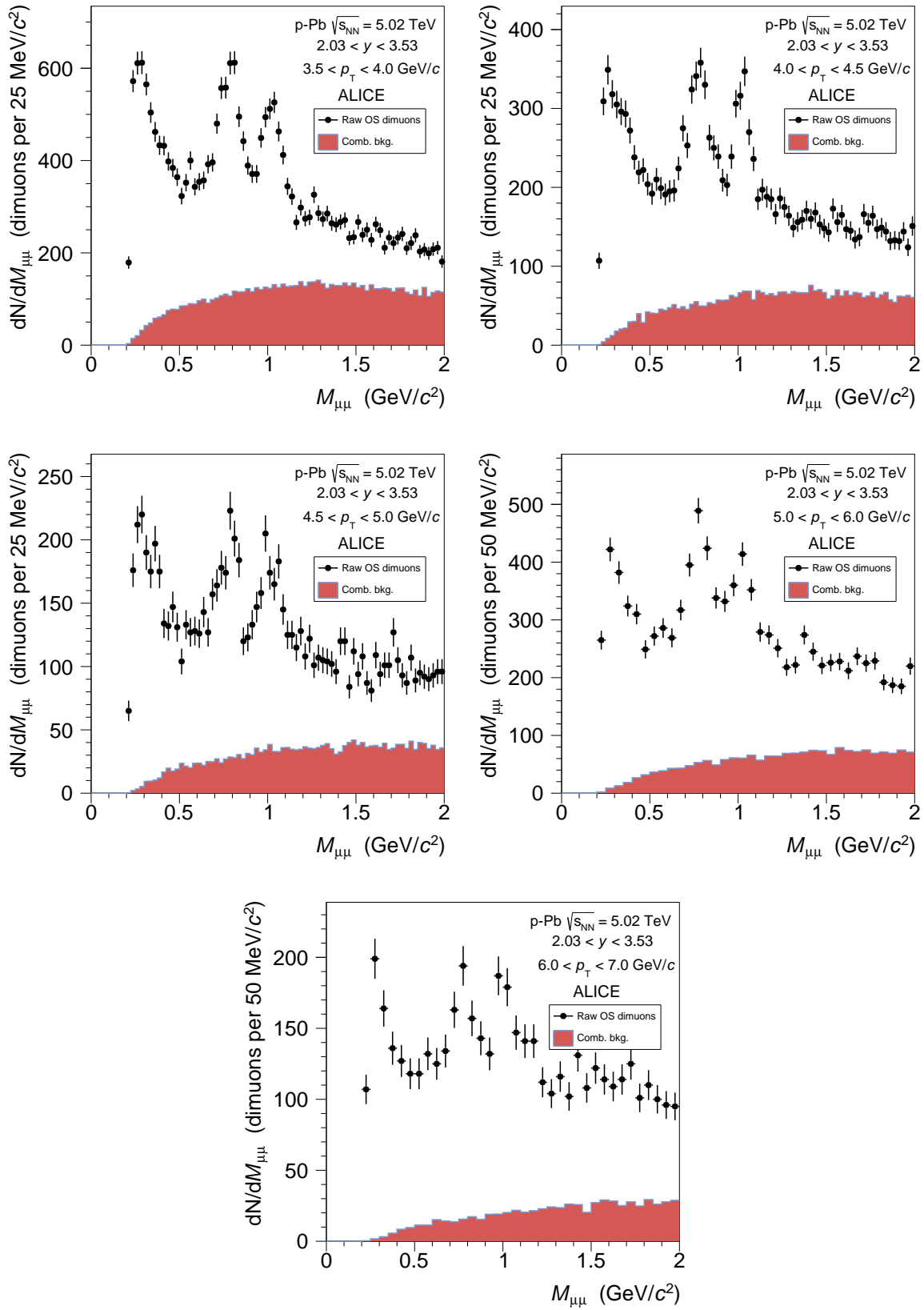
Fig. 3: Comparison between the raw opposite-sign dimuon mass spectrum and the combinatorial background, for each of the p_T intervals considered in the analysis of ϕ-meson production in p-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV in the rapidity region $2.03 < y < 3.53$ (part 1).
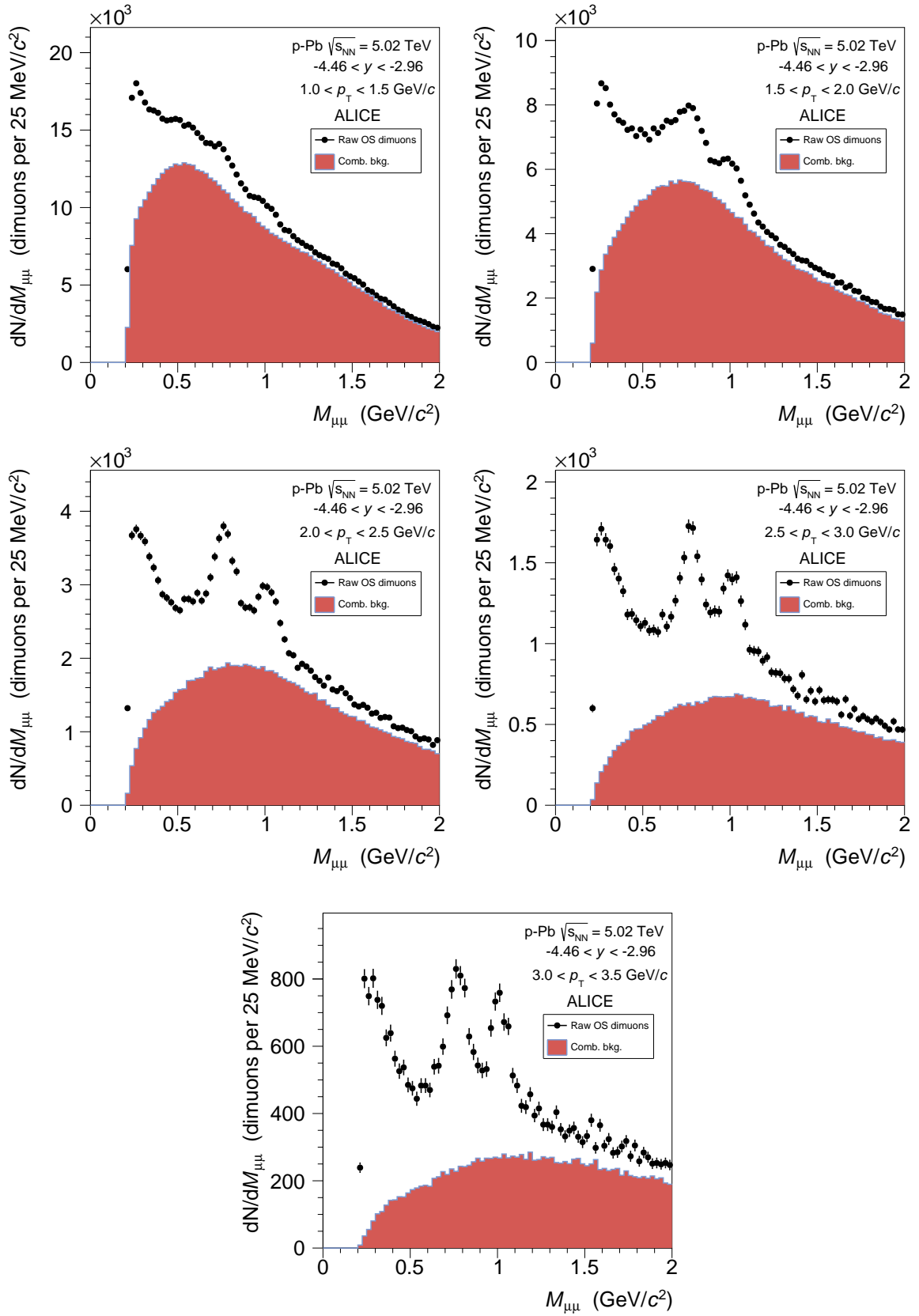
Fig. 4: Comparison between the raw opposite-sign dimuon mass spectrum and the combinatorial background, for each of the $p_{\rm T}$ intervals considered in the analysis of ϕ-meson production in p-Pb collisions at $\sqrt{s_{\rm NN}} = 5.02$ TeV in the rapidity region $2.03 < y < 3.53$ (part 2).

Fig. 5: Comparison between the raw opposite-sign dimuon mass spectrum and the combinatorial background, for each of the p_{T} intervals considered in the analysis of ϕ-meson production in p-Pb collisions at $\sqrt{s_{\mathrm{NN}}} = 5.02$ TeV in the rapidity region $-4.46 < y < -2.96$ (part 1).
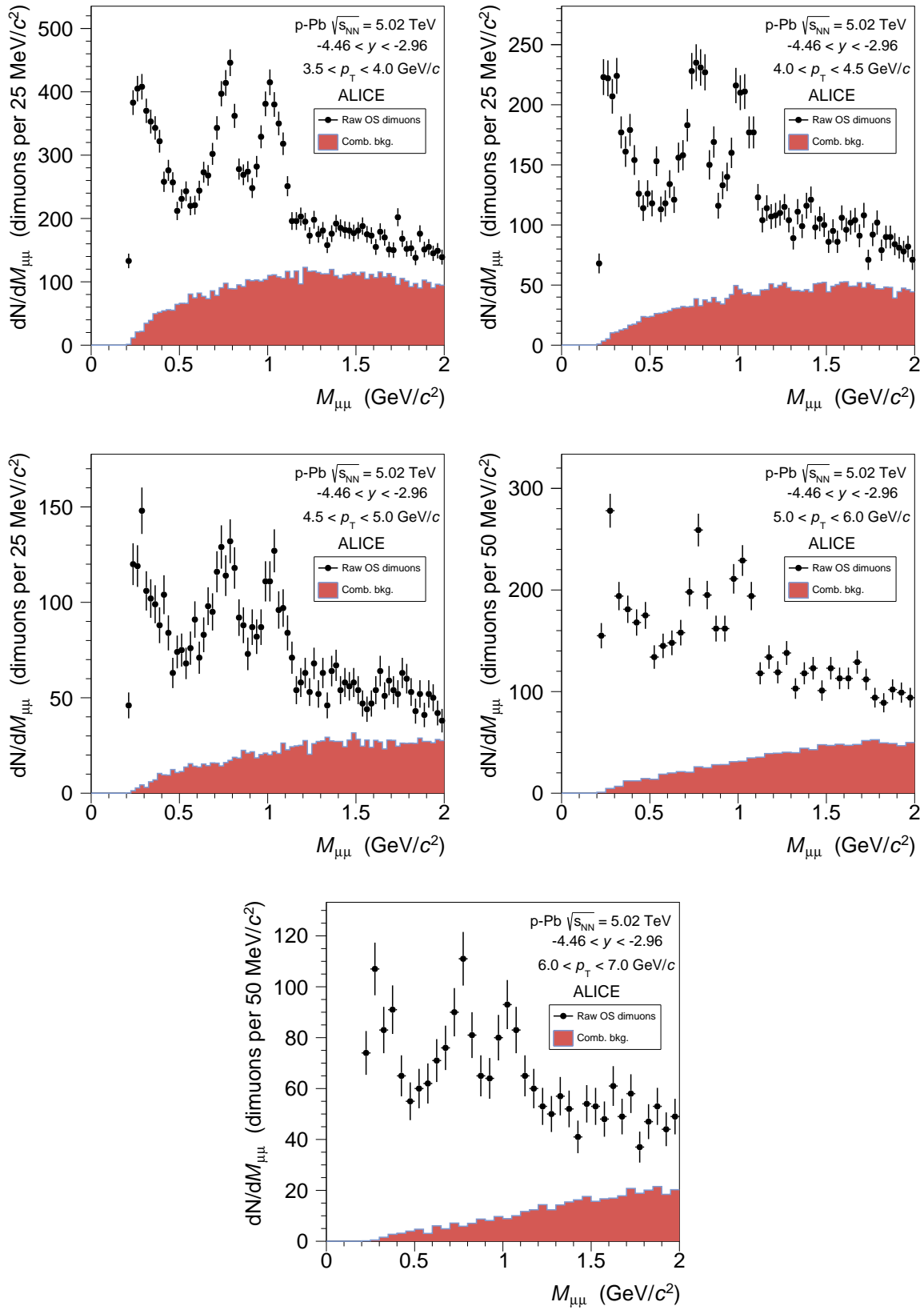
Fig. 6: Comparison between the raw opposite-sign dimuon mass spectrum and the combinatorial background, for each of the p_T intervals considered in the analysis of ϕ-meson production in p-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV in the rapidity region $-4.46 < y < -2.96$ (part 2).