

## Vector meson production at $\sqrt{s} = 7 \text{ TeV}$ and at $\sqrt{s} = 2.76 \text{ TeV}$ measured with the ALICE detector

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**Summary.** — Vector mesons are key probes of the hot and dense state of strongly interacting matter produced in heavy ion collisions. Their dilepton decay channel is particularly suitable for these studies, since dileptons have negligible final state interactions in QCD matter. We present the absolute production cross sections of  $\phi$  and  $\omega$  mesons measured with the ALICE muon spectrometer in the rapidity range  $2.5 < y < 4$  in pp collisions at  $\sqrt{s} = 7 \text{ TeV}$  and at  $\sqrt{s} = 2.76 \text{ TeV}$ , and the  $\phi/(\rho + \omega)$  ratio measured in Pb-Pb collisions at  $\sqrt{s_{NN}} = 2.76 \text{ TeV}$ .

PACS 14.40.Be – Light mesons ( $S = C = B = 0$ ).

PACS 13.20.Jf – Decays of other mesons.

PACS 25.75.-q – Relativistic heavy-ion collisions.

### 1. – Introduction and data analysis

Low mass meson ( $\rho$ ,  $\omega$ ,  $\phi$ ) production provides key information on the hot and dense state of strongly interacting matter produced in high-energy heavy ion collisions. The vector mesons [1] were detected through their decay into muon pairs in the rapidity range  $2.5 < y < 4$  using the ALICE detector [2].

The ALICE muon spectrometer is composed of a front hadron absorber, a set of cathod pad chambers (five stations, each one composed of two chambers) for the track reconstruction in a dipole field, two stations of two resistive plate chambers (RPC) for the muon trigger and an iron wall acting as a muon filter.

Data were collected in pp collisions in 2010 at  $\sqrt{s} = 7 \text{ TeV}$  and in 2011 at  $\sqrt{s} = 2.76 \text{ TeV}$ . Muon tracks were selected if the tracks reconstructed in the tracking stations matched the ones in the trigger chambers (muon trigger threshold  $p_T \sim 0.5 \text{ GeV}/c$ ) and if their rapidity was in the range  $2.5 < y_\mu < 4$ . Muon pairs were selected requiring that the dimuon rapidity was inside the interval  $2.5 < y_{\mu\mu} < 4$ . The combinatorial background was evaluated with the event mixing technique. The mass spectrum, shown in fig. 1 for dimuon  $p_T > 1 \text{ GeV}/c$ , was described as a superposition of light meson decays into

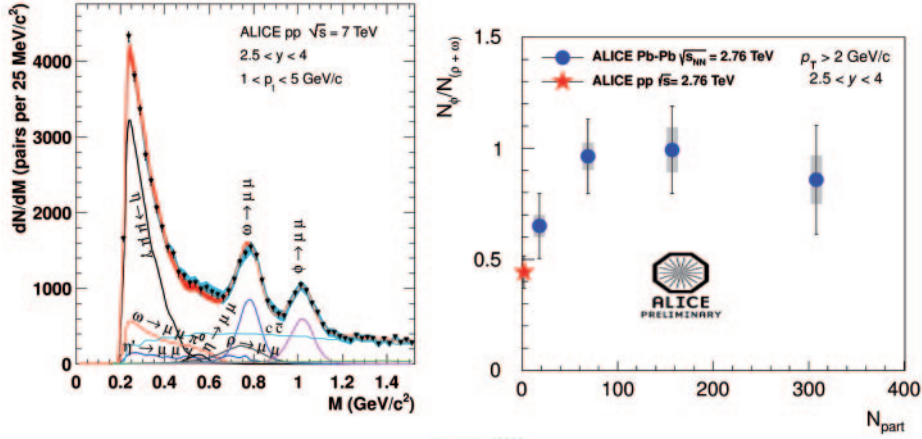


Fig. 1. – Left: fit to the dimuon invariant mass spectrum for  $p_T > 1$  GeV/ $c$  in pp collisions at  $\sqrt{s} = 7$  TeV; right:  $N_\phi/N_{\rho+\omega}$  ratio as a function of the number of participating nucleons  $N_{part}$  in Pb-Pb collisions at  $\sqrt{s} = 2.76$  TeV.

muon pairs, with an additional contribution coming from charm and beauty semi-muonic decays.

The cross section was extracted from a sample corresponding to an integrated luminosity  $L_{INT} = 55.7 \pm 2.8(\text{syst}) \text{ nb}^{-1}$  at 7 TeV and from a sample with  $L_{IN} = 17.6 \pm 0.5(\text{syst}) \text{ nb}^{-1}$  at 2.76 TeV. We obtained  $\sigma_\phi(2.5 < y < 4, 1 < p_T < 5 \text{ GeV}/c) = 0.940 \pm 0.084(\text{stat}) \pm 0.078(\text{syst}) \text{ mb}$  at 7 TeV [1] and  $\sigma_\phi(2.5 < y < 4, 1 < p_T < 4 \text{ GeV}/c) = 0.587 \pm 0.070(\text{stat}) \pm 0.045(\text{syst}) \text{ mb}$  at 2.76 TeV.

Data in Pb-Pb collisions were collected in 2011 at  $\sqrt{s_{NN}} = 2.76$  TeV. The selection criteria were the same as in the pp analysis, with an additional cut on the single muon  $p_T$  at 0.85 GeV/ $c$  to reduce the background. In fig. 1, right side, the  $N_\phi/N_{\rho+\omega}$  ratio, corrected for the acceptance, is shown as a function of the number of participating nucleons  $N_{part}$ . The Pb-Pb values obtained in four different centrality classes are compared to the value obtained in pp analysis at 2.76 TeV.

$N_\phi/N_{\rho+\omega}$  increases from pp to Pb-Pb and tends to saturate for central events.

In conclusion, both the integrated and  $p_T$ -differential cross sections of  $\phi$  and  $\omega$  in pp collisions at  $\sqrt{s} = 7$  TeV and the integrated and  $p_T$ -differential cross sections of  $\phi$  at  $\sqrt{s} = 2.76$  TeV were measured. The  $N_\phi/N_{\rho+\omega}$  ratio increases from pp to Pb-Pb collisions and saturates for more central collisions. The work is in progress to measure the nuclear modification factor of the  $\phi$  meson.

## REFERENCES

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- [2] AAMODT K. *et al.* (ALICE COLLABORATION), *JINST*, **3** (2008) S08002.