



## Measurements of prompt and non-prompt J/ψ production in Pb-Pb collisions at 5.02 TeV with ALICE

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- Introduction and motivation
- Results
  - Inclusive  $J/\psi$  production in pp and Pb-Pb collisions
  - Prompt and non-prompt J/ $\psi$  nuclear modification factor  $R_{AA}$
- Summary and outlook



## $J/\psi$ as a probe of the QGP





- The prompt J/ $\psi$  reflects the dissociation and (re-)generation contribution in QGP
- Non-prompt  $J/\psi$  can study the beauty quark and medium interaction



#### $J/\psi$ measurements with ALICE detector







## $J/\psi p_T$ spectrum in pp and Pb-Pb collisions at 5.02 TeV





- First measurement of inclusive J/ $\psi$  production at pp 5.02 TeV,  $p_T$  down to 0, new measurement consistent with ATLAS and CMS
- The statistical hadronization model describes the data at low  $p_{\rm T}$ , while the transport model agrees with  $\geq$ data for all  $p_{\rm T}$ 08/11/22



# J/ $\psi R_{AA}$ in Pb–Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV





- > The evidence of the (re-)generation contribution mainly at the central collisions and low  $p_{\rm T}$
- > The statistical hadronization model can describe the data at low  $p_{\rm T}$ , while the transport model agrees with data in whole measured  $p_{\rm T}$ -region



## Prompt and non-prompt J/ $\psi$ cross section





- Prompt J/ $\psi$  can be described by the NRQCD+CGC and ICEM calculations, while non-prompt J/ $\psi$  agrees with the FONLL prediction
- ALICE results are compatible with the CMS and ATLAS measurements







- > The slight centrality dependence hints at an increasing contribution from (re-)generation towards most central collisions for prompt  $J/\psi$
- > ALICE extends non-prompt J/ $\psi$  measurement at the LHC down to  $p_T = 1.5 \text{ GeV}/c$







- > ALICE extends the prompt and non-prompt J/ $\psi$  measurements at the LHC down to  $p_T = 1.5 \text{ GeV}/c$
- $\succ$  The results are compatible with ATLAS at higher  $p_{\rm T}$



## Centrality dependence of prompt and non-prompt J/ $\psi$ $R_{AA}$





- Prompt J/\u03c8 R<sub>AA</sub> increases towards more central collisions, points to an increasing contribution from (re-)generation
- Non-prompt J/ψ is more suppressed in central collisions, expected from heavy quark energy loss in the medium







- > Prompt J/ $\psi$  R<sub>AA</sub> increases from semicentral to central collisions in the lowest  $p_{\rm T}$  intervals
- The suppression seems stronger in central collisions compared to the semicentral at high  $p_T$  for both prompt and non-prompt J/ $\psi R_{AA}$







- Similar trends for non-prompt J/ $\psi$  and non-prompt D<sup>0</sup>  $R_{AA}$
- Non-prompt J/ $\psi$  R<sub>AA</sub> described by models implementing collisional and radiative energy loss for  $p_T > 5$  GeV/*c*
- > Prompt J/ $\psi$   $R_{AA}$  agrees with the SHMc prediction at low  $p_T$





- GEM technology replaced the old wire chamber for the TPC readout, increasing the detector's DAQ speed by a factor of 100
- Significantly improved the impact parameter resolution and the tracking efficiency. Reducing the material budget from ~1.14% to ~0.35% X<sub>0</sub>







- > The signal-to-background ratio improved significantly by using the machine method
- Three components (prompt, non-prompt, and background) approach will be used for Run 3







Run 3 can extend non-prompt J/ $\psi$  measurement to the very low  $p_T$ , the precision of the measurements will be significantly improved





- ▶ Prompt and non-prompt J/ $\psi$  are measured in Pb-Pb collisions at  $\sqrt{s_{NN}} = 5.02$  TeV
  - Dominant contribution from (re-)generation in central collisions and low  $p_{\rm T}$  for prompt J/ $\psi$
  - Strong suppression is observed for non-prompt  $J/\psi$ , as described by the energy loss models
- > The precision of the measurements will be improved significantly with Run3





# Thanks