



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

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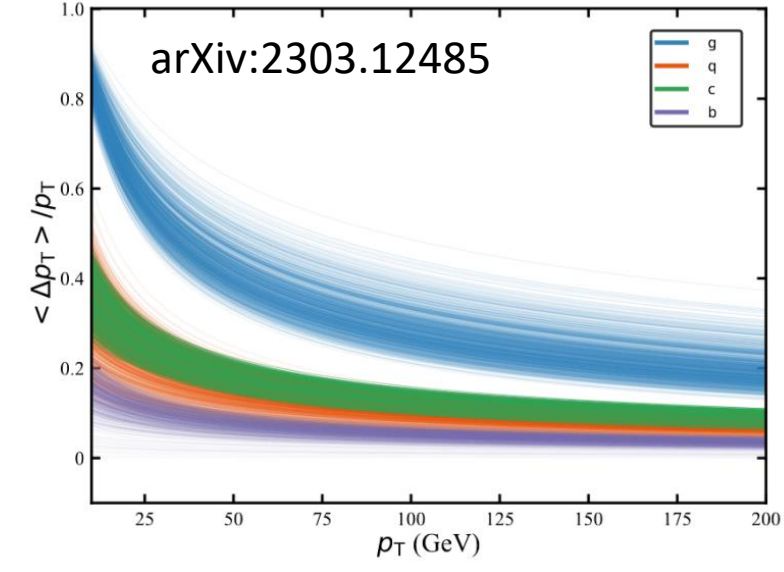
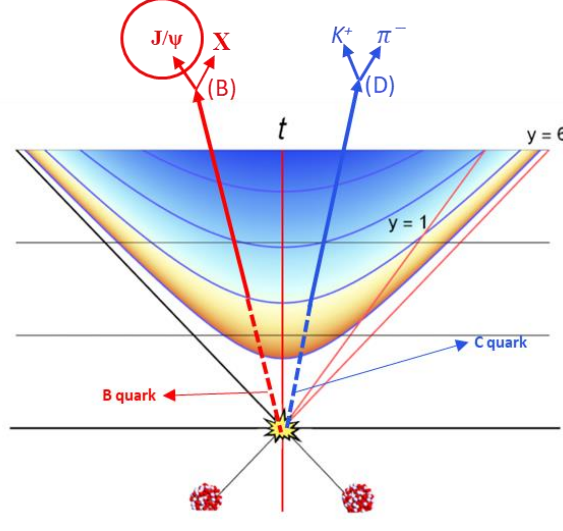
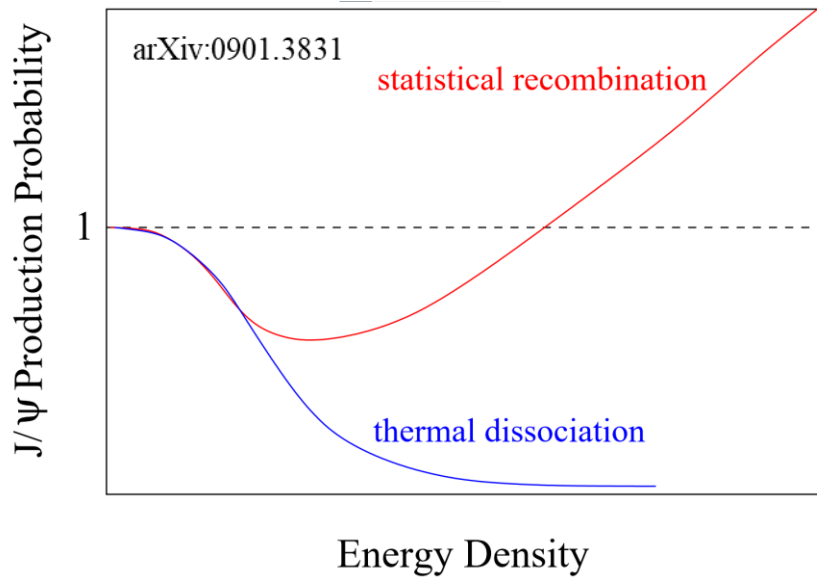
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Abstract

Quarkonia are excellent probes of deconfinement in heavy-ion collisions. For J/ψ, a bound state of $c\bar{c}$ quarks, its production yield is sensitive to color screening and dissociation in the medium. However, the charmonium regeneration is expected to be significantly larger at LHC energies than at RHIC and SPS energies since the density of uncorrelated charm-anticharm pairs in the medium is more significant. On the other hand, determining the non-prompt component of the J/ψ production, originating from b-hadron decays, allows one to access the interaction of b-quarks with the QGP. It also enables prompt J/ψ measurements as a direct comparison with prompt charmonium models.

In this talk, newly published inclusive J/ψ yield and nuclear modification factor results at midrapidity will be shown in Pb–Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV. The J/ψ-to- D^0 meson ratio, obtained in central and semi-central collisions, will also be discussed. The newly published measurements of prompt and non-prompt J/ψ yields and nuclear modification factors, performed at midrapidity in Pb–Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV, will be presented. The determination of the non-prompt J/ψ fraction extends to very low p_T with a significantly improved precision compared to previous publications. Results will be compared with available calculations.

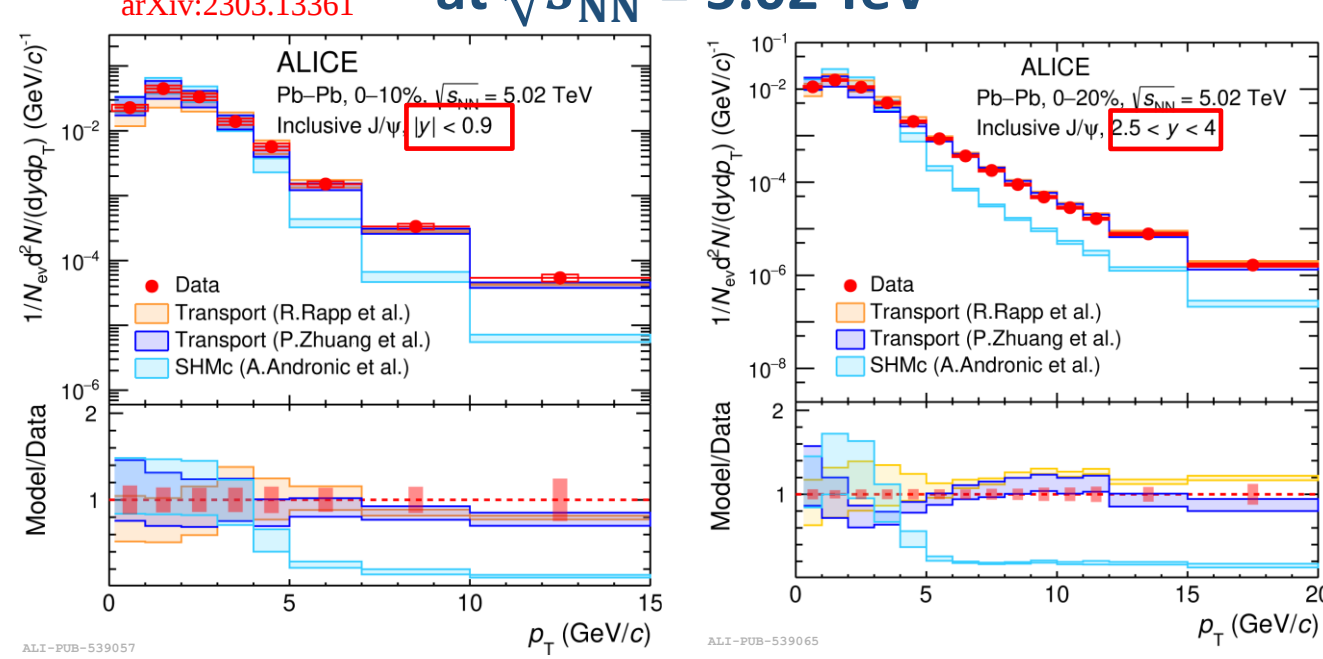
Prompt and non-prompt J/ψ



- Suppression of the direct charmonium due to **color screening** and the **dynamic dissociation**
- Charm quark production cross section at the LHC is very large, and the **(re)generation** contribution to the J/ψ is significant.

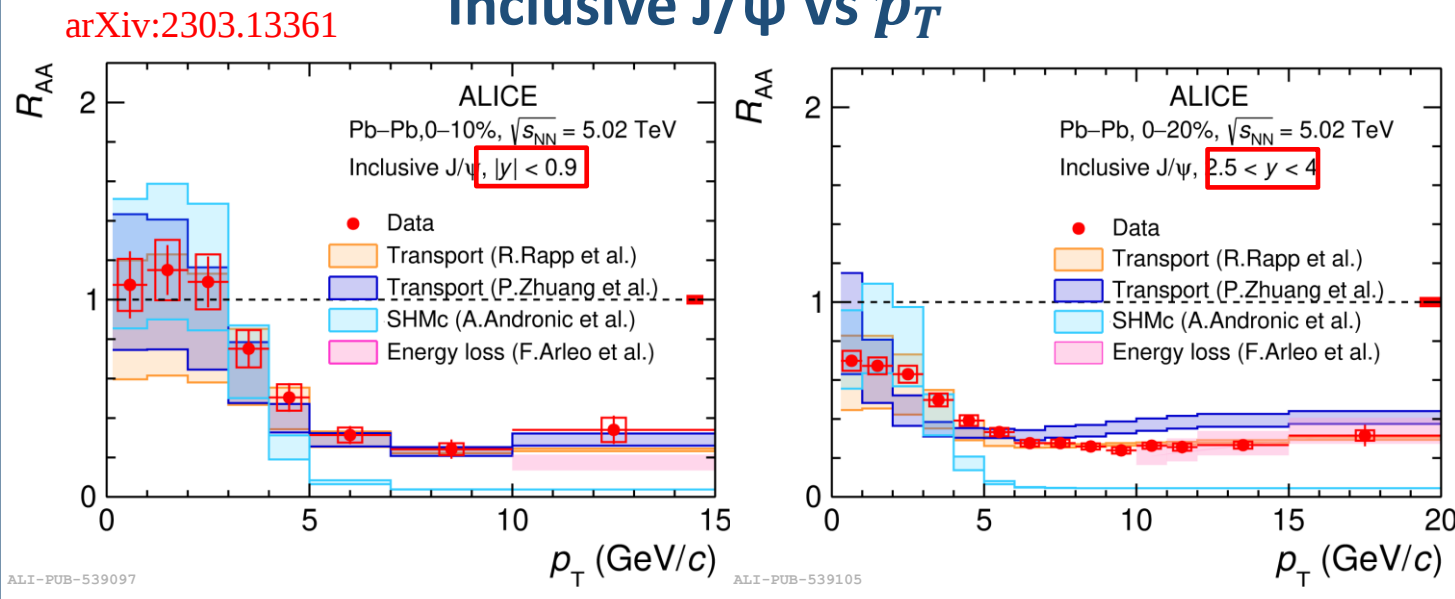
- The heavier parton losses less energy.
- Non-prompt charmonium is from the beauty hadron decays: corresponding measurements can contribute to the study of **mass dependence of parton energy loss**.

Inclusive J/ψ yield in Pb–Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV



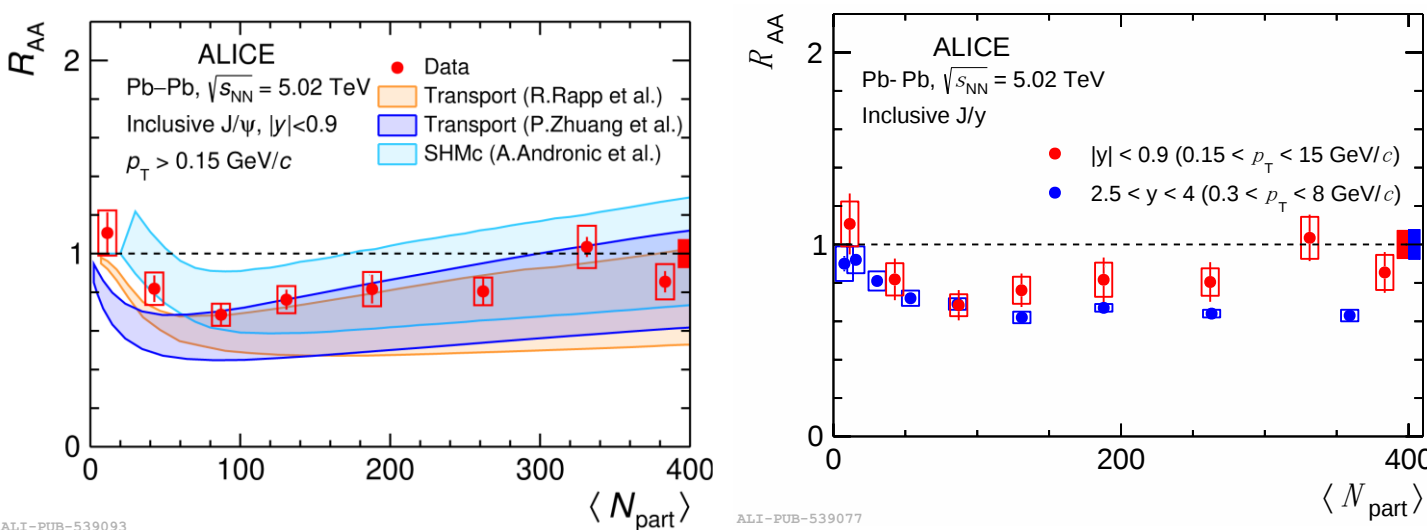
- SHMc agrees with data at low p_T , and underestimates the measurement at high p_T

Inclusive J/ψ vs p_T



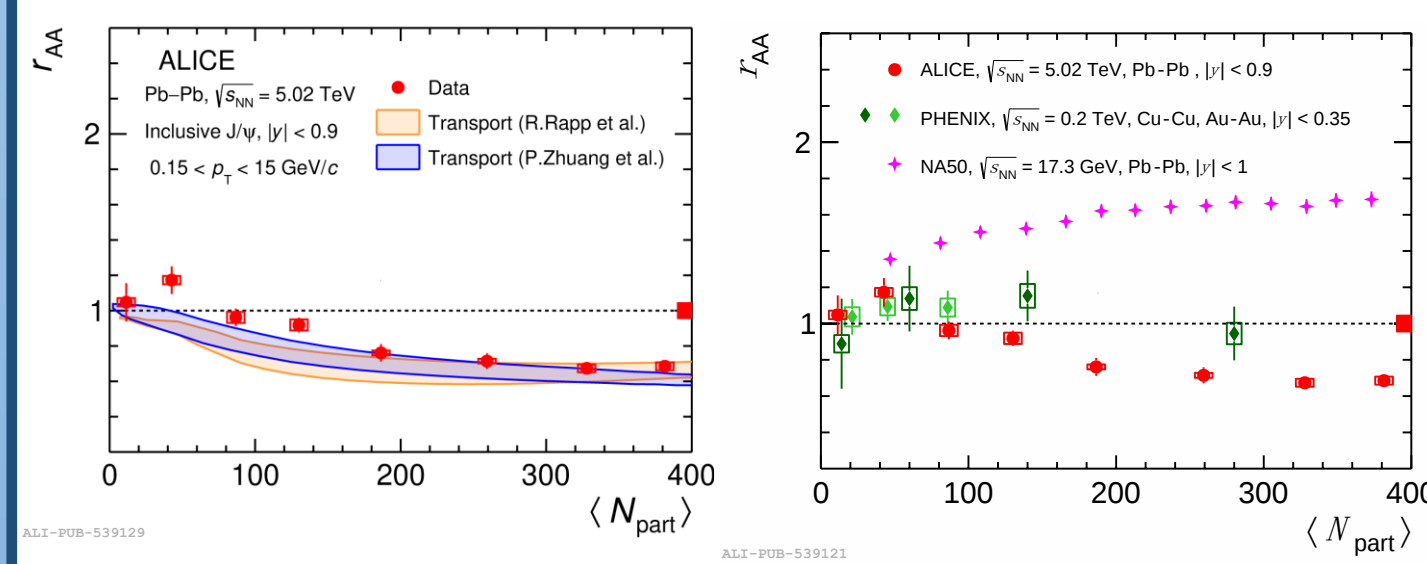
- Evidence for J/ψ (re-)generation at low p_T**
- Transport and SHMc models describe data at low p_T
- SHMc underestimates the measurement at high p_T
- Energy loss model agrees with data at high p_T

Inclusive J/ψ vs centrality



- Evidence for J/ψ (re-)generation in central collisions**
- A larger contribution at midrapidity compared to forward rapidity

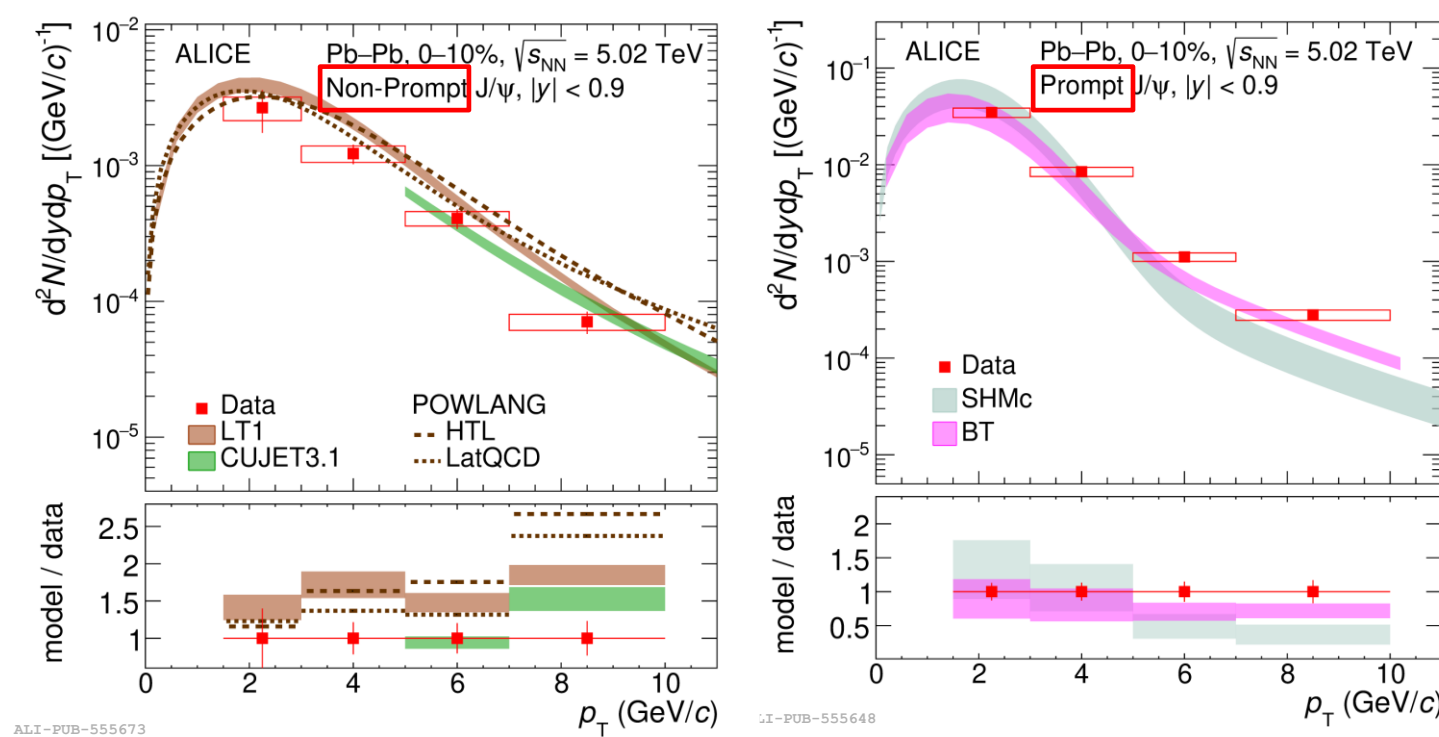
Inclusive J/ψ r_{AA}



- r_{AA} below unity indicates **a softening of the J/ψ p_T shape** in Pb–Pb collisions compared to pp collisions
- The behavior is different from the lower center-of-mass energies

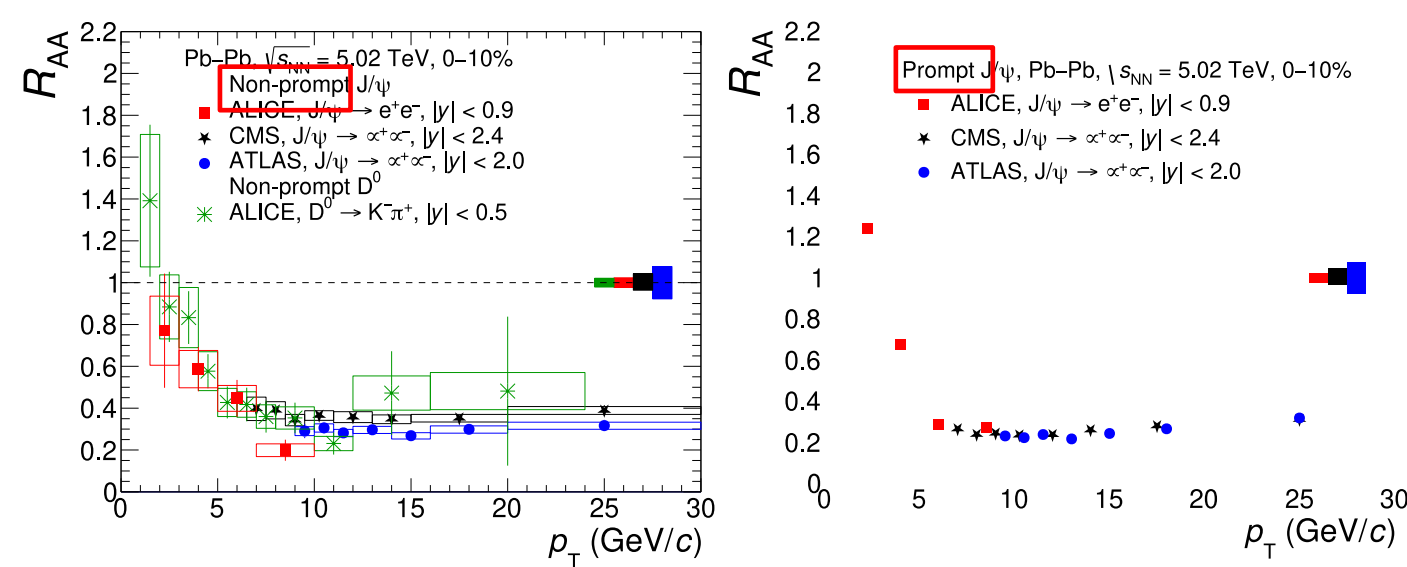
$$r_{AA} = \frac{\langle p_T^2 \rangle_{PbPb}}{\langle p_T^2 \rangle_{pp}}$$

Non-prompt and prompt J/ψ p_T spectrum



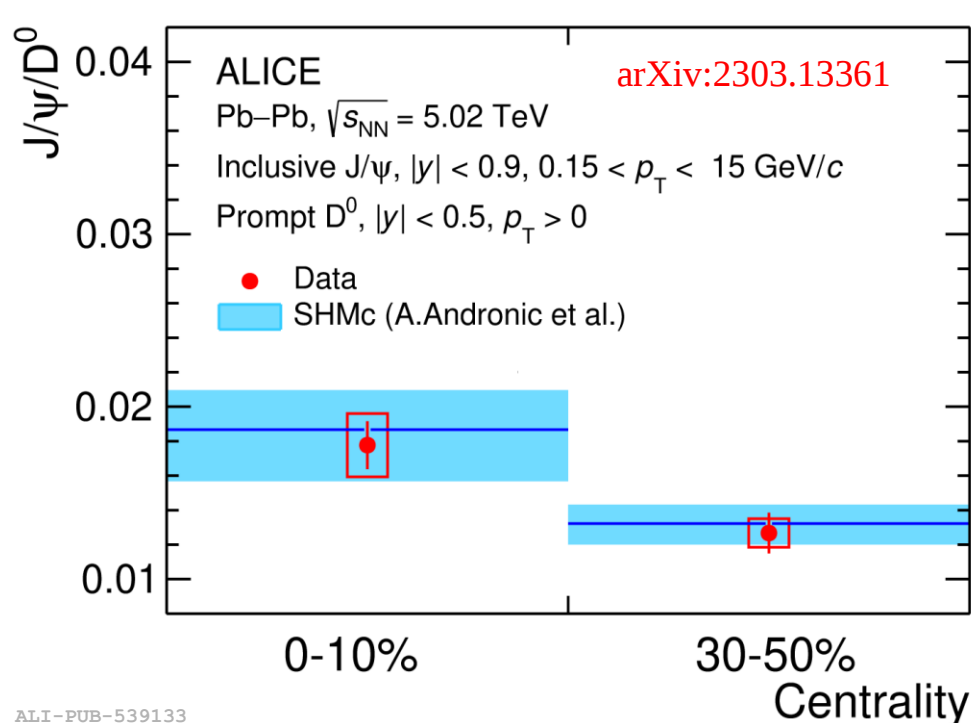
- All the models seem to overestimate data of non-prompt J/ψ
- The SHMc and BT agree with data within uncertainties for the prompt J/ψ at low p_T

p_T dependence of prompt and non-prompt J/ψ R_{AA}



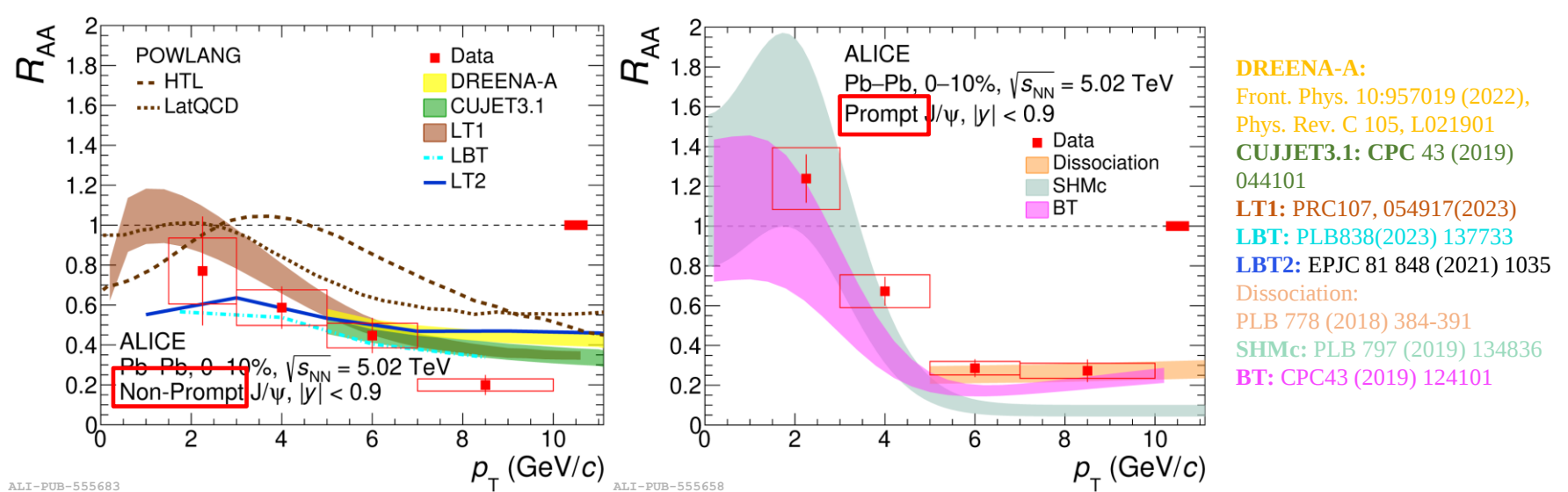
- R_{AA} extended **down to $p_T = 1.5$ GeV/c**
- compatible within uncertainties with ATLAS and CMS measurements in the common p_T range

J/ψ-to- D^0 ratio in Pb–Pb collisions



- Sensitive to hadronization mechanisms
- centrality-dependent trend of the D^0 to J/ψ ratio explained by the **increase of charm fugacity**

Non-prompt and prompt J/ψ R_{AA} :comparison with models



- Non – prompt J/ψ R_{AA} described within uncertainties: energy loss from collisional and radiative process**
- POWLANG including only collisional contributions, overestimate the R_{AA} at intermediate and high p_T
- SHMc and transport calculations including contributions from **regeneration** compatible with the measured prompt J/ψ R_{AA} **at low p_T**