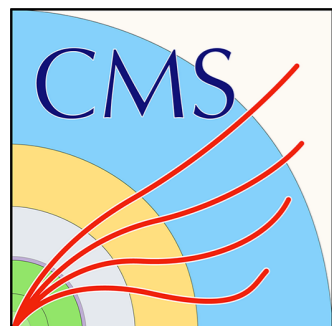


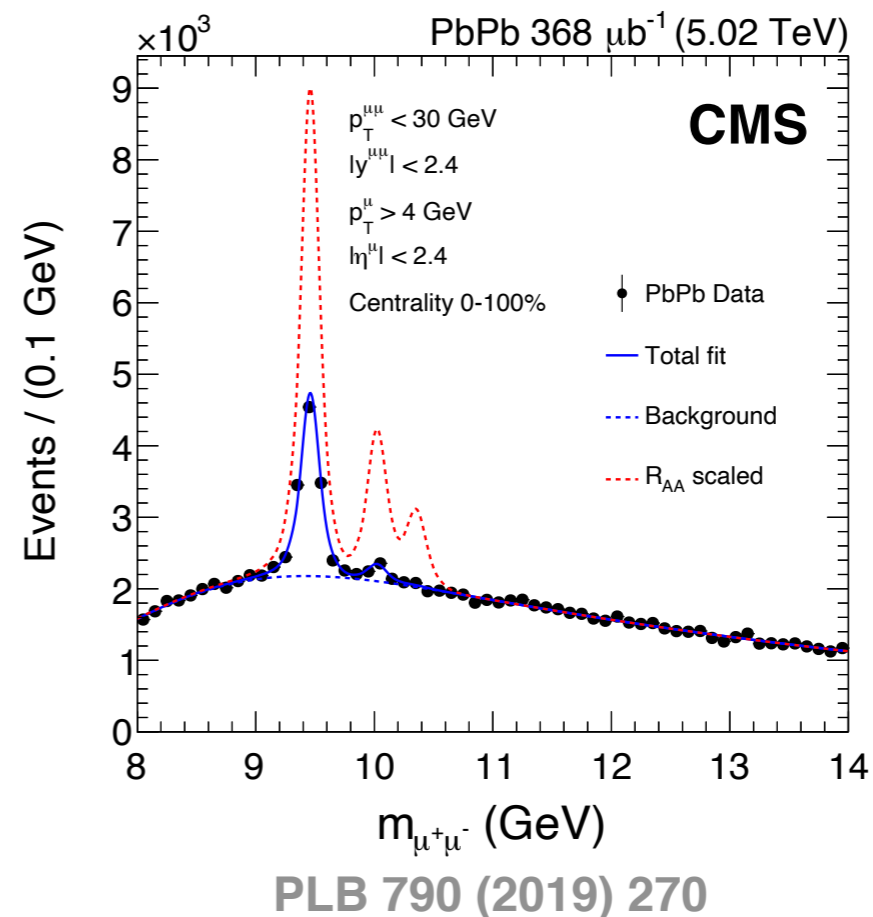
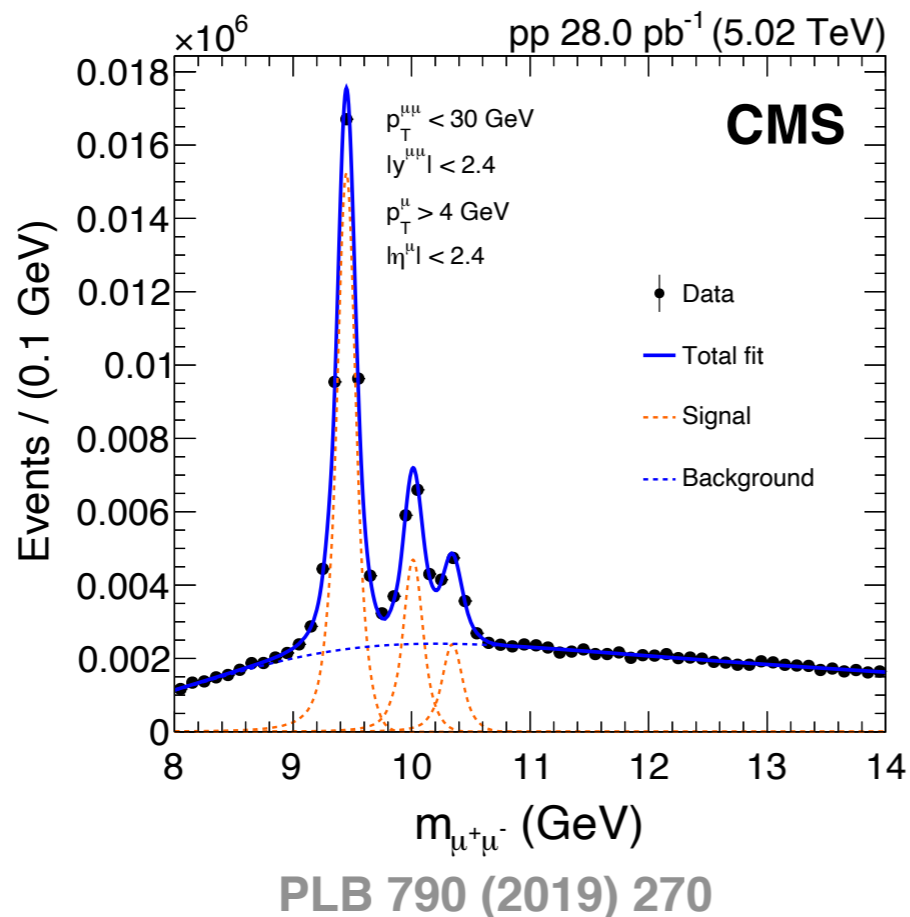
Recent dilepton results in CMS

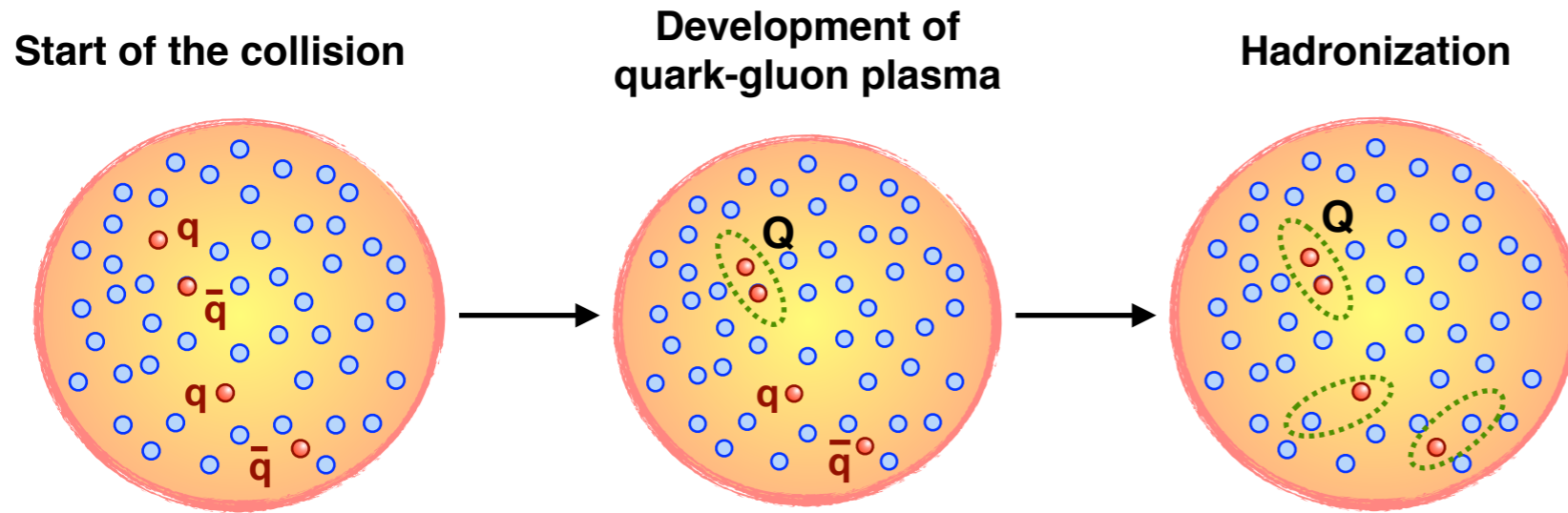
Batoul Diab

Laboratoire Leprince-Ringuet, École Polytechnique, France
25/11/2021

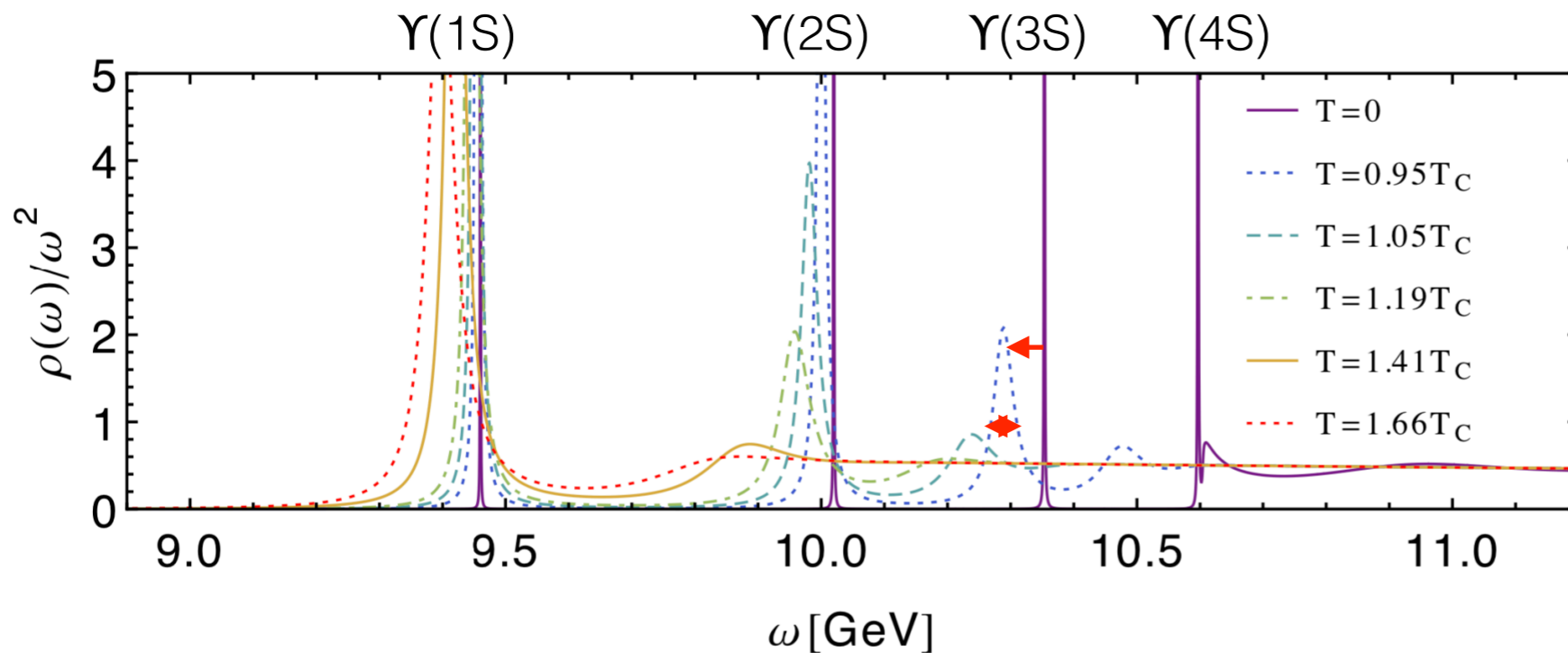


- The CMS is an ideal experiment to reconstruct quarkonium states in their decays into $\mu^+\mu^-$:
- Large detector acceptance for muons $|\eta| < 2.4$
- Very good dimuon resolution \rightarrow distinguish the ground and excited states

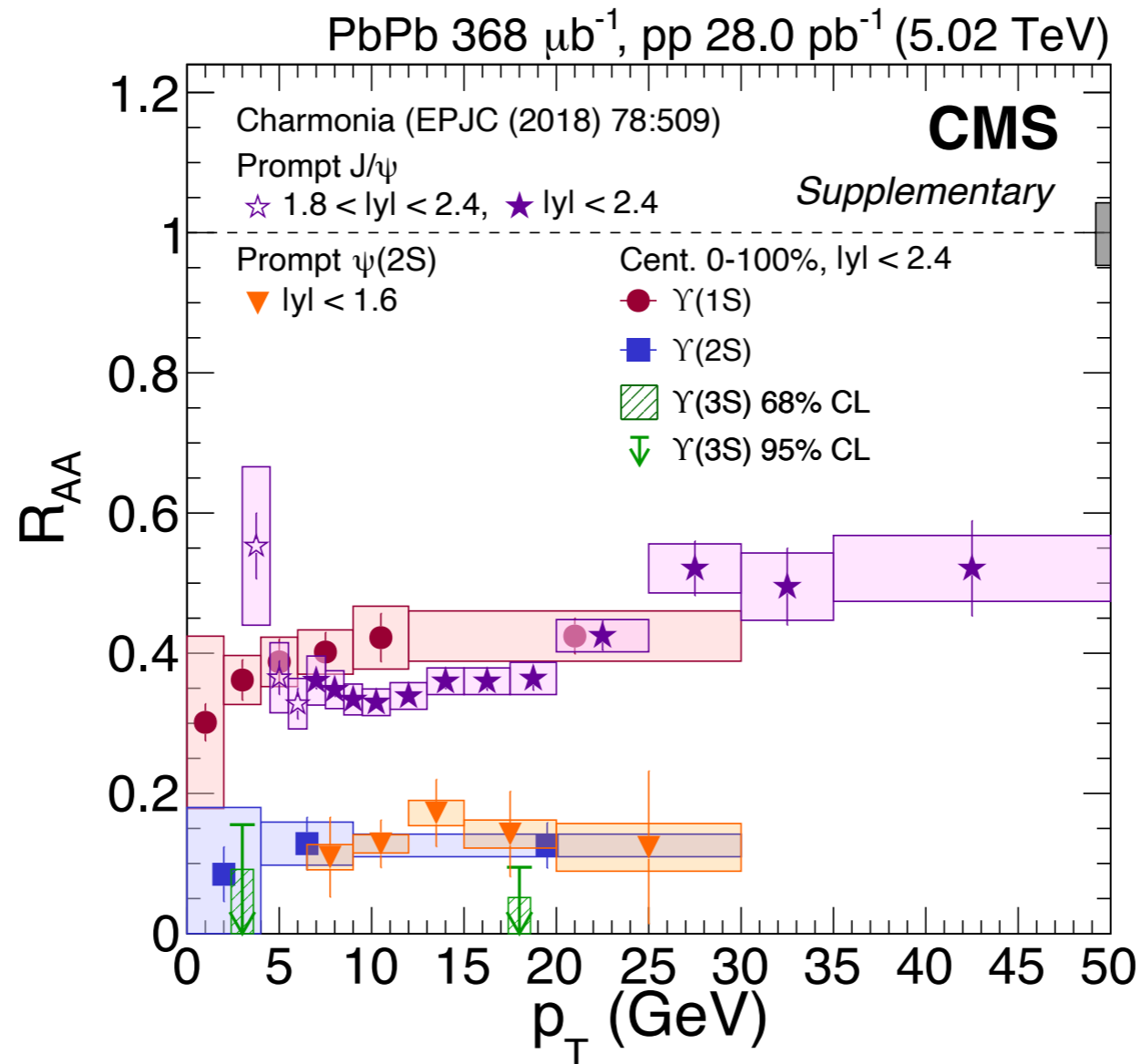




- Debye screening causes quarkonia suppression

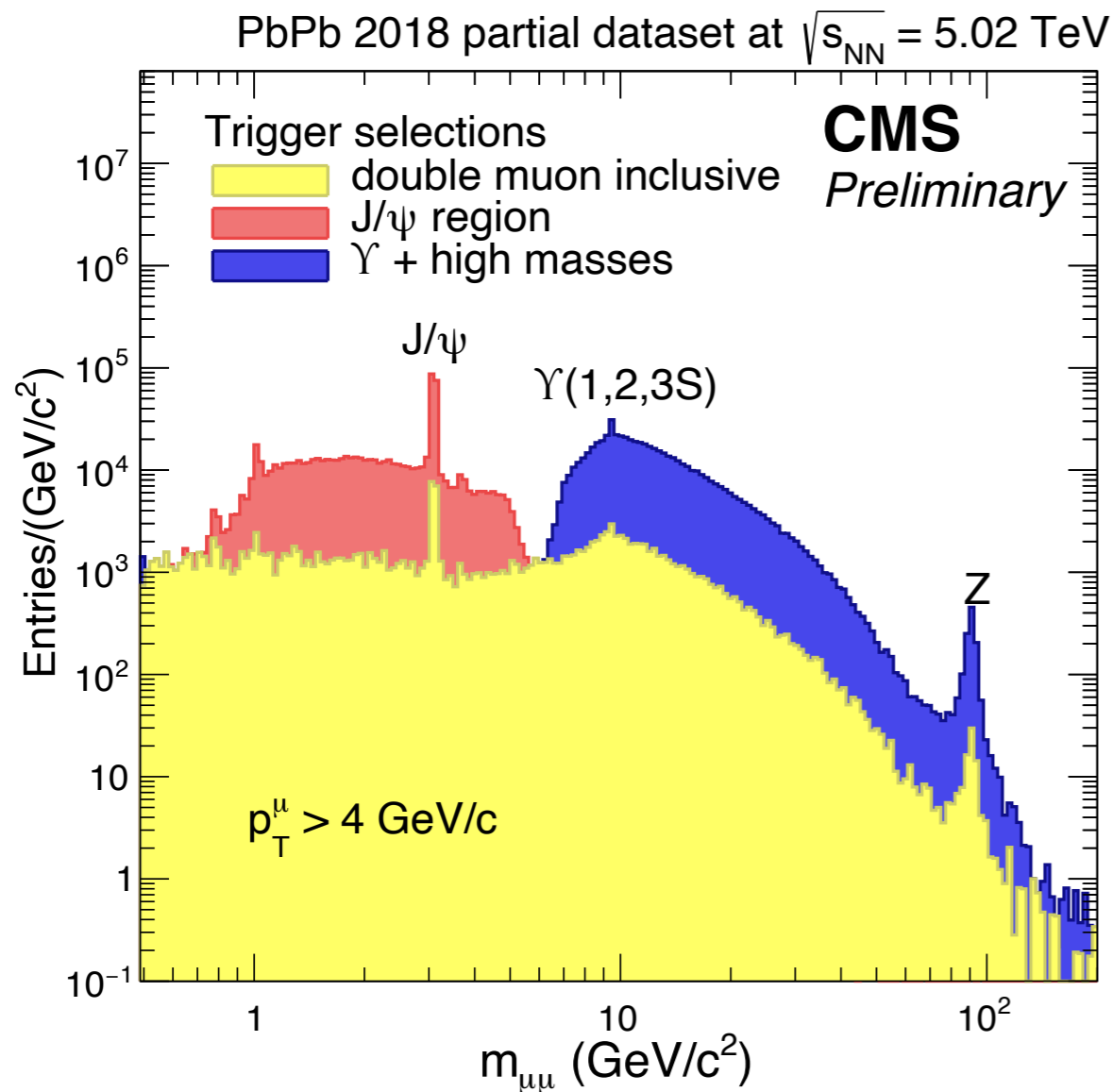


- Sequential melting can be used to probe the temperature of the QGP

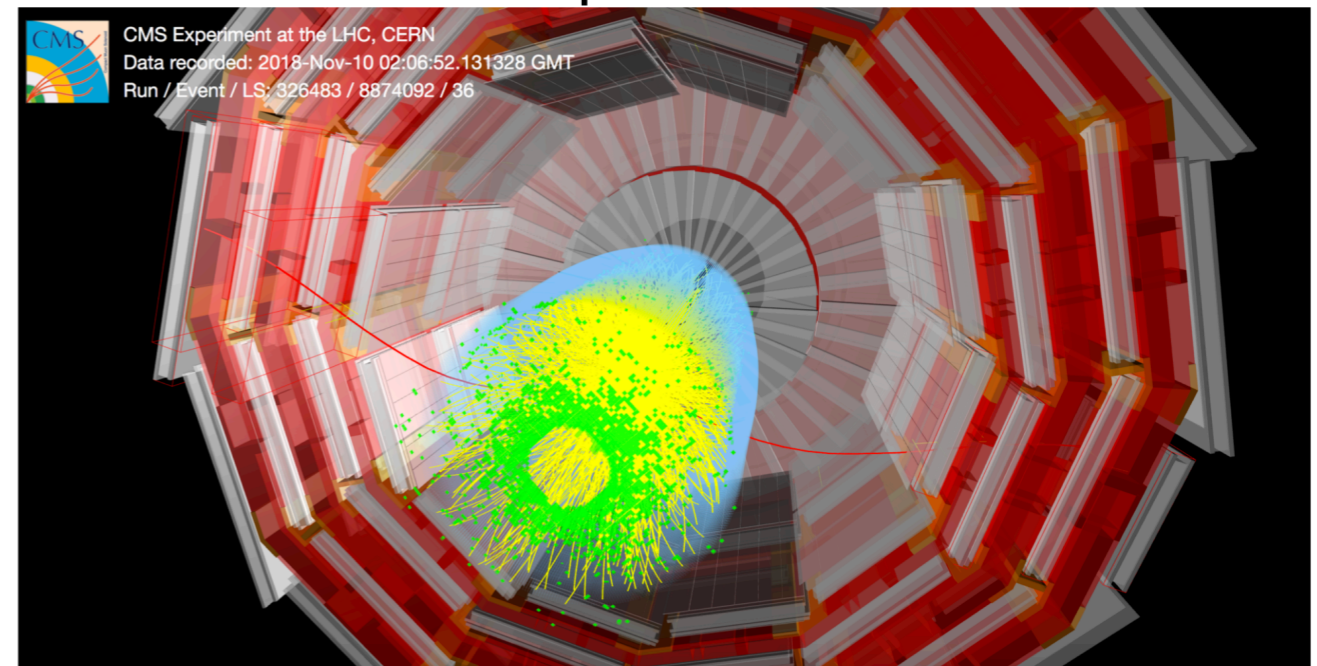


- Suppression of ψ and Υ states
- Regeneration more important in charmonia
- Increase of suppression with p_T for J/ψ and a hint for Υ

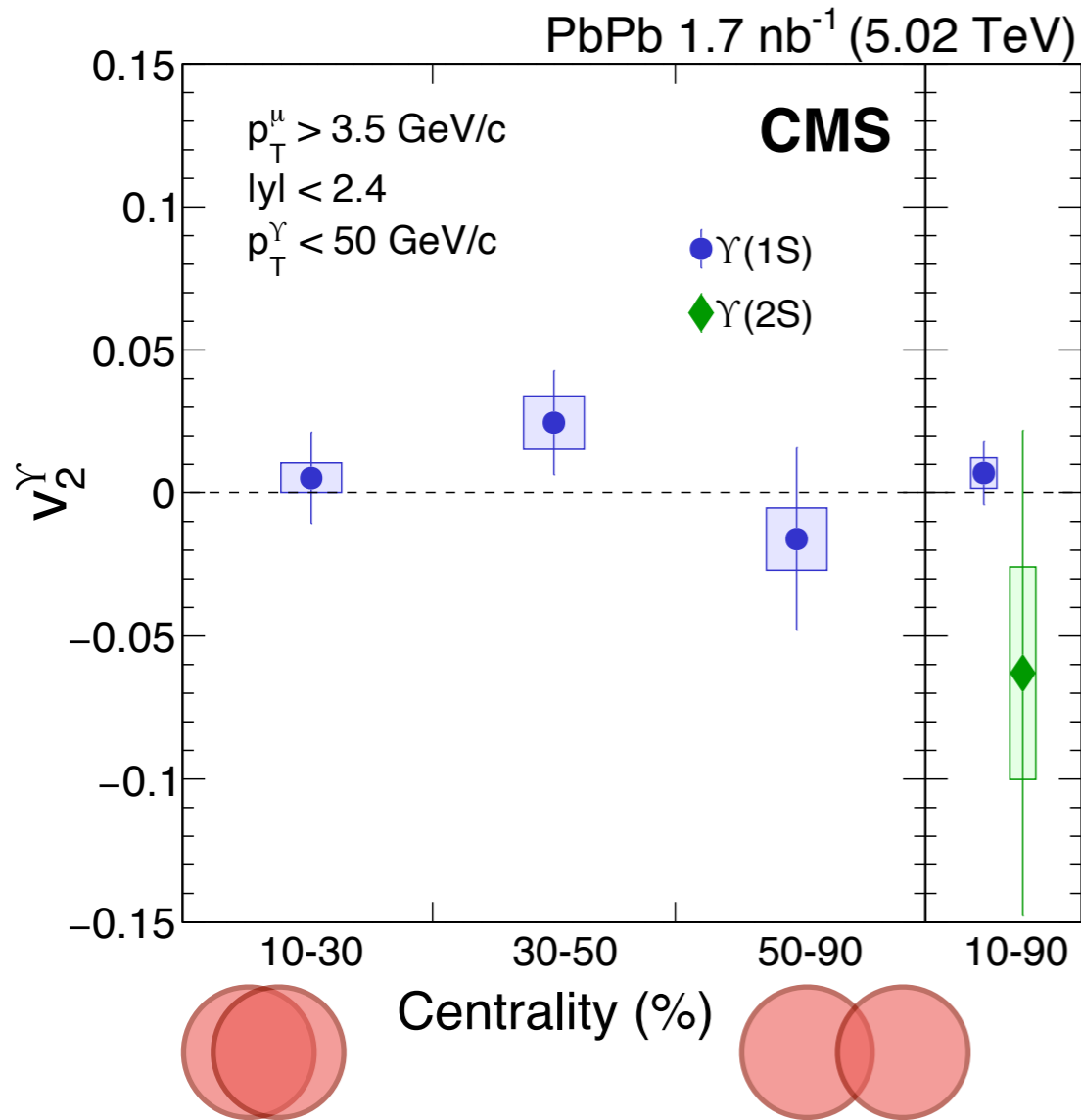
Most recent PbPb data: $\sqrt{s_{NN}} = 5.02$ TeV, $L \sim 1.7$ nb $^{-1}$



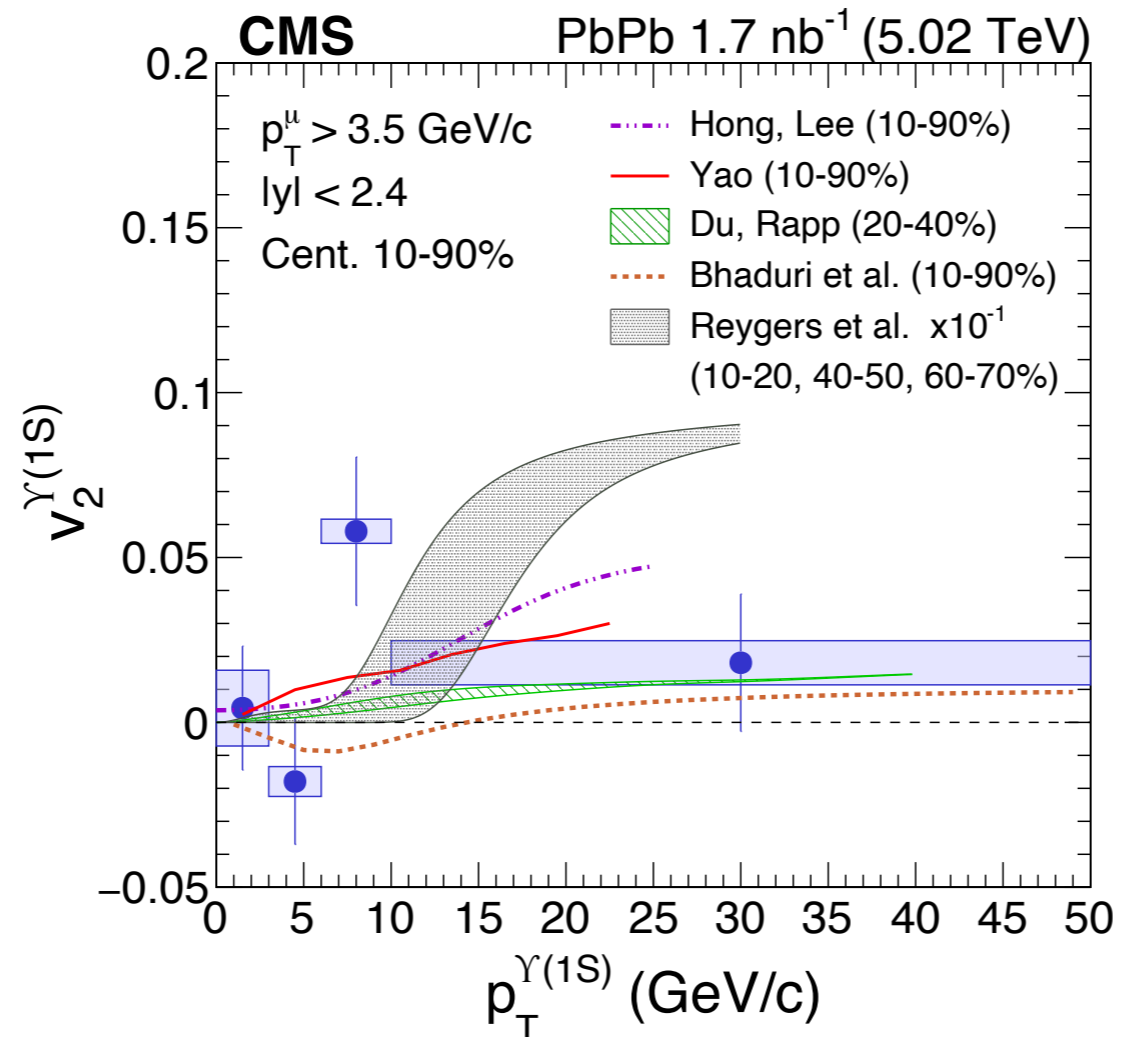
Upsilon candidate



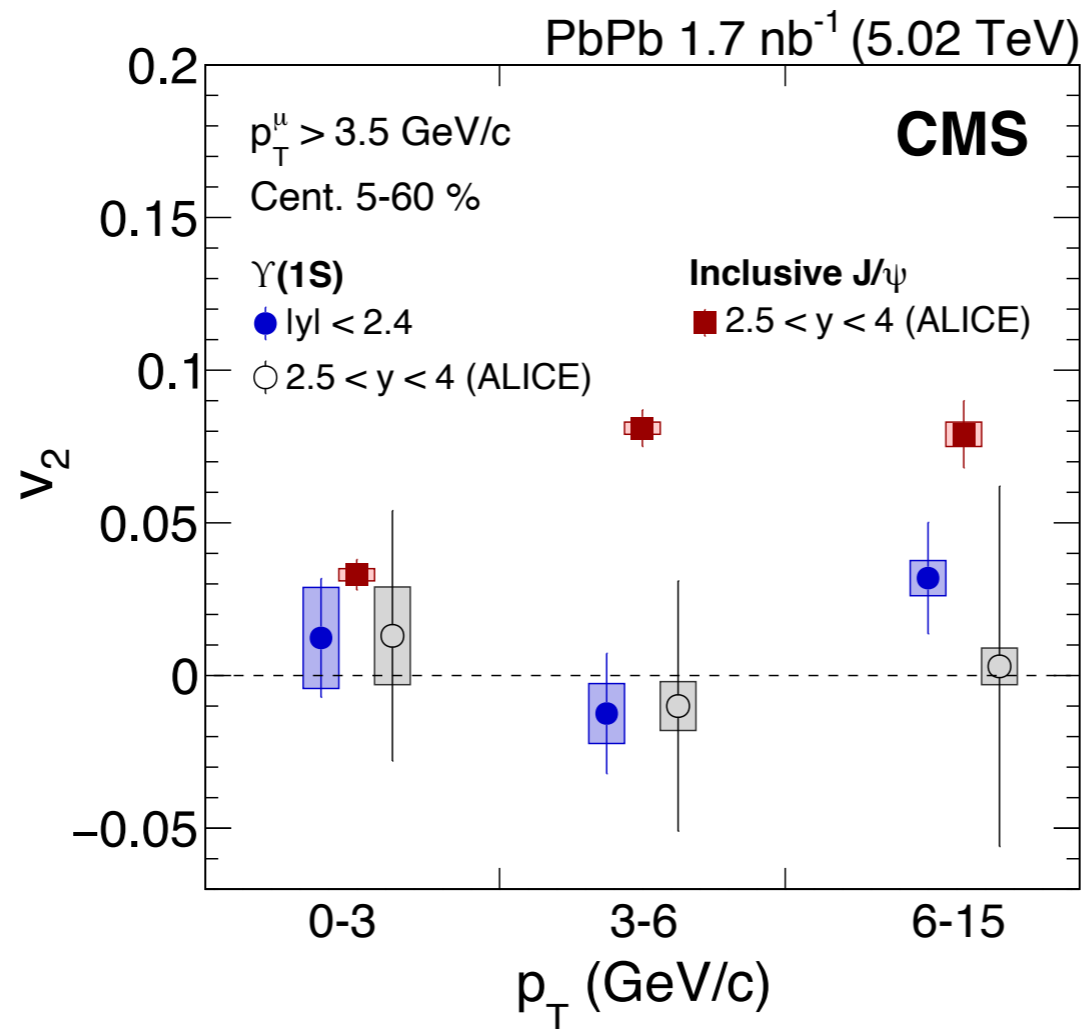
- $\sim x4.5$ more statistics compared to 2015 data
- New first-time measurements in CMS HI: Elliptic flow (v_2) of Υ , J/ ψ in jets, B_c production



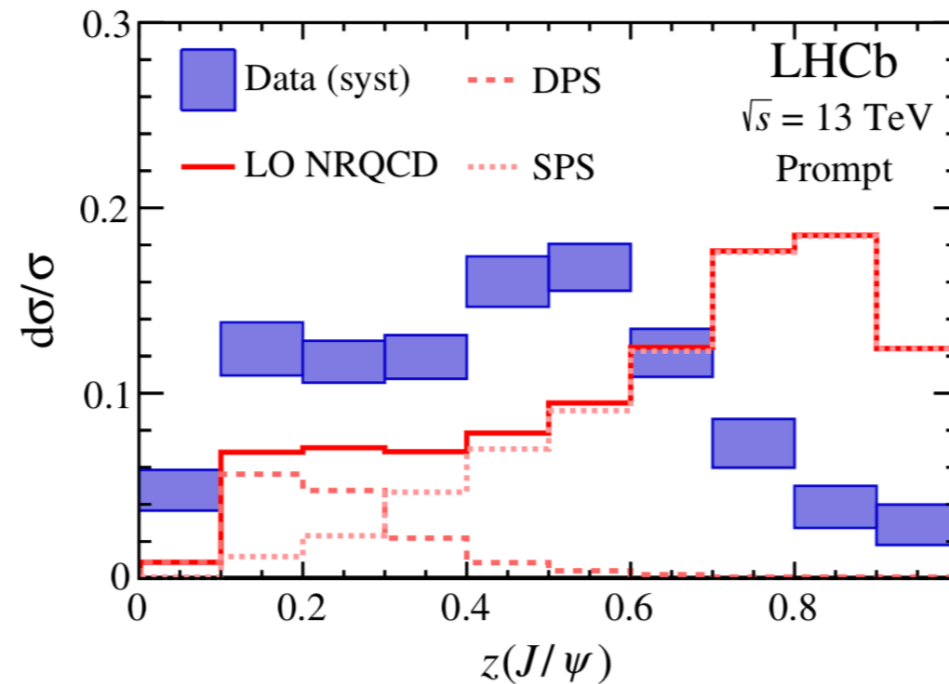
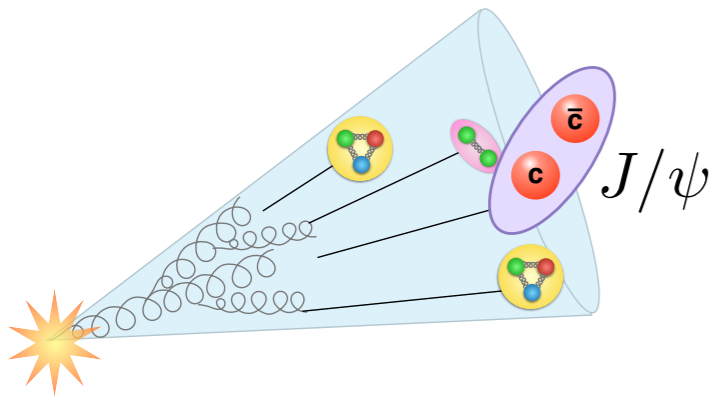
- **Precise $\Upsilon(1S)$ v_2 measurement**
 - compatible with zero in all centrality intervals
- **First measurement of $\Upsilon(2S)$ v_2**
 - provide new input to production mechanism



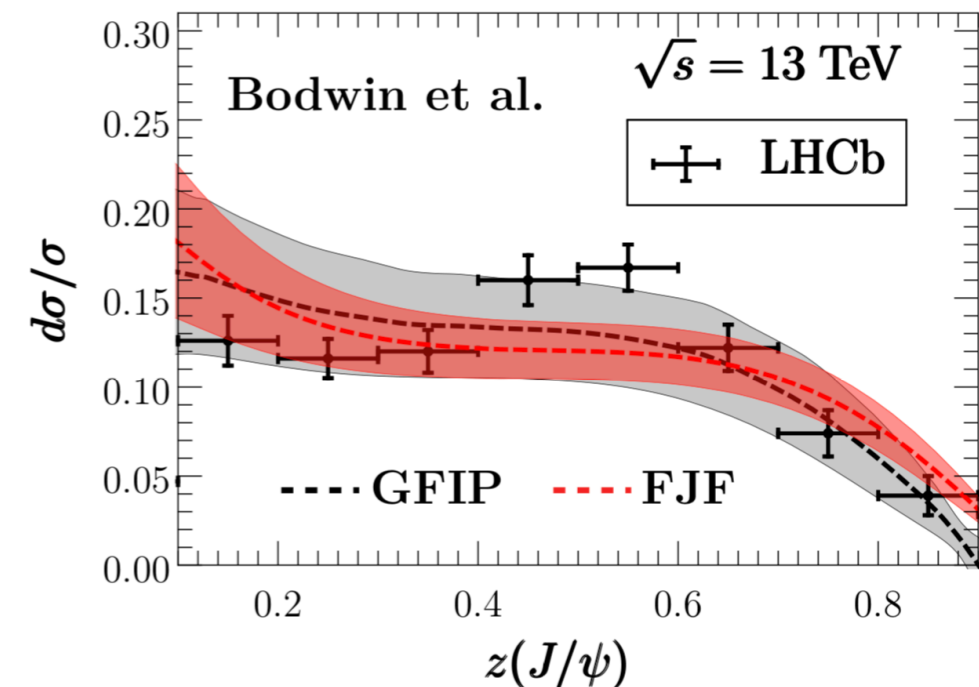
- v_2 measured with high precision as function of p_T
- Compatible with zero over all kinematic range:
 Max. ~ 2.5 standard dev. (p_T 6-10 GeV/c)



- Different v_2 for Υ and J/ψ : different medium effect of charmonia and bottomonia

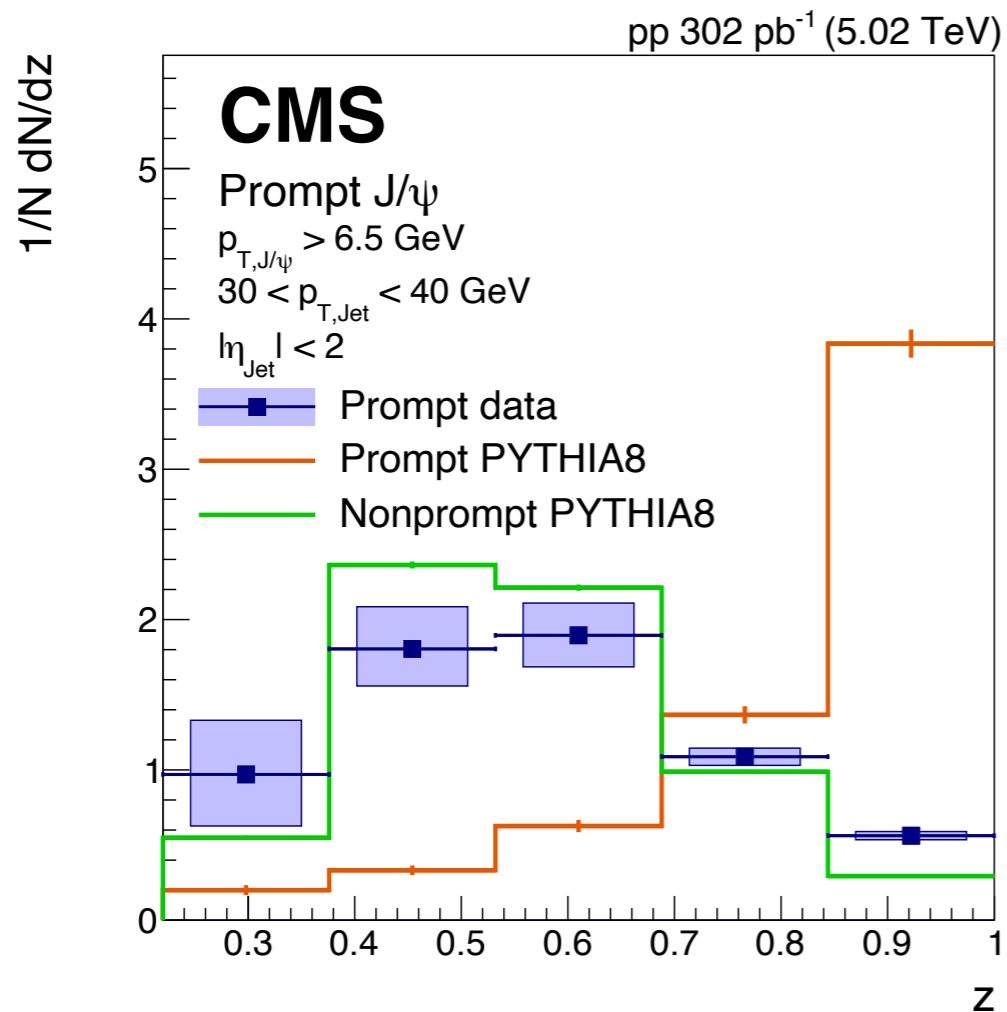


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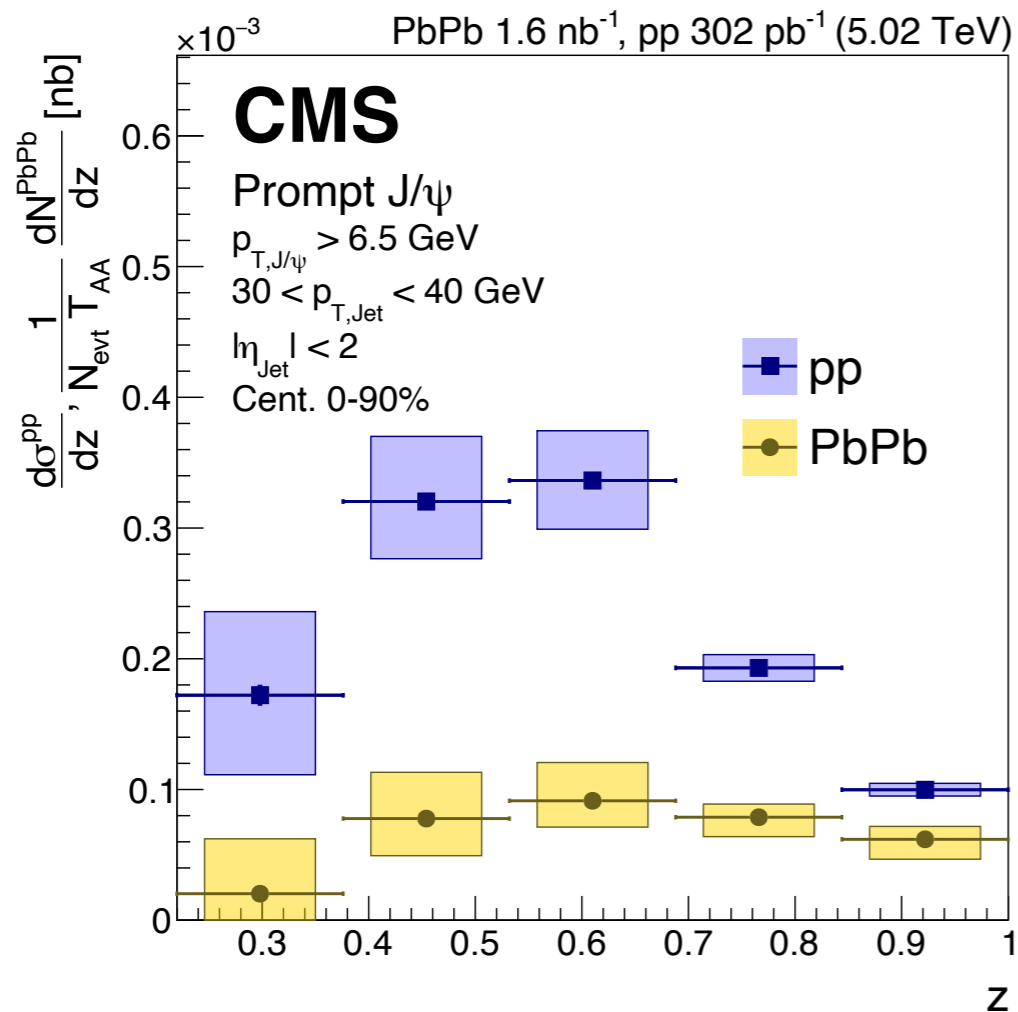


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- J/ ψ production is not fully understood
- Recent measurement by LHCb: J/ ψ in jets
- $z = J/\psi p_T / \text{jet } p_T$
- prompt J/ ψ are produced with far more jet activity than predicted by LO NRQCD
- NLL calculations reproduce data when taking into account J/ ψ production in parton showers

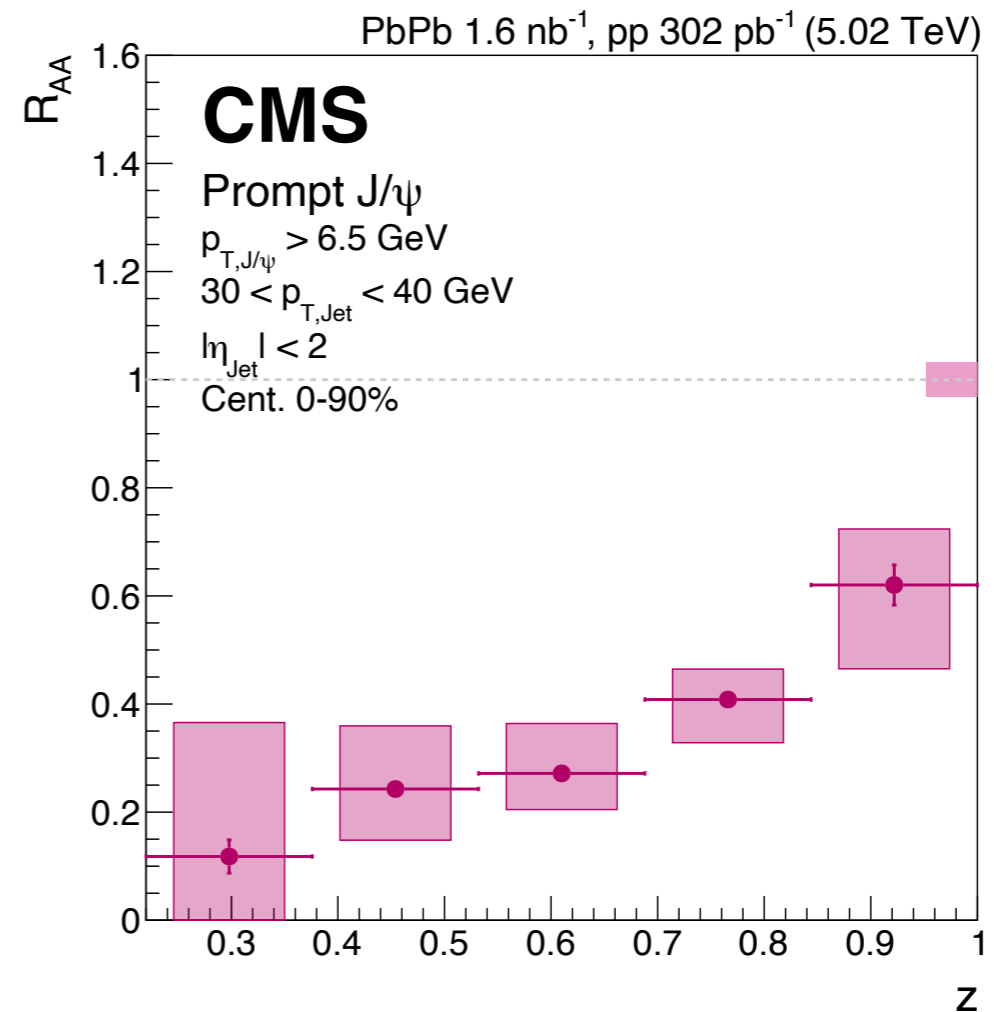
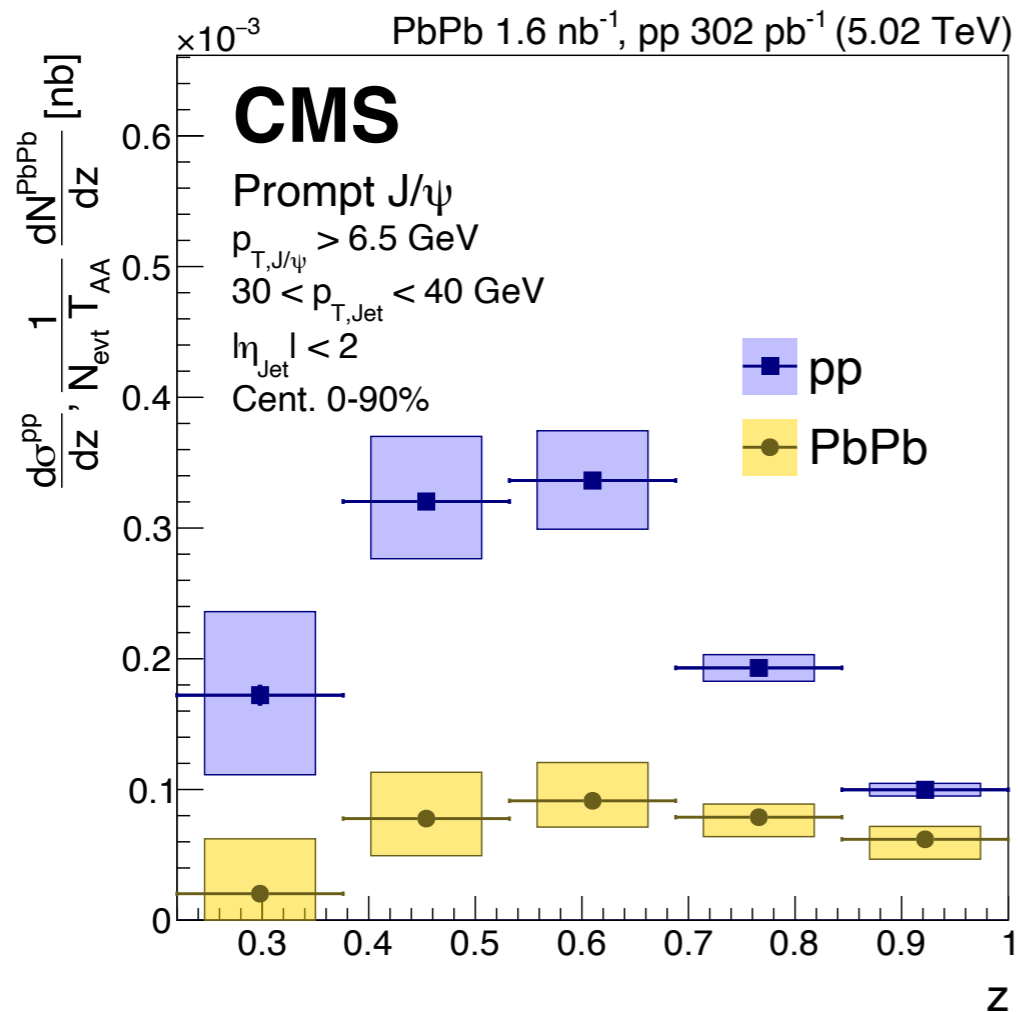


- Sizable jet component, as opposed to isolated J/ψ
- Prompt data more similar to **nonprompt PYTHIA8** than **prompt PYTHIA8**



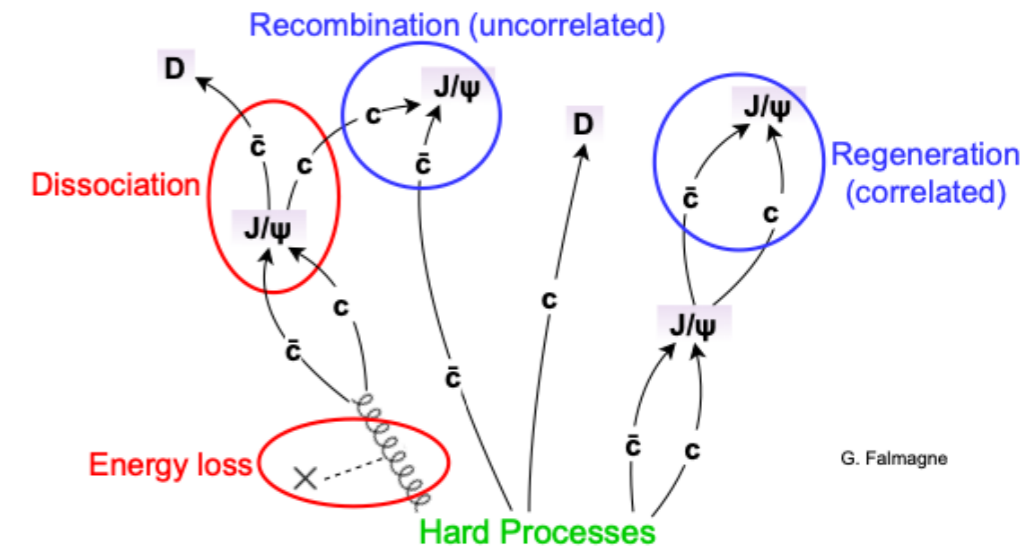
- First measurement of J/ψ in jets in PbPb collisions
- **pp** and **PbPb** have similar trends

- Suppression in PbPb in all z bins

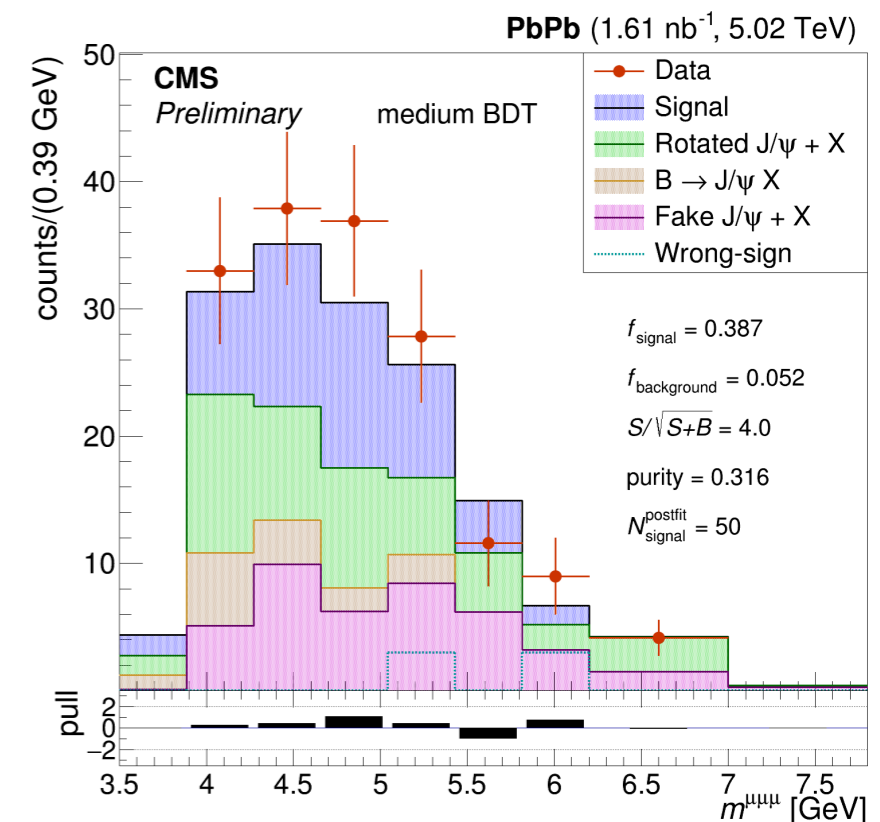


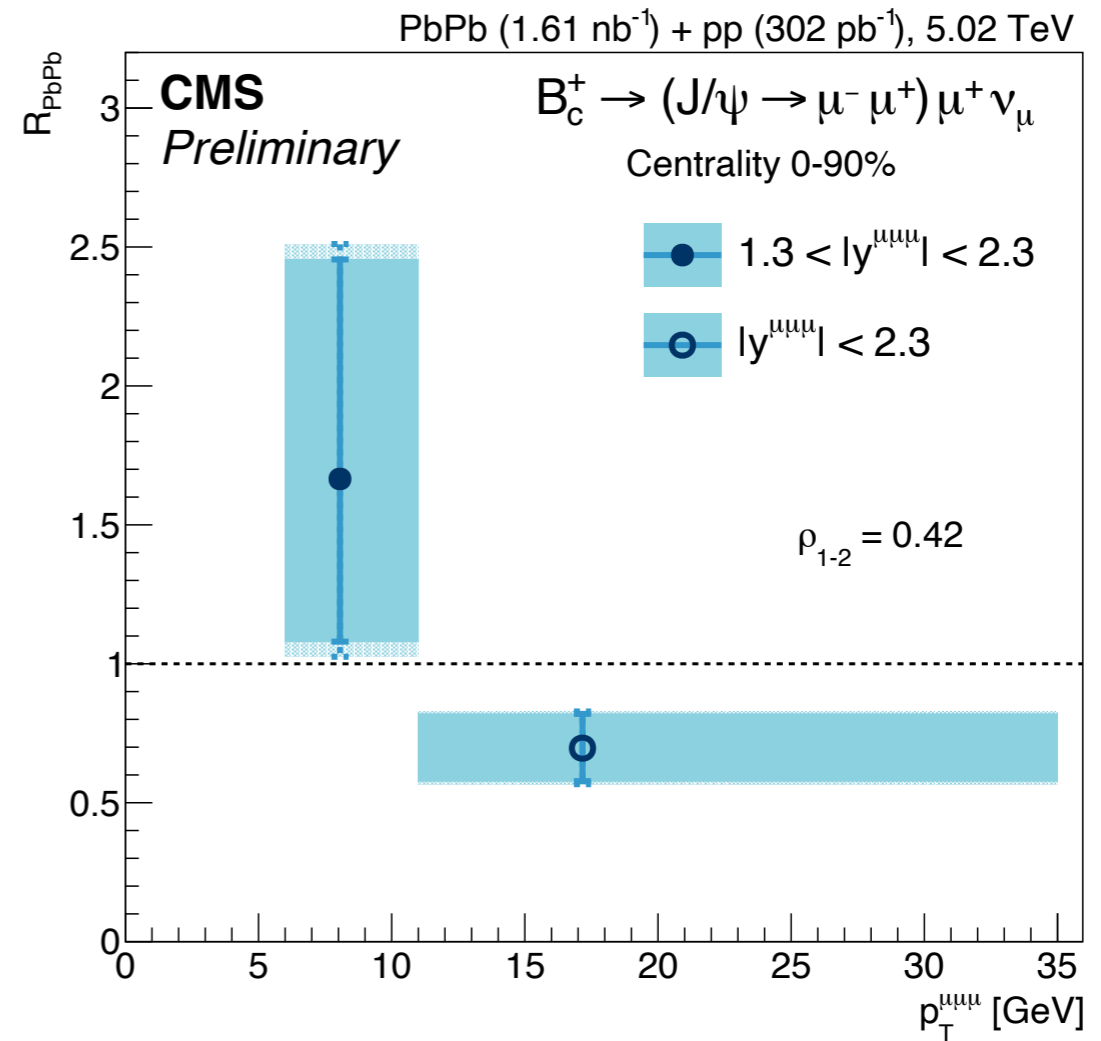
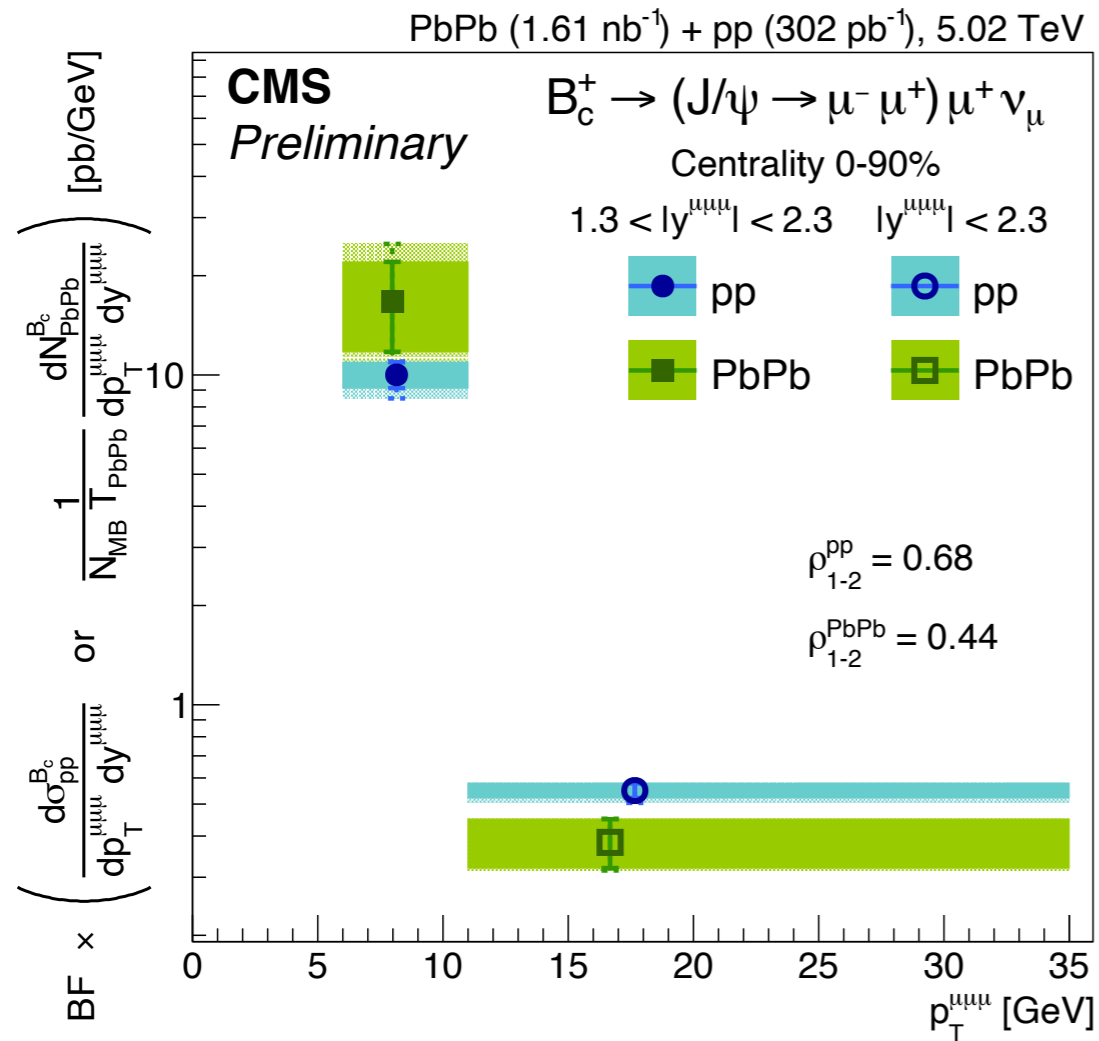
- Suppression in PbPb in all z bins
- Rising trend of R_{AA} as a function of z
- In agreement with the J/ψ production in parton shower picture

- B_c = b+c → bridge between charmonium and bottomonium

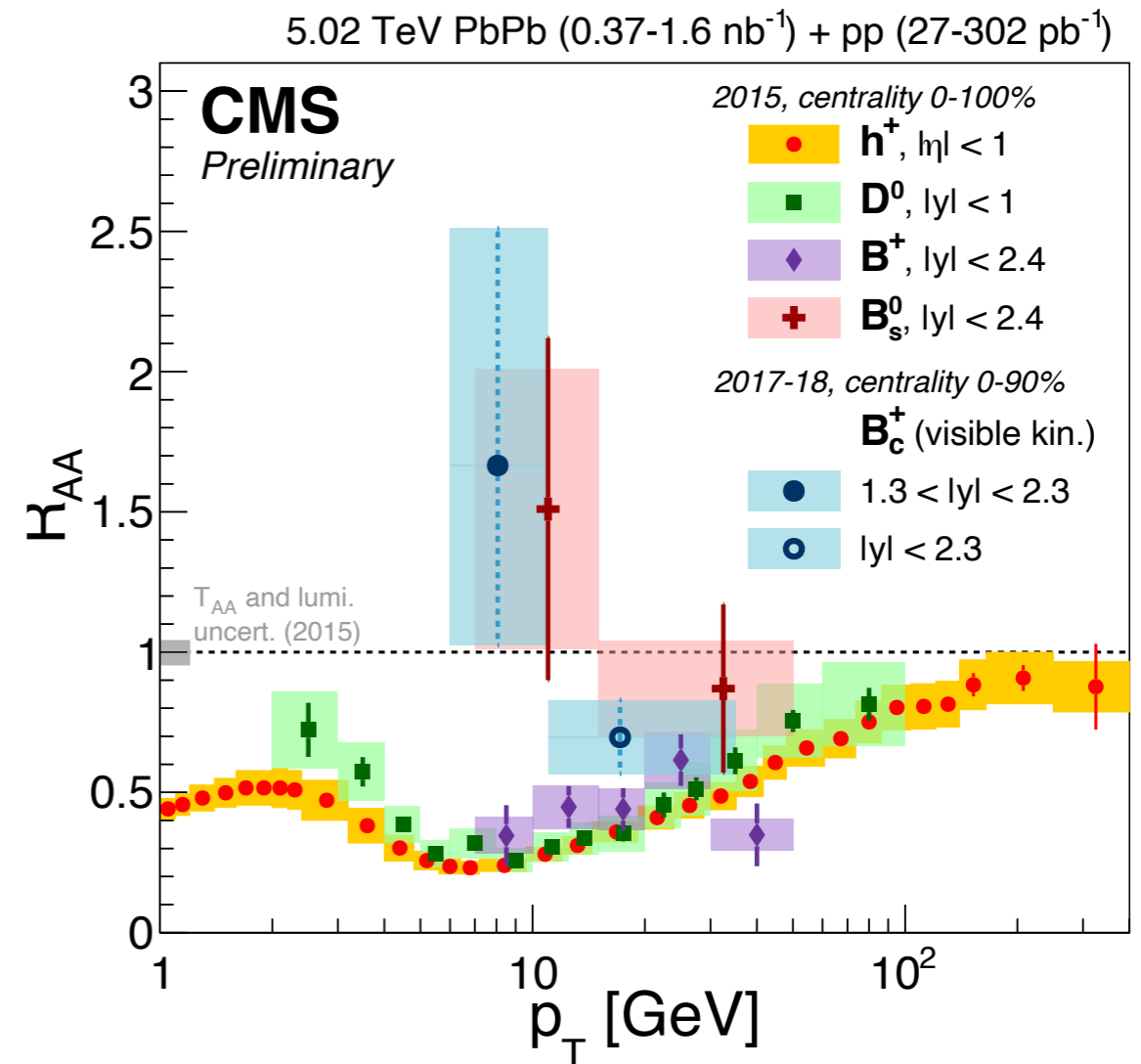
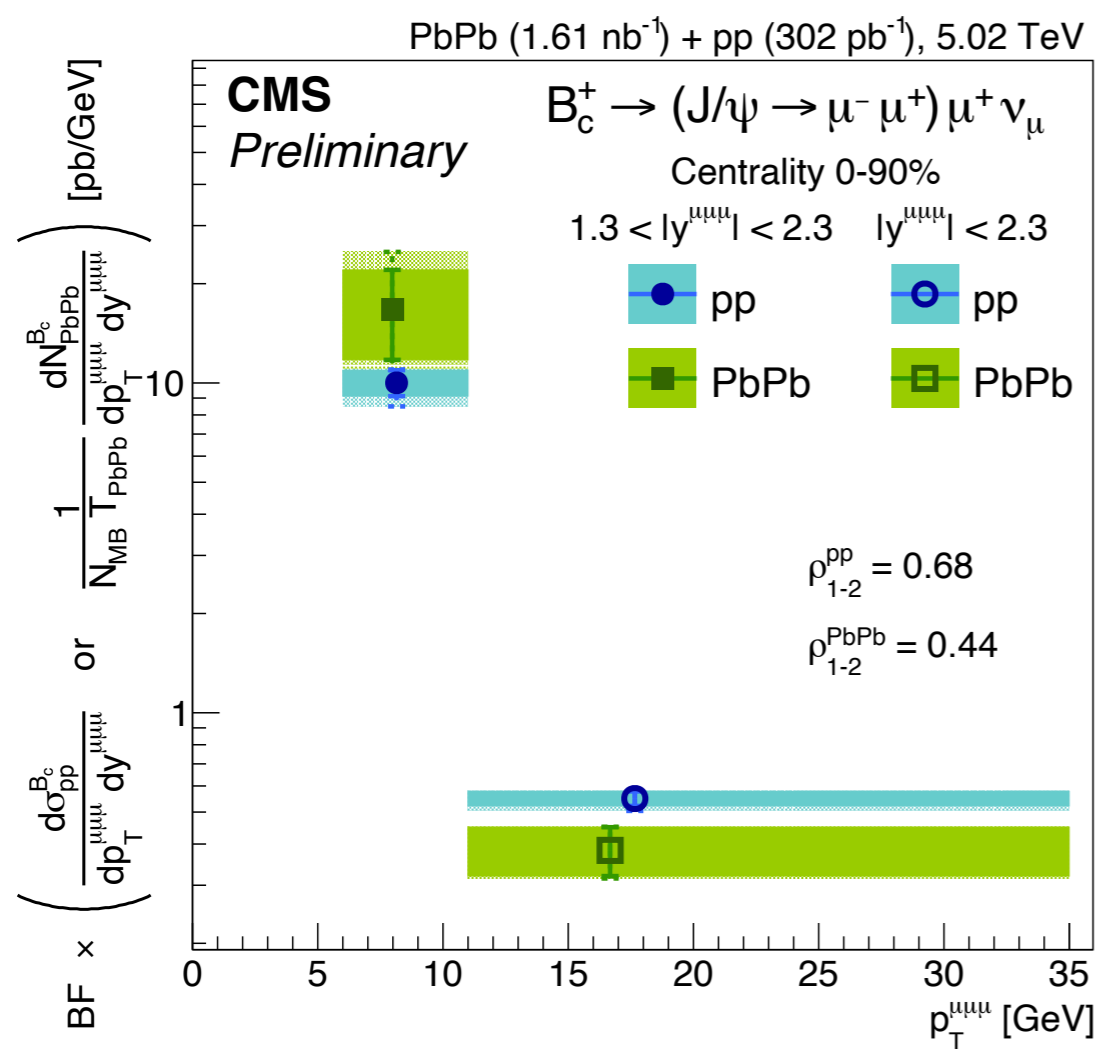


- The peak is smeared out due to neutrino not reconstructed → Need BDT and template fits
- Need good understanding of the backgrounds



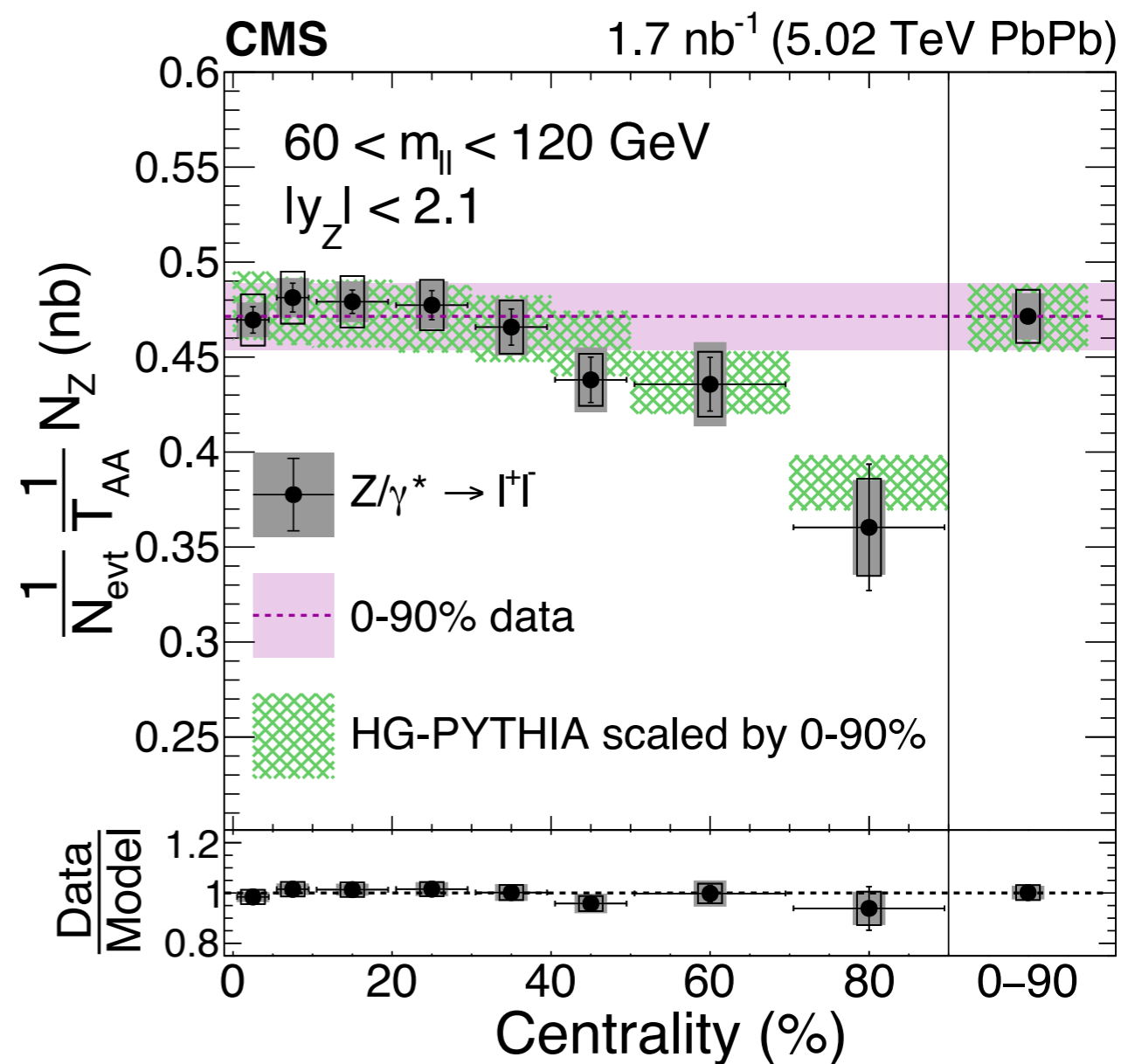


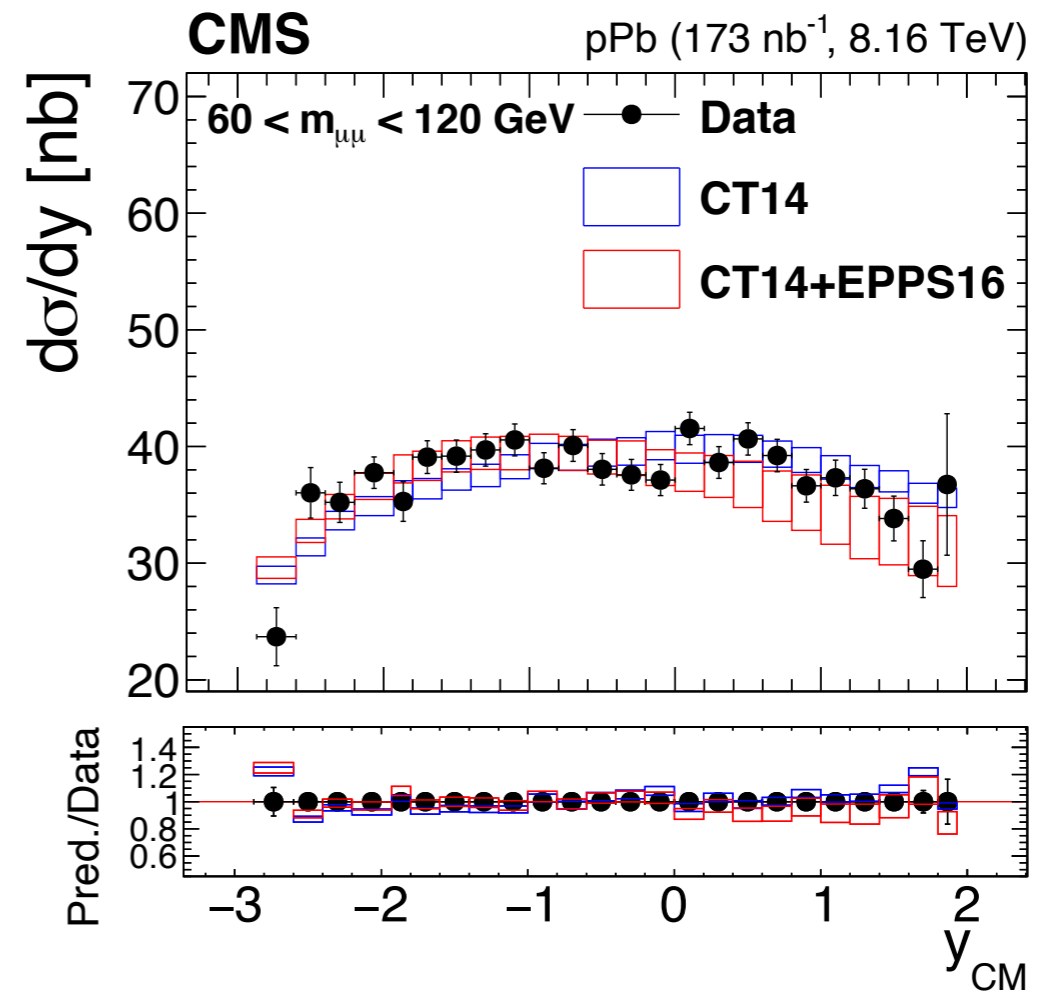
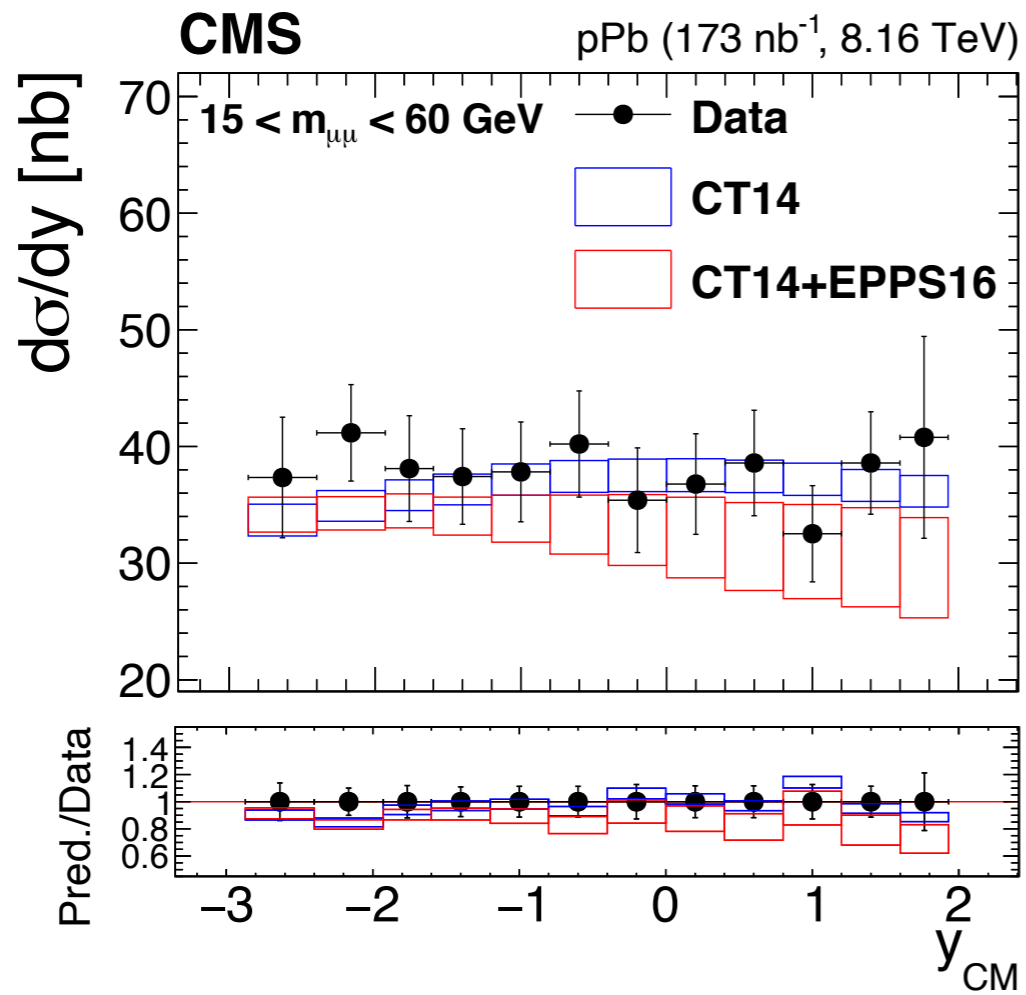
- First observation of B_c in PbPb collisions
- Hint of regeneration of low p_T and suppression at high p_T
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-



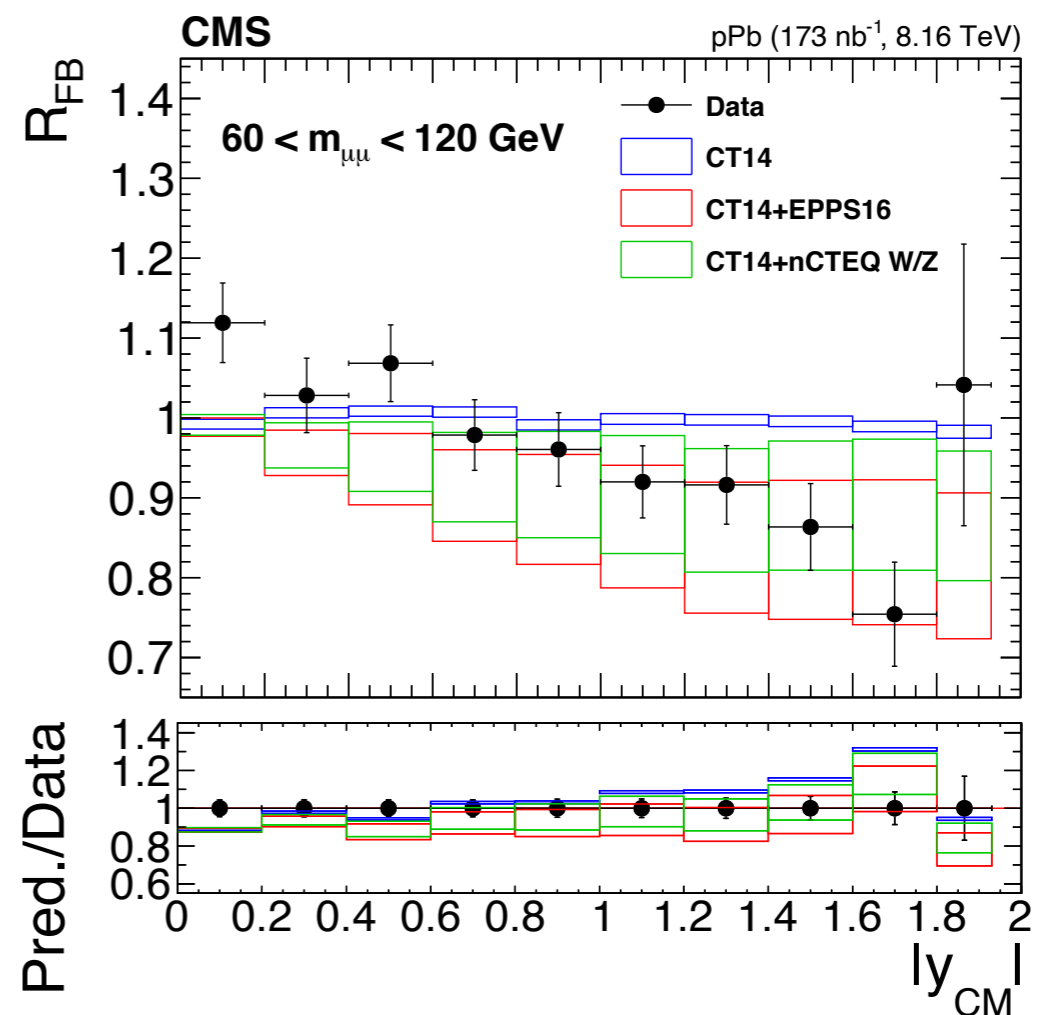
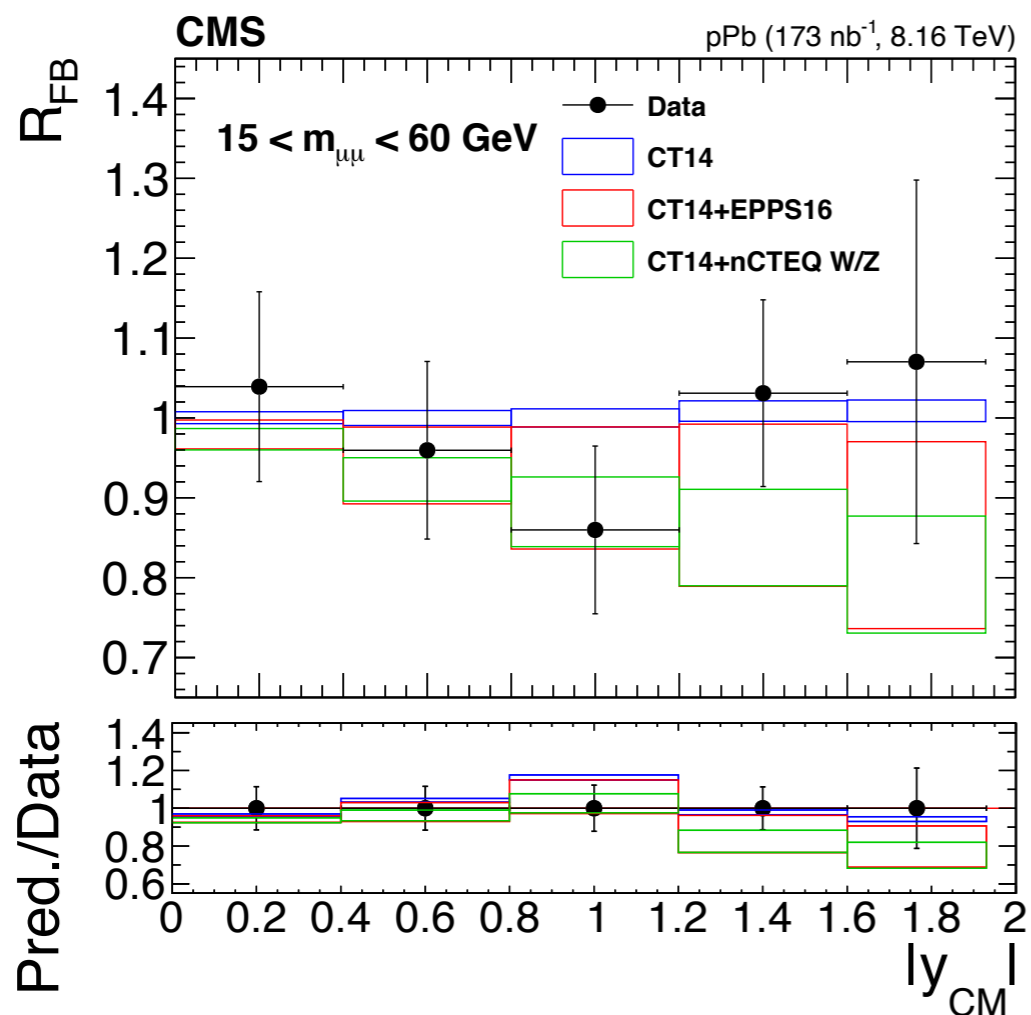
- First observation of B_c in PbPb collisions
- Hint of regeneration of low p_T and suppression at high p_T
- Significantly less suppressed than other hadrons
-

- Z is colorless
- Can be used to replace Glauber calculations
- $N_Z / (N_{\text{evt}} T_{AA})$ should be flat but it's not the case for peripheral events
- Could be explained by initial geometry biases (considered in HG-PYTHIA)





- Z → μμ channel
- Low mass inconclusive but z mass show preference to **CT14+EPPS16**
-



- Z \rightarrow $\mu\mu$ channel
- Low mass inconclusive but z mass show preference to **CT14+EPPS16**
- Forward to background ratio cancels some systematic uncertainties
- Shows clearer preference to **CT14+EPPS16** and **CT14+nCTEQ W/Z**

- CMS can cover a large range of dilepton measurements
- Quarkonia, Z
- Quarkonia measurements study suppression and regeneration effects
- Debye screening, E_{Loss} , Recombination
- Probing initial and final state effects with Z and Drell-Yan measurements.

Backup