

# B<sup>+</sup> meson nuclear modification factor in pp, pPb and PbPb at 5.02 TeV with CMS

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## Why heavy-flavour measurements?

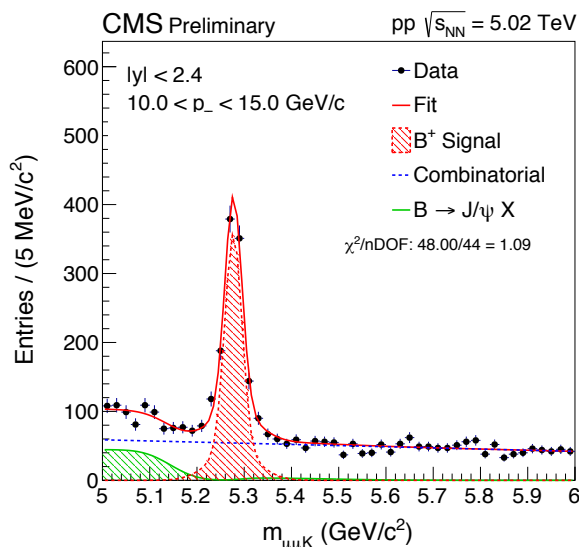
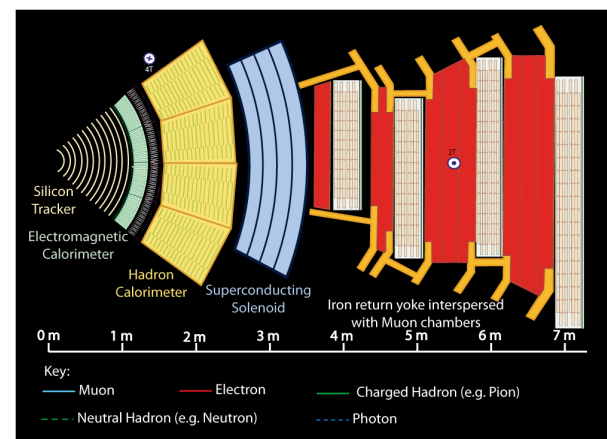
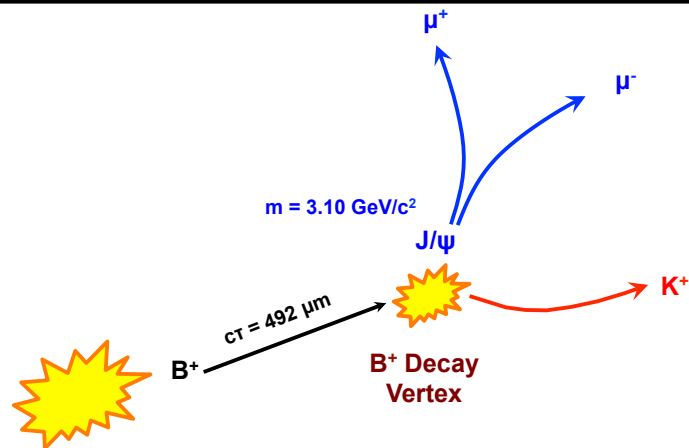
- in pp collisions, they provide an important test for perturbative QCD calculations at LHC energy regimes
- in nucleus-nucleus collisions, they are effective probes to study the effects of in-medium parton energy loss
- proton-nucleus studies provide baseline for PbPb analyses and allow one to study cold nuclear matter effects (e.g. shadowing)

## A focus on heavy-ion collisions:

- heavy quarks experience the full evolution of the medium
- once produced, they strongly interact with the deconfined medium via radiative and collisional processes
- **Flavour-dependence of radiative energy loss:**
- larger for gluons than for quarks
- dead-cone effect: gluon radiation suppressed at small angles for massive quarks

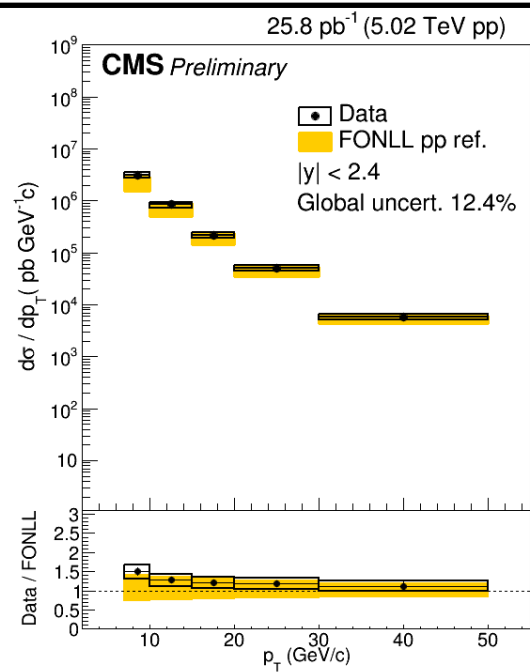
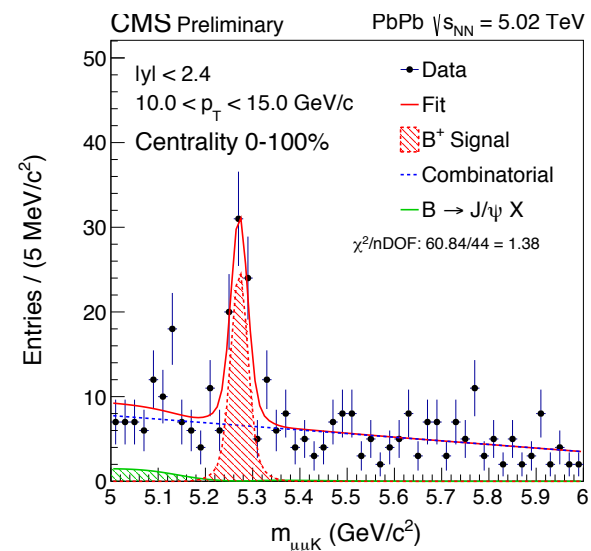
## B-meson reconstruction in CMS

- J/ψ reconstruction by vertexing muon pairs with opposite charges using kinematic fits
- B-meson candidates built by associating tracks to reconstructed J/ψ mesons
- Candidate selection based on multi-variate cut optimisation procedure

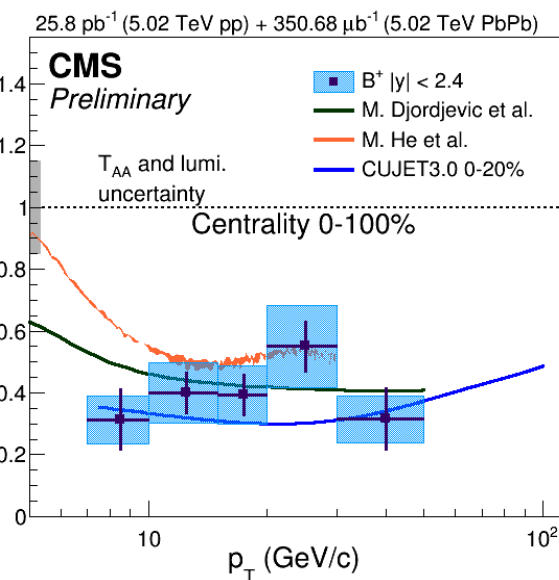
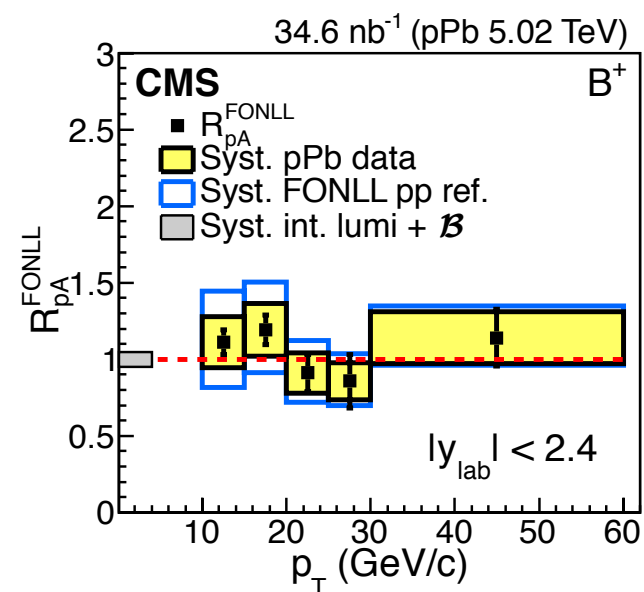


Fit to the invariant mass distributions of B<sup>+</sup>-meson candidates. Three components:

- **Signal**
- **Combinatorial background from J/ψ-track**
- **Non-prompt component from other B-meson decays forming peaking structures (e.g. from B<sup>0</sup> → J/ψ K<sup>0\*</sup>)**



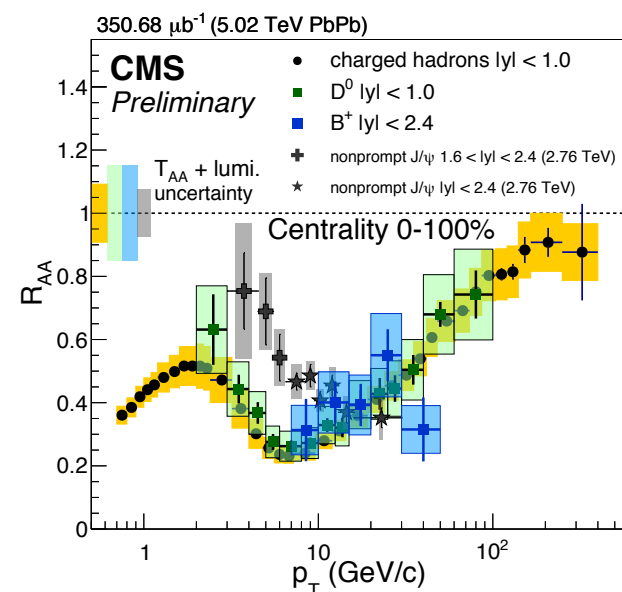
- B<sup>+</sup> p<sub>T</sub>-differential cross section measurement compatible with the predictions of FONLL  
→ *on the upper edge of FONLL band at low p<sub>T</sub>*
- B<sup>+</sup> nuclear modification factor in pPb collisions compatible with unity  
→ *no sizeable modification in pPb collision due to cold nuclear matter effects*



- Strong suppression observed in PbPb collisions in the centrality range 0-100%.  
→ *B<sup>+</sup> R<sub>AA</sub> ~ 0.3 to 0.6 with no trend vs p<sub>T</sub>*  
→ *R<sub>AA</sub> compatible with several theoretical calculations within uncertainties*
- R<sub>AA</sub> of B, D, non-prompt J/ψ and charged hadrons are compatible with each other within the uncertainties at higher p<sub>T</sub>
- *some hints of flavour dependence for p<sub>T</sub> < 10 GeV!*

## References:

- B<sup>+</sup> production in pp, PbPb and pPb: CMS-PAS-HIN-16-011
- B<sup>+</sup> production in pPb: PRL 116 (2016) 03230
- Charged particle R<sub>AA</sub>: CMS-PAS-HIN-15-015
- D meson R<sub>AA</sub>: CMS-PAS-HIN-16-001
- non prompt J/ψ: arXiv:1610.00613



- Theoretical calculations: M. Djordjevic Phys. Rev. C 94 (Oct, 2016) 044908, M. He et al. Physics Letters B 735 (2014) 445 - 450,