Direct photon and heavy flavour production in proton—proton collisions at $\sqrt{s}$ = 7 TeV with ALICE

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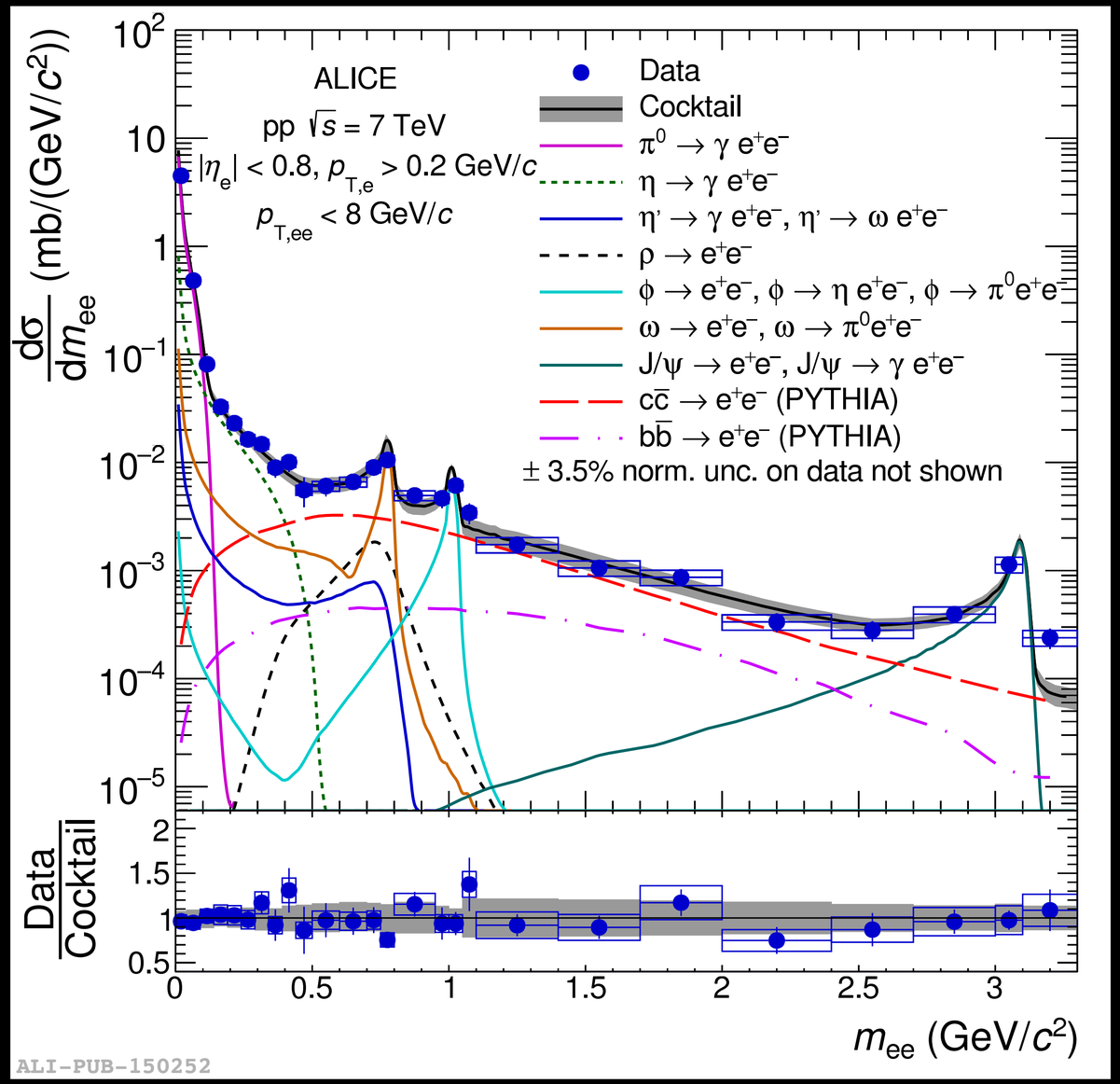
for the ALICE collaboration

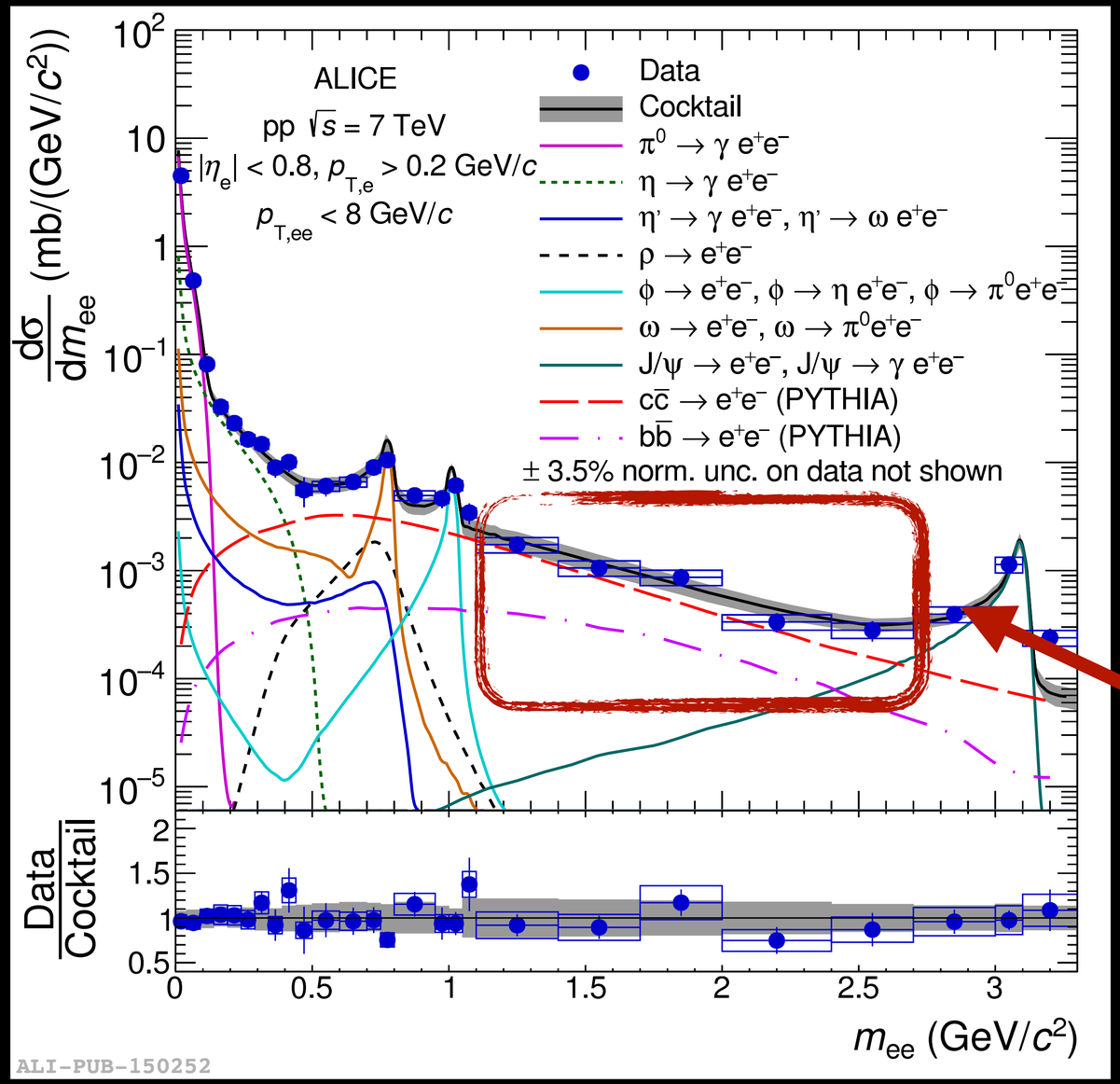
Dielectron invariant mass spectrum in pp $\sqrt{s}$=7 TeV



- Dielectron cross section measured as a function of invariant mass
- Compared to expectation from hadronic sources

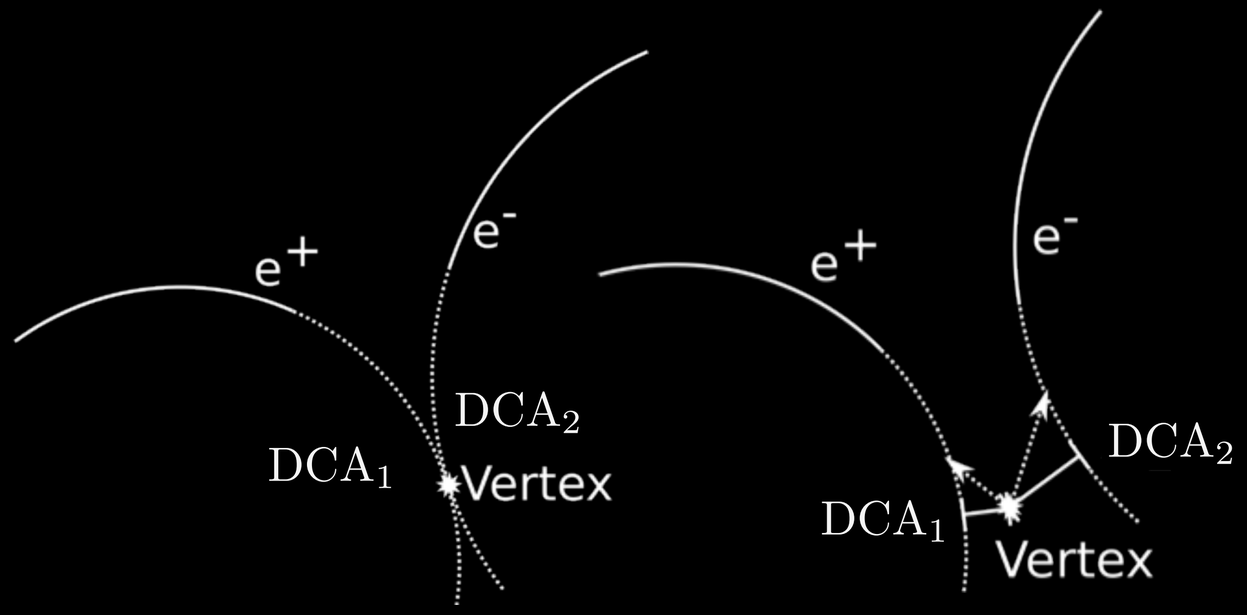
➡ e^+e^- production understood in ALICE acceptance

Dielectron invariant mass spectrum in pp $\sqrt{s}$=7 TeV



- Dielectron cross section measured as a function of invariant mass
- Compared to expectation from hadronic sources
  - ➡ e^+e^- production understood in ALICE acceptance
- Window of opportunity for measurement of thermal radiation from QGP in Pb—Pb collisions
  - ➡ Precise understanding of heavy flavour contribution necessary

Pair distance of closest approach: DCA_{ee}



$$\mathrm{DCAee} = \sqrt{\frac{\mathrm{DCA}_1^2 + \mathrm{DCA}_2^2}{2}}$$

Track DCA normalised to resolution σ

Idea:

- Charm and beauty hadrons: finite decay length ($c\tau_D$~150 μm, $c\tau_B$~470 μm)
- Separation of prompt contribution to m_{ee} and non-prompt heavy flavour by DCA_{ee}
- Expectation:

DCA_{ee} (prompt) < DCA_{ee} (non-prompt)

Dalitz and direct decays of mesons, virtual direct photons

$c\bar{c} \rightarrow ee$, $b\bar{b} \rightarrow ee$, $B \rightarrow J/\psi \rightarrow ee$

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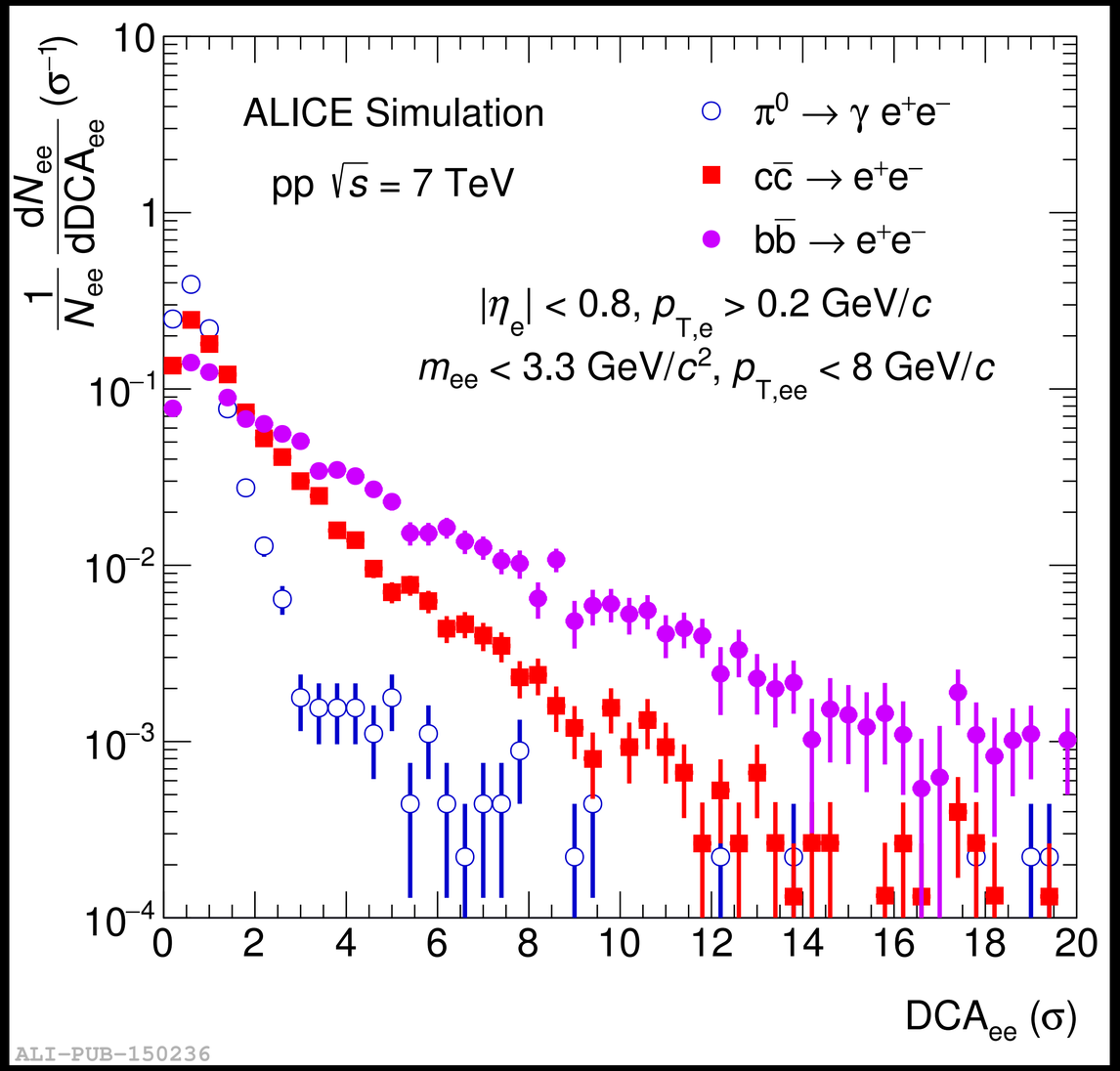

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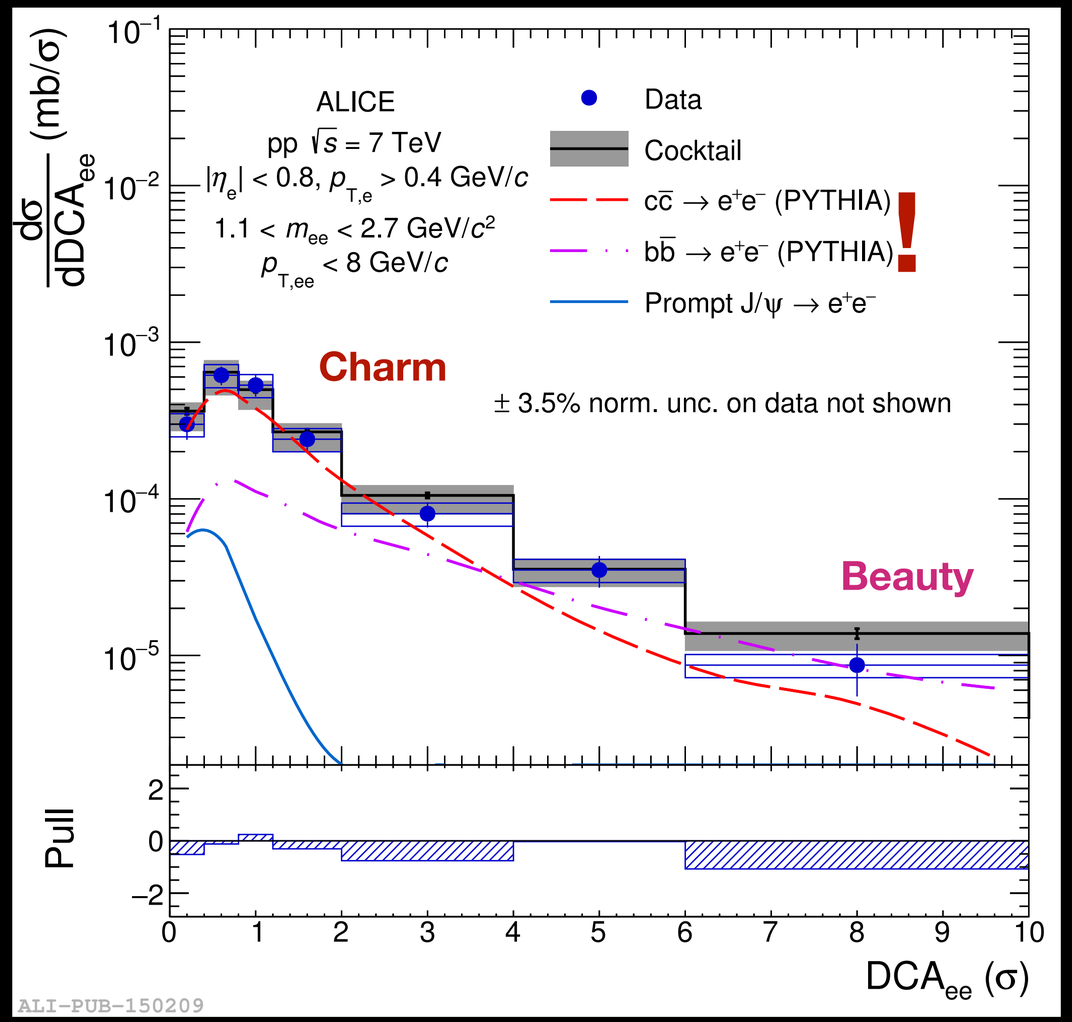
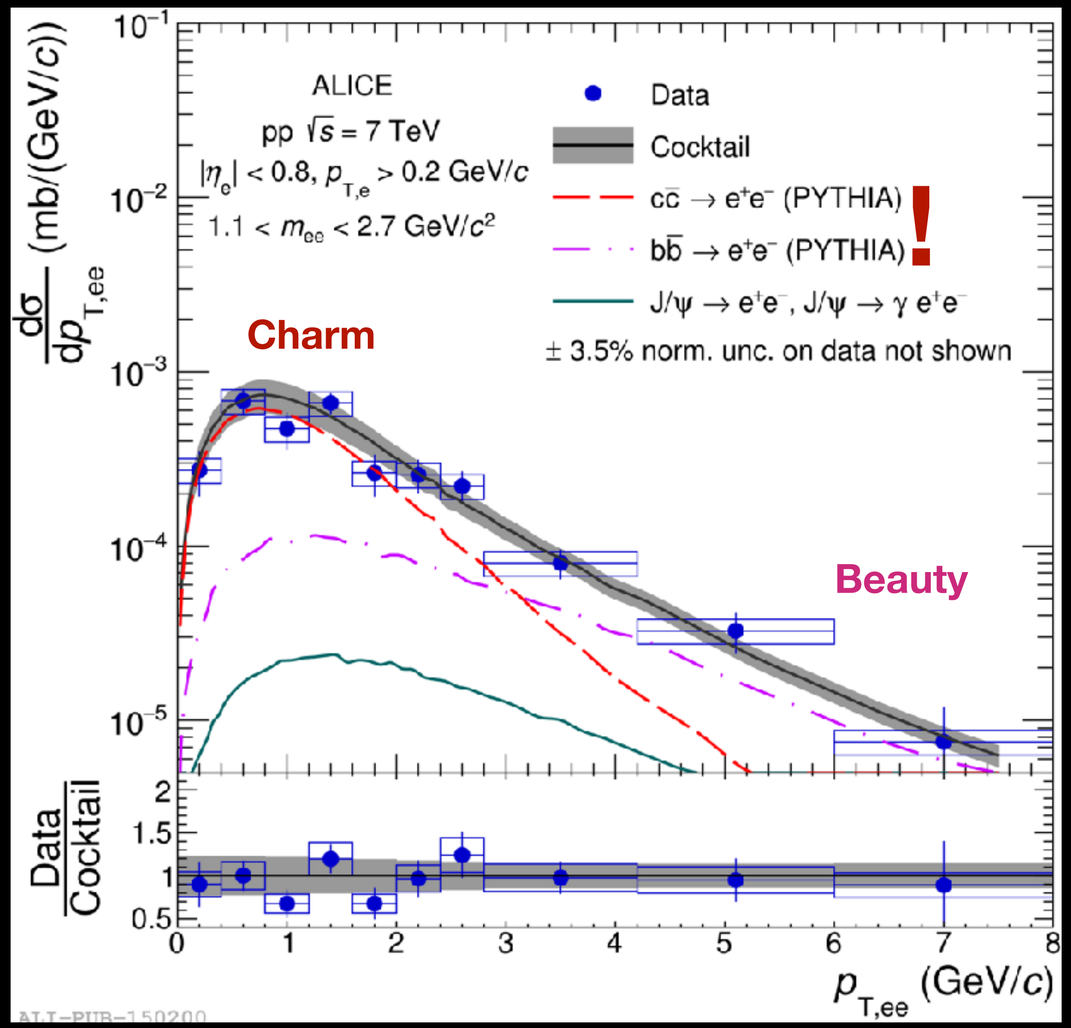
DCA_{ee} and $p_{T,ee}$: Different shape of charm and beauty

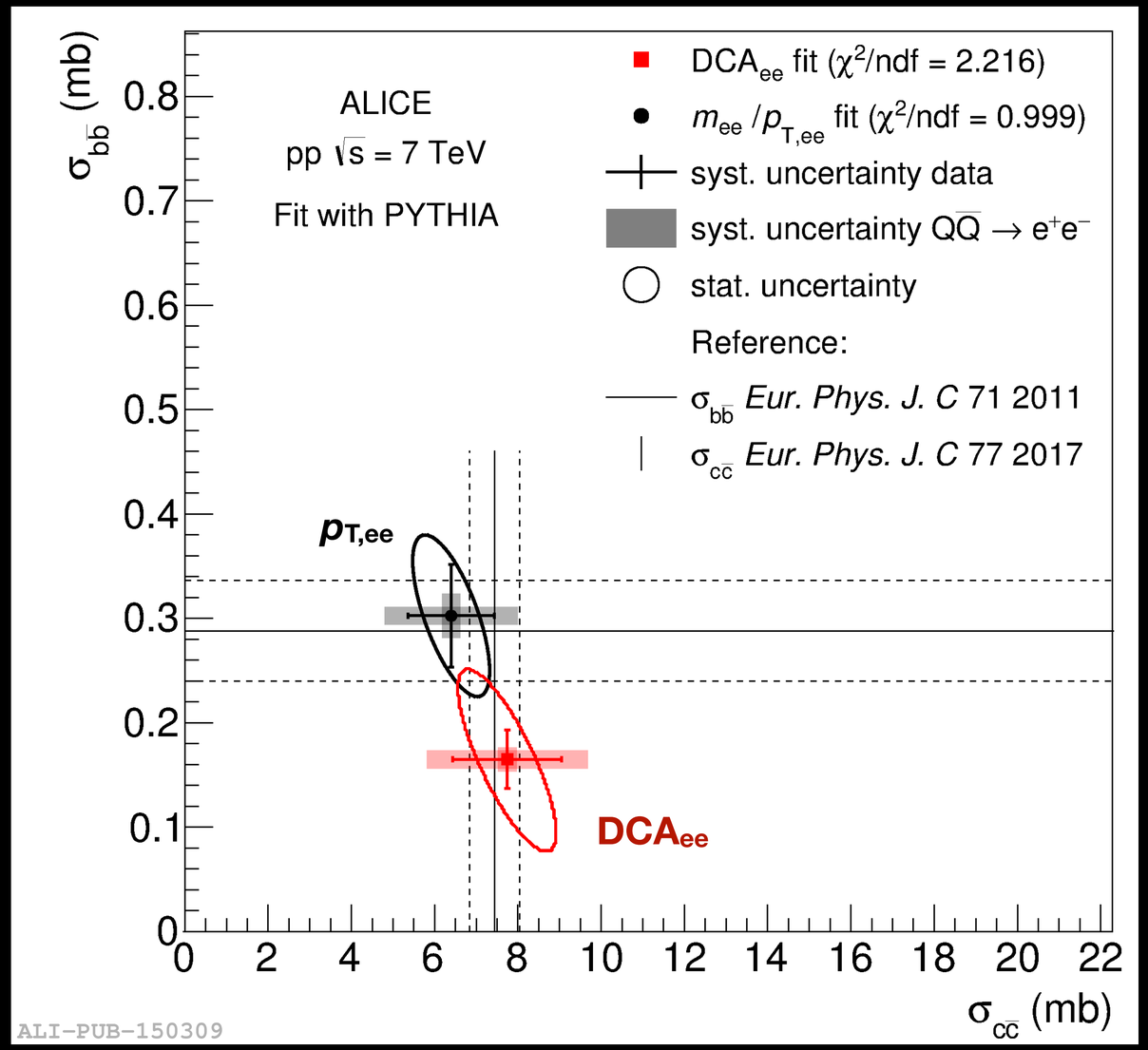




No significant prompt source in pp at $\sqrt{s}$ = 7 TeV

⇨Extract cross sections by fitting

Heavy-flavour cross sections

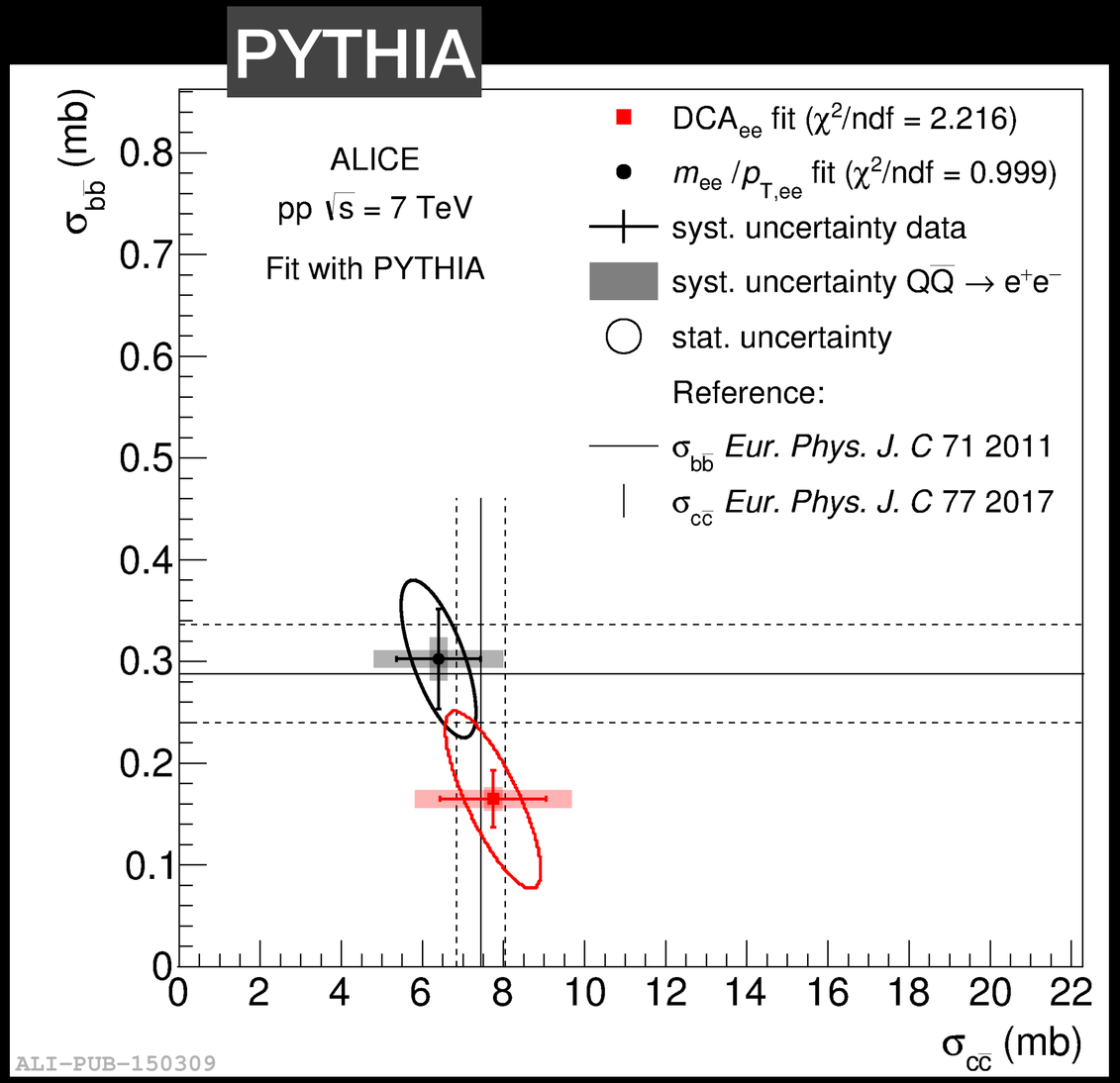


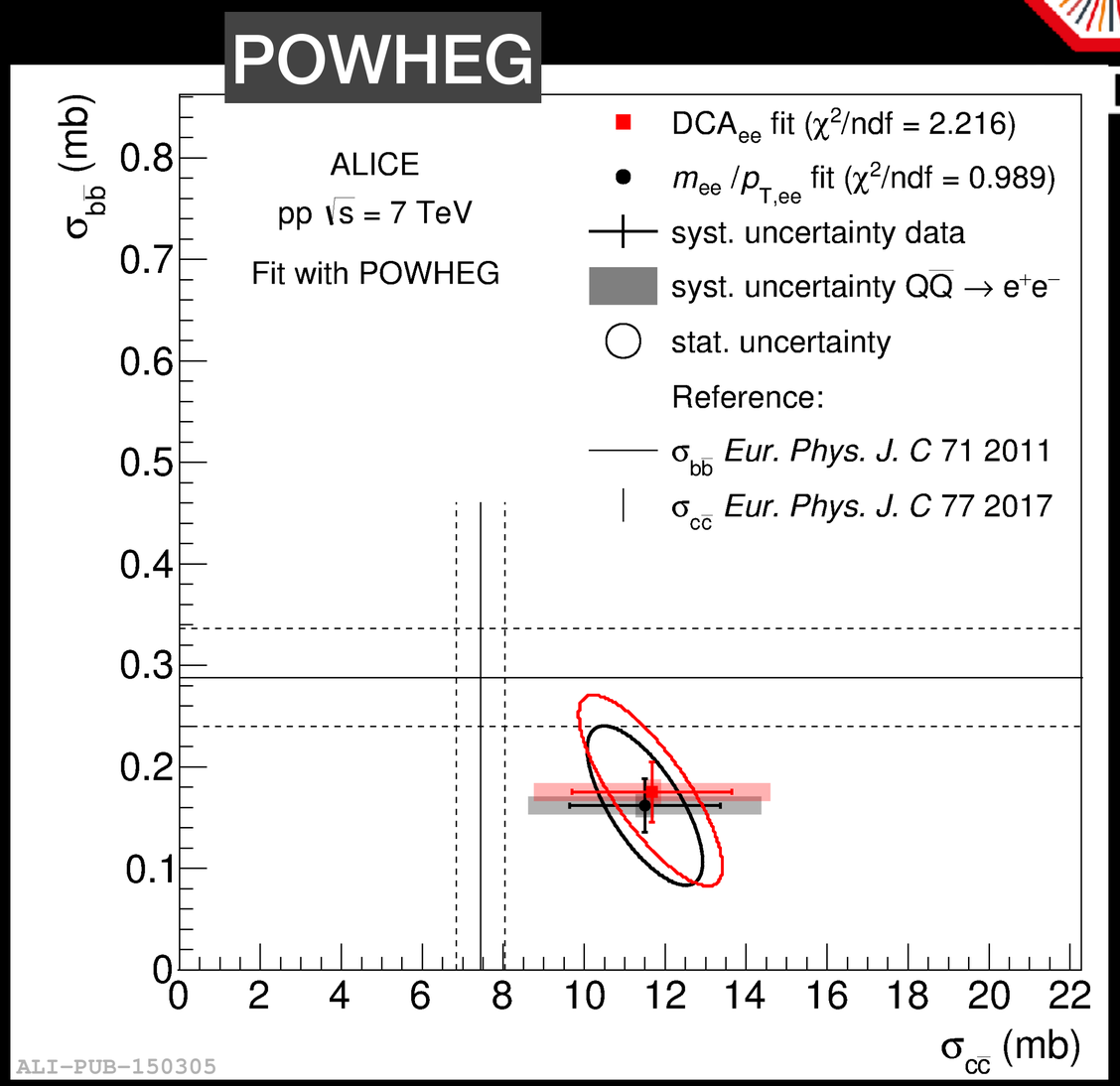
- Results from DCA_{ee} and $p_{T,ee}$ fits consistent within uncertainties
- Consistent with reference measurements (D-meson and B→J/ψ)

Next step:

- Compare different generators
- PYTHIA (LO) → POWHEG (NLO)
- Consider quark production mechanisms at different orders

PYTHIA and POWHEG

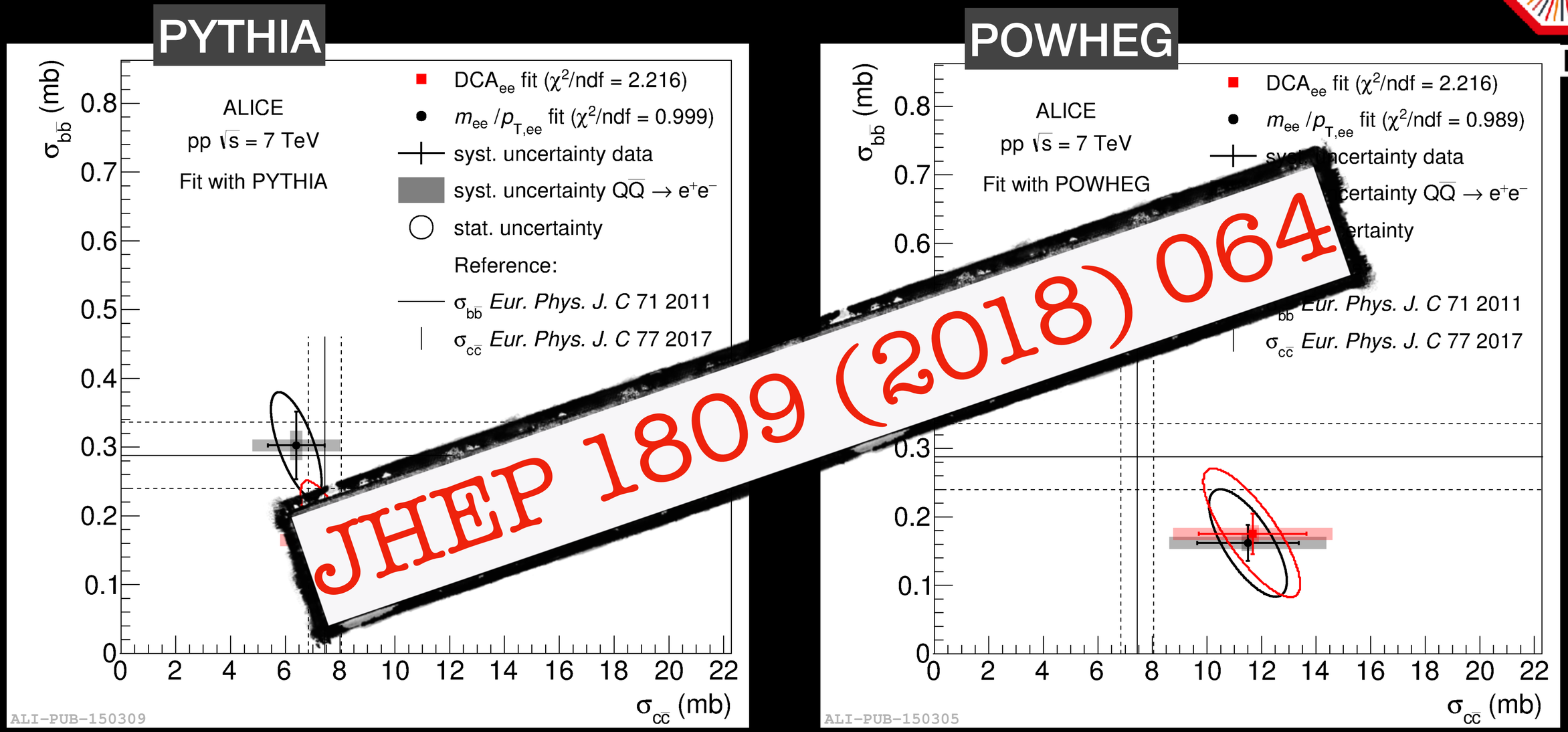




POWHEG: Significant deviation from PYTHIA

Significant model dependence of HF cross section → Sensitivity to production mechanism

PYTHIA and POWHEG



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Outlook:

Study cold nuclear matter effects on charm and possible thermal radiation in p—Pb