Open Heavy-Flavour and J/ψ production in peripheral PbPb collisions at LHCb

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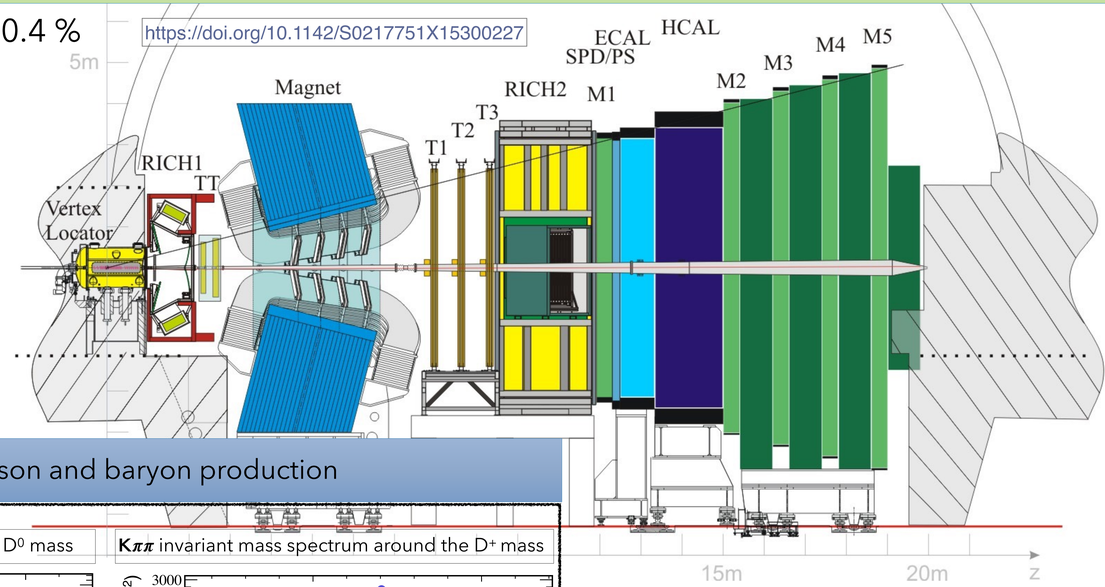
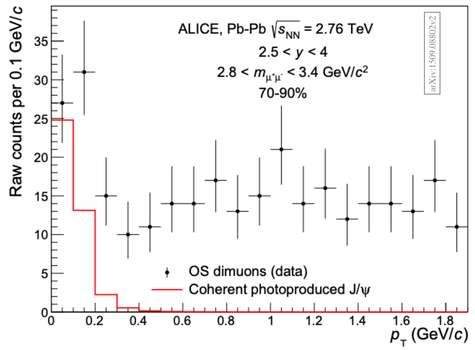
Hard Probes 2020

- Forward spectrometer optimised for c and b physics in pp collisions with great resolution; Δp/p ~ 0.4 %
- Excellent PID efficiency (Muon ID ~ 97 %, Kaon ID ~ 95 % , Electron ID ~ 90 %)
- One PbPb sample from 2015 (~10 μb^{-1}) and a new one from 2018 (~ 210 μb^{-1})
- Reconstruct events for 40 % most peripheral collisions



J/ψ photo-production in peripheral collisions

Photo-production mode: $\gamma pomeron \rightarrow J/\psi$ characterized by a very low-p_T



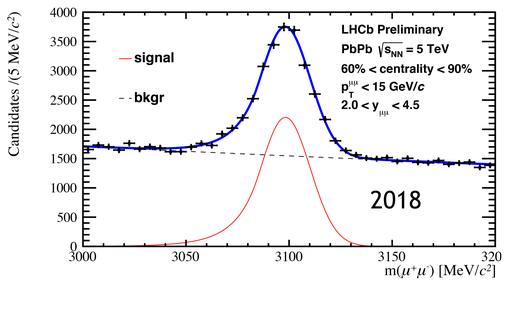
Low p_T excess first measured by the ALICE collaboration

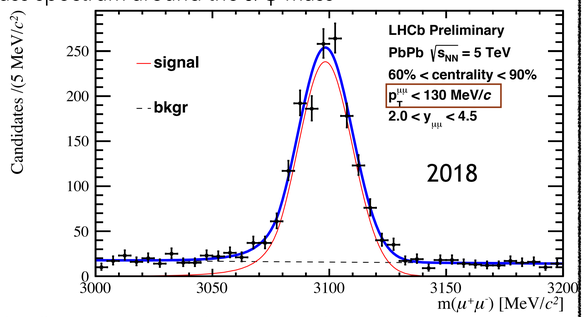
Unexpected large production !

Good resolution needed to differentiate the photo-produced J/ψ from the hadronic ones

Excellent resolution of the LHCb detector makes this analysis possible down to $p_T = 0$!

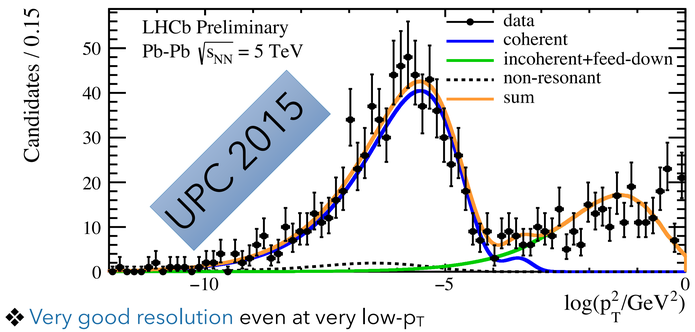
Dimuon invariant mass spectrum around the J/ψ mass





Log p_T^2 spectrum of the J/ψ in Ultra peripheral PbPb collisions

Excellent mass resolution < 20 MeV/c^2

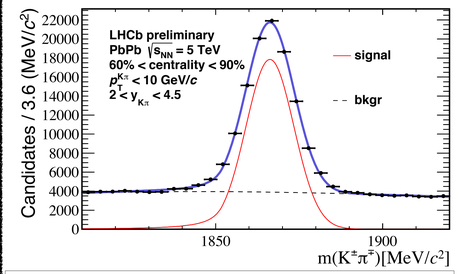


LHCb-CONF-2018-003

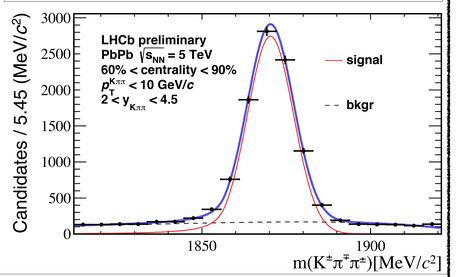
- ❖ Very good resolution even at very low-p_T
- ❖ Access to the photo-induced J/ψ domain
- ❖ Centrality dependence study possible
- ❖ p_T distribution of the photo-produced J/ψ expected to be sensitive to the geometry of the collision

Charm meson and baryon production

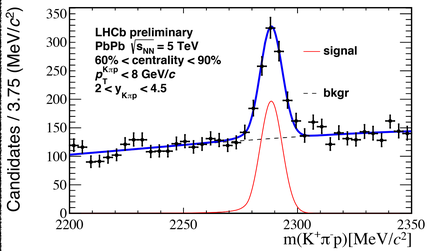
Kπ invariant mass spectrum around the D^0 mass



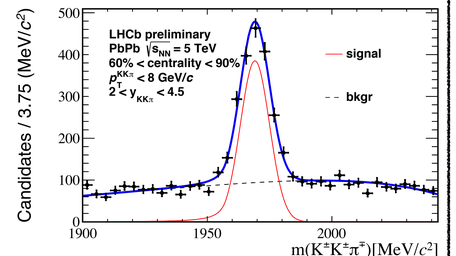
K$\pi\pi$ invariant mass spectrum around the D^+ mass



Kπp invariant mass spectrum around the Λ_c mass

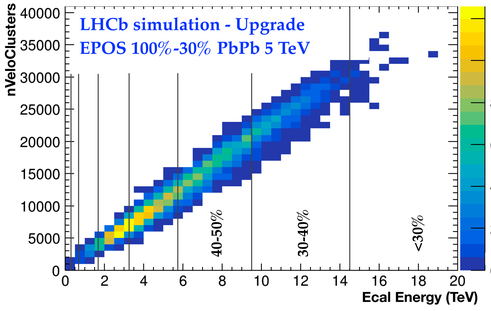


KKπ invariant mass spectrum around the D_s mass



- ❖ Charm mesons and baryon measured in peripheral PbPb collisions down to $p_T = 0$
- ❖ Relative production under study
  - ❖ Good inputs for nPdf and hadronisation models
  - ❖ Constrain transport model in cold and hot nuclear matter
- ❖ Just the tip of the iceberg
  - ❖ Correlations, flow analysis
  - ❖ etc..

Future for PbPb physics in LHCb



- ❖ Entire new tracking system for run 3
- ❖ No more saturation of the VELO for the 70% most peripheral collisions !

Bright future for PbPb physics in LHCb !

- PbPb analysis with the LHCb detector possible in peripheral collisions !
- Lots of particles can be measured with great precision and through different decay channels
- Extension of the maximum centrality reachable in PbPb collisions with the next LHCb upgrade foreseen

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