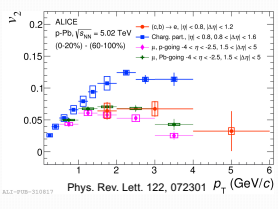
Measurement of heavy-flavour jet with electrons from heavy-flavour hadron decays in pp and p-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV with ALICE

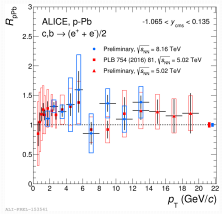
Shingo Sakai (Univ. of Tsukuba) for the ALICE Collaboration

Motivation

- Heavy quarks (charm and beauty) are strongly interacting with hot & dense QCD matter produced in Pb-Pb collisions
  - Strong suppression of heavy quarks production (R_{AA} < 1)
    - In-medium energy loss of heavy quarks in the QCD medium
  - Positive elliptic flow of particles from heavy-flavour hadron decays (v_2 > 0)
    - Heavy quarks participate to collective motion

- Observed positive v_2 of particles from heavy-flavour hadron decays in small system (p-Pb collisions)
  - Indicate final state effects in small system ?
  - Modification of heavy-quark production (R_{pPb}) not observed so far





- Probe small system by measuring jets from heavy quarks
  - If there are final state effects, i.e. energy loss
    - Production yield is suppressed
    - Radial profile of jets is modified (broaden the jet shape)

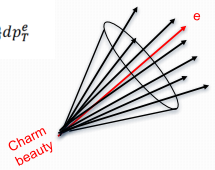
Heavy-flavour jet measurement with electrons

- Idea: use electrons from heavy-flavour hadron decays (e ← HF) to identify jets originally from charm and beauty quarks

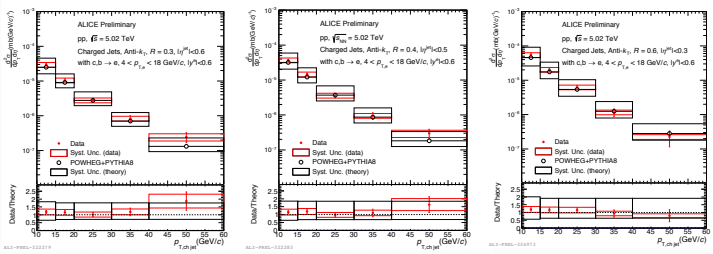
- Reconstruct charged-particle jets (FastJet algorigthm, Anti-k_T)
- Find electrons from open heavy-flavour hadron decays in reconstructed jets
  - momentum matching between electron and track in the reconstructed jets
- Subtract jets containing photonic electrons and hadrons, and get jets containing electrons from heavy-flavour hadron decays (e_{HF}-jet)

$$N_{jet}^{HF} = \int \{N_{jet}^{HF-cand}(p_T^e) - \left(\frac{1}{\varepsilon(p_T^e)} - 1\right) N_{jet}^{Pho}(p_T^e) - N_{jet}^{Had}(p_T^e)\} dp_T^e$$

  - ε: photonic electron reconstruction efficiency
- Reconstruction efficiency, unfold p_T spectrum for detector response and background fluctuations



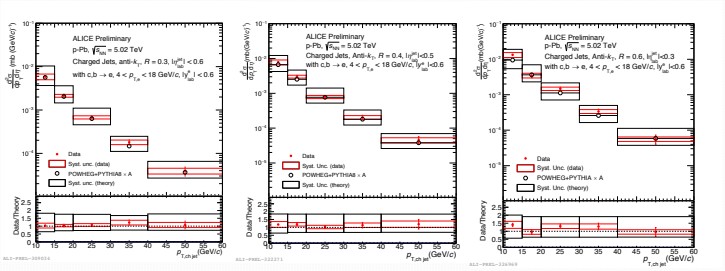
Results (pp collisions at $\sqrt{s}$ = 5.02 TeV)



- e^{HF}-jet (pp) with R=0.3, 0.4 and 0.6
  - Reference for p-Pb collisions
- Compared with a pQCD calculation (POWHEG+PYTHIA)
  - The cross sections are in good agreement with the pQCD calculation for different jet resolutions
    - POWHEG : POWHEG-v2(r3363), CTEQ6.6, HF pair creation

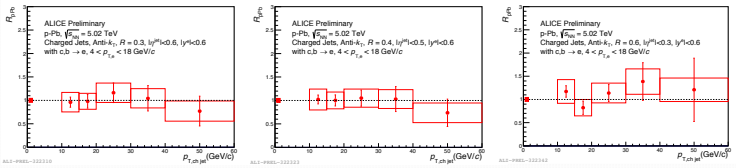
Results (p-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV)

Cross sections (R=0.3, 0.4 and 0.6)



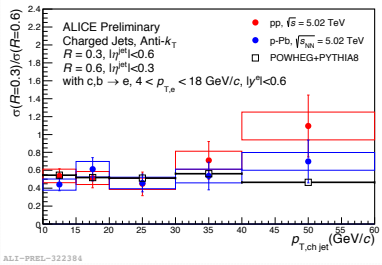
- e^{HF}-jet (p-Pb) with R=0.3, 0.4 and 0.6
  - Consistent with the POWHEG prediction

Resolution parameter (R) dependence of R_{pPb}



- R_{pPb} of e_{HF}-jet measured with R=0.3, 0.4 and 0.6 are consistent with unity
- No modification of heavy-flavours jet yield in p-Pb collisions
  - No R dependence

Ratio of the cross sections ($\sigma_{R=0.3}/\sigma_{R=0.6}$)



- Ratio of the cross section of e_{HF}-jet measured $\sigma_{R=0.3}/\sigma_{R=0.6}$ in pp & p-Pb
- R dependence of jet production is sensitive to modification of jet shape
  - pp and p-Pb results are similar within uncertainties
  - Consistent with POWHEG prediction
  - No modification of jet shape from heavy-flavour hadron decays in p-Pb collisions

- R dependence of e_{HF}-jet in p-Pb collisions indicates that there is no final state effect (energy loss) on heavy-flavour productions in small systems

Summary

- Measured jets containing electrons from heavy-flavour hadron decays in pp & p-Pb
  - with various jet resolution parameters; R=0.3, 0.4 and 0.6
- Consistent with a pQCD calculation (POWHEG+PYTHIA) for jets from charm and beauty in pp collisions
- R_{pPb} of e_{HF}-jet measured with R=0.3, 0.4 and 0.6 is equal to unity
- $\sigma_{R=0.3}/\sigma_{R=0.6}$ of e_{HF}-jet are similar in pp and p-Pb within uncertainties
  - reproduced by pQCD calculations
- Indicates there is no evidence for final state effect (energy loss) on heavy-flavour productions in small systems