Measurement of electrons from beauty hadron decays at mid-rapidity in Pb-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV

Camila de Conti on behalf of the ALICE collaboration
(University of São Paulo)
camila.de.conti@cern.ch

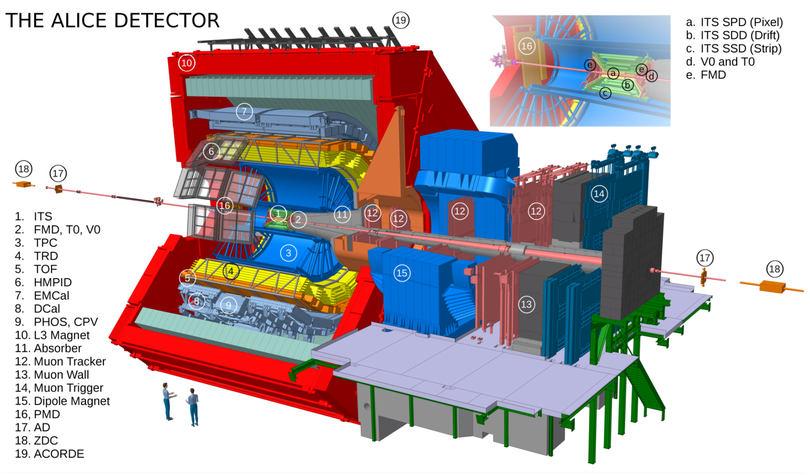
Physics motivation

- The Quark Gluon Plasma (QGP) is produced in heavy ion collisions at LHC;
- Heavy quarks (charm and beauty) are a unique probe → due to their large masses, they are produced mainly via hard parton scatterings[1] before the QGP formation and therefore they witness the full evolution of the system;
- Charm and beauty quarks are expected to loose energy in the medium via collisional and radiative processes. Both collisional and radiative energy loss are expected to be smaller for beauty than for charm quarks due to the mass dependence[2][3];
- The Nuclear modification factor (R_{AA}) is sensitive to the energy loss of quarks in the medium;

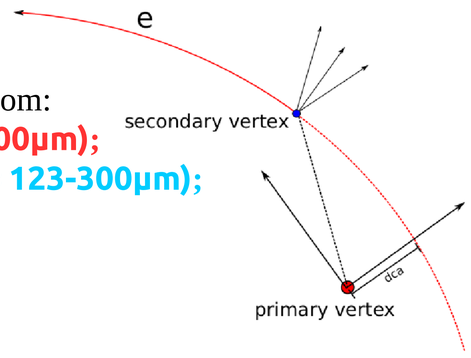
$$R_{AA} = \frac{dN_{AA}/dp_T}{\langle T_{AA}\rangle d\sigma_{pp}/dp_T}$$

ALICE apparatus

- The analysis is based on 9M central Pb-Pb events collected during LHC run II;
- **Particle Identification:** Time Projection Chamber (TPC) and Time-Of-Flight (TOF);
- **Tracking:** Inner Tracking System (ITS) and TPC;
- **Trigger:** V0 scintillators;

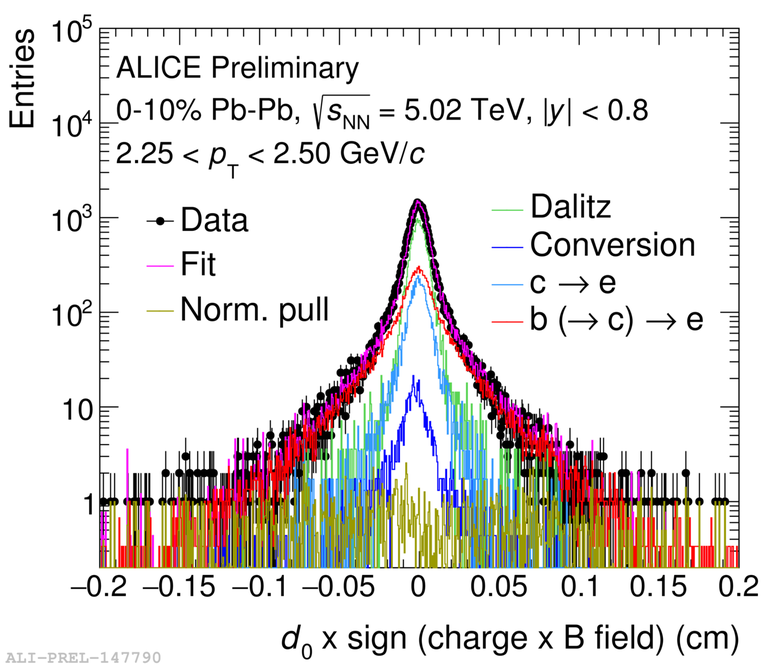


Identification of electrons from beauty hadron decays



- Inclusive electrons sample includes contribution from:
  - **Beauty hadrons semi-leptonic decays (cτ ≈ 500μm);**
  - **Charmed hadrons semi-leptonic decays (cτ ≈ 123-300μm);**
  - **Light mesons Dalitz decays;**
  - **Gamma conversion;**

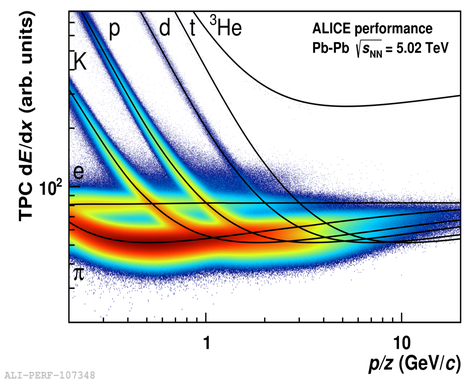
- **Separation of signal from background:**
  - Distance of Closest Approach (d_0) of the reconstructed tracks to the primary vertex is calculated;
  - Electrons from beauty hadron decays have larger d_0 distribution compared to the background electrons, what allows their identification;

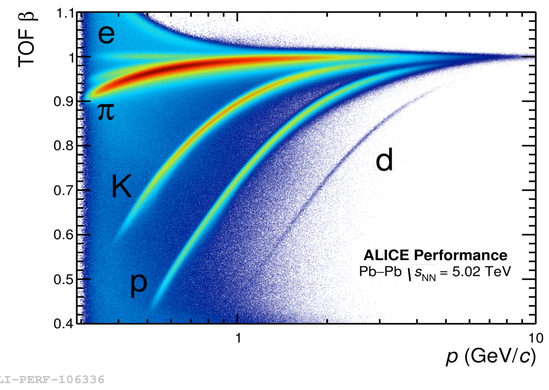


- **Fitting Procedure:**
  - Fit to the inclusive electron d_0 distribution;
  - d_0 templates of individual sources taken from Monte Carlo simulation;
  - Maximum likelihood based approach takes into account finit statistic of the Monte Carlo;

Inclusive electron identification

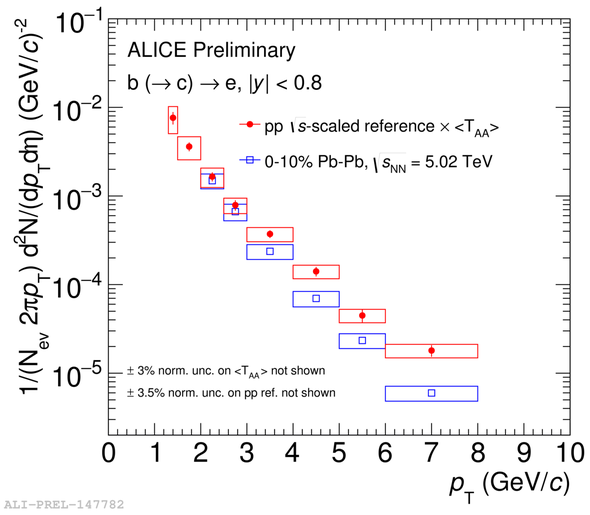
In order to perform the identification of inclusive electrons, the information of the specific energy loss in the TPC is used. In order to remove the contamination by kaons and protons in this sample, a cut on the time-of-flight of the particles measured by the TOF detector is applied.

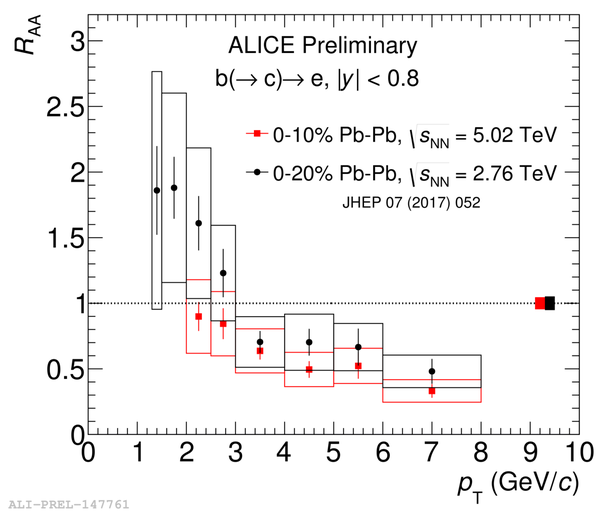


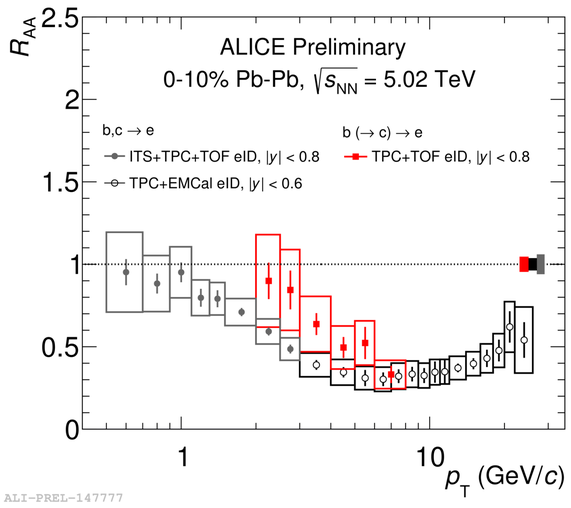


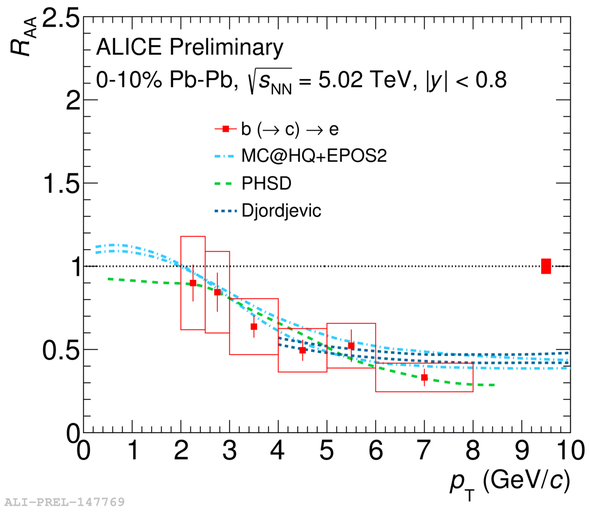
The inclusive electrons are selected by the TPC PID cut $-0.1 < dE/dx - \langle dE/dx\rangle|_e < 3$ and by the TOF PID cut $|n_\sigma^{TOF}| < 3$.

Yield and R_{AA} of electrons from beauty hadron decays









- The invariant yield of b (→c)→e is measured in Pb-Pb collisions at 5.02 TeV;
- The R_{AA} shows good agreement with run 1 measurement;
- Indication of smaller supression of b (→c)→e with respect to b,c→e;
- Measurement consistent with models that consider mass-dependent radiative and collisional energy loss;

References

[1] C. Lourenco and H. Woehri, Phys.Rept.433:127-180,2006
[2] N. Armesto at al., Phys.Rev.D71:054027,2005
[3] ALICE Collaboration, JHEP 07 (2017) 052

Work supported by CAPES