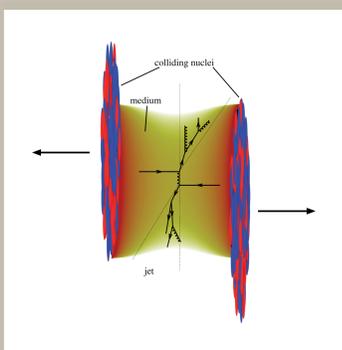




Measurement of the Nuclear Modification Factor of Electrons from Heavy Flavour Decays at mid-rapidity in Pb-Pb collisions at $\sqrt{s}_{NN} = 2.76$ TeV with ALICE

Yvonne Pachmayer for the ALICE Collaboration



J. Klein (University of Heidelberg)
In-medium shower evolution

Probing Dense Matter

Heavy-flavour (c, b) quarks are excellent probes of a quark gluon plasma (QGP):

- Produced in initial hard scattering processes
 - very short time scale
 - sensitive to the full history of the collision
 - Parton energy loss
 - Quark mass dependence
- reveal properties of the medium

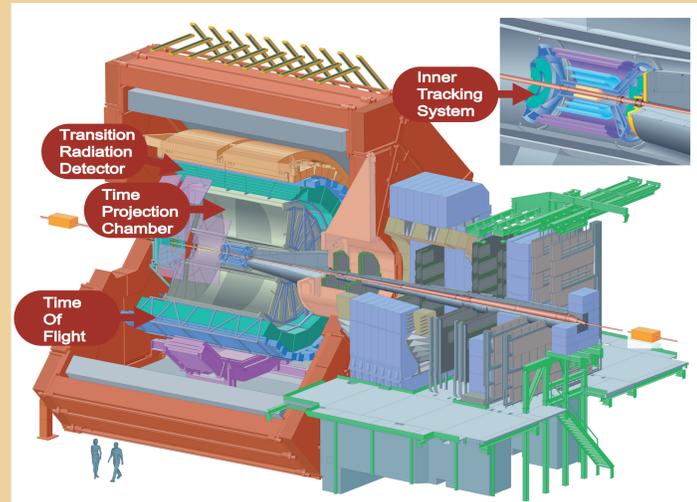
Indirect Measurement of Charm and Beauty

Identified through measurement of single electrons from semi-leptonic decays of D and B mesons:

$c \rightarrow e^+ + \text{anything}$ (B.R. 9.6%)

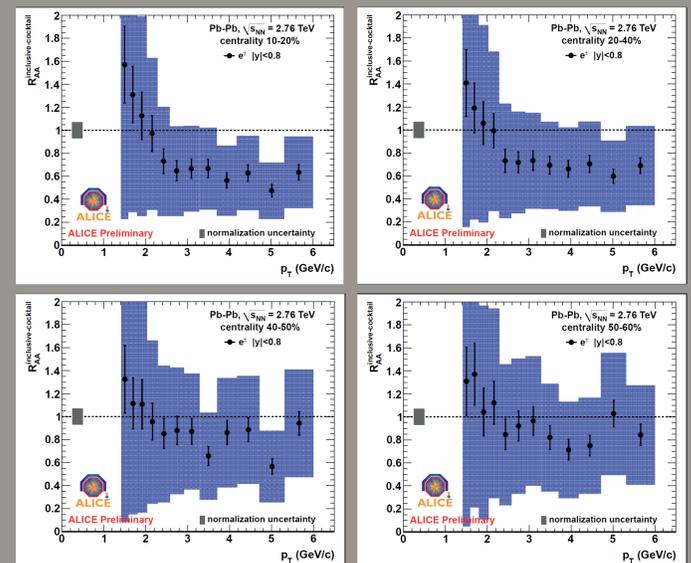
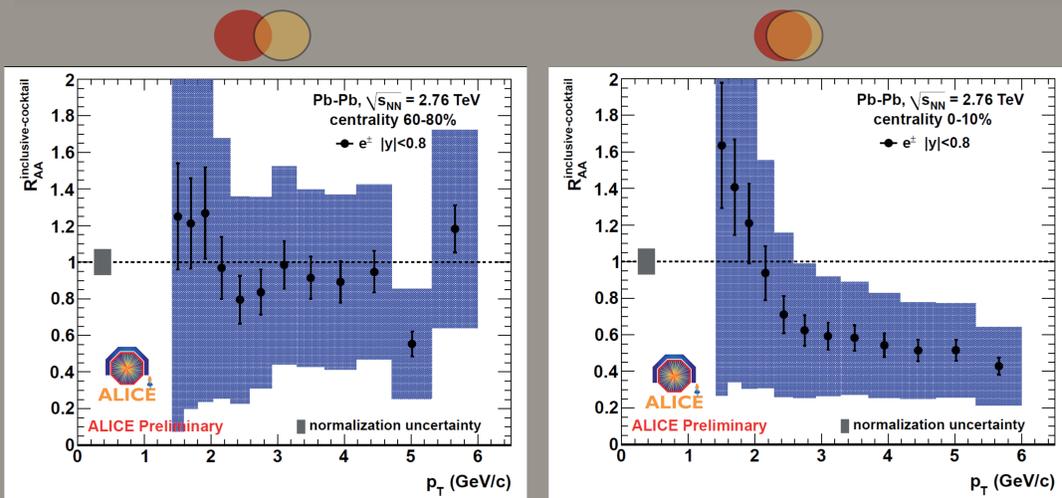
$b \rightarrow e^+ + \text{anything}$ (B.R. 10.9%)

Background sources, e.g. electron pairs from photon conversion in the detector material and π^0 - and η -Dalitz decays, subtracted with a cocktail



Nuclear Modification Factor of Cocktail-subtracted inclusive Electrons

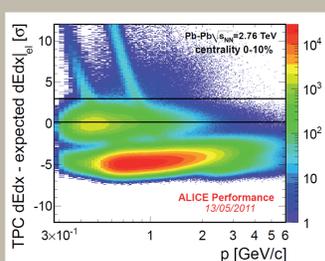
$$R_{AA}(p_T) = \frac{1}{\langle T_{AA} \rangle} \times \frac{dN_{AA}/dp_T}{d\sigma_{pp}/dp_T}$$



Significant Suppression Increasing with Centrality

Electron Candidate Selection

- Requirement of a hit in the innermost layer of ITS ($r = 3.9$ cm) to reduce background from photon conversion
- Cut on electron hypothesis in TOF, effective removal of
 - kaons up to $p = 1.5$ GeV/c
 - protons up to $p = 3$ GeV/c
- Cut on electron hypothesis in TPC - adjusted for each centrality bin
- Remaining hadron contamination
 - determined via fits of dE/dx in momentum slices
 - subtract yield
 - < 10% in the momentum range 1.5 - 6 GeV/c

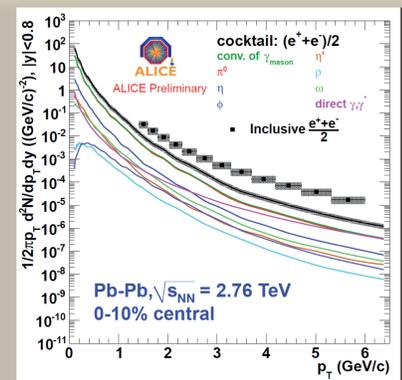


Comparison with a Cocktail

- Cocktail contains the following sources:
- γ conversion ($\pi^0 \rightarrow \gamma, \gamma \rightarrow e^+e^-$)
 - π^0, η, η' - Dalitz decays
 - ρ, ϕ decays
 - QCD photons based on NLO calculations (W. Vogelsang)

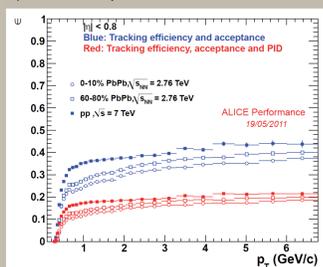
π^0 input based on charged pion measurement with ALICE

Heavier mesons implemented via m_T scaling

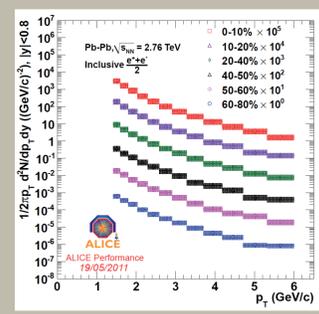


Efficiency and Acceptance Correction

- Derived from Monte Carlo Simulation
- TOF matching efficiency cross-checked with data-driven method, where the signal from $\gamma \rightarrow e^+e^-$ decays is evaluated



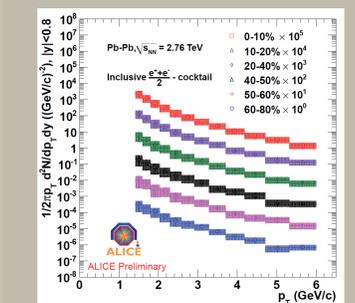
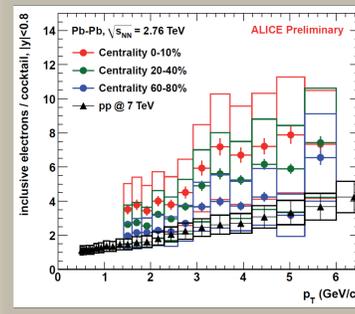
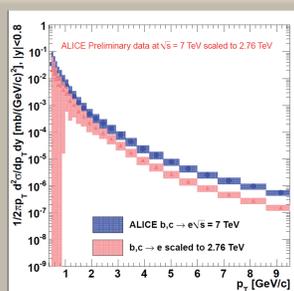
Efficiency corrected p_T spectra for all electron candidates



pp Reference Spectrum

Measurement of electrons from heavy flavour decays in pp at $\sqrt{s} = 7$ TeV scaled to the same centre-of-mass energy (right) and multiplied with the average of Glauber's nuclear overlap function $\langle T_{AA} \rangle$

- Extrapolation procedure based on FONLL
- uncertainty $\pm 10\%$ at high momenta
- identical for electrons from charm and beauty



Ratio of data over cocktail for various centrality ranges and in comparison to the corresponding result of the pp measurement at $\sqrt{s} = 7$ TeV

Hint for an Excess over the Cocktail

- ★ low p_T : Excess is centrality dependent
- Cocktail contribution missing?
- Thermal Radiation?
- ★ $p_T > 3.5$ GeV/c: Electrons from heavy flavour decays - A Priori -

Difference between data and cocktail for various centrality ranges

- Data: $\pm 35\%$
- Cocktail: $\pm 25\%$

ANALYSIS DESCRIPTION