

# Measurement of the Nuclear Modification Factor of Electrons from Heavy Flavour Decays at Mid-Rapidity in Pb-Pb Collisions at $\sqrt{s} = 2.76$ TeV with ALICE

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for the **ALICE Collaboration**



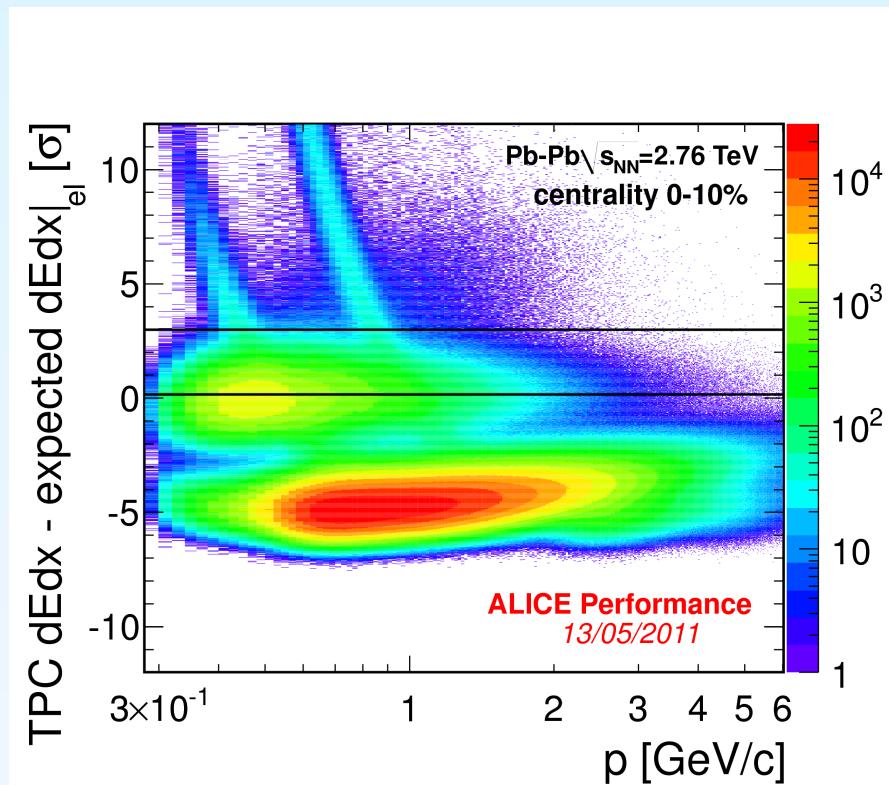
# Electron Candidate Selection

## ■ Electron Identification

- 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, suppression 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

## ■ Future: Extension to higher $p_T$ and further PID capabilities

- TRD, EmCal

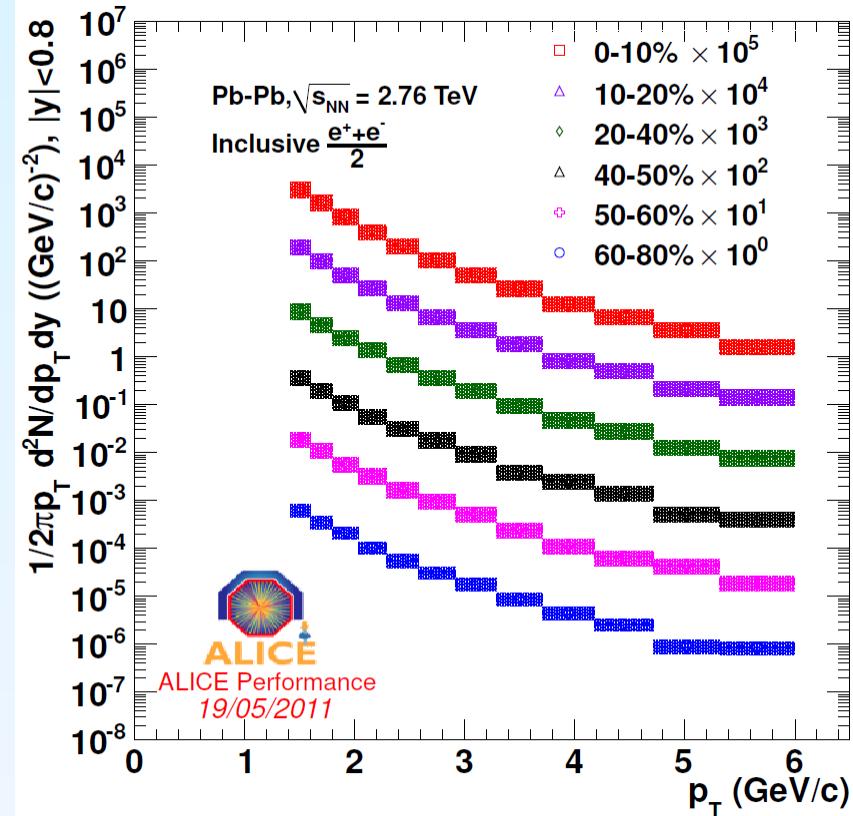
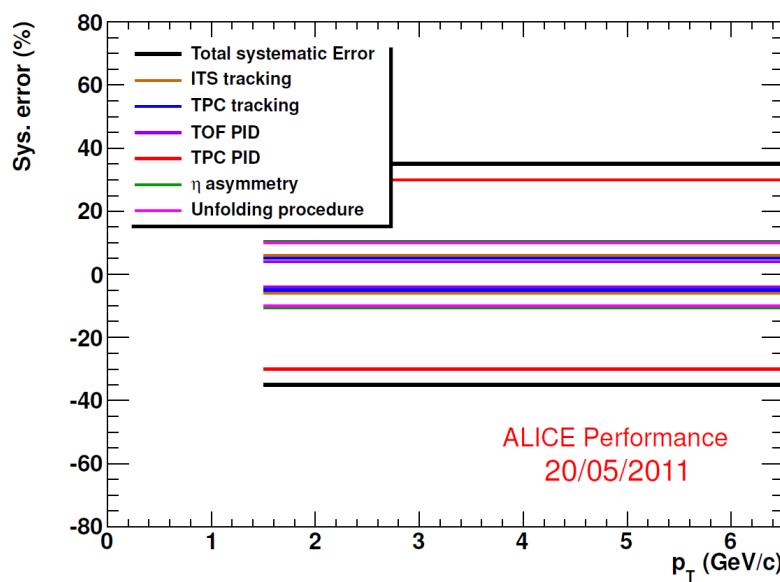


# Efficiency and Acceptance Corrected Inclusive Electron Spectra



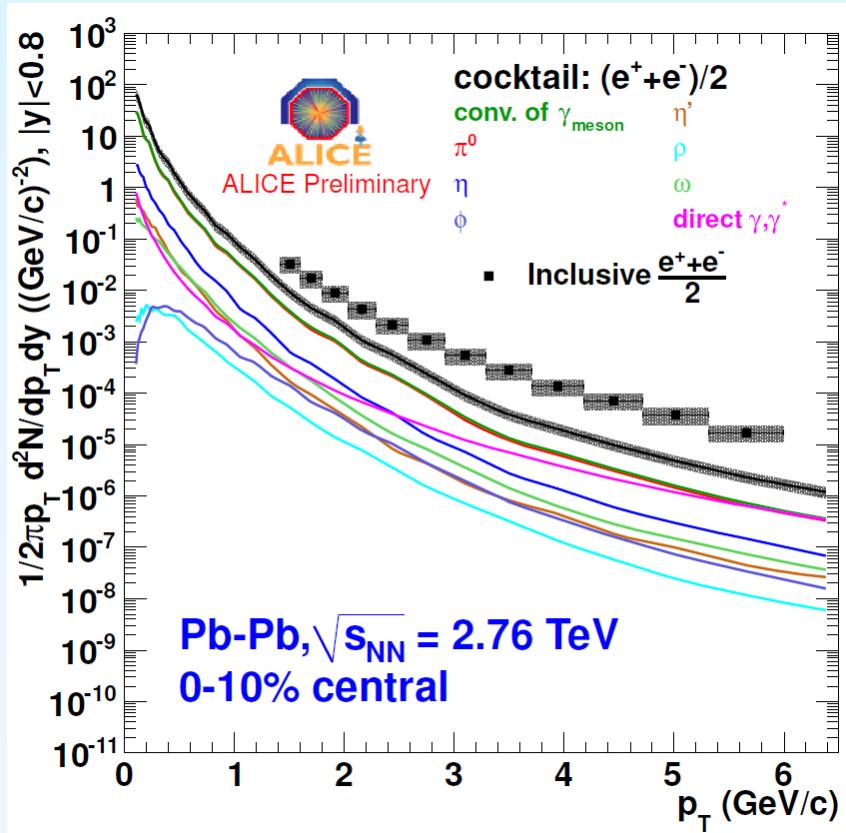
## ■ Efficiency and Acceptance Correction

- Derived from Monte Carlo Simulation
- Cross-checked where possible with data-driven method, where the signal from  $\gamma \rightarrow e^+e^-$  decays is evaluated
- Systematic Error:  $\pm 35\%$



# Comparison with Cocktail

**Method: inclusive – cocktail = electrons from heavy flavour hadron decays  
(charm and beauty)**

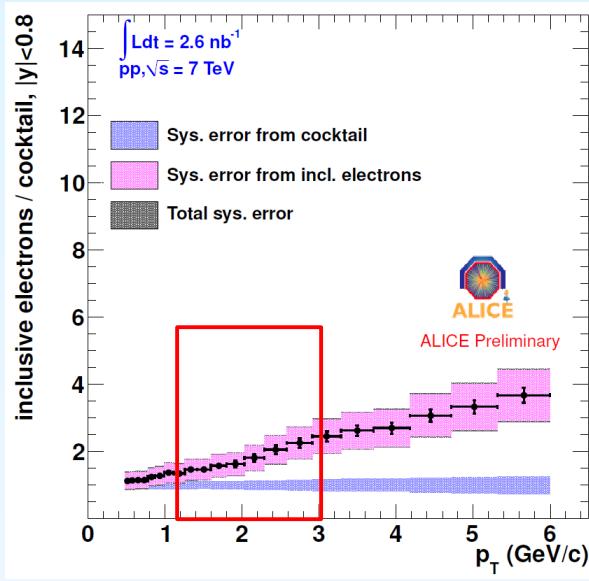


- **Cocktail contains:**
  - $\gamma$  conversion ( $\pi^0 \rightarrow \gamma\gamma$ ,  $\gamma \rightarrow e^+e^-$ )
  - $\pi^0$ ,  $\eta$ ,  $\eta'$  Dalitz decays
  - $\rho$ ,  $\phi$  decays
  - QCD photons based on NLO calculations (W. Vogelsang)
- **$\pi^0$  input based on charged pion measurement with ALICE**
- **Heavier mesons implemented via  $m_T$  scaling**
- **Systematic uncertainty:  $\pm 25\%$**

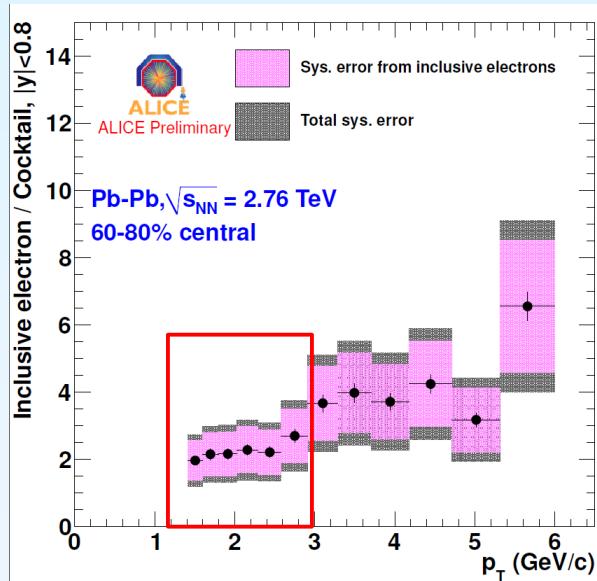
# p-p, Pb-Pb peripheral and Pb-Pb central

S. Masciocchi, Mon parallel  
M. Fasel, Thu Poster

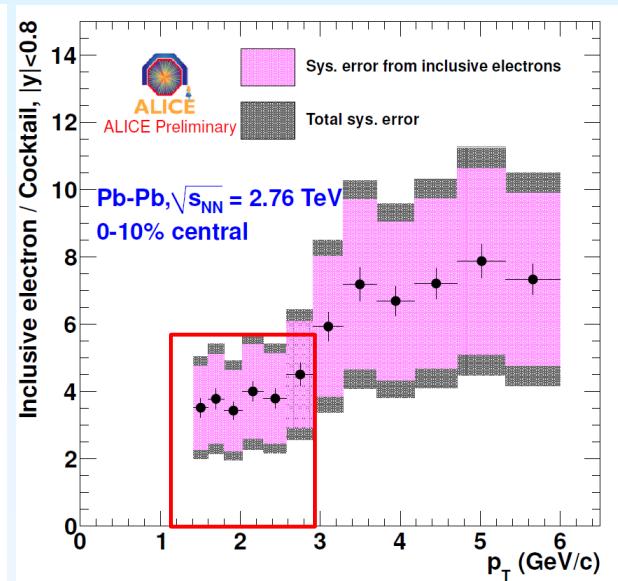
## p-p @ 7 TeV



## Pb-Pb 60-80%



## Pb-Pb 0-10%

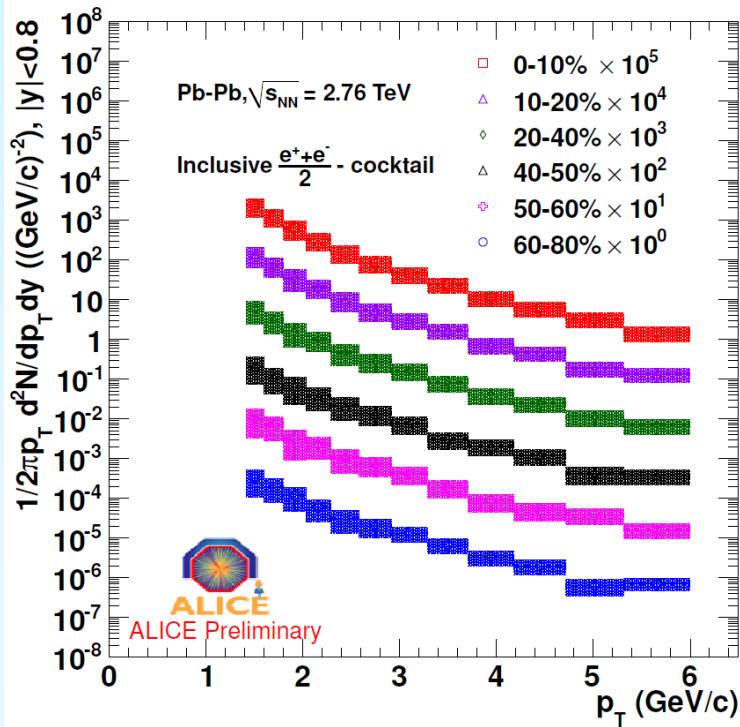


- Hint of an excess at low  $p_T$ 
  - Increases with centrality
- Additional electron source?  
Thermal Radiation?

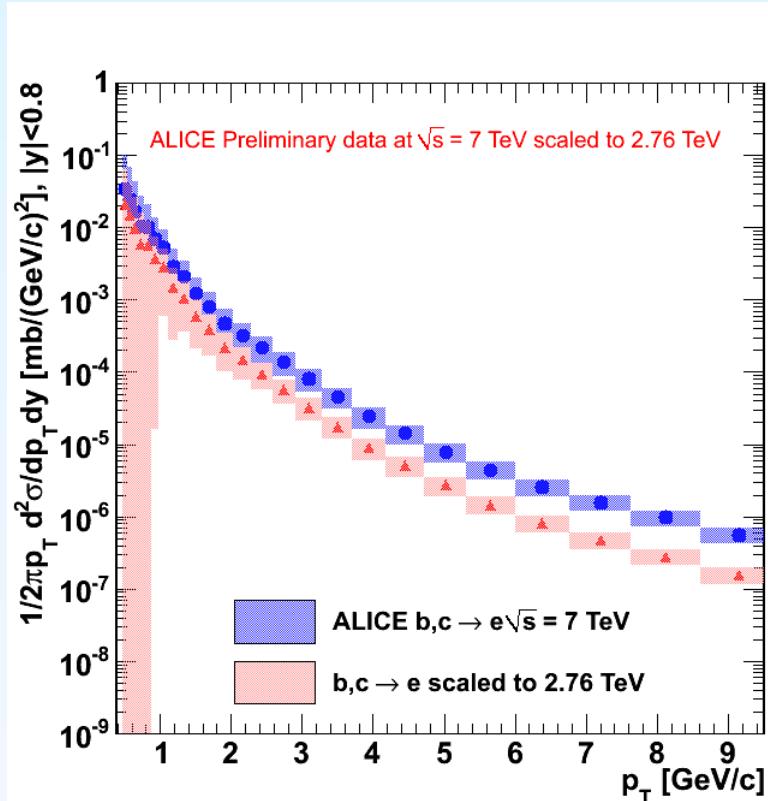
(cfr. PHENIX, PRL104 and QM2011)

**$p_T$  region 3.5-6 GeV/c:  
charm and beauty decays dominate**

# Nuclear Modification Factor - the Ingredients -



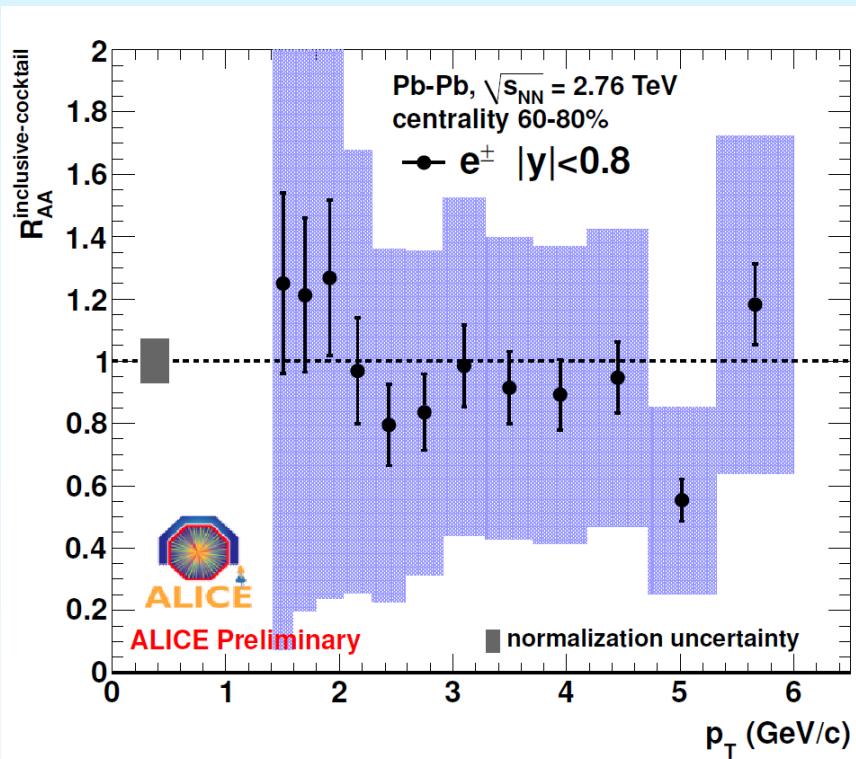
$$R_{AA}(p_T) = \frac{1}{\langle T_{AA} \rangle} \times \frac{dN_{AA}/dp_T}{d\sigma_{pp}/dp_T}$$



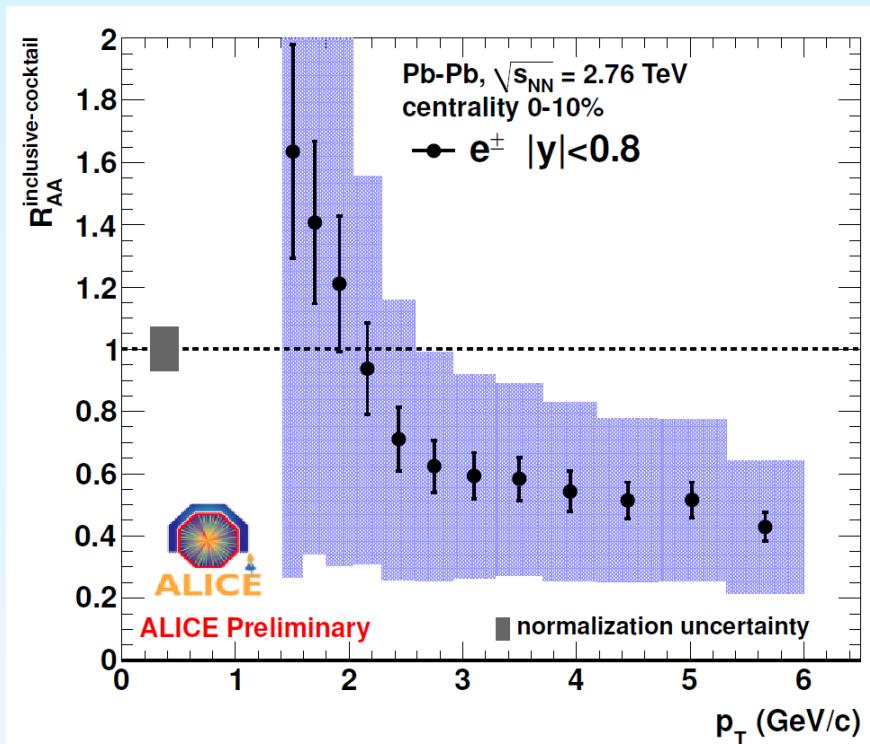
- pp reference at 2.76 TeV
  - 7 TeV spectrum scaled with FONLL
  - Identical for electrons from charm and beauty decays
  - Uncertainties
    - ~10% at  $p_T > 2$  GeV/c

# Cocktail-subtracted Electron RAA

Pb-Pb 60-80 %



Pb-Pb 0-10 %



- $p_T$  region 3.5-6 GeV/c: charm and beauty decays dominate
- Suppression in central collisions: Factor 1.5-4
- Compatible with heavy flavour decay muons
- Soon: reduction of systematic uncertainty