ALICE R_{AA} results

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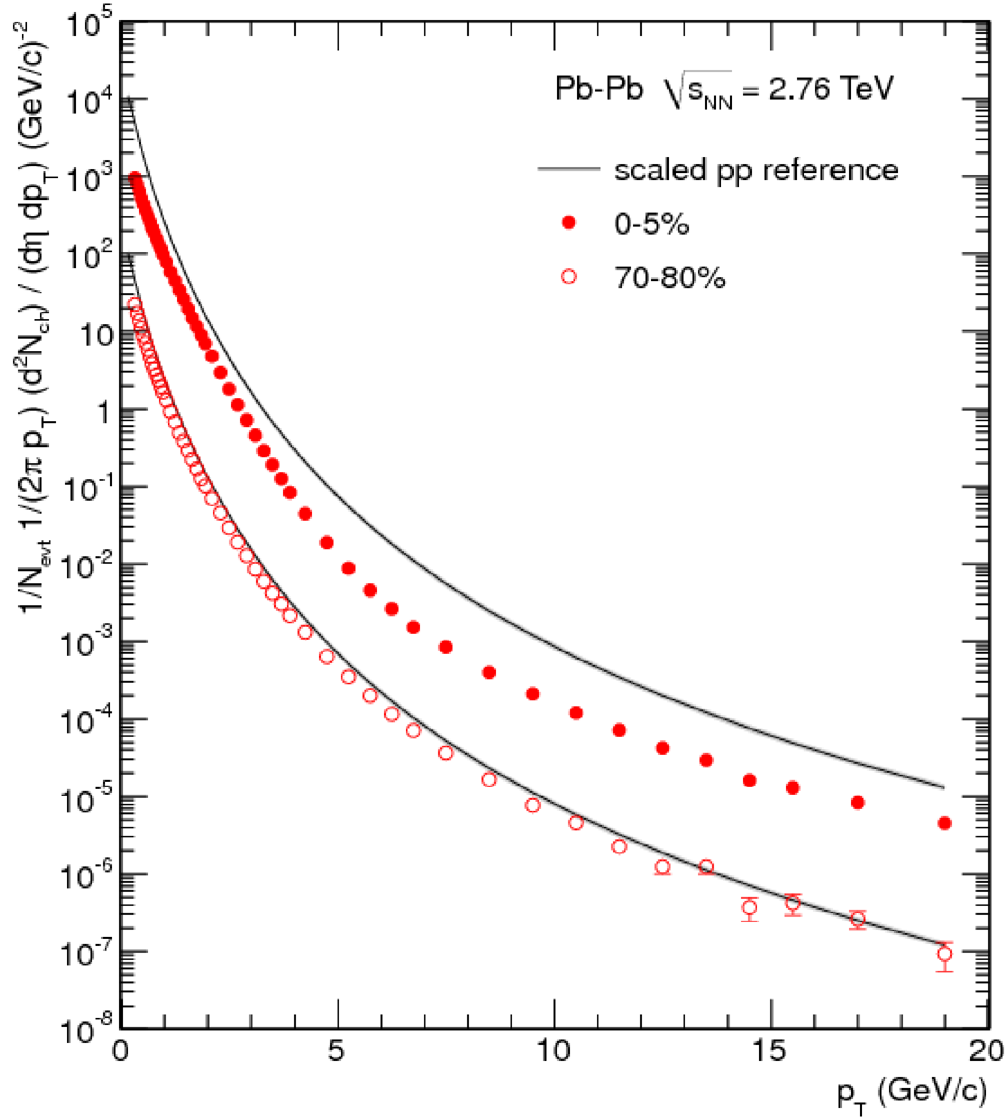
Spectra

ALICE, PLB 696, 30



Pb+Pb spectra compared to pp, scaled by N_{coll}

Corrections:

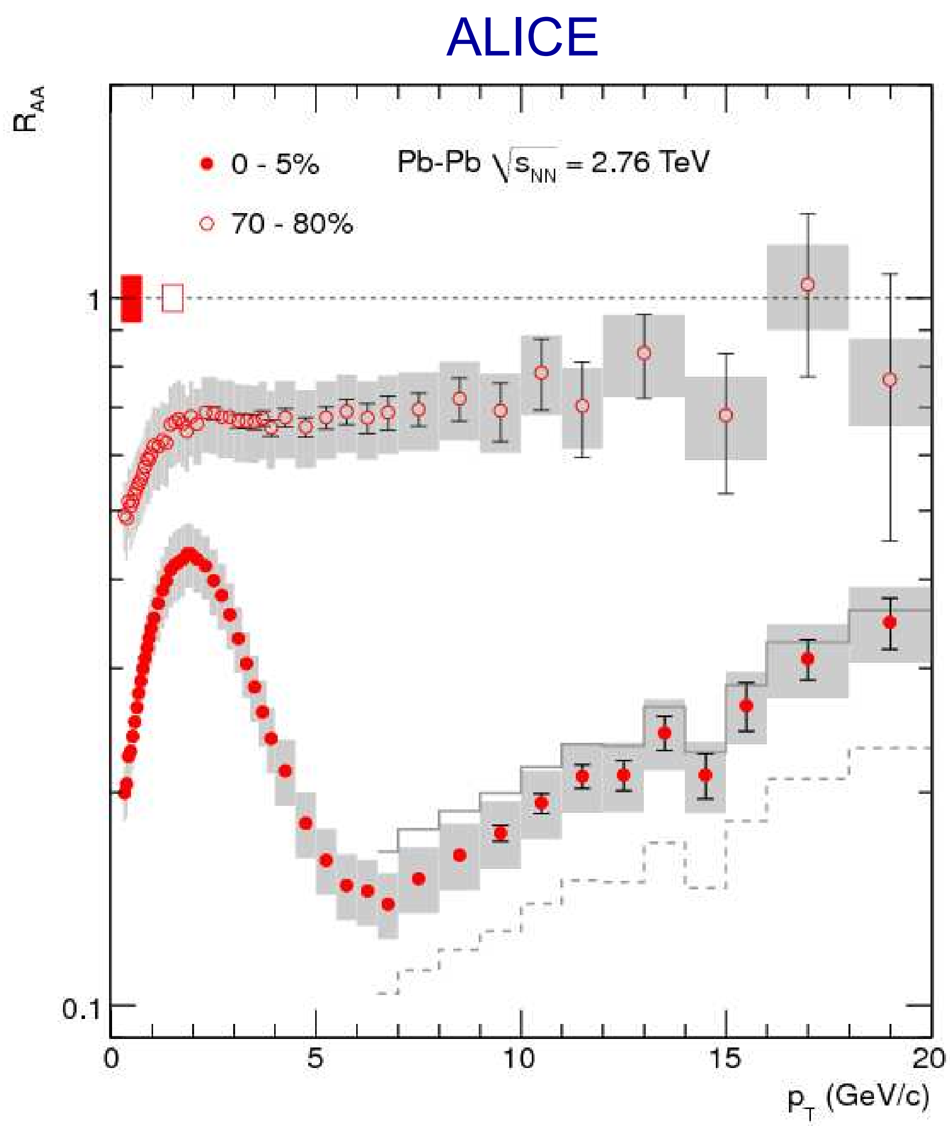
- Efficiency
- Secondaries
- Momentum resolution

ALICE published R_{AA}

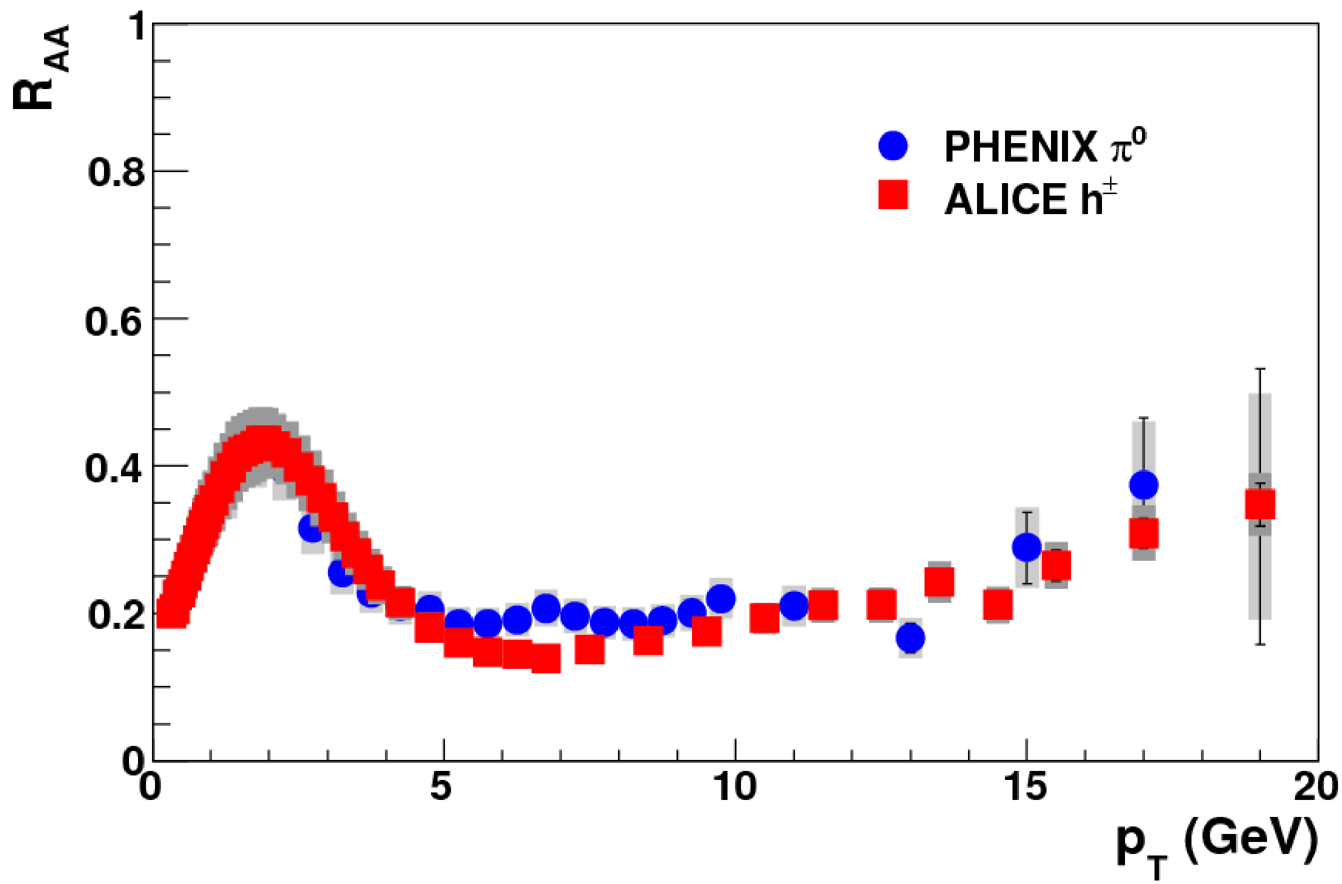
ALICE, PLB 696, 30

Main features:

- R_{AA} large, but not 1 for peripheral (70-80%)
  - Can we see it go to 1?
    $\Rightarrow$ more peripheral or γ
  - Cold nuclear matter effects?
    $\Rightarrow$ p+Pb
- Central events: R_{AA} rises with p_T (‘flat’ at RHIC)
  - More on next slides



Comparing RHIC and LHC

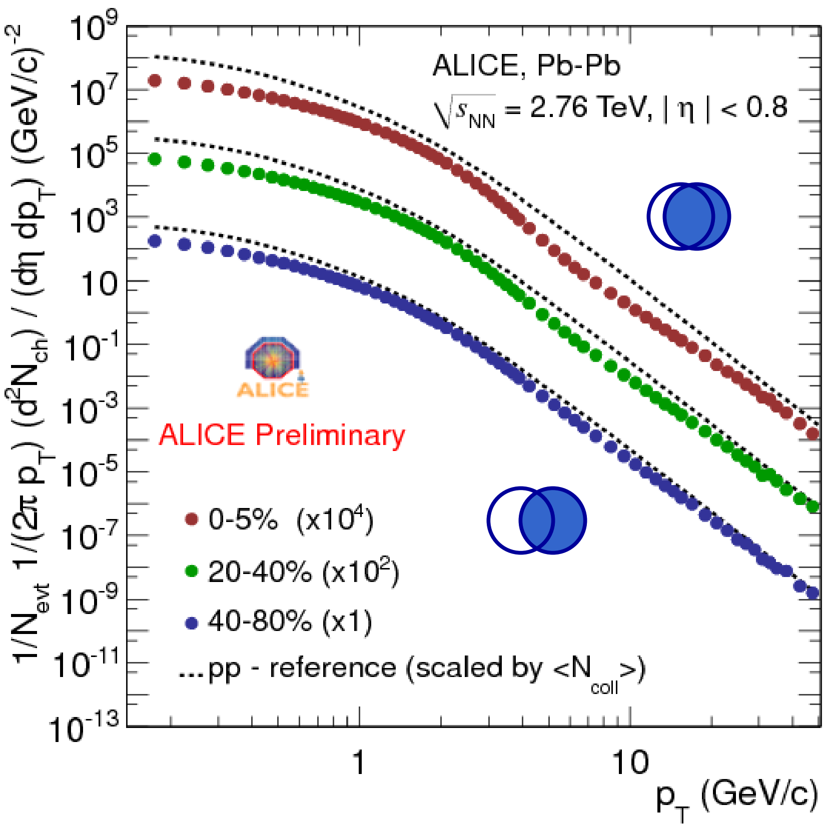


Overlaying the two results:
PHENIX π^0 and ALICE $h^{\pm}$ p_T-dependence not too different…

N.B.: Large uncertainties in RHIC result at high p_T

New (preliminary) results

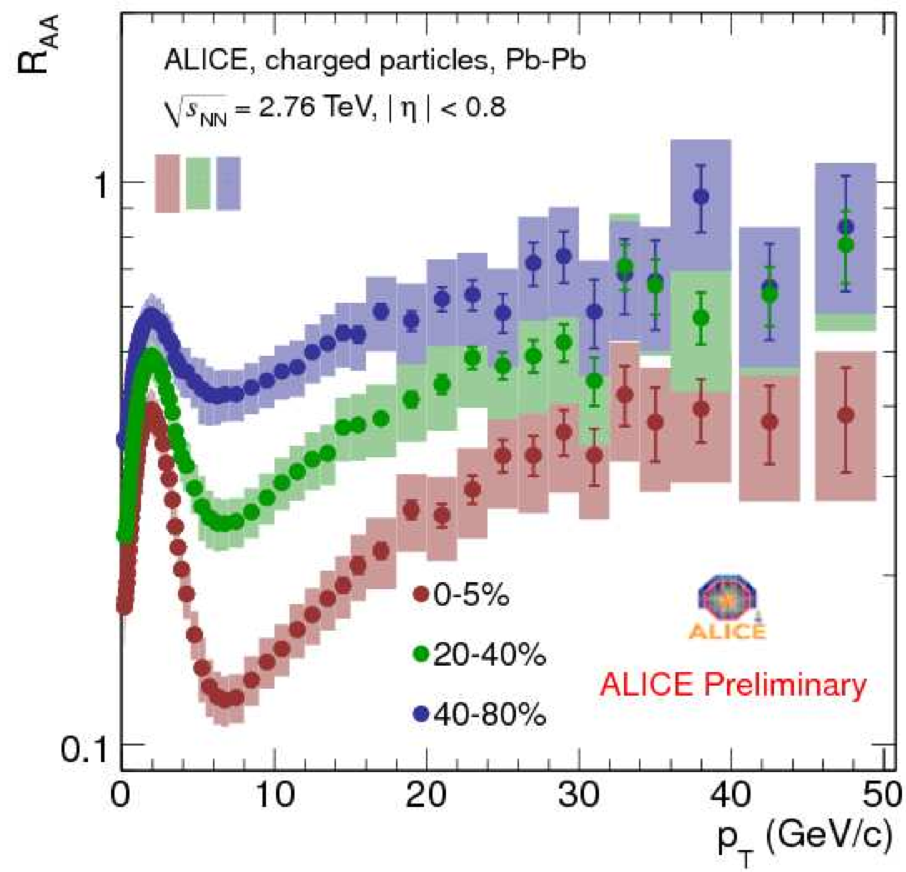
Charged hadron p_T spectra



Shape of spectra in Pb+Pb differ from p+p

Nuclear modification factor

$$R_{AA} = \frac{dN/dp_T|_{Pb+Pb}}{N_{coll}\, dN/dp_T|_{p+p}}$$



Large suppression
R_{AA} rises with p_T ← relative energy loss decreases

Comparing to theory/models

HT: X-N Wang et al, arXiv:1102.5614 (PRC)
HT: Majumder, Shen, arXiv:1103.0809
TR: T. Renk et al, arXiv:1103.5308 (PRC)
WHDG: Horowitz and Gyulassy, arXiv:1104.4958

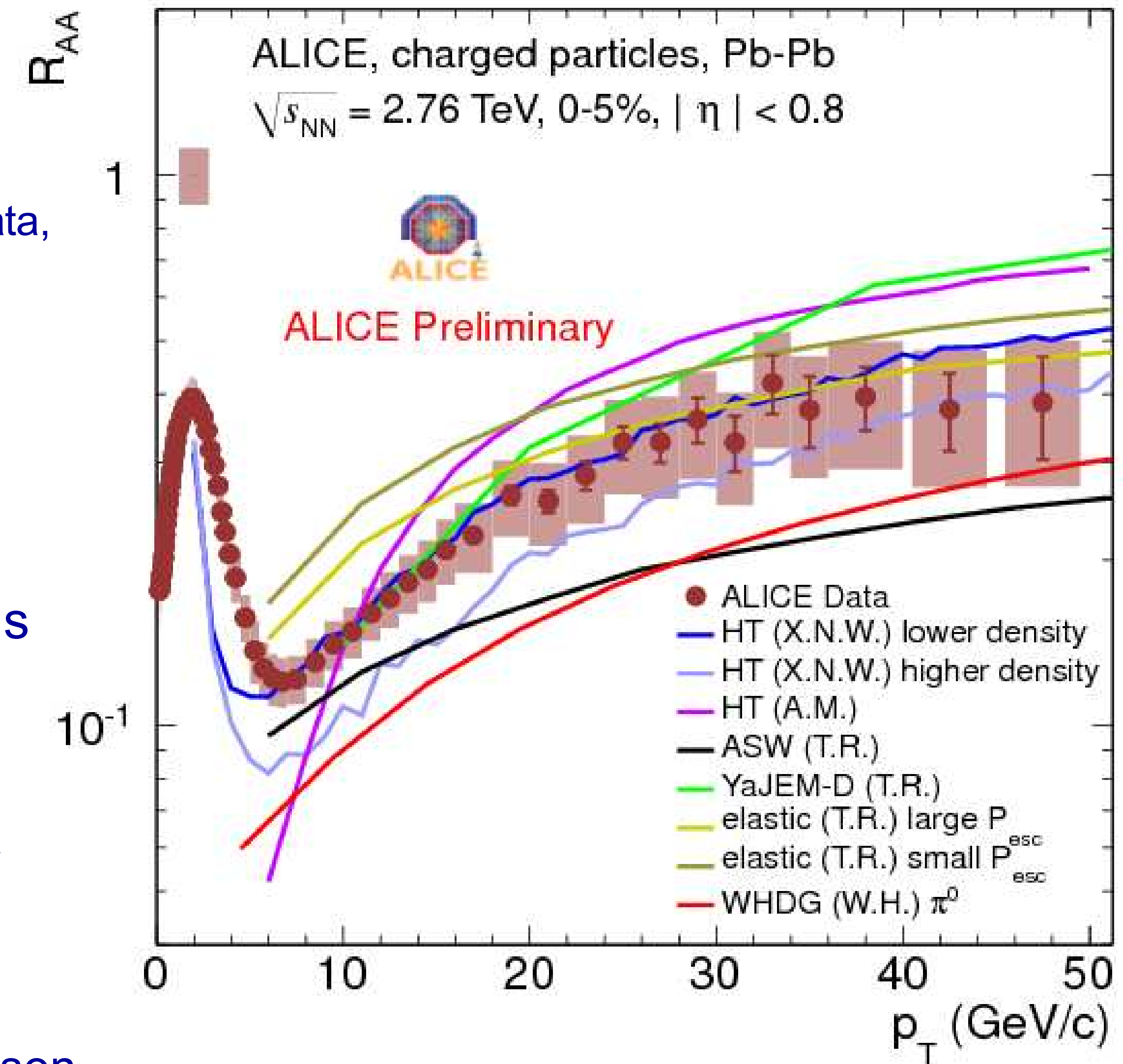
Medium density tuned to RHIC data, scaled with multiplicity

All calculations show increase with p_T

Main sensitivity:
Steepness of increase depends on p_T-dependence of E-loss

Also: extrapolation RHIC-LHC sensitive to density increase

+many subtle effects:
need careful modeling+comparison



Extra slides

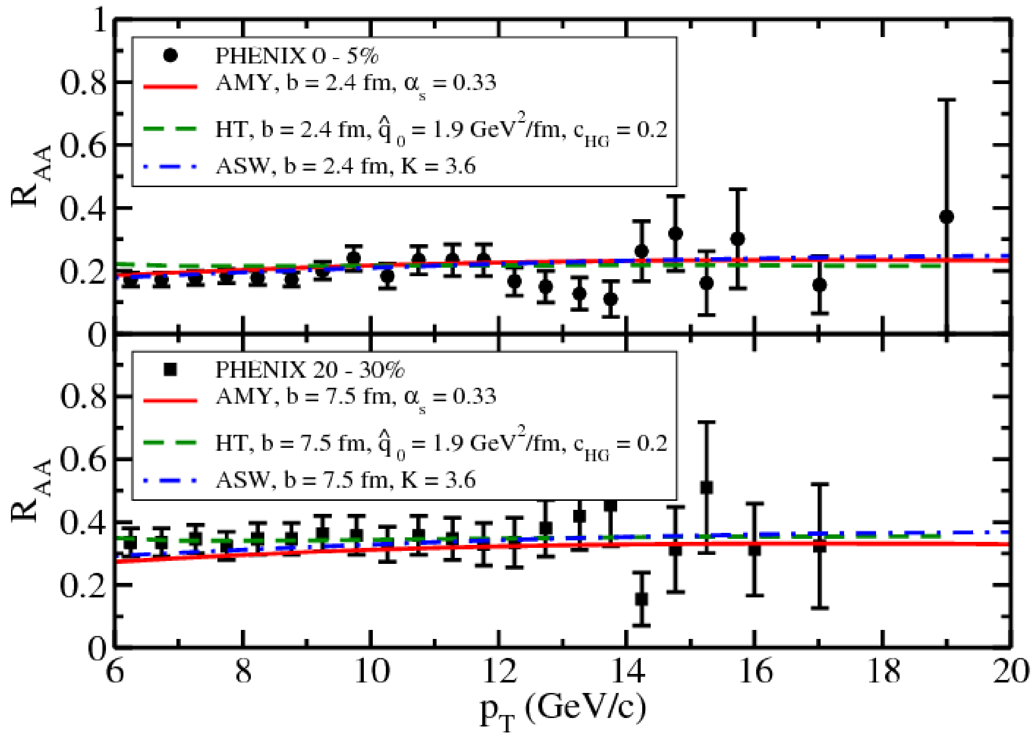
Determining $\hat{q}$ at RHIC

ASW: $\hat{q} = 10 - 20\ \mathrm{GeV}^2/\mathrm{fm}$

HT: $\hat{q} = 2.3 - 4.5\ \mathrm{GeV}^2/\mathrm{fm}$

AMY: $\hat{q} \approx 4\ \mathrm{GeV}^2/\mathrm{fm}$

Large density:
AMY: T ~ 400 MeV
Transverse kick: qL ~ 10-20 GeV



Bass et al, PRC79, 024901

All formalisms can match R_{AA}, but large differences in medium density

Why these large differences?

At RHIC: ΔE large compared to E, differential measurements difficult

Systematic uncertainties

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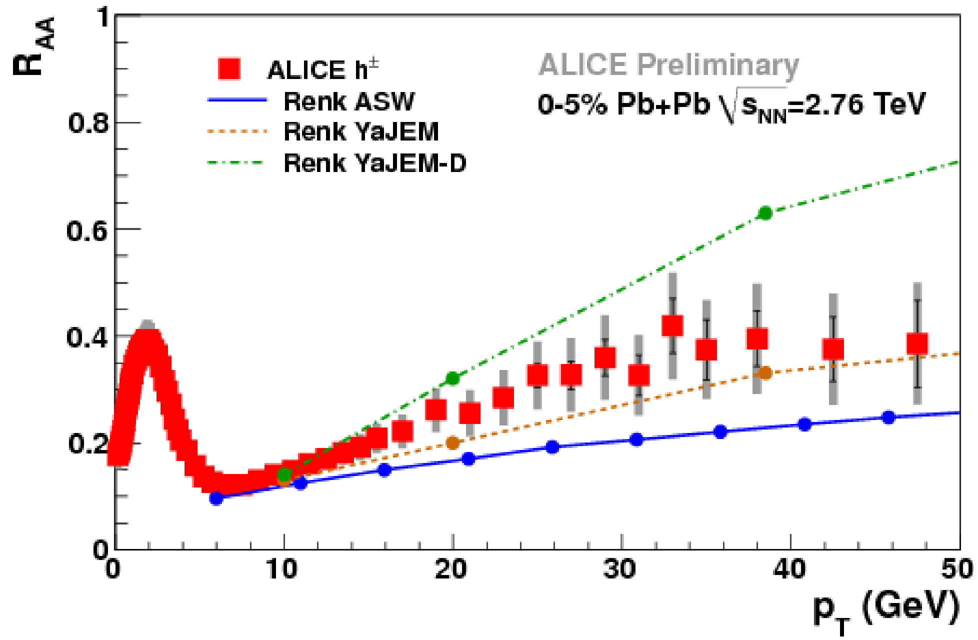
Table 2
Contributions to the systematic uncertainties on the inclusive spectra. For the p_T dependent errors the ranges are given.

Centrality class	0–5%	70–80%
Centrality selection	1%	7%
Track and event selection cuts	1–4%	1–4%
Particle composition	1–4%	1–4%
Material budget	1–2%	1–2%
Secondary particle rejection	<1%	<1%
Tracking efficiency	2–6%	2–6%
Total systematic uncertainties	5–7%	8–10%

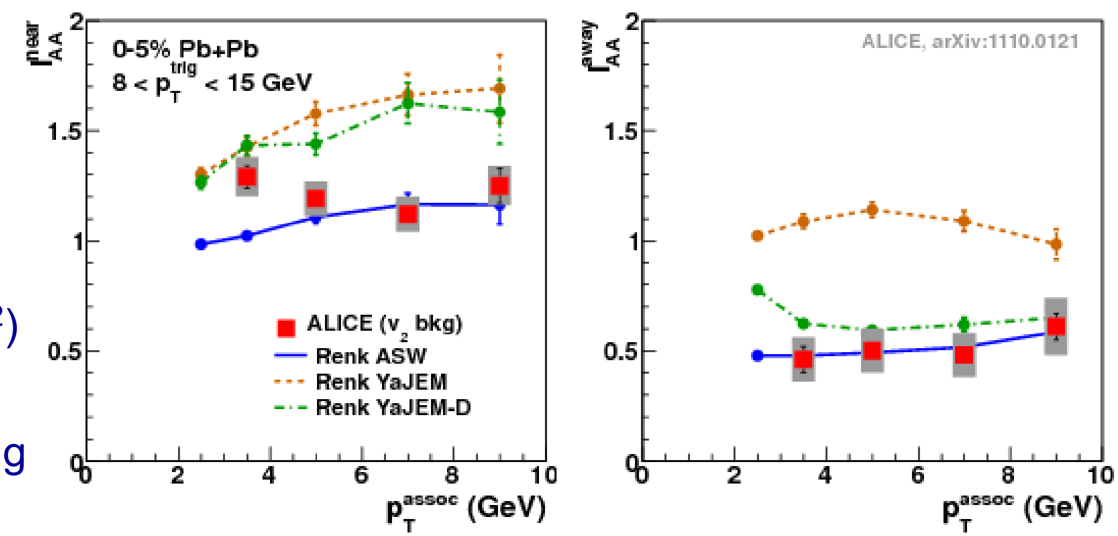
Comparing di-hadrons and single hadrons

Need simultaneous comparison to several measurements to constrain geometry and E-loss



Here: R_{AA} and I_{AA}

Three models:
ASW: radiative energy loss
YaJEM: medium-induced virtuality
YaJEM-D: YaJEM with L-dependent virtuality cut-off (induces L^2)



None of these works well without tuning