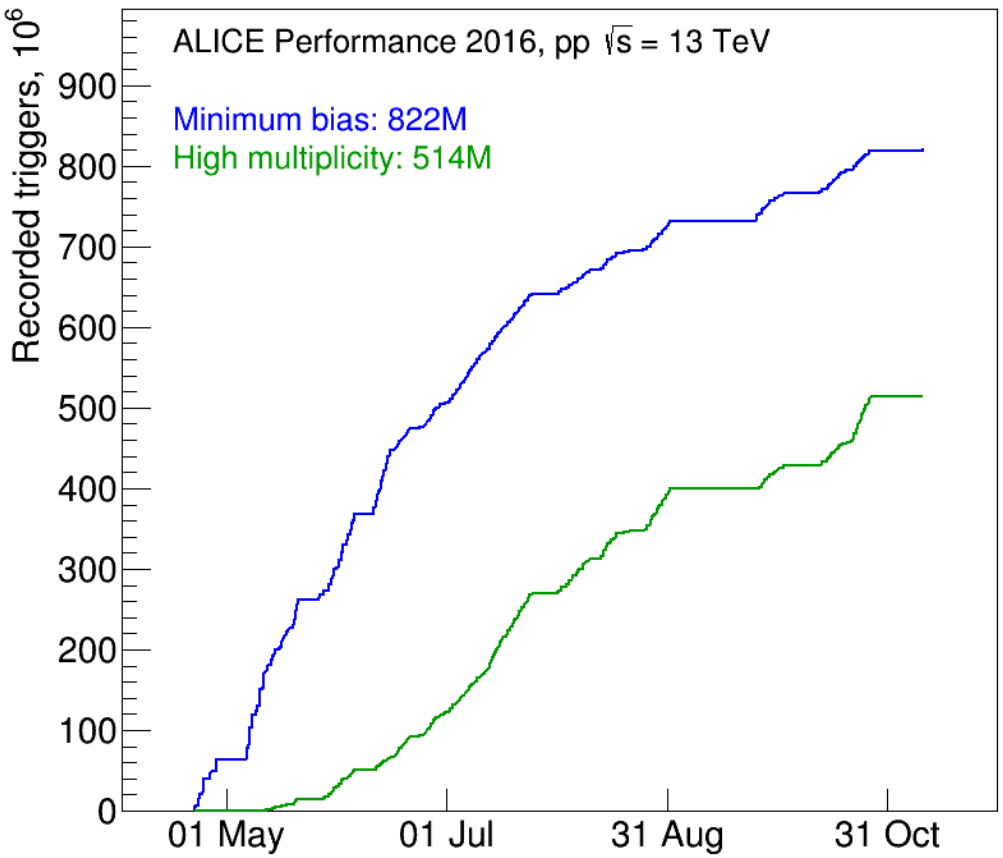
ALICE Status Report

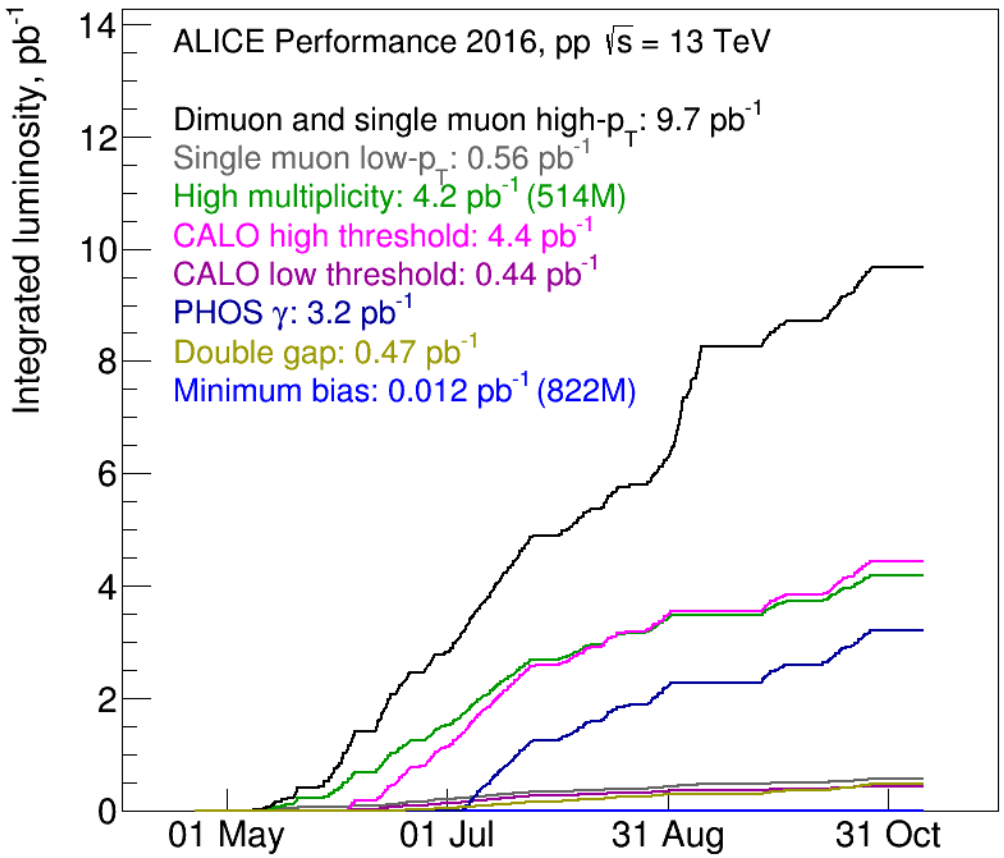
A. Andronic (GSI Darmstadt) on behalf of ALICE Collaboration

- Data taking and reconstruction
- Recent physics results
- ALICE Upgrade

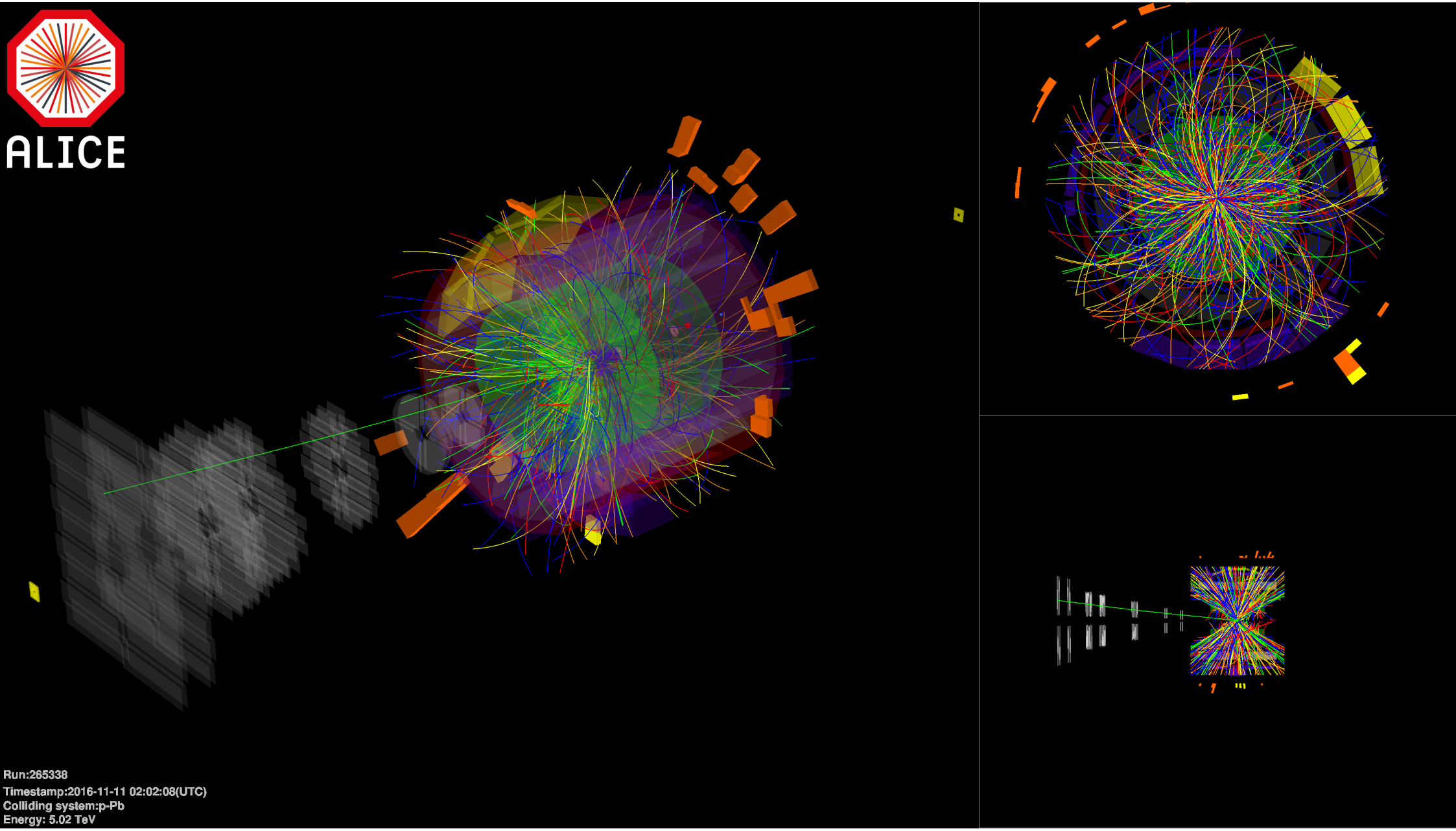
Data taking - pp $\sqrt{s}$ =13 TeV

IR: 100-550 kHz, triggered and min-bias data



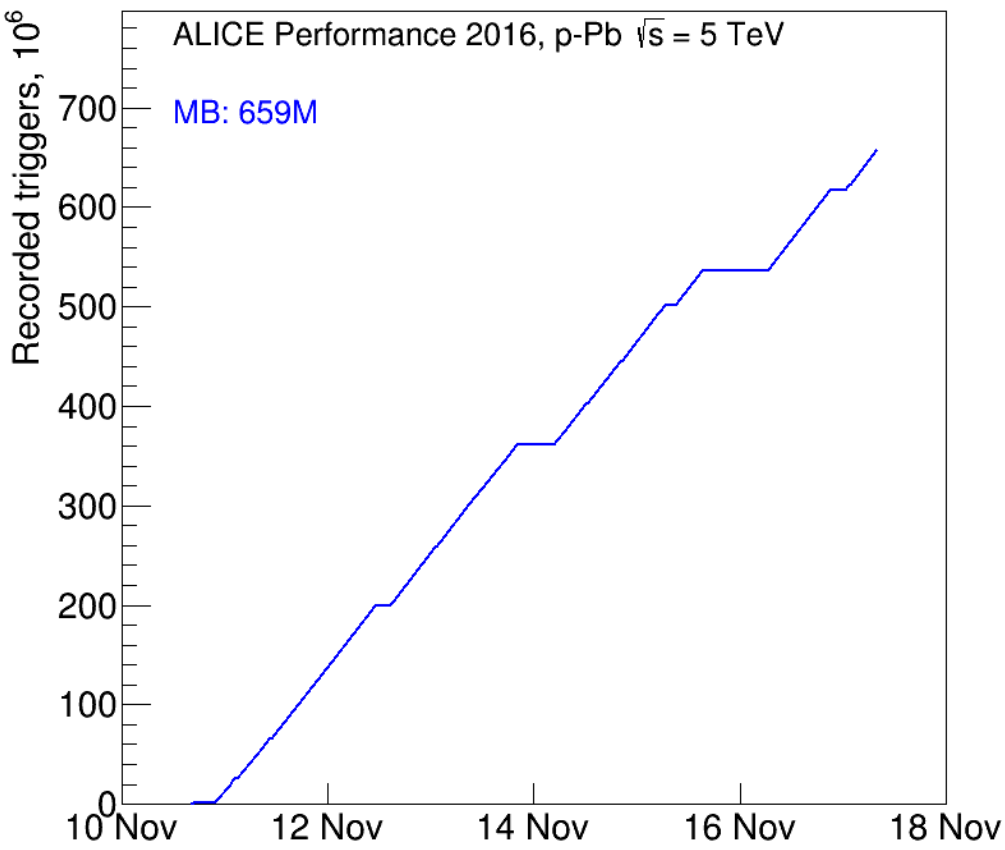


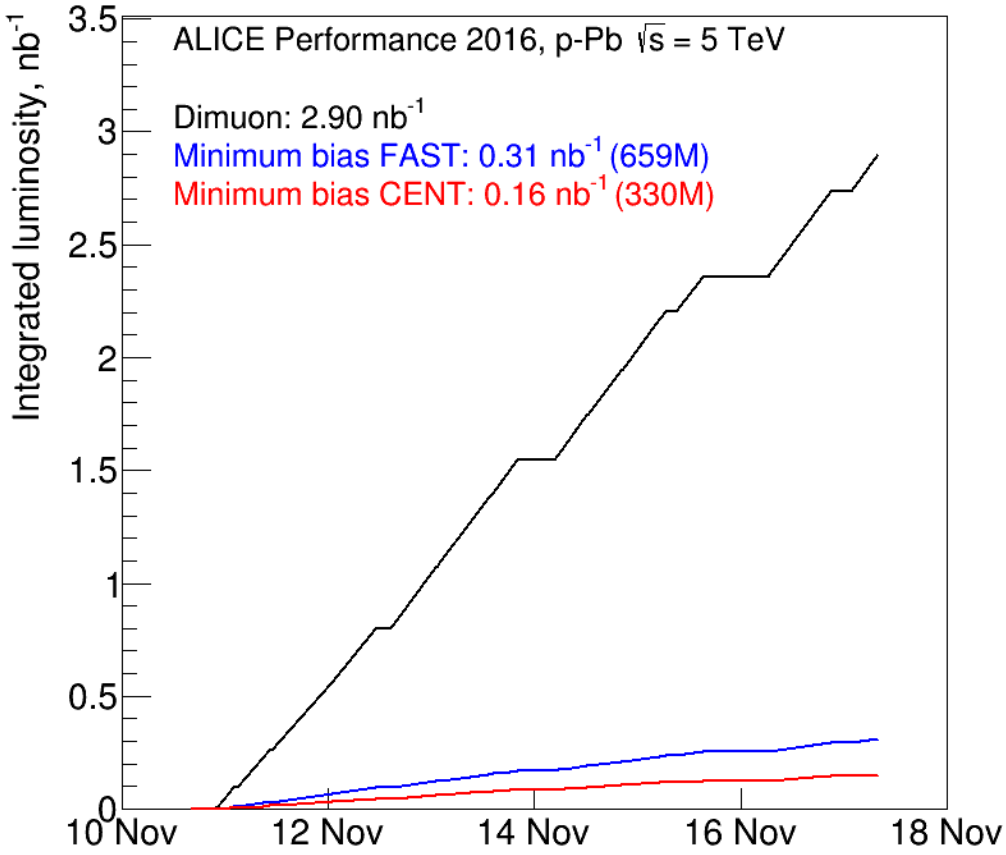
p–Pb $\sqrt{s_{\mathrm{NN}}}$ =5.02 TeV



Data taking - p–Pb $\sqrt{s_{\mathrm{NN}}}$ =5.02 TeV

focus: min-bias data; optimized 17 kHz IR, 1.6 kHz readout



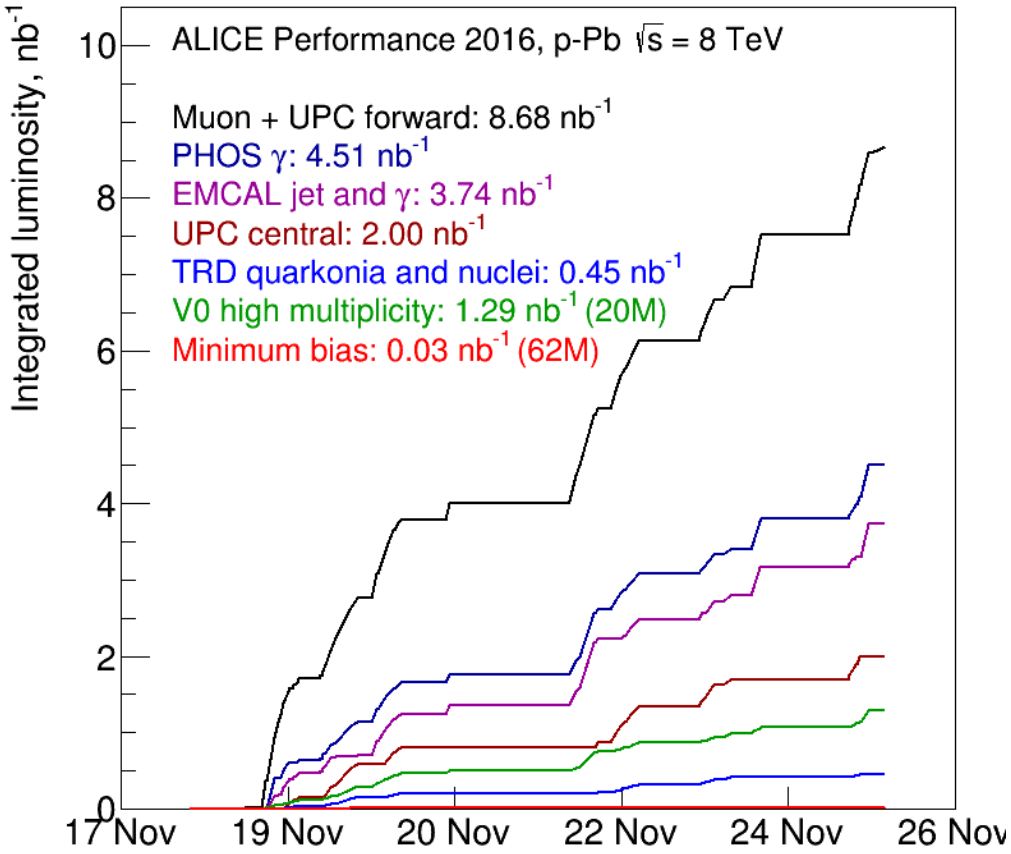


95% efficiency with full suite of sub-detectors

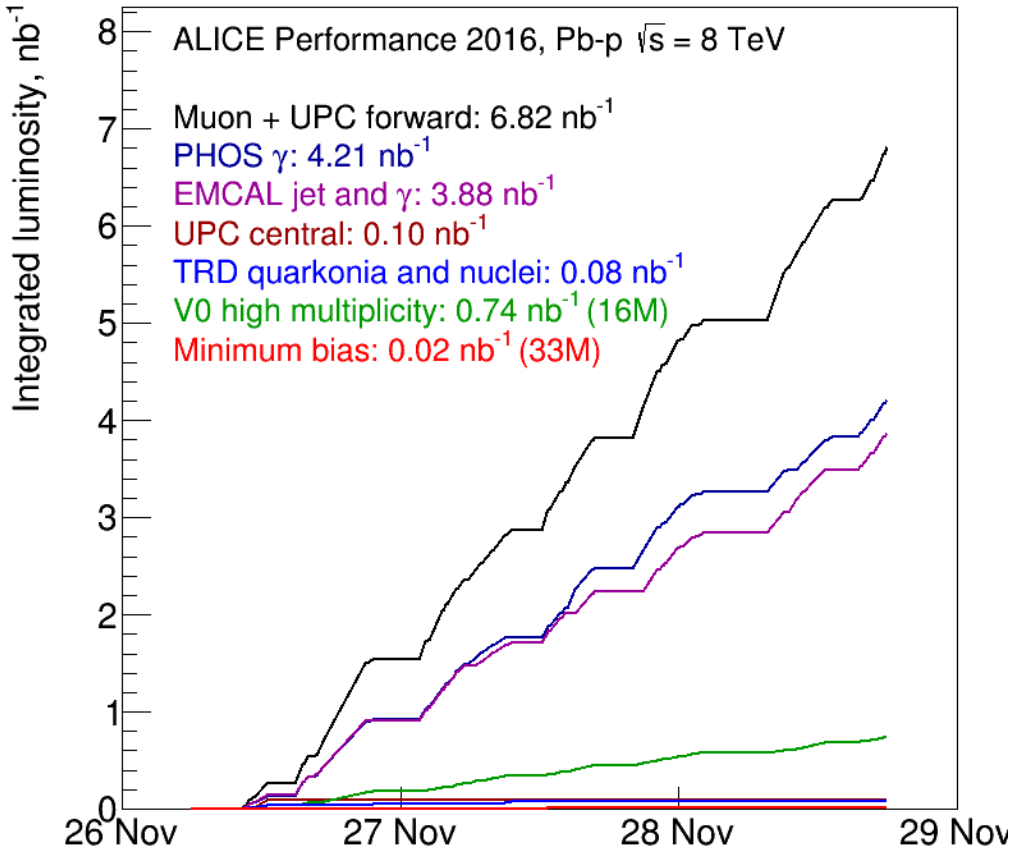
Data taking - p–Pb $\sqrt{s_{\mathrm{NN}}}$ =8.16 TeV

focus: triggered data; IR: ∼300 kHz beginning of fill

p–Pb



Pb–p

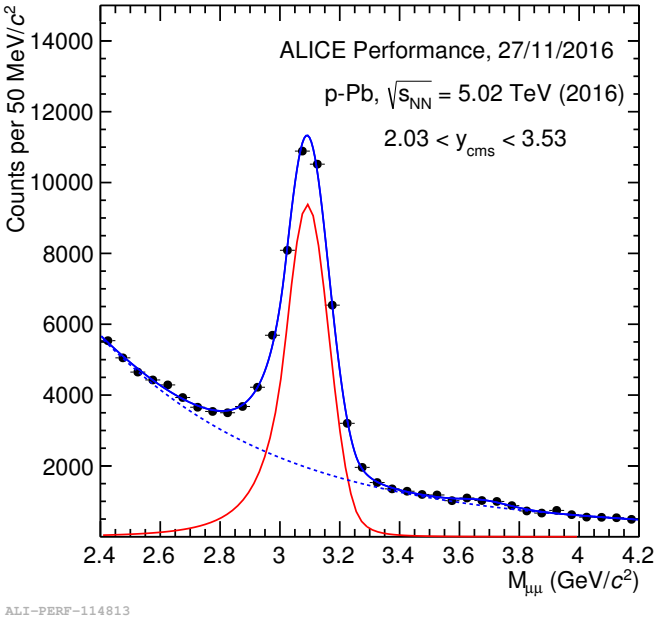


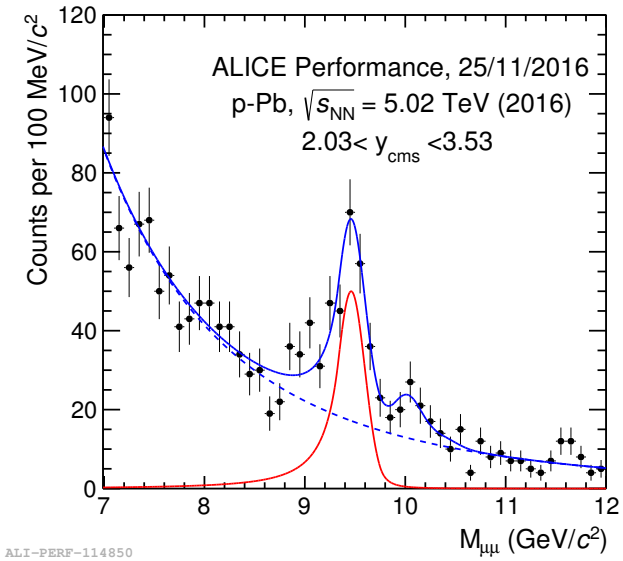
Reconstruction and MC production

- Pb–Pb 5 TeV: fully calibrated and reconstructed
- pp 13 TeV: ongoing
- fast track reconstruction (muon spectrometer and calorimeters) running synchronously with data taking
- p–Pb: calibrated (no backlog), reconstruction planned after p–Pb data taking
- massive Monte Carlo productions running

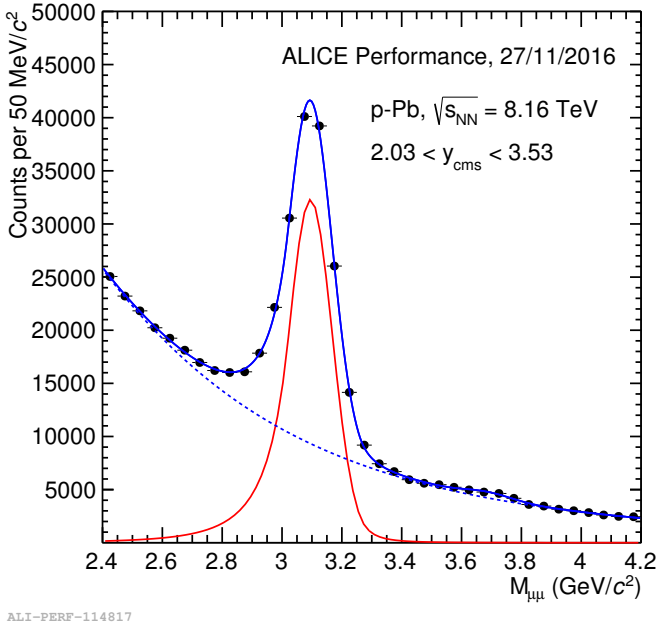
Muon Spectrometer performance

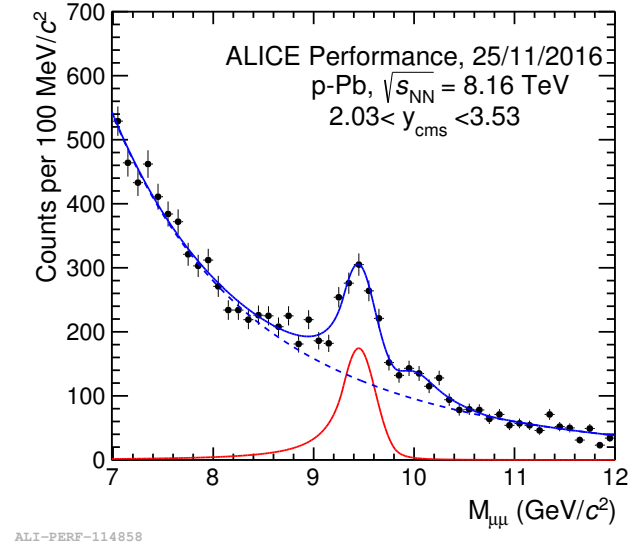
p–Pb, 5.02 TeV



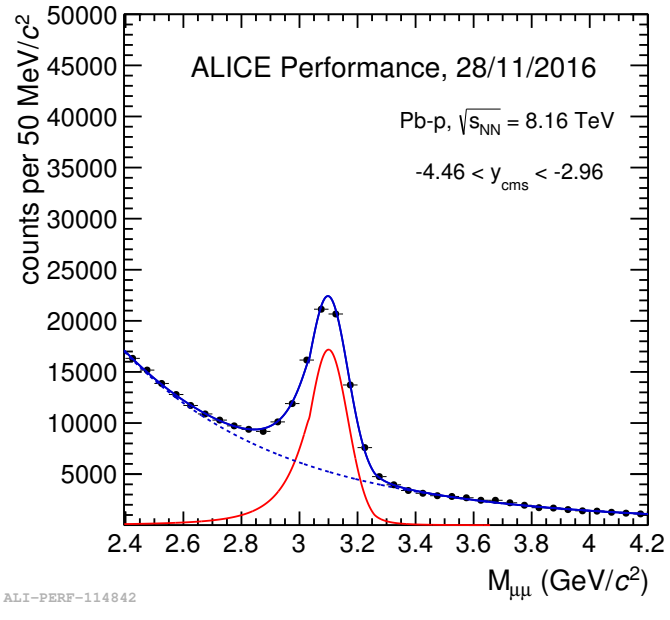


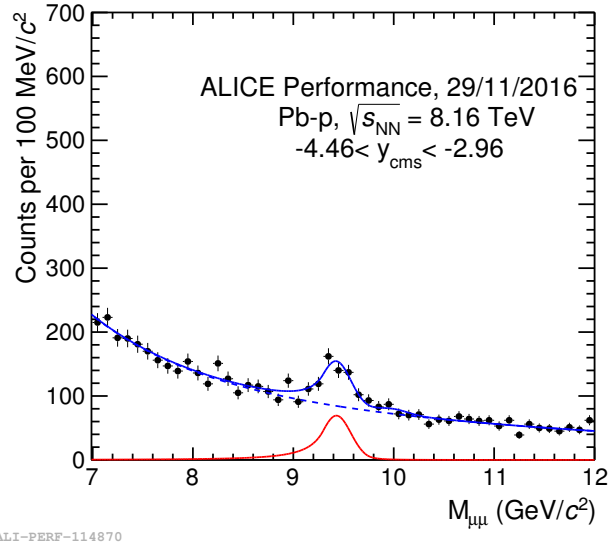
p–Pb, 8.16 TeV





Pb–p, 8.16 TeV





Recent papers

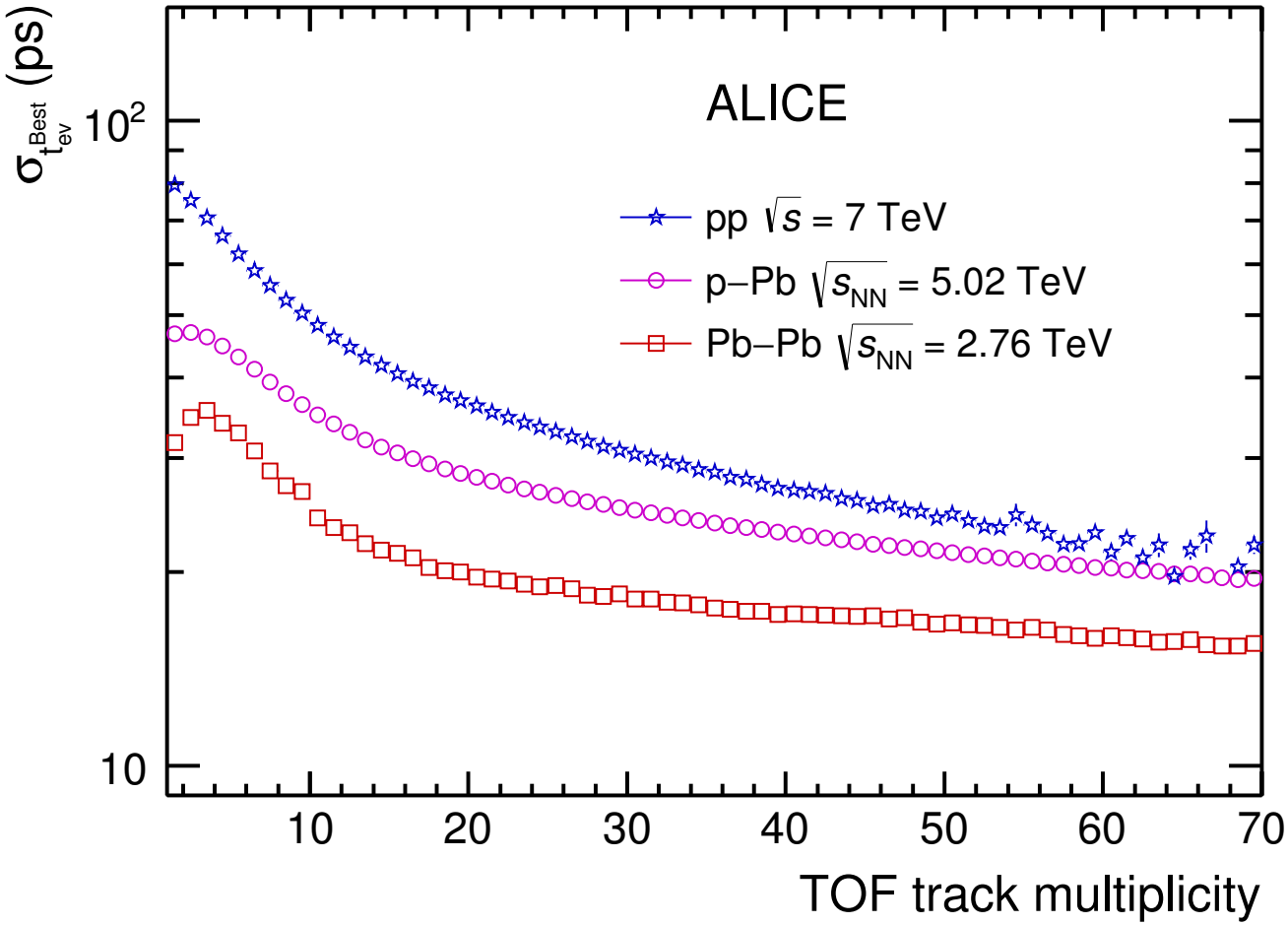
Published

- Jet-like correlations with neutral pion triggers in pp and central Pb-Pb collisions at 2.76 TeV
  Phys. Lett. B 763 (2016) 238 [arXiv:1608.07201]
- D-meson production in p–Pb collisions at $\sqrt{s_{\rm NN}} = 5.02$ TeV and pp collisions at $\sqrt{s} = 7$ TeV
  Phys. Rev. C 94 (2016) 054908 [arXiv:1605.07569]

Submitted

- W and Z boson production in p–Pb collisions at $\sqrt{s_{\rm NN}} = 5.02$ TeV, arXiv:1611.03002
- Determination of the event collision time with the ALICE detector at the LHC, arXiv:1610.03055
- Measurement of the production of high-$p_{\rm T}$ electrons from heavy-flavour hadron decays in Pb–Pb collisions at $\sqrt{s_{\rm NN}} = 2.76$ TeV, arXiv:1609.07104
- Evolution of the longitudinal and azimuthal structure of the near-side jet peak in Pb–Pb collisions at $\sqrt{s_{\rm NN}} = 2.76$ TeV, arXiv:1609.06667
- Anomalous evolution of the near-side jet peak shape in Pb–Pb collisions at $\sqrt{s_{\rm NN}} = 2.76$ TeV, arXiv:1609.06643

Event collision time

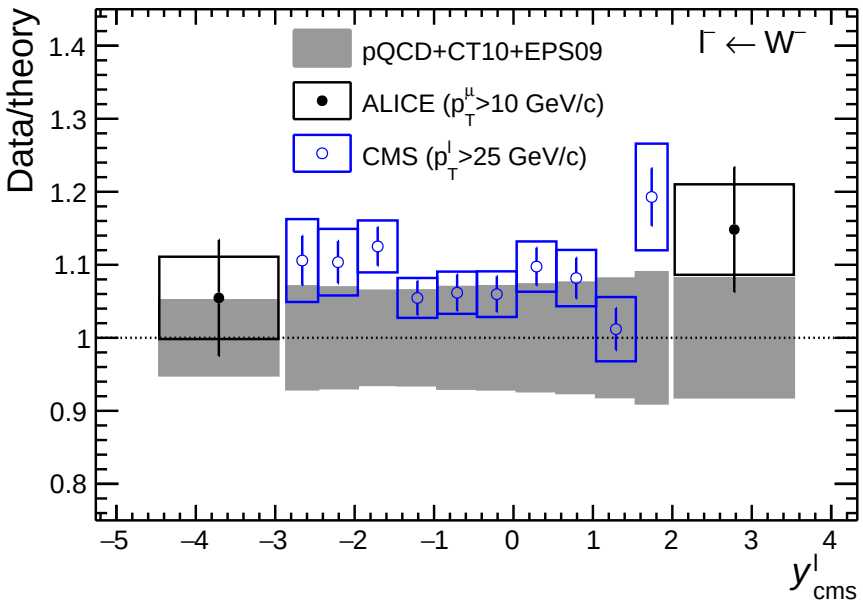


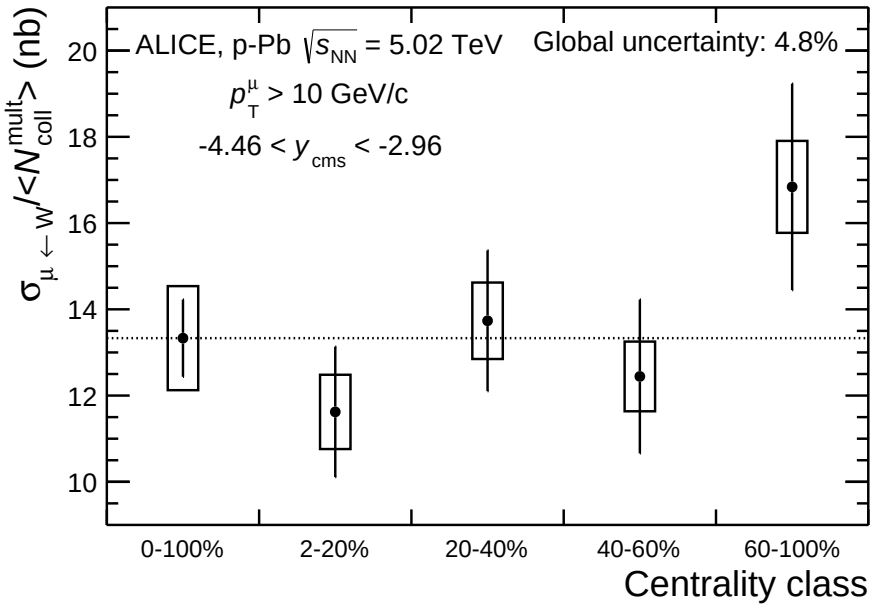
arXiv:1610.03055

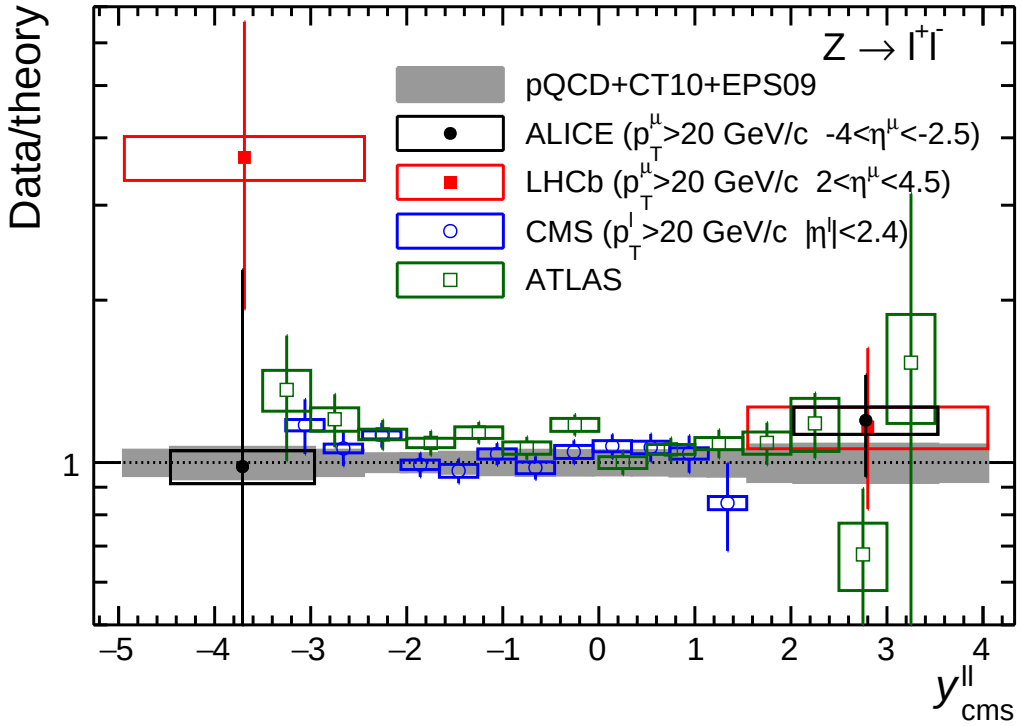
$\sigma_{t_{ev}^{Best}}$: weighted mean of t_{ev}^{T0} and t_{ev}^{TOF}

TOF track multiplicity 15 $\sim$ 50% V0A multiplicity class in p–Pb and 80% centrality class in Pb–Pb collisions

W and Z boson production (p–Pb collisions)







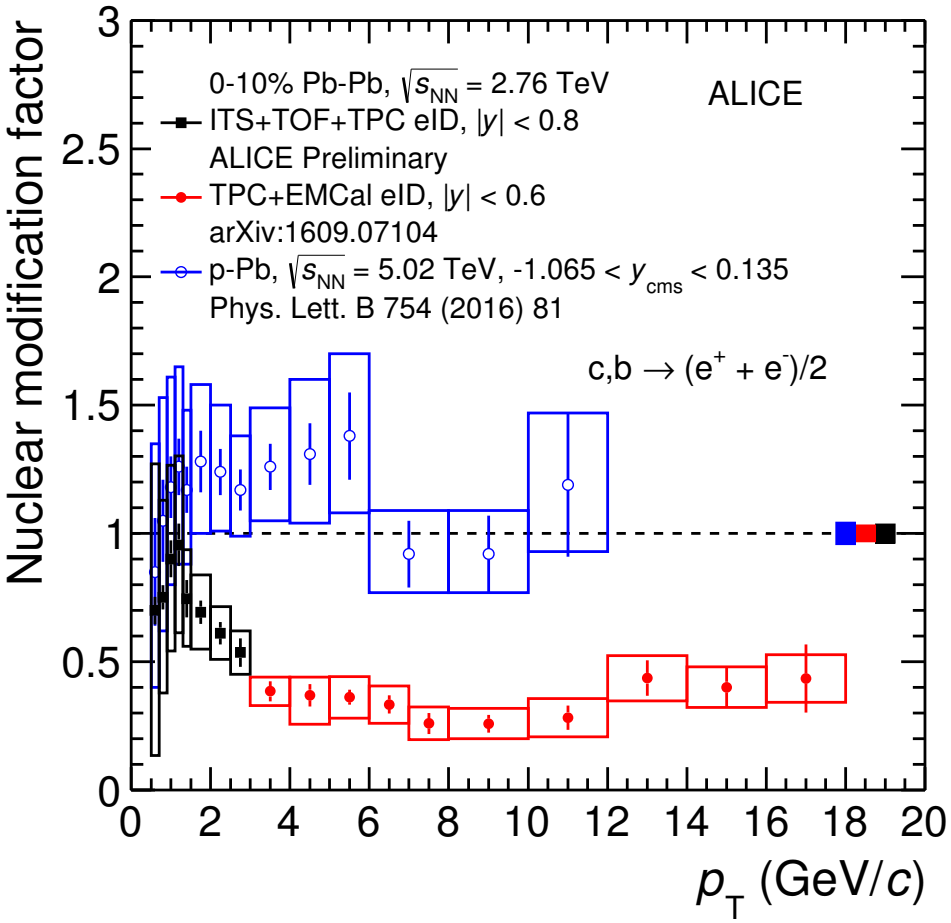
pQCD and shadowing calculations describe the data

(another) proof of binary collision scaling

arXiv:1611.03002

Heavy-quark energy loss

...via the measurement of decay electrons (from charm and beauty hadrons)



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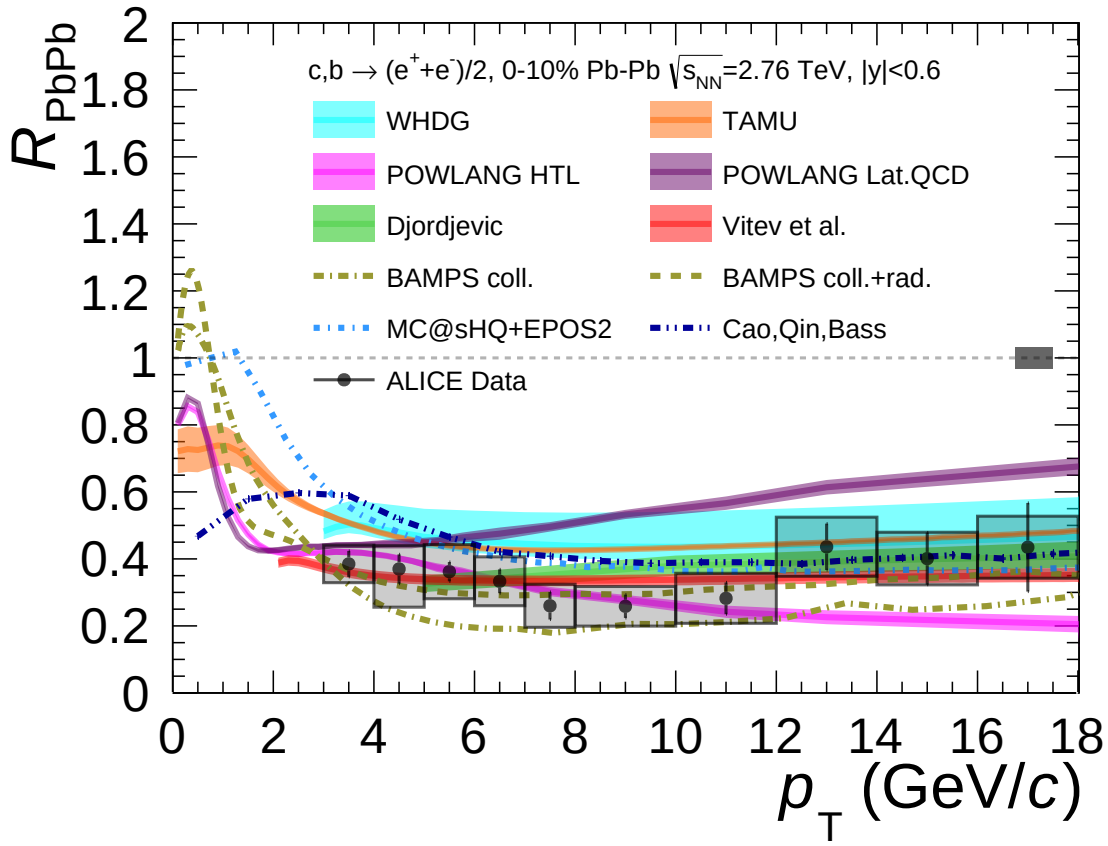


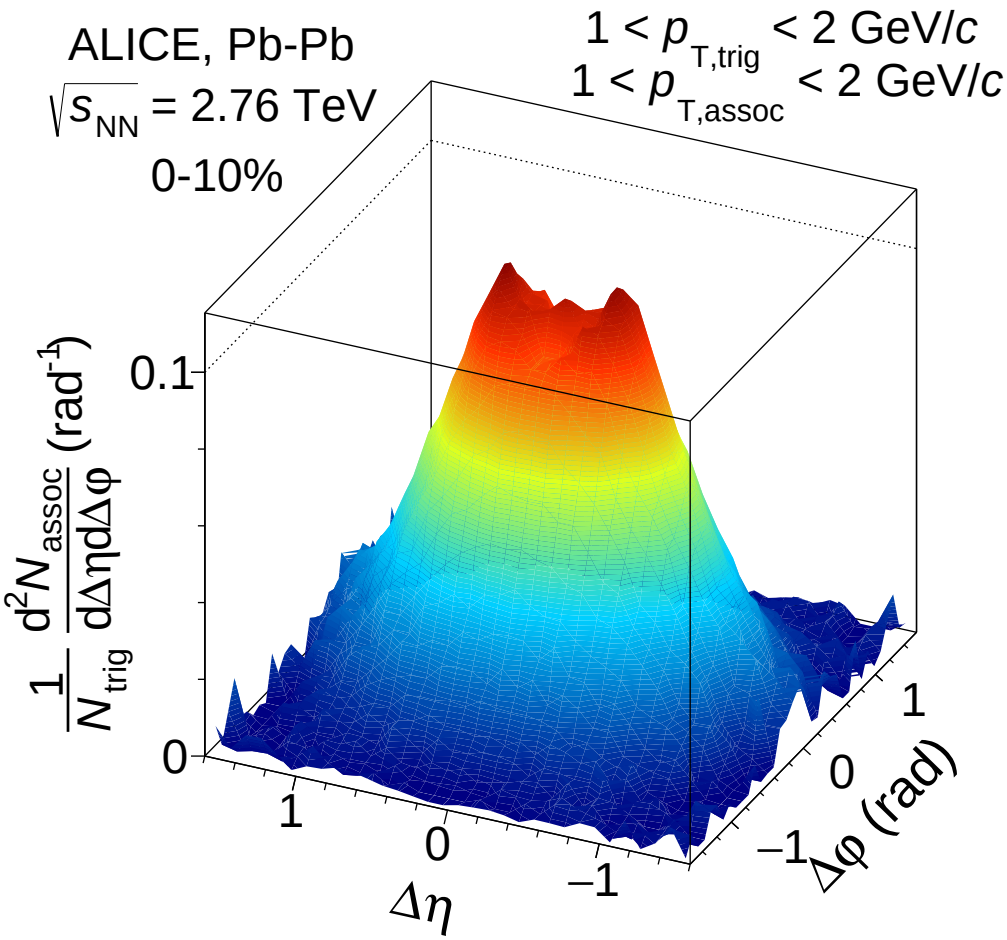
arXiv:1609.07104

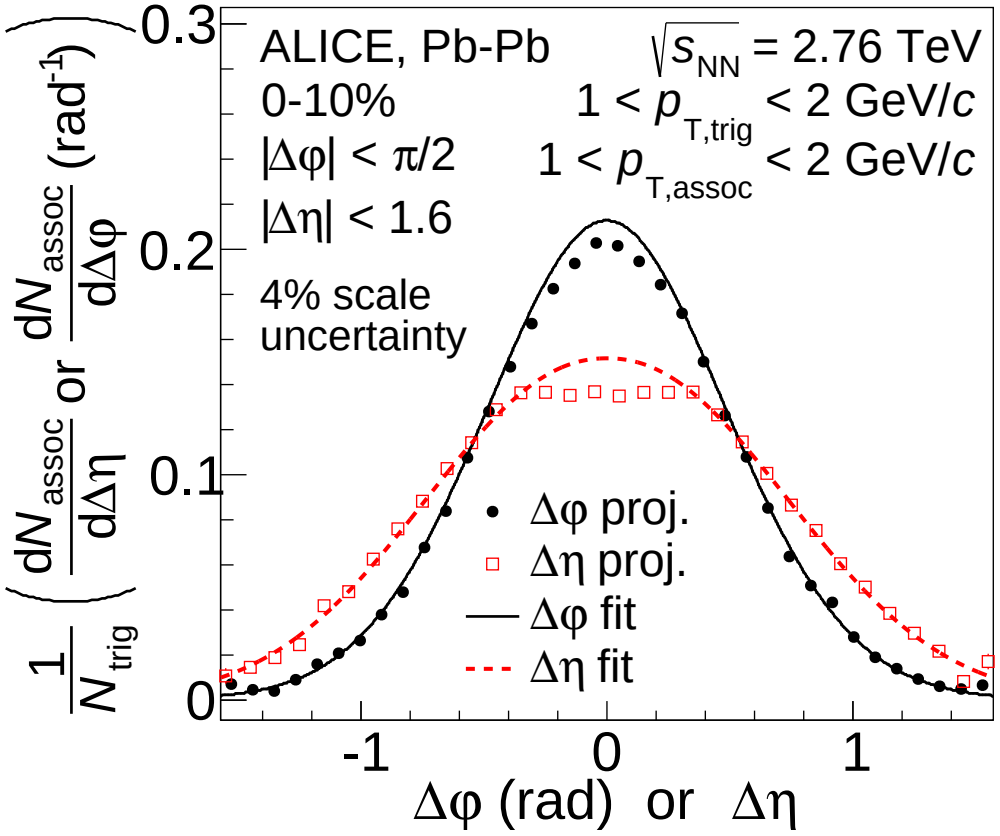
(together with D-meson data; R_{AA} & elliptic flow) constrain theoretical models

...towards extraction of HQ transport coefficients

Particle correlations

hadrons "associated" with a "trigger" (all charged particles)



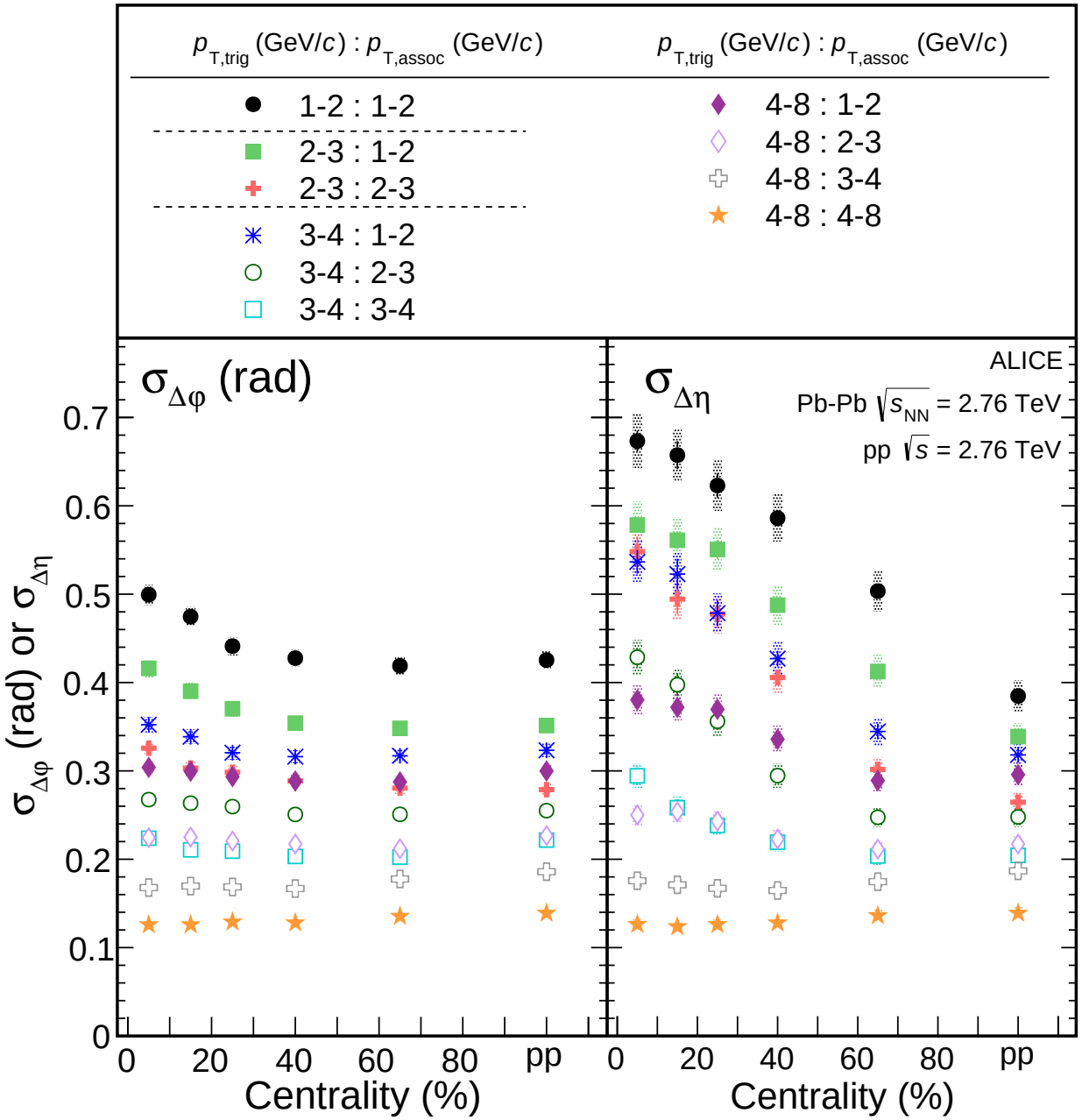


arXiv:1609.06643

combinatorial background and long-range correlations (collective flow) subtracted

conspicuous "depletion" around $\Delta\eta$=0 (excluded from fits)

Particle correlations



Data indicative of a prominent jet-medium interaction

Armesto, Salgado, Wiedeman, PRL 93 (2004) 242301

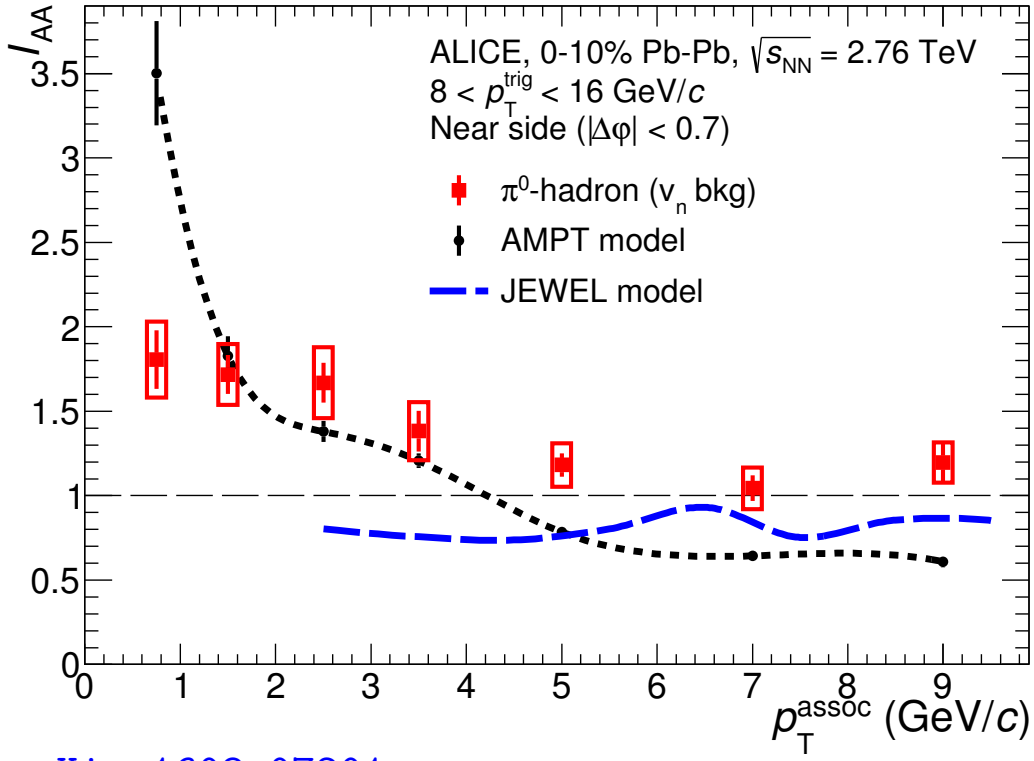
Main features of data described by transport model AMPT, which incorporates jet-medium interactions

arXiv:1609.06643

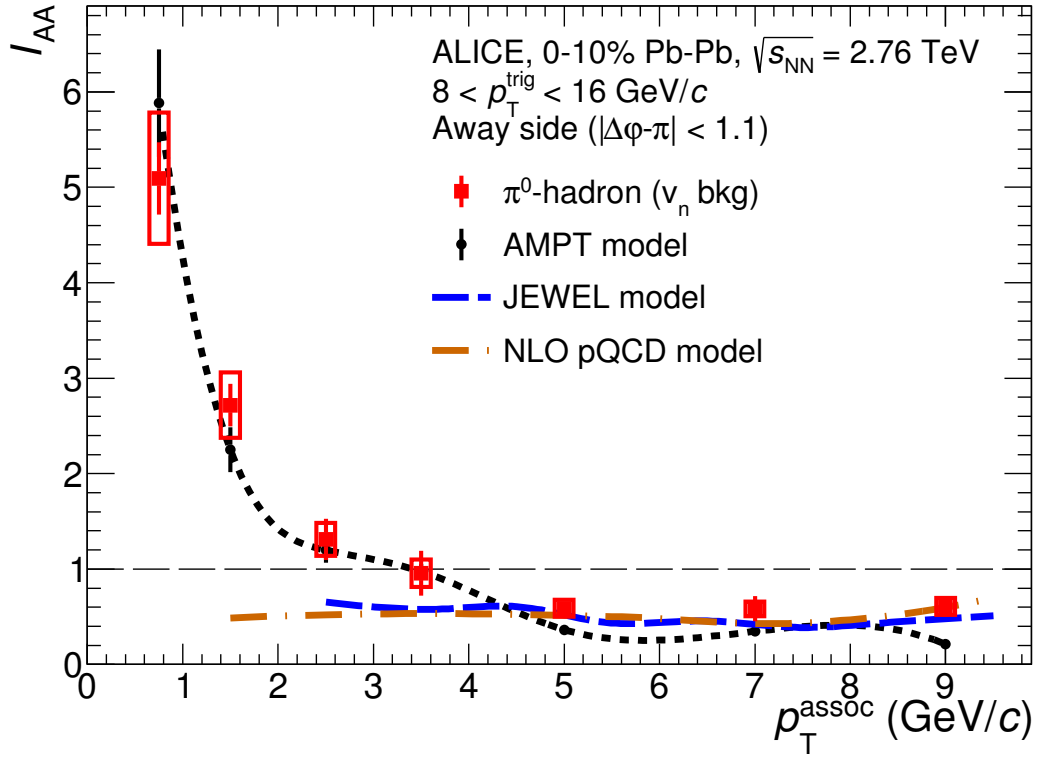
Particle correlations

hadrons "associated" with a π^0 "trigger"; $I_{\mathrm{AA}} = \frac{\text{yield in Pb}-\text{Pb}}{\text{yield in pp}}$

near side ($\Delta\phi \sim 0$)



away side ($\Delta\phi \sim \pi$)



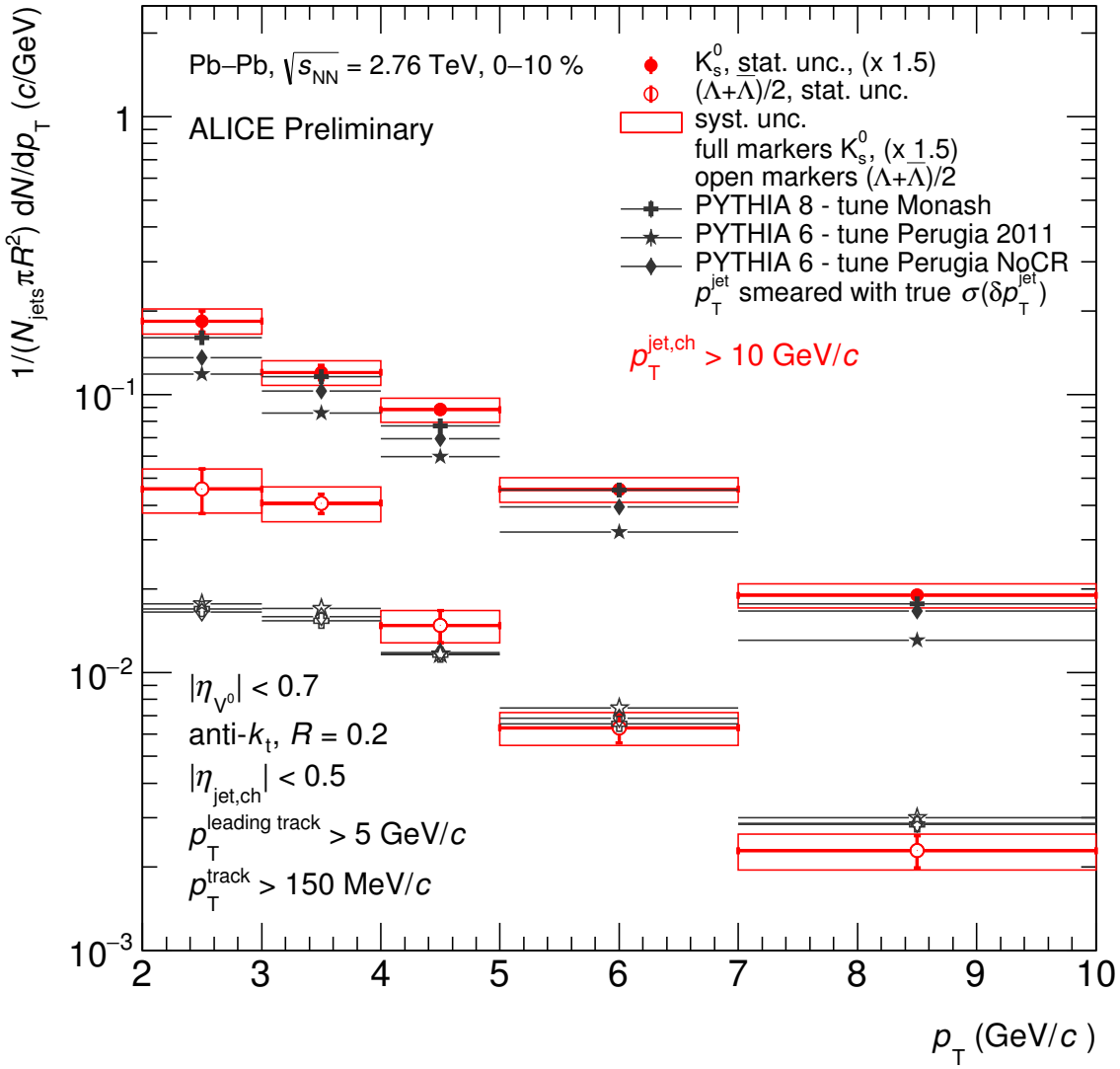
arXiv:1608.07201

High p_{T}: parton energy loss (away side: $I_{\mathrm{AA}} < 1$)

Low p_{T}: jet-medium interaction and in-medium fragmentation

Models describe data, not in all details though (at low p_{T})

Hadron production in jets



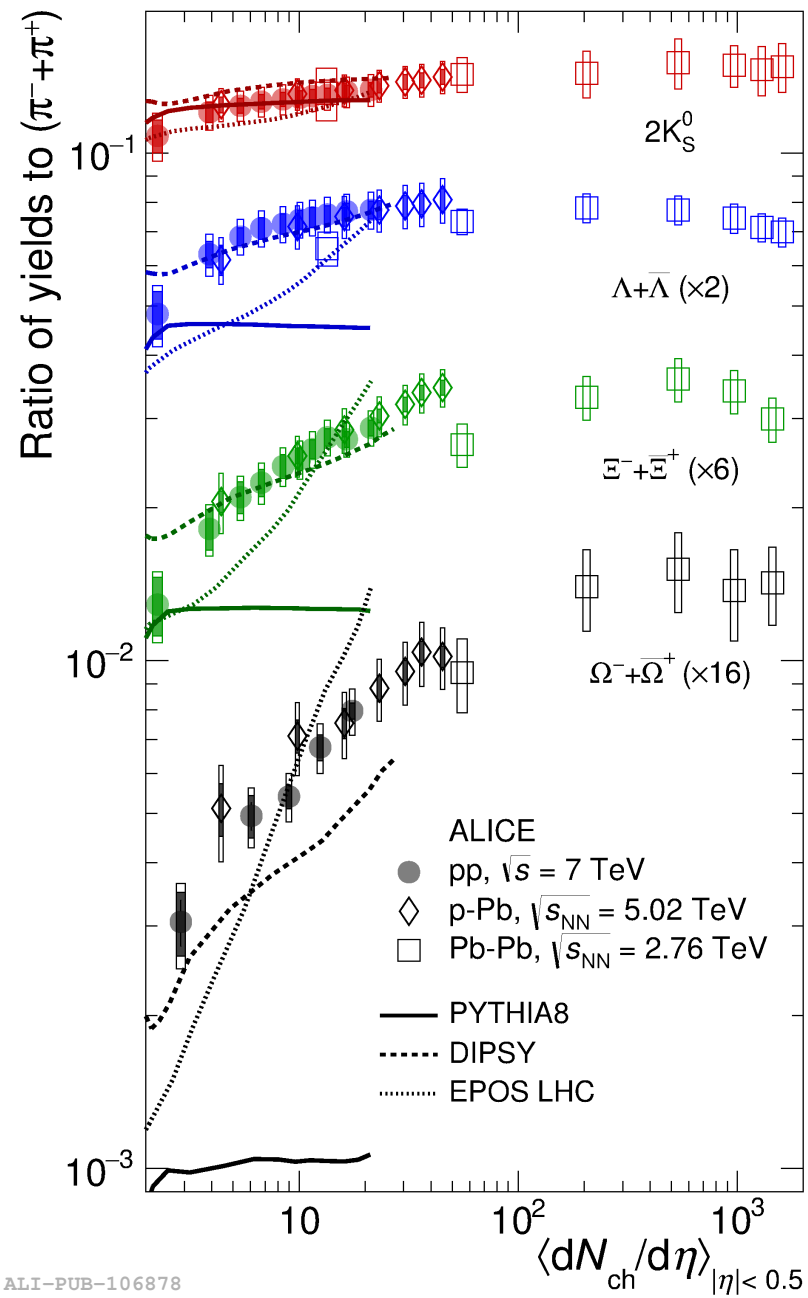
PYTHIA events smeared with background fluctuations

K^0_S: data consistent with PYTHIA within uncert.

Λ: data significantly above PYTHIA at low p_{T}

hadronization different in presence of medium?

Hyperon production



arXiv:1606.07424

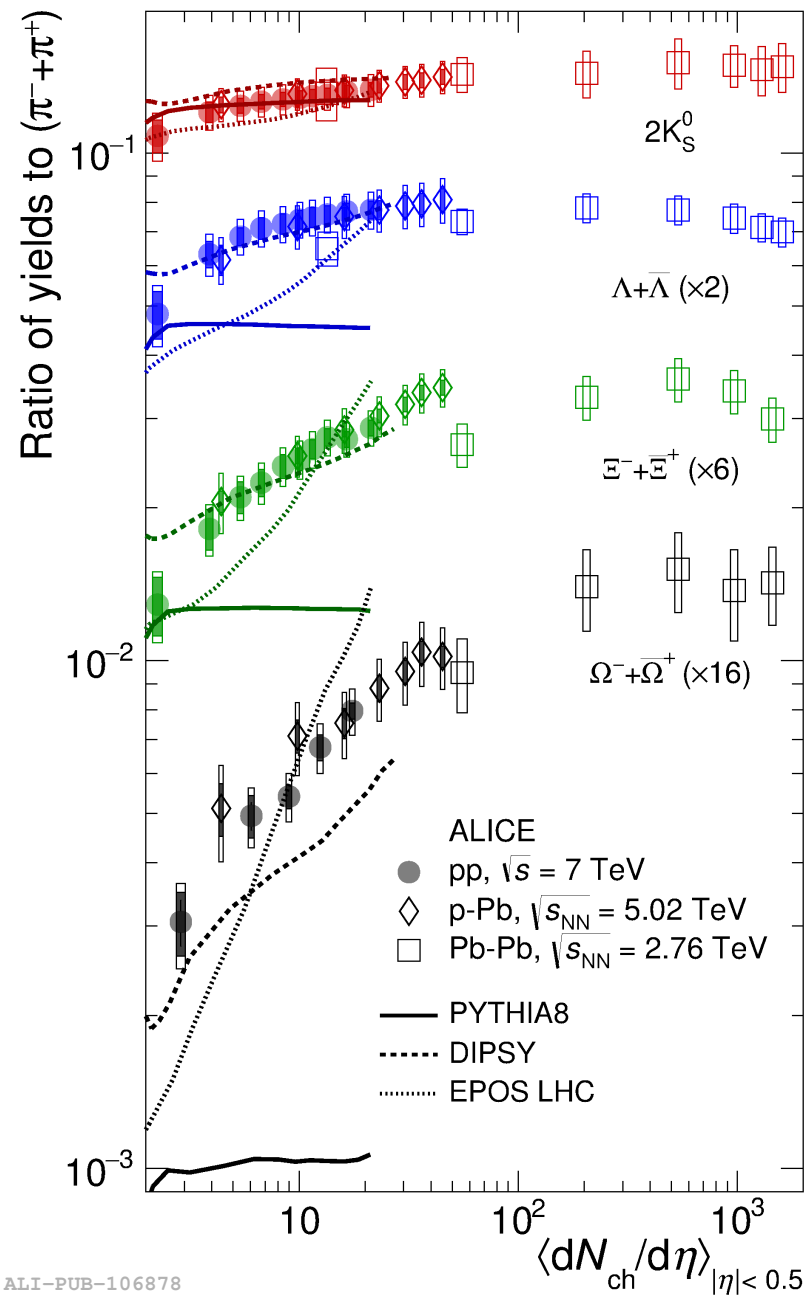
(big geometric) fireball in Pb–Pb reached with violent pp and p–Pb collisions

(grand canonical) statistical description works well in Pb–Pb (with T of QCD phase boundary)

is the same mechanism at work in small systems (at large multiplicities)?

string hadronization models do not describe data well

Hyperon production



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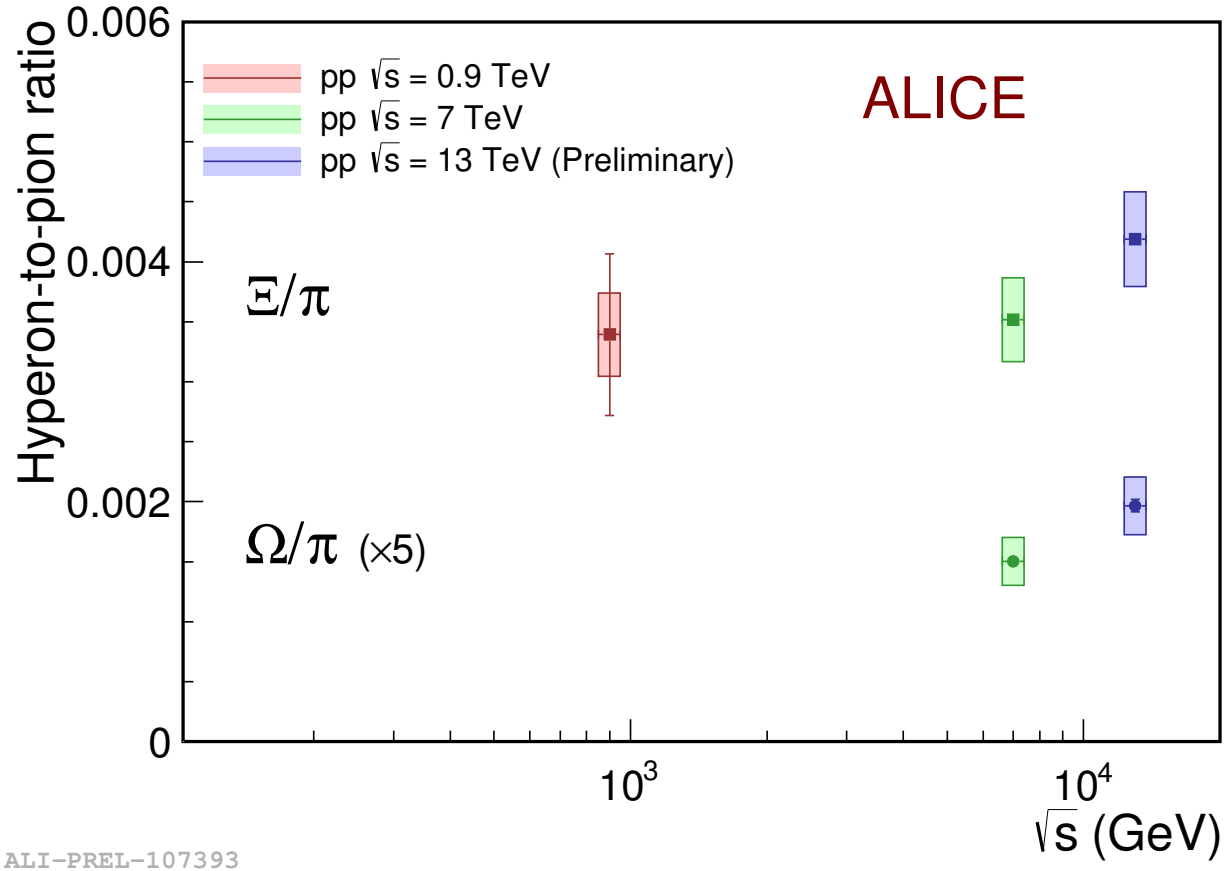
arXiv:1606.07424



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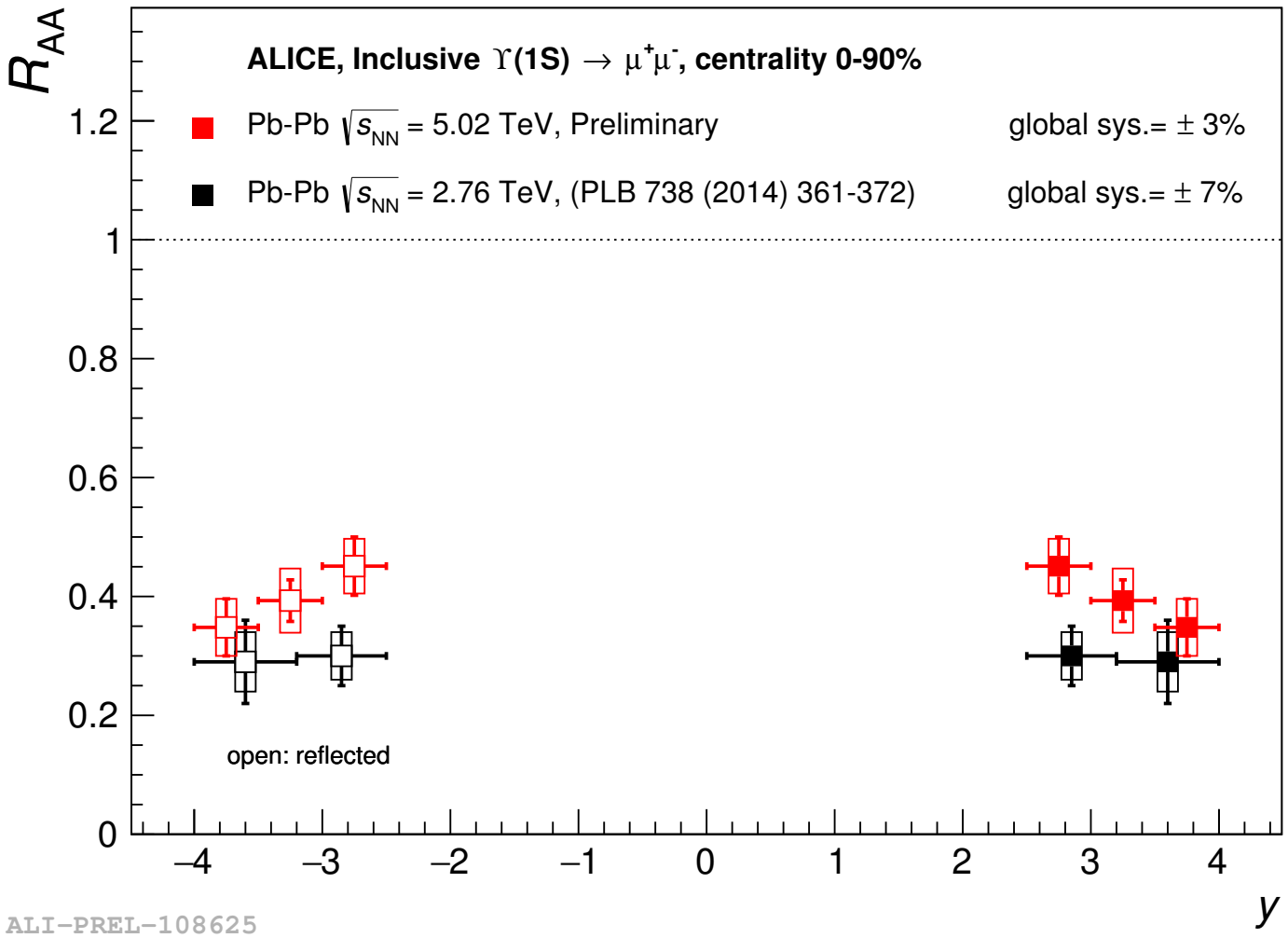
studies are being extended with pp data at $\sqrt{s} = 13$ TeV (as well as in p–Pb collisions)

Υ production

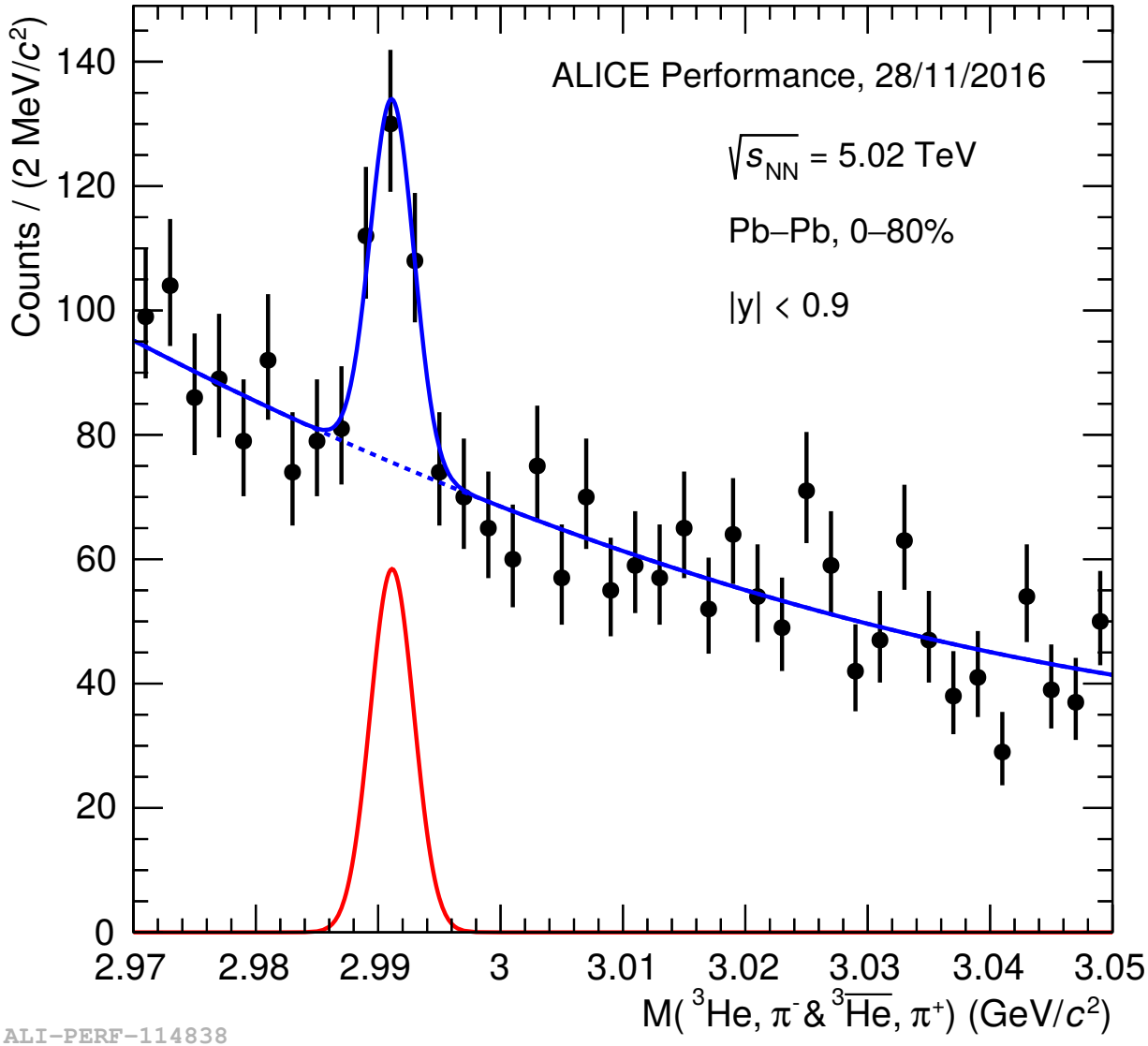


an intriguing result ...even if, considering uncertainties, not a large effect

expectation from the sequential "melting" (Debye screening): $R_{\rm AA}^{5.02} \leq R_{\rm AA}^{2.76}$

do we see (re)generation? (in QGP/at phase boundary?)

Data reconstruction / analysis



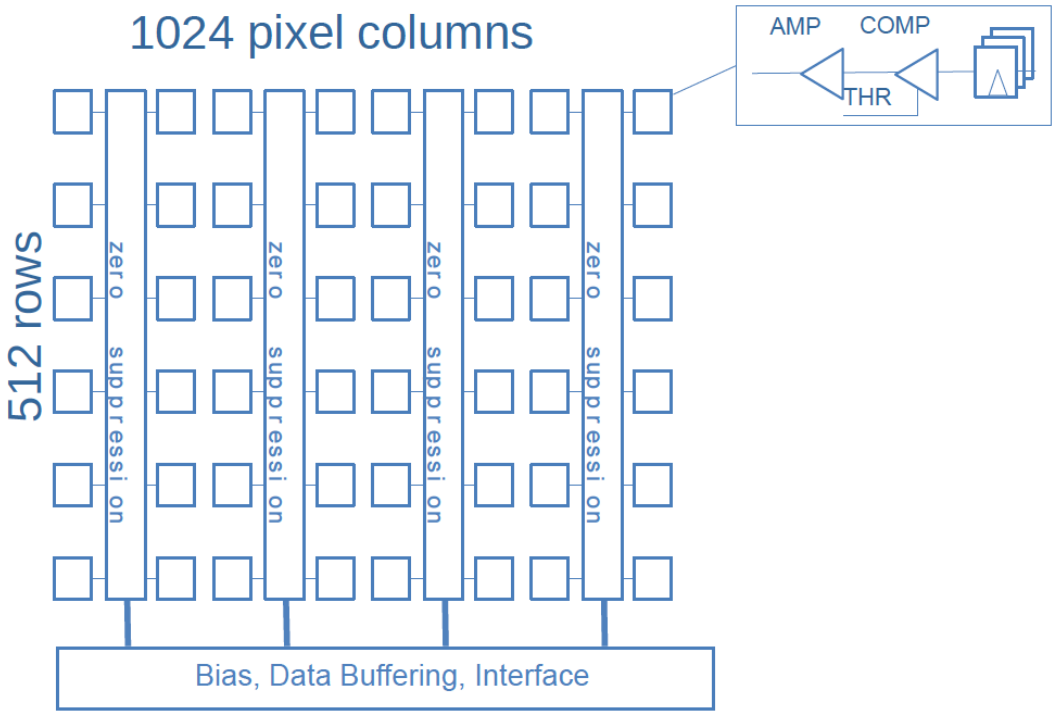
ALI-PERF-114838

Pb–Pb $\sqrt{s_{\mathrm{NN}}} = 5.02$ TeV full data set reconstructed

Hypertriton production

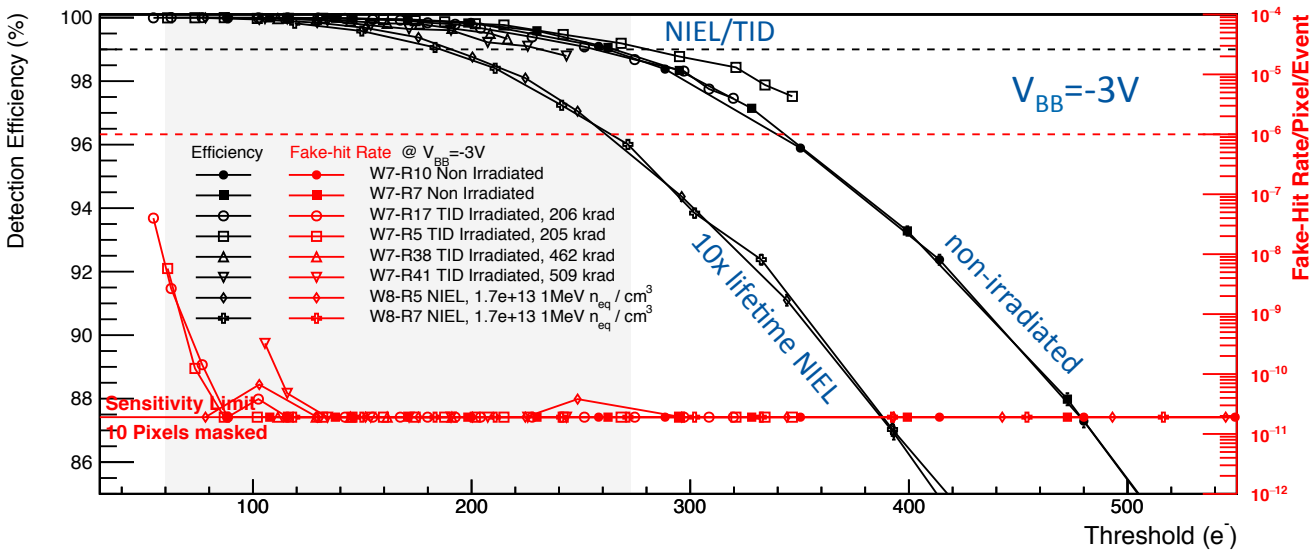
about half of all Pb–Pb statistics

ALICE Upgrade: ITS



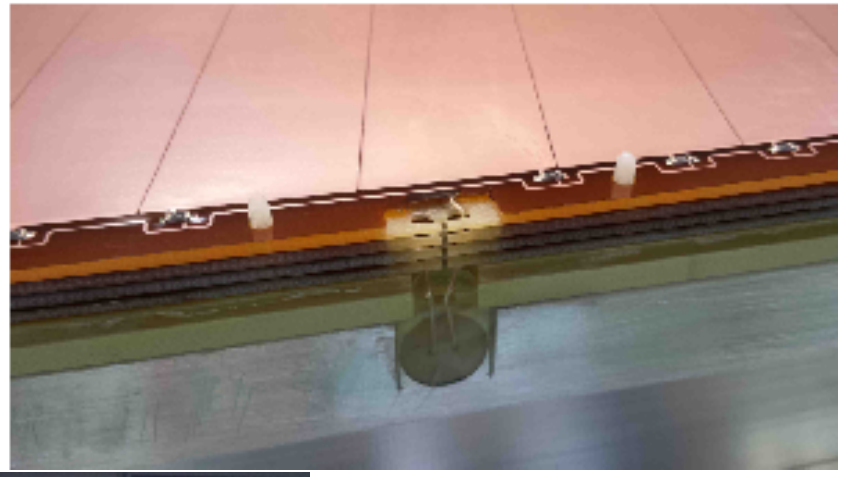
ALPIDE sensor ready for production

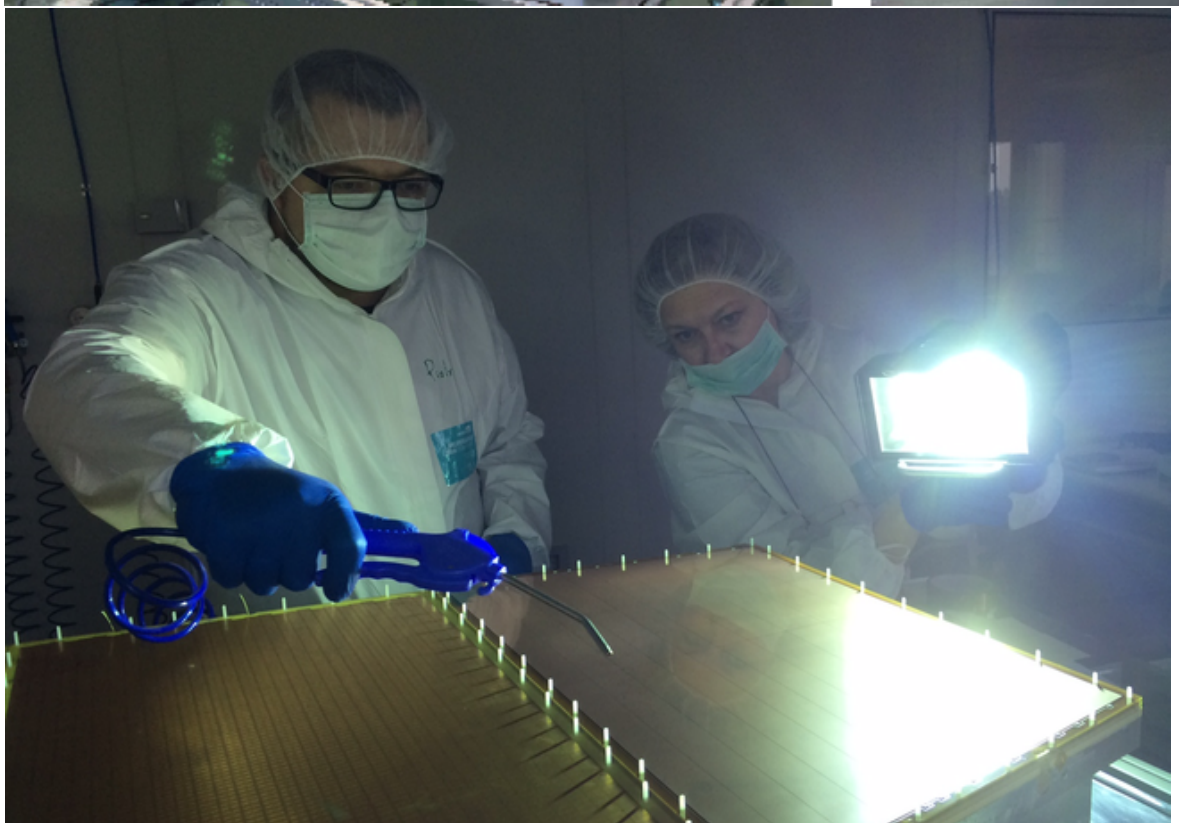
- Size: 3.0×1.5 cm^2
  50/100 μm thickness
  1.3×10^5 pixels/cm^2
- Spatial resolution: 5 μm
- Max particle rate:
  100 MHz/cm^2
- Fake-hit rate:
  $< 10^{-10}$ /pixel/event
- Power : ∼300 nW/pixel
- Continuous or external trigger



ALICE Upgrade: TPC

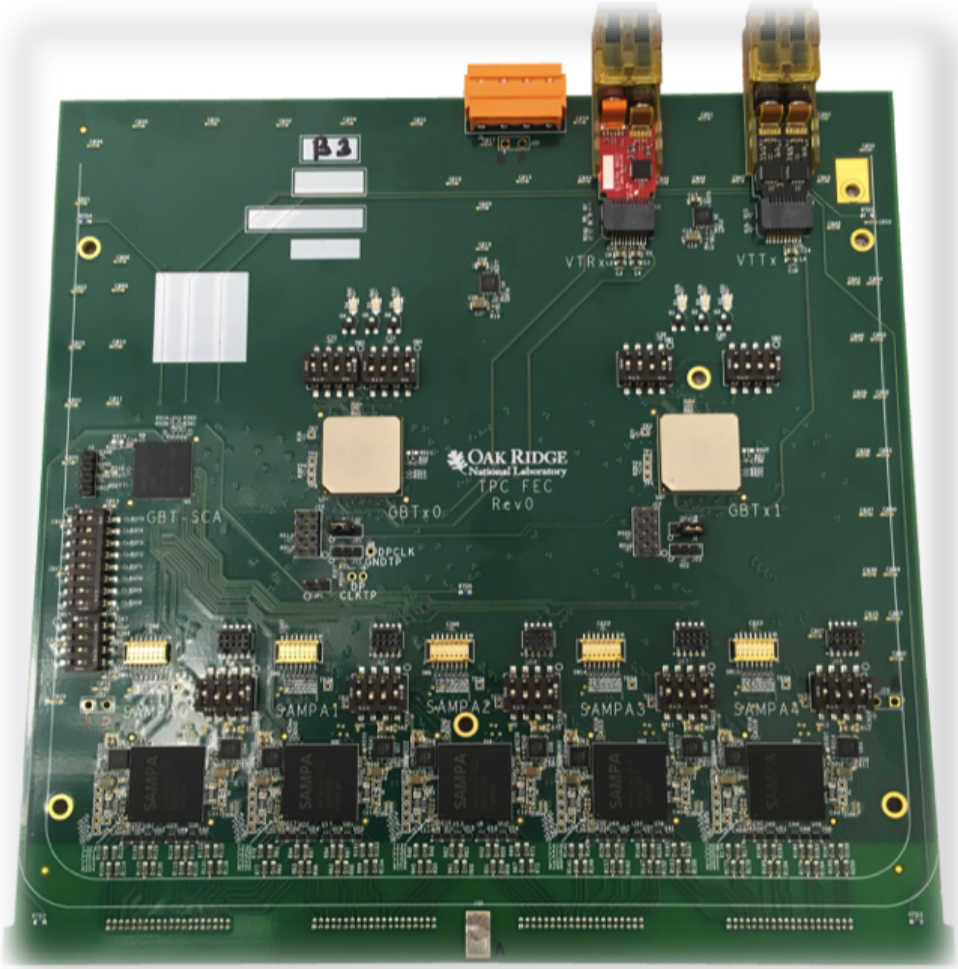
First final-design OROC assembly at NIPNE Bucharest

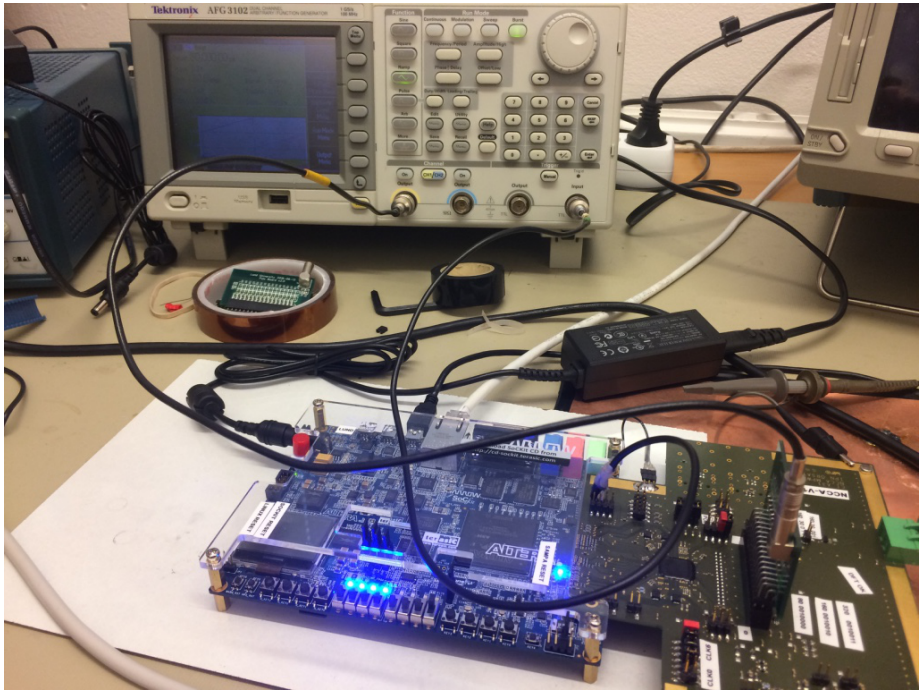




- Pre-production campaign almost completed (2 IROC + 2 OROC)
- Comprehensive test campaign in lab and beam ongoing
- Start of mass production in 2017

ALICE Upgrade: TPC





- SAMPA MPW2 chips available

  ...tests ongoing to confirm TPC specifications by Dec. 2016

- First FEC Rev0 prototype cards available, tests ongoing

Summary

- efficient data taking over whole 2016
- reconstruction in good shape
- interesting physics results (and some puzzling too)
  - detailed investigations of jet-medium (QGP) interaction
  - hyperon production in jets "enhanced" at low p_{T} (medium-modified fragmentation)
  - hint of (re)generation of Υ mesons? (QGP/phase boundary?)

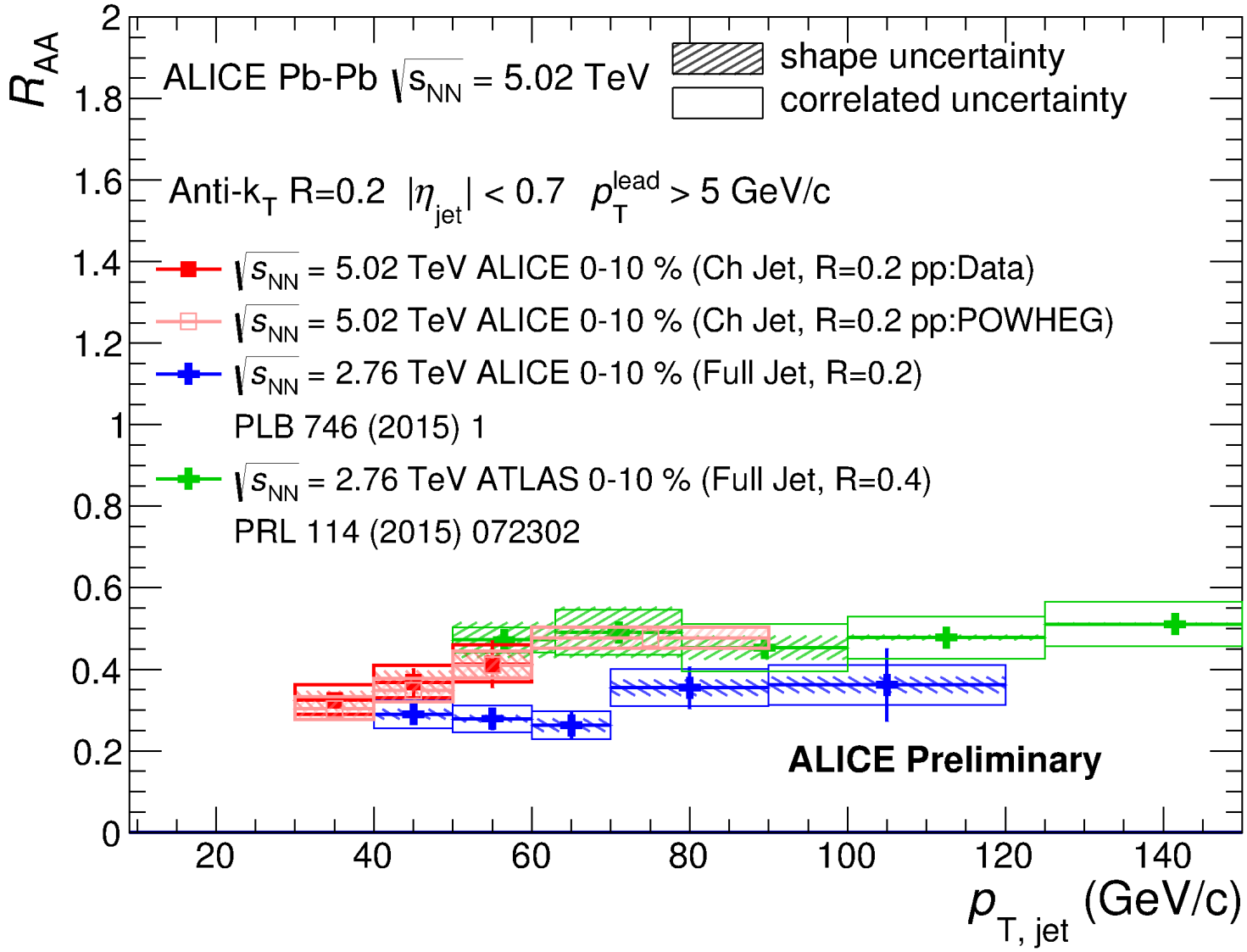
  ...more to come, in particular with Run 2 data, our largest data set
- significant improvements not only in statistics, but also on systematic uncertainties

  ...a significant set of results expected for *Quark Matter 2017* (Feb.) conference
- upgrade projects on track

Backup

Jets in Pb–Pb collsions at 5.02 TeV

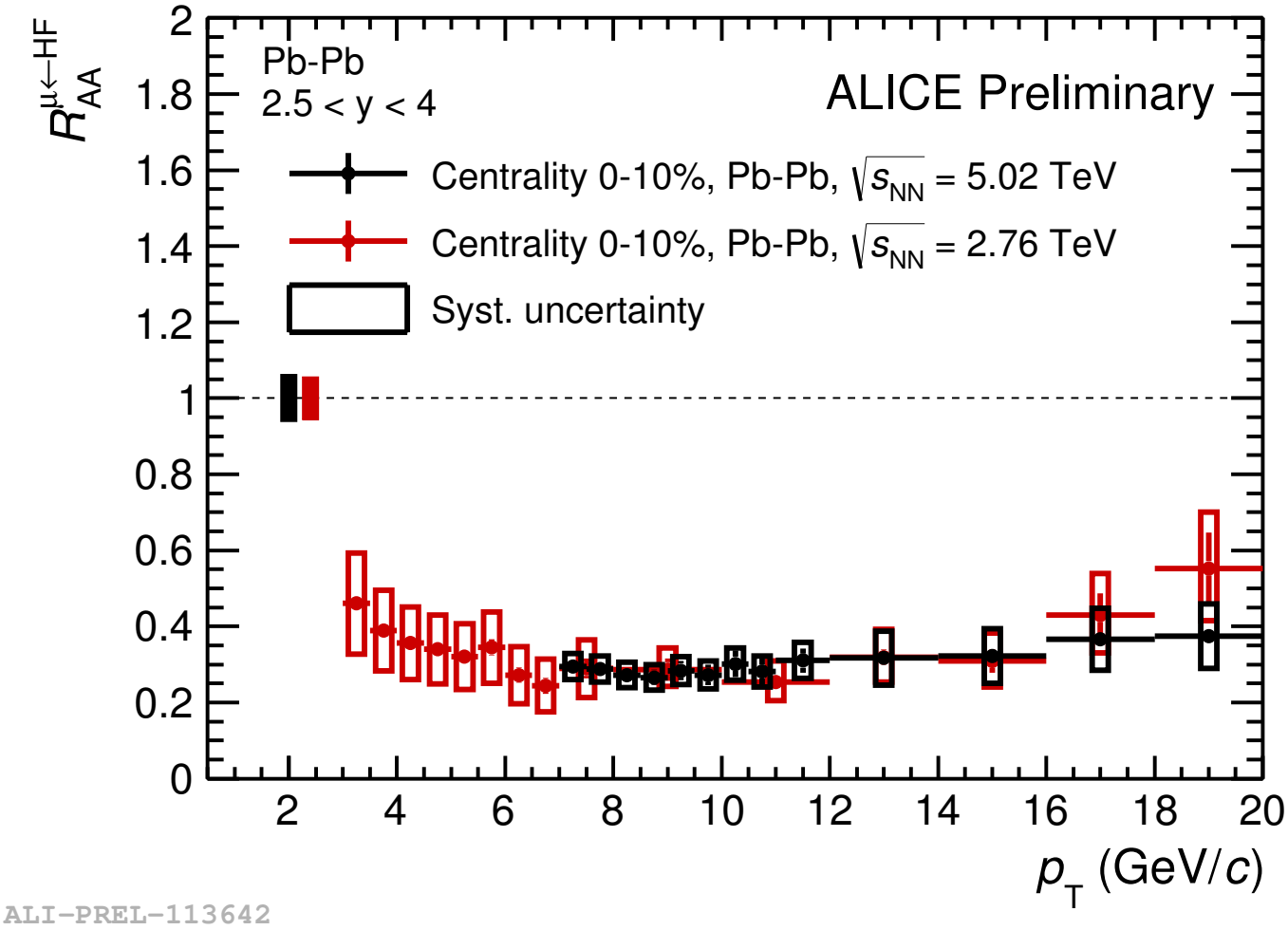
A. Andronic - ALICE collab.



ALI-PREL-114186

Heavy-quark energy loss

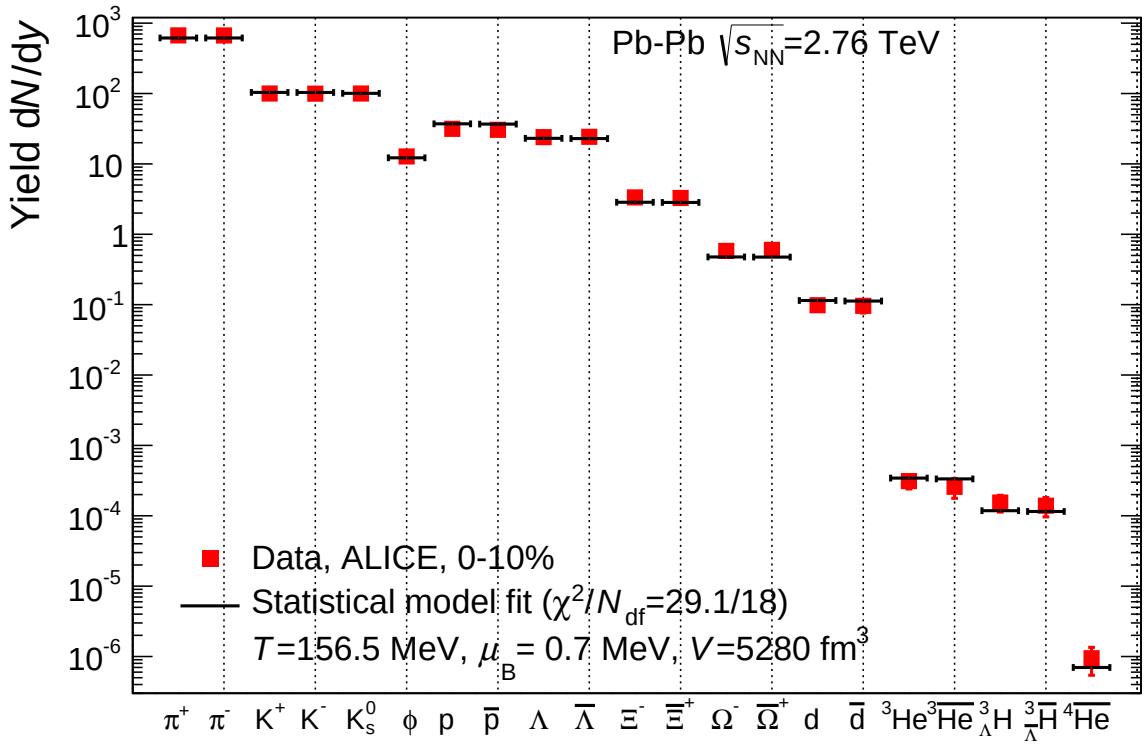
...via the measurement of decay muons (from charm and beauty hadrons)

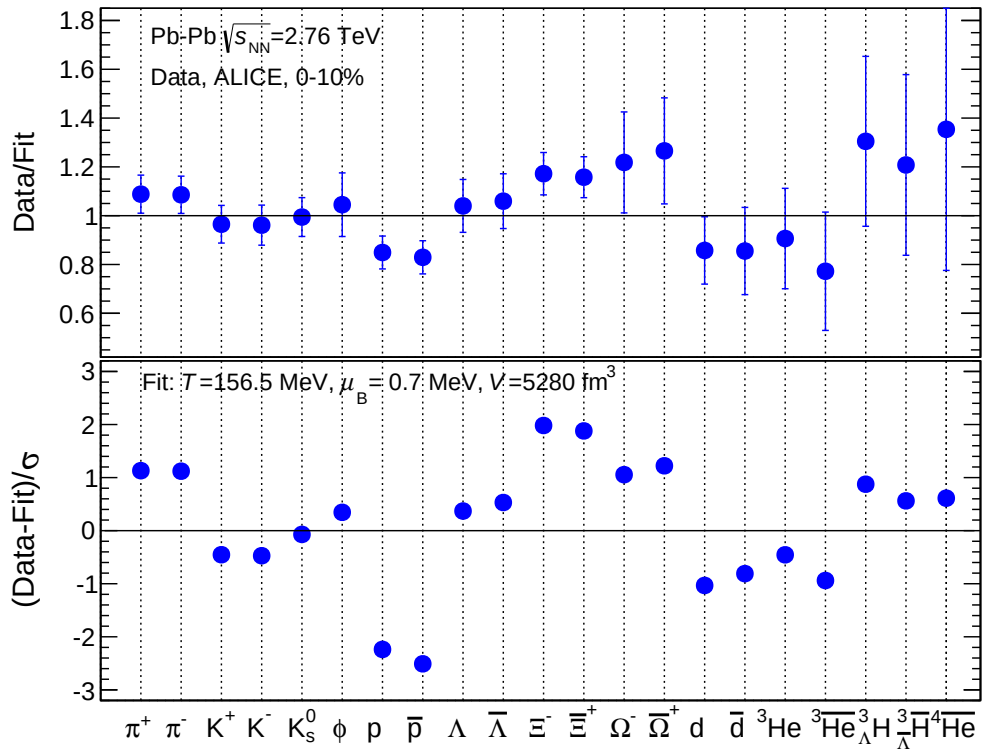


same values at the 2 energies ...not trivial, since parton spectra harder at 5.02 TeV

Hadron yields and the statistical model

A. Andronic - ALICE collab.





all species in fit

π, $K^{\pm}$, K^0 from charm included (0.7%, 2.9%, 3.1% for the best fit)

$T = 156.5 \pm 1.5$ MeV, $\mu_B = 0.7 \pm 3.8$ MeV, $V_{\Delta y=1} = 5280 \pm 410$ fm^3