A first glimpse down the rabbit hole: status of ALICE after one year

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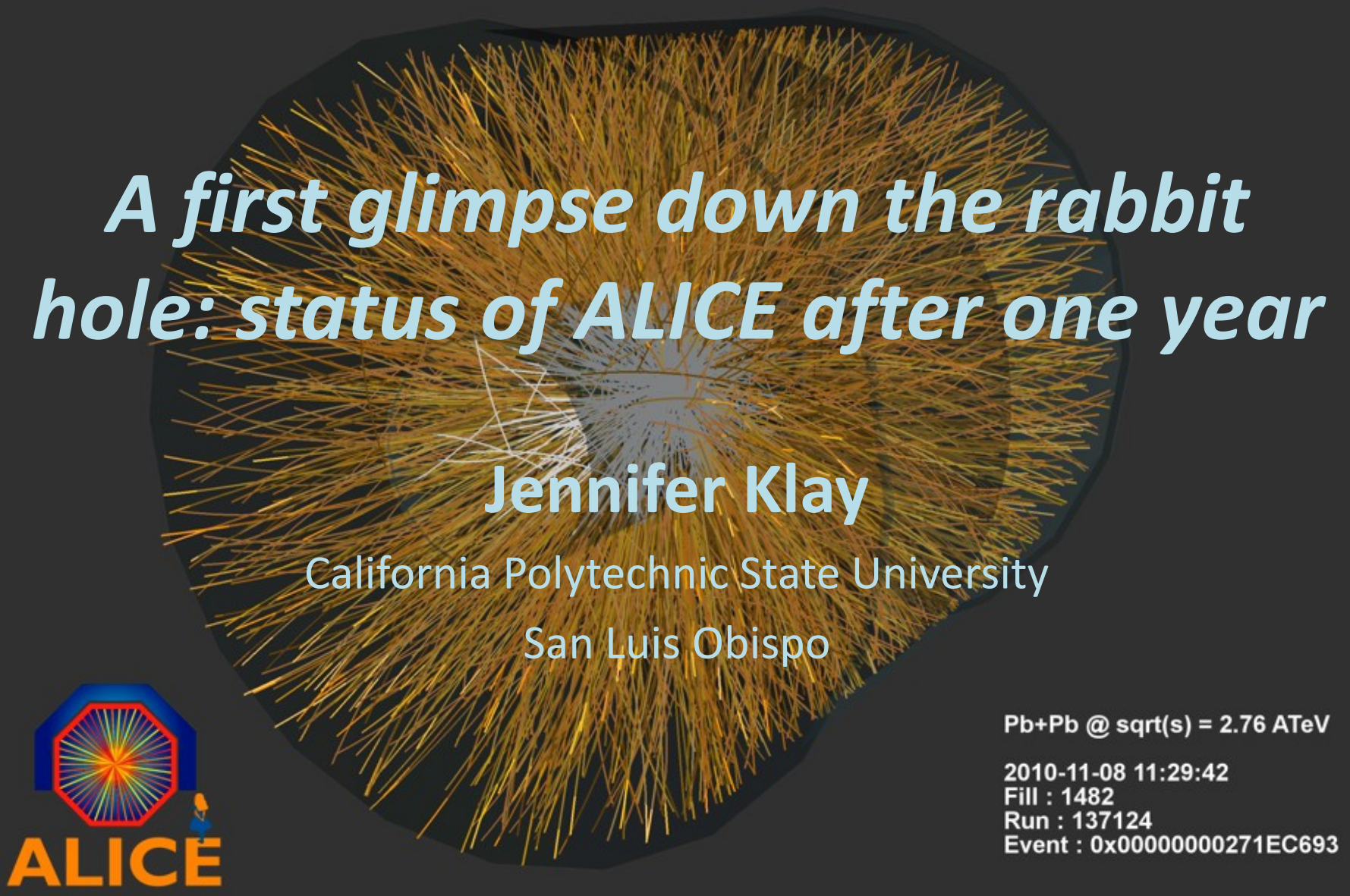
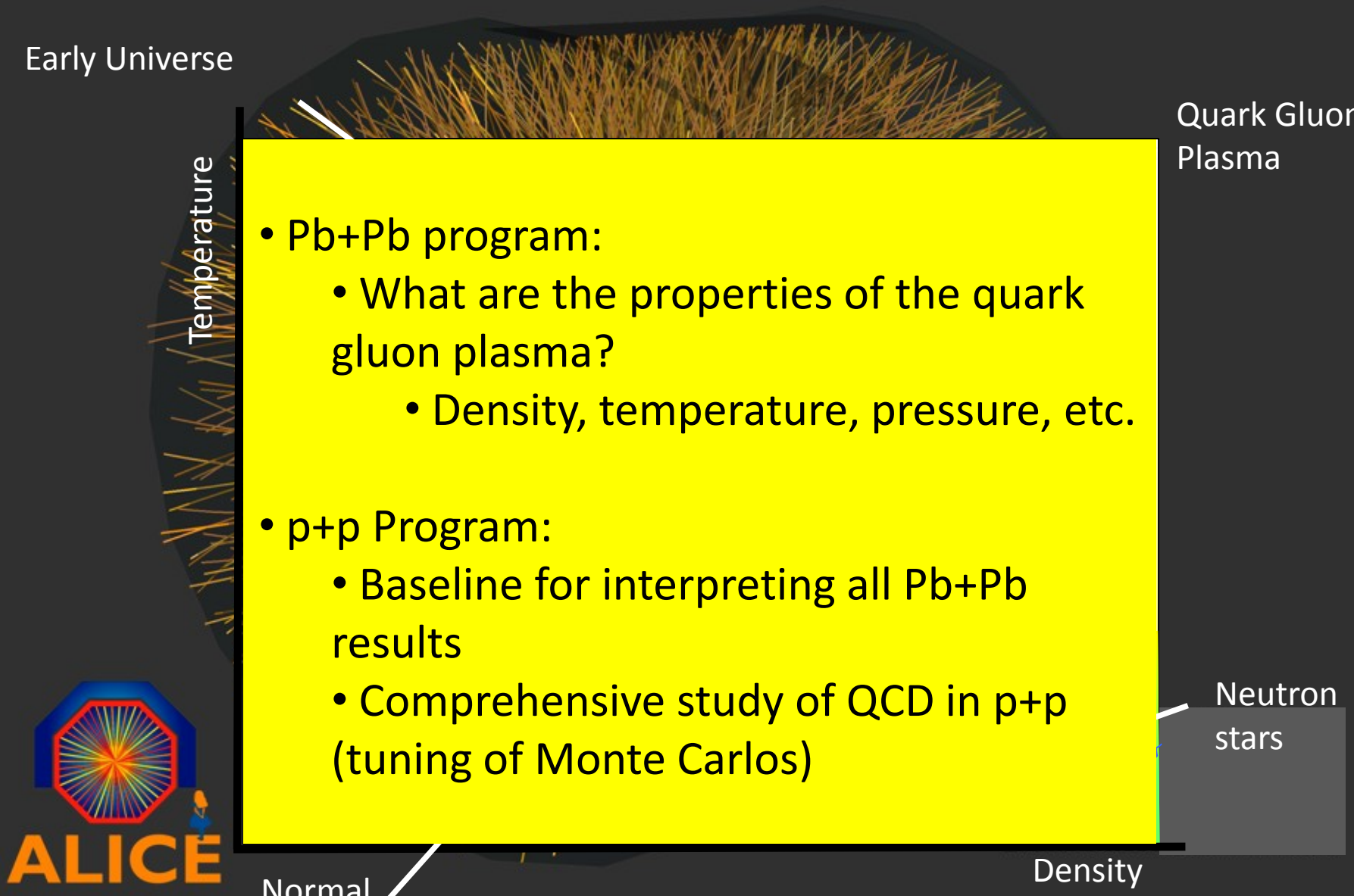


Goal of ALICE: To explore the phase diagram of nuclear matter



- Pb+Pb program:
  - What are the properties of the quark gluon plasma?
    - Density, temperature, pressure, etc.
- p+p Program:
  - Baseline for interpreting all Pb+Pb results
  - Comprehensive study of QCD in p+p (tuning of Monte Carlos)

ALICE

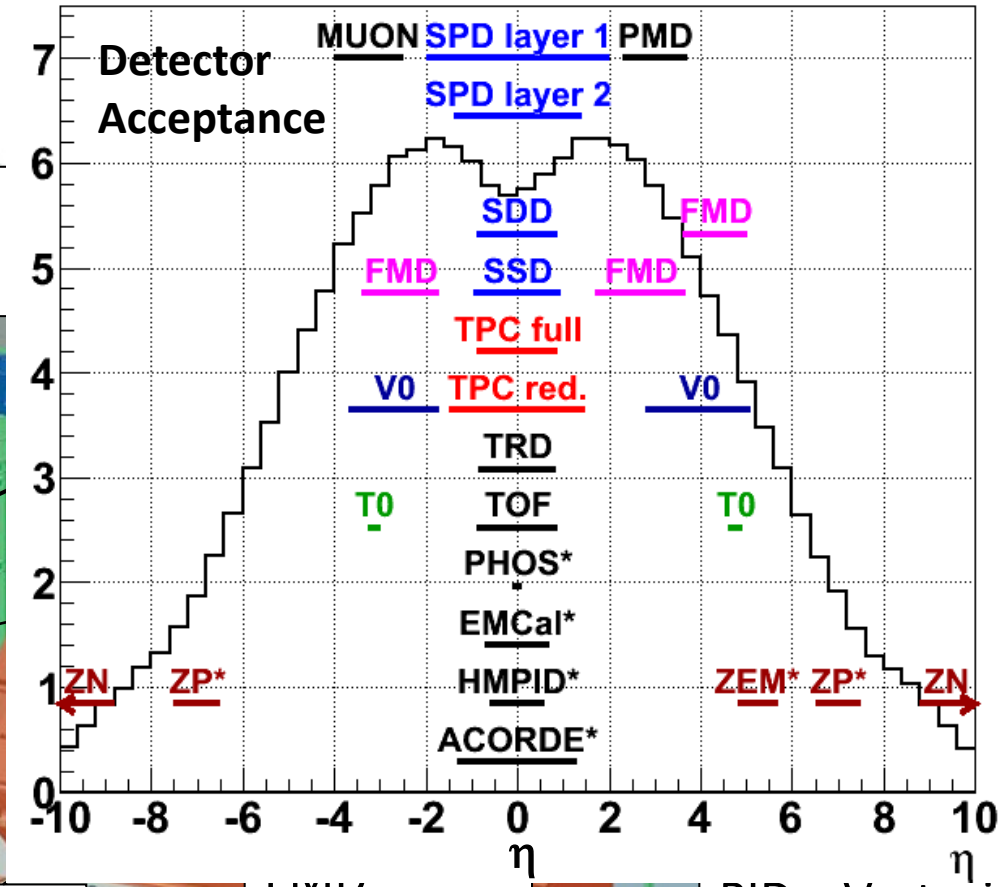
A Large Ion Collider Experiment

EMCAL
γ, π^0, jets

T0/V0

L3 Magnet

ACORDE
Cosmic trigger



TRD
Electron ID (TR)

p_T

PMD
γ multiplicity

TOF
PID

Dipole

TPC
Tracking,
PID (dE/dx)

MUON
μ-pairs

PHOS
γ, π^0, jets

Charged
multiplicity

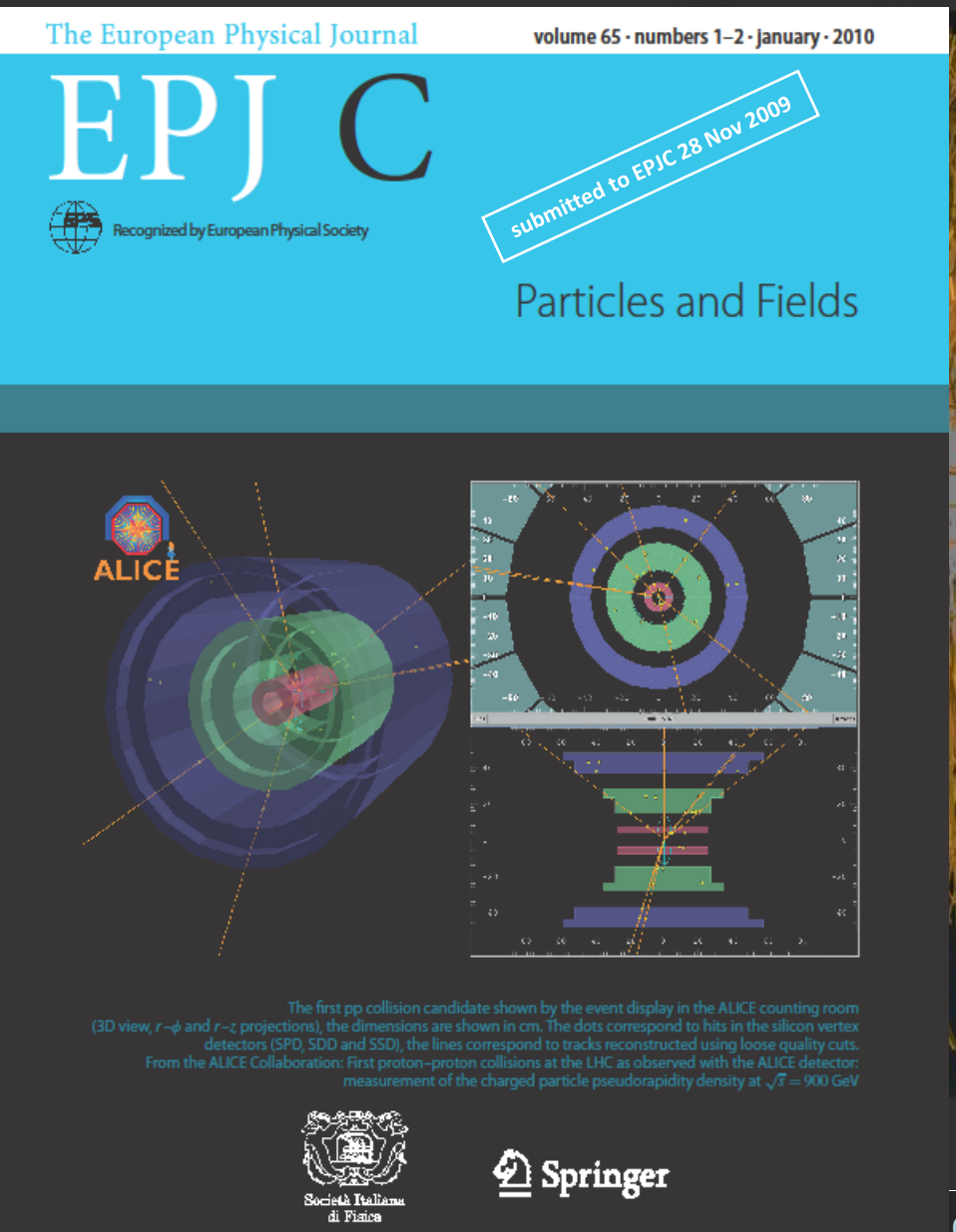
PID + Vertexing

Not shown: ZDC (at ±116m)

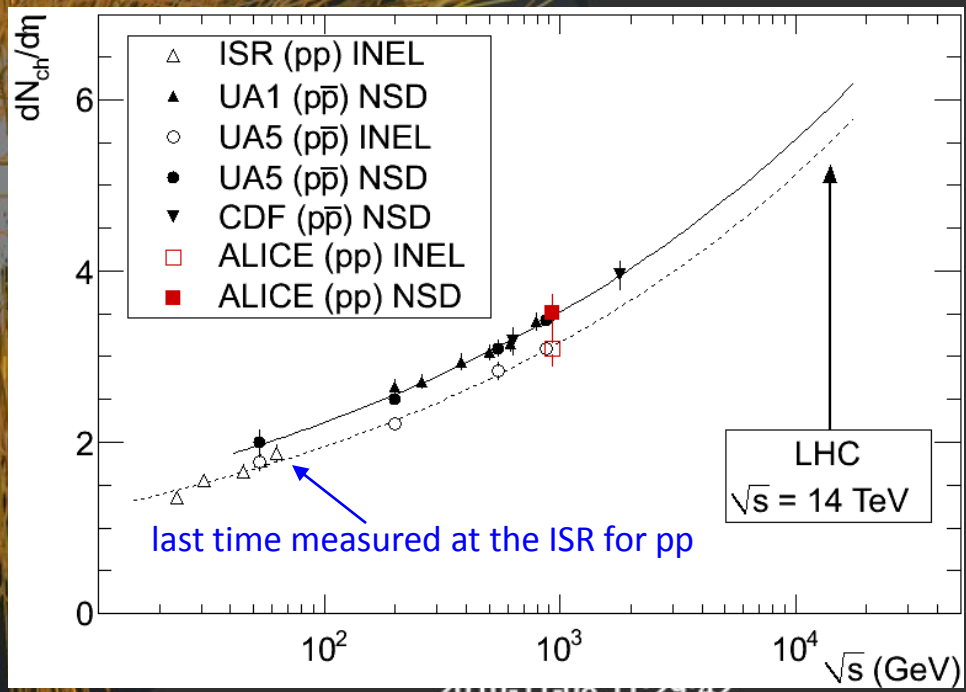
ALICE Collaboration

- More than 1,000 physicists, engineers and technicians
- Including 200 students
- From 111 institutions
- In 31 countries
- Africa, Americas, Asia, Europe

ALICE published the first LHC paper!



$dN/d\eta = 3.10 \pm 0.13$ (stat) $\pm$ 0.22 (sys)



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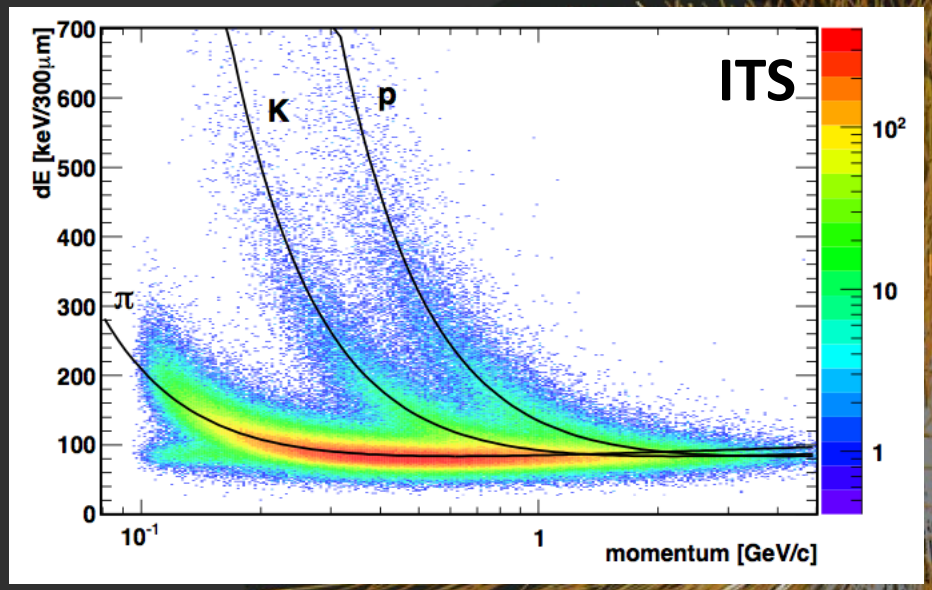
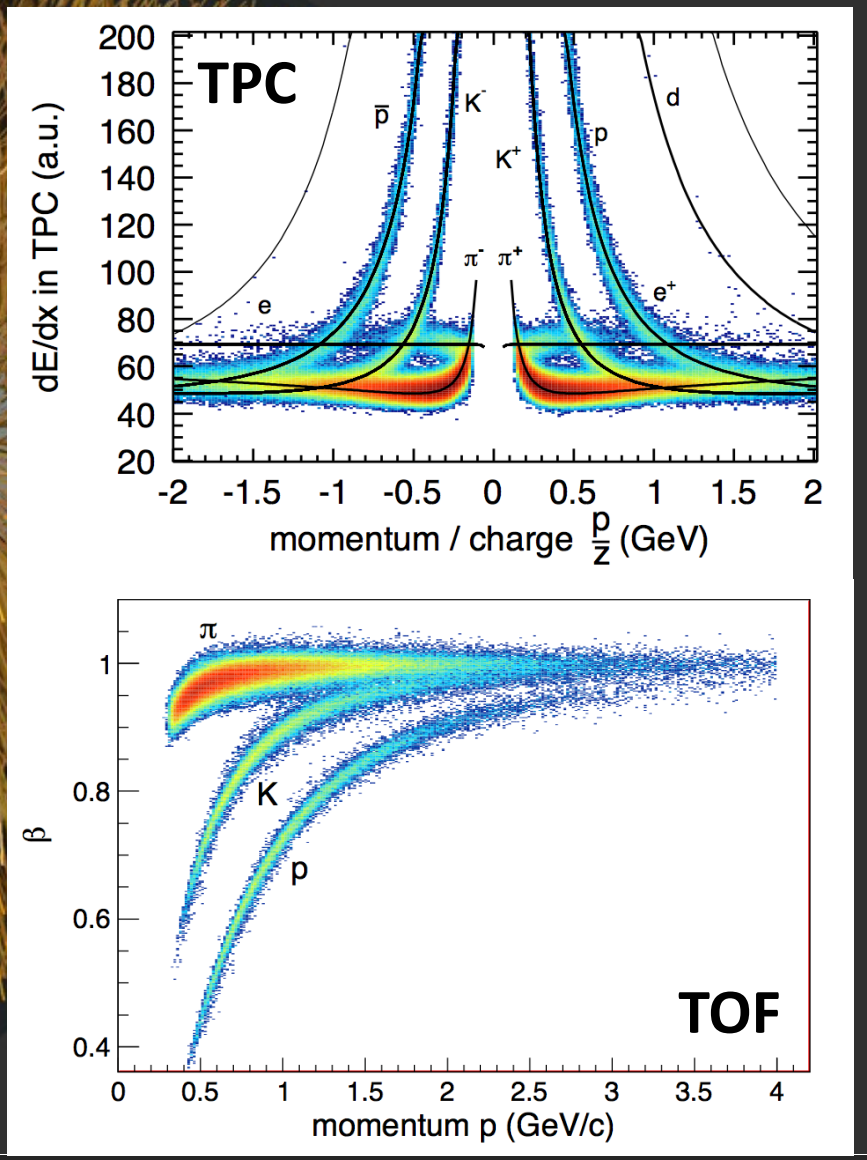
Event : 0x00000000271EC693

Detector Performance: PID

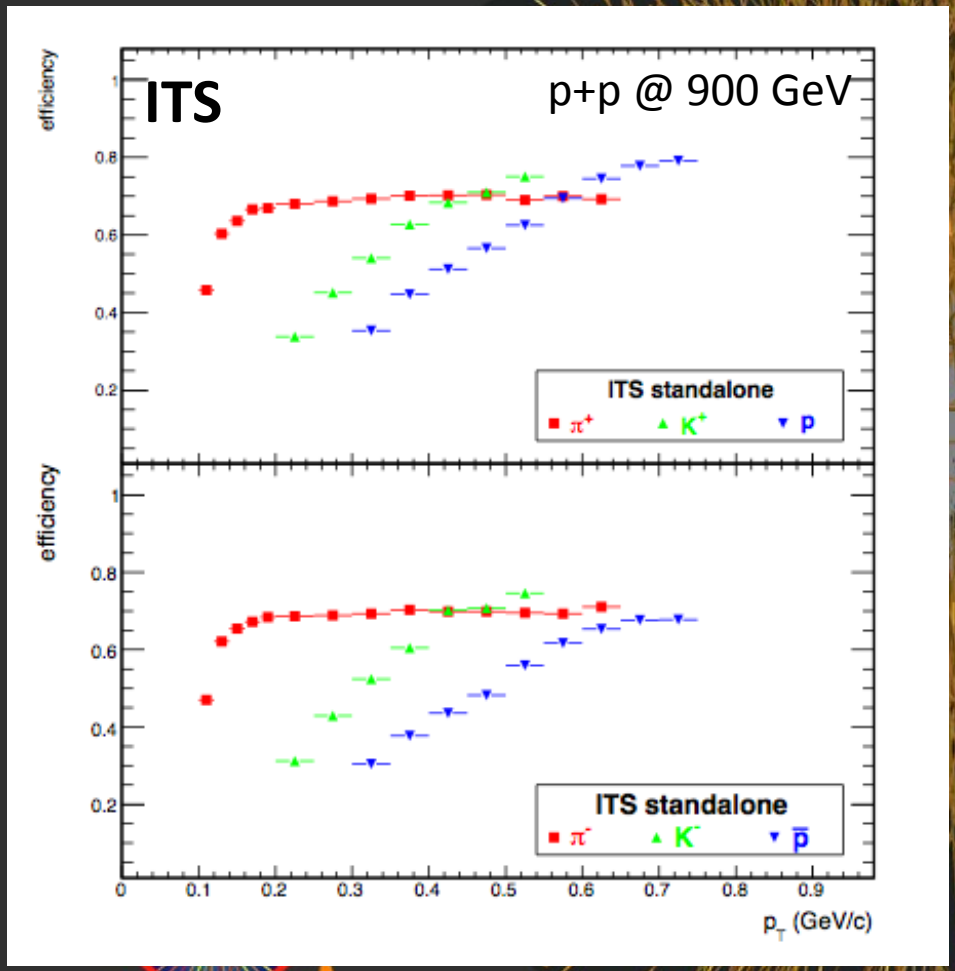


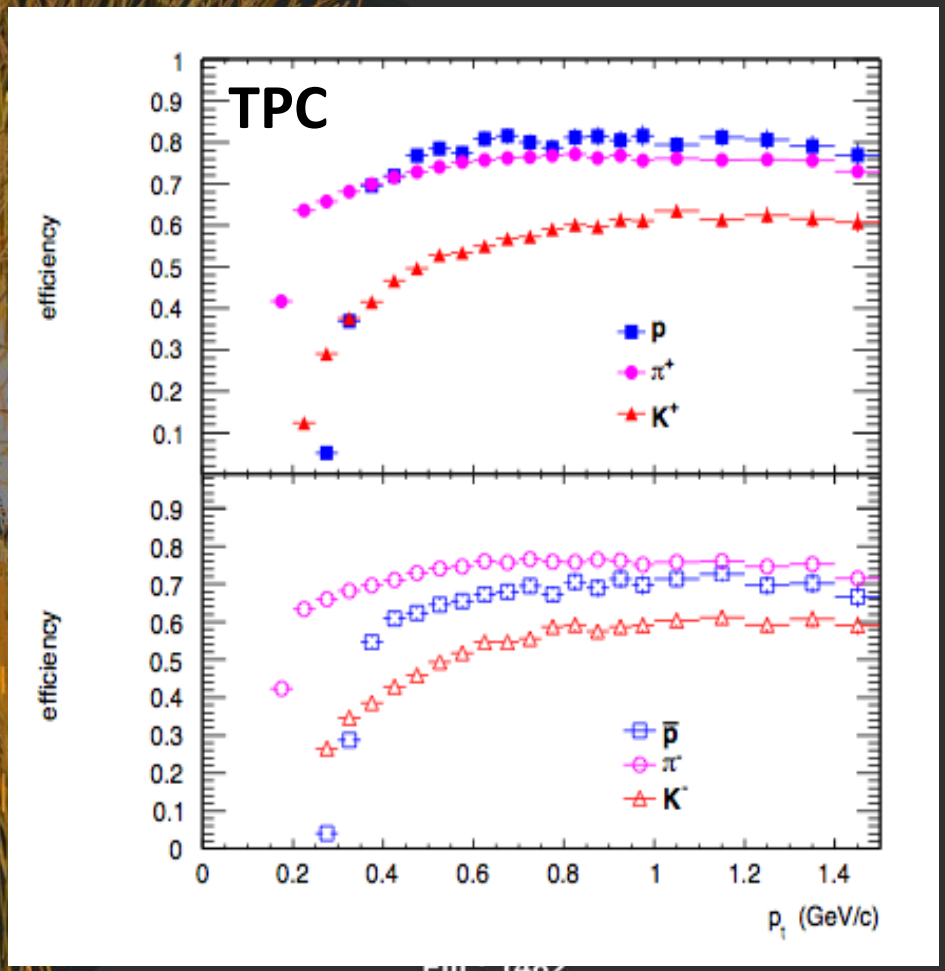


PID an ALICE specialty
→critical for Pb+Pb program

Physics Letters B 693 (2010) 53–68

Detector Performance: Efficiency





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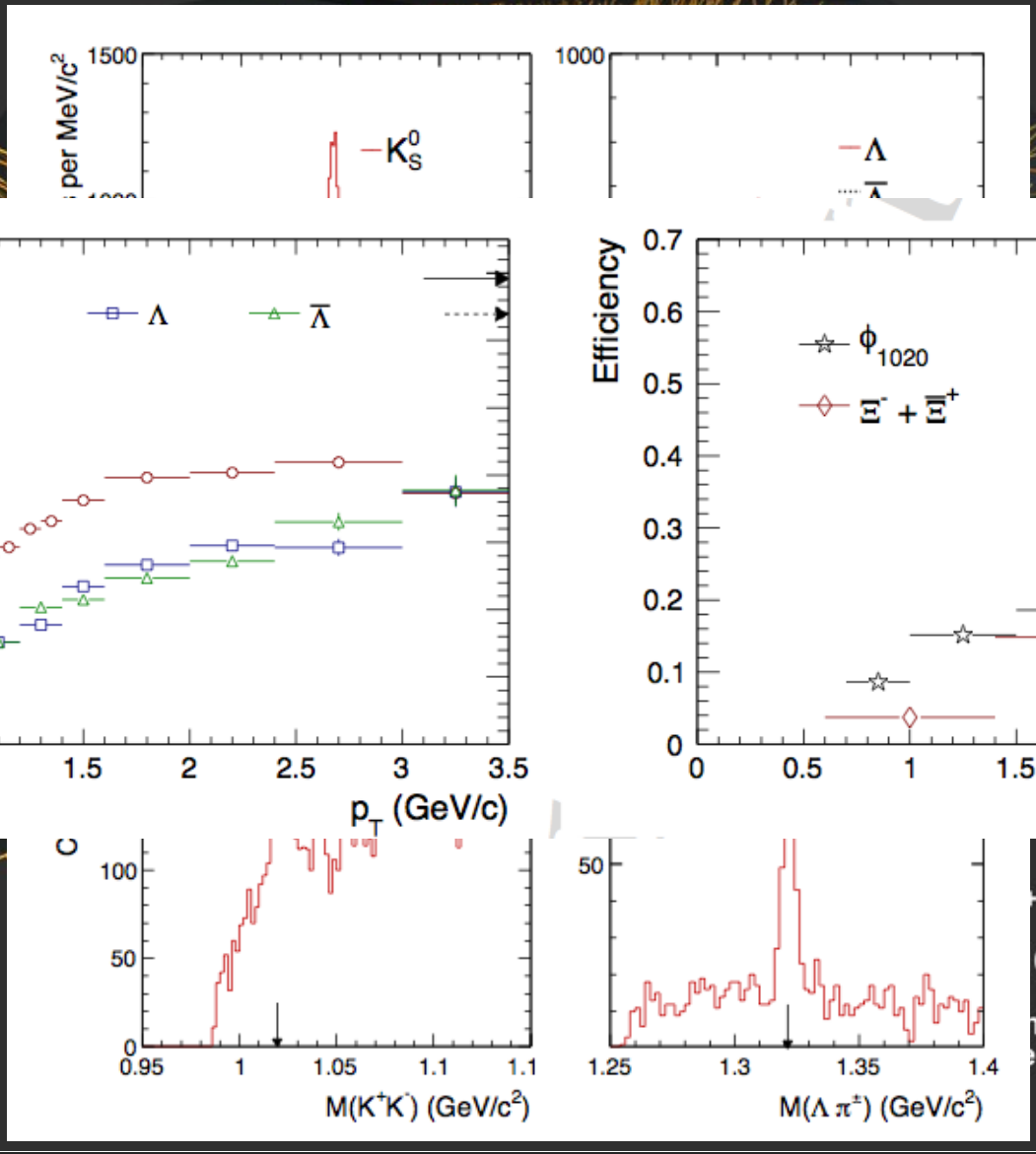
Detector Performance: Resonances

p+p @ 900 GeV
(submitted)



ALICE

Pb @ sqrt(s) = 2.76 ATeV

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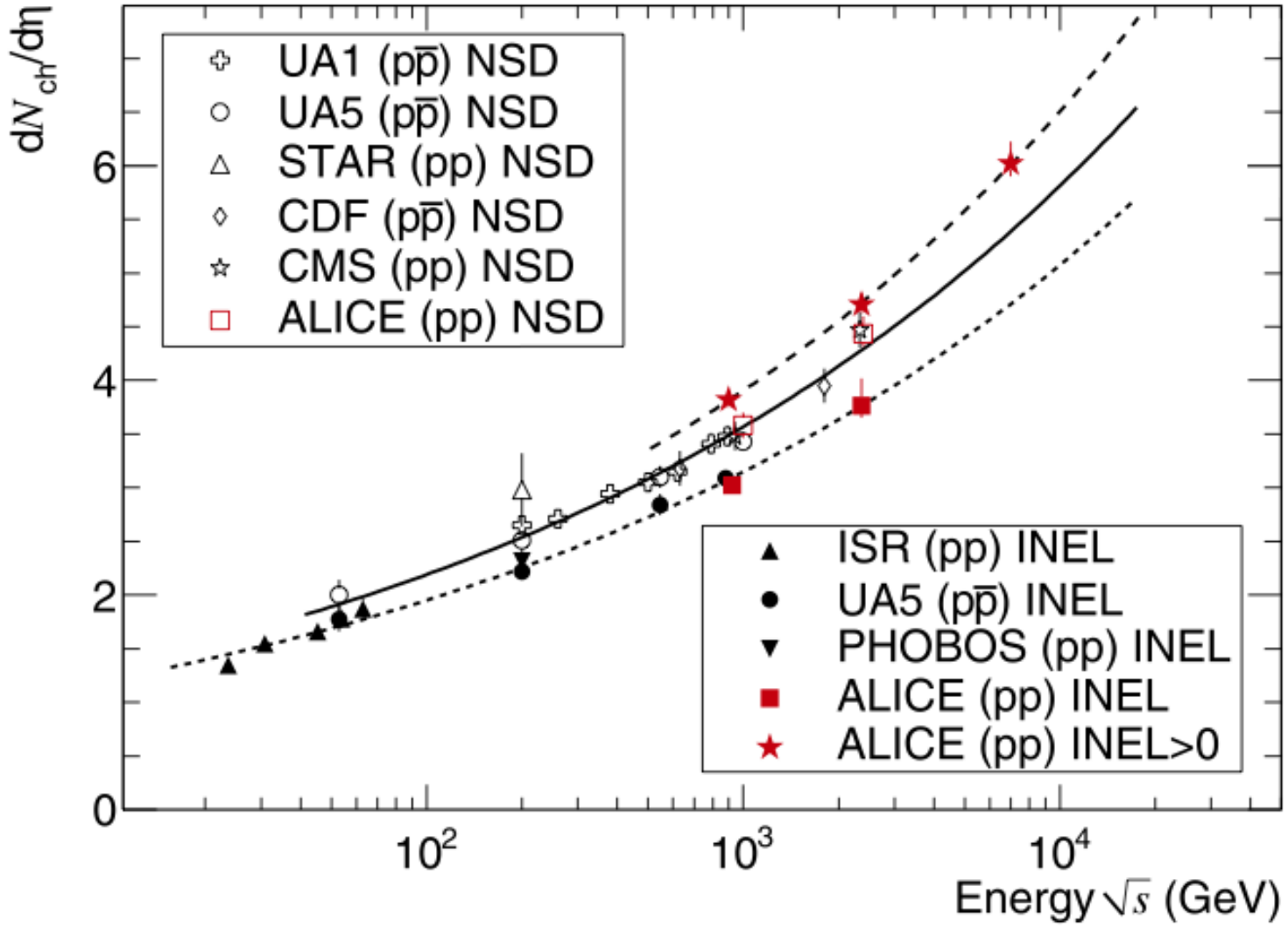
Physics papers submitted/published: 2010

- Strange particle production at central rapidity in proton-proton collisions at √s = 0.9 TeV with ALICE at LHC (Submitted)
- Transverse momentum spectra of charged particles in proton–proton collisions at √s=900 GeV with ALICE at the LHC (Physics Letters B 693 (2010) 53–68)
- Two-pion Bose-Einstein correlations in pp collisions at √s=900 GeV (Phys. Rev. D 82, 052001 (2010))
- Midrapidity Antiproton-to-Proton Ratio in pp Collisons at √s=0.9 and 7 TeV Measured by the ALICE Experiment (Phys Rev Lett Vol.105, No.7, (2010))
- Charged-particle multiplicity measurement in proton–proton collisions at √s=7 TeV with ALICE at LHC (Eur. Phys. J. C (2010) 68: 345–354)
- Charged-particle multiplicity measurement in proton–proton collisions at √s=0.9 and 2.36 TeV with ALICE at LHC (Eur. Phys. J. C (2010) 68: 89–108)
- First proton–proton collisions at the LHC as observed with the ALICE detector: measurement of the charged-particle pseudorapidity density at √s=900 GeV (Eur. Phys. J. C (2010) 65: 111-125)

p+p results: Multiplicity vs sqrt(s)

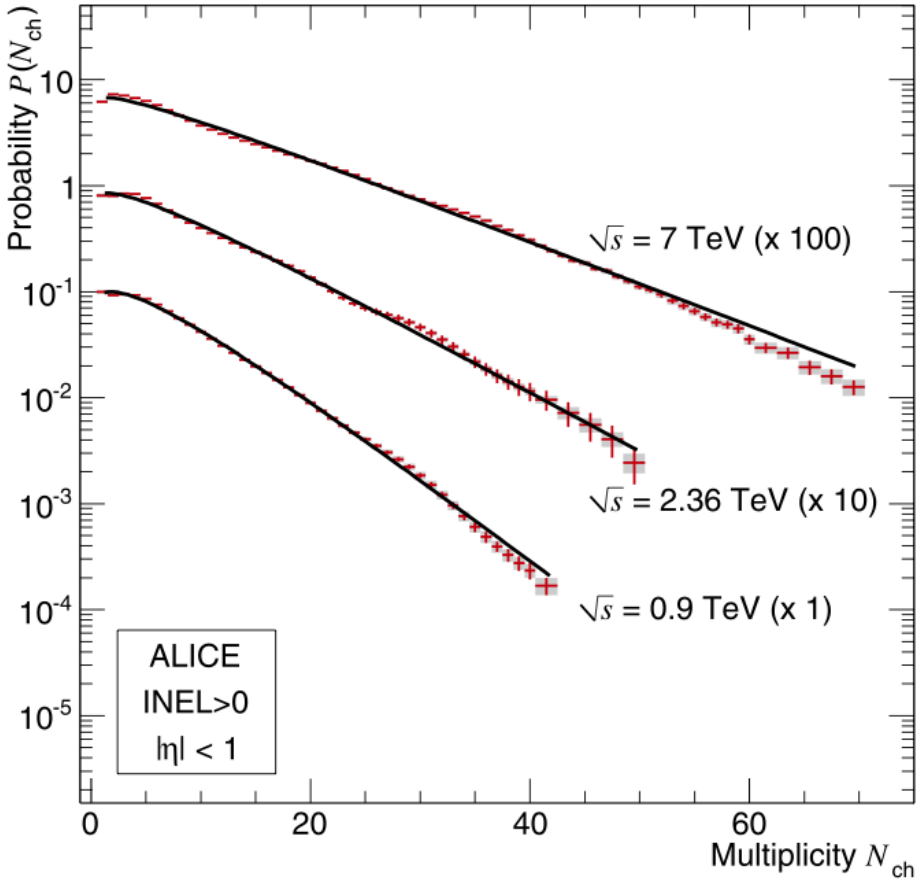
Eur. Phys. J. C (2010) 68: 345–354

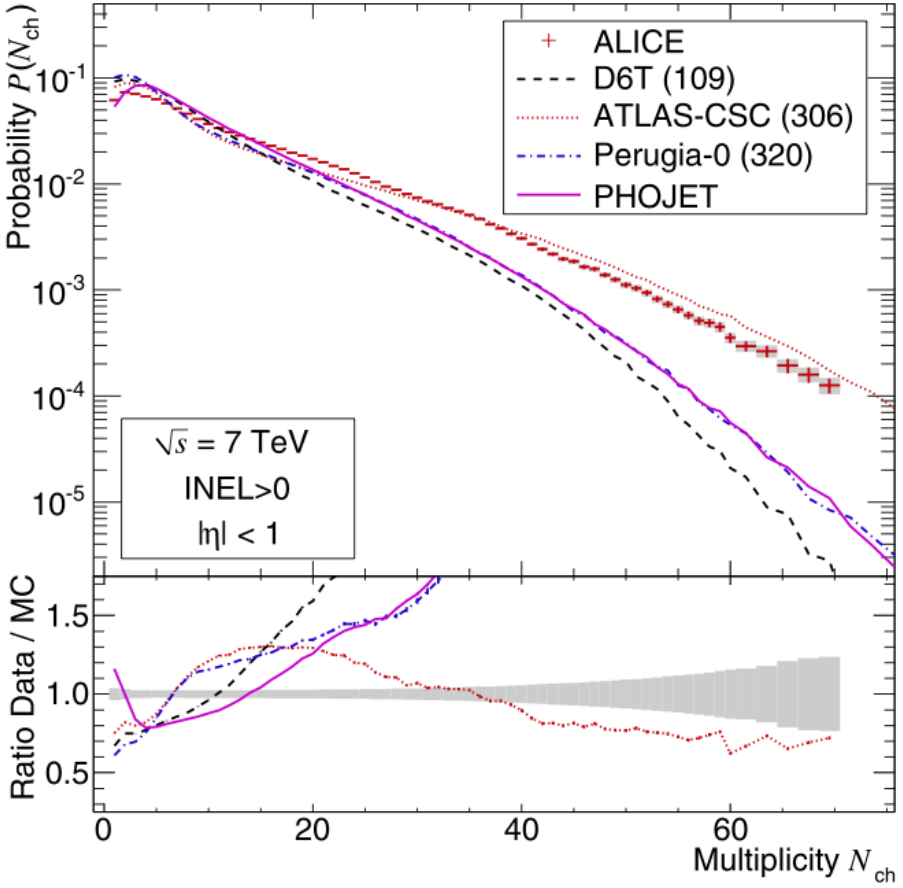


ATeV

EC693

p+p results: Charged particle multiplicity





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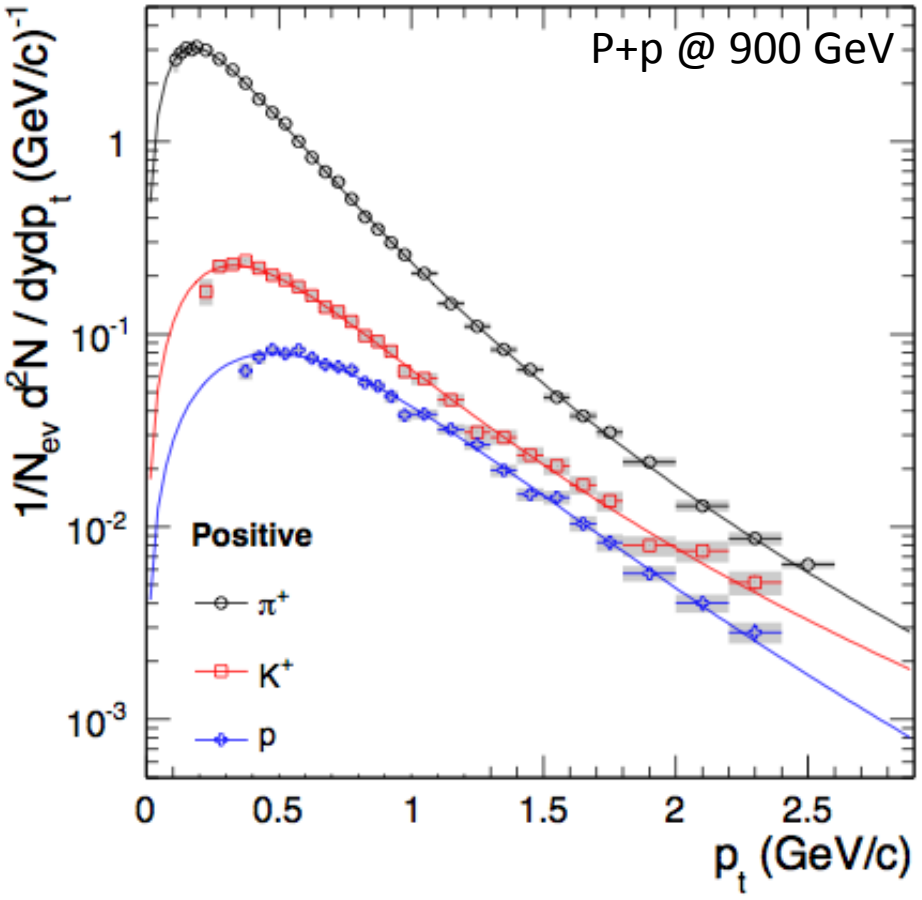
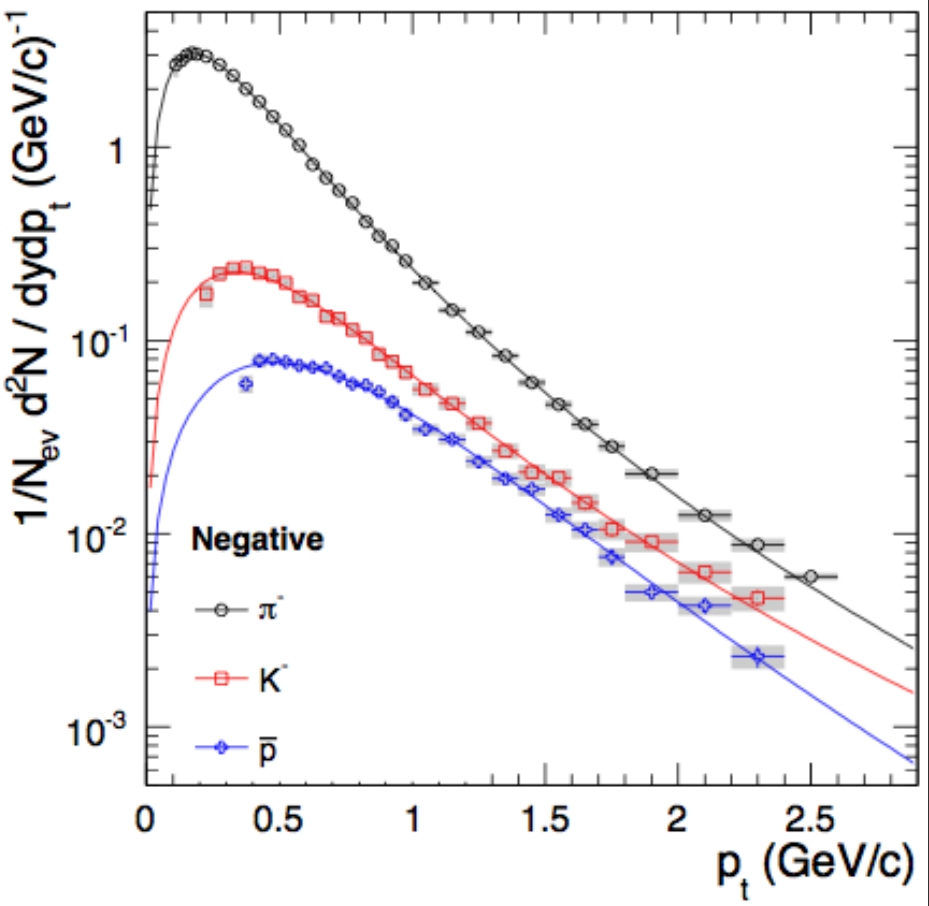
Eur. Phys. J. C (2010) 68: 345–354

p+p results: identified spectra





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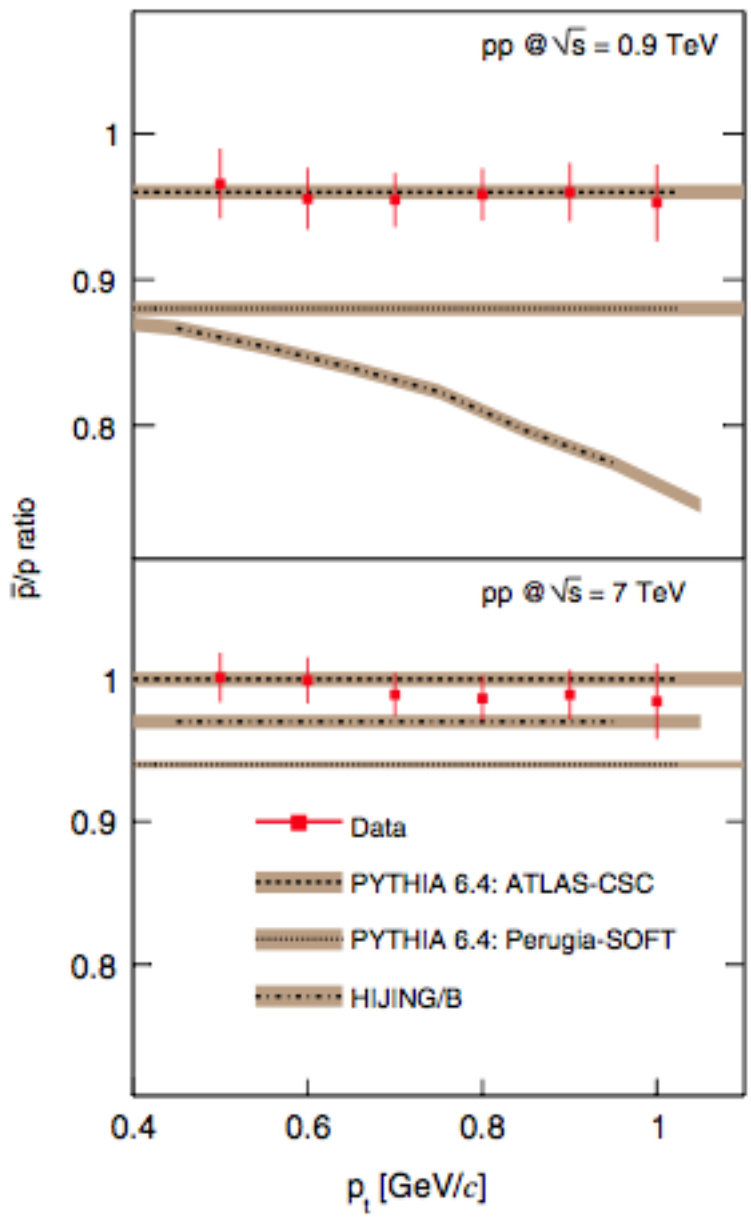
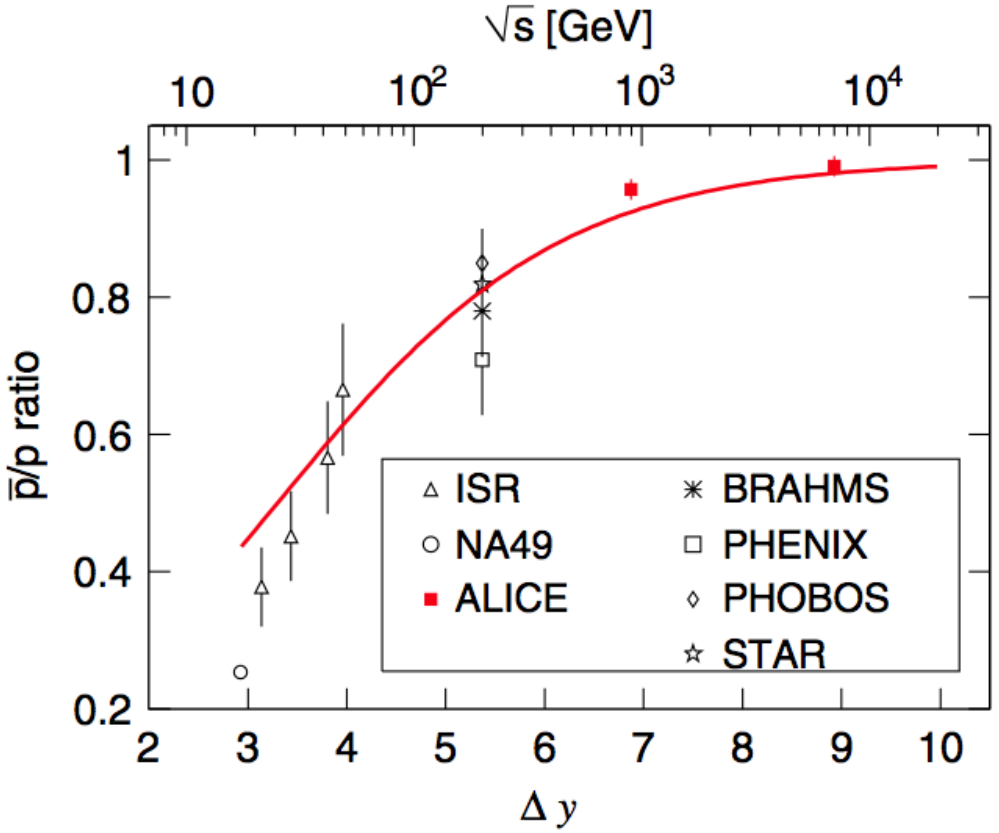
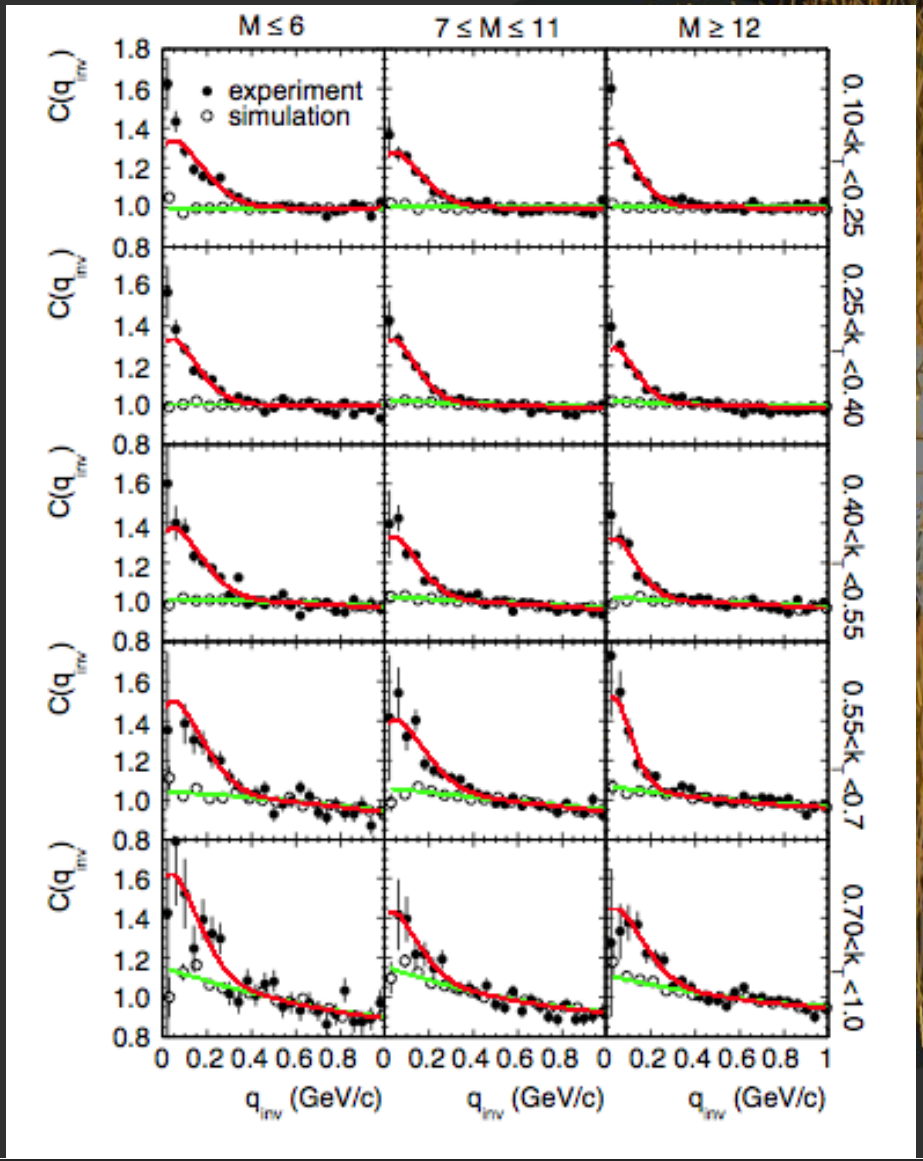
p+p results: $\bar{p}/p$ ratio

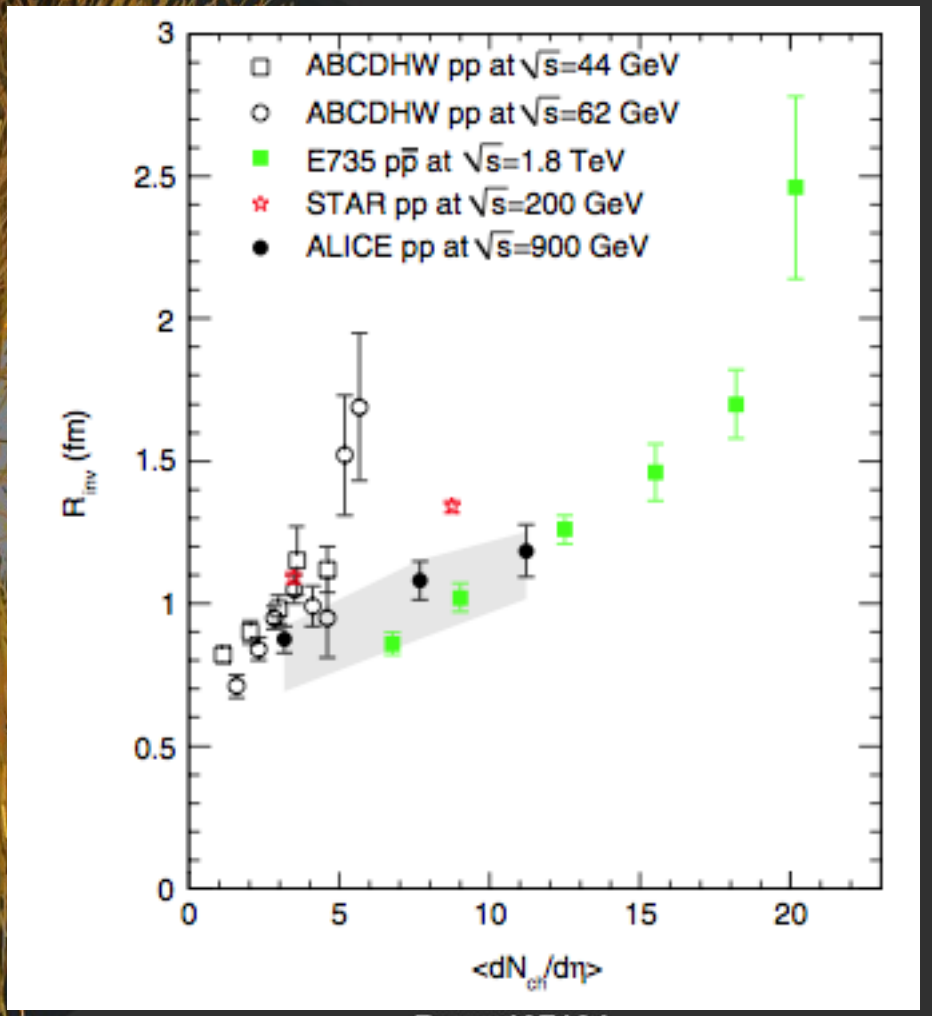




PRL 105, 072002 (2010)

p+p results: pion interferometry





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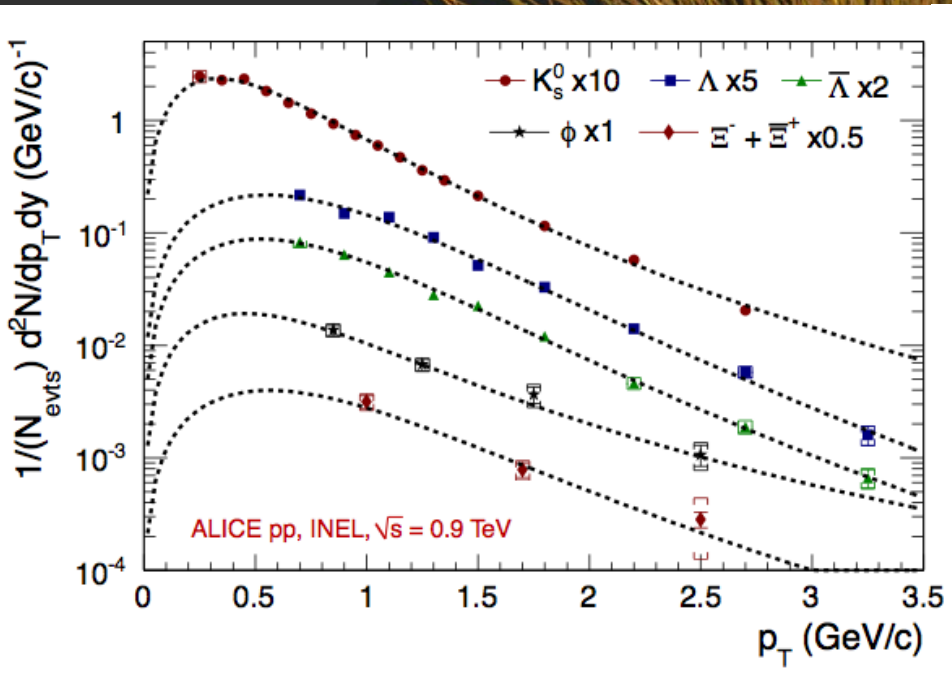
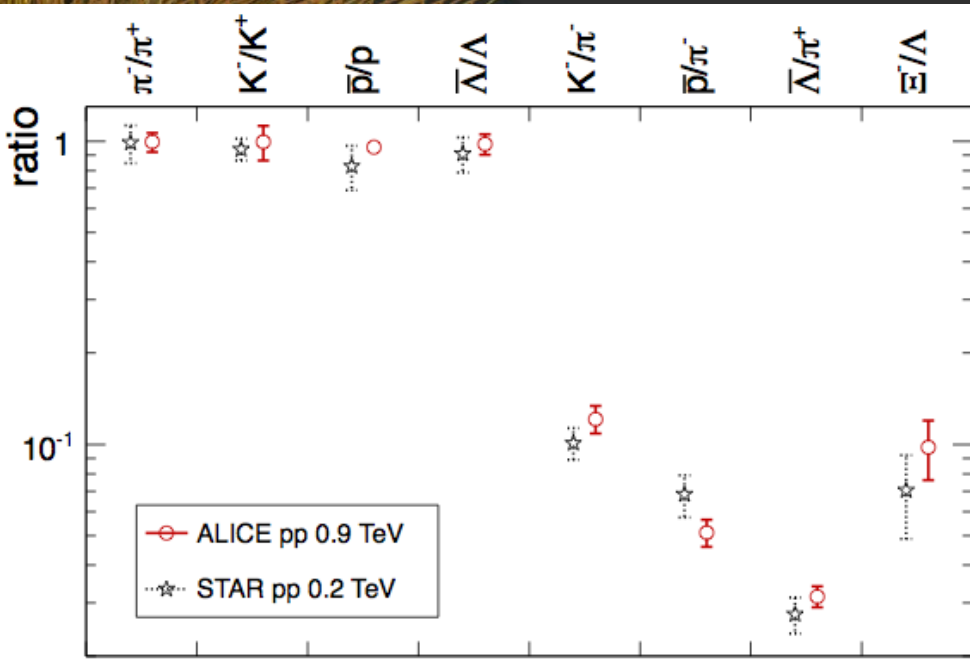
Phys. Rev. D 82, 052001 (2010)

Strangeness in p+p





Pb+Pb @ sqrt(s) = 2.76 ATeV

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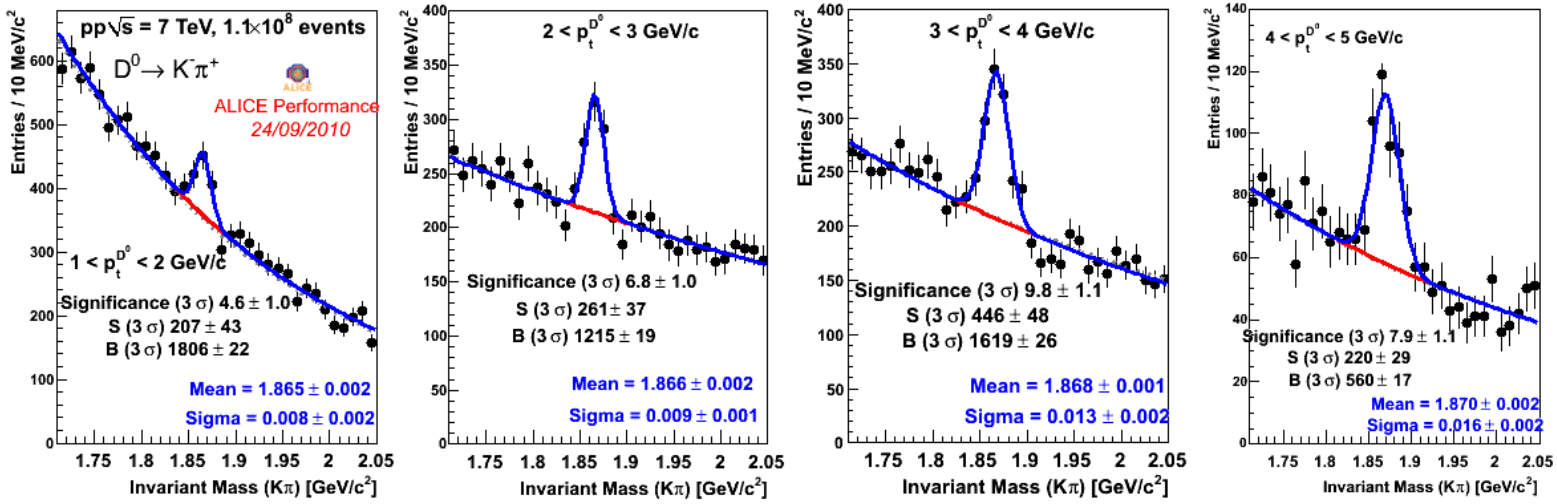
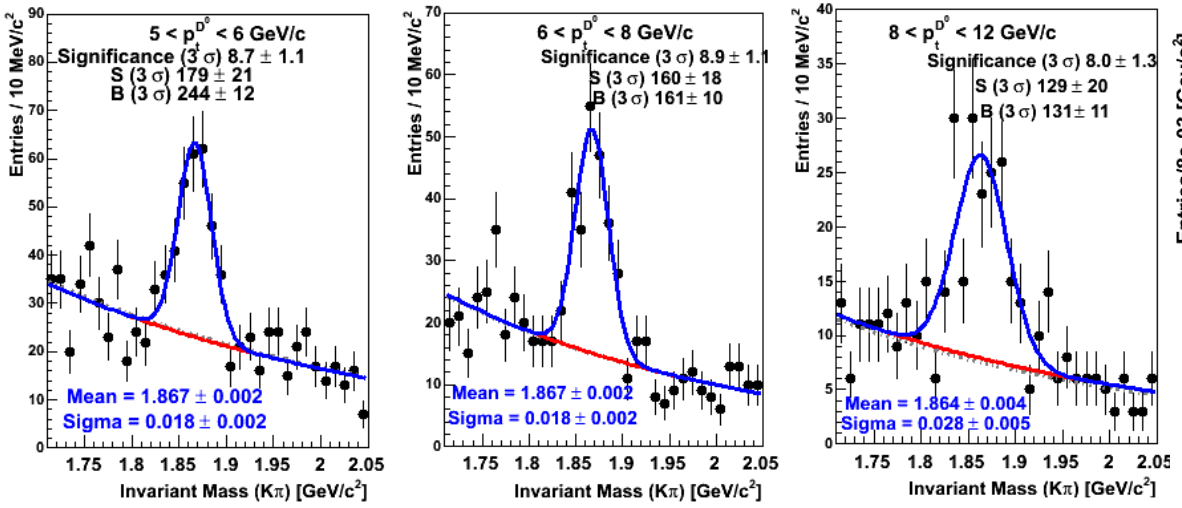
Run : 137124
Event : 0x00000000271EC693

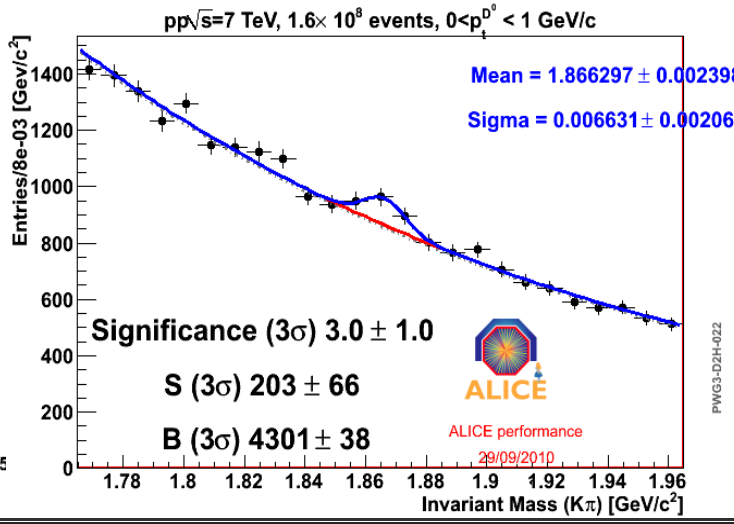
(Submitted)

p+p ongoing analyses: Open heavy flavor



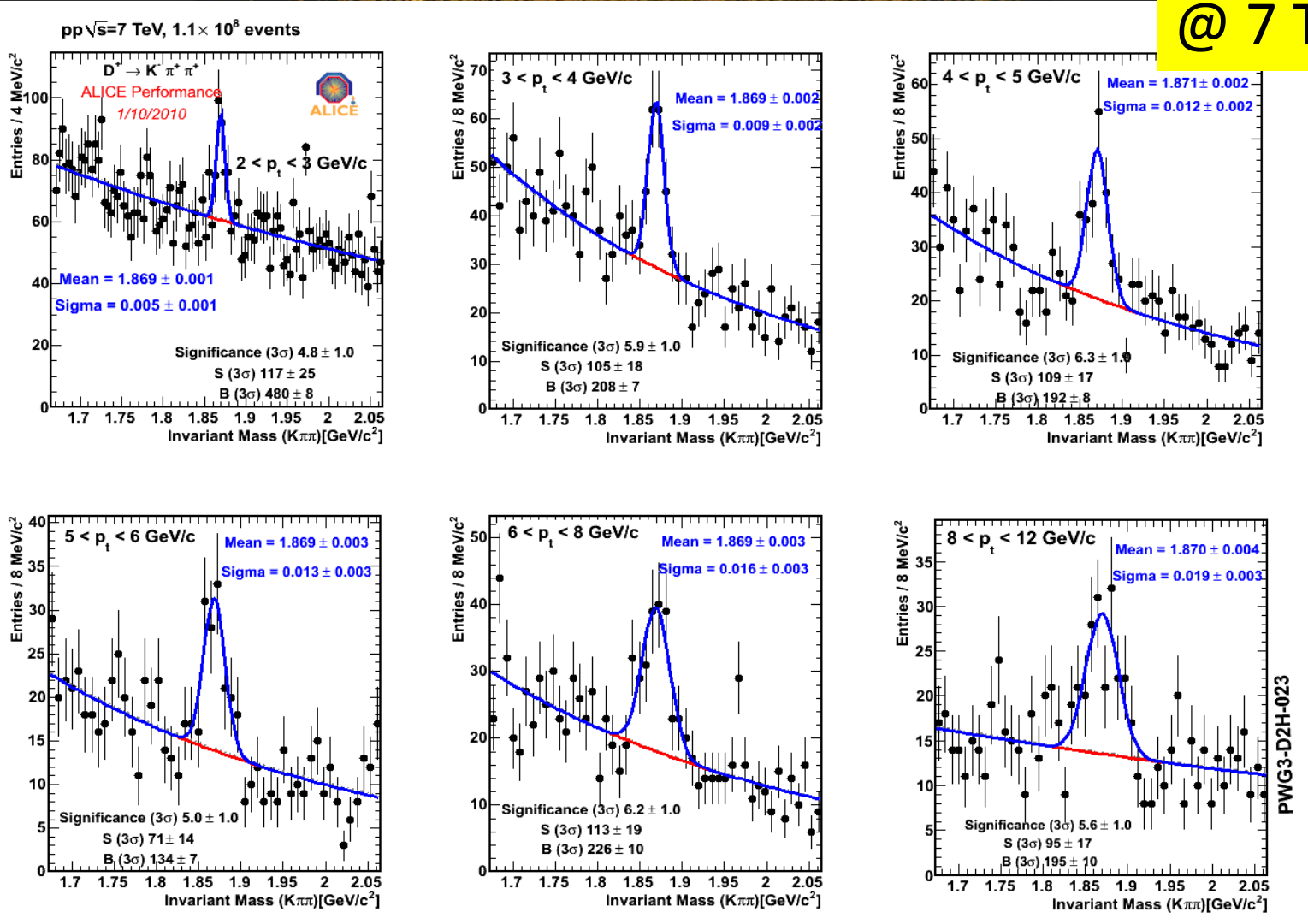
$D^0 \rightarrow K^-\pi^+$ @ 7 TeV



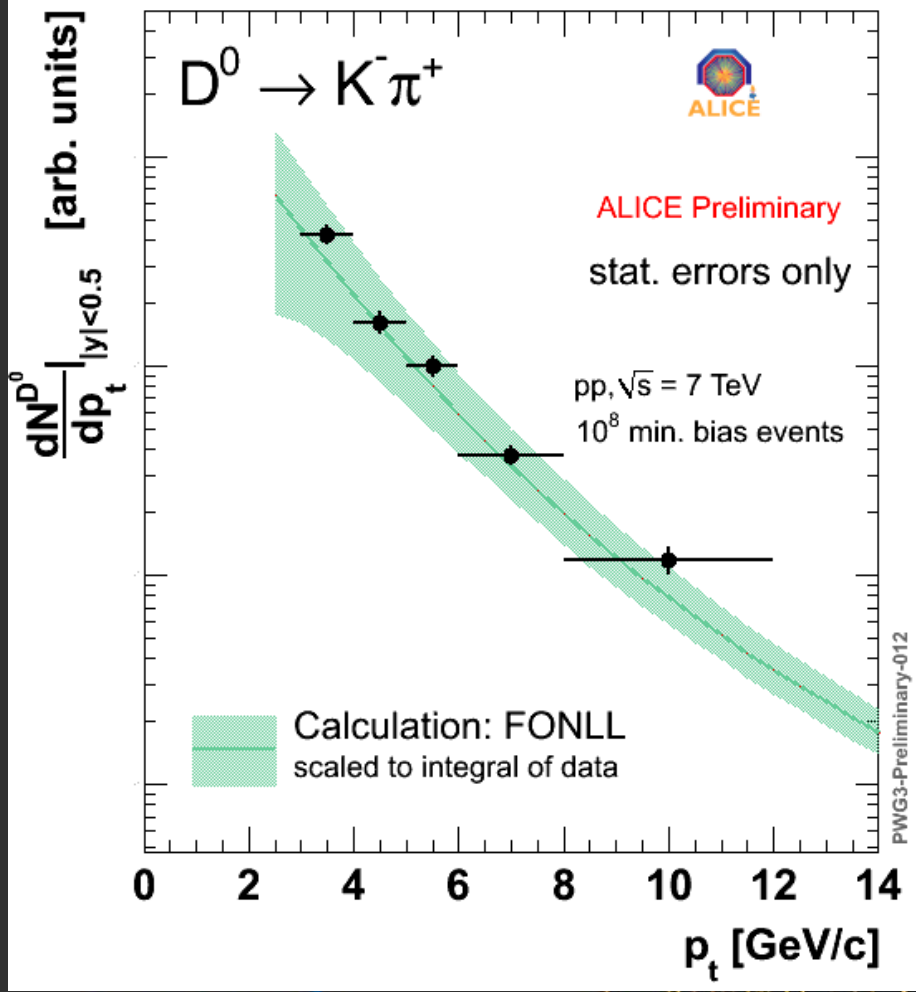


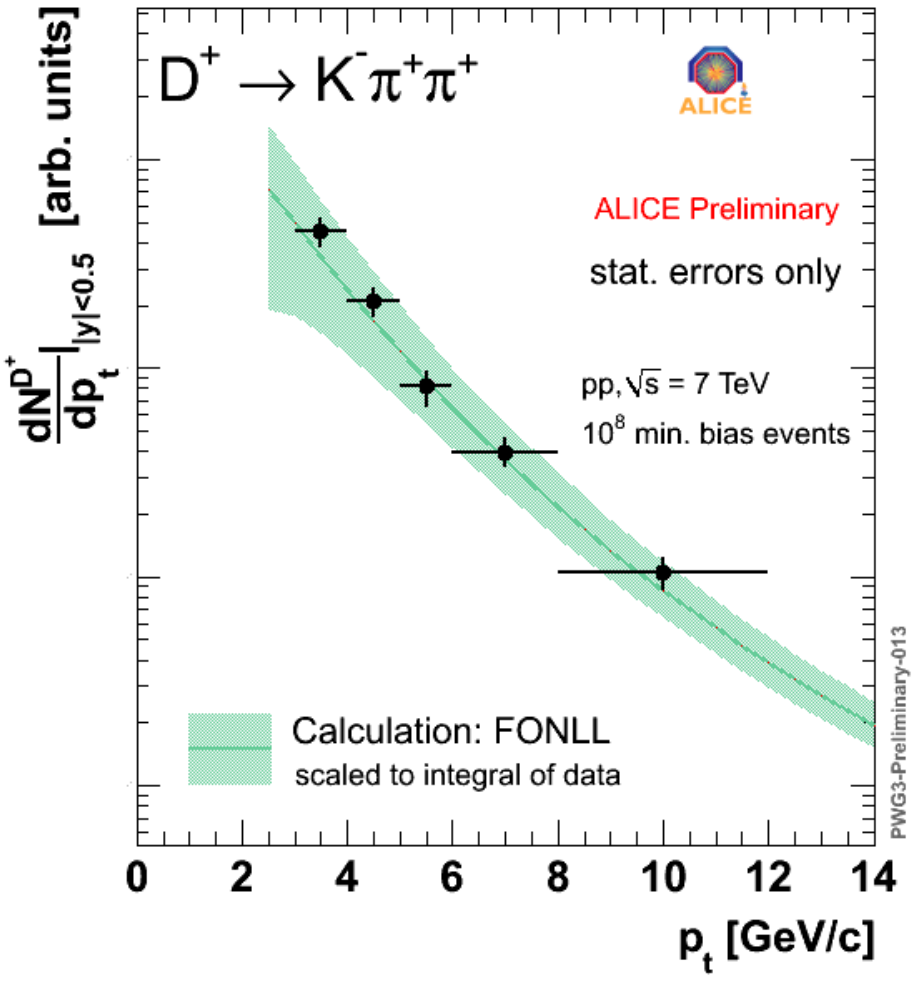
p+p results: Open heavy flavor

$D^+ \rightarrow K^-\pi^+\pi^-$ @ 7 TeV



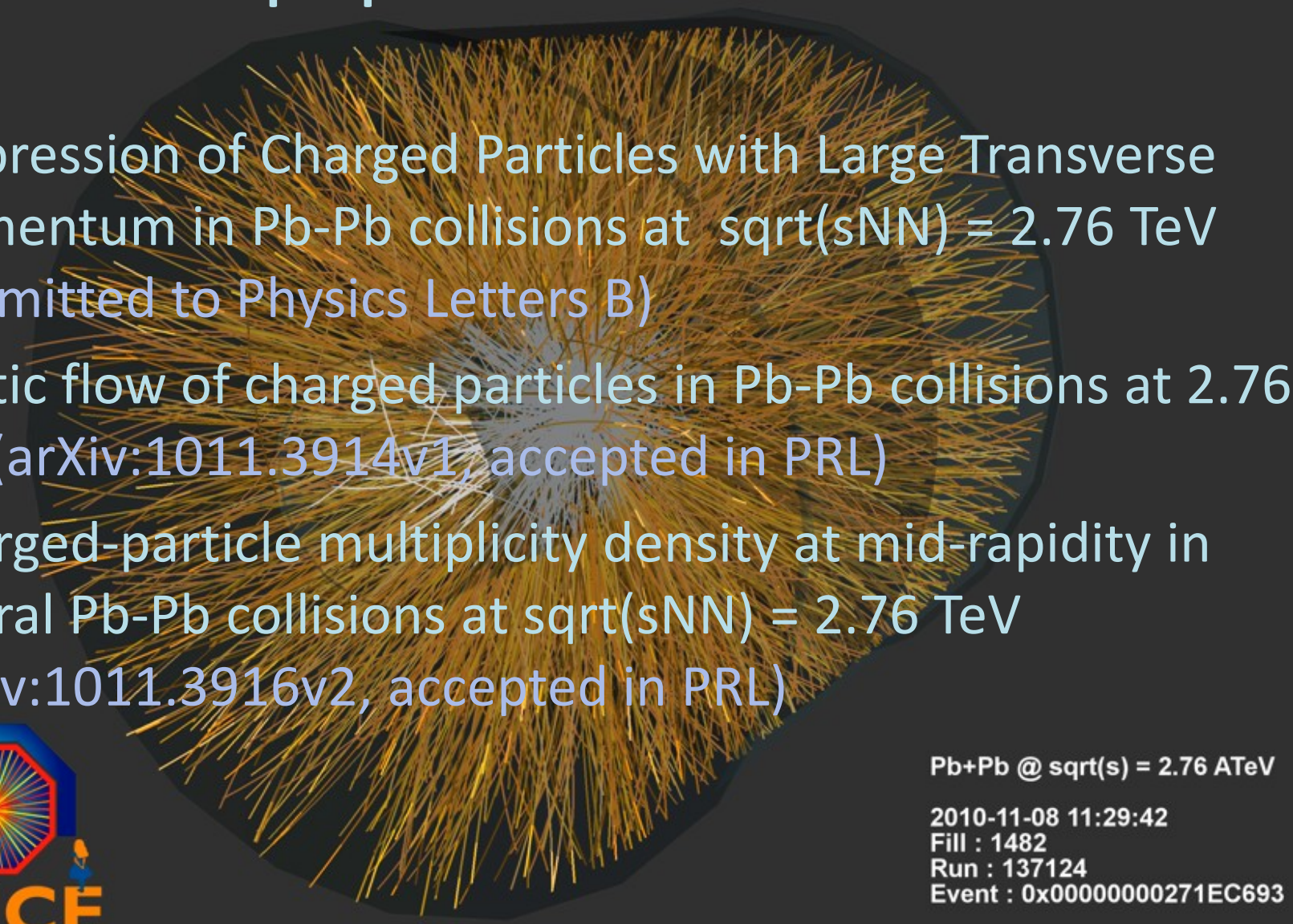
Open heavy flavor spectra



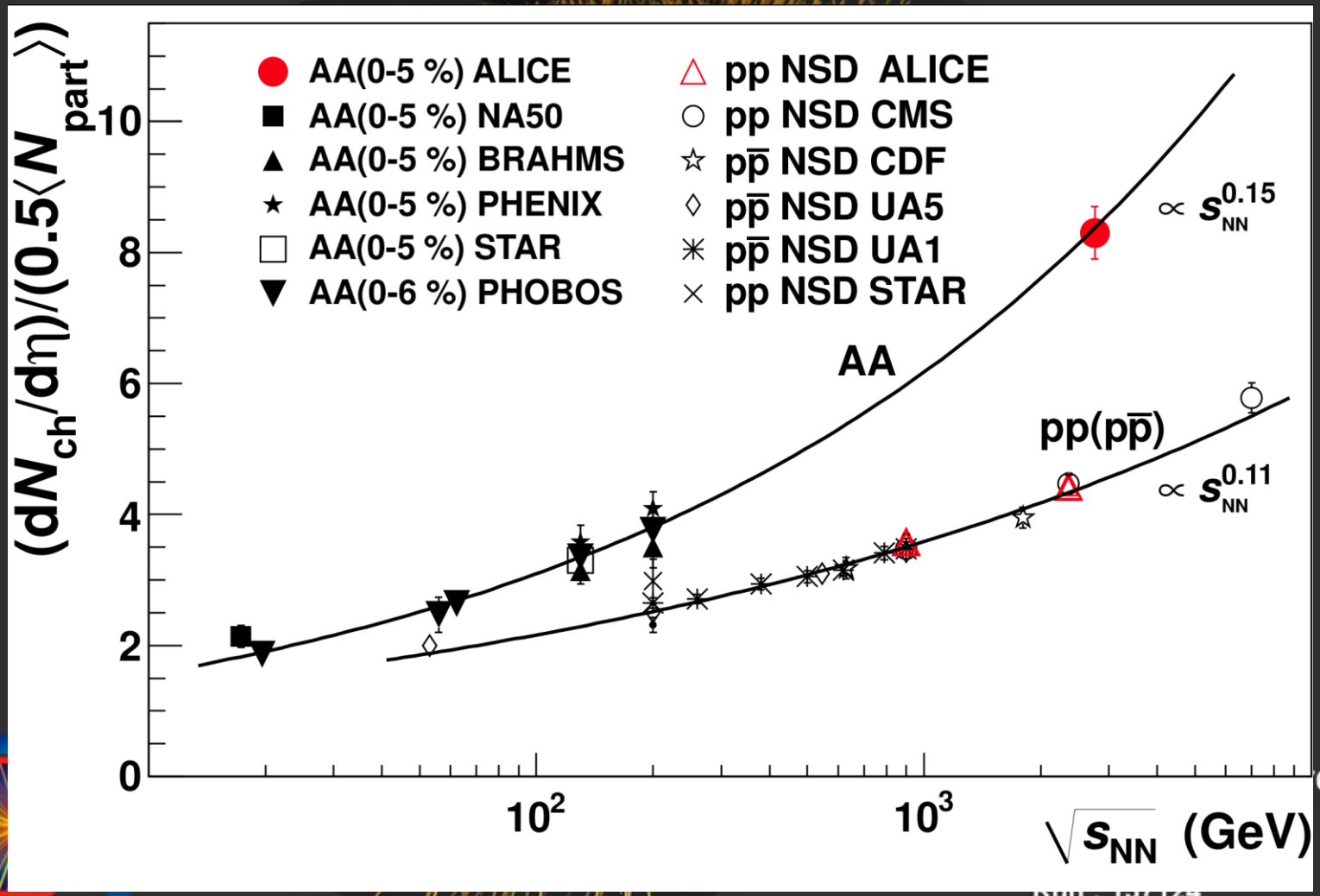


Pb+Pb papers submitted: 2010

- Suppression of Charged Particles with Large Transverse Momentum in Pb-Pb collisions at sqrt(sNN) = 2.76 TeV (Submitted to Physics Letters B)
- Elliptic flow of charged particles in Pb-Pb collisions at 2.76 TeV (arXiv:1011.3914v1, accepted in PRL)
- Charged-particle multiplicity density at mid-rapidity in central Pb-Pb collisions at sqrt(sNN) = 2.76 TeV (arXiv:1011.3916v2, accepted in PRL)

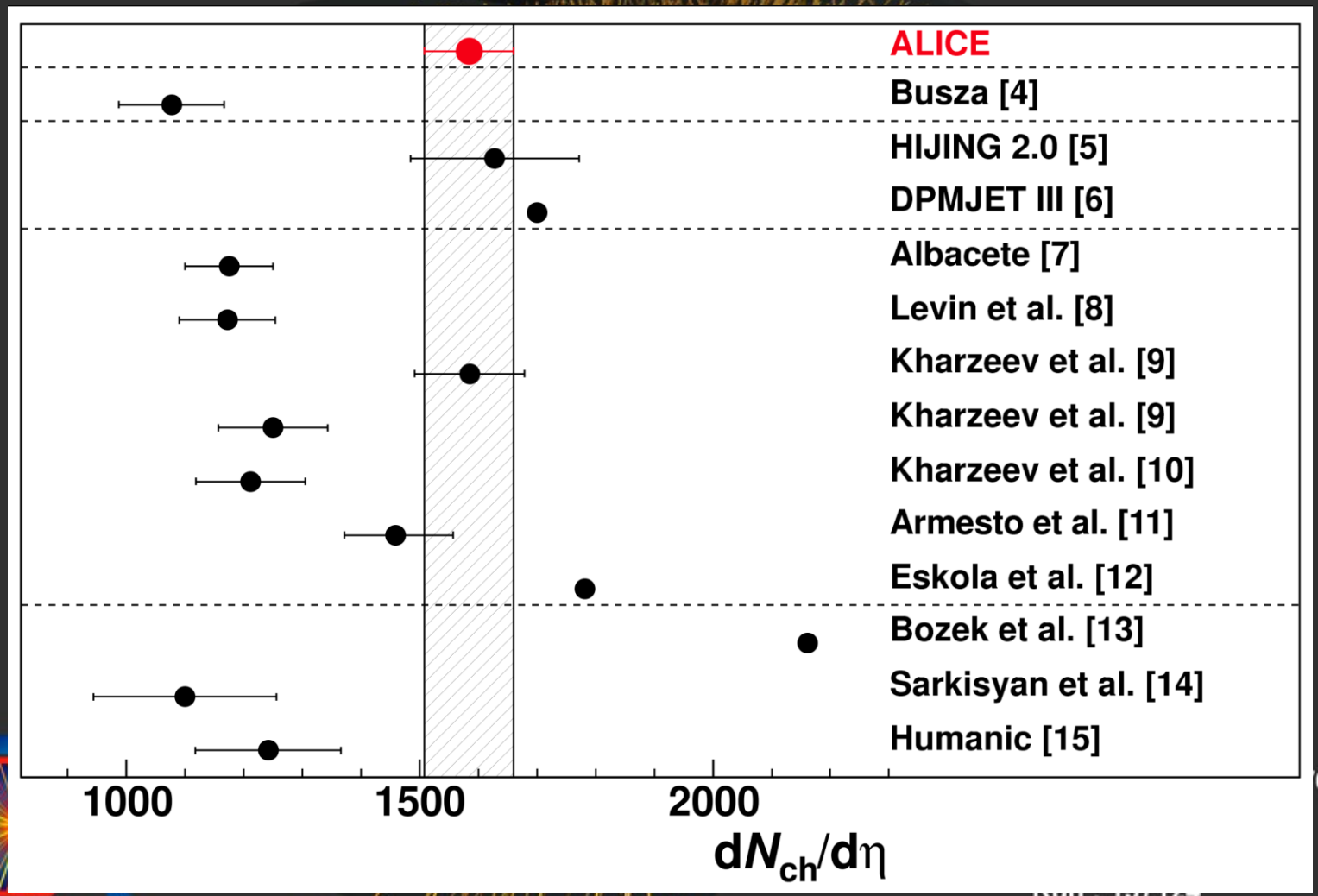


Charged particle multiplicity in central Pb+Pb



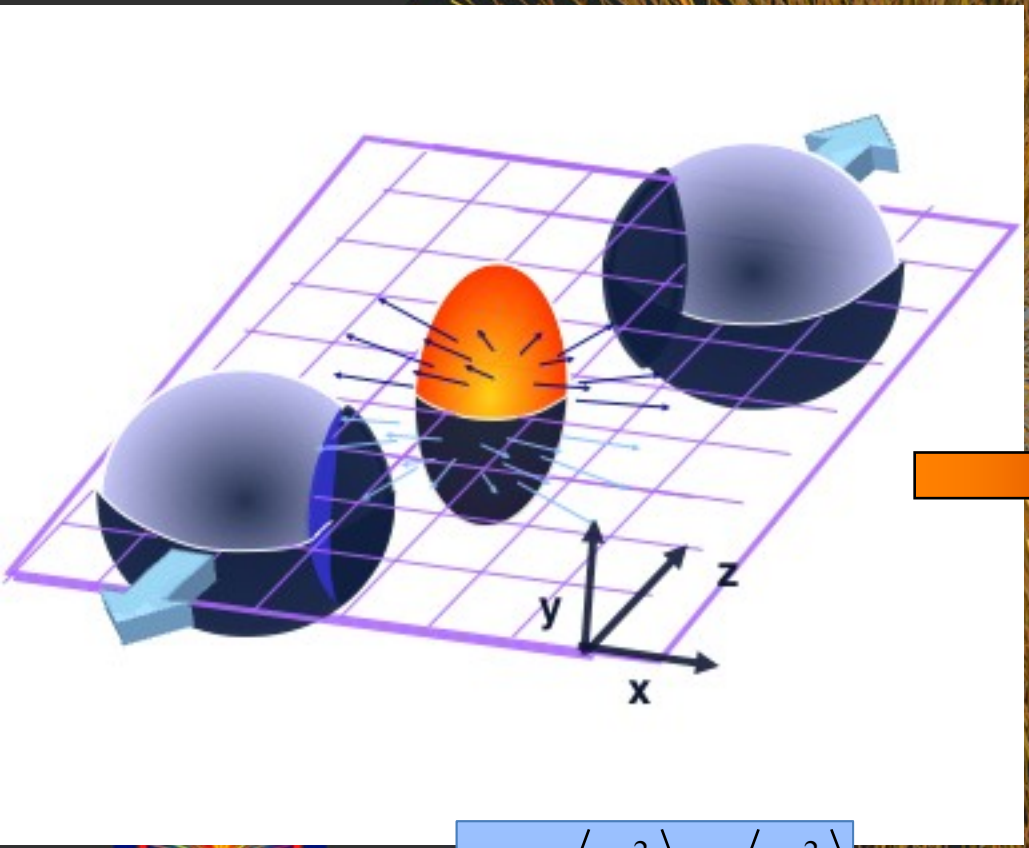
arXiv:1011.3916v2 (accepted by PRL)

How do the models compare?

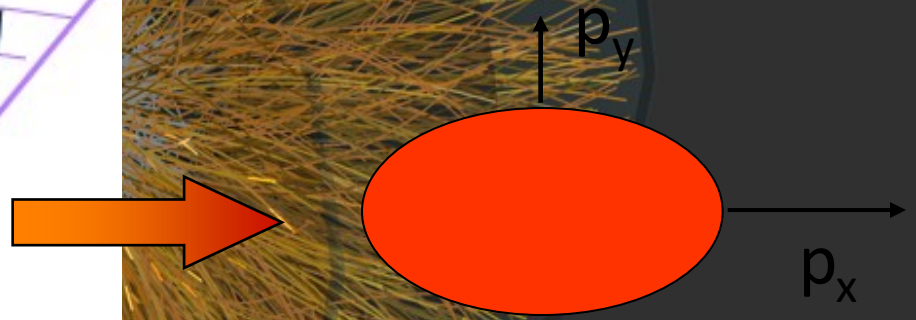


arXiv:1011.3916v2 (accepted by PRL)

Azimuthal anisotropy in Pb+Pb collisions



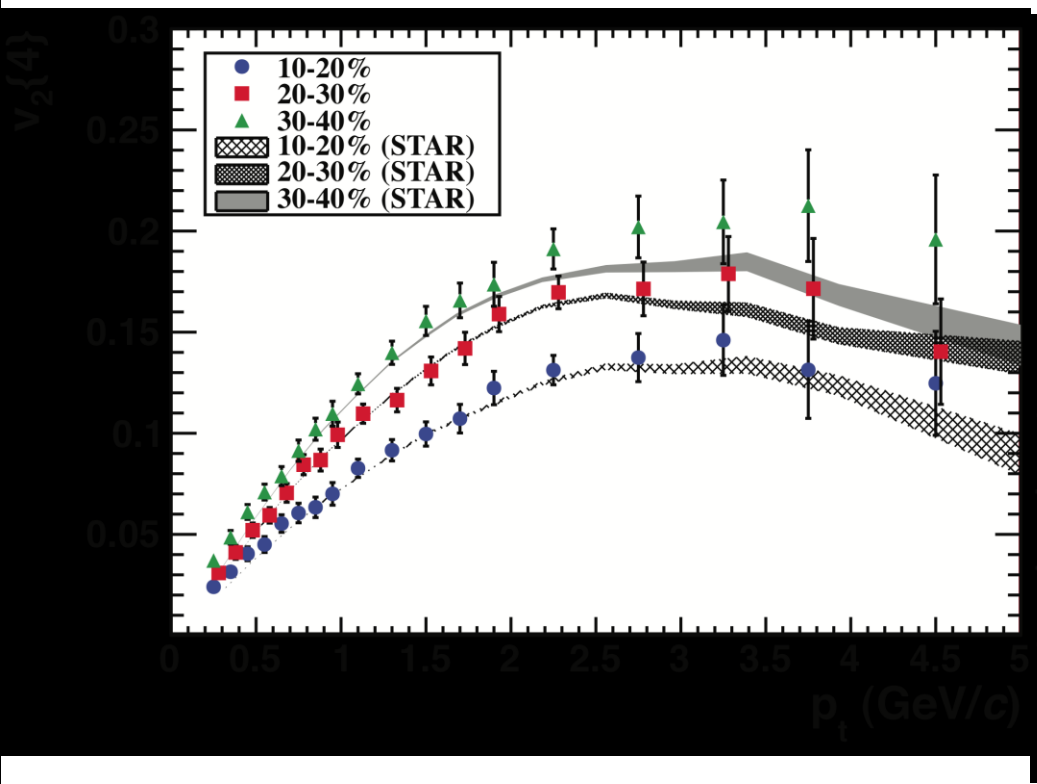
$$\phi = \text{atan}\,\frac{p_y}{p_x}$$

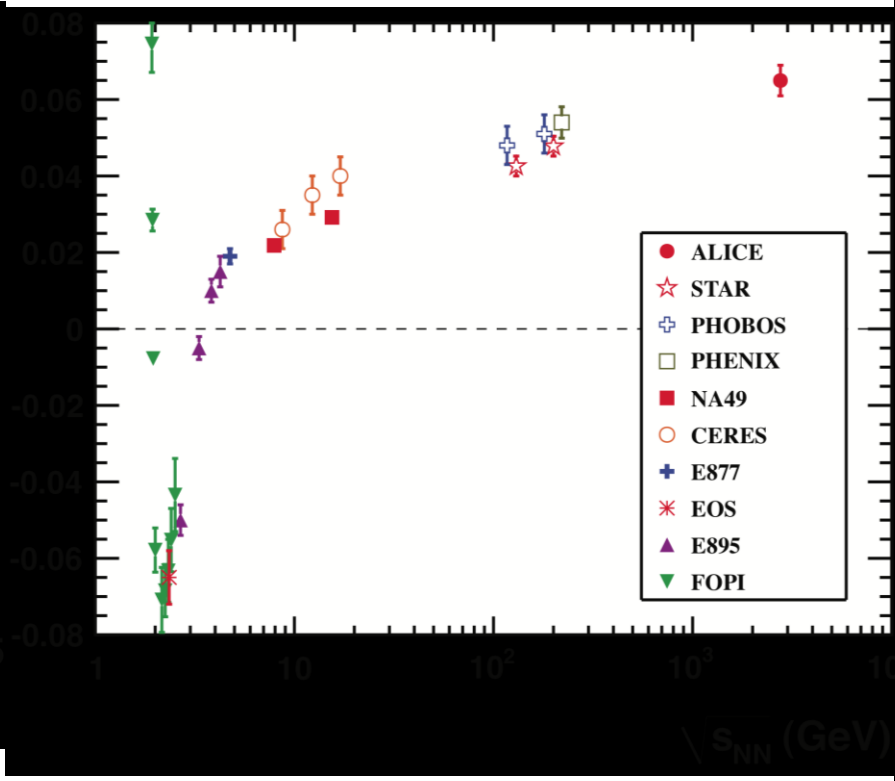


$$\varepsilon = \frac{\langle y^2 \rangle - \langle x^2 \rangle}{\langle y^2 \rangle + \langle x^2 \rangle}$$

$$v_2 = \frac{\langle p_x^2 \rangle - \langle p_y^2 \rangle}{\langle p_x^2 \rangle + \langle p_y^2 \rangle}$$

Elliptic flow at 2.76 TeV

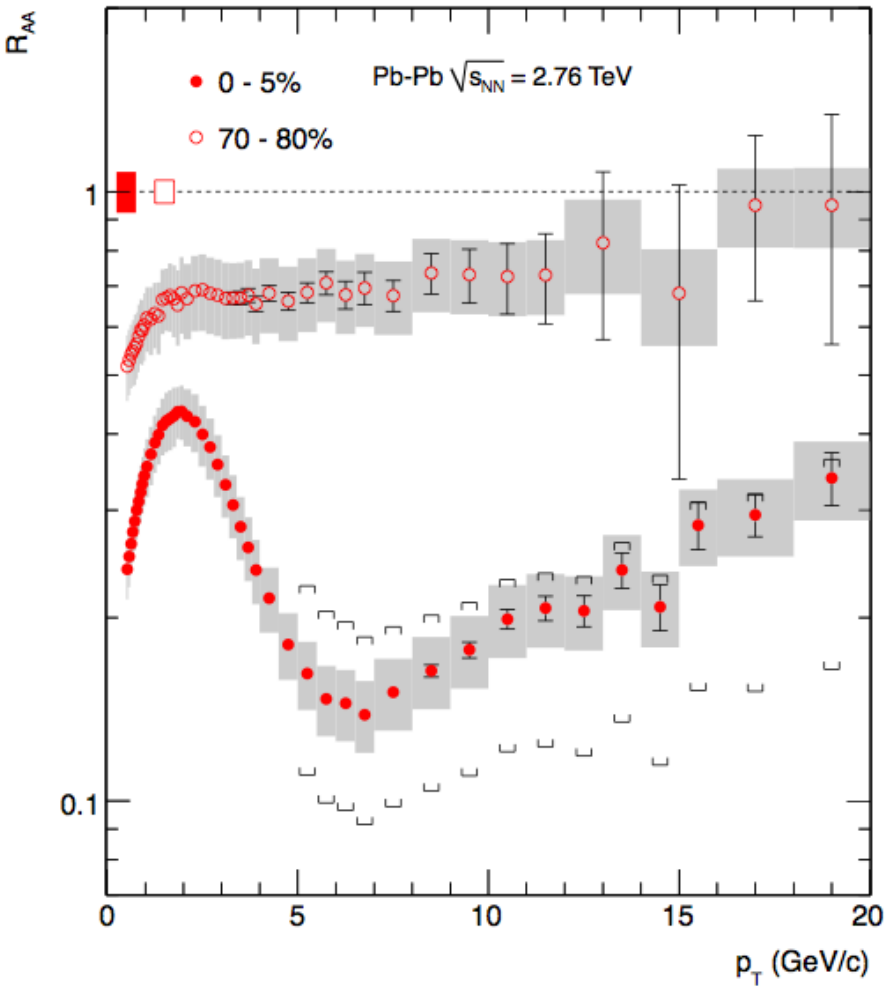


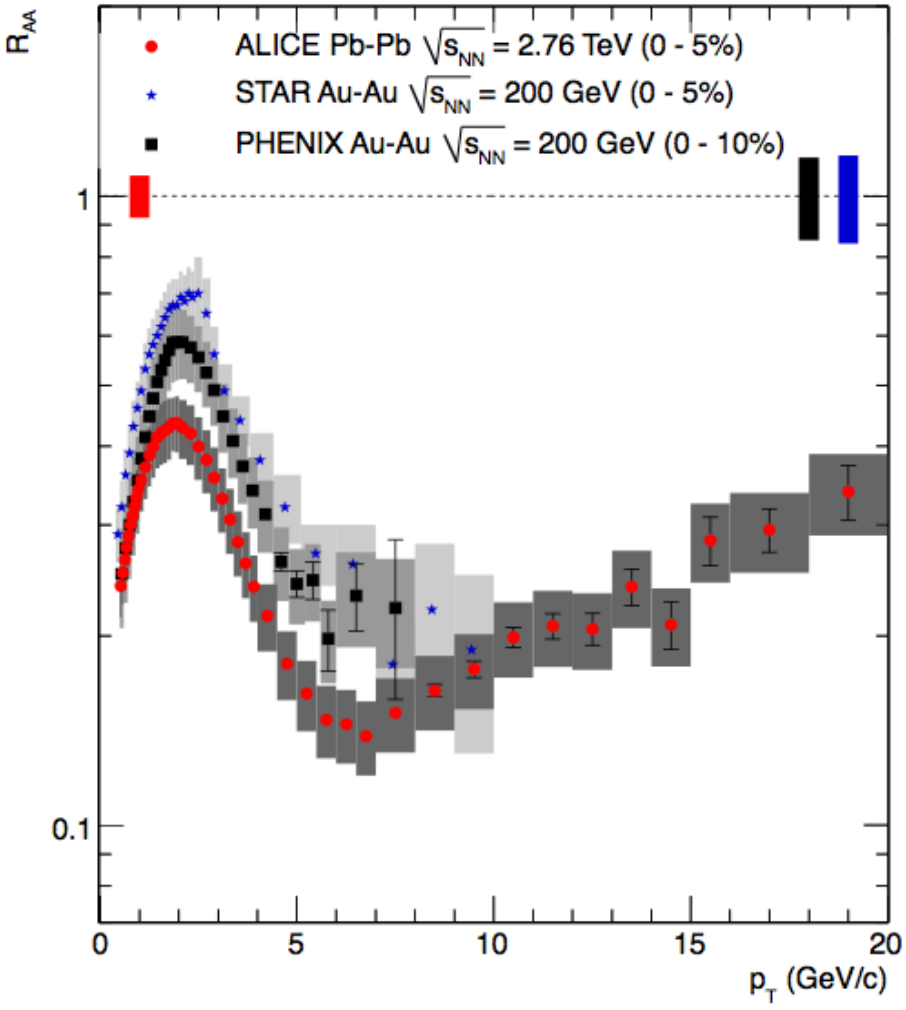


More on this from one of the world's experts (S. Voloshin) on Tuesday

arXiv:1011.3914v1 (accepted by PRL)

Charged particle suppression in Pb+Pb





$$R_{AA} = \frac{d^2N^{AA}/dp_T d\eta}{\langle N_{coll}\rangle d^2N^{pp}/dp_T d\eta}$$

Submitted to Physics Letters B

Outlook for 2011

- Several papers in preparation
  - Pb+Pb collisions:
    - Multiplicity vs centrality (submitted to PRL 08.Dec)
    - High pT particle correlations
    - Event structure analysis
    - Mean pT
    - Pion interferometry (HBT)
  - p+p collisions:
    - J/Psi production at 7 TeV
    - Charm hadron production at 7 TeV
    - Neutral pion and eta spectra
    - Identified particle spectra at 7 TeV
    - Strangeness at 7 TeV
    - Resonances at 7 TeV
- Plus many more analyses in progress

EM Calorimeter coverage to increase by more than factor of 2 during winter shutdown