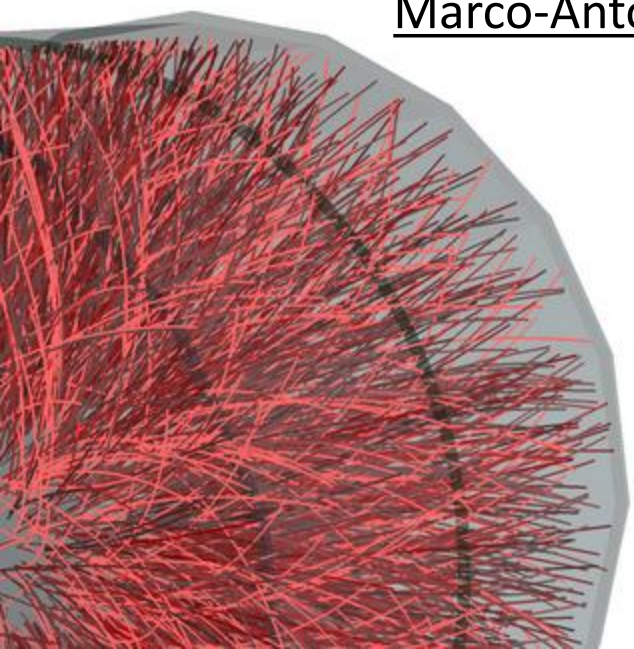


Charged hadrons production in p-p and Pb-Pb interactions at the ALICE experiment

Marco-Antonio Tangaro* for the ALICE Collaboration

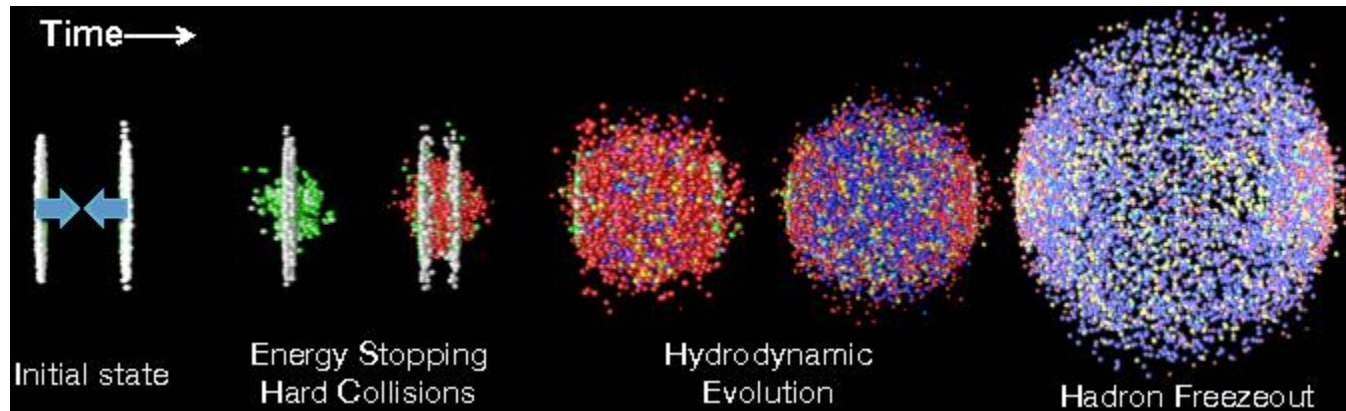
**University of Bari and INFN Bari*



Outline

- Physics Motivation
- The ALICE experiment
- PID Detector Performance: ITS, TPC, TOF and HMPID
- Charged particle spectra in p-p collisions at $\sqrt{s} = 7$ TeV
- Charged particle spectra in Pb-Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV
- Conclusions

Physics motivation



Pb-Pb collision

- Chemical freeze-out informations (Hadron yields);
- Kinetic freeze-out informations (Particle momentum distribution).

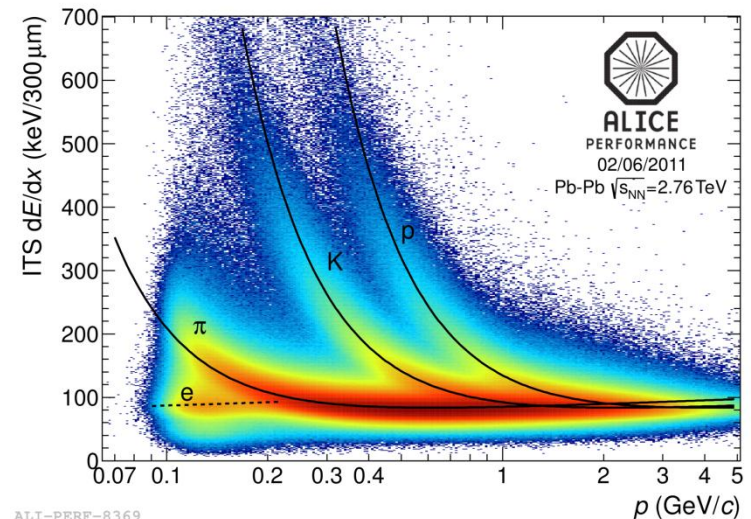
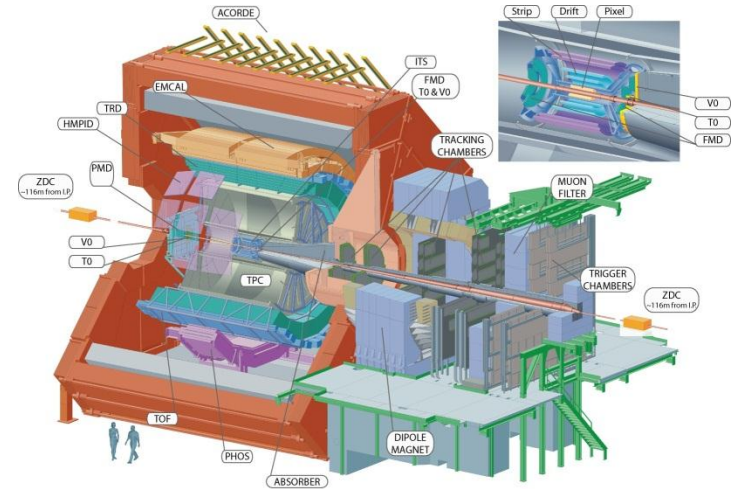
p-p collisions

- Reference for Pb-Pb data;
- Input to tune models of hadron-hadron collisions at high energies.

The ALICE detector

Inner Tracking System (ITS)

- PID energy loss ($1/\beta^2$ region).



ALI-PERF-8369

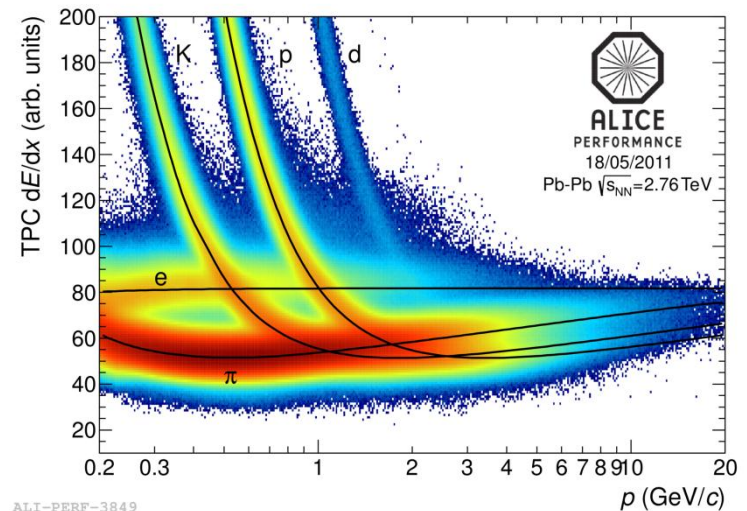
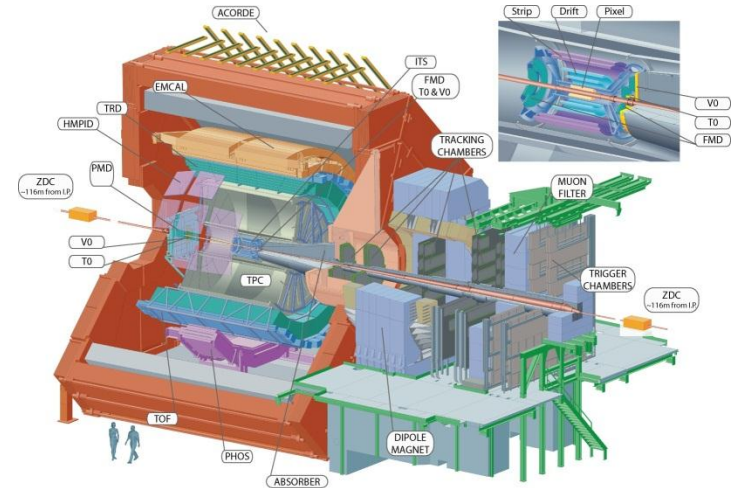
The ALICE detector

Inner Tracking System (ITS)

- PID energy loss ($1/\beta^2$ region).

Time Projection Chamber (TPC)

- PID energy loss ($1/\beta^2$ region);
- PID energy loss (relativistic rise region).



ALI-PERF-3849

The ALICE detector

Inner Tracking System (ITS)

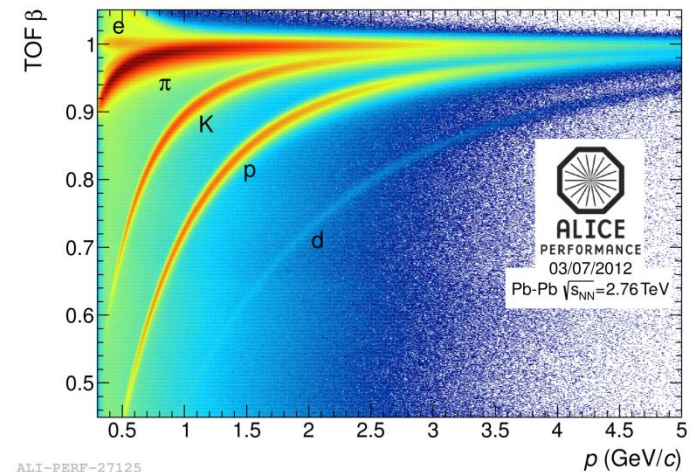
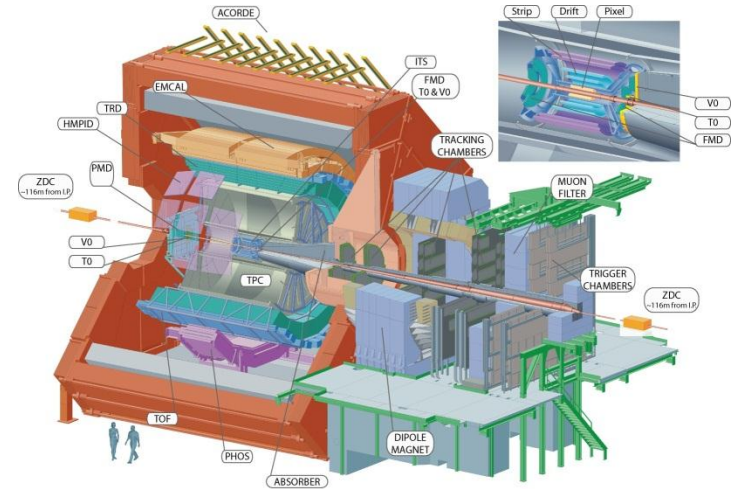
- PID energy loss ($1/\beta^2$ region).

Time Projection Chamber (TPC)

- PID energy loss ($1/\beta^2$ region);
- PID energy loss (relativistic rise region).

Time Of Flight (TOF)

- PID particle time of flight measurement.



ALI-PERF-27125

The ALICE detector

Inner Tracking System (ITS)

- PID energy loss ($1/\beta^2$ region).

Time Projection Chamber (TPC)

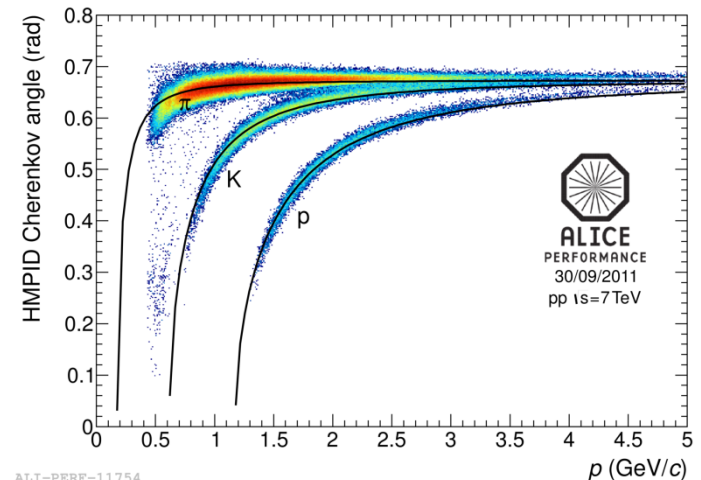
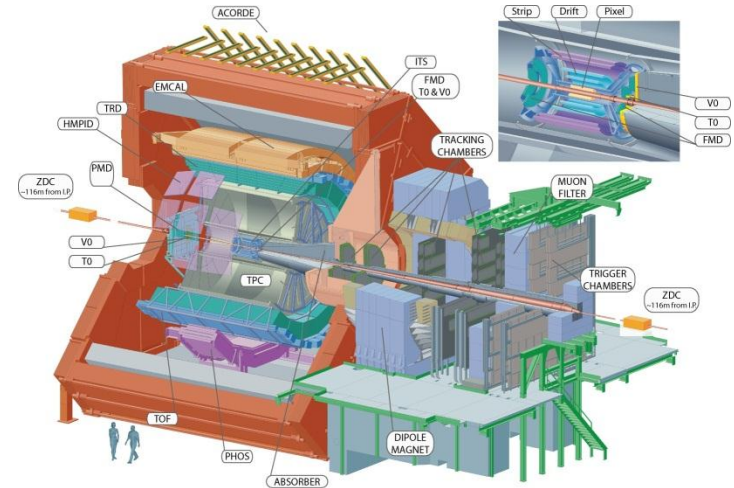
- PID energy loss ($1/\beta^2$ region);
- PID energy loss (relativistic rise region).

Time Of Flight (TOF)

- PID particle time of flight measurement.

Cherenkov detector (HMPID)

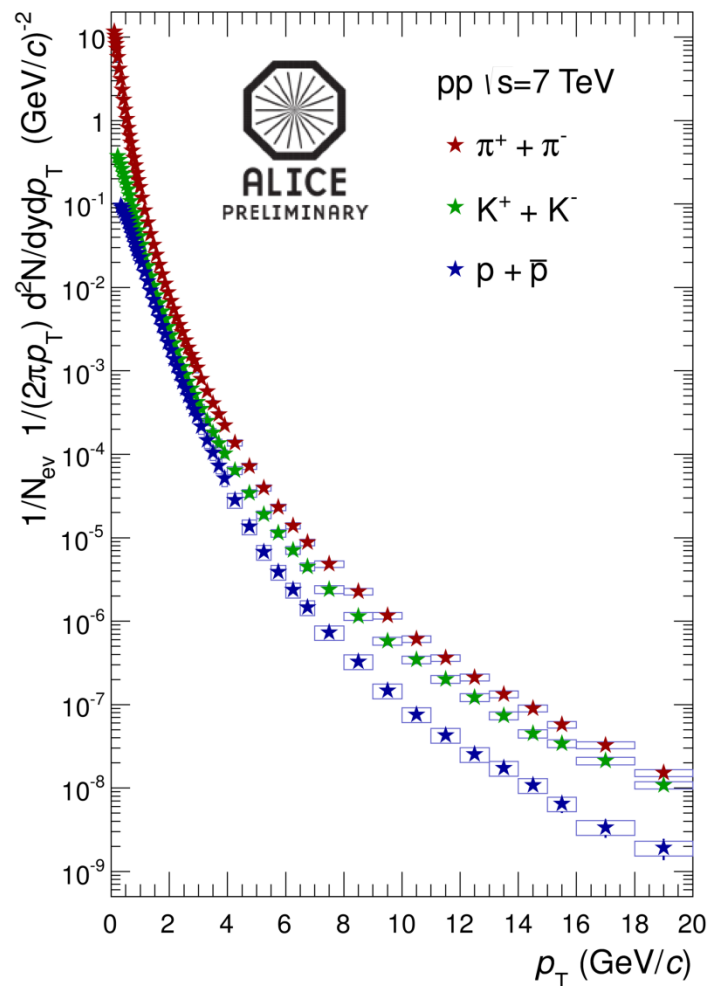
- Cherenkov Angle measurement.



ALI-PERF-11754

Charged particle spectra in p-p collisions at $\sqrt{s} = 7 \text{ TeV}$

p-p collisions at $\sqrt{s} = 7$ TeV



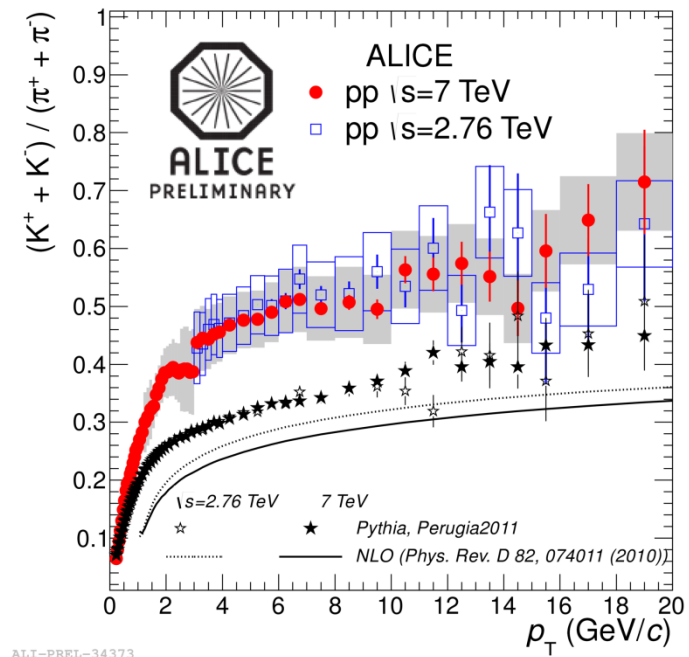
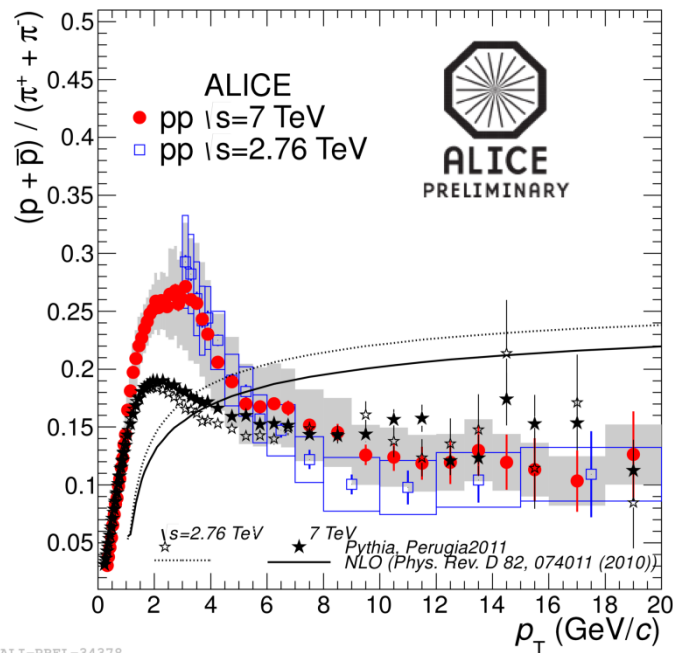
ALI-PREL-34223

Different analysis combined.

PID information by ITS, TPC, TOF and HMPID.

Charged momentum spectra in p-p collisions provide information about soft and hard interactions.

p-p collisions at $\sqrt{s} = 7$ TeV

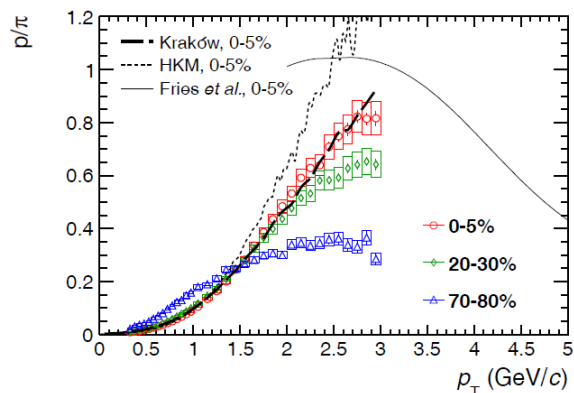
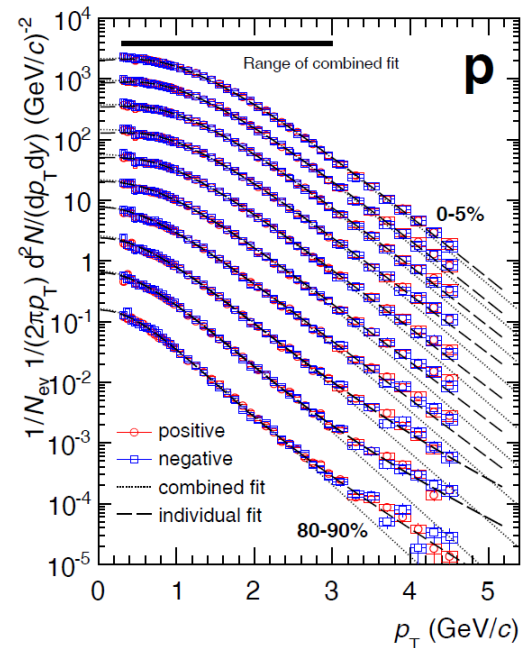
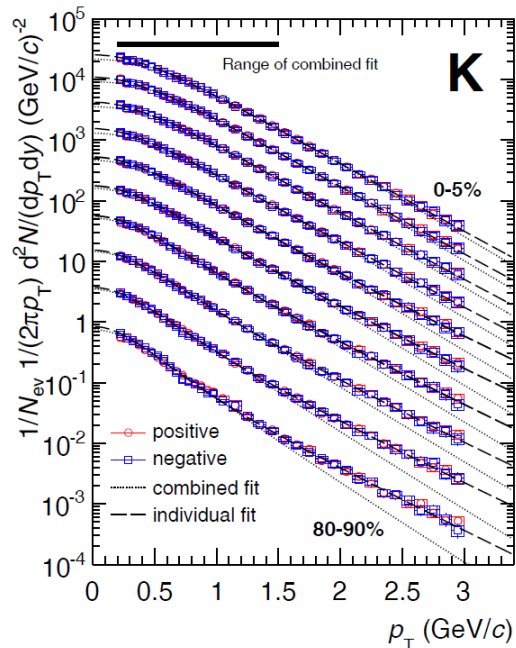
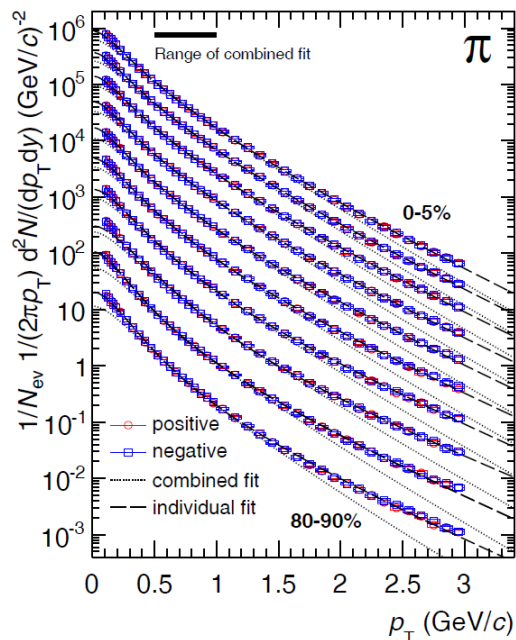


No significant energy variation between 2.76 TeV and 7 TeV.

NLO calculations and Pythia6 do not reproduce particle ratios.

Charged particle spectra in Pb-Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV

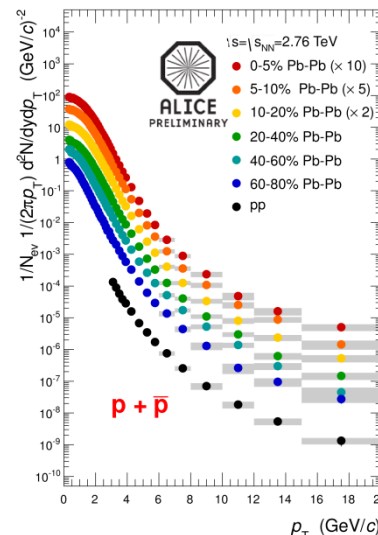
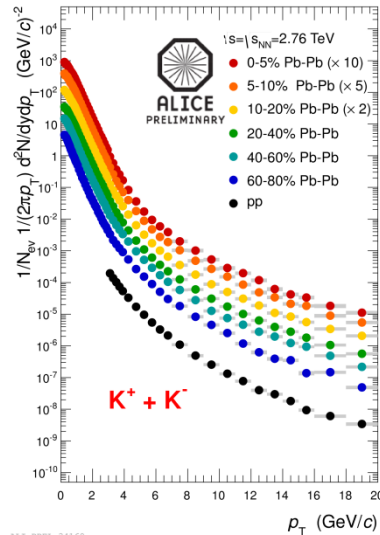
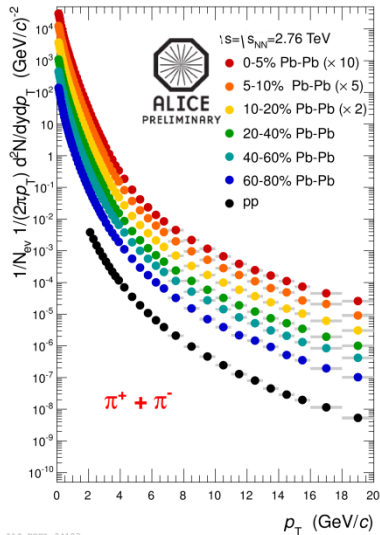
Pb-Pb collisions at $\sqrt{s}_{NN} = 2.76$ TeV



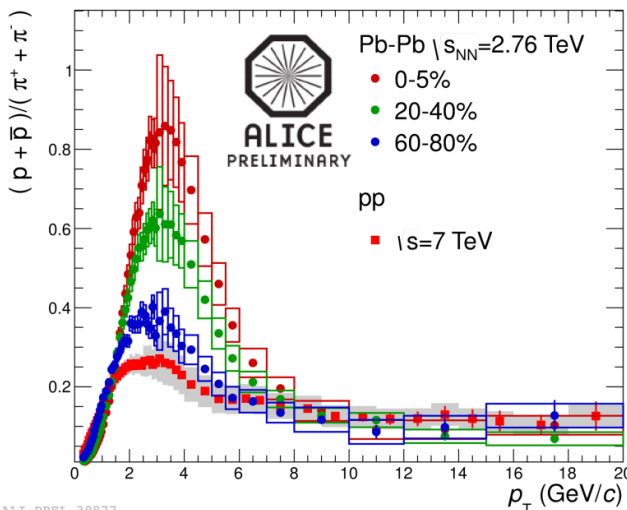
- Low p_T range
- ITS, TPC and TOF Particle Identification.
- Centrality dependence of particle spectra.

ALICE, arXiv:1303.0737

Pb-Pb collisions at $\sqrt{s}_{NN} = 2.76$ TeV



High p_T PID provided by TPC relativistic rise analysis.



p/π ratio centrality dependent.

Significant enhancement of p/π ratio at intermediate p_T , compared to p - p reference.

Talk: B. Guerzoni, Heavy Ions e QCD session

Conclusions

The ALICE experiment has unique PID capabilities.

The measurement of pions, kaons and protons production in p-p and Pb-Pb collisions have been presented.

p-p collisions at $\sqrt{s} = 7$ TeV

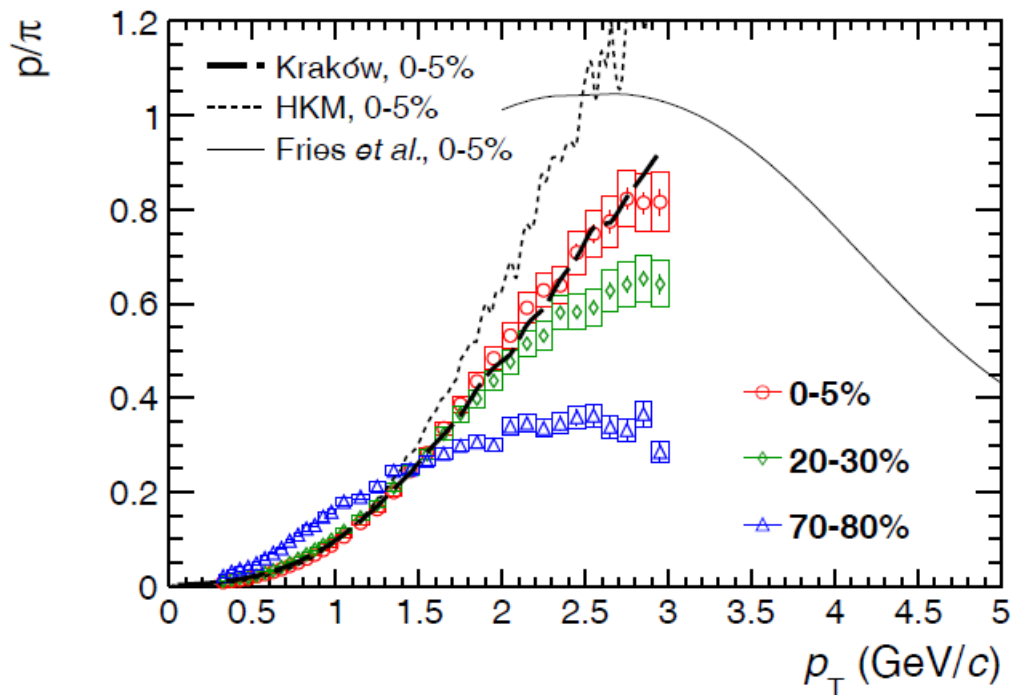
- Particle ratios energy independent.
- Particle ratios at high p_T not reproduced by NLO calculation and Pythia6.

Pb-Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV

- Clear dependence of spectra with centrality.
- Enhancement of p/π ratio at intermediate p_T .

BACKUP

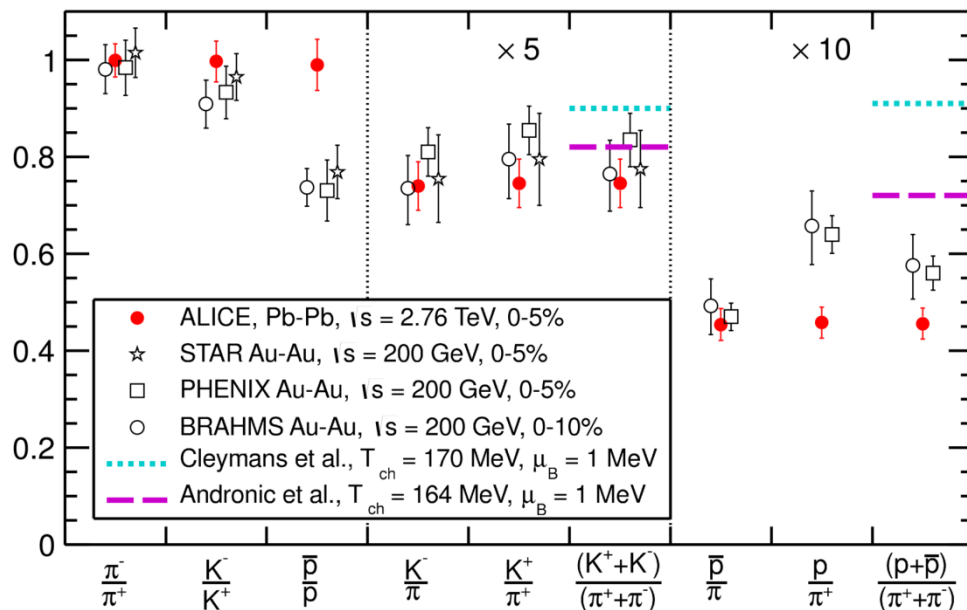
Pb-Pb collisions at $\sqrt{s}_{NN} = 2.76$ TeV



- **Kraków:** P. Bozek and I. Wyskiel-Piekarska, (2012), arXiv:1203.6513 [nucl-th].
- **HKM:** Y. Karpenko, Y. Sinyukov, and K. Werner, (2012), arXiv:1204.5351 [nucl-th].
- **R. Fries,** B. Muller, C. Nonaka, and S. Bass, Phys. Rev. Lett. 90, 202303 (2003), arXiv:0301087 [nucl-th].

Pb-Pb collisions at $\sqrt{s}_{NN} = 2.76$ TeV

PRL 109, 252301 (2012)



J. Cleymans, I. Kraus, H. Oeschler, K. Redlich, and S. Wheaton, Phys. Rev. C74, 034903 (2006).

A. Andronic, P. Braun-Munzinger, and J. Stachel, Phys. Lett. B 673, 142 (2009).

ALI-PUB-45363

All antiparticle/particle ratios are compatible with one within the uncertainties.

K/π : good agreement with thermal models within the errors.

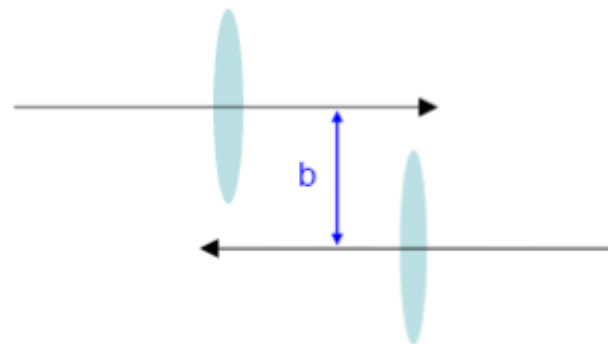
p/π : lower than expected.

Talk: B. Guerzoni, Heavy Ions e QCD session

Heavy Ion Physics

Centrality

- impact parameter : b
 - distance between colliding nuclei
 - perpendicular to the beam-axis
- large b : peripheral collisions
- small b : central collisions.



Centrality definition in ALICE based on sum of VZERO amplitude.

