

A Large Ion Collider Experiment

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**ALICE**

# **ALICE STATUS CERN- KOREA MEETING**

October 29, 2012

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# KOREA IN ALICE

## Gangnung-Wonju National University

- TOF assembly & commissioning, Muon trigger operation, **physics:**  $\Lambda$  polarization

## Sejong University

- T3 operation, **physics:** Lattice calculation  $\Lambda$  polarization,  $Y$  production in pp & PbPb

## Yonsei University

- TRD assembly and commissioning, **physics:** diffractive physics in UPC, H-dibaryon, elliptic flow

## Pusan National University

- HMPID R&D and operation, **physics:** HBT, high  $p_T$  production in PbPb

## KISTI/GSDC

- ALICE-Korea GRID computing center T1 & T2 & KIAF, **physics:**  $\Lambda$  polarization

# BUDGET

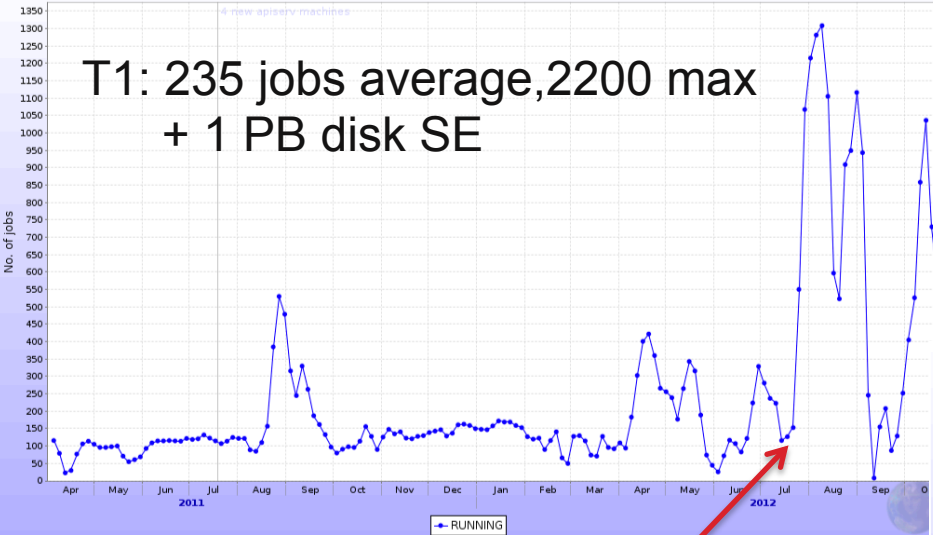
## NRF – KISTI/GSDC

- Core Common Funds: 150 kCHF + 50 kCHF (KISTI/GSDC)
- M&O-A 2013
  - 9/599 → 72 kCHF (including 8.6 kCHF energy refund from 2011)
  - 3/599 → 27 kCHF (including 3.6 kCHF energy refund from 2011)
- M&O B 2013
  - 24 + 5 kCHF (TOF + MUON Trigger)
- Computing Contribution
  - 2,2% due, 3% delivered, 6% pledged

# KISTI/GSDC

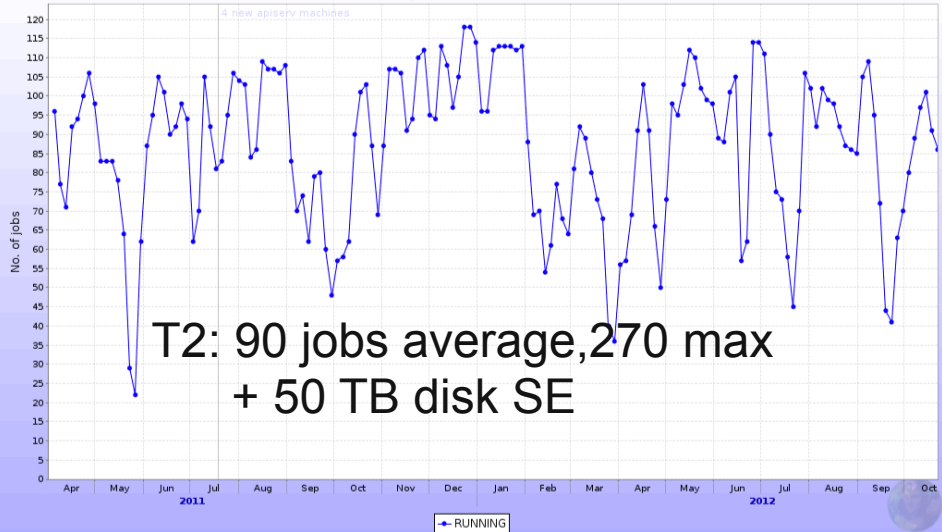
Tier1 will enter in final operation (test) in February 2013

Active jobs in KISTI\_GSDC



Network improvement

Active jobs in KISTI-CREAM



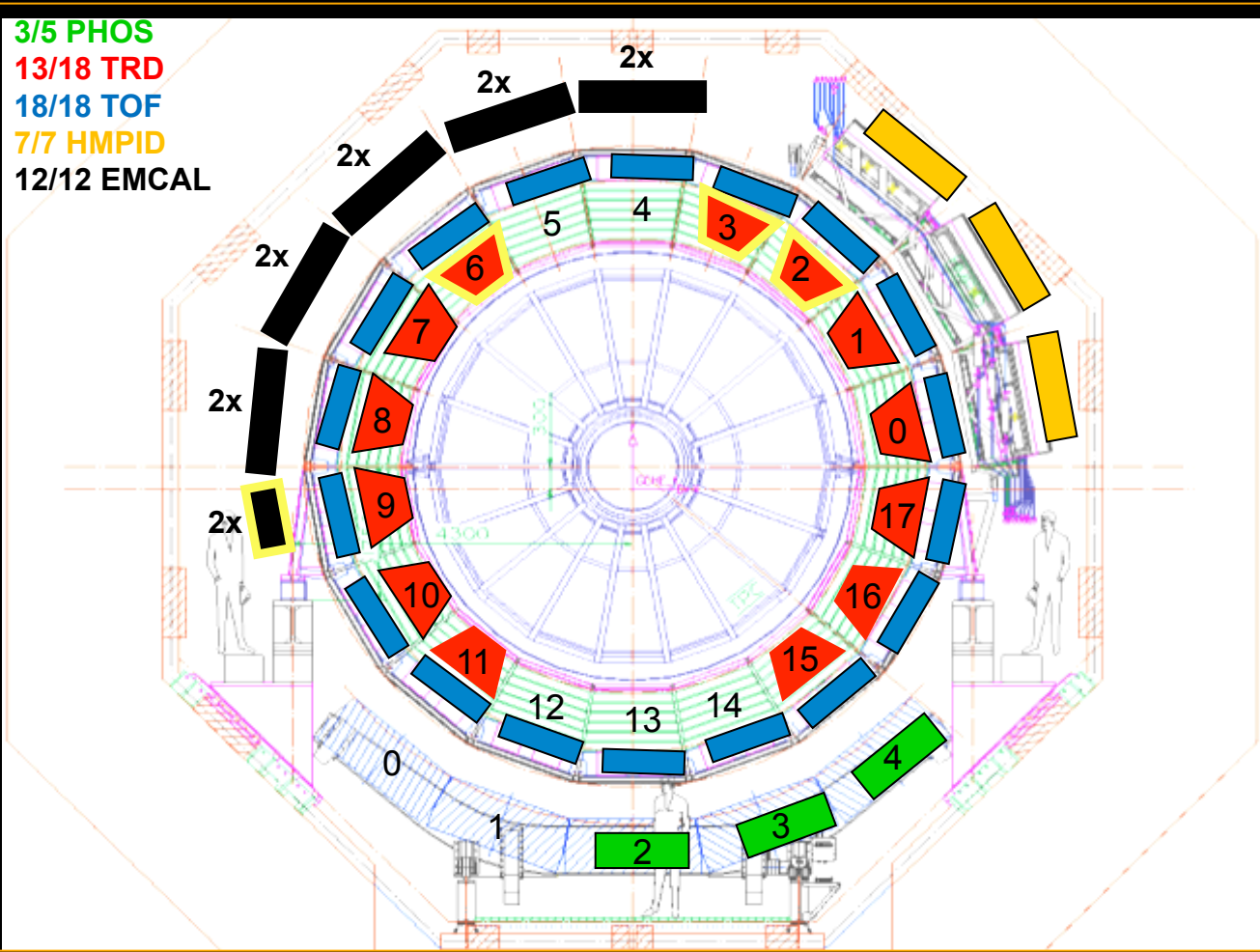


# COLLABORATION NEWS

## New members:

- Full member: Karatay University (Turkey), SUT (Thailand)
- Associate members: Rutherford Appleton Laboratory (UK), TU München (Germany), BARC (India), ASRT (Egypt), TU Kosice (Slovakia)

# DETECTOR STATUS



2013 LS1:

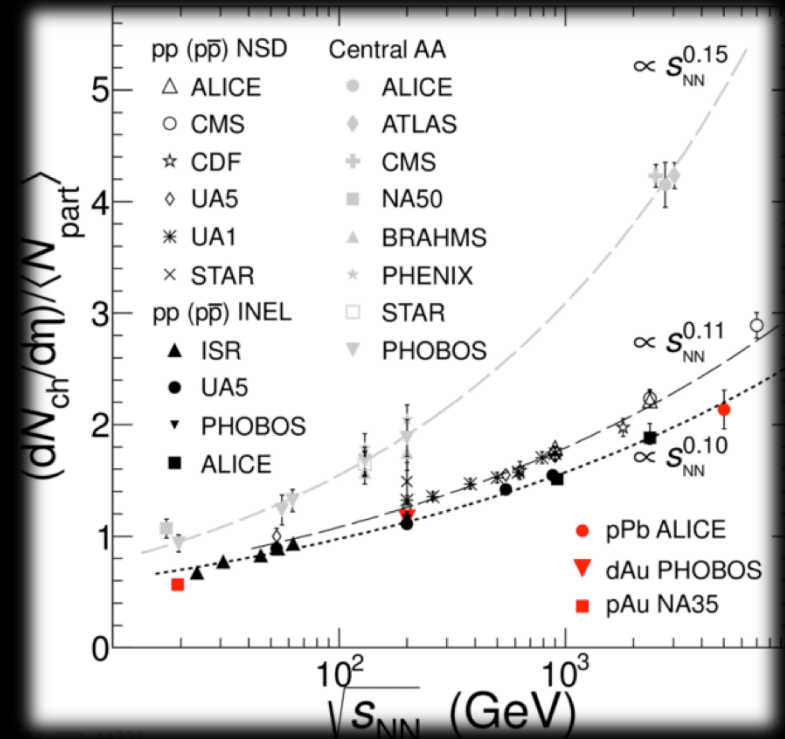
- Complete TRD
- Add DCAL + 1 PHOS module

# OPERATION

- ALICE has been taking pp @ 8 TeV (main-satellite,  $L_{\text{peak}} = 1-2$  Hz/ $\mu\text{b}$  + background)
  - MB events (200 M events)
  - Rare triggers: EMCAL jet triggers ( $0.6 \text{ pb}^{-1}$ ) + dimuon triggers ( $0.7 \text{ pb}^{-1}$ )
  - New TRD trigger:  $J/\psi$  production in central rapidity
- September main-satellite,  $L_{\text{peak}} = 18$  Hz/ $\mu\text{b}$  + background, increased rate capabilities
  - Goal to reach  $5 \text{ pb}^{-1}$  MB and dimuon triggers (1500 Y)

# OPERATION

- September 2012: pPb @ 5.02 TeV:
  - 10 M Mb events
  - Displaced vertex  $2 \times 0.26$  M events
- February 2013: pPb @ 5.02 TeV





# PUBLICATIONS & CONFERENCES

- 50 publications in refereed papers (27 since the beginning of the year)
- 250 presentations at International conferences, 57 at QM and HP



# SELECTED PHYSICS RESULTS

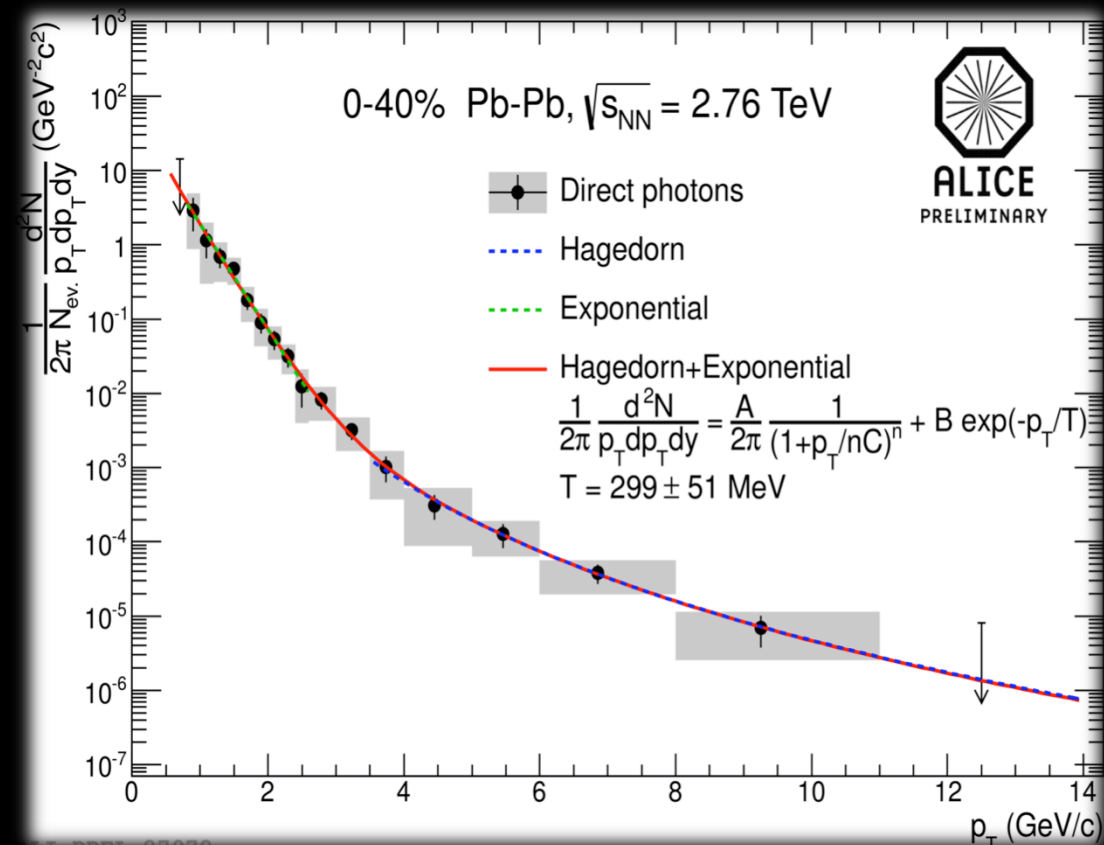
PbPb  $\sqrt{s_{NN}} = 2.76$  TeV

A hot system is formed

Everything is quenched

Everything flows

# A HOT SYSTEM IS FORMED



Direct photon radiating  
from a hot medium (QGP)  
at  $T > 300$  MeV ( $3 \times 10^{12}$  °K)

# SELECTED PHYSICS RESULTS

PbPb  $\sqrt{s_{NN}} = 2.76$  TeV

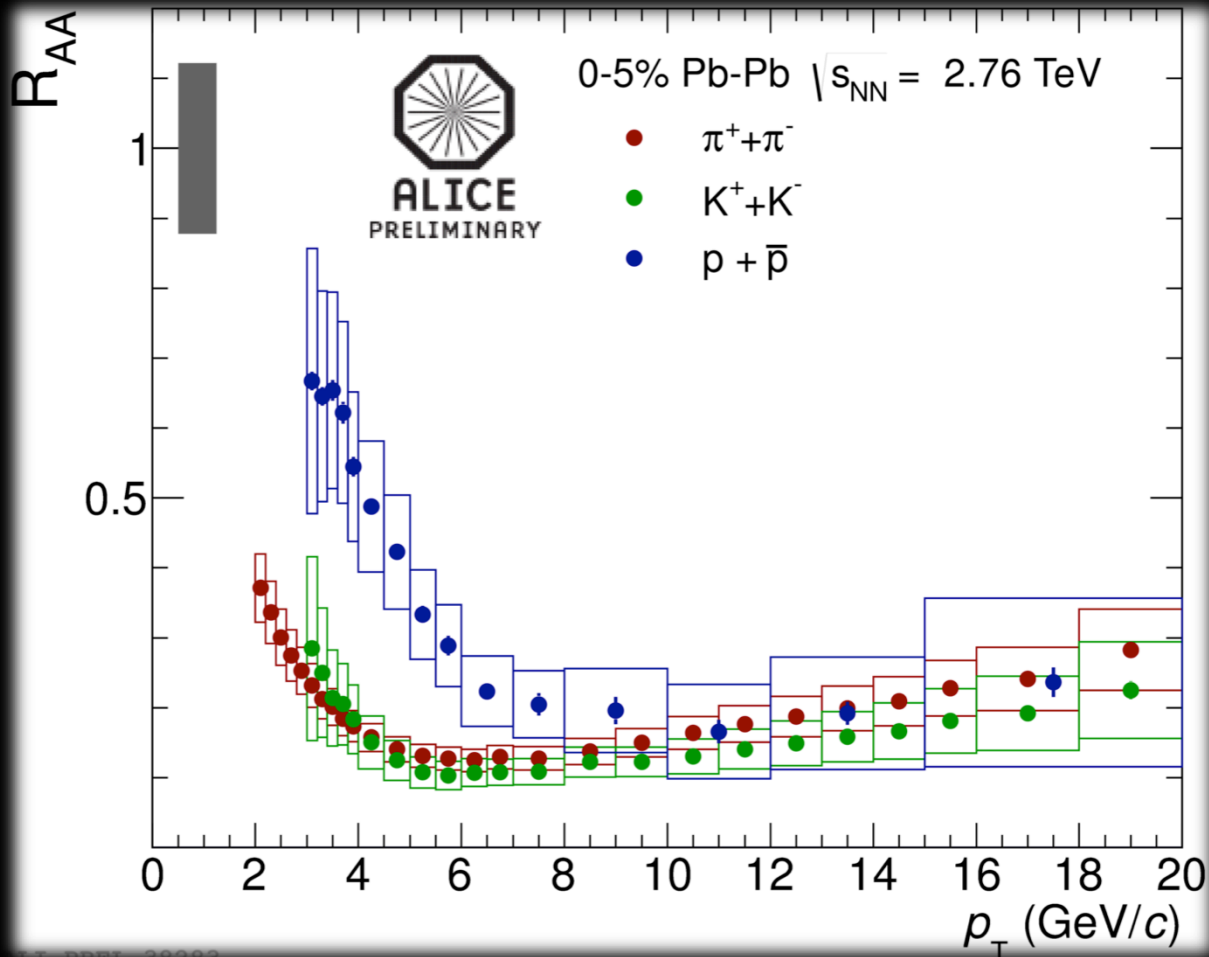
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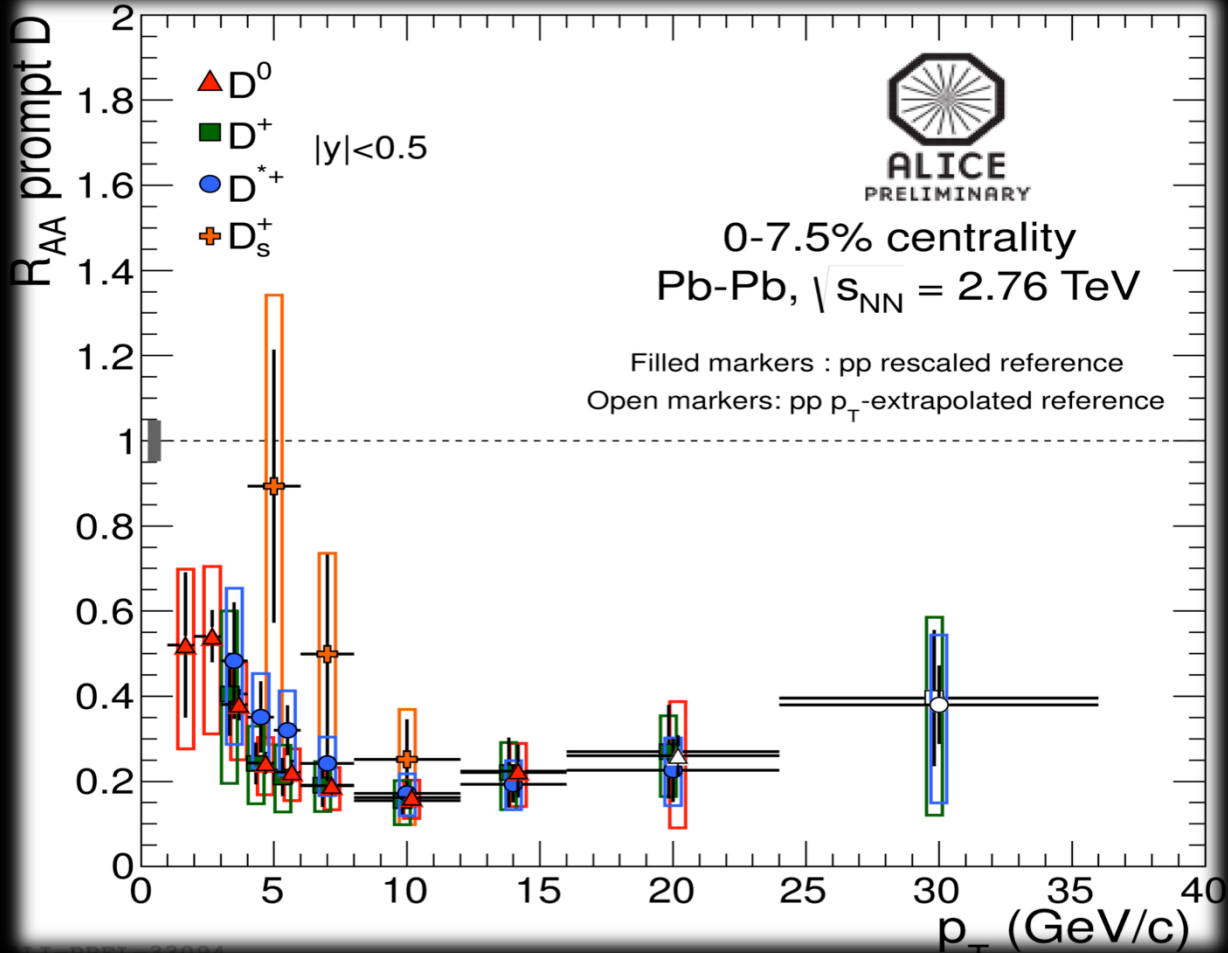
# EVERYTHING IS QUENCHED

## gluon and light quarks



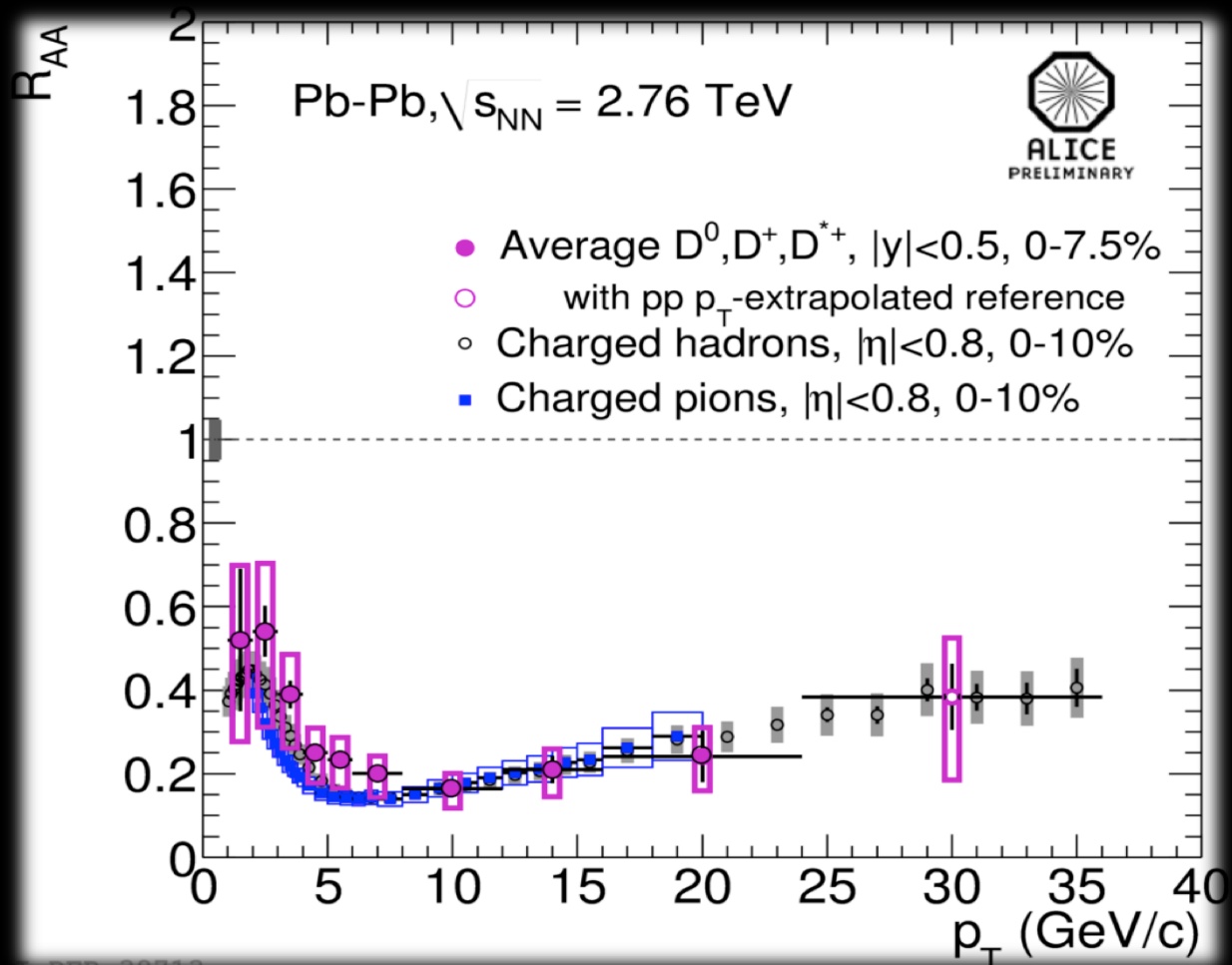
# EVERYTHING IS QUENCHED

## CHARM



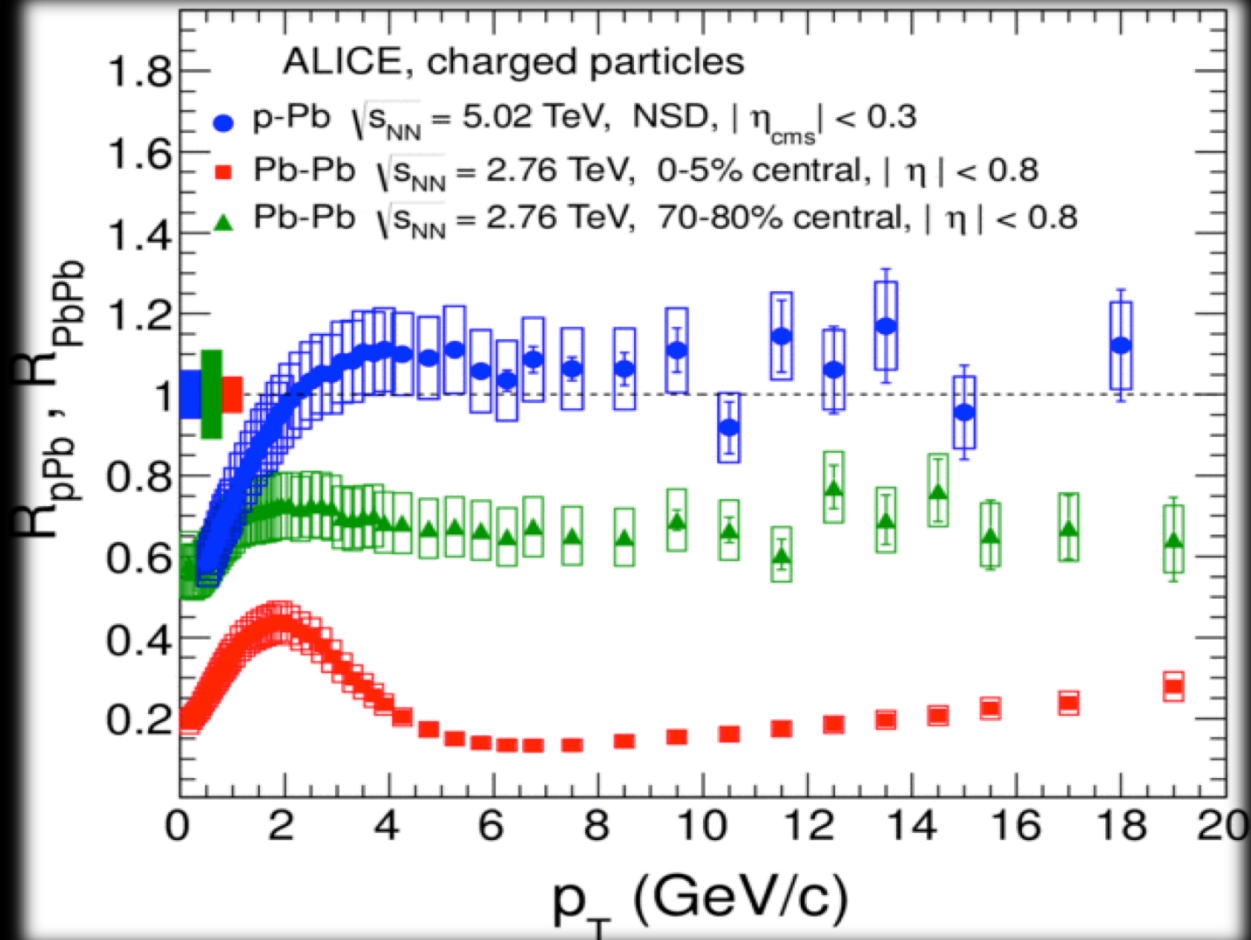
# EVERYTHING IS QUENCHED

## MASS HIERARCHY ?



# EVERYTHING IS QUENCHED

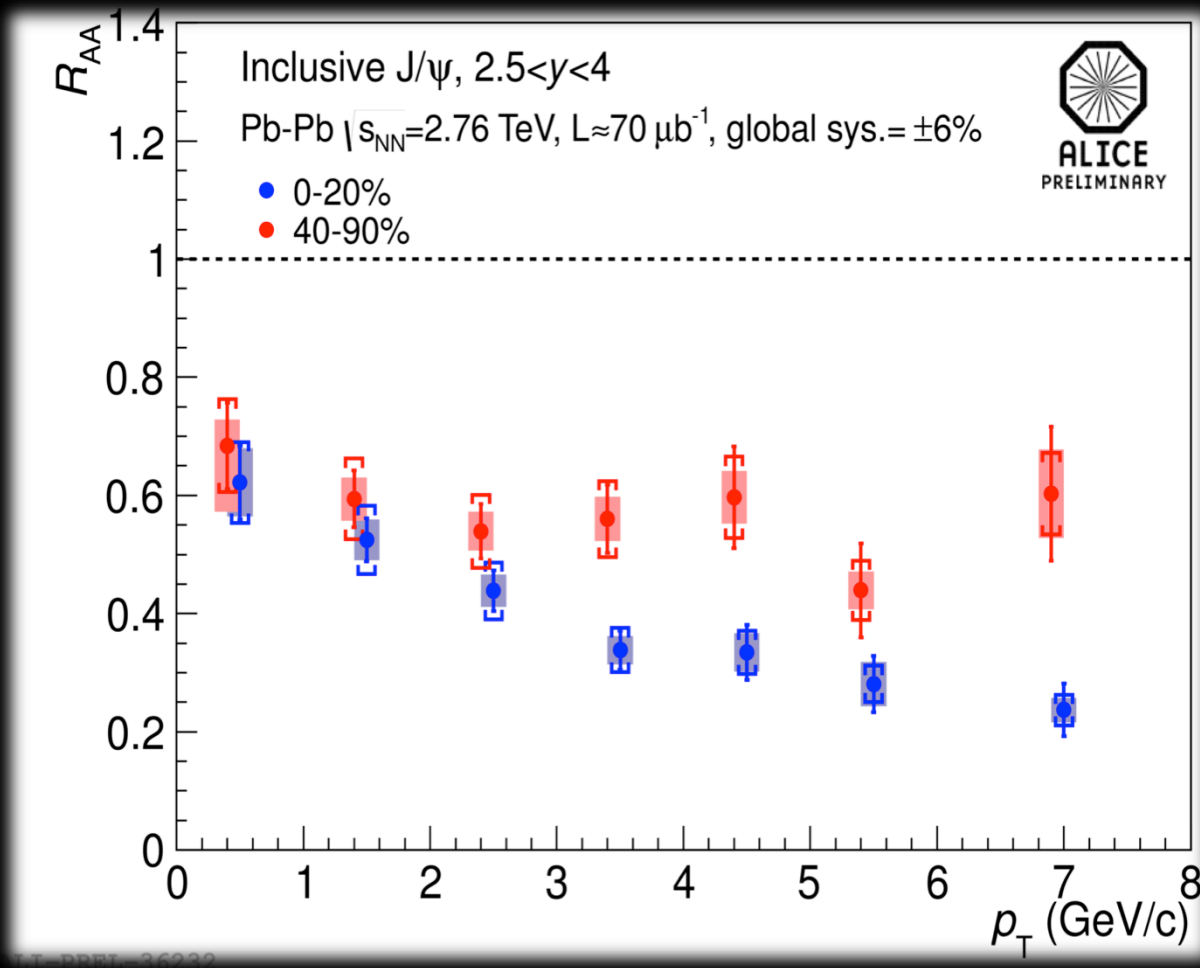
## IT'S A FINAL STATE EFFECT !





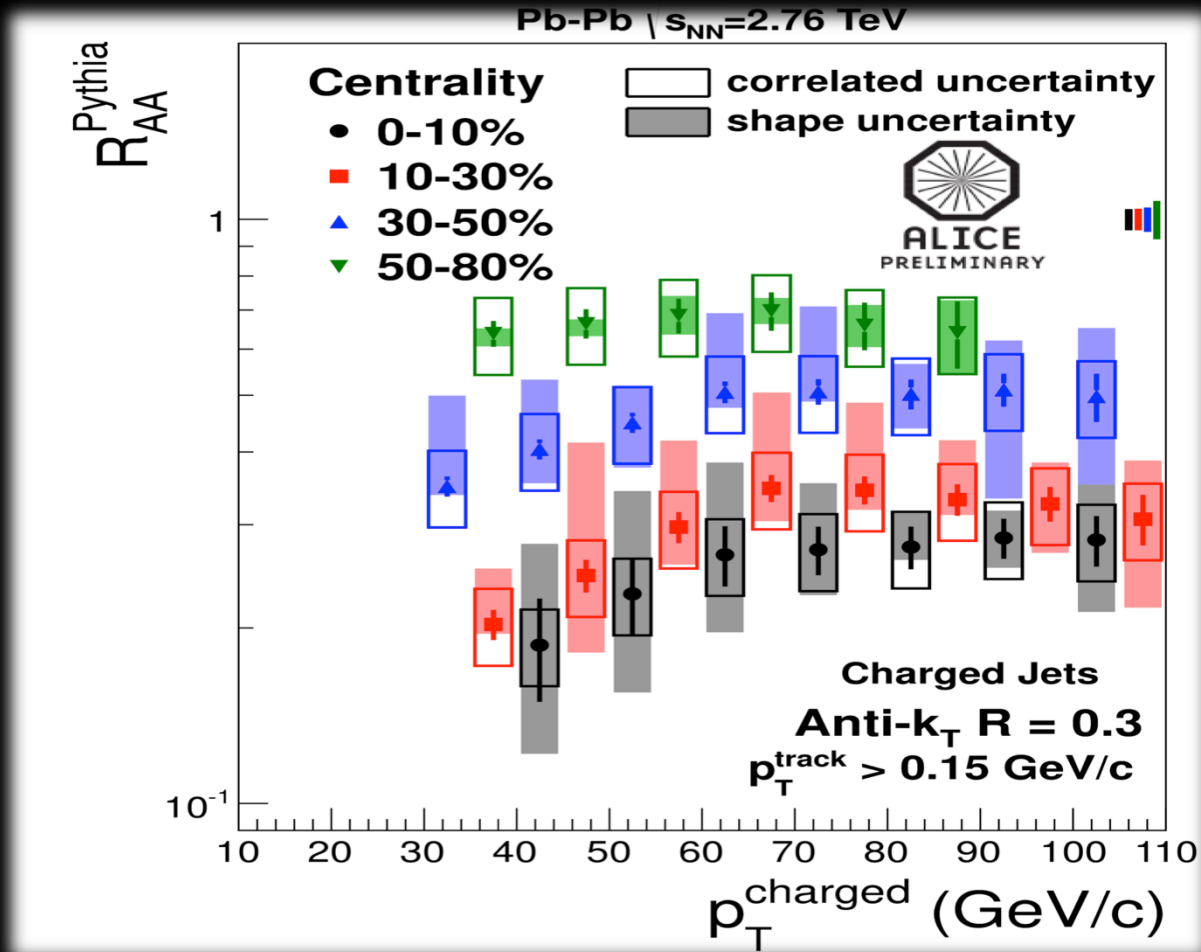
# EVERYTHING IS QUENCHED

## J/ $\Psi$ AS WELL



T. D. Brown - 36232

# EVERYTHING IS QUENCHED AND EVEN JETS





# SELECTED PHYSICS RESULTS

PbPb  $\sqrt{s_{NN}} = 2.76$  TeV

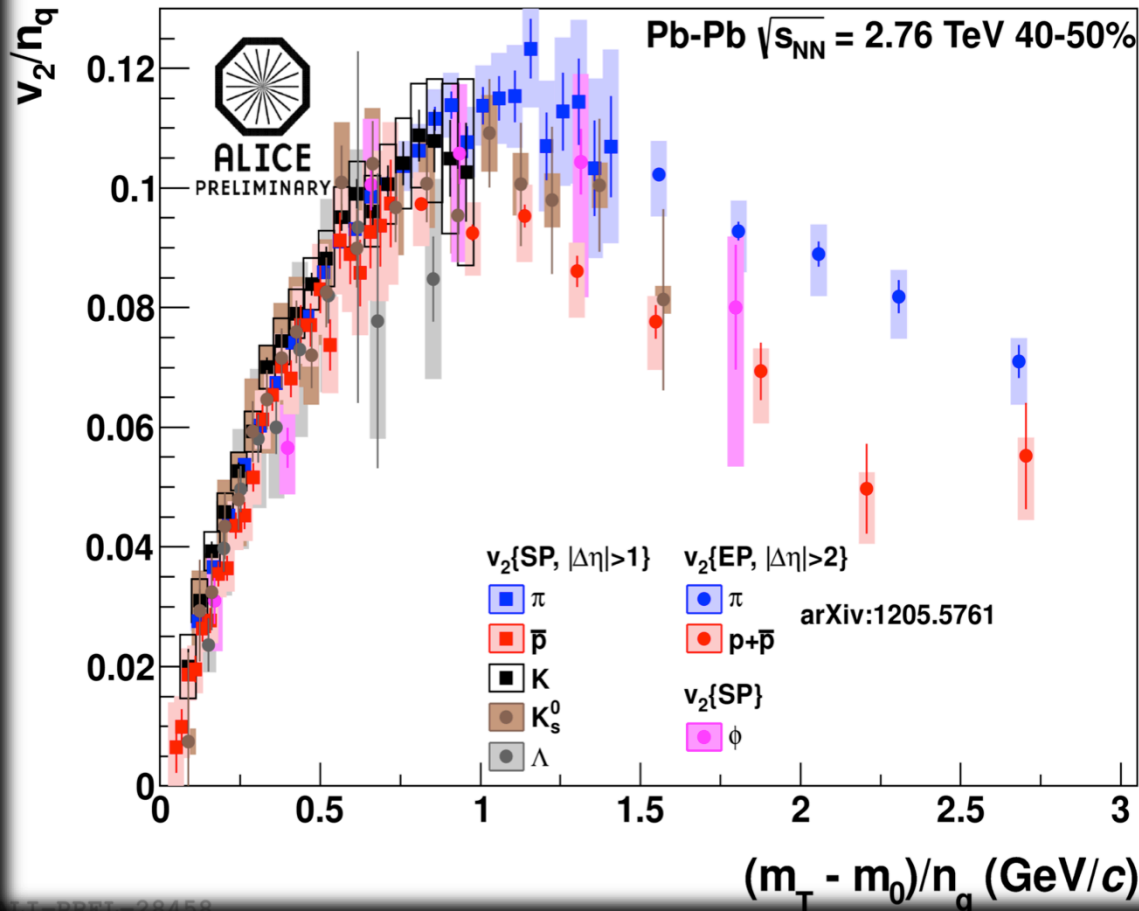
A hot system is formed

Everything is quenched

Everything flows

# EVERYTHING FLOWS

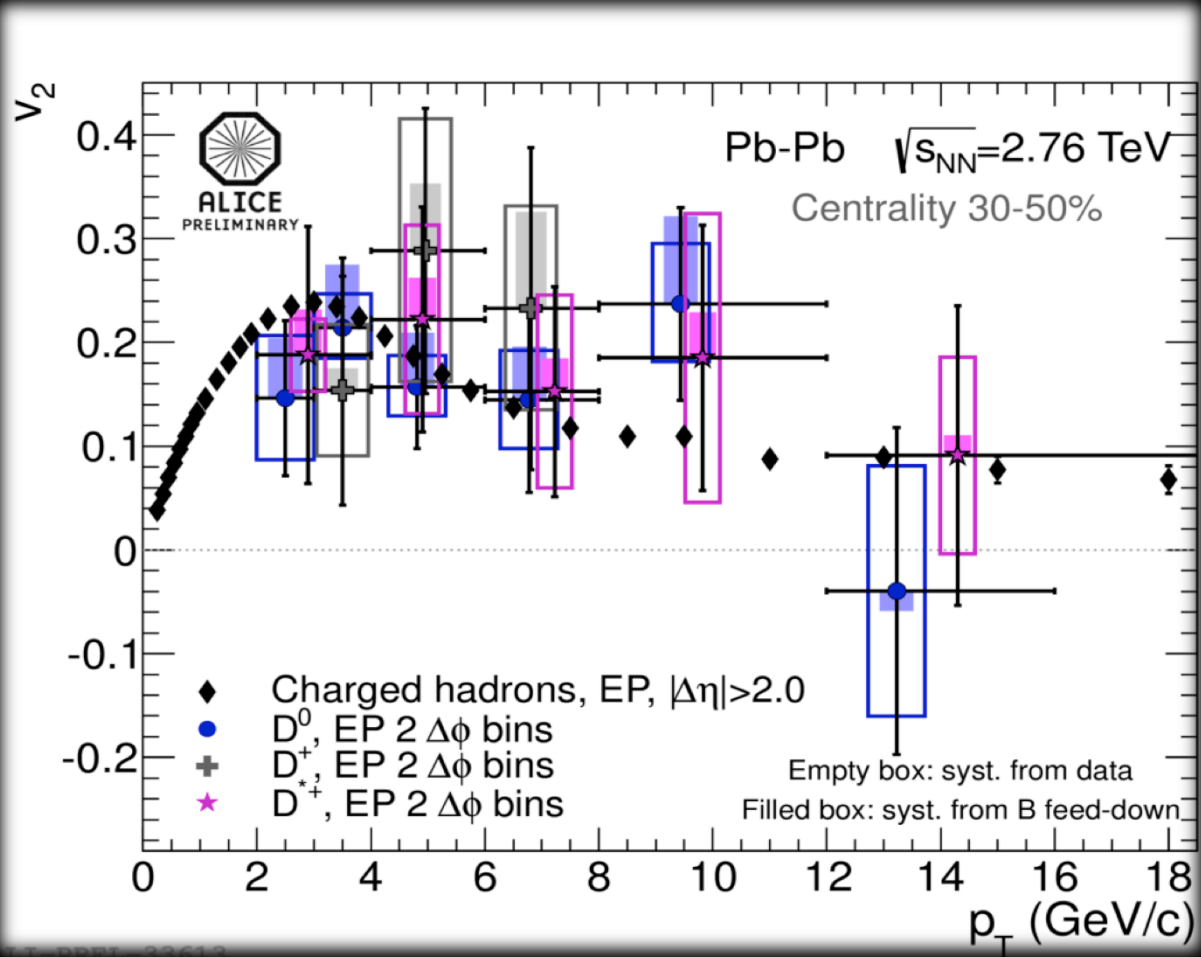
## light quarks, mesons, baryons



11-08-2012

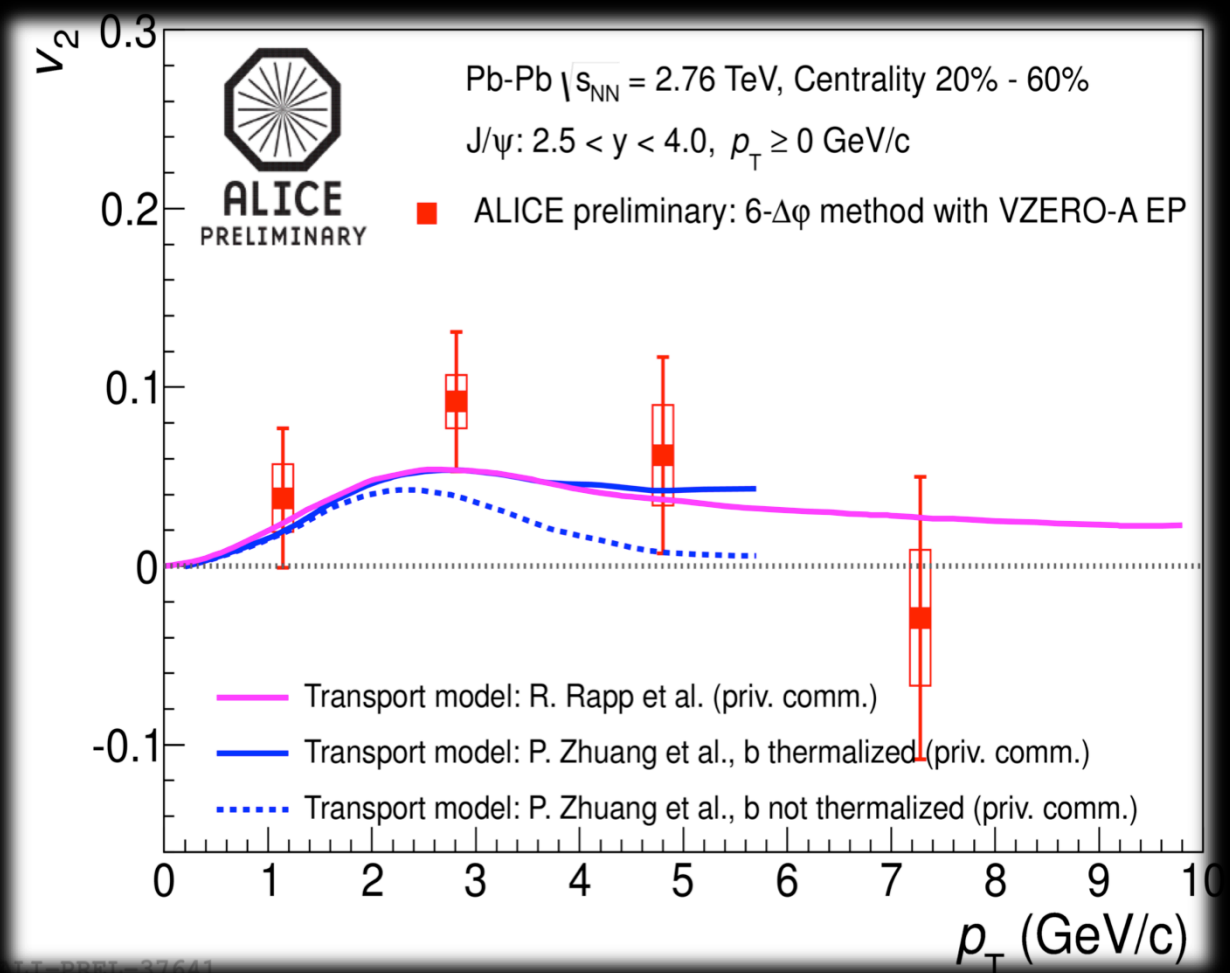
# EVERYTHING FLOWS

## CHARM



# EVERYTHING FLOWS

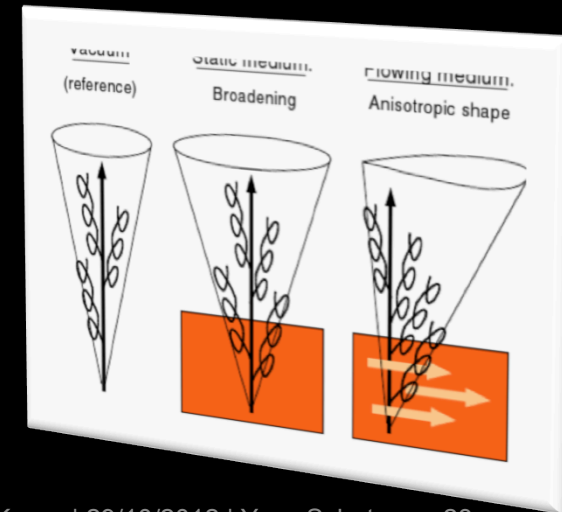
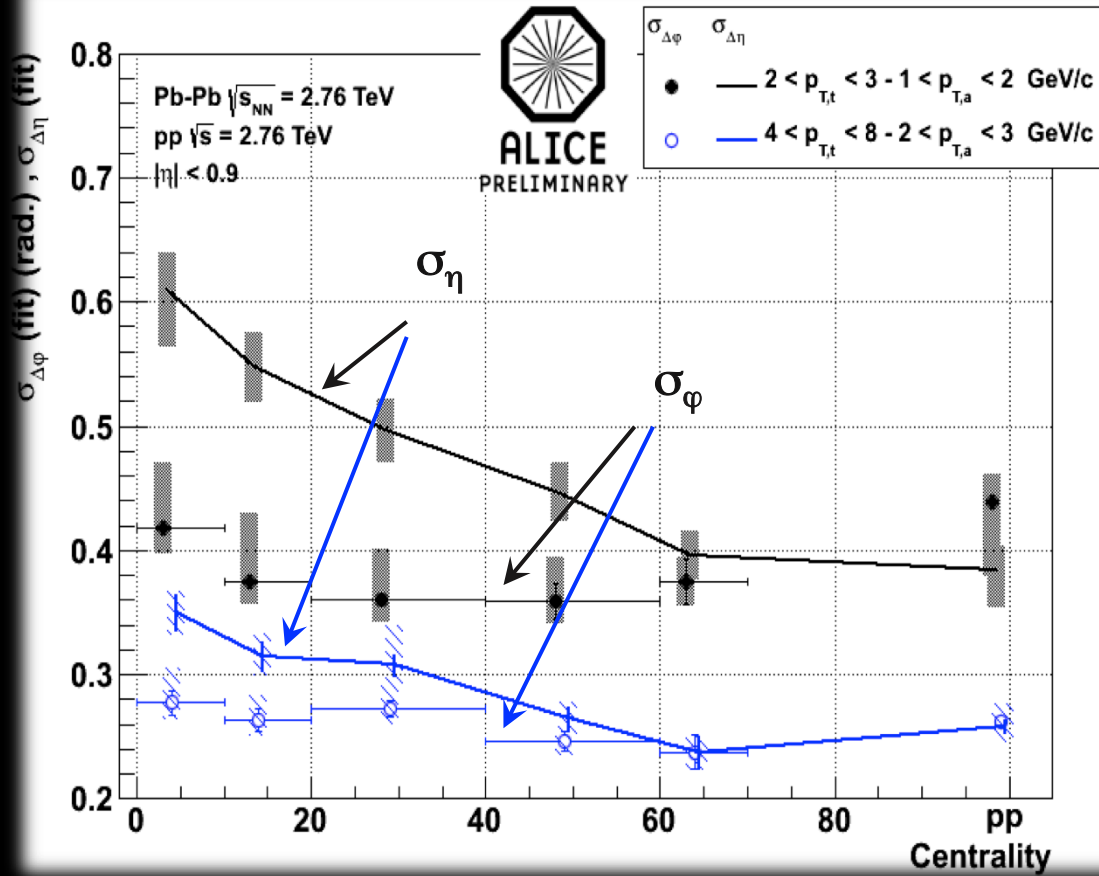
## J/ψ AS WELL



ALICE PRELIMINARY

# EVERYTHING FLOWS

## JETS BLOWN AWAY BY FLOW !



# SELECTED PHYSICS RESULTS

PbPb  $\sqrt{s_{NN}} = 2.76$  TeV

A coherent picture emerges where high  $p_T$  probes are strongly absorbed by a color dense medium and that heavy quarks thermalize in the medium





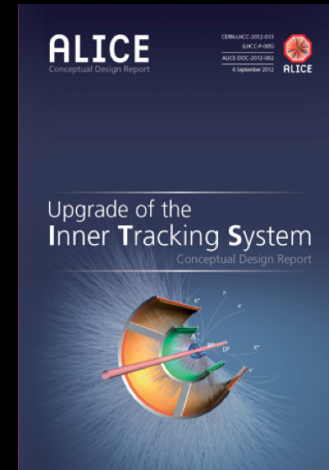
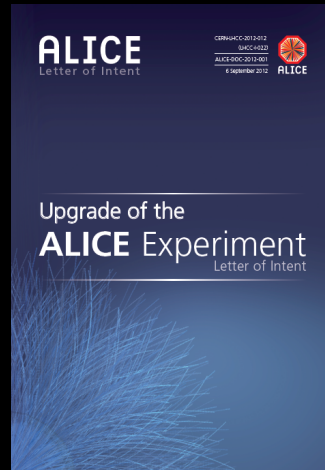
# UPGRADES

Provide a precise characterization of the high-density, high-temperature phase of strongly interacting matter

Requires high-precision, high-statistics measurements ( $10\text{nb}^{-1}@50\text{ kHz}$ )

Will be reached with the upgrade of the ALICE detector (2018) and with high luminosity running until the mid 2020's

# UPGRADES



LoI & CDR for ITS upgrade endorsed by LHCC (September 2012)

Next:

- TDRs to be submitted in about one year from now
- Decision by the Collaboration on additional projects (FoCal, MFT, VHMPID) by the end of the year
- Addendum to LoI to be submitted March 2013

# UPGRADES

Common Funds for upgrade: includes common cost for design and engineering, installation manpower, services, beam pipe, access and support structure

- 10% of the estimated cost (5,5 MCHF)
- To be shared proportional to M&O-A payers
- Payable in 6 installments 2013-2018: 12 kCHF/year + 4 kCHF/year

# KOREA AND THE UPGRADES

- **ITS**: participation to the CMS silicon sensor design & possibility for a production by a Korean company
- **VHMPID**: various contributions at the R&D phase (Gas system, transparency meter), DCS and beam test experiment
- **Computing**: code development for new architectures, Cloud model, fast simulation
- Ongoing discussions on further involvement in other projects



- ALICE had a great start and together with the pA run beginning of next year is on the way to consolidate the *Standard Model of Heavy-Ion Physics...*
- In the coming years (mid 2020's) and with its upgrade program ALICE is aiming for precision measurements on the fundamental properties of the QGP
- The sustained efforts of the Funding Agencies to support this endeavor is essential