

Soft Physics in ALICE

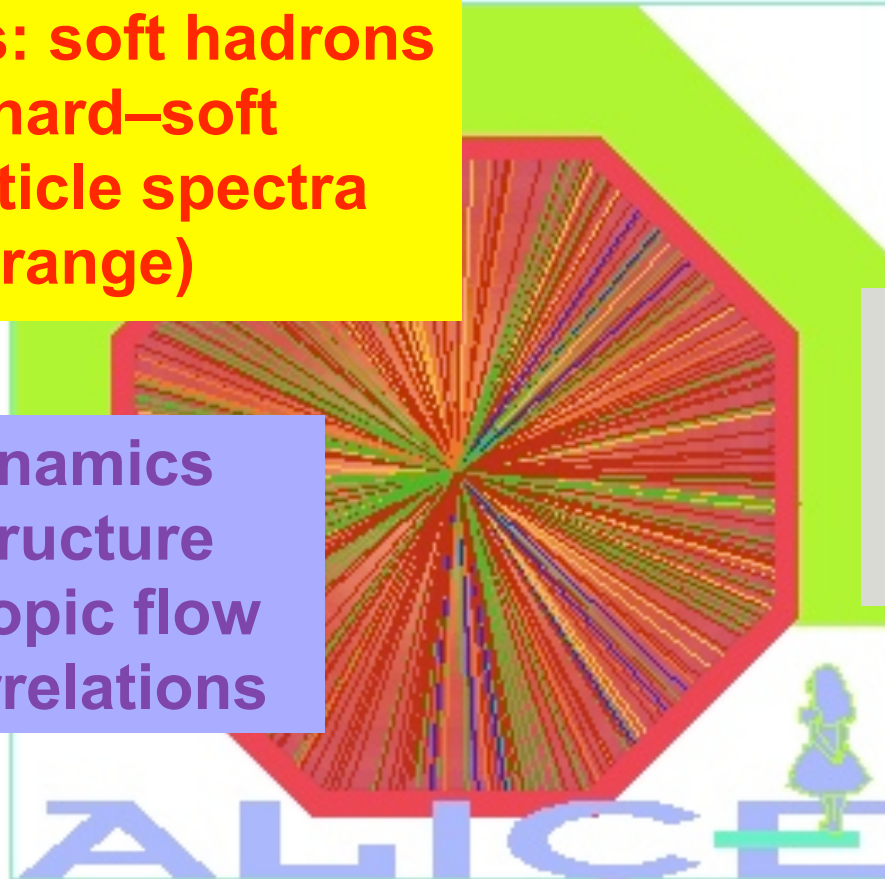
Global event properties

**Bulk properties: soft hadrons
+ interplay hard–soft
Identified particle spectra
(wide p_T range)**

**Expansion dynamics
Space-time structure
Radial, anisotropic flow
Momentum correlations**

**Chemical
composition
Hadronisation
mechanisms**

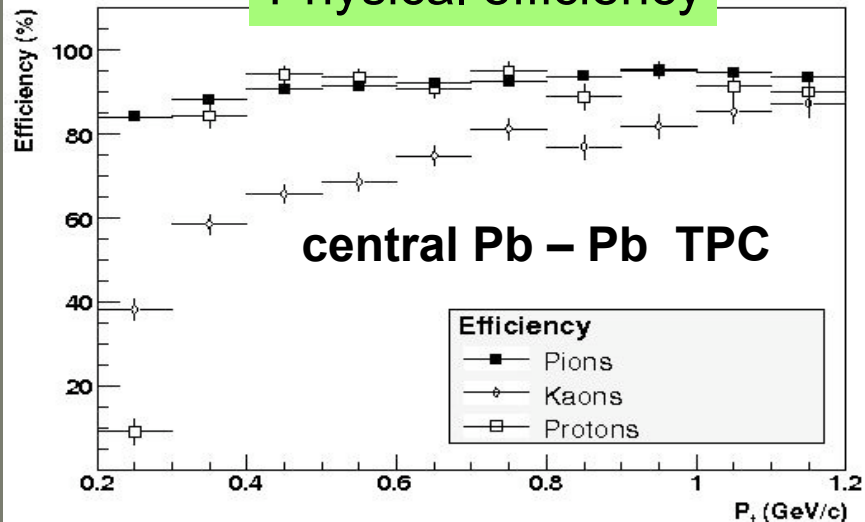
**Event by event physics
Fluctuations**



Tracking and particle identification

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Physical efficiency



For $dN_{ch}/dy = 4000$ in Pb-Pb

Reconstructed / generated ($|\eta| < 0.9$)
 ~ 90% for $p_T > 1$ GeV (limited by dead zones)

Protons : large absorption

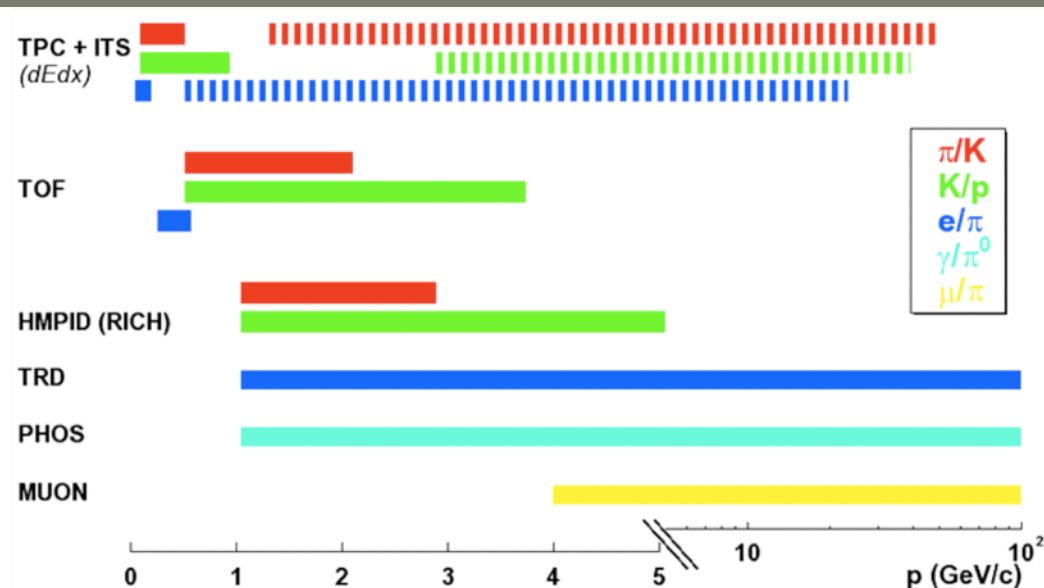
Kaons : in-flight decays

Momentum resolution:

~1% at $P_T = 1$ GeV/c, ~4% at $P_T = 100$ GeV/c

Precise vertexing (better than 100 μm)

Talks by I. Belikov
 and A. Kalweit



π, K, p : dE/dx (in TPC & ITS) + TOF and RICH

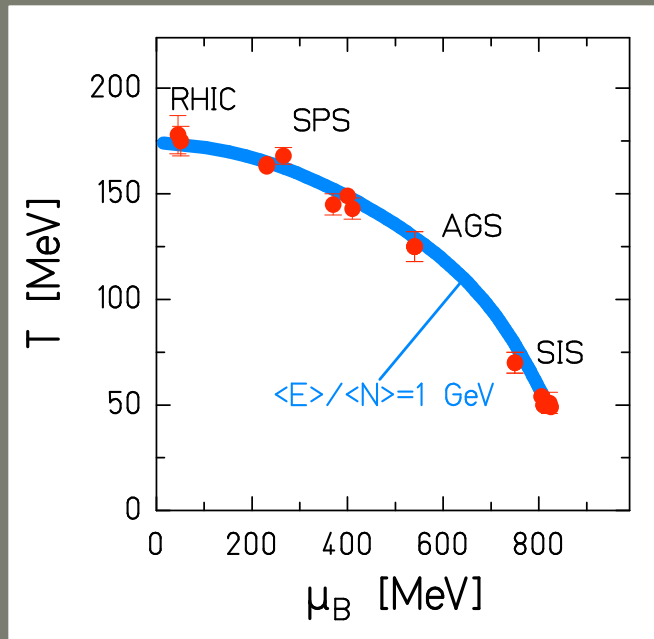
➡ $100 \text{ MeV} < p < \text{a few tens GeV}$

electrons: TRD ➡ $p > 1 \text{ GeV}$

muons: $p > 4 \text{ GeV}$

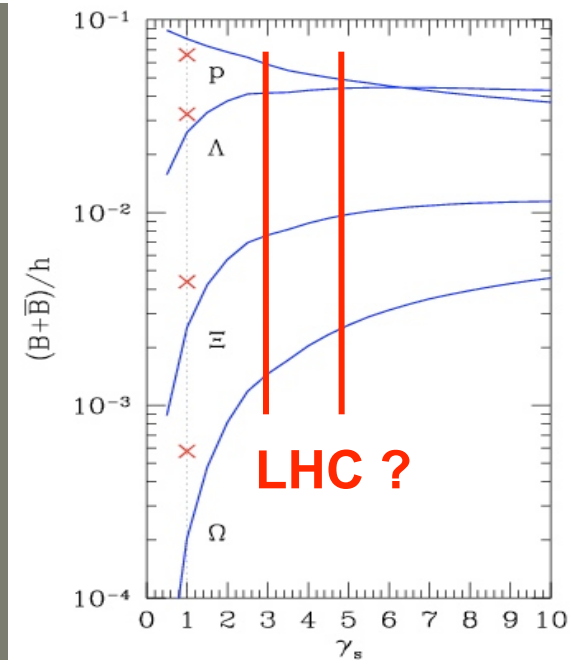
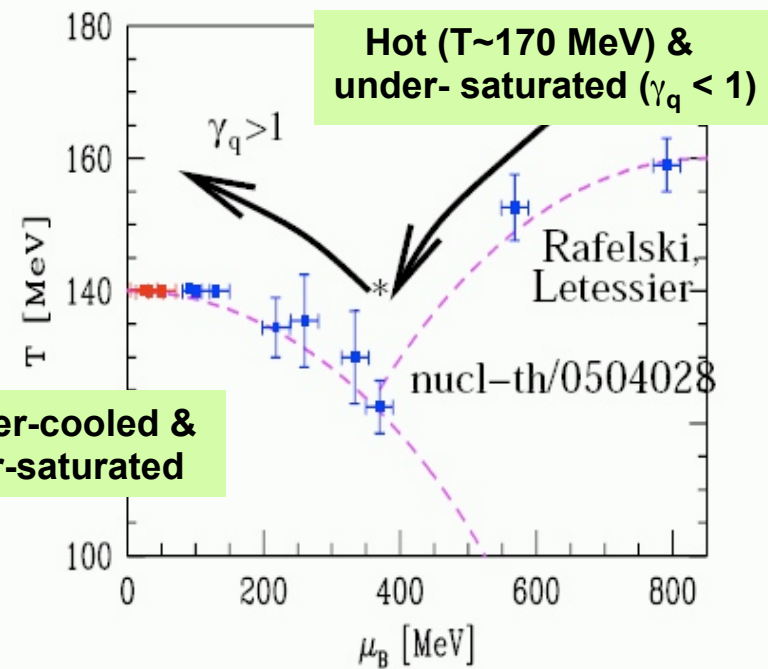
photons: PHOS ➡ $1 < p < 80 \text{ GeV}$

Chemical equilibrium vs non-equilibrium at LHC



Statistical hadron resonance gas model at equilibrium : $\rightarrow$ SPS $\rightarrow$ RHIC $\rightarrow$ LHC ($T \sim 170$ MeV, $\mu_B \sim 1$)

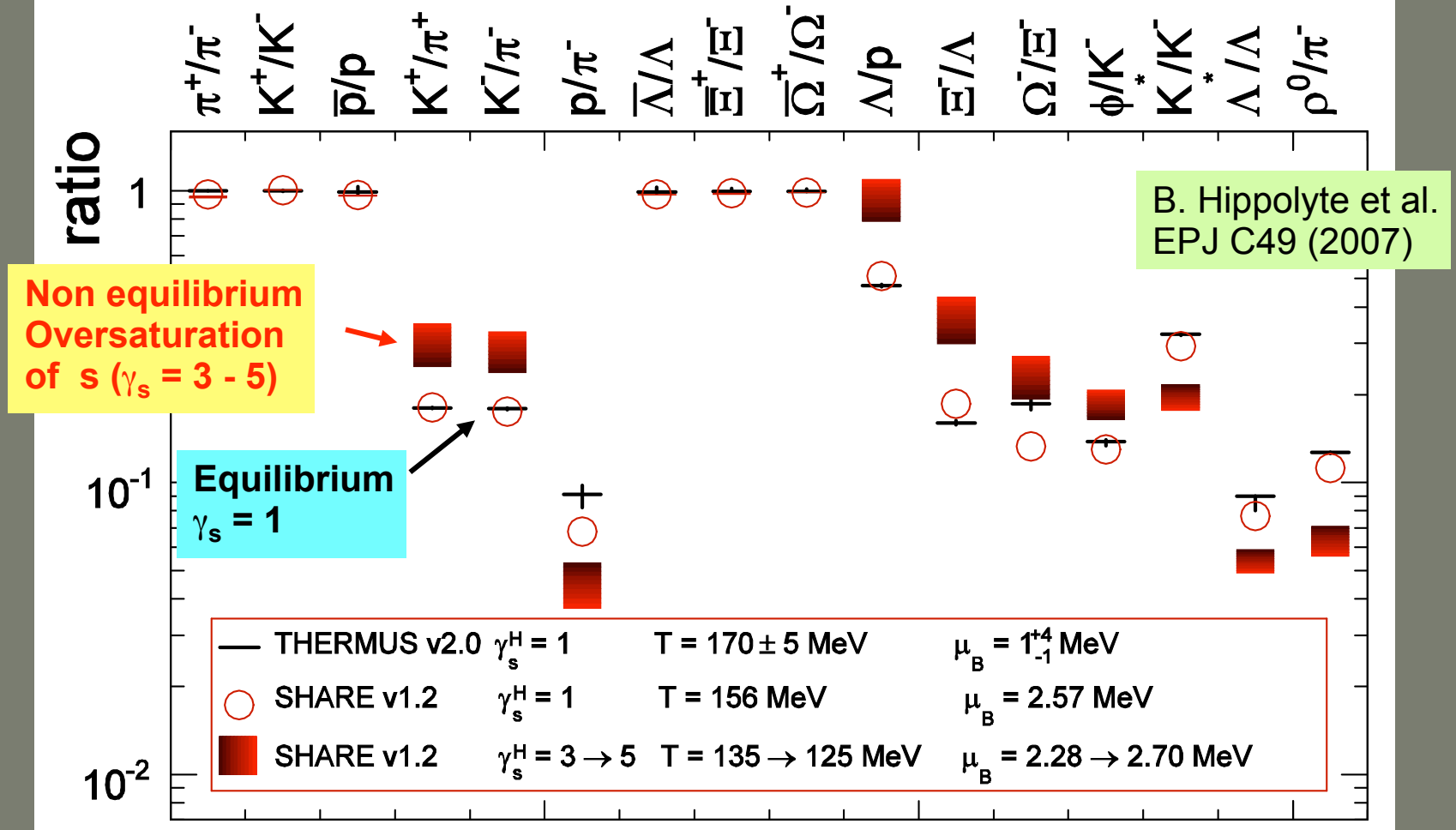
Hadronization from a super-cooled ($T \sim 140$ MeV) over-saturated system with higher entropy $\rightarrow$ out of equilibrium strangeness abundance



Equilibrium versus non equilibrium at LHC

4

ALICE Estimates : Equilibrium vs Non Eq. particle ratios



And many other questions: strangeness enhancement % energy
 Correlation volume ($N_{\text{part}} \rightarrow \text{GC}$, $N_{\text{bin}} \rightarrow \text{hard processes}$) ? Evolution in pp ?

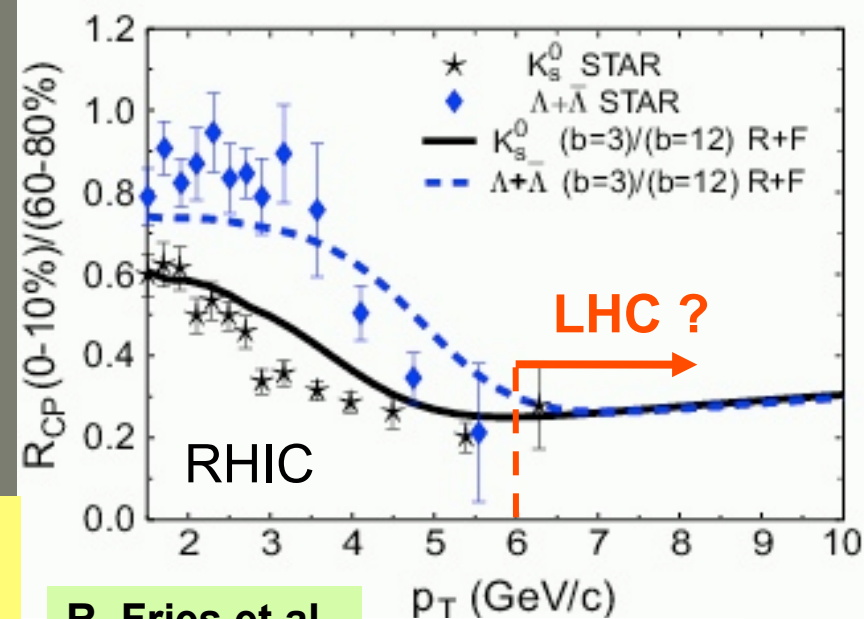
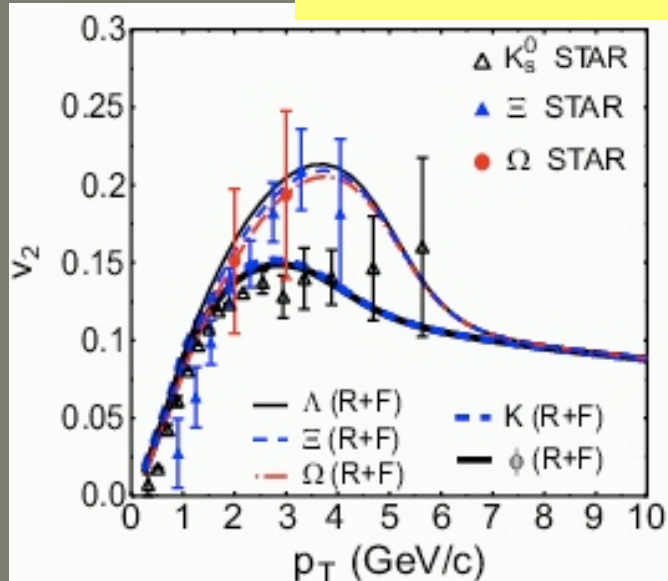
Talks by I. Kraus, H. Oeschler

Hard / soft interplay at intermediate p_T

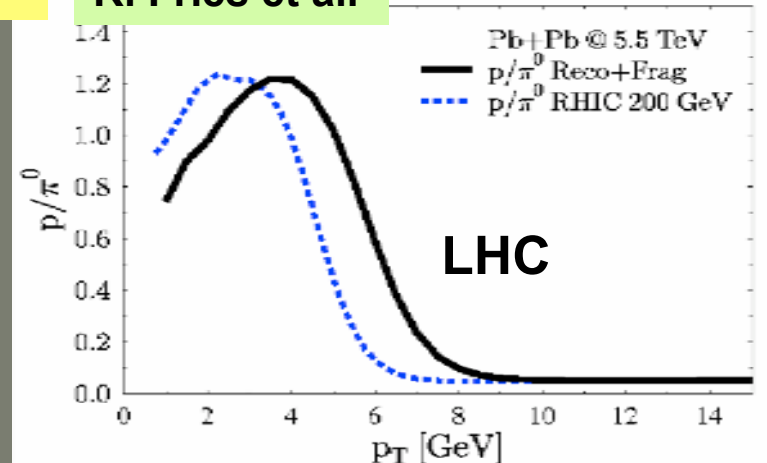
- R_{cp} : central over peripheral yields/ $\langle N_{bin} \rangle$
- Baryon/meson ratio
- Elliptic flow

Parton recombination / coalescence
+ pert. QCD: parton fragmentation ?

Strange particles give
access to a wide p_T range

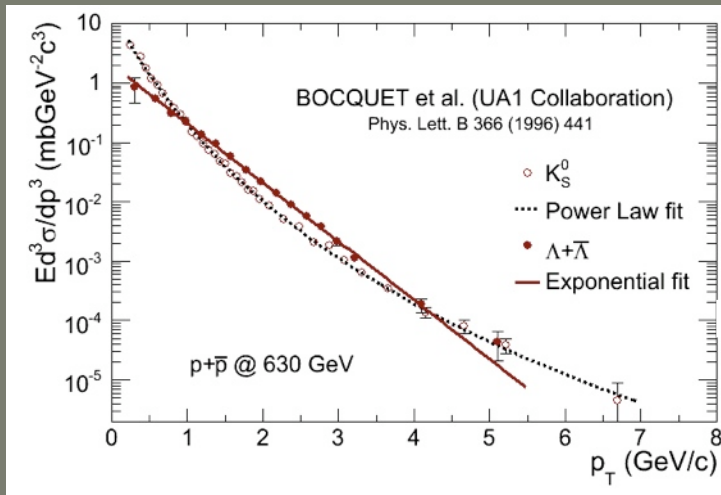


R. Fries et al.



But baryon & meson production
must be first understood in pp !

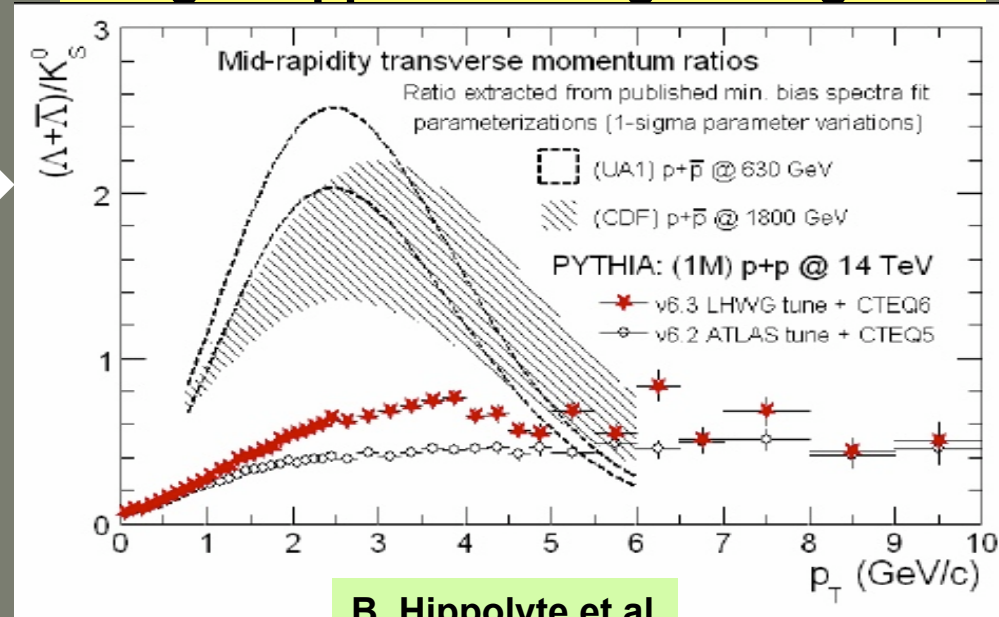
Strange baryon / meson ratio



Extracting mixed ratio from 1996 UA1 strange particle data (H. Ricaud)

This feature is not observed in pp PYTHIA simulations and ratio at 14 TeV stays well below unity.

Ratio at mid- p_T already surprisingly high in pp data at high energies



B. Hippolyte et al.
EPJ C49 (2007)

Important evolutions in PYTHIA :
 - multiple parton interactions
 - New PDF

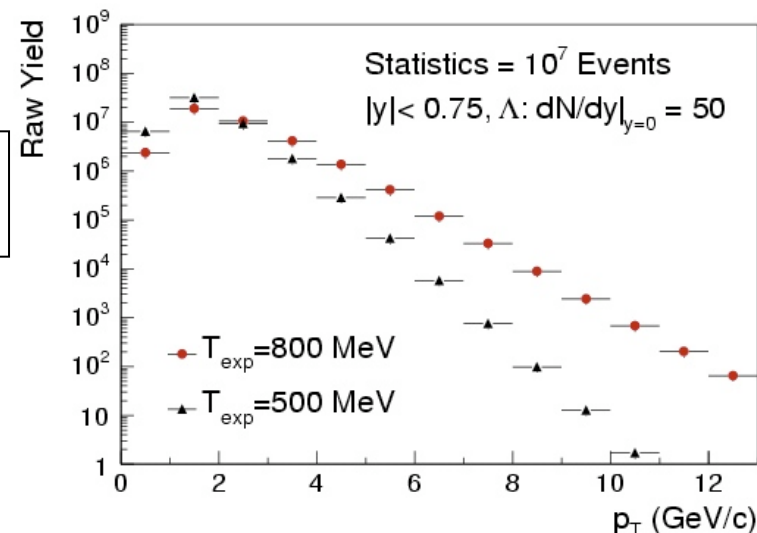
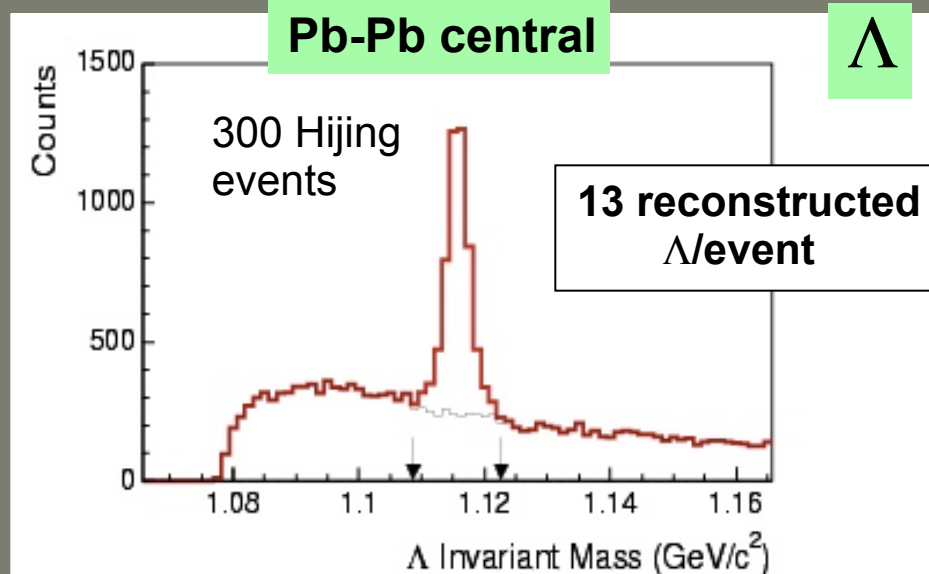


Better but still missing a factor > 2 w.r.t
 RHIC $\rightarrow$ UA1 $\rightarrow$ CDF extrapolations

What about EPOS and collective effects in pp ?
Is Strangeness production different in the bulk and in jets ?
 Talks by S. Porteboeuf and K. Werner

Topological identification of strange hadrons

Statistical limit for 1 year: $\sim 10^7$ central Pb-Pb, 10^9 min. bias pp
 $p_T \sim 13 - 15$ GeV for K^+ , K^- , K^0_s , Λ $p_T \sim 9 - 12$ GeV for Ξ , Ω

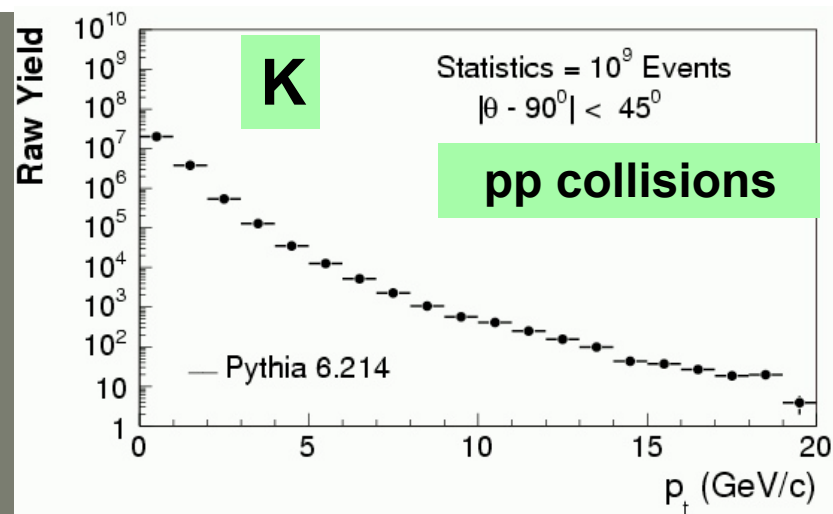


Secondary vertex and cascade finding

Reconstruction rates:

Ξ : 0.1/event Ω : 0.01/event

Identification of K^+ , K^- via
their kink topology $K \rightarrow \mu\nu$



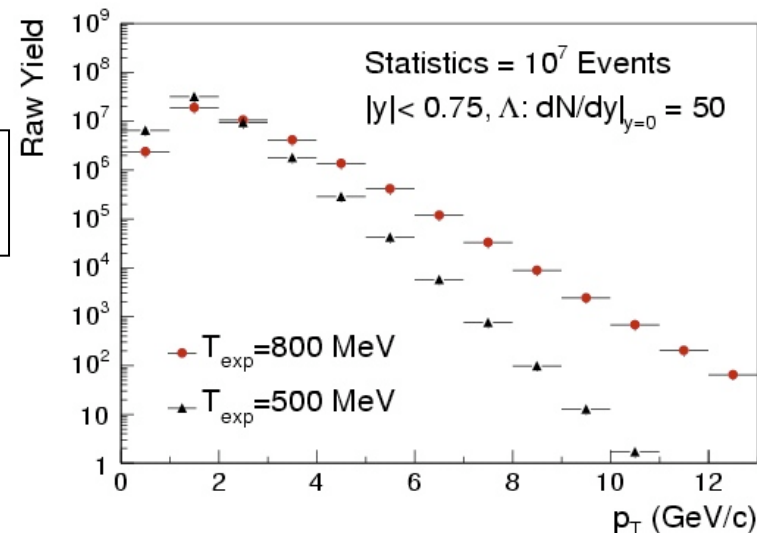
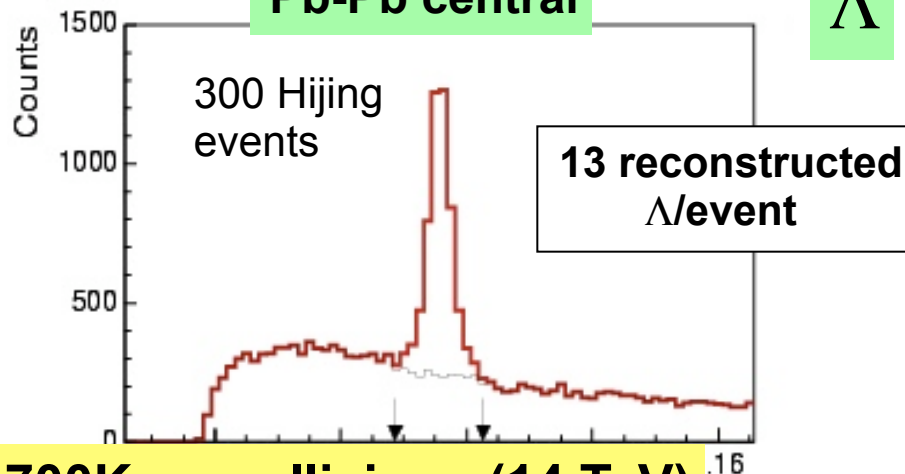
Talks by H. Ricaud and A. Maire

Topological identification of strange hadrons

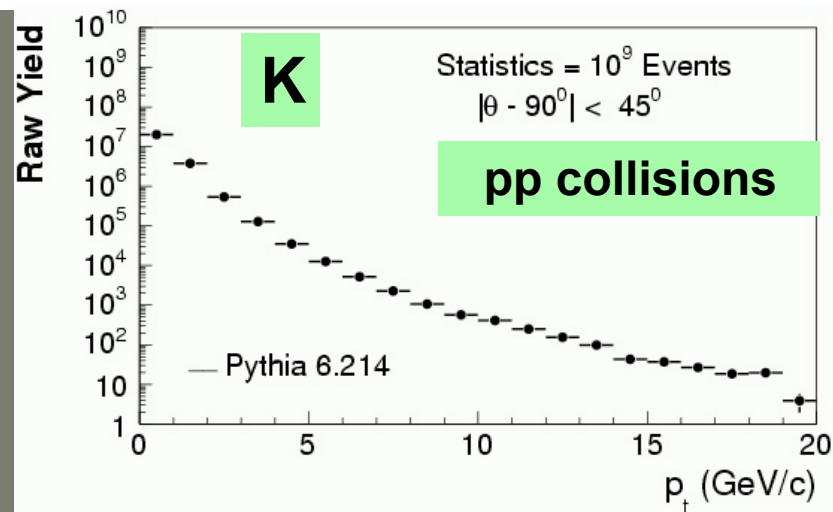
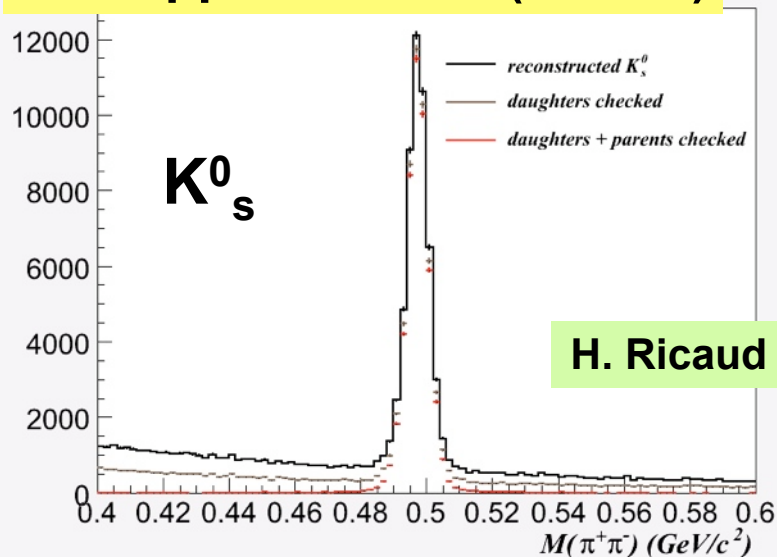
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Pb-Pb central

Λ



700K pp collisions (14 TeV)



Talks by H. Ricaud and A. Maire

With 1 month of Pb-Pb collisions (10^7 central + 10^7 MB events) many questions left open from the RHIC era should be answered ...

But before we will have a very rich program in pp

LHC commissioning with optimal luminosity ($<10^{30} \text{ cm}^{-2}\text{s}^{-1}$)

benchmark for Pb-Pb + genuine pp physics

Study of underlying event structure, ...

Advantage of ALICE: p_T cut-off $\sim 100 \text{ MeV}$

And we hope many surprises both in Pb-Pb and in pp !!!!

Last talk this evening by B. Hippolyte