Hadronization

- Idea: what to follow up on and how?

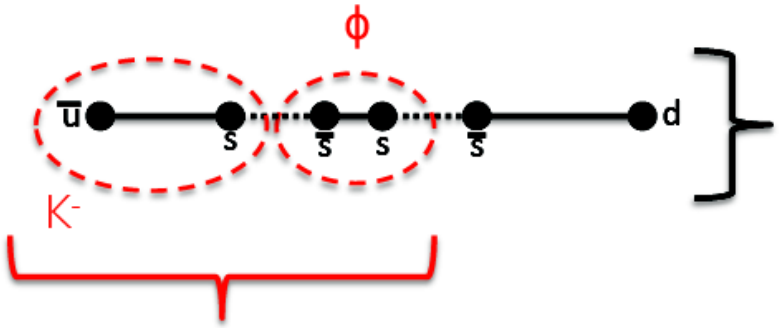
Concrete plans for QM19

- Working on π, K, p (Omar), Λ, K0s (Oliver), Φ (Adrian), Ξ (Peter) as a function of transverse spherocity (pT=1) and R_T
- Working on Ξ-π, Ξ-K, and Ξ-p (Jonatan) correlations
- After QM, plan to focus on Φ and Ξ (Jonatan, Adrian and Peter)

Hadronization: How does the hadronization process depend on the properties of the hadronizing system?

UNICAMP

How can we distinguish statistical hadronization and strings?

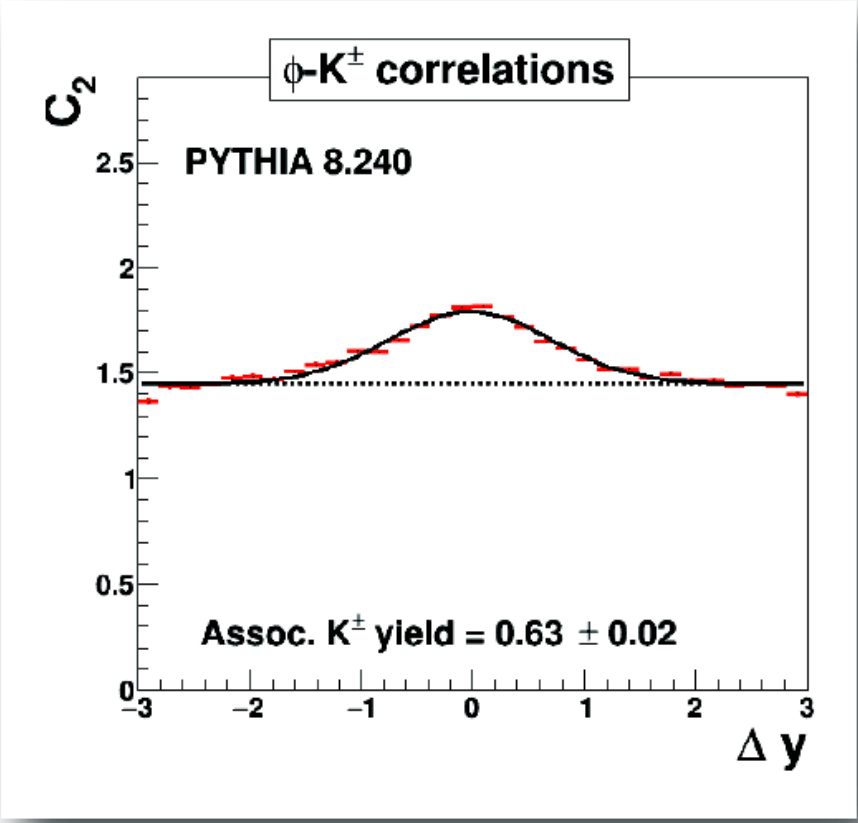


In the string model: ϕ comes with extra kaons (depending on original $q\bar{q}$ pair)

Creation of one ϕ in string or rope :

- Via 2 $s\bar{s}$ breakups: $P(1\phi) \propto P(s\bar{s})^2 \cong (1/7)^2$

- 0.6 charged kaon per phi (+ 0.6 neutral kaon) ~ 1.2 kaons per phi
- Clear prediction
- Rapidity correlations give additional information
- More: KϕK ordered in rapidity (along string)

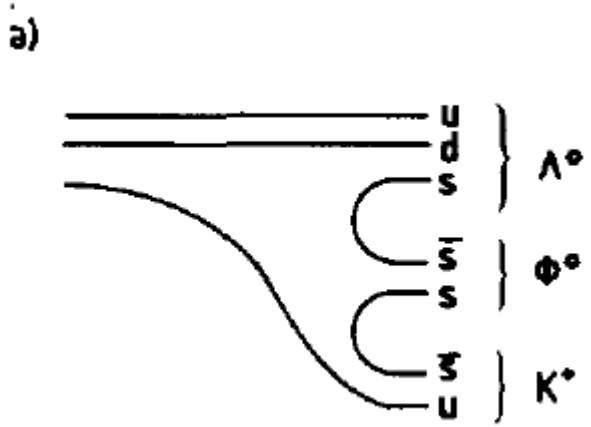


Old measurement (thanks to Gösta)

Volume 163B, number 1,2,3,4 PHYSICS LETTERS 21 November 1985

EVIDENCE FOR POMERON SINGLE-QUARK INTERACTIONS IN PROTON DIFFRACTION AT THE ISR

R608 Collaboration



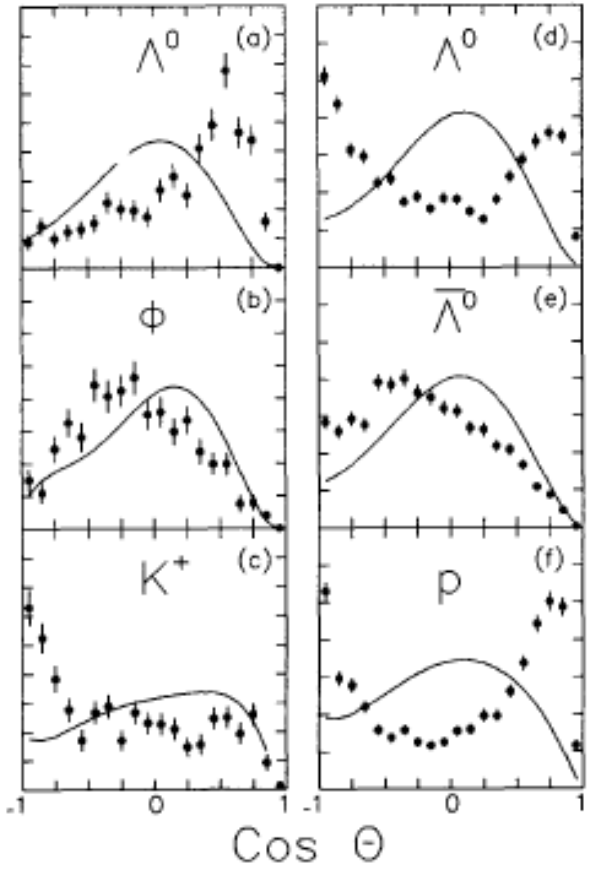
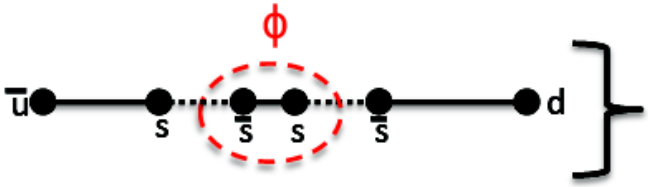


Fig. 2. Distributions in cosine of Gottfried–Jackson angles of individual particles in the forward systems; (a)–(c) Λ^0, ϕ^0, K^+ in reaction 1; (d)–(f) Λ^0, $\bar{\Lambda}^0$, p in reaction 2. Solid lines are the results of Monte Carlo calculations for isotropic phase-space events passed through our apparatus acceptance.

How can we distinguish statistical hadronization and strings?



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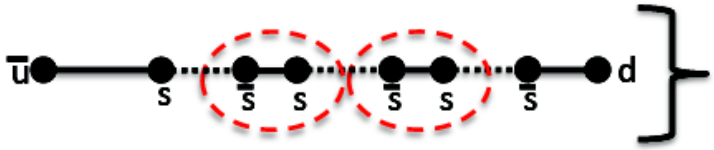
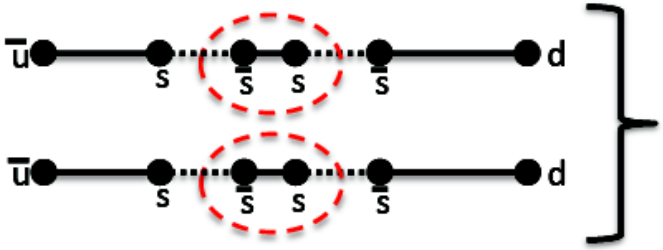


Creation of 2 ϕs in string or rope :

- Via 3 $s\bar{s}$ breakups: $P(2\phi) \propto P(s\bar{s})^3$



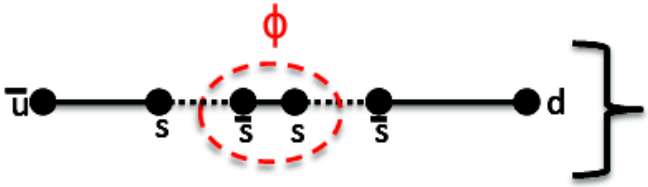
Creation of 2 decorrelated ϕs:

- Strings: via 4 $s\bar{s}$ breakups: $P(2\phi) \propto P(s\bar{s})^4$
- Stat. hadr. / other uncorrelated: $P(2\phi) \propto P(1\phi)^2$

Generally:

- String model: **$P(2\phi) > P(1\phi)^2$**
- Uncorrelated: **$P(2\phi) = P(1\phi)^2$**

How can we distinguish statistical hadronization and strings?



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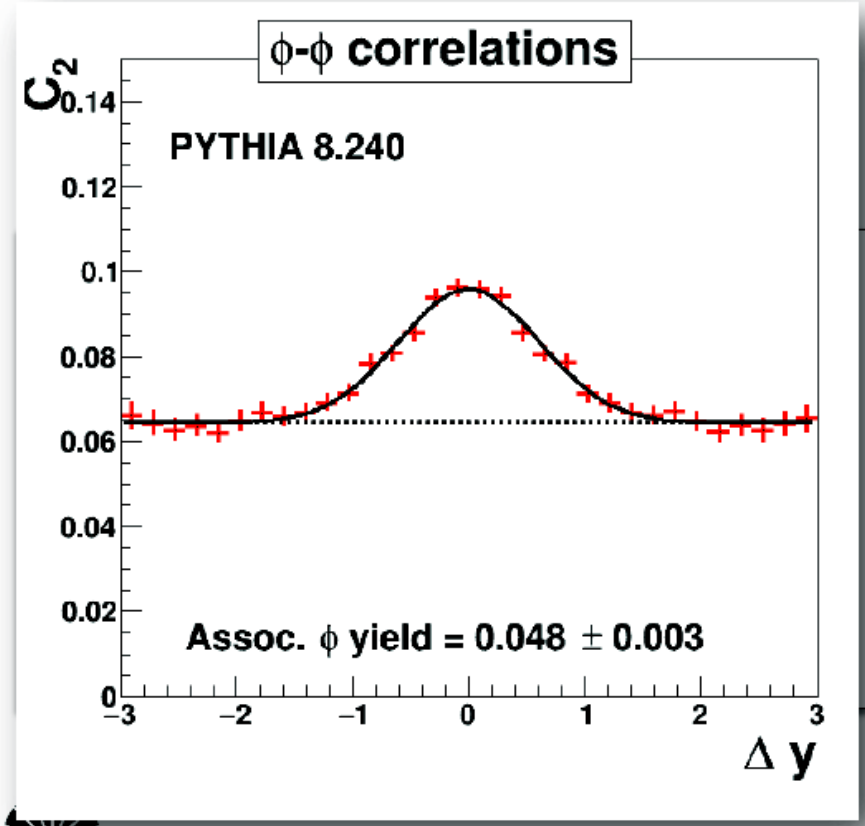

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Generally:
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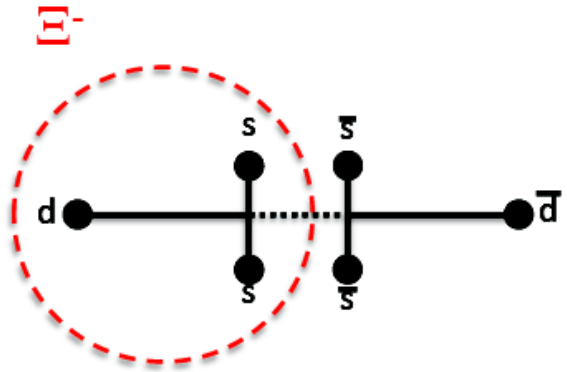
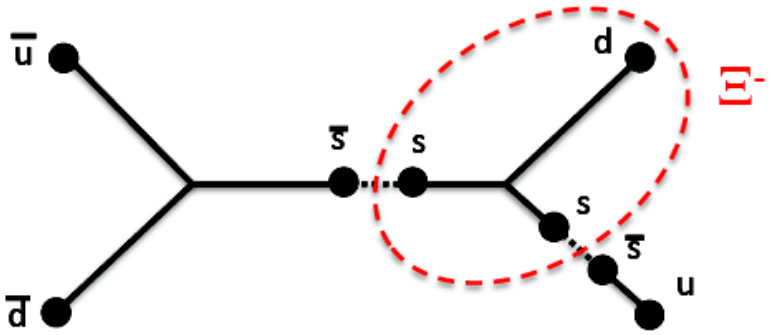
Strangeness production: strings, junctions, ropes, …



Creation in string or rope :

- Via diquark production
- Suppressed rate (high diquark mass)
- Accompanied by strange antibaryon nearby in rapidity

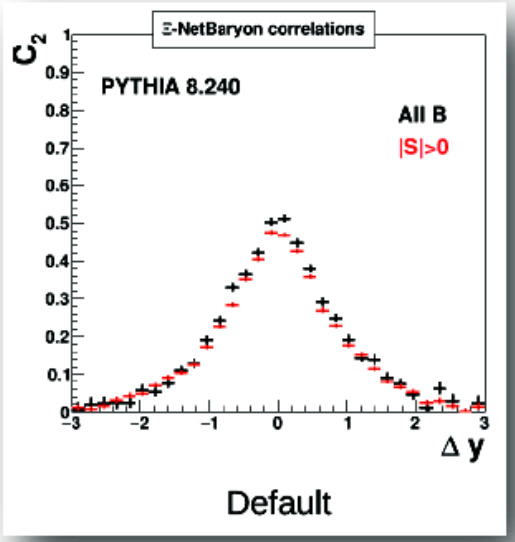
→ Flavour-baryon number correlated

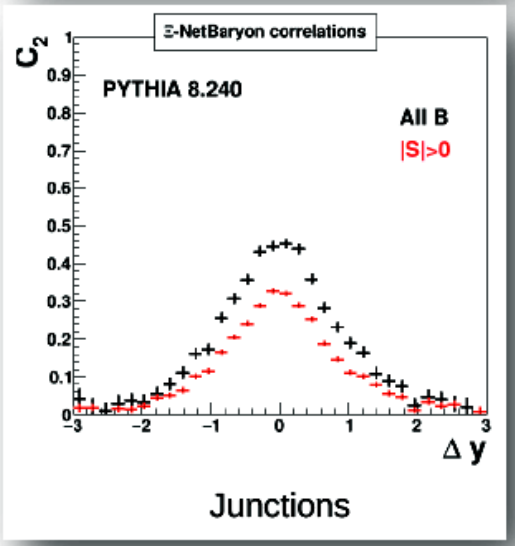


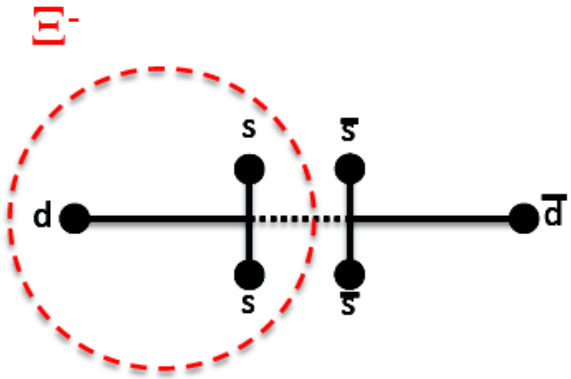
Creation in junction-antijunction:

- Via 2 $s\bar{s}$ breakups
- Not that suppressed
- Accompanied by strange meson(s)
- Balancing baryon potentially further away in rapidity
- Flavour-baryon number decorrelated

Strangeness production: strings, junctions, ropes, …



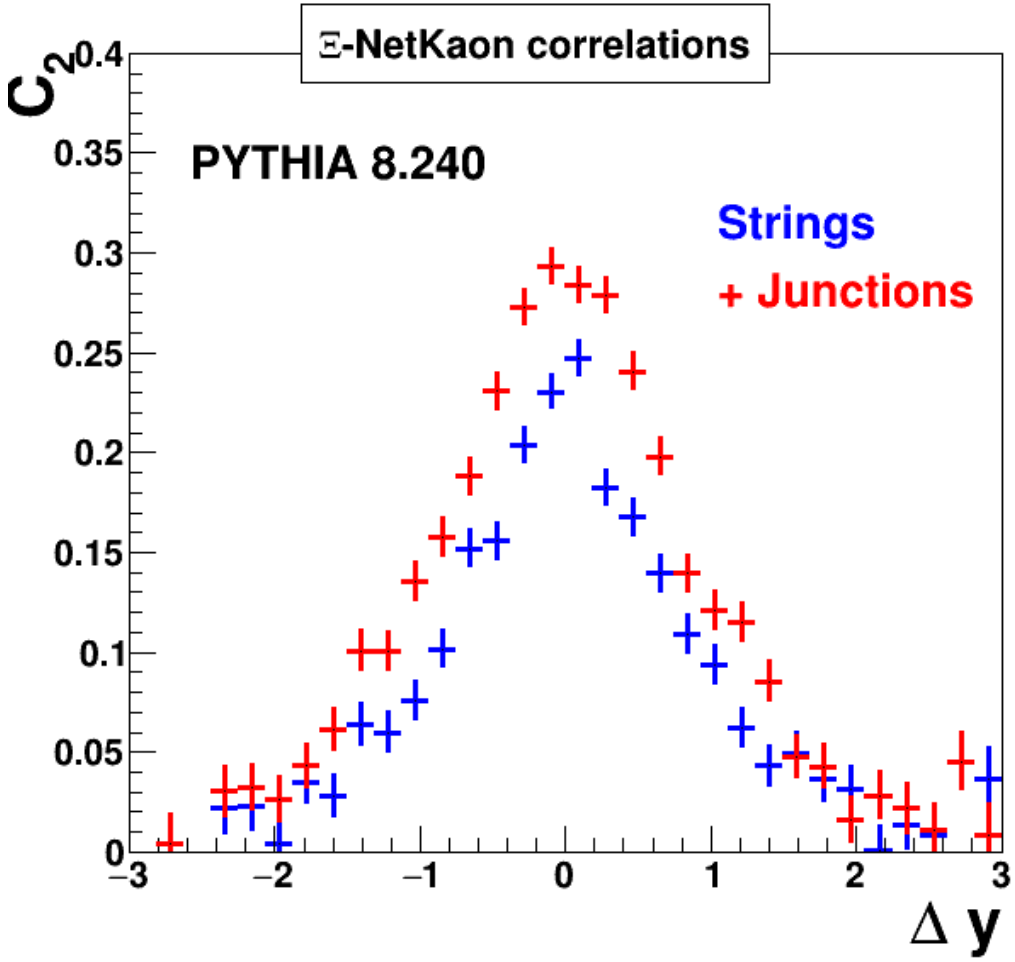




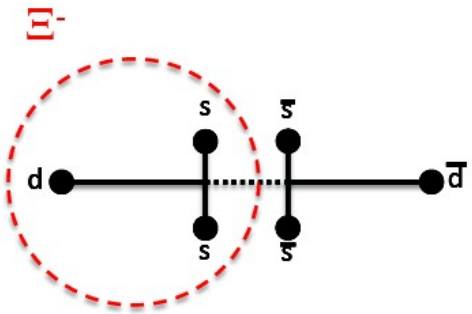
- In the string / rope case in PYTHIA: the antibaryon is at least single-strange
- With junctions: not so much

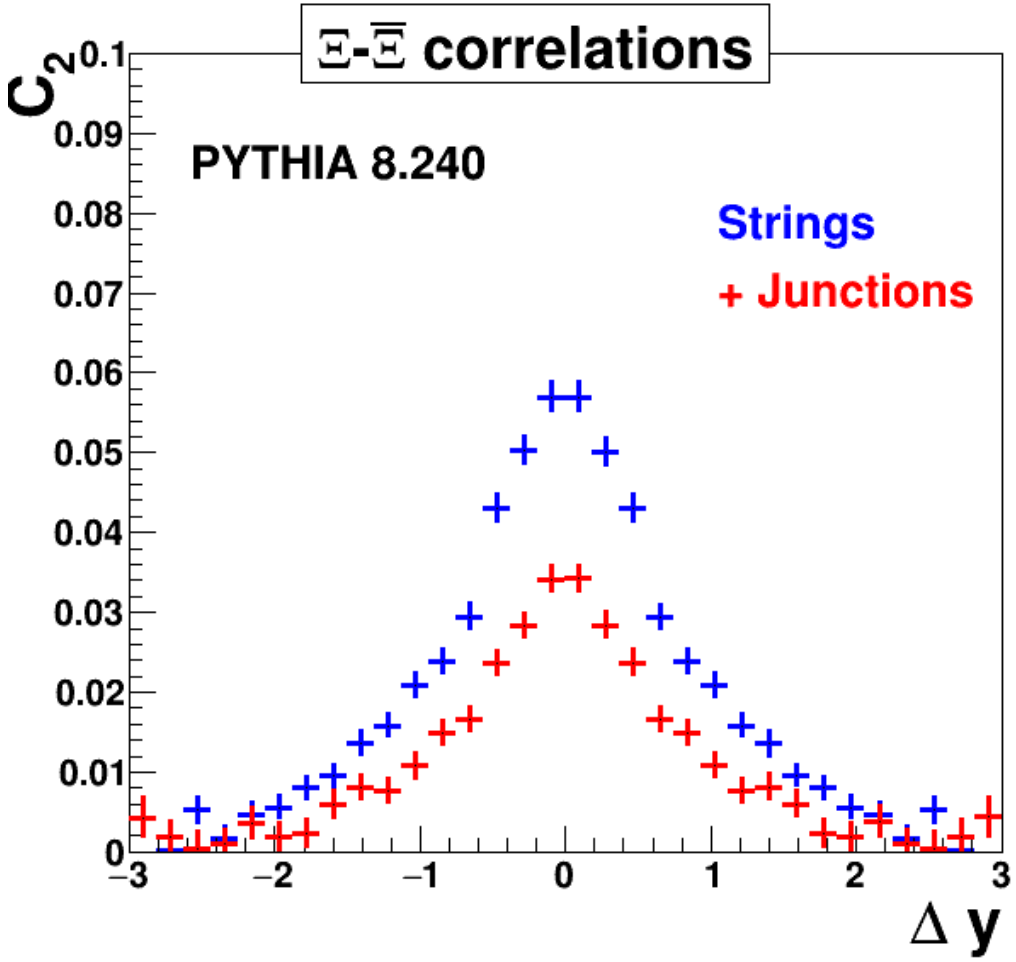
- Relevant observables:
  - Ξ-K correlation
  - Ξ-$\bar{p}$ correlation
  - Ξ-$\bar{\Xi}$ correlation

Xi-Kaon correlations
Stronger as predicted



Xi-antiXi correlations
Weaker as predicted





But still very strong!!!!

Other things

- Rope
  - Does it just enhance high mass states and preserves correlations or can strangenes be exchanged between strings
- Stat. Hadronization
  - Can one get ”predictions” → Decorrelations

Outlook

- Strangeness correlations seems to me an attractive way to pursue the origin of strangeness enhancement
  - More of the same? Strong local correlations
  - Or new channels/volume effects? Weaker local correlations → more heat bath (a la junction)