Can Quantum Number Correlations Separate Between Models of Strangeness Production in Small Systems?

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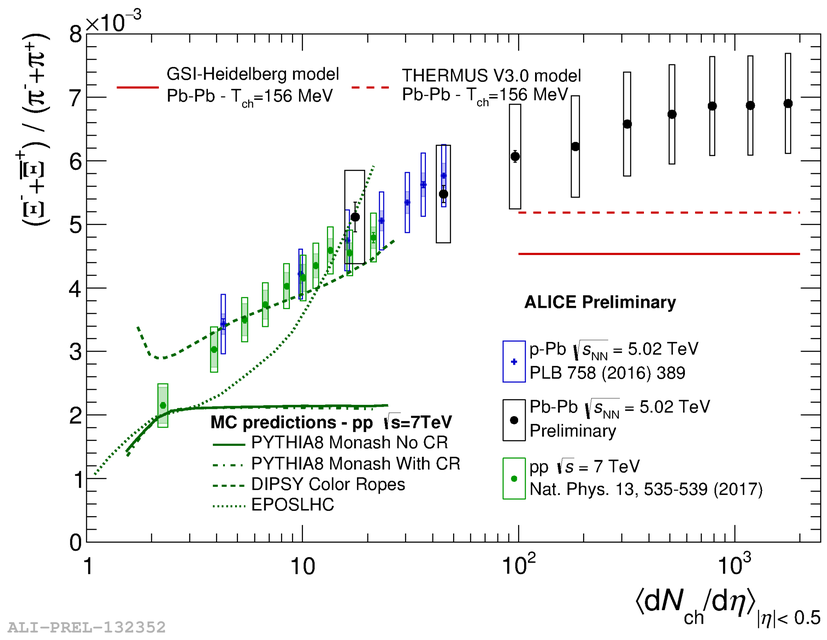
ALICE results on Ξ production vs charged particle multiplicity



pp models v1: more of the same (e.g., PYTHIA)

$$\text{pp} \sim \sum \text{parton-parton collisions}$$

No strangeness enhancement or ridges!

pp models v2: more of something similar or mixed description?

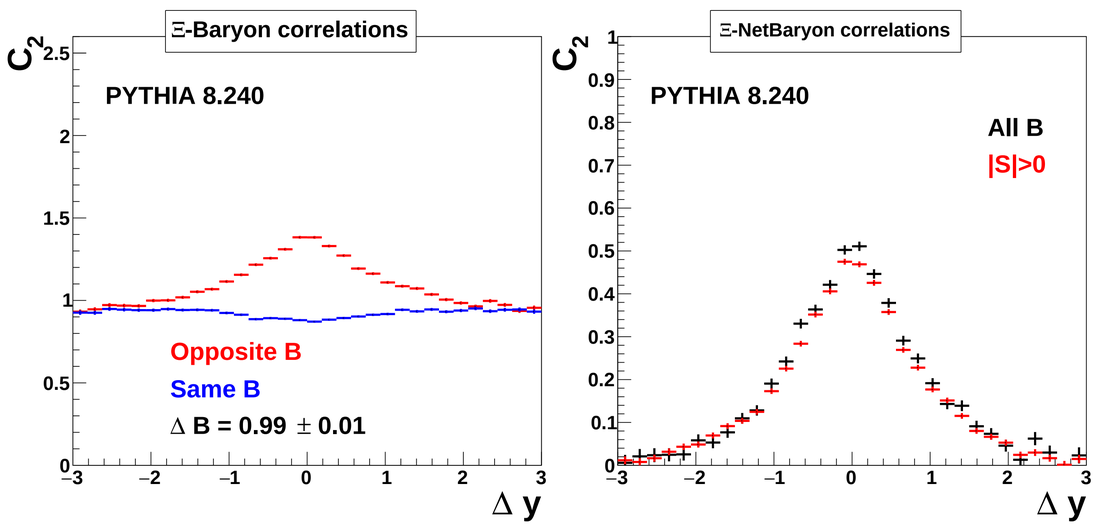
- More of something similar
  - Type 1: "micro": strings → ropes (e.g., DIPSY, Angantyr)
  - Type 2: "macro": volume effects (e.g., lifiting of canonical suppression)
- Mixed physics
  - Type 3: different phases (e.g., EPOS)
    - New production mechanisms, like recombination, also fits here

How to separate these descriptions?

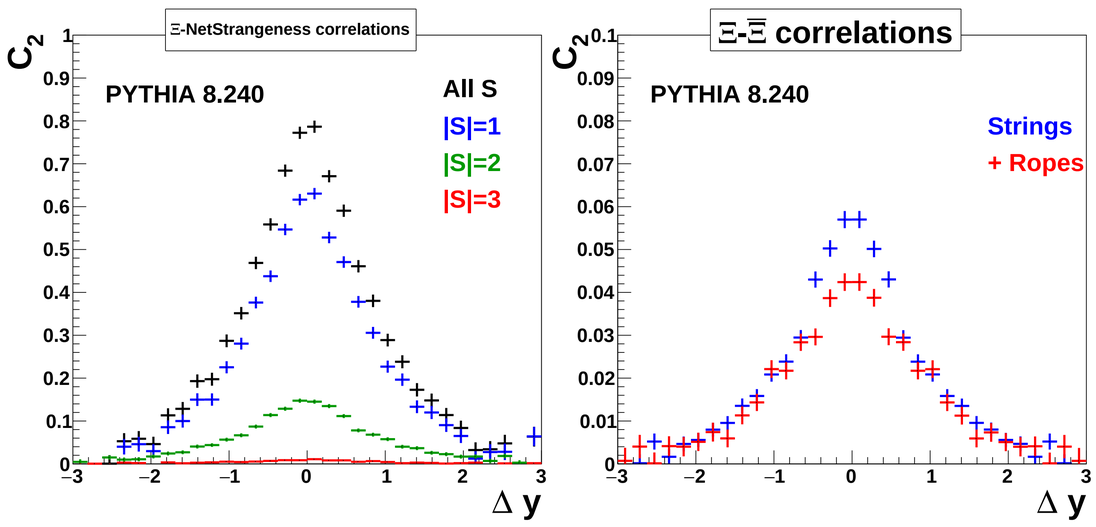
- Type 1: local parton production → local hadronization
- Type 2: local parton production → "equilibrating" interactions → local hadronization
- Type 3: different processes

Proposal: study Ξ-strangeness correlations

- Why focus on Ξ(*ssd*) in small systems?
  - Sensitive to the physics evolution (large enhacement with mult)
  - "Partonic" strangeness correlations must be very strong

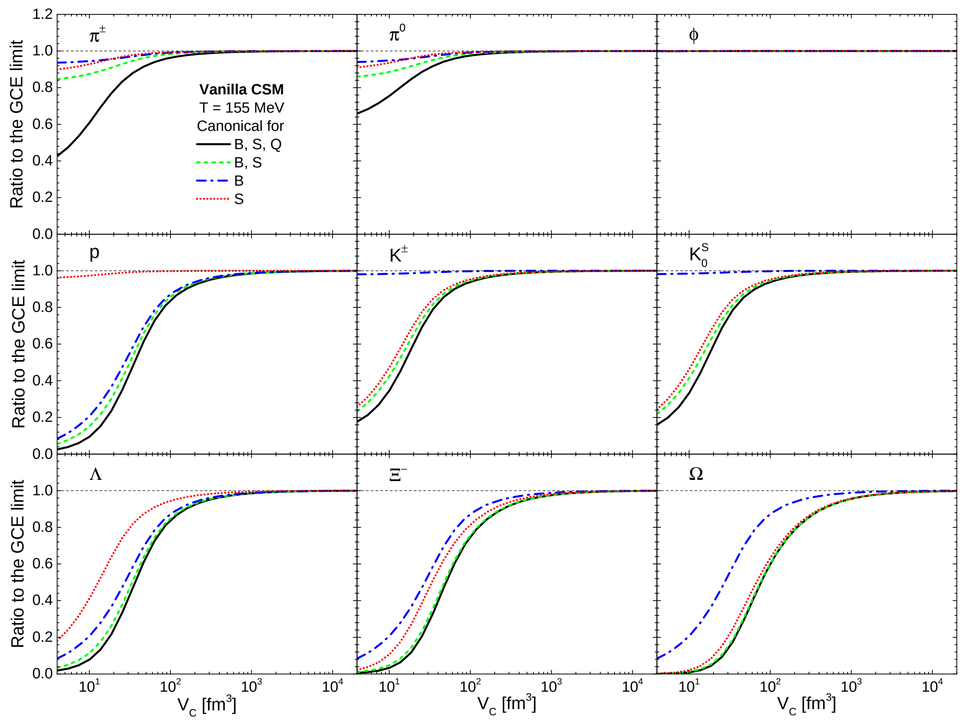


- Baryon number correlations between Ξ and non-strange baryons (e.g., protons) could be sensitive to "partonic" baryon-number "flow"



- Strings → ropes, can enhance Ξ, **but correlations are similar!**
  - Could Ξ − Ξ̄ correlations differentiate between models?
  - Can we see the lifting of canonical suppression?

Caveat 1: what is canonically suppressed?



V. Vovchenko, B. Dönigus, H. Stoecker, arXiv:1906.03145

- If this is correct then protons should also be canonically suppressed?

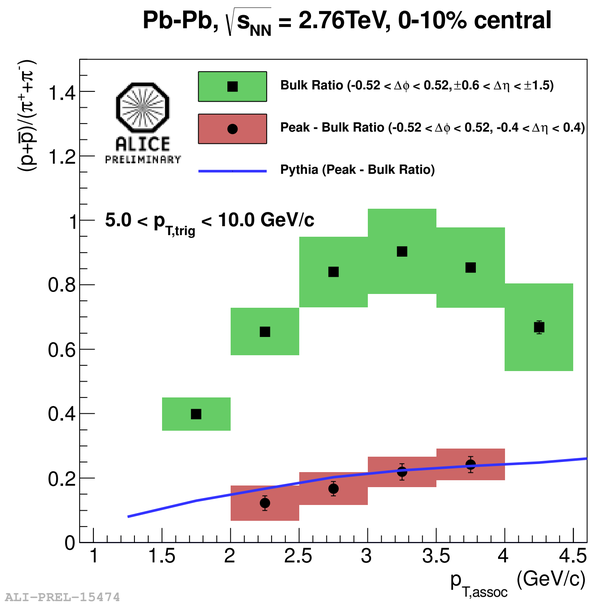
Caveat 2: no open source Type 2 and 3 generators

We miss small system implementations of macroscopic physics

- Can we improve the situation?

Caveat 3: observing QGP interactions in small systems

- Perfect liquid is so strongly interacting that there is no dissipation
- My understanding: to first order type 1 and type 2 models will be similar



- Must go to low p_{T} to find possible QGP effects!

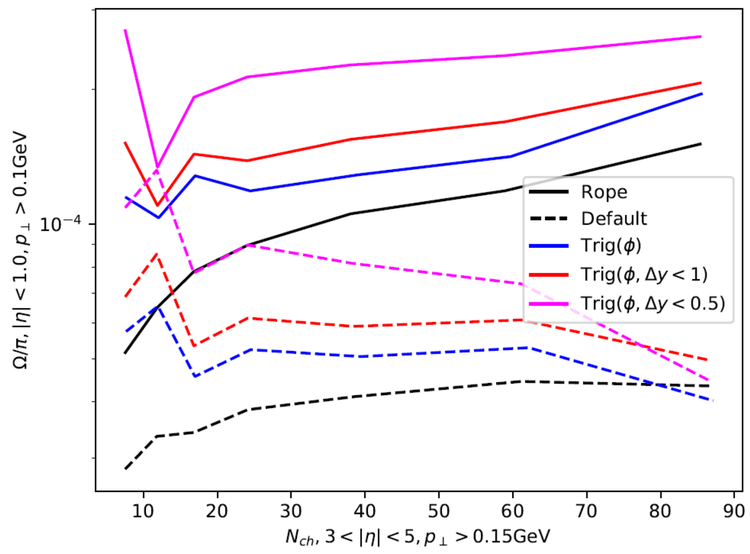
Other things 1: are models consistent with data?

Several "initial state" constraints from data:

- Forward-Backward correlations (e.g., UA5)
  - Sesitive to longitudinal extension of initial color fields
- Bulk 2-particle correlations (e.g., ATLAS)
  - Sesitive to non-linearity (particles per stringlenth)

Initial "partonic" physics must be simiular!
Do we need high quality measurements?

Other things 2: Ω/π in ϕ triggered events



Idea and figure from Christian Bierlich

- Can we use strangeness to trigger on extreme events?