Measurement of the net-kaon net-$\Xi$ correlations in pp, p–Pb and Pb–Pb collisions with ALICE

Mario Ciacco, on behalf of the ALICE Collaboration

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Hadronisation and strangeness conservation

- String fragmentation [1]
  - short-range rapidity correlations
  - mostly correlation of unlike-sign charges
- Canonical statistical hadronisation (CSM) [2]
  - thermalised hadronic system with long-range rapidity correlations
  - symmetry of like- and unlike-sign correlations

Event-by-event observables

- Cumulants $\kappa_i$
  $$\kappa_1 = \langle \eta \rangle$$
  $$\kappa_{11}(m,n) = \langle (m - \langle m \rangle)(n - \langle n \rangle) \rangle$$
  $$\kappa_2 = \langle (n - \langle n \rangle)^2 \rangle$$ → (co)variance
- Correlation $\rho$
  $$\rho(m,n) = \frac{\kappa_{11}(m,n)}{\sqrt{\kappa_2(m,n)\kappa_2(n,m)}}$$
- Net-particle number $\Delta n$
  - at the LHC, $\mu_B \approx 0$ [3] → matter balances antimatter → cancellation of the effect of volume fluctuations [4]

Results

- Second-to-first order cumulant ratio of net-$\Xi$
  - sensitive to unlike-sign strangeness correlation
  - smooth evolution across multiplicity
  - indication of longer-range rapidity correlations → ~3 units of rapidity compared to ~1 unit of rapidity for string fragmentation

Candidate selection

- Charged kaons
  - $dE/dx$ with Time Projection Chamber
  - velocity with Time-of-Flight detector
- Charged $\Xi$ baryons
  - cascade decay
  - $\Xi \rightarrow (\Lambda \rightarrow p + \pi^-) + \pi^- + cc$
  - selection based on Boosted Decision Trees [5]

References