Collective phenomenon from strange particle spectra in pp, pPb and PbPb collisions

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Motivation

- CMS has observed the “ridge” structure in pp collisions, indicating collective phenomenon in high multiplicity events in small systems.
- In the context of some hydrodynamic models, the radial flow effect has been proposed to be larger in smaller systems when compared at similar multiplicity.

Results

- Comparison with different center-of-mass energy. Does the difference completely cause by the colliding energies?

How about radial flow in pp collisions?

K0, Λ, Ξ Reconstruction and High Multiplicity Triggers

- Unique high-level triggers enable precise studies of PID v2 in very high multiplicity pPb events
- Reconstruction via topological decays in CMS silicon tracker

Analysis Method – Blast-wave model

- The Blast-wave functional form is:
  \[ \frac{1}{pT} \frac{dpN}{dN} = \int \left( 1 - \frac{\rho \sinh \beta}{\rho} \right) \left( \frac{m \cosh \rho}{T_m} \right) d\beta \]
- where \( \rho \) is defined as the velocity profile described by:
  \[ \rho = \tanh^{-1} \left( \frac{\beta_0 \rho}{R} \right) \]
- \( \beta_0 \) is the transverse expansion velocity at the surface, \( R \) is the radius of the fireball, \( l_0 \) and \( K \) are the Bessel functions

Rapidity dependence of spectra

- Models like CGC predicts that the proton-going side has stronger radial flow in pA collisions, as opposed to hydrodynamics.
- Average kinetic energy increases with negative rapidity (in Pb-going side) at high multiplicity

Multiplicty dependence of spectra

- Only pPb spectra are shown

In pT < 2 GeV/c, the difference in baryon/meson ratio increases as the system becomes smaller! Stronger radial flow in small system?

Particle density higher?

- Heavier particles <KE> increase faster in each system
- Same particle increases faster in smaller system

Peripheral 50-100%