Strangeness production in near-side and away-side jets in pp collisions at ALICE using azimuthal correlations

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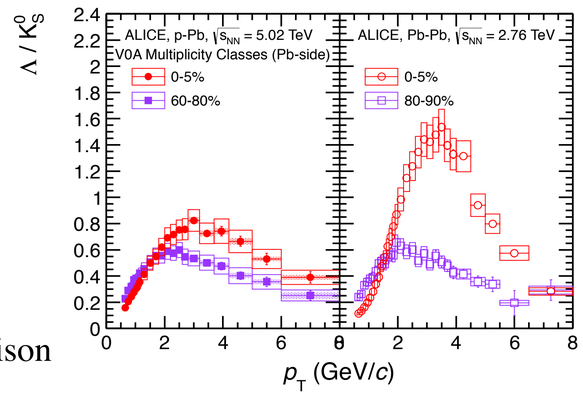
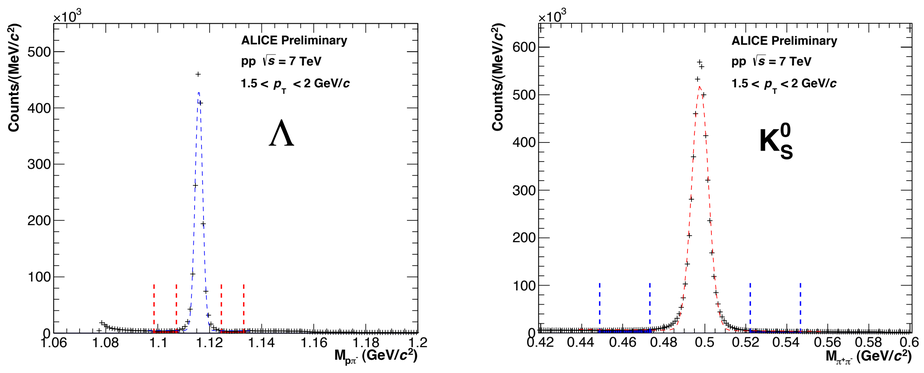
Motivation

- Enhancement of Λ/K^0_S observed in p-Pb and Pb-Pb collisions [1, 2]
- Understanding particle production mechanisms in soft and hard processes
- Measuring the Λ/K^0_S ratio in jets and in the underlying event is a possibility to further investigate this enhancement
- Need to measure a baseline in pp collisions as a point of comparison to Pb-Pb collisions



Λ and K^0_S reconstruction



- Λ and K_S^0 (V^0) can be reconstructed over a wide range of transverse momentum (p_T) via their decay topology

$$K^0_S \longrightarrow \pi^+ + \pi^-$$
$$\Lambda \longrightarrow p + \pi^-$$

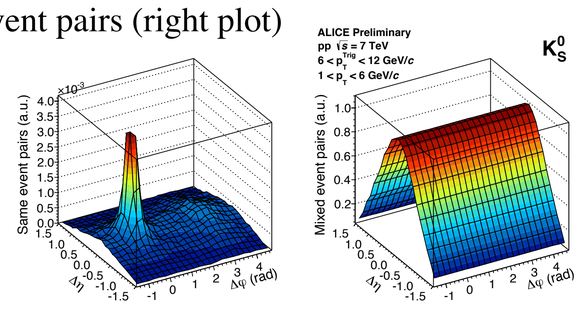
- Extract the peak position and width by fitting the invariant mass of V^0s in p_T intervals with a Gaussian + linear function
  - Choose signal candidates in 6σ region around the peak

Azimuthal correlations

- Correlation between charged leading track (trigger, $6 < p_T < 12$ GeV/c) and associated V^0s ($1 < p_T < 6$ GeV/c) are measured using the correlation function $C(\Delta\varphi,\Delta\eta)$

$$C(\Delta\varphi,\Delta\eta) = \frac{1}{N_{Trig}}\frac{d^2N_{Associated}}{d\Delta\varphi d\Delta\eta} = \beta\frac{S(\Delta\varphi,\Delta\eta)}{B(\Delta\varphi,\Delta\eta)}$$

- We measure the Signal (S) via same event pairs (left plot) and the Background (B) via mixed event pairs (right plot)



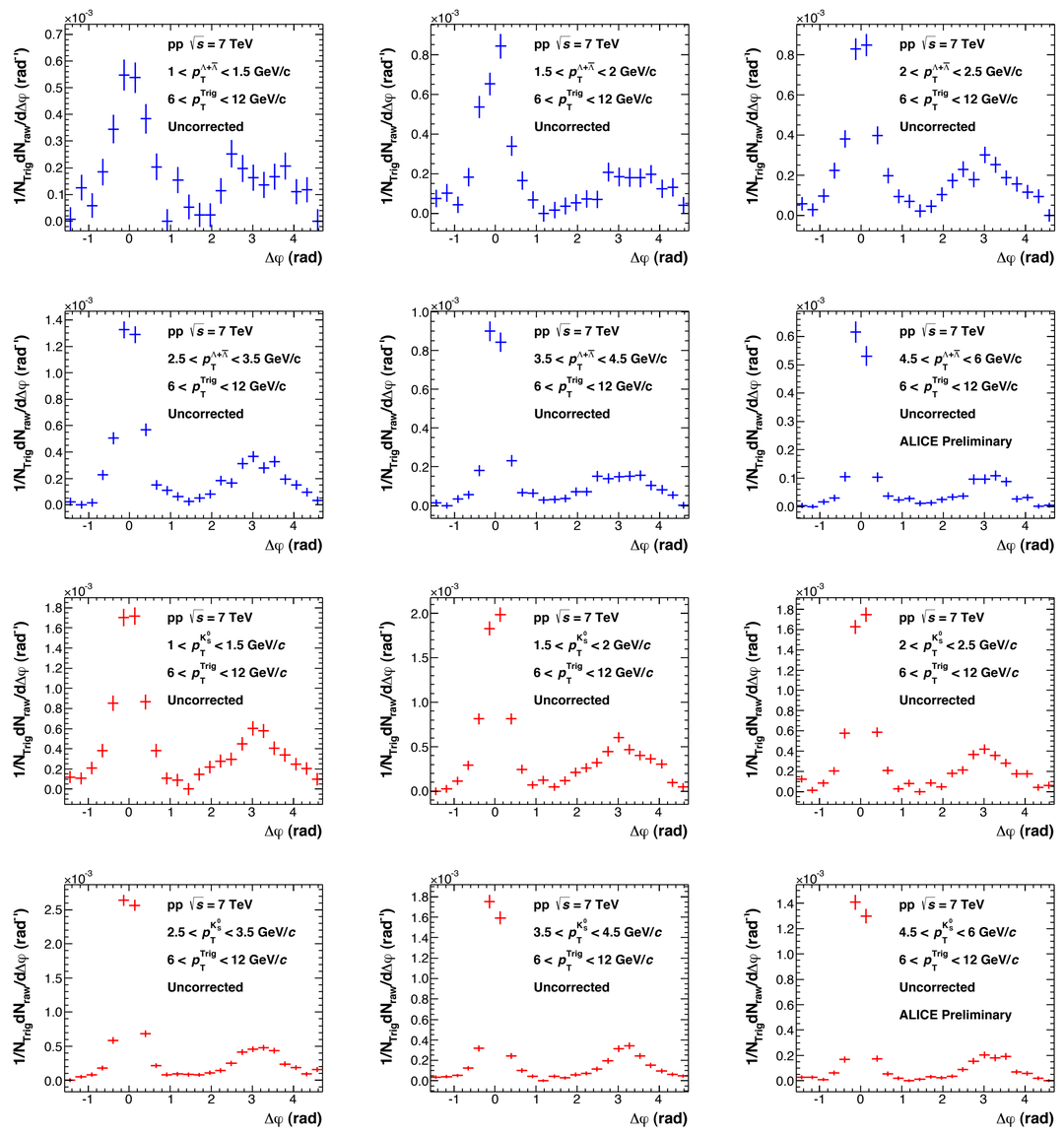
- β is the normalization factor used to normalize mixed event distribution to 1 at $(\Delta\varphi,\Delta\eta) = (0,0)$

Summary and outlook

- It has been shown that it is possible to classify the phase space as soft (underlying event) and hard (near-side, away-side) regions with respect to the charged leading track of the event
- We observe the near-side and away-side jets and the underlying event without full jet reconstruction. This shows the potential of using azimuthal correlations to probe jet-sensitive physics
- Novel feeddown method will greatly help to pin down a true yield in the soft and hard regions, allowing for an accurate representation of the primary Λ/K^0_S ratio in jets

Associated yields per trigger particle

- Associated yields per trigger particle as a function of $\Delta\varphi$ are computed by averaging $C(\Delta\varphi, \Delta\eta)$ over $|\Delta\eta| < 0.5$
- Clear near-side ($\Delta\varphi\sim 0$) and away-side peak ($\Delta\varphi\sim\pi$) can be seen for both $\mathbf{\Lambda+\bar{\Lambda}}$ and $\mathbf{K^0_S}$. All uncorrelated pairs below the minimum of the correlation functions are considered as coming from the underlying event and are thus subtracted



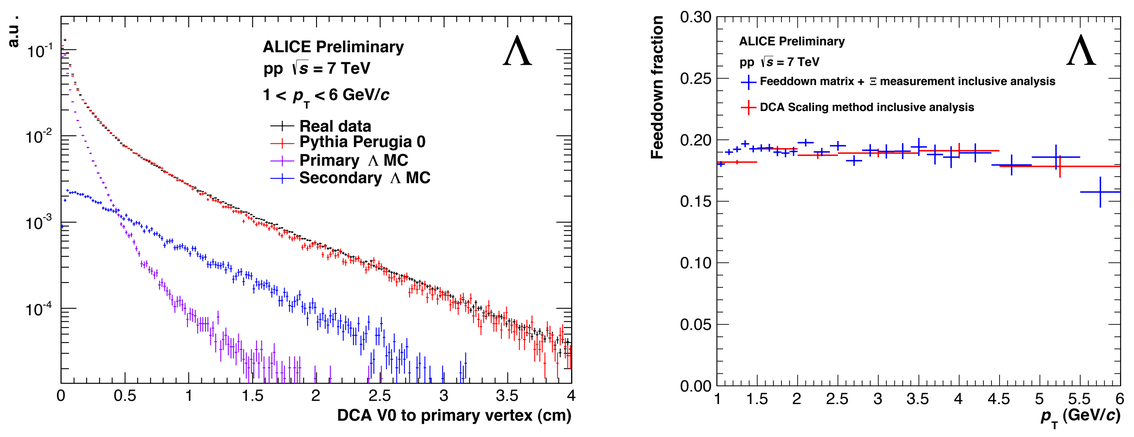
- The near-side yield (NSY) and away-side yield (ASY) in the specified ranges can be then calculated

$$NSY = \frac{1}{N_{Trig}}\int_{-\pi/3}^{\pi/3}\frac{dN^{NS}}{d\Delta\varphi}d\Delta\varphi \qquad ASY = \frac{1}{N_{Trig}}\int_{2\pi/3}^{4\pi/3}\frac{dN^{AS}}{d\Delta\varphi}d\Delta\varphi$$

Feeddown correction

In order to show a corrected Λ/K^0_S ratio the Λs need to be feeddown corrected (remove Λs from Ξ^- and Ξ^0) in the near-side, away-side, and underlying event regions

- Investigating a novel data-driven feeddown correction using a distance of closest approach (DCA) scaling method in MC.
- The feeddown fraction in measured Λs is sensitive to the selection performed on the DCA of the V0 to the primary vertex (left plot)
- By measuring the relative change of signal for different DCA selections, the amount of feeddown can be estimated (right plot)



References

1. ALICE Collaboration, Physics Letters B 728 (2014) 25–38
2. ALICE Collaboration, Phys. Rev. Lett. 111, 222301

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