Correlation of strangeness production with charged hadrons in proton-proton collisions at $\sqrt{s} = 13.6$ TeV with ALICE

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Physics motivation

- The microscopic origin of strangeness enhancement with multiplicity in pp collisions is not yet understood[1][2]
- The correlations between charged particles and strange hadrons can be used to study strange hadron production in jets and out-of jets
- In addition to the dependence of yield on multiplicity, $p_{\mathrm{T}}^{\mathrm{trigg}}$ was also investigated to study strange hadron production across processes of varying hardness in the event

ALICE detector

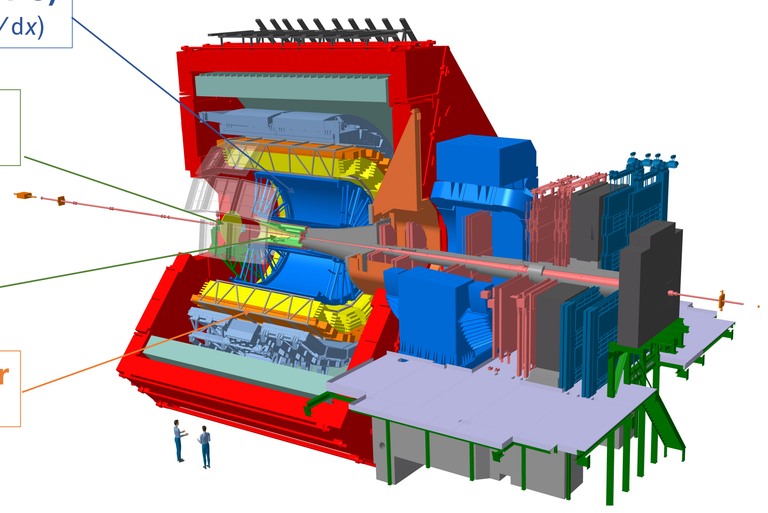
Data sample (Run 3)
pp, $\sqrt{s}$ = 13.6 TeV, 500 x 10^9 events

Time Projection Chamber (TPC)
Tracking, PID via energy loss (dE/dx)

FT0 detector
Triggering, event characterisation

Inner Tracking System (ITS)
Tracking and vertexing

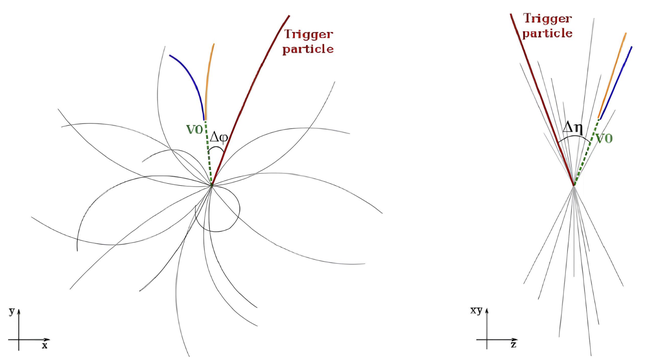
Time-of-flight (TOF) detector
PID via time of flight



PID: Particle Identification

Analysis algorithm: two-particle correlations

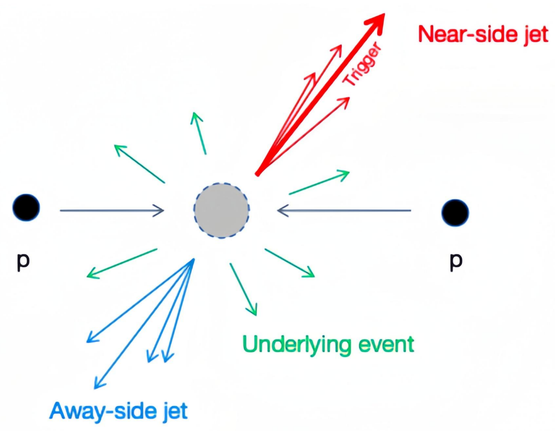
- Trigger particle: high-momentum charged hadron (2.0 < $p_{\mathrm{T}}^{\mathrm{trigg}}$ < 50.0 GeV/c)
- Associated particles: K_S^0 (0.0 < p_{T} < 15.0 GeV/c)

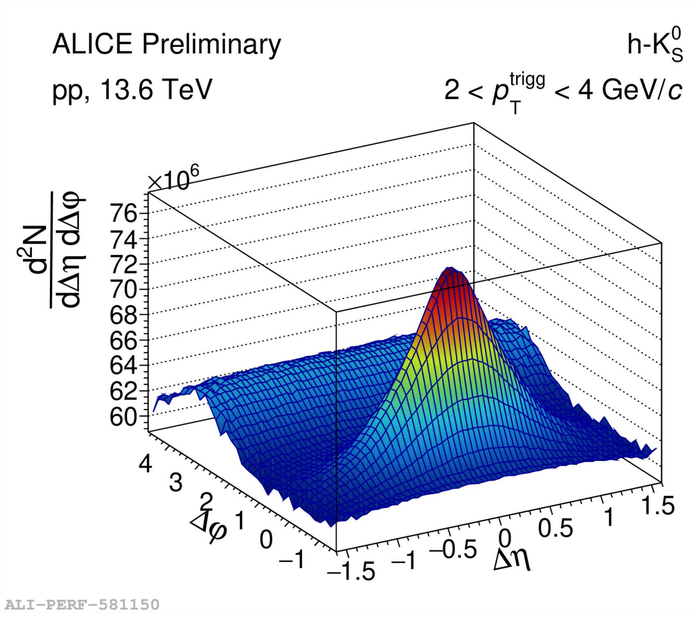


$$\Delta\varphi = \varphi_{asso} - \varphi_{trigg}$$

$$\Delta\eta = \eta_{asso} - \eta_{trigg}$$

Yield extraction





Near-side: $|\Delta\varphi| < \frac{\pi}{2}$

Away-side: $|\Delta\varphi - \pi| < \frac{\pi}{2}$

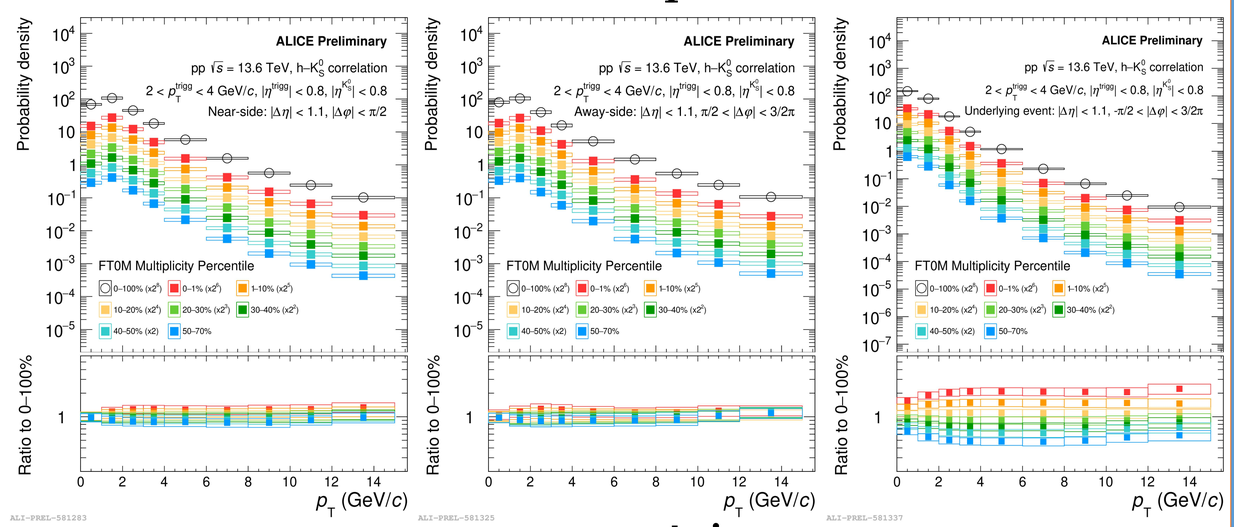
Underlying event: $-\frac{\pi}{2} < \Delta\varphi < \frac{3\pi}{2}$ *estimated by ZYAM* (zero yield at minimum)

Yield extract strategy:

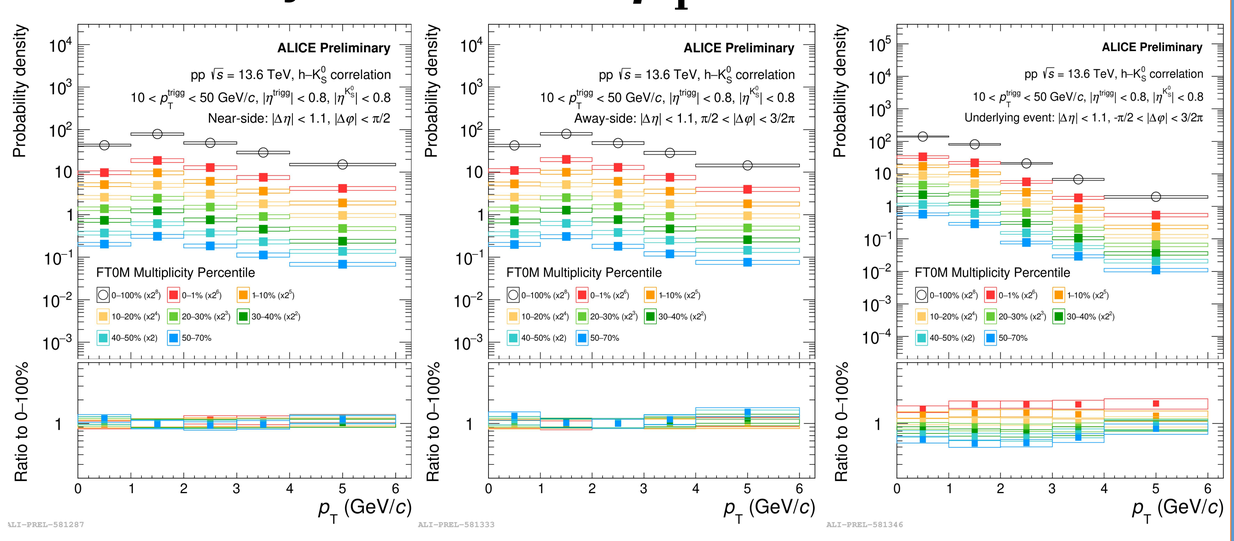
- project 2 dimensional correlation function (right plot) to $\Delta\varphi$ axis for $|\Delta\eta|$<1.1
- normalize $\Delta\varphi$ projection function by number of trigger particles
- integrate all bins in respective ranges (Near-side and Away-side need to subtract Underlying event first)

Results

Probability densities 2 < $p_{\mathrm{T}}^{\mathrm{trigg}}$ < 4 GeV/c

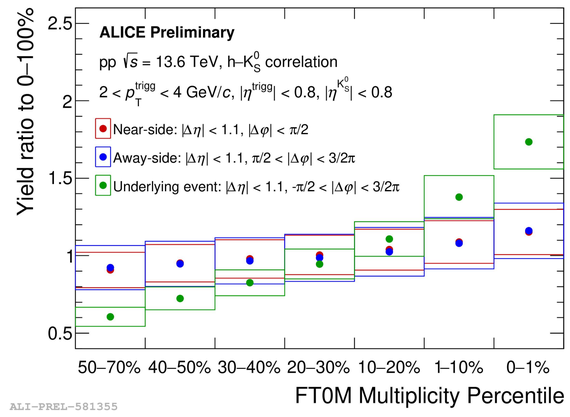


Probability densities 10 < $p_{\mathrm{T}}^{\mathrm{trigg}}$ < 50 GeV/c



- The Underlying event spectra show a larger dependence on the multiplicity than the Near-side and Away-side spectra
- The multiplicity dependence of Near-side and Away-side spectra becomes smaller with increasing $p_{\mathrm{T}}^{\mathrm{trigg}}$

p_{T} integrated yield ratios to 0–100%



- Underlying event yields increase with multiplicity
- Near-side and Away-side yields show slight dependence on multiplicity

Summary and outlook

- The Underlying event spectra show a larger dependence on the multiplicity than the Near-side and Away-side spectra
- The multiplicity dependence of the Near-side and Away-side spectra becomes weaker with increasing $p_{\mathrm{T}}^{\mathrm{trigg}}$ while Underlying event spectra does not depend on $p_{\mathrm{T}}^{\mathrm{trigg}}$
- (Multi-)strange baryons as well as model comparisons to be added in the next steps

References

[1] ALICE Collaboration. Nature Phys., 13:535–539, 2017.
[2] ALICE Collaboration. Phys. Lett. B, 758:*389–401, 2016.*