SQM 2024
The 21st International Conference on Strangeness in Quark Matter
3-7 June 2024, Strasbourg, France

Resonance production in and out of jets in pp collisions at 13.6 TeV with ALICE

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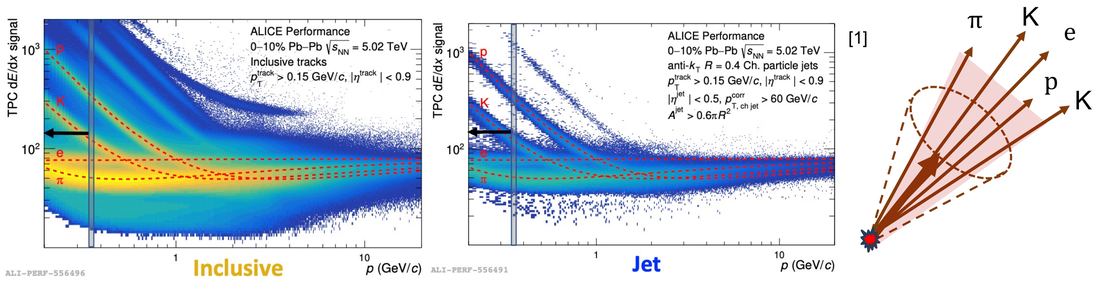
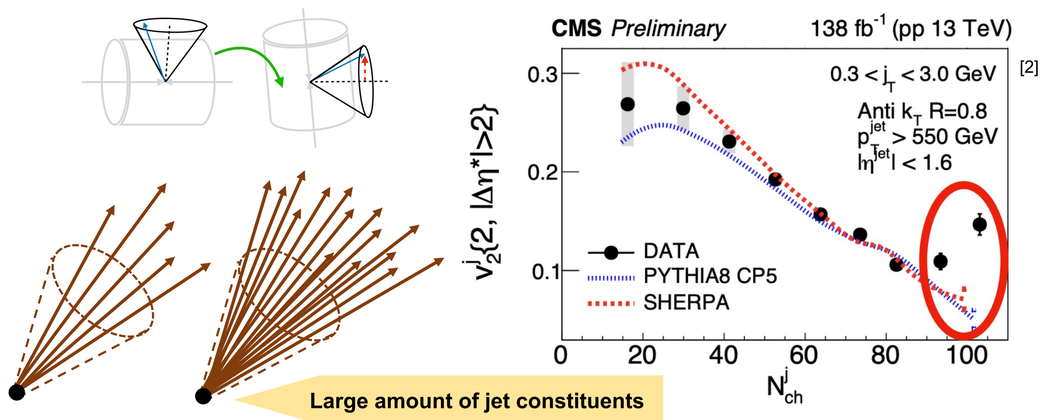
Introduction

- **What is a jet?**
  - ✓ A collimated bunch of hadrons originating from hard-scattered partons
  - ✓ Most jet constituents are π, K, p
- **What is jet hadrochemistry?**
  - ✓ Hadrochemistry : The study about the composition of hadrons
  - ✓ **Jet hadrochemistry** : The hadrochemistry of the jet constituents



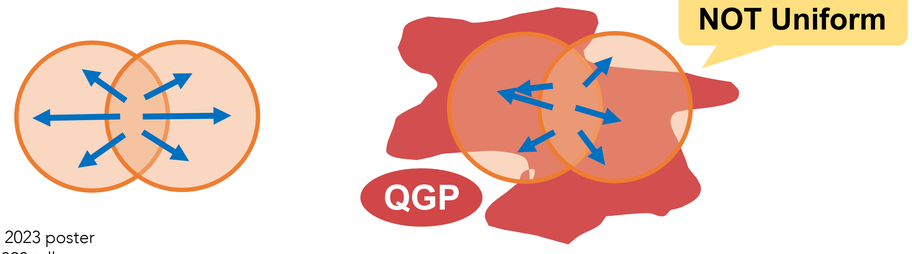
[1]

- **v_2 in high multiplicity jets?**
  - ✓ CMS showcased results of long-range correlations in high-multiplicity jets in pp collisions → Significant v_2 in N_{ch} > 80
  - ✓ **Could a deconfined QCD-medium be formed inside the jet itself?**



[2]

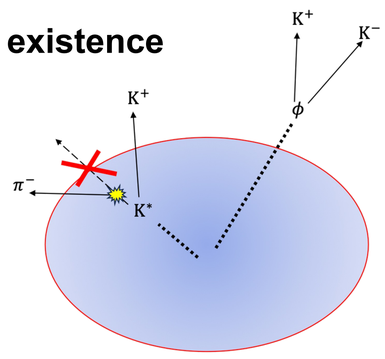
- **Elliptic flow v_2**
  - ➢ Asymmetry in the azimuthal distribution
  - ➢ Traditional evidence for the presence of a quark-gluon plasma



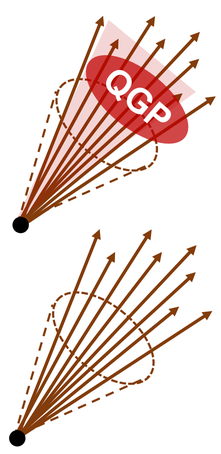
[1] S. Weyhmiller, QM 2023 poster
[2] P. Gardener, QM 2023 talk

Analysis Motivation

- **Hadronic scattering as a probe of QGP existence**
  - K^{*0} sometimes decay inside the QGP
    - ➢ Interference crash
  - ϕ lifetime is longer than K^{*0}
    - ➢ Decay outside the QGP



- **Main Hypothesis**
  - If high-multiplicity jets create a QCD-medium
    - ➢ Rescattering of K^{*0} daughters inside this jet cone
    - ➢ ϕ is largely unmodified by the QCD medium
  - If a QGP is not created, K^{*0} production might be inherently modified due to strangeness enhancement, but not its decay constituents

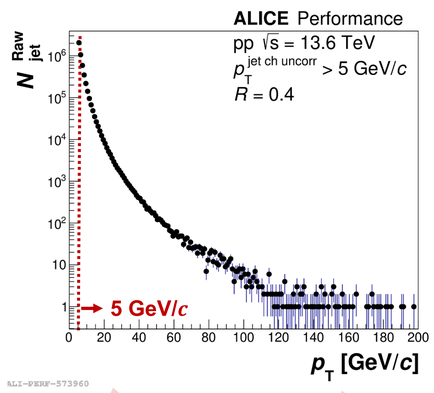


Ratio of ϕ and K^{*0} in and out of high-multiplicity jets will shed light on the possible production of a hot and dense QCD medium within these jets

Analysis Strategy

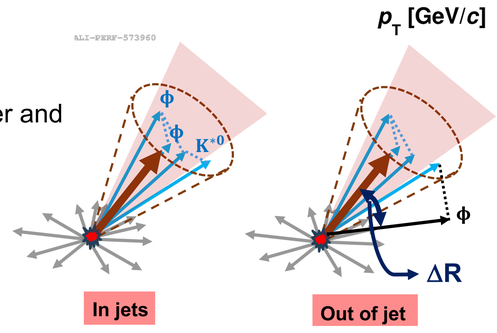
* **PID : Particle Identification**

- **Find jets**
  - ✓ $p_T^{\text{jet ch uncorr}}$ → > 5.0 GeV/c for K^{*0}; > 8.0 GeV/c for ϕ
  - ✓ Consider reconstructed invariant masses of ϕ and K^{*0} within R = 0.4 anti-k_T jet
  - ✓ Using the decay channels
    $\phi \rightarrow K^{\pm}K^{\mp}$ $\quad K^{*0} \rightarrow K^{\pm}\pi^{\mp}$



- ΔR is calculated between the reconstructed mother and the jet axis, and is defined as follows

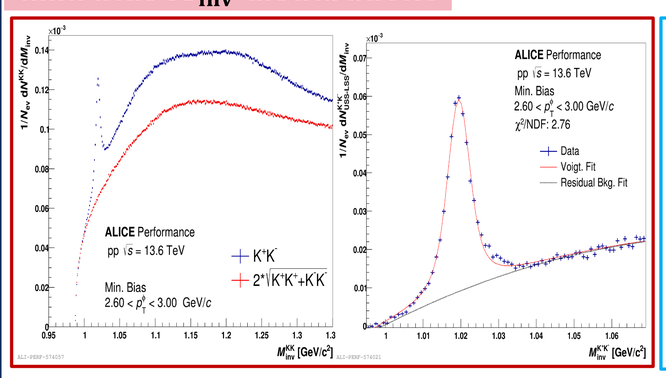
$$\Delta R = \sqrt{(\varphi_{\text{jet}} - \varphi_{\phi,K^*})^2 + (\eta_{\text{jet}} - \eta_{\phi})^2}$$

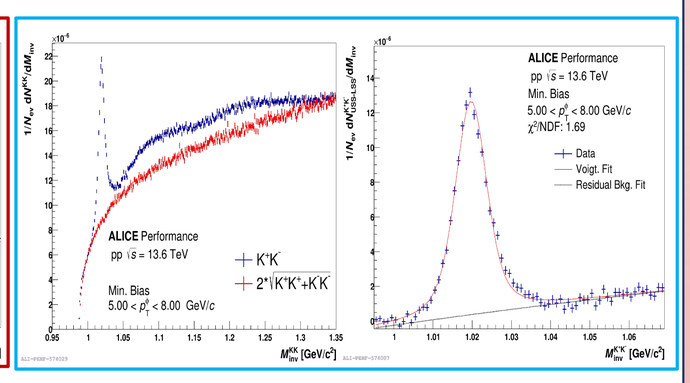


Results

- **Invariant mass plots and fits of ϕ**

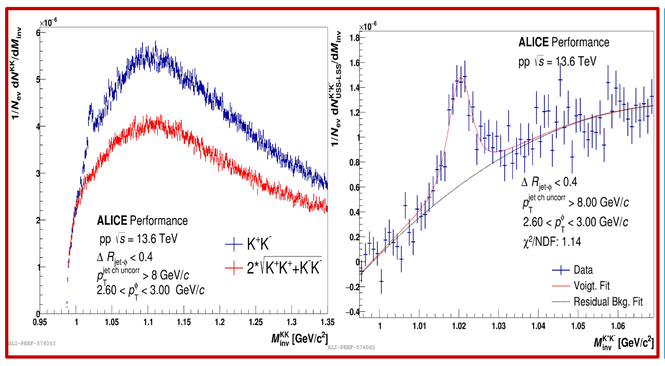
Min. bias M_{inv} distributions

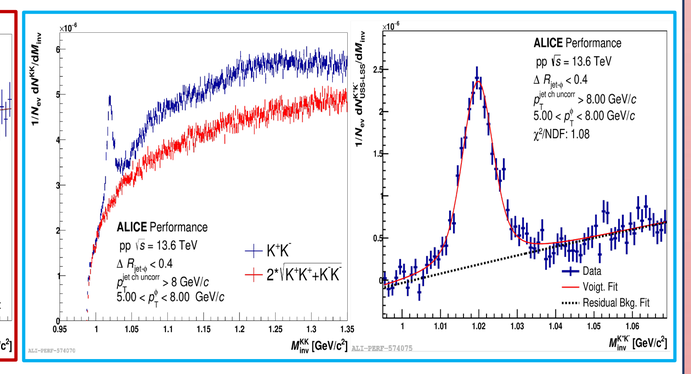




Inside jet M_{inv} distributions

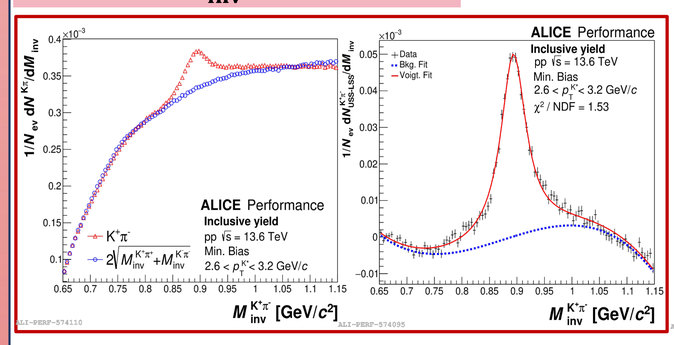
LOW p_T **HIGH p_T**

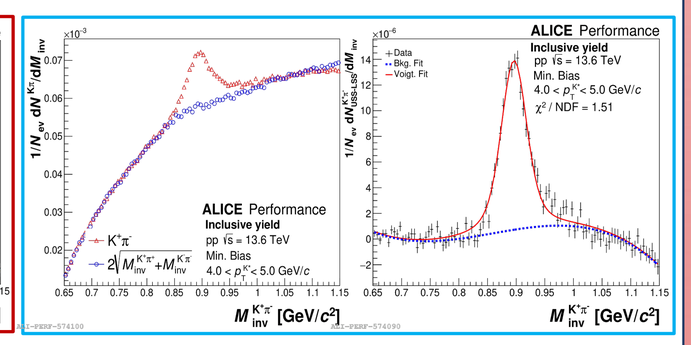




- **Invariant mass plots and fits of K^{*0}**

Min. bias M_{inv} distributions





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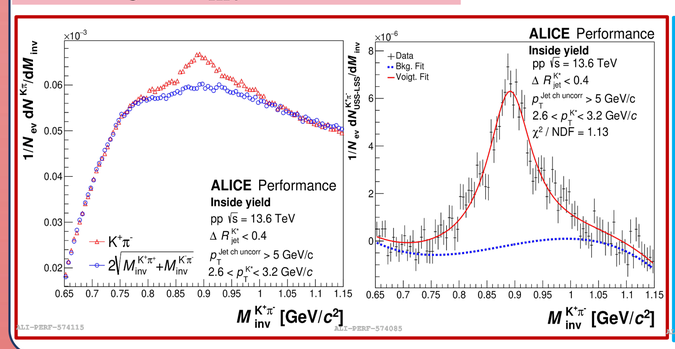

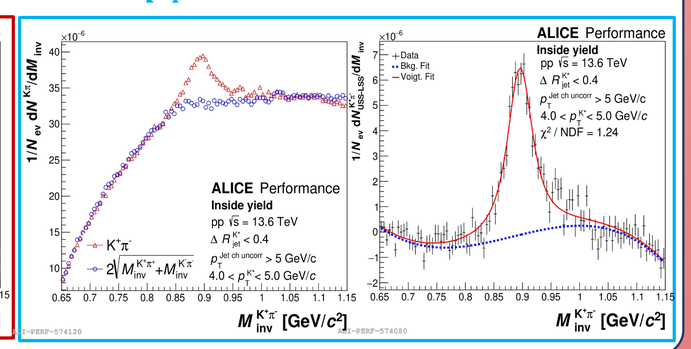

Summary and Outlook

- **This has been a first look at raw-level ϕ and K^{*0} production in jets at 13.6 TeV utilizing LHC Run3 data measured with ALICE**
- **Ongoing analysis will lead to fully corrected spectra for both particle species**
- **Once the fully corrected min. bias and in-jets results are finalized, this analysis will expand into measuring multiplicity-differential results**

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