$K^{*\pm}$ production in Pb-Pb collisions at LHC

Prottay Das (for the ALICE collaboration)
National Institute of Science Education and Research
HBNI, Jatni India

Outline:

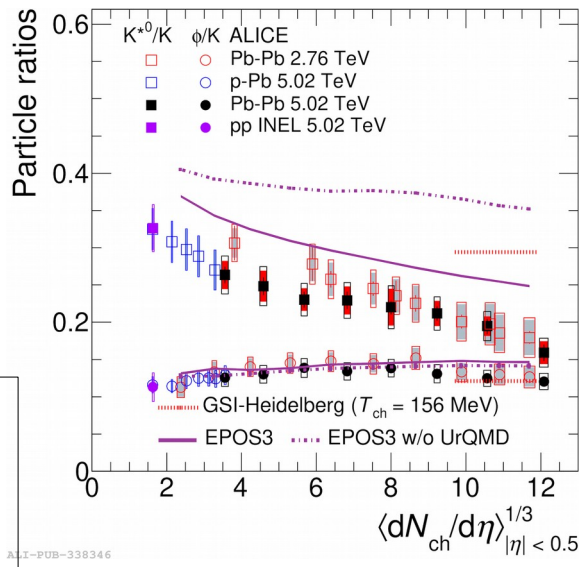
- ✔ **Introducton**
- ✔ **Signal extraction**
- ✔ **Results**
- ✔ **Summary**

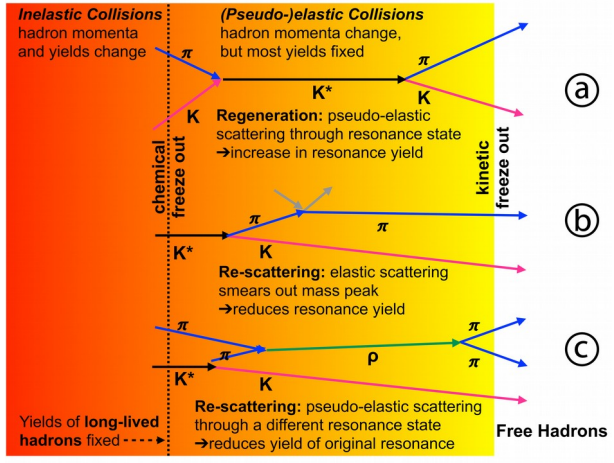
SQM2022
The 20th International Conference on Strangeness in Quark Matter
13-17 June 2022
Busan, Republic of Korea

Introduction

- ✔ **Resonances:** Short lived particles which decay via strong interaction
- ✔ **K*±** resonance is interesting becasue of its very short lifetime (~4 fm/c), comparable to that of the hadronic phase
- ✔ **K*±** measured yield is affected by **rescattering** and **regeneration** effects
- ✔ Recent measurement shows evidence of suppression of K*^{0}/K with increasing multiplicity

MOTIVATION





- ✔ Similar measurement with K*± will confirm and complement the published K*^{0} results
- ✔ The first excited state measurements of kaon family is completed

Properties of K*±

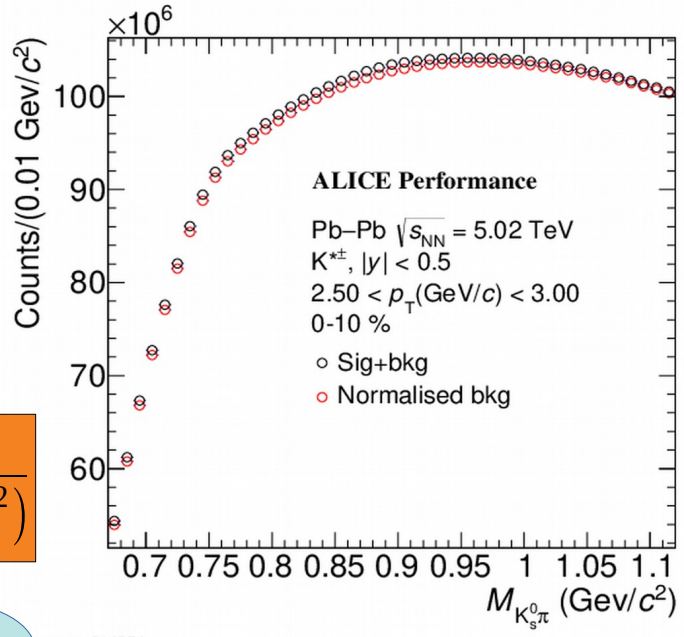
Mass (GeV/c^2)	0.891
Width (GeV/c^2)	0.050
Quark content	$u\bar{s}$
Decay mode	$K^0_s\pi^\pm$

Signal extraction

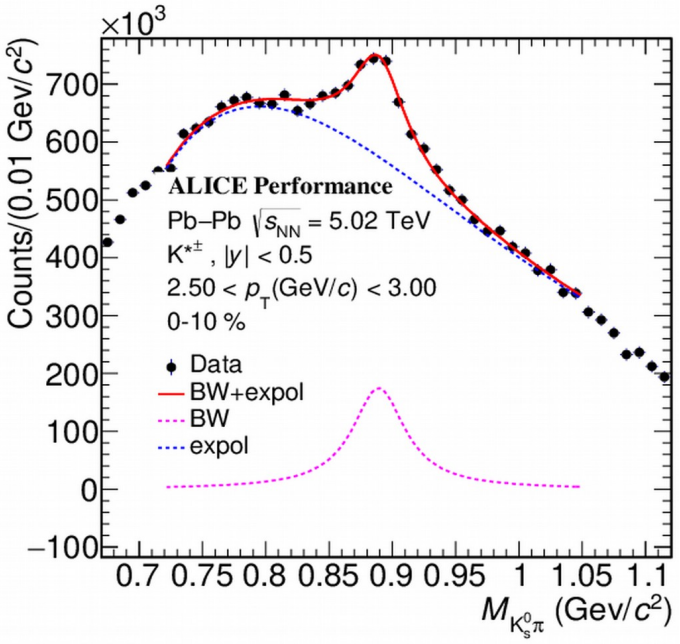
Dataset

Collision system	Pb–Pb
$\sqrt{s_{NN}}$	5.02 TeV
Events	120 M

Before background subtraction

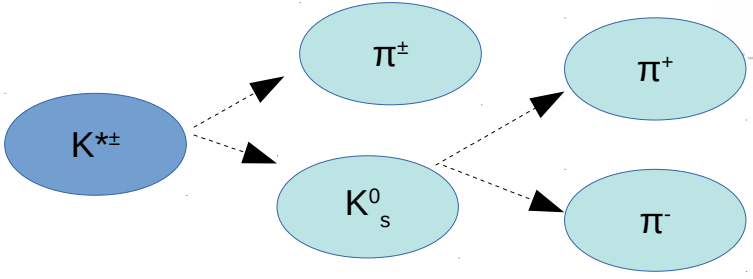


After background subtraction



✔ **Invariant mass method:**

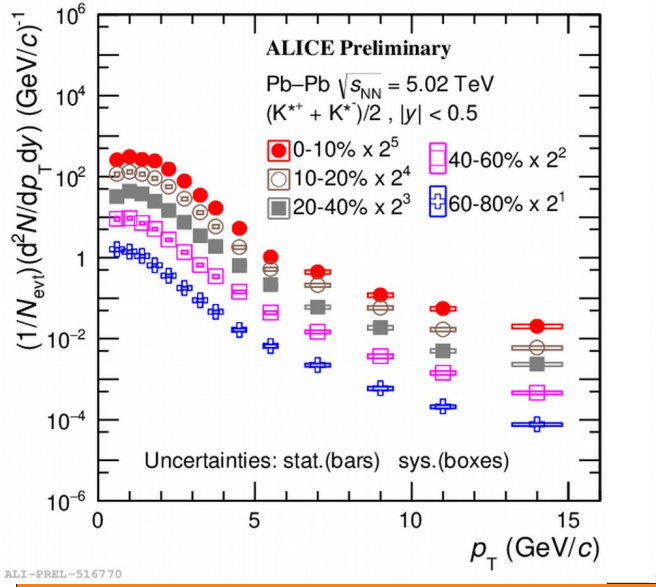
$$M_{K_s^0\pi} = \sqrt{\left(\left(E_{K_s^0} + E_\pi\right)^2 - \left(\vec{p}_{K_s^0} + \vec{p}_\pi\right)^2\right)}$$



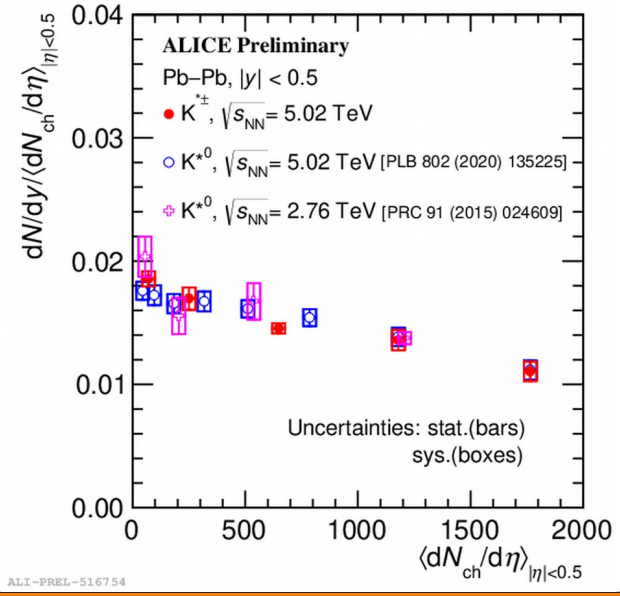
- ✔ **Combinatorial bkg:** Mixed event
- ✔ **Fit function:**
- Signal: Breit-Wigner
- Residual background: Exponential + 2nd order polynomial

Results

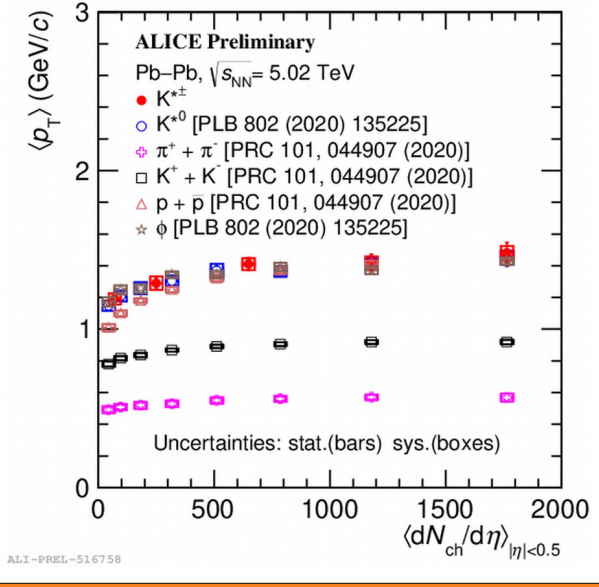
Transverse momentum spectra



Normalized yield

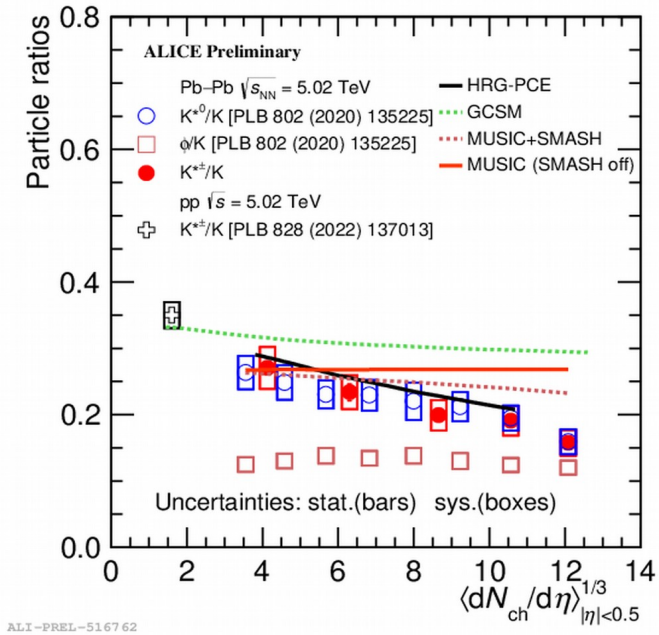


Mean transverse momentum



- ✔ Inverse slope of p_T spectra increases with increasing multiplicity
- ✔ Normalised yield decreases with increasing multiplicity
- ✔ Normalised yield of K* is similar for 5.02 TeV and 2.76 TeV at similar $\langle dN_{ch}/d\eta\rangle$
- ✔ $\langle p_T\rangle$ increases with multiplicity
- ✔ $\langle p_T\rangle$ of proton is less than that of K*,Φ in peripheral collisions

Results



- ✔ K*/K yield ratio decreases with increasing system size, in contrast to φ/K which remains constant
- ✔ Models with rescaterring effect (MUSIC+SMASH and HRG-PCE) qualitatively describe the data
- ✔ Rescattering dominates over regeneration

Summary

- ✔ First measurement of $K^{*\pm}$ is presented in Pb–Pb collisions at $\sqrt{s_{NN}}$=5.02 TeV
- ✔ Event multiplicity drives K* yield
- ✔ $\langle p_T \rangle$ increases with multiplicity due to radial flow
- ✔ $K^{*\pm}$/K yield ratio decreases with increasing system size
- ✔ HRG-PCE model and MUSIC+SMASH simulations qualitatively explain the measurements
- ✔ Results consistent with evidence of rescattering effects in the hadronic phase