Energy and Multiplicity Dependence of K*(892)^0 Production in pp Collisions with ALICE at the LHC

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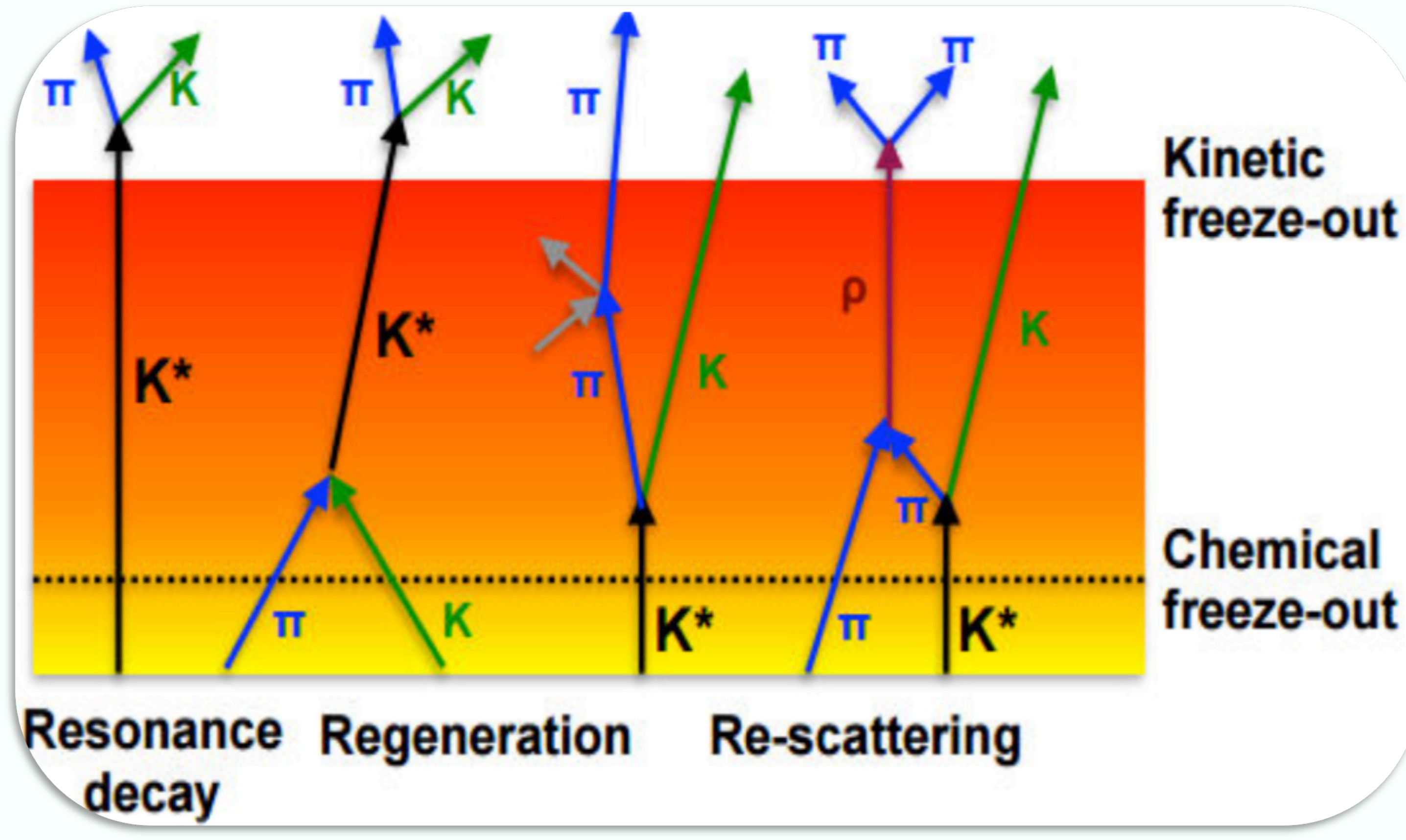
1. Motivation:

- Due to their short lifetimes, the resonances are sensitive to the properties of the hadronic phase produced in heavy-ion collisions.
- Resonances may decay within the fireball and decay daughters undergo re-scattering and regeneration.
- These processes can alter the shape of transverse momentum spectra (p_T) as well as yields of the resonances.
- In Pb-Pb collisions at 2.76 TeV, the suppression of K*^{0}/K ratio as a function of charged particle multiplicity has been observed and MC models like EPOS[3] qualitatively explains this trend with hadronic rescattering.
- The multiplicity dependent measurements in pp fill the gap between min. bias. pp and peripheral heavy-ion collisions, and are needed to look for onset of similar collective effects in small systems.
- Resonance measurements in min. bias. pp collisions are used as a baseline for heavy-ion collisions as well as for proper tuning of the QCD-inspired particle production models.



2. A Large Ion Collider Experiment (ALICE)

- At the LHC, ALICE has collected data in pp collisions at $\sqrt{s}$ = 0.9, 2.76, 5.02, 7.0, 8.0 and 13.0 TeV.
- Global tracking in ALICE is performed using ITS and TPC.
- Tracks are accepted only in the range $|\eta| < 0.8$ and with $p_T > 0.15$ GeV/c.

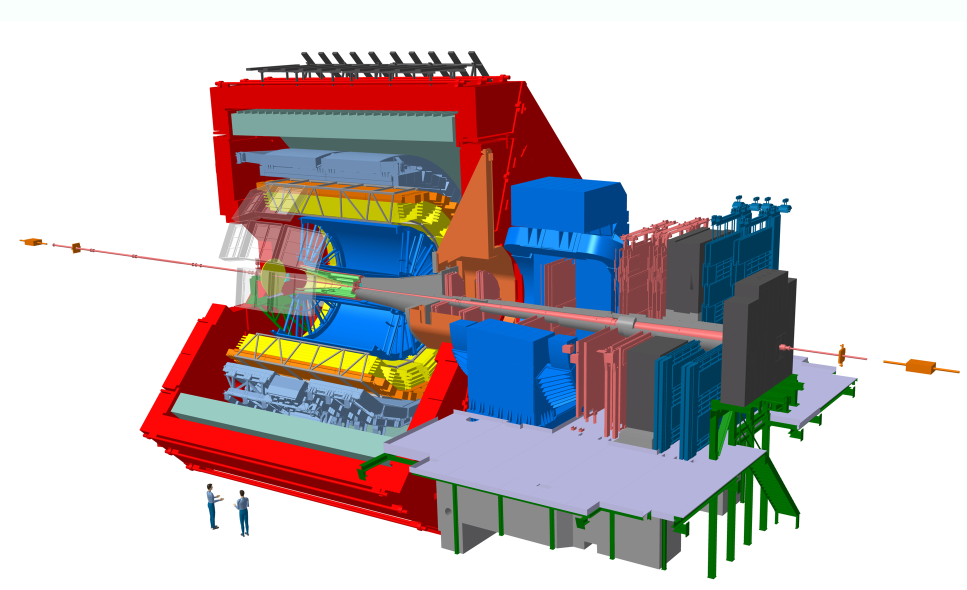
Detectors:

Inner Tracking system (ITS)
- Tracking and Vertexing

Time Projection Chamber (TPC)
- Particle tracking
- Particle identification (dE/dx)

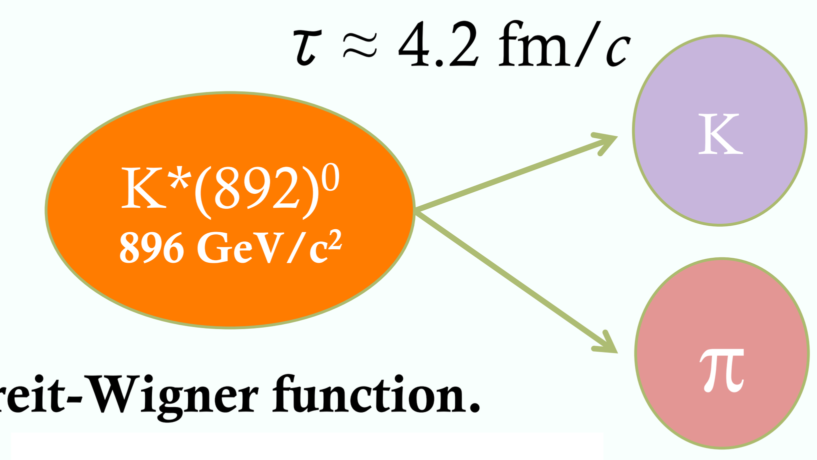
Time of Flight (TOF)
- PID via time of flight measurement

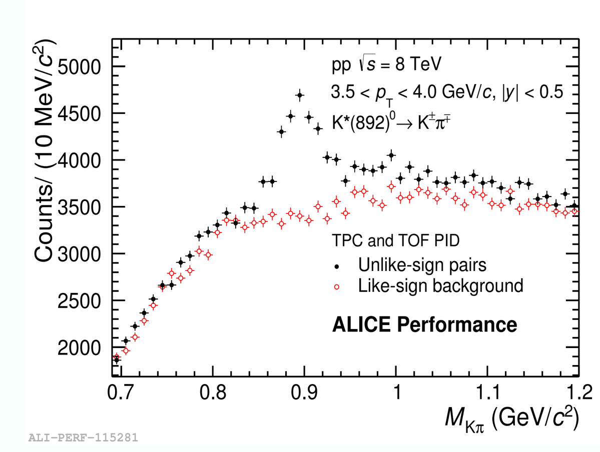
V0
- Trigger and Multiplicity estimator

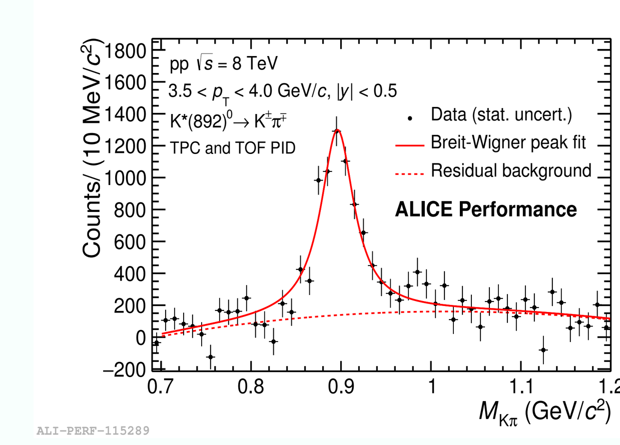


3. K*^{0} Reconstruction and Inv. Mass Spectra

- K*^{0} is reconstructed via its hadronic decay channel.
- Uncorrelated background is estimated using Unlike sign pairs from two different events.
- Inv. mass peak is described with a Breit-Wigner function.

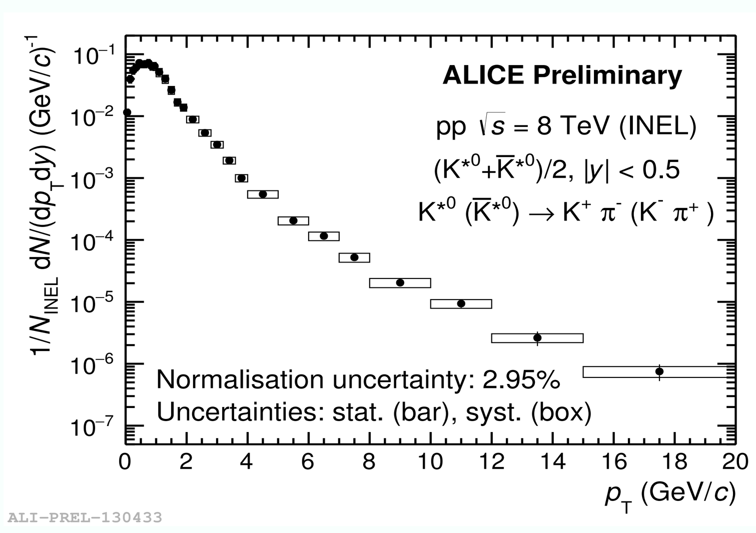


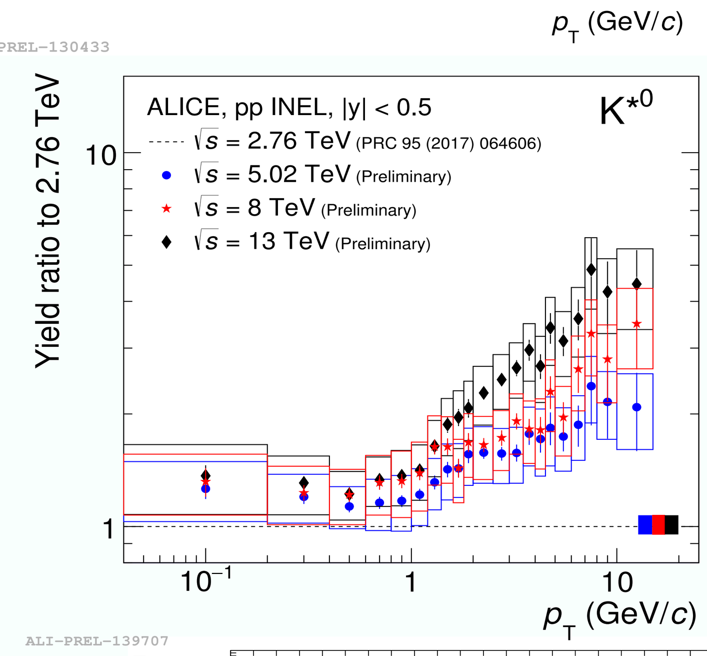


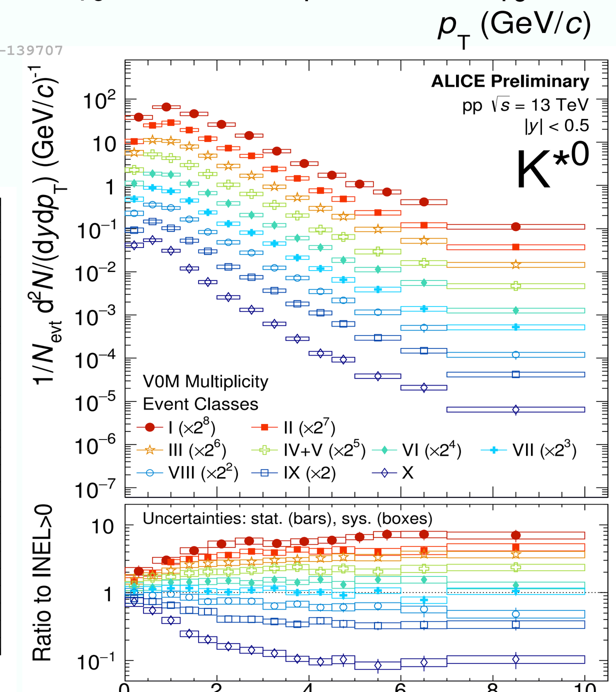


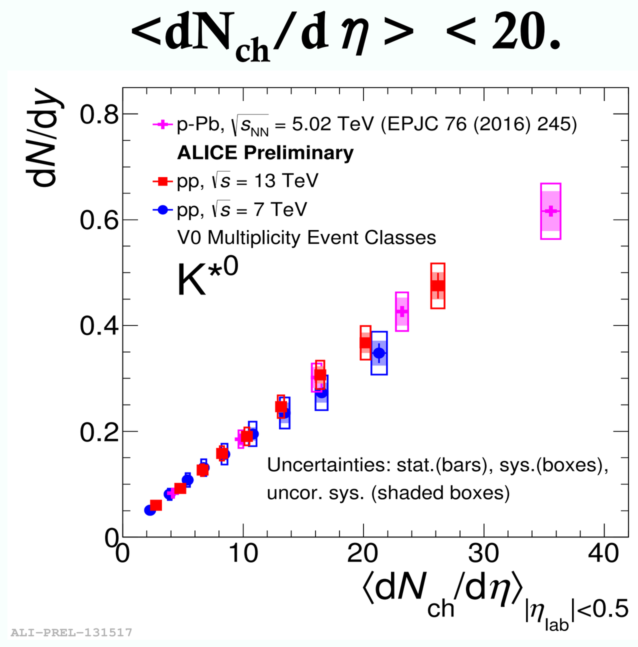
4. p_T Spectra, Yield and $\langle p_T \rangle$

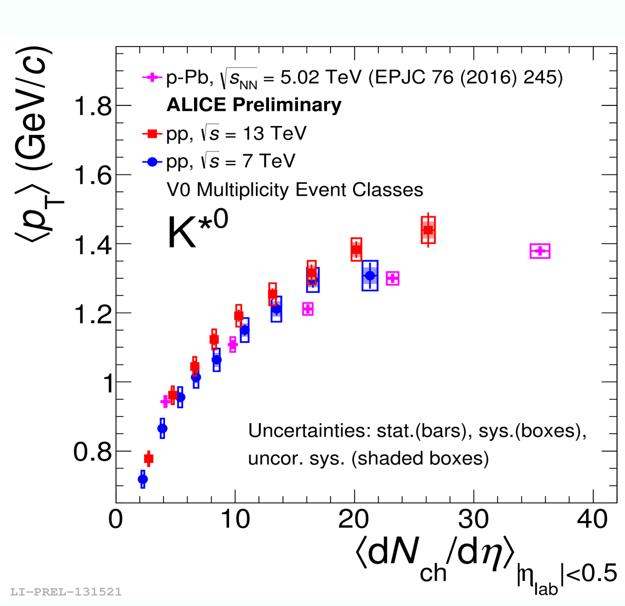
- Hardening of the min. bias. p_T spectra with collision energy is observed → Suggests more jetty events
- Hardening of p_T spectra is observed as a function of charged particle multiplicity for three different energies and for other particle species.
- Integrated yield as function of charged particle multiplicity in different collision systems suggests particle production is determined by event activity.
- $\langle p_T \rangle$ increases with charged particle multiplicity and is consistent within systematic uncertainty across different collision systems at $\langle dN_{ch}/d\eta \rangle < 20$.





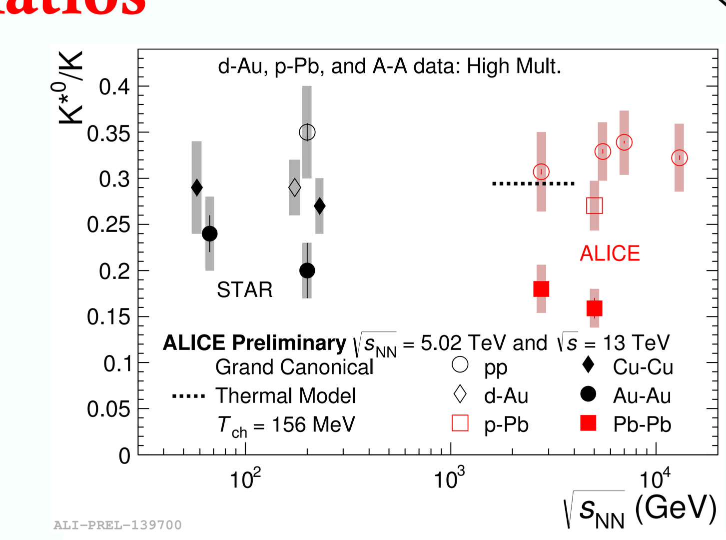


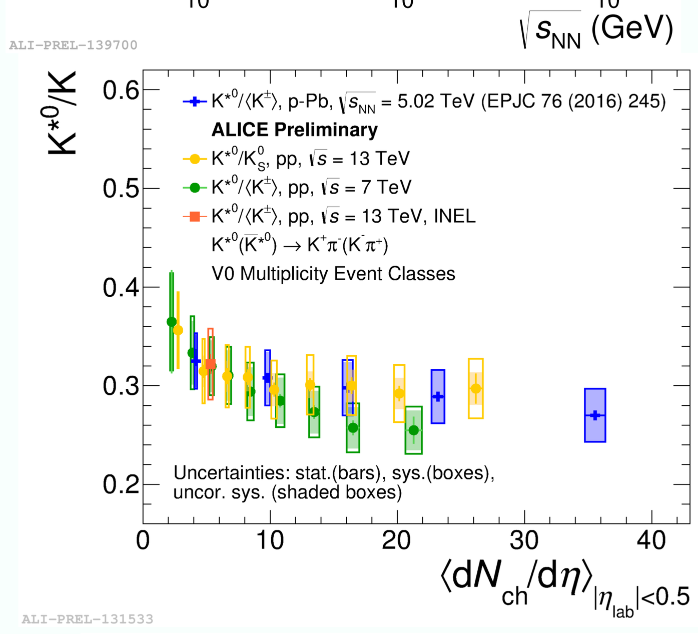


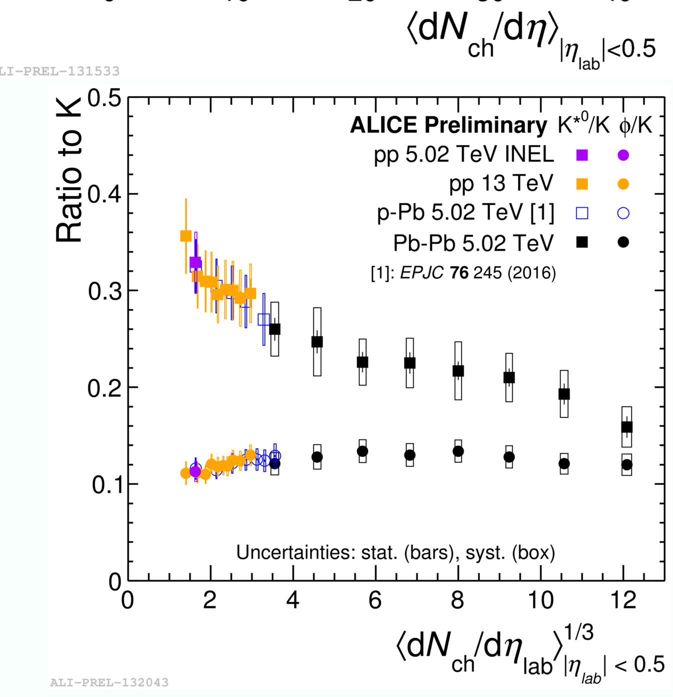


5. Particle Ratios

- No significant energy dependence of K*0/K ratios in minimum bias pp collisions is observed from RHIC to LHC energies.
- No strong energy dependence for multiplicity dependent K*/K ratio in pp.
- pp results are consistent with p-Pb in the overlap region and highest multiplicity pp/p-Pb results are consistent with peripheral Pb-Pb.
- Suppression of K*^{0}/K ratios as a function of charged particle multiplicity is observed. It suggests presence of the hadronic phase in high-multiplicity pp collisions.







6. Summary

- Hardening of p_T spectra is observed with collision energy as well as with charged particle multiplicity in pp.
- Event activity is responsible for the particle abundances.
- No significant energy dependence of K*^{0}/K ratios is observed for min. bias. as well as for multiplicity dependent measurements in pp collisions.
- Suppression of K*^{0}/K ratios as a function of charged particle multiplicity → suggests presence of the hadronic phase in high-multiplicity pp collisions.

7. References

[1]: ALICE, *EPJC* 76 245 (2016)
[2]: ALICE, *PRC* 95 064606 (2017)
[3]: A. G. Knospe et al., PRC 93 014911 (2016)