Suppression of Λ(1520) resonance production in Pb-Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV

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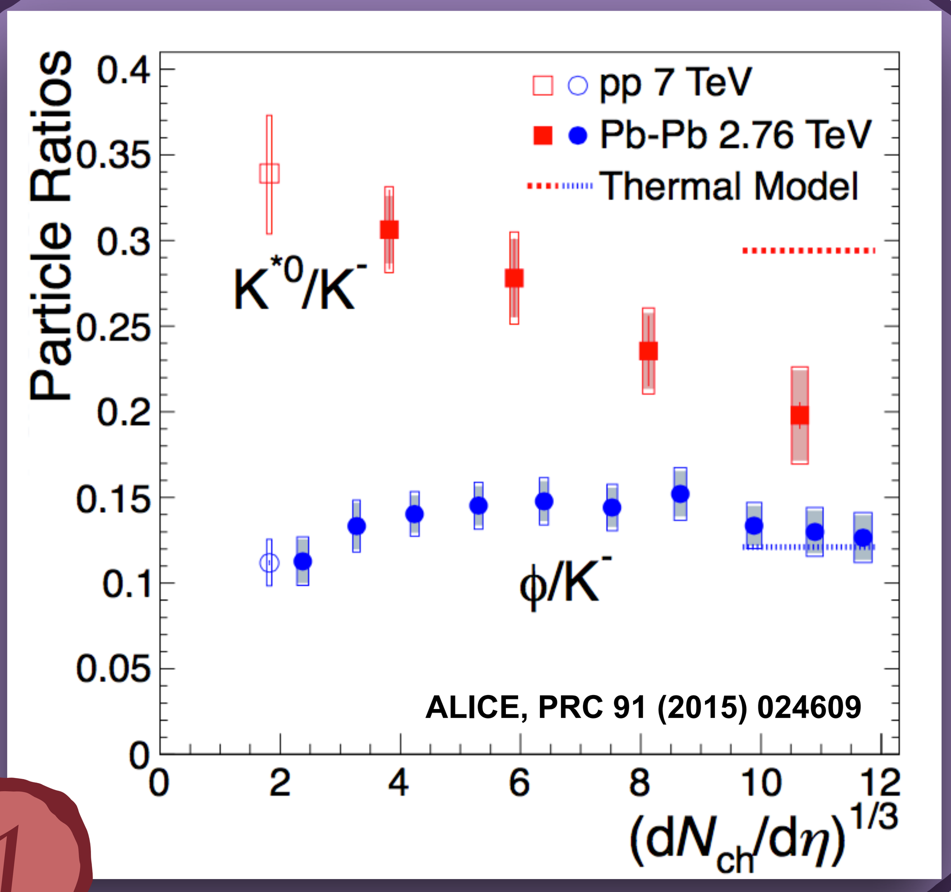
motivation



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(1) A Quark Gluon Plasma (QGP) state is created in high energy heavy-ion collisions. As the system expands, it cools down and transitions back to hadronic matter. After hadronisation, the system continues to expand until all interactions cease (kinetic freeze-out).

(2) Due to their short lifetimes ($\tau \sim$ few fm/c), resonances can decay within the hadronic medium which in turn can alter their final reconstructible yields due to re-scattering of decay products.

(3) The production of the short-lived $K^*(892)^0$ ($\tau \sim 4$ fm/c) is suppressed in central Pb-Pb collisions (Figure 1) [1], suggesting that the phenomenon might be due to the re-scattering of the $K^*(892)^0$ decay products within the dense hadronic medium before the kinetic freeze-out.

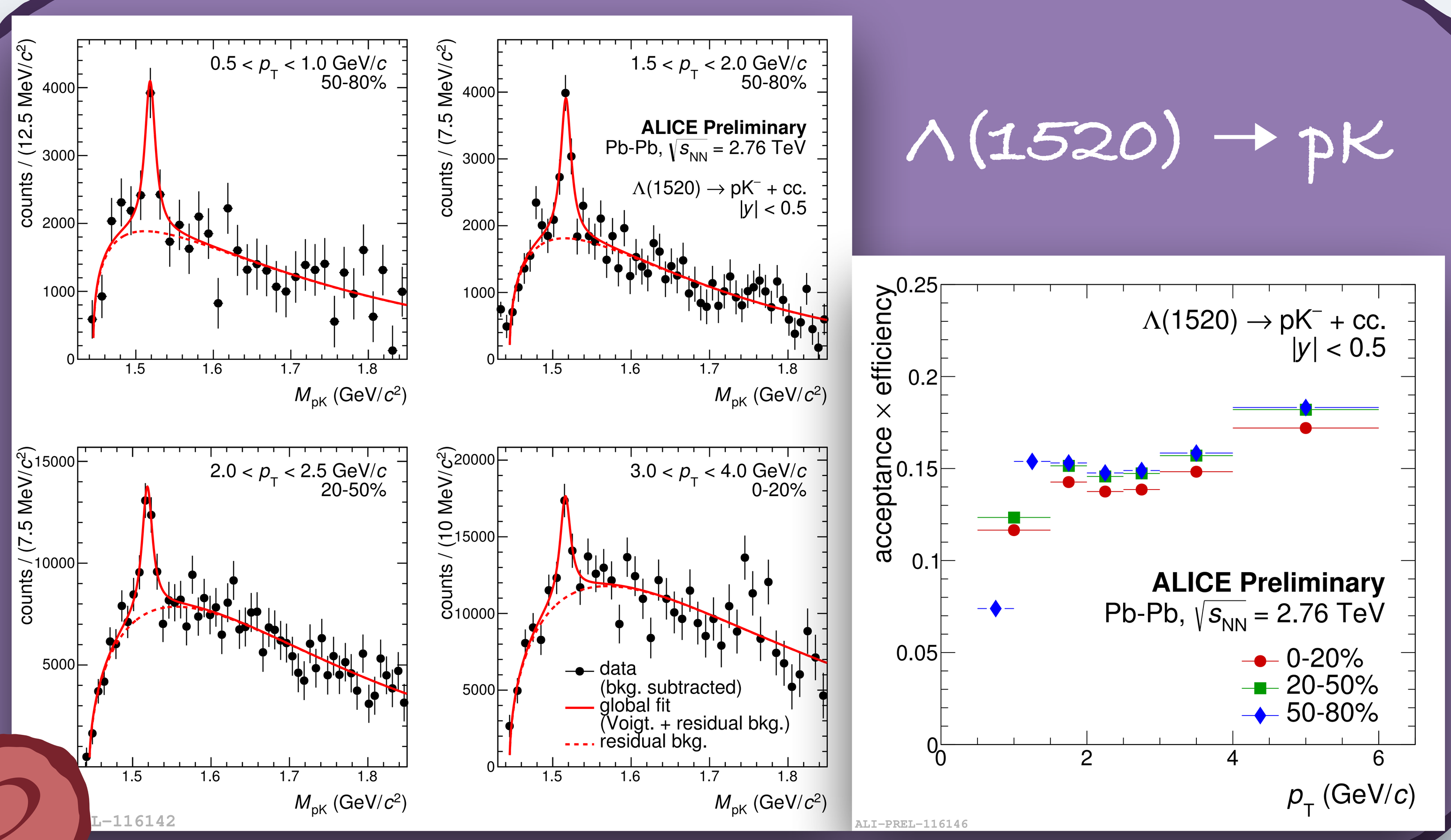
(4) No suppression is observed for the $\phi(1020)$ meson ($\tau \sim 46$ fm/c) which could indicate that it decays outside the fireball due to its longer lifetime.

(5) It is important to extend these measurements to other resonances to further probe the evolution of the dense hadronic matter after hadronisation. A good candidate is the Λ(1520), having a lifetime of $\tau(K^{*0}) < 12.6$ fm/c $< \tau(\phi)$.

(6) The production of Λ(1520) measured by the ALICE Experiment in Pb-Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV is presented. The resonance is reconstructed via invariant-mass analysis in the $\Lambda(1520) \to pK^-$ and charge conjugate decay channel. The p_T-differential yield is extracted with a combined fit (Voigtian signal + residual background) and corrected for detector acceptance and reconstruction efficiency (Figure 2).

signal & efficiency

$\Lambda(1520) \to pK$



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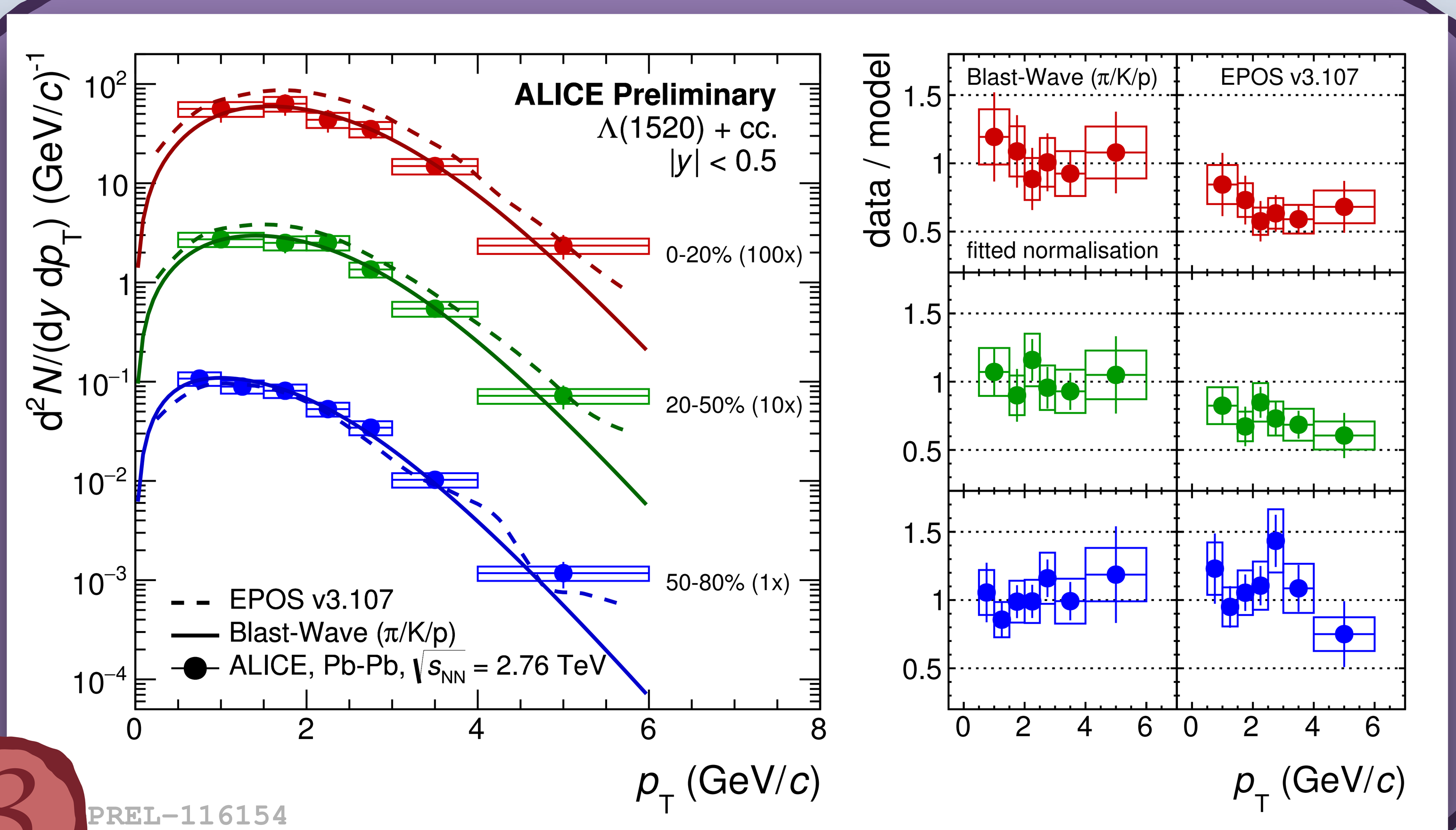
p_T spectra & predictions



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(7) The Λ(1520) + cc. p_T-differential yield measured at mid-rapidity ($|y| < 0.5$) in three centrality classes is shown in Figure 3 and compared to predictions from the Blast-Wave [2] and EPOS3 [3] models.

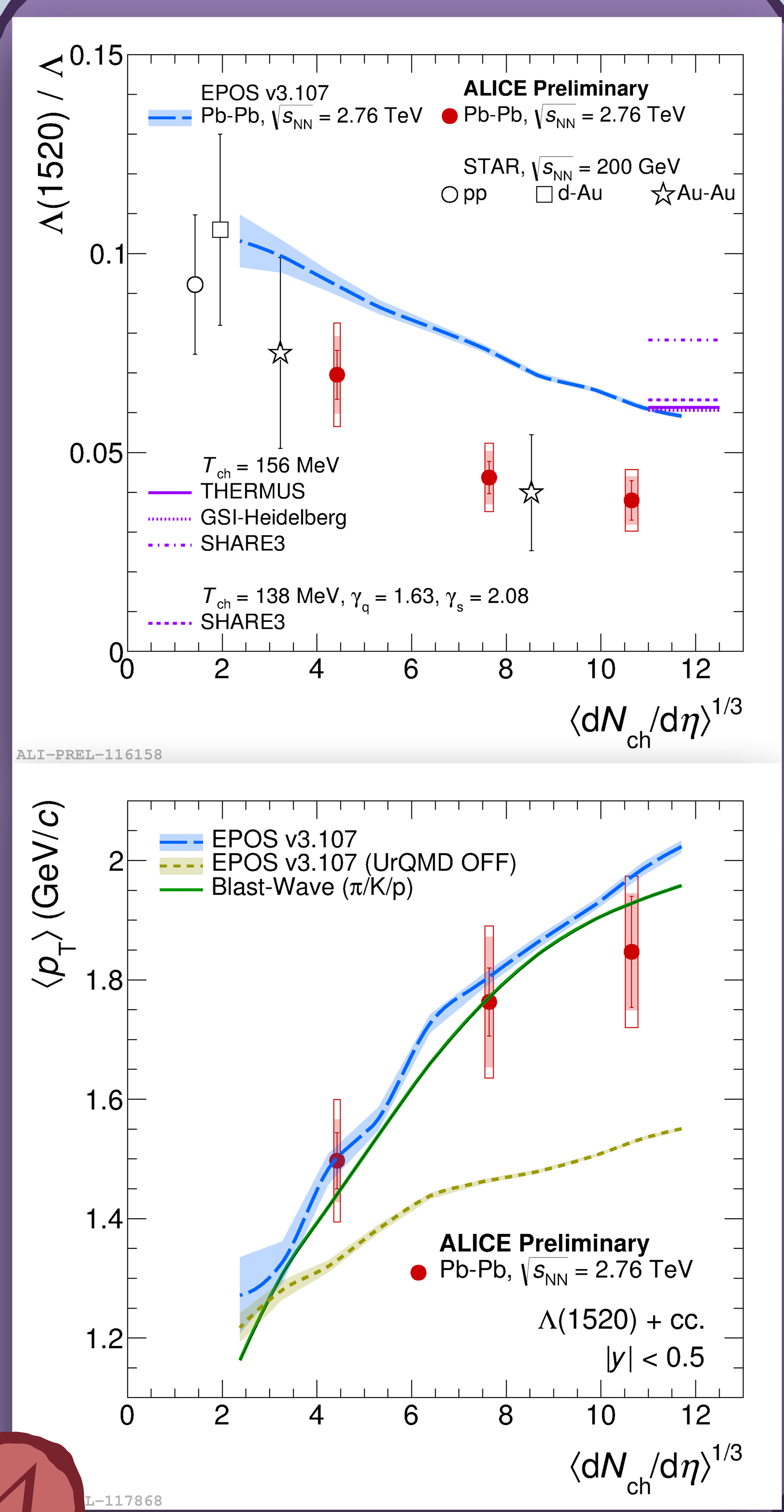
(8) The spectral shapes are in agreement with the Blast-Wave (based on the parameters obtained from π/K/p fits [4]) and EPOS3 predictions. EPOS3 slightly over-predicts the yield for central collisions.

(9) The p_T-integrated Λ(1520)/Λ yield ratio is shown in Figure 4 and compared to STAR results [5]. The ratio is suppressed in central collisions if compared to the values observed in peripheral collisions, pp collisions and predictions from statistical hadronisation models [6, 7, 8]. The EPOS3 model [3], employing UrQMD for the description of the hadronic phase, reproduces the multiplicity trend.

(10) The $\langle p_T \rangle$ increases from peripheral to central collisions (Figure 4) and is in agreement with the Blast-Wave and EPOS3 model predictions. EPOS3 fails to reproduce the data if the UrQMD stage is not enabled.

(11) These measurements, which extend STAR results to higher multiplicity and improved accuracy, further support the existence of a hadronic phase lasting long enough to cause a significant reduction of the reconstructible yield of short lived resonances.

Λ(1520)/Λ & $\langle p_T \rangle$



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