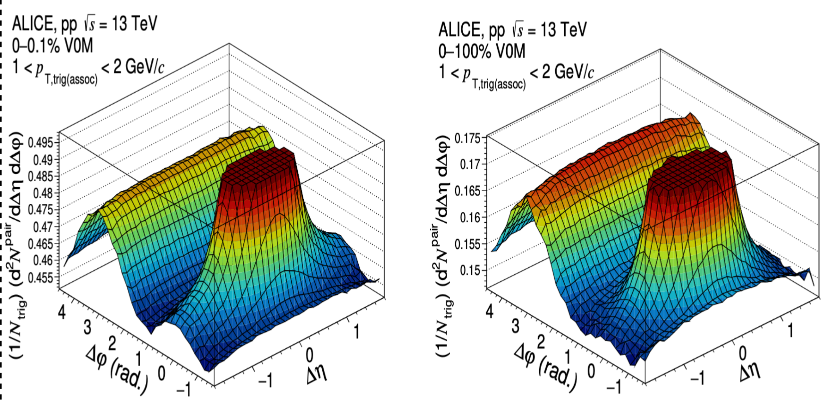
Exploring the $\Lambda(1520)$ resonance in high-multiplicity proton–proton collisions at LHC energies with ALICE

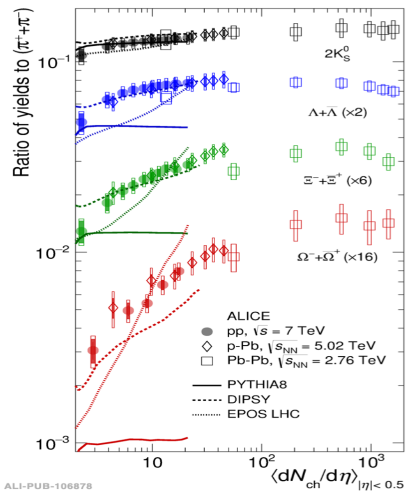
Sonali Padhan (On behalf of ALICE Collaboration)
Email- sonali.padhan@cern.ch

1. Introduction

- Hadronic resonances serve as crucial probes for investigating the hadronic phase in ultrarelativistic heavy-ion collisions due to their lifetime being comparable with its duration.
- A significant suppression in yield is observed for $K^{*0}(892)$ and $\Lambda(1520)$ in Pb−Pb collisions whereas only $K^{*0}(892)$ shows suppression in small systems.
- $\Lambda(1520)$ resonance whose lifetime (~ 13 fm/c) lies between $K^{*0}(\sim 4\ \mathrm{fm}/c)$ and $\phi(\sim 42\ \mathrm{fm}/c)$ offers unique insights into the characteristics of the hadronic phase [1][2][3].

2. Motivation



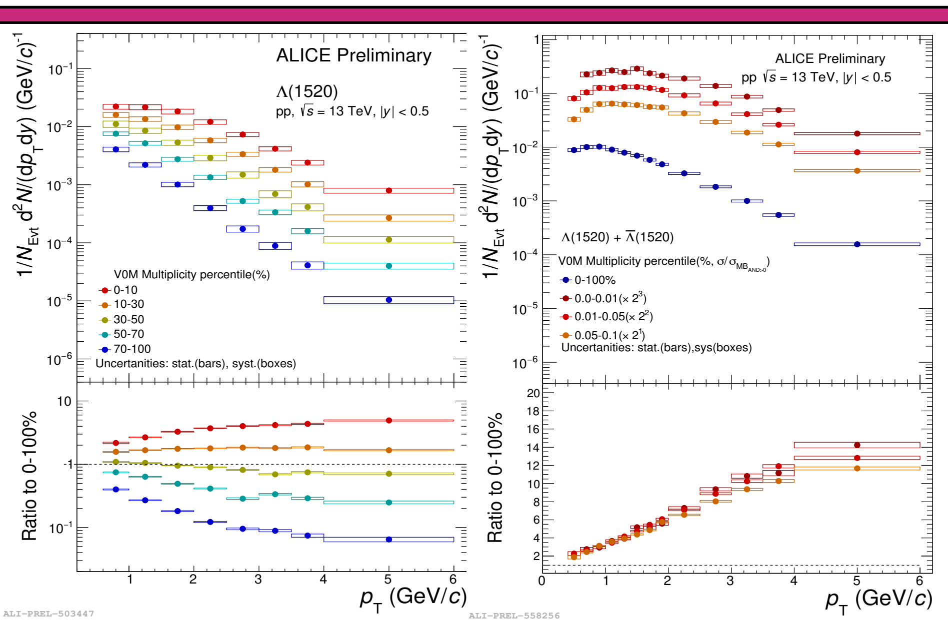


- Enhancement of strange hadron production [4] and ridge structure in high multiplicity pp collisions [5] suggesting potential QGP-like effects in small system.
- Studying the $\Lambda(1520)$ resonance helps understand its suppression in heavy-ion collisions and its potential presence in high-multiplicity pp collisions.

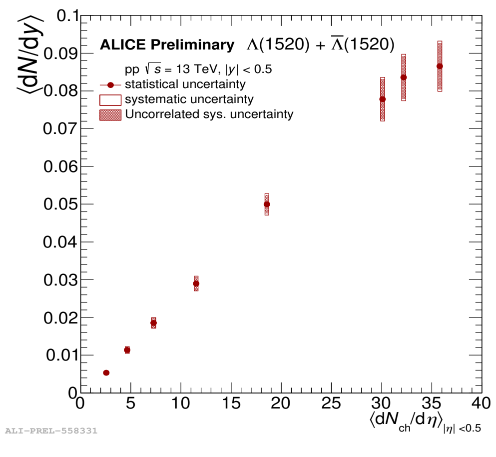
3. Results

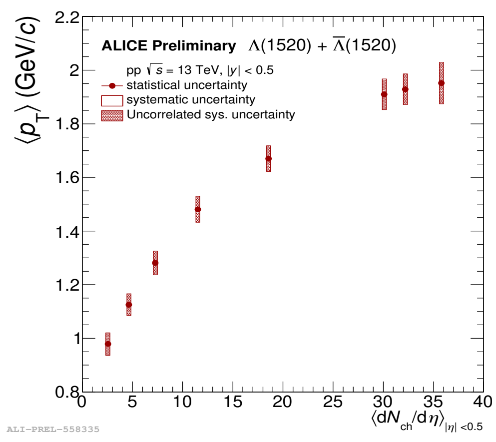
a) p_T spectra

- Lower panel shows the ratio to 0-100% multiplicity class by taking uncorrelated systematic uncertainty
- In small system, the spectral shape changes and gets harder with increasing multiplicity.
- These effects are similar to those observed in heavy-ion collisions that are typically interpreted as flow-like effects.



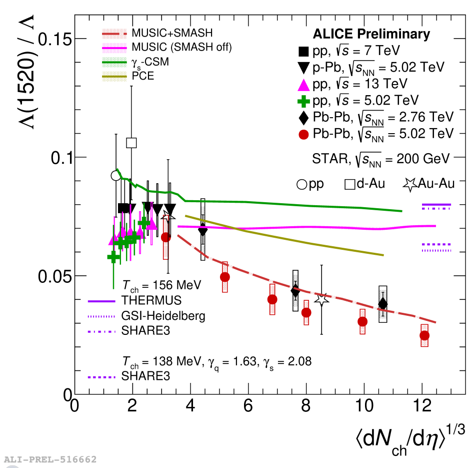
b) p_T integrated yield ($\langle dN/dy \rangle$) and Mean p_T ($\langle p_T \rangle$)

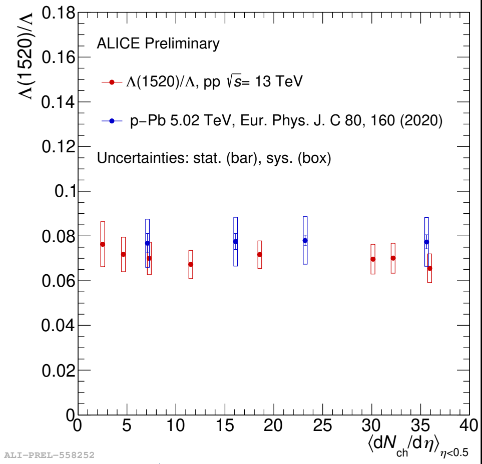




- The dN/dy and $\langle p_T \rangle$ increases with event multiplicity suggesting that multiplicity primarily influences resonance production.

c) Particle yield ratio





- No suppression is observed in $\Lambda(1520)/\Lambda$ ratio for pp collisions at $\sqrt{s}$ = 5.02 and 13 TeV.
- The $\Lambda(1520)/\Lambda$ ratio is suppressed in central Pb−Pb collisions with respect to pp and peripheral Pb−Pb collisions.

4. Conclusions

- $\Lambda(1520)/\Lambda$ ratio is not suppressed in the small system, whereas suppression in K*⁰/K ratio might suggest rescattering effects for K*⁰ production.
- Suppression is observed for $\Lambda(1520)/\Lambda$ in the A-A collisions. Primarily attributed to the dominance of re-scattering effect.

5. References

[1] Phys. Rev. C 106 , 034907 (2022)
[2] ALICE: Phys. Rev. C 99, (2019) 024905
[3]ALICE: Eur. Phys. J. C 80, 160 (2020)
[4] Nature Physics 13 (2017) 535-539
[5] JHEP05(2021)290