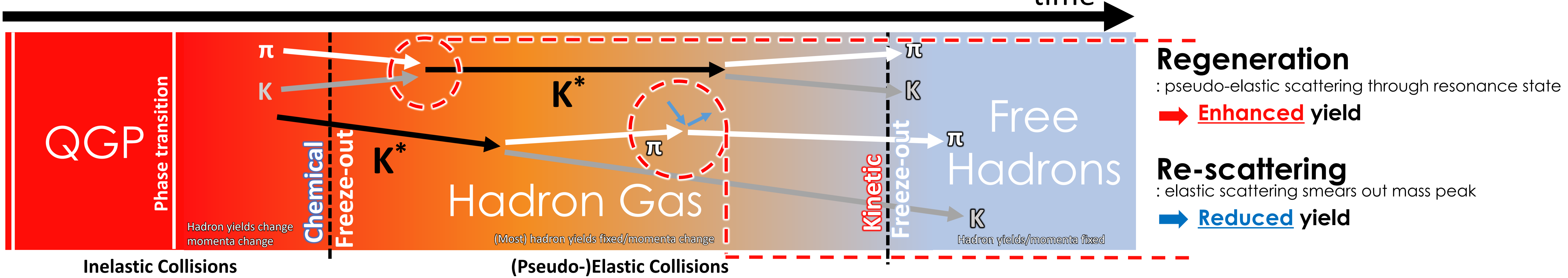


MOTIVATION: RESONANCES IN HADRONIC PHASE



RESONANCE yields are influenced by **Chemical freeze out temperature (T_{ch})**, **Lifetime of Hadronic Phase**, **Lifetime of resonance** itself, **Scattering cross-sections of decay products in the hadronic gas**.

$\Xi(1530)^0$ IN RESONANCES

in Light Flavor (strangeness)

Short lifetimes; Similar to Hadronic phase
Excited States; Can compare results to the other particle with similar quark contents

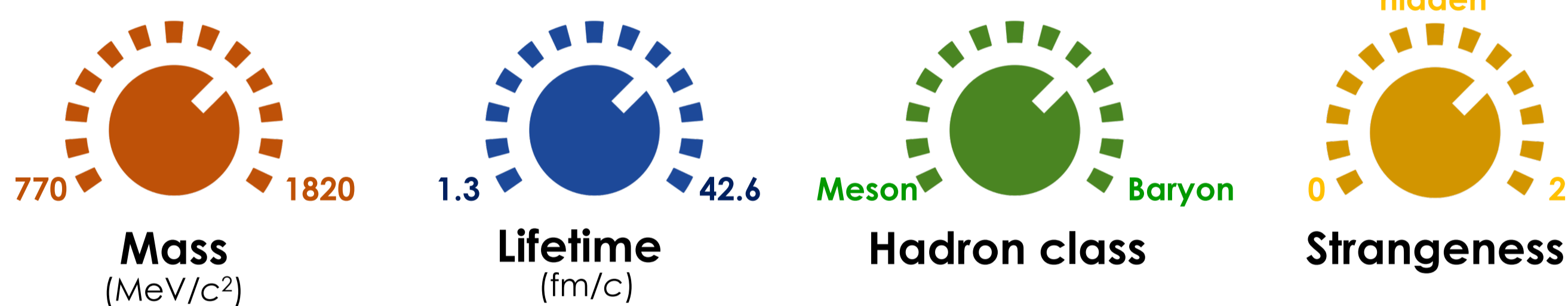
Properties

| Particle | Mass (MeV/c ²) | Lifetime (fm/c) | Decay | Branching Ratio (%) |
|-----------------------------|----------------------------|-----------------|--------------|---------------------|
| $\Phi(s\bar{s})$ | 1019 | 46.3 | K^+K^- | 48.9% |
| $\Xi(1530)^0$ | 1531 | 21.7 | $\pi^+\Xi^-$ | 66.7% |
| $\Lambda^*(uds)$ | 1520 | 12.6 | pK^- | 22.5% |
| $\Xi(1820)$ | 1823 | 8.2 | $K\Lambda$ | (unknown) |
| $\Sigma^*(uus, dds)$ | 5 | ~5 | $\pi^+\pi^-$ | 46% |
| $f_0(\text{unknown})$ | 990 | ~5 | $\pi^+\pi^-$ | (46%) |
| $K^*(d\bar{s})$ | 4.2 | 4.2 | $K^+\pi^-$ | 66.6% |
| $\rho(u\bar{u} + d\bar{d})$ | 1.3 | 1.3 | $\pi^+\pi^-$ | 100% |

RELATED CONTRIBUTIONS AT SQM 2019

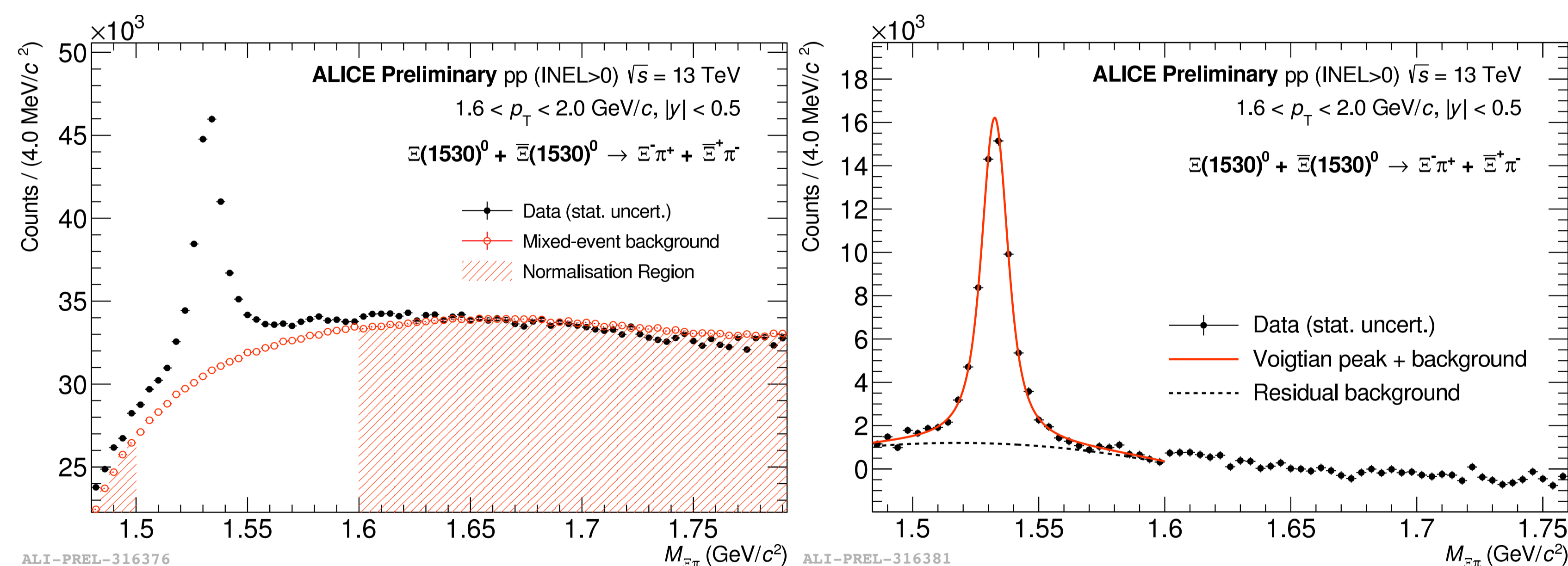
Talk: S. Tripathy at 13 Jun
Posters:

- Φ in pp: S. Tripathy, S. Kundu
- Λ^* in Pb-Pb: N. Agrawal
- $\Xi(1820)$ in pp: C. J. Myers
- f_0 in pp: F. Bellini, J. Kim
- K^* in p-Pb: D. Mallick, S. De



RESONANCES may have knobs that can be used to study the hadronic phase

SIGNAL EXTRACTION



Signal – unlike-sign pair invariant mass distribution ($\Xi^\mp + \pi^\pm$)

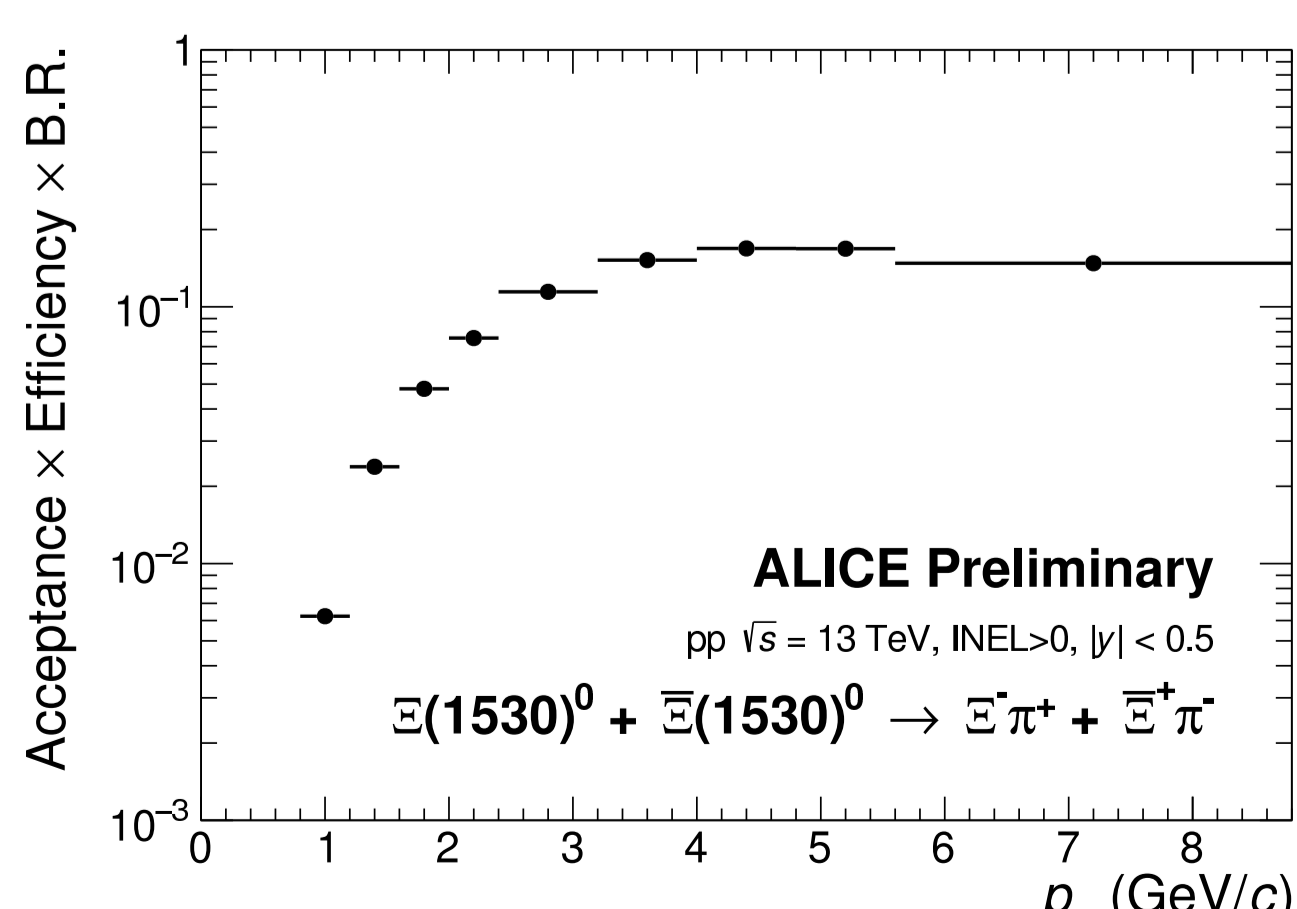
Background – unlike-sign pair from mixed event
(20 events, $\Delta V_z \leq 1$ cm)

Fit function – Voigt function (signal) + quadratic function (residual background)

$$V(m_{inv}; \sigma, \Gamma) = A \int \frac{e^{-m_{inv}^2/(2\sigma^2)}}{\sigma\sqrt{2\pi}} \frac{\Gamma}{\pi(m_{inv}^2 + \Gamma^2)} dm_{inv}$$

m_{inv} : invariant mass, Γ : intrinsic width of the resonance, σ : detector resolution

RECONSTRUCTION EFFICIENCY \times ACCEPTANCE



Using PYTHIA 8, correction factor for the raw yield

$$\epsilon_{rec} = \frac{Y_{rec}; |y| < 0.5}{Y_{gen}; |y| < 0.5}$$

REFERENCES:

- [1] ALICE Collaboration, Abelev, B., Adam, J. et al. Eur. Phys. J. C (2015) 75: 1. <https://doi.org/10.1140/epjc/s10052-014-3191-x>
- [2] ALICE Collaboration, Adamová, D., Aggarwal, M.M. et al. Eur. Phys. J. C (2017) 77: 389. <https://doi.org/10.1140/epjc/s10052-017-4943-1>

$\Xi(1530)^0$ (uss)

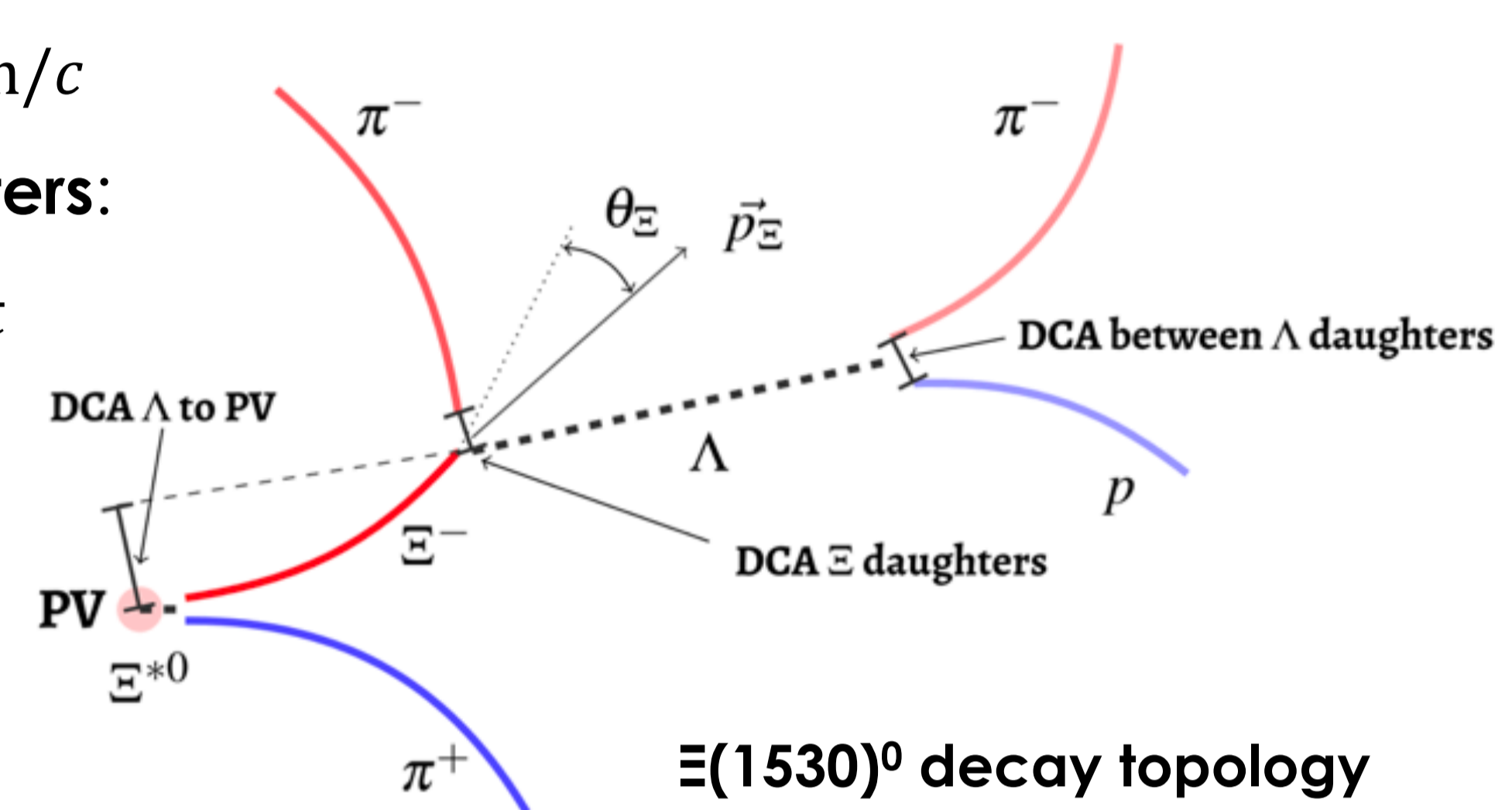
Mass: 1531 ± 0.32 MeV/c²

Width: 9.1 ± 0.5 MeV/c²

Lifetime: 21.7 fm/c

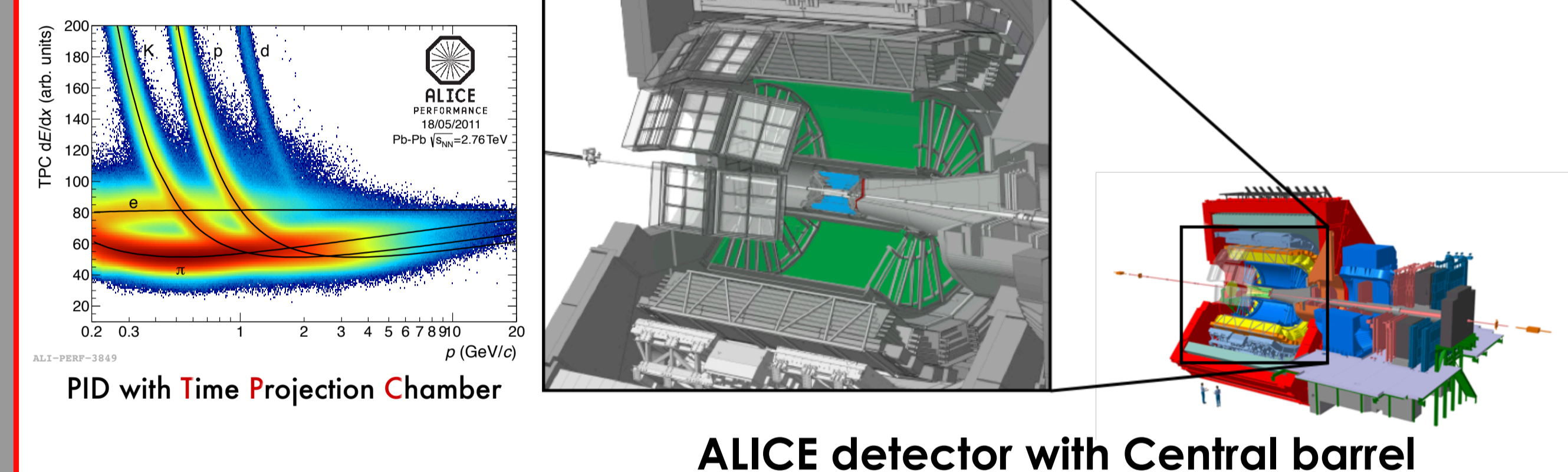
Decay daughters: $p + \pi + \pi + \pi$

B.R.: 66.7%

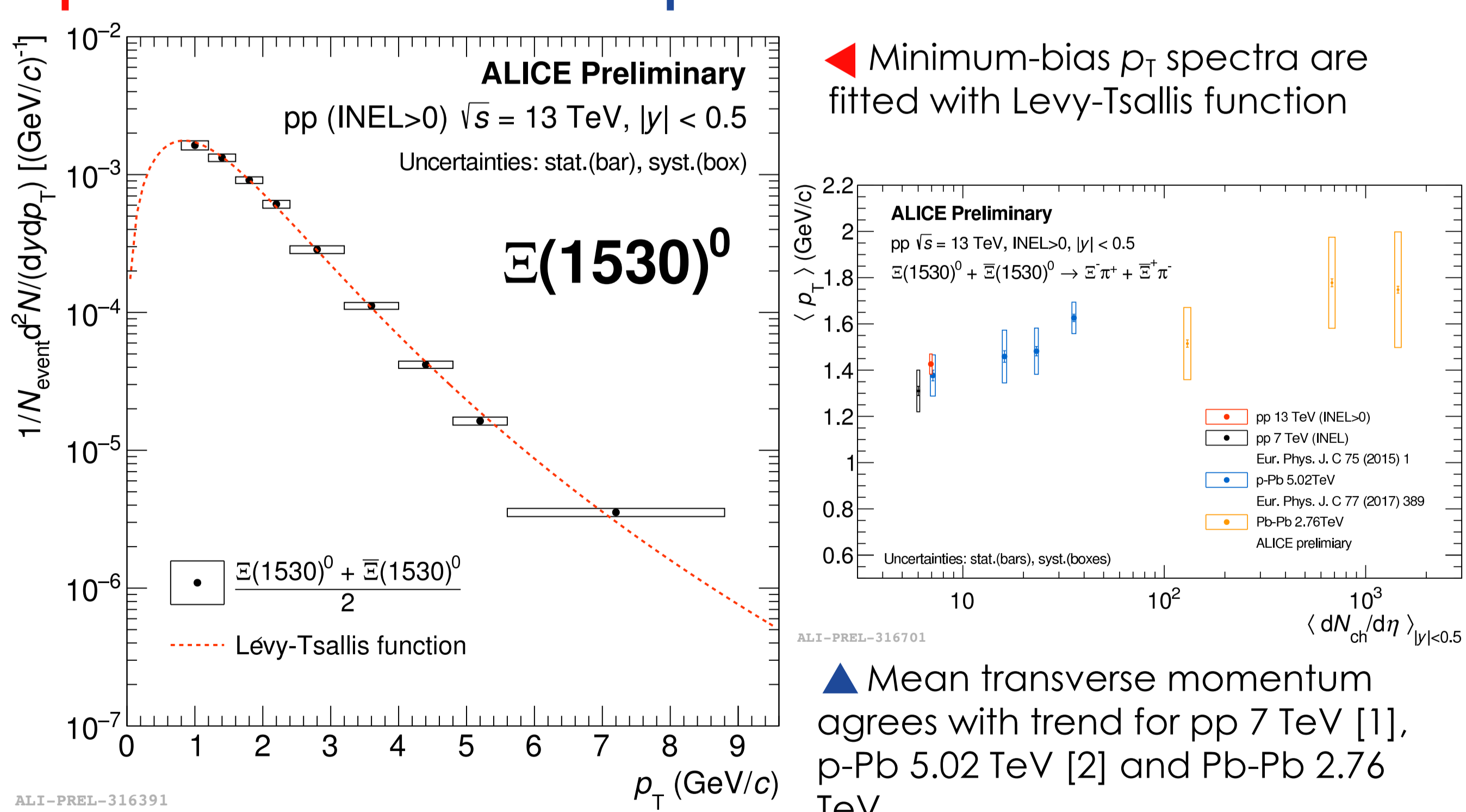


Used detector:

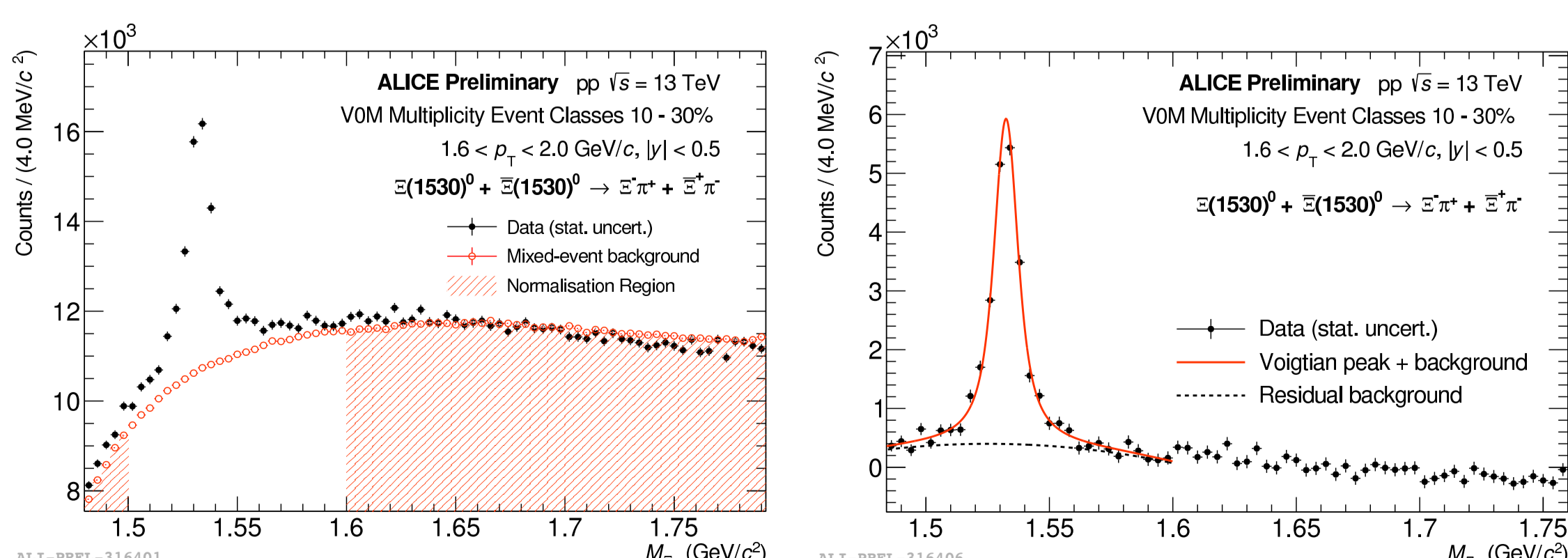
- ITS** – Tracker / Trigger / Vertexer
- TPC** – Tracker / PID (dE/dx)
- VO** – Trigger / Multiplicity estimator



p_T SPECTRUM, MEAN p_T



OUTLOOK



- The first multiplicity-dependent $\Xi(1530)$ resonance study in pp collisions at $\sqrt{s} = 13$ TeV is on going.
- Comparison to the further excited state particle, $\Xi(1820)$ can be interesting.

→ See **Corey's Poster** for the details!