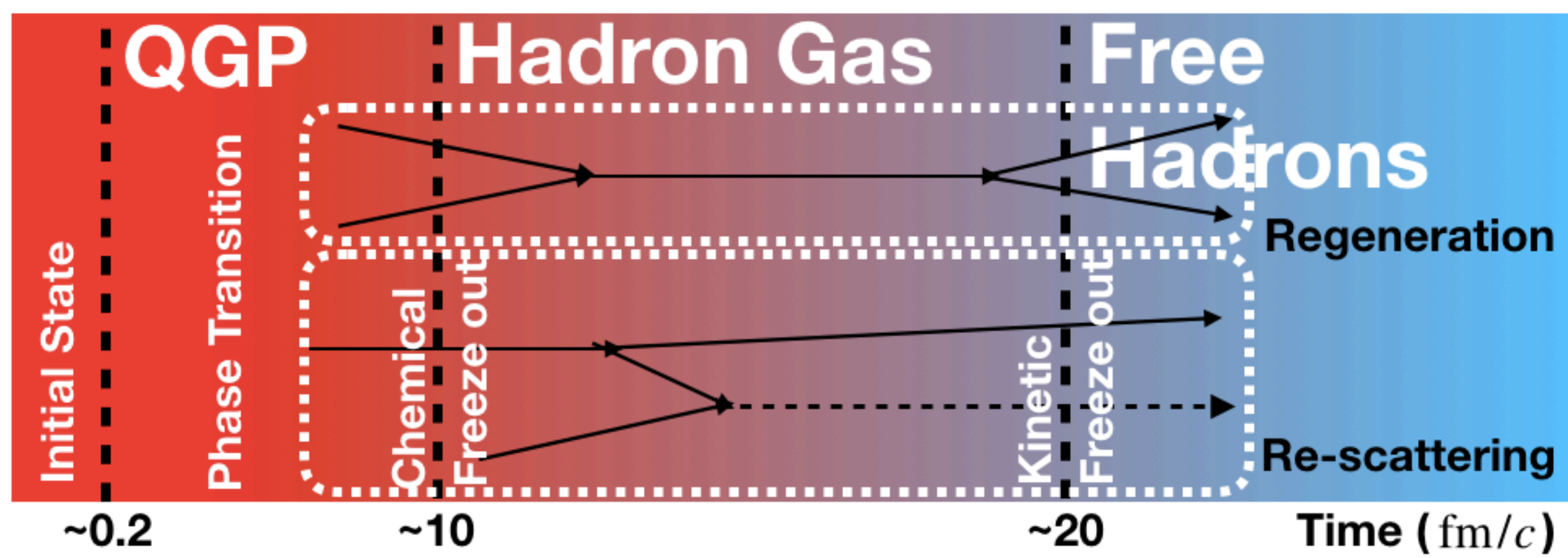


$f_0(980)$ Resonance production in small collision systems with ALICE

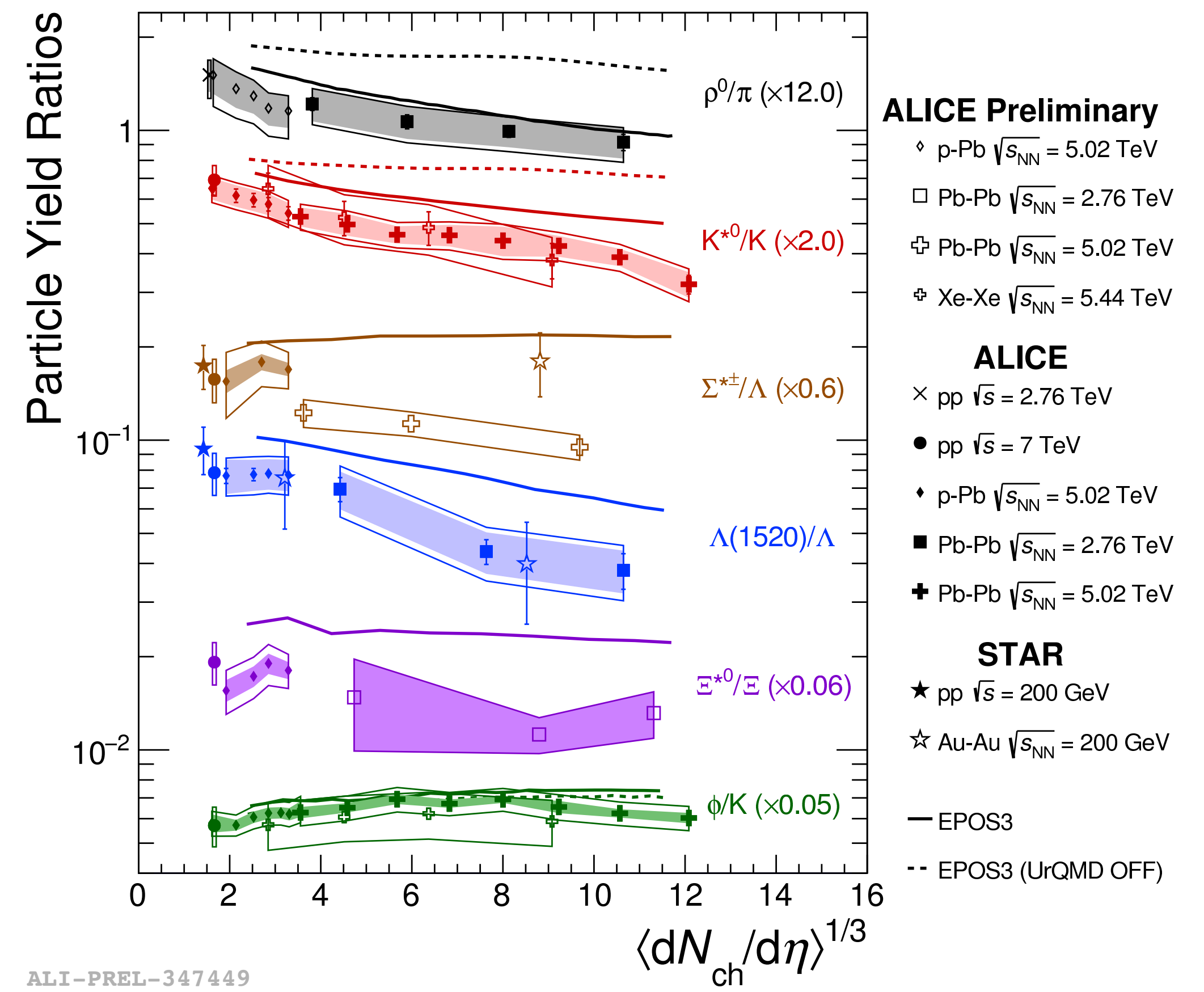
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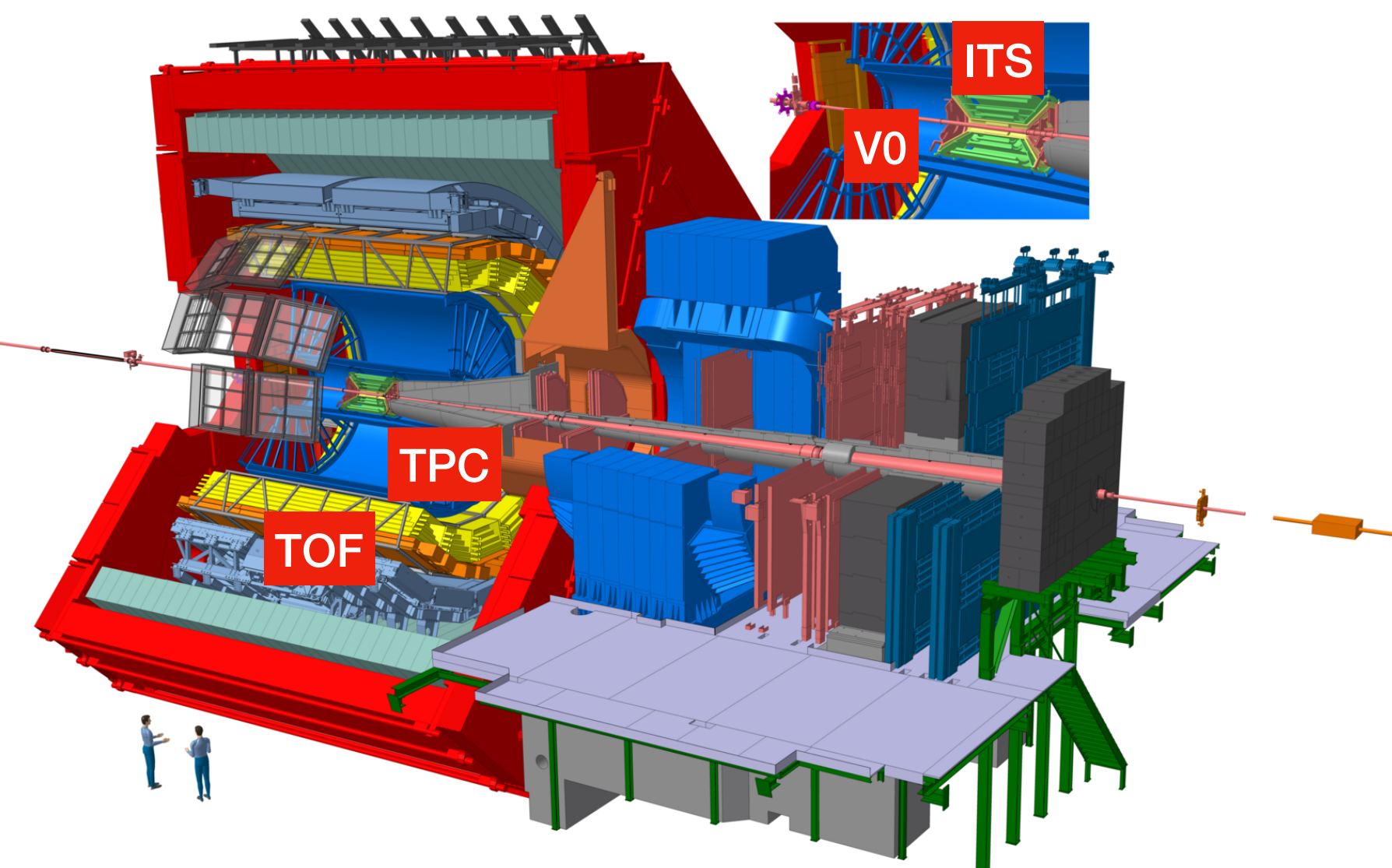
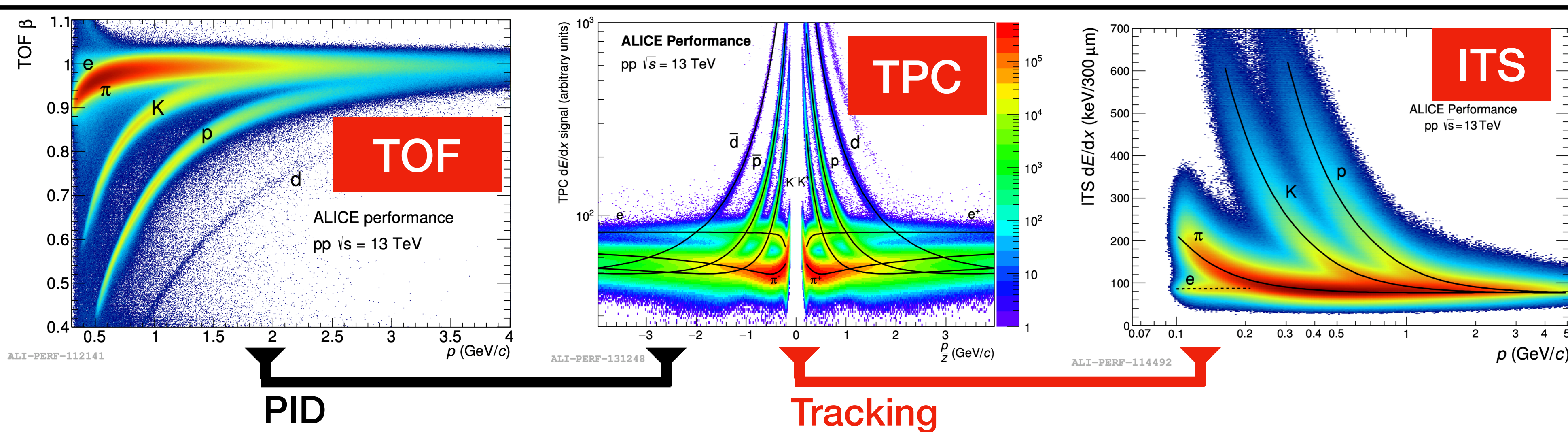
Motivation



- Short-lived resonances : powerful probes of the hadronic phase in ultra-relativistic heavy-ion collisions, $\tau \sim t_{\text{kin}} - t_{\text{ch}}$
- Measurement in small collision systems : baseline for the measurement in heavy-ion collisions.
- $f_0(980)$: scalar meson internal structure under investigation, $\tau \sim 5 \text{ fm}/c$, strong modification in hadronic phase?



$f_0(980)$ measurement with ALICE



- $f_0(980) \rightarrow \pi^+\pi^-$ decay mode for the measurement.
- Mid-rapidity selection ($|y_{f_0(980)}| < 0.5$).

Signal Extraction

- Other two resonances with similar mass as $f_0(980)$: $f_2(1270), \rho^0$
- $\pi^+\pi^-$ invariant-mass constructed and like-sign background subtracted.
- Fit : three resonances + residual background.

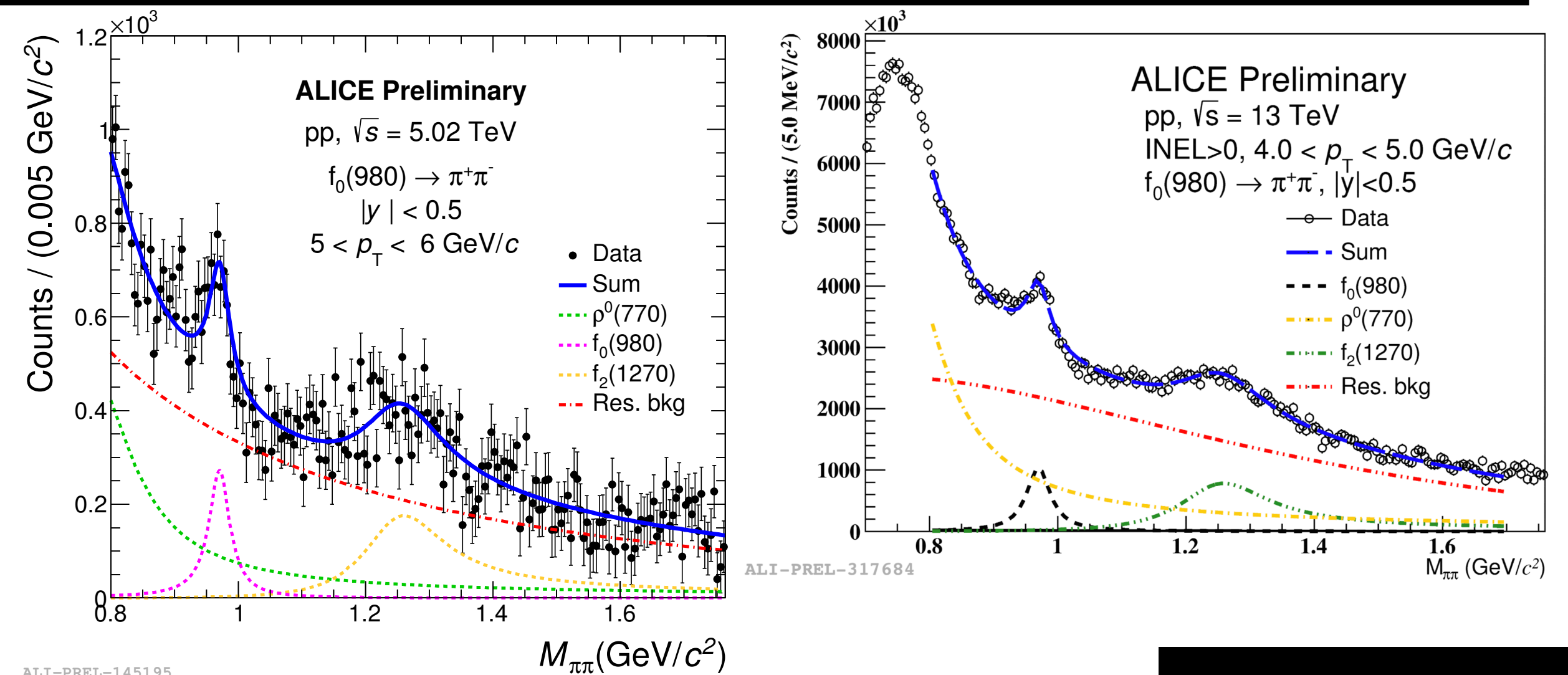
$$rBW(M_{\pi\pi}) = \frac{M_{\pi\pi} \Gamma M_0}{(M_{\pi\pi}^2 - M_0^2)^2 + M_0^2 \Gamma^2}$$

$$\Gamma = \left[\frac{M_{\pi\pi}^2 - 4m_\pi^2}{M_0^2 - 4m_\pi^2} \right]^{(2l+1)/2} \Gamma_0 \frac{M_0}{M_{\pi\pi}}$$

$$f_{BG}(M_{\pi\pi}) = (M_{\pi\pi} - 2m_\pi)^n A \exp(BM_{\pi\pi} + CM_{\pi\pi}^2)$$

$$f_{PS} = \frac{M_{\pi\pi}}{\sqrt{M_{\pi\pi}^2 + p_T^2}} \exp\left(-\frac{\sqrt{M_{\pi\pi}^2 + p_T^2}}{T}\right)$$

*Additional Phase Space correction in 5.02 TeV

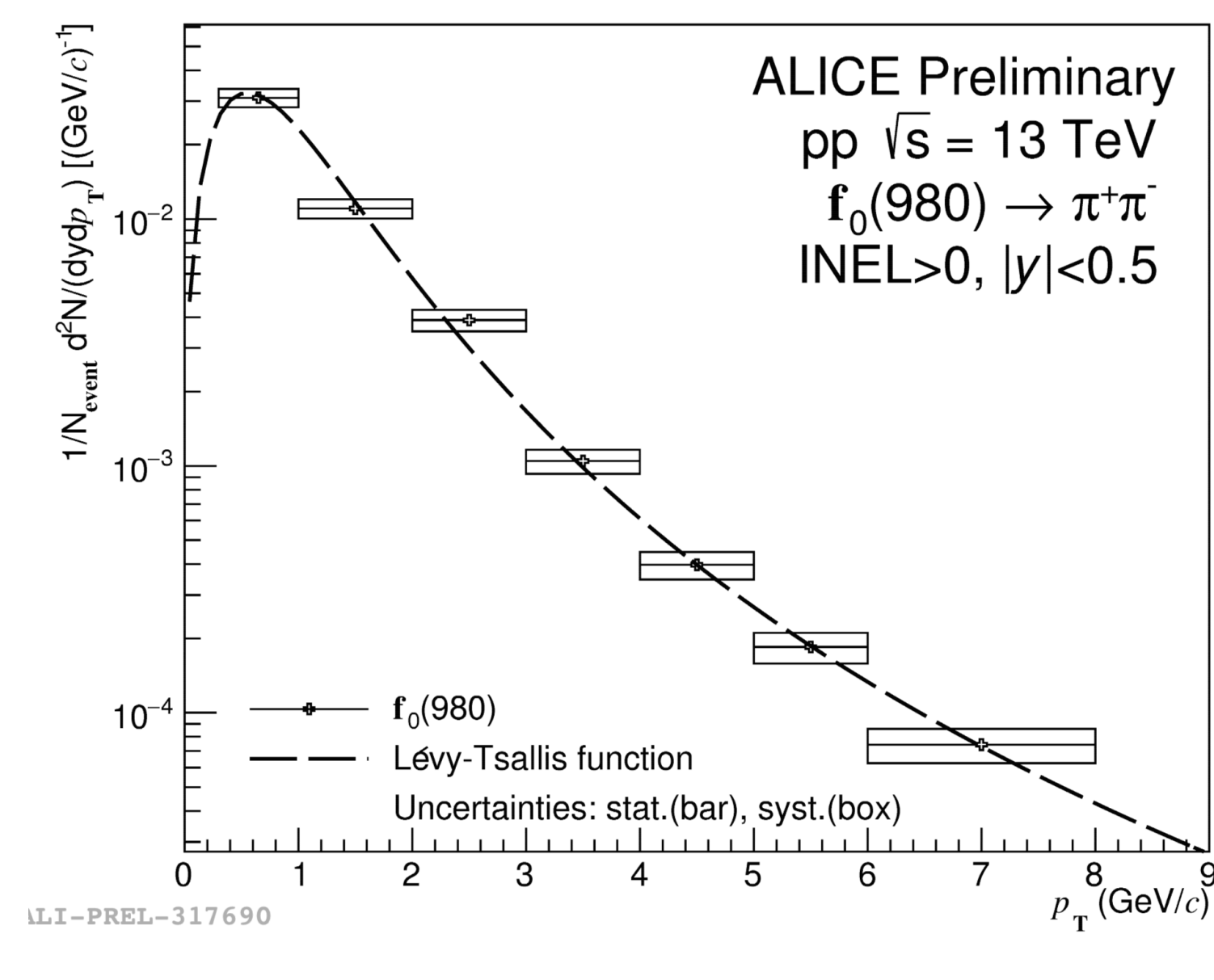
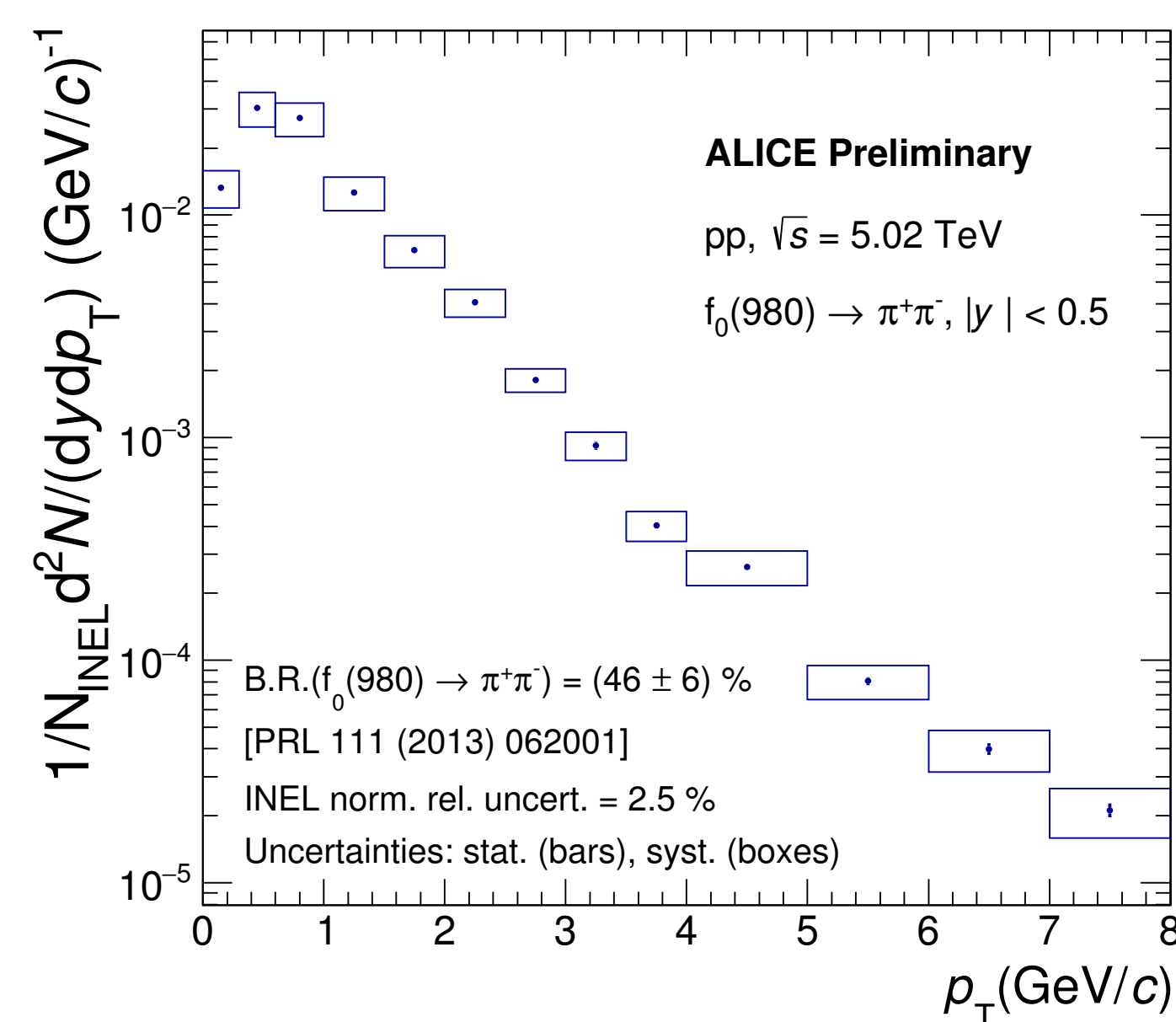
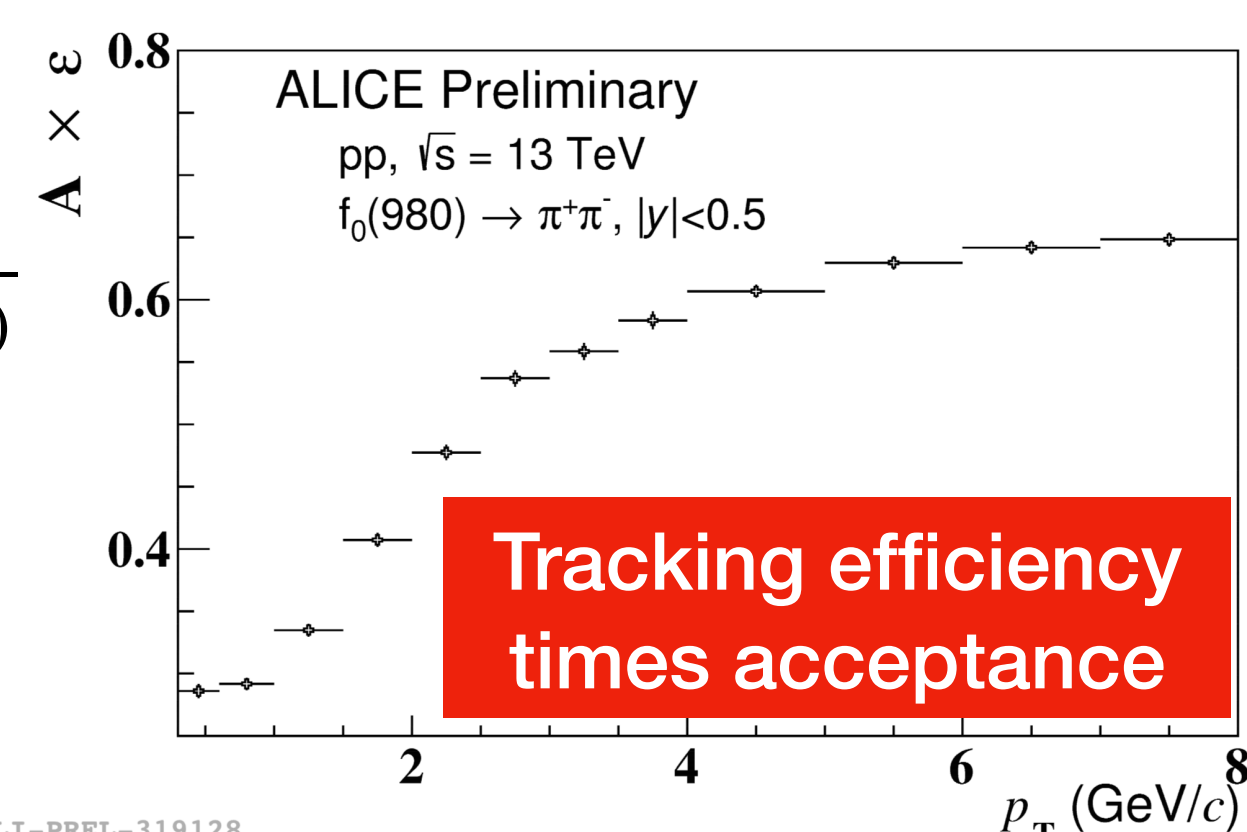


Results

- Efficiency and acceptance correction and normalization factors applied.
- Transverse momentum spectra of $f_0(980)$ have been measured and fitted with Lévy-Tsallis function.

$$\frac{1}{N_{\text{INEL}>0}} \frac{dN_{f_0}}{dy dp_T} = \frac{1}{N_{\text{KINT7}}} \frac{dN_{f_0 \rightarrow \pi^+\pi^-}}{dy dp_T} \frac{1}{B \cdot R \cdot (f_0 \rightarrow \pi^+\pi^-)}$$

$$\times \frac{N_{\text{KINT7}}}{N_{\text{INEL}>0}} \times \frac{N_{\text{KINT7 \& vtx}}}{N_{\text{KINT7}}} \times \frac{Y_{\text{INEL}>0}}{Y_{\text{KINT7 \& vtx}}}$$



Outlook

- $f_0(980)$ resonance has been measured in pp collisions at 5.02 TeV and 13 TeV.
- Signal extracted through invariant mass integration, considering contributions of other resonances and combinatorial background.
- Interesting results on multiplicity dependent $f_0(980)$ production in pp and p-Pb collisions will soon become available.

