Multiplicity dependent study of $\Lambda(1520)$ production in pp collisions at $\sqrt{s}$ = 5.02 and 13 TeV with ALICE
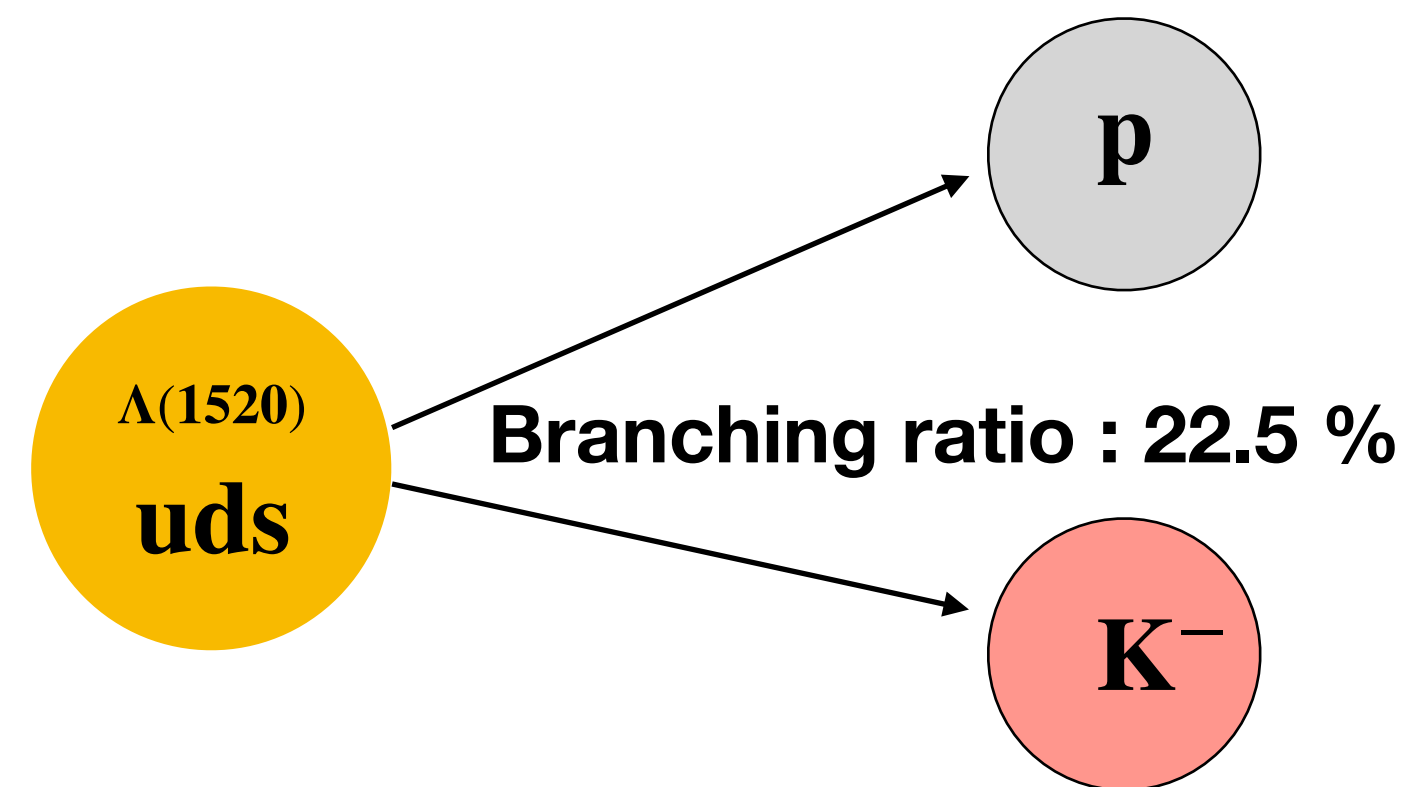

SQM 2022
The 20th International Conference on Strangeness in Quark Matter
13-17 June 2022
Busan, Republic of Korea

Sonali Padhan
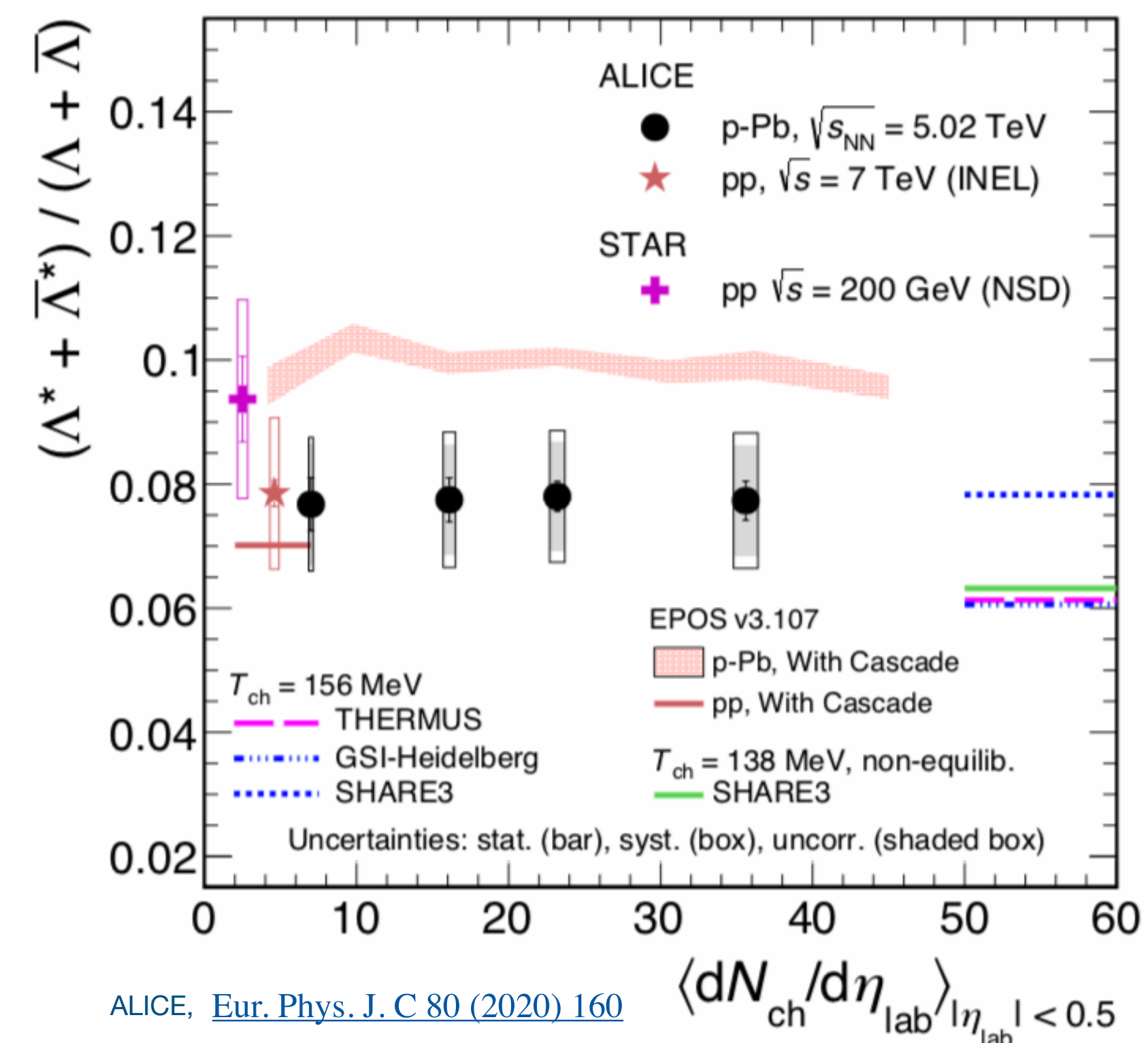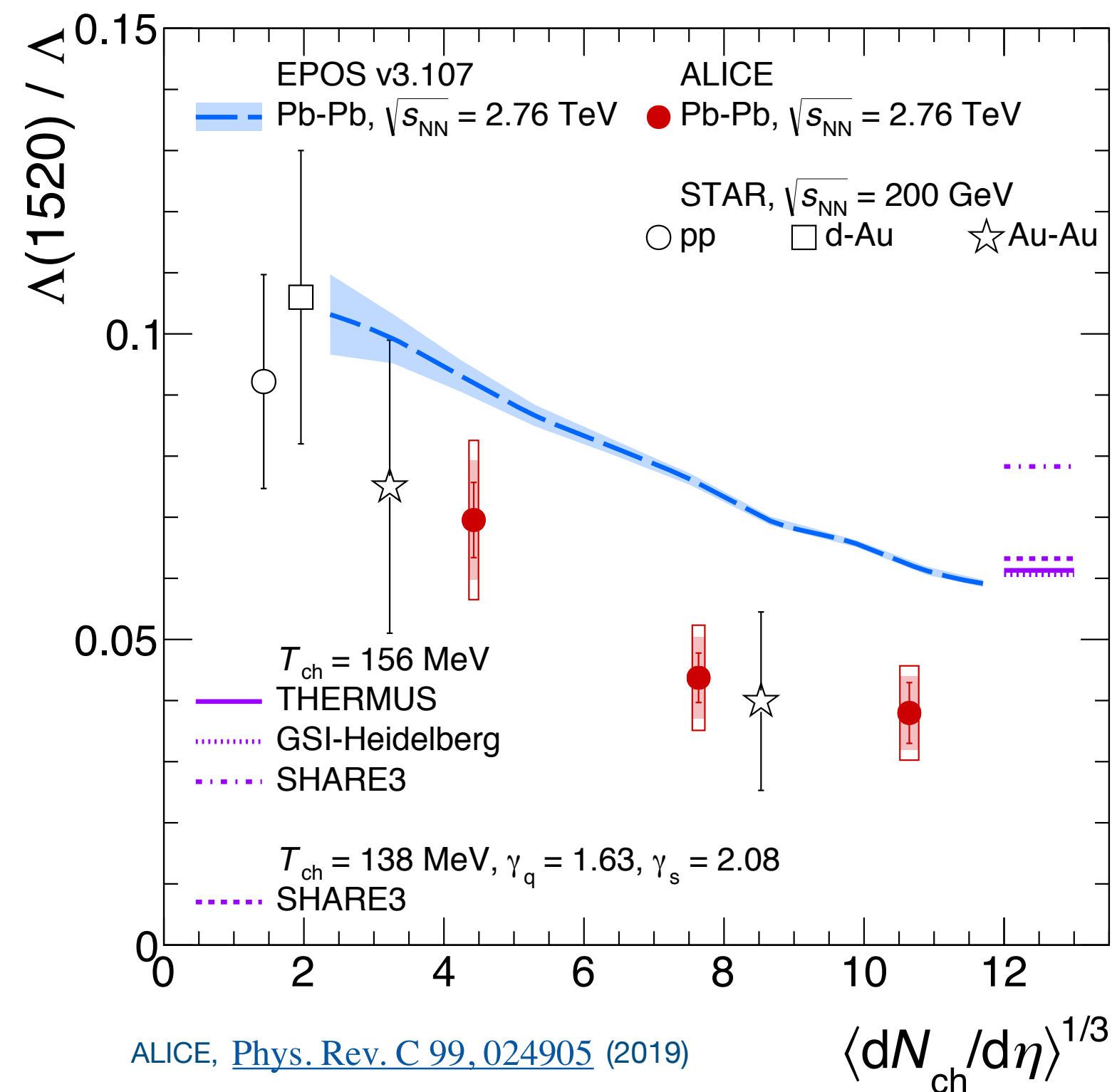**(On behalf of ALICE Collaboration)**
Indian Institute of Technology Bombay, India

14th June, 2022

Introduction

p

$\Lambda(1520)$
uds

Branching ratio : 22.5 %

K^-

Lifetime = 12.6 fm/c

mass = 1520 MeV/c^2

$\Lambda(1520) / \Lambda$

EPOS v3.107
Pb-Pb, $\sqrt{s_{NN}}$ = 2.76 TeV

ALICE
Pb-Pb, $\sqrt{s_{NN}}$ = 2.76 TeV

STAR, $\sqrt{s_{NN}}$ = 200 GeV
pp   d-Au   Au-Au

T_{ch} = 156 MeV
THERMUS
GSI-Heidelberg
SHARE3

T_{ch} = 138 MeV, γ_q = 1.63, γ_s = 2.08
SHARE3

$\langle dN_{ch}/d\eta \rangle^{1/3}$

ALICE, Phys. Rev. C 99, 024905 (2019)

$(\Lambda^* + \overline{\Lambda^*}) / (\Lambda + \overline{\Lambda})$

ALICE
p-Pb, $\sqrt{s_{NN}}$ = 5.02 TeV
pp, $\sqrt{s}$ = 7 TeV (INEL)

STAR
pp $\sqrt{s}$ = 200 GeV (NSD)

T_{ch} = 156 MeV
THERMUS
GSI-Heidelberg
SHARE3

EPOS v3.107
p-Pb, With Cascade
pp, With Cascade

T_{ch} = 138 MeV, non-equilib.
SHARE3

Uncertainties: stat. (bar), syst. (box), uncorr. (shaded box)

$\langle dN_{ch}/d\eta_{lab} \rangle_{|\eta_{lab}| < 0.5}$

ALICE, Eur. Phys. J. C 80 (2020) 160

- Hadronic resonances are effective tools for studying the hadronic phase in heavy-ion collisions.
- The study of Λ(1520), which has lifetime in between K*(~ 4 fm/c) and φ(~ 46 fm/c), is important for understanding the evolution of the system.
- The $\Lambda(1520)/\Lambda$ ratio is suppressed in central Pb−Pb collisions with respect to pp and peripheral Pb−Pb collisions, but no such suppression is observed in p−Pb collisions.
- The study of $\Lambda(1520)$ production in pp collisions can serve as a baseline for measurements in p−A and A−A systems.
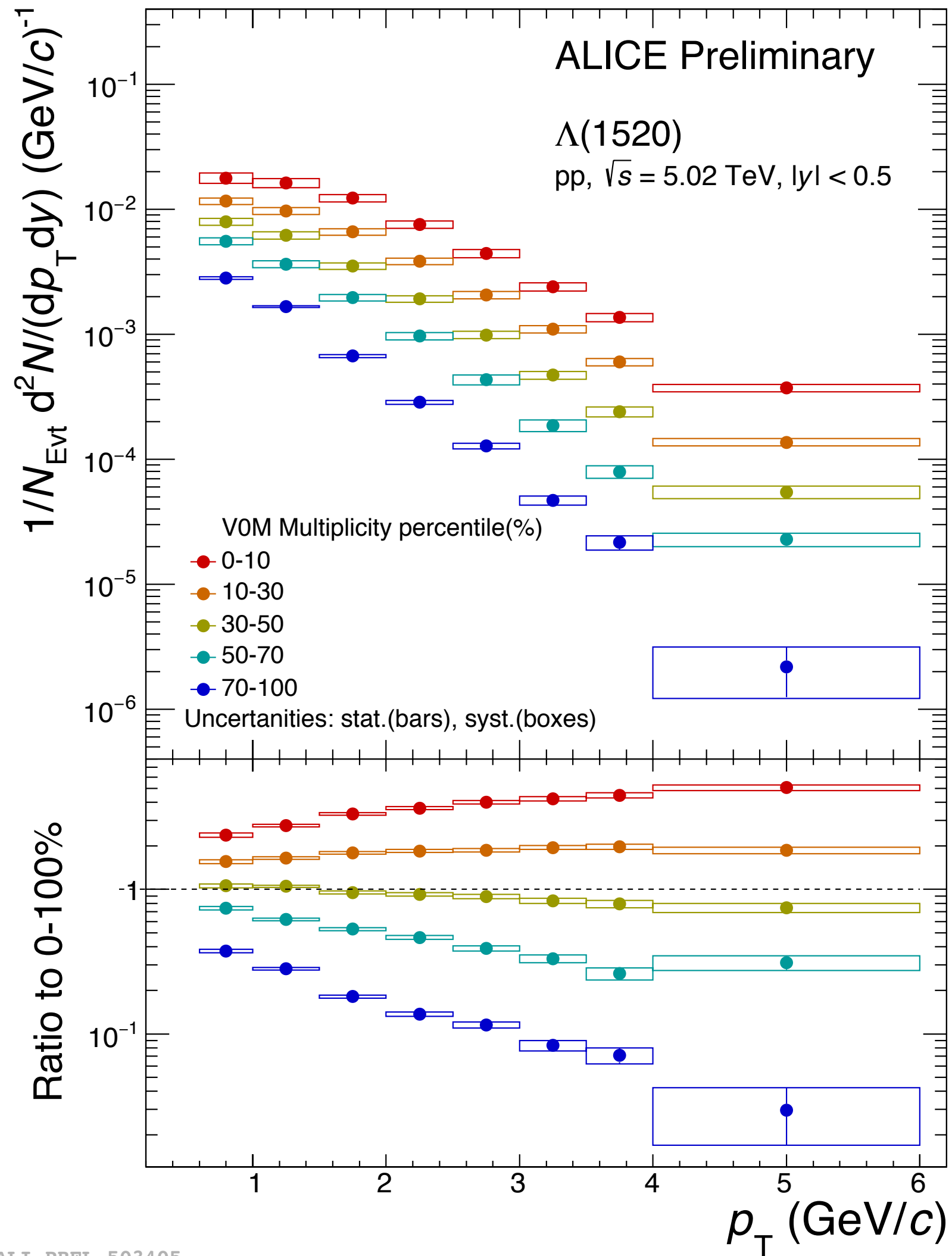
Λ(1520) Signal Extraction
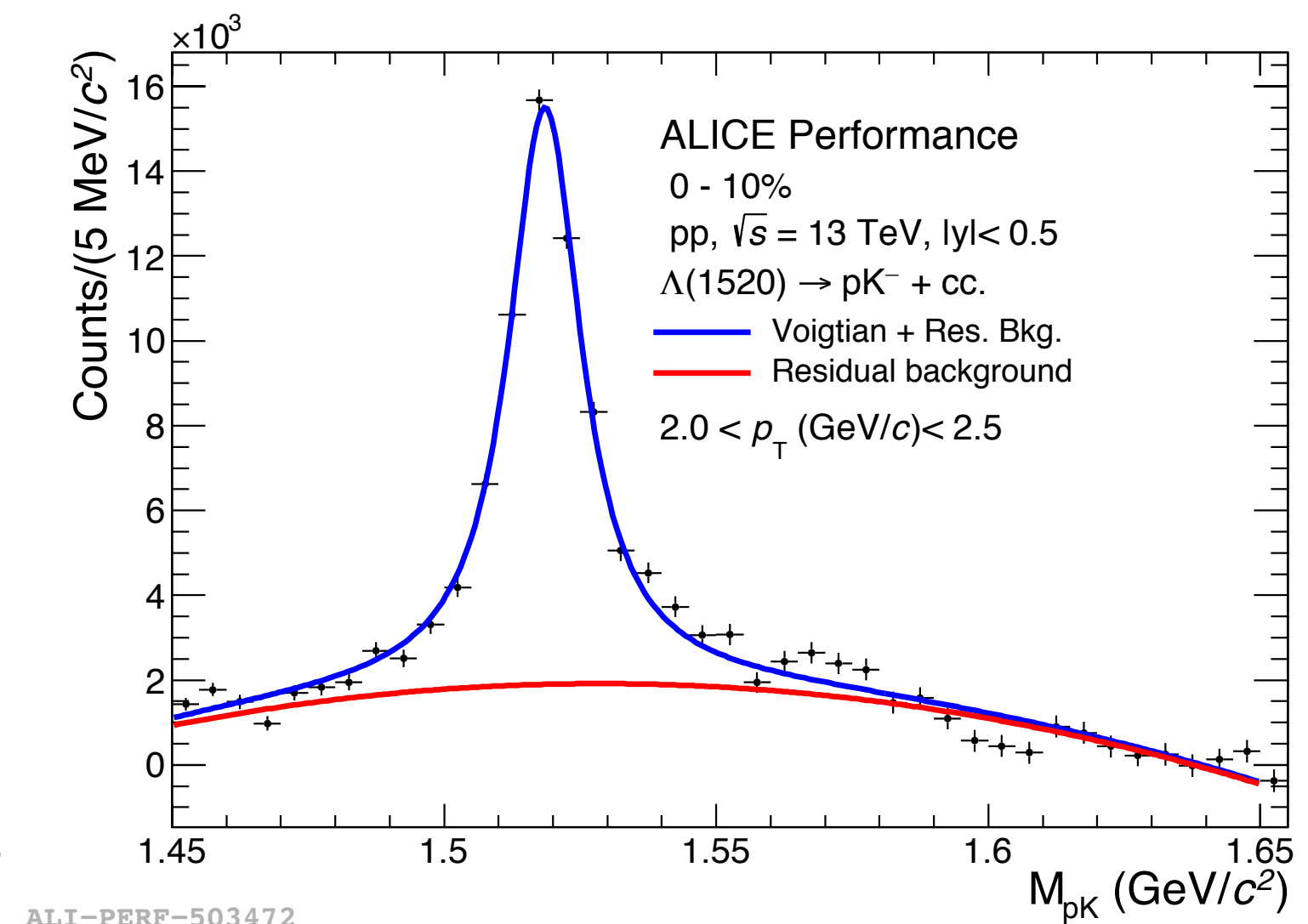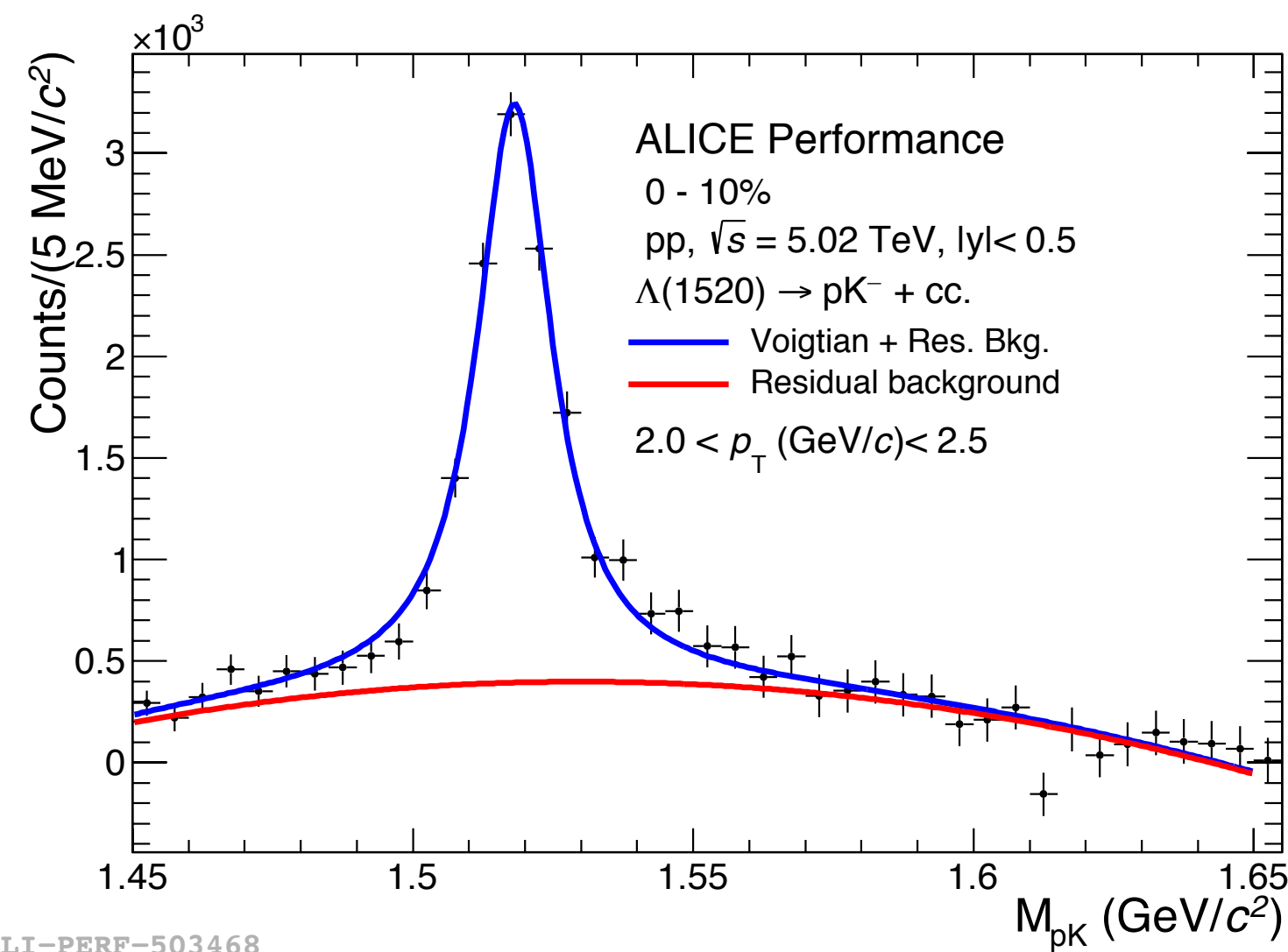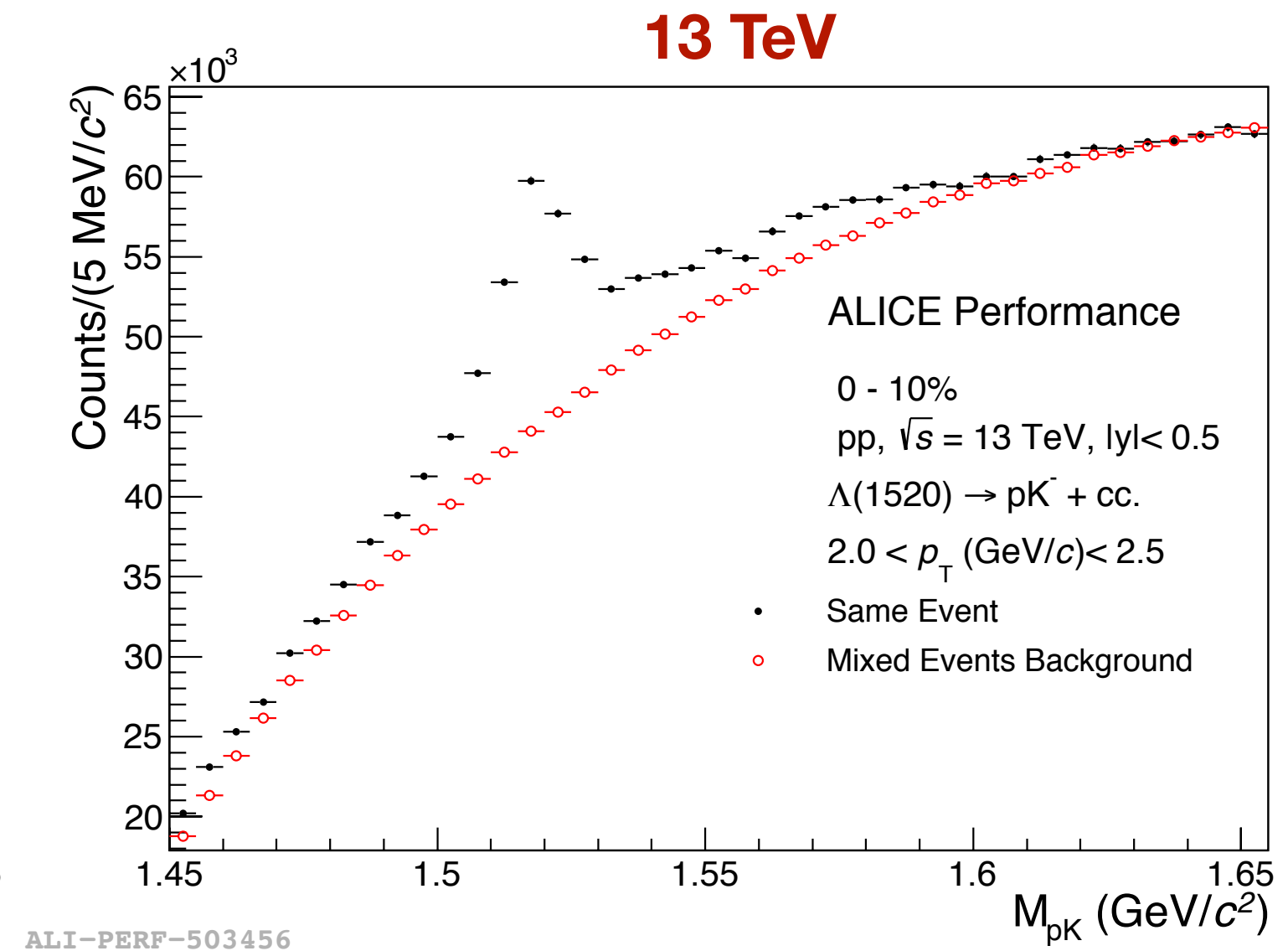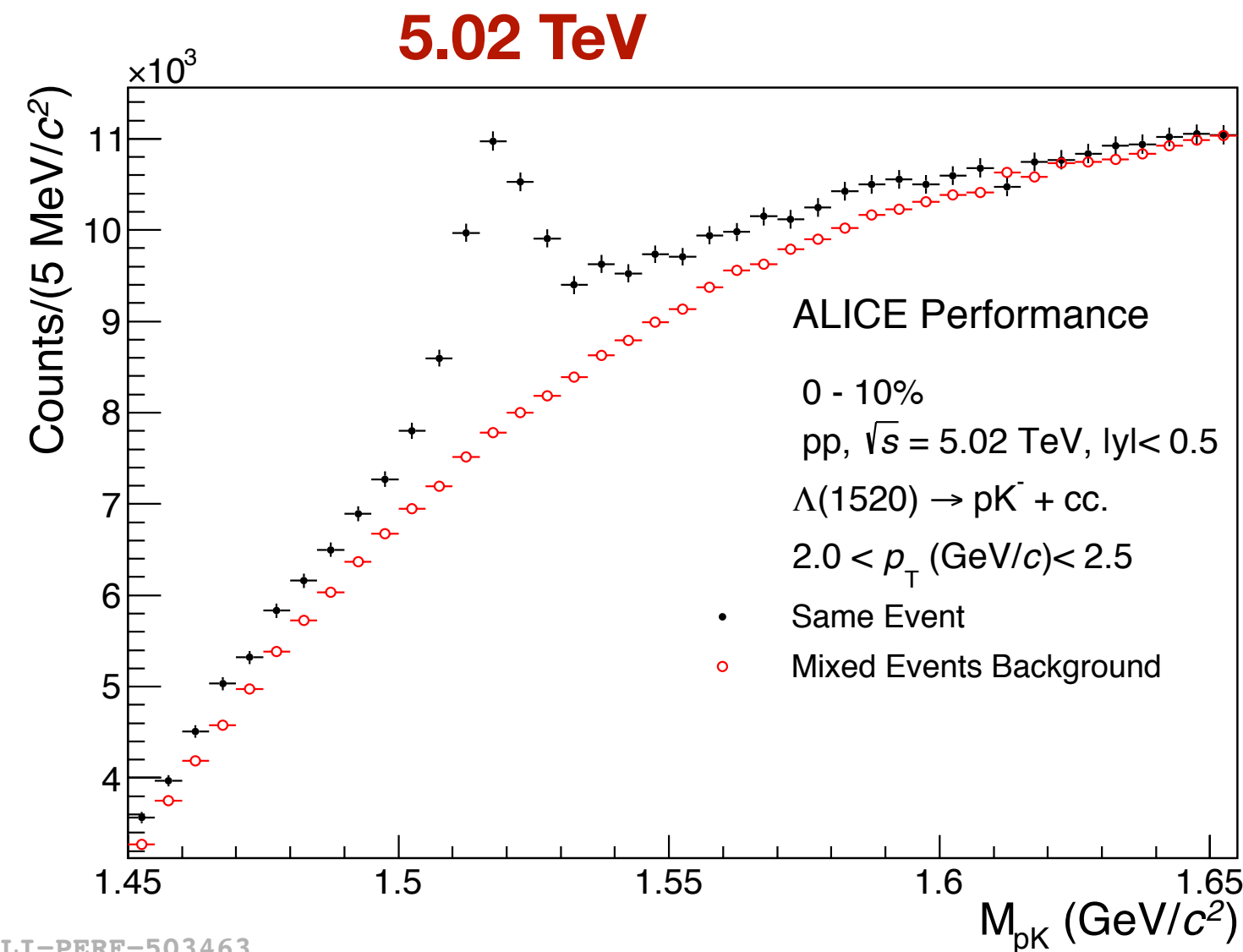
- The uncorrelated combinatorial background is estimated with the event mixing technique.

- The resulting invariant mass distributions are fitted with a Voigtian function and a 2nd order polynomial function for the residual background.
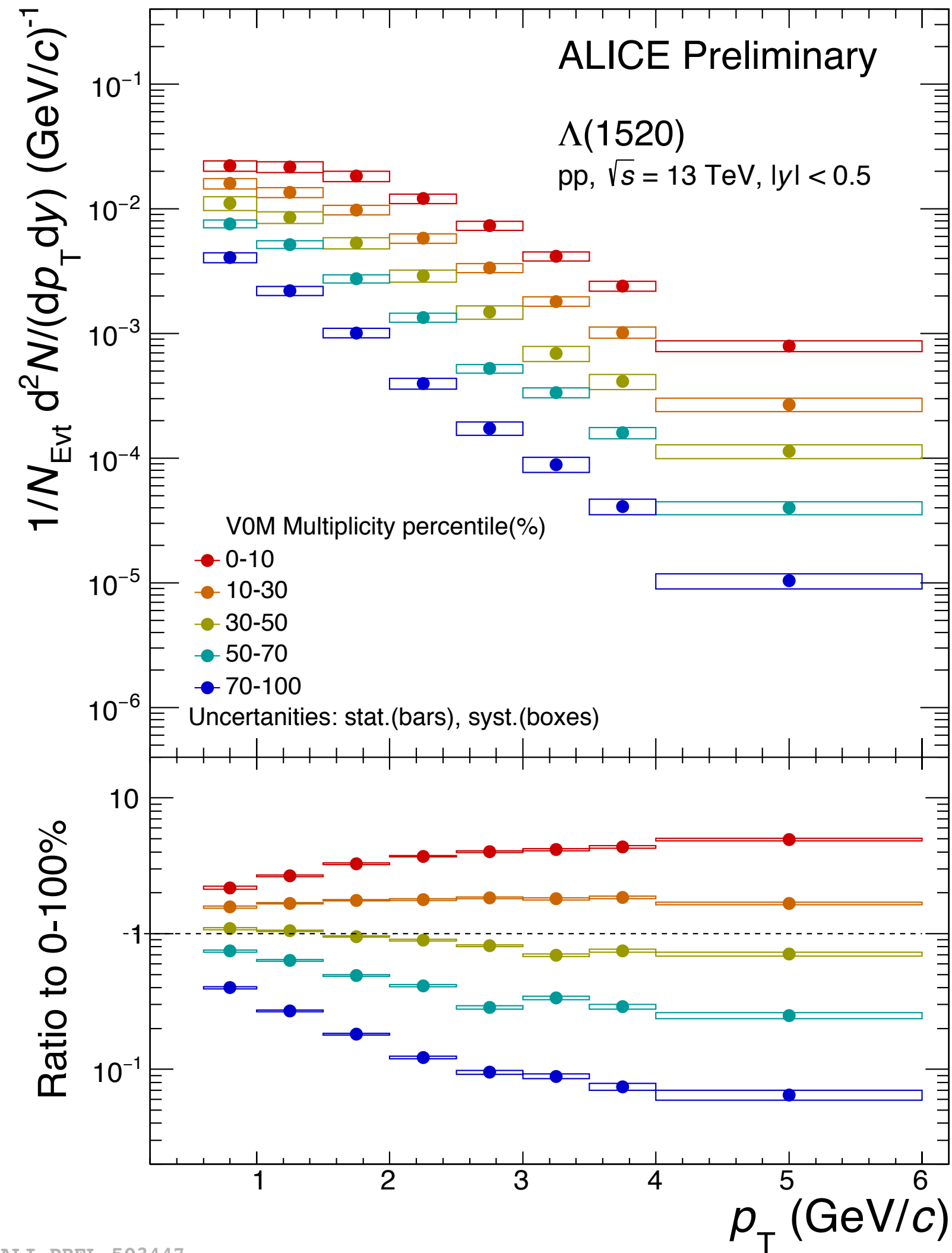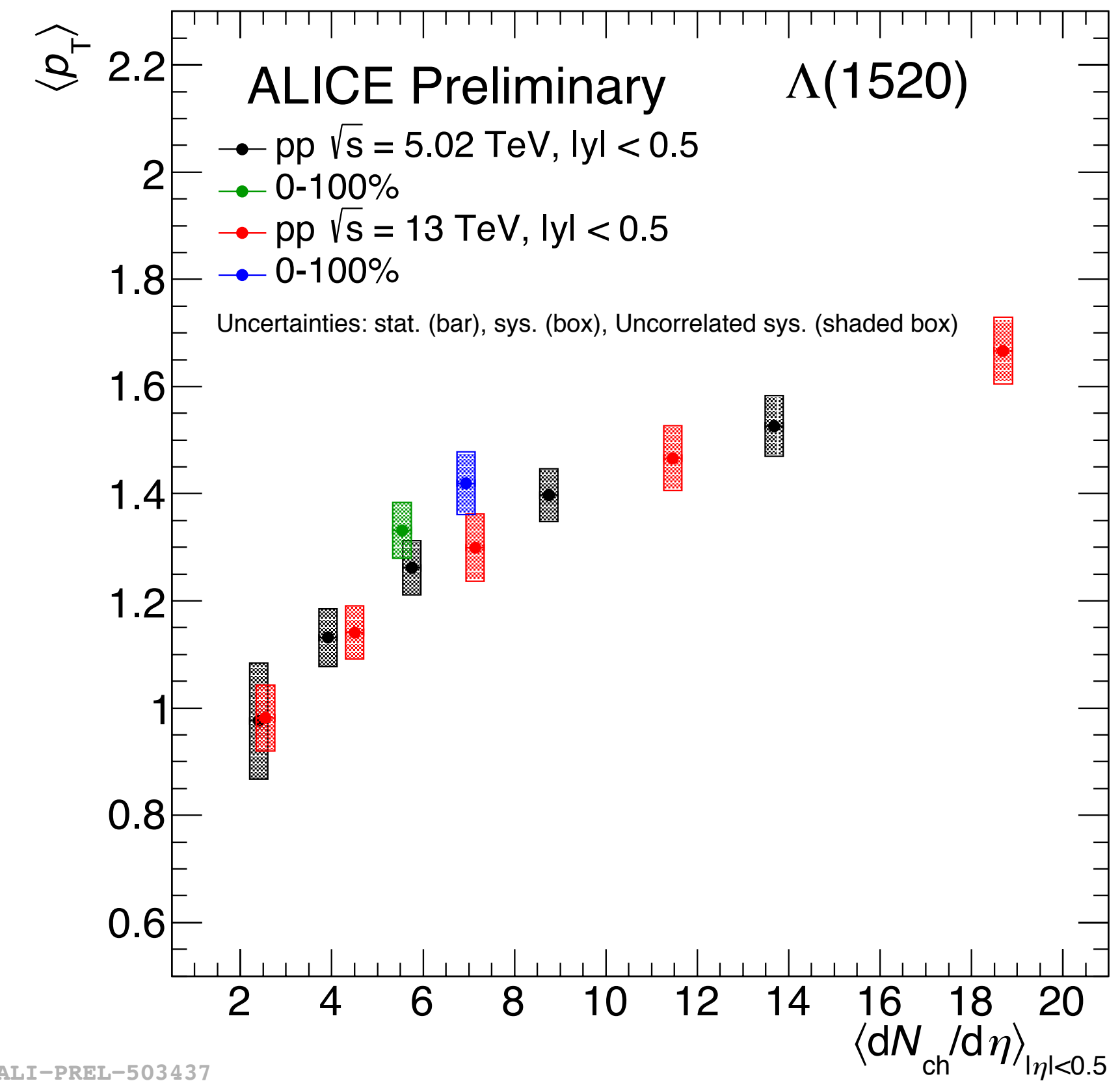
3

p_T Spectra
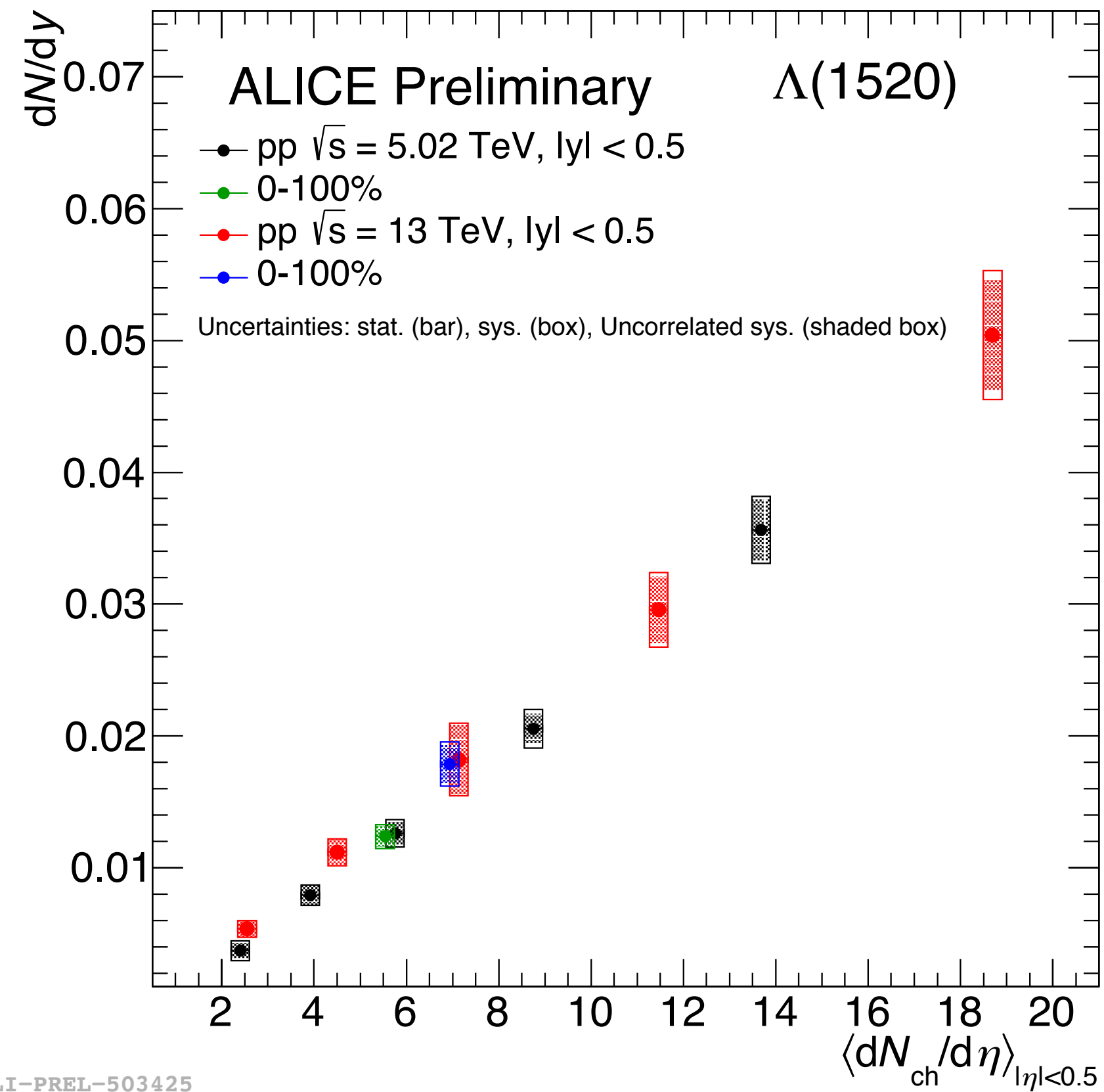
- The spectral shape gets harder with increasing event multiplicity.

- These effects are similar to those observed in heavy-ion collisions that are typically interpreted as flow-like effects.

ALI–PREL–503405

ALI–PREL–503447

ALI-PREL-503425

ALI-PREL-503437

- p_T-integrated yields (dN/dy) of $\Lambda(1520)$ and mean p_T ($\langle p_\mathrm{T}\rangle$) increase with increasing multiplicity.

- For similar dN_ch/dη , no significant center-of-mass energy dependence is observed.

ALI-PREL-503850

ALI-PREL-516662
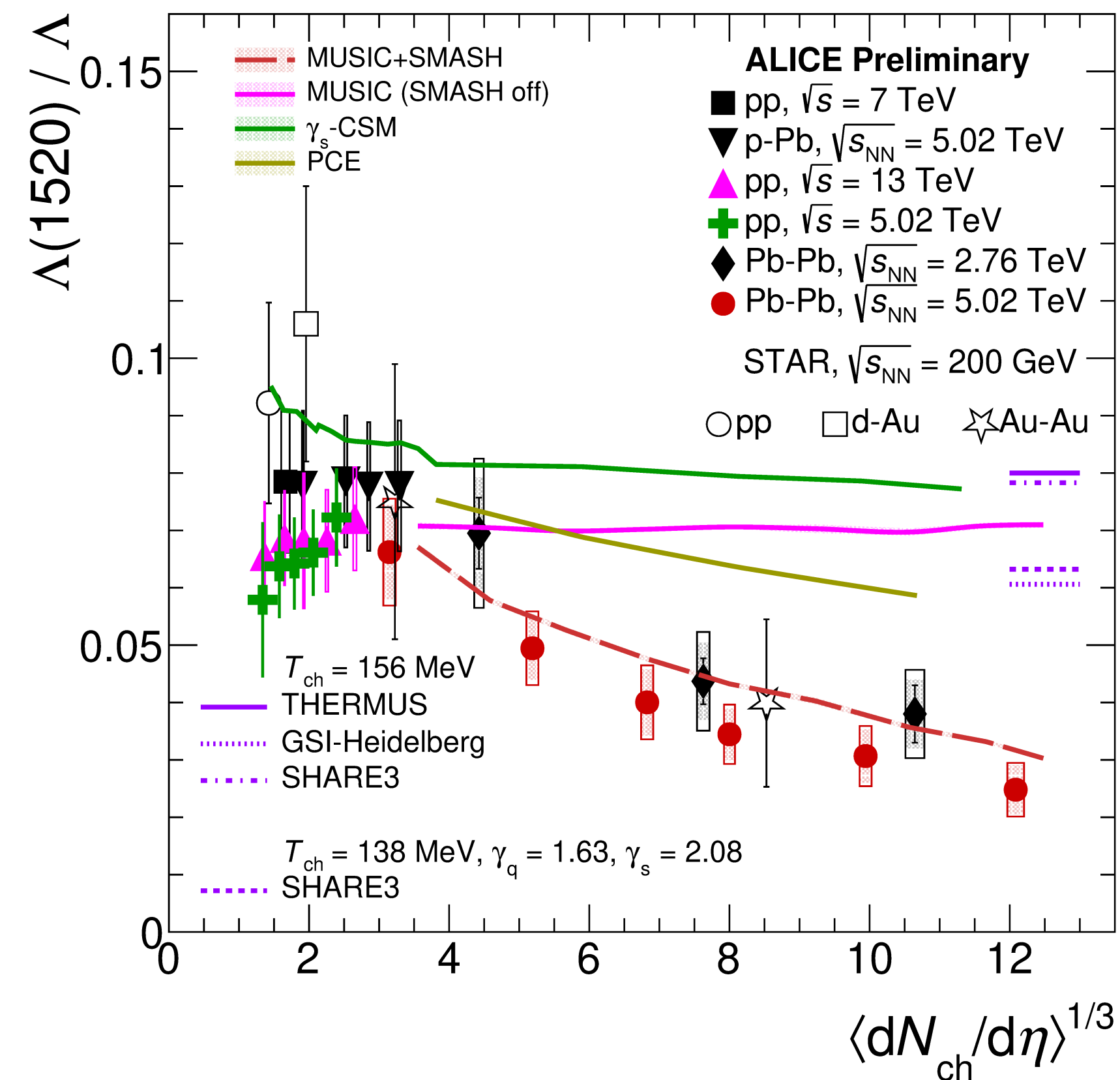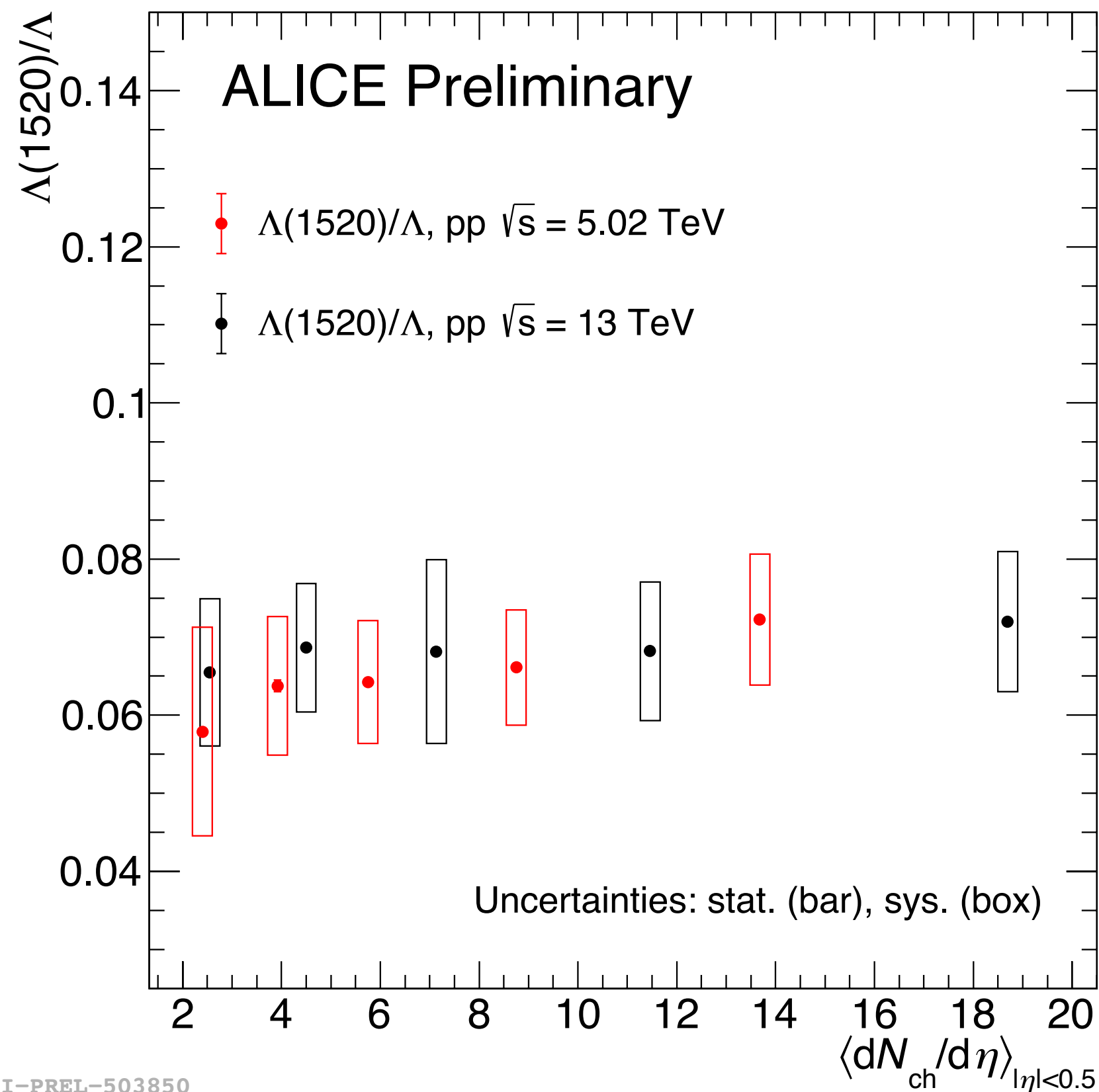
- Λ(1520)/Λ **ratio is flat in pp collisions at** $\sqrt{s}$ = **5.02 and 13 TeV.**
- **This ratio is independent of multiplicity not only in p—Pb and peripheral Pb—Pb collisions, but in pp as well.**
- **Suppression of** Λ(1520)/Λ **in most central Pb—Pb collisions with respect to pp, p—Pb, peripheral Pb—Pb and thermal model predictions.**

Thank you for your attention 6