# Studies of light-flavor hadron production in pp, pA and AA collisions with ALICE at the LHC


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on behalf of the ALICE collaboration


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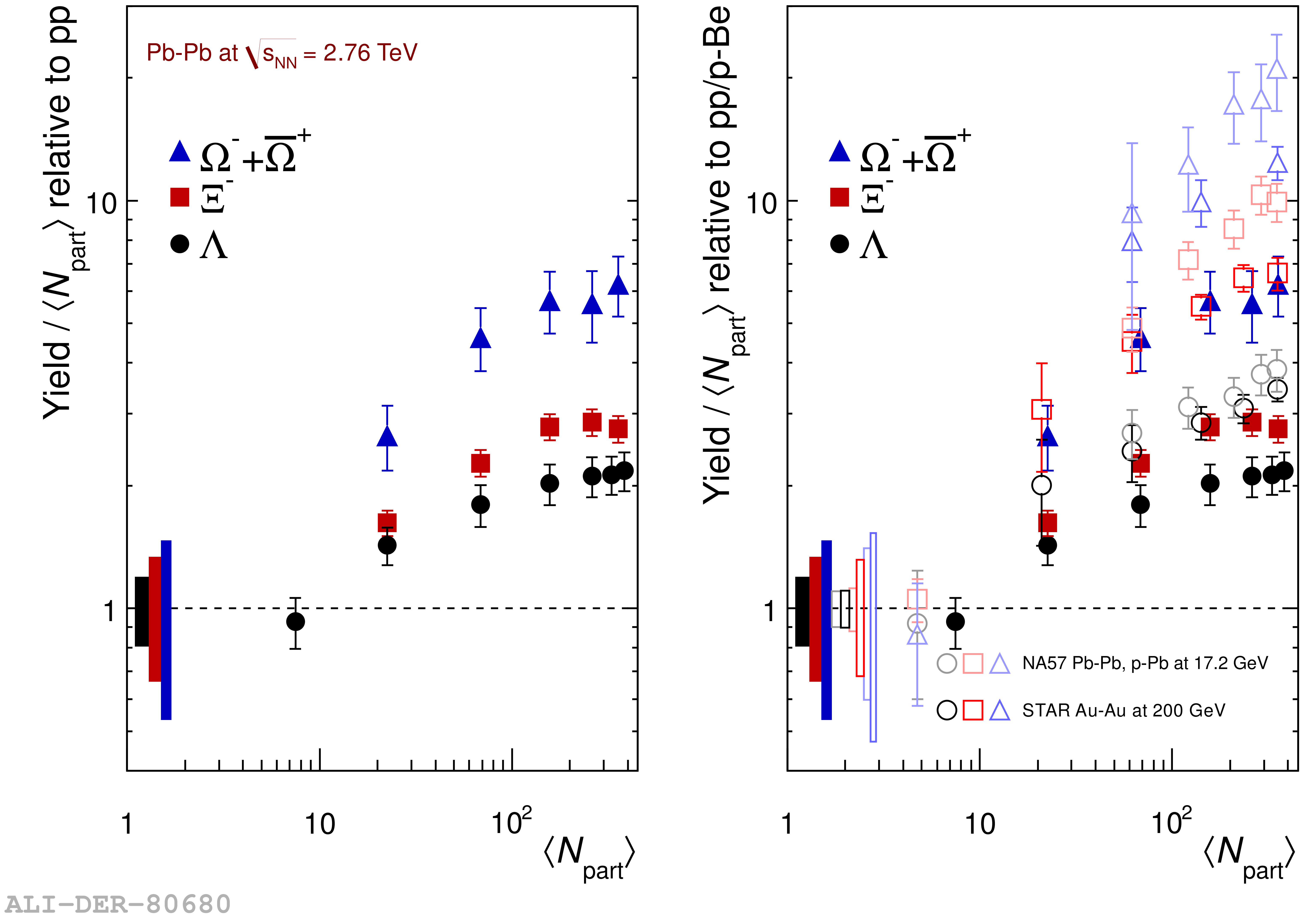
**INITIAL STAGES**
OF HIGH-ENERGY NUCLEAR COLLISIONS

# Strangeness Enhancement




- Theory: proposed as signature of QGP formation [1]
- Experiment: observed in heavy-ion (AA) collisions with respect to "elementary" ones. Larger enhancement observed at lower collision energy.
- Question to be addressed: what is the influence of the small systems reference (pp and pA) on these observations?

[1] Koch, Muller, Rafelski, Phys. Rep. 142, 167–262 (1986)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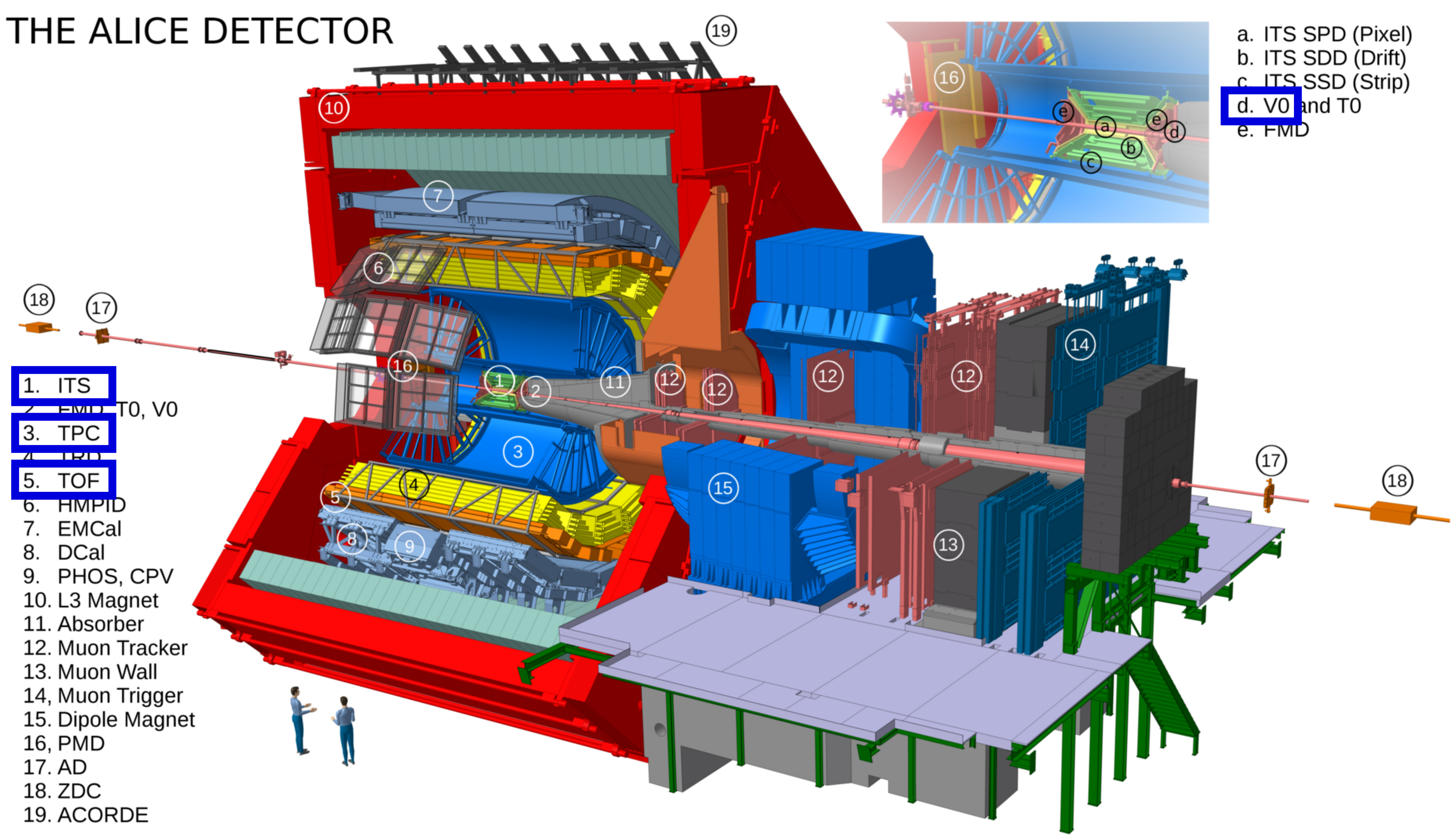
# Strangeness Identification with the ALICE Experiment

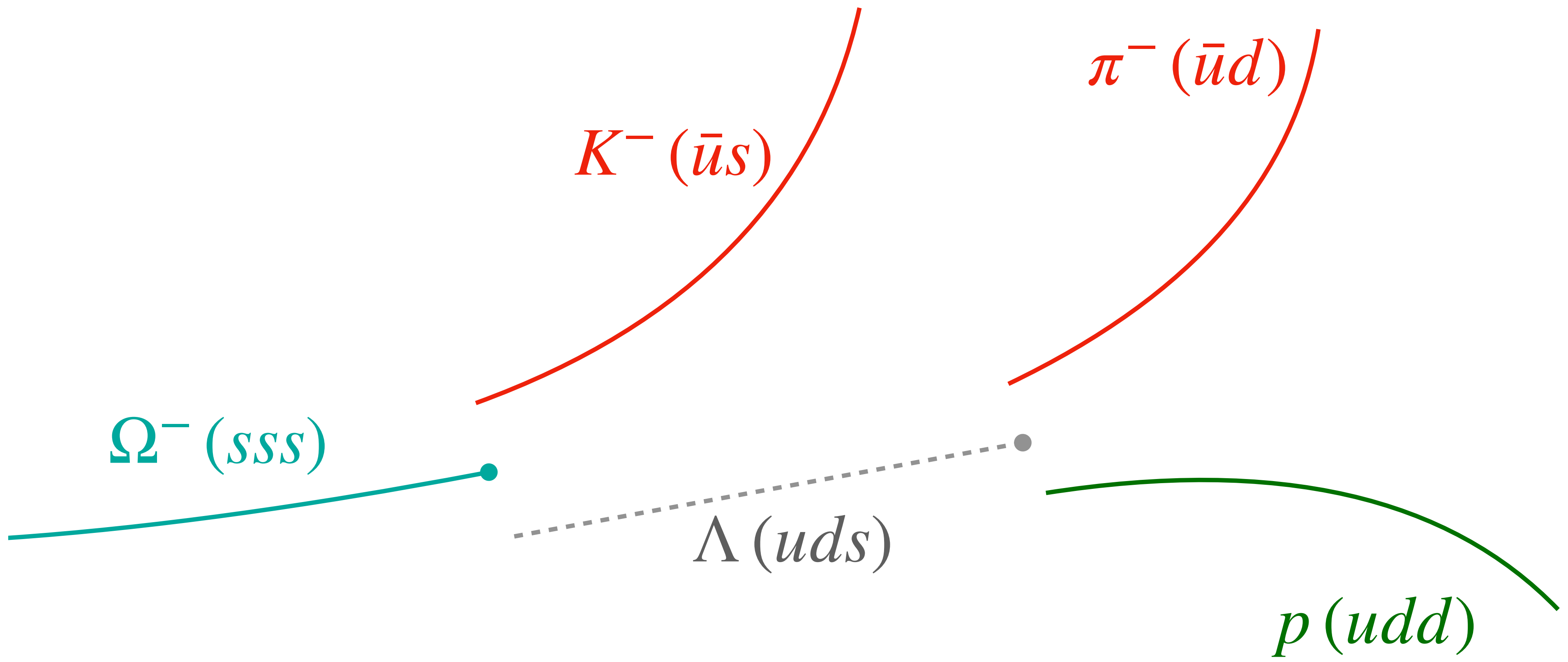



**Excellent particle identification (PID)**, thanks to:

- **ITS** (vertexing, tracking, PID via energy loss)
- **TPC** (tracking, PID via energy loss)
- **TOF** (PID via $\beta$ measurement)

**Event multiplicity** at central rapidity estimated using forward-rapidity classification (V0 scintillators' amplitude)

- Selection criteria are applied on kinematical and geometrical variables to identify $V^0$s and cascades:
  - **$V^0$** ($K^0_s$, $\Lambda$, $\bar{\Lambda}$): neutral particle weakly decaying into a pair of charged particles
  - **Cascade** ($\Xi^-$, $\bar{\Xi}^+$, $\Omega^-$, $\bar{\Omega}^+$): charged particle weakly decaying into a $V^0$ and a charged particle





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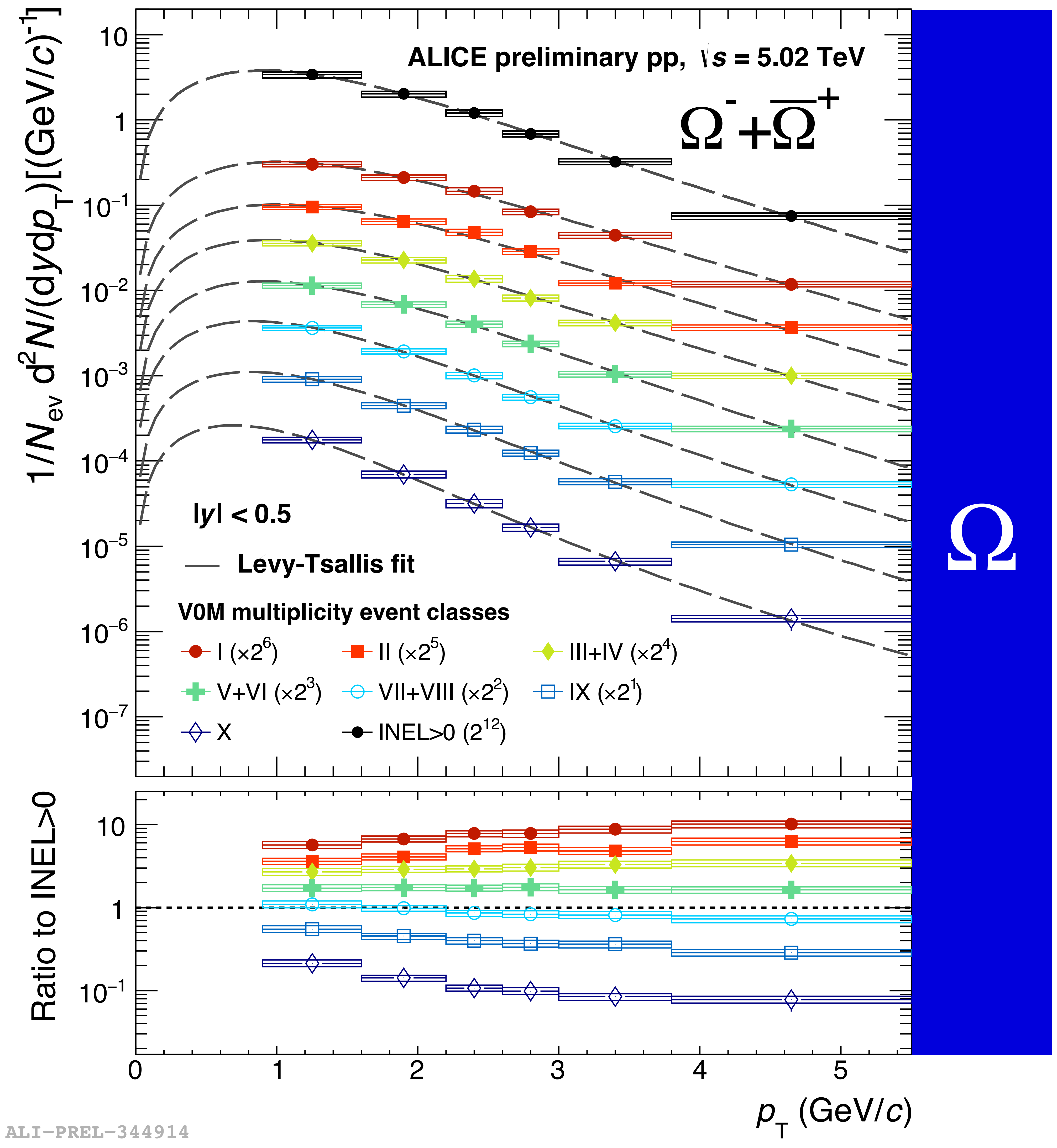
# (Multi-)strange Baryon $p_T$-spectra

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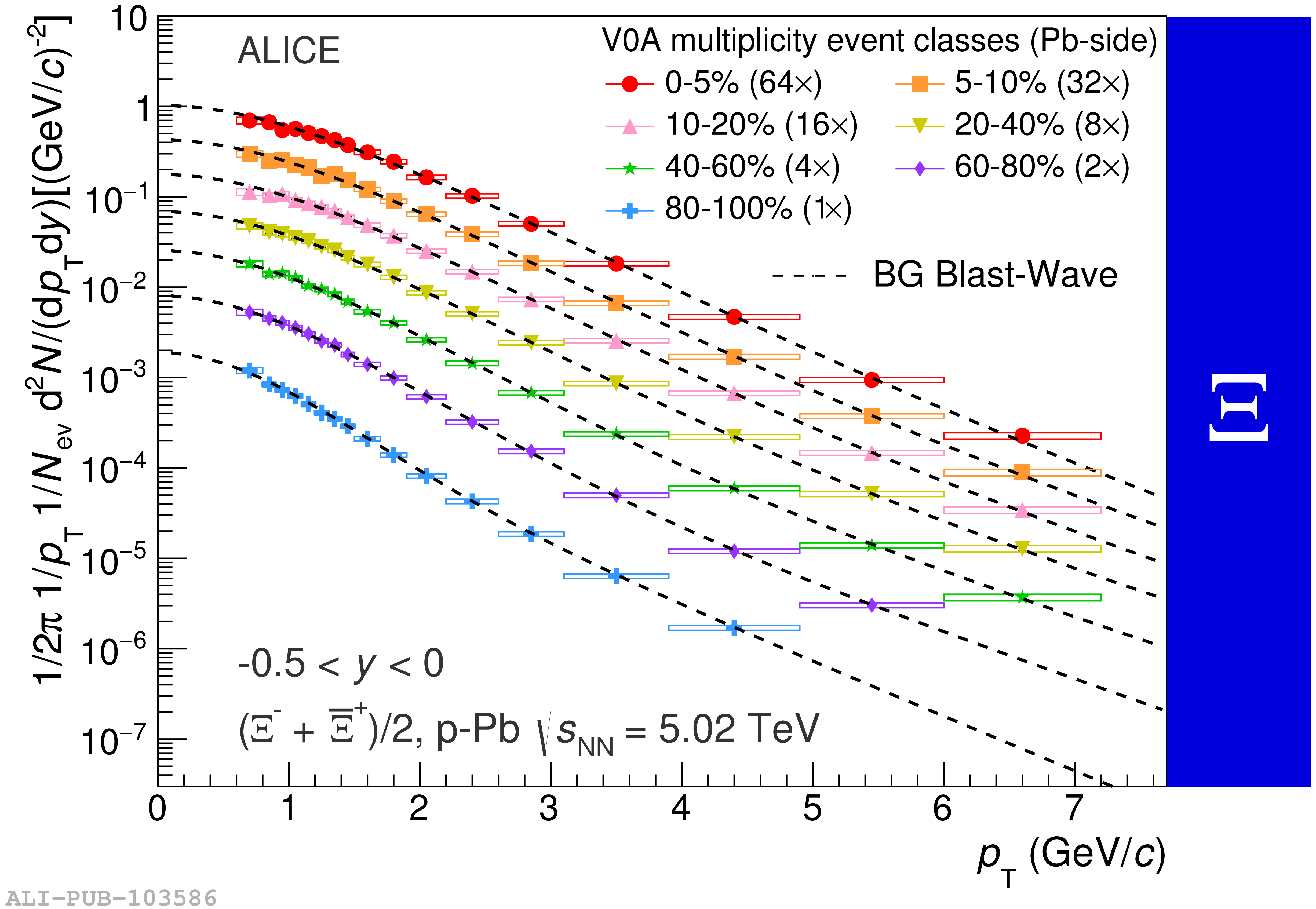
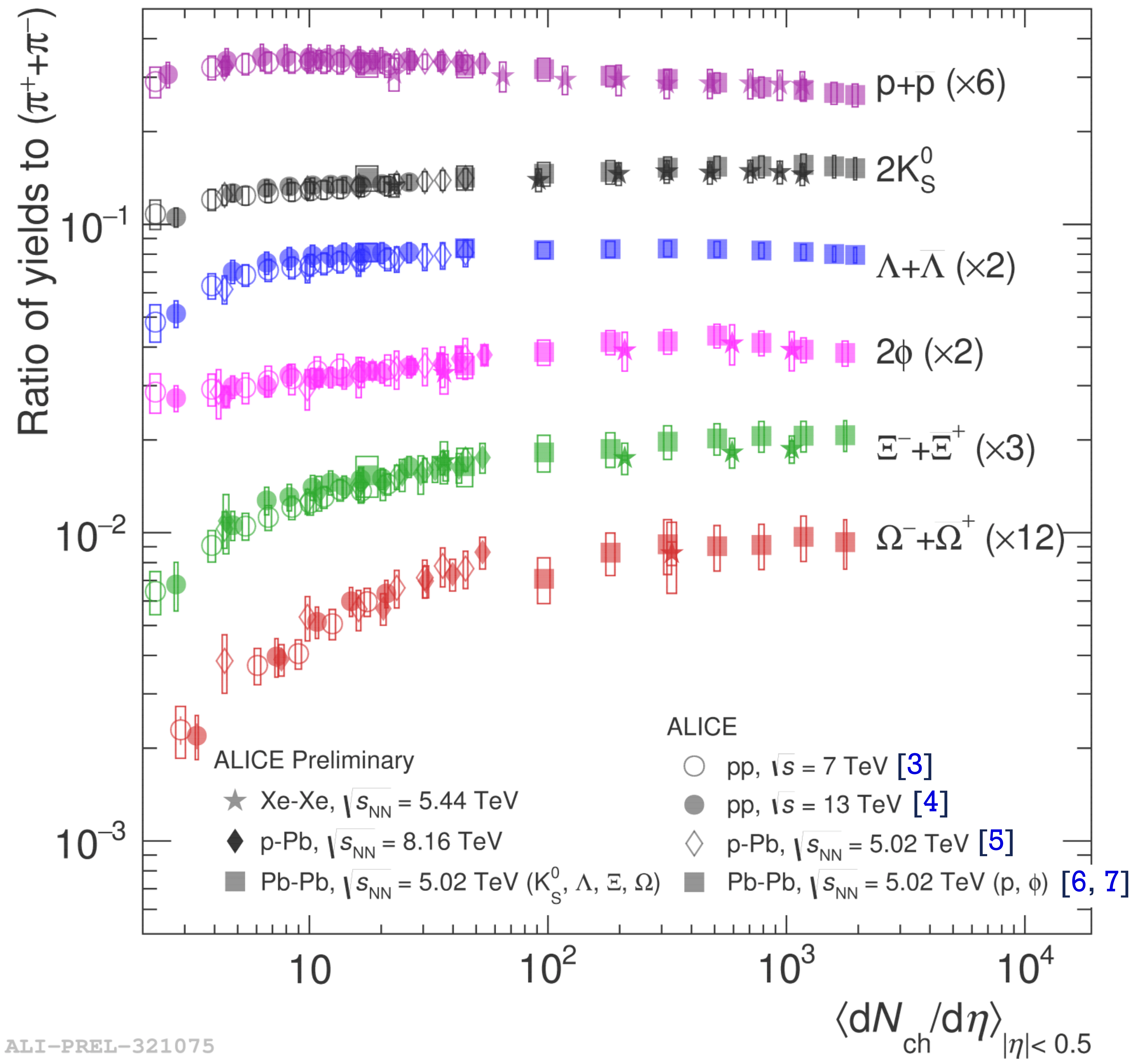



ALI-PUB-103586

- $p_T$-spectra measured for different multiplicity classes in pp, pA and AA collisions by ALICE
- Same behaviour in each collision system: spectra hardening at high multiplicity
- Common radial boost in the deconfined phase?

[2] ALICE Collaboration, *Phys. Lett. B* 758, 389-401 (2016)

# Hadrochemistry




- $p_T$-integrated yield ratios to pions show enhancement from low multiplicity pp to central Pb-Pb collisions
- Larger enhancement with increasing strangeness content
- Smooth evolution with charged particle multiplicity, regardless of centre of mass energy and collision system

**Conclusions**

- Hint of collective behaviour (or QGP formation) in small systems?
- Common mechanism which governs particle production in high-energy physics, depending only on charged particle multiplicity?


[3] ALICE Collaboration, *Nat. Phys.* 13, 535-539 (2017)
[5] ALICE Collaboration, *Phys. Lett. B* 758, 389-401 (2016)
[7] ALICE Collaboration, *PLB* 802, 135225 (2020)
[4] ALICE Collaboration, *Eur. Phys. J. C* 80, 167 (2020)
[6] ALICE Collaboration, *Phys. Rev. C* 101, 044907 (2020)