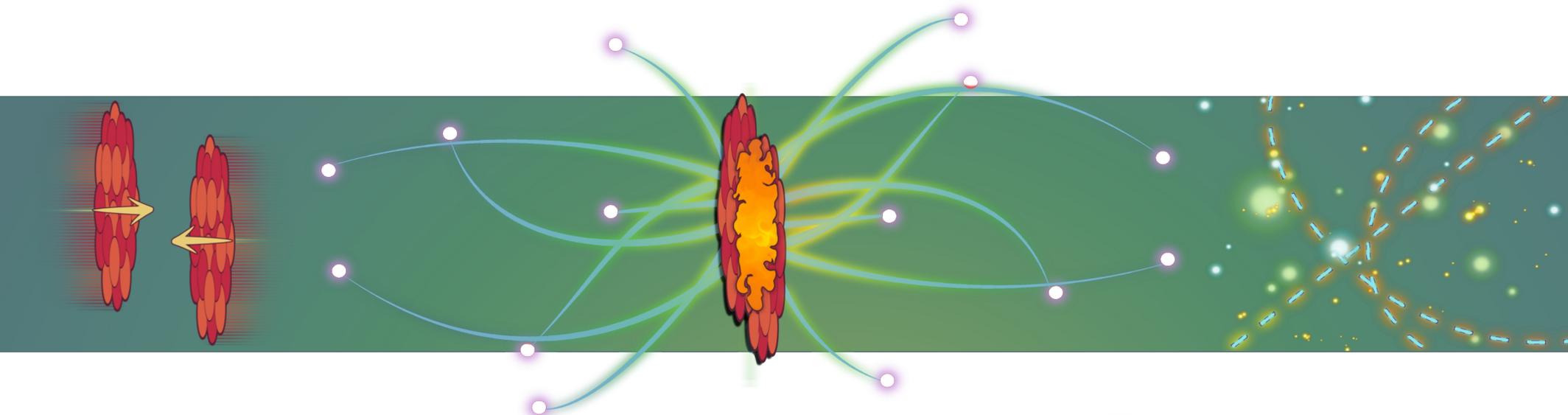


Forward-backward correlations and multiplicity fluctuations in Pb-Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV from ALICE at the LHC



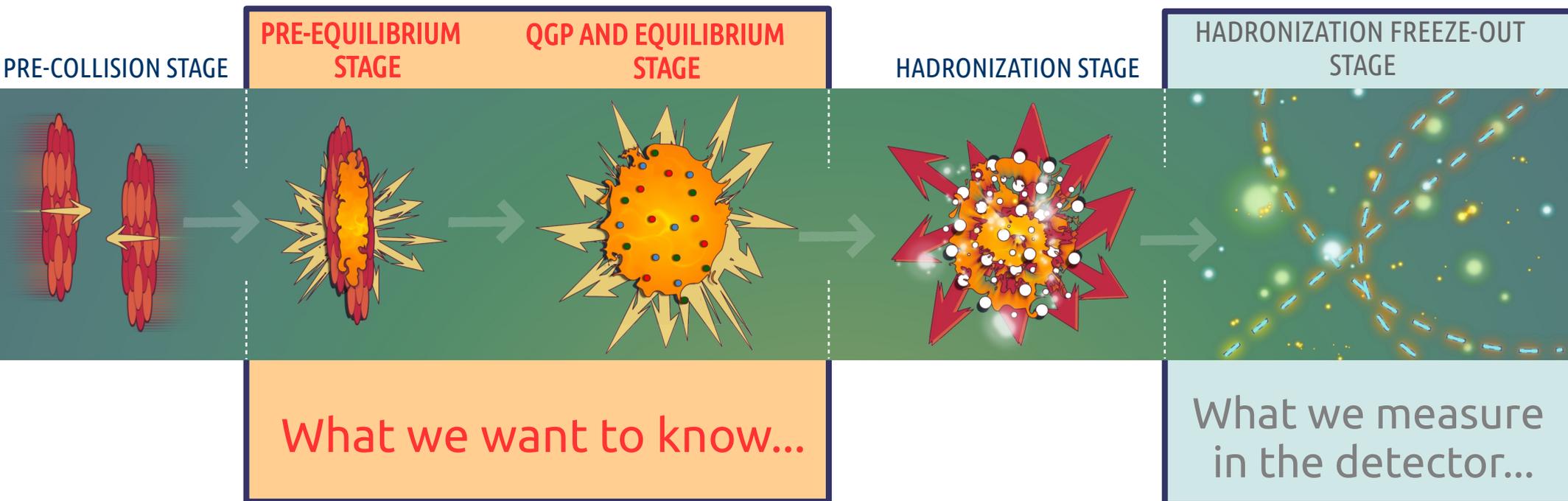
IWONA SPUTOWSKA
for the ALICE Collaboration



ALICE

H. Niewodniczański Institute of Nuclear Physics Polish
Academy of Sciences

Motivation: Why do we study correlations and fluctuations?



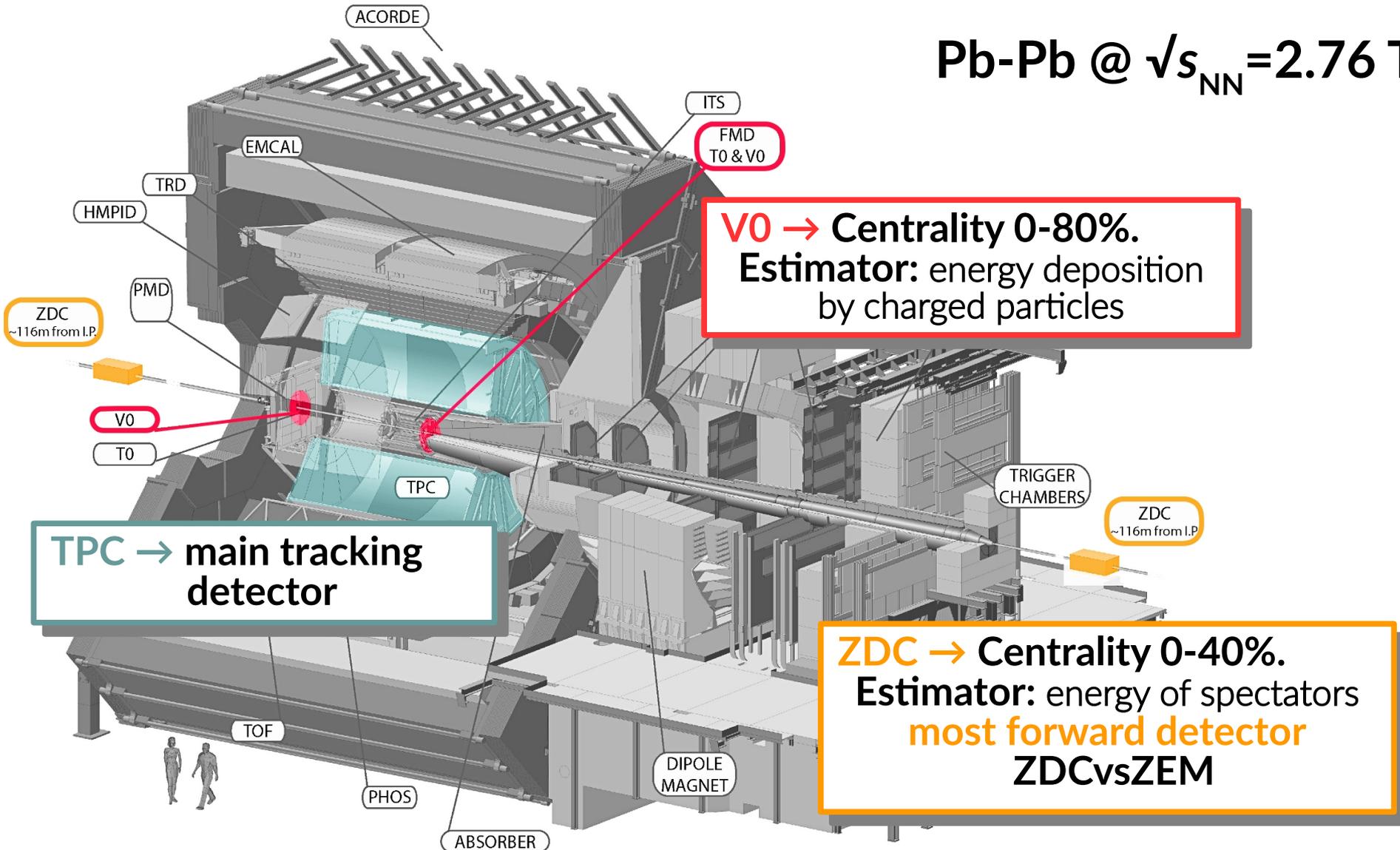
The aim of the analysis:

→ Forward-backward correlation coefficient b_{corr}

→ Strongly intensive quantity sigma Σ

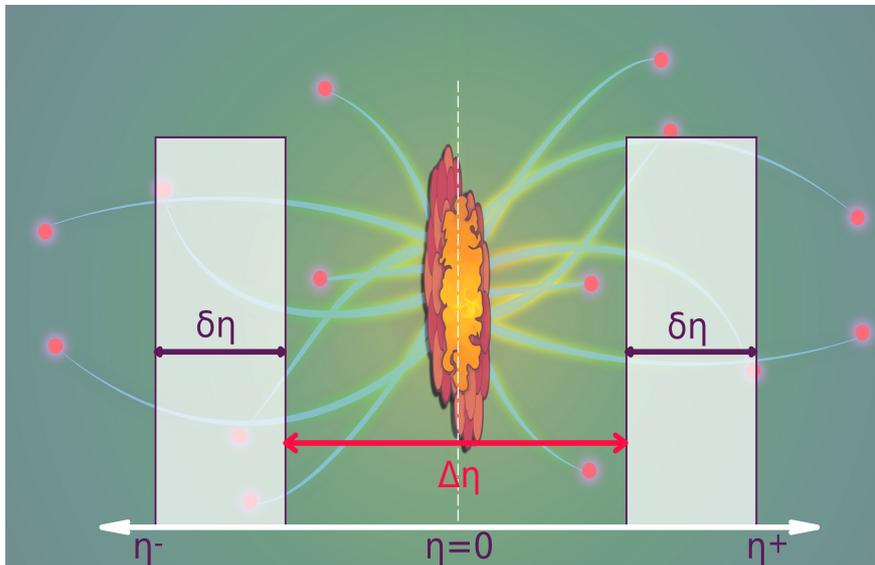
The Analysis: ALICE Experiment

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



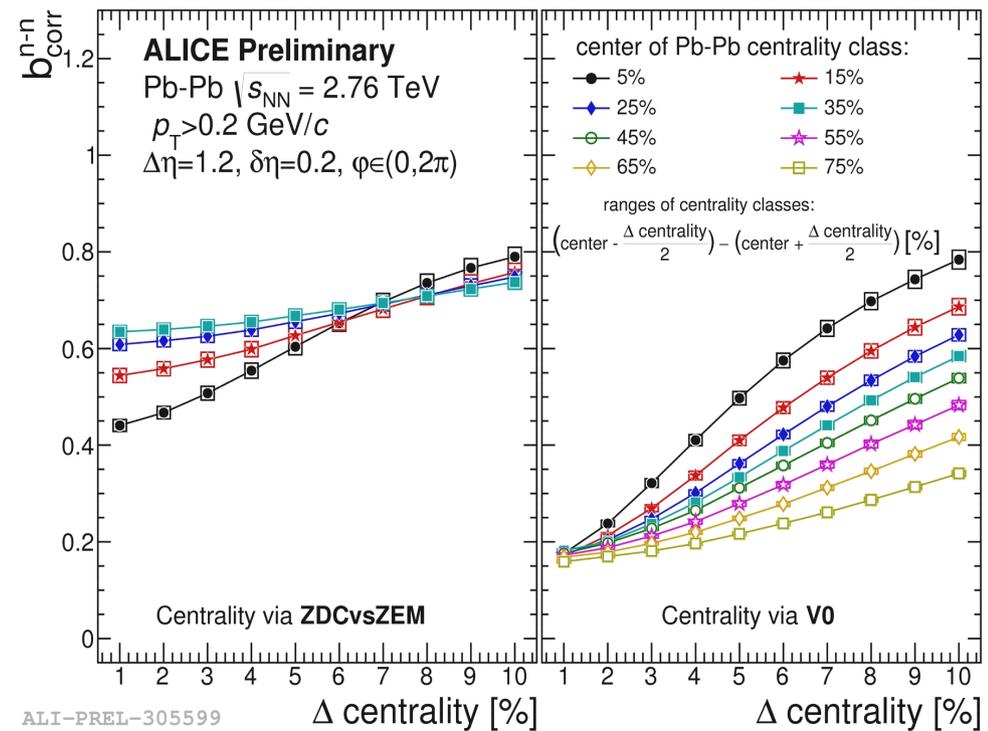
Forward-backward correlations b_{corr}

$$b_{\text{corr}} = \frac{\text{Cov}(n_F, n_B)}{\sqrt{\text{Var}(n_F) \text{Var}(n_B)}}$$



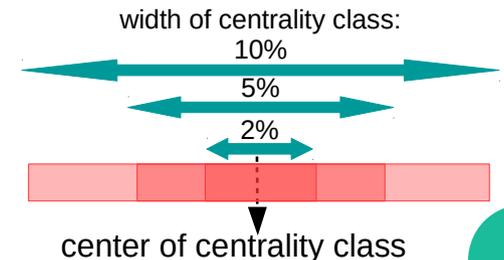
Centrality estimator:
spectators in ZDC

Centrality estimator:
charged particles in V0



geometrical fluctuations

- Dependence on centrality estimator;
- Drop of the value of b_{corr} (reduced fluctuations of N_{part}).



Strongly intensive quantity Σ

Gaździcki, Gorenstein, Phys.Rev. C84 (2011) 014904

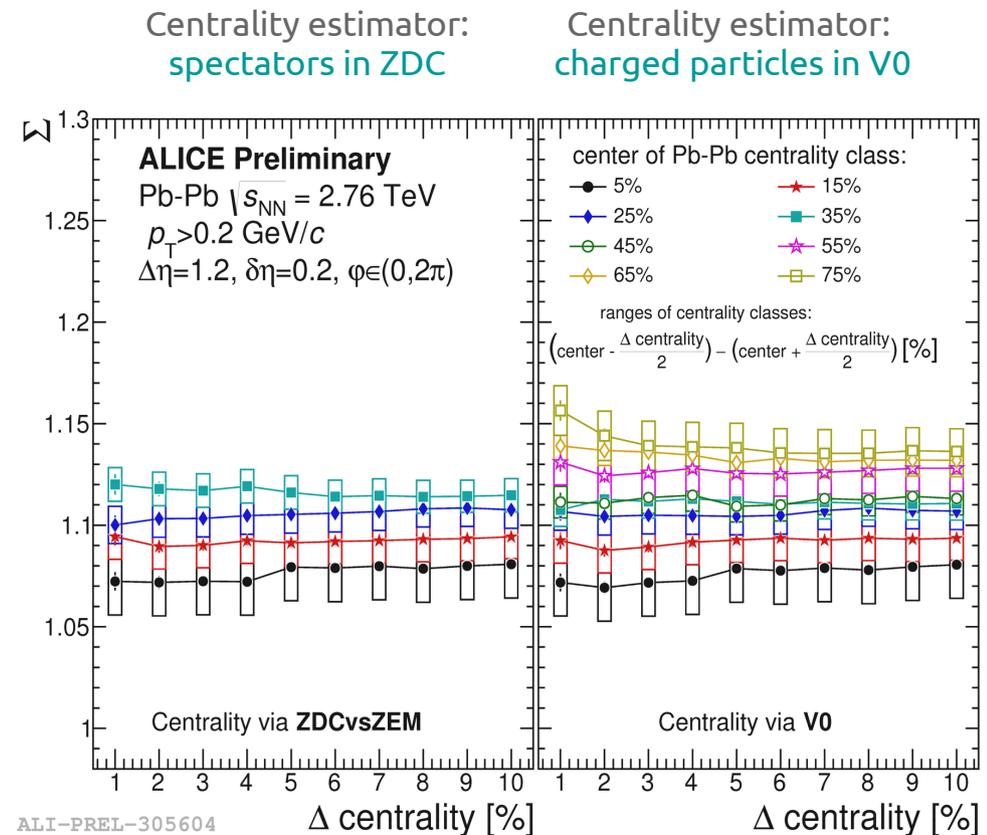
Strongly intensive quantity Σ for a symmetric collision, like Pb-Pb:

$$\Sigma \approx \omega(1 - b_{\text{corr}})$$

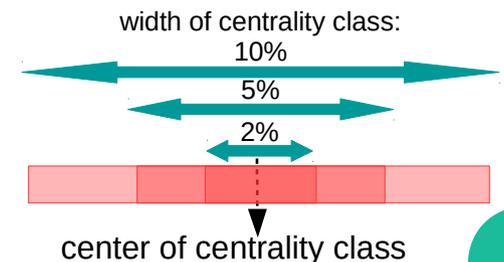
$$\text{scaled variance} = \frac{\text{variance}}{\text{mean}}$$

Σ does:

- not depend on centrality estimator;
- not depend on centrality bin width.

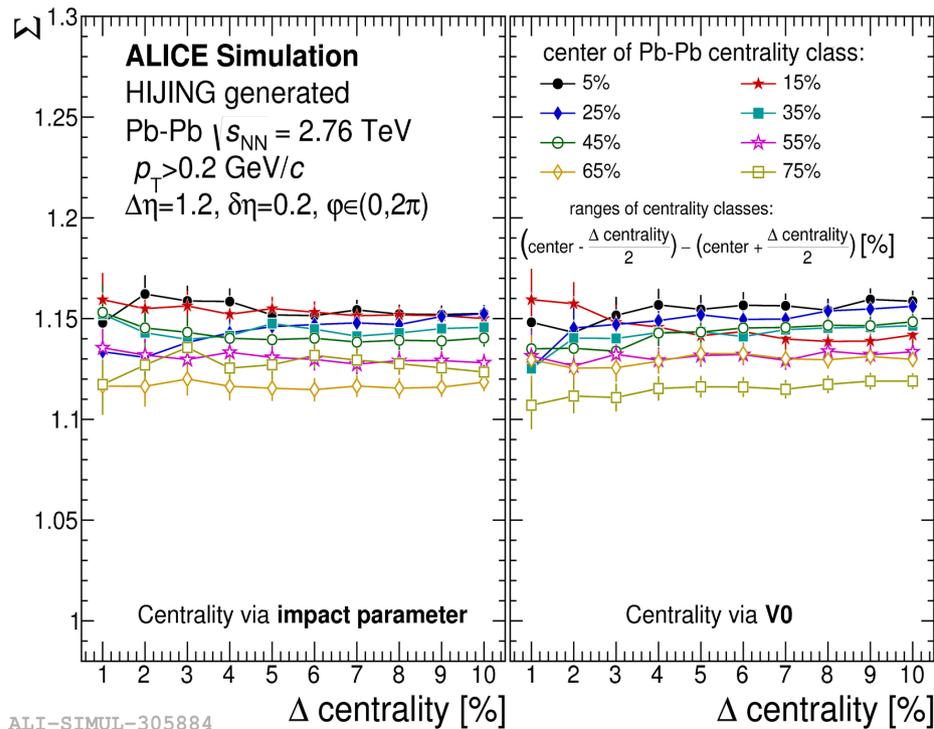


→ geometrical fluctuations



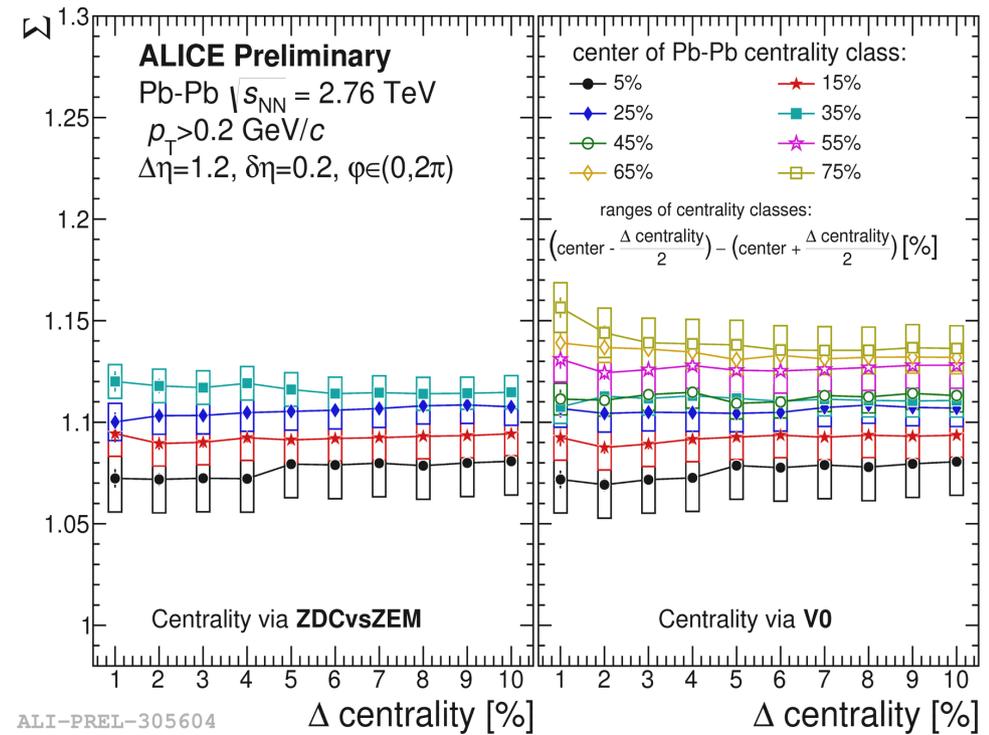
Strongly intensive quantity Σ

MC simulations



→ geometrical fluctuations

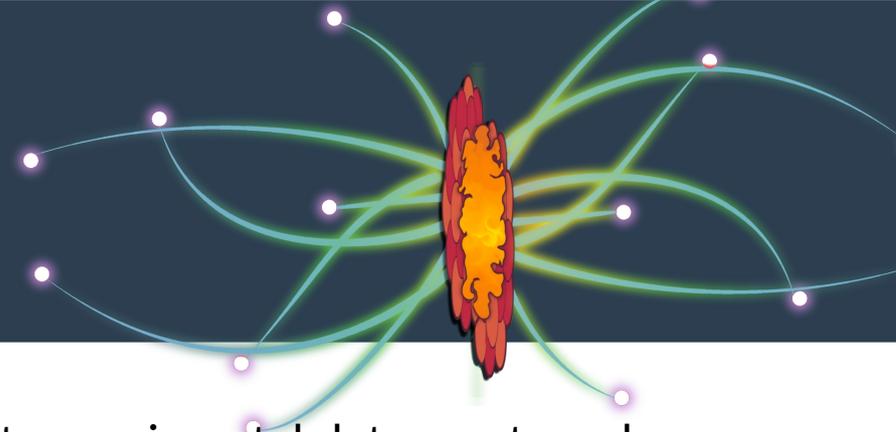
Experimental data



→ geometrical fluctuations

Different ordering of the values of Σ with centrality → possible hint about the early dynamics?

Summary



1. Data on forward-backward correlations (b_{corr}) and first experimental data on strongly intensive (Σ) quantity in Pb-Pb collisions at $\sqrt{s_{\text{NN}}}=2.76$ TeV:

→ b_{corr} : large dependence on centrality bin width and estimator!

→ b_{corr} : information on early dynamics is mixed with trivial geometrical fluctuations.

→ Σ : does not depend on centrality selection method nor on centrality bin width

→ these are properties of a strongly intensive quantity!

2. The comparison between experimental data and MC simulations for the strongly intensive quantity Σ shows different ordering of the values of Σ with centrality → possible hint about the early dynamics?

Thank you!

Strongly intensive quantity Σ

Intensive quantities do not depend on system volume.

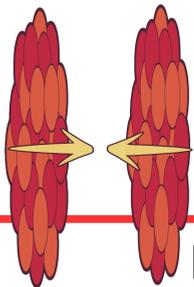
Scaled variance:
$$\omega_{B(F)} = \frac{\text{Var}(n_{B(F)})}{\langle n_{B(F)} \rangle}$$

Gaździcki, Gorenstein,
Phys.Rev. C84 (2011) 014904

Strongly Intensive quantities do not depend on system volume nor system volume fluctuations (i.e. $\text{Var}(N_s), \omega_s$) $\rightarrow \Sigma$

$$\Sigma = \frac{1}{\langle n_B \rangle + \langle n_F \rangle} [\langle n_F \rangle \omega_B + \langle n_B \rangle \omega_F - 2 \text{Cov}(n_F, n_B)]$$

For a symmetric collision, like Pb-Pb:



$$\omega_B = \omega_F \text{ and } \langle n_F \rangle = \langle n_B \rangle$$

$$\Sigma \approx \omega(1 - b_{\text{corr}})$$

For Poisson distribution: $\omega=1$ & $b_{\text{corr}}=0 \rightarrow \Sigma=1$