



29TH INTERNATIONAL  
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# Semi-inclusive recoil jet measurements via hadron-jet correlations in pp collisions at $\sqrt{s} = 5.02$ TeV with ALICE

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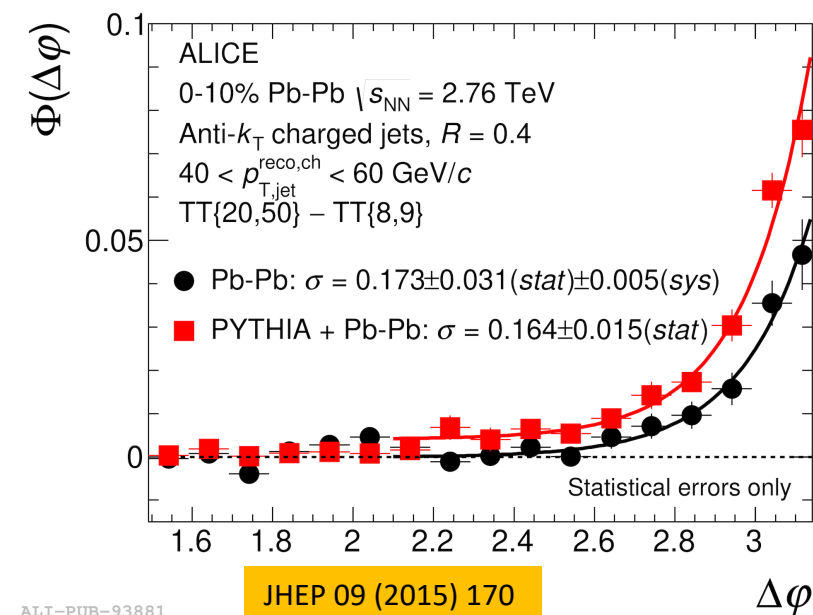
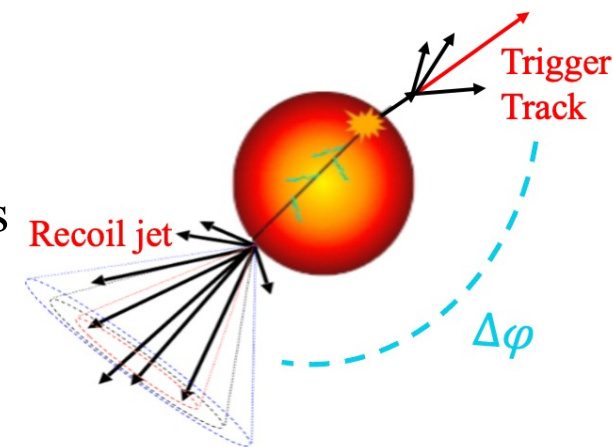
IPHC, University of Strasbourg

6 April, Krakow, Poland



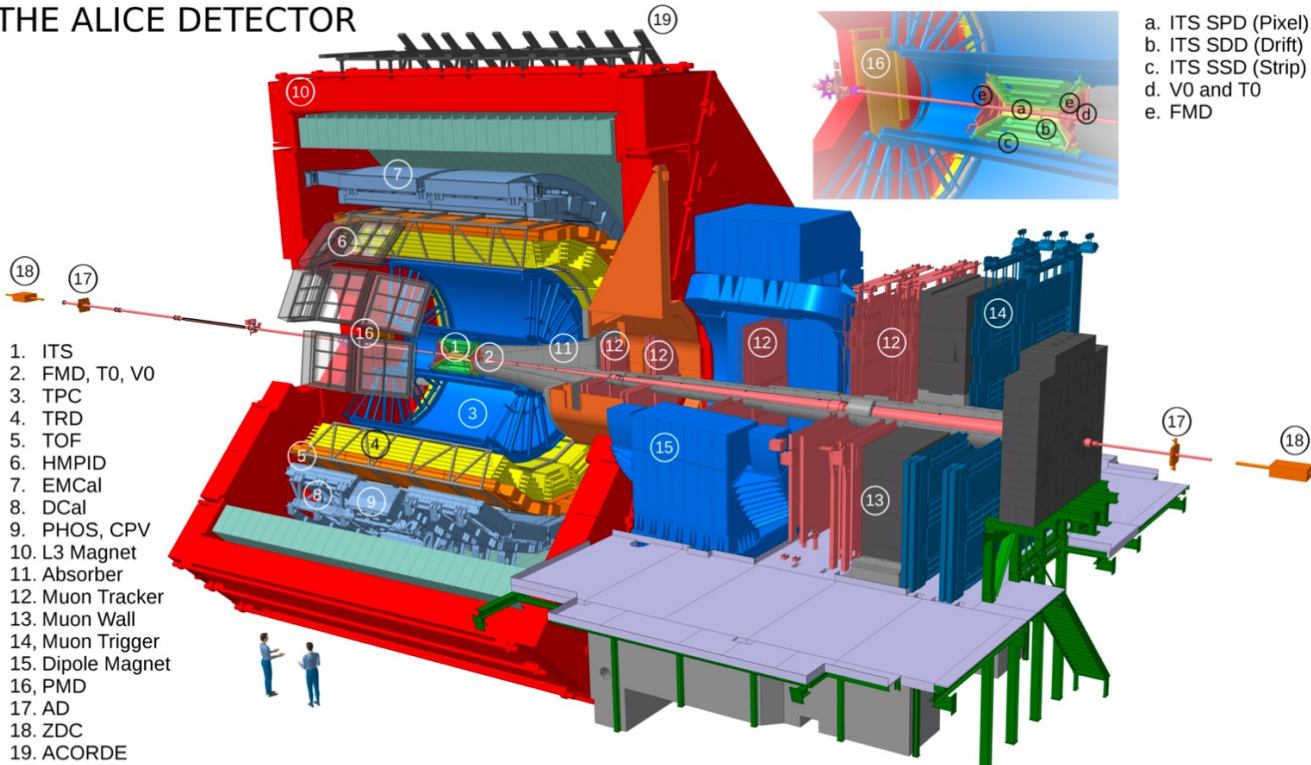
# Analysis motivation

- Recoil jet measurements can be precisely calculated by pQCD in vacuum
- Trigger track close to surface, but no bias on recoil jets
- Provide a good handle of combinatorial background by varying trigger track intervals  
→ access low  $p_T$ , large  $R$  jets
- Azimuthal distribution of recoil jets provides additional insight into QGP properties
- Hadron-jet acoplanarity broadening: vacuum (Sudakov) radiation
  - Multiple soft scattering in the QGP may further broaden  $\Delta\phi$  distribution
    - Gives direct access to transport coefficient [\[Phys. Lett. B 773 \(2017\) 672\]](#)
- Reference process for nucleus collisions
  - Recoil jet measurements show significant quenching in central Pb-Pb collisions



# Jet measurements in ALICE

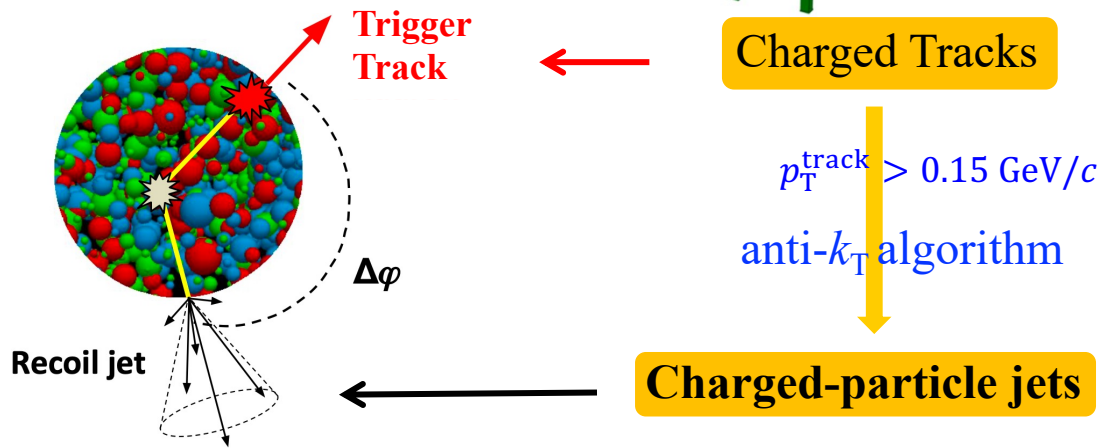
THE ALICE DETECTOR



- **V0 (V0C + V0A)**
  - $-3.7 < \eta < -1.7, 2.8 < \eta < 5.1$
  - Event multiplicity, centrality determination
  - Event trigger

- **ITS (Inner Tracking System)**
  - $|\eta| < 0.9, 0 < \varphi < 2\pi$
  - Primary vertex reconstruction
  - Event trigger

- **TPC (Time Projection Chamber)**
  - $|\eta| < 0.9, 0 < \varphi < 2\pi$
  - Charged particle tracking
  - Particle identification

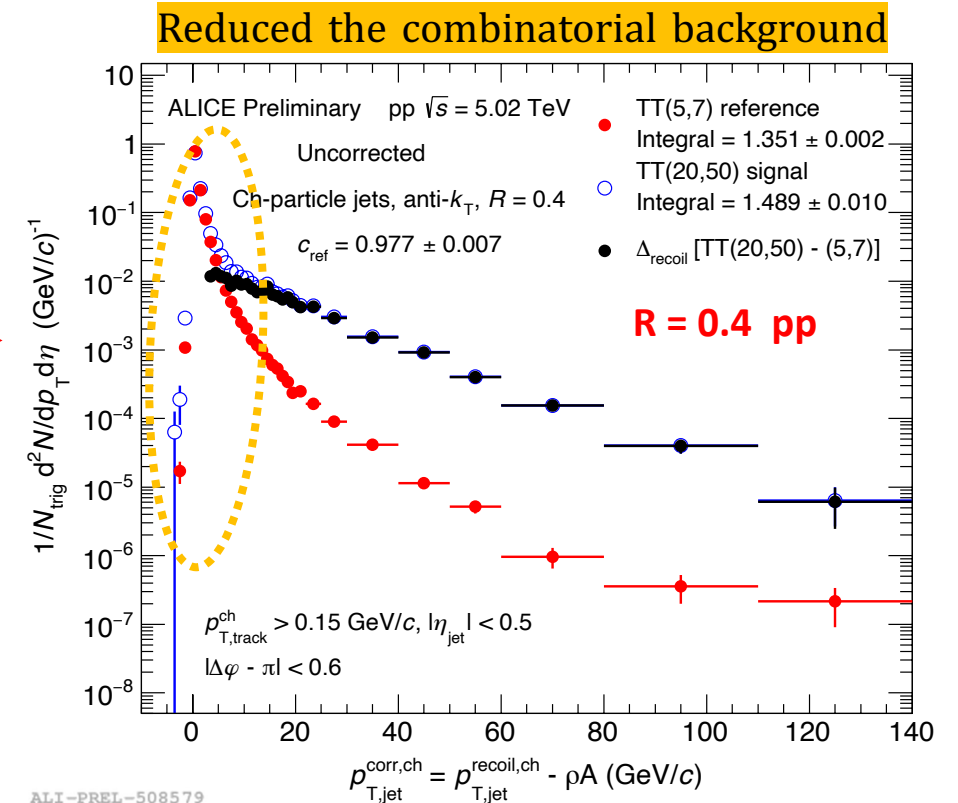
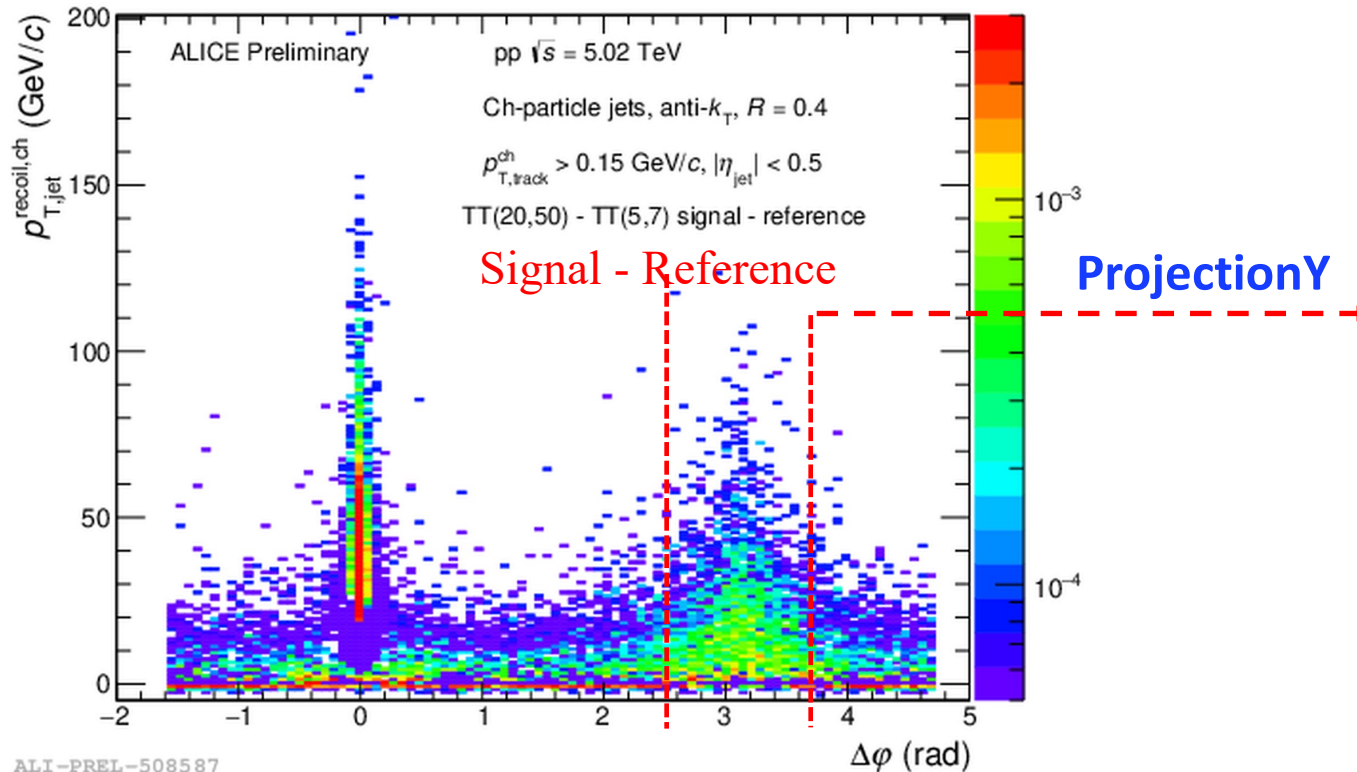


# Analysis method

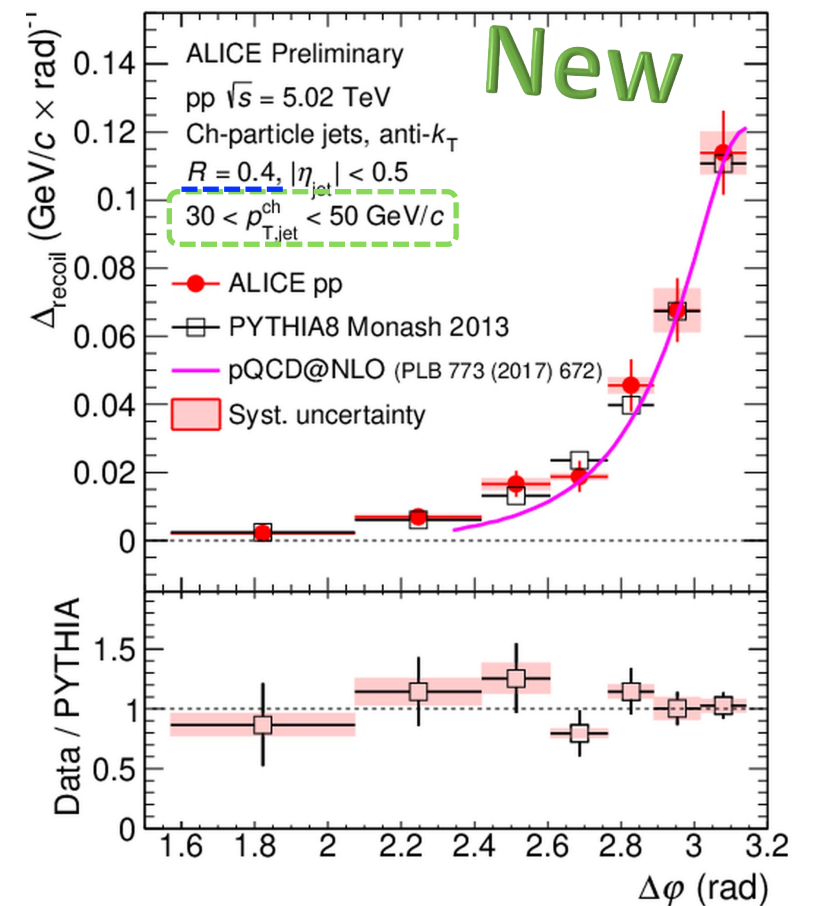
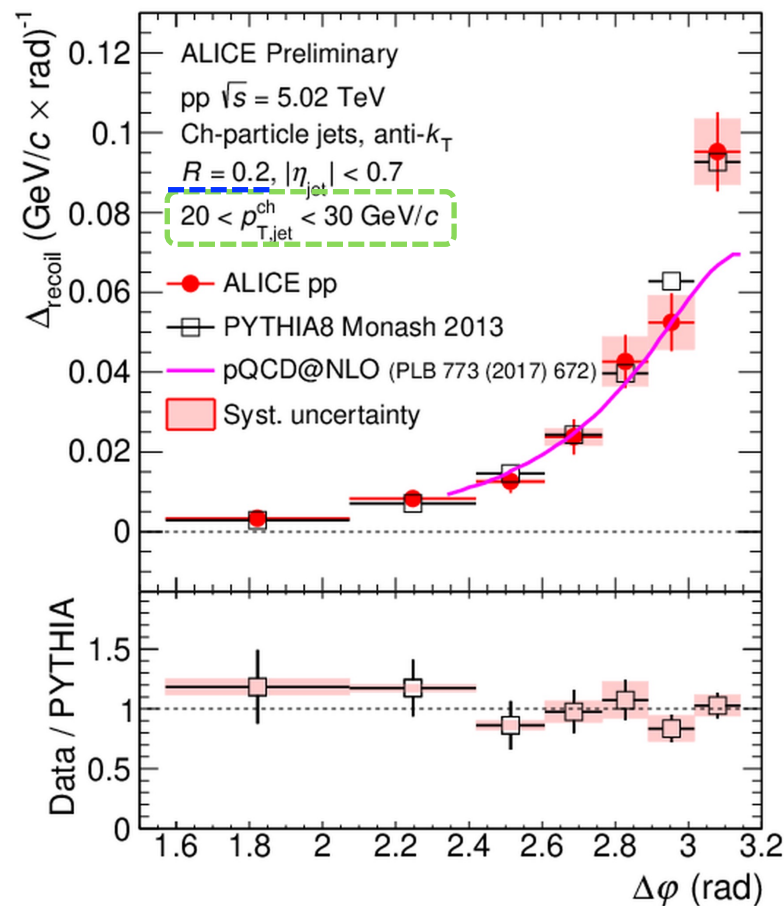
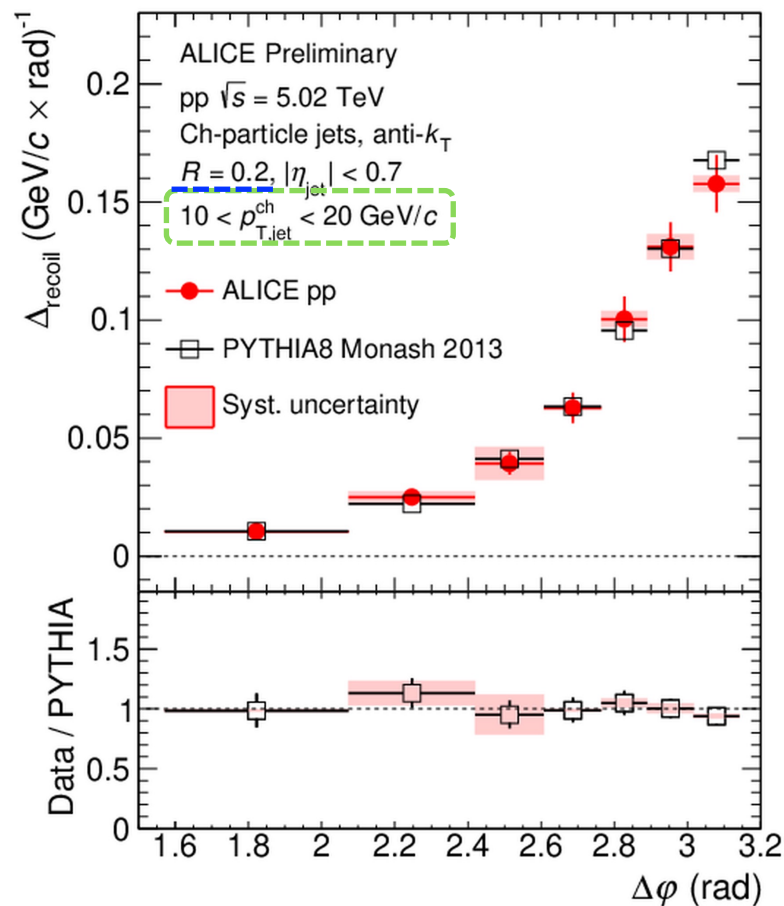
- Measure trigger-normalised yield of recoil jets
  - Trigger track (TT)  $p_T$  intervals: TT<sub>sig</sub>:  $20 < p_{T,\text{trig}} < 50 \text{ GeV}/c$ , TT<sub>ref</sub>:  $5 < p_{T,\text{trig}} < 7 \text{ GeV}/c$

- Observables  $\Delta_{\text{recoil}}$  defined as:
- Unfolding corrections
- Systematic calculation

$$\Delta_{\text{recoil}}(p_T, \Delta\varphi) = \frac{1}{N_{\text{trig}}} \frac{d^2 N_{\text{jet}}}{dp_{T,\text{jet}}^{\text{ch}} d\Delta\varphi} \Bigg|_{p_{T,\text{trig}} \in \text{TT}_{\text{Sig}}} - c_{\text{ref}} \cdot \frac{1}{N_{\text{trig}}} \frac{d^2 N_{\text{jet}}}{dp_{T,\text{jet}}^{\text{ch}} d\Delta\varphi} \Bigg|_{p_{T,\text{trig}} \in \text{TT}_{\text{Ref}}}$$



# Results: Hadron-jet $\Delta_{\text{recoil}}$ ( $\Delta\phi$ ) distributions



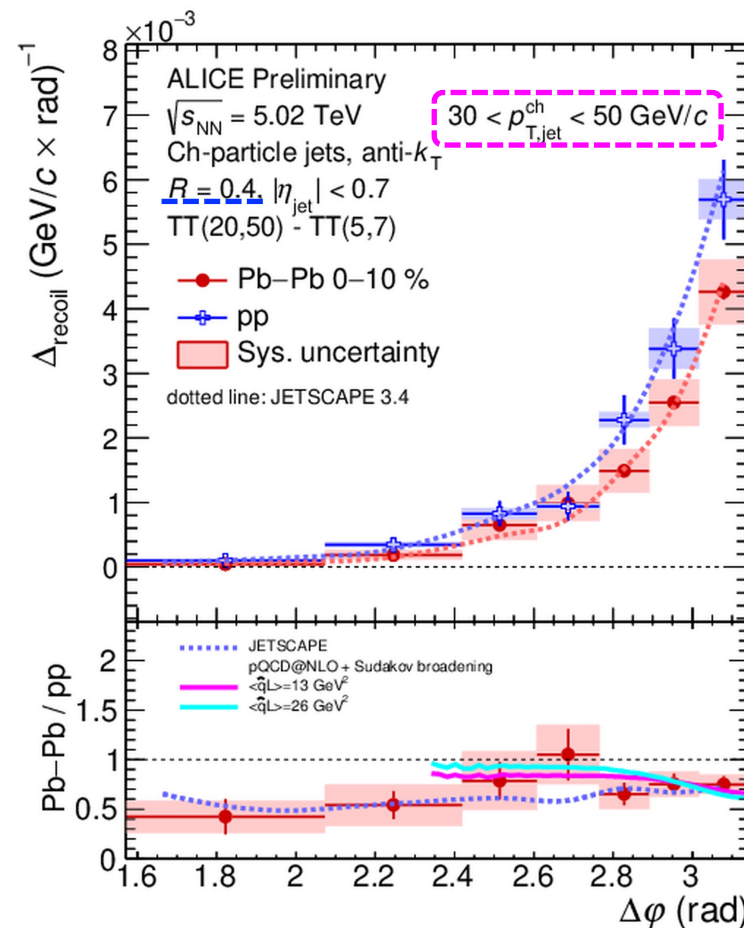
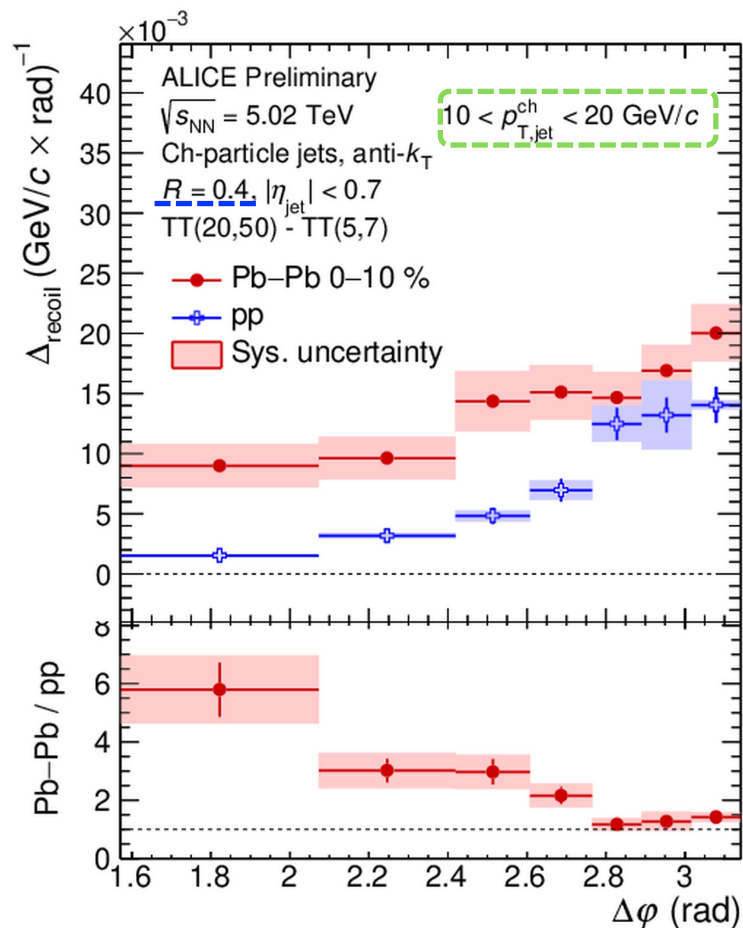
- First measurement of the **fully-corrected** hadron+jet  $\Delta\phi$  distribution in pp collisions at  $\sqrt{s} = 5.02$  TeV
  - **Good agreement of  $\Delta\phi$  distributions** between data and different predictions (PYTHIA8 and pQCD prediction<sup>1</sup>)

<sup>1</sup>[\[Phys. Lett. B 773 \(2017\) 672\]](#)

# Results: $I_{AA}$ distributions in most central Pb-Pb collisions to pp

- **Broadening at low  $p_T$  for  $R = 0.4$  jets**
- Recoil jet yield **suppressed at higher  $p_T$**
- **Reasonable description by JETSCAPE<sup>2</sup>**, and calculation including medium-induced  $p_T$  broadening<sup>1</sup> in  $\Delta\phi$ ,  $p_T$

$$I_{AA} = \Delta_{\text{recoil}}^{\text{Pb-Pb}} / \Delta_{\text{recoil}}^{\text{pp}}$$



New

[Phys. Lett. B 773 (2017) 672]<sup>1</sup>  
 [J. H. Putschke, arXiv:1903.07706]<sup>2</sup>

