

# Activity at Jeonbuk

Eun-Joo Kim

전북대학교

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# JBNU group

- Members : Eun-Joo Kim, Jun-Lee Kim(JL)
- Analysis
  - Ridge in pp@13 TeV (JL, BK, DJ)
  - $f_0(980)$  resonance in pp, p-Pb, Pb-Pb (JL, BK)

# Plan : slide from March, 2017

APPLICATION  
○○●

CURRENT STATUS  
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PLAN  
○○

BACK-UP  
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## RESEARCH PLAN

- Short term physics topics in 2017-2018
  - Spectra and cross-section measurements for light flavor resonances
  - Comparison of the above results with the results of the central diffractive events
- Long term physics topic after 2018
  - Flows of heavy flavors
  - Jet Physics with two-particle correlations
- ALICE upgrade project : collaborative effort within KoALICE on ITS upgrade project



# Summary & Outlook from Jan. 2019

- Multiplicity : paper submission and publication
- Light flavor
  - Measuring  $\left\langle \frac{dN_{f_0(980),f_2(1270)}}{d\eta} \right\rangle / \left\langle \frac{dN_{ch}}{d\eta} \right\rangle$  to check the strangeness enhancement in the small system
  - Try to analyze p-Pb and Pb-Pb data eventually
  - Apply for SQM parallel talk
  - Paper preparation and submission
- Ridge
  - The 13<sup>th</sup> High  $p_T$  workshop
  - Paper preparation and submission
- ITS
  - Jan-Feb 2019 : commissioning at CERN
  - Mar-Sep 2019 : calibration, remote work

# Status : Multiplicity (BK)

- Multiplicity : paper submission and publication
  - Paper submission : February 2020
  - Publication : 2020?

EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

CERN-EP-2019-xxx  
August 9, 2019

### Charged-particle pseudorapidity distributions as a function of event multiplicity in pp collisions at $\sqrt{s} = 5.02, 7$ and 13 TeV

**Abstract**

The multiplicity dependence of the pseudorapidity density of charged particles in proton-proton (pp) collisions at  $\sqrt{s} = 5.02, 7$  and 13 TeV measured by ALICE is reported. The analysis relies on track segments measured by the Silicon Pixel Detector in the central pseudorapidity range  $|\eta| < 1.5$ . Results are presented for inelastic events having at least one charged particle produced in the pseudorapidity interval  $|\eta| < 1$  (INEL<sub>0-1</sub>). The multiplicity dependence of the pseudorapidity density of charged particles is measured for central and forward multiplicity estimators, the latter being free from auto-correlations effects. A detailed comparison with the predictions of the general purpose QCD Monte Carlo models for pp interactions PYTHIA 8 and EPOS LHC is also presented. Both models provide a sufficient description of the data from both a qualitative and a quantitative point of view.

	Forward Multiplicity Estimator			Central Multiplicity Estimator		
	$\sqrt{s}$ (TeV)			$\sqrt{s}$ (TeV)		
	5.02	7	13	5.02	7	13
$\sigma/\sigma_{MB,pp} \rightarrow$	$(dN_{ch}/d\eta)$					
0-0.01%	24.43±0.37	27.82±0.39	35.84±0.45			
0.01-0.1%	21.62±0.30	24.05±0.27	31.06±0.39			
0.1-0.5%	19.02±0.24	21.25±0.21	26.93±0.33			
0.5-1%	17.29±0.21	19.36±0.20	24.24±0.30			
0-1%	18.44±0.23	20.60±0.23	26.01±0.32	25.15±0.44	28.19±0.80	33.01±0.52
1-5%	14.47±0.18	16.23±0.16	19.98±0.24	17.64±0.28	19.78±0.54	23.18±0.33
0-5%	15.26±0.19	17.11±0.17	21.17±0.25	19.08±0.41	21.46±0.63	25.08±0.45
5-10%	11.91±0.15	13.34±0.13	16.18±0.19	13.76±0.21	15.38±0.31	18.00±0.25
10-15%	10.29±0.13	11.50±0.12	13.77±0.17	11.53±0.17	12.79±0.21	14.91±0.20
15-20%	9.10±0.11	10.24±0.10	12.01±0.15	9.92±0.15	10.98±0.17	12.67±0.17
20-30%	7.75±0.10	8.90±0.09	10.03±0.13	8.09±0.13	8.99±0.14	10.32±0.14
30-40%	6.33±0.08	7.21±0.07	7.95±0.10	6.25±0.10	6.97±0.11	8.02±0.11
40-50%	5.21±0.07	5.84±0.06	6.32±0.08	4.96±0.08	5.44±0.09	6.17±0.09
50-70%	3.93±0.05	4.30±0.05	4.49±0.06	3.47±0.06	3.72±0.06	4.04±0.06
70-100%	2.42±0.03	2.33±0.03	2.54±0.04	1.65±0.05	1.75±0.04	1.80±0.04
0-100%	5.48±0.07	5.91±0.06	6.92±0.09	5.48±0.07	5.91±0.06	6.92±0.09

Table 1: The values of  $\langle dN_{ch}/d\eta \rangle$  that are the integral of  $dN_{ch}/d\eta$  in  $|\eta| < 0.5$  for the forward and central multiplicity classes at  $\sqrt{s} = 5.02$  to 13 TeV in pp collisions.

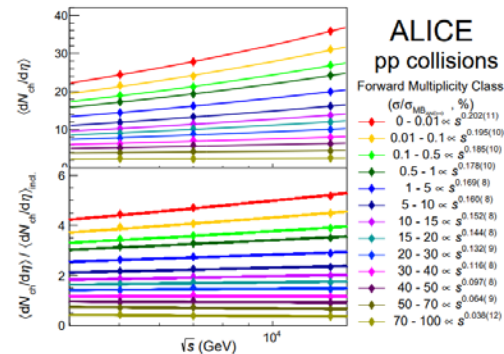


Fig. 5: Energy dependence of  $\langle dN_{ch}/d\eta \rangle$  (upper) and  $\langle dN_{ch}/d\eta \rangle$  scaled by the inclusive  $dN_{ch}/d\eta$  (lower) for the forward multiplicity classes in pp collisions.

# Status : Light flavor

- Light flavor
  - Measuring  $\left\langle \frac{dN_{f_0(980), f_2(1270)}}{d\eta} \right\rangle / \left\langle \frac{dN_{ch}}{d\eta} \right\rangle$  to check the strangeness enhancement in the small system
  - Try to analyze p-Pb and Pb-Pb data eventually
  - Apply for SQM parallel talk
  - Paper preparation and submission

# $f_0$ resonance : Analysis

- Partially approved for pp@13 TeV (2019 summer conference)
  - Minimum Bias result : approved
  - Multiplicity Dependent result : has not been approved
- For other collision systems : analysis on-going
  - p-Pb@5.02, 8.16 TeV : Analysis note uploaded in Dec. 05, 2019
  - <https://alice-notes.web.cern.ch/node/1018>
  - Pb-Pb@5.02 TeV : analysis on-going
- Goal : Hard Probe 2020
  - Approval & oral presentation

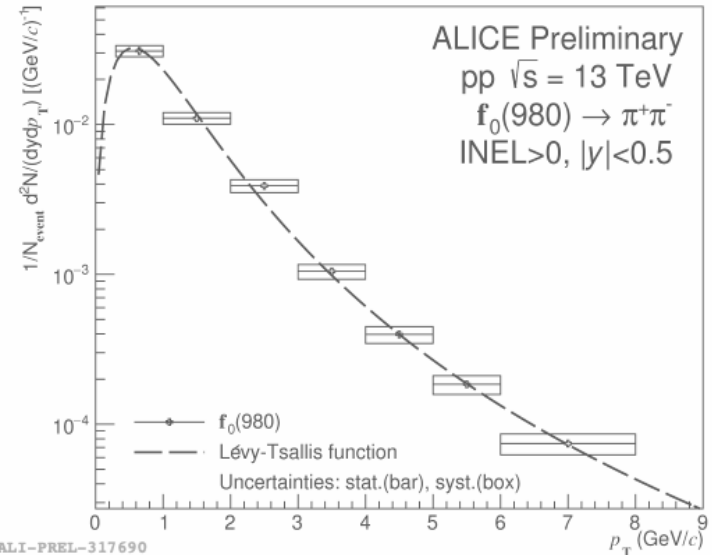
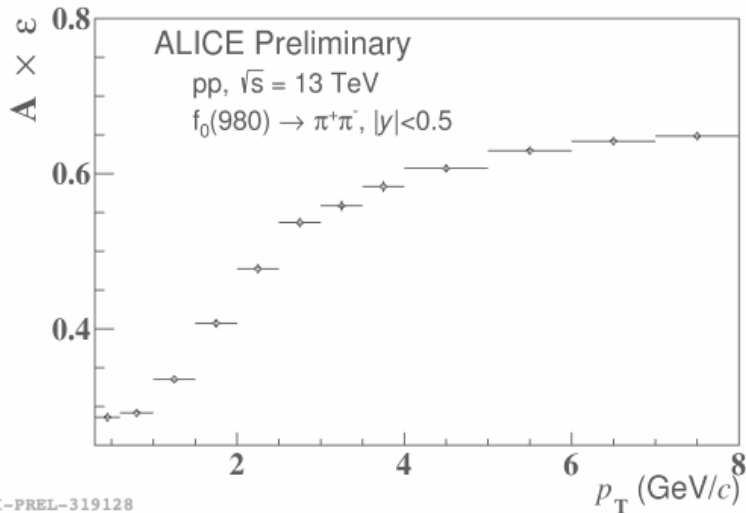
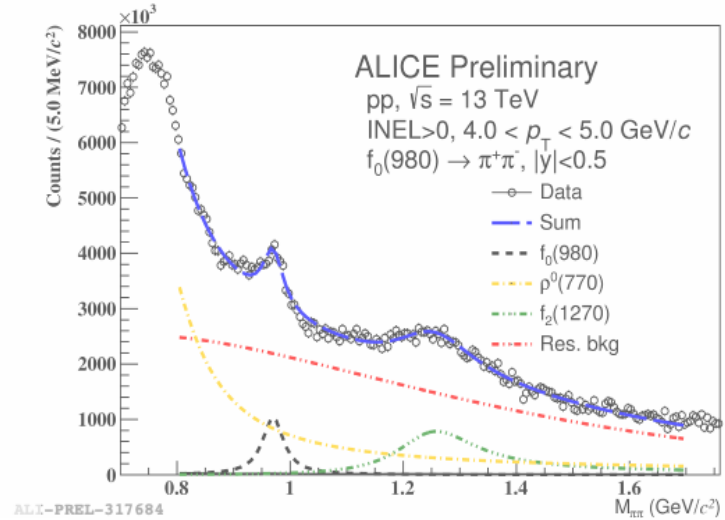
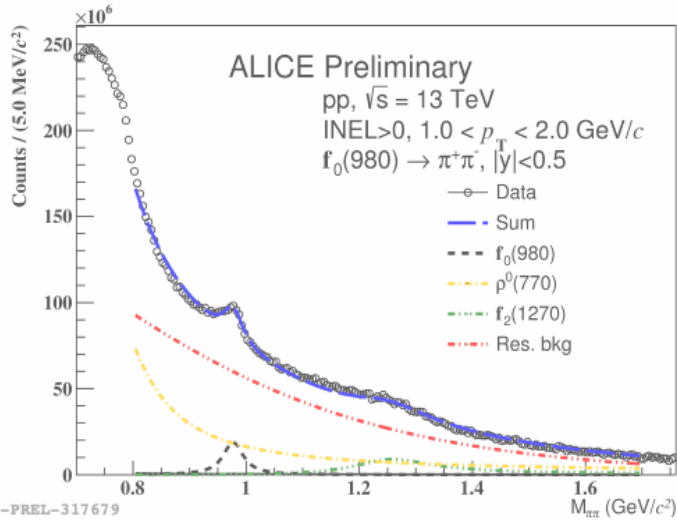
# $f_0$ resonance : Contributions

- 13 presentations at CERN internal meeting
- International Conference
  - 1 Poster presentation at SQM 2019 in Italy
- 1 oral presentation at KPS spring meeting
- Two Analysis Notes : uploaded
  - pp@13 TeV, p-Pb@5.02, 8.16 TeV

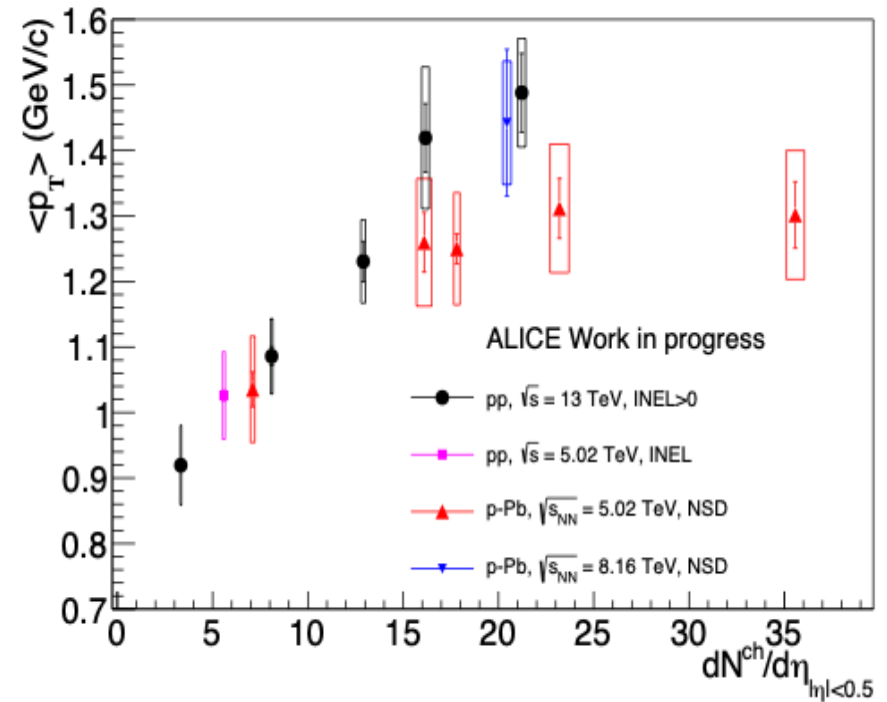
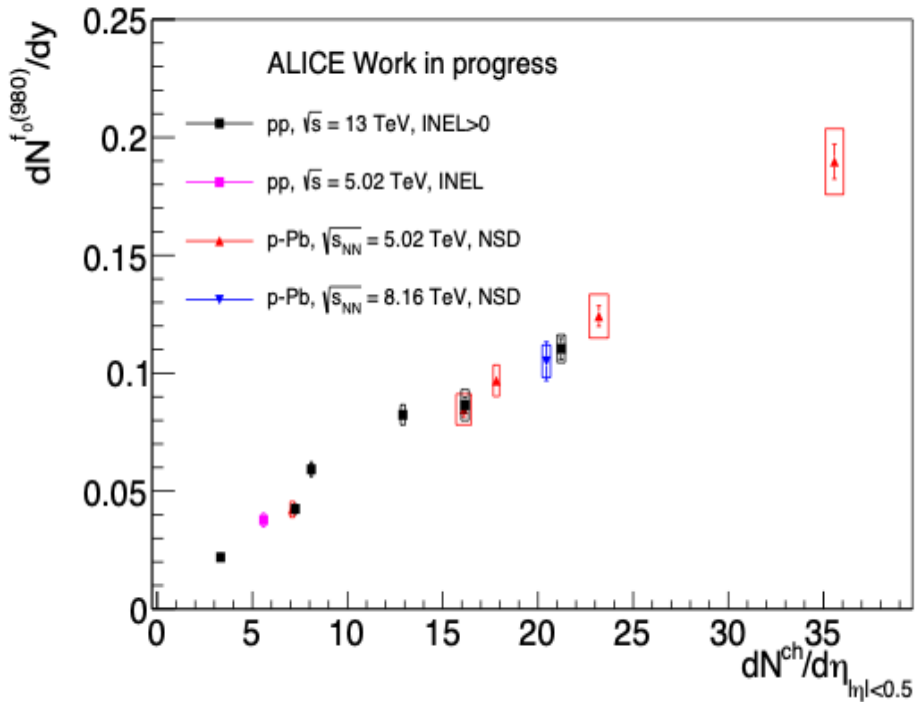


# $f_0$ : Approved figures

Signal extraction &  $p_T$  spectra in pp@13 TeV

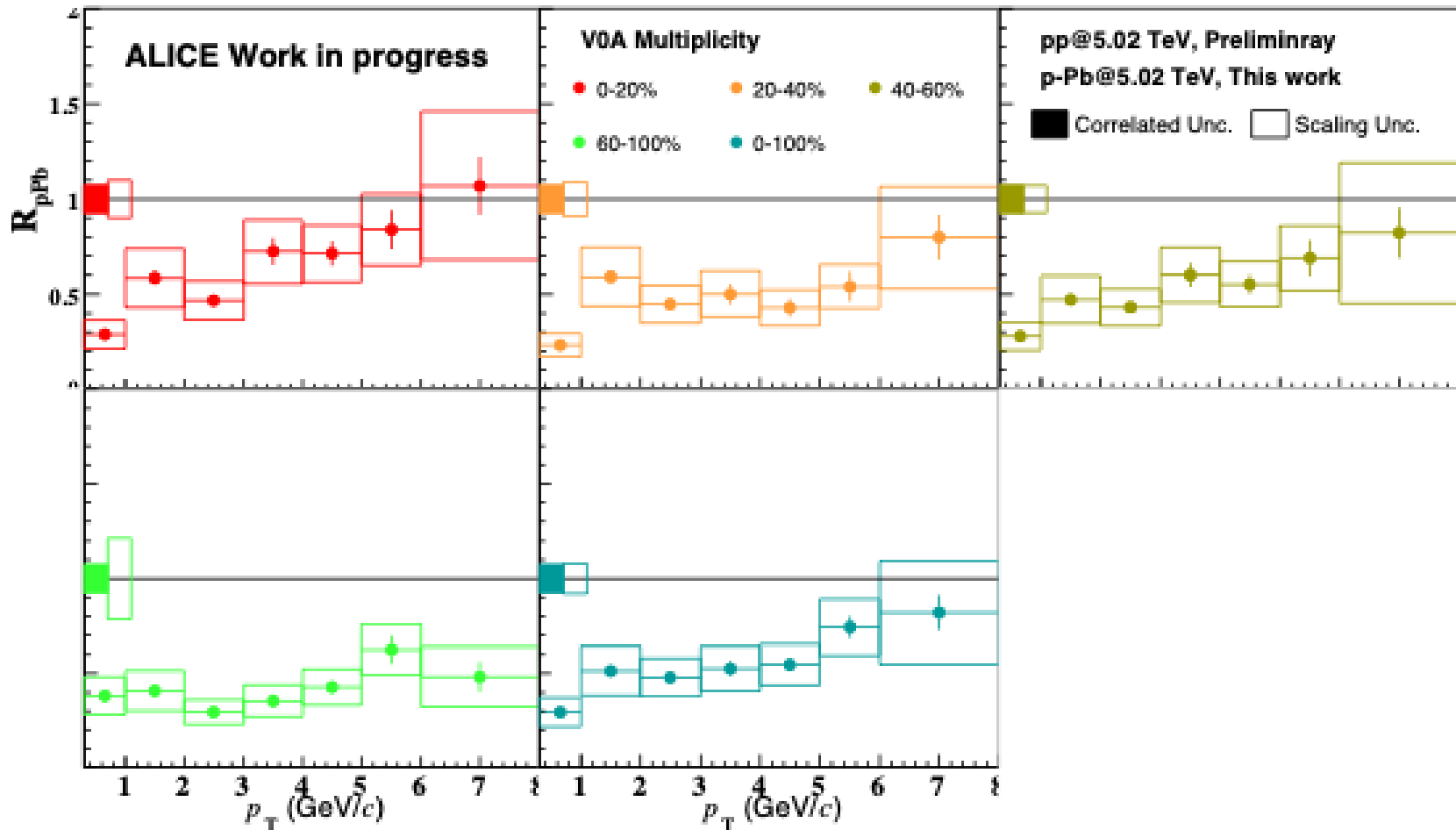


# $f_0$ : Comparison between multiple collision systems



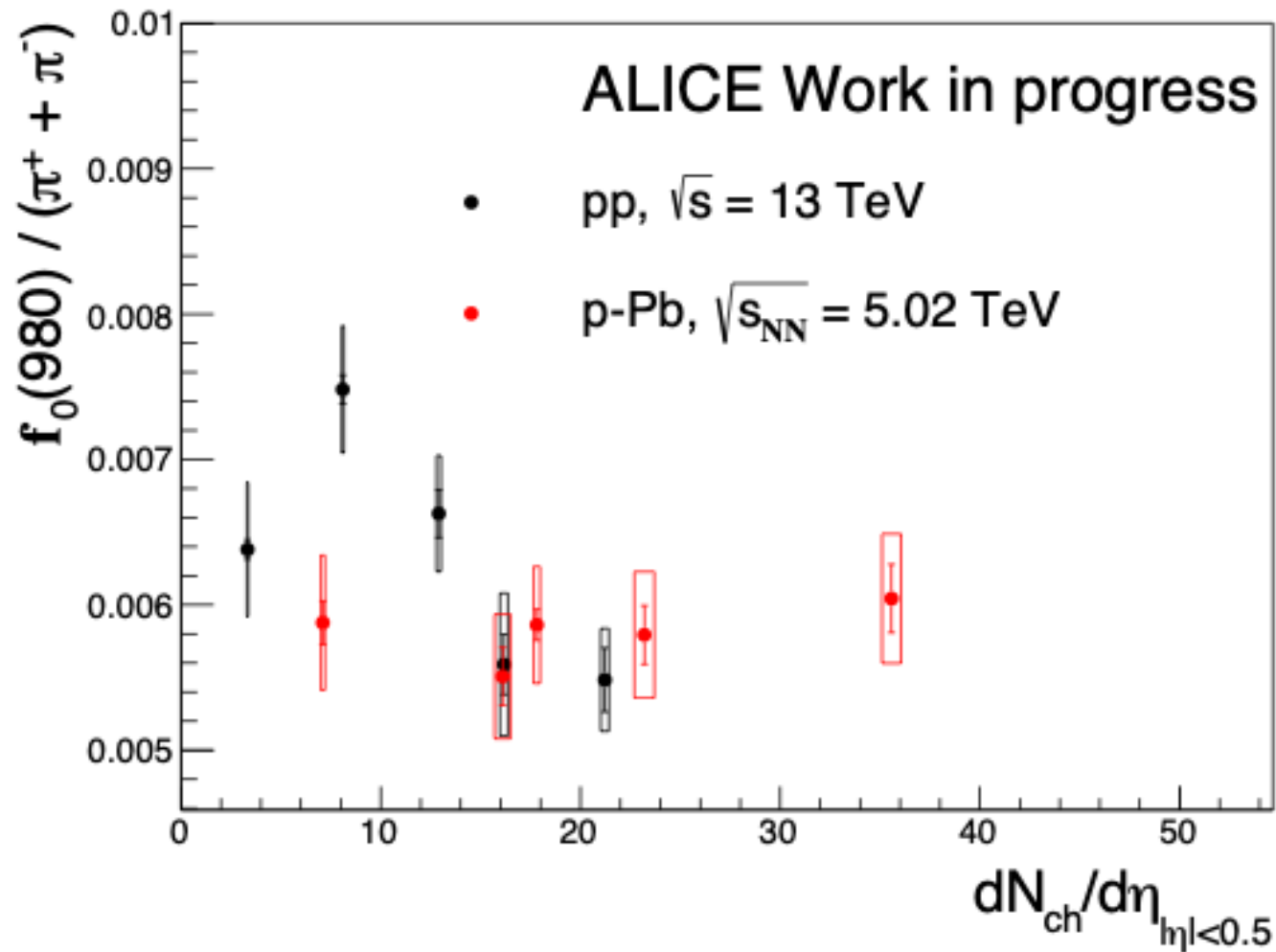
- same tendency (in terms of collisions systems and energy) ???

# $f_0 : R_{pPb}$



- suppression???
- need double check & further study

# $f_0$ : Ratio to charged pion



- No strong strange enhancement ???
- pp@5.02, p-Pb@8.16 TeV will be added

# Status : Ridge

- Ridge
  - The 13<sup>th</sup> High  $p_T$  workshop
  - Paper preparation and submission

# Ridge : Analysis

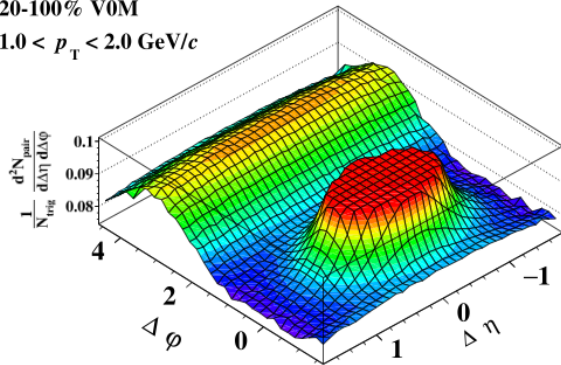
- Approved figures for 2019 summer conferences
- Leading hadron selection : new
- Leading jet selection : under study
- Paper draft & proposal : under preparation

# Ridge : Contributions

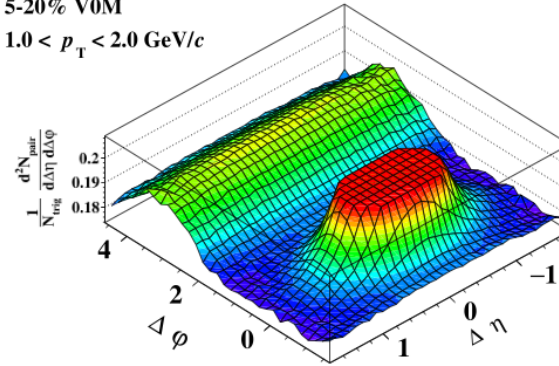
- 5 presentations at CERN internal meeting
- International Conference
  - 1 Poster presentation at Initial State 2019 in NY
  - 1 oral presentation at EPS-HEP 2019 in Belgium : Proceeding (PoS)
- 1 oral presentation at KPS fall meeting
- Analysis Notes : uploaded in April 18, 2019
  - <https://alice-notes.web.cern.ch/node/915>

# Ridge : Approved Figures

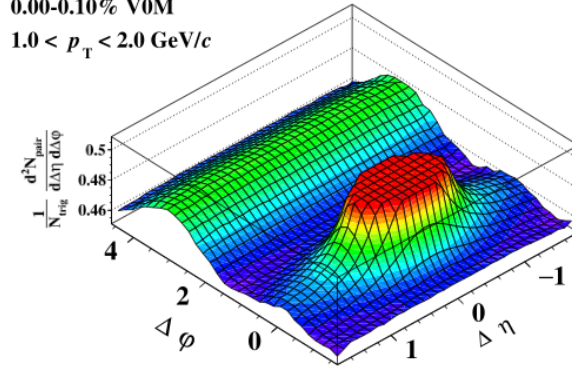
ALICE Preliminary, pp  $\sqrt{s} = 13$  TeV  
20-100% V0M  
 $1.0 < p_T < 2.0$  GeV/c



ALICE Preliminary, pp  $\sqrt{s} = 13$  TeV  
5-20% V0M  
 $1.0 < p_T < 2.0$  GeV/c



ALICE Preliminary, pp  $\sqrt{s} = 13$  TeV  
0.00-0.10% V0M  
 $1.0 < p_T < 2.0$  GeV/c

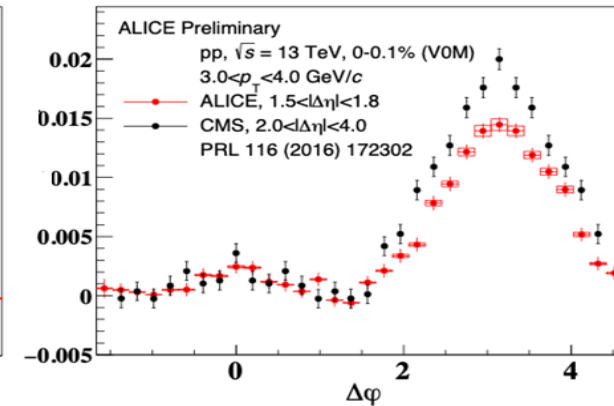
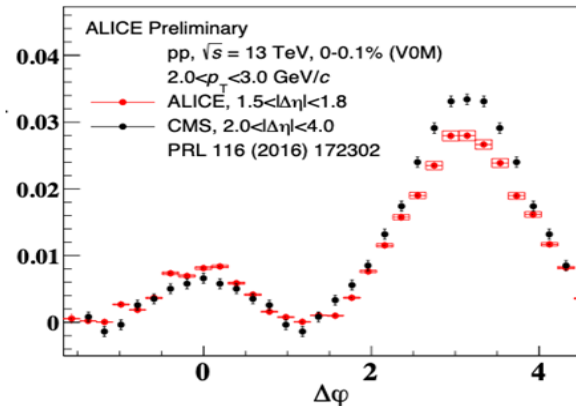
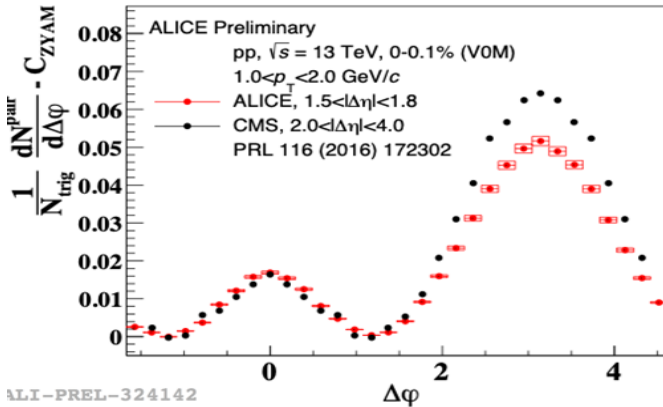


ALI-PREL-319143

ALI-PREL-319148

ALI-PREL-319153

- The long-range correlations is not seen in the low multiplicity classes
- In the high multiplicity class, the correlations is clearly seen

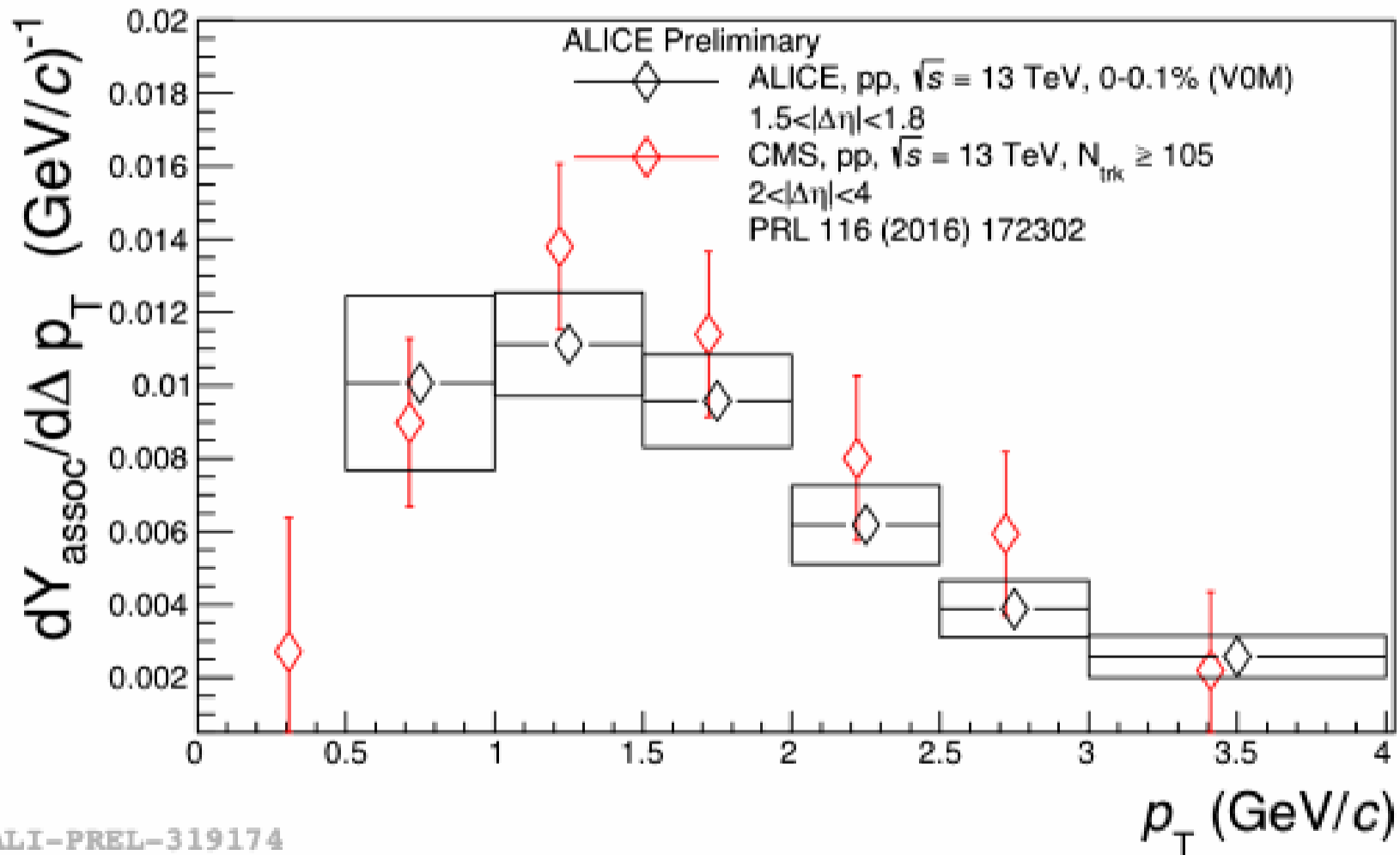


ALI-PREL-324142

- The long-range  $\Delta\phi$  distributions between ALICE and CMS are comparable each other even with different multiplicity definition



# Ridge : Approved Figures



- The associated yield are comparable between ALICE and CMS, which shows possibility of ridge analysis within ALICE acceptance

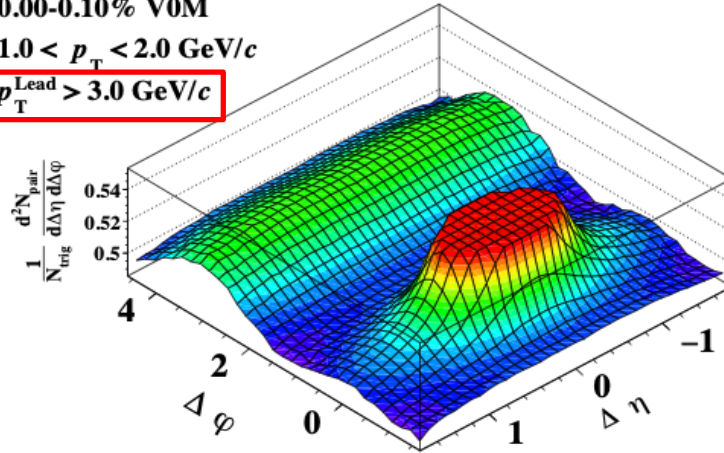
# Ridge : Approved Figures

ALICE Preliminary, pp  $\sqrt{s} = 13$  TeV

0.00-0.10% V0M

$1.0 < p_T < 2.0$  GeV/c

$p_T^{\text{Lead}} > 3.0$  GeV/c

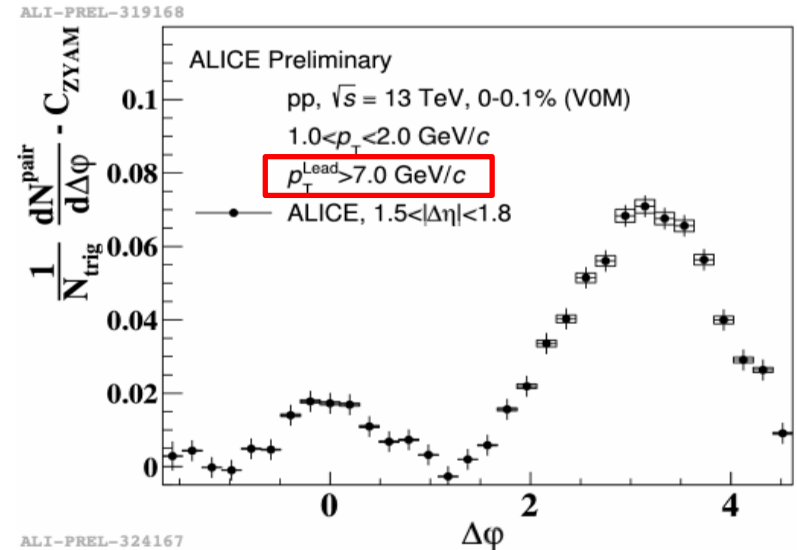
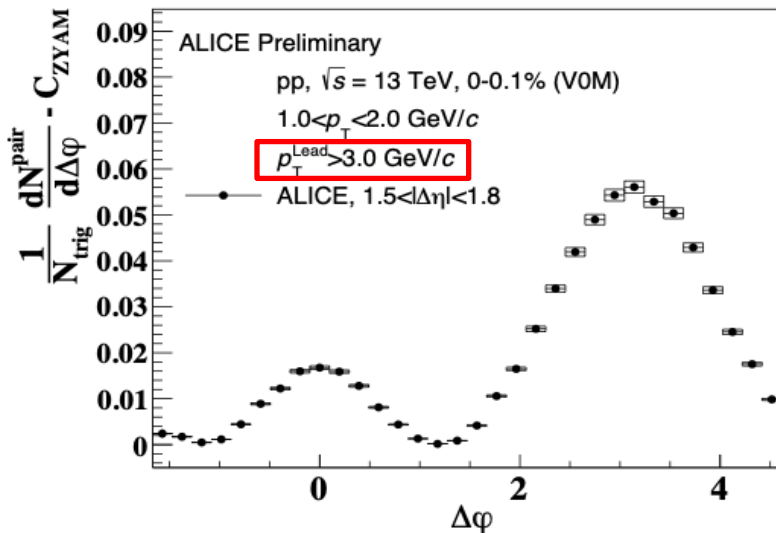
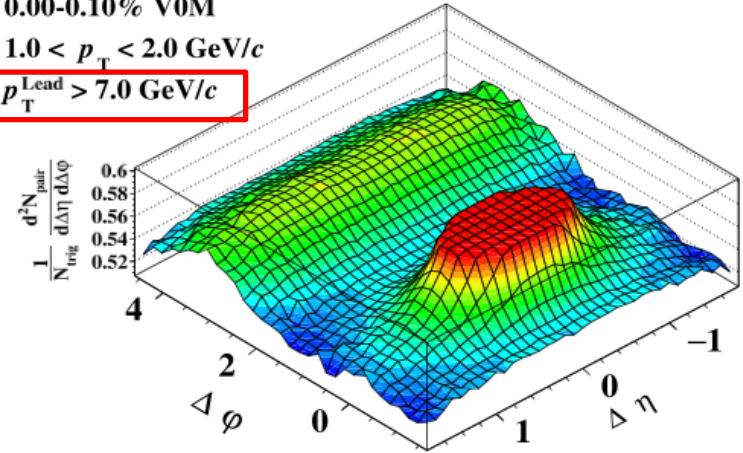


ALICE Preliminary, pp  $\sqrt{s} = 13$  TeV

0.00-0.10% V0M

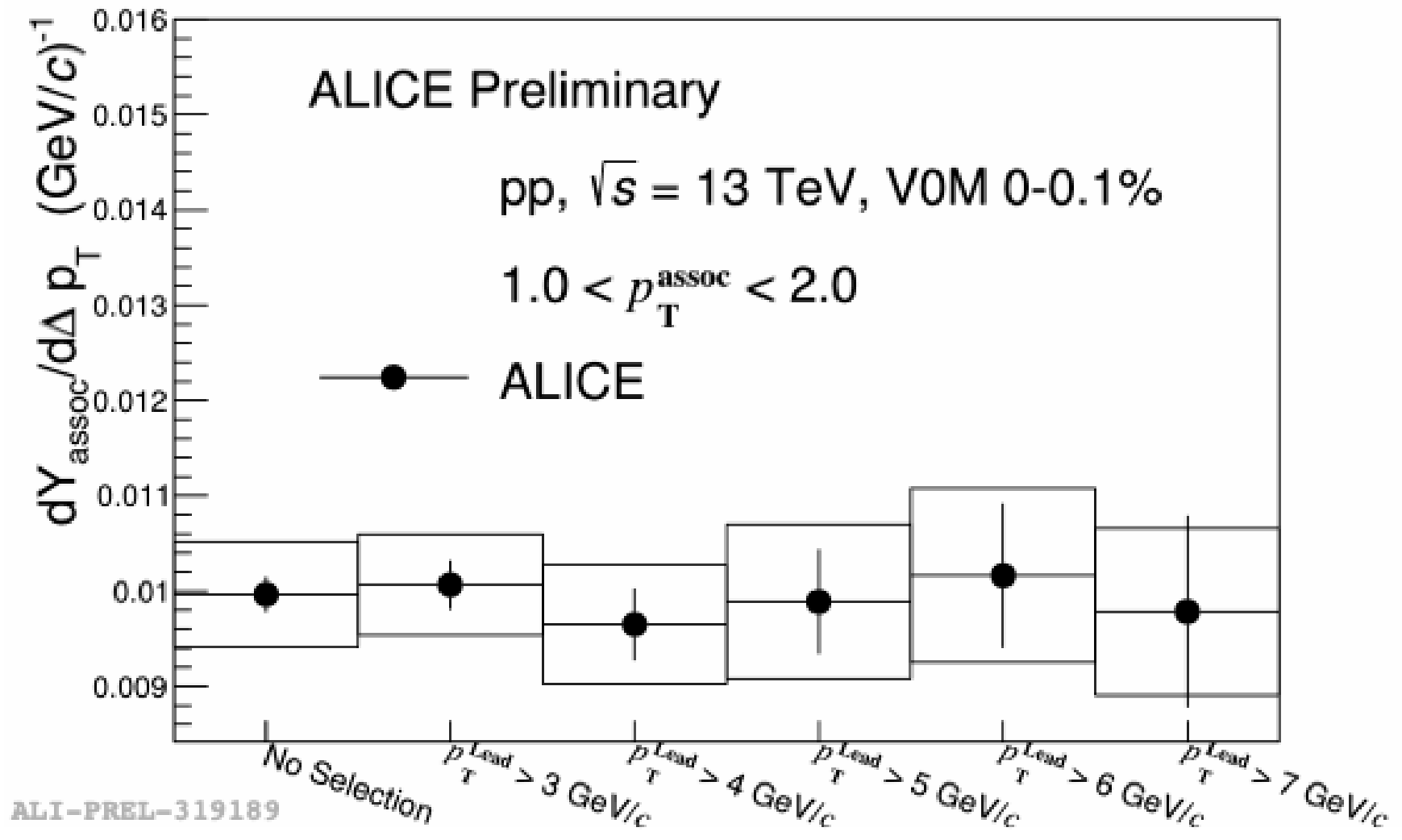
$1.0 < p_T < 2.0$  GeV/c

$p_T^{\text{Lead}} > 7.0$  GeV/c



- With Leading hadron selection, long-range correlations can be seen

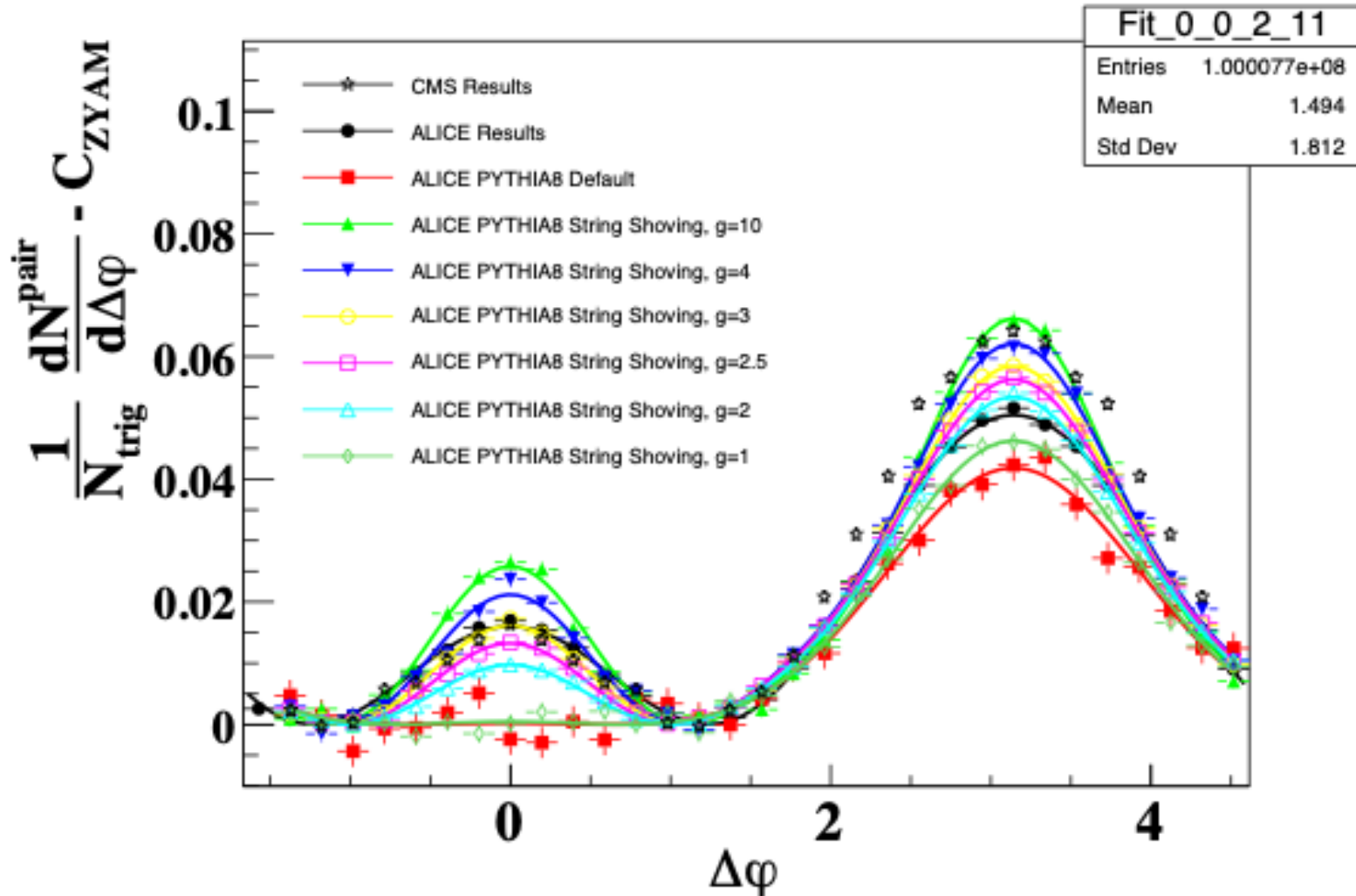
# Ridge : Approved Figures



- The associated yields are consistent with various leading hadron selection

# Ridge : Model study

RidgeLT Cent:0-0.1 TPt:1-2 APt:1-2 LPPt:0.2-20



- Dedicated model study is ongoing with the help of KIAF computing farm

# Status : ITS (service work)

- ITS
  - Jan-Feb 2019 : commissioning at CERN
  - Mar-Sep 2019 : calibration, remote work
- ITS Quality Check
  - Participation in QC works since August 2019
  - QC Analysis software package was installed in October 2019

# Summary & Outlook

- Light flavor
  - $R_{pPb}$  : under further study
  - Preparation of next approval (maybe Hard Probe 2020)
  - Pb-Pb collision system : keep going
- Ridge
  - Finalized analysis with jet reconstruction & selection
  - paper draft : January - April 2020
  - paper proposal : with jet implementation & selection
- ITS Quality Check
  - contributions???