

"Strangeness tuning" with Professor 2

... work in progress ...

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Pythia week 2024

30th April 2024



ALICE



**UNIVERSITÀ
DEGLI STUDI
DI TRIESTE**

Main goals

Tuning of strangeness enhancements measurements of ALICE experiment.

Two parallel tuning efforts:

- 1) Rope hadronization (discussion with **Christian Bierlich** and **David Dobrigkeit Chinellato**)
- 2) Close packing

Plan

- 1) Starting point: Monash tune
- 2) Tune MPI and CR parameters
- 3) Strangeness:
 - a) tune p/π and Λ/K_S^0 (vs multiplicity)
 - b) All ratios over π

Fixed "variables" (at the moment)

- Fixed LEP parameters;
- α_S^{MPI}
- NNPDF 2.3
- `ColourReconnection:timeDilationMode = 0`

Future

- `ColourReconnection:timeDilationMode = 2`
- New PDFs: MSHT20qed_lo and NNPDF40MC_lo_rc
- New GoF function: *Canonero-Cowan GoF*

Close packing

Road map with Close packing

MPI:pTO												
	CR:mPseud											
		CR:m0										
			CR:junctio nCorr									
				CP:tension								
					SF:strange JuncFactor							
						CP:qqFacQ						
							CP:facQQ					
								CP:facPT				
									CP:pTO			
										CR:timeDila tion		
											MPI:bShap e	
												ECM dep

Author: **Peter Skands**

MPI and CR – no CP

Parameters:

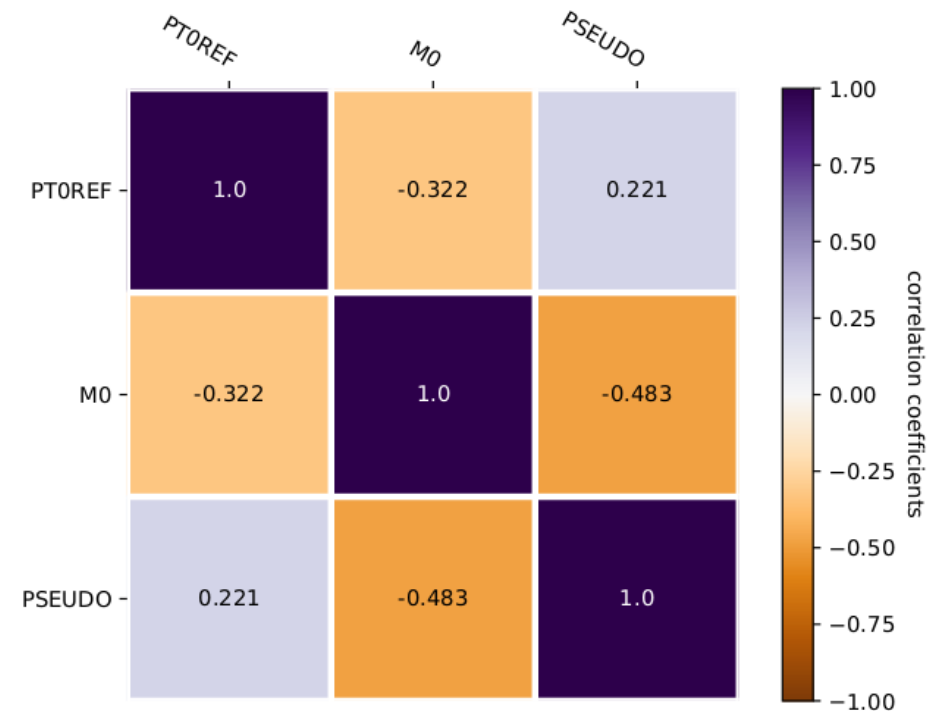
- MultipartonInteractions:pT0Ref
- ColourReconnection:m0
- ColourReconnection:mPseudo

Observables: ATLAS_2010_S8918562

- $\frac{d\langle N_{ch} \rangle}{d\eta}$ distributions
- $\langle p_T \rangle$ vs N_{ch}
- also some pT spectra

Results:

```
# GOF 297.888875
# UNITGOF 297.888875
# NDOF 243.000000
PT0REF 2.134616
M0 1.590329
PSEUDO 2.589940
```



CR Baryon to meson ratios – CP on

Parameters:

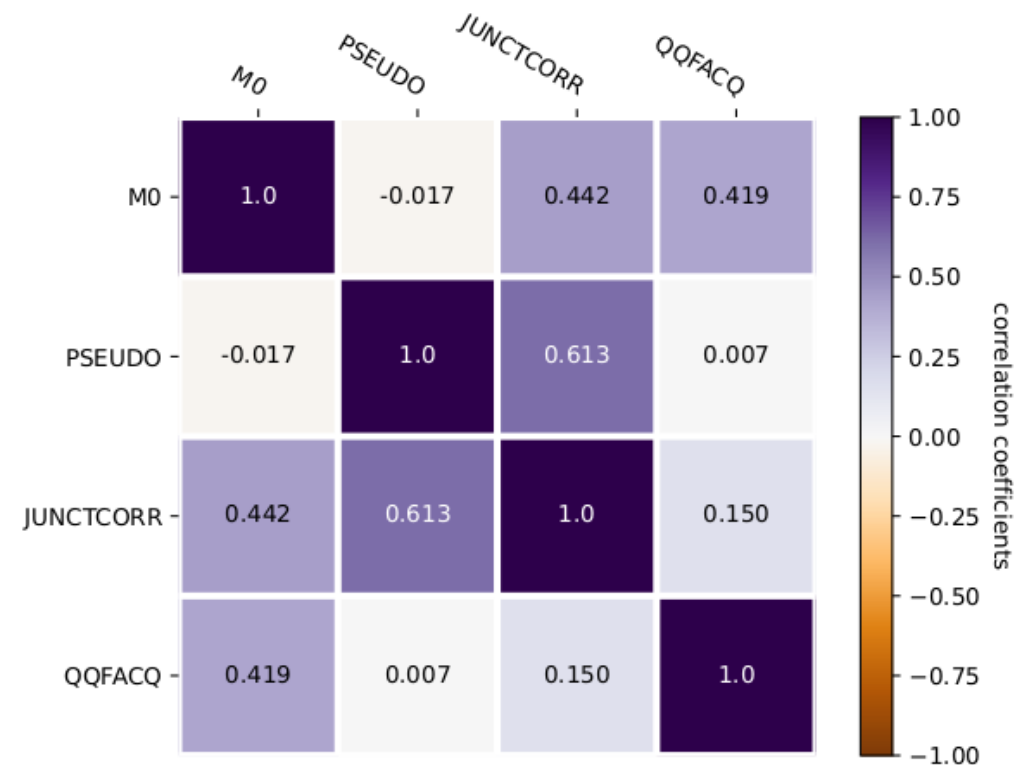
- ColourReconnection:m0
- ColourReconnection:mPseudo
- ColourReconnection:junctionCorrection
- ClosePacking:qqFacQ

Observables: ATLAS_2010_S8918562 + ALICE_2016_I1471838

- $\frac{d\langle N_{ch} \rangle}{d\eta}$ distributions
- $\langle p_T \rangle$ vs N_{ch}
- also some pT spectra
- p/π and Λ/K_S^0 (vs multiplicity)

Results:

```
# GOF 407.503502
# UNITGOF 407.503502
# NDOF 276.000000
M0          2.805054
PSEUDO      2.247251
JUNCTCORR   1.382419
QQFACQ      0.506546
```



Introducing strangeness (1)

Parameters:

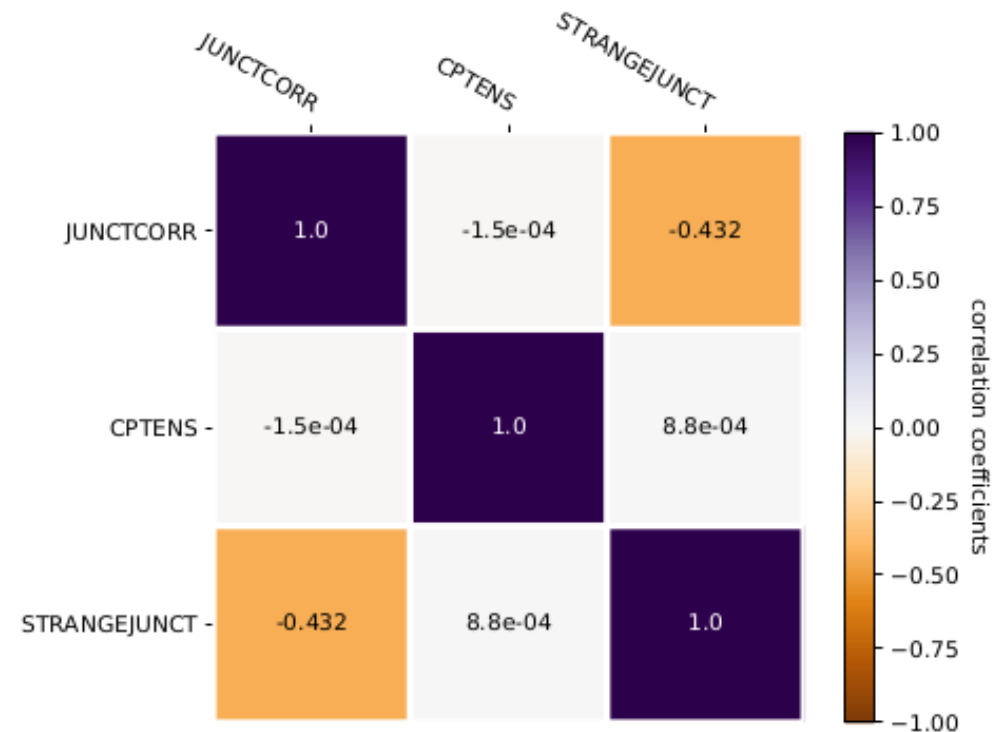
- ColourReconnection:junctionCorrection
- StringFragmentation:strangeJuncFactor
- ClosePacking:tension

Observables: ALICE_2016_I1471838

- p/π and Λ/K_S^0 (vs multiplicity)
- Ratios over π (vs multiplicity)

Results:

```
# GOF 73.606693
# UNITGOF 73.606693
# NDOF 52.000000
JUNCTCORR      1.339994
CPTENS         0.004823
STRANGEJUNCT   0.519892
```



Introducing strangeness (2)

Parameters:

- ColourReconnection:junctionCorrection
- StringFragmentation:strangeJuncFactor
- ClosePacking:tension
- ClosePacking:qqFacQ

Observables: ALICE_2016_I1471838

- p/π and Λ/K_S^0 (vs multiplicity)
- Ratios over π (vs multiplicity)

Results:

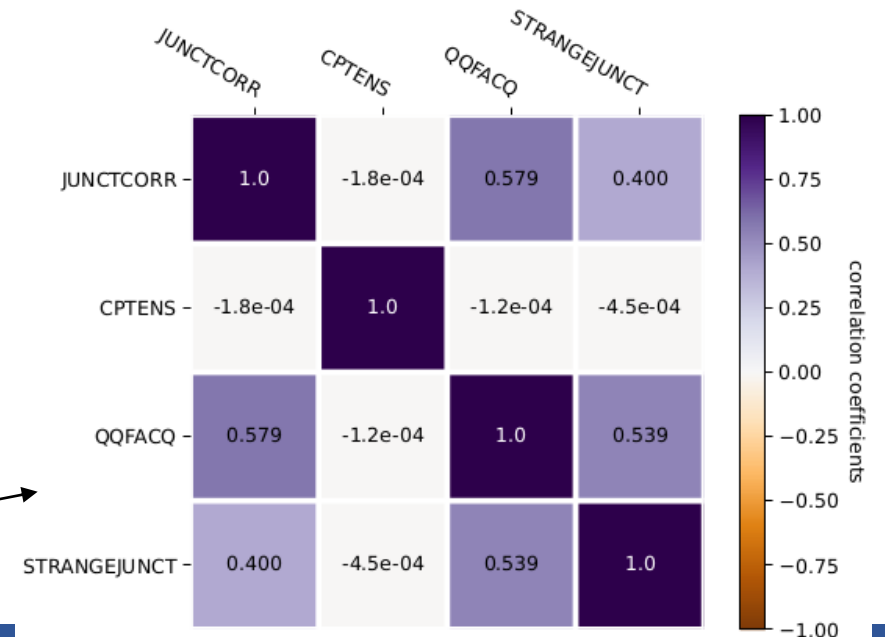
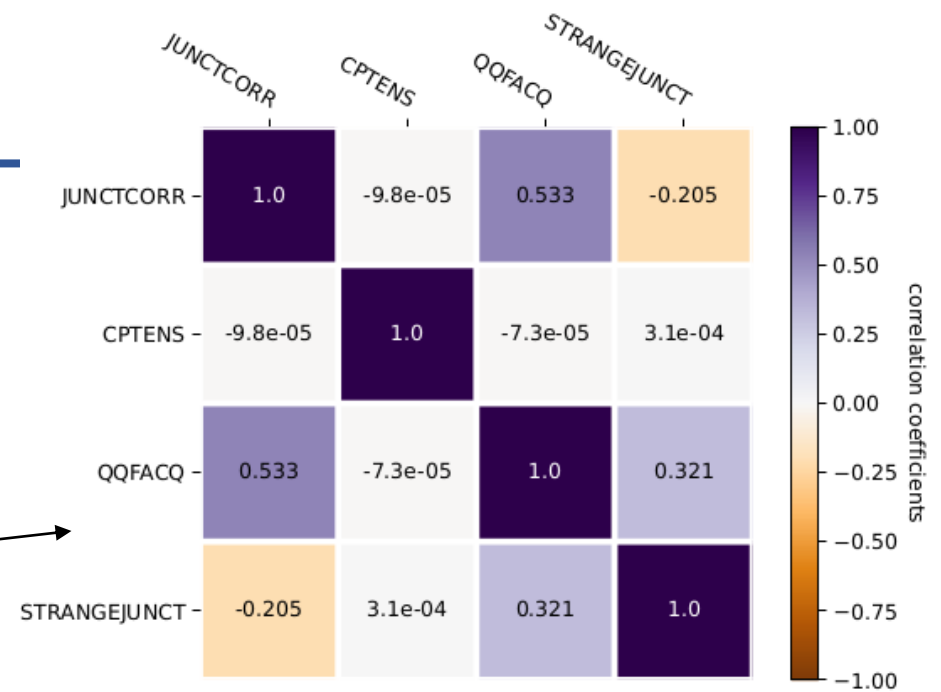
```
# GOF 79.663120
# UNITGOF 79.663120
# NDOF 51.000000
JUNCTCORR      1.581241
CPTENS          0.019370
QQFACQ         0.984177
STRANGEJUNCT   0.413841
..
```

Interpolation: polyn. Ord. 3

```
# GOF 74.897139
# UNITGOF 74.897139
# NDOF 51.000000
JUNCTCORR      1.525189
CPTENS          0.019370
QQFACQ         0.882240
STRANGEJUNCT   0.429018
```

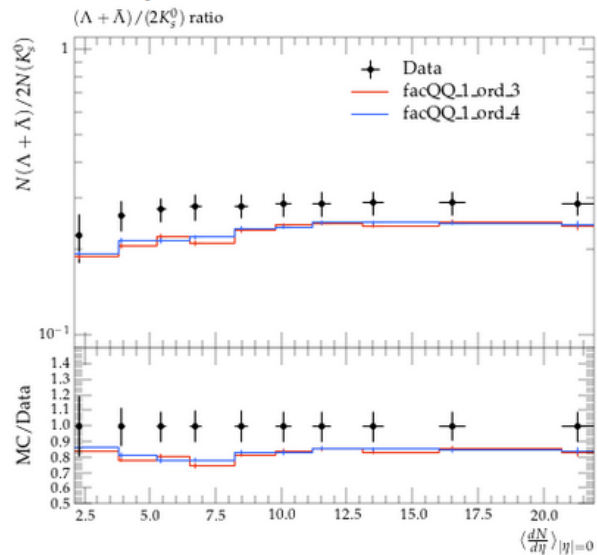
Interpolation: polyn. ord. 4

Interpolation
polyn. ord. 3

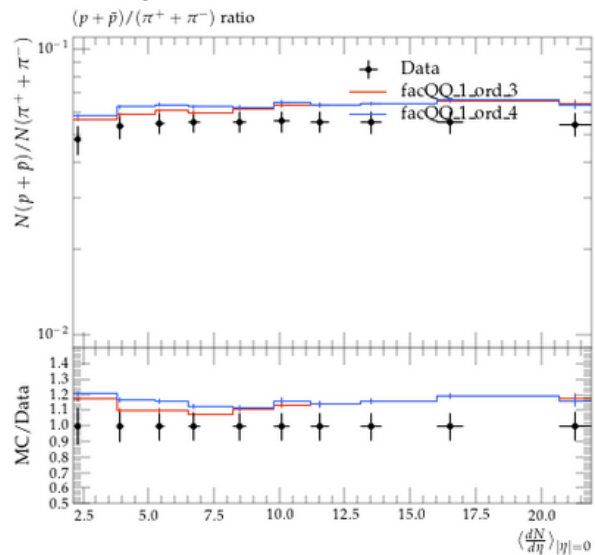


Introducing strangeness (2)

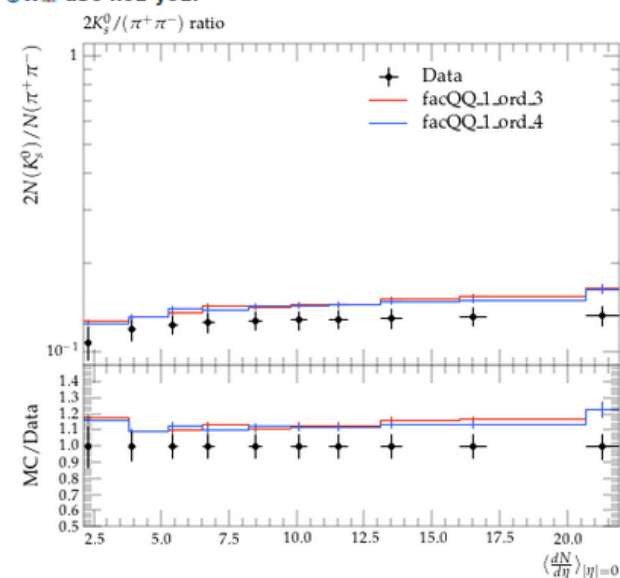
d46-x01-y01:



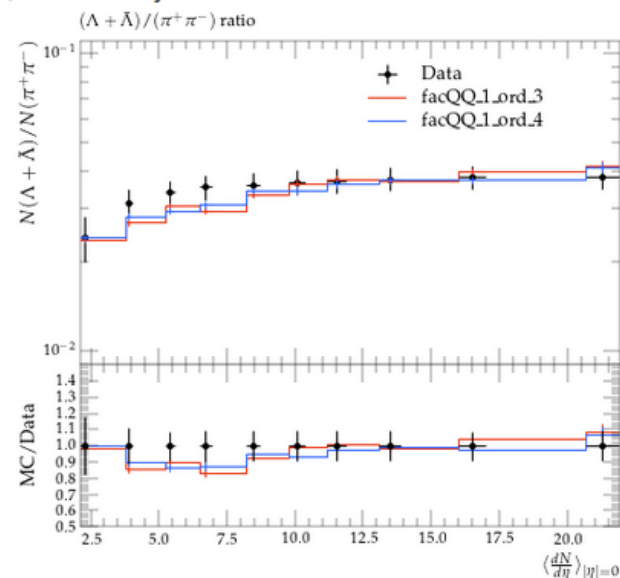
d47-x01-y01:



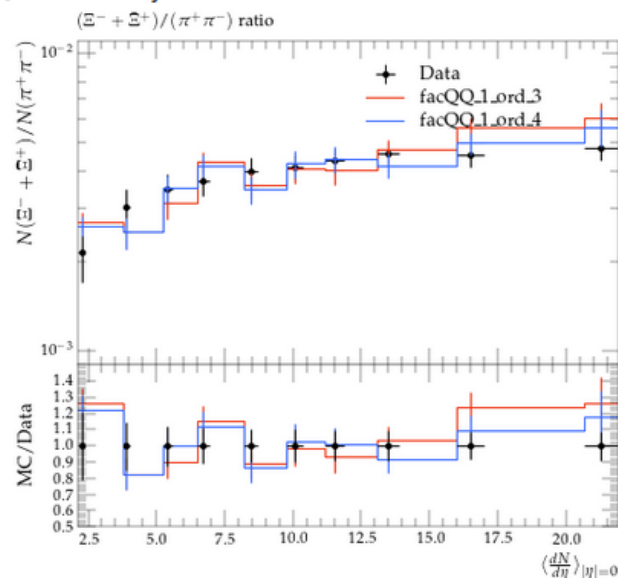
d36-x01-y01:



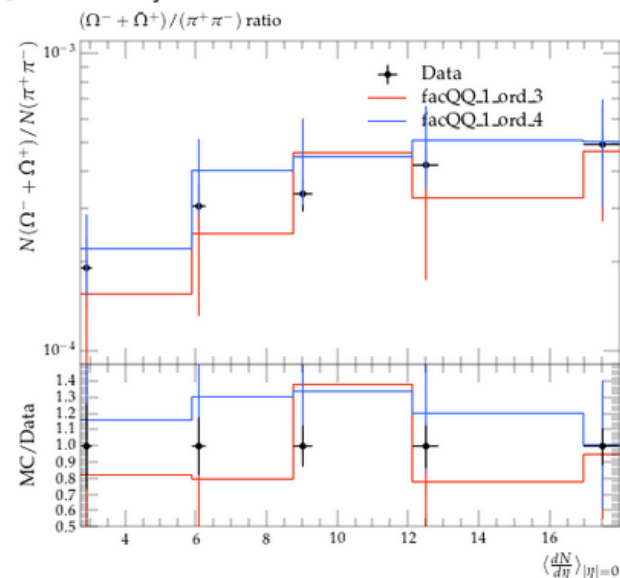
d37-x01-y01:



d38-x01-y01:



d39-x01-y01:



Rope hadronization

Rope hadronization

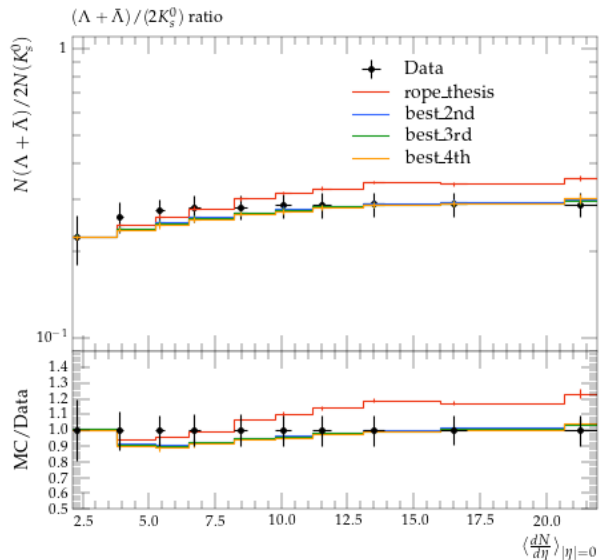
Parameters to tune	Default	Range	Rivet analyses
MultipartonInteractions:pT0Ref	2.28	[1.14, 3.42]	ALICE_2010_S8624100, ALICE_2010_S8706239, ATLAS_2010_S8894728
ColourReconnection:junctionCorrection	1.2	[0.6, 1.8]	ALICE_2020_I1797443 (with only p/π vs p_T)
Ropewalk:beta	0.2	[0.1, 0.3]	ALICE_2016_I1471838 (with only p/π vs $\langle dN/d\eta \rangle$)
Ropewalk:r0	0.5	[0.3, 0.8]	ALICE_2020_I1797443 (without p/π vs p_T)
PartonVertex:protonRadius	0.85	[0.68, 1.02]	ALICE_2016_I1471838 (without p/π vs $\langle dN/d\eta \rangle$)
PartonVertex:emissionWidth	0.1	[0.05, 0.15]	

Observables:

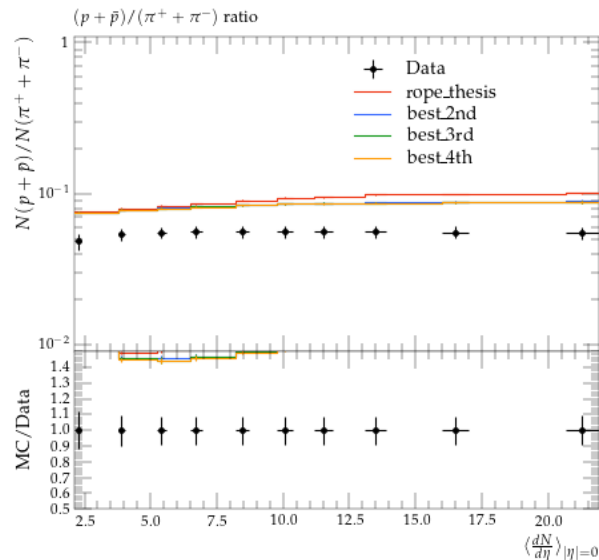
- p/π and Λ/K_S^0 vs multiplicity and p_T (ALICE_2016_I1471838 and ALICE_2020_I1797443)
- Ratios over π vs multiplicity and p_T (" ")
- UE measurements (ATLAS_2010_S8894728)
- Charged particle multiplicities (ALICE_2010_S8624100)
- p_T spectrum (ALICE_2010_S8706239)

Results for Rope hadronization

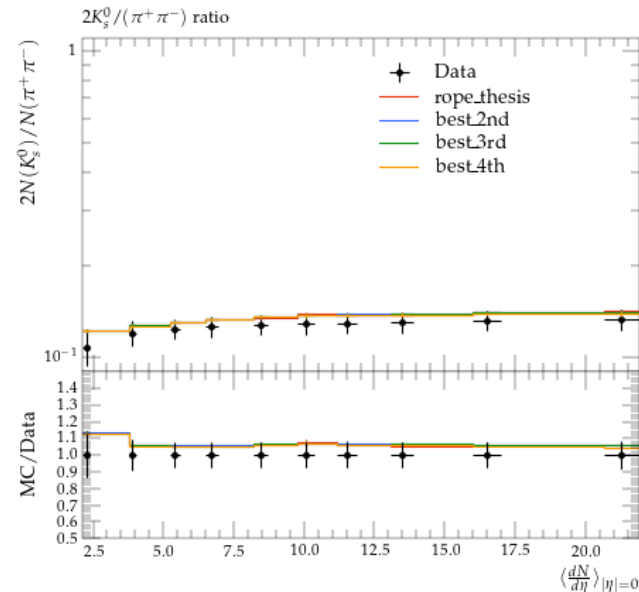
d46-x01-y01:



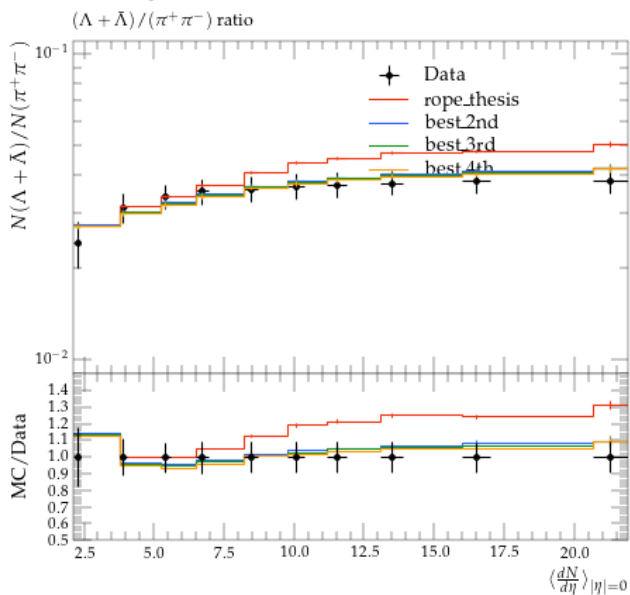
d47-x01-y01:



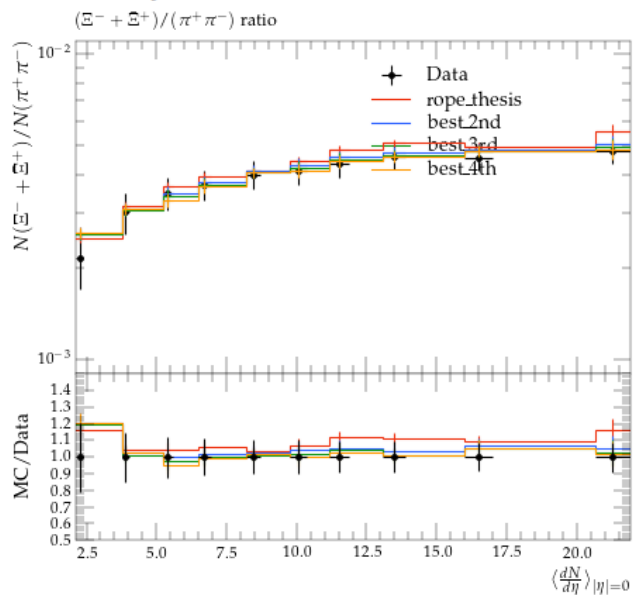
d36-x01-y01:



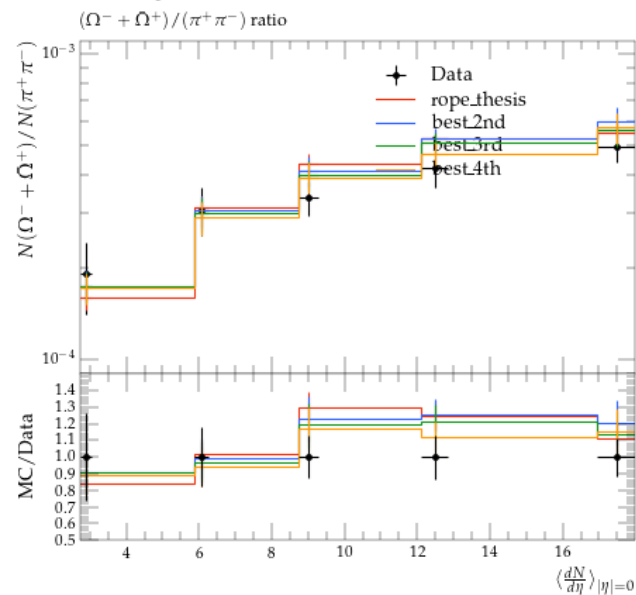
d37-x01-y01:



d38-x01-y01:



d39-x01-y01:



Thanks

Backup

Command card: Rope_thesis

```
MultiPartonInteractions:pT0Ref = 2.15  
BeamRemnants:remnantMode = 1  
BeamRemnants:saturation = 5
```

```
ColourReconnection:mode = 1  
ColourReconnection:allowDoubleJunRem = off  
ColourReconnection:m0 = 0.3  
ColourReconnection:allowJunctions = on  
ColourReconnection:junctionCorrection = 1.2  
ColourReconnection:timeDilationMode = 2  
ColourReconnection:timeDilationPar = 0.18
```

```
PartonVertex:setVertex = on  
PartonVertex:protonRadius = 0.7  
PartonVertex:emissionWidth = 0.1
```

```
Ropewalk:RopeHadronization = on  
Ropewalk:doShoving = on  
Ropewalk:tInit = 1.5  
Ropewalk:deltat = 0.05  
Ropewalk:tShove = 0.1  
Ropewalk:gAmplitude = 0.  
Ropewalk:doFlavour = on  
Ropewalk:r0 = 0.5  
Ropewalk:m0 = 0.2  
Ropewalk:beta = 0.1
```

Results Rope hadronization

First part

Interpolation with 4th order polynomial:

```
# GOF 1668.874302
# UNITGOF 1668.874302
# NDOF 737.000000
PT0REF      2.205855
JUNCTCORR   0.795469
BETA        0.201542
..
```

Second part

Interpolation with 3rd order polynomial:

```
# GOF 10703.714489
# UNITGOF 10703.714489
# NDOF 1144.000000
R0          0.620248
PRADIUS     0.846081
EMISSWIDTH  0.108825
```

Interpolation with 4th order polynomial:

```
# GOF 10749.684550
# UNITGOF 10749.684550
# NDOF 1144.000000
R0          0.570522
PRADIUS     0.795522
EMISSWIDTH  0.091099
```