# Run 17 FMS diffractive EM-jet $A_N$

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# Data set

- Data set: run 17 pp transverse $\sqrt{s} = 510$ GeV ,fms stream
  - (pp500_production_2017)
  - About 50% of the entire data sets are included in this slide. (88 / 185 fills)
  - QA plots only for this presentation.
- Production type: MuDst ; Production tag: P22ib
- Triggers for FMS : FMS small board sum, FMS large board sum and FMS-JP.
- Requirement: Event must contain Roman Pot (RP) information (pp2pp).

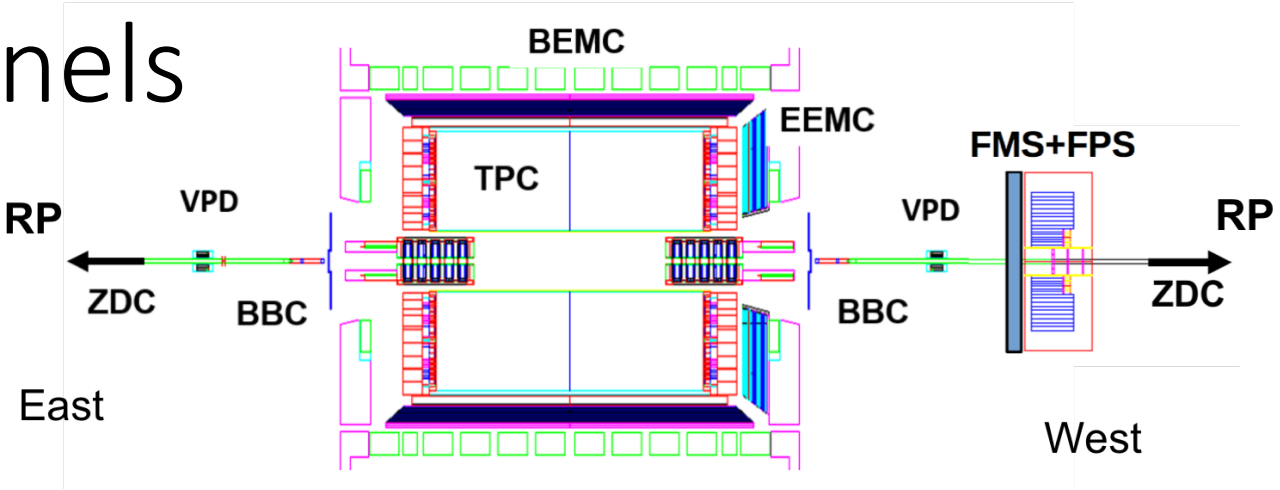
| **Total number of events from data set sample (with FMS and RP coincidence)** | **399 M** |
|---|---|
| Total number of events with FMS points | 393 M |
| Total number of events with FMS EM-jets | 386 M |

# FMS EM-jet reconstruction

- EM-jet reconstruction: Anti-$k_T$ algorithm with R=0.7 (Same as run 15 FMS analysis)
  - EM-jet: the jet reconstructed using only photons (FMS point).
  - Jet reconstruction: StJetMaker2015 , Anti-kT, R<0.7 , FMS point energy > 2 GeV, $p_T$ > 1 GeV/c, FMS point as input.
- Calibration: already applied the final run 17 FMS calibration during generating MuDst files. No additional calibration currently applied (additional hot channel masking)

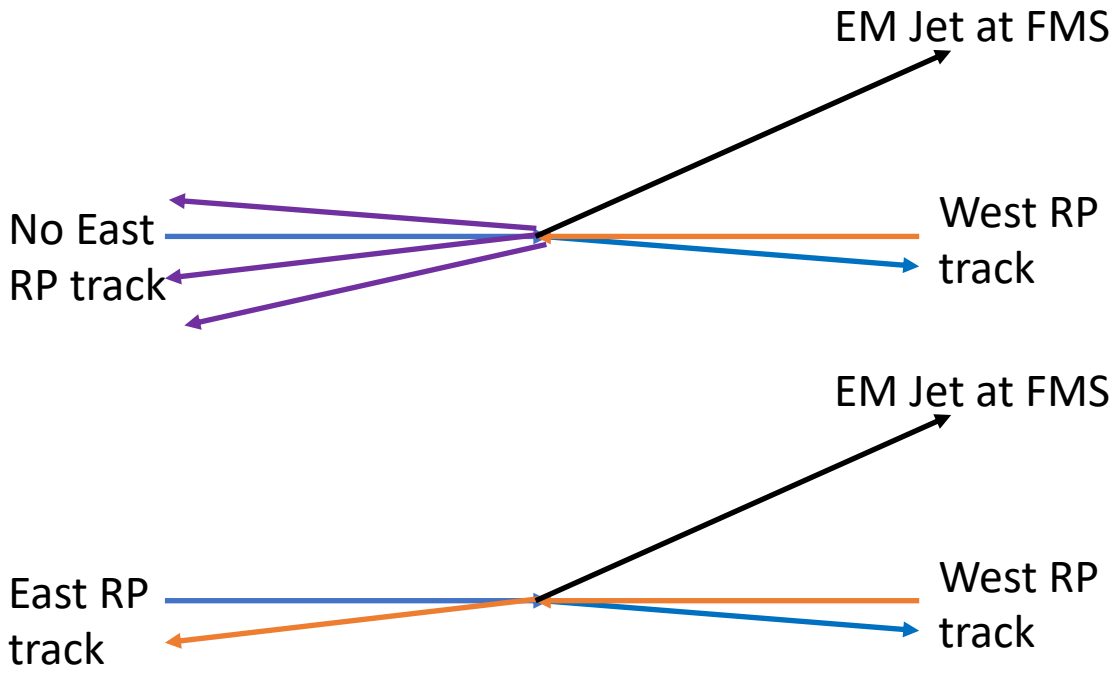
# Diffractive process channels

2 diffractive channels are considered.



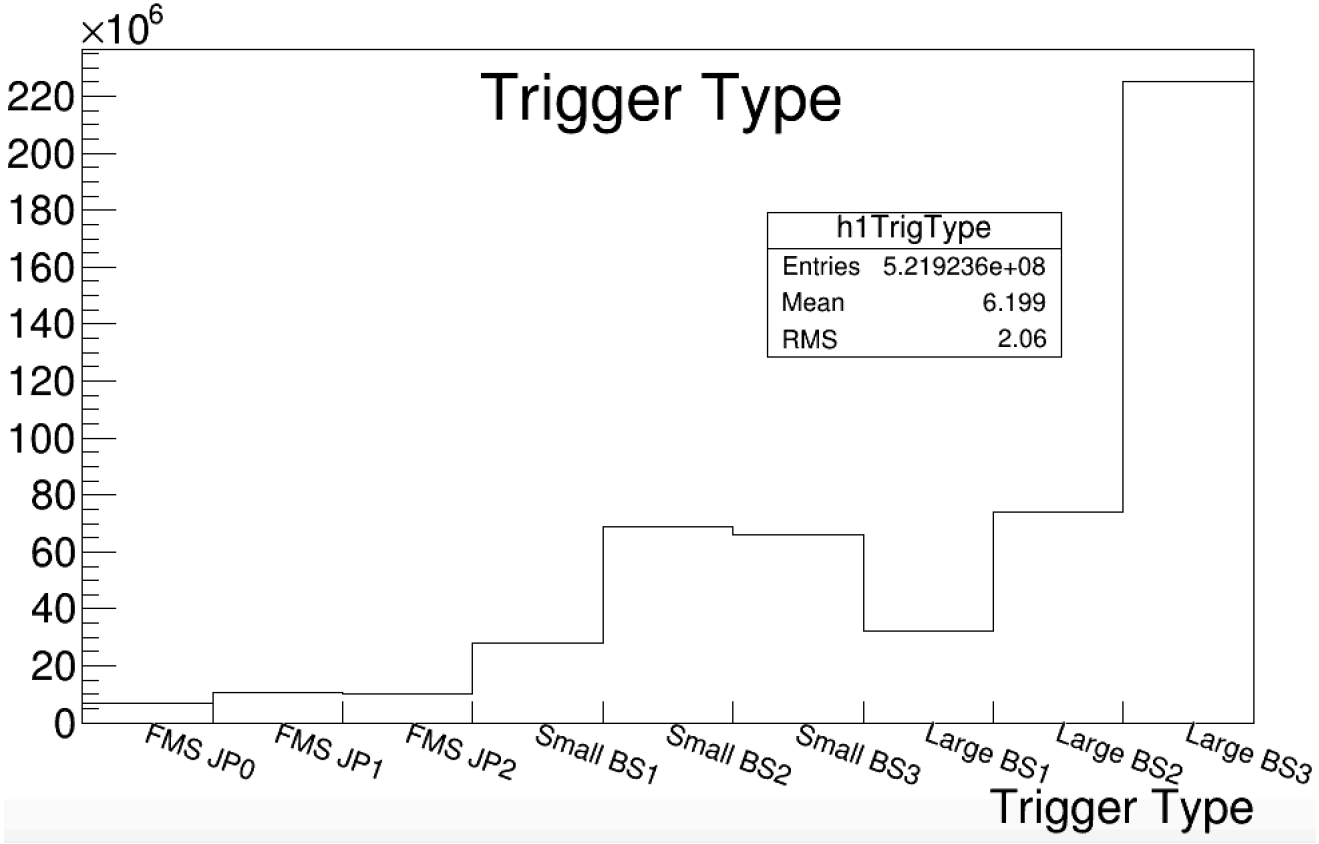

Require:

- Contain only 1 west RP track.
- Either no east side RP track or only 1 east side RP track.
- sum of west side tracks energy (west side proton + EM Jet) less than beam energy



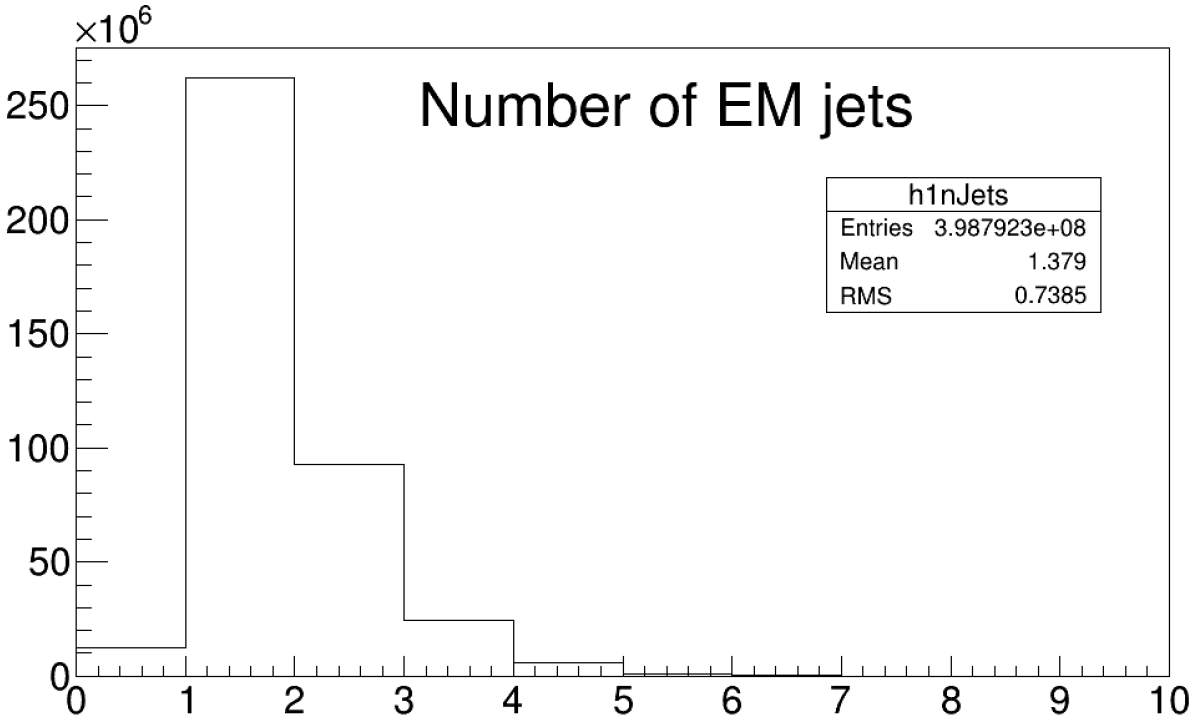
# FMS trigger distribution

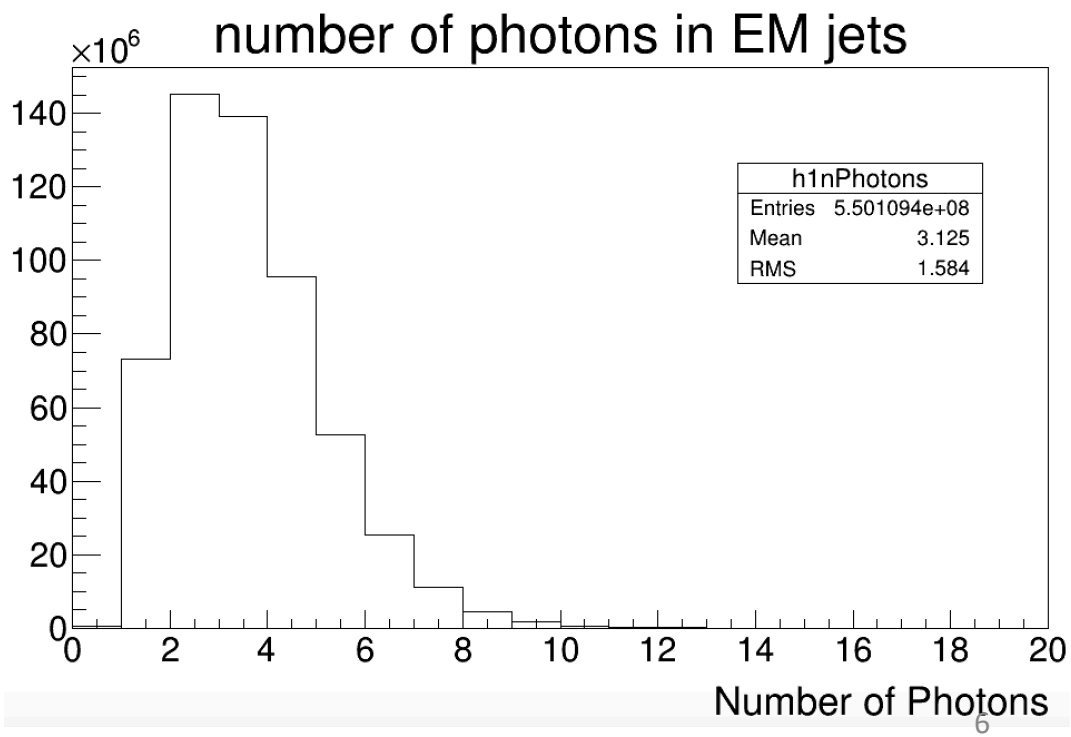
- 9 triggers are considered.
- Already filter out events without passing any FMS trigger.



# EM-jet QA

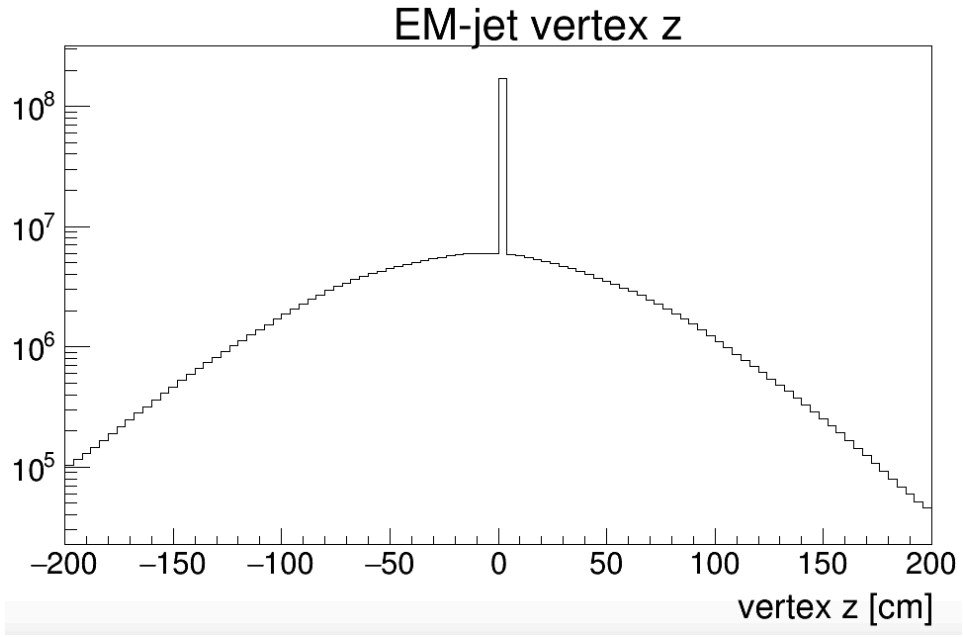
- Most of events contain 1 or 2 EM-jets.

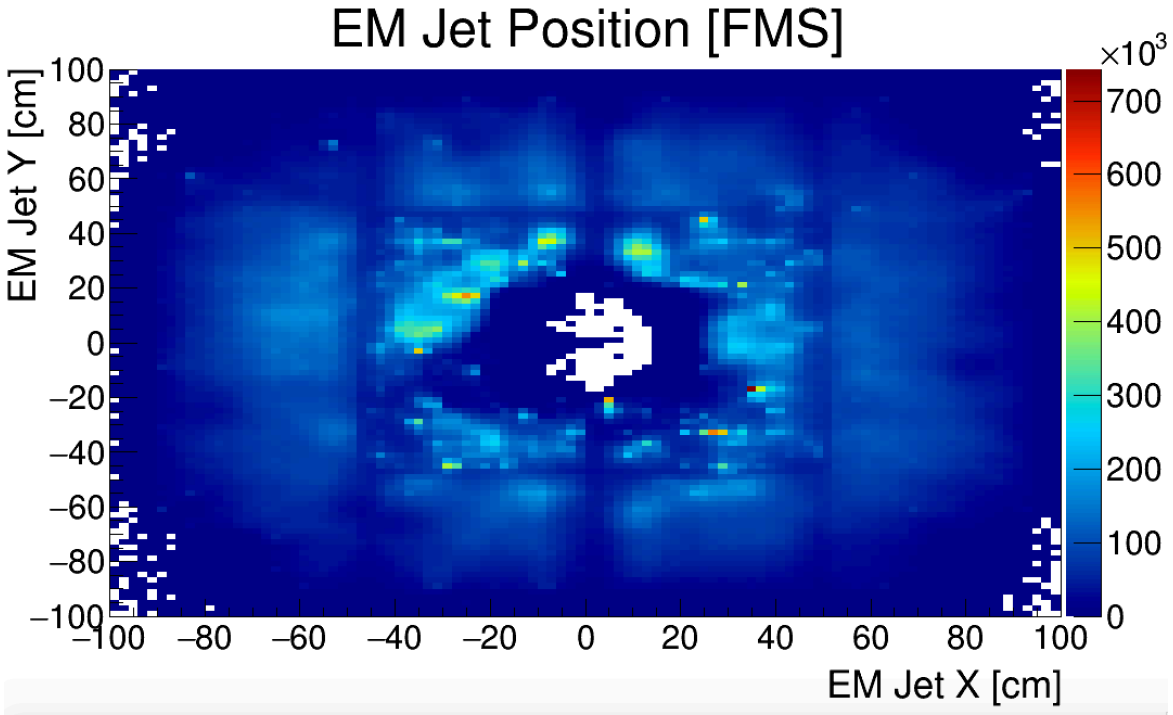


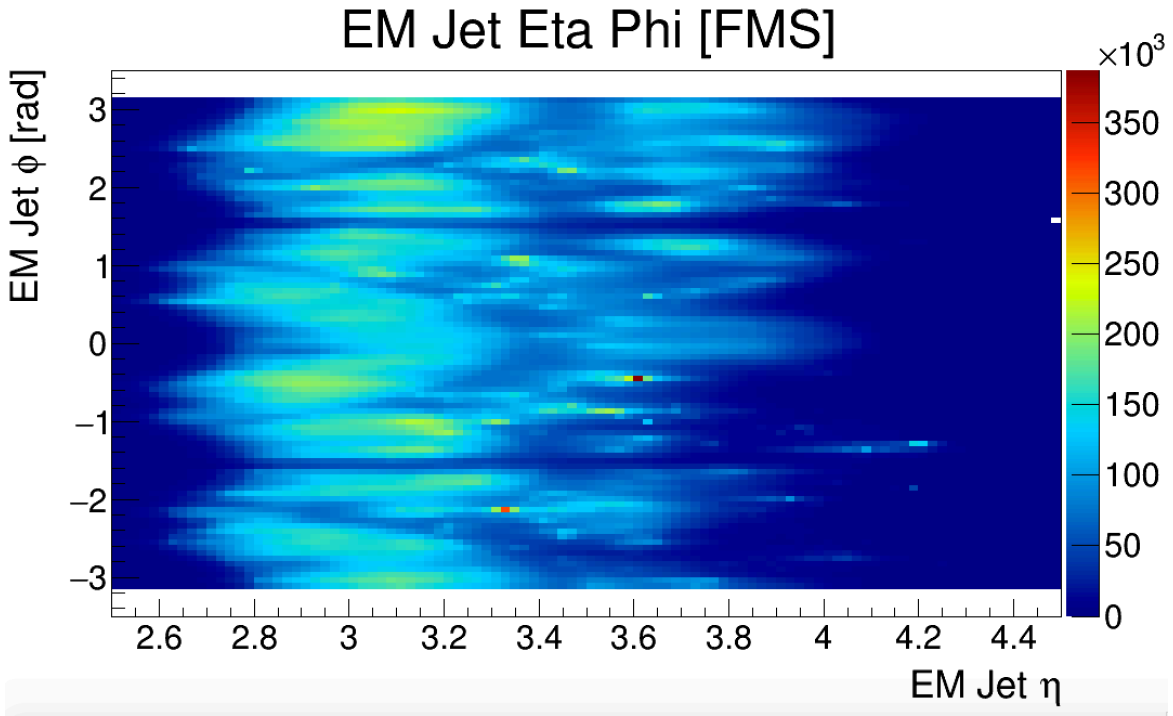



# EM-jet position QA

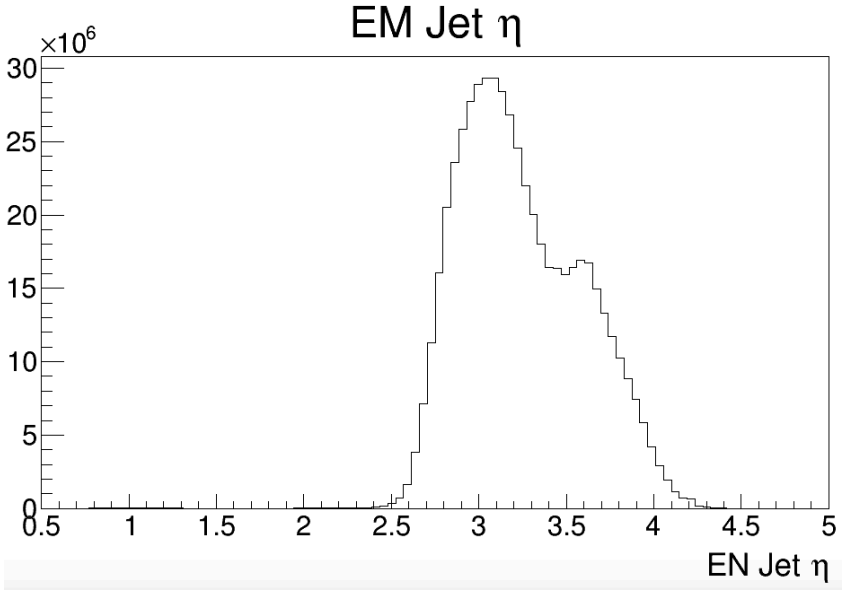
- EM-jet position for all the data.
- Determine vertex z priority according to TPC , BBC, VPD. If vertex z is still not determined by these detector, set to 0.

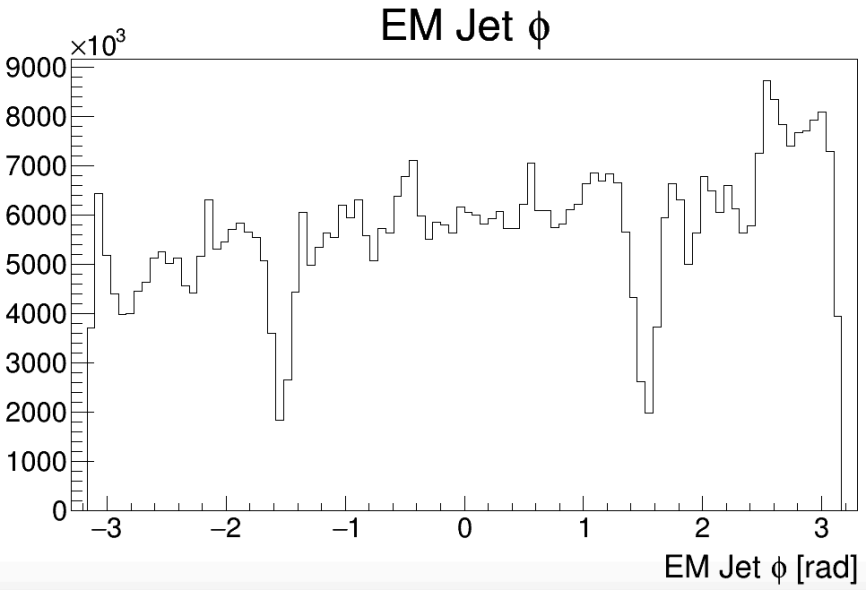


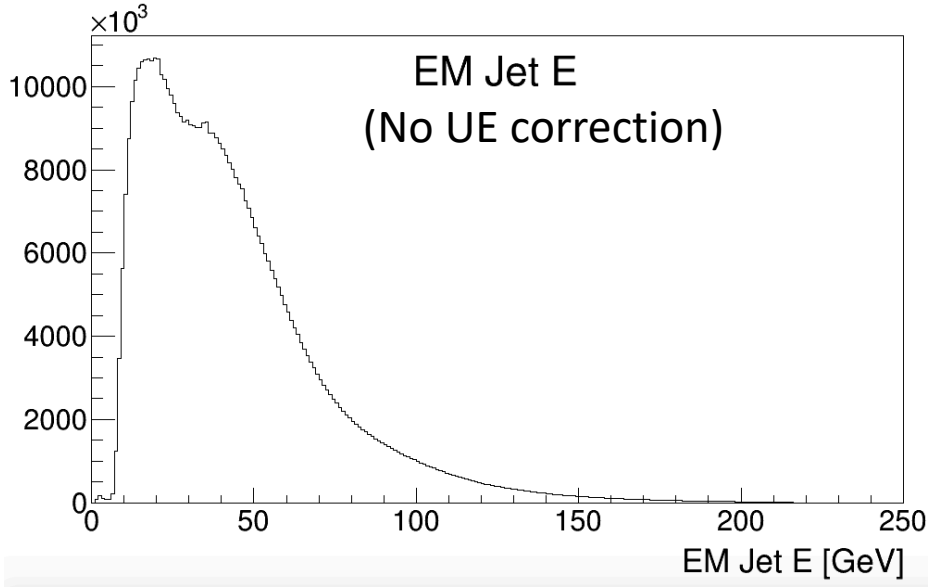



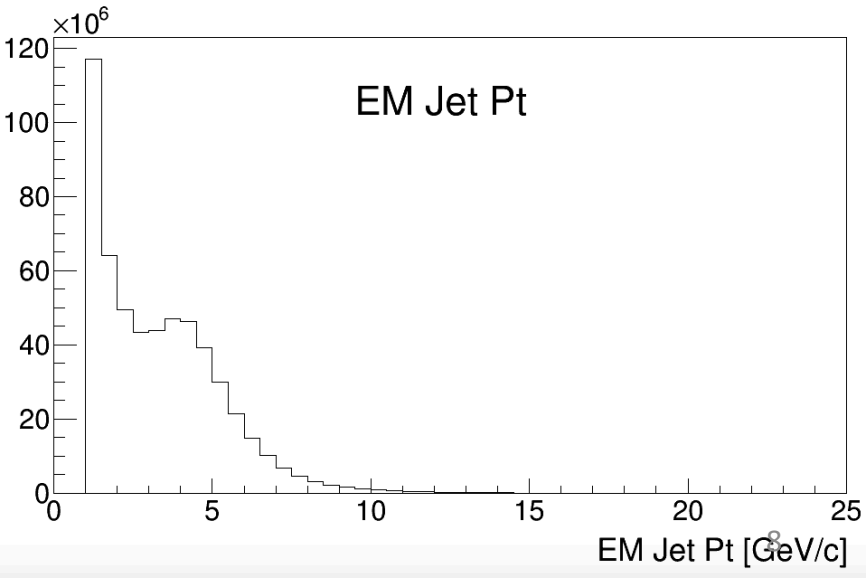



# EM-jet QA


EM Jet η
×10^6
30
25
20
15
10
5
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
EN Jet η

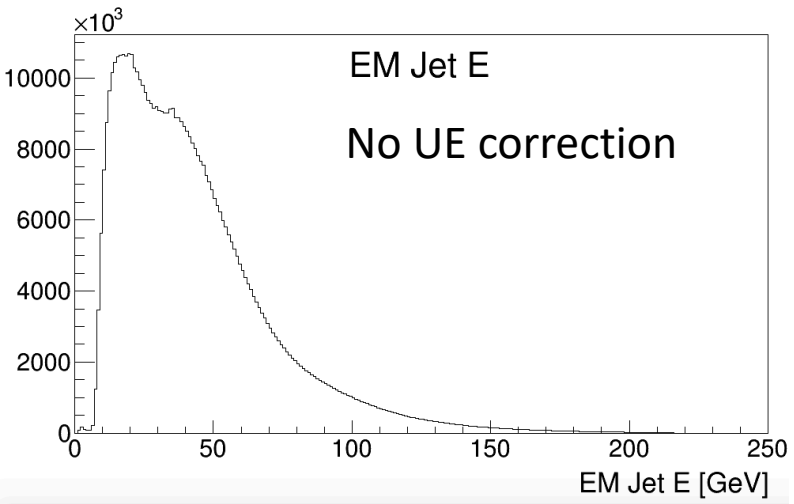

EM Jet ϕ
×10^3
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
−3
−2
−1
0
1
2
3
EM Jet ϕ [rad]

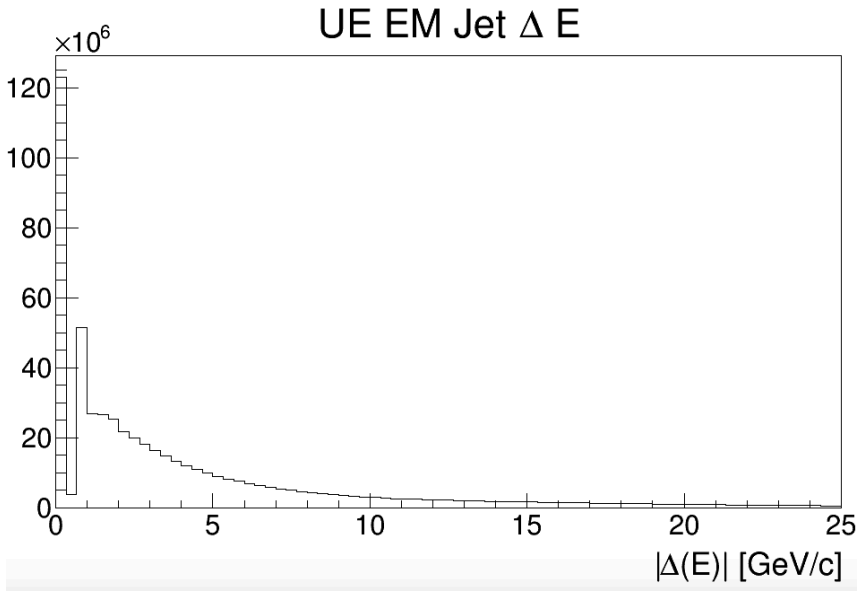

×10^3
EM Jet E
(No UE correction)
10000
8000
6000
4000
2000
0
0
50
100
150
200
250
EM Jet E [GeV]

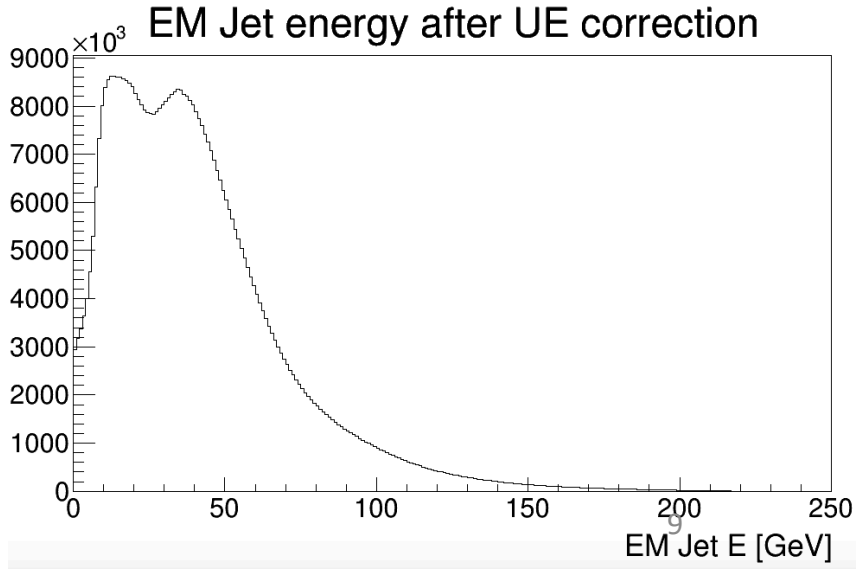

×10^6
EM Jet Pt
120
100
80
60
40
20
0
0
5
10
15
20
25
EM Jet Pt [GeV/c]

# Underlying Event correction

- The set up for UE correction is same as EM-jet for run 15.
  - UE ghost area: 0.04
  - Apply UE correction only for EM-jet energy

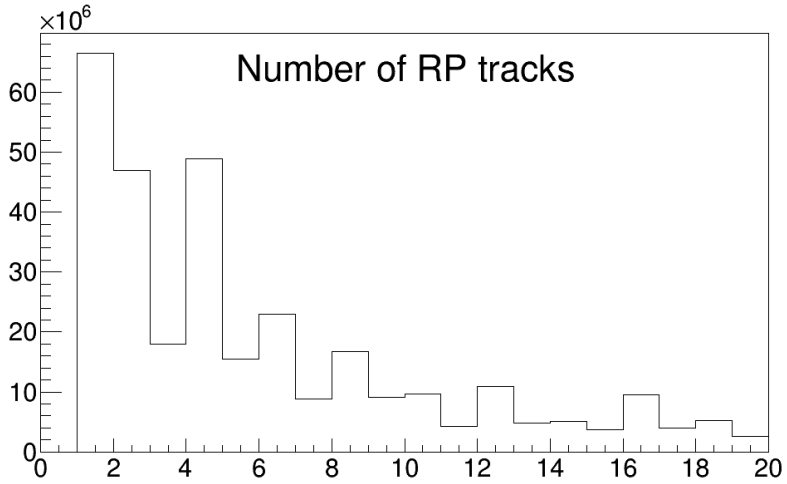


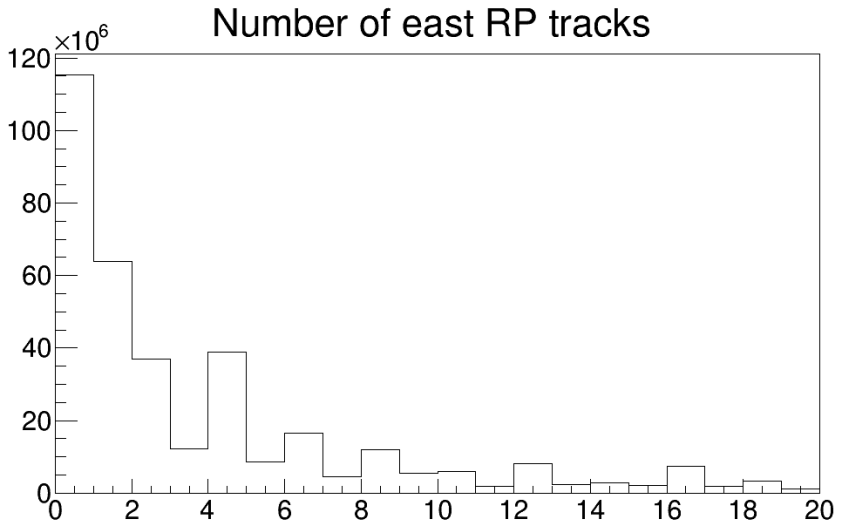



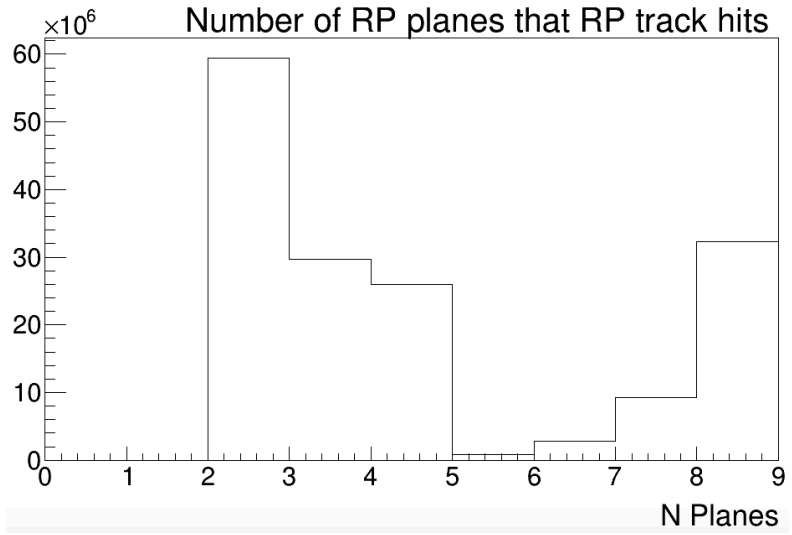



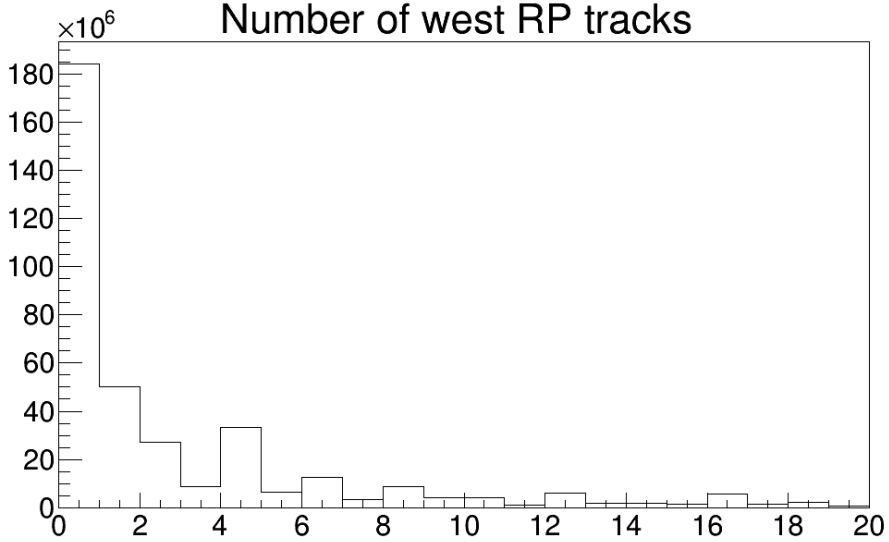
# Roman Pot track QA

- We can get Roman Pot track information in MuDst!



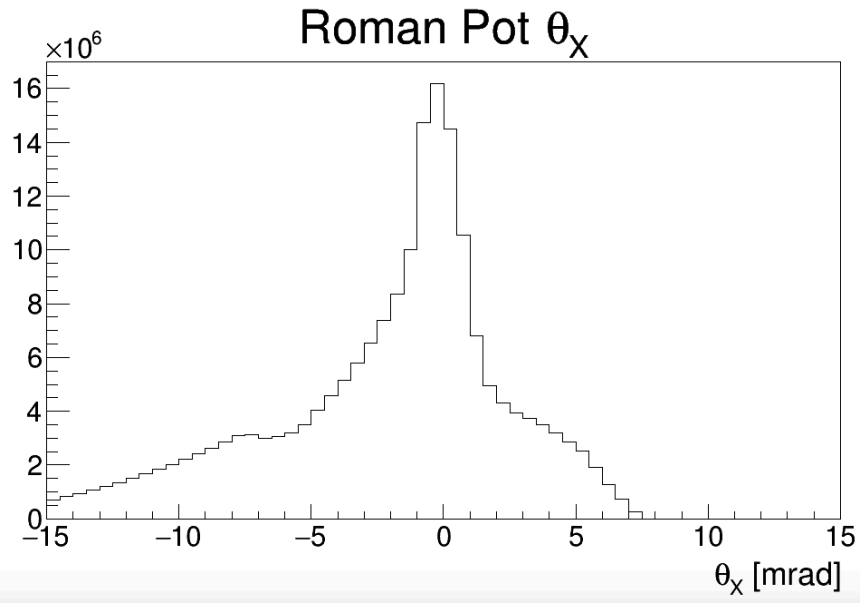



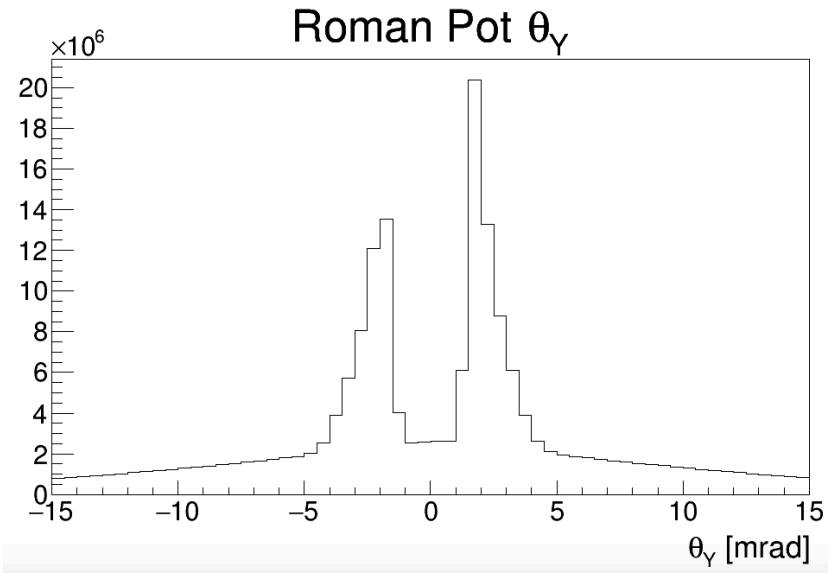



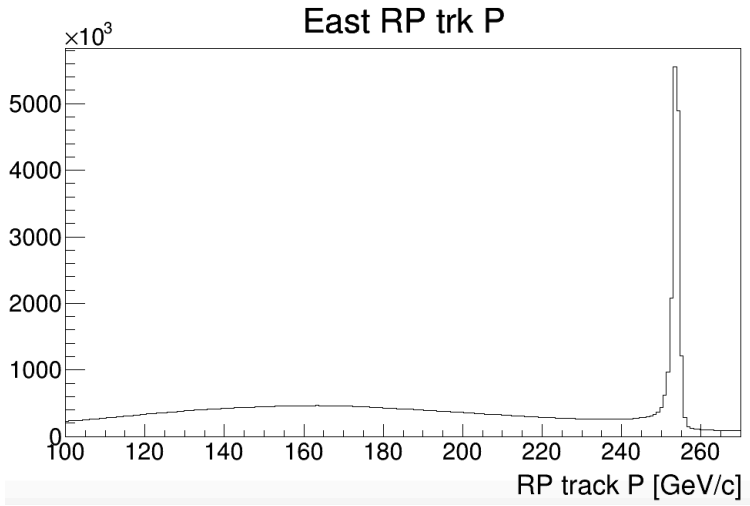



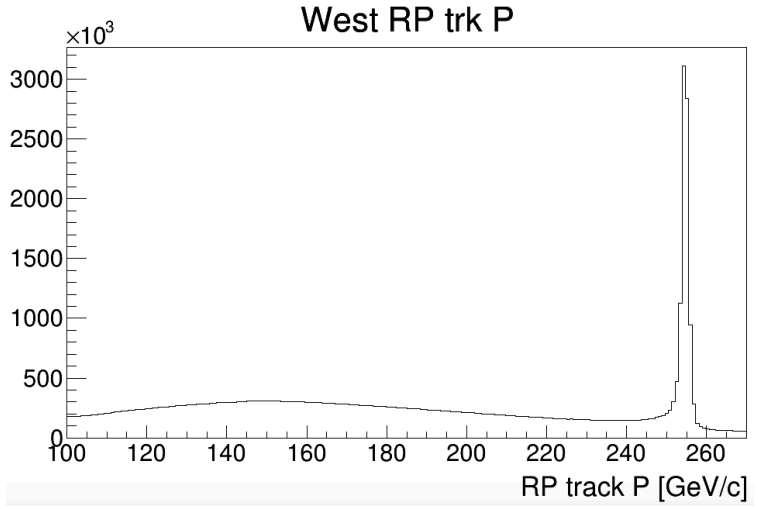
# Roman Pot track QA

- For this QA plots, we apply the basic cut on number of RP planes that the RP track hits to be >= 7 ($N_{planes} \geq 7$) to check for reasonable RP tracks.



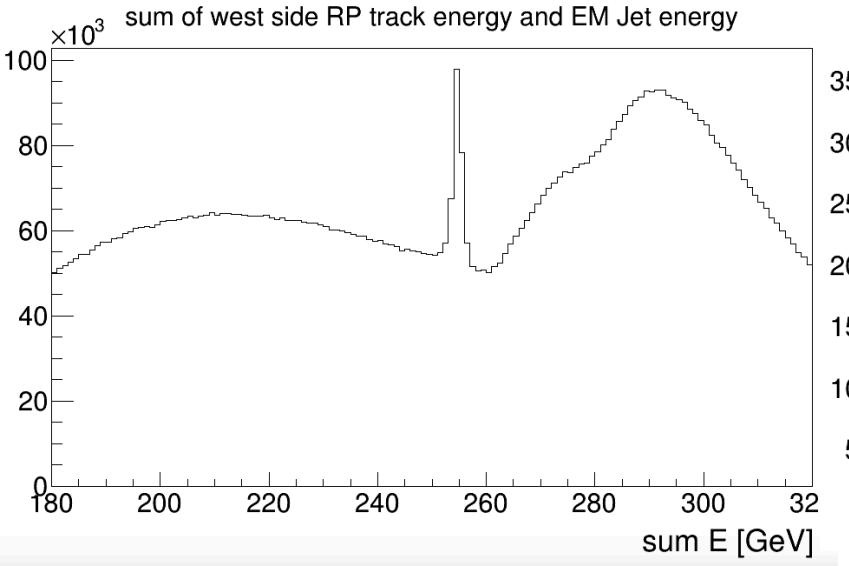



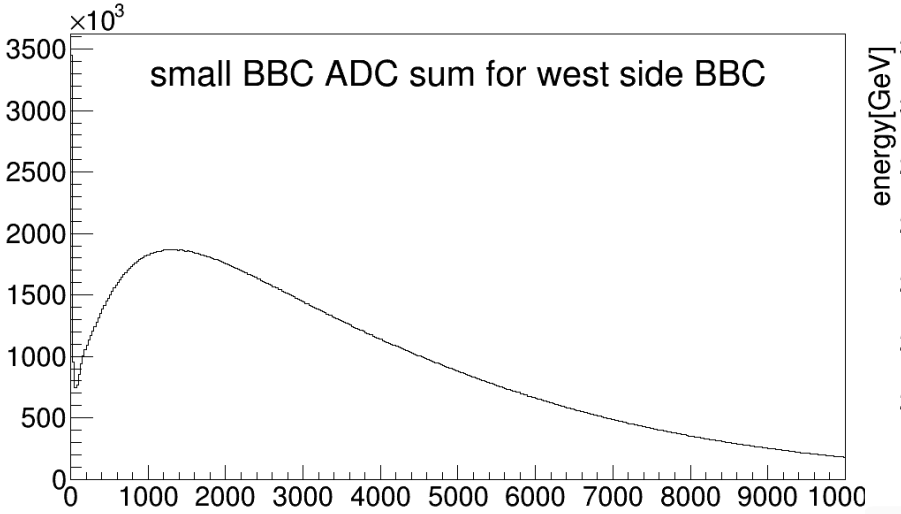



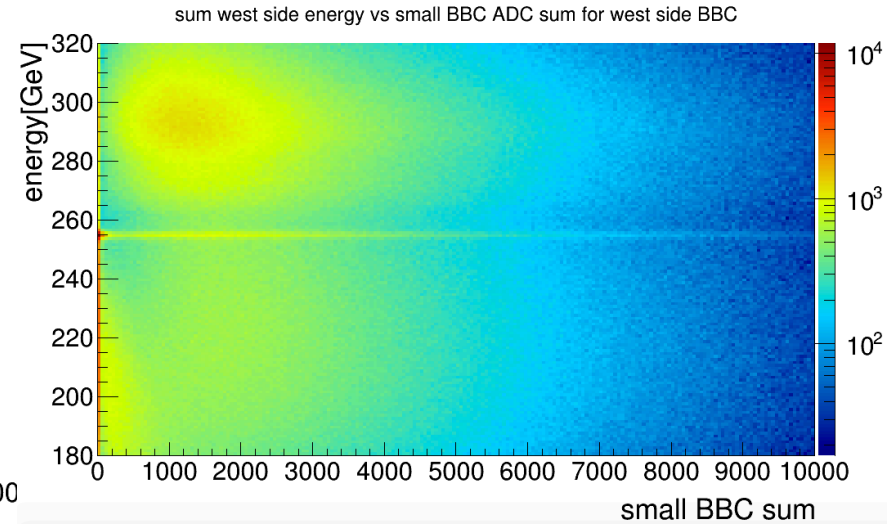



# Sum energy and west BBC distribution

- Sum energy: sum of west side RP track energy and all FMS EM-jet energy.
  - Note: only consider the 2 accepted channels.
- Only small BBC ADC sum collected in the data sets.



# Conclusion and outlook

- First look at run 17 FMS data sets. They are well generated and good enough for the diffractive EM-jet $A_N$ analysis.
- About 50% of the small size DST (NanoDst) files are already generated from MuDst files for this analysis. Hopefully can get all the files completed by the end of this year.
- Start following the similar analysis procedures for run 15 diffractive EM-jet $A_N$ analysis for run 17 diffractive EM-jet $A_N$.
  - Plan to get preliminary by March, 2023 and present in DIS 2023.