

Offline QA for run 13 W  
stream production [p14ia]  
( day 76- day 126)

Run 13 W Analysis group

# Introduction

- **1011 runs** which have produced between day 76 and day 126, **1010 (one with sanity =0, exclude)** used in the analysis.
  - Luminosity:  $126.6 \text{ pb}^{-1}$ .
  - $\text{st\_WB} = 12203$
  - $\text{st\_WE} = 7176$
- Histograms:
  - Plot average values of variable of interest as a function of run index.
  - Plot separately for L2BW triggered events & L2EW triggered events.

# W BTOW/ETOW Trigger

L2BW : Level 0

BHT3 threshold  $E_t > 7.3$  GeV

Level 2

seed tower  $E_t > 5$  GeV

2x2 cluster which include the seed tower  $E_t > 12$  GeV

L2EW : Level 0

EHT1 threshold  $E_t > 7.3$  GeV

Level 2

single tower  $E_t > 10$  GeV

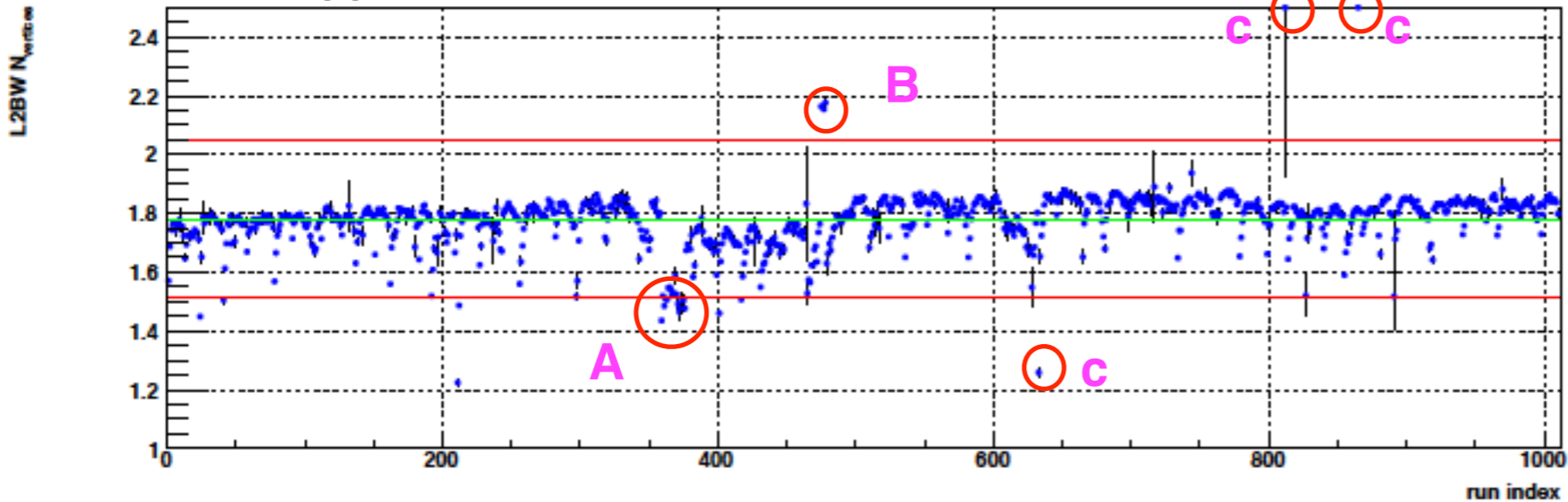
# TPC Plots

**Red Lines:**  $\pm 3$  sigma, **Green line** : Mean

# TPC Vertex - Nvertices

Parameter	Selection	Cuts
<Nvertices>	Avg. of all the primary vertices per triggered event	<ul style="list-style-type: none"> <li>• vertex ranking &gt; 0</li> <li>•  z  &lt; 100 cm</li> </ul>

## L2BW triggered



Outlier A : -> OK

- runs from Fill 17329
- low ZDC rate compare to other fills (2 order of magnitude less)

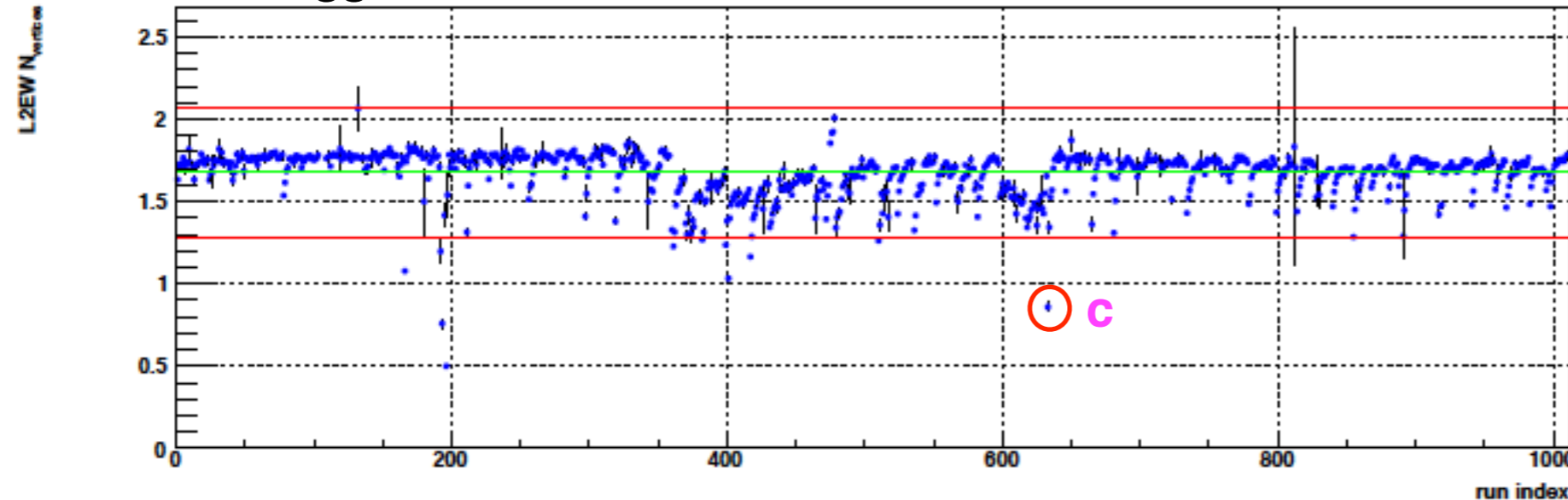
Outlier B : -> OK

- 4 runs from Fill 17352
- TPC channel (15-1) tripped frequently during this fill, TPC gas issue

Outliers C : -> exclude!

- 2 runs , negligible lumi. one - bad daq rates

## L2EW triggered

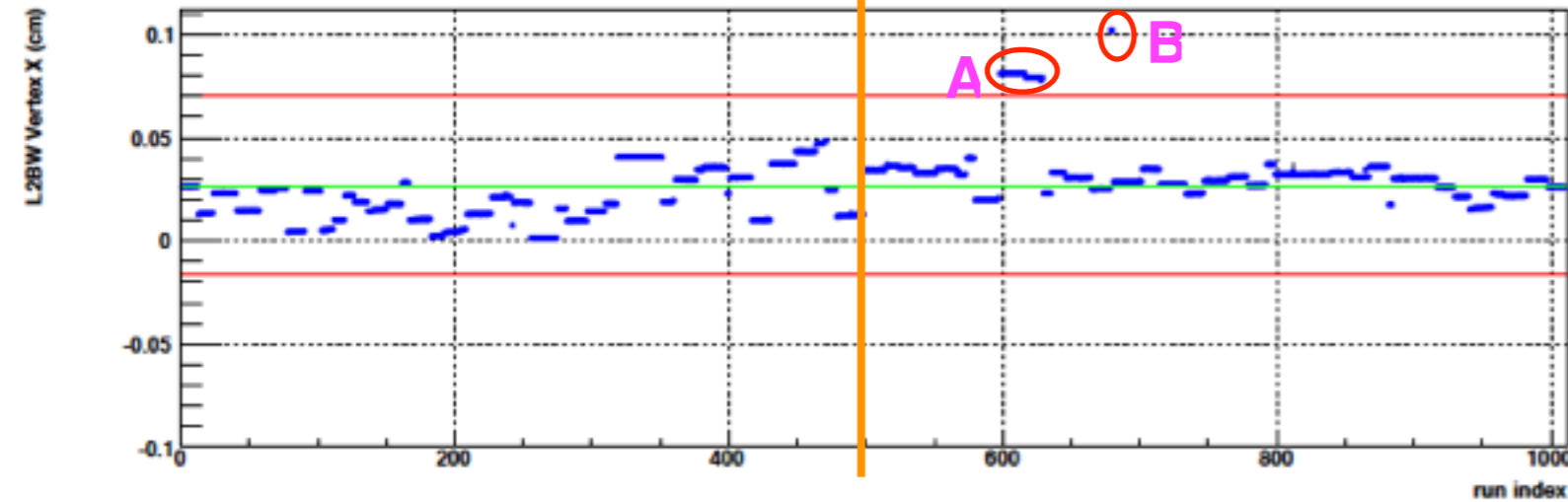


3 runs -> exclude !!

# TPC Vertex - VerX

Parameter	Selection	Cuts
<VerX>	Avg. of X vertex position of all the primary vertices per triggered event	<ul style="list-style-type: none"> <li>vertex ranking &gt; 0</li> <li> z  &lt; 100 cm</li> </ul>

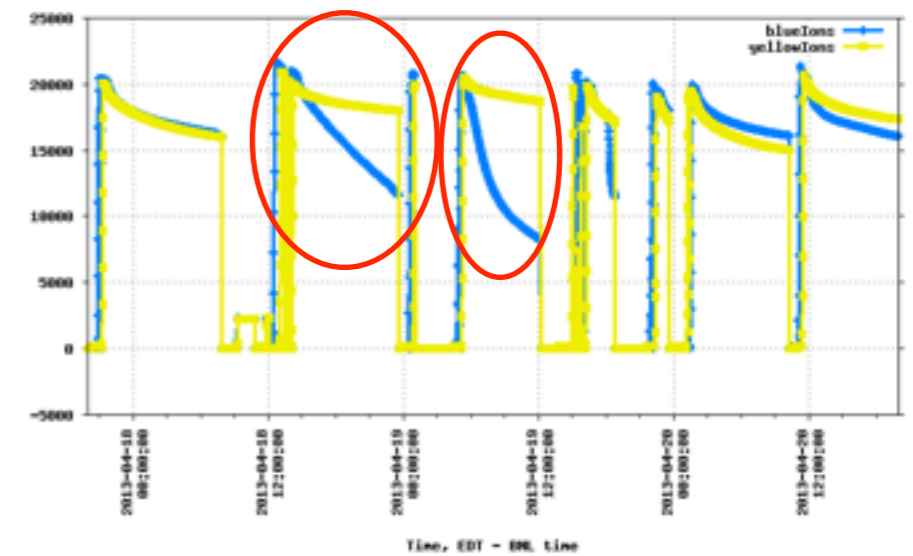
L2BW triggered



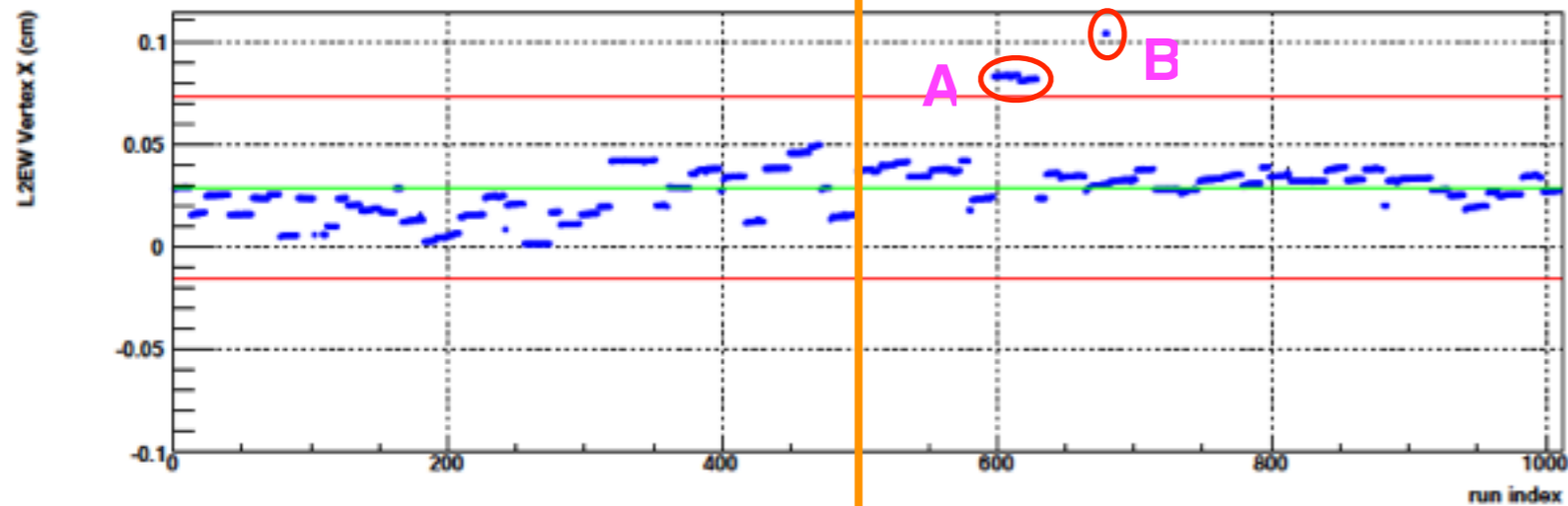
Outlier A : -> OK ??

- All runs from Fill 17399 (18) and Fill 17402 (13)

collider shift the beams (vertical position by 5 mm) !!!

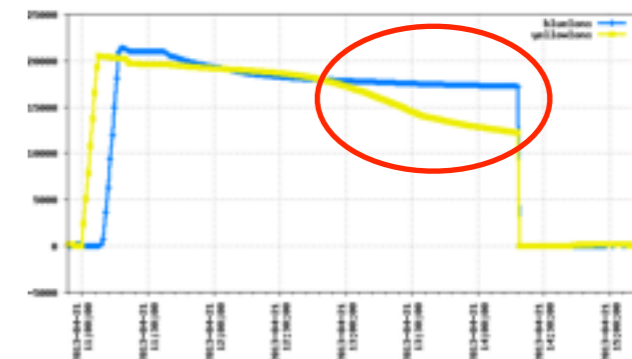


L2EW triggered



Outlier B: -> OK

- All runs (2) from Fill 17409.

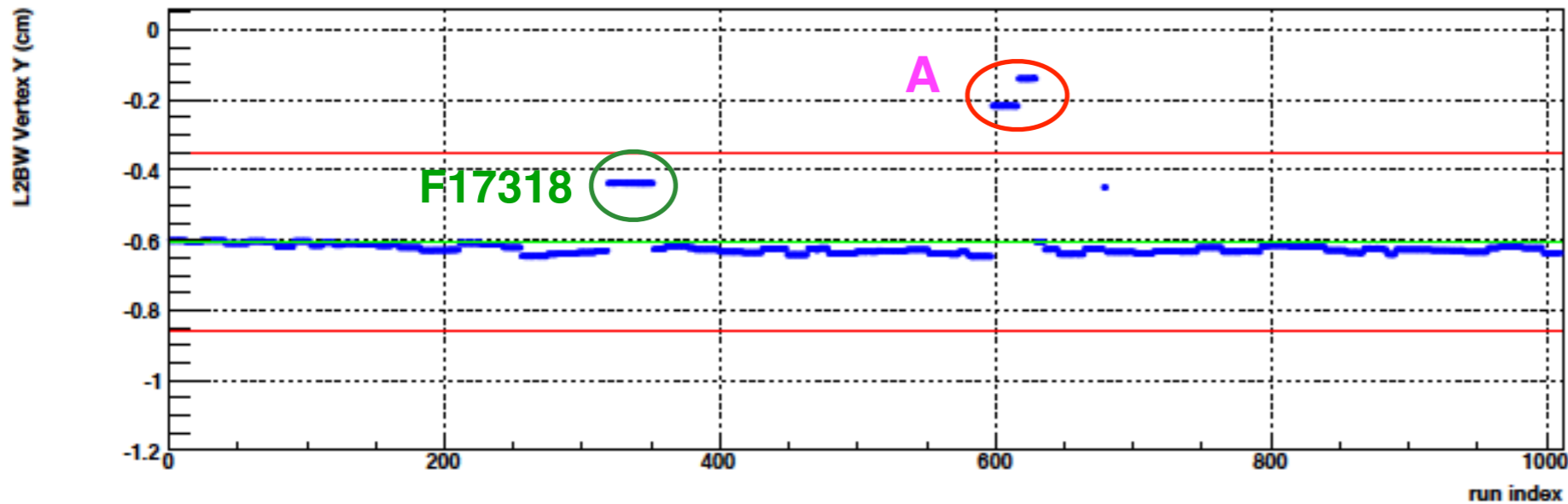


No runs exclude!!!

# TPC Vertex - VerY

Parameter	Selection	Cuts
<VerY>	Avg. of Y vertex position of all the primary vertices per triggered event	<ul style="list-style-type: none"> <li>vertex ranking &gt; 0</li> <li> z  &lt; 100 cm</li> </ul>

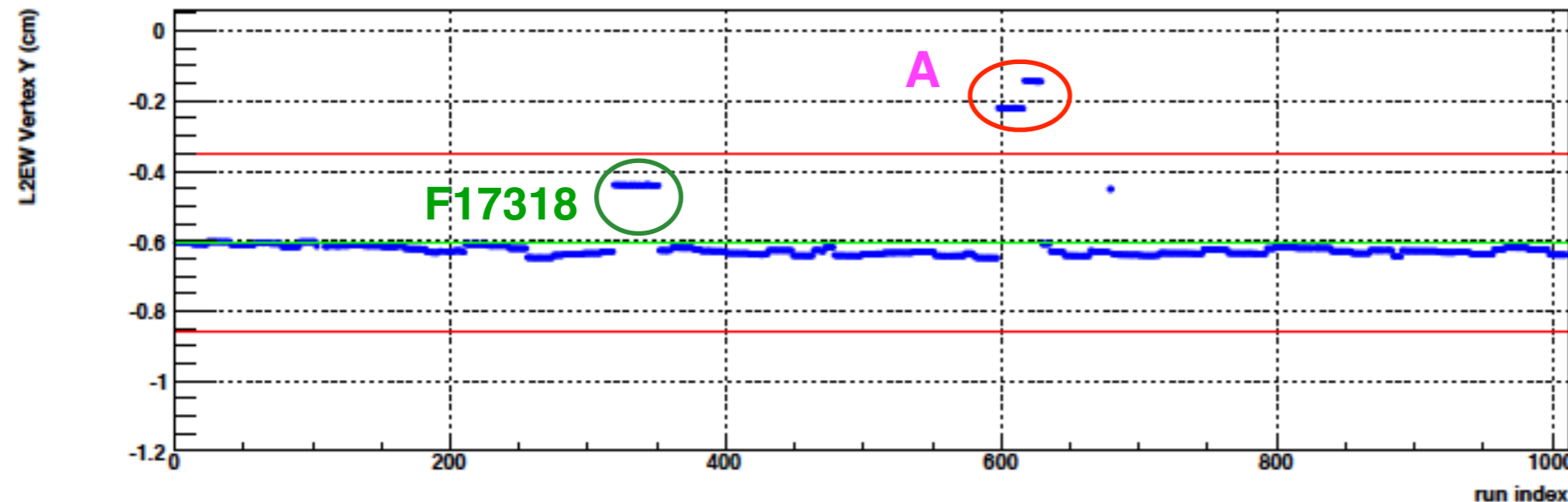
## L2BW triggered



## Outlier A :

- All runs from F17399 (18) and F17402 (13)

## L2EW triggered

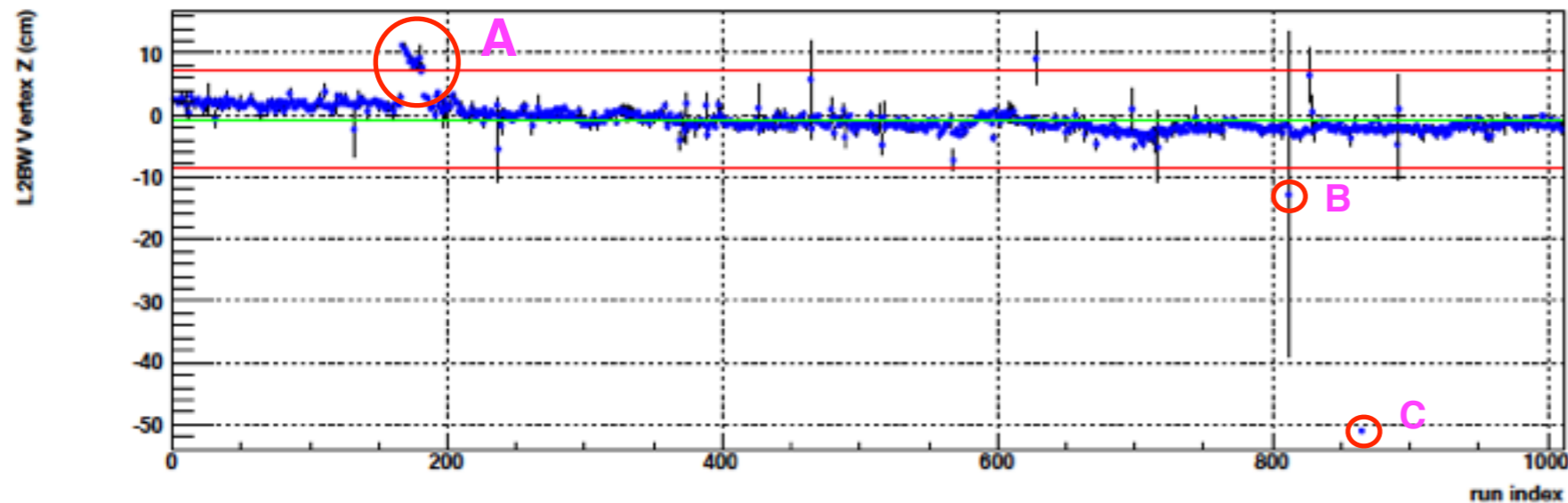


**No runs exclude!!!**

# TPC Vertex - VerZ

Parameter	Selection	Cuts
<VerZ>	Avg. of Z vertex position of all the primary vertices per triggered event	<ul style="list-style-type: none"> <li>• <b>vertex ranking &gt; 0</b></li> <li>• <b> z  &lt; 100 cm</b></li> </ul>

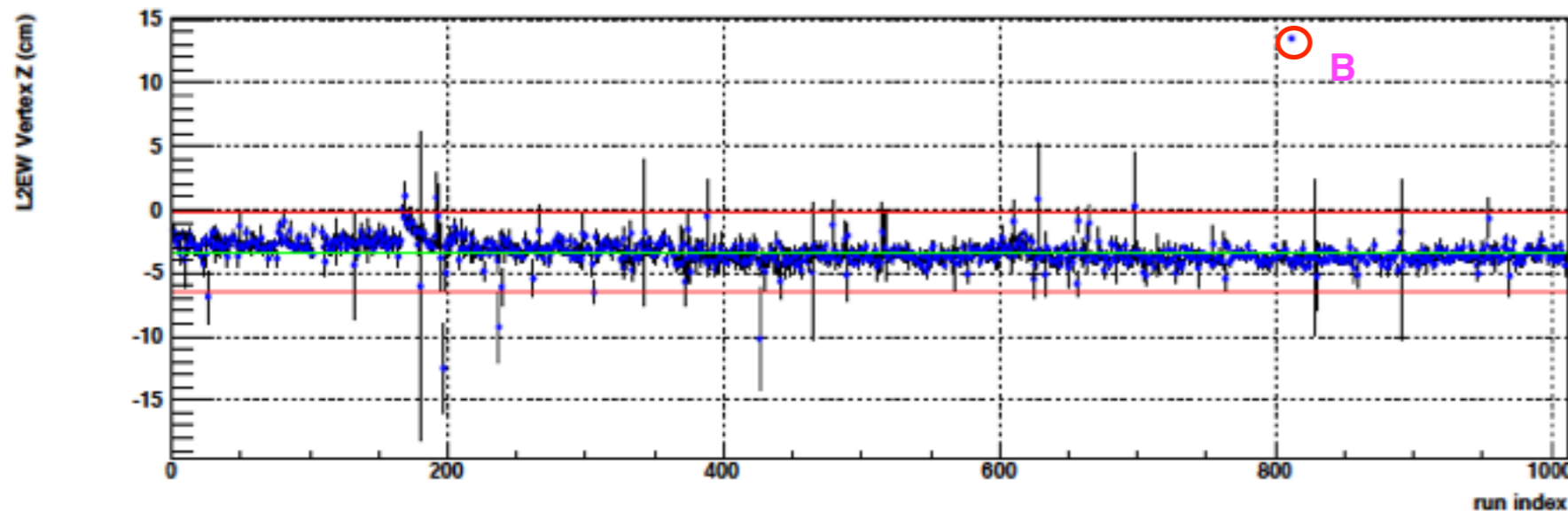
L2BW triggered



Outlier A :-> **OK**

- All runs from **F17281** (15)
- Higher Z vertex distribution (could be beam shifting issue)
- most runs have stopped due to various trigger issues.

L2EW triggered

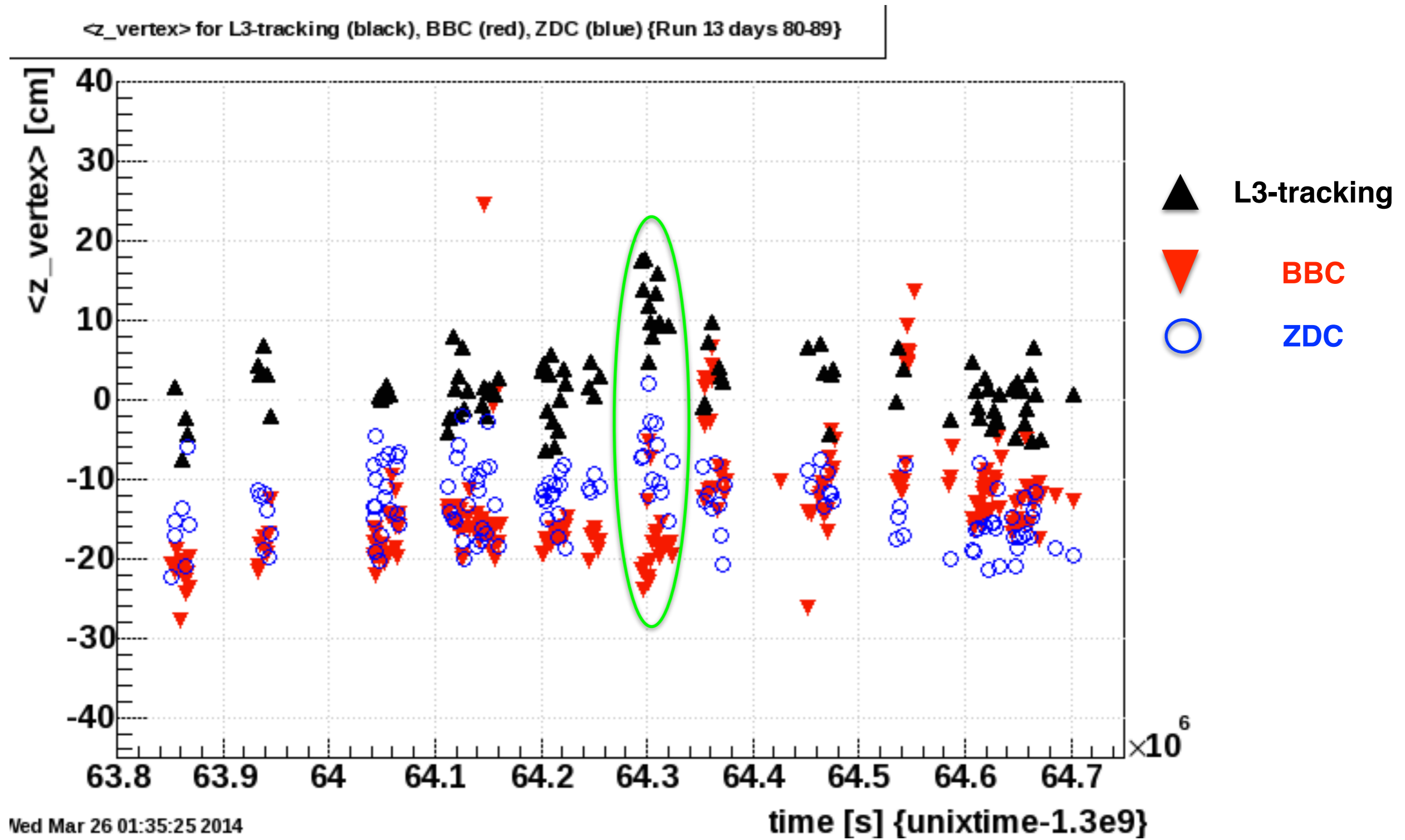


Outlier B,C :-> **Exclude**

- seen in Nvertices profiles



# $\langle \text{Ver } Z \rangle$ from BBC/ZDC/online tracking

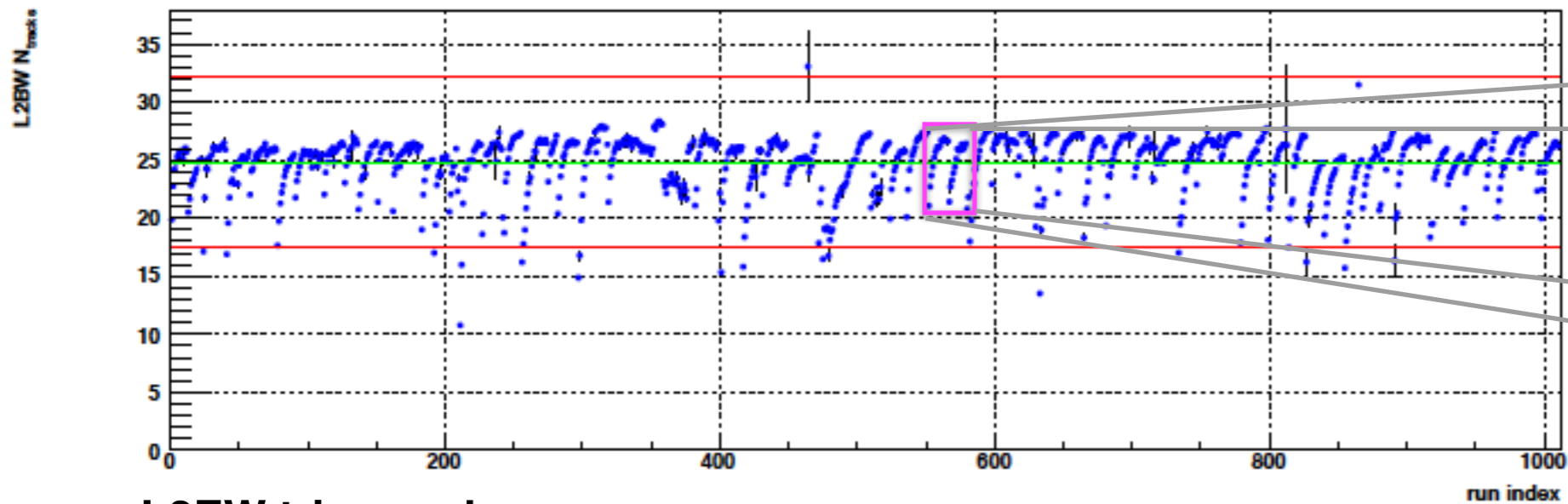


Wed Mar 26 01:35:25 2014

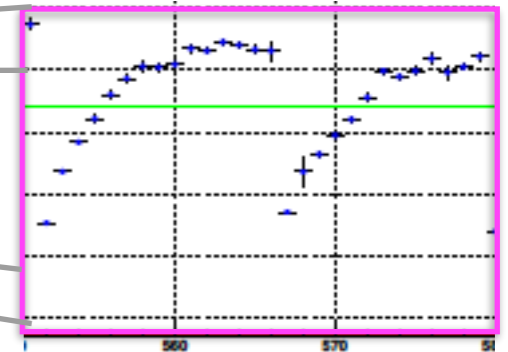
# TPC Tracks - Ntracks

Parameter	Selection	Cuts
<Ntracks>	Avg. of # of primary tracks from all the primary vertices per triggered event	<ul style="list-style-type: none"> <li>Track flag 301 or 311</li> <li>Track Pt <math>\geq 0.15</math> GeV</li> <li>nHitsFits <math>&gt; 15</math></li> <li>nHitsFits/ nHitsP <math>&gt; 0.51</math></li> </ul>

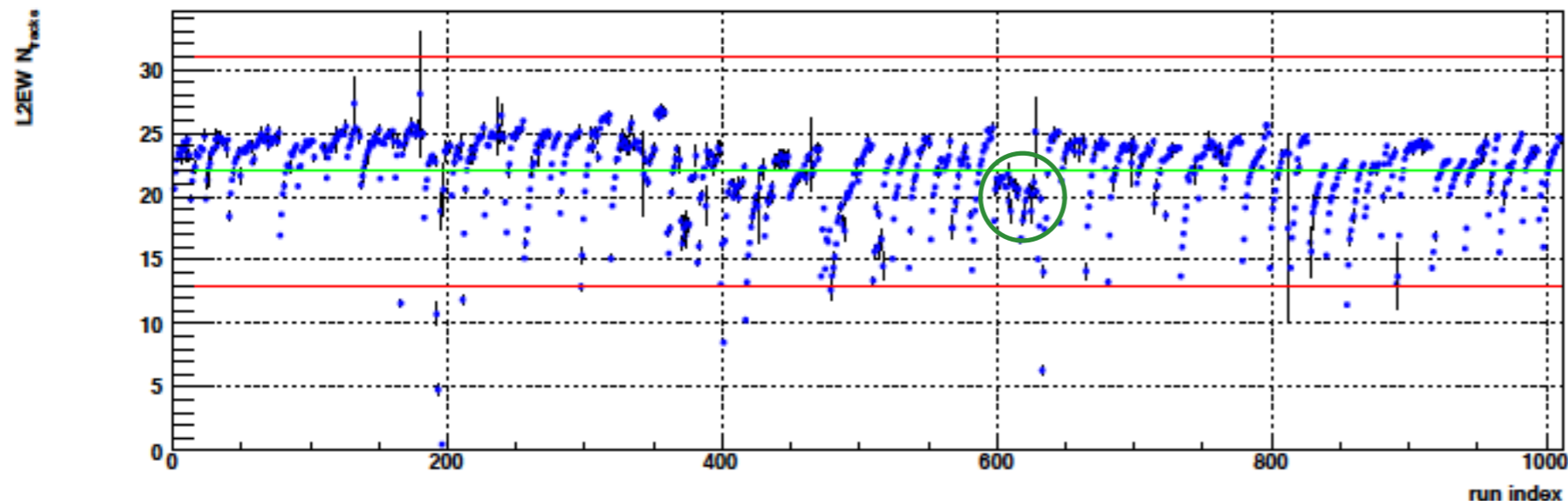
## L2BW triggered



- Clear Luminosity dependence



## L2EW triggered



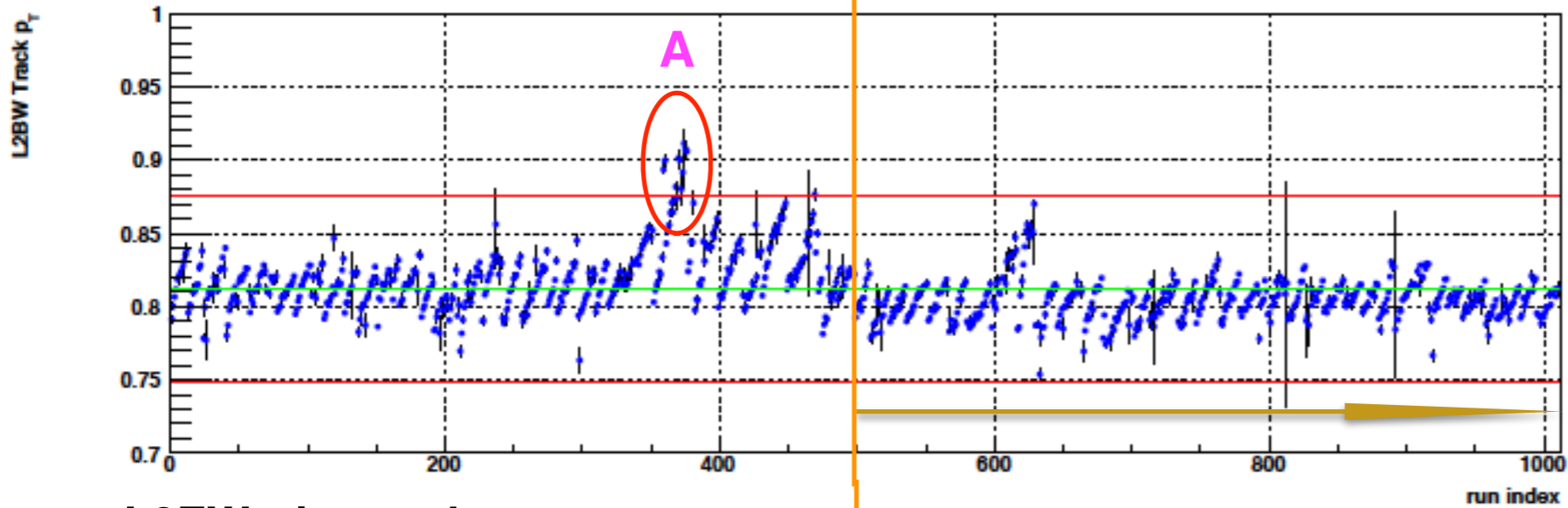
598-633, F 17399,  
F17402, F17403  
is outlier in verX and  
verY

**No runs exclude!!!**

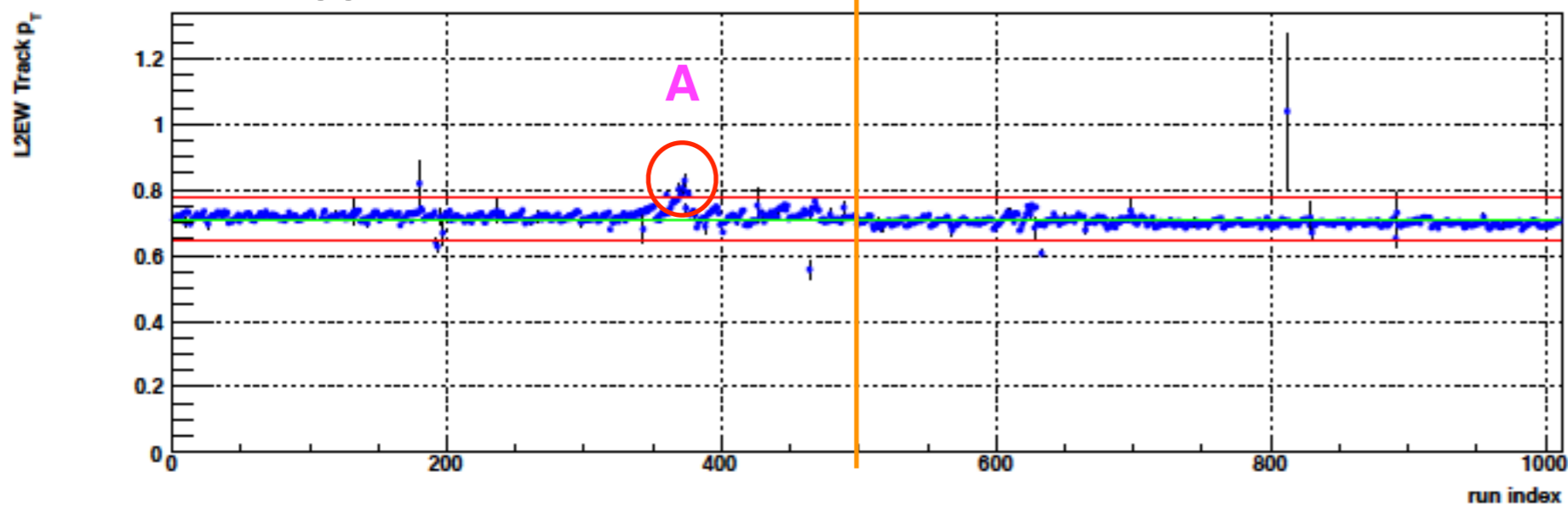
# TPC Tracks- Track Pt

Parameter	Selection	Cuts	
<Track Pt>	Avg. of all the primary track Pt from all the primary vertices per triggered event	<ul style="list-style-type: none"> <li>Track flag 301 or 311</li> <li>Track Pt <math>\geq 0.15</math> GeV</li> </ul>	<ul style="list-style-type: none"> <li>nHitsFits <math>&gt; 15</math></li> <li>nHitsFits/ nHitsP <math>&gt; 0.51</math></li> </ul>

L2BW triggered



L2EW triggered



- Clear Luminosity dependence of fill by fill.
- **TPC operation Voltages changed after day 102. (F17367)**

**Outlier A : -> OK**

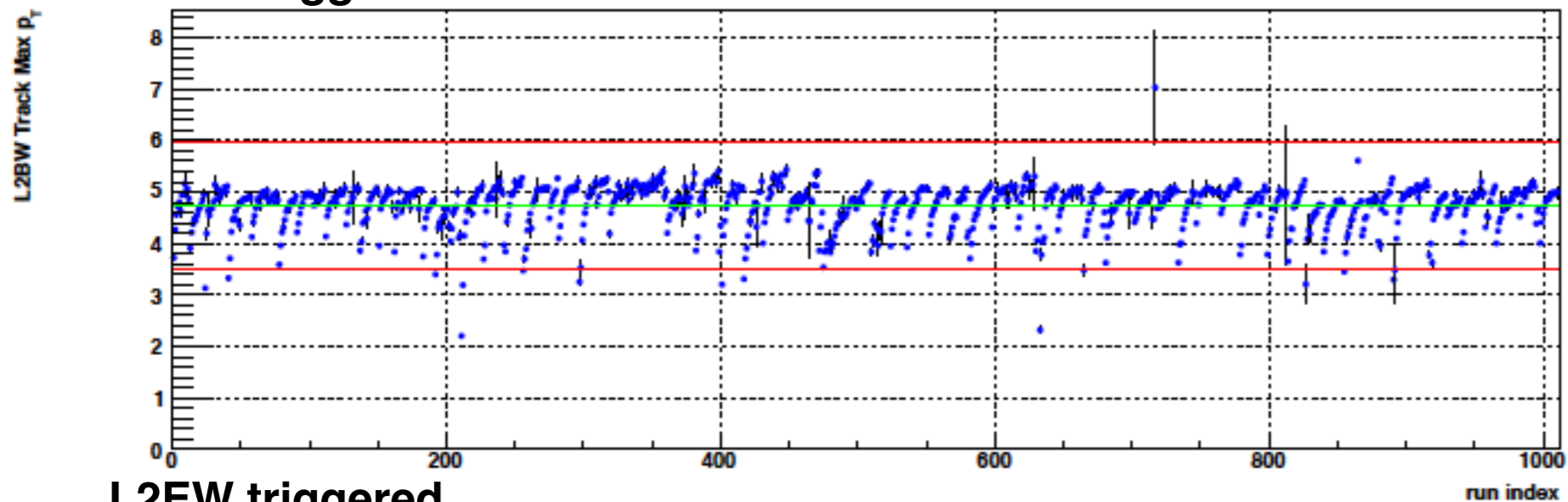
- towards end of the F17329 - luminosity drops at order of 2 . ( ALSO SEEN in Nvertices PROFILE)

**No runs exclude!!!**

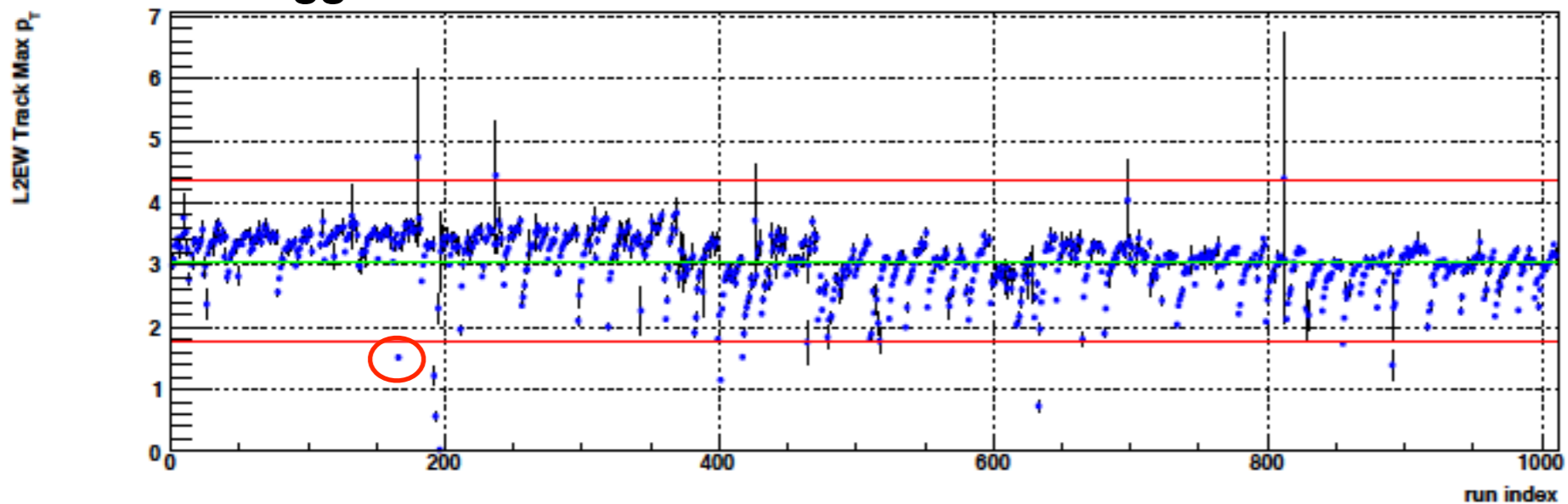
# TPC Tracks - Track Max Pt

Parameter	Selection	Cuts	
<Track MaxPt>	Avg. of Max track Pt from all the primary vertices per triggered event	<ul style="list-style-type: none"> <li>Track flag 301 or 311</li> <li>Track Pt <math>\geq 0.15</math> GeV</li> </ul>	<ul style="list-style-type: none"> <li>nHitsFits &gt; 15</li> <li>nHitsFits/ nHitsP &gt; 0.51</li> </ul>

**L2BW triggered**



**L2EW triggered**

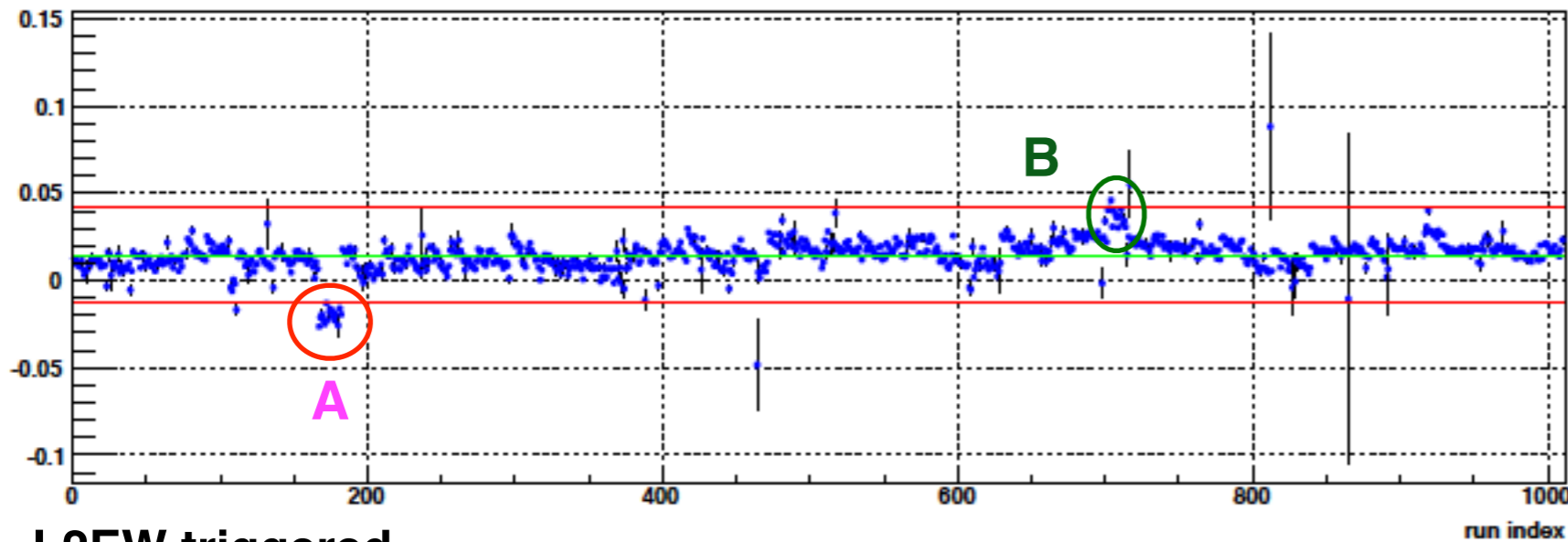


**No runs exclude!!!**

# TPC Tracks - Track Eta

Parameter	Selection	Cuts	
<Track Eta>	Avg. of track Eta of all primary tracks from all primary vertices per triggered event	<ul style="list-style-type: none"> <li>Track flag 30I or 31I</li> <li>Track Pt <math>\geq 0.15</math> GeV</li> </ul>	<ul style="list-style-type: none"> <li>nHitsFits &gt; 15</li> <li>nHitsFits/ nHitsP &gt; 0.5I</li> </ul>

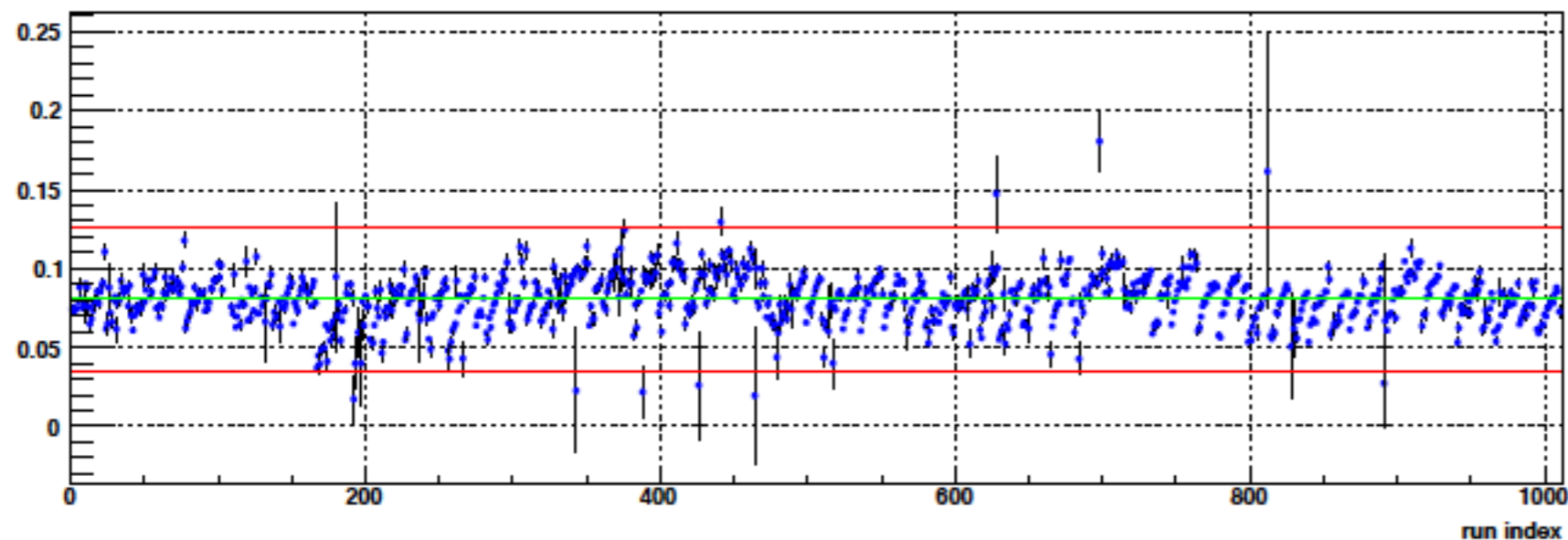
## L2BW triggered



Outlier A : -> OK

- All runs from F17281 (15)
- Caused by Higher Z vertex distribution seen in VerZ profile

## L2EW triggered



B : F17414

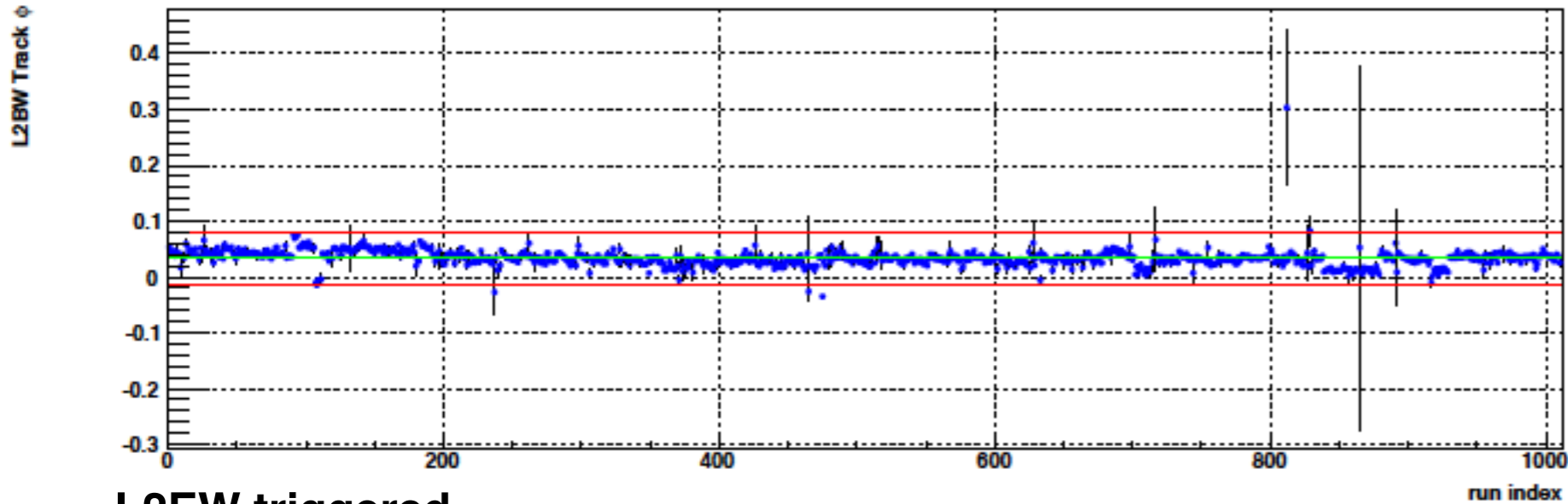
No runs exclude!!!



# TPC Tracks - Track Phi

Parameter	Selection	Cuts
<Track Phi>	Avg. of track Phi of all primary tracks from all primary vertices per triggered event	<ul style="list-style-type: none"> <li>Track flag 30I or 3II</li> <li>Track Pt <math>\geq 0.15</math> GeV</li> <li>nHitsFits <math>&gt; 15</math></li> <li>nHitsFits/ nHitsP <math>&gt; 0.5</math></li> </ul>

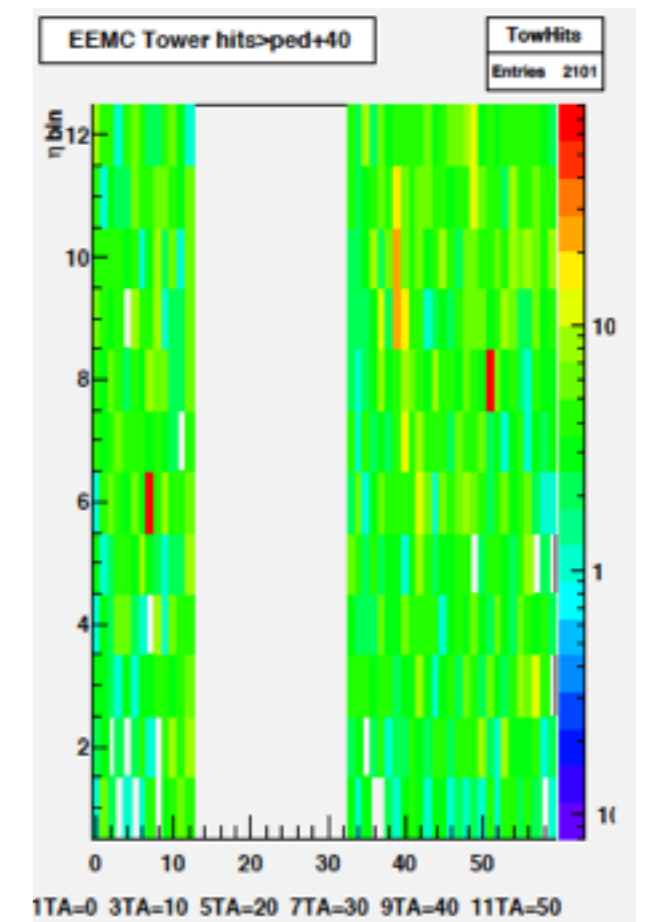
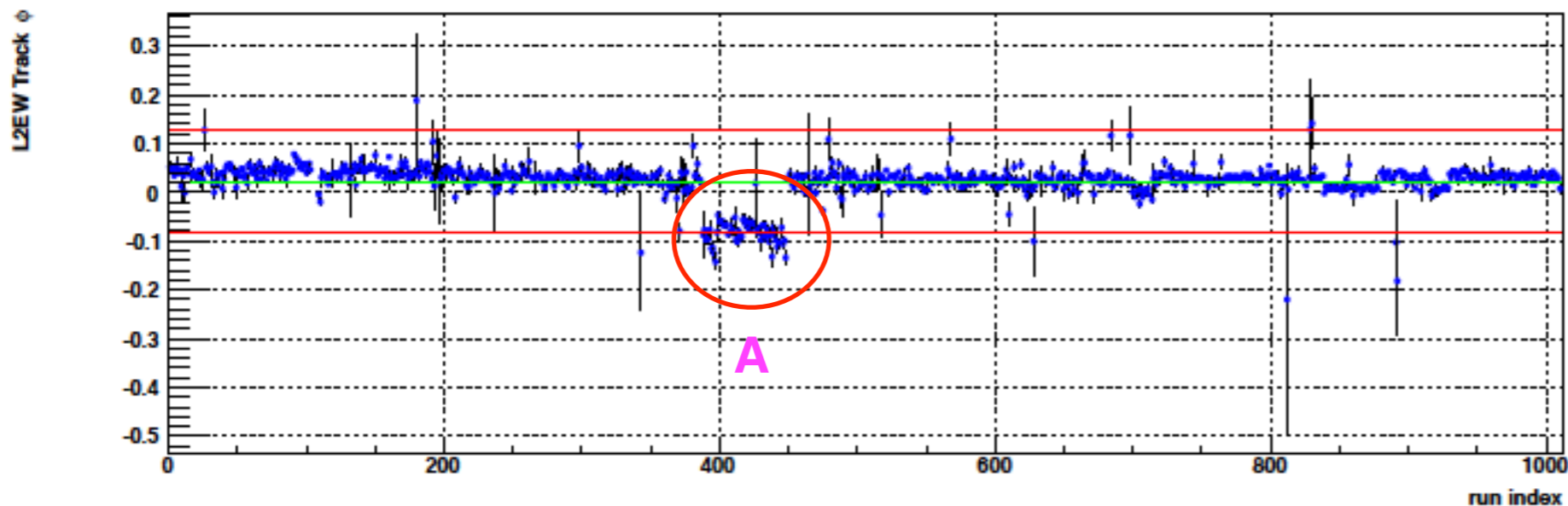
## L2BW triggered



## Outlier A : -> OK

- Starting from middle of the F17333 (15), F17335, F17338, F17340, F17341 30% of EEMC crate is off.

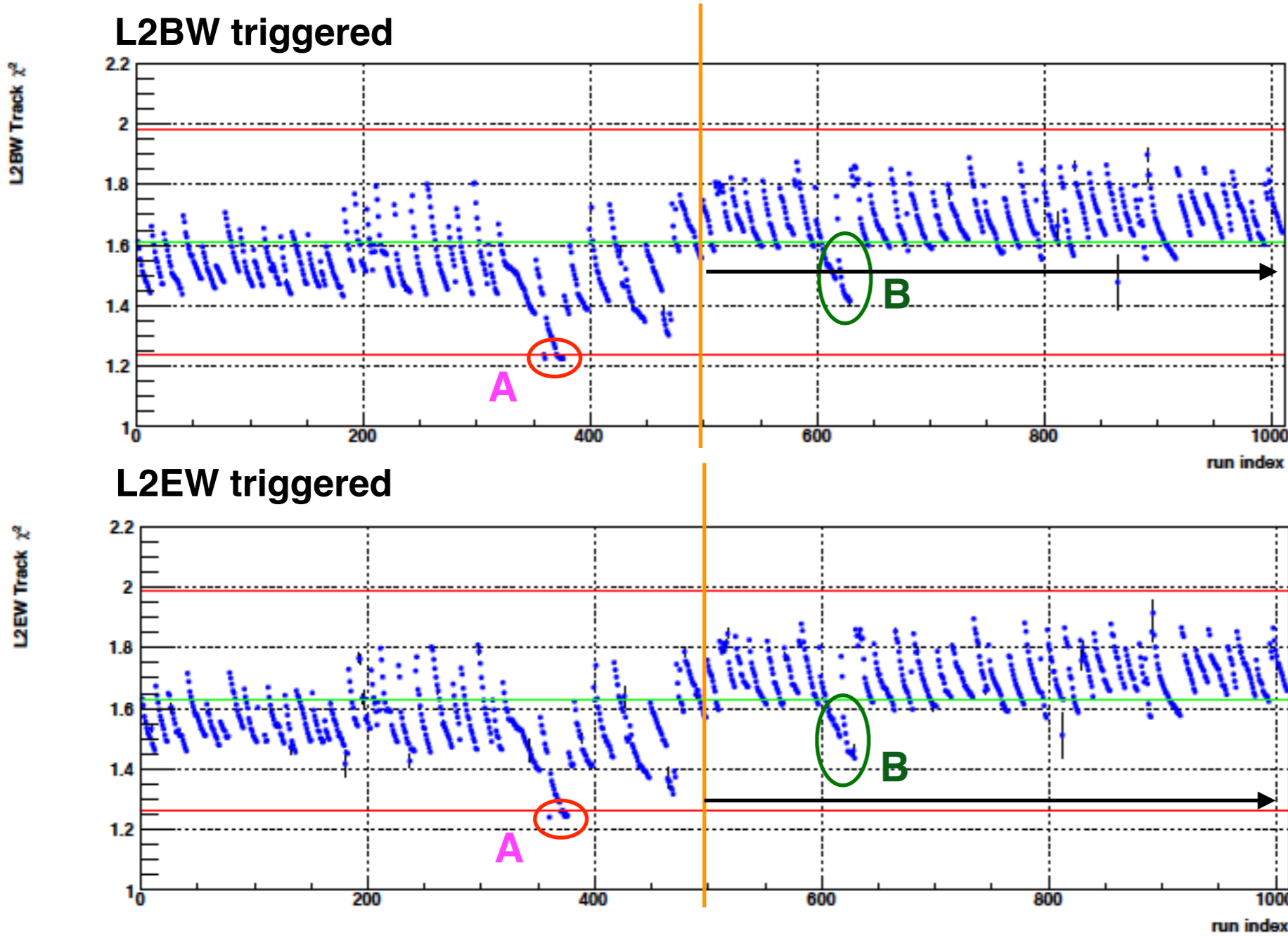
## L2EW triggered



No runs exclude!!!

# TPC Tracks - Track Chi2

Parameter	Selection	Cuts
<Track chi2>	Avg. of track chi2 of all primary tracks from all primary vertices per triggered event	<ul style="list-style-type: none"> <li>Track flag 301 or 311</li> <li>Track Pt <math>\geq 0.15</math> GeV</li> <li>nHitsFits <math>&gt; 15</math></li> <li>nHitsFits/ nHitsP <math>&gt; 0.51</math></li> </ul>



- TPC operation Voltages changed after day 102.
- Outlier A : -> OK
- end of F17329 - low luminosity

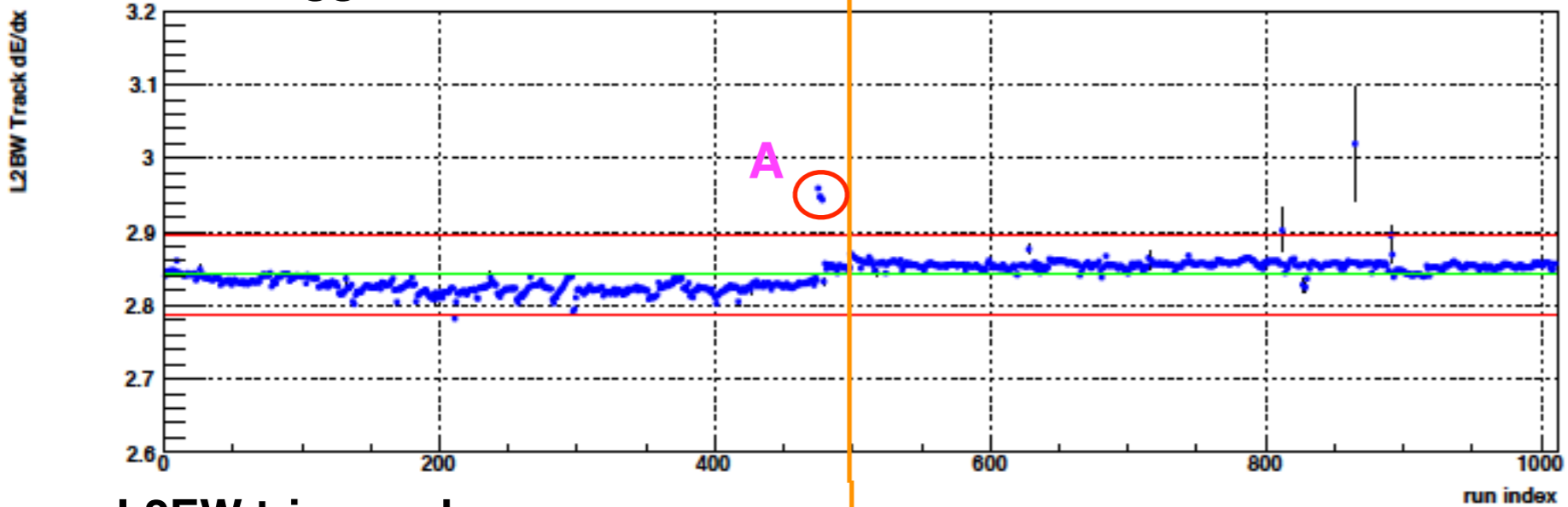
- B :**  
F17328 (1) & end of F17329
- seen as outliers in X,Y vertex position profiles

**No runs exclude!!!**

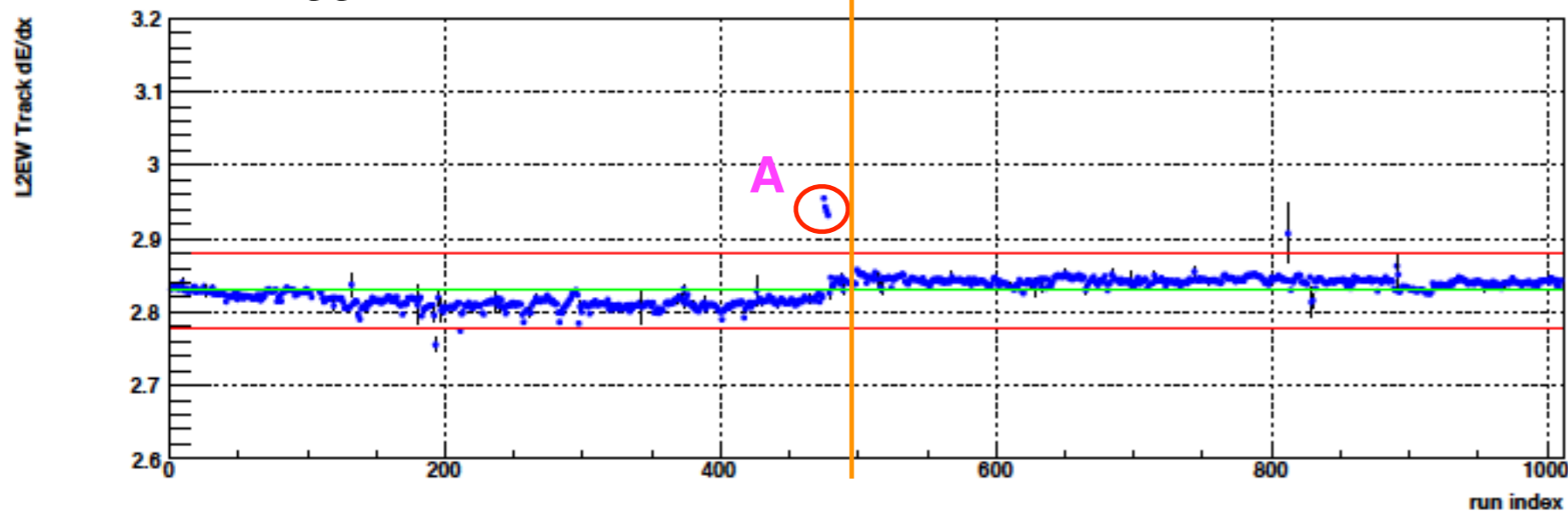
# TPC Tracks - Track dE/dX

Parameter	Selection	Cuts	
<Track dE/dX>	Avg. of track chi2 of all primary tracks from all primary vertices per triggered event	<ul style="list-style-type: none"> <li>Track flag 30I or 3II</li> <li>Track Pt <math>\geq 0.15</math> GeV</li> </ul>	<ul style="list-style-type: none"> <li>nHitsFits &gt; 15</li> <li>nHitsFits/ nHitsP &gt; 0.5I</li> </ul>

L2BW triggered



L2EW triggered



Outlier A : - OK

- Fill 17352 (4 runs) (Seen in Nvertices profile as well) due to TPC gas issue.

F17359

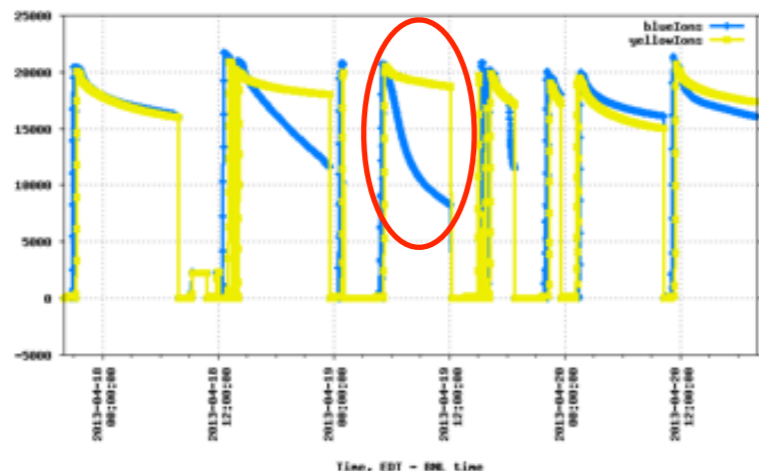
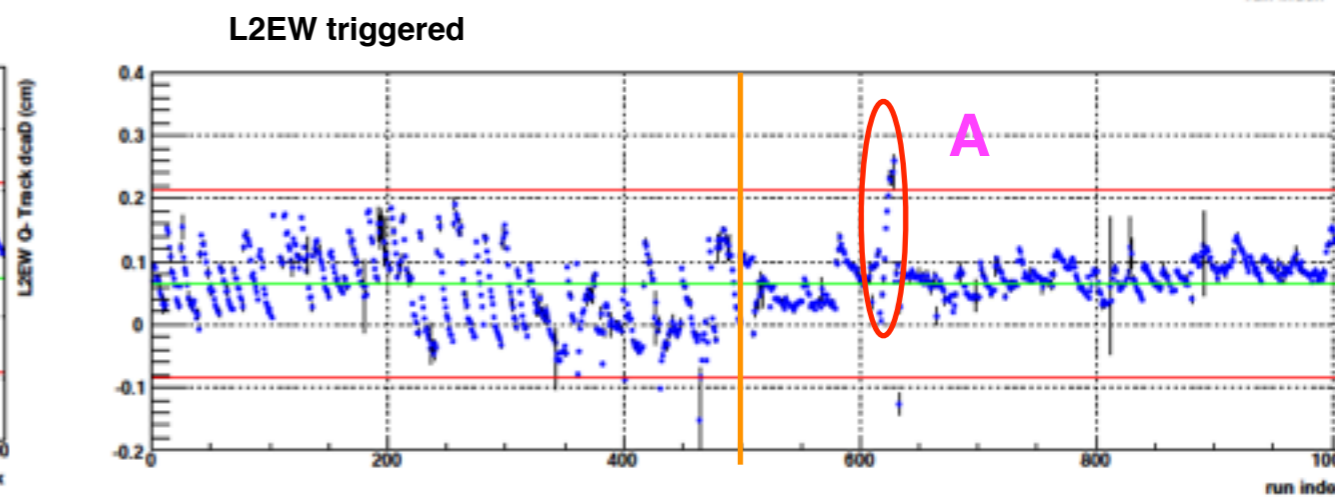
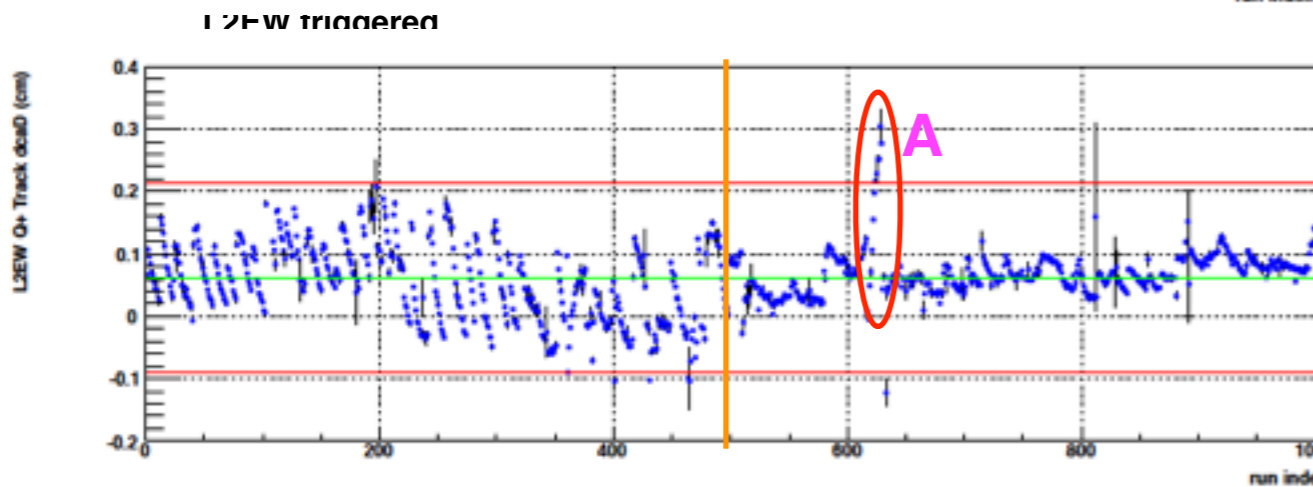
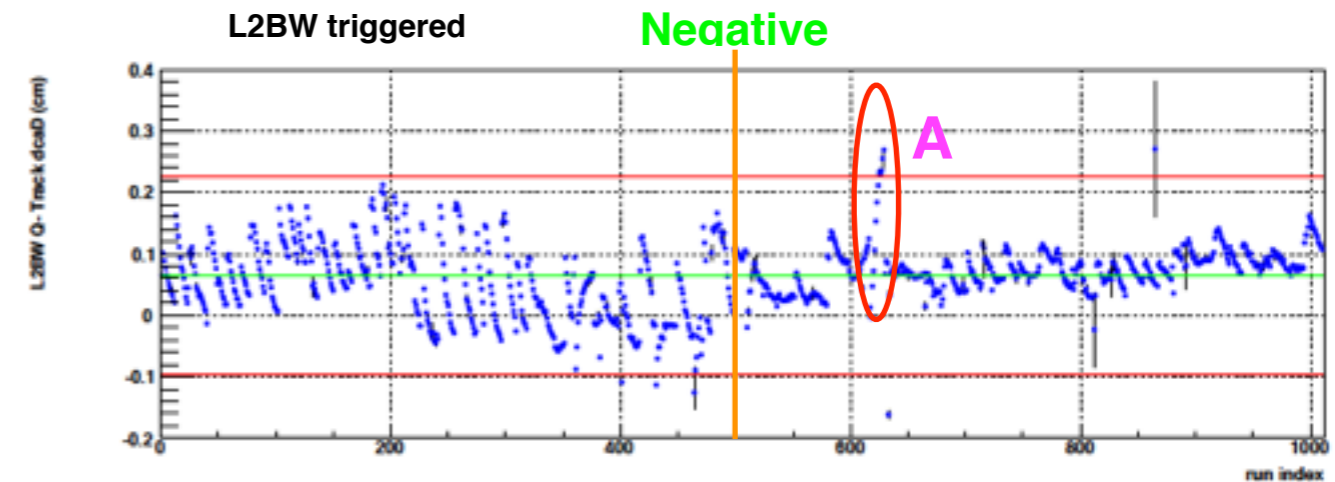
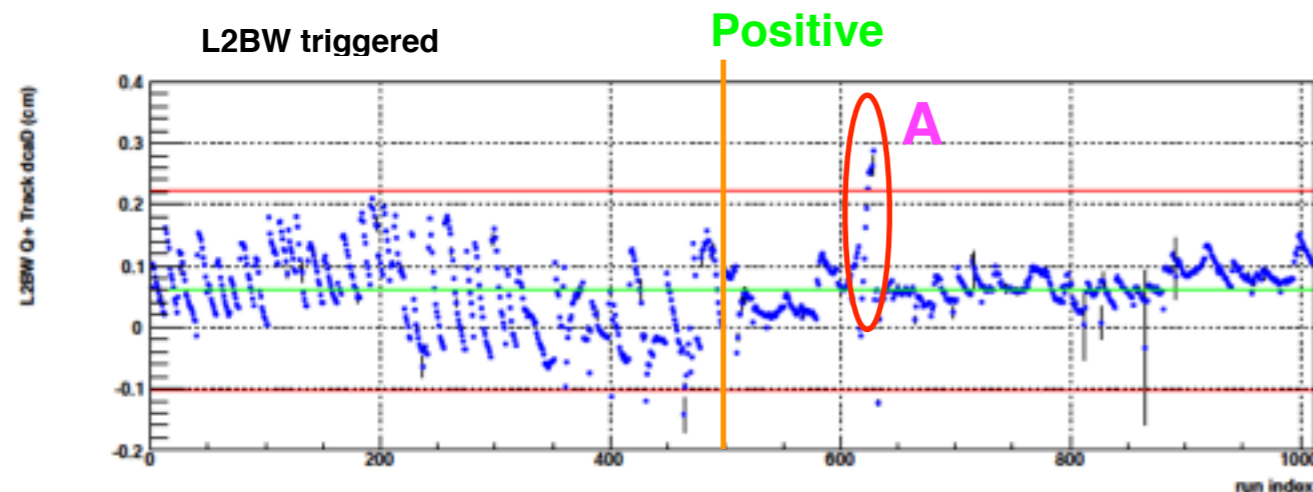
why change appear before day 102?  
confirm from Gene!

No runs exclude!!!



# TPC Tracks - Pos./Neg. Track dcaD

Parameter	Selection	Cuts
$\langle \text{Pos./Neg Track dcaD} \rangle$	Avg. of signed dca of Pos. primary track from all primary vertices per triggered event	<ul style="list-style-type: none"> <li>Track flag 301 or 311</li> <li>Track Pt <math>\geq 0.15</math> GeV</li> <li>nHitsFits <math>&gt; 15</math></li> <li>nHitsFits/ nHitsP <math>&gt; 0.51</math></li> </ul>



Outlier A : OK ????

- Fill 17402

Also seen in VerX, VerY profiles

No runs exclude!!!

# TPC Tracks - Pos./Neg. Track dcaX

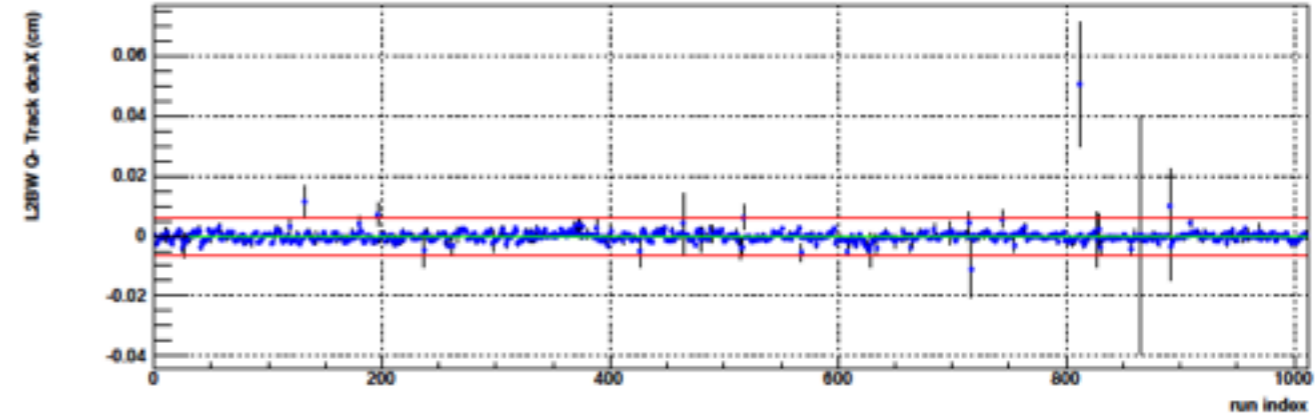
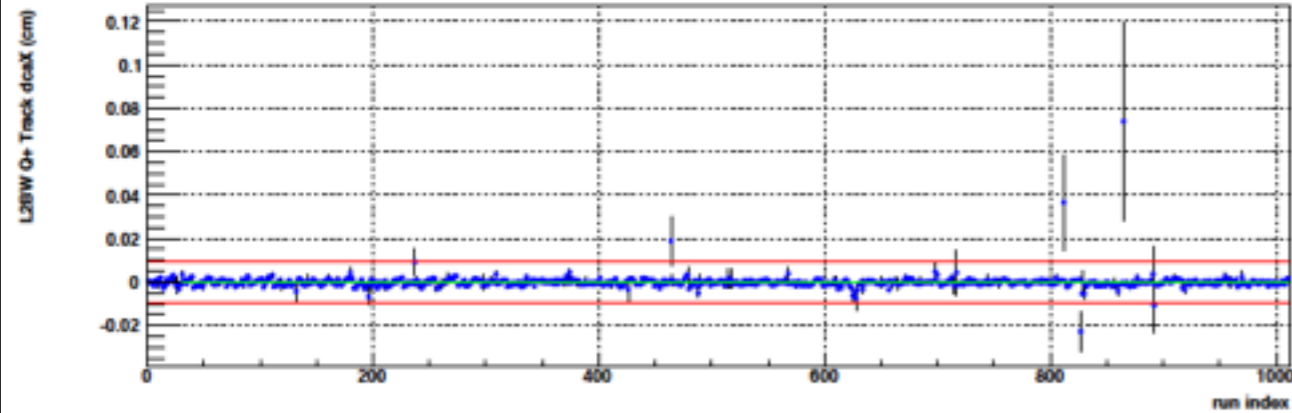
Parameter	Selection	Cuts
$\langle \text{Pos./NegTrack dcaX} \rangle$	Avg. of dca X of Pos./Neg. primary tracks from all primary vertices per triggered event	<ul style="list-style-type: none"> <li>Track flag 301 or 311</li> <li>Track Pt <math>\geq 0.15</math> GeV</li> <li>nHitsFits <math>&gt; 15</math></li> <li>nHitsFits/ nHitsP <math>&gt; 0.5</math></li> </ul>

Positive

Negative

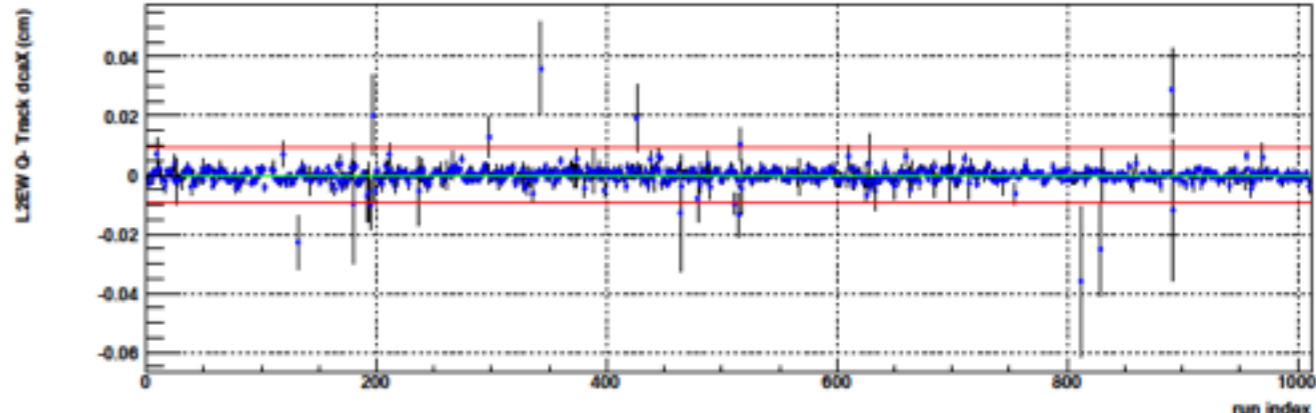
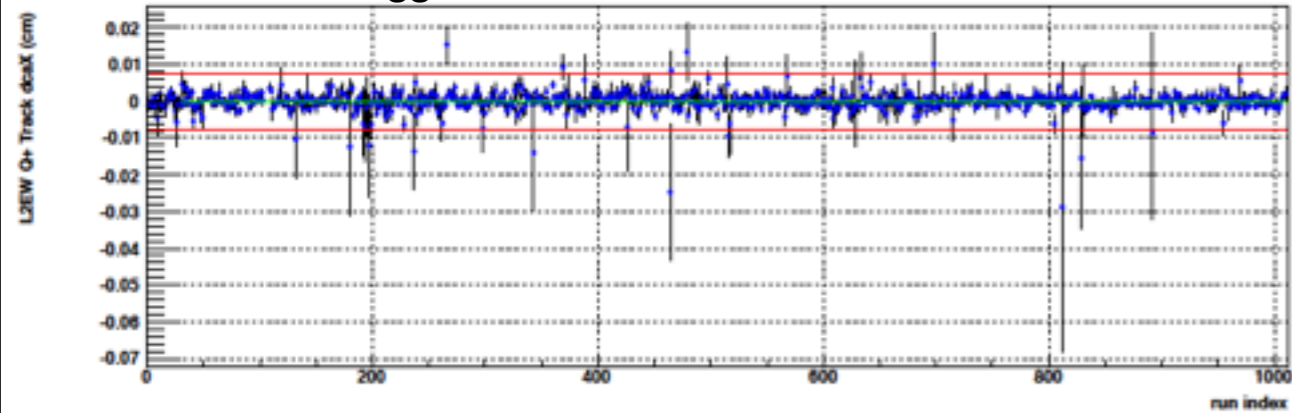
L2BW triggered

L2BW triggered



L2EW triggered

L2EW triggered



No runs exclude!!!

# TPC Tracks - Pos./Neg. Track dcaY

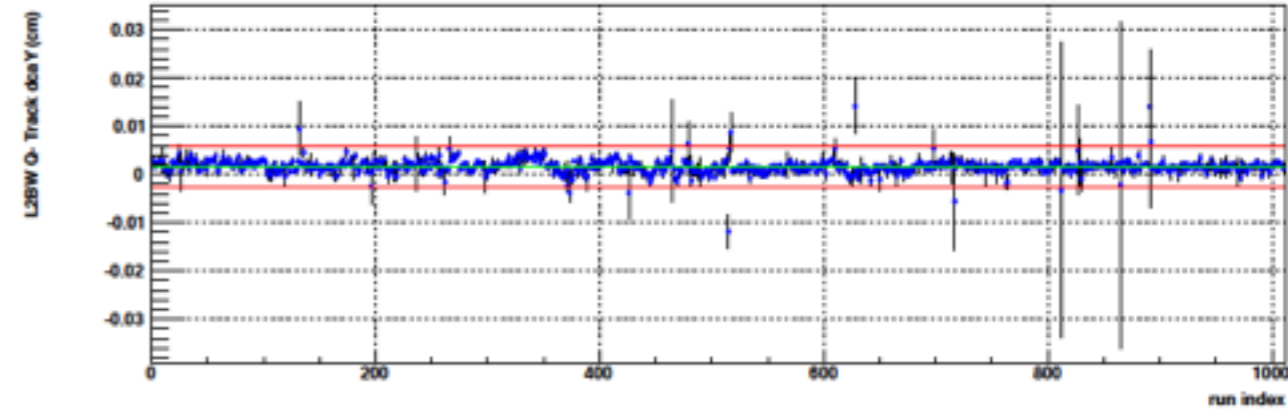
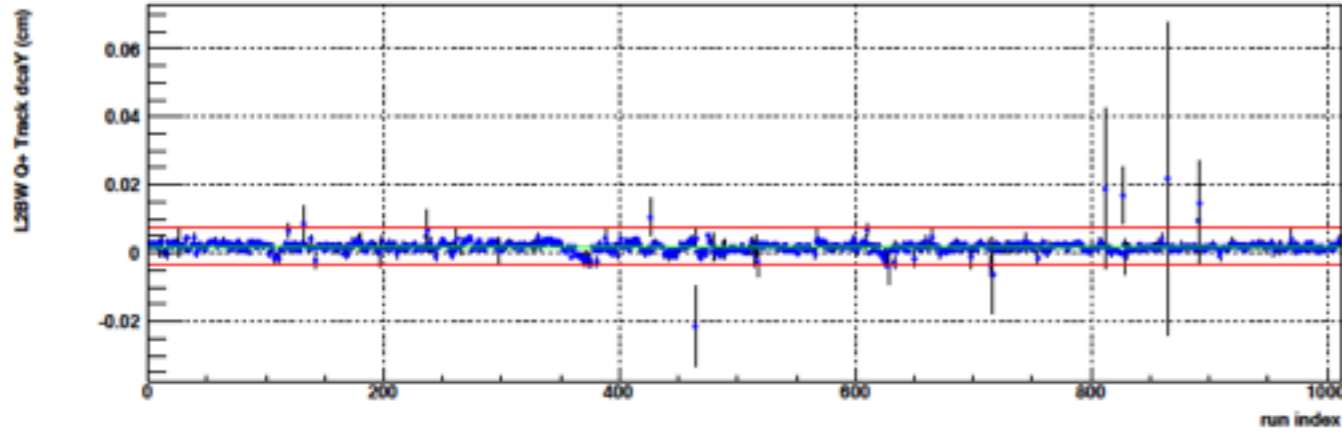
Parameter	Selection	Cuts
$\langle \text{Pos./NegTrack dcaY} \rangle$	Avg. of dca Y of Pos./Neg. primary tracks from all primary vertices per triggered event	<ul style="list-style-type: none"> <li>Track flag 301 or 311</li> <li>Track Pt <math>\geq 0.15</math> GeV</li> <li>nHitsFits <math>&gt; 15</math></li> <li>nHitsFits/ nHitsP <math>&gt; 0.51</math></li> </ul>

Positive

Negative

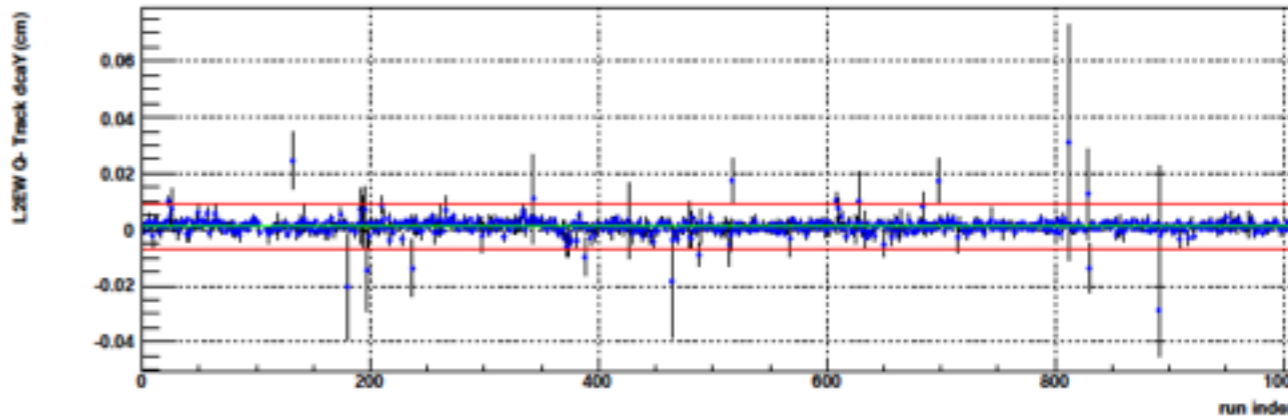
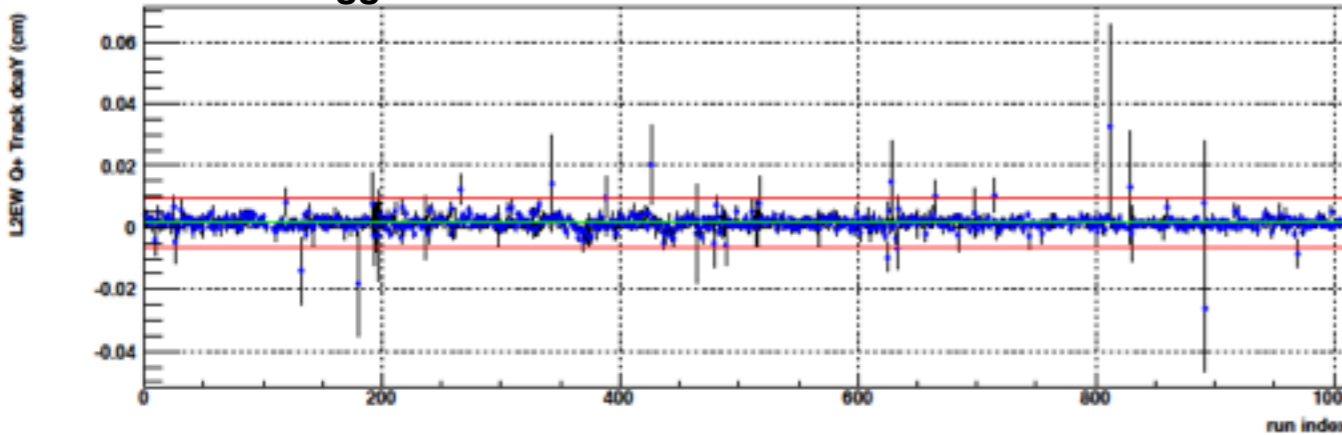
L2BW triggered

L2BW triggered



L2EW triggered

L2EW triggered

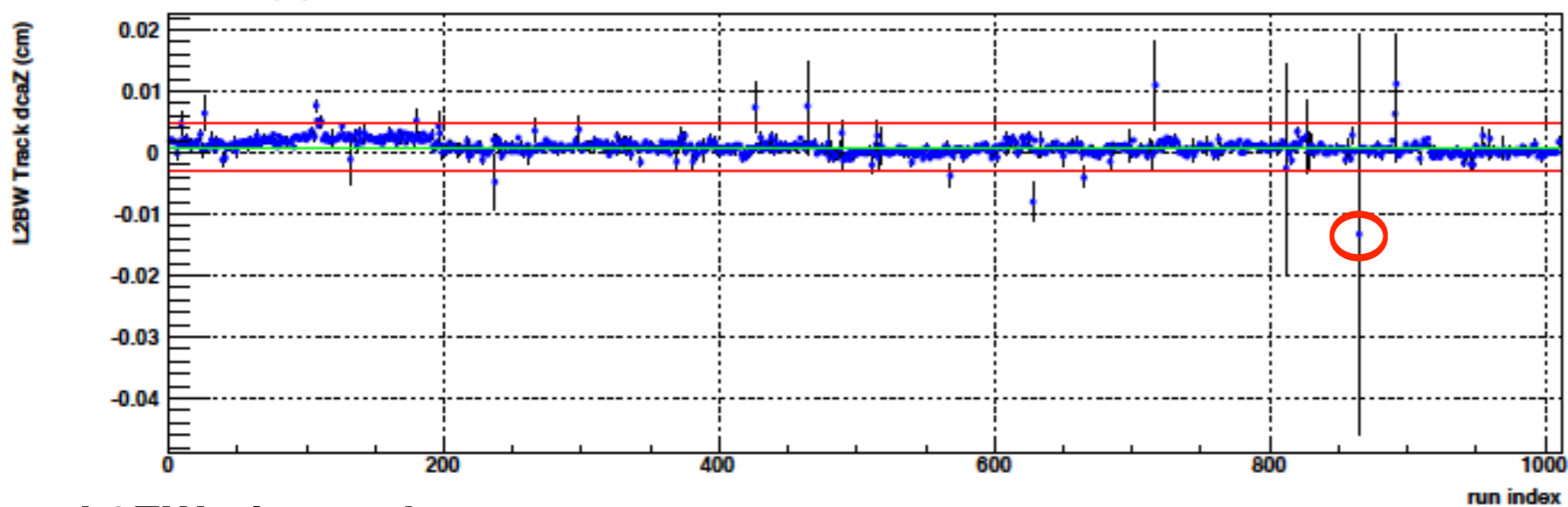


No runs exclude!!!

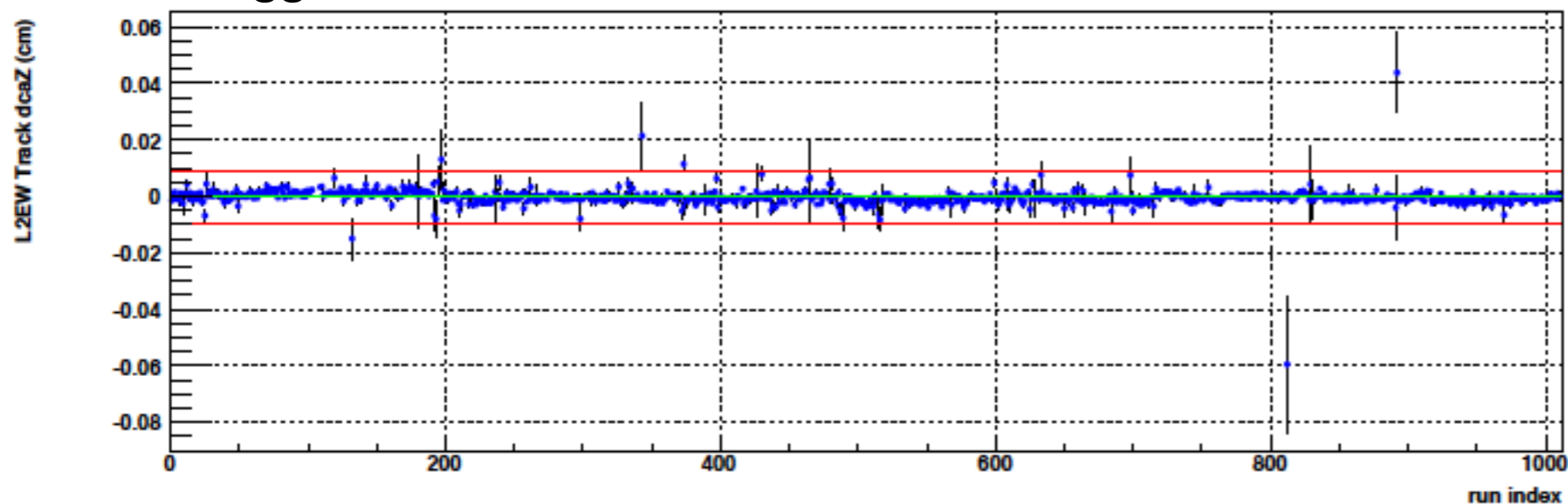
# TPC Tracks - Track dcaZ

Parameter	Selection	Cuts	
<Track dcaZ>	Avg. of track dcaZ of all primary tracks from all primary vertices per triggered event	<ul style="list-style-type: none"> <li>Track flag 301 or 311</li> <li>Track Pt <math>\geq 0.15</math> GeV</li> </ul>	<ul style="list-style-type: none"> <li>nHitsFits <math>&gt; 15</math></li> <li>nHitsFits/ nHitsP <math>&gt; 0.5</math></li> </ul>

## L2BW triggered



## L2EW triggered



**No runs exclude!!!**

# BEMC Plots

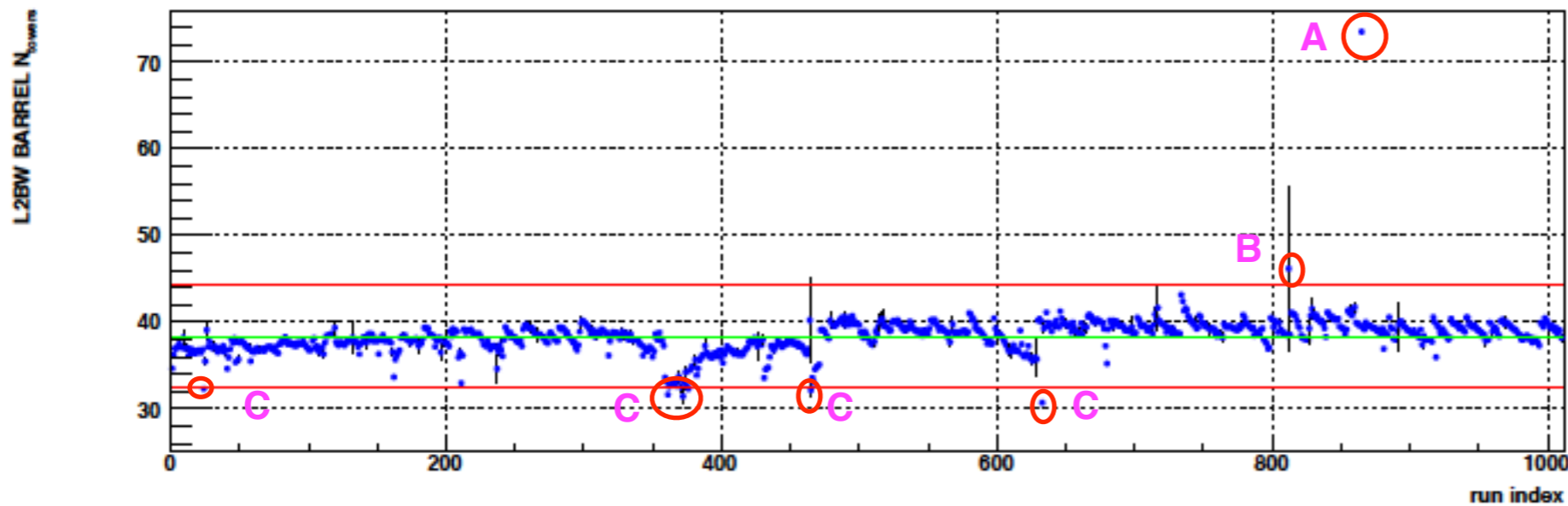
**Red Lines:**  $\pm 3$  sigma, **Green line** : Mean



# BTOW Tower- Ntower

Parameter	Selection	Cuts
<Ntower>	Avg. of N tower hits of all modules (120) per triggered event	<ul style="list-style-type: none"> <li>• <math>E_t &gt; .15 \text{ GeV}</math> (<math>E_t = (\text{rawHit}/\cosh(\text{tower\_eta}))</math>)</li> <li>• pedestal &gt; 0</li> <li>• <math>\text{adc-pedestal} &gt; 2*\text{rms}</math></li> <li>• <math>\text{status} == 1</math></li> </ul>

## L2BW triggered



Outliers A, B: -> **Exclude!!**

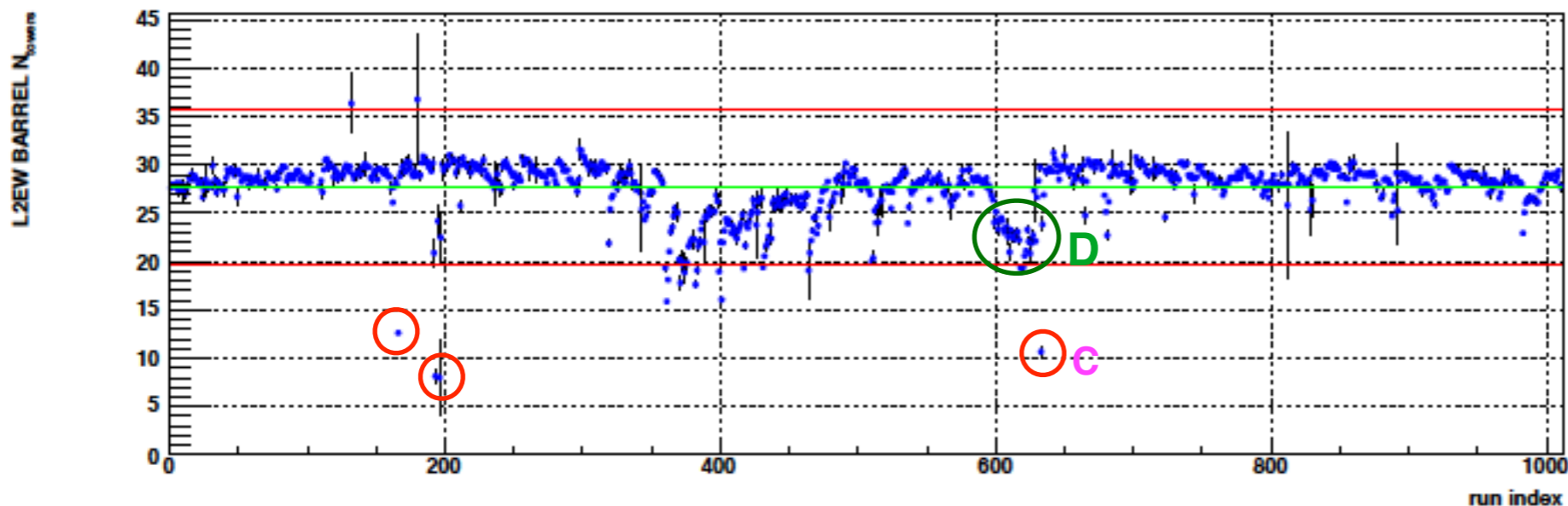
- R14118062 (100 evts)
- R14117001 (85k evts) , - negligible luminosity

Outliers Cs: -> **OK**

- Index ~ 350 - F17329 - lumi drops towards end of the fill, seen in track profiles

## L2EW triggered

F17328 - F 17347



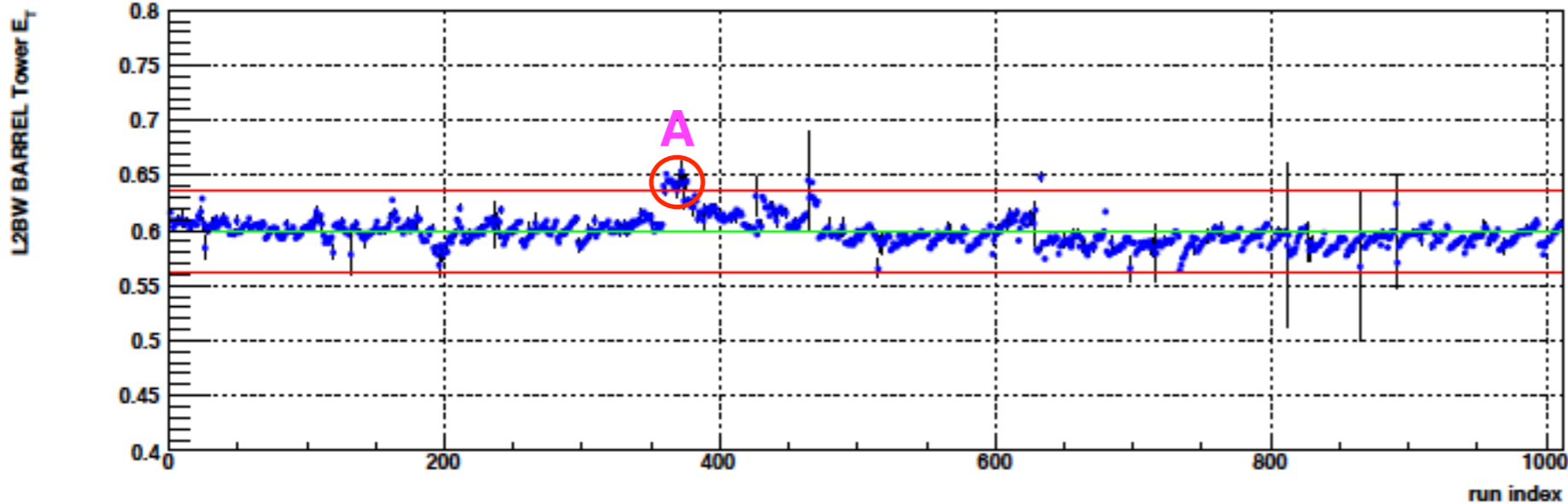
**D** : F17399 - F 17402 seen verX, verY profiles

**2 runs -> exclude !!**

# BTOW Tower- Et

Parameter	Selection	Cuts
Et	Avg. of tower Et of all modules (120) per triggered event	<ul style="list-style-type: none"> <li>• <math>Et &gt; .15 \text{ GeV}</math> (<math>Et = (\text{rawHit}/\cosh(\text{tower\_eta}))</math>)</li> <li>• pedestal <math>&gt; 0</math></li> <li>• <math>\text{adc-pedestal} &gt; 2*\text{rms}</math></li> <li>• <math>\text{status} == 1</math></li> </ul>

## L2BW triggered



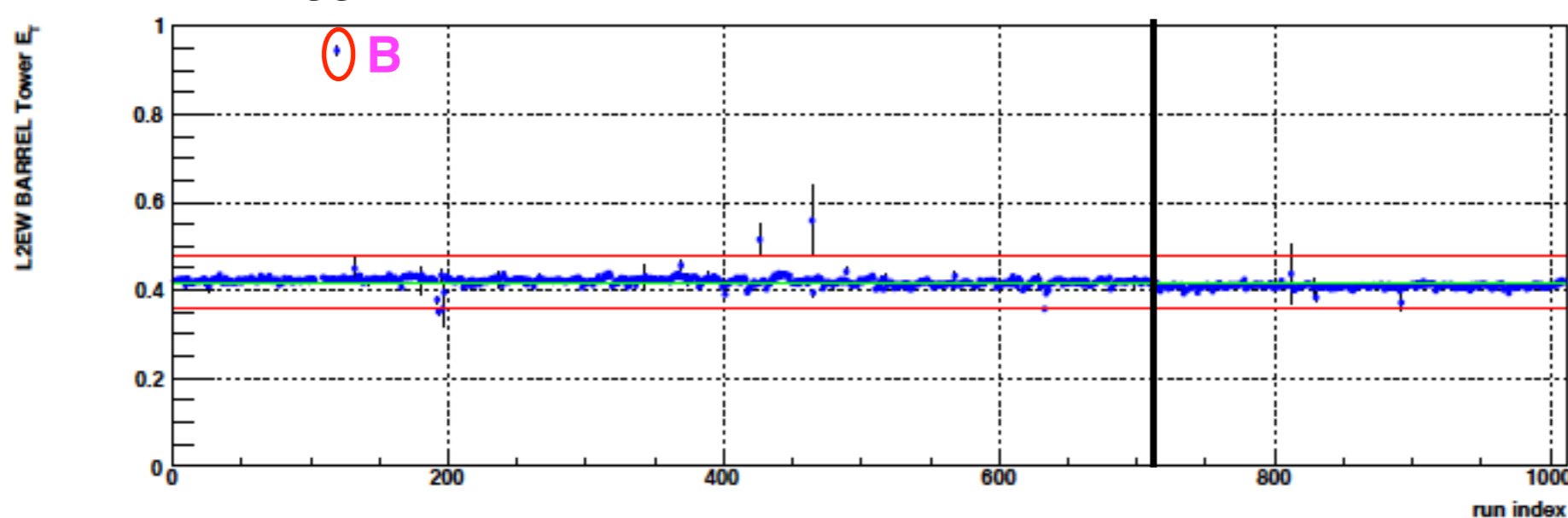
Outlier A: -> OK

- F17328- F17329 -low lumi fills

Outlier B:-> Exclude

- R14081014 : run stopped due to beam dump

## L2EW triggered



F17415 ->

At, F17414 ;R14112037

end cap trigger threshold has changed

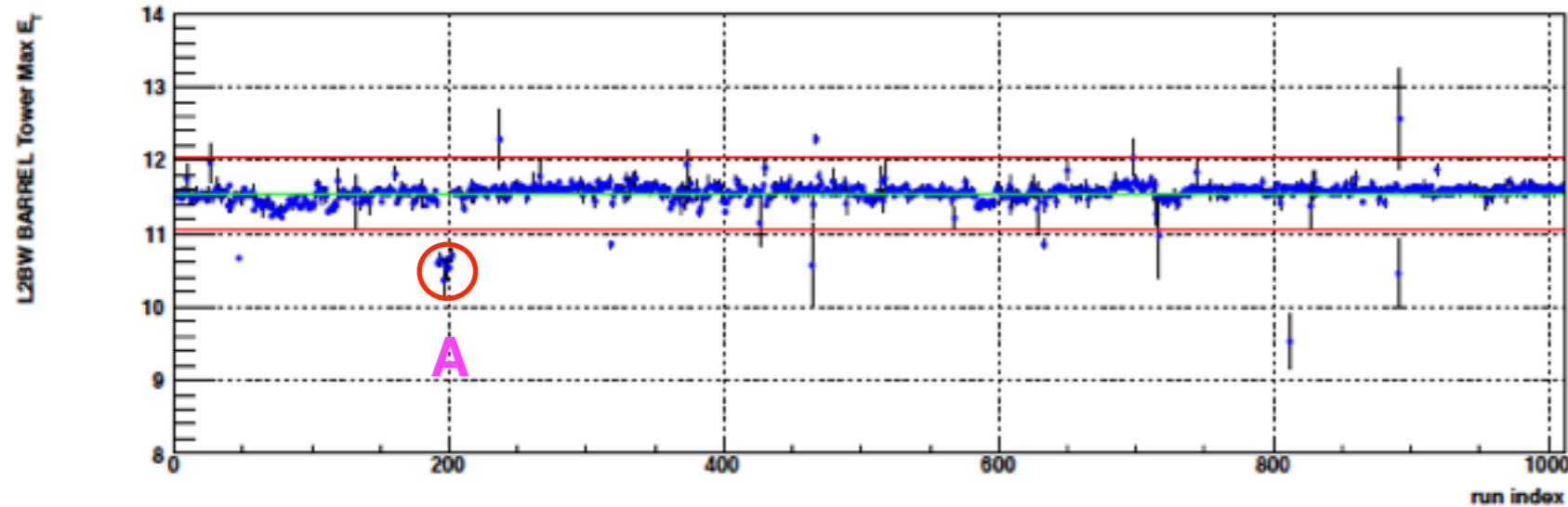
trigger ID 430305 -> 430315

1 run -> exclude !!

# BTOW Tower- Max Et

Parameter	Selection	Cuts
<Max Et>	Avg. of tower Max Et of all modules (120) per triggered event	<ul style="list-style-type: none"> <li>• <math>E_t &gt; .15 \text{ GeV}</math> (<math>E_t = (\text{rawHit}/\cosh(\text{tower\_eta}))</math>)</li> <li>• pedestal &gt; 0</li> <li>• <math>\text{adc-pedestal} &gt; 2*\text{rms}</math></li> <li>• <math>\text{status} == 1</math></li> </ul>

## L2BW triggered

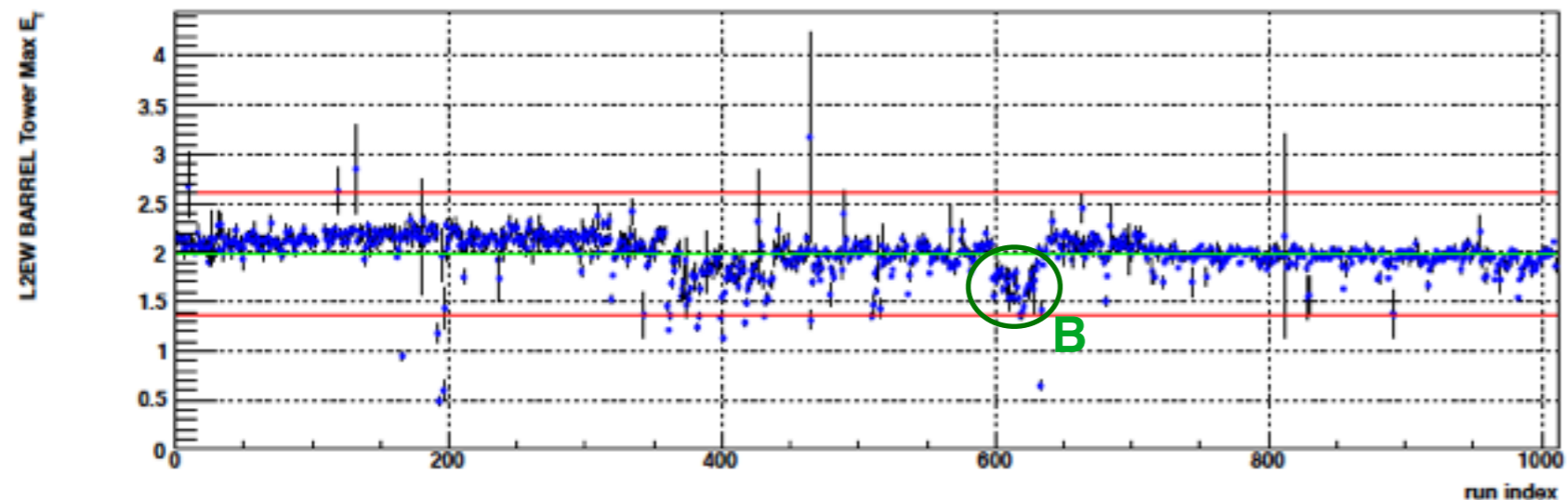


## Outlier A: -> OK

- F17393 as of shift log, during this fill NO end cap in runs and , JP0, JP1, and JP2 are all firing at 10 MHz ( does this means low pt events from previous or after bunch crossing has been accepted????)

also minor: one TPX sector masked.

## L2EW triggered



## B

F17399 - F 17402 -> due to blue beam ion intensity drops (seen in VerX, VerY profiles)

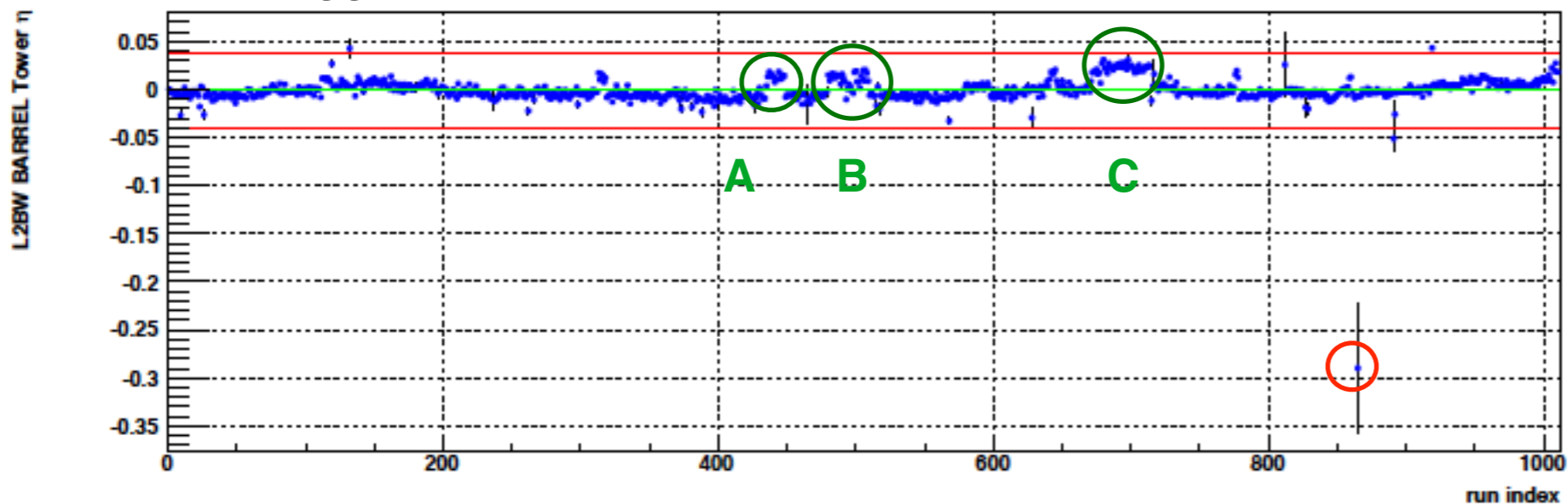
**No runs exclude!!!**



# BTOW Tower- Eta

Parameter	Selection	Cuts
Eta	Avg. of tower Eta of all modules (120) per triggered event	<ul style="list-style-type: none"> <li>• <math>E_t &gt; .15 \text{ GeV}</math> (<math>E_t = (\text{rawHit}/\cosh(\text{tower\_eta}))</math>)</li> <li>• pedestal &gt; 0</li> <li>• <math>\text{adc-pedestal} &gt; 2*\text{rms}</math></li> <li>• <math>\text{status} == 1</math></li> </ul>

## L2BW triggered



A

F17341 (30% off EEMC)

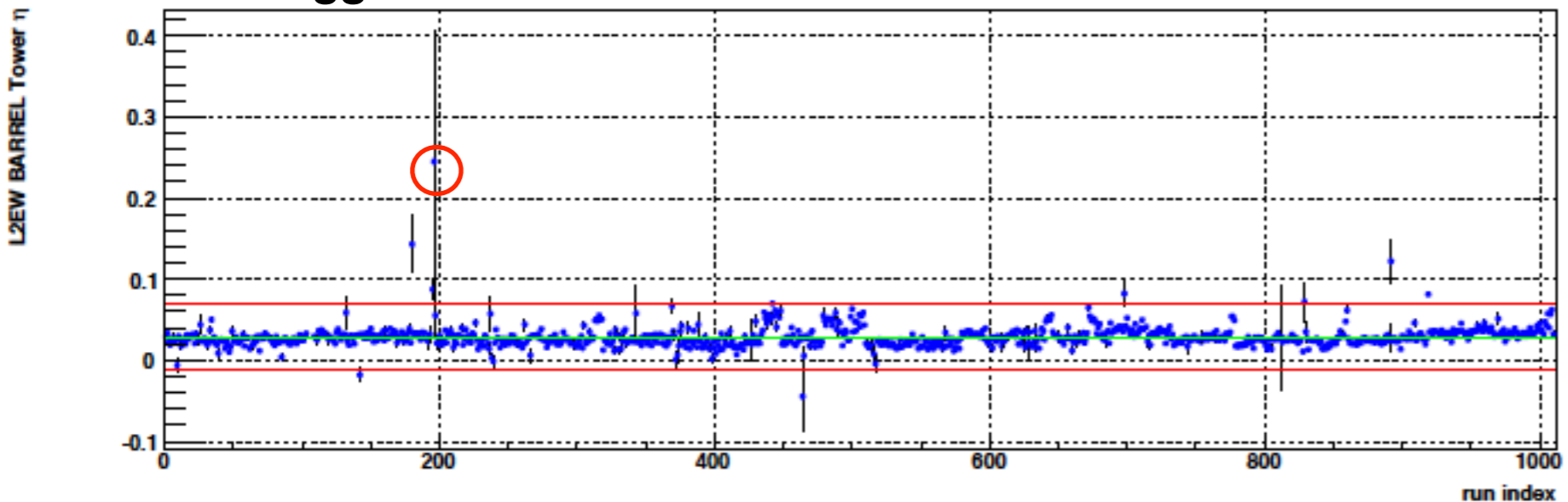
B

F17359 & F17367 -> check

C

F17414 : seen in track eta profiles

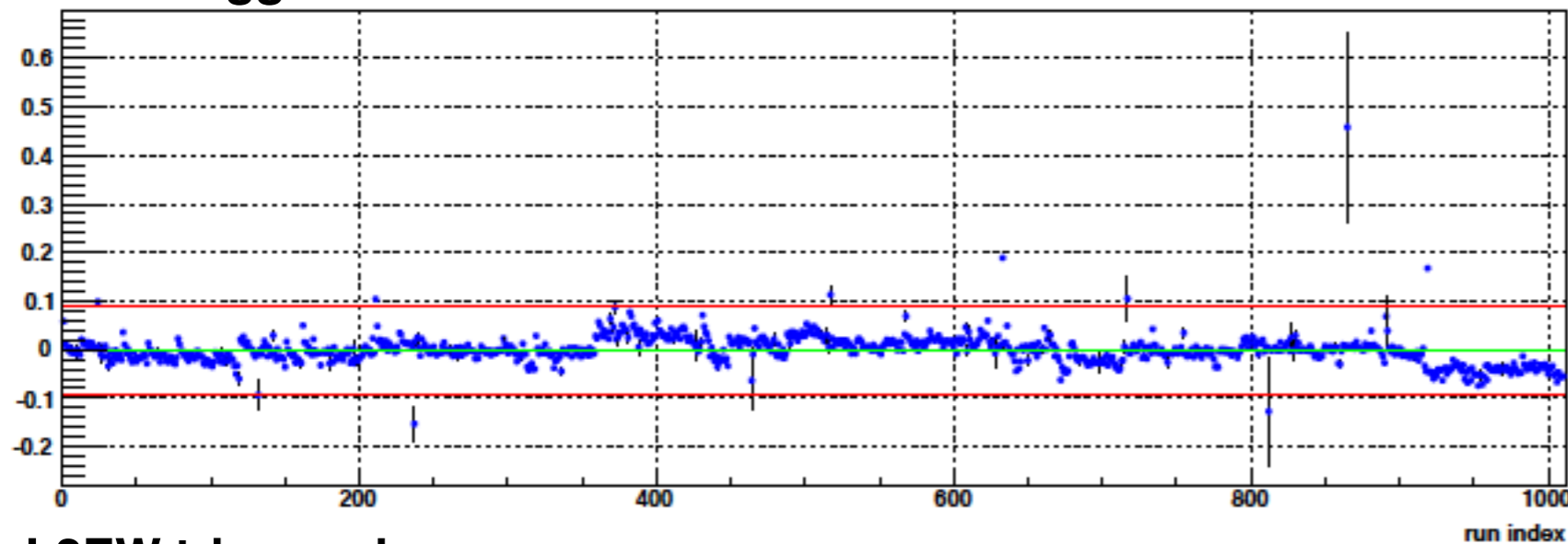
## L2EW triggered



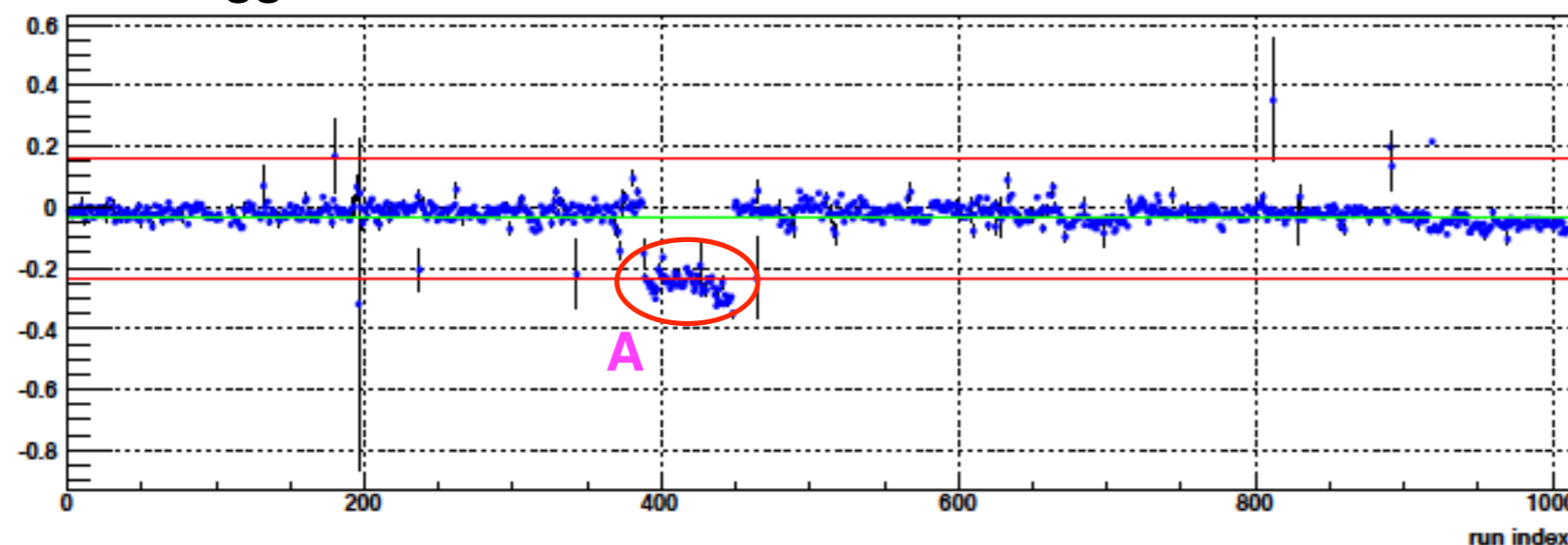
# BTOW Tower- Phi

Parameter	Selection	Cuts
Phi	Avg. of tower Phi of all modules (120) per triggered event	<ul style="list-style-type: none"> <li>• <math>E_t &gt; .15 \text{ GeV}</math> (<math>E_t = (\text{rawHit}/\cosh(\text{tower\_eta}))</math>)</li> <li>• pedestal <math>&gt; 0</math></li> <li>• <math>\text{adc-pedestal} &gt; 2*\text{rms}</math></li> <li>• <math>\text{status} == 1</math></li> </ul>

## L2BW triggered



## L2EW triggered



## Outlier A: -> OK

- Starting from middle of the F17333 (15), F17335, F17338, F17340, F17341 30% of EEMC crate is off.
- But not all the runs are outliers from these fills
- seen in track phi plots as well.

**No runs exclude!!!**

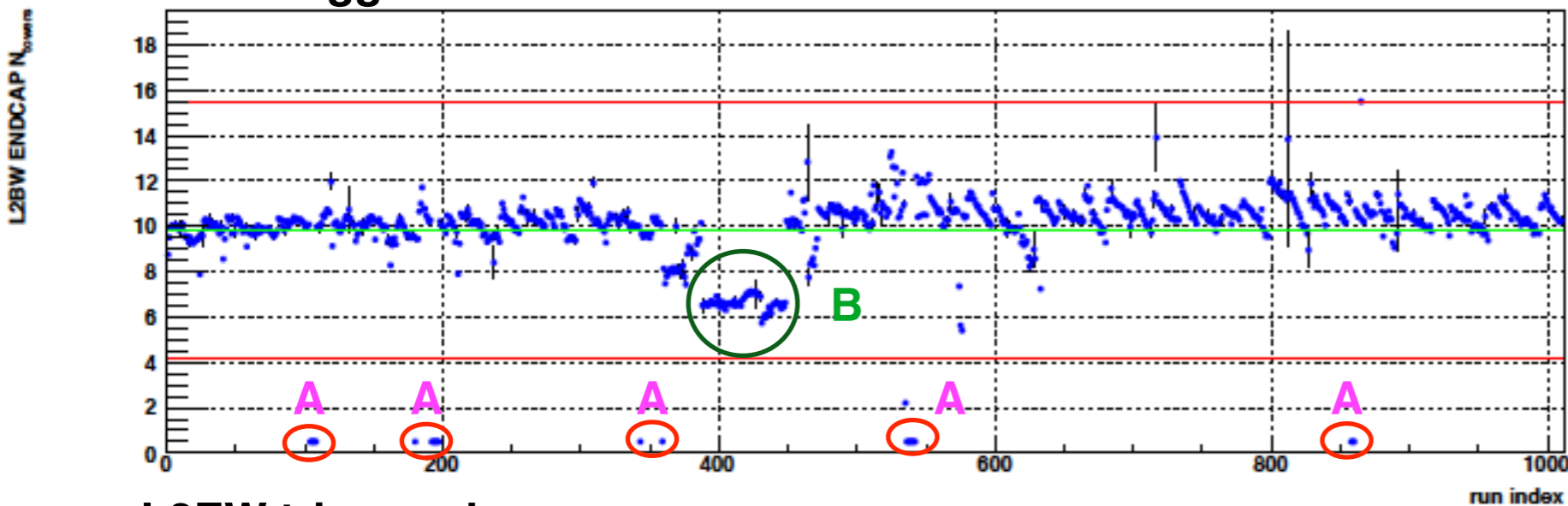
# EEMC Plots

**Red Lines:**  $\pm 3$  sigma, **Green line** : Mean

# ETOW Tower- Ntracks

Parameter	Selection	Cuts
Ntracks	Avg. of N tower hits of 720 towers per triggered event	<ul style="list-style-type: none"> <li>• <math>E_t &gt; .15 \text{ GeV}</math> (<math>E_t = (\text{adc-ped} + 0.5/\text{gain})</math>)</li> <li>• <math>\text{etow gain} &gt; 0</math></li> <li>• <math>\text{adc} &gt; \text{etowPed} + \text{sigPed} * 3</math></li> </ul>

## L2BW triggered



Outliers A: -> OK

No Endcap present during the run : Exclude from forward rapidity analysis

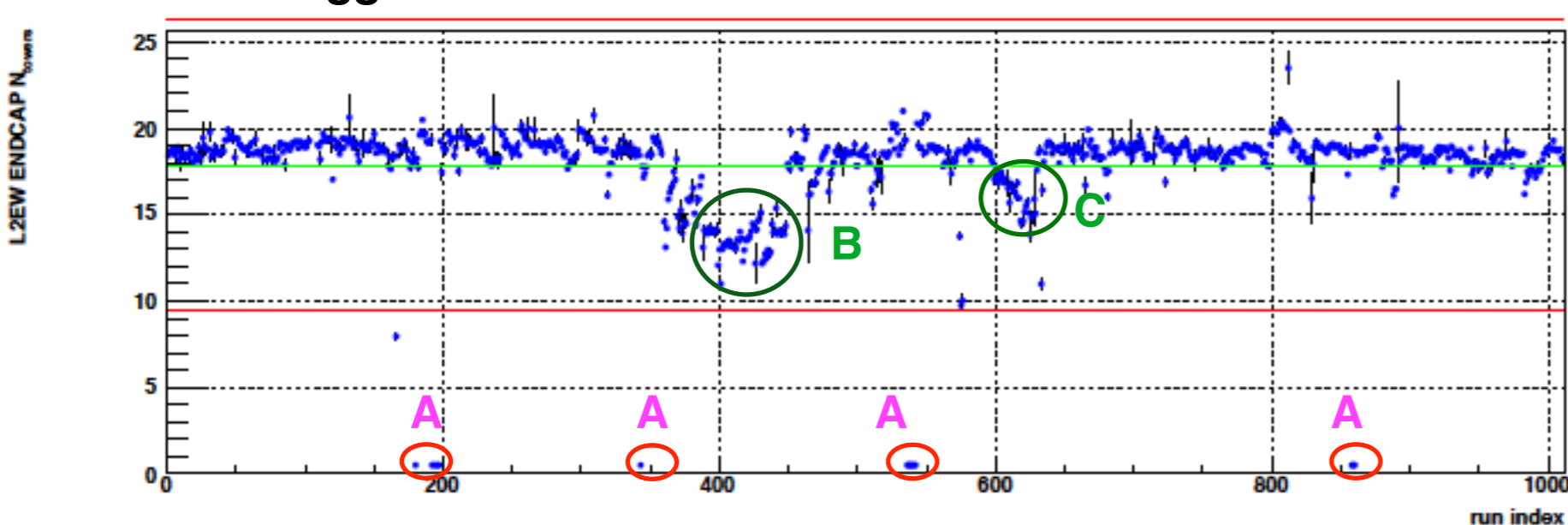
B :

F17333 from (R14096090), F338, F340, F341 to F17341 ( R14098053 ) -> due to crate missing

C :

F17399 - F 17402 -> beam intensity drops

## L2EW triggered

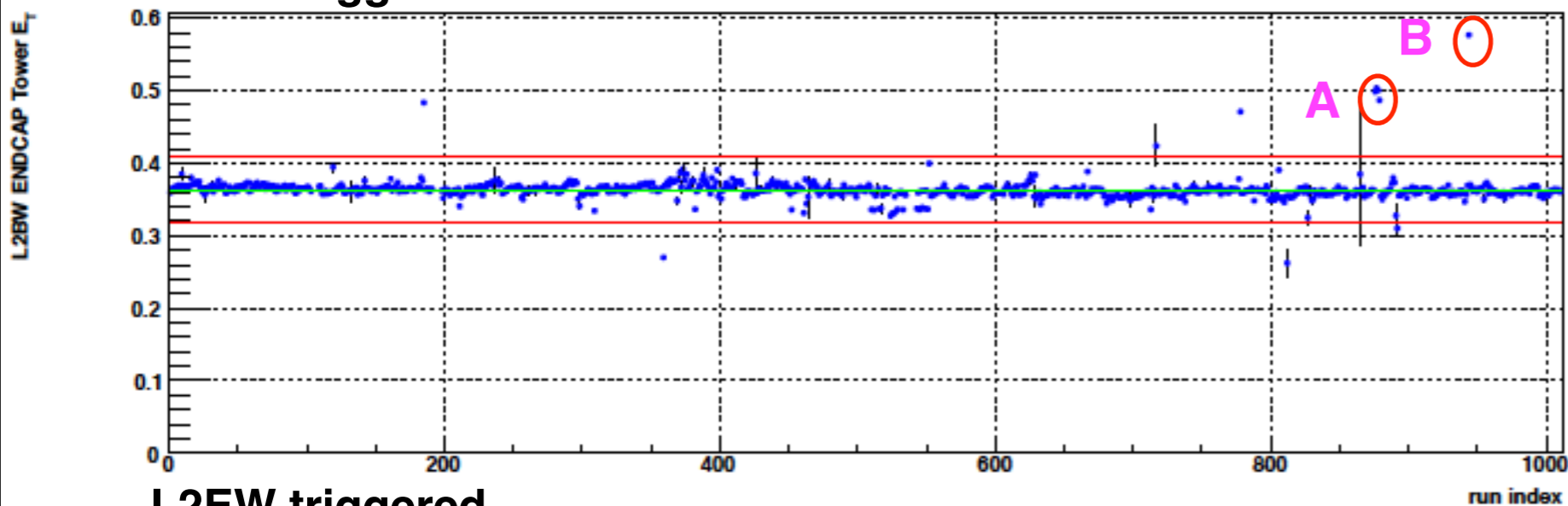


**0 count runs -> exclude from forward analysis!!**

# ETOW Tower- Et

Parameter	Selection	Cuts
Et	Avg. of Et of 720 towers per triggered event	<ul style="list-style-type: none"> <li>• <math>Et &gt; .15 \text{ GeV}</math> (<math>Et = (\text{adc-ped} + 0.5/\text{gain})</math>)</li> <li>• <math>\text{etow gain} &gt; 0</math></li> <li>• <math>\text{adc} &gt; \text{etowPed} + \text{sigPed} * 3</math></li> </ul>

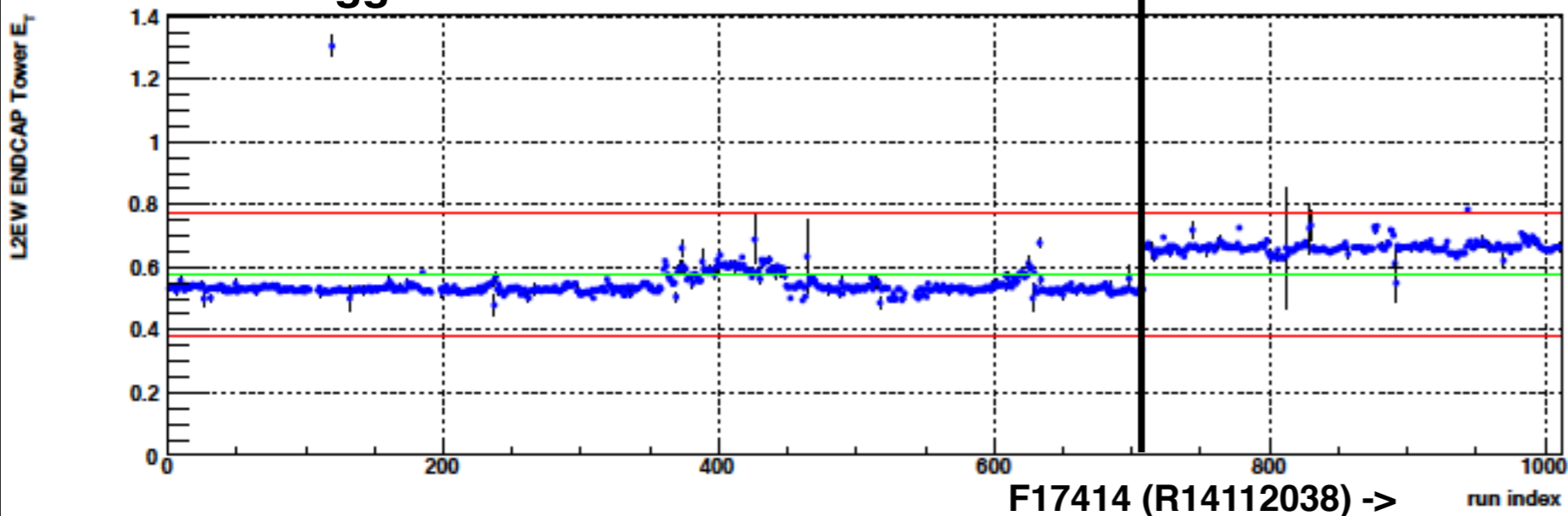
## L2BW triggered



## Outlier A , B:

- F17434, F17452 : 1-2 hot towers in EEMC eta phi plots

## L2EW triggered



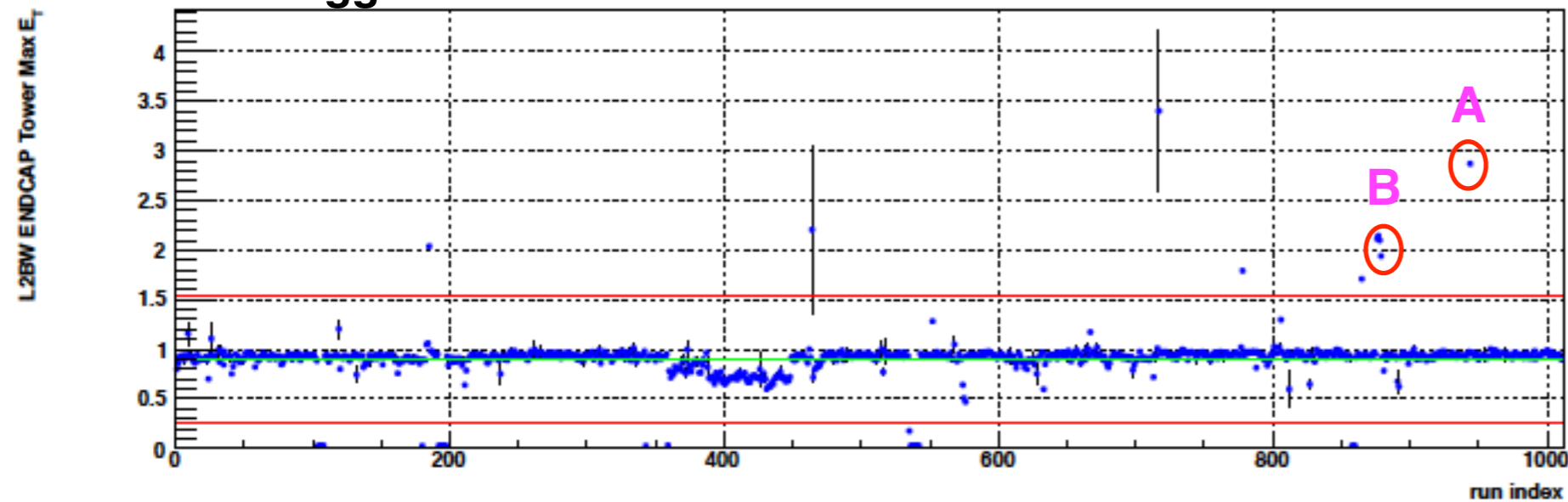
F17414 ;R14112038  
end cap **trigger threshold**  
has changed

trigger **ID 430305 -> 430315**

# ETOW Tower- Max Et

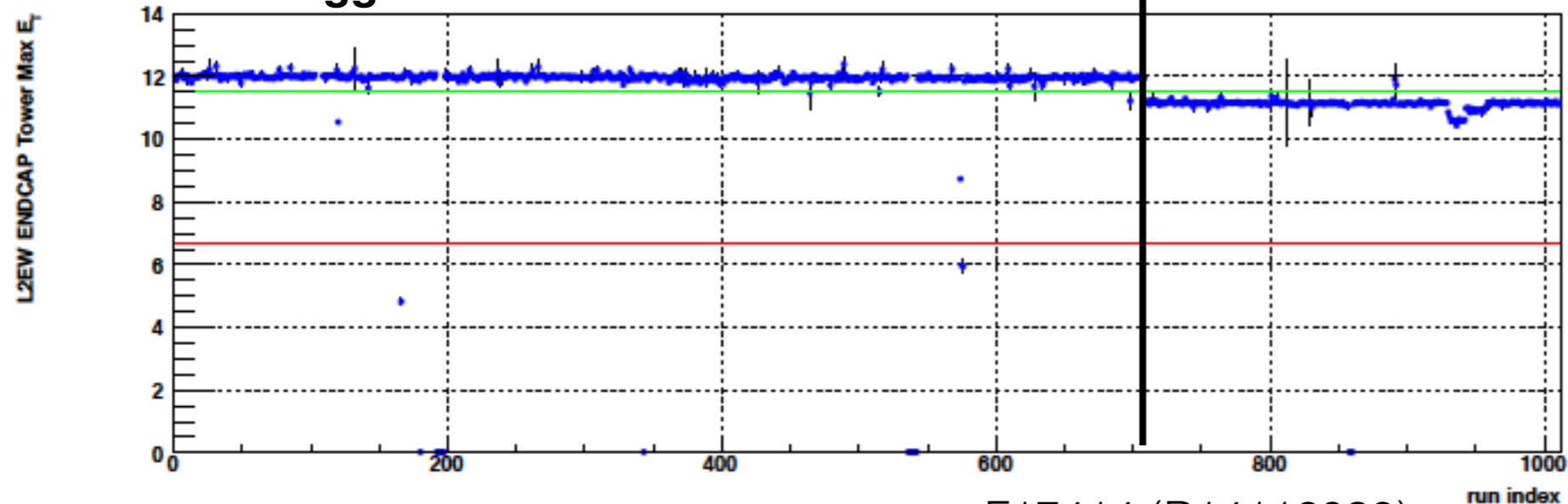
Parameter	Selection	Cuts	
Max Et	Avg. of tower Max Et of 720 towers per triggered event	<ul style="list-style-type: none"> <li>• <math>E_t &gt; .15 \text{ GeV}</math> (<math>E_t = (\text{adc-ped} + 0.5/\text{gain})</math>)</li> </ul>	<ul style="list-style-type: none"> <li>• <math>\text{etow gain} &gt; 0</math></li> <li>• <math>\text{adc} &gt; \text{etowPed} + \text{sigPed} * 3</math></li> </ul>

## L2BW triggered



- A**
  - F17452; 14123025
- B : check**
  - F17436, 4 runs, 14119022 ,24,26,27

## L2EW triggered

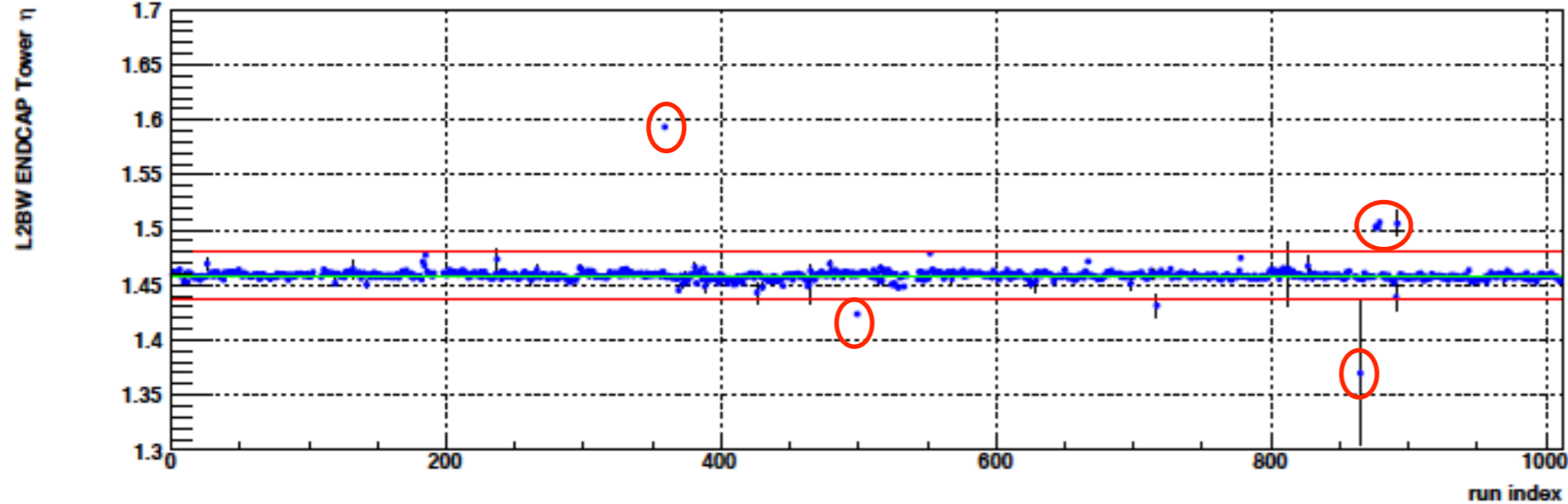


F17414 (R14112038) ->

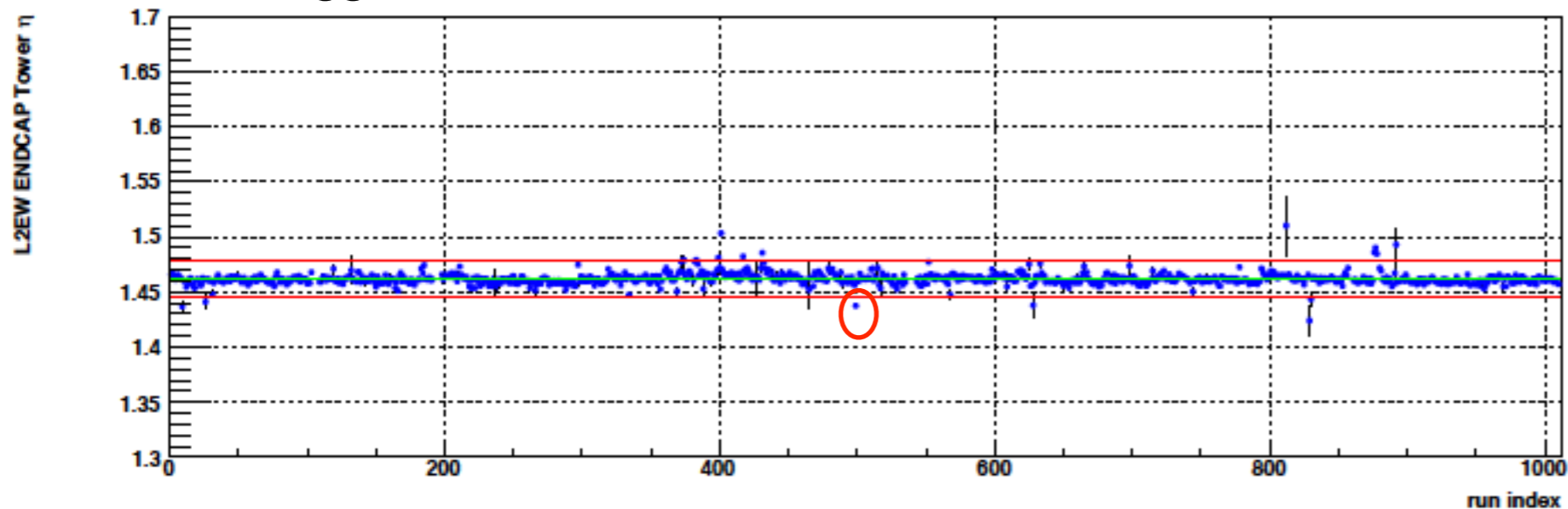
# ETOW Tower- Eta

Parameter	Selection	Cuts	
Eta	Avg. of tower Eta of 720 towers per triggered event	<ul style="list-style-type: none"> <li>• <math>E_t &gt; .15 \text{ GeV}</math> (<math>E_t = (\text{adc-ped} + 0.5/\text{gain})</math>)</li> </ul>	<ul style="list-style-type: none"> <li>• <math>\text{etow gain} &gt; 0</math></li> <li>• <math>\text{adc} &gt; \text{etowPed} + \text{sigPed} * 3</math></li> </ul>

**L2BW triggered**



**L2EW triggered**

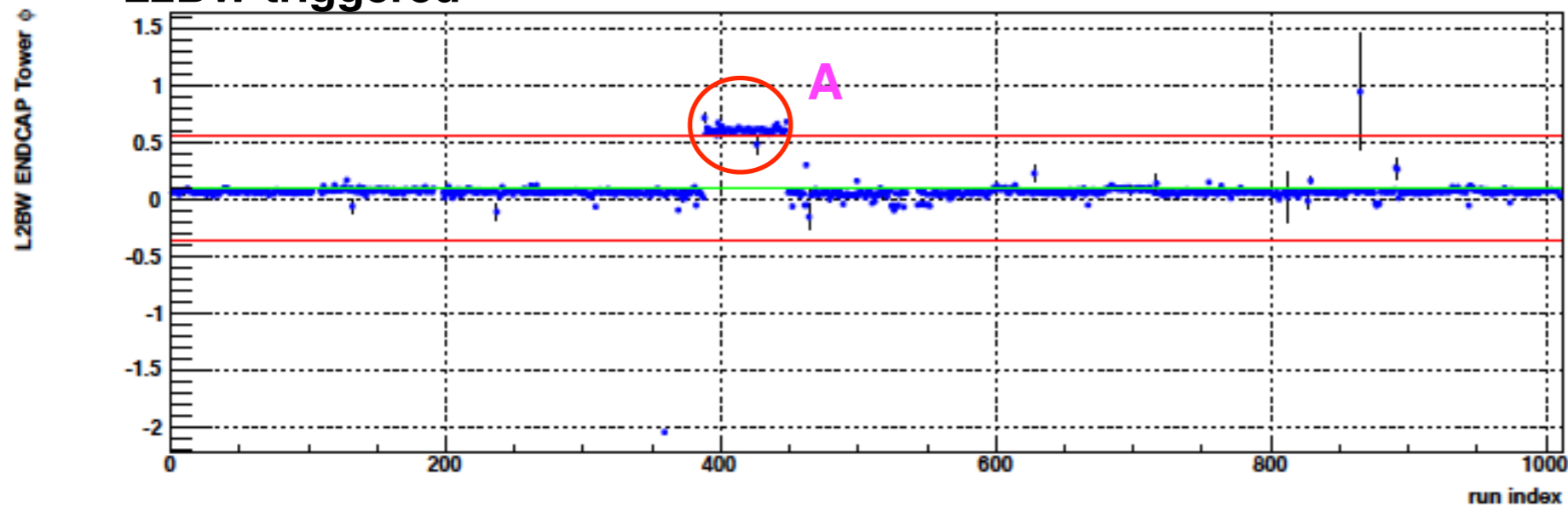




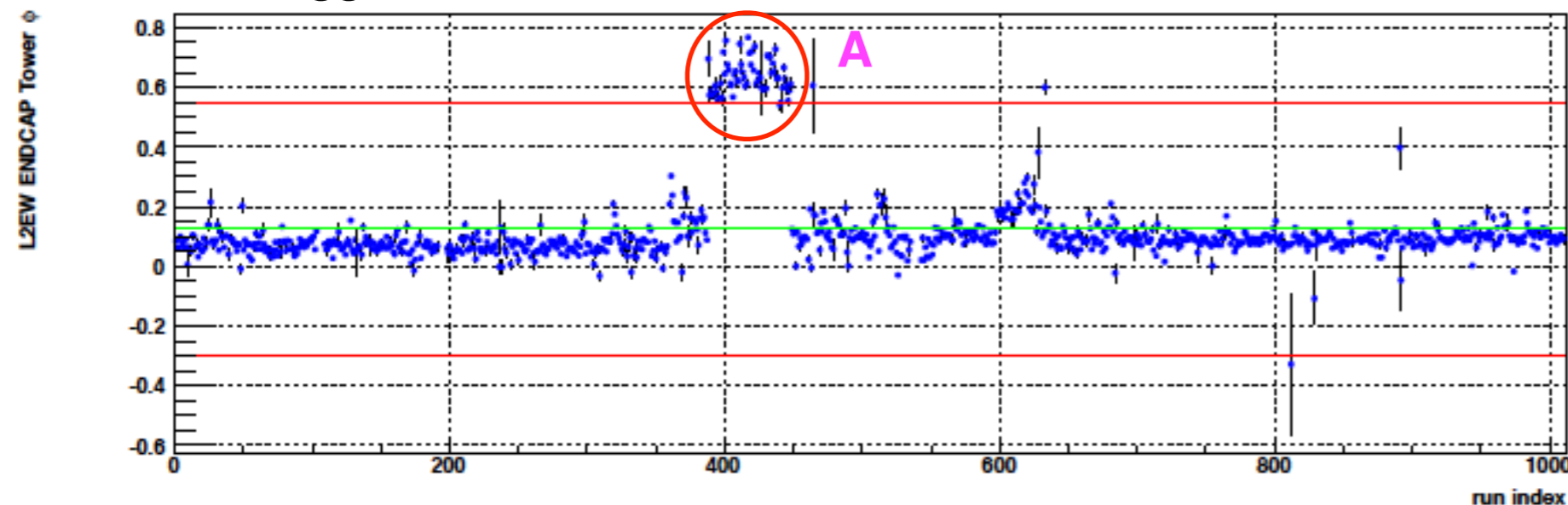
# ETOW Tower- Phi

Parameter	Selection	Cuts
Phi	Avg. of tower Phi of 720 towers per triggered event	<ul style="list-style-type: none"> <li>• <math>E_t &gt; .15 \text{ GeV}</math> (<math>E_t = (\text{adc-ped} + 0.5/\text{gain})</math>)</li> <li>• <math>\text{etow gain} &gt; 0</math></li> <li>• <math>\text{adc} &gt; \text{etowPed} + \text{sigPed} * 3</math></li> </ul>

## L2BW triggered



## L2EW triggered



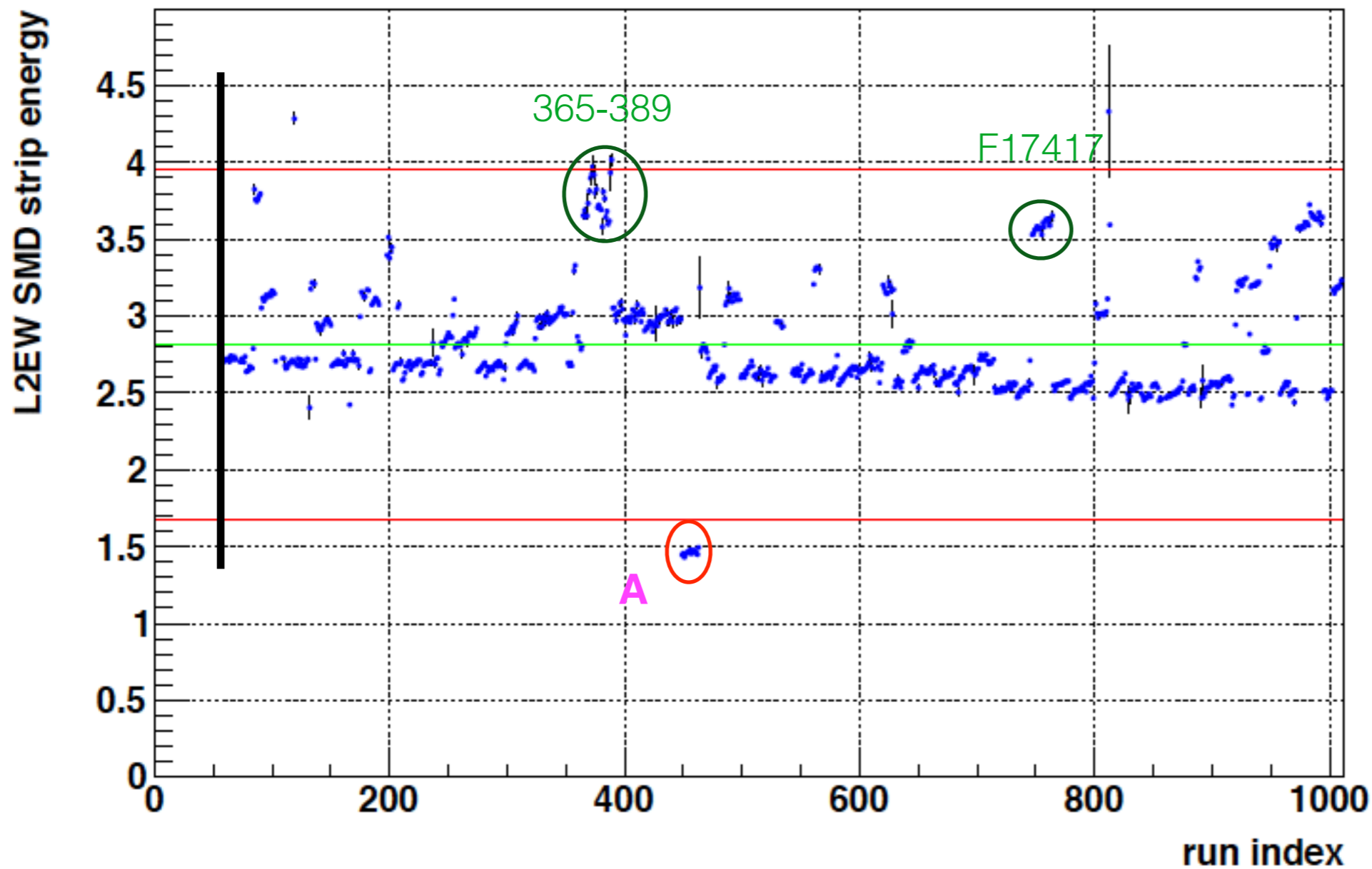
Outliers A: -> OK

- Starting from middle of the F17333 (15) , F17335, F17338, F17340, F17341 30% of EEMC crate is off.
- seen in track phi plots as well.



# ESMD -strip Et

Parameter	Selection	Cuts
Et	Avg. of strip Et of 288 strip per triggered event	



**F17244 < NO ESMD**

- ESMD only included after day 77 starting from F17244

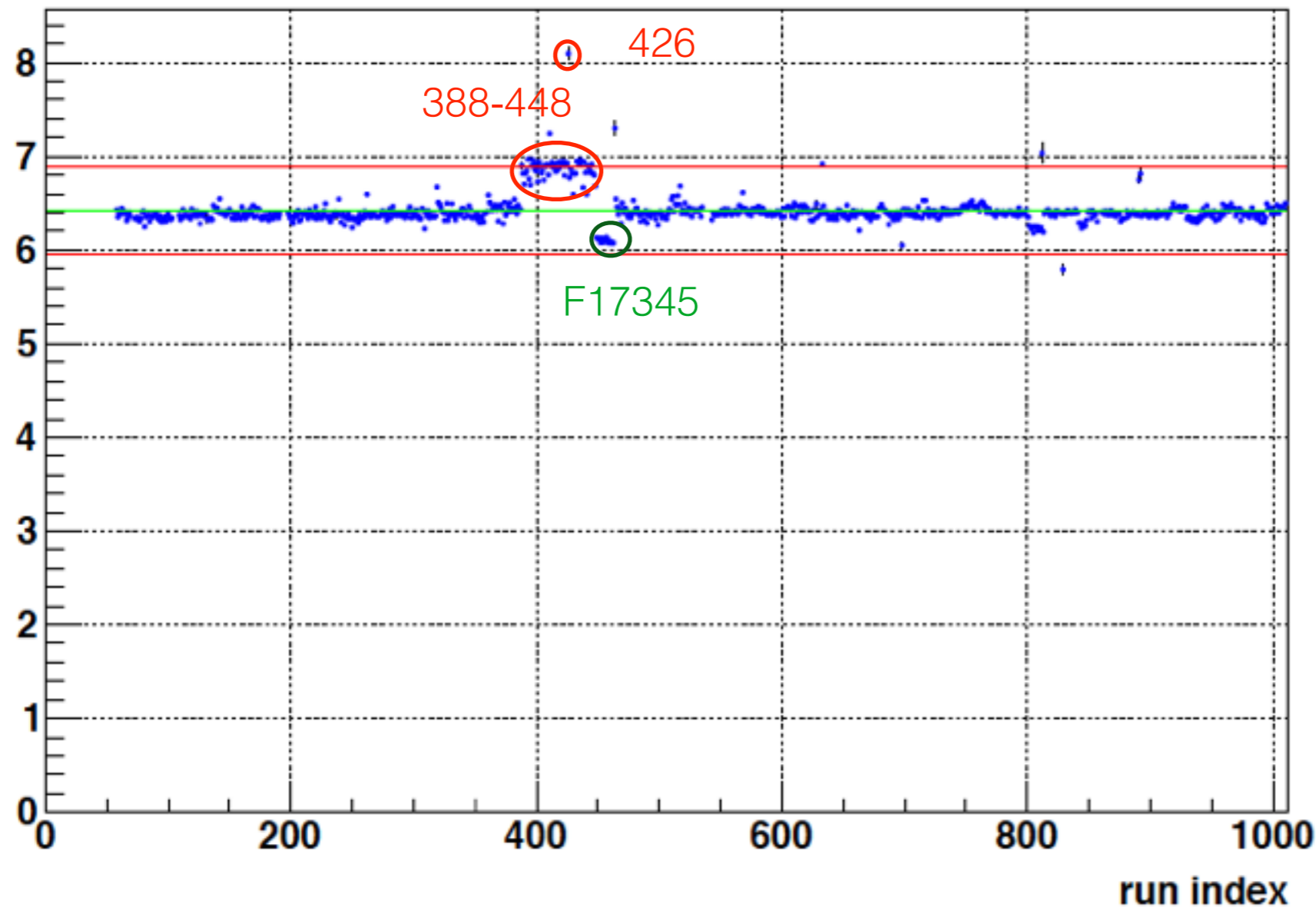
**Outlier A:**

- F17345

# ESMD -strip Et

Parameter	Selection	Cuts	
Et	Avg. of strip Et of 288 strip per triggered event		

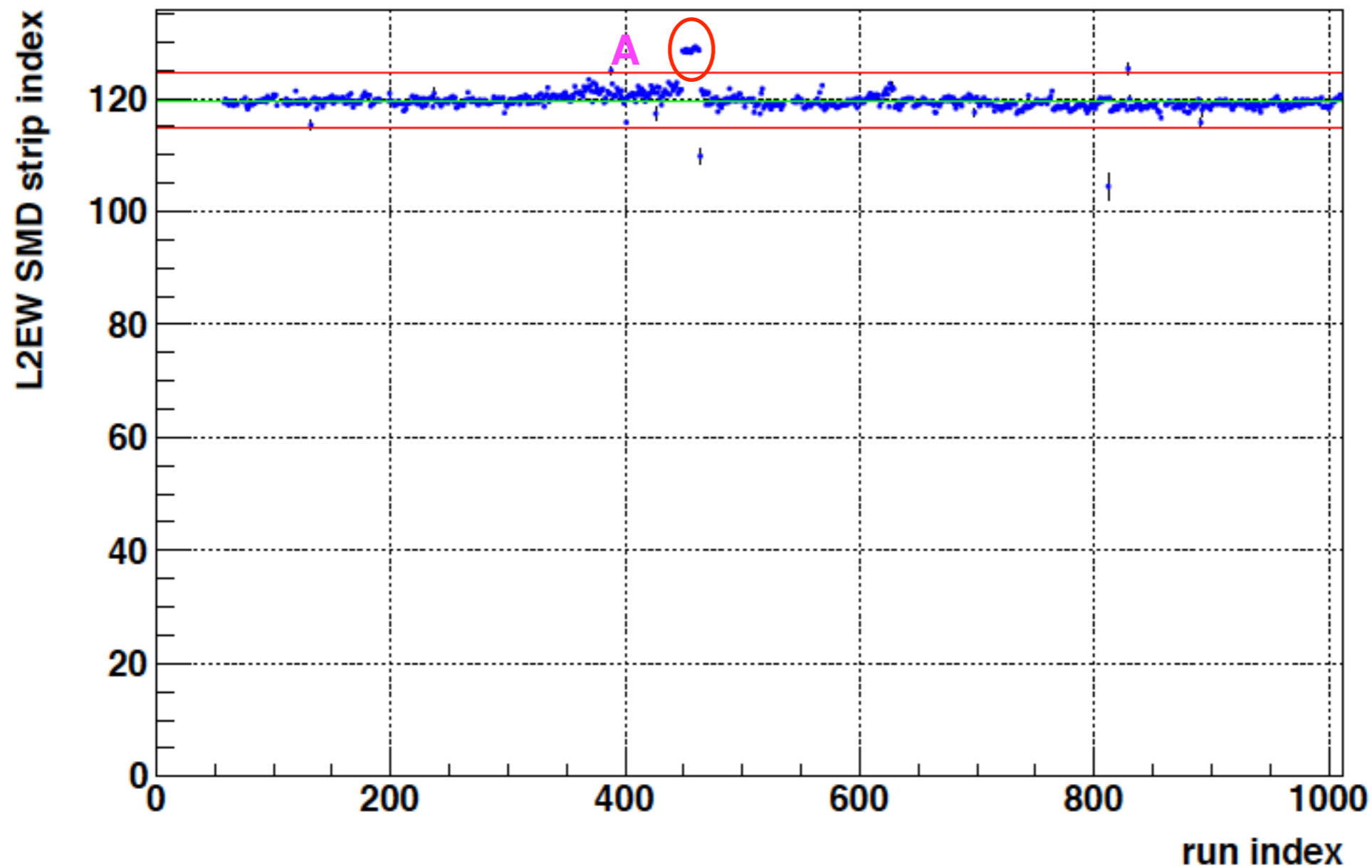
L2EW SMD strip sector



- Starting from middle of the ( R14096090 ) F17333 (15) , F17335, F17338, F17340, F17341 30% of EEMC crate is off.
- But not all the runs are outliers from these fills

# ESMD -sector Index

Parameter	Selection	Cuts	
Et	Avg. of strip Et of 288 strip per triggered event		



**Outlier A:**

- F17345

# Summary

- Runs Excluded:
  - Mid-rapidity analysis
    - Lumi  $\leq \sim 10^{-4} \text{ pb}^{-1} = 27$
    - Runs excluded from plots: =      Total exclude :
  - Forward-rapidity analysis:
    - Lumi  $\leq \sim 10^{-4} \text{ pb}^{-1} = 27$
    - Runs excluded from plots: =
      - No ENDCAP , No ESMD : 18, 57 = 69 , other :      Total exclude :
- Pre Run-Lists : Mid-rapidity (Lumi:)      Forward-rapidity (Lumi:)