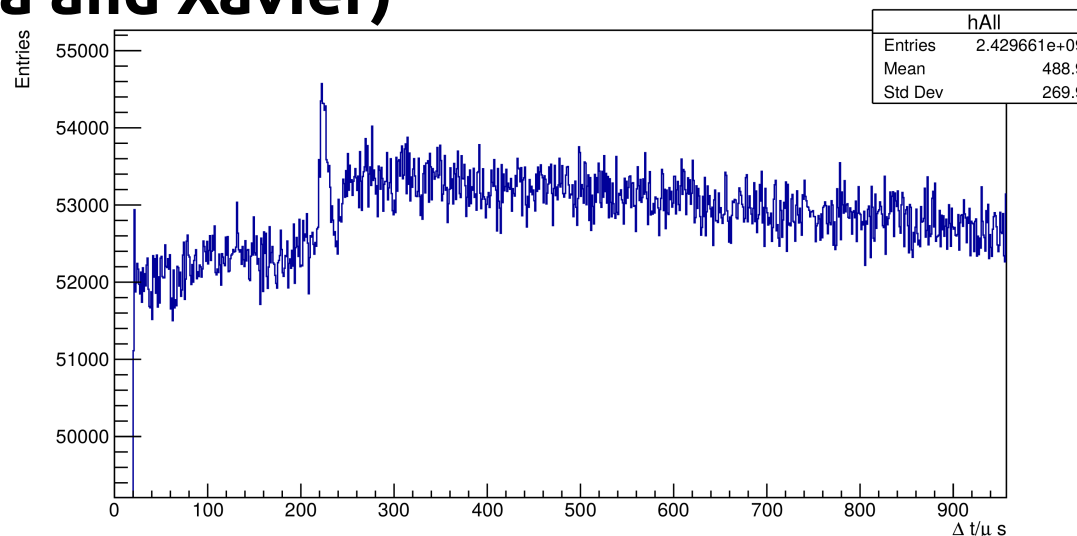


T2Dumps: Time Differences

Martin Schimassek, Darko Veberič
Karlsruhe Institute of Technology (KIT), Germany

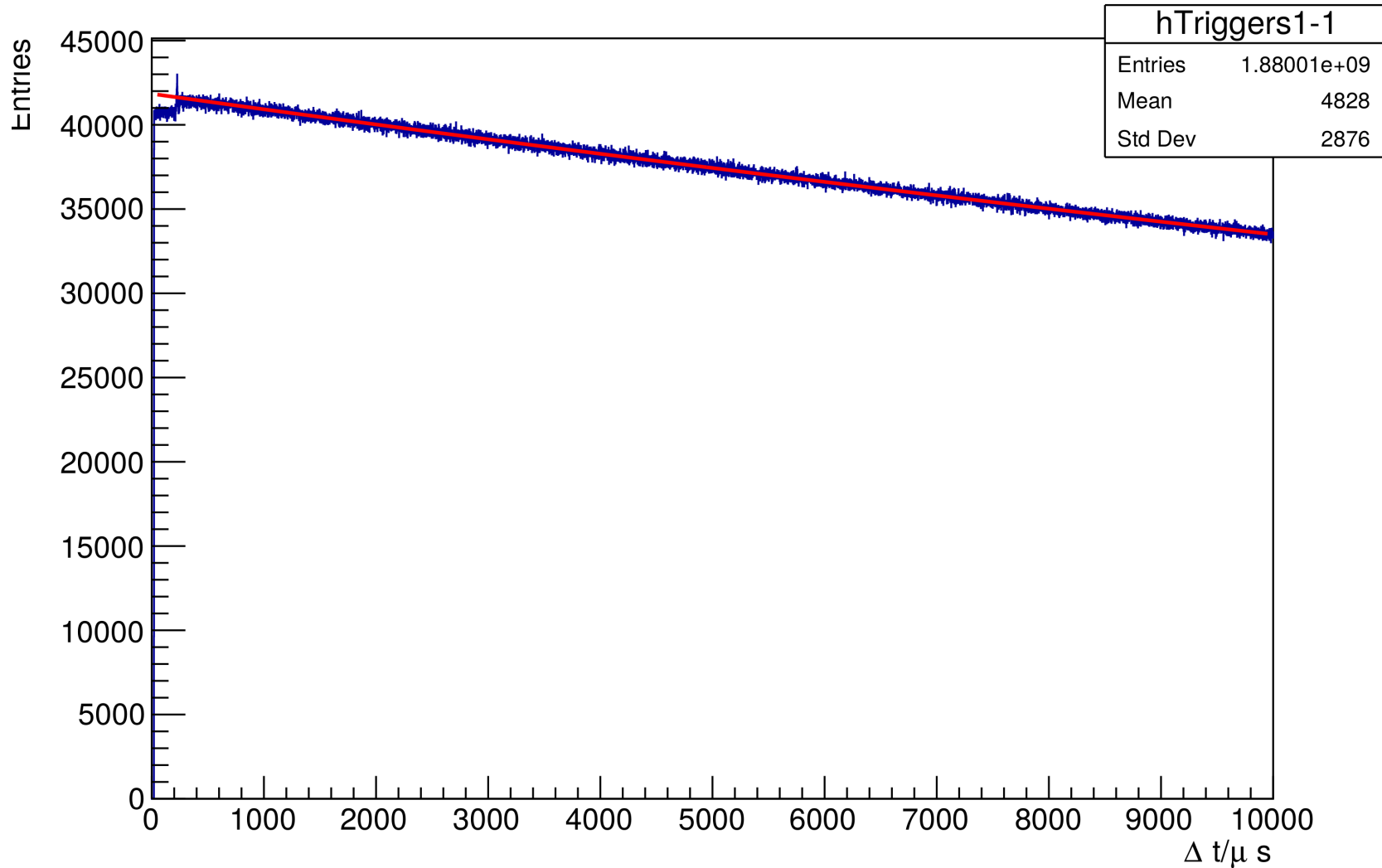
Problem?

- T2-Messages (μs , Id, Trigger-type)
- Time difference between triggers of a station
- Sum over all stations
- Check for 'unusual' features: expect dead-time and exponential
- First work: c.f. Cosmo-Geo meeting 31.05.2018 on the wiki (Roberta and Xavier)



Threshold-Threshold

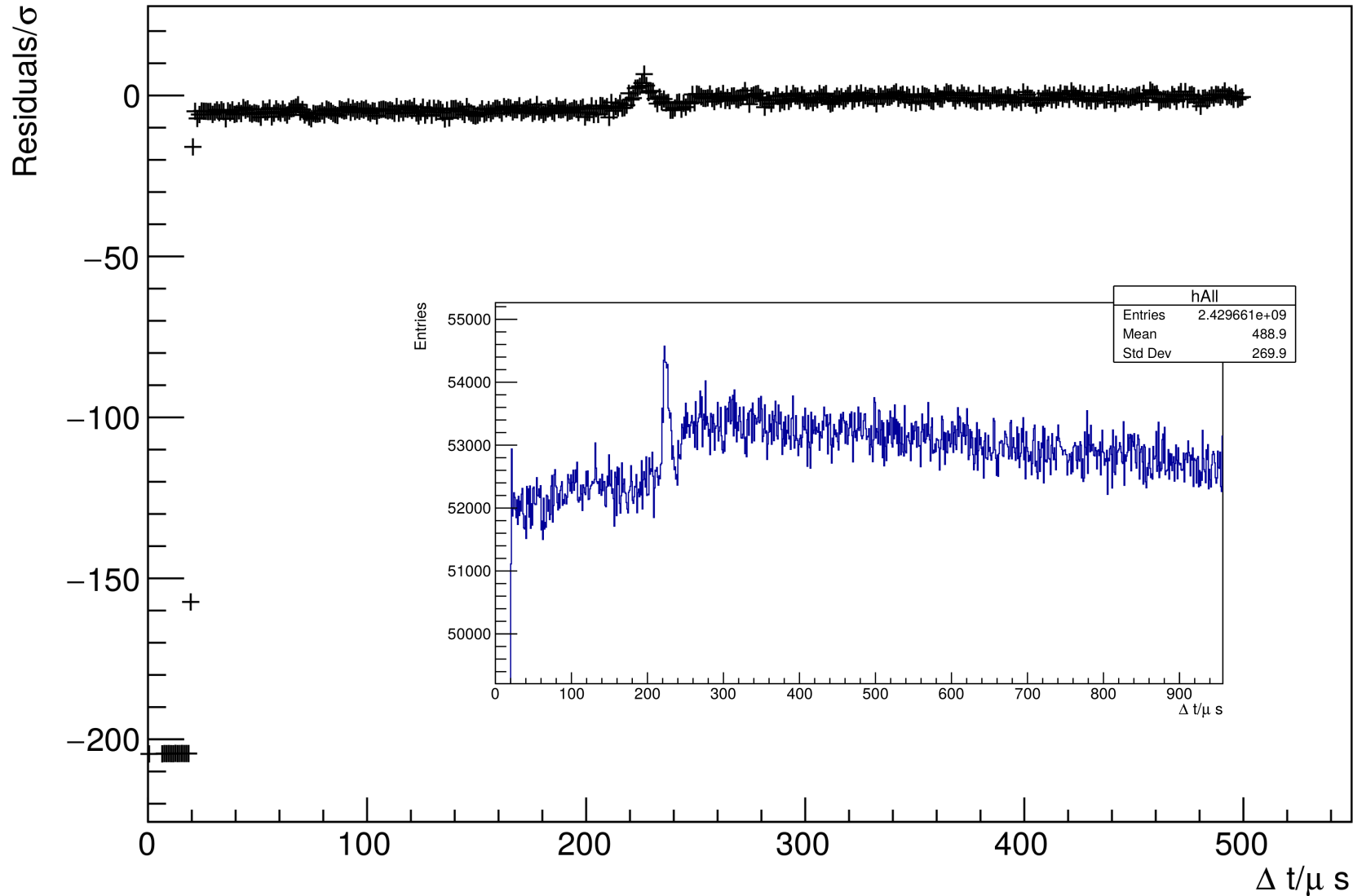
hTriggers1-1



Consider only Threshold-T2s

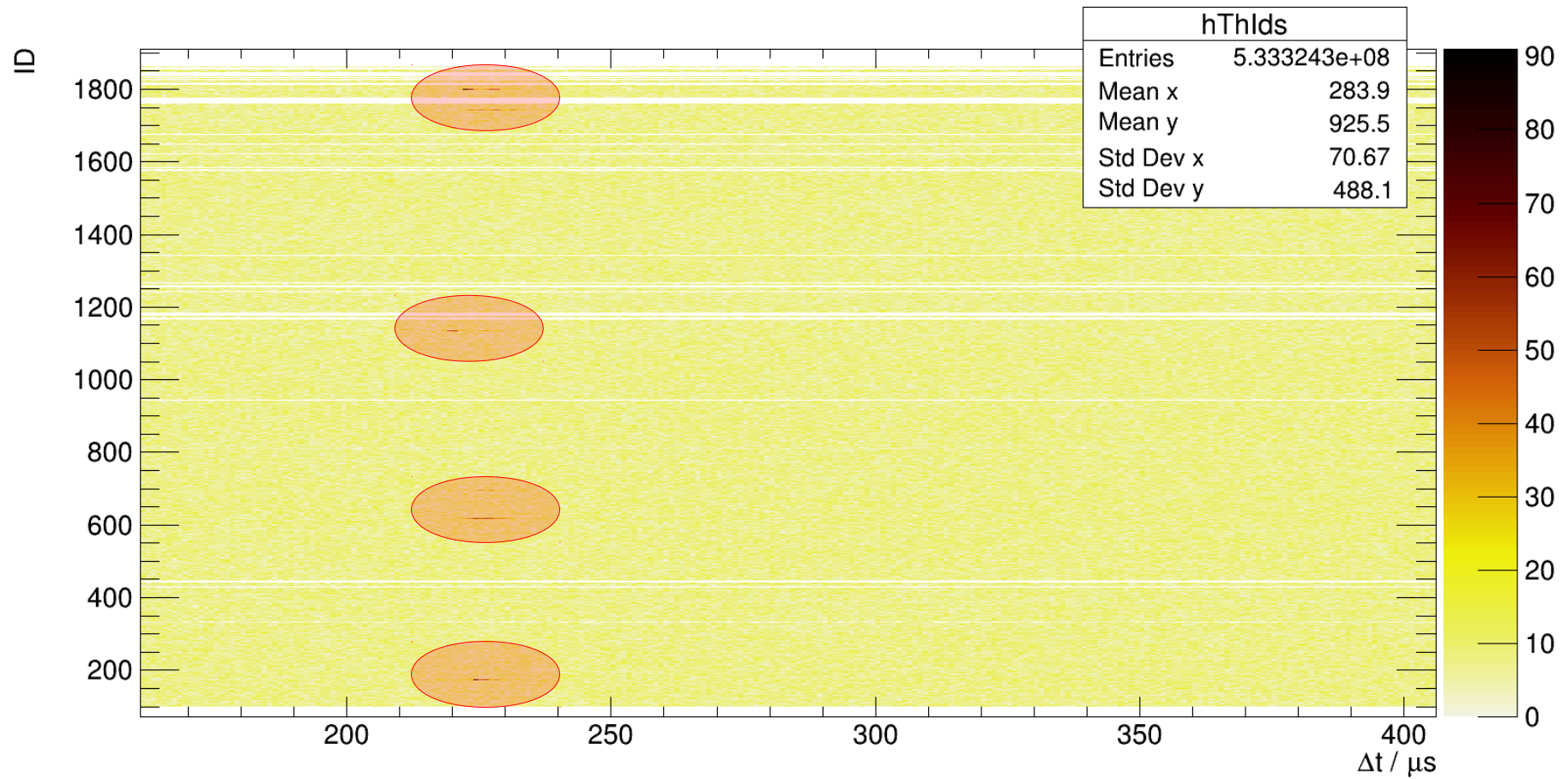
Threshold-Threshold

gResidualsZoom1-1



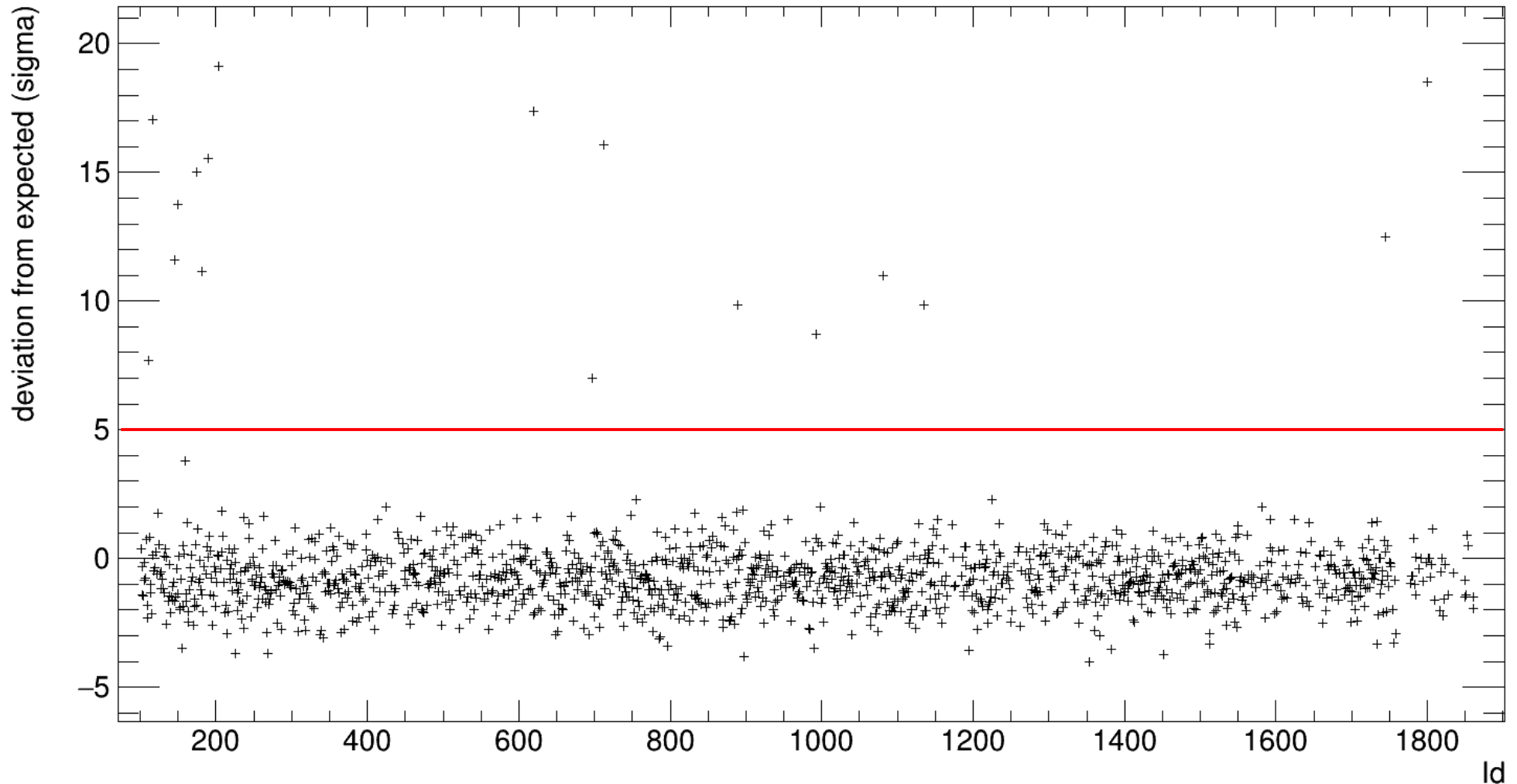
Consider only Threshold-T2s

Threshold-Threshold



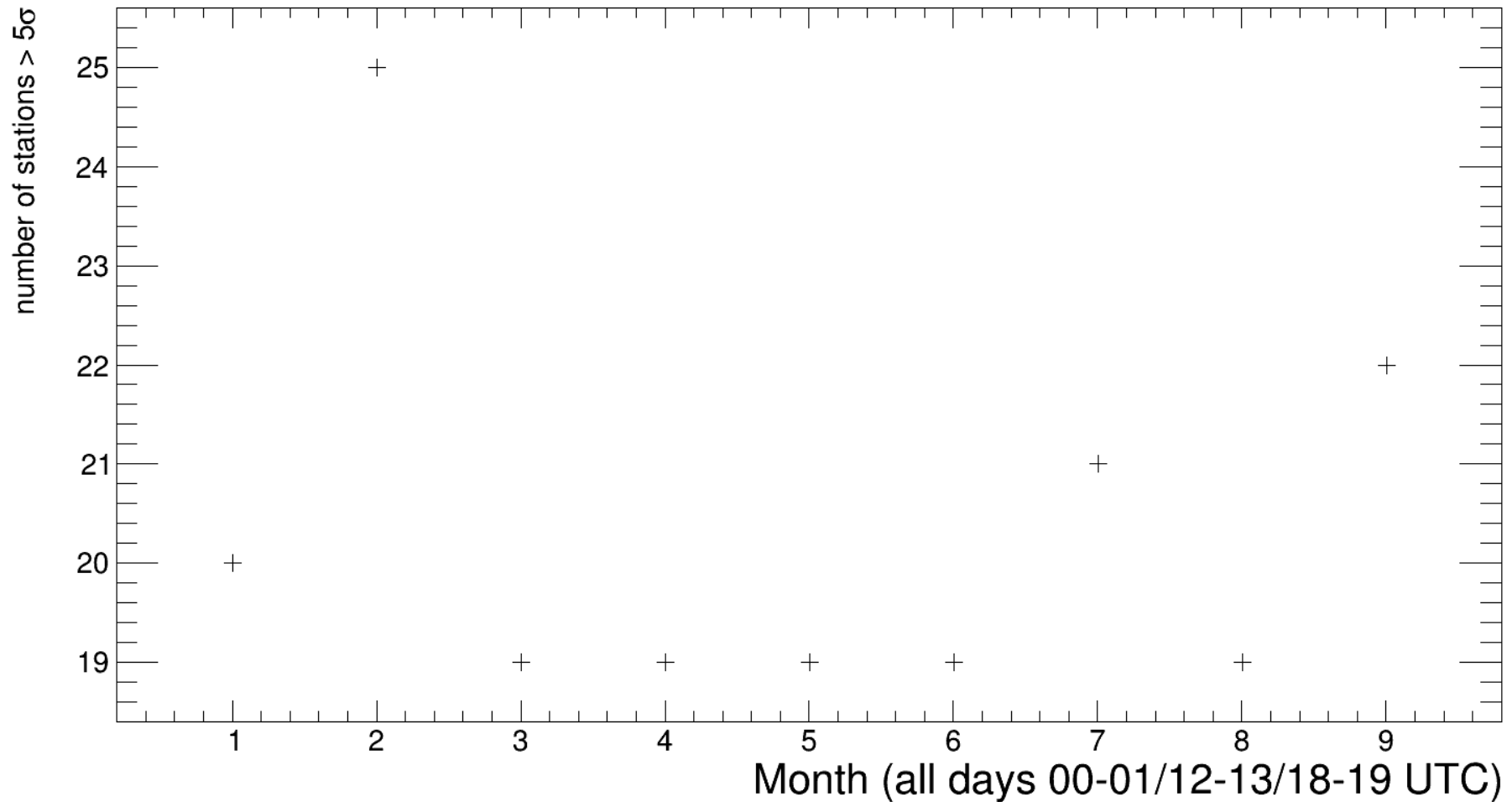
Peak is effect of few stations

Threshold-Threshold



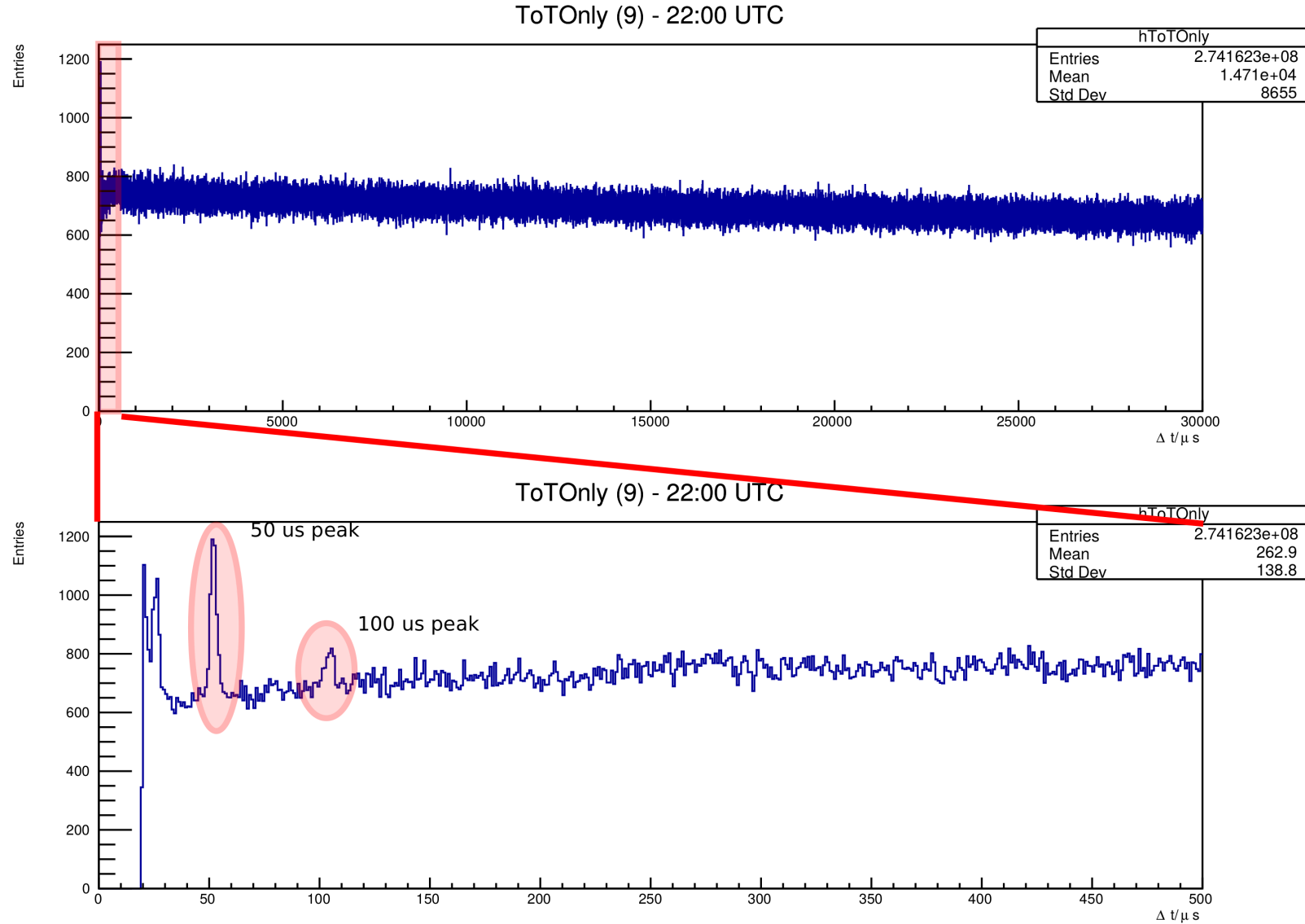
Time interval (200 μ s, 235 μ s)

Threshold-Threshold



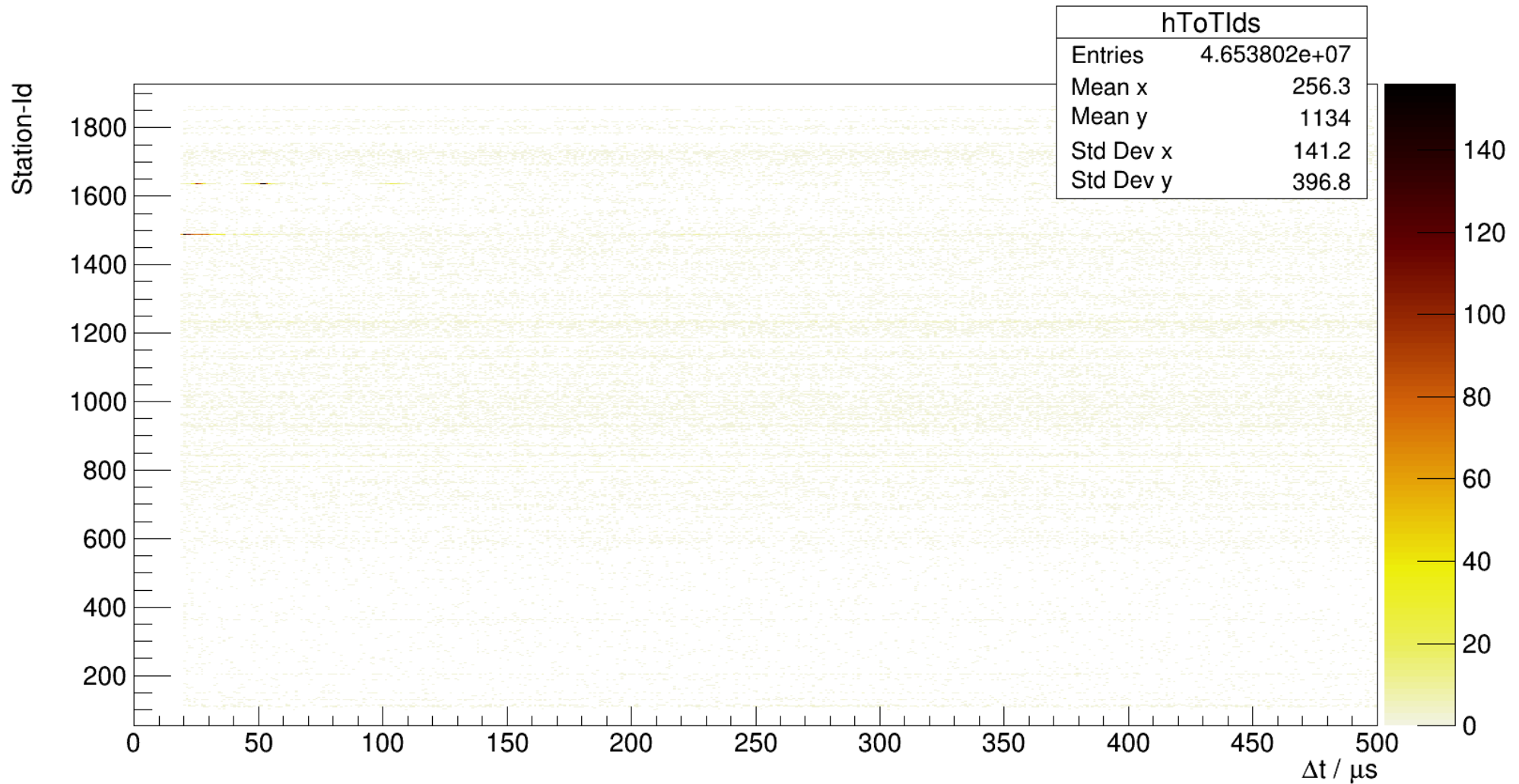
**Time intervals (20 μs, 200 μs)
(200 μs, 235 μs)**

Closer Look to ToT



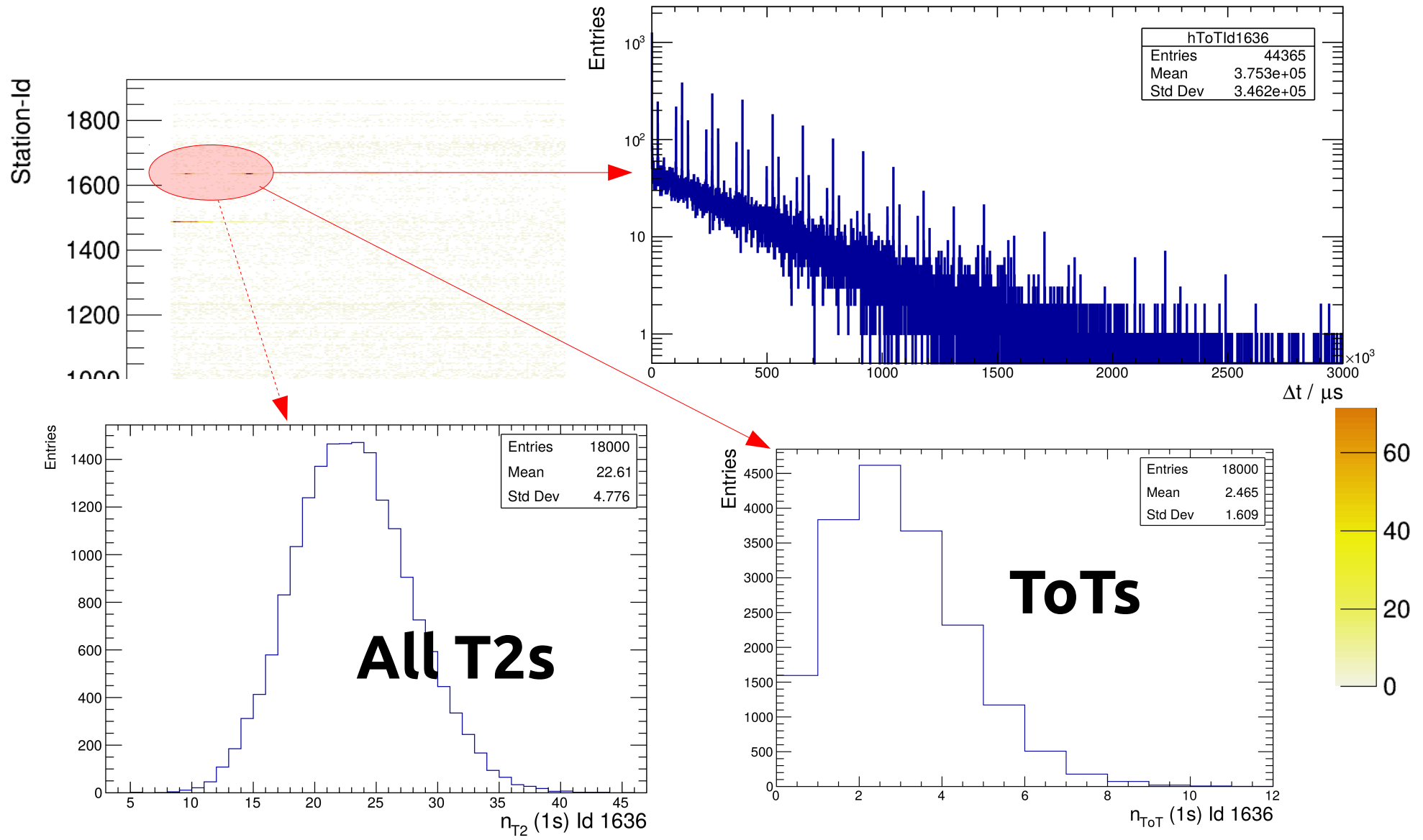
Consider only ToTs (without Th-T2s in between)

Closer Look to ToT

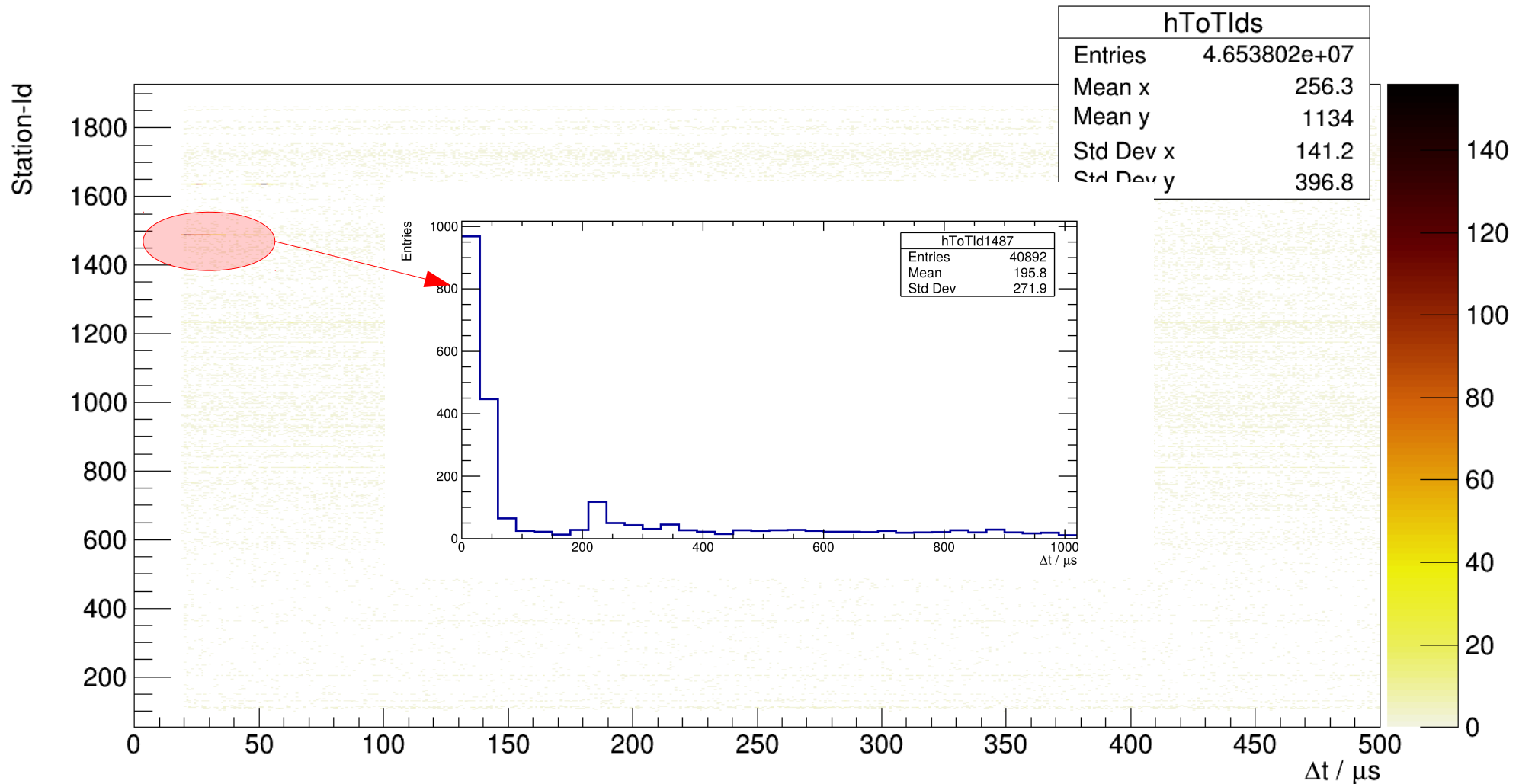


Consider only ToTs (without Th-T2s in between)

Closer Look to ToT

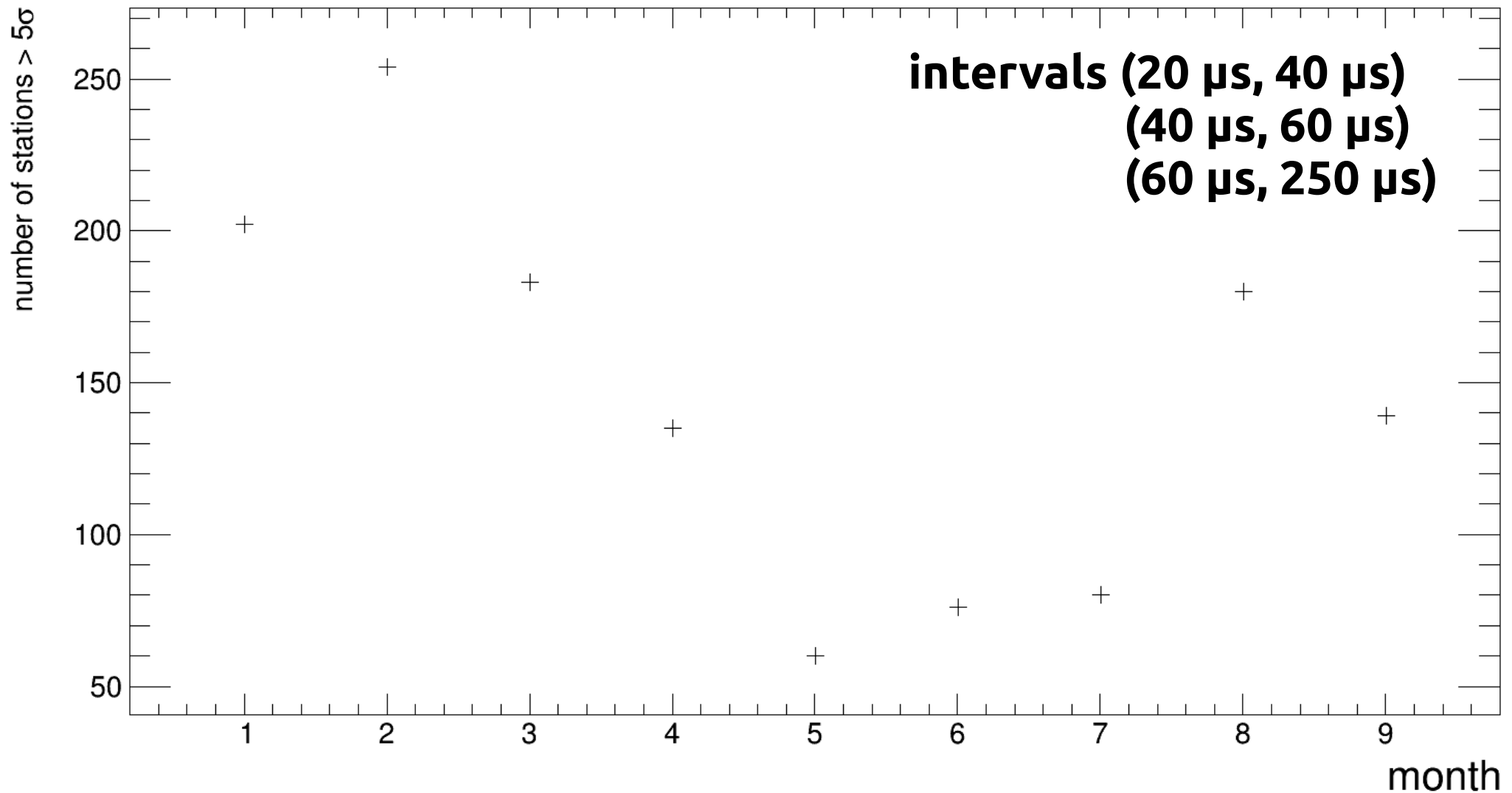


Closer Look to ToT



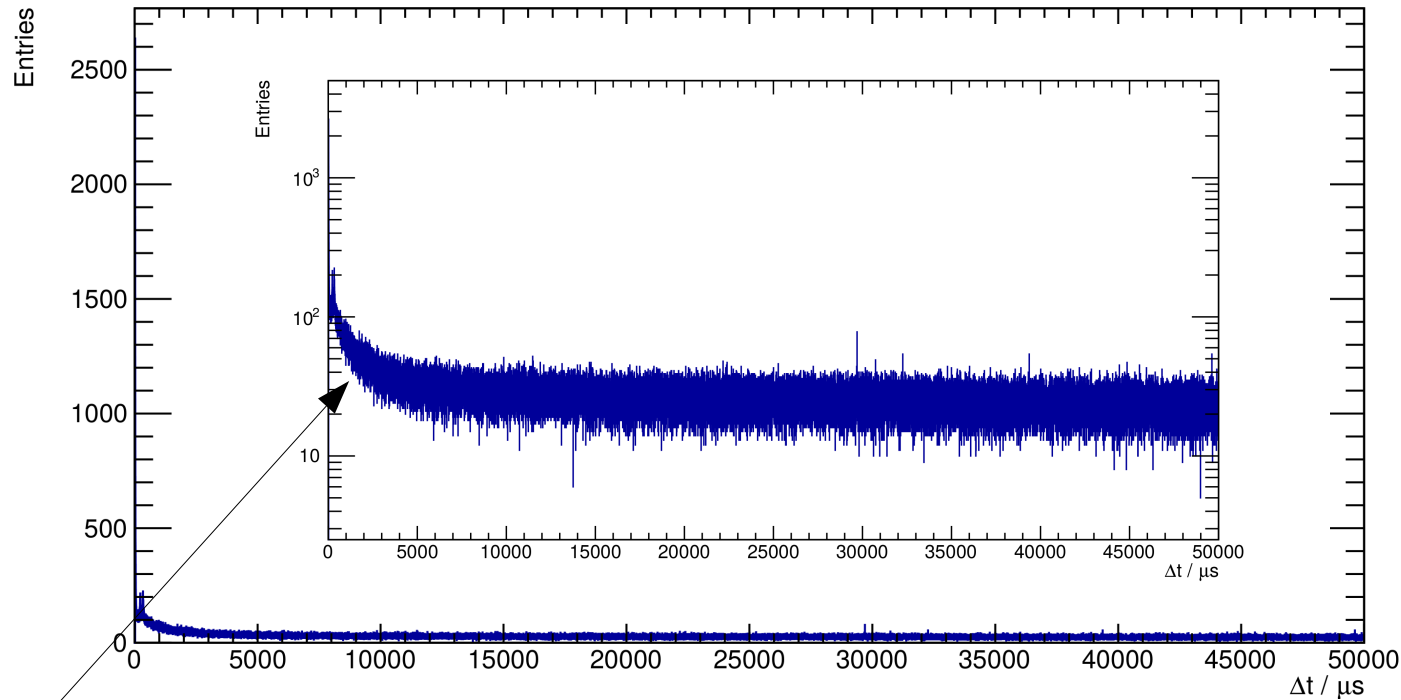
Consider only ToTs (without Th-T2s in between)

ToTs Number of Stations

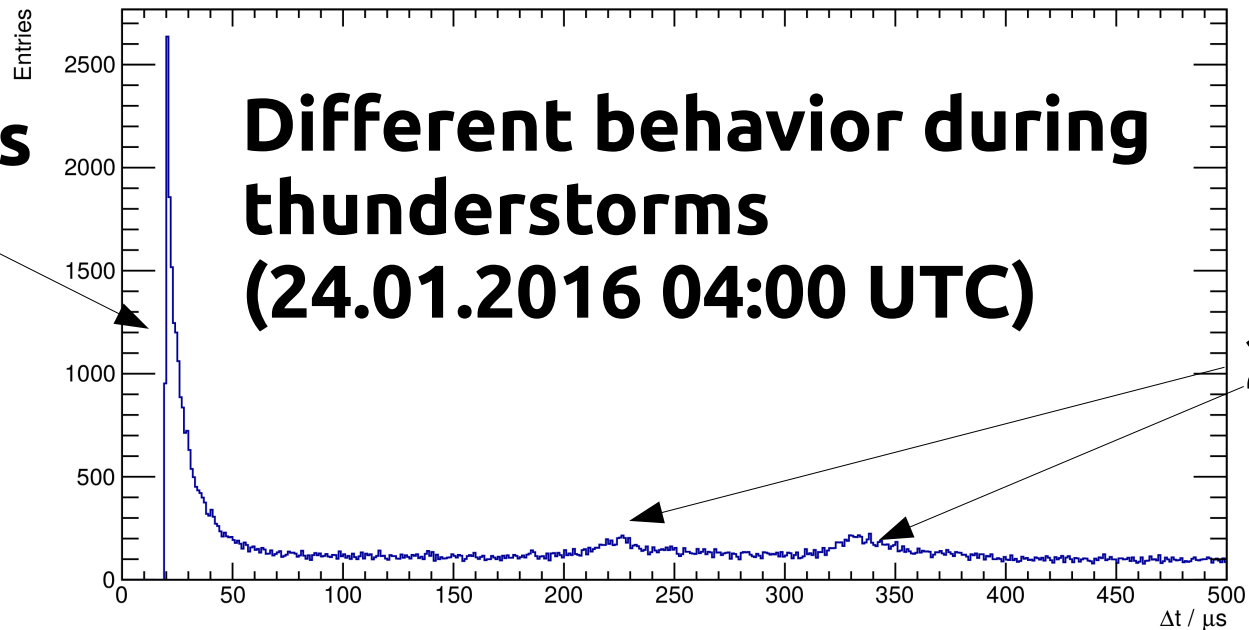


Temperature or Thunderstorms?

ToTs: Thunderstorms

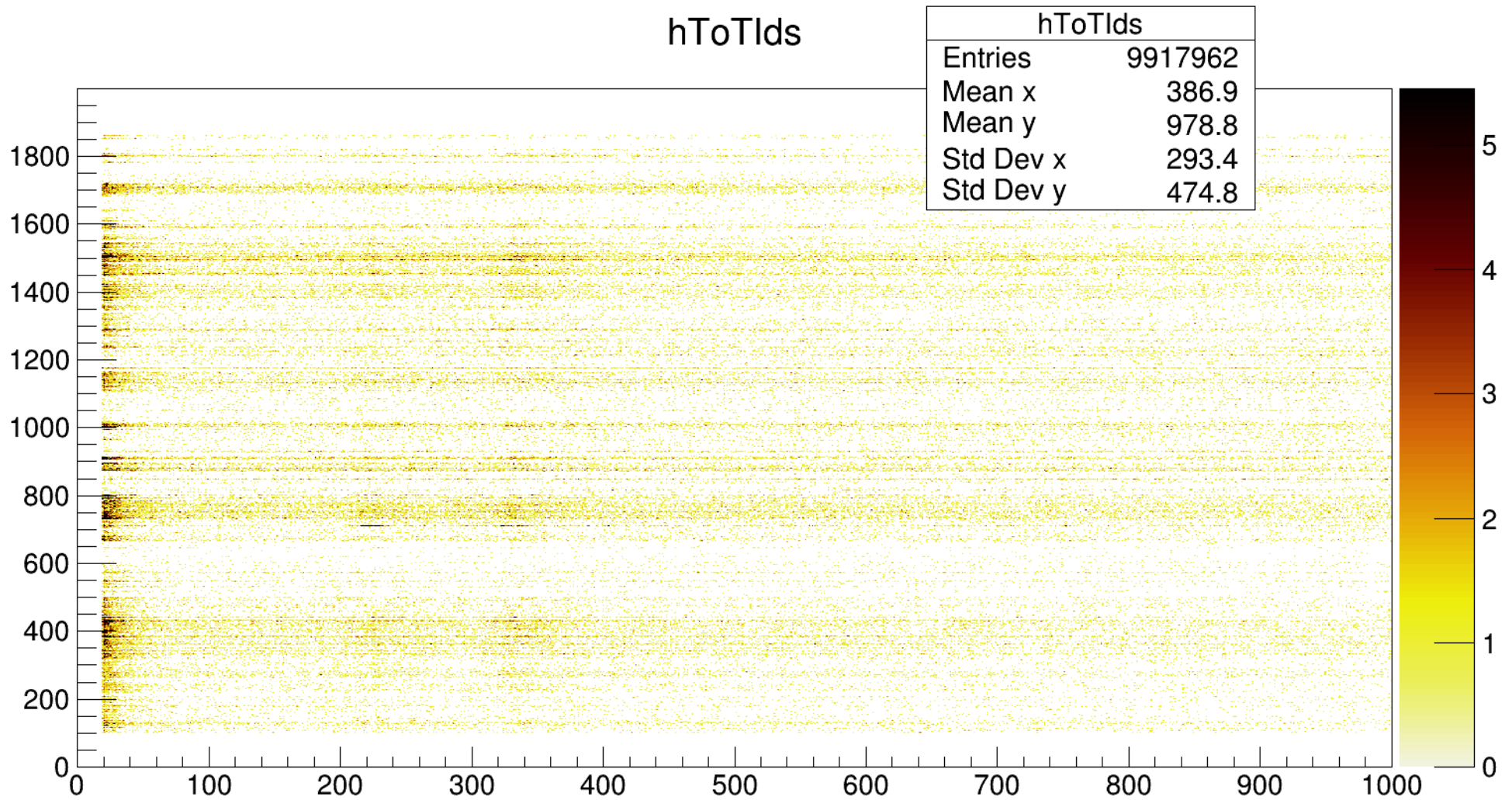


**Excess at
small times**



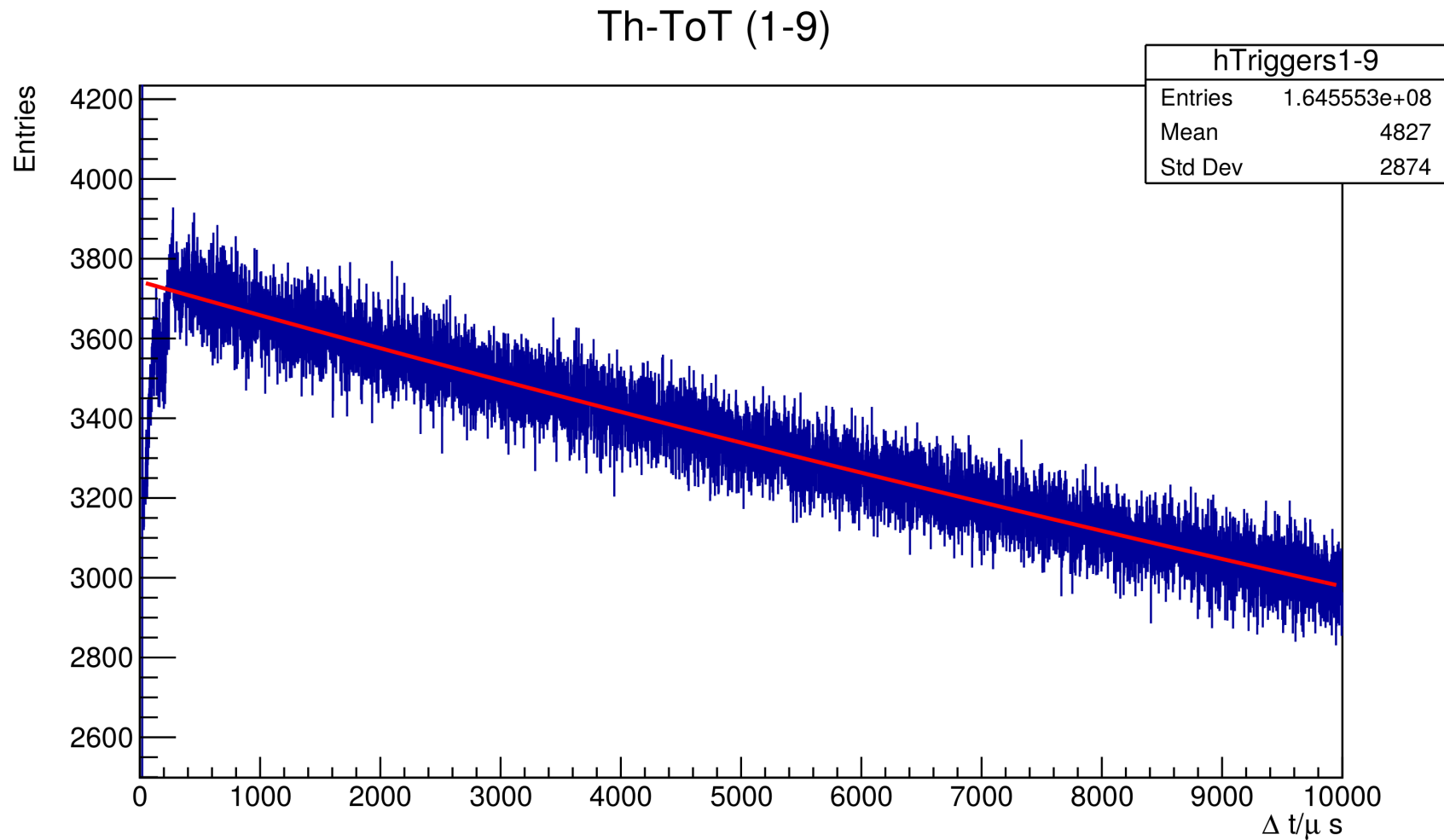
2 new peaks

ToTs: Thunderstorms



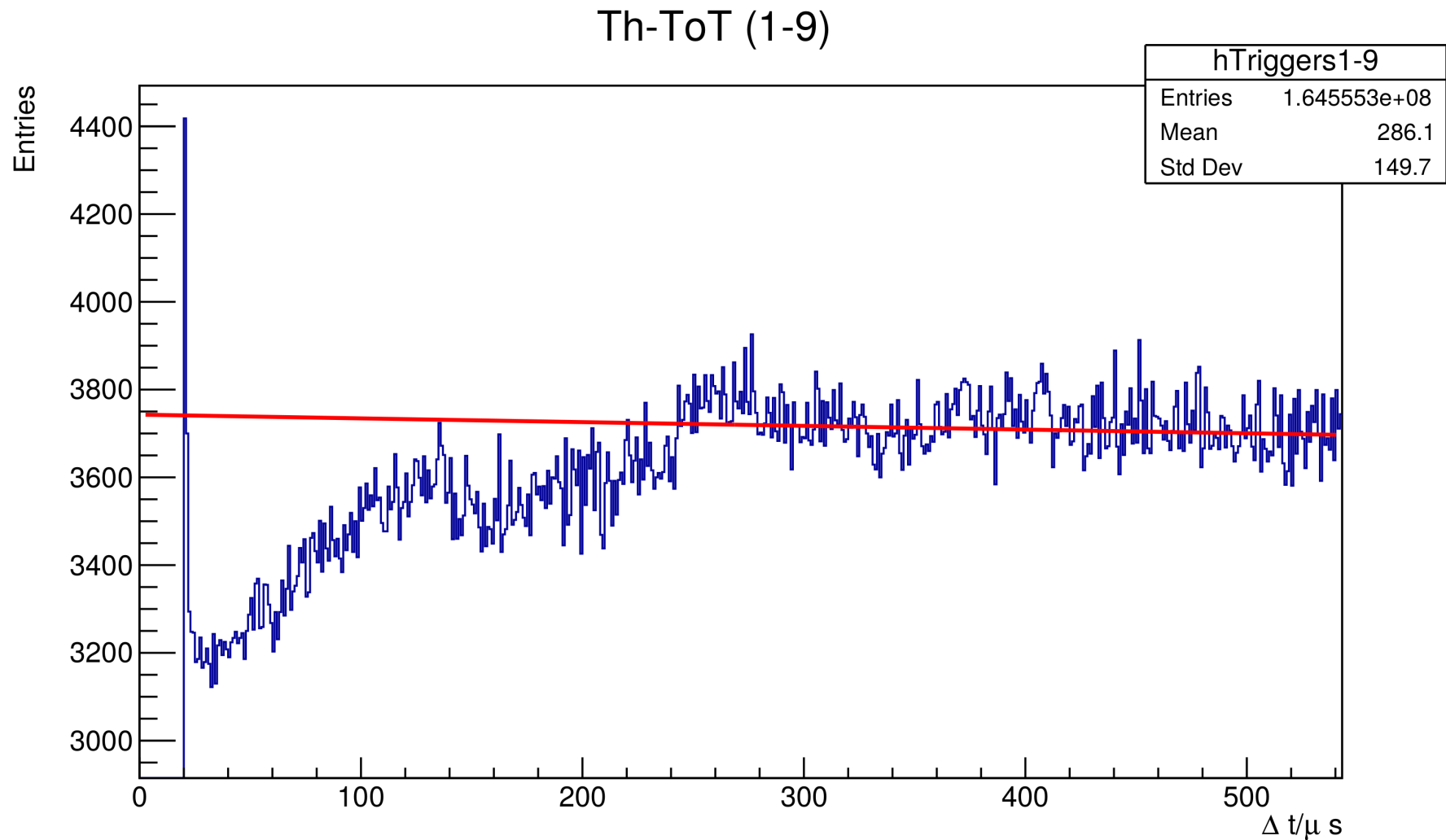
Mostly collective effect

Threshold-ToT



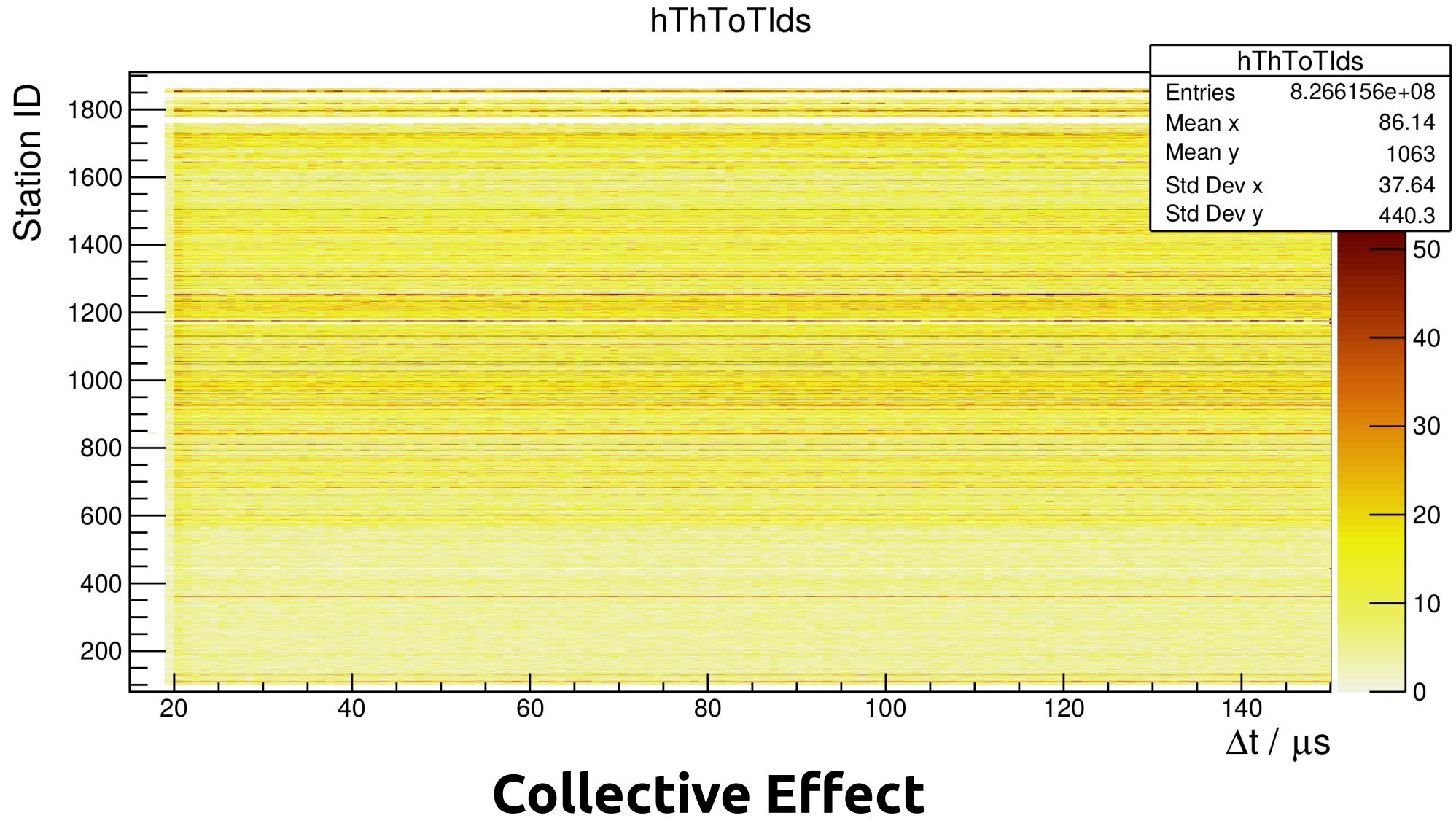
Threshold-T2s followed by ToTs

Threshold-ToT



Excess at 20 μs

Threshold-ToT



Conclusions

- **Some stations show peaks in time differences, but look normal in total T2-rate**
- **Both types of triggers, but different stations**
- **‘Long term’ behavior probably masked by thunderstorms**
- **First work: c.f. Cosmo-Geo meeting 31.05.2018 on the wiki (Roberta and Xavier)**

Back-Up

Station Ids – June 2016

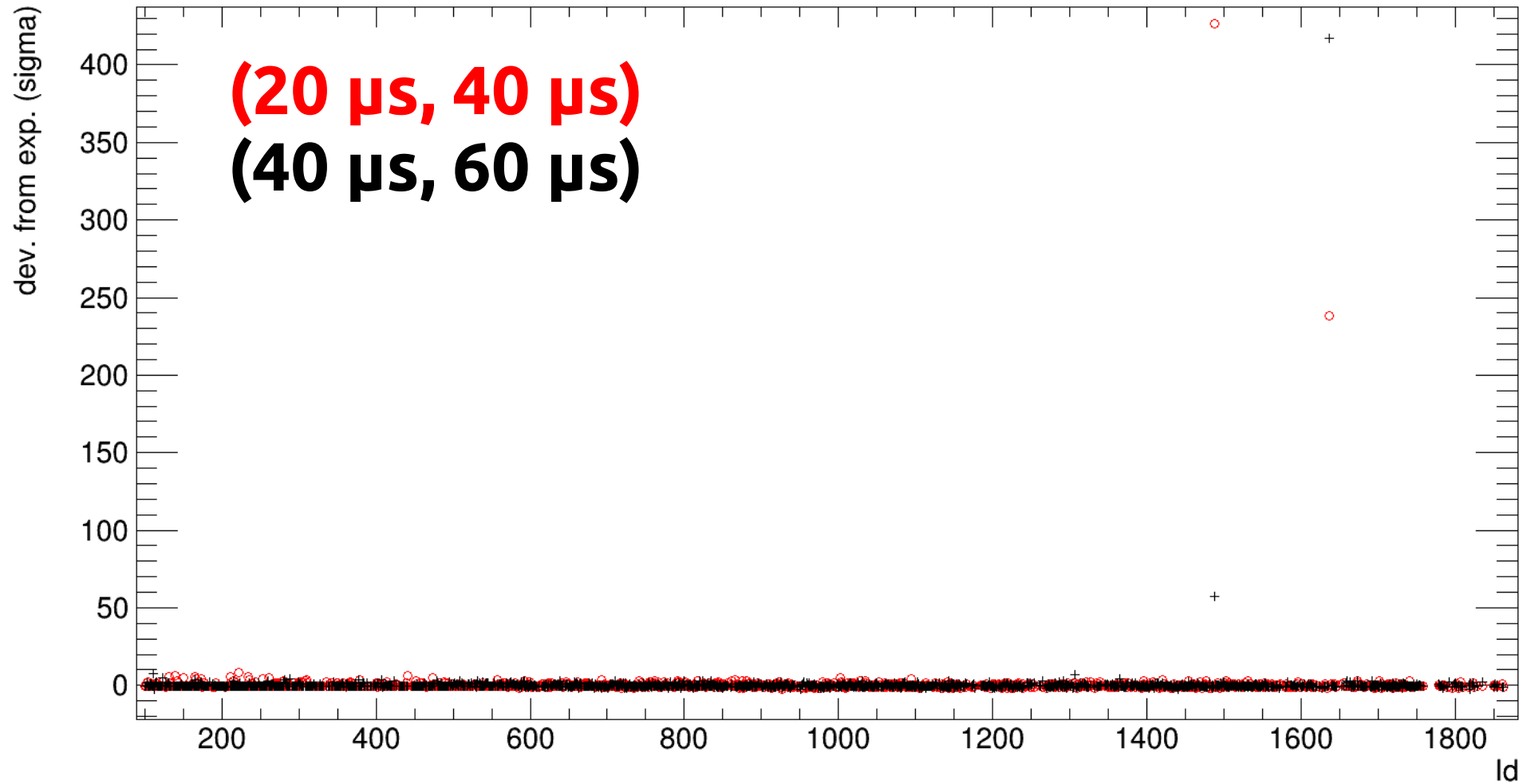
Threshold-T2s

ToTs (60-250 μ s)

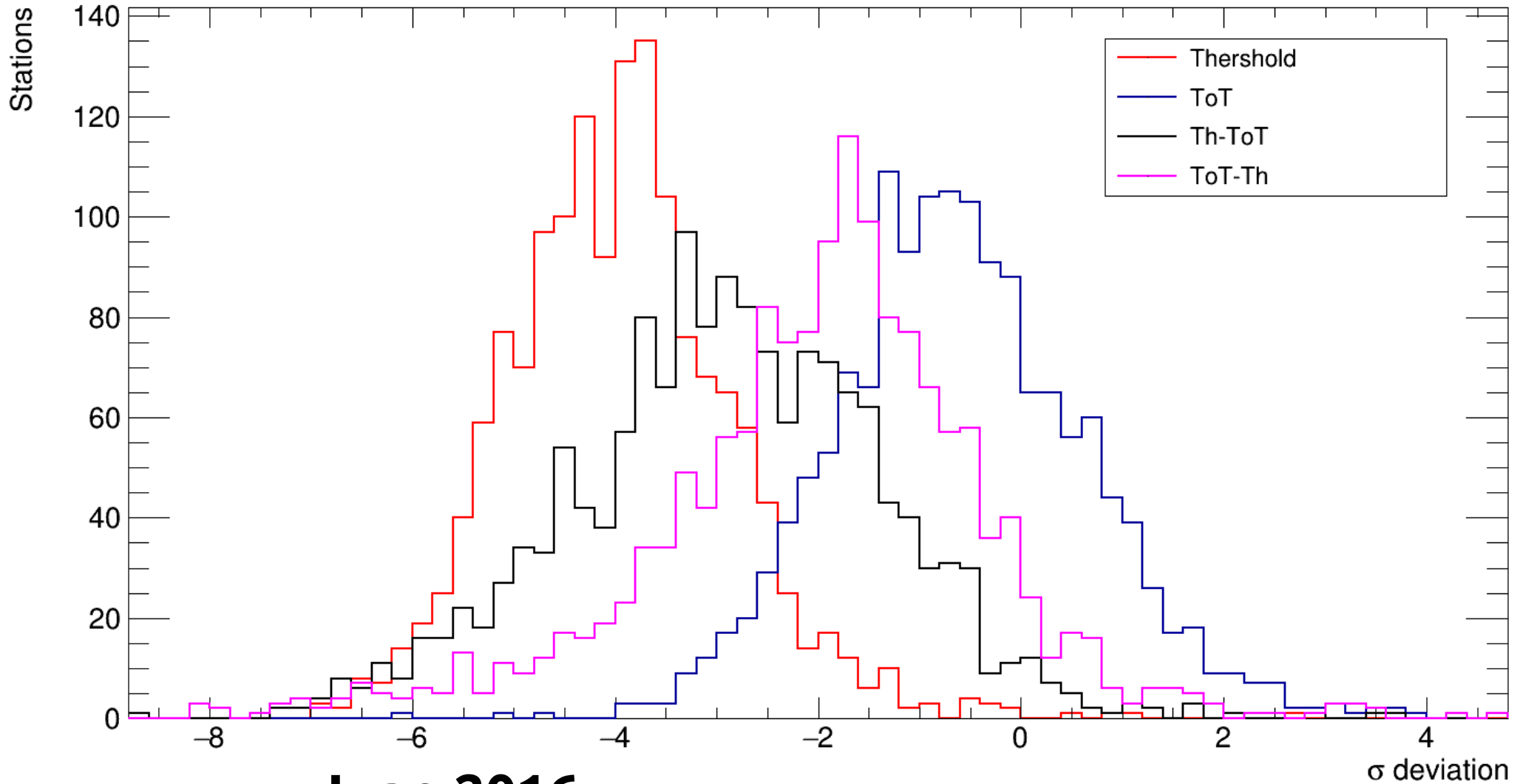
Id: 111
Id: 116
Id: 146
Id: 149
Id: 159
Id: 174
Id: 181
Id: 190
Id: 203
Id: 307
Id: 619
Id: 697
Id: 712
Id: 889
Id: 992
Id: 1081
Id: 1135
Id: 1744
Id: 1800

Id: 111	Id: 1215
Id: 151	Id: 1231
Id: 166	Id: 1234
Id: 213	Id: 1254
Id: 341	Id: 1320
Id: 379	Id: 1323
Id: 548	Id: 1453
Id: 794	Id: 1487
Id: 811	Id: 1506
Id: 816	Id: 1636
Id: 820	Id: 1643
Id: 824	Id: 1798
Id: 871	
Id: 877	
Id: 1176	

Closer Look to ToT

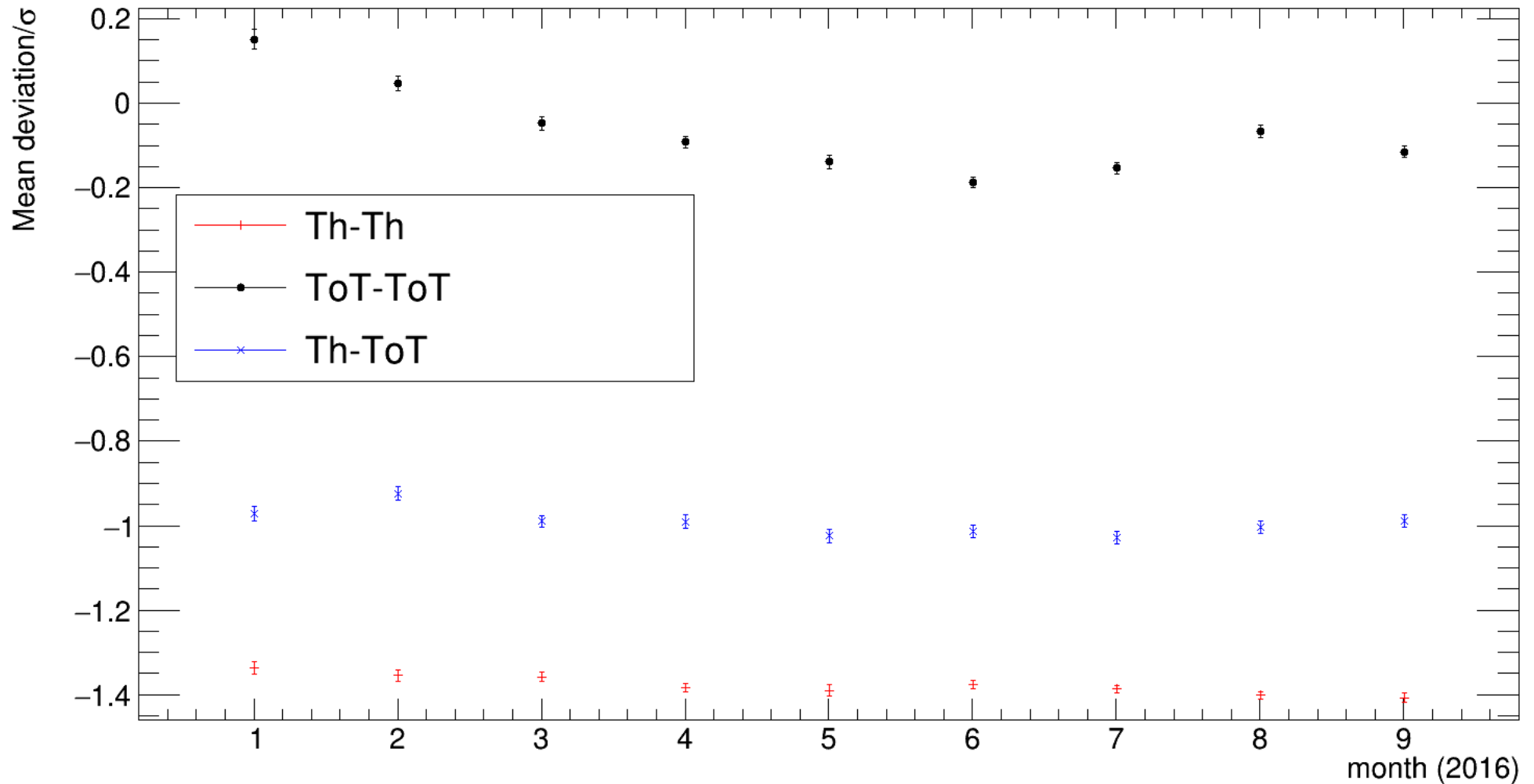


'Missing Triggers'



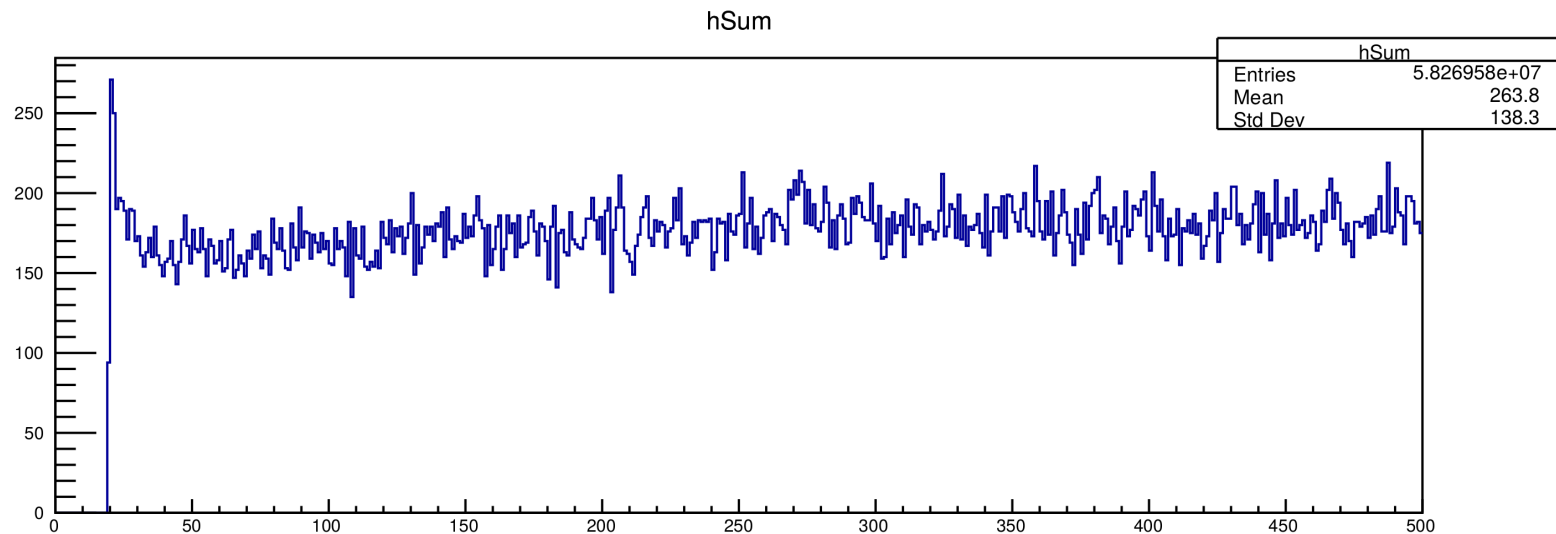
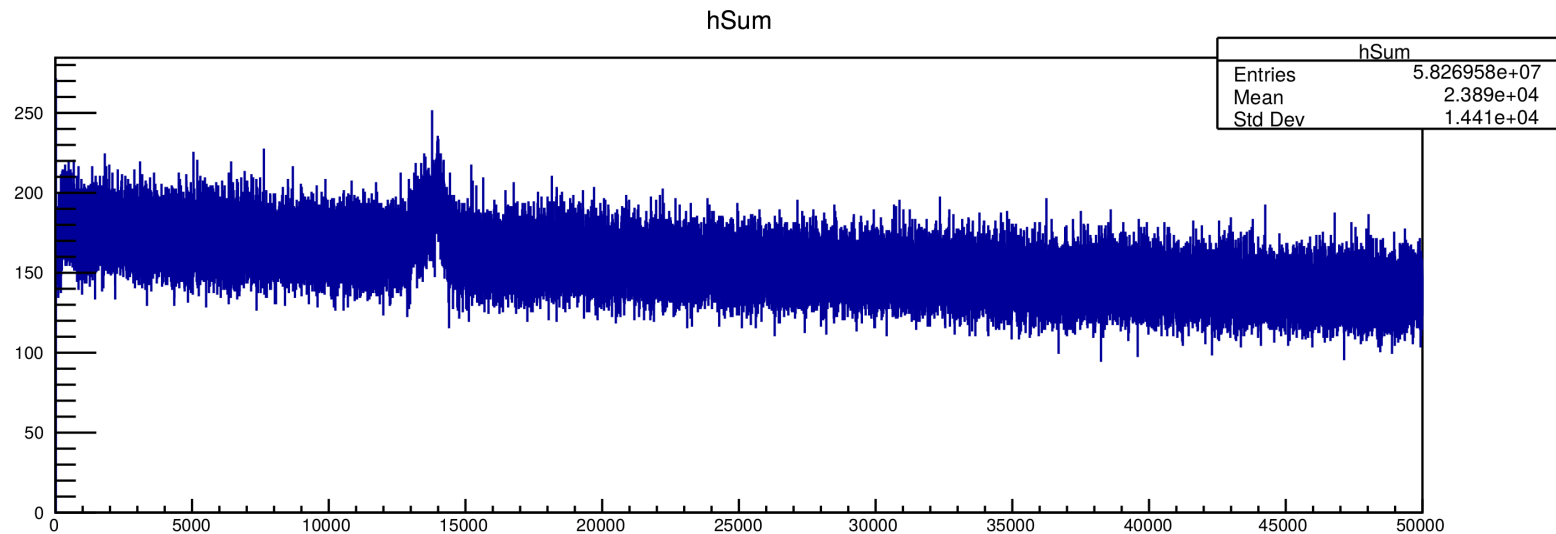
June 2016
(all days, UTC hours 0,12,18)

'Missing Triggers'



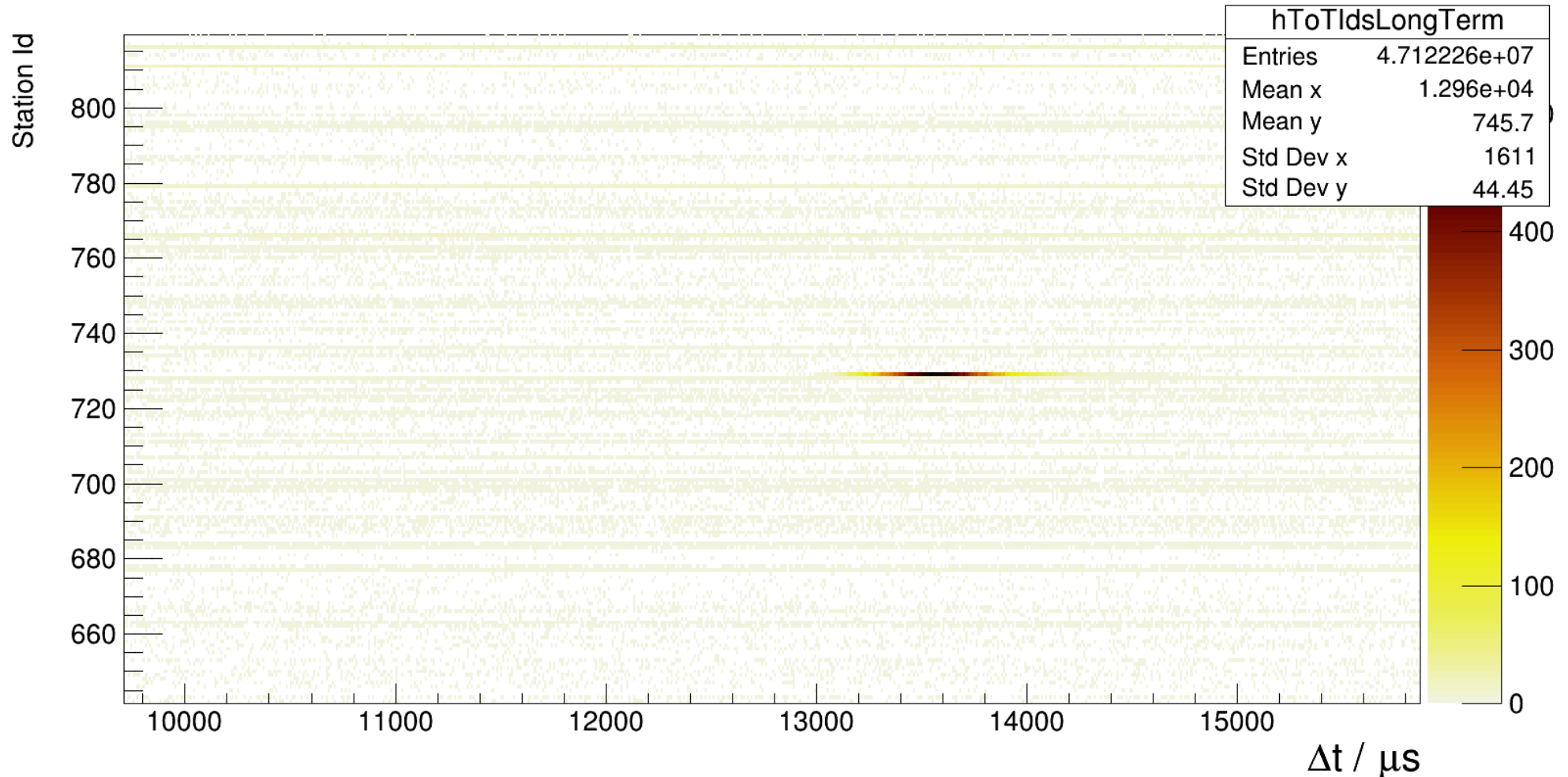
all days, UTC hours 0,12,18
deviations rescaled with $1/\sqrt{N}$

ToTs: More Features



Observed on 14/15 March 2016: peak at 13 ms

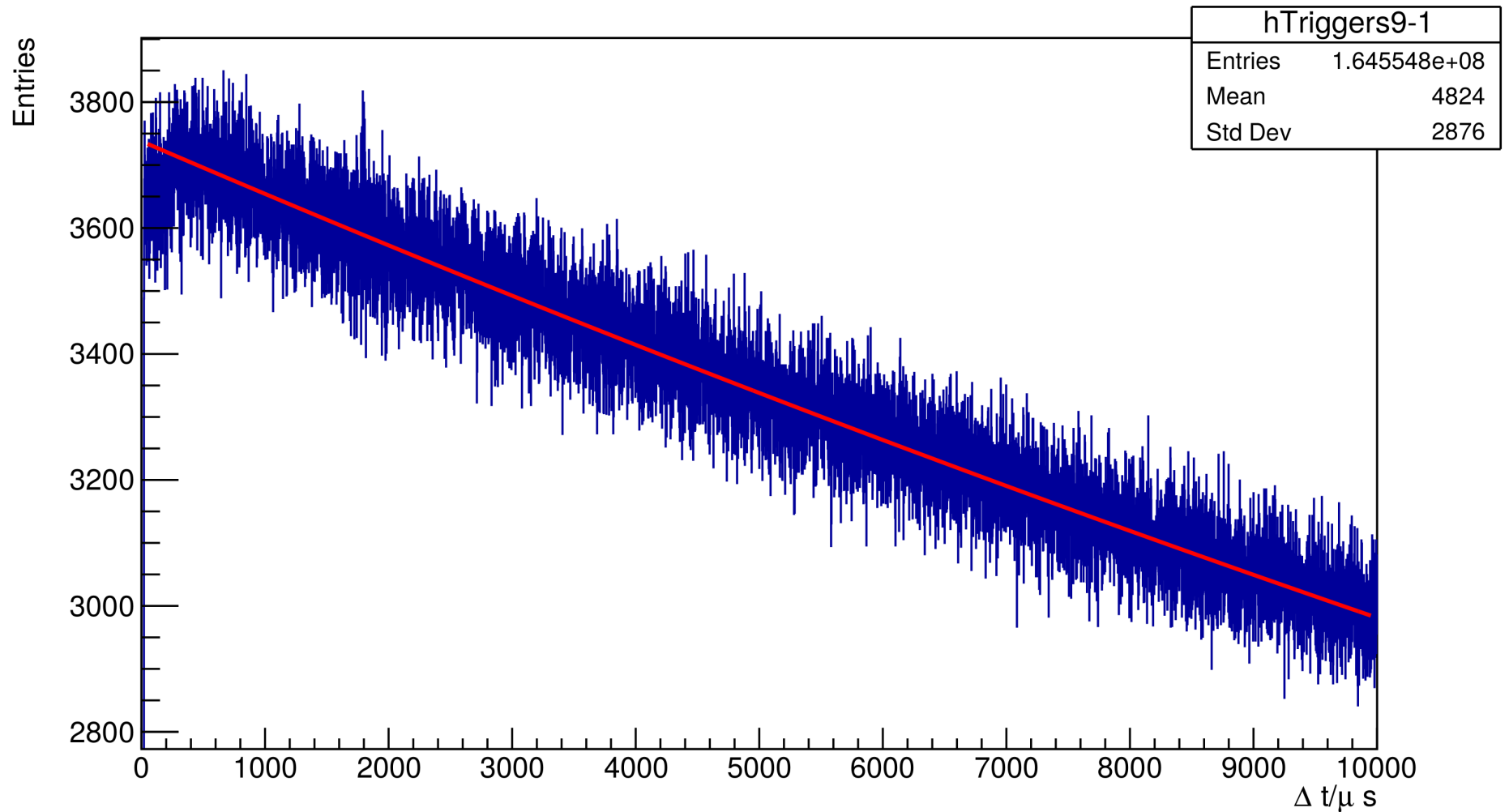
ToTs: More Features



Observed on 14/15 March 2016: caused by Station 729

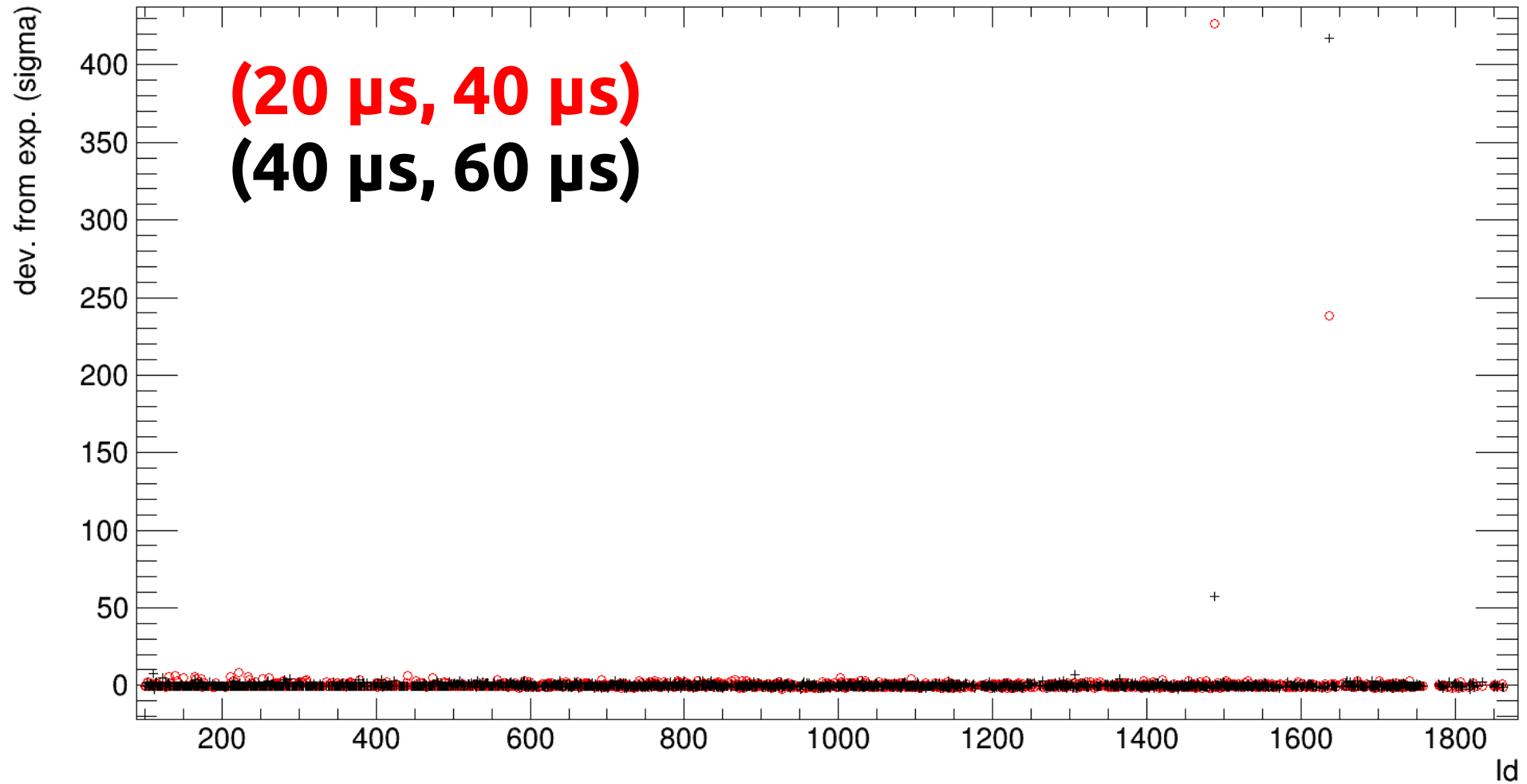
ToT-Threshold

ToT-Th

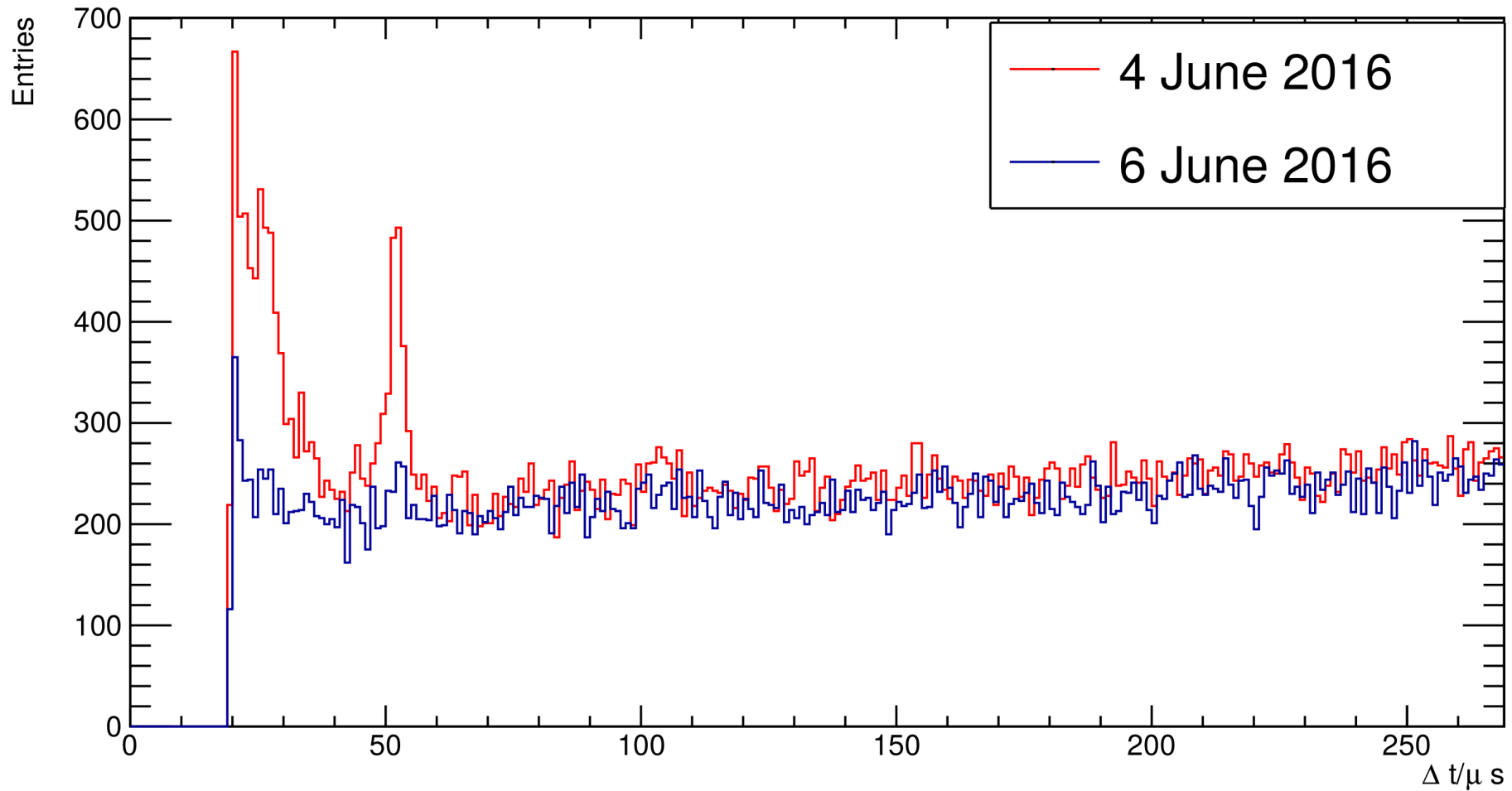


Almost no features

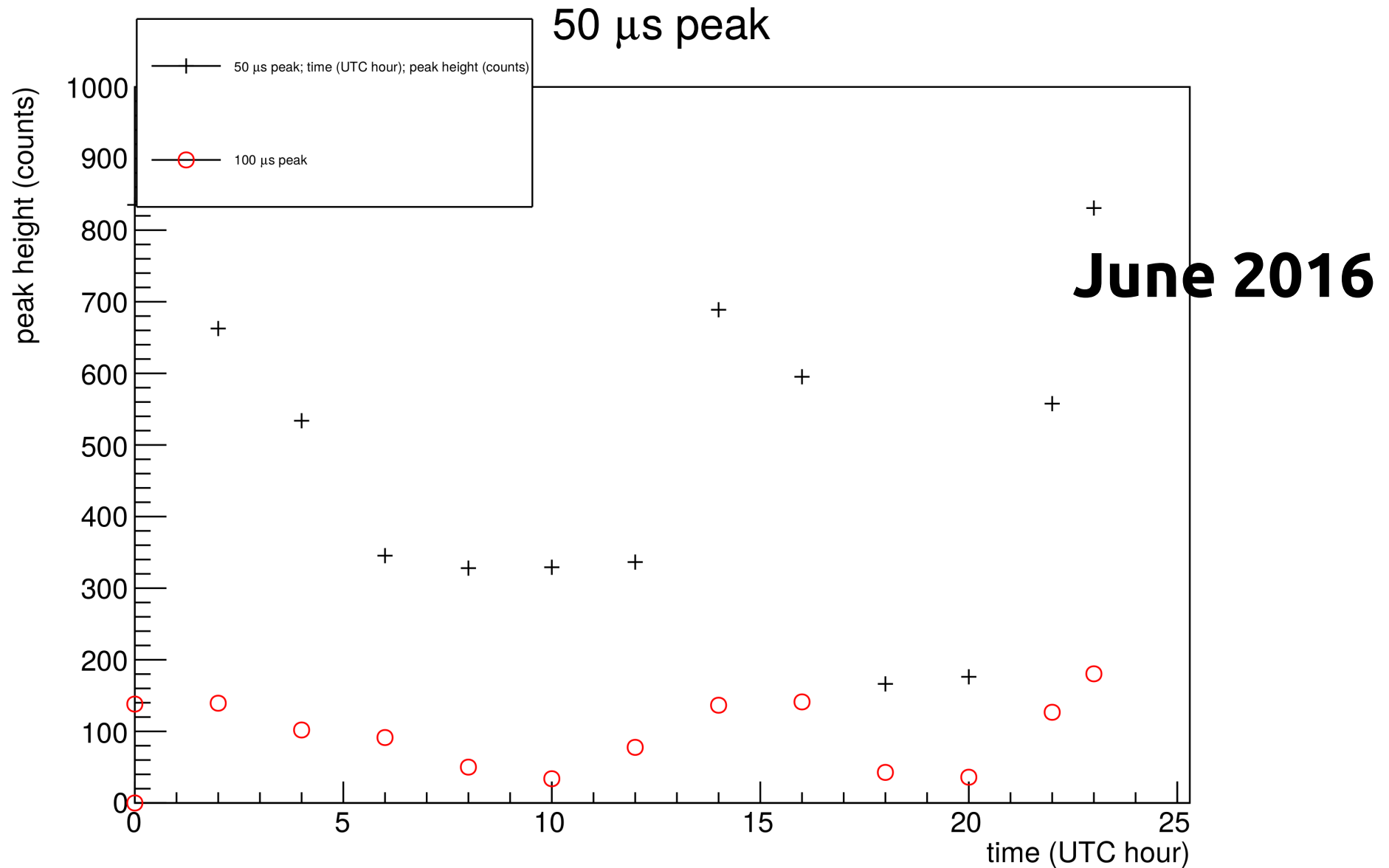
Closer Look to ToT



ToTs: Differences Day by Day

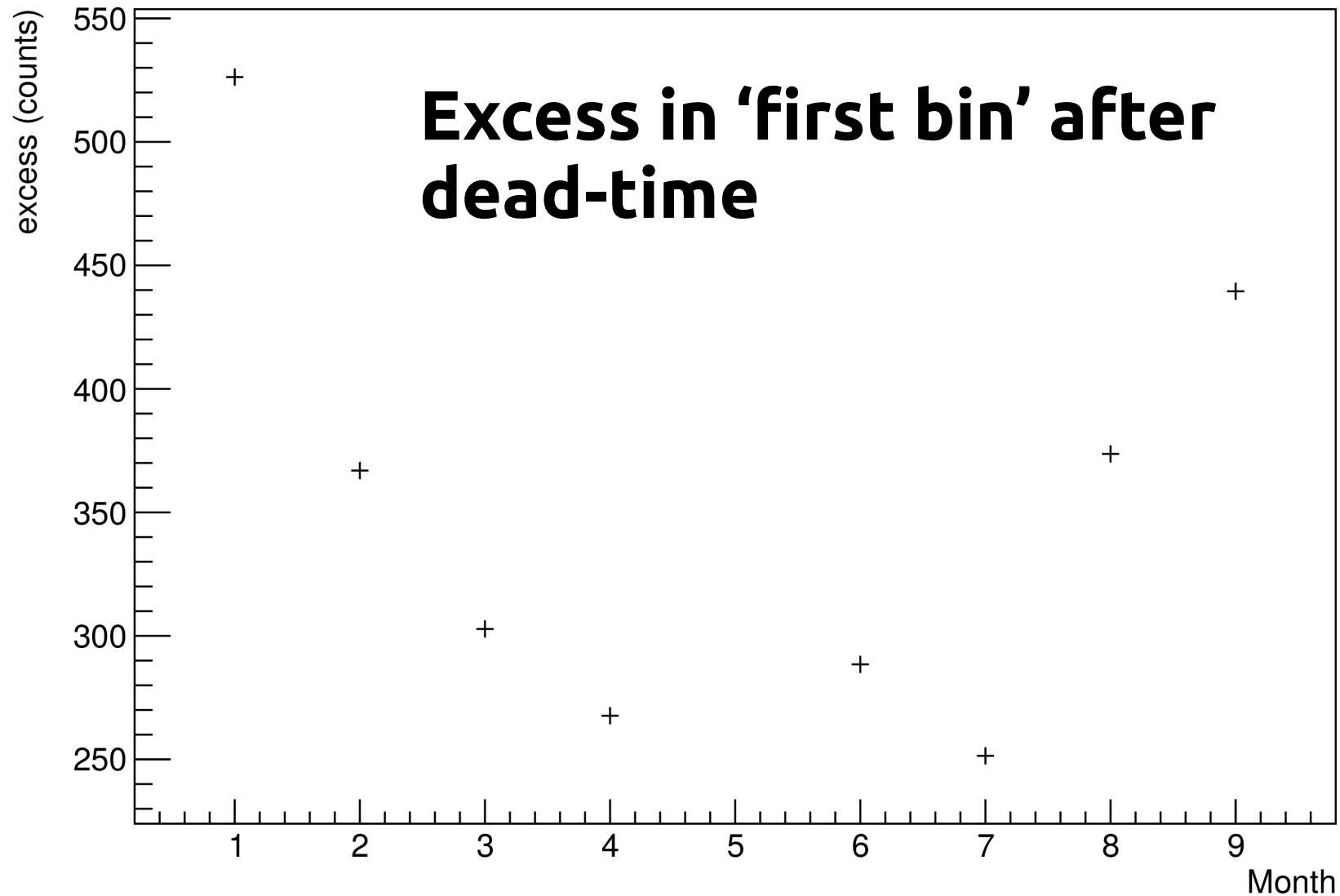


ToT-Peaks: Daily shape?



ToTs: Time of Day dependence in peaks at 50/100 us

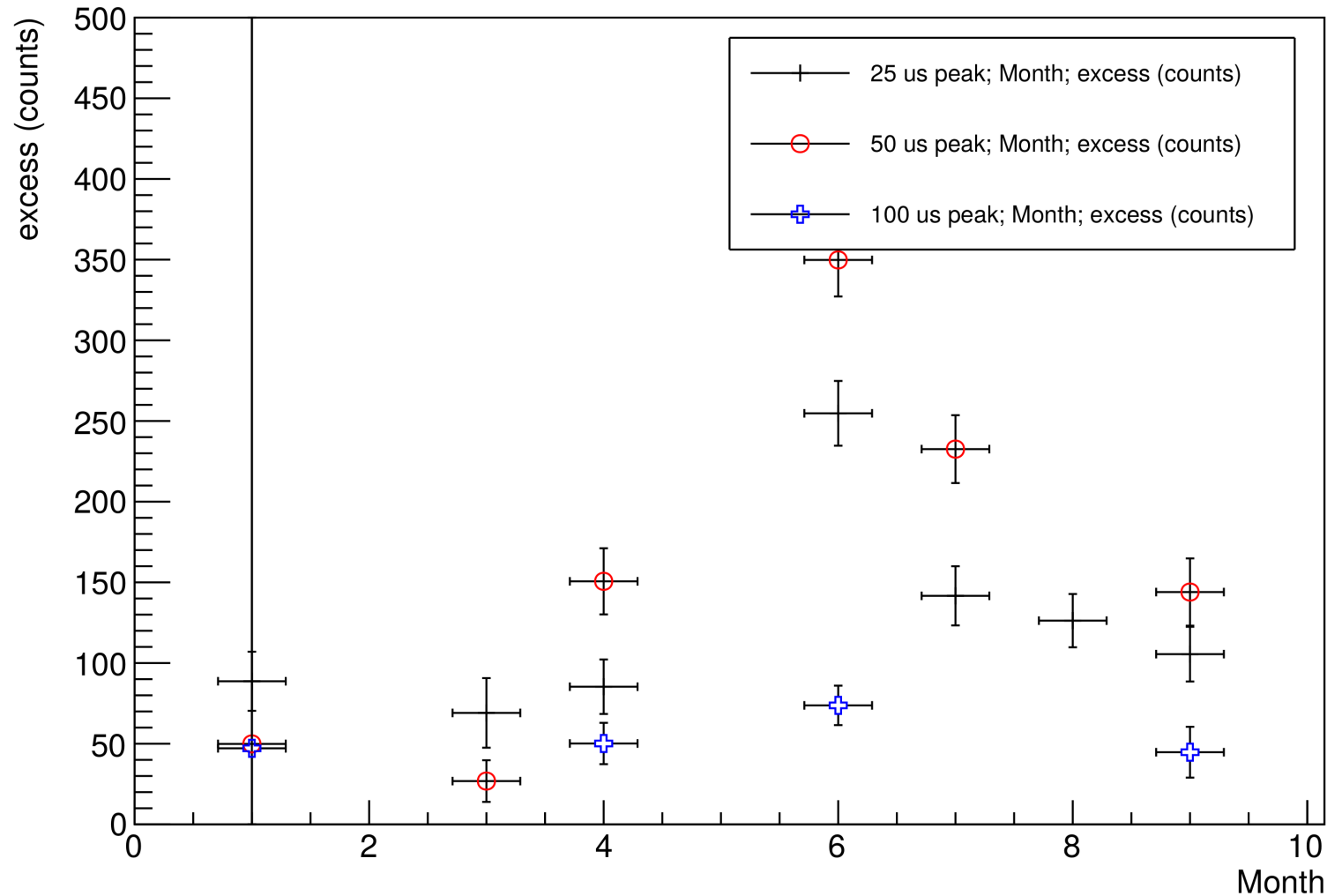
ToT-Peaks: Seasonal Changes?



ToTs: first maximum at 20 us changes with season

ToT-Peaks: Seasonal Changes?

25 us peak



ToTs: peak amplitudes change with season