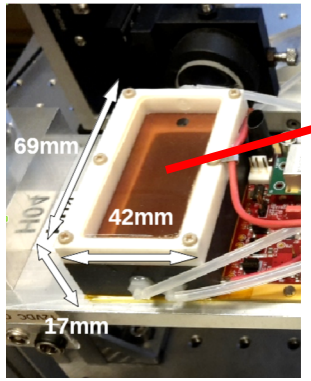
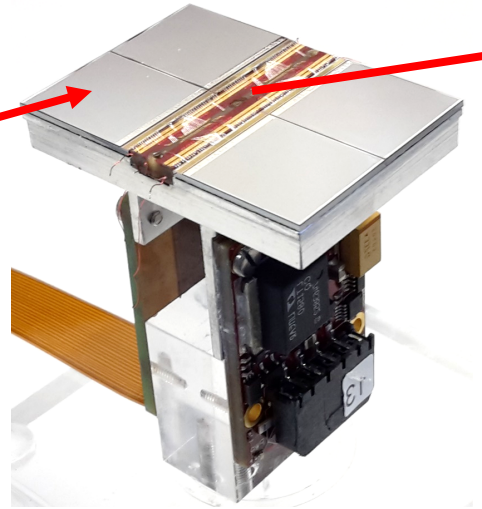
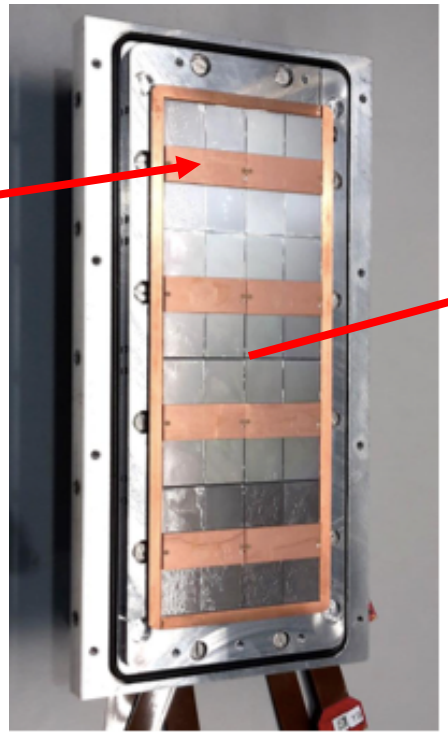
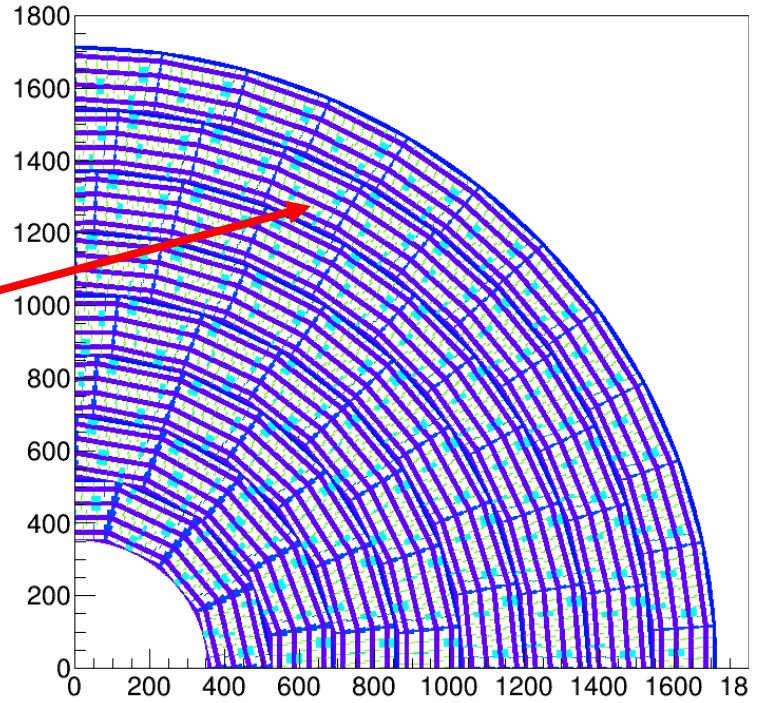
Pixel TPC









Single chip 2017

Quad 2018

Module 2019

TPC plane

Second Laser data taking with 8-quad module

Data taking run 1262 with logging of
- 1 The laser positions and times
- 2 The trigger timestamps datastream TIMESTAMP
- 3 The data streams for the two concentrators LINK0 and LINK1

Settings run V_{grid} = -300 V (low) ; V_{drift} = -280 V
- x position = 5 mm steps of 0.1 mm in total 2 steps
- 2x 100 points
- Logging laser positions (1) works
- The trigger stamps (2) were streamed

The equalisation results were used. In the *dac.txt file the actual noise mean value is stored per chip. The rms of the noise is 7.5 counts.
Now we run at mean noise + 55 counts.
NB 2 weeks ago we loaded a wrong setting in the TPX3 chip NOW fixed.

Second Laser data taking with 8-quad module

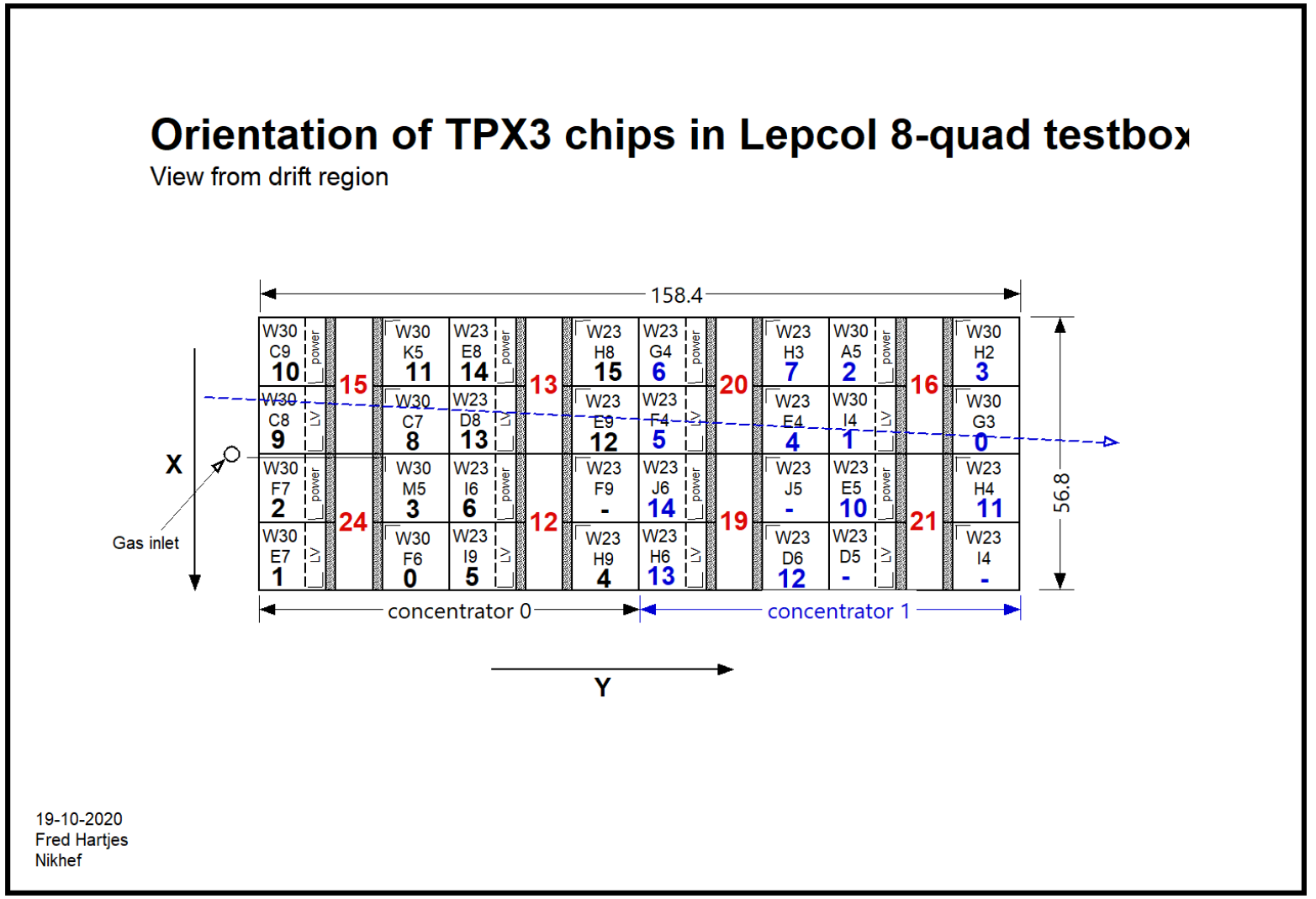
Because Kees found the problem in the loading of the thresholds, we now understand that the ToT in last run was problematic and efficiencies were low with little background.

Now we can be more ambitious.
We can use the trigger times and match the to the data streams.

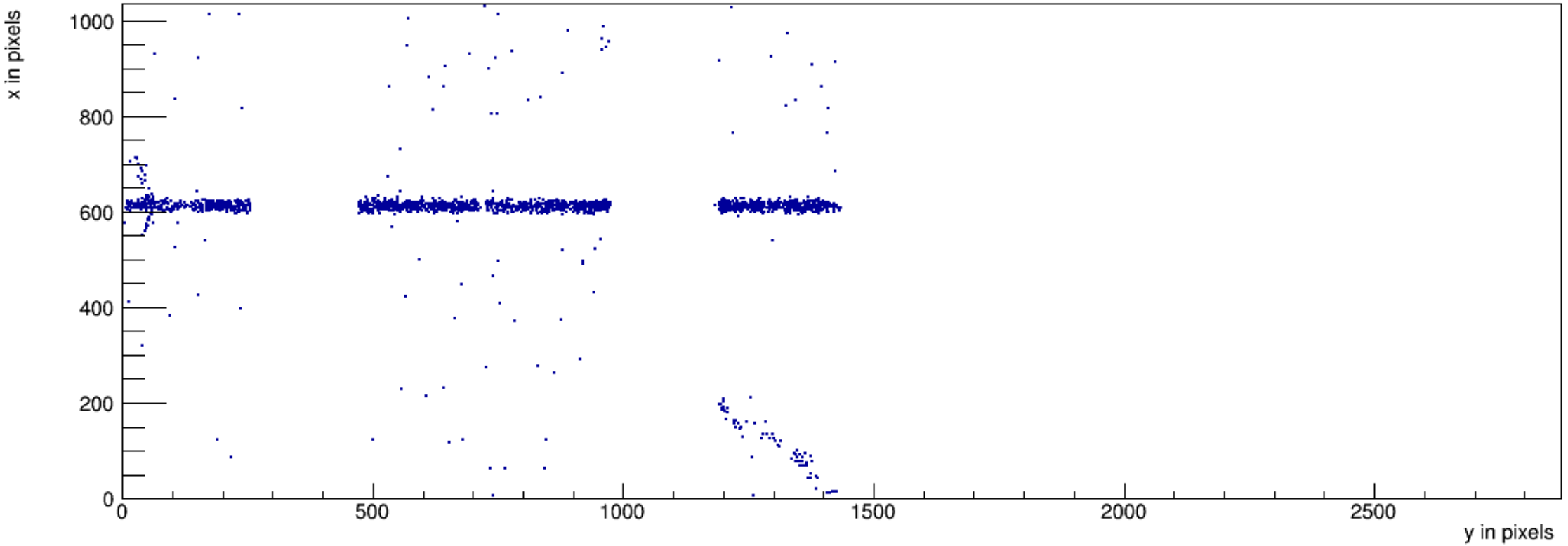
But this means that we need to get the timing right ….

We will also use the geometrical layout of Fred with the correct chip numbers and the x axis running up (as Jan proposed)

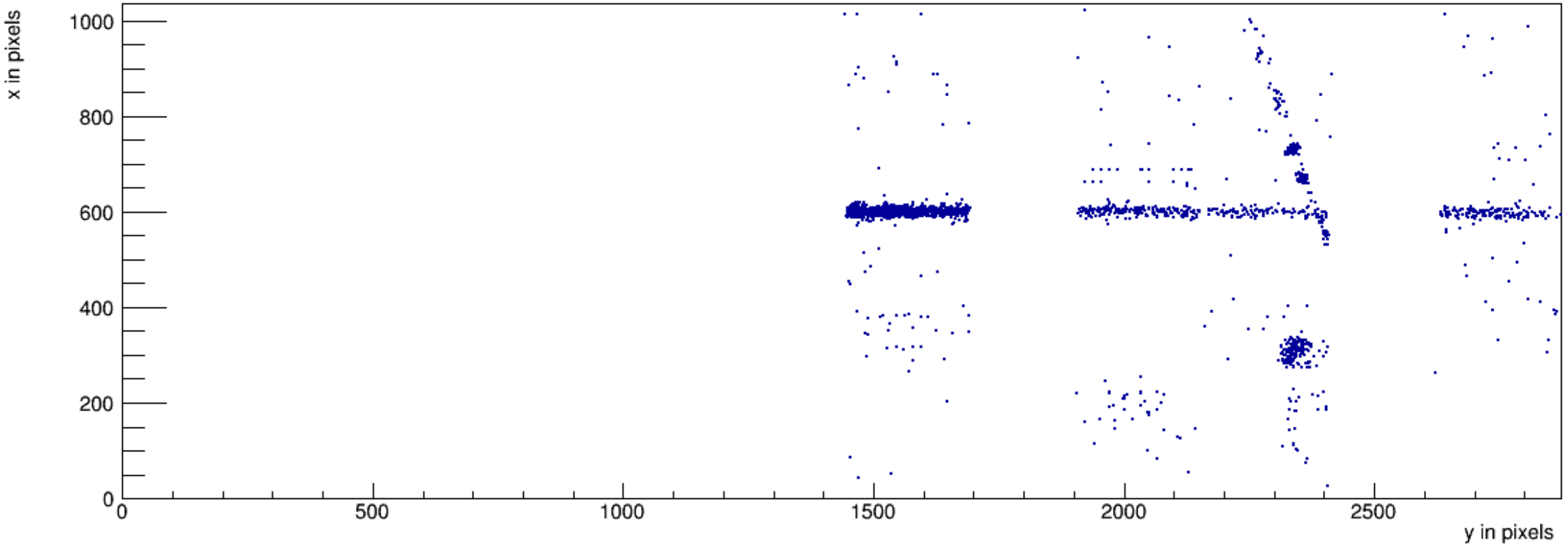
Updated event display layout



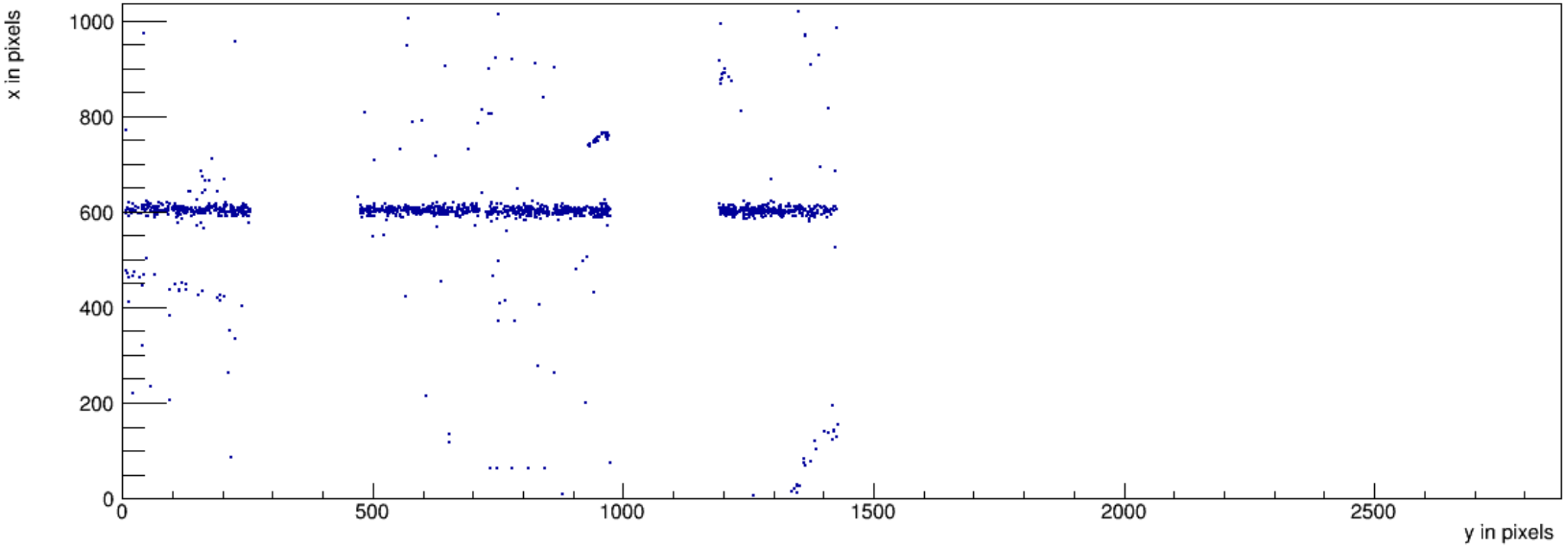
Event 19 concentrator 0



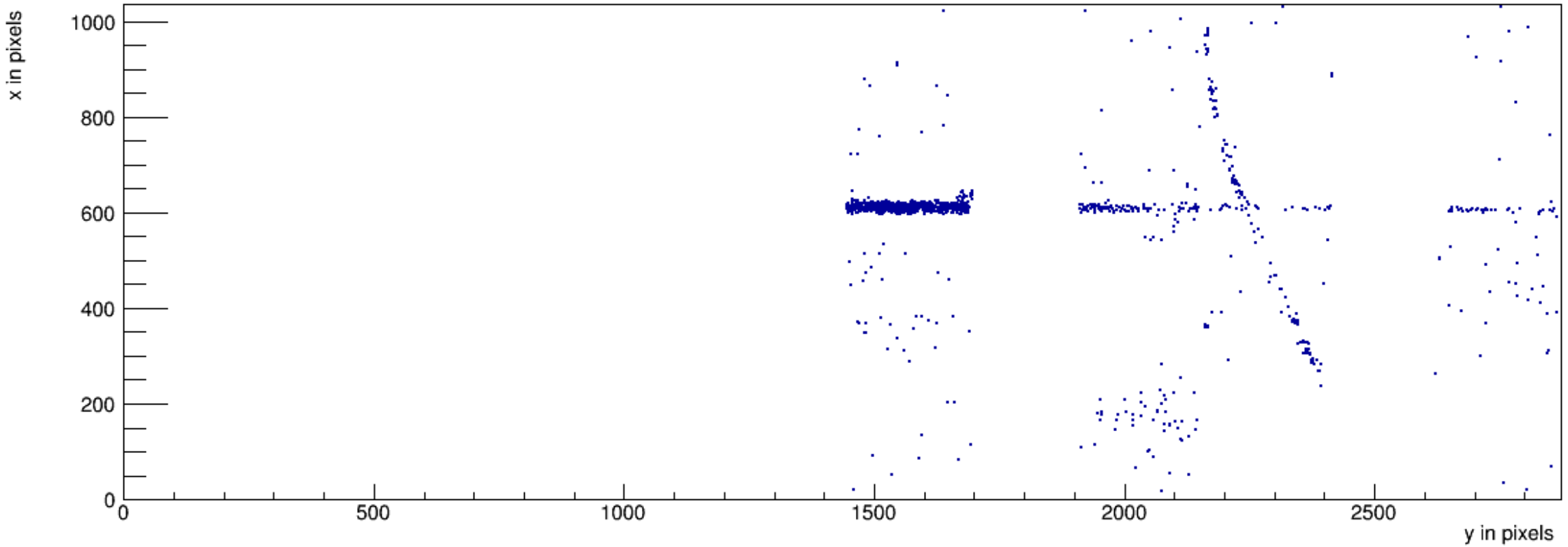
Event 19 concentrator 1



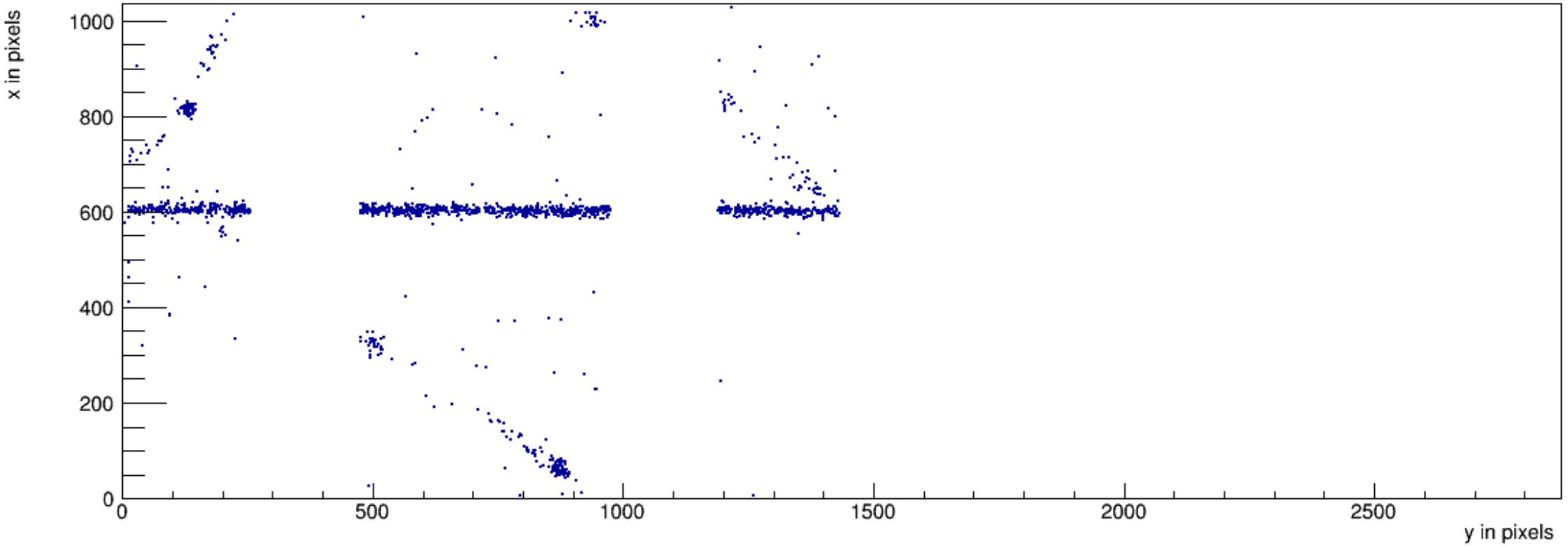
Event 164 concentrator 0



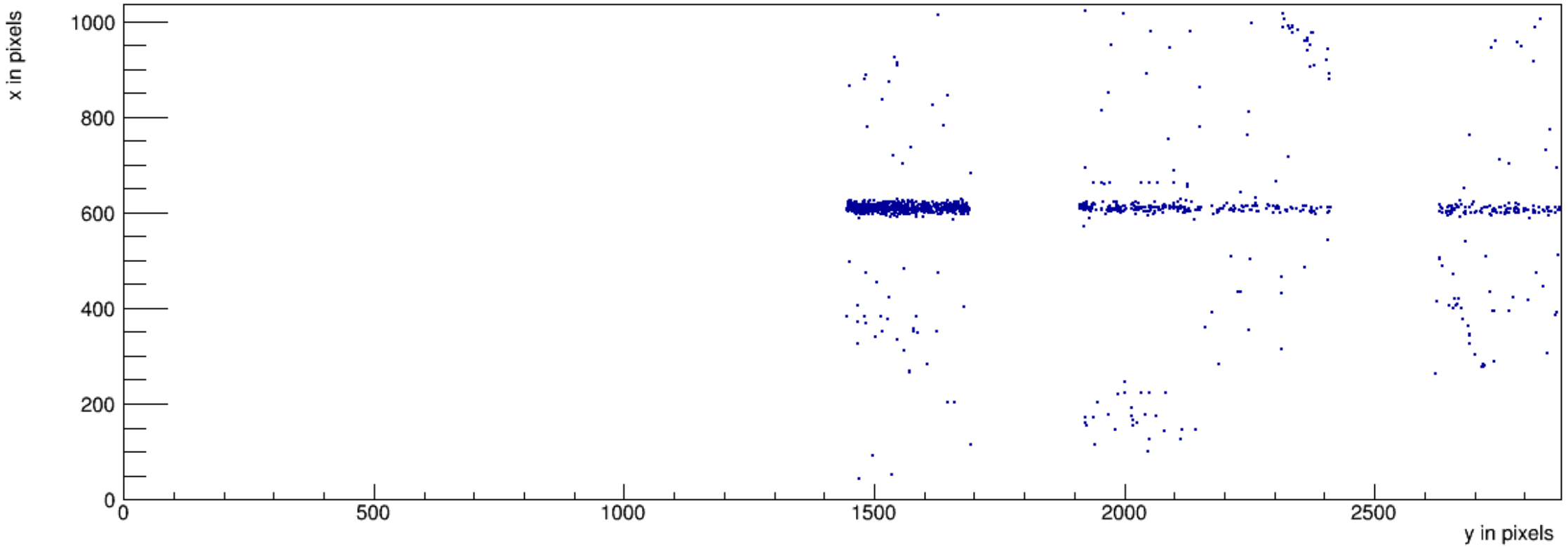
Event 164 concentrator 1



Event 187 concentrator 0



Event 187 concentrator 1



Some observations

With a loose matching between trigger time and data stream we can indeed reconstruct events. The cosmic background comes from the loose timing cut.

Whether the event numbers (trigger numbers) for concentrator 0 and 1 really correspond, I don't know yet, because of timing problems.
To match the trigger I use two "magical" timing offsets

// Link0 t_offset = 23107607003691

// Link1 t_offset = 16248544233003

difference = 6859062770688 units are = 25 ns/4096

One would not expect this. The concentrators are synchronized.

If I dump the heartbeat of LINK0 $4.8448718\ (1024)^3$

If I dump the heartbeat of LINK1 $4.8443632(1024)^3$

Why are they not the same? difference = 546105 << diff t_offset

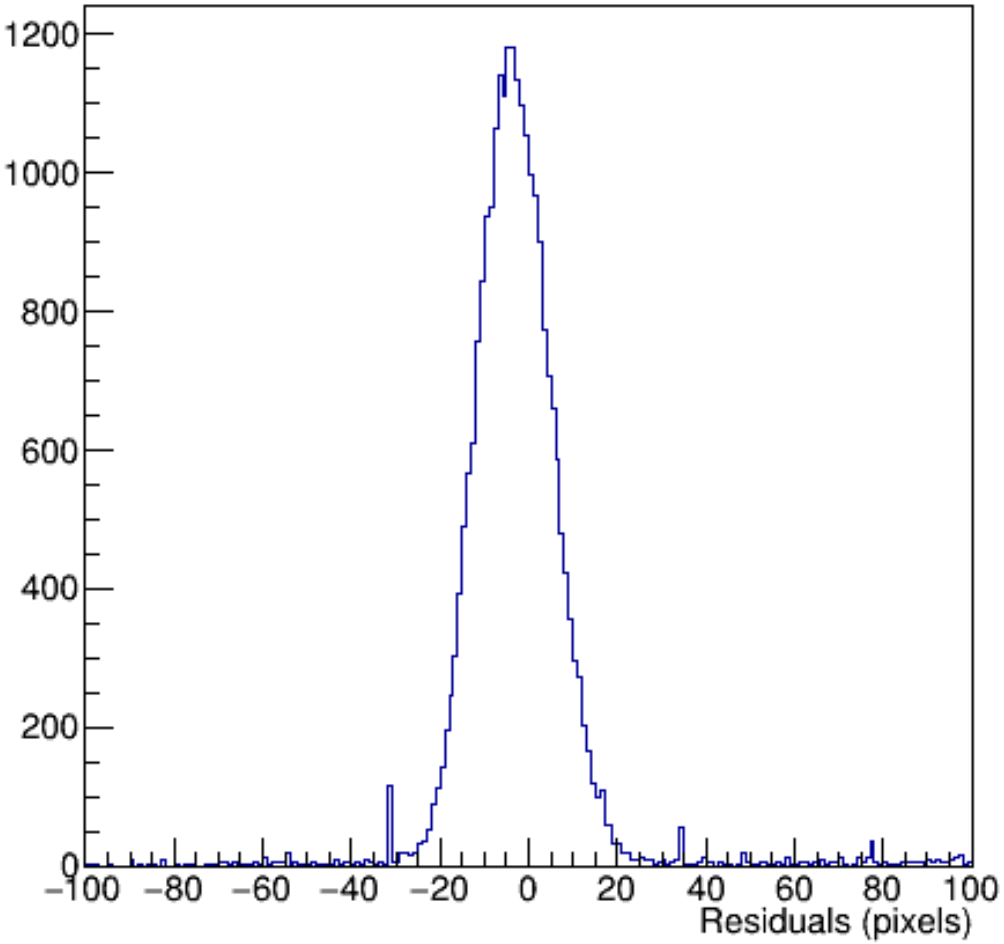
Some observations

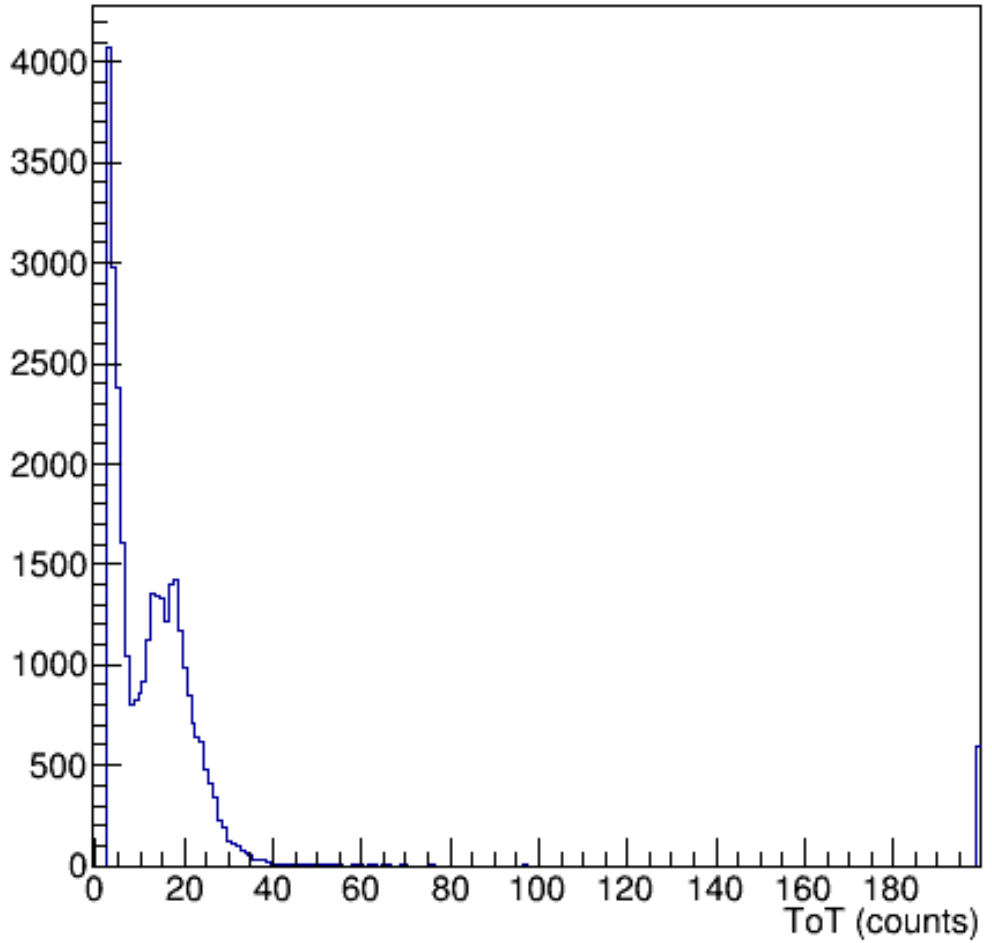
Another point is that many events are NOT reconstructable.
The are too many hits. This is an effect we know from quad. The power supply is not stable enough when current is drawn, this changes the reference voltage and all the pixels in a quad fire. So called hoera – everybody lift his arms – events.

We have 2 x 100 triggers that should give 200 reconstructable events:
For LINK0 first 100: 5 events/100 triggers last 100: 15 events /100 tr
For LINK1 first 100: 37 events/100 triggers last 100: 58 events /100 tr

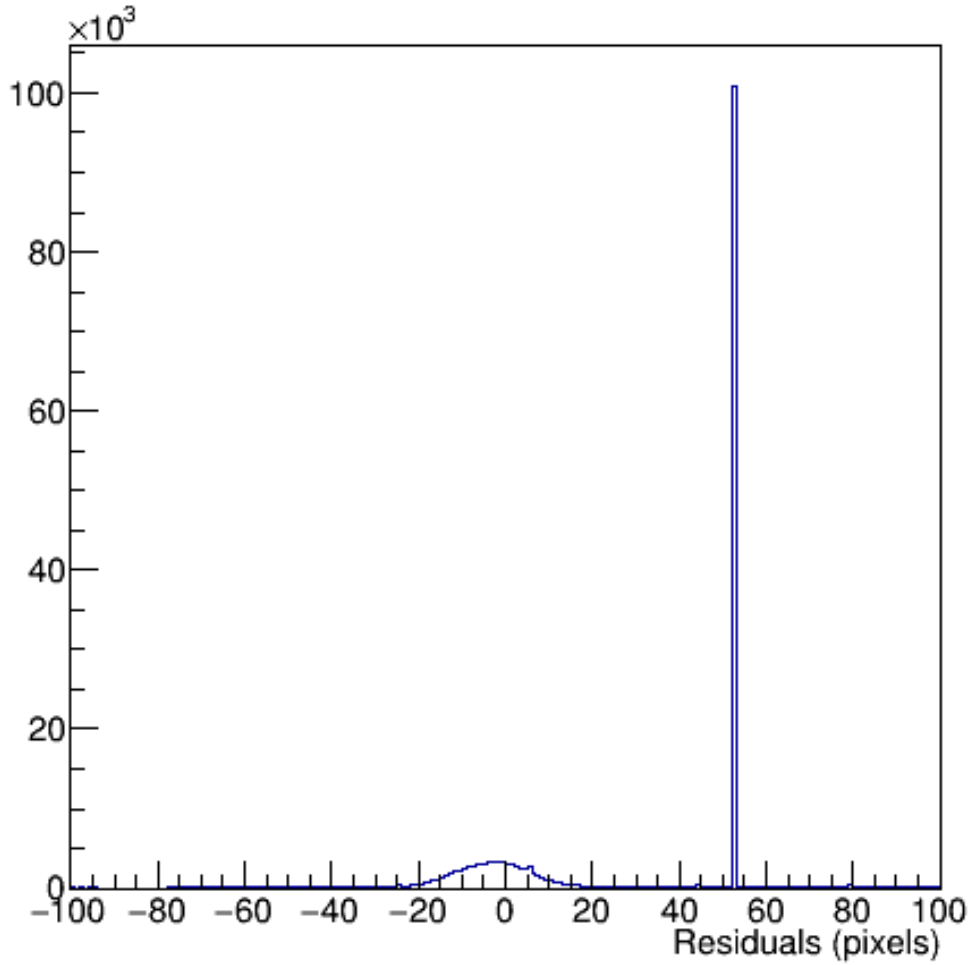
In the beginning the efficiency is lowest. But in the concentrator 0 the efficiency is low because of the abundant ionization. In concentrator 1 less hits are produced. This is really not nice. The efficiency should be 100%.

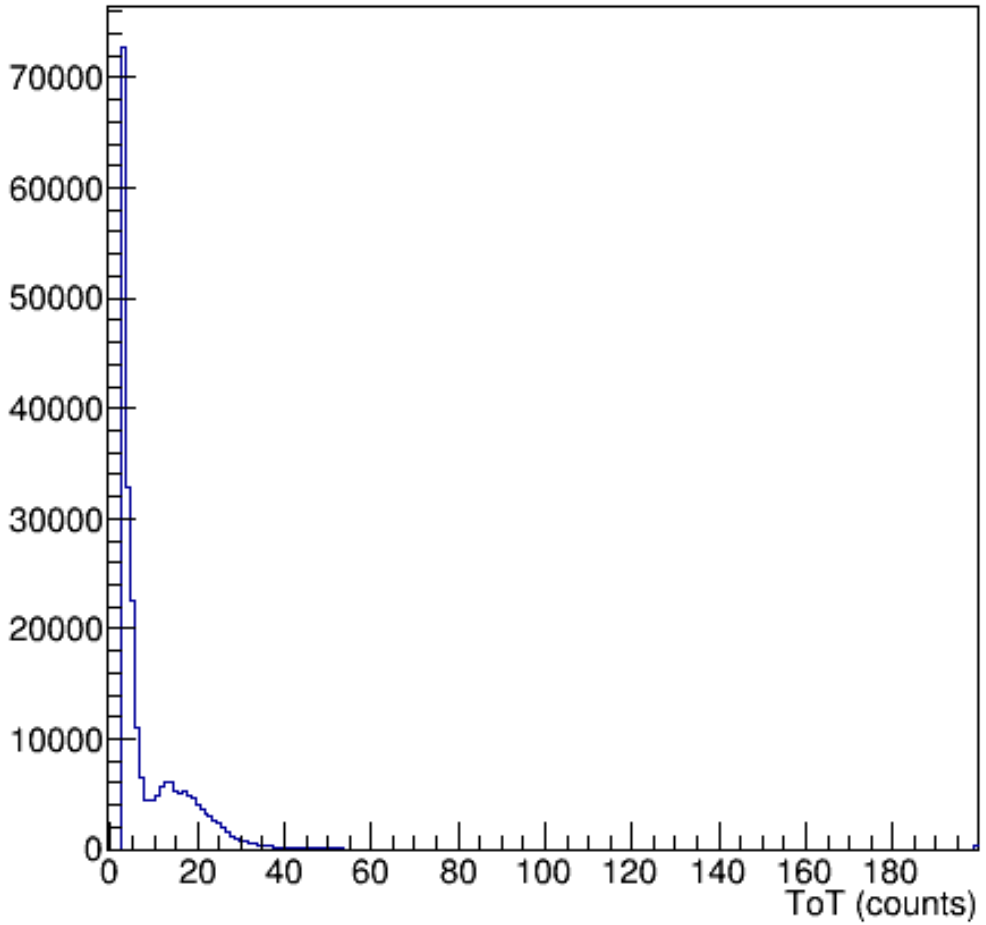
Some observations concentrator 0



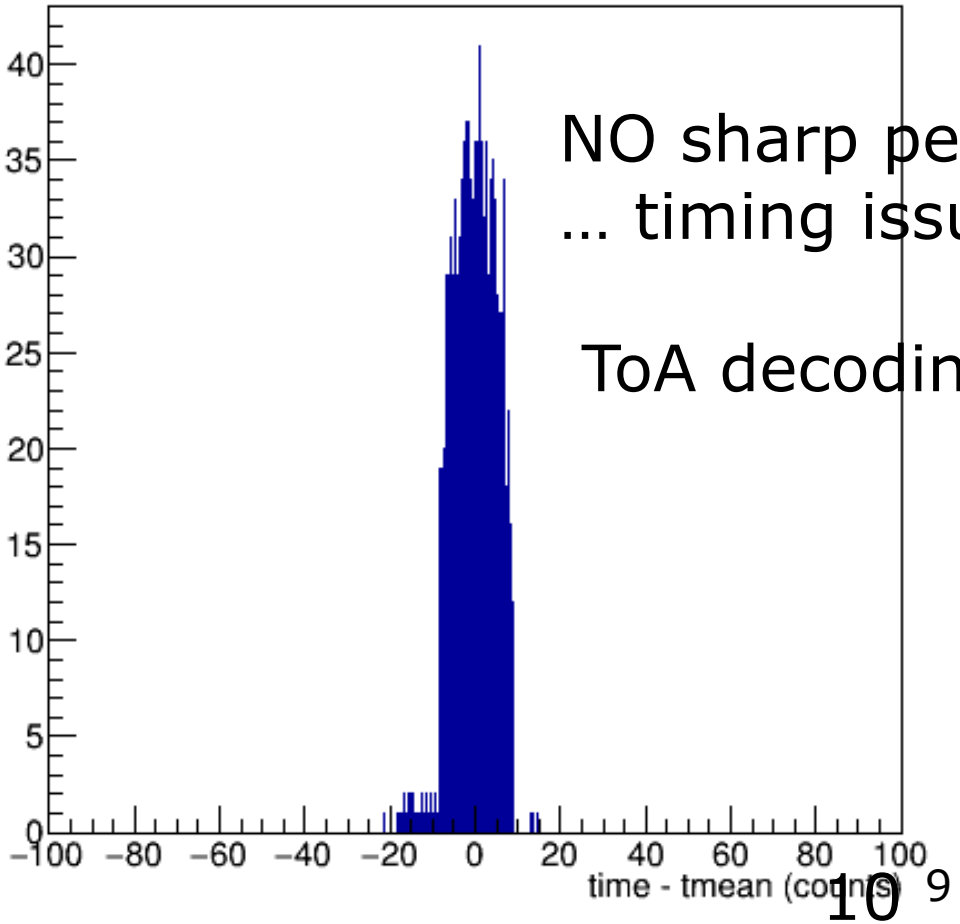


Some observations concentrator 1





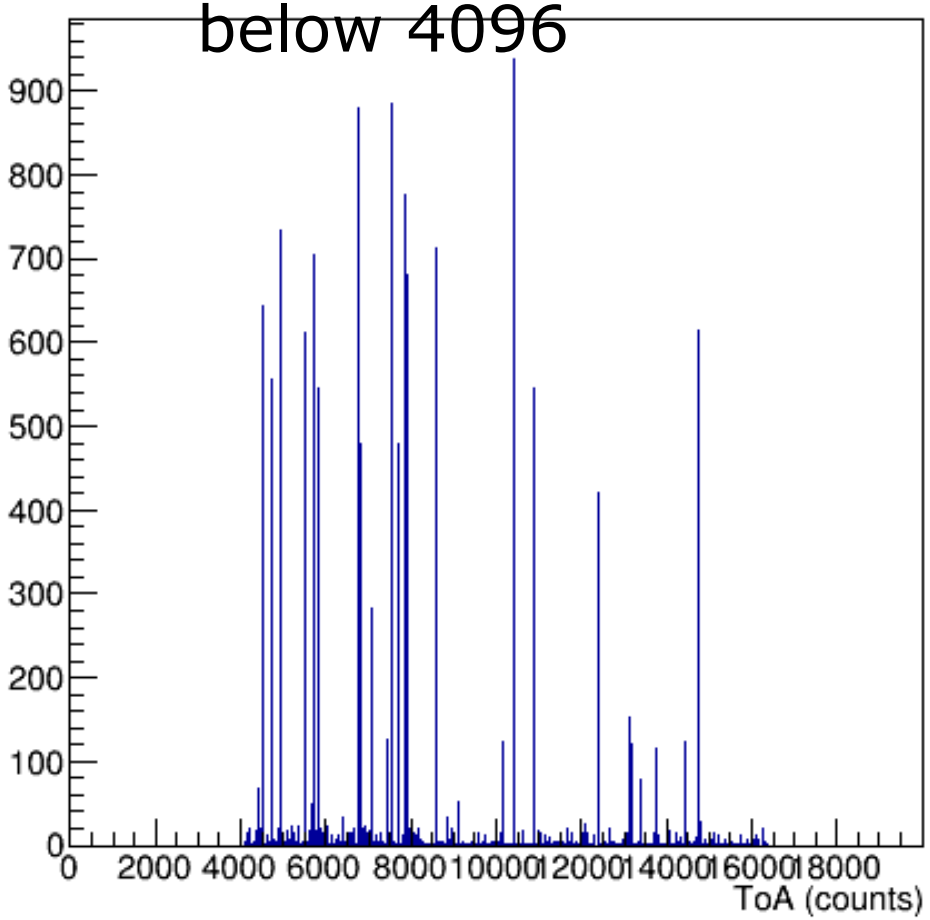
Some observations concentrator 0



NO sharp peak
… timing issue

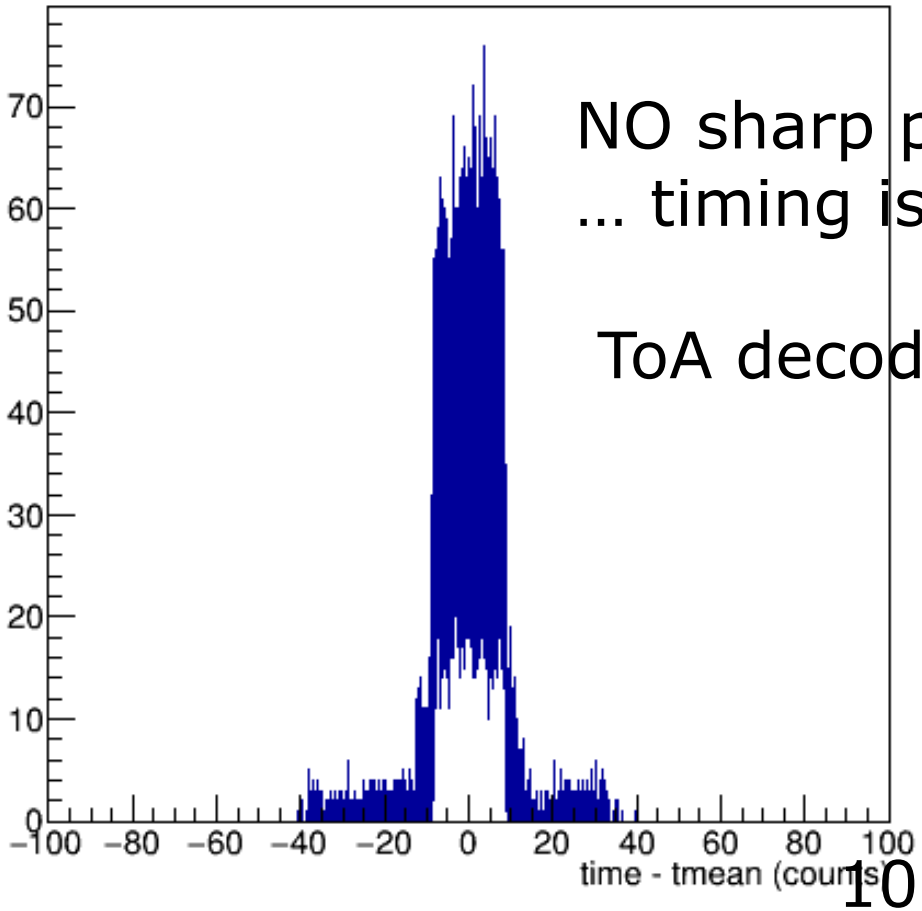
ToA decoding?

ToA decoding NO entries below 4096



10^9

Some observations concentrator 1

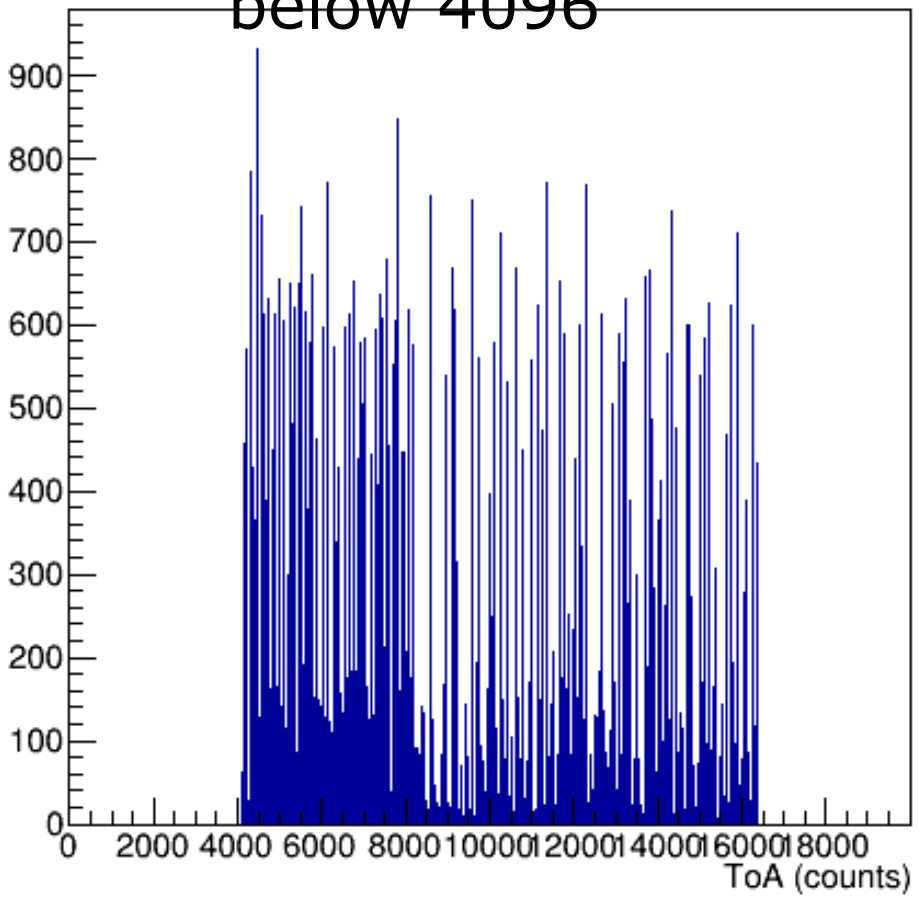


NO sharp peak
… timing issue

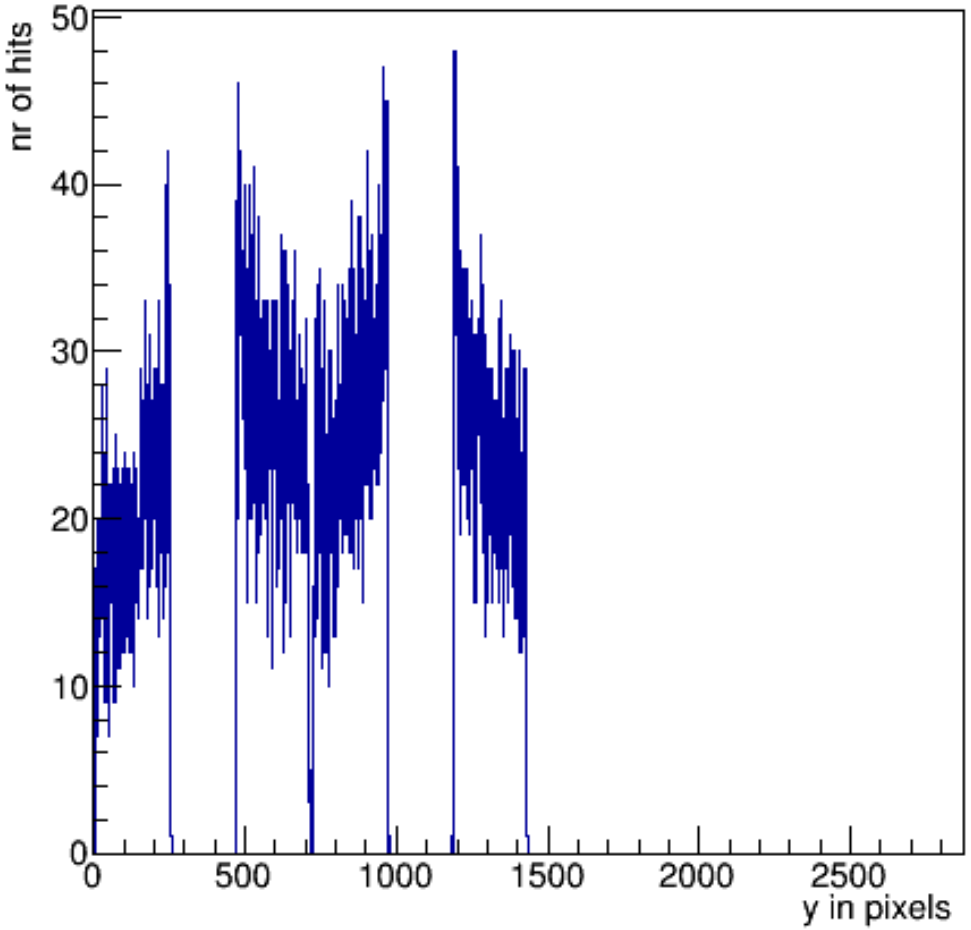
ToA decoding?

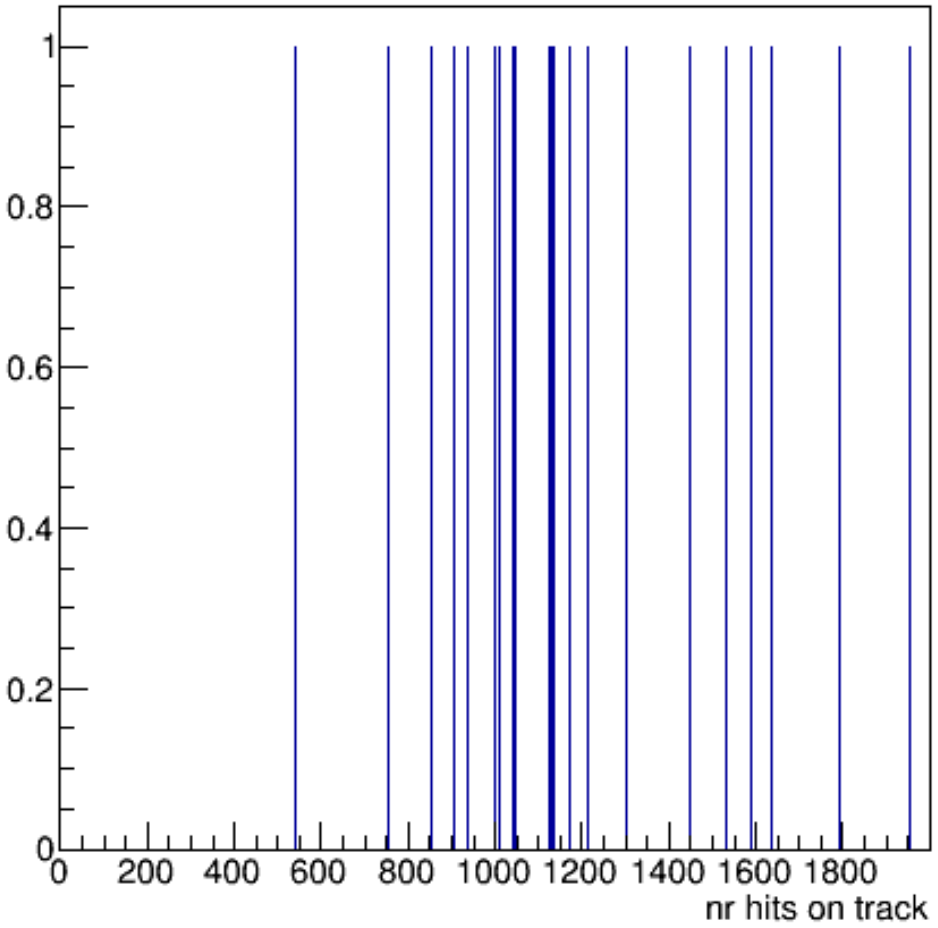
10^9

ToA decoding NO entries below 4096

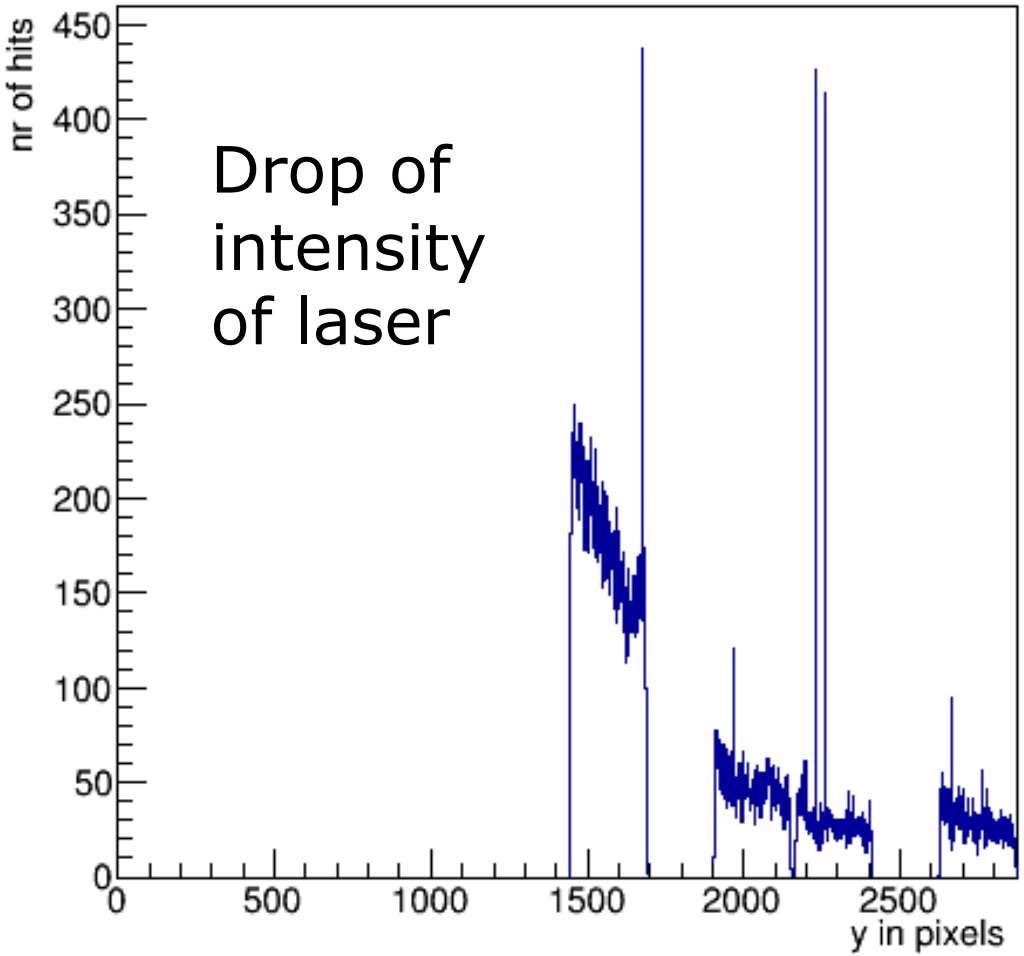


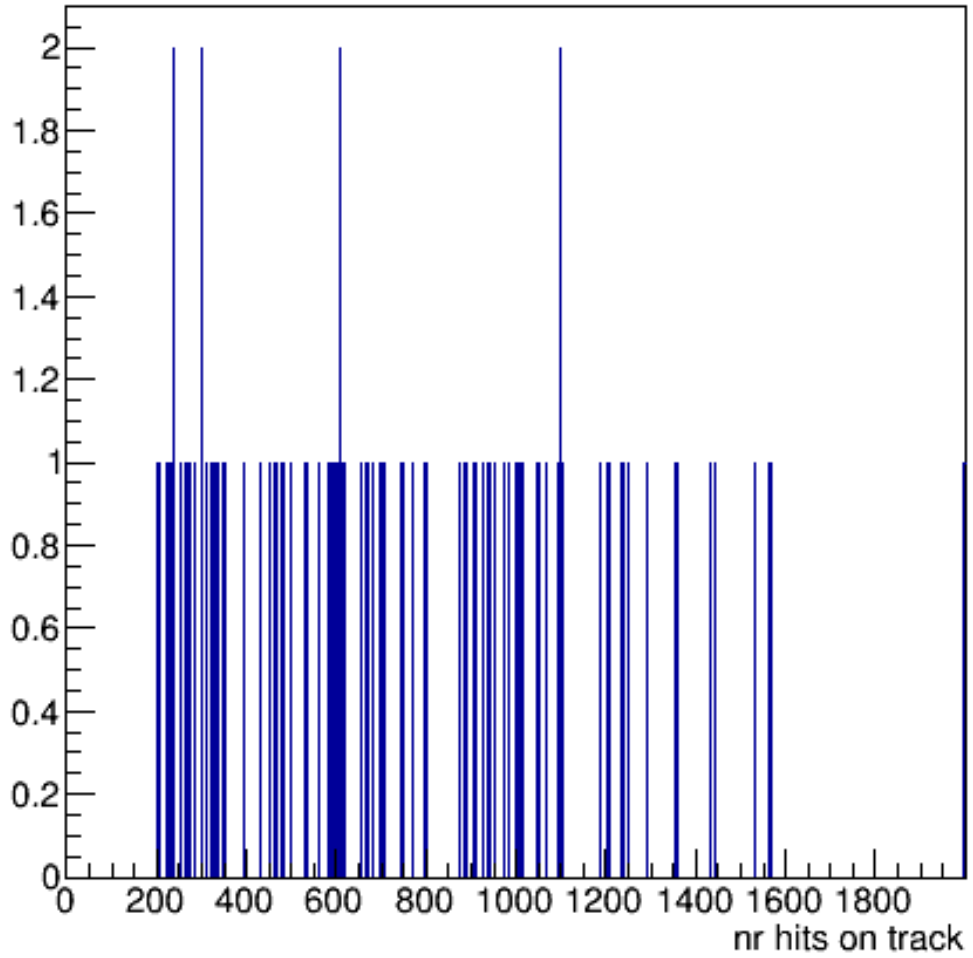
Some observations concentrator 0





Some observations concentrator 1





Conclusions

Thanks to the efforts of may of us and in particular the ET experts Sander van Doesburg, Henk Boterenbrood, Bas van der Heijden and the support of the Ruud Kluit and Martin van Beuzekom, we can now run the daq, equalize all the chips and take laser data.

The events look nice. But ….

We suffer from a problem with low voltage power supply giving ‘hoera’ events and cause a low efficiency 5-60%.

There is a timing puzzle; the concentrators need different time offsets. The timing resolution of hits on track is too broad. It might be due to a decoding problem in the ToA.

Laser intensity drops quicky starting in the middle of the third quad