Run update
and preliminary results on ArgoNeuT
vs Icarus electronics comparison

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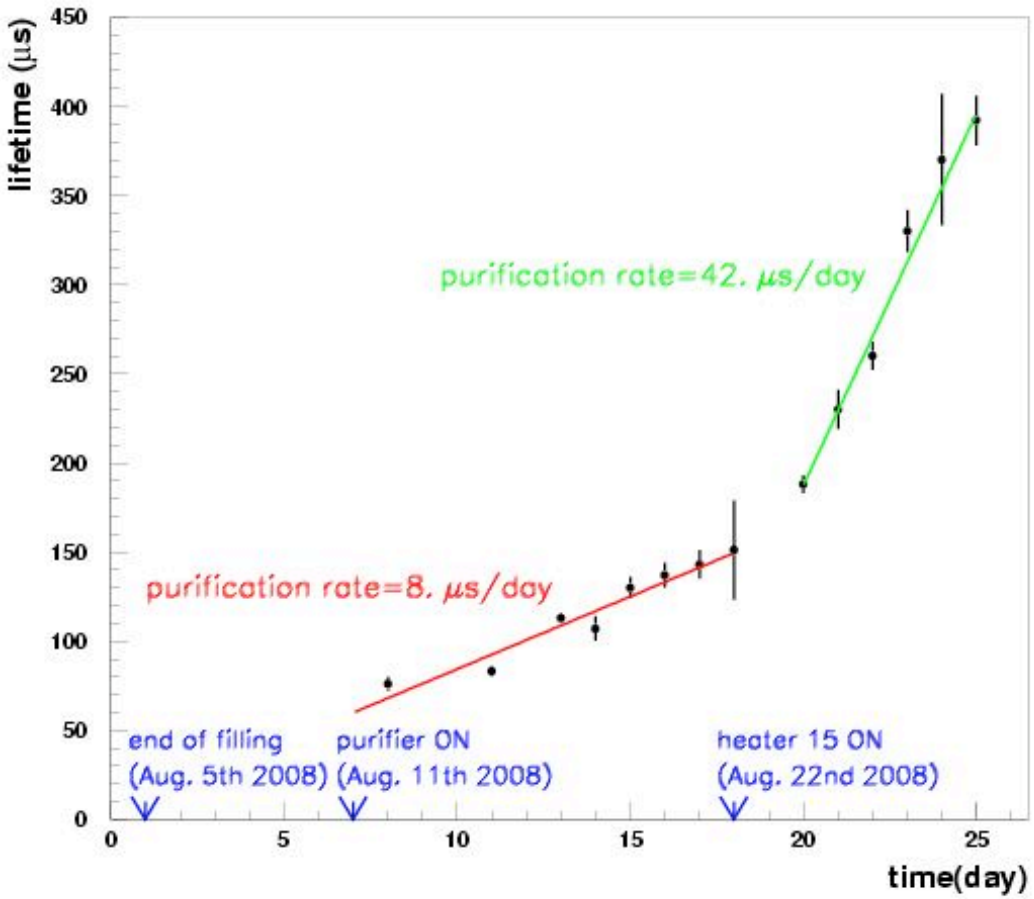
September 2nd FNAL

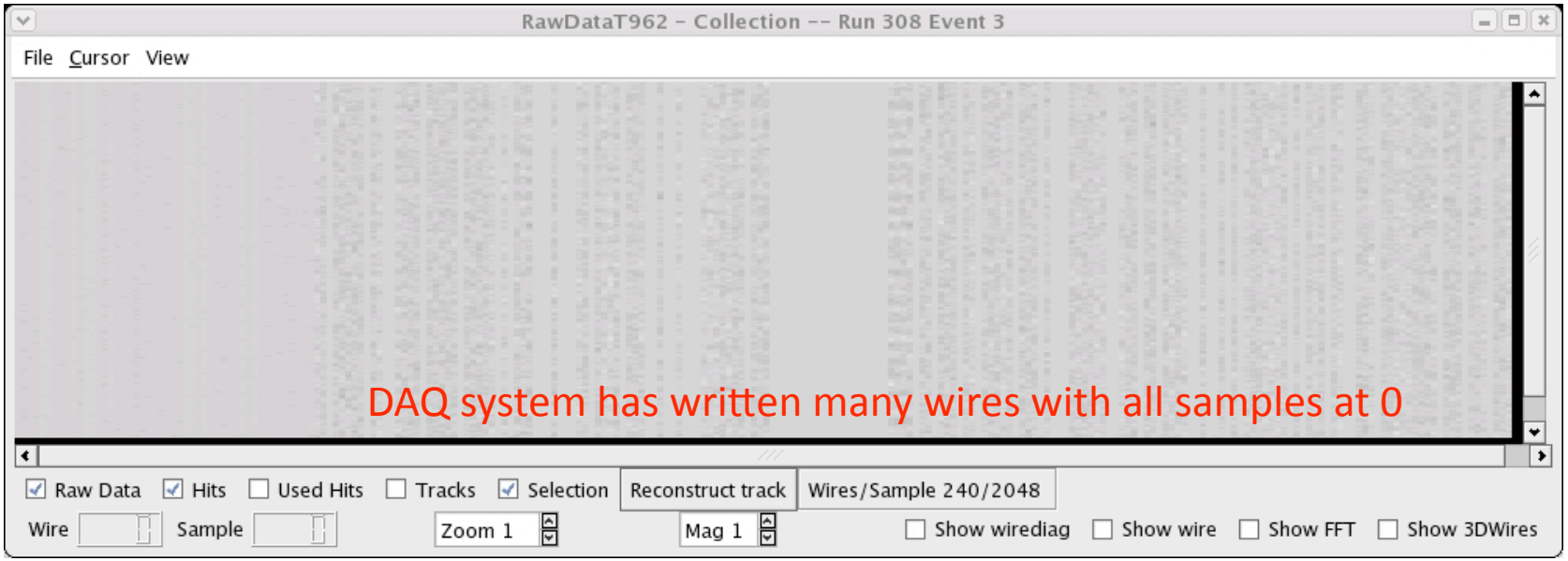
Purity Measurement

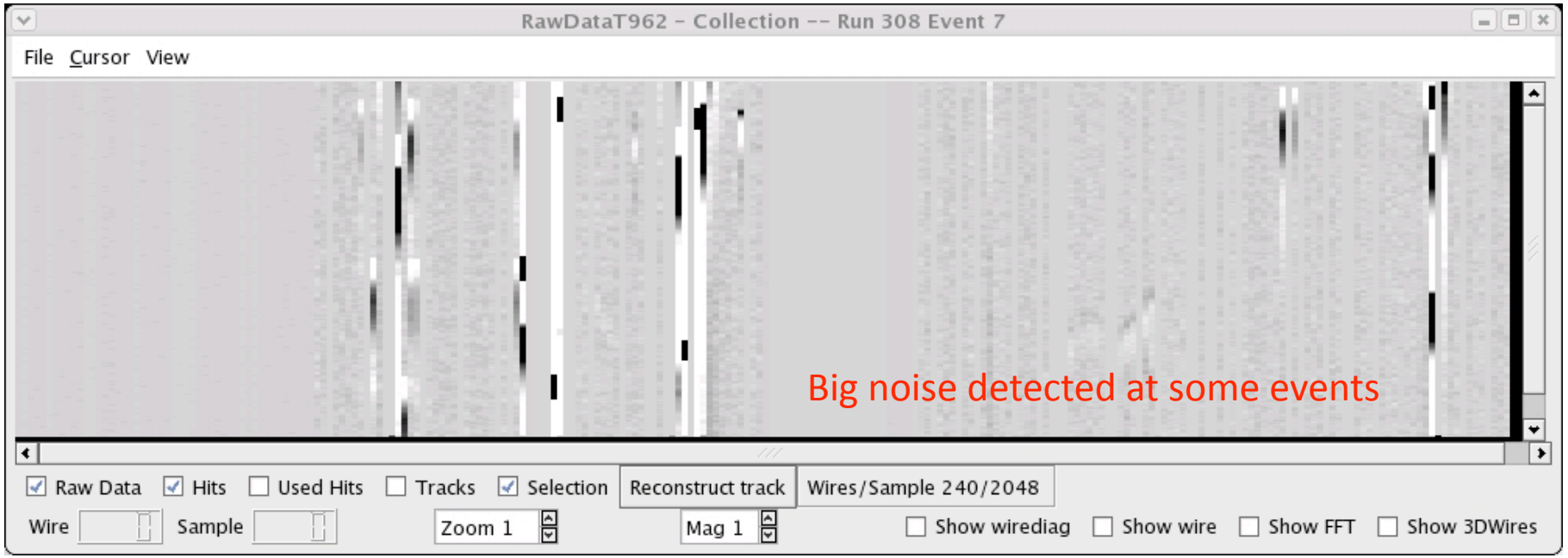


Last measurement → τ = 400 ± 10 μs (after 24 days of run)
Heater ON since August 22nd with some interruption (7days)

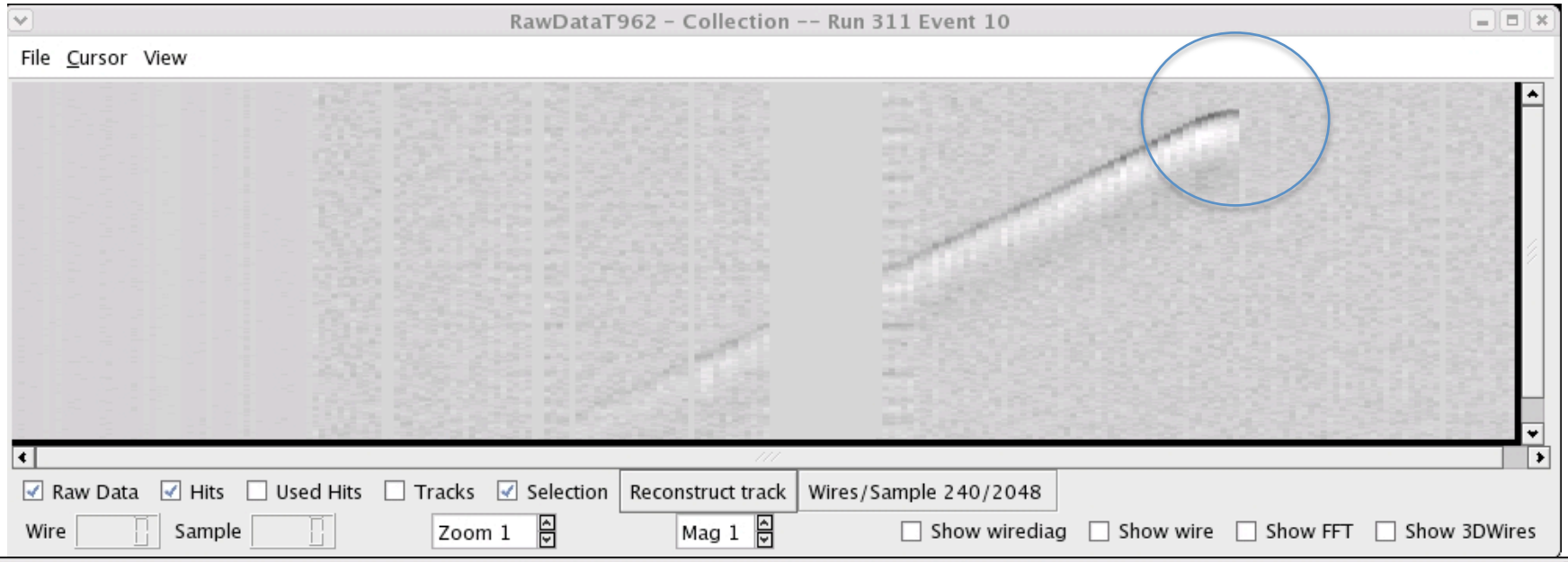
Purification rate continues to be about 42μs/day

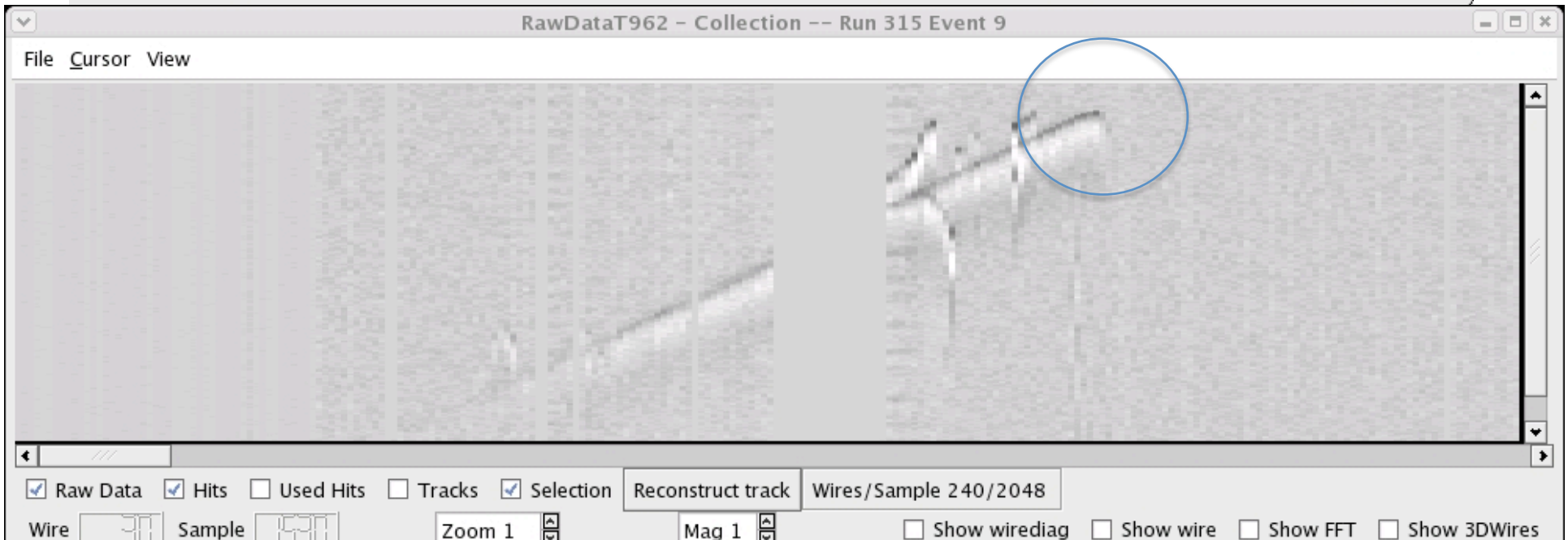
Run at 10kV (cathode HV) – useful for diagnostic





Track bending – to be further investigated





- As a first approach we thought to a non uniformity of the E field in the region between the last field ring and the first wire plane (we're not sure about the tension actually applied to the last ring because of the current drawing..)

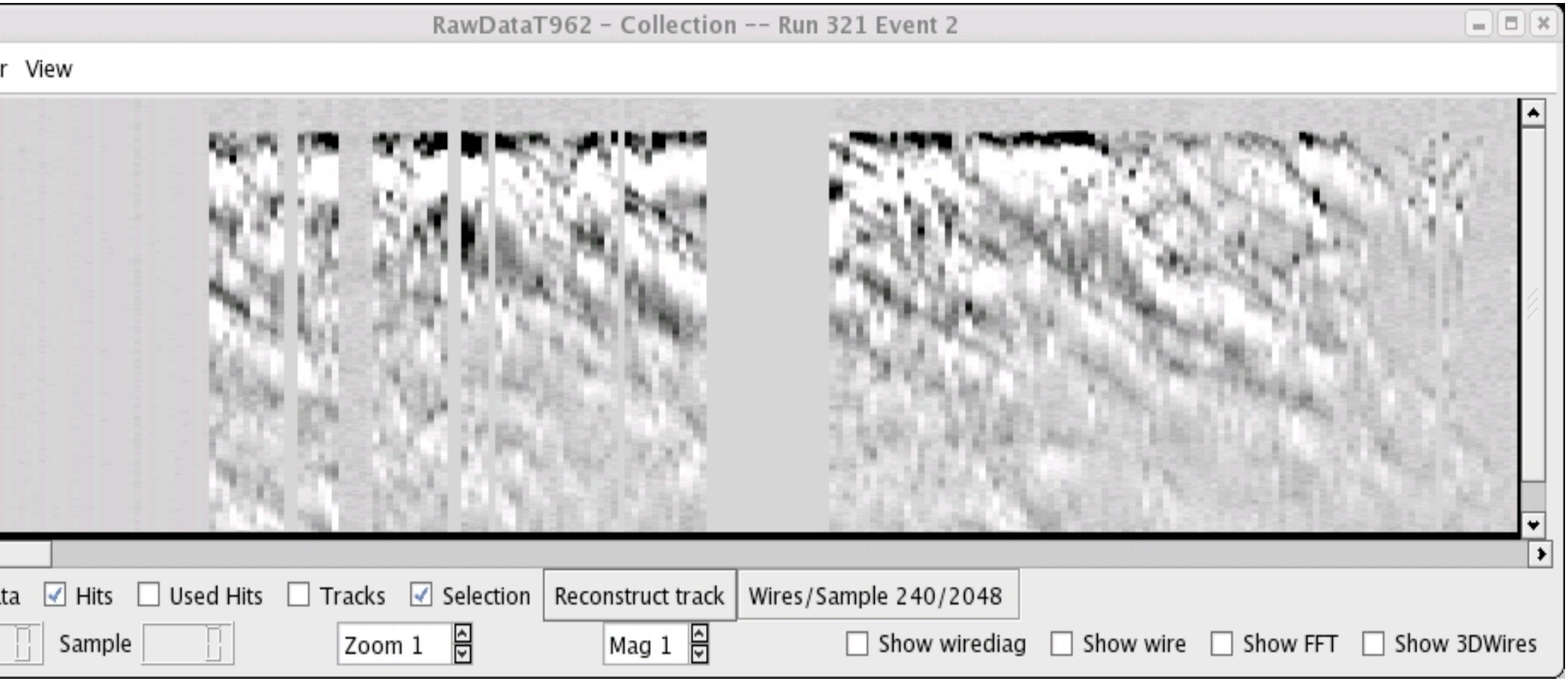
- Some runs with cathode HV -4kV, where the current vs. Voltage has a linear behaviour at R=608 MOhm, have been taken. Different bias Voltages have been tested for the wire planes:

  - HV at-4KV and bias voltages at 0V(shield), 128V(induction), and 250V(collection)
  - HV at-4KV and bias voltages at -134V(shield), -82V(induction), and 10V(collection)

- None evident difference have been noticed..
- This point needs further investigation
- Next step: scan different regions of the TPC (especially at borders) changing the external trigger geometry, but we need all the TPC equipped with Electronic boards

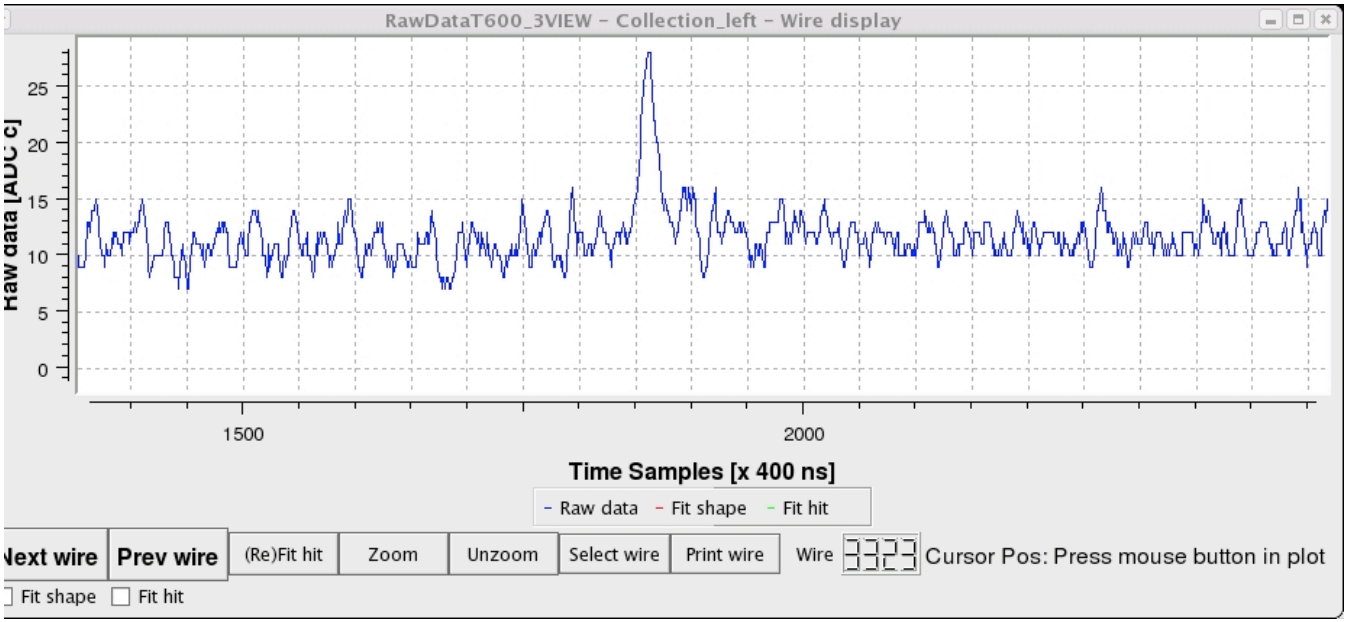
- ANY IDEAS / HINT ?

Big Shower recorded



Could be useful to a fast measurement of the Vdrift if we were recording all the drift…

Electronics comparison: Icarus signals simulation

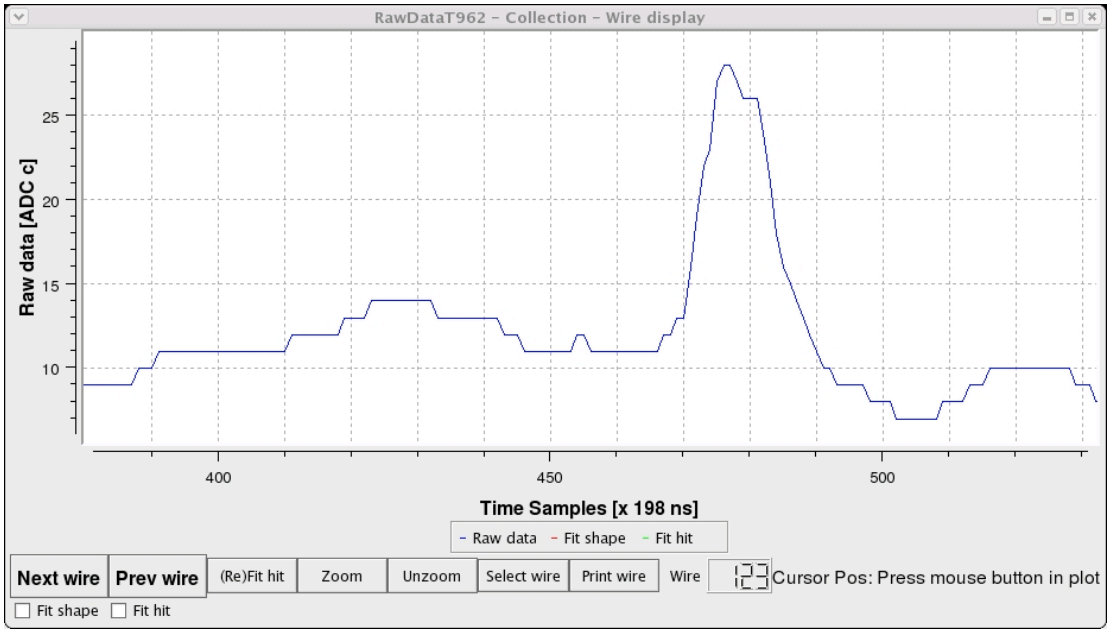


Real Icarus signal
FHWM ~ 25 samples
Corresponding to 10µs
Sampling time 400ns

40 deep angle track

Simulated Icarus signal
FHWM ~ 18 samples
Corresponding to 3.6µs
Sampling time 198ns

40 deep angle track

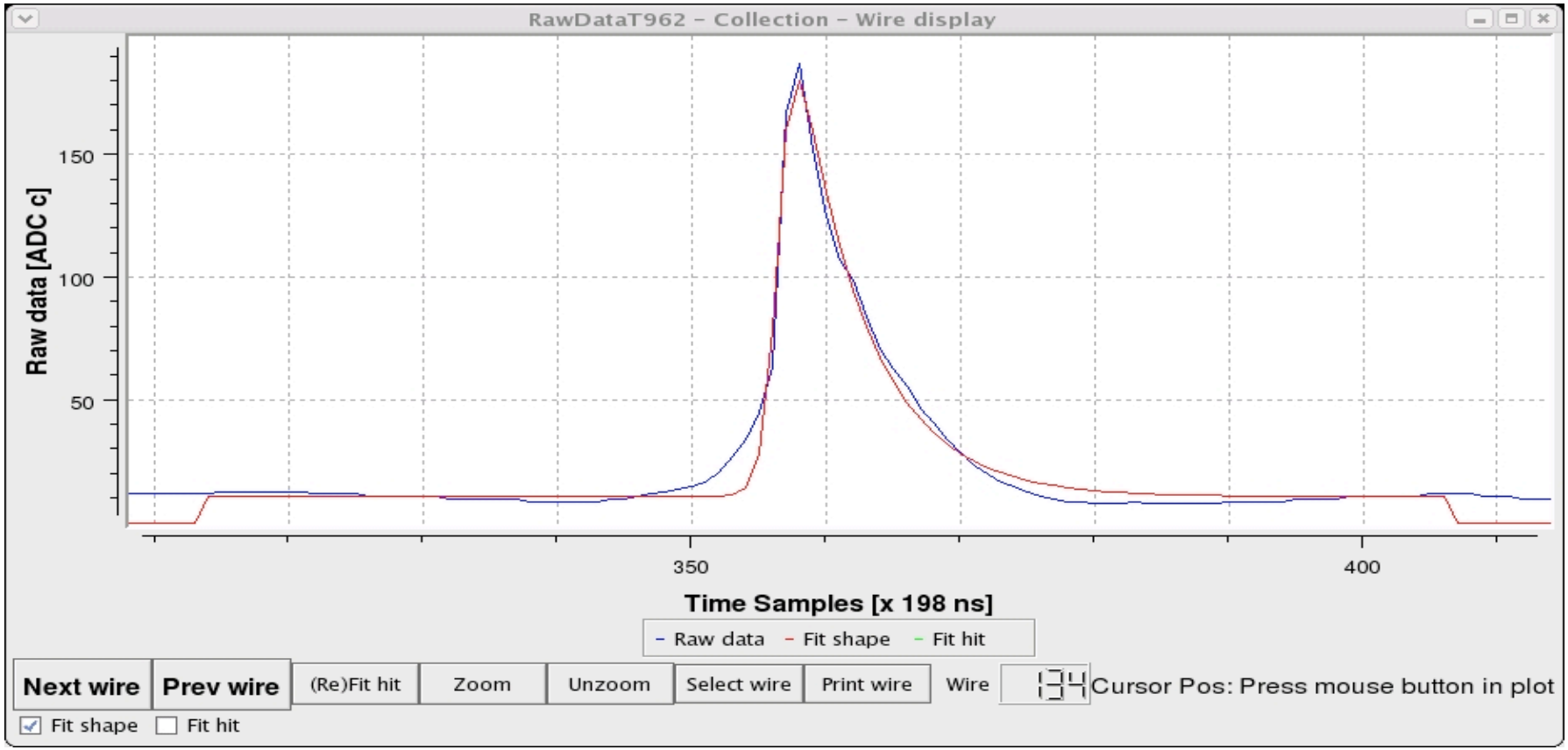


Impulse response used in the simulation must be checked in order to do a meaningful comparison

Comparison exercise

- The same exercise made by Bruce have been done using the Tool of analysis used in Icarus.
- Bruce provided a simulated set of straight muons at diffeerent deep angles: 0, 20, 40, 60 degree . Only in the collection view
- Tracks presenting δ rays have been dicarded (by visual scanning) .
- The Hit Finding has been performed on each wire; HIT “TIME” and “ENERGY” information have been extracted by fitting the signal.

Signal fit



Hit Time = time of maximum of the fit function (µs)

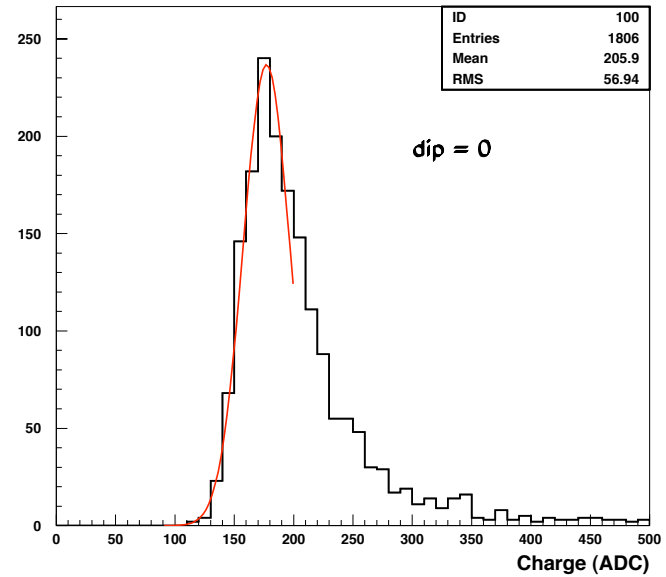
Hit Energy = Integral of the fit function around the hit (ADC)

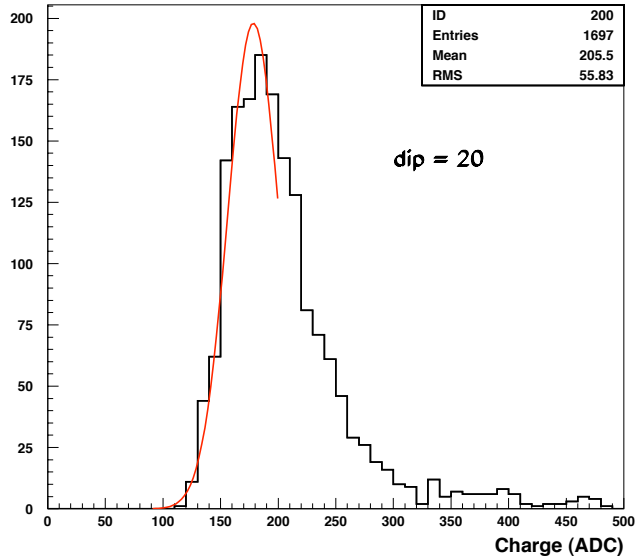
Calorimetric resolution: a rough estimate

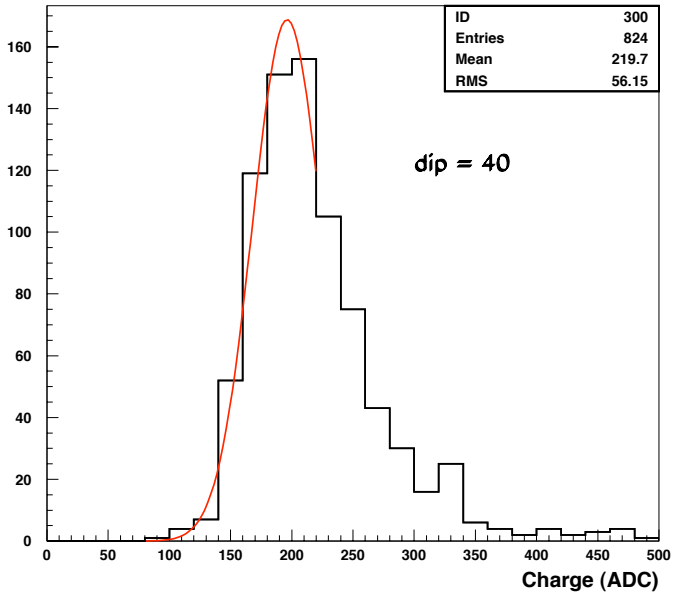
- Energy distributions (Landau) have been obtained correcting for the deep angle cosine.
- Then they have been fitted with a semi-gaussian function in order to roughly evaluate the most probable value and the distribution spread due to electronics and not to high energy physical fluctuations.
- Energy resolution has been defined as

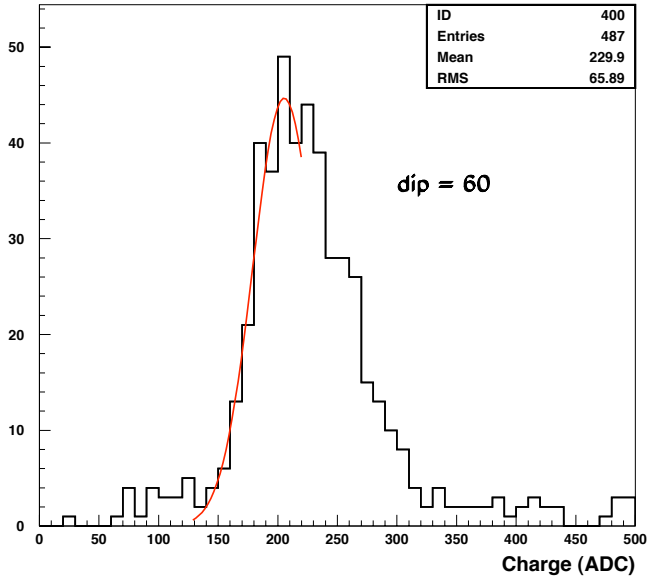
  $R=\sigma_E/\langle E\rangle$

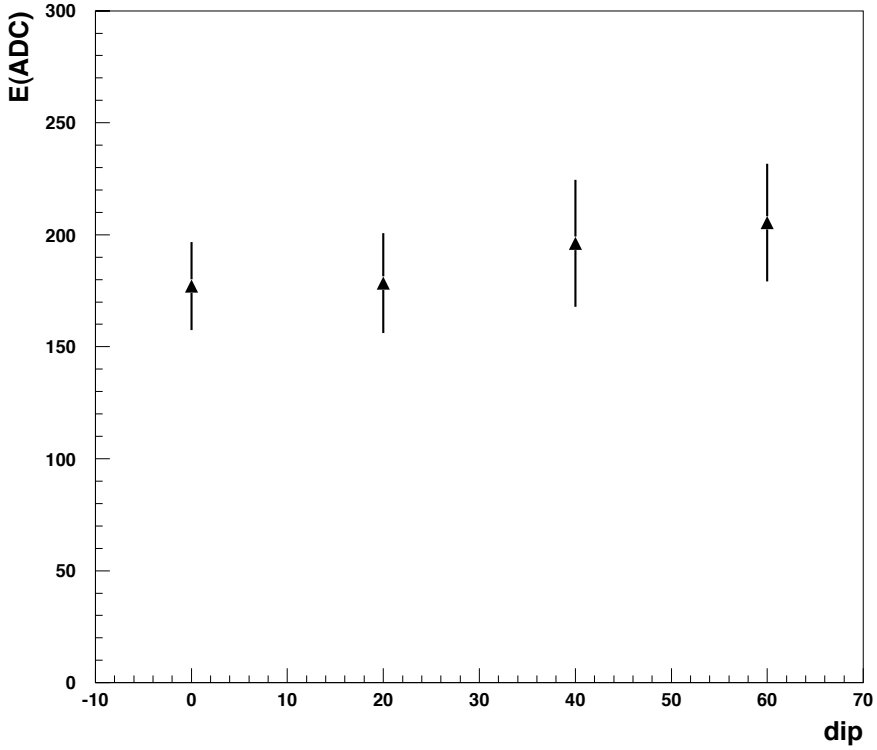
Energy distributions

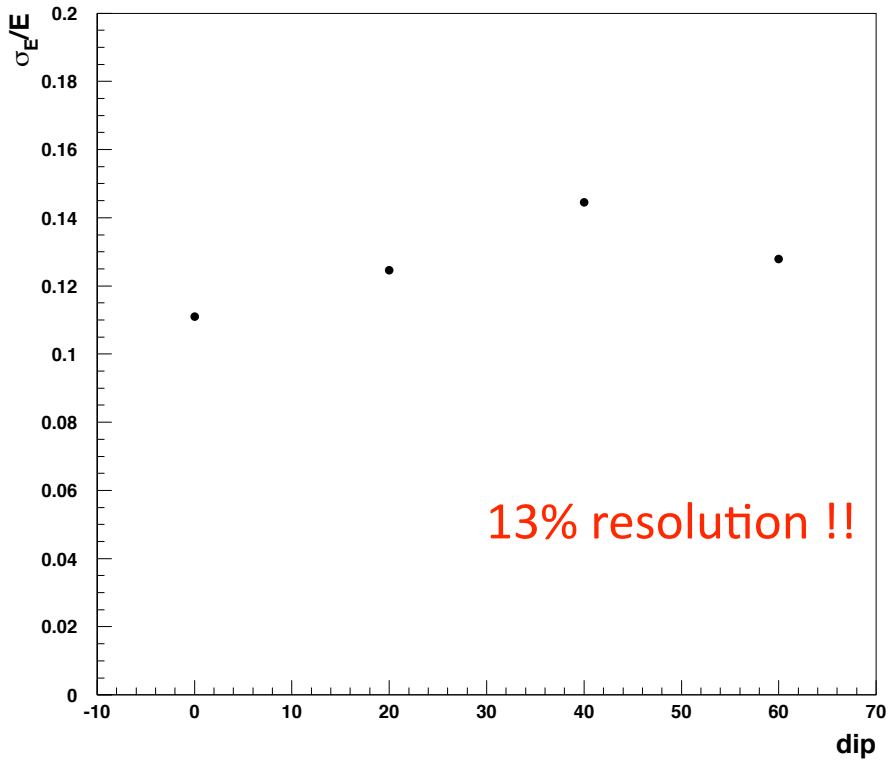






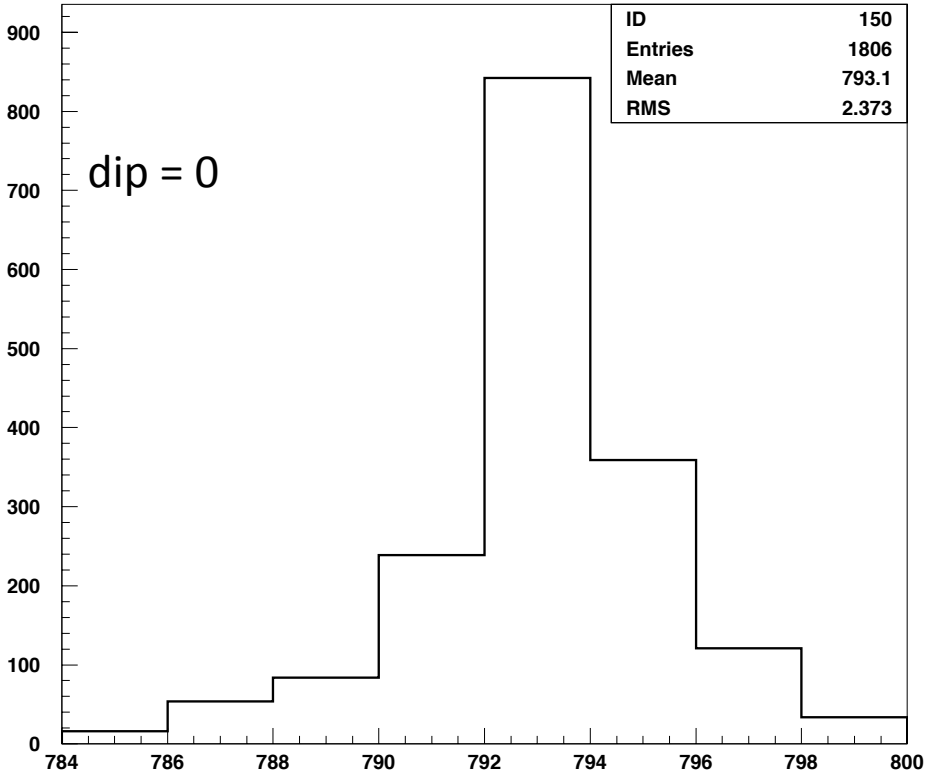




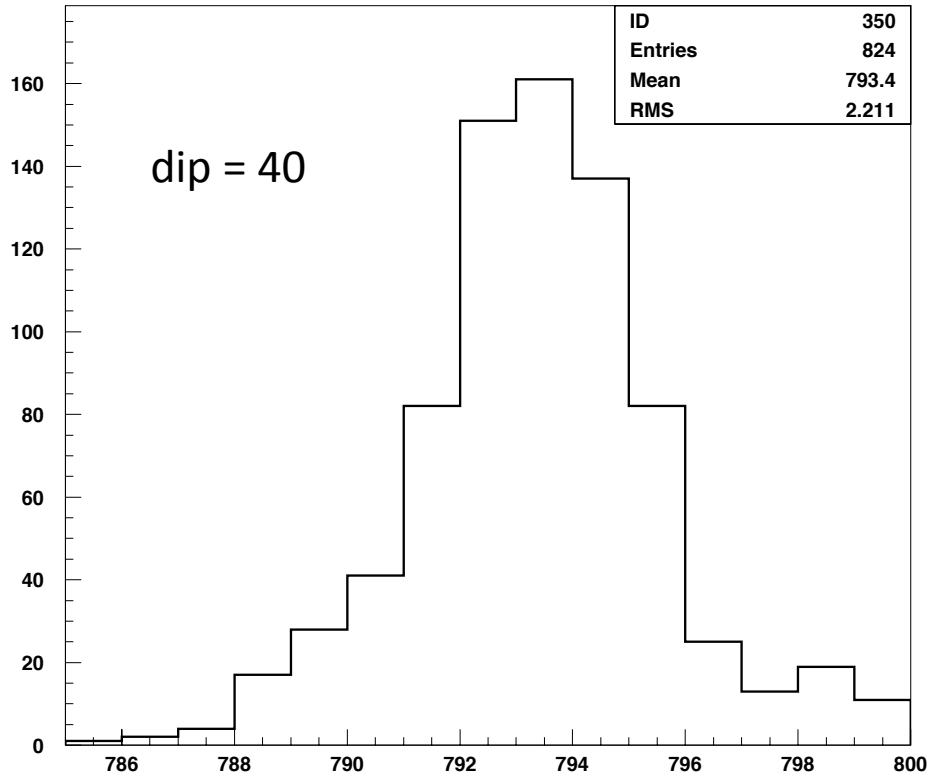


Calorimetric Resolution is evaluated to be around 13% (instead of 25% !)
The most probable value is not exactly constant at deep angle increasing..
A more accurate estimate of the most probable value is needed.

Time Resolution
(only for dip = 0 and 40 degrees for the moment)



RMS = 2.37 samples

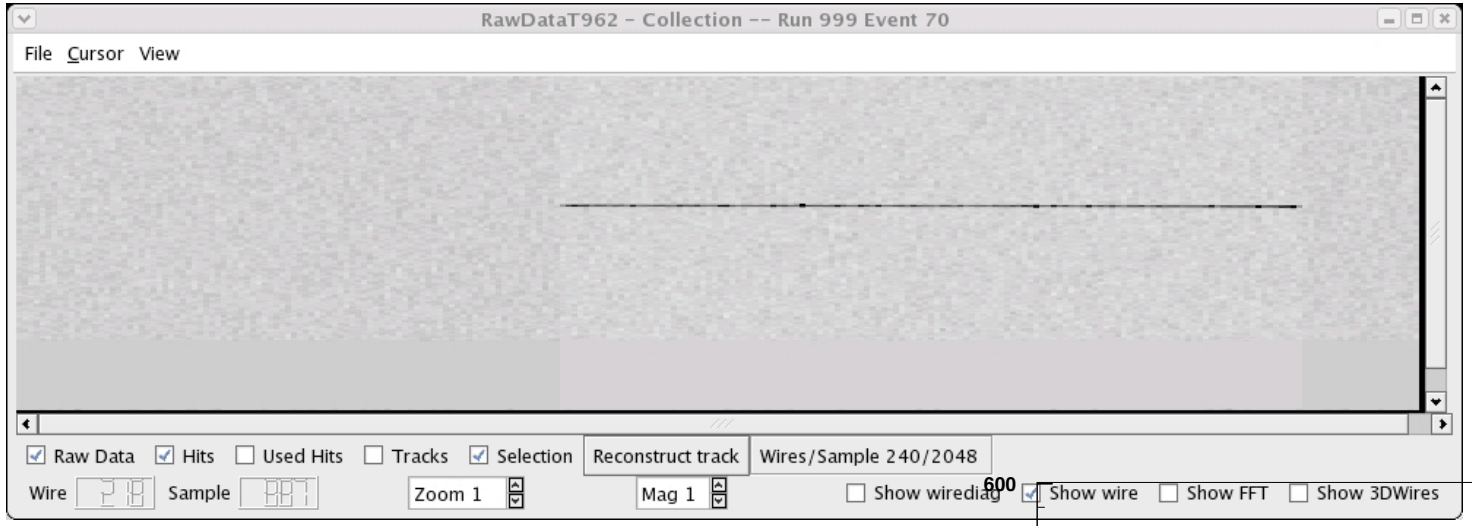


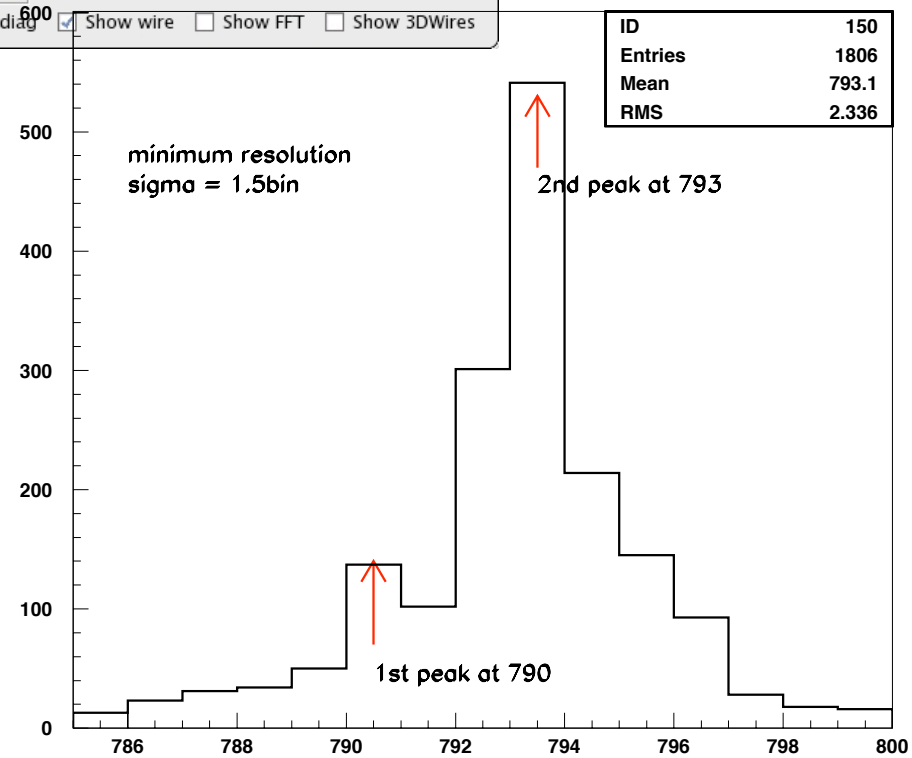
RMS = 2.21 samples

Conclusions

- This work was meant to be just an exercise since we have to check what impulse response we're using to simulate muons "alla Icarus".
- Next step in this analysis will be to fit the energy distributions with a Landau function and to calculate the time resolution also for the others deep angles.

Backup slides





Time resolution at dip = 0
could even be better (1.5 samples)

Need to check..