

BCAL Timing

Aug. 5, 2011

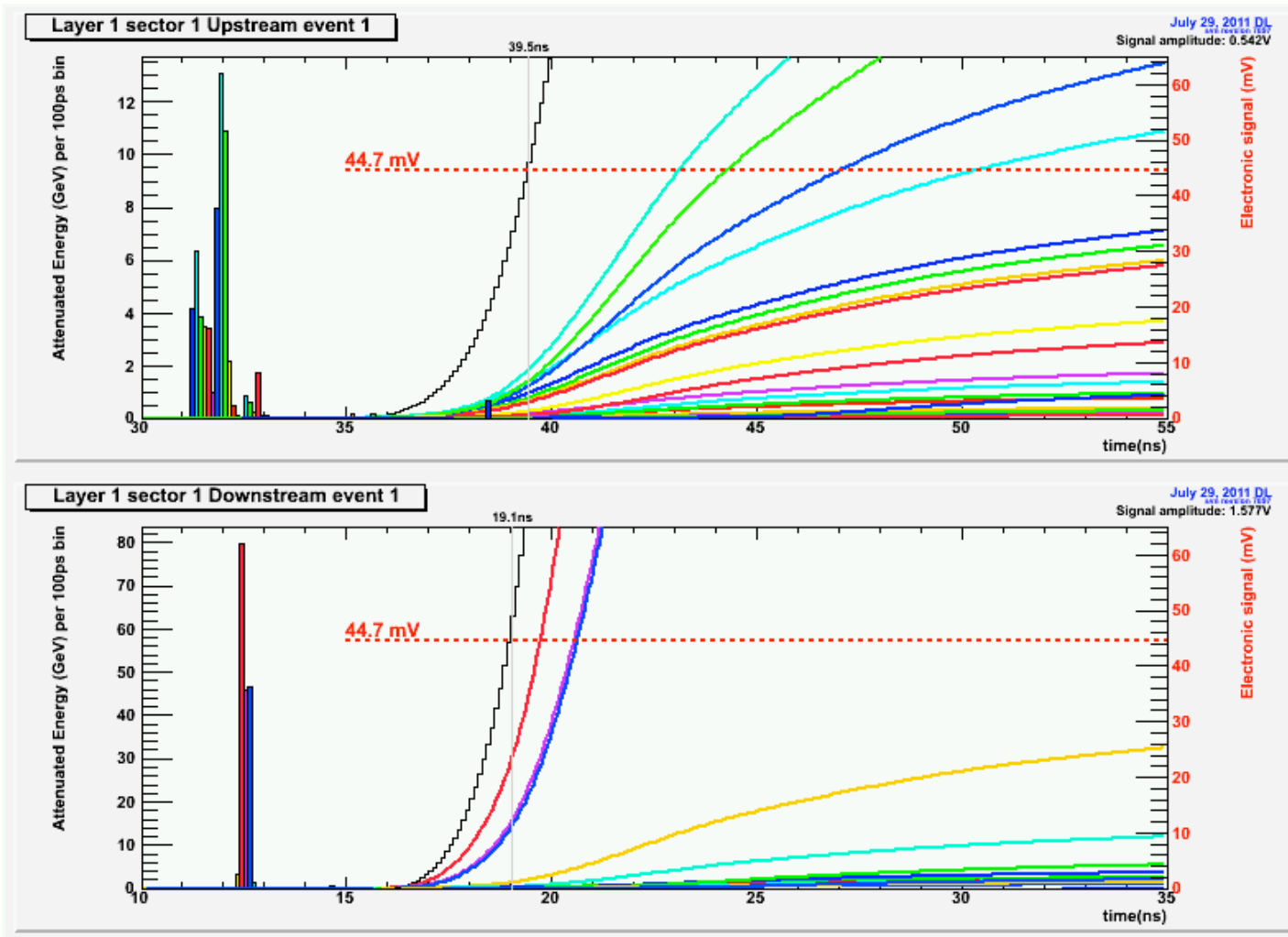
David Lawrence JLab

What I have been up to...

- Studied contributions to electronic signal at timing threshold (see next slides)
- Re-engineered complicated macro-based scheme for processing events into plugin
 - Process is simplified and sped up so now it takes minutes to do what used to take a full day
 - Added structure to make it easier to compare different segmentation schemes
 - Implemented new SiPM pulse shape ($\sim 5\text{ns}$ rise time)
- Continue the battle with timewalk corrections

Electronic pulse contributions

15ns rise time



- Energy/timing of signal arriving at SiPM is histogram on left

- Electronic pulse is curves on right (plotted against RH axis)

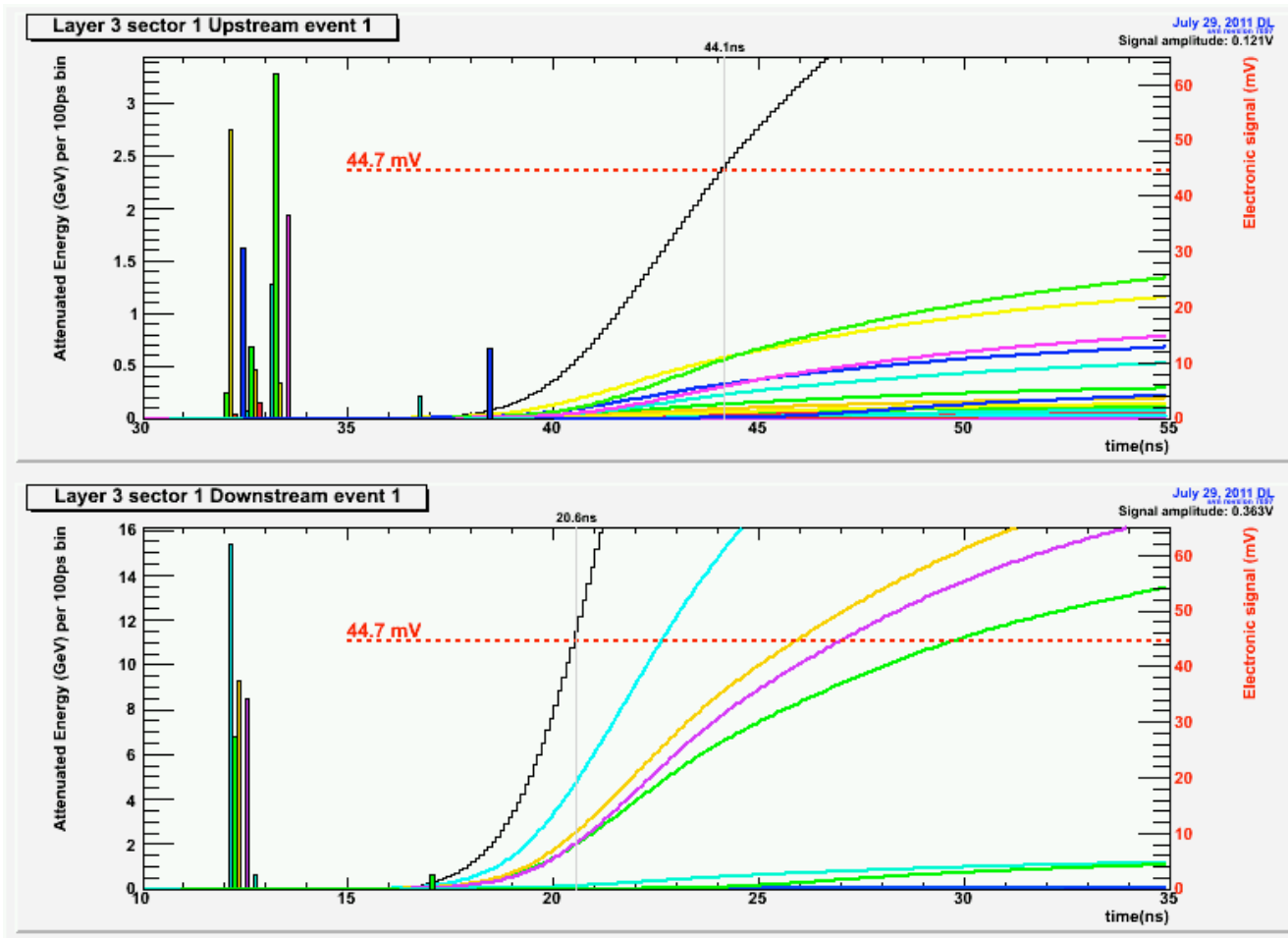
- Black line is total electronic pulse

- Thin, gray line indicates where electronic signal crossed threshold

- Colored lines are each 100ps bin

Electronic pulse contributions

15ns rise time



Earliest photons do not necessarily drive the timing.

Here, the yellow and green bins contribute equal amounts to the electronic pulse at threshold even though the green represents light arriving 1ns later

New BCAL Pulse Shape

Fig 6. from GlueX-doc-1795

New electronics design leads to a “5ns” rise time

Sharper-edged pulse is being incorporated into current study

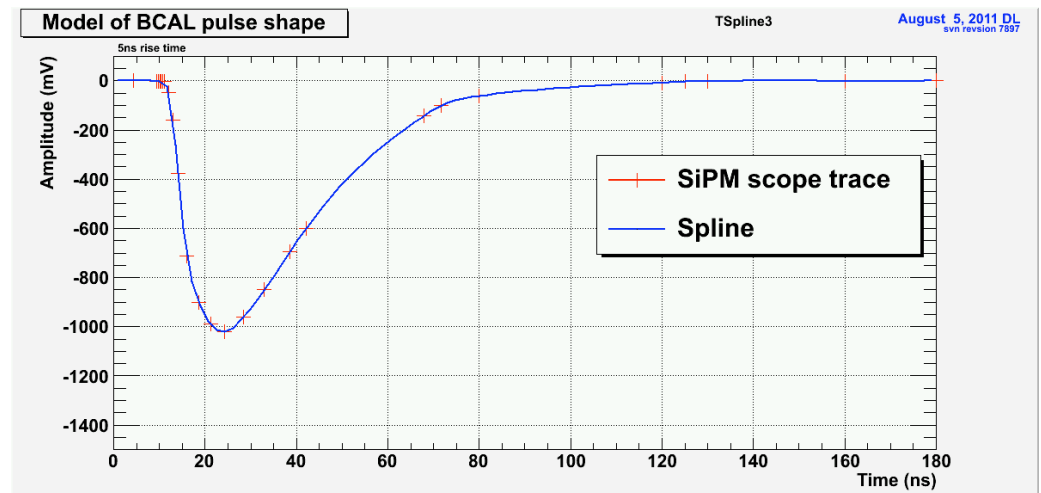
Top (magenta) waveform in scope capture on right is for BCAL_T (the one used)

Middle (green) waveform is for BCAL_A

Bottom (yellow) waveform is for fast laser Sync output (L-Trig)



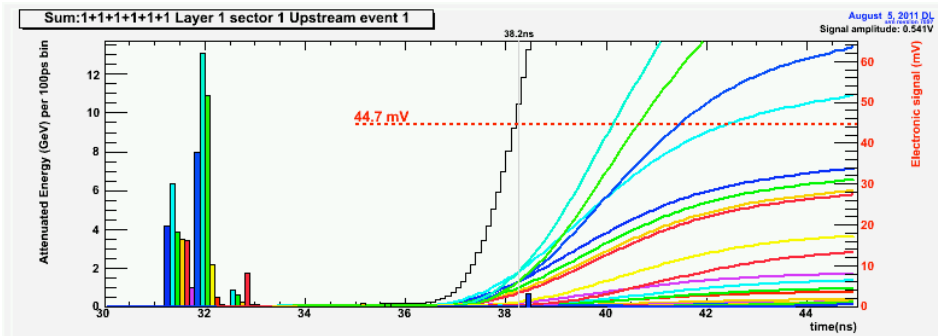
TSpline3 using points harvested from above image



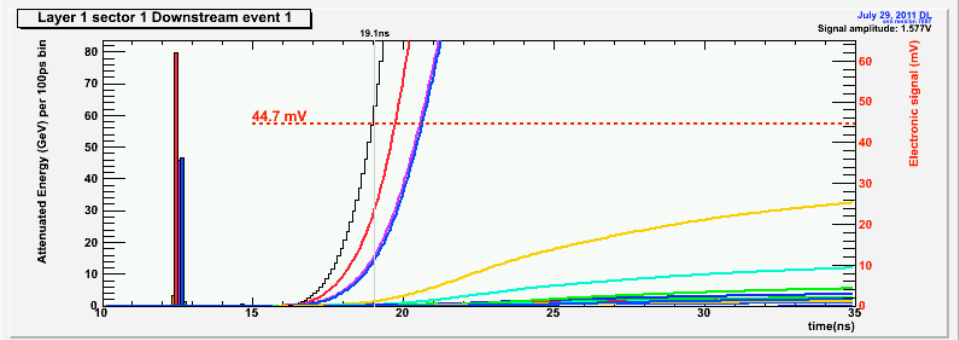
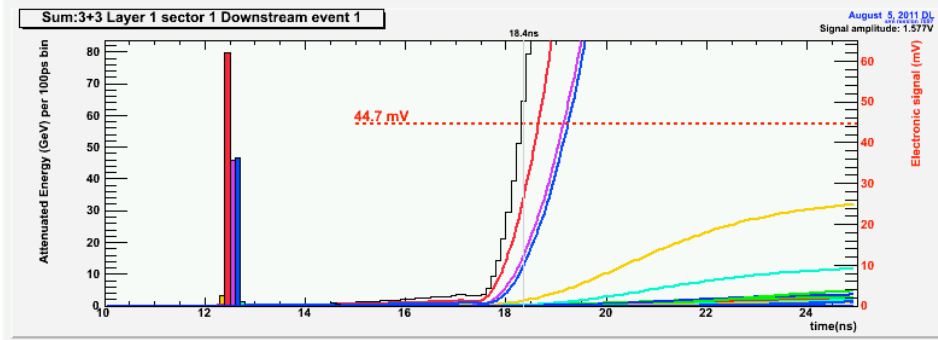
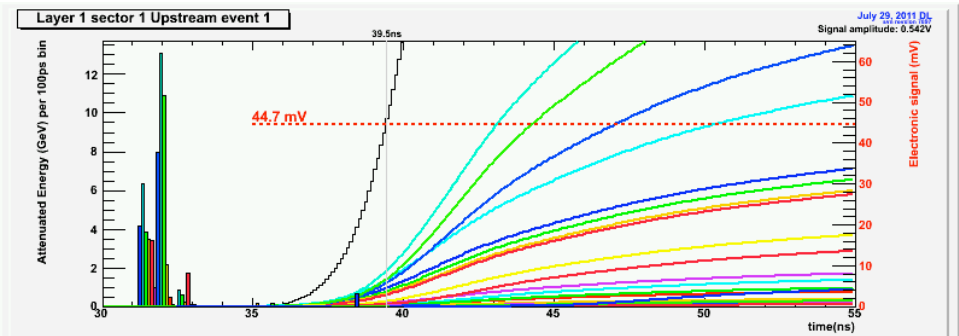
5ns vs. 15ns

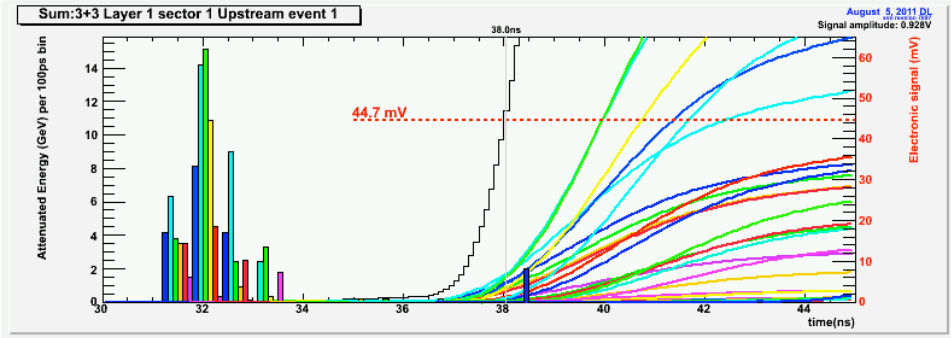
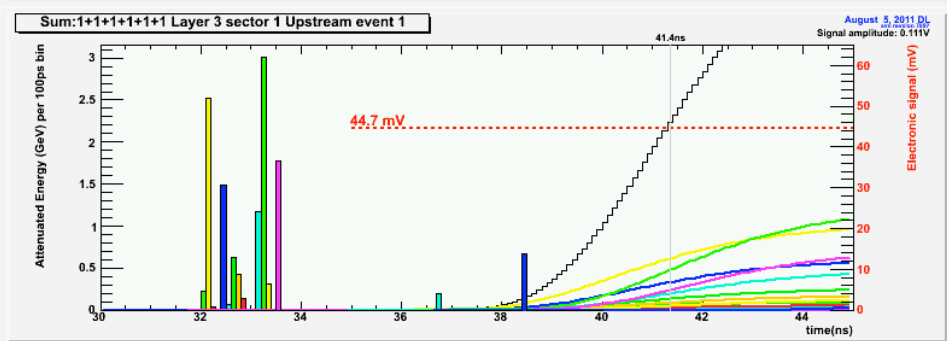
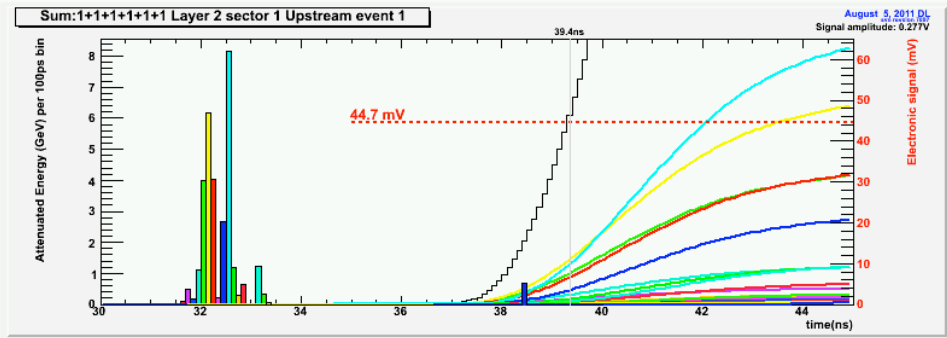
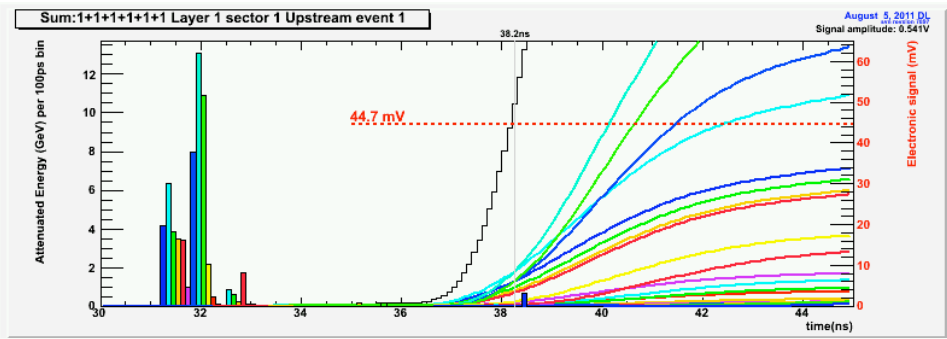
- Plots below show a similar event using both the 5ns rise time pulse shape and the 15ns rise time pulse shape
- Random sampling fluctuations and dark hits are different, but the energy deposition is the
- n.b. x-axis on plots are different!

5ns rise time



15ns rise time





Summed cell: sector1l layer 1

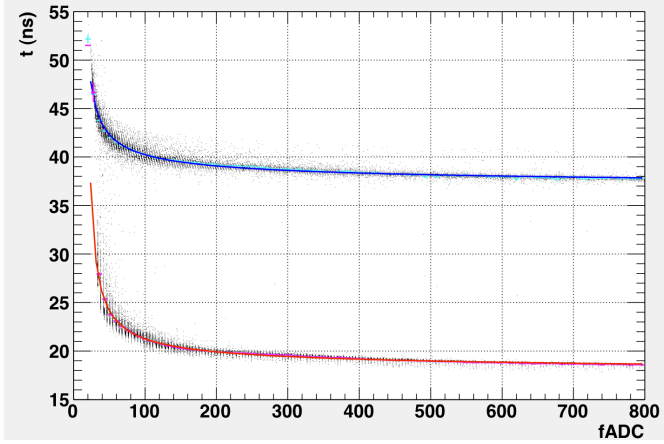
Time: 38.0ns

Individual cells: sector 1; layers 1,2,3

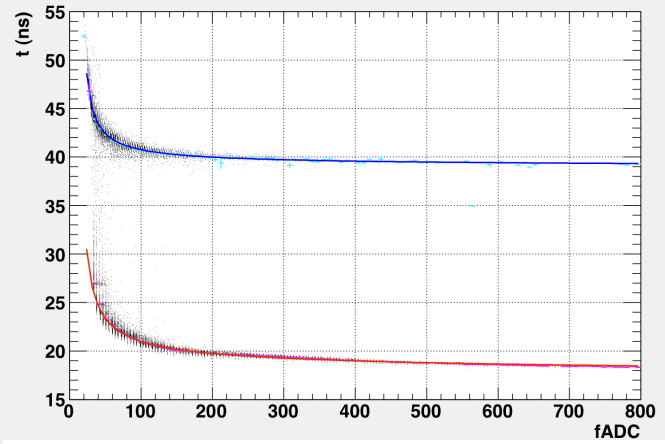
Times: 38.2ns, 39.4ns, 41.1ns

12 degrees before timewalk correction

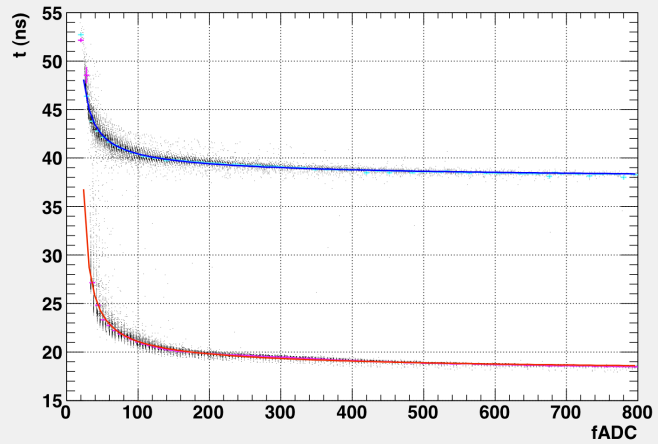
Timewalk for layer 1



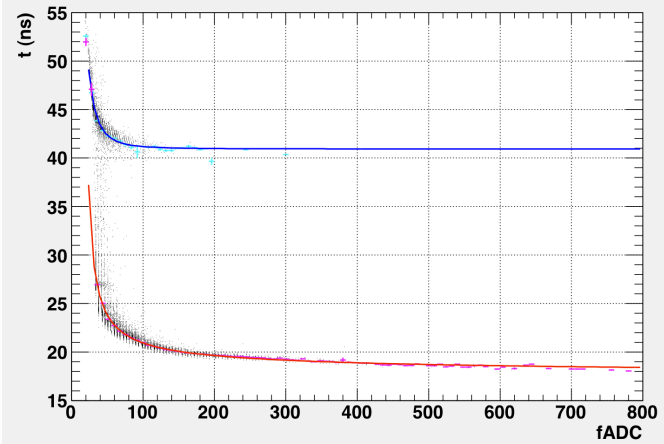
Timewalk for layer 3



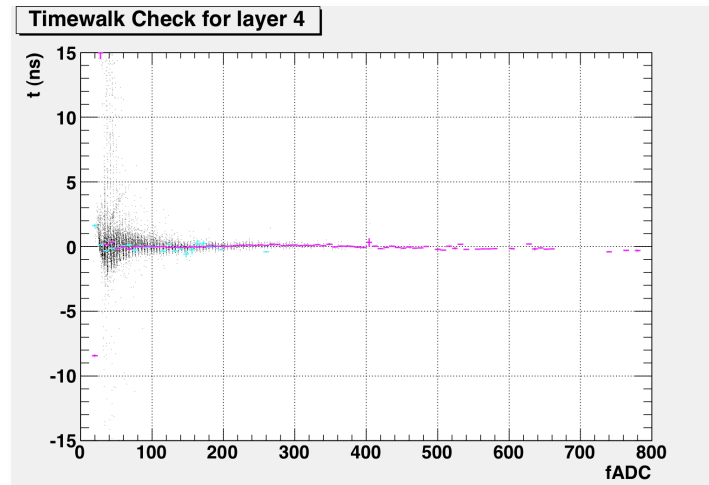
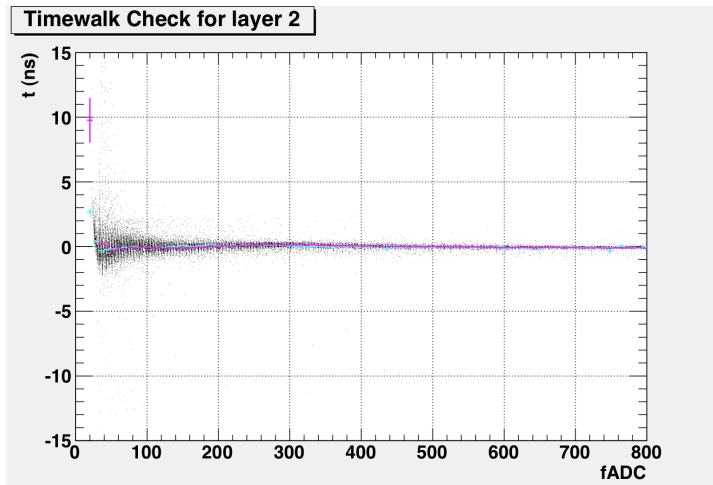
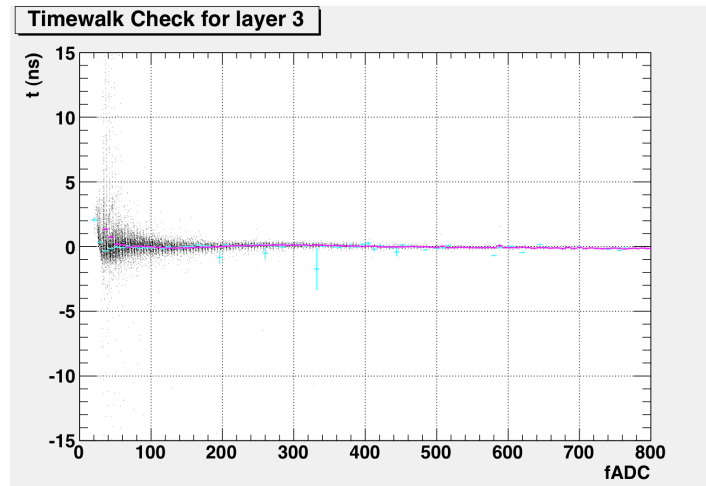
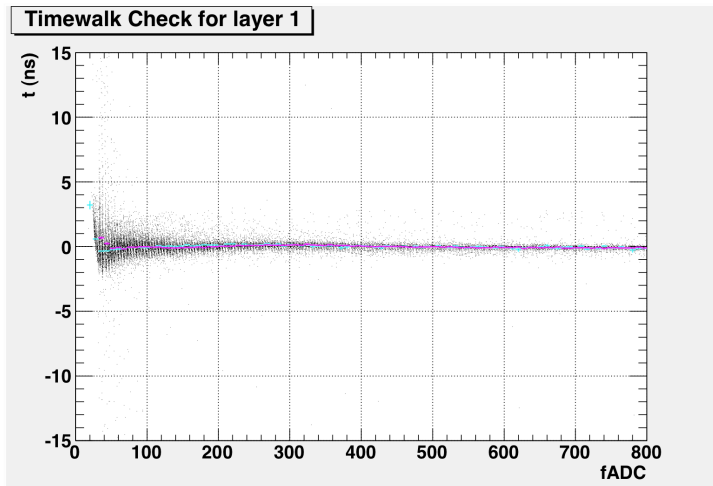
Timewalk for layer 2



Timewalk for layer 4

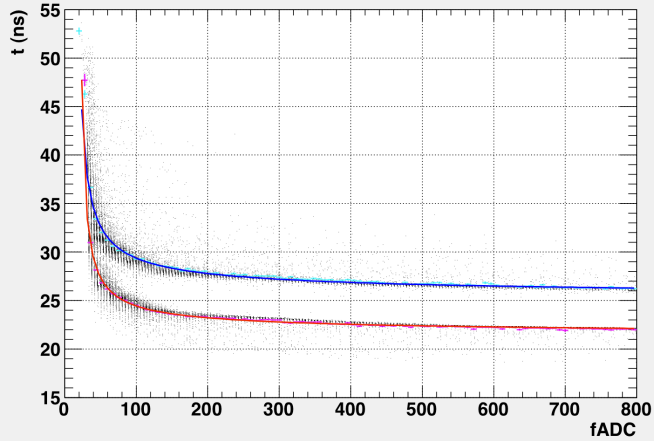


12 degrees after timewalk correction

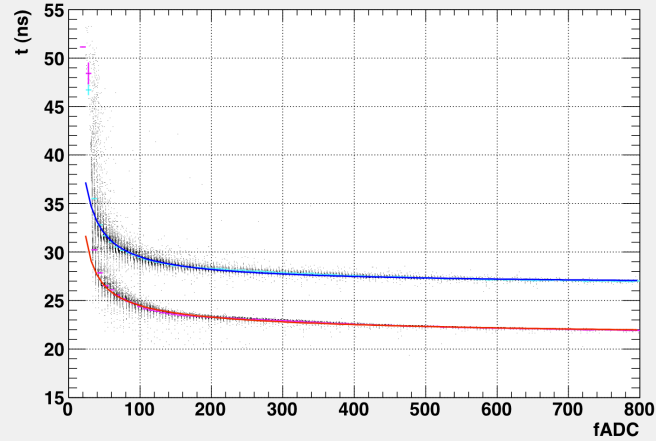


20degrees before timewalk correction

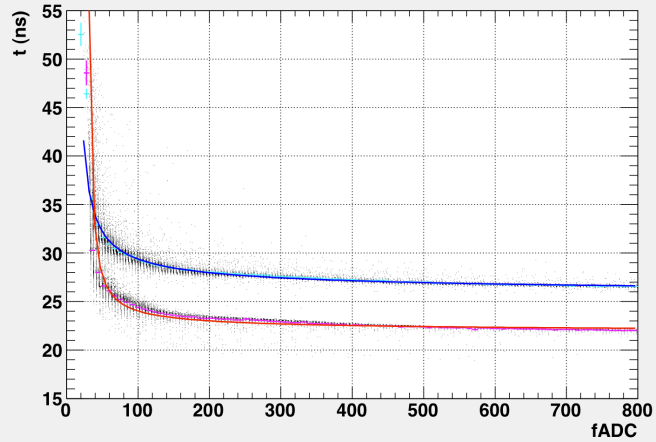
Timewalk for layer 1



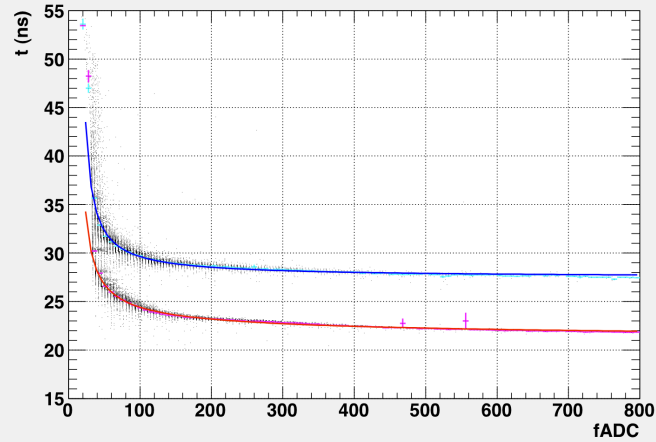
Timewalk for layer 3



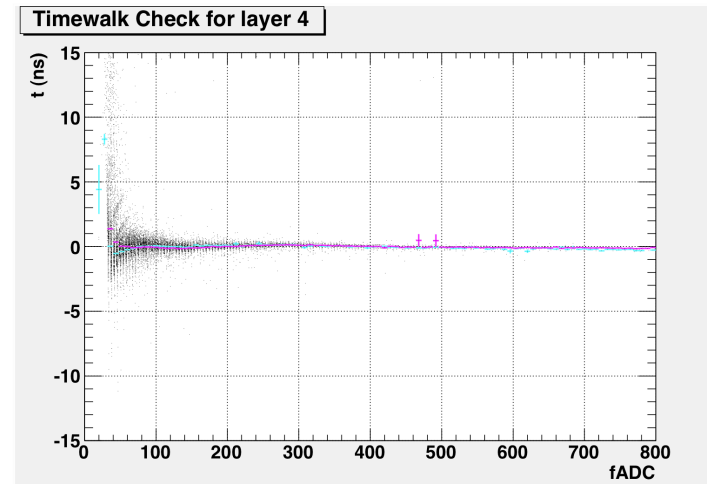
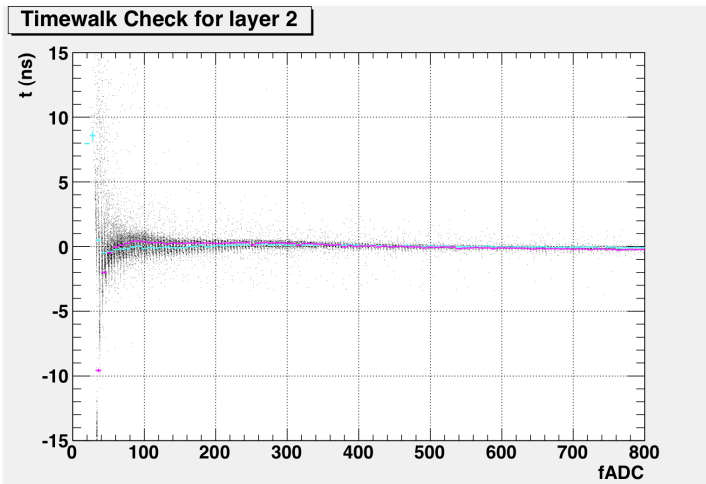
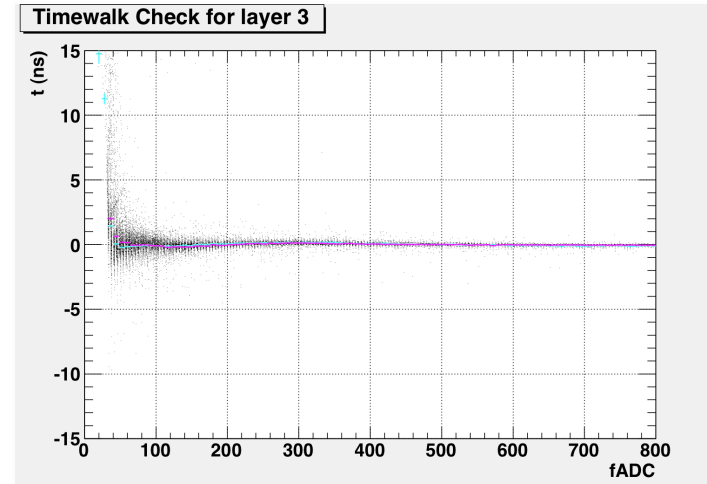
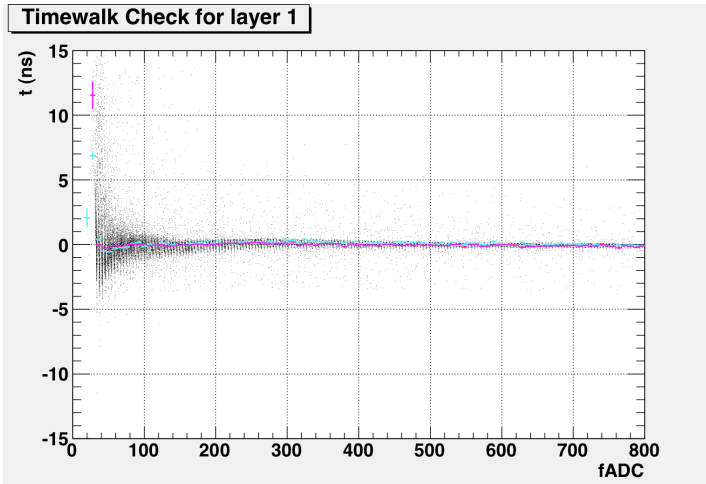
Timewalk for layer 2



Timewalk for layer 4



20 degrees after timewalk correction



Segmentation configurations

