



UNIVERSITÄT
HEIDELBERG
ZUKUNFT
SEIT 1386



GEFÖRDERT VOM
Bundesministerium
für Bildung
und Forschung



Status Update

Test-beam October 2015: Timepix3 Timing Studies

LCD Silicon Discussion

CERN, July 15th, 2020

Jens Kröger

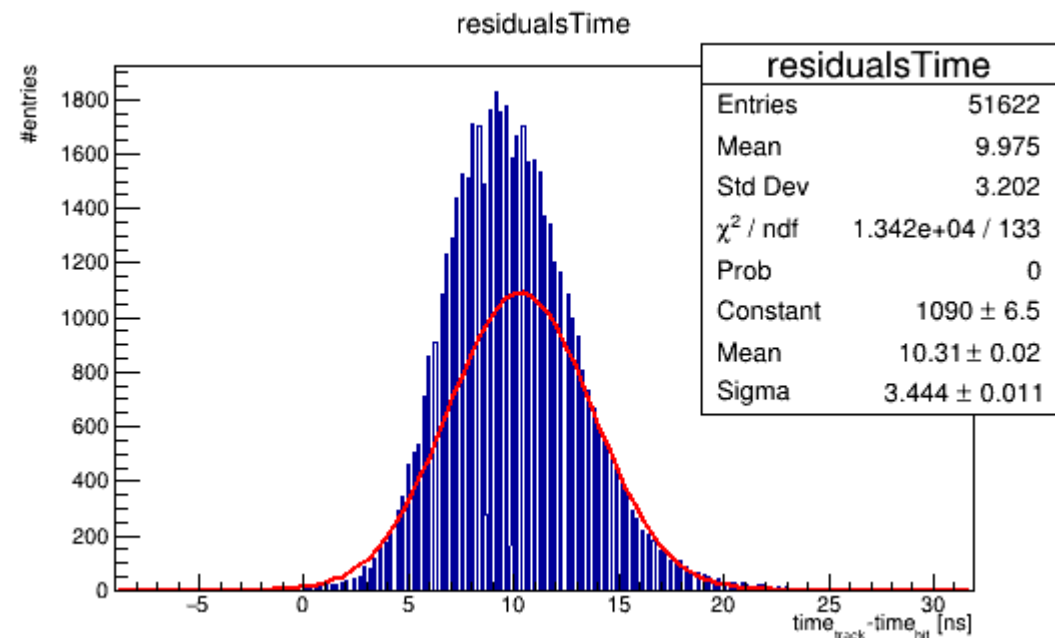
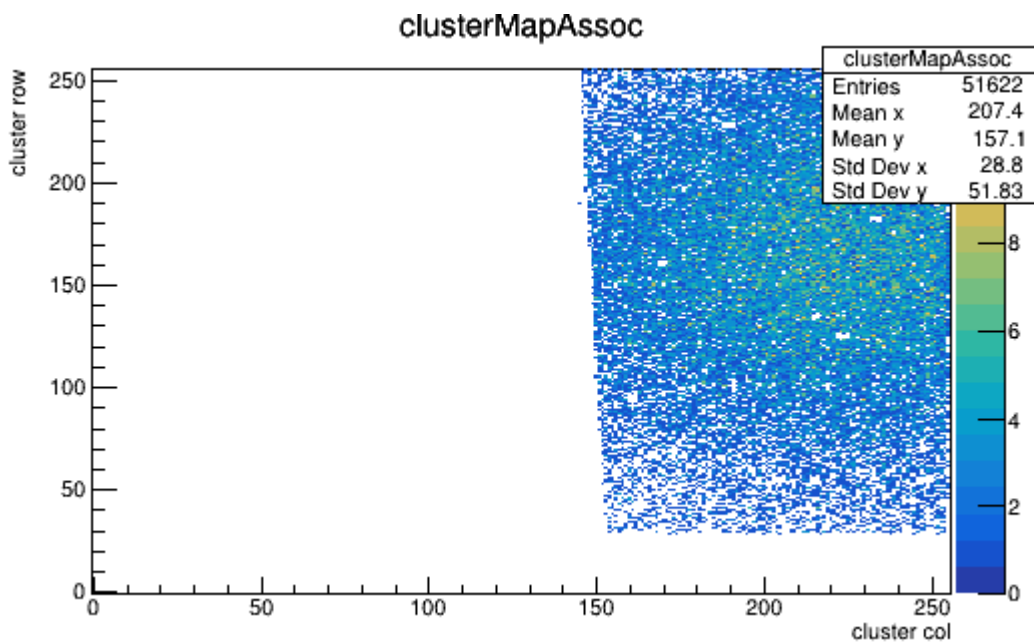
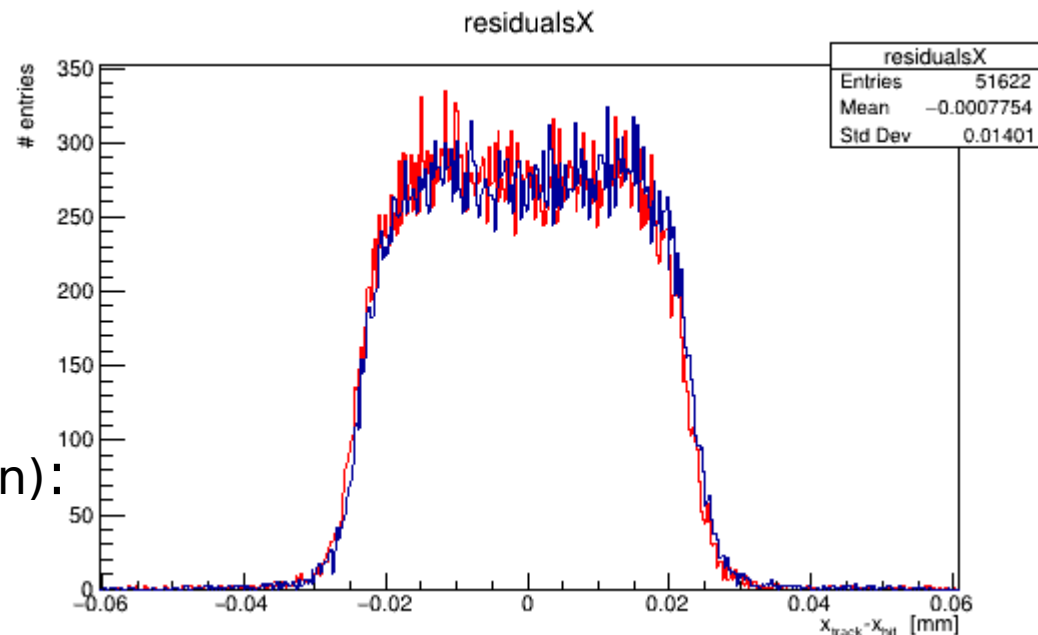
Heidelberg University & CERN

“Old” SPS data from October 2015

- start with old SPS data from Florian’s analysis
- DUT:
 - **W5_E2** (same as we use at DESY)
- run 667:
 - threshold = 1190 DAC
 - bias = -20 V
- calibration as implemented in [EventLoaderTimepix3]:
 - calibration files available from Florian

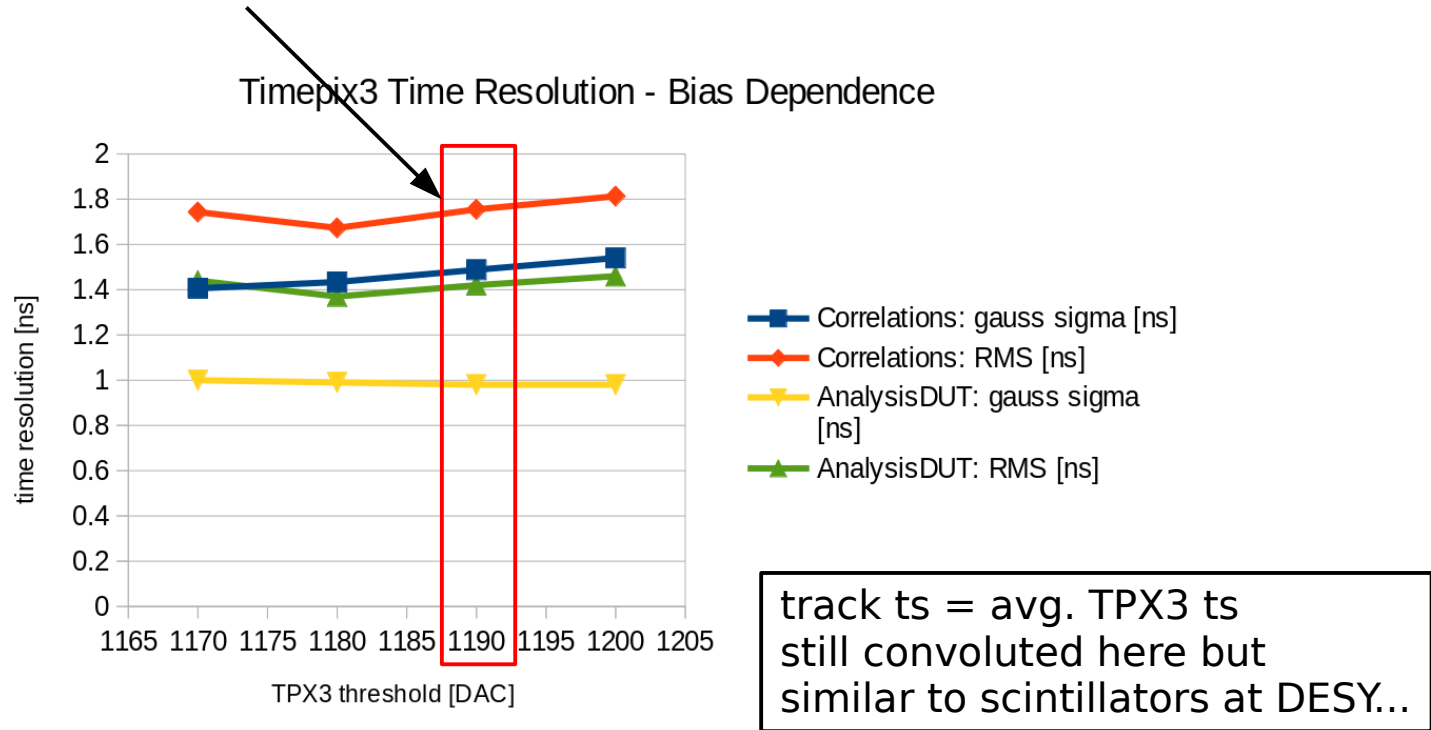
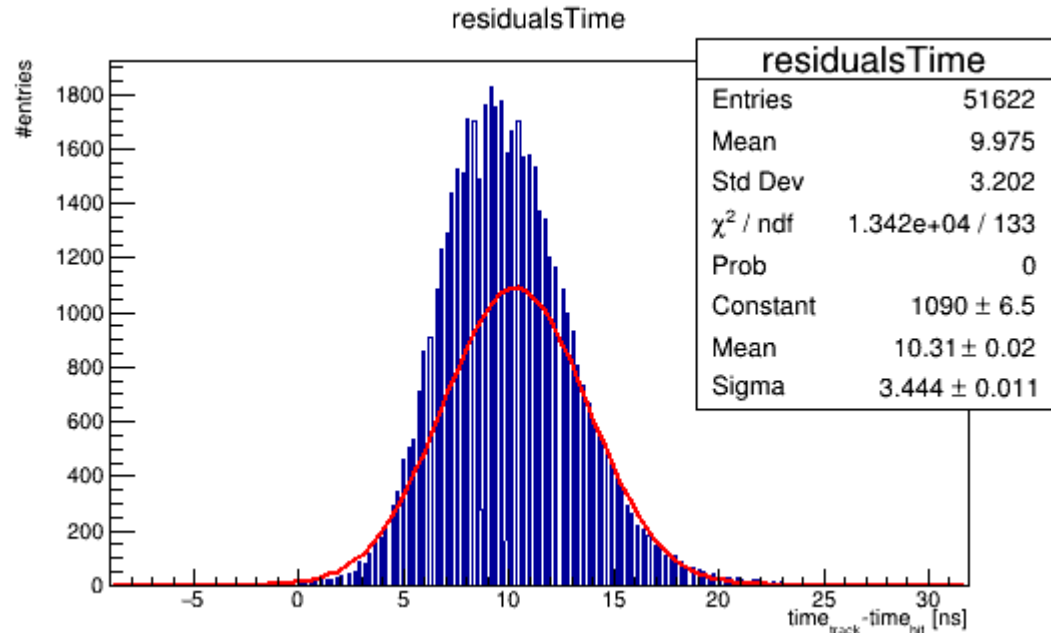
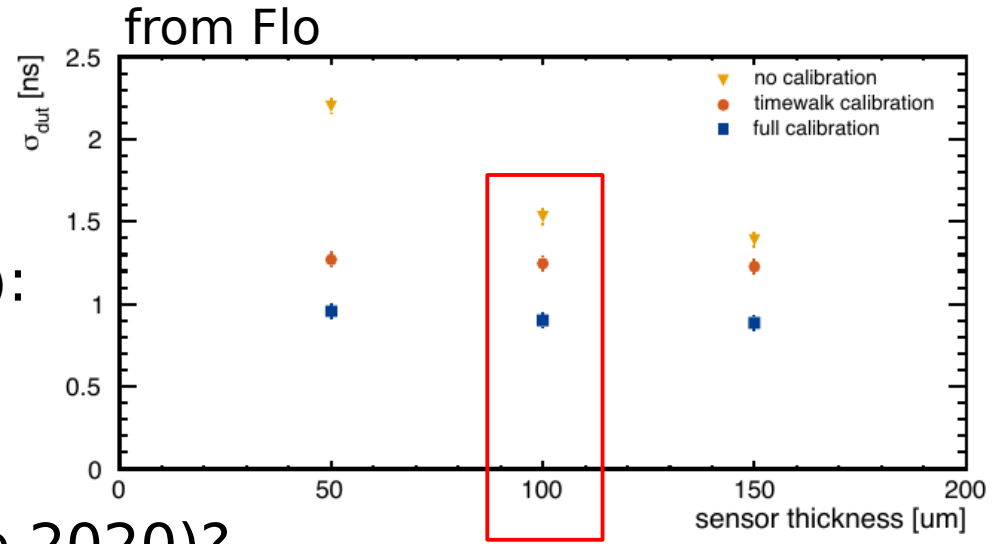
First Sanity Checks

- no full telescope coverage
- spatial resolution $\sim 14 \mu\text{m}$
 \sim binary resolution = $55/\text{sqrt}(12) = 15.9 \mu\text{m}$
- time resolution (no calibration/timewalk correction):
 - gaussian sigma $\sim 3.44 \text{ ns}$
 - RMS $\sim 3.2 \text{ ns}$



Compare w/ Flo & DESY

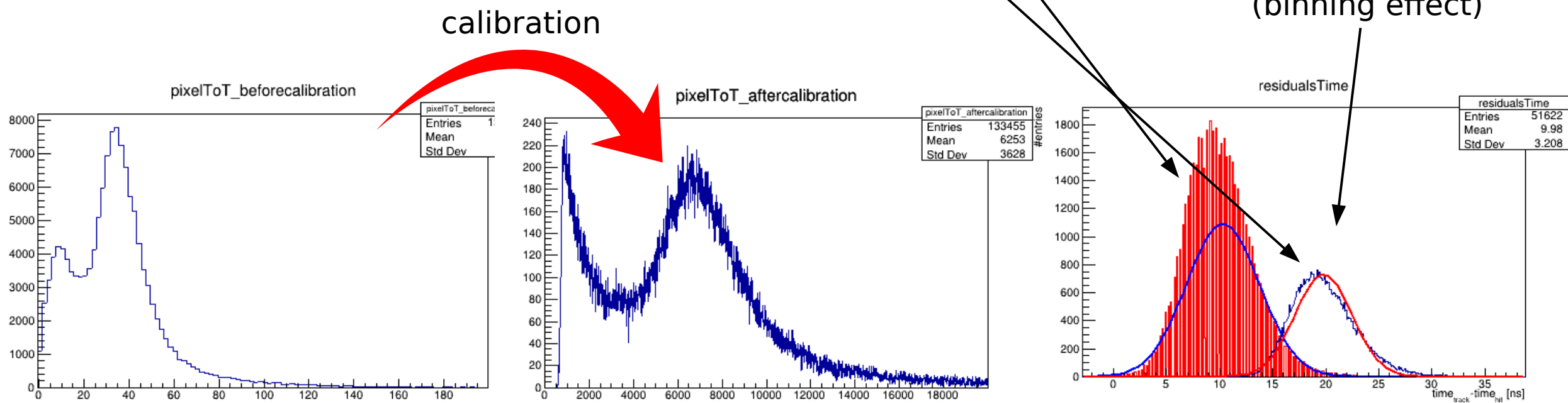
- time resolution (no calibration/timewalk correction):
 - gaussian sigma ~ 3.44 ns
 - RMS ~ 3.2 ns
- Why so much worse compared to DESY (June 2020)?



track ts = avg. TPX3 ts
still convoluted here but
similar to scintillators at DESY...

Timepix3 Calibration

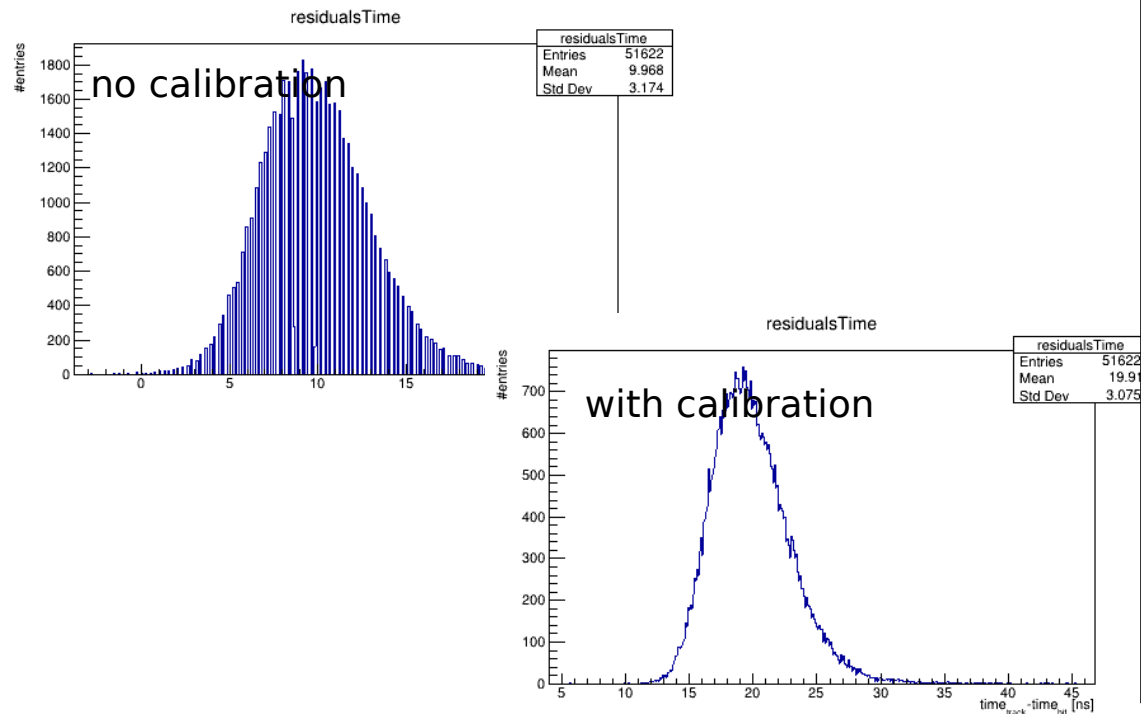
- applying calibration as implemented in [EventLoaderTimepix3]:
- time resolution:
 - before: $\sigma \sim 3.44$ ns / RMS ~ 3.2 ns
 - after: $\sigma \sim 2.68$ ns / RMS ~ 3.1 ns



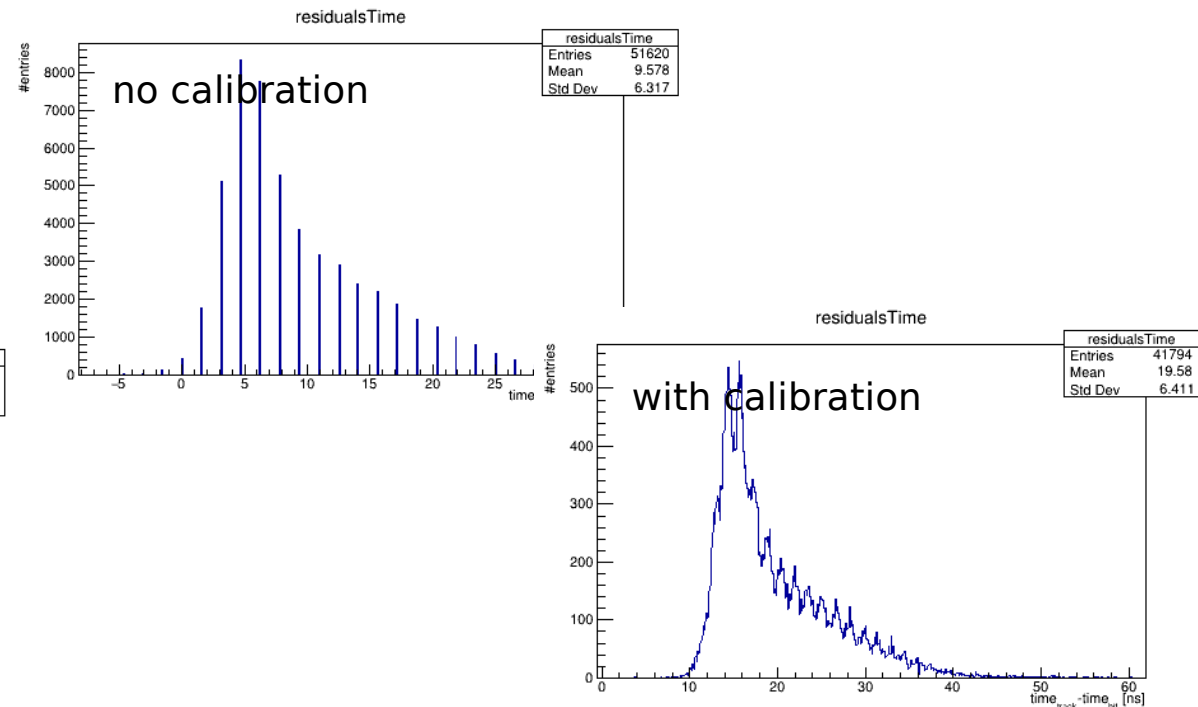
Timepix3 Time Resolution

- as reported before: time resolution much worse than expected
- but: I use avg. cluster timestamp for track, NOT SpidrSignal (trigger) as Flo
- try also using only 1 TPX3 for track timestamp → even worse:

avg. timestamp



TPX3_3 timestamp



How did Flo do his calibration?

1) timewalk calibration:

→ implemented in current master

- based on lab data, available for full sensor
- our sensor (W5_E2): thresholds 1170, 1186, 1190

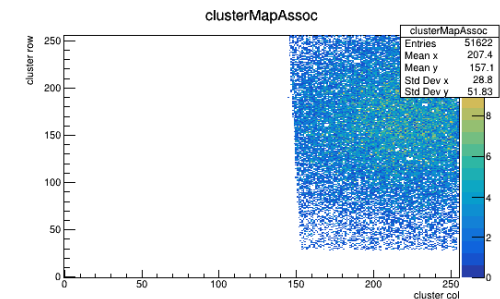
Concept:

- inject test-pulse into digital in-pixel logic
- inject test-pulse into analogue front-end → timewalk → fit function

2) delay calibration:

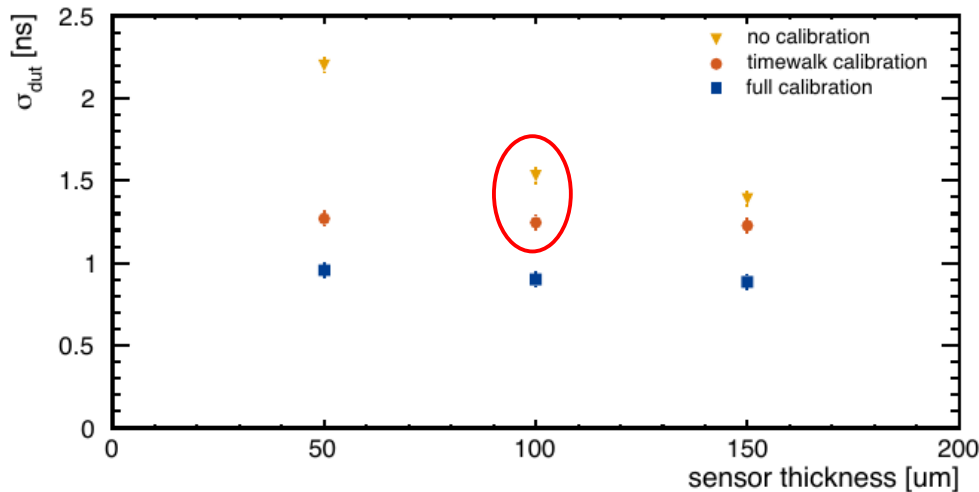
→ only implemented in Timepix3_improved_calibration

- based on test-beam data, available only for top right corner
- clock propagation top/bottom + 16 column periodicity



Using [ImproveReferenceTimestamp]

- spoke with Simon:
SpidrSignal can be used with [ImproveReferenceTimestamp]

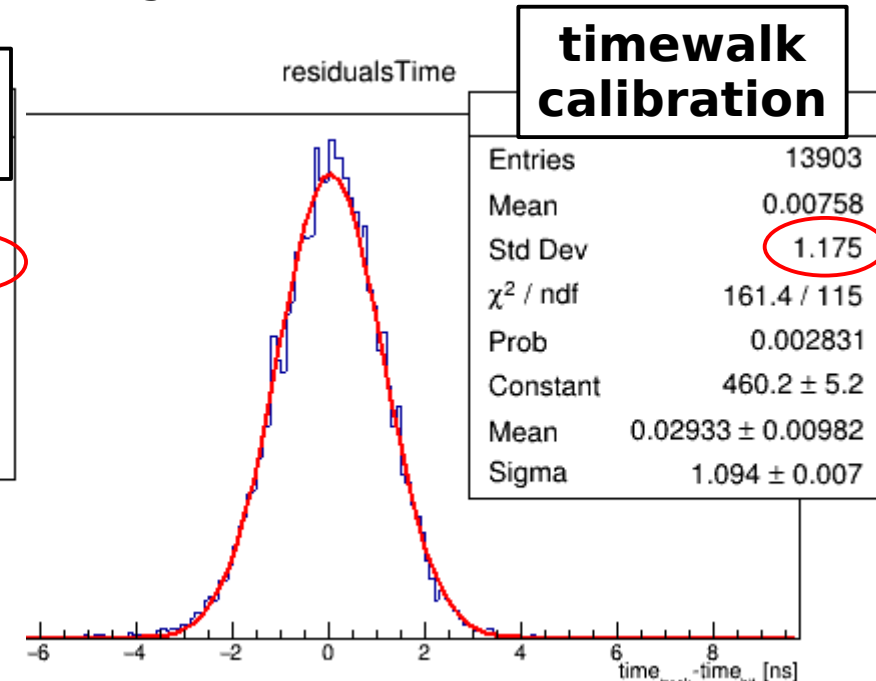
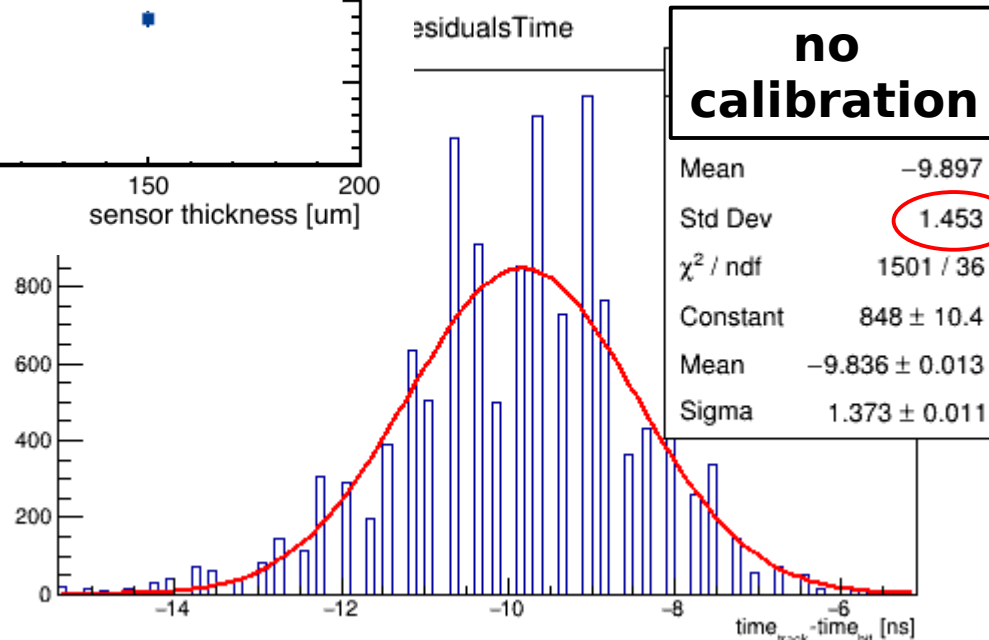


from Flo:

no calibration: RMS ~ 1.53 ns

w/ timewalk cal: RMS ~ 1.24 ns

* maybe slightly different cuts

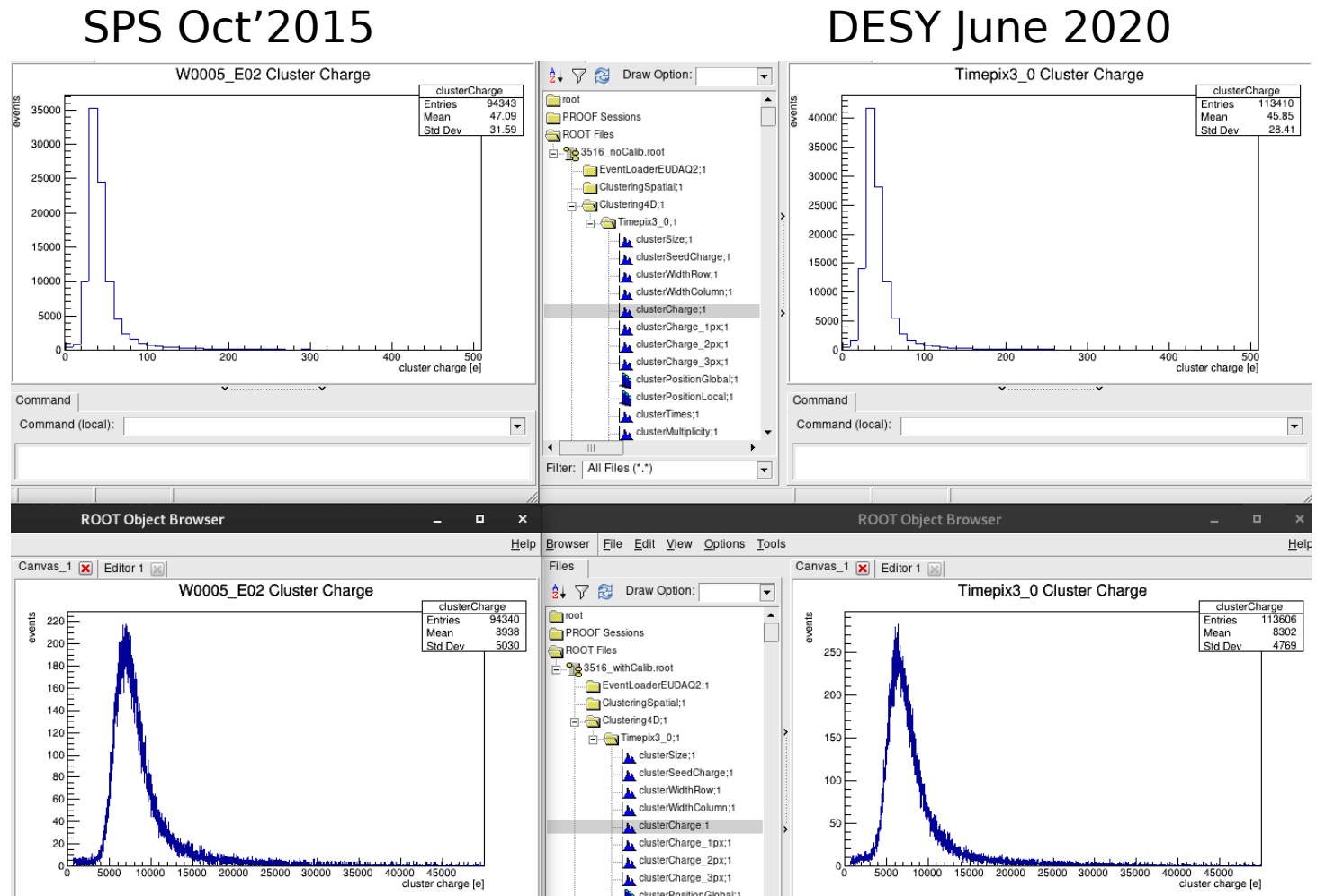


Currently: Implement calibration in EUDAQ2

- in Timepix3Event2StdEventConverter
- **cluster ToT**
→ **cluster charge**

before calibration

after calibration



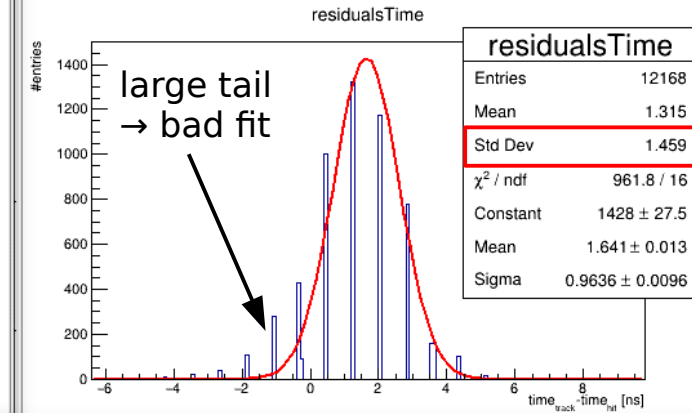
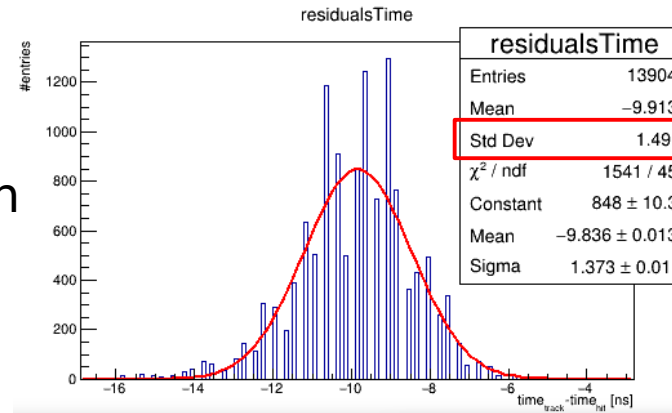
Currently: Implement calibration in EUDAQ2

- in Timepix3Event2StdEventConverter
- **time residuals**

SPS Oct'2015

DESY June 2020

before calibration

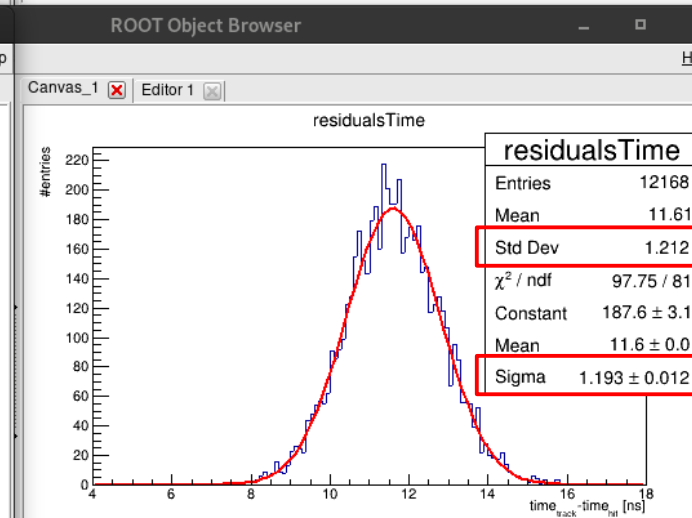
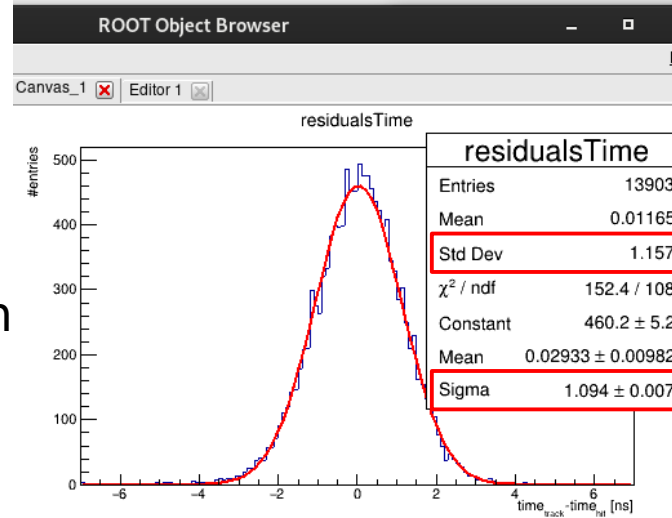


from Flo:

no calibration: RMS ~ 1.53 ns

w/ timewalk cal: RMS ~ 1.24 ns

after calibration



Other topic: TLU+Mimosa26

- Lennart discovered issue with [EventLoaderEUDAQ2]
- Mimosa readout not always 230us, often shorter
→ currently adding too many Mimosa frames to 1 event
- discussing about solution

