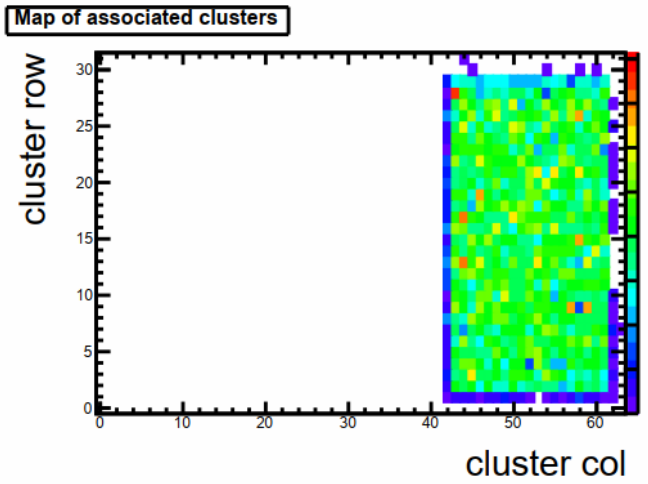
Associated clusters analysis @ TB PS202205

Jerome Baudot, Auguste Guillaume Besson, Ziad El Bitar
Szymon Bugiel, Andrei Dorokhov, Serhiy Senyukov, **Yitao WU**

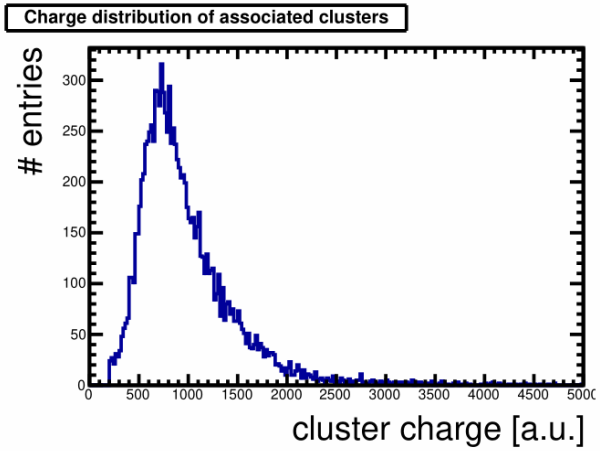
2022.06.15

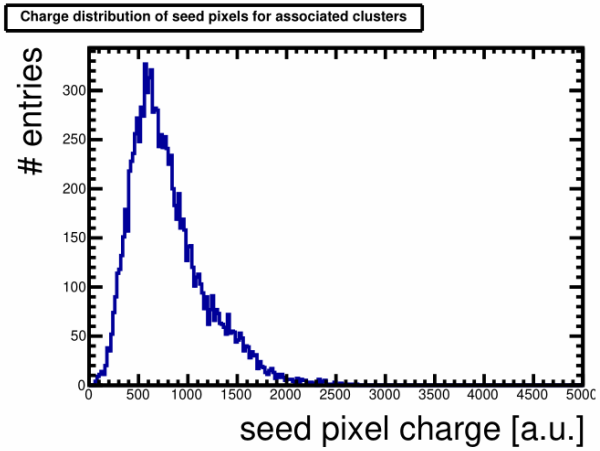
Analysis

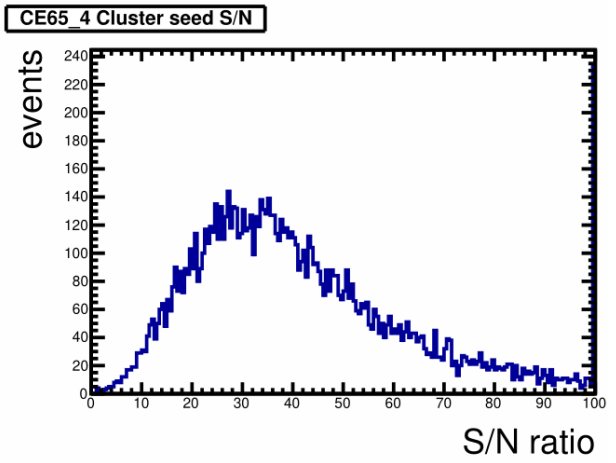
- B4 HV=10V, PSUB=0V
- Sub-matrix: SF
  - Seeding
    - **seed SNR > 2**
    - **cluster charge > 200**
    - method**: sum3x3**
  - Sensor edge: 2 pixel



WORK IN PROGRESS







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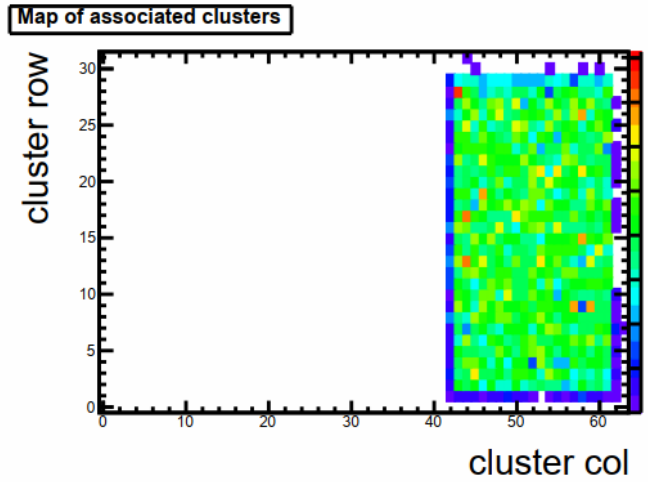


WORK IN PROGRESS

Raw efficiency : $96.5^{+0.2}_{-0.2}$ %

All tracks N_{trk} : 46385

- χ^2 / Ndf > 3 : -1223

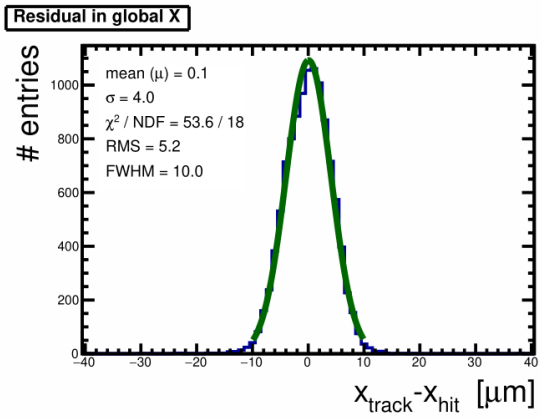
- outside DUT : -9709

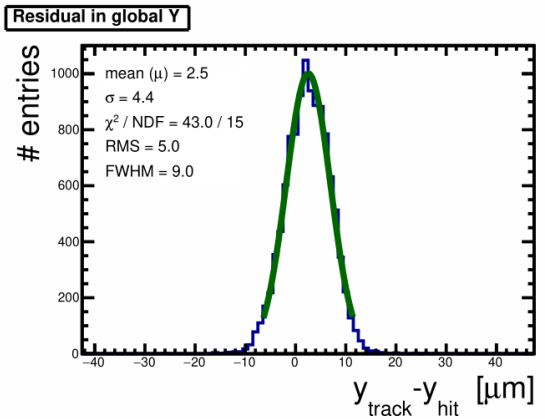
- outside ROI : -23949

- close to mask : -1223

Track pass selectoin : 11504

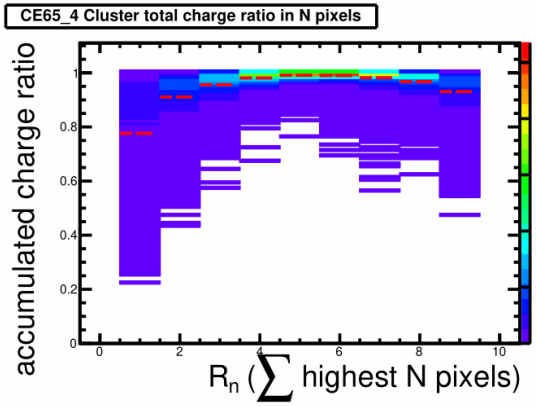
Associated clusters $N_{assoc.\ cls.}$: 11103

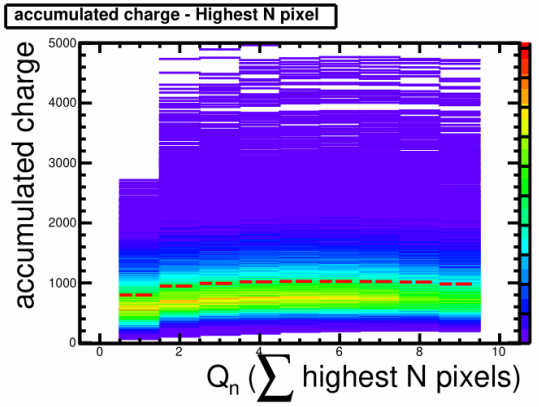


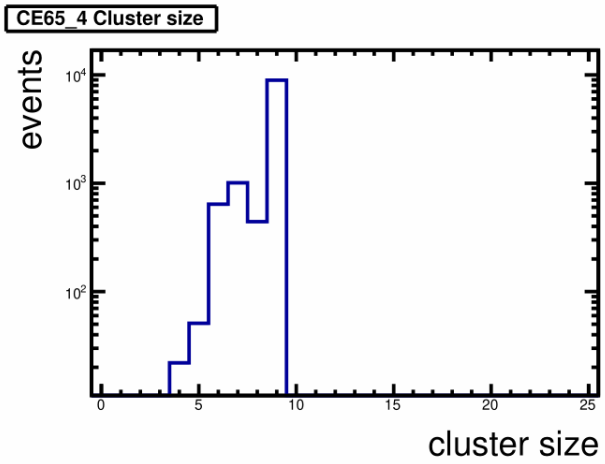


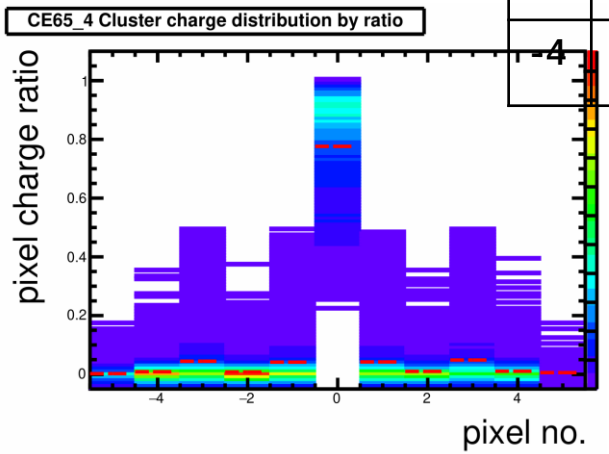
Analysis

- B4 HV=10V, PSUB=0V
  - Sub-matrix: SF
- Cluster shape
  - count all neighbours
  - ratio = $\frac{px.charge}{\max.charge}$









2	3	4
-1	0	1
-4	-3	-2

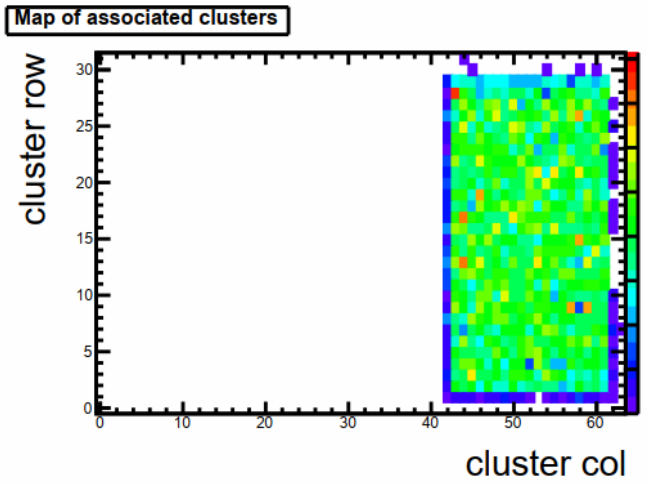
Mean

WORK IN PROGRESS

0.6%	4%	0.6%
4%	78%	4%
0.6%	4%	0.6%

Analysis

- B4 HV=10V, PSUB=0V
- Sub-matrix: AC amp.
  - Seeding
    - **seed SNR > 2**
    - **cluster charge > 1000**
    - method**: sum3x3**
  - Sensor edge: 2 pixel



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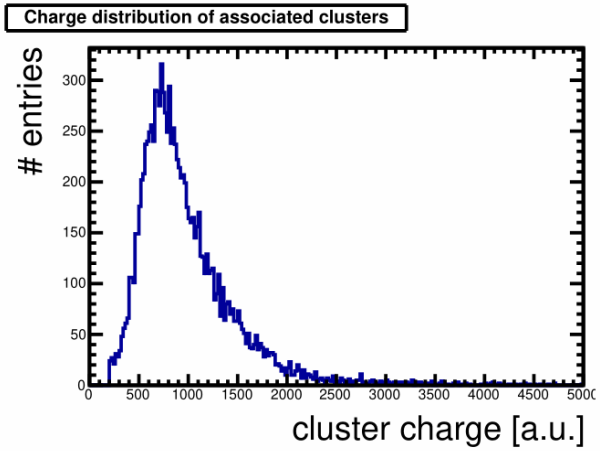

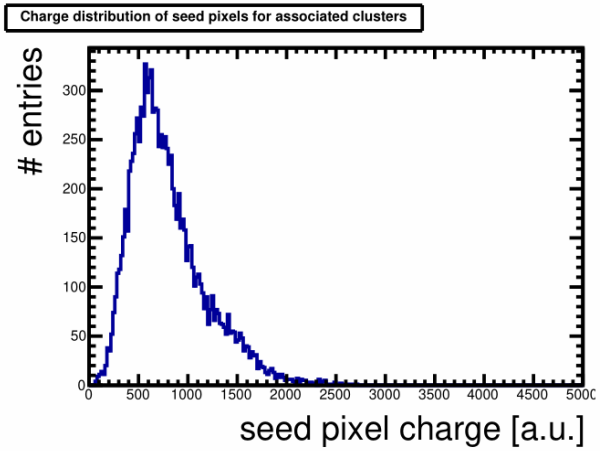

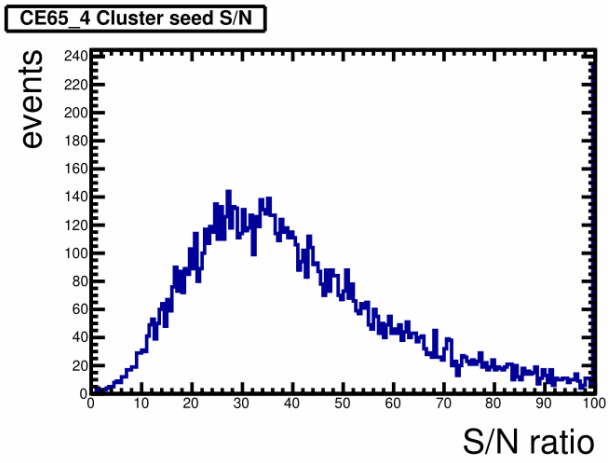

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    - **cluster charge > 200**
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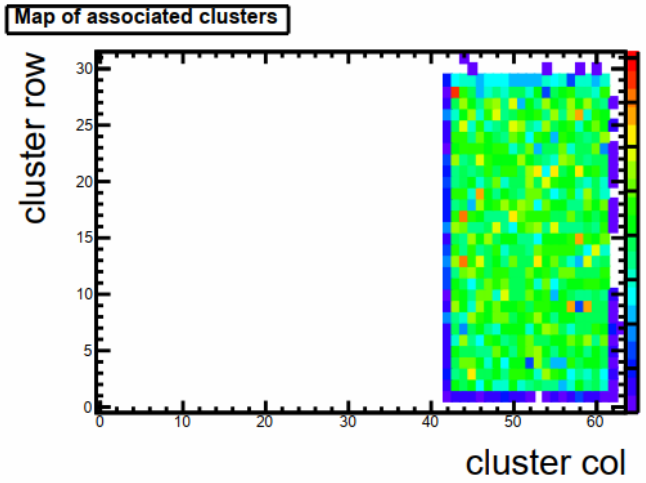

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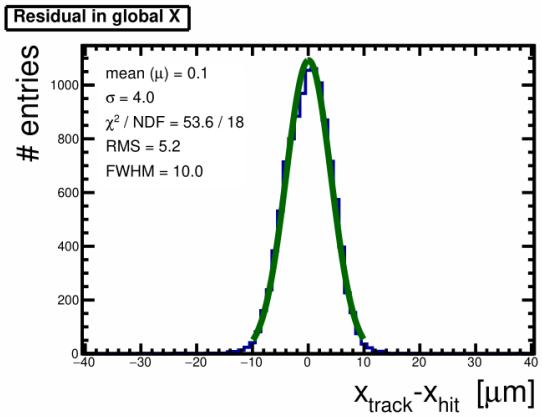

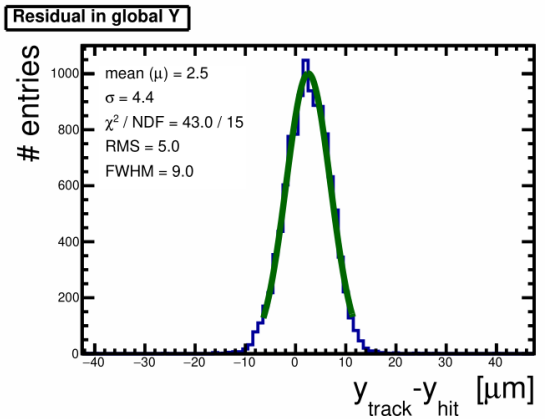

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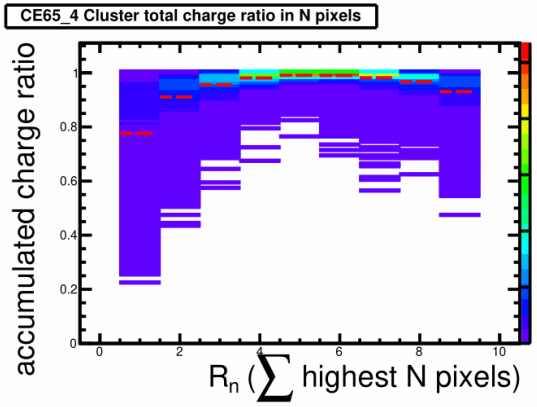
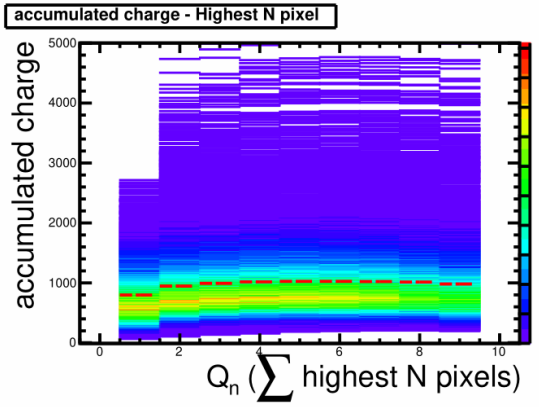
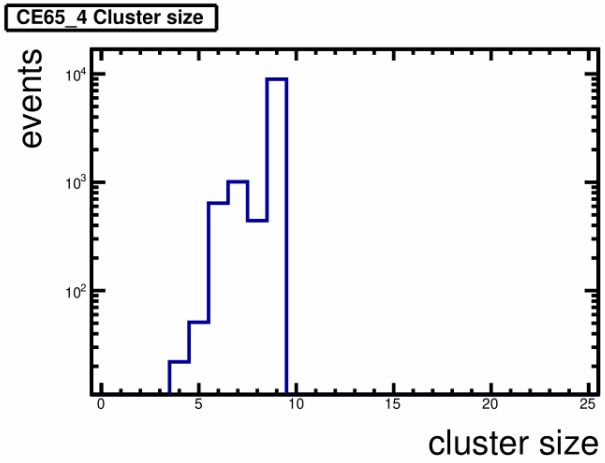
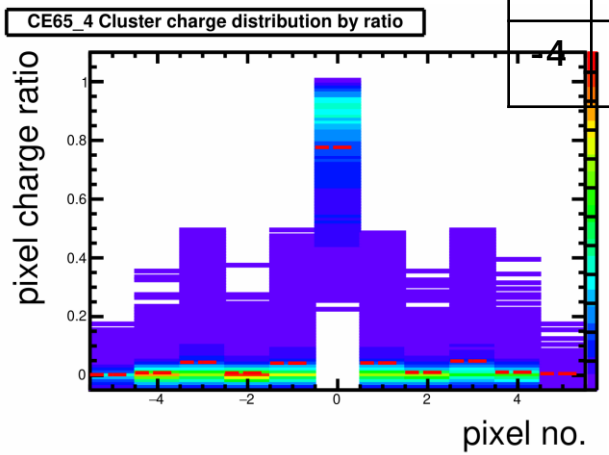
  - ratio = $\frac{px.charge}{\max.charge}$









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Mean

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4%	78%	4%
0.6%	4%	0.6%

WORK IN PROGRESS

Next

- Landau-gaussian fitting for charge and SNR
- Analysis on CE65 D4 (pitch 25um)

- Preliminary plots for approval
  - Variants: B4 (AC/DC/SF), D4 (AC/DC/SF)
  - Variables: cluster charge, seed SNR, tracking residuals

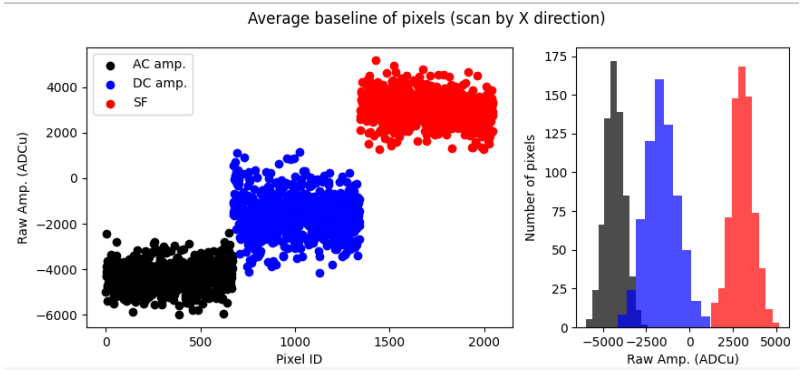
  ☐Optional: accumulated charge/Q_n, cluster shaperatio/R_n

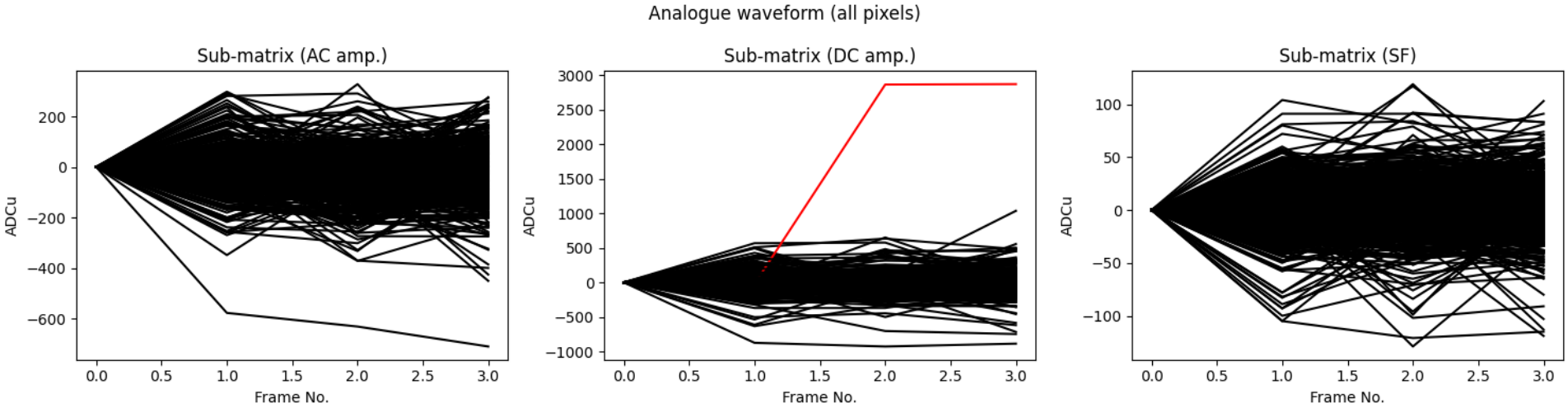
Backup

- Backup

Baseline & Signal

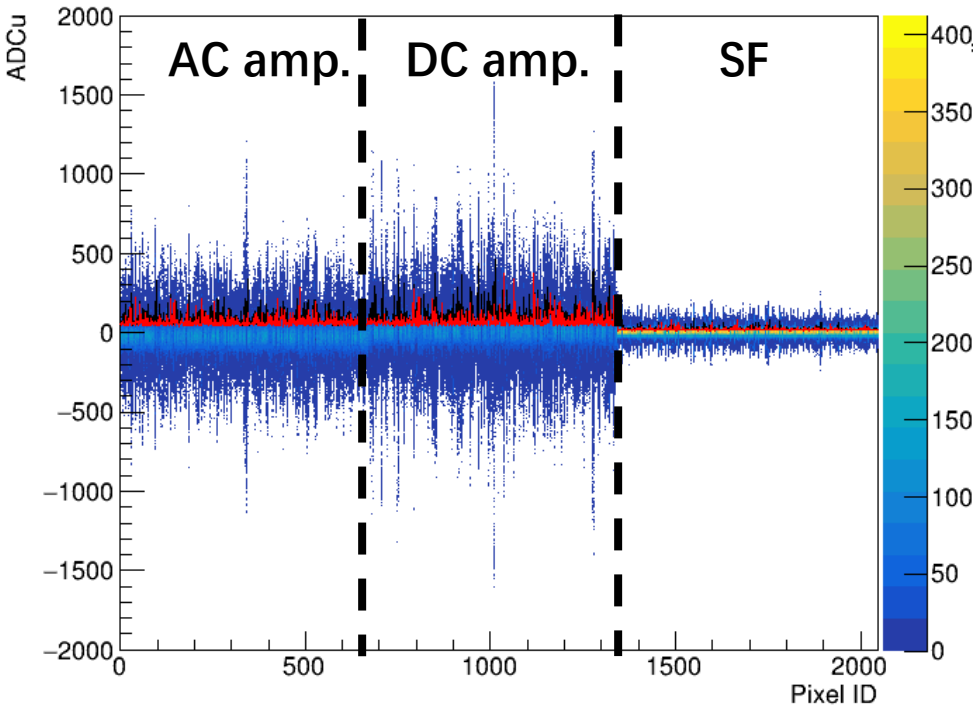
- B4 HV=10V, PSUB=0V
  - Samples: 2+2 frames
  - Readout: 10 MHz
  - Time frame: 50us
- Raw amp. = fr[-1] – fr[0]

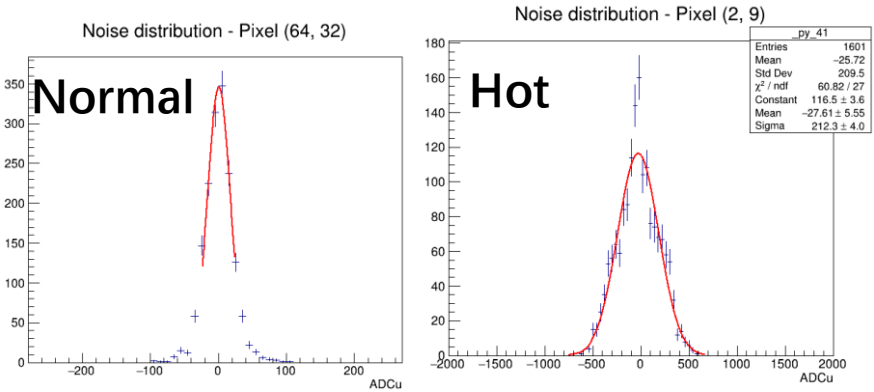


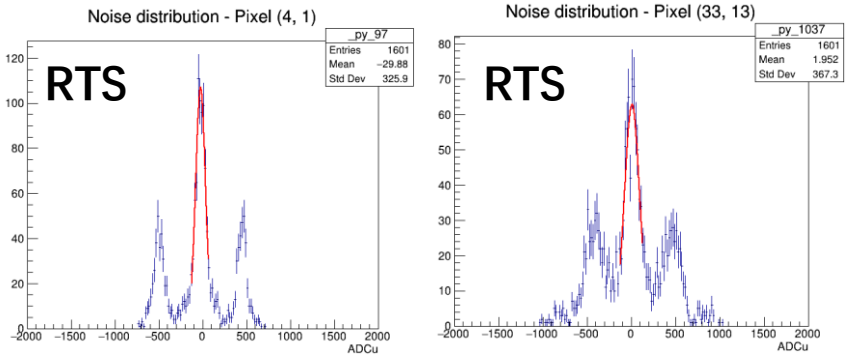


Dry-run

- B4 HV=10V, PSUB=0V
  - run187093307_220508093318.raw
  - Samples: 1601 events, 2+2 frames
  - Raw amp. = fr[-1] – fr[0]





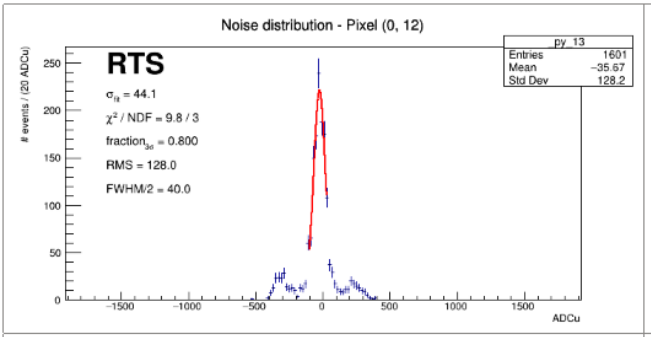


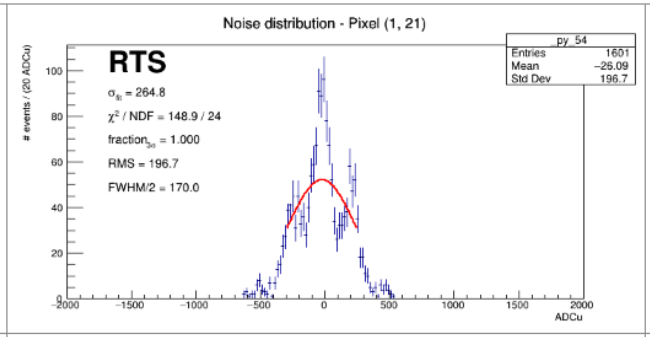
RTS: random telegraph signal (burst noise)
Hot: noise > [200, 200, 30] (ADCu)

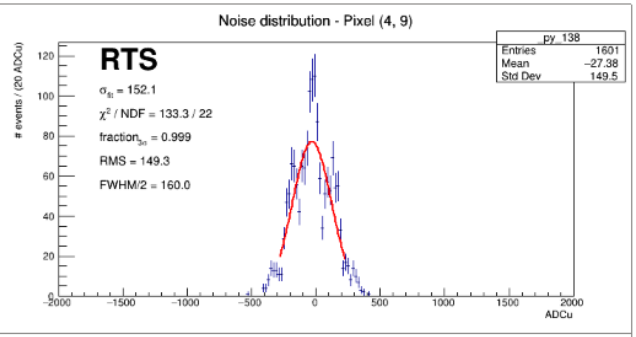
Dry-run

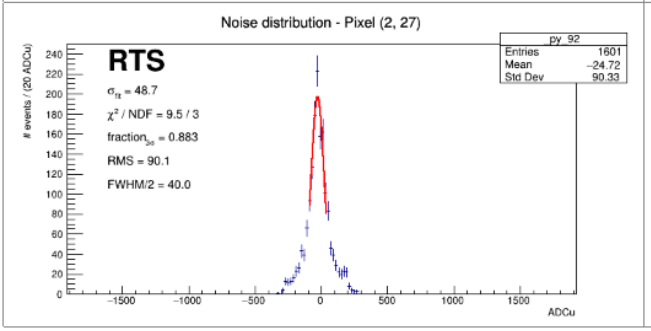
- B4 HV=10V, PSUB=0V
  - Dry-run: run187093307_220508093318.raw
  - Samples: 1601 events, 2+2 frames
  - Raw amp. = fr[-1] – fr[0]
- RTS tagging: $Fraction_{3\sigma} < 0.9$ or $\chi 2/ndf > 3$

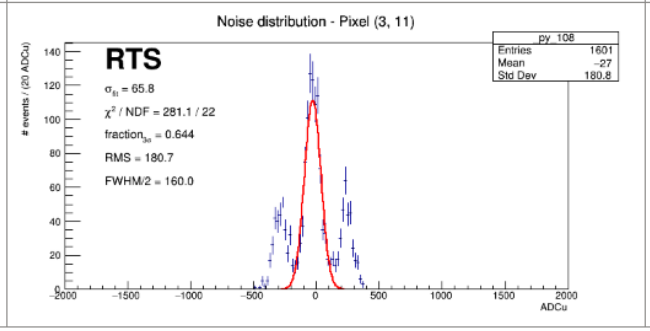
Total pixels	2048
Normal	1715
RTS	269
Hot	64

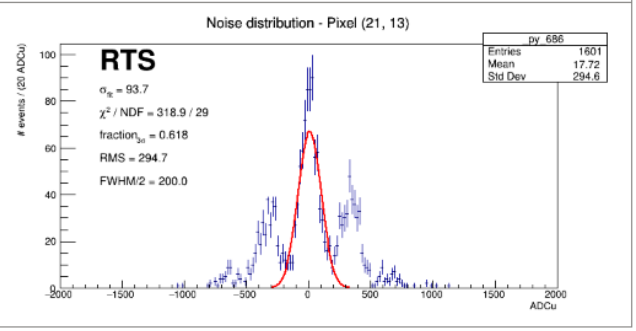






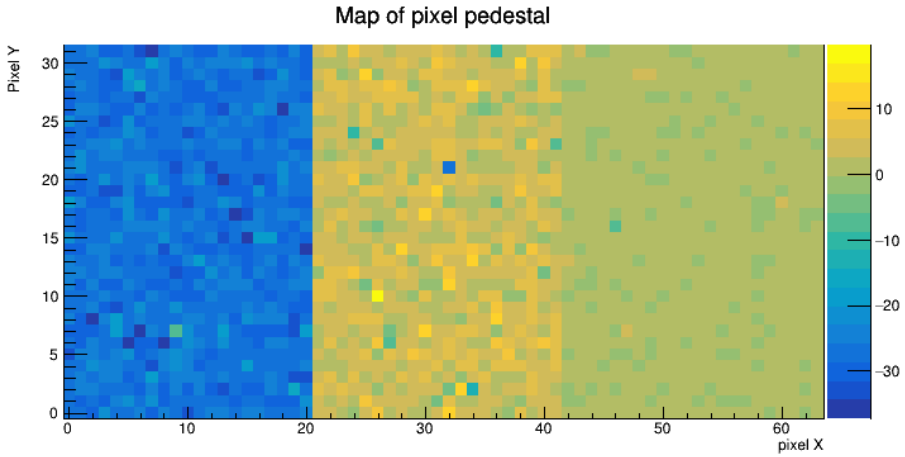


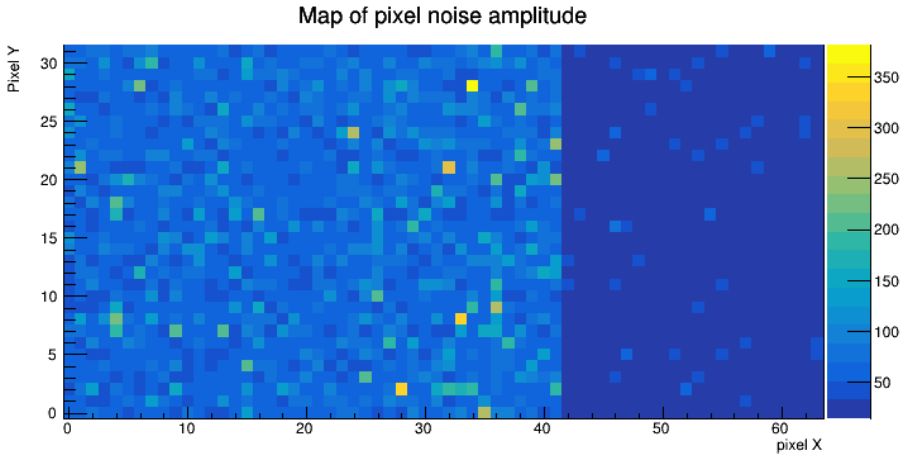




Dry-run

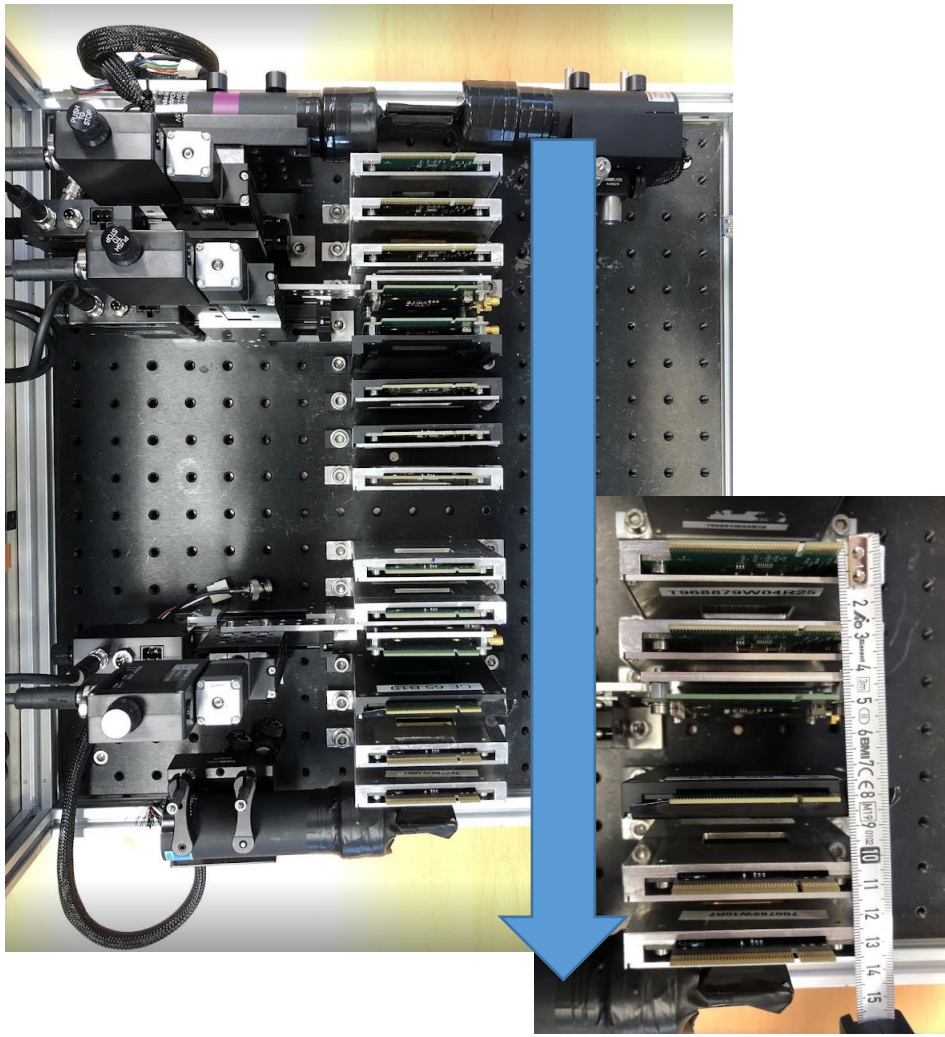
- B4 HV=10V, PSUB=0V
  - run187093307_220508093318.raw
  - Samples: 1601 events, 2+2 frames
  - Raw amp. = fr[-1] – fr[0]
- Generate pedestal and noise for each pixel
  - $Charge \equiv Raw\ amp. - pedestal$, $SNR \equiv Charge/noise$
- Mask pixels based on noise distribution (criteria TBD)





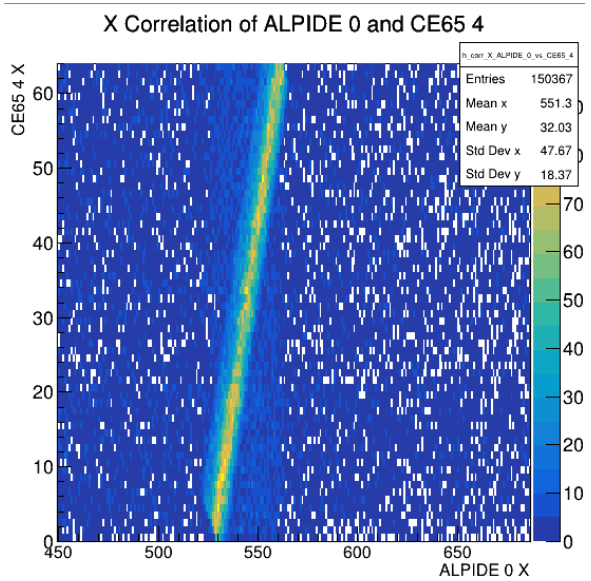
Beam setup

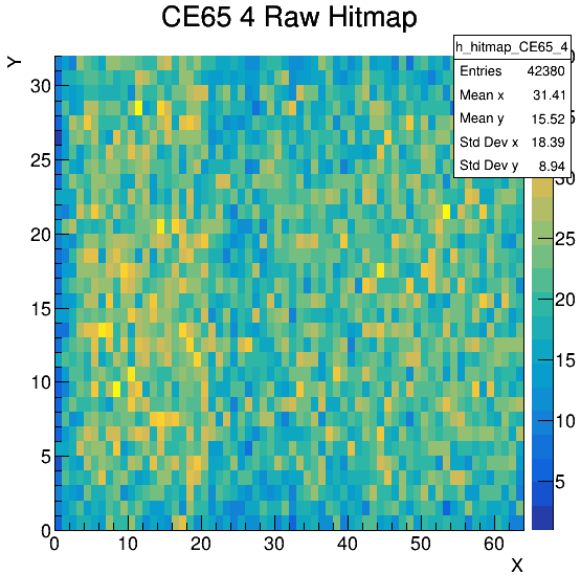
- **CERN-PS T10 (2022 May.)**
- Beam
  - Hadron (π^-) – 10 GeV
- **Telescope**
  - Trigger: Scintillators / **DPTS**
  - 2 REFS + DPTS + CE65 + 2REFS
- **Data taking**
  - May 4th – 24th
  - A4: HV=10V, 1, 2, 3, 4V
  - B4: HV=10V, 1, 2, 3, 4V
  - D4: HV=10V, 1, 2, 3, 4, 15V
  - C4: HV=10V, 1, 2, 3, 4V
    - PSUB=-3V, HV=0,1,2,3,4,10V

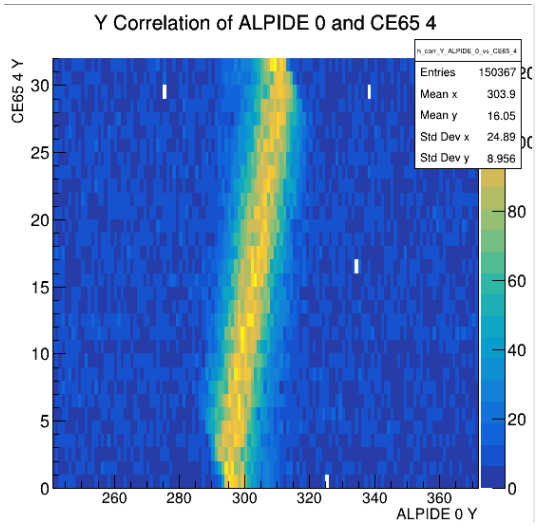


Event monitor

- B4 HV=10V
  - run187110733_220508110744.raw
  - Sample: **50k** events
- **Data taking**
  - DPTS trigger scan from X:64 -> 0
  - > 10k tracks for each sub-matrix
- **Correlation with reference**

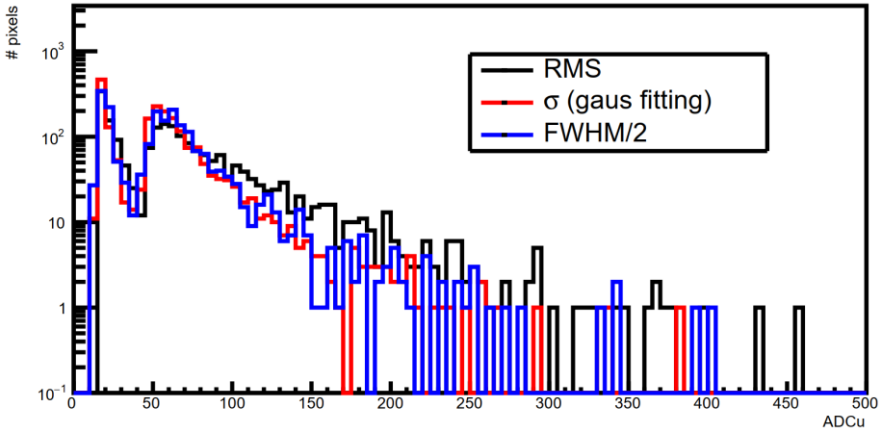


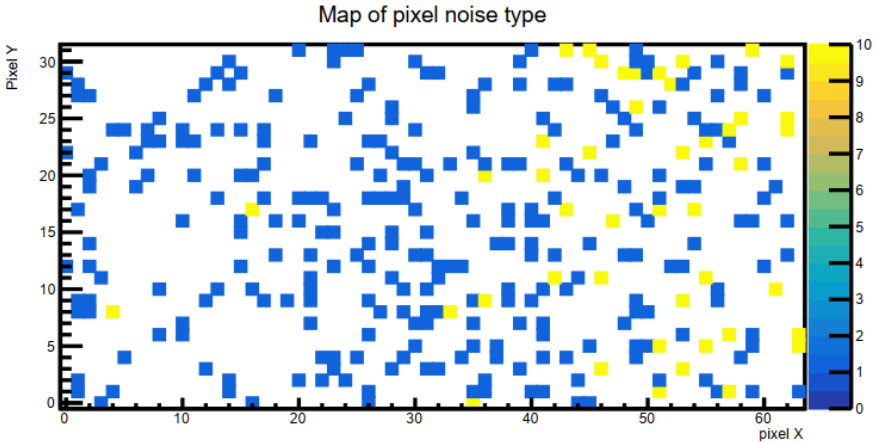


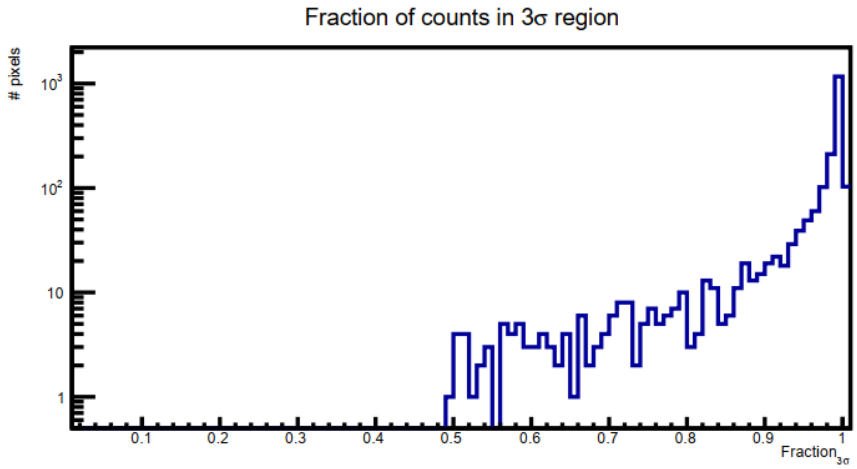


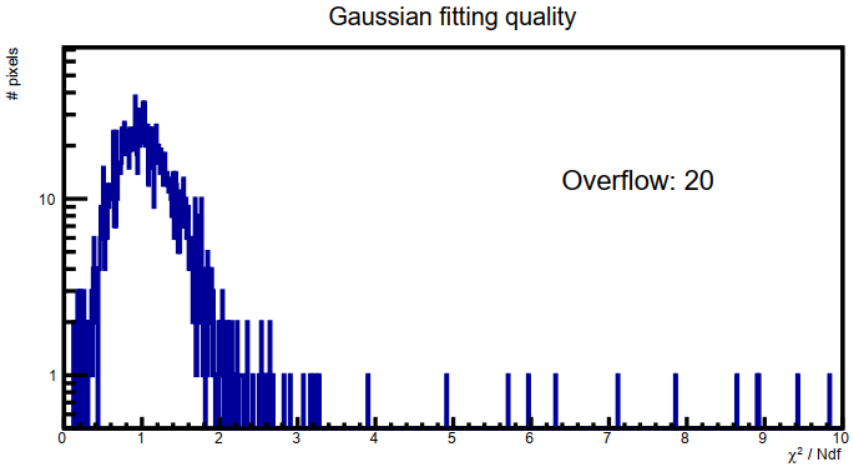
RTS

- Noise fitting



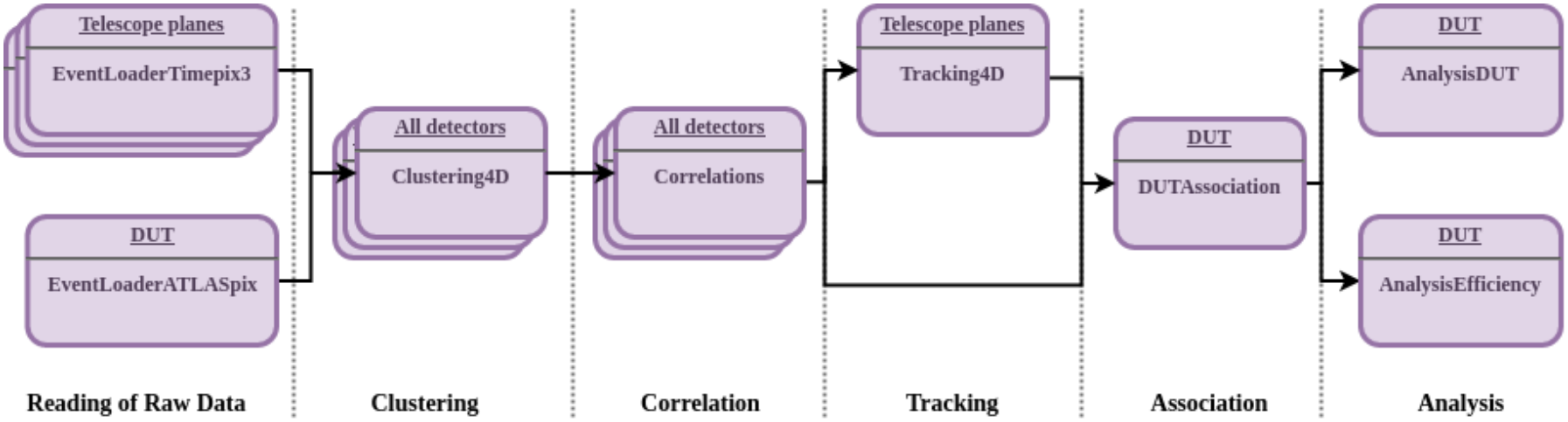


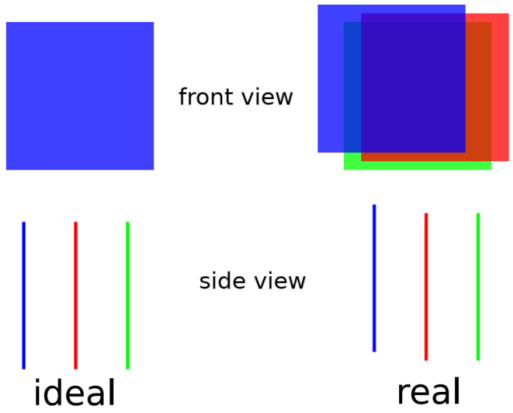


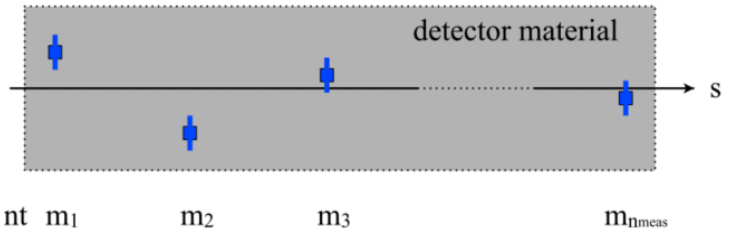


Analysis

- Data analysis – corryvrekan







Mask

- Frequency in data taking of beam run