OAK RIDGE National Laboratory

CALOROC hit rate calculations

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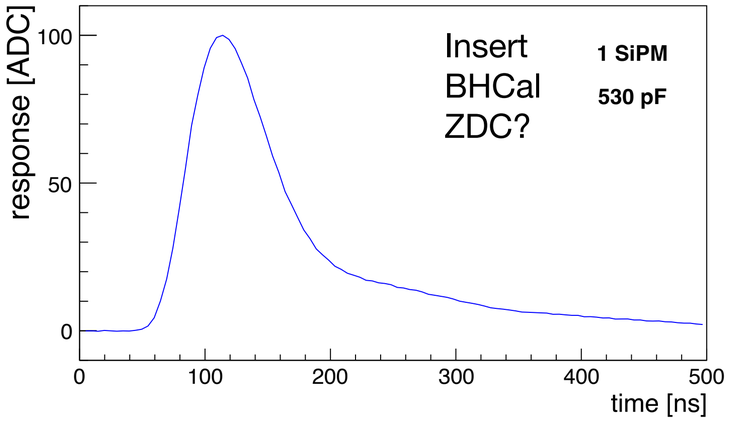
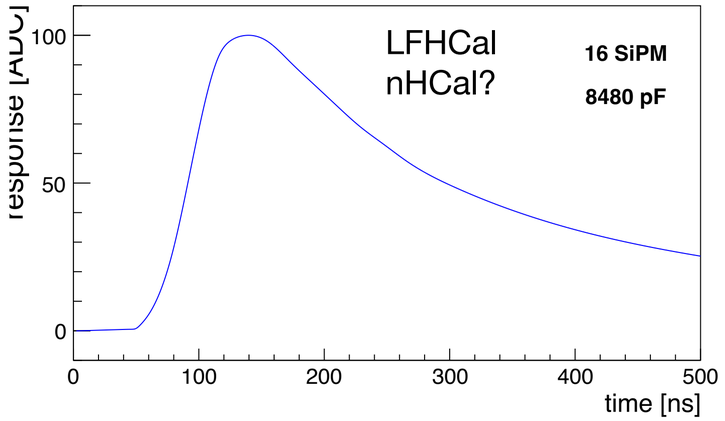
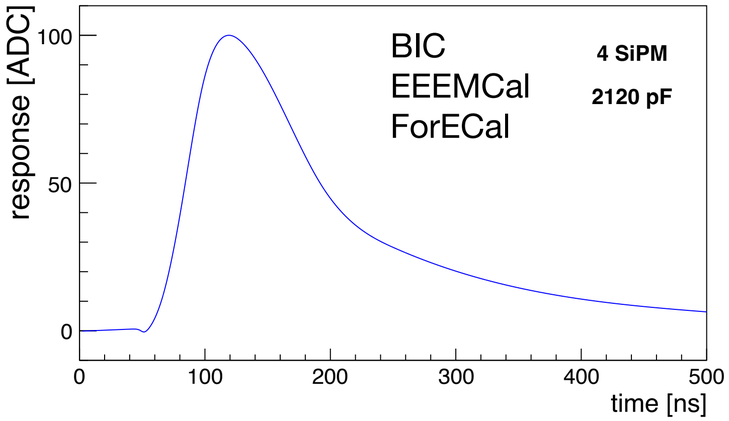
What you need to extract

Extract the hit rate from the simulation

Shaper, preamps, etc



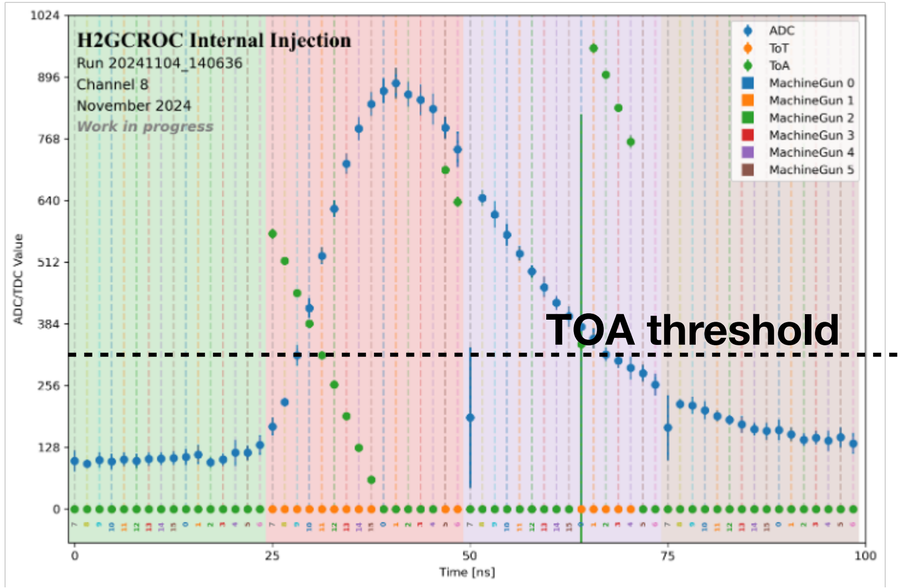




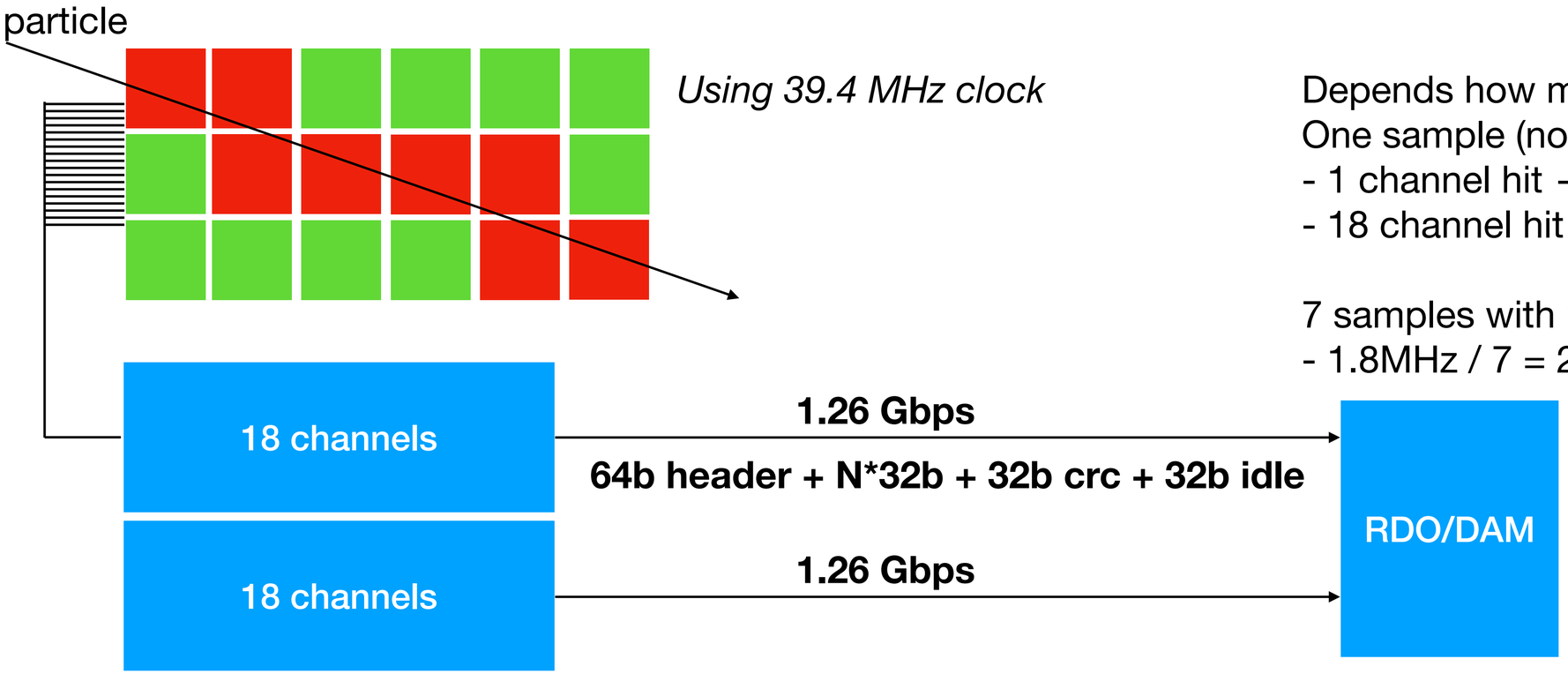
How many samples you need for the reconstruction?
What is the realistic dynamic range? (Preamp settings slightly changes the shape of the signal also)

How the CALOROC will be working:

- Once the TOA > 0, then it is auto-triggered:
  - Readout 1-7 samples (pre-set the number as needed)
  - TOA threshold is settable:
    A. What is your minimum required hit?
    B. What is the magnitude of the dark noise?
    —> A > B otherwise you will be always overwhelmed
- As the preamps are the same in CALOROC1 as in the H2GCROC, this can be tested on the bench:
  - Set the TOA threshold and check offline trigger efficiency



CALOROC readout scheme



Depends how many samples you want
One sample (not enough to fit a signal shape)
- 1 channel hit — 0.127 µs —> 7.8 MHz
- 18 channel hit — 0.558 µs —> 1.8 MHz

7 samples with 18 channel hit:
- 1.8MHz / 7 = 255kHz hit rate

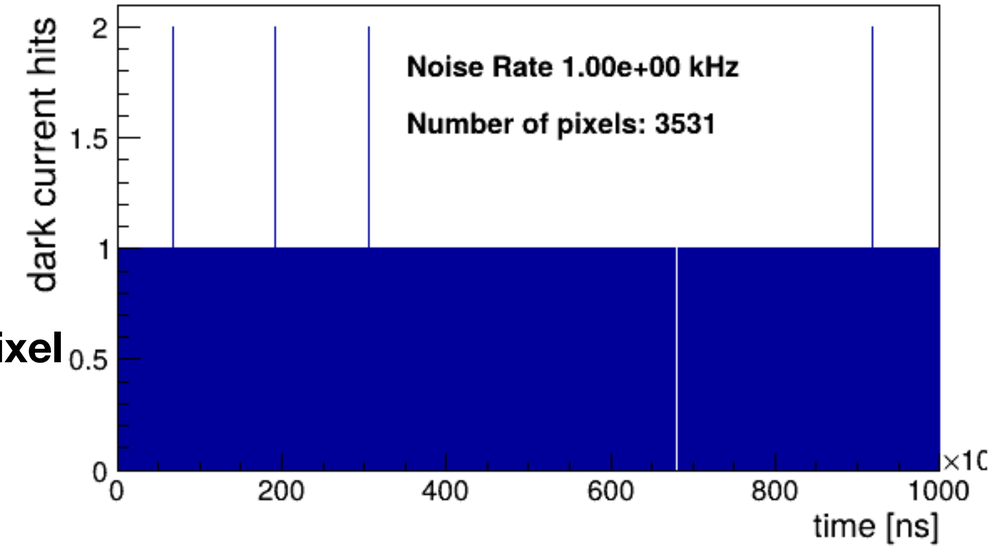
- There is a slight geometry dependency of the readout speed
- We have to determine how many samples you need:
  - More sample

Random triggers (noise):
- 2 samples per trigger 0.55 µs x 2
- Global rate = 900kHz
- Channel rate 900 kHz/18 = 50 kHz

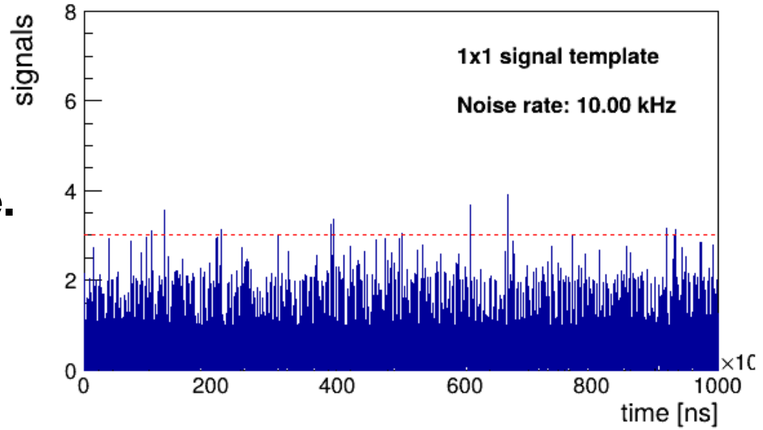
With 7 samples
Same max hit rate is 14.4kHz

Some quick visualizations

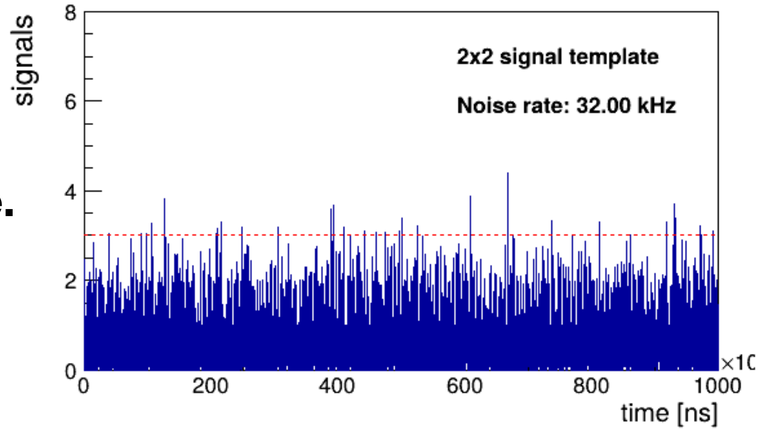
Visualization of 1ms
3531 pixels



 # pixel



p.e.



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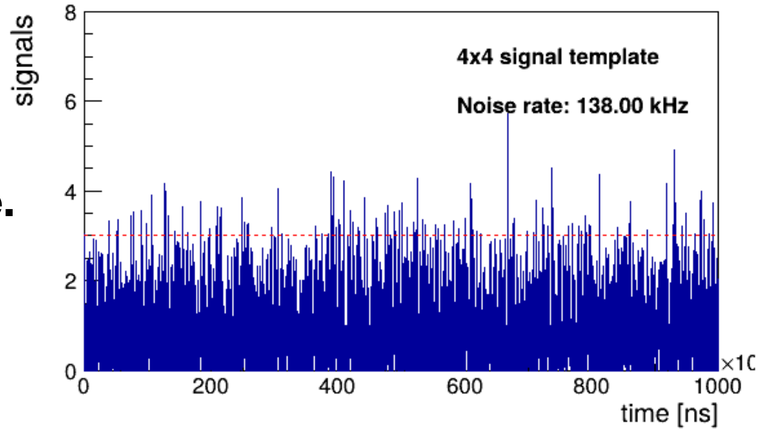
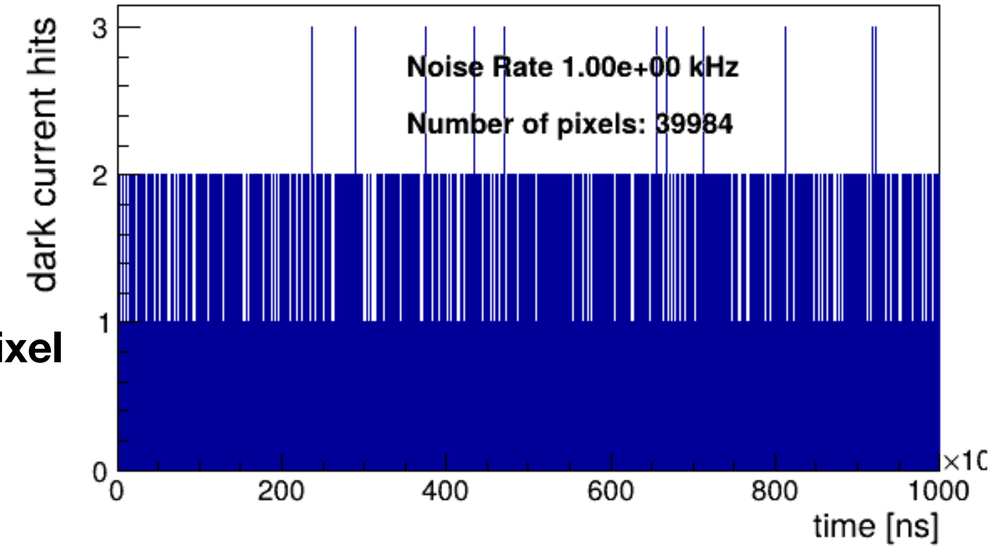


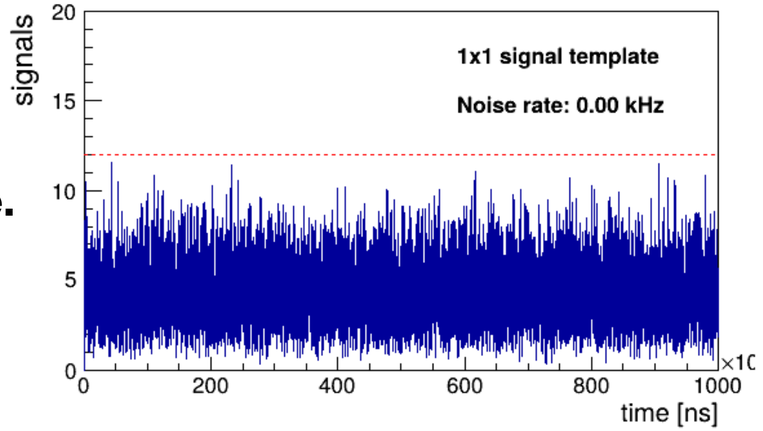
p.e.

Some quick visualizations

Visualization of 1ms
Increase pixel numbers



 # pixel



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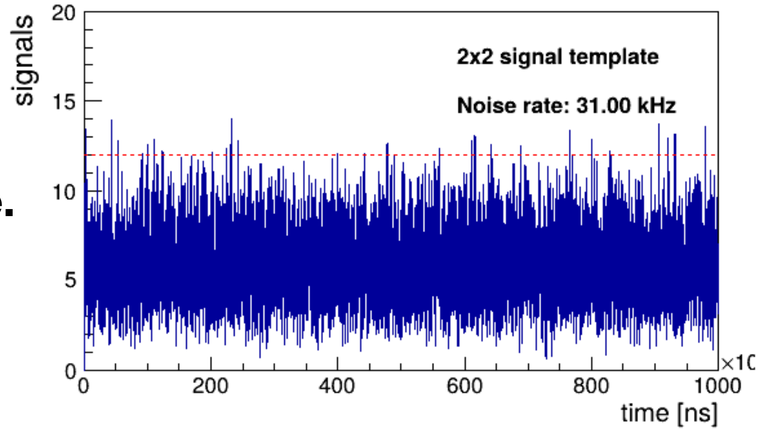

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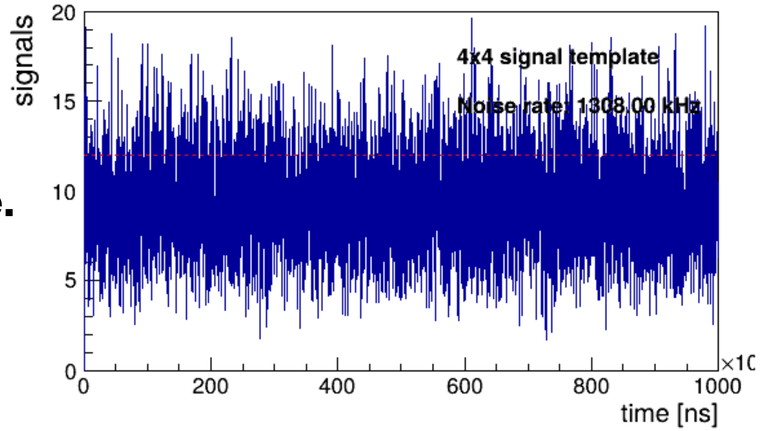

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