Discussion on CALOROC1B data model and overall direction of the digitization algorithm

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BIC Simulation Meeting
November 25, 2025

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CALOROC1B data model

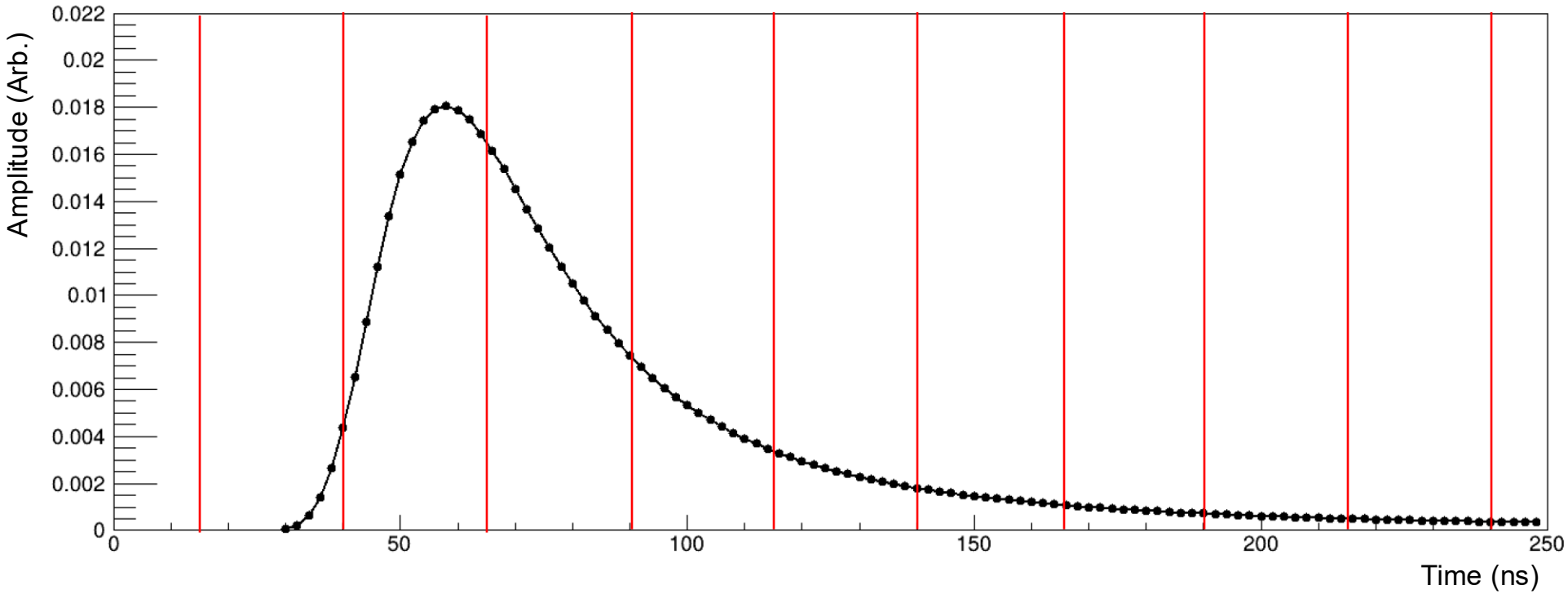
```
edm4eic::RawCALOROC1BHit:
  Description: "Raw hit from an CALOROC1B chip"

  Members:
    - uint64_t cellID
    - int32_t  samplePhase
    - int32_t  timeStamp
  VectorMembers:
    - edm4eic::CALOROC1BSample samples
```

```
edm4eic::CALOROC1BSample:
  Members:
    - uint16_t lowGainADC
    - uint16_t highGainADC
    - uint16_t timeOfArrival
```

- Since the main difference between the CALOROC1B and HGCROC chips is whether it has TOT or low gain ADC, the CALOROC1B data model has been proposed based on the HGCROC model.
- The CALOROC1B chip is not available for ePIC yet. However, if we implement the data model in simulation, we can compare its performance with the HGCROC-based one. This will help us decide which chip will ultimately be used for the ePIC calorimeters.

  The performance study with the CALOROC1B data model implemented will also provide useful input for the chip development, including parameter optimization such as thresholds and dynamic ranges.
- Would it be okay to use the above data model to reproduce the actual CALOROC1B data?

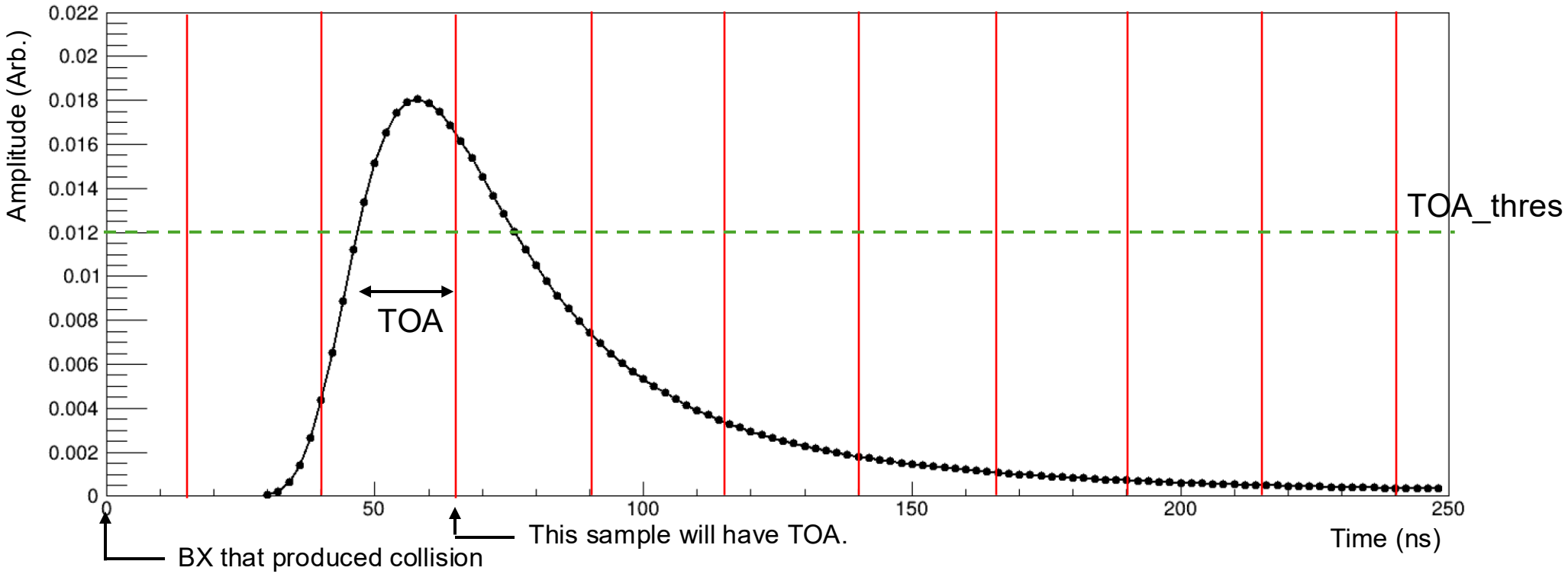
Filling timeStamp and samplePhase



- The timeStamp is intended to indicate the sample index.
- The sampleIndex might be intended to show a phase difference between the bunch crossing and a sample.
- In simulation, we cannot reproduce the timeStamp and samplePhase exactly as in the real experiment because in real experiment, all the events are linked through a continuous sequence of bunch crossings, but this is not the case in simulation.

  However, we can imitate them as needed in simulation.

Filling timeStamp and samplePhase



- TOA will be the time difference between the up-crossing point and the earliest sample after that. We cannot know the actual time of arrival from the TOA value alone.
- If we know which sample index (2) corresponds to the earliest sample of a pulse when counting it from 0 s and the phase difference between 0 s and the first sample (15 ns), we can estimate the actual time of arrival.

  The above 2 and 15 ns can be used as timeStamp and samplePhse taking into account the actual concepts of timeStamp and samplePhase.

Overall direction of the digitization algorithm

- The current digitization algorithm reproduces the HGCROC measurement, but it will be changed to the CALOROC1B measurement one. Since the code already measures the pulse amplitude (ADC), it can be changed easily, but we don't have the CALOROC1B data model for now.

  For the digitization algorithm, should we request a review after the CALOROC1B data model is merged, or can we request one beforehand?

- Do we (or other calorimeters) need to compare the CALOROC1B measurement performance with the HGCROC one in simulation to select a better one? Or is it generally expected that CALOROC1B will be used for the ePIC experiment?

- Do we (or other calorimeters) also need a digitization algorithm for the HGCROC measurement?