RawCALOROCHit data type

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RawHGCROCHit

```
edm4eic::RawHGCROCHit:
  Description: "Raw hit from an HGCROC chip"

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

```
edm4eic::HGCROCSample:
  Members:
    - uint16_t ADC
    - uint16_t timeOfArrival
    - uint16_t timeOverThreshold
    - bool     TOTInProgress
    - bool     TOTComplete
```

- RawHGCROCHit (PR) is a digitized hit data type that reproduces the HGCROC measurement. It has HGCROCSamples, which are measured every 25 ns.
- The new data type RawCALOROCHit is a data type that reproduces the CALOROC measurement. The CALOROC chip has two types, 1A and 1B.
  - 1A has the same data structure with the the HGCROC.
  - 1B has low gain ADC instead of the TOT.
  - RawHGCROCHit is extended to RawCALOROCHit as it contains both 1A and 1B samples.

CALOROC1ASample and CALOROC1BSample

```
edm4eic::HGCROCSample:
  Members:
    - uint16_t ADC
    - uint16_t timeOfArrival
    - uint16_t timeOverThreshold
    - bool     TOTInProgress
    - bool     TOTComplete
```

```
edm4eic::CALOROC1ASample:
  Members:
    - uint16_t ADC
    - uint16_t timeOfArrival
    - uint16_t timeOverThreshold
```

A new component

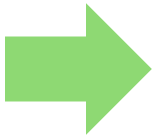
```
edm4eic::CALOROC1BSample:
  Members:
    - uint16_t lowGainADC
    - uint16_t highGainADC
    - uint16_t timeOfArrival
```

- HGCROCSample has been renamed to CALOROC1ASample.
  - TOTInProgress and TOTComplete have been removed because they are not necessary.
- A new component, CALOROC1BSample has been added.

RawCALOROCHit

```
edm4eic::RawHGCROCHit:
  Description: "Raw hit from an HGCROC chip"

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



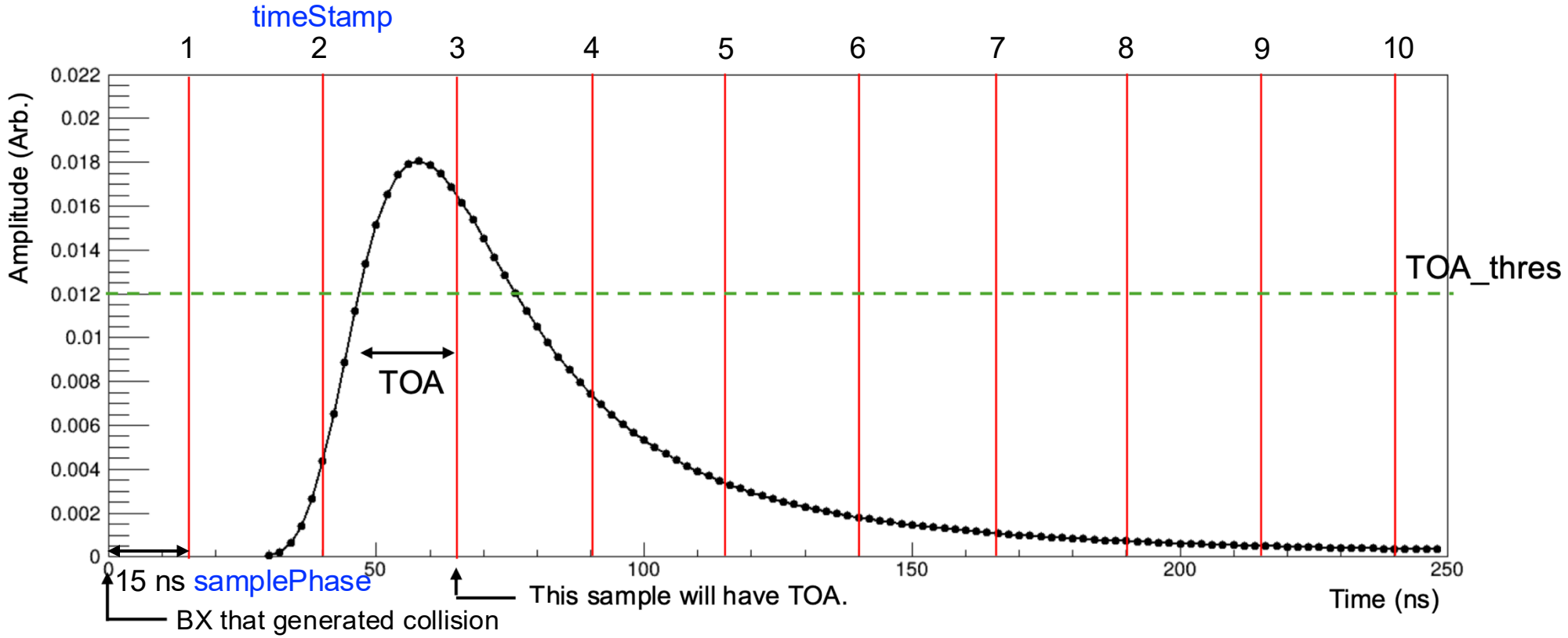
```
edm4eic::RawCALOROCHit:
  Description: "Raw hit from a CALOROC1A/B chip"

  Members:
    - uint64_t cellID
    - int32_t  samplePhase
    - int32_t  timeStamp
  VectorMembers:
    - edm4eic::CALOROC1ASample aSamples
    - edm4eic::CALOROC1BSample bSamples
```

- Finally, the RawHGCROCHit has been extended to the RawCALOROCHit.
- Using the RawCALOROCHit, we can compare the performances of the 1A and 1B chips for each detector and based on this study, we can decide which chip will be used for the ePIC experiment.
- A digitization algorithm (PR) that reproduces both CALOROC1A and 1B measurements is being implemented now.
- Once the chip type to be used in the ePIC experiment is decided, the unused chip part will be removed from both edm4eic and digitization algorithm.

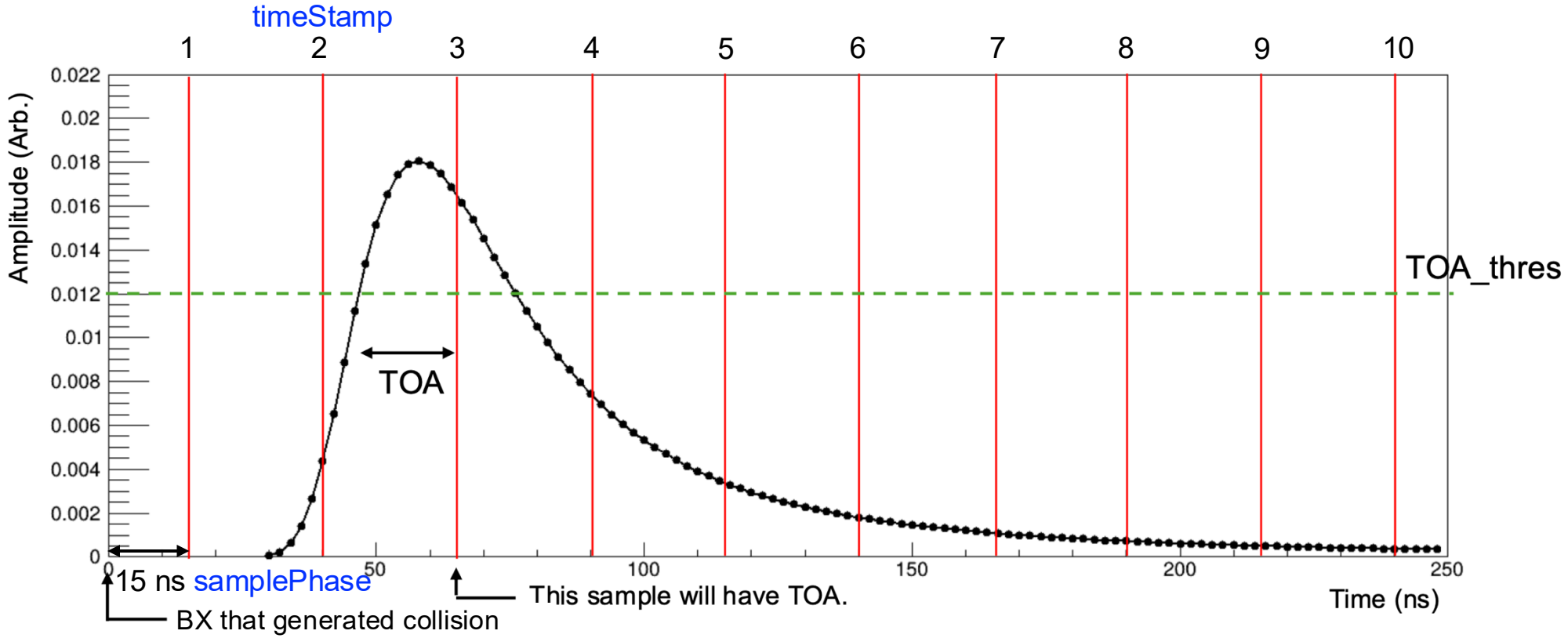
Backup

samplePhase and timeStamp



- In RawCALOROCHit, timeStamp is which sample index corresponds to the earliest sample of a pulse when counting it from 0 s. (2 in the above example)
- samplePhase is the phase difference between 0 s and the first global sample. (15 ns in the above example)
- In the real experiment, they are defined with respect to the BX. In simulation, they were defined with respect to 0 s assuming 0 s is the BX that generated collision.

Necessity of the samplePhase and timeStamp



- TOA is the time difference between the up-crossing point and the earliest sample after that.
- To have the actual time of arrival (up-crossing point), we need the samplePhase and the timeStamp.