# New Developments in the CDC Softwares

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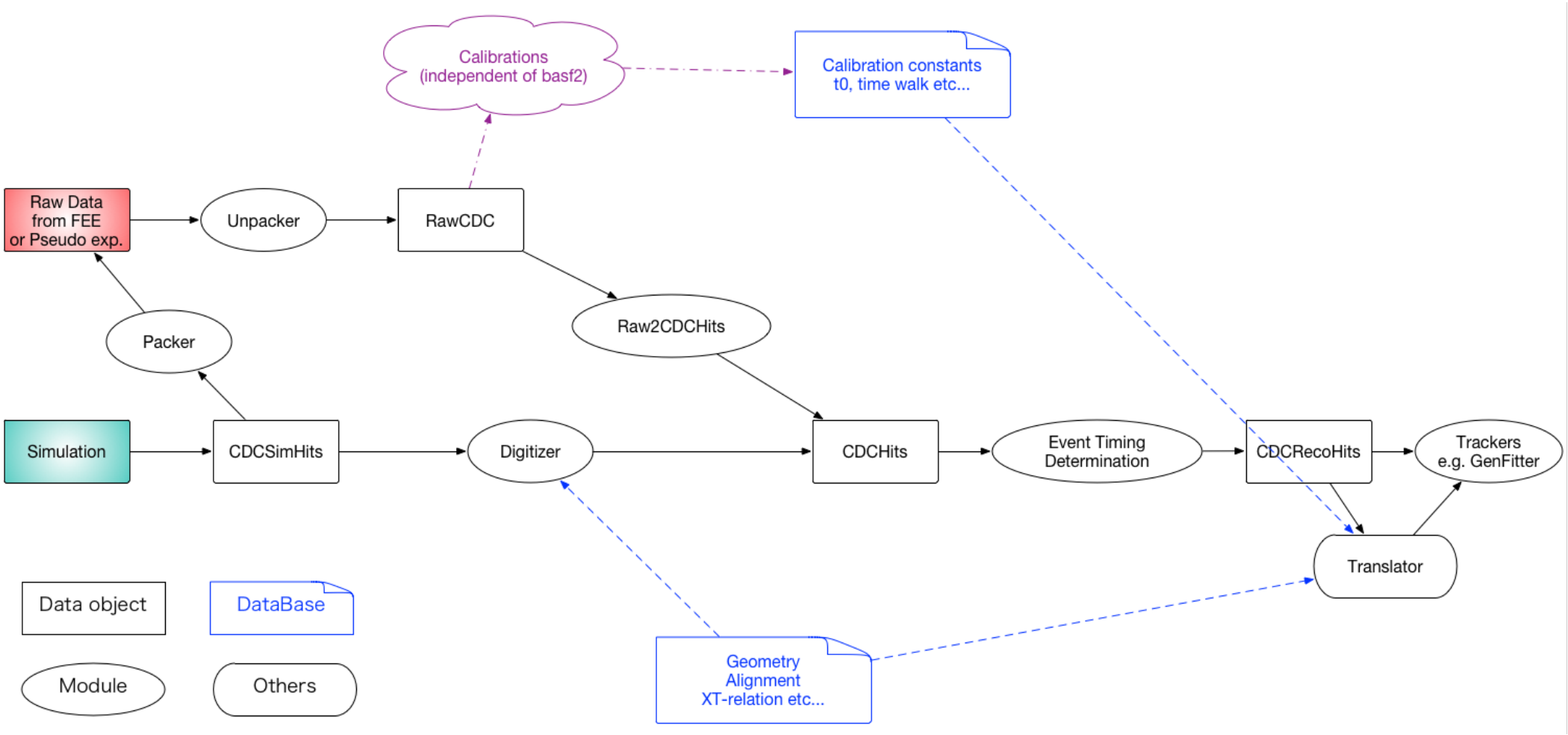
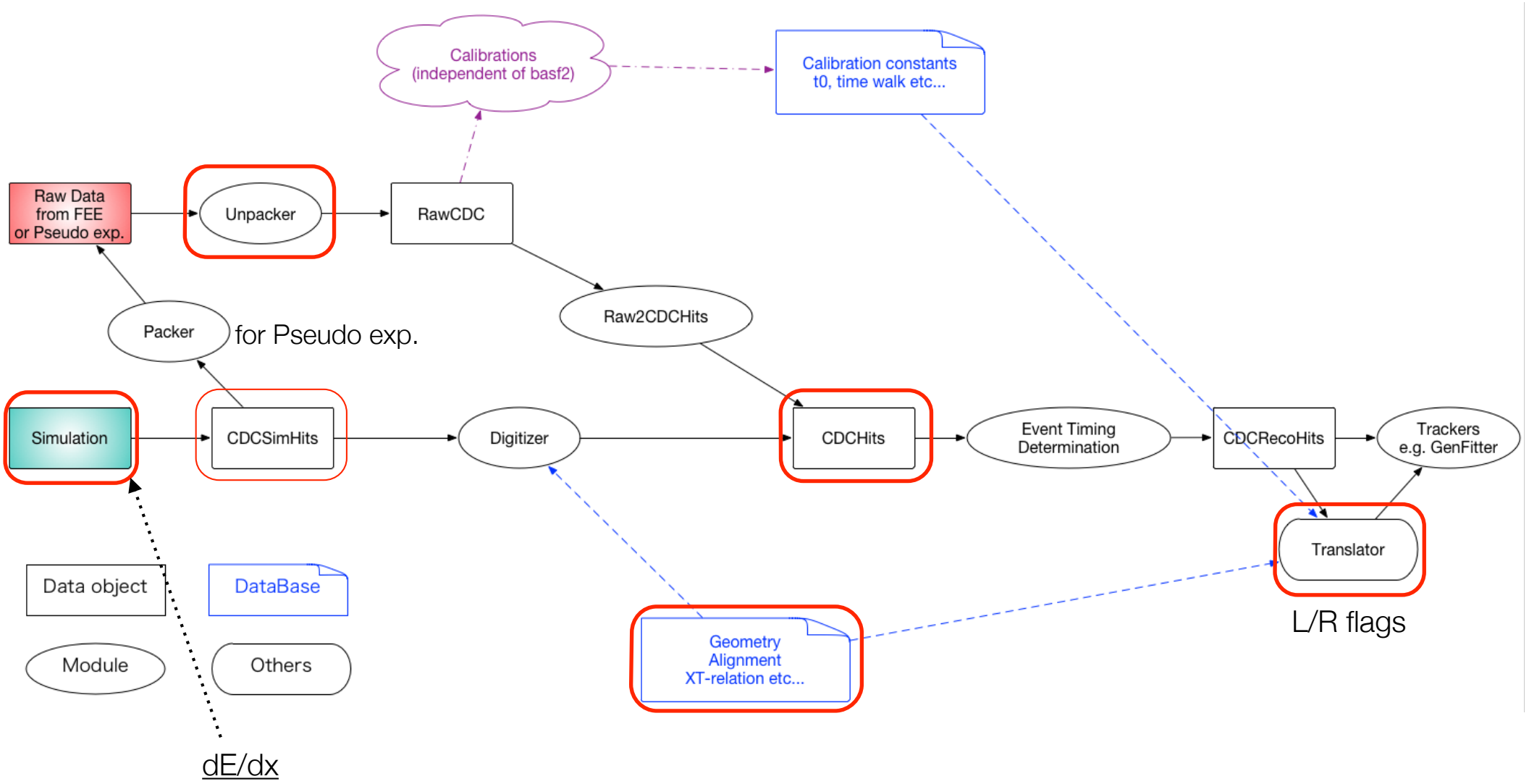
# CDC Data flow



# Today's report



# unpaker

- CDC electronics has two output modes
  - suppressed mode : 2 tdc data, 1 adc data. for experiment
  - rawdata mode : waveform data for all channels. for debug
  - unpacker for suppressed mode : almost ready. release soon
  - unpacker for rawdata mode : now confirming. need more time. for CDC debugging using Cosmic ray from this Mar.
- packer : not ready yet. will be implemented after Feb.

# dE/dx at Geant4 Level

## Study Conditions

- geometry: SVD & CDC only
- B-field: =1.5 T; =0 in the region outside CDC (i.e. r > CDC outerwall radius)
- event: single pi+ or K+ event; 10k events for each
- momentum: beta*gamma=2 at IP
- angles: uniform in phi; uniform in theta (not in cos(theta))
- interaction: only dedx & multiple scatt. on; other ints. (e.g. decay, hadron int.) off

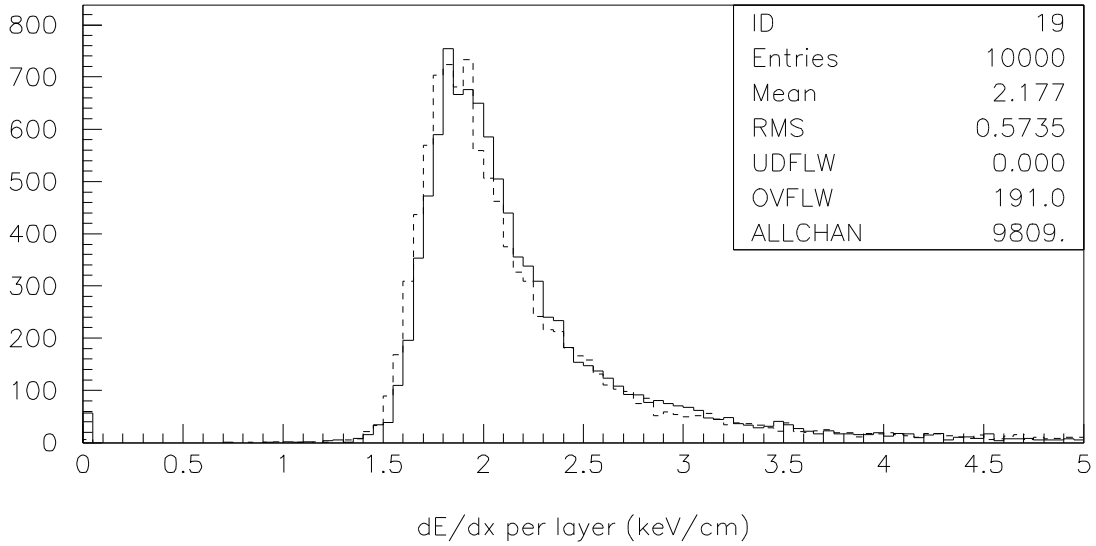
- code: r13125 (=ver. as of Oct. 9) + Geant4.10

  N.B. no difference in dEdx betw Geant4.09 and 4.10; do not care.

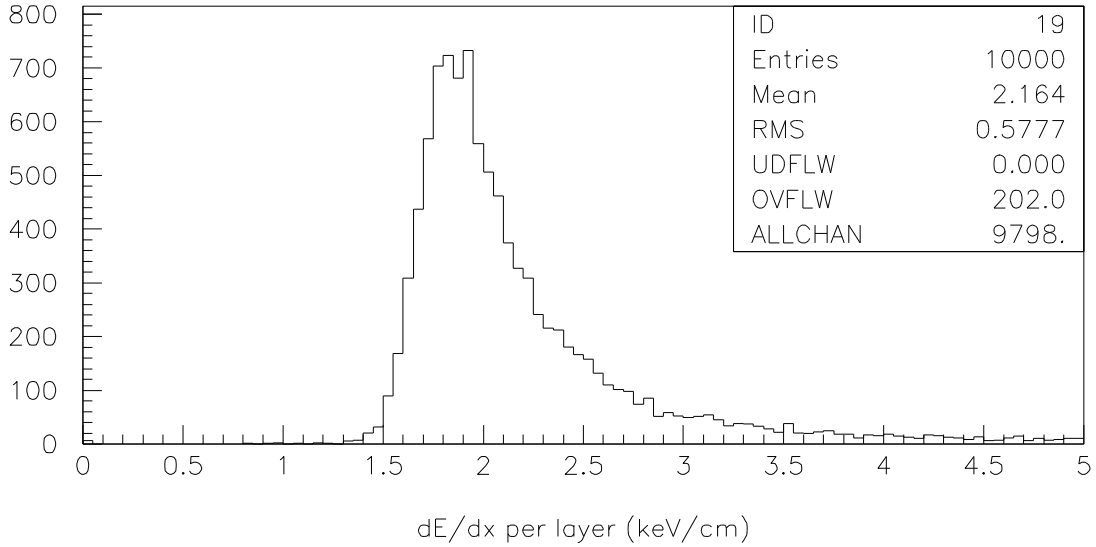
# …dE/dx at Geant4 Level

## Result

2014/11/12 14.59




*solid: pion*
*dot: kaon superimposed*




*kaon*

# 2nd hits in CDC

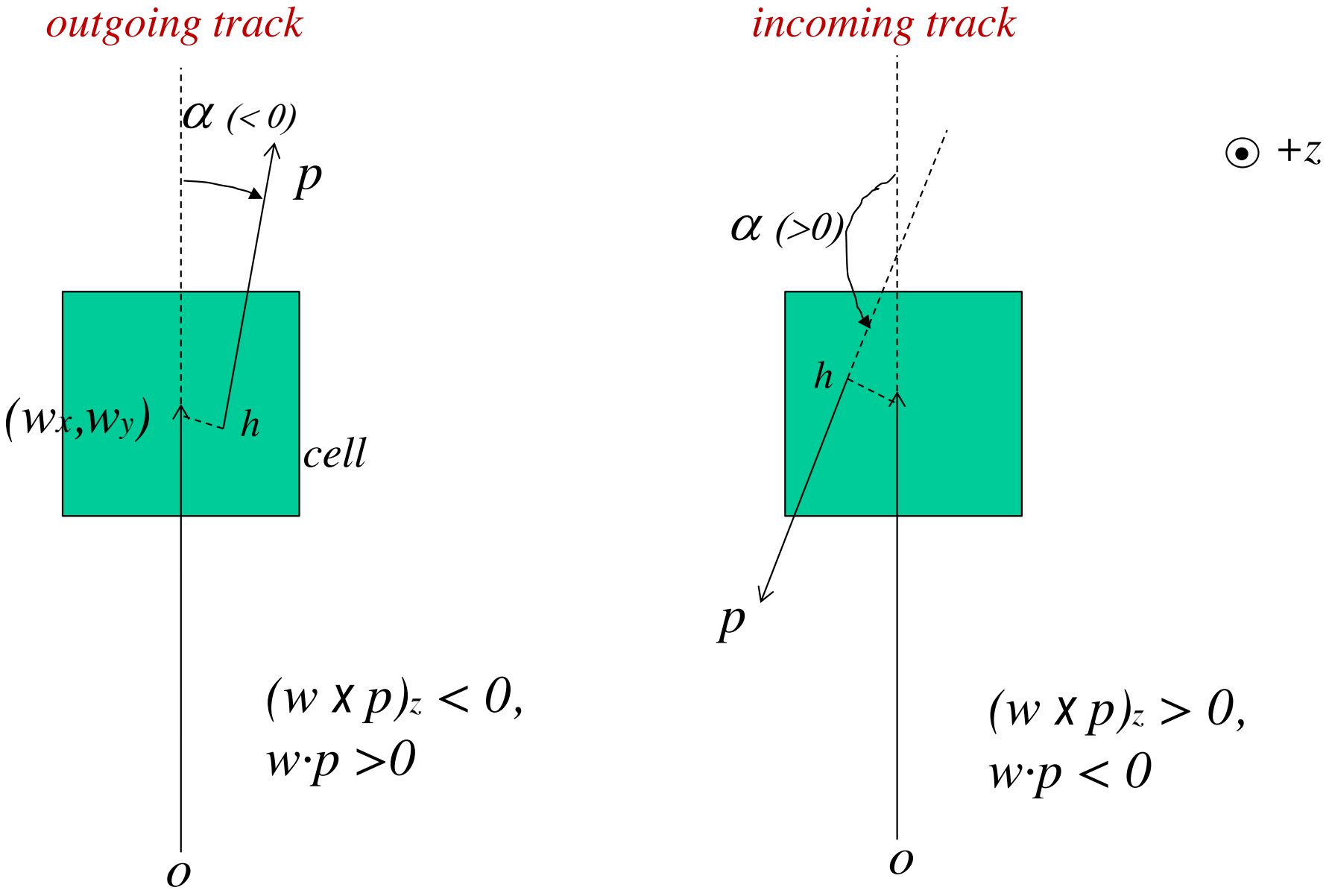
- rawdata from CDC electronics : tdc1, tdc2, adc
- current : CDCHit(tdc, adc, wireid)
  - tdc2(float), status(unsigned short) will be added
  - 2 timing data within time-window
  - integrated adc data within time-window
- Reliable simulation of 2nd tdc(tdc2) is difficult. Please do not expect too much, do not use for a while.
- New one will be implemented soon.
- When is better to install?

# Realistic TDC Translator for Realistic xt and σ

# RealisticTDCCountTranslator

- The 1st ver. was released ~16 months ago, but it seems nobody has used it (maybe too early to prepare)…
- Recently I've updated it and related codes (r14475 in svn), based on the discussion during and after the last B2GM.
- Interface:
  - void getDriftLength (unsigned short tdcCount, const WireID& wireID = WireID(),
    float timeOfFlightEstimator = 0, bool leftRight = false,
    float z = 0, float alpha = 0, float theta = pi/2);
    - leftRight = false if $((w - h) \times p)_z <= 0$; = true otherwise.
      - w: wire-position in (x,y) plane;
      - h: track hit-position in (x,y) plane;
      - p: track momentum at h in (x,y) plane.
    - alpha: track incident angle in r-phi plane [-pi, pi]; = $\mathrm{atan2}((w \times p)_z, w.p)$
    - theta: track incident angle in s-z plane (=polar angle) [0, pi]; = $\mathrm{atan2}(p_t, p_z)$.
  - Update for getDriftLengthResolution is similar, so not mention it here.

# Definition of alpha



# How to Turn on Realistic xt and σ

- Download the latest CDC codes (r14475 or later).
- Set UseSimpleDigitization param. of CDCDigitizaer to false in your steering file.

- Replace SimpleTDCCountTranslator in GenFitter with RealisticTDCCountTranslator.
- Do the same thing in your code (track-finder, etc.).

- N.B. GenFit doesn't work properly although no crash occurs, since CDCRecoHit hasn't been updated yet (as reported already).

# L/R flags

- 3 types of flags
  - old one (without momentum information)
  - new one (with momentum direction)
  - new flag for tracking (Oliver-san's algorithm)
    - last flag is now being implemented : slightly slow
    - because of many entries in CDCSimHit
    - slow but usable. Ozaki-san will release it shortly. (default is off)
    - Ozaki-san is also trying to reduce entries in the CDCSimHit

# xt & sigma

- 2 homework
  - more Realistic xt and sigma : Garfield Heed
  - beam test data analysis to confirm simulation results
- both are delayed
  - this time no slides to show

# Summary

- unpacker : almost ready for suppressed mode
- dE/dx universality at GEANT4 level was confirmed
- 2nd TDC hit will be implemented in CDCHit soon
- realisticTDCTranslator is updated
- L/R flag for tracking is now being implemented
- more realistic xt relation is delayed

# Questions

- CDCHit( tdc1, tdc2, adc, wireid, status ) will be implemented soon.
- Now realistic x-t relation/sigma are already installed but not yet turned on.
  - one problem : less tracking efficiency (~65 hits/56 layers -> ~54 hits/56 layers).
  - this may lead worse momentum resolution and bias in momentum reconstruction
  - Can we turn on? If we can, when?
- ToF from IP, propagation delay on sense wire are now off.
  - Do we need turn them on?