

FPCCD Vertex Detector

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ILC Software meeting

Talk about

My topics is to study FPCCD performance with background hits.

Today, I'll report status of studies on

→ Position Resolution to $t\bar{t}$ event

→ Tracking efficiency study

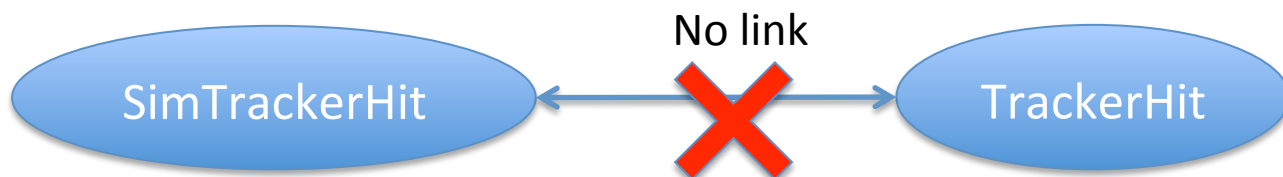
Position Resolution to ttbar event

- Until now, single-muon-event has been used to estimate the position resolution of FPCCD.
 - Result by muon depends on the phase space of generation.
 - Single-muon-event is not a natural event. So this may be an inappropriate estimation.
 - Now, ttbar event is being used to estimate PositionReso.
 - ttbar event is natural event in ILC.
 - ttbar event contains many tracks. → makes many pixel hits.
 - To know difference of them is important to effective estimation.
- But, with multi-particle-event, FPCCD Software couldn't make links between SimTrackerHits and TrackerHits to study position resolution.
- I was implementing this code.

Software Improvement

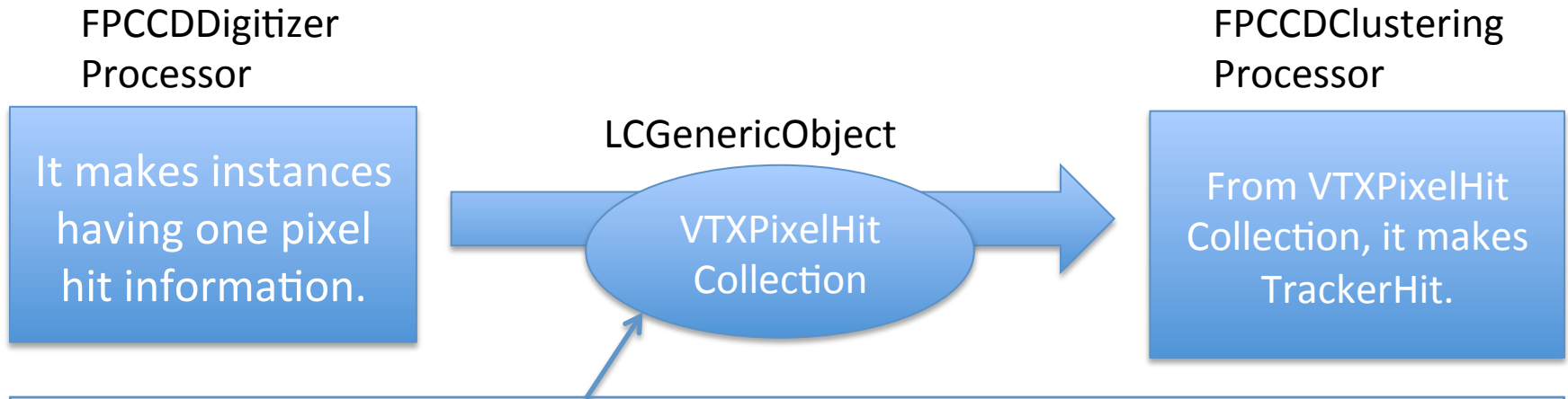
- Until now, FPCCD Software don't have an algorithm to make a link (LCRelation) between SimTrackerHit and TrackerHit when the processed event is not a single-particle-event.

ttbar = ✕



- I have improved FPCCD Software.
 - can make the link among lots of SimTrackerHit and TrackerHit.
 - can inform the multiplicity of hits. (pointer->getWeight() can be available.)
 - **Now position resolution is being estimated with ttbar event.**
 - studied items : positionReso VS hit position, momentum
 - the plot will be shown.

Algorithm for linking



By default, VTXPixelHit Collection doesn't have data about SimTrackerHit. LCGenericObject Class can have only just int, float, double value.

First I tried to attach the simtrackerhit address, but in the step from Digitizer to Clustering, address value changes to point at unknown place because, I think, the Digitizer scope where a pointer to SimTrackerHit is defined is different from the Clustering scope where a pointer to SimTrackerHit is defined.

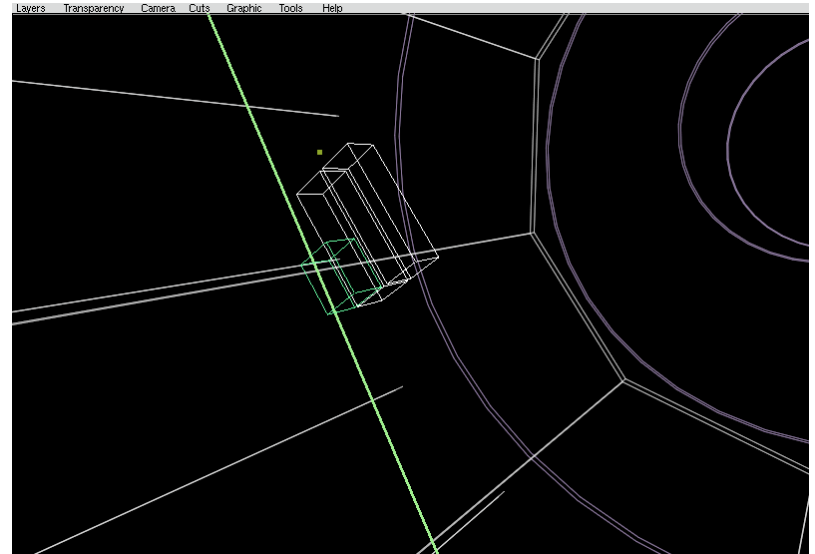
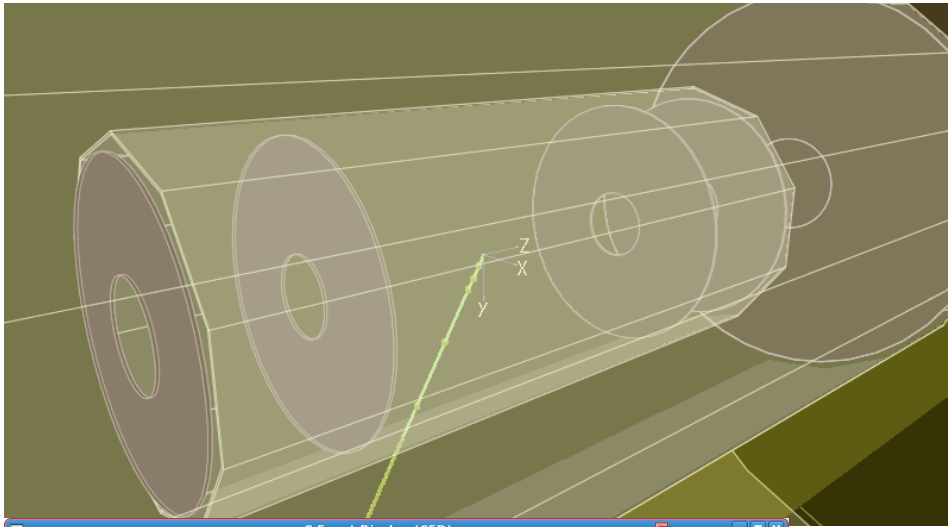
So I let VTXPixelHit Collection have the index of SimTrackerHit, namely, this "i".

SimTrackerHit* pointer = dynamic_cast<SimTrackerHit*>(col->getElementAt(i))

Tracking efficiency study

- Now this is being estimated with FPCCD Software.
 - Only Silicon Tracking.
 - fitting by SIT 2layers & VXD 6layers.
 - Hits in 3layers out of 8layers are used for seed hits.
 - Inner VXD 2layers will not be used for FPCCD tracking with background.
- To do list about tracking efficiency
 - η VS seed hits
 - SettingA: muon, 85deg, $|P| = 5, 10, 50, 100\text{GeV}$ (nonBG) $\rightarrow \eta$
VS P plot will be shown.
 - SettingB: muon, 85deg, $|P| = 100\text{GeV}$, with 1, 100, 200, 500, 1000, Full Bunch Crosses BG.
 $\rightarrow \eta$ VS BX plot will be shown.
 - SettingC: As well as SettingA & B, the configuration of pixel size 5um10um setting will be estimated.

FPCCDViewer



This is useful for background study and shows pixel hits, track, MCParticle, and etc..

Easy misses will be reduced.

Summary

- Links between SimTrackerHit and TrackerHit are now available by FPCCD software.
- CEDViewer for FPCCD is available.
- I'm ready to study
 - position resolution using ttbar events
 - tracking efficiency in various conditions.