Short documentation of changes to CBM-ToF event display

Jonathan Brandt

October 2, 2018

1 general remark

The event display was developed within the bachelor-thesis "Development of an Event Display for the Cbm-ToF cosmic test stand" by Jonathan Brandt from Heidelberg University. This document shall provide a short documentation about the software changes and added functionality to the event display (-folder) of cbmroot.

2 file changes

The software changes are located in the folder "eventdisplay" in the source files of cbmroot. Three new classes were programmed:

- CbmPointSetArray

- CbmPointSetArrayDraw

- CbmPointSetArrayEditor

each comes with its own header and source file. In addition changes to the class:

- CbmEvDisTracks

2.1 CbmEvDisTracks

This class was changed and additional functionality was added. There are two preprocessor variables that allow to return to the old functionality. **TOFDisplay = 1** enables the additional functionality. Other values disable it.

For the full functionality one needs the error of the fitted velocity of a CbmTofTracklet. This variable is called "TtErr". If the current version of CbmTofTracklet does not provide this value, one can skip it with **TOFTtErr $\neq$ 1**. It is active if it equals 1.

Two new member variables were added which determine whether fit-points and track are rendered on default.

3 default constructor

- CbmEvDisTracks(name, iVerbose, renderP, renderT)

This class is responsible for displaying tracks and the points that belong to a found track. renderP(oints) and renderT(racks) are boolean variables that determine whether the points or tracks are rendered on default. They can always be rendered or hidden by ticking the small box beside the object in the list tree menu.

- CbmPointSetArrayDraw(name, colorMode, markerMode, iVerbose, render)

This class is responsible for displaying all hits with their physical information. The boolean render determines whether the points are rendered on default. colorMode and markerMode are integers determining how the color and marker-size of the hit-markers will be calculated. These options are passed to the CbmPointSetArray.

4 displaying physics observables

For displaying TofHits (can be adjusted to any object) with their associated observables (time, ToT, cluster-size) a new object was developed: CbmPointSetArray. It inherits from TEvePointSetArray (Root-class of event display) and can be filled with several observables per hit that shall be displayed. The color and marker-size of the hit-markers can be determined according to these observables.

To change the visual appearance of the hits one can use two Combo-Boxes (one for color, the other for size). These GUI-components are provided by the class CbmPointSetArrayEditor.

In order to use the CbmPointSetArray in an event display inside the FairRoot and CbmRoot framework there has to be a FairTask which manages the object: CbmPointSetArrayDraw. In this class one fills the PSA with the relevant physical information for the current selected event.

TEve

TEveElement

TEvePointSetArray

Display Points

CbmPointSetArray

Calculate Color Marker

GUI

TGedFrame

TEvePointSetArrayEditor

DoubleSlider

CbmPointSetArrayEditor

ComboBox

CbmPointSetArrayDraw

Fill with TofHit

FairTask

FairRoot

Inherite

creates

class name

Friend class

functionality

framework

Eve Main Window

Browser Eve

Eve | Files

WindowManager
Viewers
Scenes
FairEventManager
PTrkl_hmul6
  TEveTrack Points 0
  TEveTrack Points 1
FTrkl_hmul6
  TEveTrack 0
  TEveTrack 1
TofHitTime
RhoPhi (0.0)
RhoZ (0.0)

Fit points are not
rendered on default

Style

TofHitTime [CbmPointSetArray]

TEveElement
Show: Self Children

Marker
2.0

Opacity
1

CbmPointSetArray
Color: Time
Marker: CluSize

default:
Time and CS

TEvePointSetArray
Range 0.50 16.50

Range of point IDs

Viewer 1 | RPhi View | RhoZ View | Multi View

Hide   Viewer 1   Actions

r0067_20180409_1728_DT100_Req-4

PointId = 12
Time = 1.34ns
ClusterSize = 2
ToT = 5.33[a.u.]

label of a tof-hit

TEveTrack 0
ChiSqDoF = 0.49
beta = 1.027 +/- 0.074

label of a track

Command

Command (local):

Eve Main Window

Browser Eve

Eve | Files

WindowManager
Viewers
Scenes
FairEventManager
PTrkl_hmul6
  TEveTrack Points 0
  TEveTrack Points 1
FTrkl_hmul6
  TEveTrack 0
  TEveTrack 1
TofHitTime
  Underflow
  Slice 1 [0.500, 1.500]
  Slice 2 [1.500, 2.500]
  Slice 3 [2.500, 3.500]
  Slice 4 [3.500, 4.500]

Only points of track
1 are rendered

Indivdual tof-hits
are hid

Style

TofHitTime [CbmPointSetArray]

TEveElement
Show: Self Children

Marker
2.0

Opacity
1

CbmPointSetArray
Color: ToT
Marker: CluSize (real)
  const.
  CluSize
  CluSize (real)

TEvePointSetA
Range 0.50

Editor
ComboBox Color

ComboBox Marker
(ToT and real CS are
selected)

Double Slider

Viewer 1 | RPhi View | RhoZ View | Multi View

Hide   Viewer 1   Actions

r0067_20180409_1728_DT100_Req-4

TEveTrack 1
PointId = 1
Residuals:
X = -0.157
Y = -0.173
T = 0.652

label of fit point

Command

Command (local):

4