

Delay Wire Chambers

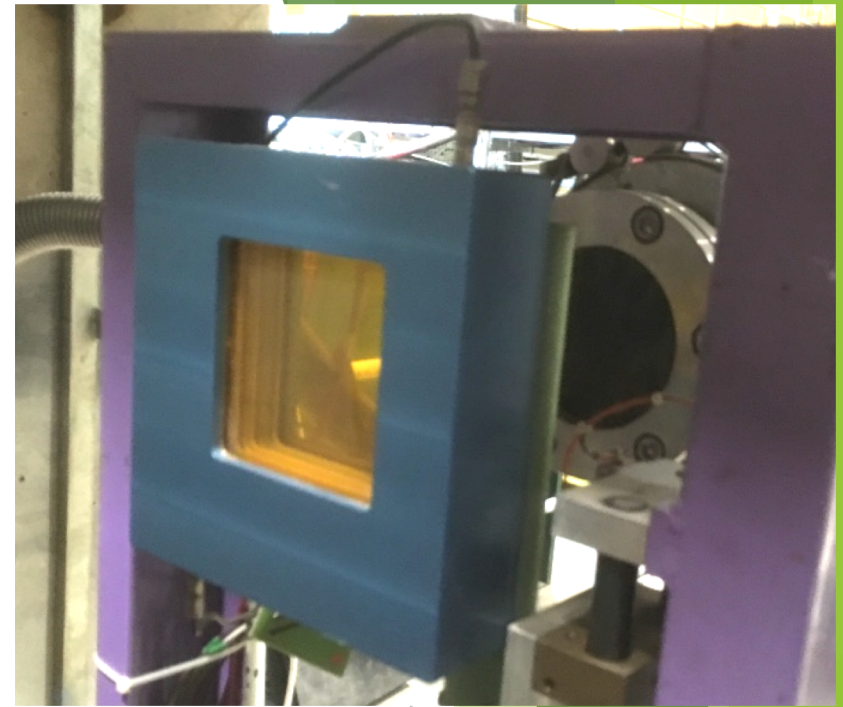
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AHCAL Tokyo analysis workshop, 24 Aug. 2018

Delay Wire Chamber

- ▶ 100 x 100 mm² chamber with wire readout
- ▶ Hit position is readout as TDC
- ▶ Four channels for each chamber: up, down, left, right
- ▶ Hit position is reconstructed as
 - ▶ $x = (\text{left} - \text{right}) * \text{slope} + \text{offset}$
 - ▶ $y = (\text{down} - \text{up}) * \text{slope} + \text{offset}$
- ▶ Position resolution of ~600 μm



Delay Wire Chamber Geometry

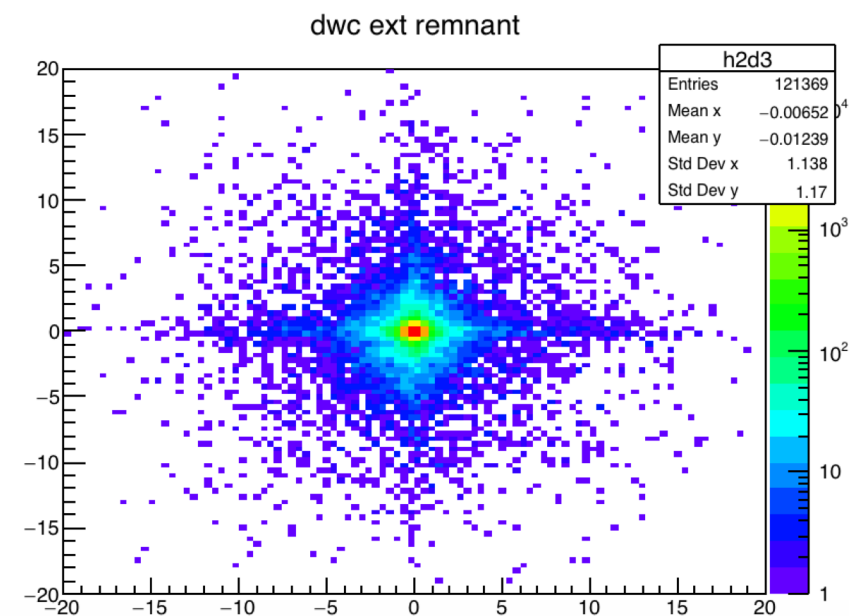
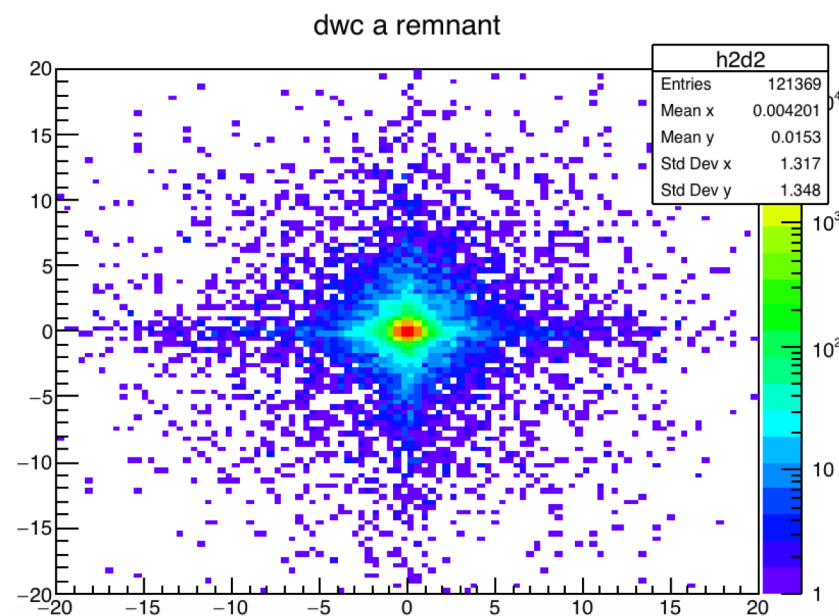
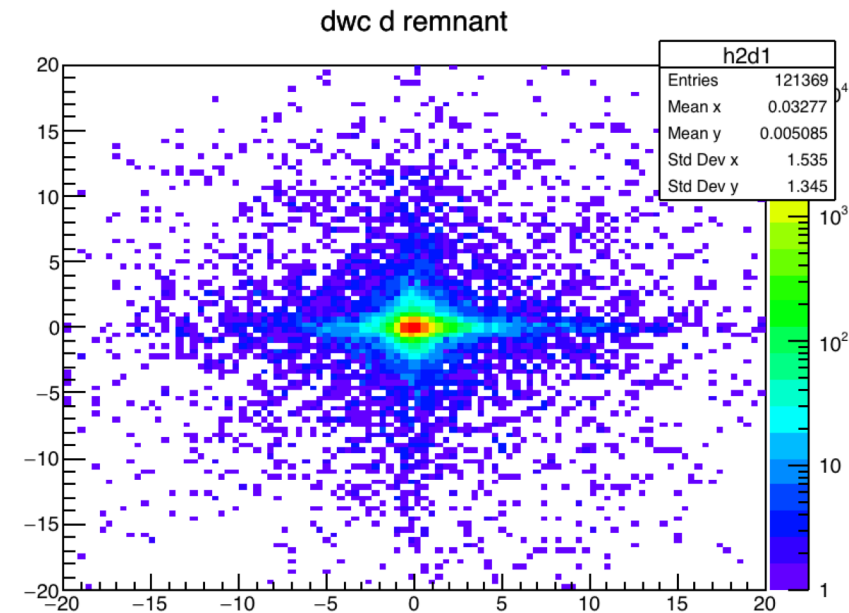
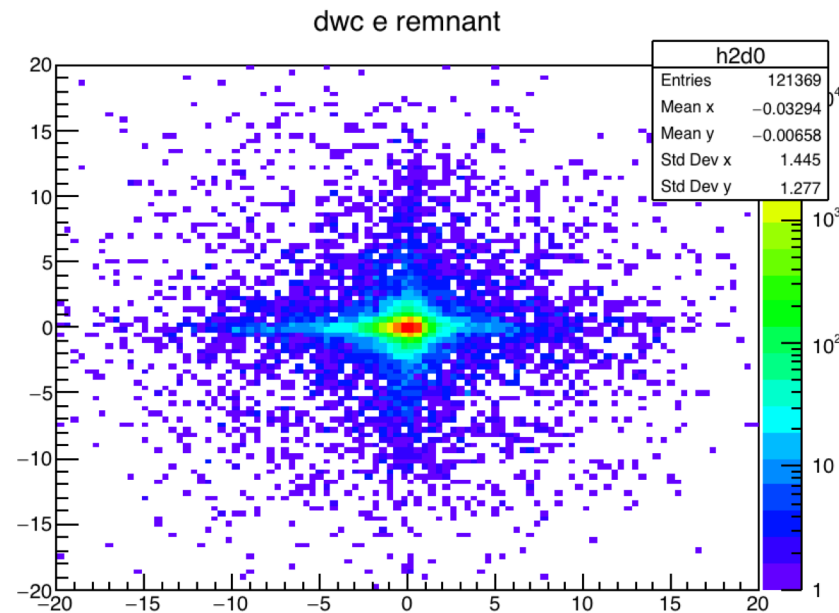
- Four chambers in 17 m range



Calibration

- ▶ Chamber ext as the standard position
- ▶ Calculated x and y offsets for the other three chambers
- ▶ Pion -160 GeV beam for calibration
- ▶ Set the offsets so that the beam hits the same x and y positions

Hit remnant from the reconstructed track



DWC Processor

- ▶ Introduces the DWC track in lcio collection
- ▶ First, match the events
 - ▶ Needs raw files to get full triggers (i.e. no event discarded)
- ▶ Then reconstruct the track and assign to the matched ahcal event

```
<processor name="myDWCProcessor" type="DWCProcessor">
  <parameter name="InputCollectionNameBIF" type="string"> BIFData </parameter>
  <parameter name="OutputCollectionNameDWC" type="string"> DWCDData </parameter>
  <parameter name="InputFileNameBIF" type="string"> /pnfs/desy.de/calice/tb-cern/native/cernAhcalM
ay2018/BifRaw/Electron/n60GeV/PP/bifraw-run060520__14p05p2018__15p39p28.raw </parameter>
  <parameter name="InputFileNameAHCAL" type="string"> /pnfs/desy.de/calice/tb-cern/native/cernAhca
lMay2018/AhcalRaw/Electron/n60GeV/PP/ahcalRaw_Run060520__14p05p2018__15p39p28.raw </parameter>
  <parameter name="InputFileNameDWC" type="string"> /pnfs/desy.de/calice/tb-cern/native/cernAhcalM
ay2018/DWC/root/dwc_run_520.root </parameter>
</processor>
```

DWC Tree Writer

```
<processor name="HcalRootTreeWriter_HCAL" type="RootTreeWriter">
  <parameter name="DwcWriteEngine_enable" type="int"> 1 </parameter>
  <parameter name="DwcWriteEngine_prefix" type="string"> dwc_ </parameter>
  <parameter name="DwcWriteEngine_InCol" type="string"> DWCDData </parameter>
```

- ▶ Writing the track information onto the root tree

- ▶ Five new branches

- ▶ nTrack: number of tracks (basically 1)
- ▶ Segment: x and y segments [mm]
- ▶ Slope: x and y slopes [mm]
 - ▶ -999 if no track reconstructed

- ▶ Track is:

- ▶ $x = \text{slopeX} * z + \text{segmentX}$

- ▶ $y = \text{slopeY} * z + \text{segmentY}$

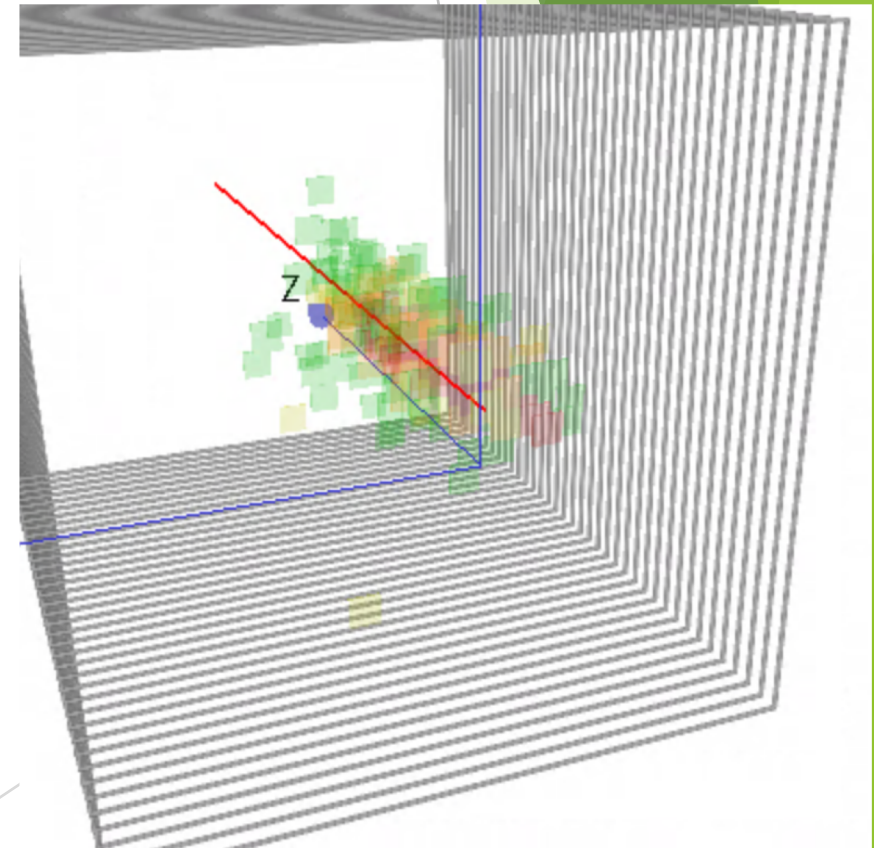
```
*.....*
*Br   42 :dwc_nTrack : dwc_nTrack/I                                     *
*Entries :   182302 : Total Size=      732222 bytes File Size =      11835 *
*Baskets :        27 : Basket Size=      82432 bytes Compression=    61.80 *
*.....*
*Br   43 :dwc_segmentX : dwc_segmentX[dwc_nTrack]/F                   *
*Entries :   182302 : Total Size=     1459629 bytes File Size =     875709 *
*Baskets :        54 : Basket Size=      76800 bytes Compression=     1.67 *
*.....*
*Br   44 :dwc_segmentY : dwc_segmentY[dwc_nTrack]/F                   *
*Entries :   182302 : Total Size=     1459629 bytes File Size =     875827 *
*Baskets :        54 : Basket Size=      76800 bytes Compression=     1.66 *
*.....*
*Br   45 :dwc_slopeX : dwc_slopeX[dwc_nTrack]/F                       *
*Entries :   182302 : Total Size=     1459513 bytes File Size =     879726 *
*Baskets :        54 : Basket Size=      76800 bytes Compression=     1.66 *
*.....*
*Br   46 :dwc_slopeY : dwc_slopeY[dwc_nTrack]/F                       *
*Entries :   182302 : Total Size=     1459513 bytes File Size =     873438 *
*Baskets :        54 : Basket Size=      76800 bytes Compression=     1.67 *
*.....*
```

DWC Track Event Display

```
<processor name="MyEventDisplayProcessor" type="DEHEventDisplayProcessor">  
  <parameter name="InputCollectionNameDWC" type="String"> DWCDData </parameter>  
  <parameter name="track_Draw" type="int"> 1 </parameter>  
  <parameter name="trackOffsets" type="int"> -17.3896 23.8753 </parameter>  
</processor>
```

- ▶ Event display with extrapolated track from DWC
- ▶ Parameters
 - ▶ track_Draw : set 1 if you want to draw tracks (0 by default)
 - ▶ trackOffsets : the position offset of AHCAL from chambers
- ▶ At the moment the trackOffset still have to be manually derived and input

electron

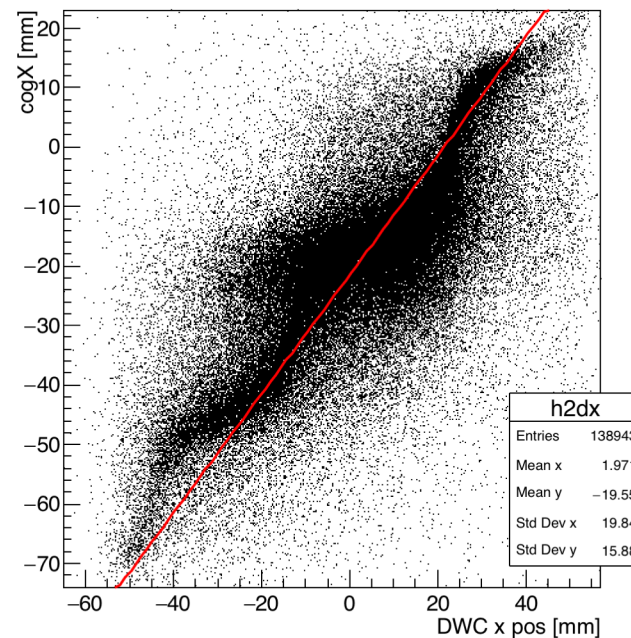


Track Offsets

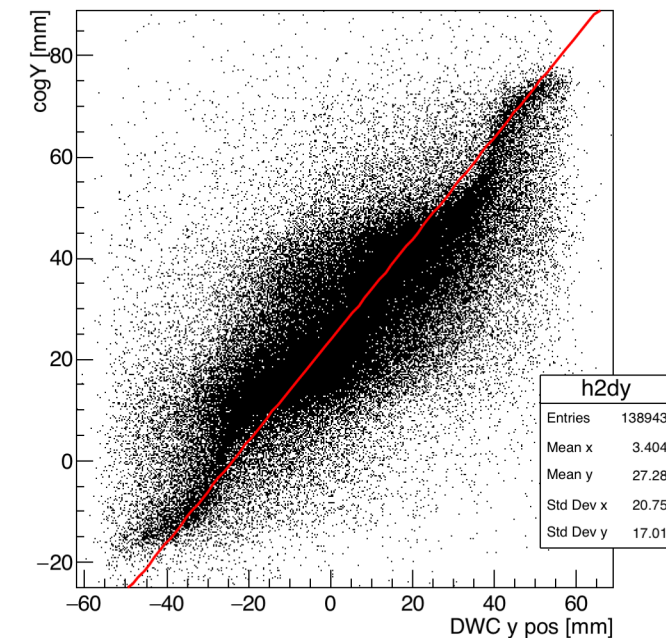
- We can derive the offset value by fitting the correlation plot with $(y=x+\text{offset})$ function

Electron

x position correlation

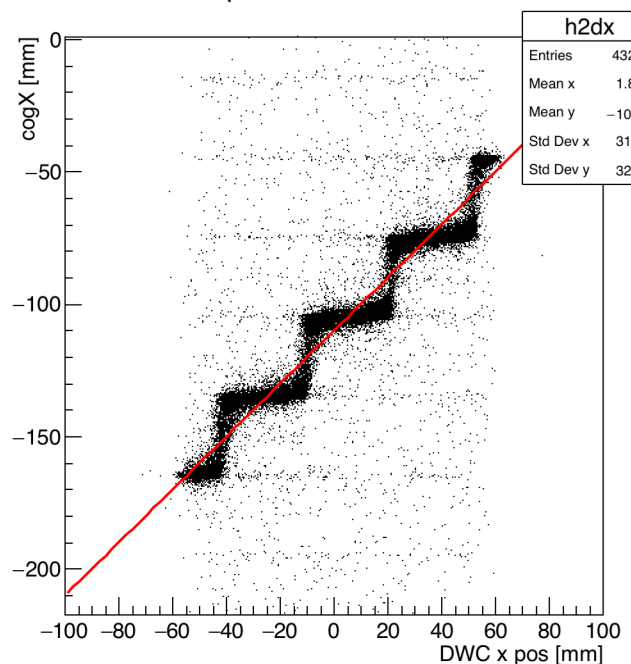


y position correlation

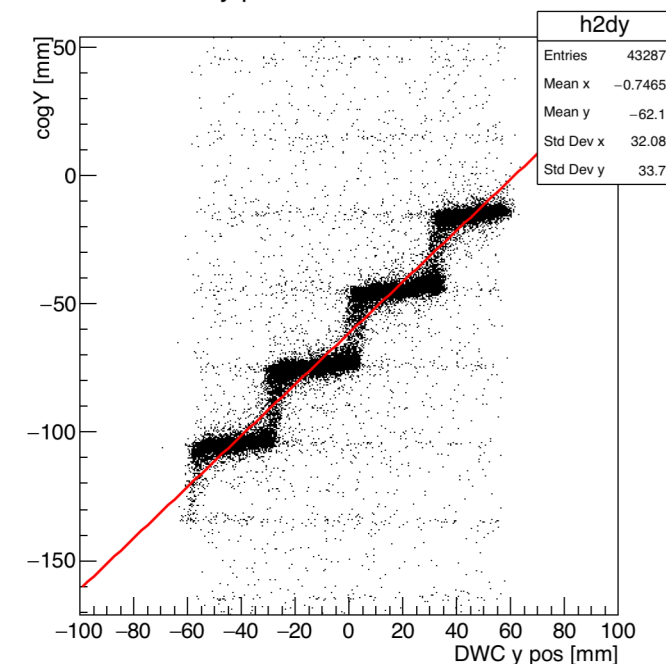


Muon

x position correlation



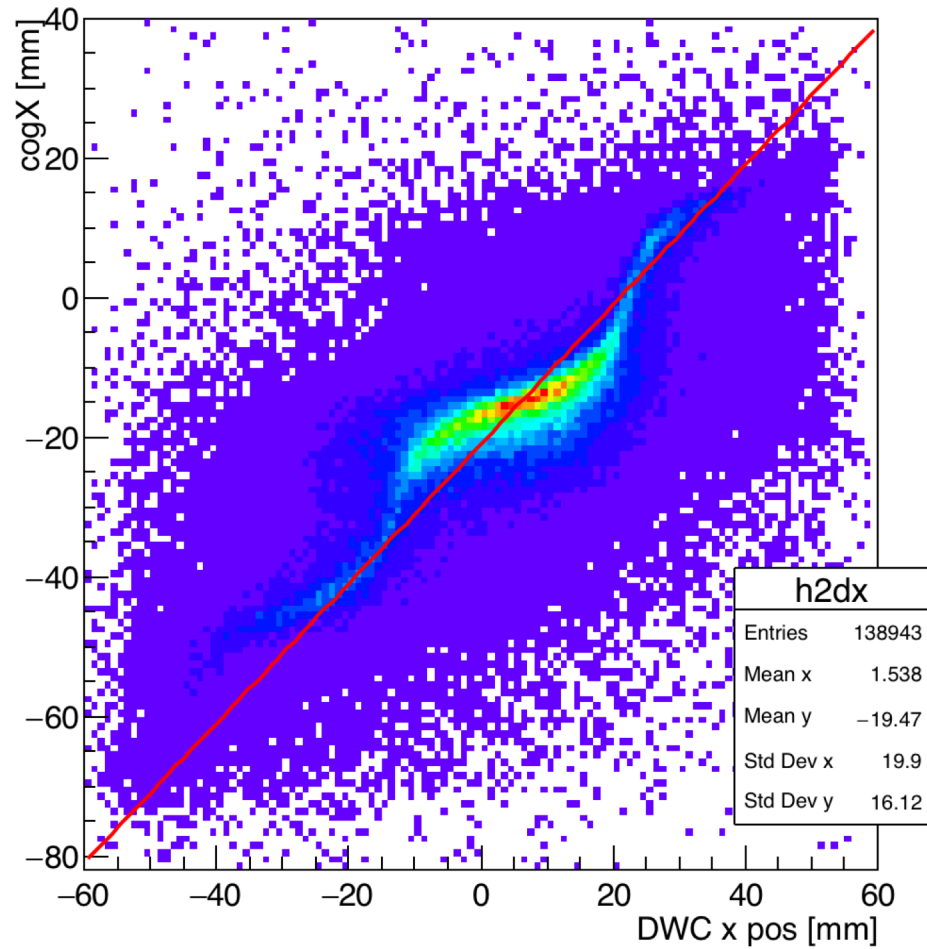
y position correlation



Summary

- ▶ We had four chambers to monitor the beam position
- ▶ Implemented the processors to make DWC data accessible
 - ▶ DWCPProcessor : reconstruct the track and write down in a collection
 - ▶ DWCWriteEngine : write the dwc track information in root tree
 - ▶ EventDisplay : able to draw the track with the hits
- ▶ Open stuffs to be done
 - ▶ Relative position between AHCAL and chambers automatically filled

x position correlation



y position correlation

