

Beam Tracking with Delay Wire Chambers

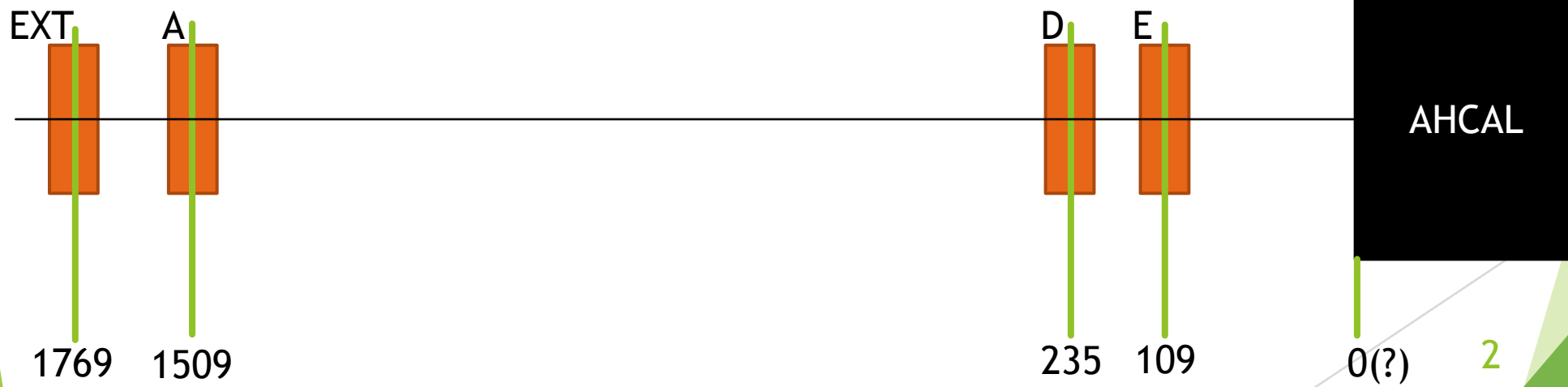
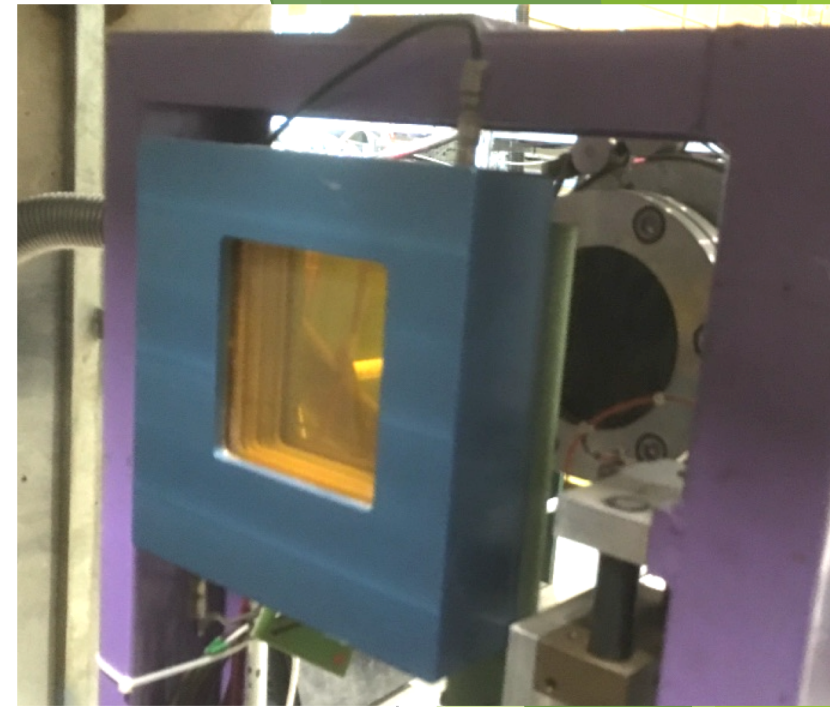
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CALICE AHCAL main meeting, 12 Dec. 2018

Delay Wire Chamber

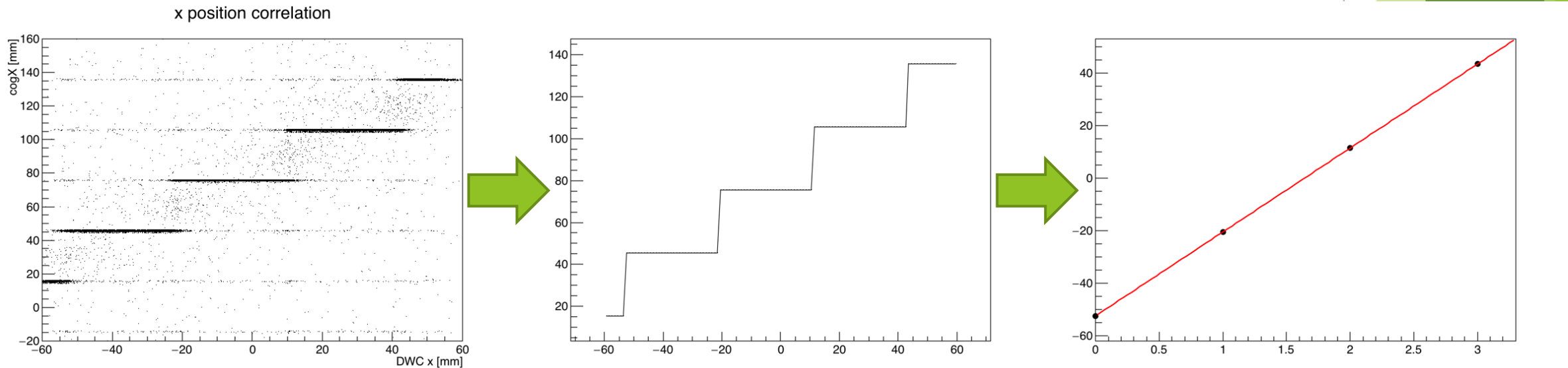
- ▶ Four 100 x 100 mm² chambers with wire readout for beam tracking
- ▶ Position resolution of ~600 um for each chamber
- ▶ Four channels for each chamber: up, down, left, right
- ▶ Hit position is reconstructed as
 - ▶ $x = (\text{left} - \text{right}) * \text{slope} + \text{offset}$
 - ▶ $y = (\text{down} - \text{up}) * \text{slope} + \text{offset}$
- ▶ Expecting **~1 mm position resolution** at AHCAL



July 2017 (Units in cm)

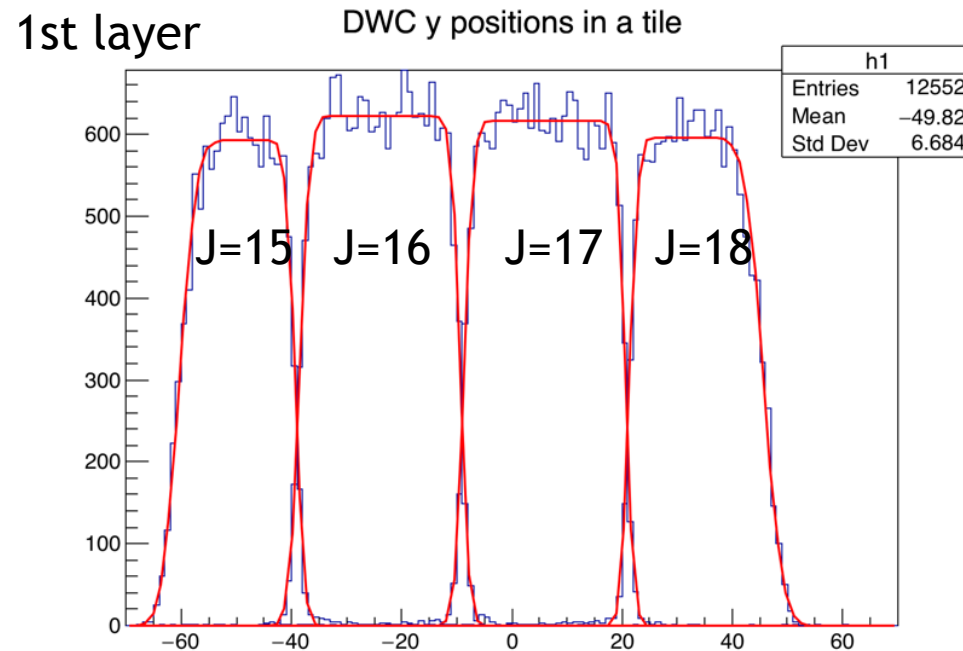
Old Method

- ▶ Detector position against the wire chambers can be measured using muons
 - ▶ Plot the center of gravity position **per layer** against the track position
 - ▶ Bin width of 1 mm
 - ▶ Extract the mode for each track position
 - ▶ Determine the tile edge by searching for the mode-changing position



Tile Position Measurement

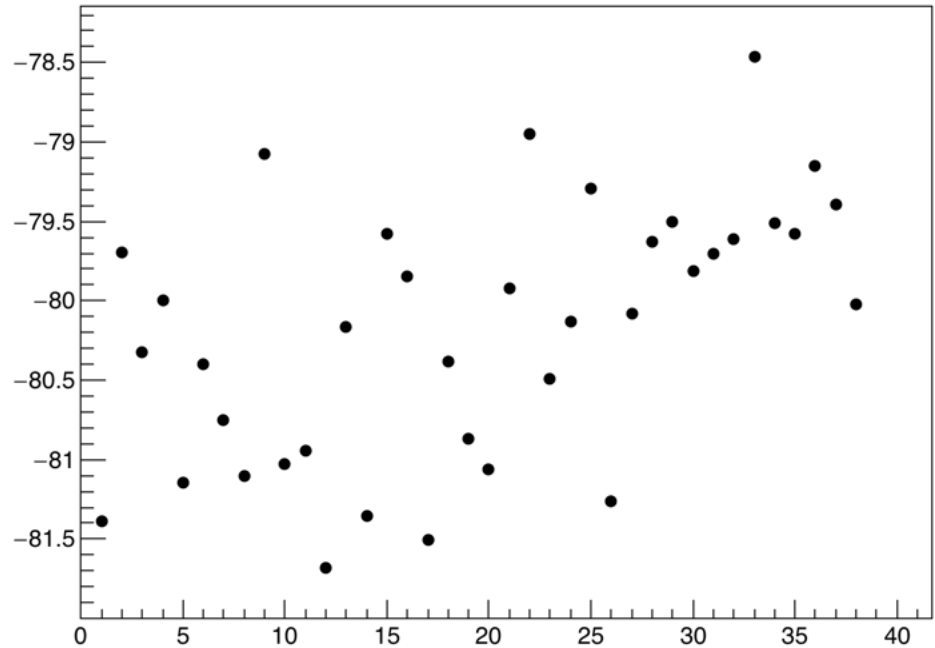
- ▶ Muon run
- ▶ For each layer, select the events by `nHitsPerLayer==1` and `hitI==const.` (or `hitJ`)
- ▶ Plot the x (or y) position given by DWC
- ▶ Fit with error function to get the edge position



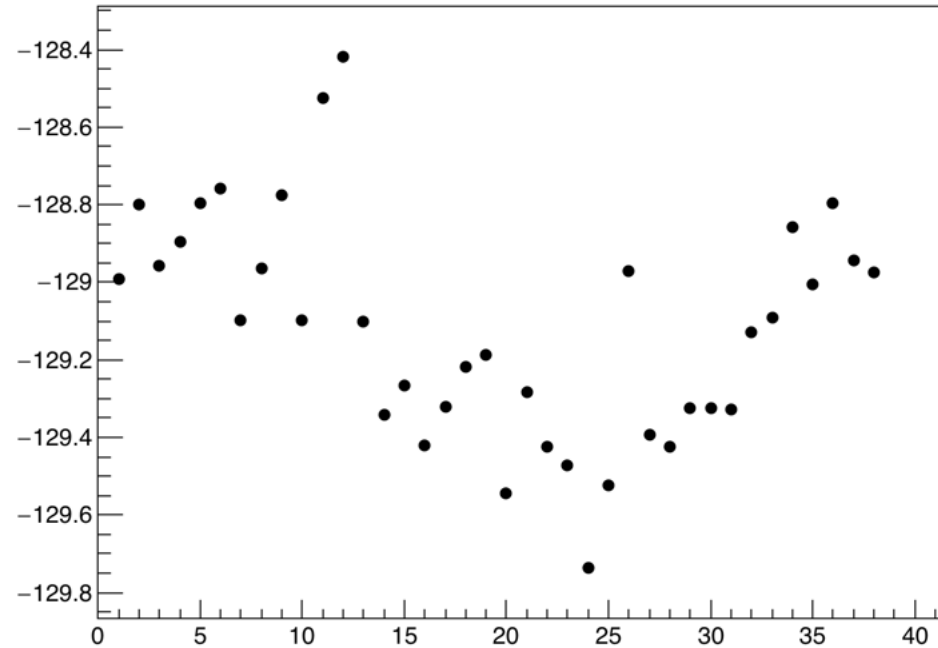
Layer Offsets

- ▶ Layer-by-layer variation of the offset is slightly larger in x direction
- ▶ Small inclination ~ 2 mrad along x and small deformation ~ 0.5 mm along y

Layer-wise X offsets



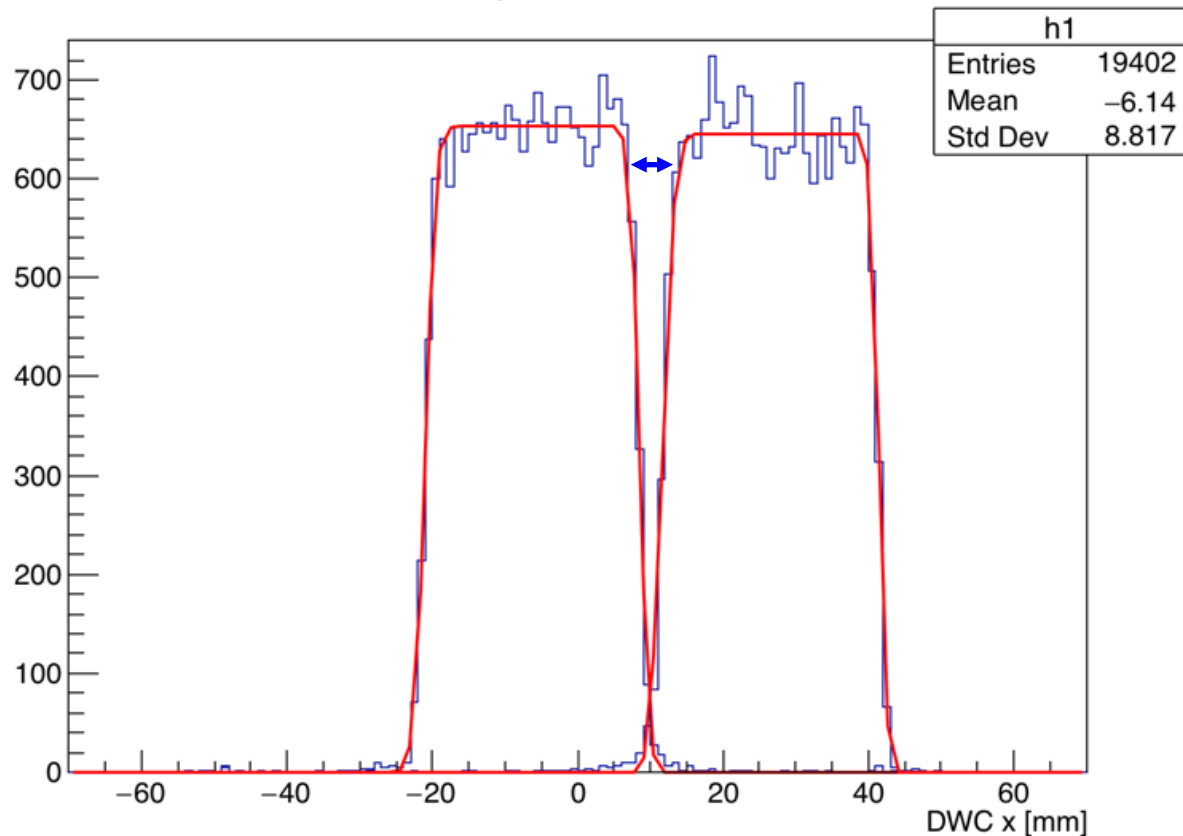
Layer-wise Y offsets



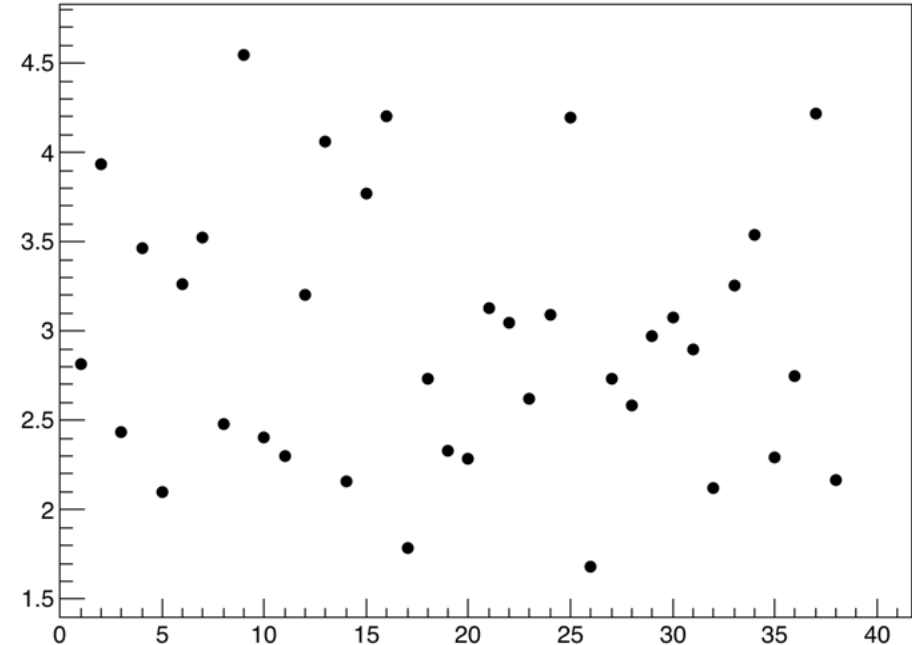
Slab Gaps

- ▶ Gap calculated as (center of $l=13$) - (center of $l=12$) - 30
- ▶ The gap varying from 1.5 to 4.5 (average in ~ 3 mm)

DWC x positions in a tile



Layer-wise slab gap



Summary

- ▶ With the new method of alignment measurement, we are now ready to get the detector x-y offsets from the beam and the slab gap for all the layers