SiW ECAL 2017 Beam Test preliminary results:

- Noise issues → bcid repetition pattern observed in 2D plots : bcid-prev_bcid
- MIP efficiency

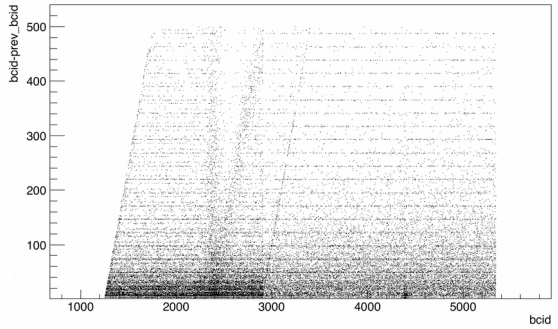
Analysis BT2017 working group

A. Irles, 30th November 2017

Noise issue: pattern in consecutive BCIDs

Reminder

- Plot discussed the 3rd august: map of bcid-prev_bcid.
  - Why prev and not next bcid? Causality?
  - Event building (bcid merging done) → buggy version of builder.
  - Data with beam → too much information in the same plot.
  - Very simple event selection done for hits (bcid) and not selection at all done for the previous hit (prev_bcid)



- Repetitive pattern observed : ~25bcid (100KHz), ~50bcid(50KHz), ~75bcid(33KHz)
- More studies presented the 14th september:
  - almost gone when several slabs were required in the selection.
  - completely gone when a signal > 0.5 mip is required
  - → hints of internal noise source

Runs

- Unfortunately, we did not take any pure “noise run” during last beam test.
- We have a couple of “noise-like runs”:
- {Conf1, grid20, 3GeV} run is almost empty of e.m shower like events
  - the magnet was tripping or wrongly configured: therefore we very low stats.
  - ~1/50 of events less than expected
  - Energy of beam is unknown.
- Comparison with a good 3GeV run {Conf1, grid24, 3GeV}

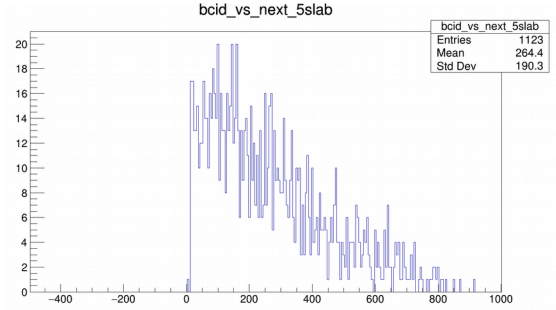
Noise runs vs beam runs

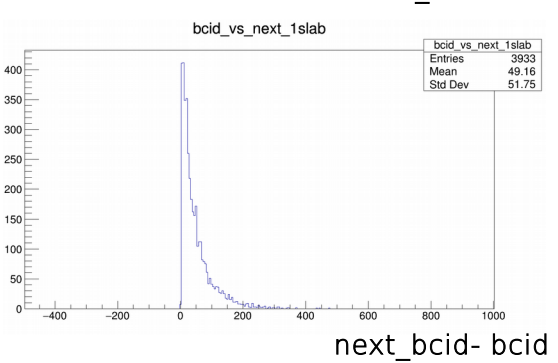
- Selection of the reference event: we require having hits (no mip cut) in exactly X slabs.
- Selection of the next event: we require having hits (no mip cut) in exactly Y slabs.

- X=6, Y=5
  - optimize selection to enhance real electron event selection and the next electron event

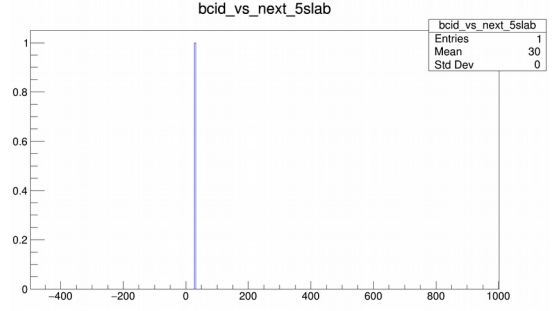
- X=6, Y=1
  - optimize selection to enhance real electron event and the next noise event

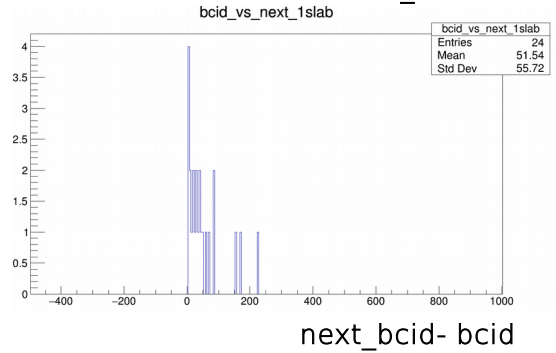
BEAM run





"Noise" run





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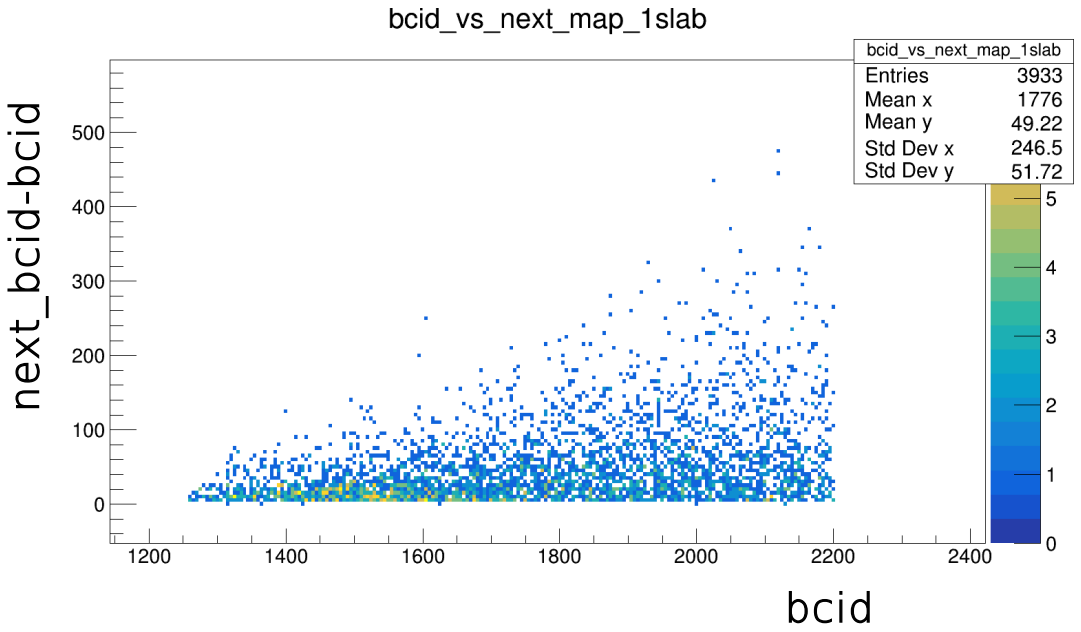


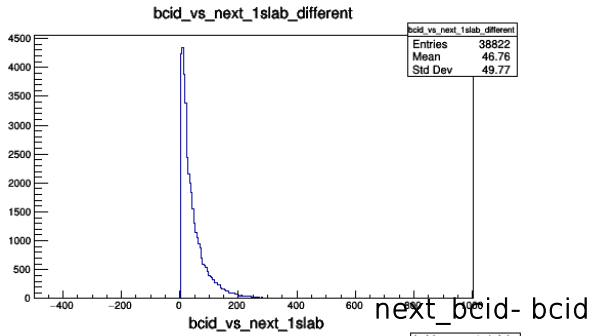
Noise runs vs beam runs

- X==1, Y==1: time correlation between noise-like events. (no mip cut)

- Case A: the consequent noise event occurs in different slab

- CASE B: the consequent noise event occurs in the same slab

BEAM run



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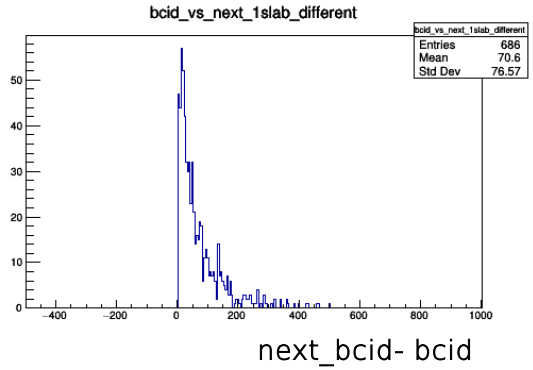

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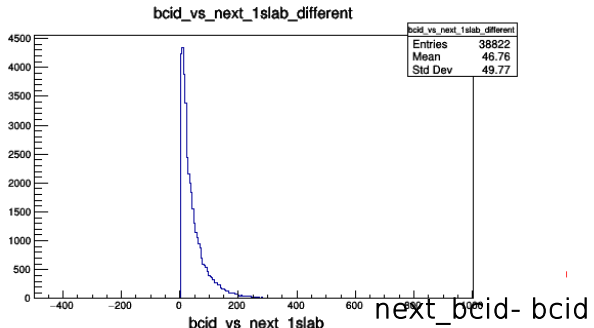

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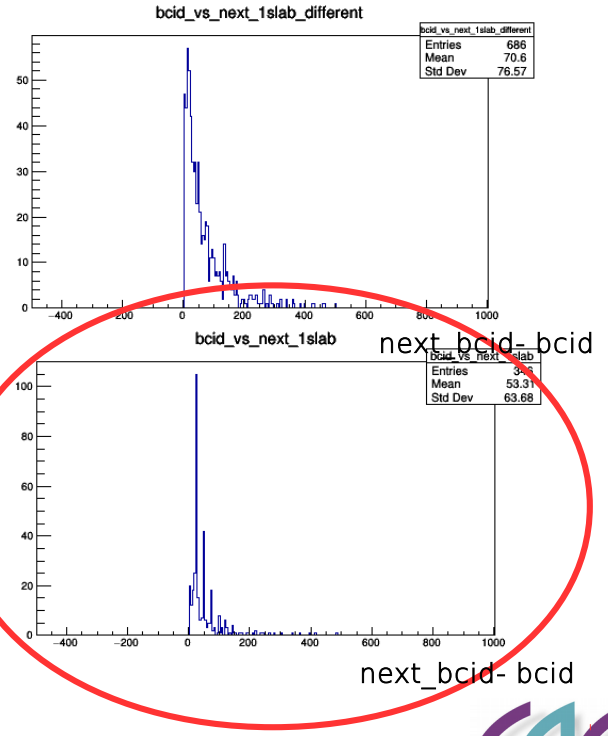

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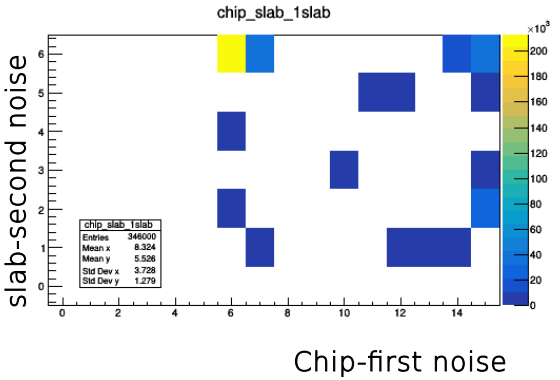
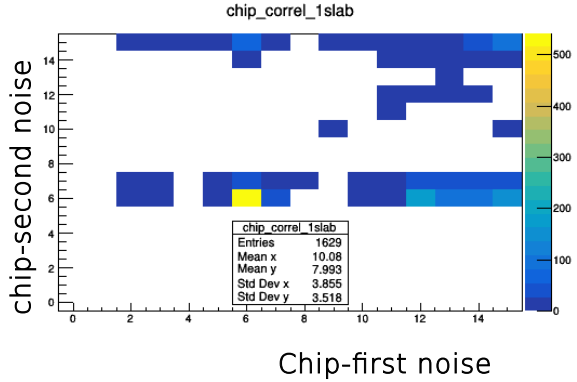


Chip-first noise



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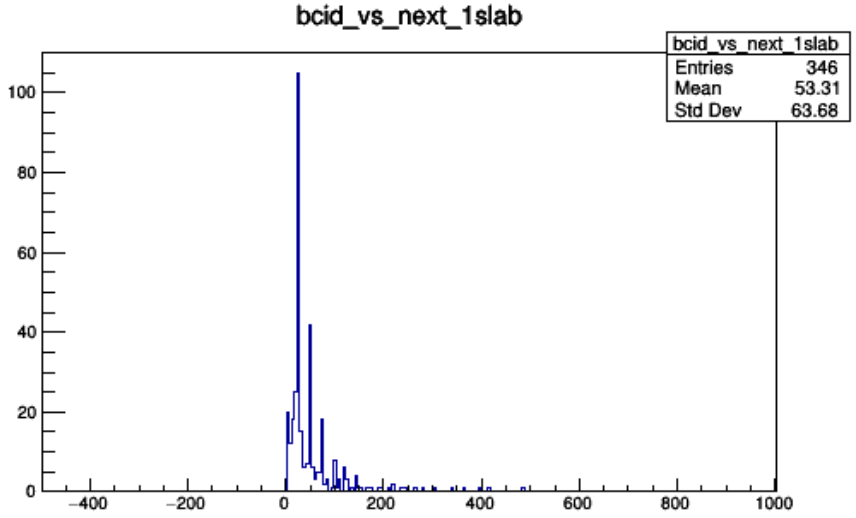

- Repetitive source of noise comes from the last layer, always in chip 6
  - far from the beam, if some
- We are not applying any MIP cut → next slide

Noise runs

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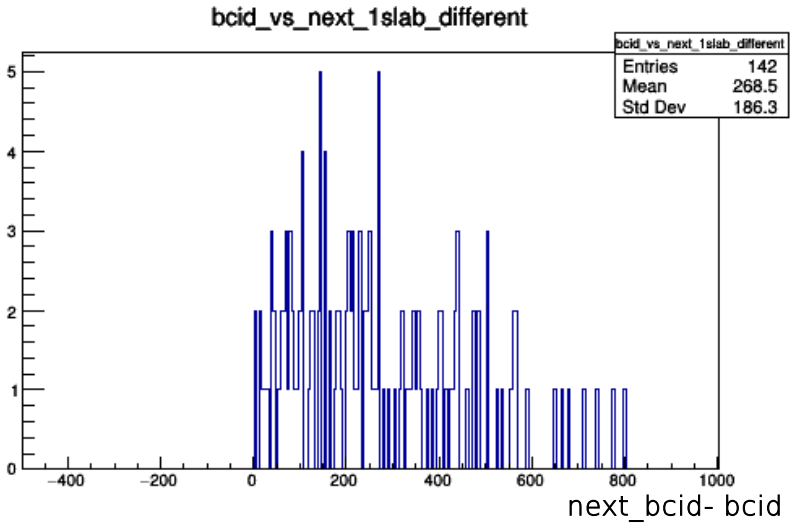
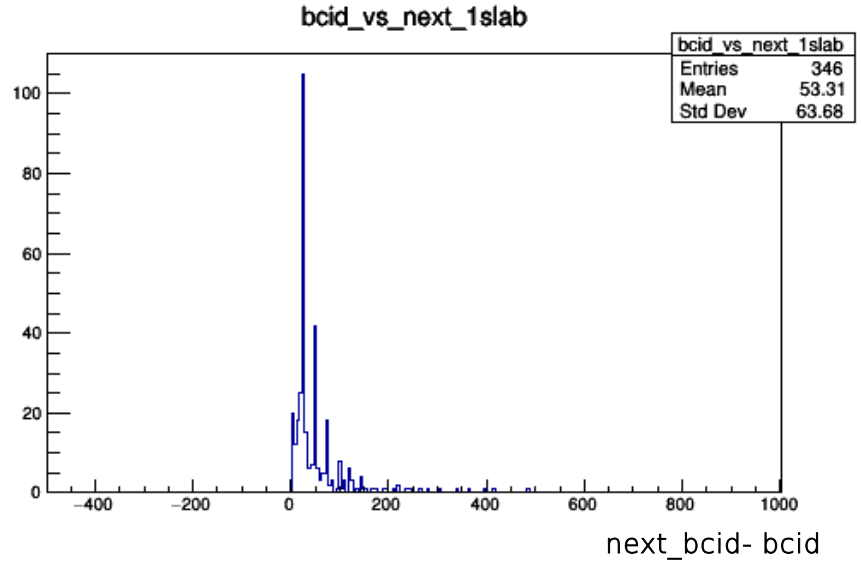
E> 0.5 mip

"Noise" run



No mip cut

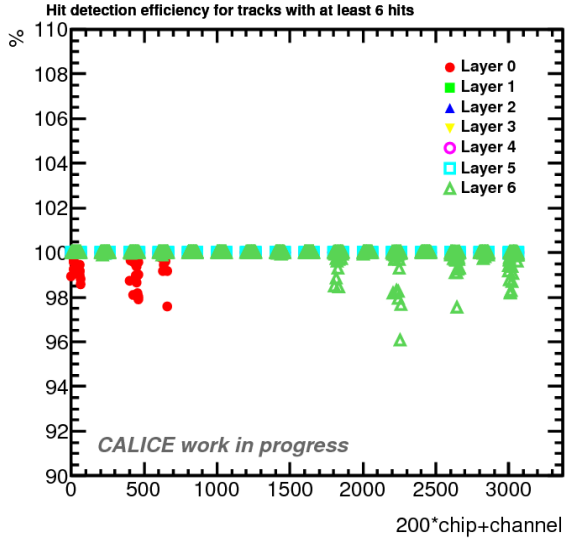


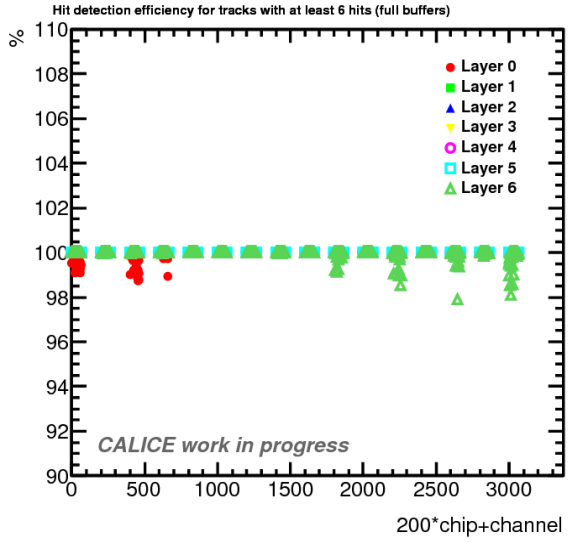
- The simplest selection cleans the noise.

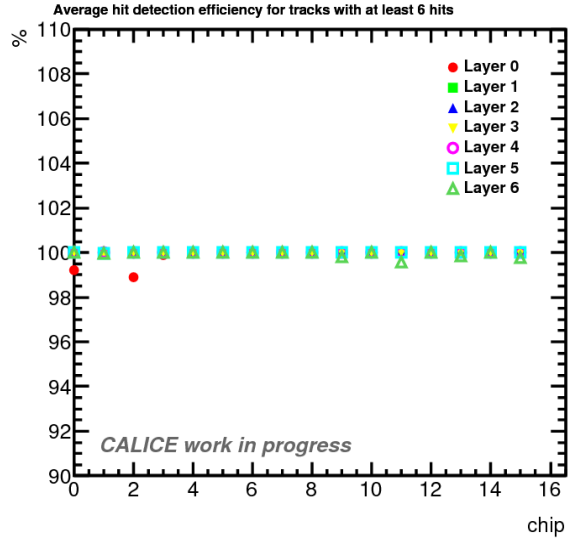
MIP efficiency

MIP efficiency

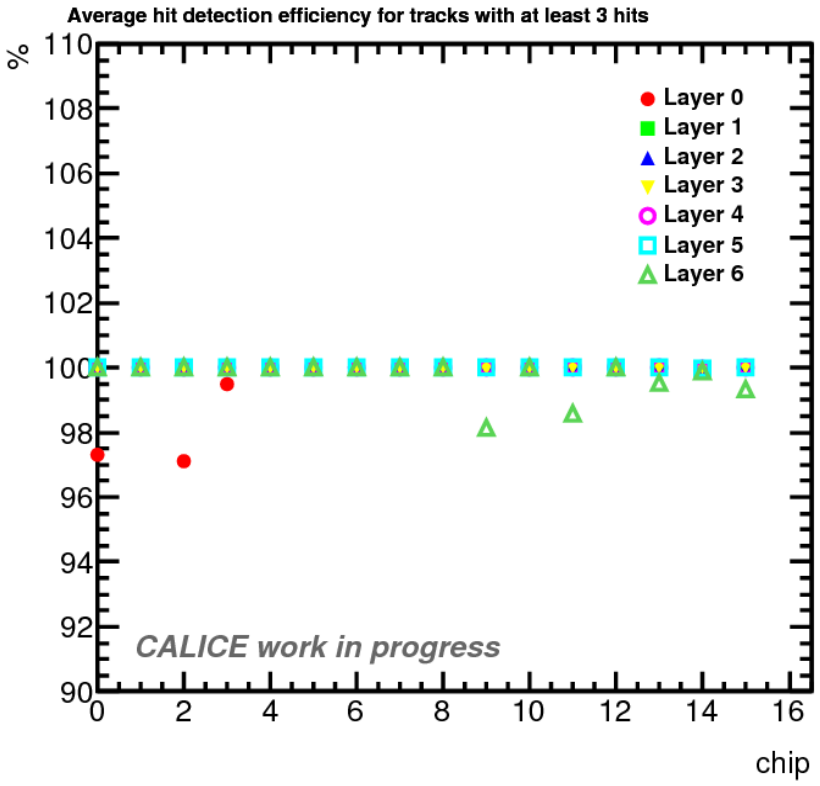
- Selection: perpendicular tracks with at least 6 hits (E>0.5 MIP).
- Inefficiencies are split in two:
  - Pure inefficiency → no signal in a channel or signal (E>0.15 MIP) tagged as pedestal.(first and last plots)
  - Inefficiencies due to chip occupancy → if latest previous SCA fill by the chip in the spill were the track event is selected was >= 13th. (middle plot)

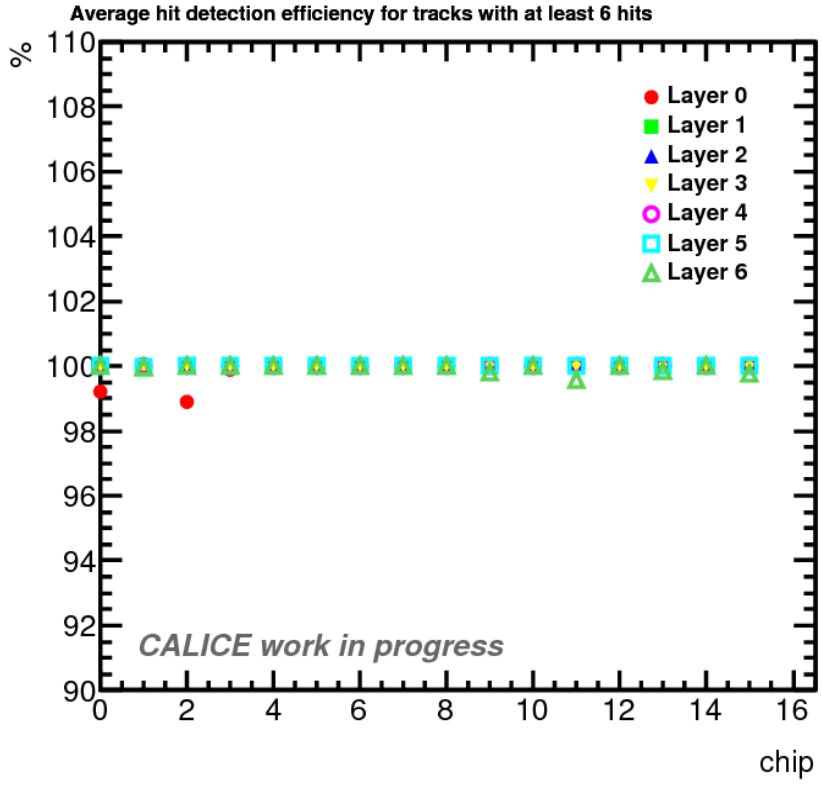






- Selection: perpendicular tracks with at least 3 hits vs 6 hits

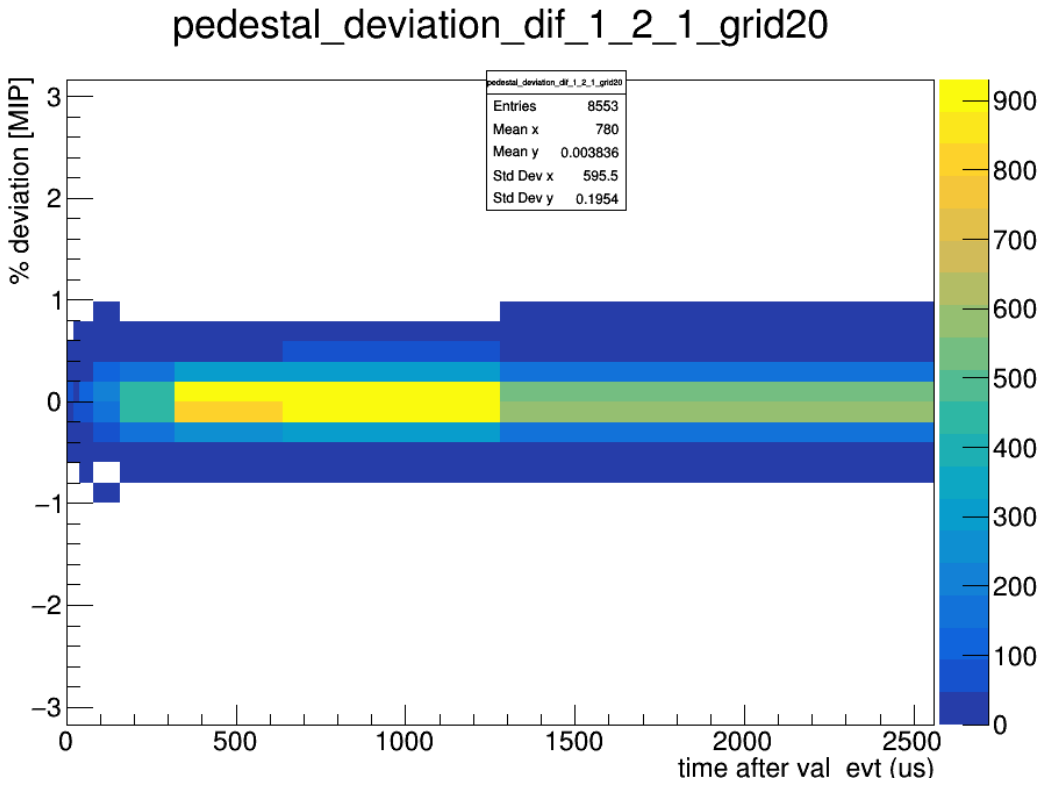




Back-up

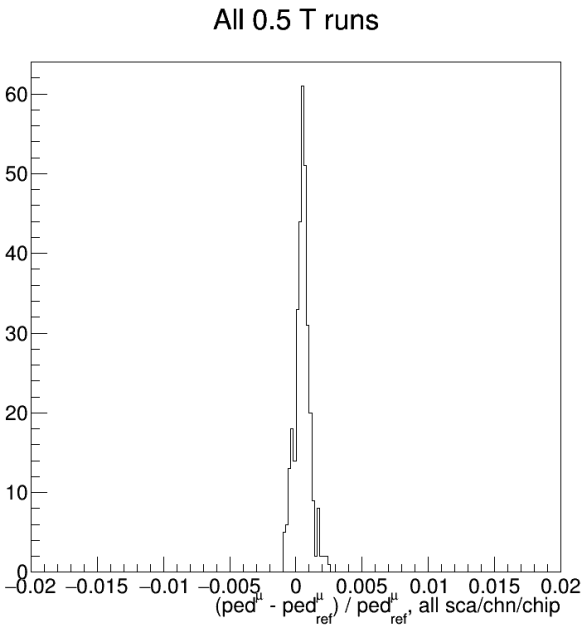
Pedestal mean position for different times within a spill

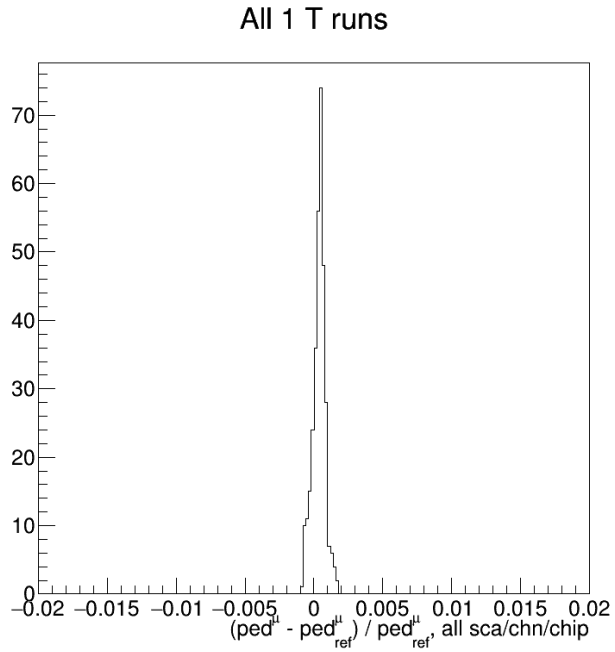
- Deviation is shown in units of ~MIP
  - assumming MIP at ~65ADC, (which is a reasonable value)
  - One entry per channel and SCA.
- Pedestal value remains constant within 0.5%MIPs
  - Similar results for all slabs/grid points



MIP electrons in magnetic field

- Analysis approach: calculate pedestals and MIPS on the fly.
- But first: check pedestal stability comparing the values with the reference run.
  - Compare pedestal mean and pedestal width using "pull-like distributions"





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