Test beam (DESY – July 2012)

DQ checks
Analysis status

Setup

- wafer 9x9 cm^2, 324 pixels 5x5 mm^2
- 6 FEV8 (4 SKIROCs per FEV)
  - 4 SKIROCs x 64 channels = 256 channels

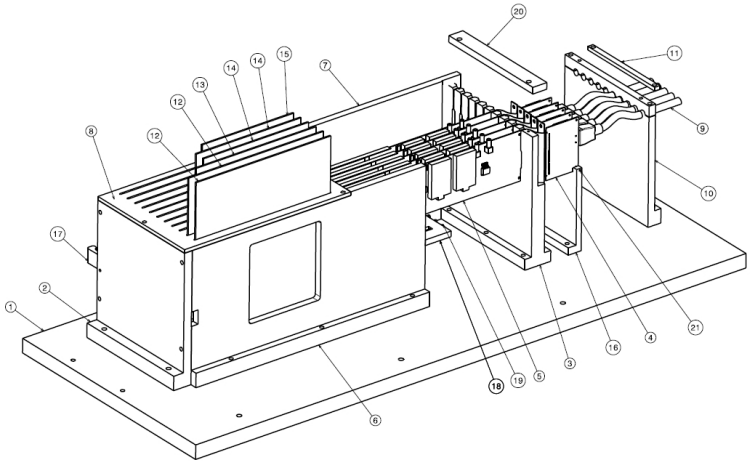
    (2 channels with 2 pixels and 22 channels with 4 pixels)

Total = 1536 channels

PreAmplifiers of noisy channels are switched off

total active channels = 1278

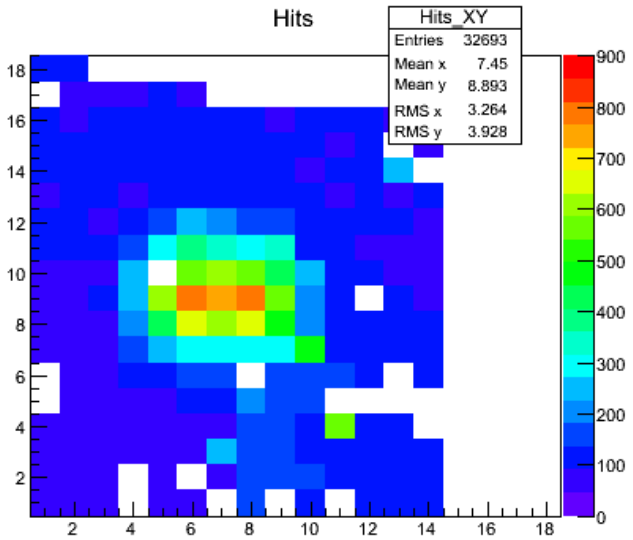
- PVC structure with position for tungsten plates (2.1 mm)



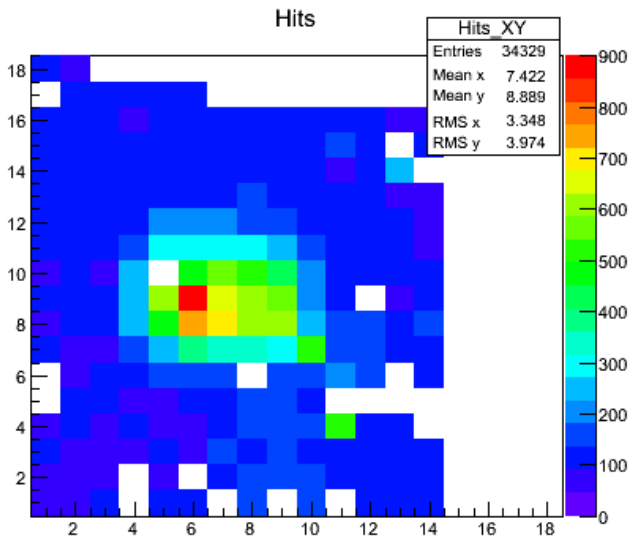
Rep	Désignation	N°Plan	Nbre	Matière	Traitement	Observation
21	Goupille DIF		1	Stubbe		
20	Couvercle Peigne 2	CAL-12-03-11	1	PVC		
19	Piston	CAL-12-03-06		Laiton		
18	Support Piston	CAL-12-03-07	1	AU4G		
17	Came de Position	CAL-12-03-14	1	Delrin		
16	Support DIF	CAL-12-03-12	1	PVC		
15	Tungstene 141 2.1		1	W		
14	Tungstene 162 2.1		2	W		
13	Tungstene 185 2.1		1	W		
12	Tungstene 209 2.1		2	W		
11	Barreau Presseur Cable	CAL-12-03-18	1	PVC		
10	Support Cable	CAL-12-03-17	1	PVC		En 2 pièces
9	Connecteur HDMI					avec Cable Rond
8	Barreau Cale H	CAL-12-03-16		PVC		
7	Plaque Coté Droit	CAL-12-03-15	1	PVC		
6	Plaque Coté Gauche	CAL-12-03-13	1	PVC		
5	Slab U Court					
4	DIF Group					
3	Peigne 2	CAL-12-03-10	1	PVC		
2	Peigne 1	CAL-12-03-09	1	PVC		
1	Plaque Support 2	CAL-12-03-08	1	PVC		

Beam spot

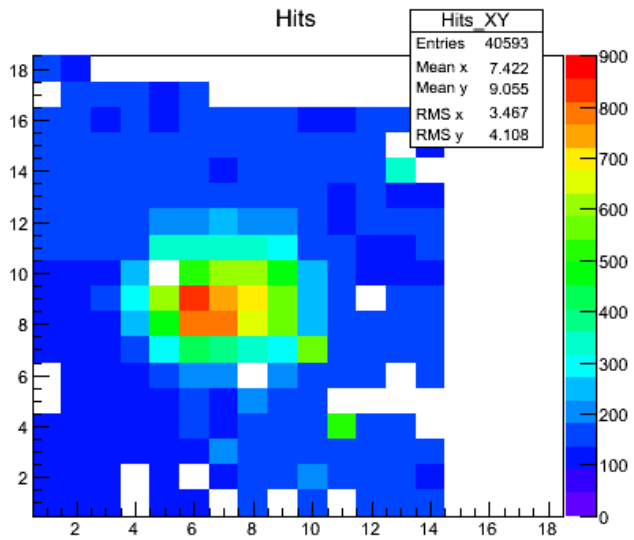
Layer 1

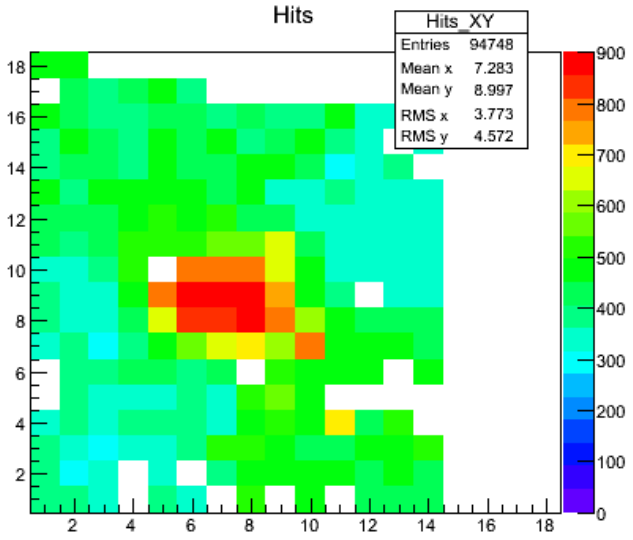


Layer 2

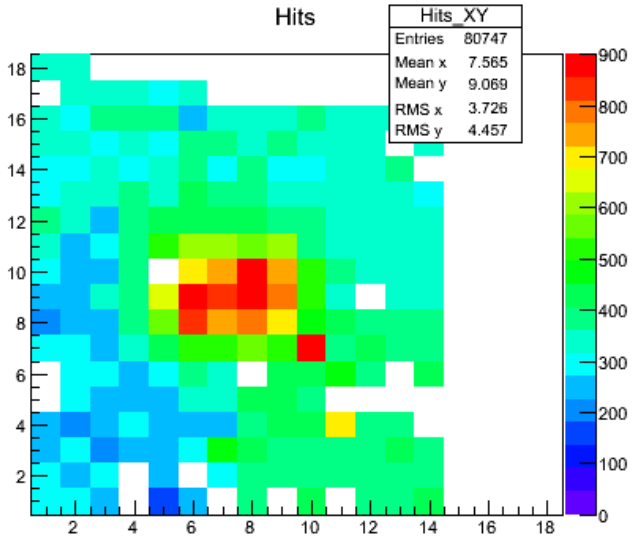


Layer 3

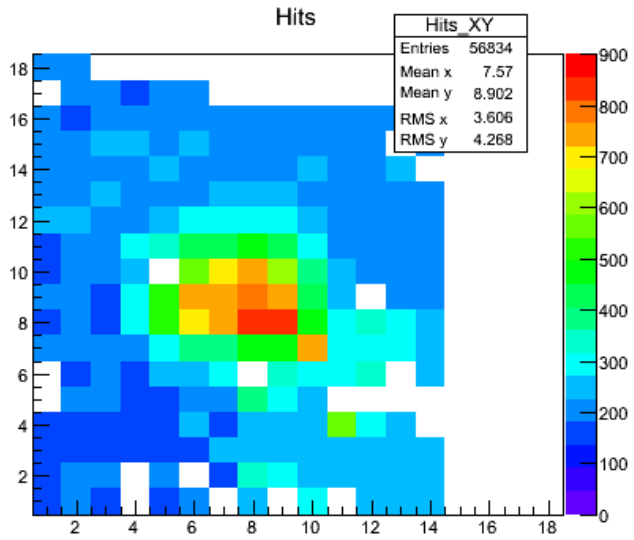




Layer 4



Layer 5



Layer 6

Goals of the test beam(from Roman's talk)

- **Main goal: Determine signal over noise ratio of the detector**
  Remember: R&D target is 10:1

- Establishment of calibration procedure for a larger number of cells

- Homogeneity of response (x,y scan of detector)

- Small physics program
  Electrons between 1-6 GeV

Data taking

- Trigger threshold calibration (no beam)

  gain, comp. Capa.

- Hold scan (beam)

  trigger threshold calibration

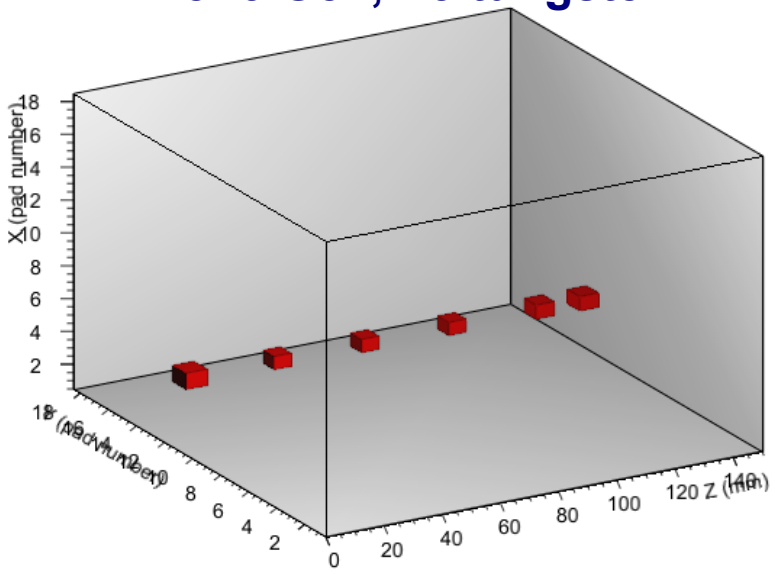
- Data taking (beam or cosmic)

Data (July 2012)

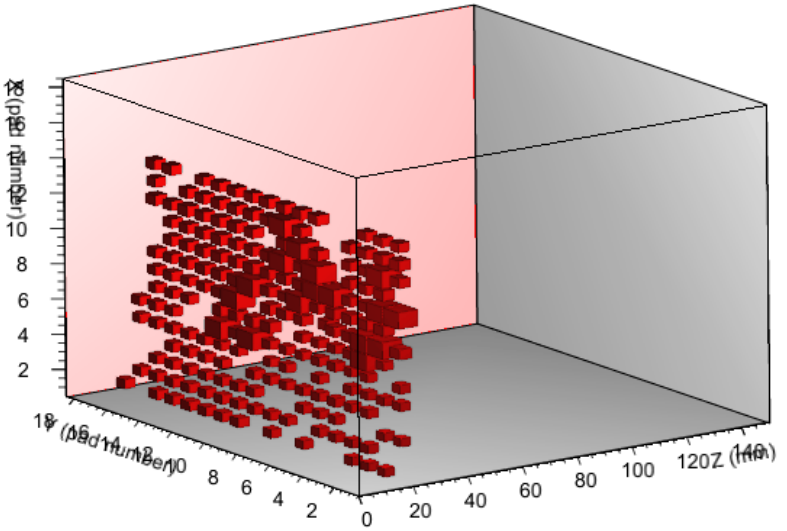
- **Trigger threshold calibration**
  - 1 gain, all channels = ~1-5 Go, ~30 min
  - Jérémy: **DONE**
- **Hold scan**
  - Need stat: 30-60 min/delay
  - Elmaddin: **DONE (low stat)**
- **XY scan**
  - Energy calibration: **DONE** (Jérémy)
  - Detection efficiency
  - Beam studies
  - Correlations...
- **Showers**
  - **4 energies**
  - **3 config**
- **Others (3 gains, some chips/channels OFF)**

Some events

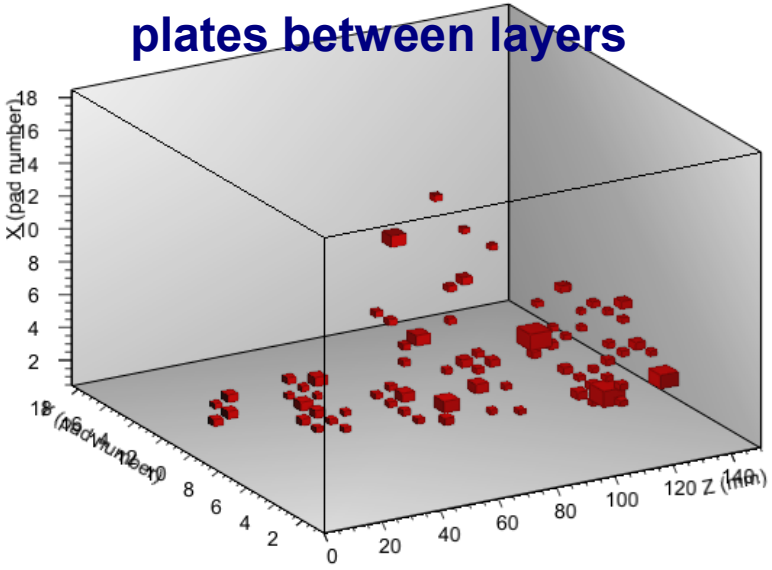
e- 3 GeV, no tungsten



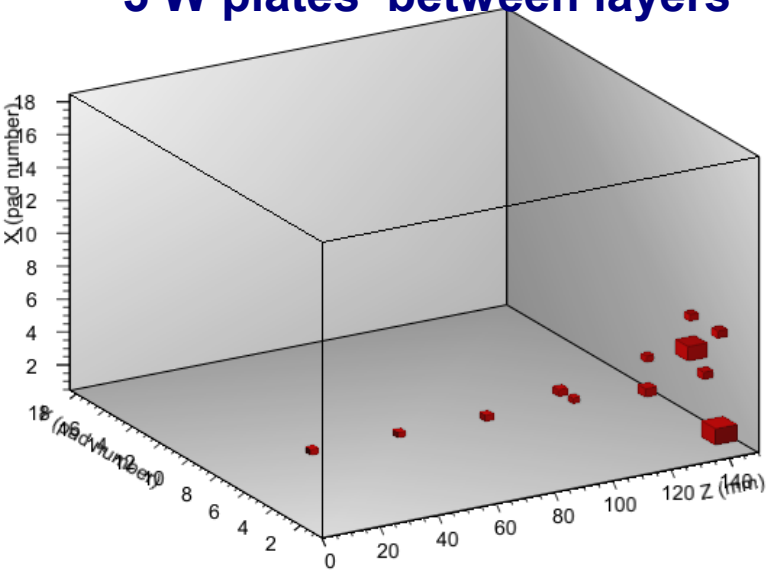
Event with a lot of hits in 1 layer



e- 3 GeV
3X0 in front of the detector + 5 W plates between layers

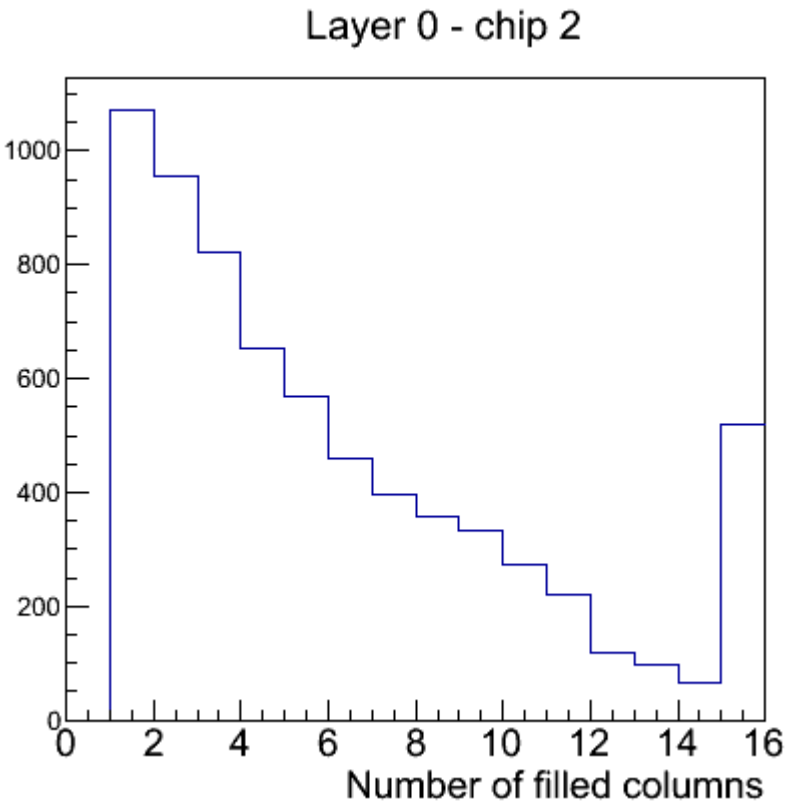


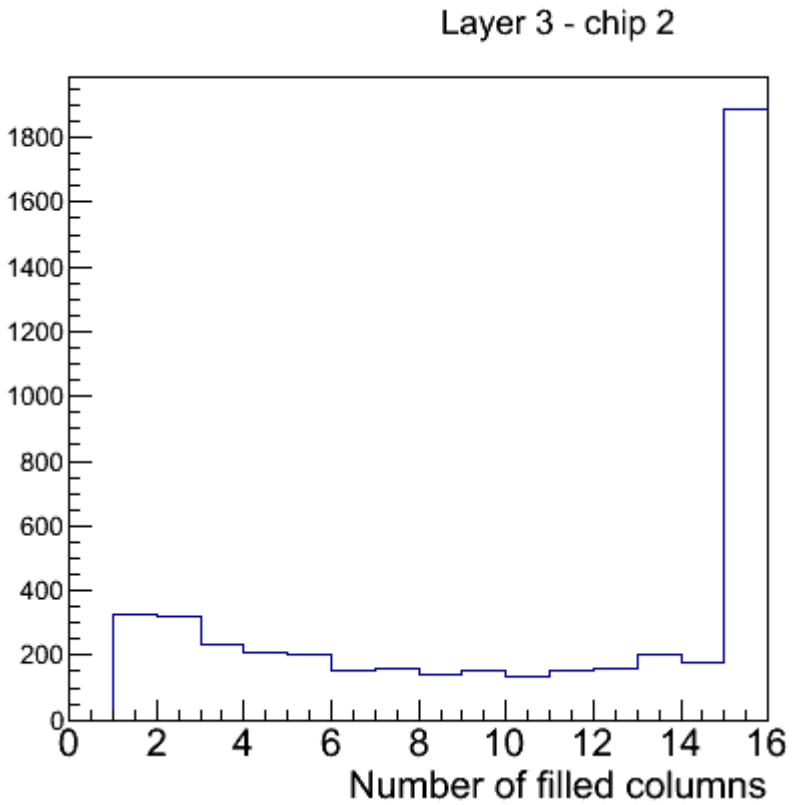
e- 1 GeV
5 W plates between layers



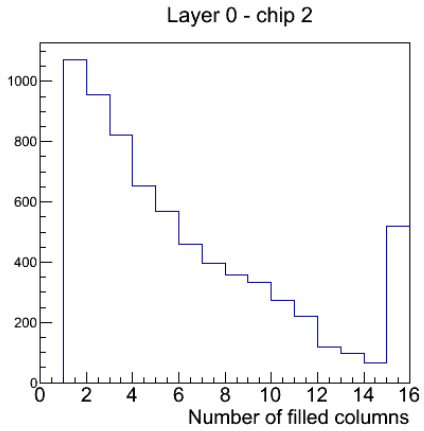
Memory occupancy (1)

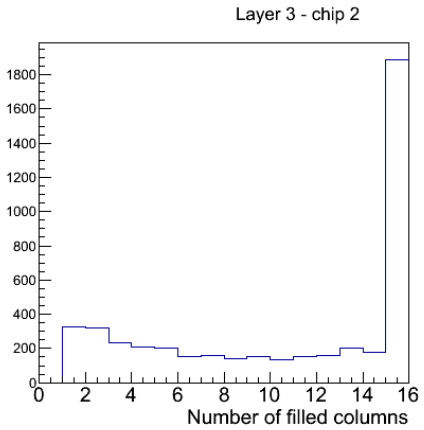
Data: 3GeV – No W – beam centered



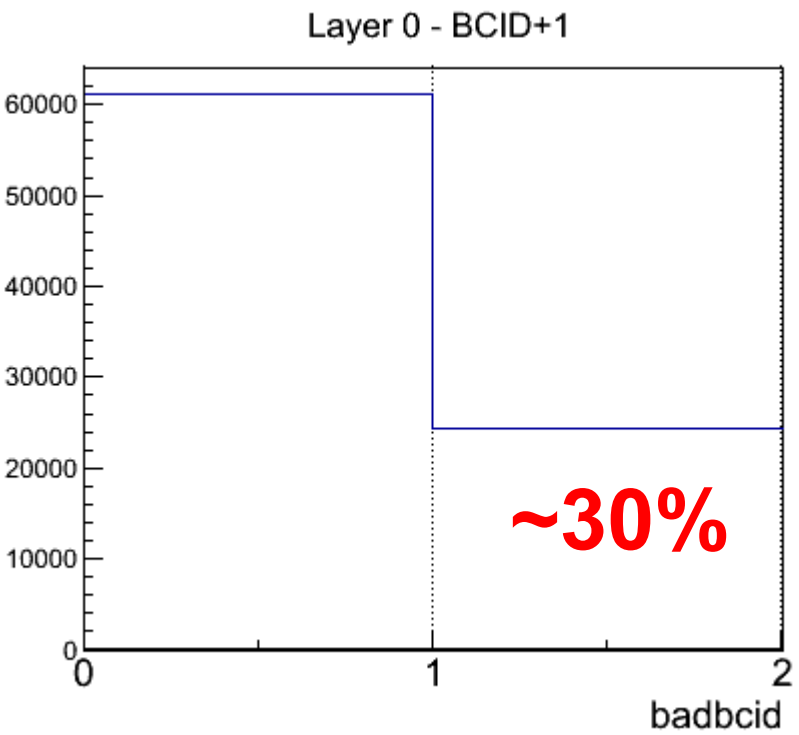


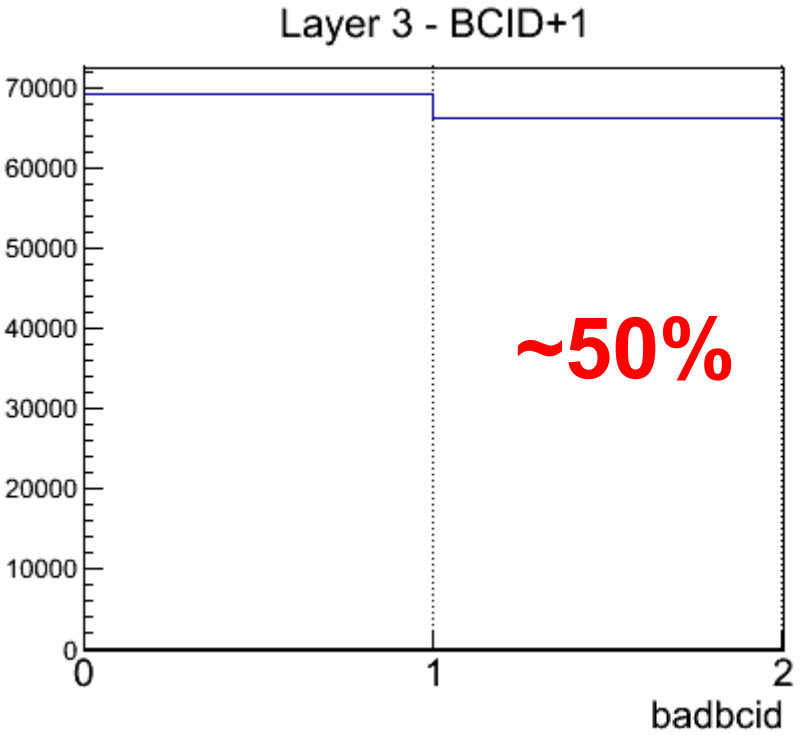
Memory occupancy – BCID +1





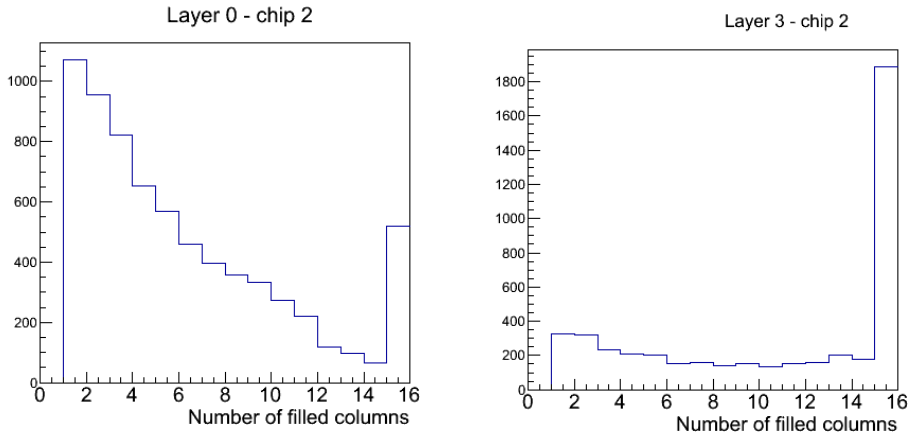
Data: 3GeV – No W – beam centered



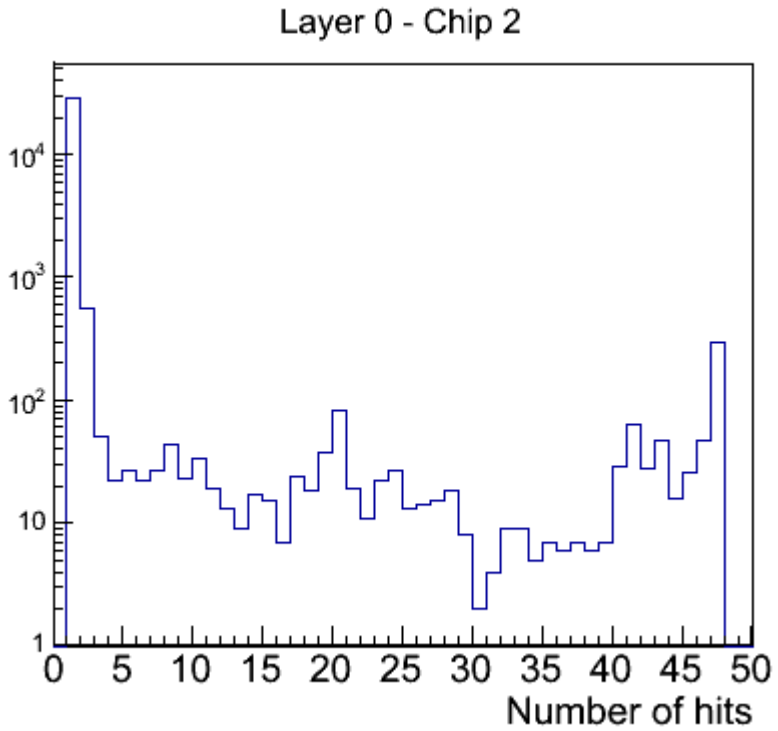


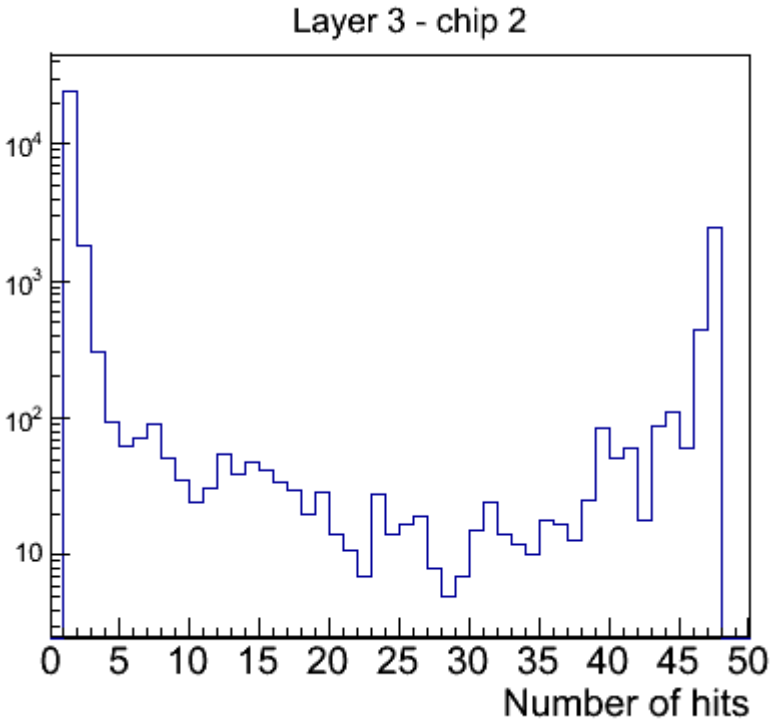
Seen on test bench, cut on BCID + 1

Memory occupancy (3)



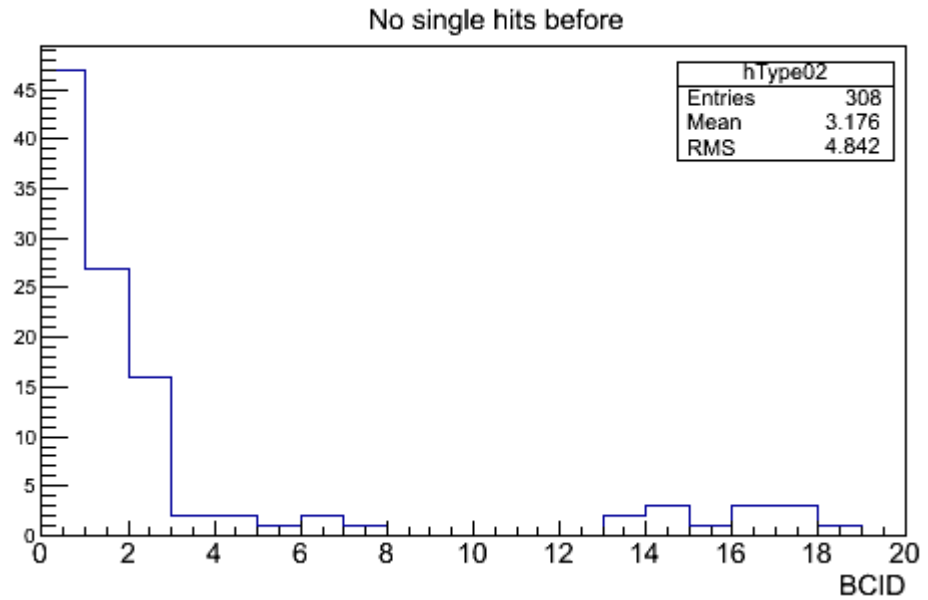
Data: 3GeV – No W – beam centered



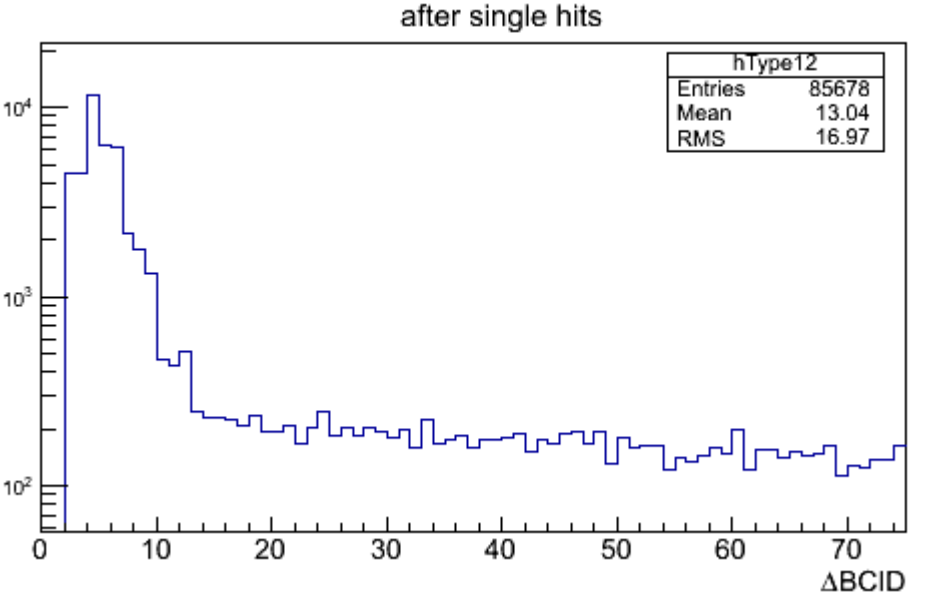


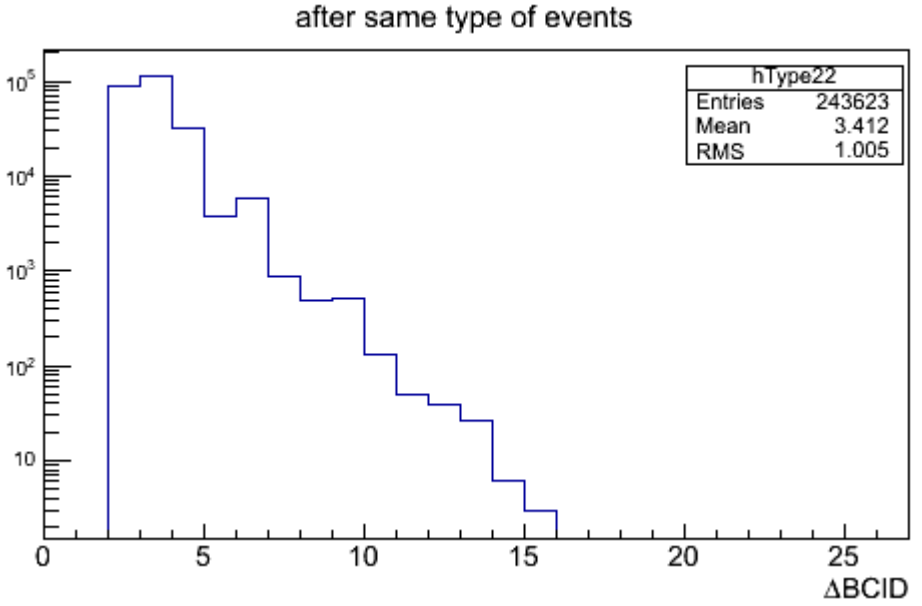
Not seen on test bench

Events with a lot of hits



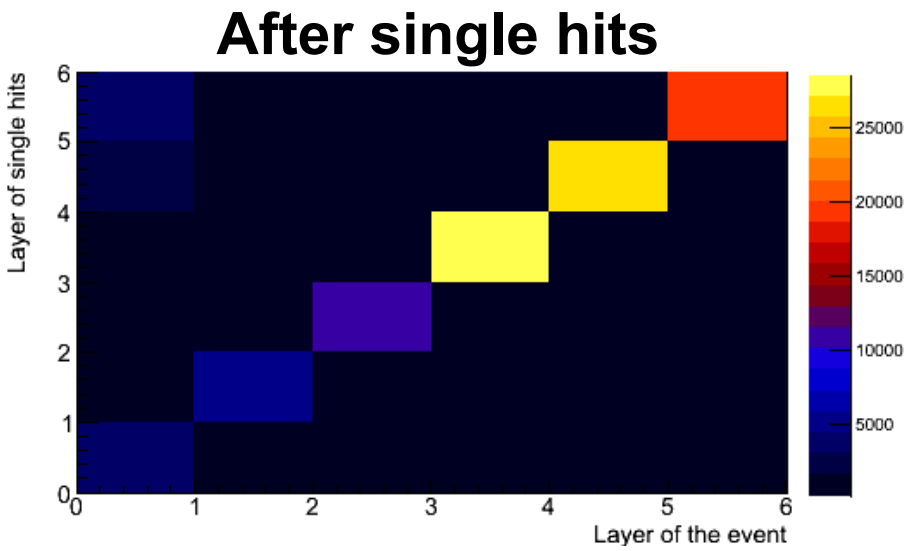
Data: 3GeV – No W – XY scan
All layers
Total number of events: $2{,}3.10^6$

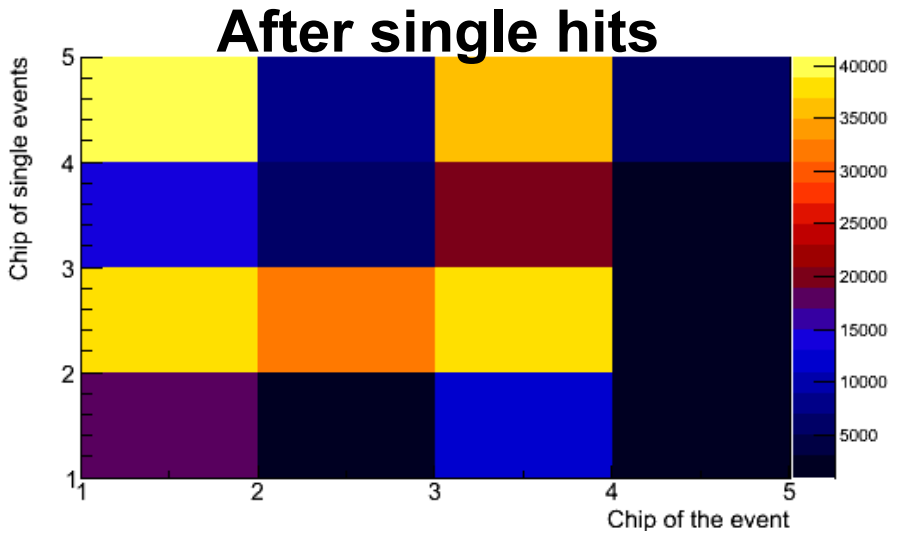


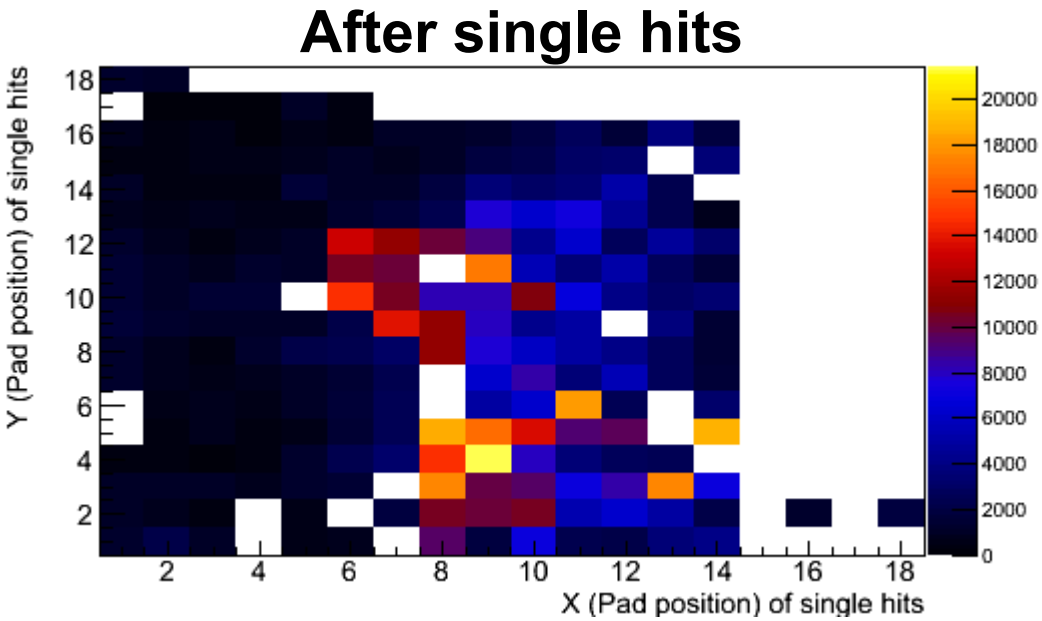


Events with a lot of hits (2)

Data: 3GeV – No W – XY scan
All layers
Total number of events: $2,3.10^6$

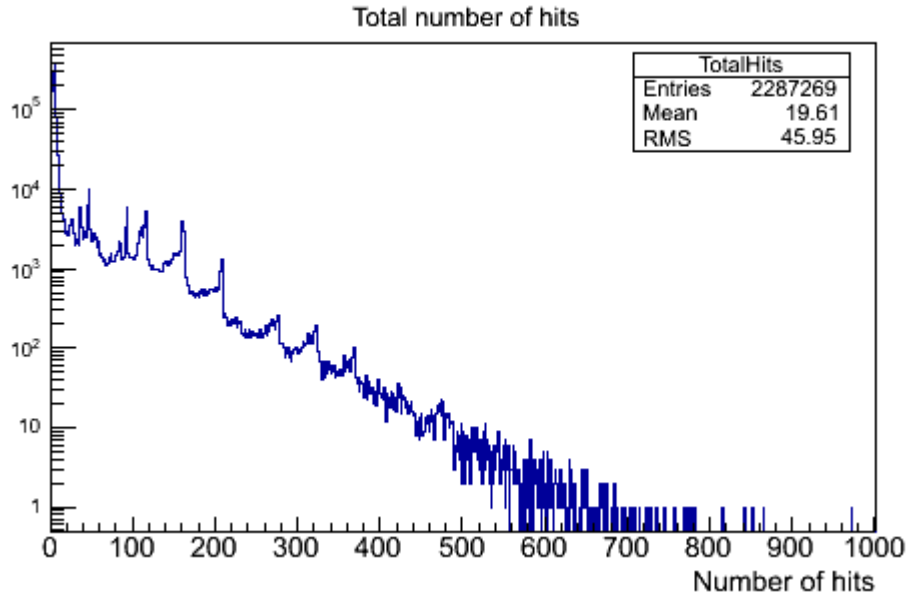


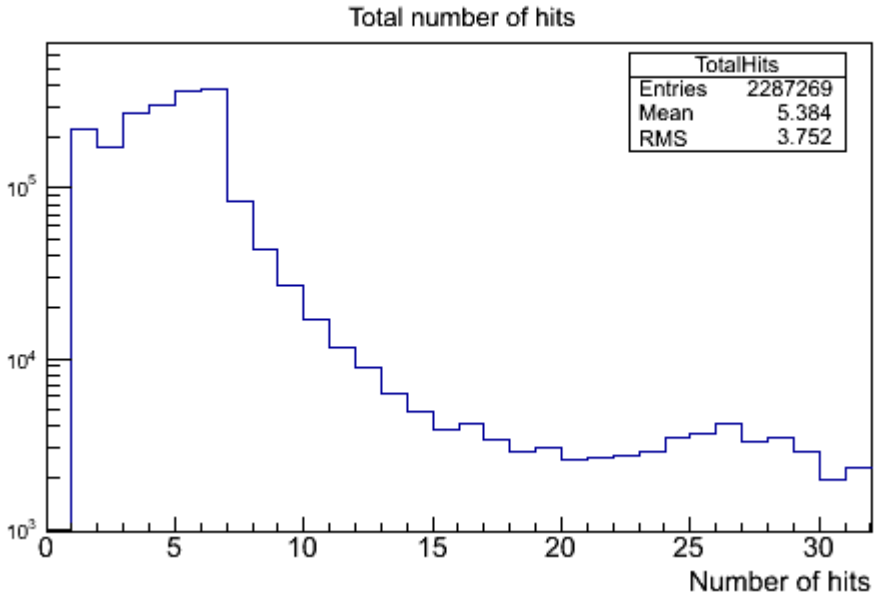




Is it just a map of noisy channels?
Is some channels induced events with a lot of hits?

MIP studies (1)





Data: 3GeV – No W – XY scan

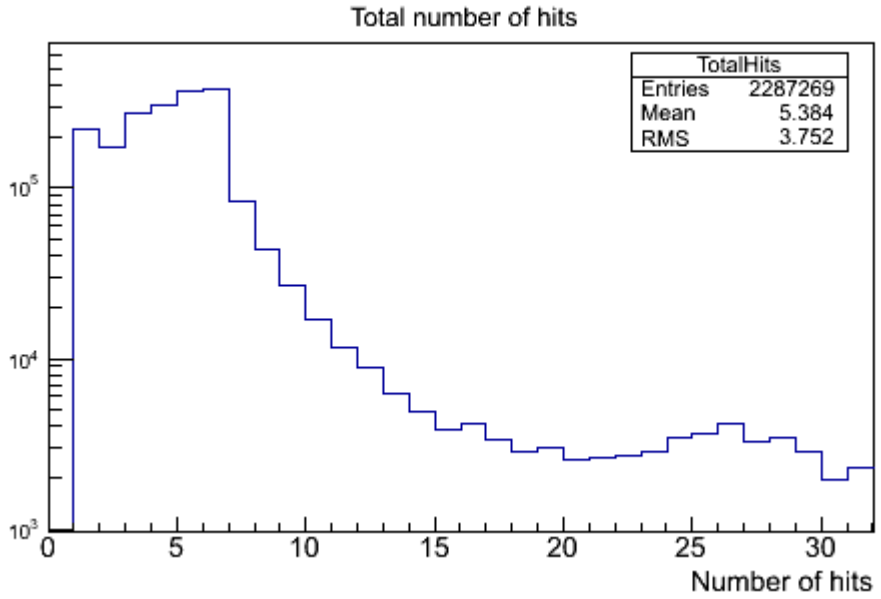
All layers

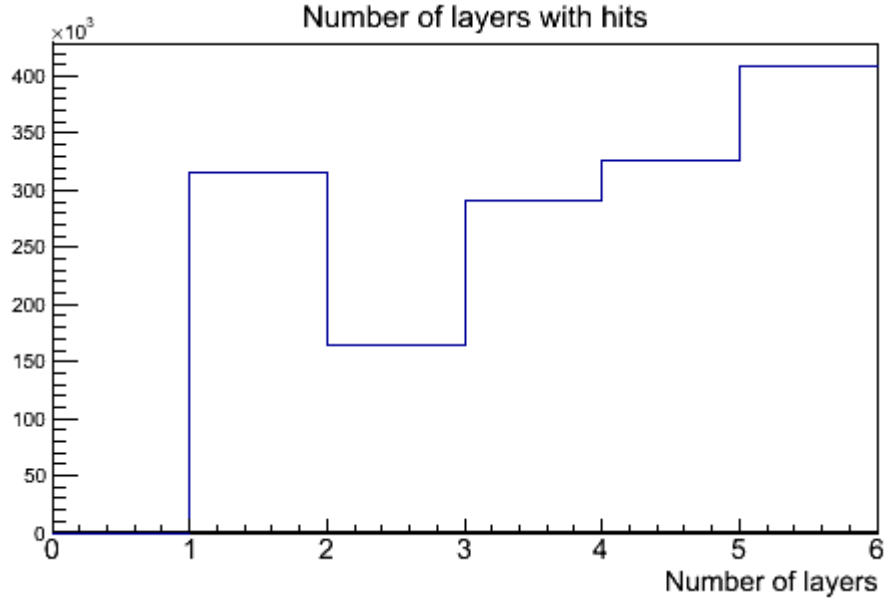
Total number of events: $2,3.10^6$

MIP selection:

- At least 3 layers with hits
- 5 hits in the same XY region (+- 1 pad)
- Nhits<10

MIP studies (2)





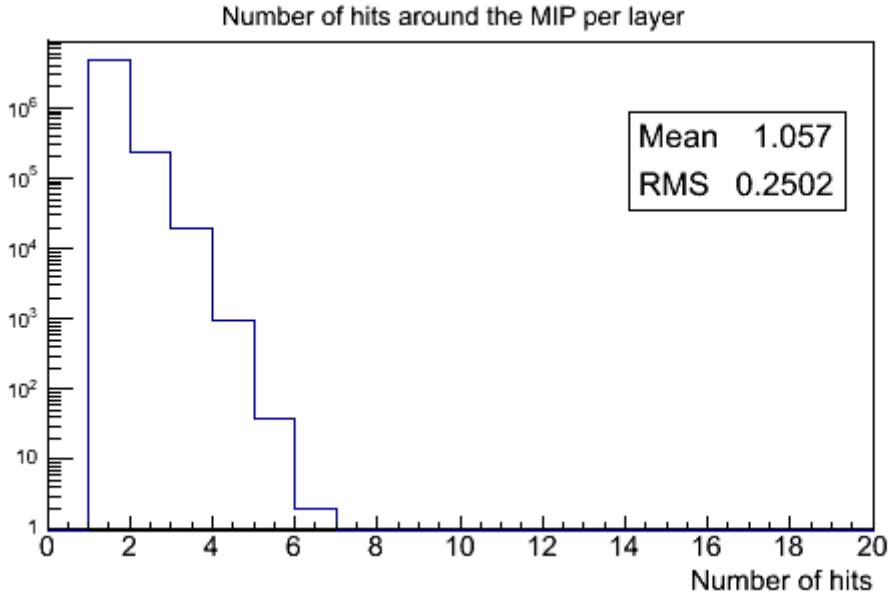
Data: 3GeV – No W – XY scan

All layers

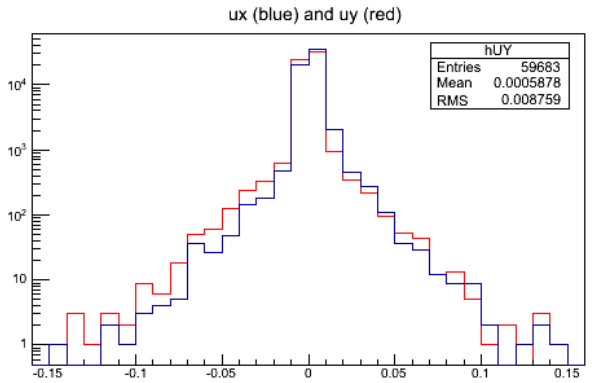
Total number of events: 2,3.10^6

MIP selection:

- At least 3 layers with hits
- 5 hits in the same XY region (+- 1 pad)
- Nhits<10



MIP studies (3)



Fit function:

$x = x_0 + k.u_x$

$y = y_0 + k.u_y$

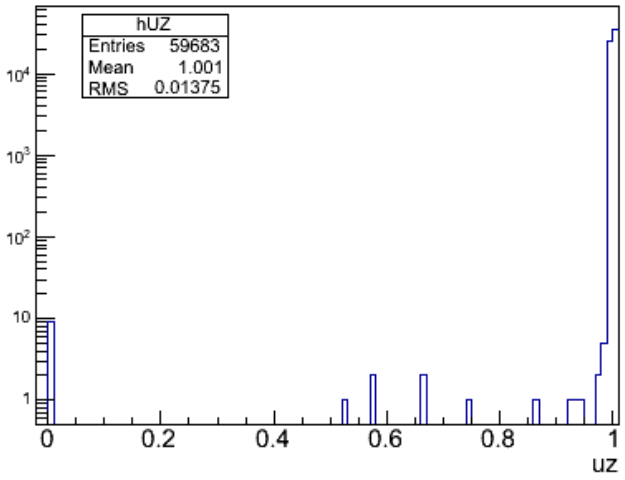
$z = \quad k.u_z$

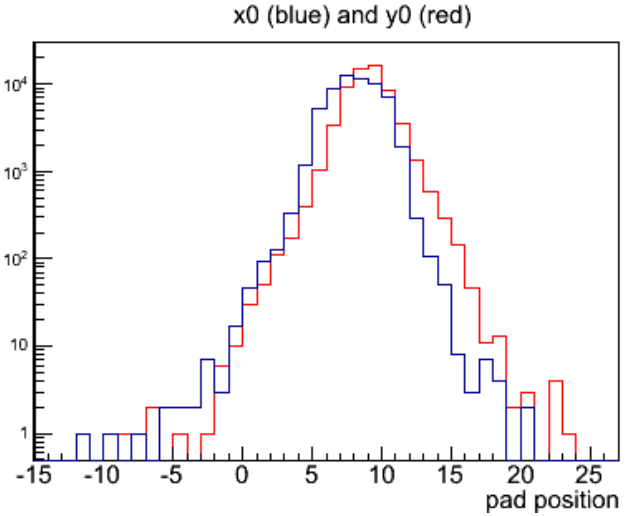
Data: 3GeV – No W – beam centered

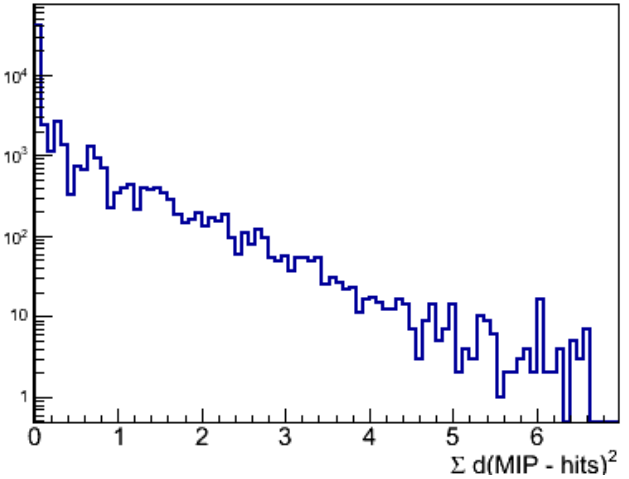
All layers

pre-selection:

3<Nhits<10



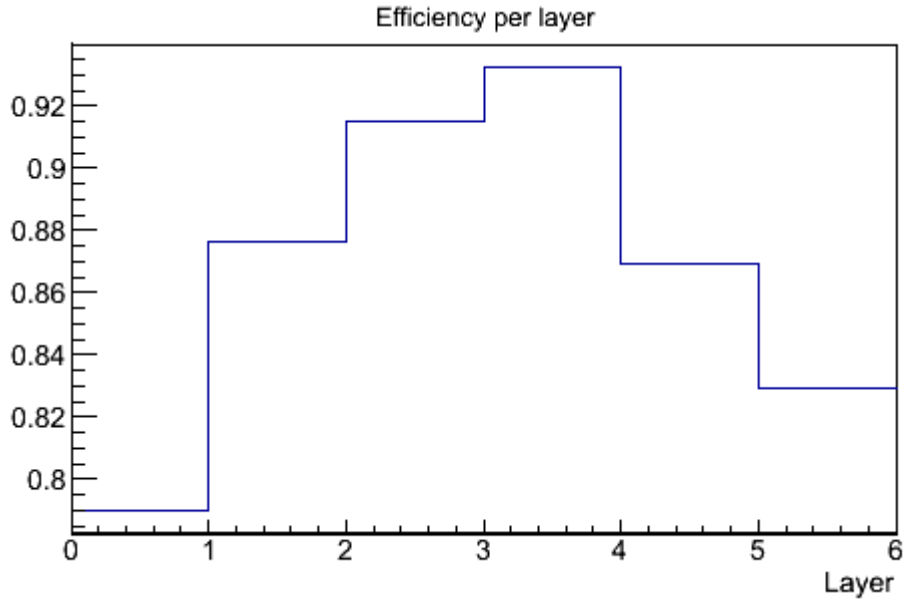




Other method: Hough transform (CPU time) → check results

Use the result to improve simulations

Efficiencies



Data: 3GeV – No W – XY scan

All layers

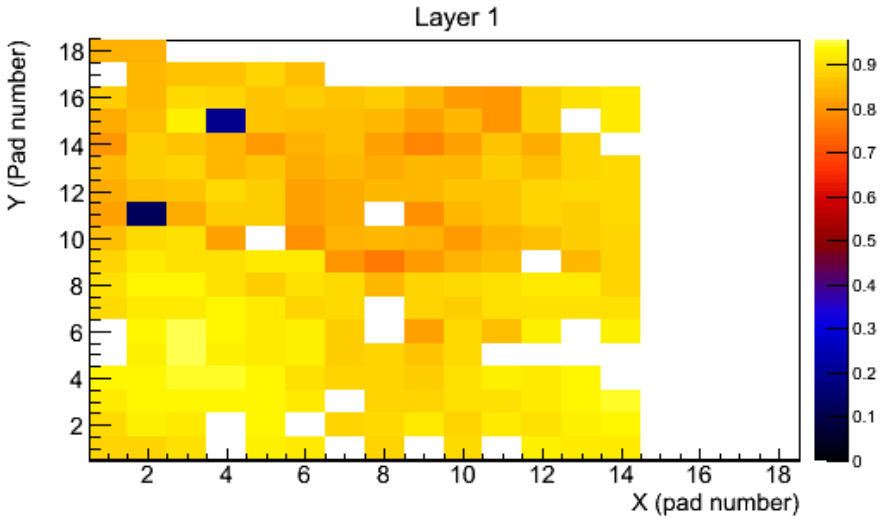
Total number of events: 2,3.10^6

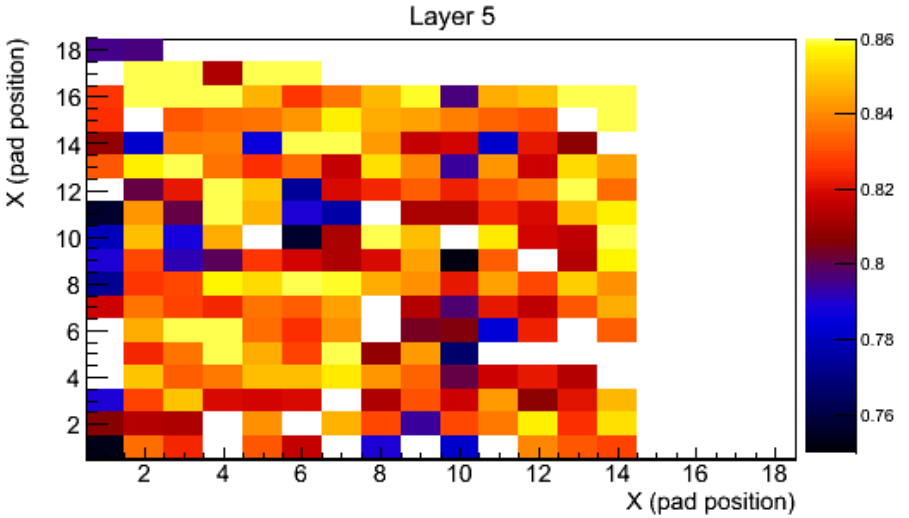
MIP selection:

- At least 3 layers with hits
- 5 hits in the same XY region (+- 1 pad)
- Nhits<10

Efficiency of 1 layer:

- 1 MIP using the 5 others layers





Simulation: 99.999%

Better MIP selection (previous slide)?

Summary

- Analysis in progress:
  - Determine signal over noise ratio of the detector (in progress: 3 gains)
    S/N = ~10-20 in function of the gain (min to max)
  - Energy calibration + Homogeneity of response (DONE)
  - Trigger threshold calibration (DONE)
  - Hold scan (DONE)
  - Efficiency (in progress)
  - Study of showers (in progress ??)
  - Crosstalk (in progress)
  - events with a lot of hits (DONE)
  - Pedestals (in progress)
  - Noise (in progress)
  - Beam study (in progress)