



Istituto Nazionale di Fisica Nucleare
SEZIONE DI LECCE



UNIVERSITÀ
DEL SALENTO



IDEA Test Beam 2018

Drift chamber

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RD_FA collaboration

Aim

- To Define the empty "Noise" & full "signal" channels in each layer per event
- Build a track from the full channels in each layer depending on the local reference frame of the chamber .

Previous Studies

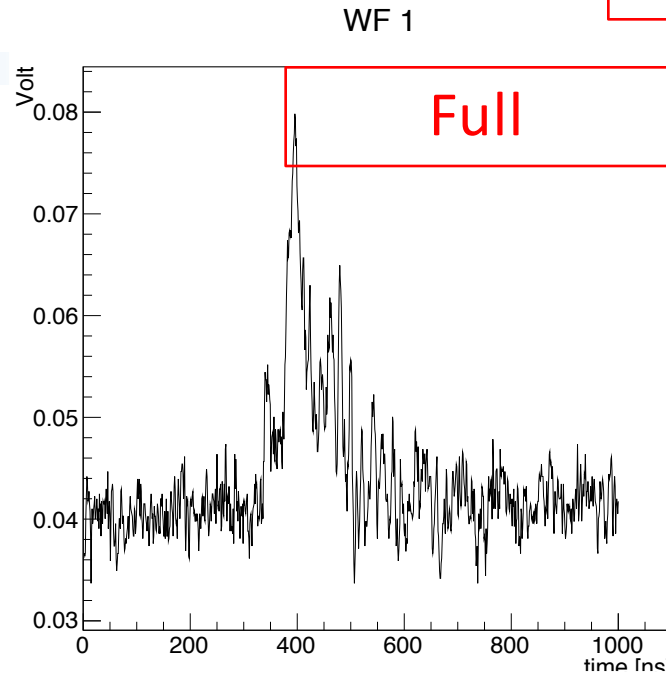
- https://indico.cern.ch/event/775682/contributions/3224240/attachments/1757115/2849649/Testbeam_lecce_21Nov_2018.pptx
- https://indico.cern.ch/event/779071/contributions/3241704/attachments/1766373/2868148/Testbeam_lecce_5Dec_2018.pdf
- https://indico.cern.ch/event/780818/contributions/3250201/attachments/1773827/2883489/Testbeam_commo.pdf

		Wave Ch											
Cell \ Lay	0	1	2	3	4	5	6	7	8	9	10	11	
11													
10							2	5	3				
9						12	11	13	1				
8						16			15				
7						17	14	18					
6						23	21	0					
5													
4						6	7	8					
3						10	9						
2													
1													
0													

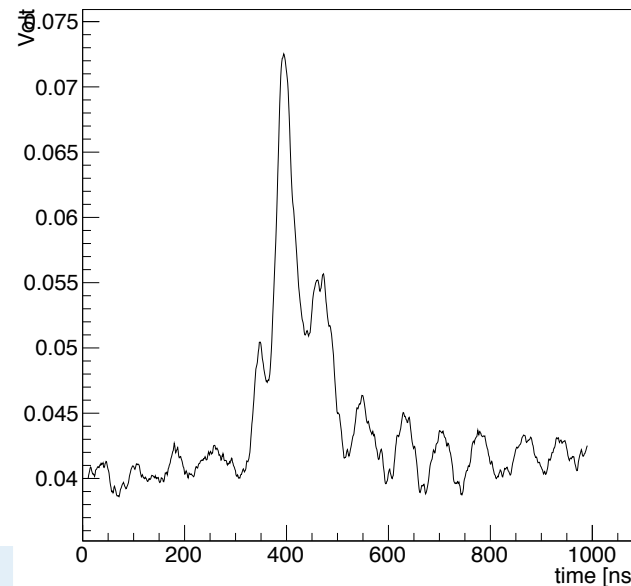
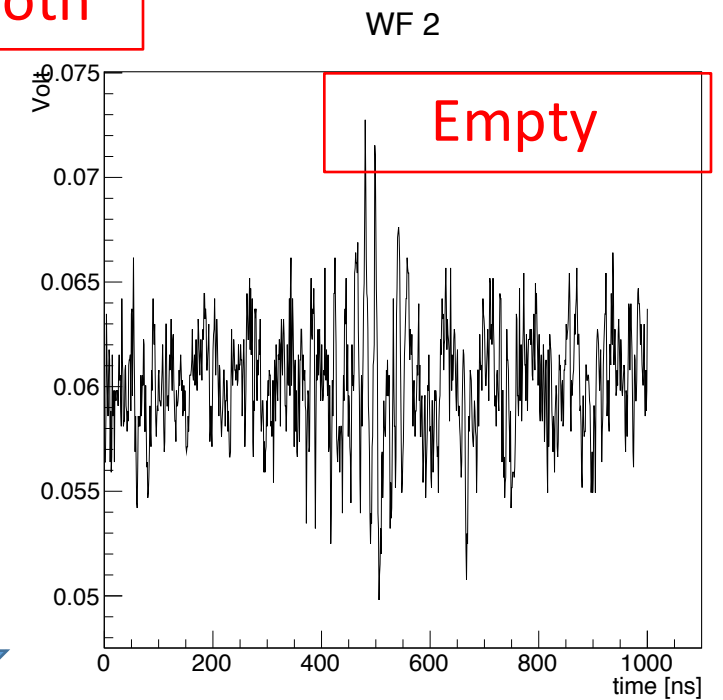
Wave Form

➤ We need to define the Full & Empty channels:

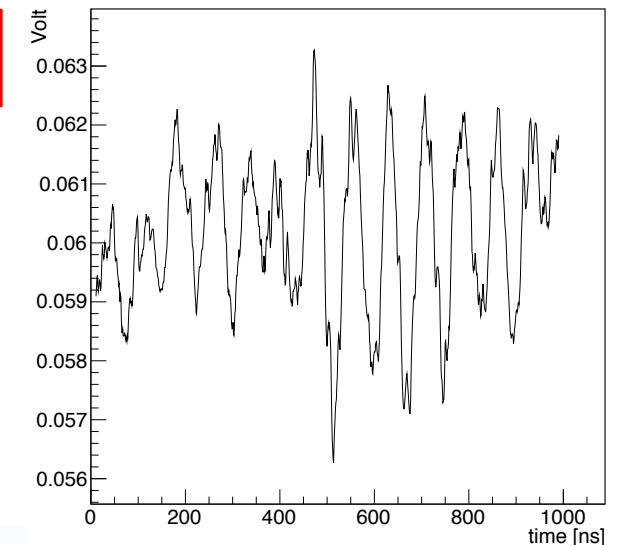
- Example of two WFs “Full & Empty”
- Smooth the wave forms by averaging the voltage in the neighboring channels of ADC
- SF = 10 => averaging 21 bins “10 bins in left + central bin + 10 bins in right”



No smooth



SF = 10



Wave Form

➤ For each smoothed WF we can Identify :

➤ Max. Volt – Bsln

➤ Where:

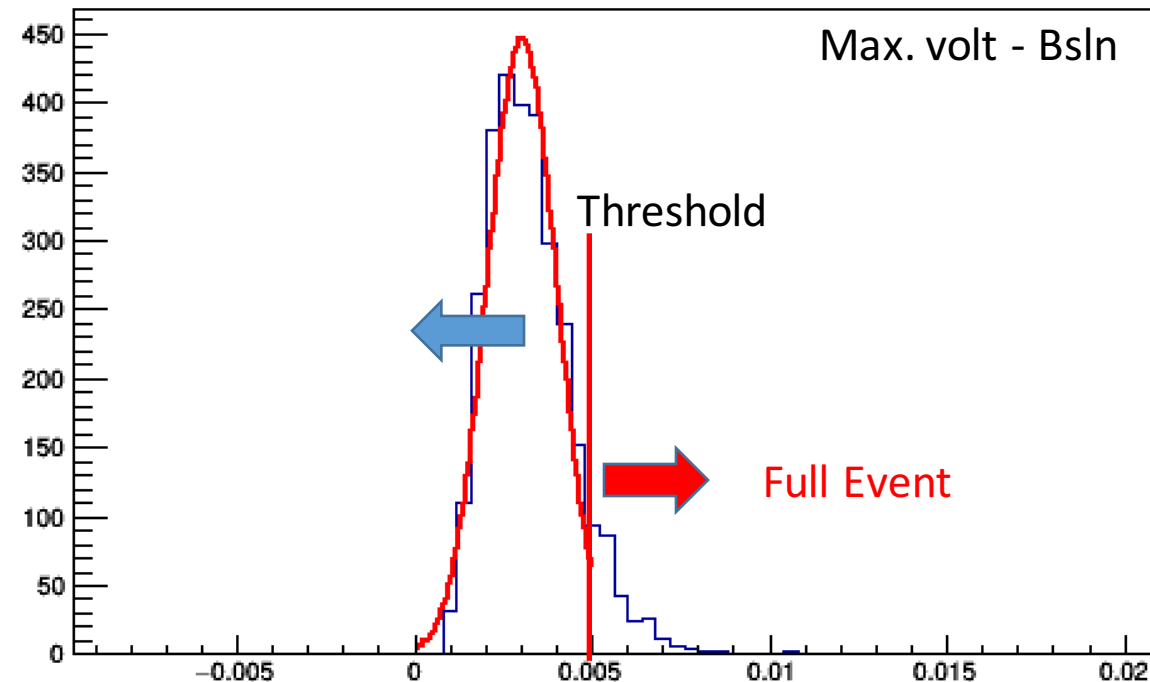
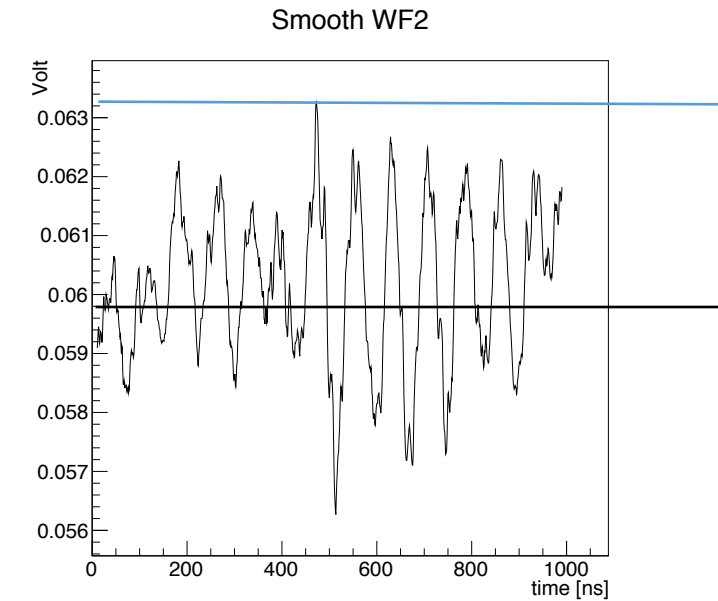
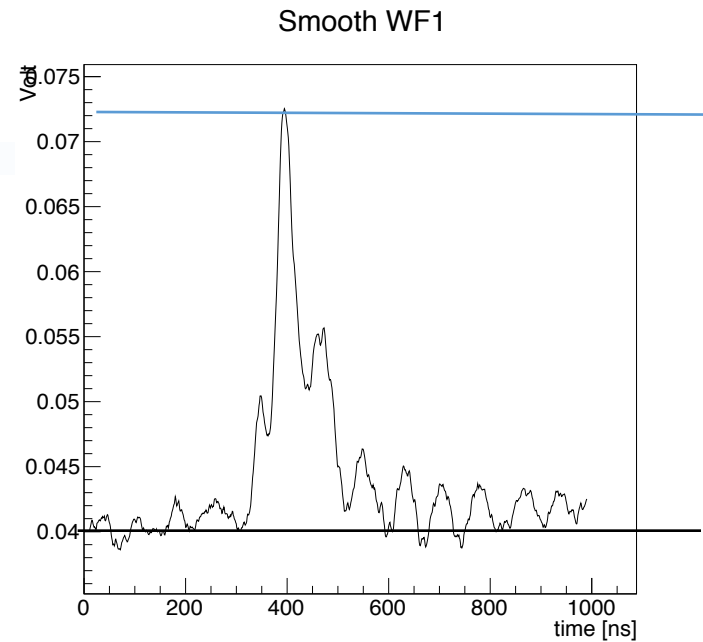
$$\text{Bsln} = \frac{(\text{sum volt first 100 bins})}{100}$$

➤ From the (Max. volt – Bsln) distribution we can define a threshold:

➤ Threshold = “ $\mu + 3\sigma$ ”

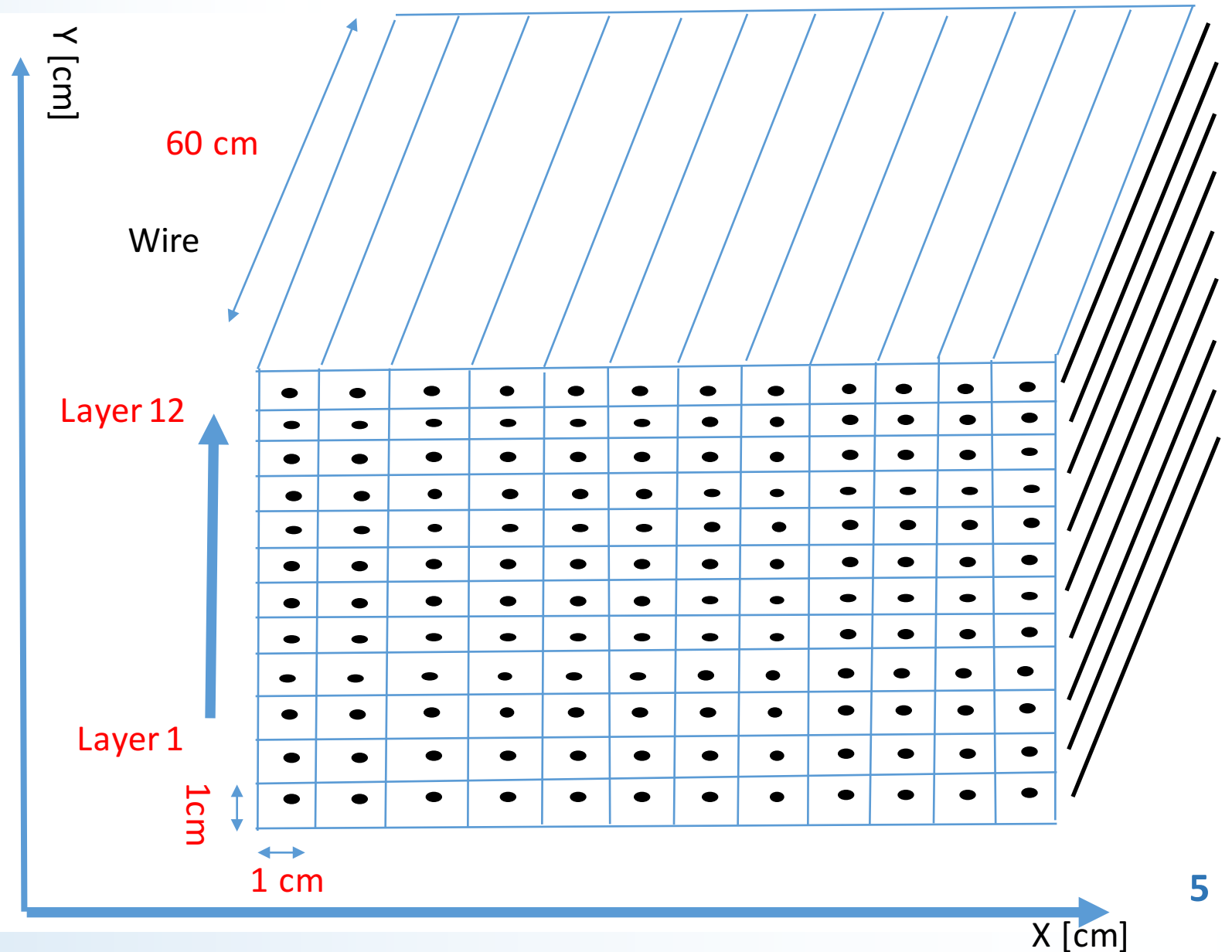
➤ We have a list of Full channels per event.

* The code now works for all the channels in all layers



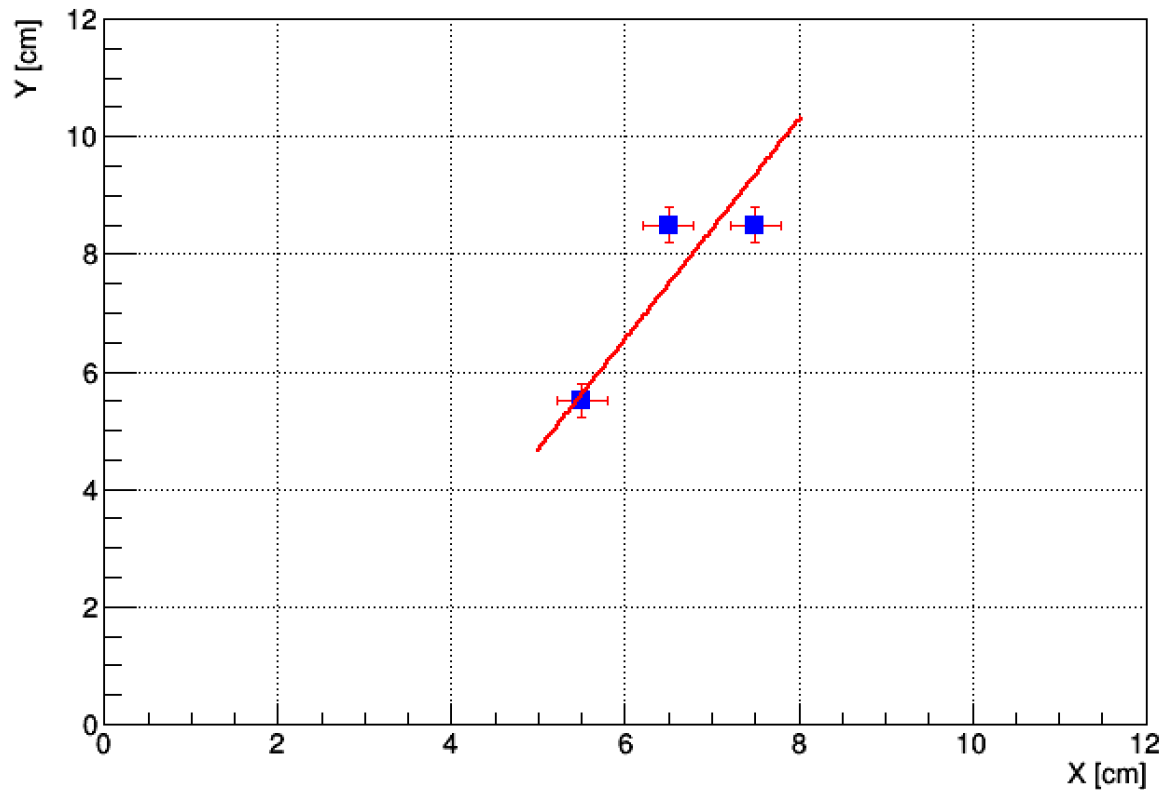
Reference Frame

- Define a local reference frame of the chamber
- Each cell is 1 cm x 1 cm
- Wire located in the center of the cell at 0.5 cm
- We defined the position of each wire



Tracking

- We can build a track for each event depending on:
 - The list of full channels in the event
 - The local reference frame
 - The position of each channel in the map
- Apply a linear Fit for the tracks



		Wave Ch											
Cell	Lay	0	1	2	3	4	5	6	7	8	9	10	11
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10								2	5	3			
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8							16			15			
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5													
4							6	7	8				
3							10	9					
2													
1													
0													

Next steps

- Test the technique for noise subtraction for more runs.
- Look at TDC data.
- Move from local reference frame to global frame.

Backup

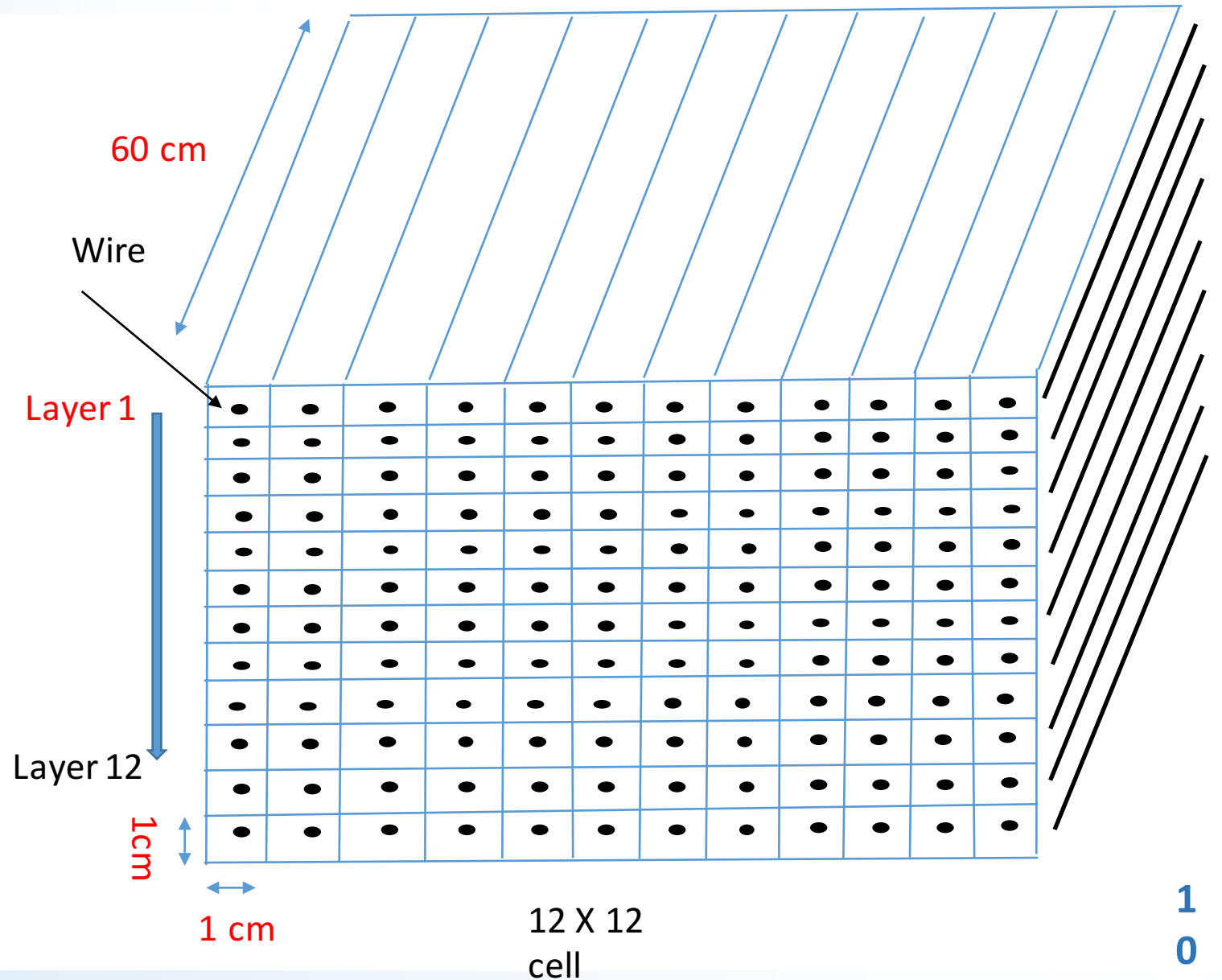
Introduction

This Drift chamber aims to have:

- A good tracking efficiency to be used in future colliders.
- A Low mass impact to minimize the M.S.
- A good Particle Identification capability based on Cluster Counting technique (main goal of the this test beam for the DCH)

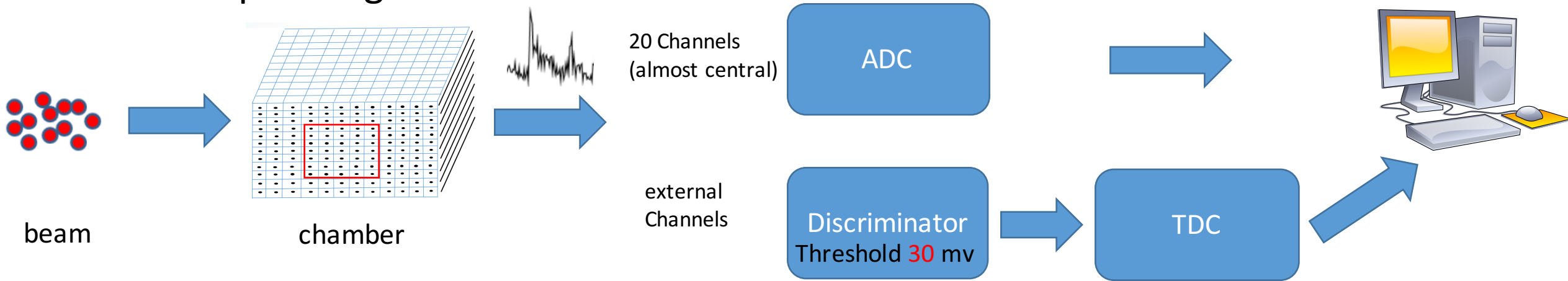
Detector setup

- The chamber consists of 12 x 12 cell
- Each cell is 1 cm x 1 cm
- the wire length is 60 cm
- The voltage applied to each wire is about 1475V (depends by the runs)
- The gas used is 90% He 10 % i-C₄H₁₀



Test Beam

- The chamber is exposed to different types of beams (Muon , Electron, Pion and Kaon) with energy 20-60GeV
- The setup during the test beam:



- During the test beam:
 - We read **just 20 cells** in the central core. (**Layer 7 was broken**)
 - Data is stored in `/lustre/cms/store/user/taliercio/TestBeam/Drift/`