

# *Lab activities @ LNF*

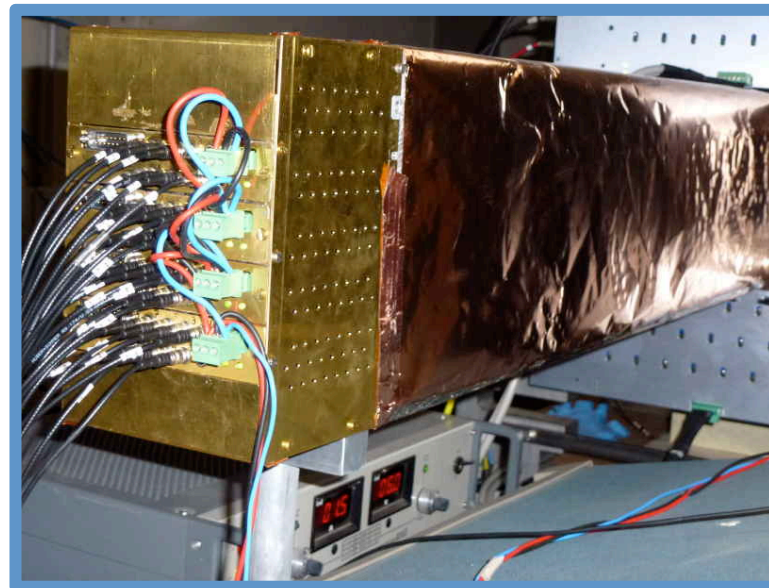
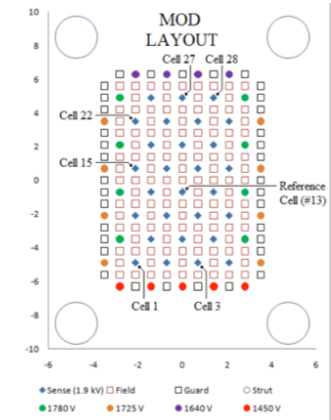
2<sup>nd</sup> SuperB Collaboration Meeting

LNF 13 December 2011

G. Finocchiaro - LNF

# Prototype 2

- 2.5m long prototype with 28 sense wires arranged in 8 layers
  - Goal: study DCH response from single clusters in a realistic environment, and serve as a test bench for the final FEE and for test of DCH trigger implementation
  - Prototype 2 integrated in the cosmic-ray tracking telescope system at LNF
  - Waveforms from all 28 cells now digitized



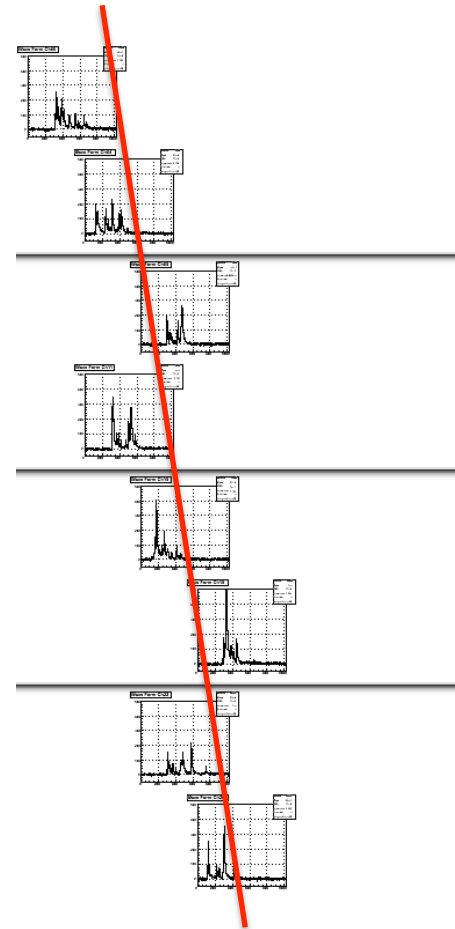
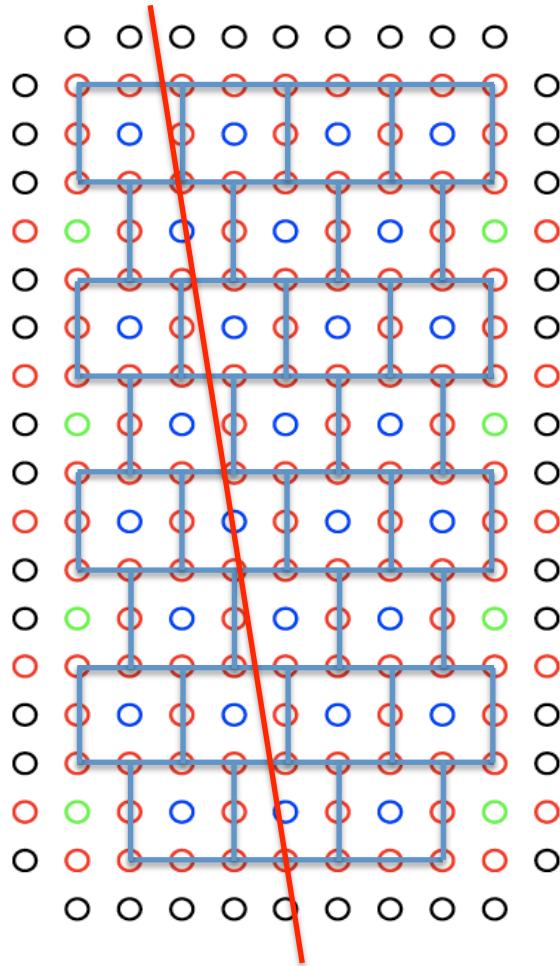
## Prototype 2 (cont.)



- Only channels with at least 3 bins 5 sigma's above pedestal are presently written to disk
- Only events with at least 1 cell in proto2 and 2+2 hits in the MT's are written to disk
  - 40kB/event
  - rate  $\sim 0.27\text{Hz}$  (1000 evts/hour)

# Sample waveforms

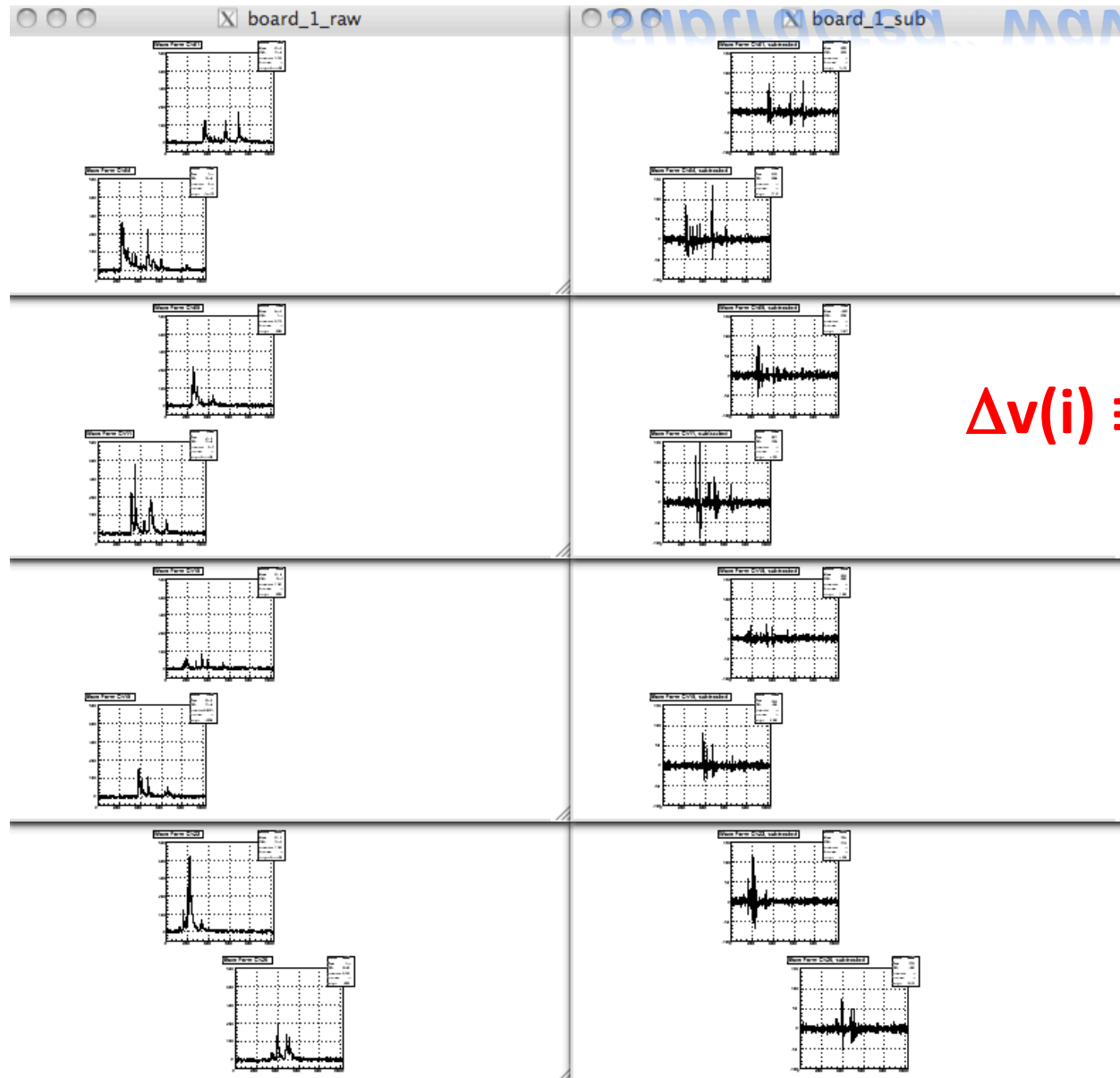
90%He-10% $iC_4H_{10}$   
HV=1750V



## Sample waveforms

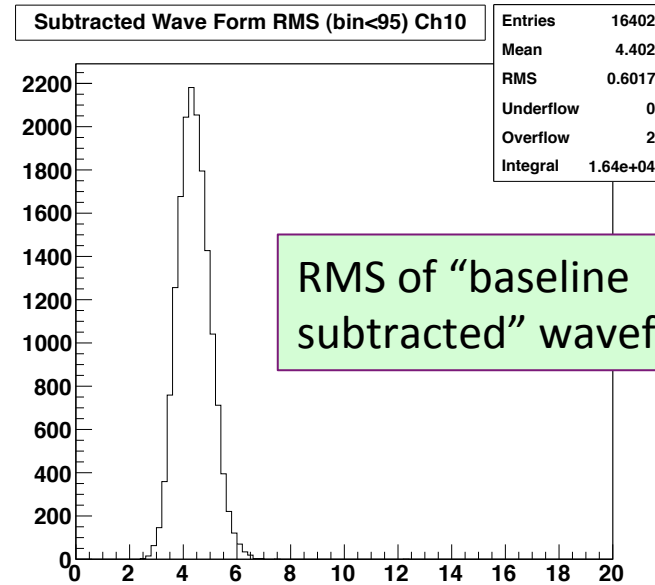
## Sample “baseline-subtracted” waveforms

$v(i)$

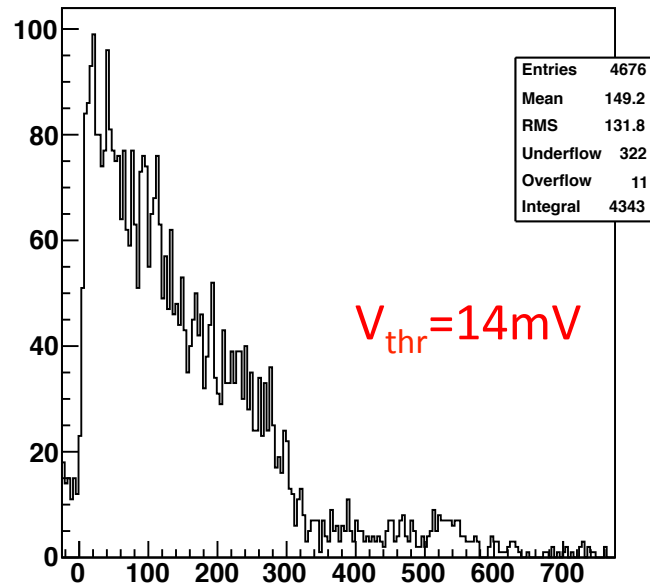


$$\Delta v(i) \equiv v(i) - \langle v_3 \rangle$$

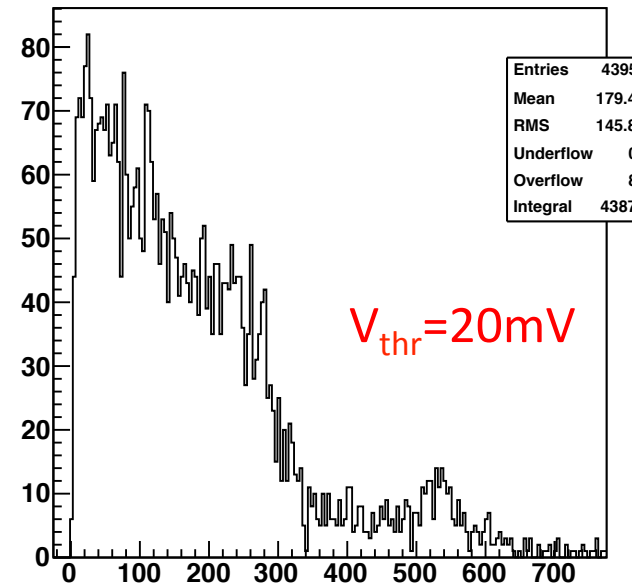
# Time of 1<sup>st</sup> cluster



P2 t<sub>drift</sub> vs x<sub>fit</sub> Ch10



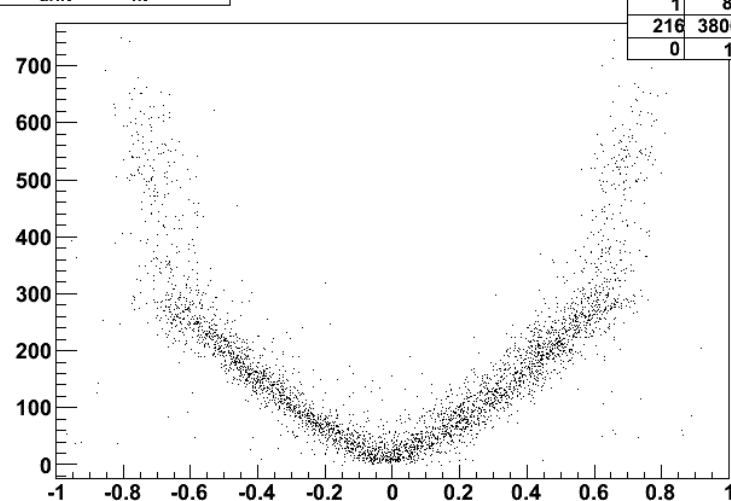
P2 t<sub>drift</sub> vs x<sub>fit</sub> Ch10



# Space-time relations

90%He-10%iC<sub>4</sub>H<sub>10</sub>  
HV=1750V

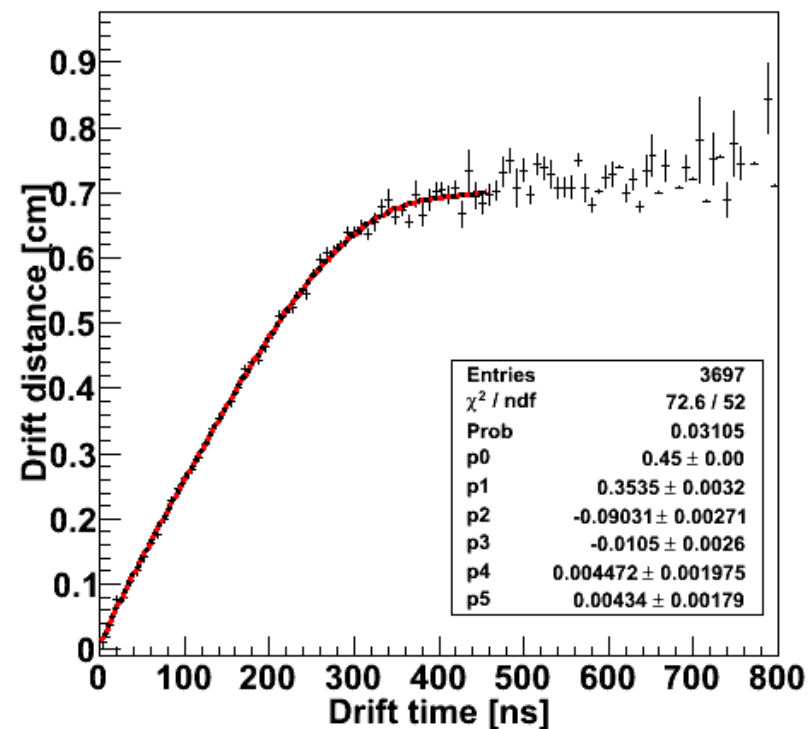
P2 t<sub>drift</sub> vs x<sub>fit</sub> Ch15



Entries		
1	8	0
216	3806	261
0	1	0

- External tracker extrapolation error larger than in the past
- Effect being investigated, not understood so far

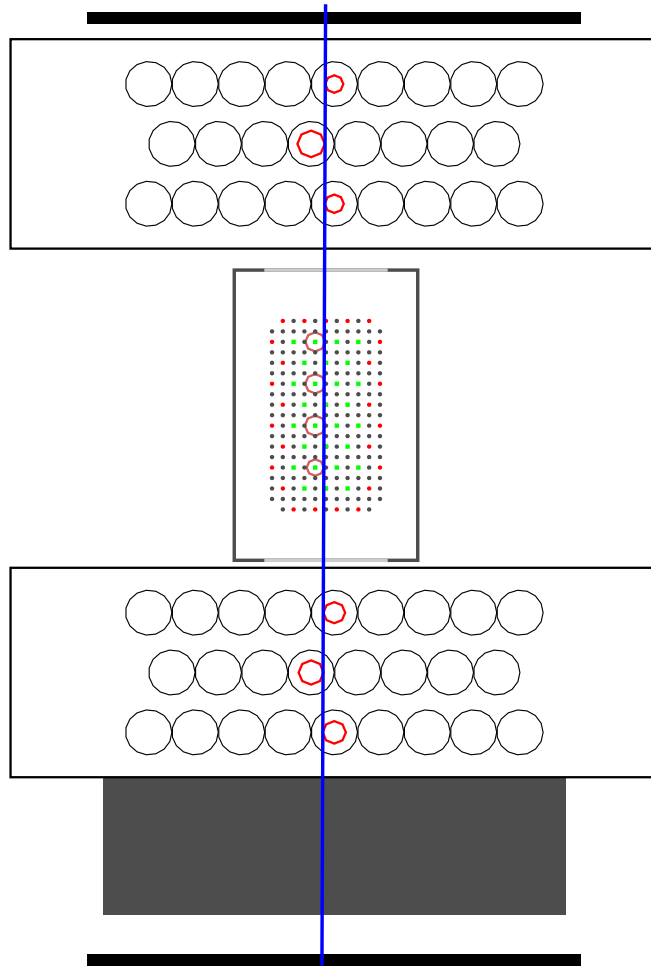
R vs t relation fitted with  
5<sup>th</sup> – order Chebychev  
polynomial



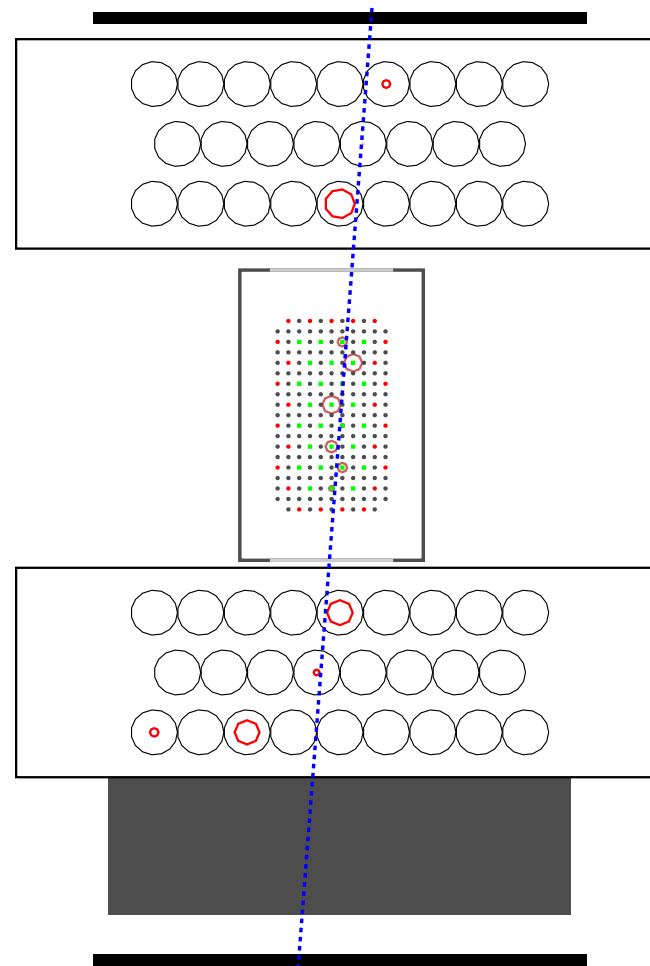
Entries	3697
$\chi^2 / \text{ndf}$	72.6 / 52
Prob	0.03105
p0	0.45 ± 0.00
p1	0.3535 ± 0.0032
p2	-0.09031 ± 0.00271
p3	-0.0105 ± 0.0026
p4	0.004472 ± 0.001975
p5	0.00434 ± 0.00179

# Event Displays

Run DAQ/run00542 Event 000



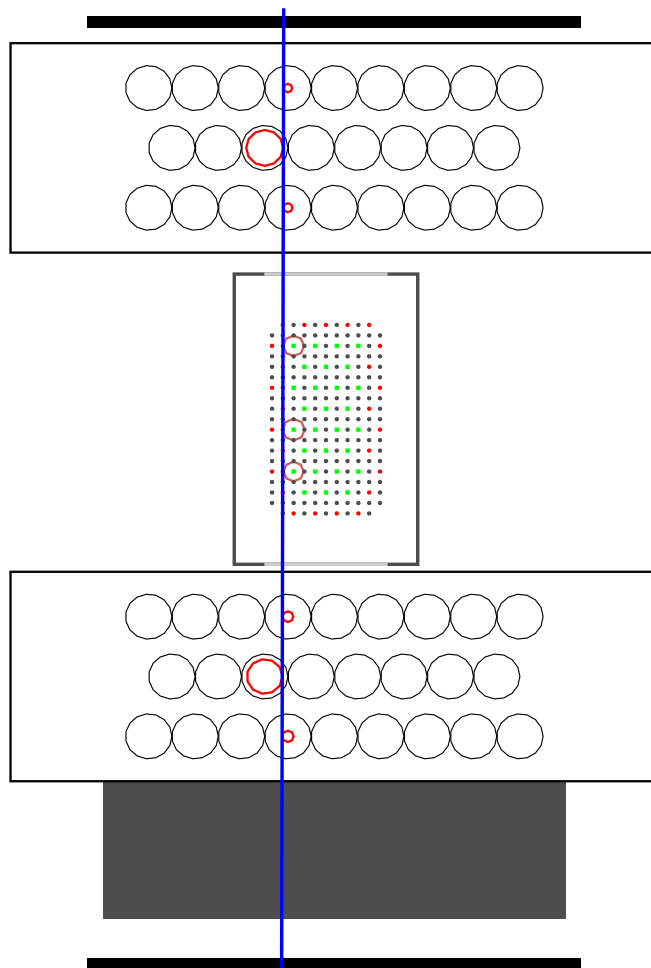
Run DAQ/run00542 Event 001



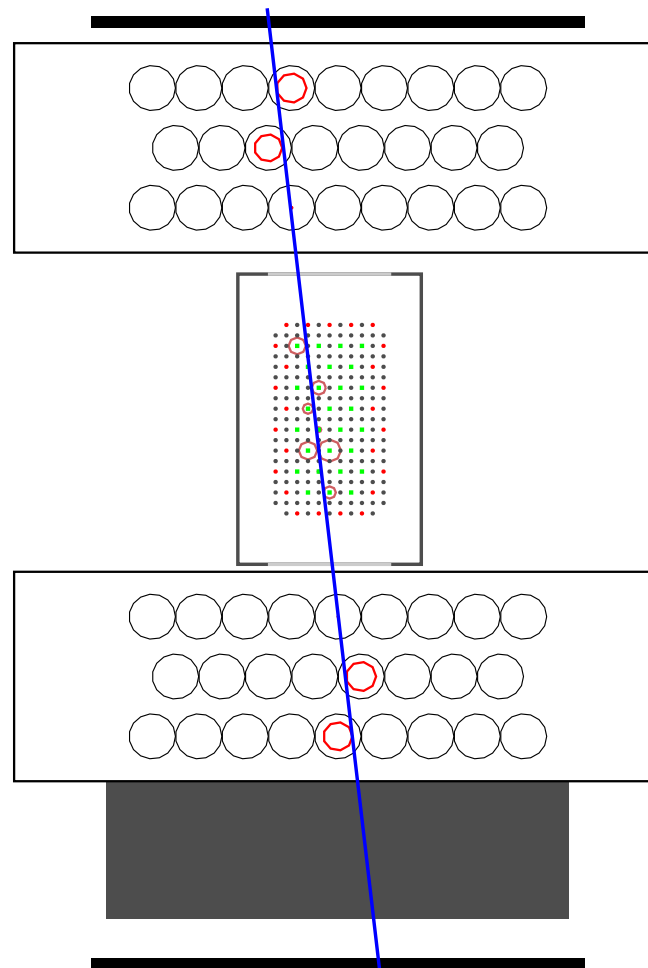


# Event Displays

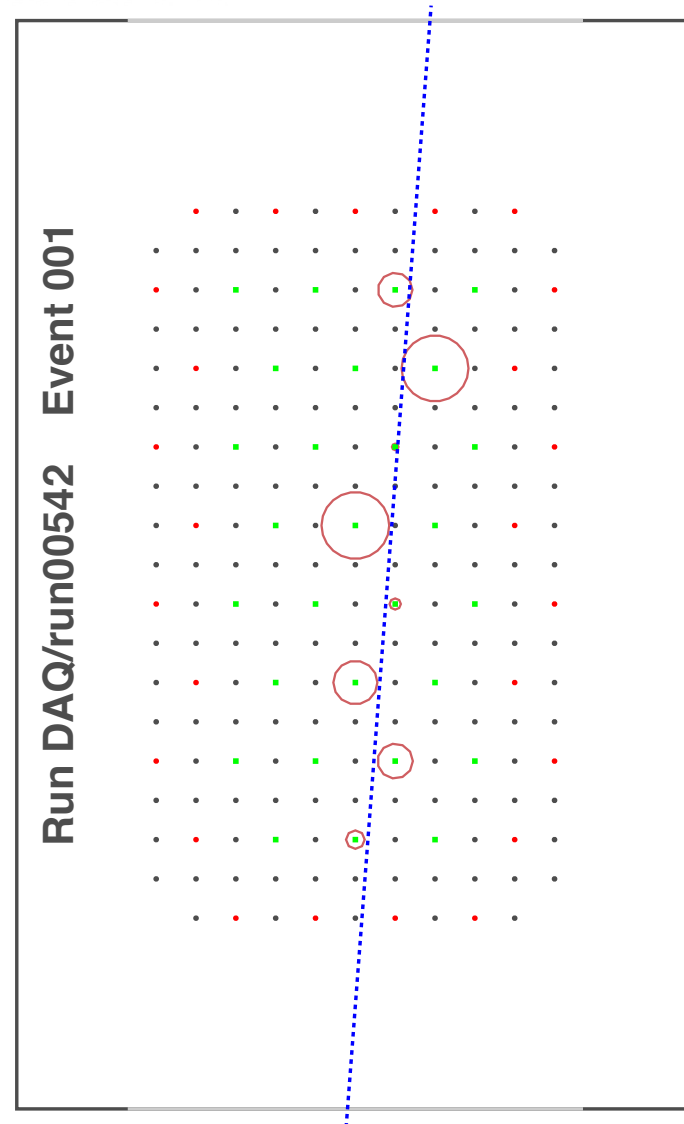
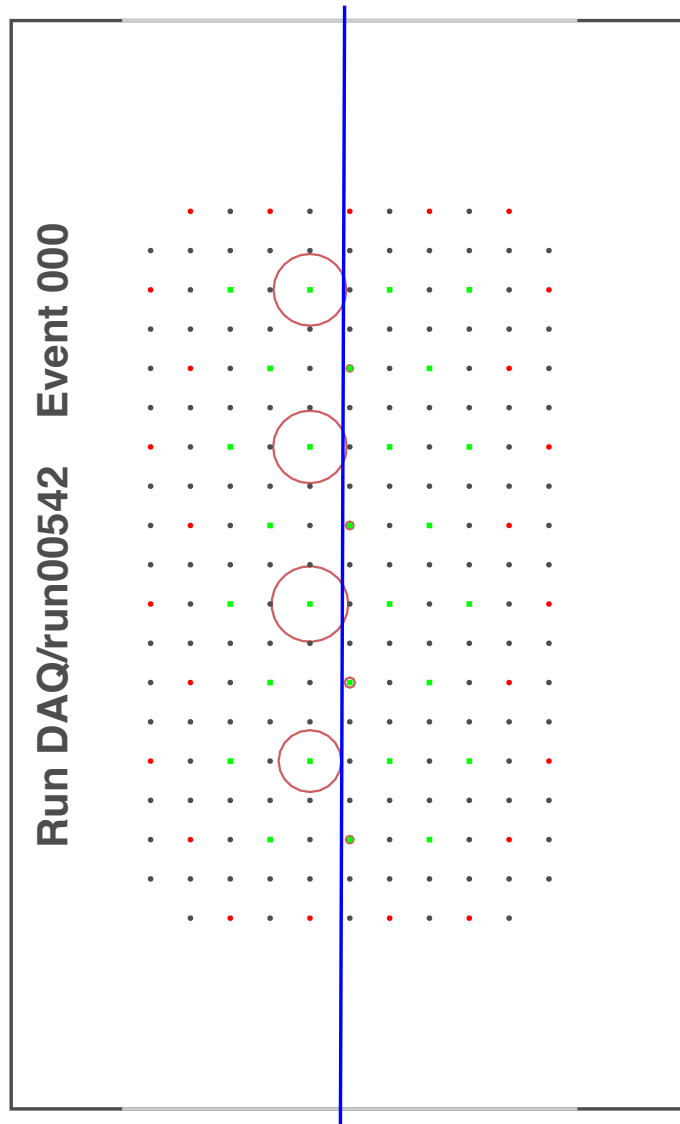
Run DAQ/run00542 Event 002



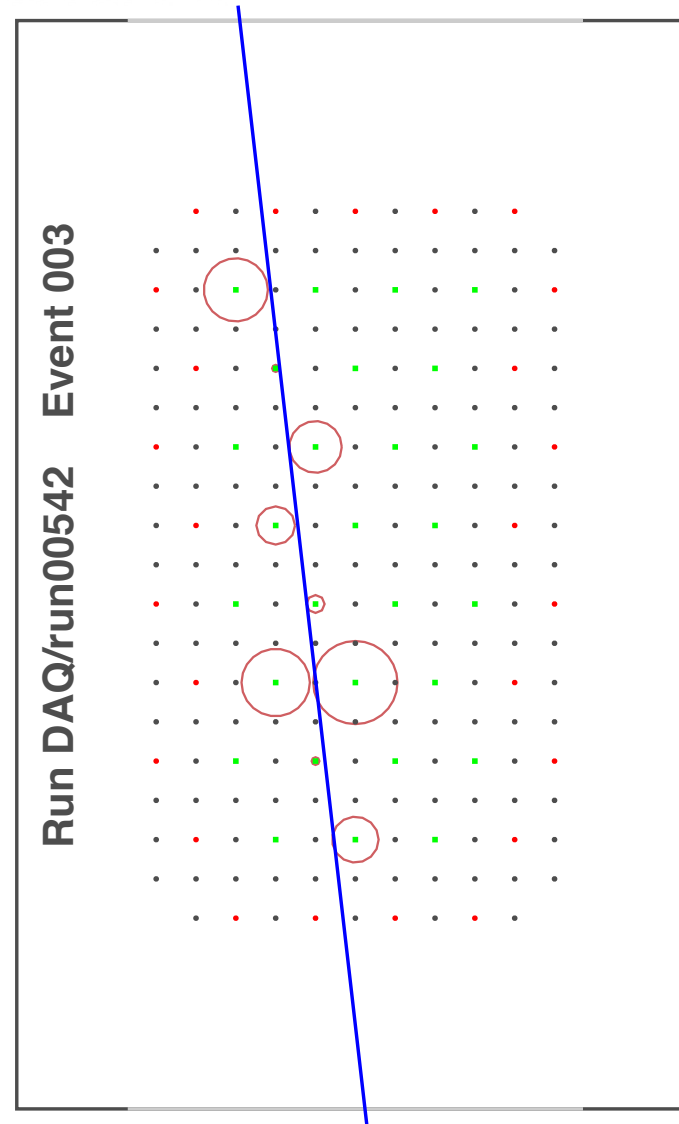
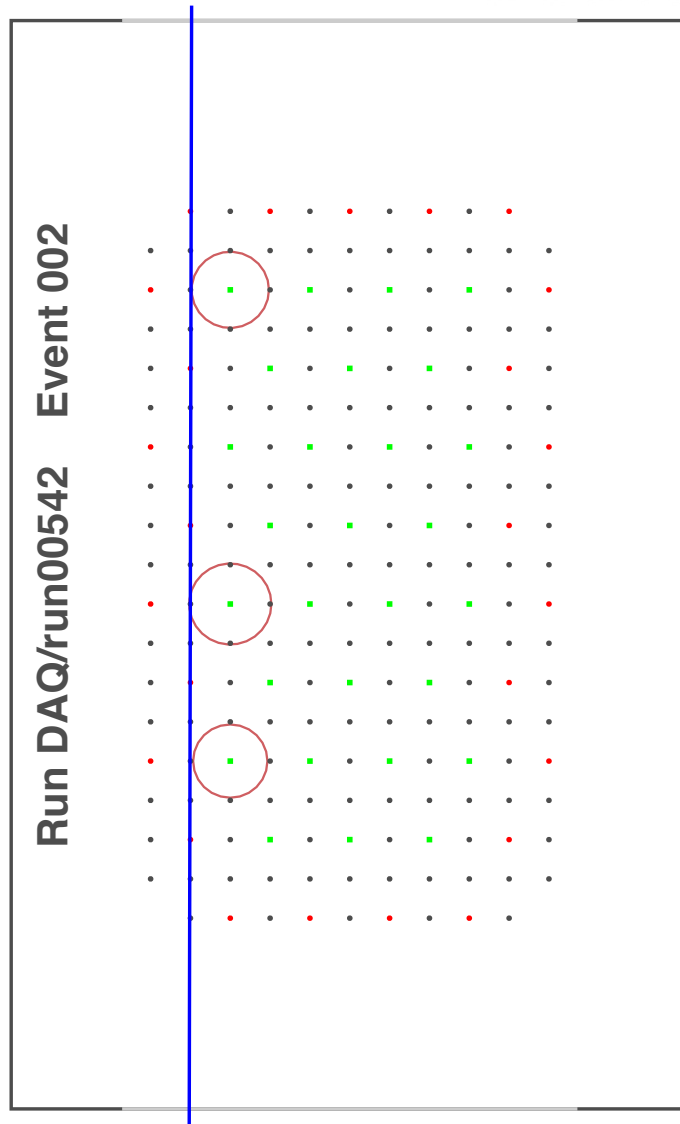
Run DAQ/run00542 Event 003



# Event Displays

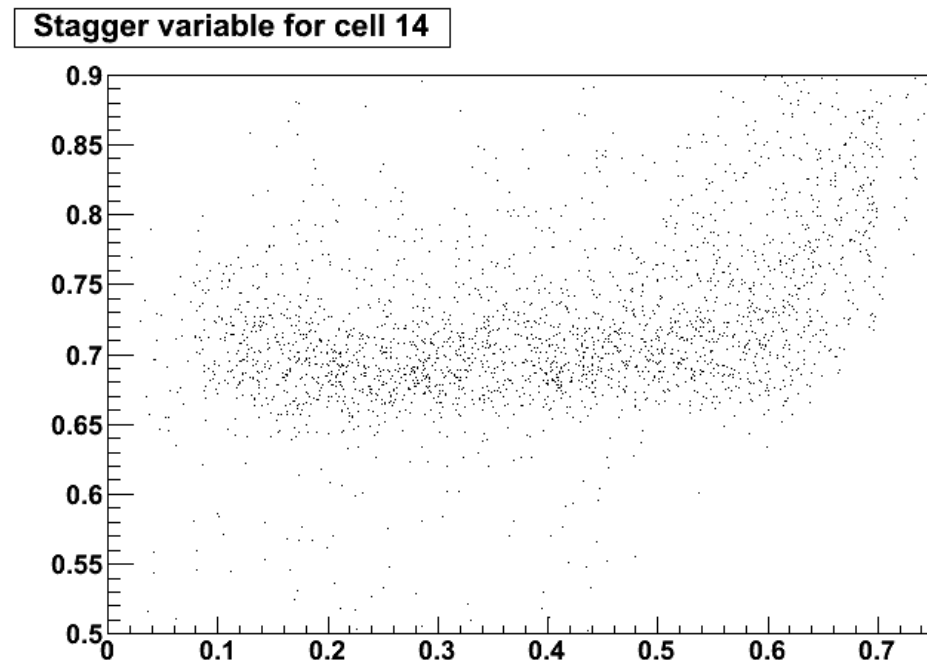
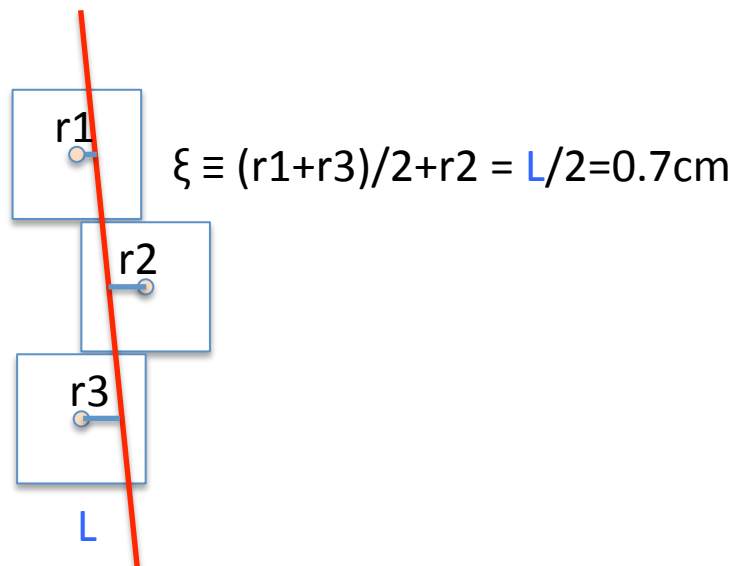


# Event Displays



# *Spatial resolution-preliminary*

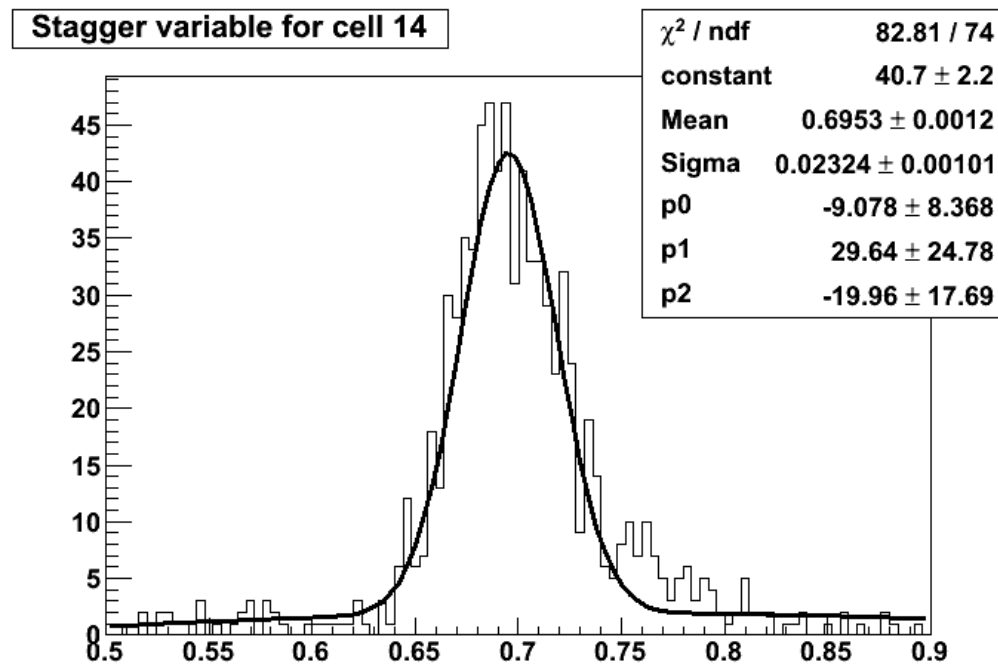
- Track fit program in proto2 still being implemented
- Given poor performance of external tracker, use correlation of cells in consecutive layers to have a sense of the spatial resolution



- The same space-time-relation is used for all cells – and is clearly not accurate ( $\xi$  not flat)

# *Spatial resolution-preliminary*

- Track fit program in proto2 still being implemented
- Given poor performance of external tracker, use correlation of cells in consecutive layers to have a sense of the spatial resolution



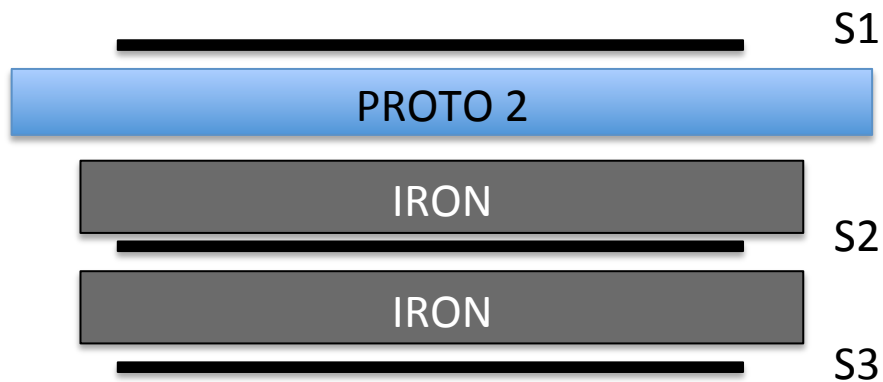
$$\text{reso} = \text{sigma} * \sqrt{3/2} \sim 190 \mu\text{m}$$

# *Proto2 data analysis - outlook*

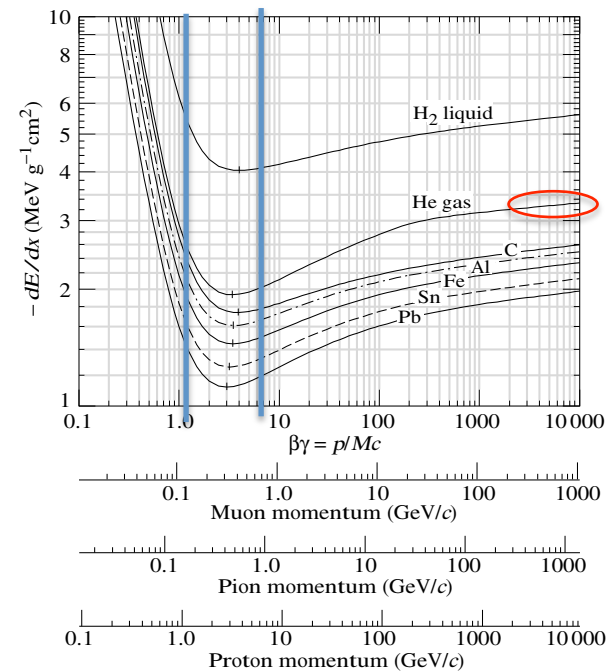
- Track fit program in Proto2 is progressing
  - pattern recognition written and working OK
- Hopefully the space-time relations determined from the external tracker are a good enough starting point for auto-calibrating the device. This will allow
  - measurement of tracking performances (efficiency, resolution)
  - analysis of  $dE/dx$  and cluster counting performances of cells actually associated to tracks → results based on the external tracking discussed in M.Piccolo's talk

# Upgrade of cosmic-ray setup

- Only ~40cm out of the 2.5m length presently covered by the trigger counters
- Plan to extend coverage to 1.5m
  - work needed to upgrade scintillator counters already in the lab and equip them with good phototubes
- Plan to use 3 scintillators with suitable absorber thickness to select MIP cosmic tracks



- $S1 \cdot S2 \cdot S3$  will provide MIPS
- High  $\beta\gamma$  tracks: see next slide



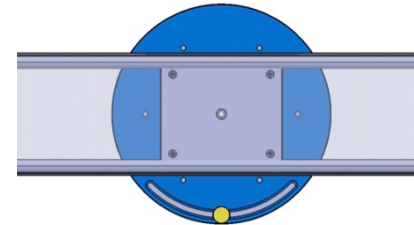
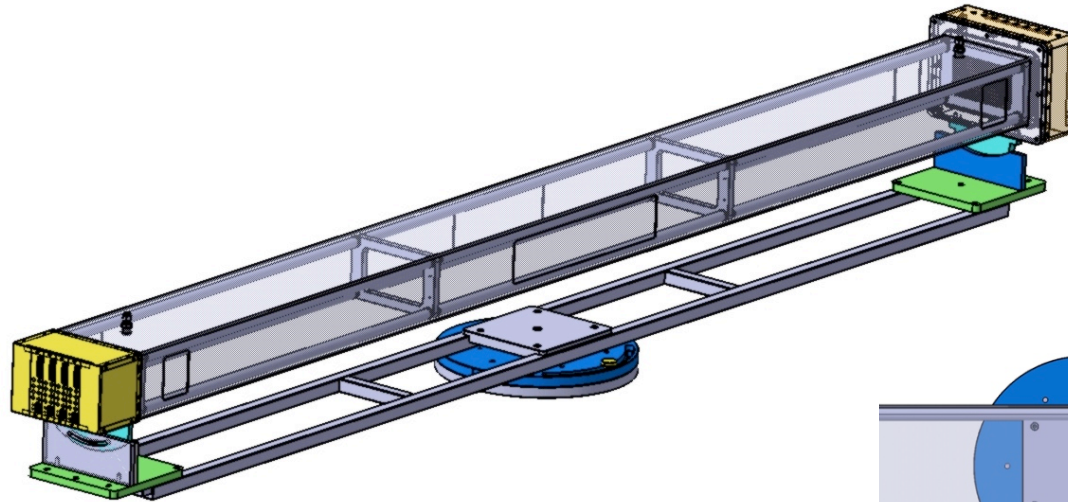
# *Beam test plans*

- Two weeks of beam time requested – and assigned – starting from Jan. 30<sup>th</sup> 2012
- Detailed data taking plan still to be finalized. Idea is to scan at least:
  - three longitudinal positions (central, close to preamp. side, far from preamp. side)
  - different “theta” angles (impact on space-charge effects)
  - different phi angles
  - a few HV settings
  - a few gas mixtures (however, proto2 volume is ~60l → cannot afford too many mixture changes)
- And of course it is still possible to bring the prototype off-site (e.g., TRIUMF)

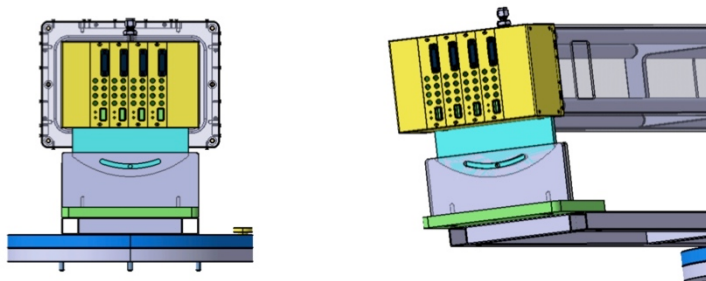


# *Rotating support for beam test*

- Mechanical design by E. Capitulo (LNF) almost complete



Detail of support for theta rotation



Detail of support for phi rotation