



# DiMuon HLT Status Report

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# Outline

- Reminder
- Cosmic Run Situation
- Cosmic Data study
- EventDisplay, Statistics, Problems
- Future plans



# Reminder

- 3 pad Hit Reconstruction for Station 4 and 5.
- Tracking with Manso Algorithm given the reconstructed points for those two stations and Trigger matching.
- Tested with simulated data in the HLT Framework.
- Last Results have been shown in last OW.



# Reminder

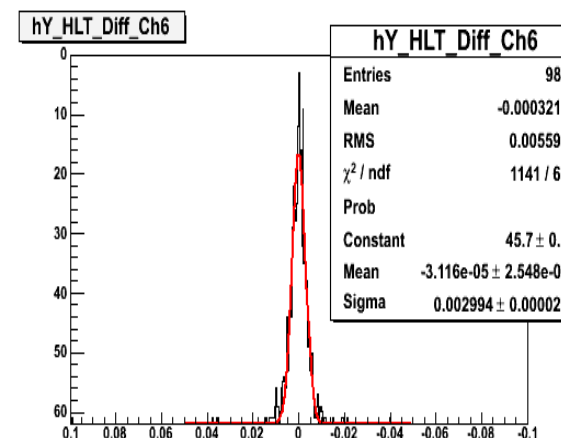
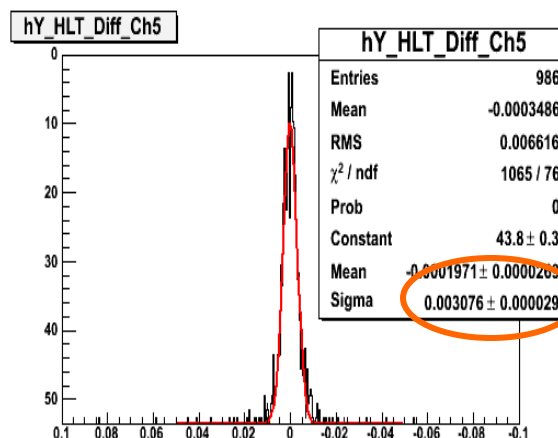
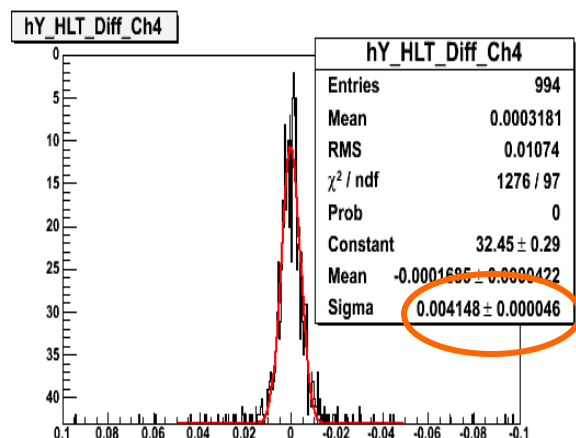
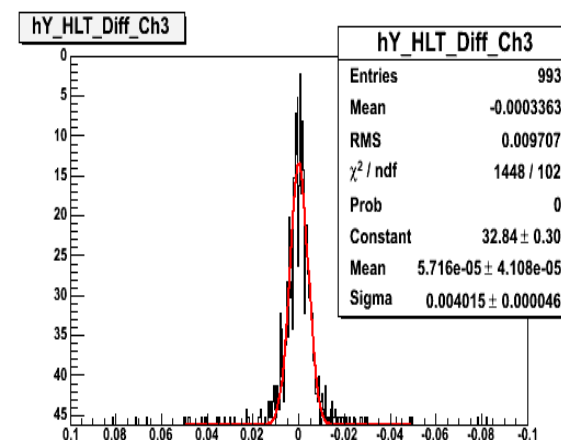
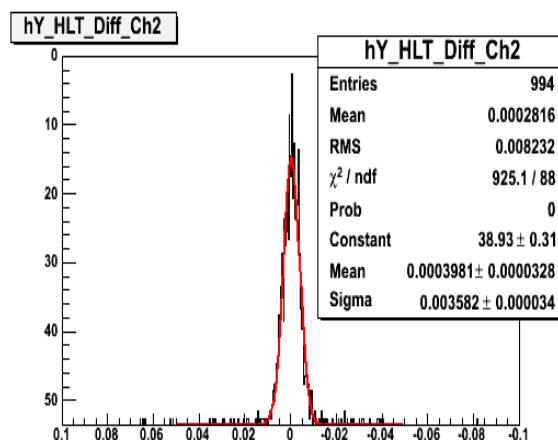
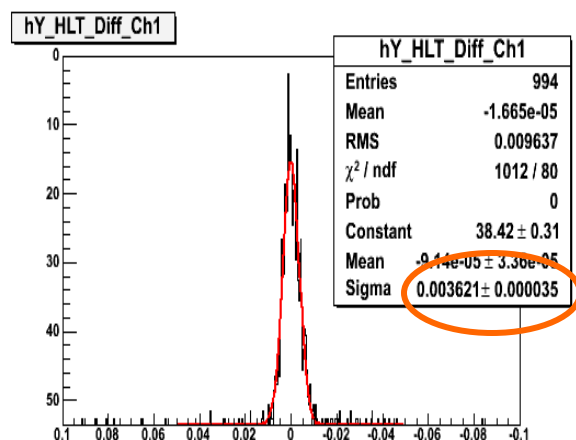
- Benchmarked processing rate capabilities of the full dHLT configuration on the HLT cluster at CERN. Results comparable to previous measurements. **1KHz** design target exceeded. Could run full chain (full configuration) with worst case simulated events (approx **150 tracks** through spectrometer) at a sustained average rate of **2.2 KHz**.
- Hit reconstruction modified to use **new decoder** + added functionality to correctly take care of **gain** in reconstruction algorithm.
- Outlook: Currently have core dHLT codes and components that are **functional and stable**. [Some cleanup of the code will continue over the next three months (For example: improve robustness, improve consistency of command line parameters, improve understandability of warning and error messages, improve documentation etc...)]



# Reminder : Cosmic Run

- But in the last Cosmic Run (Feb + March) we did **not** have Station 4 and 5.
- The configuration was **MTRK Station 1 (4 DDL)**, **MTRK Station 2 (3 DDL)**, **DDL 2565** was absent due to CROCUS initialization problem) and **one MTRG DDL** connected to the **right side**.
- The tracker is **not** supposed work with the given geometry, the plan was to **modify** and test the **hit reconstruction** algorithm for **St 1 & 2**.
- Therefore the hit reconstruction is extended to include Station 1 and 2 (and Stn 3).
- The resolution is first compared with simulated data (**geant hits**).

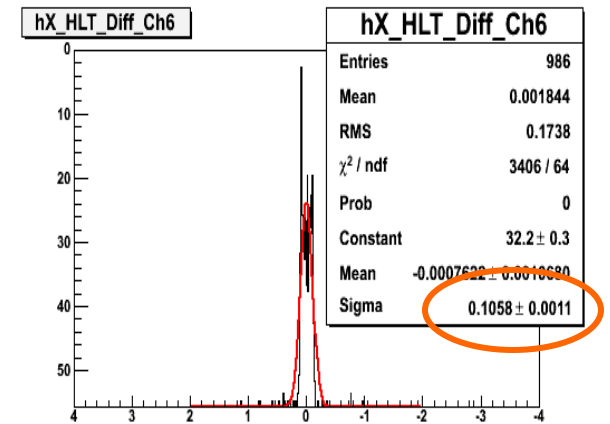
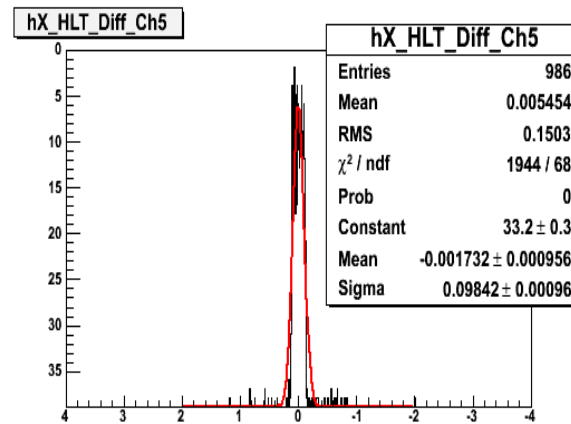
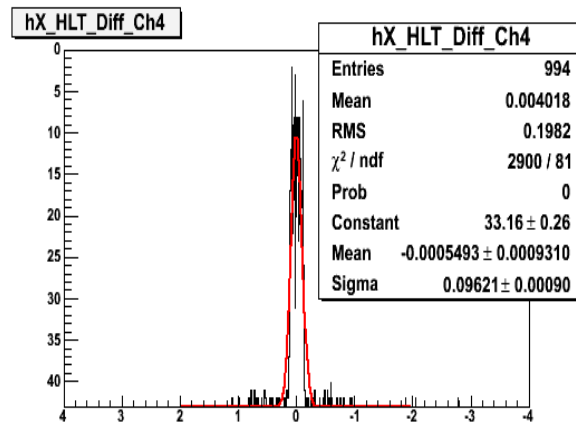
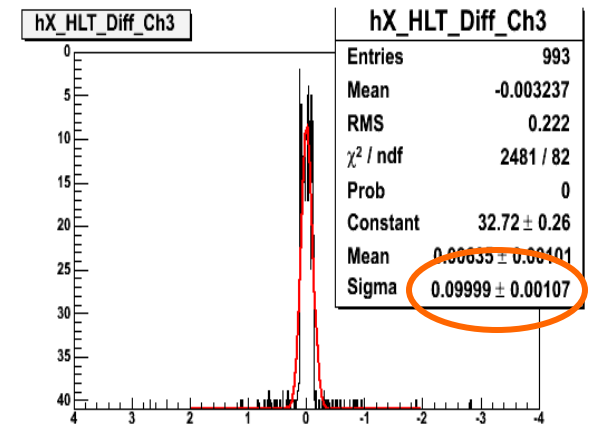
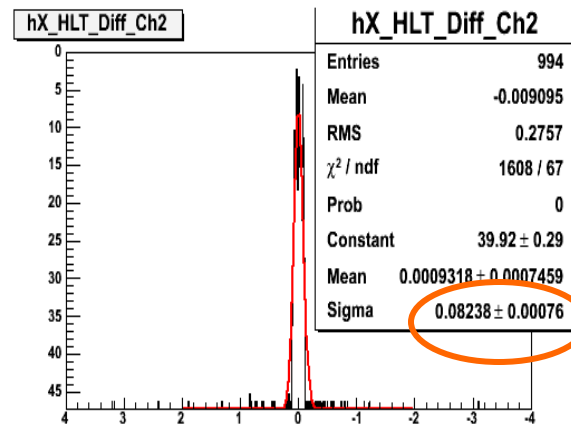
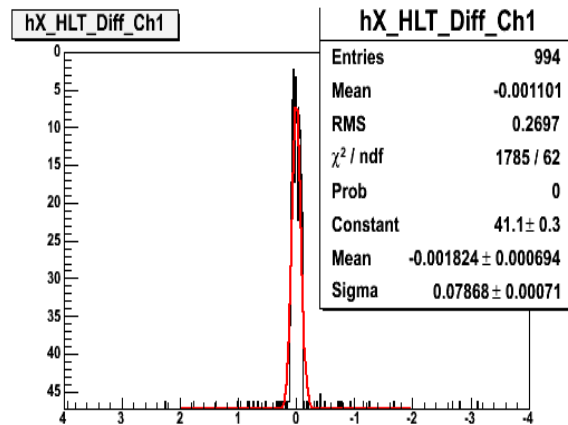
# Resolution with simulated events in Y direction



Bending Plane  $(42 \pm 35) \mu\text{m}$  for St1, 2,3 [as reported before for St 4,5]



# Resolution with simulated events in X direction



NonBending Plane ( $0.8 \pm 0.2$ ) mm for St1, 2,3 [as reported before for St4,5]



# Cosmic Run

- The most of the cosmic run was with the ACORDE trigger and only the last 3 days was with the Muon Trigger.
- With ACORDE trigger we had large data set but very few tracks at DiMuon Spectrometer. Most of the tracks are almost vertical. With MTRG Many horizontal tracks have been seen straight through the two MTRK stations and the MTRG stations.
- About 8800 events with MTRG as trigger passed through the HLT Farm.
- During the cosmic run the HLT was running most stable with MTRK and MTRG (trigger and tracker) detectors.

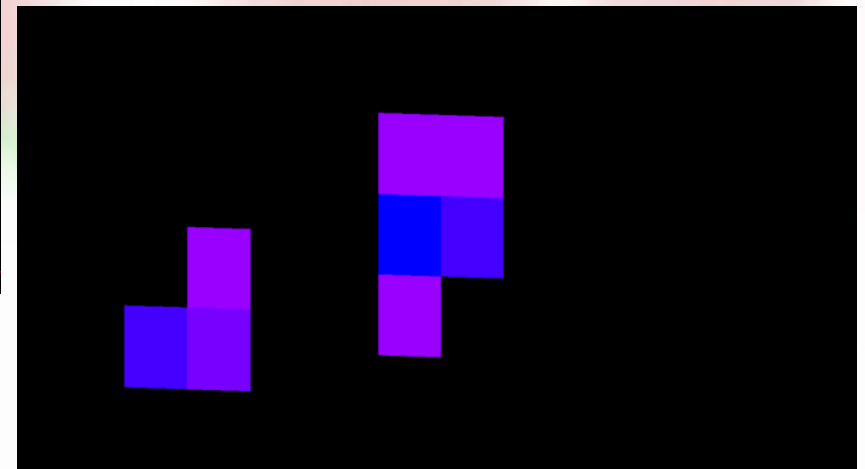
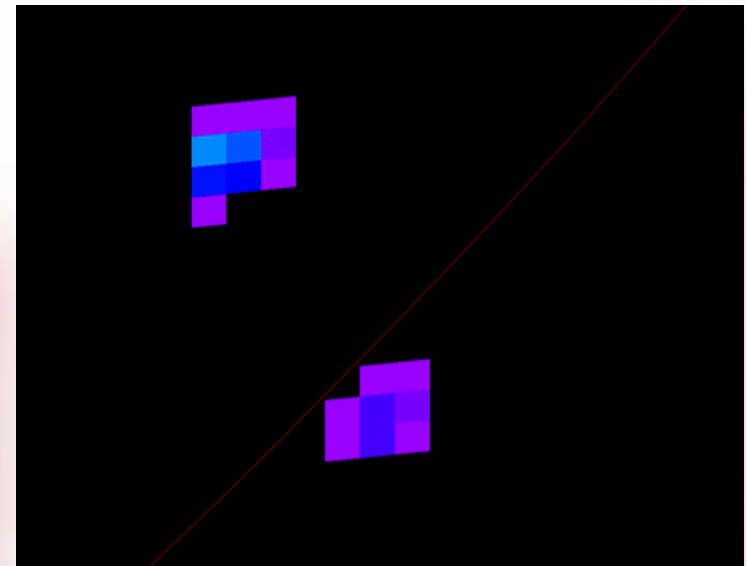
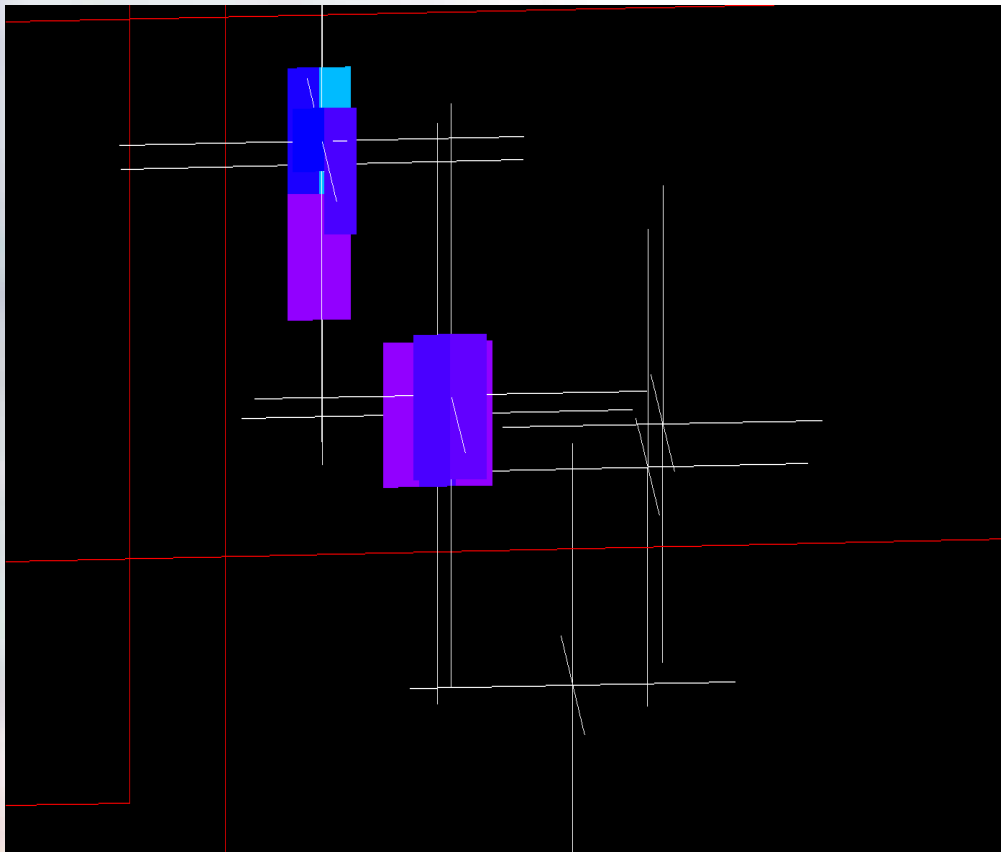




# Cosmic Run : dHLT news

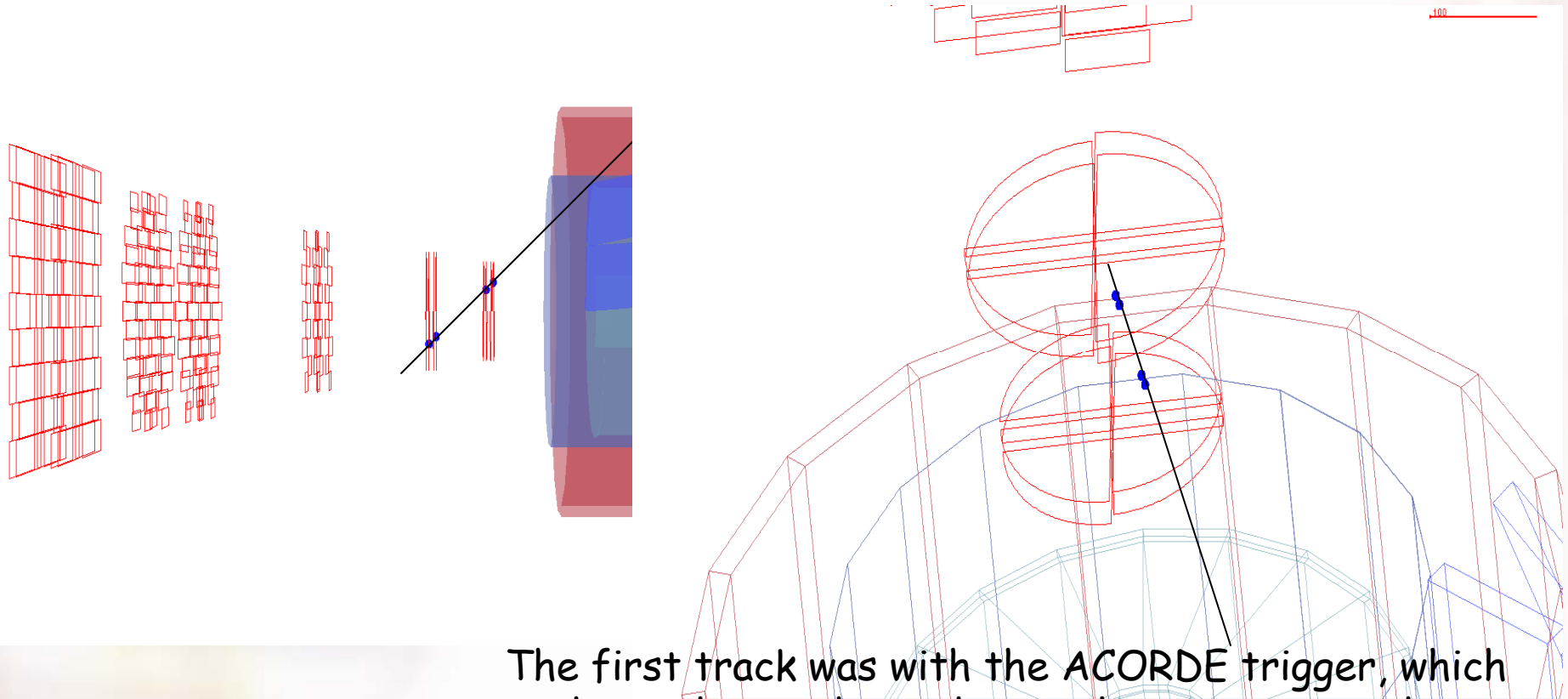
- Two news to report from DiMuon HLT.
  - I. High performance raw data decoder for tracking chambers fully integrated into AliRoot/MUON module and usable by both offline and online is checked to OK with Real Data.
  - II. Online Display of DiMuon rawdata with AliEve in ACR TV Screen.

# Typical Event Display in ACR



Run 24841

# First Track with ACORDE



Run 23549

4/10/2008

The first track was with the ACORDE trigger, which shows that we have chance also to measure the vertical tracks. Since this is very rare event and the main interest of DiMUON was to measure the tracks with trigger and tracker together the following analysis is only with MTRG as trigger.

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# Study of Cosmic Data

- Why ?
- Till now we have experienced with the simulated data with all stations and all part of detector working perfect, magnetic field on and spectrums of physically interesting observables (momentum, mass). Ideal situation.
- For the first time the DiMuon spectrometer (MTRK(~35%)+MTRG(50%) working together) is seeing the real data with real problems like sudden increase of pedestal level, cosmic shower causing large hit multiplicity, malfunctioning of the part of the detector, hot spot at certain regions of the chamber. Part of the spectrometer is functioning, with no magnetic field therefore no physics observable is possible to measure. Practical ground.
- How to face the practical problems in online without crashing or slowing the chain ?



# Study of Cosmic Data

- How ?
- For some of the selected events the DDL buffer is transformed into DDL files which are used to further analysis. So all the analysis is done offline but with the online algorithms.
- The improved hit reconstruction for Station 1 and 2 is then applied to real data to find out reconstructed points.
- Straight lines are drawn through those hits based on simple extrapolation in linear direction. Only possible because of low cluster multiplicity. Please do not misunderstand this as a tracker. Implemented because of visualization with AliEve.

# Event Display, Statistics, Problems



How much Data is Analysed ?

Total Data volume of DDL payload with MTRG as trigger **203 MB**.

Run	Total Number of Event	Pedestal Run	Nof. Tracker + Trigger DDL
26024	508	26019	7+1
25985	2209	25948	Do
25960	846	Do	Do
25954	65	Do	Do
25944	129	25938	Do
25915	805	25894	Do
25911	209	Do	Do
25910	15	Do	Do
25898	792	Do	Do
25862	331	25832	Do
25836	1326	Do	Do
25821	1014	25800	Do
25793	263	25769	Do
24943	72	24907	Do
24925	166	Do	Do
24841	16	24253	6 + 1



# Cosmic events hit reconstruction statistics



Run	Total Number of Event	Hit reconstructable Events	Nof Shower Events(>8 hits in TRG)	Large Shower Events(>20 hits in TRG)	Incomplete StLines	No StLines
26024	508	392	184	78	11	5
25985	2209	1628	795	324	48	3
25960	846	661	316	128	19	11
25954	65	42	15	7	3	1
25944	129	100	51	21	2	1
25915	805	591	270	122	13	7
25911	209	166	83	34	6	3
25910	15	11	3	2	1	0
25898	792	584	290	135	16	1
25862	331	252	123	61	1	0
25836	1326	1003	471	220	3	5
25821	1014	733	339	167	0	2
25793	263	190	104	47	7	0
24943	72	0	0	0	0	0
24925	166	120	64	24	4	1
24841	16	16	0	0	1	2
<b>Total</b>	<b>8766</b>	<b>6489</b>	<b>3108</b>	<b>1370</b>	<b>135</b>	<b>42</b>

100 %

47.8 %

21.1 %

2.08 %

0.65 %

74 %

4/10/2008

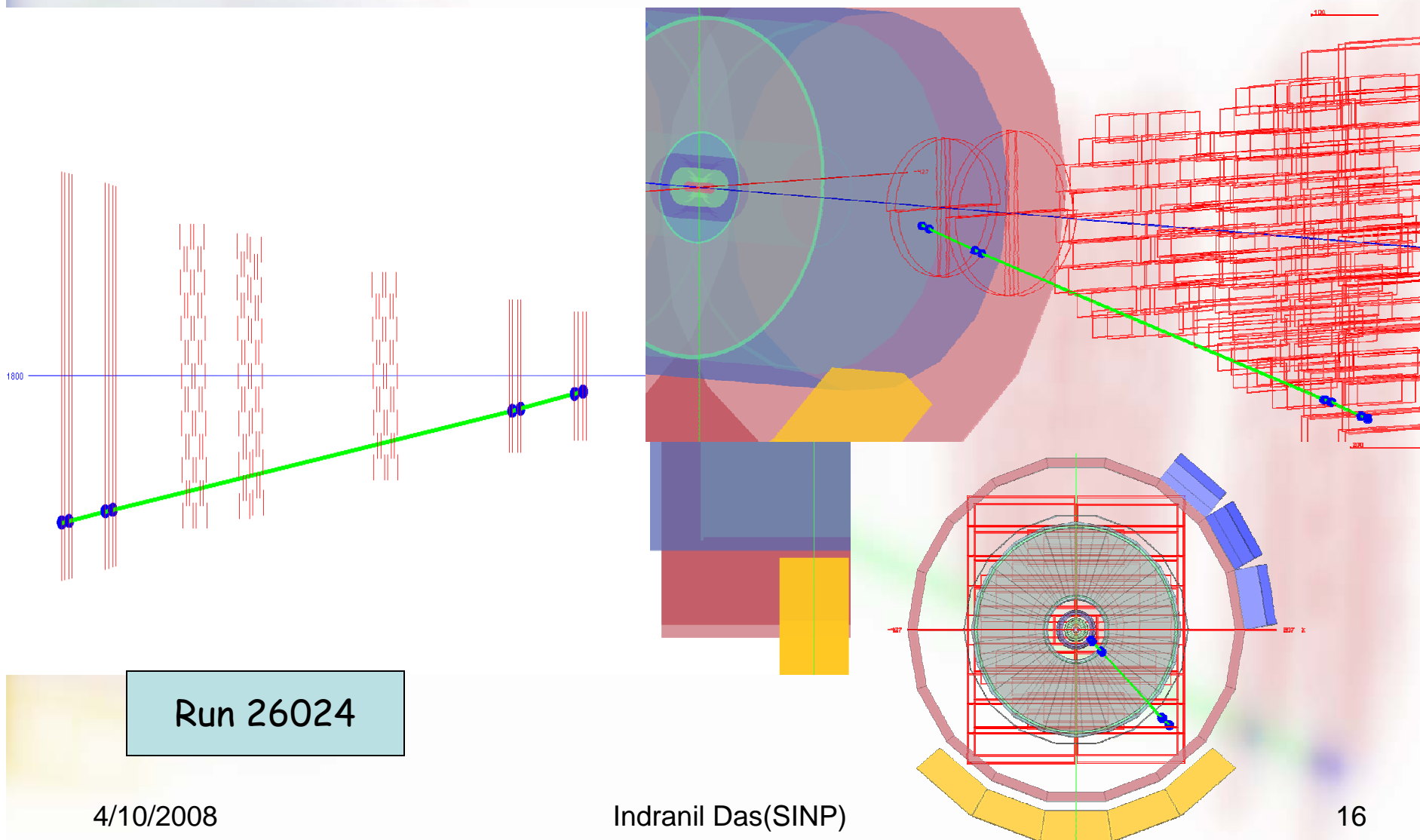
**Golden Track = Line Seg in St1 + St2 + MTRG**

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# A nice Straight Line



If Everything is fine we have,



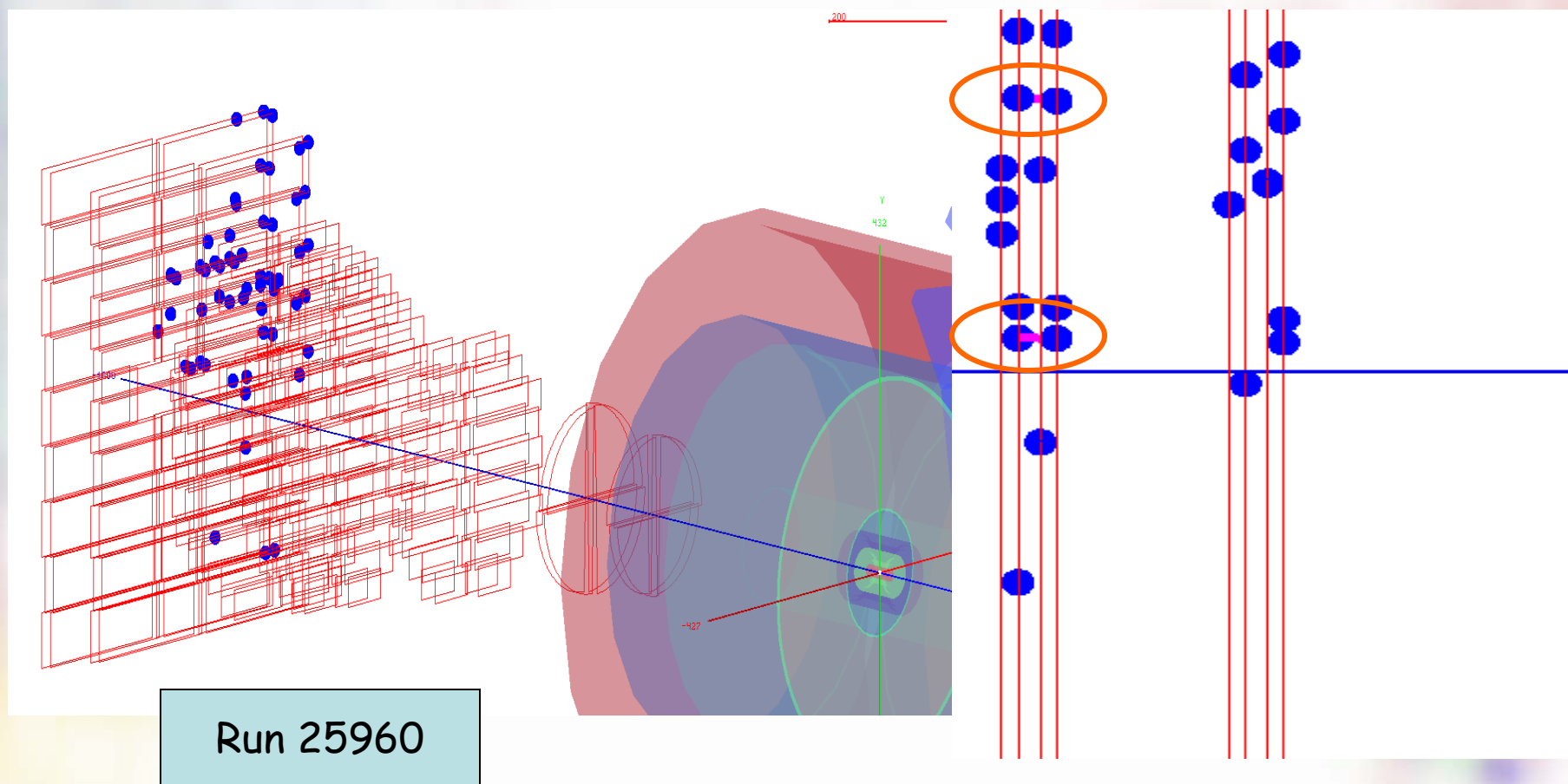
4/10/2008

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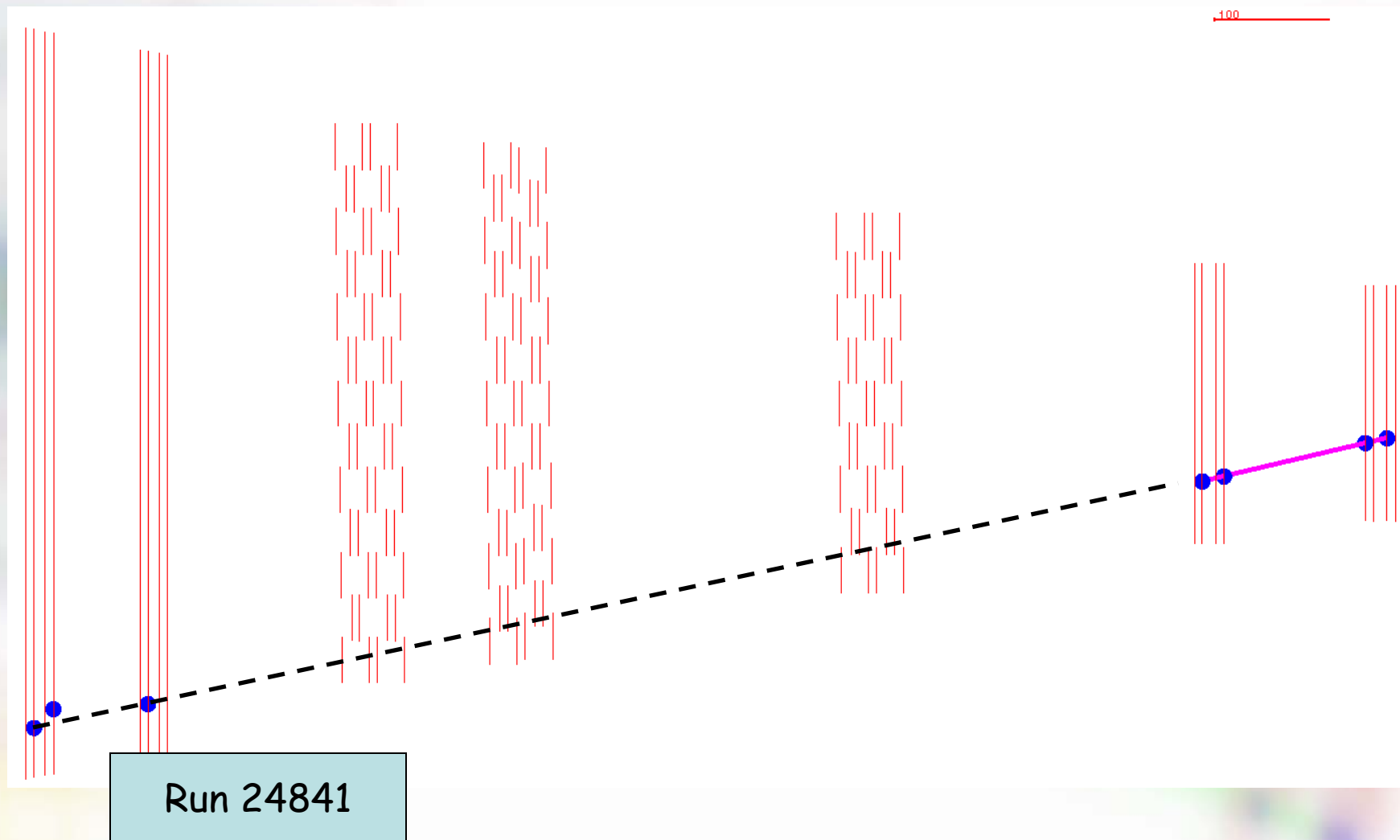
But why the number of such Straight line is so few ?

Particle hits at trigger Station no hit at MTRK, almost vertically to MTRG, producing **cosmic shower**

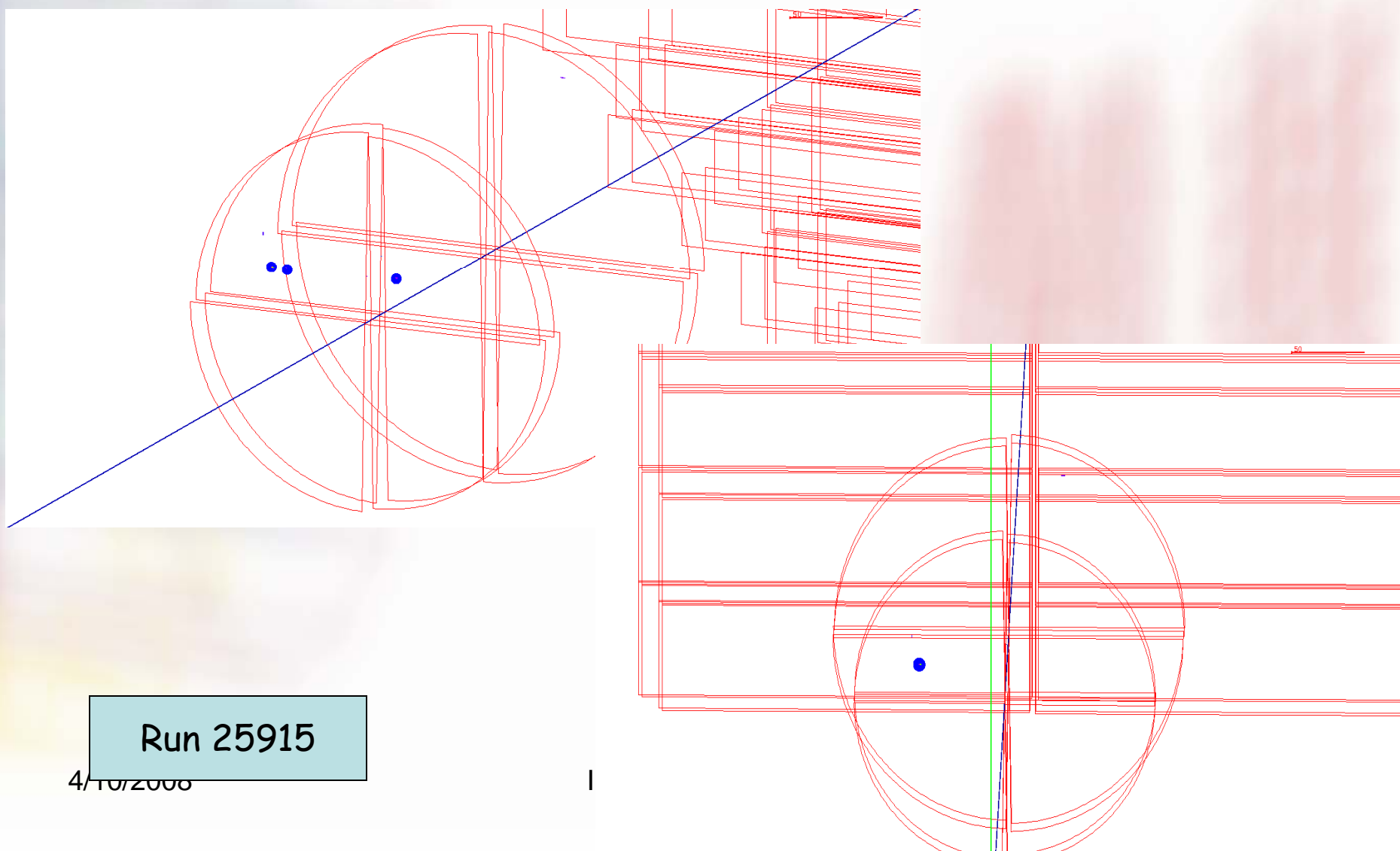




Incomplete St Line due to **misalignment(?)** or any funny pb of detection elements



Another main reason is only we have hit info for only right of the Trigger, for the left half we have **trigger info but no data**



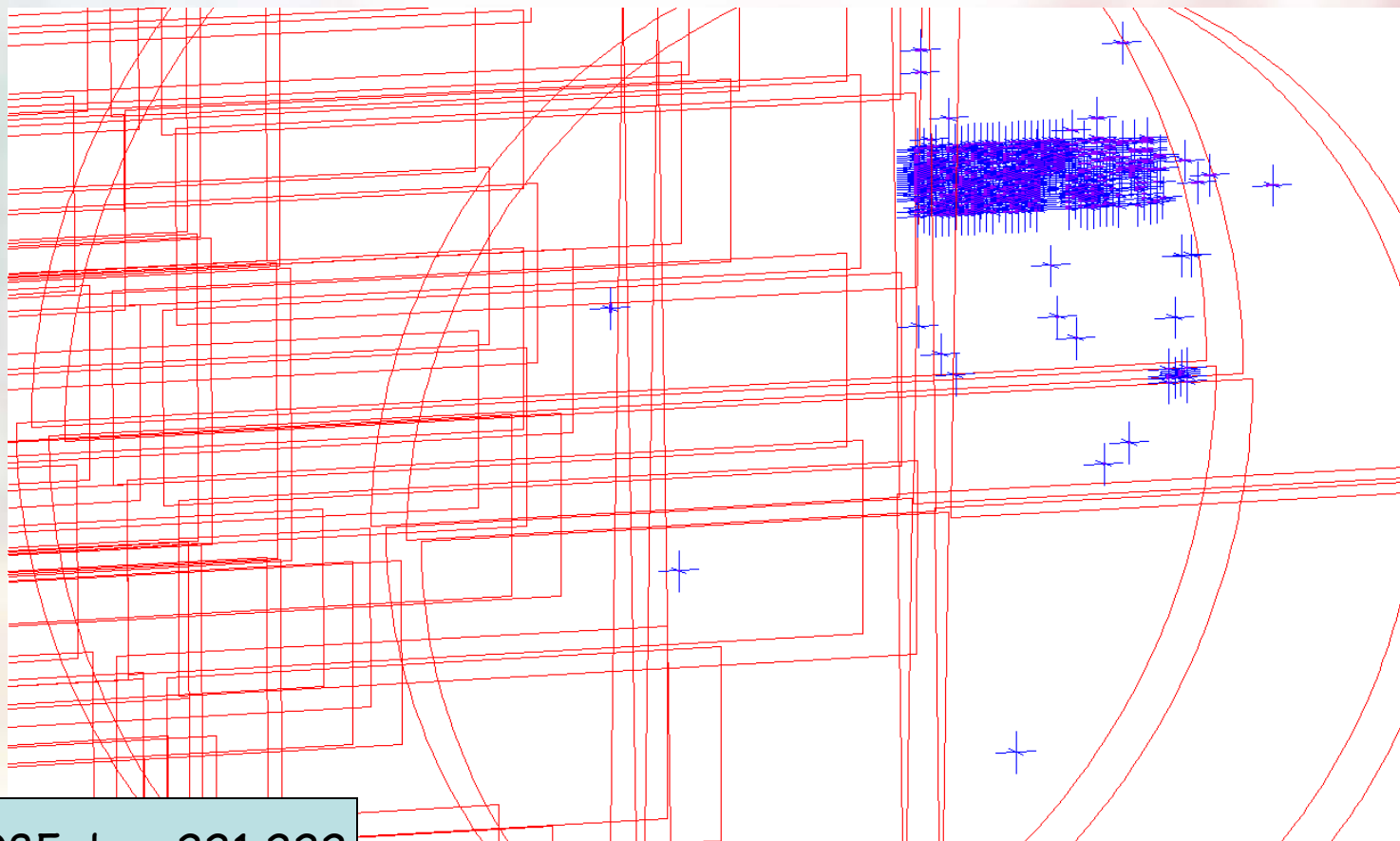
Run 25915

4/10/2008

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# Runtime Problems in detector

Malfunctioning of a part of detector, Sudden increase in pedestal value



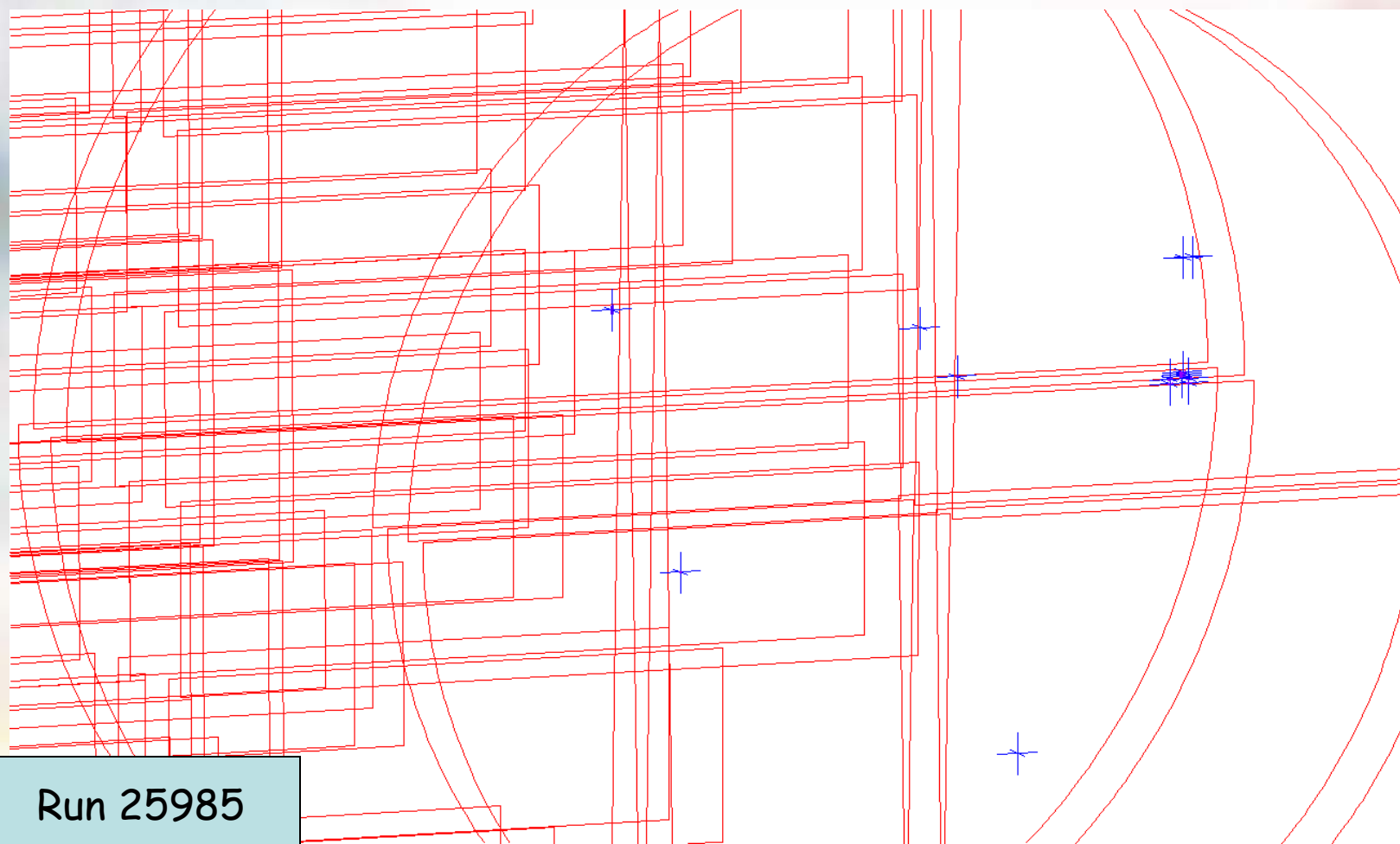
Run 25985, bus 221,222

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Which goes away when a ADC cut 10 channel is applied, but how to deal them Online ? Because if it happens for the buspatch in central region, there are ~1400 channels.

A intuitive solution is to skip the events just after raw-data decoding, otherwise the chain may slow down producing a crash at ECS.



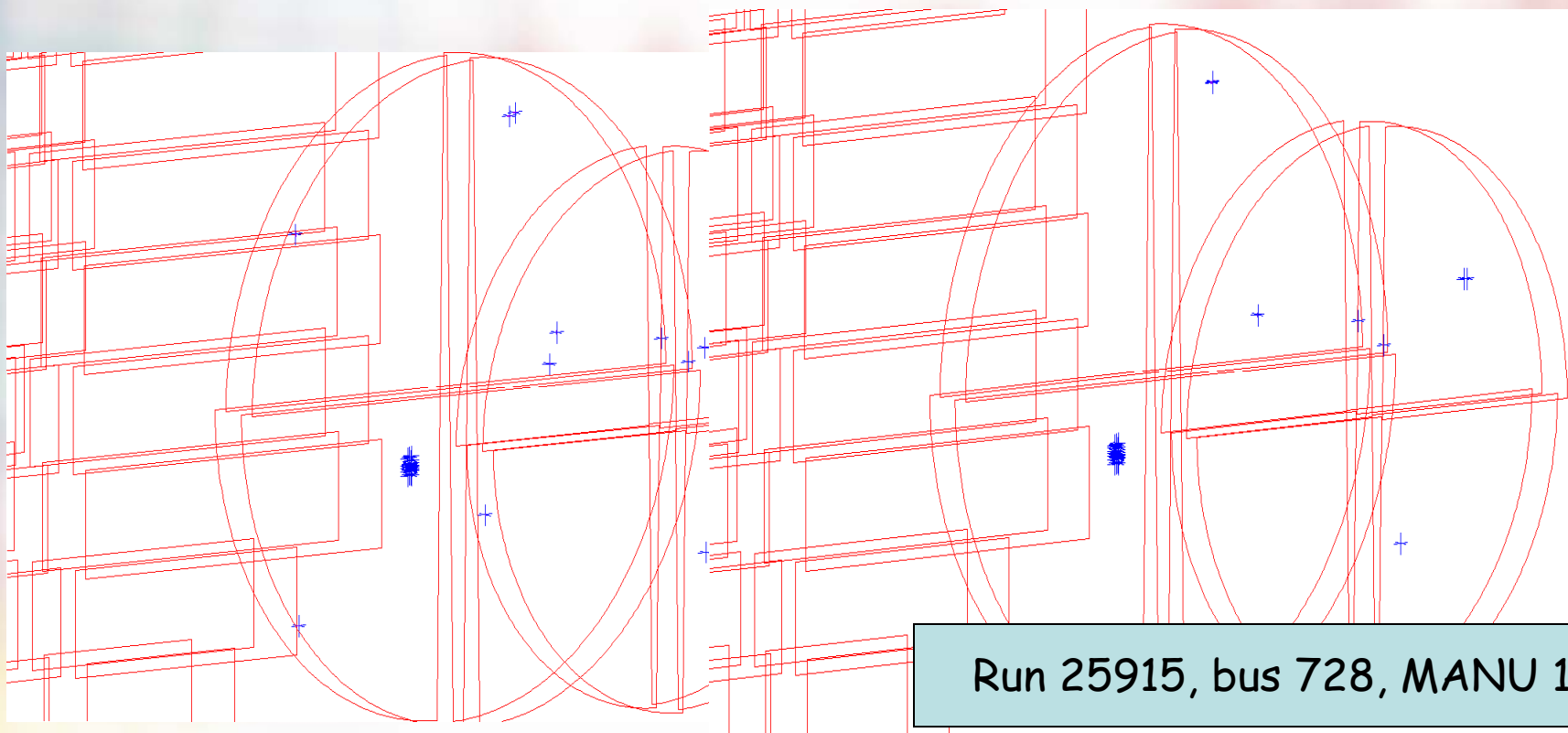
Run 25985

4/10/2008

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Another interesting problem is the "hot spot" (one MANU) went bad and for that bad MANU online will always produce rechits, since there is no chance to look into the last few set of events and compare ?  
For the moment we have to live with it and it is not so harmful, as long as the number of such bad component is few.

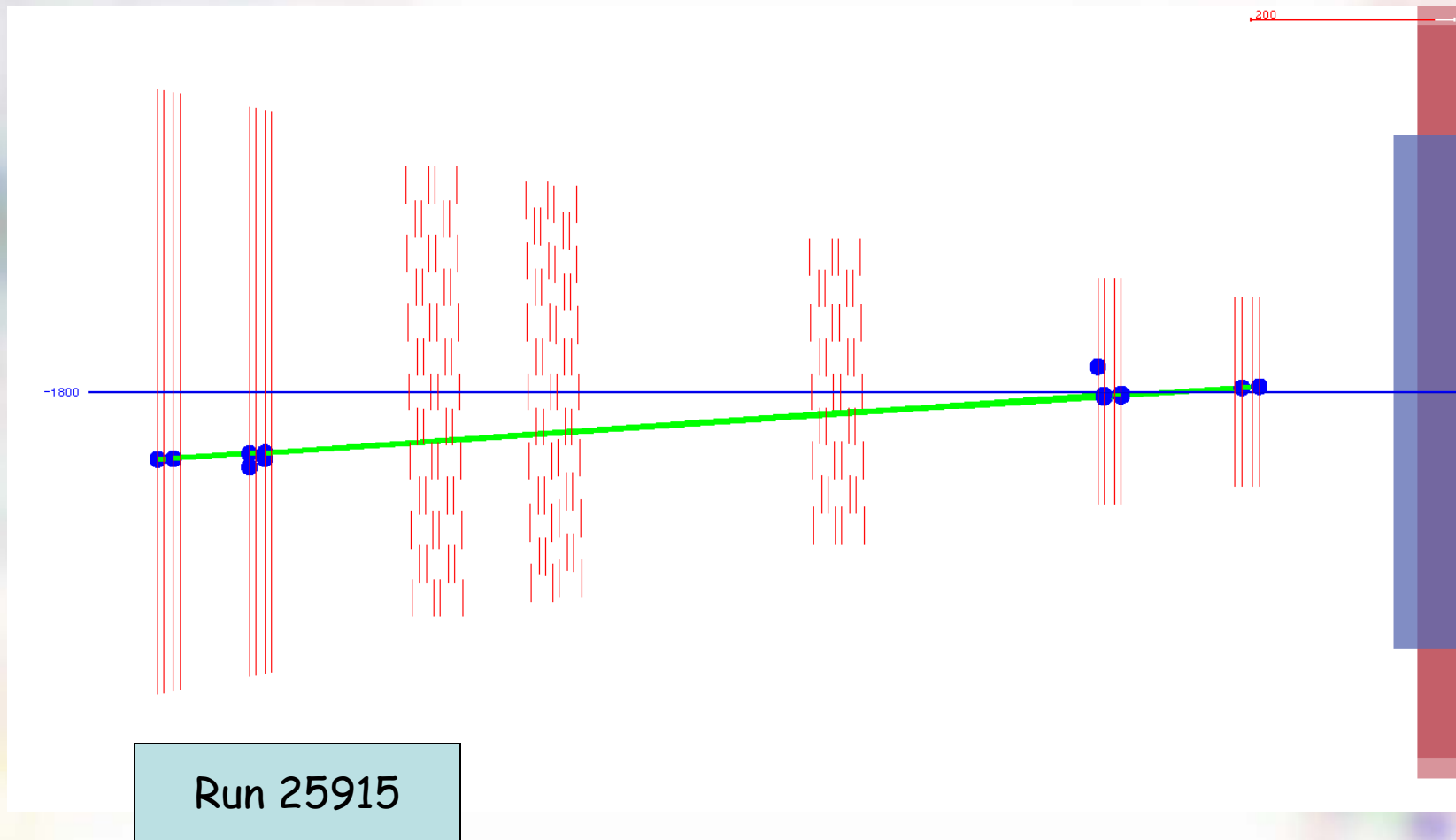


Run 25915, bus 728, MANU 1122

Run 25910, bus 728, MANU 1122

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# What is the origin of such horizontal track ?





# Future Planning

- Some work left to make the online event display easier to use with the dHLT and the end user.
- Histograms to show number of pads for hit reconstruction.
- Histograms to show the total charge per reconstructed point.
- Global Tracking for straight line tracks with all detectors (at least one hit per stations)
- Display of online reconstructed hits.
- Online track display (After proper alignment of the detection elements).