

CMS Pixels Commissioning & Participation in CMS Global Runs With An Emphasis on Forward Pixels

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on behalf of the CMS Pixels team

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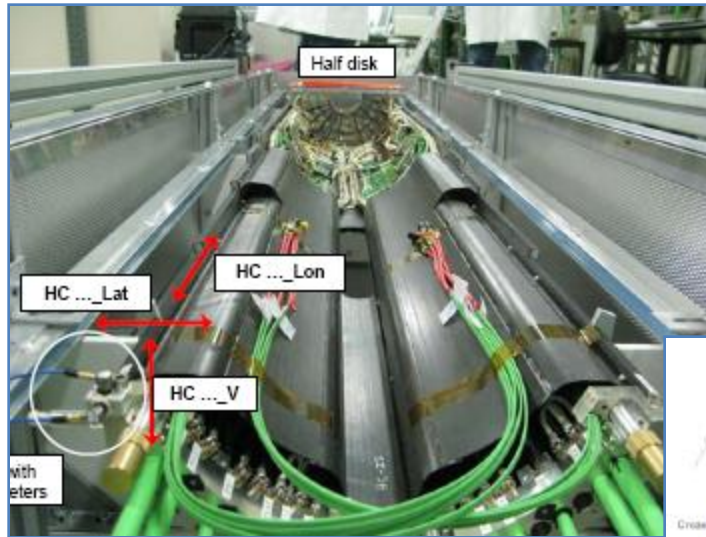
Commissioning Phase II

A Midweek Global Run with FPix

Commissioning Phase III & CRUZET 4

Cosmics in CRUZET 4

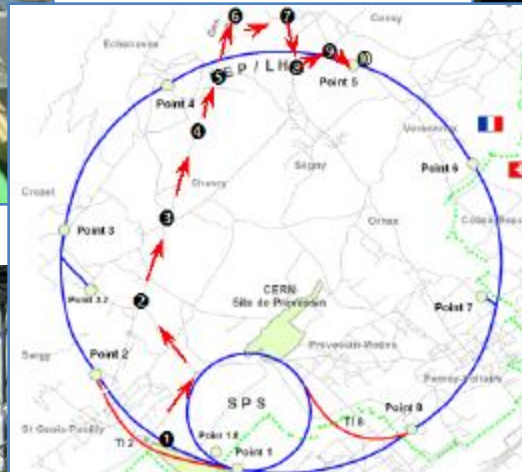
Transportation From the Tracker Integration Facility to Point 5



Fitted with accelerometers



One half-cylinder packed up and ready to go

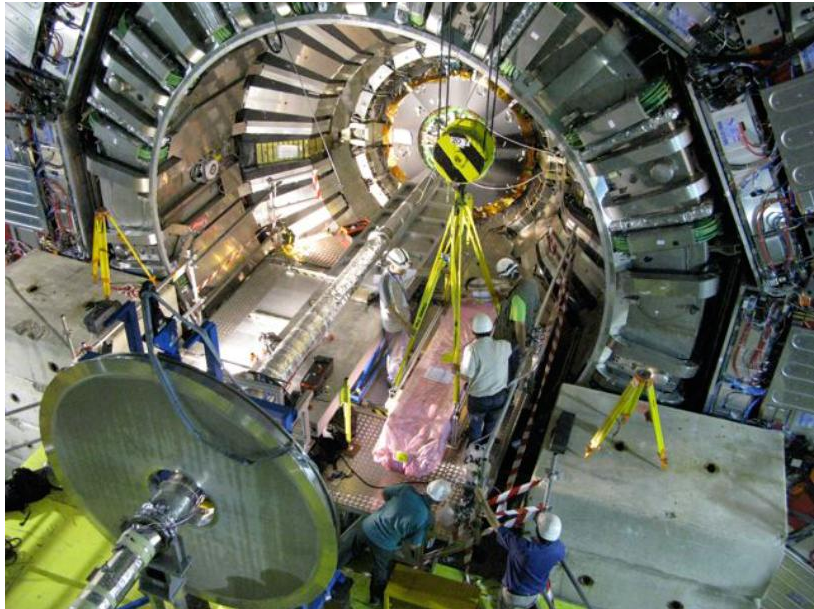
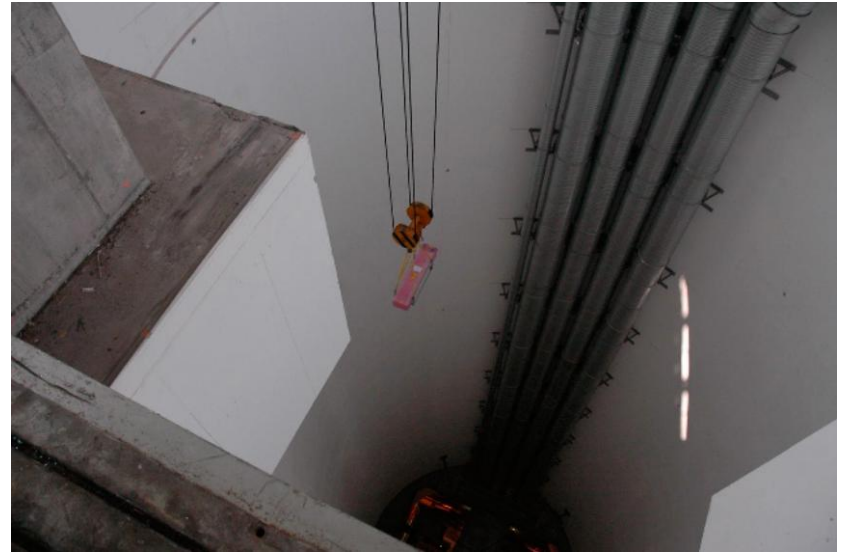


Arrival at Point 5



Four half-cylinders loaded on the truck

Lowering into the Cavern



Installation



The FPix being slid in with the BPix in place.

BPix cables were an obstacle and had to be temporarily disconnected.



Synchronous insertion of the inner and outer half-cylinders (FPix_BpI & Fpix_BpO) commences.

Double checks to ensure no touching were one of our hurdles.

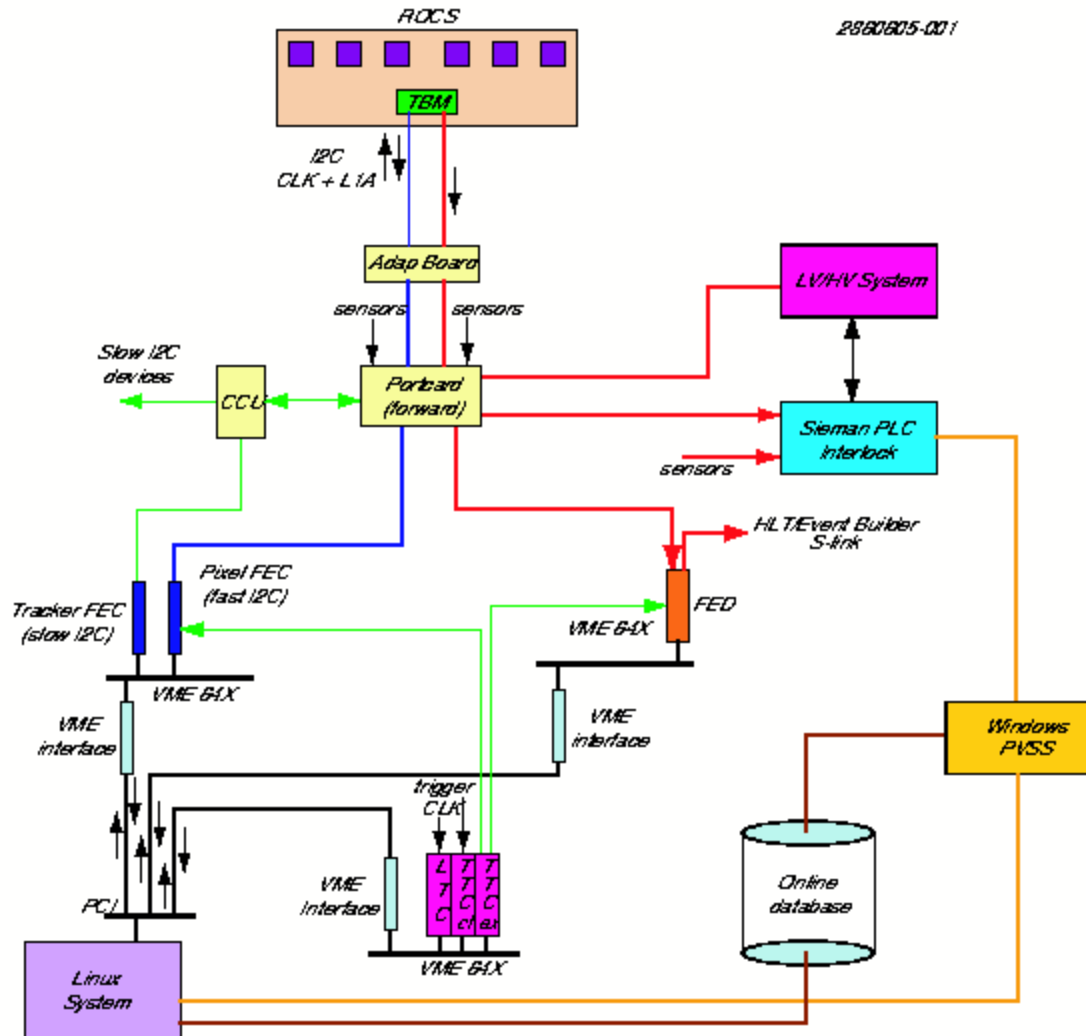


Cabling and cooling after insertion

Viola, Monsieur!



A Schematic of the Data, Control and Power Supply System

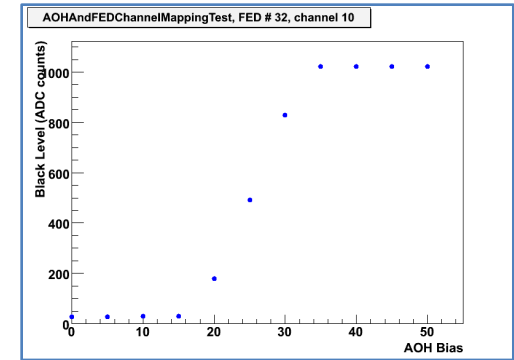


Commissioning Phase I / The Quick Checkout

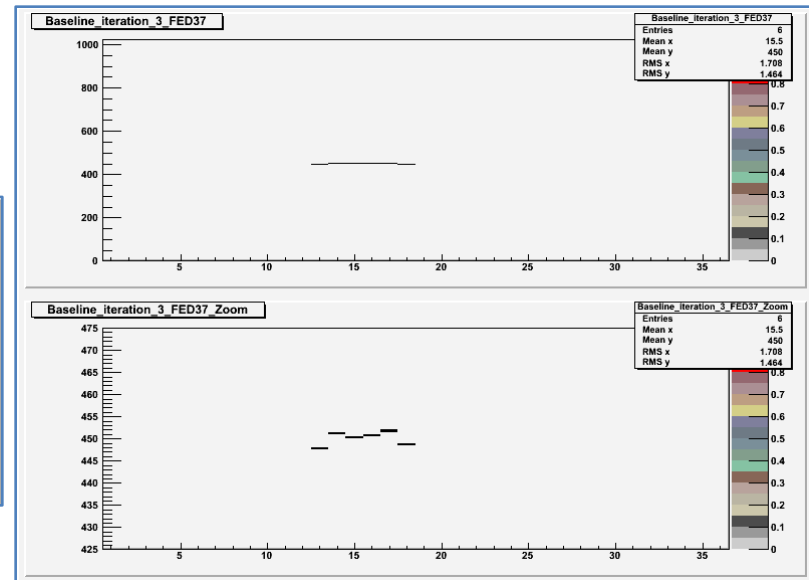
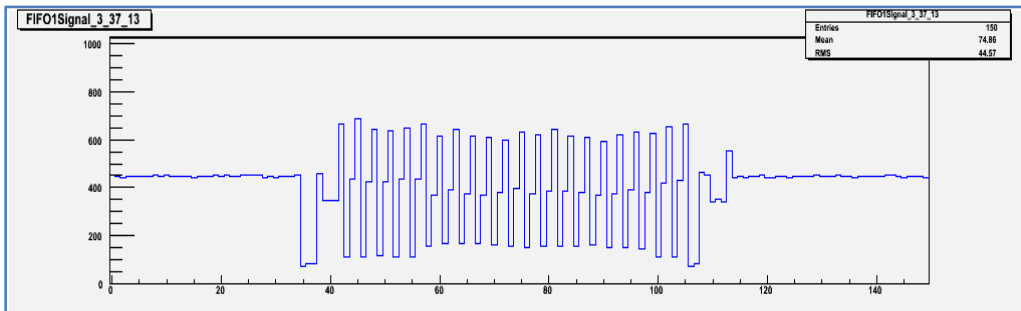
What was the Quick Checkout?

- 1 Ensure correct mapping of the data fibers
(*AOHandFEDChannelMappingTest*)
- 2 Correct mapping of the RTD temperature sensors
- 3 Appropriate change of drawn current on configuring Read Out Chips (ROCs)

Turning On: Analog = 1.6 V, 0.93 A; Digital = 2.1 V, 1.868 A
After Configuring: Analog = 1.6 V, 3.195 A; Digital = 2.1 V, 3.06 A
After Ramping V Digital to 2.6 V: Analog = 1.6 V, 3.338 A; Digital = 2.6 V, 3.59 A
After Reconfiguring: Analog = 1.6 V, 3.345 A; Digital = 2.6 V, 3.59 A



- 4 Stable baseline of the TBM analog signal
(*FEDBaselineCalibration*)



Commissioning Phase I / The Quick Checkout

Sequence of the Quick Checkout

There are 4 *Half Cylinders* in the FPix.

Each Half Cylinder has 2 *Disks*.

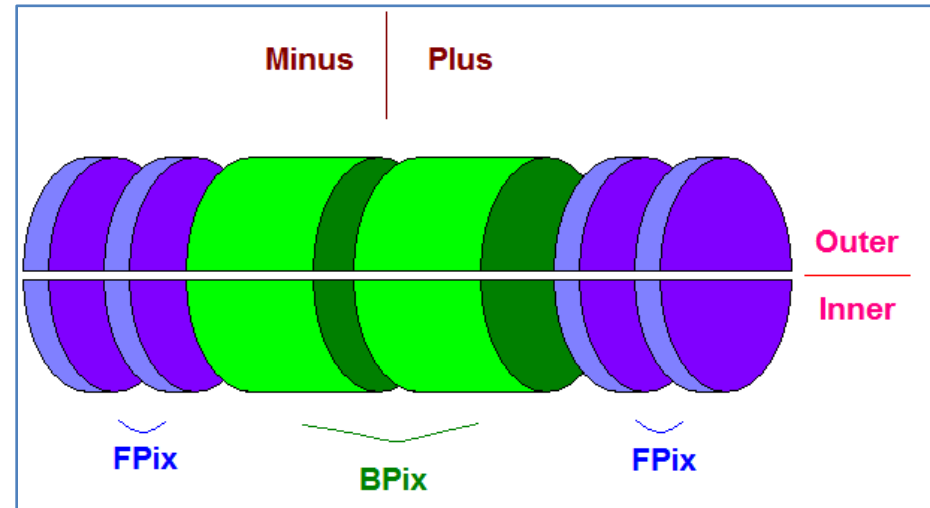
Each Disk has 4 *Sectors* (aka *Readout Groups*)

Quick checkout was done 1 Sector at a time.

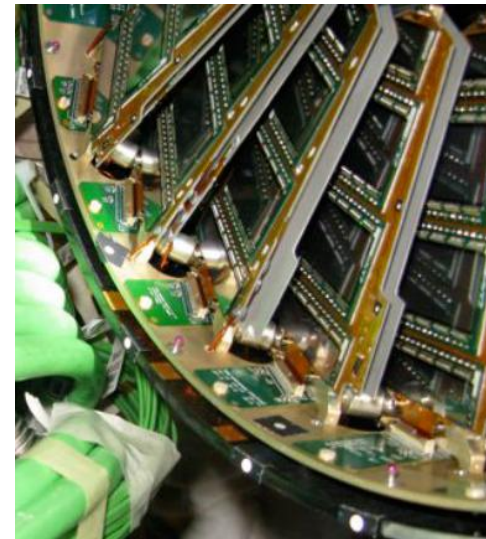
[Each Sector has 3 *Blades*.

Each Blade has 2 *Panels*.

Each Panel has 24 *ROCs* if facing interaction point, or 21 *ROCs* if facing away from interaction point.]



Division of the pixel detector into *Half Cylinders*



Close up of a Disk with its *Blades* clearly visible

Commissioning Phase I / The Quick Checkout

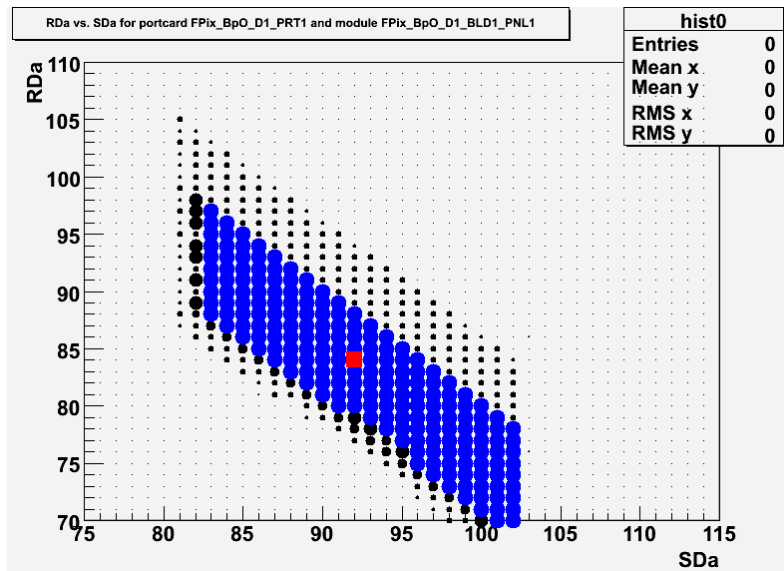
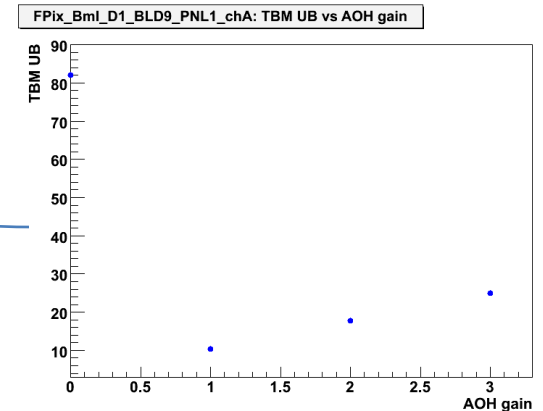
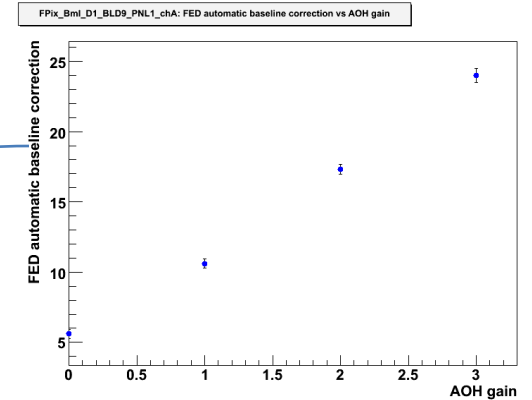
Results of the Quick Checkout

- The voltages and currents behave as expected
- The RTDs are correctly mapped and read reasonable temperatures
- All Panels send reasonable data packets
- Some Panels had large fluctuations in the analog baseline. On cleaning their optical fibre, the fluctuations calmed down. (FED 35 Channel 15, FED 39 Channel 2)
- We could not inject charge on the detector to generate artificial hits for further calibration purposes. This motivated a re-calibration of the timings and thresholds in a thorough commissioning exercise.

Commissioning Phase II

10 Steps

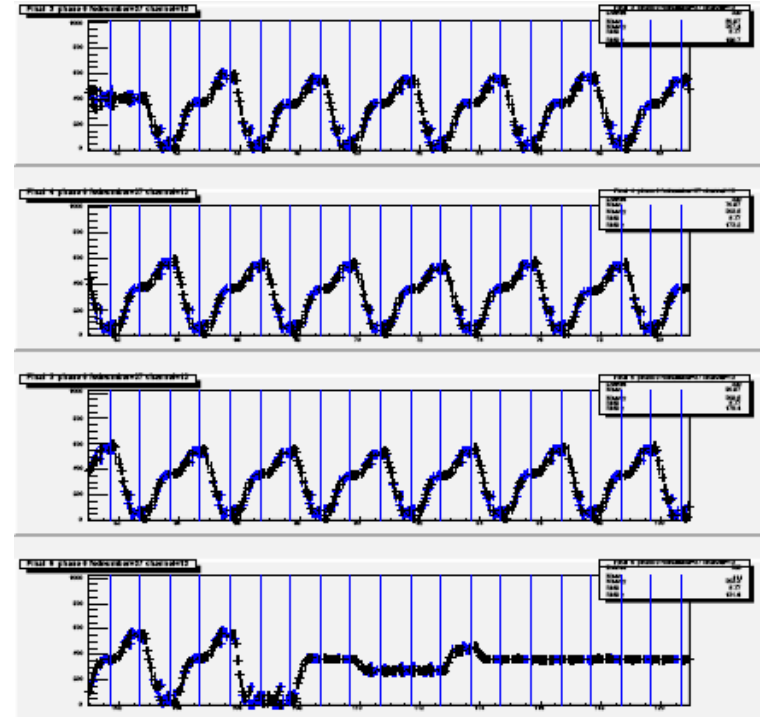
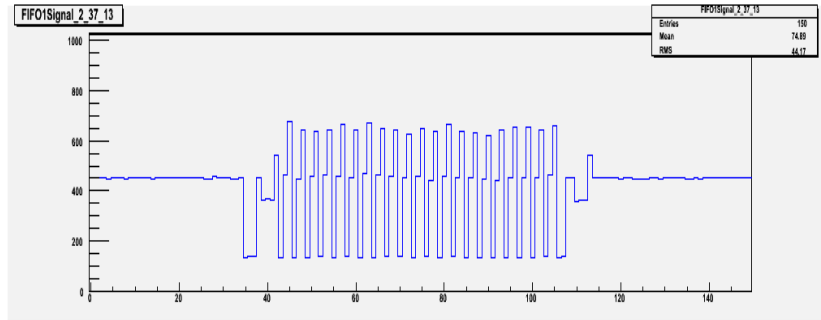
1. The pixel volume had been closed. Bias voltages could now be applied.
2. The calibration results from Phase I Commissioning were inherited
3. An *AOH Gain Scan* to optimize the light yield
4. A *Delay 25 Scan* to program to ensure the best timing for the fast I2C communication



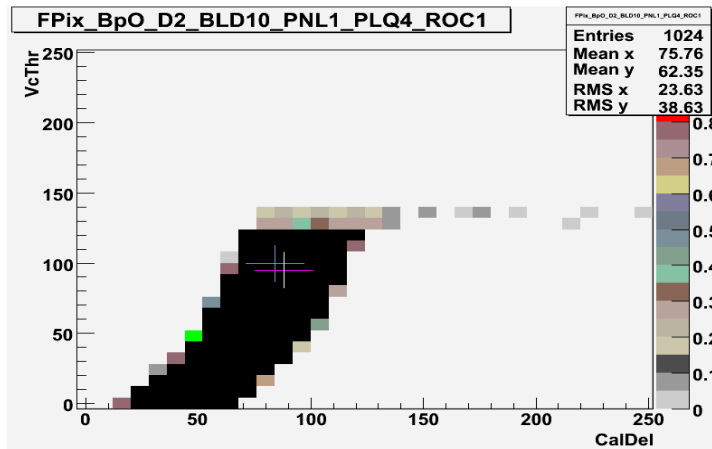
Commissioning Phase II

5. A Clock Phase and Delay Calibration for the correct sampling time of the analog signal

6. TBM UB Optimization and ROC UB Equalization

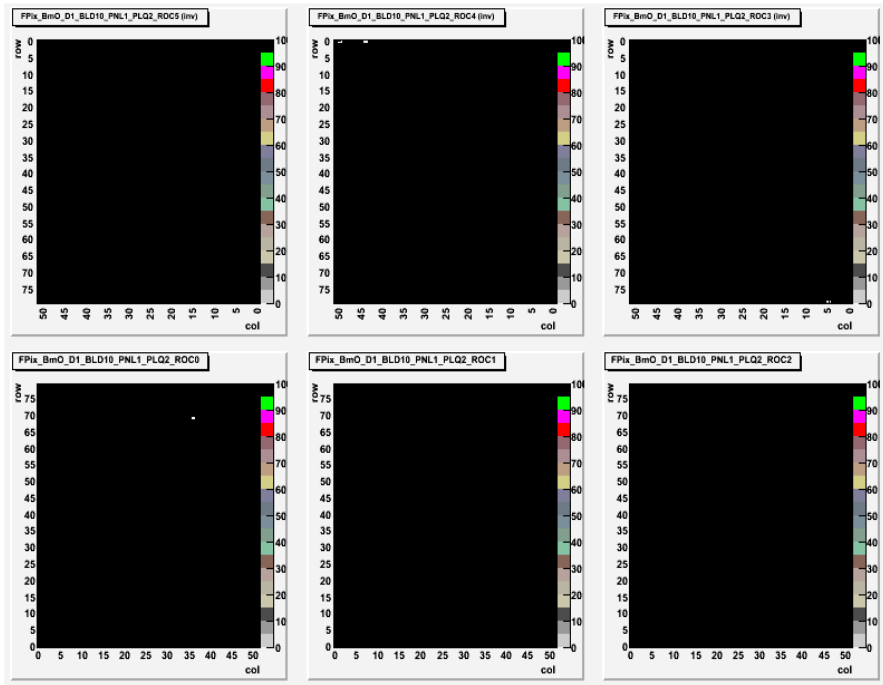


7. A VcThreshold vs CalDelay Calibration for the optimal threshold

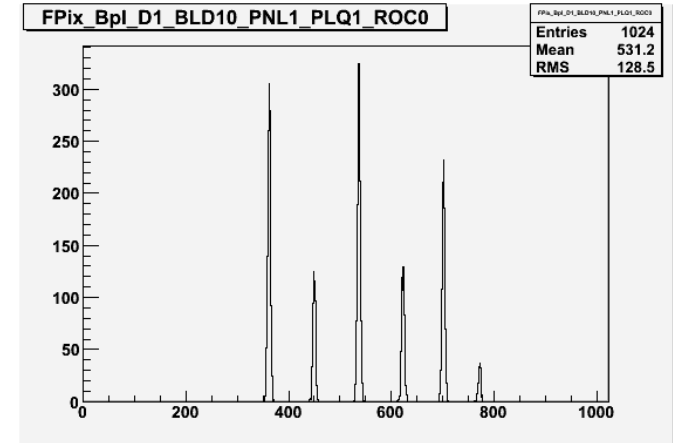


Commissioning Phase II

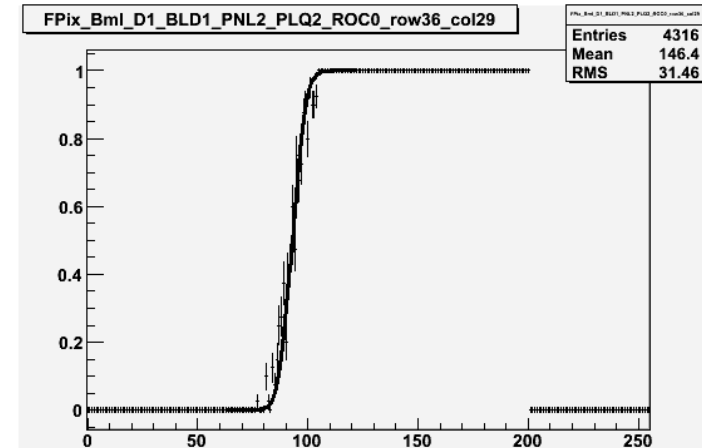
8. *AddressLevelsCalibration* for well defined address levels on the analog signal)
the analog signal)



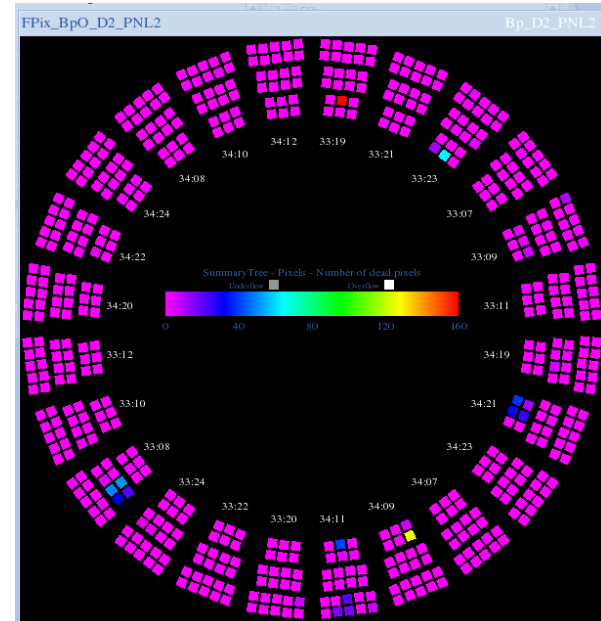
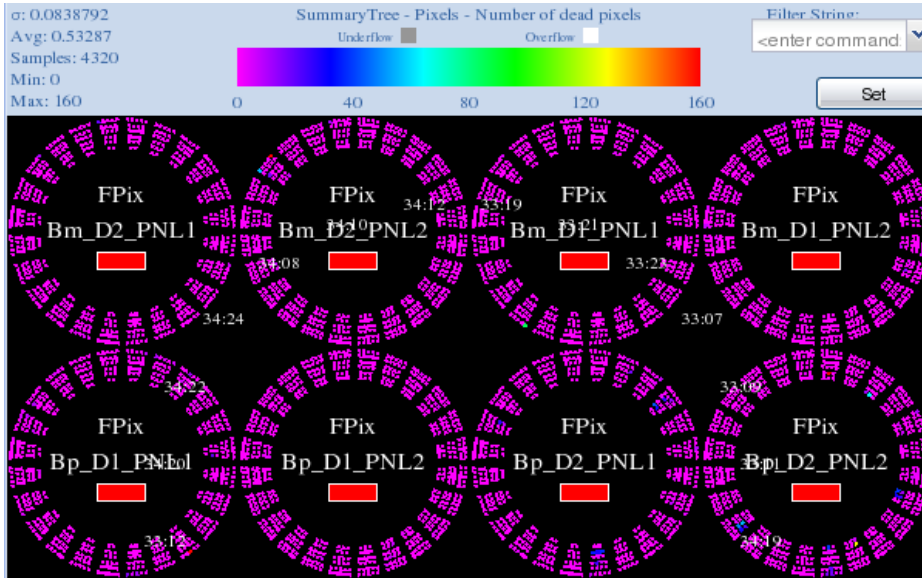
9. *Pixel Alive*



10. *S-Curve*

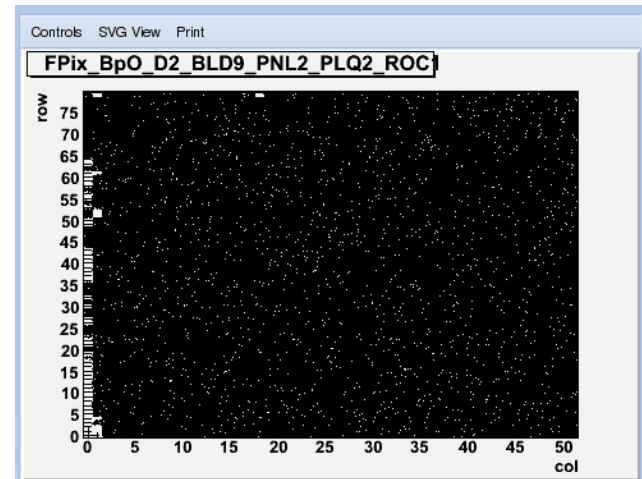


Commissioning Phase II

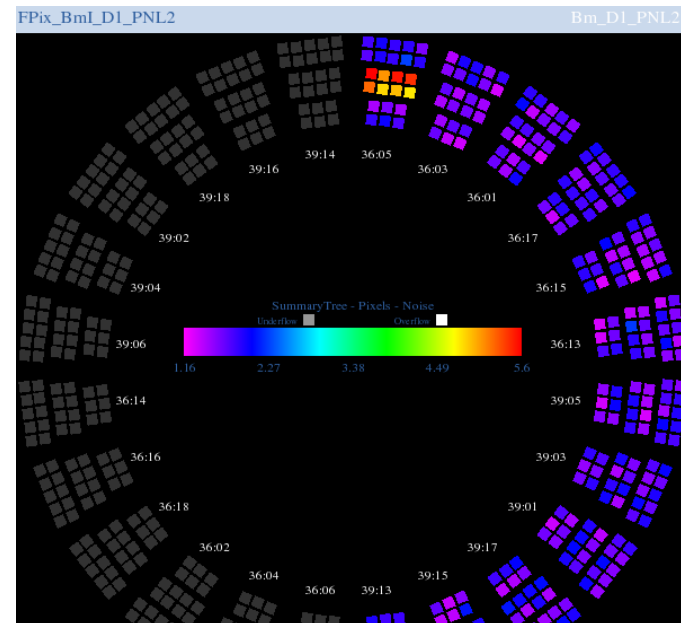
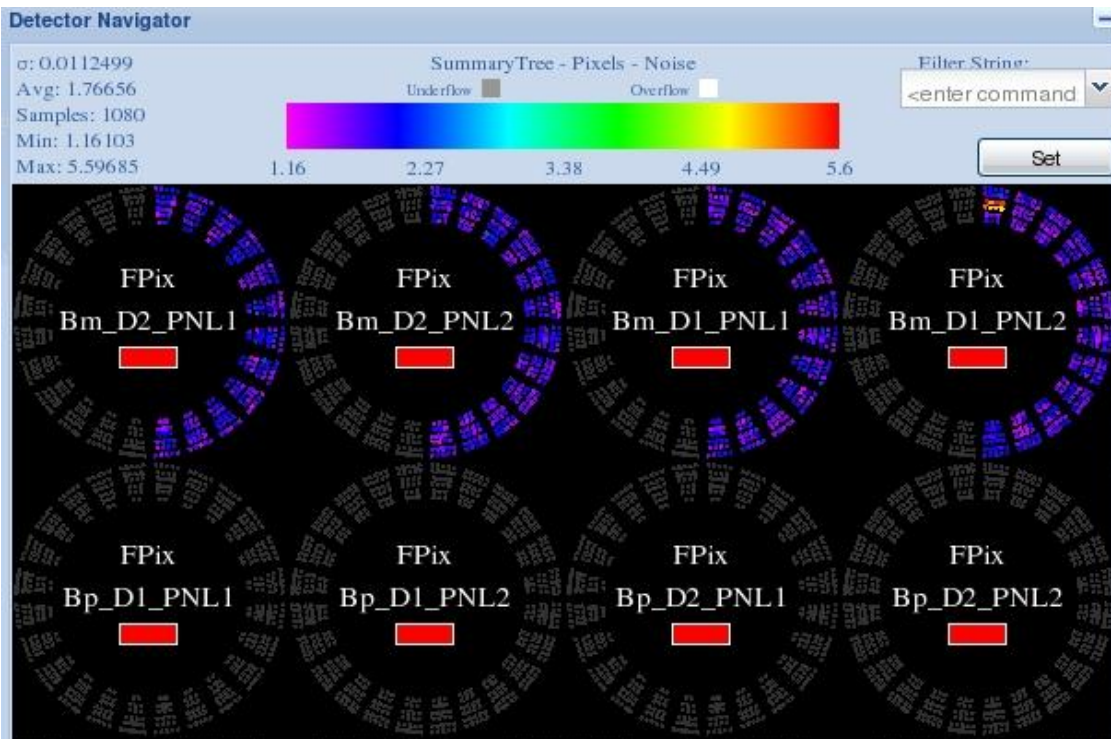


A Pixel Alive with the Entire FPix

- Some ROCs are seen with missing pixels in *BpO_D2_PNL2*
- *BpO_D2_BLD9_PNL2_PLQ2_ROC1* is investigated for your perusal



Commissioning Phase II



An S-Curve Showing the Broken High Voltage Wirebond

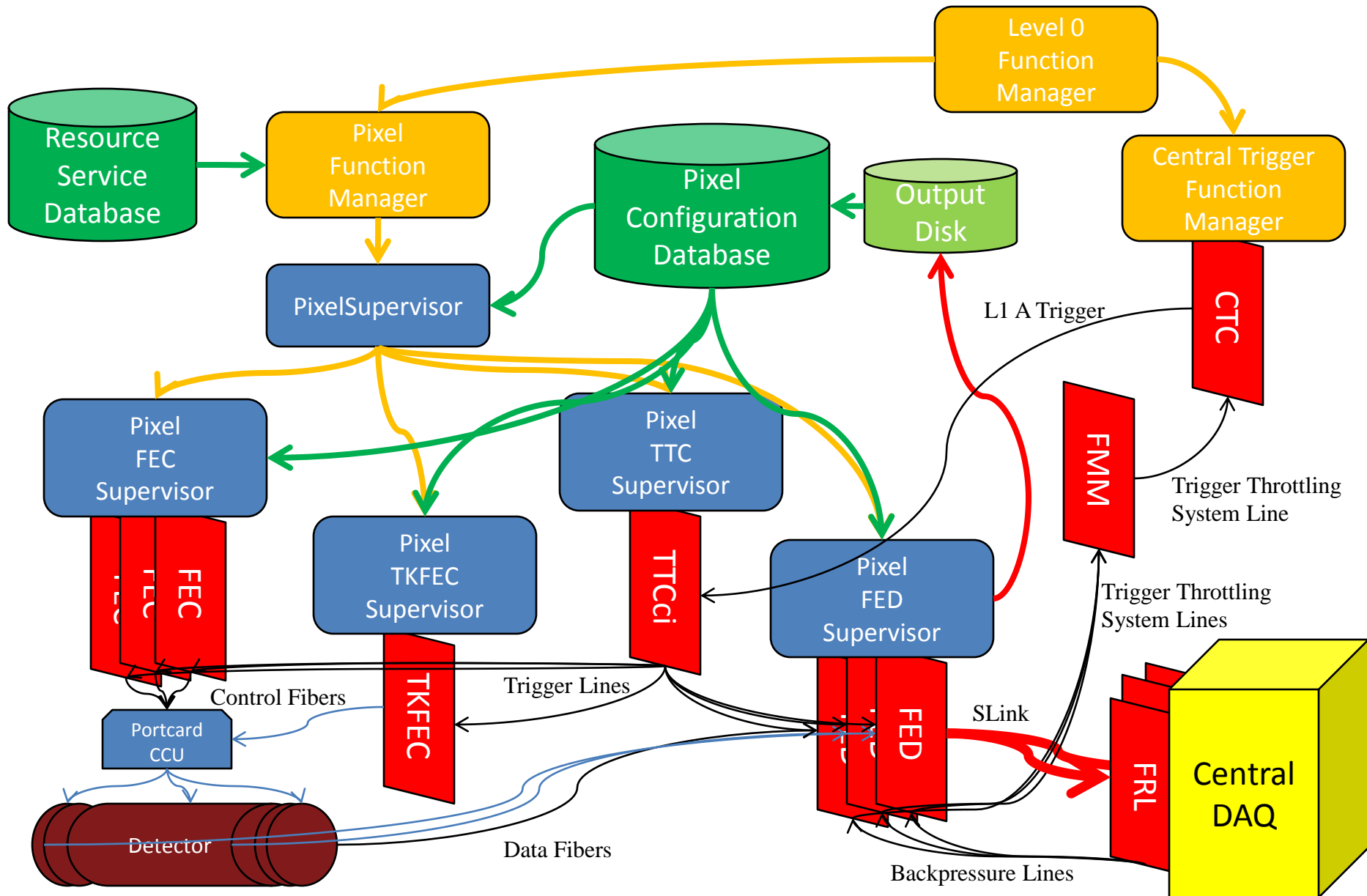
➤ *BmD1_PNL2* had been noted through inspection to have a broken high-voltage wirebond

Commissioning Phase II

Results of the Phase II Commissioning

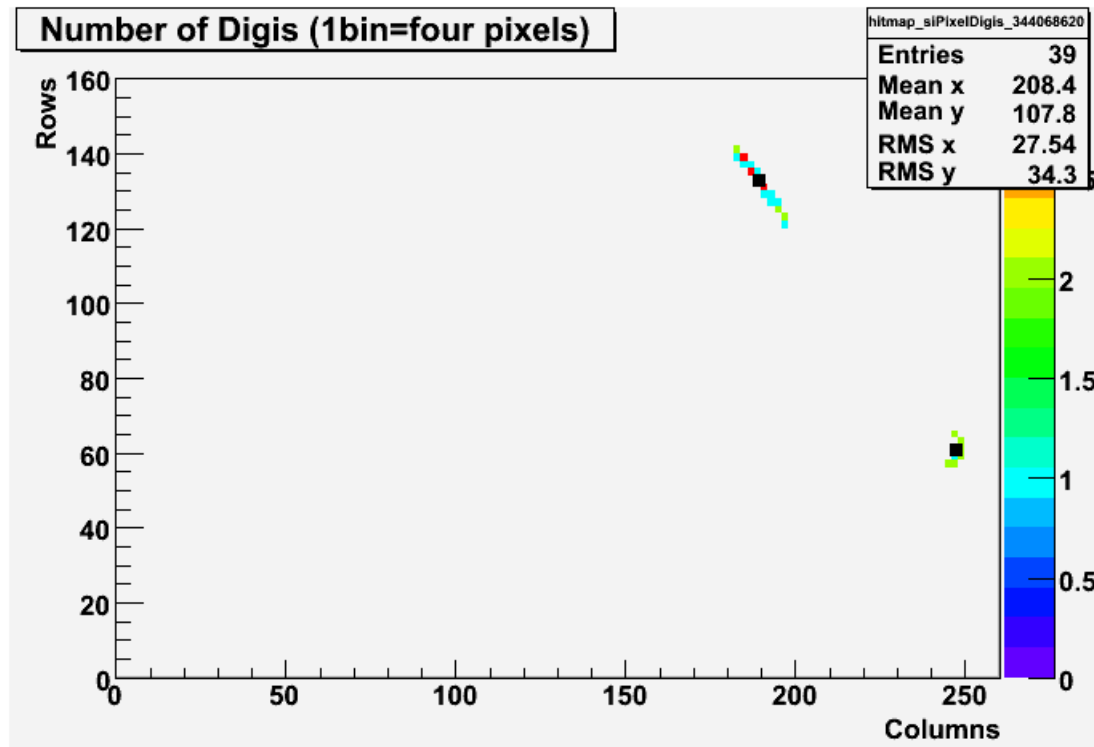
- One plaquette of 8 ROCs does not have high voltage. It will be masked out.
- A few sporadic pixels are not responsive and will also be masked out during data taking.
- Several calibrations had not been tested with more than one FED, much less more than one crate of FEDs and had to be debugged on the spot.
- The integration between DAQ and DCS required for semi-automatic power-up was tested and established as conventional procedure.
- The FPix were ready to participate in a mid-week global run with the central DAQ, under central Run Control with central Triggers by the 13th of August.

How Pixel Online Software Fits within Run Control



Midweek Global Run 13th – 14th August 2008

- ✓ Integration into central Run Control framework done
- ✓ We participated with just the FPix, well calibrated and roughly time aligned.
 - ✓ And we think we saw a cosmic in Run 56742!



Commissioning Phase III & CRUZET 4

1. Integration between the BPix and FPix under Run Control. This has been achieved.
2. Time Alignment with cosmics.
 - a) The FPix has been aligned as roughly indicated in the next slide.
 - b) The BPix is work in progress
3. We participated in CRUZET 4 as one sub-detector under central Run Control
4. Various optimizations like Trim-bit Calibration and Gain Calibration to be done

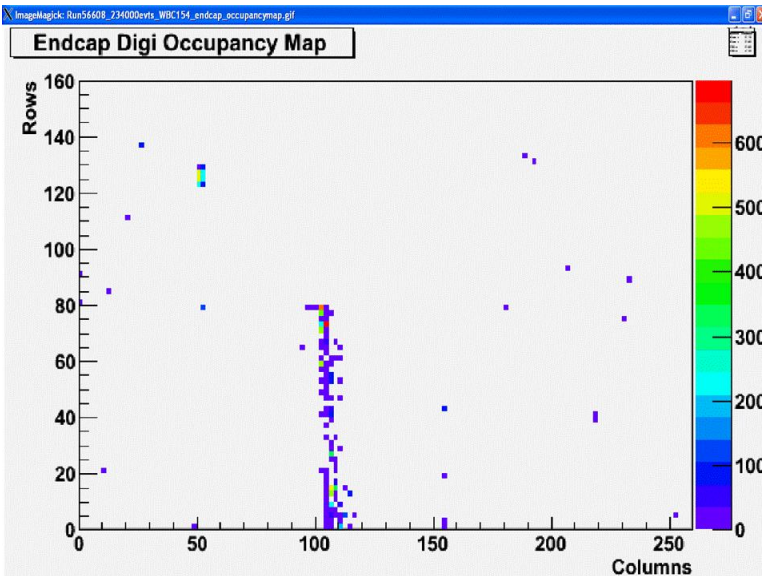
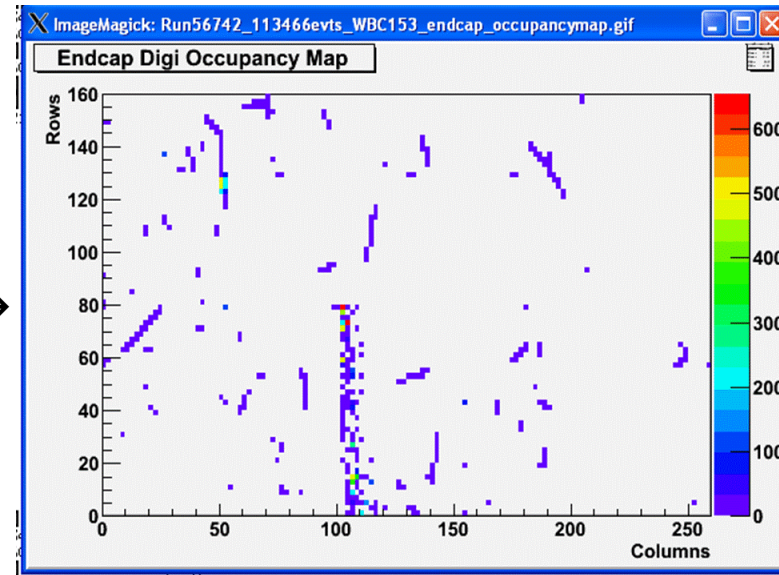
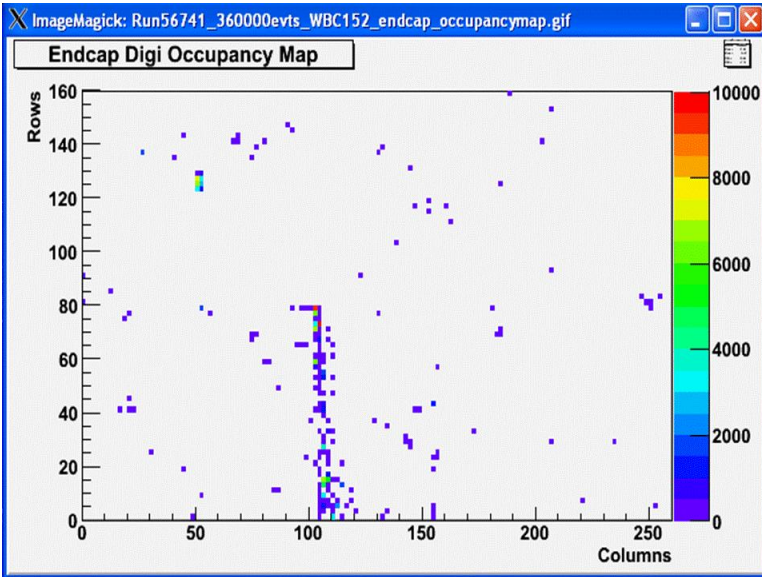
Commissioning Phase III & CRUZET 4

The Final Stage of Time Alignment in the FPix with Cosmics

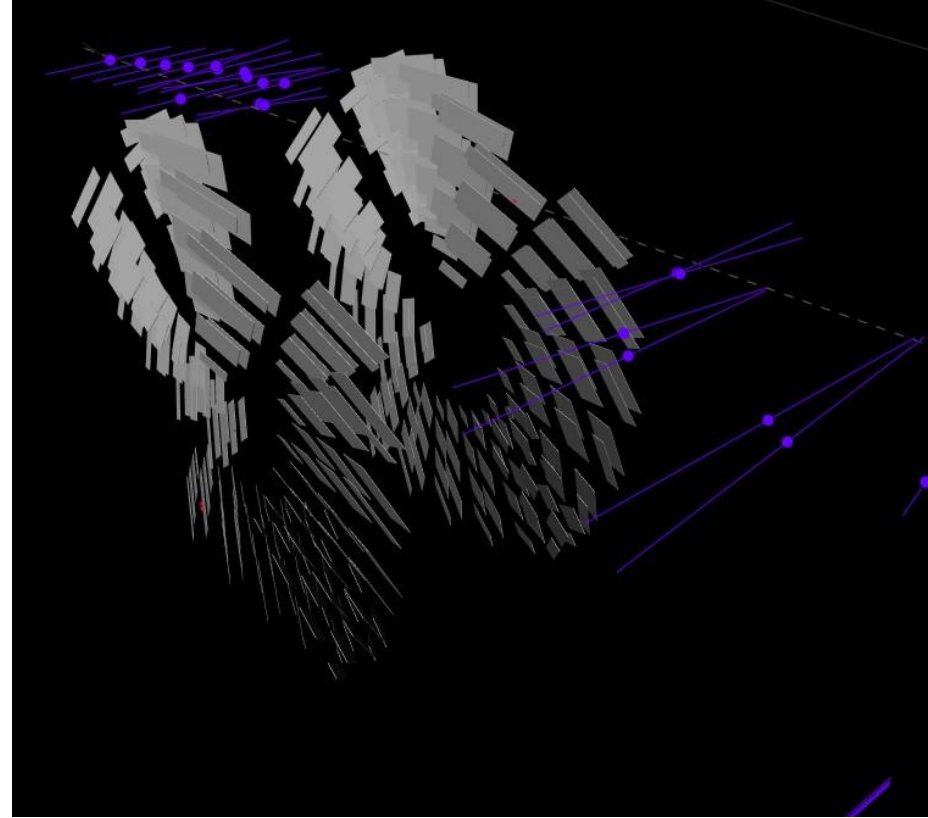
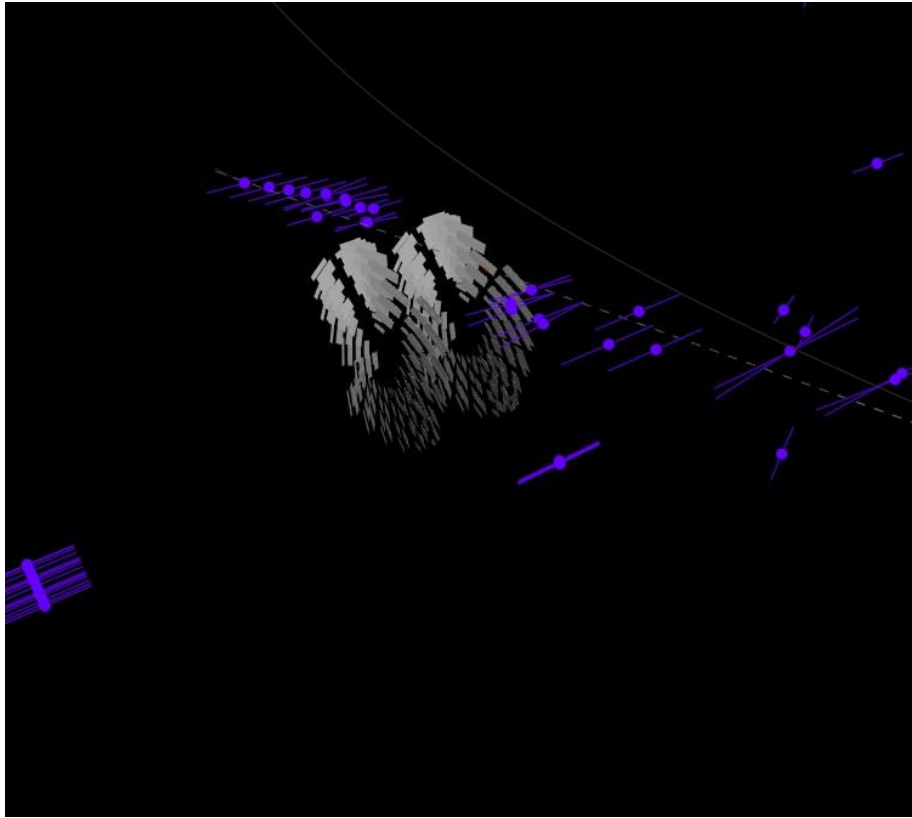
← WBC = 152

WBC = 153 →

← WBC = 154

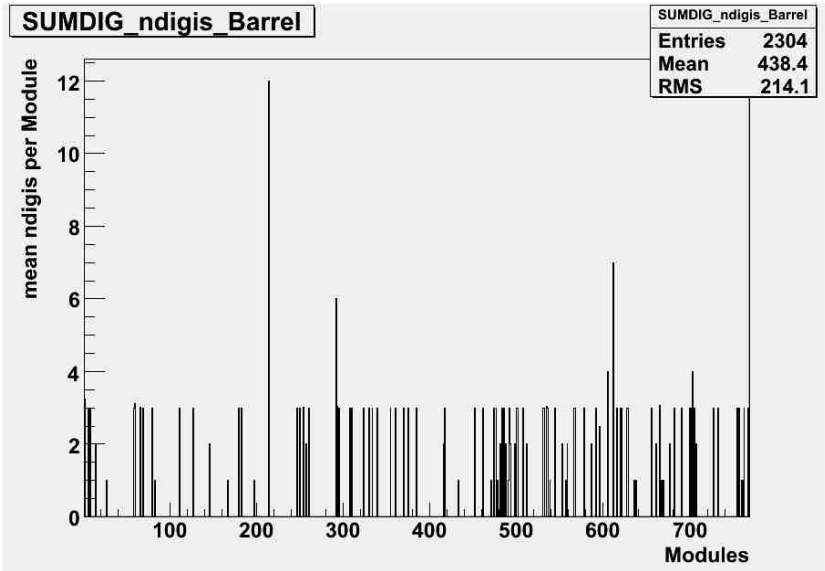


Cosmics in CRUZET 4, Run # 57553

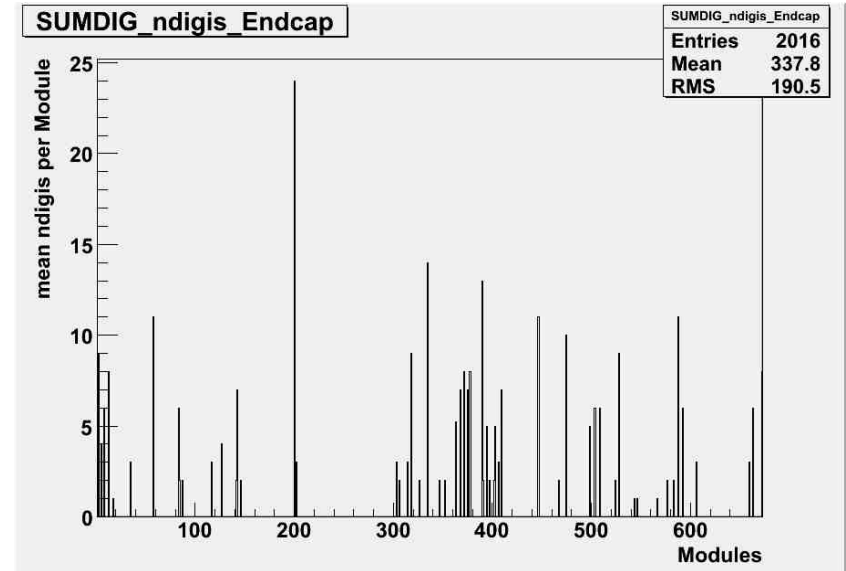


Through the Si-Strips and the FPix.
Look closer!

Cosmics in CRUZET 4, Run # 58324

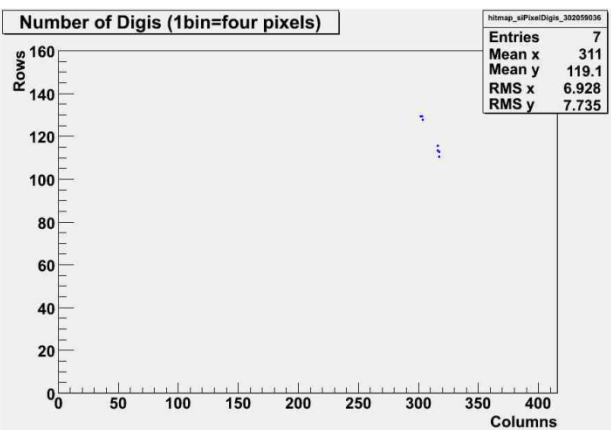


Number of digis in Barrel

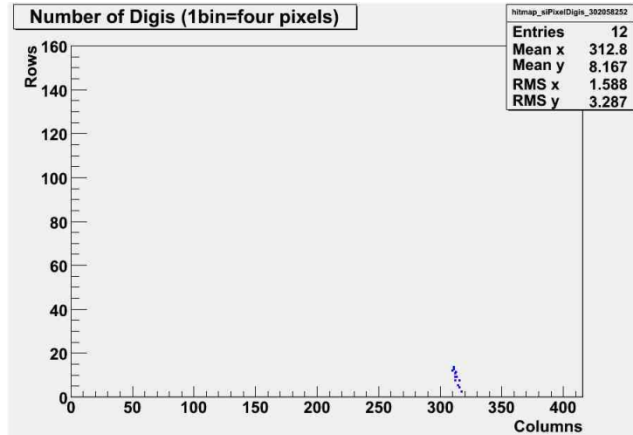


Number of digis in FPix

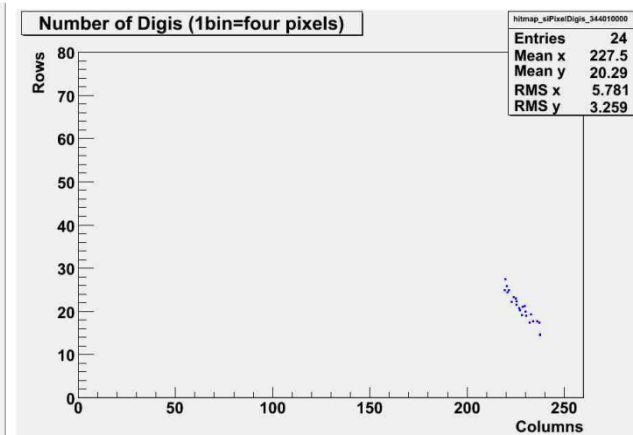
Hits in BPix_BpO_LYR1_LDR9F_MOD3



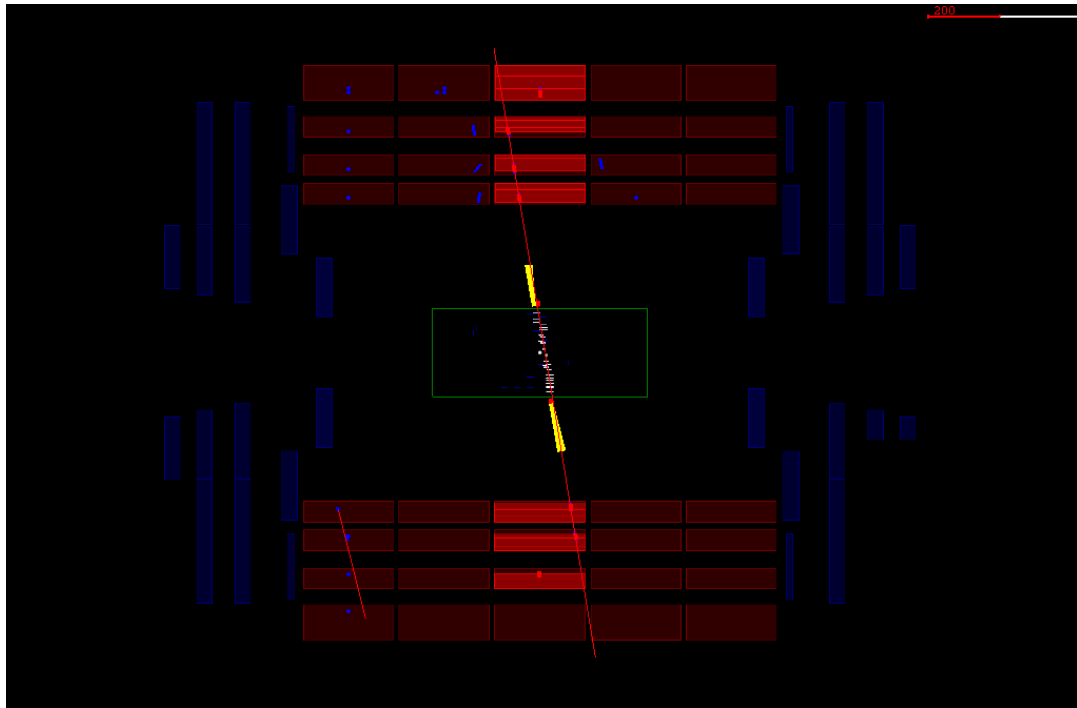
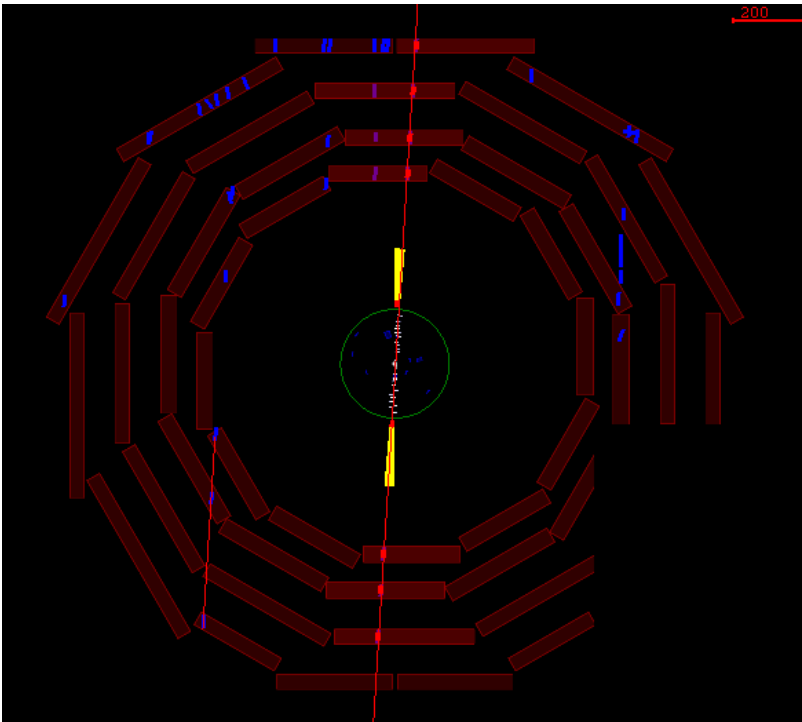
Hits in BPix_BmO_LYR1_LDR6F_MOD2



Hits in FPix_BmO_D1_BLD5_PNL1_MOD4



Cosmics in CRUZET 4



We're told the track is through the BPix here.