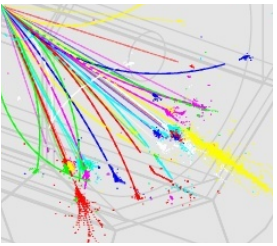
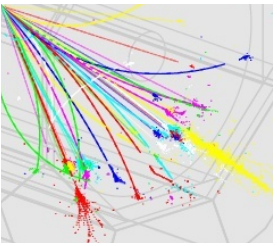


DESY Testbeam Report

RAL 18.01.2008

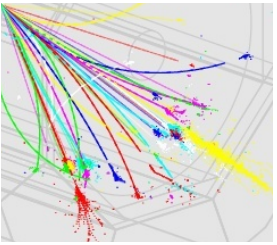
J. Ballin, P. Dauncey, A.-M. Magnan, Y. Mikami,
M. Noy, M. Stanitzki



Status before TestBeam

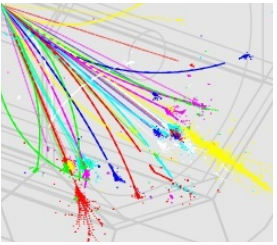
System	Comment
Chip	some testing
PCB	some testing
USBDAQ	some testing
Mechanics	untested
PMT's	untested
DAQ System	untested
Online Monitoring	not ready
Offline Analysis	not ready
Testbeam MC	not ready

- Most experience with 1 sensor systems
- Basically no testing of the whole system put together
- But we went anyway !



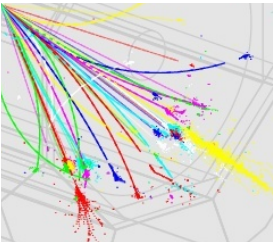
Spares

- We went with exactly 4 Sensors (+1 non-DPW)
  - 1 casualty and that is it
- Plenty of tungsten, cables, etc.
- 1 big computer + laptop cluster
- Plenty of enthusiasm



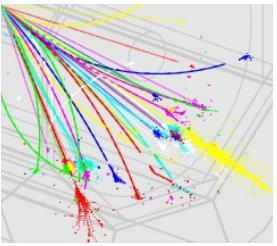
The DESY testbeam area

- We were in TestBeam Area 21
- 1-6 GeV electrons
- Hut was alright for 5 people (not spacious though)
- Plenty of space of in the area
- Movables tables, limos, etc. available from DESY
- Luckily also some NIM logic



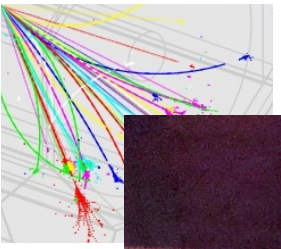
Starting up..

- Everyone came in Sunday day/night
- All equipment came by car/Ferry (Thanks to Matt & Anne-Marie for driving ...)
- Monday morning starting with Safety Course and admin
- We also learned no reliable beam between 0800 to 1100
- Around 10:30 we start unpacking

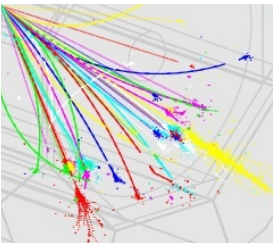


Love your collaborators !

- The ECAL guys just left without cleaning up anything
- Neither their teststand nor the hut
  - Quite a mess
- Explanation
  - They had to leave on Friday
  - Erika was supposed to clean up (she didn't know about it)
  - Thanks a lot !
- So we had to clean up their mess
  - inherited a few cables
  - plus a nice toolbox

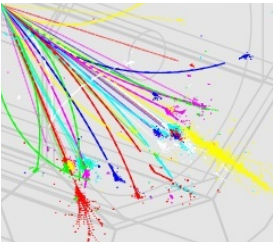



BEAM



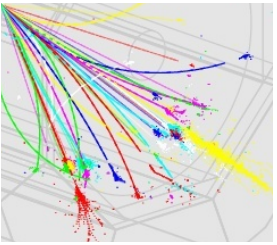
And more fun

- Putting the DAQ together proceeded quickly
- Computers were more troublesome
- DAQ Computer
  - Typo in MAC address, so we rewrite the MAC under Linux
  - Still problems connecting, after like a 60 minutes digging in total we found a Birmingham only connect in hosts.allow (not in iptables ..)
  - Also the Online display doesn't work on the Monitoring laptop
- Same time getting caliceserv going to copy files on the GRID
  - Big help from Beni



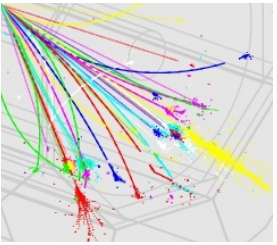
We always wanted know

- Where all the cables go to
- How to find the beam using the PMT's
- That the USB-Disk does not play nice with the USBDAQ
  - requires certain power scheme ..
- Anyway, we take off with a working system at 19:09
  - Paul updated all the software remotely

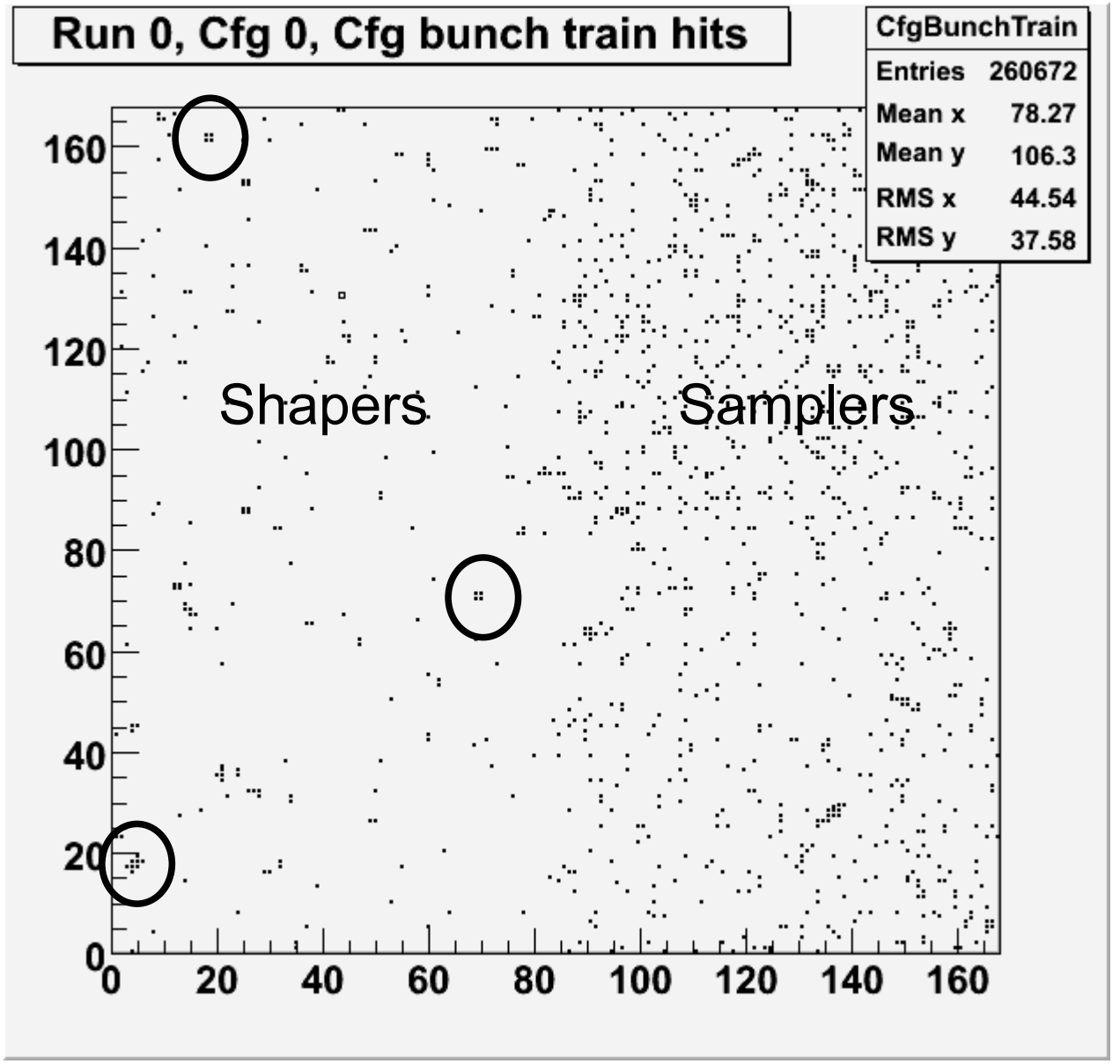


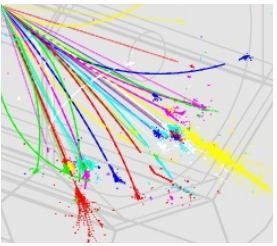
The PMT drama

- A lot of fun
- The first untested thing that really bit us
- We first noted a lot of noise on Tuesday
  - light (but we had a blanket) ?
  - but we put black tape over all sensors
  - And turned off the light
  - Thought we've fixed the problem
- Tuesday 18:30 we go for beam



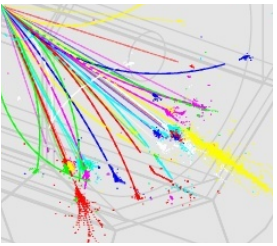
First Hits


Run 0, Cfg 0, Cfg bunch train hits
CfgBunchTrain
Entries 260672
Mean x 78.27
Mean y 106.3
RMS x 44.54
RMS y 37.58
Shapers
Samplers
0
20
40
60
80
100
120
140
160



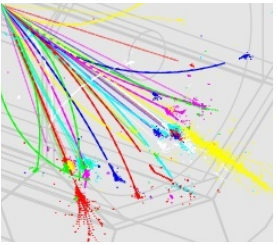
The Safety Review

- Had to be approved by DESY Safety (Wednesday noon)
- Norbert and I spend a morning cleaning the testbeam area (especially removing CALICE ECAL stuff...)
- Was very exciting
- At least we passed without problems or complaints



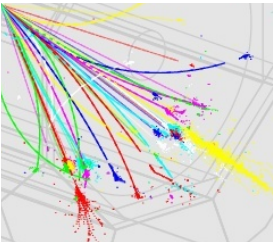
PMT's cont'd

- We still see noise
  - Cross-talk between sensors and PMT's
  - Fixed by using 5th USBDAQ
- More effort to understand the PMT's (only independent way to measure rates and find the beam)
- Thanks to Ingrid we get a NIM logic going for the PMT's
  - We were quite off-beam
  - moving around gets us to 1 kHz (the PMT's claim)
- Patching the software for 5 USBDAQs
- Later we discovered that we accidentally didn't record the PMT hits for a while after this change

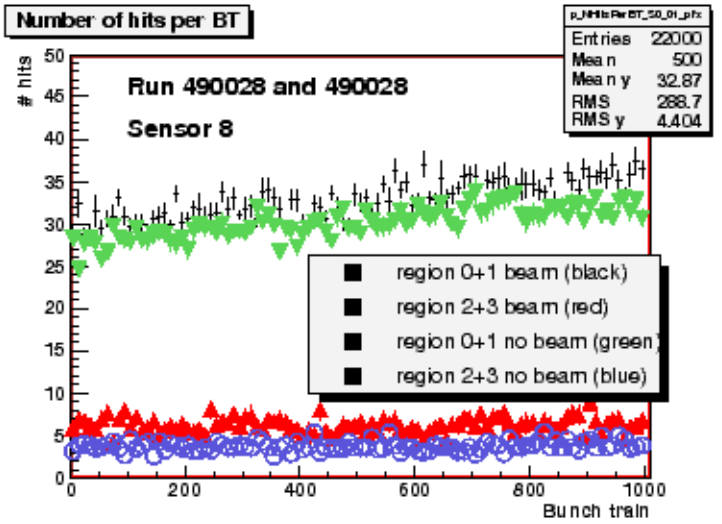


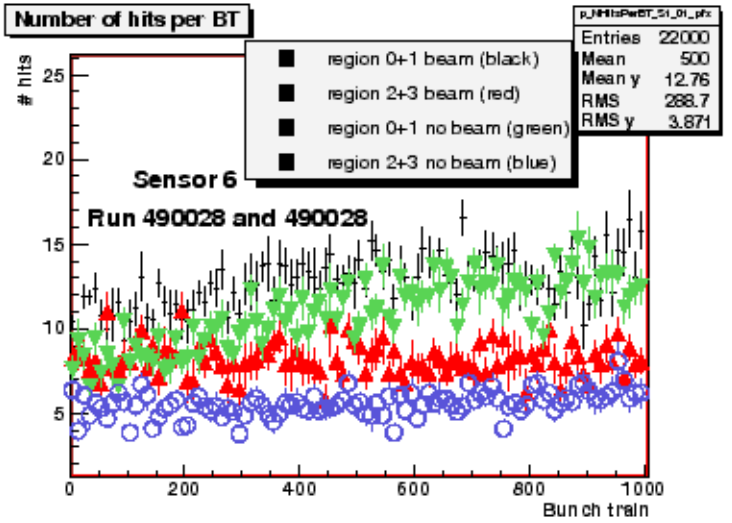
Getting the analysis going

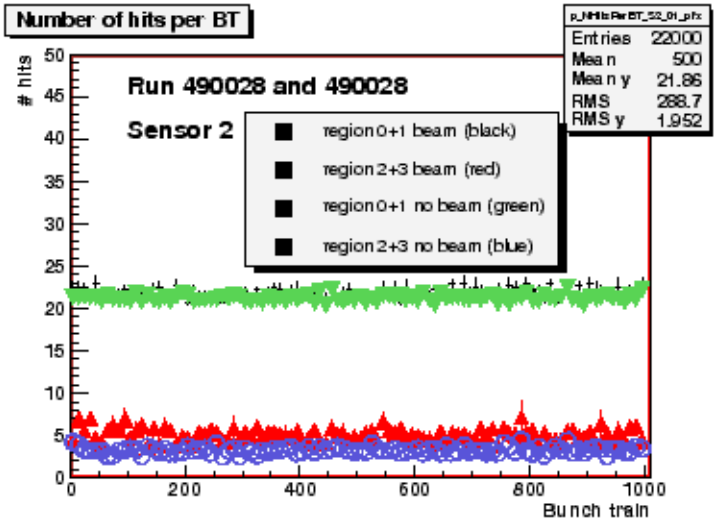
- Only know we start looking at the incoming data in more detail
- Just no time before
  - Start looking at Thresholds
  - PMT's
  - Hits ..

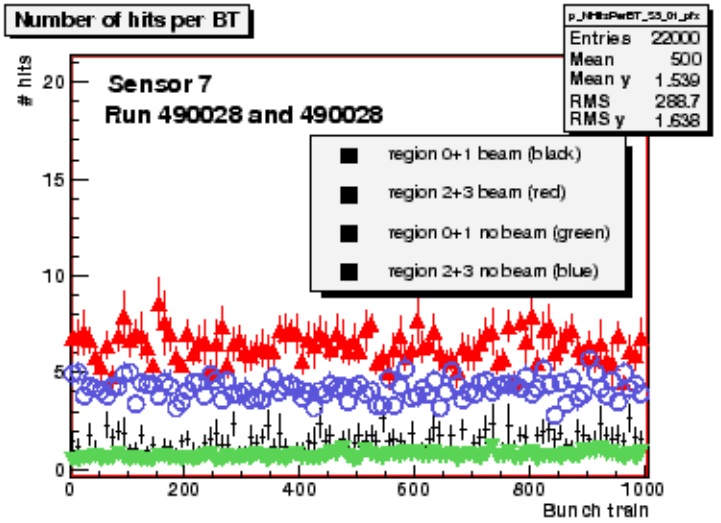


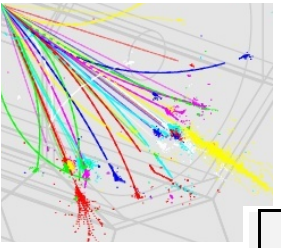
And we confirm beam



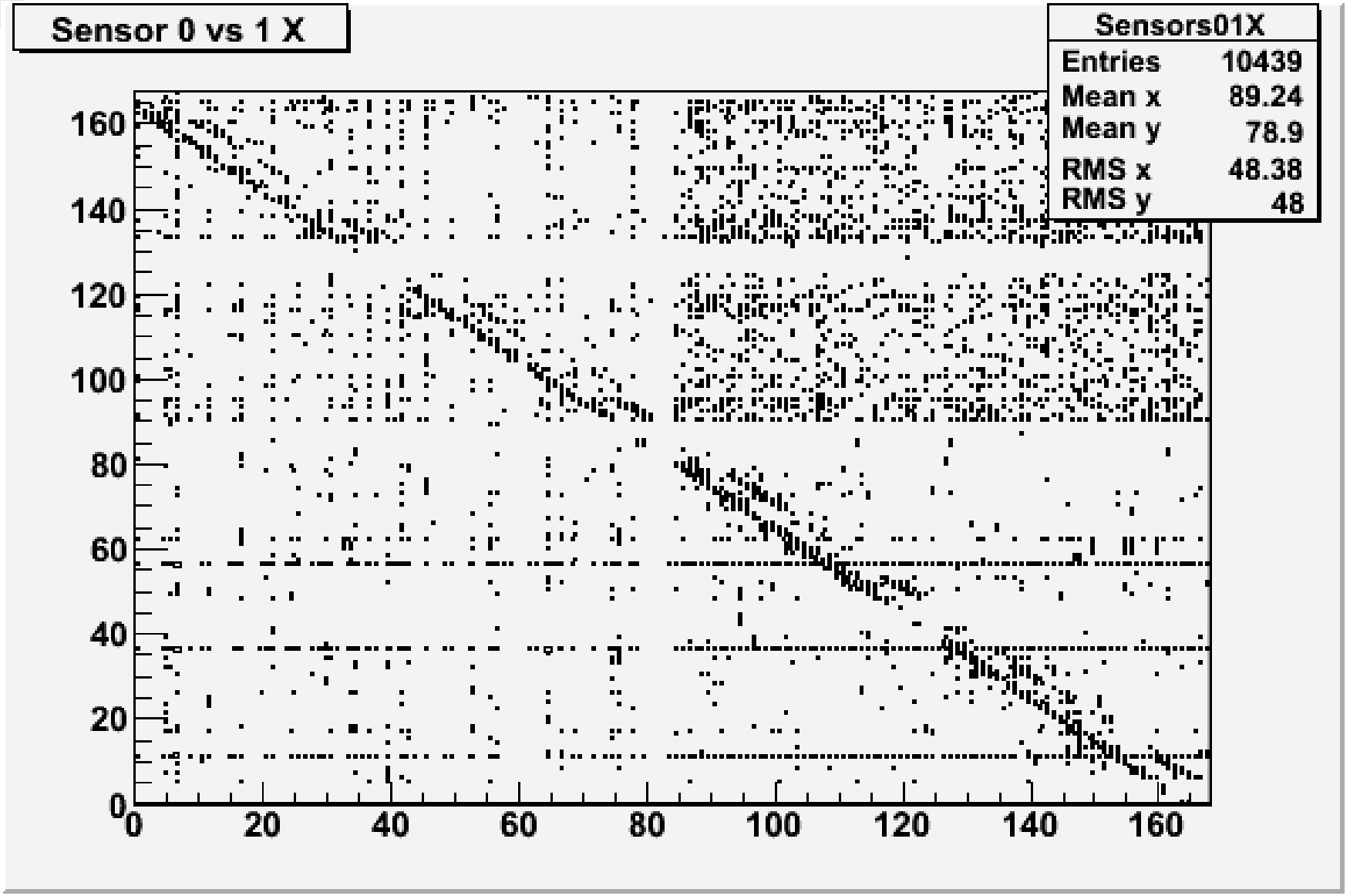


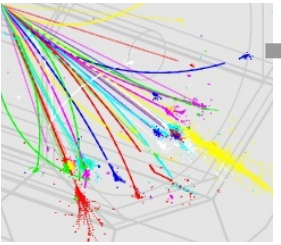






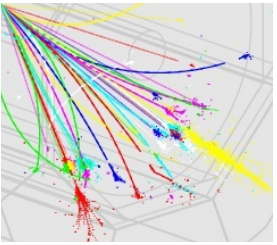
and tracks


Sensor 0 vs 1 X
Sensors01X
Entries 10439
Mean x 89.24
Mean y 78.9
RMS x 48.38
RMS y 48
160
140
120
100
80
60
40
20
0
0
20
40
60
80
100
120
140
160

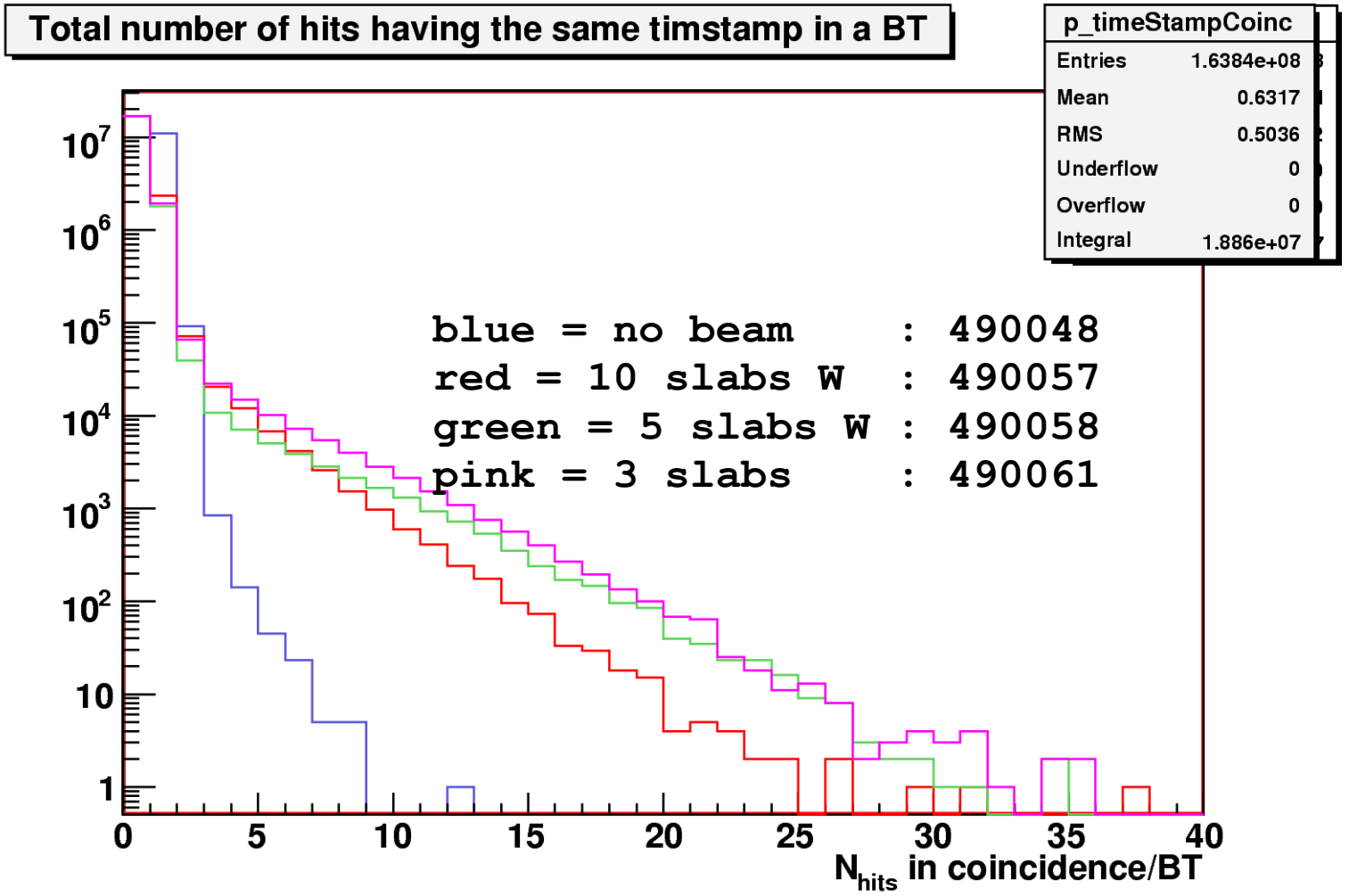


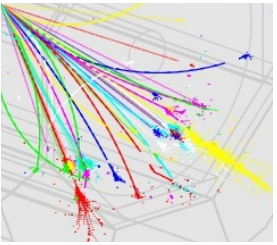
Trying to do the physics ...

- Thursday to Sunday we try to do the physics program
  - Tracking Threshold Scans
  - Runs with Tungsten
  - Run with a nonDPW one
- Everything takes much longer than expected
- We don't seem to see the showers
  - but they should be bloody obvious ...

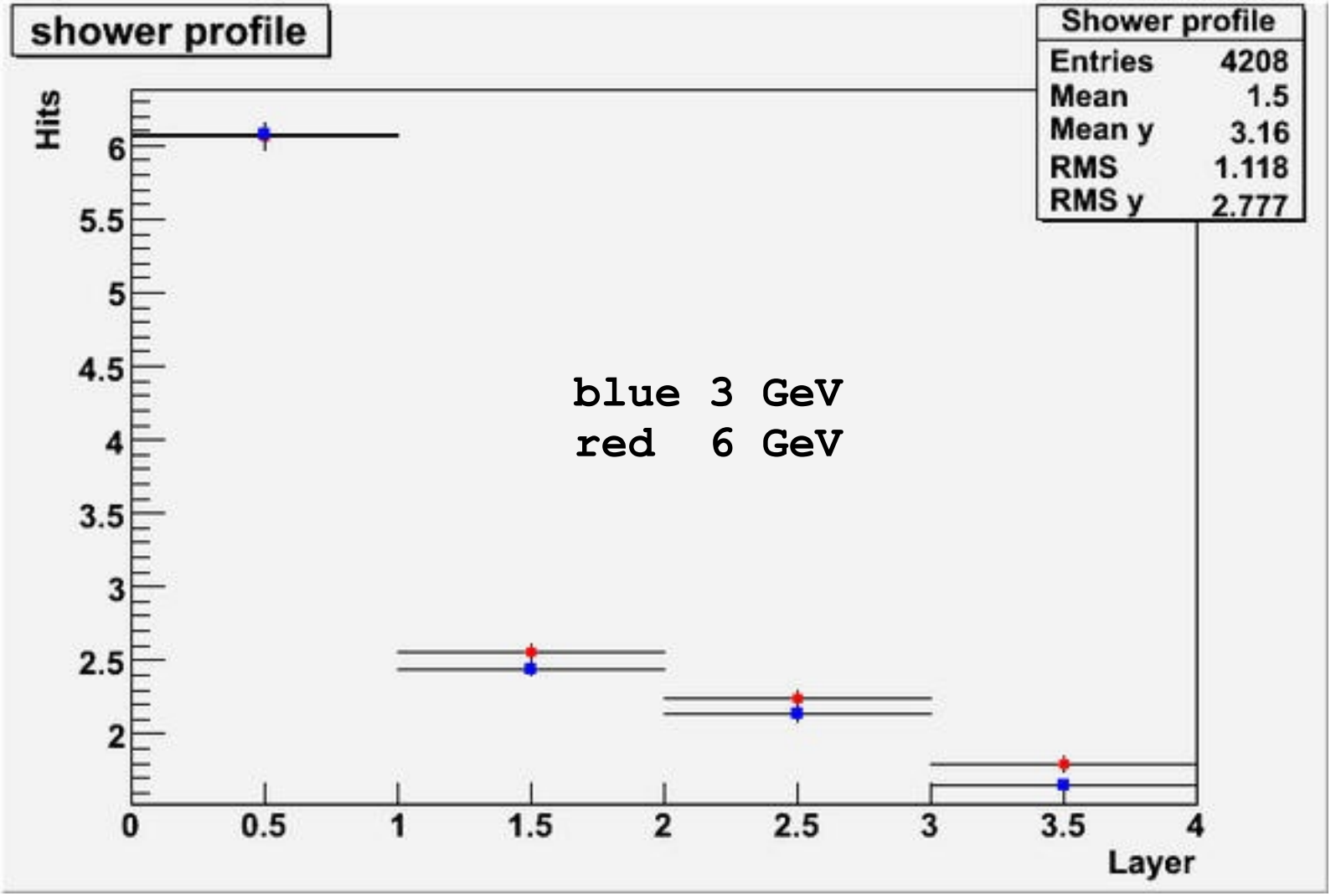


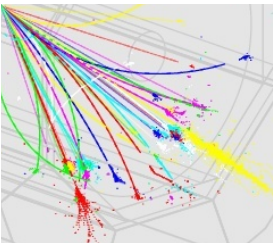
Some Success





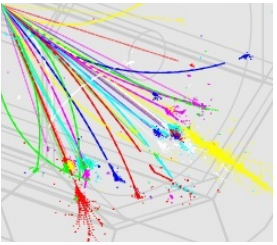
More ...


shower profile
Shower profile
Entries 4208
Mean 1.5
Mean y 3.16
RMS 1.118
RMS y 2.777
Hits
blue 3 GeV
red 6 GeV
Layer
0
0.5
1
1.5
2
2.5
3
3.5
4
2
2.5
3
4
4.5
5
5.5
6

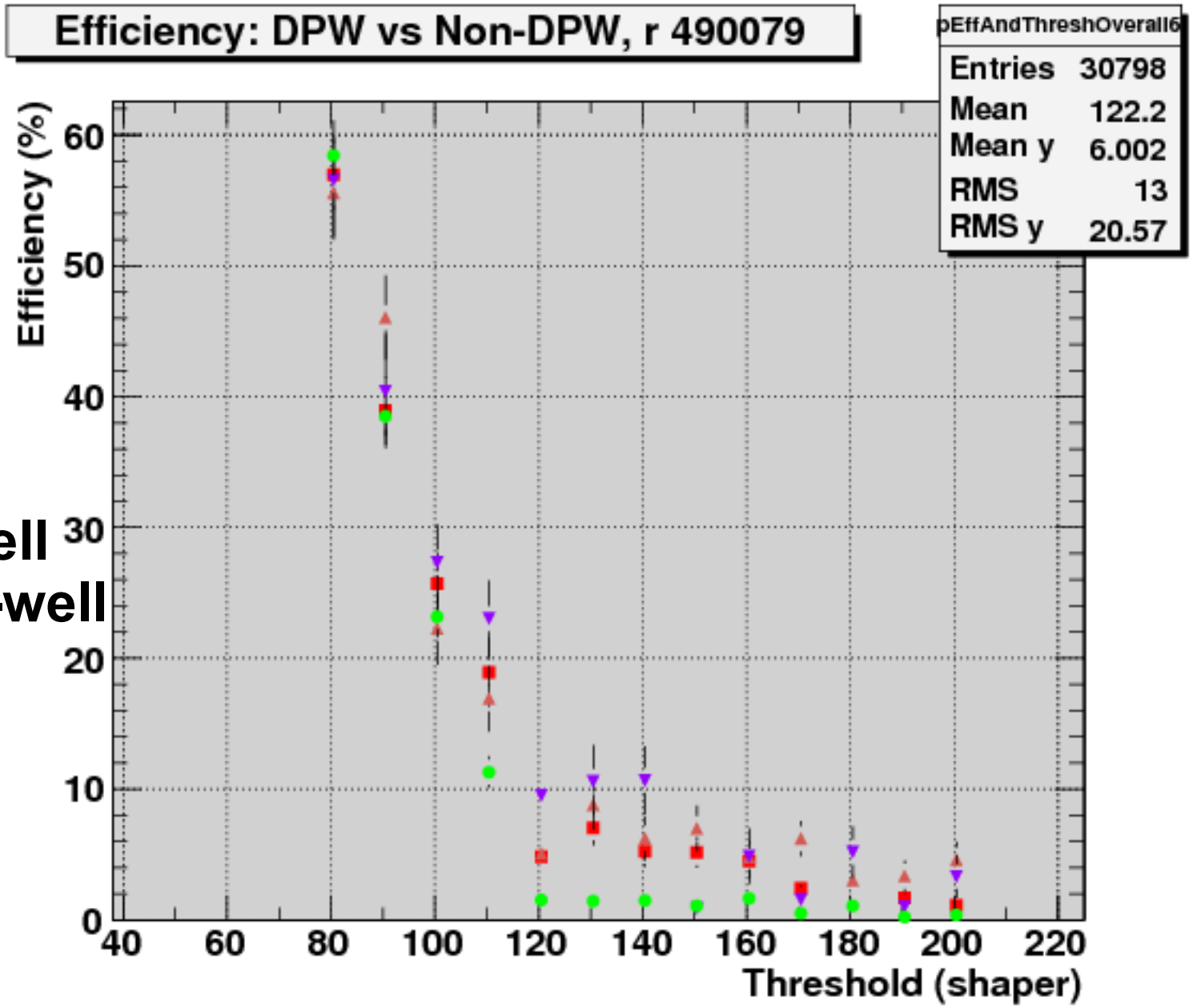


The efficiency problem

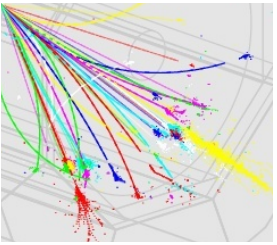
- All our studies indicate:
  - We have a efficiency problem
- See roughly a tracking efficiency of 10 %
- See evidence for shower but not enogh particles at all
- We expect between 30/50 hits for 3/6 GeV
- Long discussions ...



The Plot

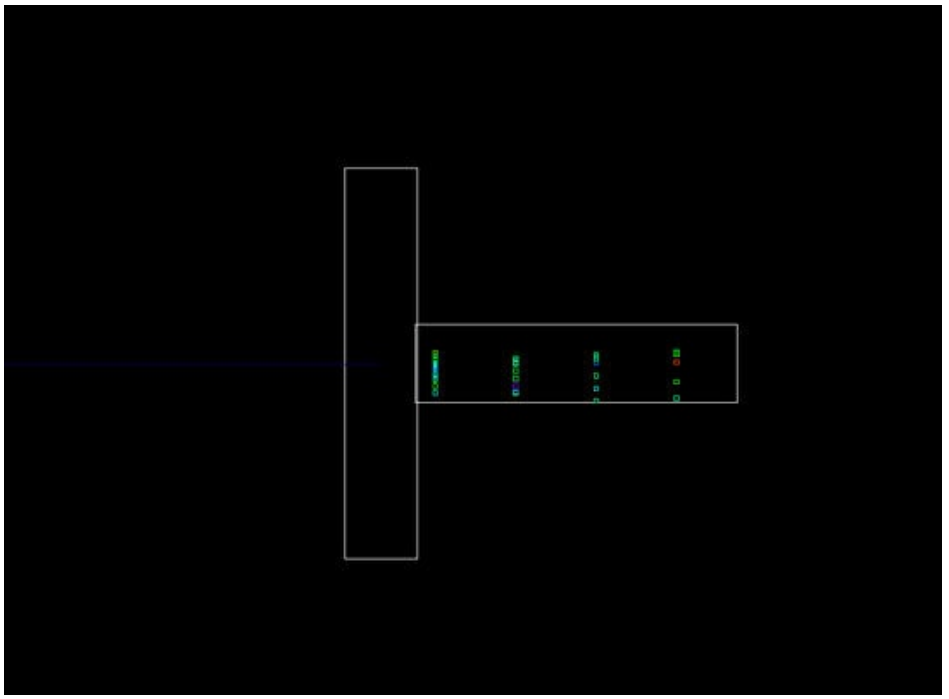


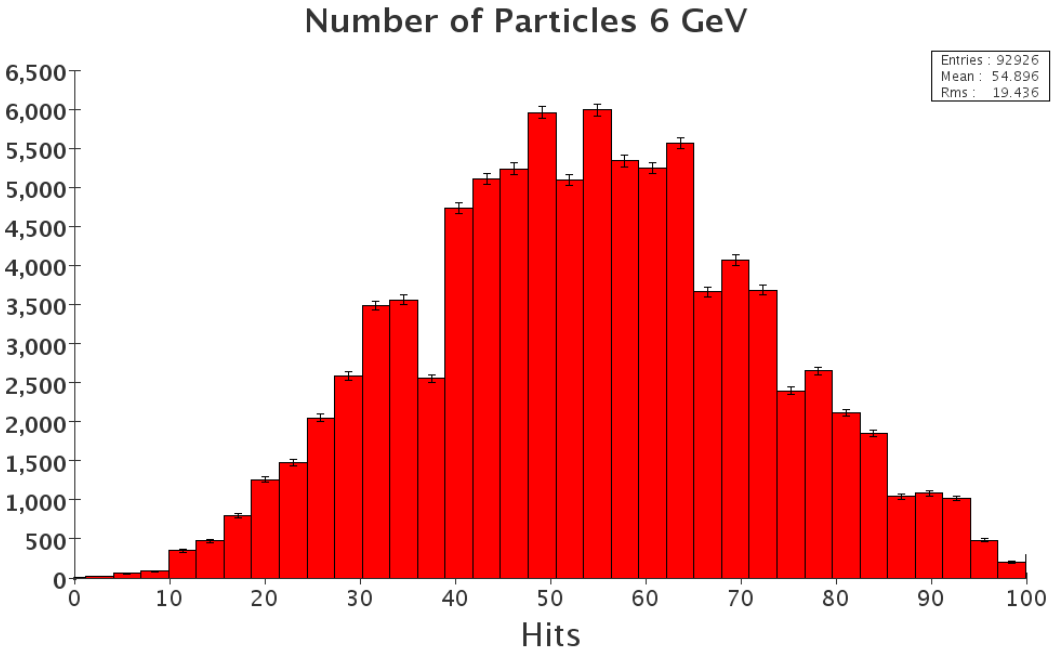
Green:
Non-deep p-well
Other: deep-p-well

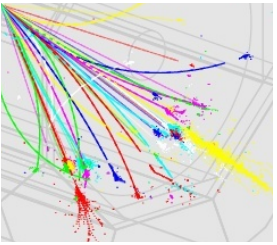


Hacking a TestBeam MC

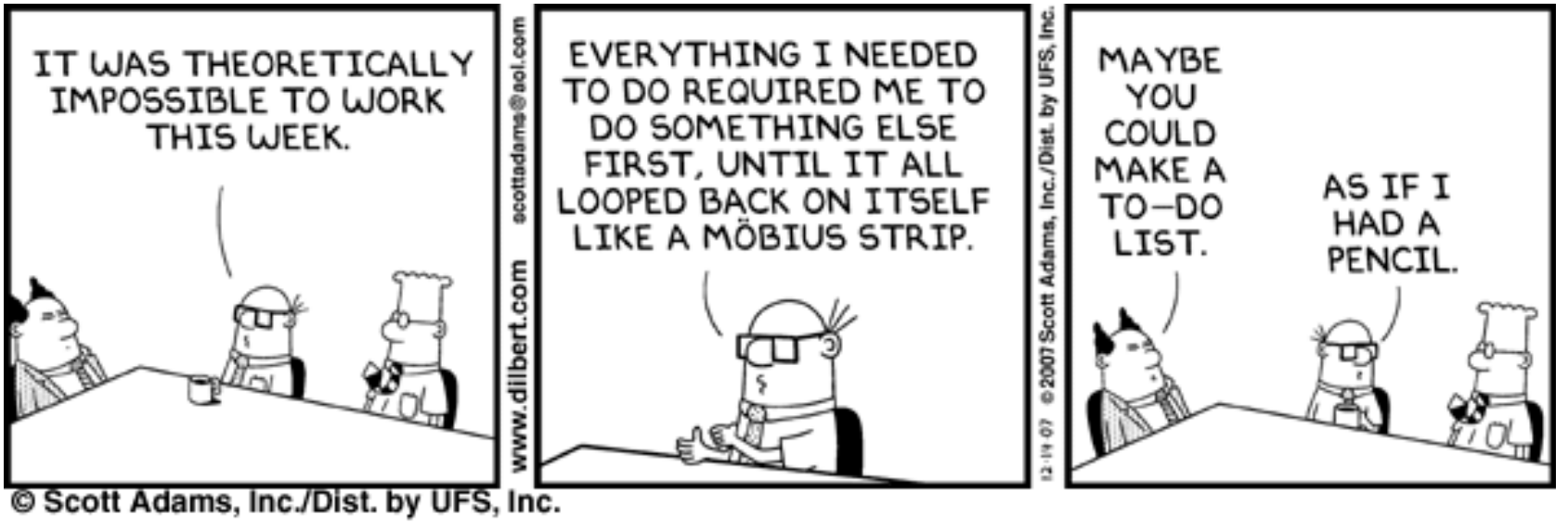
- really to prove the point we wanted to make
- Quickly put together using SLIC

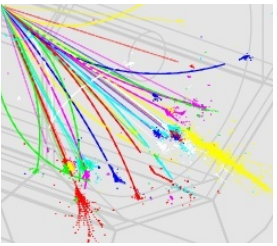






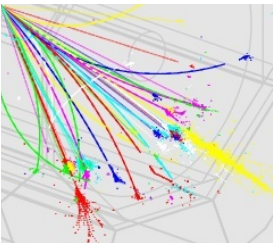
A piece of wisdom





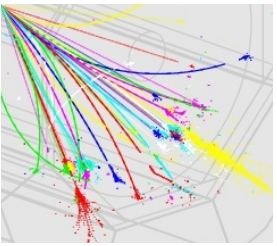
Things that worked well

- The Chip
  - ok, we have very low signal
  - But no major hick-ups extravaganzas like e.g. SVXIIIA
  - None of the chips died
- USBDAQ
  - Very reliable operation
  - Some minor issues with the USB-Bus
  - No crashes (besides us doing stupid things)
- Mechanics
  - ok to use



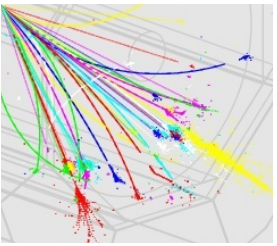
Lessons learned

- We must to do a complete system test
  - Commissioning during TestBeam is crazy
  - Exercise the entire chain from sensor to online monitoring
  - test the PMT's
- Mechanics/PCB
  - main problem was that boards popped ouf the rails
  - if we make a second generation PCB, make it 1 cm longer, so better support on the other side
  - Cables: No likely that there is a golden solution but 12 flat ribbon cables are not ideal to work with.



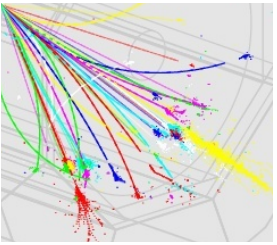
Cont'd

- DAQ software
  - same as for the system test, we went as we go
  - We should have it in CVS/SubVersion to keep track of changes
  - Even more important if people at two places look/work at it
  - Having the only real software expert sitting at Imperial is bad
    - Remote operations just doesn't work !
    - Having Paul out there would have been very useful
- Run Configurations
  - Should have the possibility to change parameters without recompiling !
  - Something we can easily add



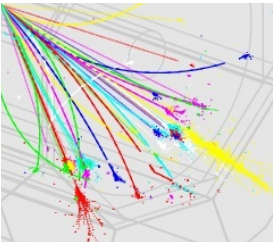
Cont'd

- Online Monitoring
  - Basically was commissioned during TestBeam
  - would have benefited from a system test
- Offline Analysis
  - We need to have a defined set of plots we want to look at right away.
  - Again something that would have come out of a system test
  - Basically wrote code “on the fly”
  - Documentation, Documentation, Documentation



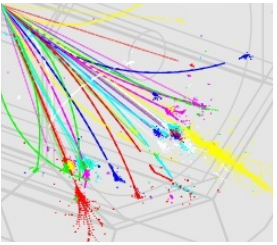
Cont'd

- Computing
  - bring own infrastructure
  - test everything before
  - more Computers for Analysis
- PMT's
  - bring own NIM logic
  - Test them thoroughly
  - maybe have more PMT's even
- Site
  - Actually going there before and looking at the area would have been good



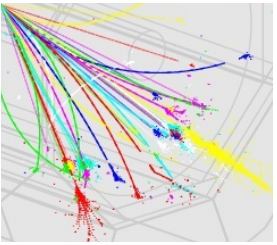
Cont'd

- Shift operation
  - never really got to that point
  - needed everyone to get things ready
  - Especially for analysis were more productive this way
  - Would have loved to move to stable operations ...



Summary

- We took ~ 70 GB of data
  - which will be quite useful
- No casualties
  - letting aside some scars
- We learned
  - The chip works
  - The efficiency is about 10 %
  - A lot of things we'd do better (if there is a next time)



Acknowledgments

- We'd like to thank
  - The DESY people, especially Norbert Meyners, Ingrid Gregor Beni Lutz and Erika Garutti
  - The Block House for serving late
  - The Penny Market for opening late