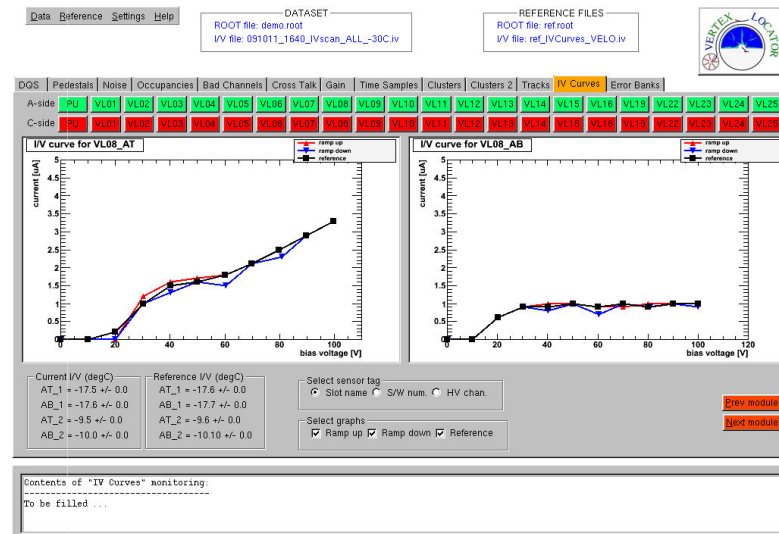
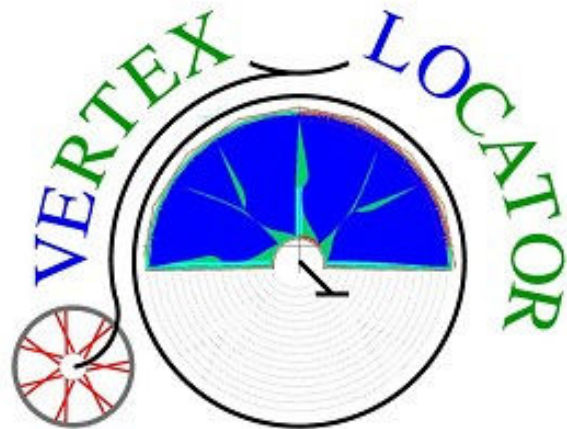


# VELO Data Quality

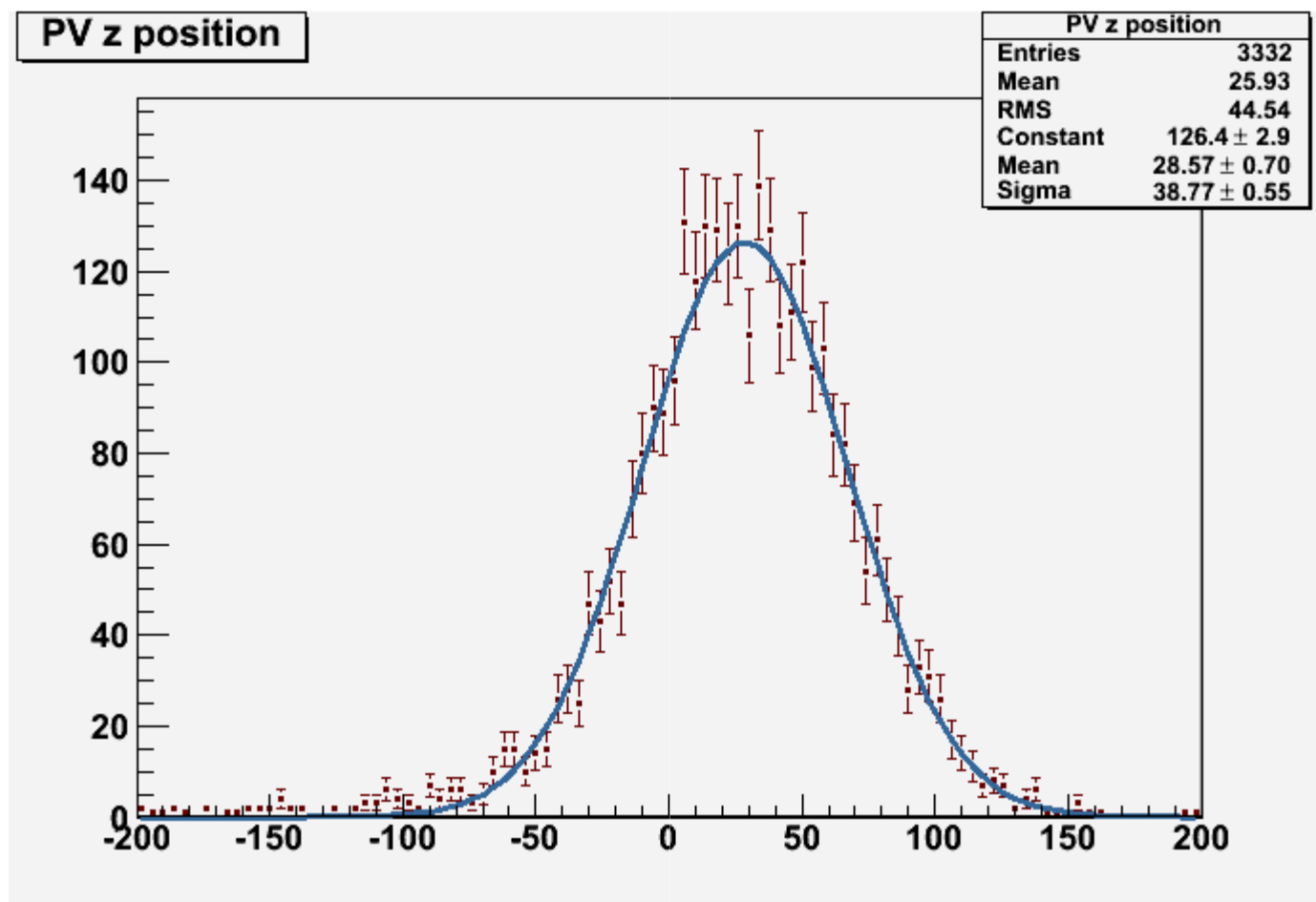
Eduardo Rodrigues  
University of Glasgow

LHCb Data Quality Meeting, CERN, 10 December 2009

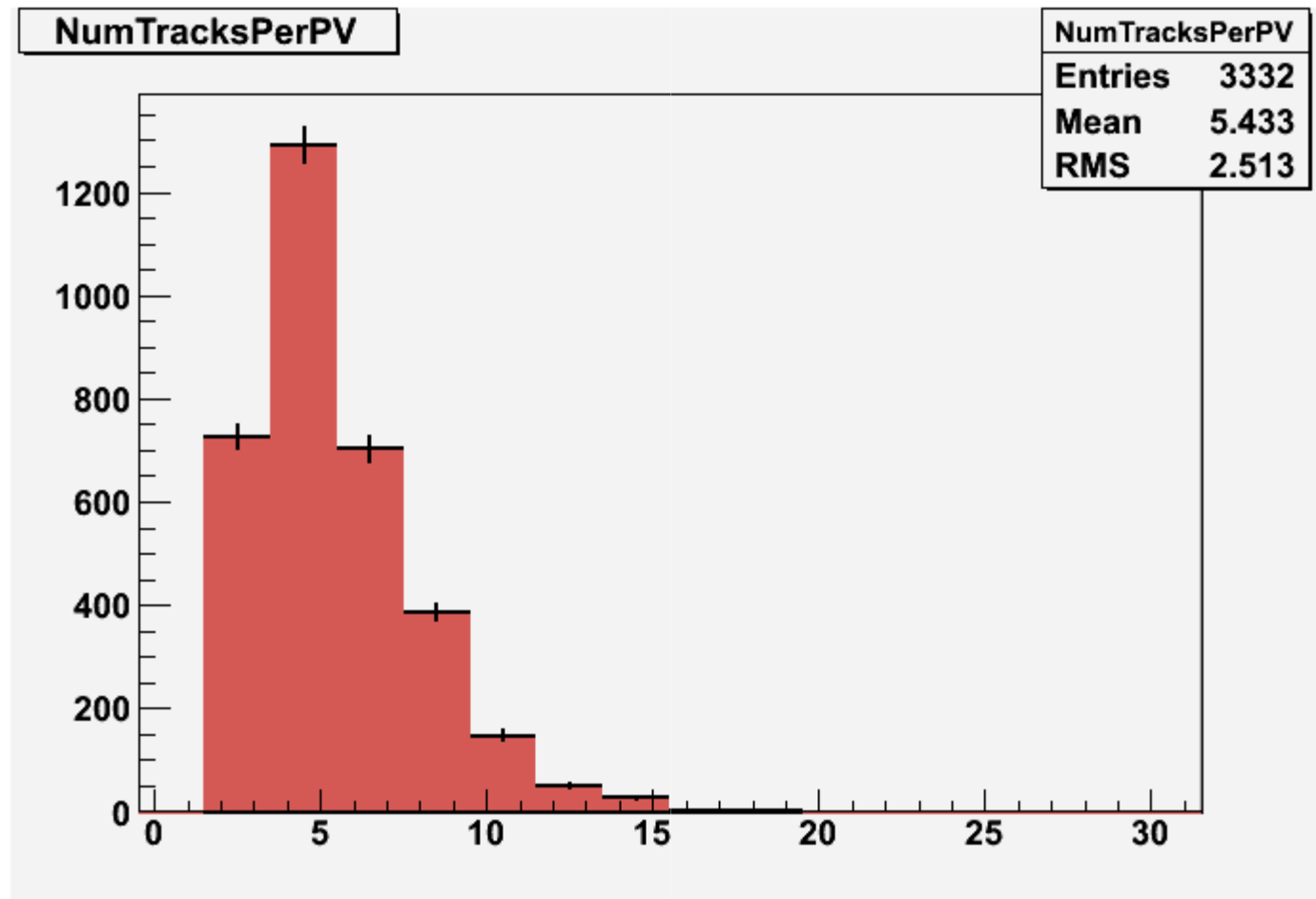


# VELO – the LHCb vertex detector ;-)

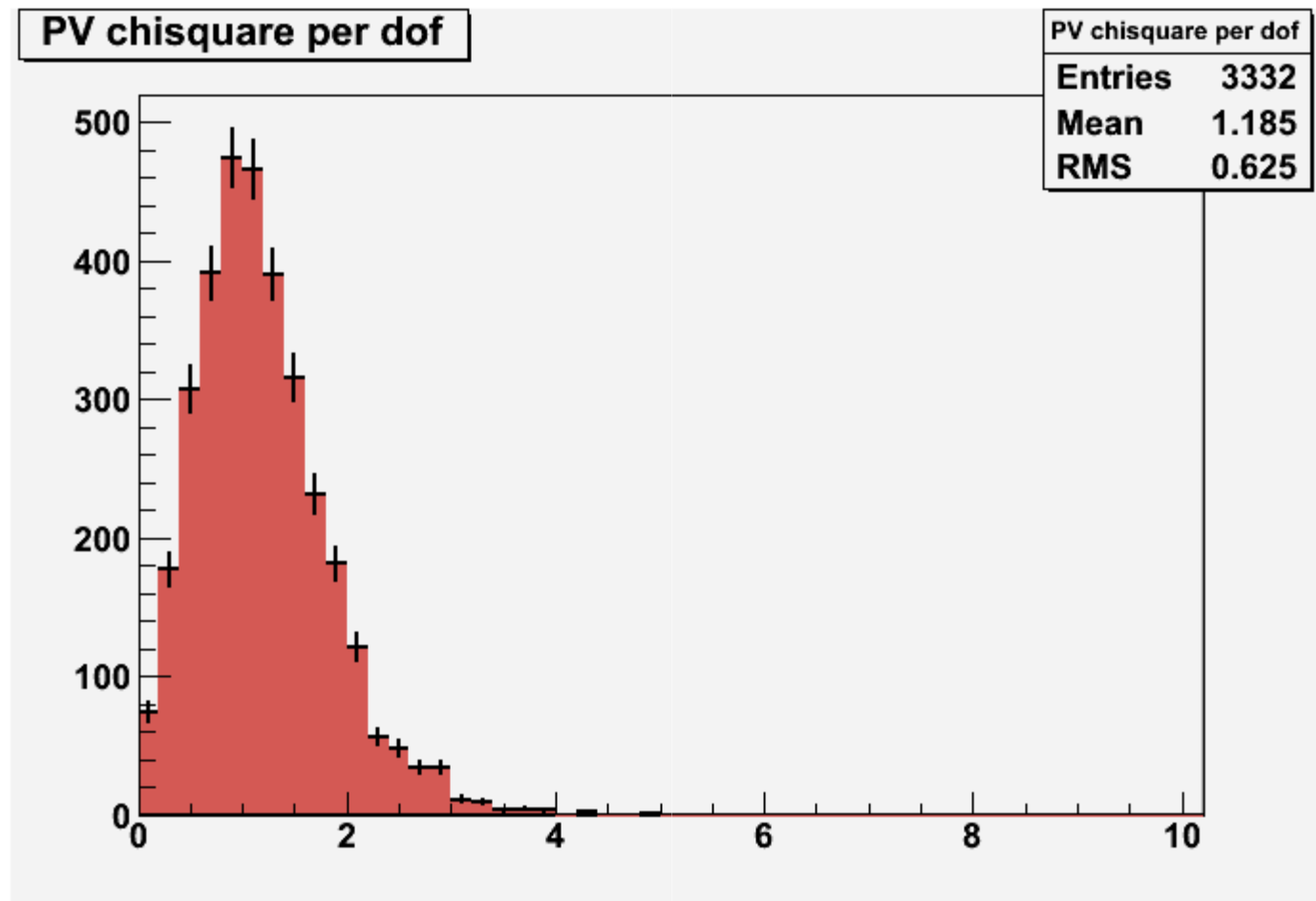
*A beautiful set of primary vertices from \*the\* run 63567*



# VELO – the LHCb vertex detector ;-)



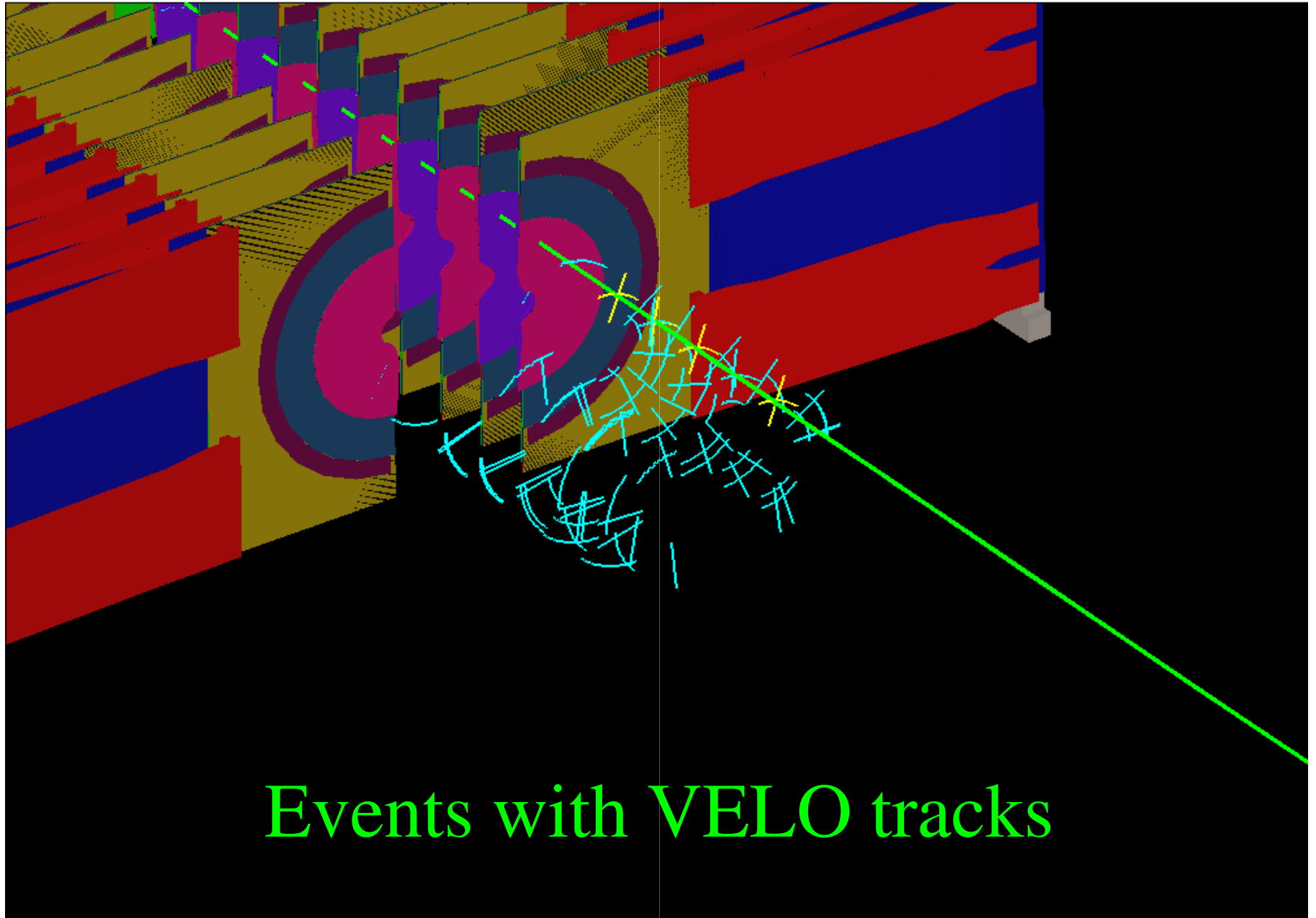
# VELO – the LHCb vertex detector ;-)



Run=62514 Evt=197885

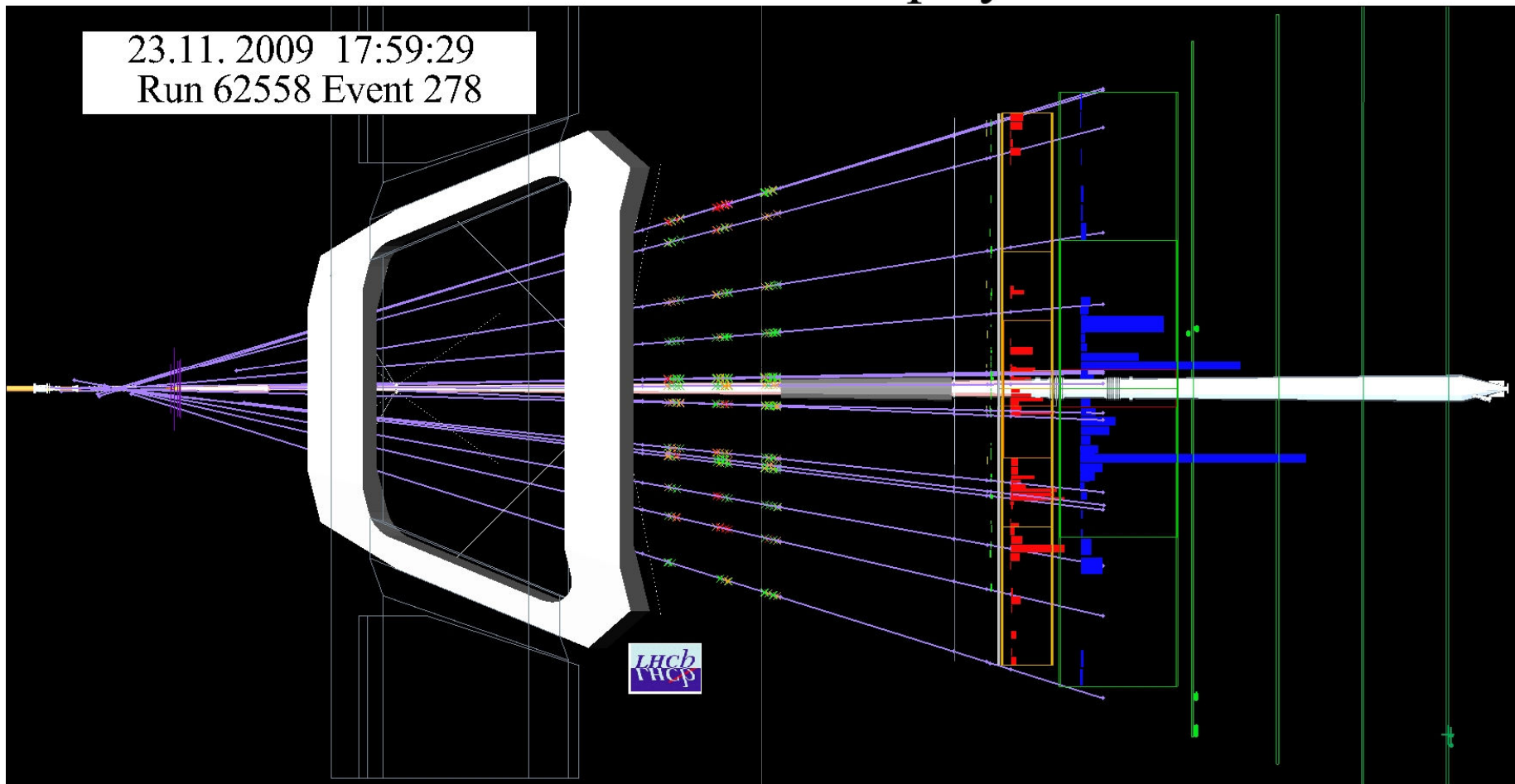
VELO tracks

22.11. 2009 00:09:58



Events with VELO tracks

## LHCb Event Display



# Overview of VELO DQ&M activities

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**Online presenter & monitoring** : Kurt

**Data Quality coordination** : Eduardo

## **Monitoring contributions – contact person(s):**

Monitoring of occupancy in HLT	: Malcolm
TELL1 algorithm & pedestals	: Tomasz
Error banks	: Chiara
Timing monitoring	: Kazu, Ivan
IV monitoring	: Lars
Noisy & dead strips	: James K.
Noise vs voltage	: Abdi
Gain monitoring	: Grant
Occupancies	: James K.
Cluster monitoring	: Eduardo, James M.-S.
Track and vertex monitoring	: Silvia
Alignment monitoring	: Silvia
IP resolution monitoring	: Michael
Pile-up system monitoring	: Serena
Monitoring GUI	: Eduardo
Landau fitting	: James M.-S.
Other contributors	: Chris, Karol, Kurt, Paula

# Web documentation

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## ❑ Web / Twiki pages:

- <https://lbtwiki.cern.ch/bin/view/VELO/VELODataQuality>
- <https://lbtwiki.cern.ch/bin/view/VELO/VELODQMShifters>
- <https://lbtwiki.cern.ch/bin/view/VELO/VELODQMAgorithms>
- <https://lbtwiki.cern.ch/bin/view/VELO/VetraScripts>
- <https://lbtwiki.cern.ch/bin/view/VELO/VeloOnlinePresenter>
- <http://lhcb-release-area.web.cern.ch/LHCb-release-area/DOC/vetra/>
- <https://lbtwiki.cern.ch/bin/view/VELO/VETRAHowTo>

## ❑ CVS repository:

- <http://isscvcs.cern.ch/cgi-bin/cvsweb.cgi/Velo/VeloDataMonitor/?cvsroot=lhcb>
- <http://isscvcs.cern.ch/cgi-bin/cvsweb.cgi/Velo/VeloRecMonitors/?cvsroot=lhcb>
- <http://isscvcs.cern.ch/cgi-bin/cvsweb.cgi/Velo/VetraScripts/?cvsroot=lhcb>
- <http://isscvcs.cern.ch/cgi-bin/cvsweb.cgi/Tell1/Vetra/?cvsroot=lhcb>



# VELO DQM framework – the GUI

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## *Why a GUI ?*

- ❑ Because it provides by construction a friendly interface to the shifter
- ❑ And it also provides a common framework on which to « plug » monitoring tasks, with basic functionality shared among the latter

## *DQM software suite*

- ❑ NZS and ZS data monitoring algorithms are packaged in Velo/VeloDataMonitor and Velo/VeloRecMonitors, respectively
- ❑ The corresponding analysis scripts (ROOT macros, Python modules/scripts) are collected in Velo/VetraScripts
- ❑ The VELO monitoring GUI is the main user interface, the one shifters will be dealing with 99% of the time
- ❑ But all the analysis scripts can also be run in standalone, i.e. not via the GUI. This may be useful in « expert mode »

The screenshot shows the VeloMoniGUI interface with several callouts:

- Top-level menu for basics:** Points to the menu bar containing Data, Reference, Settings, and Help.
- 1 tab per "monitoring task":** Points to the "Clusters" tab in the main window.
- Indicators of open ROOT/IV curve files:** Points to the DATASET and REFERENCE FILES status boxes at the top.
- Documentation window (per tab):** Points to the text area at the bottom of the Clusters tab.

**DATASET**  
ROOT file: demo.root  
IV file not yet specified

**REFERENCE FILES**  
ROOT file: ref.root  
IV reference not yet specified

VERTEX LOCATOR

DQS | Ped | Noise | Occupancies | Bad Channels | Cross Talk | Gain | Time Samp. | **Clusters** | Clusters 2 | Tracks | Curves | Error Banks

Clusters | ADC distributions

Time sample options  
 Prev3  Prev2  Prev1  Default  Next1  Next2  Next3

Reference(s)  
 On / off

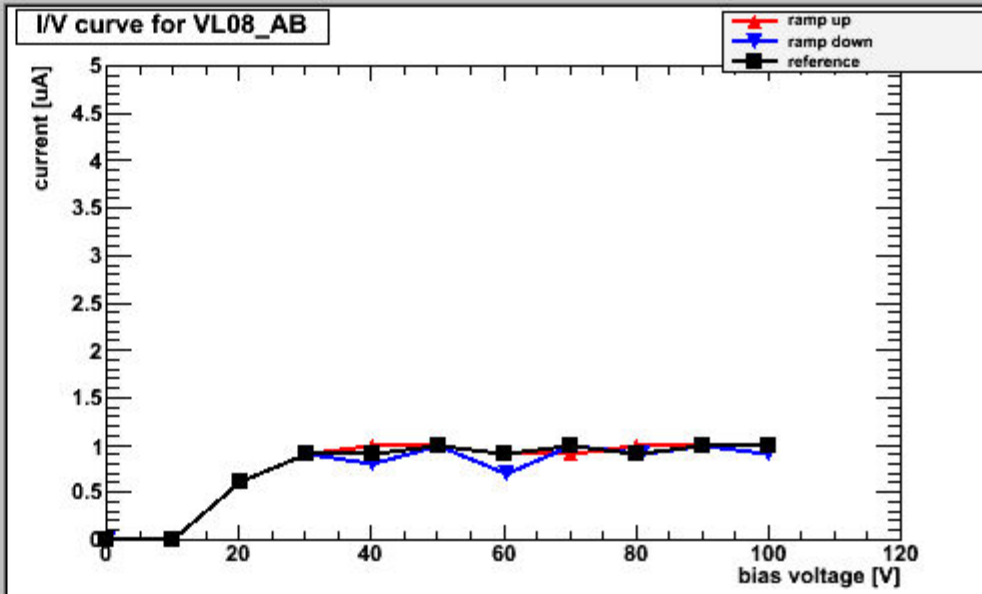
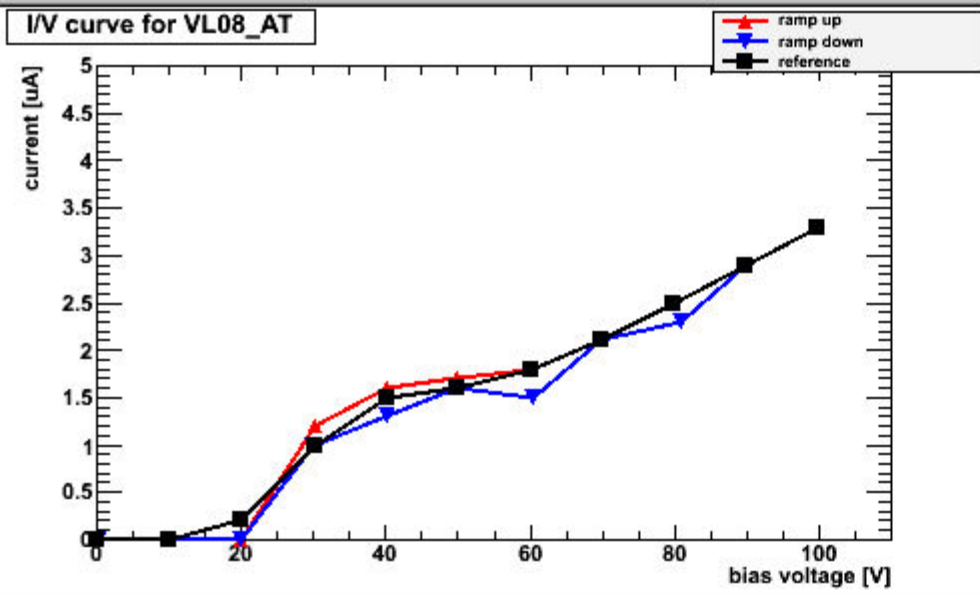
Contents of "Clusters" monitoring:  
-----  
The clusters-based monitoring displays basic distributions of clusters such as the number of (VELO) clusters per event, the number of strips per cluster and the Landau (ADC value) distributions. Certain 2D histograms allow a comparison versus the sensor number.

ROOT file: demo.root  
I/V file: 091011\_1640\_IVscan\_ALL\_-30C.iv

ROOT file: ref.root  
I/V file: ref\_IVCurves\_VELO.iv



A-side	PU	VL01	VL02	VL03	VL04	VL05	VL06	VL07	VL08	VL09	VL10	VL11	VL12	VL13	VL14	VL15	VL16	VL19	VL22	VL23	VL24	VL25
C-side	PU	VL01	VL02	VL03	VL04	VL05	VL06	VL07	VL08	VL09	VL10	VL11	VL12	VL13	VL14	VL15	VL16	VL19	VL22	VL23	VL24	VL25



Current I/V (degC)  
 AT\_1 = -17.5 +/- 0.0  
 AB\_1 = -17.6 +/- 0.0  
 AT\_2 = -9.5 +/- 0.0  
 AB\_2 = -10.0 +/- 0.0

Reference I/V (degC)  
 AT\_1 = -17.6 +/- 0.0  
 AB\_1 = -17.7 +/- 0.0  
 AT\_2 = -9.6 +/- 0.0  
 AB\_2 = -10.10 +/- 0.0

Select sensor tag  
 Slot name  S/W num.  HV chan.

Select graphs  
 Ramp up  Ramp down  Reference

Prev module  
Next module

Contents of "IV Curves" monitoring:  
 -----  
 To be filled ...

# On procedures

---

## *DQM*

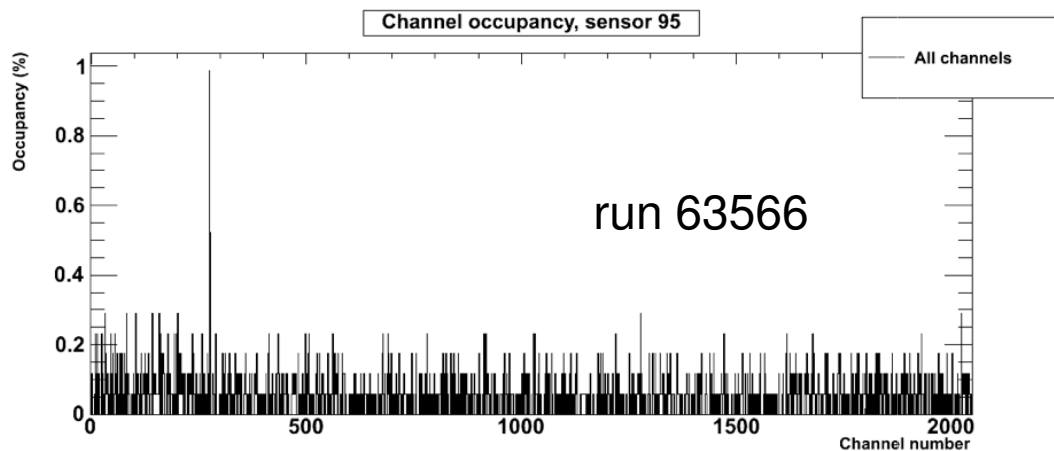
- ❑ The data quality & monitoring procedures for VELO shifters are explained in <https://lbtwiki.cern.ch/bin/view/VELO/VELODQMShifters>
  - meant to be the most up-to-date reference on procedures and practical details
- ❑ During these few days of data taking, procedures have been, in general, followed by the VELO shifters
  - though the DQ checks have not always been done fully :S
  - things will for sure improve with experience and user feedback
- ❑ Tomorrow's VELO meeting aiming at a discussion based on users experience, report of problems & next steps, etc,

## *Bug reports*

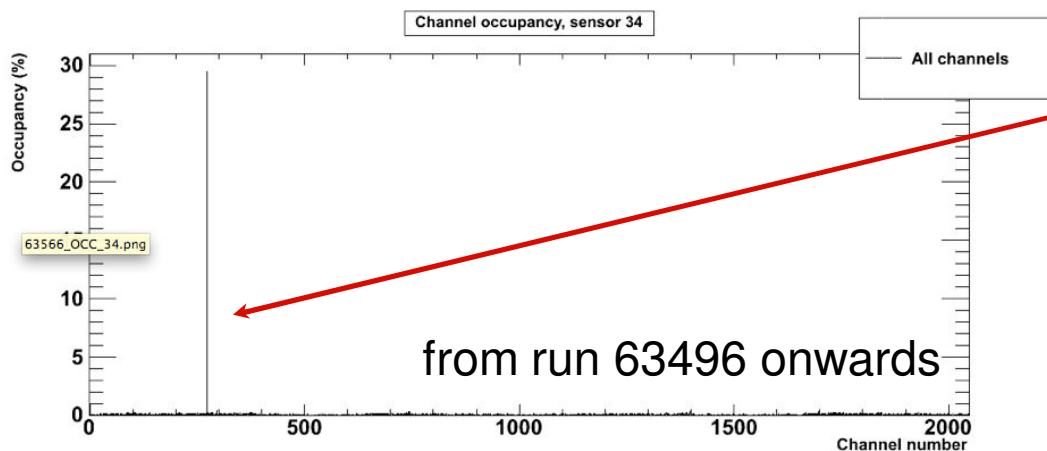
- ❑ To be done via the LHCb Data Quality Savannah portal <https://savannah.cern.ch/projects/lhcbdataquality/>
- ❑ Shifters are starting to get into this “habit” ...

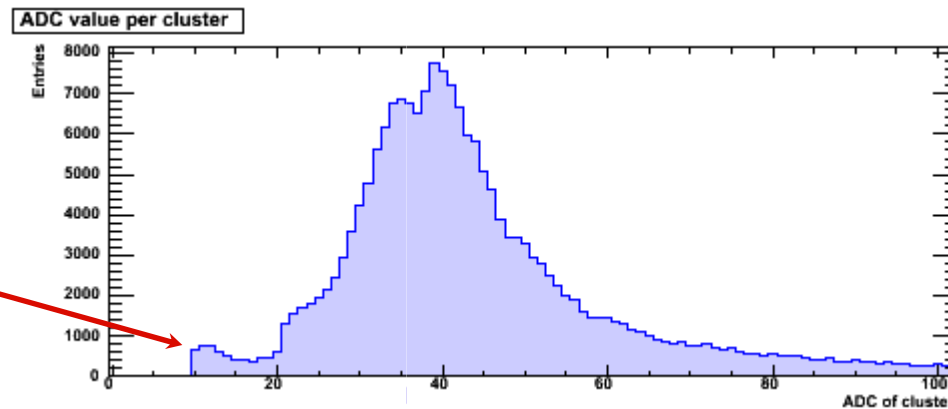
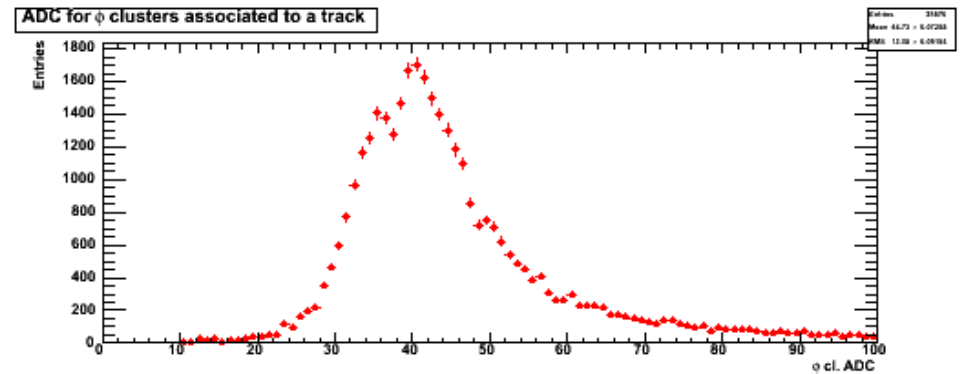
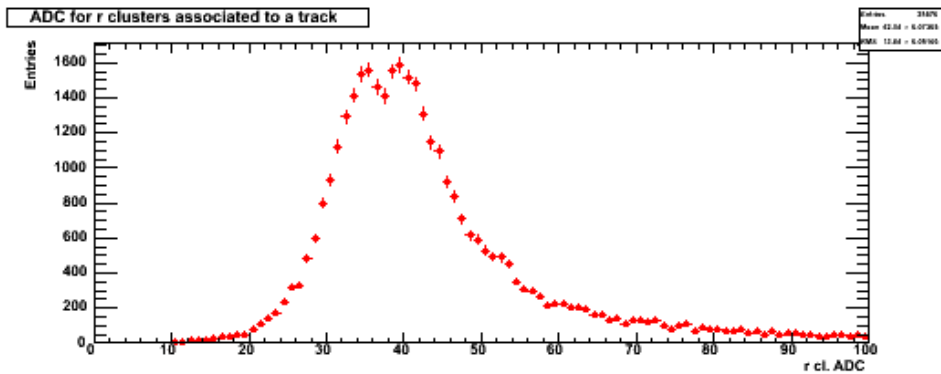
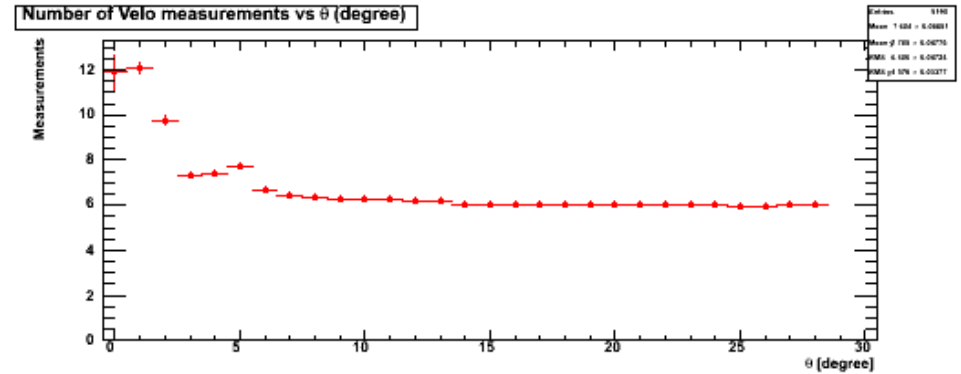
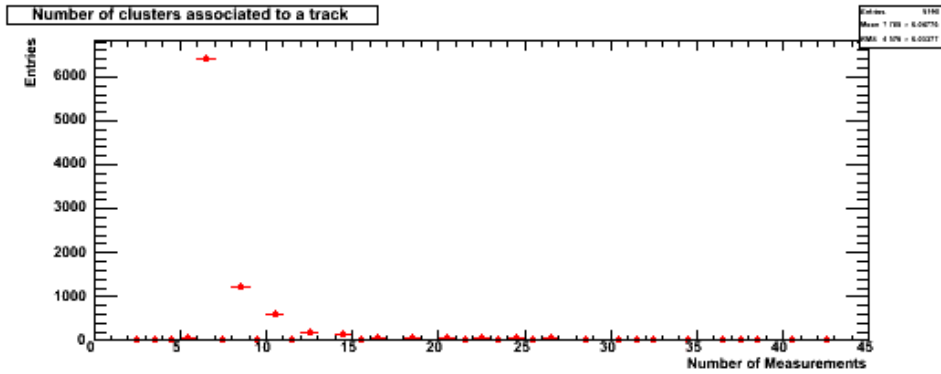
# DQM – does it fit its purpose?

*Example: occupancies moni. Finding "hot channels"*



Mostly intermittent problems.  
Static problem on sensor 34,  
channel 273





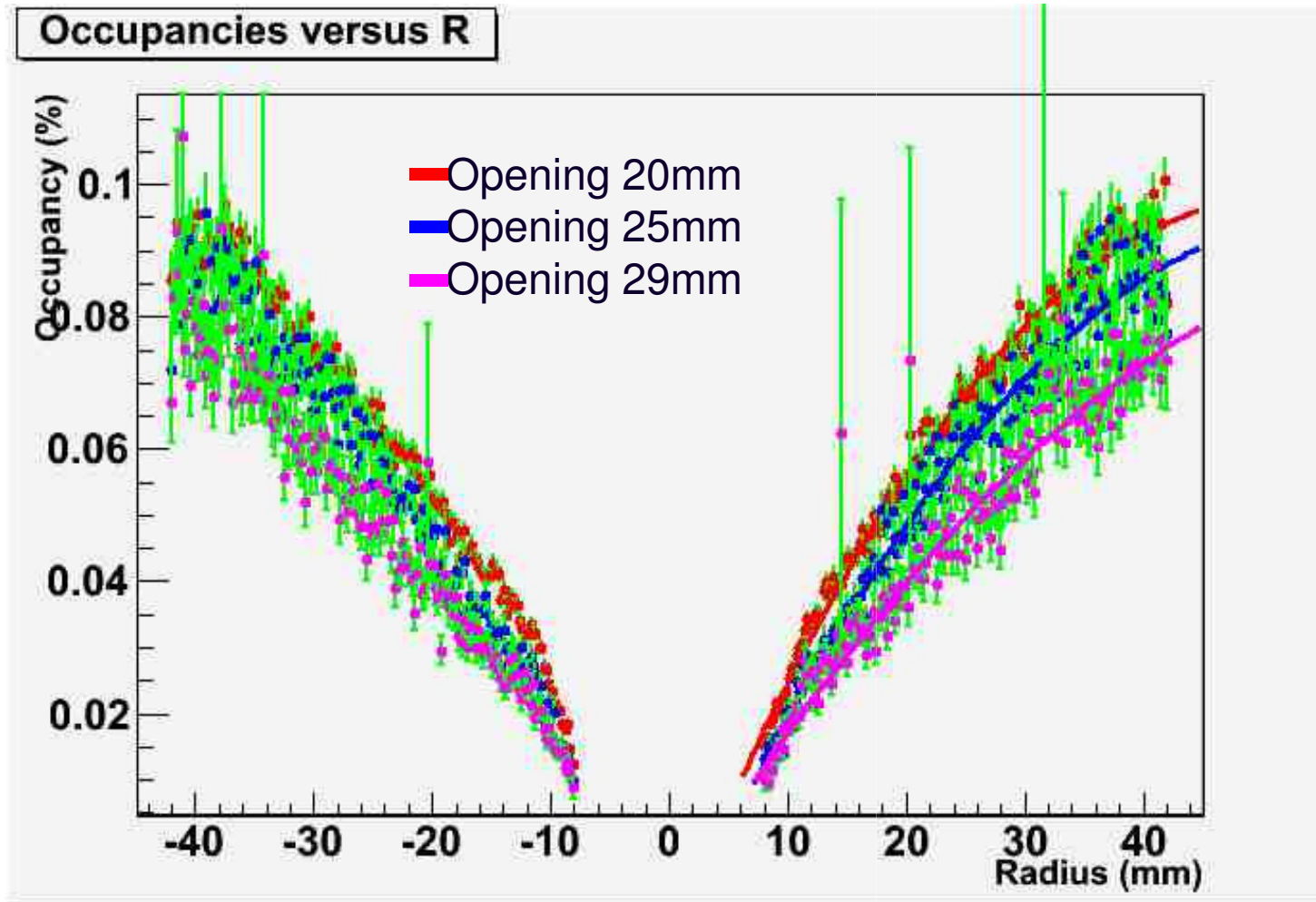
Clusters NOT on tracks

# What have we learned so far ?

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- ❑ **A lot !**
- ❑ **Procedures have shown hick-ups**
- ❑ **Addressing these will eventually result in improvements**
- ❑ **Most runs have been analysed with our DQM tools**
  - the results are stored under `/group/velo/dqm`
- ❑ **Some have been summarised in the ELOG**
  - this is an area where we need to improve
- ❑ **DQM allowed to quickly spot hot or noisy channels, high occupancies, etc.**
- ❑ **We now need to digest the data, log everything, mask hot channels, etc.**
- ❑ ***\*then\** we will be in a much better position for the 2010 data to come !**

# DQM is good. But further analysis is better !



how this  
dependence  
changes as we close



## *Tutorial*

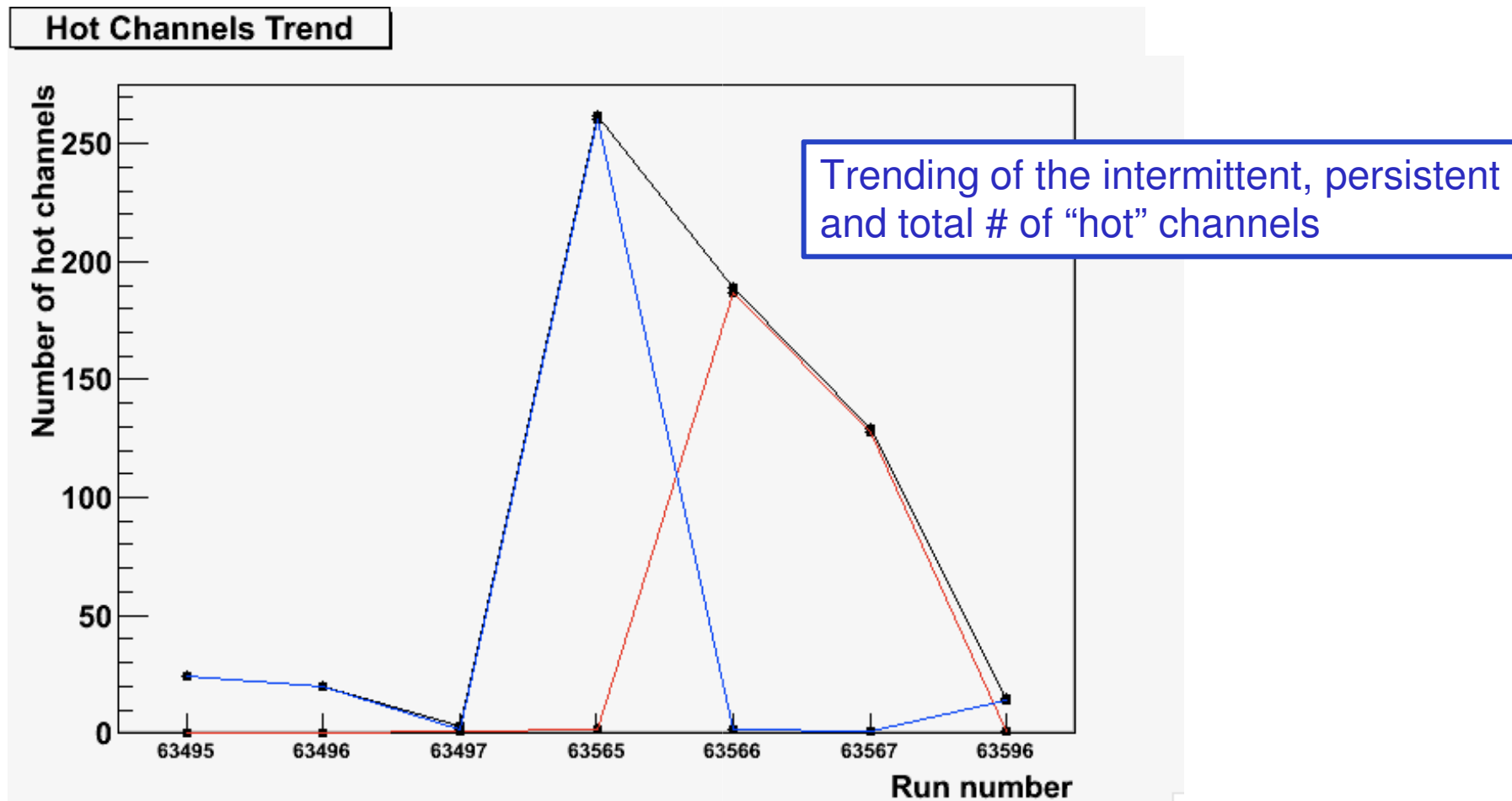
- ❑ A VELO DQ&M tutorial has been set up
  - comprehensive: some 85 slides in the first version
  - will for sure evolve a lot based on experience and user feedback

## *References*

- ❑ Quite a few references are implemented in our GUI
- ❑ But based on Monte Carlo ;-)
- ❑ Careful analysis of the 2009 data will hopefully contribute to a better understanding and will provide relevant references ...

# DQM « snapshots » are nice. What about trending?

- Example of “trending”, monitoring hot channels versus run number ...





## Conclusions

- VELO DQ & M is looking good !
- First results are rather encouraging
- We want more data. Just bring it on ... !