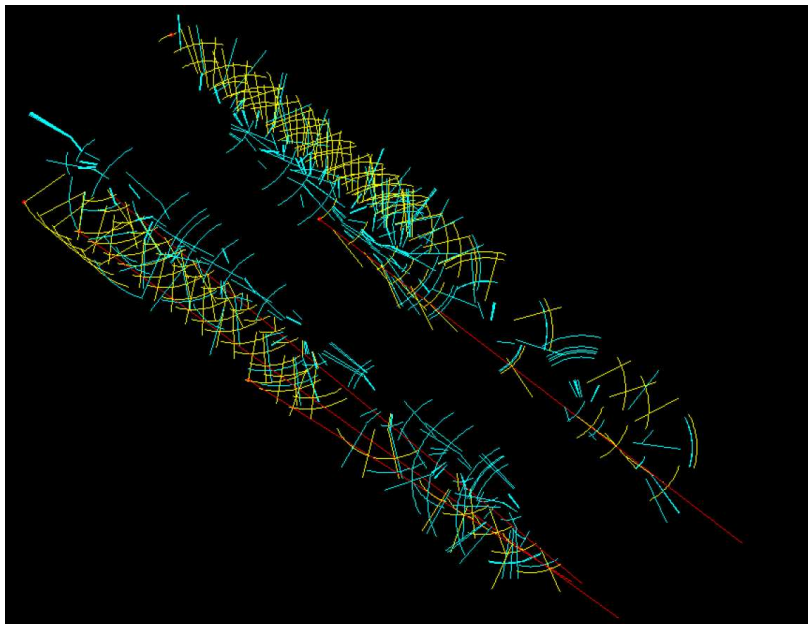# Status of VELO Software

Eduardo Rodrigues
On behalf of the VELO software group

LHCb Software Week, CERN, 10 December 2008

- *Organisation issues*

- *Status*
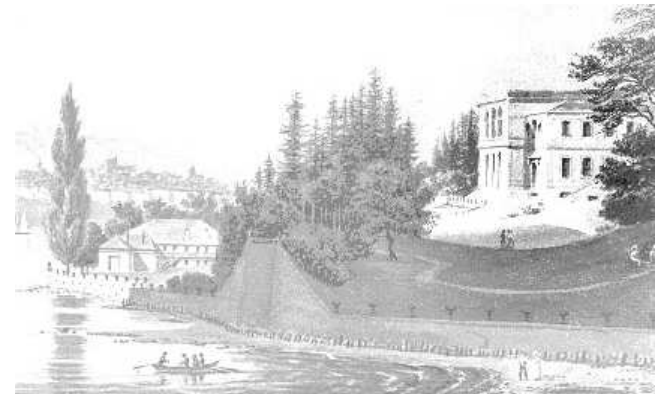
Organisation issues

Software commissioning

❑ **Algorithms delivered … but software commissioning took 2nd priority compared to hardware commissioning**

❑ **Shutdown period being exploited for commissioning of the VELO software**

❑ **Workshop on 23rd Oct. to:**
 - review status of software
 - identify critical items
 - dress a work-plan with list of milestones to achieve

Areas of work

- ❑ **PVSS, DAQ recipes**

- ❑ **Timing and gain**

- ❑ **Error banks**

- ❑ **Vetra project**

- ❑ **Monitoring**

- ❑ **TELL1 emulation**

- ❑ **Alignment**

- ❑ **Closing software**

- Twiki page
"Software milestones for 2008/2009 shutdown"

https://lbtwiki.cern.ch/bin/view/VELO/SoftwareMilestones

➡ Milestones defined for each area of activity,
with priorities set and a responsible person attached

Meetings & Co.

Commissioning meeting

- ❖ **Mondays, software section at 10h15**
- ❖ **Report on previous milestones achieved**
- ❖ **"Round-table" news**
- ❖ **Plans for the week**

Integration days

- ❖ **Thursdays**
- ❖ **Used for integration of software releases, software tests at the pit, etc.**
- ❖ **Milestones Twiki page:** https://lbtwiki.cern.ch/bin/view/VELO/SoftwareMilestones

Weekly VELO meeting

- ❖ **Progress reports avoiding details**
- ❖ **Specific presentations on items of general interest**

Milestones (1/2)

Milestone Summary

Week	Date	Milestone
44	29/10	PVSS restructuring, Test of naming panel and diagram
46	7/11	Parameter upload Plan, v6r3 firmware emulation release - deadline moved! (new Gaudi release date has been changed)
46	13/11	PVSS backup, Delay Scans
47	20/11	(Global Com.), MCMS panel
48	27/11	Firmware Installed, Faster TELL1 Parameter Uploading, User/Expert Mode, Monitoring task for HLT triggers , Online Alignment Monitoring, Standalone Macro Package, Vetra Test Suite, Offline test of Closing with Fest'09 data
49	4/12	V7r0 python-ized Release, v7r0 python, motion System in private DB, Pulse Shape Scans
50	11/12	First TELL1 parameters uploaded
3	15/1	(system down for cooling) Offline alignment monitoring, Closing test with Fest'09 in HLT
4	22/1	(system down for cooling) integrate Marathons, Round Robin NZS, Review of monitoring algorithms and macros
5	29/1	(system down for cooling)
6	5/2	(Global Com.), Review of online monitoring default pages, Green/Red light from alignment monitoring, Closing tested with motion
7	12/2	HV Scan Data, Timing Parameters Known, Tuning settings to understand error banks
8	19/2	(TELL1 Replacement)
9	26/2	Tested Parameters, TELL1 Parameter uploaded, HLT Alley for Halo tracks, Green/Red light alignment, Monitoring package for error banks
10	5/3	Alerts Scheme Table for LHCb Shifter, Test Pulse Strip Scan, Timing Parameters Uploaded, Gain Calibration, Online Presenter Messages to locate problems, Velo DQ flags summary

...

Milestones (2/2)

Milestones Achieved

Week	Date	Milestone	Person responsible
44	31/10	Parameter upload Plan	Kurt
44	31/10	PVSS restructuring	Karol
44	31/10	Test of naming panel and diagram	Mark
47	20/11	Alignment online monitoring	Marco
47	20/11	User/Expert Mode	Stefano
48	27/11	Integrate Marathons	Mark
49	04/12	Initial Parameters Uploaded, First TELL1 parameters uploaded	Kurt

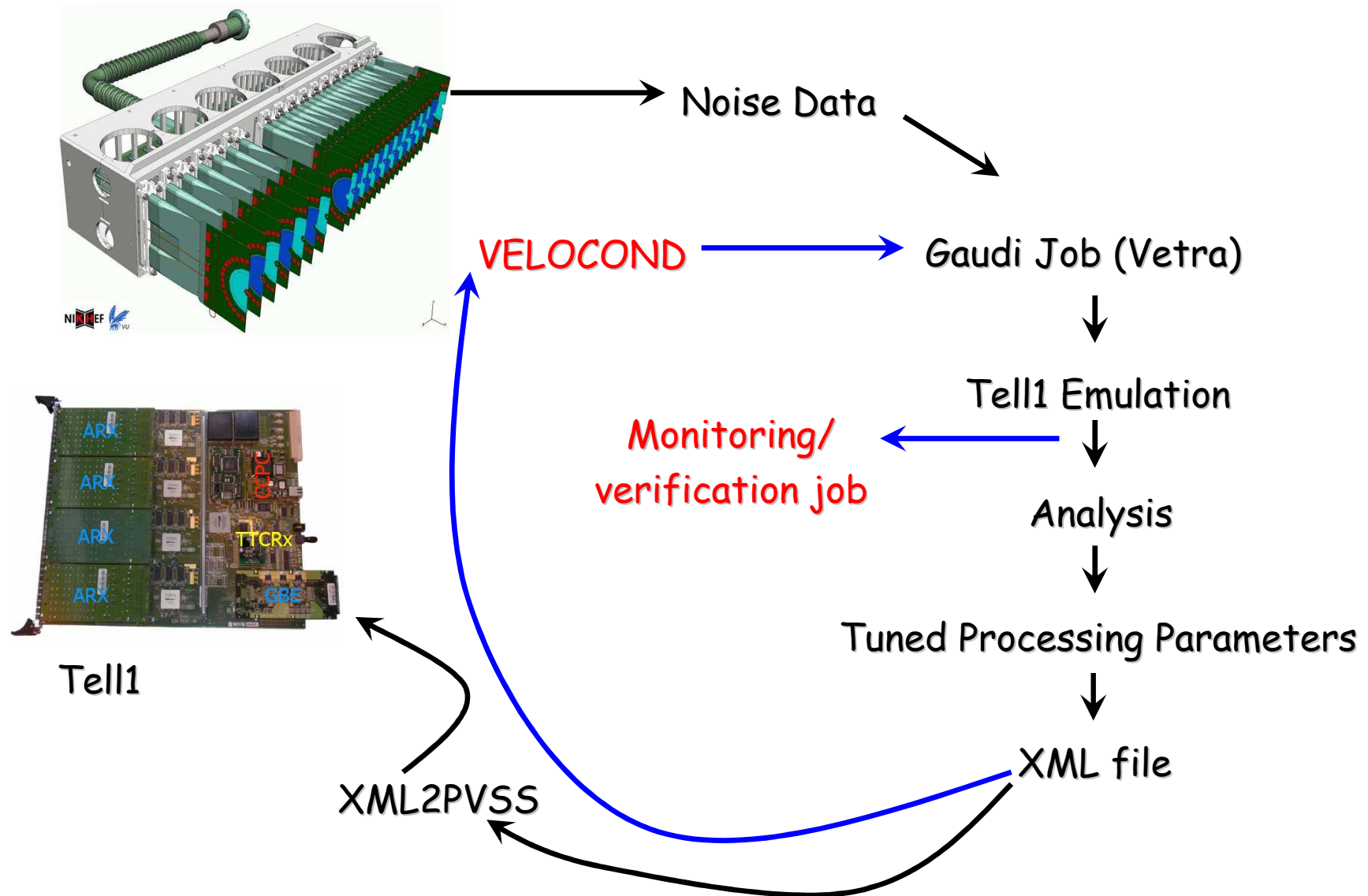# *Status report*

No such situation !

Vetra – status (1/3)

✓ The main software tool used to analyze NZS data

(installed on the online cluster at the pit)

1) Noise calculation/monitoring

2) Time alignment study

3) Beetle pulse shape measurement

4) Many more...

One of the most important tasks performed by Vetra platform is the TELL1 processing parameters calculation/tuning (see next slide)

- Velo needs ~10^6 processing parameters

- The quality of these parameters is critical for the data quality (TED data)

- The pedestal values and clusterisation thresholds proved to have the most significant influence on the ZS data

Noise Data

VELOCOND → Gaudi Job (Vetra)

Tell1 Emulation

Monitoring/ verification job

Analysis

Tuned Processing Parameters

Tell1

XML file

XML2PVSS

Vetra – status (3/3)

❑ **Current release (ST+Velo) features:**

1) **The latest TELL1 firmware**

2) **Capability of analyzing the data taken in round-robin scheme**

3) **All the information needed for the data processing is stored in the 'private' databases (e.g., VELOCOND for the VELO part)**

4) **Bit-perfectness testing suite – to check/confirm that the output of the TELL1 board is the same as the one from the Emulation (comparison is made at the level of cluster – raw - banks)**

5) **Many changes and updates of the monitoring packages driven by the TED data taken during the August and September runs**

6) **Specialized package with standard macros and scripts for shifters to make common tasks easy and automated** (see later)

7) **Pythonized options – will become the default for the next release** (see next slide)

Vetra – configurables and python options

Configurables

- ❖ **Main configuration file, Configuration.py, created**
- ❖ **Several dedicated configuration classes for each Vetra processing phase** (TELL1 processing, monitoring, output)
- ❖ **Profited from occasion to improve structure of Vetra sequences**
- ❖ **Consistency checks introduced**

Python options

- ❖ **Most of Vetra options "translated" to Python**
- ❖ **Re-structuring / improvements on occasion**

⟹ | Release of pythonized Vetra v7r0 by end of the year |

Software versioning

Backing up repository

- ❖ **All VELO software in CVS**
- ❖ **Recipes now also backed up in PVSS database**
- ❖ **PVSS: plain-text and VELO-specific files in CVS**

Tagging and releases

- ❖ **Frequent commits**
- ❖ **Packaged tagged at most on a weekly basis**

Recipes

- ❑ **Physics(default)**

- ❑ **Physics NTP**

- ❑ **Physics TP**

- ❑ **Physics TP NZS (new)**

- ❑ **Delay scan**

- ❑ **Delay scan NTP (new)**

- ❑ **TTCRx (new)**

- ❑ **TTCRx NTP (new)**

- ❑ **Threshold scan (new)**

- ❑ **Strip scan (new)**

Timing studies

❑ **Timing scans implemented and being tested**

❑ **New firmware releases under test**

❑ **TTCrx scan:**

   for time alignment of sensors

Test Pulse Scan

TestPulseShape_Tell1_027_Even_ch_0023_1

Entries   0

Mean   19.25
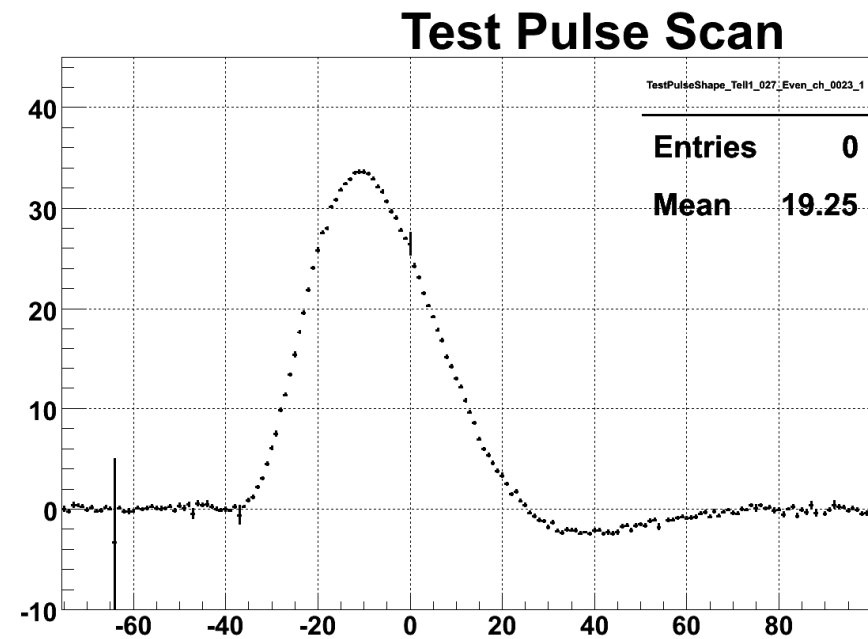
Timing studies

**Optimization of analogue receiver (Arx) digitization time:**
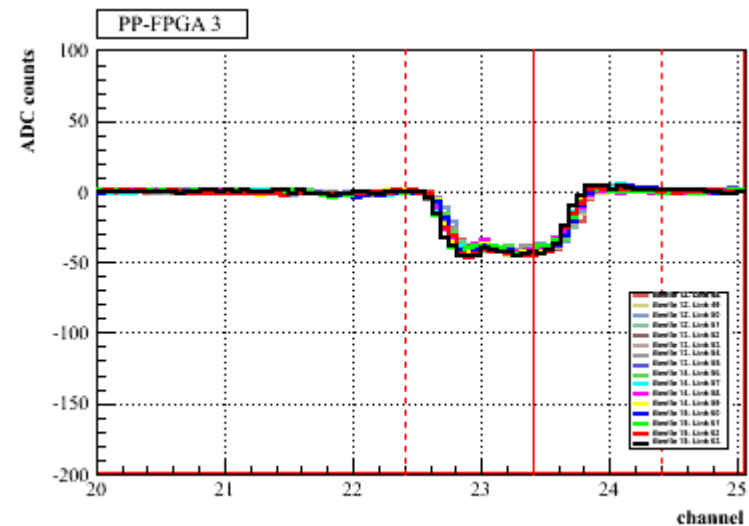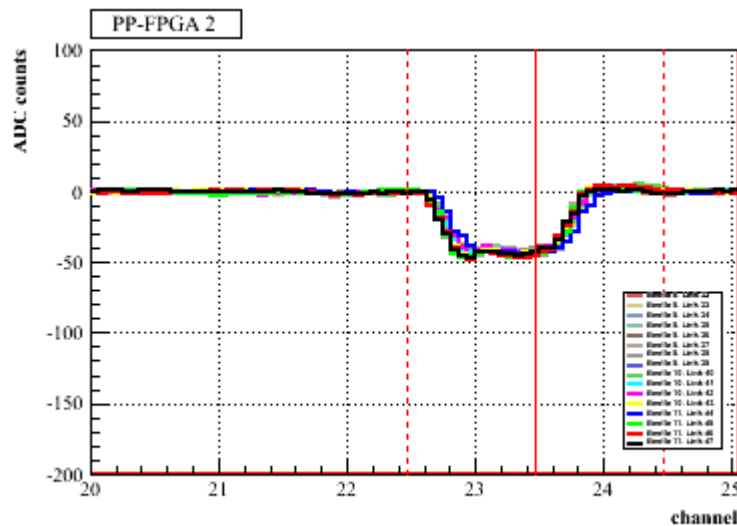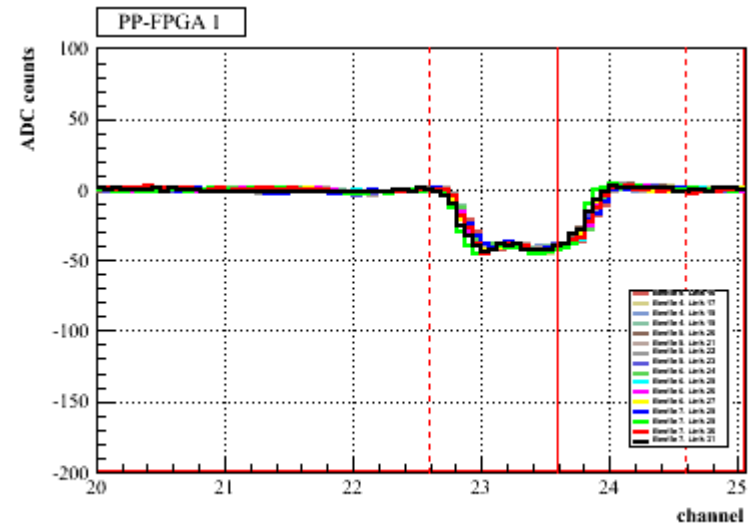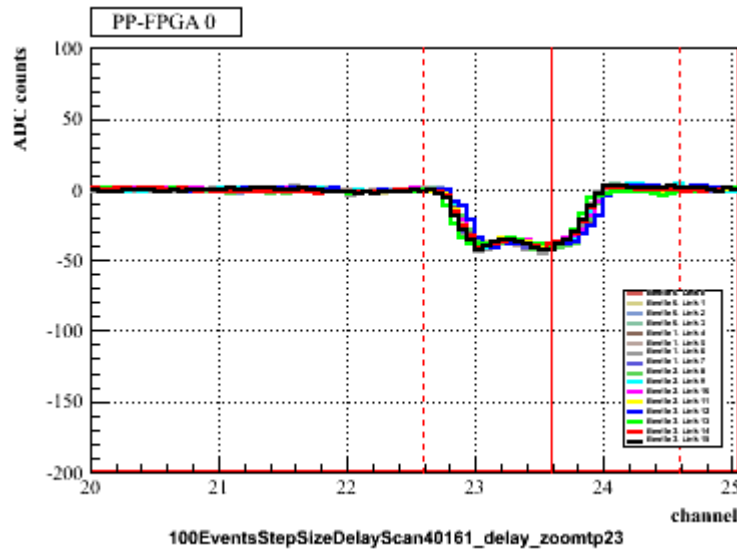
Monitoring

❑ **A lot of progress recently**

❑ **Monitoring packages fully integrated in Vetra and Brunel:**

   - VELO monitoring in standard Brunel jobs

   - Vetra has been updated with latest software

❑ **Scripts and macros are being developed to analyse data**

   (see later)

❑ **Wiki pages with documentation and HowTo's being written/updated**

Online monitoring

❑ **Contents has been rather stable since ~August**

❑ **VELO has discussed his wish list at a recent "histograms and monitoring" meeting**

❑ **New features to be exploited**

Online presenter

Monitoring – algorithms packages
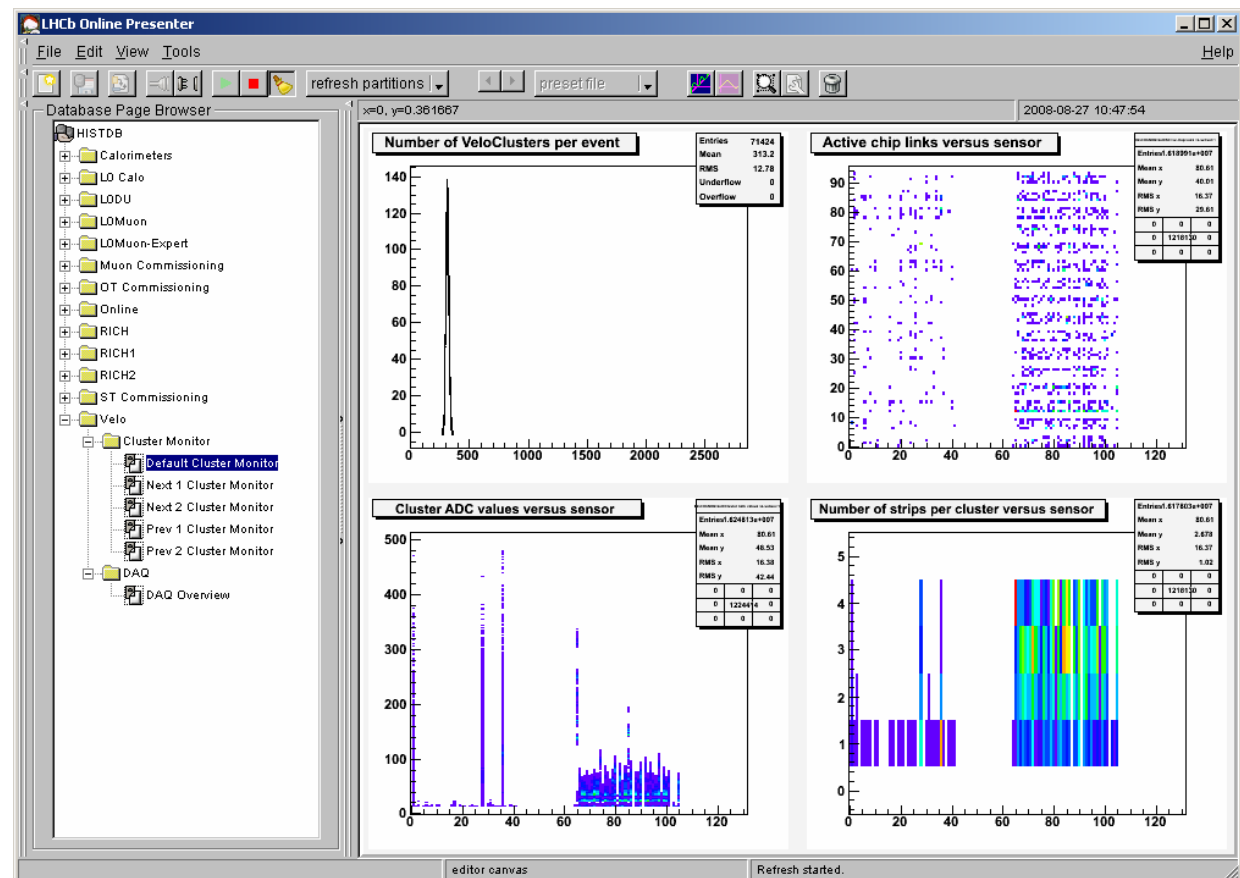
VeloRecMonitors

- ❖ **Package for "high-level" (= ZS) data**
- ❖ **Monitoring based on clusters and tracks (2 algorithms)
  - all in CVS**
- ❖ **Extra algorithms included; e.g. for beam position monitoring**
- ❖ **First alignment monitoring algorithm released**

VeloDataMonitor

- ❖ **Package for NZS data**
- ❖ **Same as always. Stable**

VeloClusterDataMonitor & VeloTrackDataMonitor

- ❖ **"Old" monitoring packages presently in "drain mode"**
- ❖ **Will be totally replaced by VeloRecMonitors**
- ❖ **But still used for now in the online monitoring**

VetraScripts

❖ **New package introduced recently**

❖ **To collect scripts, macros, Python modules for monitoring and analysis**

❖ **Many additions / improvements expected in next couple of months**
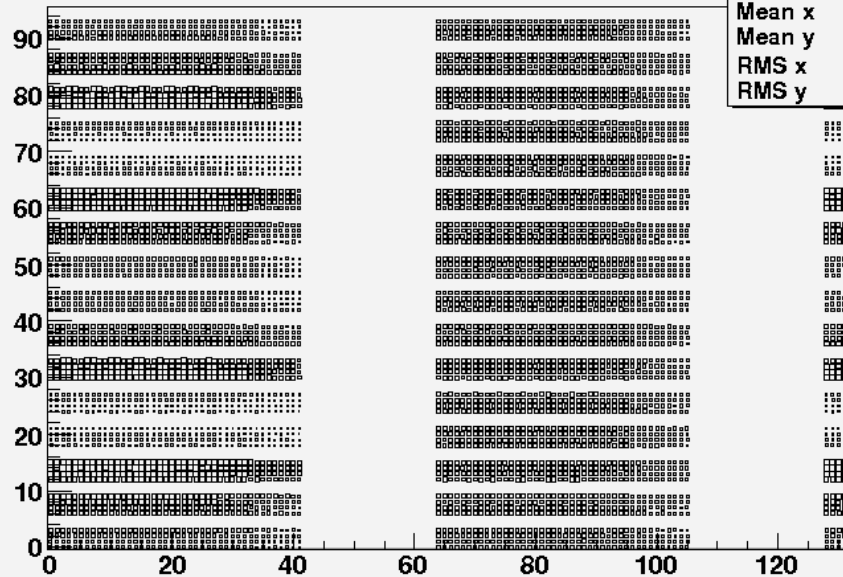
For the moment:

❖ **Torkjell: several noise monitoring macros**

❖ **Kazu, Sadia: macros for timing studies**

Examples of ongoing work:

❖ **Abdi: python script to display noise versus bias voltage**

❖ **Abdi, James: additions to cluster-based monitoring**
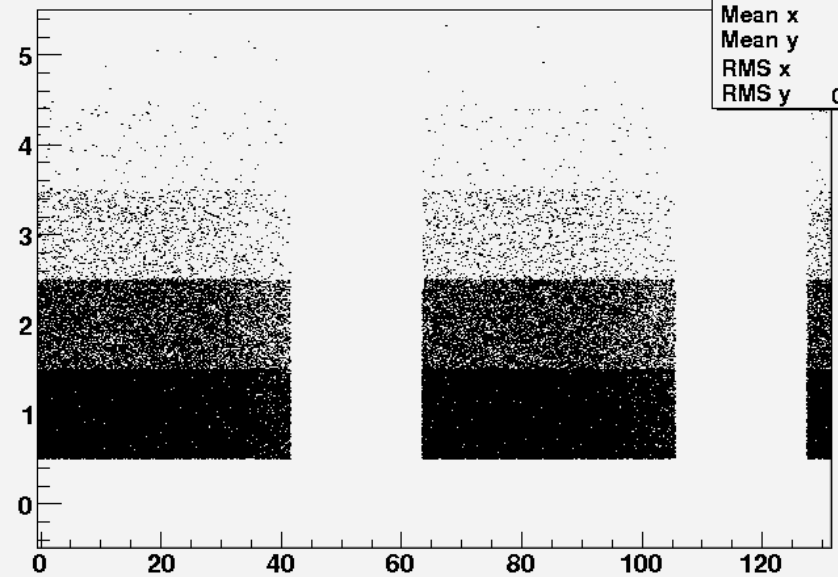
❖ **Barinjaka: IV scan analysis scripts**

Example (MC) distributions from VeloRecMonitors
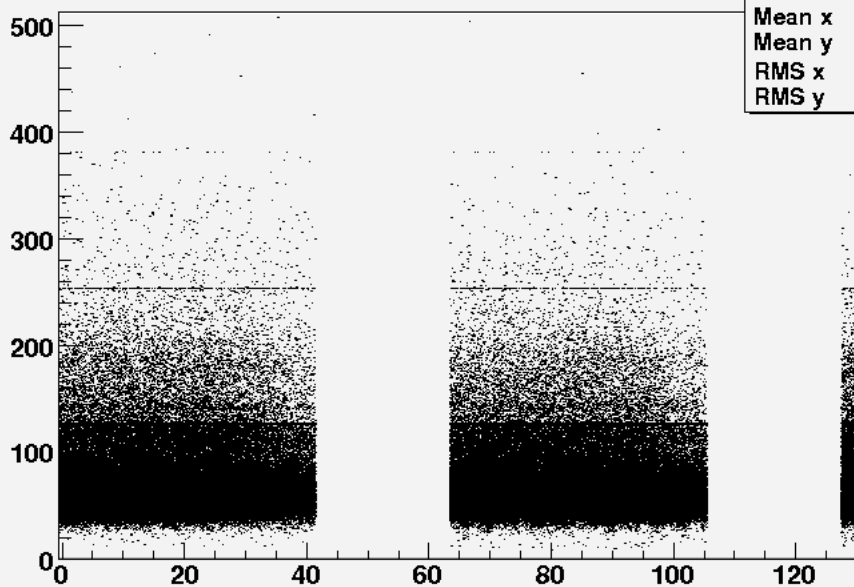

Active chip links vs sensor	
Entries	422111
Mean x	54.58
Mean y	46.5
RMS x	37.34
RMS y	27.62

Active chip links versus sensor

Cluster size vs sensor	
Entries	422111
Mean x	54.58
Mean y	1.269
RMS x	37.34
RMS y	0.4967

Number of strips per cluster versus sensor

Cluster ADC values vs sensor	
Entries	422111
Mean x	54.58
Mean y	74.02
RMS x	37.34
RMS y	35.91

Cluster ADC values versus sensor

Cluster ADC values vs sampling	
Entries	463657
Mean x	6.925
Mean y	25.44
RMS x	0.3944
RMS y	2.907

Cluster ADC values versus sampling index

Noise monitoring macros – example of GUI (1/2)
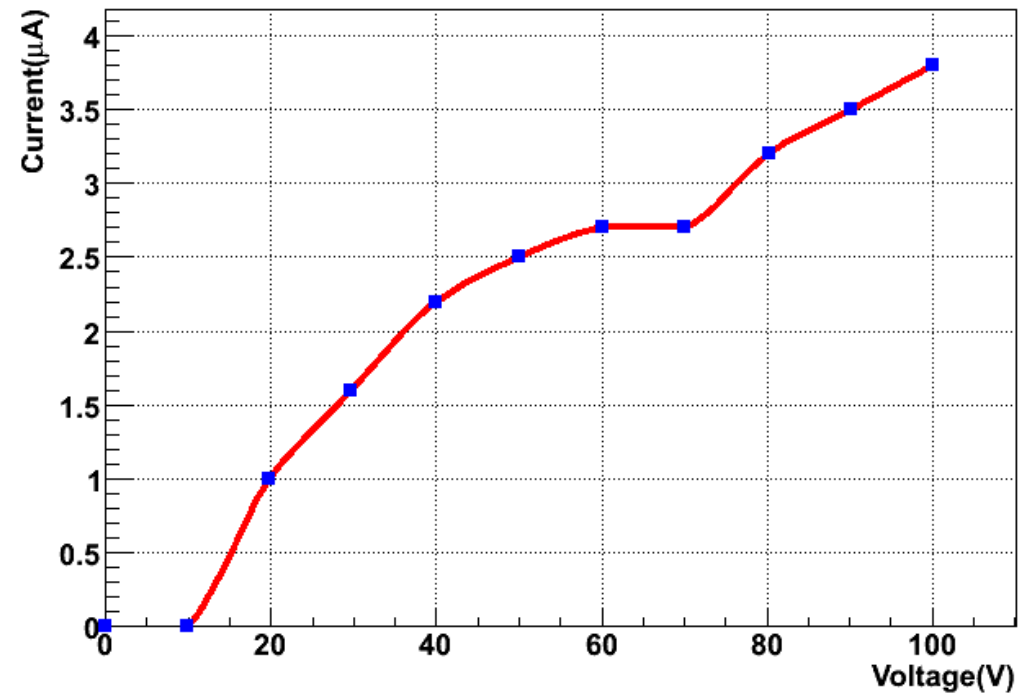
High Voltage
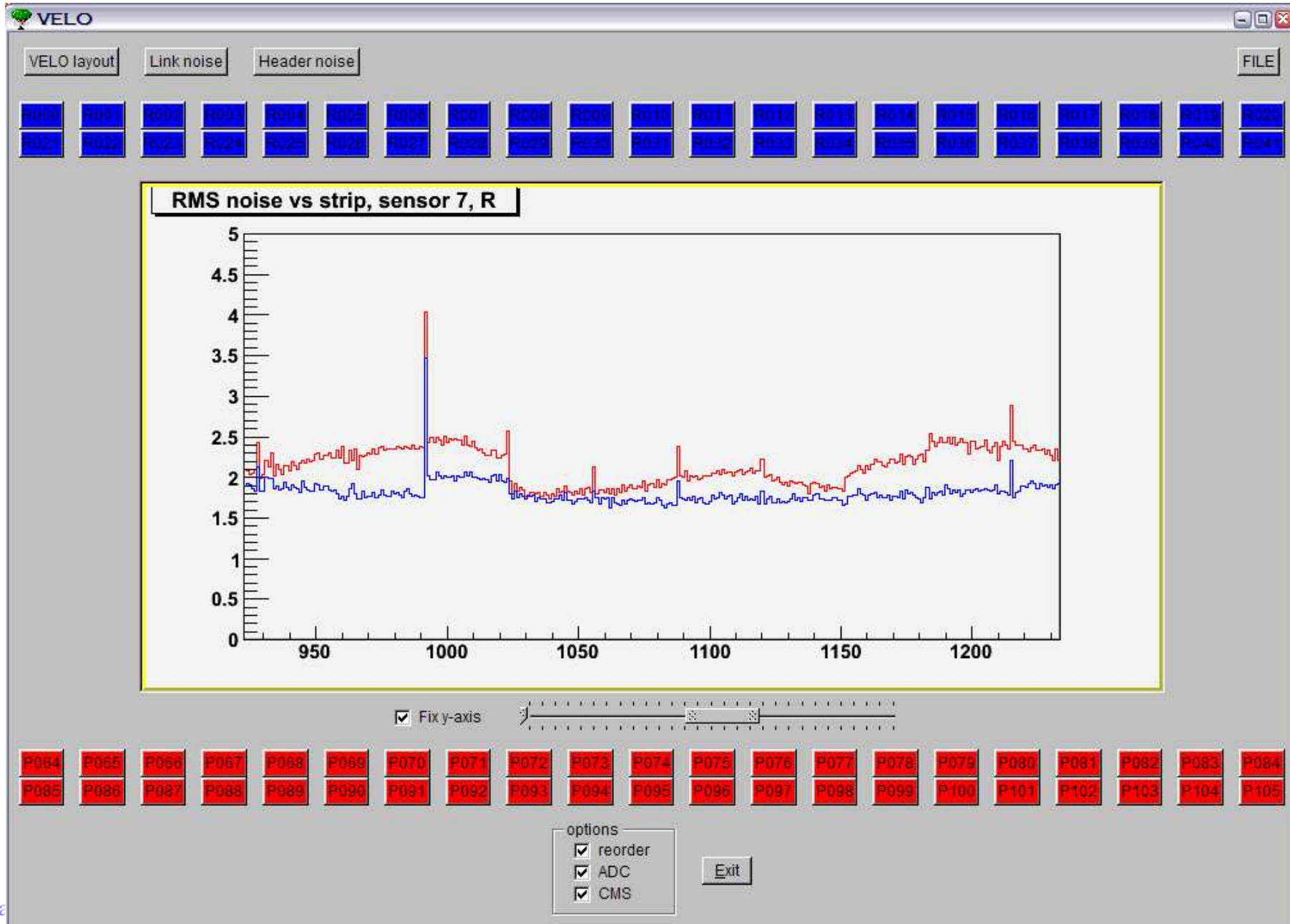
❑ **PVSS recipes available to automate IV scans**

❑ **Set initial voltage, target voltage, step,**
   single or set of sensors

❑ **A data file produced per sensor containing**
   channel number, voltage, current, sensor temperature

❑ **Analysis scripts under**
   development …

TELL1

Firmware

- ❖ **New release with round-robin NZS fixed**
- ❖ **Initial data taken on one TELL1**
- ❖ **In the meantime test with all VELO: OK**

- ❖ **Note: documentation has improved (release notes and versioning)**

Round-robin of NZS

- ❖ **First tests of data production: OK**

MCMS

- ❖ **Algorithm performance evaluation $\Rightarrow$ firmware bug fixed**
- ❖ **Corrected version at the pit**
- ❖ **Tests with latest version of Vetra**

TELL1 – parameter uploading

❑ **Quality of data significantly affected by not having
tuned TELL1 parameters uploaded**

❑ **First tests of data taking with uploaded TELL1 parameters: OK**

❑ **More tests being done**

PVSS

❑ **PVSS libraries for converting XML into the data structures digested by the framework functions that modify recipes**

❑ **Underlying XML parser is the one recently provided as a patch by ETM (vendor of PVSS)**

❑ **New panel implemented (help from Johan - thanks) :**
   allows 1-button action to amend the recipes from XML
   - **tested successfully last Thursday by uploading different clustering thresholds, reordering settings and digitization delays to several TELL1's on the VELO A-side**
   - **amending the recipes from XML for a VELO half takes ~5 min (expected speed improvement of factor 1.5-2)**

❑ **Not everything covered, but including other parameters now straightforward**

Conclusions

- VELO software plans carefully … planned !

- Items on "critical path" identified,
  given highest priority

- Good and steady progress observed