Development of the LHCb VELO monitoring software platform

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Outline

- » Why we should monitor velo (detector)
- » How the monitoring is done presently
- » Lovell – the monitoring platform
- » Improvements for the future

LHCb

- LHCb is dedicated for studying heavy quark flavour physics
- It is a single arm forward spectrometer
- Velo is located in the front of the rest of LHCb spectrometer
- It is crucial in reconstruction
- Collisions take place inside the Velo

Vertex Locator (Velo)

- Velo consists of two halves, 21 modules in each half
- Modules have an R- and ϕ -type sensor
- Each sensor consists of 2048 silicon strips
- About 170 000 readout channels
- **Each channel needs individual calibration process**

Why monitor?

- LHCb spectrometer is one of the most complex scientific devices
- It is a scientific tool that needs a lot of care
- Condition of this device is crucial to the precision and accuracy of measurements

Why monitor?

- During round 1 data taking
- Partial power cut occurred
- Lack of voltage caused imperfect calibration proces
- It wasnt until few hours later that this has been noticed
- **Incorrect calibration was already in use**

Monitoring Now

Lovell – why ?

- Vetra (emulation engine – the one producing data for monitoring) does not have a GUI
- Trending and high level analysis
- Multiple types of analyses specific to the Velo
- Two types of gui available (web and desktop)

Lovell - architecture

- Python, of course
- PyQt
- Matplotlib for plotting
- Root for histogram data readout.
- Most of the data comes from Vetra software
- Recently migrated to Gitlab (gitlab.cern.ch)

Major GUI tabs

Sub-tabs and analyses tabs

Navigation and options

Lovell - The UI layout

Lovell – Chosen Analyses – Raw Data

Lovell – Chosen Analysis - Noise

Lovell – Chosen Analyses – IV scans

Velo Calibration

- High hit threshold (depending on noise)
- Low hit threshold (40% of high hit threshold)
- Pedestals (mean value over time of signal per strip to be subtracted)

Calibration Module:

- Views most important parameters
- All values comparable to other runs

Lovell - Calibration Parameters - Pedestals

Lovell - Calibration Parameters –Hit Thresholds

Lovell - Calibration Parameters –Hit Thresholds

Future?

Future?

- Autonomic decision of recalibration
- Analysis of calibration data
- Data persistence (how to store calibration data)
- Clear procedure of TELL1 hardware calibration

Thank you for listening!