Online monitoring

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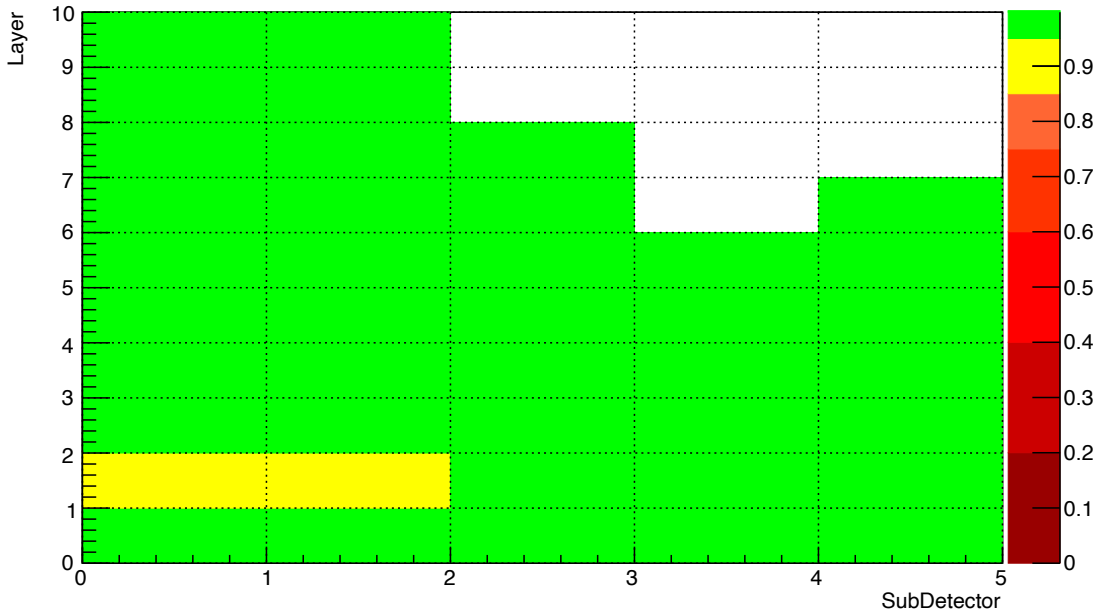
Introduction

- In case we have a beam test we will need an online monitoring tool
- Based on CMS experience on Silicon Strip Detector we made few proposals for monitoring plots
- All plots are artificially made for visualization purpose
  - NOT REAL DATA histograms!

CMS Strip Tracker – Readout components

- Around 10M channels (strips)
- 128 channels/APV (Analog Pipeline Voltage chip)
- 6 APVs/module (very few cases has 4 APVs) -> 738 channels/module
- 192 APVs/FED (Front-End Driver) ~ 430 FEDs in total

Report summary



- The fraction of modules which do not pass the Quality Test

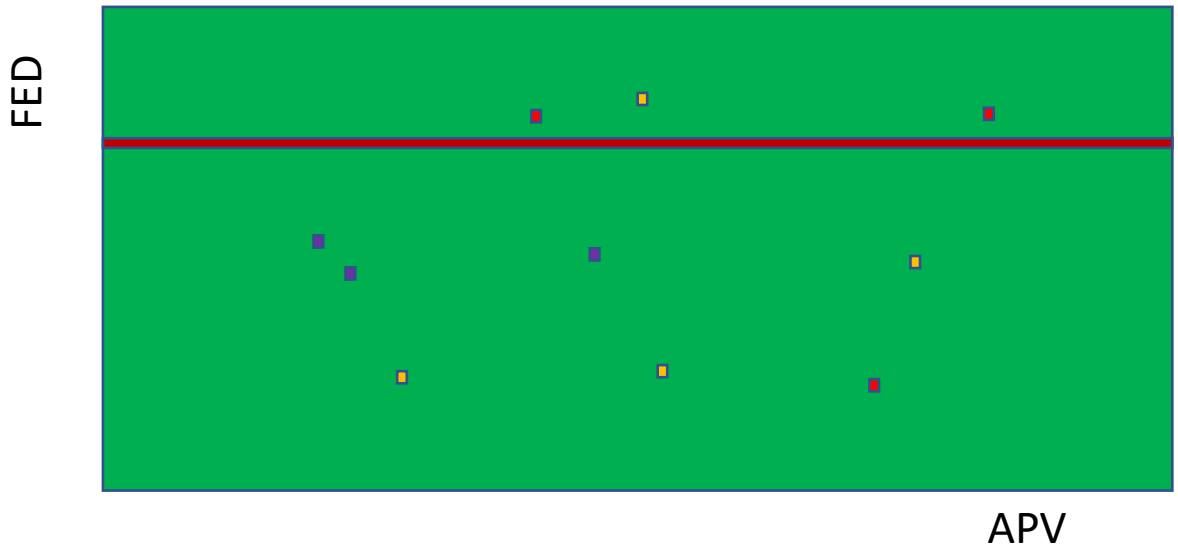
- Legend:
  - **green :** status = [95-100]% - GOOD
  - **yellow :** status = [85-95]% - (probably) BAD
  - **red :** status = [0-85]% - BAD
  - **white :** not read out

Module Quality Test

- **DCS Error**: bad if volt is off or not at the proper level.
- **Excluded FED channel**: bad if module is masked
- **Number of DIGIs[1]**: If number of DIGIs is significantly beyond expectation
- **Number of Clusters[2]**: If number of clusters is significantly beyond expectation
- **FED bad channel**: if the mean fraction of bad channels per module is above 20%

- **[1]DIGI** – Signal made when charged particle hits a strip
- The signals from a single charged particle form a **[2]Cluster**

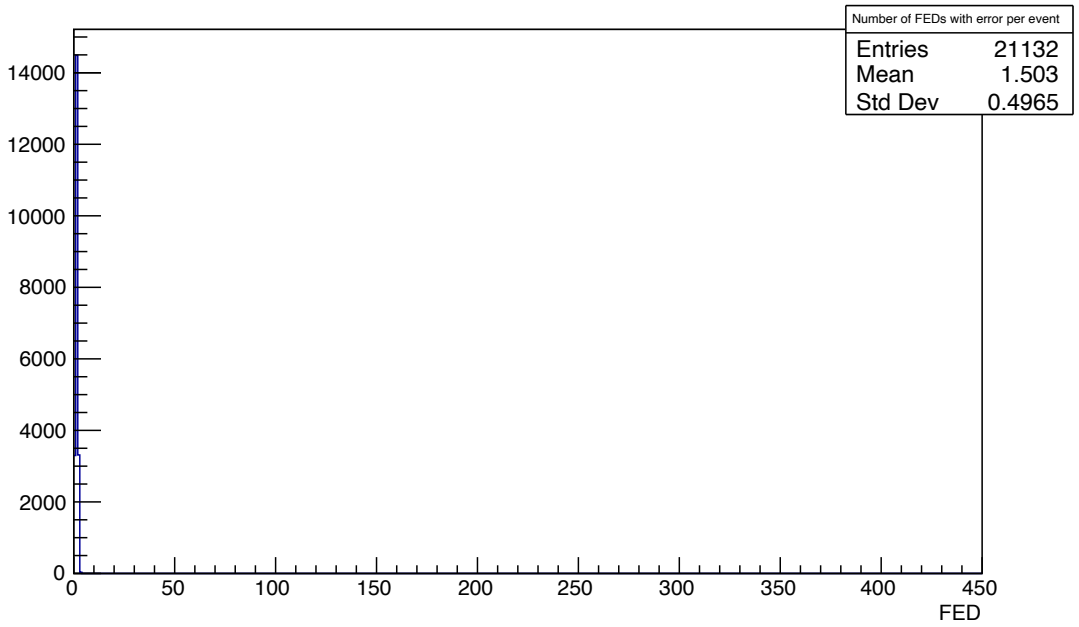
Bad modules



The Subdetector Map, filled with a color code depending on the outcome of Quality Tests.

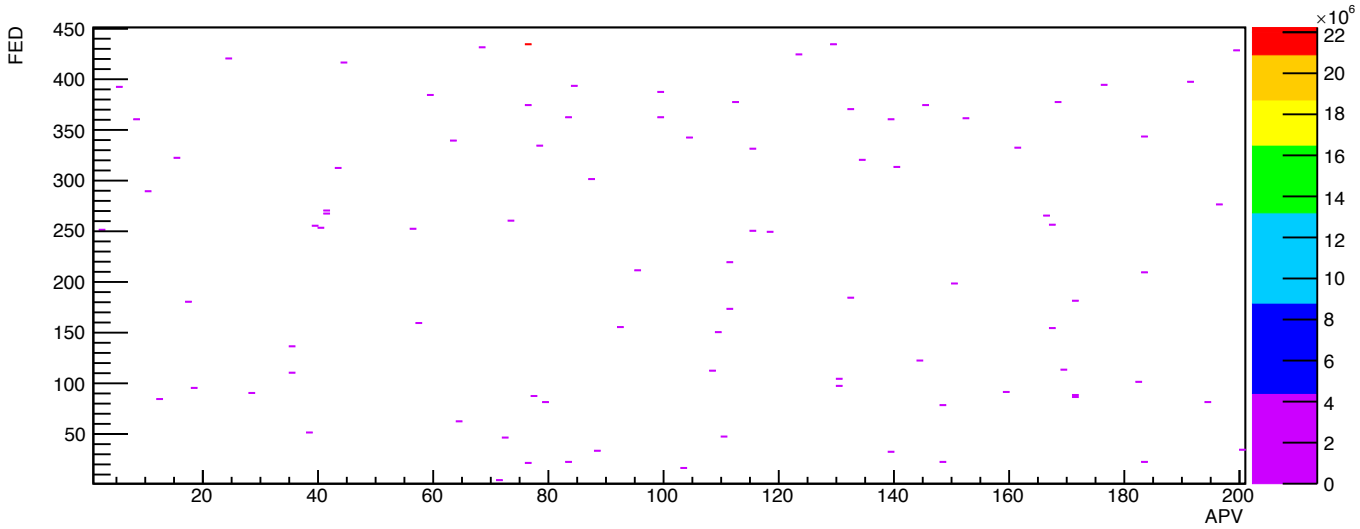
- **Green** Good
- **White** Missing
- **Dark Red** FED Errors.
- **Pink** Too high (or too low) number of Clusters
- **Orange** Too high (or too low) number of Digis
- **Red** Both high (or low) #Digis and #Clusters
- **Purple** are modules with wrong Volt.

Fed errors



- The total number of FED showing any error per event
- It is OK to have few FEDs with errors
- If the mean is more than 5 (~1%) further investigation is needed

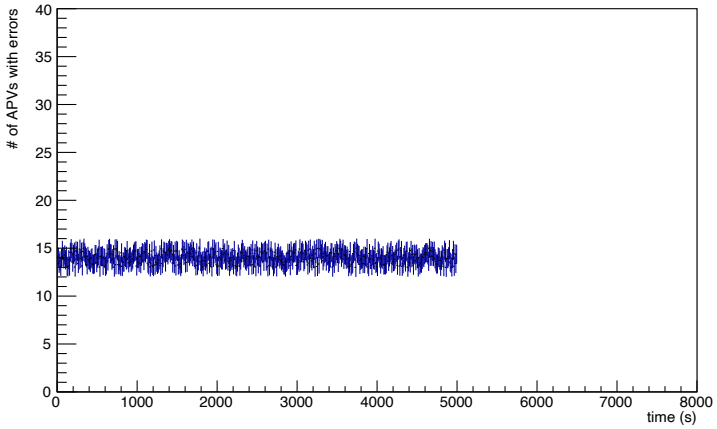
APV errors

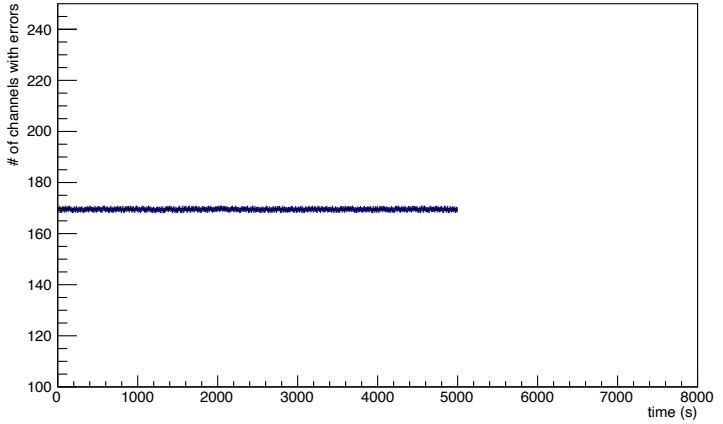


Number of any red-out error for each APV and each FED

More precise information about APV errors

APV & Channel errors vs time



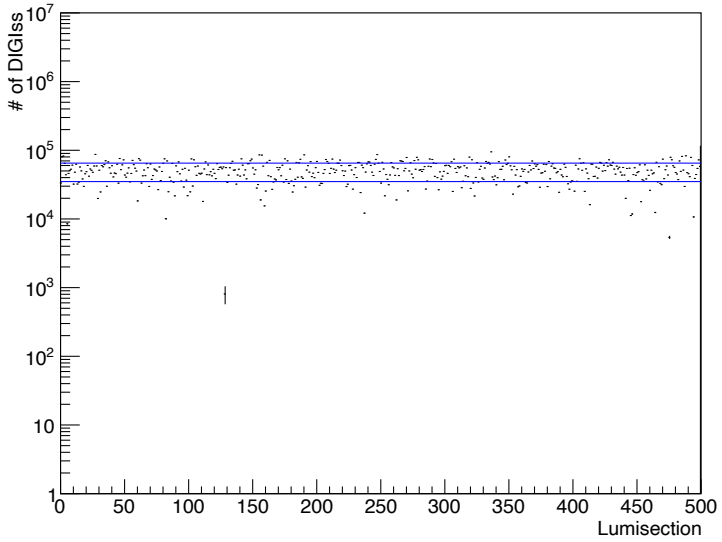


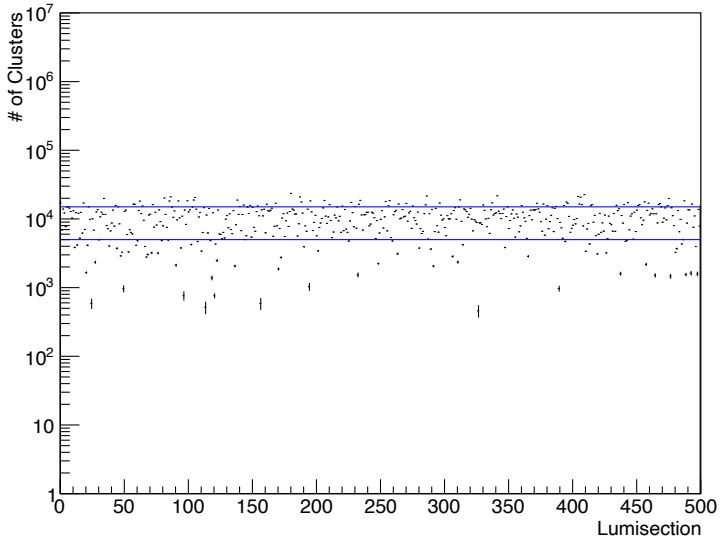
Number of APVs and channels with errors vs time.

If everything is OK should be constant.

Also should be compared with previous runs.

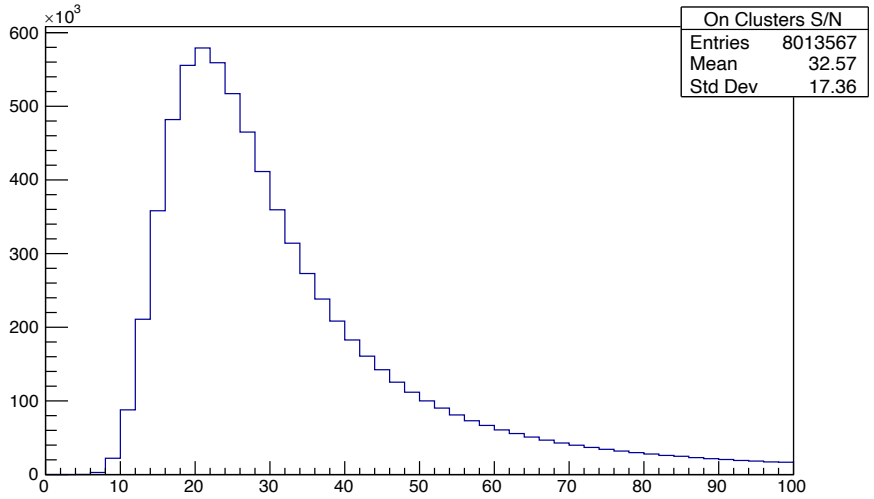
DIGI & Cluster number





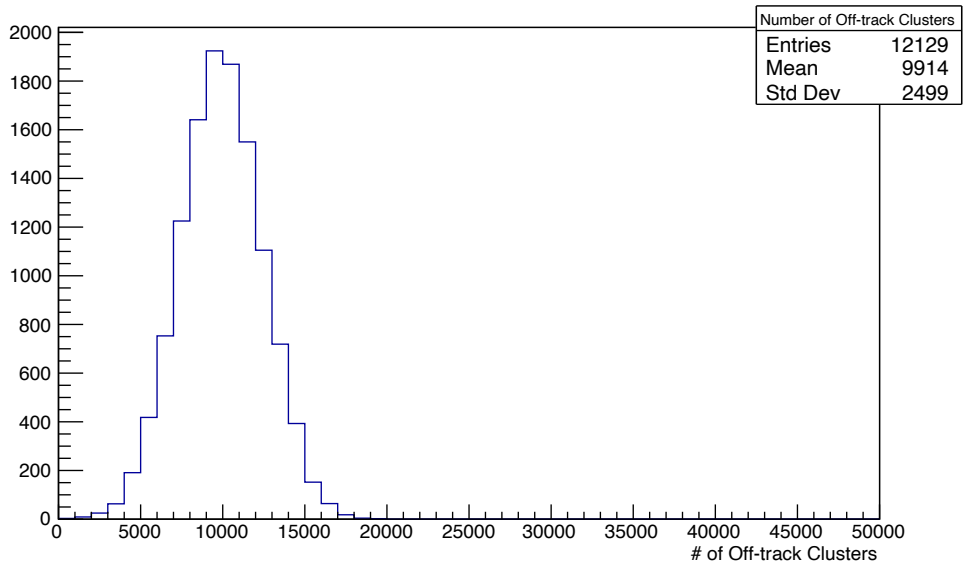
- The total number of clusters as a function of Lumisection
  - Lumisection – a time period in data taking, appr 24 seconds
- The blue lines represent safe limits where the trend should lie (although strongly depends on beam conditions)
- Trend should be uniform
- If is well beyond blue line should be investigated, but not BAD neccesserly

Cluster S/N



- The Signal-to-Noise (S/N) distribution from the clusters associated with tracks (on-track clusters)
- The shape is expected to be very close to a Landau distribution
- The peak should be greater than 20

Off-track Clusters



The distribution of total number of clusters not associated with tracks (off-track clusters)

Cannot give definitive check whether the run is good or bad.

If the shape of the distributions show a significant changes with respect to previous runs should be investigated.

Summary

- Presented first ideas for online monitoring inspired by CMS Strip detector
- Two group of plots:
  - Error plots
  - DIGIs/Clusters plots
- Probably things should be adjusted according to our detector