Online Monitoring of Silicon with SVXMon, ADCMon and SiliMon

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- Introduction to Consumers
- Introduction to the Silicon Consumers
- Details of individual consumers
  - SVXMon
  - ADCMon
  - SiliMon
- Responsibilities of CO and Silicon pager carrier
• Monitor detector and data taking in "real time" by looking at online data

• Receive events from Consumer-Server/Logger (CSL) after Level 3 (nine streams of data, APHYSR-JPHYSR, different trigger paths)

• Analyze data and create histograms (root) which are displayed in CDF Control Room

• Root files saved for future reference
Starting and Viewing Consumers

- Consumer Operator (CO) starts consumers and their displays
- CO runs script to set up either "Physics" or "Cosmics" mode
  - This selects different tcl files for the consumers
  - For SVXMon all streams in "Cosmics" vs. stream D in "Physics"
- Histograms can be accessed through Consumer Display (left for SVXMon/ACDMon)
The Three Silicon Consumers

- **SVXMon** - Main source of monitoring for Silicon (CDF Note 6163)
  - Status of chip pipelines and data (using simple online analysis)
  - Histograms showing charge and occupancy at channel, chip, half-ladder and layer granularities
  - Performance of SVT/L3 tracking
  - Error Logger for viewing/searching messages and logging of messages for offline viewing
  - Communication with Run Control for HRR requests

- **ADCMon** - Histograms of half-ladder (online) and full-ladder or chip level (offline)
  ADC count distributions

- **SiliMon** - Monitors silicon tracking efficiencies, in development (CDF Note 7580)
Cell Id and Chip Status Maps

- Maps of SVX and ISL/L00 chip status found in the "Slides" folder and displayed in control room
- Cell Id Status - shows pipeline status, in error if stuck cell id for example
- Chip Status - occupancy and charge distribution status compared to average of similar chips
- Checks can be disabled by setting status in the Problem Database to "needs work" (or variants) or "svxmon_ignore"
- Chips not receiving data will be yellow, but should wait for 100 or so events for statistics
- Chips with errors are red, but transient reds can be due to temporary fluctuations in error rate
- Should be checked by main pager carrier at beginning of every store
Cell Id and Chip Status Maps - Examples

Naming convention different from offline, converter can be found at
http://b0sili01.fnal.gov/numerology/form.html
Strip Histograms

- Found in the "Strip Plots" folder
- Show mean charge, rms charge or occupancy (%) with entries for each channel
- Individual histogram for each half ladder
- Useful for debugging dead chips, hot channels, DPS problems, etc.
- The same quantities can be found in 2D histograms ("Strip Plots 2D") and are summarized in chip ("Chip Plots"), half-ladder ("Half-ladder Plots") and layer ("Layer Plots") histograms
• Found in the "SVT Plots" folder

• Histograms of occupancy (below) or $\chi^2$ for SVT tracks
SVX Error Logger

- Tcl/Tk script that stores and displays SVXMon messages
- Is started by same startup script as SVXMon and displayed on same machine
- Can view, search, sort and save messages
- Write error summary for runs (BitReporter)

Menu Bar

Detector Selection Frame
Message Selection Frame
Status Bar
Text Frame
SVXMon Miscellaneous

- SVXMon sends HRR requests to the Consumer Error Receiver when there are stuck Cell (Cap) IDs
  - Permanently stuck Cell IDs can be ignored by placing in:
    `/cdf/onln/data/svxii/data1/svxmon/SvxMonConfig/stuckChips.txt`
- SVXMon sends hearbeat to Consumer Error Receiver, Run Control alarms if missing
- SVXMon status histograms are used in determining good run bits for Silicon
- This talk does not cover all SVXMon plots, so take a look at CDF Note 6163 if you want more details
• Histograms of ADC counts. Bottom right: healthy half ladder

• There are two versions of ADCMon - online and offline

• Online version runs as part of SVXMon framework

• Histograms (half-ladder) found in ”ADC-Mon” folder in SVXMon Consumer Display

• Script makes simple comparison with reference plots (blue), email notification

• Offline run by offline monitoring group

• Offline histograms accessed at:
  http://nucsb03.fnal.gov/adcmmon/adcmmon.html

• Histograms for full ladders, or chips
  (Plots1, Plots2 links)
• ADCMon is useful for identifying problems including: bit errors (bottom left), no data, DPS failure, hot channels (bottom right), etc.
SiliMon

- Run separately from SVXMon/ADCMon, but in same consumer framework
- Contains histograms that monitor Silicon tracking efficiency defined as: fraction of times there is an SI hit in layer/wedge/bulkhead associated with a "good" COT track that is extrapolated through that region.
- Histograms of interest found in "EffMonitor/Expert" folder, in folders "PerWedge", "PerLayer", "PerBulkhead"
- Contain histograms in two categories - Integrated Efficiency vs. Time and \((1 - \epsilon)\) vs. Detector Sections (see next page)
- SiliMon is still in development, should be monitored by CO and problems reported to manca@fnal.gov and tara@fnal.gov
- For drastic problems, main pager carrier should check other monitoring tools
- Bad SiliMon slides are NOT grounds for marking Silicon bad
- Not ideal for ISL, especially at high $|\eta|$ since no COT coverage
- Currently does not support L00 or z sides
Review of CO, MPC Responsibilities

● Consumer Operator
  – At the beginning of each store, should start SVXMon and SiliMon in proper mode (cosmics or physics)
  – Throughout run follow CO checklist (SVXMon status Maps and SiliMon Efficiency plots) - page MPC for persistent yellow (no data) or red (error) in SVXMon, email experts for problems with SiliMon
  – With SiCo set good run bits for Silicon - SVXMon is part of criteria, SiliMon is NOT

● Main Pager Carrier
  – Make sure CO starts consumers at beginning of stores and check SVXMon status histograms
  – Respond to pages from the CO and diagnose problems using expert plots, Error Logger, ADCMon and other resources
– Keep problem database up to date so known problems are masked in SVX-Mon

– Contact the "experts" if any problems with the consumers:
  * SVXMon - Not entirely clear, so by default, me (Mark Hartz), mhartz@fnal.gov
  * ADCMon - Offline: David Stuart, stuart@neutrino.physics.ucsb.edu. Online: nobody, so once again Mark Hartz, mhartz@fnal.gov
  * SiliMon - Giulia Manca, manca@fnal.gov and Tara Shears, tara@fnal.gov