Calorimeter QA Code Update

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- Packages/How to Run
- Testing
- Output
- Status Tables
- Problems

Long-term Goal

We want as much good data as possible from the run.

By good data, we mean data from working detector channels that we can put into an analysis without worrying if corruption is present.

Customer Wishes

◆ Should function 24/7

◆ Should output QA status bits on all calorimeter tower channels

◆ Should run on an online or offline data structure filled with trigger-selected data

◆ Status tables need to be immediately readable by users

Strengths and Advantages

- Good data

- Physics papers

QA Code: CSMStatusUtils

- StRoot/StEmcPool/CSMStatusUtils
  - StBemcStatusMaker (need to rename this...)
    - Takes data from all minbias triggers
    - Puts calorimeter tower ADC hits into 2d histograms
      - Binned from 0 to 150 (ADC counts)
  - CSMBuildRunMap
    - Takes 2d histograms and concatenates them by run
  - CSMStatusUtils
    - Takes 2d histograms and performs status/pedestal tests
    - Outputs status and pedestal information into
      - Text files
      - Db-usable ROOT and text files
      - Html files + gif files (bad channels; hot tower plots)
    - Concatenates text status files into differential status files

How to Run CSMStatusUtils

- One script/macro takes file of input MuDsts, outputs 2d histogram files

  - One 2dhisto file per minirun

- Second script concatenates 2d minirun histograms into 2d histograms for each run

- Third script runs the status analysis

- Fourth script runs the text file abbreviator

Output

◆ Html file gives all runs analyzed

http://www.star.bnl.gov/protected/spin/relyea/BEMCstatus/bbemc/abemc/ bemcstatus.html or eemcstatus.html

◆ Links to html files for each run

◆ Files show all problematic channels

◆ Files link to gifs for channels whose status changed from previous run to current run

◆ Status files give status of all towers by run

◆ Indexed from 1-4800 (BEMC) and 1-720 (EEMC)

◆ Abbreviated status files give status of all towers which changed status from prior run

◆ Also exist in db-readable .root format for BEMC and db-readable text format for EEMC

◆ Pedestal files give pedestals of all channels by run (also in db-readable formats)

Status Tests

- Currently, status bits are saved as:
  - BEMC status bit format for ALL text files and BEMC db-root files
  - EEMC format for EEMC db-status files

1) Empty channel test: if channel empty, set bit 0

2) Pedestal tests
  - Pedestal found by finding most populated bin, fitting gaussian to that bin
  - Range test: if pedestal mean falls outside the 10-60 count range, set bit 4
  - Width test: if pedestal width is outside the range 0.5-2.8 ADC counts, set bits 4 and 32

More Status Tests

3) Hot/cold tower tests

- ◆ Take pedestal mean and add 6 sigma; find all hits from this value to 150 (ADC counts)
- ◆ Plot all hits on TGraph; find the mean rate
  - ◆ If channel has 10x more hits than the mean, set bit 2
  - ◆ If channel has 40x fewer hits than mean, set bits 2 & 16

4) Stuck bit test

- ◆ If channel has the 1, 2, 4, or 8 bits in the ADC stuck on, set status bits 8 & 64
- ◆ If channel has the 1, 2, 4, or 8 bits in the ADC stuck off, set status bits 8 & 128

5) If channel passes all tests, set status bit to 1

Problems/Issues

- ◆ All limits are semi-arbitrary
  - ◆ Hot tower at 10x average channel rate
  - ◆ Cold tower at 1/40 average channel rate
  - ◆ Pedestal mean deemed bad between 10 and 60 counts
    - ◆ Makes little sense – I propose 3 and 150
  - ◆ Pedestal width bad outside 0.5 to 2.8 counts

- ◆ Rate needed for status tables
  - ◆ Need at least 10k / channel as a <u>bare</u> minimum; 30k would be nice
  - ◆ This will make the current run boundary system obsolete – need to move to a streaming format
    - ◆ Get data until each histogram has about 30k events
      - ◆ Would need to ignore run boundaries, instead write UNIX start/stop time to original histogram file... a few changes would be necessary

More Problems/Issues

- ◆ Some BEMC pedestals are WIDE!
  - ◆ See plots
    - ◆ 6 sigma cut leaves a few "signal" events above pedestal
    - ◆ Is a 10 sigma cut necessary?!
      - ◆ In the BEMC, about 100 channels need a 10 sigma cut
  - ◆ Double pedestals are also an issue

- ◆ Would be good to know which channels have already been masked out in the db
  - ◆ Easy – will add this ASAP

- ◆ Want to add channels masked out in the trigger
  - ◆ By no means obvious how to do this
    - ◆ Who are the experts?

Even More Problems/Issues

- ◆ Data corruption could fool this code
  - ◆ <u>Need</u> bits from all the BEMC and EEMC header corruption tests
  - ◆ Would like a good ghost pedestal test
    - ◆ Are there known dead BEMC/EEMC towers?

- ◆ Most important – where does it run?
  - ◆ We have MuDsts that will be written immediately
  - ◆ Should this run offline? Online?

- ◆ Will Panitkin plots + this be enough to quickly flag bad channels?

Conclusion

◆ In the future, more physics experiments will be done