Pulser Tools for L1Cal2b

Robert Kehoe

L1Cal2b Mtg.

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Southern Methodist University
Department of Physics

- Goals
- Status of 2A Software
- Current Roadblocks for 2I
- Installation & Commissioni

Goals

- Pulser Provides a somewhat physics-like signal
- Useful for
  - debugging, eg. Cabling, ADF boards, BLS electronics
  - Possible timing study
  - Performance measurement of system
  - Relative calibration of same species of electronics
- Use pulser to establish proper function and calibration of 2b trigger
  - removes the important constraint of needing beam
  - Comparatively few events provide useful diagnostics
  - Much of flexibility of using data, although data still necessary for specific debugging needs (eg. Cell-level) and absolute calibration

Completed so far for 2A

- Comparison of trig/full readout (Kehoe)
- Pulser unpacking (Unalan, Kehoe)
- tool for presenting pulser mapping for trigger (Renkel)

- Some improvements left
  - Eta-phi maps for specified pattern
  - Maps for combinations of patterns
  - Coordinate transformations
    - TRG<->BLS<->PHYS

- Specified most important quantities to track (Unalan et al.)

L1CalPulser - 2A

- An Examine-style executable (derived from L1CalExamine)
  - Provides trigger/precision comparisons + pulser information
- Raw output mostly defined (Unalan)
  - Array of EM/HD Et means and RMS's per pattern

RUN NUMBER 201724

ETA	PHI 1	2	3	4	5
-20	3.51+0.70	2.08+0.81	1.83+0.63	4.04+0.73	3.37+0.58
-19	37.07+0.43	2.76+0.41	3.64+0.70	45.12+0.45	41.07+0.56

  - Table of what should have fired EM || HAD
    - Words indicating which cells pulsed per readout tower
    - Mean EM and HAD Et's

ETA	PHI			
-20 :	4	14	22	28
# Cel:	20	20	20	20
:	500	500	500	500
HAD :	2.03	1.99	2.13	1.89
EM :	2.04	1.85	2.24	2.00

L1CalPulser GUI - 2A

- Parse raw output and identify (Renkel)
  - Towers which should have fired but didn't
  - Towers which fired but shouldn't have
  - Current output to text file

```
> Active region:
> eta   fi   em   had   supposed to fire(em/had)    depths (from em to had)
> -20   9    0    0       nn
> 6     12         x       ny                       000000010000
```

- Ultimately provide
  - Interface showing problems in eta-phi or pattern
    - Query individual towers : what is behavior?
    - Use L1/precision comparison to specify problem
    - Make comments at smallest granularity possible

Pulser Runs

- Basic run:
  - each of 32 Run I patterns
    - no improvement in trigger granularity to use Run II patterns
  - DAC = 100 - 150, delay = 0
  - 10 - 100 evts each, all boxes ON
  - Defined by xml and pickle files: pulser control GUI cannot write these files successfully
    - Hopefully fixed this week (Wood, Hohfeld, Renkel)

- A lot of useful development with 2A-only readout
  - Fully exploit pulser granularity: probe sub-TTs fired by different pattern
  - Develop reference tables, plots
  - Timing? time history with multiple runs?
  - More debugging of BLS system, relevant elements of GUI+diagnostics
  - Look at relative calibration for 2A system

L1Cal2B Readout and Testing

- To test 2B electronics
  - need unpacker
  - Once unpacker works,
    - we can implement into L1CalPulser (last major piece)
- Studies can begin to
  - Compare 2B/2A
    - Noise, scale, etc.
  - Compare 2B/full readout
    - debugging
    - Later for final calibration
  - Make statements about ADF, etc. electronics
    - Many questions here
      - What is expected arrangement of hardware?
      - What are specific issues to comment on? (eg. R80 problem in 2A)

What to Look At?

- For Run 2A
  - Almost all debugging and calibration performed using 4 parameters for each TT
    - Pedestal mean & RMS
    - Gain (TRG/full) mean & RMS
    - Require N-S symmetry, phi-symmetry
    - Using physics data (some pulser use this last several months)
  - Occasionally look at tails of pedestal or gain distributions
  - Ways of identifying specific BLS+cable problems well-established
- For 2B
  - Use of pulser not yet completely understood
    - Use for Calibration especially a question
  - Need to understand specific ways to diagnose 2B electronics

Installation and Commissioning

- Probably need to fork off L1CalPulser into separate CVS package
- Prior to shutdown
  - Debug as much BLS electronics as can
    - Implement more mature and transparent plots for this
    - Take from what know already
  - Establish basic principles of debugging 2B electronics and establishing its performance
    - Determine and monitor parameters which define performance of system
    - Define and implement basic hardware plots
- During shutdown
  - Extensive tests to establish full coverage

Calibration

- Prior to shutdown
  - Current calibration determined last in Fall, 2003 by Kehoe/Unalan
    - Some electronics has changed, some channels are fixed
    - Sampling differences of Trig/precision accounted for
      - Eta-dependent corrections to 1%
      - Phi-dependent variations remain – generally 5% variations vs. phi within given eta
  - Measure calibration for current set of 2A electronics
    - Precision measure for all TTs
    - Don't need to correct, just have as calibration baseline during shutdown
  - Measure calibration for whatever 2B electronics available
    - Do electronics/timing issues alter the 2A picture?
    - Compare 2B/2A ratio for real data and for pulser to understand if pulsers telling you anything useful
- During and after shutdown
  - Use pulser and uniformity arguments to establish first pass calibration for 2B
  - Establish final calibration of new system with first data

Comments

- We have some of basic components
  - Fair completeness of raw information
  - some work done to understand analysis
- Unfortunately, the tools to make the most use of the pulser and look at 2B remain unavailable
  - Huge amount of work to do AFTER these are available
  - Delay may impact whether we can accomplish all of what envisioned 6 months ago (eg. Linearity, timing…)
  - Previous slides: mandatory work
    - we need to begin looking at full range of pulser flexibility
    - We need to start looking at and understanding 2B electronics output as seen in readout