Single-CAL Test and Calibration

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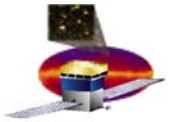
Motivation

- What is CAL calibration?
  - CAL assy & test program gives
    - Energy calibration for all CDEs
      - Derived from paddle-triggered muons and chg injection
    - Calibration for all configuration DACs
      - FLE, FHE, LAC, ULD
      - Derived from chg injection, tested with muons if possible
  - See ATDP for links to calib tables
    - e.g. see CAL FM 104 ATDP for CAL in use by I&T
- Why repeat at start of SLAC I&T?
  1. Switch to Flight TEM/TPS changed electronic performance slightly
     - See D. Smith's trending FM104_Sbay_HistSumm.pdf
     - e.g. 20-bin shift in LEX8 pedestal
  2. Single-Bay tests include configuring CAL, collecting "long" muon runs, reconstructing events, …
     - E2E tests, NASA PR runs, …

http://heseweb.nrl.navy.mil/glast/CAL_ATDP/FM104/CAL_FM104_ATDP-LAT-TD-05783-01.htm
http://www.slac.stanford.edu/~dsmith/FM104_Sbay_HistSumm.pdf

Clarification

- Let me be clear about this
  - Before you set thresholds on CAL with intent to collect and analyze photons or muons, you need to recalibrate the DACs
  - While the I&T program is
    - Mate flight TEM/TPS to CAL
    - Mate TKR to CAL + TEM/TPS
    - Run all sorts of configs, reconstruct events, etc etc
  - Then you *do need* to recalibrate DACs just after final mate
  - When the I&T program truly becomes
    - Mate flight TEM/TPS to CAL
    - Mate TKR to CAL + TEM/TPS
    - Run Single-Bay CPT (or LPT)
    - Run Multi-Bay CPT (or LPT)
    - Move on to the next tower…
  - Then there is *no need* to recalibrate DACs until just before the multi-tower muon runs
    - CPT and LPT do not require updated DAC calibs



DAC calibration procedure

- When?
  - After mate with flight TEM/TPS and CAL CPT
  - With or without TKR
  - Before configuring CAL for serious data taking
- What?
  - Run two CAL suites in sequence
  - calibDAC (run time 2¼ hrs)
    - Chg-injection measurements of FLE, FHE, LAC, and ULD thresholds
    - Covers full dynamic range of each DAC
    - Analysis is built into online scripts
  - muTrg (run time 4 hrs)
    - Four 1-hr muon runs
      - Two FLE settings at each of two trigger masks
    - Analysis is offline in root, in CM at SLAC
    - Confession
      - Current v2 muTrg running only at NRL is longer (6 hrs)
      - Three chg injection …singlex16 runs
      - Three FLE settings at each of two trigger masks
- Then you need use these results to build settings tables…

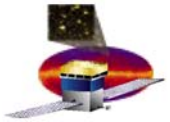
Building settings tables

- Need to build tables corresponding to desired settings
- Use existing v2 CAL sw, e.g.
  - genLACsettings
    - Inputs:
      - Desired threshold (MeV)
      - Desired gain setting (0-7, nom = 5)
      - Current LAC characterization table (…lac2adc.fits)
      - Current energy calibration (…adc2nrg.xml)
      - Current relative gain table (…relgain.fits)
    - Output
      - Time-tagged LAC settings table (…lac.xml)
  - genFLEsettings
  - genFHEsettings

Decoding existing DAC settings

- To understand current DAC settings, run v2 CAL tools
  - LACsettingstoMeV
    - Inputs
      - Settings table (…lac.xml)
      - Current LAC characterization table (…lac2adc.fits)
      - Current energy calibration (…adc2nrg.xml)
      - Current relative gain table (…relgain.fits)
    - Outputs
      - HTML report with DAC setting and corresponding energy
      - .csv table with DAC setting
  - FLEsettingstoMeV
  - FHEsettingstoMeV

- I'll be happy to give these to Eduardo for incorporation into the pipeline
  - They need to be converted to standalone and pipeline environment



Energy calibration procedure

- When?
  - After mate with flight TEM/TPS and flight TKR
  - After DAC calibration and settings generation
- What?
  - Run two CAL suites in sequence
  - calibGen (run time ½ hr)
    - Four chg-injection sweeps
      - LE channels in ground and flight gains
      - HE channels in ground and flight gains
    - Gives electronic linearity curves
  - I&T muon acquisition
    - Longer is better
  - Analysis of this pair is offline in root (calibGenCAL)
    - in CM at SLAC

Summary

- Before you set thresholds on CAL with intent to collect and analyze photons or muons, you need to recalibrate the DACs
- To recalibrate the DACs, run two suites
  - calibDAC
  - muTrg
    - And analyze off line
- To calibrate the CAL energy scale, run two suites/scripts
  - calibGen
  - I&T long muon collection
    - And analyze off line