L1CalExamine

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1/22/03

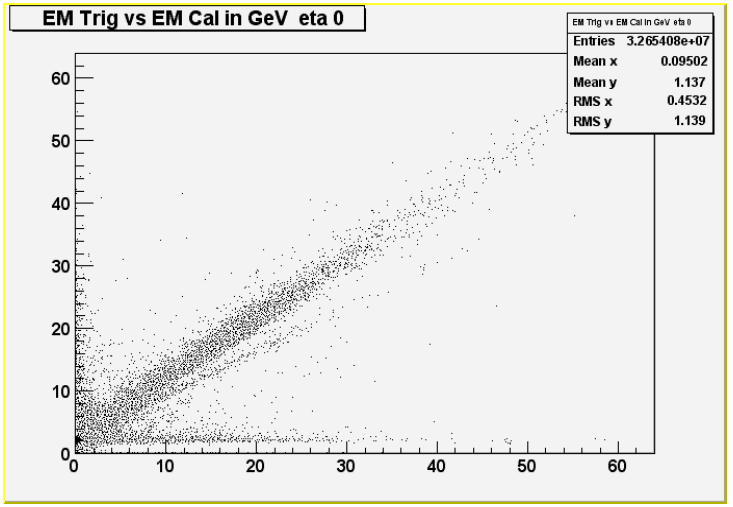
- How to Use L1CalExamine
- Shifter/Physics Plots
- Pedestal Plots
- Calibrations Plots
- Tracking Bad Towers
- What's Left?

How to Use L1CalExamine

- **login to d0ol06 or d0ol23 as d0cal**
  - > cd /online/examines/development/l1calex
  - > setup d0online
  - > d0setwa
  - > cd l1cal_examine/online
  - > ./Runme.sh
- **use of L1CalExamine.rcp**
  - expertmode = 0; dataType = "DATA";
    - **higher expertmodes turn-on detailed pedestal and gain plots**
    - **MC currently requires different unpacker than data (L1Cal vs. L0Cal)**
  - truncate = false; addpeds = false; SubtractPeds = true;
  - CEM Et and eta limits, CJT Et and eta limits; four refsets each
    - **determines what towers go into Physics and Calibration plots**
- **ExamineMgr.rcp toggles ROOT or HBOOK output**

Cal Precision Readout

- **group cells into trigger tower objects**
  - indicate what should have seen in L1Cal
  - allows crude trigsim ability
- **required to:**
  - establish calibration
    - **set of constants to configure gain DACs**
  - monitor over time (or changing RECO versions!)
- **current issues**
  - p11 Cal weights now used
    - **non-linearities taken care of**
  - able to view online
    - **had an RCP error before**

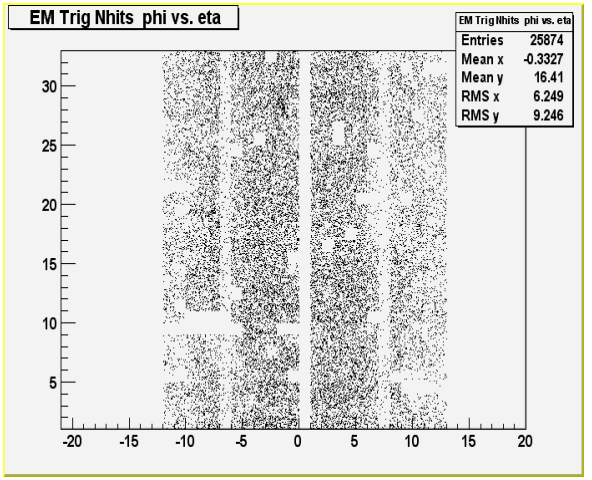


Shifter Plots

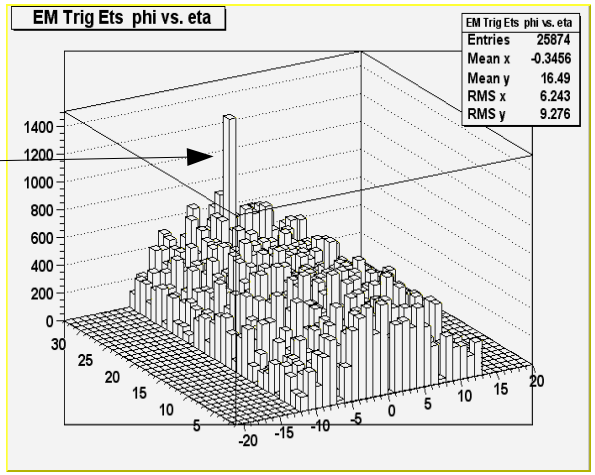
- **most plots in EM, TOT, and HD versions**
- **those with * have Trig, Cal, and Pulser versions also**
- **Et plots**
  - *1D histogram, refreshed every few minutes
  - *sum Et lego in eta vs. phi
  - Et per hit averaged over few minutes
- **# hits plots**
  - # hits lego in eta vs. phi for each of 4 refsets
    - **use EM refsets for HD**
  - rate per event (invariant of data flow thru distributor)
- **avg. pedestal and RMS over few minutes**
- **avg. gain and RMS over minutes or hours**

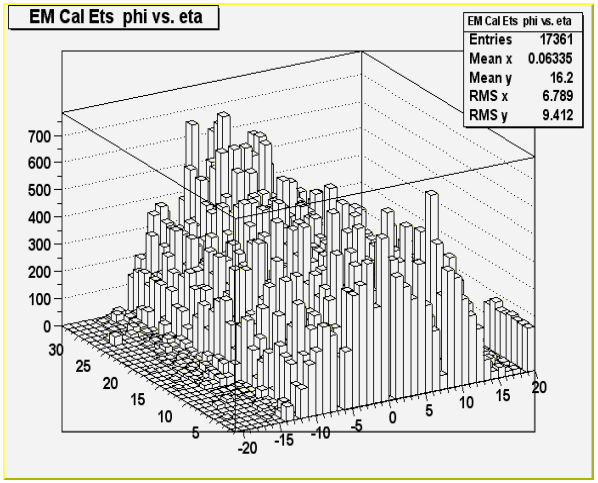
Physics Plots

- **types of plots**
  - EM, TOT, HAD
  - 1-D Ets of towers
  - 2-D of tower Ets and rates
  - missing Et, Ex, Ey
  - L1Cal and Cal (in trig. towers)
- **useful for**
  - finding hot towers
    - **those with alot of energy frequently**
  - finding noisy towers
    - **those with medium or low energy, but frequent**
  - easiest to correlate with Cal plots
    - **is problem in Cal or L1Cal, and where**
  - is physics okay?!



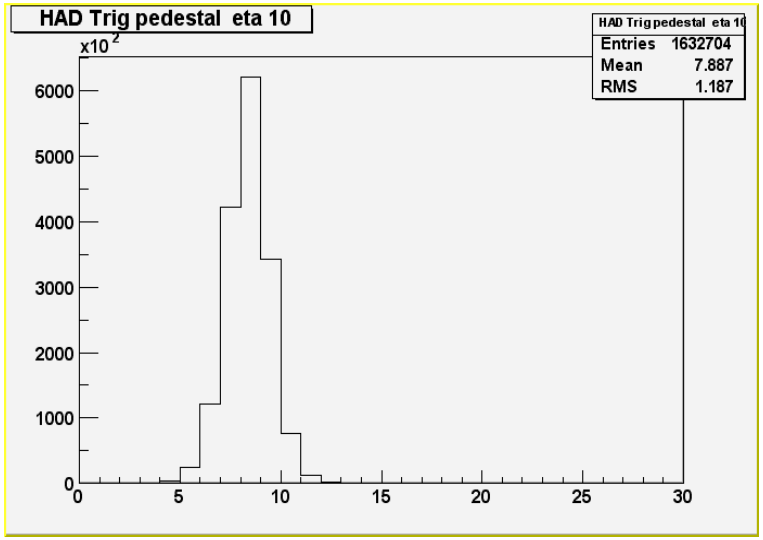
warm tower





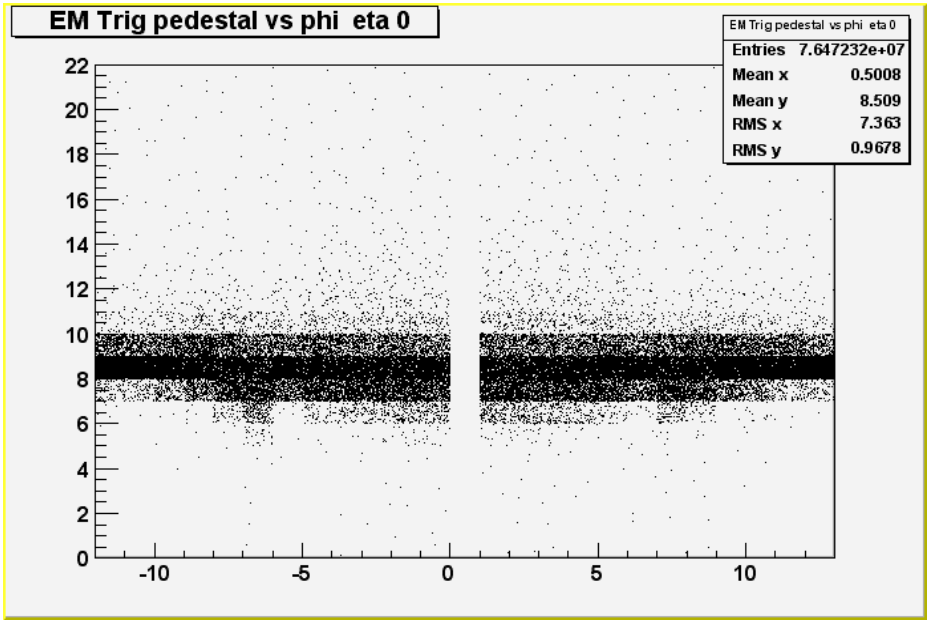
Pedestal Plots

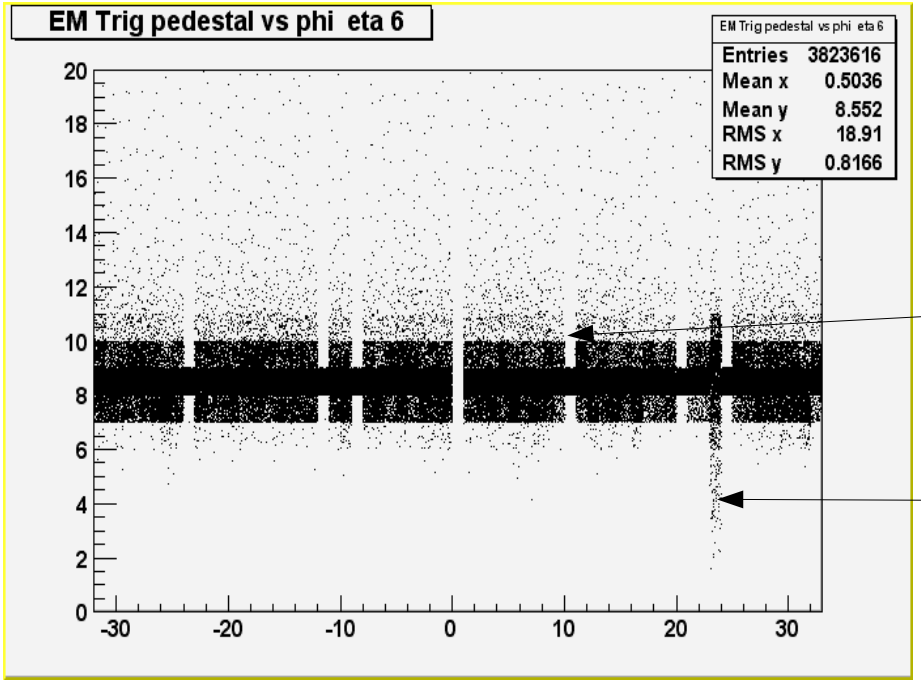
- **expert level beyond Shifter plots**
  - integrate over all events
- **EM and HAD**
  - pedestal set to ~8 counts (ie. ~2GeV)
    - **imperfect setting method, some high, low**
  - shifter mode
    - **2-D of pedestals vs. eta**
    - **1-D of pedestals at each eta**
- **probes**
  - dead/broken pedestal DACs
  - unplugged cables
  - noisy channels
  - uniformity of L1Cal
- **in Physics, BLS and CTFE coordinates**



EM Pedestals

- **Eta-dependence**
  - narrower in forward
  - ICR wide
  - Mean shifts

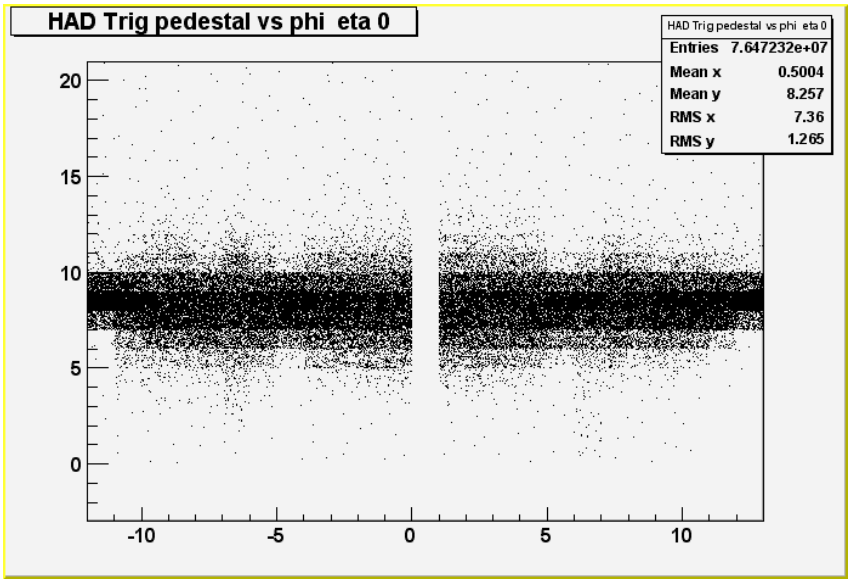


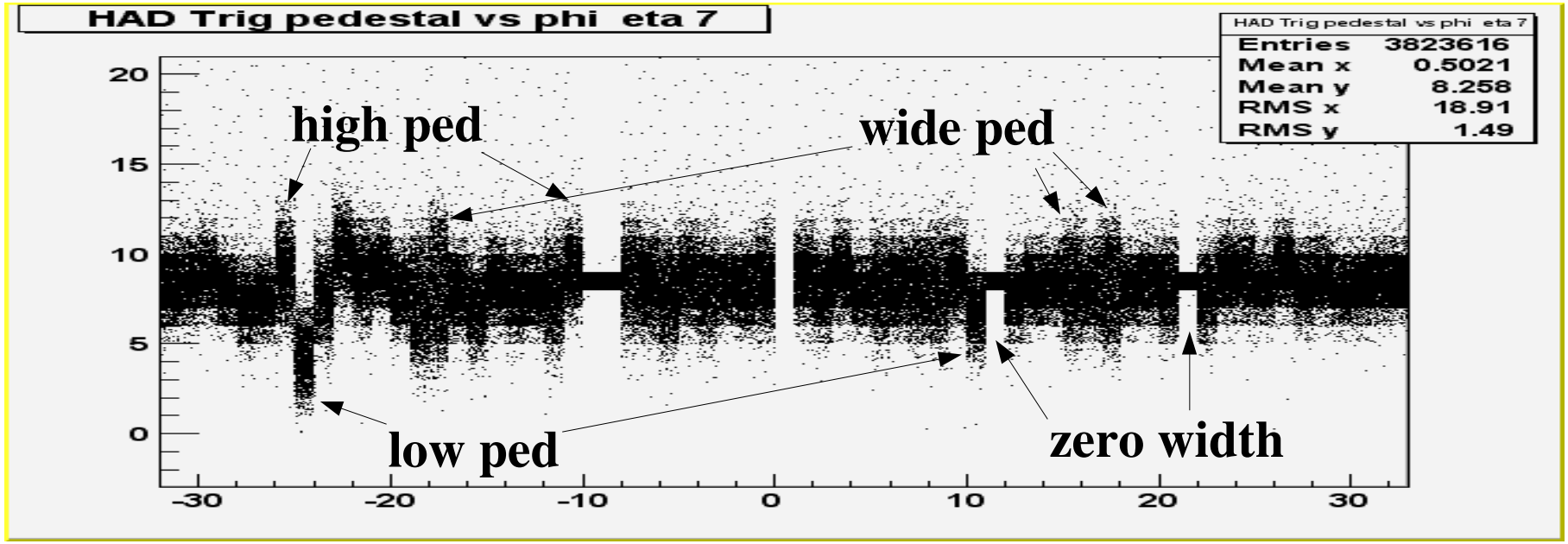


Many problem channels
- zero width pedestals
- many unplugged due to noise
- wide pedestals

HAD Pedestals

- About twice as wide as EM
- Eta dependence similar to EM
- some pedestals up to 1 GeV hi



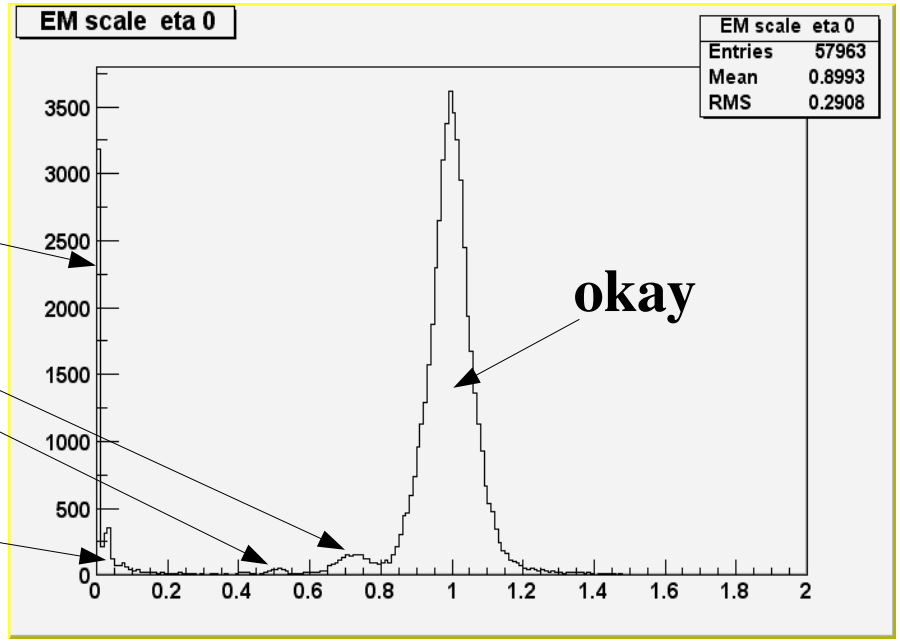


Calibration Plots

- **expert level plots**
- **EM and HAD**
  - gains set by gain DACs
    - **reference is precision readout as tuned for trigger**
      - **EM vs EM(Cal)**
      - **HAD vs FH(+CH)(Cal)**
      - **should generally be ~1**
      - **have not yet comensated for difference in sampling weights**
- **probes**
  - bad summers, drivers, differential lines
  - improper terminator card components
  - power failures, power supply instabilities
  - bad gains, improper DACs
  - timing, event misalignment issues
  - miscabling
  - improperly burned lookup PROMs
- **in Physics, BLS and CTFE coordinates**

Calibration Plots

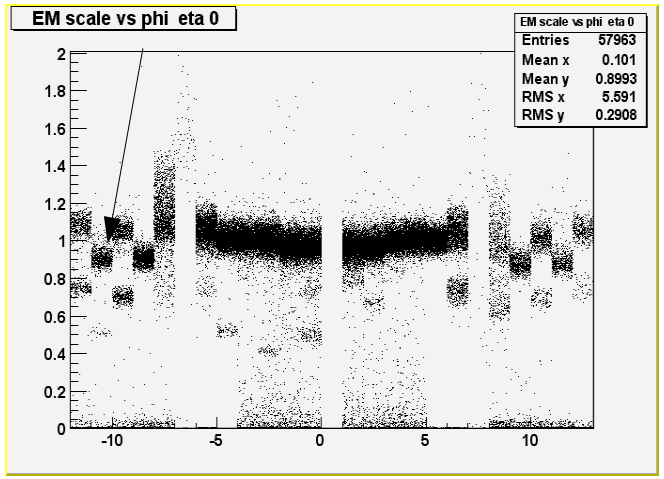
- **for each of EM and HAD**
  - 2-D Trig Et vs Cal Et
  - 1-D scale (ie. Trig/Cal)

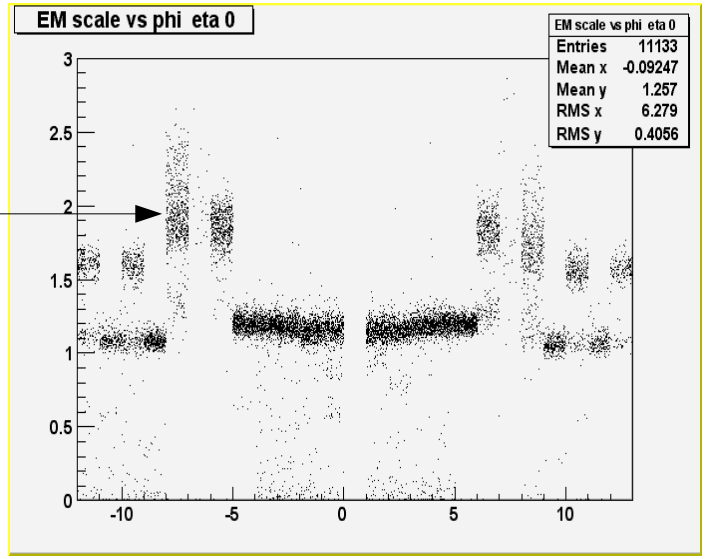


  - 2-D scale vs. Cal Et
  - 2-D scale vs eta
  - in expert mode, all plots also made seperately for each eta
- **further plans**
  - add pulser based plots to 'predict' trigger tower behavior
  - allows ability to probe towers at single cell level, or at least in groups of cells

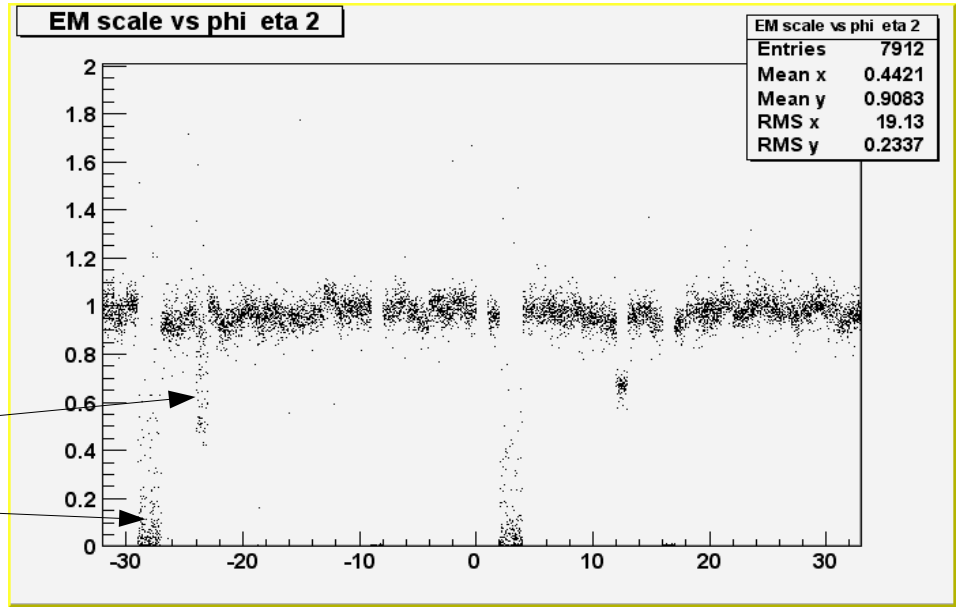
EM Calibration

- **even etas > 4**
  - wrong resistor on terminator boards
    - **causes 1.43x too high gain**
    - **corrected in configuration gain DAC**



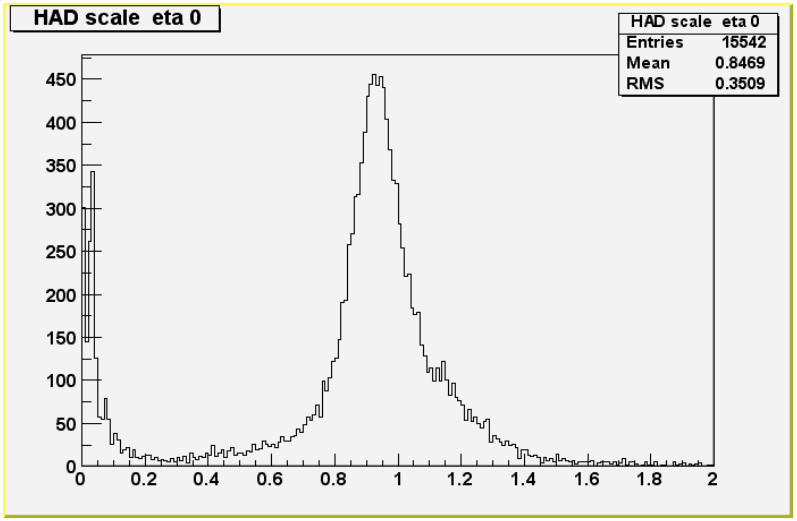


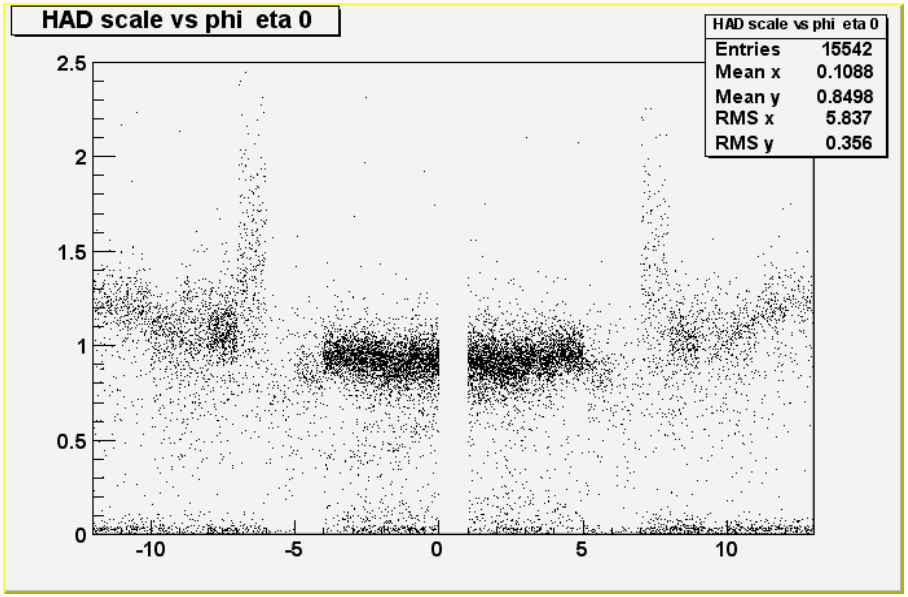
  - several problems, eg.
    - **gains ~ 0.5x or 0.75x**
      - **summers/drivers**
      - **differential signals**
    - **wide gain**
    - **no energy in trigger**



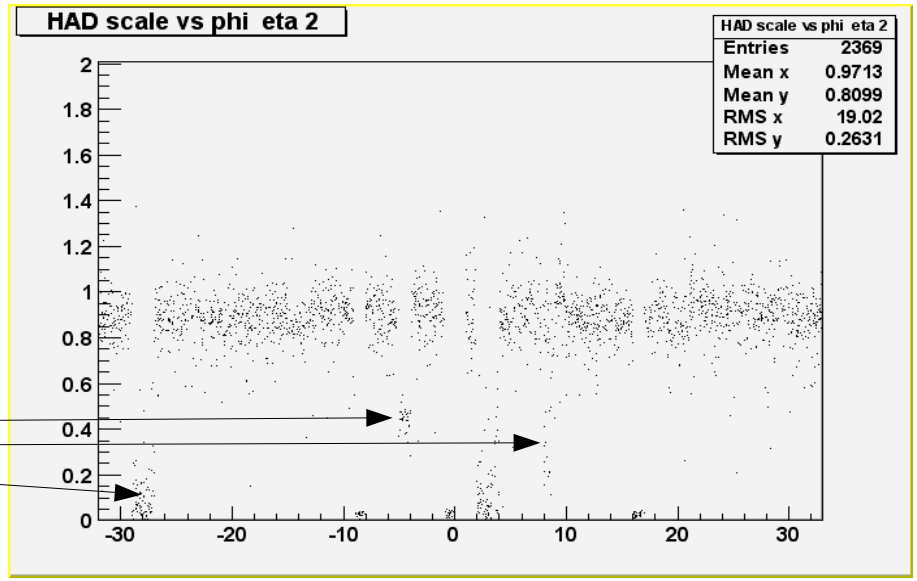
HAD Calibration

- **to eta of 1.5, off by ~1.6**
  - for central HAD
    - **0-0.8 scaled by 1.6x in HW**
    - **0.8-1.6 configured to 1.6x**
  - forward has not been scaled yet



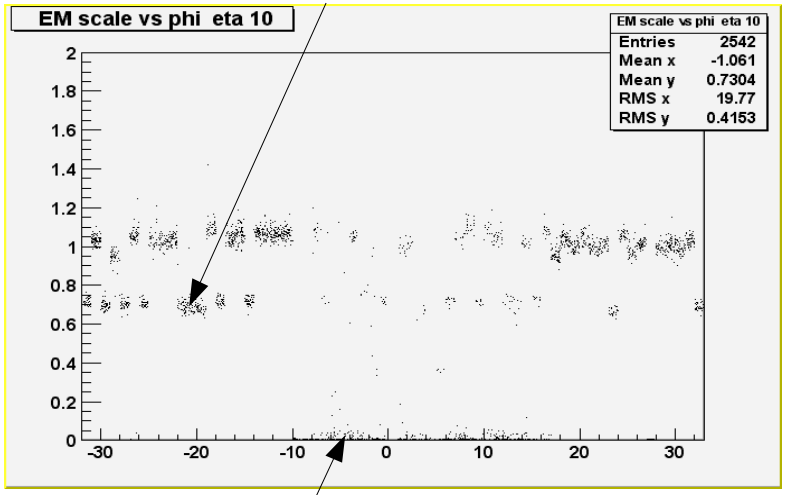


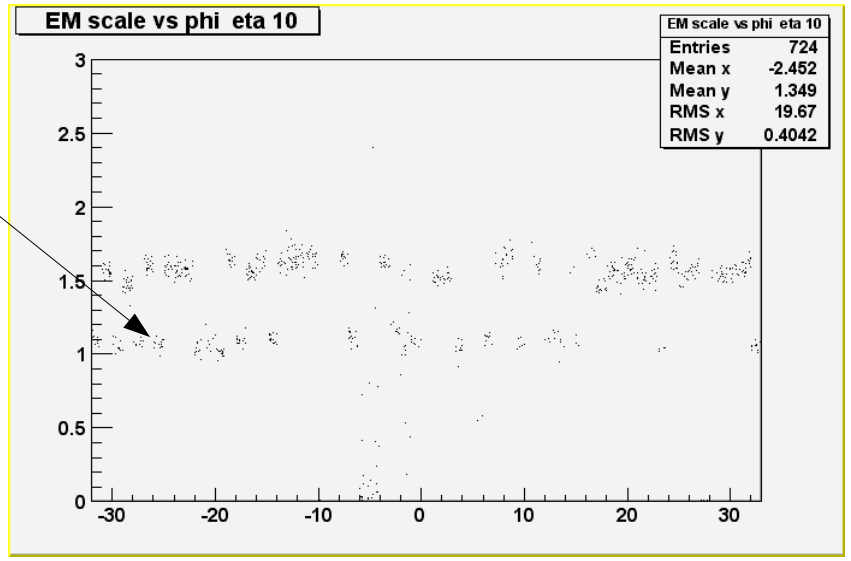
- **similar problems to EM**
  - 0.5x low, no energy, wide gain



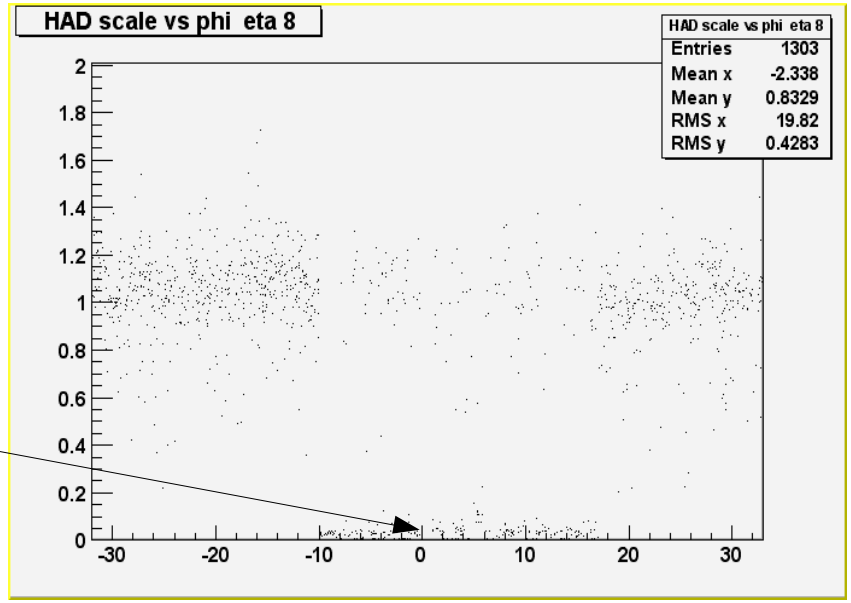
Problems with Forward Scale

- **even etas of EM**
  - some towers had correct scale
    - **now 40% low**





- **Cal/Trig misalignment**
  - much of time not same
  - EM and HAD
  - |eta| > 6
  - phi 1-16 (+eta), 1-9,10 (neg. eta)
    - **corresp. to boundary in BLS crates**



Tracking Bad Towers

www-clued0.fnal.gov/~kehoe/l1cal/l1cal_badtowers.lst

- **list of towers failing cuts on:**
  - pedestal mean and sigma
    - **avg. too high**
    - **avg. too low**
    - **width ~0**
    - **too wide**
    - **width too narrow**
  - gain mean and sigma
    - **low gain**
    - **high gain**
    - **no energy**
    - **wide gain**
  - comparison to 'medianed' reference for a particular eta
- **list currently generated during run-time**
  - to be databased with flag word and attachment
    - **maybe to significant event system**

Other Features

- **pulser code**
  - permits inter-store debugging of channels in pulser runs
  - permits fast, approximate verification of calibration status
  - in progress: finished in next two weeks
- **hot tower finder**
  - provides monitoring of intermittently hot towers
    - **the dominant problem**
  - will be finished this week
- **monitoring**
  - continuously evaluate towers during datataking
    - **rate, gain, resolution, and pedestal**
  - link into databases and/or significant-event system for tracking and alarms (right now, just flat files)