# TKR to CAL for 16 Towers

- The usual TKR extrapolation to CAL study, for the 16 tower data. Check calibrations, look for problems, etc.
- Today -- “work in progress”, leading to WorkShopSix©.
- HIGHLIGHTS --
  - *Histograms* of same old quantities (due to popular demand).
  - Good uniformity of CAL response ; good simulation agreement
  - The CalTuple had problems, now it don’t
  - ADC distributions from CalTuple where you can see the LAC edge.
  - Towards Level 3 requirements and IA workshop #6

# The Method

[Review my IA Workshop #4 presentation if you like (14 July 2005).]

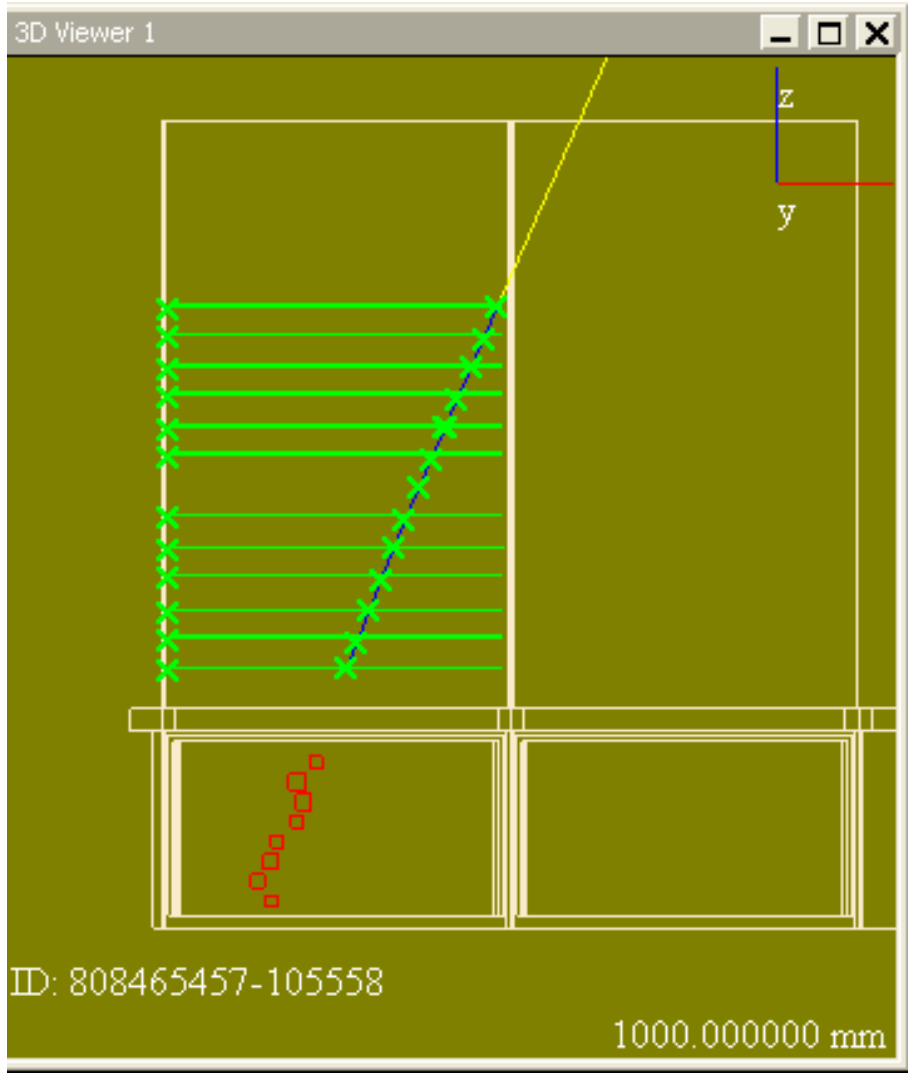
- Extrapolate TKR track to CAL, predict which crystals get hit. Look at energy deposits, positions.

- Use Tkr1EndPos, Dir. Stay a few cm away from crystal ends.

- Require:
TkrNumTracks == 1
Tkr1KalThetaMs < 0.03
Tkr1NumHits > 15

<2 MeV in adjacent crystals
Extrapolation of track must traverse top & bottom of crystal.

- Energy corrected for cosθ.

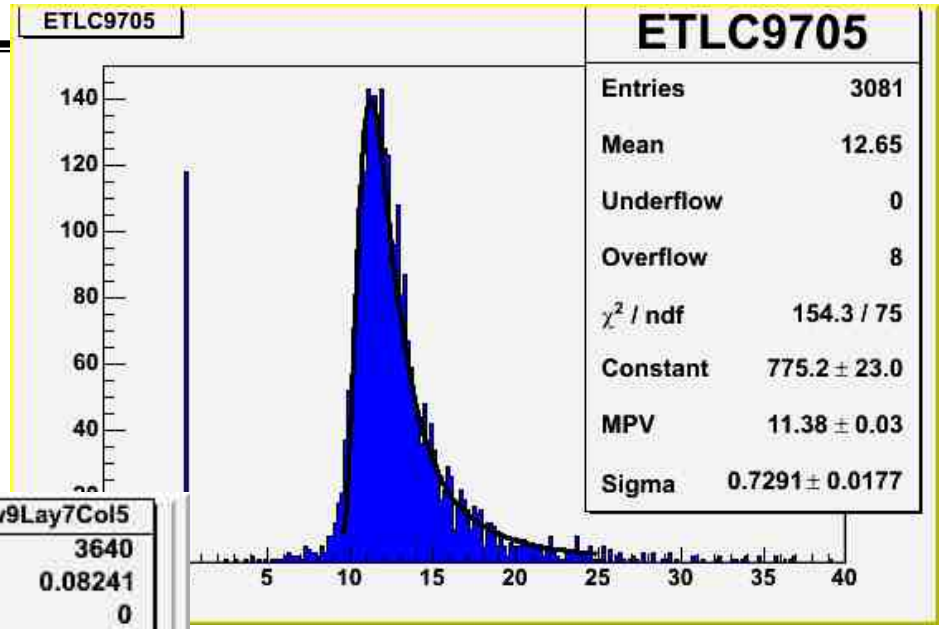


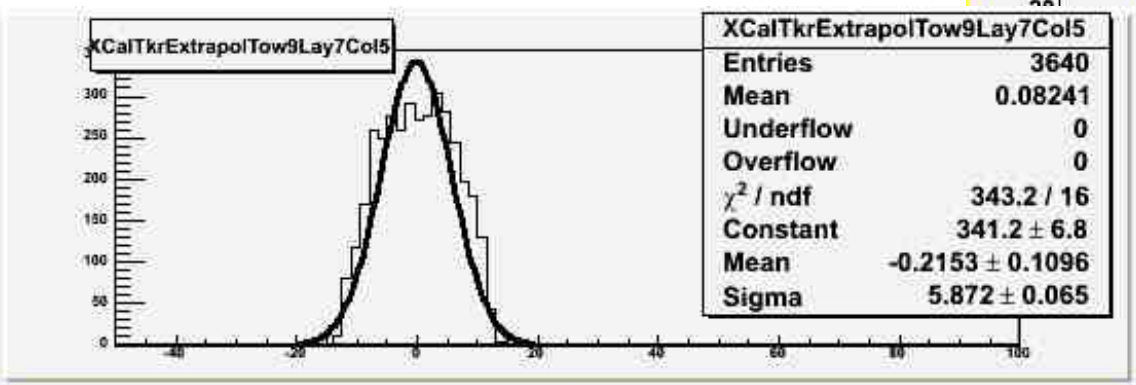
# A typical crystal: tower 9 Layer 7 Column 5

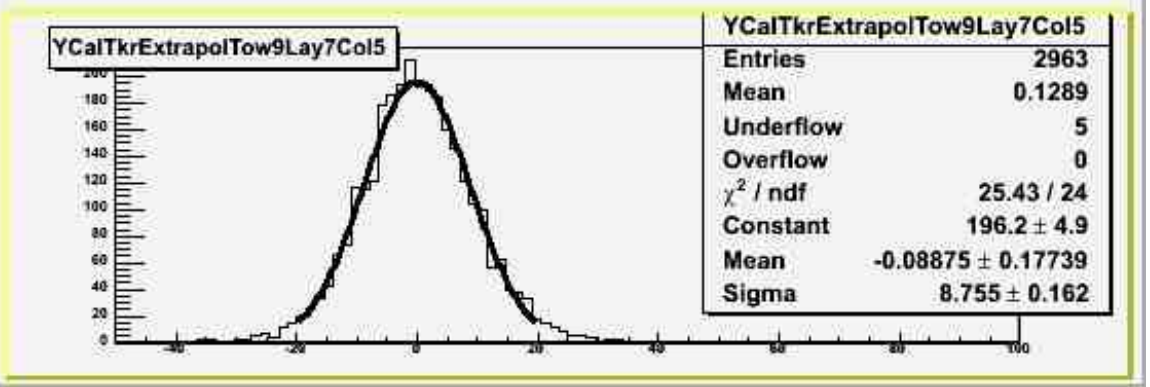
Red: six B30 runs (135005404 to 14)

Blue: eight B2 runs (135005345 to 59)

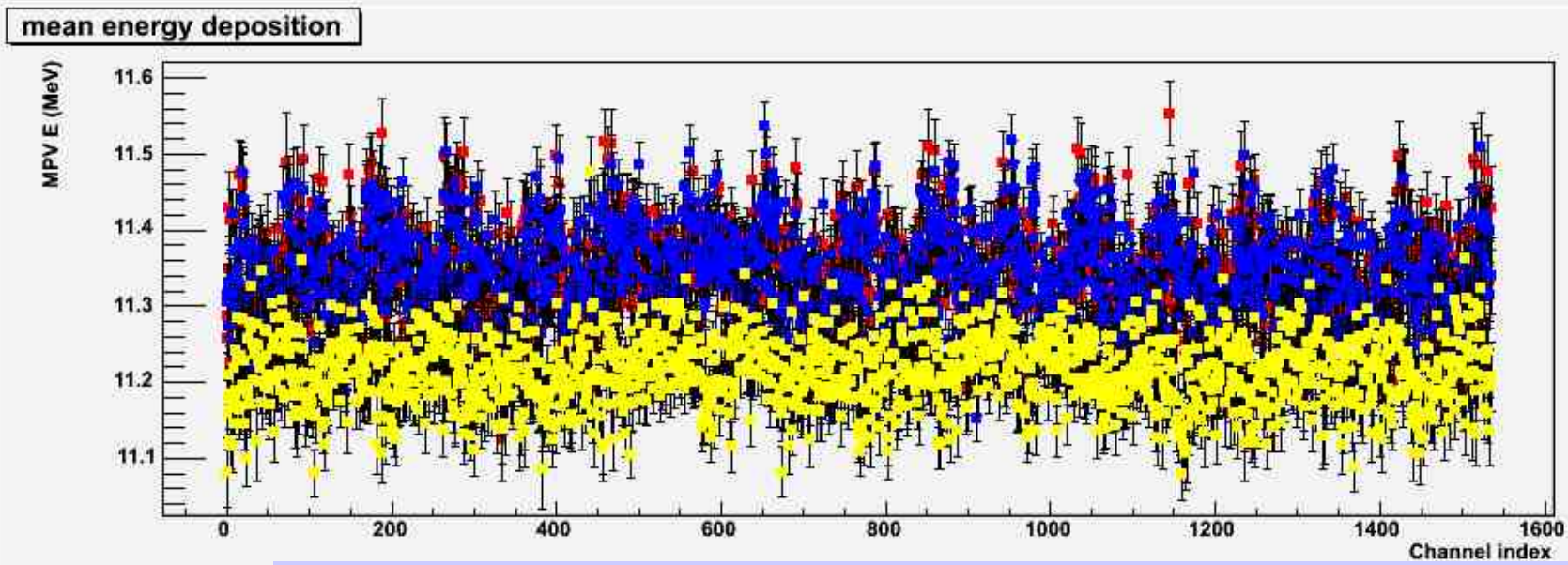
Yellow: 4M Surface Muons (v5r0703p5)



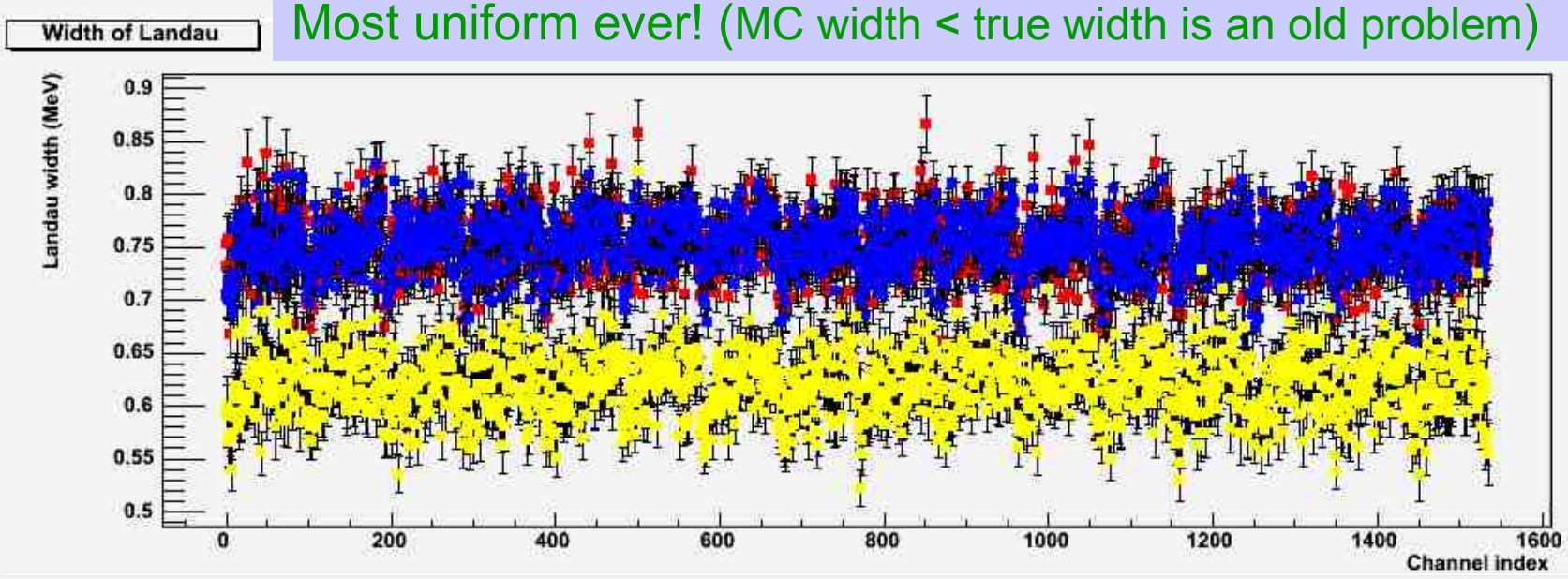



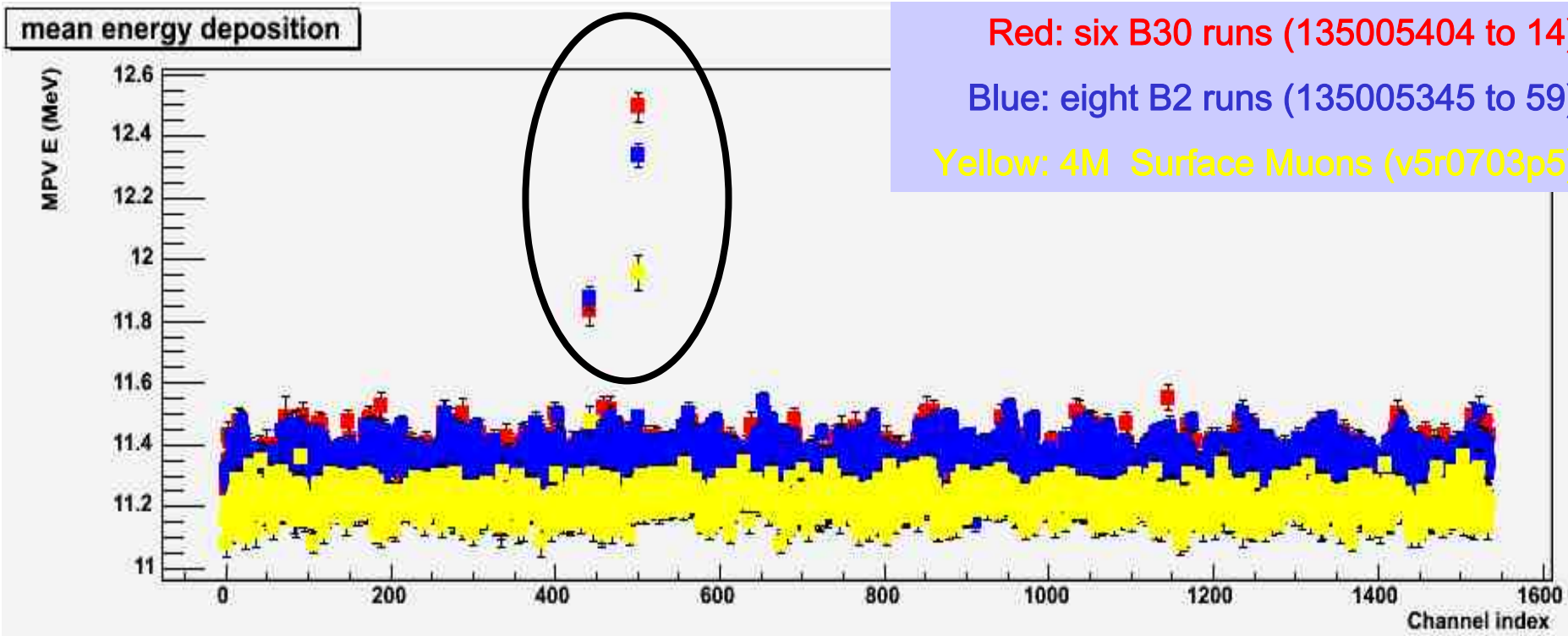
# Energy deposit vs crystal index




Most uniform ever! (MC width < true width is an old problem)



# Un-zoom y-axis of energy deposit vs crystal




2 of the 3 channels with LAC DAC = 127.

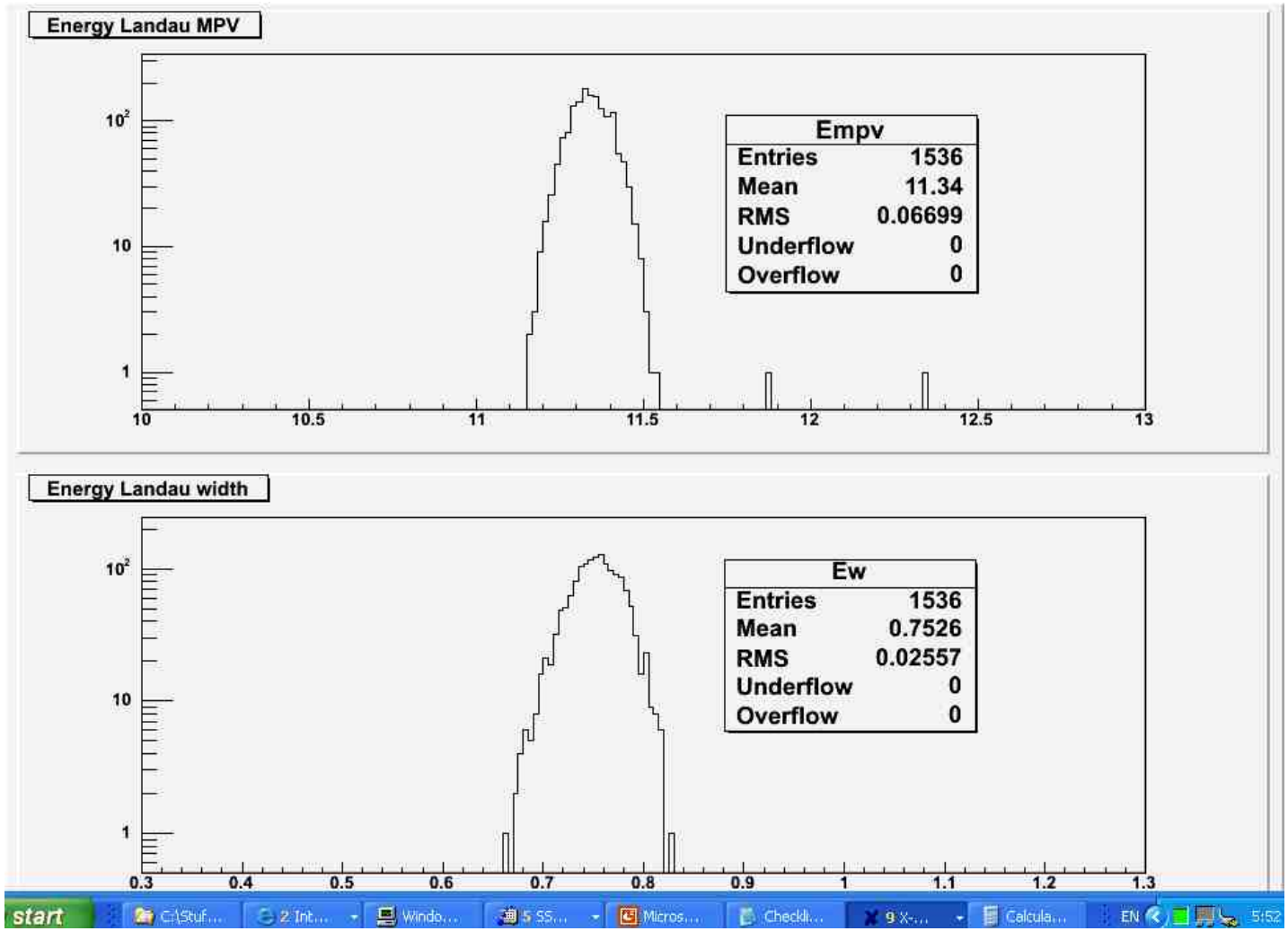
Note that simulation (nearly) reproduces the effect.

11.2 MeV by design and in MC, but 11.3 MeV in data, both B2 and B30.

(B30 used for calibration.)

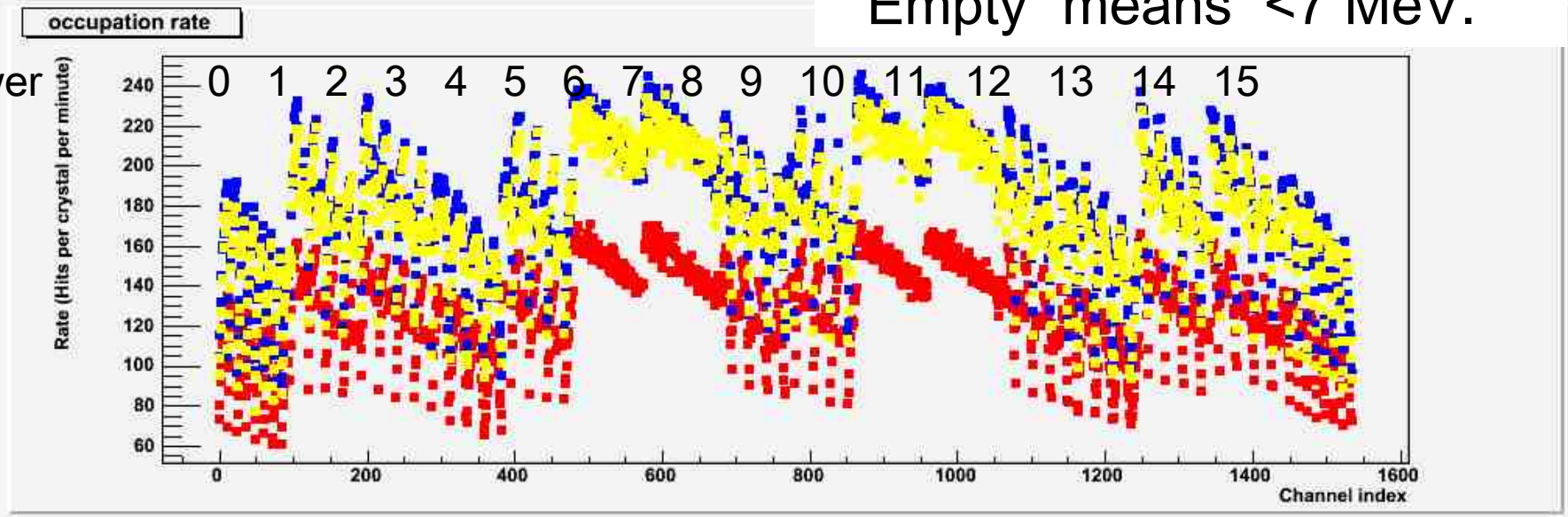
# Energy deposit histograms

Here, B2. B30 looks same, MC looks real similar.

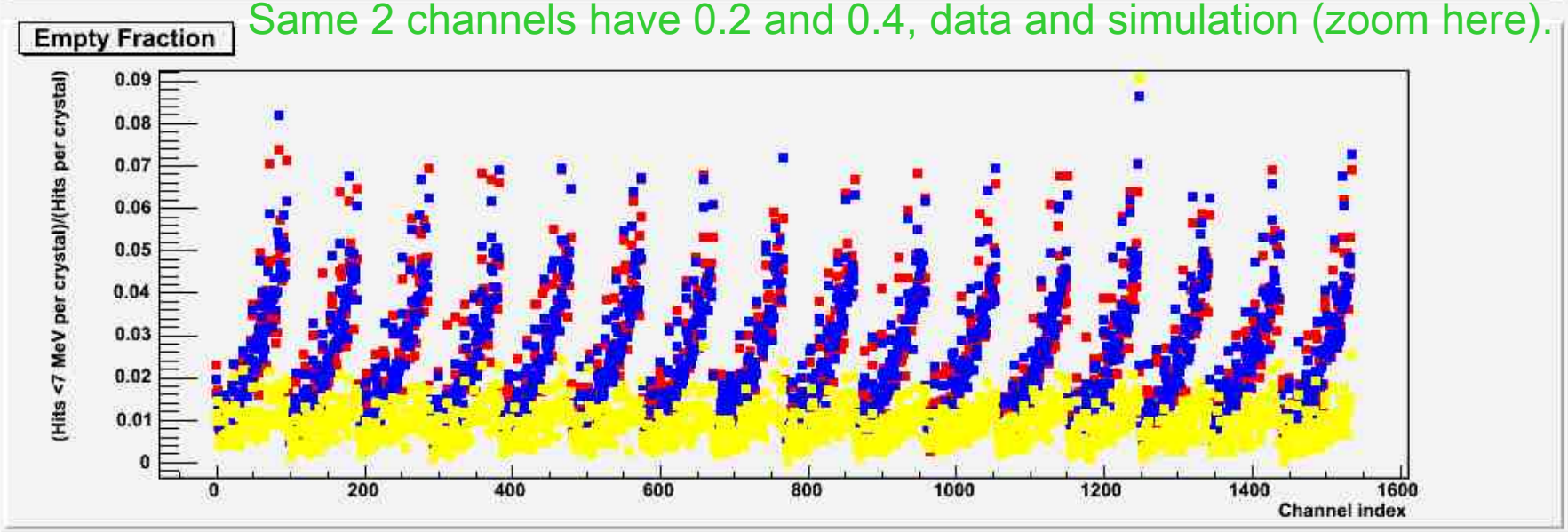


# Fraction of events where expected energy deposit is absent, per crystal.

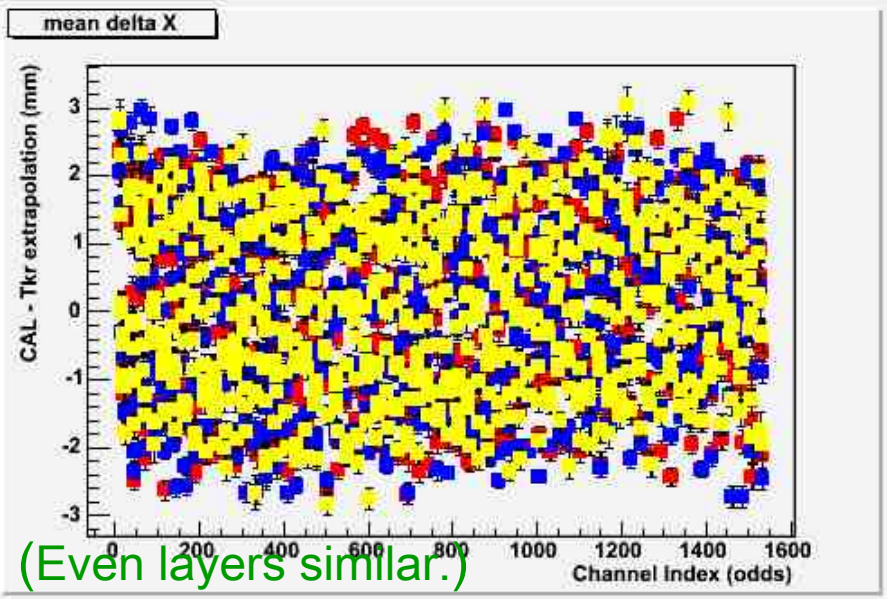
"Empty" means <7 MeV.



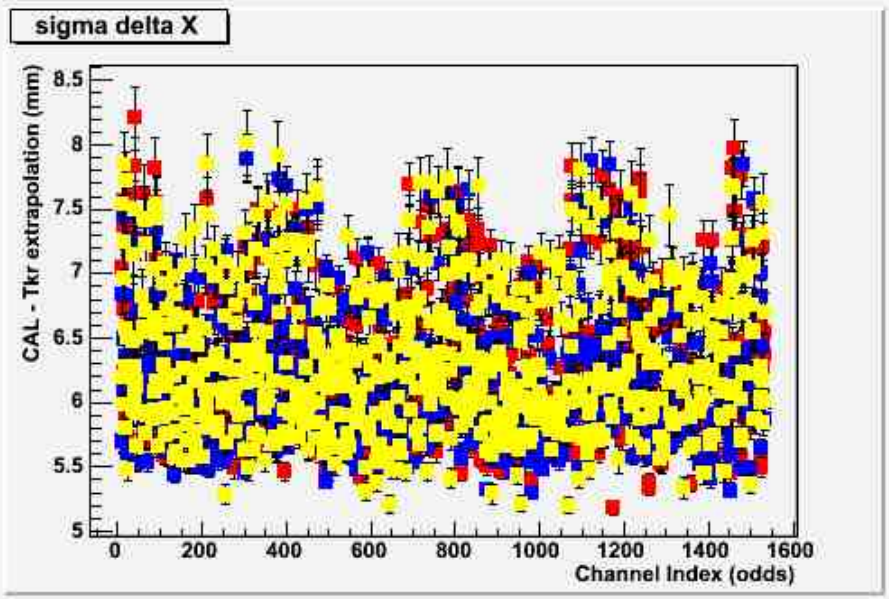

Same 2 channels have 0.2 and 0.4, data and simulation (zoom here).



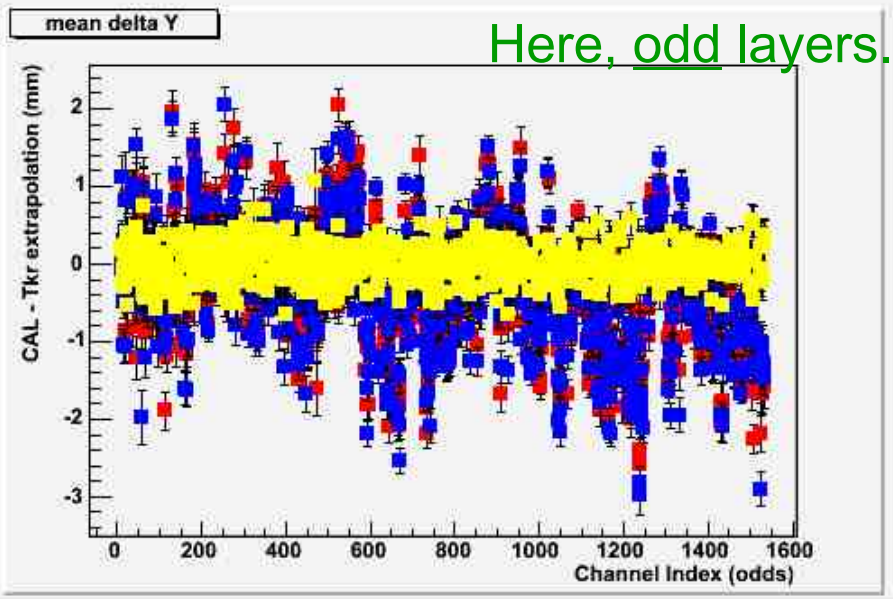
# CAL position vs extrapolated TKR position

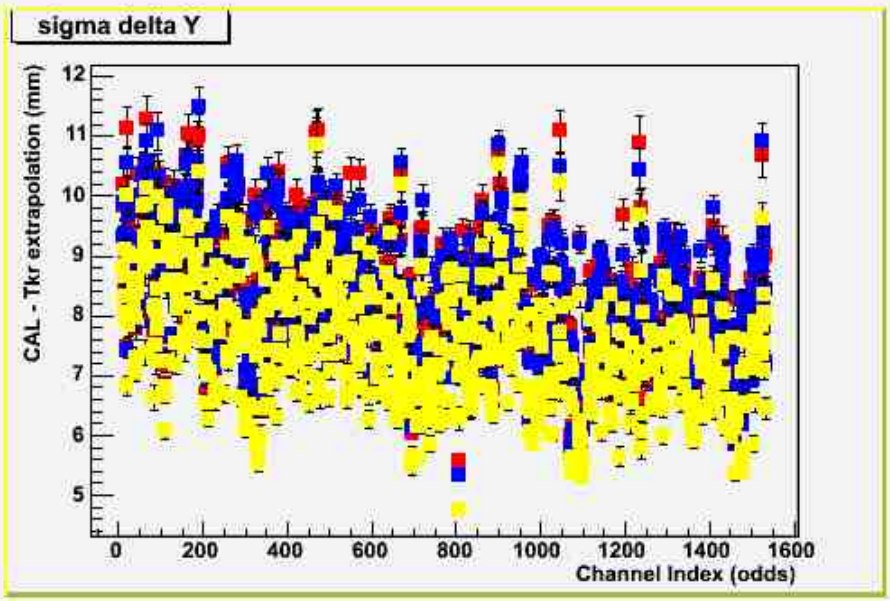



(Even layers similar.)

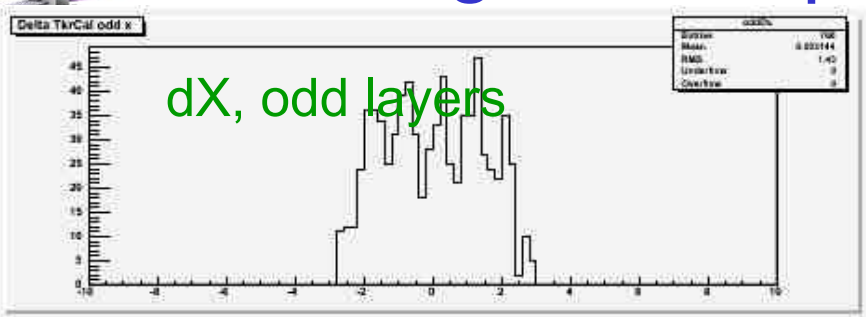


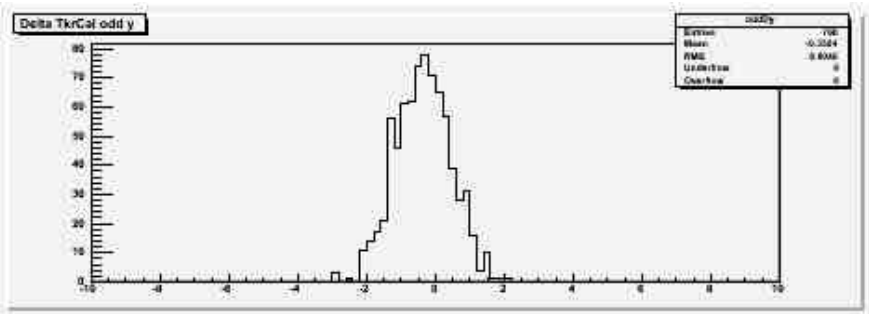

Here, odd layers.

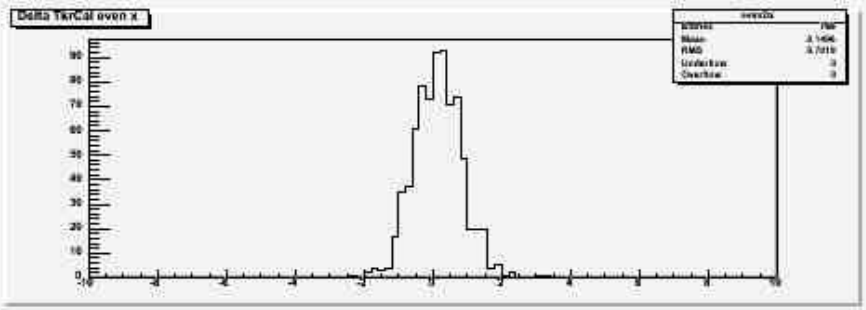


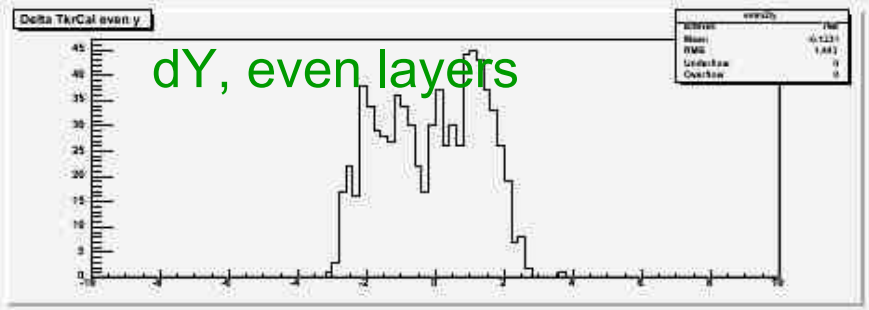



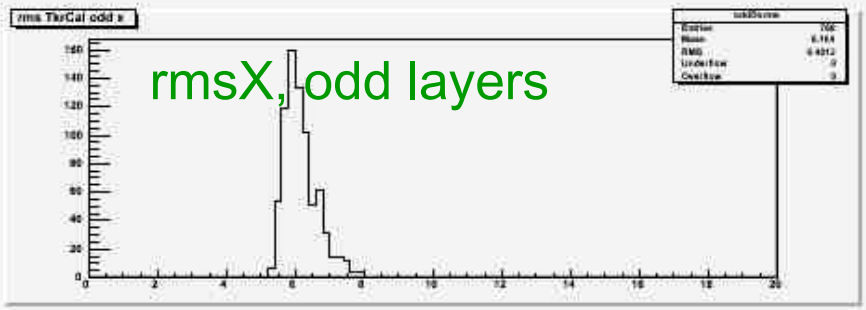
# Histograms of position differences

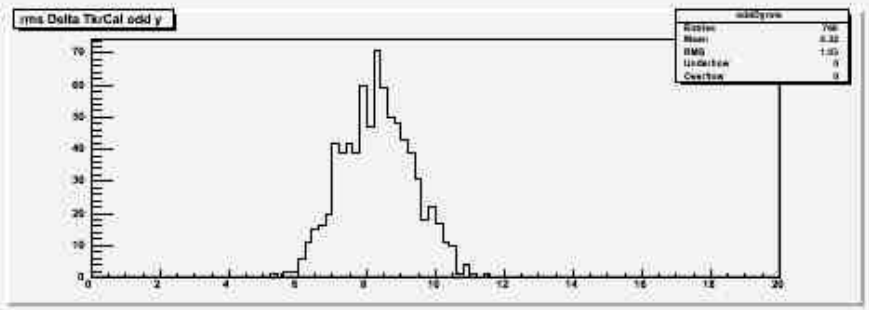


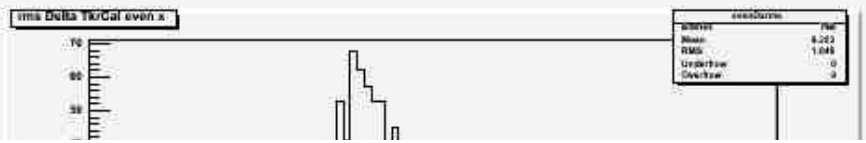



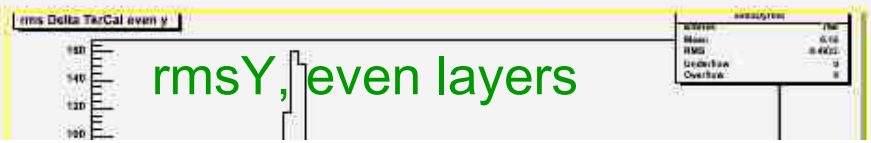



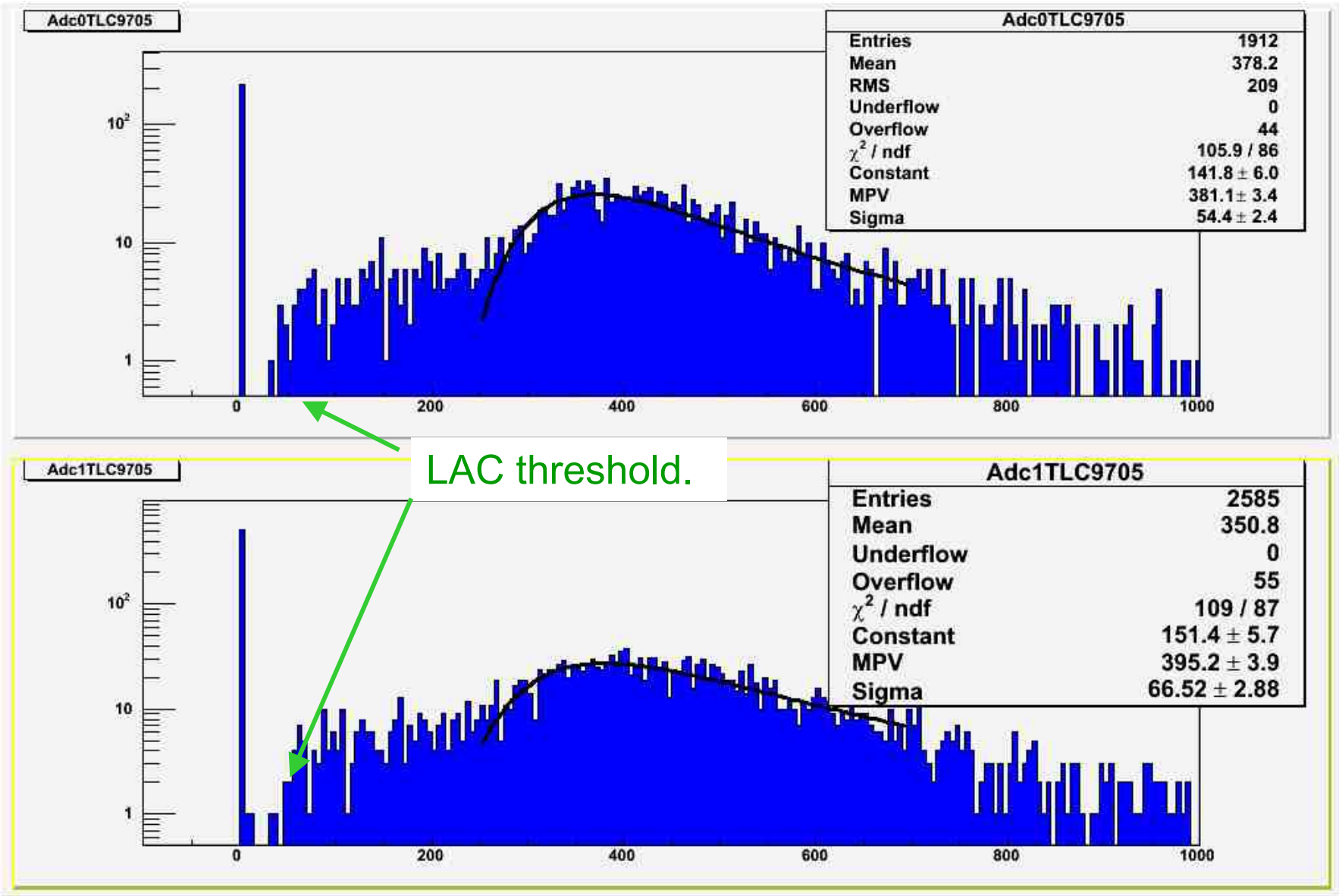




Demonstration of Level 3 CAL position req'ts will come from this. CalMIPDir gives direction req't nicely.

# Single diode pedestal-subtracted ADC counts



# CalTuple is A.O.K.

Preceding plot took a while to make: the CalTuple

a) dropped empty events, fouling up the correspondence between

Merit<->SVAC<->CalTuple

b) Had different root structure from other tuples, and different versions between MC and real data.

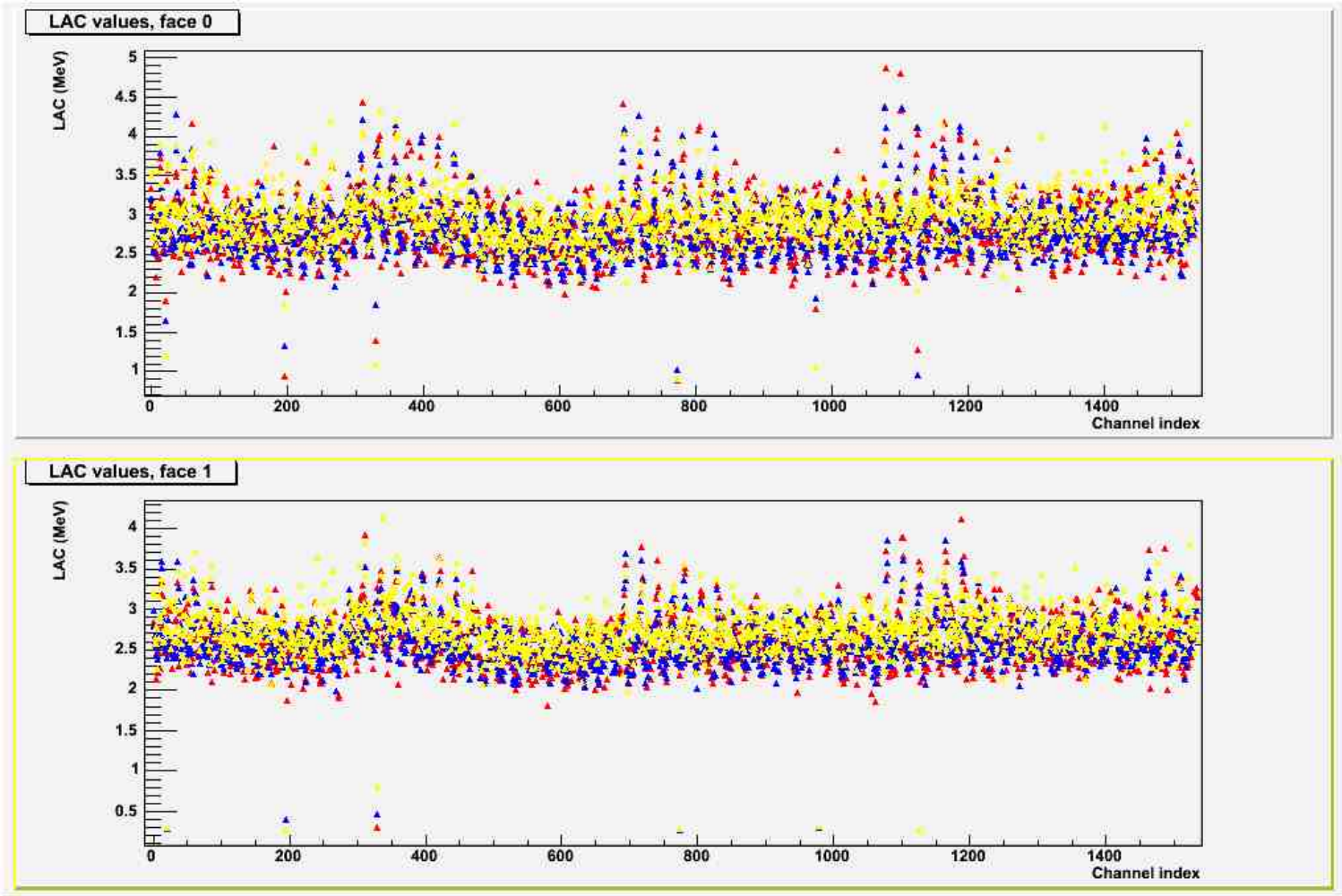
Thanks to Zach and Anders and Heather it is now “A #1”.

To express LAC in MeV: Landau fit gives MPV in ADC counts, then say

LAC_MeV = 11.2 * LAC_adc/MPV

# Observed LAC thresholds for all channels

- Find the LAC turn on, in ADC counts, crystal-by-crystal.
- Tuning in progress -- presently what I find is (maybe) 2x too high.



# For the workshop…

1. Lots already done. No big problems in 16-tower CAL reconstruction, and the calibrations uniform, which didn't use to be true, even if at 11.3 instead of 11.2 MeV. B2 and B30 give the same results. The simulation is pretty darn good for most (but not all) parameters.
2. Improve the LAC finder, compare with LacDac settings in more detail.
3. Spell out Level 3 requirements fulfillment more clearly.
4. Et cetera and so forth.