

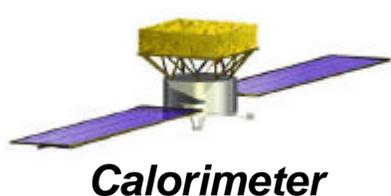
Calorimeter

*GLAST Software
15-17 May 2000*

Status of Calorimeter Software

J. Eric Grove
Naval Research Lab





The Seven Steps to Calorimetry

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□ Outline of CAL analysis

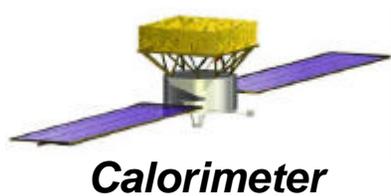
1. Read raw ROOT data
2. Subtract pedestals
3. Apply non-linearity corrections
 - Accounts for electronic effects
 - Output: charge at preamp input
4. Apply gain corrections
 - Accounts for optical contact
“e_per_MeV”
 - Output: MeV deposited, as measured in each diode and gain range.
5. Select best gain range
 - Most ADC bins, but unsaturated (ULD)
6. Calculate layer sums and total sum
 - $LLD = 3\sigma$ on pedestal width
7. Fit shower profile
 - Start with Gamma distribution...

□ IDL implementation

1. root2idl.pro *(thanks Heather!)*
2. subtract_pedestals.pro
3. ADC_to_fC.pro
4. fC_to_MeV.pro
 - Needs review for small PIN
5. range2use.pro
 - Needs to use array of ULDs
6. layersum.pro
 - LLD needs study
7. calfit.pro
 - Needs interface update

□ I've already done this for selected positron, photon, and hadron runs.



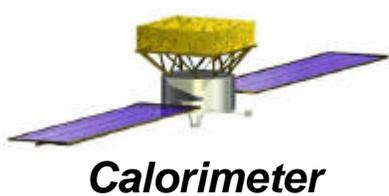


Cal S/W Documentation

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- ❑ All CAL software must be documented, by order of W.N. Johnson
 - Each functional unit (at least The Seven Steps to Calorimetry)
 - And the profile fitting needs more than just one sentence.
 - Plain ASCII text is fine! No fancy s/w-of-the-month is necessary.
 - Name
 - Purpose and Method include the physics, if appropriate!
 - Calling Sequence
 - Inputs
 - Switches
 - Outputs
 - Dependencies
 - Restrictions and Caveats “This doesn’t work off axis!!!”
 - Modification History claim your changes!!!
- ❑ Class relationships must be defined.
- ❑ Logical flow must be defined.



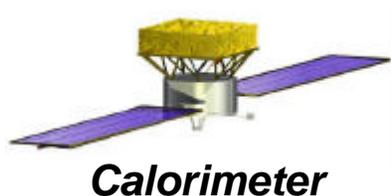


Comments on (TB)Recon

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- ❑ Define Class relationships.
- ❑ Replace “Left” and “Right” with ‘Minus’ and “Plus”
- ❑ CalProfile must integrate the Gamma fcn
- ❑ CalProfile must know about zenith angle, pathlength through CsI.
- ❑ CalProfile must not contain hardwired log thickness.
- ❑ Have we resolved the layer numbering scheme?
- ❑ CsIDetector makes no provision for differences in orientation between modules: maybe half have X on top, half have Y on top.
- ❑ CsIDetector seems to use two different Cal::e_per_MeV. This is right, but I only see one definition in Calorimeter??
- ❑ CsIDetector still uses poor light attenuation model.



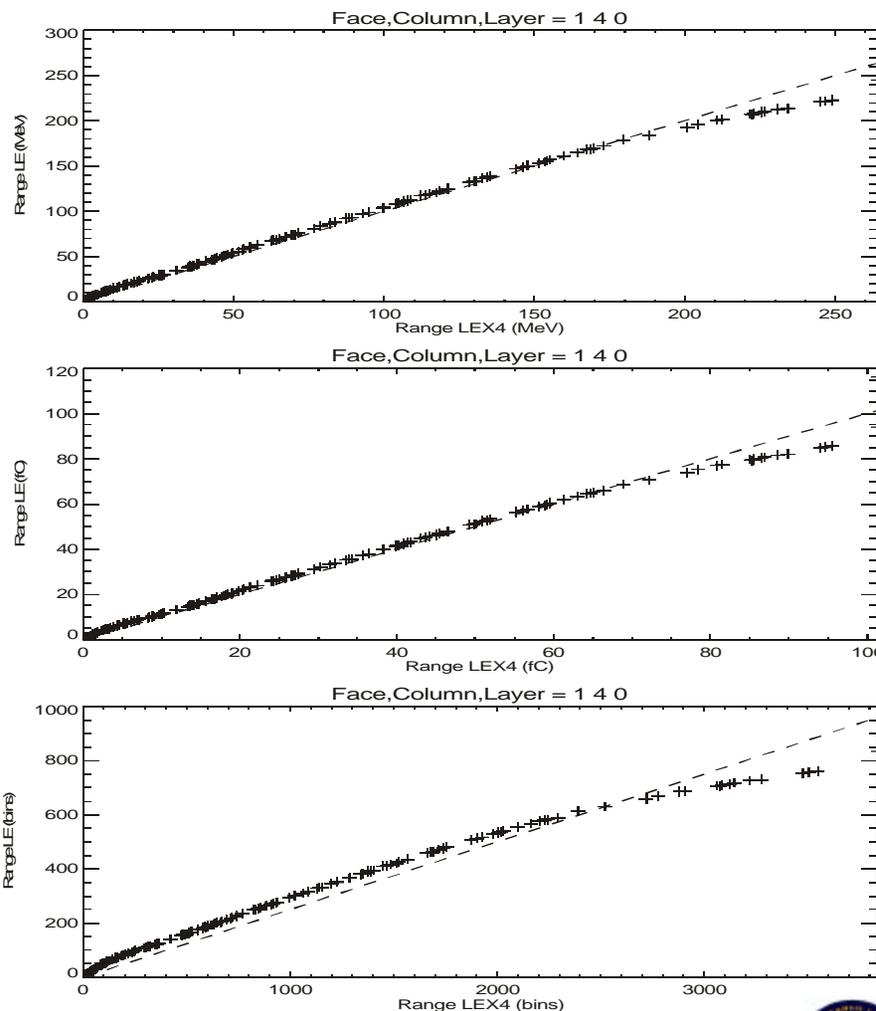


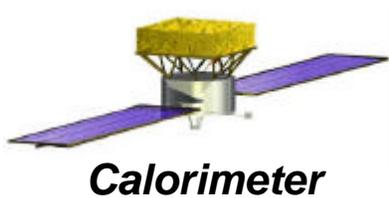
Non-linearity Correction

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- ❑ **ADC_to_fC model generally does a good job.**
 - Two-quadratics, one very near pedestal and one for broadband curvature.

- ❑ Bottom panel: raw LE v. LEX4 bins
 - Two ranges are not linearly related.
- ❑ Middle panel: after ADC_to_fC
 - Linearity restored, with some deviation in top 25% of LE
- ❑ Top panel: after fC_to_MeV
 - Diodes had similar response, so we didn't have much to correct...

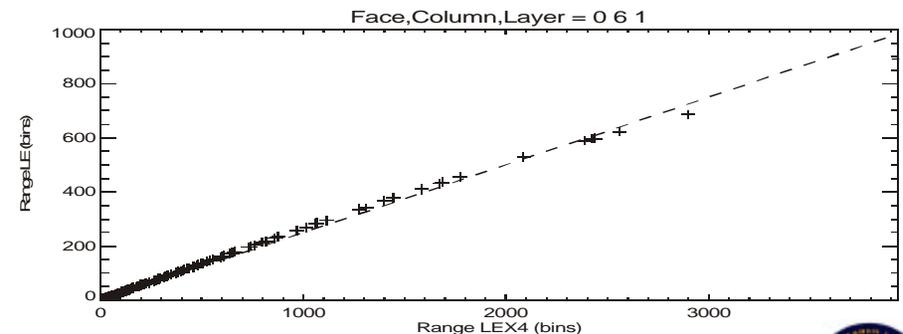
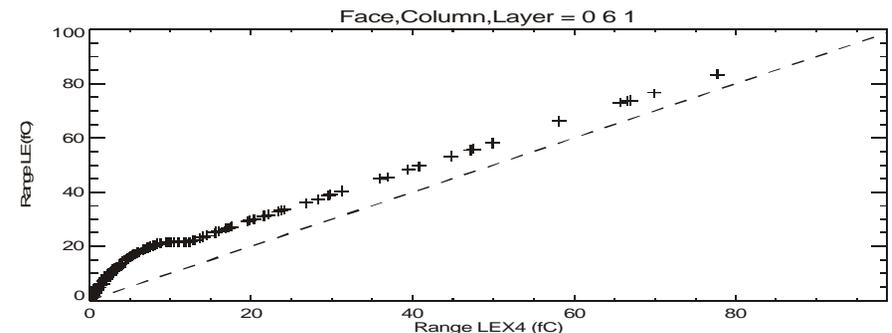
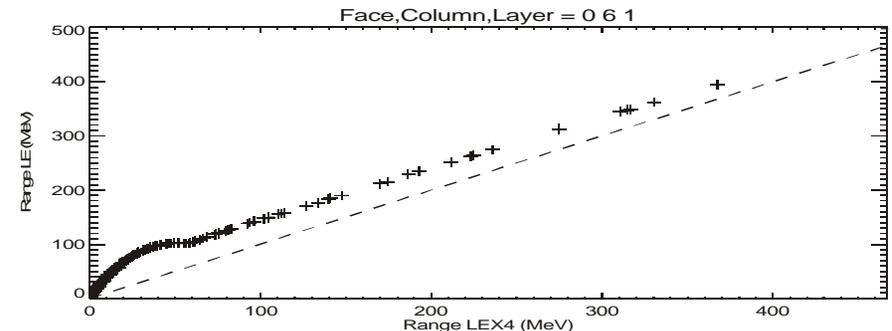




Non-linearity Correction?

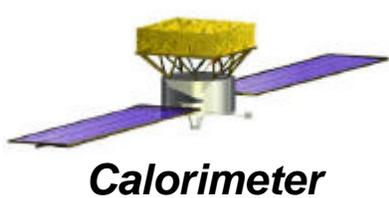
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- ❑ **ADC_to_fC model sure blew it here!**
 - Two-quadratics, one very near pedestal and one for broadband curvature.
- ❑ Bottom panel: raw LE v. LEX4 bins
 - Two ranges are fairly linear.
- ❑ Middle panel: after ADC_to_fC
 - Something seriously wrong happened here.
 - Problem is *not* in fits to pulser data.
- ❑ Top panel: after fC_to_MeV
 1. Array-index confusion somewhere?
 2. Charge-injection doesn't equate to CsI?



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Washington DC

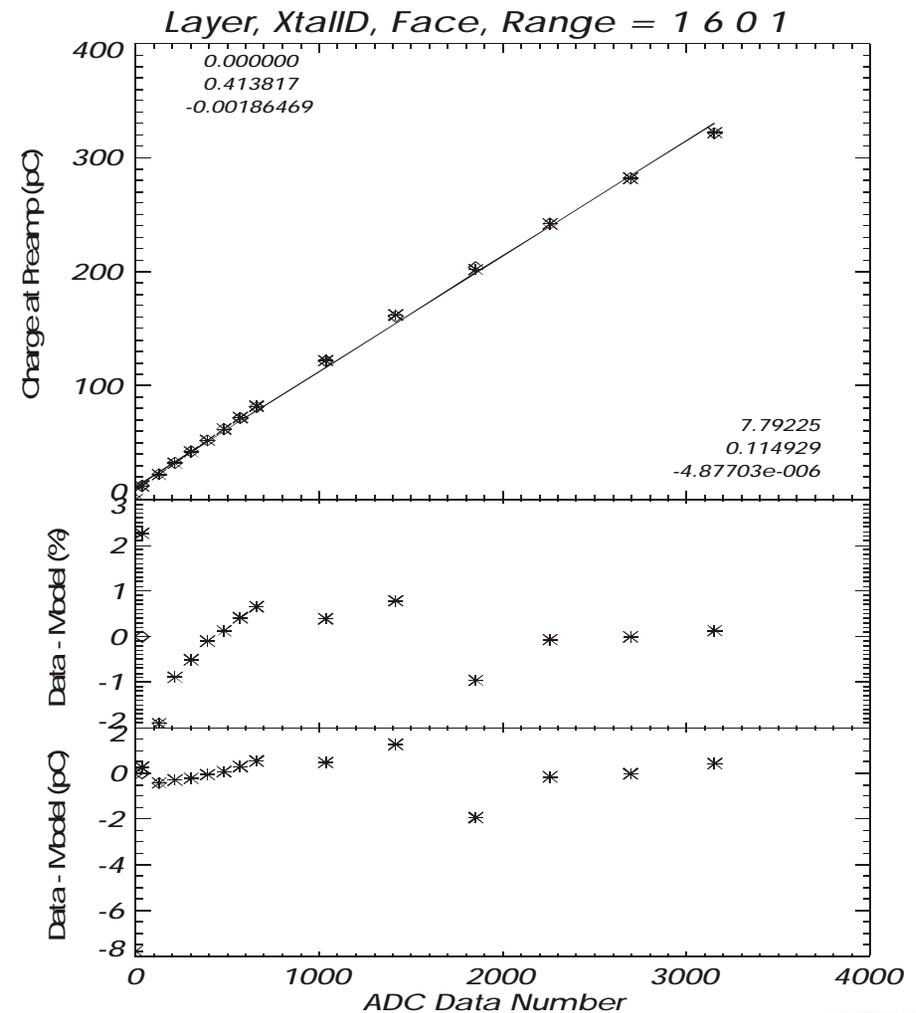


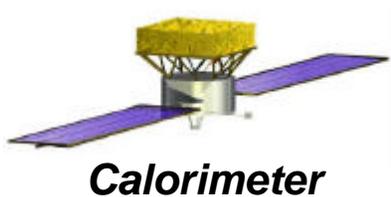


Intlin Model

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- ❑ Range 1 is well described by quadratic-quadratic model.
- ❑ Top panel
 - Chg as fcn of data number
 - Stars are data.
 - Open diamonds are model fit.
 - Model is quadratic below data number ~100 (“lower quad”) and quadratic above (“upper quad”).
 - Coefficients are printed.
 - “Solid” line is simple linear fit.
- ❑ Middle panel
 - Percentage error in model.
 - Stars are deviation of upper quad.
 - Open diamonds are deviation of lower quad.
- ❑ Bottom panel
 - Error in model, in chg units.
 - Same plot symbols as previous.





Intlin Model

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- ❑ And so is Range 0.
- ❑ Hmmmmmmm.

