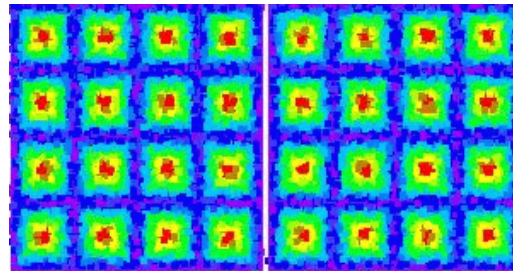
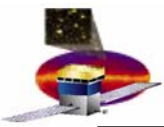


Overview of Calibrations During LAT Integration



Eduardo do Couto e Silva
Instrument Analysis Workshop 1
June 7, 2004

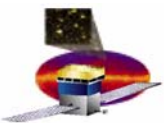


“Calibration” Semantics

Includes operations on GND and on-orbit

2 towers

- **Charge Injection Calibration**
 - charge injected in the front-end electronics, results acquired, processed and sent to ground
- **Diagnostics**
 - **Normal/Science**
 - commanded special processing and forwarding of data to ground during normal science ops
 - **Special**
 - commanded special processing and forwarding of data to ground requiring special instrument configuration
- **Event Monitoring**
 - processing and forwarding of science-related data to the ground occurring during all normal science ops
- **Offline Calibration**
 - ground processing of data received from any of the above means to calibrate the instrument
- **Monte Carlo Validation**
 - We will have a calibration unit made of 2 towers (TBR) for beam tests aiming at validating Monte Carlo simulations

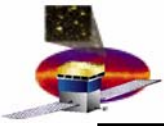


Charge Injection Calibration

During LAT integration – 2 Towers only

- **Charge Injection Calibration**
 - **For 2 towers will be mostly done with LATTE EGSE (I&T Online)**
 - » **At a later stage of Integration they will be commanded via Flight Software**
 - **Scans will be used**
 - to determine operational thresholds
 - to measure noise level
 - to measure electronic gain
 - to determine non-linearity in the front-end response
- **For calibration types see TKR and CAL talks**
 - **Some information may be required as input to the SAS reconstruction code**

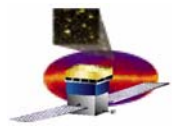
User must have access to this information in “easy-to-read” units for data analysis



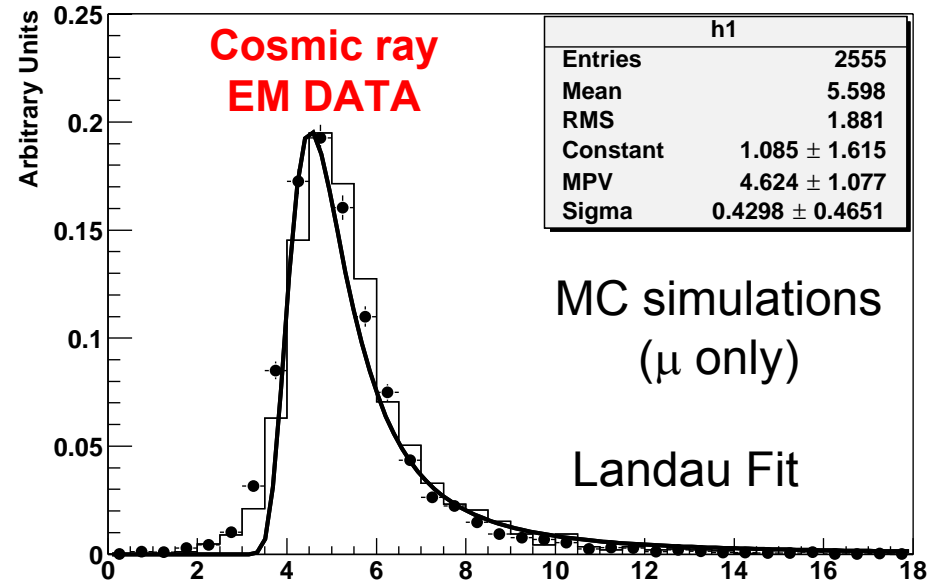
SAS Offline Calibrations

During LAT integration – 2 Towers only

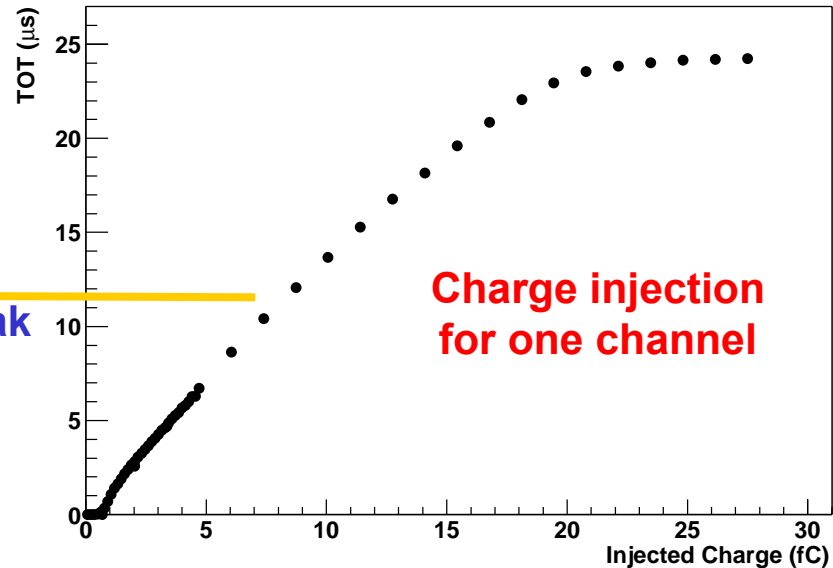
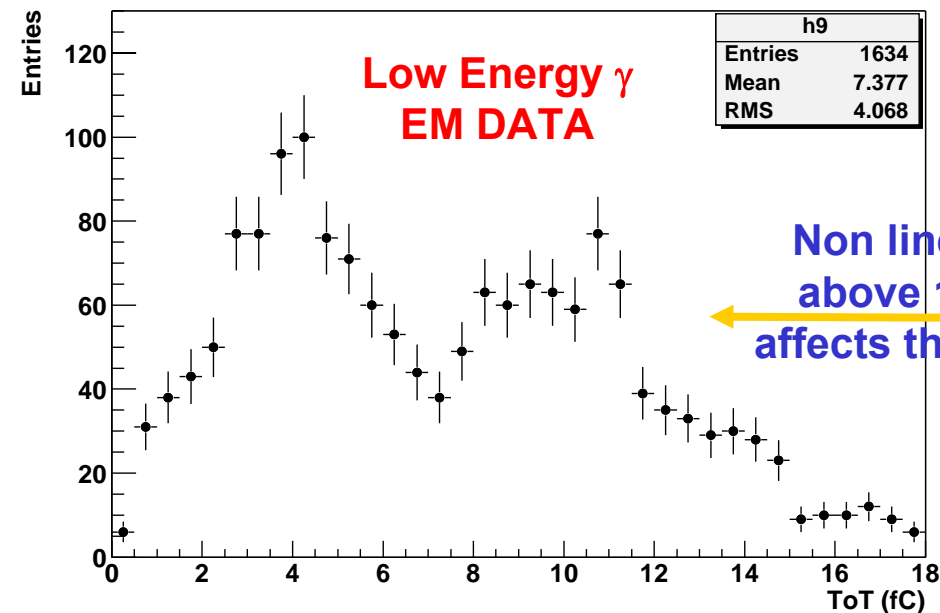
- **For details see TKR and CAL talks**
 - **For some calibration types there will be a dependence on EGSE (Online) information**
 - **Some calibrations will require many hours of data taking**
 - **Need to combine runs**
 - **Calibration data into SAS Reconstruction**
 - **For how to access and store the data and metadata see Joanne's talk**

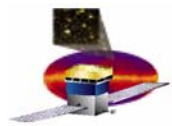


TKR - Offline Calibrations



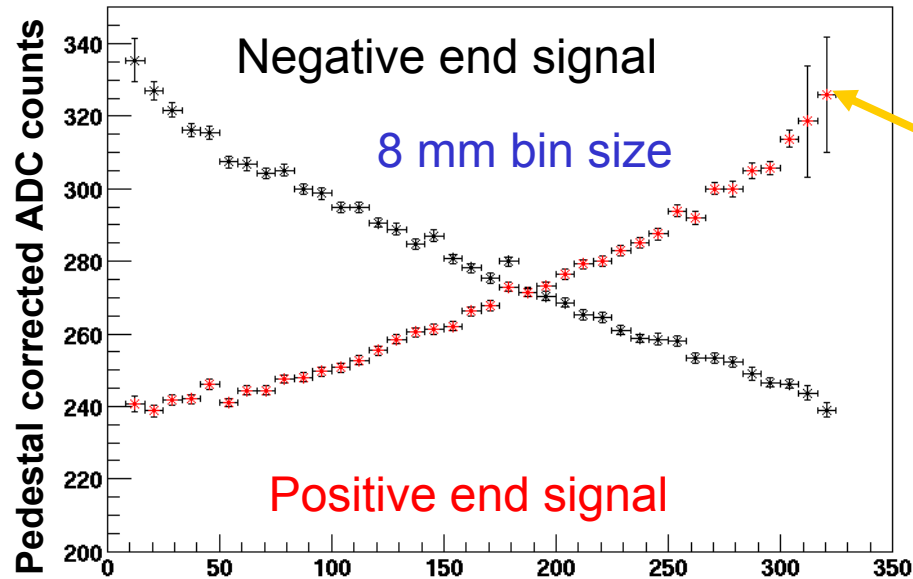
TOT Gain
 Done with charge injection
 Checked for 1 and 2 MIPS using particles
 Time consuming measurement
 (See TKR Talks for details)





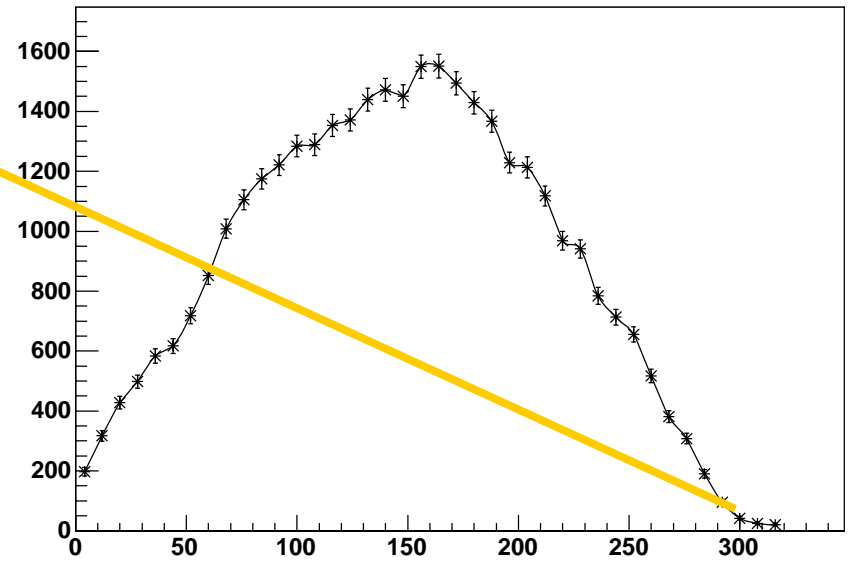
CAL- Offline Calibrations (2)

Cosmic ray EM DATA



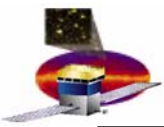
Position along the crystal (mm)

Graph



To calibrate the edge need higher statistics

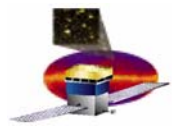
Calibrations can be done with and without TKR information (tracks)
Muon Calibrations are not the same as Galactic Cosmic Ray Calibrations
(See CAL Talks for details)



Diagnostics

During LAT integration – 2 Towers only

- **Will be able to monitor the quality of data shortly after data are taken**
 - I&T will develop code to produce reports (plots and tables) on a run-by-run basis
- **Will be able to monitor history of calibrations**
 - I&T has a prototype system to trend calibrations
 - ISOC is reviewing it and we hope to have a common system that will evolve from I&T into ISOC which is adequate for operations



Calibration List from LAT-MD-00446

C1	ACD Detection Efficiency
C2	ACD Veto threshold
C3	ACD Pedestals
C4	ACD Electronic Response
C5	ACD Integral Linearity
C6	TKR Tray Alignment
C7	TKR Tower Alignment
C8	LAT & Observaotory Alignment
C9	TKR single hit MIP efficiency
C10	TKR Noisy Channels
C11	TKR Dead Channels
C12	TKR Time-Over-Threshold Signal
C13	TKR Time-Over-Threshold Count Distribution
C14	CAL Light Asymmetry
C15	CAL Light Attenuation
C16	CAL Light Yield
C17	CAL Scintillation Efficiency
C18	CAL Pedestals
C19	CAL Electronic Gain
C20	CAL Integral non-linearity
C21	CAL Differential non-linearity
C22	CAL Noisy Channels
C23	CAL Dead Channels
C24	CAL LO Discriminator
C25	CAL HI Discriminator
C26	CAL Zero-Threshold
C27	Deadtime
C28	Time Accuracy
C29	TKR Threshold

The Science Verification Analysis and Calibration Plan LAT-MD-00446 has been a place holder for calibration AND performance It will be updated in July !

Any inputs from subsystems?

- ToT gain (See Mutsumi's talk)
- Mean and "sigma" of ToT distributions, do we need that?

To be renamed or modified

Performance

New Item!