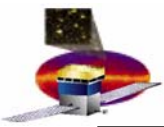


LAT Instrument Test Analysis

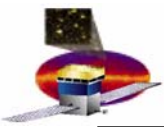
Eduardo do Couto e Silva

March 23, 2004



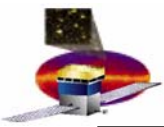
Rationale

- **As the LAT is being assembled it will undergo system tests at SLAC.**
- **This will provide an important opportunity**
 - **To uncover and quantify any instrumental effects that could have an impact on science data analysis**
 - **To apply reconstruction algorithms to real data**
 - **To start the work that will evolve in the Instrument Science Operations Center/SOG**
 - **To create a core and trained group to participate in the beam tests analysis effort (after instrument delivery)**
- **These analyses are in addition to the binary go/no-go tests in the I&T sequence. They typically use the same test data.**



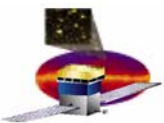
Purpose

- **Instrument test data analysis will be needed throughout the construction and testing of LAT. For now we will focus on the testing of **single and two-tower data****
 - **Goals**
 - uncover and understand subtle effects early
 - Are there additions to the go/no-go test suite?
 - Perform hardware calibrations
 - **Assumptions for the data to be analyzed**
 - Hardware passed Online (EGSE) PASS/FAIL tests
 - Online (EGSE) calibrations with charge injection were completed and the results are available
 - Integrated towers have been characterized and baseline configuration has been established



Organization

- **Preparation (March-April 2004)**
 - **Complete first draft definition of tests/analysis**
 - **This talk we will summarize our initial discussions with TKR (Leon)**
 - **End to End infrastructure needed for data analysis**
- **Meeting 1 – Workshop (May 2004 – date TBD)**
 - **Review analysis topics**
 - **Assign analysis tasks for single and two-tower tests**
 - **Develop the analysis using the MC simulation**
- **Meeting 2 – Readiness Meeting (early July 2004 - date TBD)**
 - **First set of analysis complete and ready for testing towers**
 - **Plan work for analysis of full LAT**



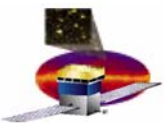
Philosophy for Data Analysis

- **Data analysis should focus on three types**
 - **Distributions using digitized data to investigate**
 - data integrity (preliminary list next slide)
 - trigger behavior
 - **Calibrations** (TBD)
 - **Distributions using with reconstructed objects to investigate** (TBD)
- **For each data analysis type there should be a summary report with**
 - **Status of test (pass or fail)**
 - **Details of the results (text and plots)**
- **As tests are repeated, results should be trended so that we can build a history of the instrument performance**



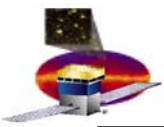
TKR - Tasks using digitized data

1. Verify that all layers triggered
2. Plot the distribution of the number of events for each trigger combination
3. Plot the distribution of number of hits in a tower and count how many events are less than 6
 1. Repeat for each layer
4. Plot the distribution of the number of layers hit for all events
5. Look for strip IDs which are there outside the range from 0 to 1535
6. Using known GTRC splits from online, check if there are more than 63 channels hit per GTRC
7. Hit map distributions
8. Plot the TOT distribution for each layer end and compare with online calibrations
 1. Count how often the last TOT bin is filled
9. Measure for each layer how many times there is a hit and no TOT
 1. Repeat but require no more than one hit in the layer
10. Measure for each layer how many times there is a TOT and no hit
 1. Repeat but require no more than one hit in the layer
11. Hit position in x vs hit position in y for all layers



Next Steps

- **TKR**
 - Define tests for calibrations
 - Defined tests for reconstructed objects
 - Calculate number of events needed for each task
 - Verify calculations using MC simulations
 - Produce plots and software (automate procedures as much as possible)
 - Define reports and corresponding output
 - Define information needed from online tests (configurations and calibration results)
 - Define scope of “investigation projects” in case we find discrepancies between our expectations and results obtained
- **CAL**
 - Initiate discussions as soon as possible
 - Eduardo and Xin will visit NRL during April for Software Workshop, propose CAL to have a face to face discussion then



How to contribute?

- **Some people already expressed interest in this effort**
- **Please contact eduardo@slac.stanford.edu (+1 650 9262698) if you want**
 - **to contribute with ideas for (or just send them)**
 - tests
 - any of the infrastructure needed
 - **to take responsibilities to**
 - design pieces of the infrastructure needed
 - implement code
 - test
 - **to participate in any other way you can be helpful to make this a successful effort**