



GLAST Large Area Telescope Instrument Science Operations Center

Overview of Beam Test

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Beam Test Objectives

- Science performance verification strategy
 - LAT phase space is huge
 - MC simulation used to verify requirements by analysis
 - Beam test used to tune and check the simulation and aspects of the reconstruction.
 - Essential component of our overall strategy
- Objectives
 - See Beam test Rationale Document LAT-TD-02152-02
 - Undergoing update
 - Highest-energy performance
 - corrections for leakage, inter-tower gaps, and backsplash (SSD in TKR and ACD).
 - Electromagnetic showers (gamma, electron)
 - beams up to at least 100 GeV.
 - Check the PSF and Energy reconstruction methods.
 - Tagged photon beam particularly in ~GeV range.
 - Compare distributions of quantities related to those used in background rejection with hadron beams.
 - Not a direct test of end-to-end rejection -- instead, check relevant distributions
 - Check trigger performance (e.g., CAL-HI), comes “free” with same data
- Beam Test Hardware
 - Impractical to put full LAT in beam
 - Use spares
 - 2 TKR modules
 - 3 or 4 CAL modules
 - 2 to 5 ACD tiles
 - 4 TEM modules
 - 1 GASII (for trigger)

Why does ISOC care about the Beam Test?

- Provides experience with LAT in real particle environment
 - benefit to ISOC science operations performance and instrument optimization
- Provides experience with LAT hardware
 - benefit to ISOC flight operations since it will be used to test procedures and facilitate debugging when on-orbit issues arise
- Provides early and more realistic feedback to MC simulations
 - benefit to ISOC software development within science analysis systems
- Strengthen ties with LAT Collaboration
 - benefit to ISOC Operation Scientist Program

Beam Test Coordination

- **Coordinators**
 - **Ronaldo Bellazzini (Italy)**
 - **Eduardo do Couto e Silva (USA, ISOC)**
 - **Benoit Lott (France)**
- **Meetings**
 - **Weekly coordination meetings by phone**
 - **Discuss organizational matters and planning**
 - **Prepare for general VRVS meeting**
 - **Bi-weekly VRVS meetings**
 - **Involves all LAT Collaborators**
 - **Inform LAT collaborators of recent developments**
 - **Gather input from collaborators**
 - **Bi-weekly report in VRVS C&A meetings**
 - **Summary of latest activities**
 - **Benefit those who cannot be present on the beam test meetings**

Beam Test and ISOC

- **Beam Test overlaps with key activities in the LAT**
 - **LAT Integration & Test @ SLAC and NRL**
 - **Spacecraft Integration to a lesser degree**
 - **ISOC implementation**
- **ISOC people participating in the beam test and with **main** responsibilities during LAT Integration and Test**
 - **Eduardo do Couto e Silva (coordination) split **Beam Test/I&T/ISOC****
 - **Ric Claus (coordination online) – **main focus is I&T****
 - **Anders Borgland (offline and data analysis) – **main focus is I&T****
- **ISOC people participating in the beam test and with **some** responsibilities during LAT Integration and Test**
 - **Richard Dubois (coordination offline)**
 - **Gary Godfrey (coordination and data analysis)**
 - **Leon Rochester (data analysis)**
- **Beam Test Management Philosophy to optimize ISOC resources**
 - **Benefit from LAT Collaborators as much as possible**
 - **we have transferred MGSE fabrication and Hardware integration to Italy and France**
 - **Transfer know-how to LAT collaborators to create redundancy**
 - **hardware tests and script development**
 - **offline software infrastructure**
 - **Participation on data analysis will be adjusted to support ISOC activities**
 - **depends on ISOC and Beam Test Schedule**

Top-Level Schedule

- **Planning and Construction Phase**

- **December 2005:**

- **Visit from INFN to SLAC**

- EGSE and MGSE development

- **Decision made to integrate CU and developed MGSE in Italy**

- First tower shipped to Italy + MGSE

- **Evaluation of 1x4 Grid modifications started (modification in progress, expect complete Feb 22)**

- SLAC works with Tapemation to make modifications

- **December 2005: Expected official schedule from CERN (announcement has been delayed, expect to hear XXXXXXXX)**

- Our current Assumption is that beam test starts Aug 1, 2006

- **January-early February 2006: Beam test plan release as LAT document (draft in progress)**

- **February 2006: Ship 1x4 grid to Italy**

- **March 2006: LAT Delivered to NRL**

- Some resources will be available @ SLAC

- Expect a meeting in Pisa to work on DAQ merging issues

- Benefit from IA and DC2 Workshop @ SLAC to have a discussion on

Top-Level Schedule (continued)

- **Integration and Test Phase**
 - **January 2006: Phase 1: Pre-integration work**
 - One tower and a GASU integrated in a single bay stand in Italy
 - **March 2006: Phase 2: Calibration Unit integration**
 - Handling plan ready
 - SLAC will ship remaining modules to Italy
 - Adapt existing scripts from LATTE4 for Calibration Unit
 - Prepare for migration of DAQ systems
 - **June 2006: Cosmic Rays and Calibration tests with charge injection and cosmic rays**
- **Delivery and Test @ CERN**
 - **July 2006: Ship CU and MGSE to CERN**
 - Need to allocate 2 weeks for customs and delivery
 - Need additional 2 weeks for testing prior start of beam test
 - **Aug 1, 2006: start of beam test**
 - Depends on final dates from CERN

ISOC FTE on Beam Test

task	FY2006	FY2007
TOTAL (SO)	2.50	2.00
Total (SO scientists)	1.75	1.50
Total (SO software dev)	0.75	0.50
Management	0.25	0.25
Scientists	0.25	0.25
Software Dev	0.00	0.00
Online	0.25	0.00
Scientists	0.00	0.00
Software Dev	0.25	0.00
Offline	0.75	0.50
Scientists	0.50	0.25
Software Dev	0.25	0.25
Data Analysis	1.25	1.25
Scientists	1.00	1.00
Software Dev	0.25	0.25

Fractions at 0.25 level mean the work is phased

Uncertainties in these numbers are moderate

We will have a Workshop in Italy on March 20, 2006 and will help clarify budget and schedule

Beam Test Budget is not part of ISOC