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 GASH (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

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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