Instrument Analysis Workshop Series

Eduardo do Couto e Silva
All Hands Meeting
SLAC, June 9, 2004
Workshop 1 - Opening Remarks

Workshop date: June 7 and 8, 2004

• Some people came to this Workshop assuming that
  – This is an I&T meeting (FALSE)
  – This is an SAS/offline meeting (FALSE)
  – Something good may be happening, but they do not have a clear idea of what it is (TRUE)
  – The weather was going to be nice (TRUE)

• ….This is the beginning of an important effort within the LAT Collaboration
  – To support Flight Integration and
  – To develop ownership of the LAT Instrument
Goals for this Workshop Series

Prepare for Instrument Data Analysis by…

• Familiarizing LAT Collaborators with the
  – LAT instrument
    – Front-End Electronics
    – Trigger and Data Acquisition
    – Data Analysis Software
  – Data taking plans during LAT integration using
    – Cosmic rays
    – Van de Graaff photons

• Creating a forum to
  – exchange knowledge between all subsystems and “hardware and software oriented people”

• Using simulated and real Data to exercise
  – reconstruction algorithms (mostly with real data)
  – data analysis tools to provide feedback to software developers

• Developing expertise to
  – uncover and quantify any instrumental effects that could have an impact on the LAT science data
  – start the work that will evolve into the Science Operations Group of the ISOC
  – create a core and trained group to participate in the beam tests analysis effort (after instrument delivery)

Develop ownership of the LAT instrument
The Workshop Series

This proposal was reviewed and discussed Tuesday afternoon.

- **Instrument Analysis Workshop 1** *(June 7-8, 2004)*
  - Kick off meeting
  - Homogenize the knowledge from people who will do the data analysis
  - Assign “projects” using Monte Carlo simulated data
- **Instrument Analysis Workshop 2** *(September, 2004 - TBR)*
  - Discuss results from projects assigned during Workshop 1
  - Discuss results from projects derived from REAL data collected with the Engineering Model 2 (ACD, CAL and TKR) *(TBR)*
  - Develop a list of instrumental effects that could have an impact on science data analysis
  - Pretty much “our Readiness Review” for Flight Integration
- **Instrument Analysis Workshop 3** *(November, 2004 - TBR)*
  - Analysis of real data from the first two towers
- **Instrument Analysis Workshop 4** *(Summer, 2005 - TBR)*
  - Analysis of real data from XX-towers *(TBD)*
- **“Instrument Analysis Workshop 5”** – Collaboration Meeting *(Full LAT- TBD)*
  - LAT Data Analysis (and to validate Monte Carlo simulation)
Goals for This Workshop

• The focus is on simulated data from the first Two Towers

• Educate people on behavior and/or performance of
  – TKR Front-End Electronics
  – CAL Front-End Electronics
  – Trigger and Data Acquisition system
  – Reconstruction software

• Provide hands-on experience
  – With SAS/I&T analysis files and tools

• Use the knowledge acquired during the workshop to
  – Complete MC projects that will be due ~ 6 weeks later (TBR)
  – Provide input to data taking plans for LAT integration
Who are the people sitting next to you?

You may fit in one or more categories

• Software Oriented
  – Familiar with SAS tools
    – C++
    – ROOT
    – SAS infrastructure
  – Want to do data analysis but are not sure what to look for in the instrument

• Hardware Oriented
  – Know about
    – C++
    – ROOT
    – SAS infrastructure
  – Terribly busy building the instrument, and are having a hard time to get started on the data analysis

• Data Analysis Oriented
  – Ready to analyze any data
    – But are not sure of
      » what tools to use
      » where the data are
      » what to expect from the instrument

• Information Oriented
  – Want to learn more about the Instrument
    – May not do data analysis
    – Knowledge will benefit their work in the LAT

• Experts
  – Know all about it
    – Please talk to me, I have lots of work for you!

The challenge was to design an agenda that would benefit everyone
First Day – Monday - June 7

AGENDA Updated June 3, 2004

• 8:00-8:30 – Registration
• 8:30-8:50 – Discussion: GLAST Status and why are we having this Workshop? Steve
• 8:50-9:15 – Introduction - Eduardo
• 9:15-12:00 – Session 1
  – What do we need to know about the MC for the data analysis of the first two towers?
    – 09:15-09:45 Overview of TKR Reconstruction – Tracy
    – 09:45-10:15 Overview of CAL Energy Measurement – Sasha
    – 10:15-10:30 Coffee break
    – 10:30-11:00 Two tower Reconstruction - Leon
    – 11:00-11:15 Description of Geometry - Anders
    – 11:15-11:30 Description of Cosmic Ray and VDG sources - Xin
    – 11:30-12:30 Tutorial 1: Download and plot variables from the merit file SVAC group
• 13:30-14:00 – Session 2
  – Tutorial 1 and Offline Analysis during Integration
    – 13:30-14:00 Tutorial 1: A guided tour through the Merit ntuple variables Bill
    – 14:00-15:00 Tutorial 1: Hands-on with cosmic ray and VDG merit ntuples SVAC group
    – 15:00-15:45 Tutorial 1: Hands-on with the Event Display - Riccardo
    – 15:45-16:00 Coffee break
    – 16:00-16:30 Overview of TKR SAS analysis during LAT integration Bill
    – 16:30-17:15 Overview of Calibrations during LAT integration Eduardo
    – 17:00-17:45 Overview of SAS Calibration Infrastructure Joanne
• 19:00 – Workshop Dinner
Second Day – Tuesday - June 8

- 8:00-8:30 – Registration
- 8:30-8:45 – Introduction - Eduardo
- 8:45-12:00 – Session 3
  - What does the detector look like and which settings will be used during data taking?
    - 09:00-09:30 TKR detector and Front end-electronics: which “knobs” to turn? Mutsumi
    - 09:30-10:00 CAL detector and Front end-electronics: which “knobs” to turn? Eric
    - 10:00-10:15 Overview of Trigger – Gregg/JJ
    - 10:15-10:30 Coffee break
    - 10:30-10:45 Trigger Event Contribution and Diagnostics – Gregg/JJ
    - 10:45-11:00 Deadtime modeling and Power Density Spectrum - Warren
    - 11:00-11:15 Overview of VDG set-up and accelerator- Gary
    - 11:15-11:30 Data Taking configurations during LAT integration - Eduardo
    - 11:30-12:00 Tutorial 2: Download SVAC analysis file and plot variables SVAC group
- 13:30-17:15 – Session 4
  - Tutorial 2 and Assignment of tasks
    - 13:30-14:00 Tutorial 2: Usage of SVAC analysis file (EM example) Xin
    - 14:00-14:30 Tutorial 2: Hands-on with the SVAC analysis file SVAC group
    - 14:30-15:00 Discussion and Assignment of MC projects All
    - 15:00-15:15 Coffee break
    - 15:15-15:45 Further Discussion (if necessary) – All
    - 15:45-16:00 Next Workshop and Future Plans Eduardo
The Projects...

Tkr1DieEdge - Distance from die (wafer) edge of initial point (0 is halfway between the dies, increases toward center of die)

“Project” to figure out what this is...

Tkr1DieEdge<5
Tkr1DieEdge>40
The LOGO

X : Tkr1X0     Y : Tkr1Y0     Z : Tkr1DieEdge

Benoit got a free dinner for figuring it out and posting the answer!
Imaging or “Imagining?”

- X: Delicious dough  Y: Delicious dough  Z: Blueberry

- Steve received the creativity prize for figuring out all details in an unconventional way!

Pieces left from Integration?!
15 Project Assignments!!

1. Implement dead channels in the tracker for imaging Luca
2. Revisit the spectrum of sea-level cosmic rays Toby
3. Define strategy for implementing Deadtime in MC Steve/Richard/Elliott/Toby
4. Validate Energy Scales using CAL EM MC/DATA Pol
5. Compare numbers from alignment procedure to those from metrology at SLAC Larry
6. Calculate the tracking efficiency of each tower using track segments Leon
7. Calculate residuals by comparing CAL and TKR locations Leon
8. Make images of the CAL layers (to expose uniformity of response of the CAL) Benoit
9. Make image of TKR layers to identify location of shorted strips and broken wirebonds Bill
10. Implement simulated trigger primitive information into MC Luis
11. How well do we find MIPs (e.g. at several angles, within a tower, across towers)? David
12. What is the light output of tracks crossing diodes? Sasha
13. What are the effects to the data when zero suppression is applied? Traudl
14. What is a “clean” muon definition? Claudia
15. Can we find gamma rays and $\pi^0$ from showers? SAS

Will send a student as part of the long term plan and will get back to us soon – Per/Staffan

A Truly International Effort
Workshop Spin-Offs

• Identified areas of improvement for the
  – sea-level cosmic ray energy spectrum used for Simulations (Xin, Toby)
  – geometry implementation in the reconstruction (Anders, Xin, Leon)
  – visualization/analysis tools (Eduardo)
• Identified variables in the analysis ntuples without physical values (Warren)
• Identified implementation “bug” in digitization algorithm for the CAL (Sasha)
• Provided a venue for System Engineering to advertise how they are capturing problems during Integration (Pat)
It was not easy…

- To get all of us here was a lot of work since we had to
  - Convince people that this was worthwhile
  - Work hard to get the infrastructure needed
  - Tune the talks to the audience
  - Annoy people with continuous requests…
CAL Detector Knobs to Turn
Or
Eduardo Don't Touch That!!!!

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The SVAC Musketeers

C'mon Richard, this is not an unreasonable request...

No mercy, Let’s get that pipeline!

The calibration packages are mine!

They won’t escape from the geometry review!

Special thanks to the three Musketeers who worked around the clock!

E. do Couto e Silva
Meanwhile in the SAS kingdom…

Here they come again… The I&T Musketeers want the towers assembled upside down with a diagonal readout and in a grid with a dodecahedron configuration. Of course, due yesterday…

Cardinal “Richardlieu”
What next?

• **Project lists**
  – Discussed this afternoon we have a lot of work ahead of us

• **User Manual**
  – I would like to prepare a user manual with the info from the workshop to help you analyze data

• **Instrument Analysis VRVS meetings**
  – Weekly basis so that we can follow up
  – I will call you periodically (to see if you miss California…)
  – Biweekly reports by me in Steve’s ANA meeting
  – Instrument Analysis List (IA) is set up (see next slide)

• **Working Meeting in July (TBR)**
  – Smaller group to
    – Evaluate where we are
    – Evaluate what to ask people to do with the EM2 data

• **Workshop 2 in September with the Collaboration Meeting**
  – 2 day workshop (TBR)

• **DATA TAKING starts in September/October!**
  – Would like to see you @ SLAC for a longer period to analyze data
Let the Numbers Tell the Story...

**NUMBER OF PARTICIPANTS**

- **Target**
- **12-Apr**
- **10-May**
- **7-Jun Registered**
- **7-Jun Day 1 - Opening**
- **Group Dinner**
- **8-Jun Day 2**
- **Assignment session**
Thank you for participating…

Thanks for the Project Management for the Support: Peter, Steve, Lowell, Dick and Elliott
Without Diana, Debbie and Chris this could not have been so smooth and enjoyable!

http://www-project.slac.stanford.edu/slacpix/index.htm

My personal thanks to the “brains” behind it…