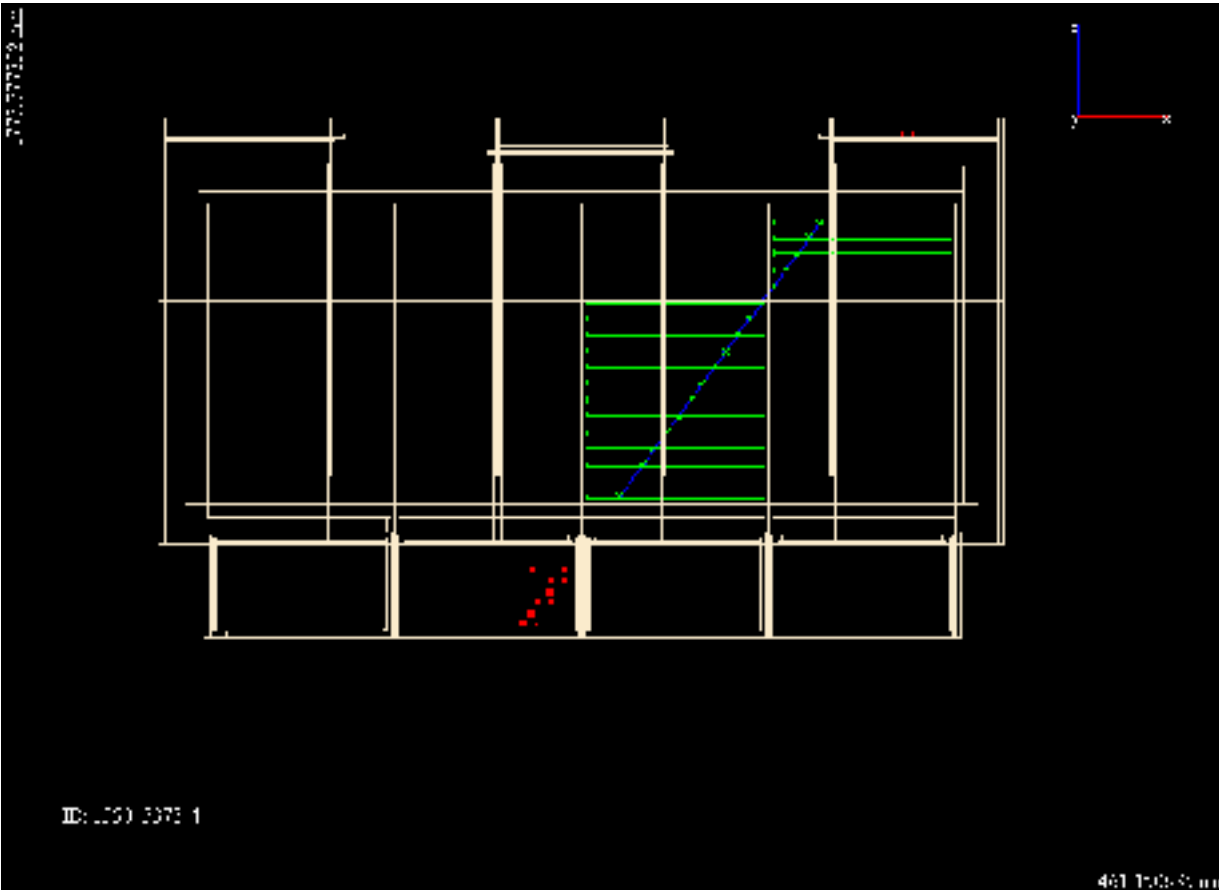


Overview Of LAT Data Taking



Anders W. Borgland

Science
Verification,
Analysis and
Calibrations
/
ISOC

Outline

- **LAT SVAC muon runs:**
 - **SVAC run types**
 - **How to get the data**
 - **Features of the data**
 - **Monte Carlo**
 - **Muon hypothesis in TkrRecon**
- **Periodic triggers and muons**
- **LAT 701 and multiple trigger engines:**
 - **'Mark my (trigger) words' the trigger engine said**
- **Data server:**
 - **Data server with SVAC and Merit ntuples**
 - **New IA event filters/ntuple pruners**
- **(Very) Near future:**
 - **LICOS/FSW muon data**
 - **What will change for the user?**
 - » **Ntuple information**
 - » **Instrument configuration information**

LAT SVAC Muon Runs

- Data taking:
 - January 13-16
- Three run types:
 - **B13:**
 - Non-zero suppressed for both CAL and ACD
 - 4-range readout in the CAL
 - High energy muon gain in the CAL
 - Three runs, each 5 minutes long
 - **B2:**
 - 'Flight' configuration
 - 23 runs, each 15 minutes long
 - 470k events per run
 - Trigger rate: 500 Hz
 - **B30:**
 - Similar to B10 runs:
 - » 4-range readout in the CAL
 - » High energy muon gain in the CAL
 - But CAL LO/Hi **not allowed** to open the trigger window
 - 60 runs, each 15 minutes long
 - Trigger rate as for B2 runs: 500 Hz

Why B30 Instead Of B10?

- Ran into a problem with the B10 runs:
 - CAL thresholds not optimal
 - Caused retriggering:
 - Real retriggering and not just discarded events
 - Only in Bay 2: FM117
 - Only in B10 runs:
 - » Well, we should also have retriggerers in the B13 runs, but
 - » Increased deadtime in B13 runs means the retriggerers become discarded events in those runs
 - Solution:
 - Not allow the CAL to open the trigger window
- Still some retriggered events in the B30 runs:
 - Coincidence between a different trigger and a CAL trigger
 - To remove these:
 - Require no CAL HI trigger in Bay 2
 - Use SVAC ntuple variable: `GemCalHeVector[2]==0`
- More details in IA Friday meeting talks

How To Get The Data?

- Use the Runs Database:
 - Links to data files, data reports etc
- List of good runs: LAT Jan '06

LAT Instrument Analysis Group

Meetings

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[Workshops 1, 2, 3, 4, 5, 6](#)
[SVAC IRA, OCB](#)
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[Databases and GUIs, December 4, 2005](#)

Finding Data

[Runs Database](#) [Trigger runs NEW!](#)
[How to get data - 19d2 - ml runs 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100](#)
[\(12 runs as of now\) - Rules](#)
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[useful things to know about the data mainly](#)
[ACCD data @ SLAC Userp link!](#)

Data Analysis

[Data Analysis Primer \(html\) \(pdf\)](#)
[How to Look at Data](#)
[Monte Carlo Generation](#)
[SVAC Simple Description](#)
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Useful Things About The Data

- A complete list of 'features' in the data can be found in:
 - [Main IA page --> Useful things to know about the data quality](#)

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Meetings	Finding Data	Data Analysis
Weekly/Friday Meetings Workshops 1, 2, 3, 4, 5 SVAC/IRA/ITC Contact info Databases and CDBs, December 1, 2005	Runs Database - Trigger runs NEW! How to get data - Linf/Lnd runs 1, 2, 3, 4, 5 towers - LAT au'08 (R2 runs as muons) - Rates Register Configuration Data quality reports Handwritten data Database information with ACDman New/old best on info (old) FN versions in the pipeline MC Simulated Data Useful Links to know about the data quality ACD data of SLAC (dump link)	Data Analysis Primer (html) (old) How to Look at Data Merge Multiple Descriptions SVAC Multiple Description How to Filter events Using the Event Display Mapping from physical space to electronic space How Multiple Descriptions Data Analysis Examples

Some 'Features'

- **Hot LAC:**
 - **Some LAC thresholds were set too low**
 - **Corresponding xtals always read out:**
 - **Concerns 6 xtals**
 - **Some of the make it into CalRecon:**
 - » **'2 MeV' cut to make it into CalRecon removes most of them**
 - **NB! Do not cause additional triggers!**
- **Minor bugs:**
 - **Merit ntuple variable 'EvtRun' is not correct**
 - **ACD tile 34 has the wrong thickness in the geometry:**
 - **12 mm instead of 10 mm**
 - **SVAC ntuple:**
 - **Bug for ACD arrays with ACD tile ID==0**
 - **Fixed!**
 - **All SVAC ntuples in data and MC have been reprocessed!**
 - **Not many bugs**

ROI

- **ROI:**
 - Not allowed to open the trigger window
 - Had one Region of Interest defined:
 - Contained all the tiles
 - ROI bit in the Gem Conditions Summary Word set if:
 - At least one tile above the Veto threshold
 - Veto threshold:
 - Set to 0.2 MIP
 - Actually closer to 0.1 MIP
 - » See Eric's talk in IA meeting of January 20
- **Reminder:**
 - There are also ACD tile bits in the GEM
- **CNO:**
 - CNO allowed to open the trigger window
 - Threshold:
 - 7.8 MIPs

Monte Carlo

- Monte Carlo:
 - Made with same EngineeringModel release as the real data
 - Uses calibration constants relevant for this data
- Two samples:
 - Surface muons
 - All gamma:
 - Slightly extended energy spectrum
- Updated list of MC available in: MC simulated data

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Timing Data

[Runs Database](#) [Trigger runs](#) [VFW](#)
[How to get data - End-End runs: 1, 2, 3, 4, 8 towers - LBL jan 06](#)
[\(SU runs as usual\) - Rules](#)
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Muon Hypothesis In TkrRecon

- **Default track reconstruction:**
 - Assumes the track is an electron
 - Uses energy deposited in CAL as initial energy for the track:
 - Determines expected multiple scattering
- **Problem:**
 - A muon leaves about 100 MeV in the CAL
 - So a 2 GeV muon will be reconstructed as a 100 MeV electron:
 - Vastly overestimates expected multiple scattering
 - Track errors not correct
- **Can tell TkrRecon it's a muon:**
 - Well, to use the muon hypothesis
 - Set the initial energy to a fixed value:
 - We use 2 GeV
 - » Close to peak of generated surface muon energy spectrum
- **Advantages:**
 - Improves track quality for muons
 - Useful for mapping out the geometry, alignment etc
- **'Disadvantage':**
 - 1/3 of the events will no longer have any tracks

Muon Hypothesis Runs

- Reprocessed all LAT B2 runs with muon hypothesis in TkrRecon.
- Made sample with corresponding MC.
- Links in Runs data base still point to original processing!
- List of runs and the unix path to the reprocessed data files: B2 runs as muons

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Meetings

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[Databases and CDs, December 1, 2005](#)

Finding Data

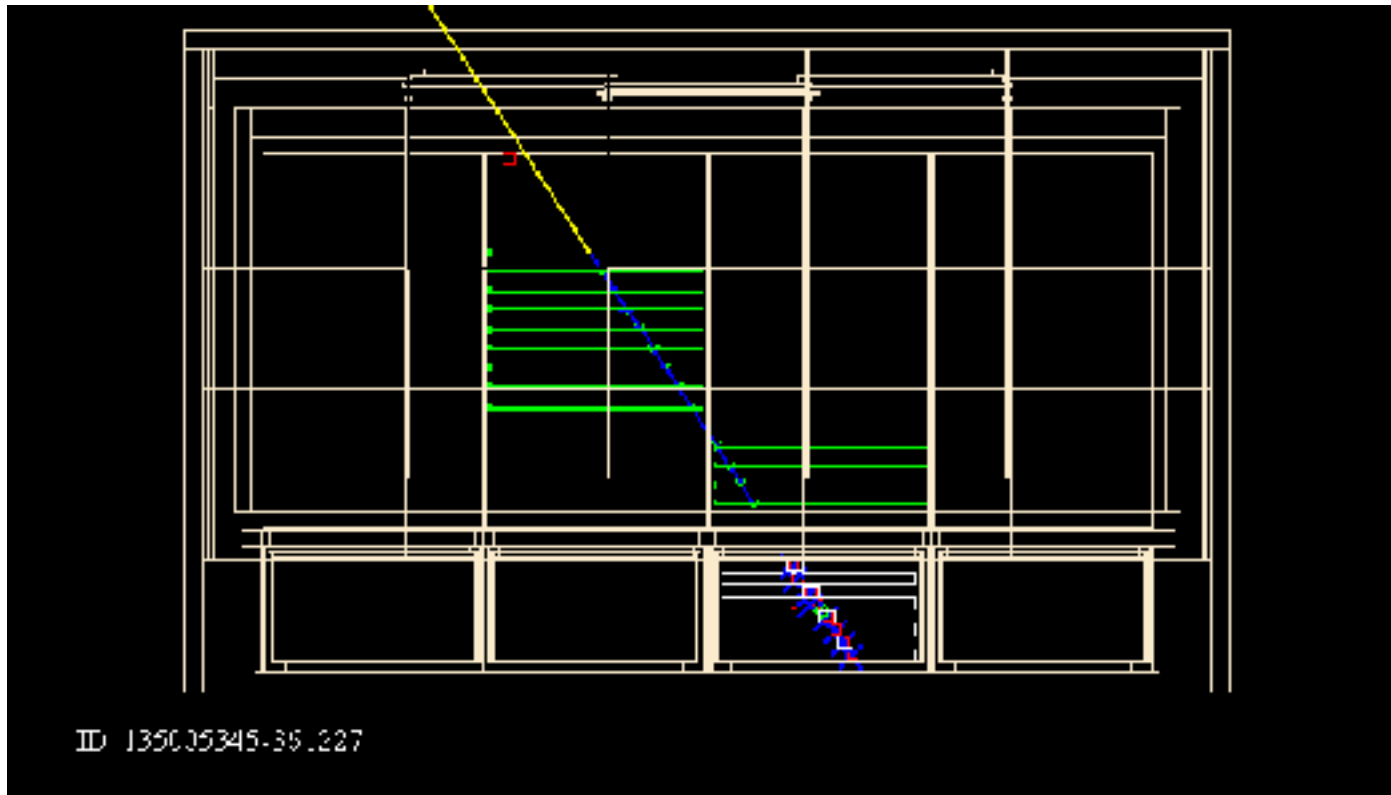
[Runs Database](#) [Trigger runs NEW!](#)
[How to get data - End3Lat runs 1, 2, 3, 4, 5, 6 towers - LAT_su08 \(B2 runs as muons\) - Rates](#)
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Data Analysis

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Periodic Triggers And Muon Events

- From Philippe Bruel:
 - Require a periodic trigger **only**
 - Do we see muon events?





Periodic Triggers And Muon Events

- **Interesting:**
 - **Is the observed rate as expected?**
- **Requires:**
 - **Understanding of the Trigger timing:**
 - **If the event comes too early wrt the periodic trigger it would have been a TKR trigger and we would never have seen the periodic trigger**
 - **Understanding the readout timing:**
 - **If the event comes too late wrt the periodic trigger we will not read it out and never see the muon**
- **Philippe can give you more details!**



Multiple Trigger Engines

- **LAT 701:**
 - Will be the new baseline run i.e. the new 'B2'
 - Has multiple trigger engines:
 - See presentations by Eric Grove in February 6 C&A meeting
- **Label:**
 - We can label (some of) the trigger engines
 - Label is inserted into the event stream:
 - We know explicitly which engine fired for each event
- **Test LAT 701 runs:**
 - Have taken several test runs
 - Trigger engine labeling broke some assumptions we make in the digitization
 - Most of the events were dropped in ldf2digi
 - Will be fixed shortly
- **Label in SVAC ntuple:**
 - Will make the trigger engine label available in the SVAC ntuple in the near future



Data Server

- **'DC2' data server:**
 - Also knows about the data pipeline files!
 - Currently only serves Merit files.
 - Will soon be extended to the SVAC ntuple
- **Will not:**
 - Serve digi and recon Root files!
- **Still:**
 - For LAT ntuple analysis it will be very useful.
 - See also Data server talk in DC2 workshop

IA Ntuple Pruners

- In the mean time:
 - I have added ntuple pruners:
 - Make cut on SVAC or Merit ntuple variables
 - Write out SVAC or Merit ntuple with only the events passing the cuts
 - 'Extends' the already existing event filters for digi/recon/mc root files
- More details in: How to filter events

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Finding Data

[Runs Database](#) [Trigger runs](#) ~~NSM?~~

[How to get data](#) [End2End runs: 1, 2, 4, 5, 8 towers](#) [LAT Jan'06](#)
([see runs as thumbnails](#)) - [images](#)

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Data Analysis

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[How to "look at Data"](#)

[Merit, Sample Description](#)

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Very Near Future: FSW

- We're entering the Flight Software era!
- In Building 33:
 - Working on powering up the LAT with FSW
 - Not an easy task!
 - Friday:
 - Managed to power up everything except the ACD
- Next step:
 - LPA: Muons with FSW and LICOS
 - Should happen this week:
 - Heard that before, eh? :-)
 - Rolling in FSW is a complicated process – expect delays!
- We are working on getting the pipeline ready for the LICOS/FSW runs.

FSW: What Does It Mean For You?

- **New data format:**
 - LSF
 - But you won't see that in your ntuples!
 - All the variables you have now will also be available after we switch to FSW
 - Will be additional information available:
 - Context information
 - More about this at a later stage
- **Configuration information:**
 - Currently we take a snapshot of all the registers before and after each run
 - We parse this to give you the 'Configuration report' you see in the runs database
- **No more snapshots!**
 - No snapshots in FSW/LICOS
- **MOOD/MOOT:**
 - Eventually we will extract configuration information from MOOD/MOOT
 - Not available yet
- **Interim solution:**
 - We're thinking about an interim solution

Summary

- **LAT SVAC Muon Data Runs:**
 - **Been available for a month now**
- **MC available:**
 - **Surface muons**
 - **All gamma**
- **Muon hypothesis in TkrRecon:**
 - **Reprocessed all LAT B2 runs using the muon hypothesis in TkrRecon**
 - **List of files available from the main IA page**
 - **MC also available**
- **Always fun to look at the data:**
 - **Even boring old periodic triggers contains interesting information :-)**
- **Multiple trigger engines:**
 - **Lots of fun we can do with that!**
- **Muons with FSW will soon be upon us:**
 - **What will they look like? ;-)**