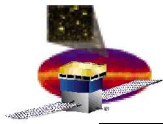




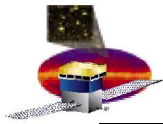
A word of caution about Trigger...

- For a 2 tower tests how do I select events that triggered on one tower only?
 - Use the **SVAC ntuple variable**
 - `GemTkrVector[4]==1 && GemTkrVector[0]==0`
 - Careful: this is a very small sample of the events and is a biased distribution, meaning that they do not correspond to typical events
- For a 2 tower tests how do I select events that opened the trigger window on one tower only?
 - You can't !!! This is a limitation in the system.
 - GemTKRvector tells you that some tower in the LAT participated in the trigger but you **can not know** which one of the towers actually opened the trigger window



Reminder on Calibrations...

- Would like subsystems to validate calibrations in the next 2 weeks for all integrated towers
 - please **scream** if you need help
- TKR for sure will have calibrations based on TKR standalone tests
 - we expect no large deviations for the integrated system
 - in the near future we will have the calibrations in the grid
- CAL should have all towers calibrated in the grid in the next 2 weeks
 - Expect no show stopper there
- We expect inter tower alignment constants available prior to the workshop
 - Within a month



Data Analysis Tasks

- The list of tasks presented in the next slides is to be used as a guide for initial plots
 - as people start looking at distributions new questions will arise
- whenever possible and/or applicable data analysis should
 - use data from integrated modules used for
 - single tower tests
 - two tower tests (preferred set to be used)
 - four tower tests (only few runs available)
 - six tower tests (data taking will start next week)
 - and compare results with Monte Carlo simulations
 - use one system against the other, i.e.
 - Cut on CAL variables and study TKR distributions
 - Cut on TKR variables and study CAL distributions



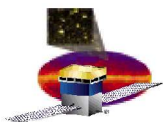
Results expected for the Workshop (1)

- **1 - Evaluate TKR uniformity by**
 - Plotting hit maps after basic selection (e.g. 1 track , good chi2)
 - Plotting the number of disconnected and partially disconnected channels
 - plotting hit efficiencies per plane
 - evaluating the stability of noisy channels during testing @ SLAC
 - comparing number of dead channels using cosmic rays and charge injection
- **2 - Evaluate TKR TOT response by**
 - comparing peak and width of TOT distributions for MIPs at different incident angles
 - Make profile plots as a function of $\cos\theta$ and ϕ
 - Studying events that saturate the TOT. Are they consistent with showers? Can we have saturation from incident particles at large angle?
 - Investigating whether noisy hits exhibit a TOT peak close to zero
- **3 - Study noise in the TKR system by**
 - comparing ratios of events with 3 and 1 strip hits and/or strip clusters for MIPs at different incident angles
 - comparing ratios of events with 2 and 1 strip hits and/or strip clusters for MIPs at different incident angles
 - doing the same as above but for runs at different threshold settings
- **4 - Evaluate redundancy in the TKR readout scheme by**
 - Comparing angular distributions, hit multiplicities and TOT values for runs read out by
 - LEFT cables only with those read out from both cable
 - RIGHT cables only with those read out from both cables
 - RIGHT cables only with those read out from LEFT cables only



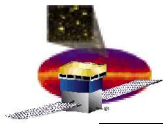
Results expected for the Workshop (2)

- 5 - Measure TKR efficiencies with external muon telescope
 - Measure efficiencies use time tagged events
- 6 - Evaluate TKR inter tower alignment and intra tower alignment
 - Produce alignment constants apply to data and compare to MC distributions
 - Do we need any information from the metrology measurements of the integrated towers at SLAC?
- 7 - Evaluate differences for towers in odd and even bay positions by
 - Measuring trigger and latching efficiencies
 - Explore all 4 (trigger/latch) combinations: (even/even), (even/odd), (odd/even), (odd/odd)
 - Extrapolating tracks into CAL and measuring residuals
 - comparing muon peaks in the CAL by selecting events that trigger either an odd or an even bay whose tracks cross more than one tower
 - comparing peak and width of TOT distributions for MIPs at different incident angles
- 8 - Study timing in the TKR by
 - Selecting events that triggered either the top or the bottom six planes of the TKR and compare the TOT distributions for MIPs and hit multiplicities
 - Compare how often a trigger primitive fired and there is no strip data and vice versa
 - Repeat the exercise above for different input trigger rates
- 9 - Evaluate If Power Distribution Unit can be a source of noise
 - in the TKR by
 - comparing distributions per plane but not individually per strip
 - in the CAL by
 - Extrapolating tracks into CAL and measuring residuals (measurements per layer)
 - Plotting the raw pulse height from one ends of a crystal versus the other end



Results expected for the Workshop (3)

- 10 - Check if CAL triggers work as expected
 - Use photon candidates by using TKR planes as veto or use cosmic ray showers (of course here you will get into all sorts of weird topologies, be careful not to go on a wild goose chase,,,)
 - Select events with CAL_LO triggers and check if energy deposition is consistent with expectations
 - Check arrival time of these events and verify if distribution is flat
 - Repeat exercise above for events that triggered CAL_HI and CAL_LO
 - Are there events with CAL_HI triggers only? How is that possible?
 - Is there any retriggering when the CAL thresholds are configured with the flight settings?
- 11- Evaluate uniformity of CAL response
 - Show CAL peaks for MIPs selected using TKR for each layer
 - Useful for item 7 (see previous page)
- 12 - Validate CAL Calibrations
 - Variable CalMIPRatio is Merit is not available on layer basis, one could go into CalValsTools and extract the information on layer basis
 - Show CAL Left-Right asymmetry using cosmic rays
 - Select MIPs and measure muon peaks for different location along the crystals and verify what is the necessary statistics to calibrate the edges
- 13- Study CAL response at different energy scale
 - Compare muon peaks for events whose pulse heights in the CAL come from the following diode combinations (small/small, big/small, big/big). Note that runs labeled B/10 have the high energy muon gain turned on for the small pin diodes so one should be able to look at these events. Also use photon selection from item 10 above (residuals could be broader for photon events because of the changes in the Energy centroid)
- 14 - Measure deadtime for integrated system
 - Does the deadtime agree with expectations when the data volume increases (e.g 4 range readout, TEM diagnostics enabled, zero suppression disabled)?
 - Does the trigger rate estimated from arrival times distribution agree with the measured trigger rates?
 - Are we testing the system close to how we operate on orbit?
- 15-Show that calculated and measured event sizes agree for different configurations



What next ?

- We had a discussion in Italy in which Ronaldo and Francesco were coordinating the TKR Italian effort
- I spoke with Neil Johnson and Dave Smith about the need to coordinate the CAL effort
- I am expecting that the gentlemen above can provide me (hopefully within a week)
 - a list of candidates to attach to each topic
 - add new topics that we have not thought about or forgotten
 - help prioritize the list if we do not have enough candidates