MICE Tracker Lab7 Tests and Readout Status

Edward Overton on behalf of the Tracker team

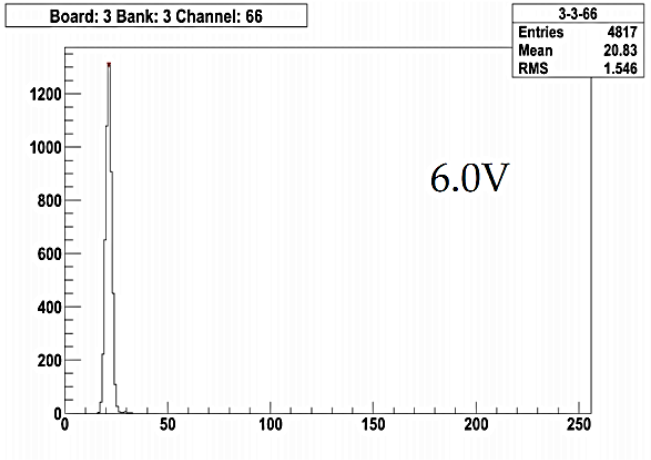
Since CM30…

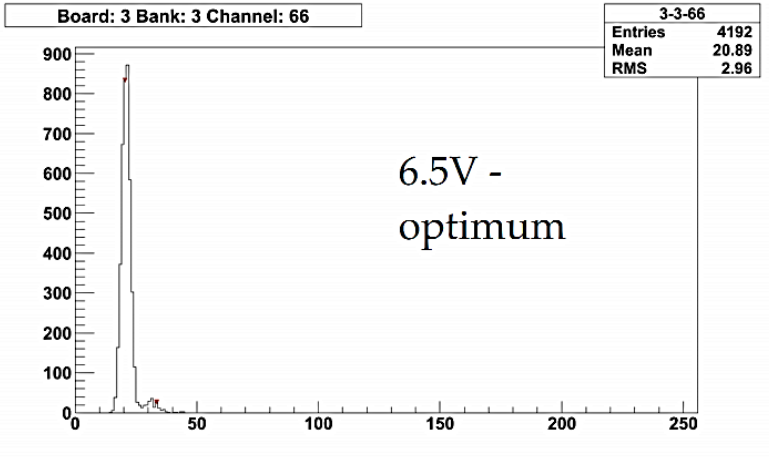
- VLPC bias voltage calibration completed for both trackers
- Setup for taking cosmic data for both trackers simultaneously
  - Two DATE LDC's have been setup and synchronised
  - Triggering has been configured to readout both trackers if a cosmic passes through either.
  - Started data taking on 22/9/11 (have 1 month of data)
- Cosmic tests are still running…

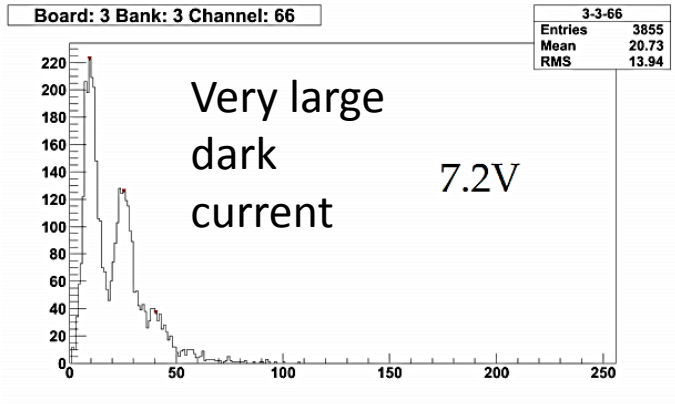
Bias Calibration of both trackers

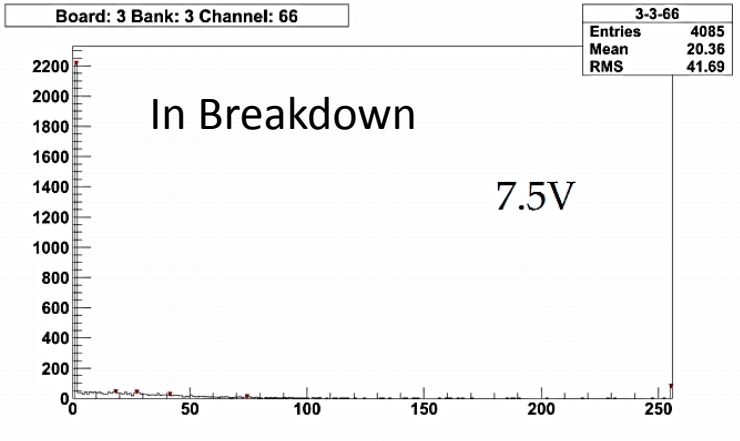
- A single LED pulser is attached to each cassette.
- The VLPC bias voltage is then scanned at voltages ranging from 6v to 8v in 100mV steps.
- At each voltage data is collected with the LED on and then with the LED off.
- Algorithm selects the optimum voltage for groups of 64 channels
  - Average rate above 1PE peak is 2%

Example of VLPC Bias





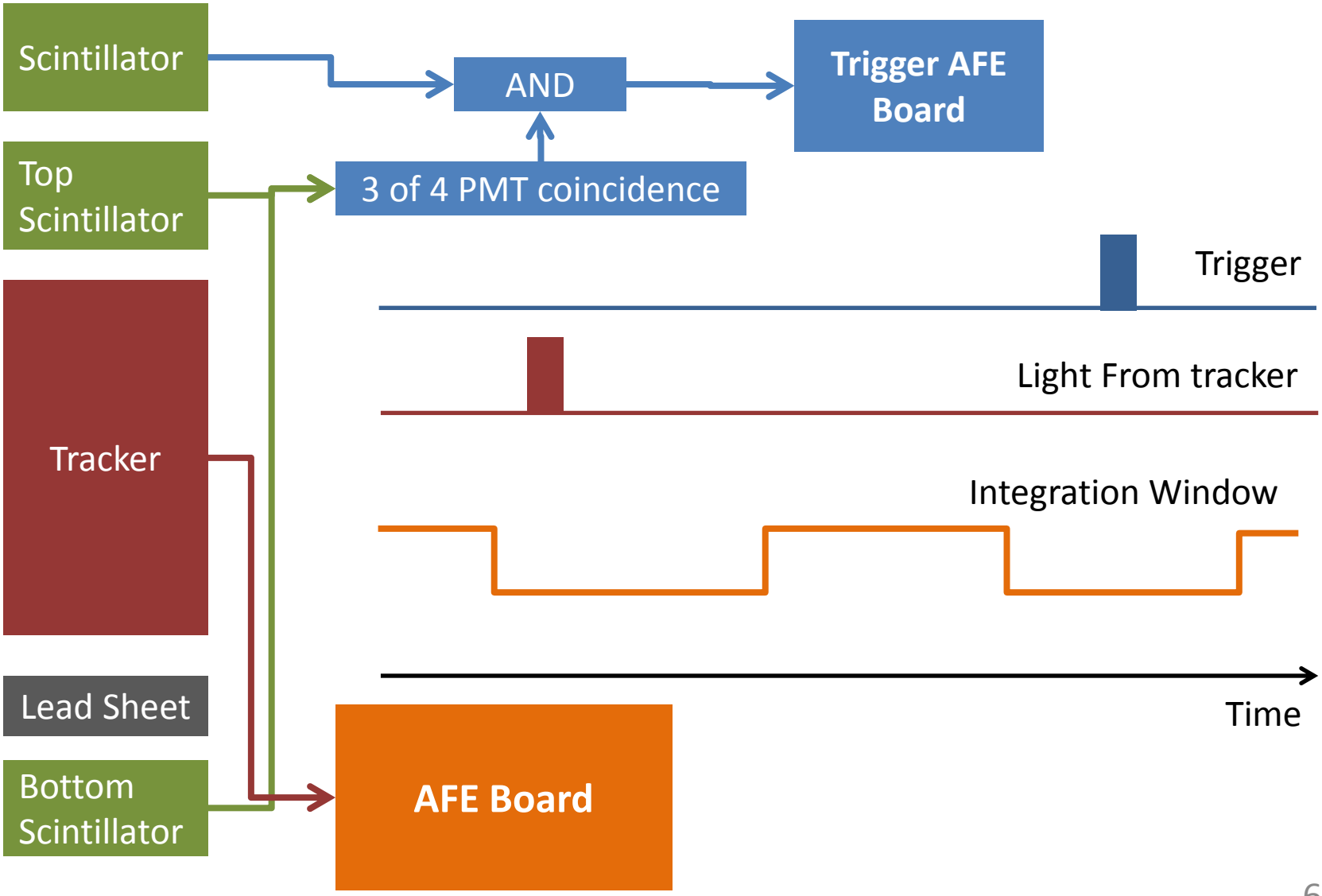




Setup in Lab7

- Both trackers have now been calibrated.
- Taking cosmic data to verify both trackers (light yield, broken channels)
- DAQ has been configured to read out both trackers through DATE:
  - Two LDC's: miceacq11, miceacq12
  - GDC: miceacq11
  - Current unsuppressed VME readout limit is ~30Hz. When zero suppression is enabled readout rate will be much higher.
- Readout is synchronised using a V977 "Trigger Reviver" module in a similar way to the MLCR.
- DATE is restarted on a daily basis to prevent any issues from the extended running and keep the file sizes manageable.
- Fixed low cosmic rate in previous run (changed termination resistor).
- Discriminators and timing are functional, but not calibrated and disabled.

Triggering


Scintillator
Top Scintillator
Tracker
Lead Sheet
Bottom Scintillator
AND
3 of 4 PMT coincidence
Trigger AFE Board
AFE Board
Trigger
Light From tracker
Integration Window
Time

Integration window and timing

- Integration window based on ISIS RF clock. In MICE this will synchronise incoming particles to the alive window of the AFE board.
- The triggers must be synchronised to the internal 51MHz AFE clock.
  - The readout triggers must not straddle two integration windows.
  - New firmware prevents this.
- Trigger sweeps performed using LED pulser to find optimum trigger delay.

3Mhz RF clock

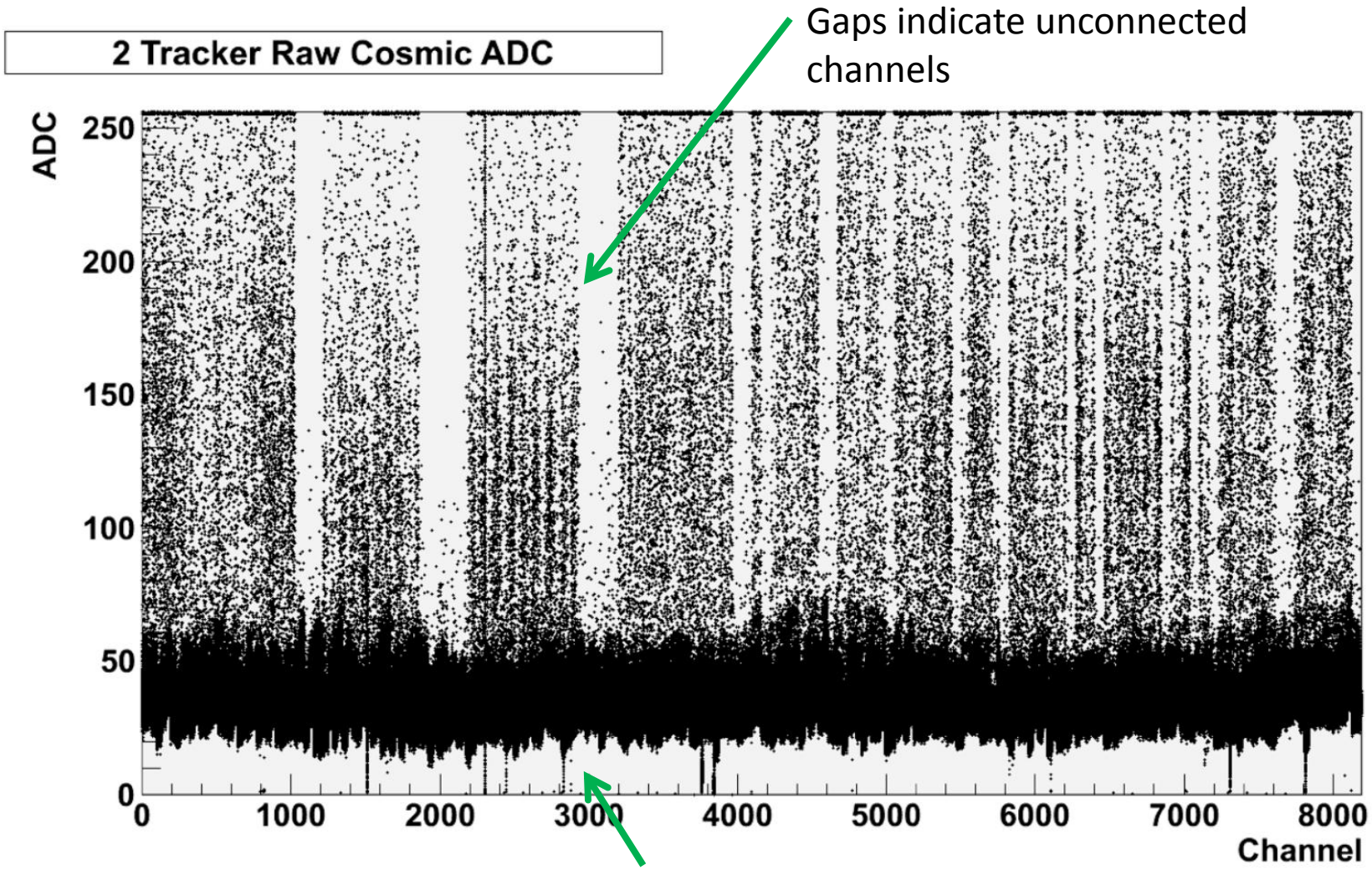
LED Pulses

Readout Triggers to AFE board

Readout Status

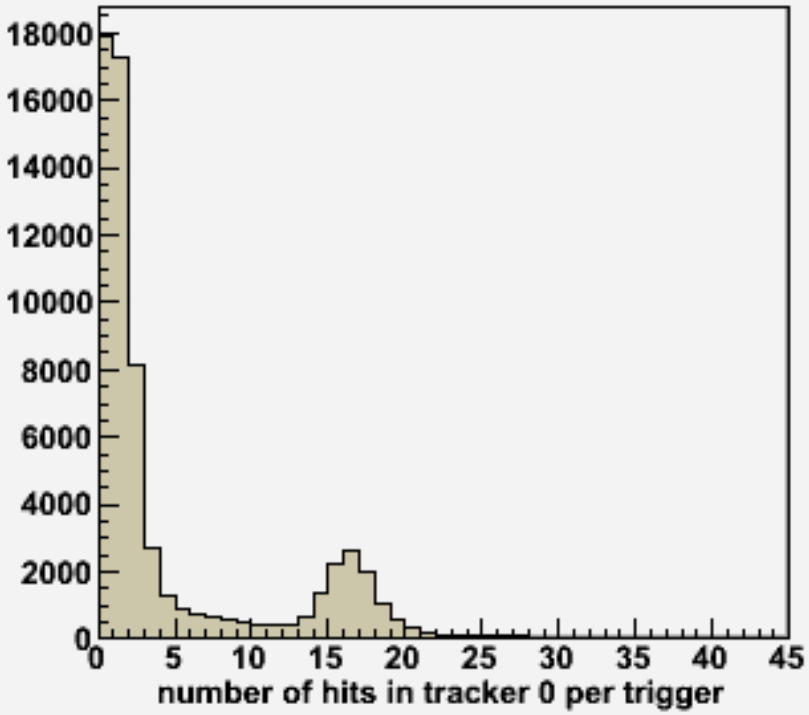
- Getting about 10K readout triggers per day for comic's
- So far collected 1 month of running.
- Trackers are reading out uneven number of events in each channel, even with zero suppression disabled.
  - Ed S has modified his analysis code to reject these readouts.
  - Seems to be a problem of the low cosmic rate
  - New firmware has been setup to fix this. Not yet downloaded to VLSB.
- Channel mapping is not completely understood

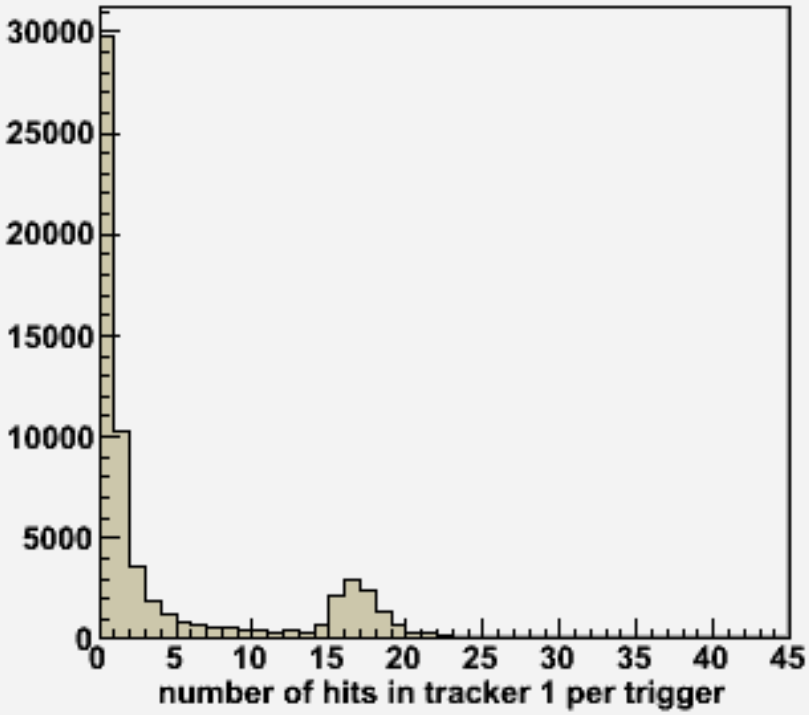
Raw Data



Lower spikes indicate channels in breakdown

Hits in each tracker





Future

- Aiming to record ISIS RF signal in control room for December run.
  - Frequency is not constant
  - Will be used to time alive window to incoming particles.
- Calibrate discriminators and timing on AFE boards
- Install LED calibration system inside tracker
- Understand channel mapping
  - Start looking for space points / fitting tracks

Summary

- Have now calibrated the VLPC biases of both trackers.
- Setup Lab7 to take cosmic data on both trackers
  - Simultaneous readout in DATE.
  - Collected 1 month of data.
  - Can definitely see some hits (above adc value over 60)
  - Need to understand channel map
- LED system is designed, awaiting install after cosmic run.
- Discriminators and timing needs to be calibrated after cosmic run.
- Aiming to monitor ISIS RF clock in control room during December run