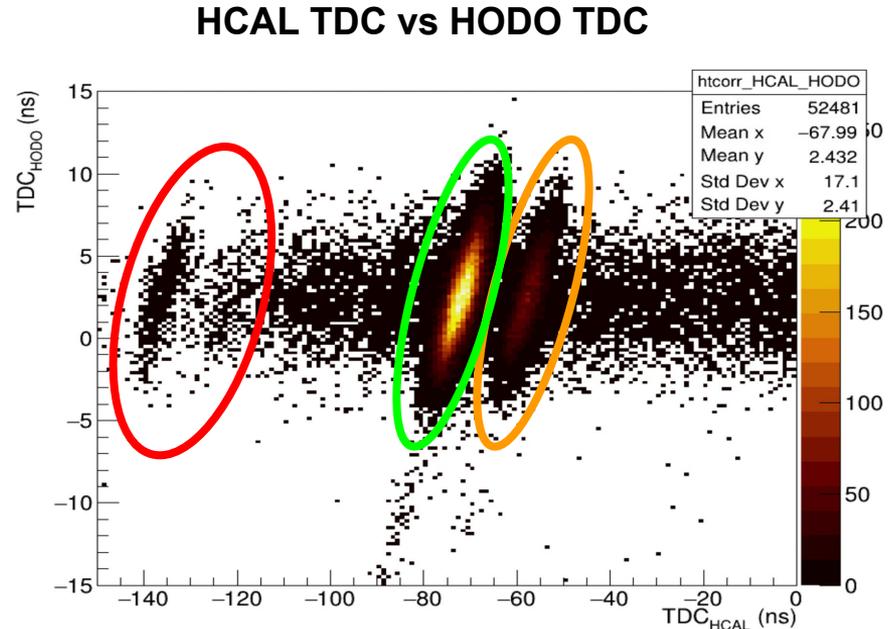


Analysis Status: SBS Collaboration Update

1. HCal analysis tools
 - a. Replay and SBS-Offline
 - b. Cluster Display GUI
2. HCal First-Pass Calibrations
 - a. Energy (complete)
 - b. Timewalk (complete)
 - c. RF corrections (complete)
 - d. TOF (In progress)
3. Common Analysis Platform
 - a. Elastic cut and settings spreadsheet
 - b. Parsing script
4. HCal Efficiencies
 - a. HCal Timing
 - b. HCal Detection Efficiency

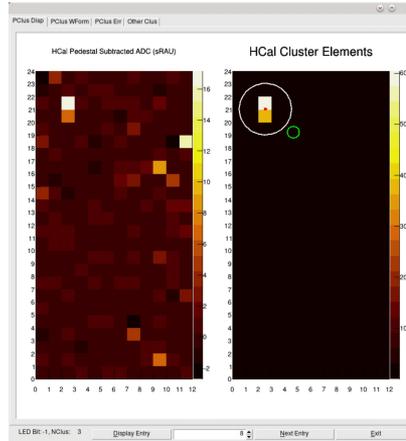
HCal Analysis Tools: Replay and SBS-Offline

1. Apparent duplication of TDC signals in data
 - a. (green) Signal (elastic, SBS8)
 - b. (red) Rollover
 - i. Testing data with rollover correction (64964 tdc unit shift, not $2^{16}-1$)
 - c. (orange) Double Peaking
 - i. Working on correction to reference time subtraction which should account for the duplication
2. Scripts
 - a. Replay to add TDC te and tot data to replayed HCal data (in-progress)
 - i. `replay_hcal_SAS_tdcalt.C`
 - ii. Relevant DB files
 - b. Timing cut on cluster members
 - i. `SBSCalorimeter.cxx`
 - c. Use updated TDC rollover correction
 - i. `SBSDecodeF1TDCModule.cxx`

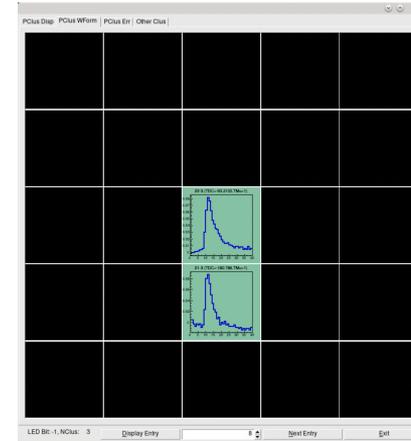


HCal Analysis Tools: Cluster Display GUI

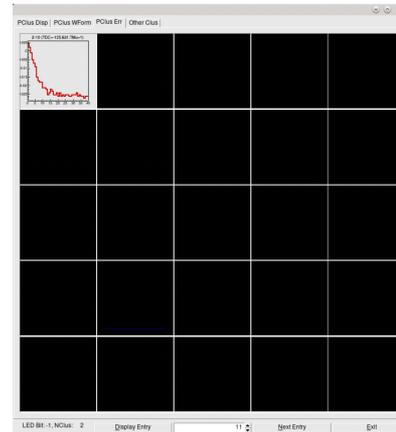
1. Data per event
2. Adds waveform data and error waveforms (negative intADC and saturation) to cluster display GUI
3. Includes expected location of cluster center from e' (green circle) and search region (white circle)
4. Gives intADC over all channels as heatmap
5. (in progress) Add reconstructed TDC signal to clusters



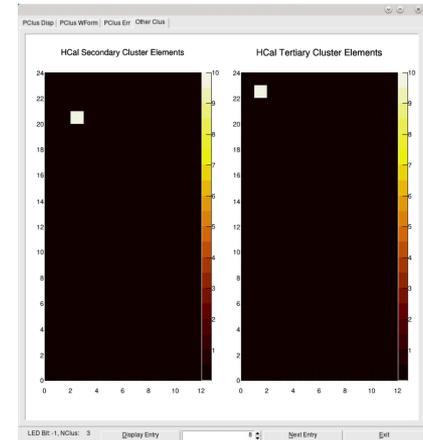
intADC and Primary Cluster Blocks



Primary Cluster Block Waveforms



Error Waveforms

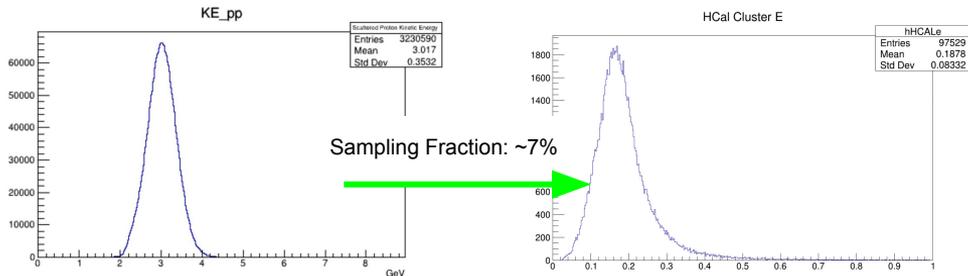


Additional Clusters

Calibrations

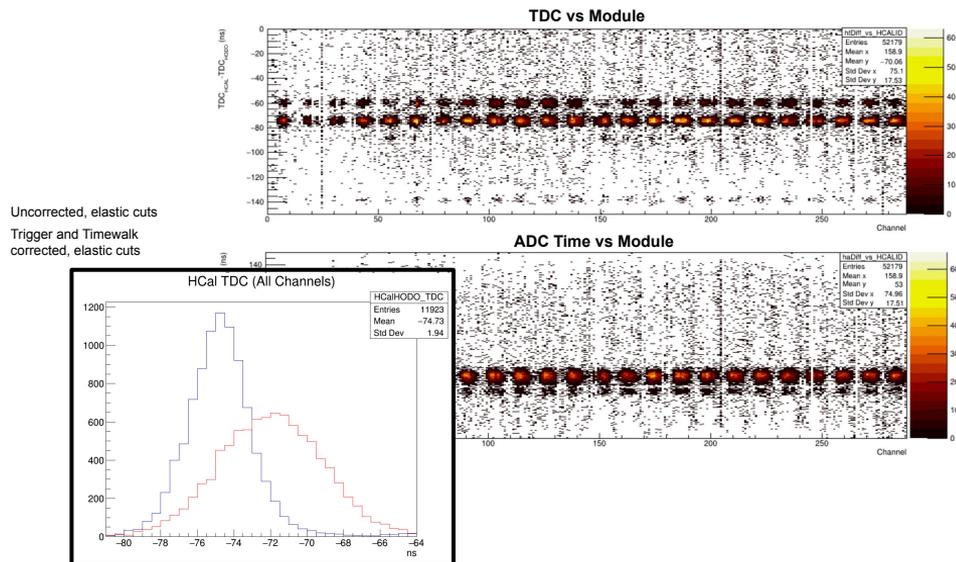
1. Energy

- ADC gain coefficients map pC integrated ADC to GeV
- Calibrated over all channels using GMN data
- (in-progress) Calibration coefficient error
- Total cluster energy post-calibration matches expected KE from e'



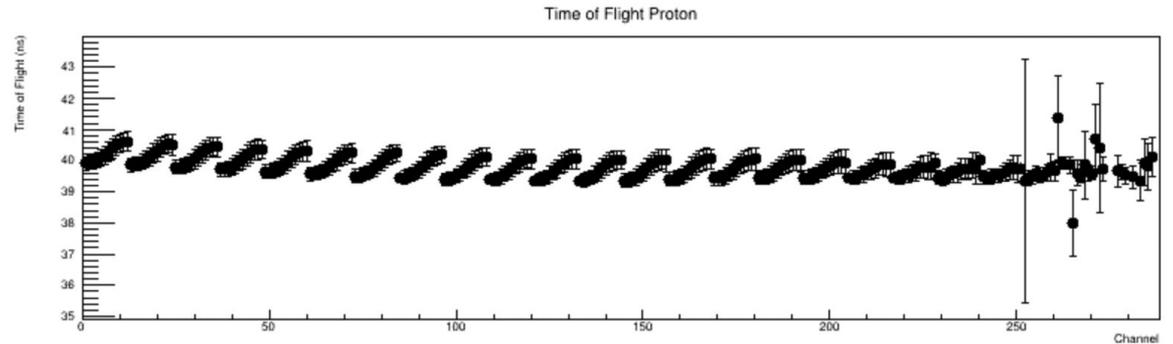
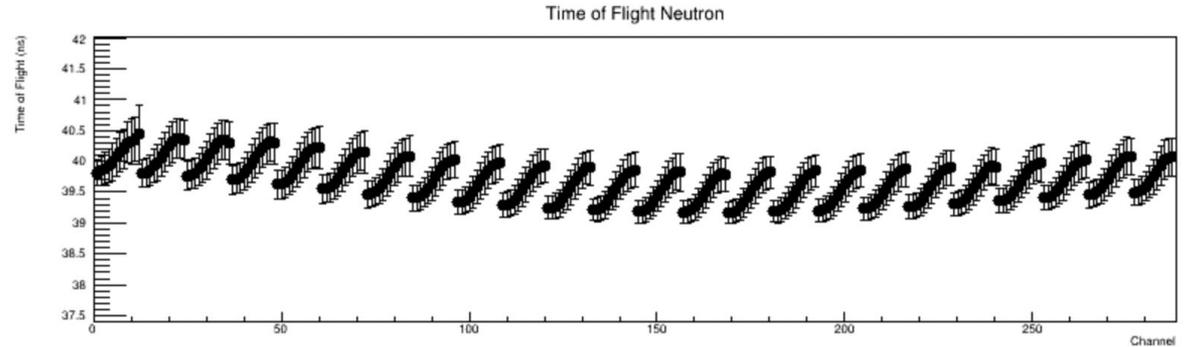
2. Timing

- Signal to be aligned and resolution improved
- Timewalk
 - Via fits to TDC vs E per channel
- RF Corrections
 - Via HCAL-HODO difference



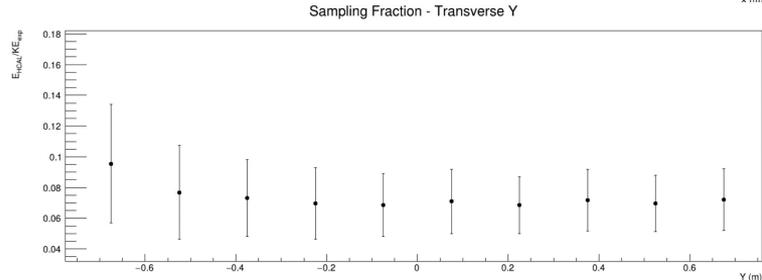
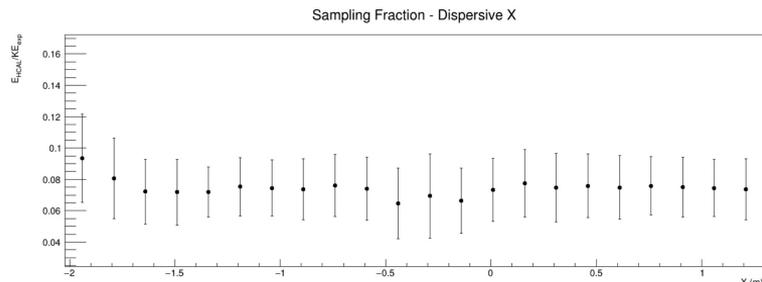
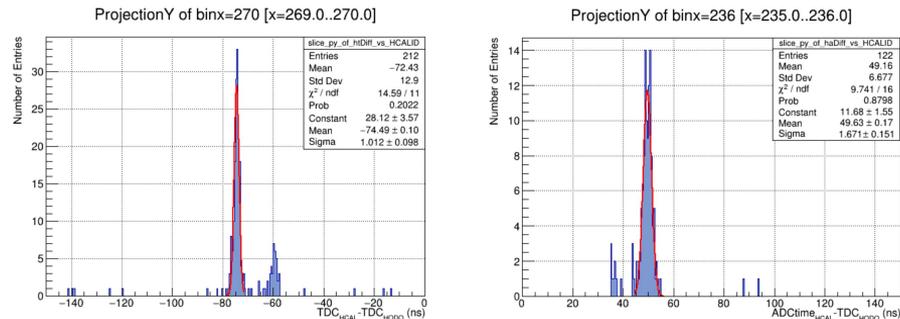
Calibrations - Timing, TOF: Simulated g4sbs data

1. Working with Isaac Smyth, a SULI student from East Tennessee State University
2. Elastics, time between scattering and HCal boundary crossing
3. Magnetic field needs additional adjustment for each SBS setting
4. All corrections extracted for SBS8, SBS 30%
 - a. Relative corrections to lowest TOF channel
 - b. When finished, will update DB



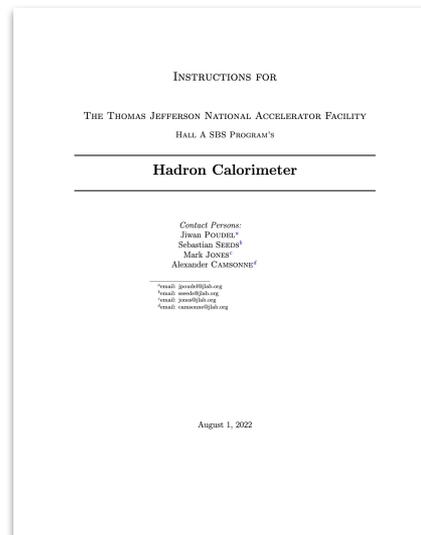
HCal Efficiencies - Timing and Detection Efficiency

1. Timing
 - a. TDC, as good as 1.0 ns resolution
 - b. ADCt, as good as 1.7 ns resolution
2. Detection Efficiency
 - a. Estimate with measurement of sampling fraction across HCal
 - b. Mean sampling fraction 6.9%
3. Waiting for first pass replay to improve statistics over all channels



Graduation Timeline

1. Will refine calibrations after first (and additional) passes
2. Will extract preliminary nTPE contribution after first pass. Hoping for preliminary results by end of the year.
3. Will continue to maintain and write documentation (including HCal NIM paper) and support HCal through GEn.
4. Planning to Graduate Summer 2023



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