

G_E^n : Analysis Overview

Robert J. Feuerbach (W&M) for
The GEN Collaboration

Preparing the analysis

- Special – two new apparatuses (and detectors) plus the beamline
 - BigBite: Track reconstruction (see Seamus's talk)
Electron Identification (*THaPreBBShower*)
Timing plane (standard *ThaScintillator*)
 - BigHand: Cluster construction
Match to Veto planes
 - New GenBeam class

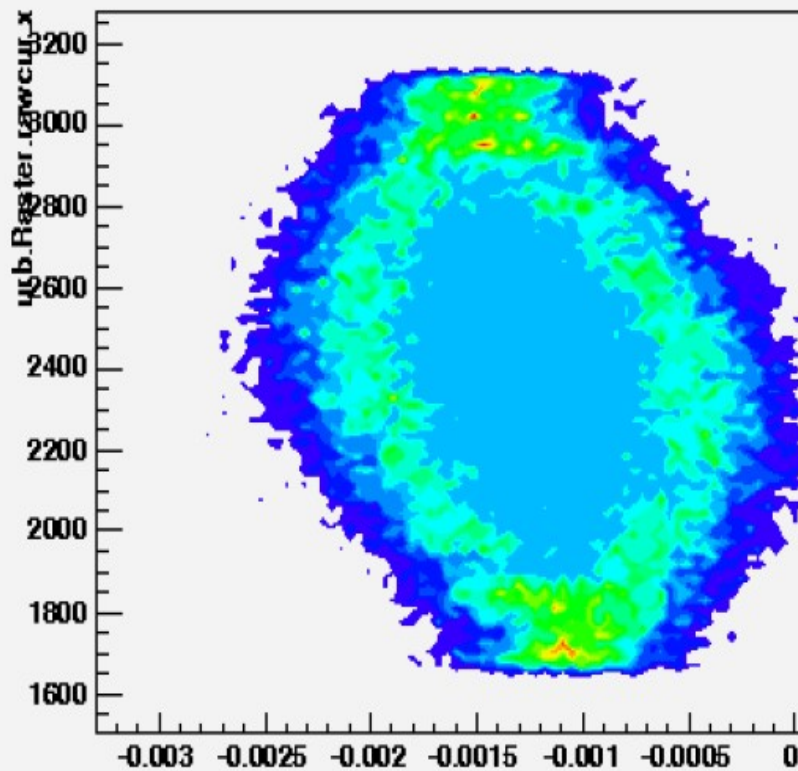
Using the Analyzer for GEn

- Worked on our own “cvs branch”, with goal to bring the wanted features back to the trunk.
 - GenBPM – new cavity BPMs (Brandon Craver)
 - GenHelicity – improved (Richard Holmes)
 - Store fully-functional ND in ROOT-file (to keep calibration information and have access to detector methods, eg: nearest-neighbor’s geometry)
- Experiment-specialized software in separate library (agen).
 - BB required a different processing order: called for a new implementation of THaAnalyzer class
 - BigHand veto and scintillators, BigBite detectors, optics, etc.

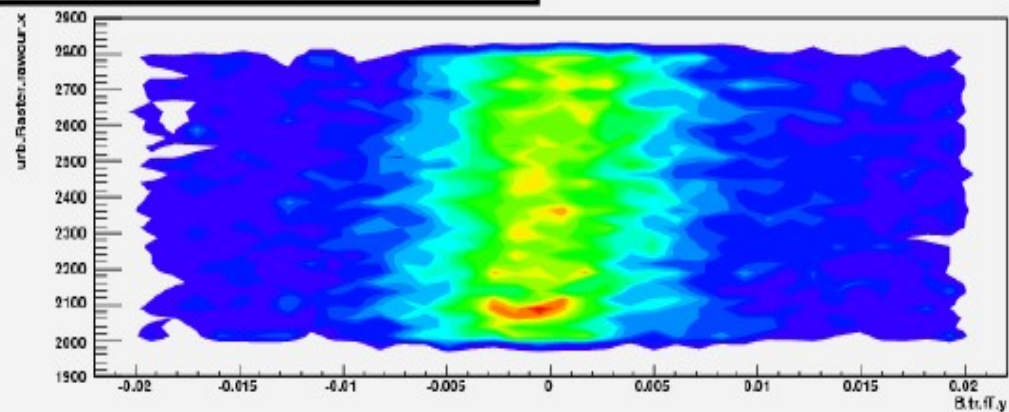
Raster calibration

$x = \langle \text{BPM}_x \rangle + \text{slope} * (\text{Raster.lx} - \langle \text{Raster.lx} \rangle)$, but slope often chosen as $\sigma(\text{BPM})/\sigma(\text{lx})$ which is WRONG. BPMs average over long times... So:

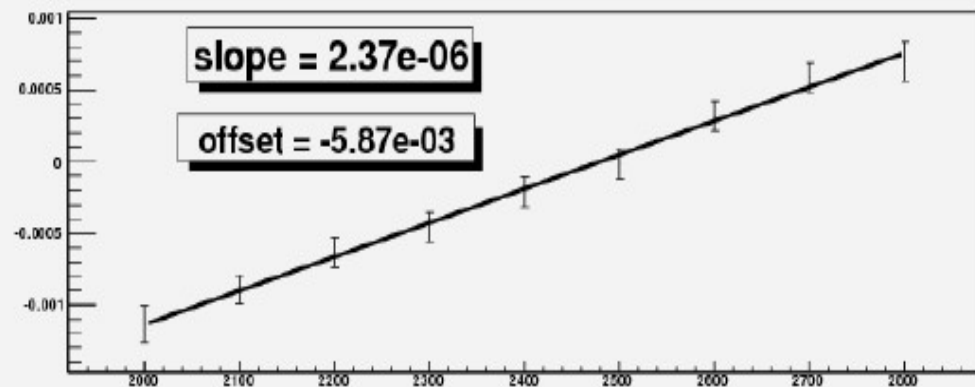
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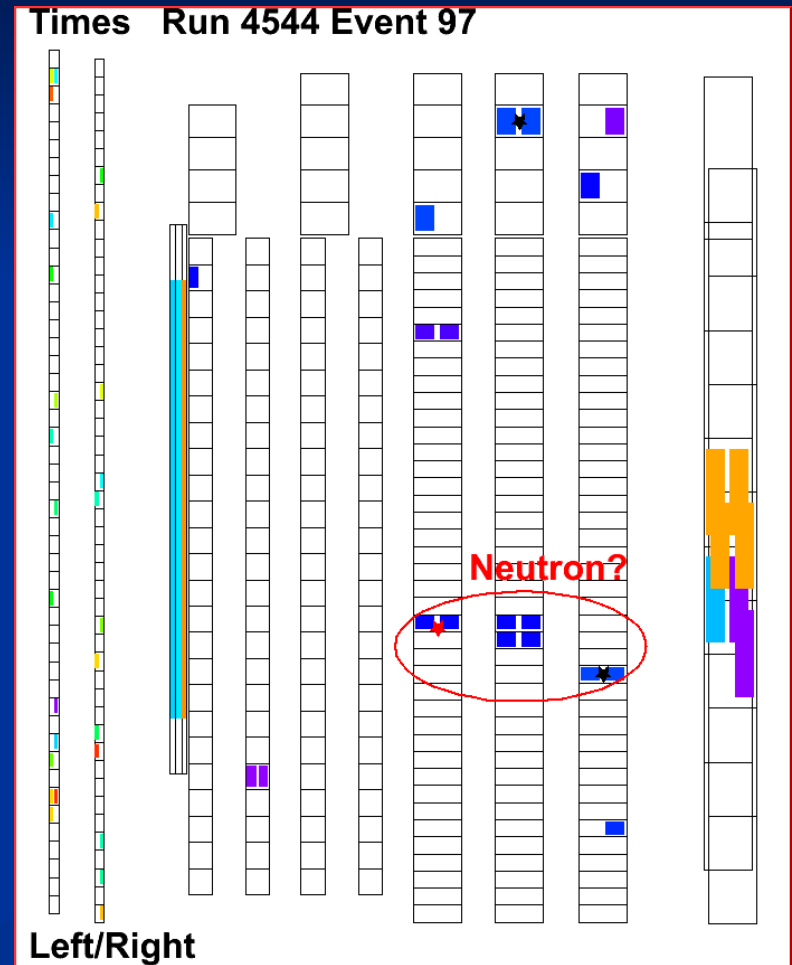
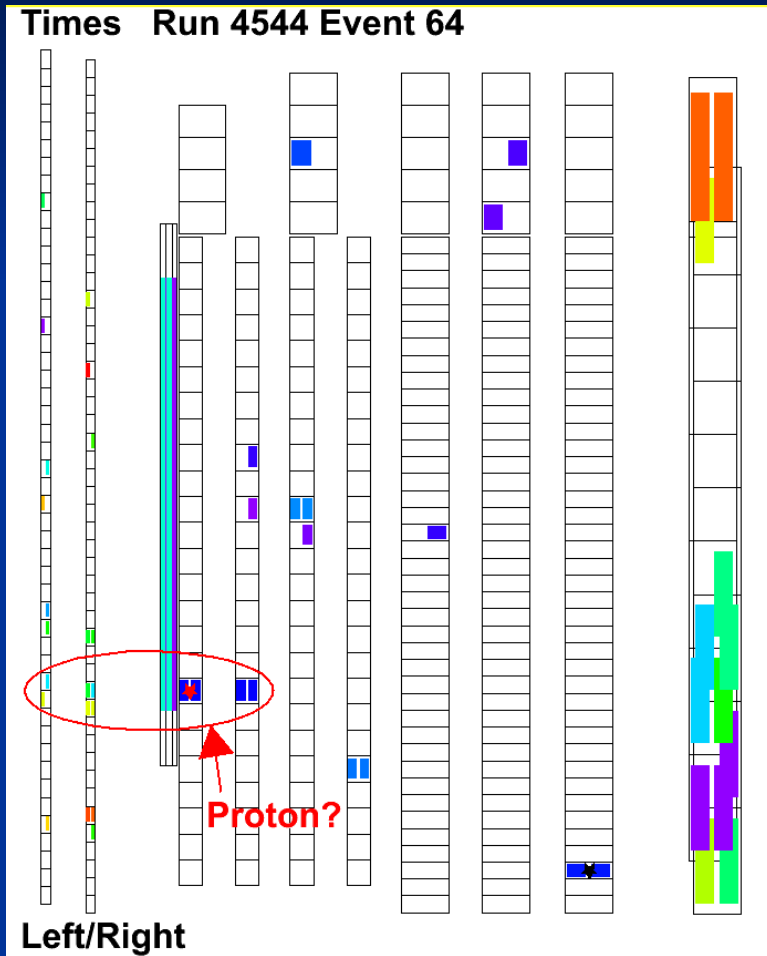
Graph



BigHand 'clustering'

- Matches geometrically-close hits and places into a single 'cluster'
 - Neighboring hits are required to have $|dt| < 10\text{ns}$.
 - Time of the hit closest to the target is used and reported as the clusters ToF.
 - Total cluster energy is calculated, as well as shape characteristics
 - Searches through each veto plane for best matching (in time) hit.

BigHand events



Databases

- Still using text-based databases for calibrations
- MySQL database containing all EPICS variable to extract running and beam (eg: IHWP) conditions that could affect the analysis.
 - Provides a nice, simple place to look through the entire experiment for oddities (eg: BB ramping down).
 - New columns for target polarization and direction are to be added.

The Farm'ing experience

- Processed kinematics #4 first, with a pass0 (one run per day analyzed) to provide the needed information for calibration.
- Used farm to analyze all kin#4 datafiles (700 files)
- Tip: priority on the farm depends upon HOW MANY jobs you have recently run --> submit 1-3 jobs for testing, no more.
- Each file in a split run can be analyzed separately, HOWEVER the *.dat.0 file must be around for proper initialization (prescale factor, date/time, etc.)
- See me for files perl scripts to submit files, or look in /work/halla/e02013/disk1/GEn/replay .
- Took 10days to analyze 700 2GB CODA files, at ~10Hz processing rate.

Farm'ing II

- Pass1 kept
 - Events with tracks
 - “special” events
 - All tracks with $g.evnum\%10==0$ (10% of data)
- Use of the analyzer's “cuts” made this easy, and permitted us to monitor the tracking.
- “Physics” pass with track reconstruction performed separately from scaler analysis.
- Post-processing analysis performed with two parallel approaches, one utilizing `T->SetAlias` and `T->Draw` (slow), the other the `Ttree::MakeClass` structure (more control).

Documentation – wiki is great

- Used HALOG
- private ELOG during experiment to track bugs and fixes, software tools, etc
- and Wiki for post-experiment information collection. GREAT for dynamic documentation of the codes behavior.

The screenshot shows a web browser window titled "TikiWiki : GEN - Windows Internet Explorer". The address bar shows the URL: <http://hallaweb.jlab.org/experiment/E02-013/wiki/tiki-index.php?page=GEN>. The page content is as follows:

GEN

GEN experiment information page (cached)

Welcome to the Hall A E02-013 GEN experiment wiki page!

This site is highly unorganized, but we are trying to fix that. Please just deal with the clutter for now.

Base Equipment

- The [Neutron Detector known as BigHand](#)
- The [BigBite](#) Spectrometer

Analysis Categories and Issues

- [BigBite Tracking and Drift Chamber Global Variables](#)
- [Neutron Detector Analysis](#)
- [Monte Carlo Reports and Package Documentation](#)
- [What is that D.ctimeL1A variable?](#)
- [How to calculate the different livetimes \(in progress\)](#)
- Proposed [GEN SQL database](#)

Replays of the data:

- [Kin4's replay with a list of targets and run numbers](#)
- [Original Pass0 Online replay of the data](#)

Looking for a run?

Brandon's log of the runs taken in the different kinematic settings and conditions is available here: [gen_runlog_brandon.txt \(31.33 Kb\)](#)

Running Conditions and DAQ formats

- [Back up of adaq cluster](#)
- [GEN Raw Data Structure \(by Robert Michaels\)](#)
- [GEN hardware connection scheme](#)
- [Specially inserted events explained](#): prescale factors, threshods, epics variables, high Voltages, [Epics variables](#)
- [GEN trigger and connection diagrams/schemes](#)

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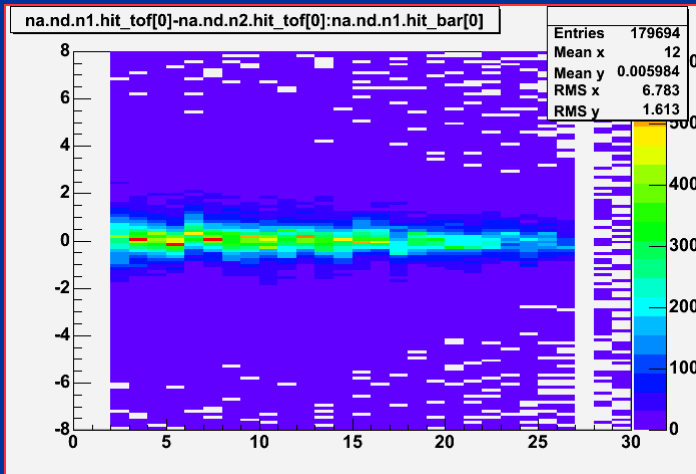
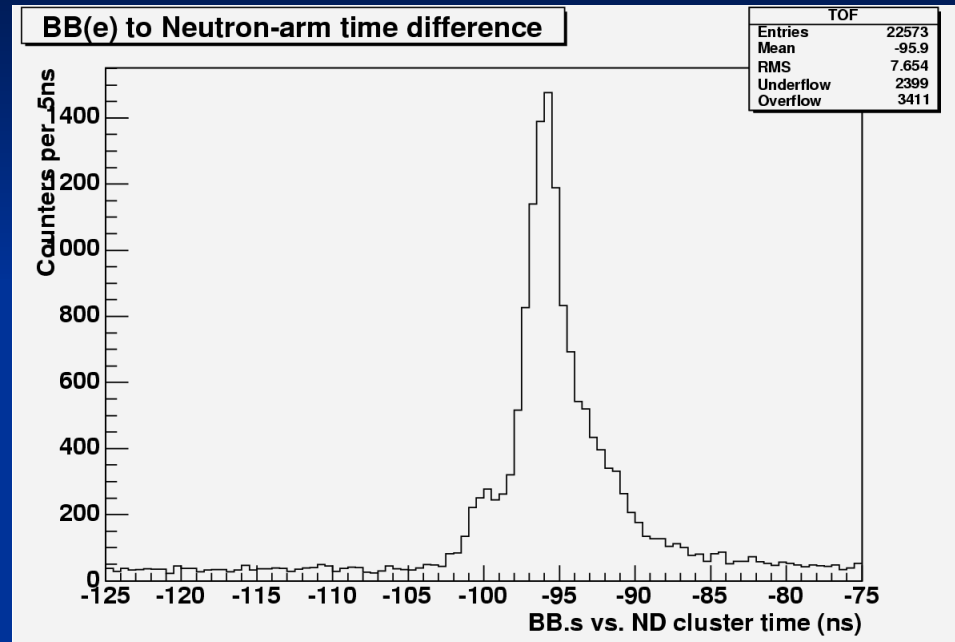
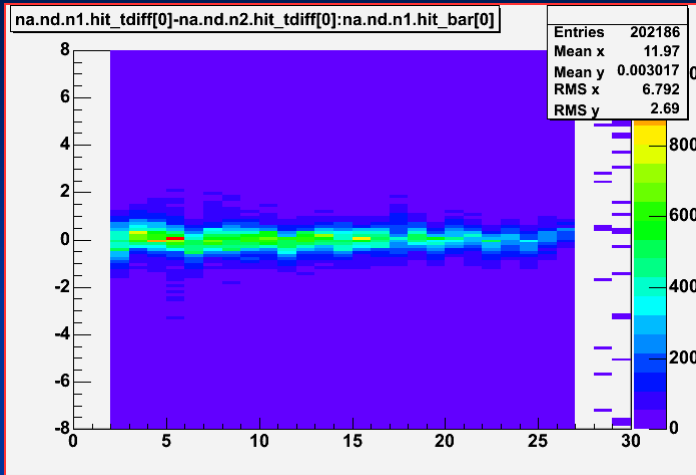
Last changes

- 1) [Neutron Detector Analysis](#)
- 2) [NA Geometry](#)
- 3) [GEN](#)
- 4) [D.ctimeL1A](#)
- 5) [AdaqBackup](#)
- 6) [BigBite Tracking and Drift Chamber Global Variables](#)
- 7) [BigBite Drift Chambers](#)
- 8) [BigBite](#)
- 9) [Livetime](#)
- 10) [NeutronDetector](#)

Summary

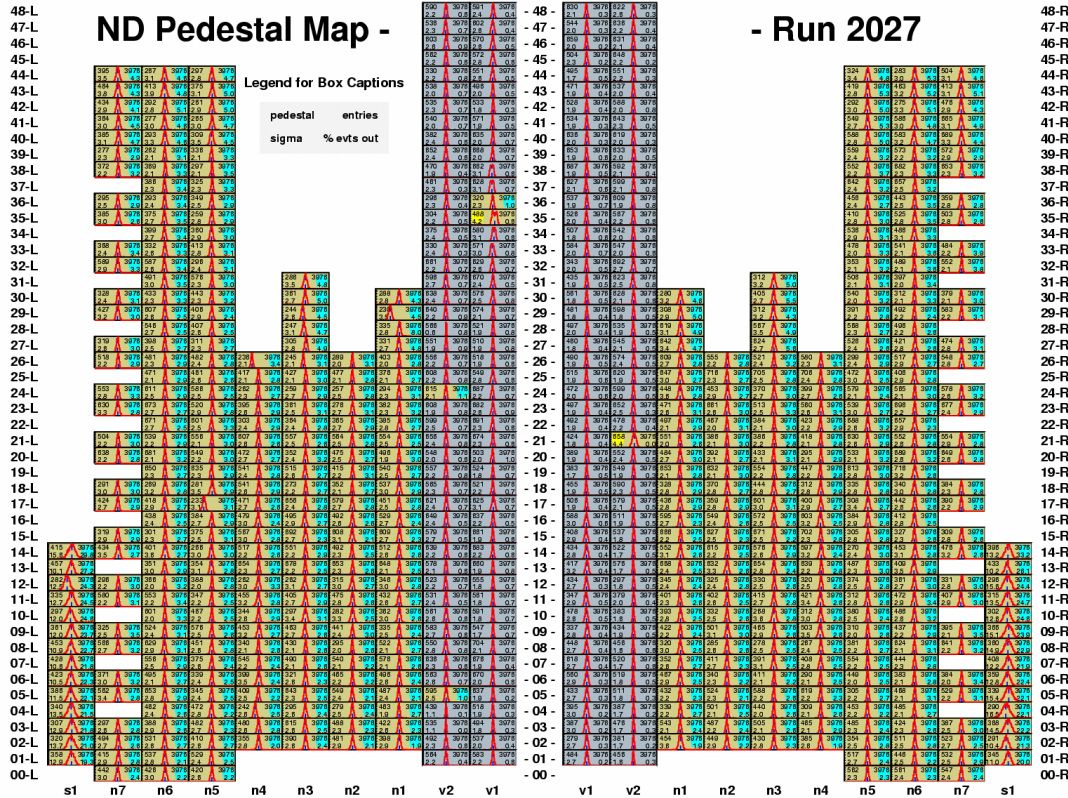
- Modular framework simplified development and permitted re-use of much of the analyzer even with non-standard equipment.
- We performed a first absolute measurement of the raster-size correction: found scale factors of 1.4 and 1.7 to the “straight” size of the beam at BPM's A and B.
- Framework in place to record ALL epics variables to a mySQL database for faster queries to monitor running conditions.
- The farm is very useful, just be aware of your priority.
-
- Wiki (with search) is great for rapidly changing documentation...

ND calibration software (timing)



J.Miller (UofMD)

ND Calibration (cont'd)



Scripts by Igor Rachek
and Pavel Evtushenko

Ongoing Analysis Tasks - Calibrations

- Database (mySQL) to collect run conditions, beam, and target information (Brandon Craver)
- ND geometry and timing calibration (Tim, Jon Miller)
- Shower calibration (Sergey Abrahamyan)
- BB Scintillator Calibration (Ameya Kolarkar)
- MWDC Calibration (Brandon and Seamus Riordan)
- BB Optics/tracking (Seamus)
- Target polarimetry (Ameya and Aidan Kelleher)
- Beam polarimetry (Alexandre)
- Target field direction (Arie Beck)
- Raster corrections (Brandon)