Hall C Working Groups

18/01/24 (18th January 2024)

Hall C Working Groups – Overview

- From the Bylaws, Sec 4.3 – Working Groups (WG)
  - Working Groups will be formed as deemed appropriate by the UB to oversee a specific project or to give advice on a specific theme of relevance to the Organization. Members may also petition the UB for the creation of a WG. Any member is eligible for membership in one or more WGs. Non-members (such as Jlab staff or theorists for example) can also take part in the working groups. Each WG shall elect a Chair, who is responsible for the WG under the general direction of the UB. Each WG is expected to report periodically to the UB and the general membership on its activities and progress. WGs which have been inactive for two or more years may be disbanded by the UB.

Active Hall C Working Groups

- **Spectrometer Performance and Future Upgrades WG**
  - Convener – Stephen Kay (University of York)
    - Quarterly analysis meetings
- **AI/ML in Hall C WG**
  - Conveners - Cristiano Fanelli (W&M), Tanja Horn (CUA), Casey Morean (CUA)
    - Foster excitement about AI/ML applications and build momentum
- **Room for more?**
  - Are people happy with WG structure/mechanism? Do we want more WGs?
    - Futures WG?
    - Theory WG?

Spectrometer Performance and Future Upgrades WG

2023 Updates

Spectrometer Performance and Future Upgrades WG – 2023 Activities

▶ Main activity is the Quarterly Analysis Meetings

- ▶ No prizes for guessing how many quarterly meetings there were in 2023
- ▶ Notes/recordings of all meetings available on the DocDB

▶ Quarterly Analysis Meeting II – January 2023

- ▶ Shorter meeting, closely followed the 2023 Hall C User meeting
- ▶ S. Kay - RF timing variables in hcana
  - ▶ New potential PID tool
- ▶ A. Usman – Detector efficiencies/performance
  - ▶ An update on detector performance/efficiencies from the KaonLT run

Spectrometer Performance and Future Upgrades WG – 2023 Activities

- Quarterly Analysis Meeting III – April 2023

  - R. Trotta – SIMC to hcana Kinematic Variable Recalculation

    - New script to reduce confusion/errors in comparing SIMC/hcana kinematic variables

  - C. Yero – Luminosity Analysis Update

    - KaonLT Boiling Study Investigation

    - Rate dependence on charge normalized yield study

  - D. Hamilton – NPS Software Update

    - Overview of NPS experiment and software challenges

    - New VTPModule class in hcana

    - Multi-block readout

Spectrometer Performance and Future Upgrades WG – 2023 Activities

▶ [Quarterly Analysis Meeting IV – August 2023](#)

- ▶ G. Niculescu – And now for something completely different…
    - ▶ New initiative to convert fortran scripts to modern languages
    - ▶ pi0.f code converted as an example
- ▶ D. Gaskell – BPM Calibration Updates
    - ▶ Updates on the BPM calibration procedure
    - ▶ Info added to the wiki

Spectrometer Performance and Future Upgrades WG – 2023 Activities

- **Quarterly Analysis Meeting V – November 2023**
  - Bumper meeting! Lots of exciting updates.
  - G. Huber – Beam and Spectrometer Offsets from Heep Coin Data
    - Overview of offset determination procedure from Heep data
  - A. Postuma – Puzzling Cointime Behaviour
    - Closer look at strange CT behaviour during KaonLT running
  - A. Patna – hcana Container
    - Update on Hall C software containerisation project
  - C. Morean – NPS Analysis Workflow Updates
    - Update on new workflow for dealing with segmented input data from NPS experiments

Path Forward/Future Plans

- [Quarterly Analysis Meeting VI – February 2024](#)
  - Agenda wide open at the minute
  - Let me know if you would like to give a talk!
    - Email talks/ideas/suggestions to Stephen.kay@york.ac.uk
  - Q – Are people happy with the format?
    - Frequency?
- Working group as a whole
  - Q – Rename? Re-arrange? Remove the WG entirely?
  - Other activities?
    - Should the WG be doing other things?
      - "Hey, where's that paper?"

AI/ML Working Group Slides

Hall C Working Group AI4HallC

THE CATHOLIC UNIVERSITY OF AMERICA

Jefferson Lab

Casey Morean, Tanja Horn, Cristiano Fanelli

(Conveners of the AI4HallC WG)

1/18/2024

DALL-E prompt:
"Create an image of data streaming into a holographic display with figments of AI and machine learning. Show a human finger touching the holographic interface"

- Hydra implementation in Hall C for NPS
  - Huge effort and help from Thomas B, Torri J, Brad S, Anil P
  - Short-term: convert and label PDF output reports
    - Labelers needed soon!
  - Medium-term: Direct PNG output from onlineGUI
  - Long-term: Pre-experiment training on simulated data
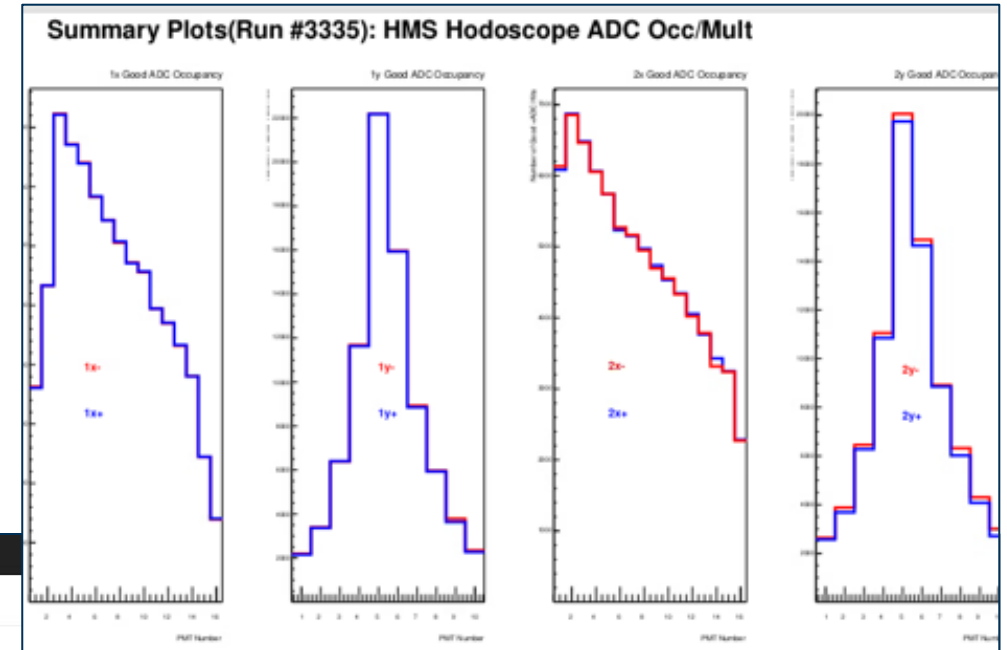
Torri and Thomas kindly offering to run models in the short-term

Current Projects – Retrieval-Augmented Generation (RAG)

- How do we leverage LLMs and AI agents to assist in research?

- One may ask, "What happened on December 12th during the NPS experiment?"
  - Links to the Logbook entry of the shift summary, follow-up entries, wiki links

- When did the drift chambers loose flow?
  - Logbook entries, wiki RC meeting, etc.

Please See Daniel Murnan slides on chATLAS from AI4EIC annual workshop!

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Logbook

Hall C Wiki

Experiment Proposals

Standard Equip. Man.

chATLAS example
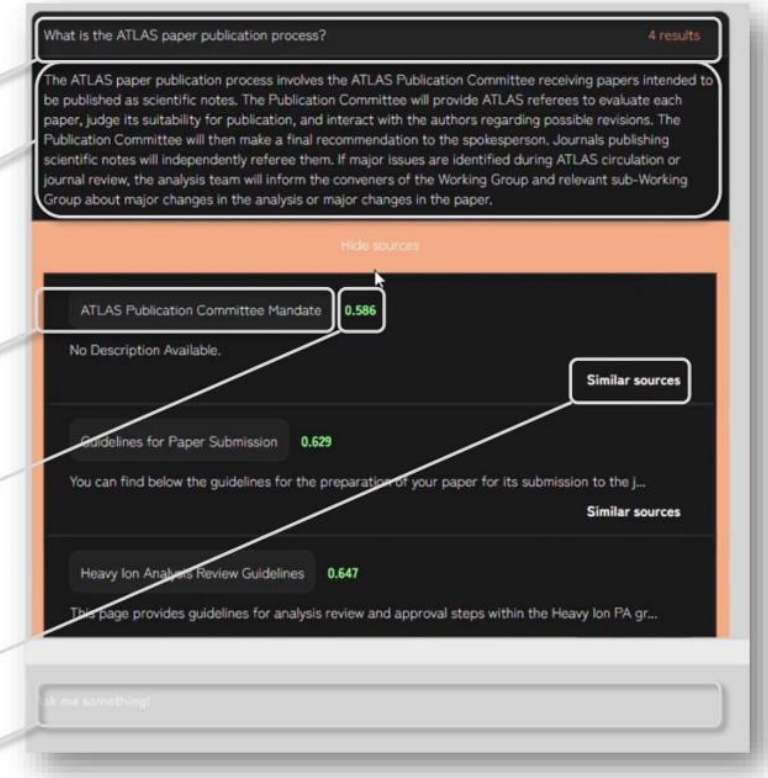
Current Projects – Dual Readout Calorimetry

- Analyze full waveforms from CHGlass blocks

- Two glass samples, one with scintillation centers, one without
    - One block only emits Cherenkov light

- Benchmark standard algorithms against ML algorithms

- Future: Perform trigger level or in-line subtraction
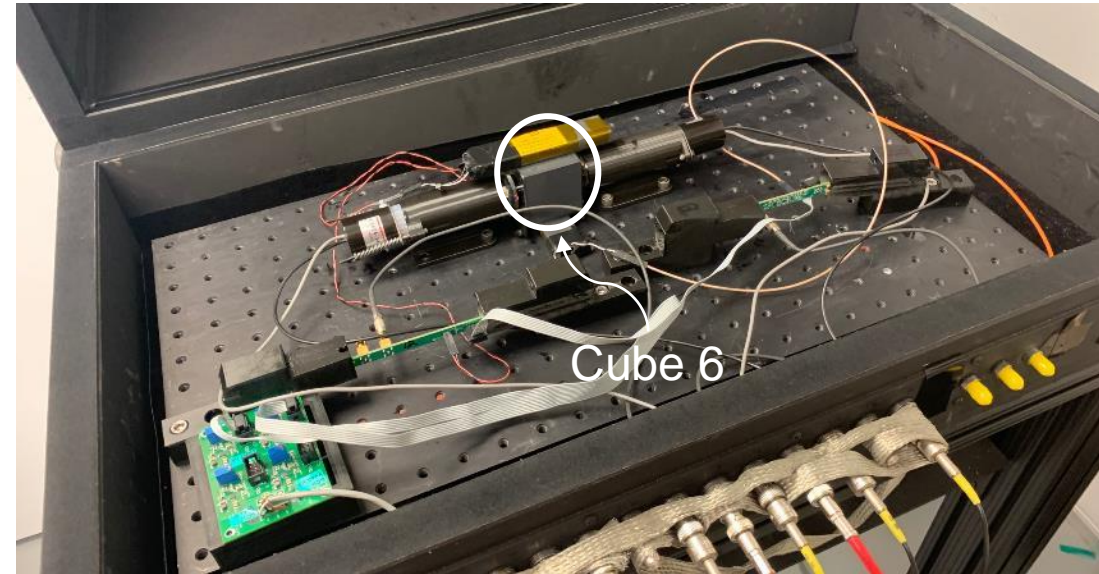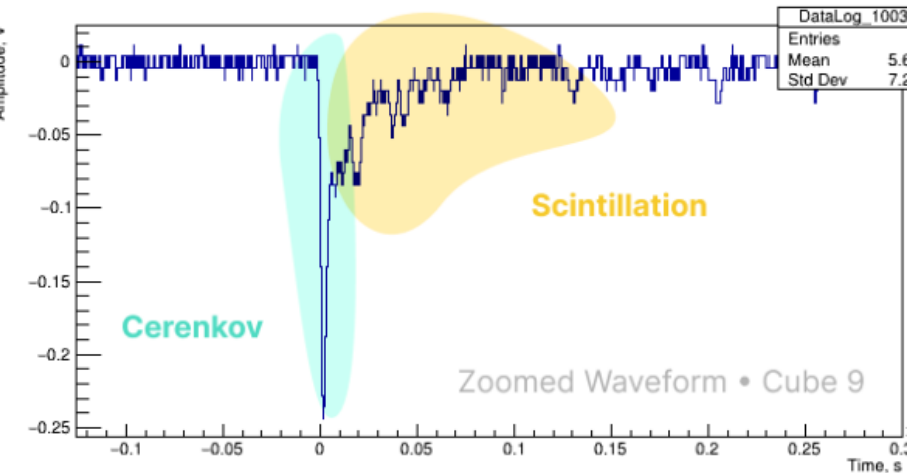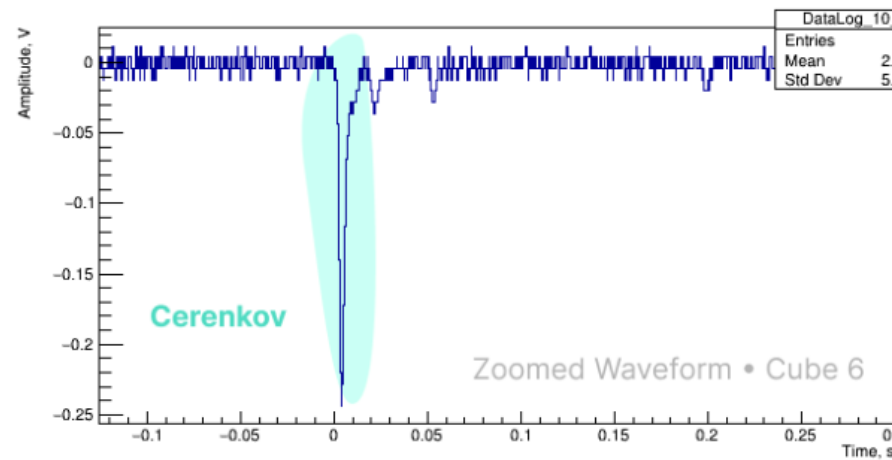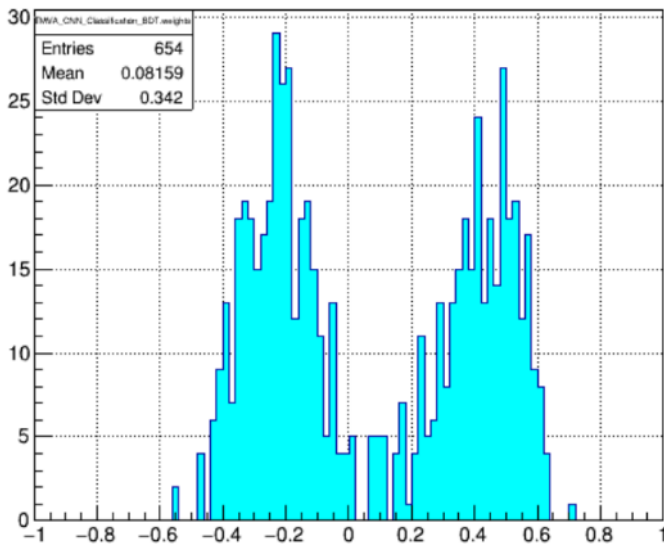
Please Get Involved!

- Contact any of the conveners to get invovled
  - cmorean@jlab.org, hornt@cua.edu, cfanelli@wm.edu

- Jump into previous meetings with:
  - Zoom Recording (ask for password)
  - Live Notes

- Upcoming Meeting February 9th at 3:00 EST

- Try Hands-On experiments
  - Open Jupyter Notebook and load an AI/ML setup
  - Start a HallC Slack channel
  - Start a bi-weekly meeting for show-and-tell
  - Mentor program for new people joining?

Contact:
cmorean@jlab.org

- Get Involved!
  - Partner up with a ML practitioner
  - Get hands-on experience!
  - Attend the Feb. 9th Meeting, 3:00 EST
    - Invitation to be circulated soon via hallc mailing list
  - Help Hydra C

- Works in Progress (cmorean@jlab.org)
  - Hydra implementation in Hall C for NPS
  - Retrieval-Augmented Generation Agent
  - Waveform analysis for dual readout calorimetry
  - Unsupervised learning for PID (TBD)

- Future
  - AI/ML pipeline for deploying models

Here's your image showcasing quarks, mesons, and hadrons personified as animated characters. They are depicted with playful features, eagerly surrounding a scientist who is ready to analyze them with artificial intelligence. The scene captures the excitement of these subatomic particles in a modern, high-tech laboratory setting.

Discussion