HCAL Biweekly Meeting Minutes 6.22.21

Nominal Agenda:

- Update of HCal status in Hall A
    - Cables in hall
- FADC return to baseline analysis
- SBS-Offline cluster finding algorithm
- Other topics

Attendance:

1. Sebastian Seeds
2. Scott Barcus
3. Brian Quinn
4. Provakar Datta
5. Jim Napolitano

Actual:

Scott

- HCal installation in hall
    - Shims in HCal installed
    - HCal stacked and in place
    - Cables and racks in hall, not in place
    - Will need to move, cannot slide.
    - HCal will not be destacked
        - Do not want to disconnect PMTs from FE amplifiers
        - Cannot use crane
    - Floor plates must be moved to accommodate HCal
    - Would need 12 additional floor plates to cover whole kinematic area
        - Likely will not be done: 50k too expensive
    - HCal will be dragged with come-alongs
        - Floor plate game – move one at a time, unused to new location
- Plan for cables
    - Ask for trellis for strain relief
        - Get approval from safety before attaching to handrails on mezzanine
        - Keep bundles small
    - SSeeds: Send link to drive to J. Napolitano and Brian Quinn
    - **Big Concerns**
        - **Safety**
        - **Strain-relief**
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Sebastian

- HCal Status Update (from slides)

- Installation pictures shown
- Counting house computer access granted to Sebastian
  - Display.C and cosCal_v4.C (cosmic calibration code) uploaded to a-onl@aonl1 under sseeds/ directory past two factor authentication gate.
- Cluster finding in SBS-offline (coarse process)
  - Use zero suppression to populate hit map array with first threshold
  - Use second threshold to define n x n clusters around local maxima in hit map
  - Push to fine process to sort clusters by energy
  - Edge of acceptance effects
    - B. Quinn: weight modules on edge of acceptance inside cluster and mark these clusters with edge flag.
    - Failing this, throw all edge clusters away
- Return to baseline analysis
  - Aim: inform photon neutron separation study to find if there is a meaningful difference between the pulse shape of photons and cosmics in fADC data.
    - B. Quinn: likely, the neutron shape (fit easily with landau vs gaussian for photon based on digitized data courtesy P. Datta) is meaningfully different than cosmics. This is due to the interaction length of hall neutrons which penetrate ~0.6m into each module (giving rise to a long trailing tail in pulse shape) and the relatively short interaction length of cosmics (only the width of each module because they pass through the detector transversely).
  - This study can still inform the viability of using integrated pulse data for future analysis
    - Integrating a pulse where the ADC window cuts a significant portion of the tail off of the signal is not useful. One can use the results of these analysis to inform an optimal ADC window size
      - Currently set to 50 samples = 200 ns
  - Results show a difference of roughly a factor of two between return-to-baseline change in ADC samples for a given module over a cosmic range of 20 RAU. This is promising, if one ignores the concerns about expecting similar pulse shapes for neutrons and cosmics.
    - Method can be used more rigorously in the hall with longitudinal neutrons.
    - At three sigma pedestal threshold for return to baseline, only a trivial number (<1%) signals fail to return to baseline within the 50 sample window.