

# *LHRS Analysis for $d_2^n$*

*Data Quality, Trigger Variable, & Scintillator Studies*

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9/2/10

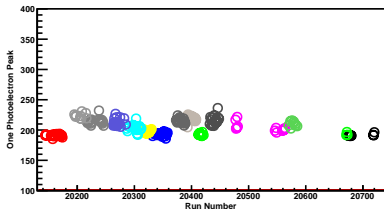
# Outline

- 1 Data Quality Study
  - GC & PR
  - VDC  $t_0$
- 2 Trigger Variable Analysis
  - DL.bit3
- 3 Scintillator Calibration
  - S2m Time Averages
  - S1 Time Averages
  - Trigger Offset for Paddles
- 4 Summary

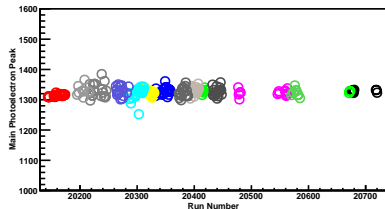
# Data Quality (1)

Momentum Dependence: GC 1 p.e., GC Main p.e., PR  $E/p$  Peaks

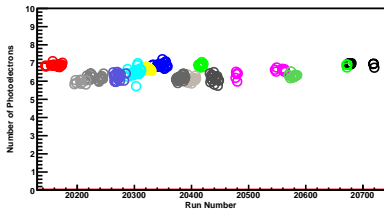
One Photoelectron Peak vs. Run Number



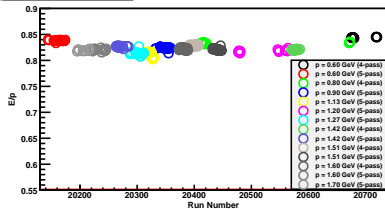
Main Photoelectron Peak vs. Run Number



Number of Photoelectrons vs. Run Number



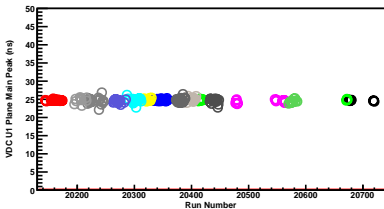
$E/p$  vs. Run Number



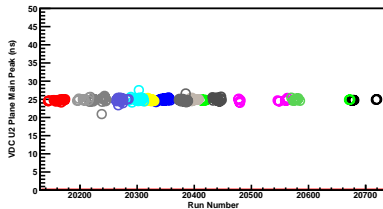
# Data Quality (2)

Momentum Dependence: VDC  $t_0$  Main Peaks for U1, U2, V1, V2 Planes

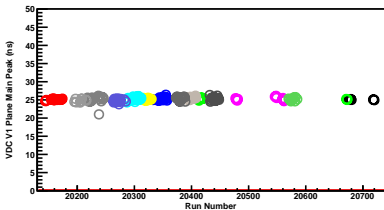
VDC U1 Plane Main Peak vs. Run Number



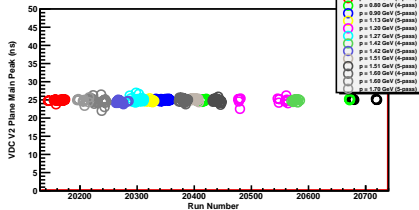
VDC U2 Plane Main Peak vs. Run Number



VDC V1 Plane Main Peak vs. Run Number



VDC V2 Plane Main Peak vs. Run Number



# Data Quality (3)

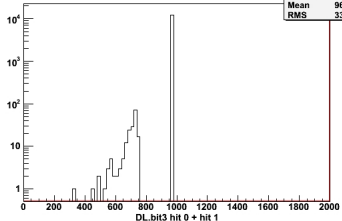
## Updated Checklist

- Updated checklist for checking the quality of the LHRS (production) data:
  - 1 Gas Čerenkov 1 p.e. peak position
  - 2 Gas Čerenkov main p.e. peak position
  - 3 Gas Čerenkov number of p.e. (sanity check on items 1 and 2)
  - 4 Pion Rejector  $E/p$
  - 5 VDC  $t_0$  for each plane
  - 6 S1, S2m TDCs
  - 7 Beam trips
  - 8 Similar plots for positive polarity runs
- Items in red have not been implemented yet
- Scintillator TDCs aren't finished yet. . .

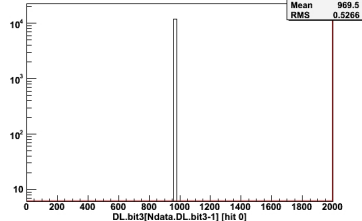
# DL.bit3 (1)

## Individual Hit Study

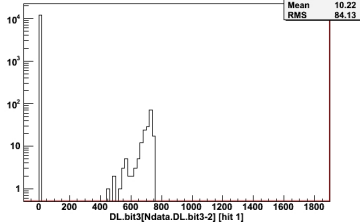
DL.bit3 {Good Electron Cuts}



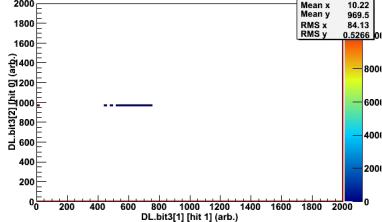
DL.bit3[2] [hit 0] {Good Electron Cuts}



DL.bit3[1] [hit 1] {Good Electron Cuts}



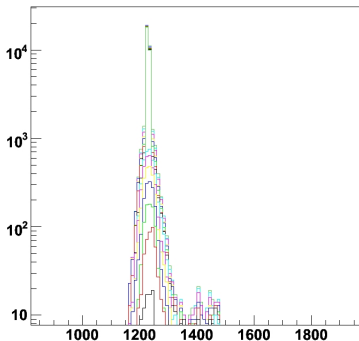
DL.bit3[2]:DL.bit3[1] {Good Electron Cuts}



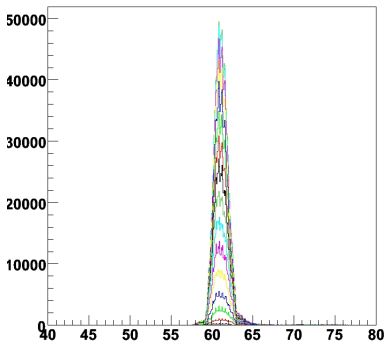
# S2m Time Averages (1)

Double Check of Time Average Overlap

S2m Raw TDC Time Overlay (Trigger, VDC, Overlapping Paddle Cuts)

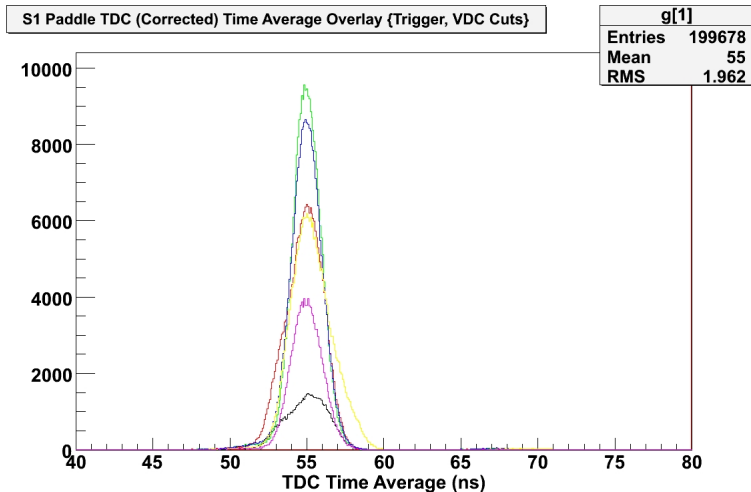


S2m Time Average Overlay (Trigger, VDC Cuts, Paddle TDCs > 9 Cuts) [Corrected Variables]



# S1 Time Averages (1)

Double Check of Time Average Overlap





# Trigger Offset for Paddles (1)

An Extra Variable to Work With (?)

- The 'fTrigOff' variable in the `THaScintillator` class:
  - `fTrigOff[fNelem]`: Induced offset of trigger time from difference between trigger and retiming. Visible in coincidence data.
  - Seems to only be read-in by the class, nothing else is done with it
    - Does another class utilize this variable?
  - Could it assist in the behavior we see in the S1 TDC times?

# Summary

- Data Quality:
  - Implemented differentiation between momentum settings by the use of different colors
  - VDC  $t_0$  check for each plane was added
    - All runs give consistent results
- Trigger Variable Study
  - Looking at individual hits in `DL.bit3` reveals that  $\sim 1\%$  of good events are correlated to bad events
- Scintillator Study
  - S2m time averages are aligned – in addition to right side PMT time averages (timing is based off of the right side)
  - S1 time averages for some paddles still show asymmetric 'Gaussian' structure

# What's Next?

- Data Quality
  - Start the implementation of a beam trip check
    - Will require replay of all runs since scalars are not included in the current ROOTfiles on the  $d_2^n$  machine
- Scintillator Study
  - Investigate the 'fTrigOff' variable further?
- LHRS Acceptance
  - Get the SAMC installation going (ran into some trouble with this)
  - Determine proper input file parameters
    - Energy range
    - Materials & their properties
    - What has changed from the CSR? Where to find such information – Survey Reports?