Hall C Replay Outline

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Contents

1 CALIBRATION

1.1 bcm_current_map

Runs over a scaler tree. Saves event number for each scaler event and bcm current values for BCM1, BCM2, BCM4a, BCM4b, BCM17

-run4shms.sh

- run.C
- ScalerCalib.C
- ScalerCalib.h

To run... root>.x run.C("<scalerROOTfile>")

1.2 bpm_calib

BPM calibration script. It expects that the HARP/BPM data for the appropriate runs are in a text file called harp_into.txt

- bpm_calibration.C
- bpm_calibration_set.C
- raster_plots.C
- setup.sh(csh), Installs script
- *Documentation*, BPM past calibrations
- *Harp_files*, harp files for calibration use

To run... root>.x bpm_calibration.C("harp_info.txt")

1.3 dc_calib

Codes for calibrating the pair of HMS/SHMS DC

- DC_calib.C
- DC_calib.h
- main_calib.C
- *Calibration_Checker*
- *scripts*
  - alignDC.py
  - DC_calib.C, Calibration code where all class methods are defined
  - DC_calib.h, Header file with variable definitions used in methods
  - main_calib.C, Executes code in DC_calib.C
  - makeAlignmentPlots.C
  - replay_alignDC_shms.C
  - *SHMS_DC_cardLog_6604*

To run...

1. Set parameter 'p(h)_using_tzero_per_wire=0' located in PARAM/<SPEC>/DC/p(h)dc_calib.

2. Replay the data to produce the uncalibrated root file, which is input in the calibration
   - The leaves of interest are...
     - SHMS: P.ngcer.npeSum, P.cal.etot, T.shms.pEL_CLEAN_tdcTime
     - HMS: H.cer.npeSum, H.cal.etot, T.hms.hEL_CLEAN_tdcTime
3. Execute... > ./hcana SCRIPTS/<SPEC>/PRODUCTION/<replay_script.C>
4. Once arguments are specified, execute... > root main_calib.C
   - When calibration is done, a directory is created called *<spec_flag>_DC_Log_<run#>*
5. The newly created parameter file must be copied to...
   - /PARAM/<SPEC>/DC/hdc_calib.param and /PARAM/<SPEC>/DC/hdc_tzero_per_w
6. Set the parameter 'p(h)_using_tzero_per_wire=1' in PARAM/<SPEC>/DC/p(h)dc_cuts.para
7. Execut... > ./hcana SCRIPTS/SHMS/PRODUCTION/<replay_script.C>
   - The drift distance should be relatively flat for a proper calibration
   - The recommended cuts for looking at drift distance...
     - P(H).dc.plane.time > 0 [(drfit_time)>0]
     - PID cuts that were applied based on PID.flags

1.4 hms_cal_calib

Calibration of HMS calorimeter with real electrons

- calibrated.deb
- hcal_calib.cpp, Steering script, takes four parameters
- input.dat, threshold parameters and initial gain constants
- THcShHit.h
- THcShowerCalib.h
- THcShTrack.h

To run... root>.x hcal_calib.cpp+("hms_replay",<run#>,<numEvts>)

- After calibration, a canvas with plots pops up. The calibration constants are written to hcal.param.<prefix> which is a format suitable for plugging into hcal.param

1.5 hms_cer_calib

Calibration for HMS cherenkov (TProof script)

- calibration.C
- calibration.h
- run_cal.C

To run ... >root "run_cal.C(<run#>,<numEvts>,COIN)"

- COIN=1 is full coincidence replay

1.6 hms_hodo_calib

HMS hodo calibration code. Determies the time offsets parameters. To use these parameters a parameter flag 'htofusinginvadc' is set to zero.

- fitHodoCalib.C, determine the effective propagation speed in the paddle
- timeWalkCalib.C, determine time walking correction factor
- timeWalkHistos.C, determine time walking correction factor

To run...

1. Replay the data with htofusinginvadc=0 and have T.<spec>.* and H.hodo.* in the root tree.
    - Go to PARAM/<SPEC>/GEN/h_fadc_debug.param and set hhodo_debug_adc=1
2. Determine time walking correction parameters

    a) root>.x timeWalkhistos.C+("<rootFile>",<run#>,"<spec>")

    b) creates timeWalkhistos.root

    c) root>.x timeWalkCalib.C+

    d) creates parameter file PARAM/<SPEC>/HODO/hhodo_TWCalib_<run#>.param
3. Replay data with htofusinginvadc=0 and new parameter files (set hhodo_TWCalib_<run#>.para to hhodo_TWCalib.param)

4. Determine the effective propagation speed in the paddle, the time difference between positive and negative PMTs and then the relative time difference of all paddles compared to paddle 7 in S1X

    - The script cuts on H.cal.etracknorm, H.cer.npeSum, and H.hod.betanotrack to select electrons. These cuts are hard coded as
        - cal >= 0.7, cer >= 0.7, and beta <= 1.5
    - Make sure H.cer.* and H.cal.etotnorm are in root tree

    a) root>.x fitHodoCalib.C+("<rootfile>",<run#>) b) creates parameter file PARAM/<SPEC>/HODO/hhodo_VpCalib_<run#>.param c) creates root file HodoCalibPlots_<run#>.root d) Analyze cosmics...

    - root>.x fithodocalib.C+("<rootFile>",<run#>,kTRUE)
    - c=-30ns/s, PID cut is just on H.hod.betanotrack with beta >= -1.2 and beta <= -0.7

5. Replay data again with new parameter file. For good calibration, the beta distribution should be centered at unity.

1.7 hms_dc_calib

Unused HMS DC calibration code!!

1.8 hodo_calib

Calibration code for hodoscope timing in HMS and SHMS

- hmstofcal.inp, tofcal_inp for HMS
- shmstofcal.inp, tofcal_inp for SHMS
- Maketof, Compile tofcal.f and make executable tofcal
- tofcal.f, Fortran code which executes the calibration
- tofcal.inp, Input file for tofcal.f

To run...

1. Compile with ./Maketof
2. Replay data by adding... (to a line in replay script)

    - HMS: gHcParam->Load("PARAM/HMS/HODO/CALIB/htofcalib.param")
    - SHMS: gHcParam->Load("PARAM/SHMS/HODO/CALIB/ptofcalib.param")

3. The replay will put the new file: hfort.37 or pfort.37 in the CALIBRATION/hodo_calib directory
    - Copy either hmstofcal.inp or shmstofcal.inp to tofcal.inp
4. Execute ./tofcal
5. Print out info on the initial chi2 of data and final chi2 of the fit
6. Creates file tofcal.param
7. Edit the parameter in tofcal.param into either PARAM/HMS/HODO/hhodo.param or PARAM/SHMS/HODO/phodo.param

1.9 ref_time

Code for determining reference time cuts

- DetTCuts_Coin.C
- DetTCuts_Coin.h
- DetTCuts.sh
- run_DetTcuts.C
- *HMS*
    - *CAL*,/CHER/,/DC/,/HODO/ printed output plots
- *SHMS*
    - *AERO*,/CAL/,/DC/,/HGC/,/HODO/ printed output plots

To run. . . ./DetTCuts.sh <replay_file> <run#> <numEvts>

1.10 shms_aero_calib

Aerogel calibration code

- gain.r
- paero_calib.C

To run. . .

1.11 shms_cal_calib

Calibration of SHMS calorimeter with real electrons

- calibrated.deb
- pcal_calib.cpp, Steering script, takes four parameters
- input.dat, threshold parameters and initial gain constants
- THcShHit.h
- THcShowerCalib.h
- THcShTrack.h

To run… root>.x pcal_calib.cpp+("shms_replay",<run#>,<numEvts>)

- After calibration, a canvas with plots pops up. The calibration constants are written to pcal.param.<prefix> which is a format suitable for plugging into pcal.param

1.12 shms_hgcer_calib

Calibrating the cherenkov and determining efficiencies.

- calibration.C
- calibration.h
- efficiencies.C
- efficiencies.h
- preprocess.C
- preprocess.h
- run_cal.C

To run… > root run_cal.C

- Options for calibrations
  - readall, read all data for root tree (slow)
  - showall, display all calibration details (many windows)
  - tracksfired, alternate calibration using tracksfired leaf

  - cuts, use PID
  - pions, PID for pions

- Options for efficiencies
  - showall, display all calibration details (many windows)
  - chercut, use the other cherenkov detector in PID
  - NGC, calibrate the nobel gas Cherenkov
  - [0-9].[0.9, # of photoelectrons to cut on]

1.13 shms_hodo_calib

SHMS hodo calibration code. Determies the time offsets parameters. To use these parameters a parameter flag 'ptofusinginvadc' is set to zero.

- fitHodoCalib.C, determine the effective propagation speed in the paddle
- timeWalkCalib.C, determine time walking correction factor
- timeWalkHistos.C, determine time walking correction factor

To run...

1. Replay the data with ptofusinginvadc=0 and have T.<spec>.* and P.hodo.* in the root tree.
   - Go to PARAM/<SPEC>/GEN/h_fadc_debug.param and set phodo_debug_adc=1
2. Determine time walking correction parameters
   a) root>.x timeWalkhistos.C+("<rootFile>",<run#>,"<spec>")
   b) creates timeWalkhistos.root
   c) root>.x timeWalkCalib.C+
   d) creates parameter file PARAM/<SPEC>/HODO/phodo_TWCalib_<run#>.param
3. Replay data with ptofusinginvadc=0 and new parameter files (set phodo_TWCalib_<run#>.para to phodo_TWCalib.param)
4. Determine the effective propagation speed in the paddle, the time difference between positive and negative PMTs and then the relative time difference of all paddles compared to paddle 7 in S1X

- The script cuts on P.cal.etracknorm, P.hgcer.npeSum, and P.hod.betanotrack to select electrons. These cuts are hard coded as
  - cal >= 0.7, hgcer >= 0.7, and beta <= 1.5
- Make sure P.hgcer.* and P.cal.etotnorm are in root tree

a) root>.x fitHodoCalib.C+("<rootfile>",<run#>) b) creates parameter file PARAM/<SPEC>/HODO/phodo_VpCalib_<run#>.param c) creates root file HodoCalibPlots_<run#>.root d) Analyze cosmics. . .

- root>.x fithodocalib.C+("<rootFile>",<run#>,kTRUE)
- c=-30ns/s, PID cut is just on P.hod.betanotrack with beta >= -1.2 and beta <= -0.7

5. Replay data again with new parameter file. For good calibration, the beta distribution should be centered at unity.

2 DATFILES

2.1 hms_recon_coeff.dat

2.2 hms_recon_coeff_opt2018.dat

2.3 shms-2019-newopt-Jan19.dat

2.4 shms-2017-optimized-2plot.dat

2.5 shms-2017-optimized.dat

2.6 shms-2011-26cm-monte_q2_m015_sec.dat

2.7 SHMS_fr_3_rec_order_#.dat

3 db2

4 DEF-FILES

5 macros

6 MAPS

7 onlineGUI

8 PARAM

9 SCRIPTS

10 TEMPLATES

11 UTIL_BATCH

12 UTIL_OL

13 UTIL_KAONLT

14 UTIL_PIONLT

15 UTIL_PROTON

16 All other scripts