April 2020 HCANA changes for other detectors

- Modified the way FADC PulseAmpRaw ==0 events are handled
  - Need to set up Default pedestals for all detectors
  - SHMS HG Cerenkov comparison
- New tree variables of the Reference time used by the detector
  - Can put cut on the reference time to skip events with bad reference time outside the good real + accidental coincidence region
- New tree variables of time difference between good Reference Time pulse and previous for hodoscope
- Add calculation of the difference between the average difference between raw ADC times and TDC times for paddles with “good” hits at both ends.
  - Tree variable P(H).hod.adctdcoffset
  - Created hodoscope method GetOffSetTime that can be used by other detectors
  - Set the ADCTDCDiffTime for detectors to

Modified the way FADC PulseAmpRaw ==0 events are handled

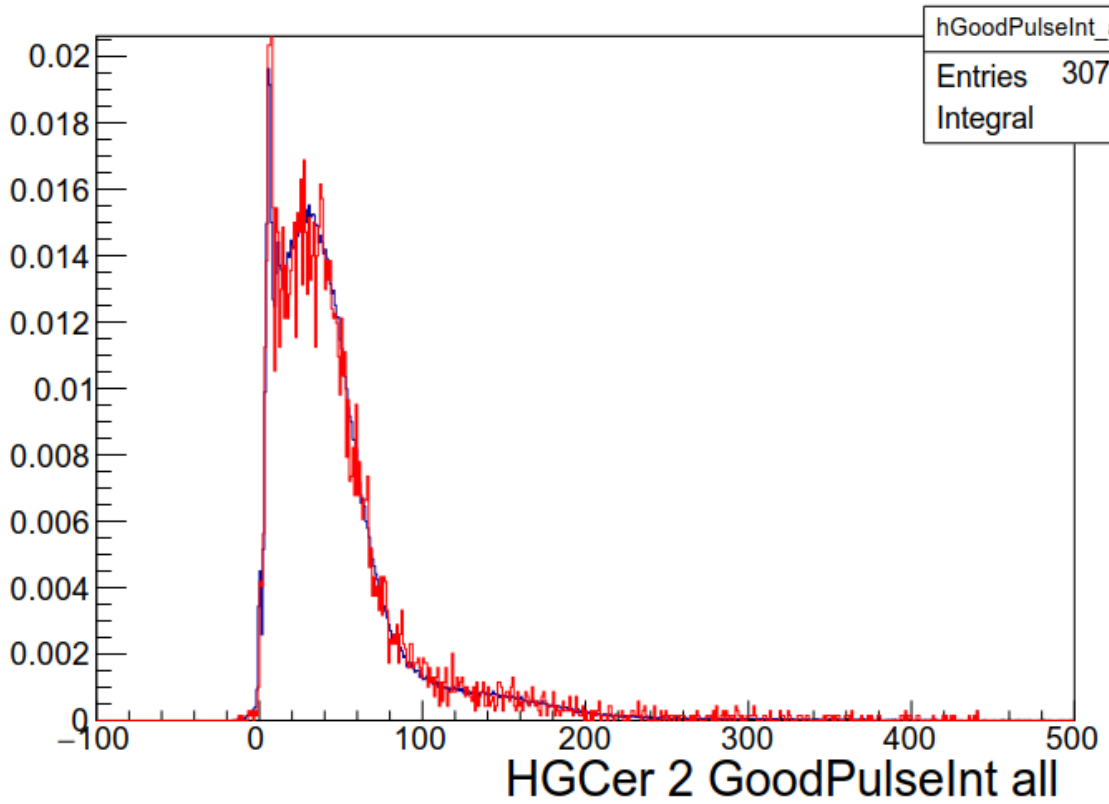
- The FADC uses the first four samples of the FADC time window to determine the pedestal.
- In a pulse is detected in the first four samples
  - FADC sets the raw pulse amp for all pulses in the window to zero
  - The pedestal is not the true pedestal for later pulses in the window.
- Old Code : Throw out the detector hits when found PulseAmpRaw ==0
- New Code: When PulseAmpRaw ==0
  - Uses an average pedestal value, PedDefault, that is a parameter for each detector PMT.
  - Calculates the PulseInt = PulseIntRaw – PedDefault
  - Set PulseAmp=0. Can be used as tag to look for these events.
  - Hodoscope detector is special. It does not use PedDefault. The PulseAmp is used for time walk correction. So when PulseAmpRaw==0, set PulseAmp=200.

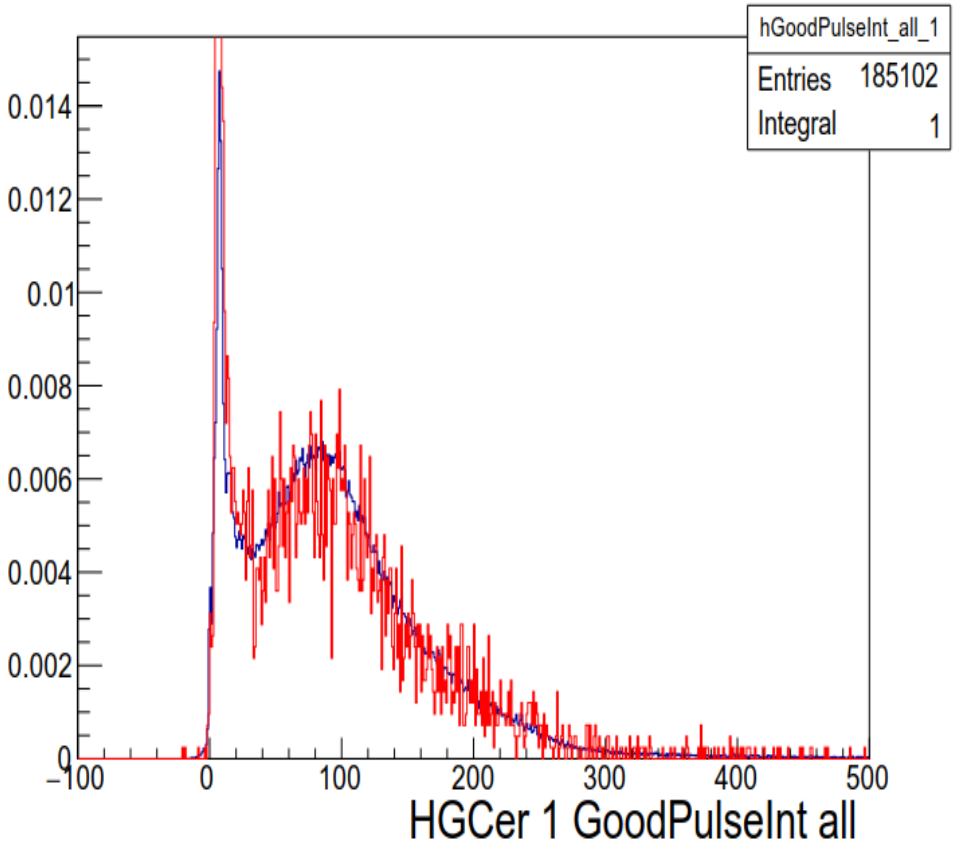
Need to set up Default pedestals for all detectors

- Created new subdirectory set_peddefault in hallc_replay/CALIBRATION .
  - The 2d histograms of goodADCPed versus the paddle number are contained in HMS_PedDefault.def and SHMS_PedDefault.def
    - Move files to DEF-files/SHMS/PRODUCTION/SHMS_PedDefault.def and DEF-files/HMS/PRODUCTION/HMS_PedDefault.def
    - Include the files in your tree/histogram def file set in replay script.
      - #include "DEF-files/SHMS/PRODUCTION/SHMS_PedDefault.def"
      - #include "DEF-files/HMS/PRODUCTION/HMS_PedDefault.def"
  - Replay the data
  - Start root in set_peddefault
    a) .L run_ped_default.C
    b) run_shms_ped_default("entirepath/DirName/filename.root")
    c) run_hms_ped_default("entirepath/DirName/filename.root")
  - The SHMS does HGCER, NGCER, AERO, Preshower and Shower
  - The HMS does CER and CAL.
  - By hand copy each set of Pedestal defaults into the detector "cuts" file
    - For example: phgcer_PedDefault= 2086, 2153, 2320, 1987

SHMS HG Cerenkov comparison

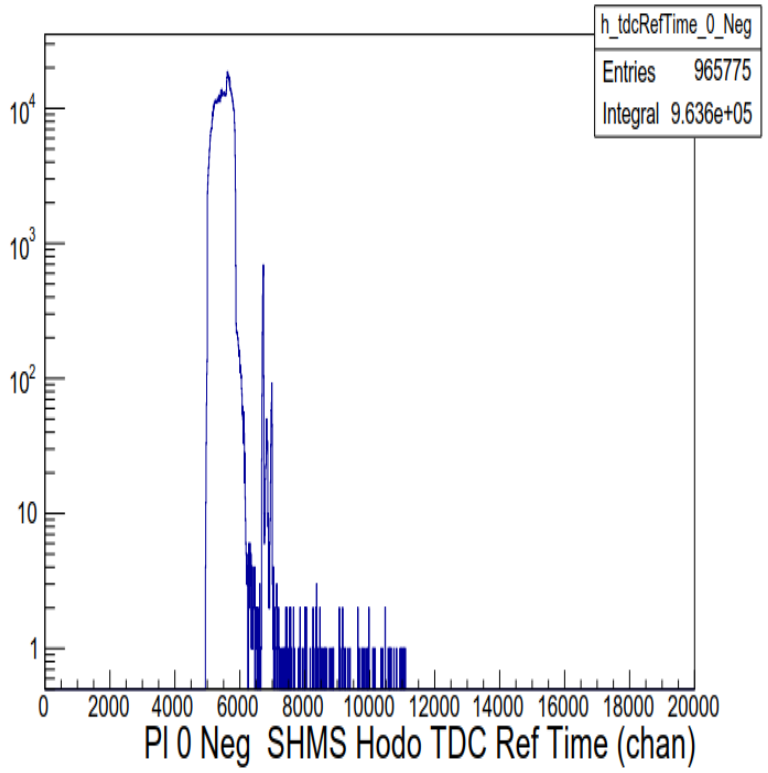
- Normalized histogram of SHMS HGCer Pulse Integral for PMT1 and PMT2.
  - Black histogram is all events.
  - Red histogram is events will PulseAmp=0 and Multiplicity > 1.
    - Interested in events with FADC channel has pulse in the pedestal region and pulse in the good ADC time – Starttime region.

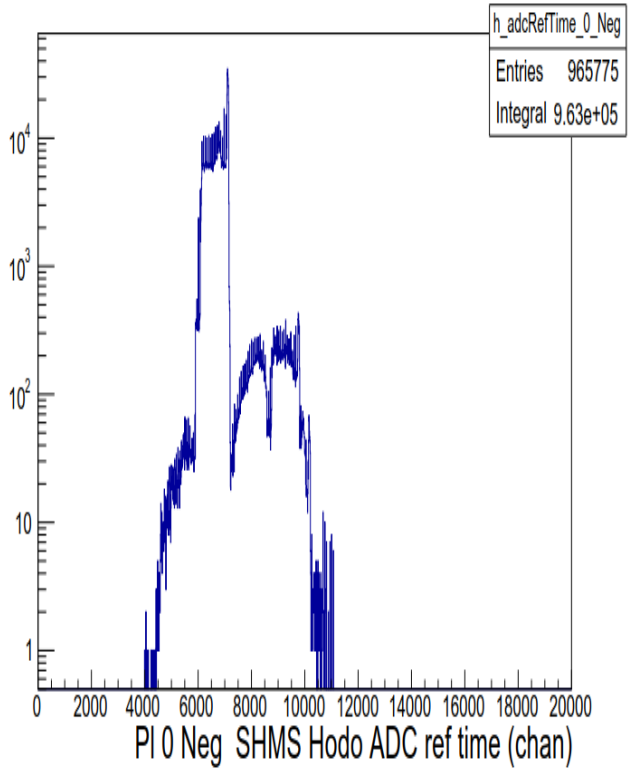


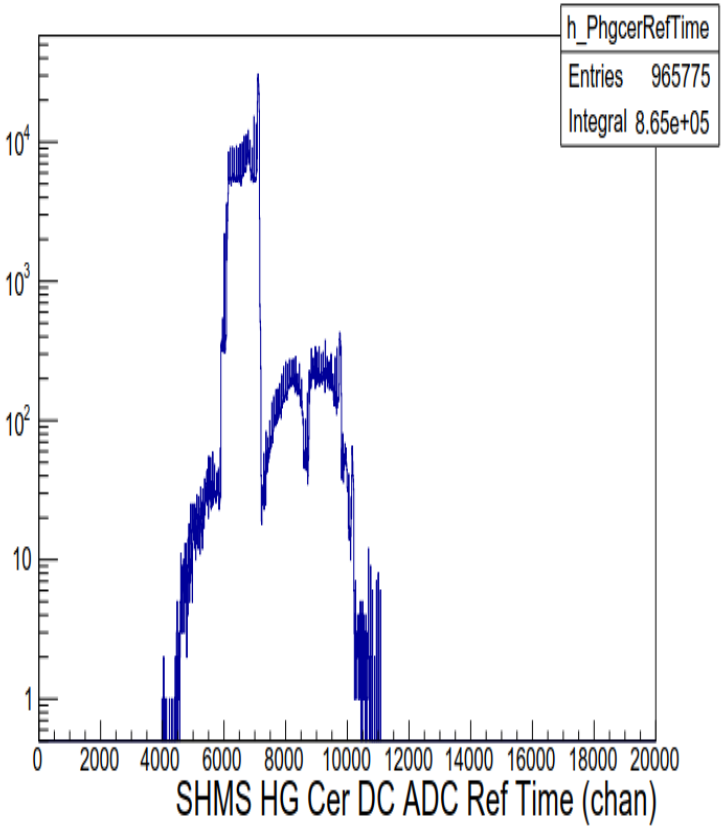


New tree variables of the Reference time used by the detector

- For HGCER and Aerogel P.hgcer.RefTime, P.aero.RefTime
- For each HODO plane, P.hod.1x.AdcRefTime or P.hod.1x.TdcRefTime
- For each DC plane , P.hod.u1.RefTime
- The ADC reference time spectra should be the same for all detectors.
- Can put cut on the hodoscope to skip events with bad reference time.

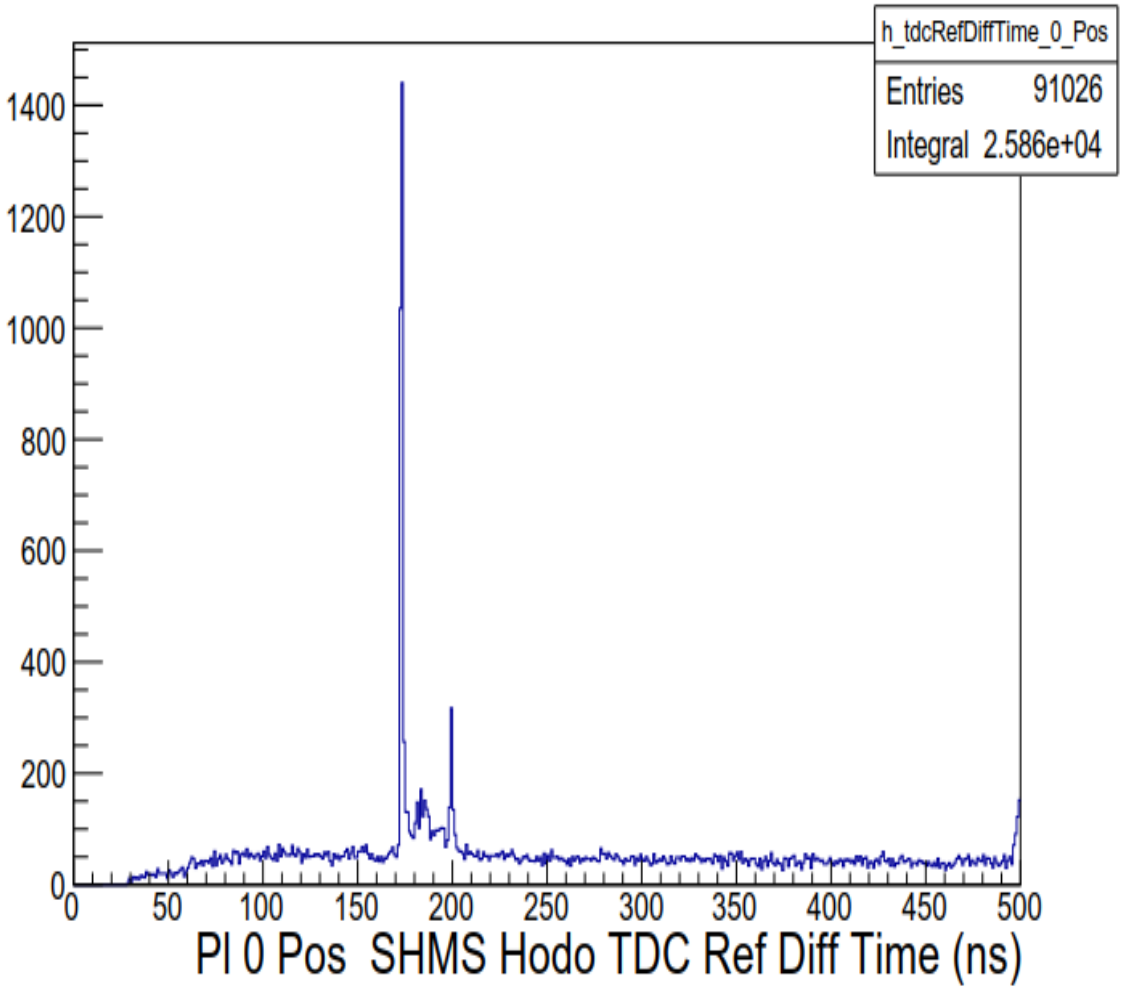


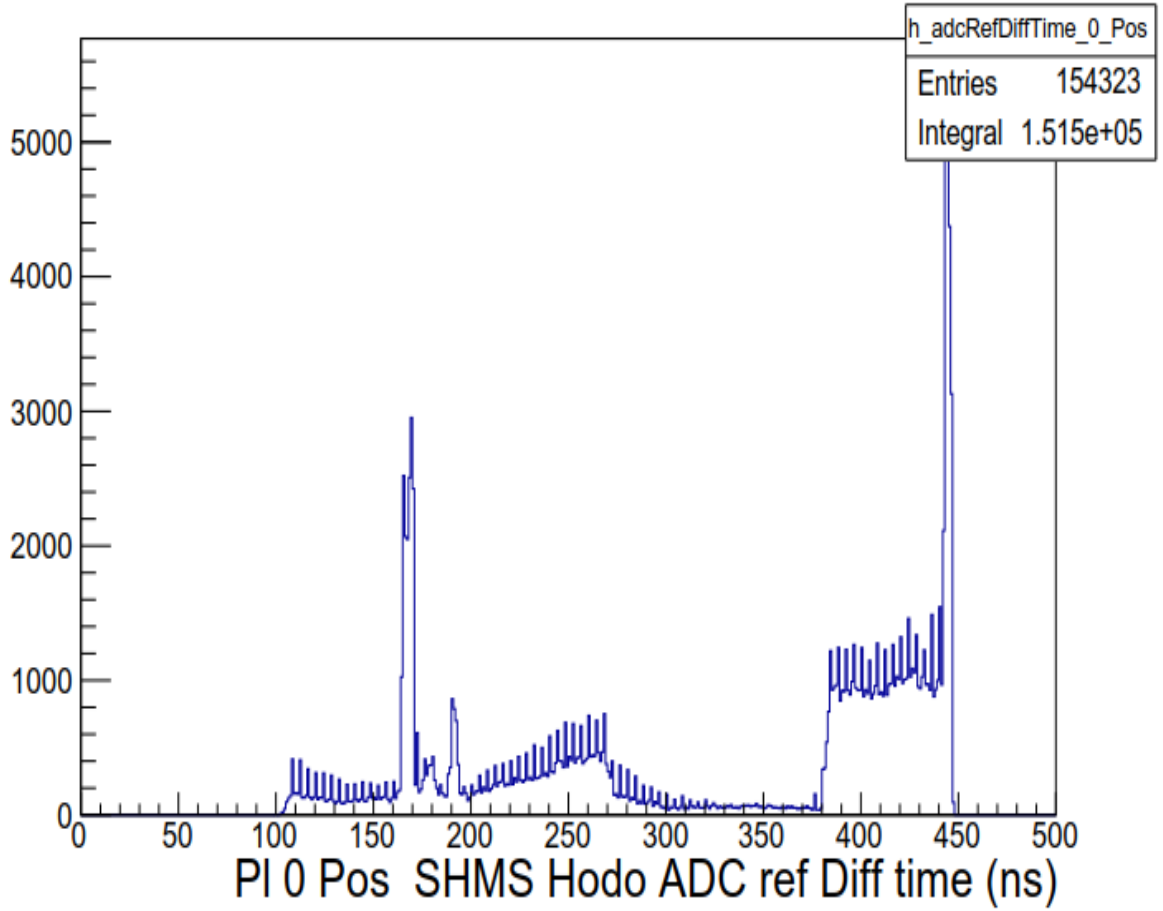




New tree variables of time difference between good Reference Time pulse and previous for hodoscope

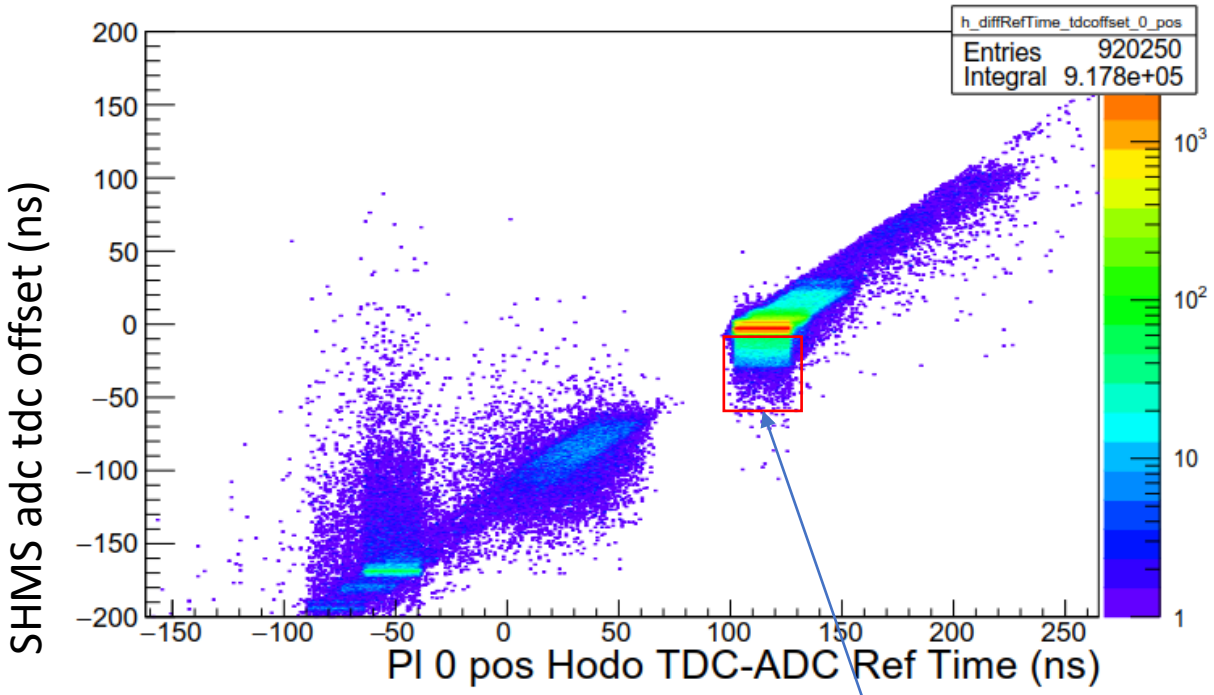
- The good reference time in the coincidence region should only have a random pulse previous to it.
- If time difference is between 170 to 200ns then the previous pulse was actually the El_REAL associated with the random HODO 3of4.
- Can reject events in the 170 to 200ns region.



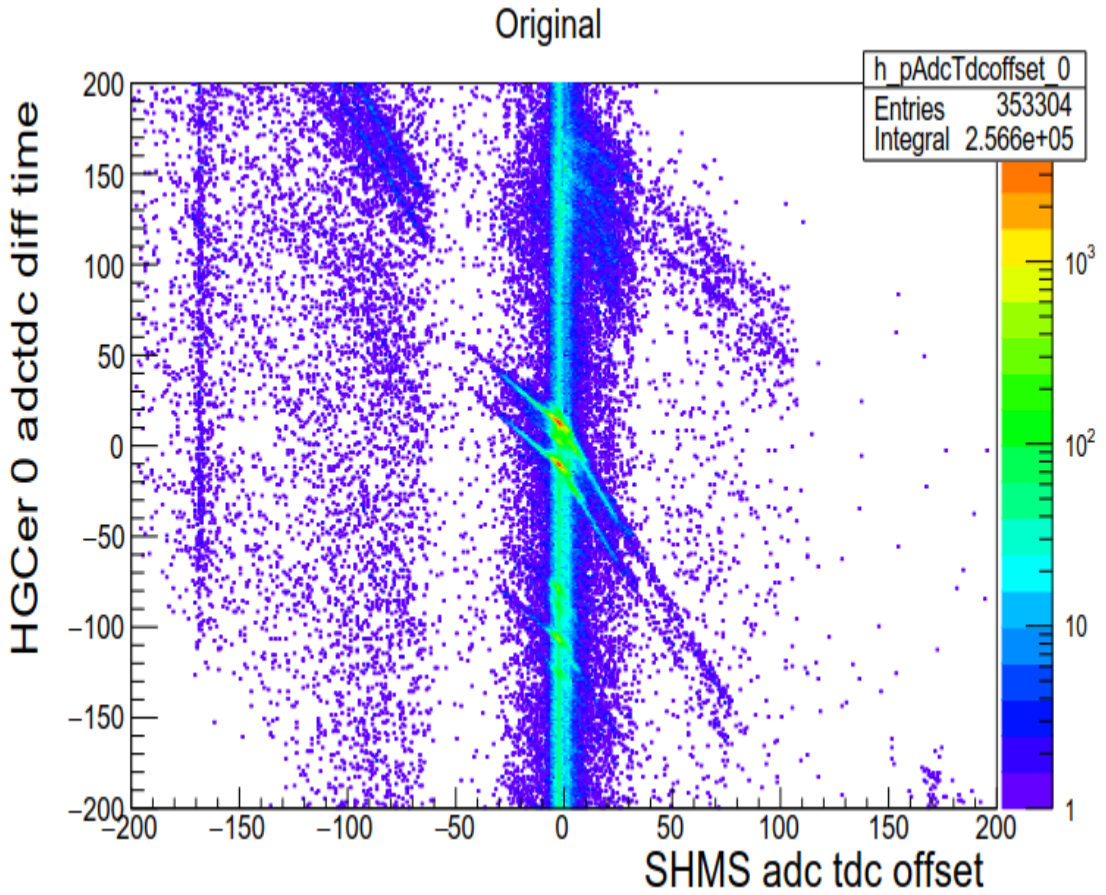


Calculation of Hodoscope difference between average ADC – TDC times

- In Hodoscope calculate adctdcoffset = Average ADC times – TDC times
  - Mainly corrects for bad ADC reference times
- New Tree variables P.hod.adctdcoffset



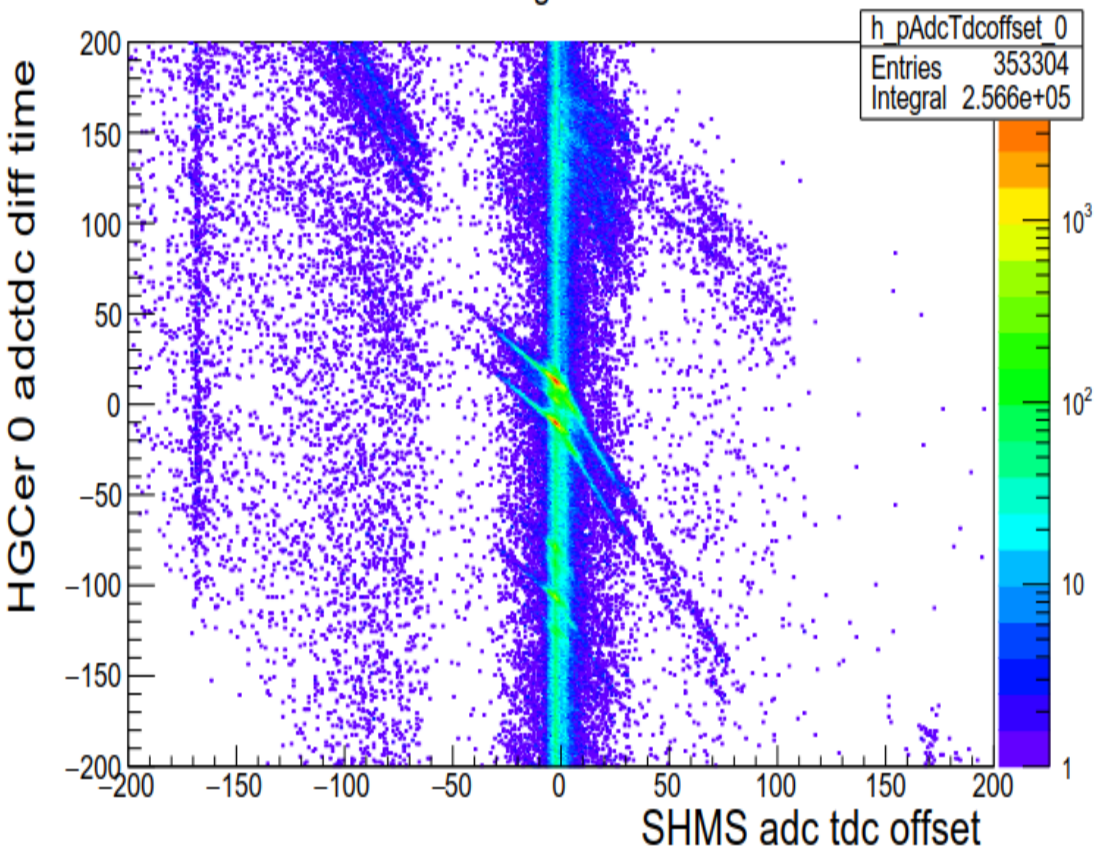
ADC pulse is random with TDC pulse. Maybe Correct ADC or TDC pulse is blocked?



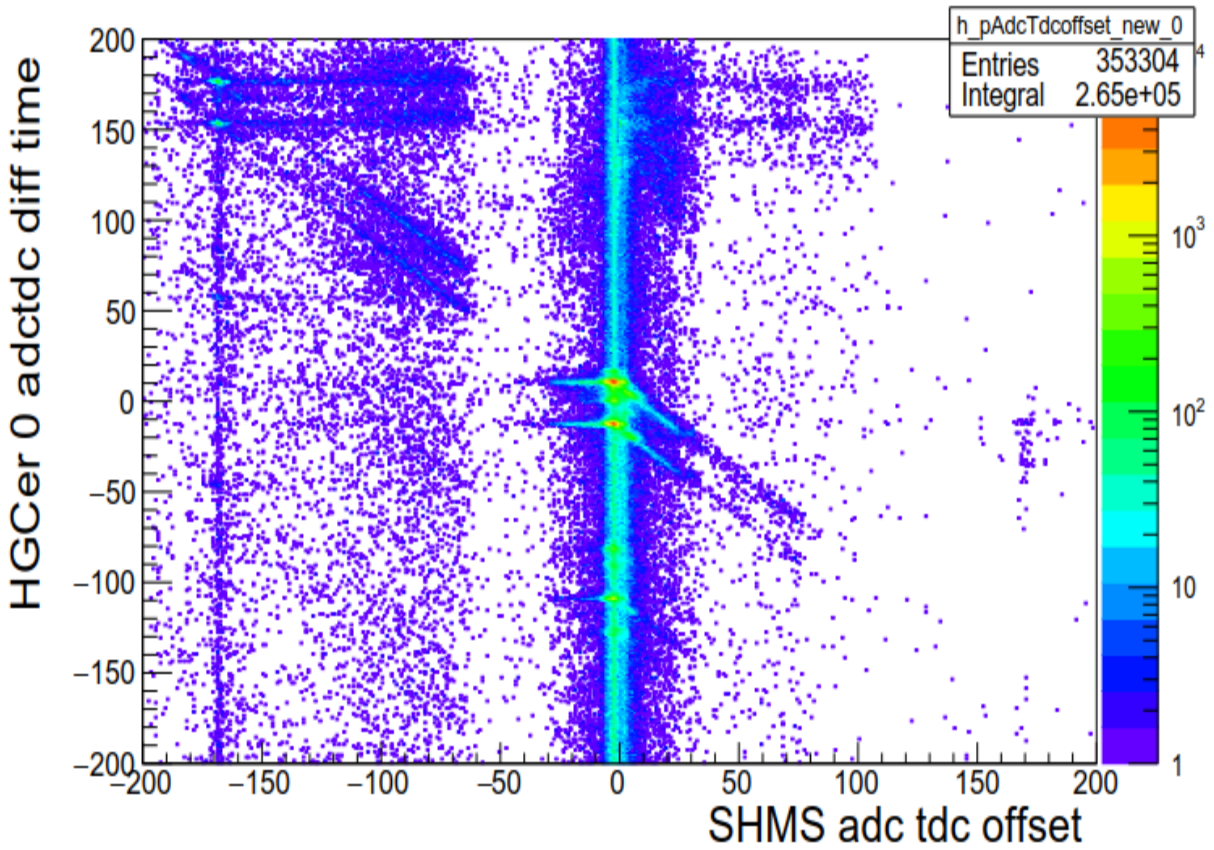
Calculation of Hodoscope difference between average ADC – TDC times

- New Hodoscope method that each detector calls to retrieve adctdcoffset.
- Detector ADcTdcDiffTime is now Startime-PulseTime-Offset
  - The ADcTdcDiffTime will shift. May need new MIN and MAX window cuts

Original



New



Calculation of Hodoscope difference between average ADC – TDC times