

PS726: Level Translator  
 PS752: Quad Two-Fold Logic Unit

PS706: Sixteen Channel Discriminator  
 PS754: Quad Four-Fold Logic Unit

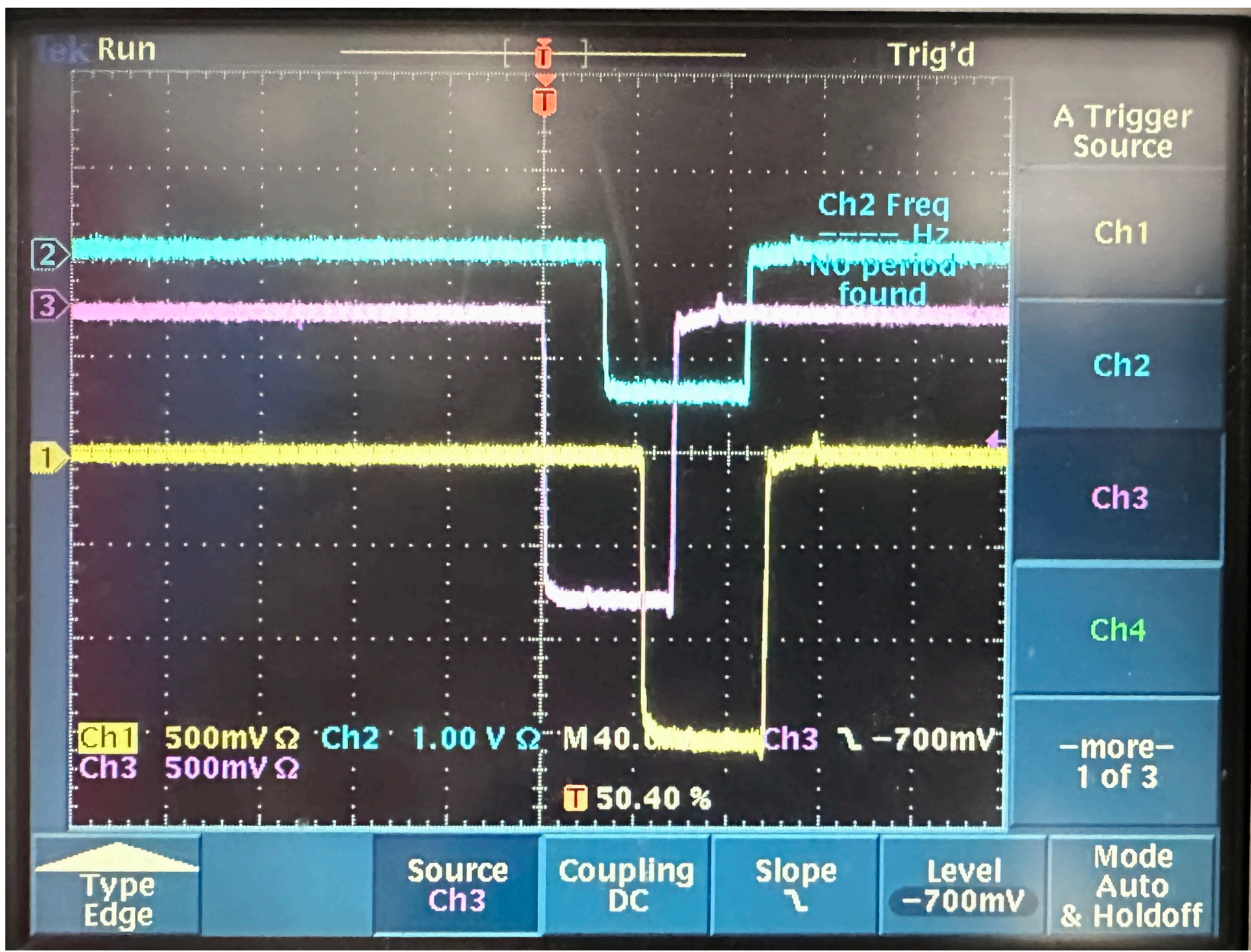
PS757: Mixed Logic Fan-in/Fan-out  
 LeCroy 429A: Logic Fan-in/Fan-out

429A: Fan-in/Fan-out

# Scope

EDTM\_HMS  
EDTM\_NPS

EDTM\_Coincidence



# Run Control

pre-scale factor ps6=0 in ROC1 means use coincidence as readout trigger

The screenshot displays the Run Control rcGui-44 interface. A red box highlights the 'ps6' parameter in the 'Prescaled R' table, which is set to 0. A red arrow points from the text box above to this parameter.

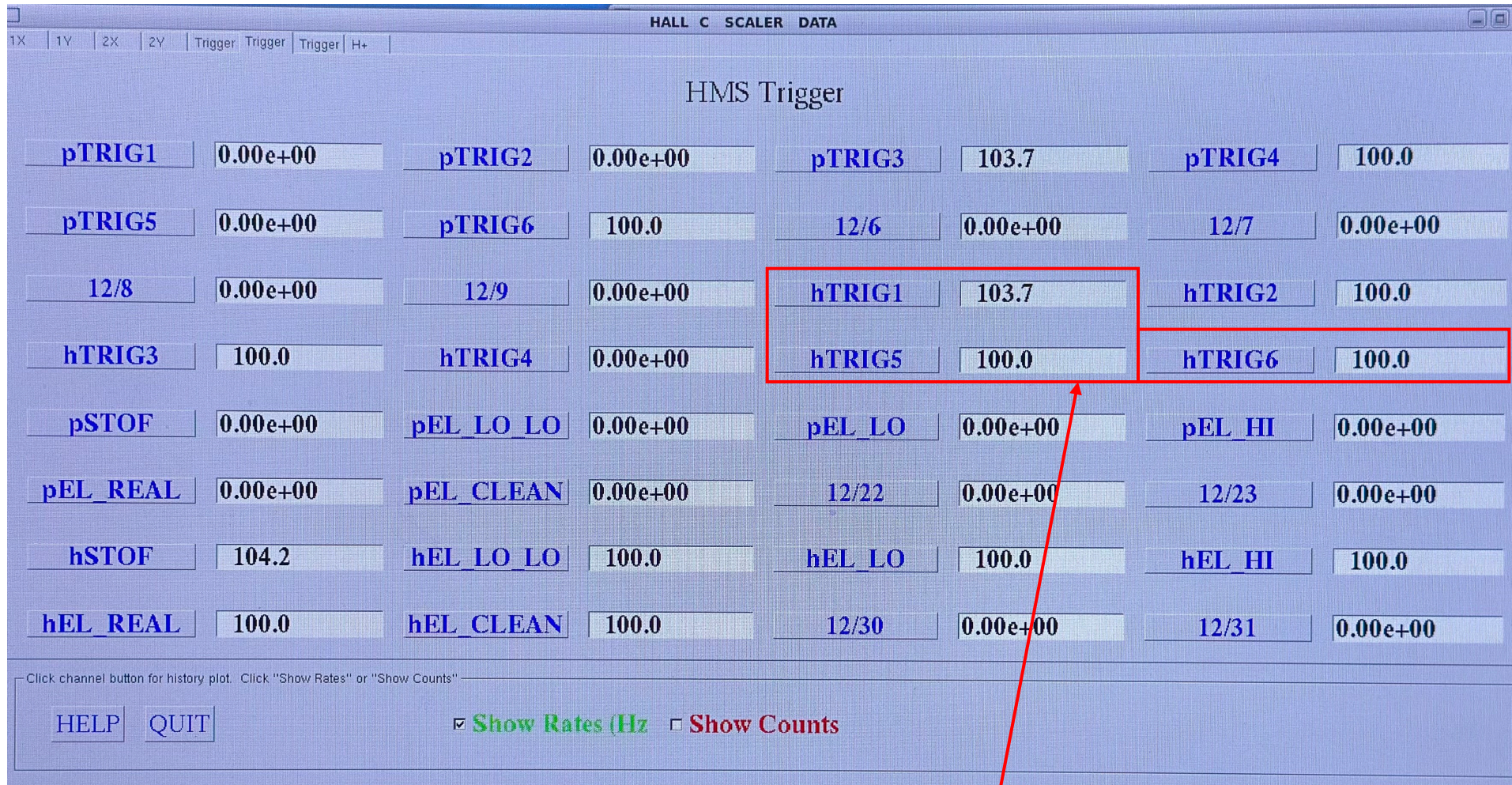
| Name | State      | EvtRate | DataRate | IntEvtRate | IntDataR... |
|------|------------|---------|----------|------------|-------------|
| ER1  | downloaded | 0.0     | 0.0      | 24.4       | 139.0       |
| PEB1 | downloaded | 0.0     | 0.0      | 25.6       | 146.0       |
| ROC5 | downloaded | 0.0     | 0.0      | 29.6       | 3.5         |
| ROC3 | downloaded | 0.0     | 0.0      | 30.1       | 16.5        |
| ROC1 | downloaded | 0.0     | 0.0      | 106.6      | 465.2       |

| Value | Scaler Rate [Hz] | Target Rate [Hz] | Prescaled R |
|-------|------------------|------------------|-------------|
| ps1   | -1               | 100.0            | 0           |
| ps2   | -1               | 100.0            | 0           |
| ps3   | -1               | 100.0            | 0           |
| ps4   | -1               | 0.0              | 0           |
| ps5   | -1               | 100.0            | 0           |
| ps6   | 0                | 100.0            | 100.0       |

| Name    | Message   | Time           | Severity |
|---------|---|----------------|----------|
| sms_hms | Prestart is started.  | 14:38:44 07/05 | INFO     |
| PEB1    | Script (/home/coda/coda/scripts/start_logruninfo.sh)                    | 14:38:46 07/05 | INFO     |
| sms_hms | waiting for... ROC1.  | 14:38:52 07/05 | WARN     |
| sms_hms | Prestart succeeded.   | 14:38:57 07/05 | INFO     |
| sms_hms | Go is started.  | 14:40:04 07/05 | INFO     |
| ER1     | Emu ER1 go: waiting for PRESTART event in module ErModule (client msg)  | 14:40:04 07/05 | INFO     |
| PEB1    | Emu PEB1 go: waiting for PRESTART event in module EbModule (client msg) | 14:40:04 07/05 | INFO     |
| sms_hms | waiting for... ROC1.  | 14:40:12 07/05 | WARN     |
| sms_hms | waiting for... ROC1.  | 14:40:17 07/05 | WARN     |
| sms_hms | waiting for... ROC1.  | 14:40:22 07/05 | WARN     |
| sms_hms | waiting for... ROC1.  | 14:40:27 07/05 | WARN     |
| sms_hms | Go succeeded.   | 14:40:28 07/05 | INFO     |
| sms_hms | End is started.   | 14:40:38 07/05 | INFO     |
| PEB1    | Script (/home/coda/coda/scripts/end_of_run-master.sh)                   | 14:40:48 07/05 | INFO     |
| sms_hms | End succeeded.  | 14:40:48 07/05 | INFO     |

The interface also includes a 'Run Parameters' section with 'ExpId' (HMS), 'Session' (HMS), and 'Configuration' (hms). The 'Run Status' section shows 'Run Number' 936, 'Run State' ended, and 'Total Events' 1,025. A graph titled 'Event Rate' shows a peak in Hz over time. The bottom of the interface has a log window with a 'Help' button.

# Trigger Rate



hTRIG1 h3/4  
hTRIG2 REAL  
hTRIG3 CLEAN  
hTRIG4 null  
hTRIG5 NPS  
hTRIG6 COIN

The trigger rate for hTRIG1 is higher than hTRIG5 and hTRIG6 because the HV was applied to PMTs, so there were some cosmic signals.

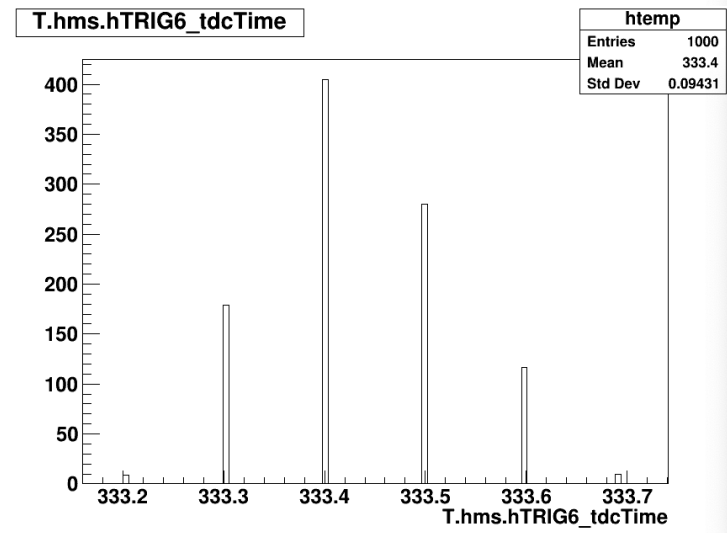
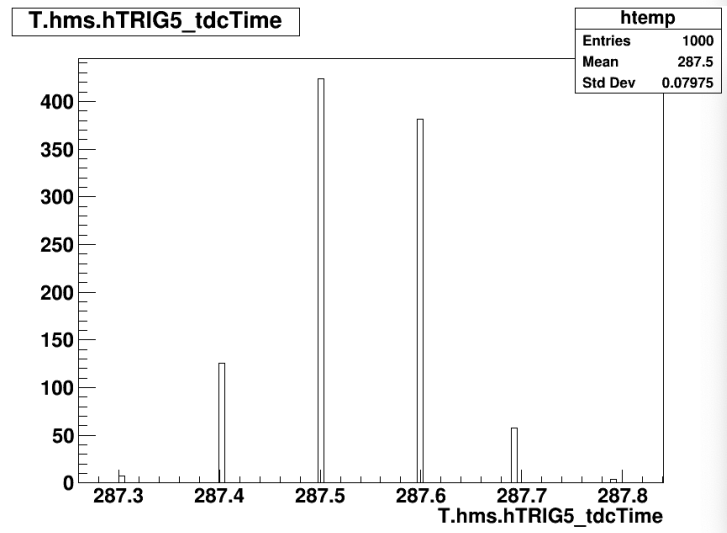
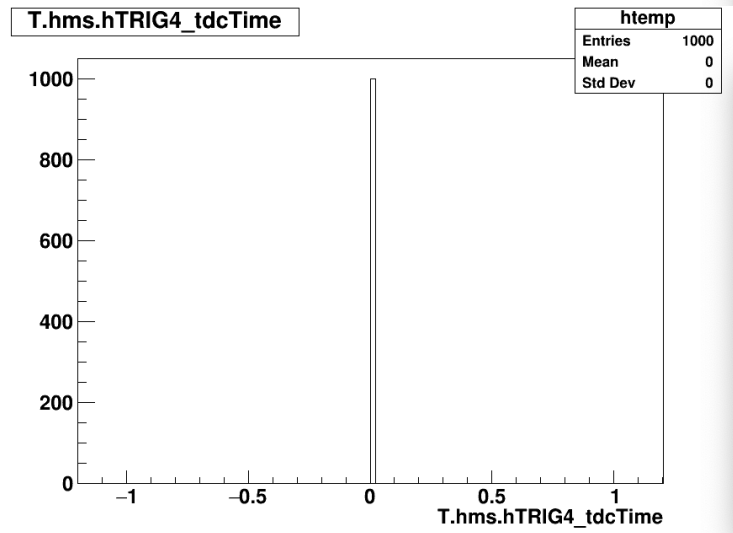
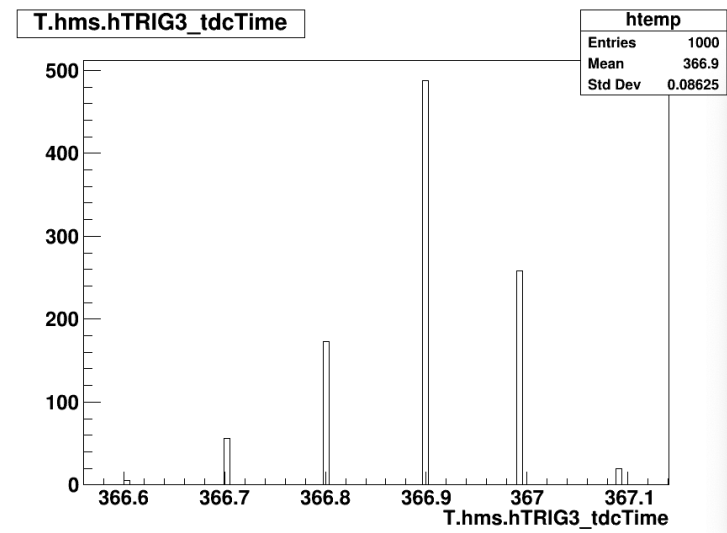
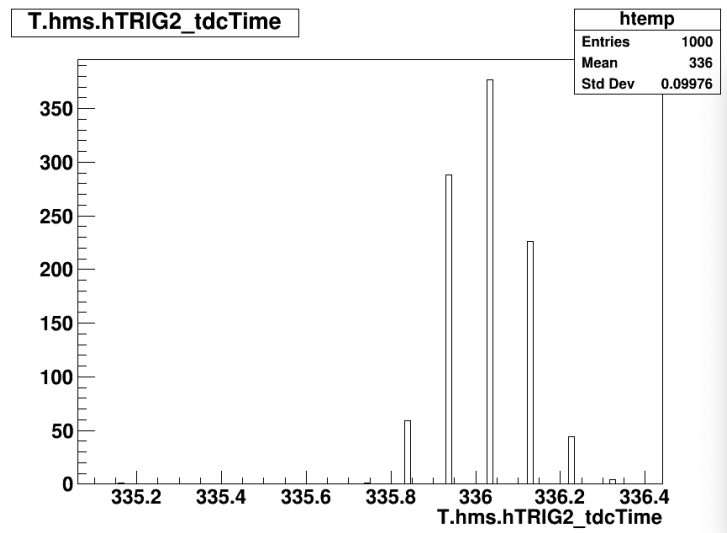
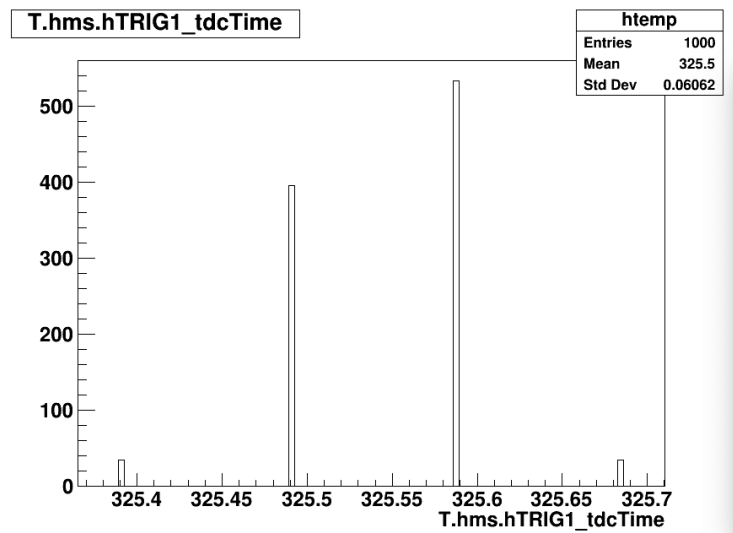
# TDC Spectrum: Trigger1-6

Replay Macro (cdaq@cdaq11): /home/cdaq/nps-2023/nps\_replay/SCRIPTS/HMS/PRODUCTION/replay\_cosmics\_hms\_nps.C

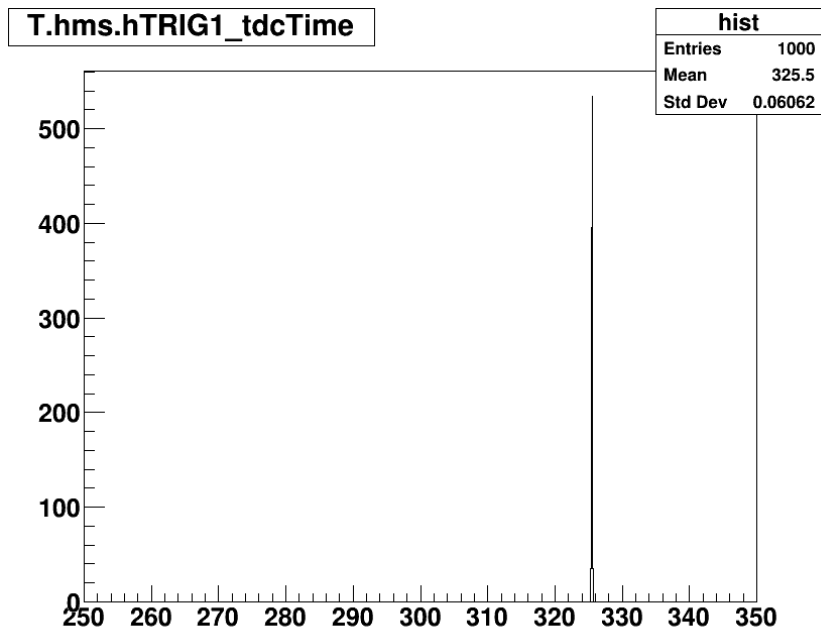
Command: .x replay\_cosmics\_hms\_nps.C(936,1000)

Output root file (cdaq@cdaq11) :

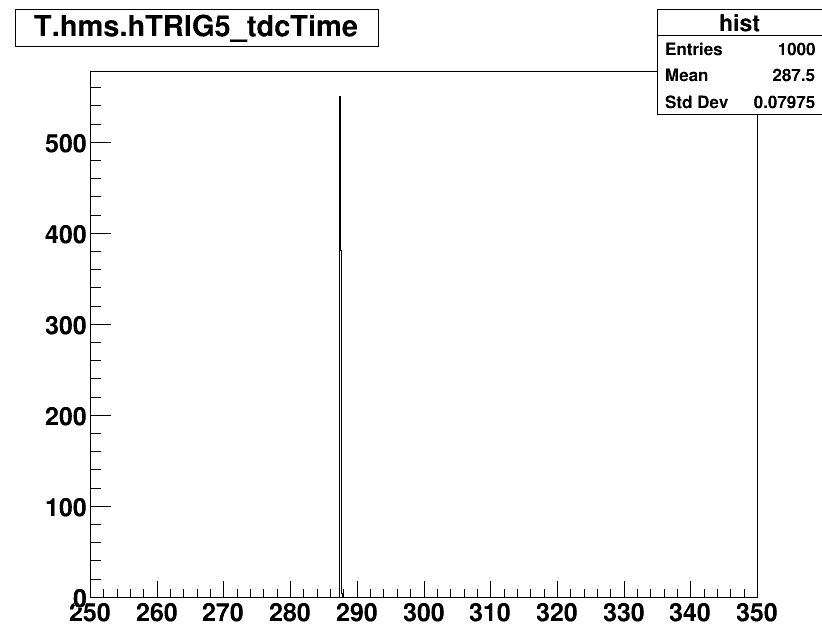
/net/cdaq/cdaq11data/cdaq/hallc-online-nps2023/ROOTFiles/HMS/hms50k/hms\_replay\_production\_936\_1000.root



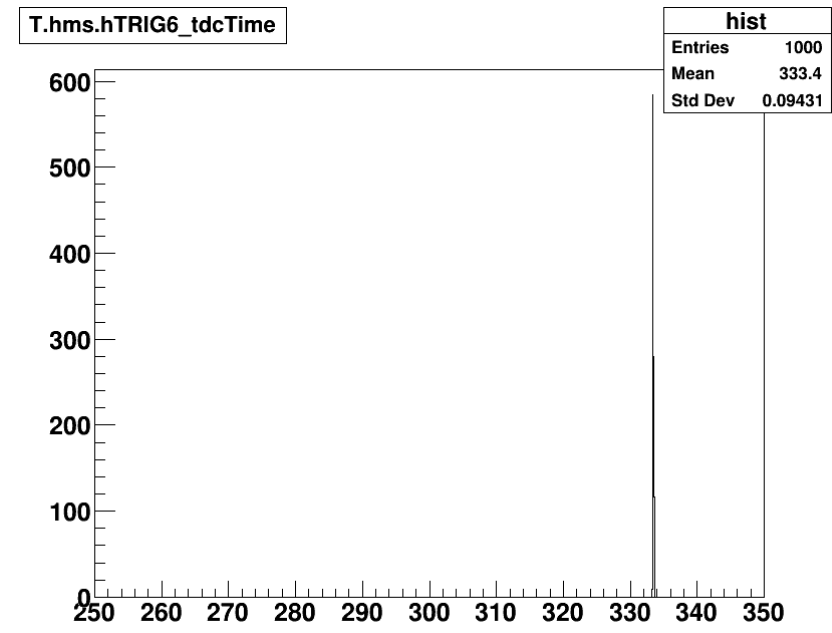
# TDC Spectrum: Trigger1,5,6



HMS



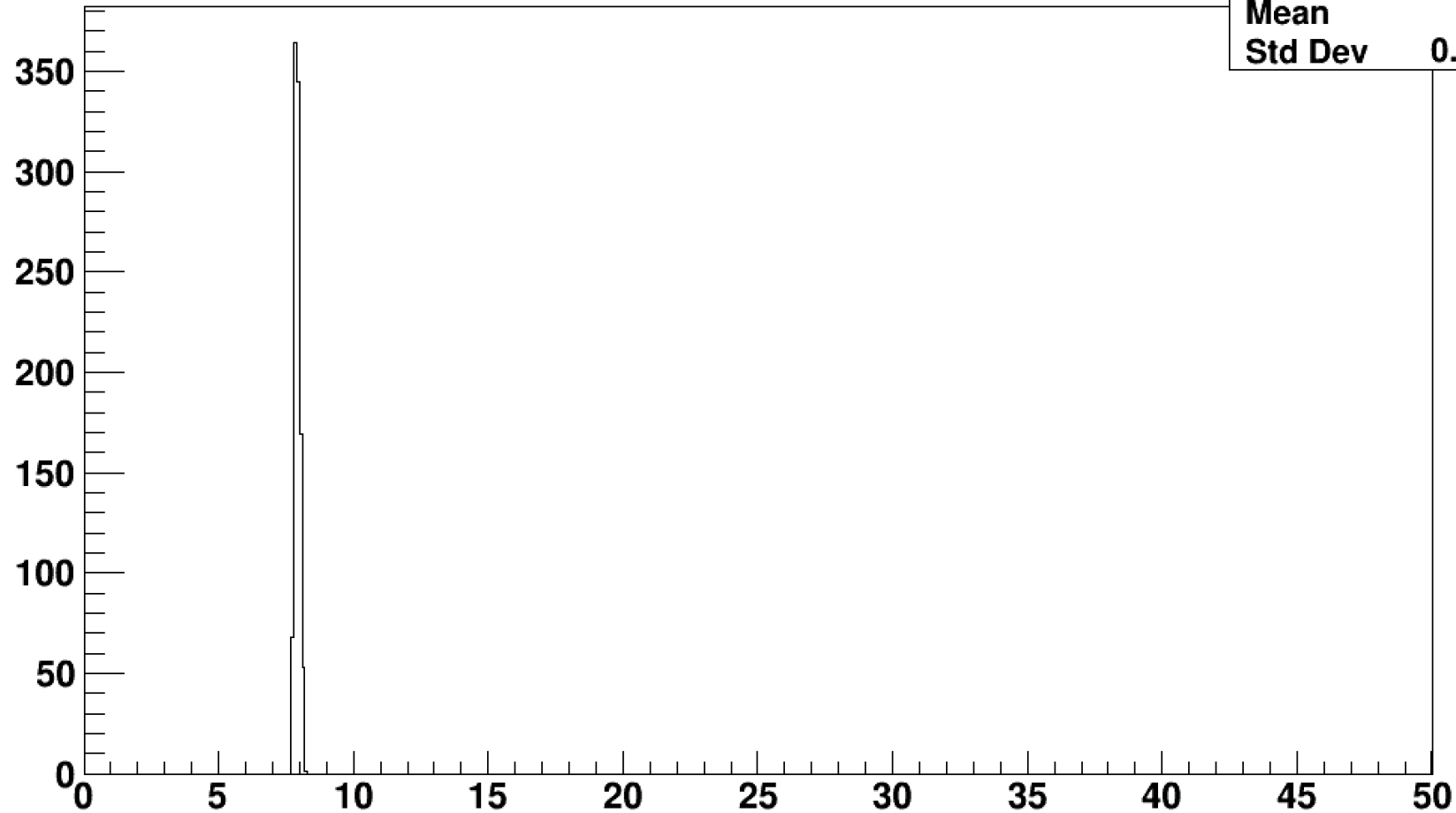
NPS



Coincidence

# TDC Spectrum: Coincidence - HMS

T.hms.hTRIG6\_tdcTime-T.hms.hTRIG1\_tdcTime

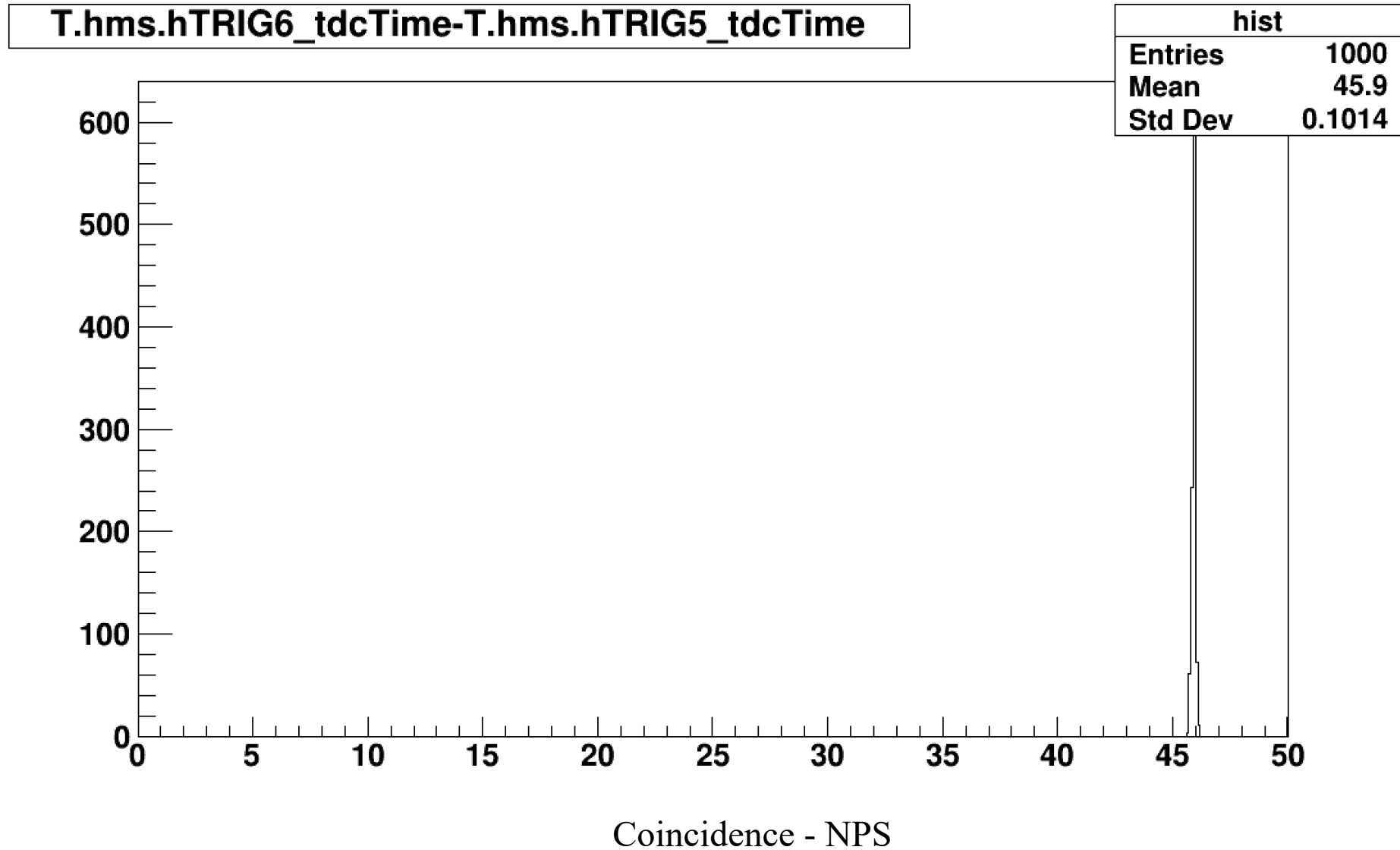


hist

|         |         |
|---------|---------|
| Entries | 1000    |
| Mean    | 7.889   |
| Std Dev | 0.09652 |

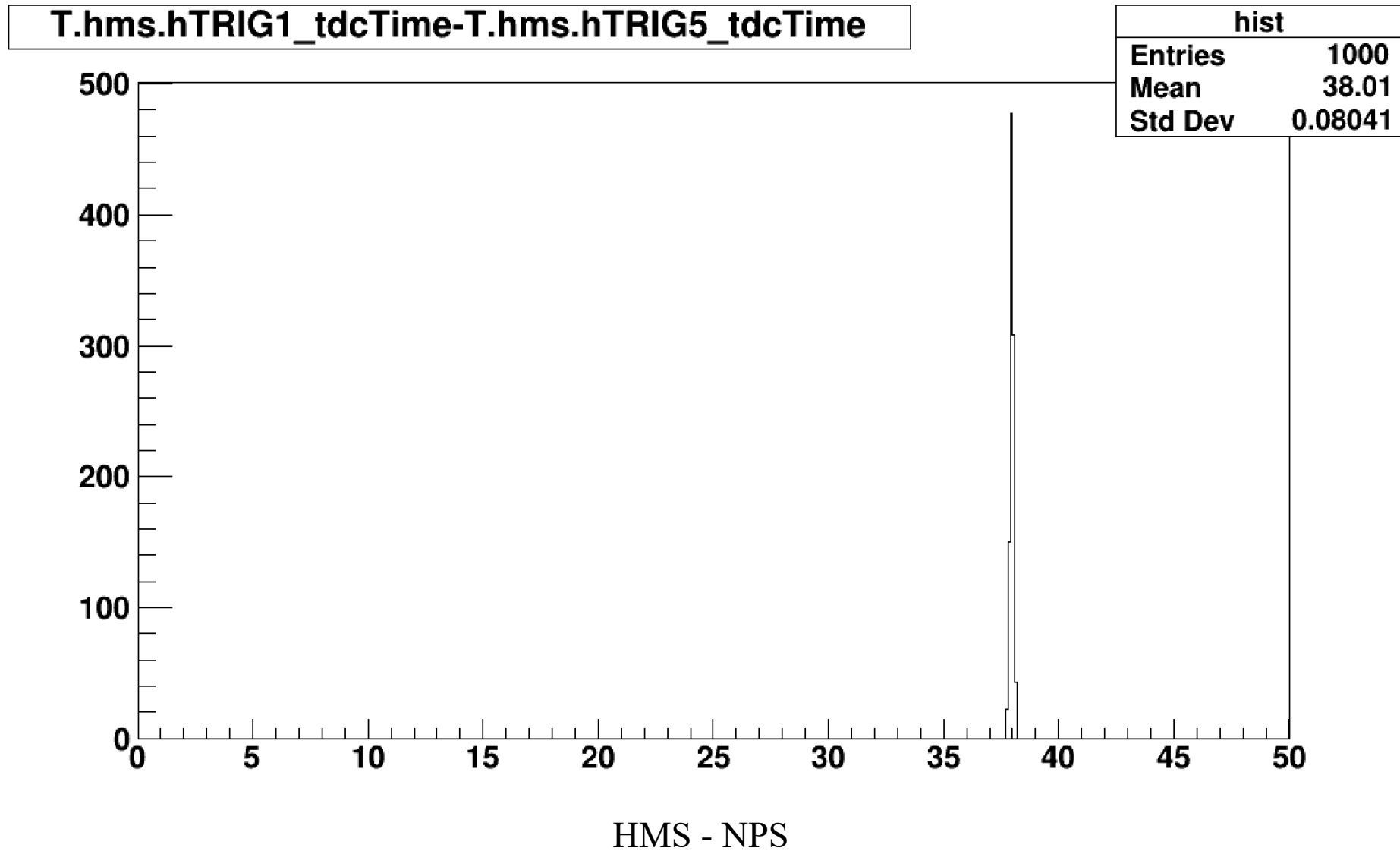
Coincidence - HMS

# TDC Spectrum: Coincidence - NPS





# TDC Spectrum: HMS - NPS

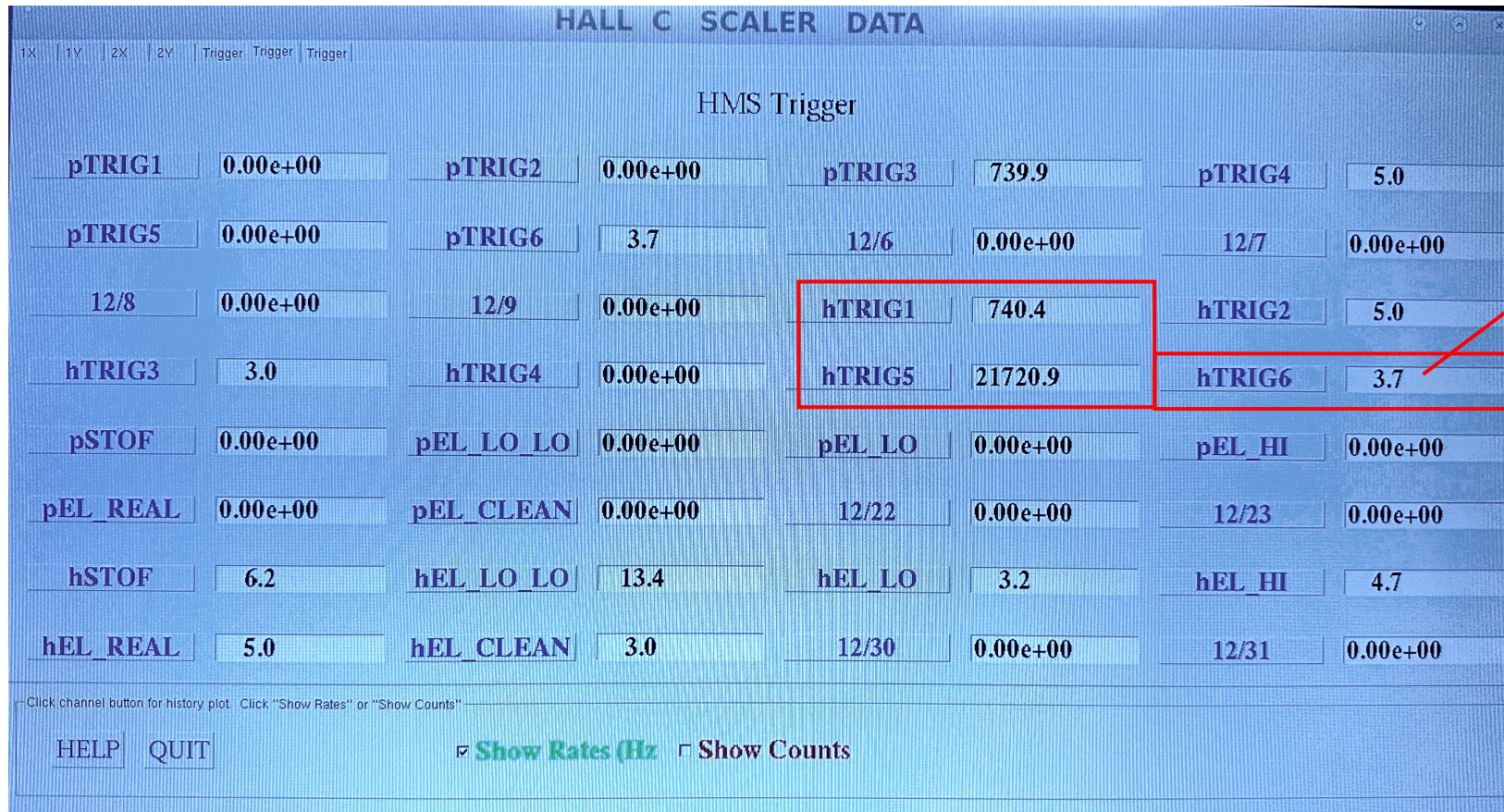


# Test with Random Signals

- Change the h3/4 trigger for HMS to h1/4 trigger so we add random signals to EDTM\_HMS
- Give random pulses to EDTM\_NPS
- Set the frequency of EDTM to be 3Hz
- From the scope we know the pulse length is 70ns

Random coincidence rate:  $21.72 \times 10^3 \times 0.7 \times 10^3 \times 140 \times 10^{-9} \approx 2.13 \text{ Hz}$

Total coincidence rate:  $2.13 + 3 = 5.13 \text{ Hz}$



Here was some fluctuation, most of the time the rate for hTRIG6 is about 5 Hz.

# Test with Random Signals

pre-scale factor ps6=0 in ROC1 means use coincidence as readout trigger

The screenshot displays the Run Control rcGui-30 interface. On the left, a terminal window shows the execution of 'kcod' and 'startROC.sh' commands, along with error messages for channel forwarding. Below the terminal is the 'DAQ Config File Settings' dialog, where 'ps6' is set to 0 and 'Scaler Rate' is 4.5 Hz. The main interface shows 'Run Parameters' for session 'HMS' and configuration 'hms'. The 'Run Status' section indicates 'Run Number 947' and 'Run State ended'. A table lists the state of various ROCs (ER1, PEB1, ROC3, ROC1). An 'Event Rate' graph shows a fluctuating rate over time. A log window at the bottom provides a detailed timeline of system events and warnings.

| Name | State      | EvtRate | DataRate | IntEvtRate | IntDataR... |
|------|------------|---------|----------|------------|-------------|
| ER1  | downloaded | 0.0     | 0.0      | 4.6        | 28.9        |
| PEB1 | downloaded | 0.0     | 0.0      | 4.6        | 28.9        |
| ROC3 | downloaded | 0.0     | 0.0      | 4.6        | 4.5         |
| ROC1 | downloaded | 0.0     | 0.0      | 4.7        | 22.5        |

| Name    | Message   | Time           | Severity |
|---------|---|----------------|----------|
| sms_hms | go succeeded.   | 15:30:30 07/06 | INFO     |
| sms_hms | End is started.   | 15:43:39 07/06 | INFO     |
| PEB1    | Script (/home/coda/coda/scripts/end_of_run-master.sh)                   | 15:43:50 07/06 | INFO     |
| sms_hms | End succeeded.  | 15:43:50 07/06 | INFO     |
| sms_hms | StartRun is started.  | 15:43:52 07/06 | INFO     |
| PEB1    | Script (/home/coda/coda/scripts/start_logruninfo.sh)                    | 15:59:42 07/06 | INFO     |
| sms_hms | waiting for... ROC1,  | 15:59:47 07/06 | INFO     |
| ER1     | Emu ER1 go: waiting for PRESTART event in module ErModule (client msg)  | 15:59:53 07/06 | WARN     |
| PEB1    | Emu PEB1 go: waiting for PRESTART event in module EbModule (client msg) | 15:59:56 07/06 | INFO     |
| sms_hms | waiting for... ROC1,  | 15:59:56 07/06 | INFO     |
| sms_hms | waiting for... ROC1,  | 16:00:03 07/06 | WARN     |
| sms_hms | waiting for... ROC1,  | 16:00:08 07/06 | WARN     |
| sms_hms | waiting for... ROC1,  | 16:00:13 07/06 | WARN     |
| sms_hms | waiting for... ROC1,  | 16:00:18 07/06 | WARN     |
| sms_hms | StartRun succeeded.   | 16:00:20 07/06 | INFO     |
| sms_hms | End is started.   | 16:00:20 07/06 | INFO     |
| PEB1    | Script (/home/coda/coda/scripts/end_of_run-master.sh)                   | 16:18:07 07/06 | INFO     |
| sms_hms | End succeeded.  | 16:18:15 07/06 | INFO     |
| sms_hms | End succeeded.  | 16:18:17 07/06 | INFO     |

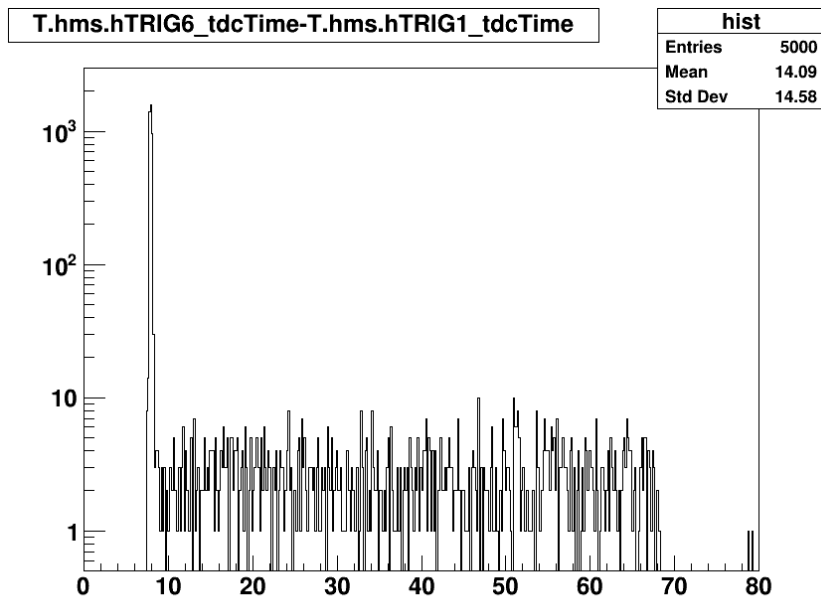
# TDC Spectrum(with Random Signals)

Replay Macro (cdaq@cdaq11): /home/cdaq/nps-2023/nps\_replay/SCRIPTS/HMS/PRODUCTION/replay\_cosmics\_hms\_nps.C

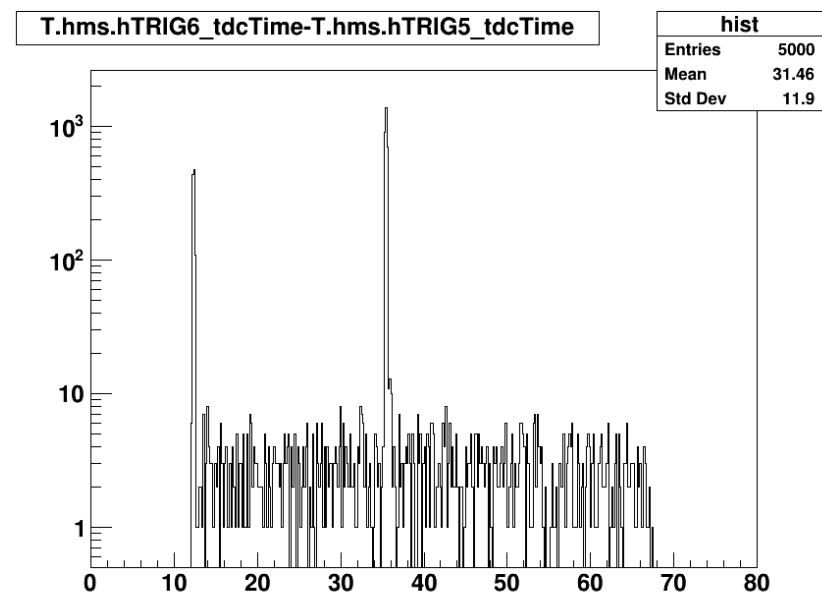
Command: .x replay\_cosmics\_hms\_nps.C(947,5000)

Output root file (cdaq@cdaq11) :

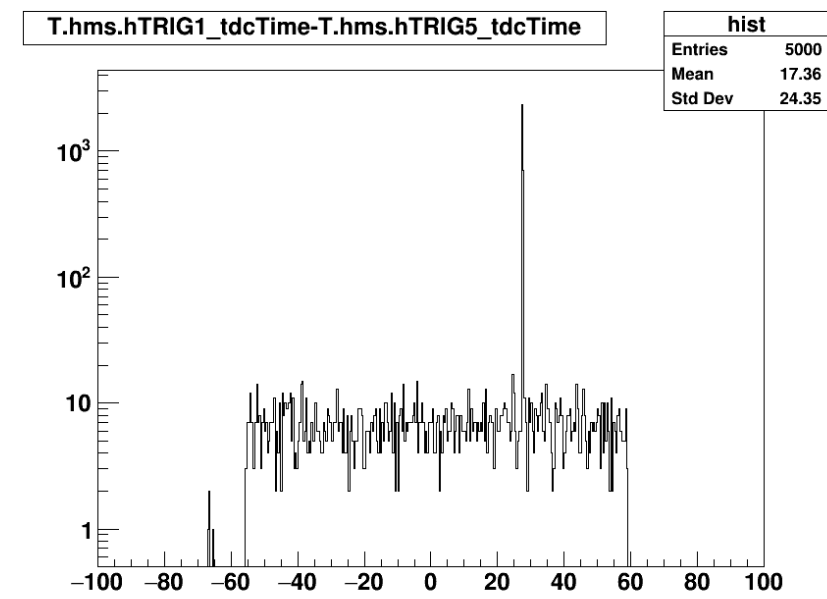
/net/cdaq/cdaq11data/cdaq/hallc-online-nps2023/ROOTFiles/HMS/hms50k/hms\_replay\_production\_947\_5000.root



Coincidence - HMS



Coincidence - NPS



HMS - NPS