

INFN GEM Update:

3/25/21-3/30/21

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Recent Activities:

Hardware (Mar. 25-30)

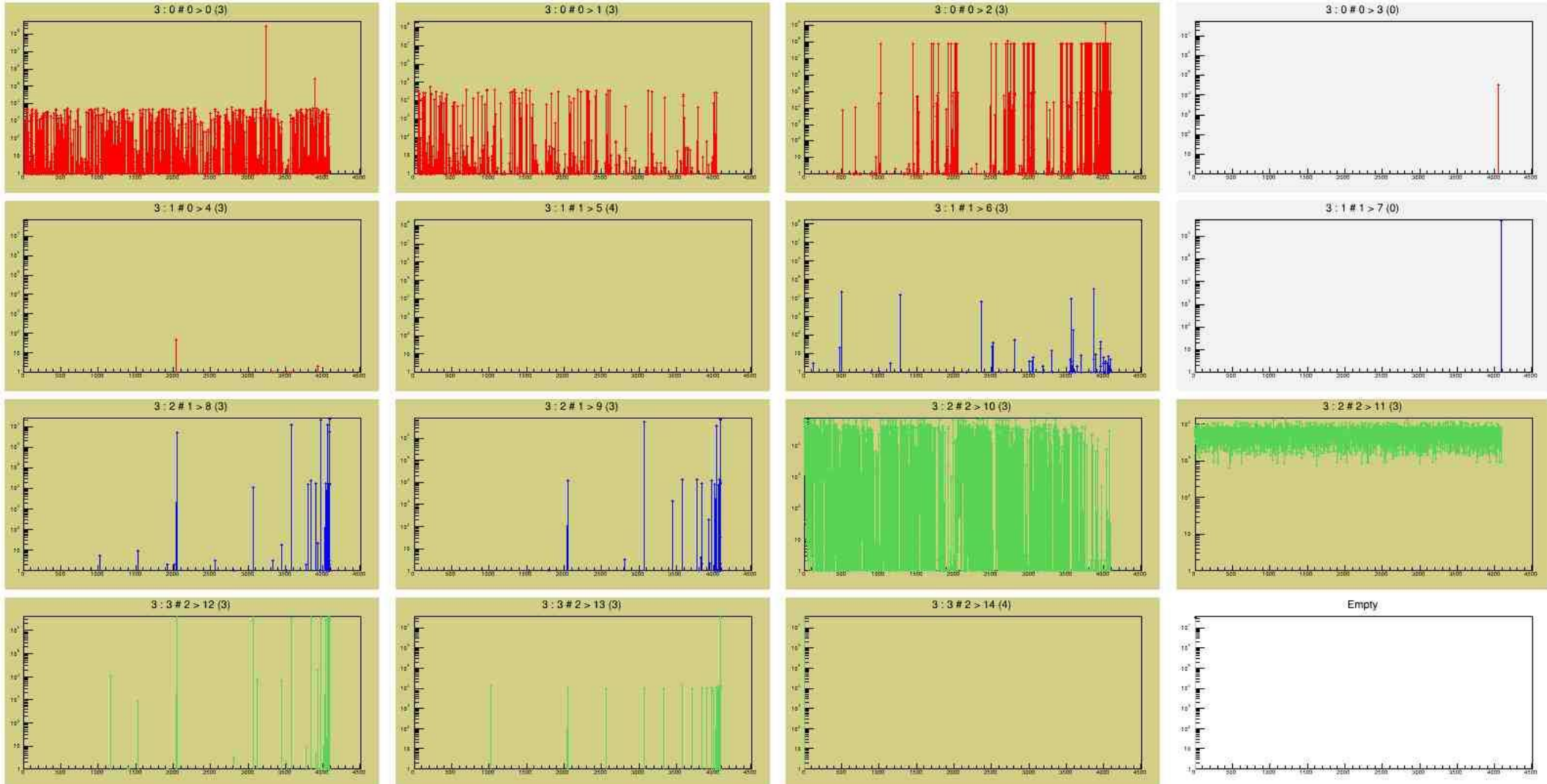
- Lots of troubleshooting related to clock distribution, thought it was linked to problem of Low Level tests. Not sure. Will need to verify optimal clock phase, just not now.
- Holly and I got the DAQ to run with 6 out of 8 INFN MPDs and all of the UVa MPDs for random pulser.
- Troubleshooting MPD in TEDF slot 3. Think slot in VME crate might be bad. Need to move to a different slot and test. Very weird plots.
- Discovered MPD in TEDF with issue. Cable needs to be resoldered to the board.
- Did test for the Detector Support group and Gas Prototype panel. Did high flow rate >300 cc/min for UVa channels and >500 cc/min for INFN channels.

Software(Mar. 30)

- Xinzhan updated the MPD SSP decoder to now process INFN GEMs. So we can create pedestal plots.
- Ben added some code to the sample mode of mpdLibTest and we can now produce clock phase plots.

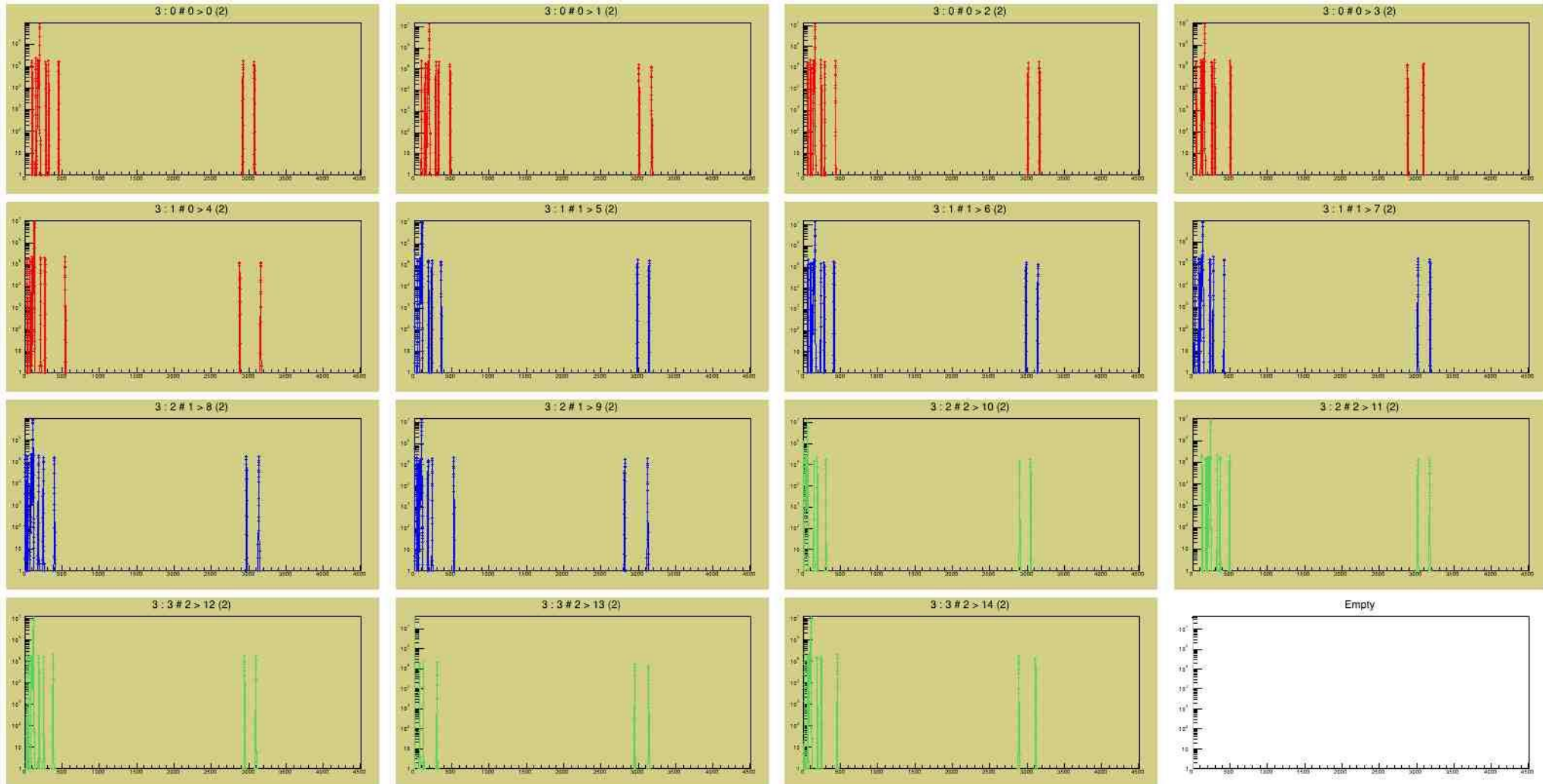
Low Level Histo Test (Amplitude vs ADC value): TEDDF MPD 3 Mar. 24

- Low Level Histo Test is good for MPD 3. Connected to chamber J0.
- Uses MPD 165



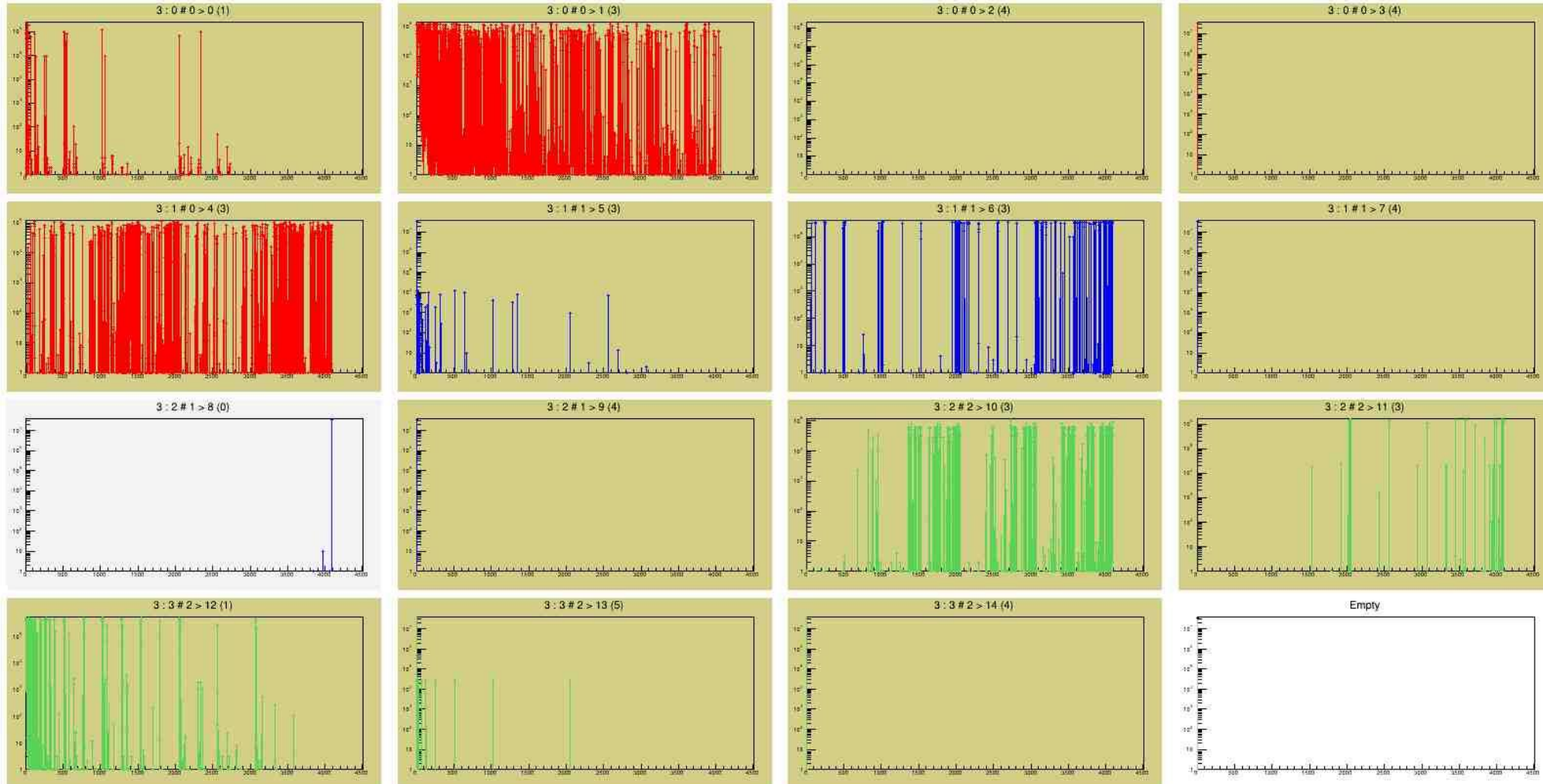
Low Level Histo Test (Amplitude vs ADC value): TEDF MPD 3 Mar. 26

- Low Level Histo Test is good for MPD 3. Connected to chamber J0.
- Using MPD 167, which has disconnected cable from board. Did not initially see that when testing.



Low Level Histo Test (Amplitude vs ADC value): TEDF MPD 3 Mar. 26

- Low Level Histo Test is good for MPD 3. Connected to chamber J0.
- Using extra MPD that is not MPD 167 or 165.
- Power cycling crate does not fix it



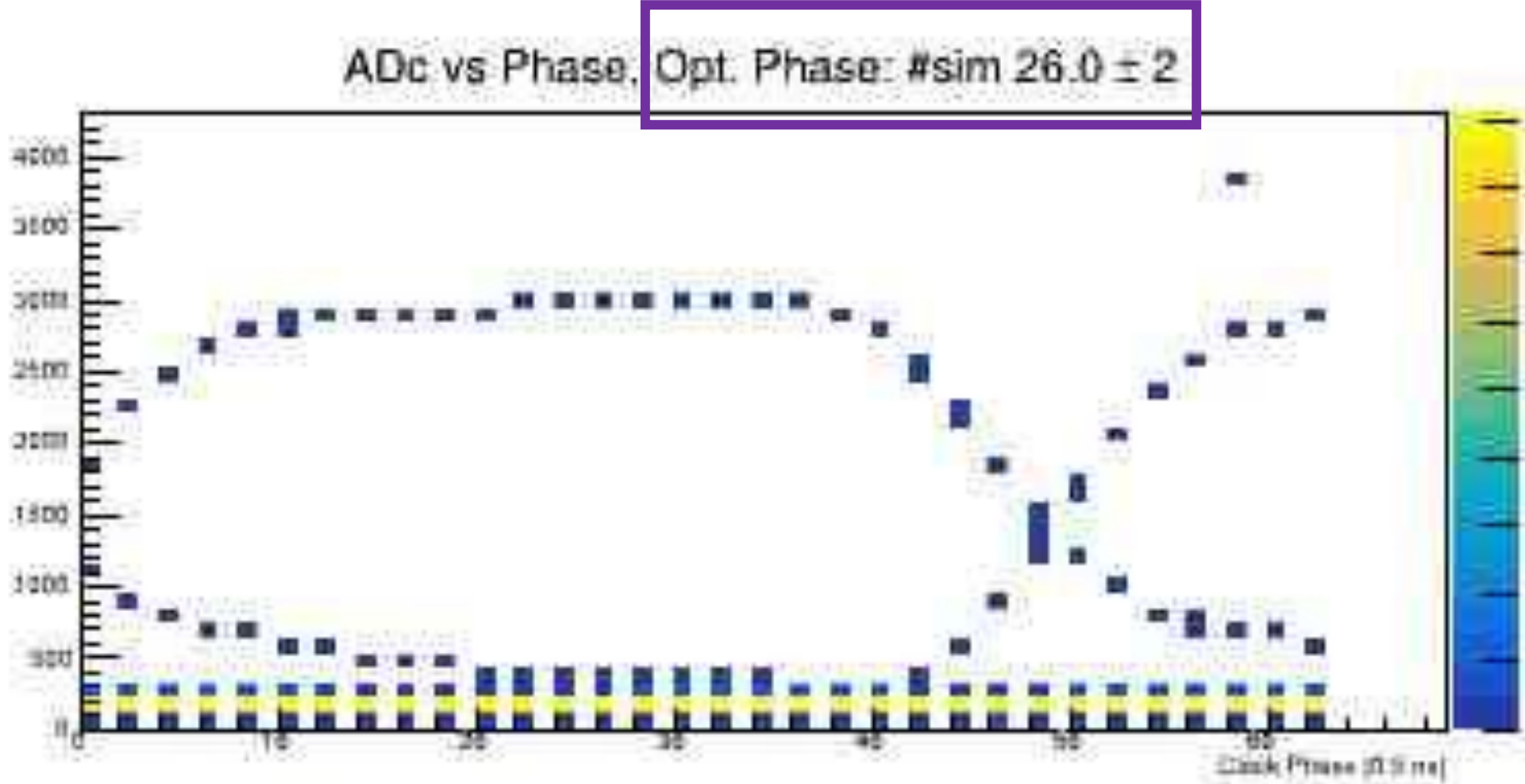
Low Level Sample Test, Mar. 30

- Thanks to Ben and Holly for figuring out why the Sample Mode was not working.
- This extra line of code did the trick.

```
/******  
 * SAMPLES TEST  
 * sample APV output at 40 MHz  
 * only for testing not for normal daq  
*****/  
if (acq_mode & 0x2) {  
  
    fout = fopen(outfile, "w");  
    if (fout == NULL) { fout = stdout; }  
  
    fprintf(fout, "# SAMPLE MODE OUTPUT\n");  
    fprintf(fout, "# CLOCK_RANGE: %d %d %d\n", clp_clock0, clp_clock1, clp_clockd);  
  
    for (k=0; k<fnMPD; k++) { // only active mpd set  
        i = mpdSlot(k);  
  
        mpdSetAcqMode(i, "sample");  
        mpdSetEventBuilding(i, 0);  
  
        // load pedestal and thr default values  
        mpdPEDTHR_Write(i);  
  
        for (kk=clp_clock0; kk<clp_clock1; kk+=clp_clockd) { // loop on clock phases  
  
            // set clock phase  
            mpdDELAY25_Set(i, kk, kk);  

```

Low Level Sample Test (ADC value vs Clock Phase): TEDF Mar. 30 Zoom-In

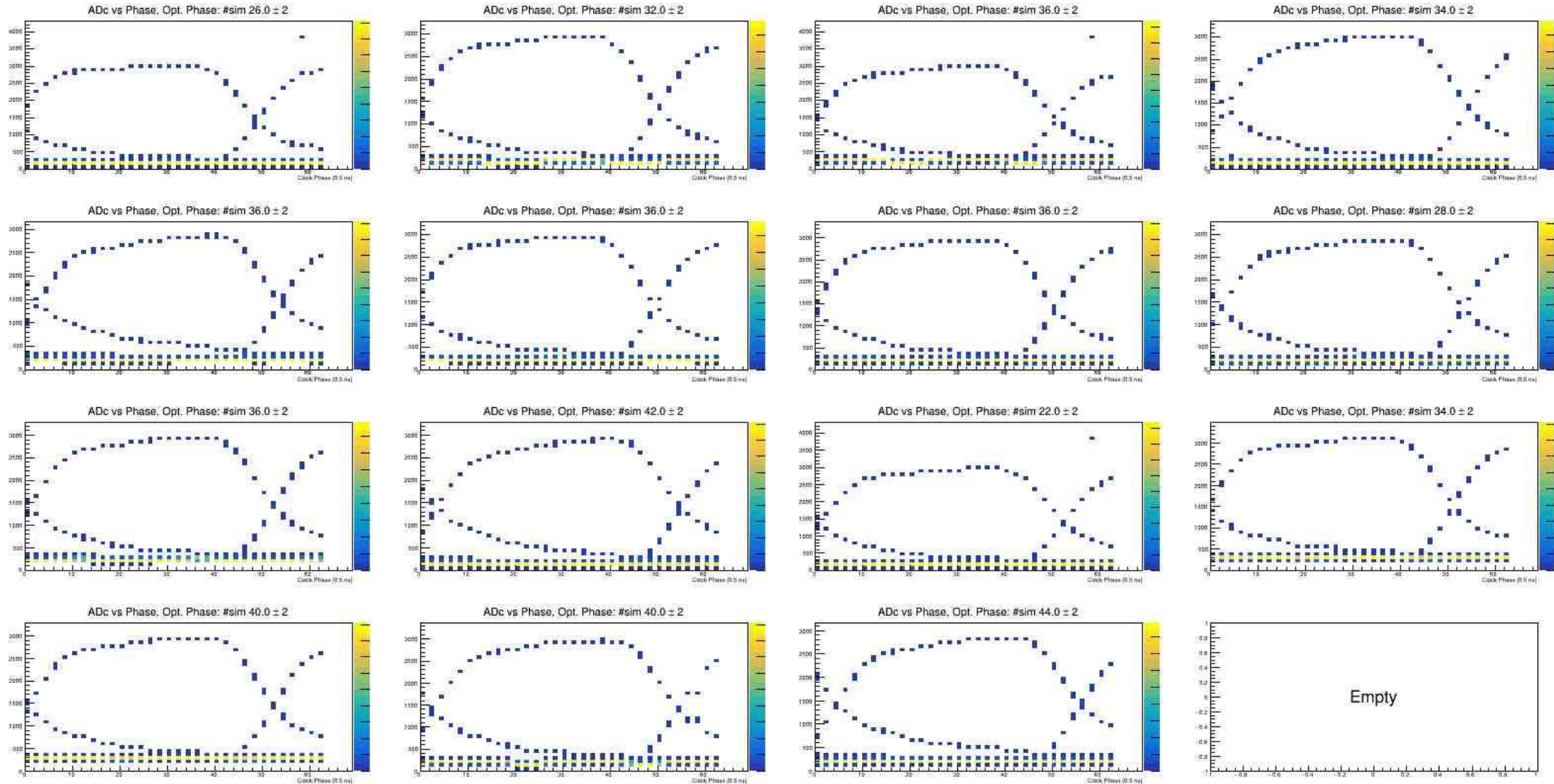


Vertical Axis:
ADC Value
with range 0 -
4000

Horizontal Axis: Clock Phase Value with range 0 – 70, 1 Clock Phase value = 0.5
nanosecond

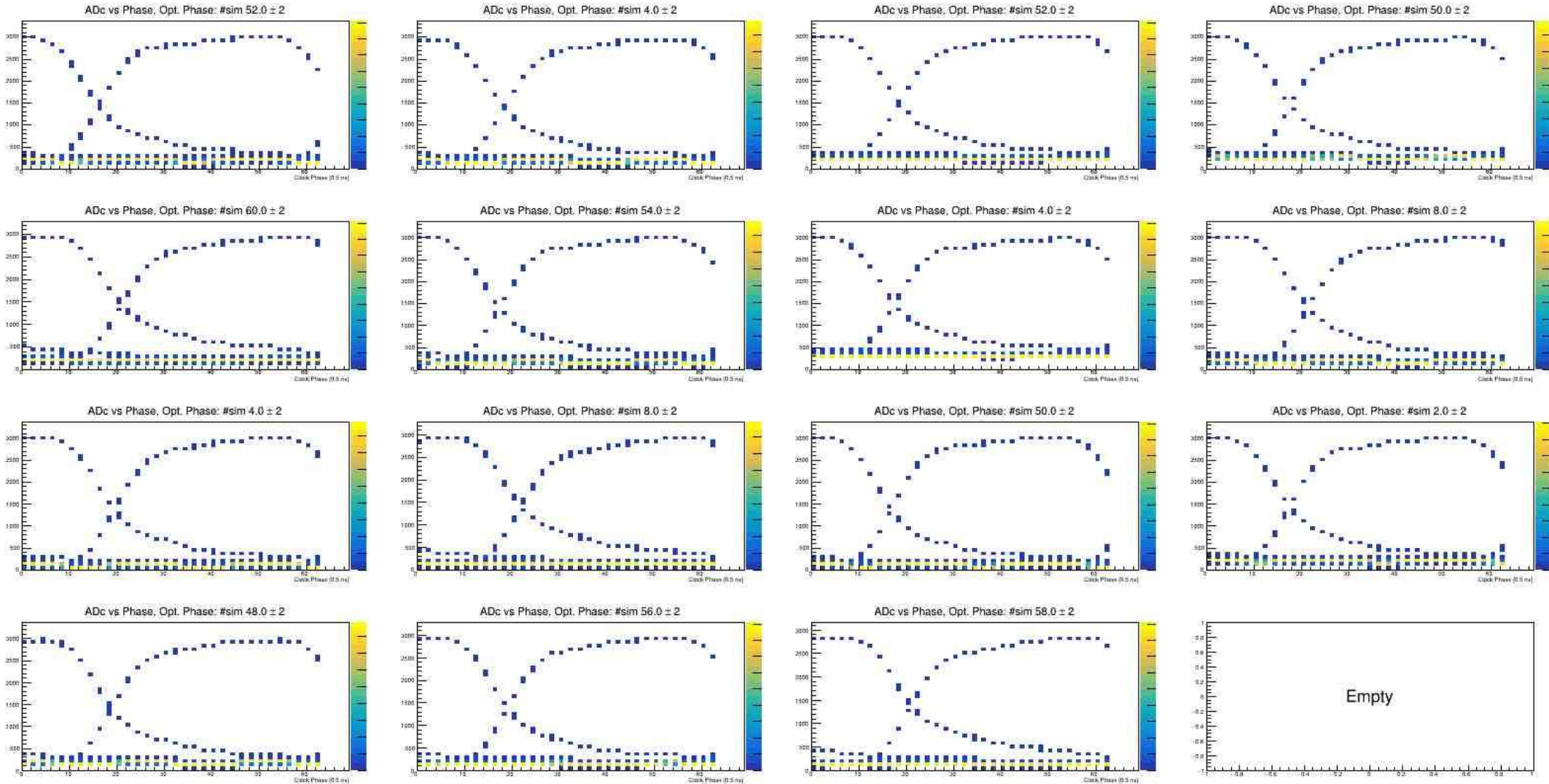
Low Level Sample Test (ADC value vs Clock Phase): TEDF MPD 5 Mar. 30

- Each plot represents an APV card. Clock Phase is set to 30 in config file.



Low Level Sample Test (ADC value vs Clock Phase): TEDF MPD 7 Mar. 30

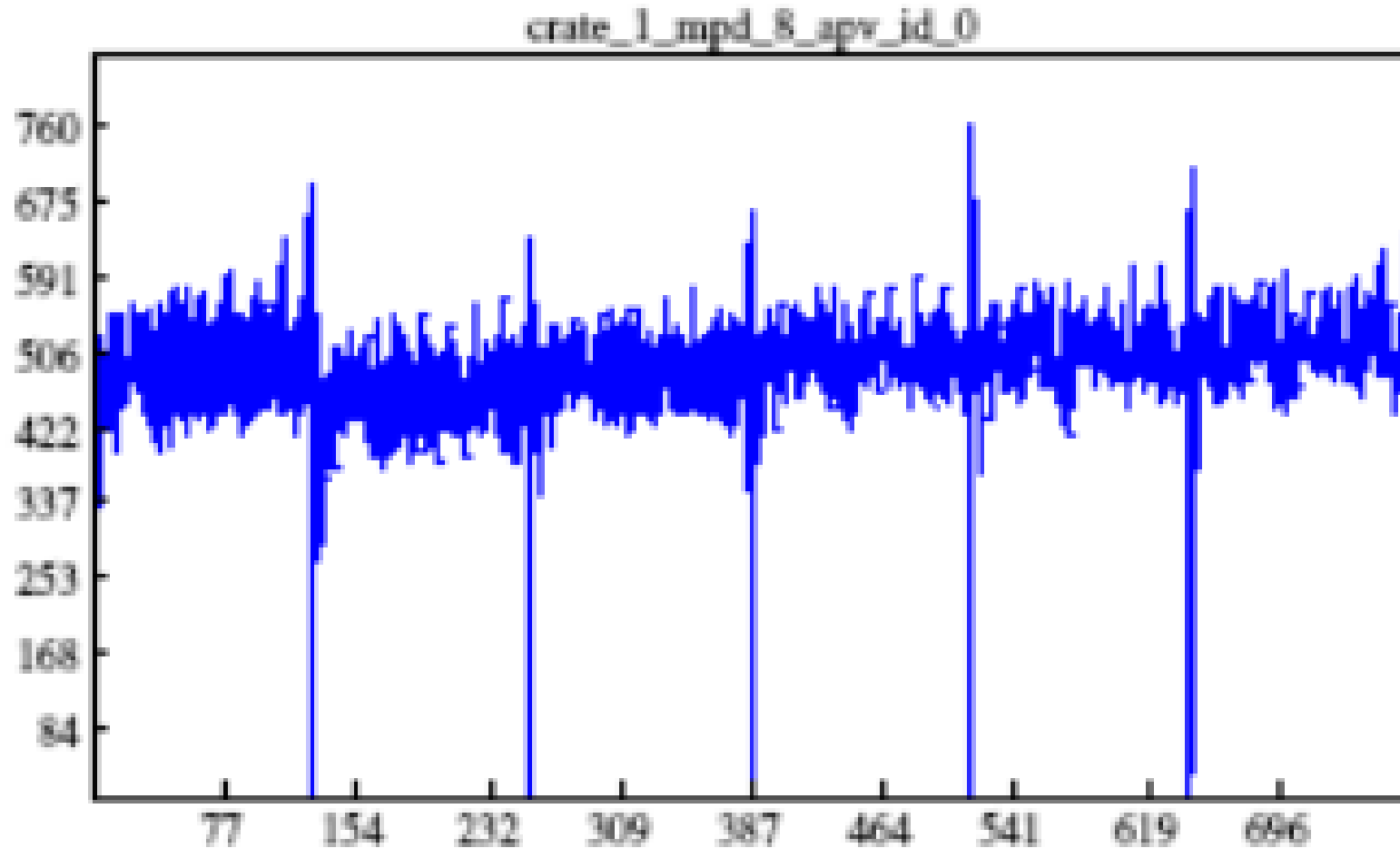
- Each plot represents an APV card. Clock Phase is set to 44 in config file.



Pedestal Plot (ADC Value vs Channel # of 6 time samples) Zoom-In

- One of the Pedestal plots that Uva has been showing for some time.

Vertical Axis:
ADC Value



Horizontal Axis: Channel number for 6 time samples. 1 time sample is 25 nanosecond

Pedestal Plot (ADC Value vs Channel # of 6 time samples) TEDF for INFN GEMs

- One of the Pedestal plots that Uva has been showing for some time.
- Now that Decoder is working, we can mass produce these plots via macro.
- Is raw pedestal, does not include common mode subtraction, etc. yet.

The screenshot displays the GEM Data Viewer application. The main window contains a grid of 16 plots, each representing a different pedestal (e.g., crate_1_mpd_8_apv_id_0 to crate_1_mpd_9_apv_id_1). Each plot shows ADC values on the y-axis and channel numbers on the x-axis. The plots exhibit a noisy baseline with periodic spikes. To the right of the plots is a control panel with the following fields and buttons:

- File:
- Event Number:
- Max events for pedestal:
- Pedestal text File Output Path:
- Replay File Output Path:
- Max File Split:
- Replay to ROOT file:

At the bottom right, a System Log window shows the following text:

```
generating pedestal for file: "/home/bbgem/bbgem_data/bbgem_717.evio.0"  
this might take a while...  
Done.  
total apv in current event : 54  
total apv in current event : 54  
total apv in current event : 54  
total apv in current event : 54  
total apv in current event : 54
```

What to do next?

- Test Lab GEM Chambers
 - Figure out problems with J4 and J3, possibly linked to MPDs 7 and 15.
 - If MPDs are available move J1 to the cosmic stand and integrate in into the system.
 - Make sure DAQ is properly connected in Test Lab.
 - Change J3 cable trays to metal.
- GEM Chambers in BigBite
 - Setup any remaining software/programs for INFN GEMs in TEDF configuration.
 - Take DAQ runs at least once a day to test DAQ stability.
 - Get any remaining issues resolved for MPDs that are not being run on DAQ.
 - Setup cosmic trigger.
 - Systematic check of clock phase.
 - Take pedestal data and check multiple analysis forms: common mode subtraction, zero suppression, etc.
 - Look for any noise issues and see if we need to adjust grounding.
 - Compare spacers for 1st track mount of BigBite Frame.
 - Test GEM HV with Low Level Tests and Pedestals.
 - Documentation for LV and Low Level Troubleshooting
- Data Analysis:
 - Create Efficiency plots by adjusting Malinga's macro for INFN GEMs.
 - Adjust Evaristo's macro if necessary to remove dead areas.