

# A few CDC updates

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# Changes to CCDB resolution parameters

In the fcal\_bcal\_m8 runs time-based tracking appeared to be not working in the CDC (it is likely the case for many more of the runs, but these were the ones I looked at)

Here is a good example:

## Track Candidate stage

The screenshot displays the Track Candidate stage interface with four detector views and several control panels.

- top view (looking down from above detector):** Shows a top-down view of the detector with a 70 cm scale bar. A coordinate system shows X pointing up and Z pointing right.
- side view from beam right (south):** Shows a side view of the detector with a 70 cm scale bar. A coordinate system shows Y pointing up and Z pointing right.
- BCAL view from downstream looking upstream:** Shows a circular view of the BCAL detector with a 20 cm scale bar. A coordinate system shows Y pointing up and X pointing left.
- FCAL view from downstream looking upstream:** Shows a circular view of the FCAL detector with a 30 cm scale bar. A coordinate system shows Y pointing up and X pointing left.

Control panels on the right include:

- BCAL colors:** A list of energy thresholds with corresponding color swatches: 10.00 GeV (blue), 3.16 GeV (purple), 1.00 GeV (magenta), 316.2 MeV (red), 100.0 MeV (orange), 31.6 MeV (yellow), 10.0 MeV (light yellow), 3.2 MeV (pale yellow), and 1.0 MeV (white).
- Track Draw Options:** A set of checkboxes and dropdown menus for DTrackCandidate, DTrackWireBased, DTrackTimeBased, DChargedTrack, DNeutralParticle, DMCThrown, and DMCTrajectoryPoint.
- Hit Draw Options:** A set of checkboxes for CDC, CDC Drift Time, CDCTruth, FDC Wire, FDC Pseudo, FDCTruth, TOF, TOFTruth, FCAL, and BCAL, along with a 'More options' button.
- Debugger** and **BcalDisp** buttons.

At the bottom, the **Track Info** section contains two tables:

Thrown						
trk:	type:	p:	theta:	phi:	z:	
-----	-----	-----	-----	-----	-----	
-----	-----	-----	-----	-----	-----	
-----	-----	-----	-----	-----	-----	
-----	-----	-----	-----	-----	-----	

Reconstructed										
trk:	type:	p:	theta:	phi:	z:	chisq/Ndof:	Ndof:	FOM:	cand:	
1	q=+	0.5579	30.51	-169.4	72.62	1.416	13	N/A	-----	
2	q=-	0.603	47.26	-0.18	74.92	0.5986	11	N/A	-----	
3	q=-	0.4438	2.481	179.4	175.2	1.423	6	N/A	-----	
4	q=+	0.767	3.485	108.3	233.7	0.7382	14	N/A	-----	

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In the fcal\_bcal\_m8 runs time-based tracking appeared to be not working in the CDC (it is likely the case for many more of the runs, but these were the ones I looked at)

Here is a good example:

## Wire-Based stage

The screenshot displays a particle detector tracking interface. It consists of four main viewports and several control panels.

- top view (looking down from above detector):** Shows a top-down view of the detector with tracks and hit patterns. A scale bar indicates 70 cm.
- side view from beam right (south):** Shows a side view of the detector with tracks and hit patterns. A scale bar indicates 70 cm.
- BCAL view from downstream looking upstream:** Shows a circular view of the BCAL detector with tracks and hit patterns. A scale bar indicates 20 cm.
- FCAL view from downstream looking upstream:** Shows a circular view of the FCAL detector with tracks and hit patterns. A scale bar indicates 30 cm.

Control panels include:

- BCAL colors:** A list of energy thresholds with corresponding color swatches: 10.00 GeV (blue), 3.16 GeV (purple), 1.00 GeV (magenta), 316.2 MeV (red), 100.0 MeV (orange), 31.6 MeV (yellow), 10.0 MeV (light yellow), 3.2 MeV (pale yellow), and 1.0 MeV (white).
- Track Draw Options:** A set of checkboxes and dropdown menus for controlling track visualization:
  - DTrackCandidate: <default>
  - DTrackWireBased: <default>
  - DTrackTimeBased: <default>
  - DChargedTrack: <default>
  - DNeutralParticle
  - DMCThrown
  - DMCTrajectoryPoint
- Hit Draw Options:** A set of checkboxes for controlling hit visualization:
  - CDC
  - CDC Drift Time
  - CDCTruth
  - FDC Wire
  - FDC Pseudo
  - FDCTruth
  - TOF
  - TOFTruth
  - FCAL
  - BCAL
  -

At the bottom, there is a **Track Info** section with a table of reconstructed tracks:

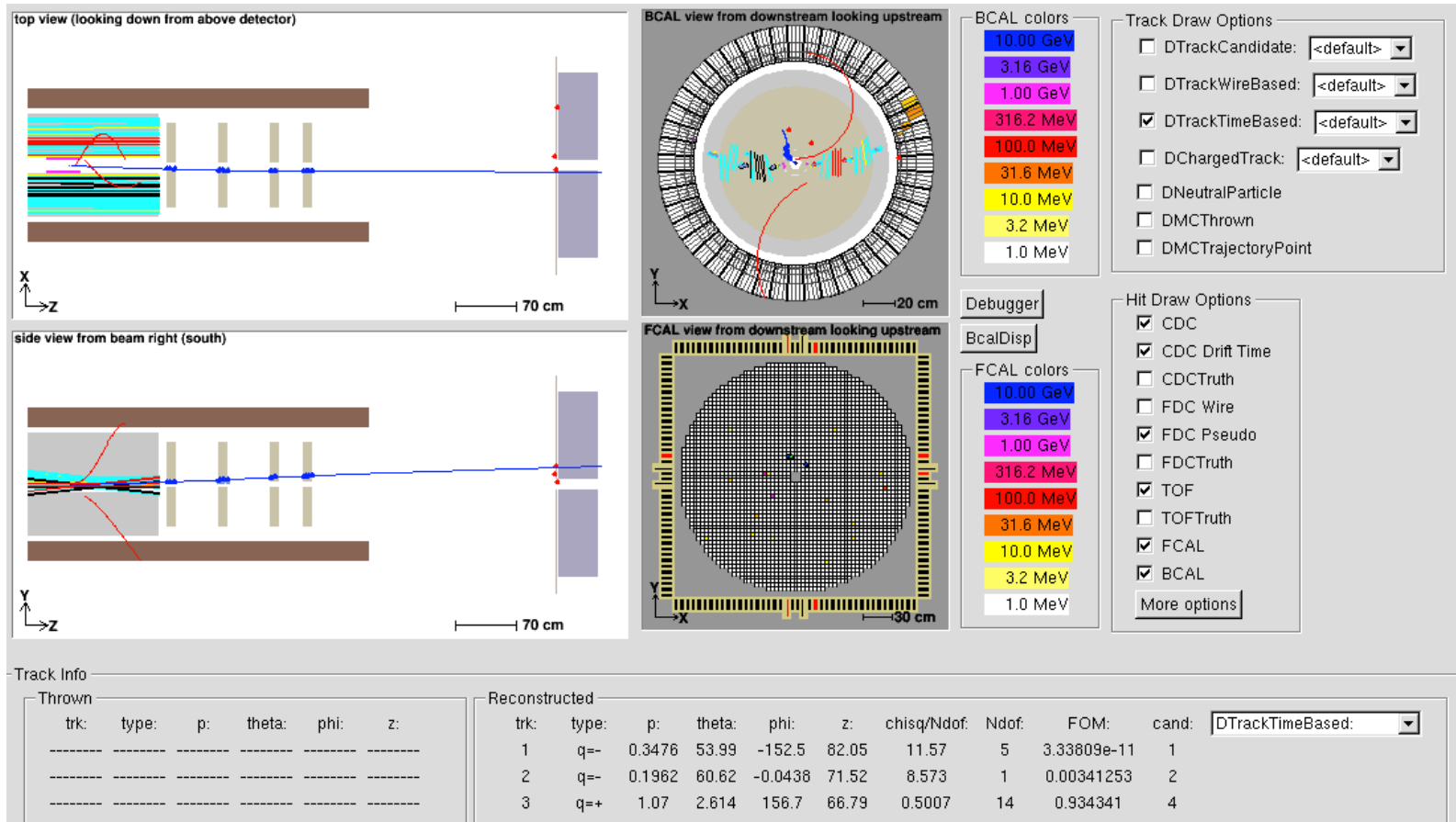
Track Info							Reconstructed										
trk:	type:	p:	theta:	phi:	z:		trk:	type:	p:	theta:	phi:	z:	chisq/Ndof:	Ndof:	FOM:	cand:	DTrackWireBased:
-----	-----	-----	-----	-----	-----		1	q=+	0.7359	29.41	-167.4	54.75	0.6731	26	N/A	1	<default>
-----	-----	-----	-----	-----	-----		2	q=-	0.4854	43.58	-13.88	58.44	0.319	20	N/A	2	<default>
-----	-----	-----	-----	-----	-----		3	q=-	0.2803	4.428	40.55	168.1	3.802	6	N/A	3	<default>
-----	-----	-----	-----	-----	-----		4	q=+	0.9918	2.602	161	69.2	0.3946	10	N/A	4	<default>

# Changes to CCDB resolution parameters

In the fcal\_bcal\_m8 runs time-based tracking appeared to be not working in the CDC (it is likely the case for many more of the runs, but these were the ones I looked at)

Here is a good example:

## Wire-Based stage



# Changes to CCDB resolution parameters

After talking with Simon, we both concluded that it could be traced back to the way the errors are being estimated for the CDC. The resolution as a function of the drift time is modeled as:

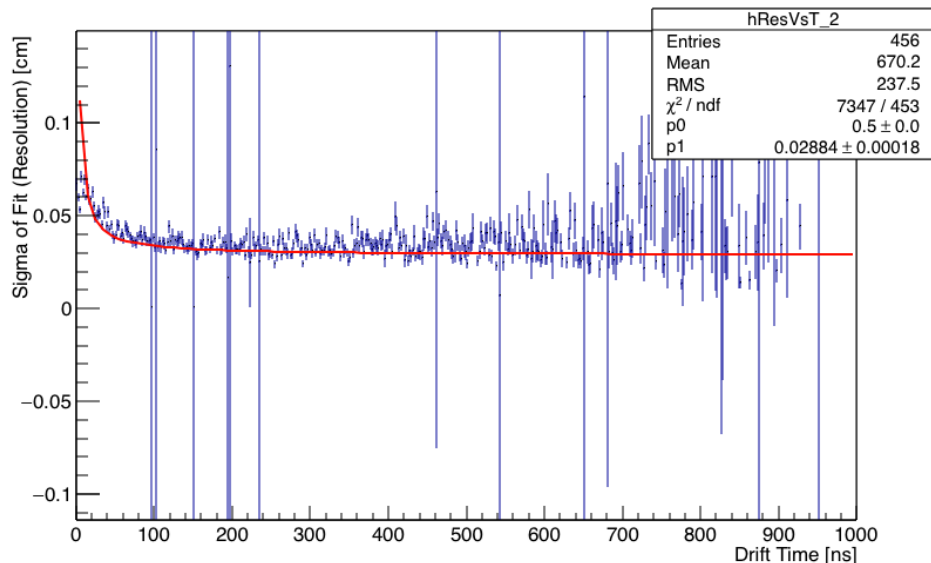
$$\sigma = \frac{p_0}{t + 1} + p_1$$

These parameters had been derived from the simulation and were

$$p_0 = 0.11, p_1 = 0.00425$$

42.5  $\mu\text{m}$  resolution!!  
This detector is really nice!

Where are we really....



Using the fit to the left, these values were adjusted to

$$p_0 = 0.5, p_1 = 0.03$$

$\sim$ 300  $\mu\text{m}$  resolution with current time-distance lookup

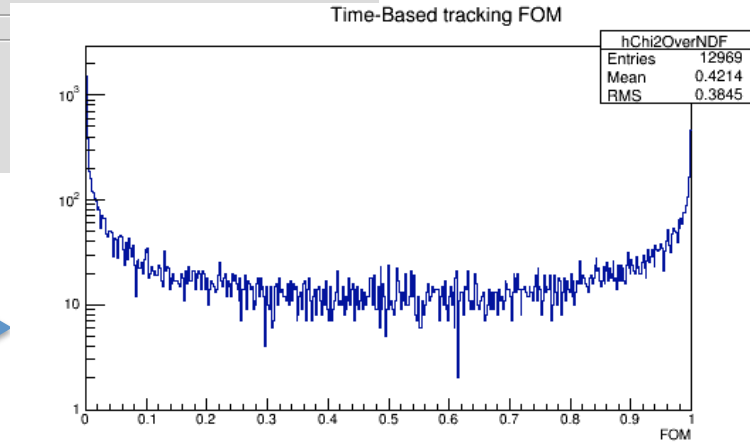
Now let's look at that event from before...

# Changes to CCDB resolution parameters

Looks much better

Track Info

Thrown						Reconstructed								
trk:	type:	p:	theta:	phi:	z:	trk:	type:	p:	theta:	phi:	z:	chisq/Ndof:	Ndof:	FOM:
---	---	---	---	---	---	1	q=+	0.6613	29	-161.8	53.48	1.636	21	0.0331742
---	---	---	---	---	---	2	q=-	0.5767	46.55	-7.979	64.58	0.7458	20	0.781236
---	---	---	---	---	---	3	q=+	1.07	2.614	156.7	66.79	0.5007	14	0.934345

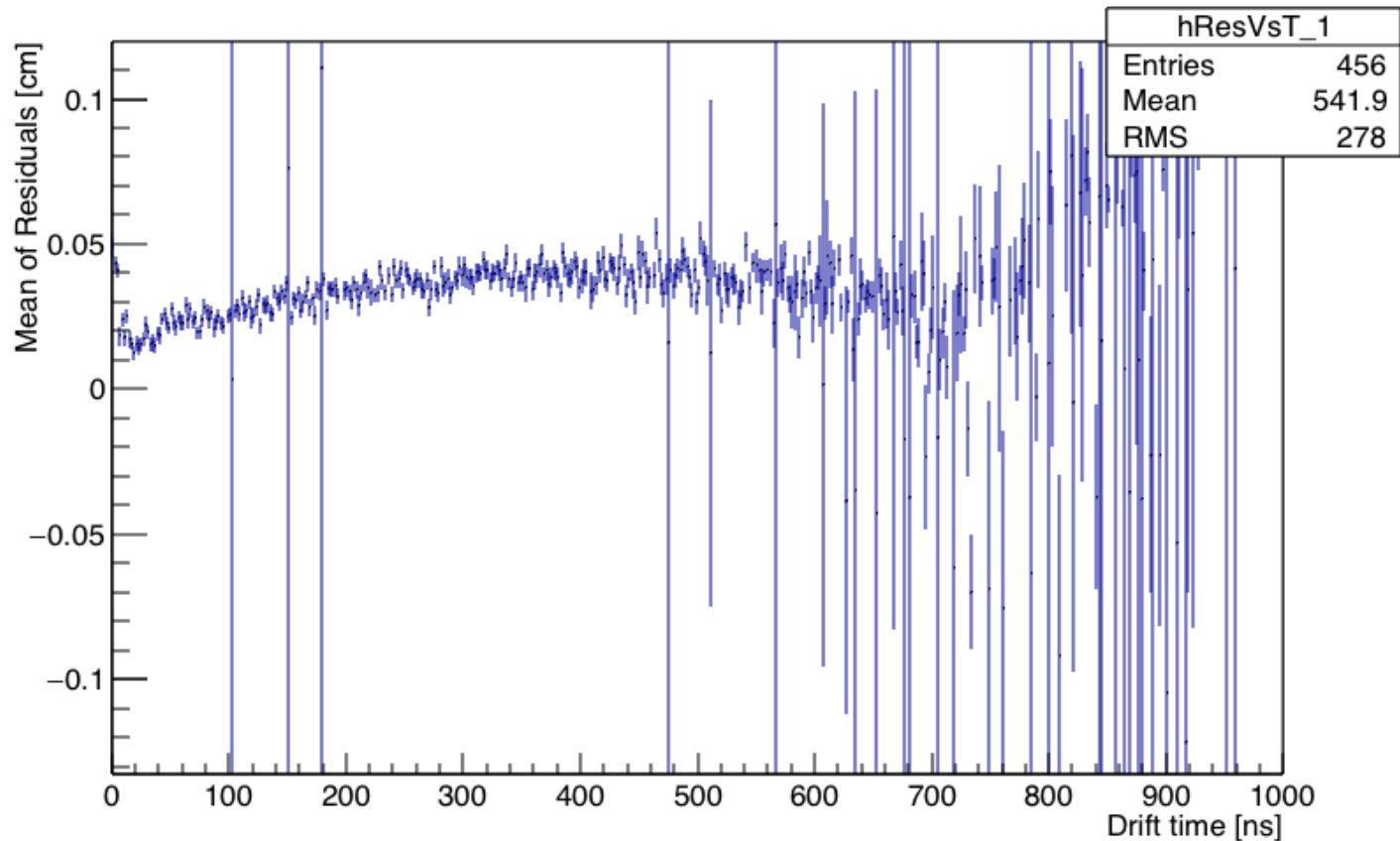


Still some bad behavior, but we may have to live with it for a little while.



# Changes to CCDB resolution parameters

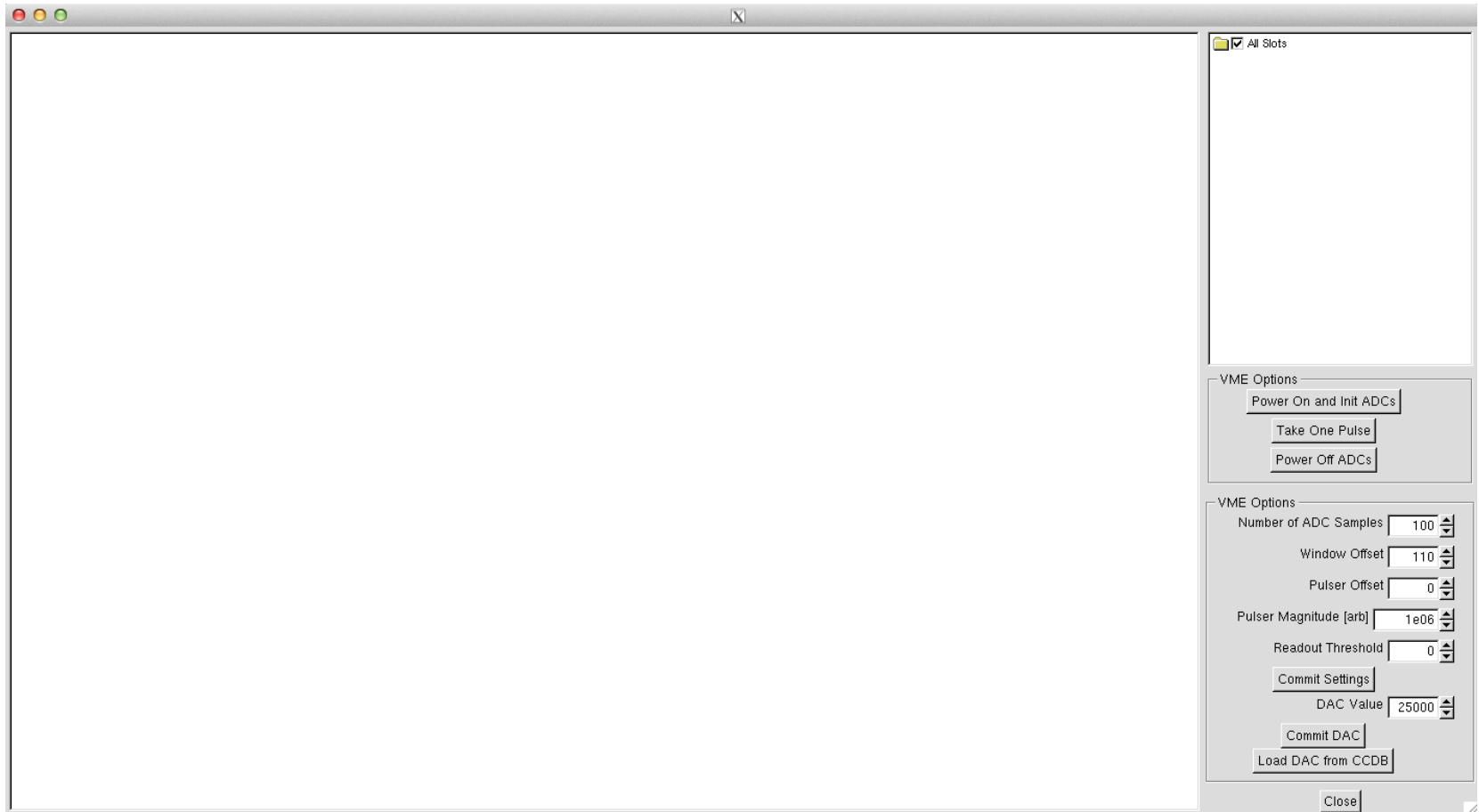
Work is now focused on selecting a better time-distance table



# fa125 Test Bench

Program now available for testing of the fADC125 with the pulser. Should help with debugging the problematic channels.

```
[hdcops@roccdc1 ~]$ cd Standalone/TestBench/  
[hdcops@roccdc1 TestBench]$ ./RunTestBench.csh
```

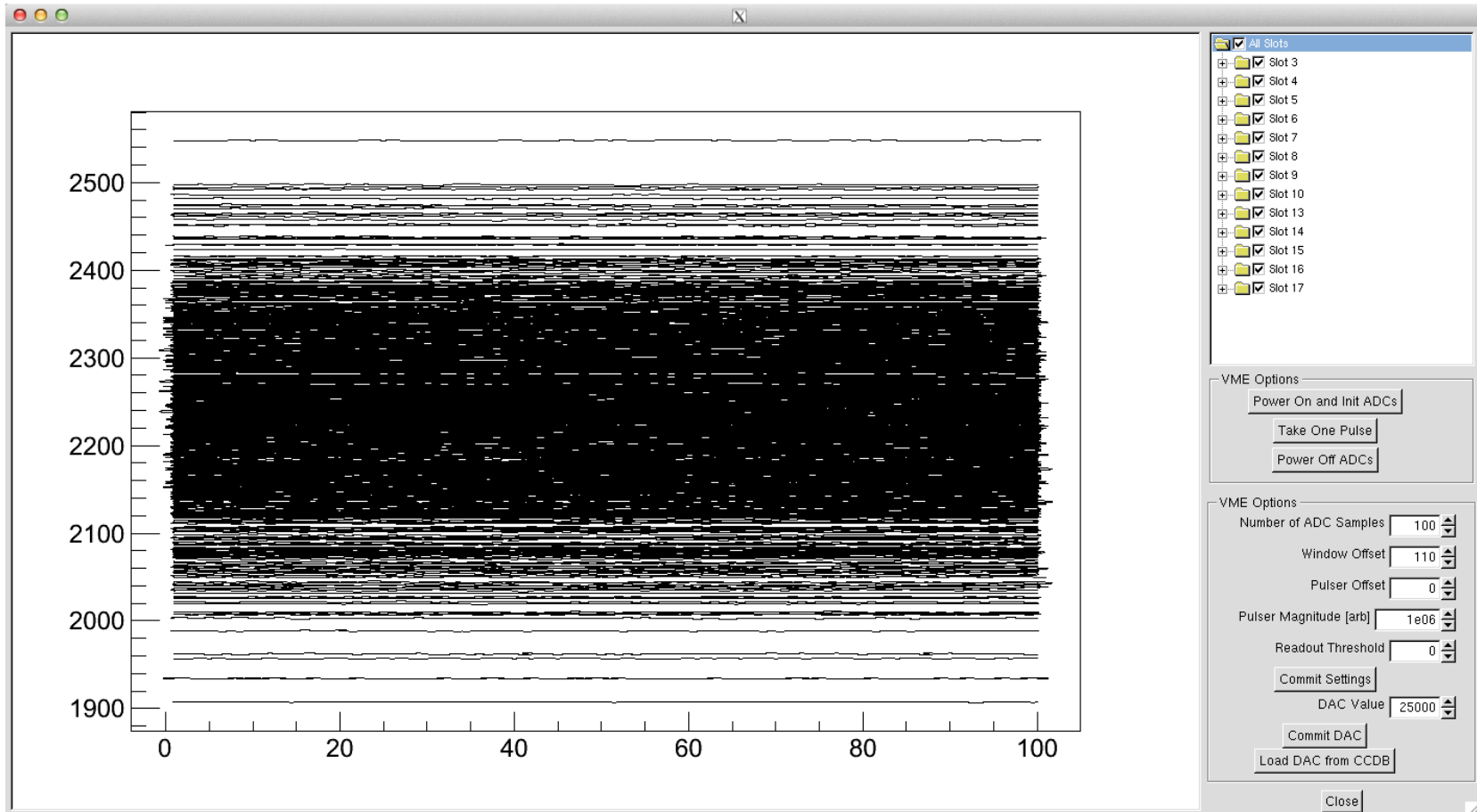




# fa125 Test Bench

Program now available for testing of the fADC125 with the pulser. Should help with debugging the problematic channels.

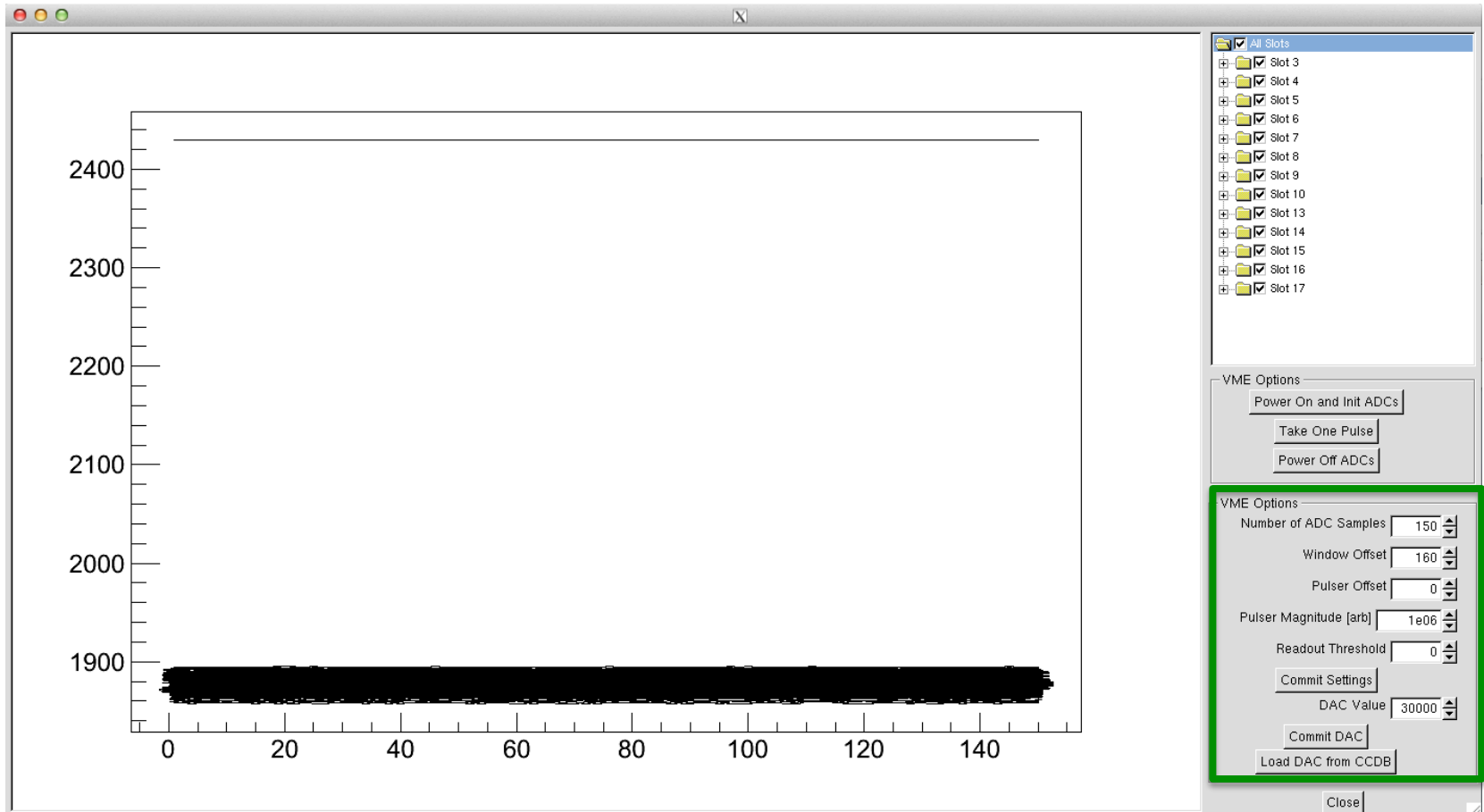
```
[hdcops@roccdc1 ~]$ cd Standalone/TestBench/  
[hdcops@roccdc1 TestBench]$ ./RunTestBench.csh
```



LV is off so this is pretty boring...

# fa125 Test Bench

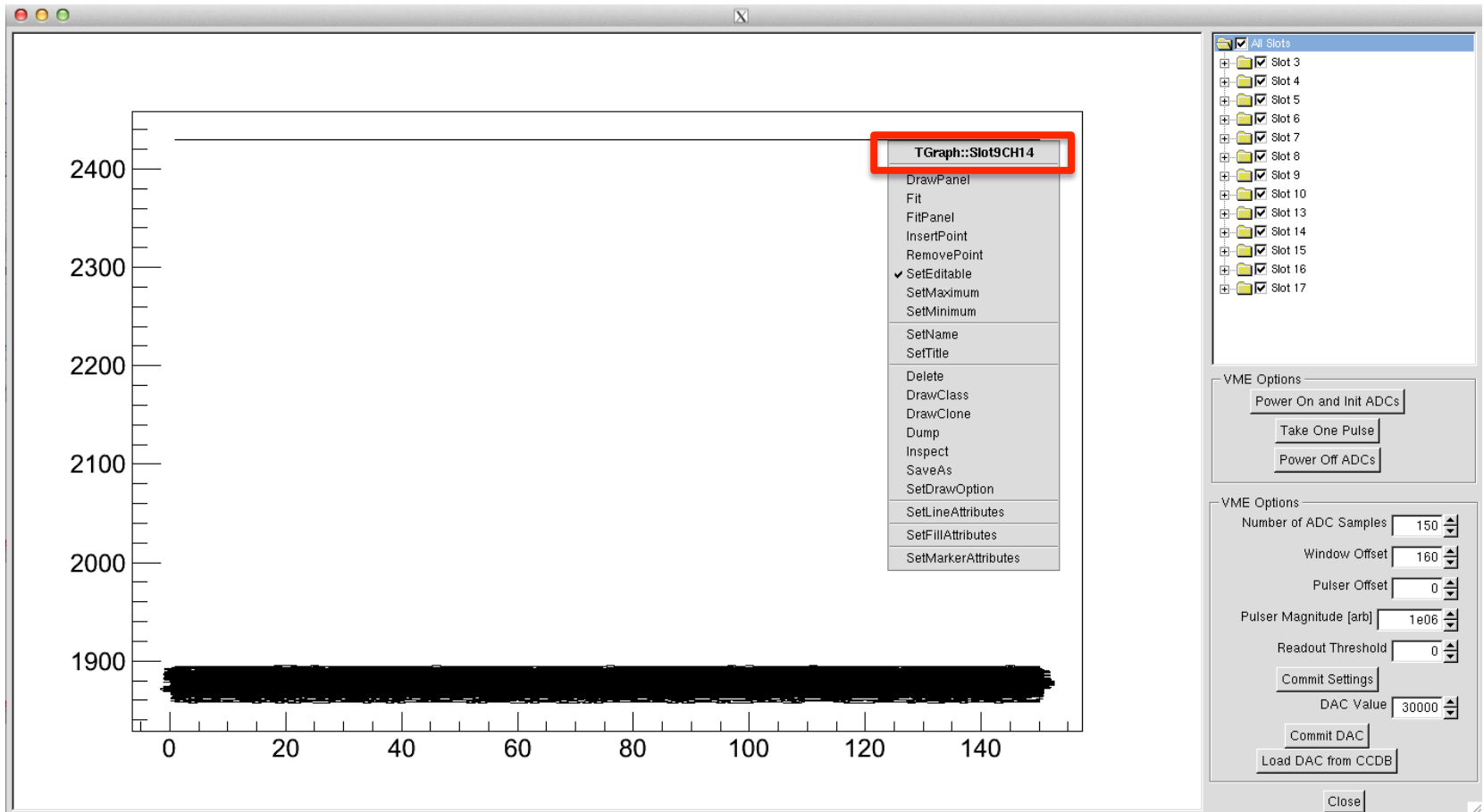
User can control fADC settings easily



LV is off so this is pretty boring...

# fa125 Test Bench

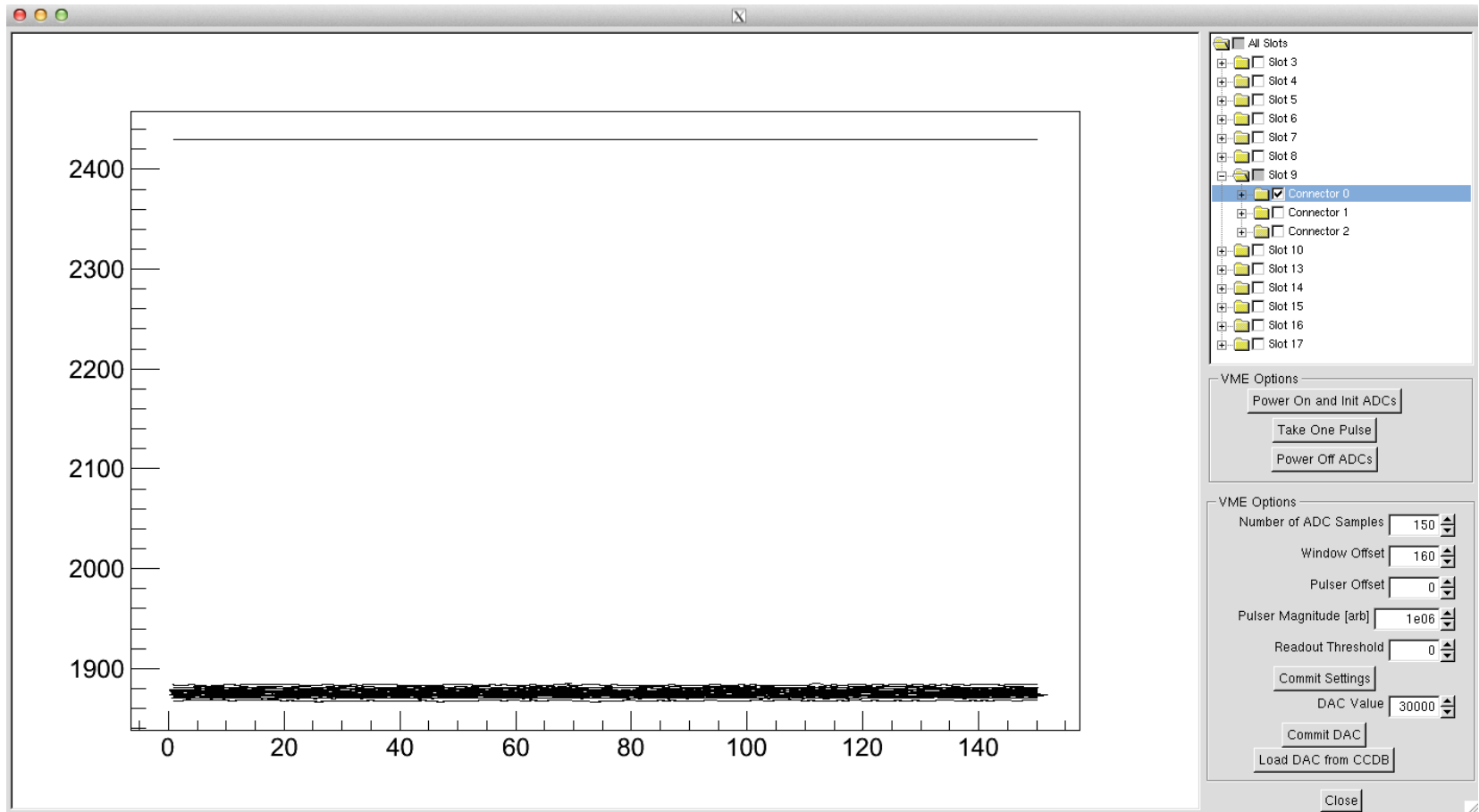
User can control fADC settings easily



LV is off so this is pretty boring...

# fa125 Test Bench

Can also select individual slots/connectors/channels



LV is off so this is pretty boring...

# fa125 Test Bench

I will be adding features as I have time. What is coming?

- Using the translation table for Crate/Slot/Channel->Det. channel lookup.
- Using the random trigger to look for real pulses.
- Setting the DAC values to a target baseline.

Suggestions welcome