DEEP UNDERGROUND
NEUTRINO EXPERIMENT

NP04 status and plans

A. Cervera
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NP04 status

- LAr filling started on March 8th

- Current level at ~2.7 m

IFIC middle			
0017 (5.497 m)	122.3 K	0018 (5.379 m)	121.7 K
0019 (5.143 m)	120.8 K	0020 (4.907 m)	119.8 K
0021 (4.671 m)	118.6 K	0022 (4.435 m)	117.5 K
0023 (4.199 m)	116.2 K	0024 (3.963 m)	114.7 K
0025 (3.727 m)	113.1 K	0026 (3.491 m)	111.0 K
0027 (3.255 m)	107.8 K	0028 (3.019 m)	103.2 K
0029 (2.783 m)	95.4 K	0030 (2.547 m)	87.2 K
0031 (2.311 m)	87.1 K	0032 (2.193 m)	87.2 K

| IFIC bottom			
0033 (2.075 m)	87.2 K	0034 (1.957 m)	87.2 K
0035 (1.839 m)	87.2 K	0036 (1.721 m)	87.1 K
0037 (1.603 m)	87.2 K	0038 (1.485 m)	87.2 K
0039 (1.367 m)	87.2 K	0040 (1.249 m)	87.2 K
0041 (1.131 m)	87.1 K	0042 (1.013 m)	87.2 K
0043 (0.895 m)	87.2 K	0044 (0.777 m)	87.1 K
0045 (0.659 m)	87.2 K	0046 (0.541 m)	87.2 K
0047 (0.423 m)	87.1 K	0048 (0.305 m)	87.2 K

NP04-CAM-401

Temperatures in APAs

LAr level

LAr purity
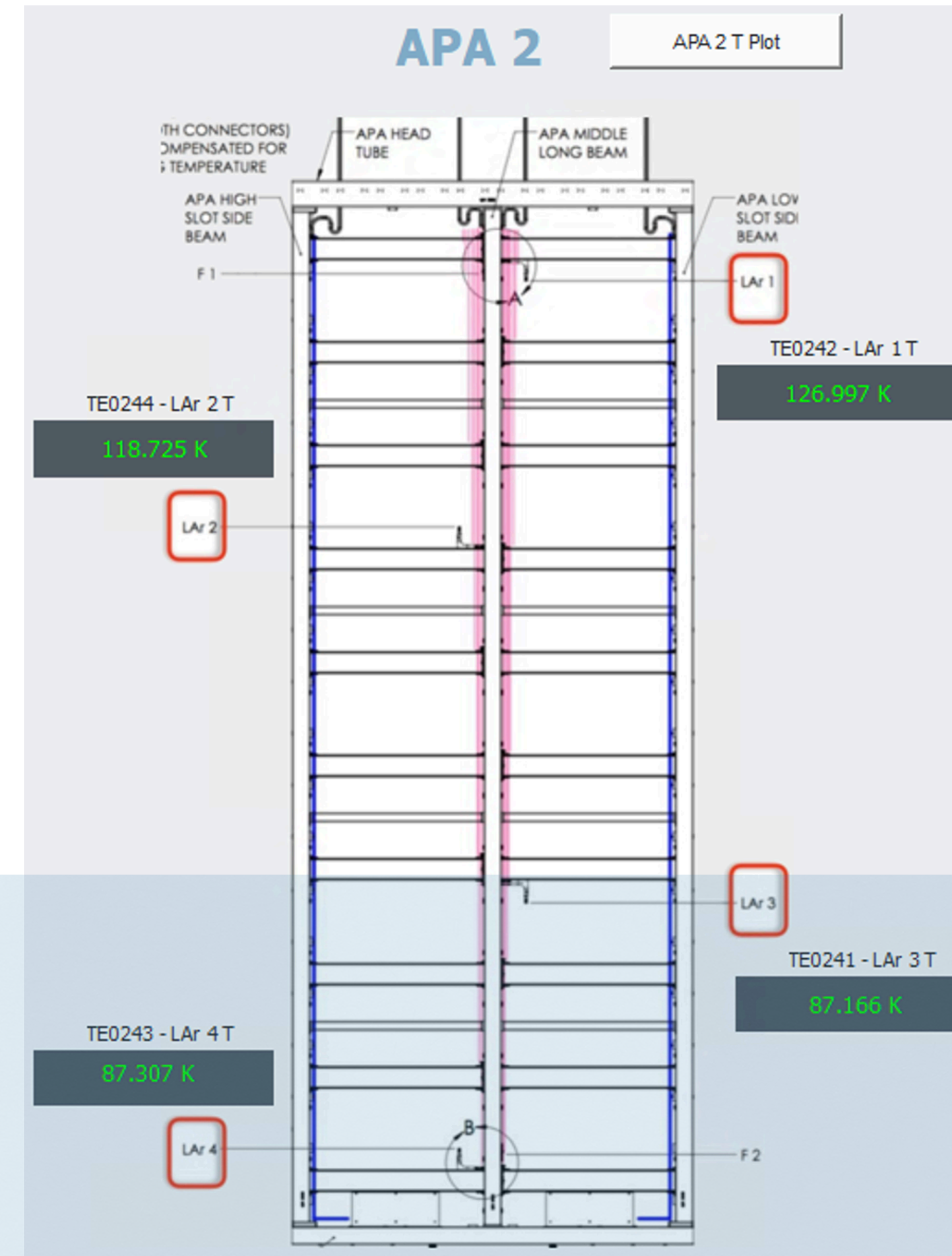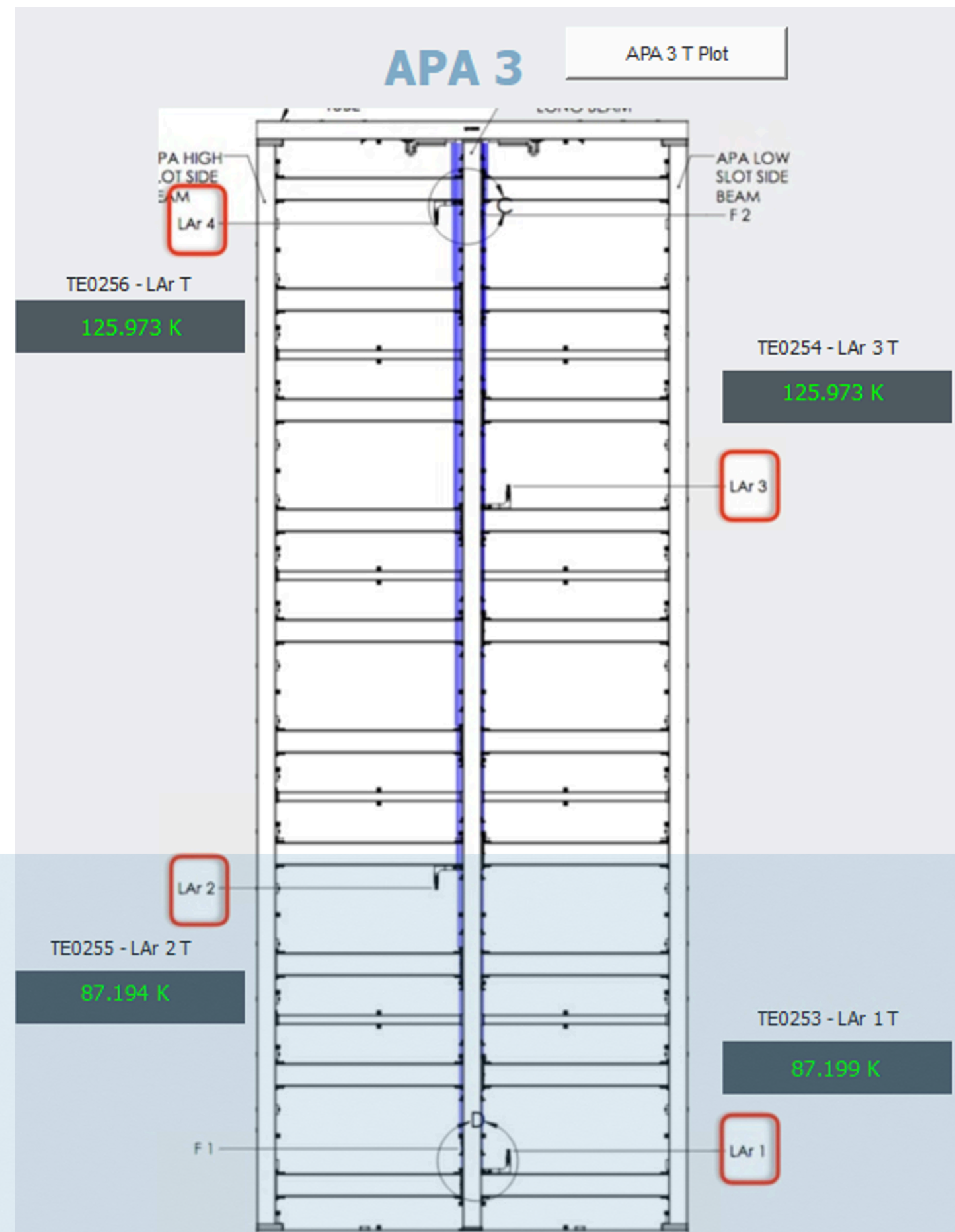
- First PrM immersed on Friday

- Very good purity for raw LAr

  - ~60 µs of electron lifetime, which corresponds to ~5 ppb O_2 equivalent.

Cathode_PrM_Bottom

Anode_PrM_Bottom
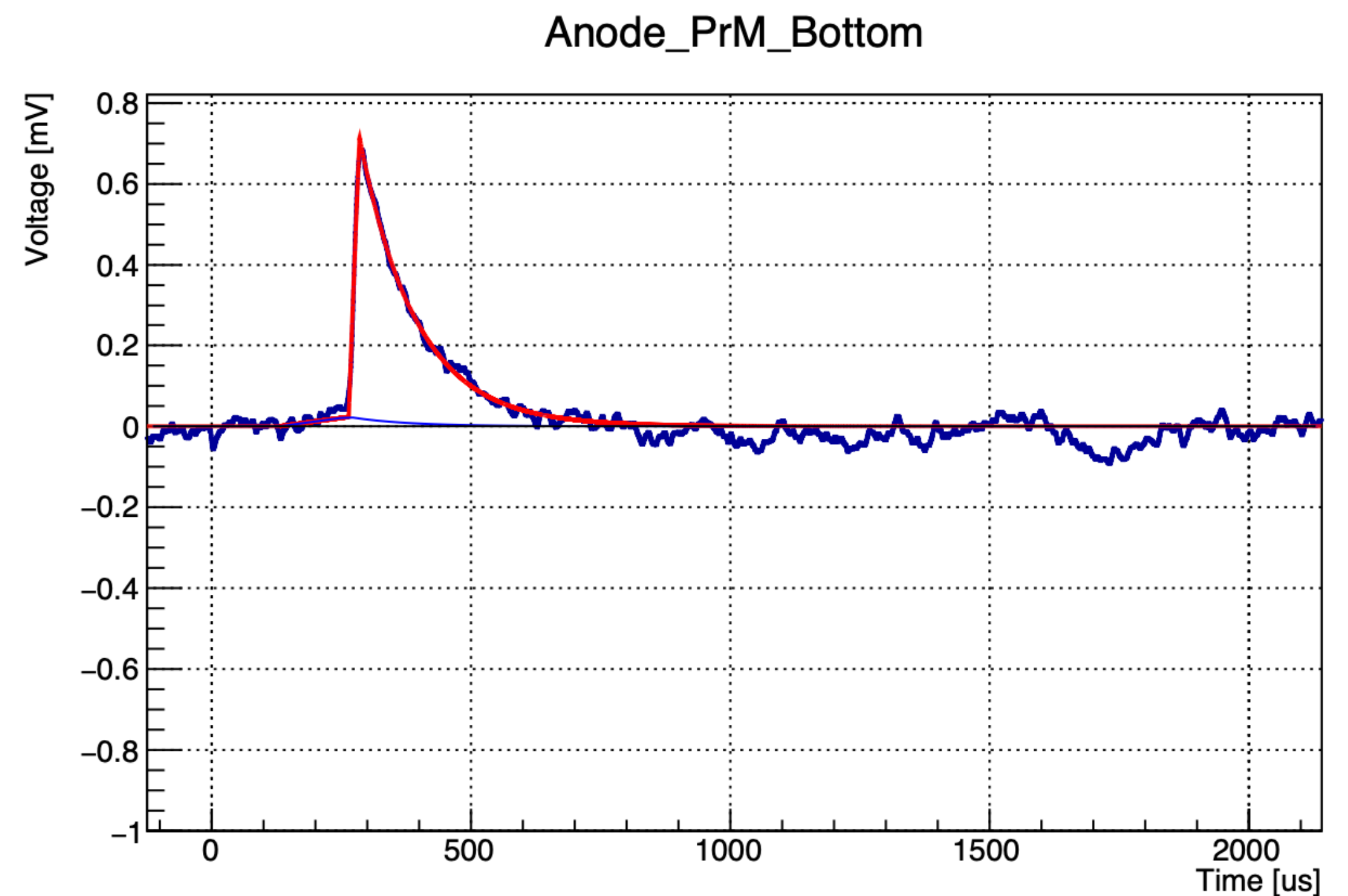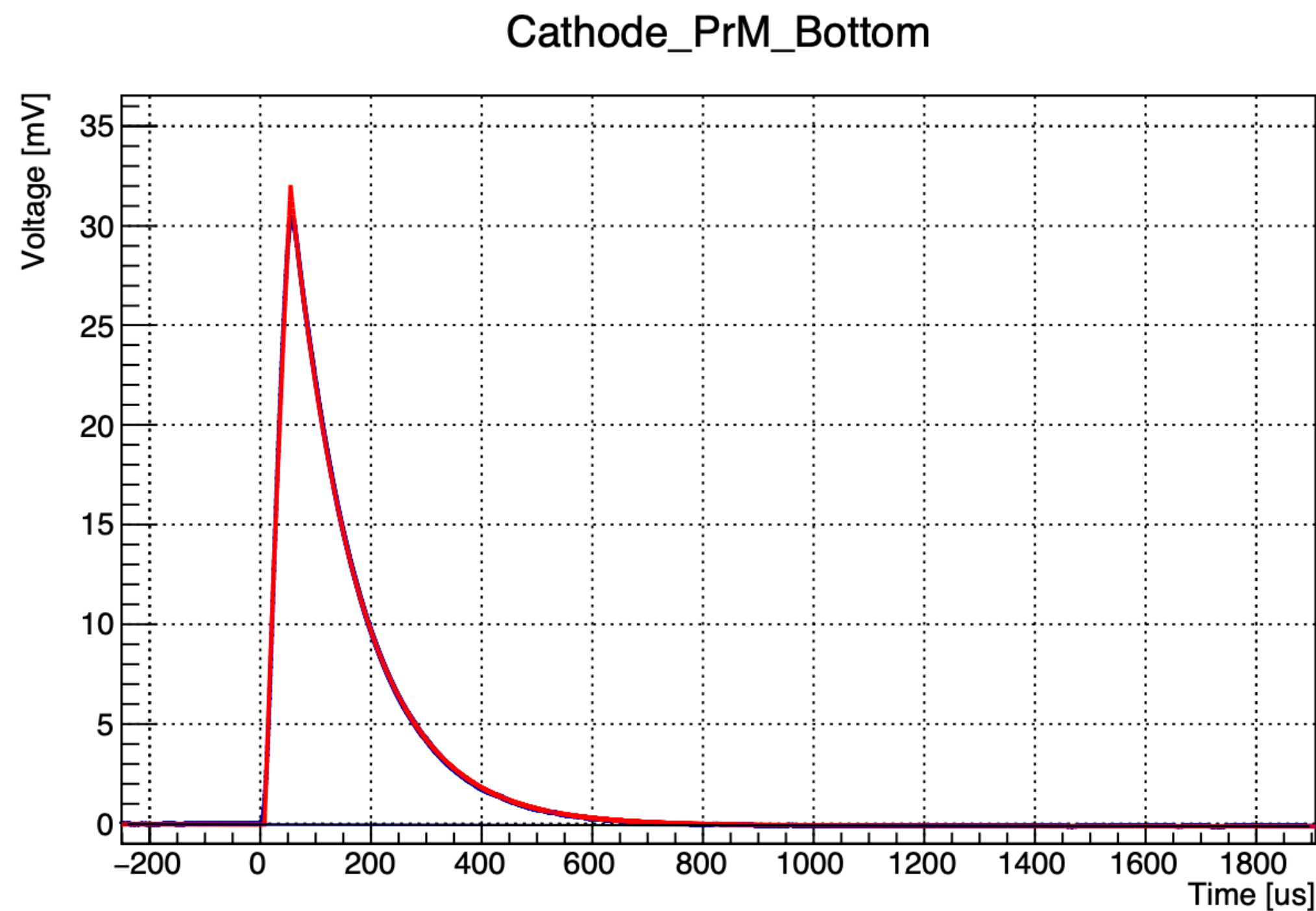
Next steps

- LAr filling will be completed in about 3 weeks (~ April 20th)

- Purification will take about 3 weeks

- Regular data taking from Mid May

- This is the preliminary beam schedule. Probably some updates at today's overlapping NP04 coordination meeting

https://ps-sps-coordination.web.cern.ch/ps-sps-coordination/schedules/ps/2024/v1.1.0/schedule_runs_v110_20240306_all.pdf
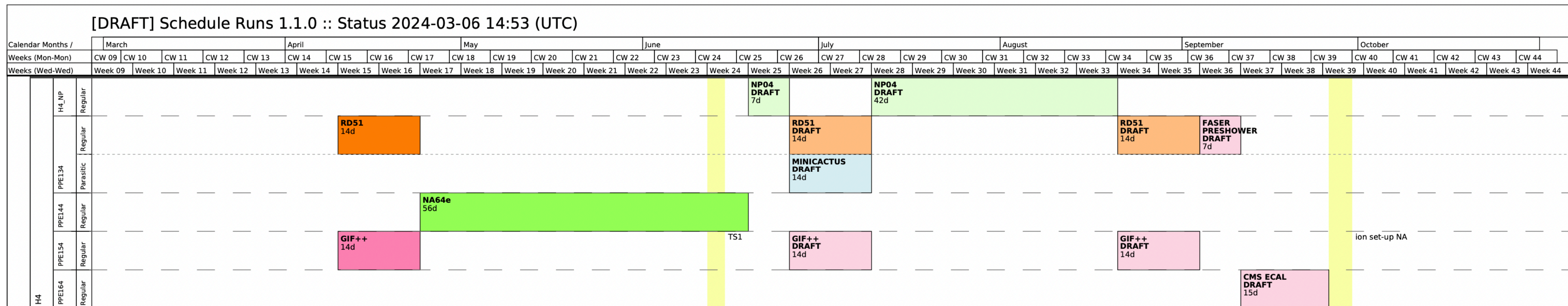
Preliminary run plan for PDS

- Preliminary run plan available with description of the different configurations

https://docs.google.com/document/d/1elJR-hDbb46q2zSVWW0pGjzX4X-2Mx0B2IIFZySZX-M/edit?usp=sharing

Study	trigger	February				March						April				purification			May		regular operation			June		
		purging				**cool**	**filling**									**purification**					**regular operation**					
IV curves and Vbd	none					d	d	d	d	d	d															
Test data in GAr	self																									
DCR	TI				d	d	d	d	d	d																
Light yield vs pur.	self												d	d	d	d										
Gain calibration	TI																			w	w	w	w	w		
Self-trigger efficiency	TI+self																									
Light yield map with laser	self														?			?								
Physics	self																									

d=daily, w=weekly, TI=Timing interface command

Forming a PDS team for NP04 data taking

- We had back in February a expert training week with Manuel as coach.

- This group of people has been active, developing several tools and helping with data and documentation

- The group will be extended with the arrival of new people already next week

- The existing documentation will be improved in order to facilitate new expert's training

- A list of tasks is being prepared and will be distributed soon

- Office space in building 892 has been requested

Access to all info, including documentation and tasks

https://docs.google.com/spreadsheets/d/14fpCjNZFnyq72wugfSGXdAcTrgFroA1AI2In7VeyZIY/edit#gid=0

		FEBRUARY
		1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
People at CERN		
Name	**Institution**	
Manuel Arroyave	FNAL	
Renan de Aguilar	UNICAMP	
Alessandro Minotti	MiB	
Anna Scanu	MiB	
Federico Galizzi	MiB	
Jacob Boza	CSU	
Fatma Boran	Indiana Uni.	
Anselmo Cervera	IFIC	
José Soto	IFIC	
Anna Balboni	Ferrara	

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Where are we with the PDS ?

- **Bias voltage studies ongoing (next slide)**

- **LED Calibration module:** standalone operation tested, integration with DAPHNE ongoing (see below).

- **Calibration trigger :** command sent by Timing Interface to both DAPHNE and the LED calibration module. DAPHNE responding (C. Benitez), almost there with calibration module.

- **Integration with DAQ**: Full DAPHNE configuration through DAQ to be released next week. Now its partially manual. We are already able to read day files. See later slides

- **Slow controls**: only DAPHNE power through DCS. Bias voltages, currents and temperatures accessible through DAQ OPmods

- **Online Monitoring:** . Through DAQ DQM, example available.

- **Self trigger data format and algorithms (see last slide)**

IV curves and breakdown voltage

Manuel
Federico
Renan
Ana
Alessandro

- All IV curves at room-T were recorded daily and breakdown voltage (V_{bd}) computed. Data saved for posterior analysis refinement. Ongoing comparison with V_{bd} measured in the labs

- **IV curves during cooldown and filling:** code by Manuel and others.

  - We took 2-3 measurements per day at the beginning and 1 measurement now

  - Detailed analysis ongoing

Temperature evolution during the first days

IV curves at various temperatures
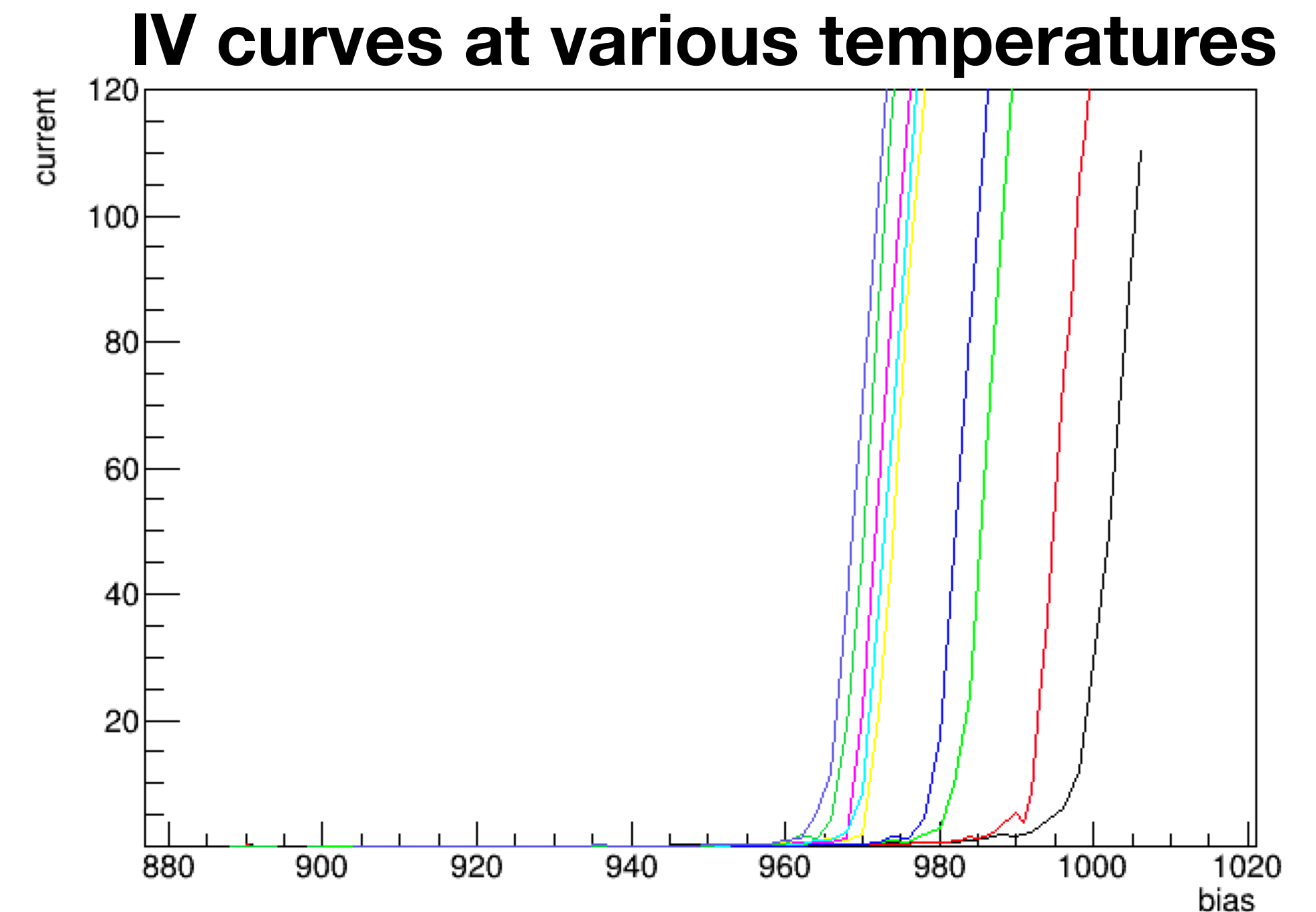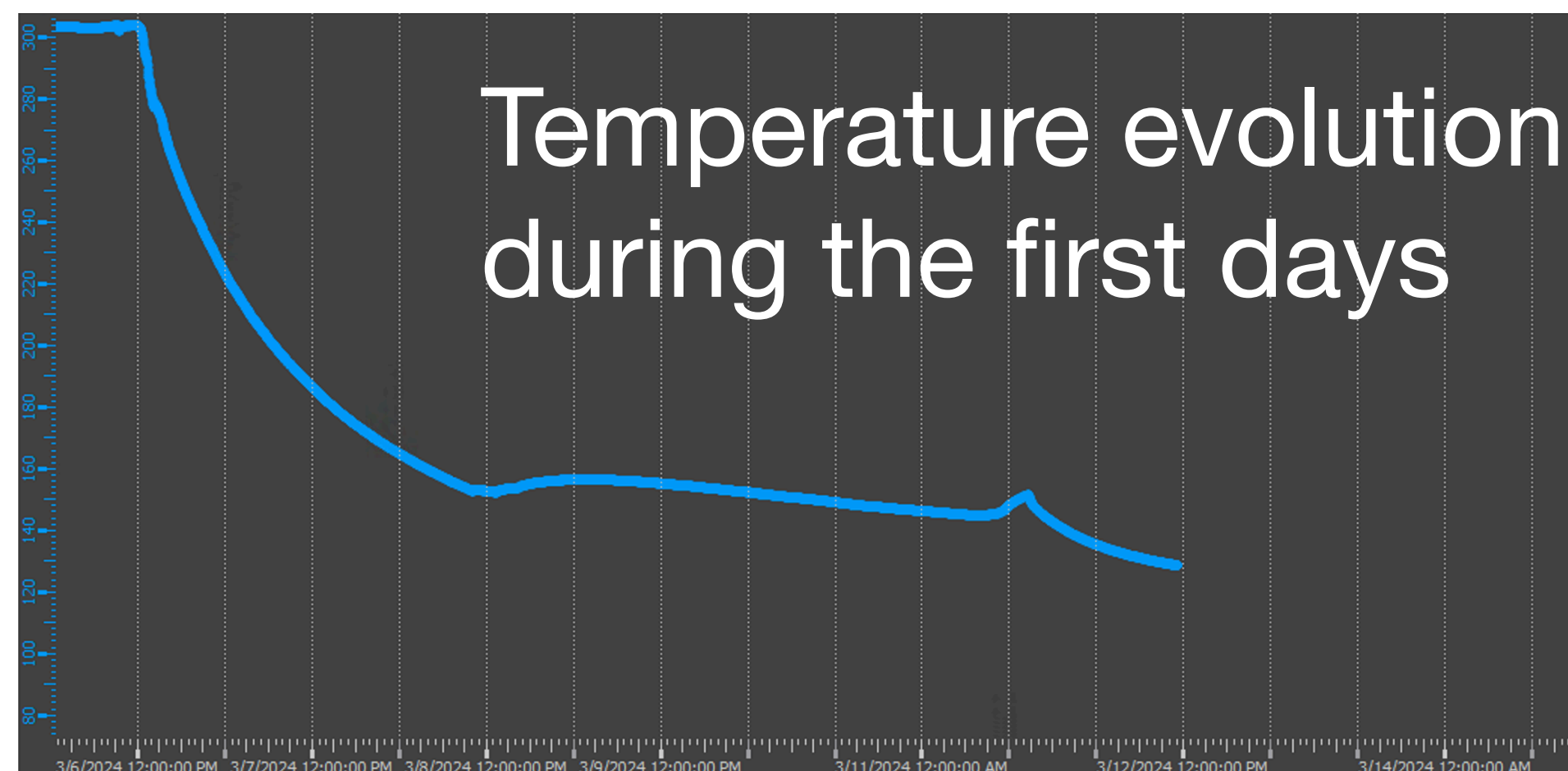
IV curves and breakdown voltage

R. De Aguiar, A. Balboni

- Ongoing detailed analysis by Renan and Anna with two different methods for estimation of V_{bd}

- Plan is to have an automatic script that creates a json file with the breakdown voltages

Integration with DAQ
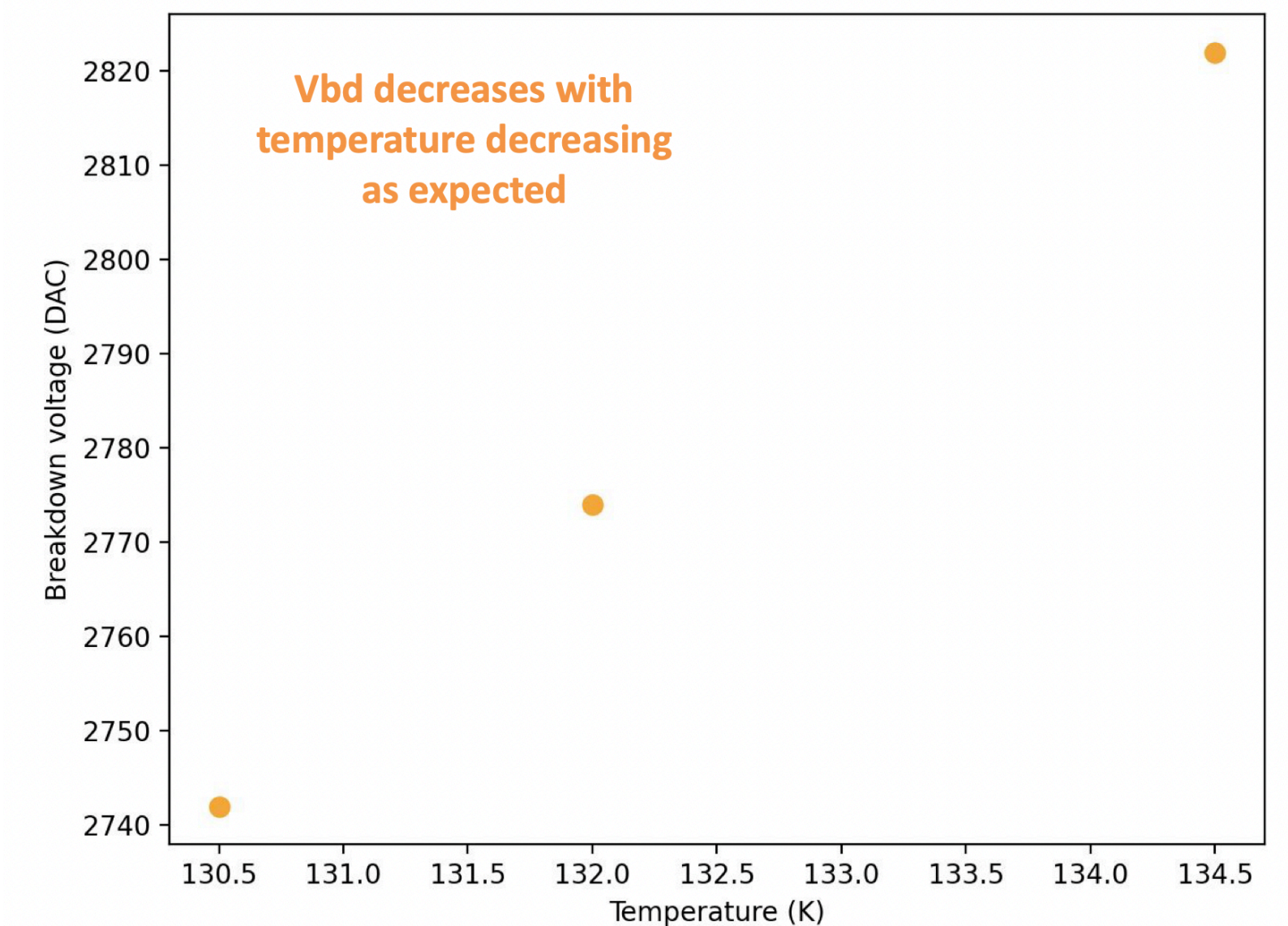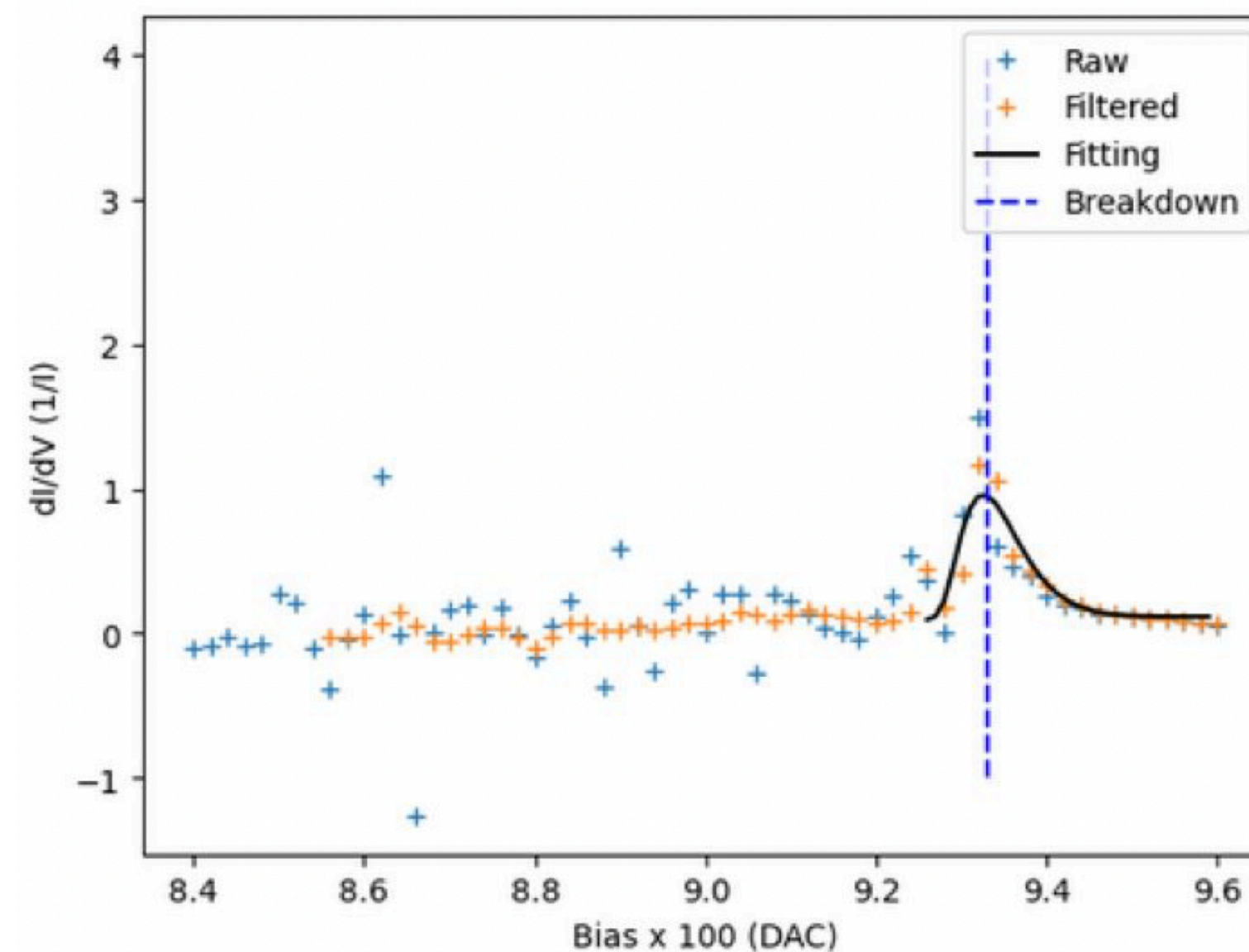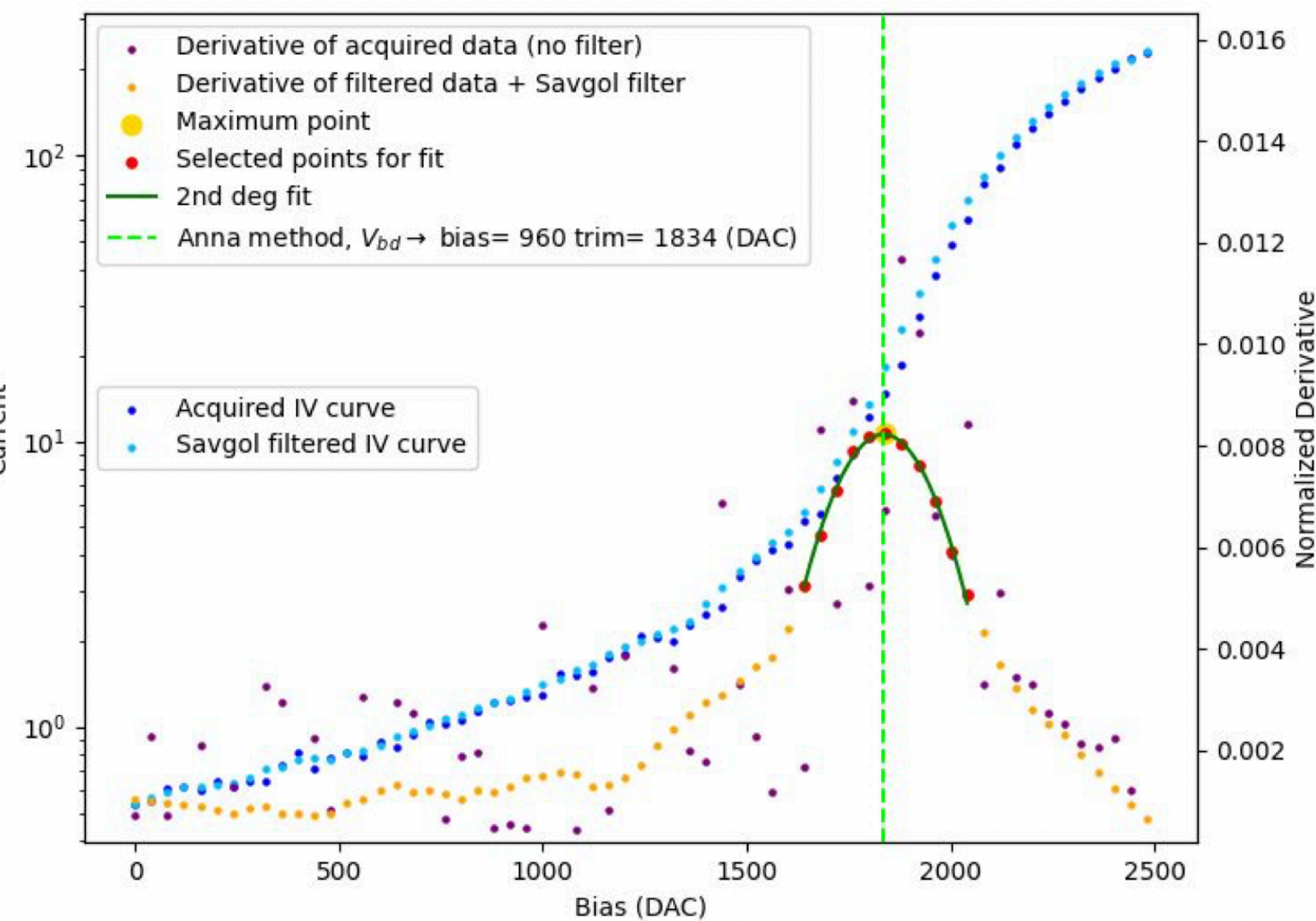
- We are currently able to take data with the DAQ

- Main DAPHNE parameters can already be configured through DAQ. The rest will be part of the DAQ release next week

DAQ files
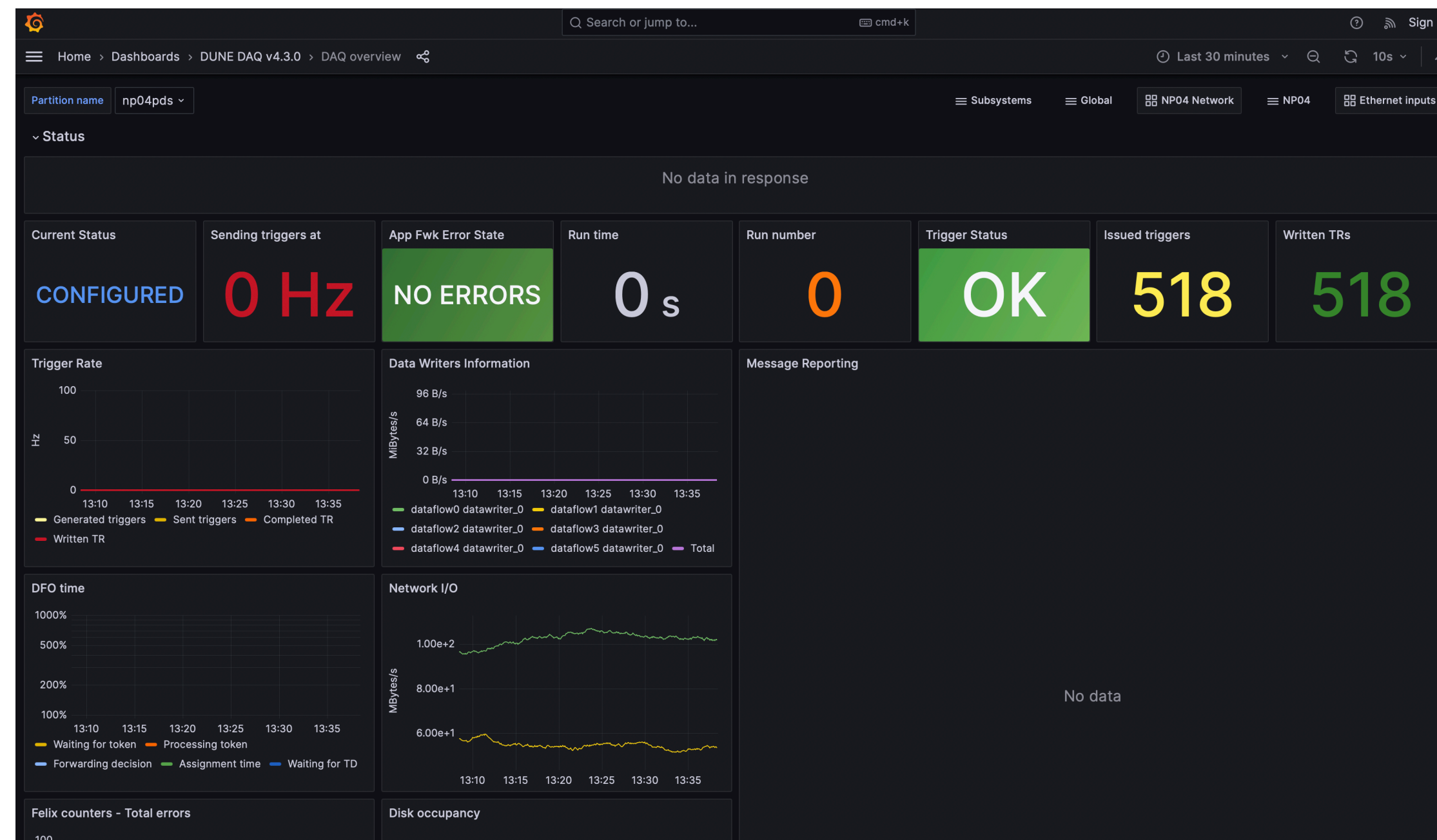
- Ongoing efforts (J. Soto et al.) to convert hdf5 files from DAQ into root files updating existing code from J. Calcutt, V. Popob y A. Oranday)

- So we are now able to take test runs and quickly look at the data

Cosmic coincidences with self trigger
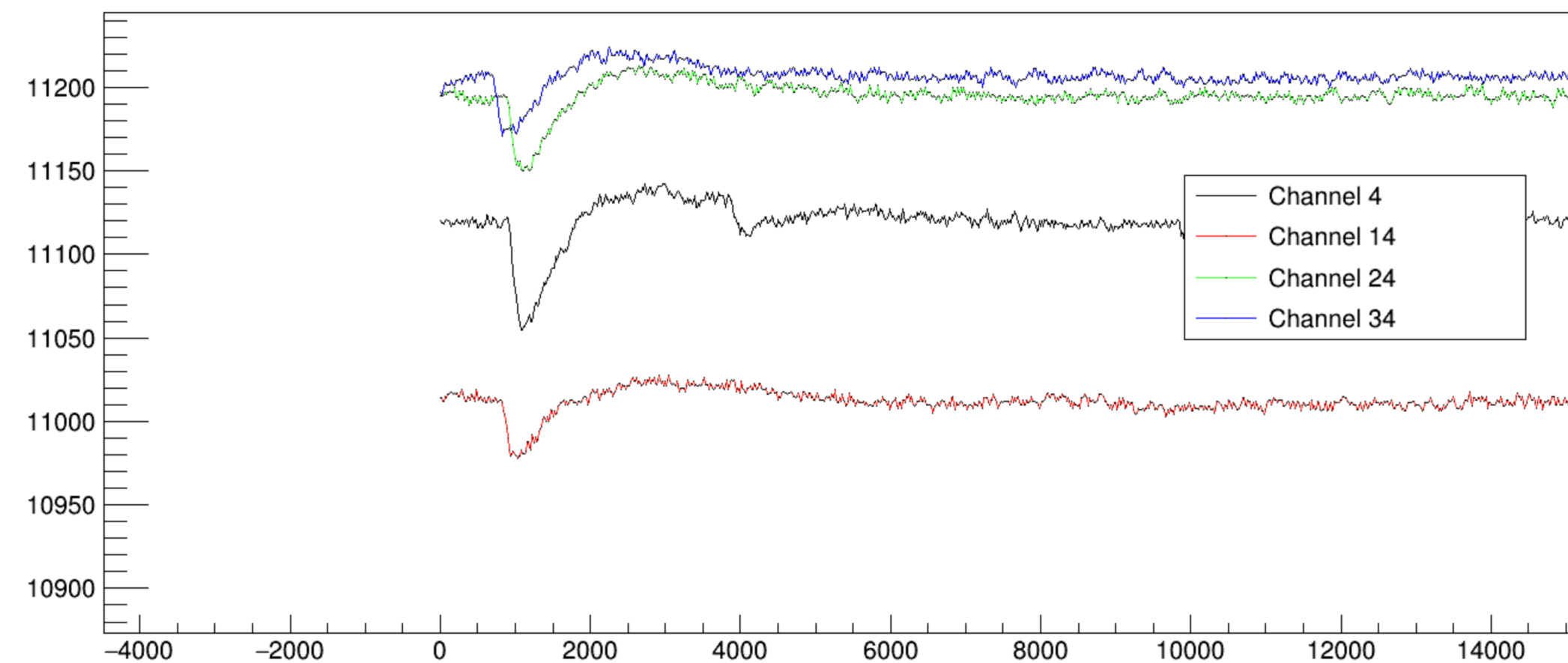
Timing command trigger at 5 kHz

Interesting runs

- We have started to fill a run list with interesting runs for tests
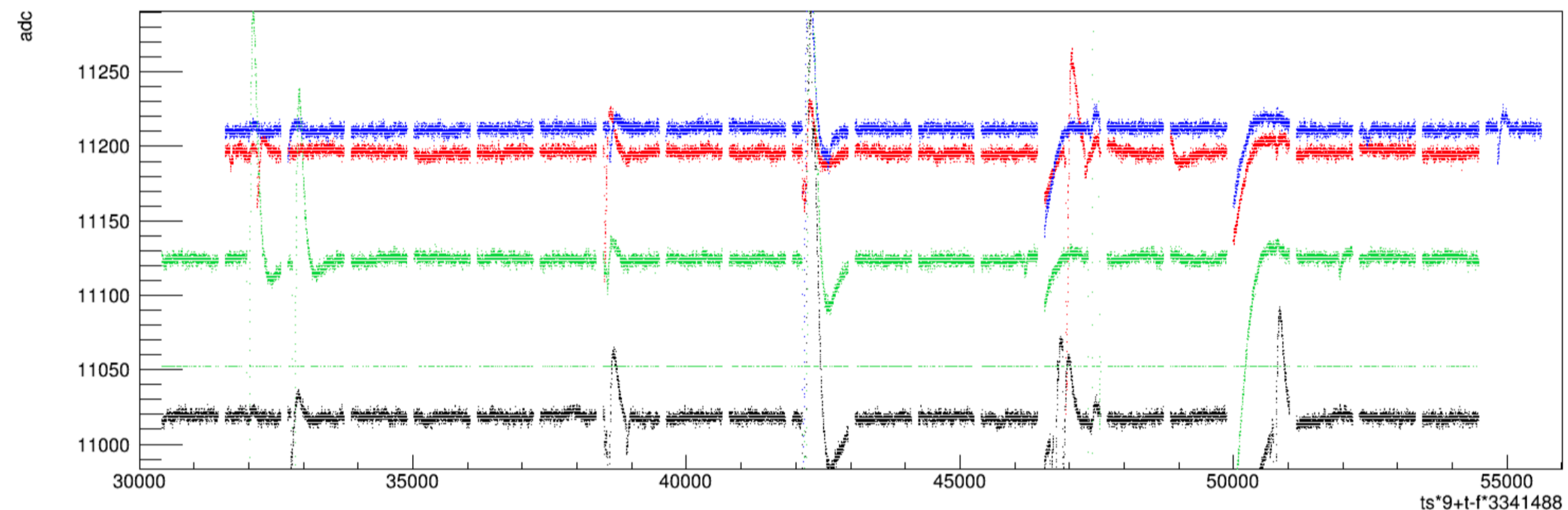
Run number	Start time	End time	Shifter	PDS expert	# triggers	Configuration	Issues/Comments
24496	2024-03-11 20:44		marroyav			cosmics. All modules biased. (which endpoints were active?)	Signal only in 20 channels from slots 9,11,13
24606			acervera			test with TI command at 5000 Hz in ch 0-7 in endpoint 113. SiPM biased	
24606			acervera			test with TI command at 5000 Hz in ch 0,2,5,7 in endpoint 113. SiPM biased	
24608			acervera		416	test with TI command at 500 Hz in ch 0,2,5,7 in endpoint 113. No bias. Constant offset at 11000	
24609			acervera		211	test with TI command at 5000 Hz in ch 0,2,5,7 in endpoint 113. No bias. Constant offset at 11000	
24610			acervera		214	test with TI command at 10000 Hz in ch 0,2,5,7 in endpoint 113. No bias. Constant offset at 11000	
24619			acervera		62	test with TI command at 5000 Hz in ch 0-7 in endpoint 113. No bias. With variable offset (1468+(ch-4)*30)	
24620			acervera		86	test with TI command at 5000 Hz in ch 0-7 in endpoint 113. No bias. With variable offset, higher slope (1100+(ch-4)*150)	

Data format

I. Lope, M. Arroyave et al.

- DAQ group is asking for the definitive self trigger frame format

- This is the current space allocation with 4 32-bits words for the header

- Ongoing discussion to increase it in order to accommodate up to five peaks

	K/D	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	Link						Slot						CrateID										DetID						Version			
1	0000	Timing master Time stamp [31:0]																															
2	0000	Timing master Time stamp [63:32]																															
3	0000	Time_Pulse_UB (10 bits, so 6 high order bits are 0)																Time_Peak (8 bits, so 2 high order bits are 0)										Channel				
4	0000	Max_Peak																Time_Pulse_0B (11 bits, so 5 high order bits are 0)														
5	0000	ADC([3:0],2)				ADC([13:0],1)												ADC([13:0],0)															
6	0000	ADC([7:0],4)								ADC([13:0],3)								ADC([13:4],2)															
7	0000	ADC([11:0],6)												ADC([13:0],5)				ADC([13:8],4)															
8	0000	ADC([1:0],9)		ADC([13:0],8)												ADC([13:0],7)														ADC([13:12],6)			
9	0000	ADC([5:0],11)					ADC([13:0],10)											ADC([13:2],9)															
10	0000	ADC([9:0],13)							ADC([13:0],12)									ADC([13:6],11)															
11	0000	ADC([13:0],15)										ADC([13:0],14)						ADC([13:10],13)															
...	0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
446	0000	ADC([3:0],1010)				ADC([13:0],1009)												ADC([13:0],1008)															
447	0000	ADC([7:0],1012)								ADC([13:0],1011)								ADC([13:4],1010)															
448	0000	ADC([11:0],1014)												ADC([13:0],1013)				ADC([13:8],1012)															
449	0000	ADC([1:0],1017)		ADC([13:0],1016)												ADC([13:0],1015)														ADC([13:12],1014)			
450	0000	ADC([5:0],1019)					ADC([13:0],1018)											ADC([13:2],1017)															
451	0000	ADC([9:0],1021)							ADC([13:0],1020)									ADC([13:6],1019)															
452	0000	ADC([13:0],1023)										ADC([13:0],1022)						ADC([13:10],1021)															
453	0	TBD				Number_Peaks_0B				Number_Peaks_UB				Charge[19:0]																			

Next steps

- With the tools for reading hdf5 files we can now start testing channel mapping and DCR

- We plan to integrate the LED calibration system in time for preliminary LED calibrations in three weeks (once detector is filled)

- Self trigger testing will come later (in about 5 weeks), but need to be prepared in advance

- C. Touramanis has been appointed run coordinator. Information about shifts will be available soon

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