

WA105 

# 3x1x1 operations: Status and plans

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+ help and feedback from many people: **Building 182 team (ETHZ, CERN, IFAE, CIEMAT, LAPP), Edoardo and Philippe (CEA Saclay), Slavic and Dario (IPNL)**

# Summary of activities

<p><b>25</b></p>	<p><b>26</b></p>	<p><b>27</b></p> <ul style="list-style-type: none"> <li>• Insulation space at atmospheric</li> <li>• <b>Capacitance measurements to see if the short is still present</b></li> <li>• <b>Open and dismount the HV setup dewar</b></li> </ul>	<p><b>28</b></p> <ul style="list-style-type: none"> <li>• <b>Grid pulsing</b></li> <li>• <b>Anode pulsing to verify we do not have additional dead channels</b></li> </ul>	<p><b>29</b></p> <p>Ramp up LEMs in liquid (grid floating)</p>
<p><b>2</b></p> <p>Change to the 100 kV PSU and with FFS terminated to ground power the cathode</p>	<p><b>3</b></p> <ul style="list-style-type: none"> <li>• <b>Test of CRP motorisation regulation system and feedback from level meter, and come back to the previous position</b></li> <li>• <b>PMT calibration measurements</b></li> </ul>	<p><b>4</b></p> <ul style="list-style-type: none"> <li>• <b>Check if the Grid-LEM short circuit has disappeared</b></li> </ul>	<p><b>5</b></p> <ul style="list-style-type: none"> <li>• <b>Test of CRP motorisation regulation system when the level decreases</b></li> <li>• <b>Capacitance measurements in GAR</b></li> <li>• <b>Progressively capacitance measurements while CRP is moving and comparison with the level meters values</b></li> </ul>	<p><b>6</b></p> <ul style="list-style-type: none"> <li>• <b>Test of CRP motorisation regulation system when the level decreases</b></li> </ul>
<p><b>9</b></p> <ul style="list-style-type: none"> <li>• <b>Capacitance measurements in GAR</b></li> <li>• <b>Progressively capacitance measurements while CRP is moving and comparison with the level meters values</b></li> </ul>	<p><b>10</b></p>	<p><b>11</b></p>	<p><b>12</b></p> <ul style="list-style-type: none"> <li>• <b>Check if the Grid-LEM short circuit has disappeared</b></li> </ul>	<p><b>13</b></p>

Ramp up LEMs in liquid (grid floating)

LEM HV test at the nominal LAr level

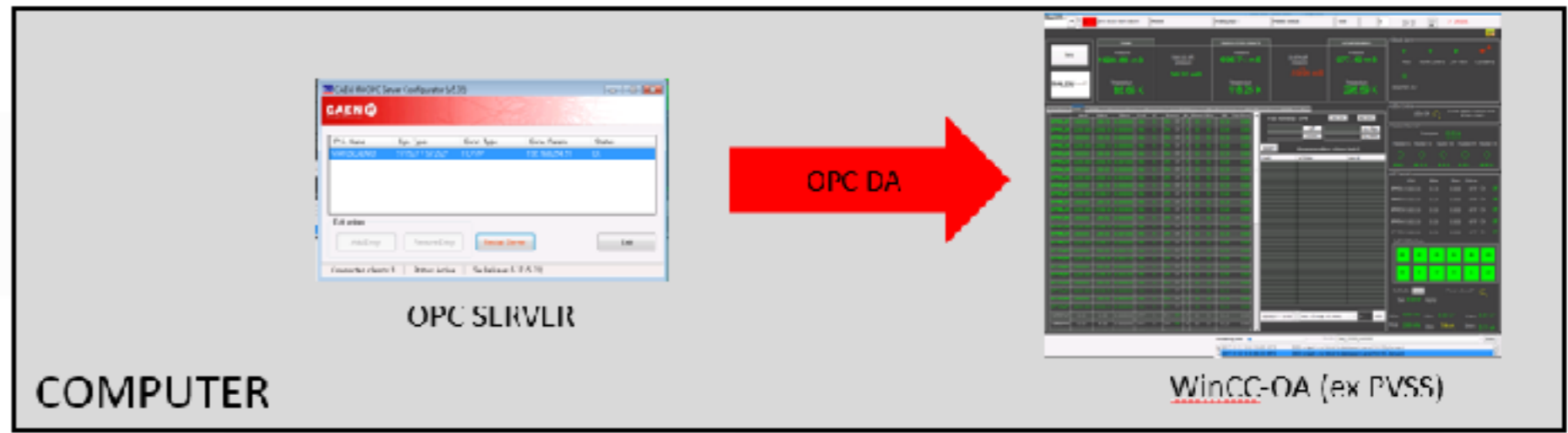
# Summary of last week

Issue/Task	Strategy followed	Status/Conclusion
<p><b>Cathode trips and cathode current fluctuations</b></p>	<p>We change the 300kV power supply to the 100kV power supply which has a better resolution and ethernet connection.</p>	<p>After solving the issues with the male connector which is inserted in the HVFT (did not fitted with the initial diameter) we are ready to perform the test.</p>
<p><b>Communication problem CAEN-PVSS:</b> When there is too much information in the network the middleware OPC Server v5.32 sends 0 for each value in OPC to WinCC-OA.</p>	<p>We propose to CAEN that when this happens instead of sending 0 the middleware does not send anything.</p>	<p>In progress, we are discussing with CAEN to find the best solution</p>
<p><b>Feedback from CRP motorisation system</b></p>	<ul style="list-style-type: none"> <li>• Movement in intervals of 0.5 mm and cross-check with capacitance measurements.</li> <li>• Tracking system, in case of a sudden reduction of the level</li> </ul>	<ul style="list-style-type: none"> <li>• The comparison between LM-CRP and motors feedback was consistent except for 2 LM.</li> <li>• The comparison with the capacitance measurements is still under investigation.</li> <li>• The tracking system works as expected, and when we reduce the level the CRP adjusts automatically to the defined</li> </ul>

# Summary



MAINFRAME

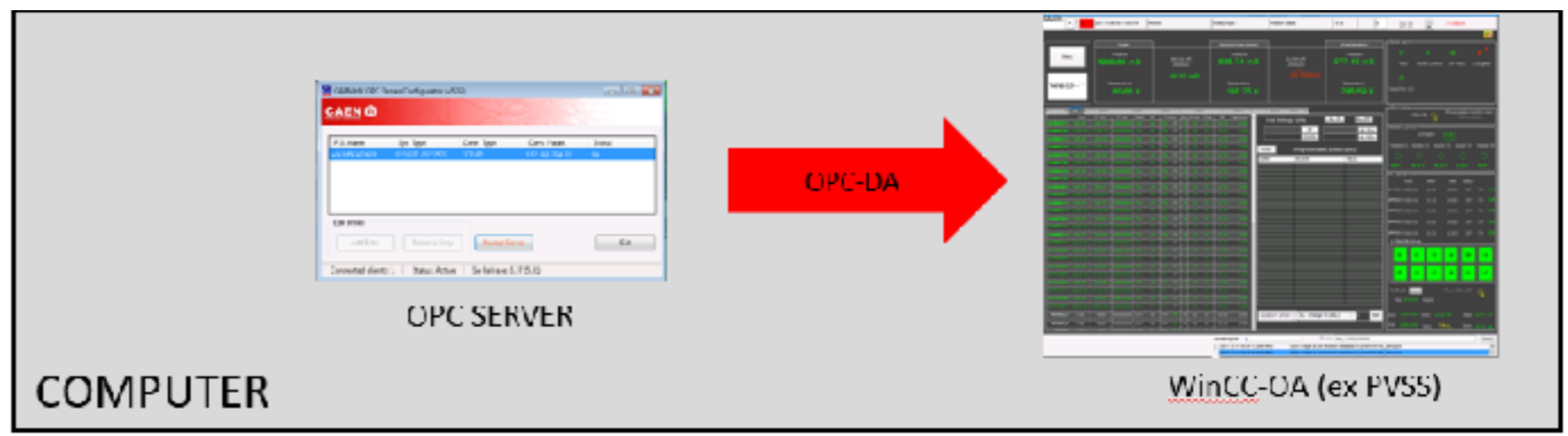


COMPUTER

WinCC-DA (ex PVSS)



MAINFRAME



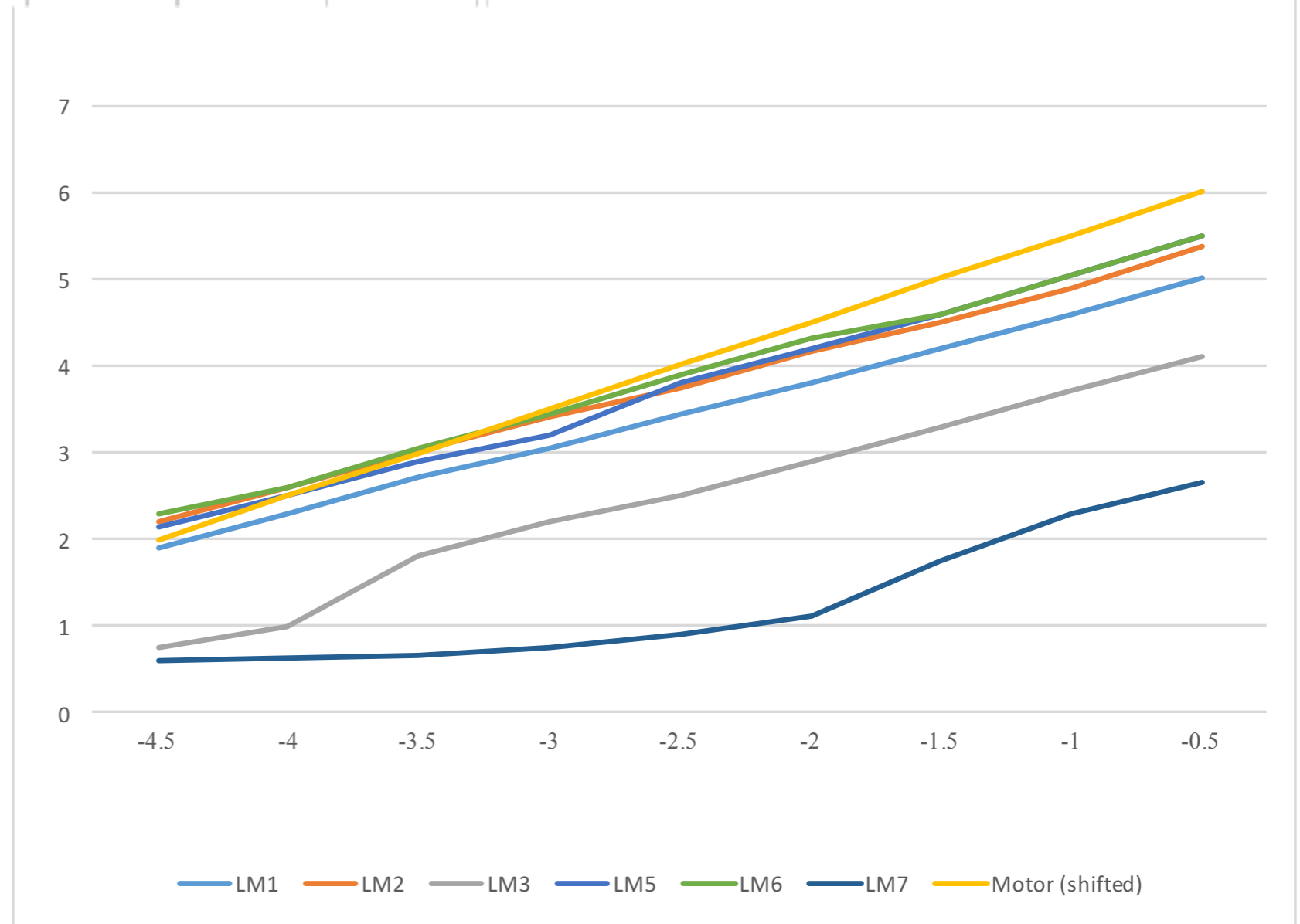
COMPUTER

WinCC-DA (ex PVSS)

# Summary

Motor	LM1	LM2	LM3	LM5	LM6	LM7
-4.5	1.9	2.2	0.76	2.15	2.3	0.6
-4	2.3	2.6	1	2.5	2.6	0.62
-3.5	2.7	3.02	1.8	2.91	3.05	0.67
-3	3.05	3.4	2.2	3.2	3.44	0.75
-2.5	3.45	3.73	2.5	3.8	3.9	0.9
-2	3.8	4.15	2.9	4.2	4.3	1.12
-1.5	4.2	4.5	3.3	4.6	4.6	1.75
-1	4.6	4.9	3.7	5.05	5.05	2.3
-0.5	5	5.37	4.11	5.5	5.5	2.66

Chart Title



**Results obtained on Tuesday  
3rd October**  
**Similar results obtained in the  
tests performed after on  
October 5th (LAPP people will  
update the final result)**

# Summary

Issue	Strategy followed	Status/Conclusion
<p style="text-align: center;"><b>Short-circuit between the LEMs and the grid</b></p>	<p><b>October, 3rd:</b> Movement of the CRP, maintaining the same liquid argon level.</p>	<p>The short-circuit was still present</p>
	<p><b>October, 5th:</b> Movement of the CRP and reduction of the level in the process</p>	<p>The short-circuit disappeared . It might be related to the liquid argon level (something on the surface?)</p>

[http://lbnodemo.ethz.ch:2500/3x1x1/171009\\_144232/short\\_larlevel\\_table.jpg](http://lbnodemo.ethz.ch:2500/3x1x1/171009_144232/short_larlevel_table.jpg)

Date	08 sept	08 sept	13 sept	14 sept	15 sept	05 oct	06 oct
Situation	Before increasing LAr level	After 2 mm LAr increase	After 2 mm LAr increase	After 2.3 mm LAr increase	Further LAr increase	Alter CRP movements and Lar adjustments	Further Lar adjustments
Level meter AI0005 (mm)	17,6	19,5	21,5	23,6	24,6	19,3	18,7
LEM7-Grid capacitance (pF)	181	201	280	273		197	187
Grid trip voltage (kV)	5	2	1				
Short circuit LEM4-GRID	NO	NO	16,4 ohm	16,4 ohm	16,4 ohm	NO	NO



# Summary

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	<p><b>October, 5th:</b> Movement of the CRP and reduction of the level in the process</p>	<p>The short-circuit disappeared . It might be related to the liquid argon level (something on the surface?)</p>
	<p>Pulsing of the grid</p>	<ul style="list-style-type: none"> <li>• No additional problematic channels</li> <li>• Slightly higher signal on channels 160-192</li> </ul>
	<p>Ramp up the grid</p>	<p>We reached between 4.2-4.5 kV on the grid using the connection on the south flange*</p> <p>We repeat the test after lowering the level 0.5 mm and no difference observed</p>

\*Several issues found in the process: in the first attempt we were not powering the right connection and later, we realised one of the cables going through the 100M $\Omega$  resistor was damaged.

# Summary

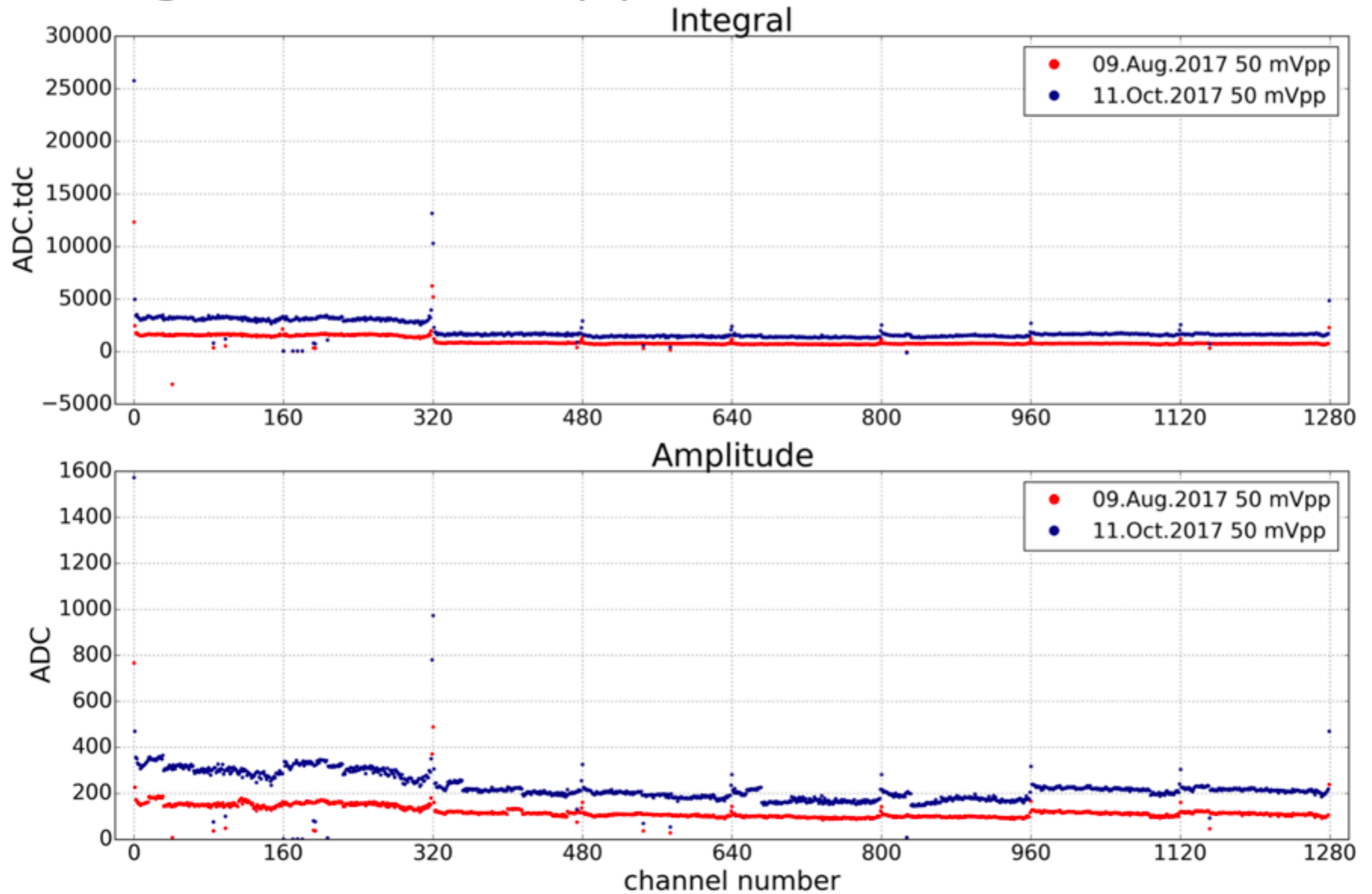
## Problematic channels

	Flange pulsing June	Flange pulsing August	Grid pulsing August	Flange pulsing September	Grid pulsing September	Grid pulsing October
View 0	41	41	41	41	41	
	85	85	85	85	85	85
	98	98	98	98	98	98
				159		
	160	160	160	160	160	160
	170	170	170	170	170	170
	175	175	175	175	175	175
	180	180	180	180	180	180
	192	192	192	192	192	192
	194	194	194	194	194	194
				207	207	207
	312					
View 1	154	154	154	154	154	
	225	225	225	225	225	225
	254	254	254			254
				282		
	357					
	507	507	507	507	507	507
	831	831	831	831	831	831
	956					

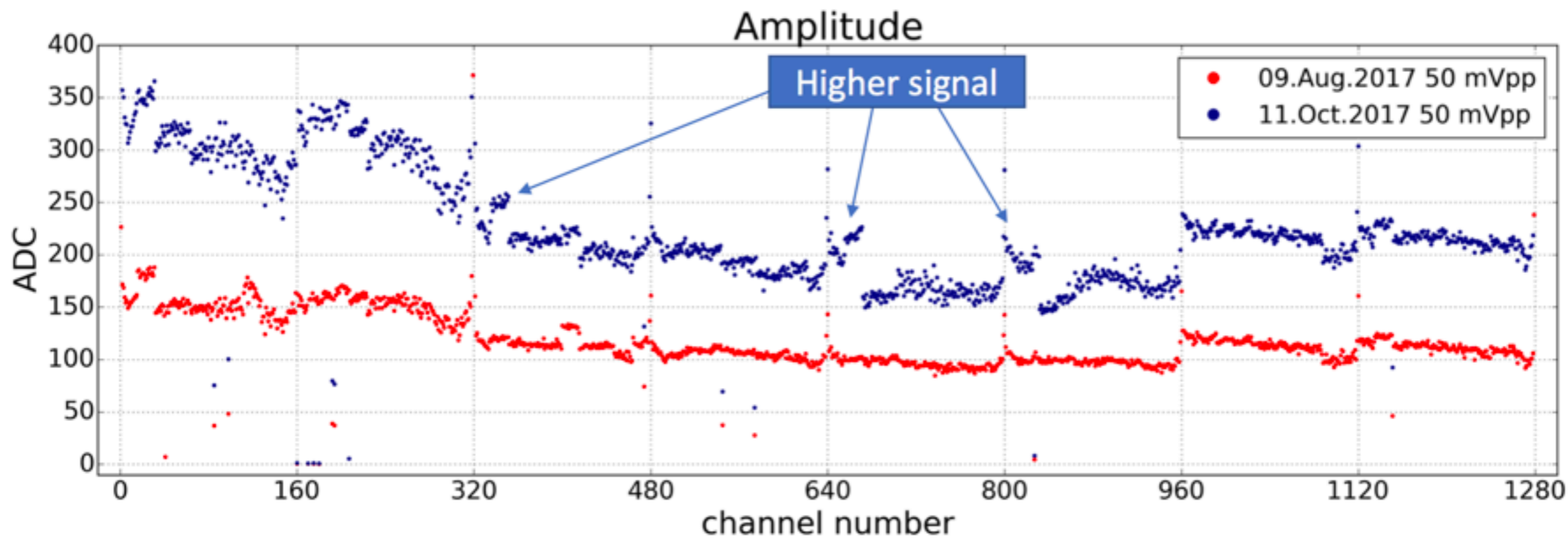
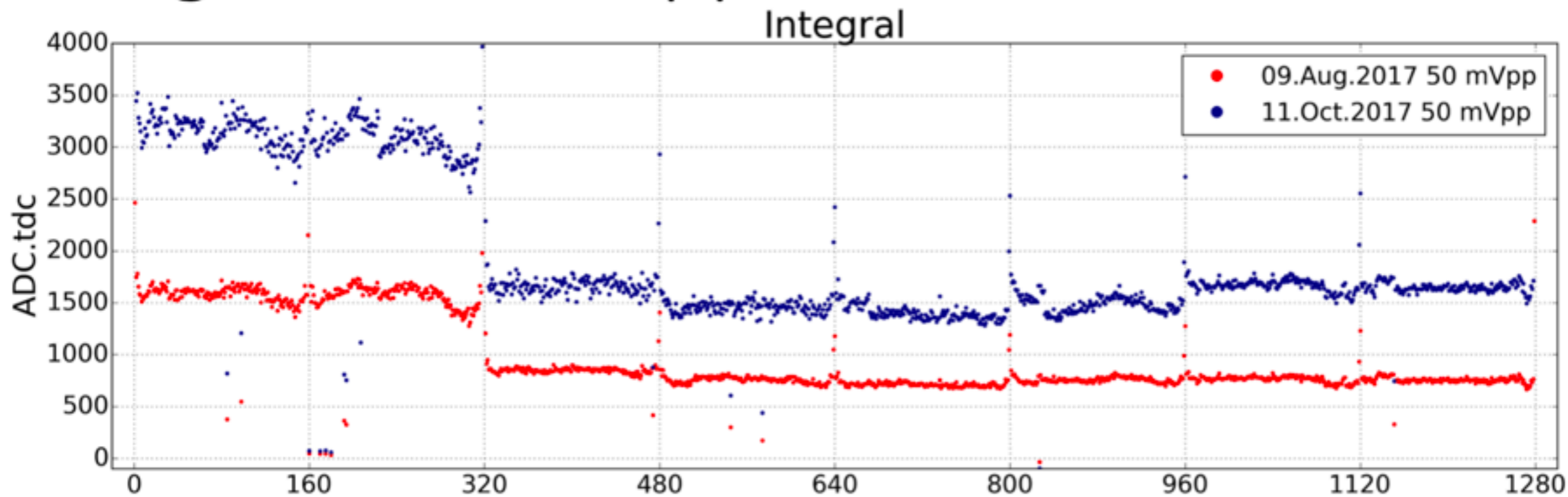
- **Problematic channel:** channel whose integral or amplitude <50% of average within that chimney for flange pulsing or within that LEM for grid pulsing
- **Dead channel:** sees no or negative signal



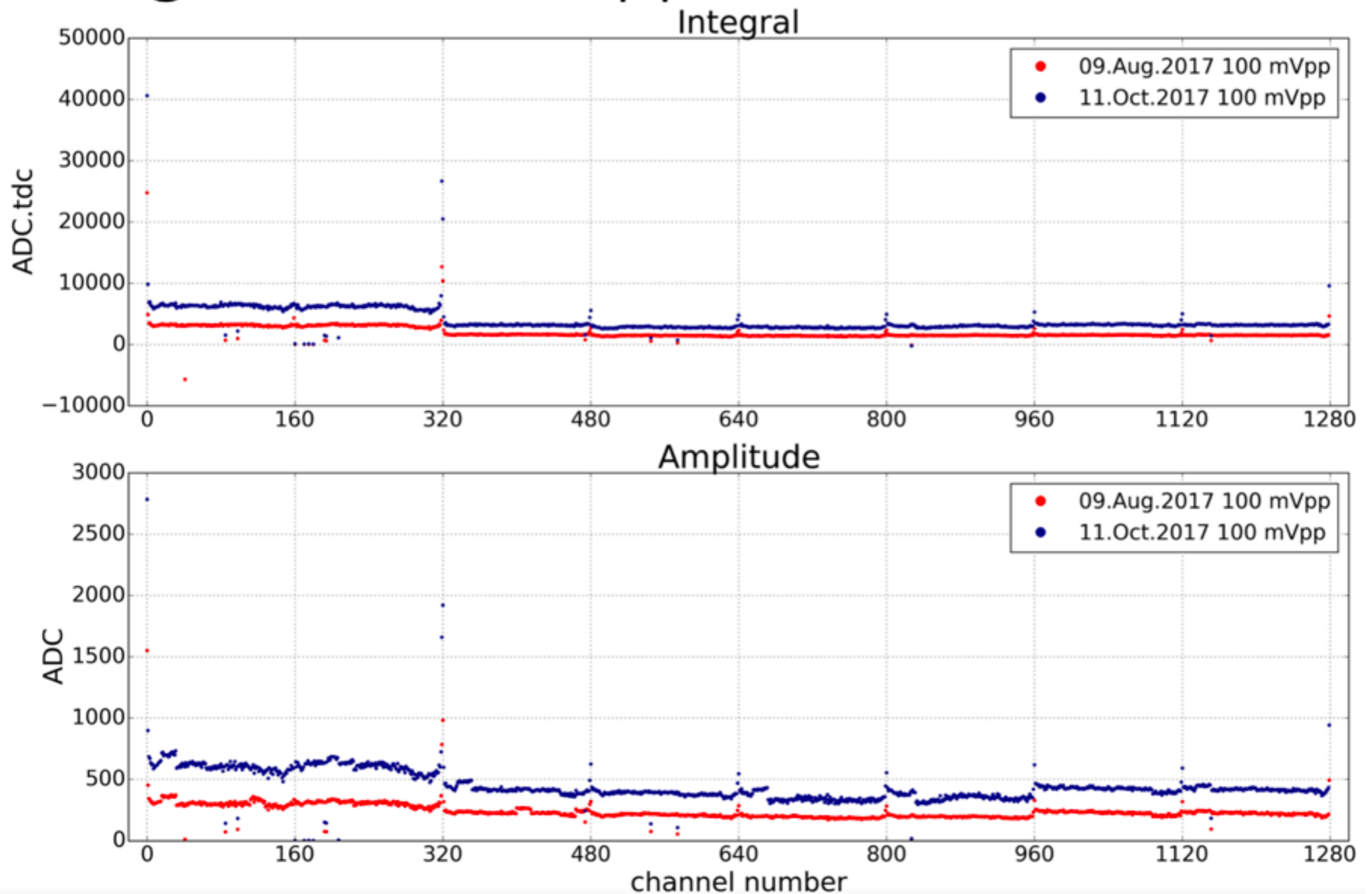
# Pulsing with 50 mVpp



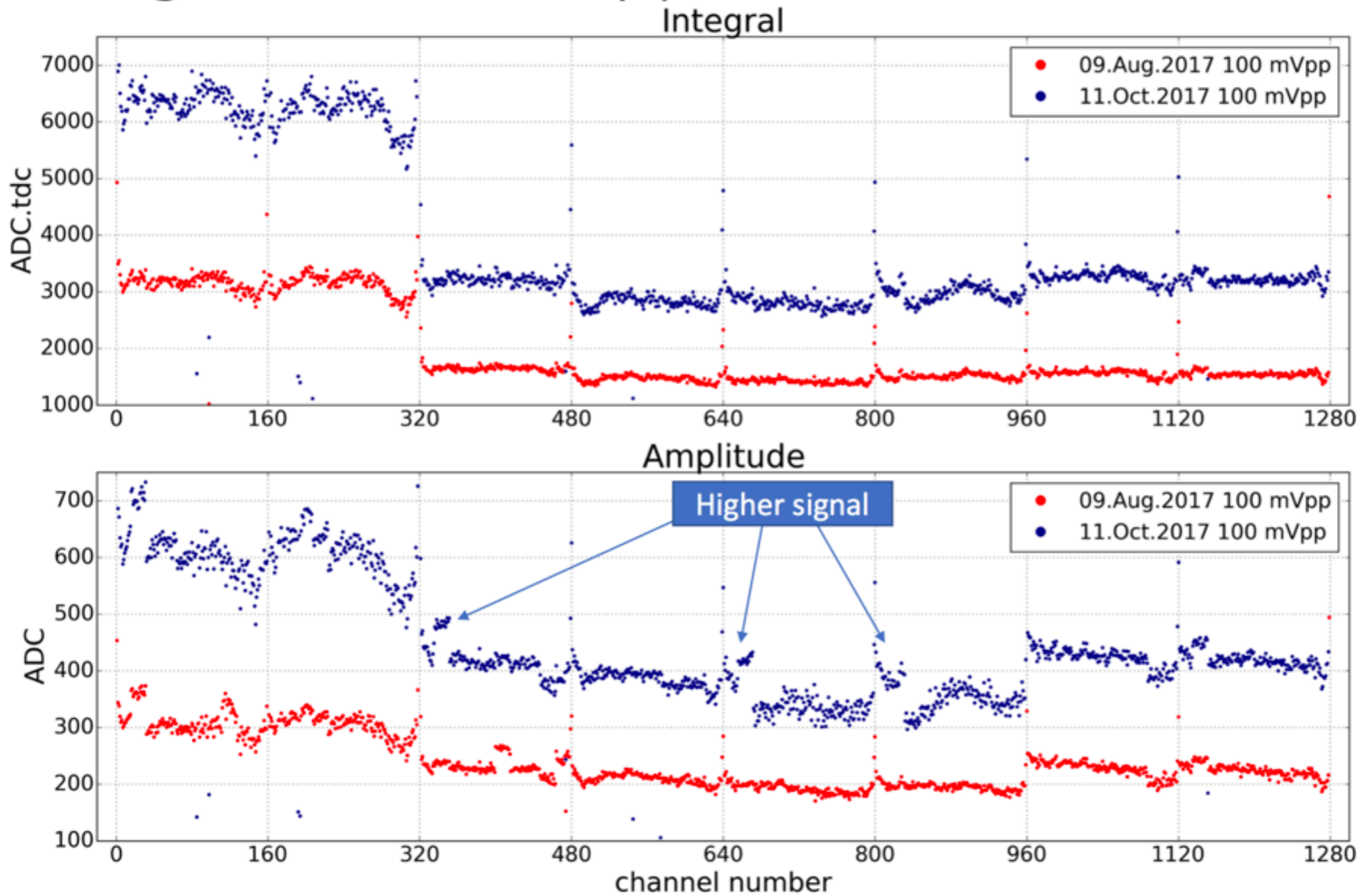
# Pulsing with 50 mVpp Zoom



# Pulsing with 100 mVpp



# Pulsing with 100 mVpp Zoom





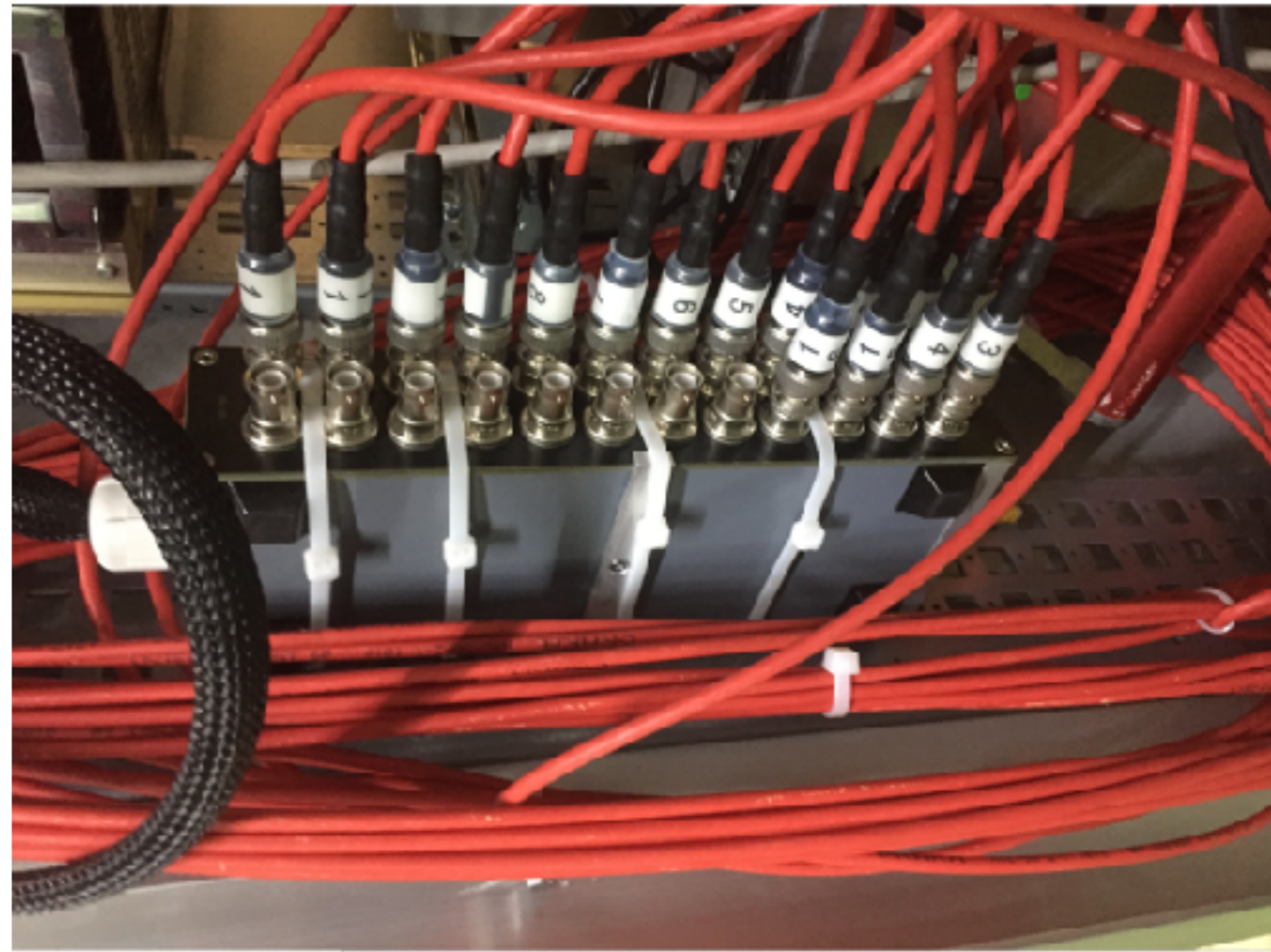
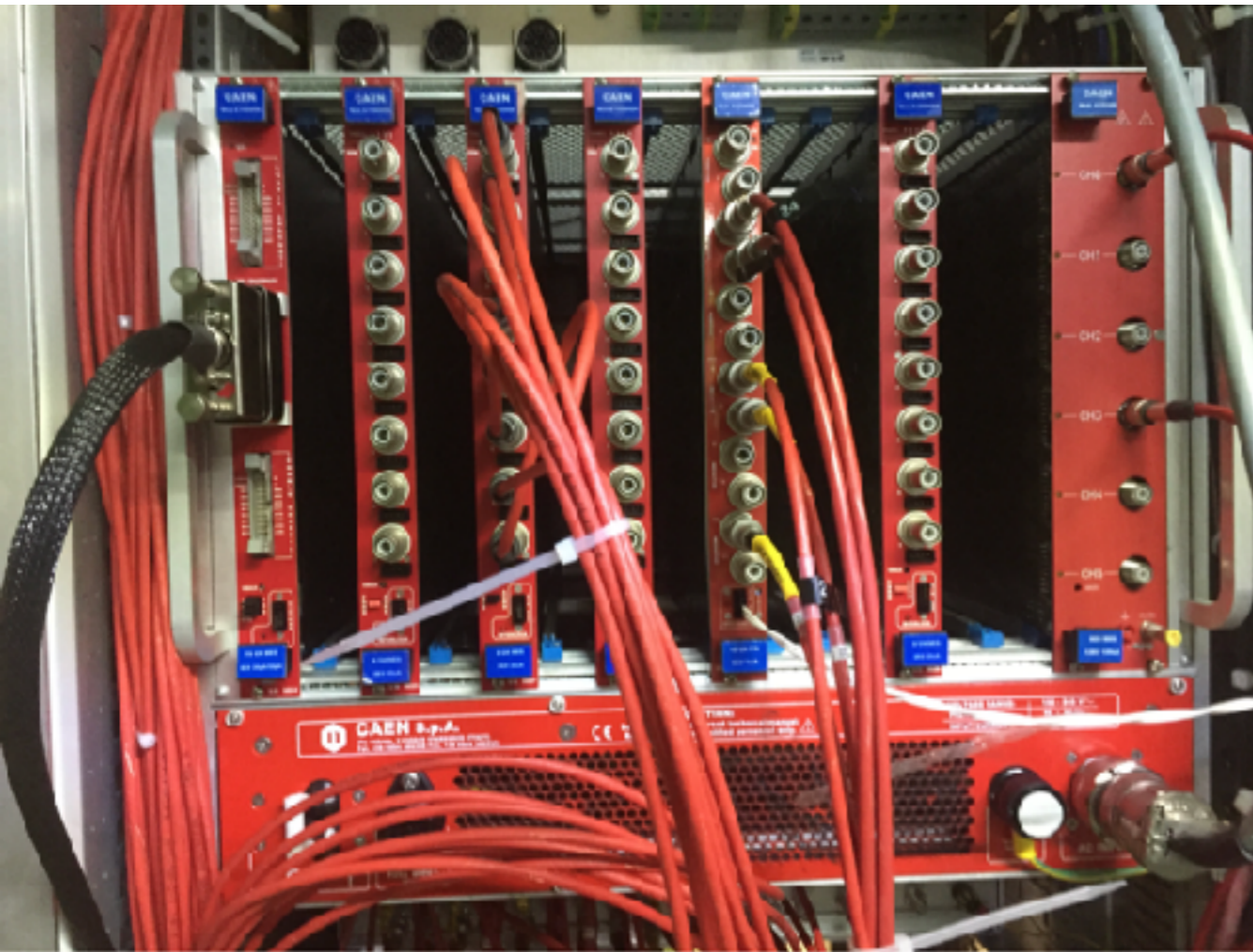
# Summary

Issue	Strategy followed	Status/Conclusion
<b>LEMs trips at 23 kV/cm</b>	Resistor board disconnected  -radial -Old one	<ul style="list-style-type: none"> <li>• Not all the LEMs tripped at the same time.</li> <li>• Several tests performed and always LEM 1 and 3 tripped.</li> <li>• Once LEM 1,3 and 4 tripped.</li> </ul>
	<ul style="list-style-type: none"> <li>• LEMs 1 and 3 floating</li> <li>• LEMs 1,2,3 and 4 floating</li> </ul>	We reach 26 kV/cm in the central LEMs
	We disconnect LEM 1 and 3 from the HV flange and repeat	In progress
	Reduce the level and see the effect	Foreseen for next week
	<ul style="list-style-type: none"> <li>• Measure precisely the leakage currents.</li> <li>• We observe a reduction of the leakage current since beginning of the week.</li> </ul>	Foreseen for next week
	In general, we observe an improvement since beginning of the week.	After immersing the LEMs, some dirtiness attached on the surface?

# Summary

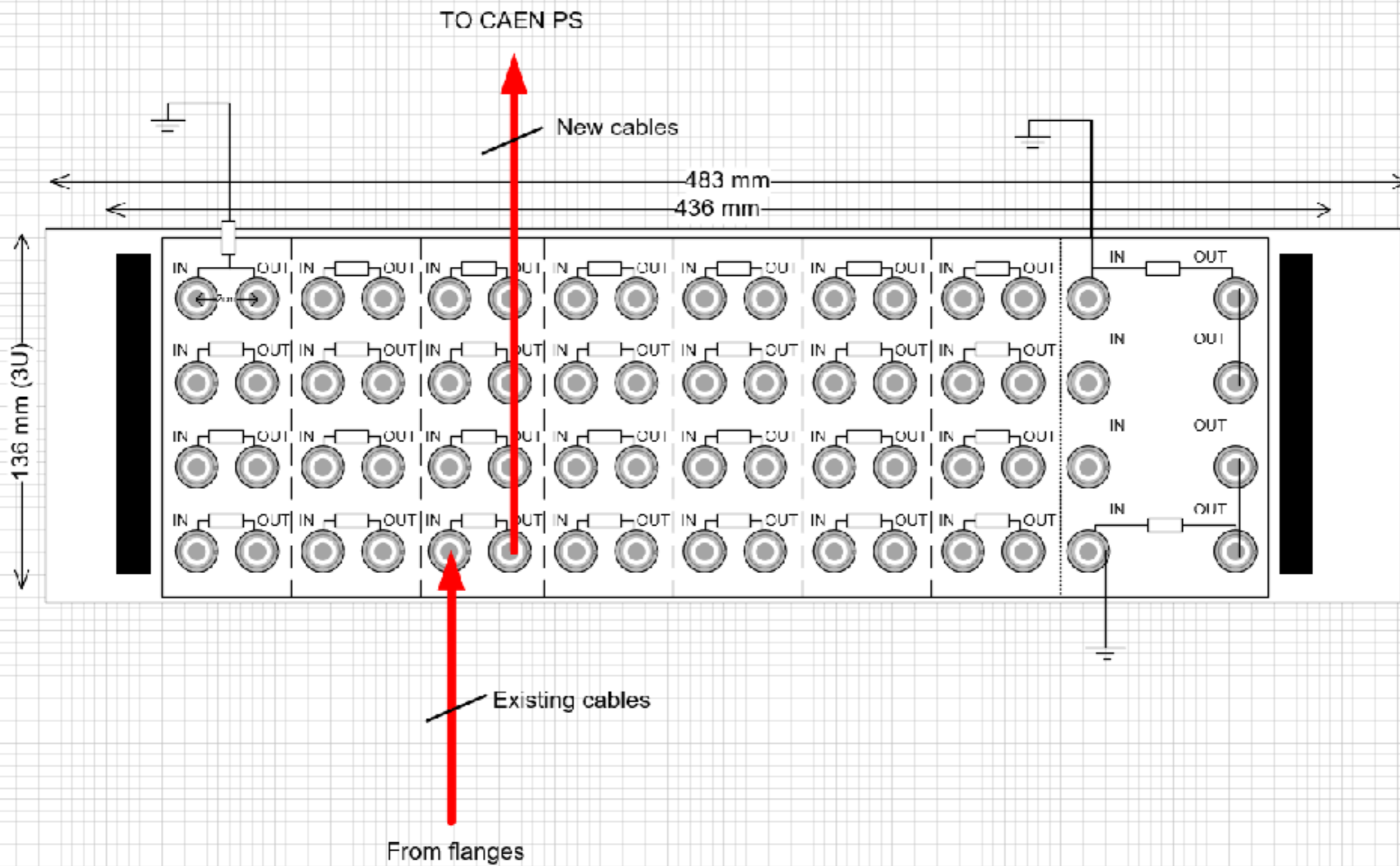
<http://lbnodemo.ethz.ch:2500/3x1x1/419>

→ The LEM HV connections reconnected through the resistor filter panel. We changed the old board (A1580HDE) used on CAEN power supply by the new one of the same type but with 16 inputs and a Radial connector (the one planned for ProtoDUNE-DP). We also closed the back of the DCS rack (CAEN power supplies are very sensitive to heat input and a lot of dust were present close to fans).





# Summary

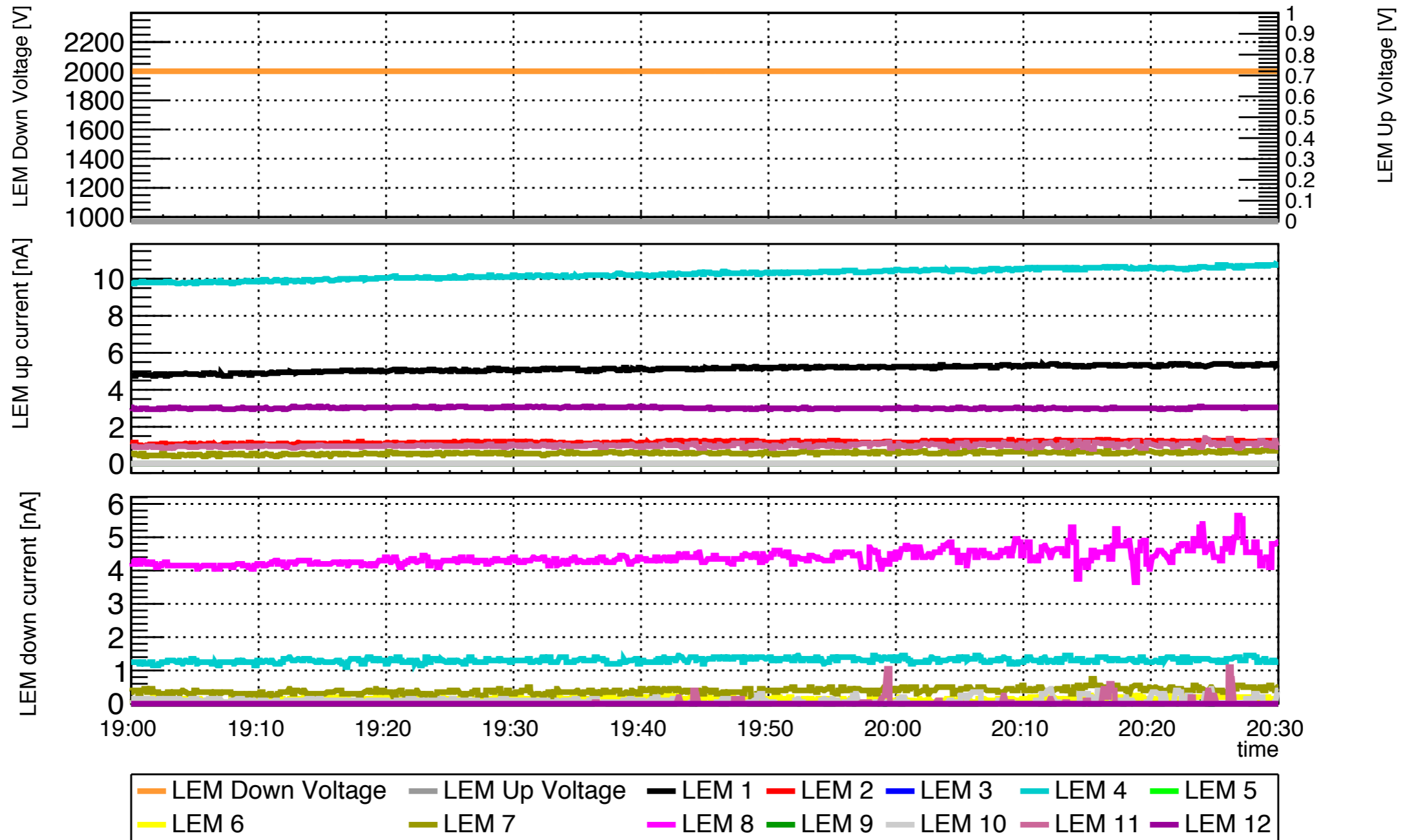


ALIM. DPS Q3



# Summary

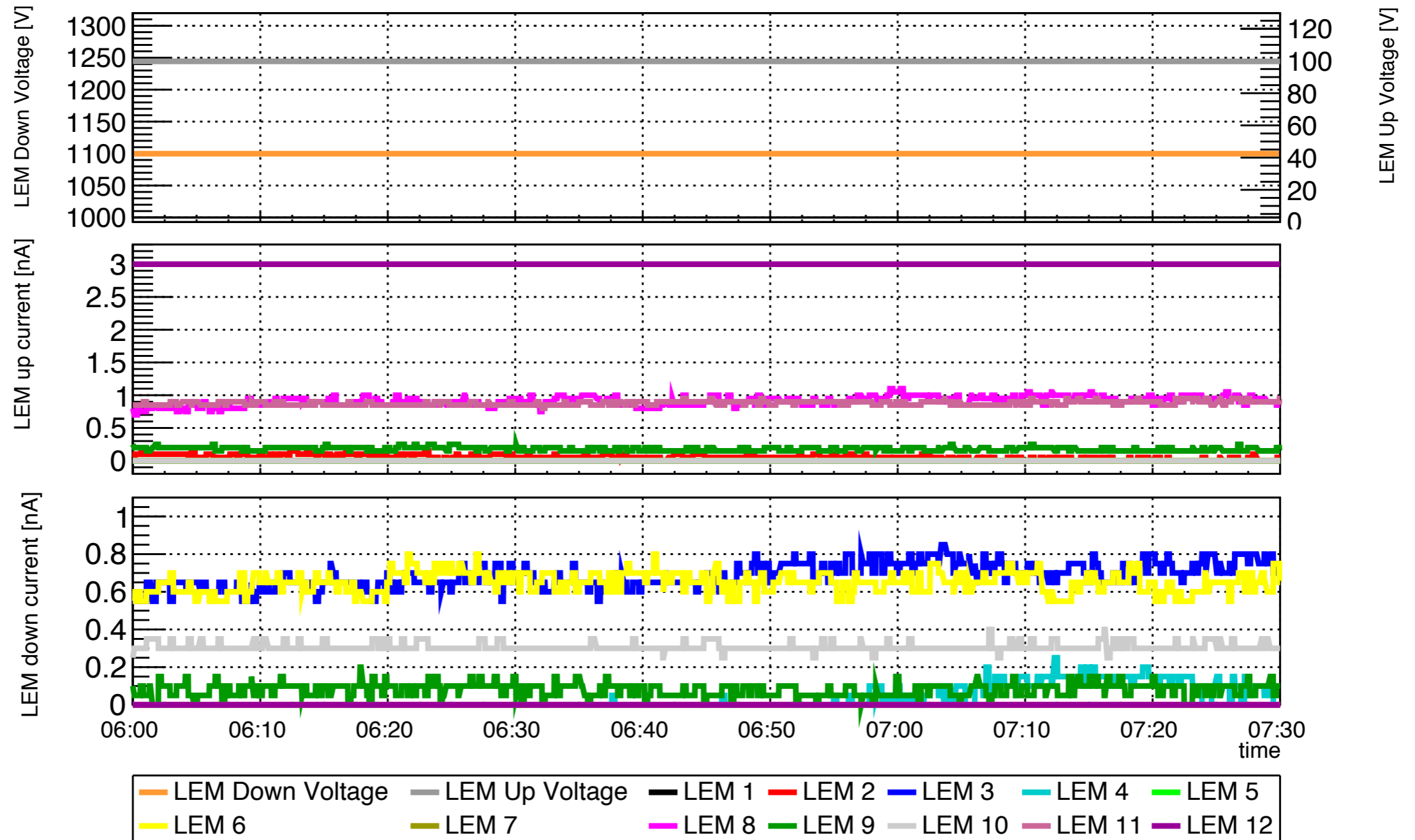
## Leakage current at the beginning of the week





# Summary

## Leakage current today



# Plans

- **Noise measurements disconnecting one by one all the different slow control sensors. This is foreseen on Monday and Lyon group will participate in the activity.**
- **With the field cage terminated to ground (first field shaper terminated to ground) power the cathode up to 100kV. Monitor the current and voltage display.**
- **Add a resistor in series and other in parallel to ground per LEM. Monitor the leakage current and understand if this helps the stability of the system.**
  - We already have a resistor and we plan to do the test in one LEM today.
- **CRP adjustment according to the results of the Bath test given by Adamo and capacitance measurements to check the uniformity.**
  - CRP completely in GAr and immerse in liquid progressively. Perform capacitance measurements at different steps and compare with previous results.
- **Reach a stable data taking conditions and try to see tracks again**
- **Test KEK electronics**
- **Dip everything in liquid, even if we can not regulate the level to measure the temperature gradients.**

# Schedule proposed

lun	mar	mié	jue	vie	dim
25	26	27	28	29	30
<ul style="list-style-type: none"> <li>Change to the 100 kV PSU and with FFS terminated to ground power the cathode</li> </ul>	<ul style="list-style-type: none"> <li>CRP motorisation regulation system</li> </ul>	<ul style="list-style-type: none"> <li>Insulation space at atmospheric</li> <li>Capacitance measurements to see if the short is still present</li> <li>Start warm-up of the HV setup dewar</li> </ul>	<ul style="list-style-type: none"> <li>Grid pulsing</li> <li>Anode pulsing to verify we do not have additional dead channels</li> </ul>	<ul style="list-style-type: none"> <li>Ramp up LEMs in liquid (grid floating)</li> <li>Improve HV grid connection in the parallel setup</li> </ul>	
<ul style="list-style-type: none"> <li>Ramp up LEMs in liquid (grid floating)</li> </ul>	<ul style="list-style-type: none"> <li>Check if the Grid-LEM short circuit disappears</li> <li>Capacitance measurements in GAr</li> </ul>	<ul style="list-style-type: none"> <li>Adjust CRP to the nominal level</li> <li>Recalibrate Level meters</li> </ul>	<ul style="list-style-type: none"> <li>LEM HV test at the nominal LAr level</li> </ul>		
	<ul style="list-style-type: none"> <li>Improve HV grid connection in the parallel setup</li> </ul>				
9	10	11	12	13	14
	<ul style="list-style-type: none"> <li>Improve HV grid connection in the parallel setup</li> </ul>				
	<ul style="list-style-type: none"> <li>LEM HV test at the nominal LAr level</li> </ul>				
16	17	18	19	20	21
	<ul style="list-style-type: none"> <li>Improve HV grid connection in the parallel setup</li> </ul>				
<ul style="list-style-type: none"> <li>Noise tests disconnecting one by one all the different sensors</li> </ul>					
23	24	25	26	27	28