RTD PRR Task Force: NP04 Data Analysis

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NP04 TMS Performance Paper

- I am in charge of the elaboration of the paper about the performance of the TMS in NP04;
- Laboratory calibration will cite the recently published paper;
- Some calibration tasks to be performed in-situ about the readout electronics (potentially next week at CERN);
- System's performance and data analysis is nearly completed;
- Has to be released by the end of November;

Performance of the temperature monitoring system of the ProtoDUNE-HD detector at CERN

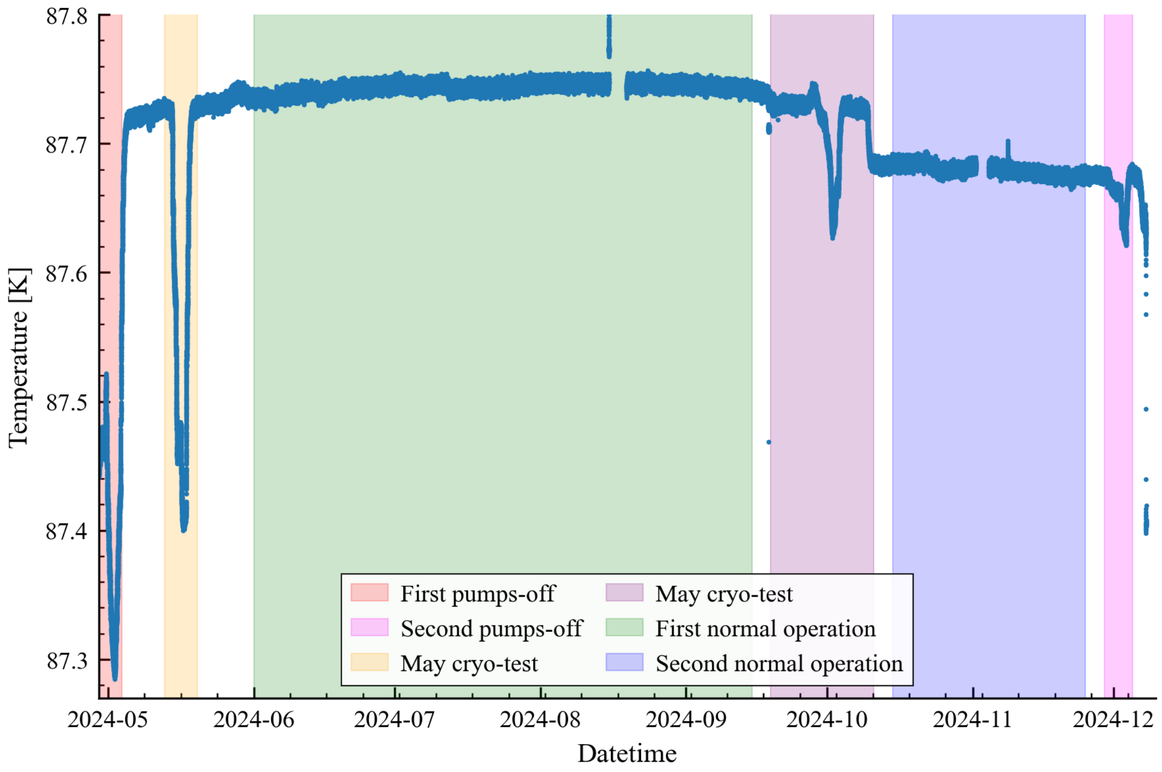
Abstract

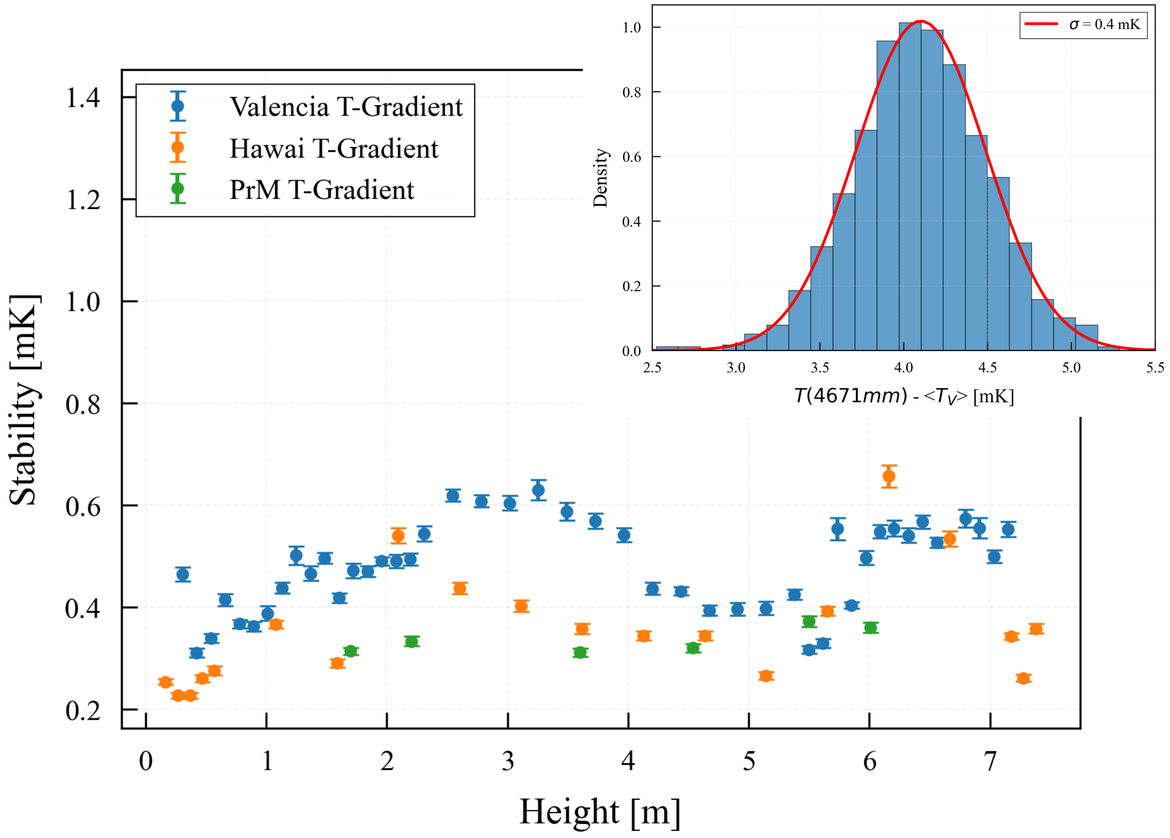
Keywords: Detectors, Liquid Argon, Cryogenics, Photon detection, Optics

Contents

NP04 Operation: Temperature Stability

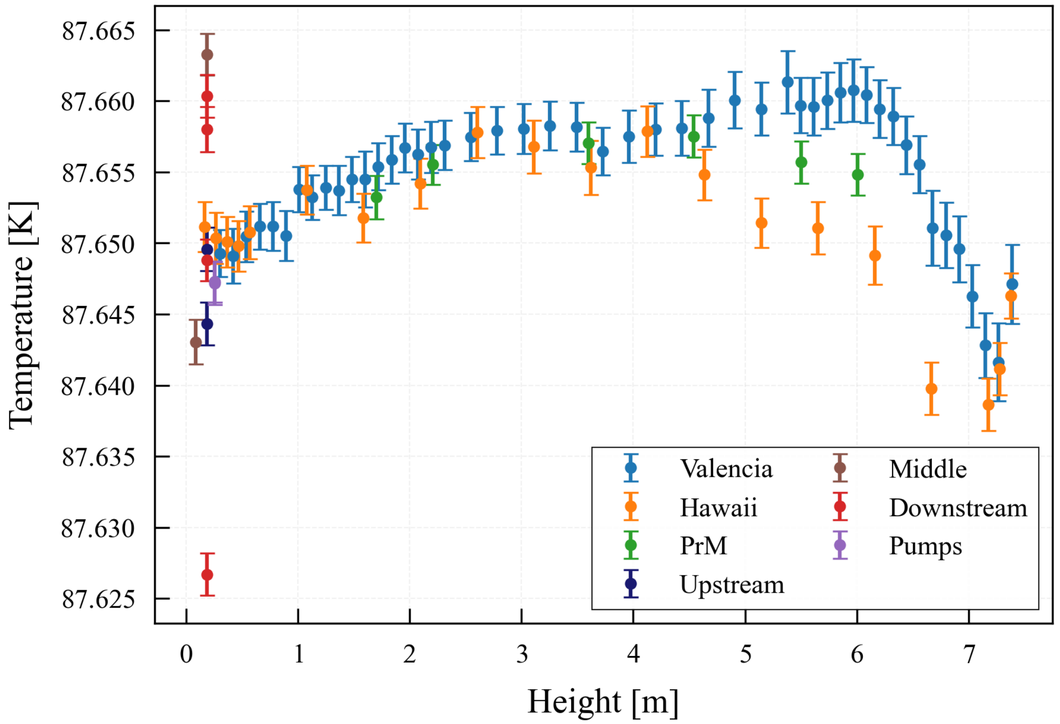
- NP04 operation is divided into several pieces: normal operation periods in **green** and **blue**;
- Long-term stability quantified to be better than 1 mK;

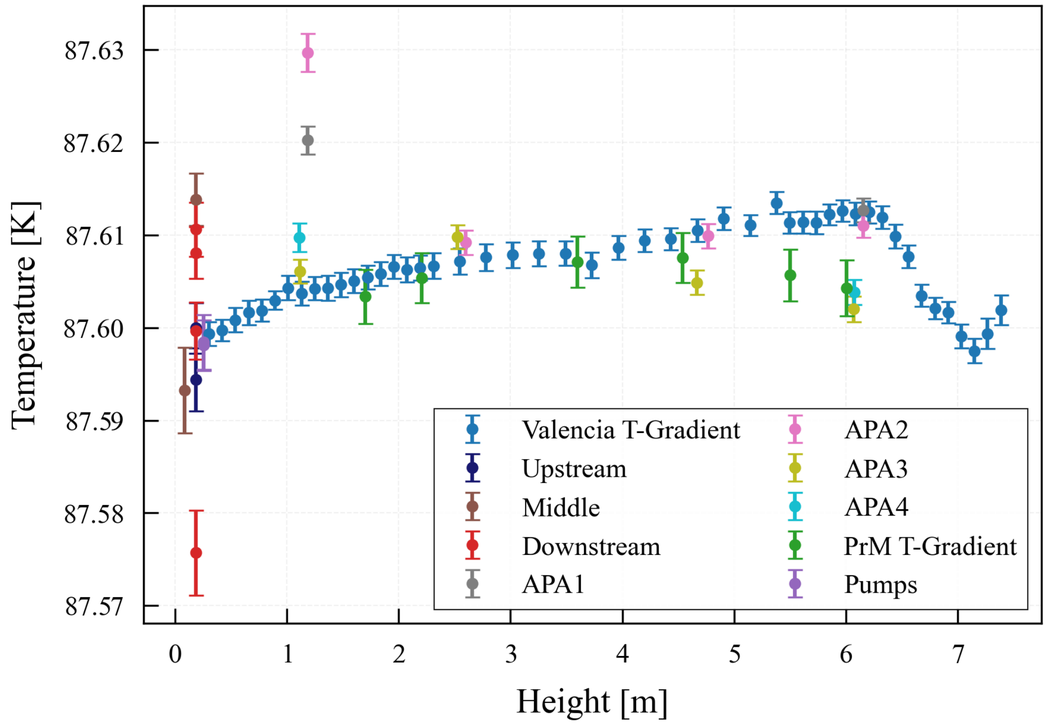




Temperature Maps: Homogeneity

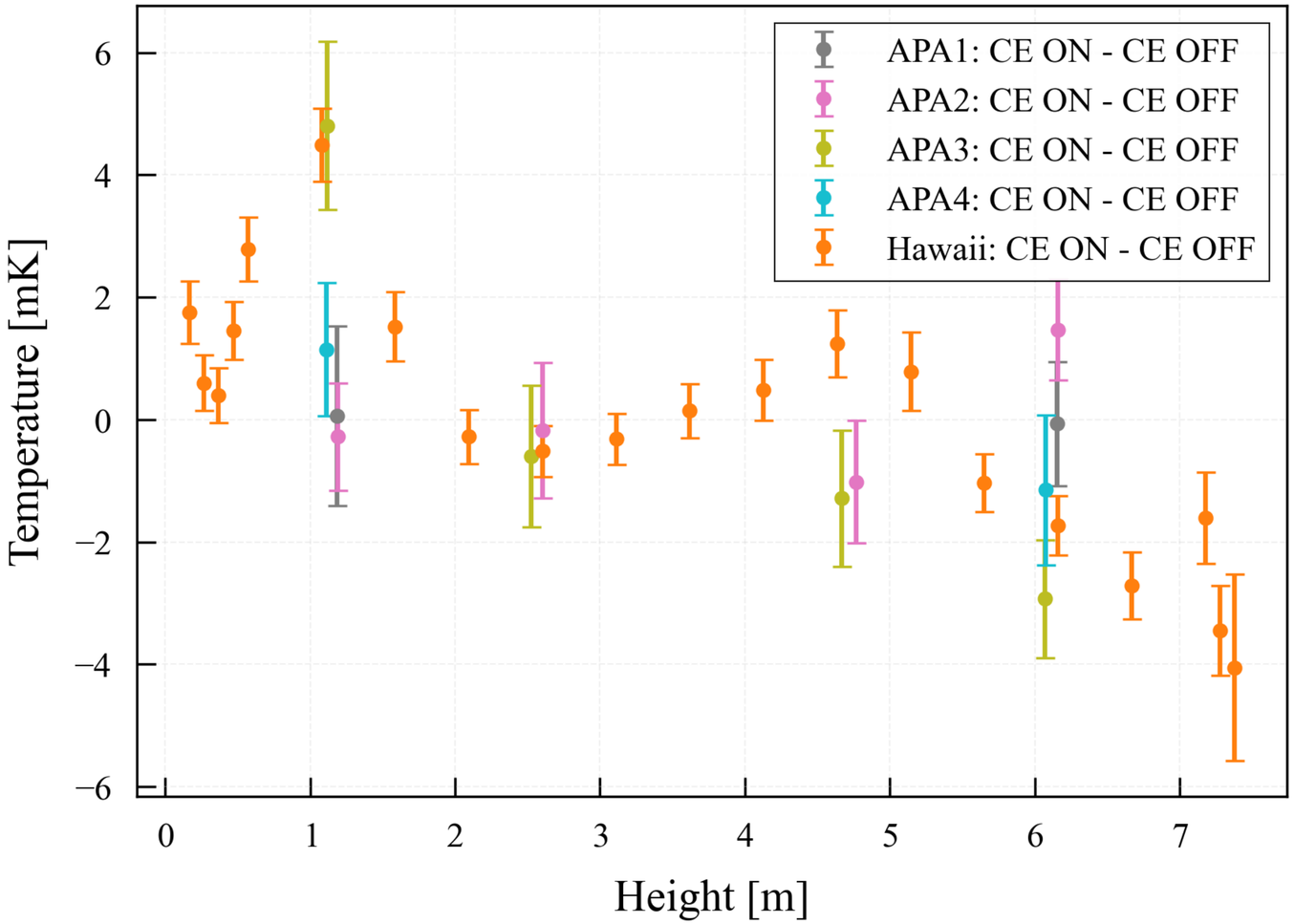
- Temperature maps are very homogeneous during both normal operation periods;





Temperature Maps: Sensitivity

- Temperature maps are sensitive to the heat released by various detector elements: TPC CE, HV, recirculation system…
- Hawaii measures a bump at ~1m corresponding to the heat released by TPC CE of APA3.
- APA3 sensor at ~1m sees it too, but APA4 does not behave the same way (to be understood);

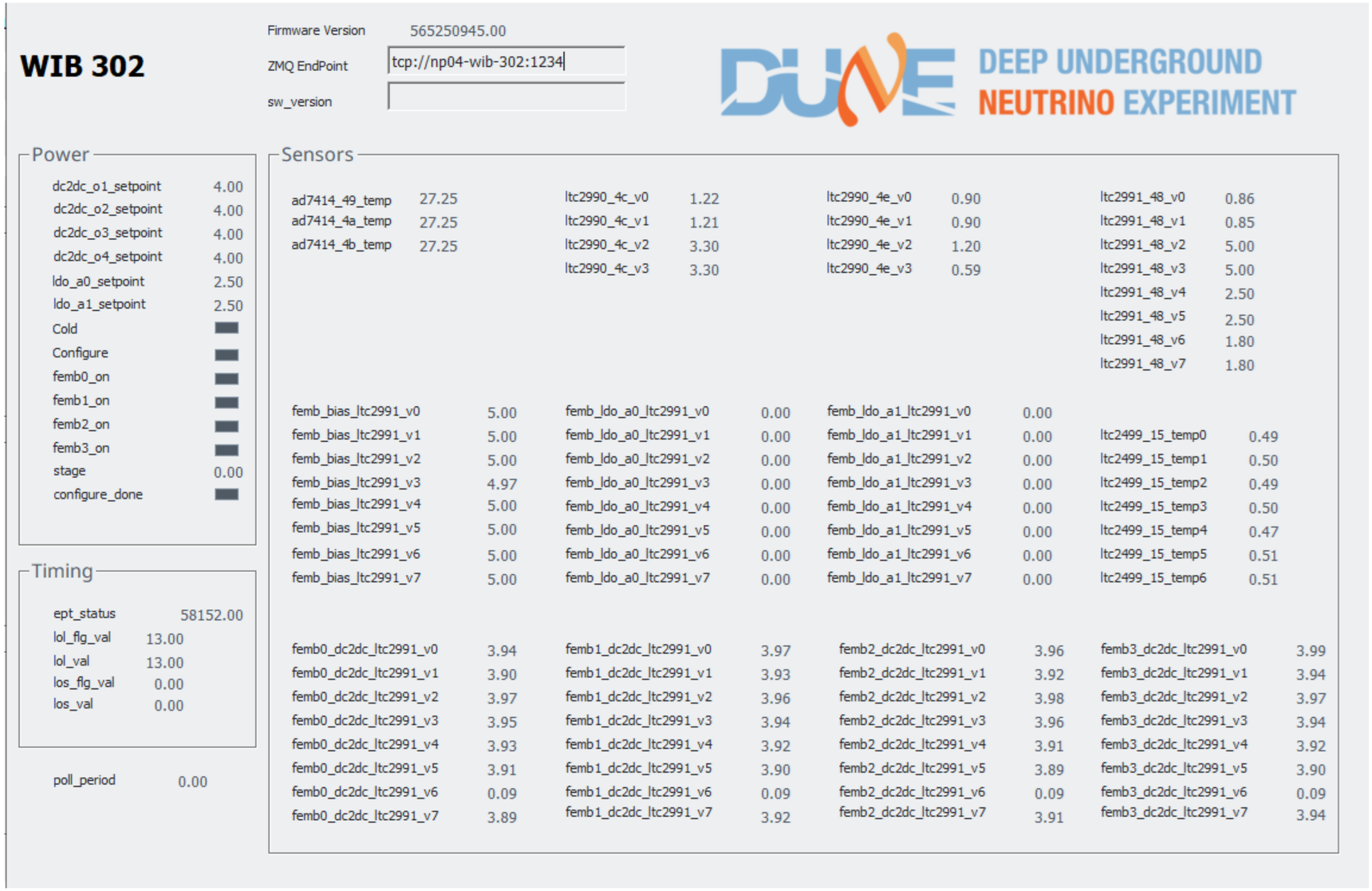


Some questions about the slow controls

- It would be great to know the **model of the resistors** used to measure the current of the boards, the differences in the TCRs between the 100 and 25 Ohm induce changes based on the room temperature
- I need a precise measurement of the cryostat inner pressure. Right now I have access to PT4910, PT4920, PT0110_REL and PT0110_ABS, which one is the correct? **I have assumed PT0110_REL**
- Is there another way of looking at the **pump differential pressure** other than looking at 4PDT4500?
- Is there another way of looking at **pump flow** other than looking at 4FT4592?
- Are there other **room temperature** sensors other than TT0100?
- There are two **level sensors**: LT0100 and 4LT4921. They both measure liquid levels, one absolute and the other a %. Which one is the most reliable?
- *Are there other key sensors in terms of LAr recirculation control?*

TPC CE

Roger Huang: "*For your purposes the bottom row is most relevant. ltc2991_v0, v2, and v4 are the power module voltages for the FEMB's power rails, which should all be ~4 V. The difference between those and v1, v3, v5 gives a current reading (I forget the exact resistor value), but what you see is typical for when the FEMBs are on. And then there's 4 sets labeled femb0, femb1, femb2, femb3 for the 4 FEMBs of one WIB.*"



WIB 302

Firmware Version 565250945.00

ZMQ EndPoint tcp://np04-wib-302:1234

sw_version

DEEP UNDERGROUND NEUTRINO EXPERIMENT

Power

dc2dc_o1_setpoint	4.00
dc2dc_o2_setpoint	4.00
dc2dc_o3_setpoint	4.00
dc2dc_o4_setpoint	4.00
ldo_a0_setpoint	2.50
ldo_a1_setpoint	2.50
Cold	
Configure	
femb0_on	
femb1_on	
femb2_on	
femb3_on	
stage	0.00
configure_done	

Timing

ept_status	58152.00
lol_flg_val	13.00
lol_val	13.00
los_flg_val	0.00
los_val	0.00

poll_period 0.00

Sensors

ad7414_49_temp	27.25	ltc2990_4c_v0	1.22	ltc2990_4e_v0	0.90	ltc2991_48_v0	0.86
ad7414_4a_temp	27.25	ltc2990_4c_v1	1.21	ltc2990_4e_v1	0.90	ltc2991_48_v1	0.85
ad7414_4b_temp	27.25	ltc2990_4c_v2	3.30	ltc2990_4e_v2	1.20	ltc2991_48_v2	5.00
		ltc2990_4c_v3	3.30	ltc2990_4e_v3	0.59	ltc2991_48_v3	5.00
						ltc2991_48_v4	2.50
						ltc2991_48_v5	2.50
						ltc2991_48_v6	1.80
						ltc2991_48_v7	1.80

femb_bias_ltc2991_v0	5.00	femb_ldo_a0_ltc2991_v0	0.00	femb_ldo_a1_ltc2991_v0	0.00		
femb_bias_ltc2991_v1	5.00	femb_ldo_a0_ltc2991_v1	0.00	femb_ldo_a1_ltc2991_v1	0.00	ltc2499_15_temp0	0.49
femb_bias_ltc2991_v2	5.00	femb_ldo_a0_ltc2991_v2	0.00	femb_ldo_a1_ltc2991_v2	0.00	ltc2499_15_temp1	0.50
femb_bias_ltc2991_v3	4.97	femb_ldo_a0_ltc2991_v3	0.00	femb_ldo_a1_ltc2991_v3	0.00	ltc2499_15_temp2	0.49
femb_bias_ltc2991_v4	5.00	femb_ldo_a0_ltc2991_v4	0.00	femb_ldo_a1_ltc2991_v4	0.00	ltc2499_15_temp3	0.50
femb_bias_ltc2991_v5	5.00	femb_ldo_a0_ltc2991_v5	0.00	femb_ldo_a1_ltc2991_v5	0.00	ltc2499_15_temp4	0.47
femb_bias_ltc2991_v6	5.00	femb_ldo_a0_ltc2991_v6	0.00	femb_ldo_a1_ltc2991_v6	0.00	ltc2499_15_temp5	0.51
femb_bias_ltc2991_v7	5.00	femb_ldo_a0_ltc2991_v7	0.00	femb_ldo_a1_ltc2991_v7	0.00	ltc2499_15_temp6	0.51

femb0_dc2dc_ltc2991_v0	3.94	femb1_dc2dc_ltc2991_v0	3.97	femb2_dc2dc_ltc2991_v0	3.96	femb3_dc2dc_ltc2991_v0	3.99
femb0_dc2dc_ltc2991_v1	3.90	femb1_dc2dc_ltc2991_v1	3.93	femb2_dc2dc_ltc2991_v1	3.92	femb3_dc2dc_ltc2991_v1	3.94
femb0_dc2dc_ltc2991_v2	3.97	femb1_dc2dc_ltc2991_v2	3.96	femb2_dc2dc_ltc2991_v2	3.98	femb3_dc2dc_ltc2991_v2	3.97
femb0_dc2dc_ltc2991_v3	3.95	femb1_dc2dc_ltc2991_v3	3.94	femb2_dc2dc_ltc2991_v3	3.96	femb3_dc2dc_ltc2991_v3	3.94
femb0_dc2dc_ltc2991_v4	3.93	femb1_dc2dc_ltc2991_v4	3.92	femb2_dc2dc_ltc2991_v4	3.91	femb3_dc2dc_ltc2991_v4	3.92
femb0_dc2dc_ltc2991_v5	3.91	femb1_dc2dc_ltc2991_v5	3.90	femb2_dc2dc_ltc2991_v5	3.89	femb3_dc2dc_ltc2991_v5	3.90
femb0_dc2dc_ltc2991_v6	0.09	femb1_dc2dc_ltc2991_v6	0.09	femb2_dc2dc_ltc2991_v6	0.09	femb3_dc2dc_ltc2991_v6	0.09
femb0_dc2dc_ltc2991_v7	3.89	femb1_dc2dc_ltc2991_v7	3.92	femb2_dc2dc_ltc2991_v7	3.91	femb3_dc2dc_ltc2991_v7	3.94

PD-SP Data

- It is very likely that we need to analyse some PD-SP temperature data too;
- The virtual machine is now not working, should I contact Roland (?) in order to have it working again and retrieve the data?
- Are the DCS-ID (long numbers) the same for PD-SP and PD-HD? At least for the cryostat slow controls and temperature sensors (Valencia, Hawaii, Ground Planes, Pipe)