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ESS weekly meeting (2022 W06)

A. Miyazaki et al

General planning: no major change

FREIA Planning	2022-01-19	2022													
		January					February				March				Ap
Equipment	Responsible	3	10	17	24	31	7	14	21	28	7	14	21	28	4	11
	week #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Liquefier & 2K pumps	Esat															
RF power stations	Mykhailo															
Cryomodule test stan	Akira			CM07				CM08				CM09				

We are here

CM07 to ESS
CM09 from Orsay

CM08 to ESS
CM10 from Orsay

- Optimistic planning without any contingency
- We aim at testing three modules before the Easter holidays

W05 & W06 progress & W07 planning

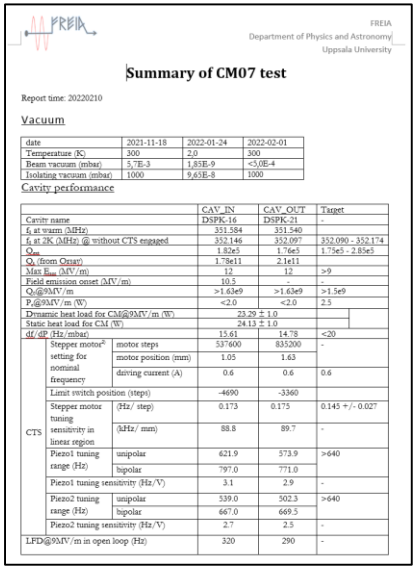
week		W05											
date		MON		TUE		WED		THU		FRI		SAT	SUN
		31-jan		01-feb		02-feb		03-feb		04-feb		05-feb	06-feb
		m	a	m	a	m	a	m	a	m	a		
previous CM	**CM07**	warming up completed	disconnect vac pumps	disconnect cryogenics	swap modules	N2 filling	out going test	waiting in the box		activate shock sensor	waiting in the box		
present CM	**CM08**	doorknob mounting				waveguide connection		connect cryo lines	connect vacuum pumps	pumping vacuum			
										start water cooling	RF calibration		
next CM	**CM09**	preparation at Orsay											

week		W06											
date		MON		TUE		WED		THU		FRI		SAT	SUN
		07-feb		08-feb		09-feb		10-feb		11-feb		12-feb	13-feb
		m	a	m	a	m	a	m	a	m	a		
previous CM	**CM07**	departure to ESS		preparing report				publish report					
present CM	**CM08**	coupler warm conditioning		Electrosys tripped		coupler warm conditioning continued			purging	N2 cooling			
		build concrete blocks on the bunker		change SCHe valve to the original ones		Service in circulation compressor; test valves in requifier		trouble shooting		start liquifier to fill the Dewar			
next CM	**CM09**	departure from Orsay		transport from Orsay				arrival at UU		reception test			

We are here

week		W07											
date		MON		TUE		WED		THU		FRI		SAT	SUN
		14-feb		15-feb		16-feb		17-feb		18-feb		19-feb	20-feb
		m	a	m	a	m	a	m	a	m	a		
present CM	**CM08**	LHe cooling	4K filling		coupler cold conditioning	2K pumping	RF calibration interlock setup	MP conditioning		CTS test			
next CM	**CM09**												

CM07 departure and reports preparation



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Summary of CM07 test

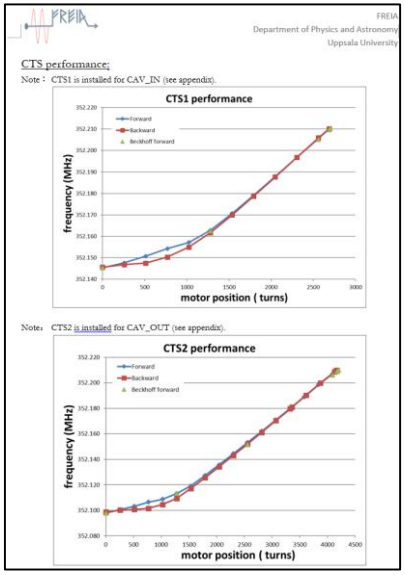
Report time: 20220210

Vacuum

date	2021-11-18	2022-01-24	2022-02-01
Temperature (K)	300	2.0	300
Beam vacuum (mbar)	5,7E-3	1,85E-9	<5,0E-4
Isolating vacuum (mbar)	1000	9,65E-8	1000

Cavity performance

			CAV_IN	CAV_OUT	Target
Cavity name			DSPK-16	DSPK-21	-
f_0 at warm (MHz)			351.584	351.540	
f_0 at 2K (MHz) @ without CTS engaged			352.146	352.097	352.090 - 352.174
Q_{ext}			1.82e5	1.76e5	1.75e5 - 2.85e5
Q_0 (from Qmsr)			1.78e11	2.1e11	
Max E_{acc} (MV/m)			12	12	>9
Field emission onset (MV/m)			10.5	-	-
Q_0@9MV/m			>1.63e9	>1.63e9	>1.5e9
P_@9MV/m (W)			<2.0	<2.0	2.5
Dynamic heat load for CM@9MV/m (W)			23.29 ± 1.0		
Static heat load for CM (W)			24.13 ± 1.0		
df/dP (Hz/mbar)			15.61	14.78	<20
CTS	Stepper motor setting for nominal frequency	motor steps	537600	835200	-
		motor position (mm)	1.05	1.63	
		driving current (A)	0.6	0.6	0.6
	Limit switch position (steps)		-4690	-3360	
	Stepper motor tuning sensitivity in linear region	(Hz/ step)	0.173	0.175	0.145 +/- 0.027
		(kHz/ mm)	88.8	89.7	-
	Piezo1 tuning range (Hz)	unipolar	621.9	573.9	>640
		bipolar	797.0	771.0	
	Piezo1 tuning sensitivity (Hz/V)		3.1	2.9	-
	Piezo2 tuning range (Hz)	unipolar	539.0	502.3	>640
		bipolar	667.0	669.5	
	Piezo2 tuning sensitivity (Hz/V)		2.7	2.5	-
LFD@9MV/m in open loop (Hz)			320	290	-



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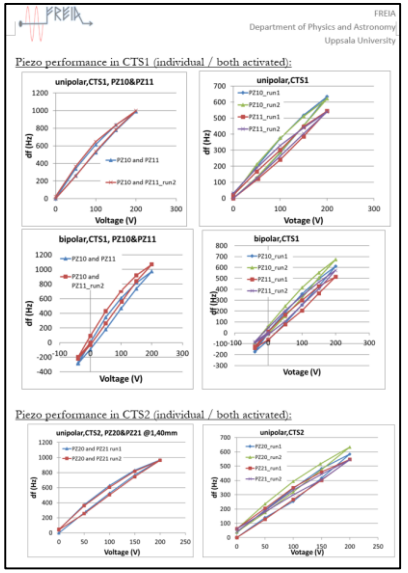
CTS performance:

Note：CTS1 is installed for CAV_IN (see appendix).

Note：CTS2 is installed for CAV_OUT (see appendix).



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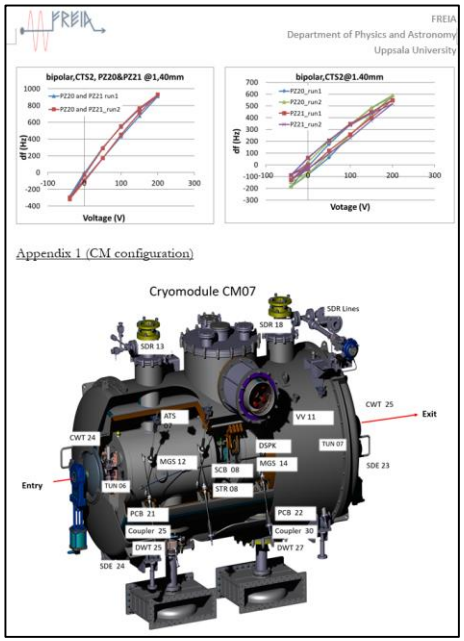
Piezo performance in CTS1 (individual / both activated):

Piezo performance in CTS2 (individual / both activated):



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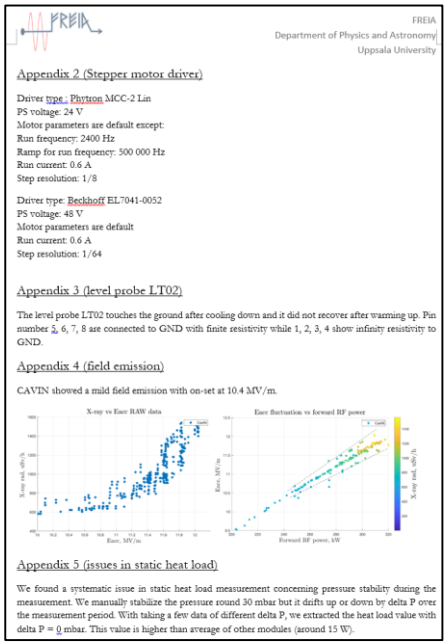
Appendix 1 (CM configuration)



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Appendix 2 (Stepper motor driver)

Driver type : Phytron MCC-2 Lin
PS voltage: 24 V
Motor parameters are default except:
Run frequency: 2400 Hz
Ramp for run frequency: 500 000 Hz
Run current: 0.6 A
Step resolution: 1/8

Driver type: Beckhoff EL7041-0052
PS voltage: 48 V
Motor parameters are default
Run current: 0.6 A
Step resolution: 1/64

Appendix 3 (level probe LT02)

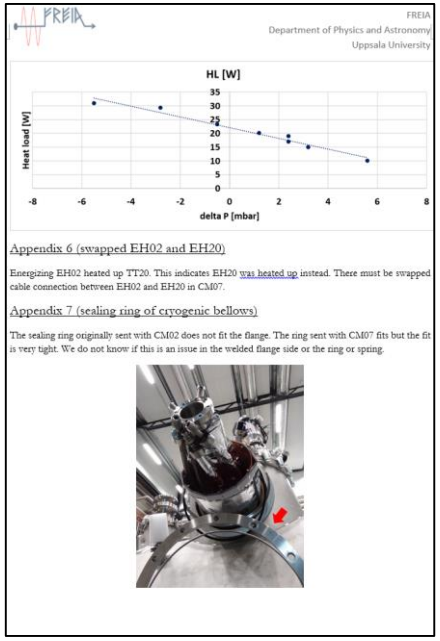
The level probe LT02 touches the ground after cooling down and it did not recover after warming up. Pin number 5, 6, 7, 8 are connected to GND with finite resistivity while 1, 2, 3, 4 show infinity resistivity to GND.

Appendix 4 (field emission)

CAVIN showed a mild field emission with on-set at 10.4 MV/m.

Appendix 5 (issues in static heat load)

We found a systematic issue in static heat load measurement concerning pressure stability during the measurement. We manually stabilize the pressure round 30 mbar but it drifts up or down by delta P over the measurement period. With taking a few data of different delta P, we extracted the heat load value with delta P = 0 mbar. This value is higher than average of other modules (around 15 W).



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Appendix 6 (swapped EH02 and EH20)

Energizing EH02 heated up TT20. This indicates EH20 was heated up instead. There must be swapped cable connection between EH02 and EH20 in CM07.

Appendix 7 (sealing ring of cryogenic bellows)

The sealing ring originally sent with CM02 does not fit the flange. The ring sent with CM07 fits but the fit is very tight. We do not know if this is an issue in the welded flange side or the ring or spring.

More appendices than usual to describe issues

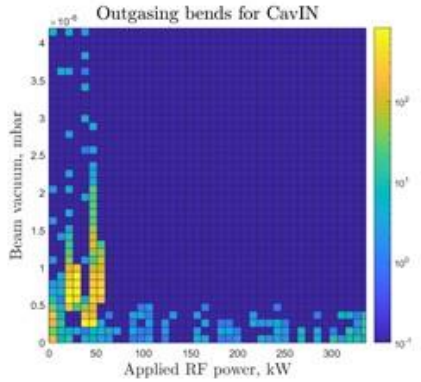
- Sealing ring
- Beckhoff driver
- EH02-EH20
- LT02
- Field emission
- Static heat load

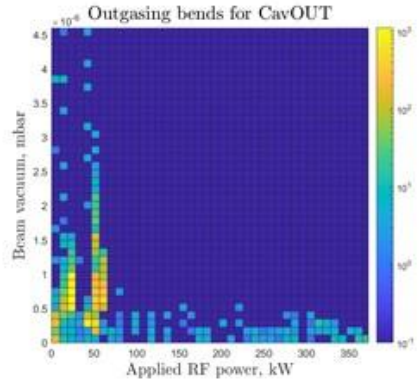
CM09 arrival

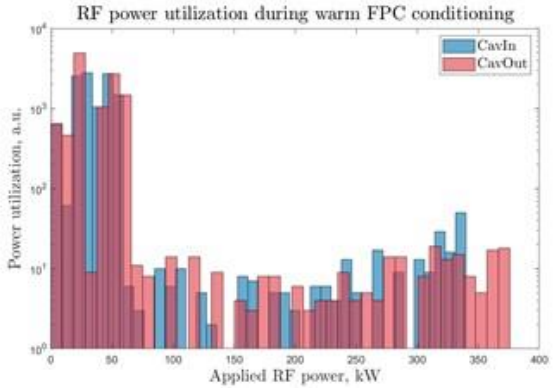
CM08: coupler conditioning

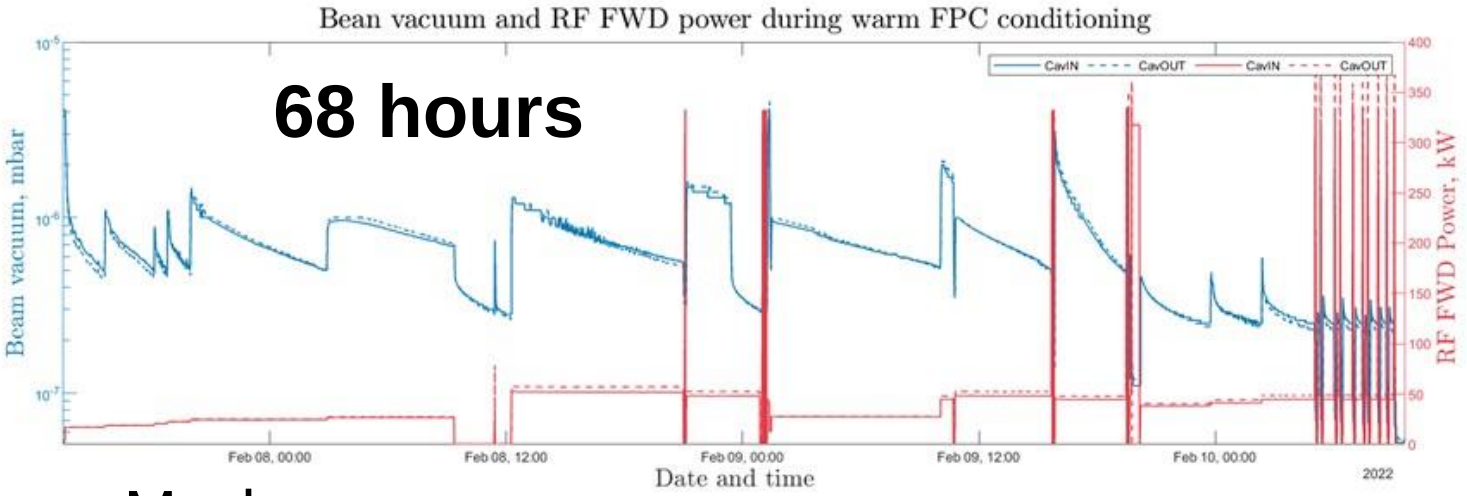
CM08 Warm FPC conditioning results

10 Feb 2022

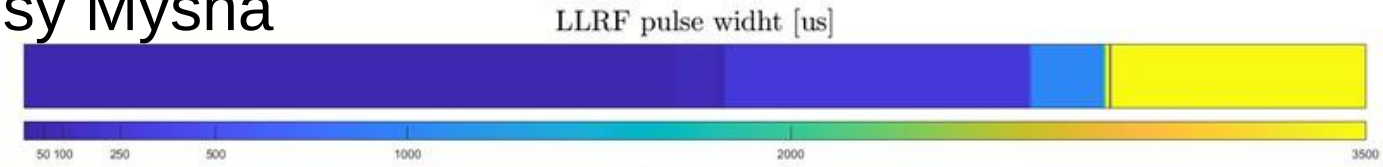




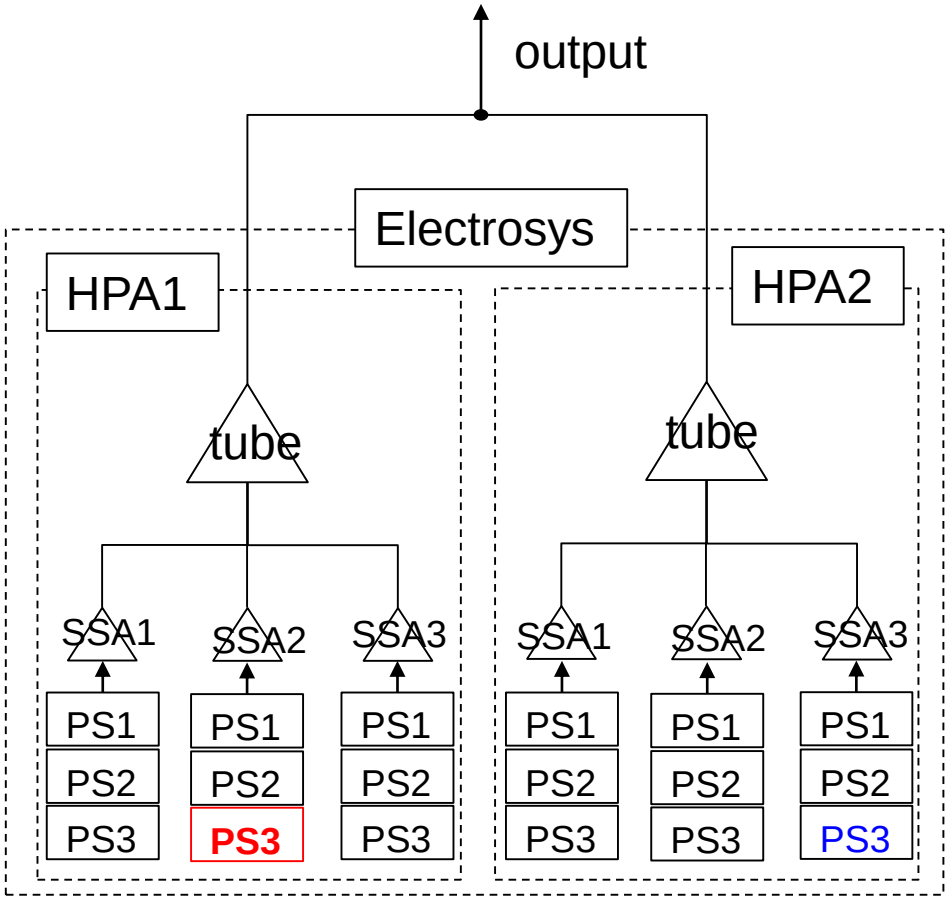


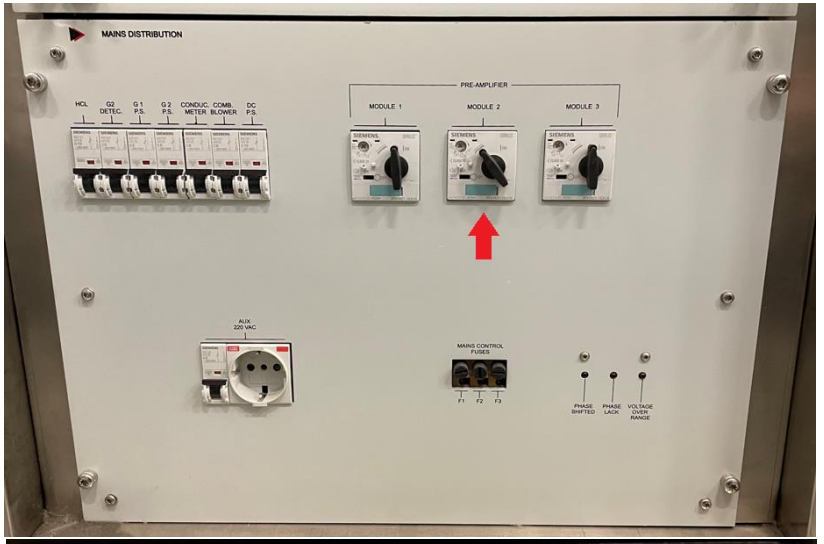


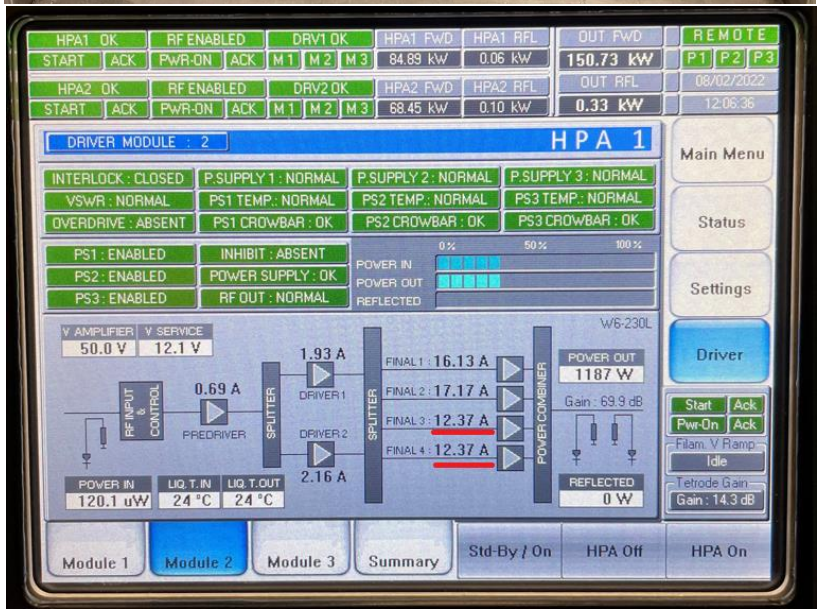
Courtesy Mysha



Electrosys→ broken power supply replaced







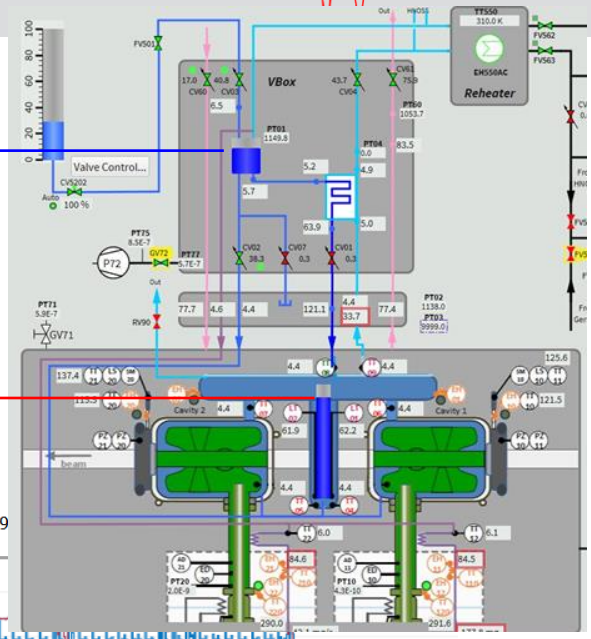
- Unbalanced current in transistors in SSA2 even after replacing the power supply
- Similar issue as HPA2-SSA3-PS3
- We have spare PSs but no spare SSA module (ordered last May but huge delay due to lack of electric components in the market)

Strategy about tetrode tubes

- Some meetings between THALES and Uppsala
  - We confirmed two initial TH595A in DB stations were malfunctioning
  - The issue is under investigation but THALES broke the tube during their test (water cooling was blocked)
  - New TH595A tubes in DB seem OK so far
  - Mysha pointed out quantitative difference
    - The very first TH595A showed crowbar issues from the very beginning and its frequency increased over months and eventually became a permanent crowbar without RF
    - The new TH595A did not show any crowbar from the beginning
- The old TH595 tubes have been operated in Electrosys for long time
- We have one spare of TH595 and one TH595A
  - We have another TH595A which showed crowbar in DB
- THALES has one TH595A in a shelf (delivery time a few days) and can provide others in 3 months
- We will order one spare but the decision is suspended until end Feb

Maintenance campaign of cryogenics

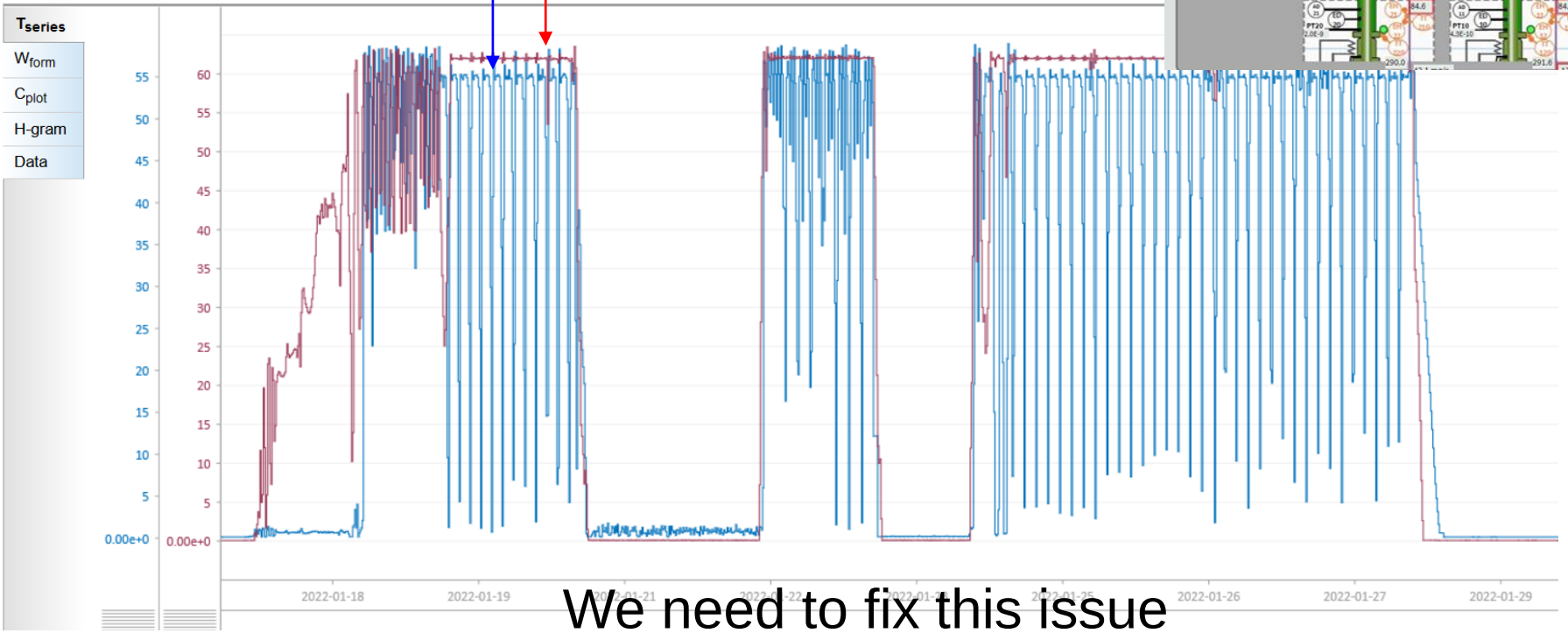
2K tank in CM is stabilized but 4K tank in VBox is not



Del	Plot	Name	DBRType	Units	Processing	Scale	Time (local)	Value	Notes
x	☑	CM-VBox:LT03:sRdV	DBR_SCALAR_DOUBLE	cm		linear	2022-01-18 **00:21:46**	0.5293941566313817	
x	☑	CM-CM:LT01:sRdV	DBR_SCALAR_DOUBLE	cm		linear	2022-01-18 **00:21:46**	24.004177257932454	

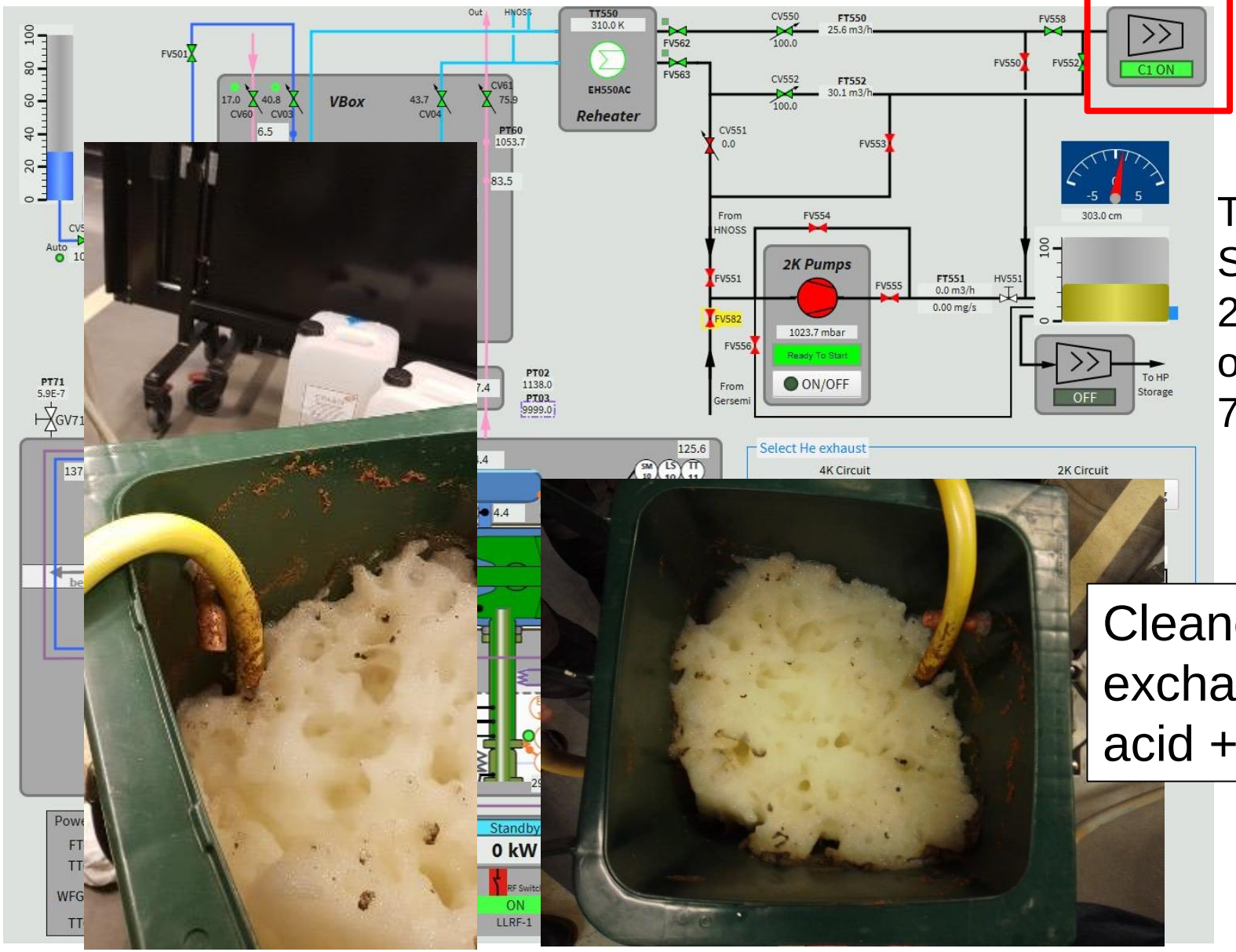
WINDOW SIZE: 1 year | 1 month | 2 w | 1 w | 2.5 d | 1 d | 18 h | 12 h | 8 h | 4 h | 2 h | 1 h | 30 m | 10 m | 5 m | 1 m | 30 s

END: 2022-01-31 09



We need to fix this issue

Reminder: first-aid on October the 11th 2021



Circulation compressor "Kaeser"

Tripped on Sep 30th 2021 due to over-heating 70C → 98C

Cleaned heat-exchanger with acid + alkali

Renewed the heat exchanger

- We hope that the system is safer now but how long?
- Do we need annual service?

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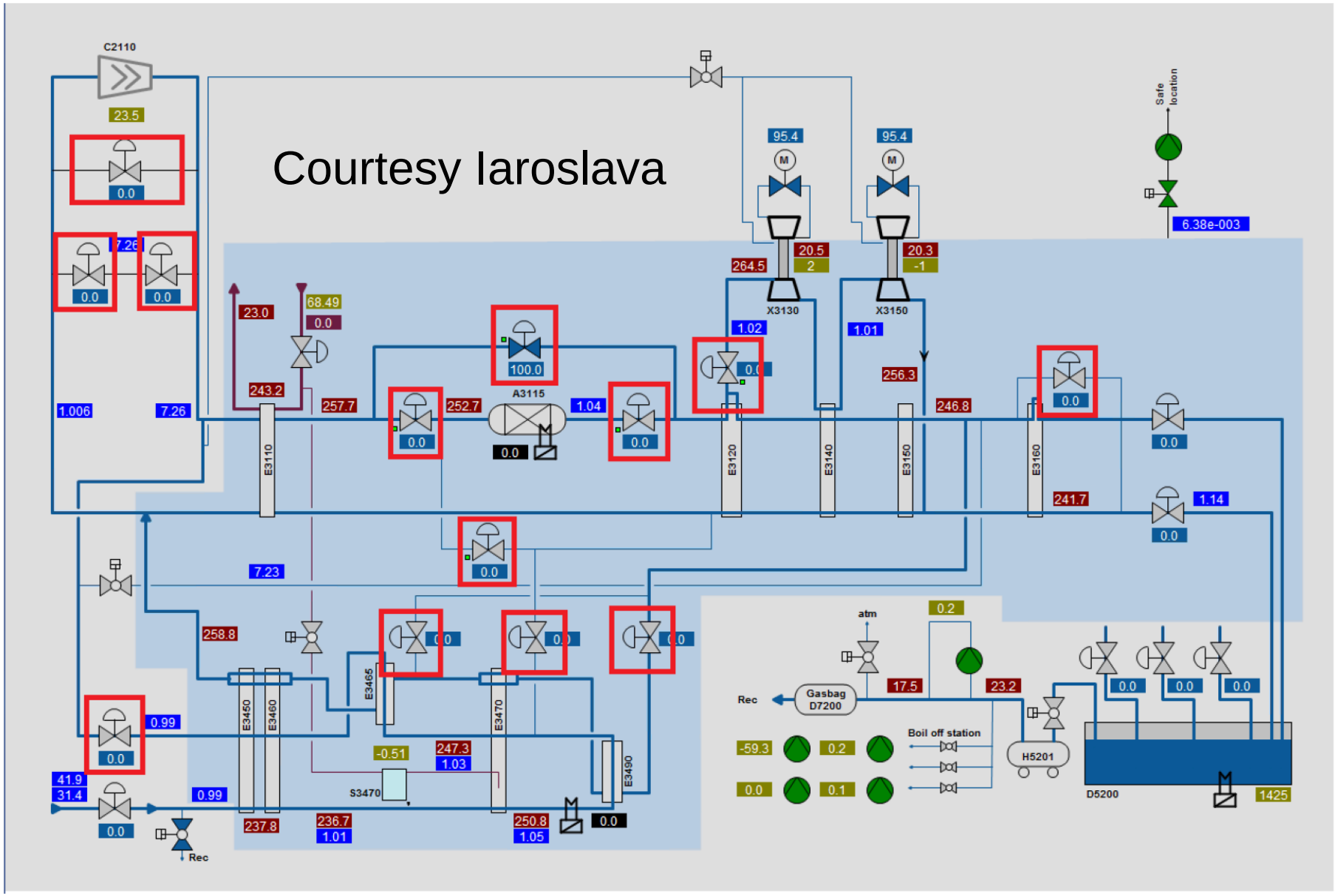
Test valves in Liquefier-compressor chain



Results of valve testing

Order	Valve name	Stroke	Status	Additional information	Initialization
1.	CV3420	10 mm	OK	Smooth motion with ramp 1.0%	OK
2.	CV3114	16 mm	OK	Ramp 100%	OK
3.	CV3130	10 mm	OK	(Controller showed 3%, GUI 0%. When set to manual went to 0% and afterwards to 100%). Ramp 1%	OK
4.	CV2250	10 mm	OK	Ramp 1%	OK
5.	CV2160	10 mm	OK	Ramp 1%	OK
5.	CV2150	10 mm	OK	Ramp 1%	Vibration in valve when moving, low clicking sound.
6.	CV3435	10 mm	OK	Ramp 1%	OK
7.	CV3465	10 mm	OK	Ramp 1%	OK
8.	CV3112	10 mm	OK	Ramp 1%	OK
9.	CV3490	10 mm	OK	Ramp 1%	OK
10.	CV3160	10 mm	OK	Ramp 1%	OK
11.	CV3111	32 mm	OK	Ramp 1%	OK
12.	CV3117	32mm	OK	Ramp 1%	OK

Courtesy Iaroslava

No major issues identified → next step is to check pressure transducer