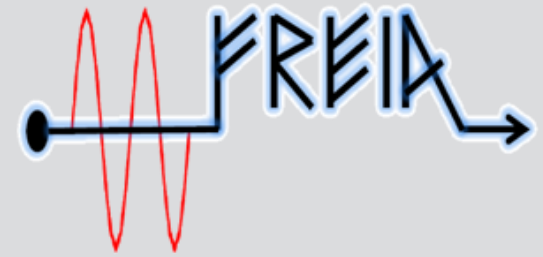




UPPSALA
UNIVERSITET



ESS weekly meeting (2021 W48)

A. Miyazaki et al.



General planning



FREIA Planning		2021-11-04														2022			
		October				November				December				January					
Equipment	Responsible	27	4	11	18	25	1	8	15	22	29	6	13	20	27	1	8	15	22
		week #																	
		39	40	41	42	43	44	45	46	47	48	49	50	51	52	1	2	3	4
Liquefier & 2K pumps	Esat	Blue	Blue	Yellow	Yellow	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Grey	Grey	Blue	Blue	Blue
RF power stations	Mykhailo				Green		Green		Green			Green	Green	Grey	Grey			Green	
Cryomodule test stand	Akira	CM04	Yellow	Green	CM03	Yellow	Green	Yellow	CM06	Yellow	Green	Grey	Grey	Grey	Grey	Yellow	CM07	Blue	Blue
Hnoss	Rocio	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Gersemi (plan A)		Red	Red	Red	Yellow	Yellow	Yellow	Blue	Yellow	Blue	Blue	Grey	Grey	Grey	Grey	Yellow	Yellow	Blue	Blue
Gersemi - cavity insert	Akira																		
Gersemi - magnet insert	Kevin					test magnet					test magnet							CCT China	Blue

We are here

Send CM06
Receive CM08

- CM06 is under cold test
- We are preparing for the next magnet test in parallel



W47 & W48 progress



week		W47											
date		MON		TUE		WED		THU		FRI		SAT	SUN
		22-nov		23-nov		24-nov		25-nov		26-nov		27-nov	28-nov
		m	a	m	a	m	a	m	a	m	a		
present CM	CM06	Beckhoff motor driver test								N2 cooling			
next CM	CM07					reception test LEMO				waiting in the docking area			
next next CM	CM08	preparation at Orsay											

week		W48											
date		MON		TUE		WED		THU		FRI		SAT	SUN
		29-nov		30-nov		01-dec		02-dec		03-dec		04-dec	05-dec
		m	a	m	a	m	a	m	a	m	a		
present CM	CM06	cooling down	4K filling	2K pumping, coupler cold conditioning, RF calibration	crain training	MP conditioning	CTS test at 2K	heat load measurement	piezo test	f vs p from 2K to 4K			
next CM	CM07	waiting in the docking area											
next next CM	CM08	preparation at Orsay											

We are here

- We started N2 cooling earlier than usual
- Insulation vacuum in transfer line (Dewar to VBox) was pumped again



W49 & W50 & W51 planning



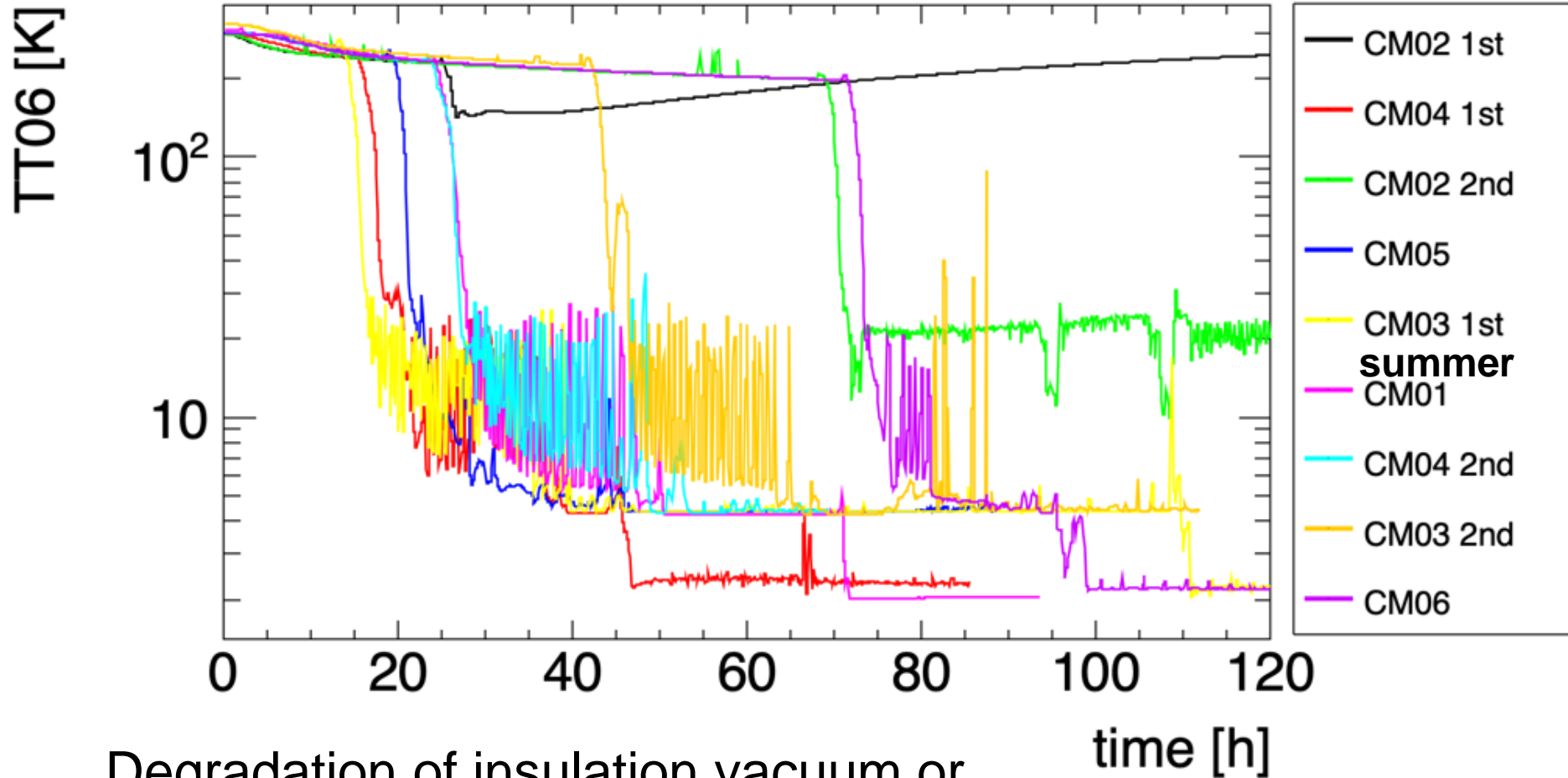
week		W49											
date		MON 06-dec		TUE 07-dec		WED 08-dec		THU 09-dec		FRI 10-dec		SAT 11-dec	SUN 12-dec
		m	a	m	a	m	a	m	a	m	a		
present CM	CM06	start warming up		vent insulation vacuum		warming up		disconnect cryogenic lines	swap modules	filling dry N2			
next CM	CM07	VNA reception test, doorknob mounting						water leak check		connect cryogenic lines	beam pumps, leak check		
next next CM	CM08	preparation at Orsay											

week		W50											
date		MON 13-dec		TUE 14-dec		WED 15-dec		THU 16-dec		FRI 17-dec		SAT 18-dec	SUN 19-dec
		m	a	m	a	m	a	m	a	m	a		
previous CM	CM06	doorknob dismounting	outgoing test (LEMO, VNA) shock sensors	activate shock sensors, close the box		waiting in the box		departure to ESS		arrival at ESS			
present CM	CM07	beam vacuum pumping				RF calibration		Try to make it with the same track					
next CM	CM08	preparation at Orsay						departure from Orsay		transport over the sea			

week		W51											
date		MON 20-dec		TUE 21-dec		WED 22-dec		THU 23-dec		FRI 24-dec		SAT 25-dec	SUN 26-dec
		m	a	m	a	m	a	m	a	m	a		
previous CM	CM06	preparation of documents						publish test report					
present CM	CM07	coupler warm conditioning											
next CM	CM08	transport over the sea						reception at UU morning		thermalization at UU			

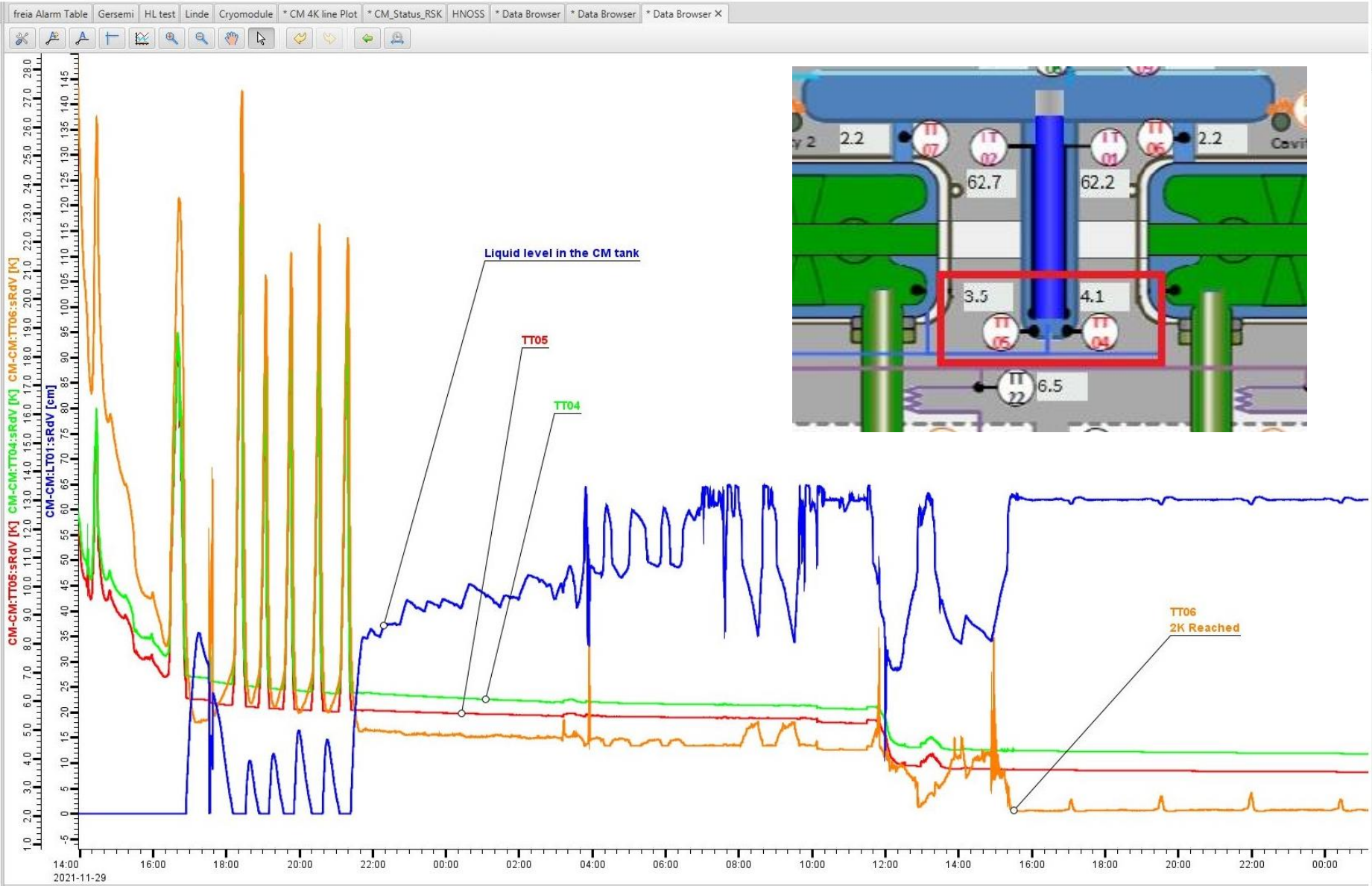
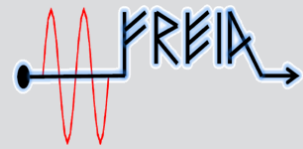
- We are using **two frames** for parallel work
 - We are using **two sets of feet** for two frames
 - The feet coming with CM02
 - Other feet coming with CM04
 - Other **two sets of feet** are ready for shipping with the CMs under tests
 - The feet coming with CM06 (under test) are in the CM06 box
 - The feet coming with CM07 (next test) are in the CM07 box
- In total **four set of feet** must be at Uppsala
-
- **Two sets of cryogenic bellows** are at Uppsala
 - The one with CM02 has been always in use
 - The one with CM04 is kept as spare
 - Two sets of bellows are in CM06 & CM07 boxes
 - **Two sets of prototype doorknobs** are in use at Uppsala

Does longer N₂ cooling help LHe filling? → not very clear

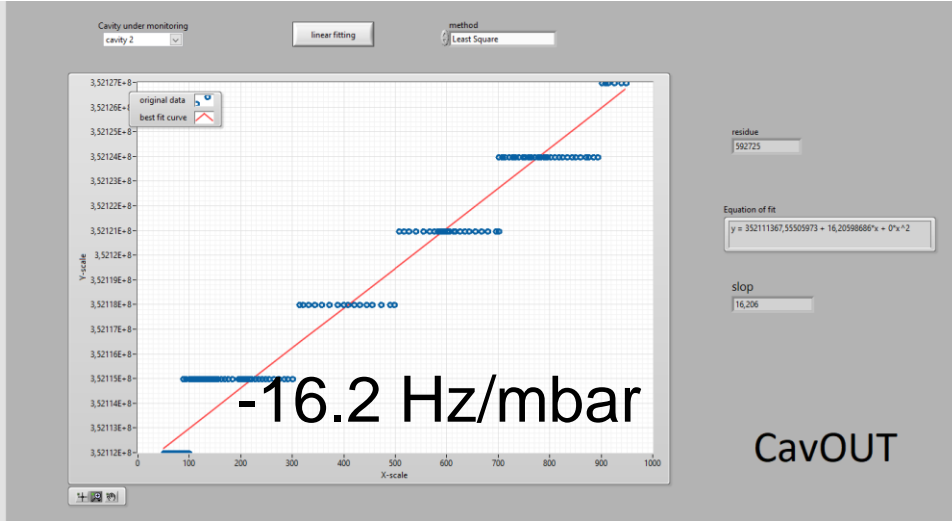
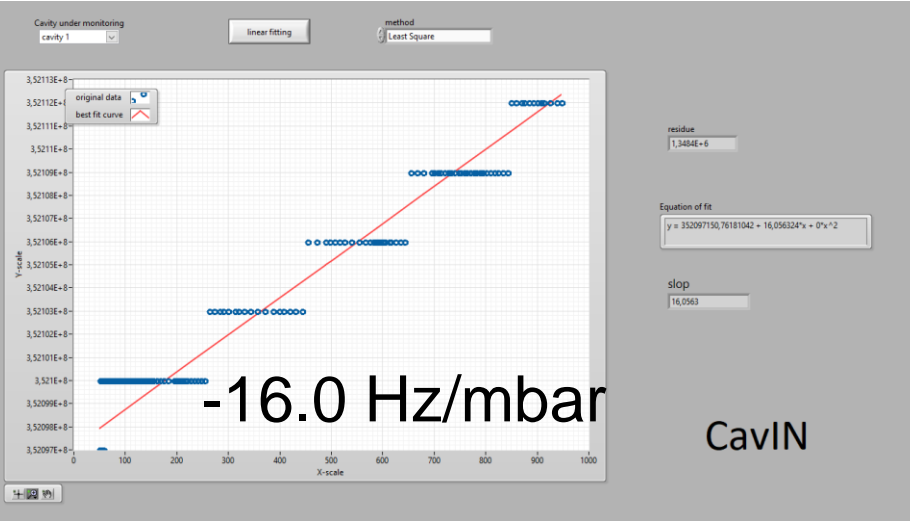


Degradation of insulation vacuum or different parameters in cryogenics?

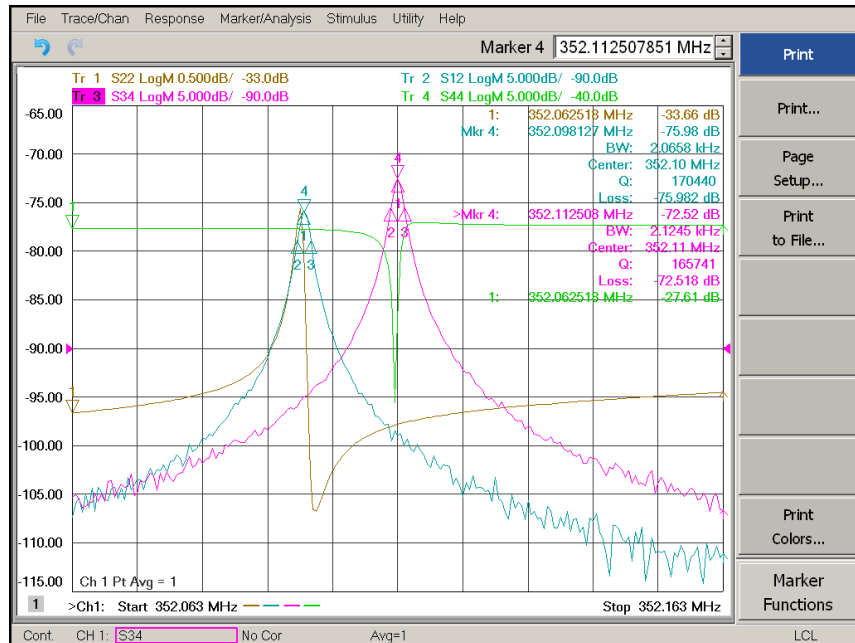
Doubt in TT04 and TT05



CM06: f vs p during 2K pumping



The span was not optimized → we redo this during warming up from 2K to 4K



	CAV IN	CAV OUT
f_0 [MHz]	352.098	352.113
QL	1.70e5	1.66e5

- Again (like CM02, CM04 1st, CM05), the power couplers are too much coupled
- Spec. is **>1.74e5**



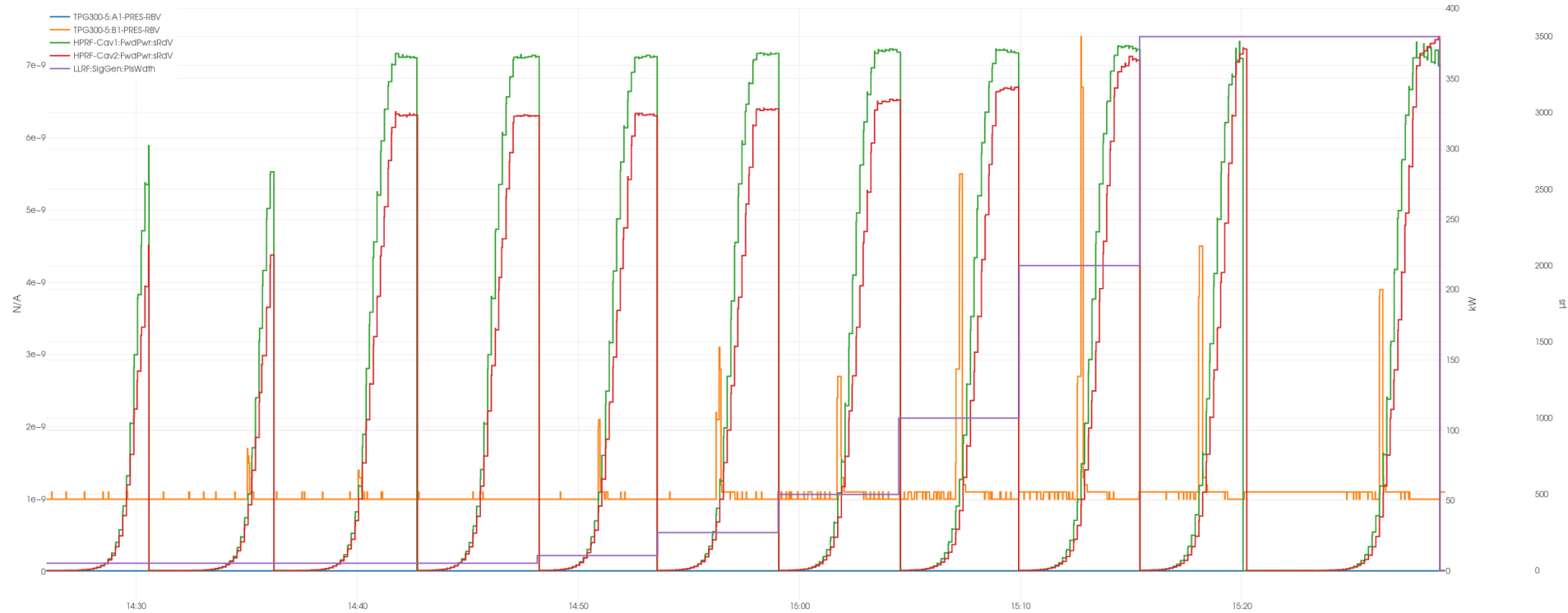
CM06: coupler cold conditioning



EPICS Archiver Appliance Viewer

30s 1m 5m 15m 30m 1h 4h 8h 1d 2d 1w 2w 1M 6M YTD 1Y Live

- TPG300-5.A1-PRES-RBV
- TPG300-5.B1-PRES-RBV
- HPRF-Cav1:PwrPwr.sRdV
- HPRF-Cav2:PwrPwr.sRdV
- LLRF:SigGen:PlsWdm



No problem
(Is this really necessary by the way?)

CM06: CAV IN reached 12 MV/m

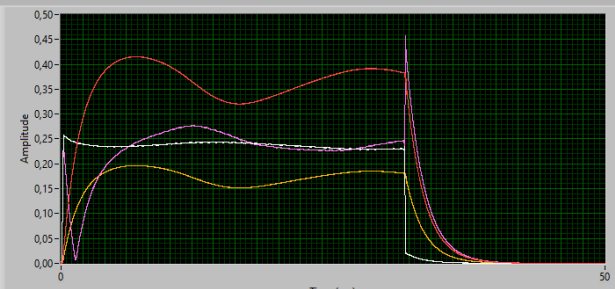



FREIA SPOKE HIGH POWER TEST_Cav 1
time: **18:28:11**

Configuration Calibration and pulse parameter setting Phase shifter and Gain control PNA Scope decay measurement heat load measurement LFD measurement

 ● status High speed (10Ms/s) Transfer speed
 Standard (50 kSample) FFT buffer size

5782 - Ch0 5782 - Ch1 Ch1 cavity
 5761 - Ch0 5761 - Ch1 5761 - Ch2 5761 - Ch3



Amplitude Time (ms)

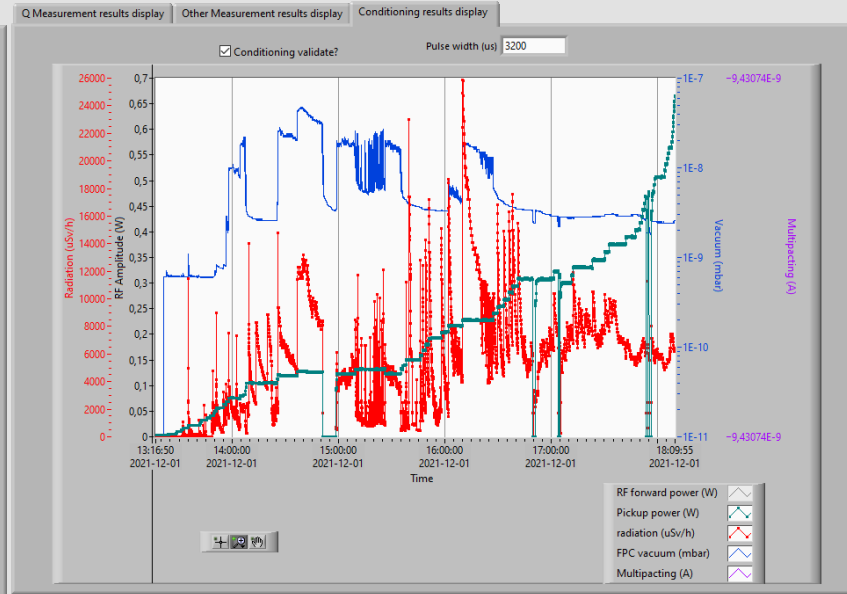
Time and Frequency Phase and Magnitude
 Last data only Buffer data

 Chart length: 400000

unwrap phase Reference for phase: 5761 - Ch1 Show buffers

FPGA setup
 Mode: Real IO Mixer freq [MHz]: 352.2 Trigger: Trigger input
 Output mixer frequency [MHz]: 352.2 Period: 0
 Output enabled: Output delay: 0 ns
 Output delay delta: 0 ps

PID control Adaptive FF Offsets Feed forward Cavity model FFT Delay
Quench detection
 Measure Tau at Time: 32000 Tau set: 120 Enable: Reset Quench Warning:
 Tau [µs]: 167,385 Quench_Warning:



Pf_max (dBm) 84,2171	Pf_max (W) 264066	P_total (W) 0	CL 170000 Qt 2,1E+11
Pr_max (dBm) 89,485	Pr_max (W) 888171	P_static (W) 0	real time frequency_fc 0E+0
Pt_max(dBm) 28,2293	Pt_max (W) 0,665171	P_heater (W) 0	Pc_dynamic(W) 0
			Vc_ave (MV) 0

Pf_max (W)	Q0_Dynamic	Eacc_Dynamic	Eacc_pk_Pt	Eacc_pk_Pf
264066	0	0	12,072	13,6874

TT04	TT06	PT02	PT03	Radiation	PT10	PT20
4,06181	2,19531	9999	30,9	6220	2,6E-9	3E-9

No exponential increase of X-rays → no FE up to 12MV/m 10

CM06: CAV OUT reached 12 MV/m (?)



FREIA SPOKE HIGH POWER TEST_Cav 2

time: 18:41:59

HELP QUIT

Configuration Calibration and pulse parameter setting Phase shifter and Gain controller PNA Scope decay measurement heat load measurement LFD measurement

Pause Single status

High speed (10Ms/s) Transfer speed
Standard (50 kSample) FFT buffer size

select for decay measurement

Display
 Time and Frequency
 Phase and Magnitude
 Last data only
 Buffer data

Time
Amplitude

Chart length
400000

unwrap phase
Reference for phase
5761 - Ch1

Show buffers

Time
Amplitude

FPGA setup
 Mode: Real IO Mixer freq [MHz]: 352.2 Trigger: Trigger input
 Output mixer frequency [MHz]: 352 Period: 0
 Output enabled
 Output delay: 0 ns
 Output delay delta: 0 ps

PID control Offsets Feed forward Cavity model FFT Delay Scale
 Adaptive FF Quench detection
 Measure Tau at Time: 32000 Tau set: 120 Enable: Reset Quench Warning
 Tau [µs]: 157,205 Quench Warning

Q Measurement results display Other Measurement results display Conditioning results display

Conditioning validate? Pulse width (µs) 3200

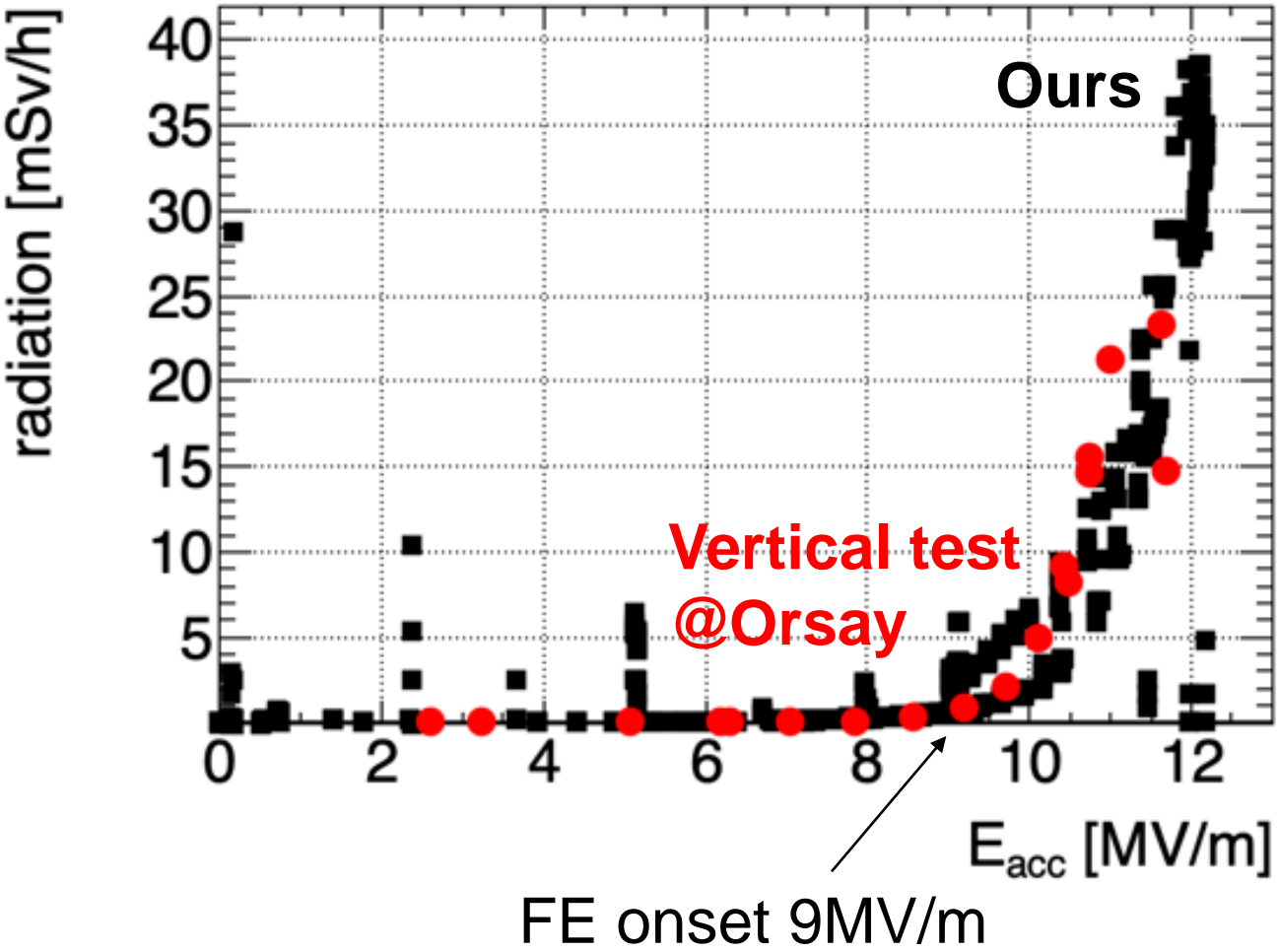
Qt=1.55e11

Pf_max (dBm)	Pf_max (W)	P_total (W)	CL 165000	Qt 1,55E+11
85,7352	374561	0		
Pf_max (dBm)	Pf_max (W)	P_static (W)	real time frequency_fc	
87,3521	543514	0		
Pf_max (dBm)	Pf_max (W)	P_heater (W)	Pc_dynamic(W)	Vc_ave (MV)
29,5298	0,897388	0	0	0

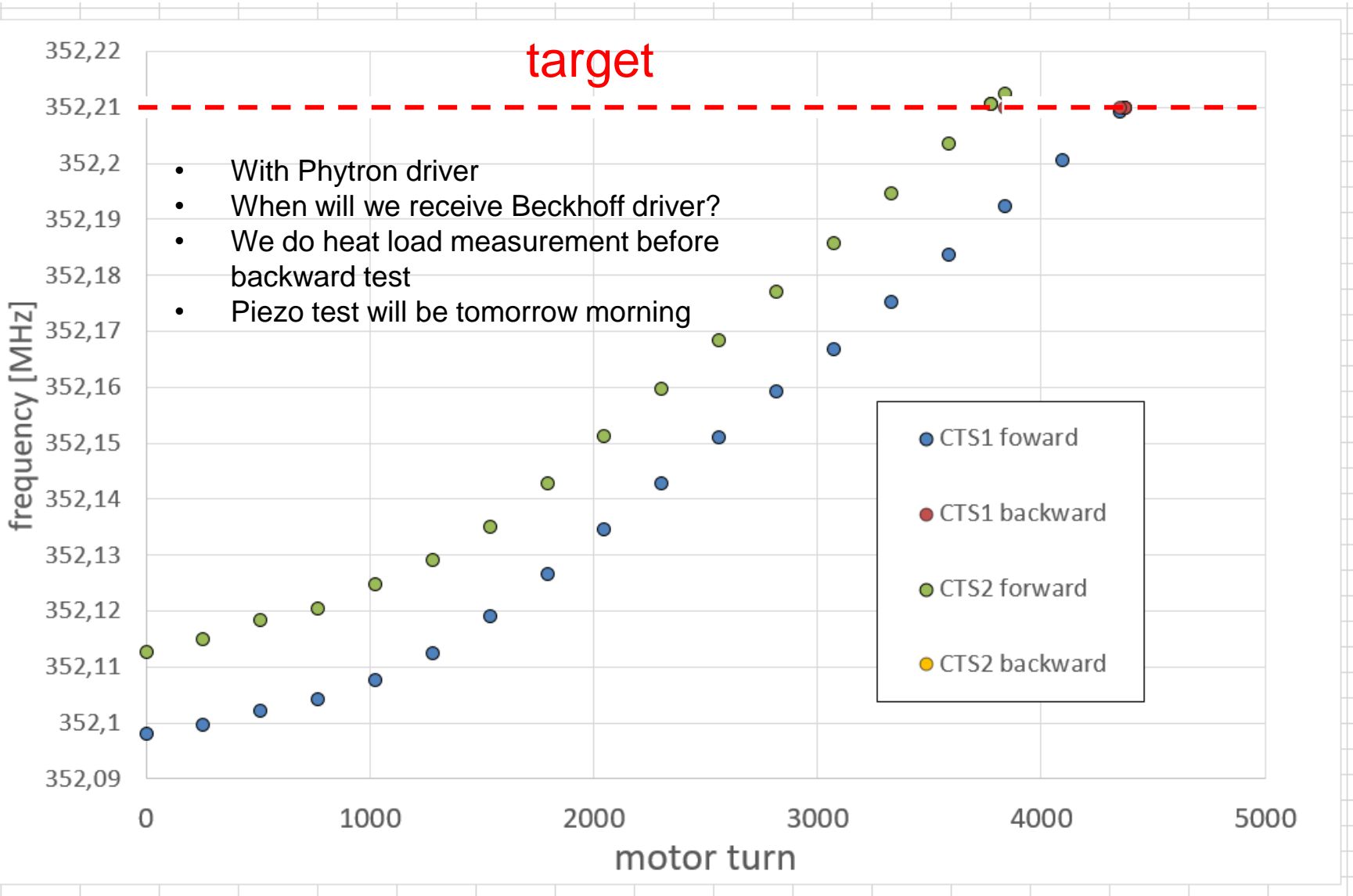
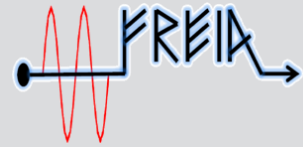
Pf_max (W)	Q0_Dynamic	Eacc_Dynamic	Eacc_pk_Pt	Eacc_pk_Pf
374561	0	0	12,0464	16,0599

TT05: 3,44999 TT07: 2,28368 PT02: 9999 PT03: 30,9 Radiation: 12100 PT10: 1,6E-9 PT20: 2,8E-9

X-rays increased by Eacc but doubt in Qt (like CM05) so the real field might be higher than usual, confirmed with bigger LFD



CM06: CTS reached 352.21 MHz



CM07: reception test



- LEMOs OK
- Pt100 & heaters OK

Cables verification CM07 at IJCLab						v1
Socket assembly				Verified by: M. Pierens		
Socket name	Sensor / Actuator type	PID name	Serial number	Electrical value (Ω) (before shipping)	C / NC	
LC01	Cernox	TT04	X138089	65,54	C	
	Cernox	TT05	X138356	76,23	C	
	Cernox	TT06	X138355	68,17	C	
	Cernox	TT07	X138087	68,27	C	
	Cernox	TT08	X139133	66,68	C	
	Cernox	TT09	X138088	68,62	C	
	PT100	TT10	PT27	107,77	C	
	PT100	TT11	PT33	107,8	C	
	Cernox	TT12	X137124	74,59	C	
	PT100	TT20	PT44	107,78	C	
	PT100	TT21	PT54	107,78	C	
	Cernox	TT22	X137123	76,21	C	
PT Coupler	PT100	TT120	PTC23	107,65	C	
		TT220	PTC30	107,64	C	
LC02	Heaters	EH01	EH19	84,23	C	
		EH02	EH20	83,55	C	
		EH10		82,99	C	
		EH20		84,62	C	
LC03	Motor sensor	SM10		2,44 (AB) / 2,47 (CD)	C	
	a limit sensor	LS10		2,1	C	
	Motor sensor	SM20		2,52 (AB) / 2,57 (CD)	C	
	a limit sensor	LS20		2,19	C	
LC07	Liquid Helium Level Sensor	LT01	7340	368,68	C	
		LT02	7342	369,16	C	
Socket name	Sensor / Actuator type	PID name	Serial number	Electrical value (μF) (before shipment)	C / NC	
LC04	Actuators	PZ10		12,38	C	
		PZ11		12,5	C	
		PZ20		12,46	C	
		PZ21		12,24	C	

Cables verification CM07 at UU						v1
Socket assembly				Verified by:		
Socket name	Sensor / Actuator type	PID name	Serial number	Electrical value (Ω) (before shipping)	C / NC	
LC01	Cernox	TT04	X138089	65,15	C	
	Cernox	TT05	X138356	76,75	C	
	Cernox	TT06	X138355	68,2	C	
	Cernox	TT07	X138087	67,9	C	
	Cernox	TT08	X139133	66,45	C	
	Cernox	TT09	X138088	68,2	C	
	PT100	TT10	PT27	107,05	C	
	PT100	TT11	PT33	106,75	C	
	Cernox	TT12	X137124	75,05	C	
	PT100	TT20	PT44	106,85	C	
	PT100	TT21	PT54	106,9	C	
	Cernox	TT22	X137123	76,2	C	
PT Coupler	PT100	TT120	PTC23	107,9	C	
		TT220	PTC30	107,9	C	
LC02	Heaters	EH01	EH19	84,1	C	
		EH02	EH20	83,4	C	
		EH10		83	C	
		EH20		84,6	C	
LC03	Motor sensor	SM10		2,4 / 2,4	C	
	a limit sensor	LS10		2	C	
	Motor sensor	SM20		2,3 / 2,4	C	
	a limit sensor	LS20		2	C	
LC07	Liquid Helium Level Sensor	LT01	7340	367,1	C	
		LT02	7342	367,5	C	
Socket name	Sensor / Actuator type	PID name	Serial number	Electrical value (μF) (before shipment)	C / NC	
LC04	Actuators	PZ10		14,2	C	
		PZ11		14,05	C	
		PZ20		14,22	C	
		PZ21		14,5	C	

- No time for VNA measurement
→ next week just before doorknob mounting

Cav_IN [Ohm]		Cav_OUT [Ohm]	
1-2	107,9	1-2	107,9
1-3		1-3	
1-4		1-4	
2-3		2-3	
2-4		2-4	
3-4		3-4	
Heater	3,4	Heater	3,2

- Some questions to THALES → another technical meeting on Dec 9th 10h
 - The origin of G1-G2 burn mark
 - Future visit of THALES technical team to Uppsala
 - Test procedure?
- ESS-THALES meeting on Feb 3rd
 - No decision yet about 52 (+2-3) spares
 - Delivery time of 9 months in such a mass production
 - This is not an option for Uppsala! (Feb + 9 months = Nov 2022!)
- We found a backdoor for small number of spares
 - 1st unit can be shipped within a couple of days (on stock),
 - 2nd unit can be shipped T0+3 months (→ Feb + 3 month = May)
- According to the statistics, the tubes will start to trip from April and will die in summer → the 2 spare tubes after February sound reasonable