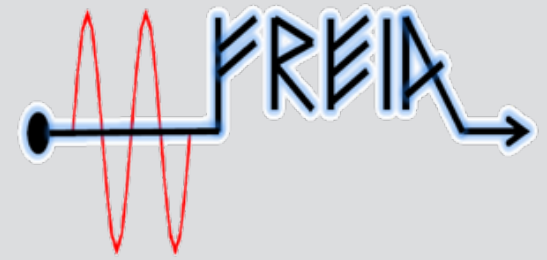




UPPSALA
UNIVERSITET



ESS weekly meeting (2021 W42)

A. Miyazaki et al.



General planning



FREIA Planning		2021-10-20												2022															
		October				November				December				January			February			March									
Equipment	Responsible	27	4	11	18	25	1	8	15	22	29	6	13	20	27	1	8	15	22	29	7	14	21	28	7	14	21	28	4
		week #																											
		39	40	41	42	43	44	45	46	47	48	49	50	51	52	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Liquefier & 2K pumps	Esat	Blue	Blue	Yellow	Green	Blue	Yellow	Blue	Blue	Blue	Yellow	Yellow	Yellow	Grey	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
RF power stations	Mykhailo	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Cryomodule test stand	Akira	CM04	Yellow	Green	CM03	Yellow	Green	CM06	Yellow	Green	Yellow	Green	Yellow	Grey	Grey	Yellow	CM07	Yellow	Green	CM08	Yellow	Green	CM09	Yellow	Green	Yellow	Green	Yellow	Green

We are here



Absence of Akira
Oct 4 – Nov 26

Chance for CM07 warm coupler conditioning

Lesson learned in past months

- Green weeks (coupler warm conditioning) are the best time-slot for departure/arrival of modules
- If everything works fine, we need
 - 1w for mechanical preparation
 - 1w for coupler conditioning
 - 1.5w for cold RF tests (incl. thermalization)
 - 1.5w for preparing for departure (incl. warming up)

4-5 days

3 days

In total 5 weeks
→ 9-10 modules
per year



W41 & W42 progress



week		W41											
date		MON 11-Oct		TUE 12-Oct		WED 13-Oct		THU 14-Oct		FRI 15-Oct		SAT 16-Oct	SUN 17-Oct
		m	a	m	a	m	a	m	a	m	a		
previous CM	CM04	disconnect cryogenic lines	swap modules	filling dry N2		doorknob dismantling	outgoing test (LEMO, VNA) shock sensors	activate shock sensors, close the box		waiting in the box			
present CM	CM03	water leak check		connect cryogenic lines	beam pumps, leak check	beam vacuum pumping			RF calibration				
next CM	CM06	preparation at Orsay							departure from Orsay		transport over the sea		

week		W42											
date		MON 18-Oct		TUE 19-Oct		WED 20-Oct		THU 21-Oct		FRI 22-Oct		SAT 23-Oct	SUN 24-Oct
		m	a	m	a	m	a	m	a	m	a		
previous CM	CM04	departure to ESS 9:00 am		preparation of documents				publish test report					
present CM	CM03	coupler warm conditioning, purging He circuit			N2 cooling			cooling down		4K filling, coupler cold conditioning			
next CM	CM06	transport over the sea						reception at UU 8:00 am		thermalization at UU			

We are here

Thanks everybody for the hard work!



W43 & W44 & W45 planning



week		W43											
date		MON		TUE		WED		THU		FRI		SAT	SUN
		25-Oct		26-Oct		27-Oct		28-Oct		29-Oct		30-Oct	31-Oct
		m	a	m	a	m	a	m	a	m	a		
present CM	CM03	2K pumping	RF calibration at cold	CTS test		RF interlock setup	MP conditioning	heat load measurements					
next CM	CM06	reception test LEMO		reception test VNA									
next next CM	CM07	preparation at Orsay											

week		W44											
date		MON		TUE		WED		THU		FRI		SAT	SUN
		1-Nov		2-Nov		3-Nov		4-Nov		5-Nov		6-Nov	7-Nov
		m	a	m	a	m	a	m	a	m	a		
present CM	CM03	start warming up		vent insulation vacuum		warming up completed		disconnect waveguide, pumping stations, ...					
next CM	CM06	doorknob mounting & water leak check						waiting in the docking area					
next next CM	CM07	preparation at Orsay											

week		W45											
date		MON		TUE		WED		THU		FRI		SAT	SUN
		8-Nov		9-Nov		10-Nov		11-Nov		12-Nov		13-Nov	14-Nov
		m	a	m	a	m	a	m	a	m	a		
present CM	CM03	disconnect cryogenic lines	swap modules	filling dry N2		doorknob dismounting	outgoing test (LEMO, VNA) shock sensors	activate shock sensors, close the box		waiting in the box			
next CM	CM06	water leak check		connect cryogenic lines	beam pumps, leak check	beam vacuum pumping			RF calibration				
next next CM	CM07	preparation at Orsay						departure from Orsay		transport over the sea 4			



W46: week for departure/arrival



week		W46											
date		MON		TUE		WED		THU		FRI		SAT	SUN
		15-Nov		16-Nov		17-Nov		18-Nov		19-Nov		20-Nov	21-Nov
		m	a	m	a	m	a	m	a	m	a		
previous CM	CM03	departure to ESS		preparation of documents				publish test report					
present CM	CM06	coupler warm conditioning											
next CM	CM07	transport over the sea						reception at UU		thermalization at UU			

CM03 departure to ESS: Nov 15th

CM07 reception at UU: Nov 18th

Cf. We might have another chance for departure/arrival in Dec

week		W50											
date		MON		TUE		WED		THU		FRI		SAT	SUN
		13-Dec		14-Dec		15-Dec		16-Dec		17-Dec		18-Dec	19-Dec
		m	a	m	a	m	a	m	a	m	a		
previous CM	CM06	departure to ESS		preparation of documents				publish test report					
present CM	CM07	coupler warm conditioning											
next CM	CM08	transport over the sea						reception at UU		thermalization at UU			

CM06 departure to ESS: Dec 13th

CM08 reception at UU: Dec 16th



CM04 departed & CM06 arrived



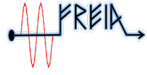
We are matured for Series tests !

GPS tracking of the CM06 transport



This is not published online but read-out afterwards

CM04's report will be circulated after the meeting



FREIA
Department of Physics and Astronomy
Uppsala University

Summary of CM04 2nd test

Report time: 20211021

Vacuum

date	2021-06-30	2021-09-30	2021-10-08
Temperature (K)	300	2	300
Beam vacuum (mbar)	2,10E-3	2,0E-9	<5E-4
Isolating vacuum (mbar)	1000	1,8E-7	1000

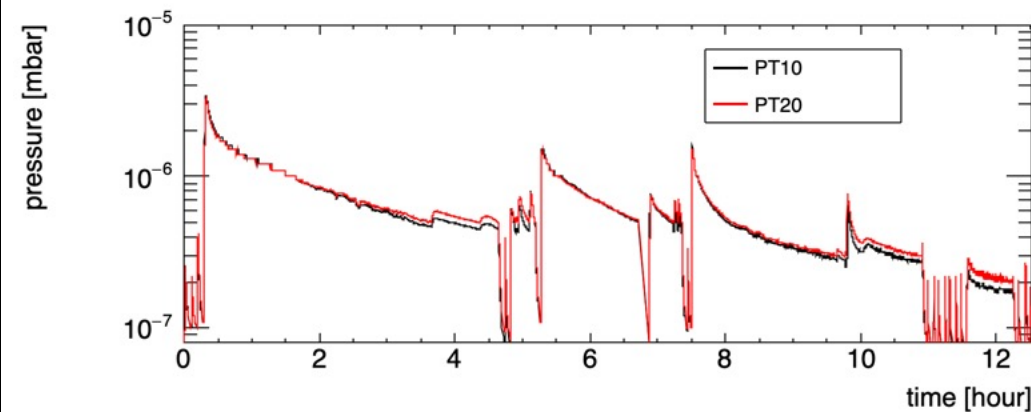
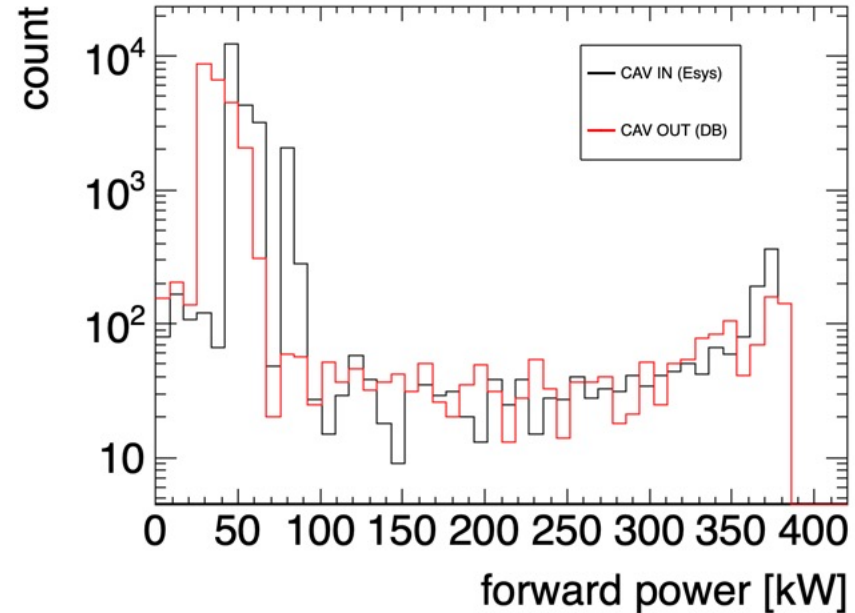
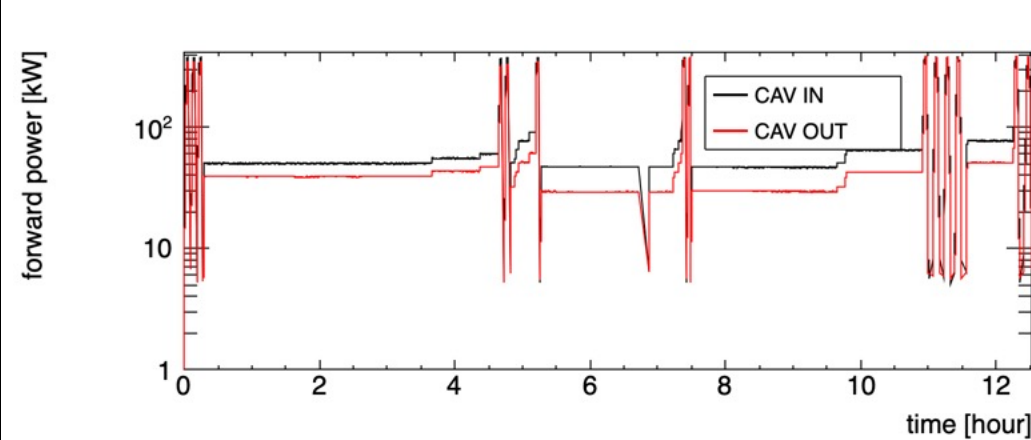
Cavity performance

	CAV_IN	CAV_OUT	Target
Cavity name	DSPK08	DSPK11	-
f_0 at warm (MHz)	351.566	351.538	-
f_0 at 2K (MHz) @ without CTS engaged	352.121	352.104	352.090 - 352.174
Q_{ext}	1.91e5	1.9e5	1.75e5 - 2.85e5
Q_r (from Orsay)	2.31e11	3.35e11	-
Max E_{acc} (MV/m)	12.3	12.1	>9
Field emission onset (MV/m)	-	-	-
$Q_r @ 9MV/m$	>1.63e9	>1.63e9	>1.5e9
$P_r @ 9MV/m$ (W)	<2.0	<2.0	2.5
Dynamic heat load for CM @ 9MV/m (W)	14.96 +/- 1.0		
Static heat load for CM (W)	14.54 +/- 1.0		
df/dP (Hz/mbar)	14.5	15.7	<20
Stepper motor ²⁾ setting for nominal frequency	motor steps	678400	828800
	motor position (mm)	1.325	1.61875
CTS sensitivity in linear region	driving current (A)	0.6	0.6
	Limit switch position (steps)	-40	-5000
Piezo1 tuning range (Hz)	(Hz/ step)	0.171	0.182
	(kHz/ mm)	87.4	93.3
Piezo1 tuning sensitivity (Hz/V)	unipolar	604	451
	bipolar	695	658
Piezo2 tuning range (Hz)	unipolar	478	566
	bipolar	856	558
Piezo2 tuning sensitivity (Hz/V)		2.39	2.83
LFD @ 9MV/m in open loop (Hz)	232	237	-

Day	Time	Pressure (mbar)	Leak	Name of operator
2021-10-20	14:50	1.0E-03	1.0E-01	C.Santberg
2021-11-1	11:50	2.1E-03	1.0E-01	C.Santberg
2021-11-5	8:45	2.3E-03	1.0E-01	C.Santberg
2021-11-9	9:30	2.3E-03	1.0E-01	C.Santberg
2021-11-17	9:50	2.3E-03	1.0E-01	C.Santberg
2021-11-18	10:30	2.3E-03	1.0E-01	C.Santberg
2021-11-19	9:30	2.4E-03	1.0E-01	C.Santberg
2021-11-20	15:15	2.8E-03	1.0E-01	A.Mazaa
2021-11-21	15:50	2.8E-03	1.0E-01	A.Mazaa
2021-11-24	10:50	2.8E-03	1.0E-01	A.Mazaa
2021-11-26	10:30	2.9E-03	1.0E-01	A.Mazaa
2021-11-29	17:50	2.8E-03	1.0E-01	A.Mazaa
2021-12-3	13:50	2.8E-03	1.0E-01	A.Mazaa
2021-12-10	02:20	2.9E-03	1.0E-01	A.Mazaa
2021-12-20	8:15	2.9E-03	1.0E-01	A.Mazaa
2021-12-28	10:15	3.0E-03	1.0E-01	A.Mazaa
2021-12-29	7:45	3.0E-03	1.0E-01	A.Mazaa
2021-12-30	10:50	3.1E-03	1.0E-01	A.Mazaa
2021-12-31	7:50	3.1E-03	1.0E-01	A.Mazaa
2022-01-04	10:30	3.2E-03	1.0E-01	C.Santberg
2022-01-15	9:30	3.3E-03	1.0E-01	C.Santberg
2022-01-18	10:30	3.2E-03	1.0E-01	C.Santberg
2022-01-25	9:30	3.4E-03	1.0E-01	C.Santberg
2022-01-28	10:30	3.4E-03	1.0E-01	C.Santberg
2022-01-29	10:15	3.5E-03	1.0E-01	A.Mazaa
2022-01-30	9:50	3.5E-03	1.0E-01	A.Mazaa
2022-01-31	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-01	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-02	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-03	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-04	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-05	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-06	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-07	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-08	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-09	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-10	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-11	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-12	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-13	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-14	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-15	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-16	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-17	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-18	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-19	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-20	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-21	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-22	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-23	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-24	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-25	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-26	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-27	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-28	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-02-29	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-01	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-02	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-03	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-04	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-05	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-06	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-07	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-08	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-09	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-10	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-11	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-12	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-13	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-14	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-15	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-16	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-17	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-18	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-19	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-20	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-21	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-22	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-23	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-24	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-25	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-26	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-27	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-28	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-29	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-30	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-03-31	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-01	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-02	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-03	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-04	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-05	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-06	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-07	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-08	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-09	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-10	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-11	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-12	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-13	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-14	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-15	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-16	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-17	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-18	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-19	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-20	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-21	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-22	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-23	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-24	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-25	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-26	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-27	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-28	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-29	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-04-30	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-05-01	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-05-02	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-05-03	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-05-04	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-05-05	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-05-06	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-05-07	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-05-08	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-05-09	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-05-10	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-05-11	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-05-12	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-05-13	10:15	3.6E-03	1.0E-01	A.Mazaa
2022-05-14	10:15	3.6E-03	1.0E-01	A.Mazaa

CONFIG									
CM04 (STR04)									
Cryomodule	Hall 106 @LUCAS				UU				
Location	2021-14-15		2021-16-15		2021-7-6		2021-8-30		2021-10-13
VNA modal	Agilent		Agilent		Agilent		Agilent		Agilent
T (C)	26		26		2K		2K		2K
Pcavity (mbar)	8*10 ⁻⁴		8*10 ⁻⁴		2.3e-3		1.00E-07		1.00E-07
Pinvolating vacuum (mbar)	PA		PA		PA		PA		PA
Pcavity (mbar)	PA		PA		PA		PA		PA
RF measurements @ T=300K	RF measurements @ T=300K before testing		RF measurements @ T=300K during the test		RF measurements @ T=300K after testing		RF measurements @ T=300K		RF measurements @ T=300K
Cavity location	Cavity IN	Cavity OUT	Cavity IN	Cavity OUT	Cavity IN	Cavity OUT	Cavity IN	Cavity OUT	Cavity OUT
Coupler	SPK-DBPK-08	SPK-DBPK-11	SPK-DBPK-08	SPK-DBPK-11	SPK-DBPK-08	SPK-DBPK-11	SPK-DBPK-08	SPK-DBPK-11	SPK-DBPK-11
Manchets	SPK-DWT-30	SPK-DWT-32	SPK-DWT-30	SPK-DWT-32	SPK-DWT-30	SPK-DWT-32	SPK-DWT-30	SPK-DWT-32	SPK-DWT-32
S11 (off resonance)	-0.1322	-0.1482	-0.08	-0.07	-0.02	-0.05	-0.02	-0.04	-0.04
S11 (on resonance)	-0.6441	-0.82	-0.78	-0.72	-0.78	-0.74	-0.73	-0.83	-0.83
S21 (off resonance)	-81.421	-84.335	-82.78	-84.57	-74.78	-74.14	-80.07	-84.24	-84.24
S21 (on resonance)	351.560	351.530	351.560	351.538			351.570	351.549	351.549
Frequency @ 2K (MHz)	352.144	352.128			352.121	352.104			
Q _{ext} (MHz)	0.584	0.566			0.265	0.266			
Bandwidth (MHz)	40.67	40.02			38.7905	38.871	1.85	1.93	39.05
Q _{ext} (calculated)	854	8780			8065.5	9046.6	18075.1	182020	9002
For information									
S11 pick-up cable (measurement @ reception)	-1.78	-1.85							
S11 pick-up cable (measurement on CM)	-3.72	-3.53	-3.63	-3.58	-1.94	-1.9			

This coupler was conditioned in the second time without venting beam vacuum with two power stations and two pumping stations

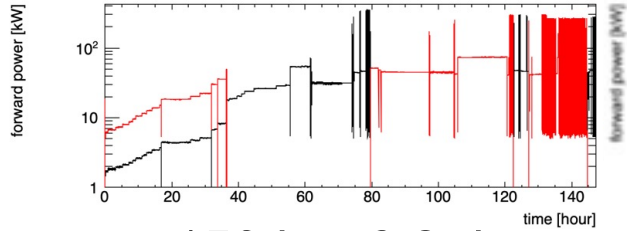


- 12 hours except for down-time
- Down-time was due to the automatic software finished at midnight, but we still needed some final check

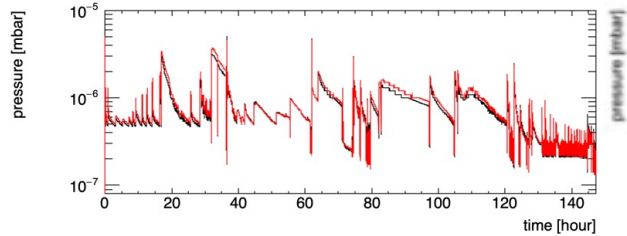
Summary of coupler warm conditioning



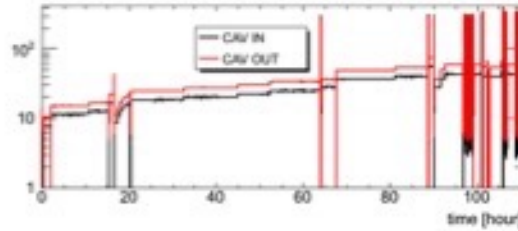
1 station; 2 pumps (CM04)



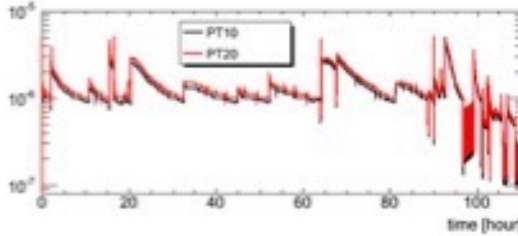
150 h = 6.2 days



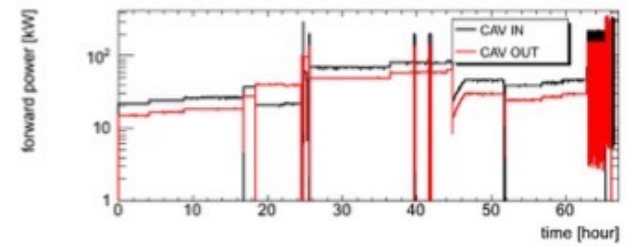
2 stations; 1 pump (CM03)



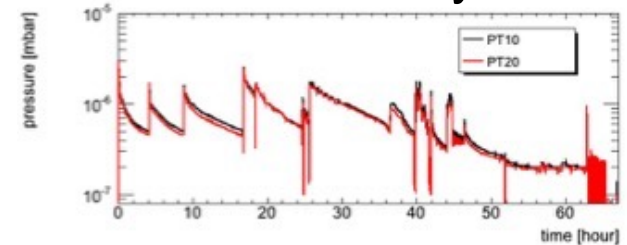
110 h = 4.5 days



2 stations; 2 pumps (CM05)



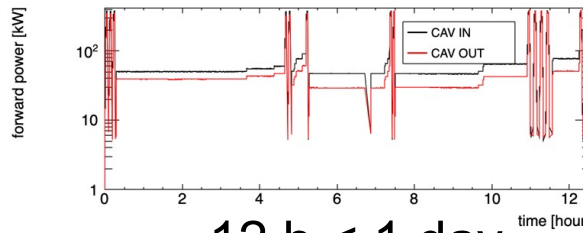
70 h = 3 days



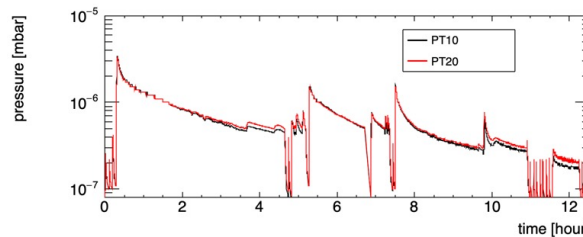
2nd conditioning
(= ESS commissioning)

Less than
one day

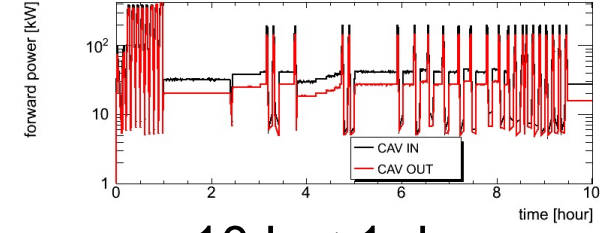
2 stations; 2 pumps (CM03)



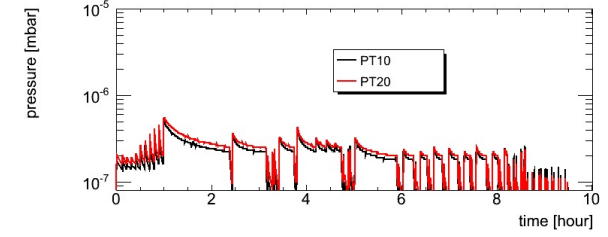
12 h < 1 day



2 stations; 2 pumps (CM02)

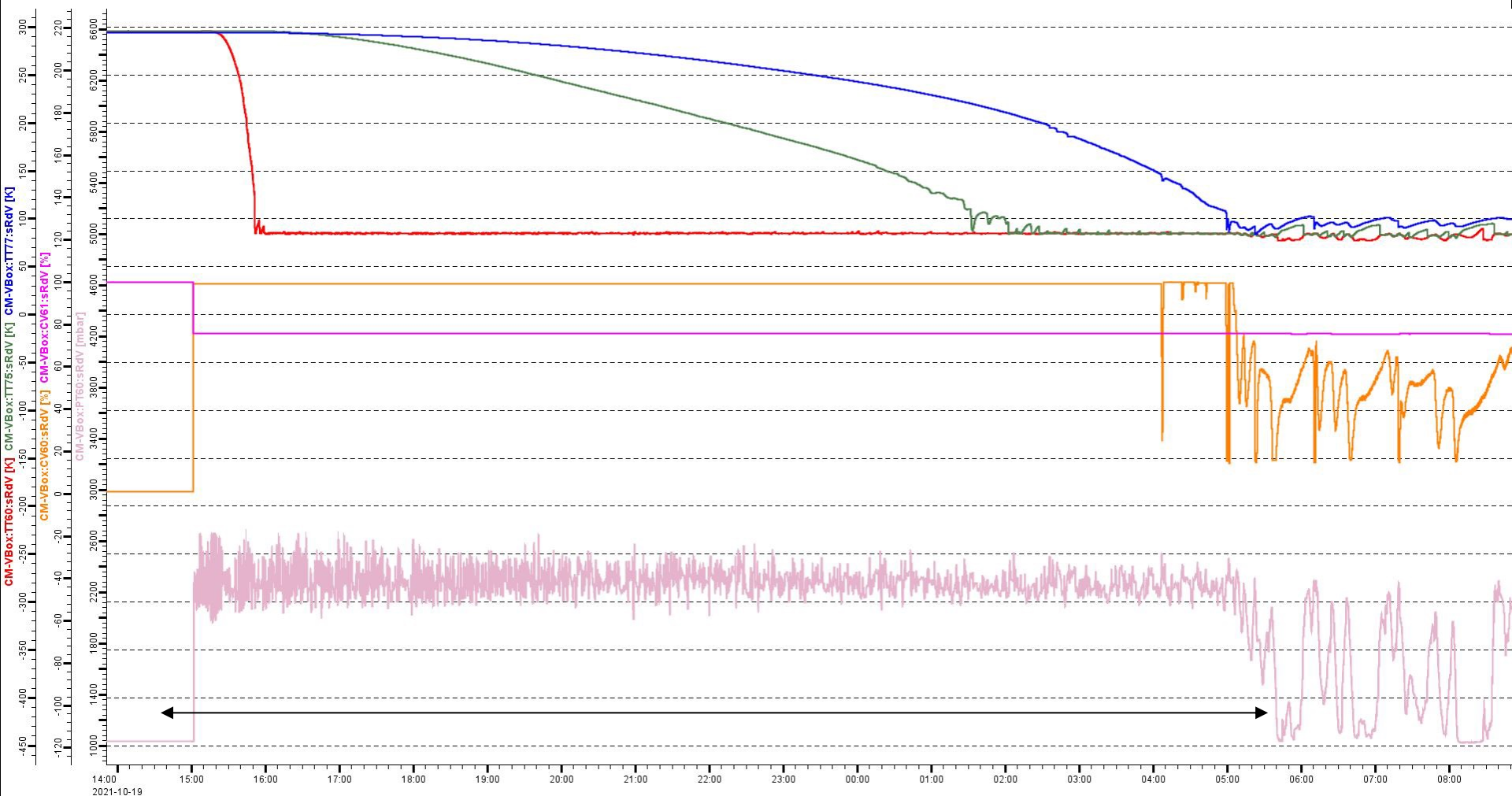


10 h < 1 day



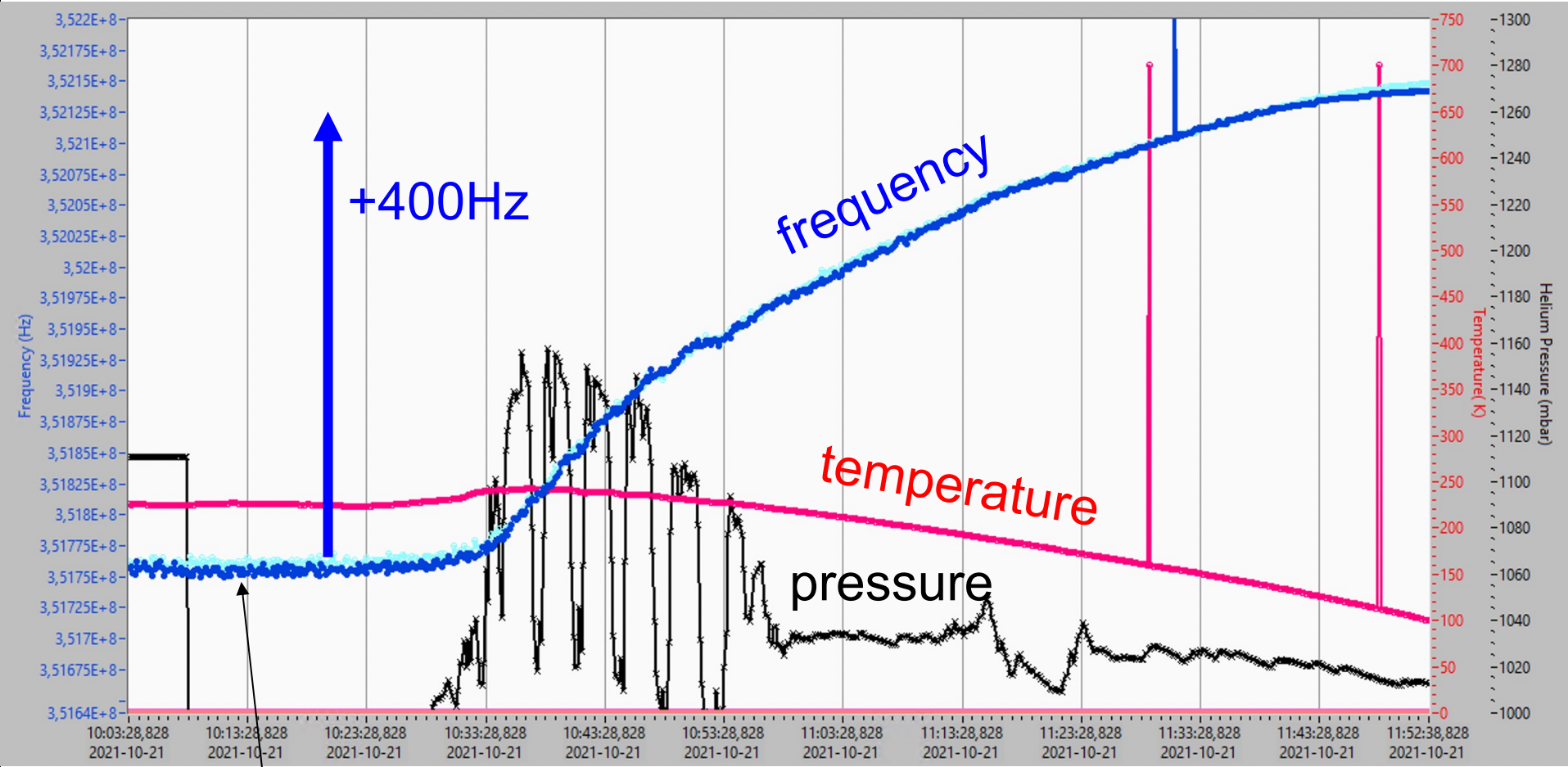


CM03: N2 cooling



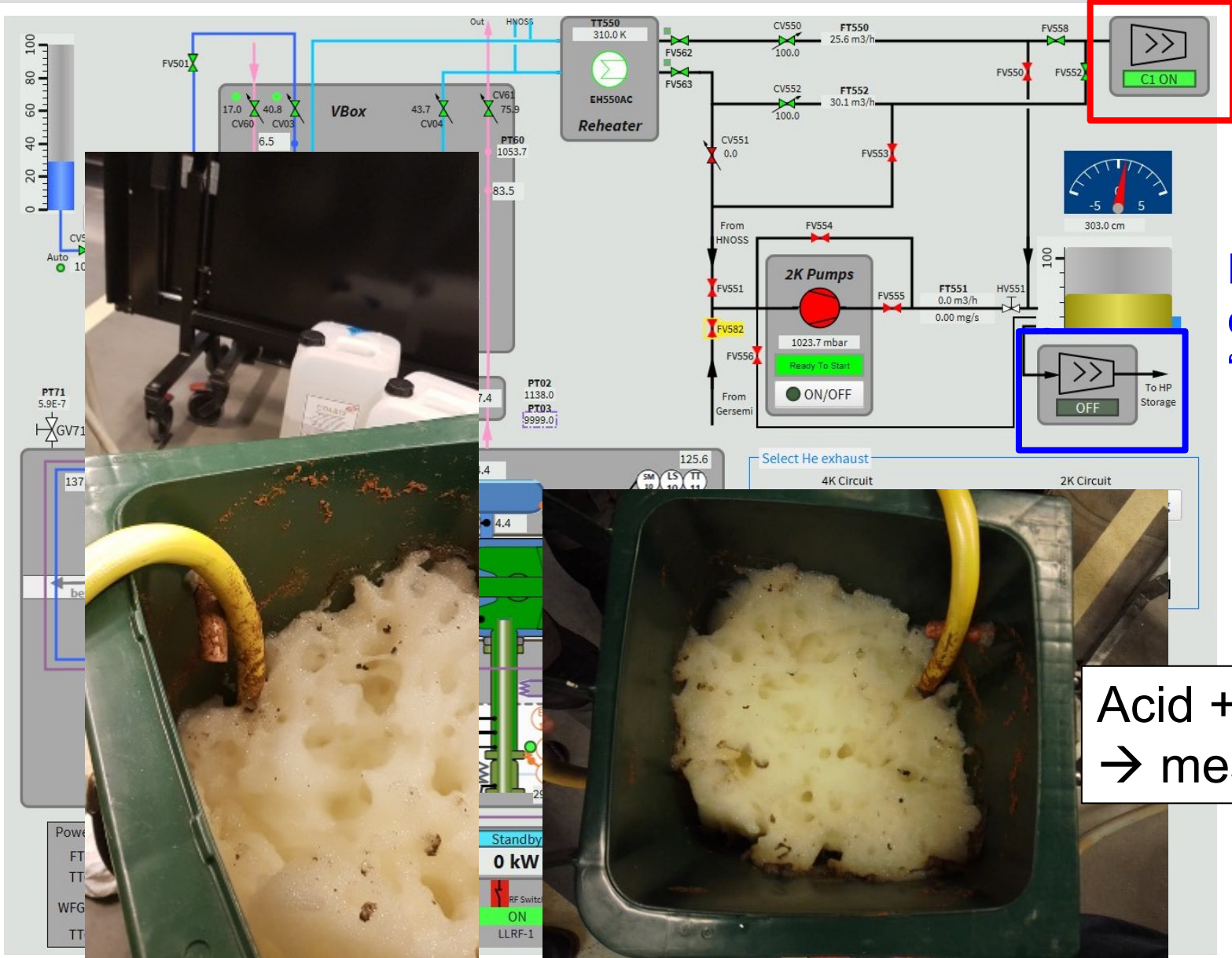
“Visible” cooling down completed in 14 hours
But we decided to take 2 days for thermalization

CM03: f vs T during cooling down



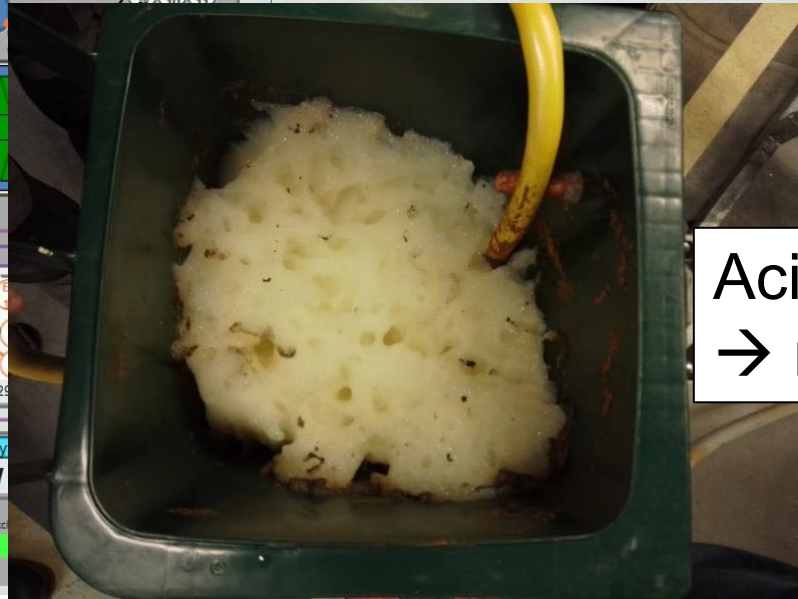
The cavities were already cooled down from 300K to ~200K by N2 over the night

News in Kaeser circulation compressor



Circulation compressor
"Kaeser"

Recovery compressor
"Bauer"



Acid + alkali
→ messy



Kaeser service: Oil filter was changed

