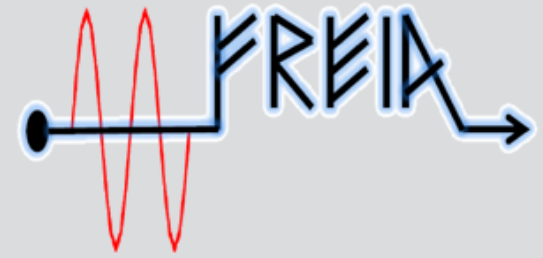




UPPSALA  
UNIVERSITET



# ESS weekly meeting (W22)

A. Miyazaki et al.




# W22 progress and plan



W				next CM	CM under test	previous CM	
				CM01	CM03	CM05	
21	THU	27-May	m a	ready for shipping to UU	He cooling down		publish reports
	FRI	28-May	m a		coupler cold conditioning	4K He filling	
	SAT	29-May			thermalize cold tuning system		
	SUN	30-May					
22	MON	31-May	m a	pick-up at Orsay	f vs P	2K pumping	
					stepper motor initialization	prepare heaters	
	TUE	1-Jun	m a	shipping over the sea	stepper motor		
					piezo test		
	WED	2-Jun	m a		RF calibration & interlock setup	static heat load & heaters	
					Cavity RF conditioning		
	THU	3-Jun	m a	arrive at UU	Heat load measurements		
FRI	4-Jun	m a	thermalization at UU	CTS1 disengage			
SAT	5-Jun			thermalize cold tuning system			
SUN	6-Jun						
23	MON	7-Jun	m a	reception tests (LEMOs)	investigate CTS1 stepper motor		
	TUE	8-Jun	m a				
	WED	9-Jun	m a				
	THU	10-Jun	m a		Start warming up		
					warming up		
	FRI	11-Jun	m a		beak insulation vacuum		
	SAT	12-Jun			warming up		
SUN	13-Jun						

Next step:  
CM04?





# W22 progress



W				next CM	CM under test		previous CM	
				<b>CM01</b>	<b>CM03</b>		<b>CM05</b>	
21	THU	27-May	m a	ready for shipping to UU	He cooling down		publish reports	
	FRI	28-May	m a		coupler cold conditioning	4K He filling		
	SAT	29-May			thermalize cold tuning system			
	SUN	30-May						
22	MON	31-May	m a	pick-up at Orsay	f vs P	2K pumping		
	TUE	1-Jun	m a	shipping over the sea	stepper motor initialization	prepare heaters		
	WED	2-Jun	m a		stepper motor	piezo test		
	THU	3-Jun	m a	arrive at UU	RF calibration & interlock setup	static heat load & heaters		
	FRI	4-Jun	m a	thermalization at UU	Cavity RF conditioning			
	SAT	5-Jun			Heat load measurements	CTS1 disengage		
	SUN	6-Jun			thermalize cold tuning system			
23	MON	7-Jun	m a	reception tests (LEMOs)	investigate CTS1 stepper motor			
	TUE	8-Jun	m a					
	WED	9-Jun	m a					
	THU	10-Jun	m a		Start warming up			
	FRI	11-Jun	m a		warming up	beak insulation vacuum		
	SAT	12-Jun			warming up			
SUN	13-Jun							



the ferry between Germany and Sweden was delayed yesterday (it left only at 23:30 instead of 16:30) and that the truck will be delivered at 14:00. **No info to UU directly**

## On going

Lieu prévu livraison(lieu,pays) / Place of delivery (place,country)
FREIA LABORATORY DEPT OF PHYSICS AND ASTRONOMY  752 37 Uppsala SE <b>wrong</b> Tel <b>+46468883221</b>



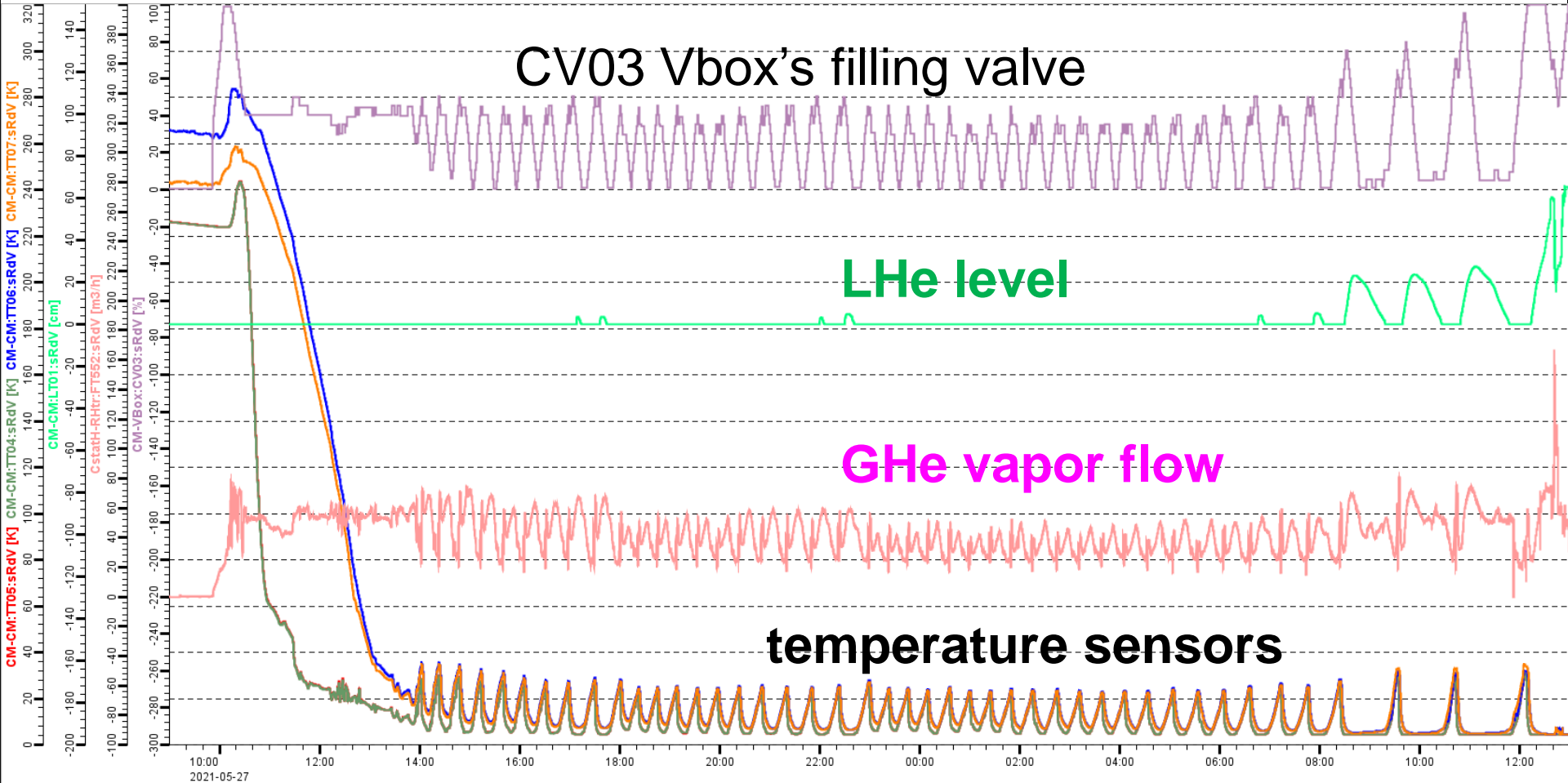
# W22 progress



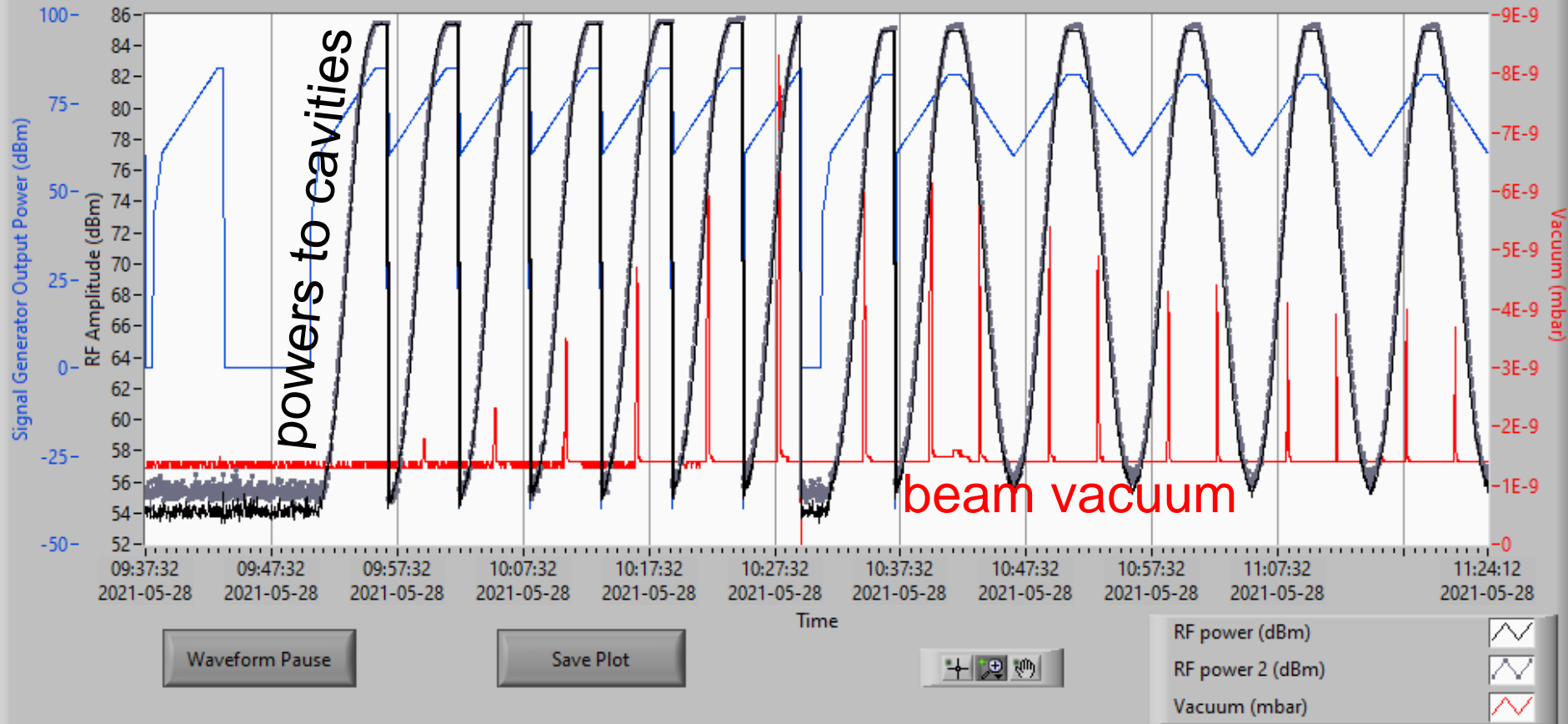
W				next CM	CM under test	previous CM	
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23	MON	7-Jun	m a	reception tests (LEMOs)	investigate CTS1 stepper motor		
	TUE	8-Jun	m a				
	WED	9-Jun	m a				
	THU	10-Jun	m a		Start warming up		
					warming up		
	FRI	11-Jun	m a		beak insulation vacuum		
SAT	12-Jun		warming up				
SUN	13-Jun						

# CM03: cooling down rate

150 K (12:06h) < TT06 and TT07 < 50 K (12:55)  
→ rate=2.04 K/min



# CM03: coupler cold conditioning

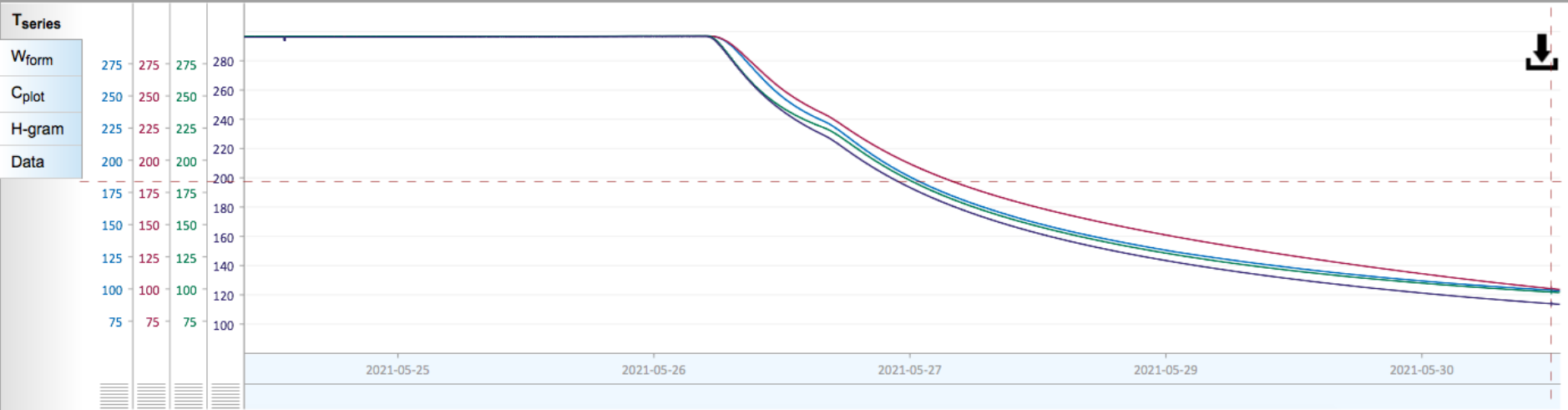


**No problems**



Del	Plot	Name	DBRType	Units	Processing	Scale	Time (local)	Value	Notes
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CM-CTS:TT10:sRdV	DBR_SCALAR_DOUBLE	K	<input type="text"/>	linear	2021-05-31 07:28:28	99.05506083583143	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CM-CTS:TT11:sRdV	DBR_SCALAR_DOUBLE	K	<input type="text"/>	linear	2021-05-31 07:28:28	100.261298577286	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CM-CTS:TT20:sRdV	DBR_SCALAR_DOUBLE	K	<input type="text"/>	linear	2021-05-31 07:28:28	97.607637017071	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CM-CTS:TT21:sRdV	DBR_SCALAR_DOUBLE	K	<input type="text"/>	linear	2021-05-31 07:28:28	113.94360307210823	

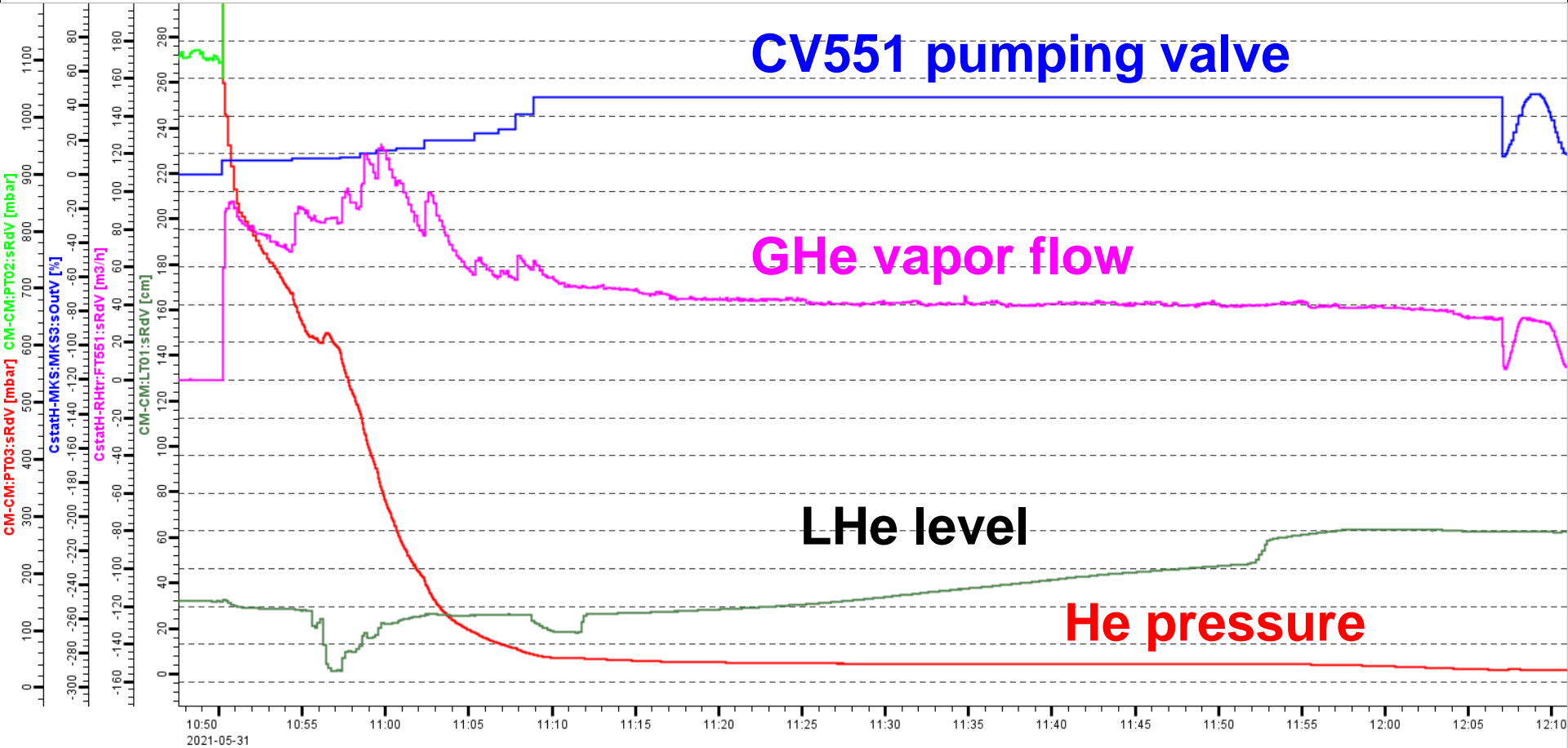
WINDOW SIZE:                  **END:** 2021-05-31 08 :40 :50



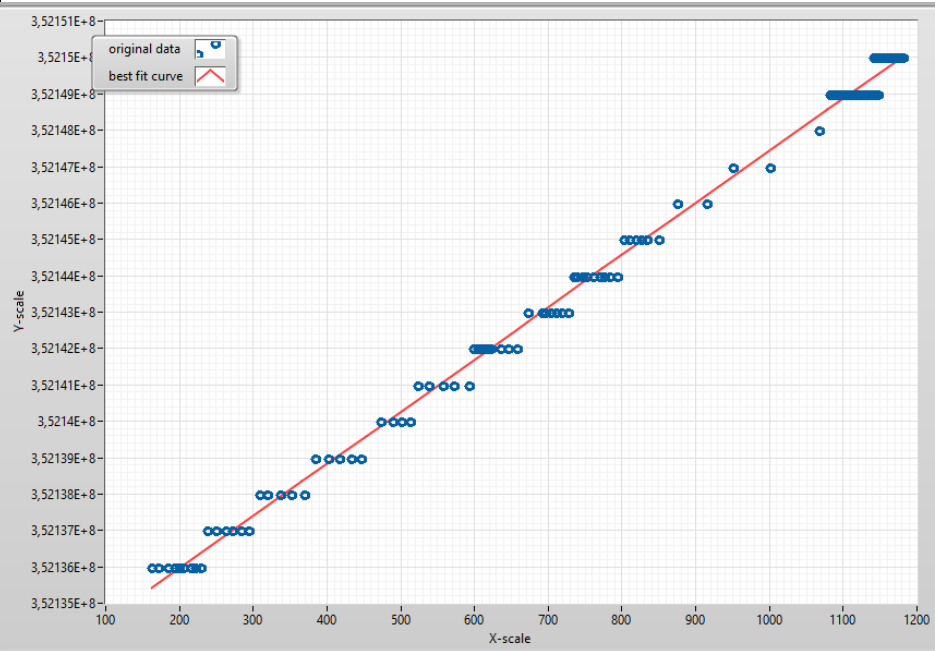
Start N2 cooling May 26 evening  
Reached around 100K May 31 morning

} 4 days



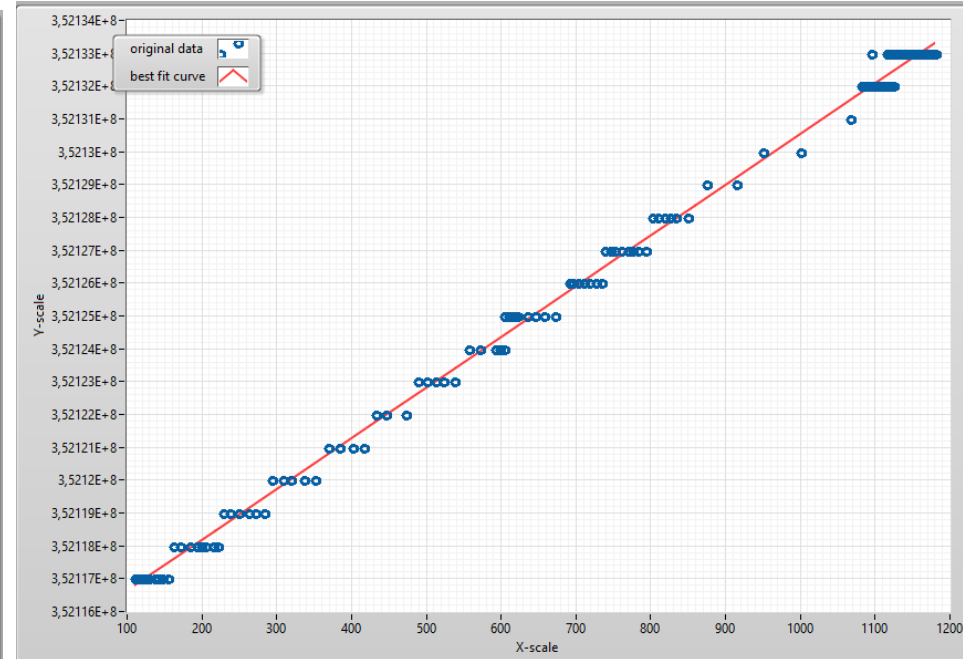


## CAV IN



14.3 Hz/mbar

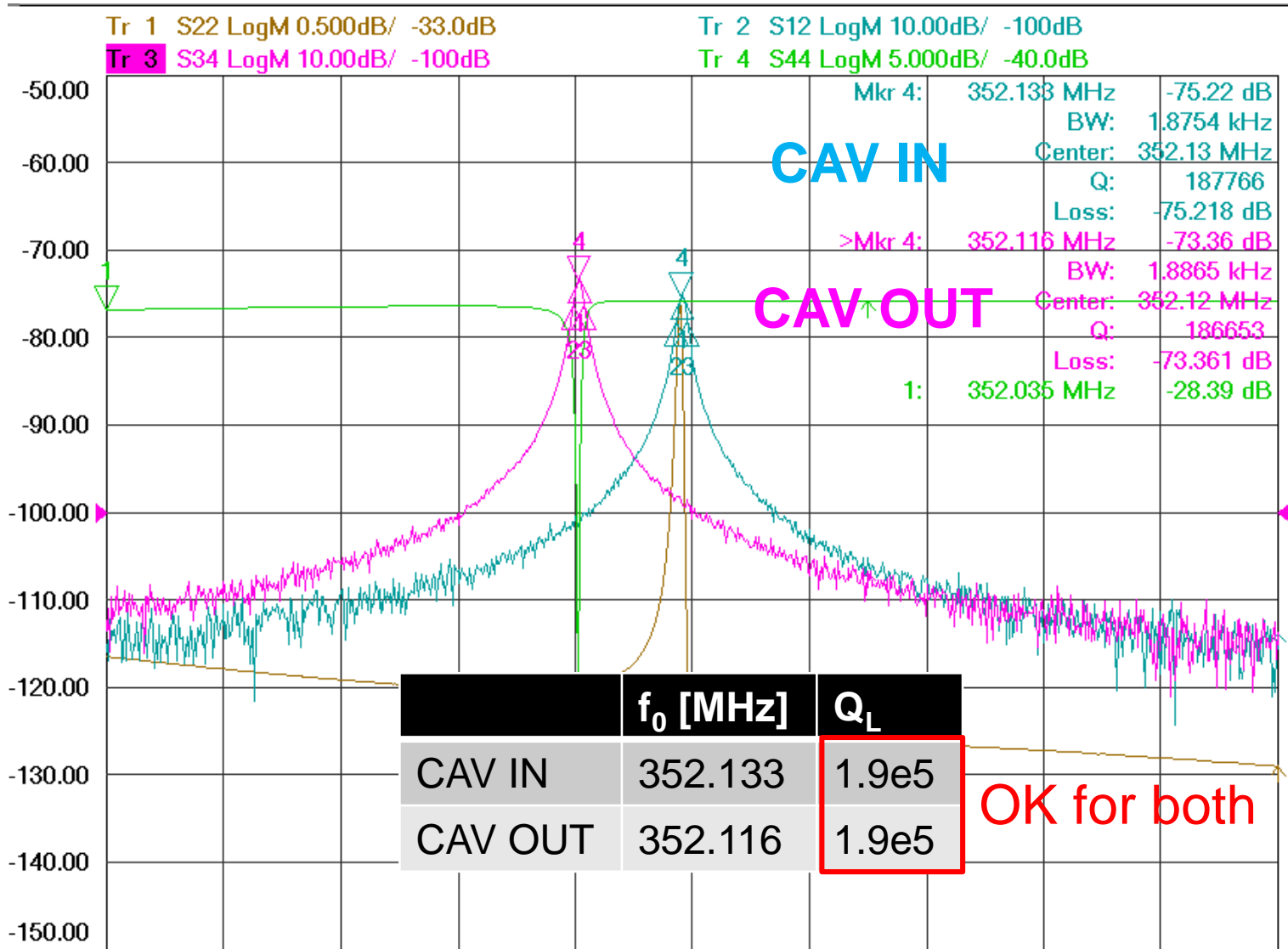
## CAV OUT



15.5 Hz/mbar

**No problems**

# CM03: cavities without CTS engaged



# CM03: CAV IN performance



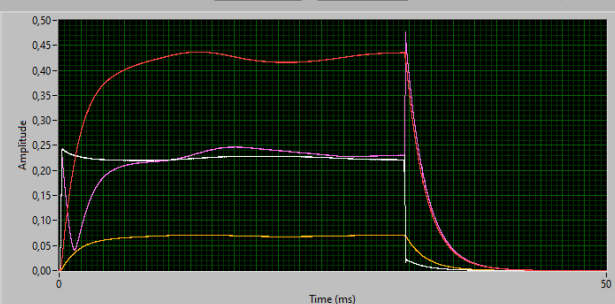
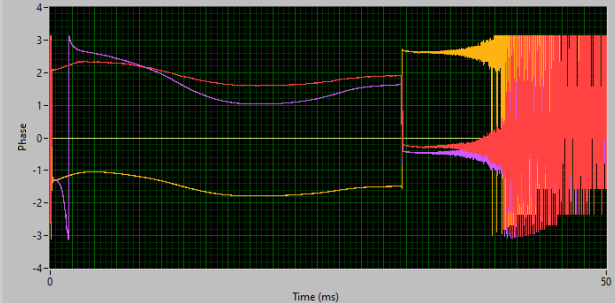

**FREIA SPOKE HIGH POWER TEST\_Cav 1**
time: 19:01:39   

Configuration   Calibration and pulse parameter setting   Phase shifter and Gain controller   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

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

select for decay measurement

Display

Time and Frequency

Phase and Magnitude

Buffer

Last data only

Buffer data

Amplitude   Time

Chart length

40000

unwrap phase

Reference for phase

5761 - Ch1

Show buffers

Amplitude   Time

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

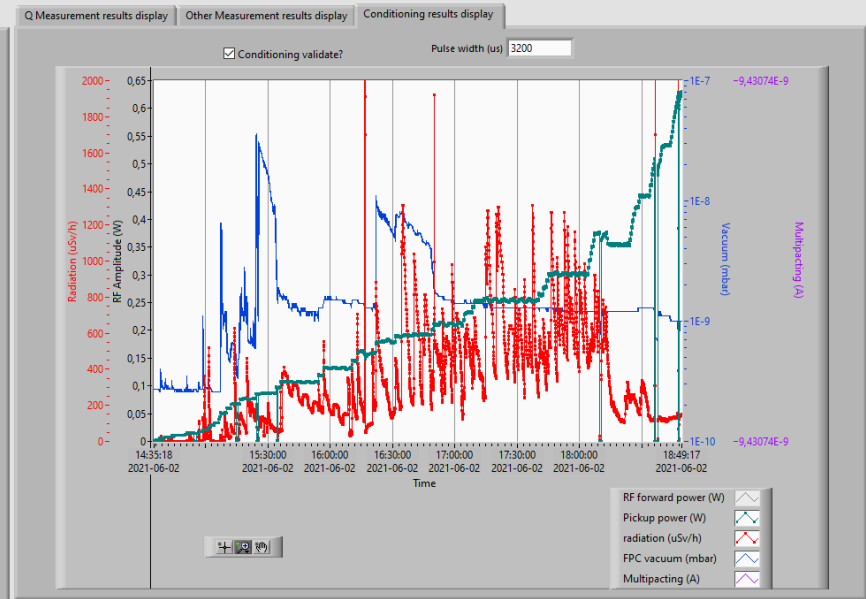
Output delay delta: 0 ps

PID control   Adaptive FF   Offsets   Feed forward   Cavity model   FFT   Delay

Quench detection

Measure Tau at Time: 32000   Tau set: 145   Enable:    Reset Quench Warning:

Tau [µs]: 178,221   Quench Warning:



Pf_max (dBm) 83,7207	Pf_max (W) 235544	P_total (W) 0	QL 191000   Qt 2,2E-11
Pr_max (dBm) 90,0852	Pr_max (W) 1,01982E+6	P_static (W) 0	real time frequency_fc 0E+0
Pt_max(dBm) 27,9976	Pt_max (W) 0,630613	P_heater (W) 0	Pc_dynamic(W) 0
			Vc_ave (MV) 0

Pf_max (W)	Q0_Dynamic	Eacc_Dynamic	<b>Eacc_pk_Pt</b>	<b>Eacc_pk_Pf</b>
235544	0	0	12,0308	13,7023

TT04	TT06	PT02	PT03	Radiation	PT10	PT20
2,09208	2,08649	9999	31	144	1E-9	1,9E-9

# CM03: CAV OUT performance



FREIA SPOKE HIGH POWER TEST\_Cav 2

time: 19:07:43

HELP QUIT



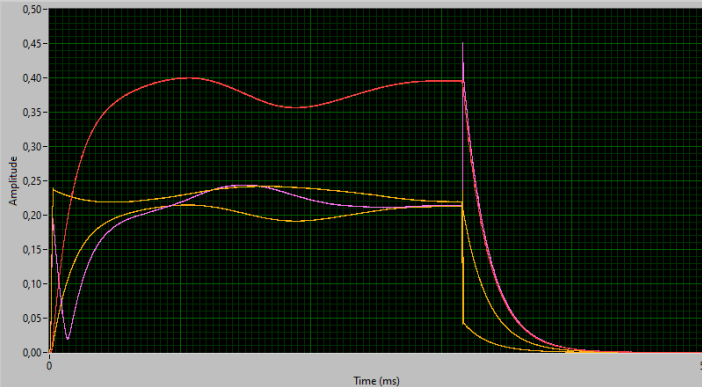
Configuration Calibration and pulse parameter setting Phase shifter and Gain controller PNA Scope decay measurement heat load measurement LFD measurement

Pause Single status

High speed (10Ms/s) Transfer speed

Standard (50 kSample) FFT buffer size

- 5785 - Ch0I
- 5785 - Ch0Q
- Ch1I cavity
- Ch1Q cavity
- 5785 - Ch1I
- 5785 - Ch1Q
- 5761 - Ch0I
- 5761 - Ch0Q
- 5761 - Ch1I
- 5761 - Ch1Q
- 5761 - Ch2I
- 5761 - Ch2Q
- 5761 - Ch3I
- 5761 - Ch3Q



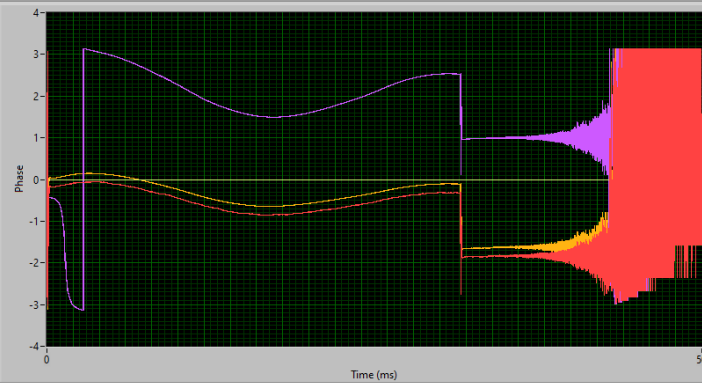
select for decay measurement

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

Time  
Amplitude

Chart length  
400000

- Ch0
- Ch1 cavity
- Ch1
- Ch0
- Ch1
- Ch2
- Ch3



unwrap phase  
 Reference for phase  
 5761 - Ch1

Show buffers  
 Time  
Amplitude

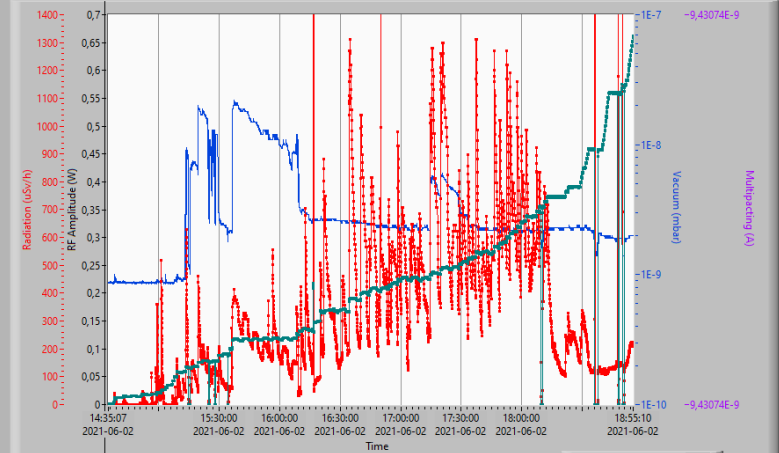
FPGA setup

Mode Mixer freq [MHz] Trigger  
 Real IO 352 Trigger input  
 Output mixer frequency [MHz] Period  
 352 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 Tau set Enable Reset Quench Warning  
 32000 150  
 Tau [us] Quench\_Warning  
 200,719

Q Measurement results display Other Measurement results display Conditioning results display

Conditioning validate? Pulse width (us) 3200



- RF forward power (W)
- Pickup power (W)
- radiation (uSv/h)
- FPC vacuum (mbar)
- Multipacting (A)

Pf_max (dBm) 83,4778	Pf_max (W) 222731	P_total (W) 0	Qt 191000	Qt 2,1E+11
Pr_max (dBm) 89,0923	Pr_max (W) 811392	P_static (W) 0	real time frequency_fc 0E+0	
Pt_max (dBm) 28,2029	Pt_max (W) 0,661132	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
222731	0	0	12,0353	13,3243

No field emission

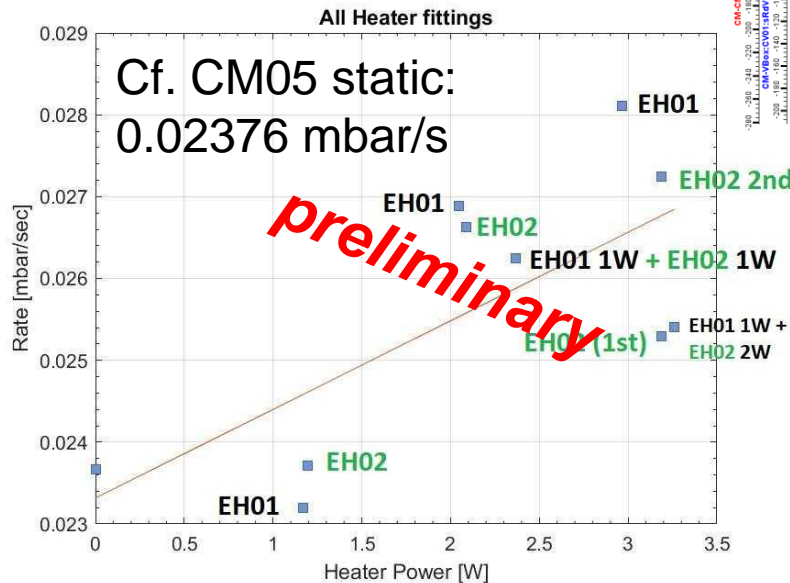
TT05 2,11131 TT07 2,37183 PT02 9999 P\_03 30,8 P\_04 209 T10 1,1E-9 T11 2E-9

## Fomr GHe vapor flow

June 2<sup>nd</sup> 9:30 14.31 W

June 3<sup>rd</sup> 9:30 14.69 W

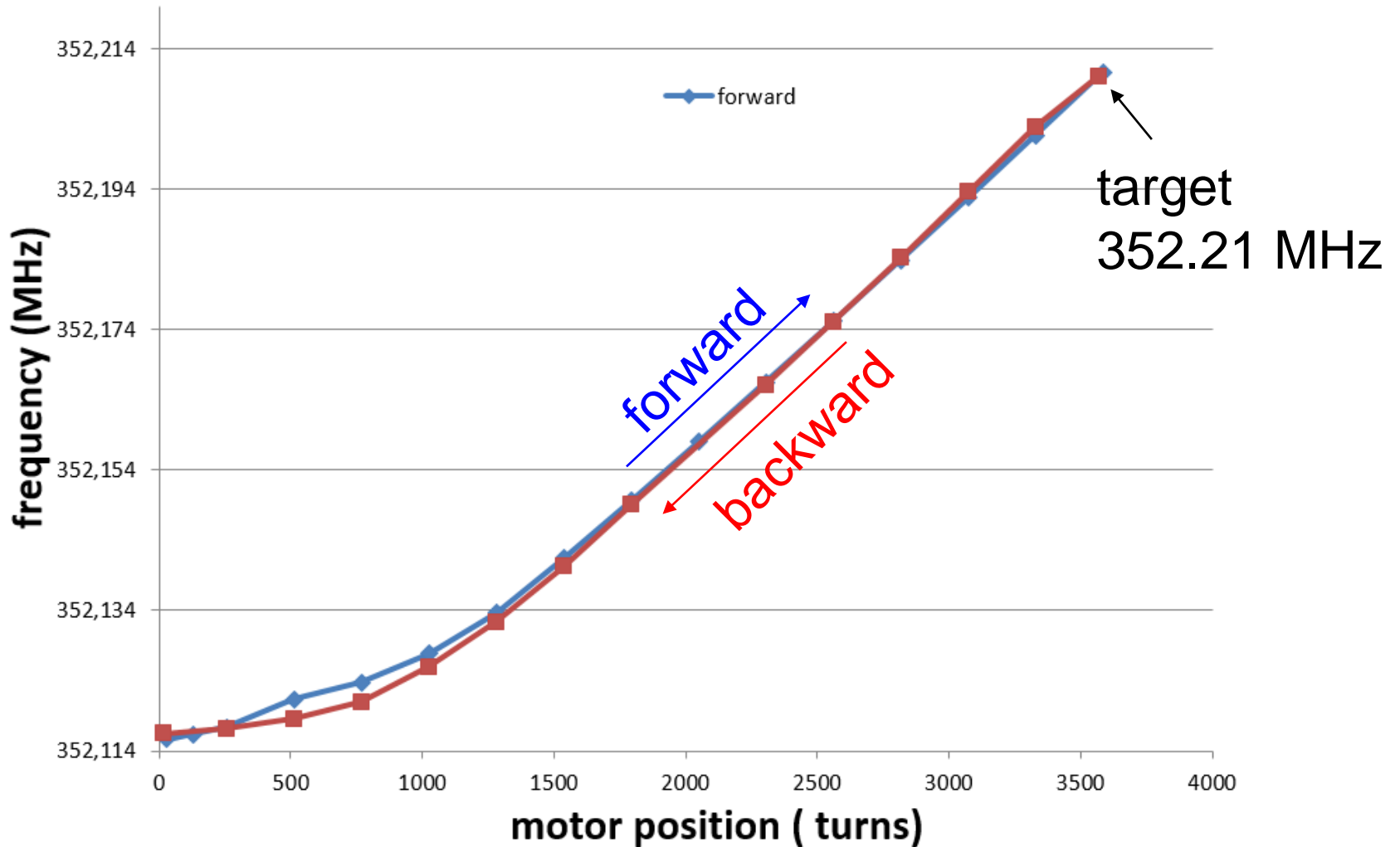
## We are also trying pressure rise method



- Using the DC heaters to calibrate the pressure rise rate
- Positive correlation is observed but needs to be investigated more

Dynamic heat load measurement is ongoing right now but is promisingly good i.e. maybe not visible

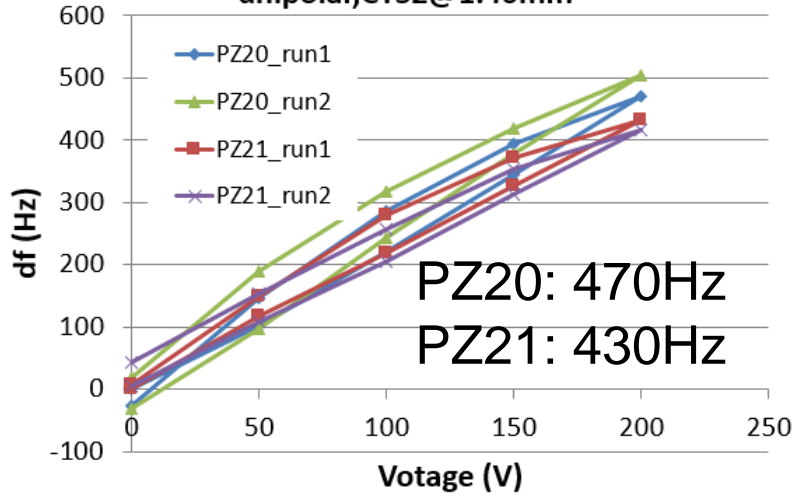
## CTS2 performance





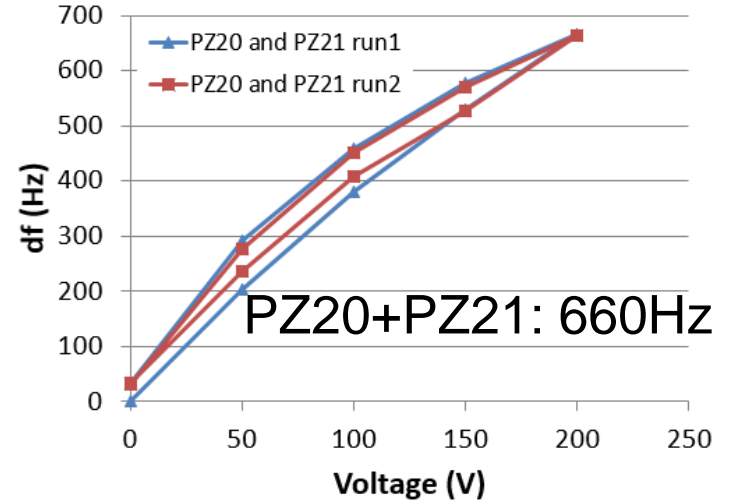
## unipolar 0-200V

unipolar,CTS2@1.40mm



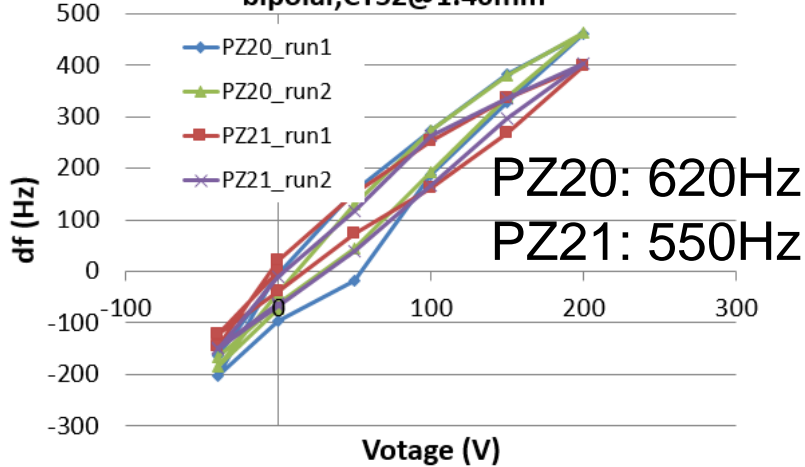
## unipolar 0-200V

unipolar,CTS2, PZ20&PZ21 @1,40mm



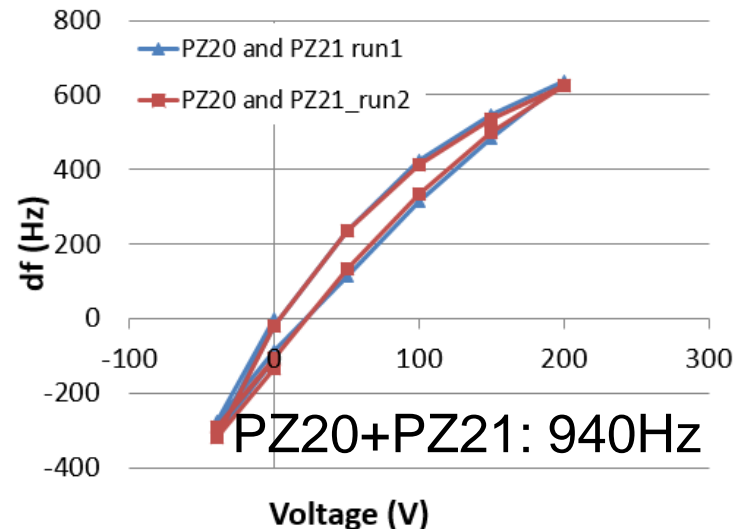
## bipolar -40 - +200V

bipolar,CTS2@1.40mm



## bipolar -40 - +200V

bipolar,CTS2, PZ20&PZ21 @1,40mm

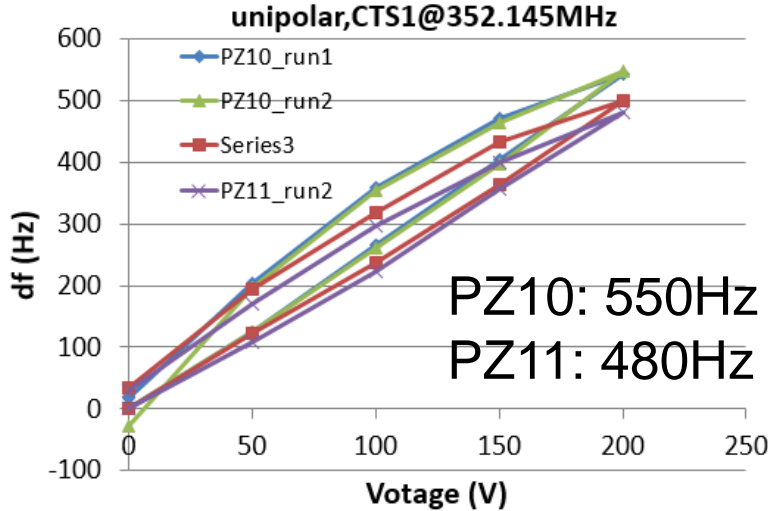




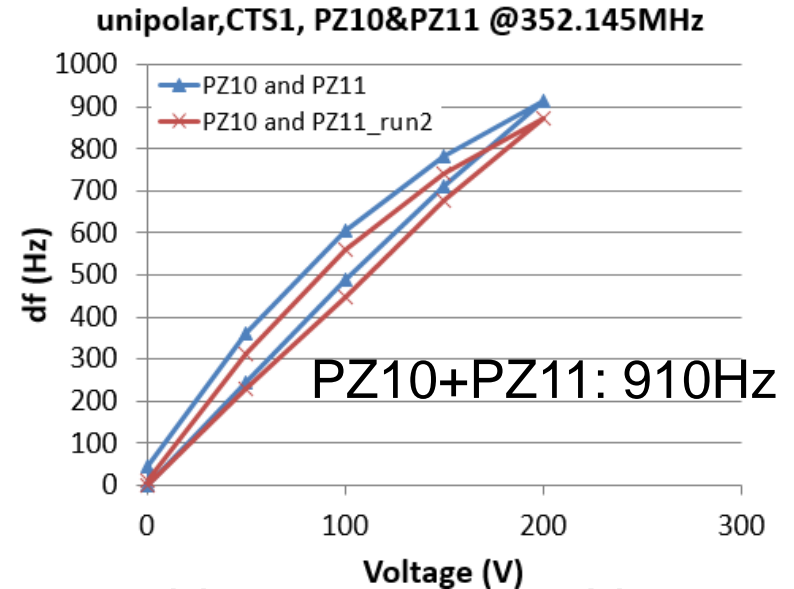
# CM03: CTS1 piezos *maybe* OK



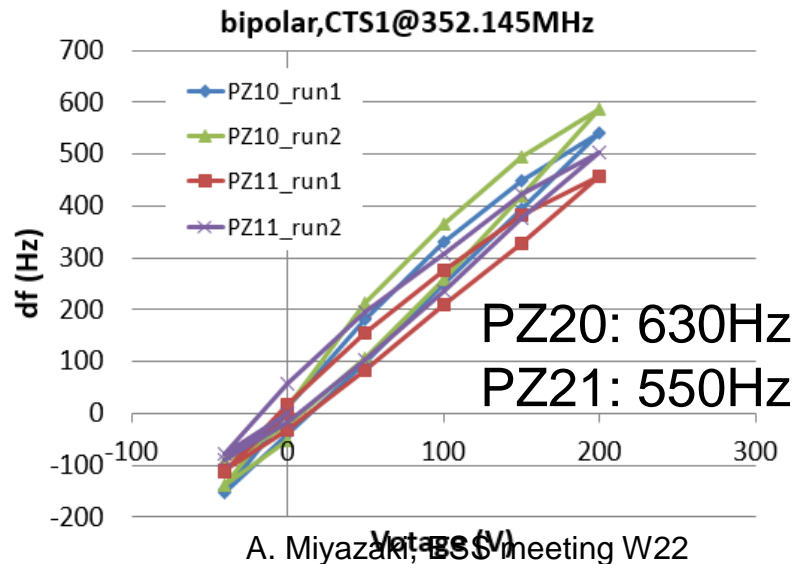
## unipolar 0-200V



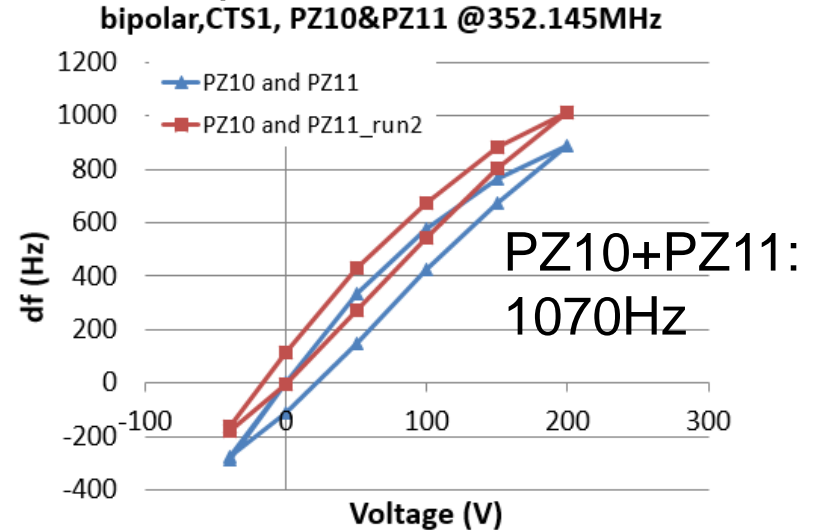
## unipolar 0-200V



## bipolar -40 - +200V



## bipolar -40 - +200V





## CM03: CTS1 behavior



- With 0.6A, first limit switch found at about -30. (led off) move in opposite direction several times led back on at maybe -10. Go negative again and can now not find the switch for -200.
- With 1.2A, it moved again but stuck as shown in the last slide
- Different from the issues in the first CM02 test, because it did not move even before the first engagement to the cavity
- There looks like a friction from the beginning

# Test plan: 3 working days reserved



THU	3-Jun	m a	arrive at UU	Heat load measurements
FRI	4-Jun	m a	thermalization at UU	CTS1 disengage
SAT	5-Jun			thermalize cold tuning system
SUN	6-Jun			
MON	7-Jun	m a	reception tests (LEMOs)	investigate CTS1 stepper motor
TUE	8-Jun	m a		
WED	9-Jun	m a		
THU	10-Jun	m a		Start warming up
FRI	11-Jun	m a		warming up
SAT	12-Jun			beak insulation vacuum
SUN	13-Jun			warming up

take frequency during  
disengagement

Use 1.2A from  
the beginning

decision making:  
return to Orsay?