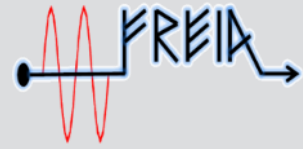




ESS spoke CM05/CM02 (2nd run)
weekly meeting
20210415
Han Li



CM status



- CM02 outgoing test
- CM02 packing
- CM05 installation
- CM05 FPC warm conditioning
- Test plan

- Dismount with valve-box, waveguide ✓
- Move out of the bunker ✓
- Fill the insulation vacuum with dry nitrogen ✓
- Dismount the doorknob ✓
- Electric continuity check ✓
- Outgoing test ✓
- Mount shock sensors ✓
- Packing ✓



Shipment arrangement is on 10th April, we need ESS's green light for the shipping

➤ Electrical sensors verification

Incoming

Cables verification CM02 at UU			v2
Socket assembly		Verified by : A. Miyazaki	
Socket name	PID name	Electrical value (Ω) (after transport)	C / NC
LC01	TT04	59,8	C
	TT05	59,95	C
	TT06	60,4	C
	TT07	61,9	C
	TT08	91,25	C
	TT09	93,5	C
	TT10	105,5	C
	TT11	105,75	C
	TT12	2,95	NC
	TT20	105,55	C
	TT21	107,7	C
	TT22	87,8	C
PT Coupler	TT120	107	C
	TT220	107	C
LC02	EH01	84,1	C
	EH02	85,2	C
	EH10	82,3	C
	EH20	82	C
LC03	SM10	2,2 / 2,3	C
	LS10	1,9	C
	SM20	2,2 / 2,3	C
	LS20	1,9	C
LC07	LT01	367,6	C
	LT02	368,1	C
Socket name	PID name	Electrical value (μF)	C / NC
LC04	PZ10	14,2	C
	PZ11	14,21	C
	PZ20	14,13	C
	PZ21	14,36	C

outgoing

Cables verification CM02 at UU			v2
Socket assembly		Verified by :M. Zhovner	
Socket name	PID name	Electrical value (Ω) (after transport)	C / NC
LC01	TT04	59,7	C
	TT05	60,05	C
	TT06	60,05	C
	TT07	61,65	C
	TT08	90,7	C
	TT09	92,75	C
	TT10	105,9	C
	TT11	106,3	C
	TT12	4,25	NC
	TT20	106,15	C
	TT21	106,2	C
	TT22	87,4	C
PT Coupler	TT120	107	C
	TT220	107	C
LC02	EH01	84,1	C
	EH02	85,4	C
	EH10	82,3	C
	EH20	82	C
LC03	SM10	2,2 / 2,3	C
	LS10	1,9	C
	SM20	2,2 / 2,3	C
	LS20	1,9	C
LC07	LT01	368,05	C
	LT02	367,6	C
Socket name	PID name	Electrical value (μF)	C / NC
LC04	PZ10	14,59	C
	PZ11	14,23	C
	PZ20	14,61	C
	PZ21	14,14	C



CM02 Cavity parameters @ RT



➤ Same RF results as in incoming test has been observed.

CONFIG									
Cryomodule	CM02								
Location	Hall 106			Hall 106			UU		
Date	10/5/2020	10/6/2020	2/2/2021	2/2/2021	2/23/2021	2/23/2021	3/24/2021	4/12/2021	
VNA model	HP	HP	HP	HP	KS	KS	KS	KS	
T (°C)	18.8°C (P1100 107 Ohm)	18.8°C (P1100 107 Ohm)	20	20	16°C (P1100 106 Ohm)	16°C (P1100 106 Ohm)	2	20	
Pcavity (mbar)	9,20E-03	9,20E-03	1,50E-03	1,50E-03	< 0,0006	< 0,0006	3,20E-10	UR (below E-04)	
Insulating vacuum (mbar)	PA	Vacuum (TBC)	PA	PA	PA	PA	Vacuum	PA	
Pcryolines (mbar)	PA	Vacuum (TBC)	PA	PA	PA	PA	Vacuum	PA	
	RF measurements @ T=300K before testing		RF measurements @ T=300K after testing		RF measurements @ T=300K after delivery		RF measurements @ T=2K during the test		RF measurements @ T=300K after testing
Cavity location	Cavity IN	Cavity OUT	Cavity IN	Cavity OUT	Cavity IN	Cavity OUT	Cavity IN	Cavity OUT	Cavity IN
Cavité	DSPK02	DSPK07	DSPK02	DSPK07	DSPK02	DSPK07	DSPK02	DSPK07	DSPK02
Coupleur	CPL01	CPL04	CPL01	CPL04	CPL01	CPL04	CPL01	CPL04	CPL01
Manchette	DWT01	DWT17	DWT01	DWT17	DWT01	DWT17	DWT01	DWT17	DWT01
S11 (off resonance)	-0,11	-0,12	-0,228	-0,147	-0,06	-0,06			-0,02
S11 (@ resonance)	-0,91	-0,8	-1,072	-0,815	-0,86	-0,69			-0,82
S21 (@ resonance)	-86,06	-85,7	-82,417	-82,093	-86,08	-85,77	-78,68	-75,28	-85,93
Frequency (MHz)	351,585	351,588	351,588	351,546	351,59	351,547			351,592
Frequency @ 2K (MHz)	352,158	352,119	352,158	352,119			352,134	351,098	
Shift (MHz)	0,573	0,531	0,570	0,573					
Bandwidth (kHz)	40,8	39,2	39,5	39,1	39,2	39,4	2,289	1,867	39,6
Qloaded	8566	8927	8860	8958	8906	8991	154000	220000	8872
For information S11 pick-up cable (measurement @ reception)	-1,79	-1,80							
S11 pick-up cable (measurement on CM)	-3,45	-3,71	-3,44	-3,76	-3,50	-3,70			-3,41
Qt (calculated)	3,00E+11	3,00E+11	3,00E+11	3,00E+11					
Qt (measurement in vertical test @ 2K)	4,00E+11	3,48E+11	4,00E+11	3,48E+11					
	Results (under coupled)		Results (under coupled)		Results (under coupled)		Results (over coupled)		Results (under coupled)
S11 (corrected)	-0,80	-0,68	-0,84	-0,67	-0,80	-0,63	0,0	0,0	-0,8
S21 (corrected)	-84,3	-83,8	-80,6	-80,1	-84,3	-83,9	-78,7	-75,3	-84,2
Qext (measured on CM @ 300K)	1,95E+05	2,37E+05	1,91E+05	2,42E+05	2,02E+05	2,57E+05			201661
Qext (measured on CM @ 2K)							154000	220000	255983
For information Qext (calculated with CST Studio)	1,82E+05	2,12E+05	1,82E+05	2,12E+05					
Qt (measured on CM)	4,04E+11	3,21E+11	1,88E+11	1,37E+11	4,22E+11	3,08E+11			4,12E+11
Qt (measured on CM @ 2K)							4,55E+13	2,97E+13	5,50E+11
Qo	8960	9276	9290	9302	9316	9317			9280
G (Ohm)	127	132	132	132	132	132			132

Hardware:

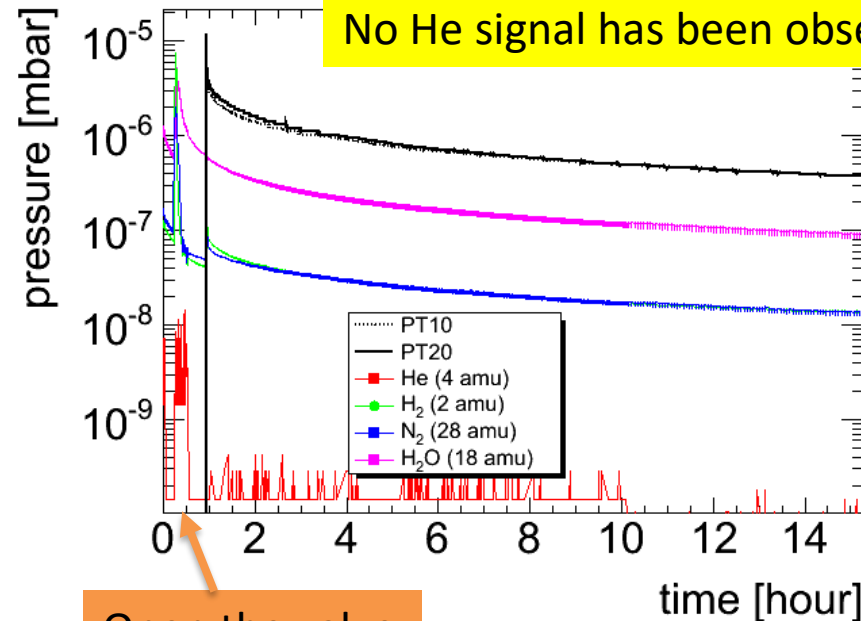
- Doorknob ✓
- Sensors and gauges: arc detector, electron pickup ✓
- Waveguide bellows mounting ✓
- Safety valve mounting ✓
- Pressure gauge mounting ✓
- Turbo-pump mounting for insulation vacuum ✓
- View ports for alignment ✓
- Cryogenic jumper ✓
- Beam vacuum pumping cart connection ✓
- FPC water cooling pipe connection ✓
- Cabling: arc, e-pickup, lemo connector... ✓
- CM alignment checking with insulation vacuum
- Close bunker ✓



Beam vacuum and leak test



- Connect two pumping carts on both sides.
- Connect compress gas to both gate valves.
- Both gate valves are fully open after pipe leak check.
- Both insulation vacuum and helium circuit have been leak tested during purging procedure (using He gas)
- RGA is connected to the beam vacuum



Open the valve
before RGA

FPC warm conditioning



Hardware setting:

- Two pumping carts on both sides ✓
- Amplifiers are ready ✓

FPC conditioning:

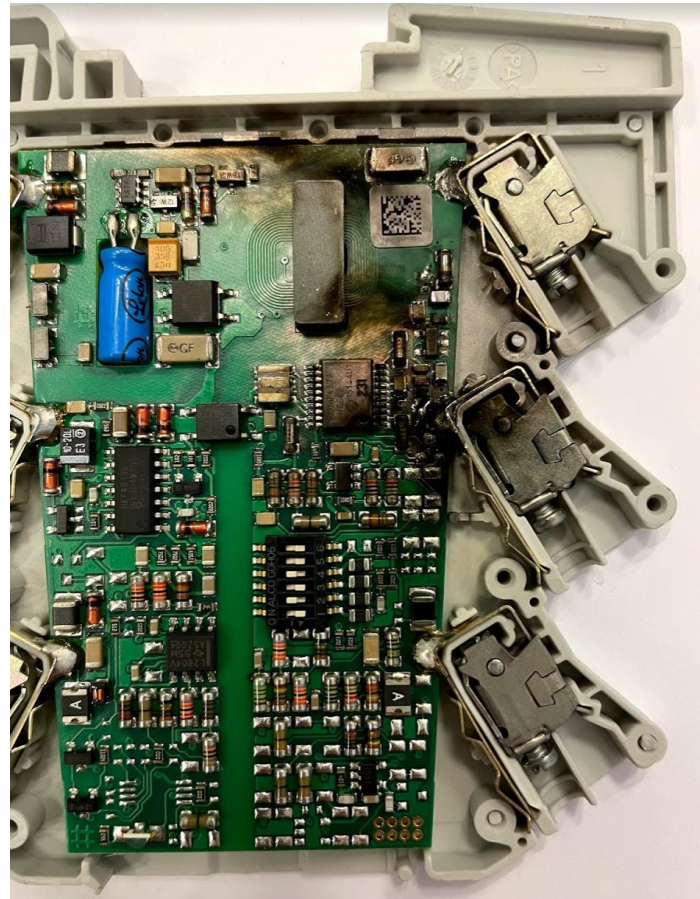
- FPCs' conditioning are done by FREIA auto conditioning program
- Test with RF station and coupler (off resonance) up to around 400kW @ 3.2ms
- Using e- pickup and arc interlock for FPC
- Frequency for off resonance conditioning : 353 MHz

Parameter	value
Loop control time (s)	1
Pulse repeat rate (Hz)	14
Vacuum upper limit (mbar)	5e-6
Vacuum lower limit (mbar)	5e-7
Initial pulse length (μs)	50
pulse length step	50μs, 100μs, 250μs, 500 μs, 1ms, 2 ms, 3.2ms
Vacuum hardware interlock (mbar)	1e-5
e- pickup interlock (mA)	2

DB station issue



- Two components (CV1, CV3) of DB section A was exploded during FPC conditioning (10 kW, 50us)
- It also causes the nextby component malfunctional. These components used in measuring the anode voltage for the tube.
- RF station is turned off and FPC conditioning is stopped.
- New components are ordered and might be received in Friday.





Preliminary time plan



Test item	time	comment
Disconnect, packing, shipment CM05 installation	2 nd -9 th Apr.	
DB station repair	15 th – 16 th Apr.	Order new components
CM05 FPC warm conditioning	19 th – 21 th Apr.	
CM alignment measurement	21 th Apr.	
CM cooldown to 4 K	22 th Apr.	
FPC cold conditioning	23 th Apr.	Simultaneously
CM cooldown to 2 K	26 rd Apr.	
CTS test	27 th – 28 th Apr.	CTS measurement
alignment at cold	28 th Apr.	
Cavity conditioning (on resonance) Heat load/Q measurement	29 th -30 th Apr.	Open loop
CM warm up	1 st -5 th May	
alignment at warm	6 th May	