Test Report

HELEM2206000300-3

FINAS
Finnish Accreditation Service
T004 (EN ISO/IEC 17025)

INTENTIONAL RADIATOR TESTS ACCORDING TO FCC PART 15 E AND ISED CANADA REQUIREMENTS

Equipment Under Test:	Hublet Smart Docking Station
Model:	Hublet-M2
Customer / Manufacturer:	Hublet Oy Itälahdenkatu 22 B 00210 Helsinki Finland
FCC Rule Part:	15.407
IC Rule Part:	RSS-247, Issue 2, 2017 RSS-GEN Issue 5 Amendment 2, 2021
KDB:	789033 D02 General U-NII Test Procedures New Rules v02r01 (December 14, 2017)

- *partial testing, see test suite for details*

Date:	30 September 2022	Date:	4 October 2022
Issued by:	Lauri Sippola Testing Engineer	Checked by:	Rauno Repo Senior EMC Specialist

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GENERAL REMARKS

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Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.

RELEASE HISTORY

Version	Changes	Issued
1.0	Initial release	30 September 2022

PRODUCT DESCRIPTION

Equipment Under Test

Model:	Hublet-M2
Serial no:	-
FCC ID:	2AT23-M2M3-MODEL2
IC:	-
Radio module or chip:	Integrated in Rasberry Pi (FCC ID: 2ABCB-RPI4B)

General Description

Tablet docking station contains a power supply, PCB, Rasberry Pi single board computer and a barcode scanner and RFID card reader and has slots for either 3 or 6 tablets. The docking station uses a 5 V internal voltage to power a tablet locking mechanism, indicator LED lights and the Rasberry Pi computer through the PCB. Tablet locking/release and the lights are controlled by the computer.

The RFID reader (reading either 125 kHz or 13.56 MHz RFID tag) or barcode scanner are connected to the Rasperry Pi computer via USB 3.0, and they are used to read information from the customers, e.g. a library card, and the information is processed in the Rasberry Pi. The information can be sent to either the Hublet docking station owner's information network or Hublet cloud service via either WLAN connection or Ethernet/LAN connection, depending on how the owner wants the dock connected. Through the interaction and information gotten from the server a tablet may be unlocked from the dock for the customer to use.

Classification

Fixed device	☐
Mobile Device (Human body distance > 20cm)	☒
Portable Device (Human body distance < 20cm)	☐

Modifications Incorporated in the EUT

No modifications.

Ratings and declarations

The EUT is using Rasberry Pi board computer (FCC ID: 2ABCB-RPI4B) for 5 GHz WLAN operation.

Mechanical size of EUT	59 x 126 x 59 cm
Operating voltage during the tests:	120 VAC, 50 Hz

SUMMARY OF TESTING

Test Specification	Description of Test	Result
§15.203	Antenna requirement	**PASS**
§15.207(a) / RSS-GEN 8.8	Conducted Emissions on Power Supply Lines	**N/T(1**
§15.407(a) / RSS-247 6.2	Maximum Conducted Output Power	**N/T(1**
§15.407(e) / RSS-247 6.2	26 dB and 6 dB Emission Bandwidth	**N/T(1**
§15.407(a) / RSS-247 6.2	Power Spectral Density	**N/T(1**
RSS-GEN 6.7	99% Occupied Bandwidth	**N/T(1**
§15.407(b) / RSS-247 6.2	Conducted Spurious Emissions and band edges	**N/T(1**
§15.407(c) / RSS-247 6.4	Transmission in case of Absence of Information	**N/T(1**
§15.407(g) / RSS-GEN 6.11	Frequency Stability	**N/T(1**
§15.205, §15.209, §15.407(b) / RSS-247 6.2	Unintentional Radiated Emissions	**PASS**

1) Not tested by the request of the customer

The decision rule applied for the tests results stated in this test report is according to the requirements of section 1.3 of ANSI C63.10-2013.

EUT Test Conditions during Testing

The EUT was in continuous transmit mode during all the tests.

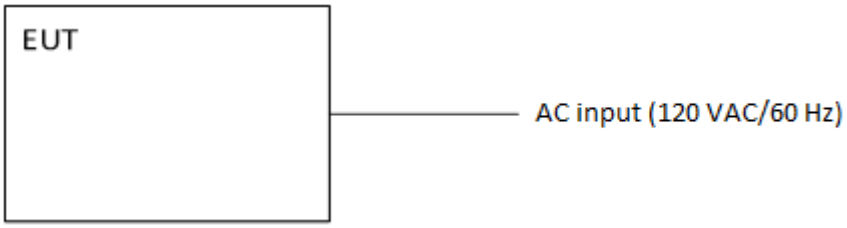

Figure 1: Test setup blocking diagram

Table 1: Test frequencies and settings

Mode	Channel	Frequency (MHz)
1	36	5170
2	140	5700

Test Facility

Testing Laboratory / address: FCC designation number: **FI0002** ISED CAB identifier: **T004**	SGS Fimko Ltd Takomotie 8 FI-00380, HELSINKI FINLAND
Test Site:	☐ K10LAB, ISED Canada registration number: **8708A-1** ☒ K5LAB, ISED Canada registration number: **8708A-2** ☐ T10LAB

TEST RESULTS

Antenna requirement

Standard: FCC Rule §15.203
Tested by: LAS
Date: 1 August 2022

FCC Rule: 15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Specification	Requirement (at least one of the following shall be applied)	Conclusion
§15.203	1. Permanently attached antenna 2. Unique coupling to the intentional radiator 3. Professionally installed radio. The installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.	**PASS**
Note	Option 1 is used	

Transmitter Radiated Spurious Emissions 1 - 40 GHz

Standard:	ANSI C63.10	(2013)
Tested by:	LAS	
Date:	28 July 2022	
Temperature:	47 %	
Humidity:	24 °C	
Measurement uncertainty:	± 4.51 dB	Level of confidence 95 % (k = 2)

FCC Rule: 15.407(b),15.205, §15.209
RSS-247 6.2

Sections 15.407(b)(1-3) specifies the unwanted emissions limit for the U-NII-1 and U-NII-2 bands. As specified, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz.

Section 15.407(b)(4) specifies the unwanted emission limit for the U-NII-3 band. A band emission mask is specified in section 15.407(b)(4)(i). All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

Applicable to	EIRP Limit (Peak)	Field Strength at 3m (Peak)
15.407(b)(1)-(3) RSS-247 6.2.1.2, 6.2.2.2, 6.2.3.2	-27 dBm/MHz	68.2 dBµV/m
15.407(b)(4)(i) RSS-247 6.2.4.2	-27 dBm/MHz [1)] 10 dBm/MHz [2)] 15.6 dBm/MHz [3)] 27 dBm/MHz [4)]	68.2 dBµV/m [1)] 105.2 dBµV/m [2)] 110.8 dBµV/m [3)] 122.2 dBµV/m [4)]
1) Beyond 75 MHz or more of the band edge. 2) Increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge. 3) Increasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edge. 4) From 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.		

At 3 m measurement distance: $EIRP[dBm] = E[dB\mu V/m] - 95.2$

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a)**.**

Frequency range [MHz]	Limit [µV/m]	Limit [dBµV/m]	Detector
0.009-0.490	2400/F(kHz)	48.5-13.8	Quasi-peak
0.490-1.705	24000/F(kHz)	33.8-22.97	Quasi-peak
1.705-30.0	30	29.54	Quasi-peak
30 - 80	100	40.0	Quasi-peak
88 - 216	150	43.5	Quasi-peak
216 - 960	200	46.0	Quasi-peak
960 - 1000	500	53.9	Quasi-peak
Above 1000	500	53.9	Average
Above 1000	5000	73.9	Peak

The correction factor in the final result table contains the sum of the transducers (antenna + amplifier + cables).

Peak values of emissions below 1000 MHz measured for reference as well as transmitter fundamental.

Results LOW channel

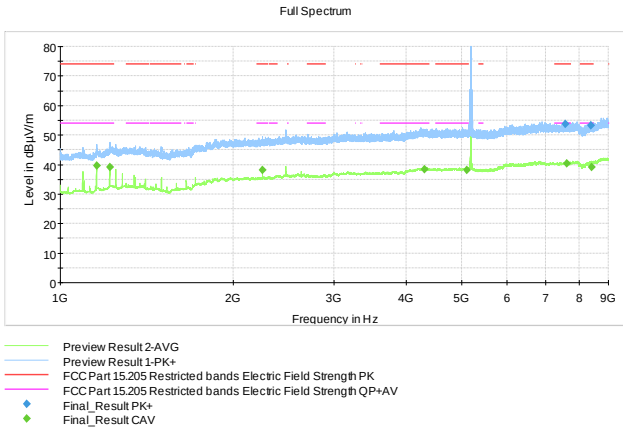

Figure 2: LOW channel (1 GHz – 9 GHz)

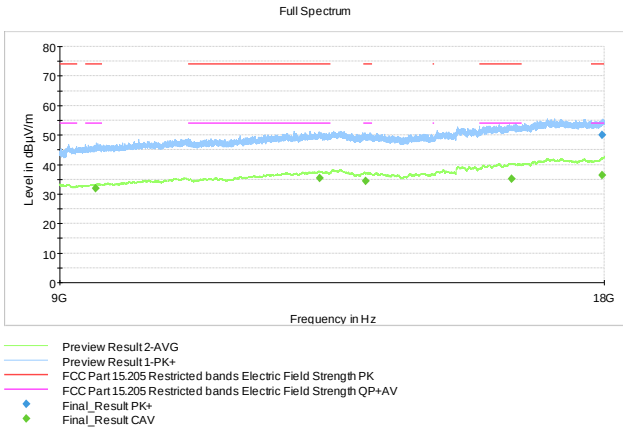

Figure 3: LOW channel (9 GHz – 18 GHz)

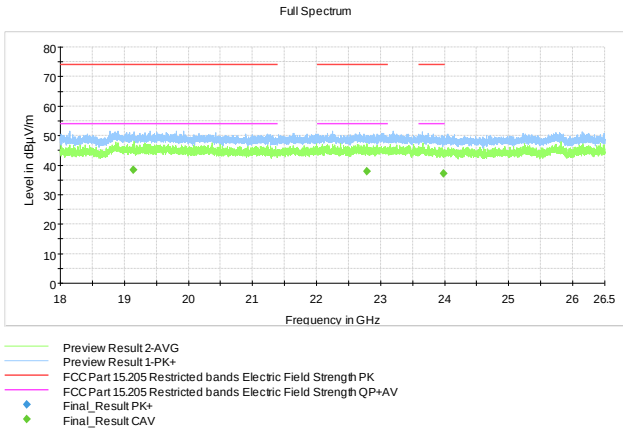

Figure 4: LOW channel (18 GHz – 26.5 GHz)

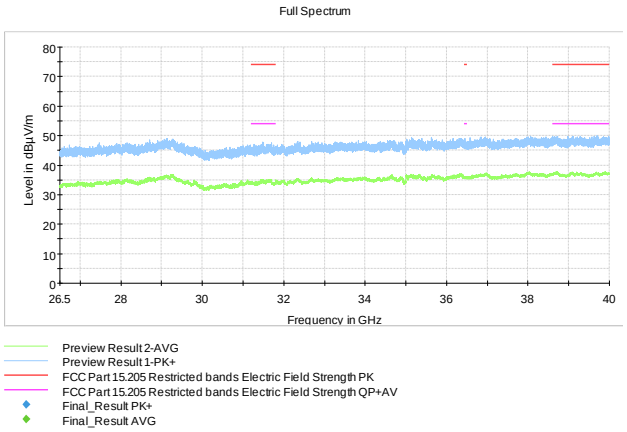

Figure 5: LOW channel horizontal (26.5 GHz – 40 GHz)

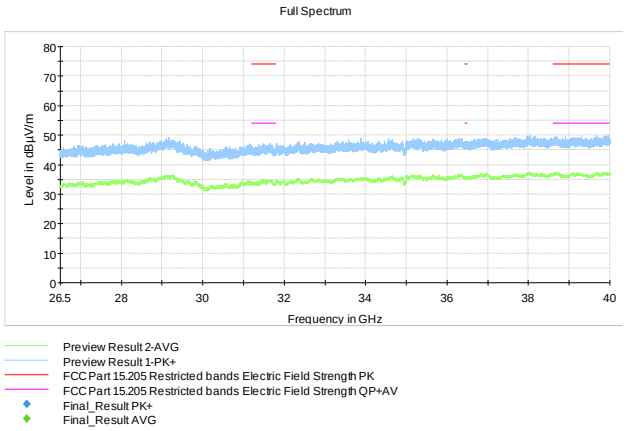

Figure 6: LOW channel vertical (26.5 GHz – 40 GHz)

Table 2: Peak results LOW channel

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7565.600000	53.81	74.00	20.19	15x1000.0	1000.000	169.0	V	309.0	20.1
8399.800000	53.14	74.00	20.86	15x1000.0	1000.000	302.0	V	210.0	21.1
17952.600000	49.97	74.00	24.03	15x1000.0	1000.000	263.0	V	321.0	24.6

Table 3: Average results LOW channel

Frequency (MHz)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1156.200000	39.74	54.00	14.26	15x1000.0	1000.000	165.0	V	328.0	8.8
1218.800000	39.14	54.00	14.86	15x1000.0	1000.000	184.0	V	62.0	9.9
2250.000000	38.16	54.00	15.84	15x1000.0	1000.000	269.0	H	39.0	13.2
4308.000000	38.49	54.00	15.51	15x1000.0	1000.000	350.0	V	217.0	16.5
5103.400000	38.09	54.00	15.91	15x1000.0	1000.000	100.0	H	344.0	16.9
7611.600000	40.28	54.00	13.72	15x1000.0	1000.000	232.0	V	219.0	20.3
8419.600000	39.14	54.00	14.86	15x1000.0	1000.000	344.0	H	285.0	21.5
9421.600000	31.89	54.00	22.11	15x1000.0	1000.000	214.0	V	165.0	14.2
12530.400000	35.46	54.00	18.54	15x1000.0	1000.000	243.0	H	44.0	17.6
13289.400000	34.49	54.00	19.51	15x1000.0	1000.000	165.0	V	135.0	17.9
15990.000000	35.11	54.00	18.89	15x1000.0	1000.000	262.0	H	219.0	21.8
17947.400000	36.52	54.00	17.48	15x1000.0	1000.000	372.0	V	165.0	24.6
19144.150000	38.37	54.00	15.63	15x1000.0	1000.000	189.0	V	209.0	7.1
22785.600000	37.94	54.00	16.06	15x1000.0	1000.000	224.0	V	216.0	7.6
23984.700000	37.16	54.00	16.84	15x1000.0	1000.000	139.0	V	73.0	4.7

Results HIGH channel

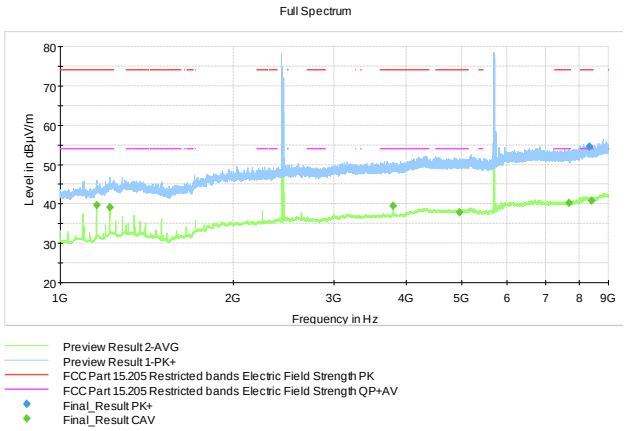

Figure 7: HIGH channel (1 GHz – 9 GHz)

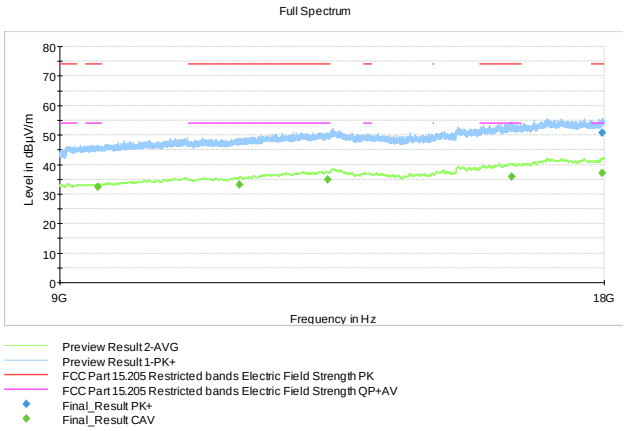

Figure 8: HIGH channel (9 GHz – 18 GHz)

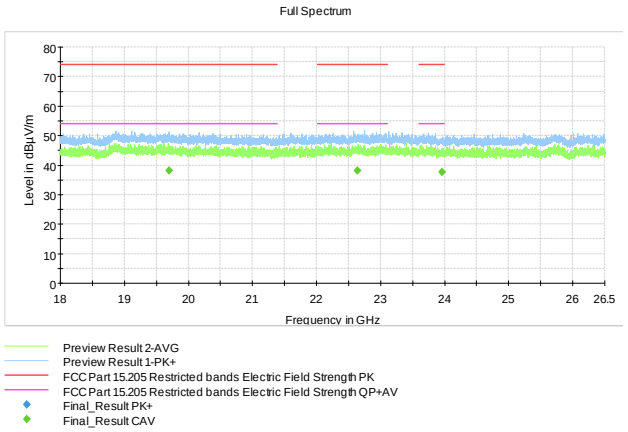

Figure 9: HIGH channel (18 GHz – 26.5 GHz)

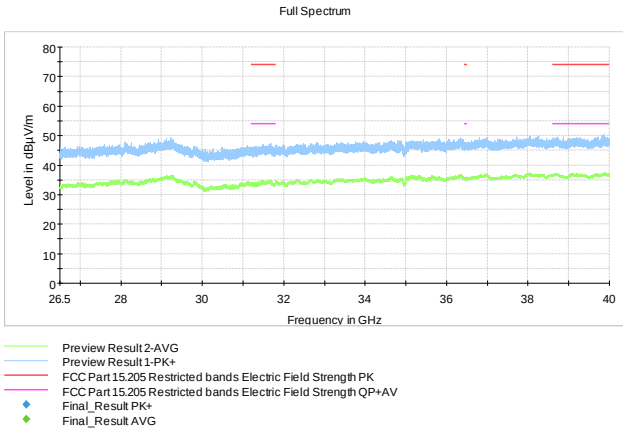

Figure 10: HIGH channel horizontal (26.5 GHz – 40 GHz)

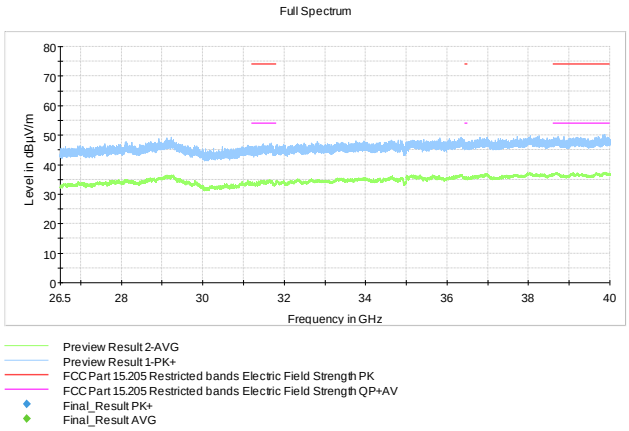

Figure 11: HIGH channel vertical (26.5 GHz – 40 GHz)

Table 4: Peak results HIGH channel

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
8332.800000	54.60	74.00	19.40	15x1000.0	1000.000	284.0	V	234.0	21.2
17954.400000	50.86	74.00	23.14	15x1000.0	1000.000	105.0	V	293.0	24.6

Table 5: Average results HIGH channel

Frequency (MHz)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1156.200000	39.64	54.00	14.36	15x1000.0	1000.000	161.0	V	328.0	8.8
1218.800000	39.11	54.00	14.89	15x1000.0	1000.000	180.0	V	59.0	9.9
3800.000000	39.48	54.00	14.52	15x1000.0	1000.000	156.0	H	331.0	15.4
4953.800000	37.90	54.00	16.10	15x1000.0	1000.000	165.0	H	330.0	16.8
7689.200000	40.19	54.00	13.81	15x1000.0	1000.000	107.0	V	70.0	20.4
8418.400000	40.86	54.00	13.14	15x1000.0	1000.000	337.0	V	300.0	21.5
9441.400000	32.47	54.00	21.53	15x1000.0	1000.000	235.0	V	101.0	14.4
11311.800000	33.21	54.00	20.79	15x1000.0	1000.000	253.0	V	165.0	16.6
12654.600000	35.00	54.00	19.00	15x1000.0	1000.000	248.0	H	121.0	17.6
15999.800000	35.87	54.00	18.13	15x1000.0	1000.000	251.0	V	19.0	21.8
17957.200000	37.21	54.00	16.79	15x1000.0	1000.000	233.0	V	2.0	24.6
19693.550000	38.26	54.00	15.74	15x1000.0	1000.000	289.0	H	282.0	6.8
22640.550000	38.23	54.00	15.77	15x1000.0	1000.000	244.0	H	305.0	8.1
23954.750000	37.53	54.00	16.47	15x1000.0	1000.000	225.0	V	179.0	5.1

TEST EQUIPMENT

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
ANTENNA	ROHDE & SCHWARZ	HFH2-Z2 , 335.4711.52	inv. 8013	2020-10-28	2022-10-28
ANTENNA	SCHWARZBECK	VULB 9168	inv. 8911	2020-11-04	2022-11-04
ANTENNA	EMCO	3160-09, emi 18-26.5GHz	inv. 7294	2022-02-22	2023-02-22
ANTENNA	ETS LINDGREN	3160-10, emi 26.5-40GHz	inv. 9151	2022-08-08	2023-08-08
ANTENNA	EMCO	3117, emi 1-18GHz	inv. 7293	2022-06-12	2024-06-16
ANTENNA MAST	MATURO	TAM 4.0E	inv. 10181	NCR	NCR
ATTENUATOR	PASTERNACK	PE 7004-4 (4dB)	inv. 10126	2021-03-30	2023-03-30
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW26	inv. 10679	2022-06-20	2023-06-20
MAST & TURNTABLE CONTROLLER	MATURO	NCD	inv. 10183	NCR	NCR
POWER SUPPLY	CALIFORNIA INSTR.	5001 iX Series II	inv. 7826	NCR	NCR
RF PREAMPLIFIER	CIAO	CA118-3123	inv. 10278	2022-09-21	2023-09-21
RF PREAMPLIFIER	CIAO	CA1840-5019	inv. 10593	2022-09-21	2023-09-21
TEMPERATURE/ HUMIDITY SENSOR	EDS	OW-ENV-TH, K5 SAC	inv. 10517	2021-10-22	2022-10-22
TEST SOFTWARE	ROHDE & SCHWARZ	EMC-32	-	-	-
TURNTABLE	MATURO	DS430 UPGRADED	inv. 10182	NCR	NCR

NCR = No calibration required

END OF REPORT