Test Report

HELEM2206000300-2

T004 (EN ISO/IEC 17025)

INTENTIONAL RADIATOR TESTS ACCORDING TO FCC PART 15 C 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:	15.225
IC Rule Part:	RSS-210, Issue 10, 2019 RSS-GEN Issue 5 Amendment 2, 2021

- *partial testing, see test suite for details*

Date:	30 September 2022	Date:	4 October 2022
Issued by:		Checked by:	
	Lauri Sippola Testing Engineer		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

Equipment Under Test:	Hublet Smart Docking Station
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

Operating Frequencies:	125 kHz, 13.56 MHz

Power Supply

Operating voltage:	120 VAC, 60 Hz
Maximum Current:	3.0 A

Cables

Cable:	Length:	Type:
AC mains	1 m	Unshielded (L, N, PE)
Ethernet	1 m	Unshielded

Peripherals

Peripheral	Description / Usage
Test PC	Device configuration
WiFi router	WiFi connection

SUMMARY OF TESTING

Test Specification	Description of Test	Result
§15.203	Antenna Requirement	PASS
§15.207(a), RSS-GEN 8.8	Conducted emissions 150 kHz to 30 MHz	PASS
§15.209(a), RSS-210 B.6(a)	Radiated Emissions 9 kHz to 1 GHz	PASS
RSS-GEN 6.7	Occupied bandwidth (99%)	PASS
§15.215(c)	20 dB bandwidth	PASS

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

Configuration of the EUT was made to correspond to the actual assembling conditions as far as possible. RFID reader and bar code reader were enabled and set in continuous reading operation.

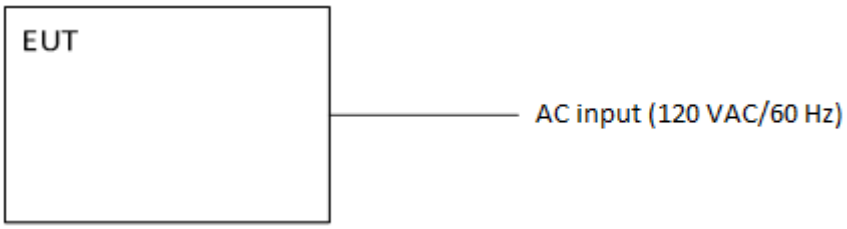

Figure 1: Test setup blocking diagram

Table 1. Normal and extreme test conditions

Test conditions:	Temperature [ºC]:	Voltage [V]:	Frequency [Hz]:
Normal	+20 - 25	120	60

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	

Conducted Emissions In The Frequency Range 150 kHz - 30 MHz

Standard:	ANSI C63.10	(2013)
Tested by:	LAS	
Date:	28 July 2022	
Temperature:	47 %	
Humidity:	24 °C	
Measurement uncertainty:	± 2.9 dB	Level of confidence 95 % (k = 2)

FCC Rule: 15.207 (a)
RSS-GEN 8.8

Conducted disturbance voltage was measured with an artificial main network from 150 kHz to 30 MHz with 4.5 kHz steps and a resolution bandwidth of 9 kHz. Measurements were carried out with peak and average detectors.

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

Test results

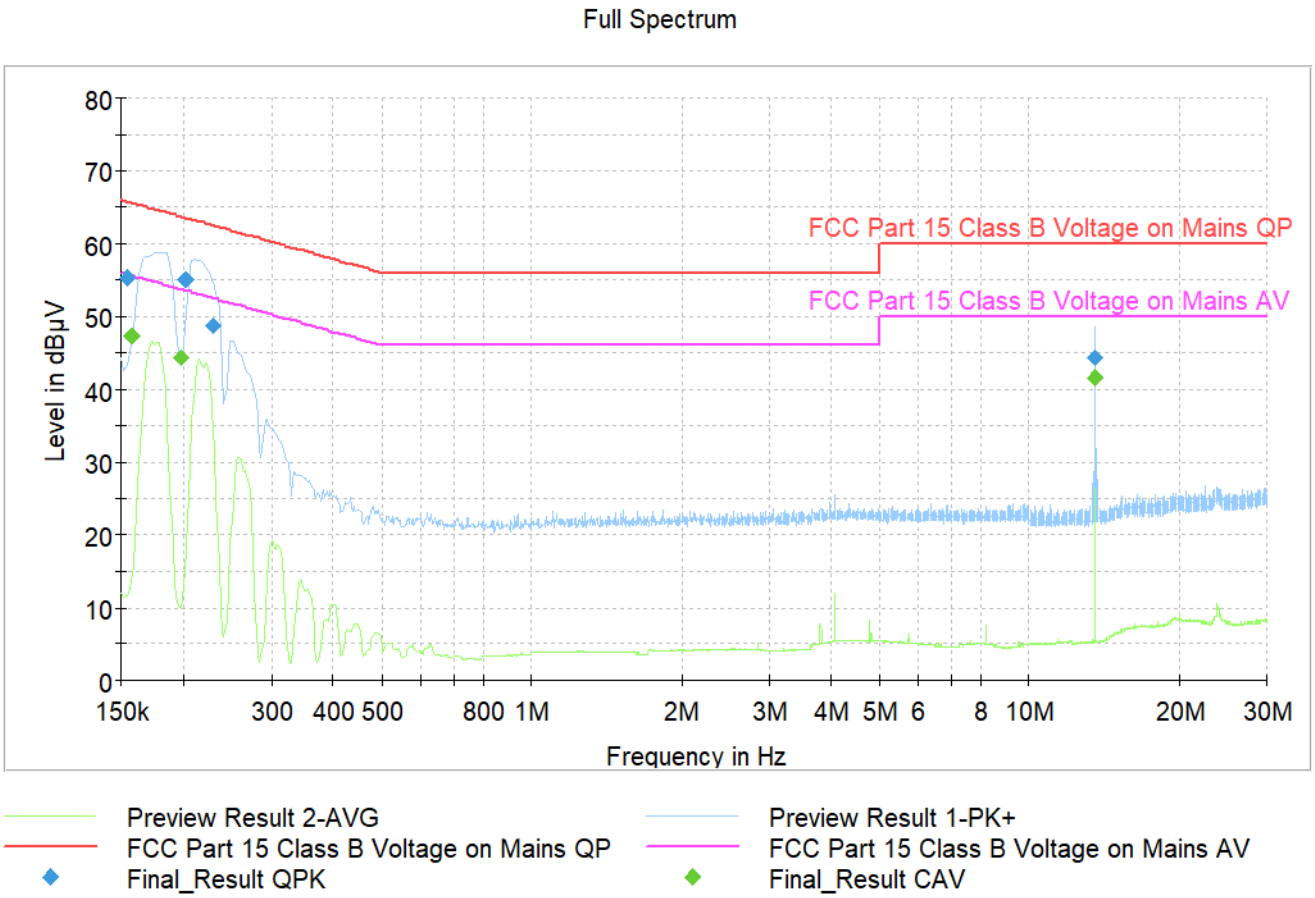

Figure 2. The measured curves with peak- and average detector.

Table 2: Final quasi-peak results

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.154000	55.27	15x1000.0	9.000	N	9.7	10.51	65.78
0.202250	55.03	15x1000.0	9.000	N	9.7	8.49	63.52
0.230250	48.86	15x1000.0	9.000	L1	9.7	13.58	62.44
13.558500	44.26	15x1000.0	9.000	N	10.4	15.74	60.00

Table 3: Final average results

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	47.21	15x1000.0	9.000	L1	9.7	8.36	55.57
0.198250	44.27	15x1000.0	9.000	L1	9.7	9.41	53.68
13.558500	41.49	15x1000.0	9.000	N	10.4	8.51	50.00

Radiated Emissions 9 kHz to 1 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: 15.225(a)-(d)
RSS-210 B.6(a)

The field strength of any emissions within the band 13.110-14.010 MHz shall not exceed the following limits:

Frequency range [MHz]	Limit [µV/m]	Distance [m]	Detector
13.110 - 13.410	106	30	Quasi-peak
13.410 - 13.553	334	30	Quasi-peak
13.553 - 13.567	15848	30	Quasi-peak
13.567 - 13.710	334	30	Quasi-peak
13.710 - 14.010	106	30	Quasi-peak

The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209 and RSS-GEN.

Frequency range [MHz]	Limit [µV/m]	Distance [m]	Detector
0.009 - 0.490	2400/F(kHz)	300	Quasi-peak
0.490 - 1.705	24000/F(kHz)	30	Quasi-peak
1.705 - 30.0	30	30	Quasi-peak
30 - 88	100	3	Quasi-peak
88 - 216	150	3	Quasi-peak
216 - 960	200	3	Quasi-peak
960 - 1000	500	3	Quasi-peak

According to ANSI C63.10 (clause 5.3.2) and RSS-Gen (Clause 4.11) the measurements below 30 MHz can be performed at a closer distance than the EUT limit distance, the results shall be extrapolated to limit distance by using the square of an inverse linear distance extrapolation factor (40 dB/ decade). This method was used when performing measurements at a distance of 3 m instead of limit distances 300 m or 30 m.

According to §15.209(c) any unwanted emission shall not exceed the level of the fundamental emission. As the measurement has been made from 3m distance and the result has been extrapolated by -40 dB to the 30 meter distance, the correct levels of fundamental emission for comparison to unwanted emissions in the 30 – 1000 MHz frequency range is 84.96 dBµV/m , [Result 30m + 40log(30m/3m)]

The correction factor in the final result table contains the sum of the transducers (antenna + cables + distance). The result value is the measured value corrected with the correction factor.

Test results

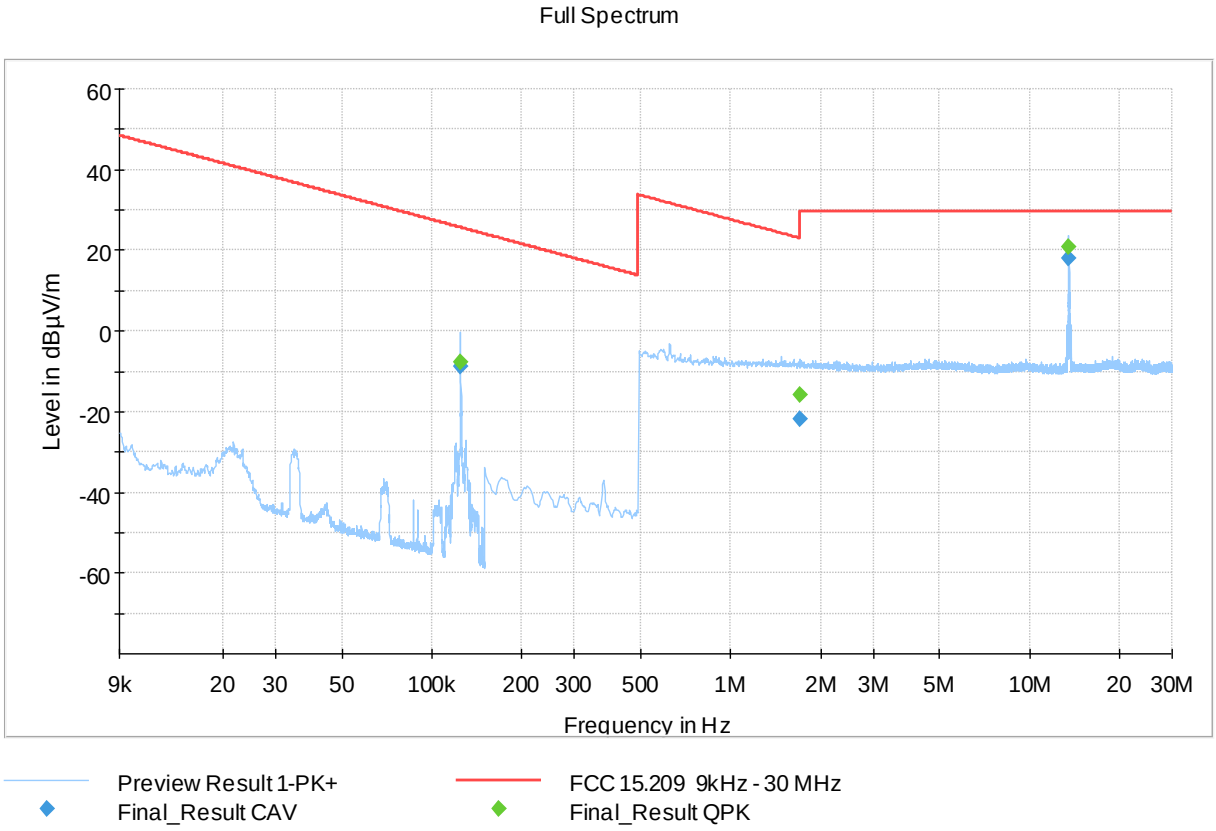

Figure 3: TX radiated emission 9 kHz to 30MHz

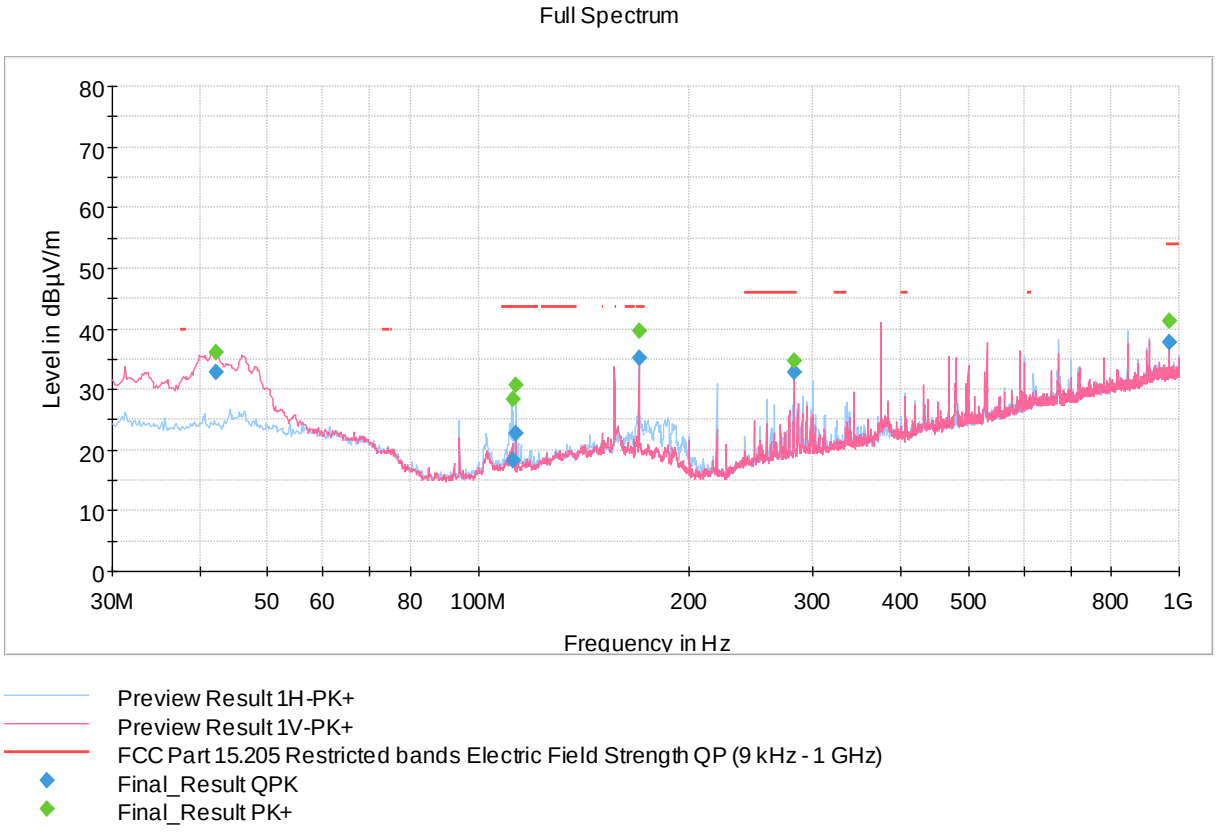

Figure 4: TX radiated emission 30 – 1000 MHz

Table 4: The final results with Quasi-peak detector

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
0.124880	-7.85	25.67	33.52	15x1000.0	0.200	190.0	V	74.0	-60.2
1.699750	-15.78	23.03	38.81	15x1000.0	9.000	100.0	V	21.0	-20.2
13.559000	20.96	29.50	8.54	15x1000.0	9.000	190.0	V	50.0	-20.0
112.085000	18.29	43.52	25.23	15x1000.0	120.000	187.0	H	200.0	15.1
112.895000	22.75	43.52	20.77	15x1000.0	120.000	286.0	H	351.0	15.2
169.385000	35.20	43.52	8.32	15x1000.0	120.000	159.0	H	167.0	17.9
282.335000	32.80	46.02	13.22	15x1000.0	120.000	183.0	V	6.0	19.0
968.755000	37.80	53.98	16.18	15x1000.0	120.000	180.0	V	59.0	32.1

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

99% Occupied Bandwidth

Standard:	RSS-GEN
Tested by:	LAS
Date:	1 August 2022
Temperature:	23 ± 3 °C
Humidity:	20 - 75 % RH

RSS-GEN 6.7

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained.

Test results

Table 5: 99% occupied bandwidth test results

TX Frequency	99 % BW [kHz]	Limit	Result
125 kHz	16.616338366	N/A	PASS
13.56 MHz	694.930506949	N/A	PASS

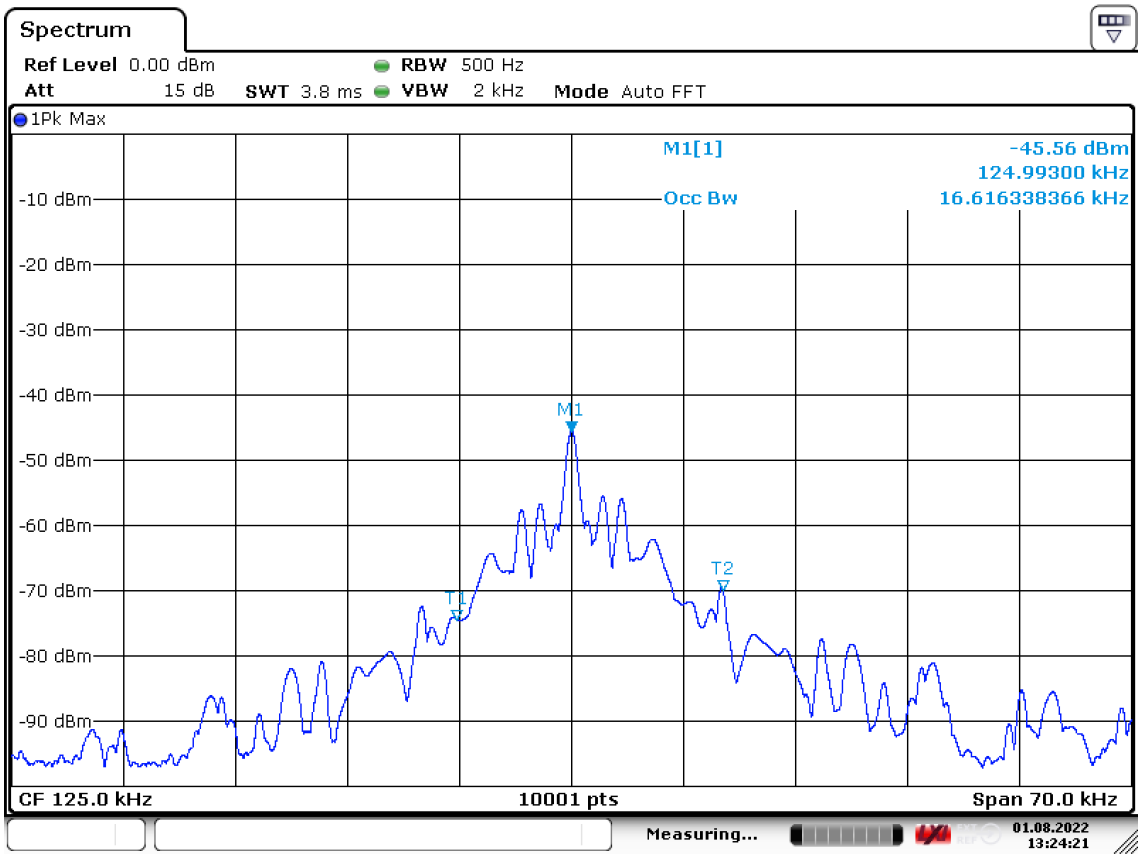

Figure 5: 99% OBW (125 kHz)

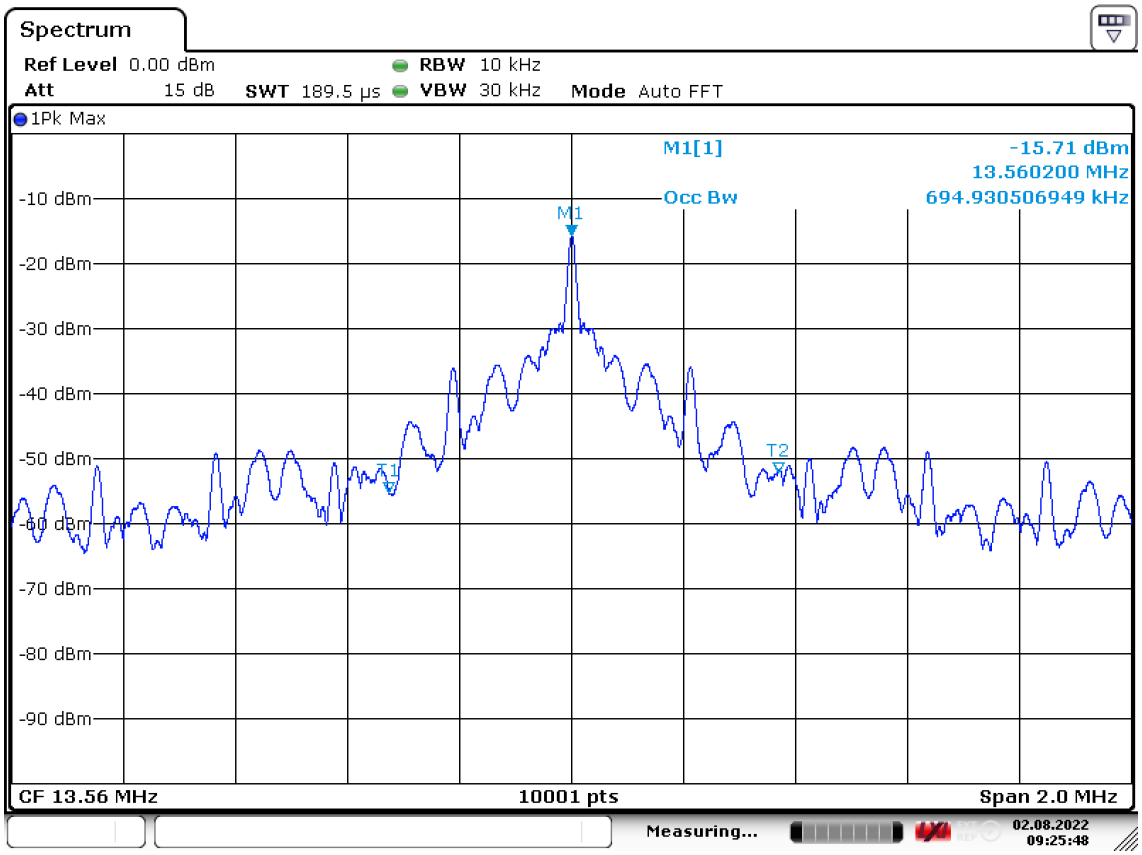

Figure 6: 99% OBW (13.56 MHz)

20 dB Emission Bandwidth

Standard:	ANSI C63.10	(2013)
Tested by:	LAS	
Date:	1 August 2022	
Temperature:	23 ± 3 °C	
Humidity:	20 - 75 % RH	

FCC Rule: 2.1049, 15.215(c)

Intentional radiators operating under the alternative provisions to the general emission limits must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated.

Test results

Table 6: 20 dB bandwidth test results

f [MHz]	20 dB BW [kHz]	Limit	Result
0.125	**1.0439**	no requirements	-
13.56	**117.888**	within 13.110-14.010 MHz	PASS

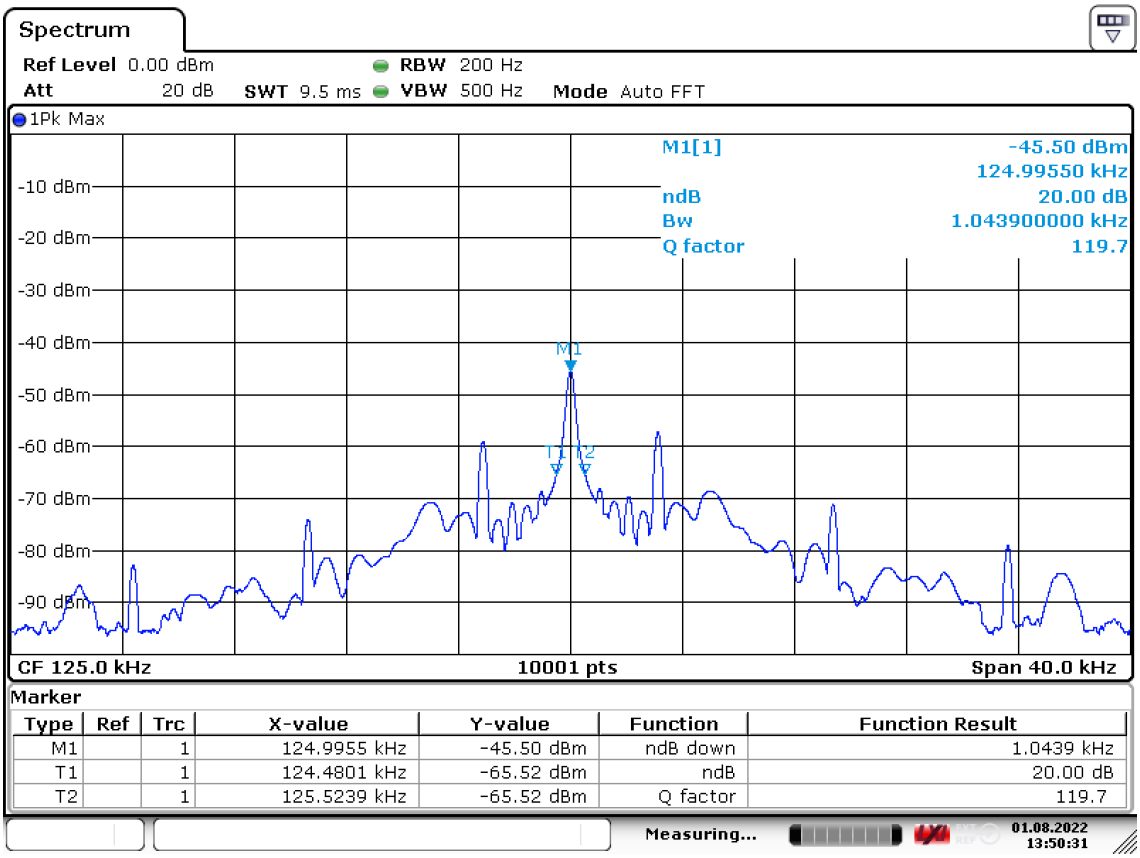

Figure 7: 20 dB emission bandwidth (125 kHz)

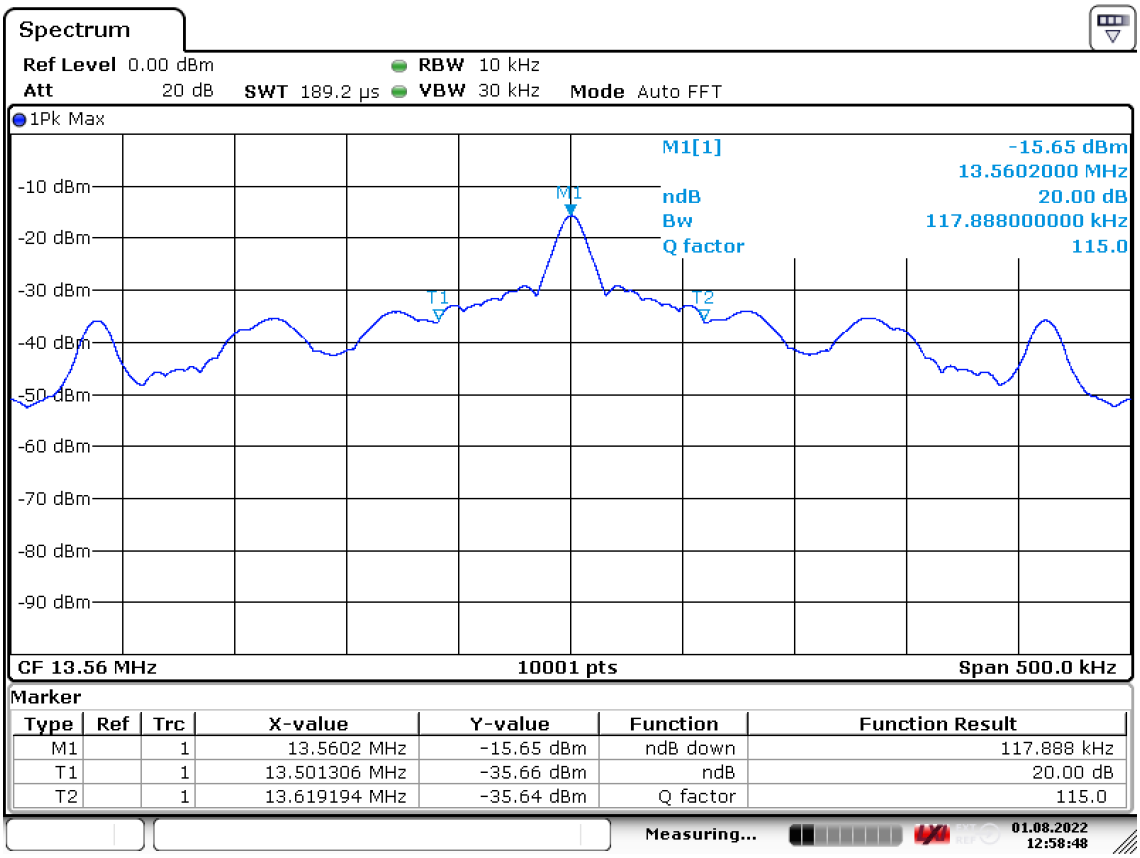

Figure 8: 20 dB emission bandwidth (13.56 MHz)

TEST EQUIPMENT

Radiated emissions

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
ANTENNA	SCHWARZBECK	VULB 9168	inv. 8911	2020-11-04	2022-11-04
ANTENNA	ROHDE & SCHWARZ	HFH2-Z2 , 335.4711.52	inv. 8013	2020-10-28	2022-10-28
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
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

Conducted emissions

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW26	inv. 10679	2022-06-20	2023-06-20
LISN	ROHDE & SCHWARZ	ENV216	inv. 9611	2022-02-02	2023-02-02
TEST SOFTWARE	ROHDE & SCHWARZ	EMC-32	-	-	-
POWER SUPPLY	CALIFORNIA INSTR.	5001 iX Series II	inv. 7826	NCR	NCR

NCR = No calibration required

END OF REPORT