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File Number **23/36404738M1**

TEST REPORT

Electromagnetic Compatibility

Petitioner's Reference:	Wallbox USA Inc.		
Company Address:	723 N. Shoreline Blvd Mountain View, CA 94043		
Represented by:	Ezequiel Manzini		
Equipment:	WALLBOX RFID		
Brand:	WALLBOX	PMN:	RFID01
Sample #1:	PATRF16B1	Applus Id:	18585-00001
HMN:	N/A		
Result:	**complies**		

It has been tested and complies with the applicable standard. See test result summary section.

Applicable Standard:	
EMC standard/s:	**FCC 47 CFR Part 15 Subpart C Intentional Radiators (January 2021)[1]** **ICES-003 Issue 7 – 2020 (updated October 2020)** **ISED RSS-210 Issue 10 (December 2019) + Amendment (April 2020)**

[1]The latest modifications of the standard, published at the date of the tests reported in this document, have been considered.

Dates and Test Site:	Applus Barcelona, Bellaterra
Equipment Reception Date	October 25, 2023
Test Initial Date:	October 25, 2023
Test Final Date:	October 25, 2023

Modification Description: M1

This report replaces and supersedes the report 23/36404738 dated on December 4, 2023.

Modifications performed: Page 1: ISED standard amendment added. Page 5, FCC ID:" 2BB8L-RFID01" and ISED IC: "31519-RFID01 added. Page 1, PMN:" RFID01" and HMN:"N/A" added. Page 1, ANSI 63.4 -2014 standard deleted (does not apply as product standard). Page 5. HVIN and FVIN indicated instead HW and SW version. Page 9, Canada CAVID indicated. It is responsibility of the petitioner to replace the previous version with this one.

Test Manager: Juan Carlos Parrilla
Date of issue: Bellaterra, January 19, 2024

LUIS GUARDIOLA ECHEVARRIA
2024.01.19 13:03:39 +01'00'

EMC & Wireless Technical Manager
Electrical and Electronics
LGAI Technological Center S.A.

ENSAYO ISO 17025 Nº9 / LE894

1 TEST RESULTS SUMMARY

Test Description	Sample #	DUT Test Modes	Results	Criteria Note
Antenna requirements according to FCC 47 CFR Part 15 (15.203) and RSS-Gen	#1	Mode 1	PASS	--
Radiated Spurious Emissions according to FCC 47 CFR Part 15 (15.35 / 15.205/15.209) and RSS-210	#1	Mode 1	PASS	--
Conducted Emissions according to FCC 47 CFR Part 15 (15.207) and RSS-Gen	#1	Mode 1	N/A	--
Emission Mask according to FCC 47 CFR Part 15 (15.225) and RSS-210	#1	Mode 1	PASS	--
Occupied bandwidth and 20dB Bandwidth according to FCC 47 CFR Part 2 (2.202) and RSS-Gen	#1	Mode 1	PASS	--
Frequency Stability according to FCC 47 CFR Part 15 (15.225(e)) and RSS-210	#1	Mode 1	PASS	--

Table 1: Test description

The test results are shown in detail on the following pages.

The criteria to give conformity in those cases where it is not implicit in the standard or specification will be, for EMC emissions tests, a non-simple binary decision rule will be followed with a safety zone equal to the value of the uncertainty (w = U).

In this case, the upper limit of the value of the probability of false acceptance, according to ILAC G8, is 2.5 % and the criteria notes are:

CN1: The measured results are above the upper limit, even considering the uncertainty interval.
CN2: The measured results are above the specified limits, but within the uncertainty interval. It is therefore not possible to state compliance based on the 95% level of confidence. However, the results indicate that non-compliance is more probable than compliance.
CN3: The measured results are below the specified limits, but within the uncertainty interval. It is therefore not possible to state compliance based on the 95% level of confidence. However, the results indicate that compliance is more probable than non-compliance.
CN4: The measured results are within the limits, including the uncertainty interval.

2 INDEX

3 GENERAL DESCRIPTION OF TEST ITEMS

3.1 EQUIPMENT DESCRIPTION

This information has been provided by the customer and it is not covered by the accreditation. LGAI does not assume any responsibility from it.

EQUIPMENT DESCRIPTION				
Description	RFID BOARD FOR IDENTIFICATION OF USER			
EUT Version	**FVIN**		**HVIN**	
	--		PATRF16B1	
Power supply 1	3.3 VDC	--	--	--
Power supply 2	24 VDC	--	--	--
Applicability	**Fixed Equipment**	**Vehicular Equipment**	**Portable Equipment**	
	☒	☐	☐	
Equipment Size (mm)	**Length**	**Width**	**Height**	
	68	58	8.8	
Operating Frequency (MHz)	13.56			
FCC ID	2BB8L-RFID01			
ISED ID	31519-RFID01			

Table 2: Equipment description

Modules description							
Description	**Mod #**	**Radio Chipset**	**Band**	**Model**	**Technology**	**Operating Frequency range**	**Antenna Gain (dBi)**
	1	CLRC66303HNY	13.56 MHz	CLRC66303HNY	RFID-NFC	13.56 MHz	-3.90

´Table 3: Modules description

3.1.1 Samples

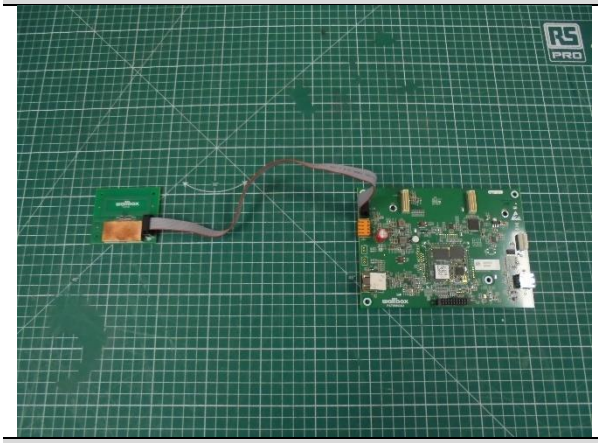
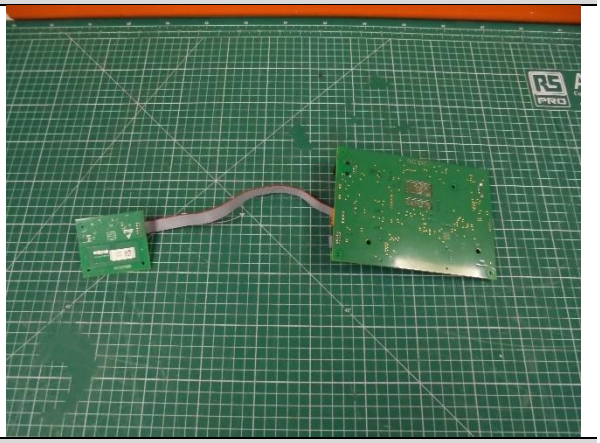
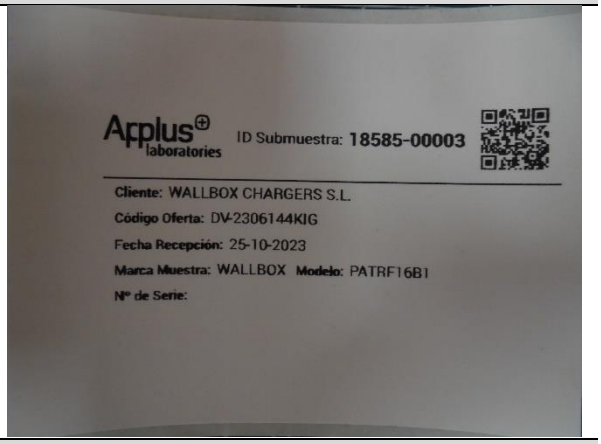
Sample #1	
	
Front View	**Rear View**
	
Top View	**Bottom View**
	
Manufacturer Label	**Applus Label Picture 1**

Table 4: Sample #1 description

3.1.2 Auxiliary Equipment

Auxiliary Equipment	
	
Auxiliary Equipment 1	**Applus Label Picture 2**
	
Auxiliary Equipment 2	**Applus Label Picture 3**

Description	Port #	Name	Type	Comments
	--	HMI BOARD	SUPERNOVA	PATHM43A2

Table 5: Auxiliary equipment #1 description

3.2 DUT TEST MODES

DUT Operation Modes		
Mode #	**Description**	**Set-up**
1	To define the test mode used for emissions test: - Continuously transmitting	Table top

Table 6: DUT test modes

3.3 ACCEPTANCE CRITERIA

According to standard **FCC 47 CFR Part 15 Subpart C and ICES-003 Issue 7**

3.4 TEST FACILITIES ID

TEST FACILITIES ID	
FCC Test Firm Registration Number:	507478
ISED Assigned Code:	5766A
CABID:	ES0001

Table 7: Test facilities ID

3.5 COMPETENCES AND GUARANTEES

LGAI Technological Center, S.A. is a testing laboratory accredited by the National Accreditation Body (ENAC -Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 9/LE894.
In order to assure the traceability to other national and international laboratories, Applus+ Laboratories has a calibration and maintenance program for its measurement equipment.
Applus+ Laboratories guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at Applus+ Laboratories at the time of performance of the test.
Applus+ Laboratories is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test. The results presented in this Test Report apply only to the particular item under test established in this document.

General conditions:

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of Applus+ Laboratories.

4 TEST RESULTS

4.1 ANTENNA REQUIREMENTS

4.1.1 Test Setup Required

According to FCC 47 CFR Part 15 C and RSS-Gen, an intentional radiator shall be designed to ensure that no antenna other that furnished by responsible party shall be used with the device. The use of a permanently attached antenna or an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.
The manufacturer may design the unit so that a broken antenna can be replaced by the used, but the user of a standard antenna jack or electrical connector is prohibited.

- The antenna must be permanently attached to the unit.
- Antenna must use a unique type of connector to attach the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

Antenna Connector Construction: After verifying the antenna documentation declared by the customer, it is verified that the antenna is permanently installed on the unit and that the EUT does not have an antenna connector.

Result: Compliance

4.2 RADIO-FREQUENCY RADIATED EMISSIONS

4.2.1 Test Setup Required

According to standard ANSI C63.10:2013

Tabletop equipment

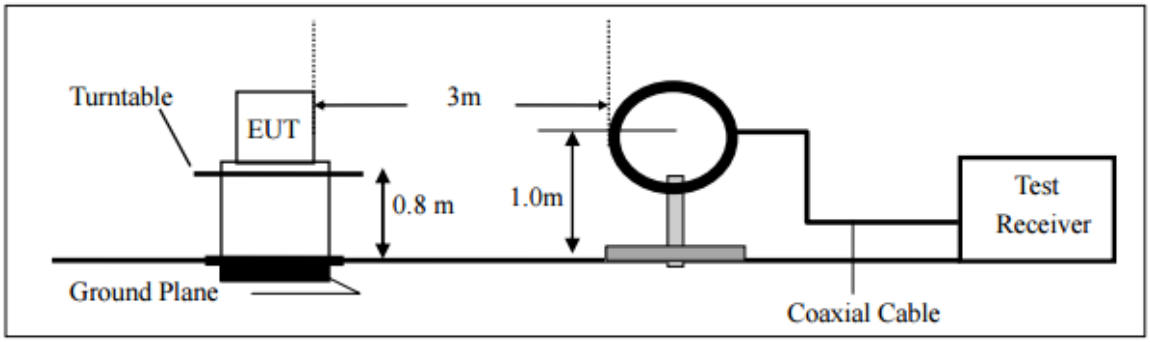


Fig. 1: Radio-frequency radiated emissions setup of table top equipment.

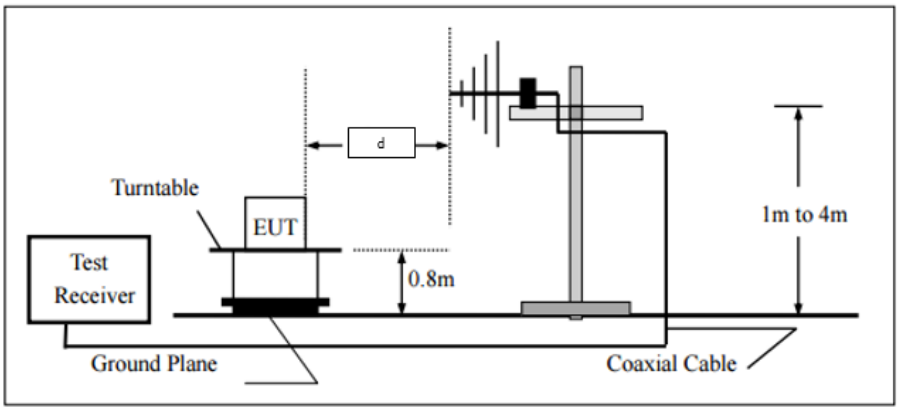


Fig. 2: Radio-frequency radiated emissions of table top equipment from 30 MHz to 1000 MHz

Distance "d" depends on test chamber.

4.2.2 Test Procedure

The test site, 3 m semi-anechoic chamber, has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10-2013 and ANSI C63.4 2014.

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 30 MHz to 1 GHz in semi-anechoic chambers. The receiving antennas are conforming to specifications ANSI C63. These antennas can be moved over the height range between 1 m and 4 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received.

Pre-measurement

- The turntable rotates from 0° to 360°
- The antenna is polarized vertical and horizontal
- The antenna height changes from 1 m to 4 m
- At each turntable position, antenna polarization and height the receiver finds the maximum of all emissions

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.10
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable position 360º and antenna height between 1 m and 4 m
- The final measurement is done with quasi-peak detector (as described in ANSI C63.4) for 9 kHz to 30 MHz emissions test
- The final measurement is done with quasi-peak detector (as described in ANSI C63.4) for 30 MHz to 1 GHz emissions test
- The final measurement is done in the position (azimuth, height and antenna polarization) causing the highest emissions with Peak and CAverage detector (as described in ANSI C63.4) for 1 GHz to 18 GHz test
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factors, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is shown

Correction Factor:

Emission Level = Read Level +Corrections (Antenna Factor + Cable Loss – Amplifier Gain (if applies) + Attenuator (if applies))

4.2.3 Test Parameters

According to FCC Part 15.209:

Frequency (MHz)	Field strength (µV/m)	Measurement Distance
0.009-0.490	2400/F(kHz)	300 NOTE 1
0.490-1.705	24000/F(kHz)	30 NOTE 2
1.705-30	30	30 NOTE 2
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

Table 8: Radio-frequency radiated emissions requirements

Note 1: The limits have been modified according to the applicable standard applying the formula: $L_2 = L_1 - 40log(d_2/d_1)$*, where:*

L_2: New Limit.
L_1: Limit at 300 meters.
d_1: 300 meters (standard distance).
d_2: 3 meters (new measurement distance).

Note 2: The limits have been modified according to the applicable standard applying the formula: $L_2 = L_1 - 40log(d_2/d_1)$*, where:*
L_2: New Limit.
L_1: Limit at 30 meters.
d_1: 30 meters (standard distance).
d_2: 3 meters (new measurement distance).

4.2.3.1 Receiver Parameters

According to standard ANSI C63.10:2013:

Frequency Range [MHz]	Detector	Resolution Bandwidth	Video Bandwidth
0.009 – 0.15	Quasi-peak (QP)	200 Hz	1 kHz
0.15 - 30	Quasi-peak (QP)	9 kHz	30 kHz
30-1000	Quasi-peak (QP)	100 kHz	300 kHz

Table 9: Receiver parameters – Radio-frequency radiated emissions

4.2.4 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
25/10/2023	I. Serrano	J.M. Nadales	20.5	51.6	989.0

Table 10: Test environmental conditions – Radio-frequency radiated emissions

4.2.5 Summary Test Results

Frequency Range[1] [MHz]	Axis	Test Area	Distance [m]	Emissions	Results
0.009 – 30	X	SAC 2	3	QP < Limit - I	PASS
0.009 – 30	Y	SAC 2	3	QP < Limit - I	PASS
0.009 – 30	Z	SAC 2	3	QP < Limit - I	PASS
30 – 1000	N/A	SAC 2	3	QP < Limit - I	PASS

Table 11: Summary test results – Radio-frequency radiated emissions

Upper limit according to the tenth harmonic of the maximum internal frequency declared by the manufacturer or to 40 GHz, whichever is lower.

4.2.6 Test Setup Photographs

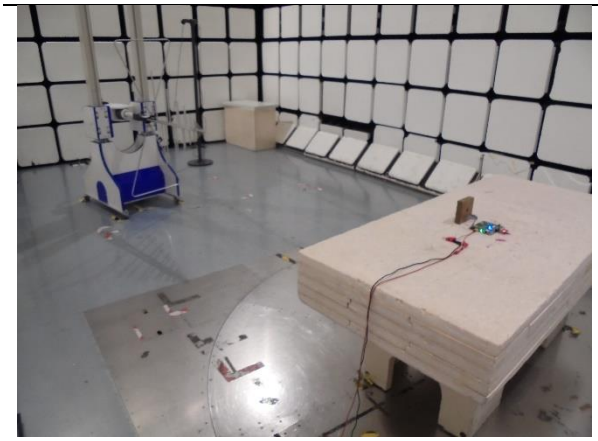
RADIO-FREQUENCY RADIATED EMISSIONS – TEST SETUP	
	
	

Table 12: Radio-frequency radiated emissions test setup

4.2.7 Test Results

4.2.7.1 Ambient Levels. Frequency range: 9 kHz – 30 MHz

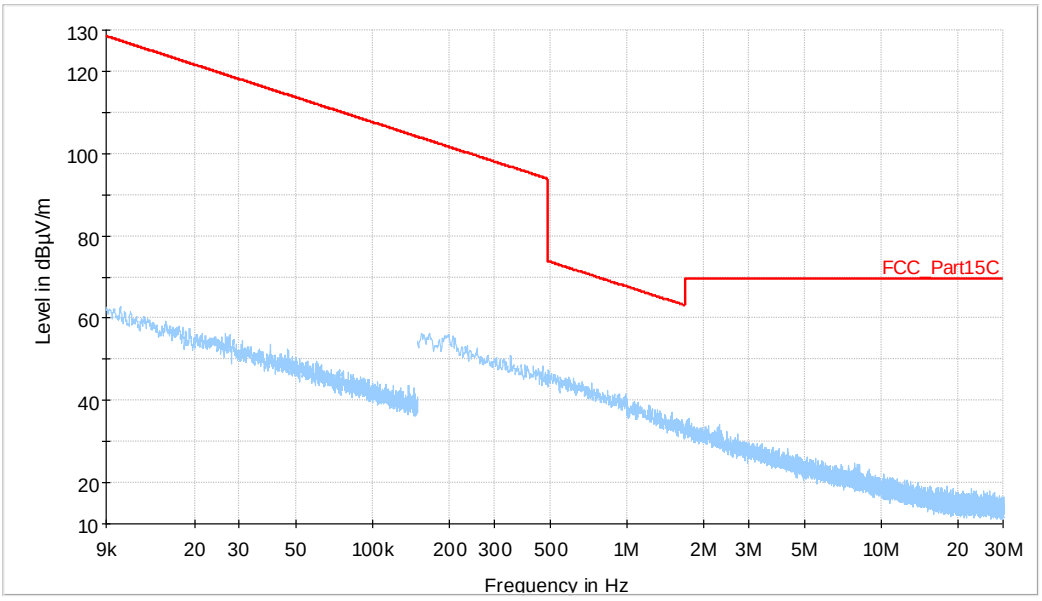


Fig. 3: Ambient level. X axis. Frequency range: 9 kHz – 30 MHz

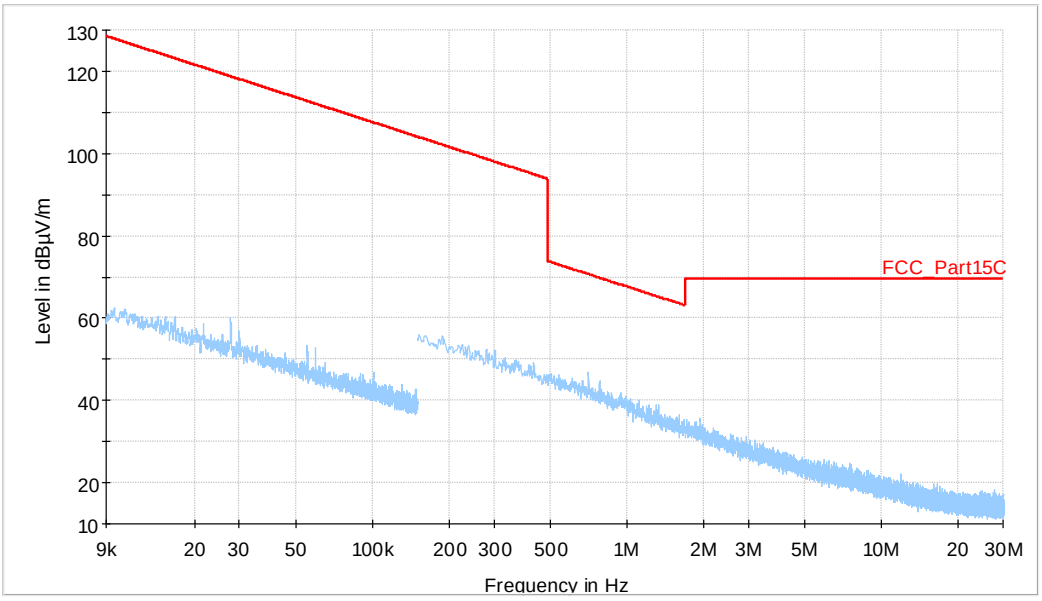


Fig. 4: Ambient level. Y axis. Frequency range: 9 kHz – 30 MHz

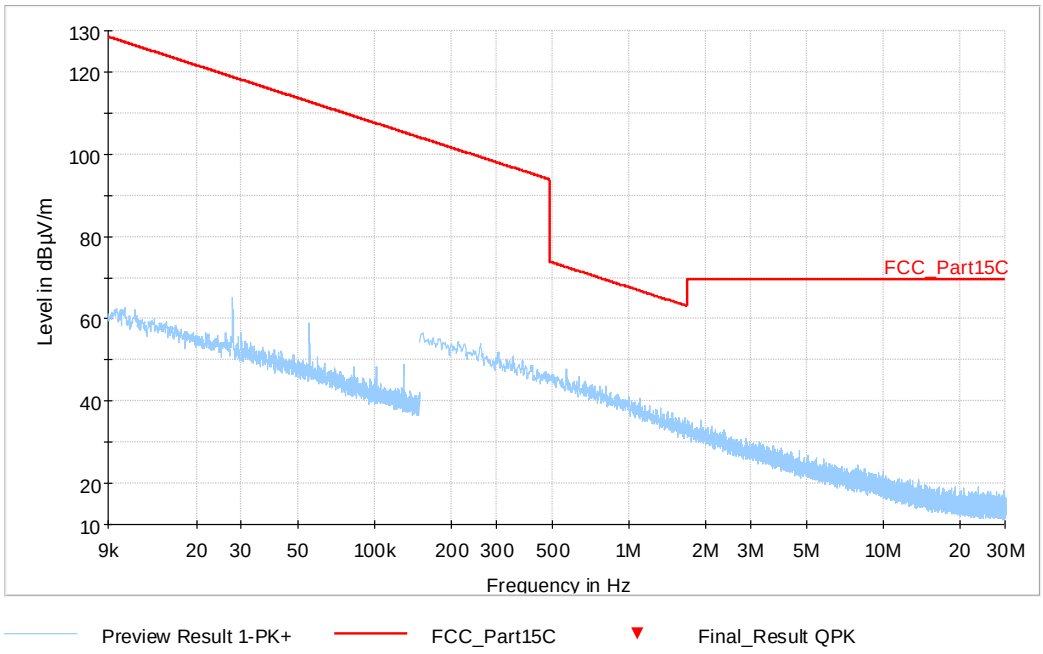


Fig. 5: Ambient level. Z axis. Frequency range: 9 kHz – 30 MHz

4.2.7.2 Ambient Levels. Frequency range: 30 MHz – 1 GHz

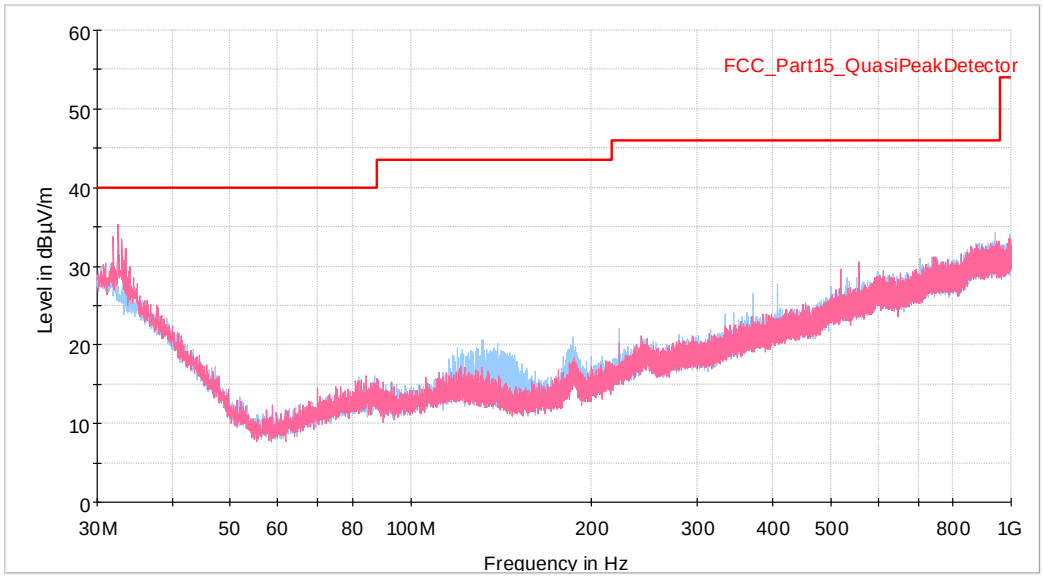


Fig. 6: Ambient level. Frequency range: 30 MHz – 1 GHz

4.2.7.3 Sample #1. Mode 1. Frequency range: 9 kHz – 30 MHz Axis X

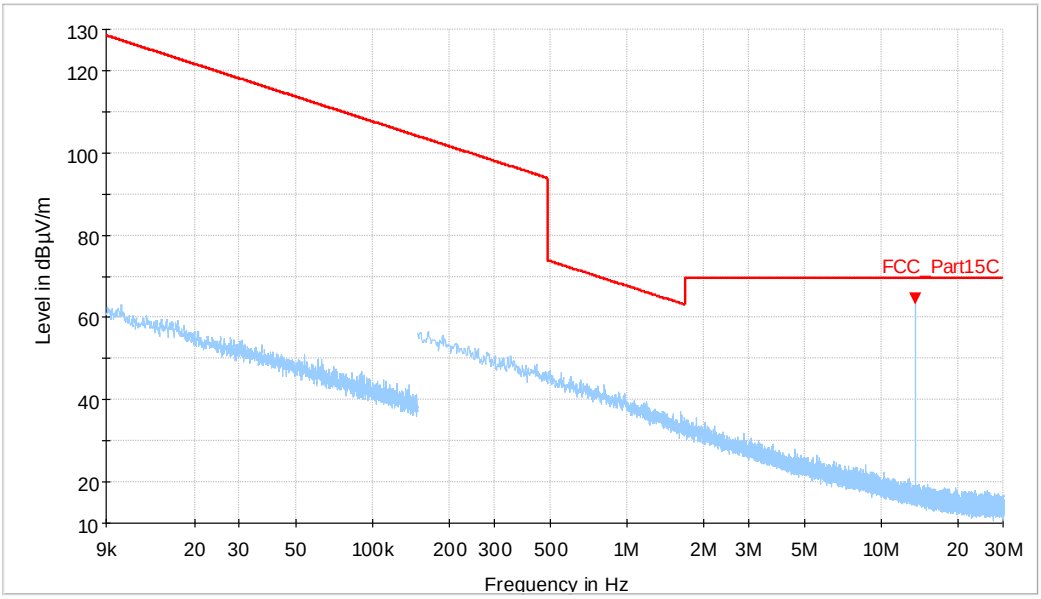


Fig. 7: Sample #1. Mode 1. Frequency range: 9 kHz – 30 MHz Axis X

FINAL MEASUREMENTS

Operating Frequency (MHz)	E Field (dBµV/m @ 3m)	Azimuth
13.560610	64.59	2.0

Table 13: Final Measurements– Radio-frequency radiated emissions

4.2.7.4 Sample #1. Mode 1. Frequency range: 9 kHz – 30 MHz Axis Y

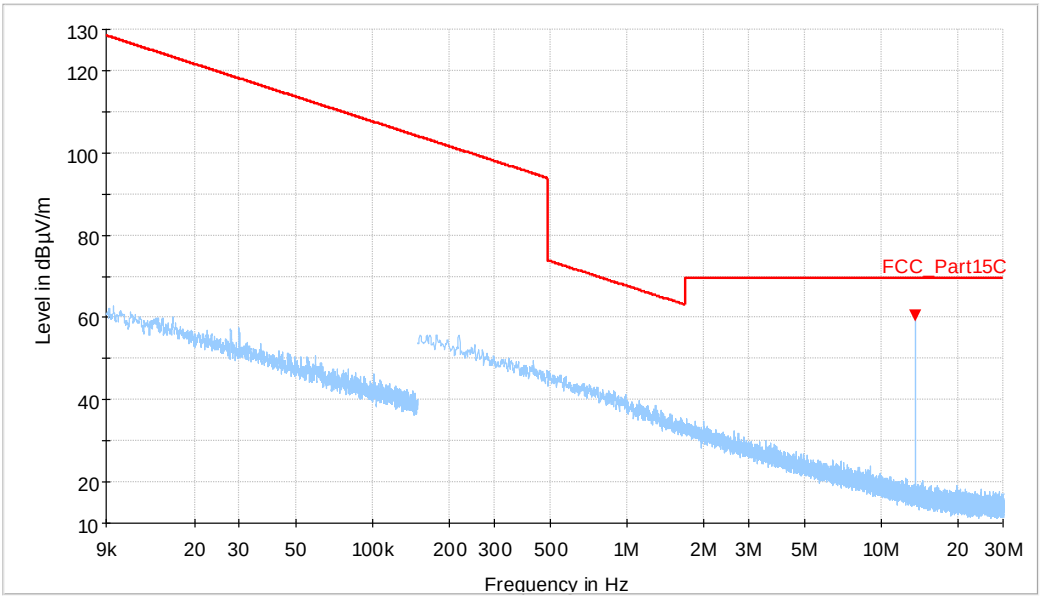


Fig. 8: Sample #1. Mode 1. Frequency range: 9 kHz – 30 MHz Axis Y

FINAL MEASUREMENTS

Operating Frequency (MHz)	E Field (dBµV/m @ 3m)	Azimuth
13.561	60.51	284

Table 14: Final Measurements– Radio-frequency radiated emissions

4.2.7.5 Sample #1. Mode 1. Frequency range: 9 kHz – 30 MHz Axis Z

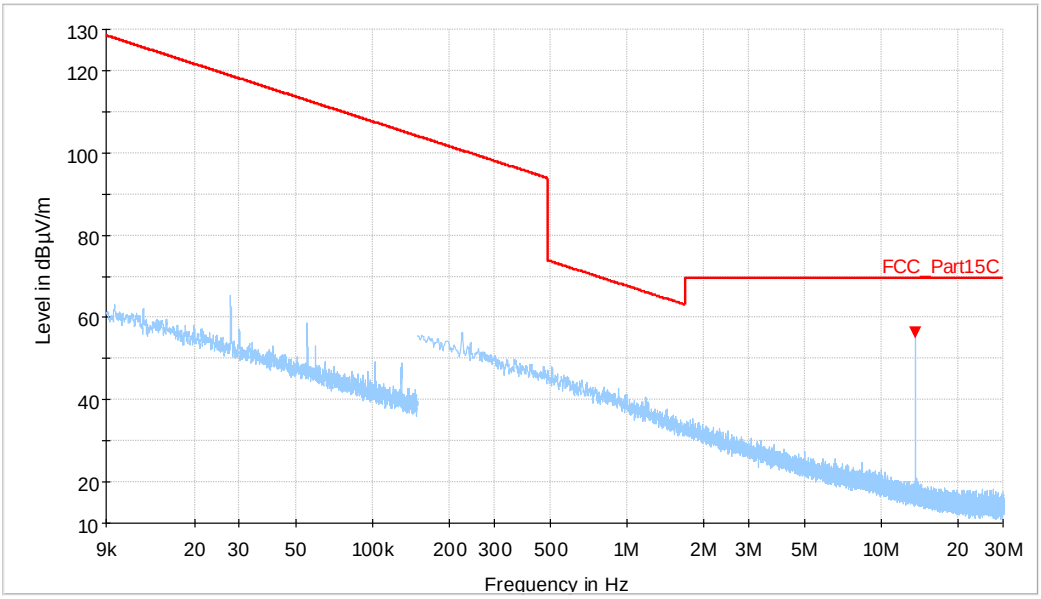


Fig. 9: Sample #1. Mode 1. Frequency range: 9 kHz – 30 MHz Axis Z

FINAL MEASUREMENTS

Operating Frequency (MHz)	E Field (dBµV/m @ 3m)	Azimuth
13.560610	56.32	10.8

Table 15: Final Measurements– Radio-frequency radiated emissions

4.2.7.6 Sample #1. Mode 1. Frequency range: 30 MHz – 1 GHz

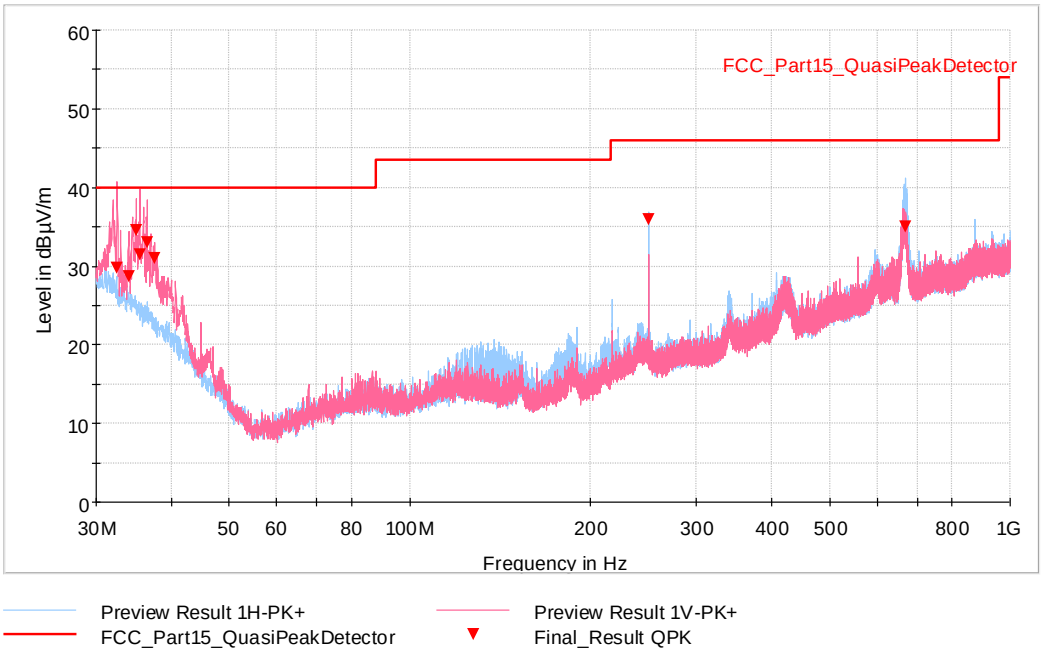


Fig. 10: Sample #1. Mode 1. Frequency range: 30 MHz – 1GHz

FINAL MEASUREMENTS

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
32.489	29.76	40.00	10.24	109.0	V	211.0	24.9
34.009	28.75	40.00	11.25	106.0	V	16.0	23.9
35.011	34.59	40.00	5.41	105.0	V	302.0	23.2
35.464	31.46	40.00	8.54	110.0	V	254.0	22.9
36.466	32.97	40.00	7.03	100.0	V	269.0	22.2
37.501	31.00	40.00	9.00	100.0	V	285.0	21.5
249.996	35.92	46.00	10.08	108.0	H	121.0	18.7
668.421	34.97	46.00	11.03	100.0	H	73.0	26.0

Table 16: Final Measurements– Radio-frequency radiated emissions

4.2.8 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
ACTIVE LOOP ANTENNA	EMCO	6502	05-ER-019	04/10/2023	04/10/2024
BILOG ANTENNA	SCHWARZBECK	VULB 9162	1042229	14/02/2023	14/02/2024
RF CABLE	HUBER&SUHNER	SF126E	1042729	21/08/2023	21/08/2024
RF CABLE	HUBER&SUHNER	SF103/11N/16N/4000MM	1041909	10/02/2023	10/02/2024
RF CABLE	N/A	N/A	104572	11/08/2023	11/08/2024
ATTENUATOR	HUBER&SUHNER	6803.17.B	1042020	08/08/2023	08/08/2024
EMI RECEIVER	ROHDE & SCHWARZ	ESW26	1041791	19/12/2022	19/12/2023
SEMIANECHOIC CHAMBER SAC2	EUROSHIELD	TC2	104563	15/03/2023	15/03/2026
TEST SOFTWARE	ROHDE & SCHWARZ	EMC32 v.10.50.00	104624	--	--
MAST-TABLE CONTROLLER	MATURO	NCD/052/8931211	1042758	--	--

Table 17: Test Instruments – Radio-frequency radiated emissions

4.2.9 Uncertainty

Test Type	Test Description	Uncertainty
Emissions	RADIO-FREQUENCY RADIATED EMISSIONS 9 kHz – 30 MHz	± 3.87 dB
Emissions	RADIO-FREQUENCY RADIATED EMISSIONS 30 MHz – 1 GHz	± 5.22 dB

Table 18: Radio-frequency radiated emissions measuring Uncertainties

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by a coverage factor k=2, which for normal distribution corresponds to a coverage probability of approximately 95%.

4.3 Emission Mask

4.3.1 Test Setup Required

According to standard ANSI C63.10-2013

4.3.1.1 Tabletop equipment

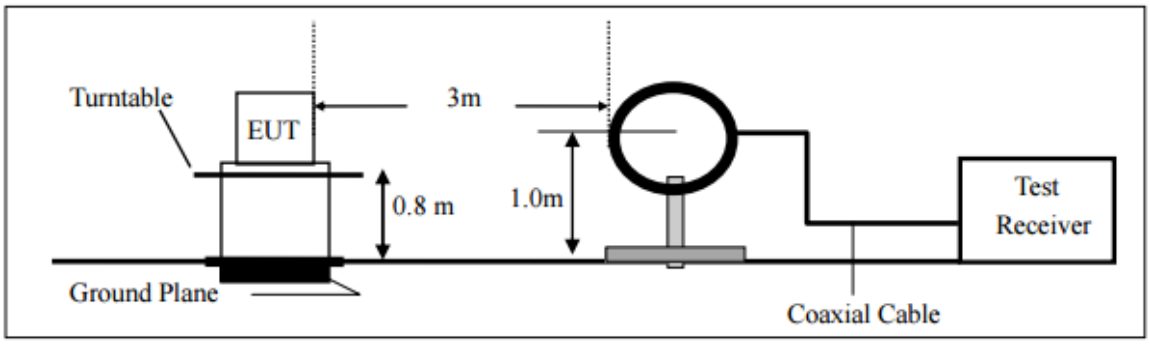


Fig. 11: Radio-frequency radiated emissions setup of table top equipment.

4.3.2 Test Procedure

The test site, 3 m semi-anechoic chamber, has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10-2013

At radio frequency radiated emission final measurement using QP detector have been made on the operating frequency of the EUT in order to determine worst case of polarization and azimuth at 9 kHz to 30 MHz frequency range.

Emission mask shall be measured in the given worst-case scenario.

4.3.3 Test Parameters

According to standard FCC 47 CFR Part 15 C 15.225:

Frequency (MHz)	Field strength (µV/m)	Measurement Distance
13.11 – 13.41	106	30 NOTE 1
13.41 – 13.553	334	30 NOTE 1
13.553 – 13.567	15848	30 NOTE 1
13.567 – 13,71	334	30 NOTE 1
13.71 – 14.01	106	30 NOTE 1

Table 19: Emission Mask requirements

Note 1: The limits have been modified according to the applicable standard applying the formula: $L_2 = L_1 - 40log(d_2/d_1)$*, where:*

L_2: New Limit.
L_1: Limit at 30 meters.
d_1: 30 meters (standard distance).
d_2: 3 meters (new measurement distance).

4.3.3.1 Receiver Parameters

According to standard ANSI C63.4:2014

Frequency Range [MHz]	Detector	Resolution Bandwidth [kHz]
13.11 – 14.01	Max Peak	10

Table 20: Receiver parameters – Emission Mask

4.3.4 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
25/10/2023	I. Serrano	J.M. Nadales	20.5	51.6	989.0

Table 21: Test environmental conditions Emission Mask

4.3.5 Summary Test Results

Frequency Range [MHz]	Axis	Azimuth	Test Area	Results
13.11 – 14.01	X	2	SAC2	PASS

Table 22: Summary test results – Emission Mask

4.3.6 Test Setup Photographs

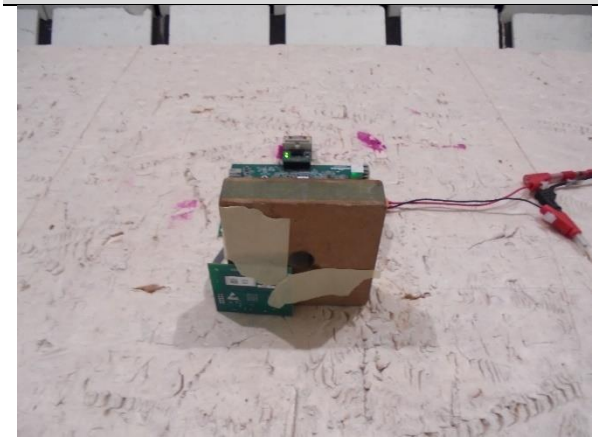
EMISSION MASK – TEST SETUP	
	

Table 23: Emission Mask test setup

4.3.7 Test Results

4.3.7.1 Ambient Levels Emission Mask. Frequency range: 13.11 MHz – 14.01 MHz

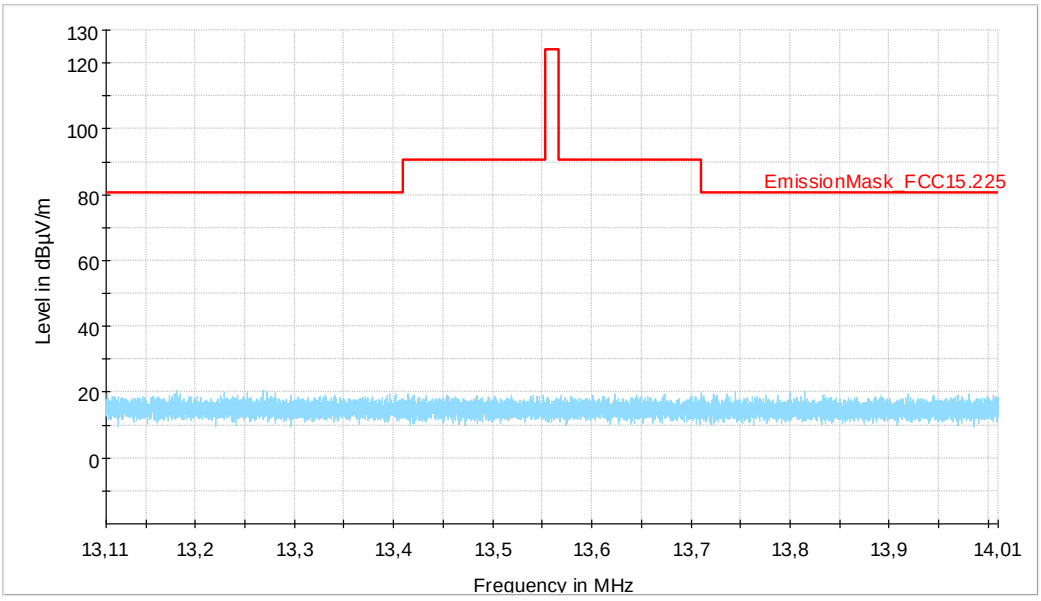


Fig. 12: Ambient level. Emission Mask

4.3.7.2 Sample #1. Mode 1. Emission Mask. Frequency range: 13.11 MHz – 14.01 MHz

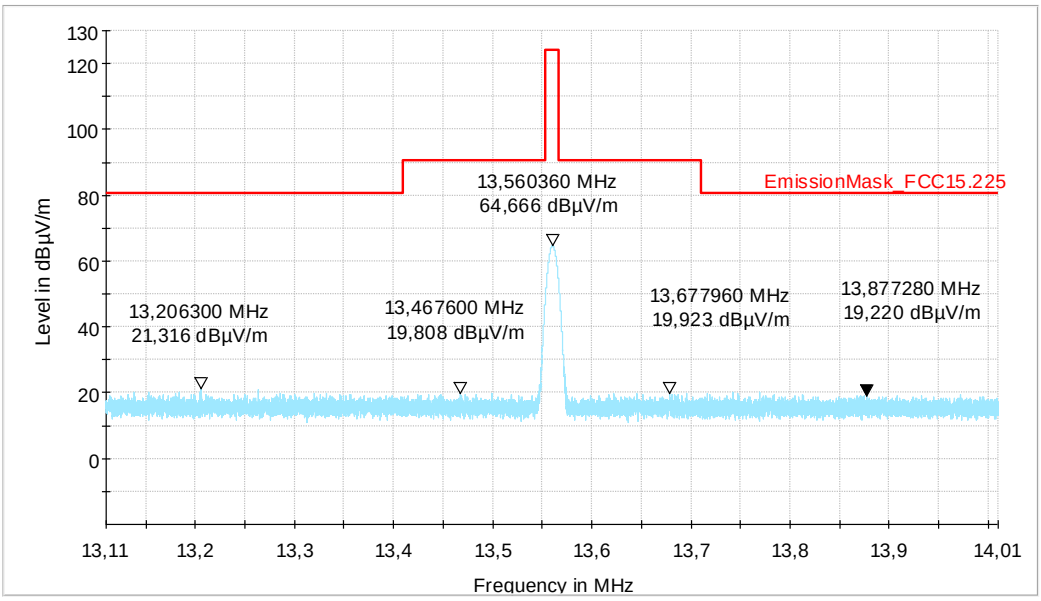


Fig. 13: Sample #1. Mode 1. Emission Mask

4.3.8 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
ACTIVE LOOP ANTENNA	EMCO	6502	05-ER-019	04/10/2023	04/10/2024
RF CABLE	HUBER&SUHNER	SF126E	1042729	21/08/2023	21/08/2024
RF CABLE	HUBER&SUHNER	SF103/11N/16N/4000MM	1041909	10/02/2023	10/02/2024
RF CABLE	N/A	N/A	104572	11/08/2023	11/08/2024
EMI RECEIVER	ROHDE & SCHWARZ	ESW26	1041791	19/12/2022	19/12/2023
SEMIANECHOIC CHAMBER SAC2	EUROSHIELD	TC2	104563	15/03/2023	15/03/2026
TEST SOFTWARE	ROHDE & SCHWARZ	EMC32 v.10.50.00	104624	--	--
MAST-TABLE CONTROLLER	MATURO	NCD/052/8931211	1042758	--	--

Table 24: Test Instruments – Emission Mask

4.3.9 Uncertainty

Test Type	Test Description	Uncertainty
Emissions	EMISSION MASK	± 2.56 dB

Table 25: Emission Mask measuring Uncertainties

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by a coverage factor k=2, which for normal distribution corresponds to a coverage probability of approximately 95%.

4.4 OCCUPIED BANDWIDTH AND 20 DB BANDWIDTH

4.4.1 Test Setup Required

Fig. 14: Occupied Bandwidth set up

4.4.2 Test procedure

The frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0,5 percent of the total mean power radiated by a give emission. The occupied bandwith shall be reported for all equipment.

In some cases, the "x dB bandwidth" is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission in attenuated x dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

4.4.3 Test parameters

According to ANSI 63.10-2013

Connect the EUT to the spectrum analyzer and use the following settings:

- Center frequency: The nominal EUT channel center frequency.
- Span: between 2 and 5 times the OBW.
- RBW: between 1% and 5% of the OBW.
- VBW: ≥ 3 x RBW.
- Sweep time: Auto.
- Detector: Max Peak
- Trace mode: Max Hold.

Use the 99% power bandwidth function of the instrument and "-n dB" function if available, if these functions are not available in the spectrum analyzer, delta marker method can be applied instead.

4.4.4 Test environmental conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
25/10/2023	I. Serrano	J.M. Nadales	20.5	51.6	989.0

Table 26: Test environmental conditions Occupied Bandwidth

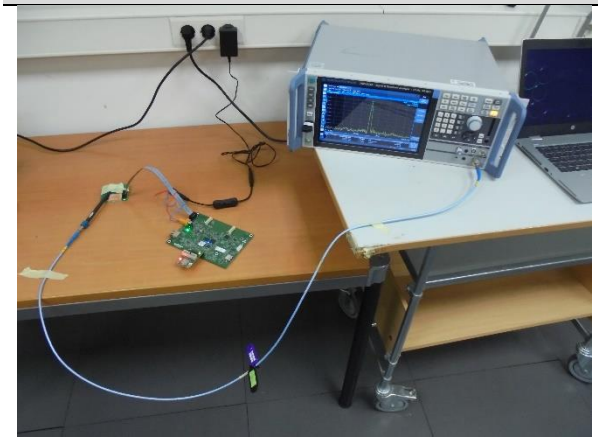
4.4.5 Summary Test Results

Operating frequency (MHz)	99% Bandwidth	20 dB Bandwidth	Results
13.560432	439.243	518.000	PASS

Table 27: Test Results Occupied Bandwidth

4.4.6 Test Setup Photographs

Occupied Bandwidth – TEST SETUP



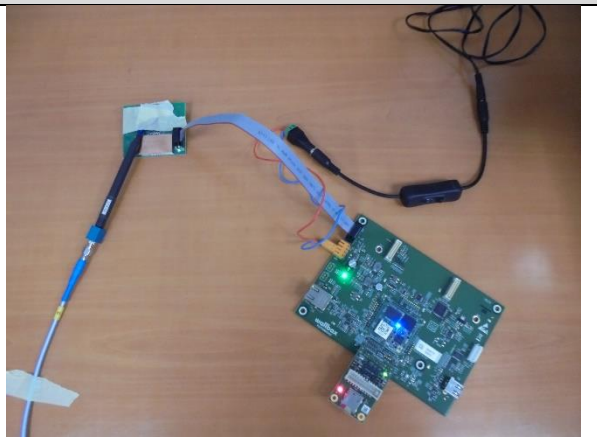


Table 28: Occupied Bandwidth test setup

4.4.7 Test Result

Operating Frequency [MHz]	t1 [kHz]	t2 [kHz]	Occupied Bandwidth [kHz]	20 dB Bandwidth [kHz]
13.560432	13560.175	13560.693	0.439	0.518

Table 29: Test results – Occupied Bandwidth

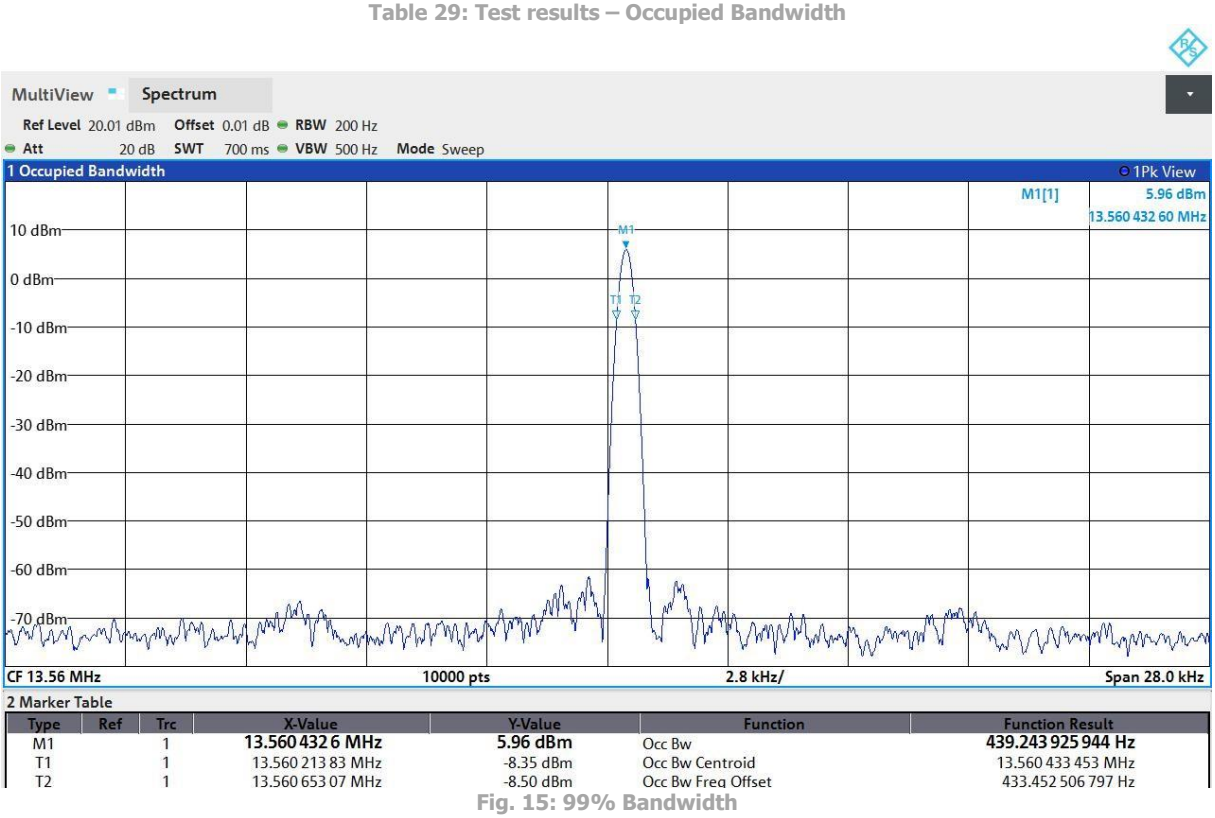


Fig. 15: 99% Bandwidth

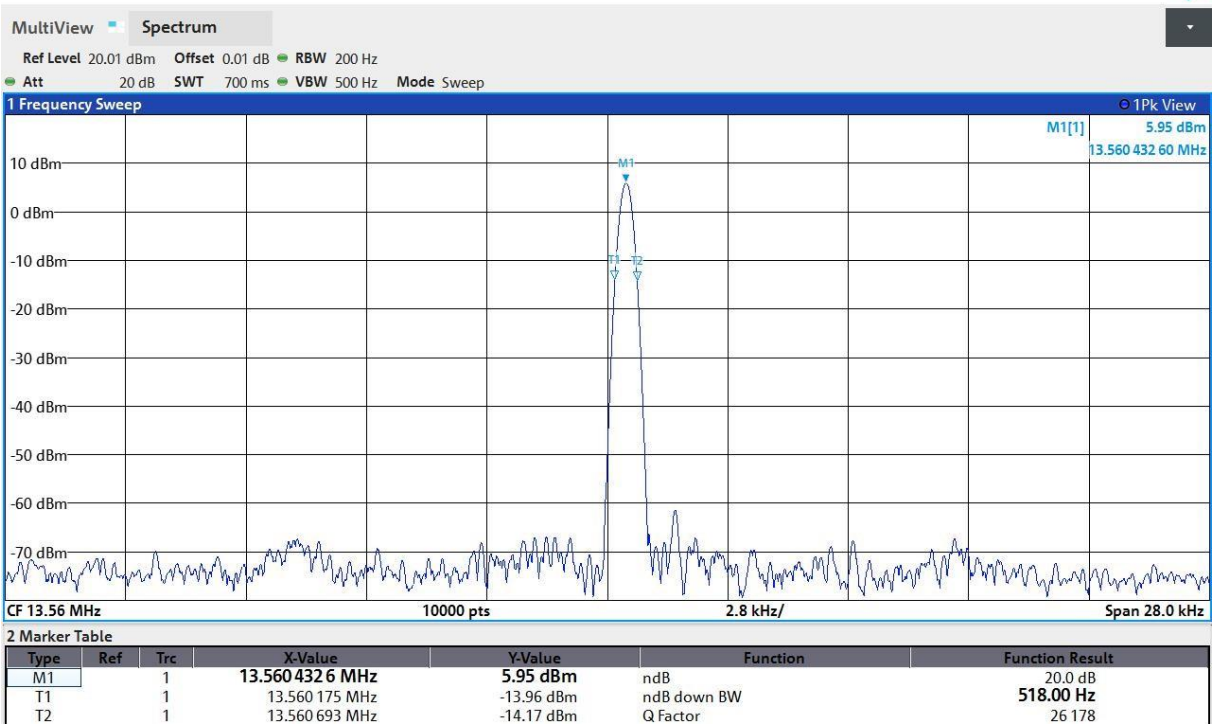


Fig. 16: 20 dB Bandwidth

4.4.8 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
Signal & Spectrum Analyzer	R&S	FSVA3044	1042700	23/02/2022	15/11/2024
RF CABLE 40GHz	HUBERSUHNER	SF102	1042545	18/05/2023	18/05/2024
Antenna langer	EMV-Technik	LFR400	--	--	--

Table 30: Test Instruments – Occupied bandwidth

4.4.9 Uncertainty

Test Type	Test Description	Uncertainty
Emissions	OCCUPIED BANDWIDTH	± 75.54 Hz

Table 31: Measuring uncertainties – Occupied Bandwidth

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by a coverage factor k=2, which for normal distribution corresponds to a coverage probability of approximately 95%.

4.5 FREQUENCY STABILITY

4.5.1 Test Setup Required

Fig. 17: Frequency Stability set up

4.5.2 Test procedure

The frequency tolerance of the Carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed with using a new battery.

4.5.3 Test parameters

According to ANSI 63.10-2013

Connect the EUT to the spectrum analyzer and adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument but is strong enough to allow measurement of the operating or fundamental frequency of the EUT).

Turn the EUT off and place it inside the environmental temperature chamber. For devices that have oscillator heaters, energize only the heater circuit.

Set the temperature control on the chamber to the highest specified in the regulatory requirements for the type of device and allow the oscillator heater and the chamber temperature to stabilize.

While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.

4.5.4 Test environmental conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
26/10/2023	J.M. Nadales	Óscar Costa	22.7	57.6	998.7

Table 32: Test environmental conditions Frequency Stability

4.5.5 Summary Test Results

Operating frequency (MHz)	OBW (kHz)	Max Tolerance (%)	Results
13.56	0.5	0.000162237	PASS

Table 33: Test Results Frequency Stability

4.5.6 Test Setup Photographs

Frequency Stability – TEST SETUP	
	

Table 34: Frequency Stability test setup

4.5.7 Test Result

Temperature (ºC)	Voltage (Vdc)	Observed Time	Frequency (MHz)	Tolerance (%)	Limit (%)	Result
-20	3.3	0 min	13.560461	-0.00025073	± 0.01	PASS
		2 min	13.560458	-0.000228606	± 0.01	PASS
		5 min	13.560455	-0.000206483	± 0.01	PASS
		10 min	13.560452	-0.00018436	± 0.01	PASS
-10	3.3	0 min	13.560461	-0.00025073	± 0.01	PASS
		2 min	13.560463	-0.000265478	± 0.01	PASS
		5 min	13.560463	-0.000265478	± 0.01	PASS
		10 min	13.560461	-0.00025073	± 0.01	PASS
0	3.3	0 min	13.560455	-0.000206483	± 0.01	PASS
		2 min	13.560455	-0.000206483	± 0.01	PASS
		5 min	13.560458	-0.000228606	± 0.01	PASS
		10 min	13.560458	-0.000228606	± 0.01	PASS
10	3.3	0 min	13.560435	-5.89952E-05	± 0.01	PASS
		2 min	13.560441	-0.000103242	± 0.01	PASS
		5 min	13.560449	-0.000162237	± 0.01	PASS
		10 min	13.560449	-0.000162237	± 0.01	PASS
22.7	3.3	0 min	13.560427	0	± 0.01	PASS
		2 min	13.560427	0	± 0.01	PASS
		5 min	13.560427	0	± 0.01	PASS
		10 min	13.560427	0	± 0.01	PASS
22.7	2.805	0 min	13.560427	0	± 0.01	PASS
		2 min	13.560427	0	± 0.01	PASS
		5 min	13.560427	0	± 0.01	PASS
		10 min	13.560427	0	± 0.01	PASS
22.7	3.795	0 min	13.560427	0	± 0.01	PASS
		2 min	13.560427	0	± 0.01	PASS
		5 min	13.560427	0	± 0.01	PASS
		10 min	13.560427	0	± 0.01	PASS
30	3.3	0 min	13.560416	8.11184E-05	± 0.01	PASS
		2 min	13.560416	8.11184E-05	± 0.01	PASS
		5 min	13.560416	8.11184E-05	± 0.01	PASS
		10 min	13.560416	8.11184E-05	± 0.01	PASS
40	3.3	0 min	13.560405	0.000162237	± 0.01	PASS
		2 min	13.560405	0.000162237	± 0.01	PASS
		5 min	13.560405	0.000162237	± 0.01	PASS
		10 min	13.560405	0.000162237	± 0.01	PASS
50	3.3	0 min	13.560405	0.000162237	± 0.01	PASS
		2 min	13.560405	0.000162237	± 0.01	PASS
		5 min	13.560405	0.000162237	± 0.01	PASS
		10 min	13.560405	0.000162237	± 0.01	PASS

Table 35: Test results – Frequency Stability

4.5.8 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
Climatic Chamber	Thermotron	SE-300-2-2	CL110772	14/02/2023	14/02/2024
Signal & Spectrum Analyzer	R&S	FSVA3044	1042700	23/02/2022	15/11/2024
RF CABLE 40GHz	HUBERSUHNER	SF102	1042545	18/05/2023	18/05/2024
Antenna langer	EMV-Technik	LFR400	--	--	--

Table 36: Test Instruments –Frequency Stability

4.5.9 Uncertainty

Test Type	Test Description	Uncertainty
Emissions	FREQUENCY STABILITY	± 75.54 Hz

Table 37: Measuring uncertainties – Frequency Stability

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by a coverage factor k=2, which for normal distribution corresponds to a coverage probability of approximately 95%.