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File Number **23/36403866M2**

TEST REPORT
Radiofrequency

Petitioner's Reference:		Servicios de Radio Wavenet	
Company Address:	Pol. Ind. Requena, N79, 45214 Cedillo del Condado, Toledo		
Represented by:	Julián Peral Alonso		
Equipment:		Neso 2.4	
Brand:	Wavenet	PMN:	Neso 2.4
Sample #1:	2723/08A	Applus Id:	17991-00006
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 (October 2021)[1]** **RSS-247 – Issue 2 (February 2017)**

[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	September 25, 2023
Test Initial Date:	October 3, 2023
Test Final Date:	October 4, 2023

Modification Description: M1

This report replaces and supersedes the report 23/36403866 dated on October 31, 2023.

Modifications performed: Included explicit reference to PMN, HVIN and FVIN numbers and summary of limits and measuring distance of section 4.7.3.1 updated due to an error in the test template. Pages 1, 5, 41 and 51 are affected. It is responsibility of the petitioner to replace the previous version with this one.

Modification Description: M2

This report replaces and supersedes the report 23/36403866M1 dated on November 17, 2023.

Modification performed: The antenna gains in table 2 and table 22 are modified according to the customer's specification. The EIRP value is updated in the Maximum Peak Conducted Output Power test in section 4.4.6. Pages 5 and 26 are affected. In addition, general information updated. It is responsibility of the petitioner to replace the previous version with this one.

Test Manager: Alejandro Sáez
Date of issue: Bellaterra, December 12, 2023

LUIS GUARDIOLA ECHEVARRIA
2023.12.12 12:44:28 +01'00'

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

ENSAYO ISO 17025 Nº9 / LE894

The results refer only and exclusively to the sample, product or material delivered for testing, and tested under conditions stipulated in this document. The equipment has been tested under conditions stipulated by standard(s) quoted in this document. This document will not be reproduced otherwise than in full.
This is the first page of the document, which consists of 78 pages.

1 TEST RESULTS SUMMARY

Test Description	Sample #	DUT Test Modes	Results	Criteria Note
ANTENNA REQUIEREMENTS (FCC Part 15.247 (d), RSS-247 5.5)	#1	-	PASS	N/A
OCCUPIED BANDWIDTH (99%) (FCC Part 15.247 (a), RSS-247 5.2)	#1	Mode 1	PASS	CN4
6 dB BANDWITDH (FCC Part 15.247 (a), RSS-247 5.2)	#1	Mode 1	PASS	CN4
MAXIMUM PEAK CONDUCTED OUTPUT POWER (FCC Part 15.247 (c), RSS-247 5.4)	#1	Mode 1	PASS	CN4
POWER SPECTRAL DENSITY (FCC Part 15.247 (b), RSS-247 5.4)	#1	Mode 1	PASS	CN3
BAND EDGE (FCC Part 15.247 (d), RSS-247 5.5)	#1	Mode 1	PASS	CN4
RADIOFREQUENCY RADIATED EMISSIONS (FCC Part 15.247 (d), RSS-247 5.5)	#1	Mode 1	PASS	CN3

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	IEM/IFB TRANSMITTER							
EUT Version	**FVIN**				**HVIN**			
	2.3.1.0A				5.0A			
Power supply	AC		1 PH + N		90 – 240 VAC		50-60 Hz	
Modulation	GFSK							
Channel list	**Channel**	**Freq [MHz]**	**Channel**	**Freq [MHz]**	**Channel**	**Freq [MHz]**	**Channel**	**Freq [MHz]**
	37	2402	9	2422	18	2442	28	2462
	0	2404	10	2424	19	2444	29	2464
	1	2406	38	2426	20	2446	30	2466
	2	2408	11	2428	21	2448	31	2468
	3	2410	12	2430	22	2450	32	2470
	4	2412	13	2432	23	2452	33	2472
	5	2414	14	2434	24	2454	34	2474
	6	2416	15	2436	25	2456	35	2476
	7	2418	16	2438	26	2458	36	2478
	8	2420	17	2440	27	2460	39	2480
Equipment Type	DTS							

Table 1: Equipment description

RF FEATURES	
Radio chipset	NORDIC 24L01
Brand	Wavenet
Module model	NESO 2.4
Peak gain antenna	2.3 dBi
FCC ID	2BC55NESO24-23
ISED ID	31435-NESO24-23

Table 2: RF Features

3.2 TEST CONFIGURATION

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

<table>
<tr><th colspan="5">TEST CONFIGURATION</th></tr>
<tr><td>Power Supply</td><td colspan="4">120 VAC, 60 Hz</td></tr>
<tr><td rowspan="2">Set-up</td><td colspan="2">Description</td><td colspan="2">Orientation</td></tr>
<tr><td colspan="2">The EUT horizontally, as it is intended to be placed in normal operation.</td><td colspan="2"> 

Fig. 1: EUT Orientation</td></tr>
<tr><td>Normal test temperatures</td><td colspan="4">15 ºC to 35 ºC</td></tr>
<tr><td>Equipment Type</td><td colspan="4">DTS</td></tr>
<tr><td>Test exercise</td><td colspan="4">For measurements tests the EUT is configured at maximum RF output power with continuous modulated transmission, DC < 98% constant according to the customer specifications.</td></tr>
<tr><td rowspan="4">Test Modes</td><td>Channel</td><td>Description</td><td>Frequency [MHz]</td><td>Bandwidth [MHz]</td></tr>
<tr><td>37</td><td>Low</td><td>2402</td><td>2</td></tr>
<tr><td>17</td><td>Middle</td><td>2440</td><td>2</td></tr>
<tr><td>39</td><td>High</td><td>2480</td><td>2</td></tr>
</table>

Table 3. Test Configuration

3.2.1 Samples

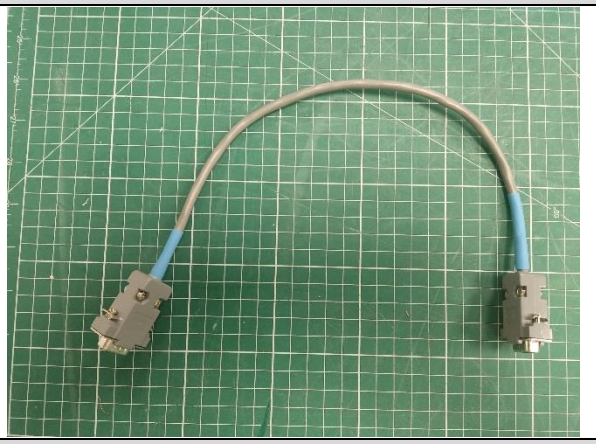
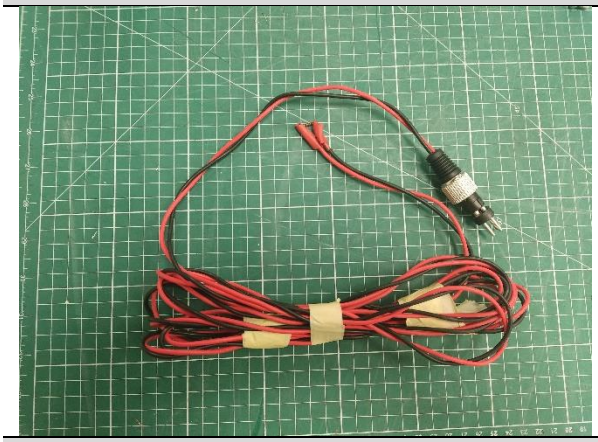
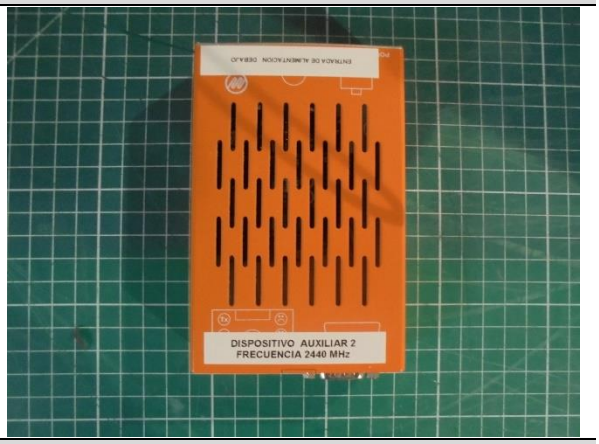
Sample #1	
	
Front View	**Rear View**
	
EUT Power Supply	**EUT Communication cable**
	
Applus Audio Cable	**Applus ID Label**

Table 4: Sample #1 description

3.2.2 Auxiliary Equipment

Auxiliary Equipment	
	
Auxiliary Equipment 1	**Auxiliary Equipment 2**
	
Auxiliary Equipment 3	**Auxiliary Equipment Power Supply**

	Port #	Name	Type	Comments
Description	0	Auxiliary equipment 1	Radio communicator	Provided by customer
	1	Auxiliary equipment 2	Radio communicator	Provided by customer
	2	Auxiliary equipment 3	Radio communicator	Provided by customer
	3	Charger	Power Supply	Provided by customer

Table 5: Auxiliary equipment #1 description

3.2.3 DUT Modifications performed

No modifications have been performed.

3.3 DUT TEST MODES

<table>
<tr><th colspan="4">DUT Operation Modes</th></tr>
<tr><th>Mode #</th><th colspan="2">Description</th><th>Set-up</th></tr>
<tr><td rowspan="5">1</td><td colspan="2">The equipment is configured with a test software in order to select the channels required by the standard. The customer provides 3 auxiliary equipment to perform this configuration:</td><td rowspan="5">Table top</td></tr>
<tr><td colspan="2"><table>
<tr><th>Name</th><th>Channel</th><th>Operation Frequency [MHz]</th></tr>
<tr><td>Auxiliary Equipment 1</td><td>37</td><td>2402</td></tr>
<tr><td>Auxiliary Equipment 2</td><td>17</td><td>2440</td></tr>
<tr><td>Auxiliary Equipment 3</td><td>39</td><td>2480</td></tr>
</table></td></tr>
<tr><td colspan="2">By means of the EUT Communication cable (RS-232), the auxiliary equipment is connected to the sample to configure its frequency.

The audio input is terminated with 180 ohms by a cable provided by applus.</td></tr>
</table>

Table 6: DUT Operation Modes

3.4 CONTROL AND MONITORING

According to customer specifications, the EUT start up procedure is as follows:

1. Connect the EUT power supply cable.
2. Connect the RS-232 cable to the auxiliary equipment.
3. Connect the audio cable
4. Switch on the EUT
5. Connect the power cable of the auxiliary equipment.

Once the setup is set up, a receiver is used to verify that the channel configured is the one required.

3.5 ACCEPTANCE CRITERIA

According to standard FCC Title 47 part 15.247 (d) and RSS-247 (5.5).

3.6 TEST FACILITIES ID

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

Table 7: Test facilities ID

3.7 COMPETENCES AND GUARANTEES

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4 TEST RESULTS

4.1 ANTENNA REQUIREMENT

4.1.1 Test Setup Required

Not applicable

4.1.2 Test Procedure

Not aplicable

4.1.3 Test Parameters

4.1.3.1 Requirements

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. The use of a permanently attached antenna or of 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 user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§ 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

4.1.4 EMI Receiver configuration

Not applicable

4.1.5 Test Environmental Conditions

Not applicable

4.1.6 Summary Test Results

Not applicable

4.1.7 Test Setup Photographs

Not applicable

4.1.8 Test Results

Antenna has been specificaly designed for NESO 2.4 and FCC/ISED rules complying. In addition, the User Manual will incorporate the following message in all the sections where antenna and/or FCC/ISED rules could be involved:

"WARNING: Do not turn, change or disconnect the antenna. The antenna supplied is the one proper for the NESO 2.4 transmitter, and the one suitable for the best efficiency as well as the FCC / ISED standards and rules applied compliance.
Substitution or alteration of the supplied antenna could be harmful to the system efficiency and will cause the unfulfillment of FCC/ISED standards and rules applied."

4.1.9 Test Equipment Used

Not applicable

4.1.10 Uncertainty

Not applicable

4.2 OCCUPIED CHANNEL BANDWIDTH (99%)

4.2.1 Test Setup Required

According to standard ANSI C63.10:2013

4.2.1.1 Tabletop equipment

Fig. 2: Occupied Channel Bandwidth setup of table top equipment.

4.2.2 Test Procedure

1. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for EMI receiver shall be between 1.5 times and 5 times the OBW.
2. The nominal IF filter bandwidth shall be in the range of 1% and 5% of the OBW and video bandwidth shall be approximately three times the RBW, unless otherwise by applicable requirement.
3. Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for lineal operation.
4. Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth
5. Set detection mode to peak and mode to max hold. Allow the trace to stabilize.

4.2.3 Test Parameters

4.2.3.1 Requirements

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 given emission. In some cases, for example multichannel frequency-division systems, the percentage of 0.5 percent may lead to certain difficulties in the practical application of the definitions of occupied and necessary bandwidth; in such cases a different percentage may prove useful

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

4.2.4 EMI Receiver configuration

During the conducted test, the EMI receiver was set with the following configurations:

Central frequency [MHz]	Span [MHz]	Detector	Resolution Bandwidth [kHz]	Video Bandwidth [kHz]
Channel frequency	4	Max Peak	20	100

Table 8: EMI Receiver configuration – Occupied Channel Bandwidth 99%

4.2.5 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
04/10/2023	Javier Nadales	--	22.5	62.4	1006.4

Table 9: Test environmental conditions – Occupied Channel Bandwidth 99%

4.2.6 Summary Test Results

Channel	Description	Central Frequency [MHz]	99% Bandwidth [MHz]	Band Edge Left [MHz]	Band Edge Right [MHz]	Limit [MHz]	Results
37	Low	2402	1.323	2401.243	2402.566	2400 – 2483.5	PASS
39	High	2480	1.273	2479.263	2480.536	2400 – 2483.5	PASS

Table 10: Summary Test Results – Occupied Channel Bandwidth 99%

4.2.7 Test Setup Photographs

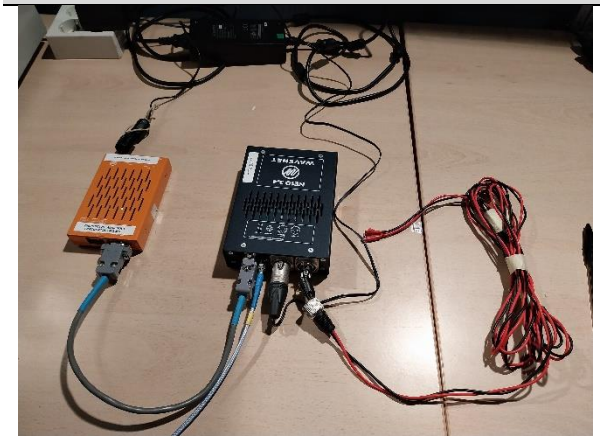
OCCUPIED CHANNEL BANDWIDTH 99% – TEST SETUP	
	

Table 11. Test Setup – Occupied Channel Bandwidth 99%

4.2.8 Test Results

4.2.8.1 Sample #1. Mode 1. Channel Low

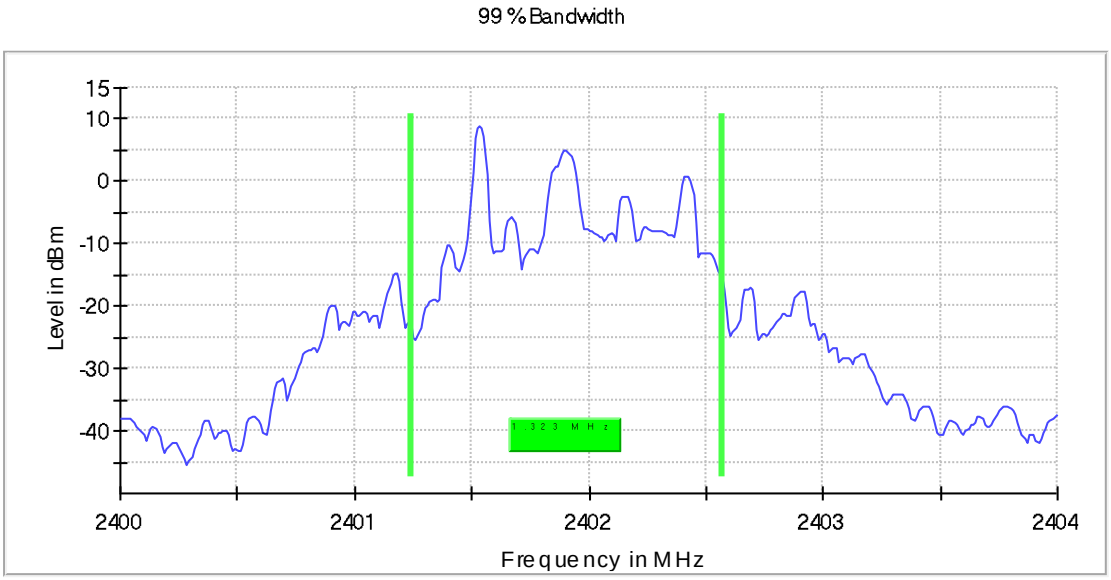


Fig. 3: – Channel Low - 99% Occupied Channel Bandwidth

4.2.8.2 Sample #1. Mode 1. Channel High

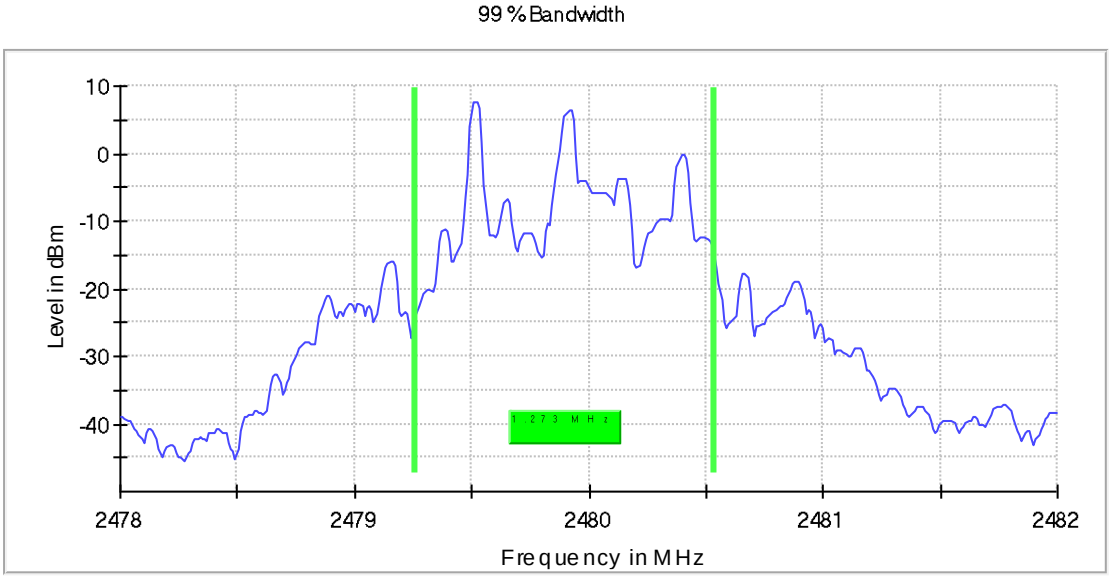


Fig. 4: Channel - High 99% Occupied Channel Bandwidth

4.2.9 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
RF SWITCH	ROHDE & SCHWARZ	OSP120	1042701	24/03/2022	24/03/2024
SIGNAL SPECTRUM ANALYZER	ROHDE & SCHWARZ	FSVA3044	1042700	23/02/2022	15/11/2024
CABLE RF 40 GHz	HUBERSUHNER	SF102	1042546	18/05/2023	18/05/2024
RF CABLE	ASTROLAB	32026-29094-29094-24TC	1041565	16/05/2023	16/05/2024

Table 12: Test Instruments – 99% Occupied Channel Bandwidth

4.2.10 Uncertainty

Test Type	Test Description	Uncertainty
Emission	RF bandwidth measurements	±75.99 Hz

Table 13: 99% Occupied Channel Bandwidth 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 DTS BANDWIDTH

4.3.1 Test Setup Required

According to standard ANSI C63.10:2013

4.3.1.1 Tabletop equipment

Fig. 5: DTS Bandwidth setup of table top equipment.

4.3.2 Test Procedure

a) Set RBW = 100 kHz.

b) Set the VBW ≥ [3 × RBW].

c) Detector = peak.

d) Trace mode = max hold.

e) Sweep = auto couple.

f) Allow the trace to stabilize.

g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

4.3.3 Test Parameters

4.3.3.1 Requirements

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 given emission. In some cases, for example multichannel frequency-division systems, the percentage of 0.5 percent may lead to certain difficulties in the practical application of the definitions of occupied and necessary bandwidth; in such cases a different percentage may prove useful

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

4.3.4 EMI Receiver configuration

During the conducted test, the EMI receiver was set with the following configurations:

Central frequency [MHz]	Span [MHz]	Detector	Resolution Bandwidth [kHz]	Video Bandwidth [kHz]
Channel frequency	4	Max Peak	100	300

Table 14: EMI Receiver configuration – DTS Bandwidth

4.3.5 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
04/10/2023	Javier Nadales	--	22.5	62.4	1006.4

Table 15: Test environmental conditions – DTS Bandwidth

4.3.6 Summary Test Results

Channel	Description	Central Frequency [MHz]	DTS Bandwidth [MHz]	Band Edge Left [MHz]	Band Edge Right [MHz]	Limit [MHz]	Results
37	Low	2402	1.120	2401.400	2402.520	> 0.5	PASS
17	Middle	2440	1.120	2439.400	2440.520	> 0.5	PASS
39	High	2480	1.080	2479.400	2480.480	> 0.5	PASS

Table 16: Summary Test Results – DTS Bandwidth

4.3.7 Test Setup Photographs

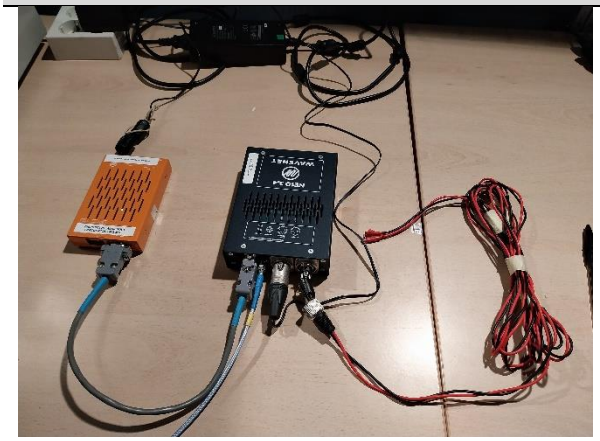
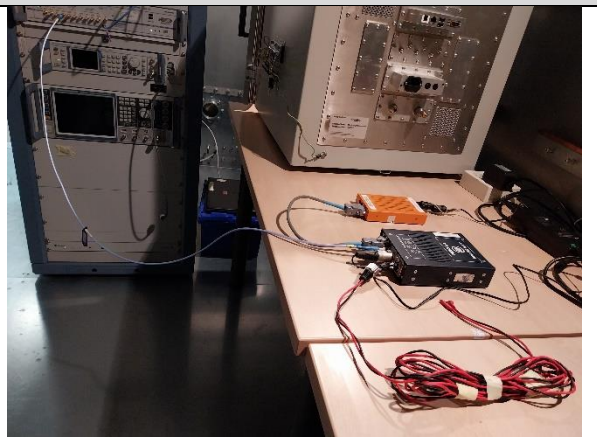
DTS Bandwidth – TEST SETUP	
	

Table 17. Test Setup – DTS Bandwidth

4.3.8 Test Results

4.3.8.1 Sample #1. Mode 1. Channel Low

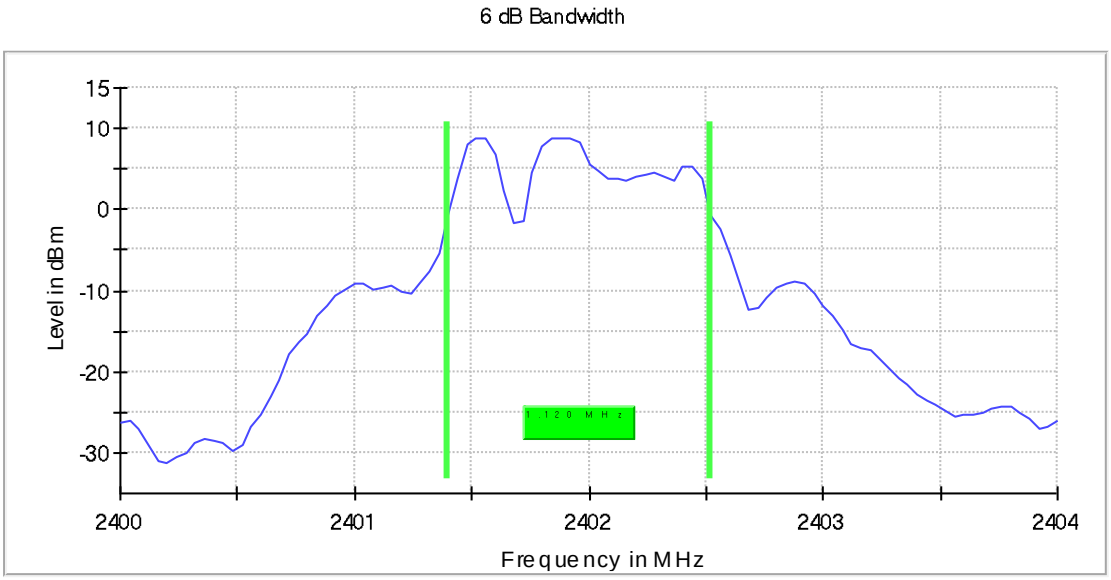


Fig. 6: Channel Low - DTS Bandwidth

4.3.8.2 Sample #1. Mode 1. Channel Middle

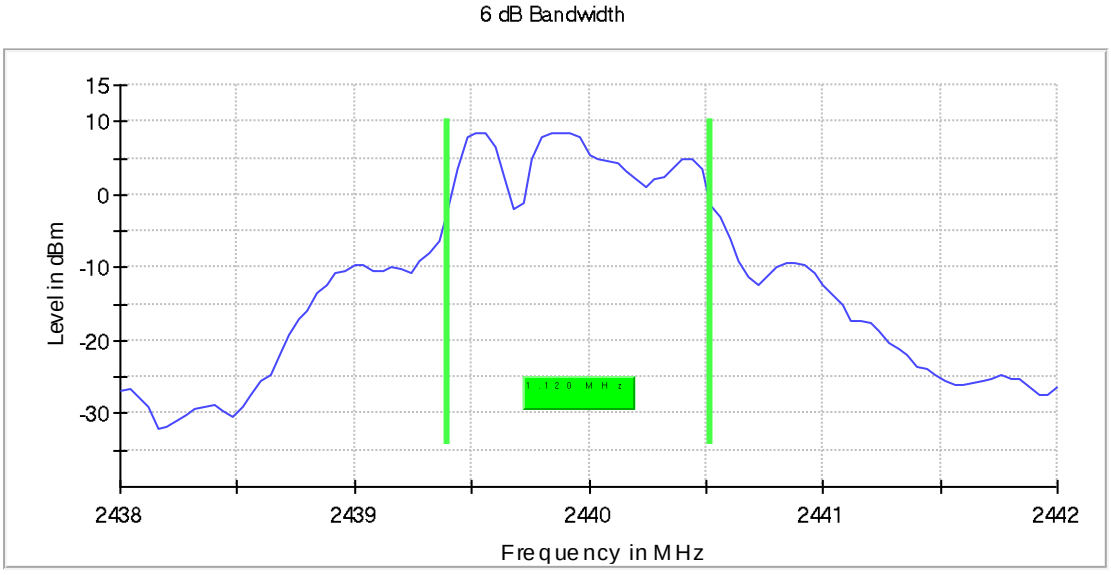


Fig. 7: Channel Middle -DTS Bandwidth

4.3.8.3 Sample #1. Mode 1. Channel High

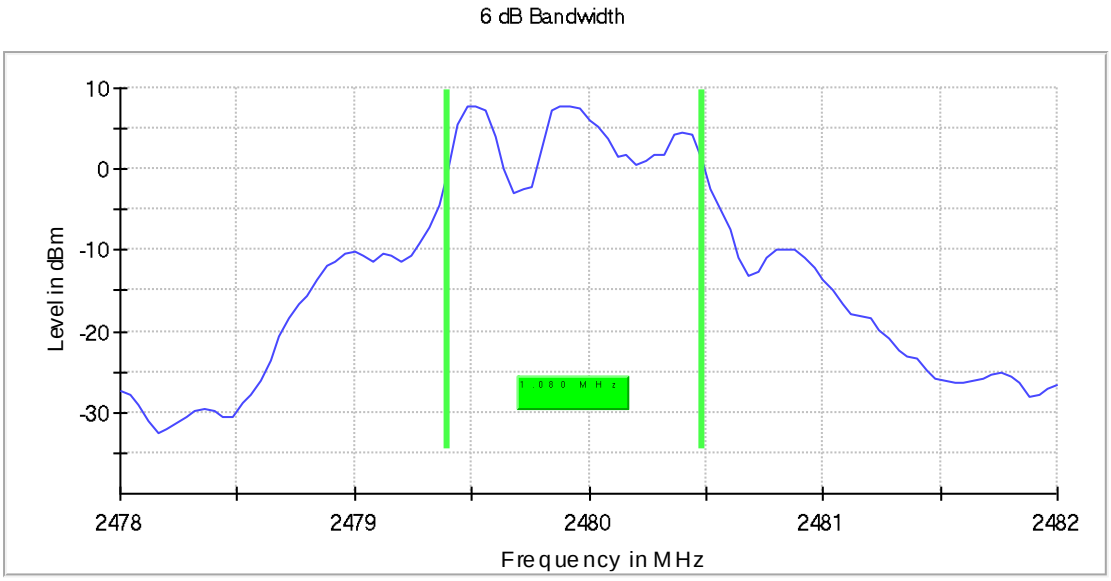


Fig. 8: Channel High - DTS Bandwidth

4.3.9 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
RF SWITCH	ROHDE & SCHWARZ	OSP120	1042701	24/03/2022	24/03/2024
SIGNAL SPECTRUM ANALYZER	ROHDE & SCHWARZ	FSVA3044	1042700	23/02/2022	15/11/2024
CABLE RF 40 GHz	HUBERSUHNER	SF102	1042546	18/05/2023	18/05/2024
RF CABLE	ASTROLAB	32026-29094-29094-24TC	1041565	16/05/2023	16/05/2024

Table 18: Test Instruments – DTS Bandwidth

4.3.10 Uncertainty

Test Type	Test Description	Uncertainty
Emission	RF bandwidth measurements	±75.99 Hz

Table 19: DTS Bandwidth 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 MAXIMUM PEAK CONDUCTED OUTPUT POWER

4.4.1 Test Setup Required

According to standard ANSI C63.10:2013

4.4.1.1 Tabletop equipment

Fig. 9: Maximum Peak Conducted Output Power setup of table top equipment.

4.4.2 Test Procedure

1. The EUT is configured to transmit continuously, or to transmit with a constant duty cycle.
2. At all times when the EUT is transmitting, it shall be transmitting at its máximum power control level.
3. The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five
4. If the transmitter does not transmit continuously, measure the duty cycle, D.
5. Measure the average power of the transmitter. This measurement is an average over both the ON and OFF periods of the transmitter.
6. Adjust the measurement in dBm by adding [10 log (1 / D)], where D is the duty cycle.

4.4.3 Test Parameters

4.4.3.1 Requirements

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

4.4.4 EMI Receiver / Power Meter configuration

During the conducted test, the OSP Power Meter was setting as follow:

Measurement Time [s]	Points	Time Resolution [µs]
Channel frequency	Max Peak	100

Table 20: Power Meter configuration – Maximum Peak Conducted Output Power

4.4.5 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
04/10/2023	Javier Nadales	--	22.5	62.4	1006.4

Table 21: Test environmental conditions – Maximum Peak Conducted Output Power

4.4.6 Summary Test Results

Channel	Description	Central Frequency [MHz]	Peak Power [dBm]	Antenna Gain [dBi]	E.I.R.P [dBm]	Limit [dBm]	Results
37	Low	2402	8.6	2.3	10.9	30.0	PASS
17	Middle	2440	8.1	2.3	10.4	30.0	PASS
39	High	2480	7.5	2.3	9.7	30.0	PASS

Table 22: Summary Test Results – Maximum Peak Conducted Output Power

4.4.7 Test Setup Photographs

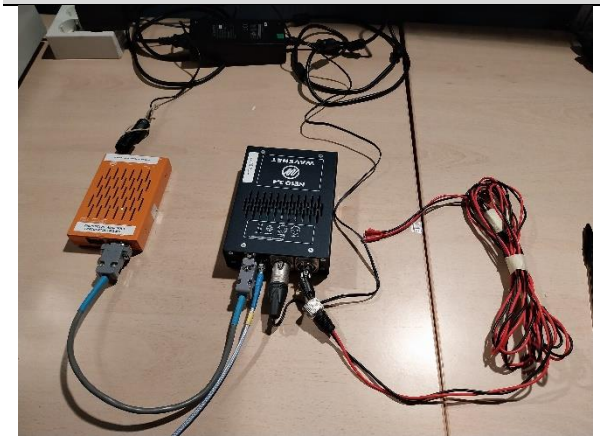
Maximum Peak Conducted Power– TEST SETUP	
	

Table 23. Test Setup – Maximum Peak Conducted Output Power

4.4.8 Test Results

4.4.8.1 Sample #1. Mode 1. Channel Low

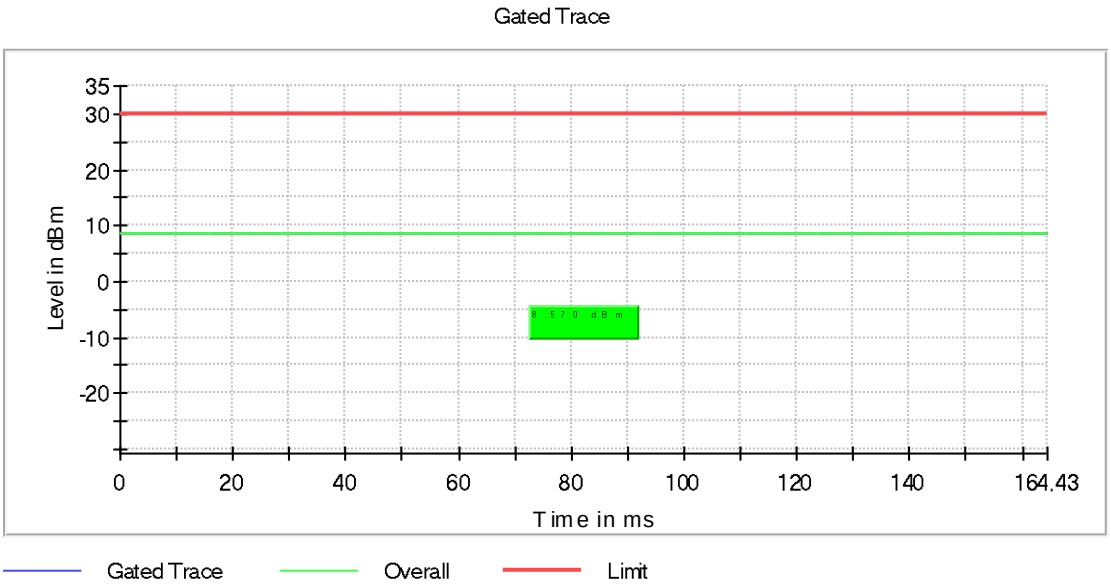


Fig. 10: Channel Low- Maximum Peak Conducted Output Power

4.4.8.2 Sample #1. Mode 1. Channel Middle

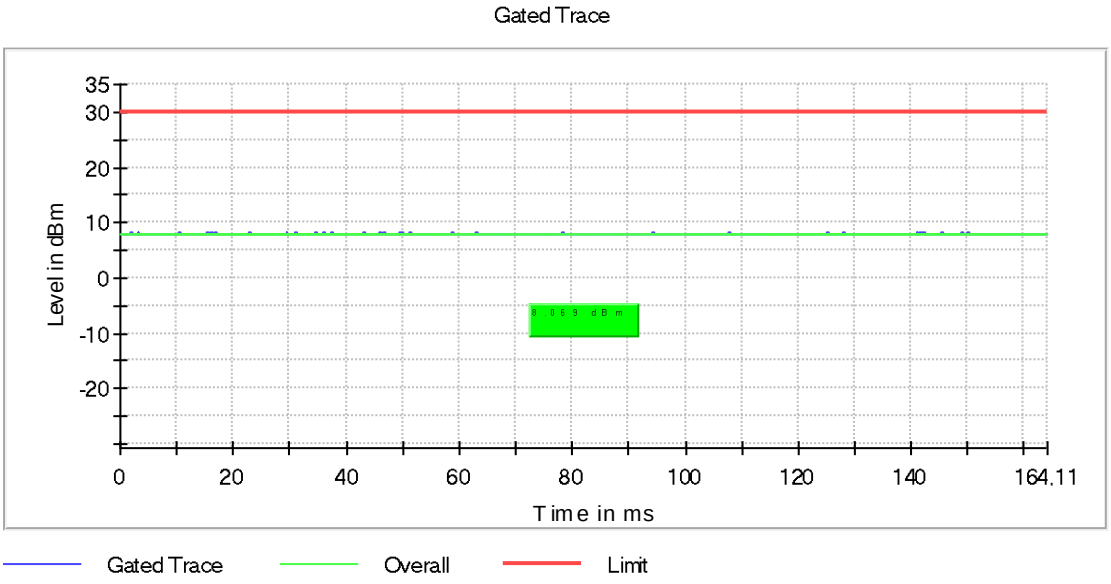


Fig. 11: Channel Middle - Maximum Peak Conducted Output Power

4.4.8.3 Sample #1. Mode 1. Channel High

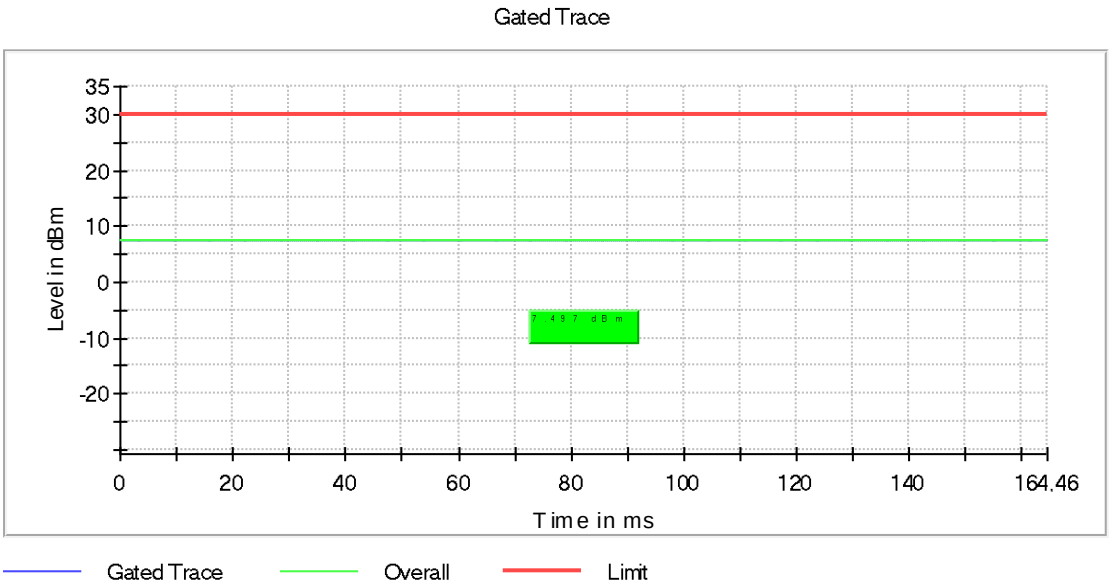


Fig. 12: Channel High - Maximum Peak Conducted Output Power

4.4.9 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
RF SWITCH	ROHDE & SCHWARZ	OSP120	1042701	24/03/2022	24/03/2024
SIGNAL SPECTRUM ANALYZER	ROHDE & SCHWARZ	FSVA3044	1042700	23/02/2022	15/11/2024
CABLE RF 40 GHz	HUBERSUHNER	SF102	1042546	18/05/2023	18/05/2024
RF CABLE	ASTROLAB	32026-29094-29094-24TC	1041565	16/05/2023	16/05/2024

Table 24: Test Instruments – Maximum Peak Conducted Output Power

4.4.10 Uncertainty

Test Type	Test Description	Uncertainty
Emissions	RF output power measurements [Conducted]	±1.22 dB

Table 25: Maximum Peak Conducted Output Power 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%.

4.5 POWER SPECTRAL DENSITY

4.5.1 Test Setup Required

According to standard ANSI C63.10:2013

4.5.1.1 Tabletop equipment

Fig. 13: Power Spectral Density setup of table top equipment.

4.5.2 Test Procedure

a) Set instrument center frequency to DTS channel center frequency.

b) Set span to at least 1.5 times the OBW.

c) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.

d) Set VBW ≥ [3 × RBW].

e) Detector = power averaging (rms) or sample detector (when rms not available).

f) Ensure that the number of measurement points in the sweep ≥ [2 × span / RBW].

g) Sweep time = auto couple.

h) Employ trace averaging (rms) mode over a minimum of 100 traces.

i) Use the peak marker function to determine the maximum amplitude level.

j) If the measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced).

4.5.3 Test Parameters

4.5.3.1 Requirements

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

4.5.4 EMI Receiver configuration

During the conducted test, the EMI receiver was set with the following configurations:

Central frequency [MHz]	Span [MHz]	Detector	Resolution Bandwidth [kHz]	Video Bandwidth [kHz]
Channel frequency	3	RMS	10	30

Table 26: EMI Receiver configuration – Power Spectral Density

4.5.5 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
04/10/2023	Javier Nadales	--	22.5	62.4	1006.4

Table 27: Test environmental conditions – Power Spectral Density

4.5.6 Summary Test Results

Channel	Description	Central Frequency [MHz]	PSD [dBm]	Limit [dBm]	Results
37	Low	2402	7.794	8.0	PASS
17	Middle	2440	7.371	8.0	PASS
39	High	2480	6.826	8.0	PASS

Table 28: Summary Test Results – Power Spectral Density

4.5.7 Test Setup Photographs

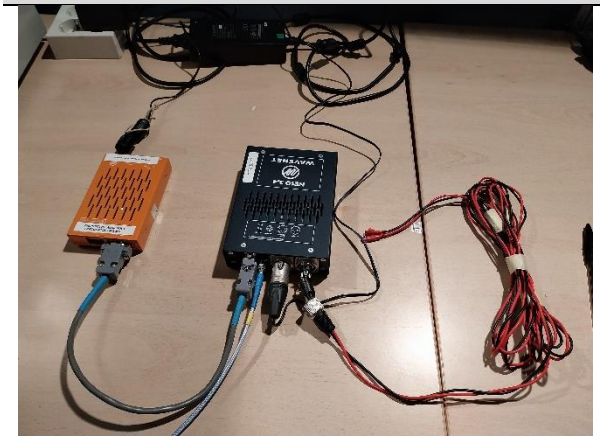
Power Spectral Density – TEST SETUP	
	

Table 29. Test Setup – Power Spectral Density

4.5.8 Test Results

4.5.8.1 Sample #1. Mode 1. Channel Low

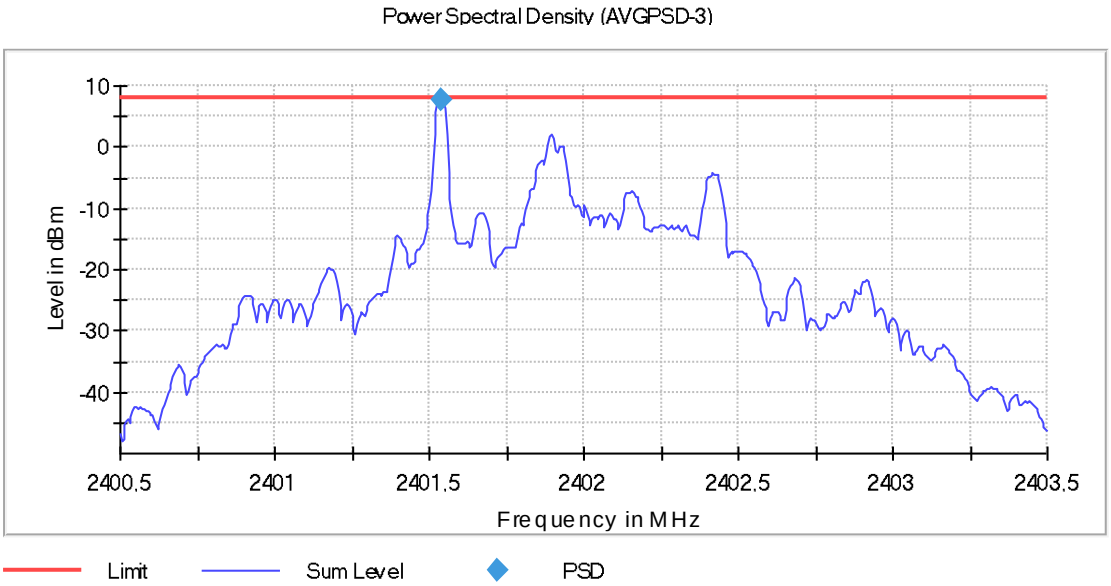


Fig. 14: Channel Low - Power Spectral Density

4.5.8.2 Sample #1. Mode 1. Channel Middle

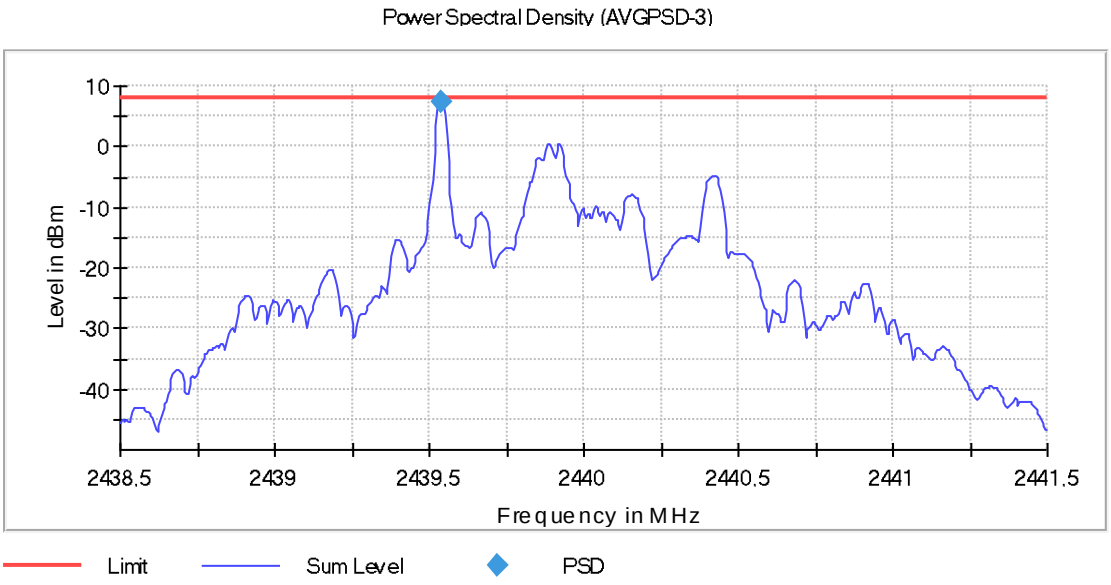


Fig. 15: Channel Middle - Power Spectral Density

4.5.8.3 Sample #1. Mode 1. Channel High

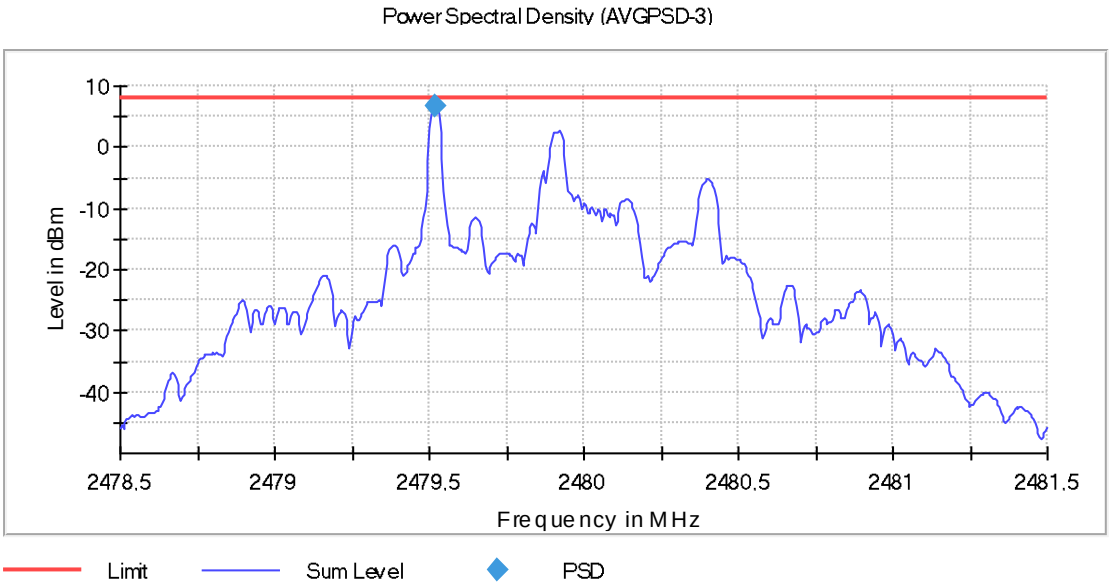


Fig. 16: Channel High- Power Spectral Density

4.5.9 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
RF SWITCH	ROHDE & SCHWARZ	OSP120	1042701	24/03/2022	24/03/2024
SIGNAL SPECTRUM ANALYZER	ROHDE & SCHWARZ	FSVA3044	1042700	23/02/2022	15/11/2024
CABLE RF 40 GHz	HUBERSUHNER	SF102	1042546	18/05/2023	18/05/2024
RF CABLE	ASTROLAB	32026-29094-29094-24TC	1041565	16/05/2023	16/05/2024

Table 30: Test Instruments – Power Spectral Density

4.5.10 Uncertainty

Test Type	Test Description	Uncertainty
Emissions	Power spectral density measurements [Conducted]	±2.56 dB

Table 31: Power Spectral Density 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%.

4.6 BAND EDGE

4.6.1 Test Setup Required

According to standard ANSI C63.10:2013

4.6.1.1 Tabletop equipment

Fig. 17: Band Edge setup of table top equipment.

4.6.2 Test Procedure

a) Set instrument center frequency to the frequency of the emission to be measured (must be within 2 MHz of the authorized band edge).

b) Set span to 2 MHz.

c) RBW = 100 kHz.

d) VBW ≥ [3 × RBW].

e) Detector = peak.

f) Sweep time = auto.

g) Trace mode = max hold.

h) Allow sweep to continue until the trace stabilizes (required measurement time may increase for low-duty-cycle applications).

i) Compute the power by integrating the spectrum over 1 MHz using the analyzer's band power measurement function with band limits set equal to the emission frequency (femission) ± 0.5 MHz.

j) If the instrument does not have a band power function, then sum the amplitude levels (in power units) at 100 kHz intervals extending across the 1 MHz spectrum defined by femission ± 0.5 MHz.

4.6.3 Test Parameters

4.6.3.1 Requirements

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

4.6.4 EMI Receiver configuration

During the conducted test, the EMI receiver was set with the following configurations:

Central frequency [MHz]	Span [MHz]	Detector	Resolution Bandwidth [kHz]	Video Bandwidth [kHz]
Channel frequency	83.5	Max Peak	100	300

Table 32: EMI Receiver configuration – Band Edge

4.6.5 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
04/10/2023	Javier Nadales	--	22.5	62.4	1006.4

Table 33: Test environmental conditions – Band Edge

4.6.6 Summary Test Results

Channel	Description	Central Frequency [MHz]	Band Edge	Limit [dBm]	Results
37	Low	2402	Limit - I <= PK < Limit	-22.4	PASS
39	High	2480	Limit - I <= PK < Limit	-22.4	PASS

Table 34: Summary Test Results – Band Edge

4.6.7 Test Setup Photographs

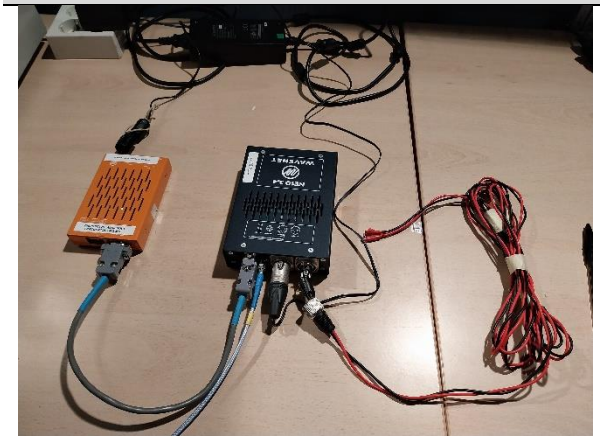
Band Edge – TEST SETUP	
	

Table 35. Test Setup – Band Edge

4.6.8 Test Results

4.6.8.1 Sample #1. Mode 1. Channel Low

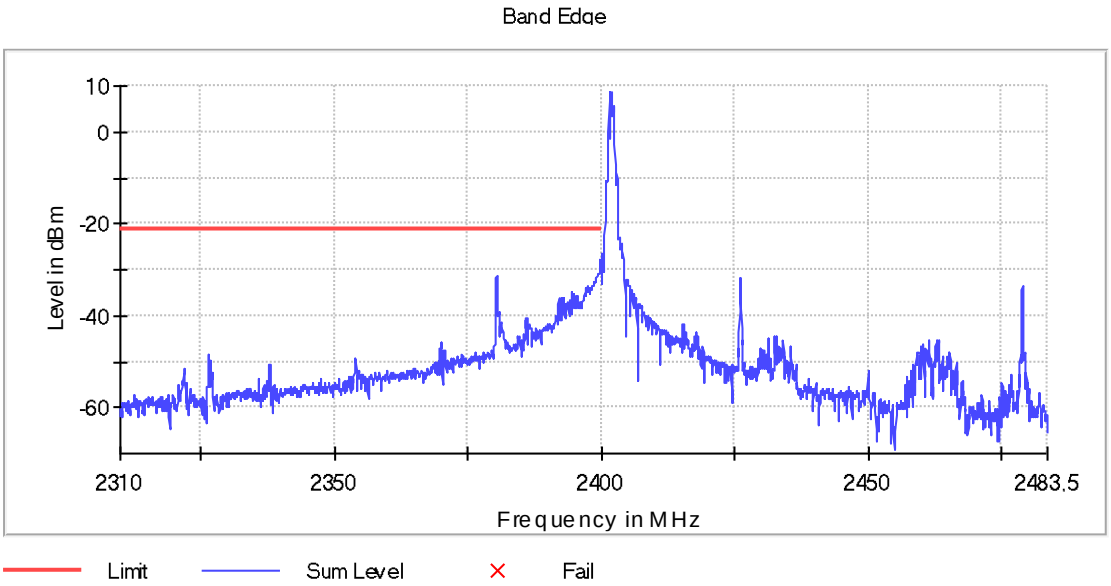


Fig. 18: Channel - Low Band Edge

FINAL MEASUREMENTS

Frequency [MHz]	Level [dBm]	Margin [dB]	Limit [dBm]
2399.799	-27.9	6.6	-21.3
2399.849	-27.9	6.7	-21.3
2399.899	-28.1	6.8	-21.3
2399.749	-28.2	6.9	-21.3
2399.949	-28.6	7.3	-21.3
2399.699	-30.3	9.0	-21.3
2399.649	-30.3	9.1	-21.3
2399.499	-30.7	9.4	-21.3
2399.449	-30.8	9.6	-21.3
2399.549	-30.8	9.6	-21.3
2399.299	-31.0	9.7	-21.3
2399.349	-31.0	9.8	-21.3
2399.399	-31.0	9.8	-21.3
2399.599	-31.1	9.8	-21.3
2399.249	-31.1	9.8	-21.3

Table 36: Channel Low - Band Edge

4.6.8.2 Sample #1. Mode 1. Channel High

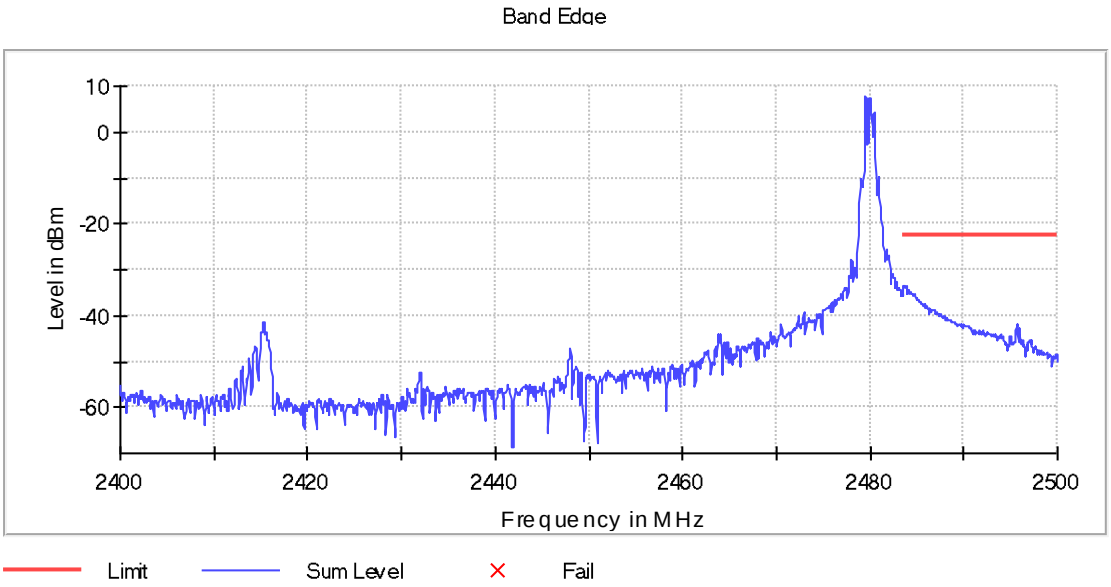


Fig. 19: Channel High - Band Edge

FINAL MEASUREMENTS

Frequency [MHz]	Level [dBm]	Margin [dB]	Limit [dBm]
2483.550	-33.4	11.0	-22.4
2483.600	-33.5	11.1	-22.4
2483.750	-33.7	11.2	-22.4
2483.650	-33.7	11.2	-22.4
2483.700	-33.7	11.2	-22.4
2483.851	-33.7	11.3	-22.4
2483.800	-33.7	11.3	-22.4
2483.901	-34.2	11.8	-22.4
2484.051	-34.2	11.8	-22.4
2484.001	-34.3	11.9	-22.4
2484.101	-34.6	12.2	-22.4
2484.151	-34.8	12.4	-22.4
2484.202	-34.9	12.4	-22.4
2484.302	-34.9	12.5	-22.4
2484.252	-35.1	12.7	-22.4

Table 37. Channel High - Band Edge

4.6.9 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
RF SWITCH	ROHDE & SCHWARZ	OSP120	1042701	24/03/2022	24/03/2024
SIGNAL SPECTRUM ANALYZER	ROHDE & SCHWARZ	FSVA3044	1042700	23/02/2022	15/11/2024
CABLE RF 40 GHz	HUBERSUHNER	SF102	1042546	18/05/2023	18/05/2024
RF CABLE	ASTROLAB	32026-29094-29094-24TC	1041565	16/05/2023	16/05/2024

Table 38: Test Instruments – Band Edge

4.6.10 Uncertainty

Test Type	Test Description	Uncertainty
Emissions	RF output power measurements	1.22 dB

Table 39: Band Edge 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%.

4.7 RADIO-FREQUENCY RADIATED EMISSIONS

4.7.1 Test Setup Required

According to standard ANSI C63.10:2013:

4.7.1.1 Tabletop equipment

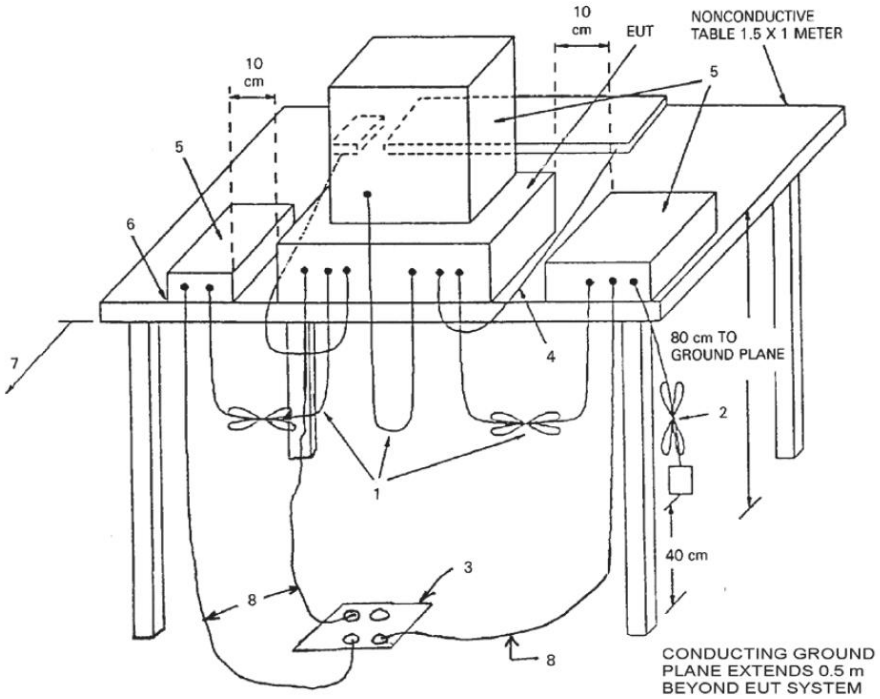


Fig. 20: Radio-frequency radiated emissions setup of table top equipment.

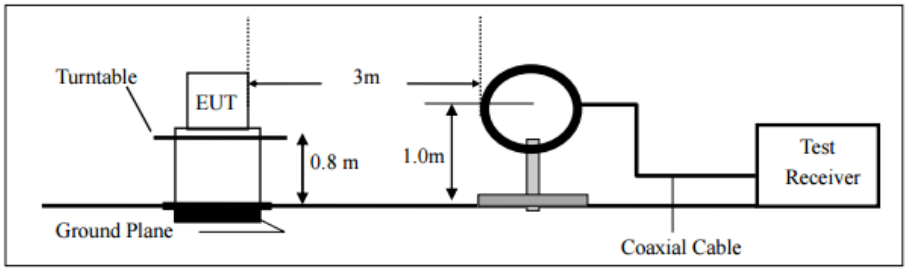


Fig. 21: Radio-frequency radiated emissions of table top equipment from 9 kHz to 30 MHz

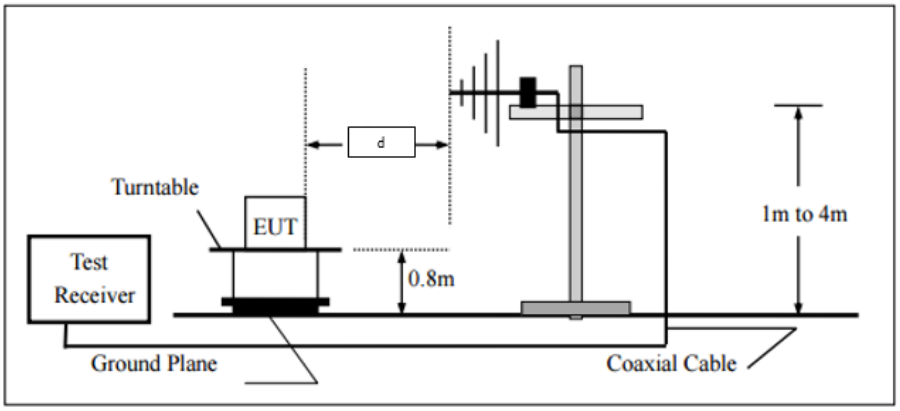


Fig. 22: Radio-frequency radiated emissions of table top equipment from 30 MHz to 1000 MHz

Distance "d" depends on test chamber.

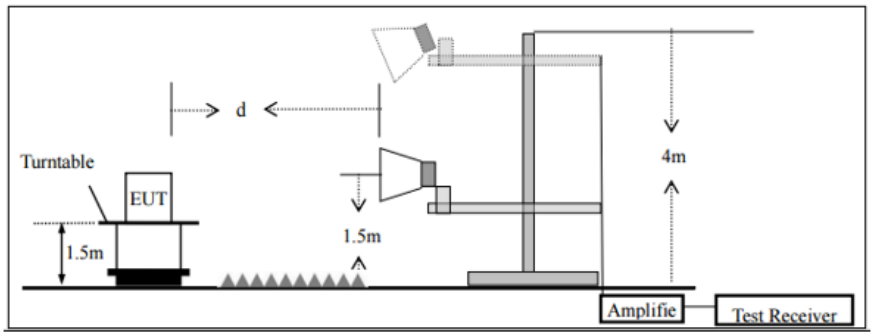


Fig. 23: Radio-frequency radiated emissions setup of table top equipment above 1 GHz

Distance "d" depends on test chamber.

4.7.1.2 Floor standing equipment

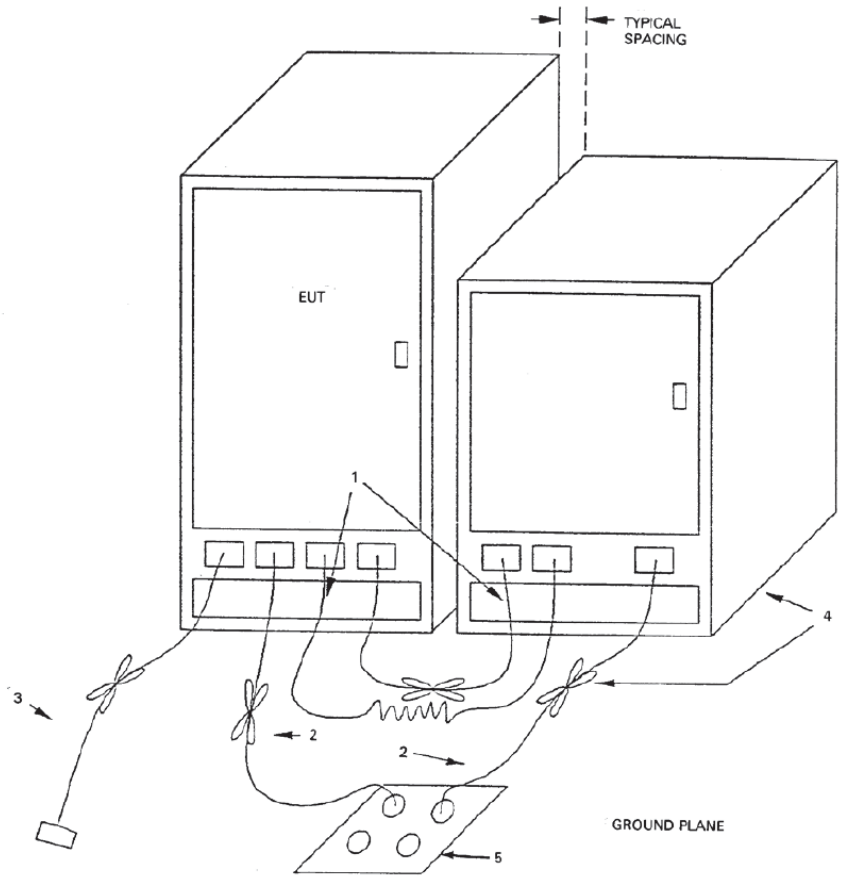


Fig. 24: Radio-frequency radiated emissions of floor-standing setup equipment.

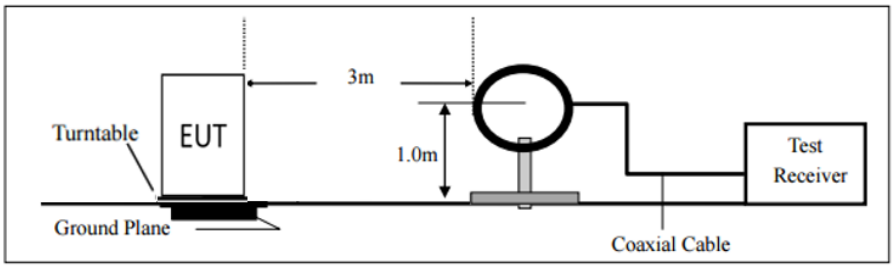


Fig. 25: Radio-frequency radiated emissions of floor-standing setup equipment from 9 kHz to 30 MHz

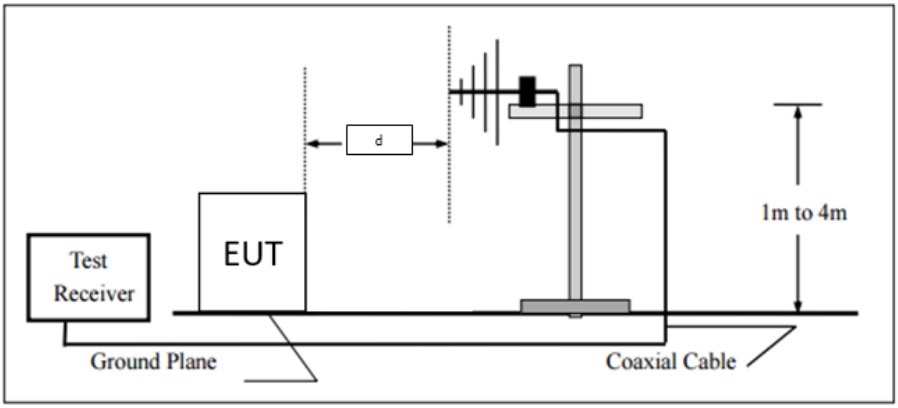


Fig. 26: Radio-frequency radiated emissions of floor-standing setup equipment from 30 MHz to 1000 MHz

Distance "d" depends on test chamber.

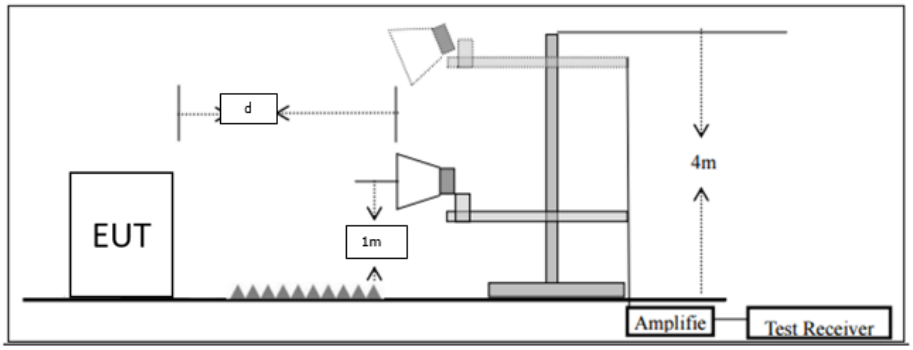


Fig. 27: Radio-frequency radiated emissions of floor-standing setup equipment above 1 GHz

Distance "d" depends on test chamber.

4.7.2 Test Procedure

a) Set the center frequency and span to encompass frequency range to be measured

b) Set the RBW = 100 kHz.

c) Set the VBW ≥ [3 × RBW].

d) Detector = peak.

e) Sweep time = auto couple.

f) Trace mode = max hold.

g) Allow trace to fully stabilize.

h) Use the peak marker function to determine the maximum amplitude level.

4.7.3 Test Parameters

4.7.3.1 Requirements

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)

Only spurious emissions are permitted in any of the frequency bands listed below:

Frequency [MHz]	Frequency [MHz]	Frequency [MHz]	Frequency [GHz)]
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
(1)0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	(2)
13.36–13.41			

Table 40. Restricted bands of operation

1 Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.
2 Above 38.6

According to § 15.209(a) and RSS-Gen section 8.9, the radiated emission limits for restricted bands are:

Frequency Range [MHz]	Quasi-peak detector (QP) [dBµV/m]	Peak detector (PK) [dBµV/m]		Average detector (AVG) [dBµV/m]	
	3 m measuring distance	3 m measuring distance	1 m measuring distance[1]	3 m measuring distance	1 m measuring distance[1]
0.009 – 0.490	20log(2400/F[kHz]) + 80	N/A	N/A	N/A	N/A
0.490 – 1.705	20log(24000/F[kHz]) + 40	N/A	N/A	N/A	N/A
1.705 - 30	20log(24000/F[kHz]) + 40	N/A	N/A	N/A	N/A
30 – 88	40.0	N/A	N/A	N/A	N/A
88 – 216	43.5	N/A	N/A	N/A	N/A
216 – 960	46.0	N/A	N/A	N/A	N/A
960 – 1000	54.0	N/A	N/A	N/A	N/A
1000 – 18000	N/A	74	N/A	54	N/A
18000 - 40000	N/A	N/A	83.54	N/A	63.54

Table 41: Radio-frequency radiated emissions requirements

Note 1: The limits has been modified according to the applicable standard applying the formula: $L_2 = L_1 - 20log(d_2/d_1)$*, where:*

L_2: New Limit.
L_1: Limit at 3 meters.
d_1: 3 meters (standard distance).
d_2: 1 meter (new measurement distance).

According to FCC Part 15 Subpart C FCC 15.247, the limits for unrestricted bands are:

Frequency Range [MHz]	Test Mode	Field strength [µV/m]	Measurement distance [m]
30 – 88	Peak power / RMS averaging	-20 dBc / -30 dBc	3
88 – 216			
216 – 960			
Above 960			

Table 42. Radiated Emission limits. Unrestricted bands

4.7.3.2 Receiver Parameters

According to standard ANSI C63.4:2014:

Frequency Range [MHz]	Detector	Resolution Bandwidth [MHz]	Video Bandwidth [MHz]
0.009 – 0.15	Quasi-peak (QP)	$200 \cdot 10^{-6}$	$1 \cdot 10^{-3}$
0.15 – 30	Quasi-peak (QP)	$9 \cdot 10^{-3}$	$30 \cdot 10^{-3}$
30 – 1000	Quasi-peak (QP)	0.12	0.30
Above 1000	Peak (PK)	1	3
	Average (AVG)	1	10

Table 43: Receiver parameters – Radio-frequency radiated emissions

4.7.4 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
03/10/2023	Javier Nadales	--	21.3	71.3	1004.1

Table 44: Test environmental conditions – Radio-frequency radiated emissions

4.7.5 Summary Test Results

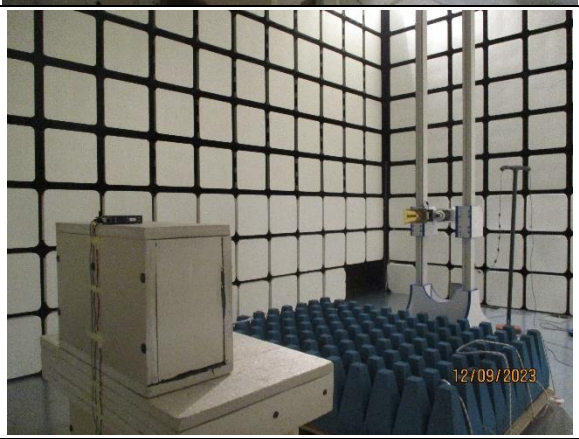
Frequency Range [MHz]	Test Area	Distance [m]	Emissions	Results
9 kHz – 30 MHz	SAC 1	3 m	--	N/A[1]
30 MHz – 1 GHz	SAC 1	3 m	Limit - I <= QP < Limit	PASS
1 GHz – 3.5 GHz	SAC 1	3 m	Limit - I <= PK < Limit Limit - I <= AVG < Limit	PASS
3.5 GHz – 8 GHz	SAC 1	3 m	Limit - I <= PK < Limit Limit - I <= AVG < Limit	PASS
8 GHz – 18 GHz	SAC 1	3 m	Limit - I <= PK < Limit Limit - I <= AVG < Limit	PASS
18 GHz – 26 GHz	SAC 1	1 m	Limit - I <= PK < Limit Limit - I <= AVG < Limit	PASS

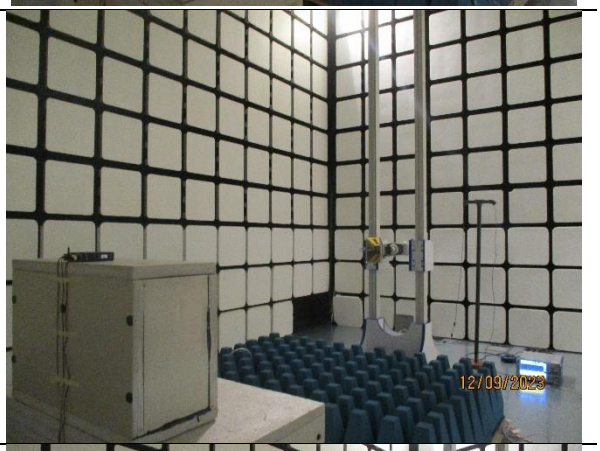
Table 45: Summary test results – Radio-frequency radiated emissions

Note 1: According to RSS-Gen section 6.13.2 and ANSI C63.10:2013 section 5.5 as the lowest radio frequency generated by the equipment is above 30 MHz, the spectrum shall be investigated from 30 MHz.

4.7.6 Test Setup Photographs

RADIO-FREQUENCY RADIATED EMISSIONS – TEST SETUP





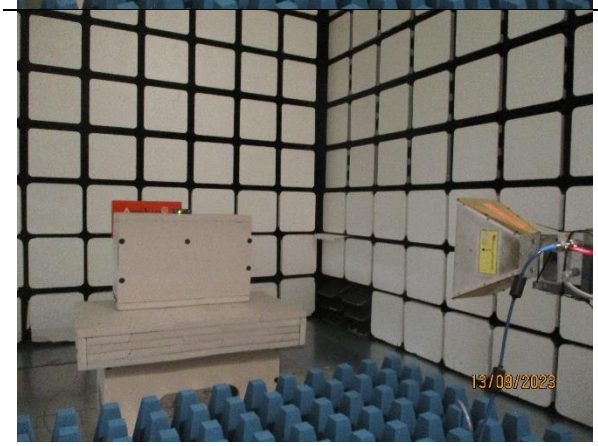
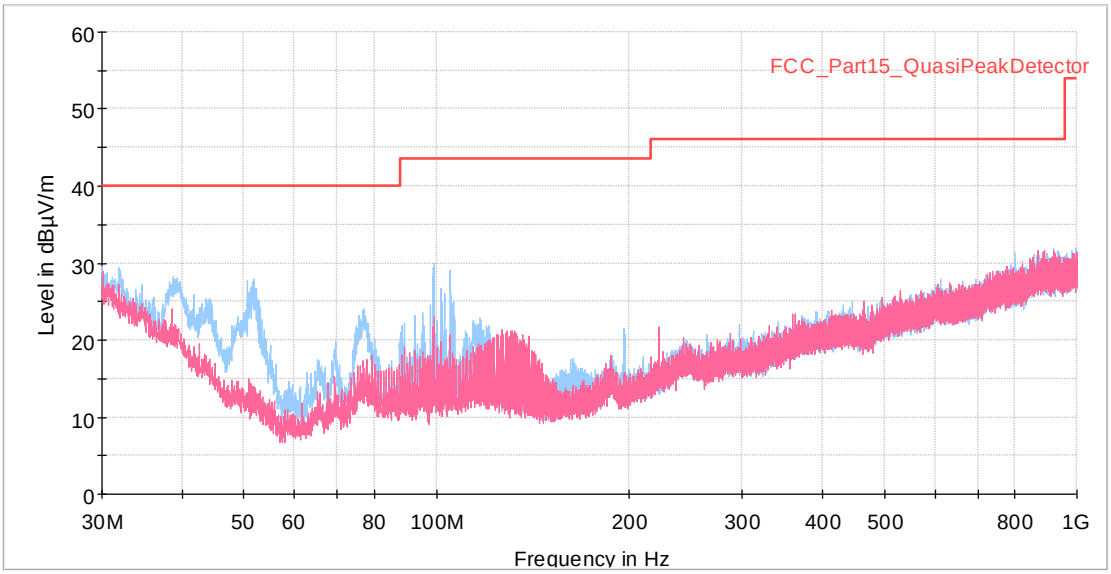


Table 46: Radio-frequency radiated emissions test setup

4.7.7 Test Results

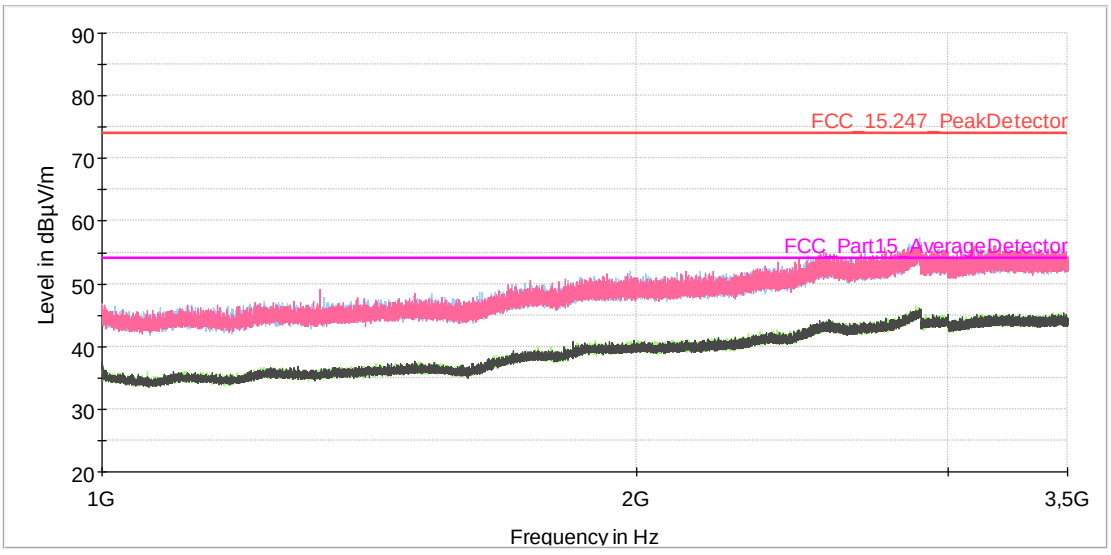
4.7.7.1 Ambient Levels. Frequency range: 30 MHz – 1 GHz



Preview Result 1H-PK+
Critical_Freqs PK+
Final_Result QPK
Preview Result 1V-PK+
FCC_Part15_QuasiPeakDetector

Fig. 28: Ambient level. Frequency range: 30 MHz – 1 GHz

4.7.7.2 Ambient Levels. Frequency range: 1 GHz – 3.5 GHz



Preview Result 2H-AVG
Preview Result 2V-AVG
FCC_15.247_PeakDetector
Final_Result PK+
Preview Result 1H-PK+
Preview Result 1V-PK+
FCC_Part15_AverageDetector
Final_Result AVG

Fig. 29: Ambient level. Frequency range: 1 GHz – 3.5 GHz

4.7.7.3 Ambient Levels. Frequency range: 3.5 GHz – 8 GHz

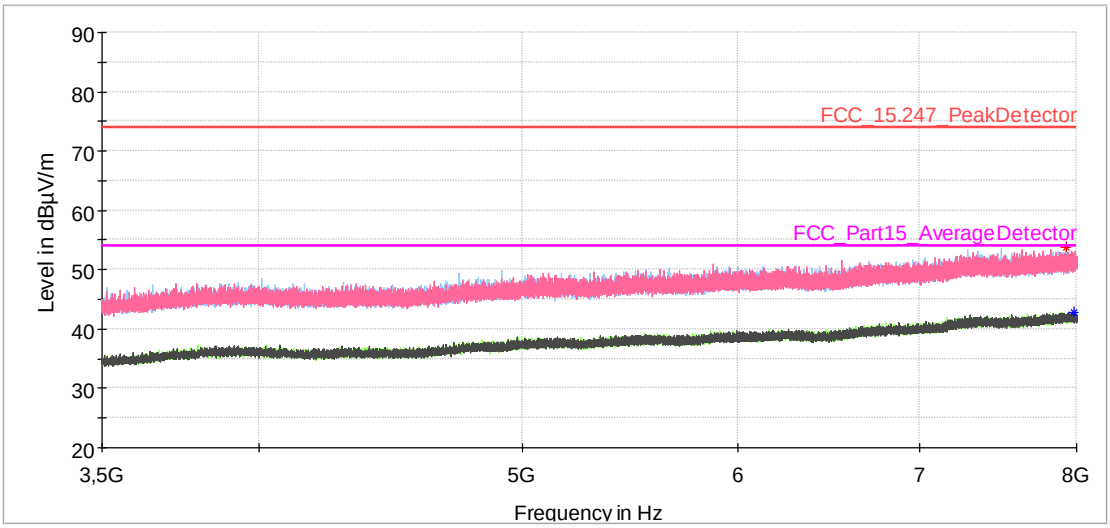


Fig. 30: Ambient level. Frequency range: 3.5 GHz – 8 GHz

4.7.7.4 Ambient Levels. Frequency range: 8 GHz – 18 GHz

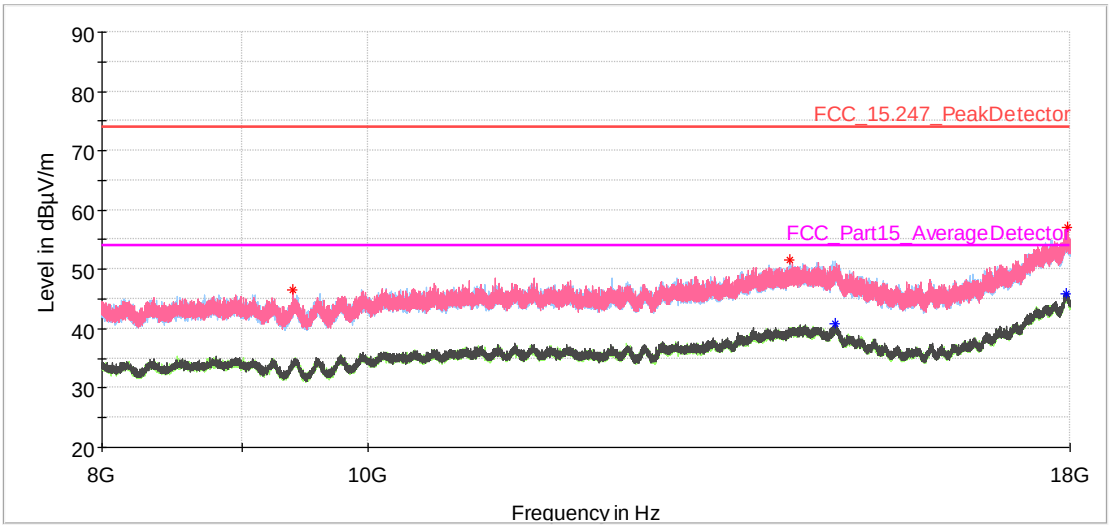


Fig. 31: Ambient level. Frequency range: 8 GHz – 18 GHz

4.7.7.5 Ambient Levels. Frequency range: 18 GHz – 26 GHz

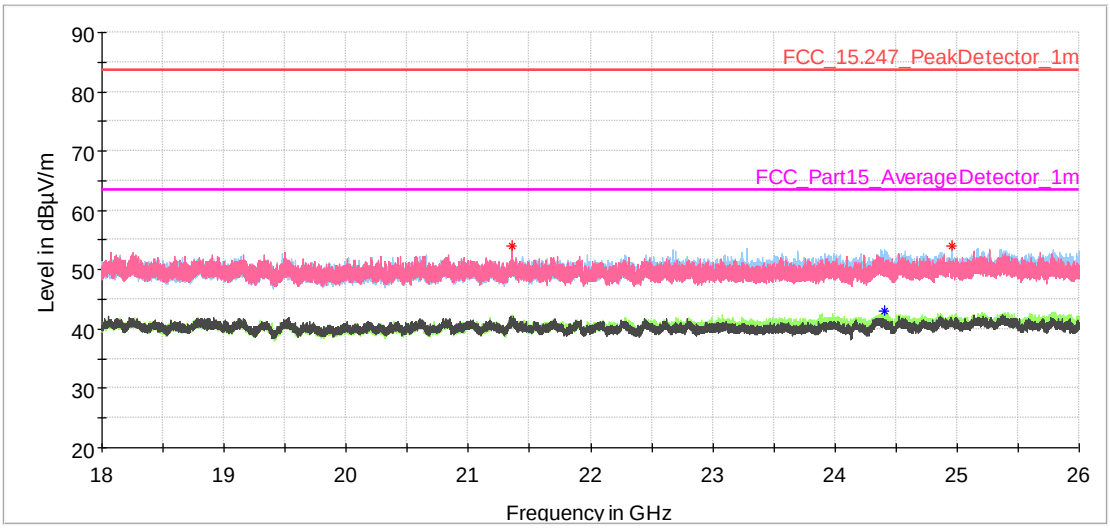


Fig. 32: Ambient level. Frequency range: 18 GHz – 26 GHz

4.7.7.6 Sample #1. Mode 1. Frequency range: 30 MHz – 1 GHz. Channel Low

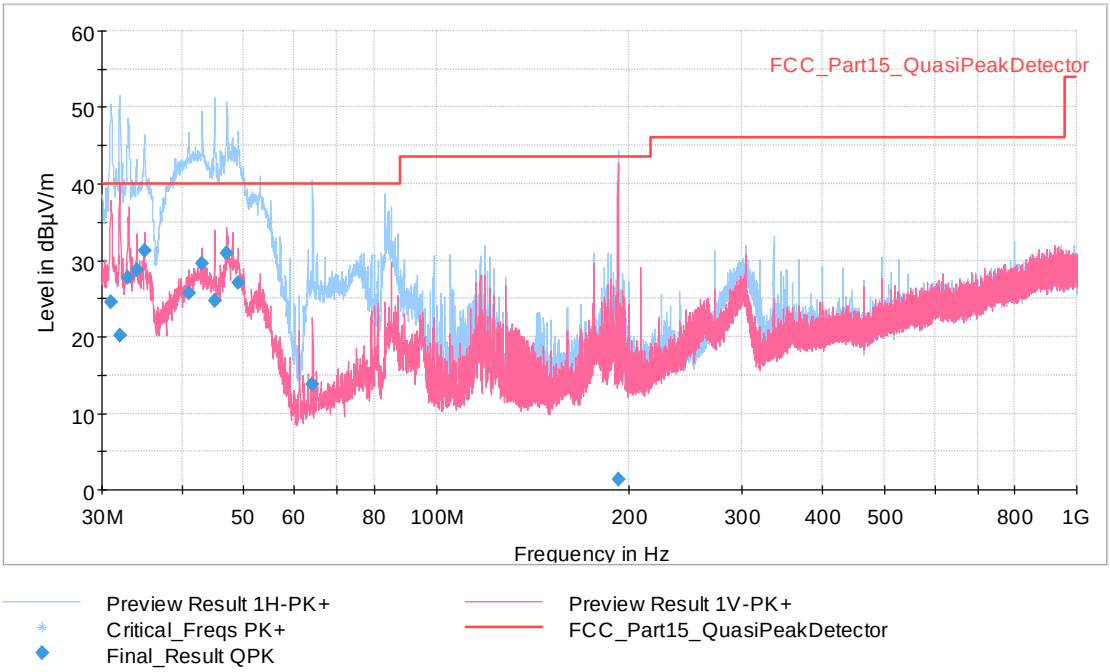


Fig. 33: Sample #1. Mode 1. Frequency range: 30 MHz – 1 GHz. Channel Low

FINAL MEASUREMENTS

Frequency [MHz]	QuasiPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]
31.002	24.61	40.00	15.39	104.0	H	267.0
31.972	20.13	40.00	19.87	100.0	H	351.0
32.942	27.76	40.00	12.24	100.0	H	189.0
34.041	28.68	40.00	11.32	100.0	H	124.0
35.011	31.23	40.00	8.77	106.0	H	306.0
40.993	25.76	40.00	14.24	100.0	H	0.0
43.030	29.64	40.00	10.36	103.0	H	267.0
45.002	24.67	40.00	15.33	104.0	H	306.0
47.039	30.91	40.00	9.09	100.0	H	306.0
49.012	27.14	40.00	12.86	100.0	H	319.0
64.014	13.71	40.00	26.29	123.0	H	163.0
192.022	1.34	43.50	42.16	100.0	H	163.0

Table 47: Sample #1. Mode 1. Frequency range: 30 MHz – 1 GHz. Channel Low

4.7.7.7 Sample #1. Mode 1. Frequency range: 30 MHz – 1 GHz. Channel Middle

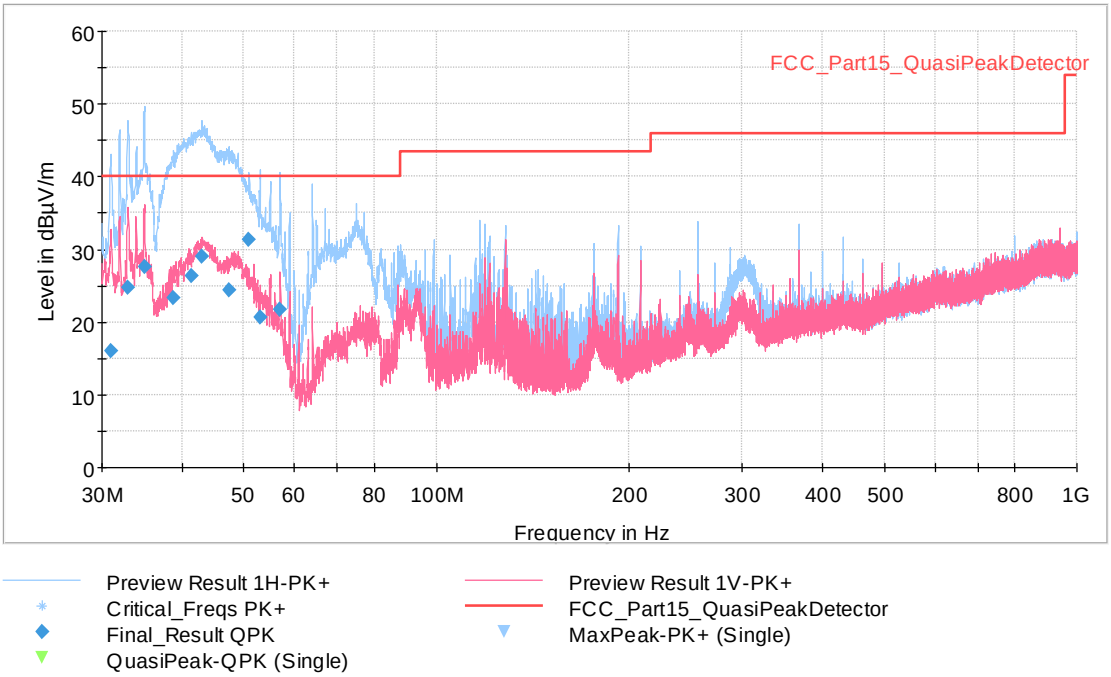


Fig. 34: Sample #1. Mode 1. Frequency range: 30 MHz – 1 GHz. Channel Middle

FINAL MEASUREMENTS

Frequency [MHz]	QuasiPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]
30.970	15.94	40.00	24.06	123.0	H	211.0
32.974	24.81	40.00	15.19	111.0	H	289.0
34.979	27.51	40.00	12.49	108.0	H	0.0
38.859	23.32	40.00	16.68	103.0	H	40.0
41.316	26.29	40.00	13.71	104.0	H	224.0
42.965	28.97	40.00	11.03	107.0	H	289.0
47.298	24.48	40.00	15.52	103.0	H	263.0
50.952	31.32	40.00	8.68	104.0	H	315.0
52.956	20.68	40.00	19.32	100.0	H	289.0
56.933	21.74	40.00	18.26	108.0	H	289.0

Table 48: Sample #1. Mode 1. Frequency range: 30 MHz – 1 GHz. Channel Middle

4.7.7.8 Sample #1. Mode 1. Frequency range: 30 MHz – 1 GHz. Channel High

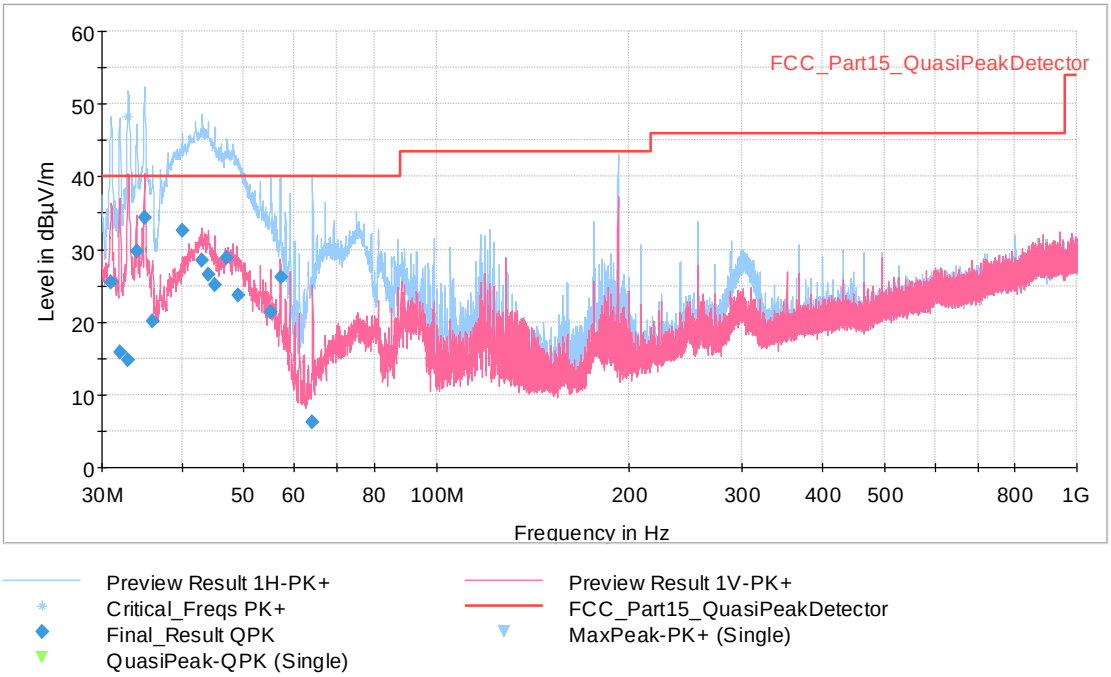


Fig. 35: Sample #1. Mode 1. Frequency range: 30 MHz – 1 GHz. Channel High

FINAL MEASUREMENTS

Frequency [MHz]	QuasiPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]
31.002	25.45	40.00	14.55	107.0	H	156.0
31.972	15.86	40.00	24.14	104.0	H	221.0
32.974	14.76	40.00	25.24	117.0	H	156.0
34.041	29.72	40.00	10.28	100.0	H	299.0
34.979	34.41	40.00	5.59	100.0	H	37.0
35.949	20.08	40.00	19.92	100.0	H	1.0
40.023	32.51	40.00	7.49	100.0	H	286.0
43.030	28.42	40.00	11.58	104.0	H	51.0
43.935	26.50	40.00	13.50	104.0	H	7.0
45.002	25.09	40.00	14.91	100.0	H	169.0
47.072	28.79	40.00	11.21	100.0	H	356.0
49.076	23.60	40.00	16.40	100.0	H	273.0
55.026	21.28	40.00	18.72	112.0	H	221.0
57.030	26.22	40.00	13.78	128.0	H	356.0
63.982	6.17	40.00	33.83	135.0	H	260.0

Table 49: Sample #1. Mode 1. Frequency range: 30 MHz – 1 GHz. Channel High

4.7.7.9 Sample #1. Mode 1. Frequency range: 1 GHz – 3.5 GHz. Channel Low

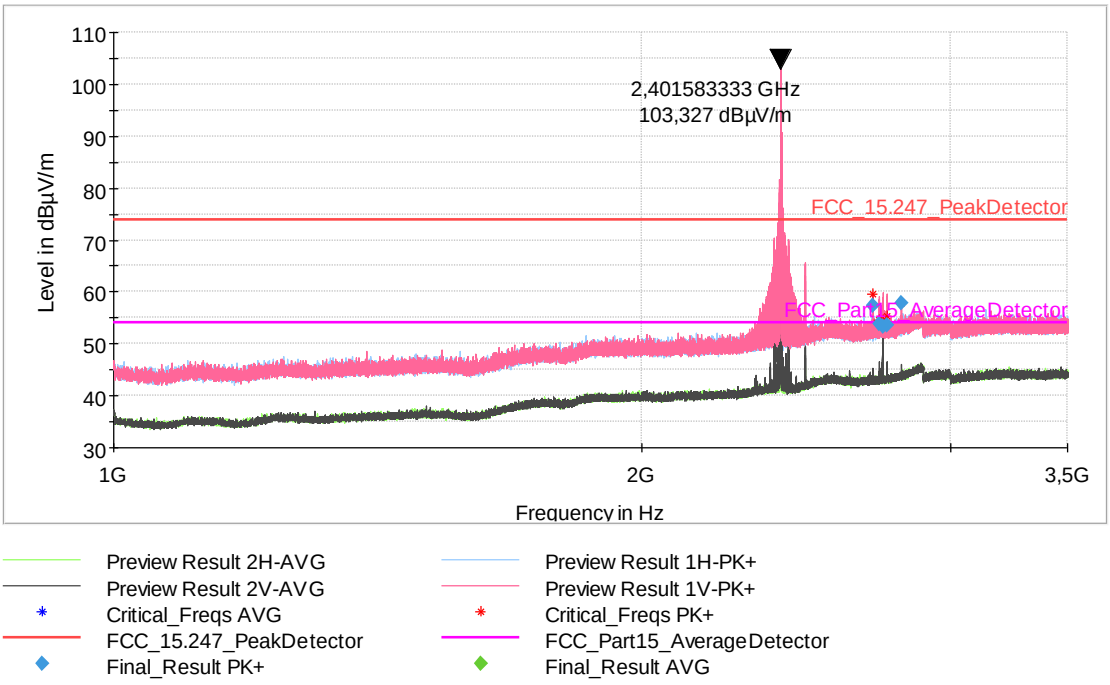


Fig. 36: Sample #1. Mode 1. Frequency range: 1 GHz – 3.5 GHz. Channel Low

FINAL MEASUREMENTS

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
2710.833[2]	57.39	74.00	16.61	142.0	V	349.0
2735.083[2]	53.83	74.00	20.17	156.0	V	37.0
2747.166[2]	53.27	74.00	20.73	155.0	V	0.0
2760.916[2]	53.45	74.00	20.55	264.0	V	0.0
2813.166[2]	57.87	74.00	16.13	105.0	V	349.0

Table 50: Sample #1. Mode 1. Frequency range: 1 GHz – 3.5 GHz. Channel Low

Note 2: Radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified in Table 42. See results in clause 4.7.7.10.

4.7.7.10 Sample #1. Mode 1. Spurious emission restricted band. Channel Low

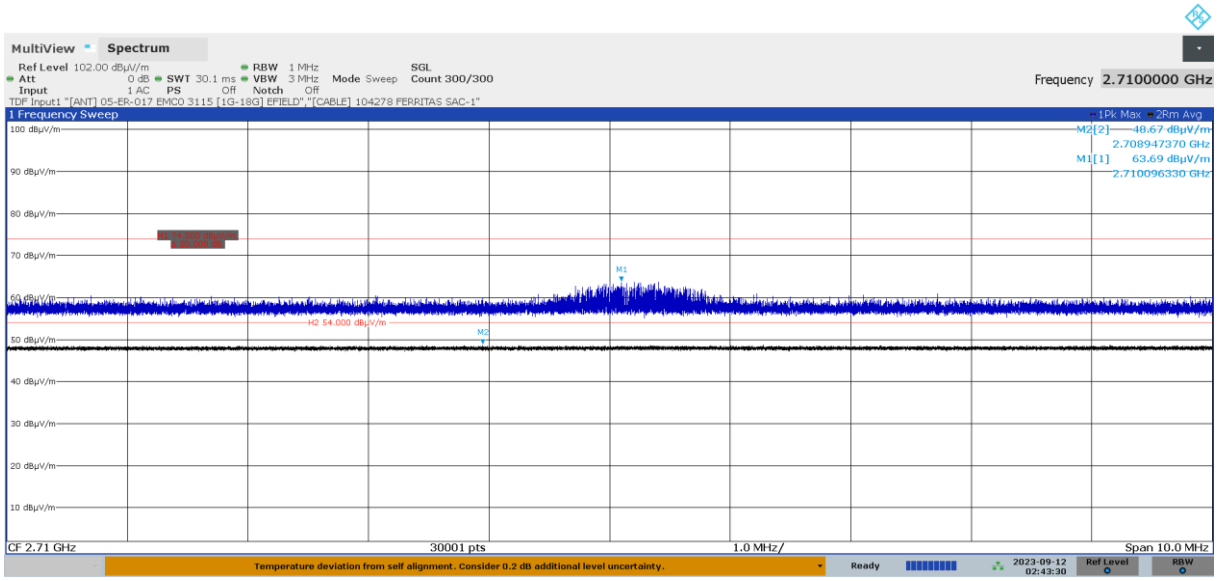


Fig. 37: Sample #1. Mode 1. Spurious frequency: 2710 MHz. Channel Low

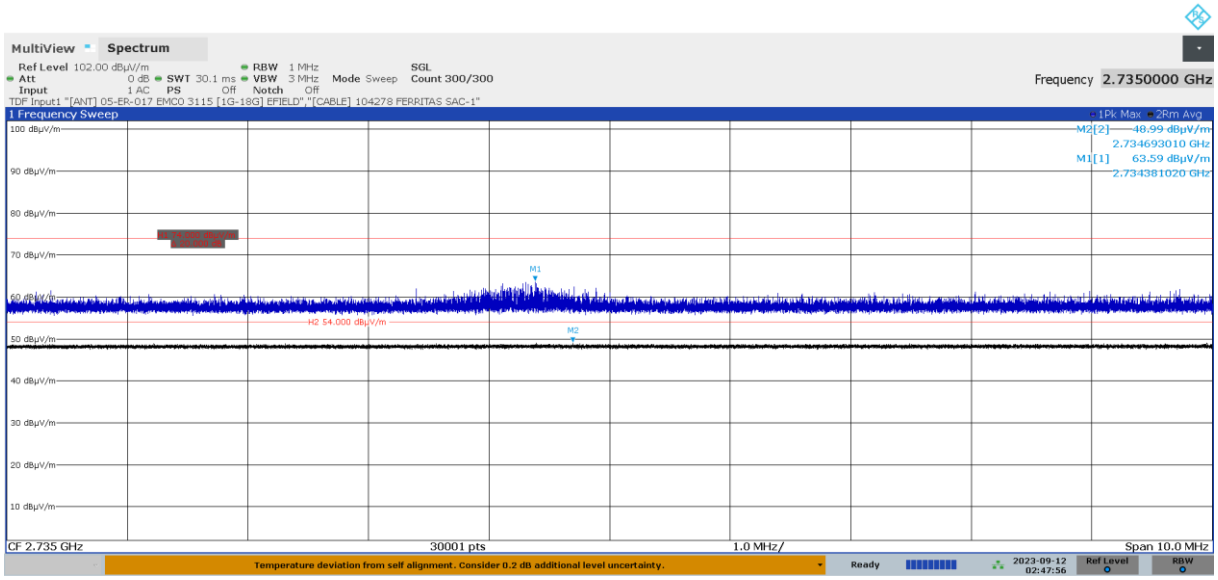


Fig. 38: Sample #1. Mode 1. Spurious frequency: 2735 MHz. Channel Low

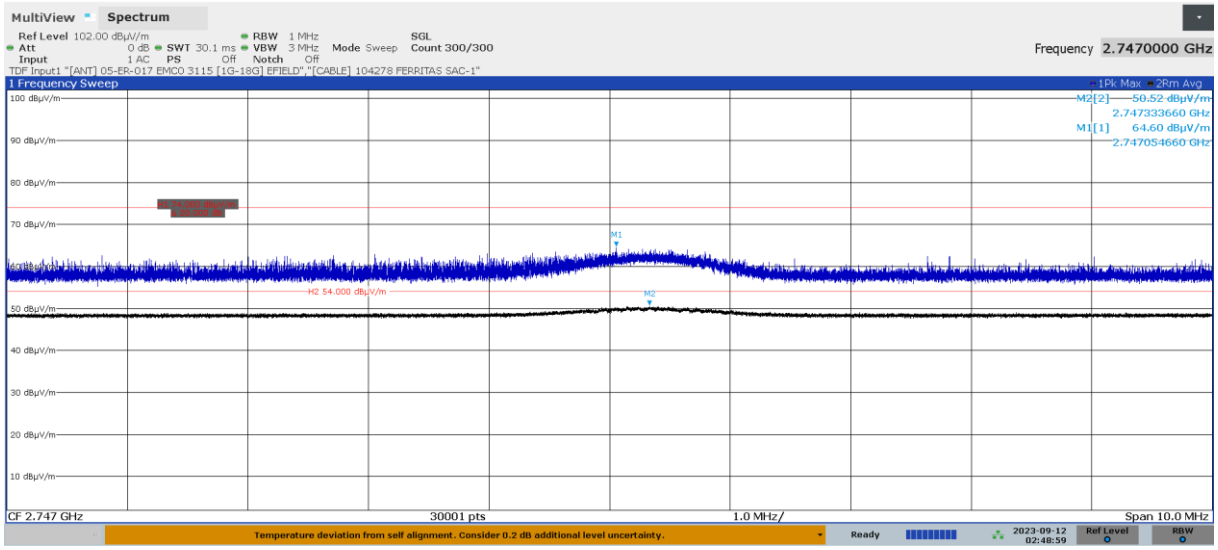


Fig. 39: Sample #1. Mode 1. Spurious frequency: 2747 MHz. Channel Low

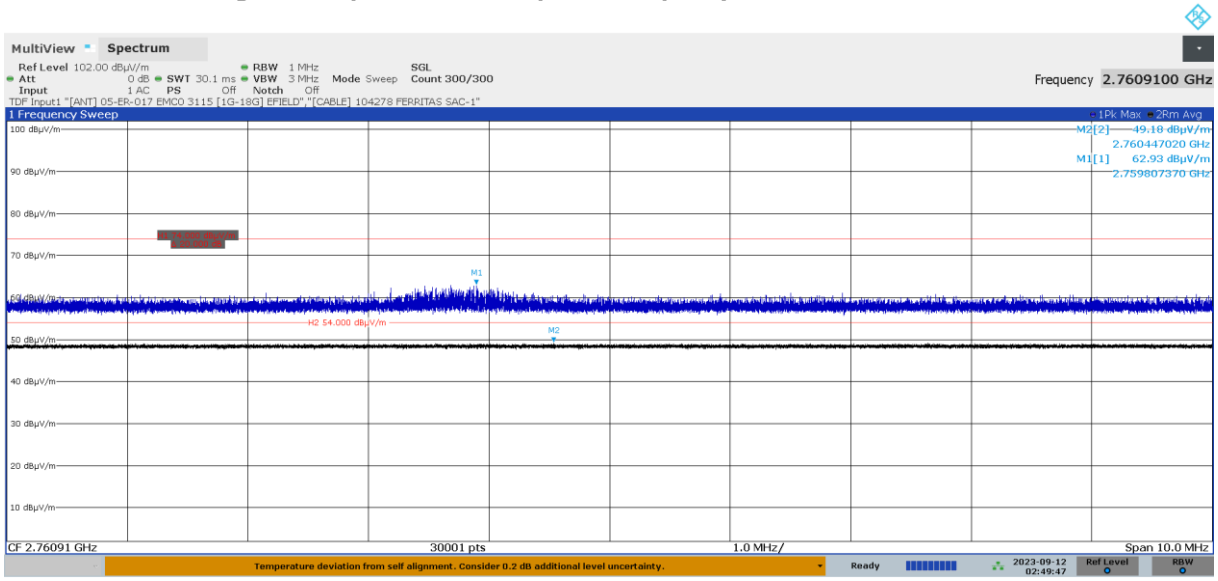


Fig. 40: Sample #1. Mode 1. Spurious frequency: 2760 MHz. Channel Low

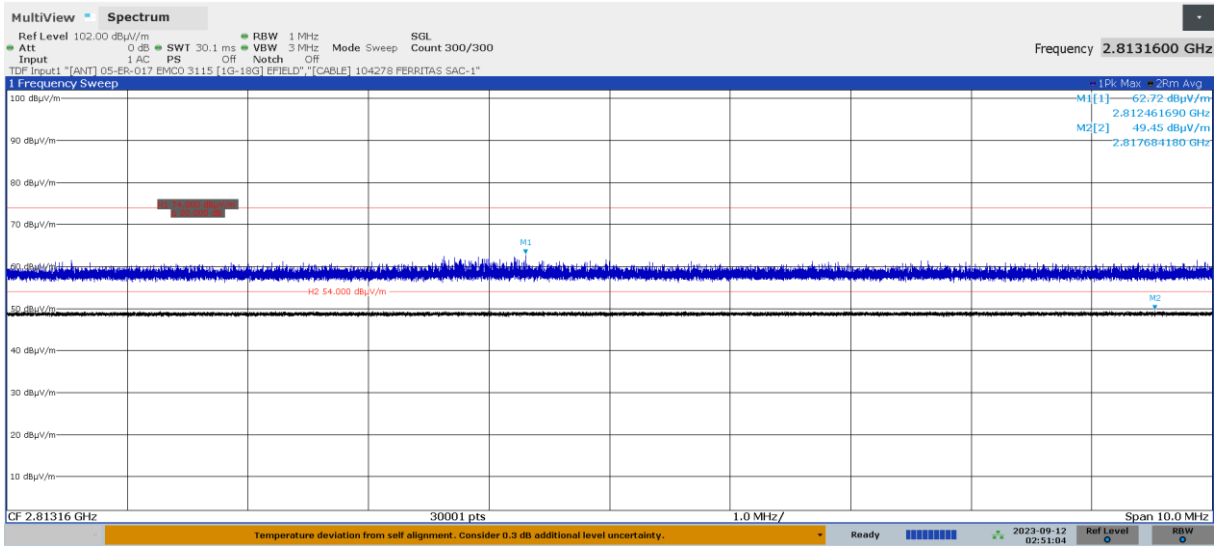


Fig. 41: Sample #1. Mode 1. Spurious frequency: 2813 MHz. Channel Low

4.7.7.11 Sample #1. Mode 1. Frequency range: 1 GHz – 3.5 GHz. Channel Middle

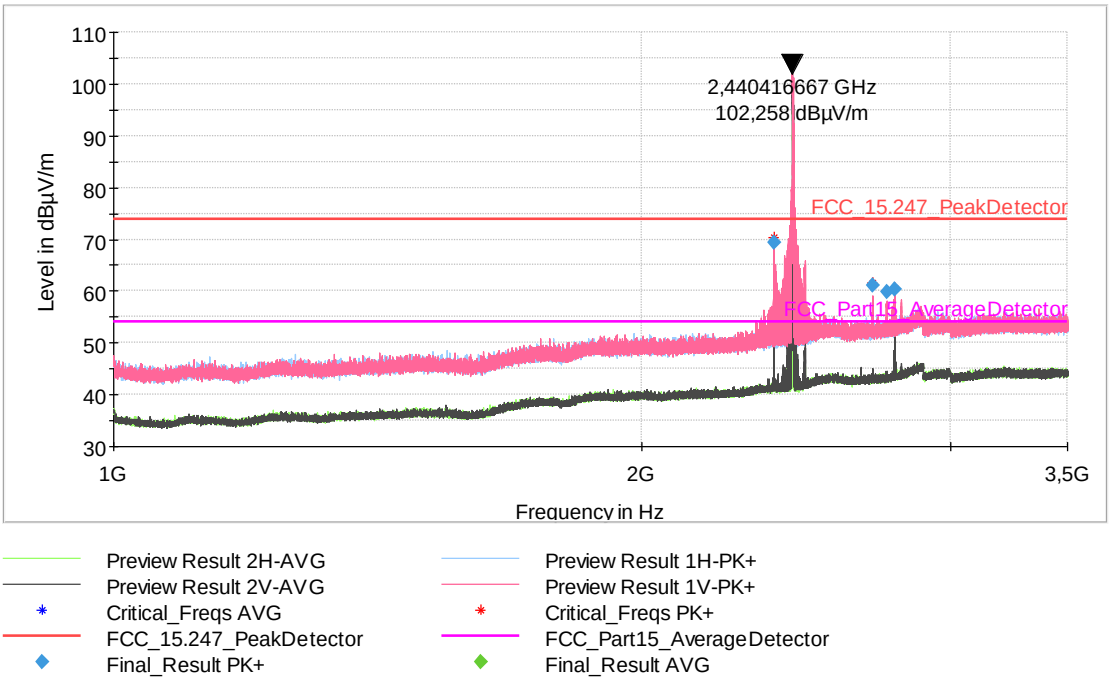


Fig. 42: Sample #1. Mode 1. Frequency range: 1 GHz – 3.5 GHz. Channel Middle

FINAL MEASUREMENTS

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
2380.916[2]	69.46	74.00	4.54	151.0	V	195.0
2709.916[1]	61.17	74.00	12.83	146.0	V	195.0
2759.583[1]	59.76	74.00	14.24	157.0	V	165.0
2790.666[1]	60.37	74.00	13.63	149.0	V	165.0

Table 51: Sample #1. Mode 1. Frequency range: 1 GHz – 3.5 GHz. Channel Middle

Note 1: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. See section 4.4.6.
Maximum Peak Power (dBm) + 95.25 -20 (dB) > Spurious Levels Emission

Note 2: Radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified in Table 42. See results in clause 4.7.7.12

4.7.7.12 Sample #1. Mode 1. Spurious emission restricted band. Channel Middle

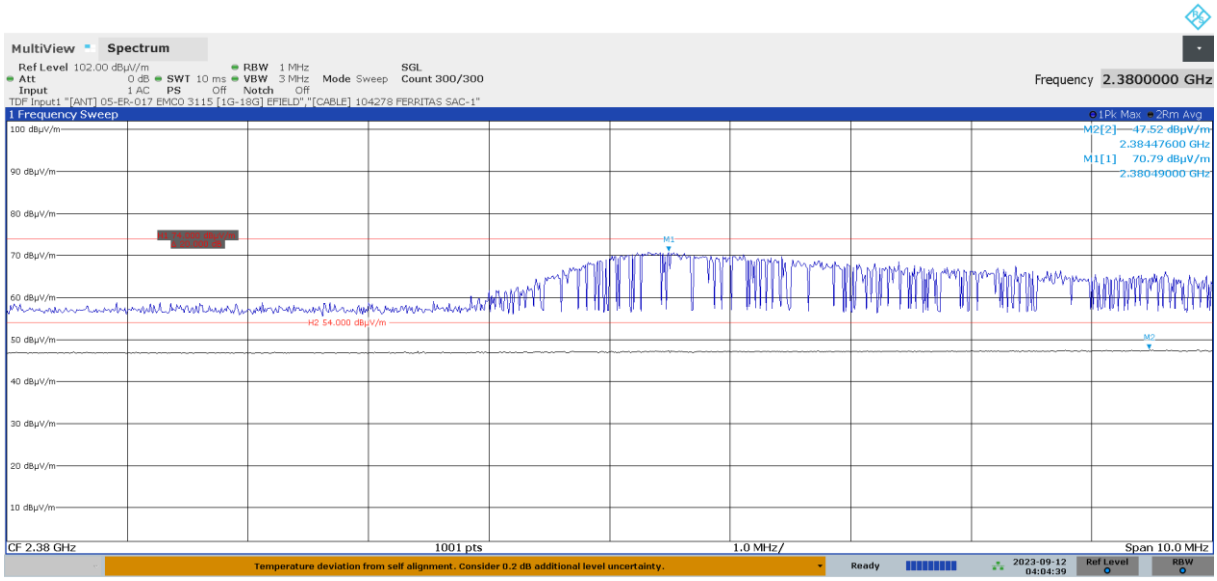


Fig. 43: Sample #1. Mode 1. Spurious frequency: 2380 MHz. Channel Middle

4.7.7.13 Sample #1. Mode 1. Frequency range: 1 GHz – 3.5 GHz. Channel High

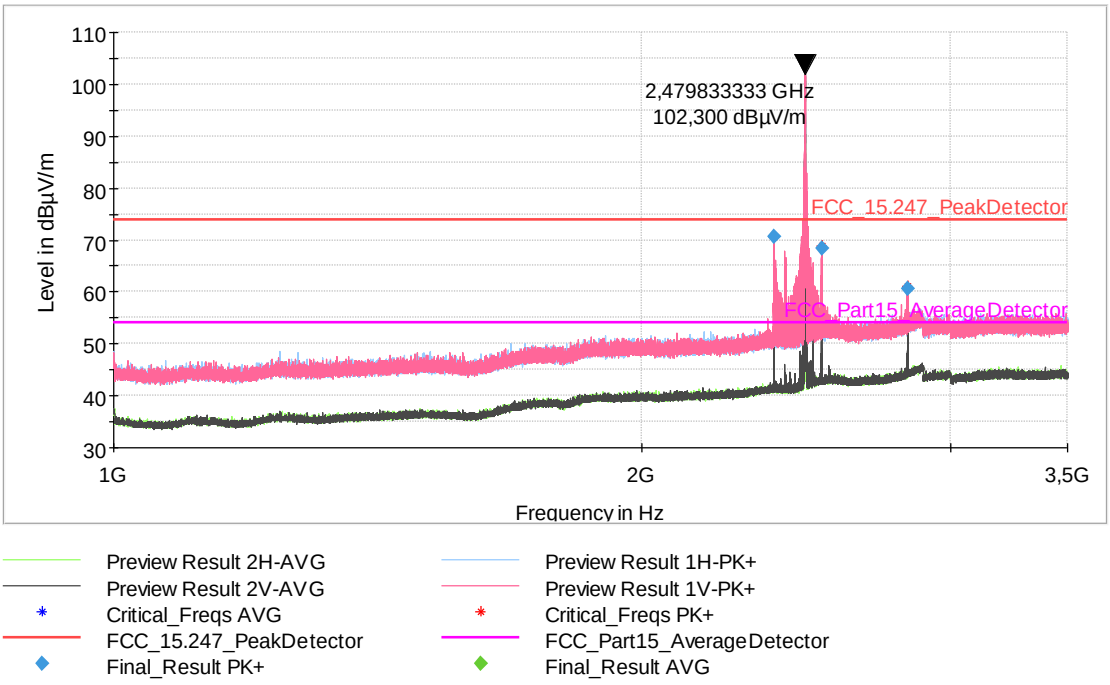


Fig. 44: Sample #1. Mode 1. Frequency range: 1 GHz – 3.5 GHz. Channel High

FINAL MEASUREMENTS

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
2380.416[2]	70.53	74.00	3.47	152.0	V	356.0
2534.000[1]	68.41	74.00	5.59	133.0	V	346.0
2836.416[2]	60.50	74.00	13.50	160.0	V	180.0

Table 52: Sample #1. Mode 1. Frequency range: 1 GHz – 3.5 GHz. Channel High

Note 1: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. See section 4.4.6.
Maximum Peak Power (dBm) + 95.25 -20 (dB) > Spurious Levels Emission

Note 2: Radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified in Table 42. See results in clause 4.7.7.14

4.7.7.14 Sample #1. Mode 1. Spurious emission restricted band. Channel High

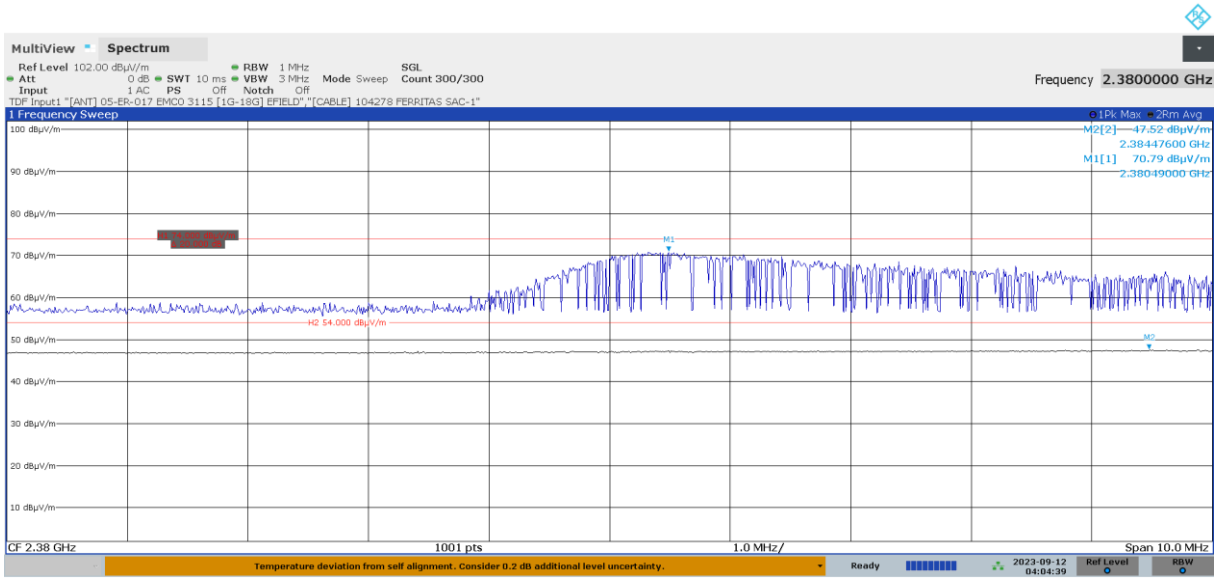


Fig. 45: Sample #1. Mode 1. Spurious frequency: 2380 MHz. Channel High

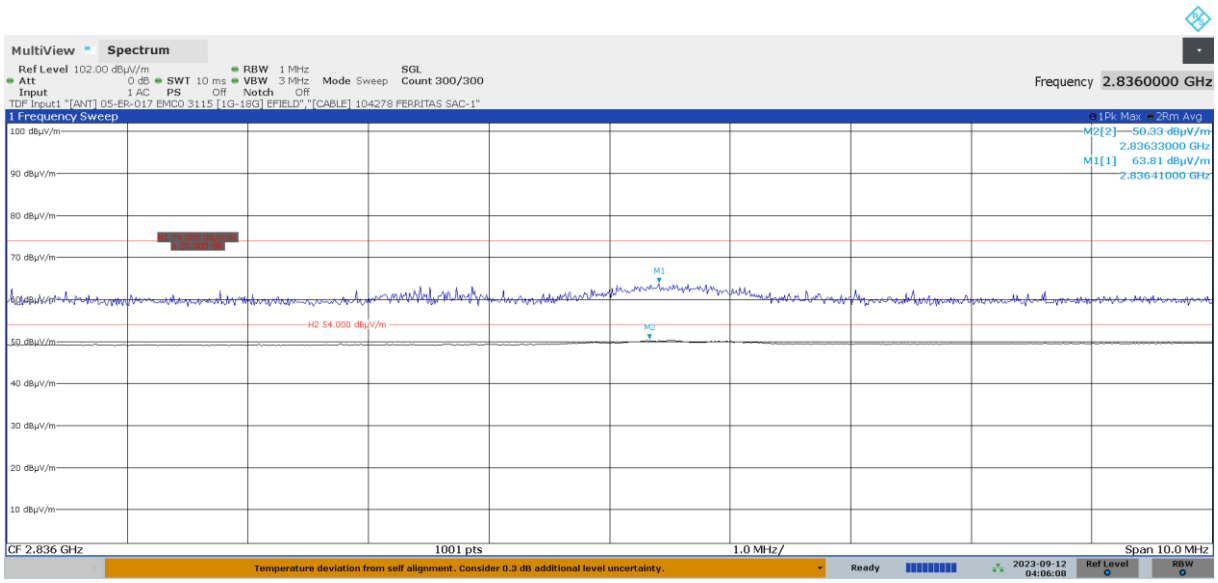


Fig. 46: Sample #1. Mode 1. Spurious frequency: 2856 MHz. Channel High

4.7.7.15 Sample #1. Mode 1. Frequency range: 3.5 GHz – 8 GHz. Channel Low

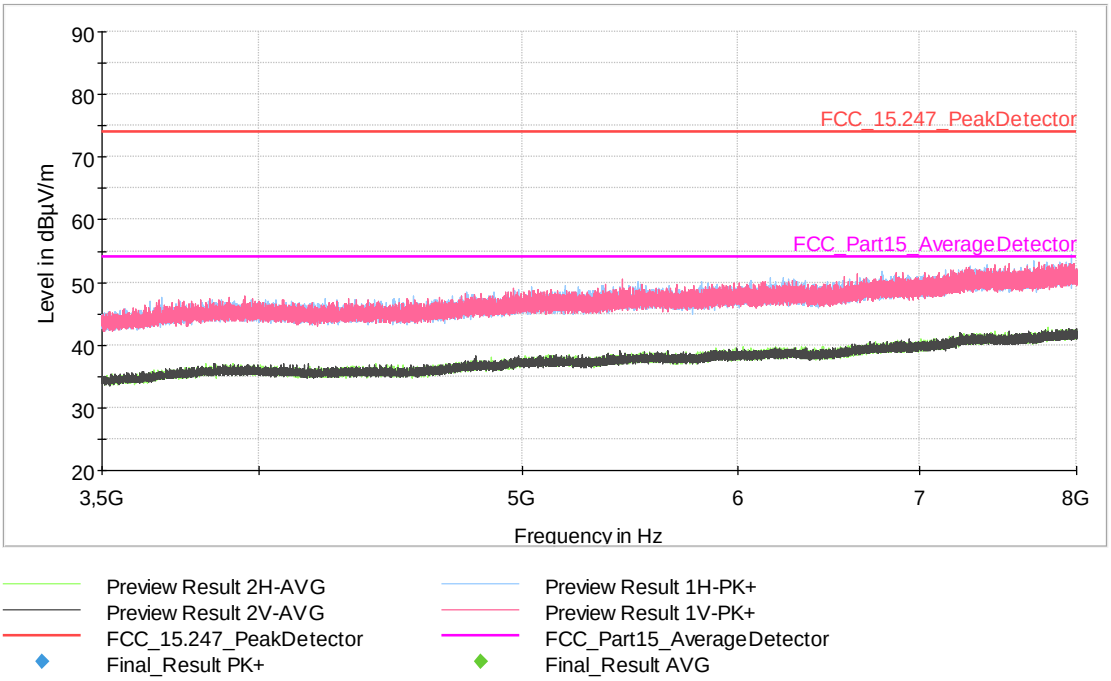


Fig. 47: Sample #1. Mode 1. Frequency range: 3.5 GHz – 8 GHz. Channel Low

FINAL MEASUREMENTS

No spurious detected. All emissions are below of the average limit.

4.7.7.16 Sample #1. Mode 1. Frequency range: 3.5 GHz – 8 GHz. Channel Middle

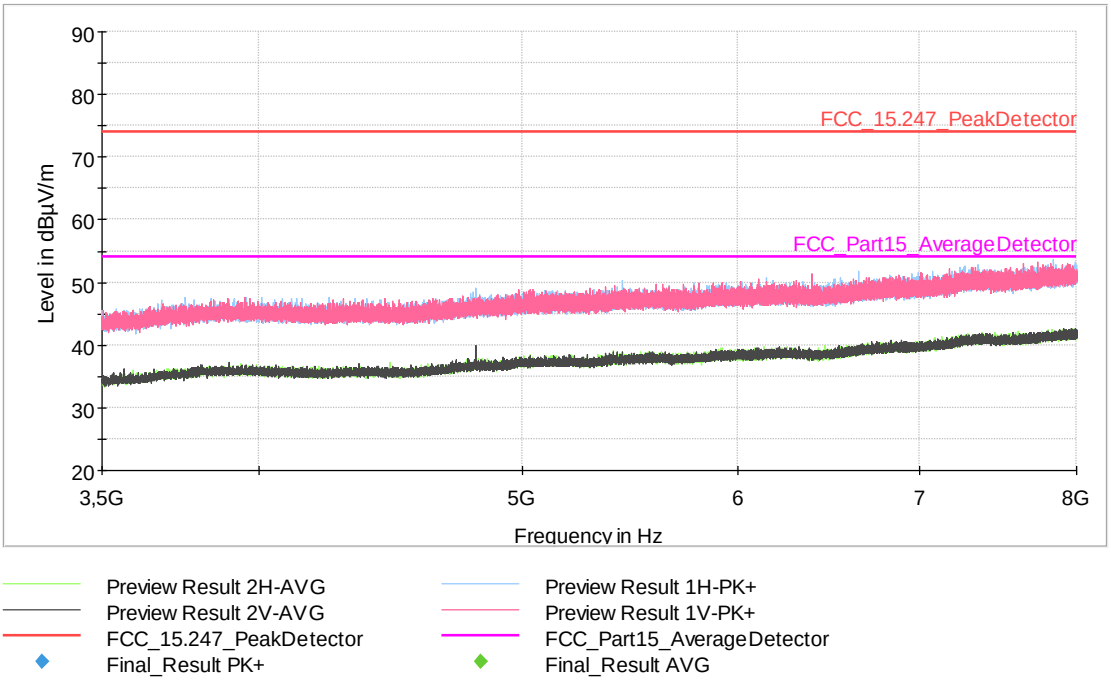


Fig. 48: Sample #1. Mode 1. Frequency range: 3.5 GHz – 8 GHz. Channel Middle

FINAL MEASUREMENTS

No spurious detected. All emissions are below of the average limit.

4.7.7.17 Sample #1. Mode 1. Frequency range: 3.5 GHz – 8 GHz. Channel High

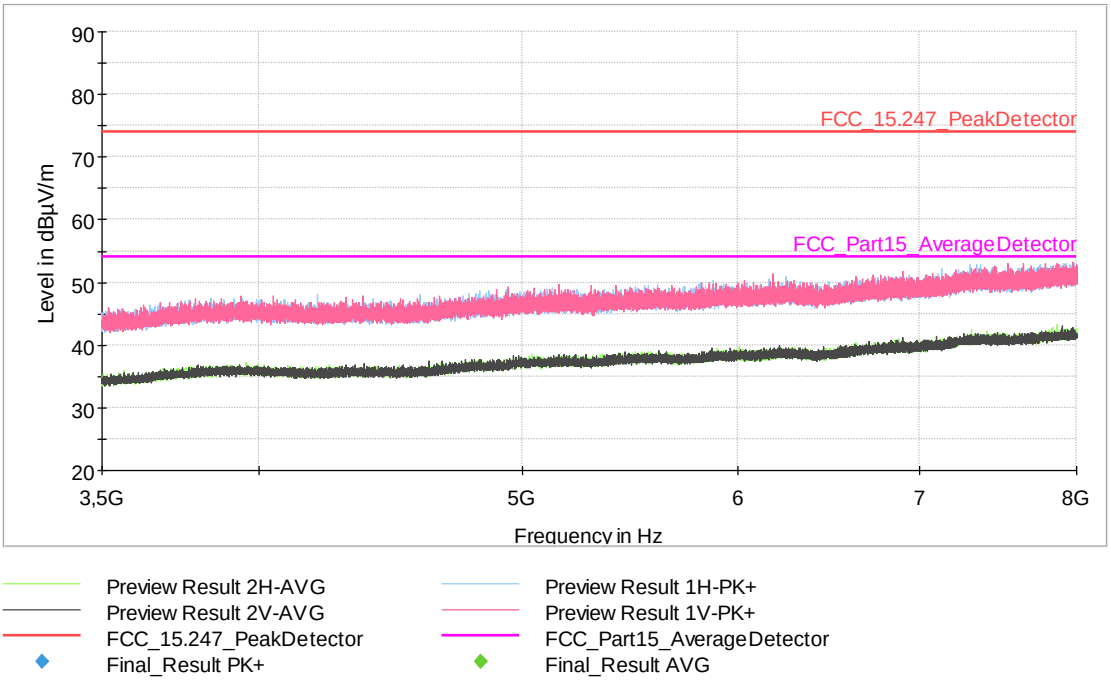


Fig. 49: Sample #1. Mode 1. Frequency range: 3.5 GHz – 8 GHz. Channel High

FINAL MEASUREMENTS

No spurious detected. All emissions are below of the average limit.

4.7.7.18 Sample #1. Mode 1. Frequency range: 8 GHz – 18 GHz. Channel Low

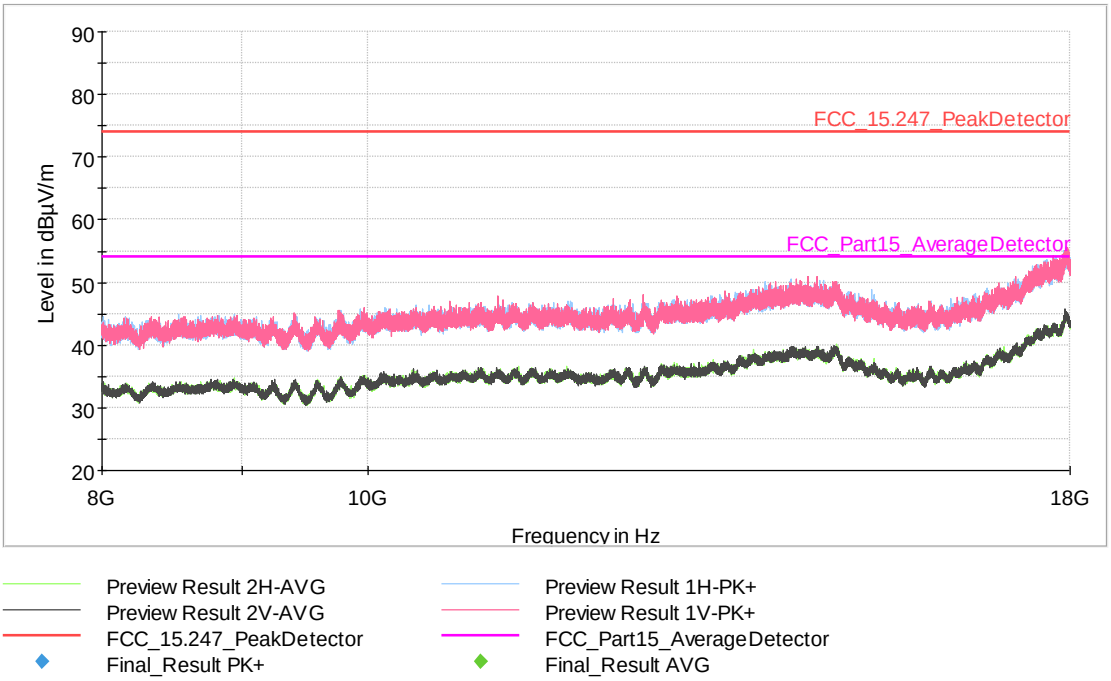


Fig. 50: Sample #1. Mode 1. Frequency range: 8 GHz – 18 GHz. Channel Low

FINAL MEASUREMENTS

No spurious detected. All emissions are below of the average limit.

4.7.7.19 Sample #1. Mode 1. Frequency range: 8 GHz – 18 GHz. Channel Middle

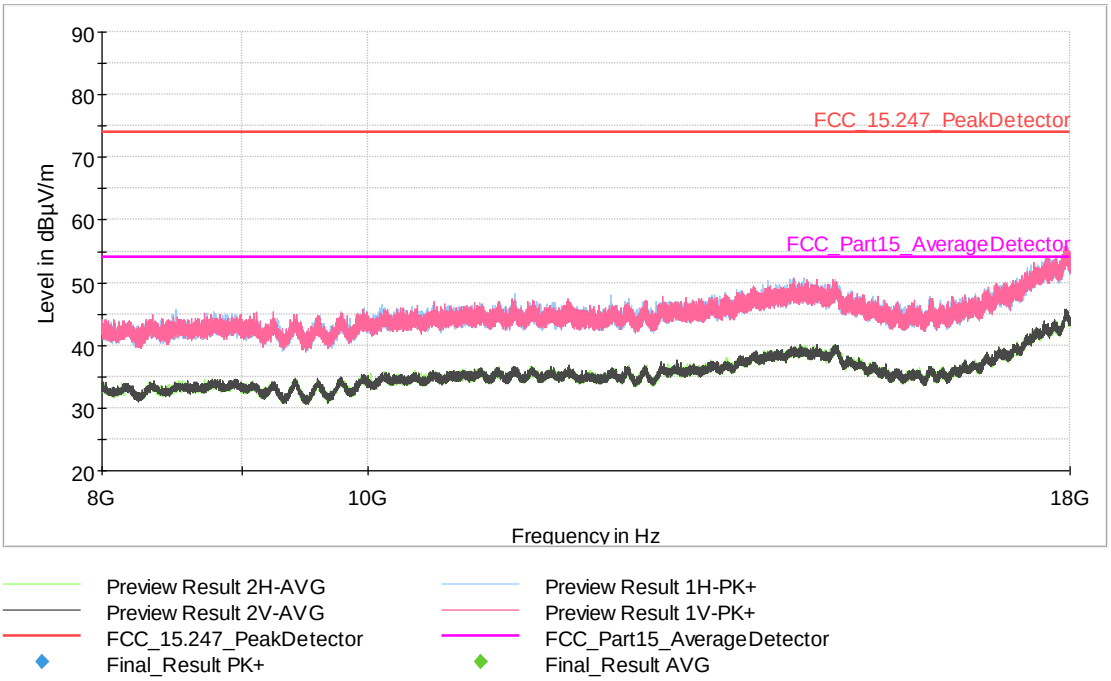


Fig. 51: Sample #1. Mode 1. Frequency range: 8 GHz – 18 GHz. Channel Middle

FINAL MEASUREMENTS

No spurious detected. All emissions are below of the average limit.

4.7.7.20 Sample #1. Mode 1. Frequency range: 8 GHz – 18 GHz. Channel High

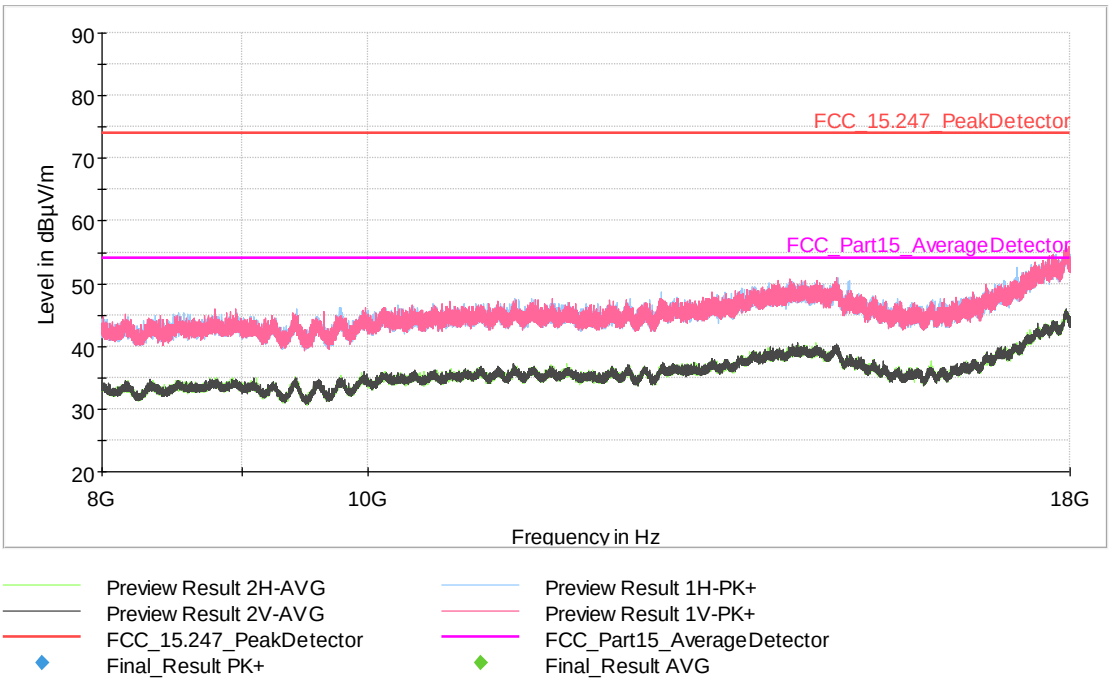


Fig. 52: Sample #1. Mode 1. Frequency range: 8 GHz – 18 GHz. Channel High

FINAL MEASUREMENTS

No spurious detected. All emissions are below of the average limit.

4.7.7.21 Sample #1. Mode 1. Frequency range: 18 GHz – 26 GHz. Channel Low

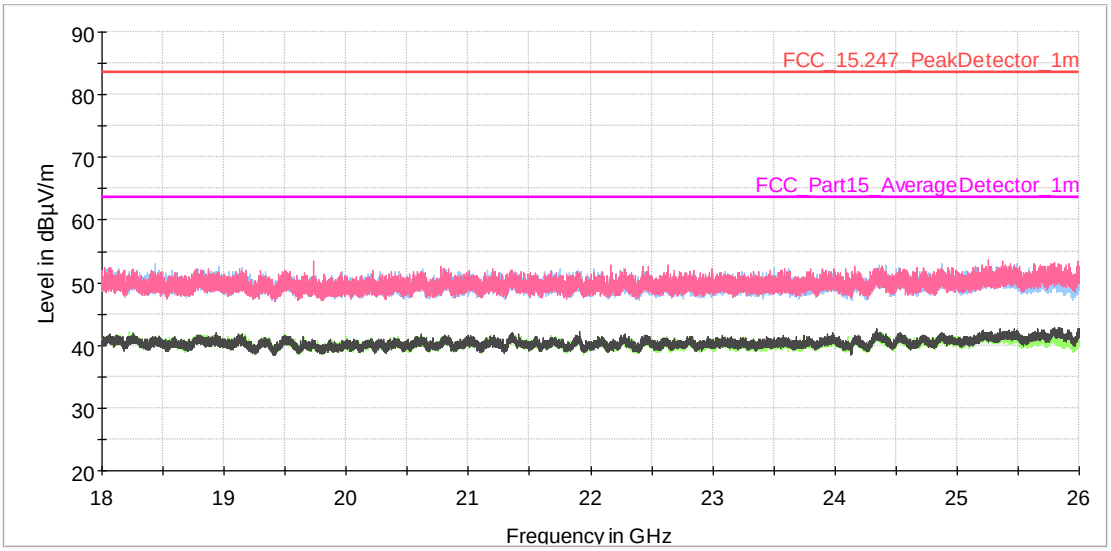
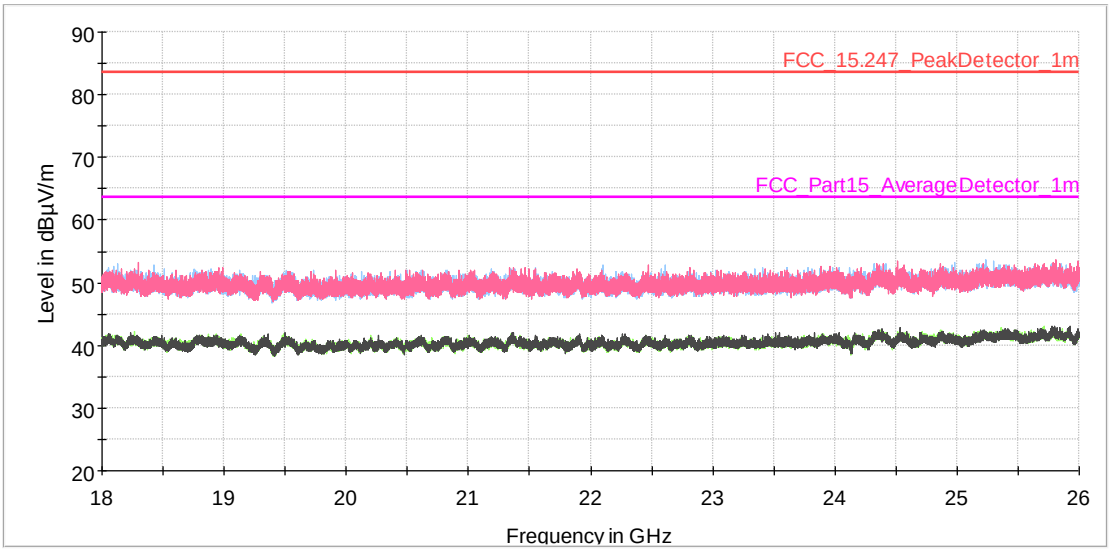


Fig. 53: Sample #1. Mode 1. Frequency range: 18 GHz – 26 GHz. Channel Low

FINAL MEASUREMENTS

No spurious detected. All emissions are below of the average limit.

4.7.7.22 Sample #1. Mode 1. Frequency range: 18 GHz – 26 GHz. Channel Middle



Preview Result 2H-AVG
Preview Result 2V-AVG
FCC_15.247_PeakDetector_1m
Final_Result PK+
Preview Result 1H-PK+
Preview Result 1V-PK+
FCC_Part15_AverageDetector_1m
Final_Result AVG

Fig. 54: Sample #1. Mode 1. Frequency range: 18 GHz – 26 GHz. Channel Middle

FINAL MEASUREMENTS

No spurious detected. All emissions are below of the average limit.

4.7.7.23 Sample #1. Mode 1. Frequency range: 18 GHz – 26 GHz. Channel High

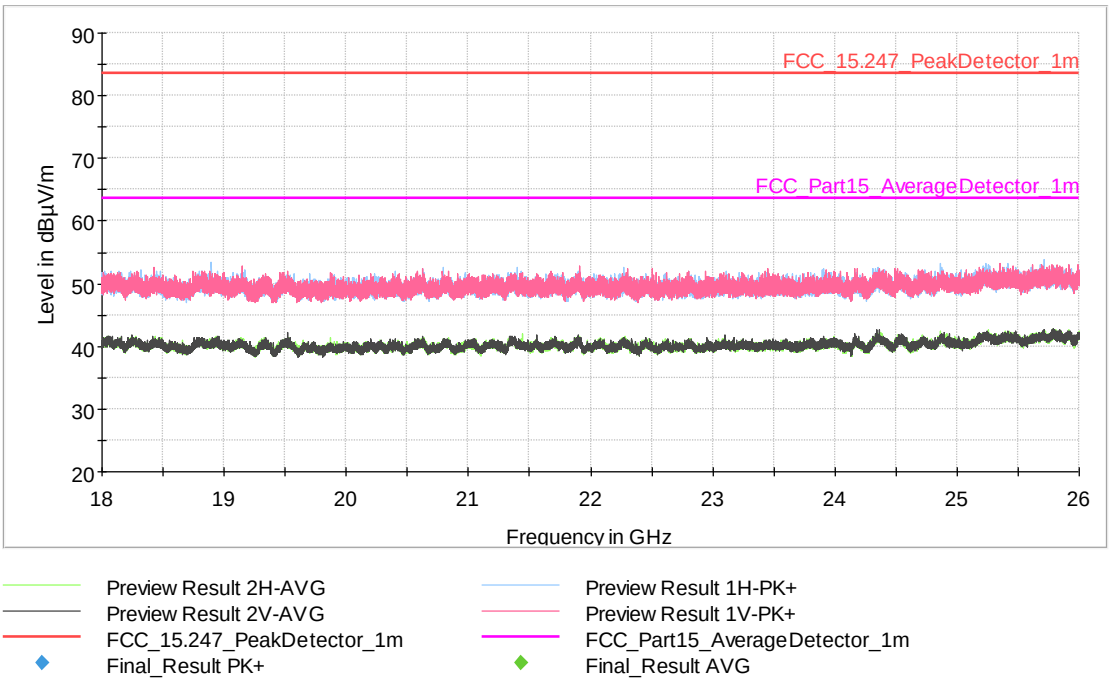


Fig. 55: Sample #1. Mode 1. Frequency range: 18 GHz – 26 GHz. Channel High

FINAL MEASUREMENTS

No spurious detected. All emissions are below of the average limit.

4.7.8 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
BILOG ANTENNA	SCHWARZBECK	VULP 9164	1042740	08/11/2022	08/11/2023
ACTIVE LOOP ANTENNA	EMCO	6502	05-ER-019	03/10/2022	03/10/2023
RF CABLE	HUBER+SUHNER	SF126E	1042728	21/08/2023	21/08/2024
3 DB ATTENUATOR	HUBER+SUHNER	6803.17.B	1042021	25/05/2023	25/05/2024
RF CABLE	RHODE & SCHWARZ	NA	1041502	03/10/2022	03/10/2023
RF CABLE	HUBER+SUHNER	SF104	1041964	22/06/2023	22/06/2024
EMI RECEIVER	RHODE & SCHWARZ	ESW 8	1042686	21/02/2023	21/02/2024
HORN ANTENNA	EMCO	3115	05-ER-182	04/11/2022	04/11/2023
HIGHPASS FILTER	WAINWRIGHT INSTRUMENTS	WHNX6-2765-3500-26500-40CC	1042511	12/05/2023	12/05/2024
RF CABLE	HUBER+SUHNER	SF104/11N/11N	1042586	08/06/2023	08/06/2024
RF AMPLIFIER	BONN ELEKTRONIK	BLMA 0118-M	1041733	12/05/2023	12/05/2024
RF CABLE	HUBER+SUHNER	SF102	1042545	18/05/2023	18/05/2024
RF CABLE	ASTROLAB	32026-29094-29094-24TC	1041565	16/05/2023	16/05/2024
HORN ANTENNA	MVG	EH 1840	1042685	14/04/2022	14/04/2024
EMI RECEIVER	RHODE & SCHWARZ	ESU 40	1041155	04/08/2023	04/08/2025
TEST SOFTWARE	ROHDE & SCHWARZ	EMC32 v.10.50.00	104624	--	--
MAST-TABLE CONTROLLER	MATURO	NCD	1042758	--	--

Table 53: Test Instruments – Radio-frequency radiated emissions

4.7.9 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
Emissions	RADIO-FREQUENCY RADIATED EMISSIONS 1 GHz – 6 GHz	± 5.22 dB
Emissions	RADIO-FREQUENCY RADIATED EMISSIONS 6 GHz – 18 GHz	± 5.44 dB
Emissions	RADIO-FREQUENCY RADIATED EMISSIONS 18 GHz – 26 GHz	± 5.04 dB
Emissions	RADIO-FREQUENCY RADIATED EMISSIONS 26 GHz – 40 GHz	± 5.51 dB

Table 54: 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%.