LGAI Technological Center, S.A. (APPLUS)
Campus de la UAB. Ronda de la Font del Carme, s/n.
08193 Bellaterra (Barcelona) (Spain)
T +34 93 567 20 00 / F +34 93 520 20 01
www.appluslaboratories.com

File Number **23/36404067M1**

TEST REPORT
Radiofrequency

Petitioner's Reference:	Lock Up Smart Doors S.L.		
Company Address:	Calle Escritor Jeronimo Tristante, N10, 3B, Murcia, 30100, SPAIN		
Represented by:	Juan Jesus Pinuaga Cascales		
Equipment:	Boost Classic		
Brand:	Operto	PMN:	PUV-002
Sample #1:	N/A	Applus Id:	17169-00002
Sample #2:	N/A	Applus Id:	17169-00003
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 3 (August 2023)**

[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	July 11, 2023
Test Initial Date:	July 12, 2023
Test Final Date:	October 31, 2023
Modification Description	M1

This report replaces and supersedes the report 23/36404067 dated on November 17, 2023.

Modifications performed: 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 21, 2023

LUIS GUARDIOLA ECHEVARRIA
2023.12.21 16:59:47 +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 REQUIEREMENTS (FCC Part 15.203, RSS-GEN 6.8)	#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	CN4
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	Wireless module to add BLE capabilities to hotel locks							
EUT Version	**FVIN**				**HVIN**			
	7.5.2				V2			
Power supply	DC		+/-		4 -11 V		-- 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	CC2640
Brand	Texas Instruments
Module model	N/A (Not a module, radio is part of the rest of the system)
Peak gain antenna	+3.3 dBi
FCC ID	2BB7M-PUV-002
ISED ID	30937-PUV002

Table 2: RF Features

3.2 TEST CONFIGURATION

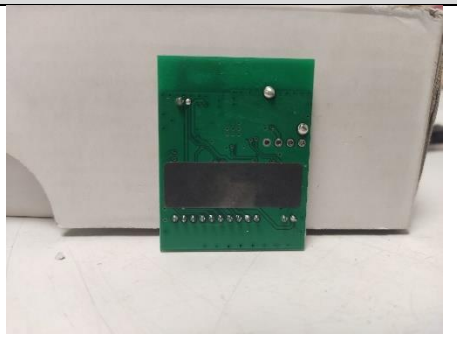
<table>
<tr><th colspan="4">TEST CONFIGURATION</th></tr>
<tr><td>Power Supply</td><td colspan="3">Power by 3 x batteries AA 1.5V. Total power 4.5V</td></tr>
<tr><td rowspan="2">Set-up</td><td>Description</td><td colspan="2">Orientation</td></tr>
<tr><td>The EUT horizontally, as it is intended to be placed in normal operation.</td><td colspan="2">  </td></tr>
<tr><td>Normal test temperatures</td><td colspan="3">15 ºC to 35 ºC</td></tr>
<tr><td>Equipment Type</td><td colspan="3">DTS</td></tr>
<tr><td>Test exercise</td><td colspan="3">For measurements tests the EUT is configured at maximum RF output power with continuous modulated transmission, DC > 98% constant according to the customer.</td></tr>
<tr><td rowspan="4">Test Modes</td><td>Channel</td><td>Frequency [MHz]</td><td>Bandwidth [MHz]</td></tr>
<tr><td>37</td><td>2402</td><td>2</td></tr>
<tr><td>17</td><td>2440</td><td>2</td></tr>
<tr><td>39</td><td>2480</td><td>2</td></tr>
</table>

Fig. 1: EUT Orientation

Table 3. Test Configuration

3.2.1 Samples

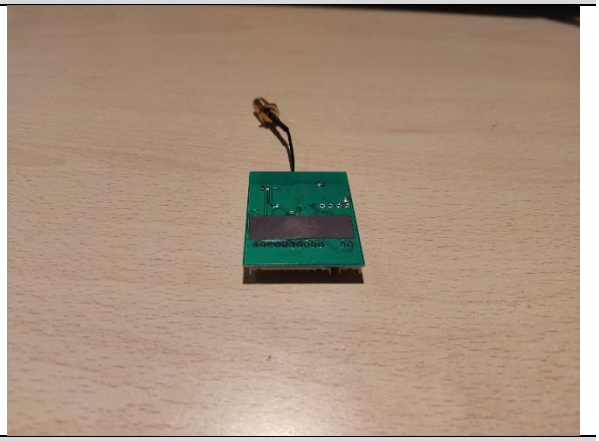
Sample #1	
	
Front View	**Rear View**
	Applus laboratories ID Submuestra: **17169-00002** **Cliente:** SHERPA CERTIFICATION S.L **Código Oferta:** DV-2302204K00-3 **Fecha Recepción:** 11-07-2023 **Marca Muestra:** Sherpa **Modelo:** Boost Classic **Nº de Serie:**
Id Label	**Applus ID Label**

Table 4: Sample #1 description

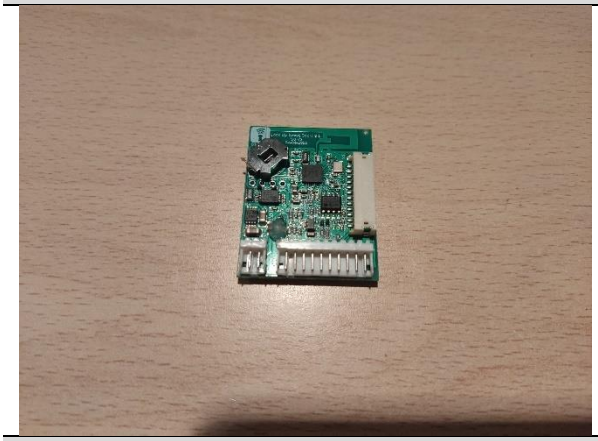
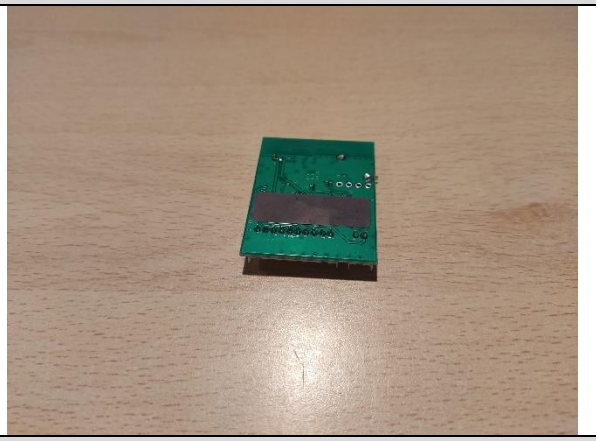
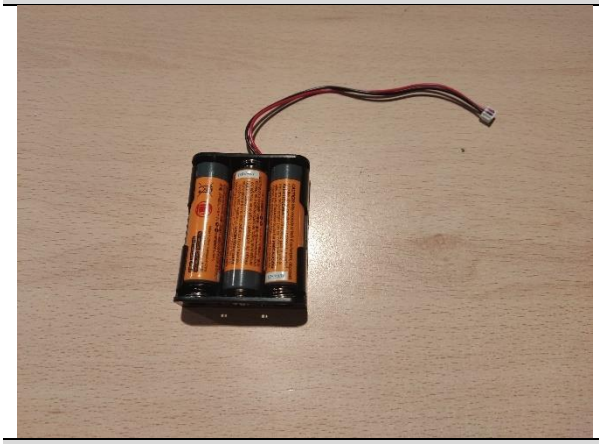
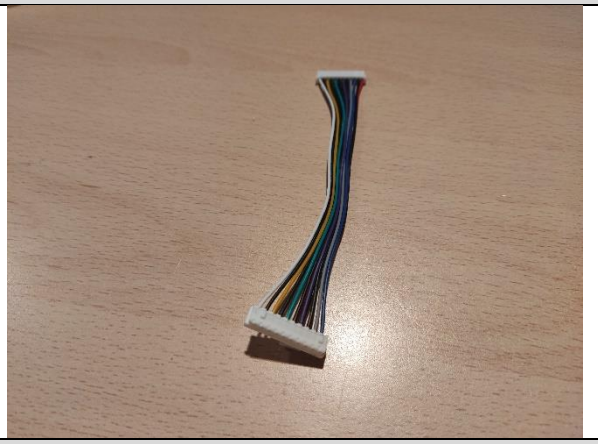
Sample #2	
	
Front View	**Rear View**
	Applus laboratories ID Submuestra: **17169-00003** **Cliente:** SHERPA CERTIFICATION S.L **Código Oferta:** DV-2302204K00-3 **Fecha Recepción:** 11-07-2023 **Marca Muestra:** Sherpa **Modelo:** Boost Classic **Nº de Serie:**
Applus Audio Cable	**Applus ID Label**

Table 5: Sample #2 description

3.2.2 Auxiliary Equipment

Auxiliary Equipment





Battery Holder

Production cables

Serial Cable

USB to Serial Converter

	Port #	Name	Type	Comments
Description	0	Battery Holder	Power Supply	Provided by customer
	1	Production cables	Communication	Provided by customer
	2	Serial cable	Communication	Provided by customer
	3	USB to Serial Converter	Communication	Provided by customer
	5	HCI Tester Version 3.0.0.37	Software	Provided by Applus

Table 6: Auxiliary equipment #1 description

3.2.3 DUT Modifications performed

No modifications have been performed.

3.3 DUT TEST MODES

DUT Operation Modes		
Mode #	**Description**	**Set-up**
1	• The EUT is configured as indicated in the document "Certification Lab Test Guide" provided by the costumer. • For sections 4.2, 4.3, 4.4, 4.5, and 4.6; Sample 1, with Antenna connector is used and for section 4.7 Sample 2 is used. • The software used to send commands to the devices are provided by Texas Instruments (TI), the manufacturer of the IC used for radio communication. • The app is called HCITester, used to send any HCI command available for the device. • The application is used to configure the channel and power of the EUT before performing the test by means of the following commands: ○ HCI_EXT_SetTxPowerCmd: ○ HCI_EXT_ModemTestTxCmd • The EUT is configured at RF output power: ○ +5 dBm: Clasuse 4.2; 4.3; 4.4; 4.5; 4.6 ○ - 3 dBm: Clause 4.7	Table top

Table 7: DUT Operation Modes

3.4 CONTROL AND MONITORING

During the tests, a receiver is used to check that the operating frequency is in accordance with the frequency configured in the software.

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 8: Test facilities ID

3.7 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.
IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of Applus+ Laboratories.

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.

This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of Applus+ Laboratories and the Accreditation Bodies.

4 TEST RESULTS

4.1 ANTENNA REQUIREMENT

4.1.1 Test Setup Required

Not applicable

4.1.2 Test Procedure

Not applicable

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

The EUT has an integral antenna PCB.
Customer's disclaimer of responsibility for not modifying the antenna: "**Do not modify this unit! Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment**"

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: Setup of table top equipment - Occupied Channel Bandwidth 99%

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 9: EMI Receiver configuration – Occupied Channel Bandwidth 99%

4.2.5 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
12/07/2023	Javier Nadales	--	23.5	61.8	1004.3

Table 10: Test environmental conditions – Occupied Channel Bandwidth 99%

4.2.6 Summary Test Results

Channel	Central Frequency [MHz]	99% Bandwidth [MHz]	Band Edge Left [MHz]	Band Edge Right [MHz]	Limit [MHz]	Results
37	2402	1.052	2401.463	2402.516	2400 – 2483.5	PASS
39	2480	1.072	2479.453	2480.526	2400 – 2483.5	PASS

Table 11: Summary Test Results – Occupied Channel Bandwidth 99%

4.2.7 Test Setup Photographs

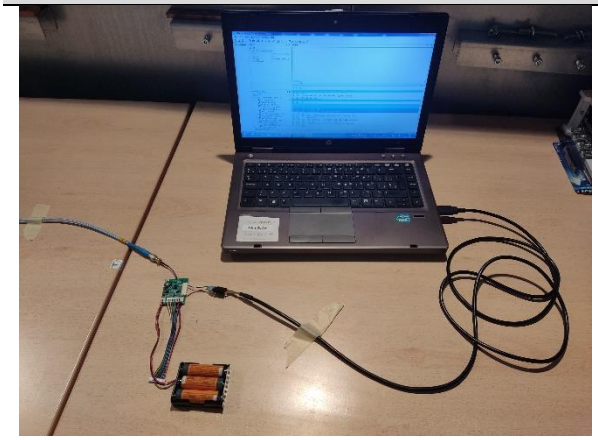
OCCUPIED CHANNEL BANDWIDTH 99% – TEST SETUP	
	

Table 12. Test Setup – Occupied Channel Bandwidth 99%

4.2.8 Test Results

4.2.8.1 Sample #1. Mode 1. Channel Low

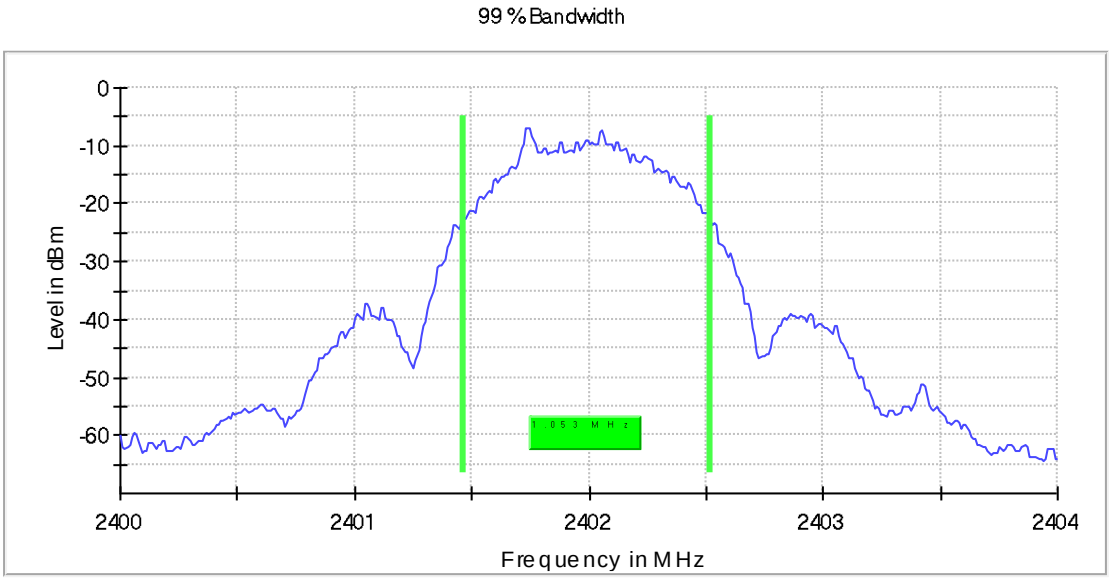


Fig. 3: – Channel Low - 99% Occupied Channel Bandwidth

4.2.8.2 Sample #1. Mode 1. Channel High

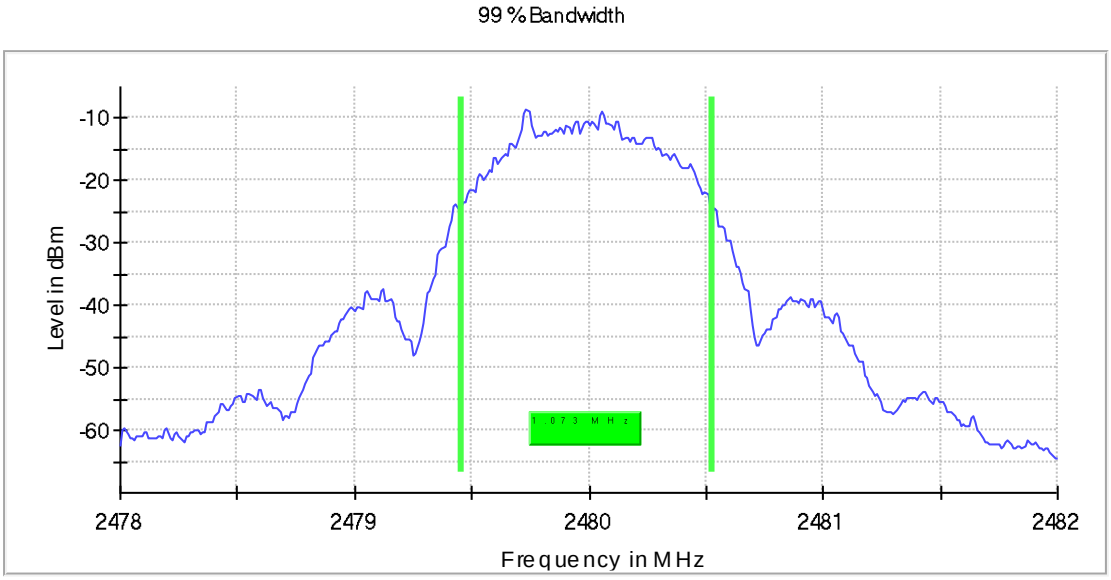


Fig. 4: Channel - High 99% Occupied Channel Bandwidth

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 13: Test Instruments – 99% Occupied Channel Bandwidth

4.2.10 Uncertainty

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

Table 14: 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: Setup of table top equipment - DTS Bandwidth

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 15: EMI Receiver configuration – DTS Bandwidth

4.3.5 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
12/07/2023	Javier Nadales	--	23.5	61.8	1004.3

Table 16: Test environmental conditions – DTS Bandwidth

4.3.6 Summary Test Results

Channel	Central Frequency [MHz]	DTS Bandwidth [MHz]	Band Edge Left [MHz]	Band Edge Right [MHz]	Limit [MHz]	Results
37	2402	0.800	2401.600	2402.400	> 0.5	PASS
17	2440	0.800	2439.600	2440.400	> 0.5	PASS
39	2480	0.840	2479.560	2480.400	> 0.5	PASS

Table 17: Summary Test Results – DTS Bandwidth

4.3.7 Test Setup Photographs

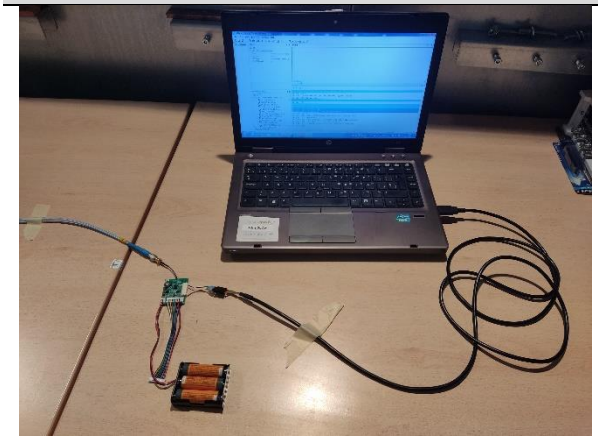
DTS Bandwidth – TEST SETUP	
	

Table 18. Test Setup – DTS Bandwidth

4.3.8 Test Results

4.3.8.1 Sample #1. Mode 1. Channel Low

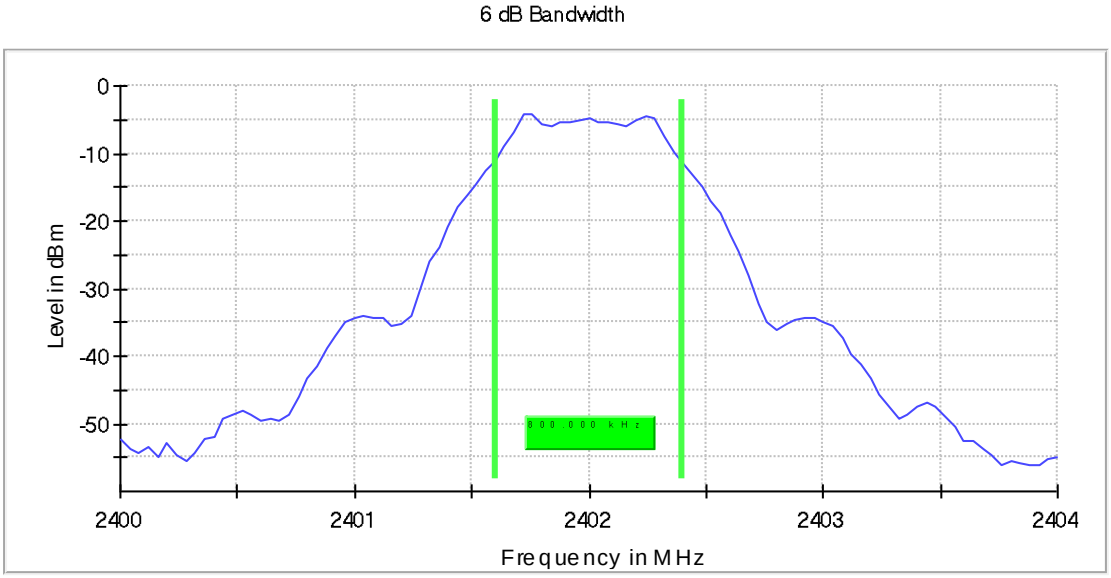


Fig. 6: Channel Low - DTS Bandwidth

4.3.8.2 Sample #1. Mode 1. Channel Middle

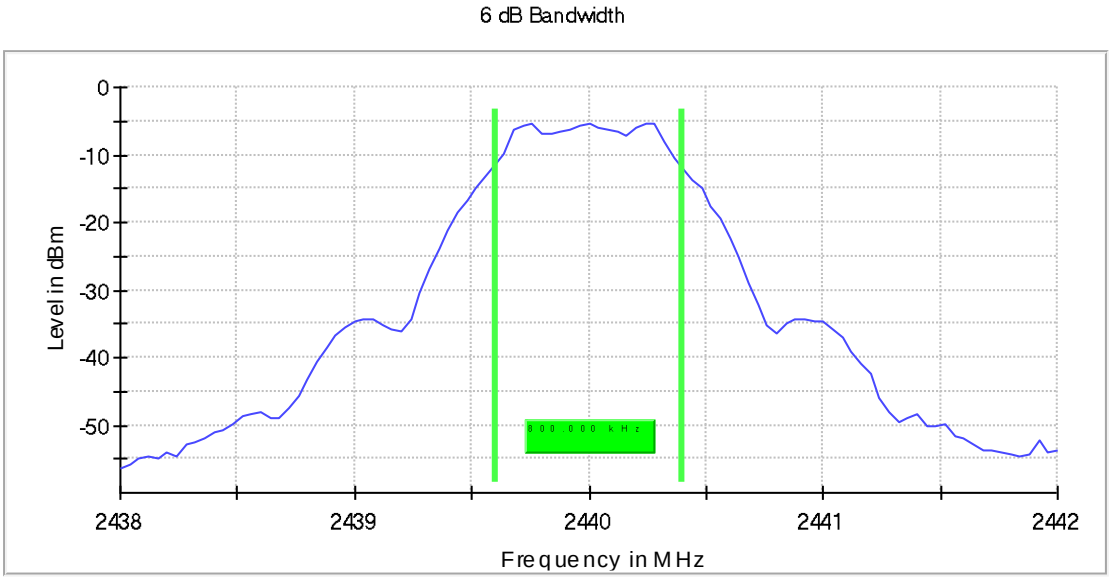


Fig. 7: Channel Middle -DTS Bandwidth

4.3.8.3 Sample #1. Mode 1. Channel High

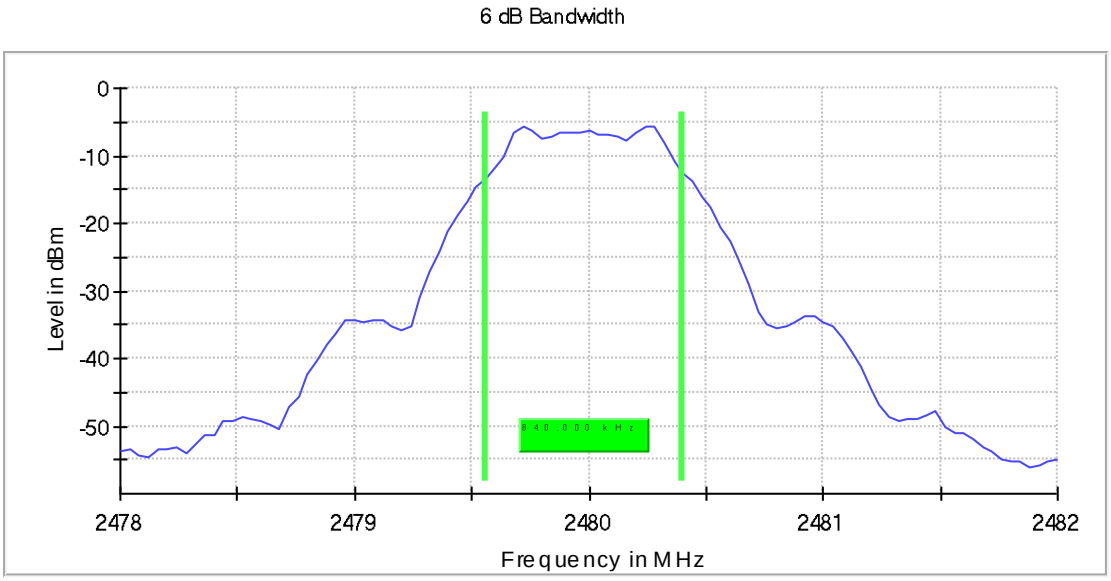


Fig. 8: Channel High - DTS Bandwidth

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 19: Test Instruments – DTS Bandwidth

4.3.10 Uncertainty

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

Table 20: 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. Set the RBW ≥ DTS bandwidth.
2. Set VBW ≥ [3 × RBW].
3. Set span ≥ [3 × RBW].
4. Sweep time = auto couple.
5. Detector = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use peak marker function to determine the peak amplitude level..

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 EMI Receiver was setting as follow:

Central frequency [MHz]	SPAN [MHz]	Detector	Resolution Bandwidth [kHz]	Video Bandwidth [kHz]
Channel frequency	3	Max Peak	1000	3000

Table 21: EMI Receiver configuration – Maximum Peak Conducted Output Power

4.4.5 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
12/07/2023	Javier Nadales	--	23.5	61.8	1004.3

Table 22: Test environmental conditions – Maximum Peak Conducted Output Power

4.4.6 Summary Test Results

Channel	Central Frequency [MHz]	Peak Power [dBm]	Antenna Gain [dBi]	E.I.R.P [dBm]	Limit [dBm]	Results
37	2402	-3.9	+3.3	-0.6	30.0	PASS
17	2440	-4.8	+3.3	-1.5	30.0	PASS
39	2480	-7.5	+3.3	-4.2	30.0	PASS

Table 23: Summary Test Results – Maximum Peak Conducted Output Power

4.4.7 Test Setup Photographs

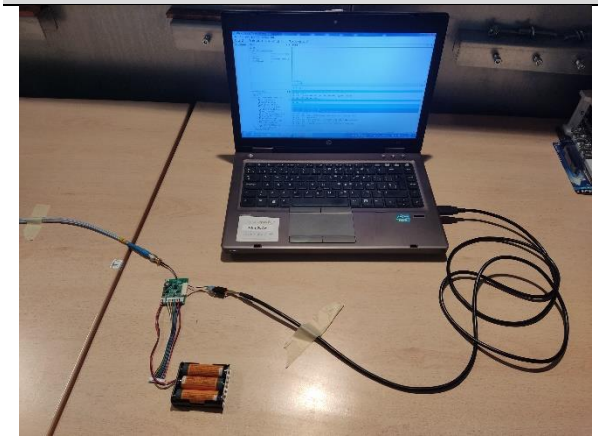
Maximum Peak Conducted Power– TEST SETUP	
	

Table 24. Test Setup – Maximum Peak Conducted Output Power

4.4.8 Test Results

4.4.8.1 Sample #1. Mode 1. Channel Low

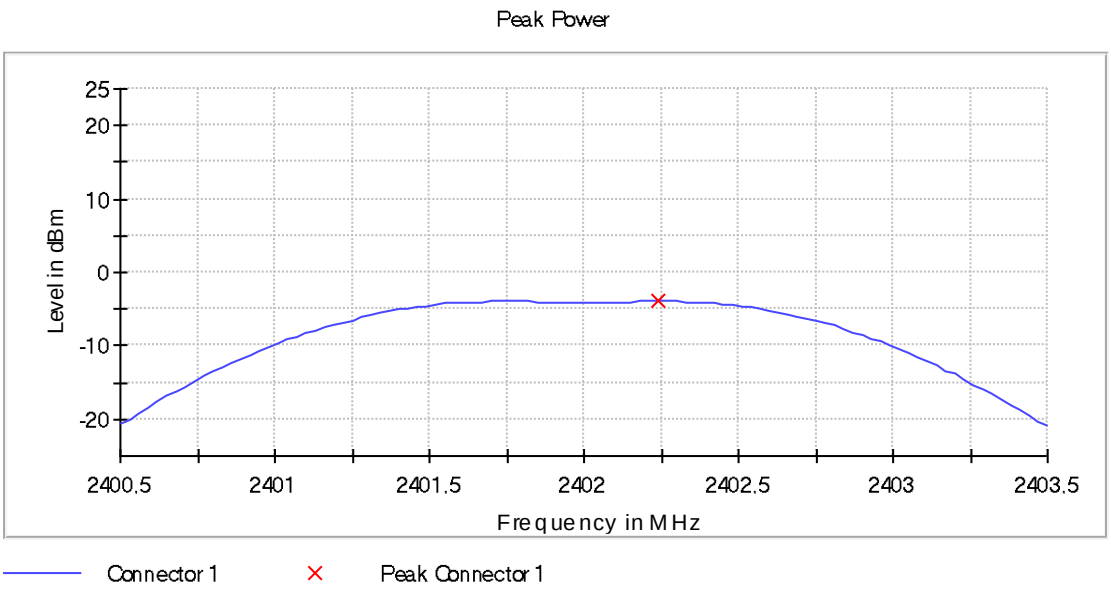


Fig. 10: Channel Low- Maximum Peak Conducted Output Power

4.4.8.2 Sample #1. Mode 1. Channel Middle

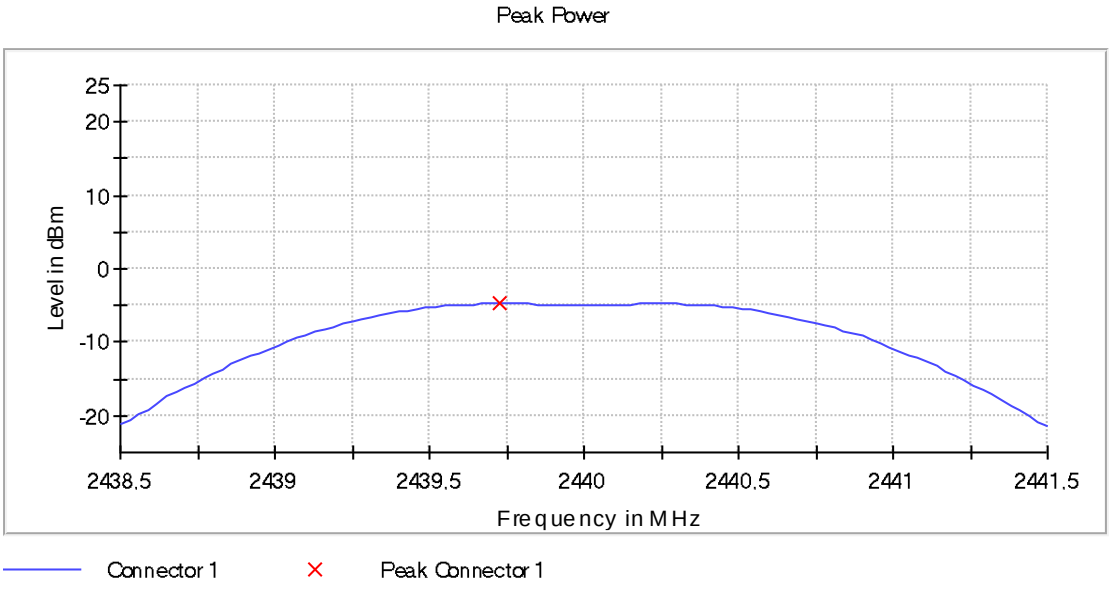


Fig. 11: Channel Middle - Maximum Peak Conducted Output Power

4.4.8.3 Sample #1. Mode 1. Channel High

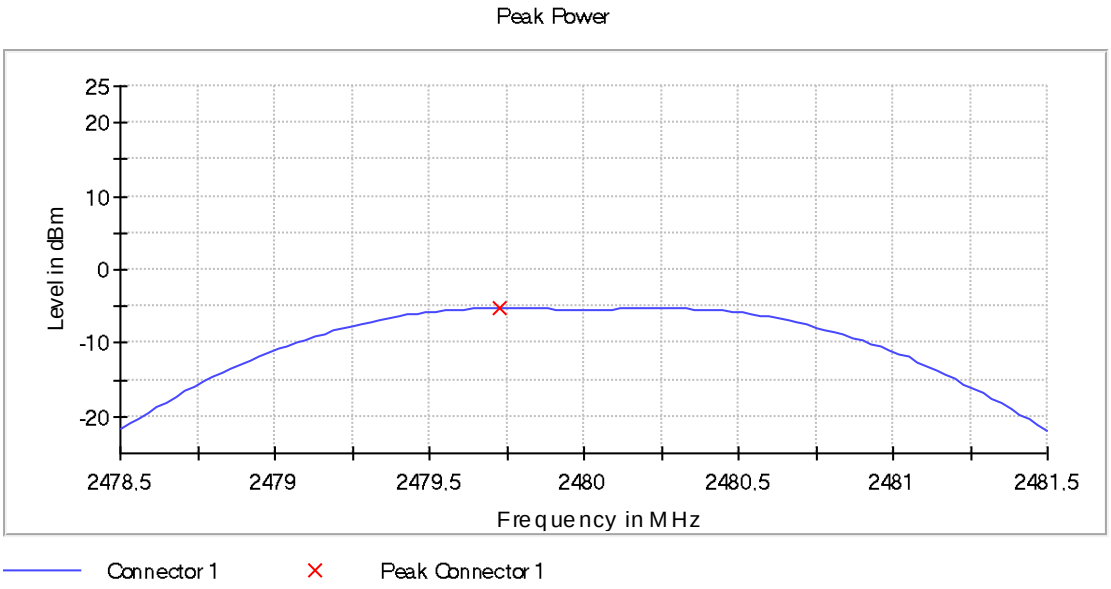


Fig. 12: Channel High - Maximum Peak Conducted Output Power

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 25: 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 26: 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: Setup of table top equipment - Power Spectral Density

4.5.2 Test Procedure

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ [3 × RBW].
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

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	1.5 x DTS Bandwidth	Max Peak	10	30

Table 27: EMI Receiver configuration – Power Spectral Density

4.5.5 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
12/07/2023	Javier Nadales	--	23.5	61.8	1004.3

Table 28: Test environmental conditions – Power Spectral Density

4.5.6 Summary Test Results

Channel	Central Frequency [MHz]	PSD [dBm]	Limit [dBm]	Results
37	2402	-8.819	8.0	PASS
17	2440	-9.487	8.0	PASS
39	2480	-9.853	8.0	PASS

Table 29: Summary Test Results – Power Spectral Density

4.5.7 Test Setup Photographs

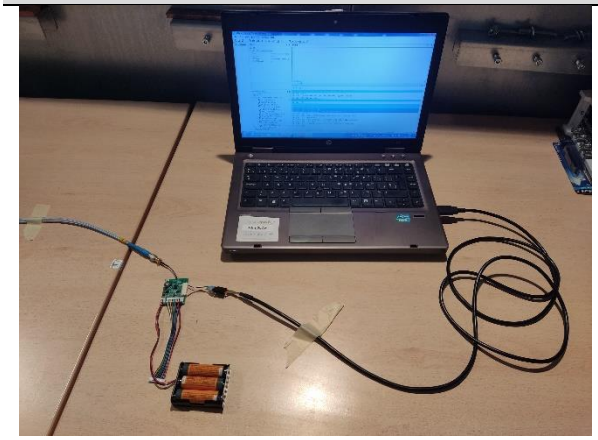
Power Spectral Density – TEST SETUP	
	

Table 30. Test Setup – Power Spectral Density

4.5.8 Test Results

4.5.8.1 Sample #1. Mode 1. Channel Low

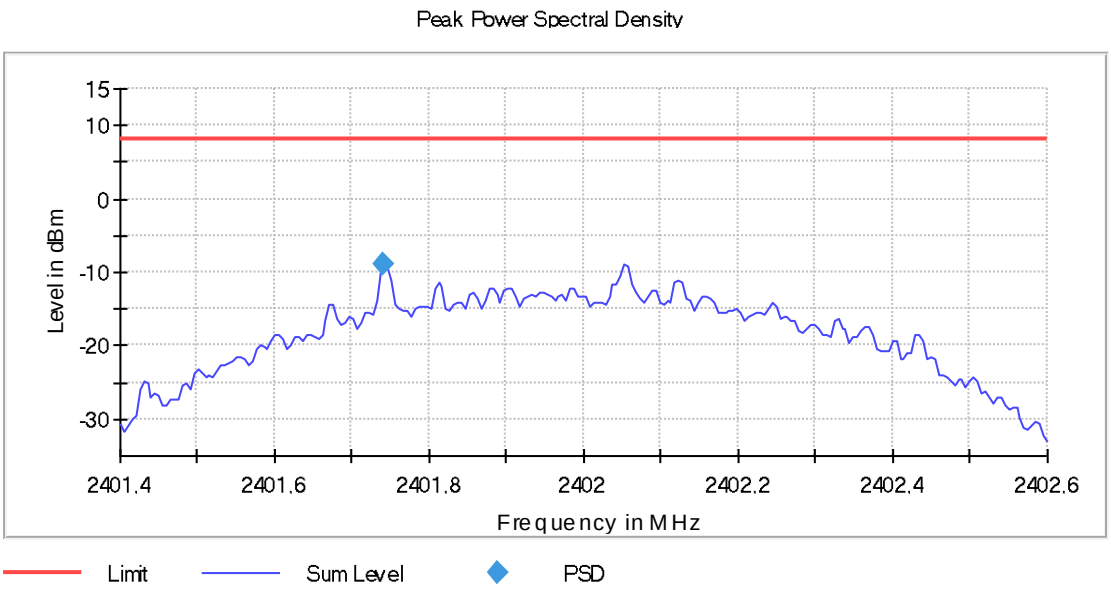


Fig. 14: Channel Low - Power Spectral Density

4.5.8.2 Sample #1. Mode 1. Channel Middle

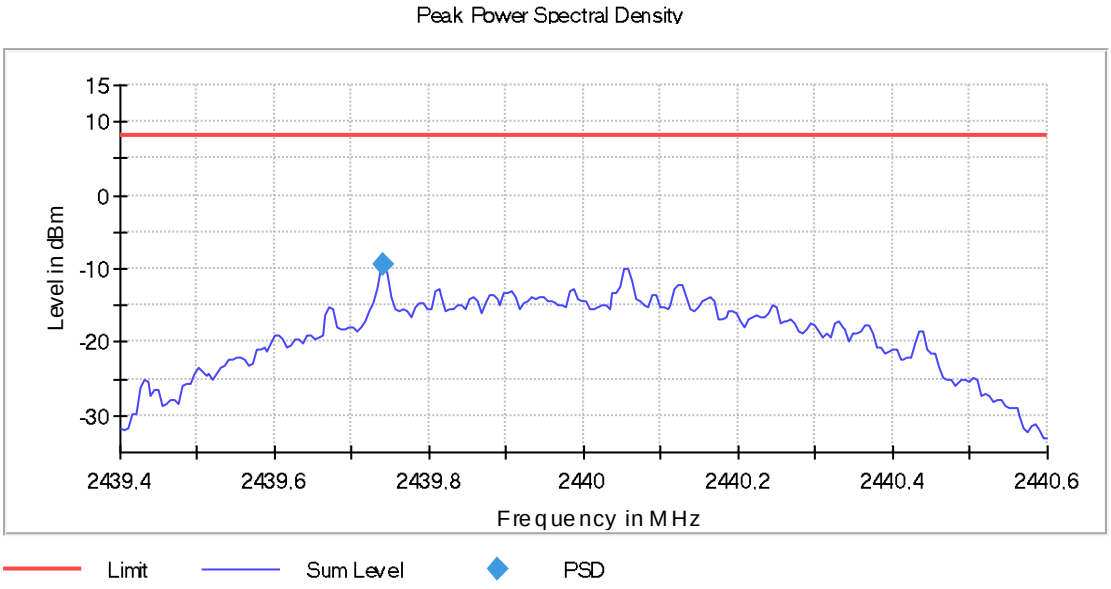


Fig. 15: Channel Middle - Power Spectral Density

4.5.8.3 Sample #1. Mode 1. Channel High

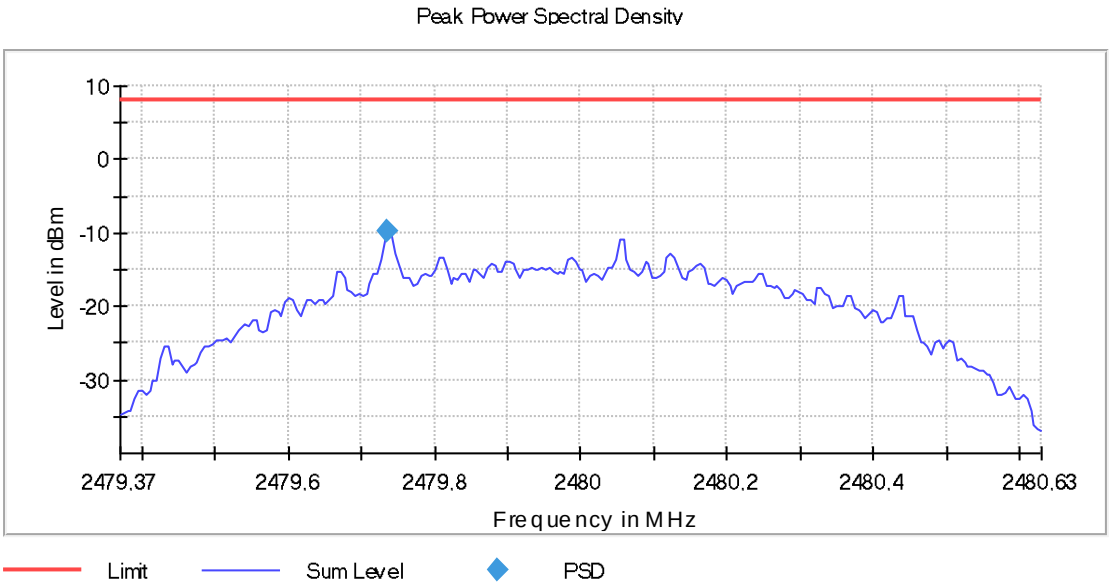


Fig. 16: Channel High- Power Spectral Density

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 31: Test Instruments – Power Spectral Density

4.5.10 Uncertainty

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

Table 32: Uncertainties - Power Spectral Density

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

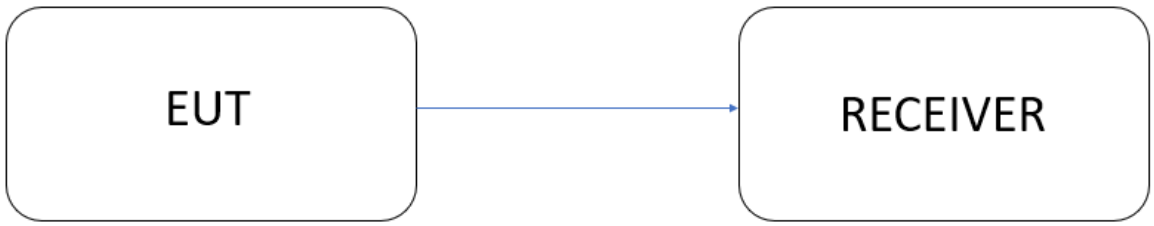


Fig. 17: Setup of table top equipment - Band Edge

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 MHz	Max Peak	100	300

Table 33: EMI Receiver configuration – Band Edge

4.6.5 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
12/07/2023	Javier Nadales	--	23.5	61.8	1004.3

Table 34: Test environmental conditions – Band Edge

4.6.6 Summary Test Results

Channel	Central Frequency [MHz]	Band Edge	Limit [dBm]	Results
37	2402	PK < Limit - I	-24.6	PASS
39	2480	PK < Limit - I	-25.6	PASS

Table 35: Summary Test Results – Band Edge

4.6.7 Test Setup Photographs

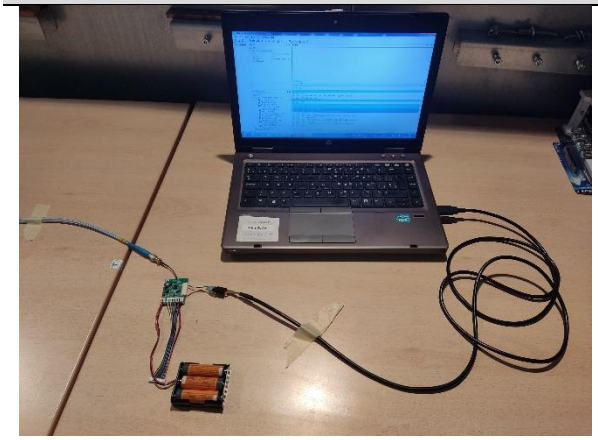
Band Edge – TEST SETUP	
	

Table 36. Test Setup – Band Edge

4.6.8 Test Results

4.6.8.1 Sample #1. Mode 1. Channel Low

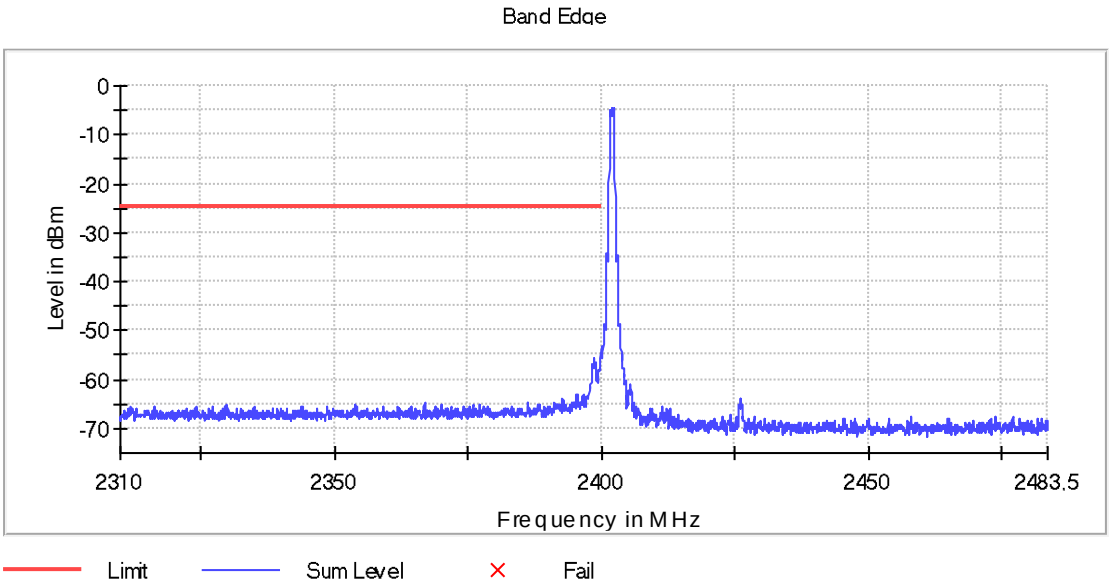


Fig. 18: Channel Low - Band Edge

FINAL MEASUREMENTS

Frequency [MHz]	Level [dBm]	Margin [dB]	Limit [dBm]
2399.949	-53.2	28.6	-24.6
2399.899	-55.5	30.8	-24.6
2398.599	-55.7	31.0	-24.6
2398.549	-56.1	31.5	-24.6
2398.649	-56.4	31.8	-24.6
2398.749	-56.5	31.9	-24.6
2398.849	-56.6	32.0	-24.6
2399.849	-56.7	32.1	-24.6
2398.799	-56.8	32.2	-24.6
2398.349	-56.8	32.2	-24.6
2398.299	-57.1	32.5	-24.6
2398.899	-57.2	32.5	-24.6
2398.399	-57.3	32.6	-24.6
2398.699	-57.3	32.6	-24.6
2399.799	-57.5	32.8	-24.6

Table 37: Channel Low - Band Edge

4.6.8.2 Sample #1. Mode 1. Channel High

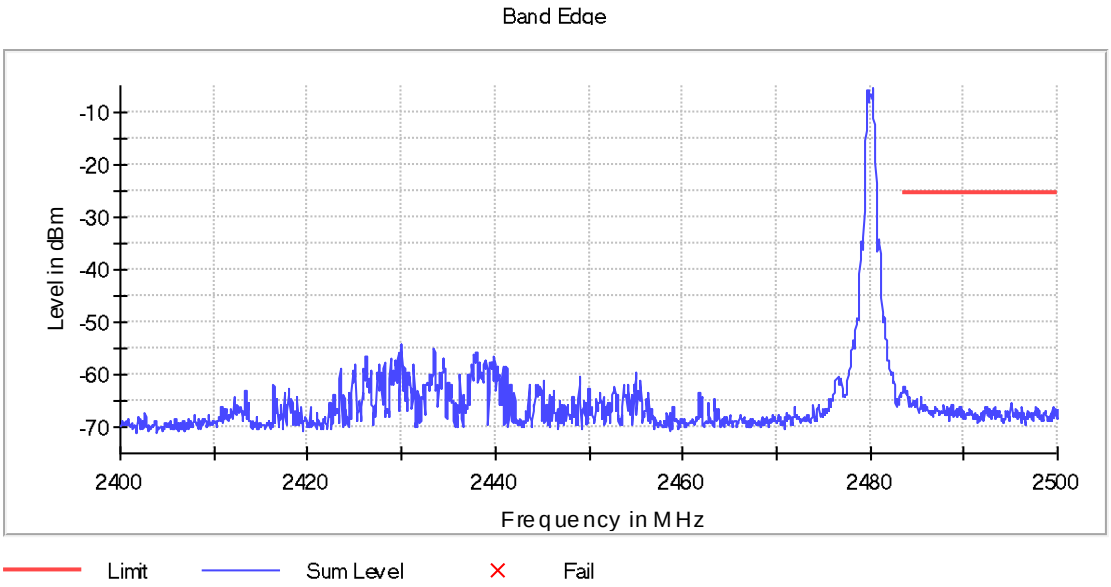


Fig. 19: Channel High - Band Edge

FINAL MEASUREMENTS

Frequency [MHz]	Level [dBm]	Margin [dB]	Limit [dBm]
2483.600	-62.2	36.6	-25.6
2483.650	-62.5	36.9	-25.6
2483.550	-63.0	37.4	-25.6
2483.951	-63.3	37.7	-25.6
2483.700	-63.3	37.8	-25.6
2483.800	-63.4	37.9	-25.6
2484.001	-63.6	38.0	-25.6
2483.750	-63.6	38.0	-25.6
2483.901	-63.9	38.4	-25.6
2483.851	-63.9	38.4	-25.6
2484.101	-64.4	38.8	-25.6
2484.202	-64.4	38.8	-25.6
2485.405	-64.4	38.9	-25.6
2484.904	-64.5	39.0	-25.6
2484.151	-64.6	39.0	-25.6

Table 38. 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 39: Test Instruments – Band Edge

4.6.10 Uncertainty

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

Table 40: Uncertainties - Band Edge

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

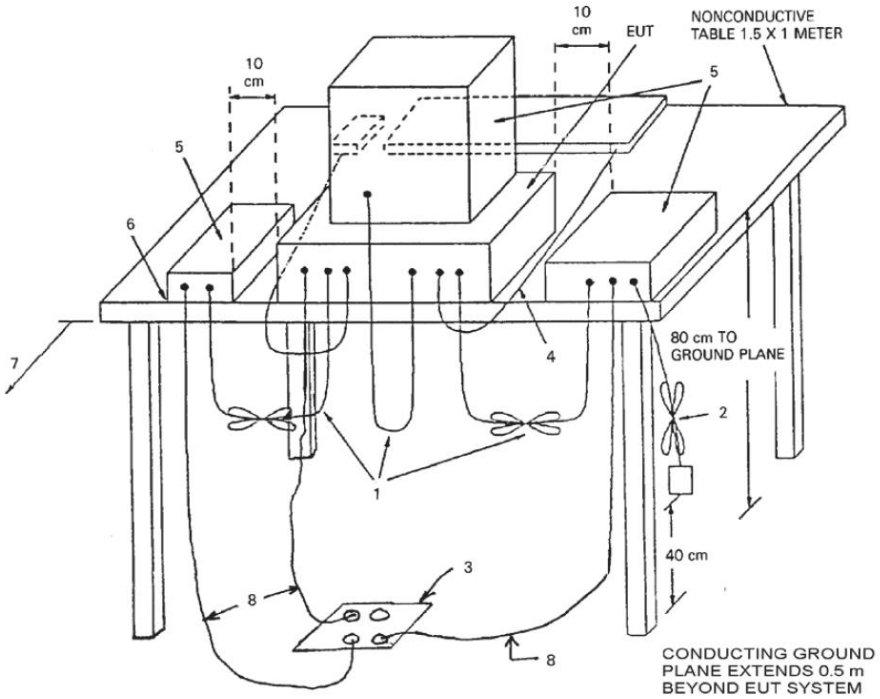


Fig. 20: Radio-frequency radiated emissions setup of table top equipment.

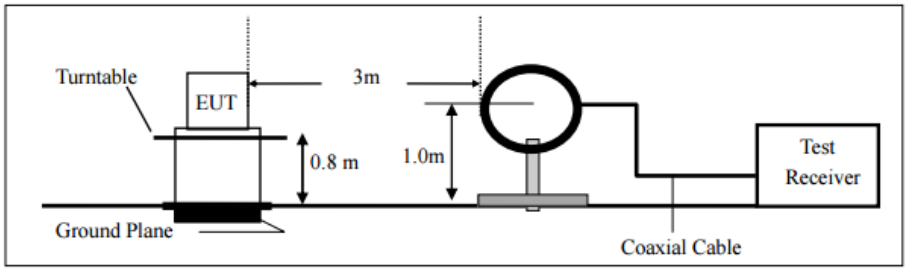


Fig. 21: Radio-frequency radiated emissions of table top equipment from 9 kHz to 30 MHz

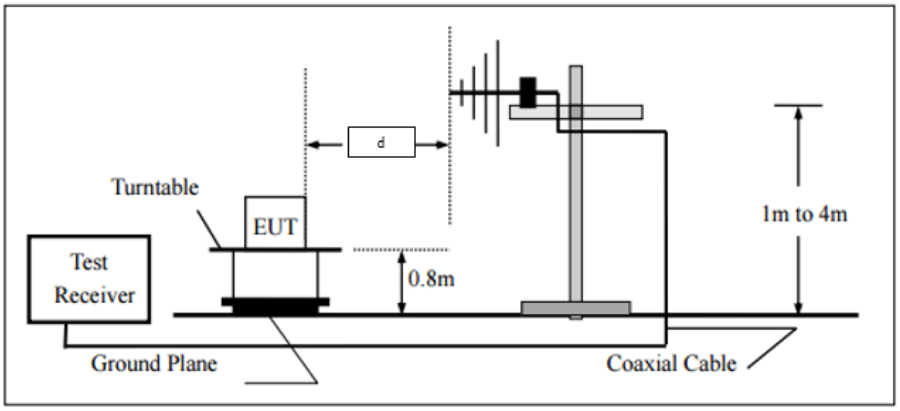


Fig. 22: Radio-frequency radiated emissions of table top equipment from 30 MHz to 1000 MHz

Distance "d" depends on test chamber.

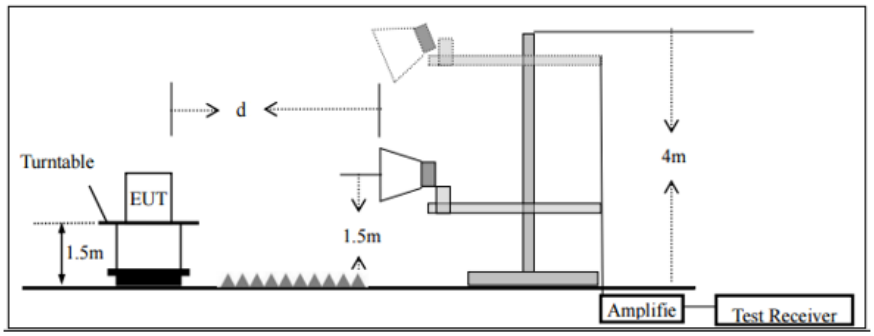


Fig. 23: Radio-frequency radiated emissions setup of table top equipment above 1 GHz

Distance "d" depends on test chamber.

4.7.1.2 Floor standing equipment

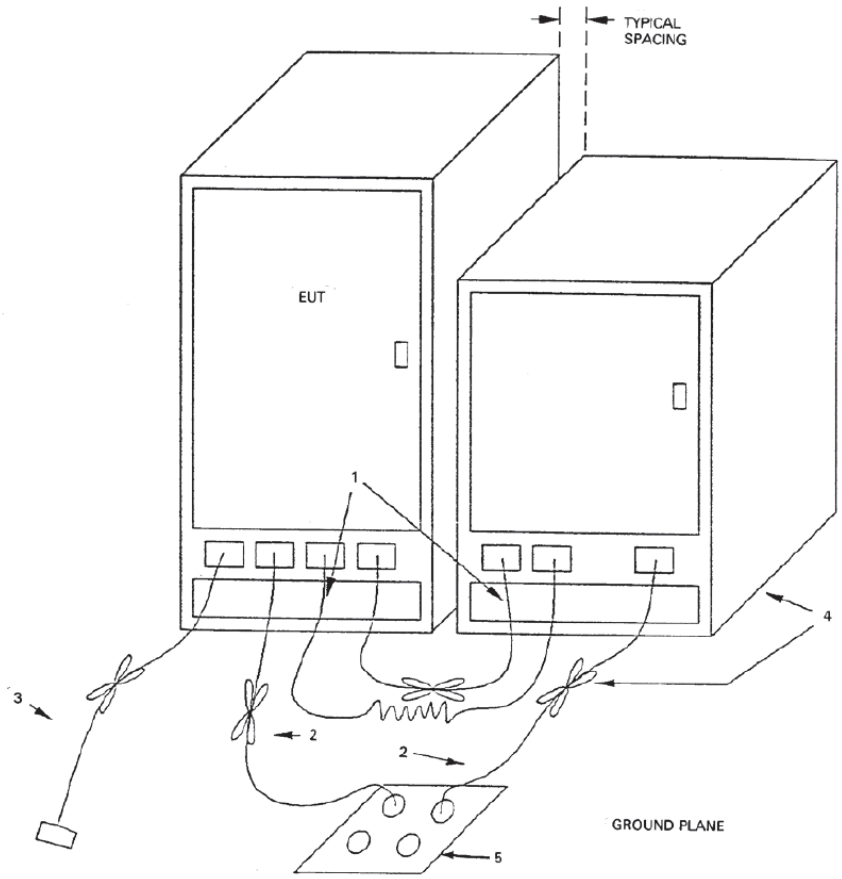


Fig. 24: Radio-frequency radiated emissions of floor-standing setup equipment.

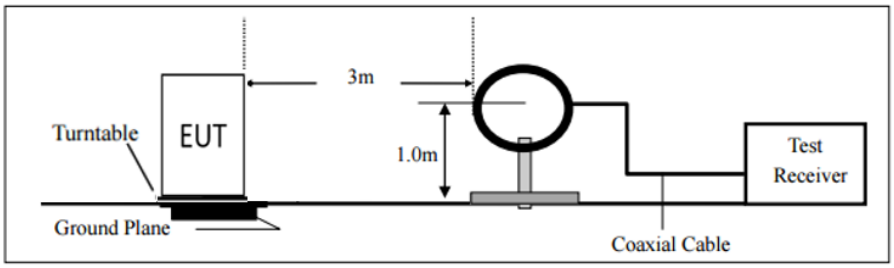


Fig. 25: Radio-frequency radiated emissions of floor-standing setup equipment from 9 kHz to 30 MHz

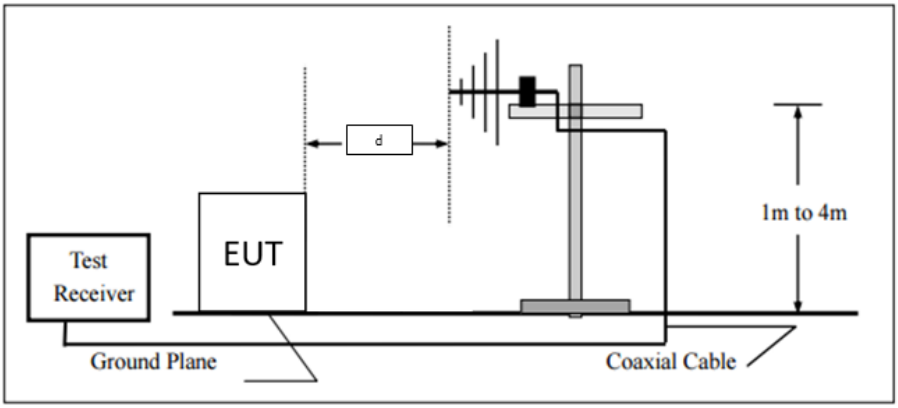


Fig. 26: Radio-frequency radiated emissions of floor-standing setup equipment from 30 MHz to 1000 MHz

Distance "d" depends on test chamber.

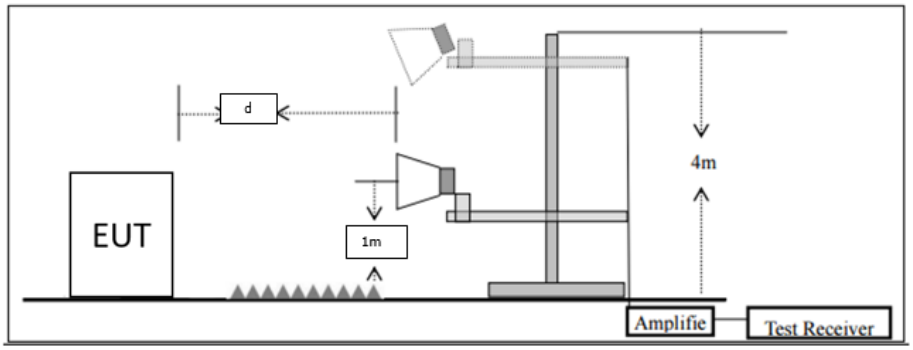


Fig. 27: Radio-frequency radiated emissions of floor-standing setup equipment above 1 GHz

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 41. 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 42: General Requirements - Radio-frequency radiated emissions limits

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, the limits are:

Frequency [MHz]	Test Mode	Field strength [µV/m]	Measurement distance [m]
30 – 18000	Peak power	-20 dBc	3
18000 - 40000	/ RMS averaging	/ -30 dBc	1

Table 43. Radiated Emission limits

4.7.3.2 Receiver Parameters

According to standard ANSI C63.10:2013:

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 44: Receiver parameters – Radio-frequency radiated emissions

4.7.4 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
13/10/2023	Javier Nadales	-	21.3	71.3	1004.1
14/10/2023	Jose María Llauradó	-	20.7	69.5	1003.1
31/10/2023	Javier Nadales	-	22.4	57.2	982.0

Table 45: 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]
30MHz – 1GHz	SAC 1	3 m	Limit - I <= QP < Limit	PASS
1 GHz – 3.5 GHz	SAC 1	3 m	PK < Limit - I AVG < Limit - I	PASS
3.5 GHz – 18 GHz	SAC 1	3 m	PK < Limit - I Limit - I <= AVG < Limit	PASS
18 GHz – 26 GHz	SAC 1	1 m	PK < Limit - I AVG < Limit - I	PASS

Table 46: 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

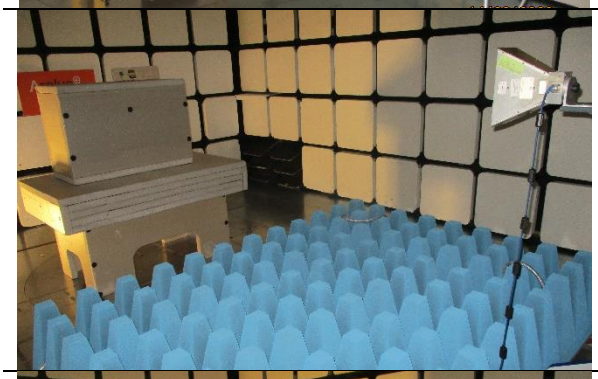
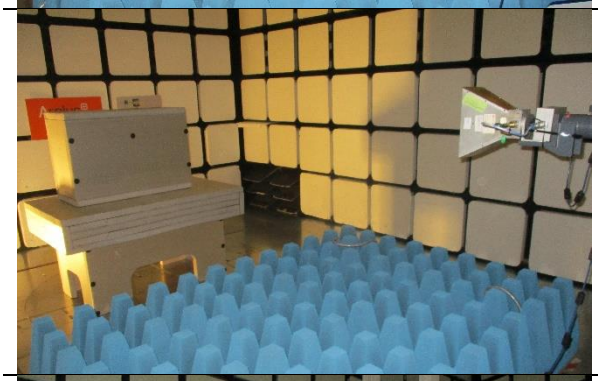
RADIO-FREQUENCY RADIATED EMISSIONS – TEST SETUP	
	
	
	
	

Table 47: Radio-frequency radiated emissions test setup

4.7.7 Test Results

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

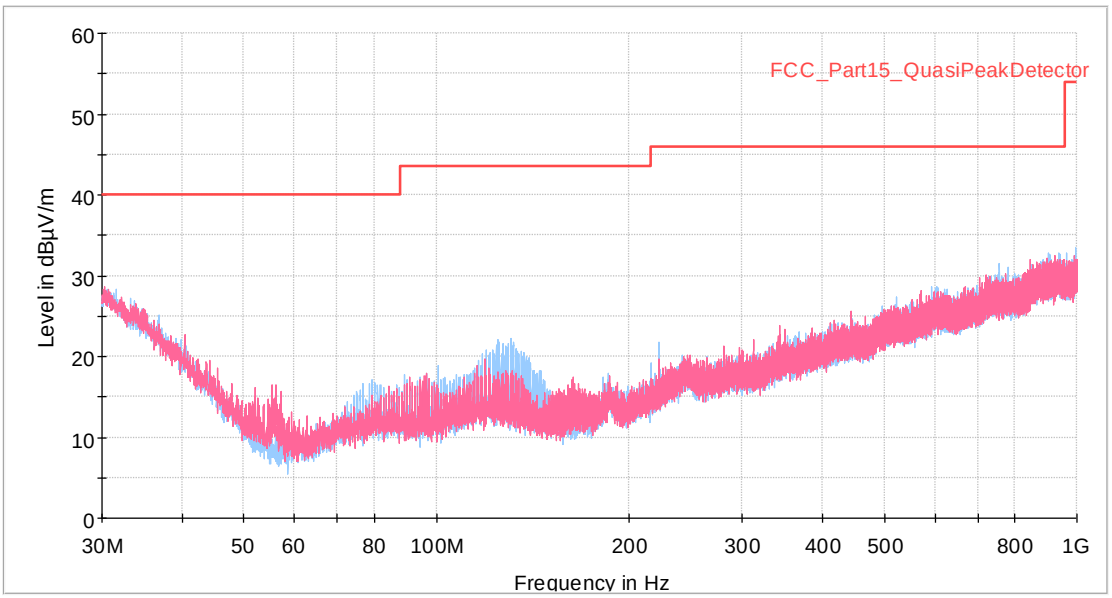


Fig. 28: Ambient level. Frequency range: 30 MHz – 1 GHz

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

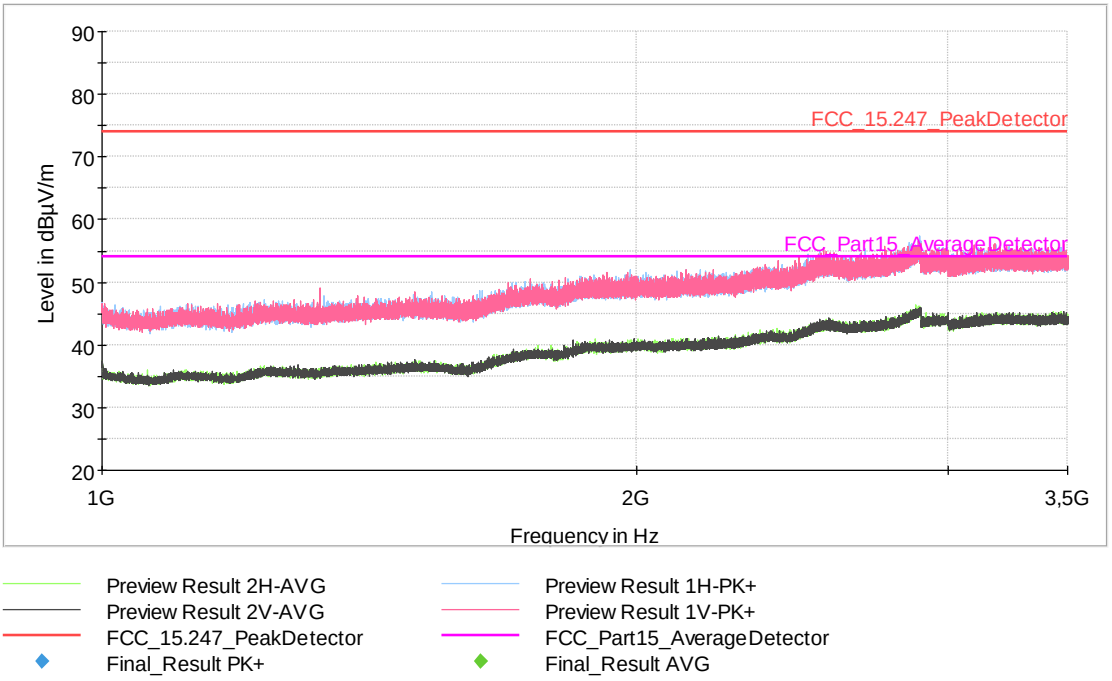


Fig. 29: Ambient level. Frequency range: 1 GHz – 3.5 GHz

4.7.7.3 Ambient Levels. Frequency range: 3.5 GHz – 18 GHz

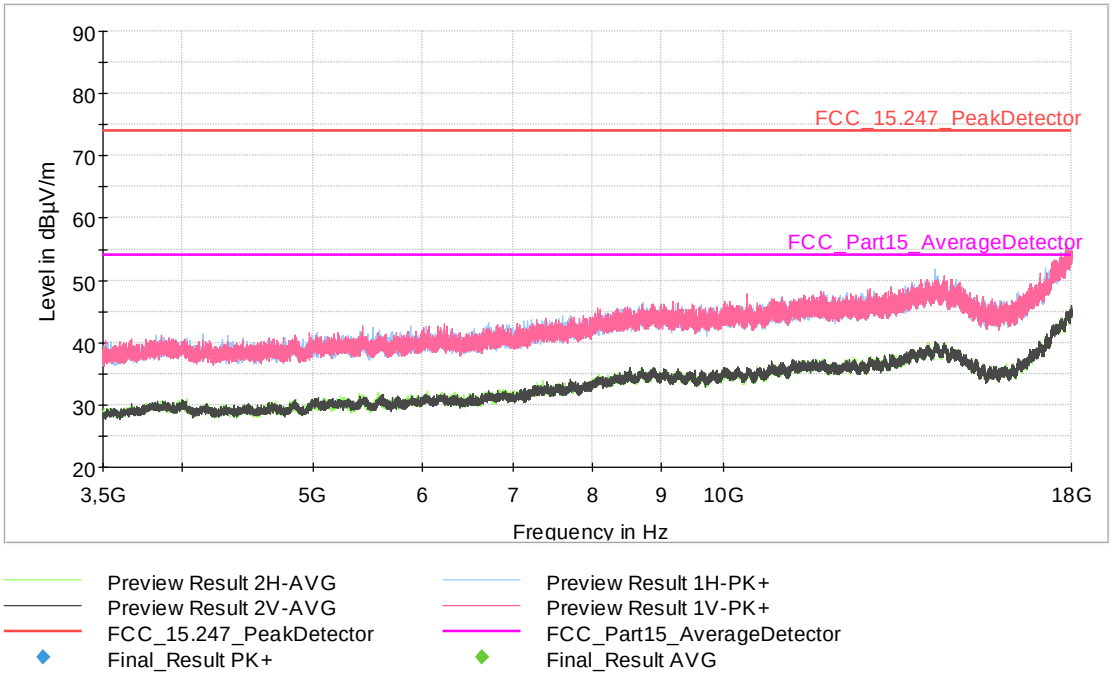


Fig. 30: Ambient level. Frequency range: 3.5 GHz – 18 GHz

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

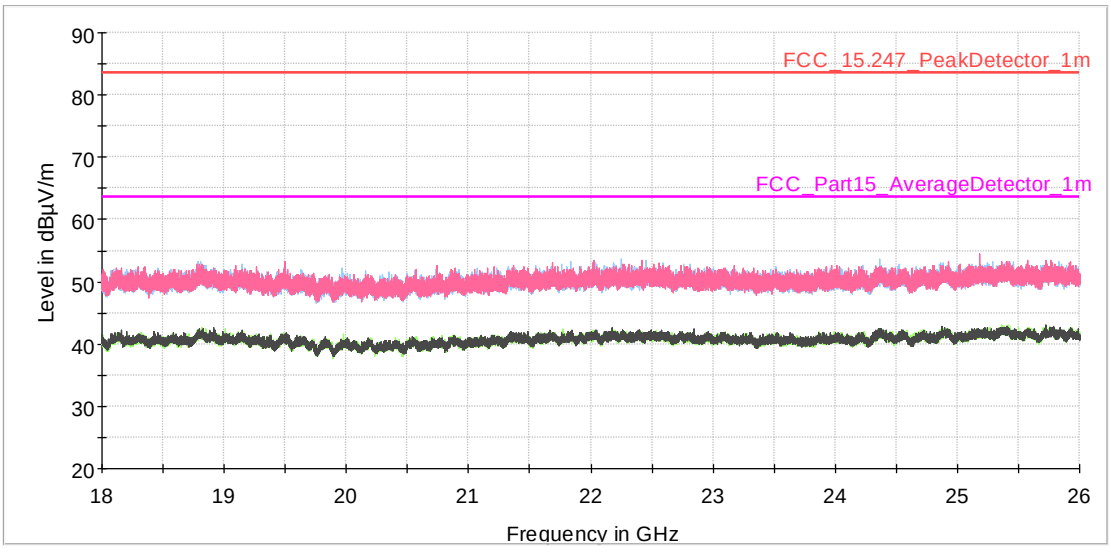


Fig. 31: Ambient level. Frequency range: 18 GHz – 26 GHz

4.7.7.5 Sample #2. Mode 1. Frequency range: 30 MHz – 1 GHz. Channel Low

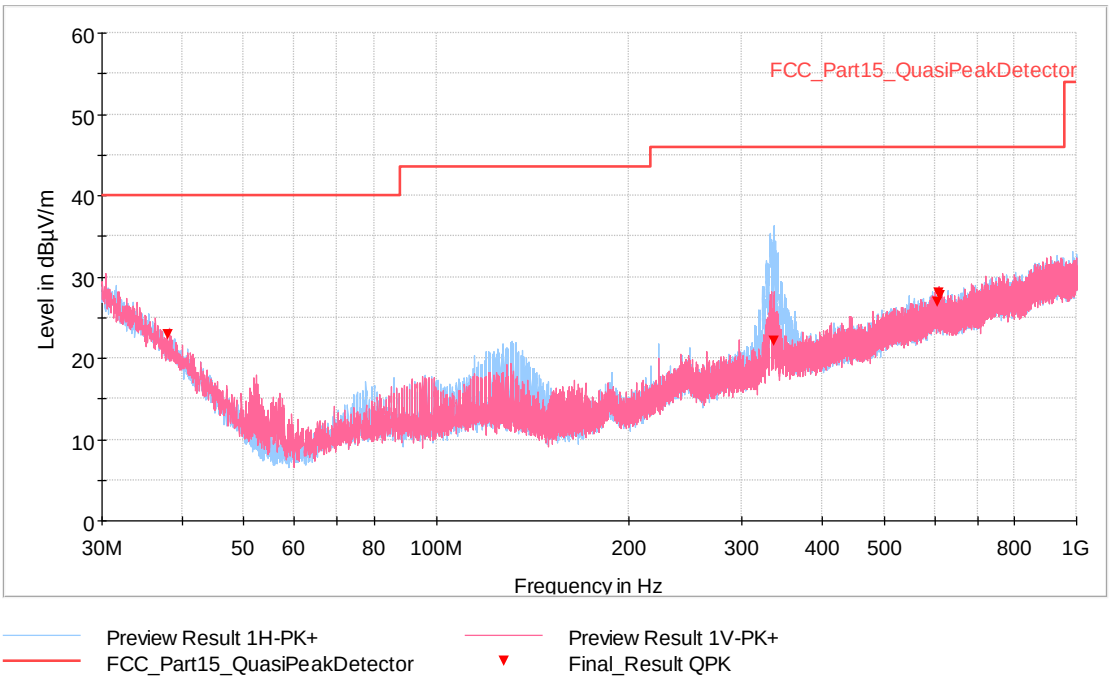


Fig. 32: Sample #2. Mode 1. Frequency range: 30 MHz – 1 GHz. Channel Low

FINAL MEASUREMENTS

Frequency [MHz]	QuasiPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]
38.083	22.84	40.00	17.16	100.0	V	174.0
332.607	20.31	46.00	25.69	110.0	H	21.0
334.905	22.09	46.00	23.91	115.0	H	0.0
608.125	26.88	46.00	19.12	100.0	V	0.0
610.000	27.94	46.00	18.06	110.0	H	63.0
612.051	27.62	46.00	18.38	100.0	V	15.0

Table 48: Sample #2. Mode 1. Frequency range: 30 MHz – 1 GHz. Channel Low

4.7.7.6 Sample #2. Mode 1. Frequency range: 30 MHz – 1 GHz. Channel Middle

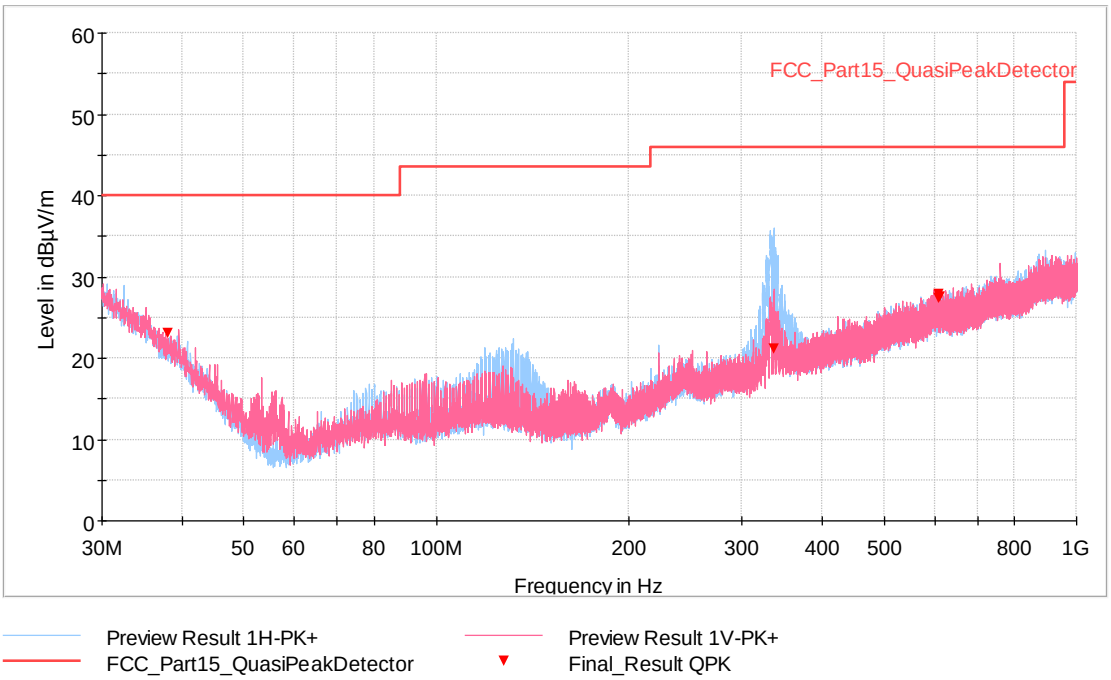


Fig. 33: Sample #2. Mode 1. Frequency range: 30 MHz – 1 GHz. Channel Middle

FINAL MEASUREMENTS

Frequency [MHz]	QuasiPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]
38.000	23.01	40.00	16.99	100.0	V	113.0
332.478	21.13	46.00	24.87	105.0	H	349.0
334.778	21.13	46.00	24.87	100.0	H	0.0
609.550	27.42	46.00	18.58	115.0	H	245.0
610.766	27.92	46.00	18.08	100.0	V	32.0
612.000	27.55	46.00	18.45	100.0	V	0.0

Table 49: Sample #2. Mode 1. Frequency range: 30 MHz – 1 GHz. Channel Middle

4.7.7.7 Sample #2. Mode 1. Frequency range: 30 MHz – 1 GHz. Channel High

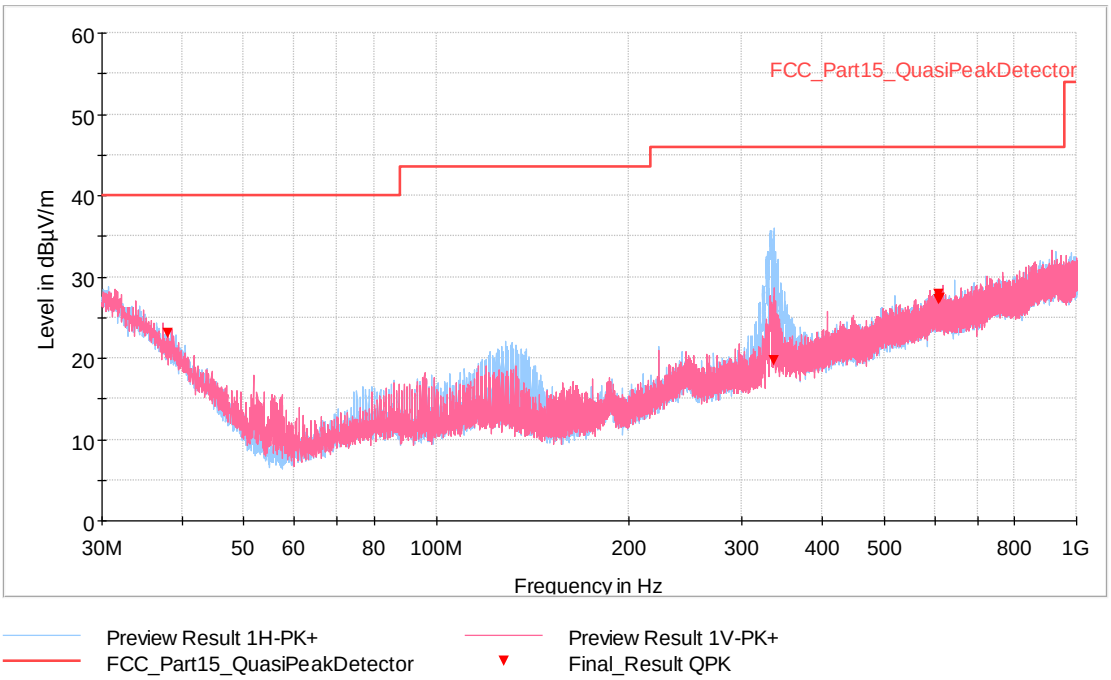


Fig. 34: Sample #2. Mode 1. Frequency range: 30 MHz – 1 GHz. Channel High

FINAL MEASUREMENTS

Frequency [MHz]	QuasiPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]
38.051	22.97	40.00	17.03	100.0	V	197.0
332.252	21.80	46.00	24.20	100.0	H	0.0
336.552	19.63	46.00	26.37	104.0	H	0.0
608.831	27.21	46.00	18.79	100.0	V	197.0
610.027	27.81	46.00	18.19	100.0	H	19.0
612.000	27.38	46.00	19.62	100.0	V	4.0

Table 50: Sample #2. Mode 1. Frequency range: 30 MHz – 1 GHz. Channel High

4.7.7.8 Sample #2. Mode 1. Frequency range: 1 GHz – 3.5 GHz. Channel Low

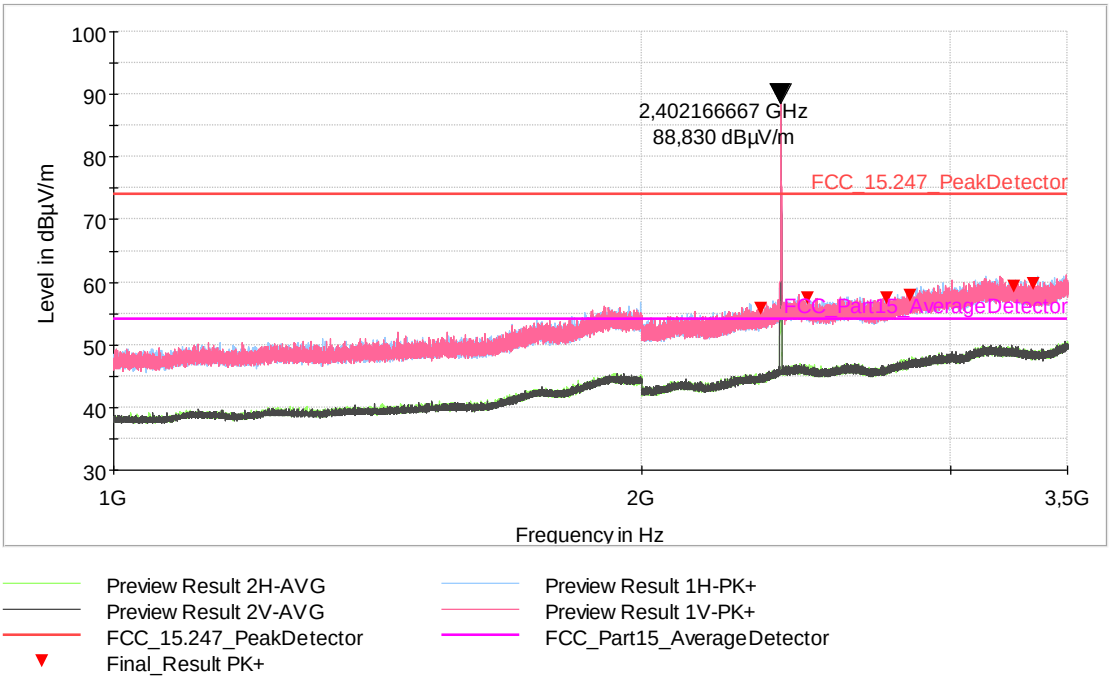


Fig. 35: Sample #2. Mode 1. Frequency range: 1 GHz – 3.5 GHz. Channel Low

FINAL MEASUREMENTS

Frequency [MHz]	MaxPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]
2341.666	55.84	74.00	18.16	152.0	V	217.0
2490.000	57.48	74.00	16.52	135.0	V	33.0
2760.166	57.51	74.00	16.49	150.0	H	0.0
2847.125	57.92	74.00	16.08	163.0	V	242.0
3263.916	59.32	74.00	14.68	150.0	V	0.0
3346.000	59.77	74.00	14.23	160.0	V	357.0

4.7.7.9 Sample #2. Mode 1. Frequency range: 1 GHz – 3.5 GHz. Channel Middle

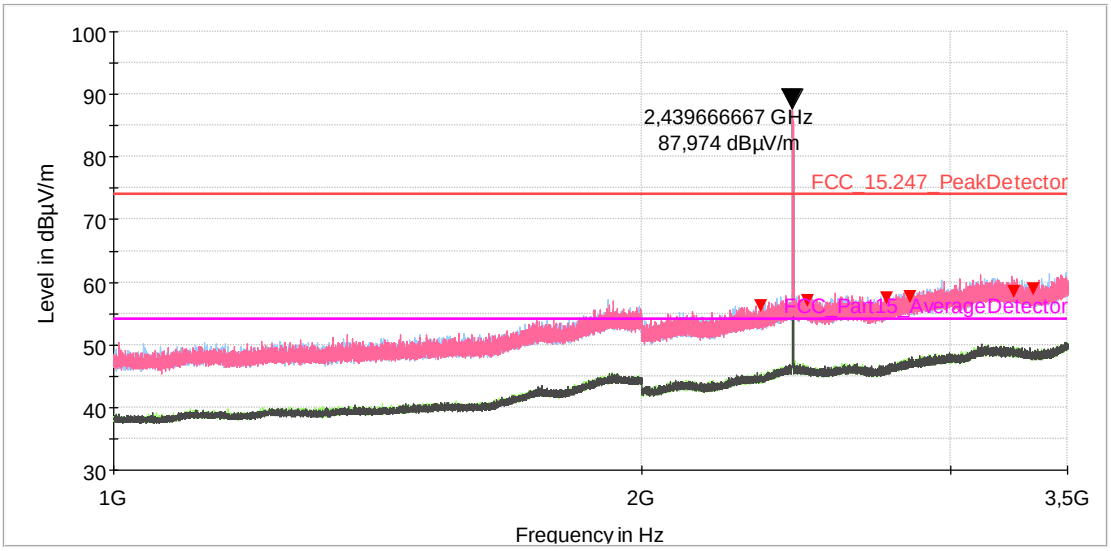


Fig. 36: Sample #2. Mode 1. Frequency range: 1 GHz – 3.5 GHz. Channel Middle

FINAL MEASUREMENTS

Frequency [MHz]	MaxPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]
2341.166	56.21	74.00	17.79	155.0	V	2.0
2491.000	56.98	74.00	17.02	150.0	H	357.0
2763.083	57.34	74.00	16.66	162.0	H	219.0
2847.966	57.62	74.00	16.38	150.0	V	0.0
3263.275	58.55	74.00	15.45	158.0	H	174.0
3348.788	58.87	74.00	15.13	142.0	H	0.0

4.7.7.10 Sample #2. Mode 1. Frequency range: 1 GHz – 3.5 GHz. Channel High

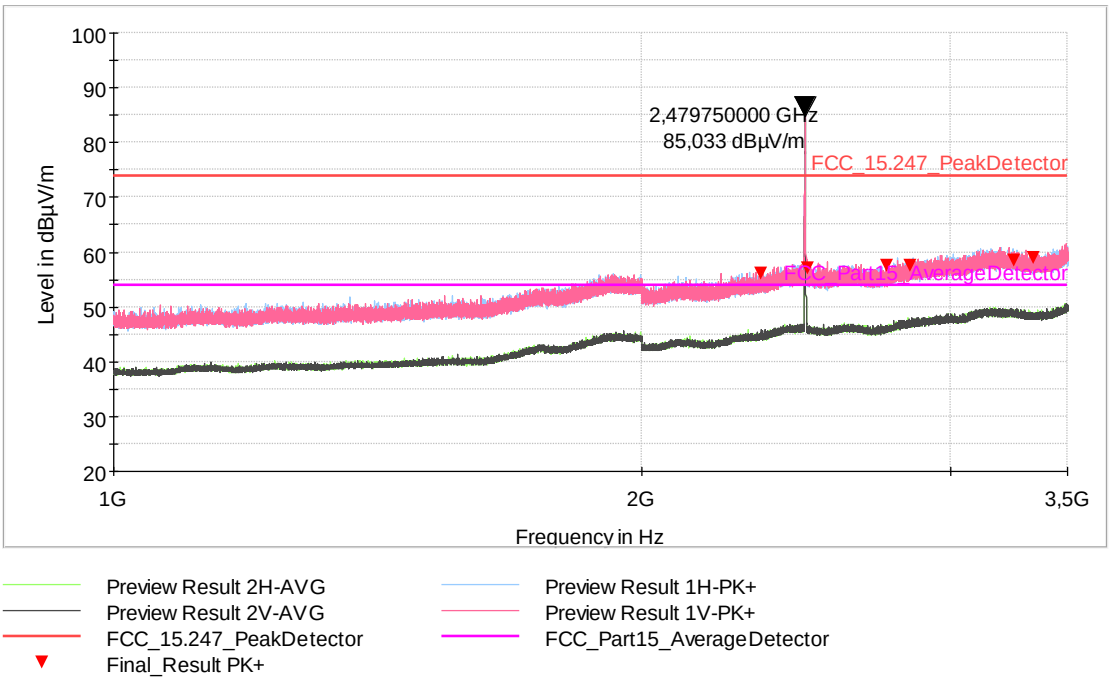


Fig. 37: Sample #2. Mode 1. Frequency range: 1 GHz – 3.5 GHz. Channel High

FINAL MEASUREMENTS

Frequency [MHz]	MaxPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]
2342.000	56.09	74.00	17.91	167.0	H	0.0
2490.166	57.07	74.00	16.93	155.0	V	359.0
2762.833	57.43	74.00	16.57	150.0	H	31.0
2848.083	57.54	74.00	16.46	150.0	H	168.0
3263.916	58.42	74.00	15.58	158.0	V	354.0
3349.666	58.93	74.00	15.07	150.0	V	202.0

4.7.7.11 Sample #2. Mode 1. Frequency range: 3.5 GHz – 18 GHz. Channel Low

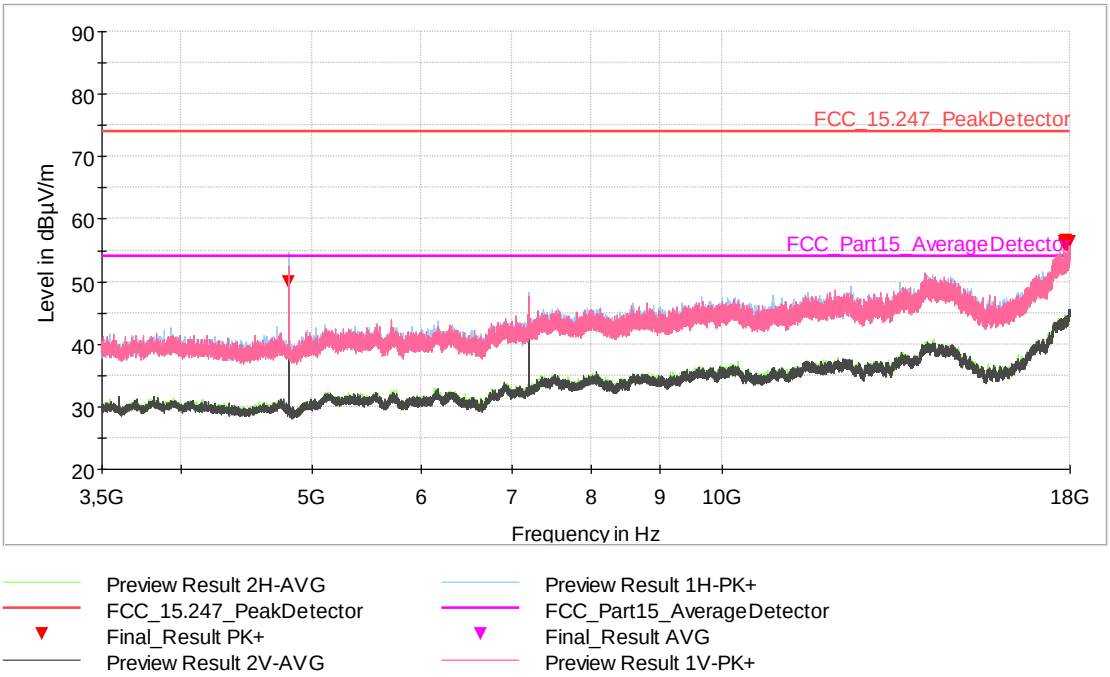


Fig. 38: Sample #2. Mode 1. Frequency range: 3.5 GHz – 18 GHz. Channel Low

FINAL MEASUREMENTS

Frequency [MHz]	MaxPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]
4803.066	49.84	74.00	24.16	100.0	H	2.0
17830.833	55.85	74.00	18.15	150.0	V	194.0
17854.033	56.42	74.00	17.58	150.0	H	24.0
17873.366	56.47	74.00	17.53	165.0	V	23.0
17913.000	55.67	74.00	18.33	150.0	H	91.0
17934.750	55.84	74.00	18.16	150.0	H	0.0
17984.533	56.29	74.00	17.71	160.0	V	312.0

Table 52: Sample #2. Mode 1. Frequency range: 3.5 GHz – 18 GHz. Channel Low

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.
Frequency emissions are >20 dB below Maximum Radiated Output Power. See 4.7.7.8

Note 2: Radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified in Table 43. See results in clause 4.7.7.12

4.7.7.12 Sample #2. Mode 1. Spurious emission restricted band. Channel Low

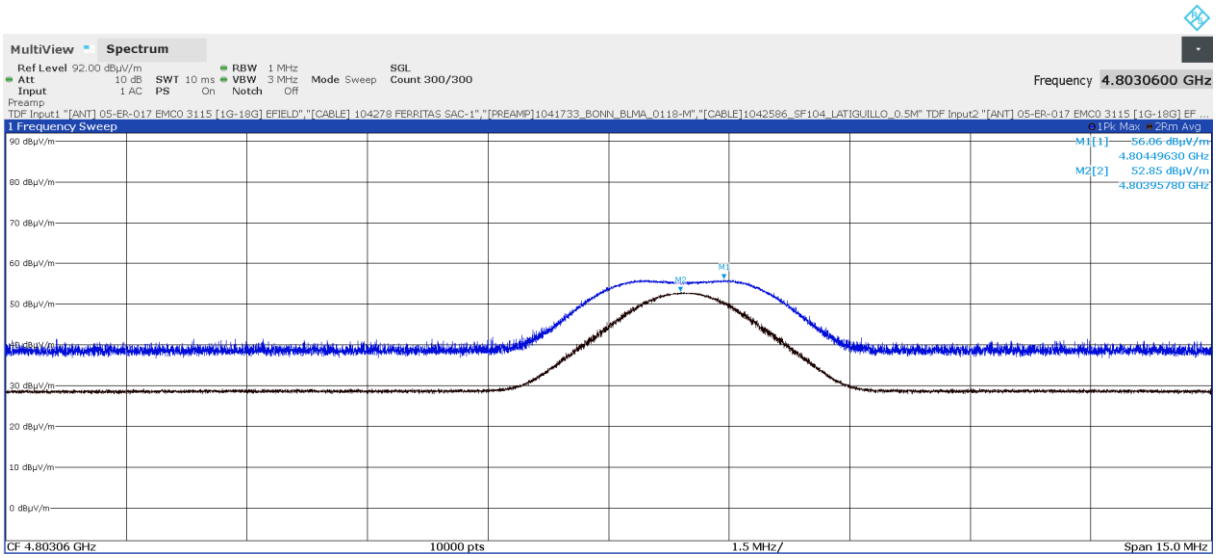


Fig. 39: Sample #2. Mode 1. Spurious frequency: 4803 MHz. Channel Low

4.7.7.13 Sample #2. Mode 1. Frequency range: 3.5 GHz – 18 GHz. Channel Middle

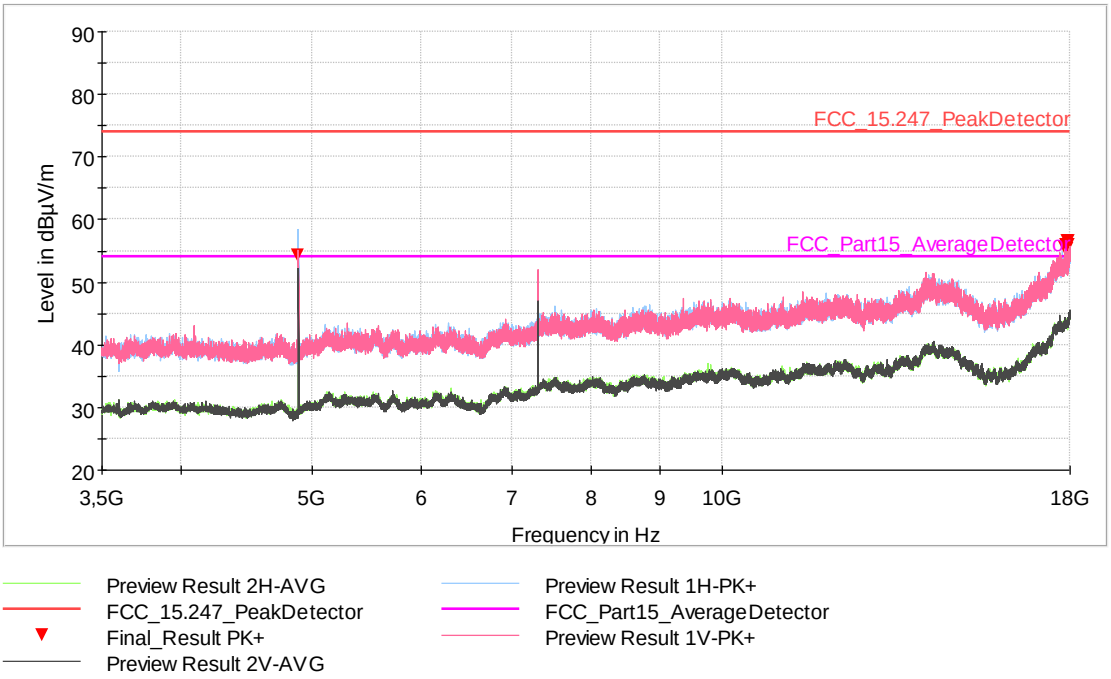


Fig. 40: Sample #2. Mode 1. Frequency range: 3.5 GHz – 18 GHz. Channel Middle

FINAL MEASUREMENTS

Frequency [MHz]	MaxPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]
4880.400	54.37	74.00	19.63	100.0	H	213.0
17850.650	55.54	74.00	18.46	150.0	H	237.0
17882.550	55.93	74.00	18.07	135.0	V	0.0
17912.516	55.36	74.00	18.64	155.0	V	148.0
17935.716	56.59	74.00	17.41	150.0	H	134.0
17963.266	56.47	74.00	17.53	148.0	H	52.0
17976.316	55.84	74.00	18.16	150.0	H	69.0
4880.400	54.37	74.00	19.63	100.0	H	213.0

Table 52: Sample #2. Mode 1. Frequency range: 3.5 GHz – 18 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.
Frequency emissions are >20 dB below Maximum Radiated Output Power. See 4.7.7.9

Note 2: Radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified in Table 43. See results in clause 4.7.7.14

4.7.7.14 Sample #2. Mode 1. Spurious emission restricted band. Channel Middle

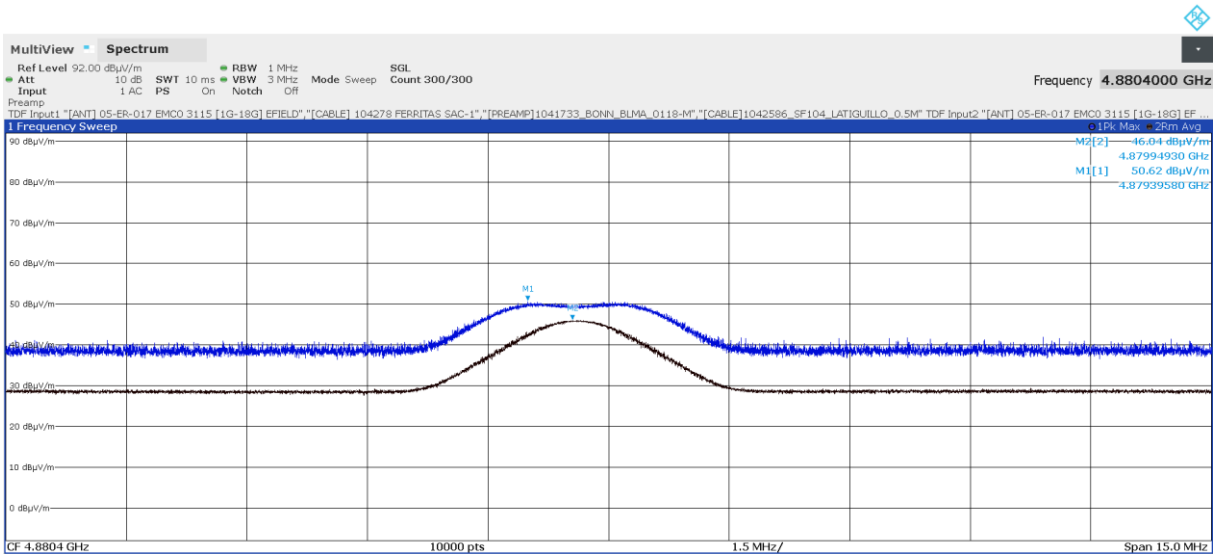


Fig. 41: Sample #2. Mode 1. Spurious frequency: 4880 MHz. Channel Middle

4.7.7.15 Sample #2. Mode 1. Frequency range: 3.5 GHz – 18 GHz. Channel High

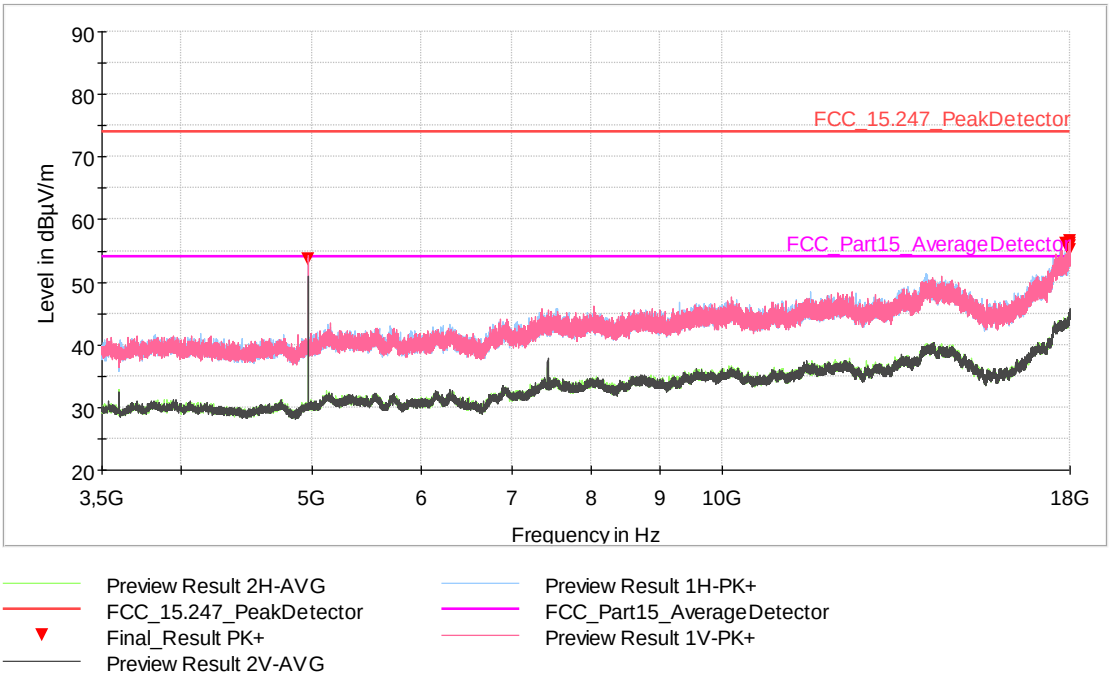


Fig. 42: Sample #2. Mode 1. Frequency range: 3.5 GHz – 18 GHz. Channel High

FINAL MEASUREMENTS

Frequency [MHz]	MaxPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]
4959.183	53.74	74.00	20.26	100.0	V	241.0
17892.700	56.04	74.00	17.96	150.0	H	1.0
17952.150	55.16	74.00	18.84	156.0	H	20.0
17983.083	56.18	74.00	17.83	150.0	H	261.0
17991.783	56.53	74.00	17.47	150.0	V	63.0
17995.166	55.01	74.00	18.99	132.0	H	127.0
17998.550	55.79	74.00	18.21	143.0	H	176.0

Table 52: Sample #2. Mode 1. Frequency range: 3.5 GHz – 18 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.
Frequency emissions are >20 dB below Maximum Radiated Output Power. See 4.7.7.10

Note 2: Radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified in Table 43 See results in clause 4.7.7.16

4.7.7.16 Sample #2. Mode 1. Spurious emission restricted band. Channel High

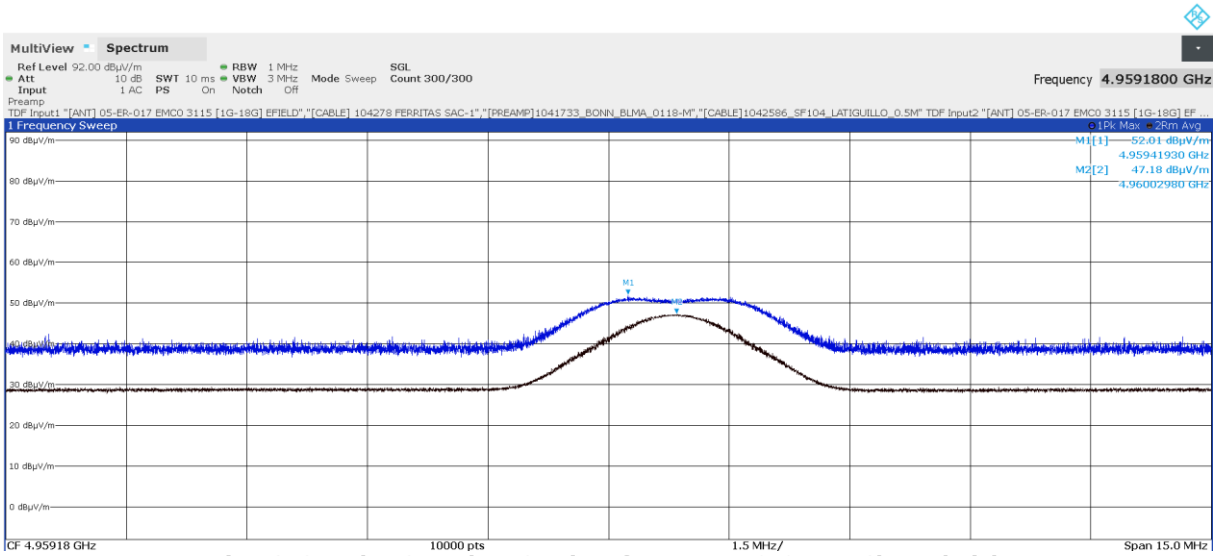
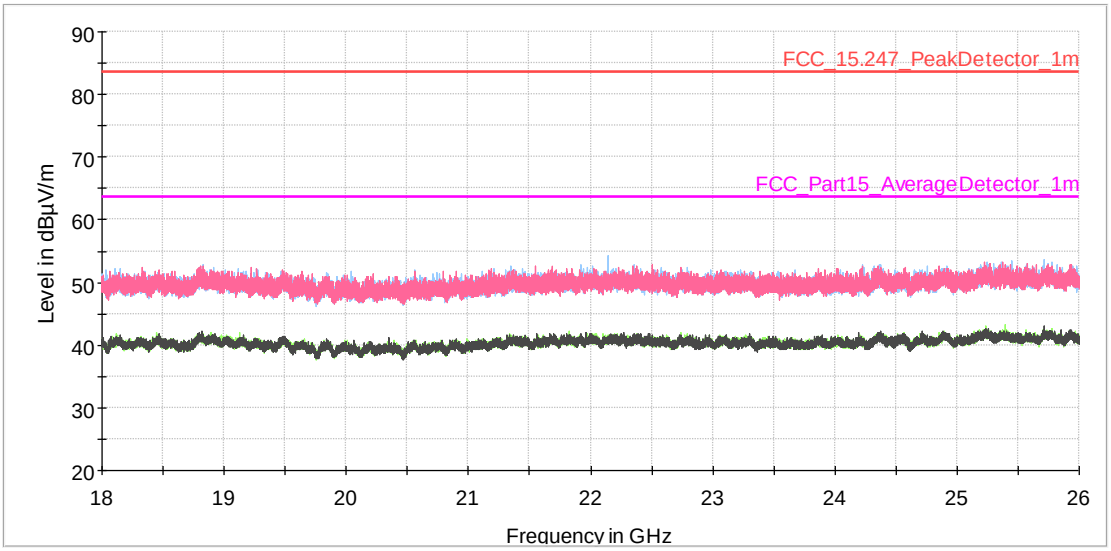


Fig. 43: Sample #2. Mode 1. Spurious frequency: 4959 MHz. Channel High

4.7.7.17 Sample #2. Mode 1. Frequency range: 18 GHz – 26 GHz. Channel Low



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. 44: Sample #2. Mode 1. Frequency range: 18 GHz – 26 GHz. Channel Low

FINAL MEASUREMENTS

No spurious detected.

4.7.7.18 Sample #2. Mode 1. Frequency range: 18 GHz – 26 GHz. Channel Middle

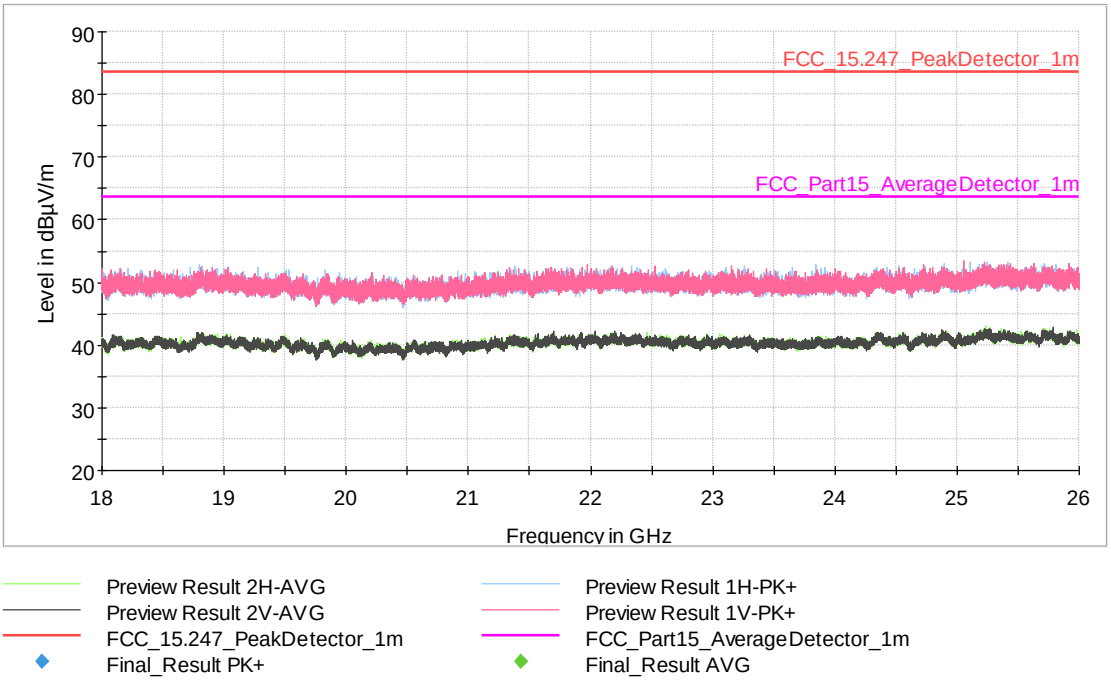


Fig. 45: Sample #2. Mode 1. Frequency range: 18 GHz – 26 GHz. Channel Middle

FINAL MEASUREMENTS

No spurious detected.

4.7.7.19 Sample #2. Mode 1. Frequency range: 18 GHz – 26 GHz. Channel High

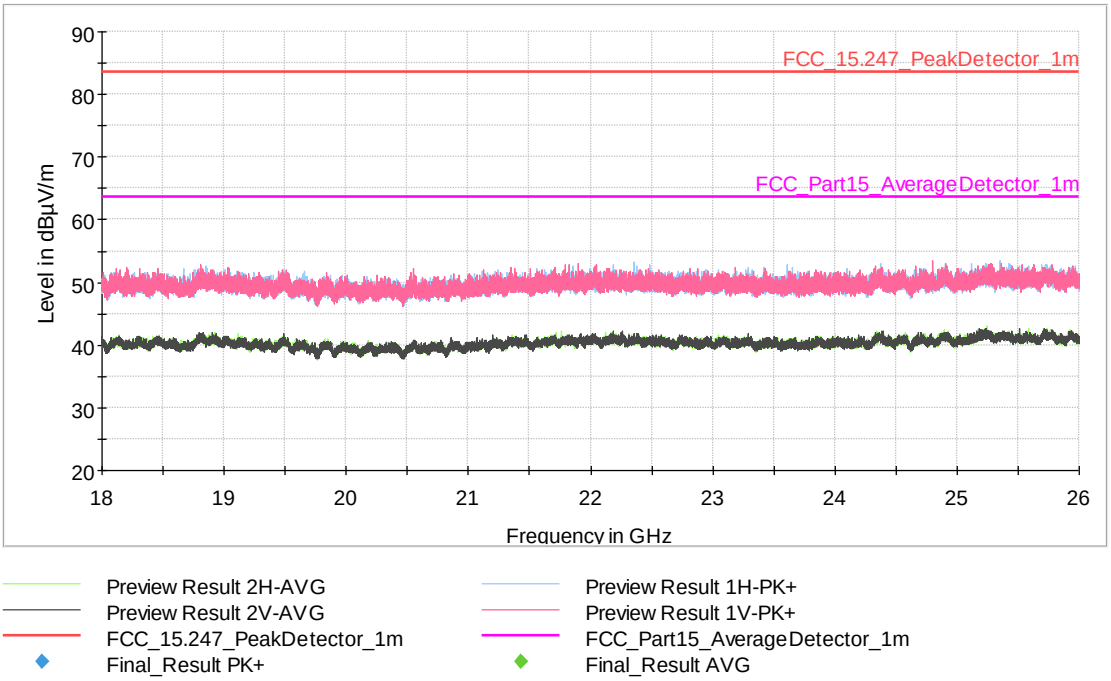


Fig. 46: Sample #2. Mode 1. Frequency range: 18 GHz – 26 GHz. Channel High

FINAL MEASUREMENTS

No spurious detected.

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	09/10/2023	09/10/2024
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
SEMIANECHOIC CHAMBER SAC1	EUROSHIELD	TC1	104446	12/10/2022	12/10/2024
TEST SOFTWARE	ROHDE & SCHWARZ	EMC32 v.10.50.00	104624	--	--
MAST-TABLE CONTROLLER	MATURO	NCD	1042758	--	--

Table 51: 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 52: 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%.