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File Number **24/36402498M1**

TEST REPORT
Radiofrequency

Petitioner's Reference:	**BARCELONA SMART TECHNOLOGIES, S.L.**		
Company Address:	C/ GUITARD 43 2-1 08014 BARCELONA		
Represented by:	Mayte Penella		
Equipment:	U-Spot		
Brand:	Urbiotica	PMN:	U-SPOT-3.0
Sample #1:	0080E11505C9FD18	Applus Id:	19168-00002
Sample #2:	0080E11505C9EE60	Applus Id:	19168-00003
Result:	**complies**		

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

Applicable Standard:	
Radio standard/s:	**FCC 47 CFR Part 15 Subpart C (October 2023)[1]** **RSS-Gen Issue 5 April 2018 + Amendment 1 (March 2019) + Amendment 2 (February 2021)[1]** **RSS-247 – Issue 3 (October 2023)[1]**

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

Dates and Test Site:	Applus Barcelona, Bellaterra
Equipment Reception Date	October 6, 2023
Test Initial Date:	October 13, 2023
Test Final Date:	December 4, 2023
Modification Description	M1

This report replaces and supersedes the report 24/36402498 dated on June 3 2024
Modifications performed:

- Eliminated Photographs. For confidentiality issues, all photographs are included in an annexed document. General Description and Test Setup photographs clauses are affected.

It is responsibility of the petitioner to replace the previous version with this one.

Test Manager: Alejandro Sáez
Date of issue: Bellaterra, July 24, 2024

JOSE MANUEL SUAREZ ROMAN
Firmado digitalmente por JOSE MANUEL SUAREZ ROMAN
Fecha: 2024.07.29 08:40:30 +02'00'

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 70 pages.

1 TEST RESULTS SUMMARY

Test Description	Sample #	DUT Test Modes	Results	Criteria Note
ANTENNA REQUIREMENTS (FCC Part 15.203, RSS-GEN 6.8)	--	--	PASS[1]	N/A
99 % OCCUPIED BANDWIDTH (FCC Part 15.247 (a), RSS-GEN 6.7)	#2	Mode#1	--[2]	N/A
20 dB OCCUPIED BANDWIDTH (FCC Part 15.247 (a)(1), RSS-247 5.1)	#2	Mode#1	--[2]	N/A
DTS BANDWIDTH (FCC Part 15.247 (d), RSS-247 5.5)	#2	Mode#1	--[2]	N/A
MAXIMUM PEAK OUTPUT POWER (FCC Part 15.247 (b)(2), RSS-247 5.4)	#2	Mode#1	PASS	CN4
POWER SPECTRAL DENSITY (FCC Part 15.247 (f), RSS-247 5.3)	#2	Mode#1	PASS	CN4
BAND EDGE (FCC Part 15.247 (d), RSS-247 5.5)	#2	Mode#1	PASS	CN4
TIME OF OCCUPANCY (DWELL TIME) (FCC Part 15.247 (f), RSS-247 5.3)	--	--	PASS[1]	N/A
CARRIER FREQUENCY SEPARATION (FCC Part 15.247 (a)(1), RSS-247 5.1)	#2	Mode#1	PASS	CN4
RADIO-FREQUENCY 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.

Note 1: Test declared by the customer.
Note 2: There is no requirement for this type of hybrid system to comply. The result is included for information.

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Within our improvement program we would be grateful if you would send us any commentary that you consider opportune, to the person in charge who signs this document, or to the Quality Manager of Applus+, in the following e-mail address: satisfaccion.cliente@applus.com

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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 smart parking sensor for outdoor vehicle detection in parking spots with the possibility of transmitting BLE and LoRa simultaneously.			
EUT Version	**FVIN**		**HVIN**	
	1.0		SPG.1.0.0.0	
Power supply	Battery Powered	+/-	3 V	- Hz
Modulation	CSS			
Channel	**Channel**	**Operating frequency [MHz]**	**Channel**	**Operating frequency [MHz]**
	1	902.3	5	908.5
	2	903.9	6	910.3
	3	905.3	7	912.7
	4	906.9	8	914.9
Equipment Type	Hybrid System			

Table 1: Equipment description

RF FEATURES		
Radio chipset	STM32WLE5CC	DA14531
Brand	ST Microelectronics	Dialog Semiconductor / Renesas
Module model	No Module	DA14531MOD
Peak gain antenna [dBi]	-2.02	-0.5
Emission Designator	131KF7D	2M00F7D
FCC ID	--	Y82-DA14531MOD
ISED ID	--	9576A-DA14531MOD

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

TEST CONFIGURATION			
Power Supply	Internal battery (3 V_{DC})		
Set-up	**Description**		
	The EUT horizontally, as it is intended to be placed in normal operation.		
Normal test temperatures	15 ºC to 35 ºC		
Equipment Type	HYBRID SYSTEM EQUIPMENT		
Test exercise	For measurements tests the EUT is configured at maximum RF output power with continuous modulated transmission, DC < 98% constant according to the customer specifications.		
Test Modes	**Channel**	**Frequency [MHz]**	**Bandwidth [kHz]**
	Low	902.3	125
	Middle	908.5	125
	High	914.9	125

Table 3. Test Configuration

3.2.1 DUT Modifications performed

No modifications have been performed.

3.3 DUT TEST MODES

DUT Operation Modes		
Mode #	**Description**	**Set-up**
1	• The equipment is configured as described in the document provided by the customer U-Spot Certification 3.0 v1.0, clause 4. • Through the UART communication the frequency and power are configured. • The conducted tests (Occupied Channel Bandwidth (99%), 20 dB Bandwidth, DTS Bandwidth, Maximum Peak Conducted Output Power, Power Spectral Density, Band Edge), have been performed configured by the software at 20 dBm. • The Radio Frequency Radiated Emissions test has been performed configured by the software at 18 dBm. • Use of manufacturer software is made to configure a continuous modulated test signal where sample and a gateway are linked and the PER is shown at the end of the communication.	Table top

Table 4: DUT Operation Modes

3.4 CONTROL AND MONITORING

Control and monitoring are performed as described in the document provided by the customer U-Spot Certification 3.0 v1.0.

Through the Gateway, data frames related to temperature and magnetic field are sent to the Certifications tool v2.1.2 web server.

3.5 ACCEPTANCE CRITERIA

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

3.6 PHOTOGRAPHS

Photographs identifying the equipment under test and its auxiliaries, as well as assembly photographs for radiated and conducted tests, can be found in the document: 24/36403663.

3.7 TEST FACILITIES ID

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

Table 5: Test Facilities ID

3.8 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.
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4 TEST RESULTS

4.1 ANTENNA REQUIREMENTS

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.

For intentional device, according to RSS-Gen issue 5 section 6.8, the applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

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 Results

The EUT has an integral antenna PCB.

Customer's disclaimer of responsibility for not modifying the antenna: "**"Do not open the device. Opening the device and/or modifying any inner part could void the user's authority to operate the equipment"**

4.1.8 Test Equipment Used

Not applicable

4.1.9 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. 1: Occupied Channel Bandwidth setup of tabletop 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

There is no requirement for this type of hybrid system to comply. The result is included for information.

4.2.3.2 Receiver Parameters

Central frequency [MHz]	Span [kHz]	Detector	Resolution Bandwidth [kHz]	Video Bandwidth [kHz]
Channel frequency	300	Max Peak	5	20

Table 6: EMI Receiver Configuration – Occupied Channel Bandwidth 99%

4.2.4 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
13/11/2023	Javier M. Nadales	--	22.5	62.4	1006.4

Table 7: Test Environmental Conditions – Occupied Channel Bandwidth 99%

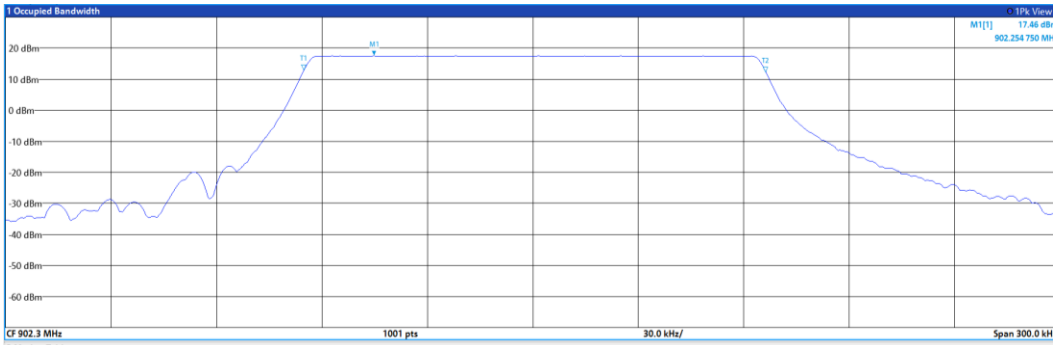
4.2.5 Summary Test Results

Sample	Description	Central Frequency [MHz]	99% Bandwidth [MHz]	Band Edge Left [MHz]	Band Edge Right [MHz]
#2	Low	902.3	0.131	902.234	902.366
	Middle	908.5	0.131	908.434	908.566
	High	914.9	0.131	914.835	914.966

Table 8: Summary Test Results – Occupied Channel Bandwidth 99%

4.2.6 Test Results

4.2.6.1 Sample#2. Mode#1. Channel Low

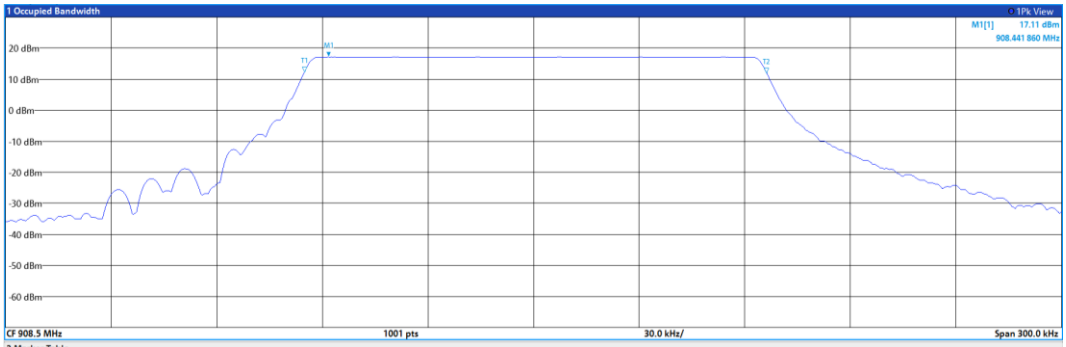


2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	902.254 75 MHz	17.46 dBm	Occ Bw	131.297 849 989 kHz
T1		1	902.234 841 MHz	13.04 dBm	Occ Bw Centroid	902.300 490 197 MHz
T2		1	902.366 139 MHz	12.26 dBm	Occ Bw Freq Offset	490.196 959 734 Hz

Fig. 2: Channel Low – 99% Occupied Channel Bandwidth

4.2.6.2 Sample#2. Mode#1. Channel Middle



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	908.441 86 MHz	17.11 dBm	Occ Bw	131.170 799 291 kHz
T1		1	908.434 956 MHz	12.39 dBm	Occ Bw Centroid	908.500 541 242 MHz
T2		1	908.566 127 MHz	11.87 dBm	Occ Bw Freq Offset	541.242 041 349 Hz

Fig. 3: Channel Middle – 99% Occupied Channel Bandwidth

4.2.6.3 Sample#2. Mode#1. Channel High

2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	914.839 16 MHz	16.62 dBm	Occ Bw	131.153 071 947 kHz
T1		1	914.835 014 MHz	11.90 dBm	Occ Bw Centroid	914.900 590 69 MHz
T2		1	914.966 167 MHz	11.45 dBm	Occ Bw Freq Offset	590.689 665 556 Hz

Fig. 4: Channel Middle – 99% Occupied Channel Bandwidth

4.2.7 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
SIGNAL SPECTRUM ANALYZER	ROHDE & SCHWARZ	FSVA3044	1042700	23/02/2022	15/11/2024
CABLE RF 40 GHz	HUBERSUHNER	SF102	1042545	18/05/2023	18/05/2024

Table 9: Test Instruments – 99% Occupied Channel Bandwidth

4.2.8 Uncertainty

Test Type	Test Description	Uncertainty
Emission	RF bandwidth measurements	±77.6 Hz

Table 10: 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 20 dB BANDWIDTH

4.3.1 Test Setup Required

According to standard ANSI C63.10:2013

4.3.1.1 Tabletop equipment

Fig. 5: 20 dB Bandwidth setup of tabletop equipment

4.3.2 Test Procedure

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW.

b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW, unless otherwise specified by the applicable requirement.

c) Set detection mode to peak and trace mode to max hold.

d) Place two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the "−xx dB down amplitude". If a marker is below this "−xx dB down amplitude" value, then it shall be as close as possible to this value. The occupied bandwidth is the frequency difference between the two markers. Alternatively, set a marker at the lowest frequency of the envelope of the spectral display, such that the marker is at or slightly below the "−xx dB down amplitude". Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.

4.3.3 Test Parameters

4.3.3.1 Requirements

There is no requirement for this type of hybrid system to comply. The result is included for information.

4.3.3.2 Receiver Parameters

The test procedure shall be as follows:

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

- Centre frequency: the nominal Operating Frequency under test.
- Span: At least 2 x OCW.
- RBW: 1% to 3% of OCW without being below of 100 Hz.
- VBW: 3 x RBW.
- Detector: RMS.
- Trace mode: Max Hold.

When the trace is completed the peak value of the trace shall be located and the analyzer marker placed on this peak.

4.3.4 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [hPa]
13/11/2023	Javier M. Nadales	--	22.5	62.4	1006.4

Table 11: Test Environmental Conditions – 20 dB Bandwidth

4.3.5 Summary Test Results

Sample	Description	Operating frequency [MHz]	20 dB Bandwidth [kHz]	Band Edge Left [MHz]	Band Edge Right [MHz]
#2	Low	902.3	146.25	902.227	902.374
	Middle	908.5	145.65	908.428	908.574
	High	914.9	145.65	914.828	914.974

Table 12: Summary Test Results – 20 dB Bandwidth

4.3.6 Test Results

4.3.6.1 Sample #2. Mode#1. Channel Low

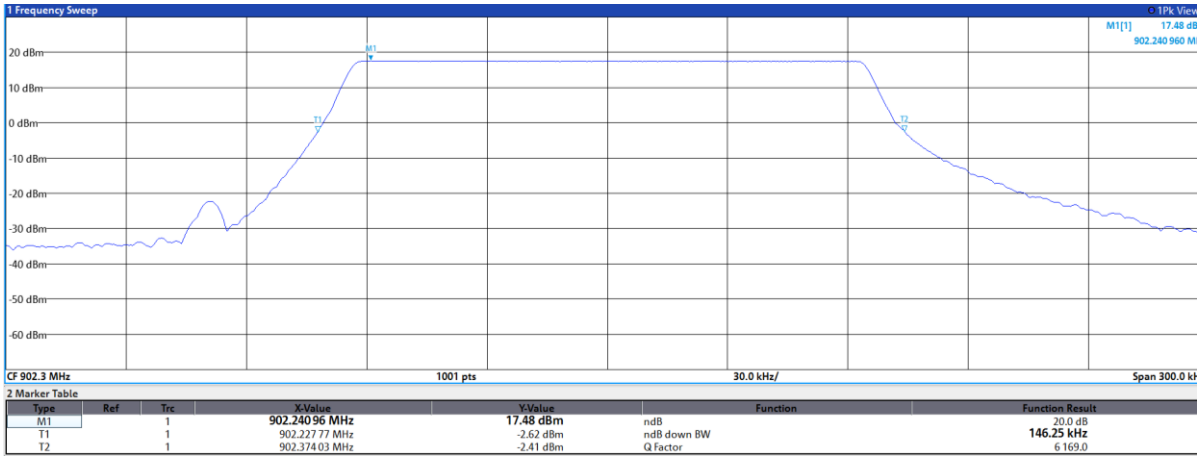


Fig. 6: Channel Low – 20 dB Bandwidth

4.3.6.2 Sample #2. Mode#1. Channel Middle

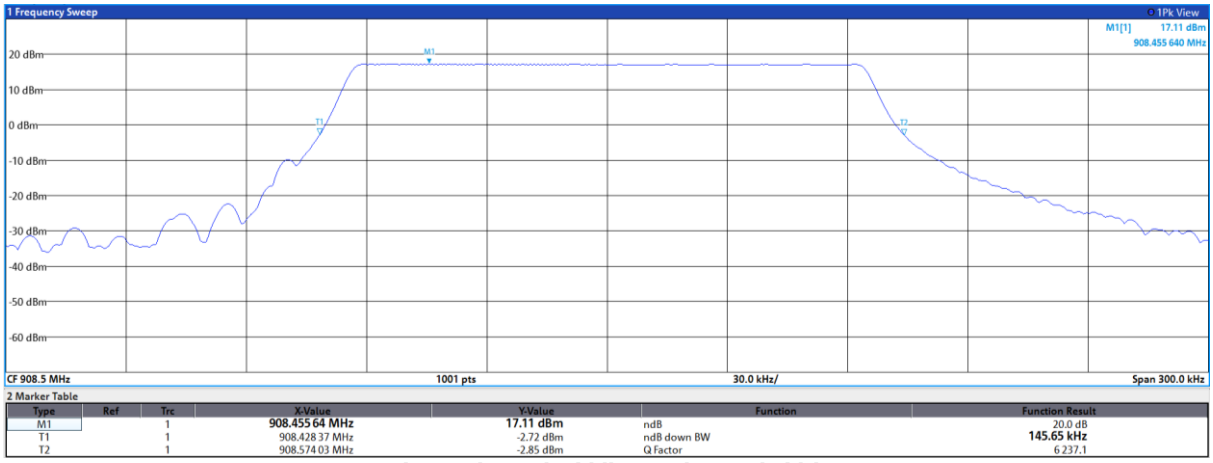


Fig. 7: Channel Middle -20 dB Bandwidth

4.3.6.3 Sample #2. Mode#1. Channel High

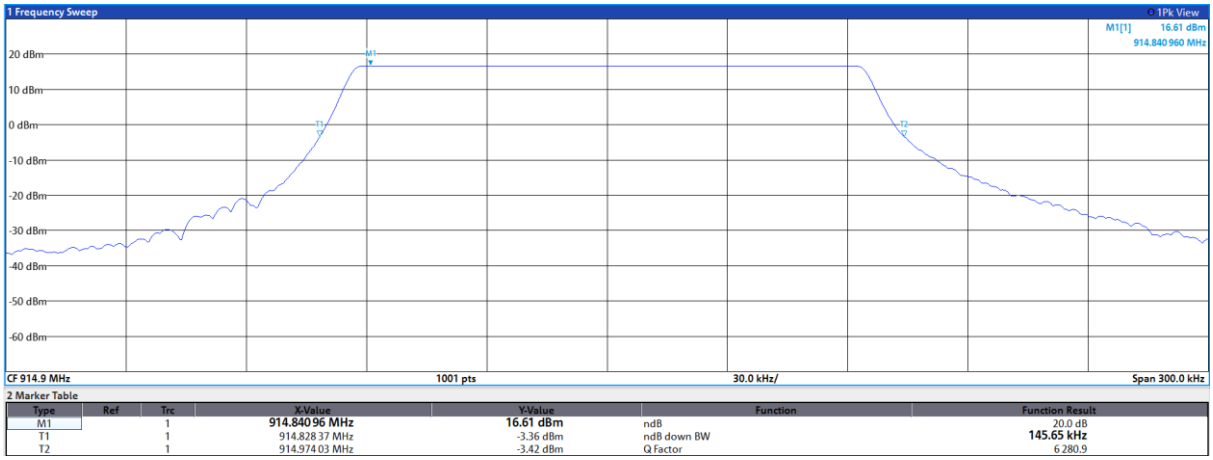


Fig. 8: Channel High - 20 dB Bandwidth

4.3.7 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
SIGNAL SPECTRUM ANALYZER	ROHDE & SCHWARZ	FSVA3044	1042700	23/02/2022	15/11/2024
CABLE RF 40 GHz	HUBERSUHNER	SF102	1042545	18/05/2023	18/05/2024

Table 13: Test Instruments – 20 Bandwidth

4.3.8 Uncertainty

Test Type	Test Description	Uncertainty
Emissions	RF bandwidth measurements	± 77.6 Hz

Table 14: Measuring Uncertainties – 20 Bandwidth

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

4.4 DTS BANDWIDTH

4.4.1 Test Setup Required

According to standard ANSI C63.10:2013

4.4.1.1 Tabletop equipment

Fig. 9: DTS Bandwidth setup of tabletop equipment.

4.4.2 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.

4.4.3 Test Parameters

4.4.3.1 Requirements

There is no requirement for this type of hybrid system to comply with the 500 kHz minimum bandwidth normally associated with a DTS device. The result is included for information.

4.4.3.2 Receiver Parameters

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	Max Peak	100	300

Table 15: EMI Receiver configuration – DTS Bandwidth

4.4.4 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
13/11/2023	Javier M. Nadales	--	22.5	62.4	1006.4

Table 16: Test environmental conditions – DTS Bandwidth

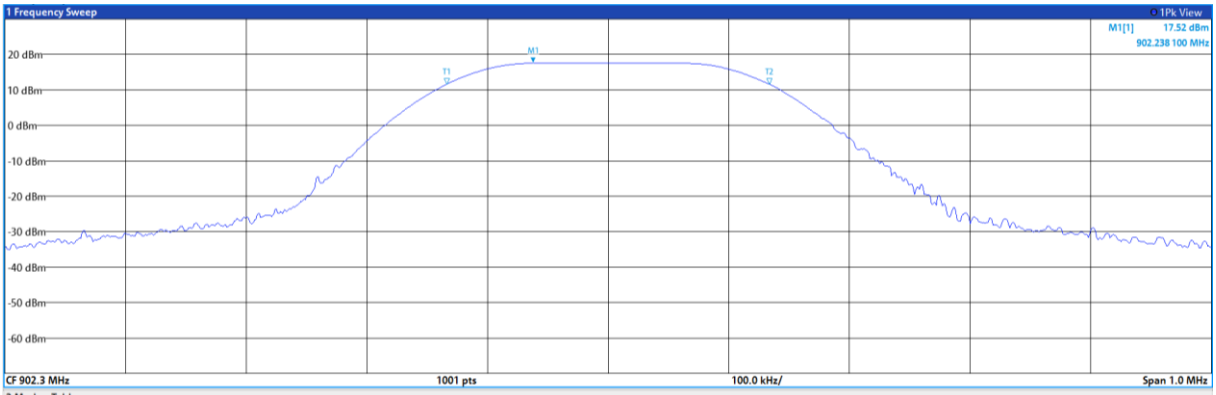
4.4.5 Summary Test Results

Sample	Description	Central Frequency [MHz]	DTS Bandwidth [kHz]	Band Edge Left [MHz]	Band Edge Right [MHz]
#2	Low	902.3	267.70	902.166	902.433
	Middle	908.5	266.70	908.366	908.632
	High	914.9	266.70	914.766	915.032

Table 17: Summary Test Results – DTS Bandwidth

4.4.6 Test Results

4.4.6.1 Sample #2. Mode#1. Channel Low

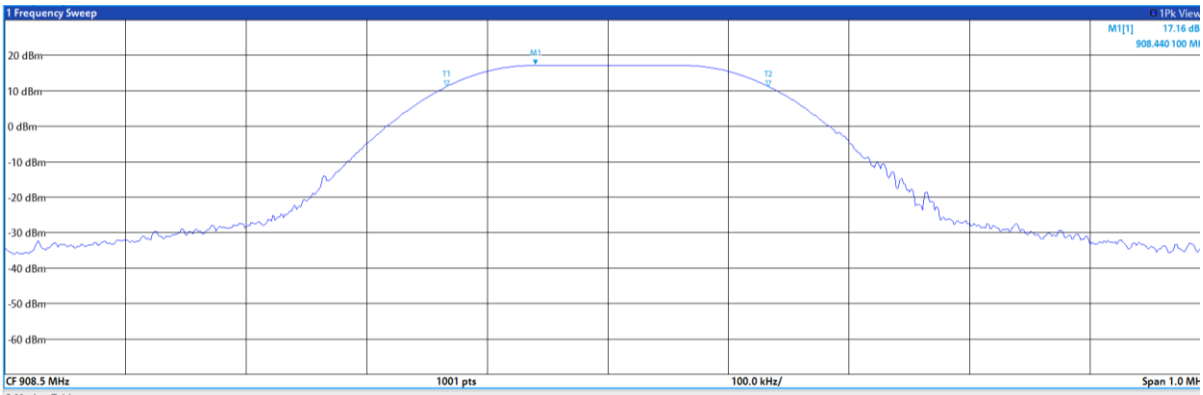


2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	902.2381 MHz	17.52 dBm	ndB	6.0 dB
T1		1	902.166 1 MHz	11.59 dBm	ndB down BW	267.70 kHz
T2		1	902.433 9 MHz	11.59 dBm	Q Factor	3 369.9

Fig. 10: Channel Low - DTS Bandwidth

4.4.6.2 Sample #2. Mode#1. Channel Middle

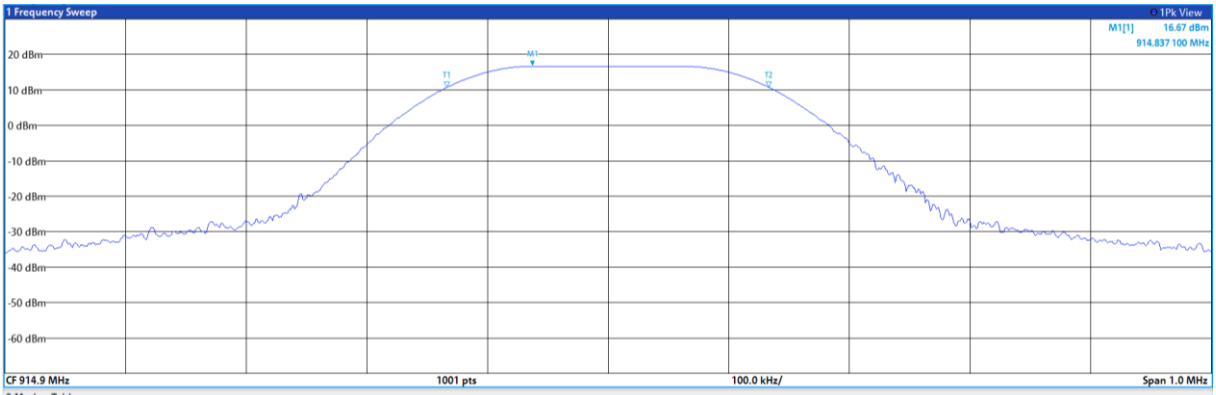


2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	908.4401 MHz	17.16 dBm	ndB	6.0 dB
T1		1	908.366 1 MHz	11.18 dBm	ndB down BW	266.70 kHz
T2		1	908.632 9 MHz	11.23 dBm	Q Factor	3 405.8

Fig. 11: Channel Middle -DTS Bandwidth

4.4.6.3 Sample #2. Mode#1. Channel High



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	914.8371 MHz	16.67 dBm	ndB	6.0 dB
T1		1	914.766 1 MHz	10.67 dBm	ndB down BW	266.70 kHz
T2		1	915.032 9 MHz	10.75 dBm	Q Factor	3 429.8

Fig. 12: Channel High - DTS Bandwidth

4.4.7 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
SIGNAL SPECTRUM ANALYZER	ROHDE & SCHWARZ	FSVA3044	1042700	23/02/2022	15/11/2024
CABLE RF 40 GHz	HUBERSUHNER	SF102	1042545	18/05/2023	18/05/2024

Table 18: Test Instruments – DTS Bandwidth

4.4.8 Uncertainty

Test Type	Test Description	Uncertainty
Emission	RF bandwidth measurements	±77.6 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%.

4.5 MAXIMUM PEAK CONDUCTED OUTPUT POWER

4.5.1 Test Setup Required

According to standard ANSI C63.10:2013

4.5.1.1 Tabletop equipment

Fig. 13: Maximum Peak Conducted Output Power setup of tabletop equipment.

4.5.2 Test Procedure

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

b) Set RBW = 1% to 5% of the OBW, not to exceed 1 MHz.

c) Set VBW ≥ [3 × RBW].

d) Number of points in sweep ≥ [2 × span / RBW]. (This gives bin-to-bin spacing ≤ RBW / 2, so that narrowband signals are not lost between frequency bins.)

e) Sweep time = auto.

f) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.

g) If transmit duty cycle < 98%, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at the maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no OFF intervals) or at duty cycle ≥ 98%, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run."

h) Trace average at least 100 traces in power averaging (rms) mode.

i) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

.

4.5.3 Test Parameters

4.5.3.1 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.

4.5.3.2 Receiver Parameters / Power Meter configuration

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

Central frequency [MHz]	Span [kHz]	Detector	Resolution Bandwidth [kHz]	Video Bandwidth [kHz]
Channel frequency	500	Rms Avg	5	20

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

4.5.4 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
13/11/2023	Javier M. Nadales	--	22.5	62.4	1006.4

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

4.5.5 Summary Test Results

Sample	Description	Central Frequency [MHz]	Peak Power [dBm]	Limit [dBm]	Results
#2	Low	902.3	17.52	30.0	PASS
	Middle	908.5	17.06	30.0	PASS
	High	914.9	16.60	30.0	PASS

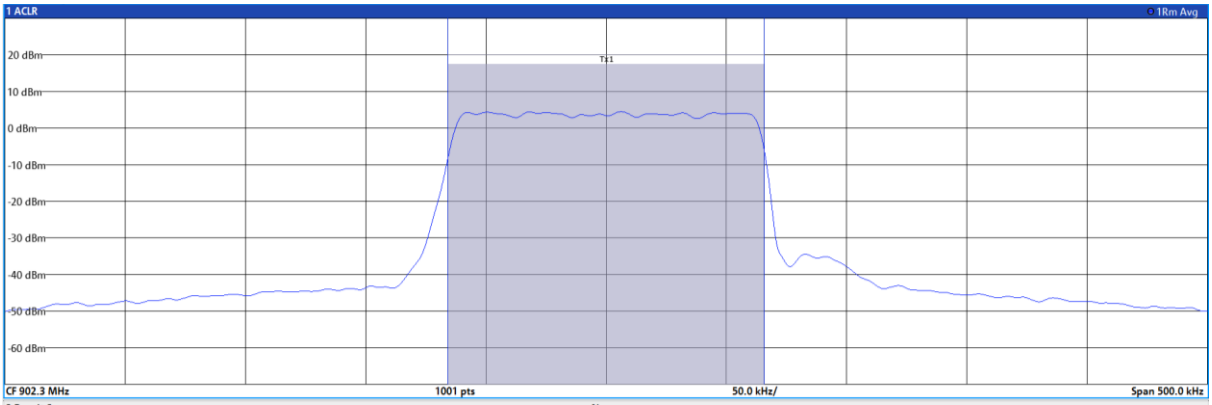
Table 22: Summary Test Results – Maximum Peak Conducted Output Power

Sample	Description	Central Frequency [MHz]	E.I.R.P [dBm]	Limit [dBm]	Results
#2	Low	902.3	15.50	36.0	PASS
	Middle	908.5	15.04	36.0	PASS
	High	914.9	14.58	36.0	PASS

Table 23: Summary Test Results – Maximum Peak Output Power

4.5.6 Test Results

4.5.6.1 Sample #1. Mode#1. Channel Low

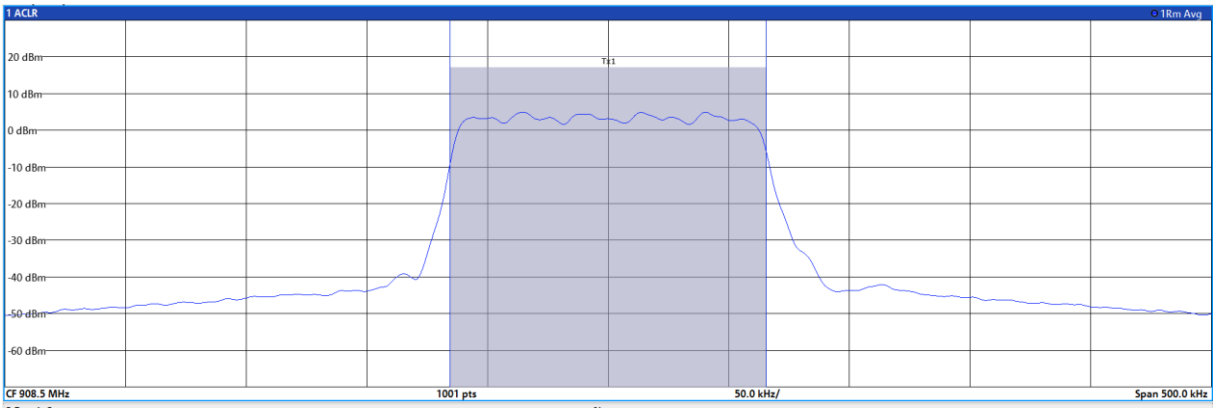


2 Result Summary — None

Channel	Bandwidth	Offset	Power
Tx1 (Ref)	131.297 kHz		17.52 dBm
Tx Total			17.52 dBm

Fig. 14: Channel Low- Maximum Peak Conducted Output Power

4.5.6.2 Sample #1. Mode#1. Channel Middle

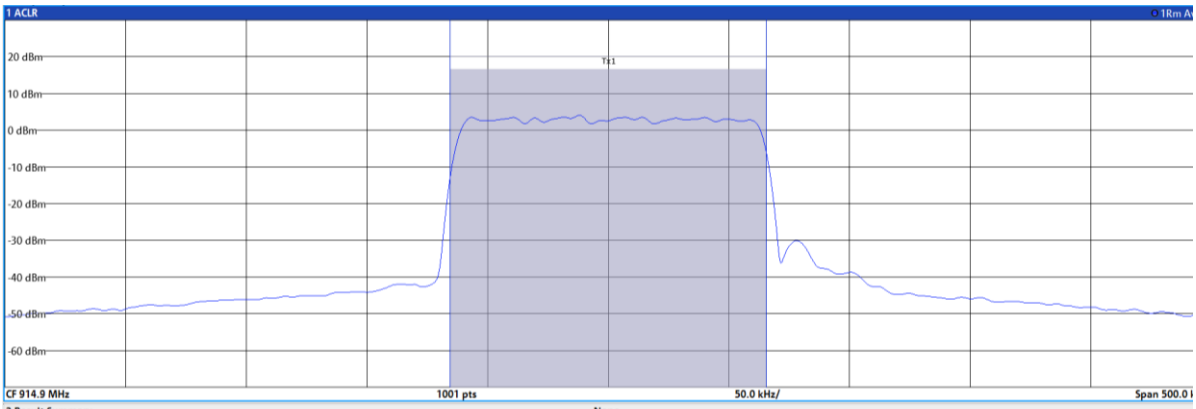


2 Result Summary — None

Channel	Bandwidth	Offset	Power
Tx1 (Ref)	131.170 kHz		17.06 dBm
Tx Total			17.06 dBm

Fig. 15: Channel Middle - Maximum Peak Conducted Output Power

4.5.6.3 Sample #1. Mode#1. Channel High



2 Result Summary — None

Channel	Bandwidth	Offset	Power
Tx1 (Ref)	131.153 kHz		16.60 dBm
Tx Total			16.60 dBm

Fig. 16: Channel High - Maximum Peak Conducted Output Power

4.5.7 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
SIGNAL SPECTRUM ANALYZER	ROHDE & SCHWARZ	FSVA3044	1042700	23/02/2022	15/11/2024
CABLE RF 40 GHz	HUBERSUHNER	SF102	1042545	18/05/2023	18/05/2024

Table 24: Test Instruments – Maximum Peak Conducted Output Power

4.5.8 Uncertainty

Test Type	Test Description	Uncertainty
Emissions	RF output power measurements [Conducted]	±1.3 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%.

4.6 POWER SPECTRAL DENSITY

4.6.1 Test Setup Required

According to standard ANSI C63.10:2013

4.6.1.1 Tabletop equipment

Fig. 17: Power Spectral Density setup of tabletop equipment.

4.6.2 Test Procedure

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

b) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.

c) Set VBW ≥ [3 × RBW].

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

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

f) Sweep time = auto couple.

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

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

i) 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)

4.6.3 Test Parameters

4.6.3.1 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. The same method of determining the conducted output power shall be used to determine the power spectral density.

4.6.3.2 Receiver Parameters

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	500	Rms Avg	5	20

Table 26: EMI Receiver configuration – Power Spectral Density

4.6.4 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
13/11/2023	Javier M. Nadales	--	22.5	62.4	1006.4

Table 27: Test environmental conditions – Power Spectral Density

4.6.5 Summary Test Results

Sample	Description	Central Frequency [MHz]	PSD [dBm]	Limit [dBm]	Results
#2	Low	902.3	3.55	8.0	PASS
	Middle	908.5	3.14	8.0	PASS
	High	914.9	3.19	8.0	PASS

Table 28: Summary Test Results – Power Spectral Density

4.6.6 Test Results

4.6.6.1 Sample #2. Mode#1. Channel Low

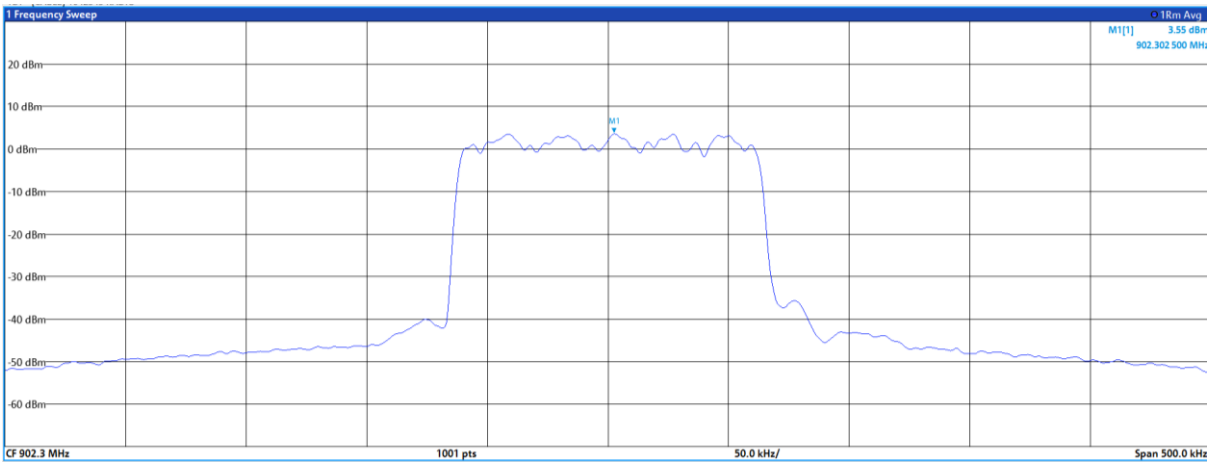


Fig. 18: Channel Low - Power Spectral Density

4.6.6.2 Sample #2. Mode#1. Channel Middle

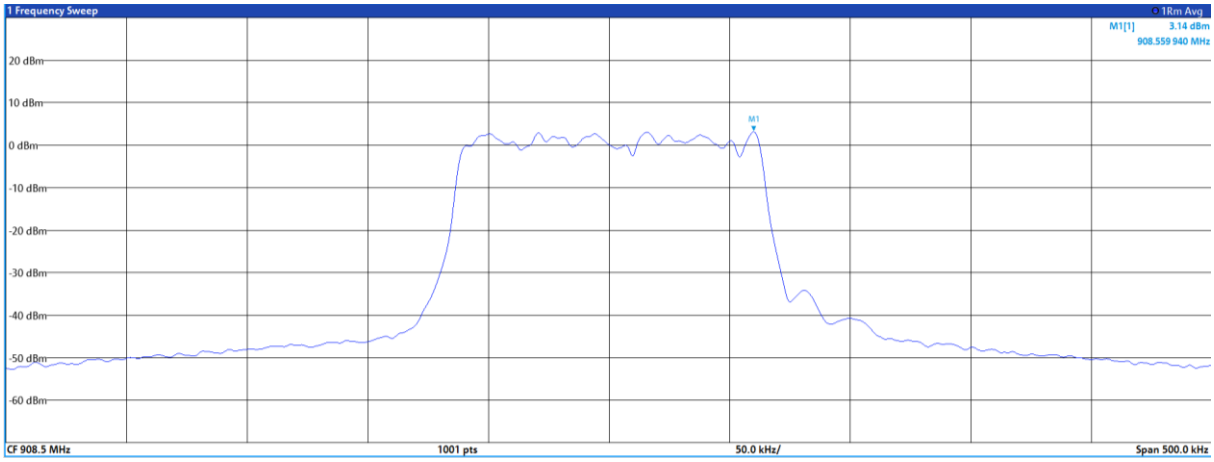


Fig. 19: Channel Middle - Power Spectral Density

4.6.6.3 Sample #2. Mode#1. Channel High

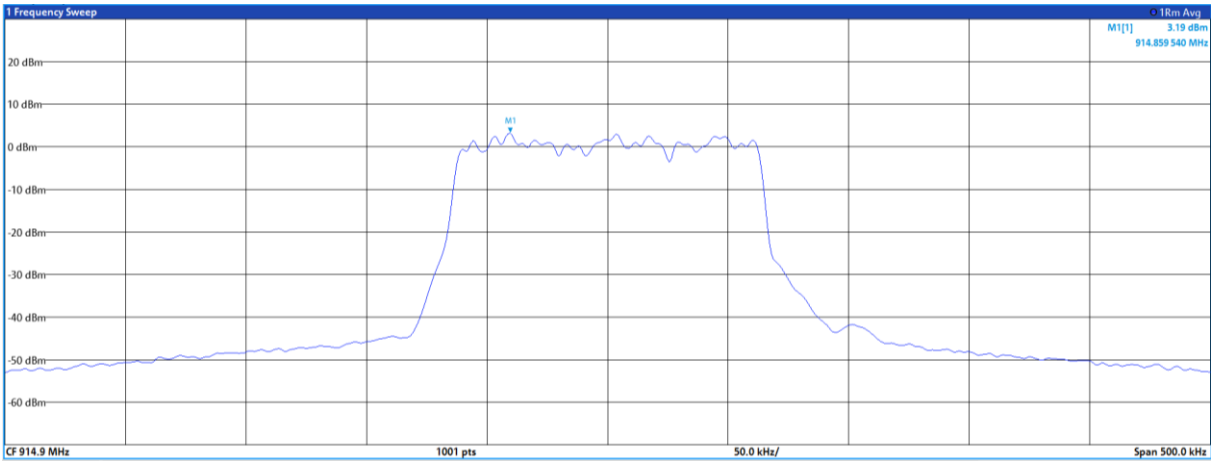


Fig. 20: Channel High- Power Spectral Density

4.6.7 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
SIGNAL SPECTRUM ANALYZER	ROHDE & SCHWARZ	FSVA3044	1042700	23/02/2022	15/11/2024
CABLE RF 40 GHz	HUBERSUHNER	SF102	1042545	18/05/2023	18/05/2024

Table 29: Test Instruments – Power Spectral Density

4.6.8 Uncertainty

Test Type	Test Description	Uncertainty
Emissions	Power spectral density measurements [Conducted]	±2.7 dB

Table 30: 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%.

4.7 BAND EDGE

4.7.1 Test Setup Required

According to standard ANSI C63.10:2013

4.7.1.1 Tabletop equipment

Fig. 21: Band Edge setup of tabletop equipment.

4.7.2 Test Procedure

a) Span: Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products that fall outside of the authorized band of operation.

b) Reference level: As required to keep the signal from exceeding the maximum instrument input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level.

c) Attenuation: Auto (at least 10 dB preferred).

d) Sweep time: Coupled.

e) Resolution bandwidth: 100 kHz.

f) Video bandwidth: 300 kHz.

g) Detector: Peak.

h) Trace: Max hold.

i) Allow the trace to stabilize. For the test with the hopping function turned ON, this can take several minutes to achieve a reasonable probability of intercepting any emissions due to oscillator overshoot

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) (see § 15.205(c)).

4.7.3.2 Receiver Parameters

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	30	Max Peak	100	300

Table 31: EMI Receiver configuration – Band Edge

4.7.4 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
13/11/2023	Javier M. Nadales	--	22.5	62.4	1006.4

Table 32: Test environmental conditions – Band Edge

4.7.5 Summary Test Results

Sample	Description	Central Frequency [MHz]	Band Edge	Limit [dBm]	Results
#2	Low	902.3	PK < Limit - I	-12.53	PASS
	High	914.9	PK < Limit - I	-13.36	PASS

Table 33: Summary Test Results – Band Edge

4.7.6 Test Results

4.7.6.1 Sample #2. Mode#1. Channel Low

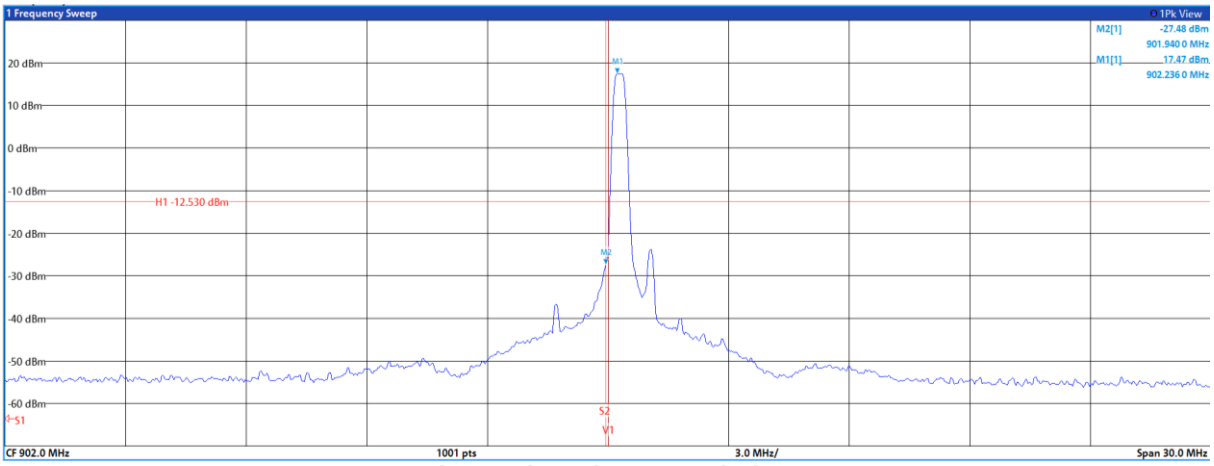


Fig. 22: Channel Low - Band Edge

4.7.6.2 Sample #2. Mode#1. Channel High

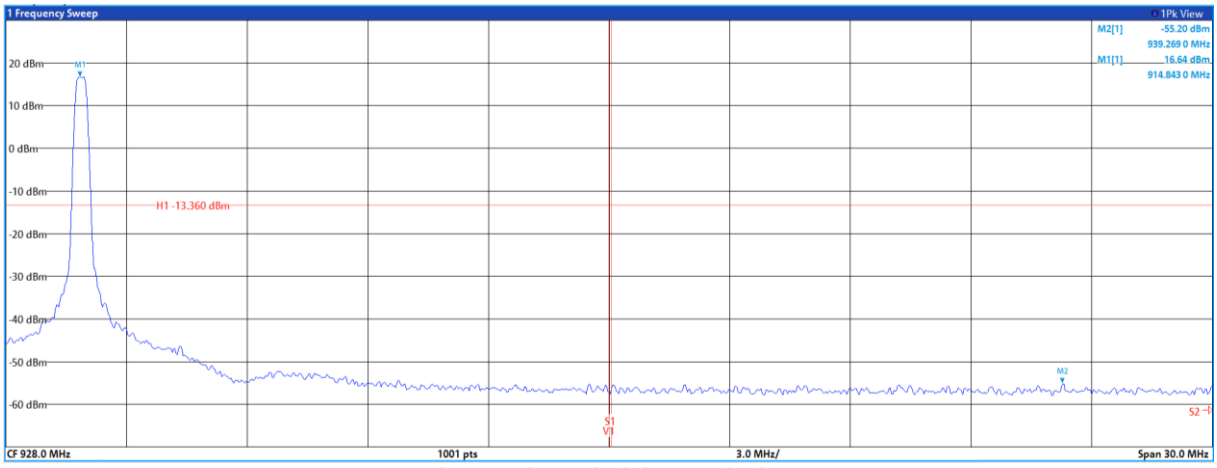


Fig. 23: Channel High - Band Edge

4.7.7 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
SIGNAL SPECTRUM ANALYZER	ROHDE & SCHWARZ	FSVA3044	1042700	23/02/2022	15/11/2024
CABLE RF 40 GHz	HUBERSUHNER	SF102	1042545	18/05/2023	18/05/2024

Table 34: Test Instruments – Band Edge

4.7.8 Uncertainty

Test Type	Test Description	Uncertainty
Emissions	RF output power measurements	±1.3 dB

Table 35: 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%.

4.8 TIME OF OCCUPANCY (DWELL TIME)

4.8.1 Test Setup Required

According to standard ANSI C63.10:2013

4.8.1.1 Tabletop equipment

Fig. 24: Time of Occupancy (Dwell Time) setup of tabletop equipment.

4.8.2 Test Procedure

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

a) Span: Zero span, centered on a hopping channel.

b) RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.

c) Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.

d) Detector function: Peak.

e) Trace: Max hold.

4.8.3 Test Parameters

4.8.3.1 Requirements

According to FCC Part 15.247 (f) and RSS-247 clause 5.3, hybrid systems are those that employ a combination of both frequency hopping and digital modulation techniques. The frequency hopping operation of the hybrid system, with the direct sequence or digital modulation operation turned-off, shall have an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4. (0.4 x 8 = 3.2 seconds)

4.8.3.2 EMI Receiver configuration

Not applicable

4.8.4 Test Environmental Conditions

Not applicable

4.8.5 Summary Test Results

to measurement limitations, it is not possible to measure the Time of Occupancy, however, the customer declares its compliance.

4.8.6 Test Setup Photographs

Not applicable

4.8.7 Test Results

In FCC we will use Spreading Factor 9. At this spreading factor, the maximum number of bytes that can be sent are 61 B. At this SF factor the dwell time will be under 400 ms in any case. Spreading Factor is limited by FW.

4.8.8 Test Equipment Used

Not applicable

4.8.9 Uncertainty

Not applicable

4.9 CARRIER FREQUENCY SEPARATION

4.9.1 Test Setup Required

According to standard ANSI C63.10:2013

4.9.1.1 Tabletop equipment

Fig. 25: Carrier frequency separation setup of tabletop equipment.

4.9.2 Test Procedure

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

a) Span: Wide enough to capture the peaks of two adjacent channels.

b) RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.

c) Video (or average) bandwidth (VBW) ≥ RBW.

d) Sweep: Auto.

e) Detector function: Peak.

f) Trace: Max hold.

g) Allow the trace to stabilize.

4.9.3 Test Parameters

4.9.3.1 Requirements

According to FCC Part 15.247 (a) and RSS-247 clause 5.1, hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

4.9.3.2 Receiver Parameters

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

Frequency range [MHz]	Detector	Resolution Bandwidth [kHz]	Video Bandwidth [kHz]
902 – 903.5	Max Peak	50	200

Table 36: EMI Receiver configuration – Carrier Frequency Separation

4.9.4 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
04/12/2023	Javier M. Nadales	--	21.7	49.2	1011.3

Table 37: Test environmental conditions – Carrier Frequency Separation

4.9.5 Summary Test Results

Sample	Carrier Frequency Separation [kHz]	Limit (20 dB bandwidth) [kHz]	Results
#2	200.75	146.25	PASS

Table 38: Summary Test Results – Carrier Frequency Separation

4.9.6 Test Results

4.9.6.1 Sample #2. Mode#1.

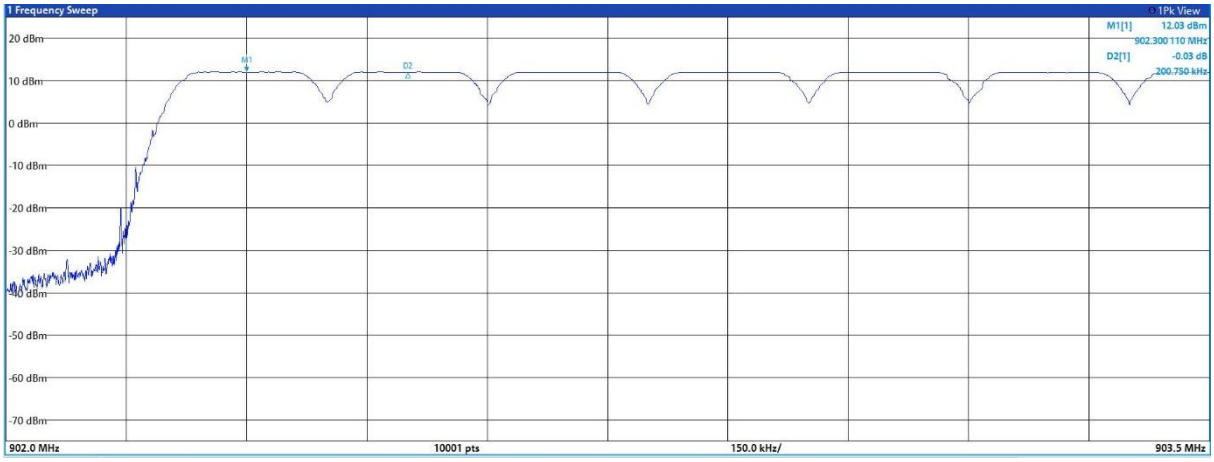


Fig. 26: Carrier Frequency Separation

4.9.7 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
SIGNAL SPECTRUM ANALYZER	ROHDE & SCHWARZ	FSVA3044	1042700	23/02/2022	15/11/2024
CABLE RF 40 GHz	HUBERSUHNER	SF102	1042545	18/05/2023	18/05/2024

Table 39: Test Instruments – Carrier frequency separation

4.9.8 Uncertainty

Test Type	Test Description	Uncertainty
Emissions	RF bandwidth measurements	±77.6 Hz

Table 40: Measuring Uncertainties – Carrier Frequency Bandwidth

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

4.10 RADIO-FREQUENCY RADIATED EMISSIONS

4.10.1 Test Setup Required

According to standard ANSI C63.10:2013

4.10.1.1 Tabletop equipment

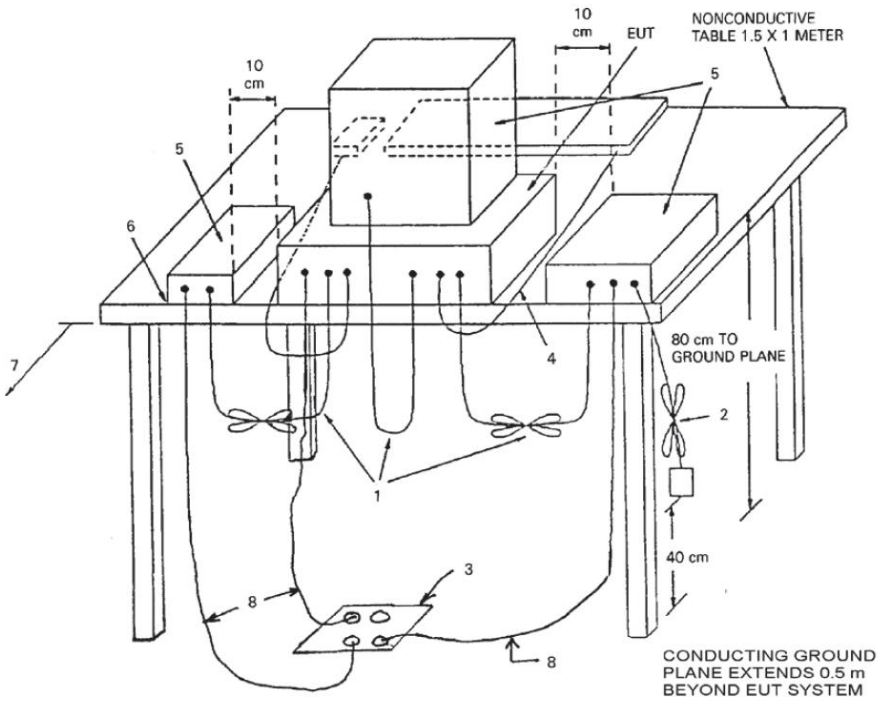


Fig. 27: Radio-frequency radiated emissions setup of table top equipment.

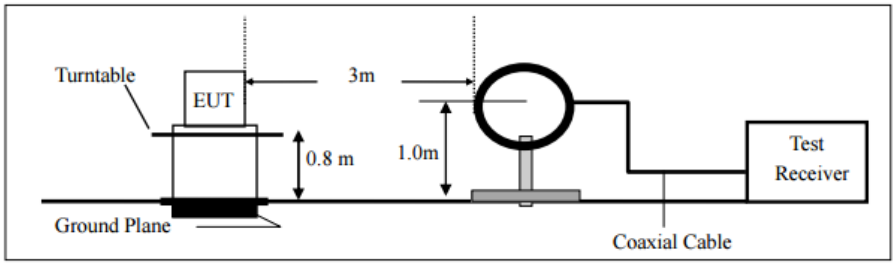


Fig. 28: Radio-frequency radiated emissions of table top equipment from 9 kHz to 30 MHz

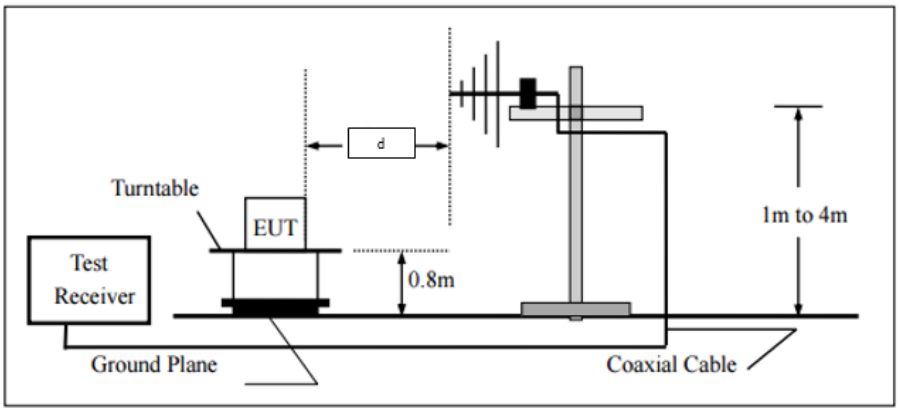


Fig. 29: Radio-frequency radiated emissions of table top equipment from 30 MHz to 1000 MHz

Distance "d" depends on test chamber.

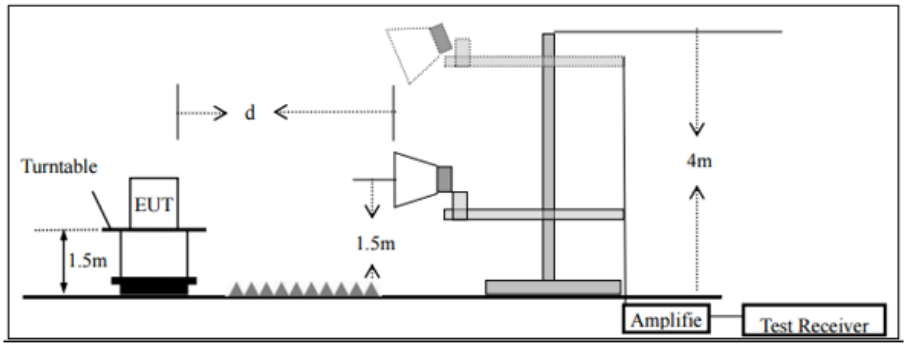


Fig. 30: Radio-frequency radiated emissions setup of table top equipment above 1 GHz

Distance "d" depends on test chamber.

4.10.1.2 Floor standing equipment

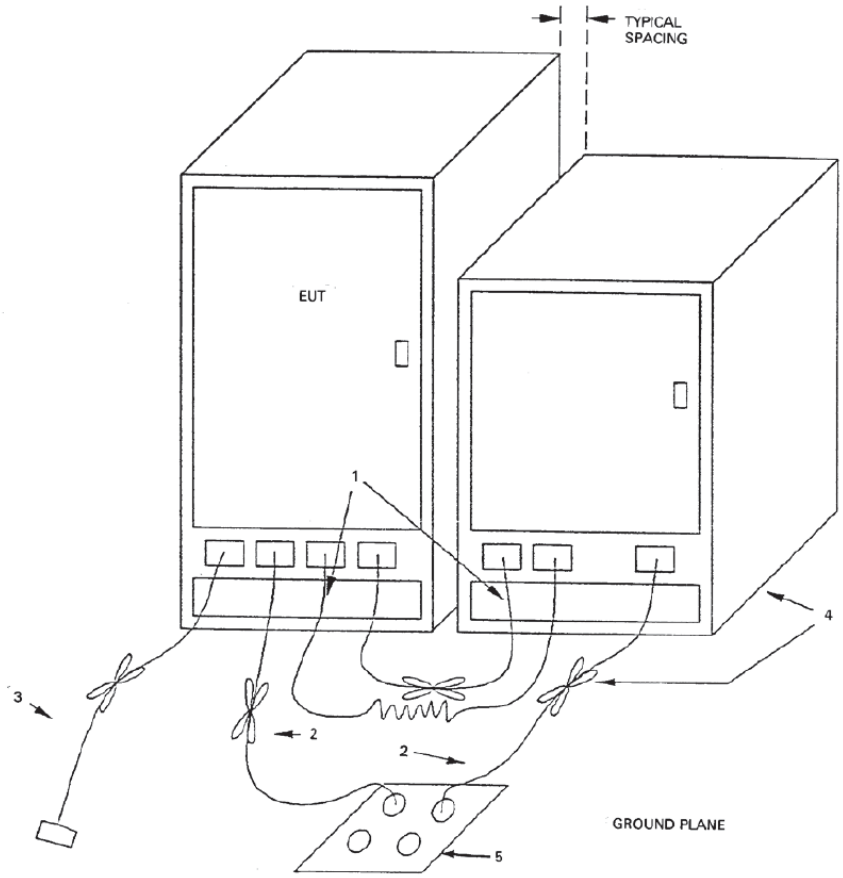


Fig. 31: Radio-frequency radiated emissions of floor-standing setup equipment.

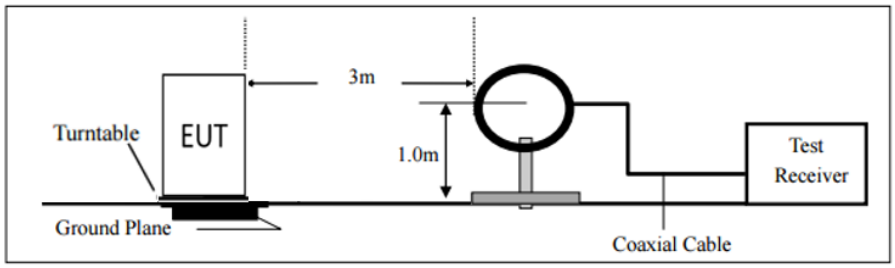


Fig. 32: Radio-frequency radiated emissions of floor-standing setup equipment from 9 kHz to 30 MHz

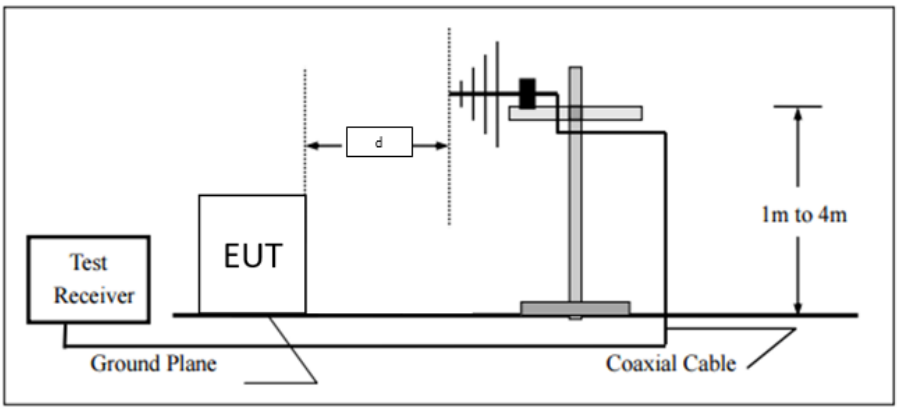


Fig. 33: Radio-frequency radiated emissions of floor-standing setup equipment from 30 MHz to 1000 MHz

Distance "d" depends on test chamber.

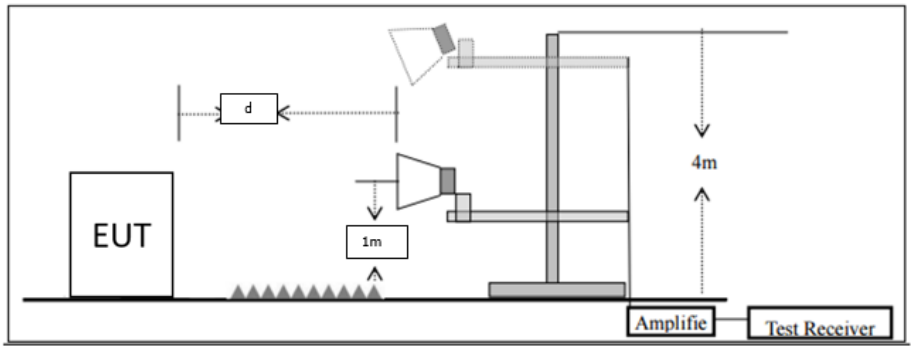


Fig. 34: Radio-frequency radiated emissions of floor-standing setup equipment above 1 GHz

Distance "d" depends on test chamber.

4.10.2 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.

4.10.3 Test Parameters

4.10.3.1 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 ICES-003 Issue 7 (3.2.2) the radiated emission limits for restricted bands are:

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: 8.5 meters (new measurement distance).

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: Radio Emission limits – Restricted bands

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 and RSS-247 section 6, the limits for unrestricted bands are:

Frequency [MHz]	Test Mode	Field strength [µV/m]	Measurement distance [m]
0.009 – 18000	Peak power / RMS averaging	-20 dBc / -30 dBc	3
18000 - 40000			1

Table 43. Radiated Emission limits. Unrestricted bands

4.10.3.2 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)	$200 \cdot 10^{-6}$	$1 \cdot 10^{-3}$
30 – 1000	Quasi-peak (QP)	0.12	0.30
Above 1000	Peak (PK)	1	3
	Average (AVG)	1	$10 \cdot 10^{-6}$

Table 44: Receiver parameters – Radio-frequency radiated emissions

4.10.4 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
11/10/2023	I Serrano	--	21.3	61.3	1004.1
02/12/2023	J.M. Nadales	--	20.4	57.7	978.4

Table 45: Test environmental conditions – Radio-frequency radiated emissions

4.10.5 Summary Test Results

Sample	Frequency Range [MHz]	Test Area	Distance [m]	Emissions	Results
#1	9 kHz – 30 MHz	SAC 2	3 m	QP < Limit - I	PASS
	30 MHz – 1 GHz	SAC 2	3 m	QP < Limit - I	PASS
	1 GHz – 10 GHz	SAC 2	3 m	PK < Limit - I Limit - I <= AVG < Limit	PASS

Table 46: Summary test results – Radio-frequency radiated emissions

4.10.6 Test Results

4.10.6.1 Ambient Levels. Frequency range: 9 kHz – 30 MHz at *X* axis

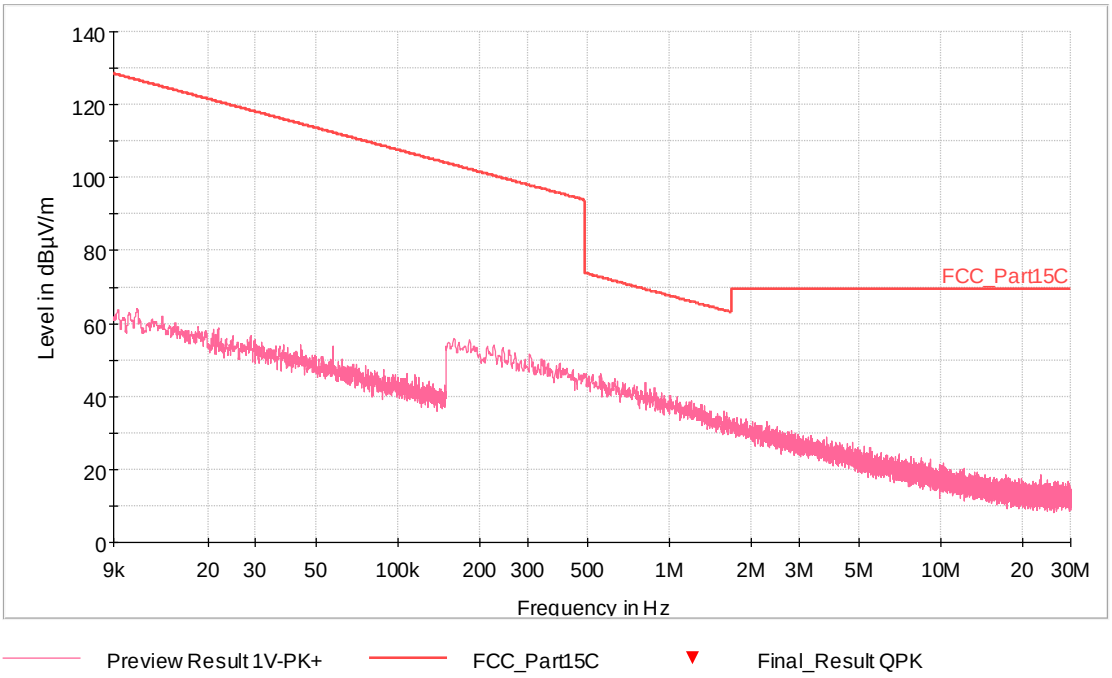


Fig. 35: Ambient level. Frequency range: 9 kHz – 30 MHz *X* axis

4.10.6.2 Ambient Levels. Frequency range: 9 kHz – 30 MHz at *Y* axis

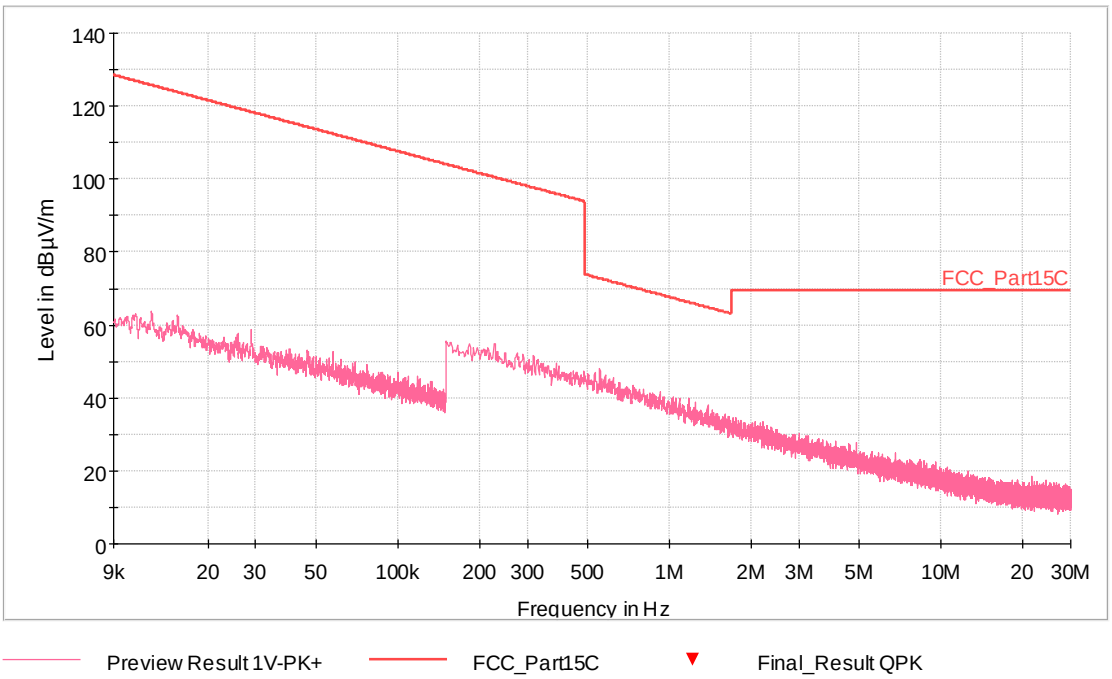


Fig. 36: Ambient level. Frequency range: 9 kHz – 30 MHz *Y* axis

4.10.6.3 Ambient Levels. Frequency range: 9 kHz – 30 MHz at *Z* axis

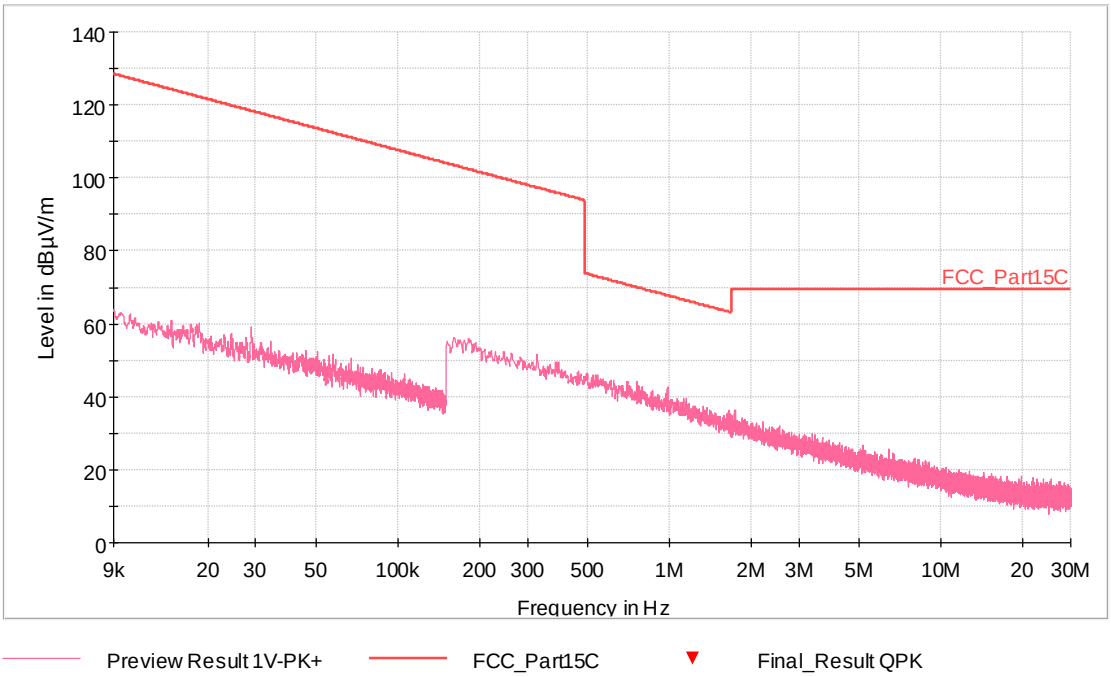


Fig. 37: Ambient level. Frequency range: 9 kHz – 30 MHz *Z* axis

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

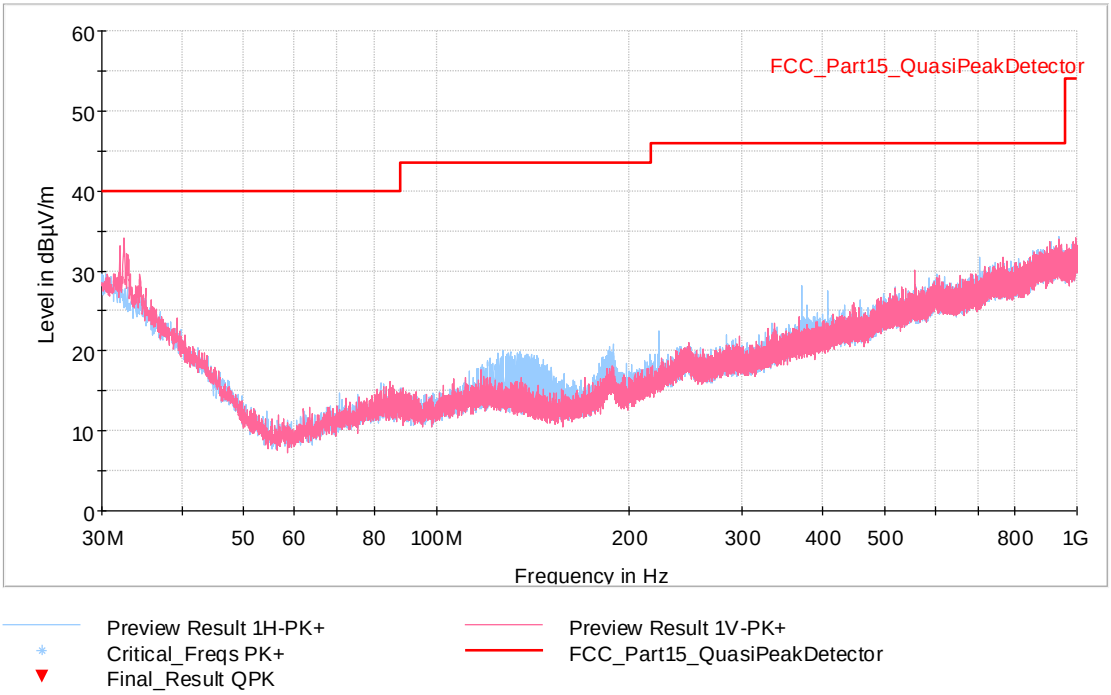
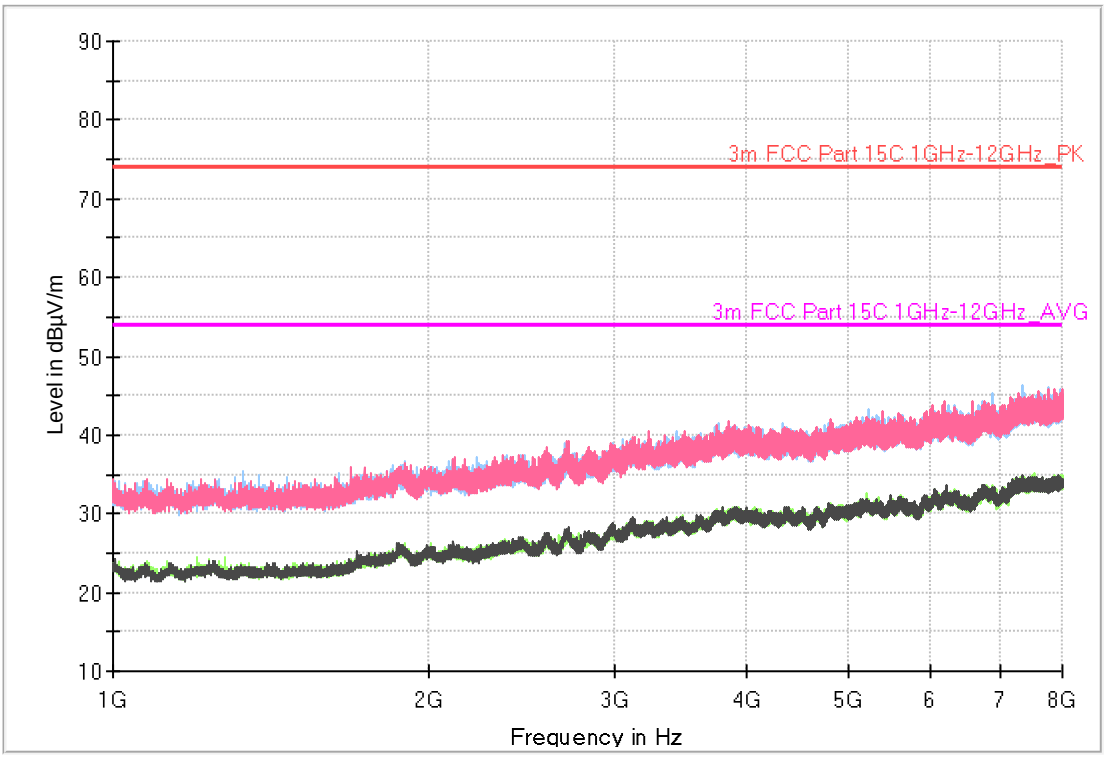


Fig. 38: Ambient level. Frequency range: 30 MHz – 1 GHz

4.10.6.5 Ambient Levels. Frequency range: 1 GHz – 8 GHz



Preview Result 2H-AVG
Preview Result 2V-AVG
3m FCC Part 15C 1GHz-12GHz_AVG
Preview Result 1H-PK+
Preview Result 1V-PK+
3m FCC Part 15C 1GHz-12GHz_PK

Fig. 39: Ambient level. Frequency range: 1 GHz – 8 GHz

4.10.6.6 Ambient Levels. Frequency range: 8 GHz – 10 GHz

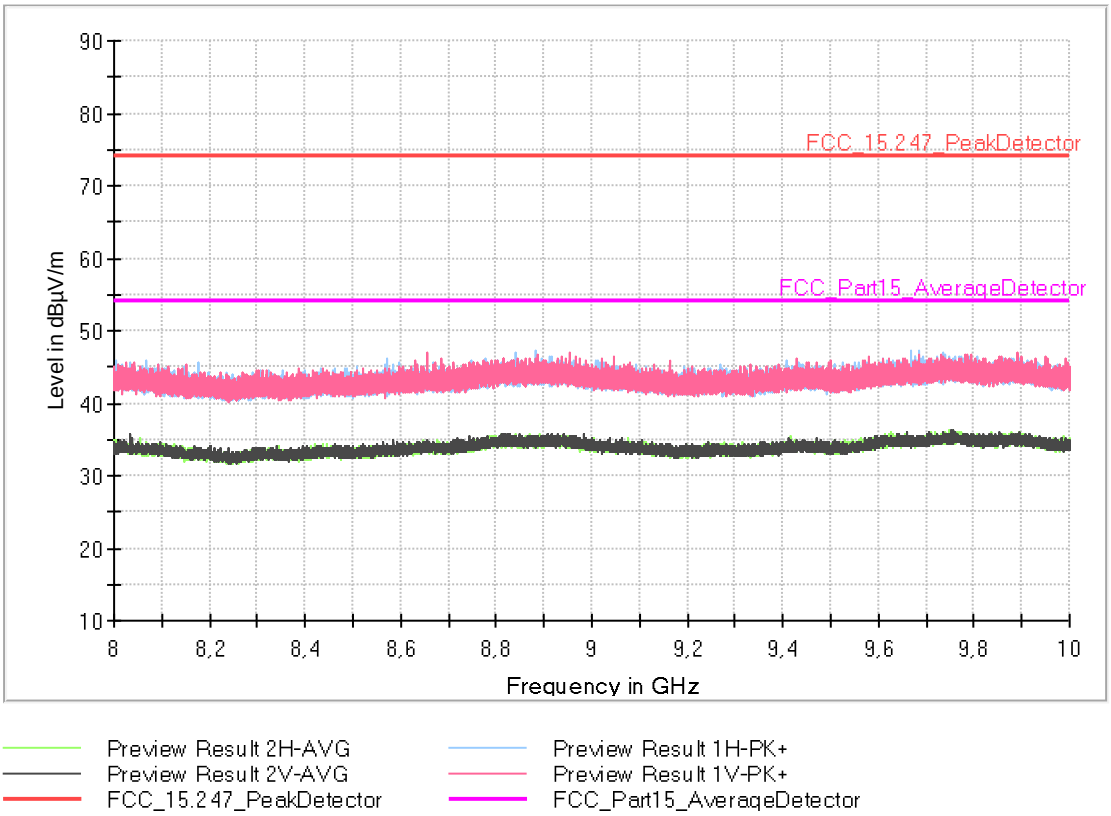
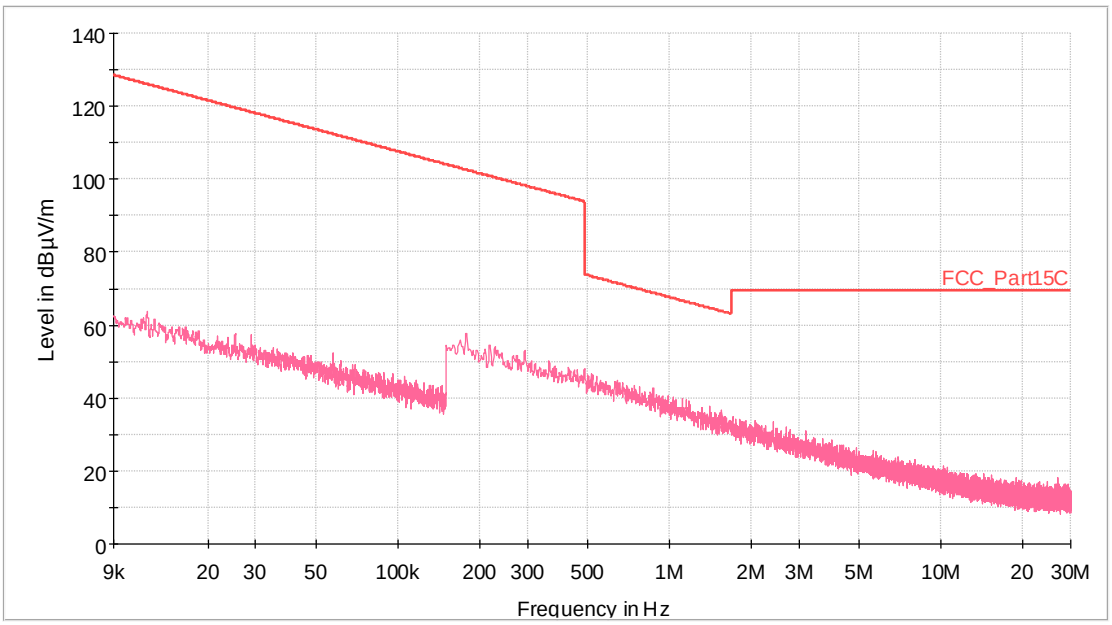


Fig. 40: Ambient level. Frequency range: 8 GHz – 10 GHz

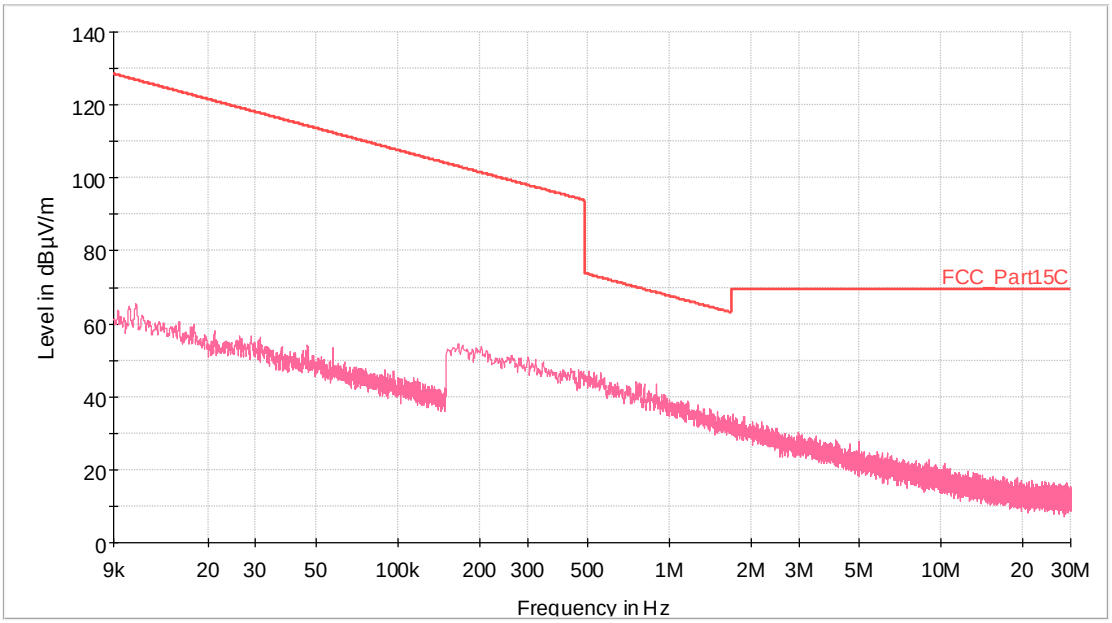
4.10.6.7 Sample #1. Mode#1. Frequency range: 9 kHz – 30 MHz at *X* axis



Preview Result 1V-PK+ FCC_Part15C Final_Result QPK

Fig. 41: Sample #1. Mode#1. Frequency range: 9 kHz – 30 MHz at X axis

4.10.6.8 Sample #1. Mode#1. Frequency range: 9 kHz – 30 MHz at *Y* axis



Preview Result 1V-PK+ FCC_Part15C Final_Result QPK

Fig. 42: Sample #1. Mode#1. Frequency range: 9 kHz – 30 MHz at Y axis

4.10.6.9 Sample #1. Mode#1. Frequency range: 9 kHz – 30 MHz at *Z* axis

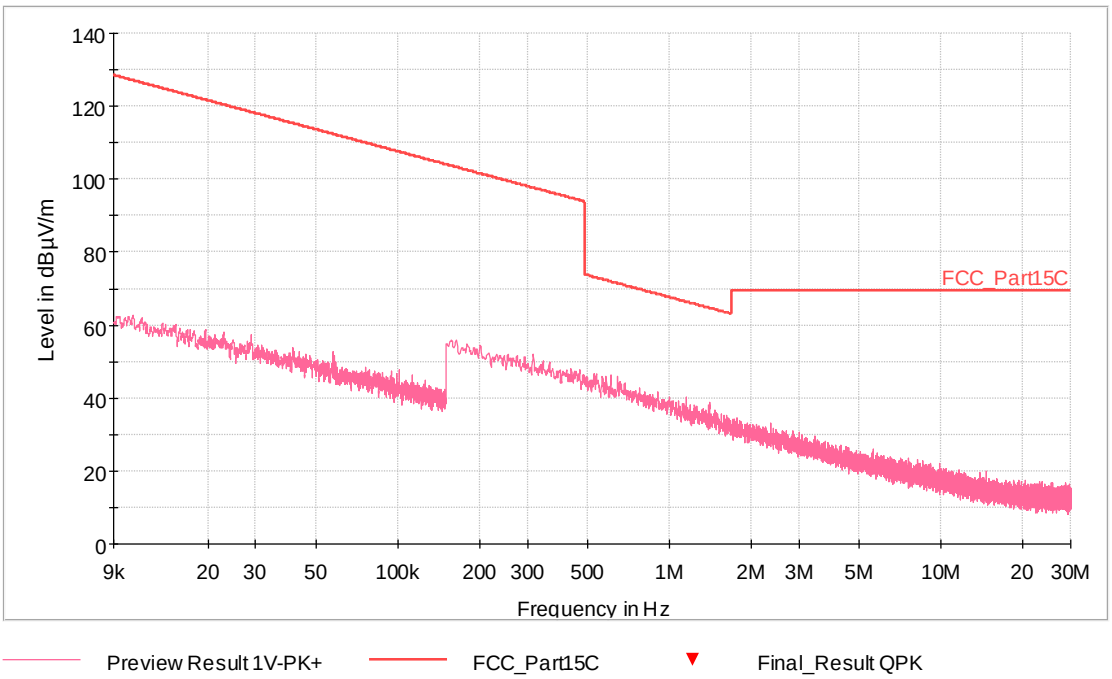


Fig. 43: Sample #1. Mode#1. Frequency range: 9 kHz – 30 MHz at Z axis

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

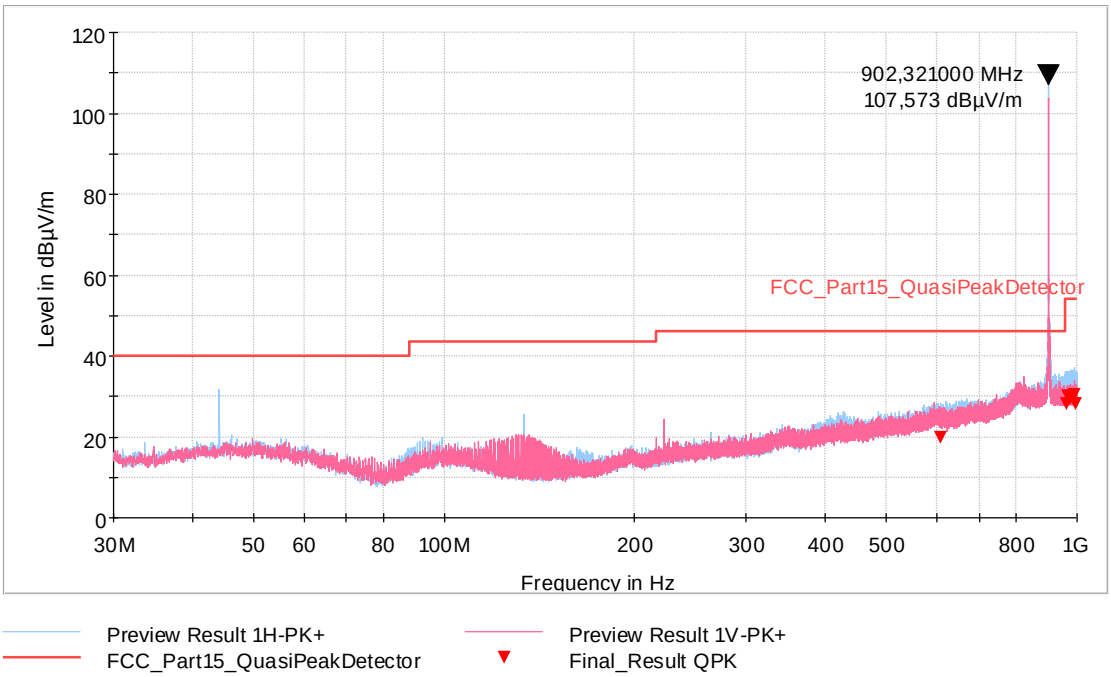


Fig. 44: Sample #1. Mode#1. Frequency range: 30 MHz – 1 GHz. Channel Low

FINAL MEASUREMENTS

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
610.060	19.7	46.0	26.3	20.0	120.000	137.0	H	238.0	25.2
964.045	28.2	54.0	25.8	20.0	120.000	118.0	H	127.0	29.7
967.763	30.0	54.0	24.0	20.0	120.000	113.0	H	44.0	29.7
978.336	29.4	54.0	24.6	20.0	120.000	100.0	H	19.0	29.9
988.748	30.4	54.0	23.6	20.0	120.000	100.0	H	83.0	30.1
996.766	28.1	54.0	25.9	20.0	120.000	117.0	H	57.0	30.4

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

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

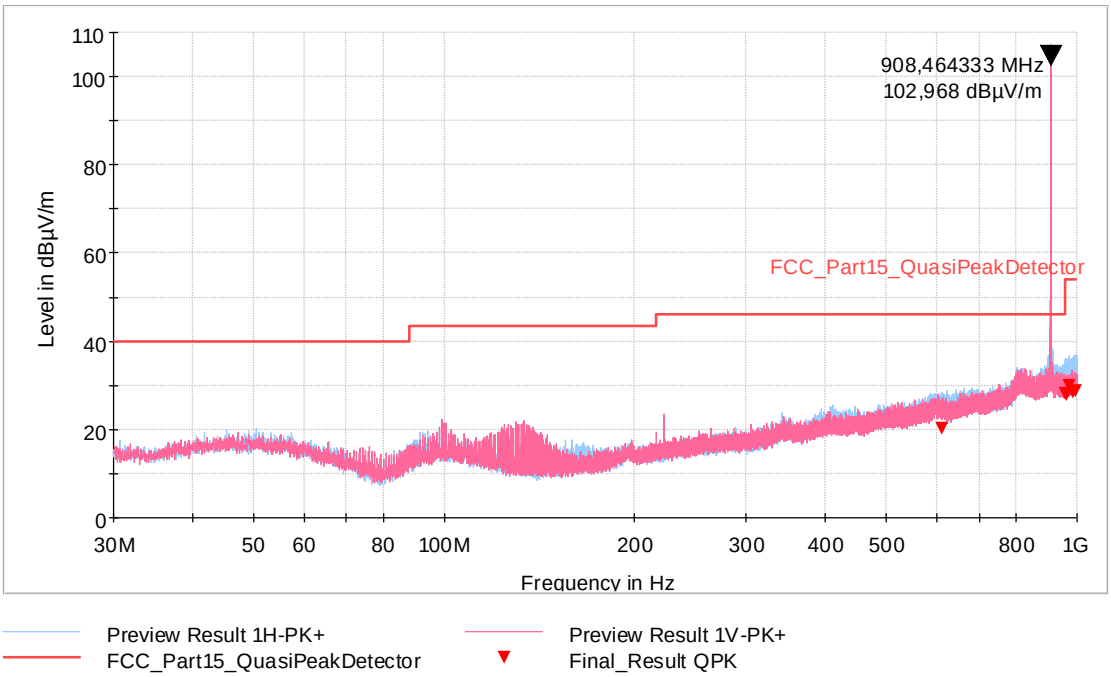


Fig. 45: Sample #1. Mode#1. Frequency range: 30 MHz – 1 GHz. Channel Middle

FINAL MEASUREMENTS

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
610.286	20.2	46.0	25.8	20.0	120.000	100.0	H	0.0	25.2
960.003	28.2	54.0	25.8	20.0	120.000	113.0	H	61.0	29.7
963.334	27.8	54.0	26.2	20.0	120.000	118.0	H	30.0	29.7
972.549	30.0	54.0	24.0	20.0	120.000	120.0	H	0.0	29.8
984.738	28.5	54.0	25.5	20.0	120.000	107.0	H	324.0	30.0
996.540	28.8	54.0	25.2	20.0	120.000	109.0	H	0.0	30.4

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

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

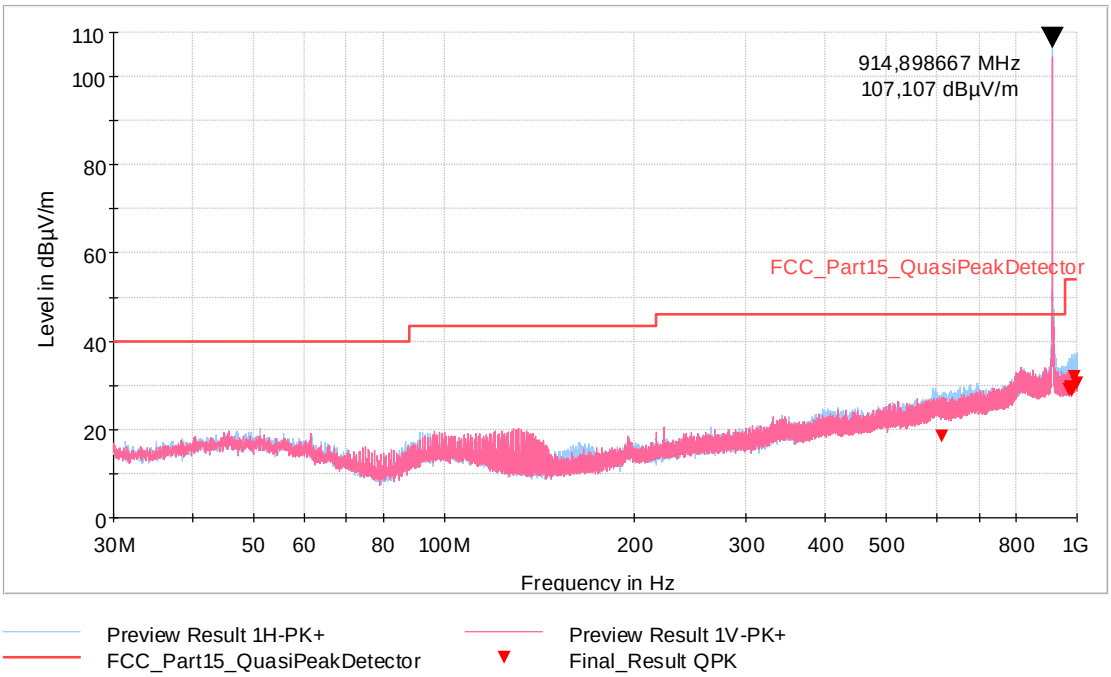


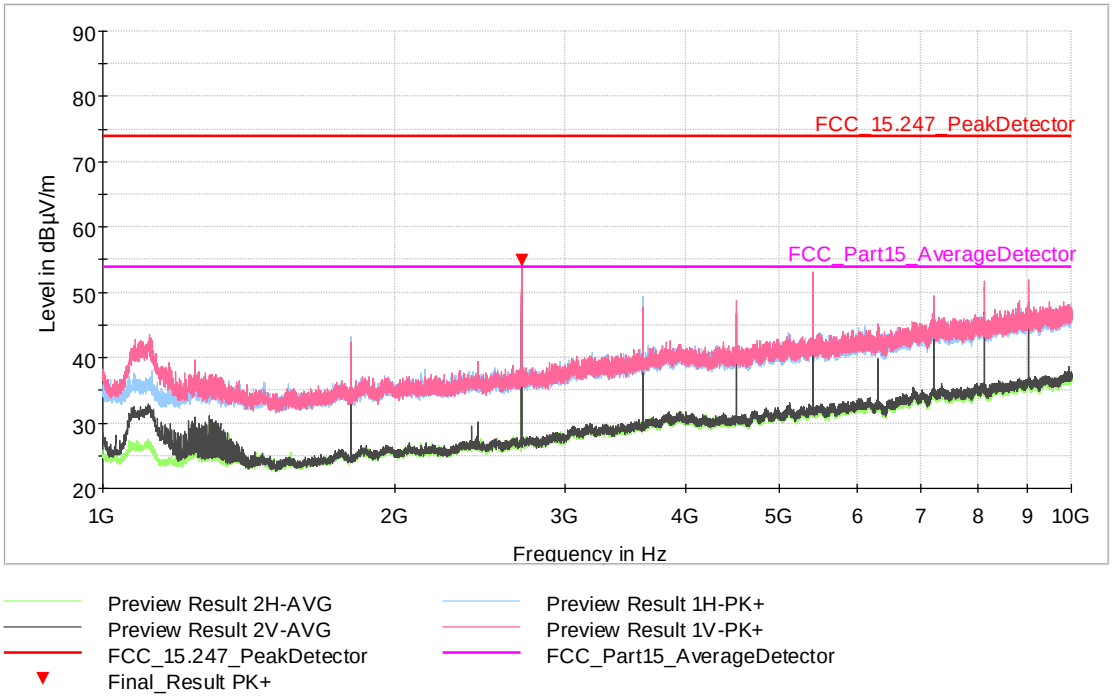
Fig. 46: Sample #1. Mode#1. Frequency range: 30 MHz – 1 GHz. Channel High

FINAL MEASUREMENTS

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
611.224	18.6	46.0	27.4	20.0	120.000	266.0	H	312.0	25.2
970.156	29.2	54.0	24.8	20.0	120.000	108.0	H	268.0	29.7
978.886	29.6	54.0	24.4	20.0	120.000	172.0	H	338.0	29.9
983.025	28.7	54.0	25.3	20.0	120.000	117.0	H	0.0	30.0
989.524	31.9	54.0	22.1	20.0	120.000	113.0	H	284.0	30.2
998.351	30.6	54.0	23.4	20.0	120.000	107.0	H	312.0	30.4

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

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



FINAL MEASUREMENTS

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
2706.700[1,2]	54.8	74.0	19.2	147.0	V	175.0

Table 50: Sample #1. Mode#1. Frequency range: 1 GHz – 8 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.

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 4.10.6.14

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

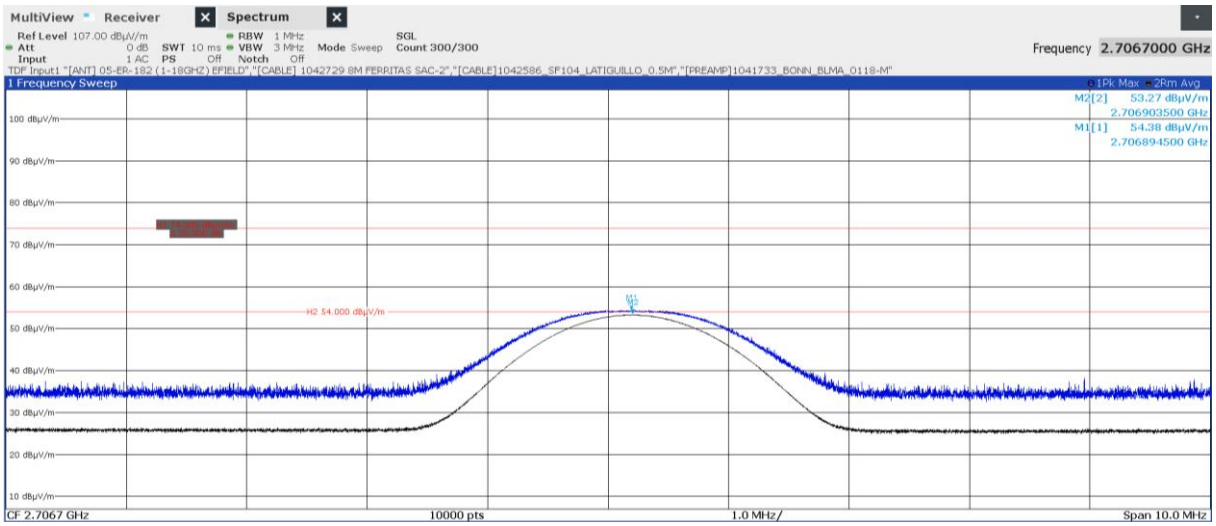


Fig. 47: Sample #1. Mode#1. Spurious frequency: 2706.7 MHz. Channel Low

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

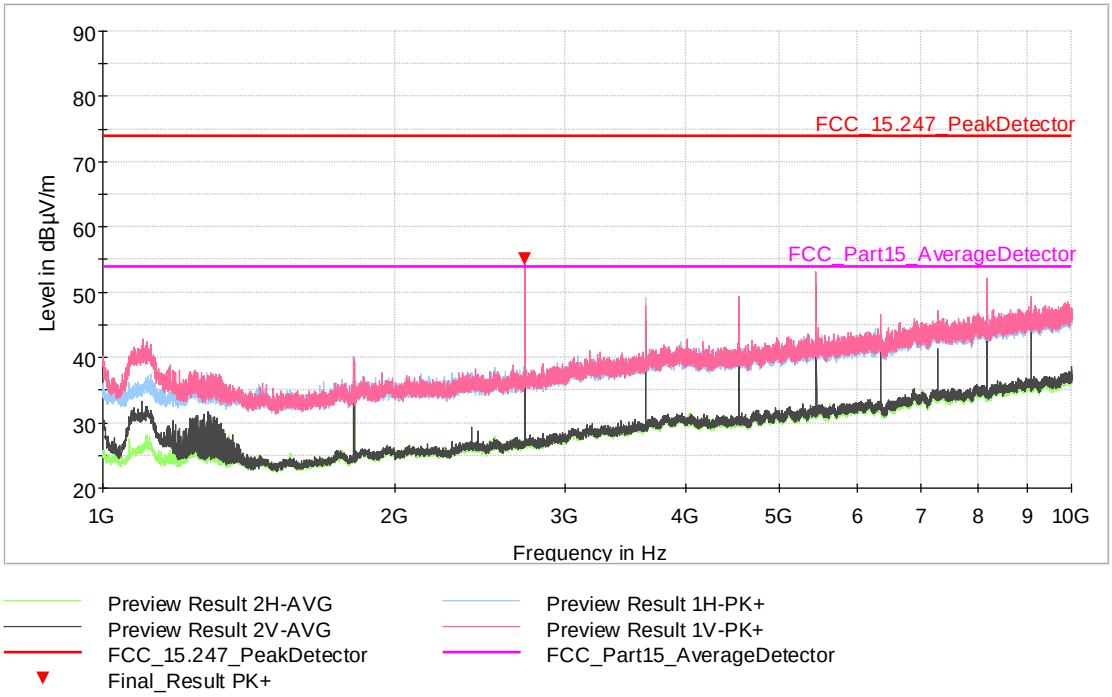


Fig. 48: Sample #1. Mode#1. Frequency range: 1 GHz – 8 GHz. Channel Middle

FINAL MEASUREMENTS

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
2725.300[1,2]	55.1	74.0	18.9	147.0	V	174.0

Table 51: Sample #1. Mode#1. Frequency range: 1 GHz – 8 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.

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 4.10.6.16

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

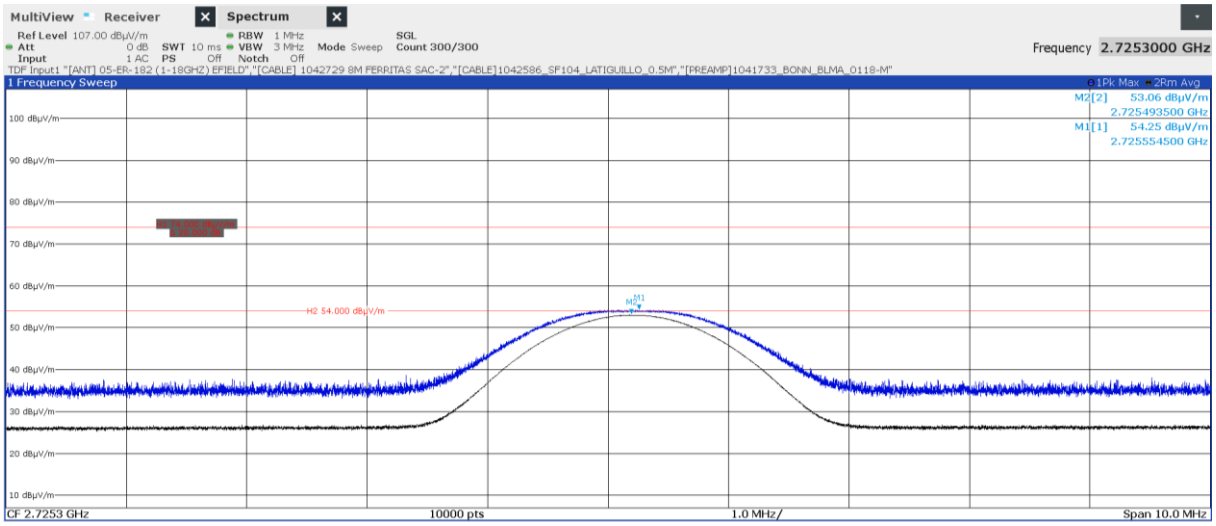
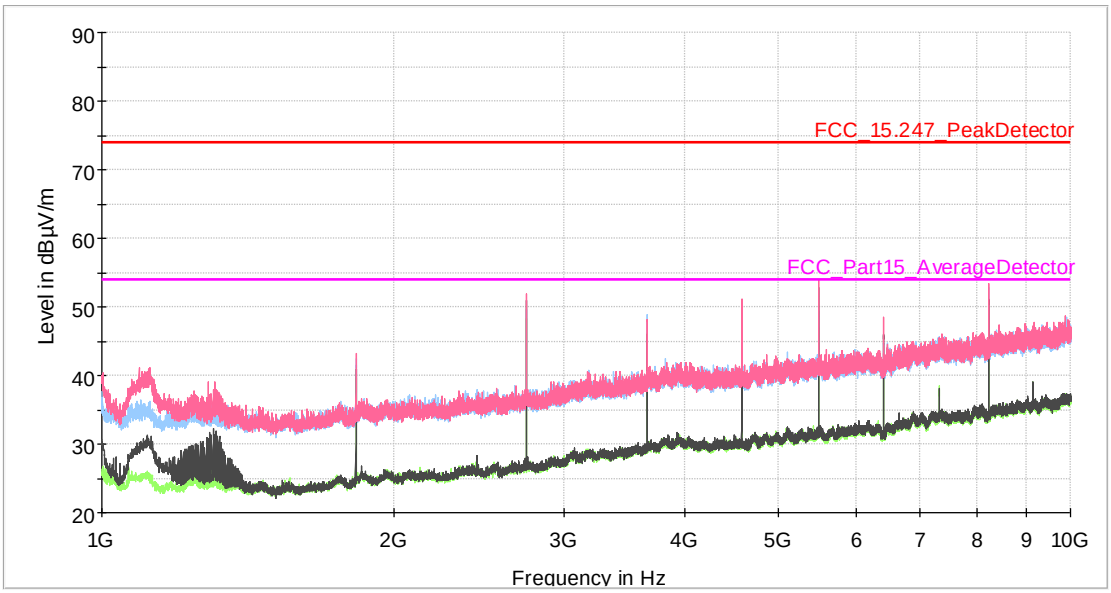


Fig. 49: Sample #1. Mode#1. Spurious frequency: 2725.3 MHz. Channel Middle

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



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

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

FINAL MEASUREMENTS

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

4.10.6.18 Sample #1. Mode#1. Frequency range: 8 GHz – 10 GHz. Channel Low

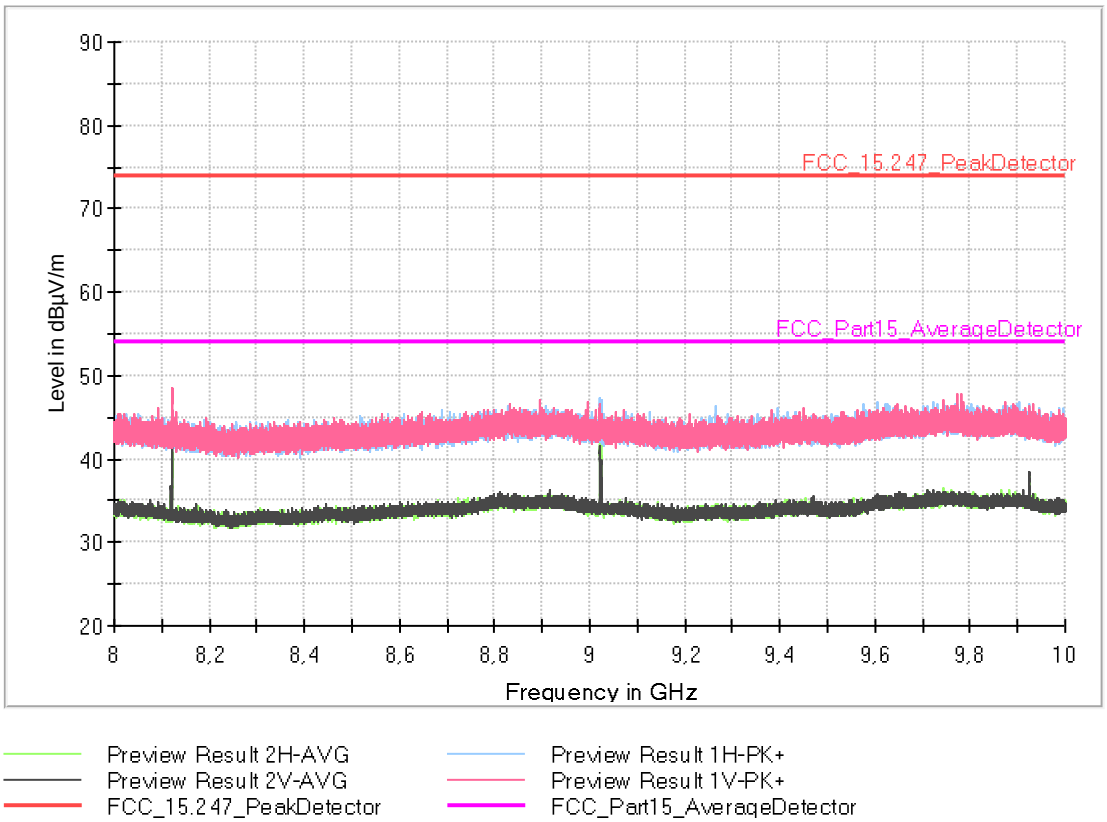


Fig. 51: Sample #1. Mode#1. Frequency range: 8 GHz – 10 GHz. Channel Low

FINAL MEASUREMENTS

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

4.10.6.19 Sample #1. Mode#1. Frequency range: 8 GHz – 10 GHz. Channel Middle

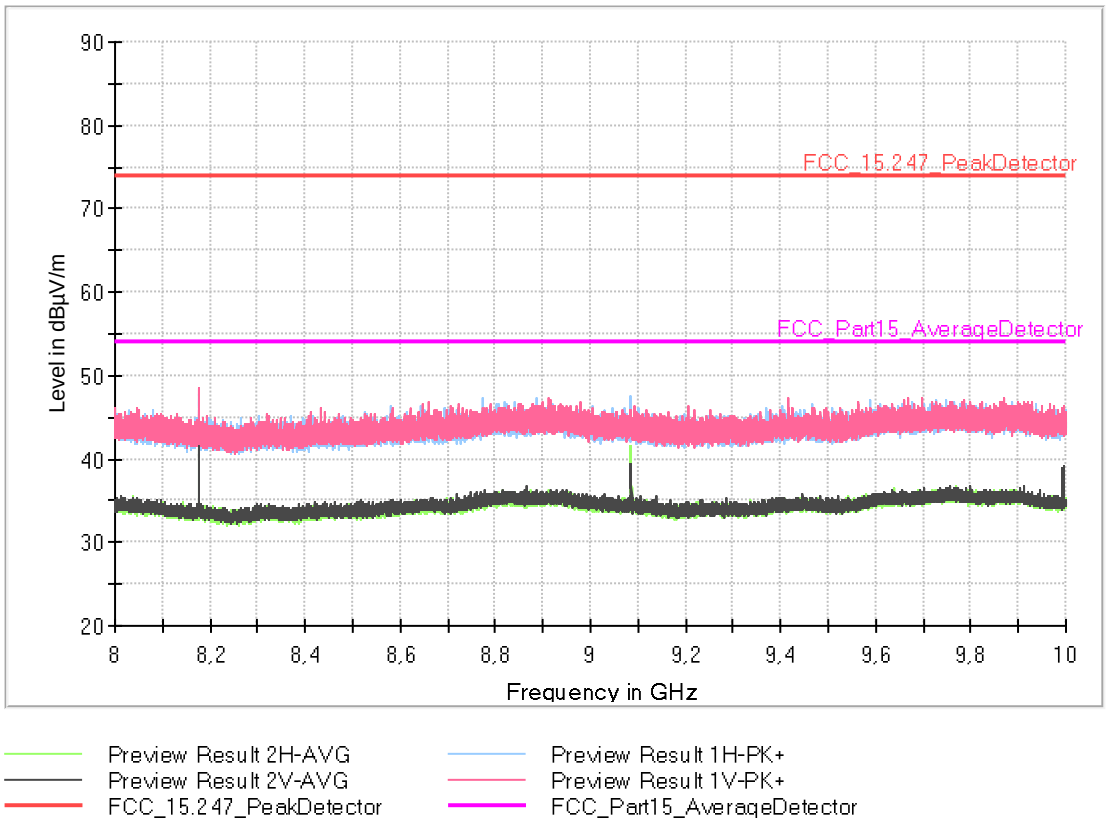


Fig. 52: Sample #1. Mode#1. Frequency range: 8 GHz – 10 GHz. Channel Middle

FINAL MEASUREMENTS

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

4.10.6.20 Sample #1. Mode#1. Frequency range: 8 GHz – 10 GHz. Channel High

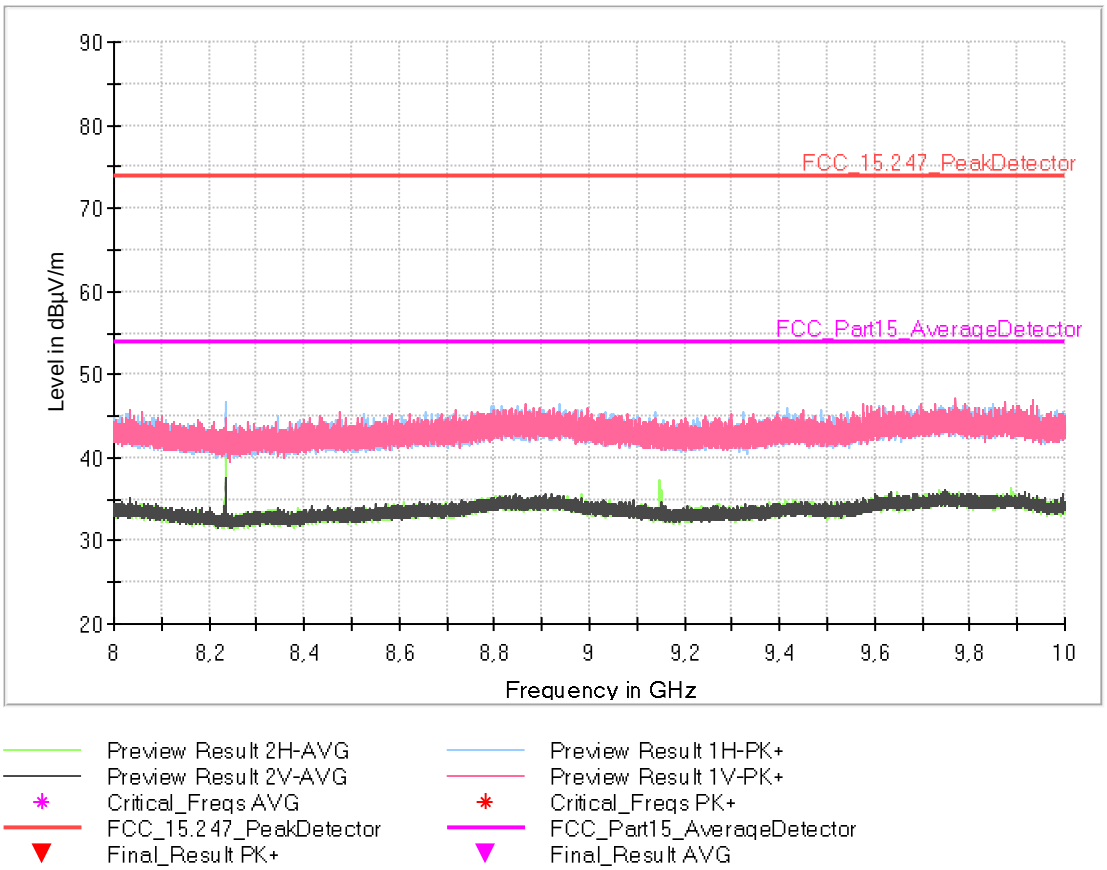


Fig. 53: Sample #1. Mode#1. Frequency range: 8 GHz – 10 GHz. Channel High

FINAL MEASUREMENTS

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

4.10.7 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
BILOG ANTENNA	SCHWARZBECK	VULP 9164	1042740	08/11/2023	08/11/2024
ACTIVE LOOP ANTENNA	EMCO	6502	05-ER-019	04/10/2023	04/10/2024
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	HUBER+SUHNER	SF104	1041964	22/06/2023	22/06/2024
EMI RECEIVER	RHODE & SCHWARZ	ESW 26	1041791	14/11/2023	14/11/2024
HORN ANTENNA	EMCO	3115	05-ER-182	08/11/2023	08/11/2024
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
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 52: Test Instruments – Radio-frequency radiated emissions

4.10.8 Uncertainty

Test Type	Test Description	Uncertainty
Emissions	RADIO-FREQUENCY RADIATED EMISSIONS 9 kHz – 30 MHz	± 3.9 dB
Emissions	RADIO-FREQUENCY RADIATED EMISSIONS 30 MHz – 1 GHz	± 5.3 dB
Emissions	RADIO-FREQUENCY RADIATED EMISSIONS 1 GHz – 6 GHz	± 5.3 dB
Emissions	RADIO-FREQUENCY RADIATED EMISSIONS 6 GHz – 18 GHz	± 5.5 dB
Emissions	RADIO-FREQUENCY RADIATED EMISSIONS 18 GHz – 26 GHz	± 5.1 dB
Emissions	RADIO-FREQUENCY RADIATED EMISSIONS 26 GHz – 40 GHz	± 5.6 dB

Table 53: 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%.