Test report for

47 CFR Part 15 Subpart C

RSS-247, RSS-Gen

The RvA is signatory to ILAC - MRA

Product name	: WIB-2100
Applicant	: Cowmanager BV
FCC ID	: Y8K-WIB2100
IC	: 22382-WIB2100

Test report No. : P000535365 002 V2.0

Laboratory information

Accreditation

Kiwa Nederland B.V. complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:2017. The accreditation covers the quality system of the laboratory as well as the specific activities as described in the authorized annex bearing the accreditation number L015 and is granted by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie).

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Documentation

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Testing Location

Test Site	Kiwa Nederland B.V.
Test Site location	Wilmersdorf 50 7327 AC Apeldoorn The Netherlands Tel. +31 88998 3393
Test Site FCC	NL0001
CABID	NL0001

Revision History

Version	Date	Remarks	By
v0.50	21-01-2026	First draft	TK
v1.00	29-01-2026	Initial release	PVW
V2.0	21-04-2026	Added ILAC and RvA logo on front page	PvW

Table of Contents

Summary of Test results

FCC	ISED	Description	Section in report	Verdict
--	--	Duty cycle	3.1	N.A.*
15.247(d) 15.209 (a)	RSS-Gen 8.9	Radiated spurious emissions	3.2	Pass
15.205 (a)	RSS Gen 8.10	Spurious emissions in the restricted bands	3.2	Pass
15.247 (a)	RSS-247 5.2(a)	6 dB bandwidth	3.3	Pass
--	RSS-Gen 6.7	99% bandwidth	3.4	Pass
15.247 (b)	RSS-247 5.4 (d)	RF output power	3.5	Pass
15.247 (e)	RSS-247 5.2 (b)	Power spectral density	3.6	Pass
15.247 (d)	RSS-247 5.5	Band edge	3.7	Pass
15.207 (c)	RSS-Gen 8.8	AC power-line conducted emissions	3.8	Pass

Decision rule: Pass/Fail decisions are based on measurement results without taking into account measurement uncertainty.

*Added for reporting purposes only.

1 General Description

1.1 Applicant

Client name:	Cowmanager BV
Address:	Gerverscop 9
Zip code:	3481LT, Harmelen, the Netherlands
Telephone:	31348443840
E-mail:	certification@cowmanager.com
Contact name:	Natasha Parisha

1.2 Manufacturer

Manufacturer name:	Cowmanager BV
Address:	Gerverscop 9
Zip code:	3481LT, Harmelen, the Netherlands
Telephone:	31348443840
E-mail:	certification@cowmanager.com
Contact name:	Natasha Parisha

1.3 Tested Equipment Under Test (EUT)

Product name:	WIB-2100
Brand name:	CowManager
FCC ID:	Y8K-WIB2100
IC:	22382-WIB2100
Product type:	Long range router
Model(s):	WIB
Batch and/or serial No.	00 8744
Software version:	6.135 (this is the test version of (identical) 6.4)
Hardware version:	21.1
Date of receipt	16-01-2026
Tests started:	16-01-2026
Testing ended:	21-01-2026

1.3.1 Auxiliary items

AUX1

Product name:	Designated Power supply for EUT
Brand name:	Globtek inc
Product type:	AC/DC adapter
Model(s):	GTM4601-1005-USB
Batch and/or serial No.	WR9QA200USBN23MDR6B
Remarks:	Connects to EUT

1.4 Product specifications of Equipment under test

Tx Frequency:	2405MHz-2480MHz
Rx frequency:	2405MHz-2480MHz
Occupied channel width:	2MHz
Antenna type:	Omni directional whip
Antenna gain:	8 dBi
Type of modulation:	BPM, BPSK
Emission designator	2M27F1D

Disclaimer: The operating frequency bands are declared by the applicant

1.5 Environmental conditions

Normal test conditions:

Temperature (*) : +15°C to +25°C
Relative humidity(*) : 20 % to 75 %

1.6 Measurement standards

- ANSI C63.10-2020/Cor 1-2023/C63.10a-2024
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02

1.7 Applicable standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.207
- FCC Part 15 Subpart C §15.209
- FCC Part 15 Subpart C §15.247
- RSS-Gen Issue 5
- RSS-247 Issue 4

1.8 Observation and remarks

EUT was mounted on a metal pole and connected to the transmissions antenna at the top of the pole. This setup is representative of the installation in the field.
The EUT contains a 802.15.4a radio module.
The manufacturer specifies that the maximum duty cycle that can be achieved in the final product is 5%. The explanation for this maximum duty cycle is given in chapter 3.1. Based on this maximum duty cycle, the average value of the radiated emissions that are temporally related to the transmitter have been calculated in accordance with the ANSI C63.10:2020 clause 11.12.2.5.2.2.
The radiated emissions measurement were performed with the transmitter at power setting 25. This will be 21 in the final product, it was confirmed that the radiated emissions result would not get worse at this this lower power setting.

1.9 Modifications to the EUT (Equipment Under Test)

The power setting of the transmitter was changed from 25 to 21.

1.10 Conclusions

The sample of the product showed **NO NON-COMPLIANCES** to the specifications stated in paragraph 1.7 of this report.

The results of the test as stated in this report, are exclusively applicable to the product items as identified in this report. Kiwa Nederland B.V. accepts no responsibility for any properties of product items in this test report, which are not supported by the tests as specified in paragraph 1.7 *"Applicable standards".*

All tests are performed by:

Name : Ing. T. Keltjens

Review of test methods and report by:

Name : P. van Wanrooij, BASc

The above conclusions have been verified by the following signatory:

Date : 21-04-2026

Name : P. van Wanrooij

Function : Test Engineer

Signature :

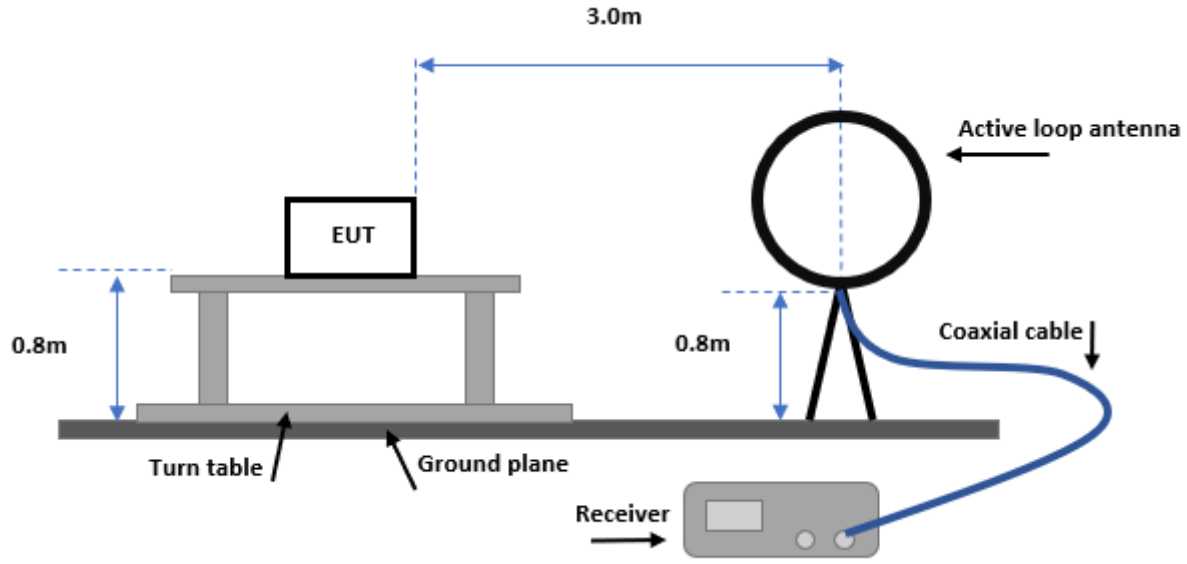
2 Test configuration of the Equipment Under Test

2.1 Test mode

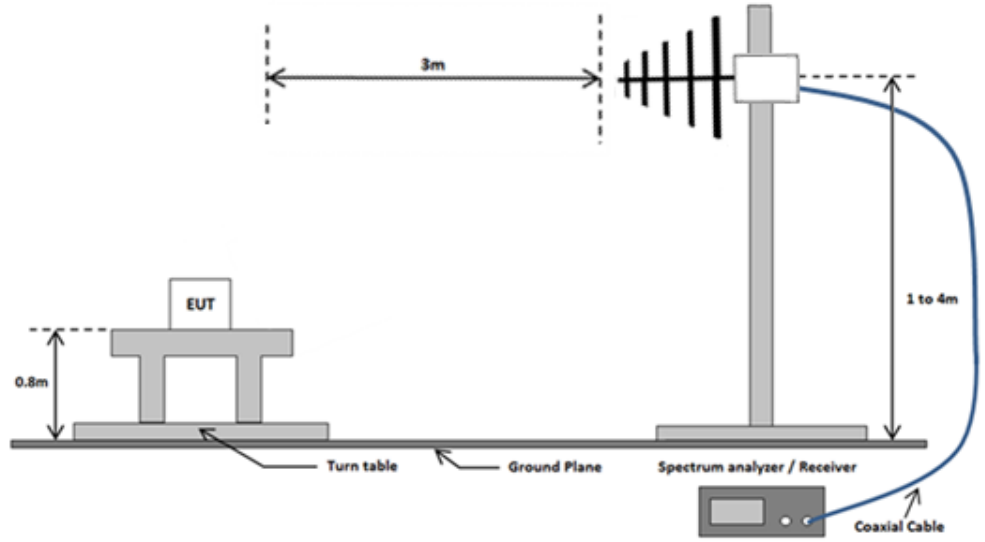
The manufacturer provided a test firmware that allowed the radio to transmit at a 100% duty cycle with modulation. All test except the duty cycle test were performed using this test firmware.

2.2 Test setups

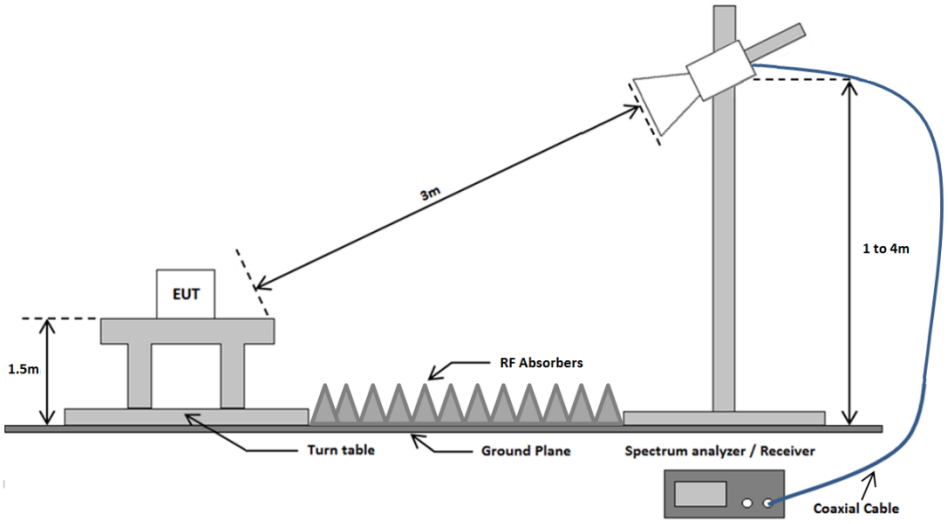
Radiated emissions test setup 9 kHz – 30 MHz



Radiated emissions test setup 30 MHz - 1 GHz

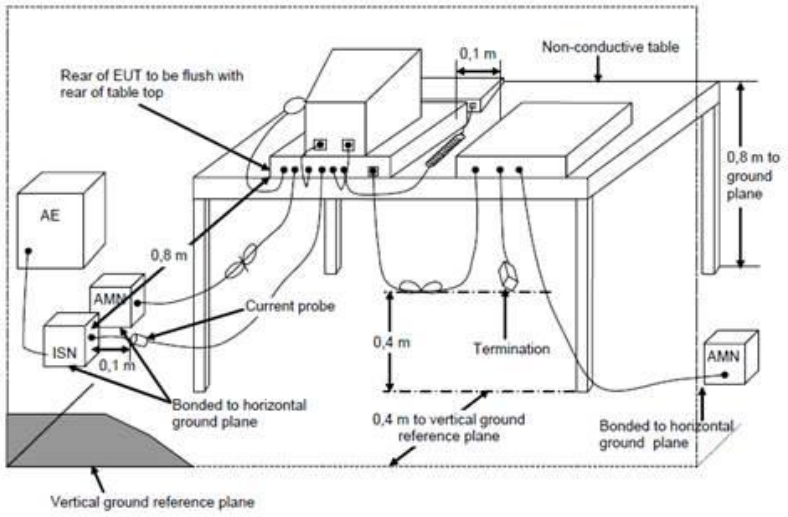


Radiated emissions test setup above 1 GHz

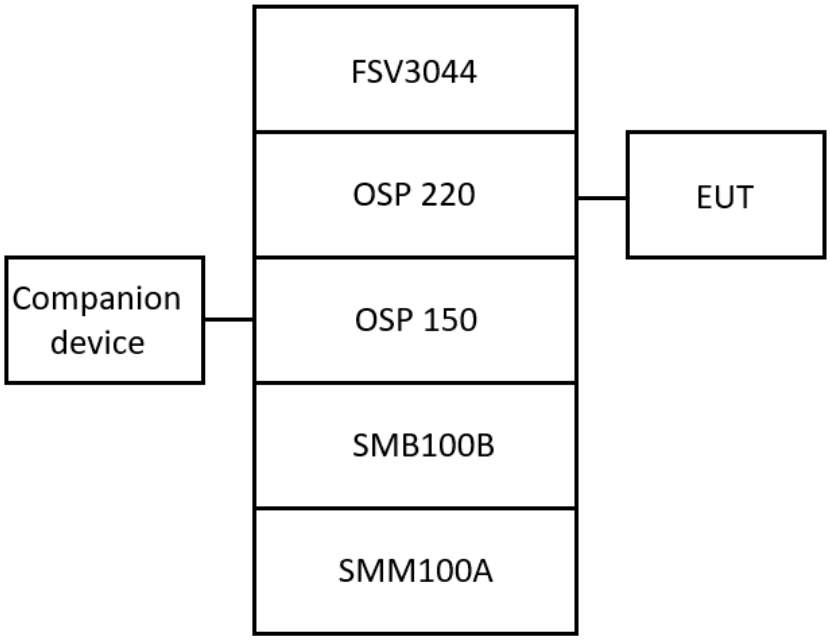


AC Power line conducted emissions test setup

Emissions test at AC mains



Antenna port conducted tests



List of used cables					
Number	**Function**	**From**	**To**	**Length**	**Remarks**
1	AC Power	mains 120Vac 60 Hz	AUX1	3m	-
2	5 Vdc power	AUX1	EUT	3m	-

2.3 Equipment used in the test configuration

Description	Manufacturer	Model	ID	Cal. Done date	Cal. due date	Used at Par.
EMI Test receiver	Rohde & Schwarz	EPL1000	115435	12-2025	12-2026	3.8
EMI Receiver	Rohde & Schwarz	ESR7	114870	01-2025	31-01-2026	3.2
Spectrum Analyzer	Rohde & Schwarz	FSV3044	114923	10-2025	10-2026	3.2
2.5 GHz HPF	Wainwright	WHKX12-2477.75-2650-18000-40SS	115031	08-2025	08-2026	3.2
Active loop antenna	EMCO	6502	114515	02-2025	02-2028	3.2
Biconical antenna + 6dB attenuator	Schwarzbeck + HP	VHA9103 + 8491A	114436	07-2024	07-2027	3.2
Logperiodic antenna	Schwarzbeck	VULP 9118B	115028	11-2024	11-2027	3.2
Horn antenna	EMCO	3115	114607	01-2025	01-2028	3.2
Horn antenna	FLANN-MICROWAVE	20240-25	114518	NA*	NA*	3.2
Preamplifier 1-18 GHz	µComp Nordic	MCNA-40-0010800-25-10P	114771	10-2025	10-2026	3.2
Preamplifier 18-40 GHz	Schwarzbeck	BBV-9721	115026	10-2025	10-2026	3.2
Semi-Anechoic Chamber	ETS Lindgren	SAR	114624	03-2023	03-2026	3.2
Test software	Raditeq	Radimation Version 2024.2.1	--	--	--	3.2
LISN /Two line V-network	Rohde & Schwarz	ENV 216	114379	11-2025	11-2027	3.8

*Note: Standard gain horn antennas do not need calibration
NA= Not Applicable

Description	Manufacturer	Model	ID	Cal. Done date	Cal. due date	Used at Par.
Spectrum analyser	Rohde & Schwarz	FSV3044	114923	10-2025	10-2026	3.3 – 3.7
Power meter and switch unit	Rohde & Schwarz	OSP220	115042	01-2024	01-2027	3.3 – 3.7
Switch unit	Rohde & Schwarz	OSP150	115041	11-2023	11-2026	3.3 – 3.7
10dB attenuator	Radiall	R415620000	114233	11-2025	11-2026	3.3 – 3.7

2.4 Sample calculations

All formulas for data conversions and conversion factors are reported in chapter 4 of this test report.

3 Test results

3.1 Duty cycle

3.1.1 Limit

No limit, for reporting purposes only.

3.1.2 Measurement instruments

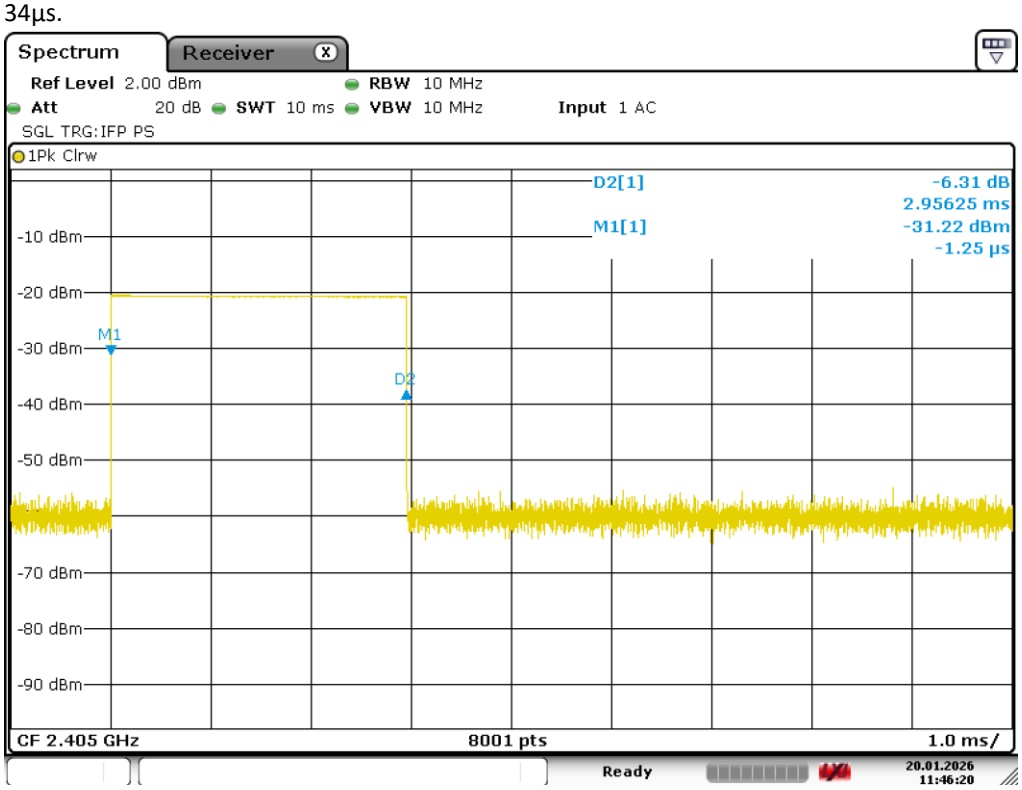
The measurement instruments are listed in chapter 2.3 of this report.

3.1.3 Test procedure

IRN 401 – Method 2

3.1.4 Test result

Duration of one transmission with payload of 88 bytes is 2.956ms. Transmission duration per byte of data is 34µs.



This shows the transmission duration per byte of data is around 34µs.
The manufacturer states for every connected device to the router 764 bytes of data will be transmitted every hour. The manufacturer declares the maximum number of devices that can be connected in the field is 2000. So, 2000 devices x 764 bytes x 34µs = 51.952s of transmission time per hour. So, the maximum duty cycle is 51.952/3600 x 100% = 1.45%. For safety reasons the manufacturer has stated the maximum duty cycle is 5%.

3.2 Radiated spurious emissions

3.2.1 Limit

FCC 15.209(a)

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance(m)
0.009 – 0.490	2400/F(kHz)	20*{log[2400]-log[F(kHz)]}	300*
0.490 – 1.705	24000/F(kHz)	20*{log[24000]-log[F(kHz)]}	30*
1.705 – 30.0	30	29.5	30*
30 -88	100	40	3
88 - 216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

*Note: Measured values in the plots 9 kHz to 30 MHz corrected to 30m or 300m limit distance according to the method described in ANSI C63.10-2020, clause 6.4

RSS-GEN

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Magnetic field strength (H-Field) (µA/m)	Magnetic field strength (H-Field) (dBµA/m)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance(m)
0.009 – 0.490	6.37/F (kHz)	20*{log[6.37]-log[F(kHz)]}	N.A.	20*{log[6.37] - log[F(kHz)]} + 51.5	300*
0.490 – 1.705	63.7/F (kHz)	20*{log[63.7]-log[F(kHz)]}	N.A.	20*{log[63.7] - log[F(kHz)]} + 51.5	30*
1.705 - 30	0.08	-21.9	N.A.	29.6	30*
30 -88	N.A.	N.A.	100	40	3
88 - 216	N.A.	N.A.	150	43.5	3
216-960	N.A.	N.A.	200	46	3
Above 960	N.A.	N.A.	500	54	3

*Note: Measured values in the plots 9 kHz to 30 MHz corrected to 30m or 300m limit distance according to the method described in ANSI C63.10-2020, clause 6.4.

3.2.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

3.2.3 Test setup

The test setup is as shown in chapter 2.2 of this report.

3.2.4 Test procedure

9 kHz – 30 MHz: According to ANSI C63.10-2020, section 6.4
30 MHz to 26.5 GHz: According to ANSI C63.10-2020, section 6.5 and 6.6
The average value of the radiated emissions peaks between 1-18GHz that are temporally related to the transmitter have been calculated in accordance with the Ansi C63.10:2020 11.12.2.5.2.2.

9 kHz to 30 MHz: IRN 441 – Method 10
30 MHz to 1 GHz: IRN 441 – Method 1

The spectrum was examined from 0.009 MHz to 26.5 GHz, more than the 10th harmonic of the highest intentional generated frequency (2.48 GHz). Final radiated emission measurements were made at 3m distance.

The 6 highest emission amplitudes relative to the appropriate limit were recorded in this report. Field strength values of radiated emissions at frequencies not listed in the tables are more than 20 dB below the applicable limit.

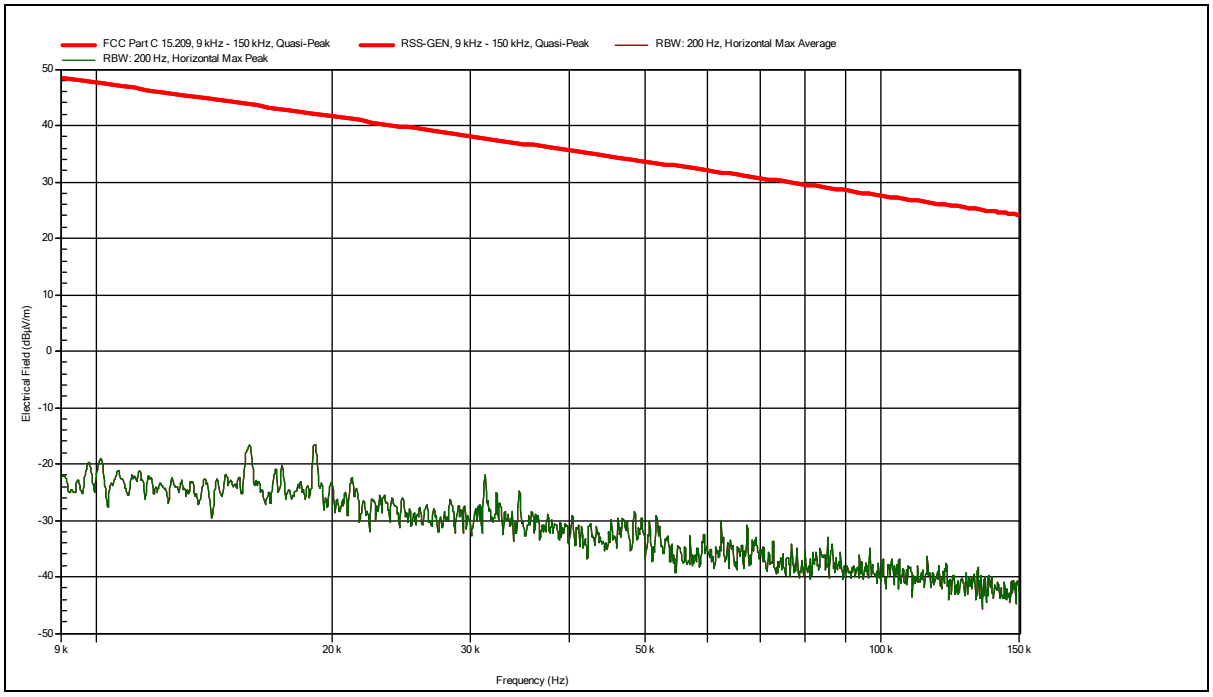
3.2.5 Measurement Uncertainty

Frequency range	Polarization	Uncertainty
9 kHz – 30 MHz	--	±1.6 dB
30 – 200 MHz	Horizontal	±4.5 dB
	Vertical	±5.4 dB
200 -1000 MHz	Horizontal	±3.6 dB
	Vertical	±4.6 dB
1 – 18 GHz	Horizontal	±5.7 dB
	Vertical	±5.7 dB
18 – 26.5 GHz	Horizontal	±4.9 dB
	Vertical	±4.9 dB

3.2.6 Test results

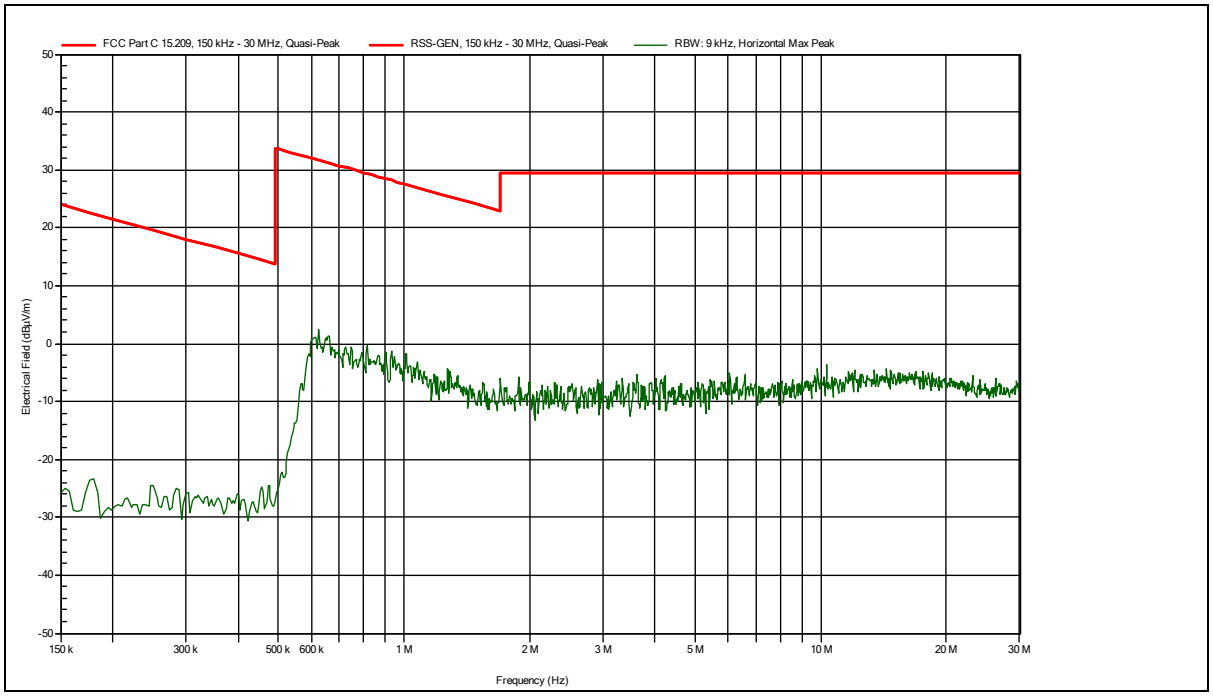
Radiated emission semi anechoic chamber 9 kHz to 150 kHz

Resolution bandwidth:	200 Hz	Video bandwidth:	500 Hz
Antenna distance:	3 m		
Antenna polarization:	Parallel		
Mode of operation:	Running		



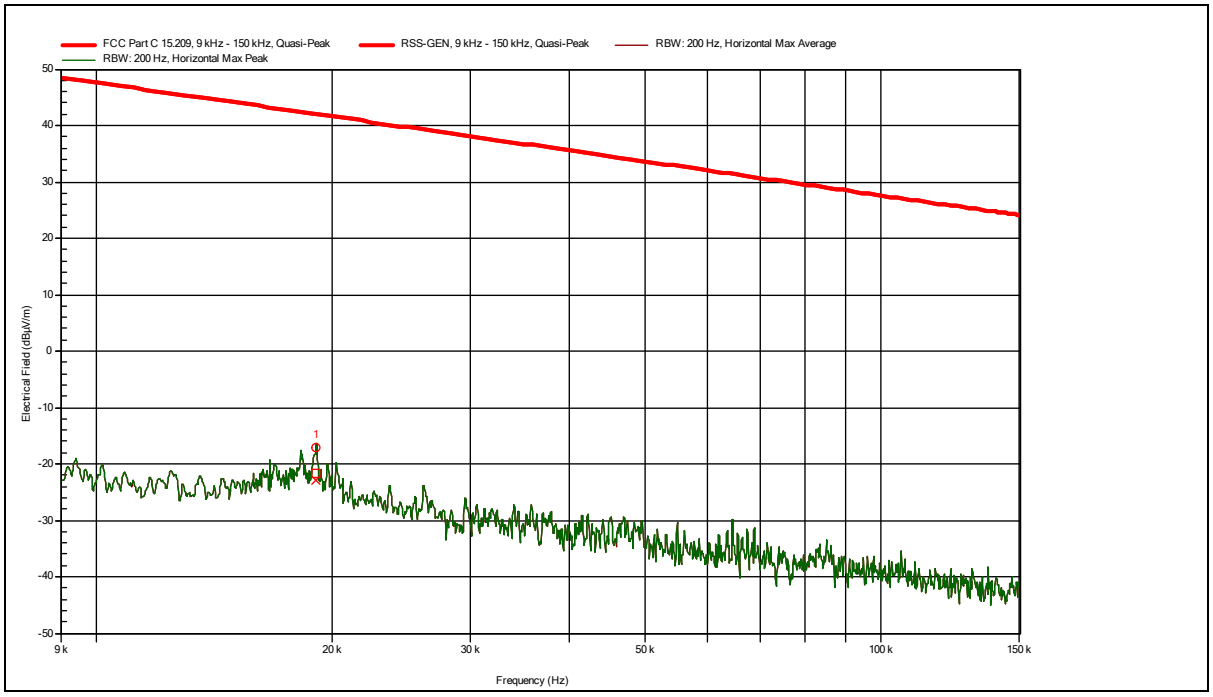
Radiated emission semi anechoic chamber 150 kHz to 30 MHz

Resolution bandwidth:	9 kHz	Video bandwidth:	30 kHz
Antenna distance:	3 m		
Antenna polarization:	Parallel		
Mode of operation:	Running		



Radiated emission semi anechoic chamber 9 kHz to 150 kHz

Resolution bandwidth:	200 Hz	Video bandwidth:	500 Hz
Antenna distance:	3 m		
Antenna polarization:	Perpendicular		
Mode of operation:	Running		

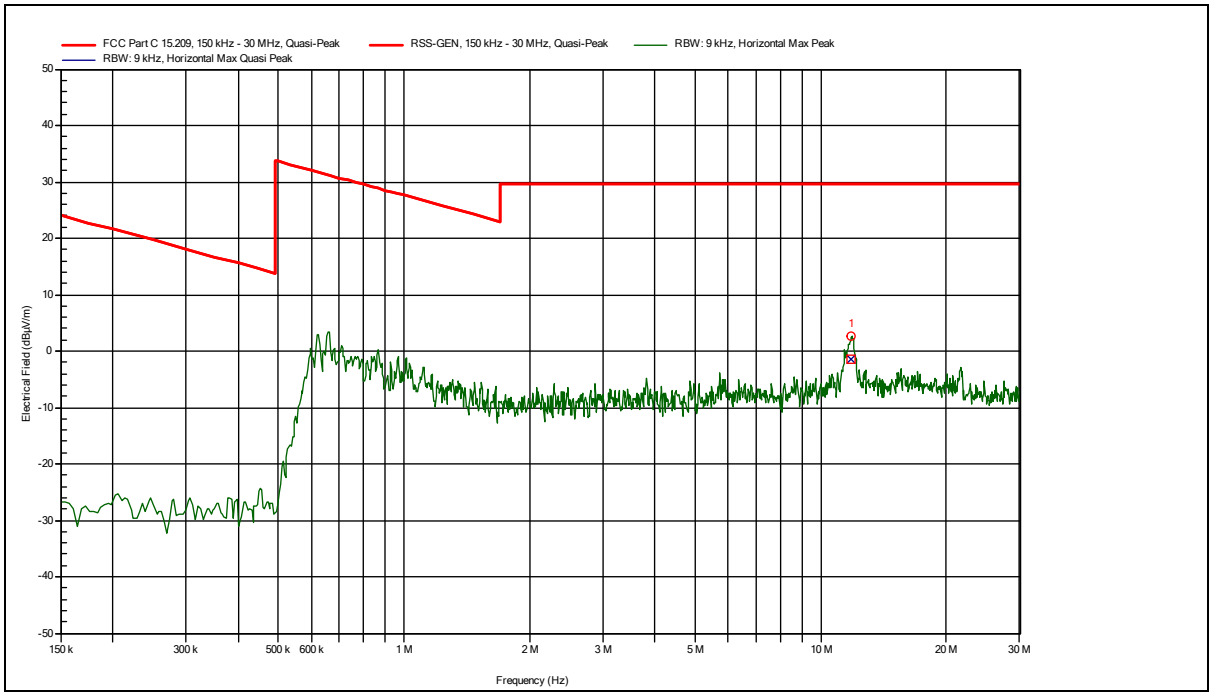


Detected peaks

Peak Number	Frequency (MHz)	Quasi-Peak (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Angle (degrees)	Height (m)	Polarization	Status
1	0,019	-21,8	42	266	1	Horizontal	Pass

Radiated emission semi anechoic chamber 150 kHz to 30 MHz

Resolution bandwidth:	9 kHz	Video bandwidth:	30 kHz
Antenna distance:	3 m	Antenna height:	1 - 4 m
Antenna polarization:	Perpendicular		
Mode of operation:	Running		

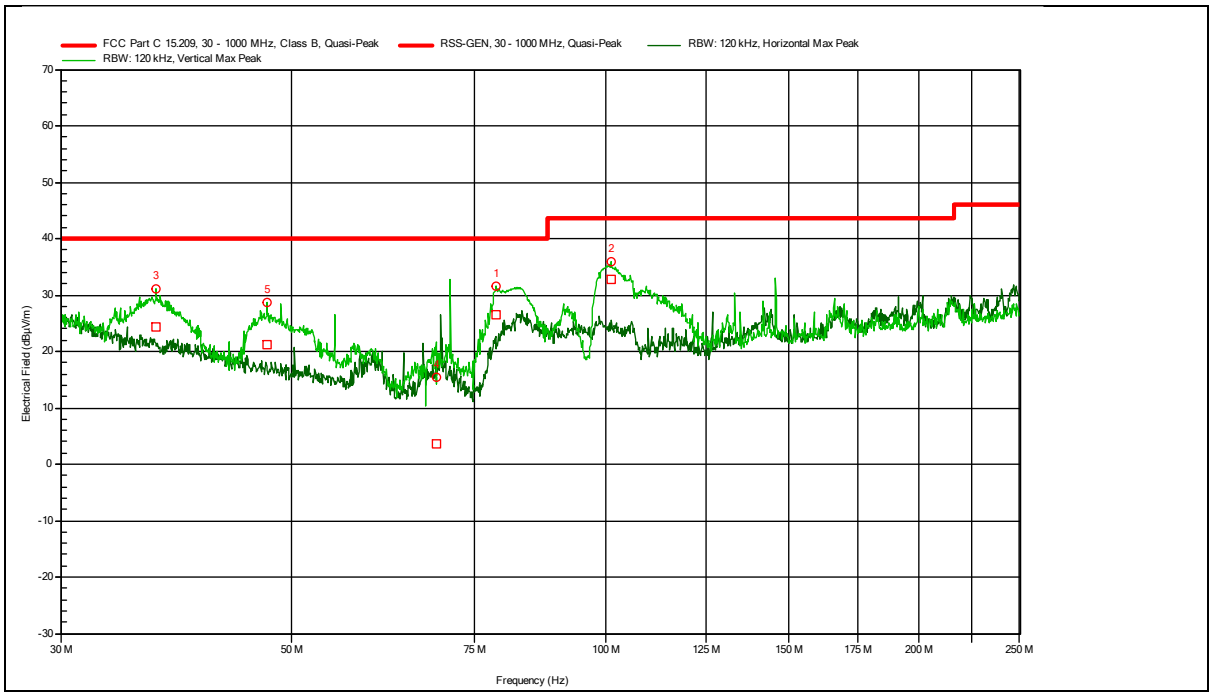


Detected peaks

Peak Number	Frequency (MHz)	Quasi-Peak (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Angle (degrees)	Height (m)	Polarization	Status
1	11,855	-1,5	29,5	173	1	Horizontal	Pass

Radiated emission semi anechoic chamber 30 MHz to 250 MHz

Resolution bandwidth:	120 kHz	Video bandwidth:	300 kHz
Antenna distance:	3 m	Antenna height:	1 - 4 m
Antenna polarization:	Both		
Mode of operation:	Running Channel 11 - TX 25		

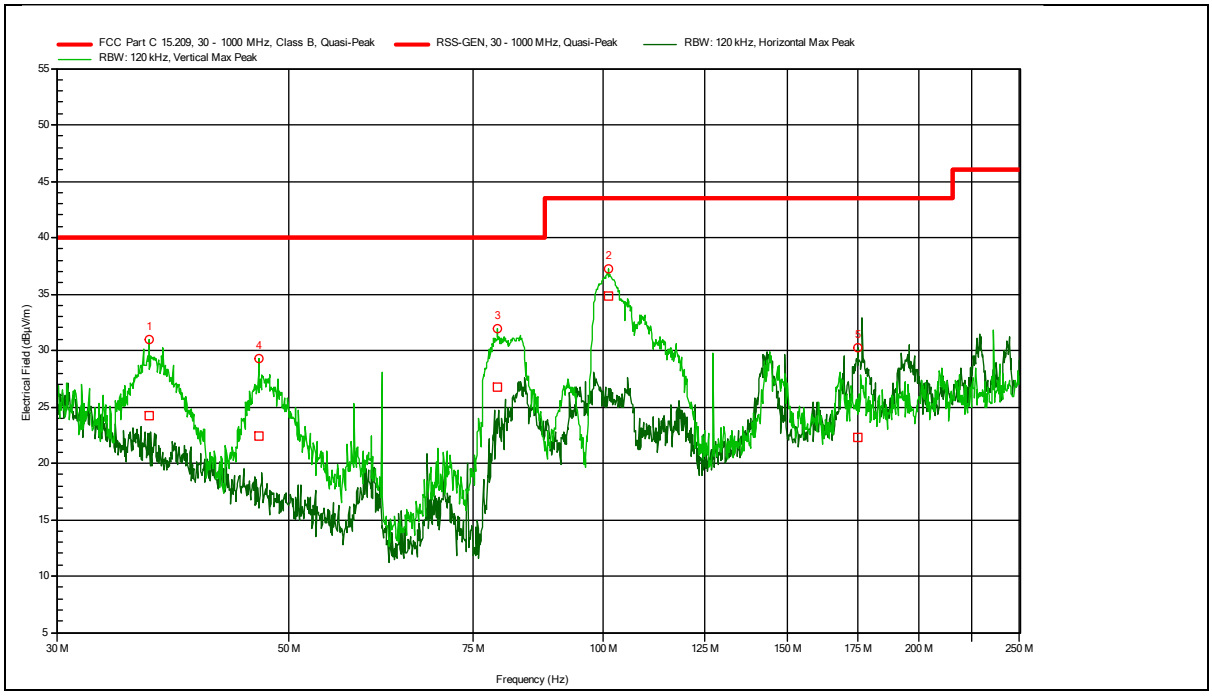


Detected peaks

Peak Number	Frequency (MHz)	Quasi-Peak (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Angle (degrees)	Height (m)	Polarization	Status
3	37,015	24,4	40	63	1	Vertical	Pass
2	101,207	32,9	43,5	95	1	Vertical	Pass
1	78,613	26,5	40	126	1	Vertical	Pass
4	68,847	3,6	40	312	4	Vertical	Pass
5	47,357	21,2	40	312	1	Vertical	Pass

Radiated emission semi anechoic chamber 30 MHz to 250 MHz

Resolution bandwidth:	120 kHz	Video bandwidth:	300 kHz
Antenna distance:	3 m	Antenna height:	1 - 4 m
Antenna polarization:	Both		
Mode of operation:	Running Channel 18 - TX 25		

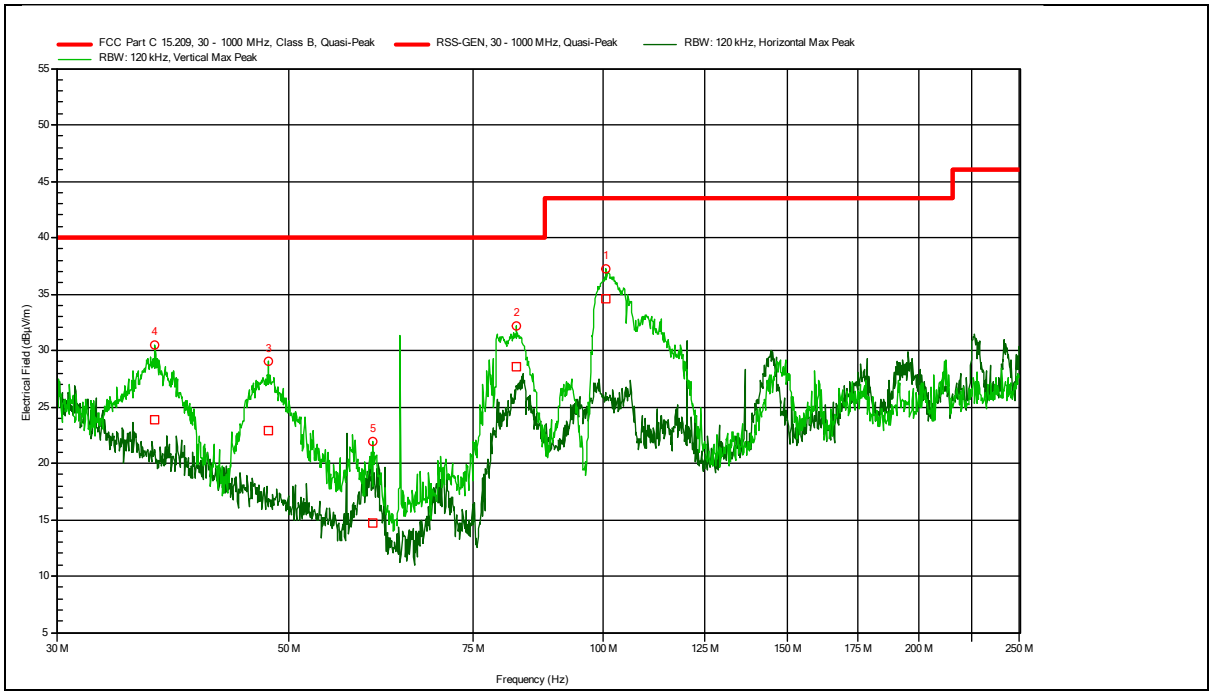


Detected peaks

Peak Number	Frequency (MHz)	Quasi-Peak (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Angle (degrees)	Height (m)	Polarization	Status
1	36,799	24,2	40	94	1	Vertical	Pass
2	101,112	34,8	43,5	94	1	Vertical	Pass
3	79,302	26,8	40	125	1	Vertical	Pass
4	46,788	22,3	40	314	1	Vertical	Pass
5	174,949	22,2	43,5	314	2,5	Horizontal	Pass

Radiated emission semi anechoic chamber 30 MHz to 250 MHz

Resolution bandwidth:	120 kHz	Video bandwidth:	300 kHz
Antenna distance:	3 m	Antenna height:	1 - 4 m
Antenna polarization:	Both		
Mode of operation:	Running Channel 26 - TX 25		

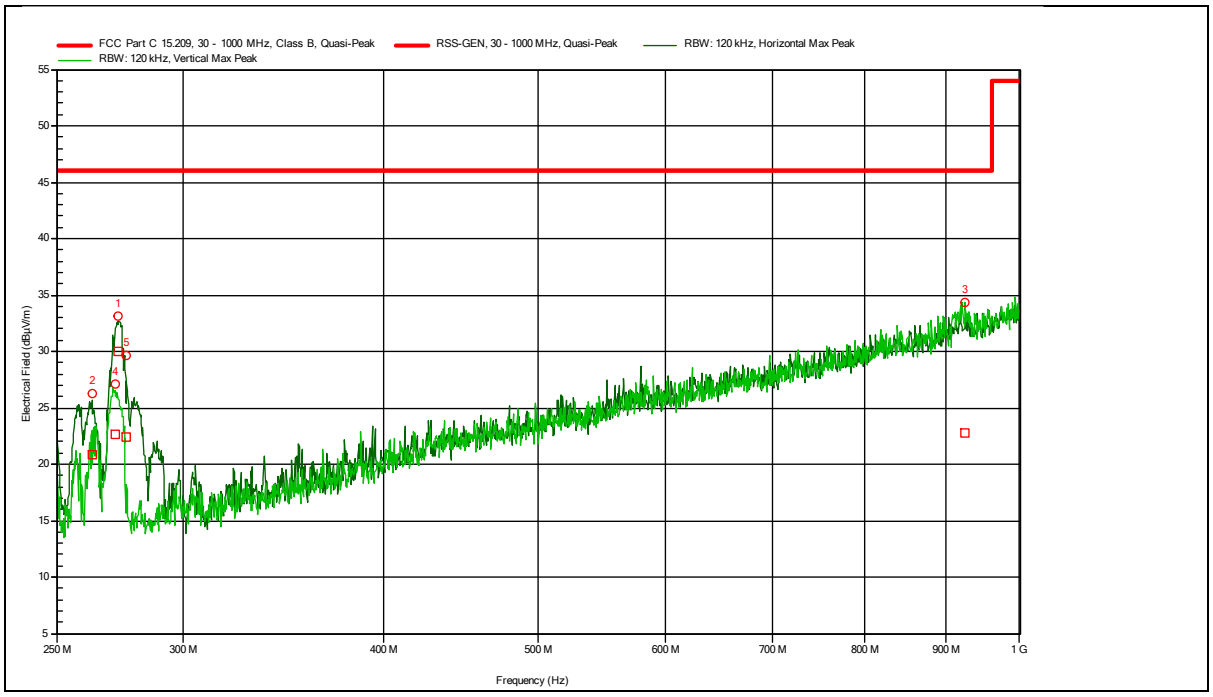


Detected peaks

Peak Number	Frequency (MHz)	Quasi-Peak (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Angle (degrees)	Height (m)	Polarization	Status
4	37,276	23,9	40	63	1	Vertical	Pass
1	100,578	34,6	43,5	95	1	Vertical	Pass
2	82,687	28,5	40	127	1	Vertical	Pass
5	60,263	14,6	40	235	1,5	Vertical	Pass
3	47,897	22,9	40	314	1	Vertical	Pass

Radiated emission semi anechoic chamber 250 MHz to 1 GHz

Resolution bandwidth:	120 kHz	Video bandwidth:	300 kHz
Antenna distance:	3 m	Antenna height:	1 - 4 m
Antenna polarization:	Both		
Mode of operation:	running Ch11 - TX 25		

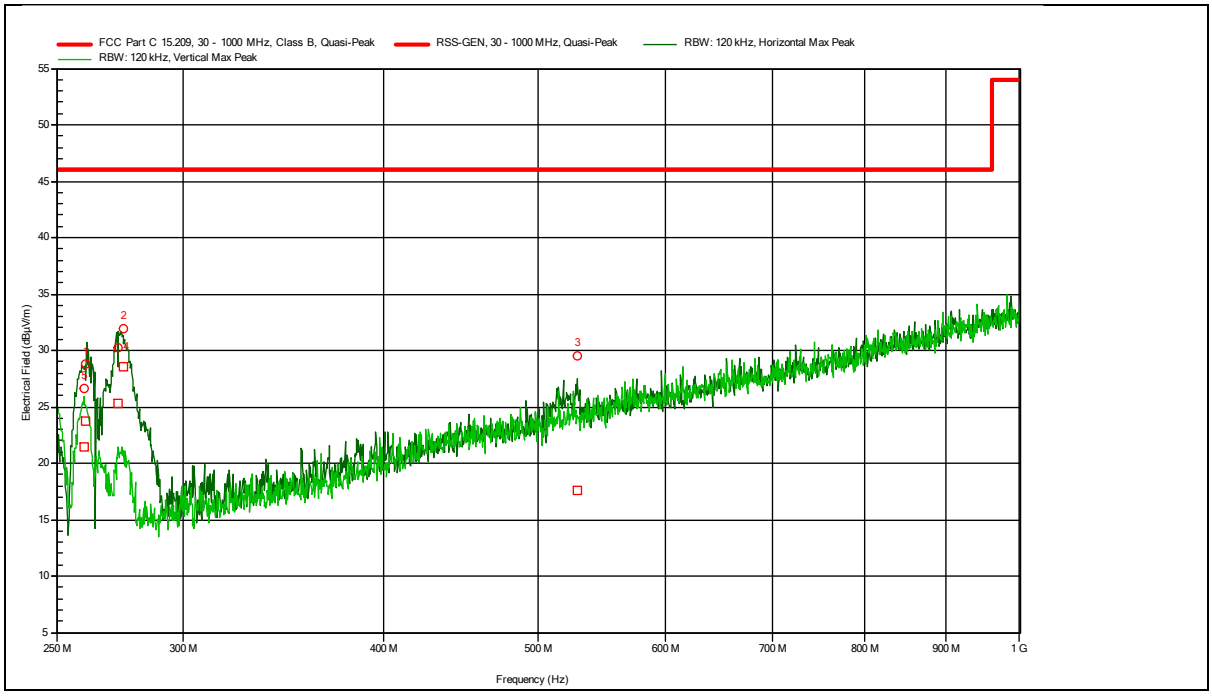


Detected peaks

Peak Number	Frequency (MHz)	Quasi-Peak (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Angle (degrees)	Height (m)	Polarization	Status
3	924,78	22,8	46	124	3	Vertical	Pass
1	273,091	30	46	172	1	Horizontal	Pass
5	276,32	22,4	46	191	1,5	Horizontal	Pass
4	272,037	22,6	46	221	2	Vertical	Pass
2	263,129	20,9	46	357	1	Horizontal	Pass

Radiated emission semi anechoic chamber 250 MHz to 1 GHz

Resolution bandwidth:	120 kHz	Video bandwidth:	300 kHz
Antenna distance:	3 m	Antenna height:	1 - 4 m
Antenna polarization:	Both		
Mode of operation:	running Ch18 - TX 25		

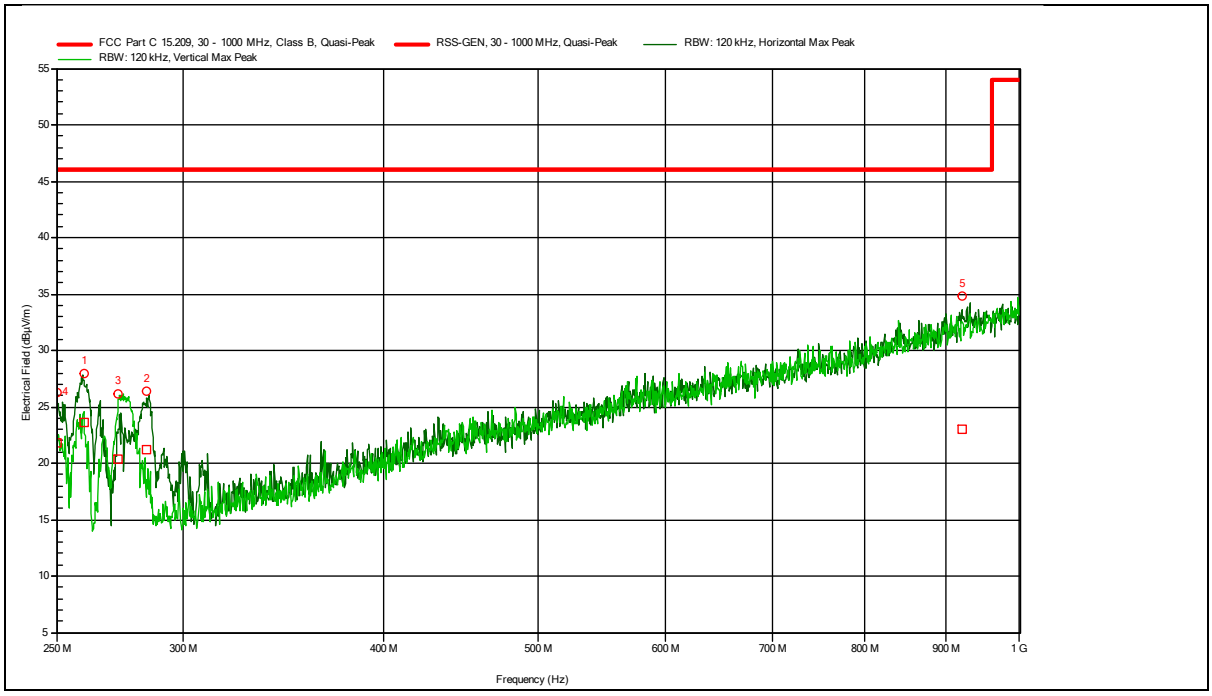


Detected peaks

Peak Number	Frequency (MHz)	Quasi-Peak (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Angle (degrees)	Height (m)	Polarization	Status
1	260,644	23,8	46	169	1	Horizontal	Pass
2	275,244	28,6	46	169	1	Horizontal	Pass
3	529,455	17,6	46	189	1,5	Horizontal	Pass
4	273,015	25,3	46	219	1,5	Horizontal	Pass
5	260,238	21,5	46	220	1	Vertical	Pass

Radiated emission semi anechoic chamber 250 MHz to 1 GHz

Resolution bandwidth:	120 kHz	Video bandwidth:	300 kHz
Antenna distance:	3 m	Antenna height:	1 - 4 m
Antenna polarization:	Both		
Mode of operation:	running Ch26 - TX 25		

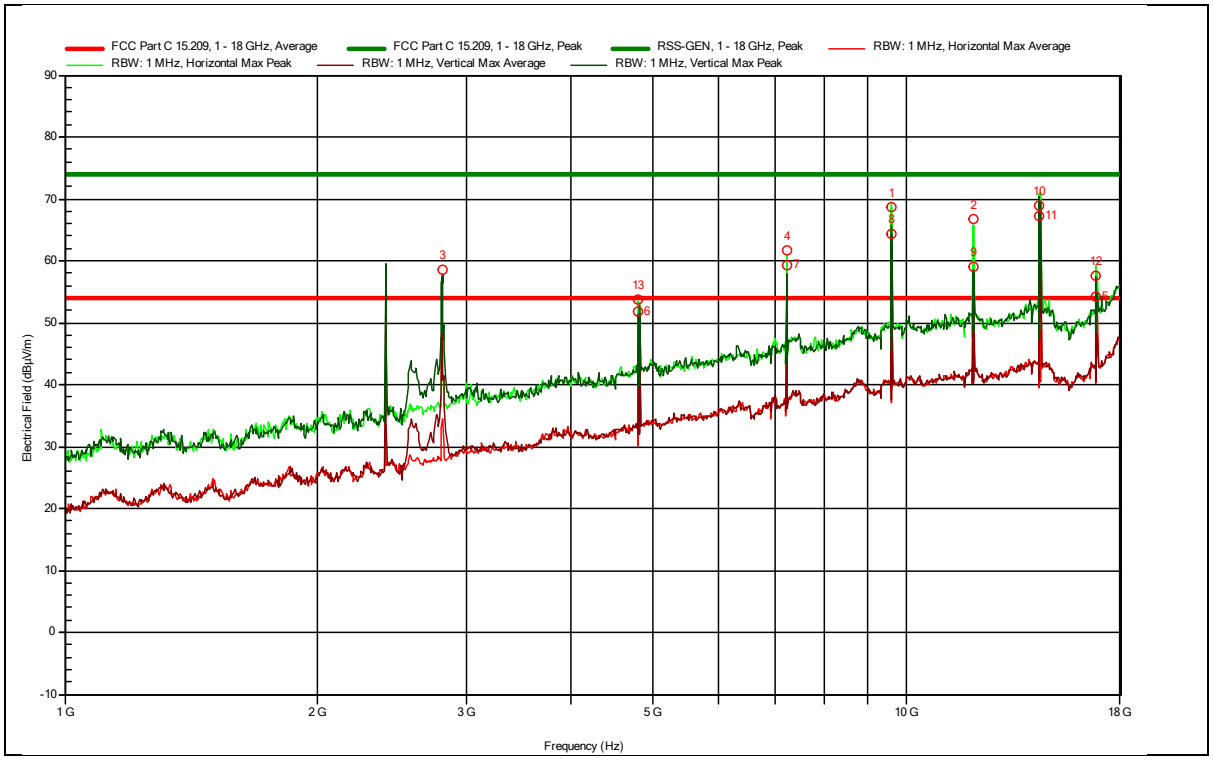


Detected peaks

Peak Number	Frequency (MHz)	Quasi-Peak (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Angle (degrees)	Height (m)	Polarization	Status
2	284,627	21,2	46	138	1	Horizontal	Pass
5	919,678	23	46	139	3	Horizontal	Pass
1	260,03	23,6	46	169	1	Horizontal	Pass
3	273,404	20,3	46	252	1	Vertical	Pass
4	250,36	21,8	46	359	1,5	Horizontal	Pass

Radiated emission full anechoic chamber 1 GHz to 18 GHz

Resolution bandwidth:	1 MHz	Video bandwidth:	3 MHz
Antenna distance:	3 m	Antenna height:	1 m to 4 m
Antenna polarization:	Both		
Mode of operation:	Running Channel 11- 25 TX		



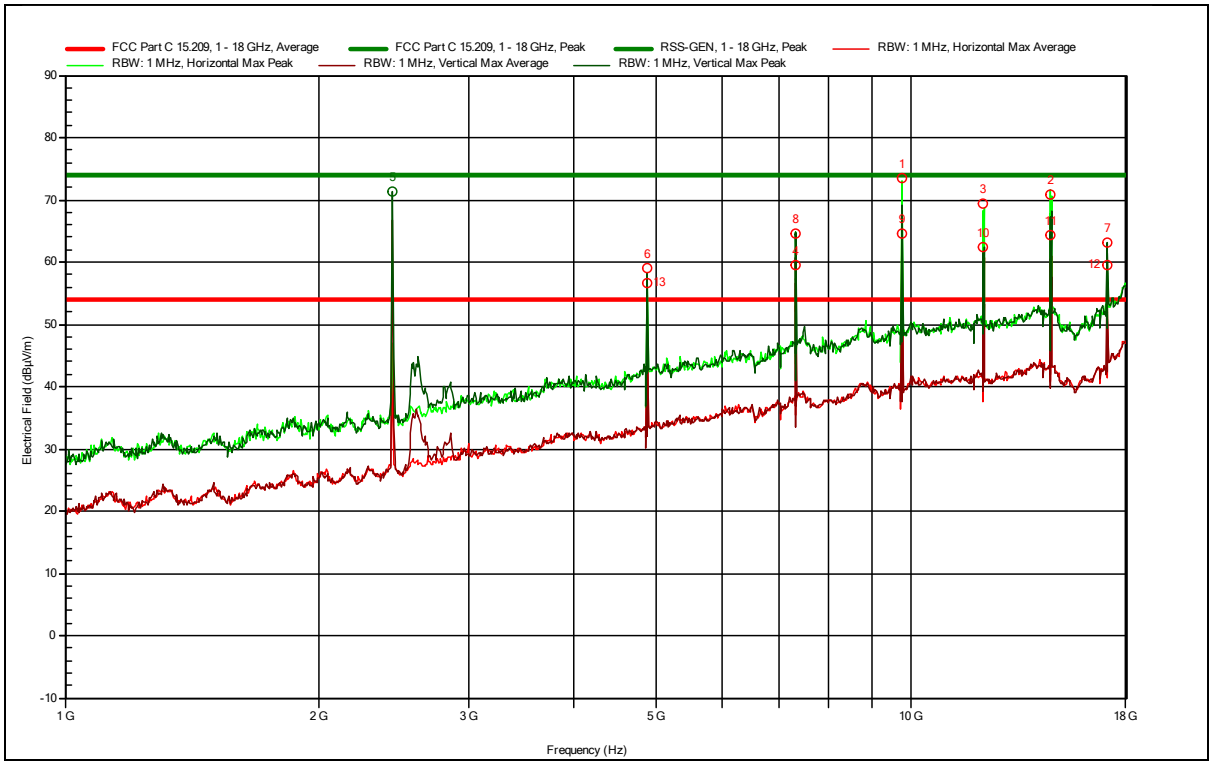
Detected peaks

Peak Number	Frequency (MHz)	Peak (dBµV/m)	Peak Limit (dBµV/m)	Average (dBµV/m)	Average Limit (dBµV/m)	Angle (degrees)	Height (m)	Polarization	Status
7	7216,542	59,3	74	33.3	54	141	1,25	Vertical	Pass
9	12027,419	59	74	33	54	173	2,5	Vertical	Pass
5	16838,672	54,2	74	28.2	54	204	1	Horizontal	Pass
8	9622,004	64,3	74	38.3	54	205	1,5	Vertical	Pass
11	14427,019	67,3	74	41.3	54	205	1,25	Vertical	Pass
1	9618,048	68,7	74	42.7	54	235	4	Horizontal	Pass
13	4810,934	53,8	74	27.8	54	235	2,5	Horizontal	Pass
2	12022,549	66,8	74	40.8	54	236	2	Horizontal	Pass
10	14432,99	68,8	74	42.8	54	236	2	Horizontal	Pass
12	16831,511	57,7	74	31.7	54	251	1	Vertical	Pass
4	7213,5	61,7	74	35.7	54	252	1,75	Horizontal	Pass
6	4808,953	51,8	74	25.8	54	252	4,1	Vertical	Pass
3	2811,596	58,6	74	32.6	54	313	2	Vertical	Pass

Note: It was confirmed all detected peaks were related to the transmitter. Thus, the average can be calculated in accordance with the Ansi C63.10:2020 11.12.2.5.2.2.
Note: The peak at 2.405 GHz is the transmissions frequency and thus not subject to the limit line.

Radiated emission full anechoic chamber 1 GHz to 18 GHz

Resolution bandwidth:	1 MHz	Video bandwidth:	3 MHz
Antenna distance:	3 m	Antenna height:	1 m to 4 m
Antenna polarization:	Both		
Mode of operation:	Running Channel 18- 25 TX		



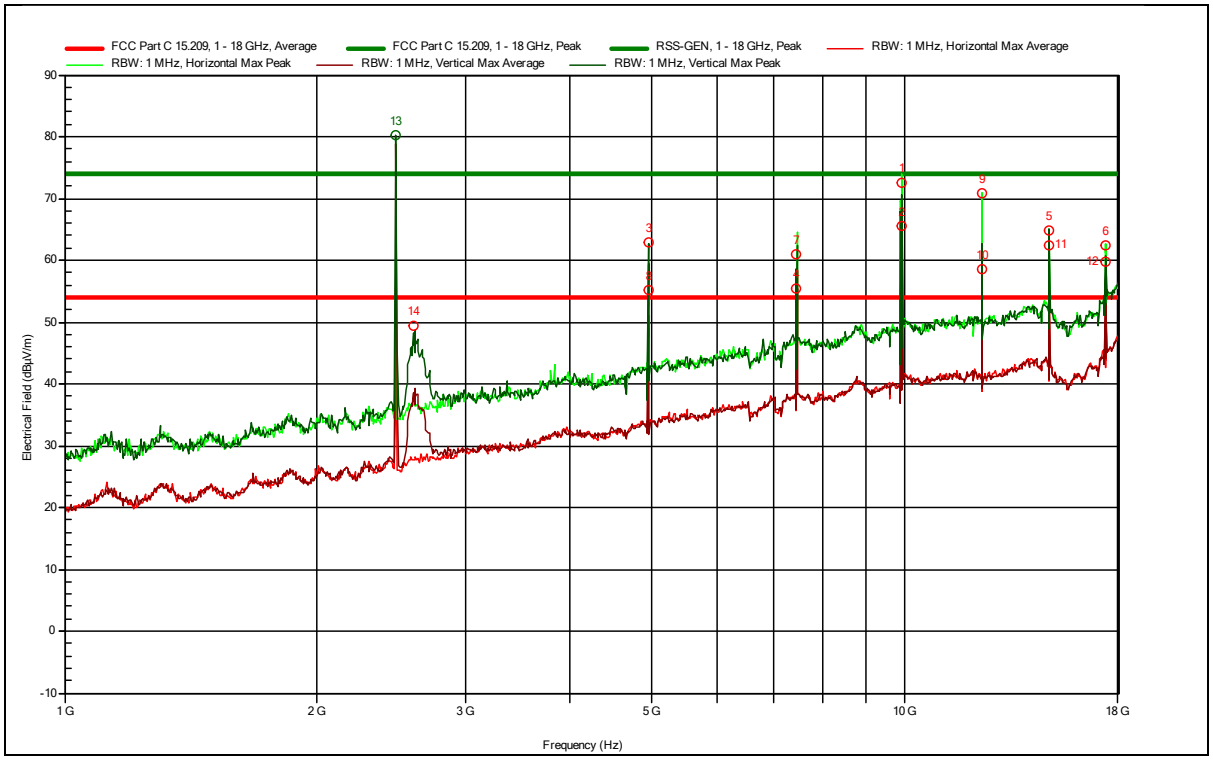
Detected peaks

Peak Number	Frequency (MHz)	Peak (dBµV/m)	Peak Limit (dBµV/m)	Average (dBµV/m)	Average Limit (dBµV/m)	Angle (degrees)	Height (m)	Polarization	Status
4	7321,422	59,4	74	33.4	54	77	1,25	Horizontal	Pass
10	12202,529	62,3	74	36.3	54	92	1,25	Vertical	Pass
7	17076,603	63,2	74	37.2	54	189	1	Vertical	Pass
9	9761,966	64,7	74	38.7	54	204	3,5	Vertical	Pass
2	14643,036	70,8	74	44.8	54	219	1,25	Horizontal	Pass
12	17083,559	59,4	74	33.4	54	233	1	Horizontal	Pass
11	14637,086	64,4	74	38.4	54	234	2,5	Vertical	Pass
8	7318,536	64,5	74	38.5	54	234	3,5	Vertical	Pass
3	12197,545	69,3	74	43.3	54	250	2,75	Horizontal	Pass
13	4879,007	56,6	74	30.6	54	251	1,25	Horizontal	Pass
1	9758,066	73,6	74	47.6	54	252	3,25	Horizontal	Pass
6	4881,056	59	74	33	54	264	1,5	Vertical	Pass
5	2438,625	71,3	74	45.3	54	328	1,5	Vertical	Pass

Note: It was confirmed all detected peaks were related to the transmitter. Thus, the average can be calculated in accordance with the Ansi C63.10:2020 11.12.2.5.2.2.
Note: The peak at 2.44 GHz is the transmissions frequency and thus not subject to the limit line.

Radiated emission full anechoic chamber 1 GHz to 18 GHz

Resolution bandwidth:	1 MHz	Video bandwidth:	3 MHz
Antenna distance:	3 m	Antenna height:	1 m to 4 m
Antenna polarization:	Both		
Mode of operation:	Running Channel 26- 25 TX		



Detected peaks

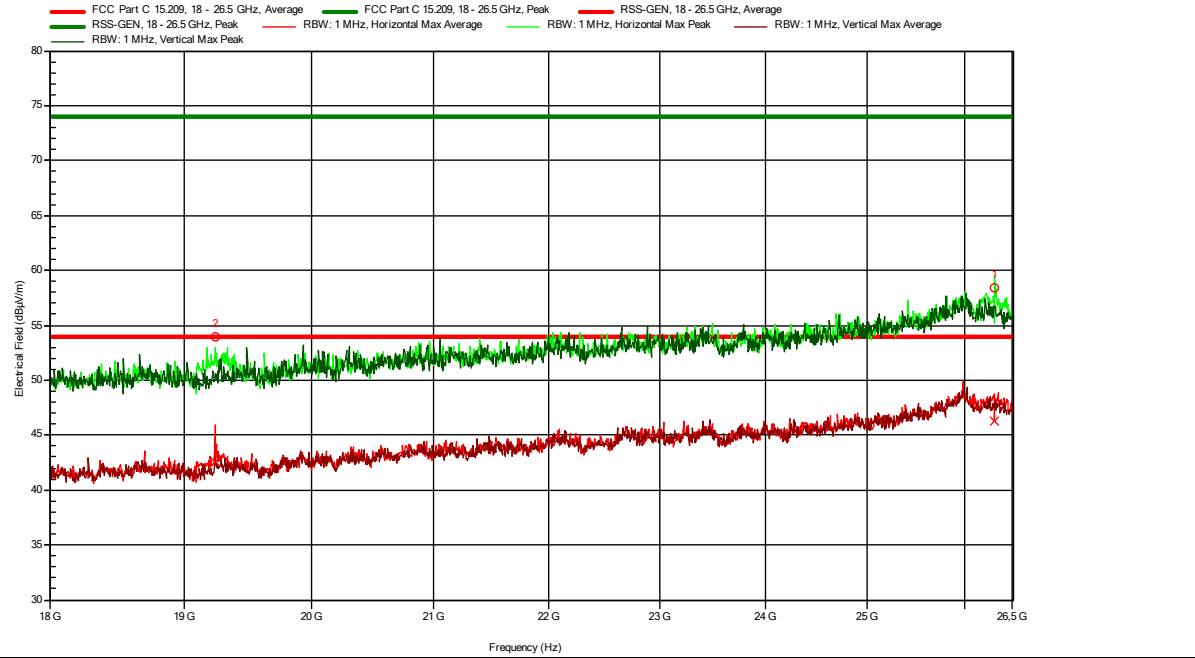
Peak Number	Frequency (MHz)	Peak (dBµV/m)	Peak Limit (dBµV/m)	Average (dBµV/m)	Average Limit (dBµV/m)	Angle (degrees)	Height (m)	Polarization	Status
3	4958,992	62,9	74	36.9	54	44	1,5	Vertical	Pass
6	17363,505	62,4	74	36.4	54	142	1	Horizontal	Pass
7	7441,499	61	74	35	54	157	1,25	Vertical	Pass
10	12397,515	58,4	74	32.4	54	157	1,25	Vertical	Pass
12	17356,467	59,8	74	33.8	54	188	1	Vertical	Pass
5	14883,147	64,8	74	38.8	54	190	4	Vertical	Pass
4	7438,364	55,4	74	29.4	54	202	2,25	Horizontal	Pass
2	9922,09	65,5	74	39.5	54	204	3,25	Vertical	Pass
8	4960,961	55,2	74	29.2	54	204	1,25	Horizontal	Pass
1	9918,021	72,5	74	46.5	54	233	2,5	Horizontal	Pass
9	12402,55	70,9	74	44.9	54	251	1,25	Horizontal	Pass
11	14877,098	62,5	74	36.5	54	265	1	Horizontal	Pass
13	2479	80,2	74	54.2	54	295	1,5	Vertical	Pass
14	2607,202	49,3	74	23.3	54	326	1,75	Vertical	Pass

Note: It was confirmed all detected peaks were related to the transmitter. Thus, the average can be calculated in accordance with the Ansi C63.10:2020 11.12.2.5.2.2.

Note: The peak at 2.48 GHz is the transmissions frequency and thus not subject to the limit line.

Radiated emission full anechoic chamber 18 GHz to 26,5 GHz

Resolution bandwidth:	1 MHz	Video bandwidth:	3 MHz
Antenna distance:	3 m	Antenna height:	1 m to 4 m
Antenna polarization:	Both		
Mode of operation:	Running Channel 11 - TX 25		

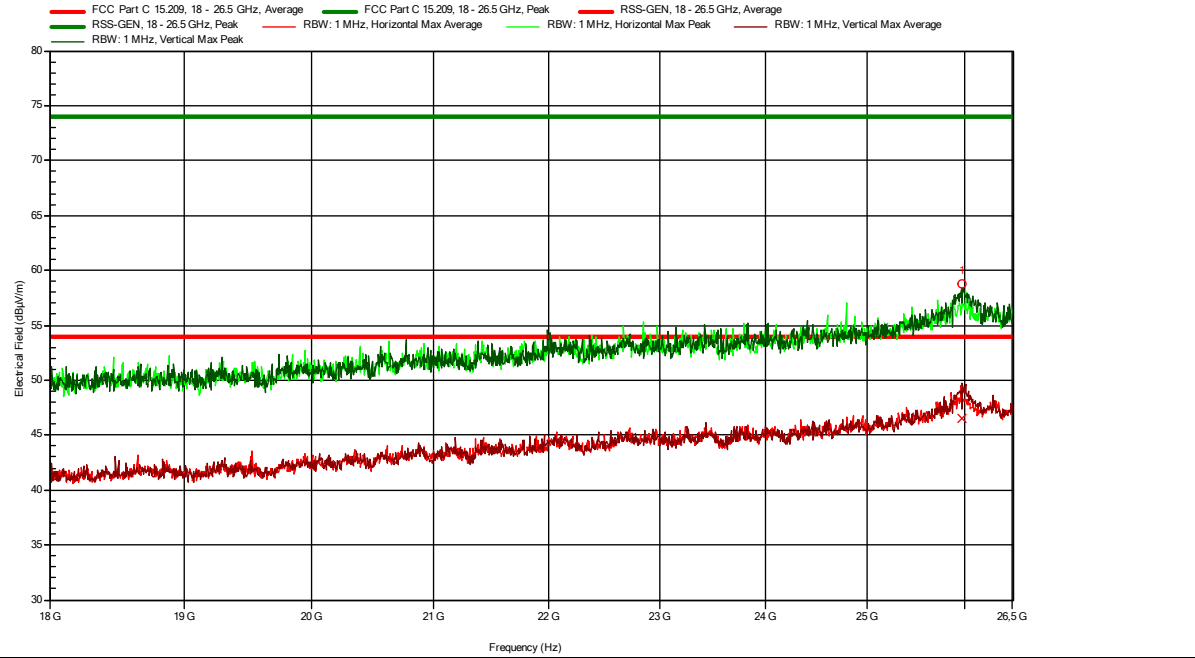


Detected peaks

Peak Number	Frequency (MHz)	Peak (dBµV/m)	Peak Limit (dBµV/m)	Average (dBµV/m)	Average Limit (dBµV/m)	Angle (degrees)	Height (m)	Polarization	Status
1	26306,625	58,4	74	46,3	54	78	1,2	Horizontal	Pass
2	19235,832	53,9	74	42,6	54	108	1	Horizontal	Pass

Radiated emission full anechoic chamber 18 GHz to 26,5 GHz

Resolution bandwidth:	1 MHz	Video bandwidth:	3 MHz
Antenna distance:	3 m	Antenna height:	1 m to 4 m
Antenna polarization:	Both		
Mode of operation:	Running Channel 18 - TX 25		

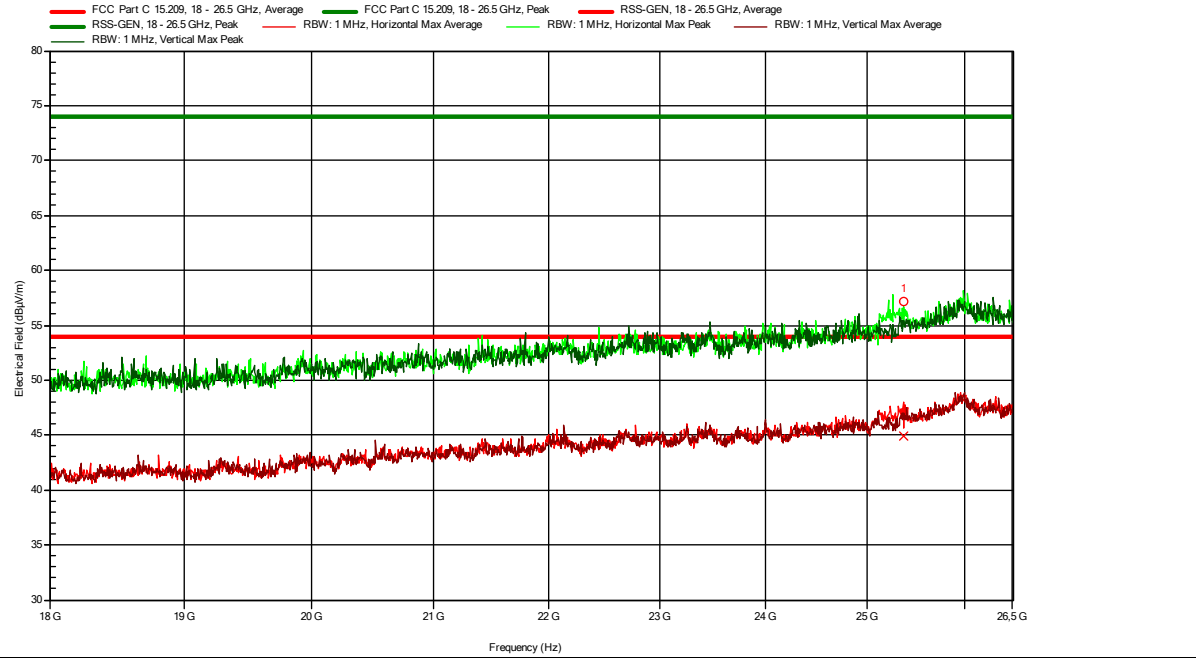


Detected peaks

Peak Number	Frequency (MHz)	Peak (dBµV/m)	Peak Limit (dBµV/m)	Average (dBµV/m)	Average Limit (dBµV/m)	Angle (degrees)	Height (m)	Polarization	Status
1	25961,869	58,8	74	46,6	54	189	2	Vertical	Pass

Radiated emission full anechoic chamber 18 GHz to 26,5 GHz

Resolution bandwidth:	1 MHz	Video bandwidth:	3 MHz
Antenna distance:	3 m	Antenna height:	1 m to 4 m
Antenna polarization:	Both		
Mode of operation:	Running Channel 26 - TX 25		



Detected peaks

Peak Number	Frequency (MHz)	Peak (dBµV/m)	Peak Limit (dBµV/m)	Average (dBµV/m)	Average Limit (dBµV/m)	Angle (degrees)	Height (m)	Polarization	Status
1	25369,251	57,2	74	44,9	54	31	3,3	Horizontal	Pass

3.3 6dB bandwidth Measurement

3.3.1 Limit

The minimum 6 dB Bandwidth shall be at least 500 kHz.

3.3.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

3.3.3 Test setup

The test setup is as shown in chapter 2.2 of this report.

3.3.4 Test procedure

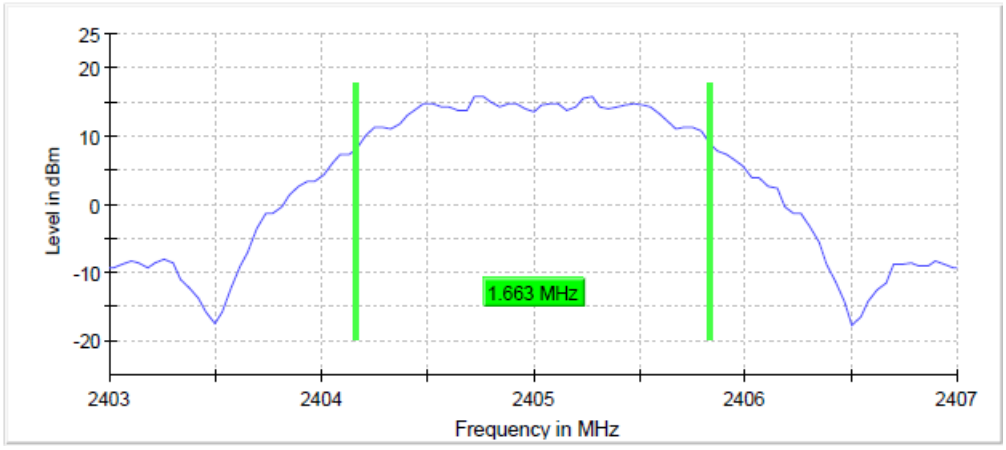
According to ANSI C63.10, section 6.9
IRN 404 - Occupied bandwidth (Hz) Method 4 – DTS Bandwidth.

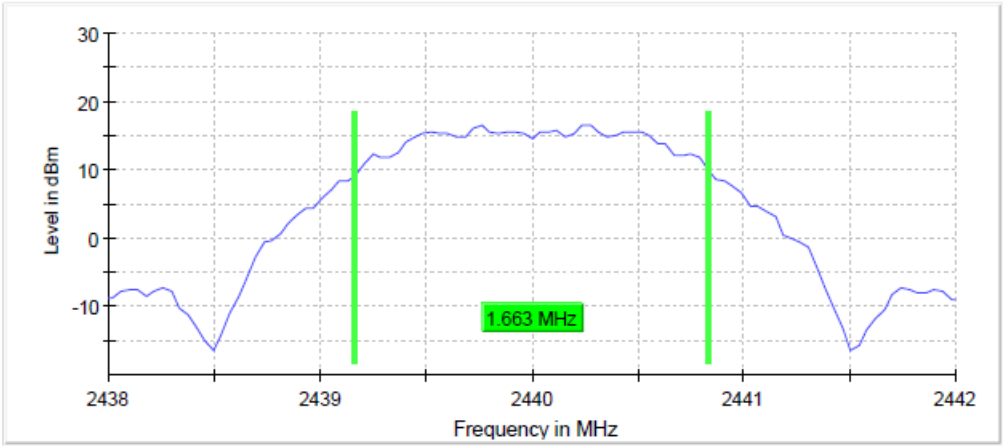
3.3.5 Test Results of the 6 dB bandwidth Measurement

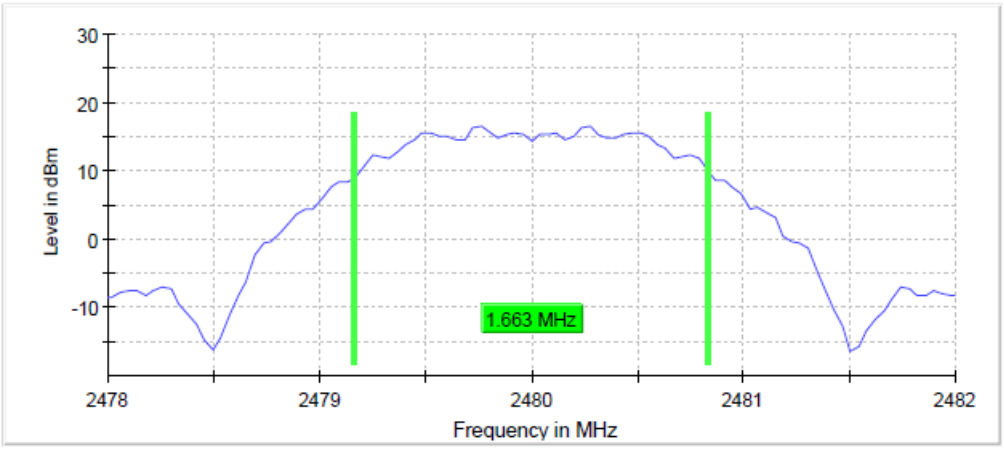
Technology Std.	Channel	Frequency (MHz)	Data rate	6dB bandwidth (kHz)
802.15.4a	11	2405	2 Mbps	1663.4
	18	2440	2 Mbps	1663.4
	26	2480	2 Mbps	1663.4
Uncertainty	± 36.2 kHz			

Note: plots are provided on the next page.

3.3.6 Plots of the 6 dB bandwidth







3.4 99% Occupied Bandwidth

3.4.1 Limit

According to RSS-Gen 6.7

3.4.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

3.4.3 Test setup

The test setup is as shown in chapter 2.2 of this report.

3.4.4 Test procedure

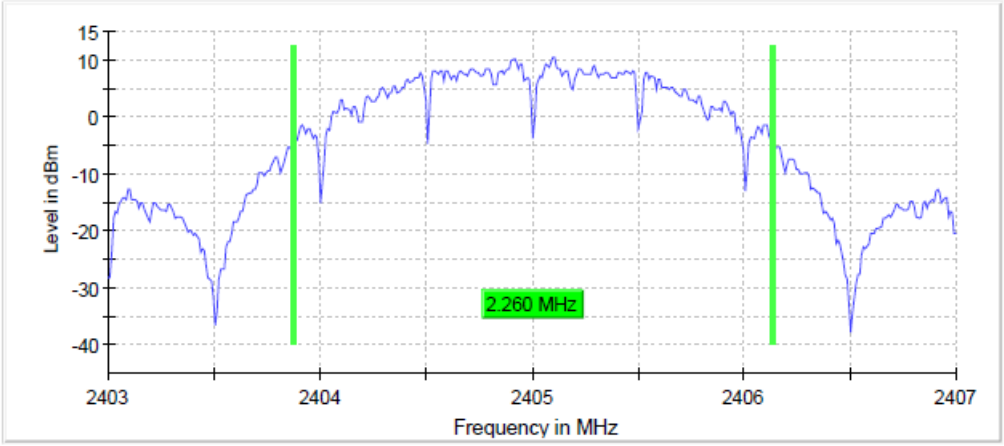
According to ANSI C63.10, section 6.9
IRN 404 - Occupied bandwidth (Hz) Method 1 – XX % power bandwidth.

3.4.5 Test results of the 99% occupied bandwidth measurement

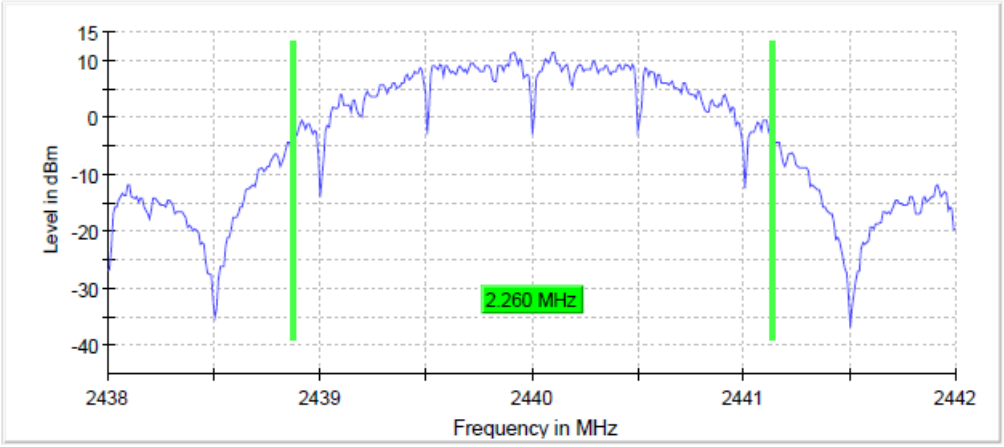
Technology Std.	Channel	Frequency (MHz)	Data rate	99% bandwidth (kHz)
802.15.4a	11	2405	2 Mbps	2260
	18	2440	2 Mbps	2260
	26	2480	2 Mbps	2270
Uncertainty	± 12 kHz			

3.4.6 Plots of the 99% occupied bandwidth measurement

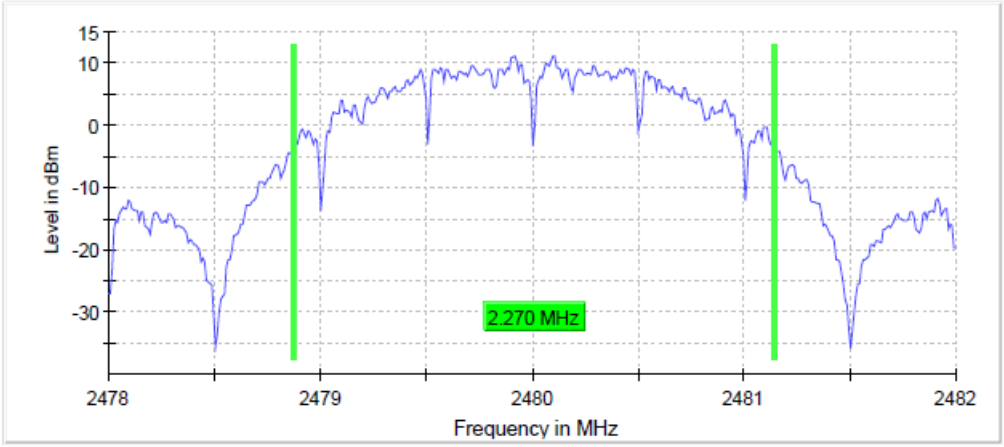
Channel 11



Channel 18



Channel 26



3.5 Output Power Measurement

3.5.1 Limit

FCC: For systems using digital modulation in the 2400-2483.5 MHz, the limit for the peak output power is 1W (30 dBm). If transmitting antenna of directional gain greater than 6 dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. So, the maximum peak conducted output power shall not exceed 28dBm.

RSS: For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. The e.i.r.p. shall not exceed 4W.

3.5.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

3.5.3 Test setup

The test setup is as shown in chapter 2.2 of this report.

3.5.4 Test procedure

The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02.
IRN 402 - RF power (W) - Method 12

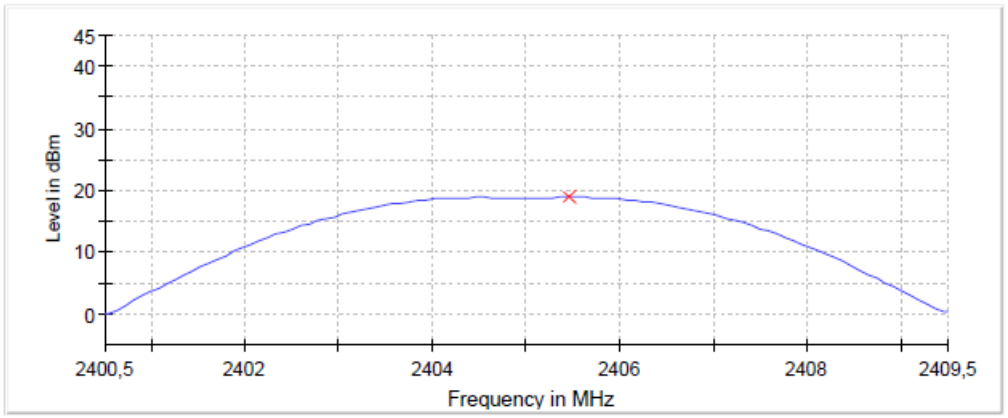
3.5.5 Test results of Output Power Measurement

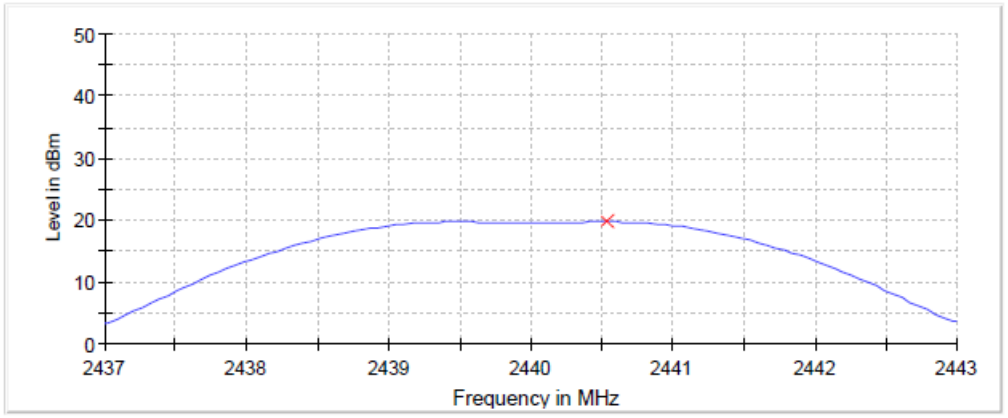
Peak method

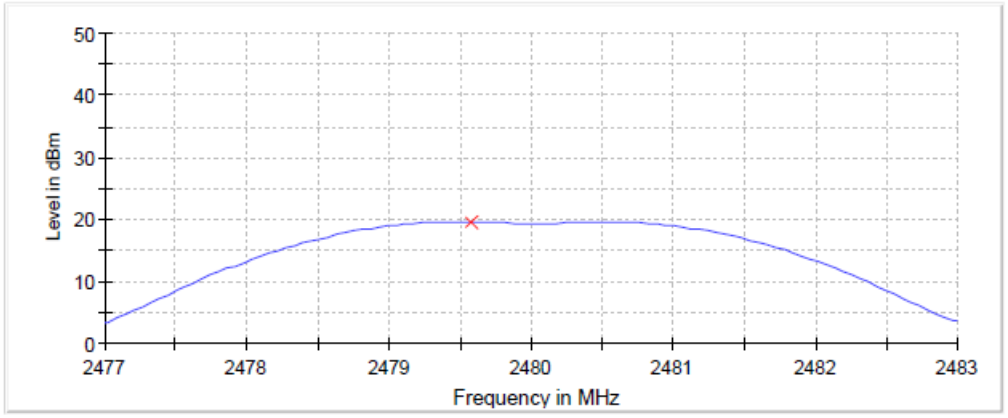
Technology Std.	Channel	Frequency (MHz)	Data rate	Peak output power conducted (dBm)	Peak output power conducted (W)	Peak output power EIRP (W)
802.15.4a	11	2405	1 Mbps	18.8	0.076	0.479
	18	2440	1 Mbps	19.7	0.093	0.589
	26	2480	1 Mbps	19.6	0.091	0.575
Uncertainty				±0.71 dB		

Note: plots are provided on the next page

3.5.6 Plots of the Output power







3.6 Power Spectral Density

3.6.1 Limit

The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band at any time interval of continuous transmission.

3.6.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

3.6.3 Test setup

The test setup is as shown in chapter 2.2 of this report.

3.6.4 Test procedure

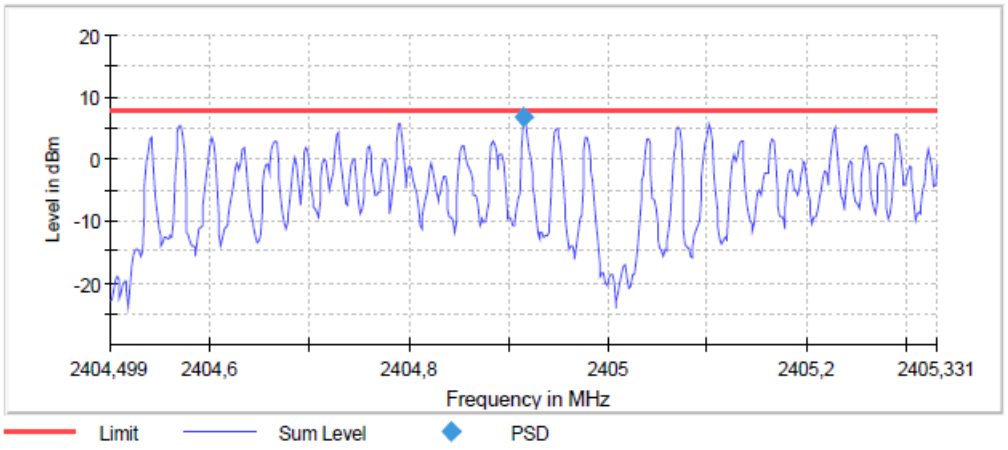
The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02.
IRN 412 - Spectral power density (W per n.Hz) - Method 5 – Peak method PKPSD (PSD in 3 kHz band)

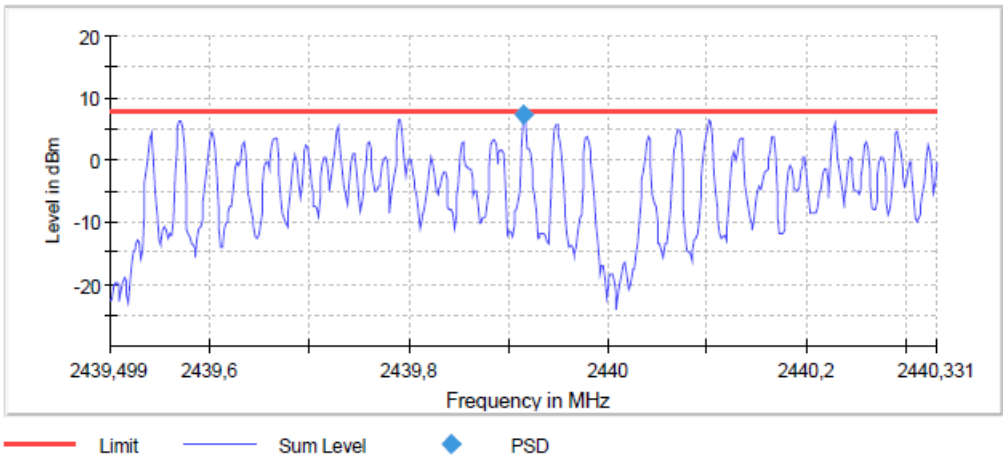
3.6.5 Test results of Power Spectral Density Measurement

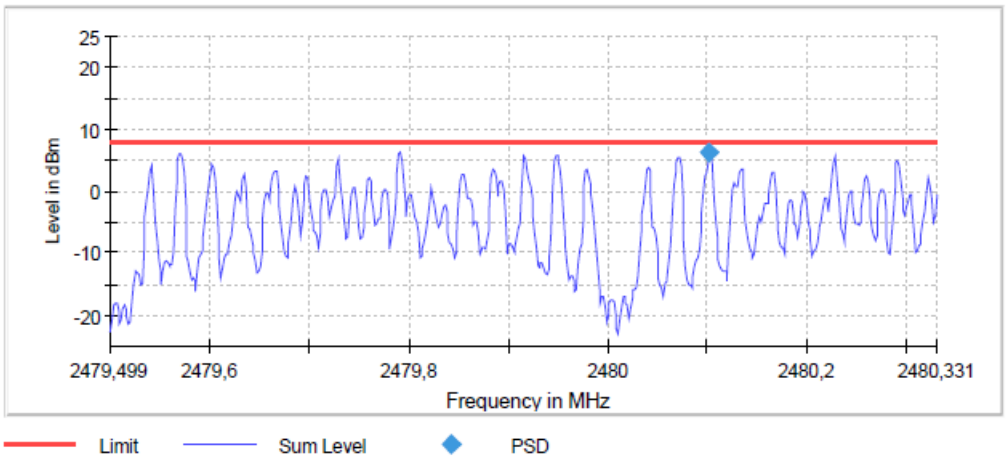
Technology Std.	Channel	Frequency (MHz)	Data rate	PSD conducted (dBm/3 kHz)	Limit (conducted) (dBm/3kHz)
802.15.4a	11	2405	2 Mbps	6.755	8
	18	2440	2 Mbps	7.260	8
	26	2480	2 Mbps	6.331	8
Uncertainty	±2 dB				

Note: plots are provided on the next page

3.6.6 Plots of the Power Spectral Density







3.7 Band edge Measurement

3.7.1 Limit

Band edge:
At the edge of the authorized band the RF power shall be at least 20 dB down.

3.7.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

3.7.3 Test setup

The test setup is as shown in chapter 2.2 of this report. Antenna port conducted.

3.7.4 Test procedure

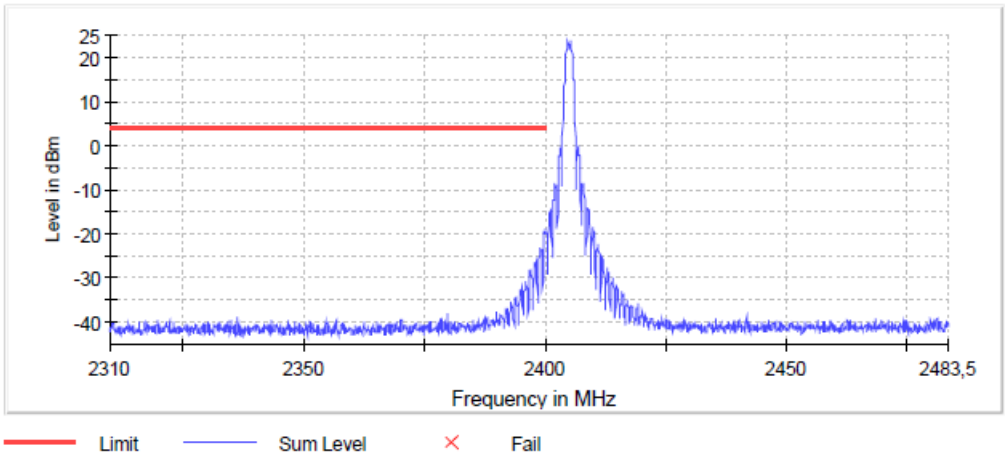
The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02, section 8.7.
IRN 413 – Method 13

3.7.5 Measurement Uncertainty

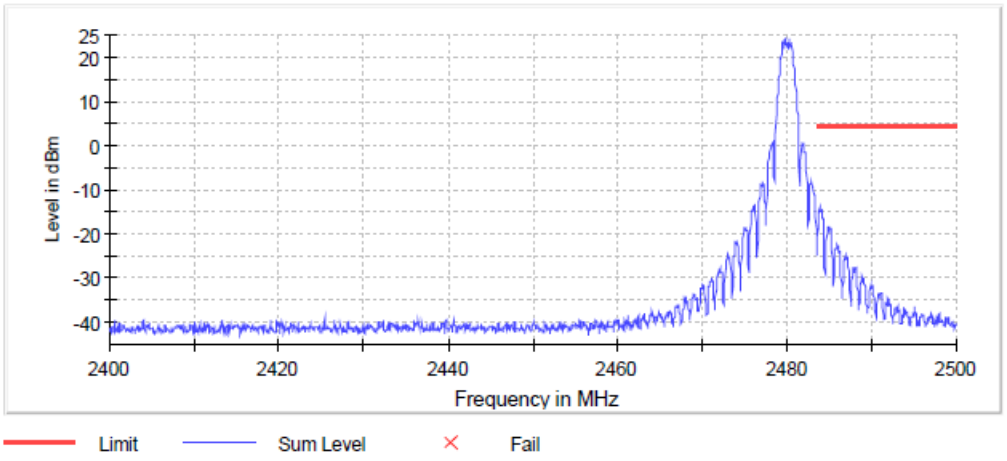
± 1.4 dB

3.7.6 Plots of the Band edge Measurements

802.15.4a Lower band edge (Channel 11)



802.15.4a Upper band edge (Channel 26)



3.8 AC Power-line conducted emissions

3.8.1 Limit

According to 15.207 (a), (c)

An intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN).

Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

Since the FCC and RSS limits are exactly the same.

Frequency (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56[1]	56 to 46[1]
0.5 – 5	56	46
5 – 30	60	50

Note 1: The level decreases linearly with the logarithm of the frequency.

3.8.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

3.8.3 Test setup

The test setup is as shown in chapter 2.2 of this report.

3.8.4 Test procedure

According to ANSI C63.10-2020 Section 6.2
IRN 439 – Method 1

3.8.5 Measurement uncertainty

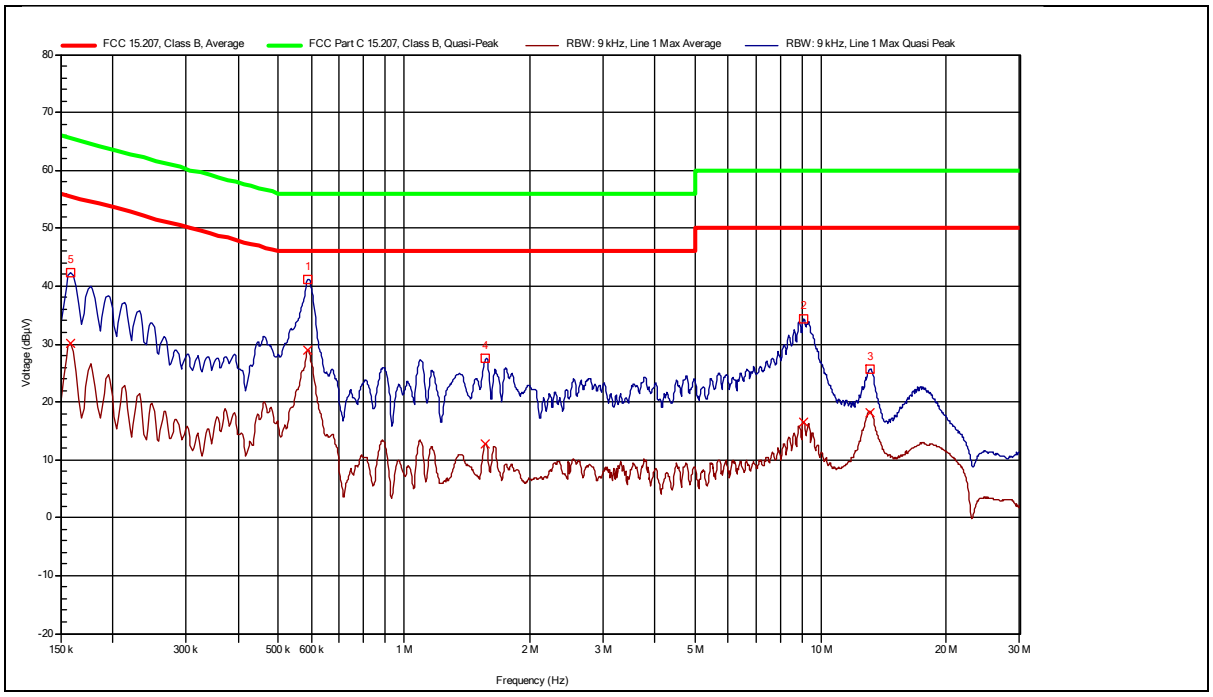
+/- 3.6 dB

3.8.6 AC Power Line Conducted emission data of the EUT, results

Conducted emission AMN 150 kHz to 30 MHz

Bandwidth: 9 kHz Line: Line 1

Mode of operation: Running with radio on

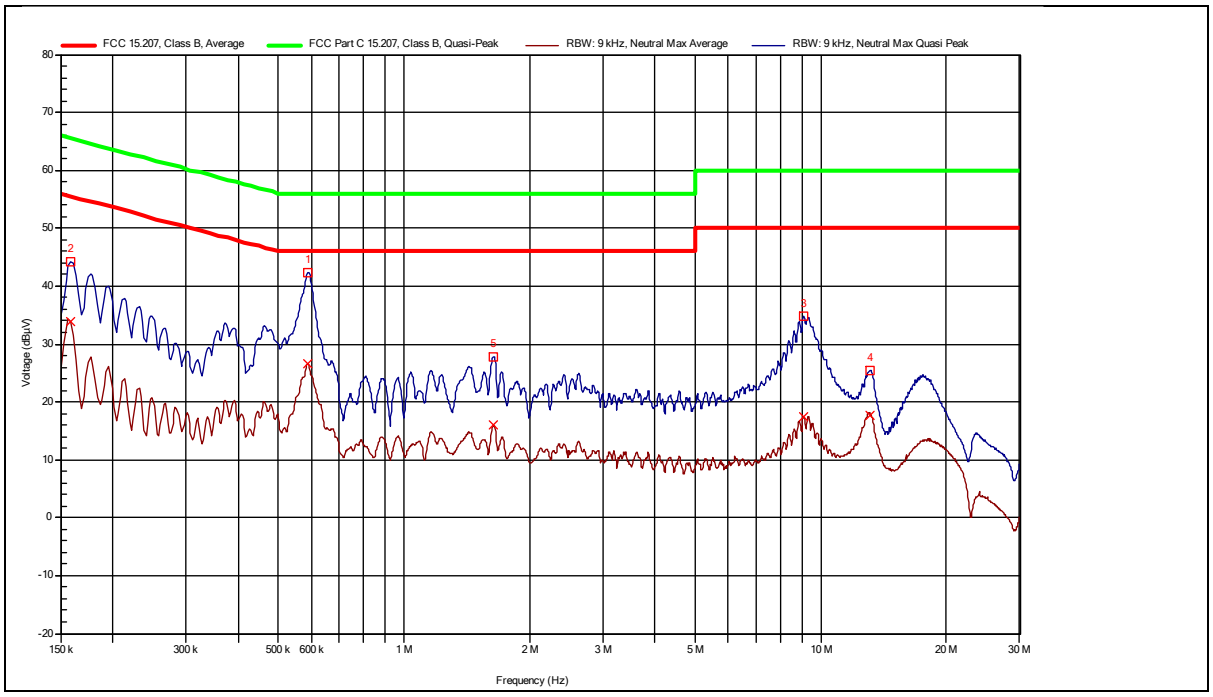


Detected peaks

Peak Number	Frequency (MHz)	Quasi-Peak (dBµV)	Quasi-Peak Limit (dBµV)	Average (dBµV)	Average Limit (dBµV)	Status
1	0,589	41,3	56	28,9	46	Pass
2	9,105	34,2	60	16,5	50	Pass
3	13,142	25,7	60	18,2	50	Pass
4	1,572	27,5	56	12,7	46	Pass
5	0,159	42,2	65,5	30	55,5	Pass

Conducted emission AMN 150 kHz to 30 MHz

Bandwidth:	9 kHz	Line:	Neutral
Mode of operation:	Running with radio on		



Detected peaks

Peak Number	Frequency (MHz)	Quasi-Peak (dBµV)	Quasi-Peak Limit (dBµV)	Average (dBµV)	Average Limit (dBµV)	Status
1	0,586	42,4	56	26,6	46	Pass
2	0,159	44,3	65,5	33,8	55,5	Pass
3	9,094	34,7	60	17,5	50	Pass
4	13,121	25,5	60	17,7	50	Pass
5	1,637	27,8	56	15,9	46	Pass

4 Sample calculations

All formulas for data conversions and conversion factors are reported in this chapter.

Conducted emission Measurement:

U_{lisn} (dBµV) = U (dBµV) + Corr. (dB)

Where:
U = Measuring receiver voltage
LISN insertion loss = Voltage division factor of LISN
Corr. = sum of single correction factors of used LISN, cables and pulse limiter.
Linear interpolation will be used for frequencies in between the values in the table.

Frequency (MHz)	**Voltage division LISN (db)**	**Cable loss (dB)**	**Corr. (dB)**
	114379 SN: 230000813 Rohde & Schwarz ENV 216	**114770**	
0.15	9.7	0.02	9.72
0.2	9.68	0.03	9.71
0.3	9.68	0.03	9.71
0.5	9.69	0.08	9.77
0.7	9.69	0.25	9.94
0.8	9.69	0.25	9.94
1	9.68	0.11	9.79
2	9.7	0.15	9.85
3	9.71	0.21	9.92
5	9.72	0.21	9.93
7	9.76	0.25	10.01
8	9.77	0.25	10.02
10	9.77	0.29	10.06
15	9.84	0.34	10.18
20	9.88	0.37	10.25
25	9.97	0.43	10.4
30	10.08	0.45	10.53

Magnetic field strength measurement:

$$H\left[dB\left(\mu\frac{A}{m}\right)\right] = V[dB(\mu V)] + AF^{H}\left[\frac{dB}{\Omega m}\right] + \text{Corr. (dB)}$$

Where:
H is the magnetic field strength (to be compared to the limit)
V is the voltage level measured by the receiver or spectrum analyzer
AF^{H} is the magnetic antenna factor
Corr. = sum of single correction factors of used cable and amplifier (if applicable).
Linear interpolation will be used for frequencies in between the values in the table.
Tables shows an extract of the values.

Electric field strength measurement:

$$E\left[dB\left(\mu\frac{V}{m}\right)\right] = V[dB(\mu V)] + AF\left[\frac{dB}{m}\right] + \text{Corr. (dB)}$$

Where:
E is the electric field strength (to be compared to the limit)
V is the voltage level measured by the receiver or spectrum analyzer
AF is the electric antenna factor
Corr. = sum of single correction factors of used cable and amplifier (if applicable).
Linear interpolation will be used for frequencies in between the values in the table.
Tables shows an extract of the values.

Frequency (MHz)	**AF^{H}**	**AF**	**300m to 3m and 30m to 3m correction (dB)**	**Cable Loss (dB)**	**Corr. (dB)**
	ID: 114515 EMCO 6502	**ID: 114515 EMCO 6502**		**ID: 114928**	
0.009	-33.03	18.89	80	0	-80
0.01	-33.88	18.03	80	0	-80
0.02	-38.29	13.51	80	0	-80
0.03	-39.87	11.85	80	0	-80
0.04	-40.55	11.1	80	0	-80
0.1	-41.38	10.18	80	0	-80
0.2	-41.51	10.03	78.2	0.1	-78.1
0.49	-41.56	9.97	70.2	0.3	-69.9
0.5	-41.57	9.96	40	0.3	-39.7
1	-41.61	9.91	40	0.4	-39.6
3	-41.59	9.88	34.5	0.4	-34.1
5	-41.59	9.89	30.1	0.5	-29.6
10	-41.77	9.62	24	0.6	-23.4
15	-42.23	9.1	20.5	0.9	-19.6
20	-42.95	8.33	20	0.9	-19.1
25	-43.97	7.27	20	0.3	-19.7
27	-44.53	6.73	20	0.4	-19.6
30	-45.49	5.75	20	0.4	-19.6

Field Strength Measurement:

$$E\left(dB\left(\frac{\mu V}{m}\right)\right) = U(dB\mu V) + AF\ \left(\frac{dB}{m}\right) + Corr.(dB)$$

Where:
E = Electric field strength
U = Measuring receiver voltage
AF = Antenna factor
Corr. = sum of single correction factors of used cable and amplifier (if applicable).
Linear interpolation will be used for frequencies in between the values in the table.
Tables shows an extract of the values.

Frequency (MHz)	AF (dB/m) ID: 114435 VHA 9103	Cable loss (dB) Id: 114928	Attenuator (dB) ID:114525 Hewlett Packet	Corr. (dB)
30	20.5	1.1	6	7.1
100	10.4	2.5	6	8.5
150	15.5	3.1	6	9.1
200	16.8	3.6	6	9.6
250	18.1	4.2	6	10.2

Frequency (MHz)	AF (dB/m) ID: 114385 Vulp 9118B	Cable loss (dB) Id: 114928	Corr. (dB)
250	11.7	4.2	4.2
300	12.8	4.9	4.9
350	14.1	5.8	5.8
400	15.5	6.6	6.6
450	17	7.1	7.1
500	17.5	7.5	7.5
550	18.3	7.6	7.6
600	19.2	7.8	7.8
650	20.1	7.8	7.8
700	20.5	8.1	8.1
750	21	8.6	8.6
800	21.4	8.9	8.9
850	21.8	9.4	9.4
900	22.6	9.7	9.7
950	23	10	10
1000	23.2	10.4	10.4

Frequency (MHz)	AF (dB/m) 114607 Emco 3115 SN: 9412-4377	Gain (dB) 114690 µComp Nordic MCNA-40-0010800-25-10P	Cable loss (dB) 114691	Corr. (dB)
1000	23.6	45.1	2.7	-43
2000	27.1	44.7	3.9	-41.4
3000	30.5	44.2	4.8	-40
4000	32.7	43.5	5.6	-38.6
5000	33.2	43.1	6.3	-37.5
6000	34.6	43.0	6.9	-36.7
7000	35.2	42.9	7.3	-36.5
8000	37.0	43.3	8.2	-36.1
9000	38.1	43.3	8.5	-35.4
10000	38.2	43.0	9.0	-34.8
11000	38.3	42.9	9.5	-34.2
12000	39.1	42.6	9.9	-33.6
13000	39.2	43.6	10.6	-33.8
14000	41.1	44.3	10.8	-34.6
15000	40.2	44.4	11.4	-34
16000	37.5	44.3	11.6	-33.5
17000	41.1	44.5	12.0	-33.1
18000	44.0	44.9	12.3	-33.5

Frequency (MHz)	AF (dB/m) Kiwa ID: 114518 Flann 20240-25	Gain (dB) Kiwa ID: 115026 Schwarzbeck BBV 9721	Cable loss (dB) 114691	Corr. (dB)
18000	31.3	34.5	12.3	-22.2
19000	31.5	34.9	12.5	-22.4
20000	31.7	34.3	13.0	-21.3
21000	31.9	34.1	13.7	-20.4
22000	32.1	34.1	14.4	-19.7
23000	32.2	33.6	14.9	-18.7
24000	32.3	32.9	15.4	-17.5
25000	32.4	33.6	16.3	-17.3
26000	32.5	33.6	18.5	-15.1
26500	32.5	33.5	17.7	-15.8

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