RADIO TEST REPORT

No. 2401854STO-102

RF Performance

EQUIPMENT UNDER TEST

Equipment:	Time of flight sensor with BLE capability
Type/Model:	Tork Level Sensor 3.0
Manufacturer:	Essity Hygiene and Health AB
Tested by request of:	Essity Hygiene and Health AB

SUMMARY

Referring to the emission limits, and the operating mode during the tests specified in this report, the equipment complies with the requirements according to the following standards:

47 CFR Part 15: Subpart C: Intentional radiators. Section 15.247

RSS-GEN Issue 5 (2018) + A1(2019) + A2(2021): General requirements of compliance of radio apparatus (2018)

RSS-247 Issue 3 (2023): Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

For details, see clause 2 – 4.

Date of issue: December 12, 2024

Tested by: Björn Utermöhl

Approved by: Anders Svensson

Revision History

Test report number	Date	Description	Changes
2401854STO-102	September 27, 2024	First release	-
2401854STO-102	December 12, 2024	Second release	Moved pictures to separate documents

CONTENTS

1 CLIENT INFORMATION

The EUT has been tested by request of

Company	Essity Hygiene and Health AB Mölndals Bro 2 405 03 Göteborg Sweden
Name of contact	Rickard Holmersson Phone: +46 31 746 06 63

2 EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment:	Time of flight sensor with BLE capability	
Type/Model:	652918	
Brand name:	Tork Level Sensor 3.0	
Manufacturer:	Essity Hygiene and Health AB	
Transmitter frequency range:	2402 – 2480 MHz	
Receiver frequency range:	2402 – 2480 MHz	
Number of channels:	40	
Antenna:	☒ Internal antenna	☐ External antenna
Antenna connector:	☒ None, internal antenna	☐ Yes
Antenna gain:	1.6 dBi	
Rating conducted RF output power:	+8 dBm	
Type of modulation:	GFSK	
Operational duty cycle:	5%	
Transmitter standby mode supported:	☐ Yes	☒ No

2.2 Additional information about the EUT

The EUT consists of the following units:

Unit	Type	Serial number
RADIO-CW#1	Transmitter module with internal antenna	Not visible
RADIO-CW#2	Transmitter module modified with antenna connector for test purpose	Not visible

During the tests the EUT supported following software:

Software	Version	Comment
radio-carrier	1.0	-

2.3 Peripheral equipment

Peripheral equipment is equipment needed for correct operation of the EUT, but not included as part of the testing and evaluation of the EUT.

Equipment	Type / Model	Manufacturer	Serial no.
-	-	-	-

2.4 Test signals and operation modes

All tests are made with EUT in test mode transmitting continuous modulated carrier on the following channels:

Channel 1 = 2402MHz
Channel 20 = 2440MHz
Channel 40 = 2480MHz

2.5 Modifications made to improve EMC-characteristics

The EUT was not modified during the testing.

3 TEST SPECIFICATIONS

3.1 Standards

Requirements:

47 CFR Part 15 (2020): Subpart C: Intentional radiators. Section 15.247

RSS-GEN Issue 5 (2018) + A1(2019) + A2(2021): General requirements of compliance of radio apparatus.

RSS-247 Issue 3 (2023): Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

Test methods:
ANSI C63.10-2020: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

3.2 Additions, deviations and exclusions from standards and accreditation

No additions, deviations or exclusions have been made from standards and accreditation.

3.3 Decision rule

The statements of conformity are reported as:
Passed – When the measured values are within the specified limits.
Failed – When one or more measures values are outside the specified limits.

3.4 Test site

Measurements were performed at:

Intertek Semko AB.
Torshamnsgatan 43,
P.O. Box 1103
SE-164 22 Kista

Intertek Semko AB is an FCC listed test site with site registration number 90913.
Intertek Semko AB is an FCC accredited conformity assessment body with designation number SE0002.
Intertek Semko AB is an Industry Canada listed test facility with IC assigned code 2042G.
Intertek Semko AB is an ISED recognized wireless testing laboratory with CAB identifier SE0003.

Measurement chambers

Measurement Chamber	Type of chamber	IC Site filing #
BJÖRKHALLEN	Semi-anechoic 3 m	2042G-1
Radiohallen	Fully anechoic 3 m	2042G-4

4 TEST SUMMARY

The results in this report apply only to sample tested:

Requirement	Description	Result
FCC §15.203 **RSS-GEN 8.3** **FCC §15.247 (b)(4)** **RSS-247 5.4(4), 5.4(5)**	**Antenna** The EUT has integrated non detachable antenna which can't be removed without breaking the EUT. The antenna gain is less than 6 dBi	**PASS**
FCC Part 15.205 **RSS-GEN 8.10**	**Restricted bands of operations** The transmit frequency, including fundamental components of modulation, of license-exempt radio apparatus shall not fall within the restricted frequency bands listed in CFR 47 §15.205 and in RSS-GEN section 8.10. EUT operates in unrestricted 2400 – 2483.5 MHz frequency band.	**PASS**
FCC §15.207, 15.107 **RSS-GEN 8.8 table 3**	**Conducted continuous emission in the frequency range 150 kHz to 30 MHz, AC Power input port** Battery operated equipment.	**NA**
FCC §15.247 (d), 15.209(a) **RSS-GEN 8.9** **RSS-247 5.5**	**Radiated emission of electromagnetic fields in the frequency range 30 – 1000 MHz** The EUT complies with the limits. The margin to the limit was at least 15 dB at the noise floor, no disturbances detected above the noise floor. See clause 5.4.	**PASS**
FCC §15.247(d), 15.209(a) **RSS-GEN 8.9** **RSS-247 5.5**	**Radiated emission of electromagnetic fields in the frequency range above 1 GHz** The EUT complies with the limits. The margin to the limit was at least 3 dB at 7205.5 MHz. See clause 5.5.	**PASS**
FCC §15.247(e), 15.209(a) **RSS-247 5.5**	**Radiated Band edge** The EUT complies with the limits. The margin to the limit was at least 1 dB at 2483.5 MHz. See clause 6.4.	**PASS**
FCC §15.247(a)(2) **RSS-GEN 6.7** **RSS-247 5.2(1)**	**Occupied 6 dB bandwidth** The EUT complies with the limits. The margin to the limit is at least 0.29 MHz See clause 9.4.	**PASS**
RSS-GEN 6.7	**Occupied 99% bandwidth** See clause 10.3.	**PASS**
FCC §15.247(b) **RSS-247 5.4(4)**	**Conducted output power** The EUT complies with the limits. The margin to the limit was at least 20 dB at 2440 MHz. See clause 8.4.	**PASS**

FCC §15.247(e) **RSS-247 5.2(2)**	**Peak power spectral density** The EUT complies with the limits. The margin to the limit was at least 9 dB at 2440 MHz. See clause 11.4.	**PASS**
FCC §15.247(e) **RSS-247 5.5**	**Conducted Band edge** The EUT complies with the limits. The margin to the limit was at least 20 dB. See clause 7.4.	**PASS**

5 RADIATED RF EMISSION IN THE FREQUENCY-RANGE 30 MHZ TO 26 GHZ

Date of test:	20 August 2024	**Test location:**	Björkhallen / Radiohallen
EUT Serial:	RADIO-CW#1	**Ambient temp:**	22°C
Tested by:	Björn Utermöhl Algot Rickman Sandipan Basu	**Relative humidity:**	48%
Test result:	Pass	**Margin:**	3 dB

5.1 Test set-up and test procedure.

The test method is in accordance with ANSI C63.10-2020.
The EUT was set up in order to emit maximum disturbances.
The EUT was placed on an insulating support 0.8 and 1.5 m above the turntable which is part of the reference ground plane.
Overview sweeps were performed with the measurement receiver in max-hold mode and the peak detector activated in the frequency-range 30 – 1000 MHz. Above 1 GHz additionally the average detector was activated.
Portable device: Pre scan was made in three orthogonal EUT orientations, x, y and z. For above 1 GHz, the EUT was rotated automatically by the antenna tower in 22 degree increments to expose all orientations.

5.2 Test conditions

Test set-up:	**30 MHz to 1000 MHz**		
Test receiver set-up:			
Preview test:	Peak,	RBW 120 kHz	VBW 1 MHz
Final test:	Quasi-Peak,	RBW 120 kHz	VBW 1 MHz
EUT height above ground plane:	0.8 m		
Measuring distance:	3 m		
Measuring angle:	0 – 359°		
Antenna			
Height above ground plane:	1 – 4 m		
Polarisation:	Vertical and Horizontal		
Type:	Bilog		

Test set-up:	**1 GHz – 26.5 GHz**		
Test receiver set-up:			
Preview test:	Peak,	RBW 1 MHz	VBW 3 MHz
	Average,	RBW 1 MHz	VBW 3 MHz
Final test:	Peak,	RBW 1 MHz	VBW 3 MHz
	Average	Peak value + 20 x LOG (Duty cycle) / RBW 1 MHz VBW 3 MHz	
EUT height above ground plane:	1.5 m		
Measuring distance:	3 m		
Measuring angle:	0 – 359°		
Antenna			
Height above ground plane:	1.5 m		
Polarisation:	Vertical and Horizontal		
Type:	Horn		
Antenna tilt:	NA		

5.3 Requirements

Within restricted bands:
Reference: CFR 47 §15.209, RSS-Gen section 8.9

Field strength of emissions must comply with limits shown in table below

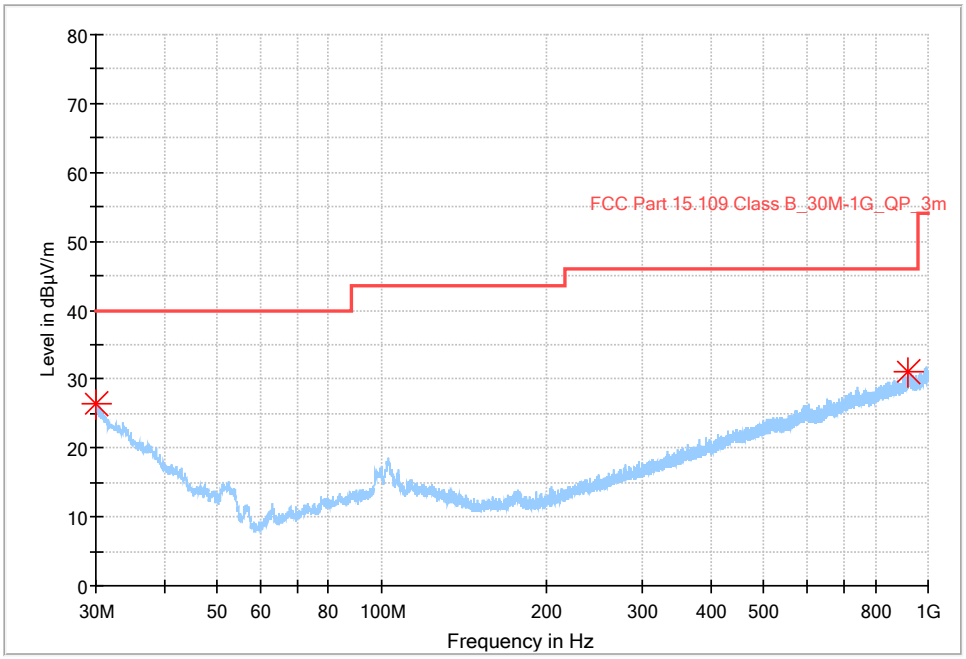
Frequency range [MHz]	Field strength at 3 m (dBµV/m)	Field strength at 10 m (dBµV/m)	Detector (dBµV/m)
30 – 88	40.0	29.5	Quasi Peak
88 – 216	43.5	33.0	Quasi Peak
216 – 960	46.0	35.5	Quasi Peak
960 – 1000	54.0	43.5	Quasi Peak
Above 1000	54.0 / 74.0	43.5 / 63.5	Average / Peak

The values for 10 m measuring distance are calculated by subtracting 10.5 dB from the 3 m limit. (i.e. an extrapolation factor of 20 dB/decade according to CFR 47 §15.31(f)(1))

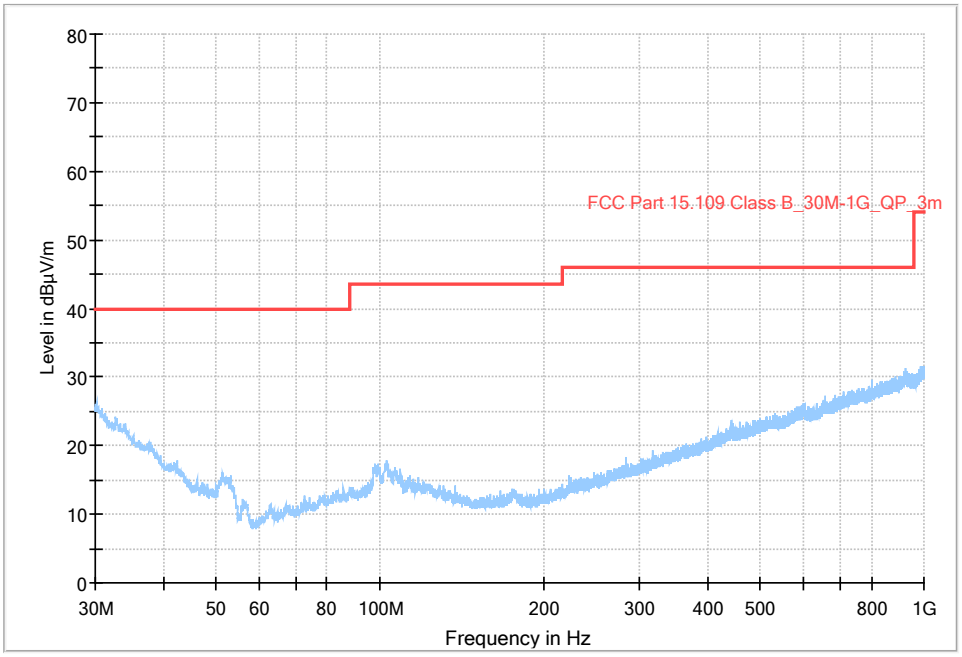
Outside the restricted bands:
Reference: CFR 47 §15.247(d), RSS-247 5.5,

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits.

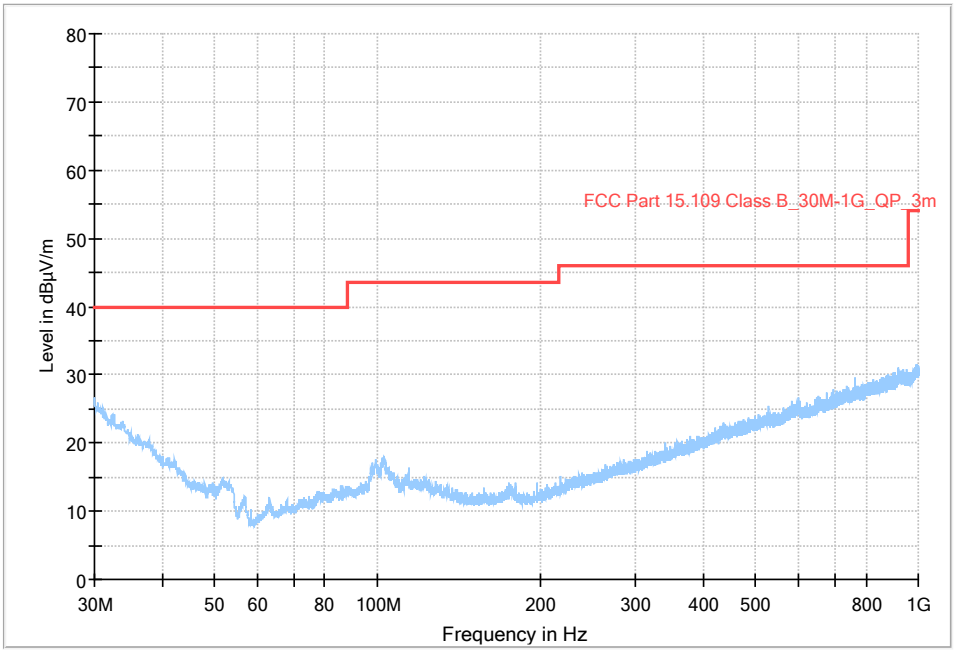
5.4 Test results 30 MHz – 1000 MHz, TX



Diagram, Peak overview sweep, 30 – 1000 MHz at 3 m distance. TX low channel, EUT orientation X.



Diagram, Peak overview sweep, 30 – 1000 MHz at 3 distance. TX low channel, EUT orientation Y.



Diagram, Peak overview sweep, 30 – 1000 MHz at 3 m distance. TX low channel, EUT orientation Z.

Measurement results, Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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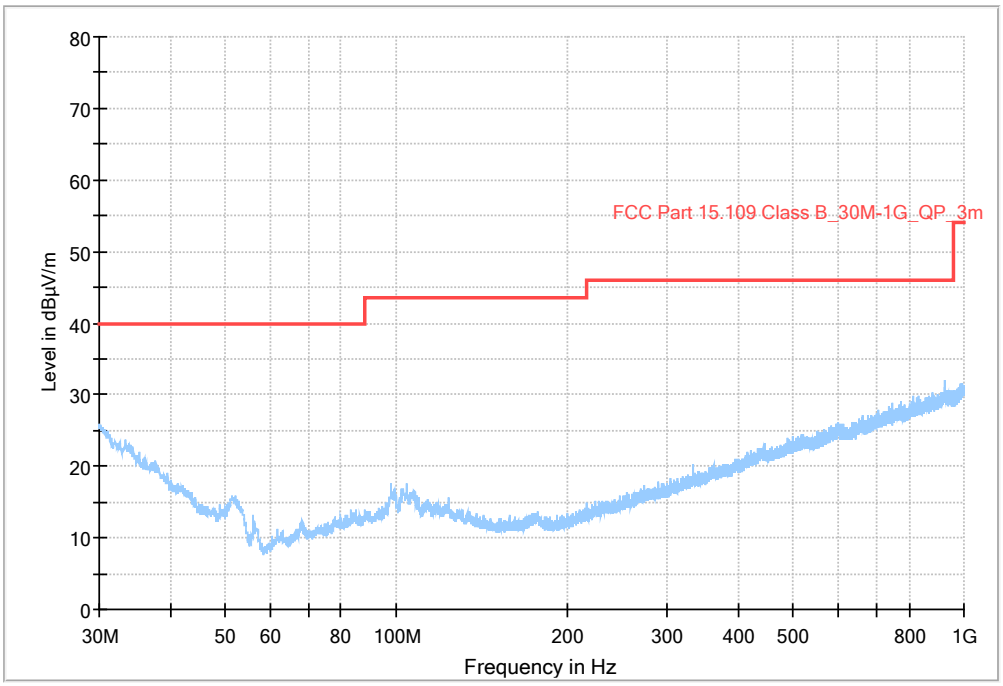
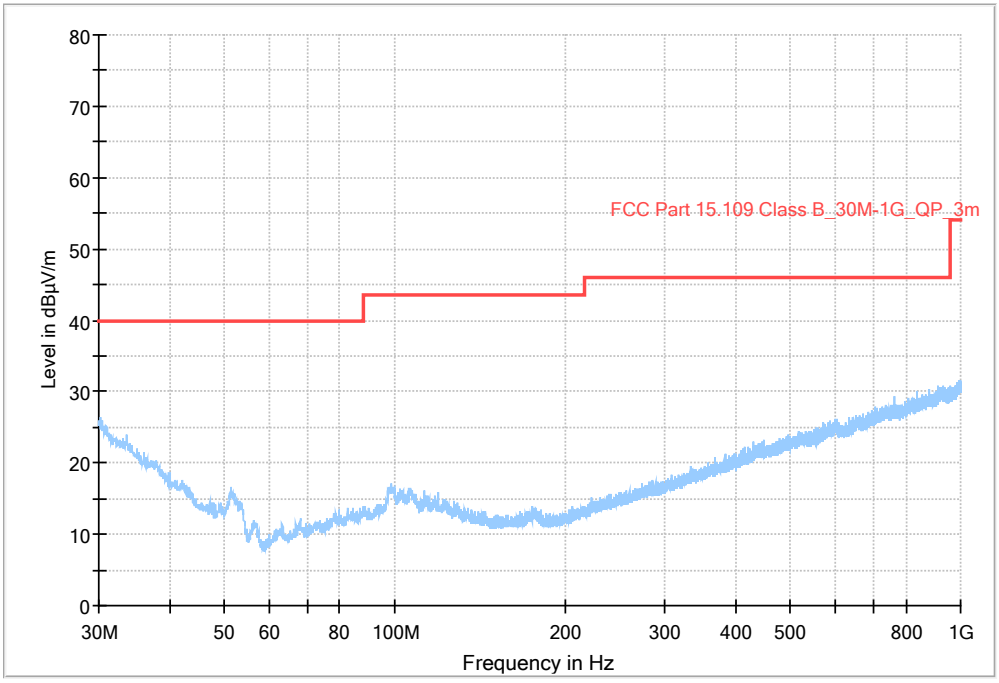
No emissions are found above noise floor or closer than 20 dB from limit. Margin to noise floor is at least 15 dB.

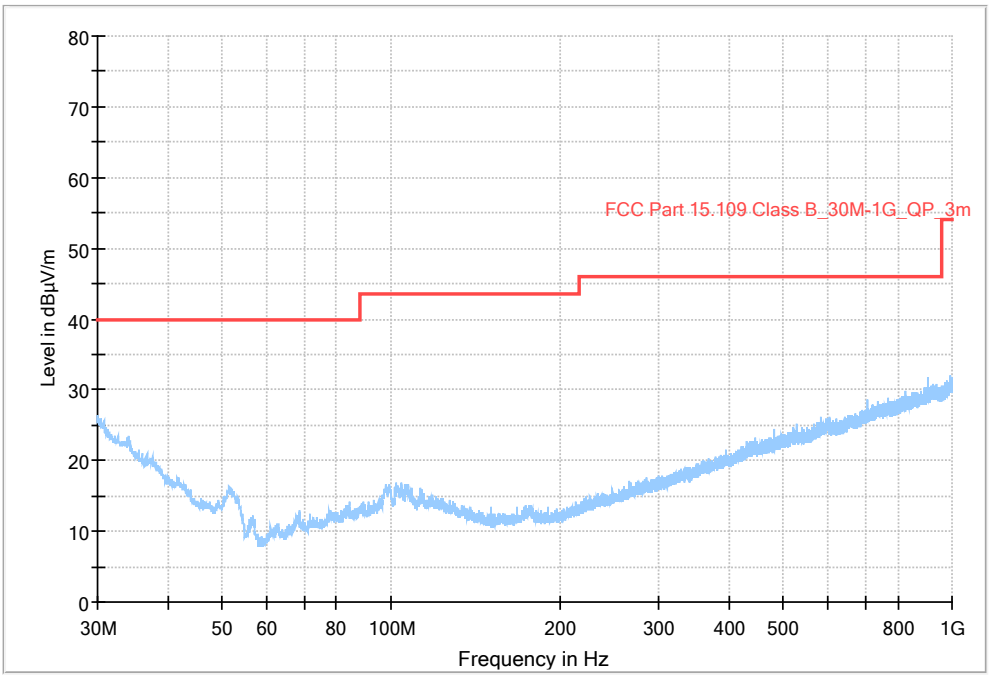
Result [dBµV/m] = Analyser reading [dBµV] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB]



Diagram, Peak overview sweep, 30 – 1000 MHz at 3 m distance. TX mid channel, EUT orientation X.



Diagram, Peak overview sweep, 30 – 1000 MHz at 3 m distance. TX mid channel, EUT orientation Y.



Diagram, Peak overview sweep, 30 – 1000 MHz at 3 m distance. TX mid channel, EUT orientation Z.

Measurement results, Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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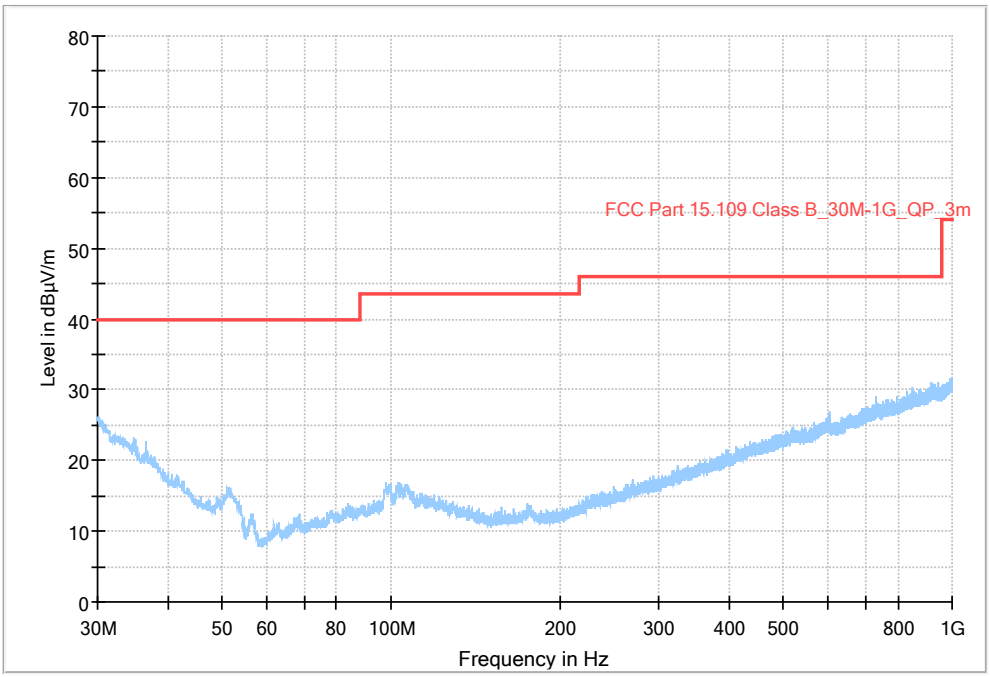
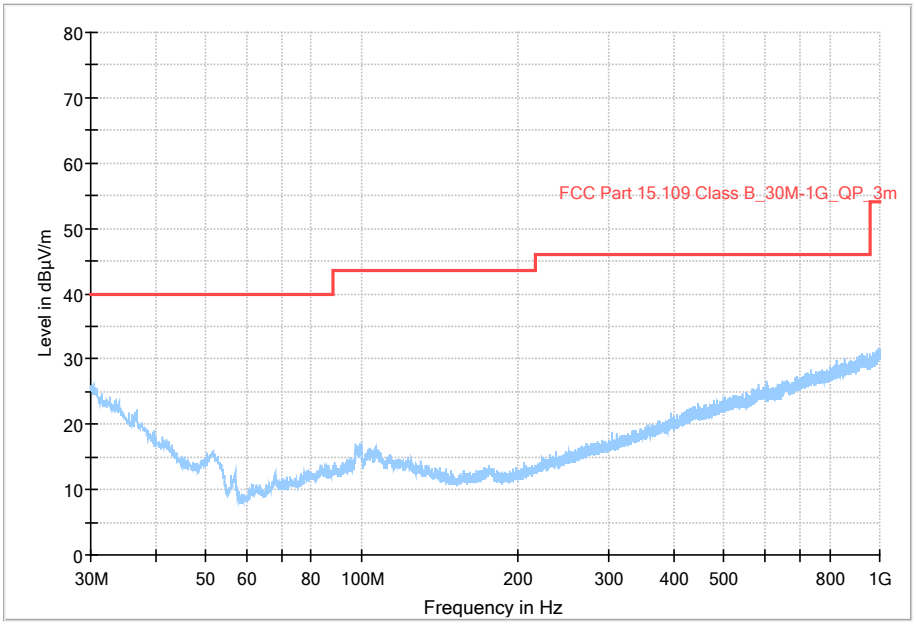
No emissions are found above noise floor or closer than 20 dB from limit. Margin to noise floor is at least 15 dB

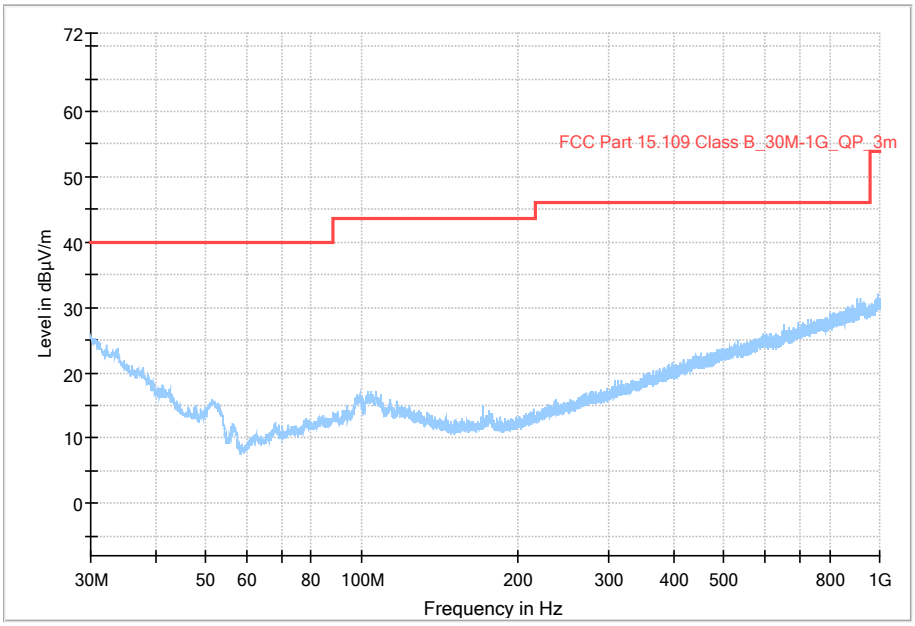
Result [dBµV/m] = Analyser reading [dBµV] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB]



Diagram, Peak overview sweep, 30 – 1000 MHz at 3 m distance. TX high channel, EUT orientation X.



Diagram, Peak overview sweep, 30 – 1000 MHz at 3 m distance. TX high channel, EUT orientation Y.



Diagram, Peak overview sweep, 30 – 1000 MHz at 3 m distance. TX high channel, EUT orientation Z.

Measurement results, Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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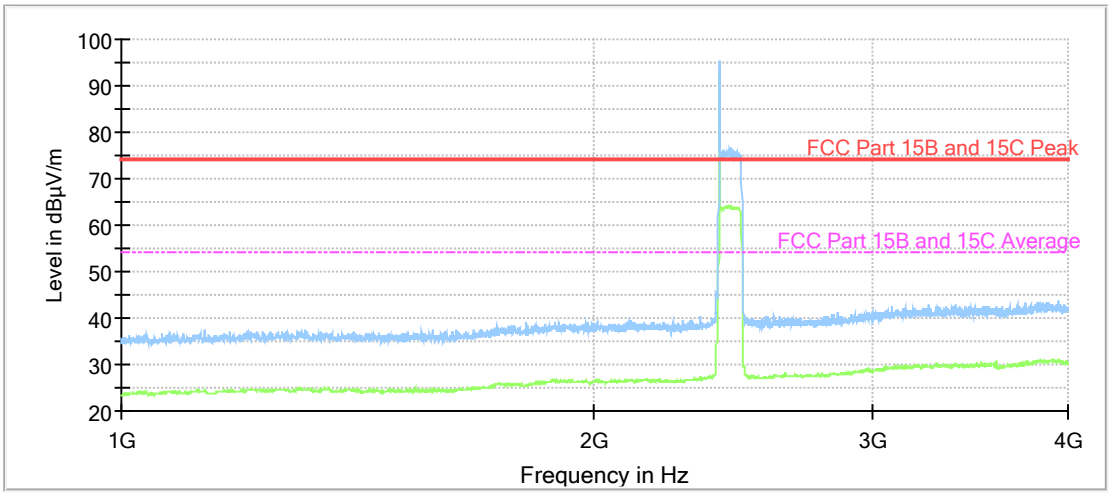
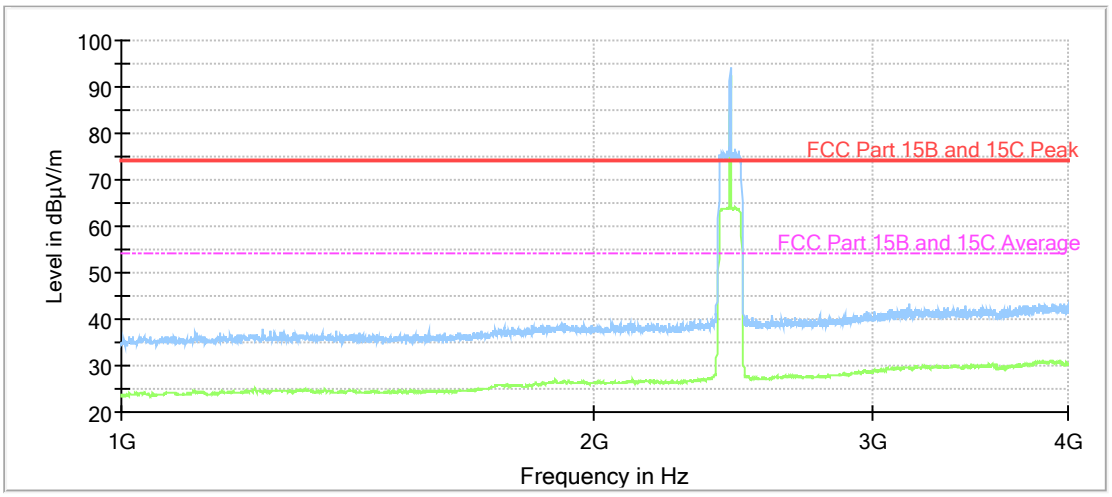
No emissions are found above noise floor or closer than 20 dB from limit. Margin to noise floor is at least 15 dB

Result [dBµV/m] = Analyser reading [dBµV] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB]

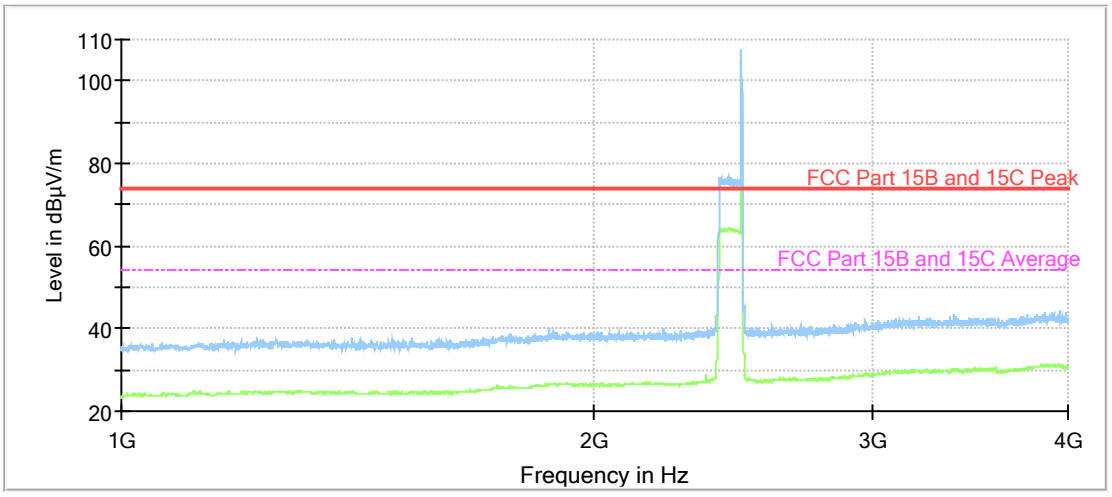
5.5 Test results 1 GHz – 26.5 GHz, TX



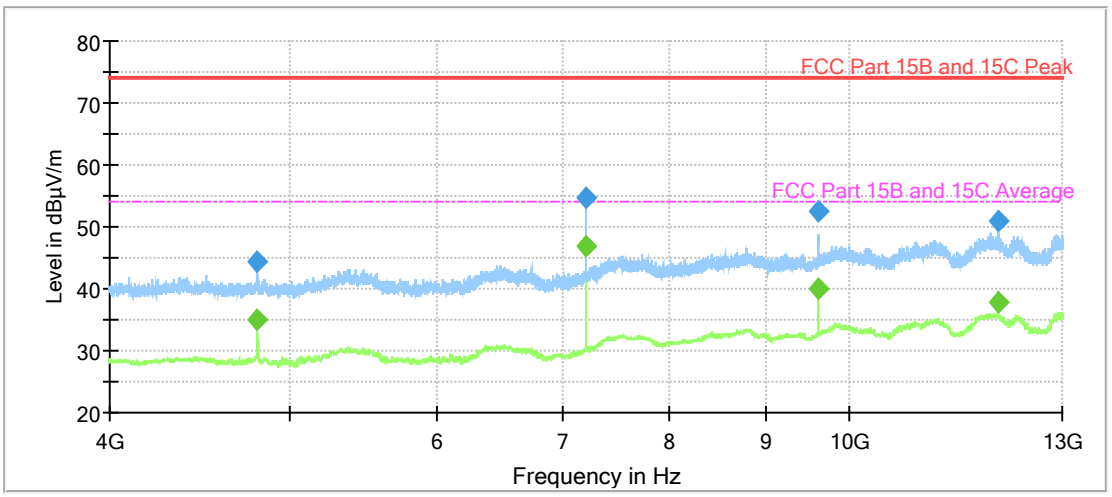
Diagram, Peak overview sweep, 1– 4 GHz at 3 m distance. TX low channel. Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0.



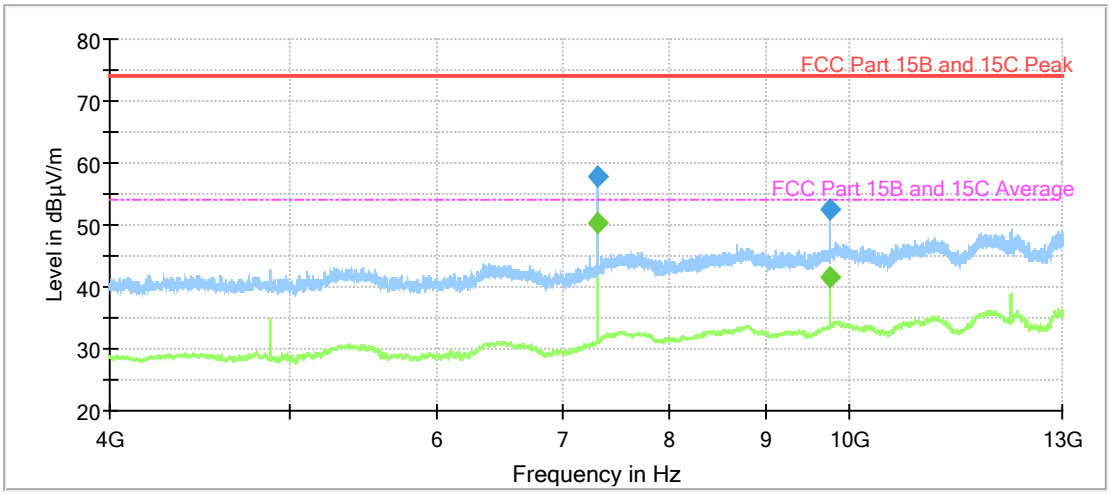
Diagram, Peak overview sweep, 1– 4 GHz at 3 m distance. TX Mid channel. Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0.



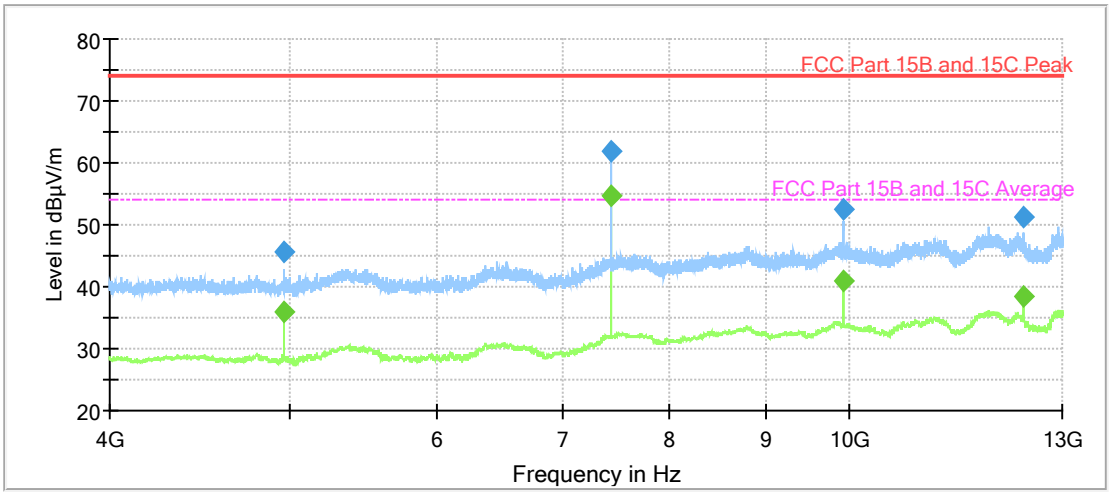
Diagram, Peak overview sweep, 1– 4 GHz at 3 m distance. TX High channel. Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0.



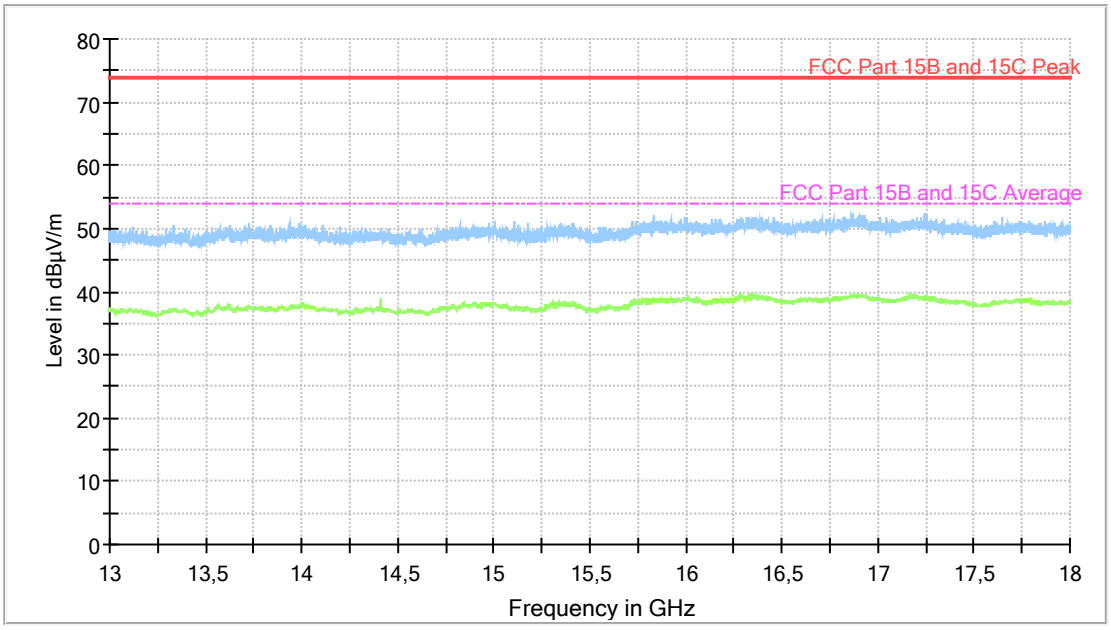
Diagram, Peak overview sweep, 4– 13 GHz at 3 m distance. TX low channel. Emissions below 4000 MHz are attenuated by high-pass filter K&L 4410-X4500/18000-0.



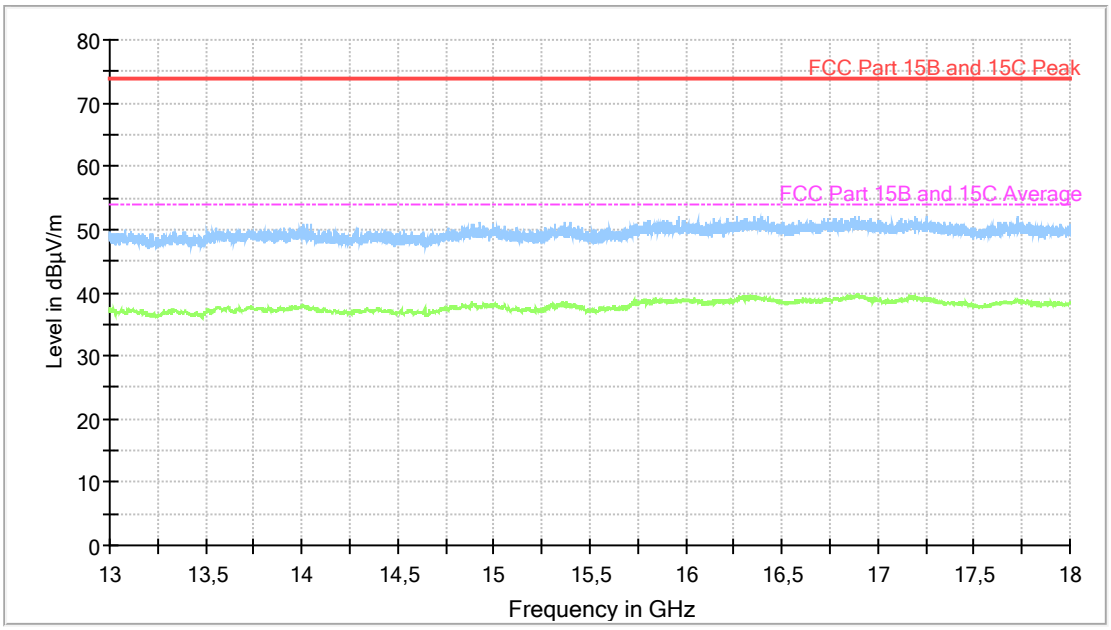
Diagram, Peak overview sweep, 4– 13 GHz at 3 m distance. TX mid channel. Emissions below 4000 MHz are attenuated by high-pass filter K&L 4410-X4500/18000-0.



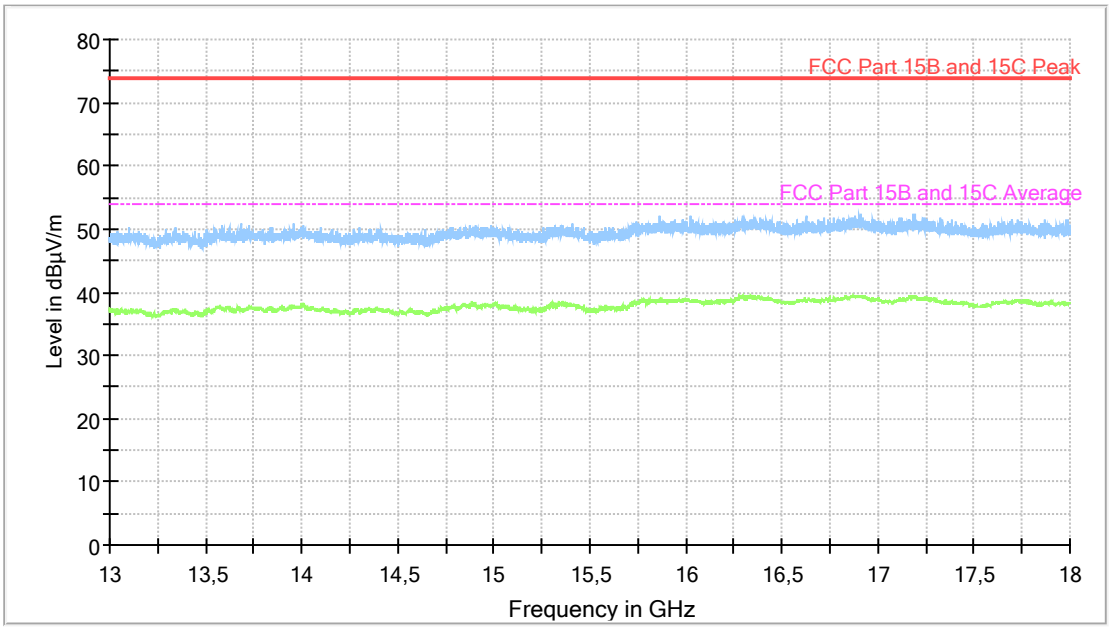
Diagram, Peak overview sweep, 4– 13 GHz at 3 m distance. TX high channel. Emissions below 4000 MHz are attenuated by high-pass filter K&L 4410-X4500/18000-0.



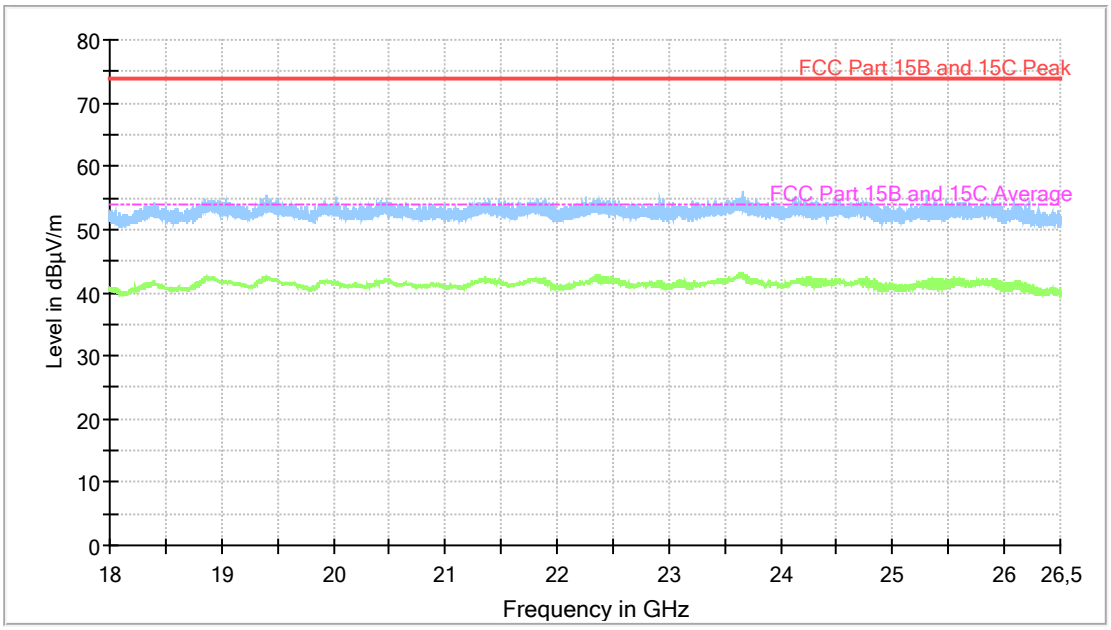
Diagram, Peak overview sweep, 13 – 18 GHz at 3 m distance. TX low channel.



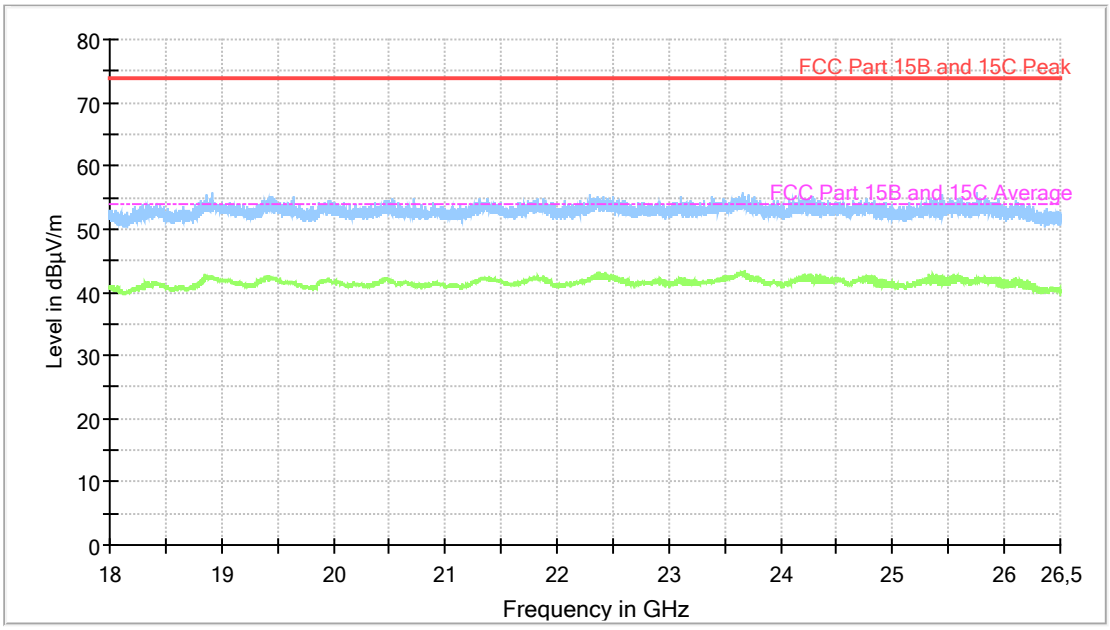
Diagram, Peak overview sweep, 13 – 18 GHz at 3 m distance. TX mid channel.



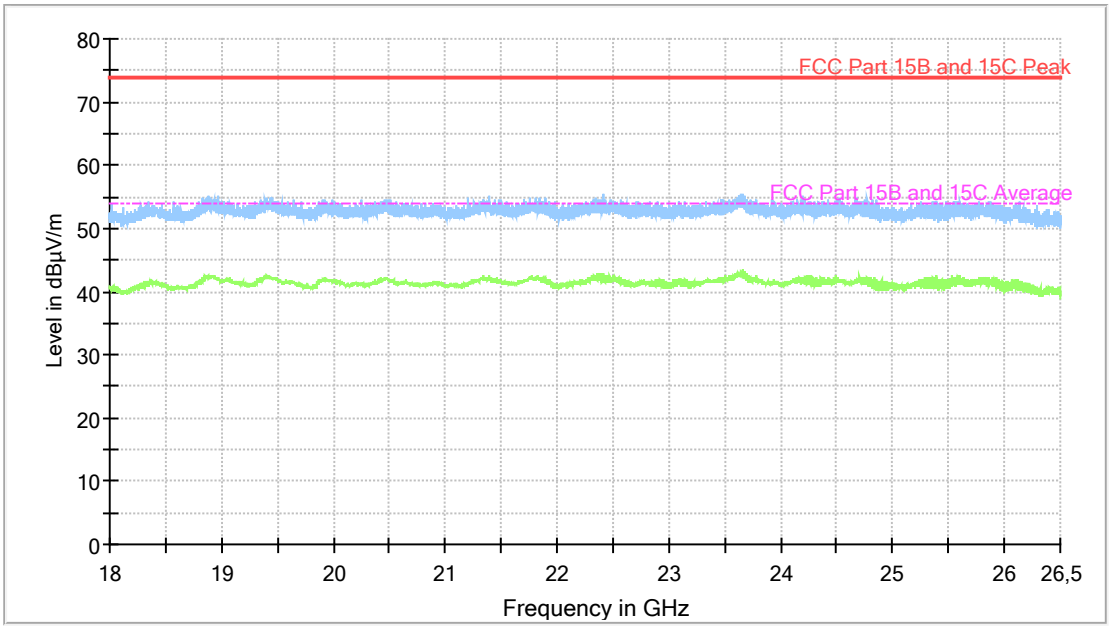
Diagram, Peak overview sweep, 13 – 18 GHz at 3 m distance. TX high channel.



Diagram, Peak overview sweep, 18 – 26.5 GHz at 3 m distance. TX low channel.



Diagram, Peak overview sweep, 18 – 26.5 GHz at 3 m distance. TX mid channel.



Diagram, Peak overview sweep, 18 – 26.5 GHz at 3 m distance. TX high channel.

Measurement results, Peak, TX low channel

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]	Correction factor [dB]
4804.411667	44.47	74.00	H	29.53	-4
7205.245556	54.84	74.00	V	19.16	2
9606.926111	52.45	74.00	V	21.55	5
12010.797222	50.97	74.00	H	23.03	5

Measurement results, Average, TX low channel

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]	Correction factor [dB]
4804.000000	35.14	54.00	V	18.86	-4
7205.500000	46.85	54.00	V	7.15	2
9607.000000	40.15	54.00	V	13.85	5
12009.000000	37.97	54.00	H	16.03	5

Measurement results, Peak, TX middle channel

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]	Correction factor [dB]
7320.703889	57.85	74.00	V	16.15	2
9759.457778	52.63	74.00	V	21.37	5

Measurement results, Average, TX middle channel

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]	Correction factor [dB]

7319.500000	50.36	54.00	V	3.64	2
9761.000000	41.54	54.00	V	12.46	5

Measurement results, Peak, TX high channel

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]	Correction factor [dB]
4959.971667	45.61	74	H	28.39	-3
7440.837222	61.99	74	V	12.01	2
9920.829444	52.54	74	V	21.46	5
12401.166111	51.11	74	V	22.89	4

Measurement results, Average, TX high channel

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]	Correction factor [dB]
4960.000000	35.90	54.00	H	18.10	-3
7440.500000	35.99*	54.00	V	18.01	2
9919.000000	41.05	54.00	V	12.95	5
12401.500000	38.58	54.00	V	15.42	4

*Average measurement for this point was obtained by applying a duty cycle correction factor to the peak measurement of δ(dB) = 20 log(0.05) = -26 dB.

All other measured disturbances have a margin of more than 20 dB to the limits.

Result [dBµV/m] = Analyser reading [dBµV] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB]

6 RADIATED BAND EDGE MEASUREMENT

Date of test:	29 Augusti 2024	**Test location:**	Radiohallen
EUT Serial:	RADIO-CW#1	**Ambient temp:**	21 °C
Tested by:	Björn Utermöhl Nahome Micheal Algot Rickman	**Relative humidity:**	50 %
Test result:	Pass	**Margin:**	1.3 dB

6.1 Test set-up and test procedure.

The test method is in accordance with ANSI C63.10-2020 section 6.10.5.

The EUT was set up in order to emit maximum disturbances.
The EUT was placed on an insulating support 0.8 and 1.5 m above the turntable which is part of the reference ground plane.
Overview sweeps were performed with the measurement receiver in max-hold mode and the peak detector activated.
Portable device: Pre scan was made in three orthogonal EUT orientations.

6.2 Test conditions

Detector: Peak,
RBW: 1 MHz
VBW: 3 MHz

Detector: RMS,
RBW: 1 MHz
VBW: 3 MHz

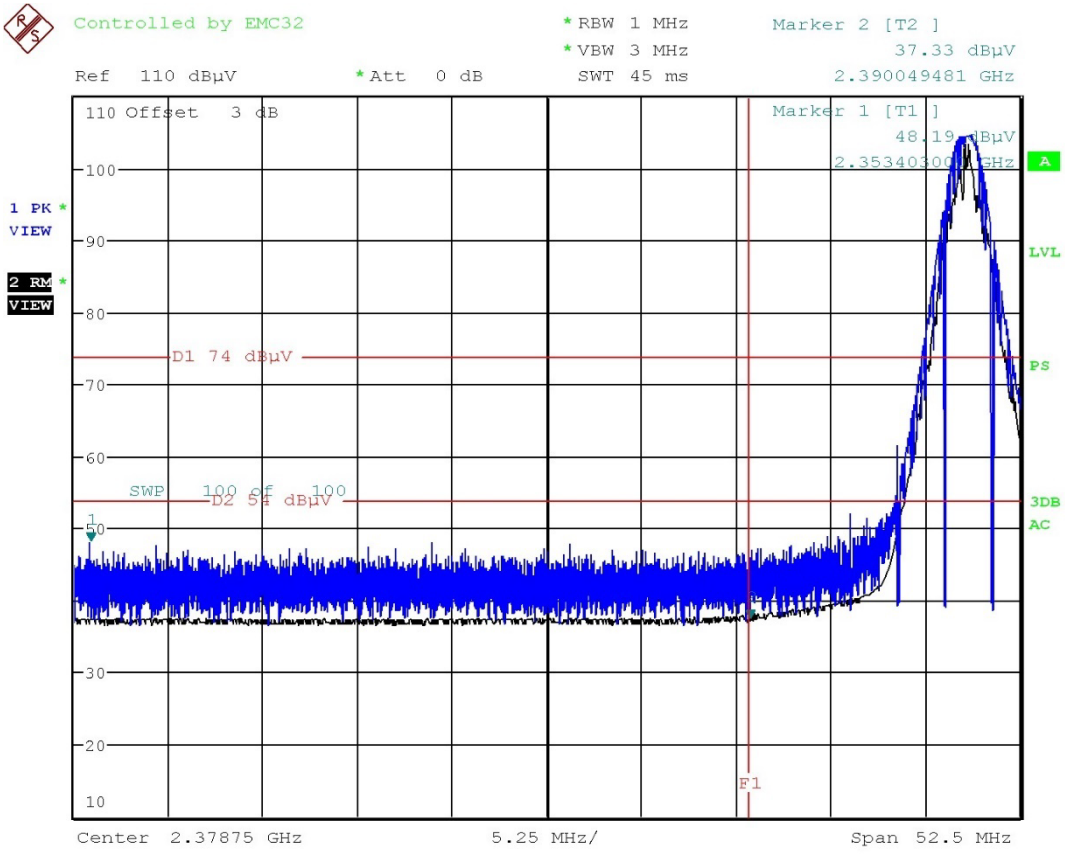
6.3 Requirement

Within restricted bands:
Reference: CFR 47 §15.209, RSS-Gen section 8.9

Field strength of emissions must comply with limits shown in table below

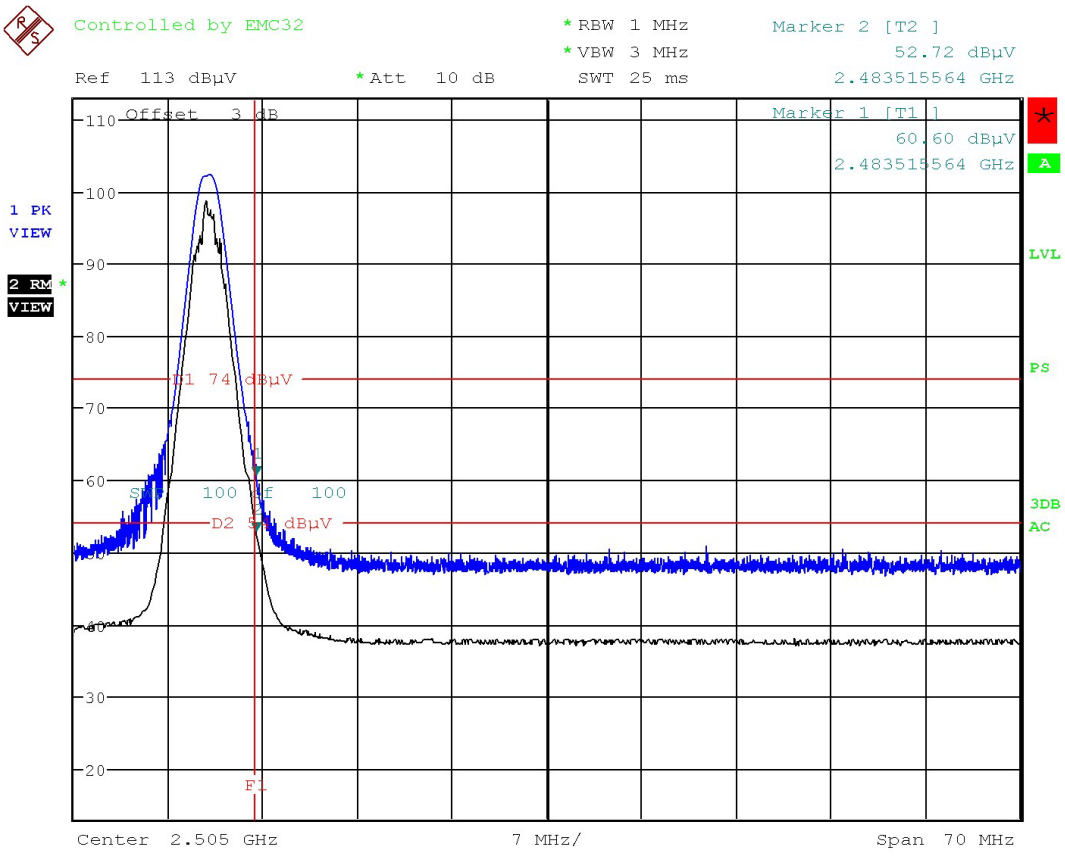
Frequency range [MHz]	Field strength at 3 m (dBµV/m)	Field strength at 10 m (dBµV/m)	Detector (dBµV/m)
30 – 88	40.0	29.5	Quasi Peak
88 – 216	43.5	33.0	Quasi Peak
216 – 960	46.0	35.5	Quasi Peak
960 – 1000	54.0	43.5	Quasi Peak
Above 1000	54.0 / 74.0	43.5 / 63.5	Average / Peak

6.4 Test results radiated band edge



Date: 29.AUG.2024 13:58:44

Screenshot: Lower band edge sweep, single channel



Date: 29.AUG.2024 14:50:26

Screenshot: High band edge sweep, single channel

Test results peak

Band edge	Peak [dBµV]	Limit [dBµV]	Margin [dB]
Lower	48.2	74.0	25.8
Upper	60.6	74.0	13.4

Test results average

Band edge	Average [dBµV]	Limit [dBµV]	Margin [dB]
Lower	37.3	54.0	16.7
Upper	52.7	54.0	1.3

7 CONDUCTED BAND EDGE MEASUREMENT

Date of test:	15 August 2024	**Test location:**	TS8997
EUT Serial:	RADIO-CW#2	**Ambient temp:**	20 °C
Tested by:	Björn Utermöhl Nahome Micheal Algot Rickman	**Relative humidity:**	60 %
Test result:	Pass	**Margin:**	> 20 dB

7.1 Test set-up and test procedure.

The test method is in accordance with ANSI C63.10-2020 section 6.10.4.

The EUT was connected to spectrum analyser via rf-cable and attenuator.

The EUT was set up in order to emit maximum disturbances.

7.2 Test conditions

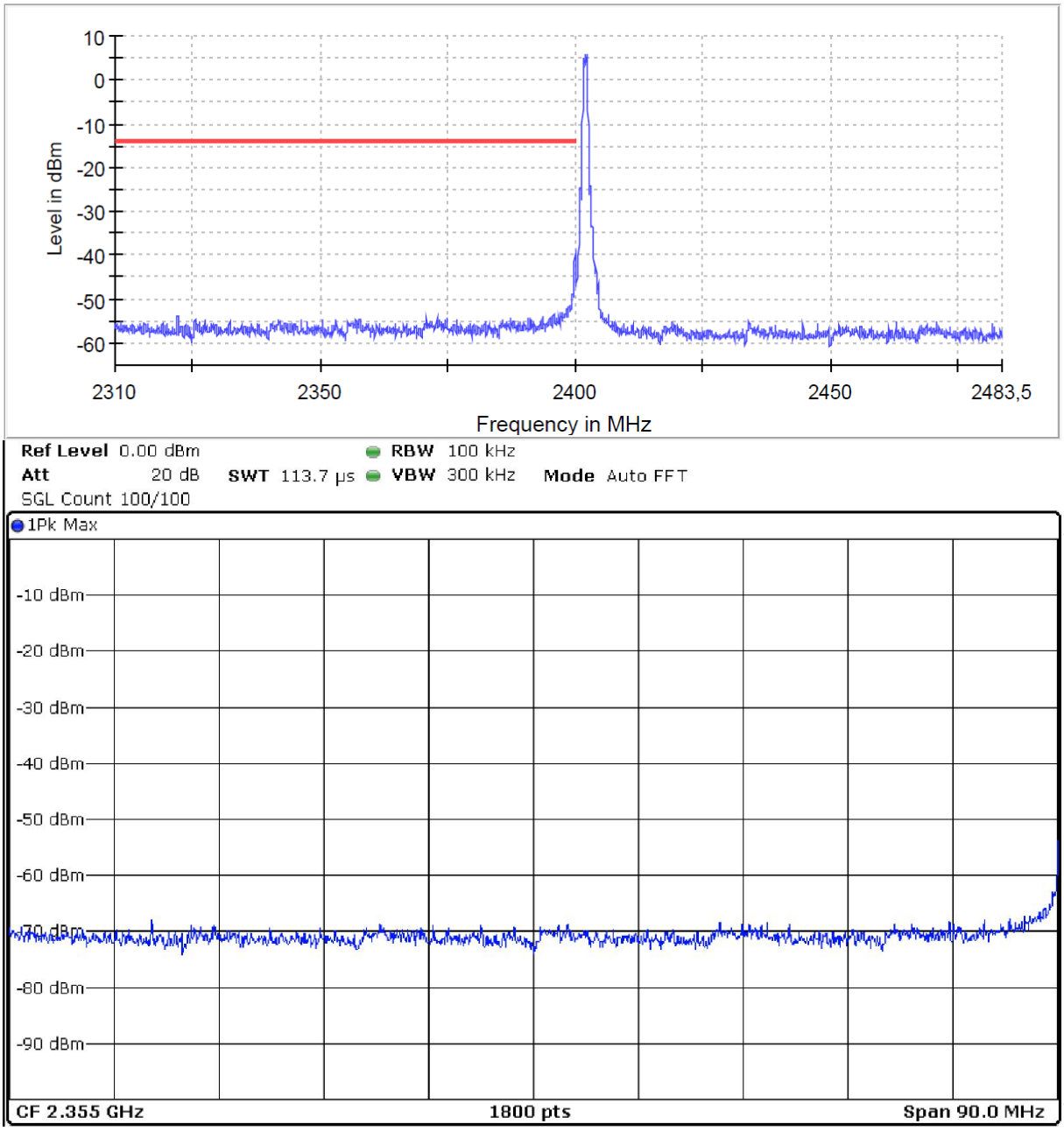
Detector: Peak,
RBW: 100 kHz
VBW: 300 kHz

7.3 Requirement

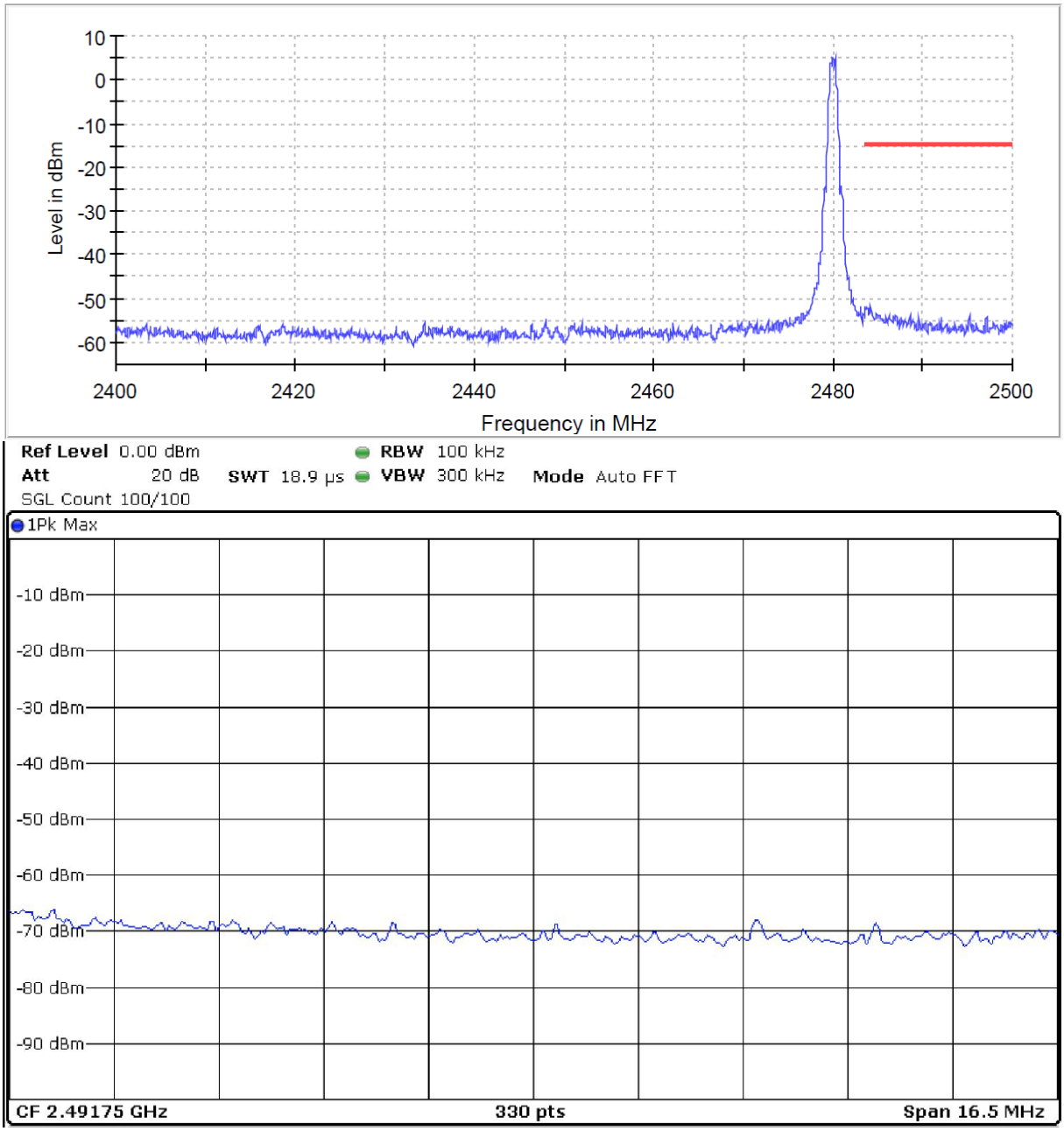
Reference: CFR 47 §15.247(d), RSS-247 5.5,

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits.

7.4 Test results



Screenshot: Lower band edge sweep, single channel



Screenshot: Upper band edge sweep, single channel

Test results

Band edge	Delta [dBc]	Limit [dBc]	Margin [dB]
Lower	45.7	20.0	25.7
Upper	57.0	20.0	37.0

8 PEAK CONDUCTED OUTPUT POWER

Date of test:	15 Augusti 2024	**Test location:**	TS8997
EUT Serial:	RADIO-CW#2	**Ambient temp:**	20 °C
Tested by:	Björn Utermöhl Nahome Micheal Algot Rickman	**Relative humidity:**	60 %
Test result:	Pass	**Margin:**	> 20 dB

8.1 Test set-up and test procedure.

The test method is in accordance with ANSI C63.10-2020 section 11.9.1.1.

The EUT was connected to spectrum analyser via rf-cable and attenuator.

8.2 Test conditions

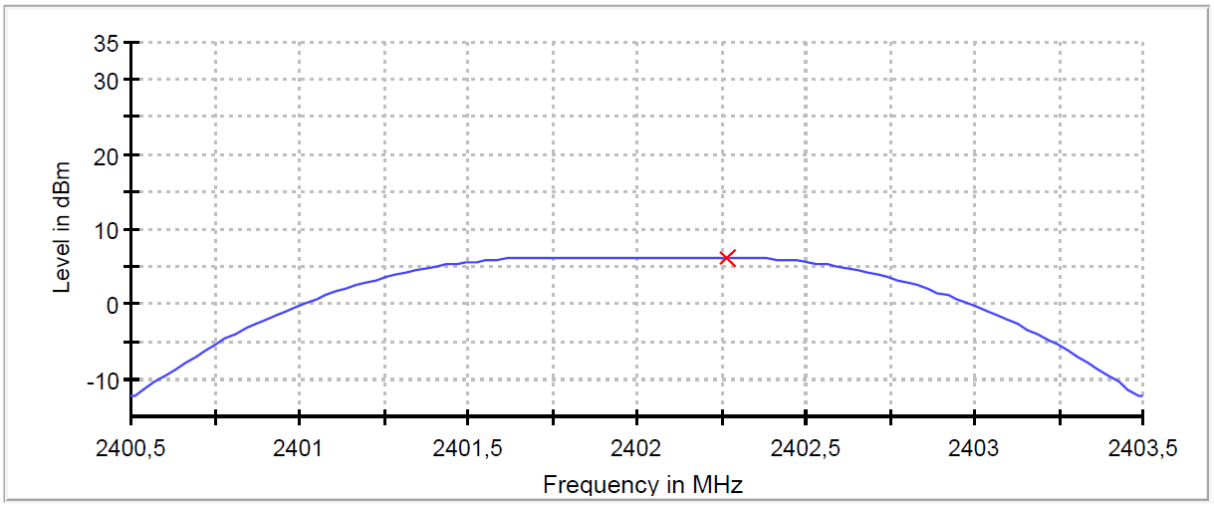
Detector: Peak,
RBW: >OBW
VBW: 3 x RBW
Span: >3 x OBW

The EUT was set up in order to emit maximum disturbances.

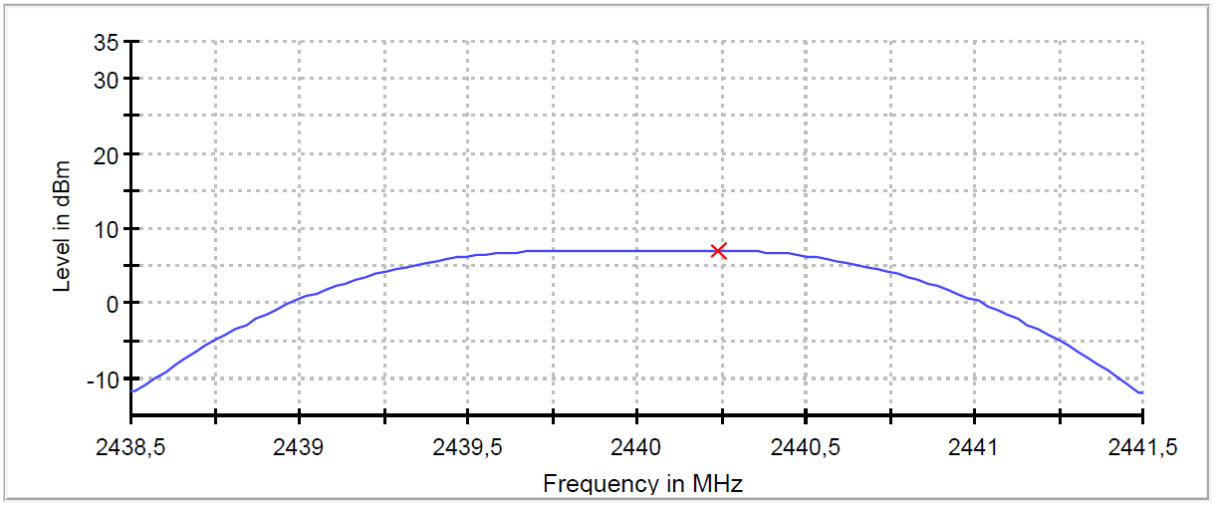
8.3 Requirements

Reference: CFR 47§15.247(b)(3), RSS-247 5.4
For DTSs employing digital modulation techniques operating in the bands 902 – 928 MHz, 2400 – 2483.5 MHz and 5725 – 5850 MHz, the maximum peak conducted output power shall not exceed 1W.

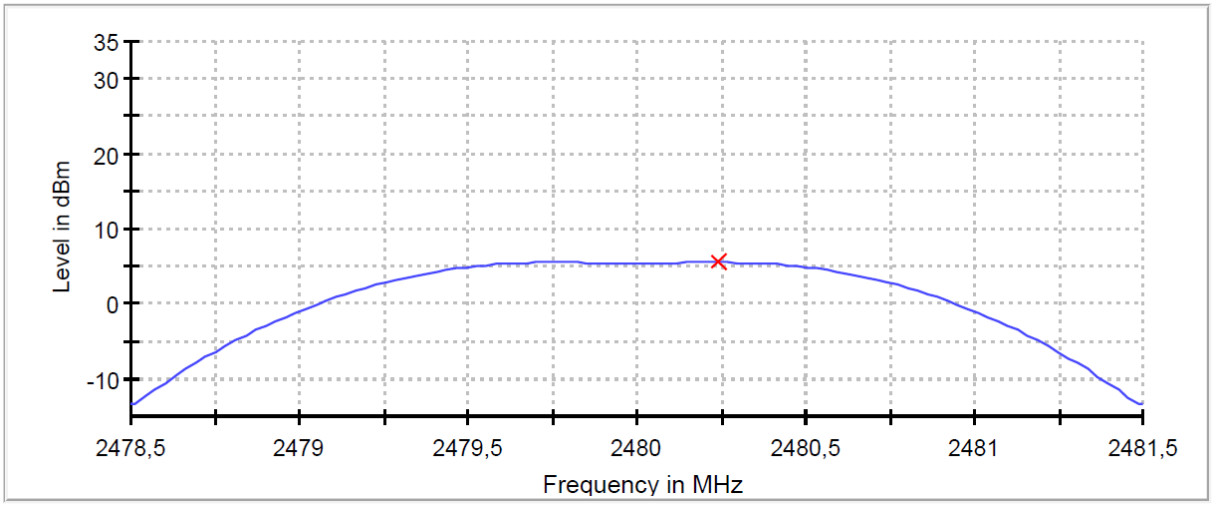
8.4 Test results



Screenshot: Output power, low channel



Screenshot: Output power, middle channel



Screenshot: Output power, high channel

Test result

Channel [MHz]	Output power [dBm]
2402	6.2
2440	7.0
2480	5.5

9 OCCUPIED 6 DB BANDWIDTH

Date of test:	15 August 2024	**Test location:**	TS8997
EUT Serial:	RADIO-CW#2	**Ambient temp:**	20°C
Tested by:	Björn Utermöhl Nahome Micheal Algot Rickman	**Relative humidity:**	60%
Test result:	Pass	**Margin:**	0.29 MHz

9.1 Test set-up and test procedure.

The test method is in accordance with ANSI C63.10-2020 section 11.8.1.

The EUT was connected to spectrum analyser via rf-cable and attenuator.

9.2 Test conditions

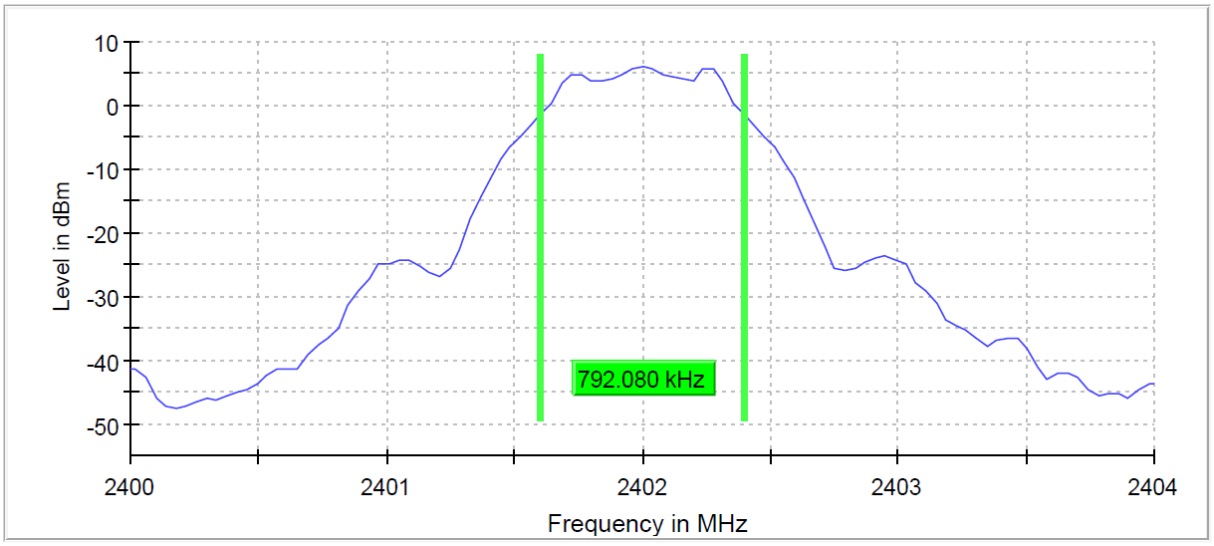
Detector: Peak,
RBW: 100 kHz
VBW: 3 x RBW
Span: >1,5 x OBW

The EUT was set up in order to emit maximum disturbances.

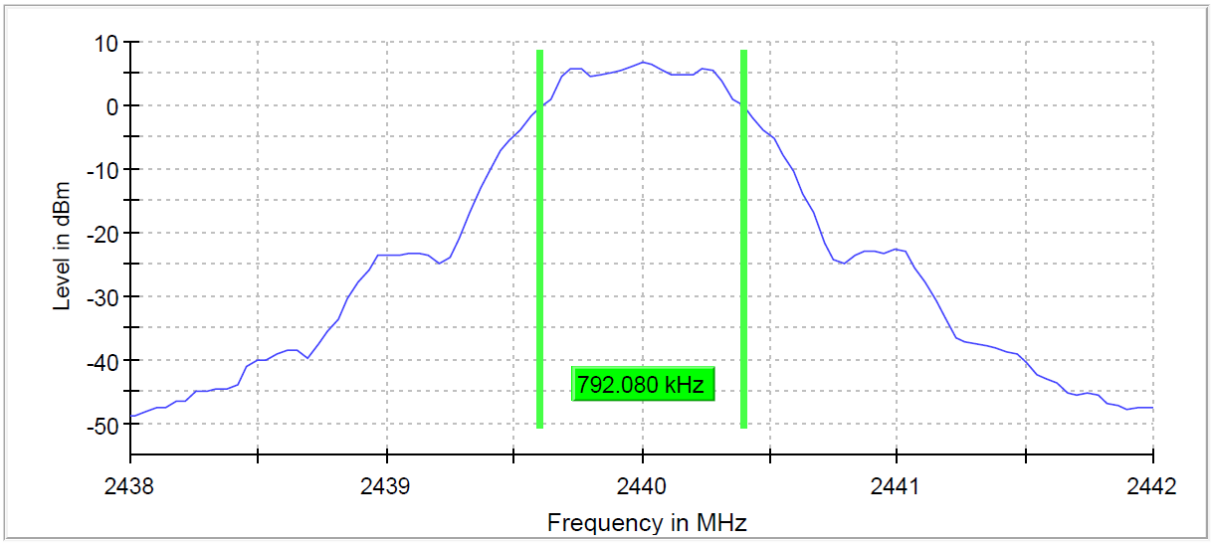
9.3 Requirements

Reference: CFR 47§15.247(a)(2), RSS-247 5.2(1)
The minimum 6 dB bandwidth shall be 500 kHz.

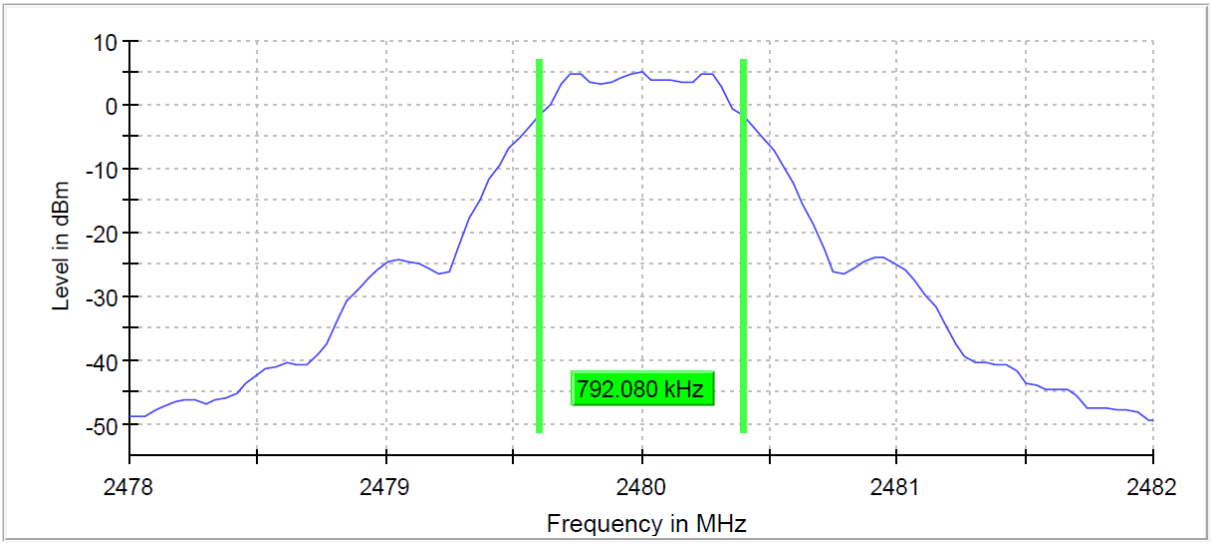
9.4 Test results



Screenshot: Occupied 6 dB bandwidth Measurement, low channel



Screenshot: Occupied 6 dB bandwidth Measurement, middle channel



Screenshot: Occupied 6 dB bandwidth Measurement, high channel

Test result

Channel [MHz]	6 dB BW [MHz]
2402	0.79208
2440	0.79208
2480	0.79208

10 99 % BANDWIDTH

Date of test:	15 August 2024	**Test location:**	TS8997
EUT Serial:	RADIO-CW#2	**Ambient temp:**	20°C
Tested by:	Björn Utermöhl Nahome Micheal Algot Rickman	**Relative humidity:**	60%
Test result:	Pass	**Margin:**	N/A

10.1 Test set-up and test procedure.

The test method is in accordance with RSS-GEN section 6.7.

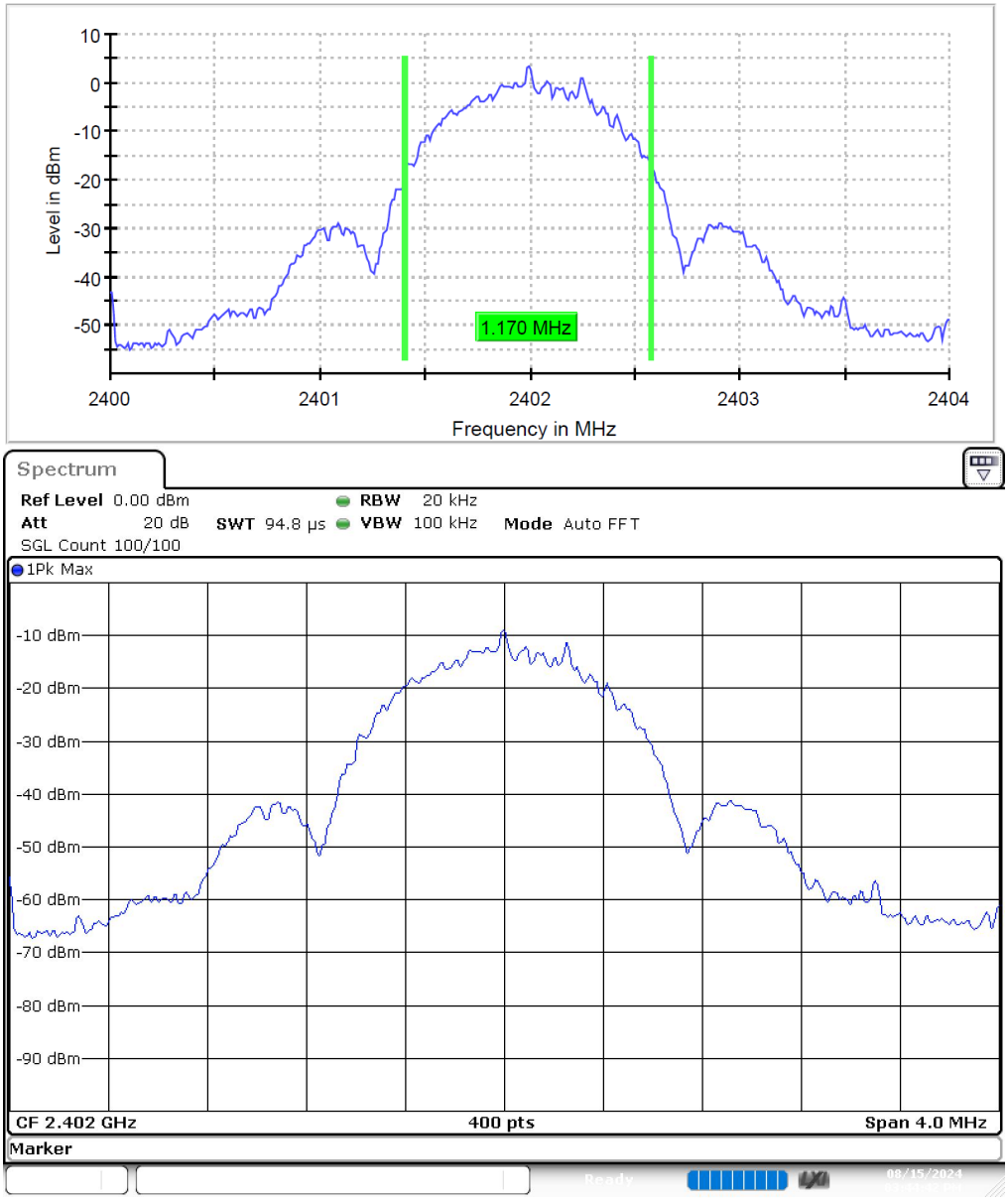
The EUT was connected to spectrum analyser via rf-cable and attenuator. Spectrum analyser with occupied bandwidth measurement function is used to determine the occupied bandwidth.

10.2 Test conditions

Detector: Peak,
RBW: 1 – 5 % of OBW
VBW: 3 x RBW

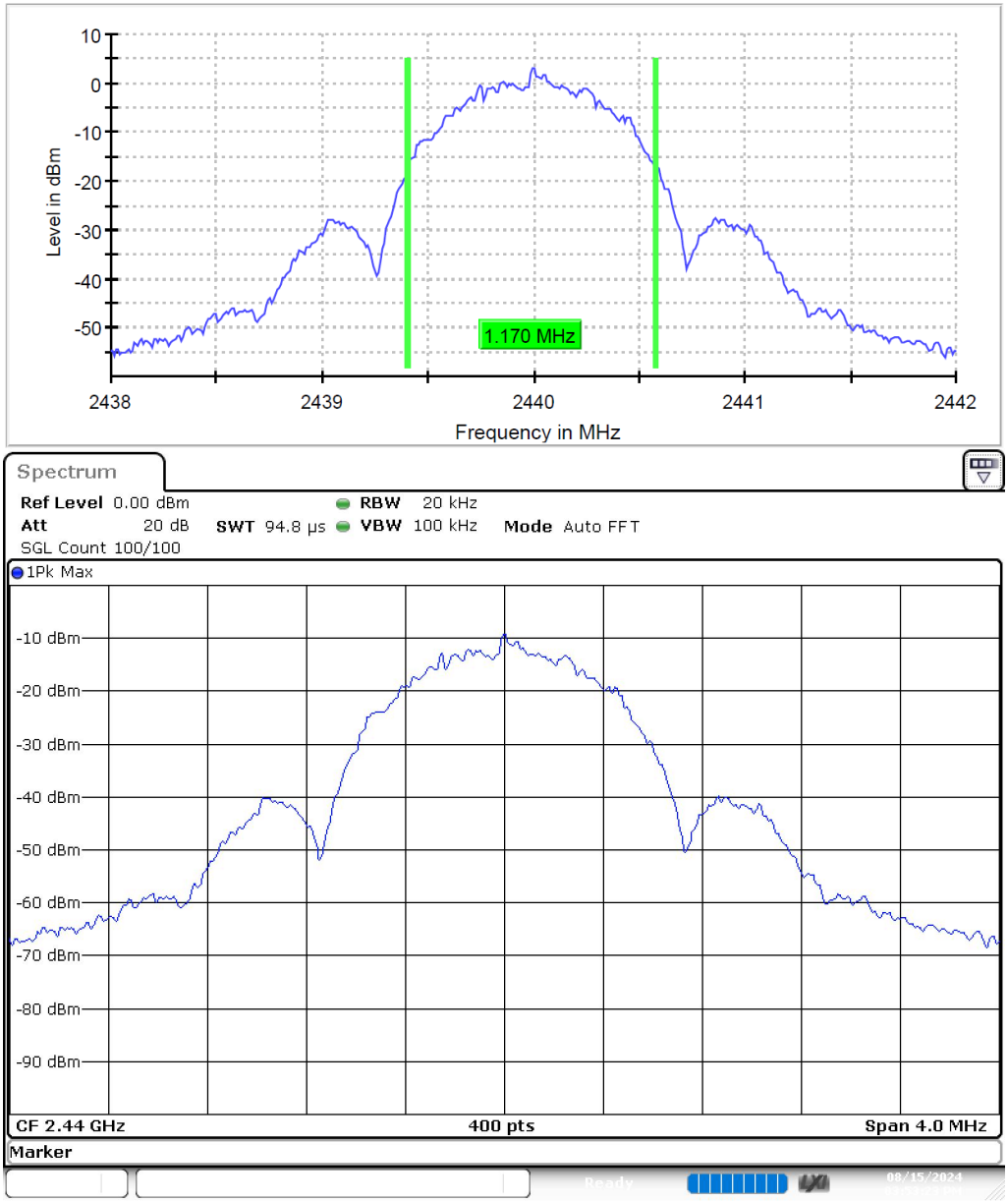
The EUT was set up in order to emit maximum disturbances.

10.3 Test results



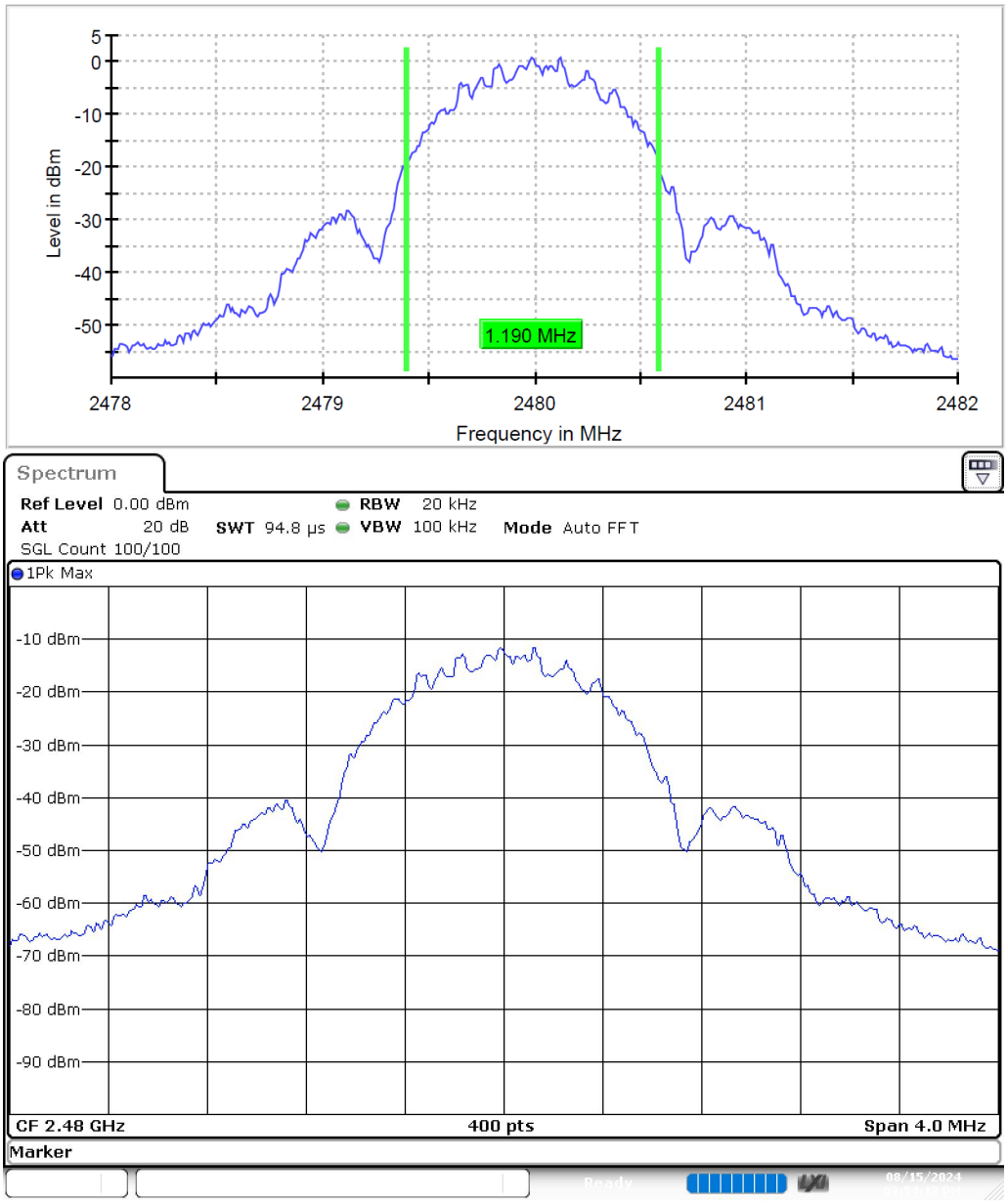
Date: 15.AUG.2024 15:44:43

Screenshot: 99 % bandwidth Measurement, low channel



Date: 15.AUG.2024 15:53:24

Screenshot: 99 % bandwidth Measurement, middle channel



Date: 15.AUG.2024 15:54:12

Screenshot: 99 % bandwidth Measurement, high channel

Test result

Channel [MHz]	99 % BW [MHz]
2402	1.170
2440	1.170
2480	1.190

11 PEAK POWER SPECTRAL DENSITY

Date of test:	15 August 2024	**Test location:**	TS8997
EUT number:	RADIO-CW#2	**Ambient temp:**	20°C
Tested by:	Björn Utermöhl Nahome Micheal Algot Rickman	**Relative humidity:**	60%
Test result:	Pass	**Margin:**	> 9 dB

11.1 Test set-up and test procedure.

The test method is in accordance with ANSI C63.10-2020 section 11.10.2.

The EUT was connected to spectrum analyser via rf-cable and attenuator.

11.2 Test conditions

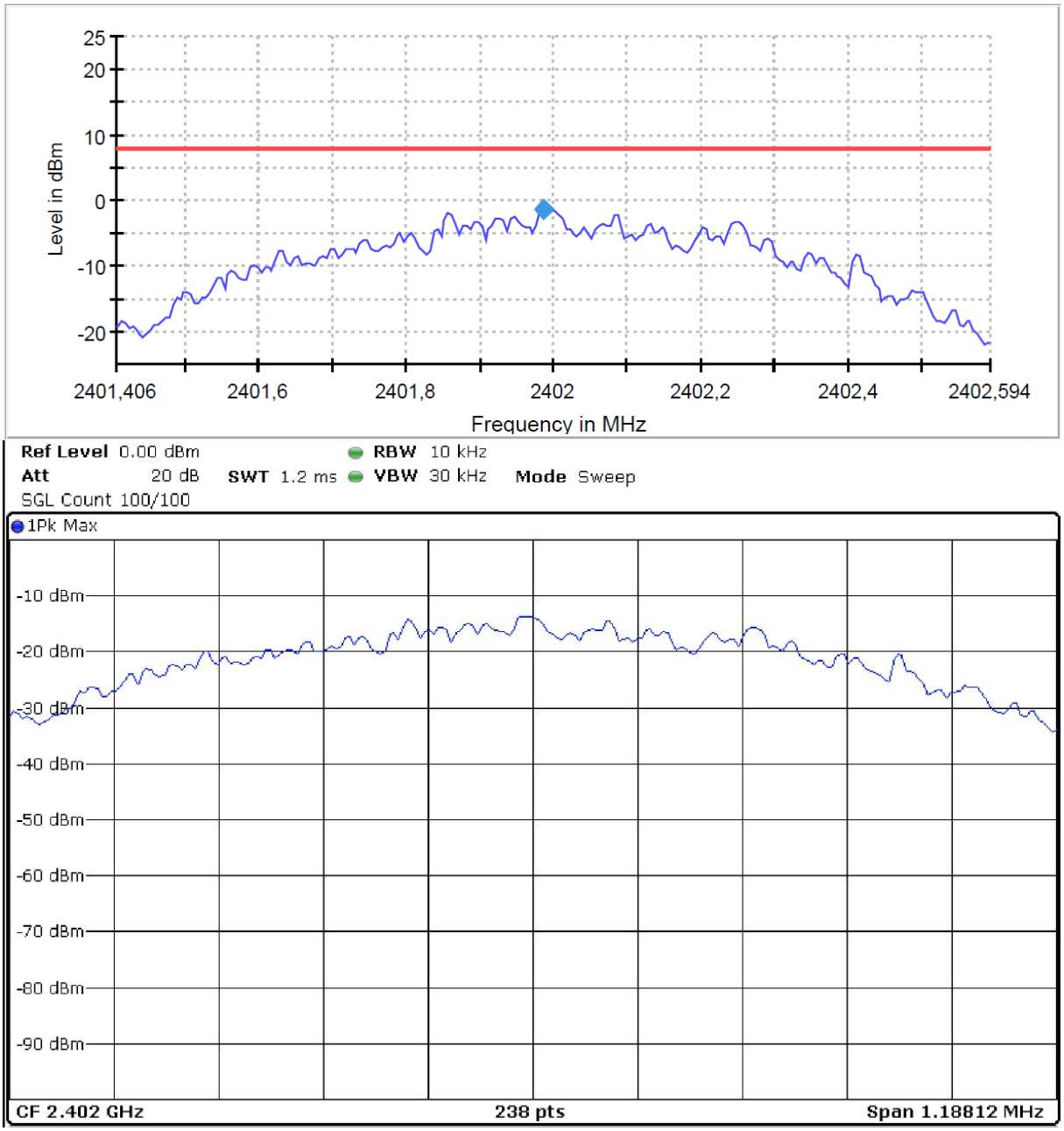
Detector: Peak,
RBW: 10 kHz
VBW: >3 x RBW
Span: 1.5 x 6 dB bandwidth

The EUT was set up in order to emit maximum disturbances.

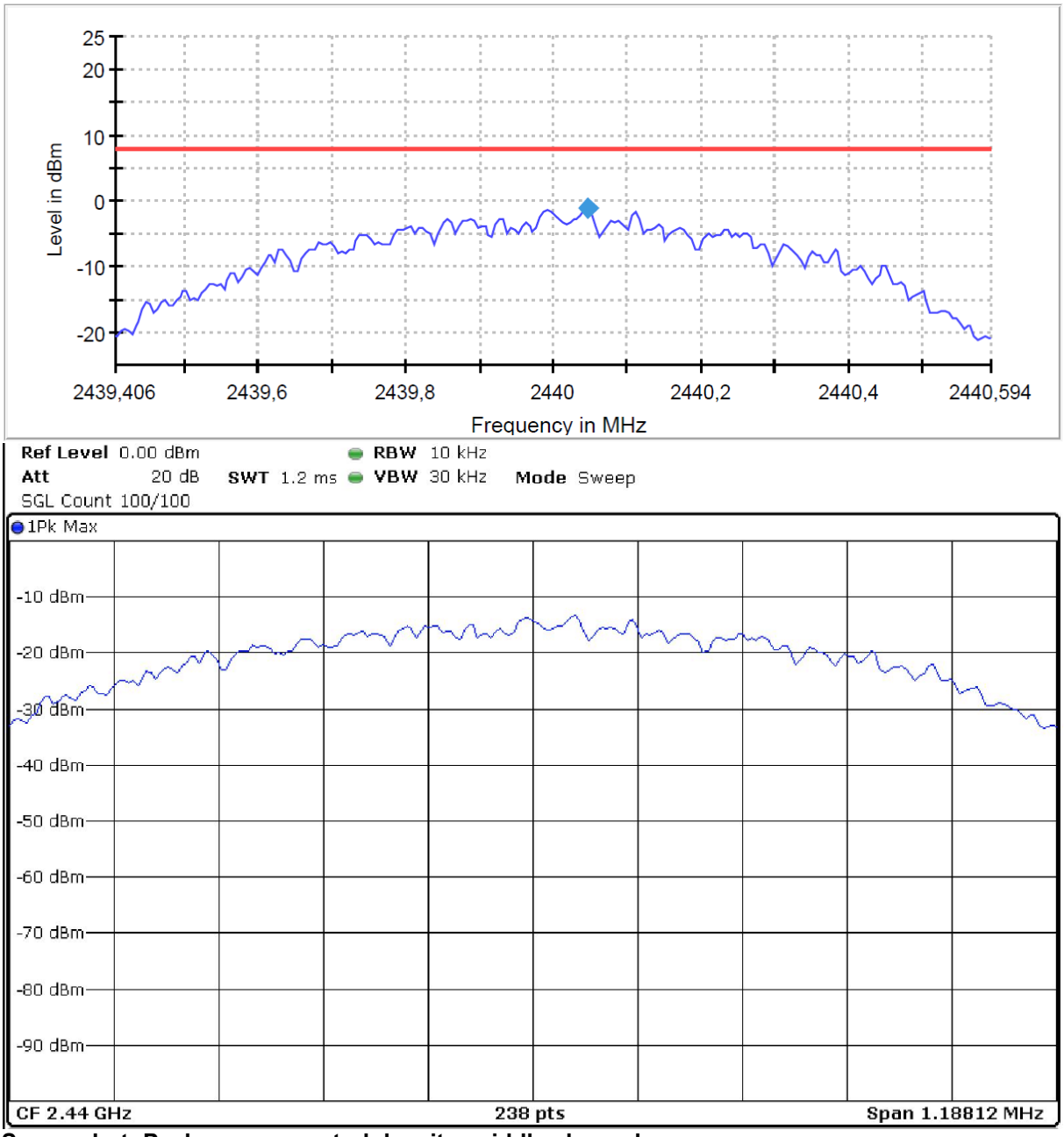
11.3 Requirements

Reference: CFR 47§15.247(3), RSS-247 5.2(2)
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.

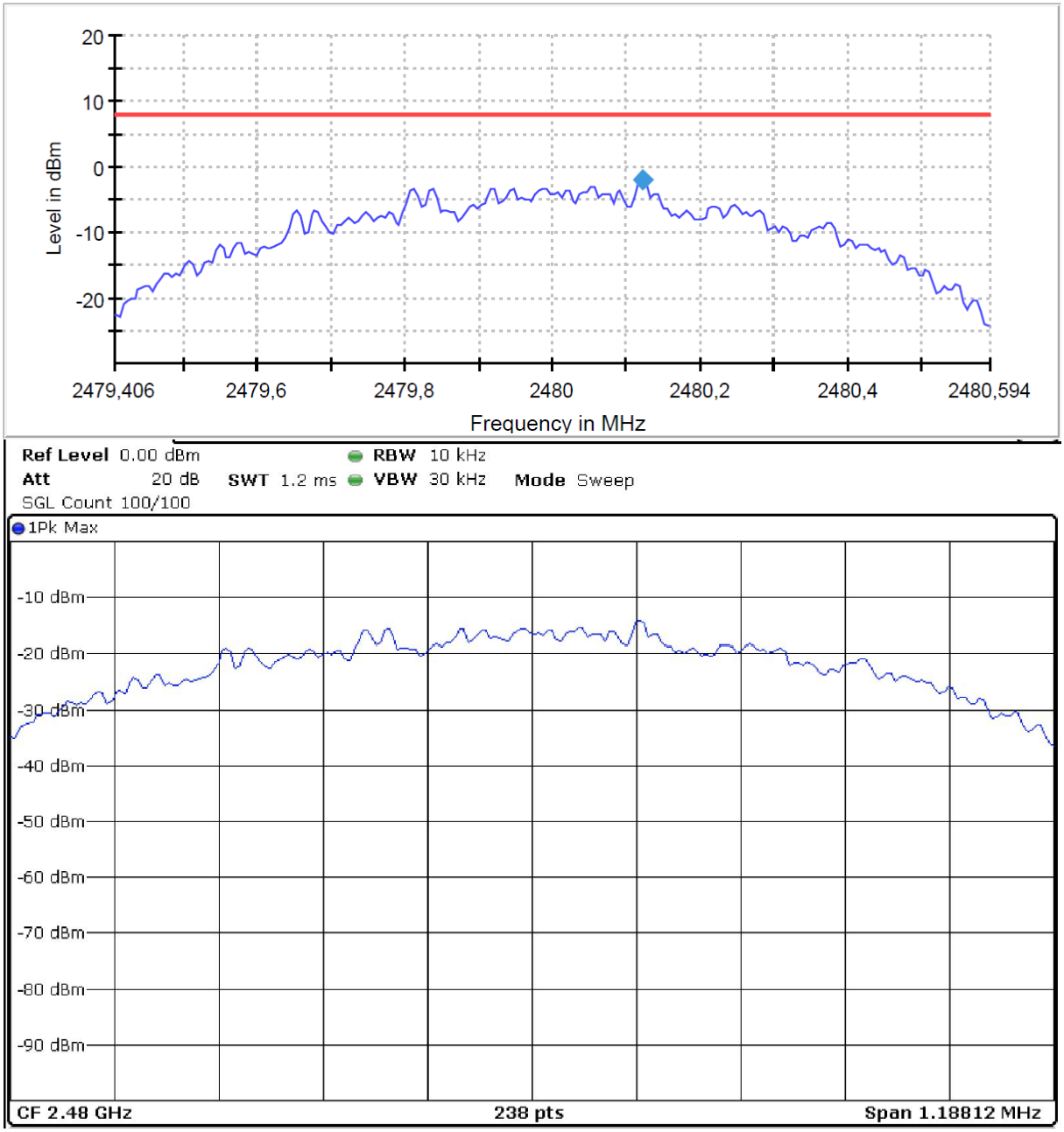
11.4 Test results



Screenshot: Peak power spectral density, low channel



Screenshot: Peak power spectral density, middle channel



Screenshot: Peak power spectral density, high channel

Test result

Channel [MHz]	PSD [dBm/3kHz]
2402	-1.401
2440	-1.009
2480	-1.881

12 TEST EQUIPMENT

Björkhallen

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde & Schwarz	EMC32 - 11.50.00	--	--	--
Receiver	Rohde & Schwarz	ESW44	33950	July 2024	1 year
BiLog antenna	Rohde & Schwarz	HL562	32310	July 2024	2 years
Measurement cable	Rosenberger	UFB311A	39053	August 2024	1 year
Measurement cable	Suhner	Sucoflex 104	39033	October 2023	1 year
Measurement cable	Huber + Suhner	Sucoflex 104 PE	39086	December 2023	1 year

Radiohallen

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde & Schwarz	EMC32 - 11.60.00	--	--	--
Signal analyzer	Rohde & Schwarz	ESU 40	13178	July 2024	1 year
Measurement cable	Huber + Suhner	Sucoflex 102	39135	July 2024	1 year
Measurement cable	Huber + Suhner	Sucoflex 102	39136	July 2024	1 year
Measurement cable	Huber + Suhner	Sucoflex 102	39138	July 2024	1 year
Horn antenna	EMCO	3115	4936	October 2024	1 year
Pre amplifier	Sangus	00101400-23-10P -6-S ; AFS44-12002400-32-10P -44	12335	July 2024	1 year
Horn antenna	EMCO	3160-08	30099	September 2024	2 years
Horn antenna	EMCO	3160-09	34187	October 2020	5 years
2,4 GHz band reject filter:	K&L MICROWAVE INC	WRCGV10-2381-2401-2479-2499-40SS	34448	December 2023	1 year
4 GHz high pass filter	K&L MICROWAVE INC	4410-X4500/18000-0/0	5133	May 2024	1 year
10 dB Attenuator:	Huber+Suhner	5910_N-50-010	33208	December 2023	1 year
20 dB Attenuator:	Huber+Suhner	5920_N-50-010/199_NE	32697	April 2024	1 year
Anechoic Chamber	COMTEST	Fully anechoic room	32600	October 2023	2 years

TS8997

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde & Schwarz	EMC32 - 11.70.00	--	--	--
Signal analyzer	Rohde & Schwarz	FSV 30	32594	July 2024	1 year
Open switch and control platform	Rohde & Schwarz	OSP-B157W8	33942	July 2024	1 year
Measurement cable	Huber + Suhner	LU7-S074-500	39170	April 2024	1 year
Measurement cable	Huber + Suhner	LU7-S083-3000	39185	April 2024	1 year
Measurement cable	Huber + Suhner	Sucoflex 104 PE	39091	December 2023	1 year
Signal generator:	Rohde & Schwarz	SMBV100A	32593	July 2024	1 year
Temperature chamber:	Vötsch	VC4018	12282	N/A	N/A
Communication tester	Rohde & Scwharz	CMW500	34164	N/A	N/A
Combiner 4-port	ANZAC	DS-4-4	3551	November 2023	3 years

13 MEASUREMENT UNCERTAINTY

Continuous conducted disturbances with AMN in the frequency range 9 kHz to 30 MHz ± 3.7 dB

Measurement uncertainty for radiated disturbance

Uncertainty for the frequency range 30 to 1000 MHz at 3 m	± 5.1 dB
Uncertainty for the frequency range 30 to 1000 MHz at 10 m	± 5.0 dB
Uncertainty for the frequency range 1.0 to 18 GHz at 3 m	± 4.7 dB
Uncertainty for the frequency range 18 to 26 GHz at 3 m	± 4.8 dB
Uncertainty for the frequency range 26 to 40 GHz at 3 m	± 5.7 dB

Measurement uncertainty is calculated in accordance with CISPR 16-4-2:2011.
The measurement uncertainty is given with a confidence of 95 %.

14 TEST SET UP AND EUT PHOTOS

EUT photos are in separate document 2401854STO-104.
Test set up photos are in separate document 2401854STO-105.