

RADIO TEST REPORT

No. 1610688STO-002, Ed. 1

RF Performance

EQUIPMENT UNDER TEST

Equipment: Wireless dimmer with ZigBee
Type/Model: ICTC-G-1
Manufacturer: IKEA of Sweden AB
Tested by request of: IKEA of Sweden 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 (2015): Subpart C: Intentional radiators. Section 15.247

47 CFR Part 15 (2015): Subpart B: Unintentional radiators

RSS-GEN Issue 4 (2014): General requirements of compliance of radio apparatus (2014)

RSS-247 Issue 1 (2015): Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices

For details, see clause 2 – 4.

Date of issue: 2016-07-04

Tested by:


Robert Hietala

Approved by:


Matti Virkki

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Revision History

Edition	Date	Description	Changes
1	2016-07-04	First release	

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1 CLIENT INFORMATION

The EUT has been tested by request of

Company: IKEA of Sweden AB
Box 702
343 81 Älmhult
Sweden

Name of contact: Stefan Backlund
Phone +46 476 81 000

2 EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment: Wireless dimmer with ZigBee
Type/Model: ICTC-G-1
Brand name: IKEA
Serial number: --
Manufacturer: IKEA of Sweden

Transmitter frequency range: 2405 – 2480 MHz
Receiver frequency range: 2405 – 2480 MHz
Frequency agile or hopping: Yes No
Antenna: Internal antenna External antenna
Antenna connector: None, internal antenna Yes
Antenna gain: -0.5 dBi
Rating RF output power: 3.3 dBm (measured conducted)
Type of modulation: OQPSK
Temperature range: Category I (General): -20°C to +55°C
 Category II (Portable equipment): -10°C to +55°C
 Category III (Equipment for normal indoor use): +5°C to +35°C
 Other: 0°C to +45°C
Transmitter standby mode supported: Yes No

2.2 Additional information about the EUT

The EUT consists of the following units:

Unit	Type	Serial number	Comment
Unit 1	Wireless Dimmer	--	With internal antenna
Unit 2	Wireless Dimmer	--	With SMA-connector

During the tests the EUT supported following software:

Software	Version	Comment
Trådfri Wireless Dimmer	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.
Laptop computer	ThinkPad T440s	Lenovo	--

2.4 Test signals and operation modes

Continuous signal with modulation and a duty cycle of 100 %.

3 TEST SPECIFICATIONS

3.1 Standards

Requirements:

47 CFR Part 15 (2015): Subpart C: Intentional radiators. Section 15.247

47 CFR Part 15 (2015): Subpart B: Unintentional radiators

RSS-GEN Issue 4 (2014): General requirements of compliance of radio apparatus (2014).

RSS-247 Issue 1 (2015): Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices

Test methods:

ANSI C63.10-2013: 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 Test site

Measurements were performed at:

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

Intertek Semko AB is a FCC listed test site with site registration number 90913
Intertek Semko AB is a FCC accredited conformity assessment body with designation number SE0002
Intertek Semko AB is an Industry Canada listed test facility with IC assigned code 2042G

Measurement chambers

Measurement Chamber	Type of chamber	IC Site filing #
STORA HALLEN	Semi-anechoic 10 m and 3 m	2042G-2

4 TEST SUMMARY

The results in this report apply only to sample tested:

Requirement	Description	Result
FCC §15.203 RSS-GEN 8.3	Antenna requirement The EUT has integrated non detachable antenna which can't be remove without breaking the EUT.	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 powered.	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 10 dB. See clause 6.4 – 6.5.	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 10 dB. See clause 6.6 – 6.7.	PASS
FCC §15.247(a)(2) RSS-GEN 6.6 RSS-247 5.2(1)	Occupied bandwidth The EUT complies with the limits. See clause 8.4.	PASS
FCC §15.247(b) RSS-247 5.4(4)	Conducted output power The EUT complies with the limits. See clause 7.4.	PASS
FCC §15.247(e) RSS-247 5.2(2)	Peak power spectral density The EUT complies with the limits. See clause 10.4.	PASS
FCC §15.247(e) RSS-247 5.5	Band edge The EUT complies with the limits. See clause 5.4.	PASS

5 BAND EDGE

Date of test:	2016-06-30	Test location:	Wireless Center
EUT Serial:	--	Ambient temp:	22 °C
Tested by:	Robert Hietala	Relative humidity:	39 %
Test result:	Pass	Margin:	> 10 dB

5.1 Test set-up and test procedure.

The test method is in accordance with ANSI C63.10-2013 section 6.10.4.

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

5.2 Test conditions

Detector: Peak, max hold
 RBW: 100 kHz
 VBW: 3 x RBW
 Span: 30 MHz

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

5.3 Requirement

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

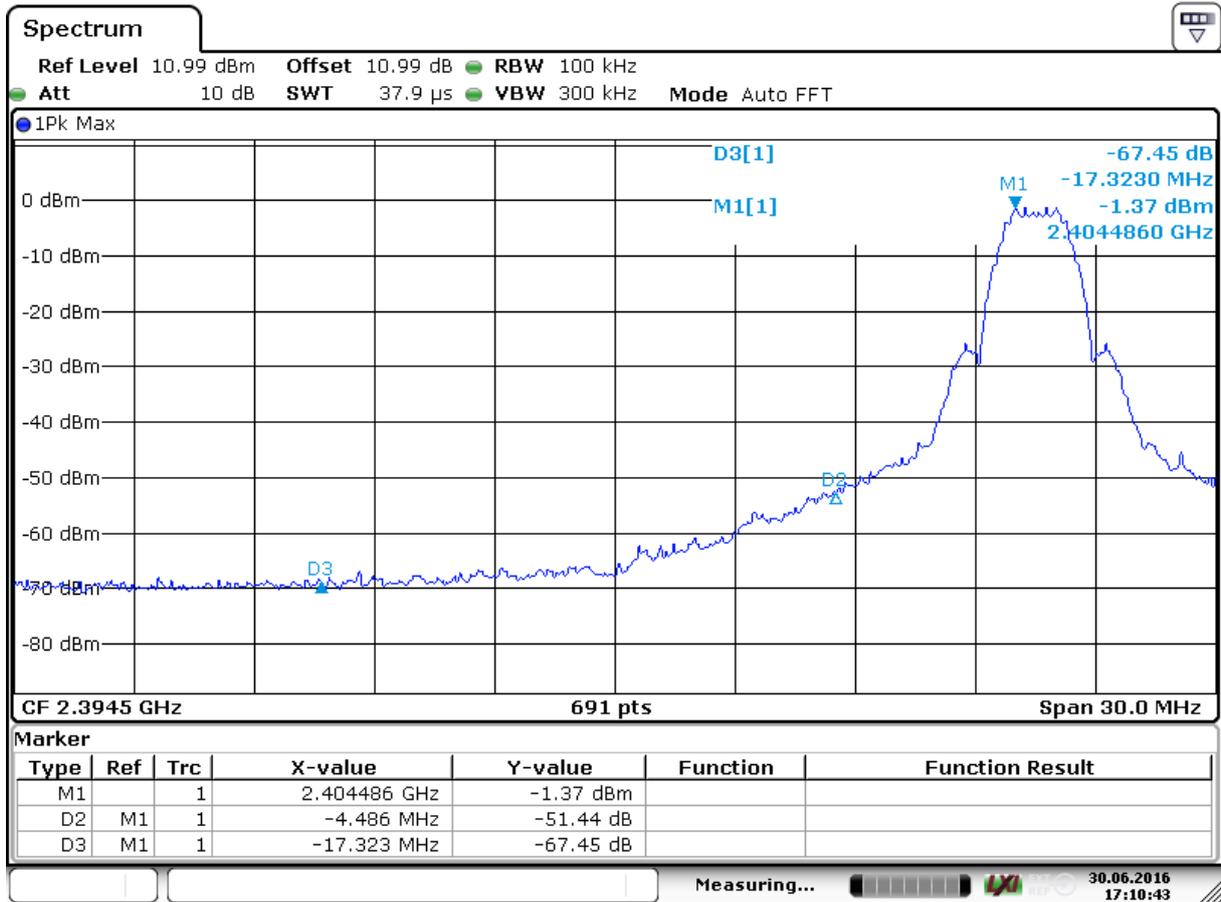
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits.

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

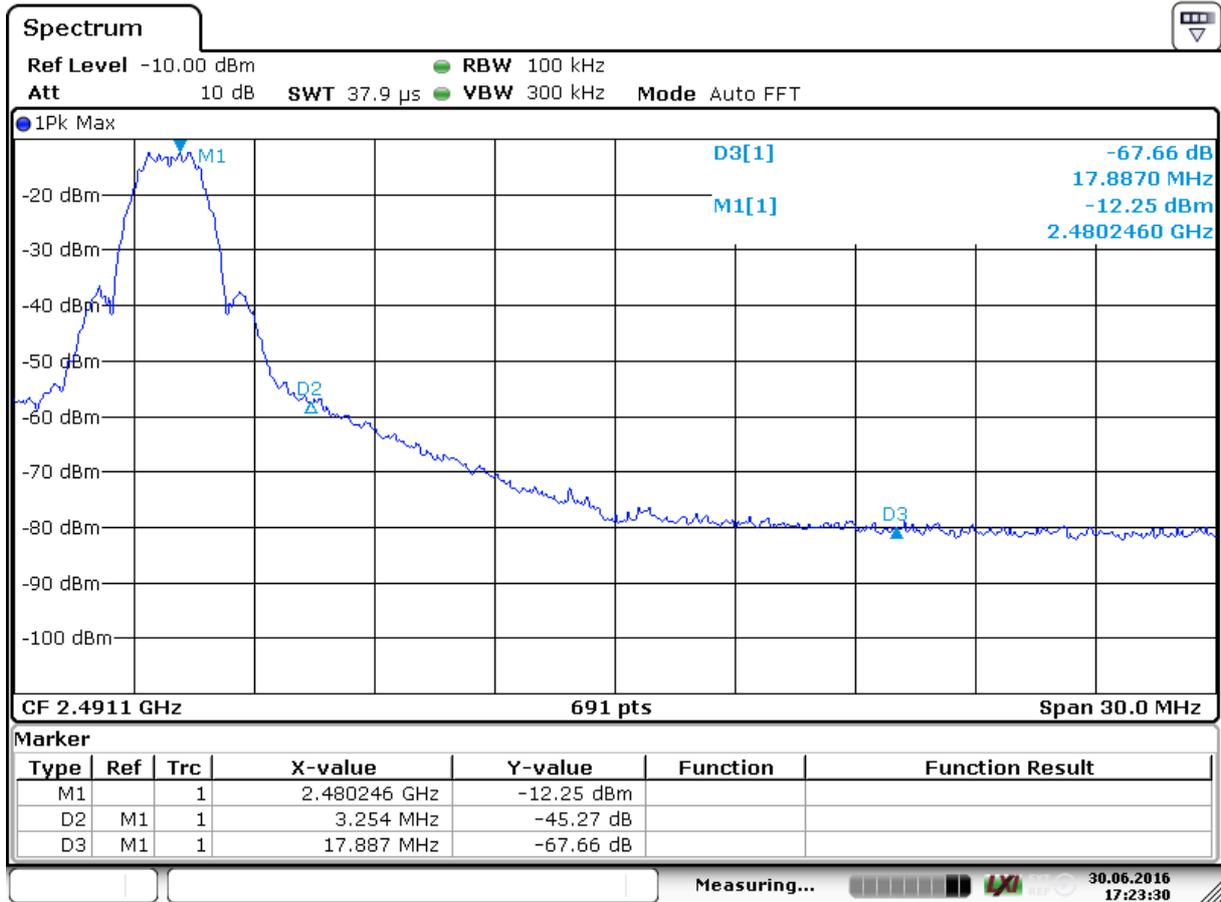
Frequency range [MHz]	Field strength at 3 m (dB μ V/m)	Field strength at 10 m (dB μ V/m)	Detector (dB μ V/m)
30 – 88	40.0	29.5	Quasi Peak
88 – 216	43.5	33.0	Quasi Peak
216 – 960	46.0	35.5	Quasi Peak
960 – 1000	54.0	43.5	Quasi Peak
Above 1000	54.0 / 74.0	43.5 / 63.5	Average / Peak

5.4 Test results



Date: 30 JUN 2016 17:10:43

Lower band edge



Date: 30 JUN 2016 17:23:30

Upper band edge

Test results

Band edge	Delta [dBc]	Limit [dBc]	Margin [dB]
Lower	51.4	20.0	31.4
Upper	45.3	20.0	25.3

6 RADIATED RF EMISSION IN THE FREQUENCY-RANGE 30 MHZ TO 26.5 GHZ

Date of test:	2016-05-20	Test location:	Stora Hallen / Wireless Center
EUT Serial:	--	Ambient temp:	22 °C
Tested by:	Robert Hietala	Relative humidity:	39 %
Test result:	Pass	Margin:	> 10 dB

6.1 Test set-up and test procedure.

The test method is in accordance with ANSI C63.10-2013.
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 two orthogonal EUT orientations.

6.2 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

EUT height above ground plane: 1.5 m

Measuring distance: 3 m

Measuring angle: 0 – 359°

Antenna

Height above ground plane: 1 – 4 m

Polarisation: Vertical and Horizontal

Type: Horn

Antenna tilt: Activated

6.3 Requirements

Within restricted bands and receive mode:
Reference: CFR 47 §15.209, §15.109, 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

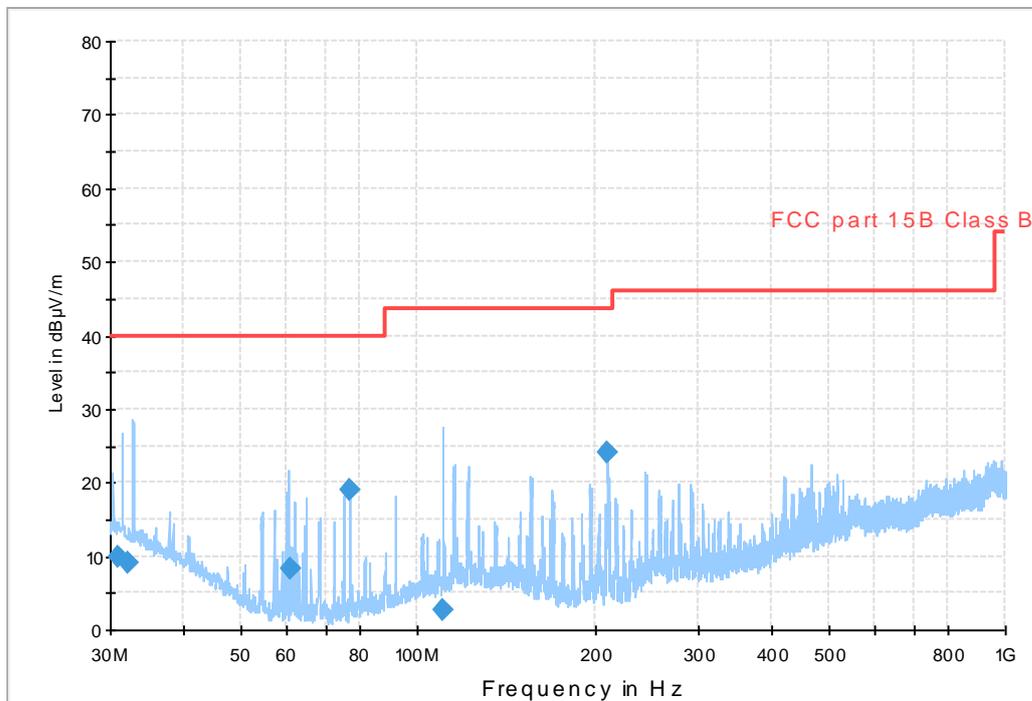
The values for 10 m measuring distance are calculated by subtracting 10.5 dB from the 3 m limit. (i.e. an extrapolation factor of 20 dB/decade according to CFR 47 §15.31(f)(1))

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.

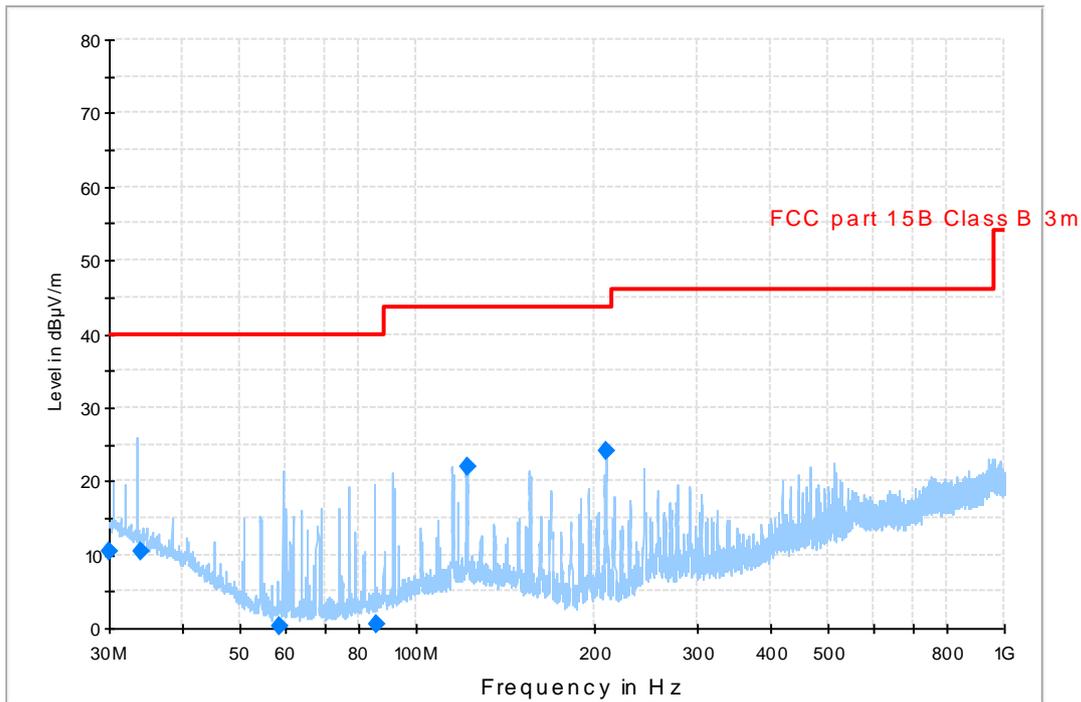
6.4 Test results 30 MHz – 1000 MHz, TX

Radio FCC 30 - 1000 MHz FCC class B 10m continuous TT rotation



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

Radio FCC 30 - 1000 MHz FCC class B 10m continuous TT rotation



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

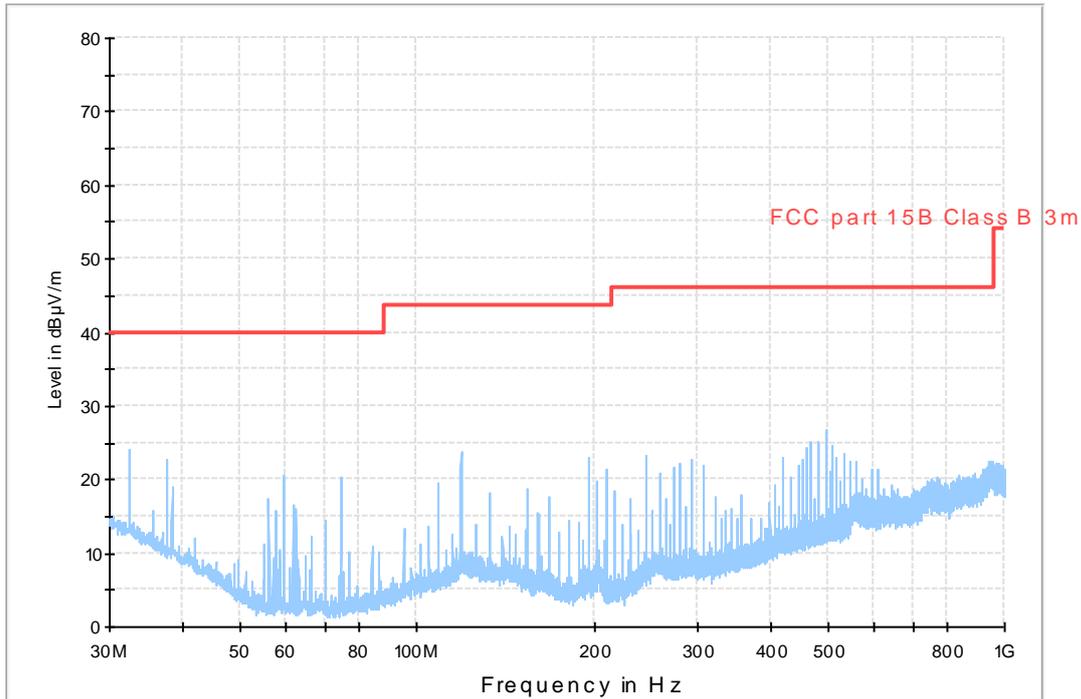
Measurement results, Quasi Peak

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Position	Margin [dB]
30.080	10.0	29.5	V	Y	19.5
30.887	9.9	29.5	V	X	19.6
32.205	9.0	29.5	V	X	20.5
33.875	10.0	29.5	V	Y	19.5
58.589	-0.2	29.5	V	Y	29.7
61.001	8.3	29.5	V	X	21.2
76.794	18.9	29.5	V	X	10.6
85.376	-0.1	29.5	V	Y	29.6
110.682	2.5	33.0	V	X	30.5
122.045	21.0	33.0	H	Y	12.0
210.121	22.9	33.0	H	Y	10.1
210.523	24.0	33.0	H	X	9.0

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

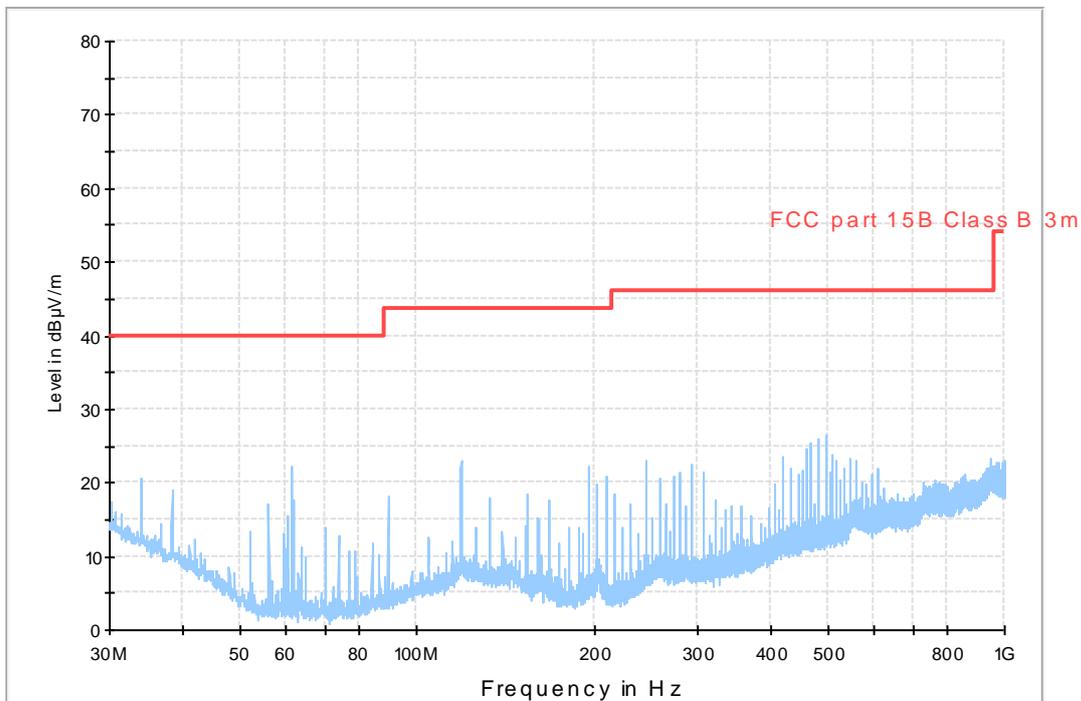
6.5 Test results 30 MHz – 1000 MHz, RX

Radio FCC 30 - 1000 MHz FCC class B 10m continuous TT rotation



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

Radio FCC 30 - 1000 MHz FCC class B 10m continuous TT rotation



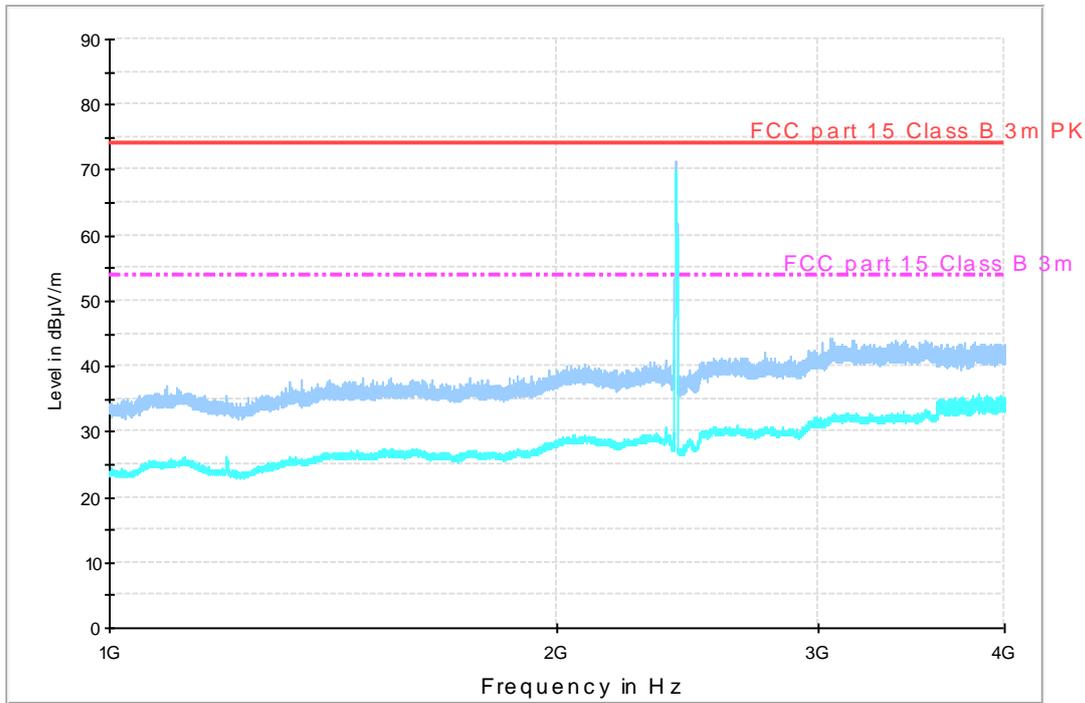
Diagram, Peak overview sweep, 30 – 1000 MHz at 3 m distance. RX low channel, EUT orientation Y.

Measurement results, Quasi Peak

No emissions are found above noise floor or closer than 20 dB from limit.

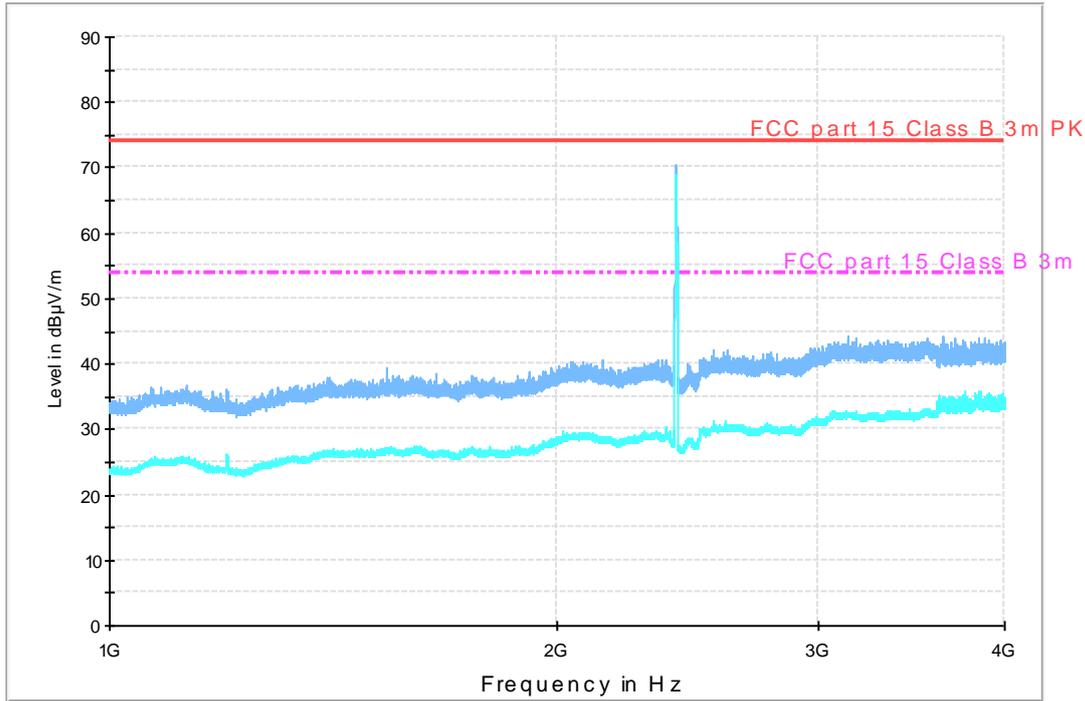
6.6 Test results 1 GHz –26.5 GHz, TX

FCC 1 G - 4 G class B 3m ESU40 Continuous TT rotation



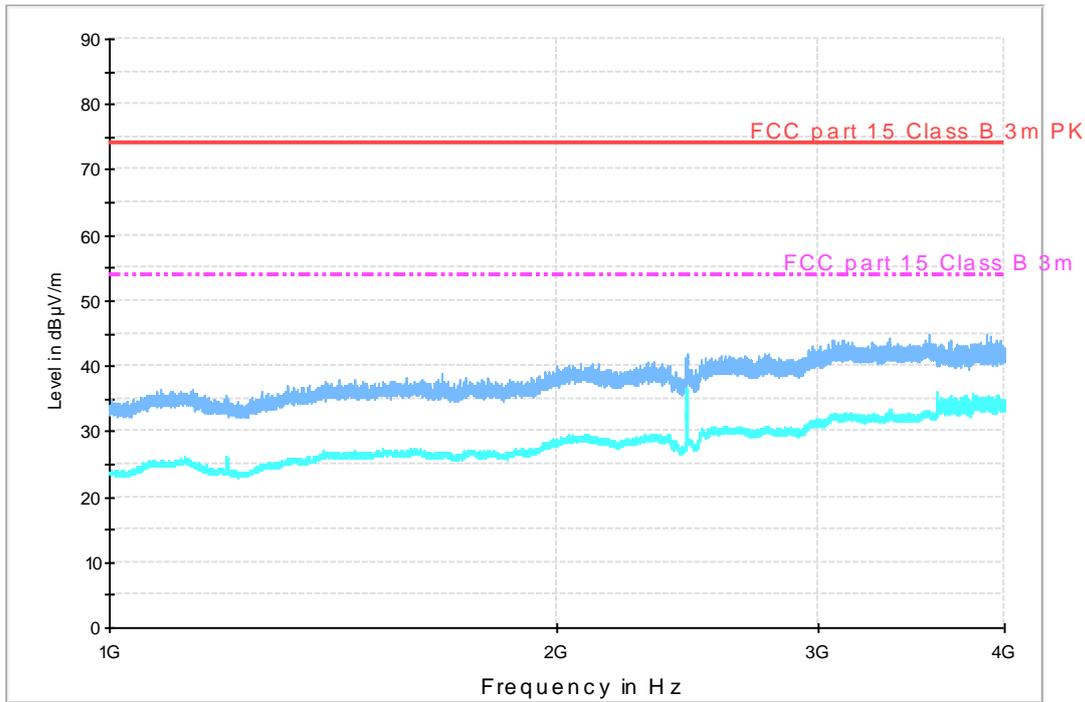
Diagram, Peak overview sweep, 1– 4 GHz at 3 m distance. TX low channel, EUT orientation X. Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0.

FCC 1 G - 4 G class B 3m ESU40 Continuous TT rotation



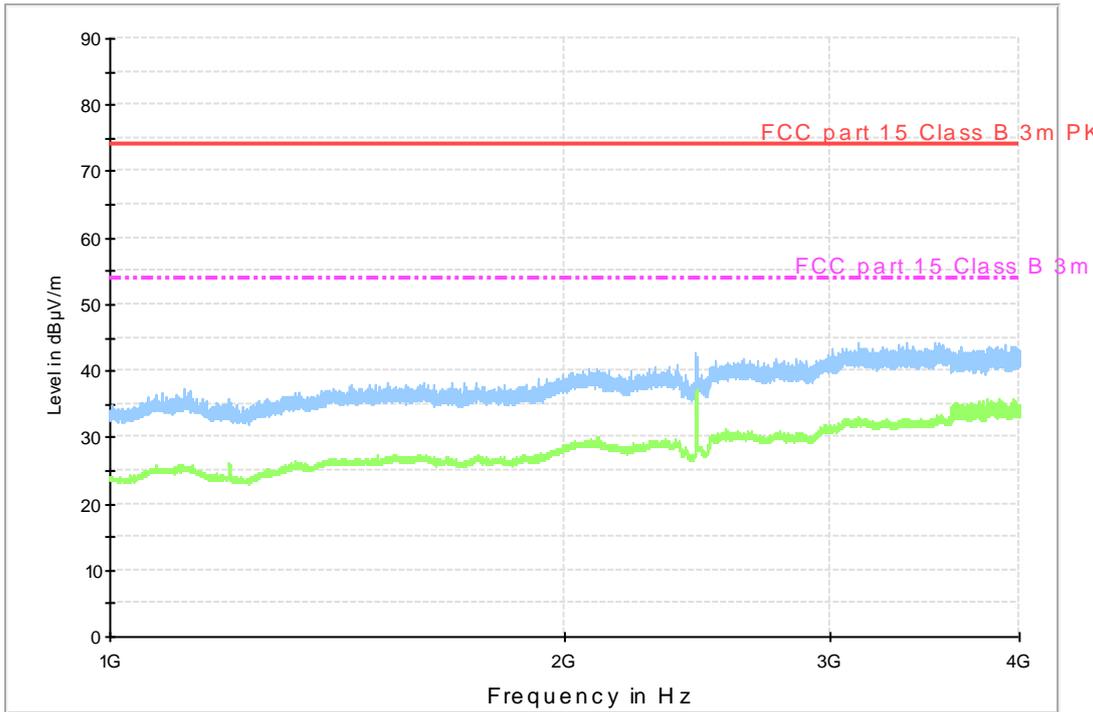
Diagram, Peak overview sweep, 1– 4 GHz at 3 m distance. TX low channel, EUT orientation Y. Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0.

FCC 1 G - 4 G class B 3m ESU40 Continuous TT rotation



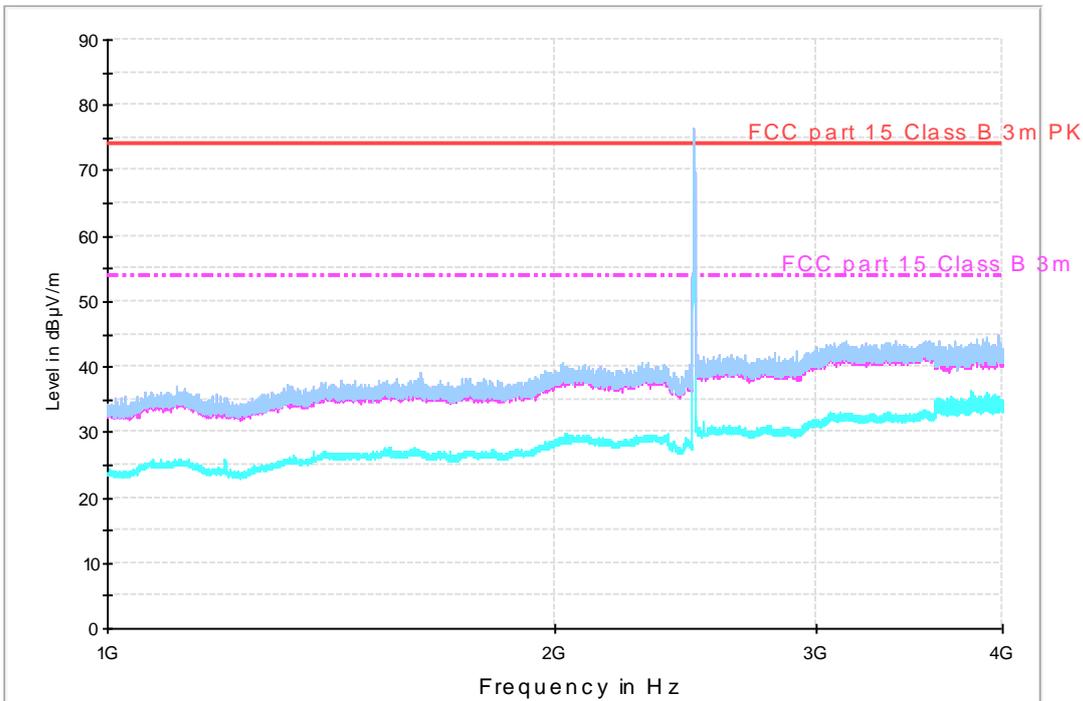
Diagram, Peak overview sweep, 1– 4 GHz at 3 m distance. TX mid channel, EUT orientation X. Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0.

FCC 1 G - 4 G class B 3m ESU40 Continuous TT rotation



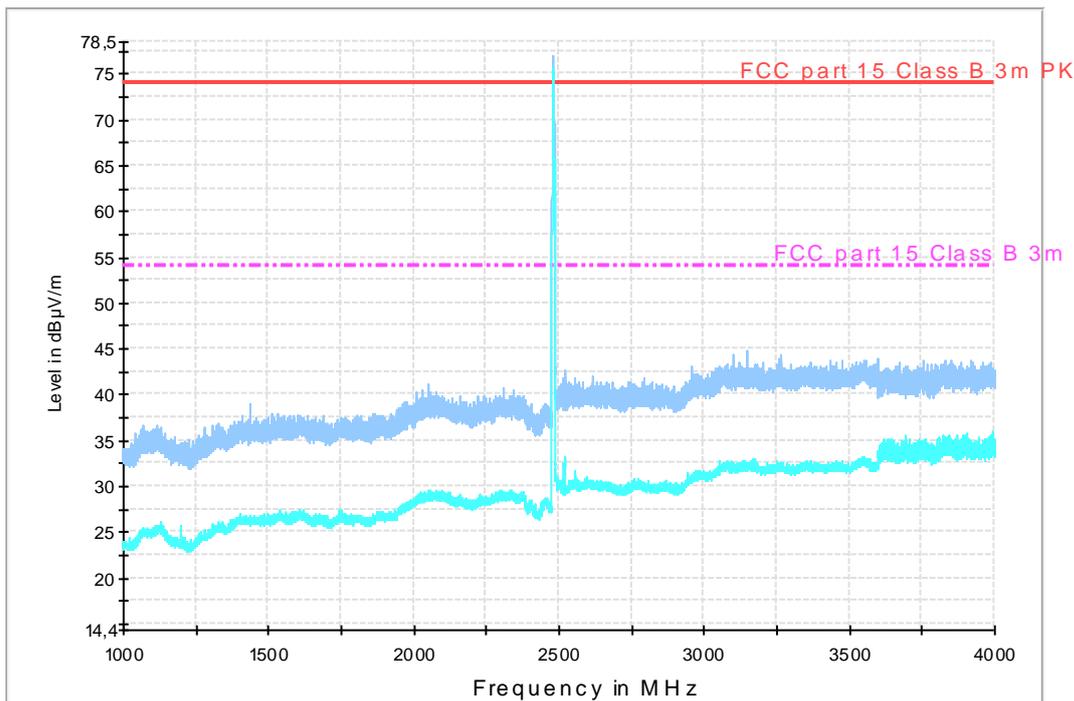
Diagram, Peak overview sweep, 1– 4 GHz at 3 m distance. TX mid channel, EUT orientation Y. Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0.

FCC 1 G - 4 G class B 3m ESU40 Continuous TT rotation



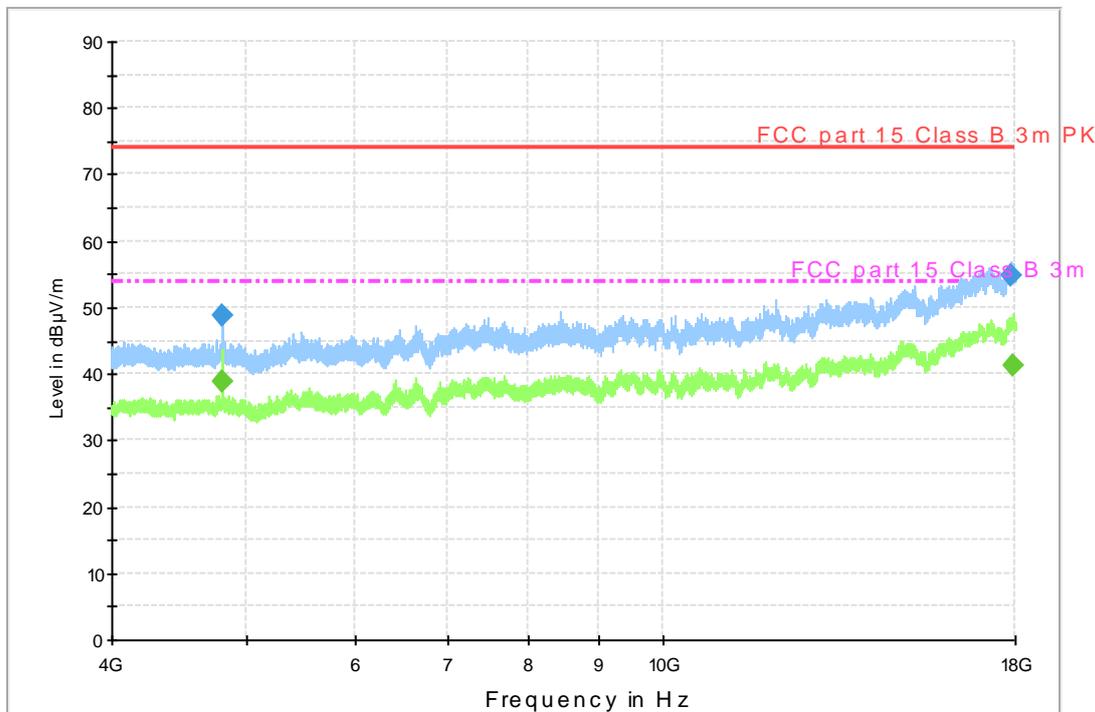
Diagram, Peak overview sweep, 1– 4 GHz at 3 m distance. TX highd channel, EUT orientation X. Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0.

FCC 1 G - 4 G class B 3m ESU40 Continuous TT rotation



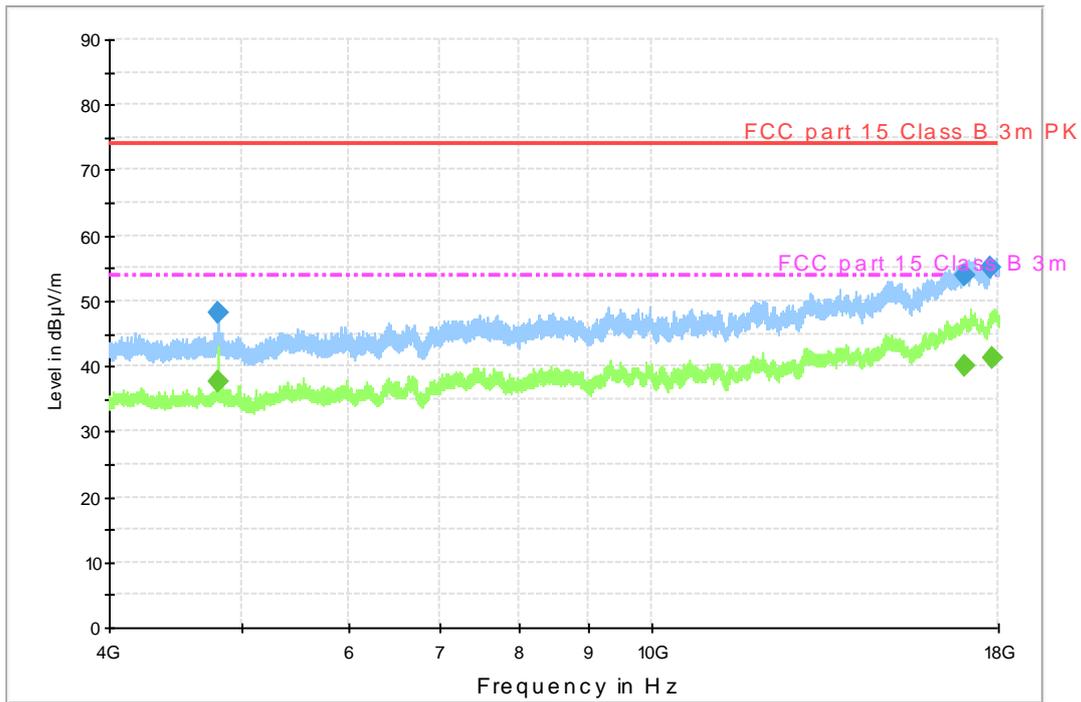
Diagram, Peak overview sweep, 1– 4 GHz at 3 m distance. TX high channel, EUT orientation Y. Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0.

FCC 4 G - 18 G class B 3m ESU40 Continuous TT rotation



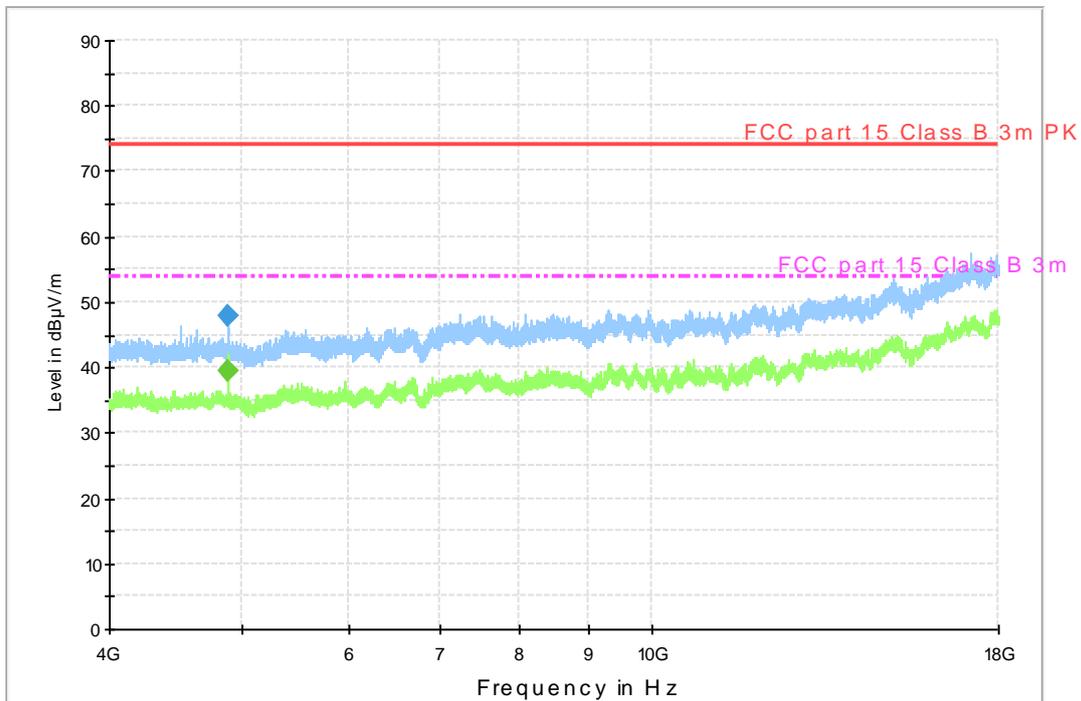
Diagram, Peak overview sweep, 4 – 18 GHz at 3 m distance. TX low channel, EUT orientation X.

FCC 4 G - 18 G class B 3m ESU40 Continuous TT rotation



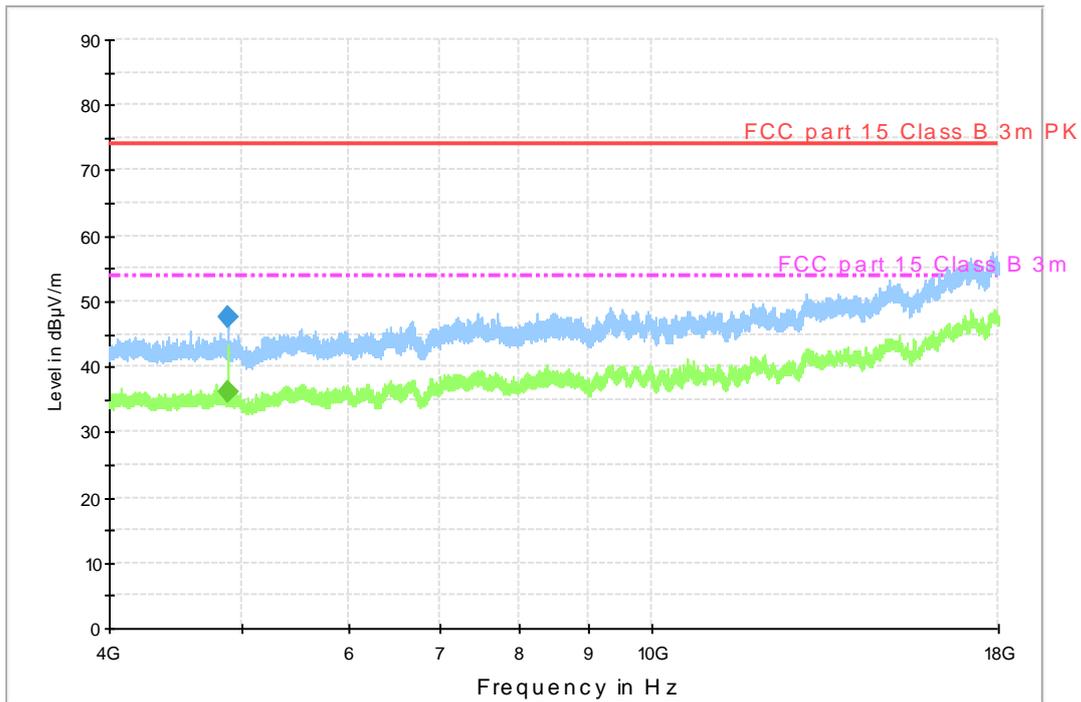
Diagram, Peak overview sweep, 4 – 18 GHz at 3 m distance. TX low channel, EUT orientation Y.

FCC 4 G - 18 G class B 3m ESU40 Continuous TT rotation



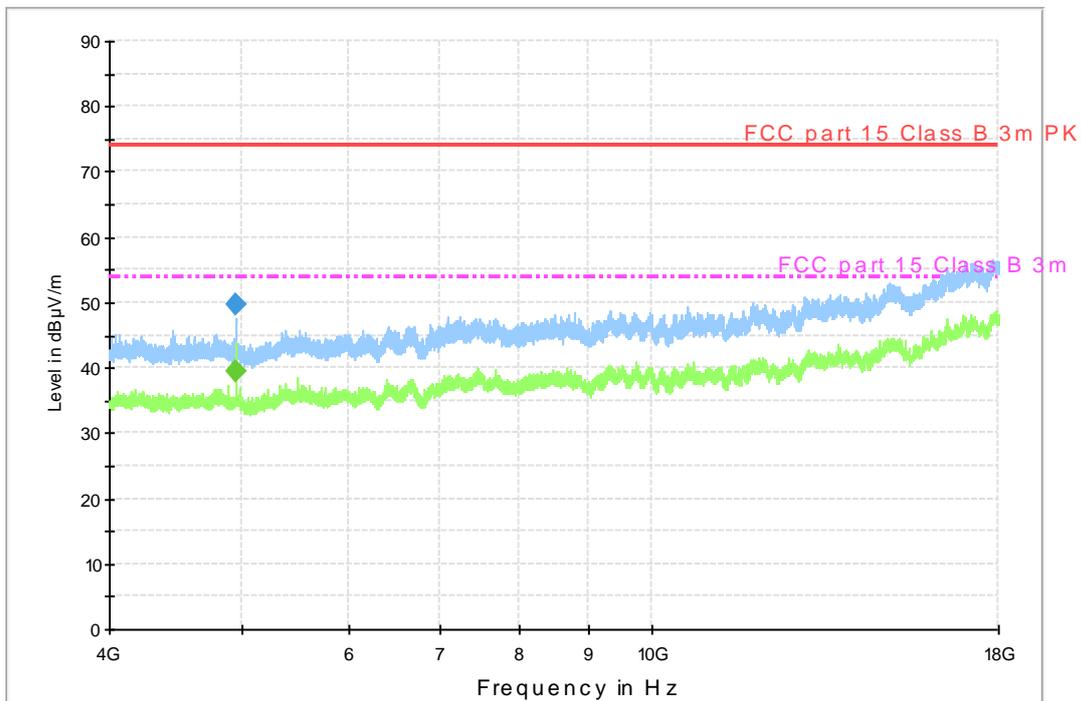
Diagram, Peak overview sweep, 4 – 18 GHz at 3 m distance. TX mid channel, EUT orientation X.

FCC 4 G - 18 G class B 3m ESU40 Continuous TT rotation



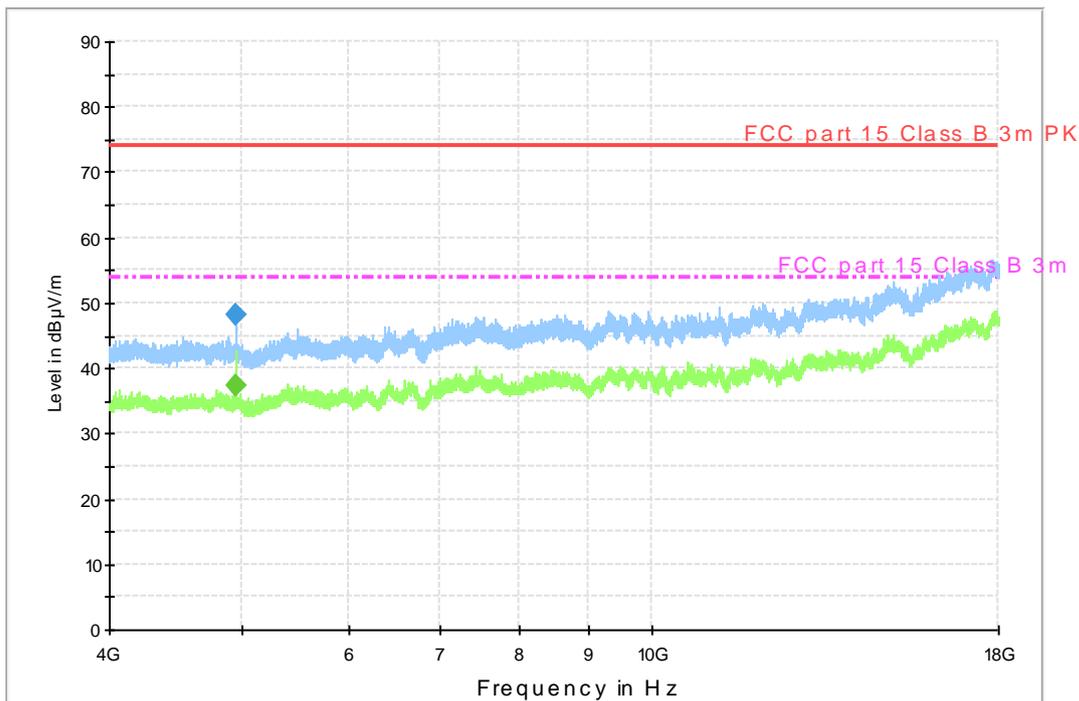
Diagram, Peak overview sweep, 4 – 18 GHz at 3 m distance. TX mid channel, EUT orientation Y.

FCC 4 G - 18 G class B 3m ESU40 Continuous TT rotation



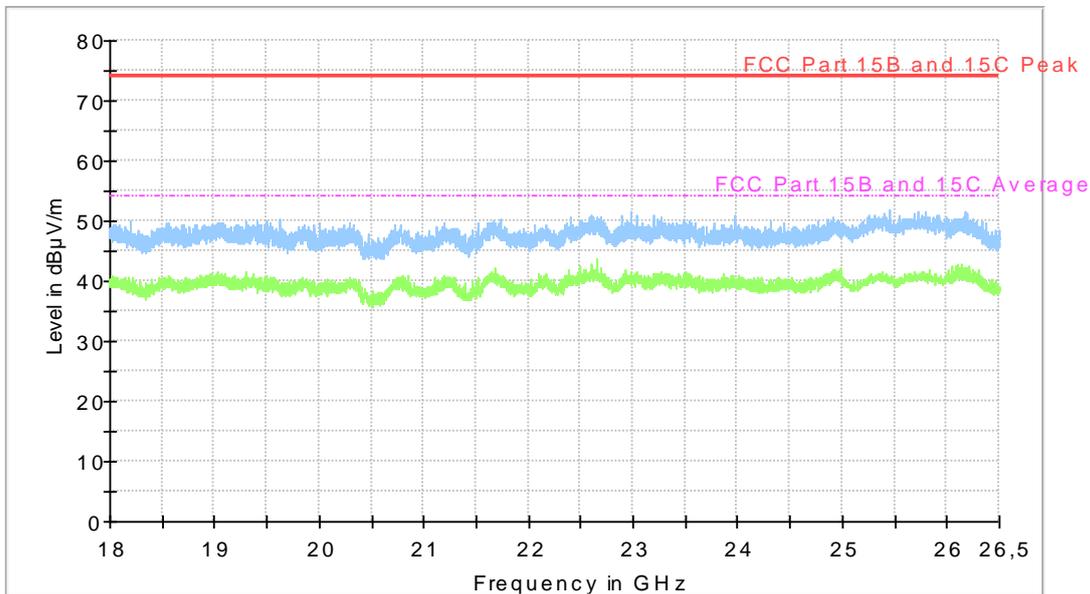
Diagram, Peak overview sweep, 4 – 18 GHz at 3 m distance. TX high channel, EUT orientation X.

FCC 4 G - 18 G class B 3m ESU40 Continuous TT rotation



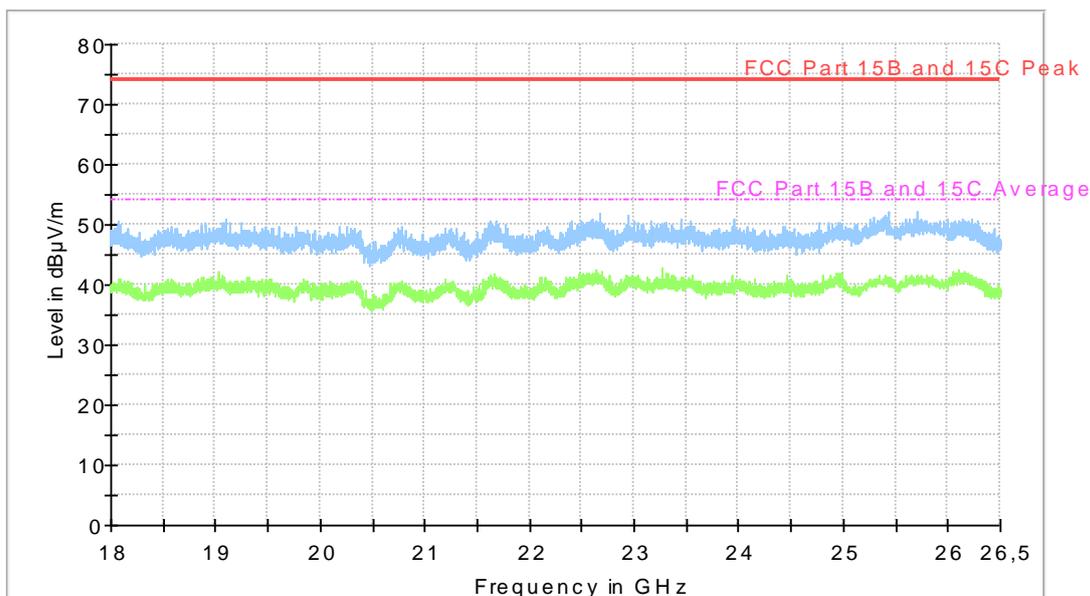
Diagram, Peak overview sweep, 4 – 18 GHz at 3 m distance. TX high channel, EUT orientation Y.

Full Spectrum



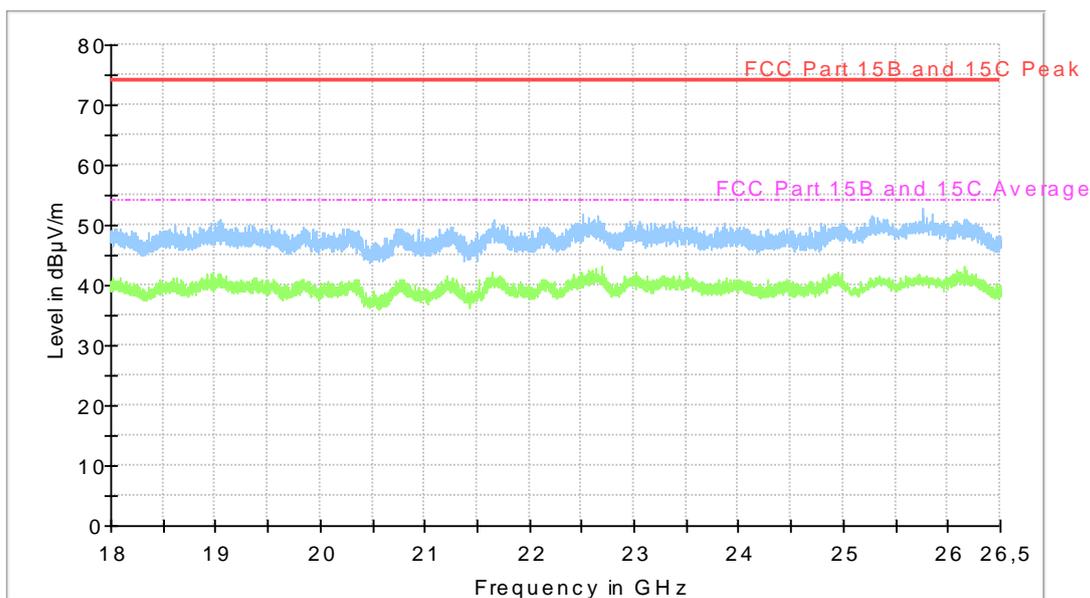
Diagram, Peak overview sweep, 18 – 26.5 GHz at 3 m distance. TX low channel, EUT orientation X.

Full Spectrum



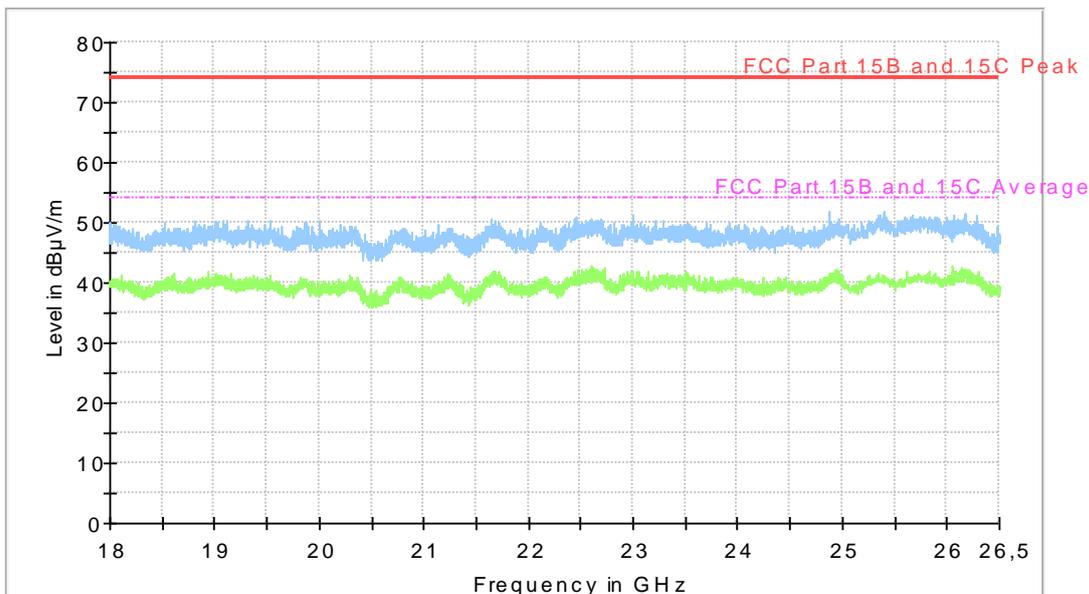
Diagram, Peak overview sweep, 18 – 26.5 GHz at 3 m distance. TX low channel, EUT orientation Y.

Full Spectrum



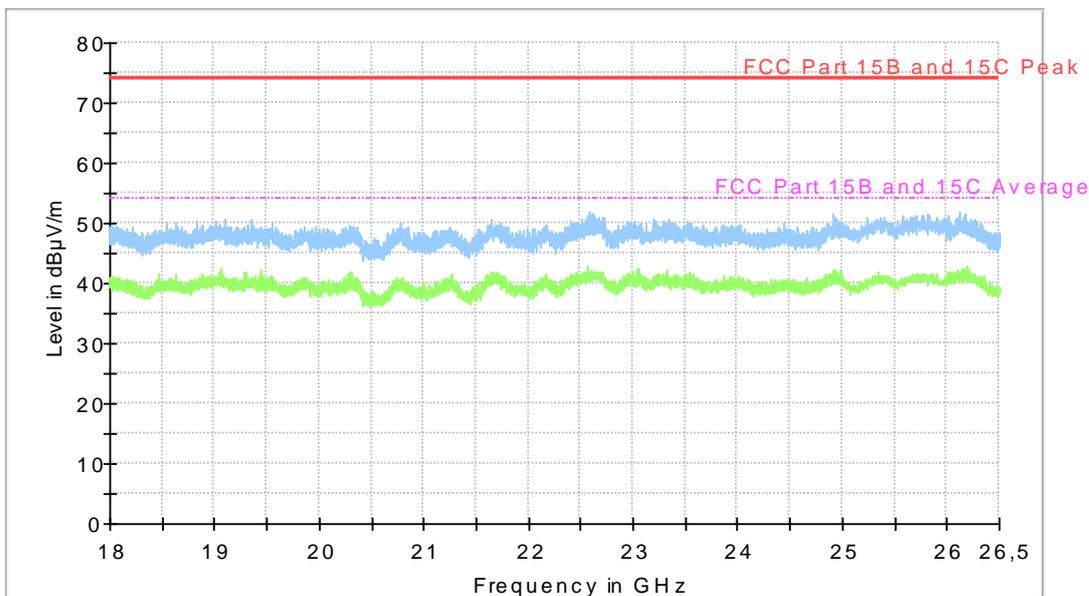
Diagram, Peak overview sweep, 18 – 26.5 GHz at 3 m distance. TX mid channel, EUT orientation X.

Full Spectrum



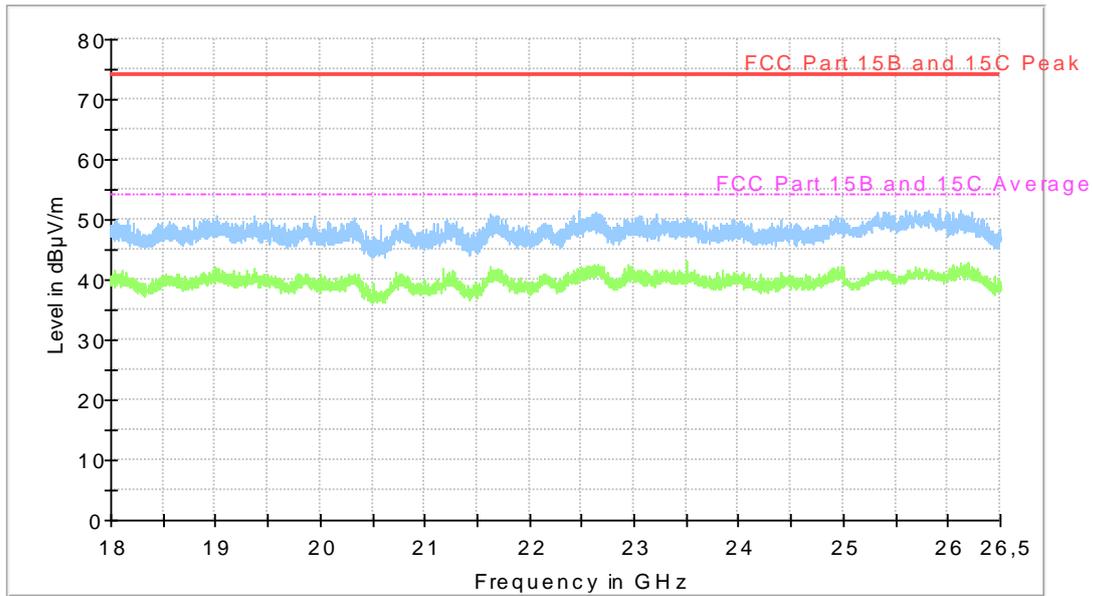
Diagram, Peak overview sweep, 18 – 26.5 GHz at 3 m distance. TX mid channel, EUT orientation Y.

Full Spectrum



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

Full Spectrum



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

Measurement results, Peak, TX low channel

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	EUT orientation	Polarization H/V	Margin [dB]
4811.1	48.7	74.0	X	H	25.3
4811.1	48.2	74.0	Y	V	25.8
17006.9	54.0	74.0	Y	H	20.0
17784.9	55.0	74.0	Y	H	19.0
17906.2	54.7	74.0	X	H	19.3

Measurement results, Average, TX low channel

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	EUT orientation	Polarization H/V	Margin [dB]
4810.6	38.9	54.0	X	H	15.1
4810.6	37.5	54.0	Y	V	16.5
16999.9	39.9	54.0	Y	V	14.1
17827.3	41.1	54.0	Y	V	12.9
17951.5	41.2	54.0	X	H	12.8

Measurement results, Peak, TX middle channel

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	EUT orientation	Polarization H/V	Margin [dB]
4889.9	47.7	74.0	X	H	26.3
4891.3	47.5	74.0	Y	V	26.5

Measurement results, Average, TX middle channel

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	EUT orientation	Polarization H/V	Margin [dB]
4890.4	36.2	54.0	Y	V	17.8
4890.9	39.6	54.0	X	H	14.4

Measurement results, Peak, TX high channel

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	EUT orientation	Polarization H/V	Margin [dB]
2483.5	43.4	74.0	X	H	30.6
2483.5	45.2	74.0	Y	V	28.8
4960.9	48.0	74.0	Y	H	26.0
4961.3	49.7	74.0	X	H	24.3

Measurement results, Average, TX high channel

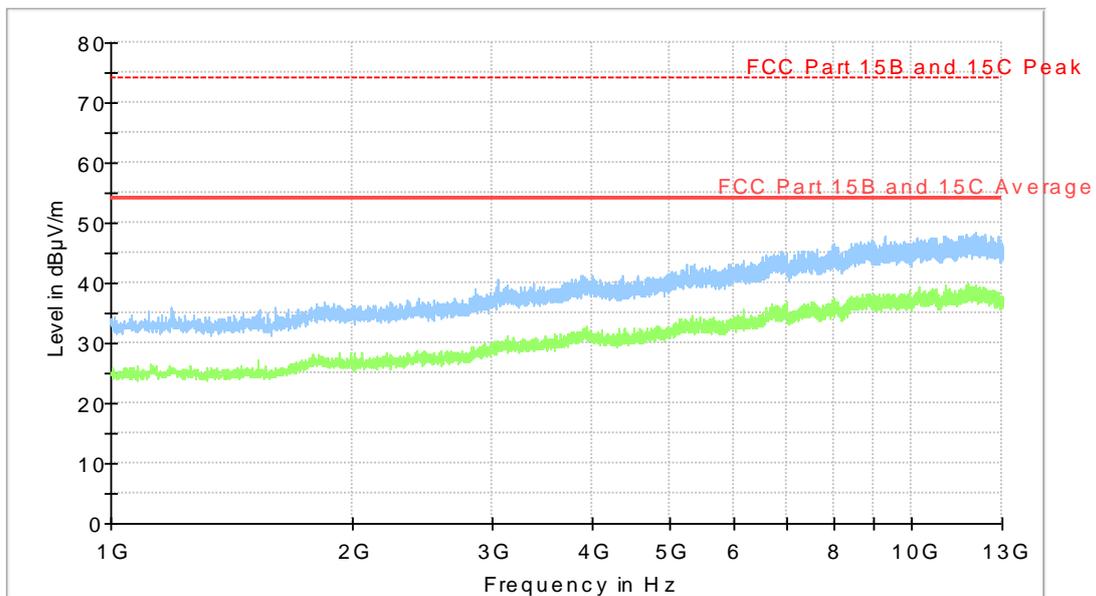
Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	EUT orientation	Polarization H/V	Margin [dB]
2483.5	31.8	54.0	X	H	22.2
2483.5	33.1	54.0	Y	V	20.9
4930.4	39.6	54.0	X	H	14.1
4960.9	37.5	54.0	Y	V	16.5

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]

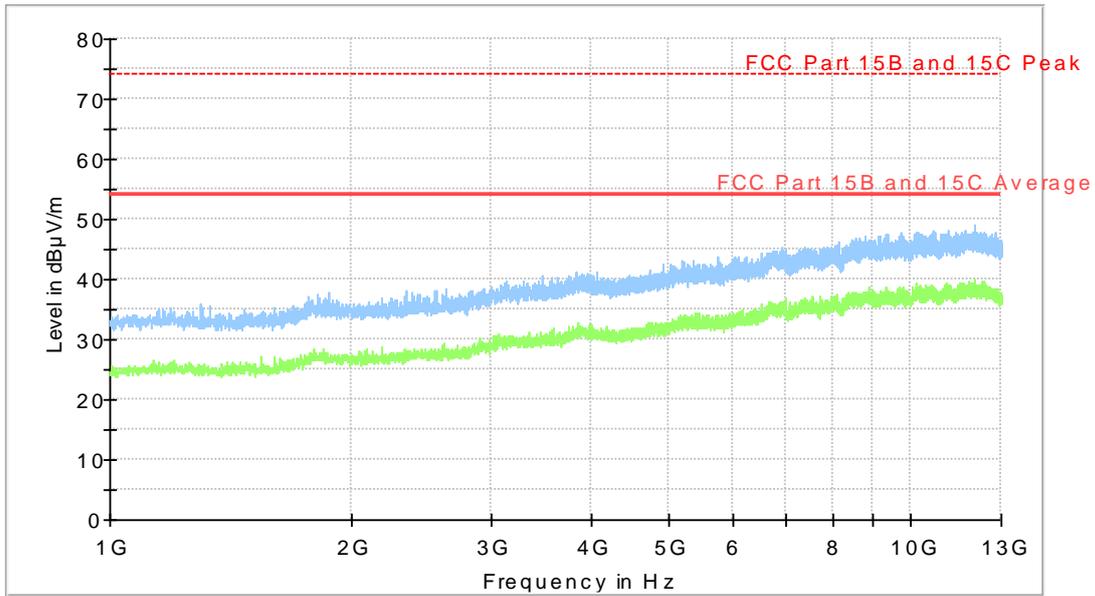
6.7 Test results 1 GHz – 13 GHz, RX

Full Spectrum



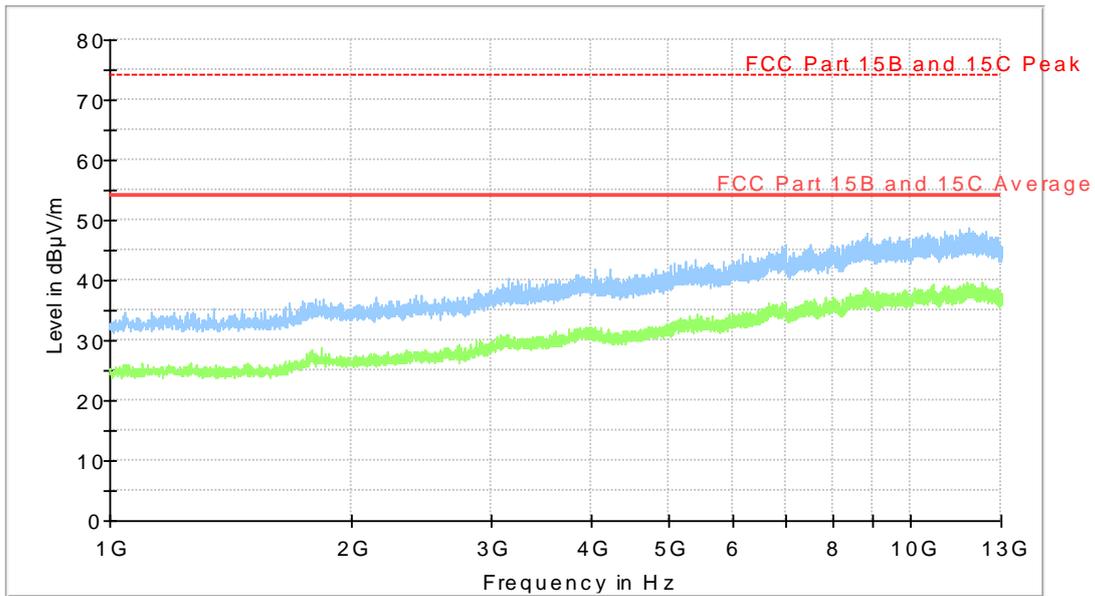
Diagram, Peak overview sweep, 1– 13 GHz at 3 m distance. RX low channel, EUT orientation X.

Full Spectrum



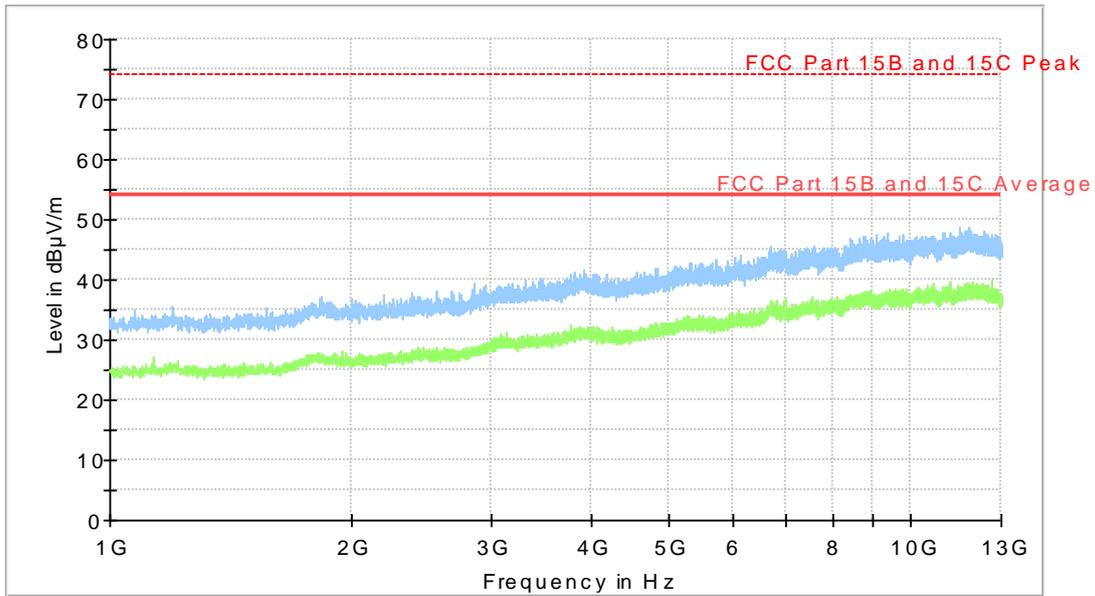
Diagram, Peak overview sweep, 1– 13 GHz at 3 m distance. RX low channel, EUT orientation Y.

Full Spectrum



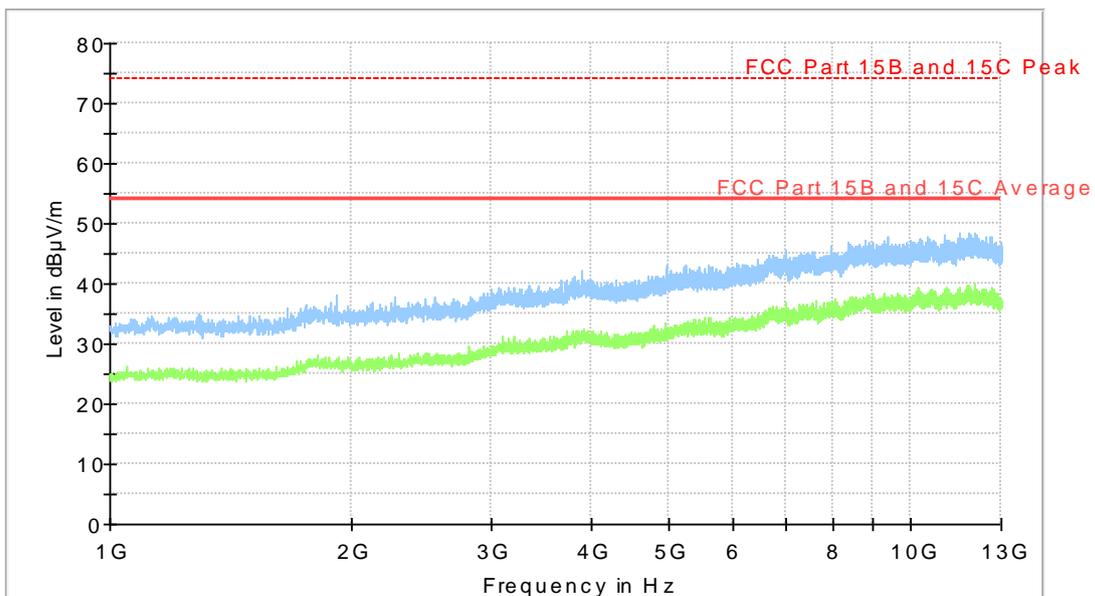
Diagram, Peak overview sweep, 1– 13 GHz at 3 m distance. RX mid channel, EUT orientation X.

Full Spectrum



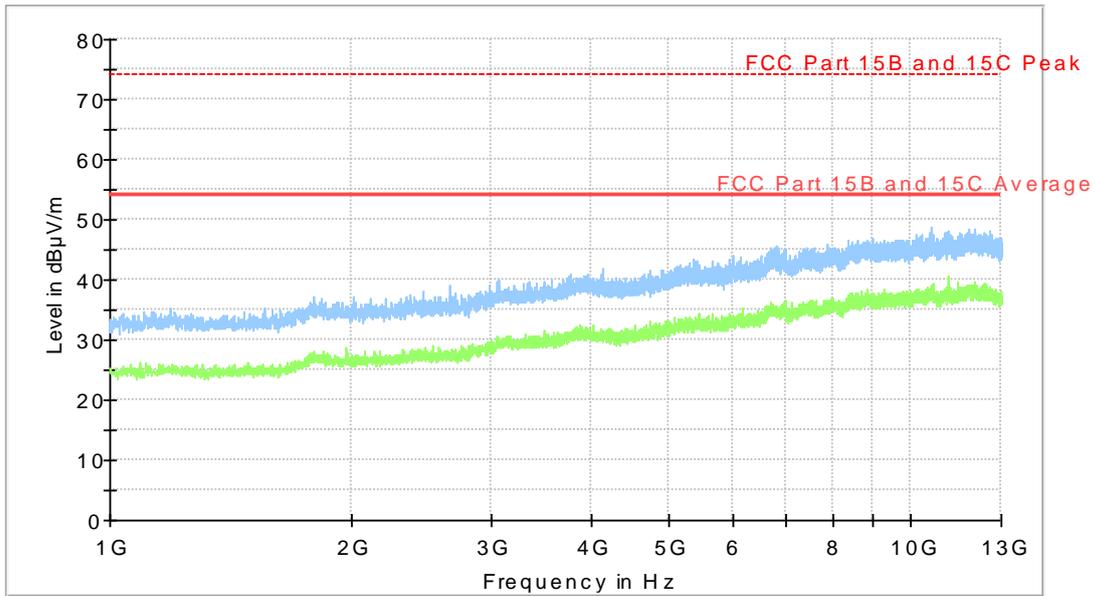
Diagram, Peak overview sweep, 1– 13 GHz at 3 m distance. RX mid channel, EUT orientation Y.

Full Spectrum



Diagram, Peak overview sweep, 1– 13 GHz at 3 m distance. RX high channel, EUT orientation X.

Full Spectrum



Diagram, Peak overview sweep, 1– 13 GHz at 3 m distance. RX high channel, EUT orientation Y.

Measurement results

No emissions are found above noise floor or closer than 20 dB from limit

7 PEAK CONDUCTED OUTPUT POWER

Date of test:	2016-05-16	Test location:	Wireless Center
EUT Serial:	--	Ambient temp:	20 °C
Tested by:	Robert Hietala	Relative humidity:	36 %
Test result:	Pass	Margin:	> 10 dB

7.1 Test set-up and test procedure.

The test method is in accordance with ANSI C63.10-2013 section 11.9.1.1.

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

7.2 Test conditions

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

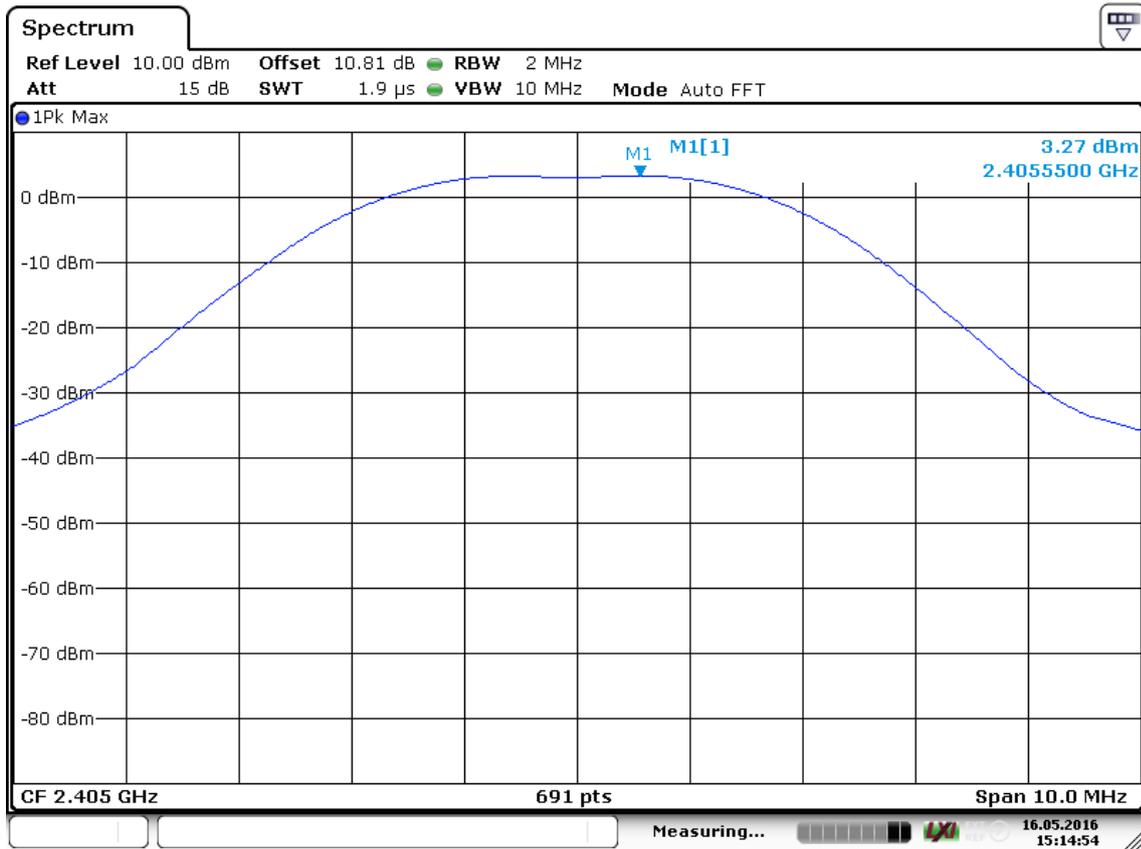
The EUT was set up in order to emit maximum disturbances.

7.3 Requirements

Reference: CFR 47§15.247(b)(3), RSS-247 5.4

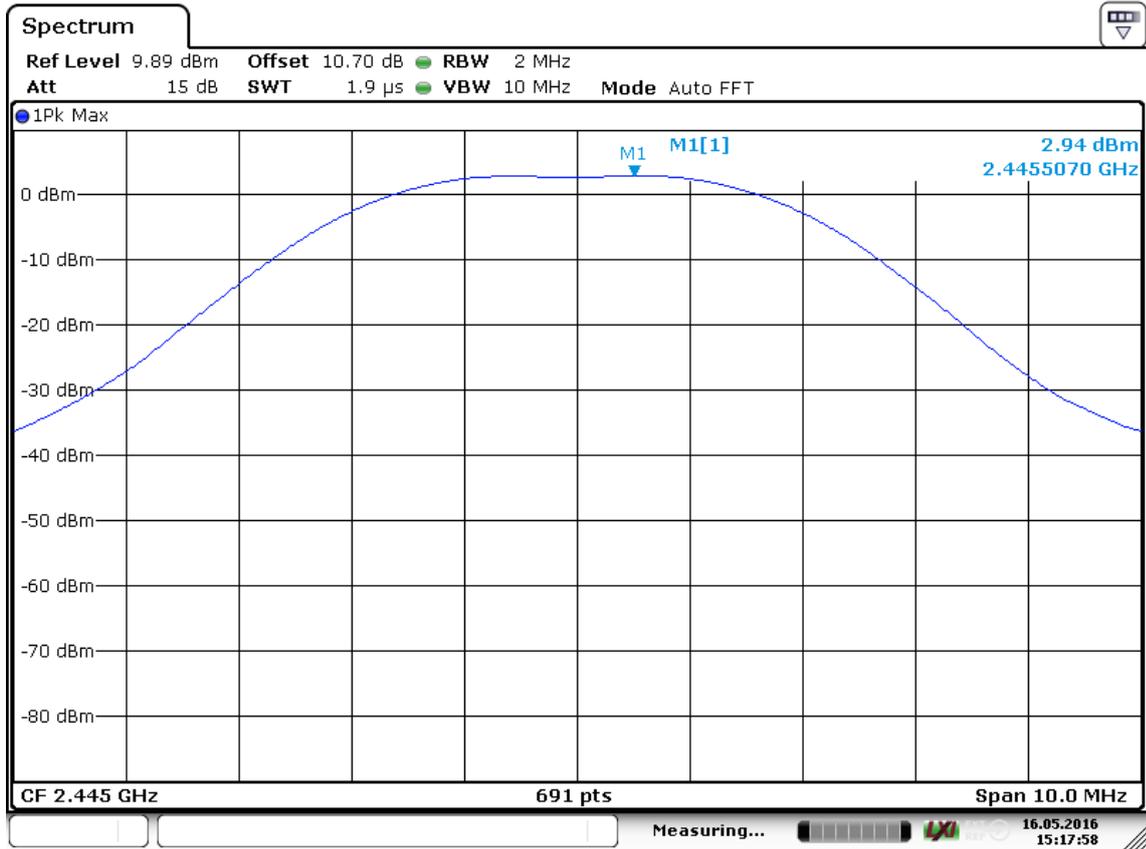
For DTSs employing digital modulation techniques operating in the bands 902 – 128 MHz, 2400 – 2483.5 MHz and 5725 – 5850 MHz, the maximum peak conducted output power shall not exceed 1W.

7.4 Test results



Date: 16 MAY 2016 15:14:54

Screenshot: Output power, low channel



Date: 16 MAY 2016 15:17:58

Screenshot: Output power, middle channel



Date: 16 MAY 2016 15:21:38

Screenshot: Output power, high channel

Test result

Channel [MHz]	Output power [dBm]	Limit [dBm]	Margin [dB]
2405	3.3	30.0	26.7
2445	2.9	30.0	27.1
2480	3.0	30.0	27.0

8 OCCUPIED 6 DB BANDWIDTH

Date of test:	2016-05-16	Test location:	Wireless Center
EUT Serial:	--	Ambient temp:	20 °C
Tested by:	Robert Hietala	Relative humidity:	36 %
Test result:	Pass	Margin:	1.1 MHz

8.1 Test set-up and test procedure.

The test method is in accordance with ANSI C63.10-2013 section 11.8.1.

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

8.2 Test conditions

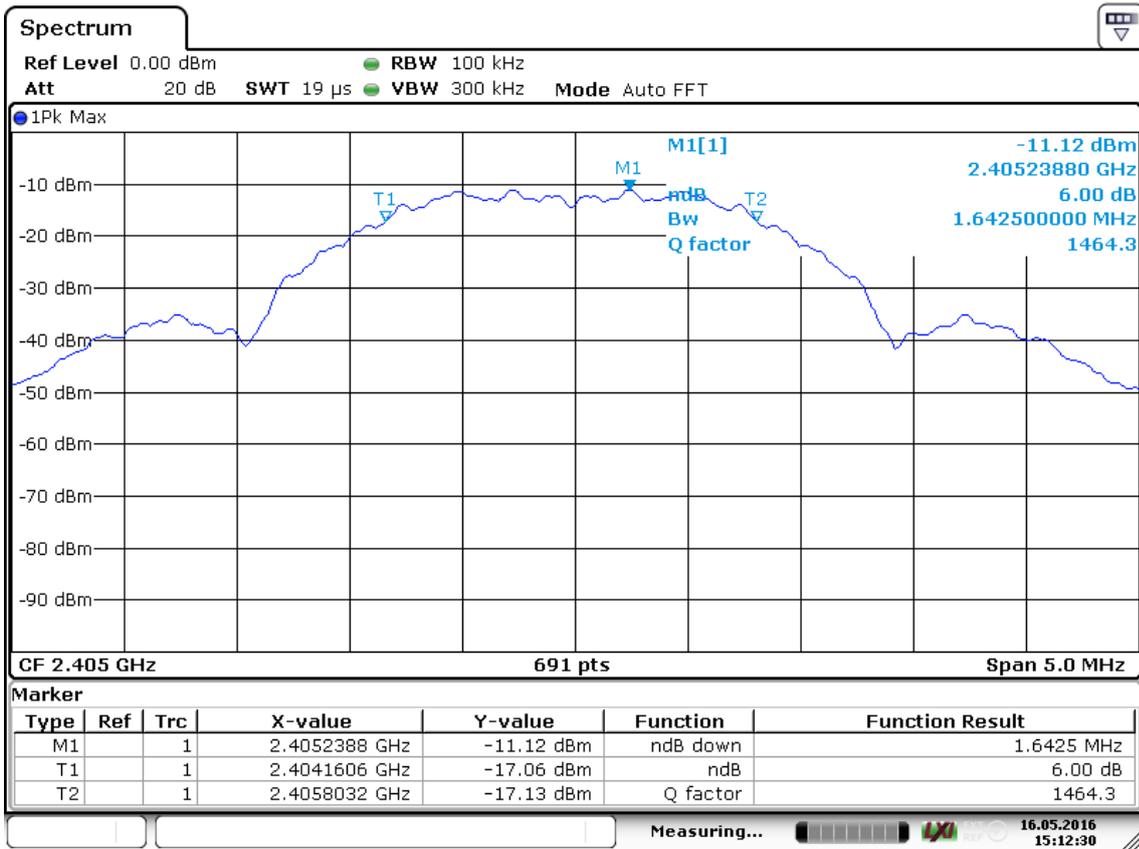
Detector: Peak,
RBW: 100 kHz
VBW: 3 x RBW
Span: >1.5 x OBW

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

8.3 Requirements

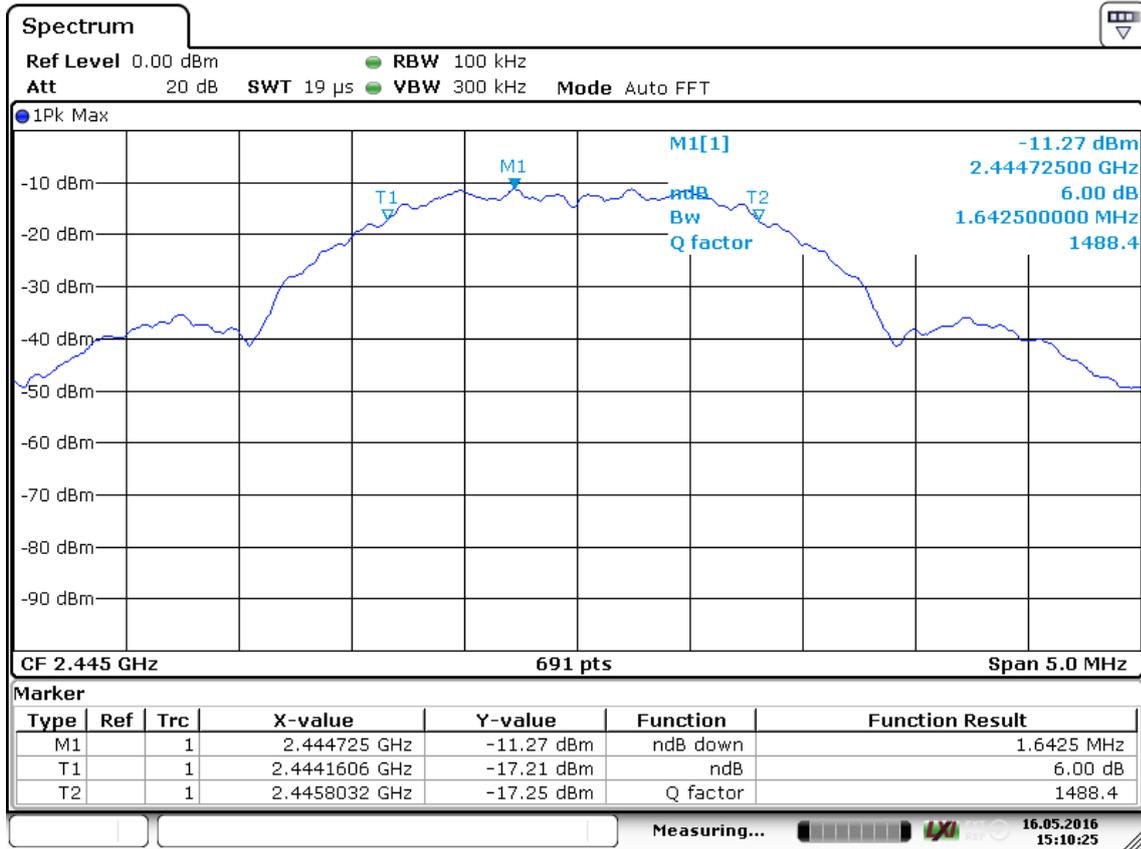
Reference: CFR 47§15.247(a)(2), RSS-247 5.2(1)
The minimum 6 dB bandwidth shall be 500 kHz.

8.4 Test results



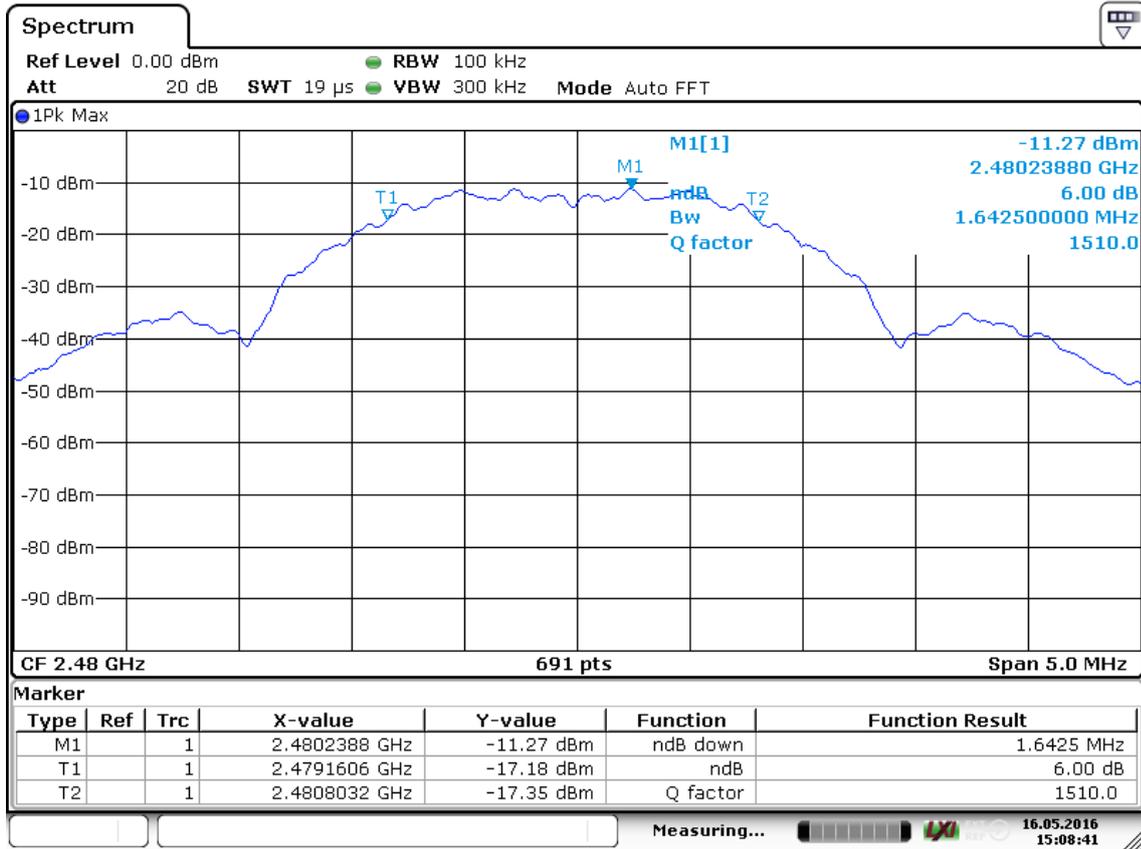
Date: 16 MAY 2016 15:12:29

Screenshot: Occupied 6 dB bandwidth Measurement, low channel



Date: 16 MAY 2016 15:10:25

Screenshot: Occupied 6 dB bandwidth Measurement, middle channel



Date: 16 MAY 2016 15:08:42

Screenshot: Occupied 6 dB bandwidth Measurement, high channel

Test result

Channel [MHz]	6 dB BW [MHz]	Limit [MHz]	Margin [MHz]
2405	1.6	0.5	1.1
2445	1.6	0.5	1.1
2480	1.6	0.5	1.1

9 99 % BANDWIDTH

Date of test:	2016-05-30	Test location:	Wireless Center
EUT Serial:	--	Ambient temp:	22 °C
Tested by:	Robert Hietala	Relative humidity:	38 %
Test result:	Pass	Margin:	--

9.1 Test set-up and test procedure.

The test method is in accordance with RSS-GEN section 6.6.

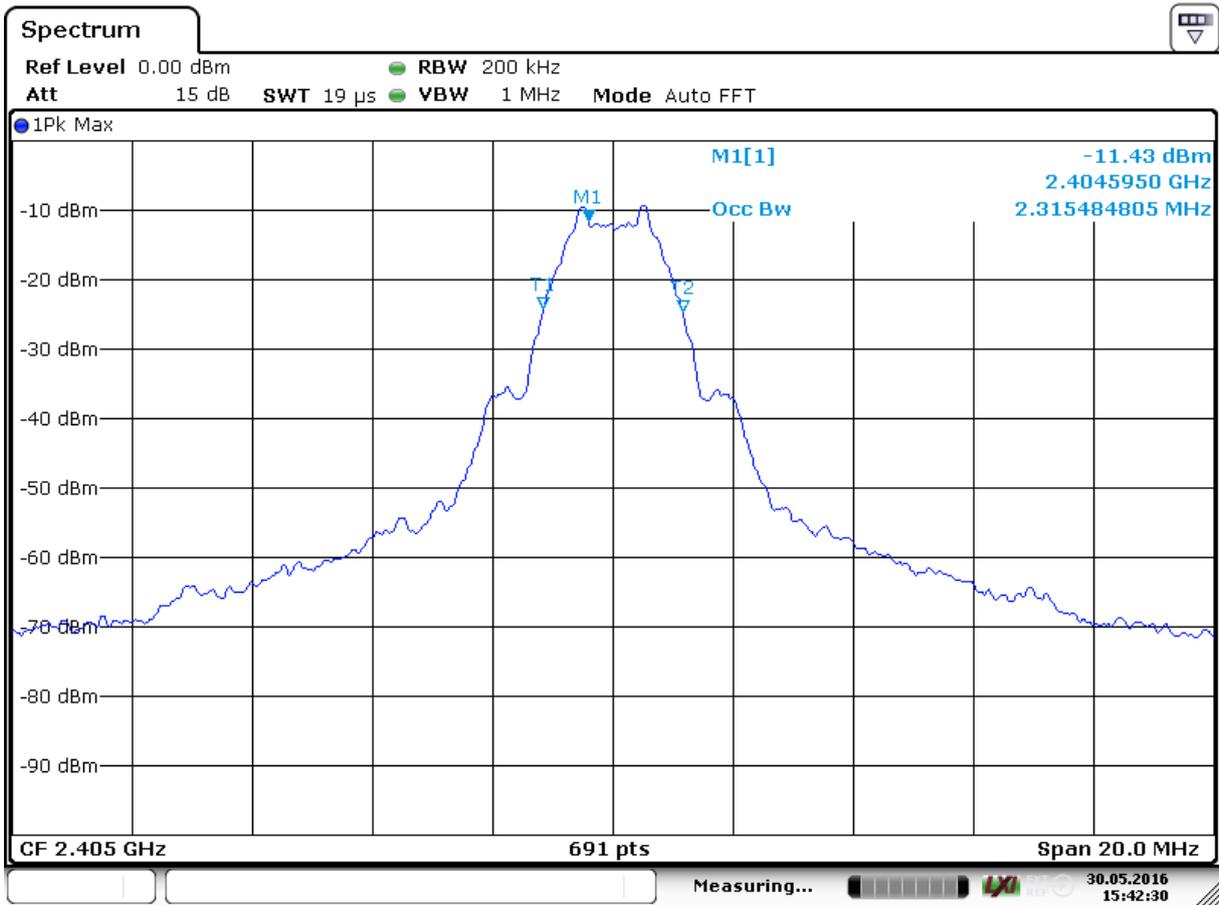
The EUT was connected to spectrum analyser via rf-cable and attenuator. Spectrum analyser with occupied bandwidth measurement function is used to determine the occupied bandwidth.

9.2 Test conditions

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

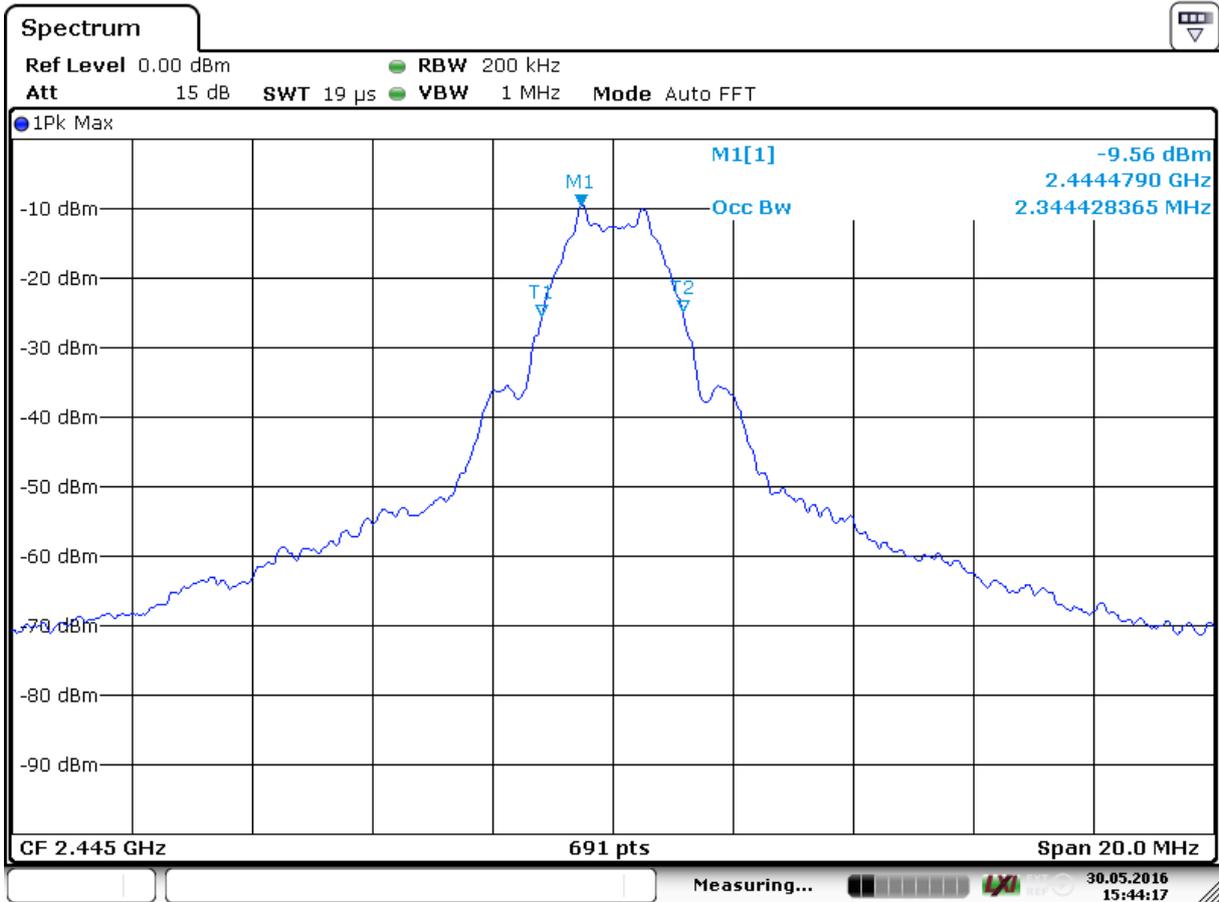
The EUT was set up in order to emit maximum disturbances.

9.3 Test results



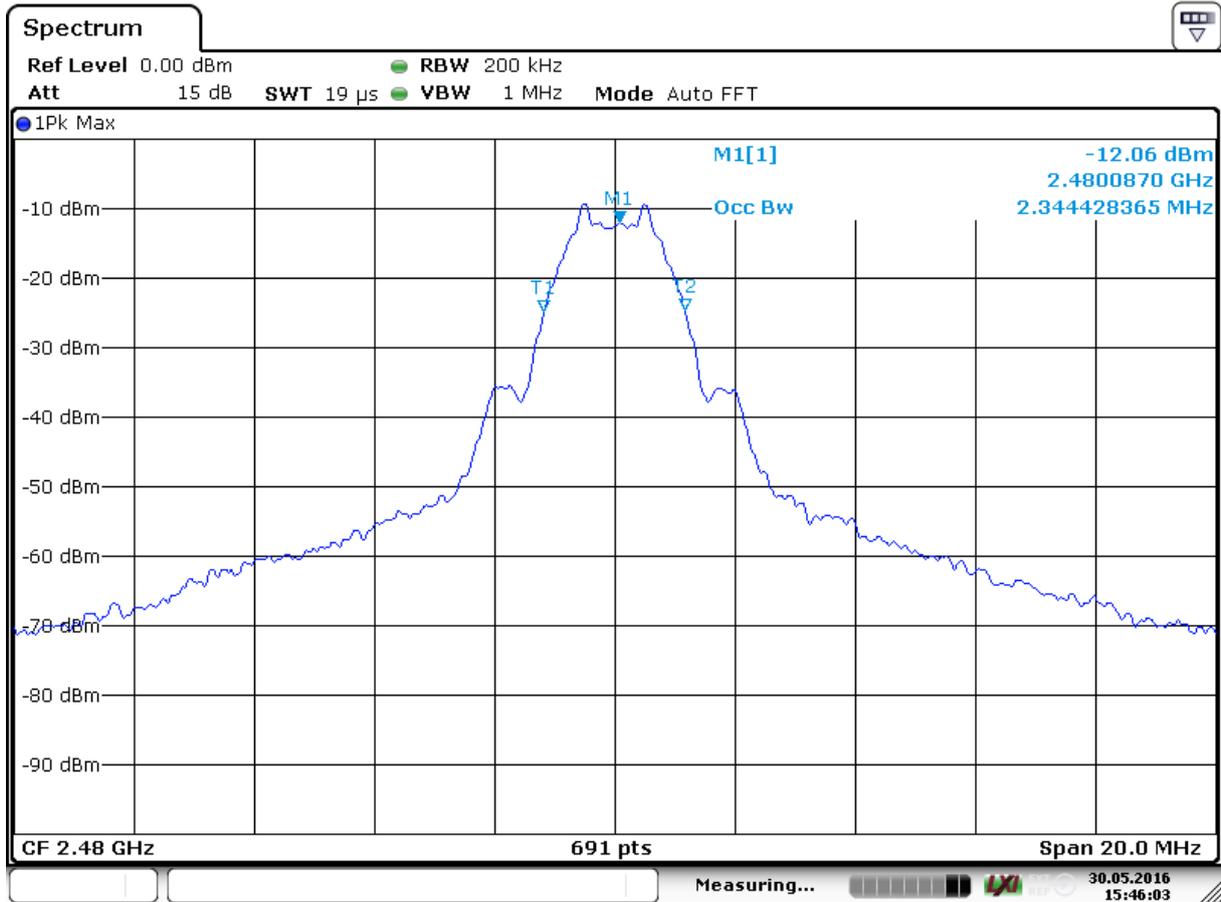
Date: 30 MAY 2016 15:42:30

Screenshot: 99 % bandwidth Measurement, low channel



Date: 30 MAY 2016 15:44:16

Screenshot: 99 % bandwidth Measurement, middle channel



Date: 30 MAY 2016 15:46:03

Screenshot: 99 % bandwidth Measurement, high channel

Test result

Channel [MHz]	99 % BW [MHz]	Limit [MHz]	Margin [MHz]
2405	2.3	--	--
2445	2.3	--	--
2480	2.3	--	--

10 PEAK POWER SPECTRAL DENSITY

Date of test:	2016-05-16	Test location:	Wireless Center
EUT number:	--	Ambient temp:	21 °C
Tested by:	Robert Hietala	Relative humidity:	36 %
Test result:	Pass	Margin:	> 10 dB

10.1 Test set-up and test procedure.

The test method is in accordance with ANSI C63.10-2013 section 11.10.2.

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

10.2 Test conditions

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

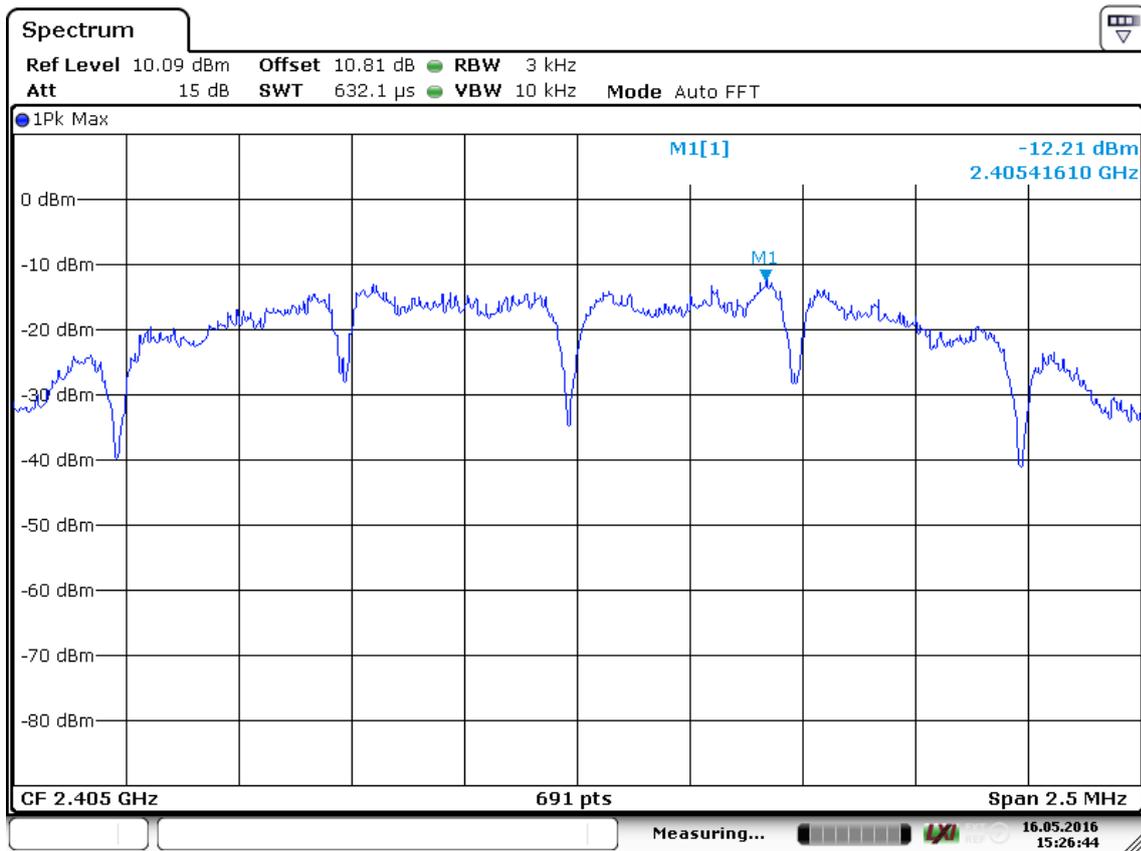
The EUT was set up in order to emit maximum disturbances.

10.3 Requirements

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

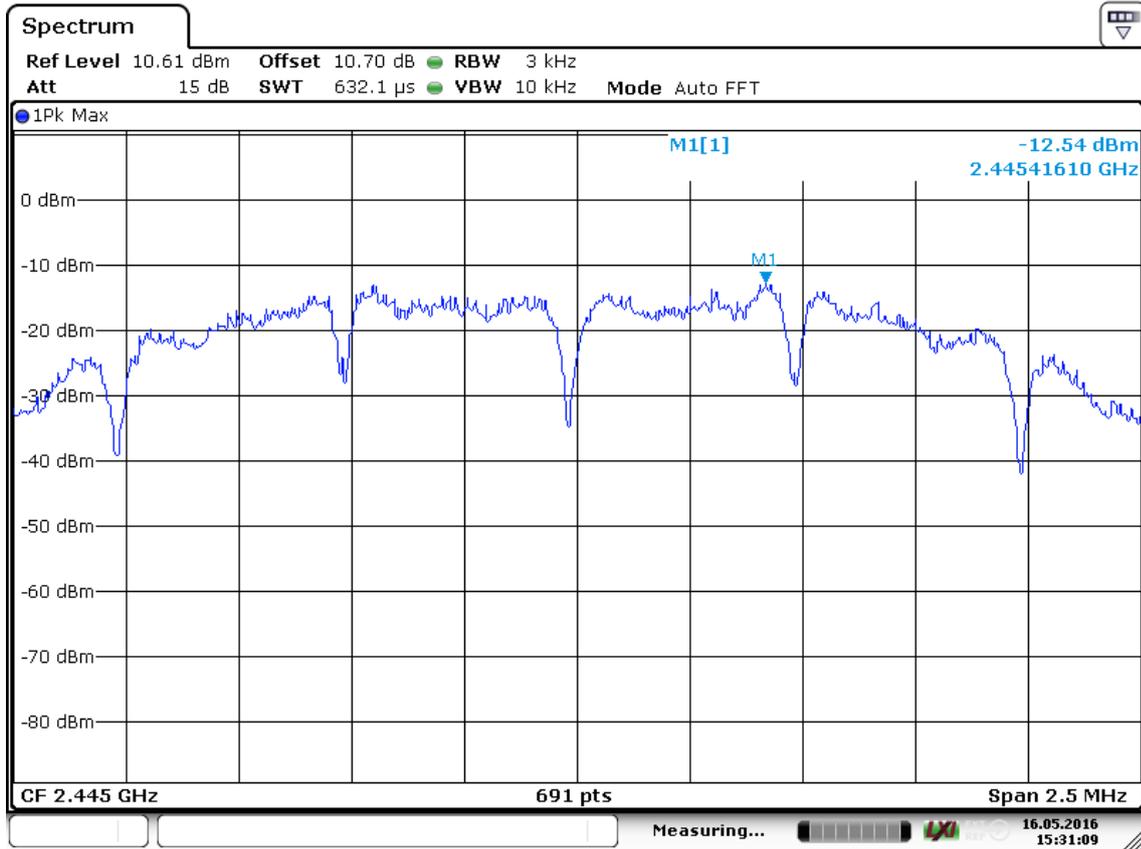
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

10.4 Test results



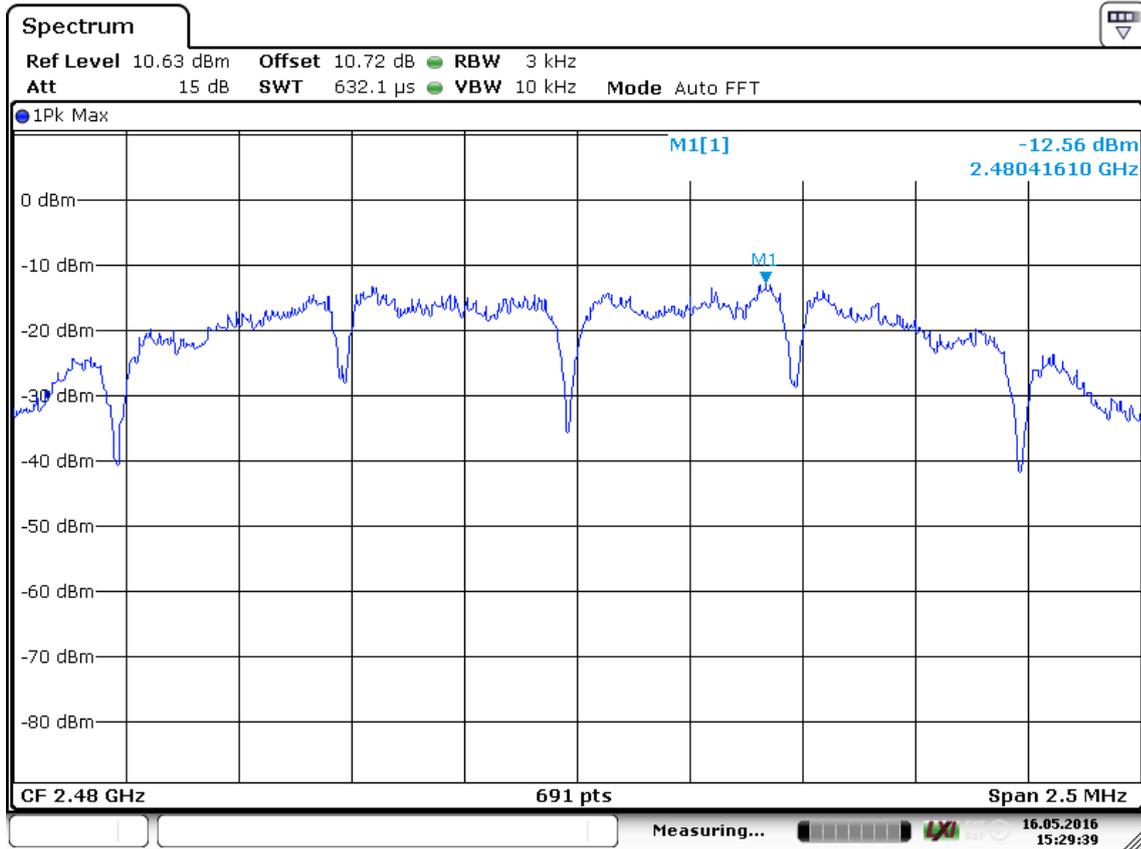
Date: 16 MAY 2016 15:26:45

Screenshot: Peak power spectral density, low channel



Date: 16 MAY 2016 15:31:09

Screenshot: Peak power spectral density, middle channel



Date: 16 MAY 2016 15:29:38

Screenshot: Peak power spectral density, high channel

Test result

Channel [MHz]	PSD [dBm/3kHz]	Limit [dBm]	Margin [dB]
2405	-12.2	8.0	20.2
2445	-12.5	8.0	20.5
2480	-12.6	8.0	20.6

11 TEST EQUIPMENT

Stora Hallen

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde & Schwarz	EMC32 – 8.51.0	--	--	--
Receiver	Rohde & Schwarz	ESU 8	12866	07-2015	1 year
Receiver	Rohde & Schwarz	ESU 40	13178	07-2015	1 year
BiLog antenna	Chase	CBL6110A	971	07-2015	3 years
Preamplifier	HP	--	7992 / 7993	06-2015	1 year
Horn antenna	Rohde & Schwarz	HF907	31246	06-2015	1 year
2,4 GHz band reject filter:	K&L MICROWAVE INC	6N45-2450/T100-0/0	12389	03-2016	1 year
4 GHz high pass filter	K&L MICROWAVE INC	4410-X4500/18000-0/0	5133	07-2015	1 year

Wireless Center and 3m FAC

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde & Schwarz	EMC32 – 9.21.0	--	--	--
Signal analyzer	Rohde & Schwarz	FSIQ 40	12793	07-2015	1 year
Measurement cable	Huber + Suhner	Sucoflex 104 PE	39070	07-2015	1 year
Measurement cable	Huber + Suhner	Sucoflex 104 PE	39079	07-2015	1 year
Measurement cable	Huber + Suhner	Sucoflex 104	5191	07-2015	1 year
Horn antenna	EMCO	3115	4936	04-2014	3 years
Pre amplifier	Sangus	00101400-23-10P -6-S ; AFS44-12002400-32-10P -44	12335	07-2015	1 year
Horn antenna	EMCO	3160-08	30099	10-2013	3 years
Horn antenna	EMCO	3160-09	30101	10-2013	3 years
Signal analyzer:	Rohde & Schwarz	FSV 30	32594	07-2015	1 year
Signal generator:	Rohde & Schwarz	SMB100A	32592	07-2015	1 year
Signal analyzer	Rohde & Schwarz	FSIQ 40	12793	07-2015	1 year
2,4 GHz band reject filter:	K&L MICROWAVE INC	6N45-2450/T100-0/0	12389	03-2016	1 year
4 GHz high pass filter	K&L MICROWAVE INC	4410-X4500/18000-0/0	5133	07-2015	1 year
Multimeter	Fluke	179	33105	10-2015	1 year

12 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 %.

13 TEST SET UP AND EUT PHOTOS

EUT photos are in separate document 1610688STO-001 Annex 1.

Test set up photos are in separate document 1610688STO-001 Annex 2.