

RADIO TEST REPORT

No. 1610783STO-006, Ed. 1

RF Performance

EQUIPMENT UNDER TEST

Equipment: Gateway
Type/Model: E1526 Trådfri
Manufacturer: IKEA of Sweden
Tested by request of: IKEA of Sweden

SUMMARY

Referring to the emission limits, and the operating mode during the tests specified in this report, the 2.5 GHz Wi-Fi radio 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 Licence-Exempt Local Area Network (LE-LAN) Devices

For details, see clause 2 – 4.

Date of issue: 2016-09-05

Tested by:


Matti Virkki

Approved by:


Stefan Andersson

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Revision History

Edition	Date	Description	Changes
1	2016-09-05	First release	

Version 1.00

CONTENTS

	Page
1 Client Information	4
2 Equipment under test (EUT).....	4
2.1 Identification of the EUT	4
2.2 Additional information about the EUT	5
2.3 Peripheral equipment.....	5
2.4 Test signals and operation modes	5
3 Test Specifications	6
3.1 Standards	6
3.2 Additions, deviations and exclusions from standards and accreditation	6
3.3 Test site.....	6
4 Test Summary	7
5 Radiated rf Emission in the frequency-range 1 to 26.5 GHz.....	8
5.1 Test set-up and test procedure.....	8
5.2 Test conditions	8
5.3 Requirements.....	9
5.4 Test results 1 GHz – 25 GHz, TX	9
5.5 Test results 1 GHz – 13 GHz, RX	16
6 Conducted band edge measurement.....	18
6.1 Test set-up and test procedure.....	18
6.2 Test conditions	18
6.3 Requirement.....	18
6.4 Test results.....	19
7 conducted output power	23
7.1 Test set-up and test procedure.....	23
7.2 Test conditions	23
7.3 Requirements	23
7.4 Test results.....	23
8 Occupied 6 dB bandwidth	29
8.1 Test set-up and test procedure.....	29
8.2 Test conditions	29
8.3 Requirements	29
8.4 Test results.....	30
9 power spectral density.....	35
9.1 Test set-up and test procedure.....	35
9.2 Test conditions	35
9.3 Requirements.....	35
9.4 Test results.....	36
10 Test equipment.....	41
11 Measurement uncertainty.....	42
12 Test set up and EUT photos.....	42

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: Daniel Lind

2 EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment: Gateway
Type/Model: E1526 Trådfri
Brand name: IKEA
Serial number: No visible serial number on EUT
Manufacturer: IKEA of Sweden AB
Transmitter frequency range: 2412 – 2462 MHz
Receiver frequency range: 2412 – 2462 MHz
Frequency agile or hopping: Yes No
Antenna: Internal antenna External antenna
Antenna connector: None, internal antenna Yes
Antenna gain: 1,4 dBi
Rating RF output power: 18 dBm (conducted)
Type of modulation: BPSK, QPSK, 16-QAM, 64 QAM
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: <-20°C to +55°C
Transmitter standby mode supported: Yes No

2.2 Additional information about the EUT

The gateway is part of the TRÅDFRI platform from IKEA of Sweden and contain;

- 802.15.4 ZigBee radio
- 802.11 a/b/g/n Wi-Fi radio.
- Ethernet

This report covers tests of the 2.4 GHz Wi-Fi radio parts.

During the tests the EUT supported following software:

Software	Version	Comment
Test software	Beta6	For continuous transmitter test
User firmware	0.7.0	

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.
AC / DC adaptor	KMW-050-050-NA-U	IKEA of Sweden	
PC	T450s	Lenovo	

2.4 Test signals and operation modes

Continuous signals

802.11 b 11 Mbps data rate
 802.11 g 9 Mbps data rate
 802.11 n mode MCS 7 20 MHz channel

Continuous receive mode

Radiated emissions were measured using b mode which gave highest output power.

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 Licence-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 See test report 1610783STO-004	NT
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 See test report 1610783STO-004	NT
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 2.8 dB at 2483.5 MHz. See clause 5. The measured result is below the upper limit, but by a margin less than half of the uncertainty interval. It is therefore not possible to state compliance based on the 95% level of confidence. However, the result indicates that compliance is more probable than non-compliance.	PASS
FCC §15.247(a)(2) RSS-GEN 6.6 RSS-247 5.2(1)	Occupied bandwidth The EUT complies with the limits. The margin to the limit is at least 7.3 MHz See clause 8.	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 13.5 dB at See clause 7.	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 21.8 dB. See clause 9	PASS
FCC §15.247(e) RSS-247 5.5	Band edge The EUT complies with the limits. The margin to the limit was at least 5.9 dB See clause 6.	PASS

5 RADIATED RF EMISSION IN THE FREQUENCY-RANGE 1 TO 26.5 GHZ

Date of test:	2016-05-24	Test location:	Stora Hallen
EUT Serial:	No serial on EUT	Ambient temp:	22 °C
Tested by:	Matti Virkki	Relative humidity:	40 %
Test result:	Pass	Margin:	2.8 dB

5.1 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.

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: 10 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 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 – 4 m

Polarisation: Vertical and Horizontal

Type: Horn

Antenna tilt: Activated

5.3 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))

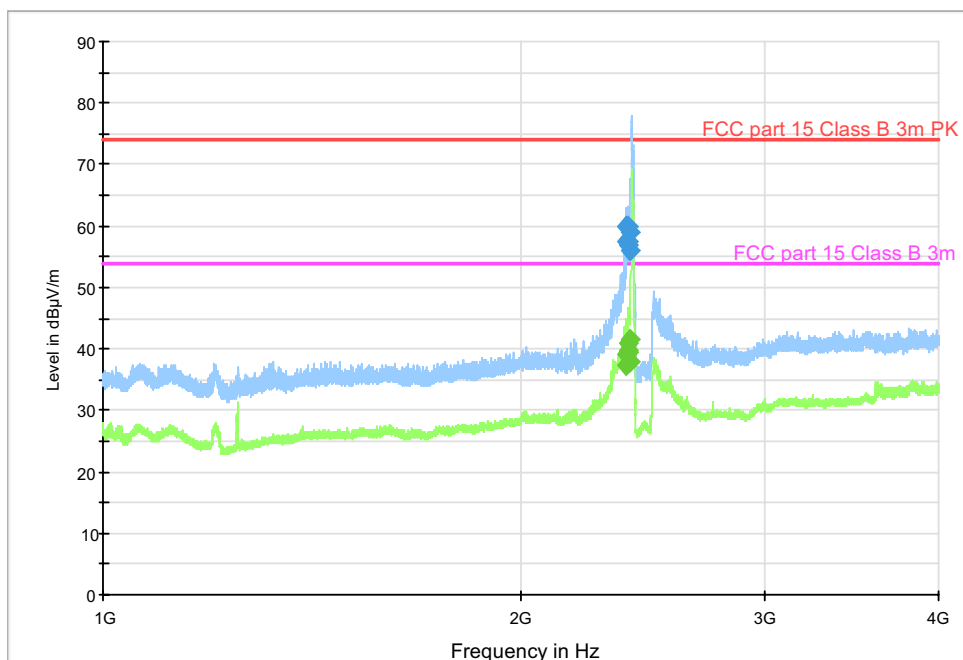
Outside the restricted bands:

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.

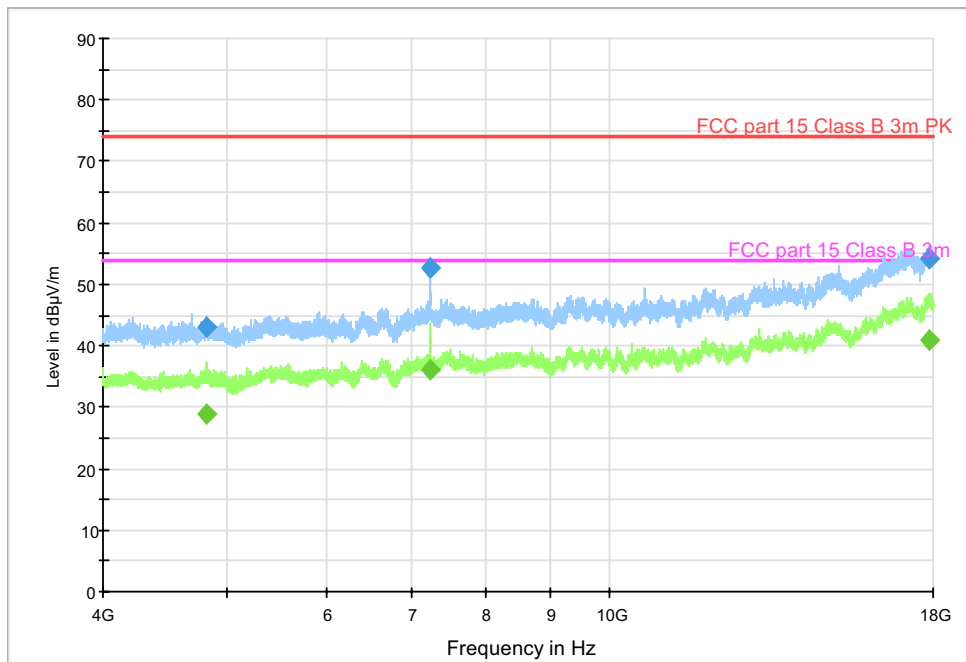
5.4 Test results 1 GHz – 25 GHz, TX

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



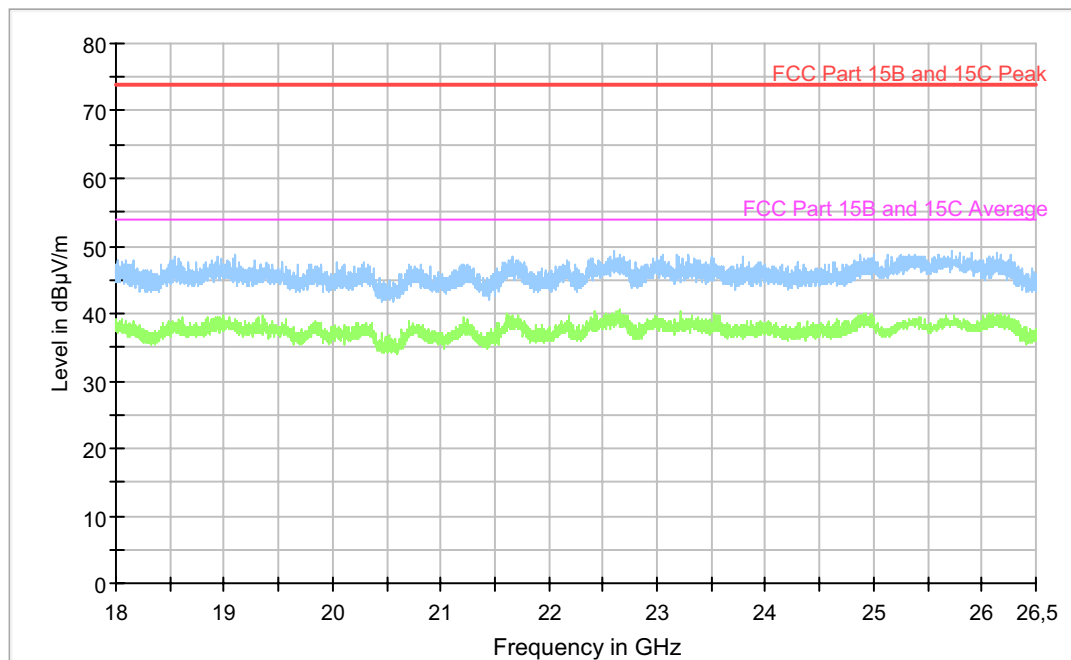
Diagram, Peak overview sweep, 1– 4 GHz at 3 m distance. TX low channel, Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0.

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



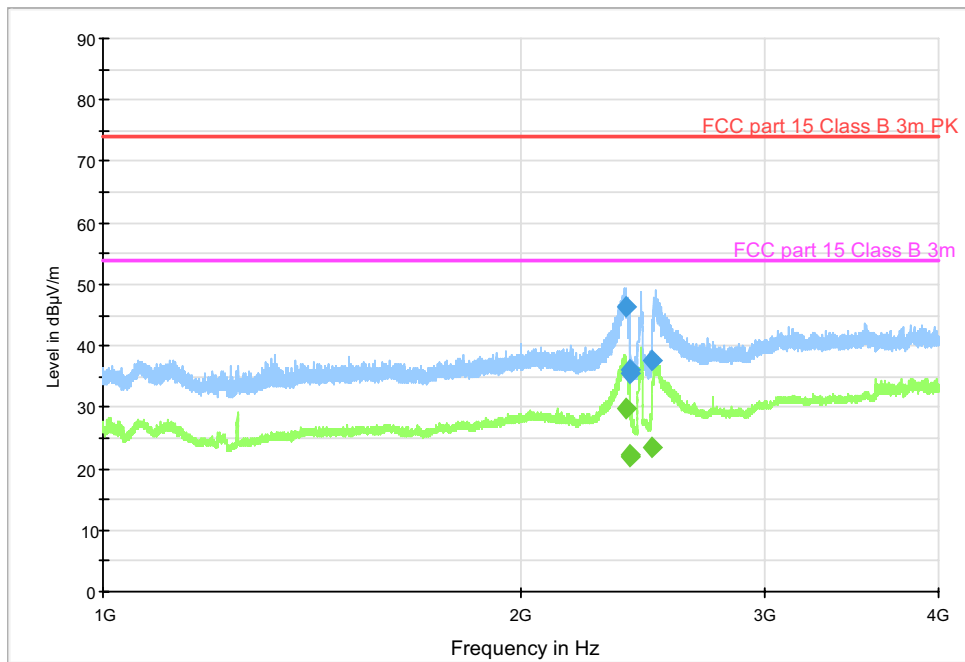
Diagram, Peak overview sweep, 4– 18 GHz at 3 m distance. TX low channel. Emissions below 4000 MHz are attenuated by high-pass filter K&L 4410-X4500/18000-0.

Full Spectrum



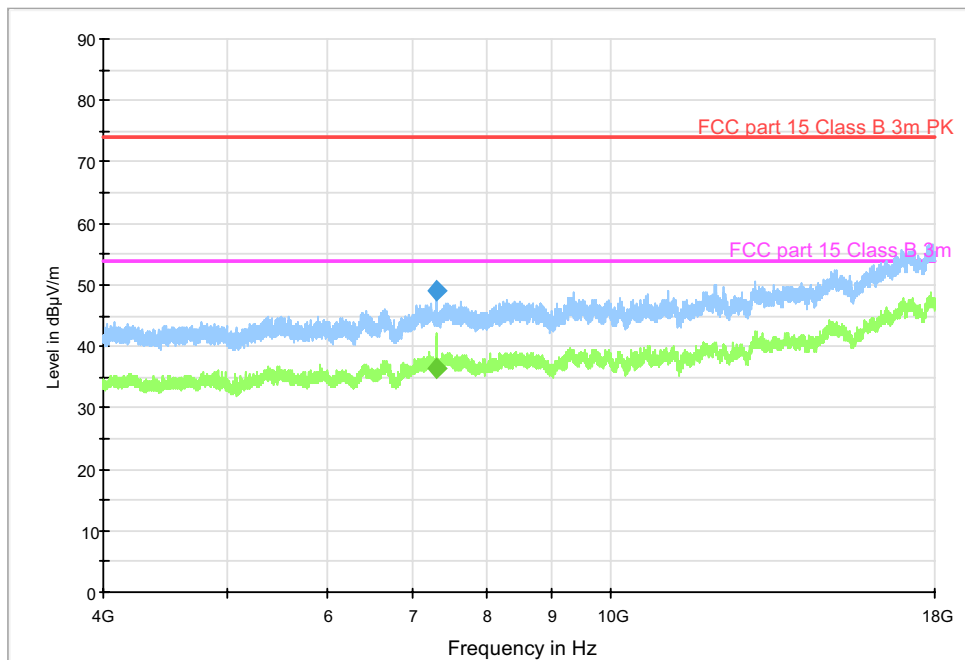
Diagram, Peak overview sweep, 18 – 26.5 GHz at 3 m distance. TX low channel.

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



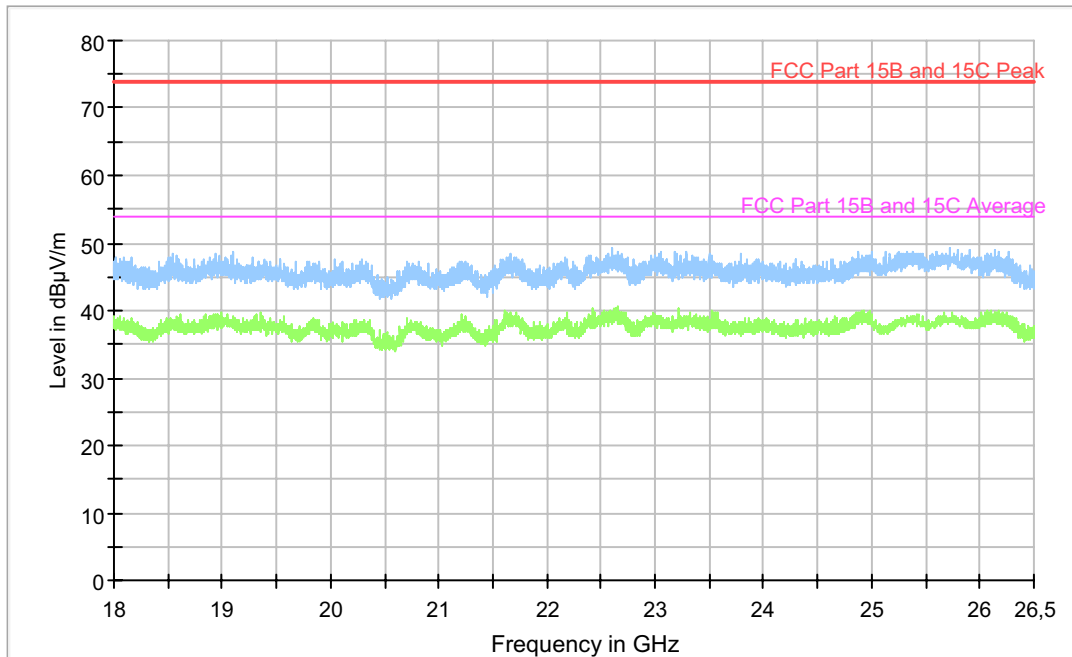
Peak overview sweep, 1– 4 GHz at 3 m distance. TX middle channel, Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0.

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



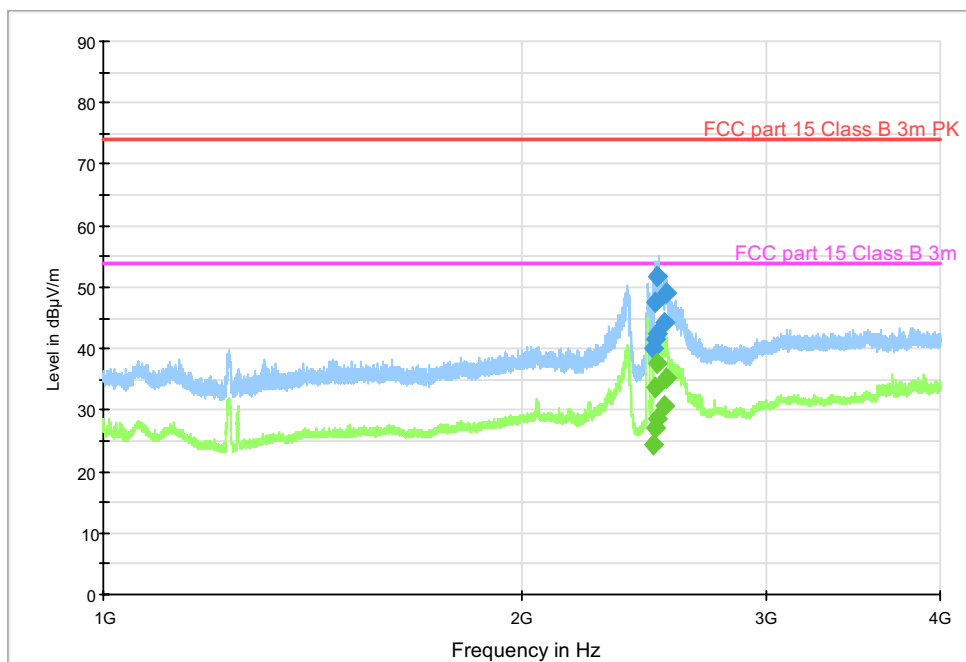
Peak overview sweep, 4– 18 GHz at 3 m distance. TX middle channel. Emissions below 4000 MHz are attenuated by high-pass filter K&L 4410-X4500/18000-0.

Full Spectrum



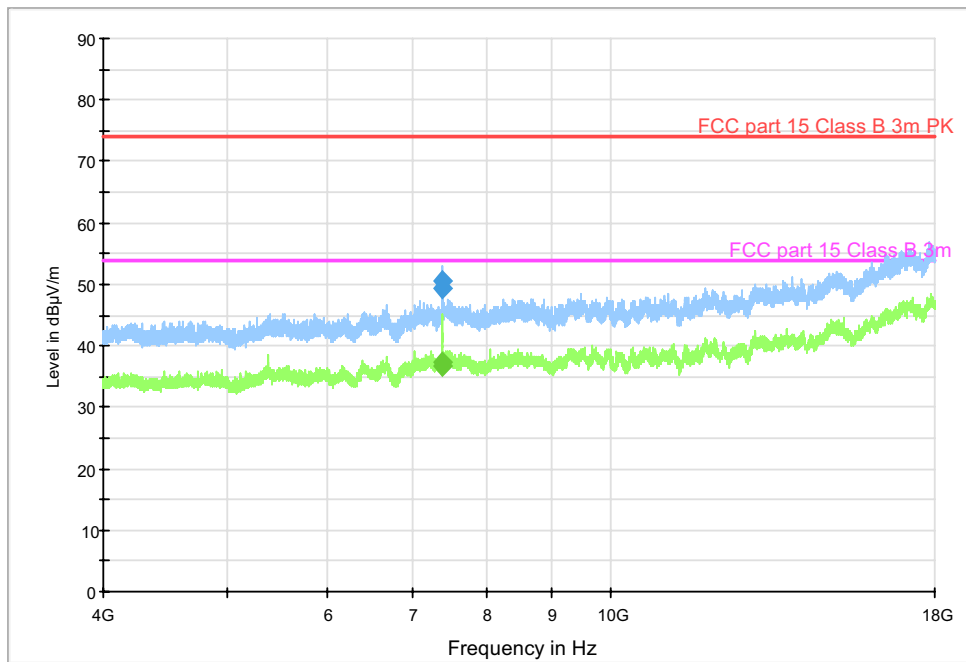
Diagram, Peak overview sweep, 18 – 26.5 GHz at 3 m distance. TX middle channel.

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



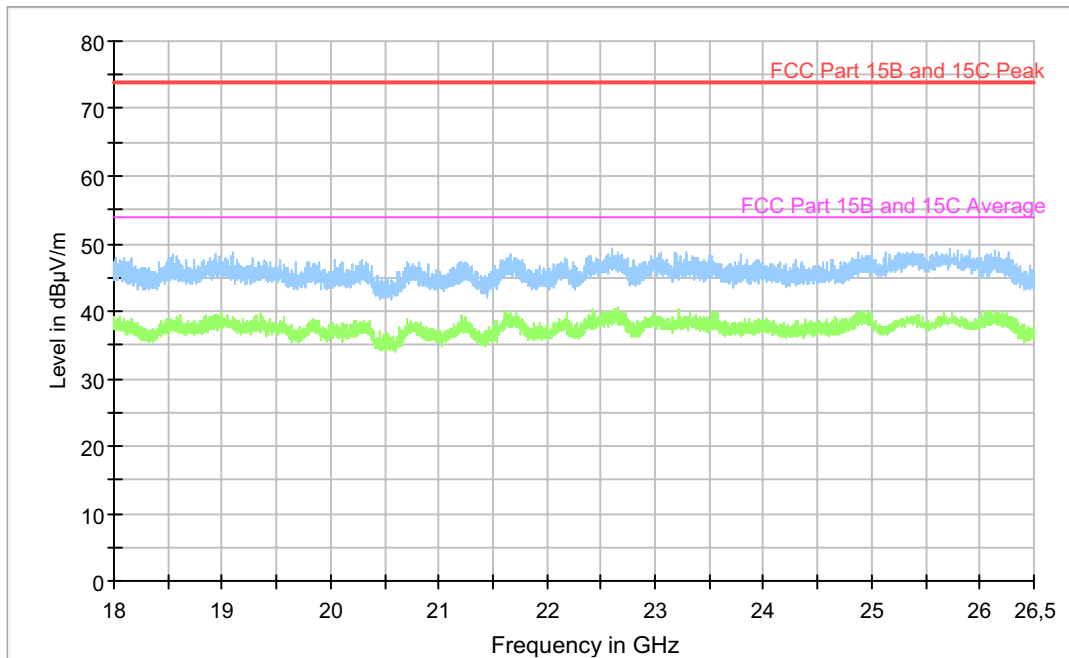
Peak overview sweep, 1– 4 GHz at 3 m distance. TX high channel, Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0.

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



Peak overview sweep, 4– 18 GHz at 3 m distance. TX high channel. Emissions below 4000 MHz are attenuated by high-pass filter K&L 4410-X4500/18000-0.

Full Spectrum



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

Measurement results, Peak, TX low channel

Frequency [MHz]	Level [dB μ V/m]	Limit [dB μ V/m]	Polarization H/V	Margin [dB]
2383.9	57.4	74.0	V	16.6
2385.2	59.8	74.0	H	14.2
2387.5	60.0	74.0	H	14.0
2390.0	56.8	74.0	H	17.2
2392.8	57.4	74.0	H	16.6
2393.9	58.9	74.0	H	15.1
2400.0	58.1	74.0	V	15.9
4821.8	42.9	74.0	H	29.1
7236.3	52.6	74.0	H	11.4
17882.4	54.3	74.0	V	19.7

Measurement results, Average, TX low channel

Frequency [MHz]	Level [dB μ V/m]	Limit [dB μ V/m]	Polarization H/V	Margin [dB]
2383.9	37.4	54.0	V	16.6
2385.2	39.1	54.0	H	14.9
2387.5	39.4	54.0	H	14.6
2390.0	39.6	54.0	H	14.4
2392.8	41.0	54.0	H	12.6
2393.9	41.4	54.0	H	12.2
2400.0	40.0	54.0	V	14.1
4821.8	28.8	54.0	H	25.2
7236.3	36.2	54.0	H	17.8
17882.4	40.9	54.0	V	13.1

Measurement results, Peak, TX middle channel

Frequency [MHz]	Level [dB μ V/m]	Limit [dB μ V/m]	Polarization H/V	Margin [dB]
2379.9	46.4	74.0	H	19.6
2400.0	37.7	74.0	H	36.3
2483.5	64.4	74.0	V	36.5
7310.1	49.0	74.0	H	25.0

Measurement results, Average, TX middle channel

Frequency [MHz]	Level [dB μ V/m]	Limit [dB μ V/m]	Polarization H/V	Margin [dB]
2379.9	29.9	54.0	H	24.1
2400.0	22.0	54.0	H	32.0
2483.5	50.5	54.0	V	3.5
7310.1	36.3	54.0	H	17.7

Measurement results, Peak, TX high channel

Frequency [MHz]	Level [dB μ V/m]	Limit [dB μ V/m]	Polarization H/V	Margin [dB]
2483.5	66.5	74.0	V	7.5
2492.8	54.9	74.0	V	19.1
2493.0	48.9	74.0	V	25.1
2502.6	43.0	74.0	V	31.0
2502.8	51.8	74.0	V	2.2
2536.6	44.4	74.0	H	29.6
2538.4	49.1	74.0	V	24.9
7386.1	50.5	74.0	H	23.5
7387.1	49.4	74.0	H	24.6

Measurement results, Average, TX high channel

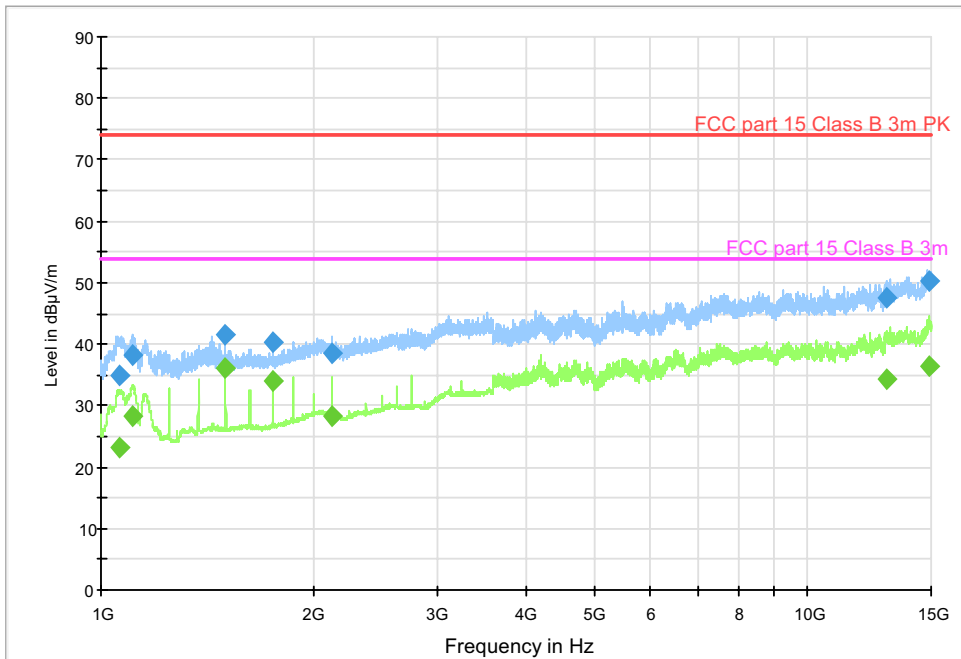
Frequency [MHz]	Level [dB μ V/m]	Limit [dB μ V/m]	Polarization H/V	Margin [dB]
2483.5	51.2	54.0	V	2.8
2492.8	46.9	54.0	V	7.1
2493.0	40.9	54.0	V	13.1
2502.6	28.7	54.0	V	25.3
2502.8	37.6	54.0	V	16.4
2536.6	30.6	54.0	H	23.4
2538.4	35.3	54.0	V	18.7
7386.1	37.3	54.0	H	16.7
7387.1	36.6	54.0	H	17.4

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

Result [dB μ V/m] = Analyser reading [dB μ V] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB] + band reject filter loss [dB]

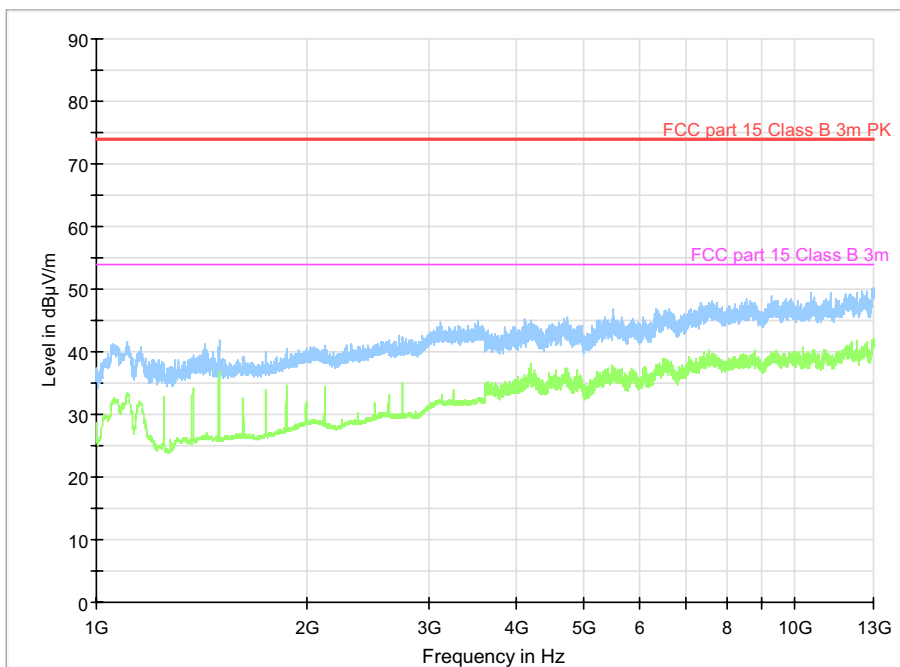
5.5 Test results 1 GHz – 13 GHz, RX

FCC 1 G - 10 G class B 3m ESU40 Continuous TT rotation



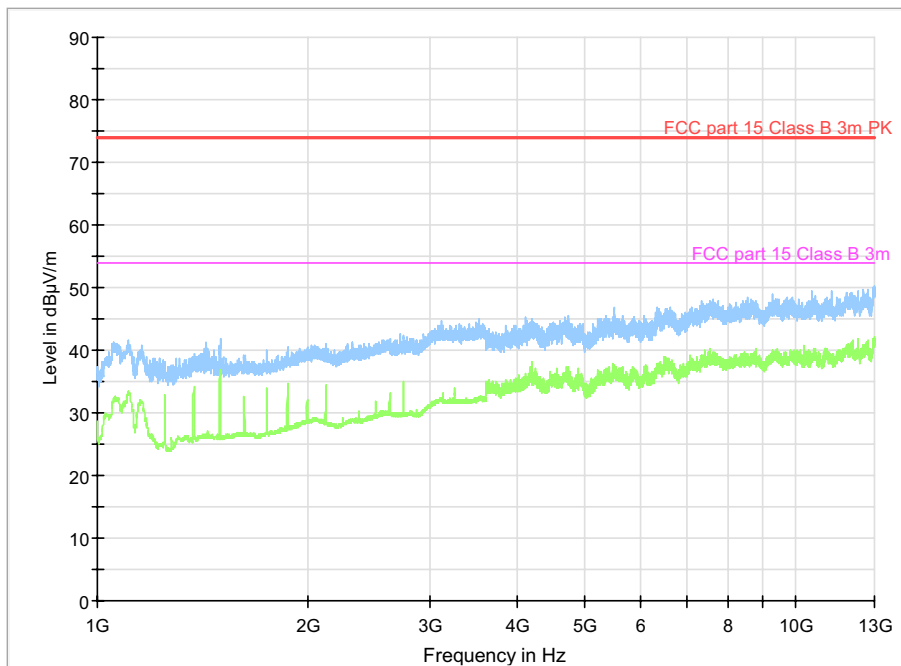
Diagram, Peak overview sweep, 1– 15 GHz at 3 m distance. RX low channel,

FCC 1 G - 10 G class B 3m ESU40 Continuous TT rotation



Diagram, Peak overview sweep, 1– 13 GHz at 3 m distance. RX middle channel

FCC 1 G - 10 G class B 3m ESU40 Continuous TT rotation



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

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

Measurement results, Peak, RX low channel

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
1059.5	35.0	74.0	H	39.0
1108.0	38.3	74.0	H	35.7
1499.9	41.5	74.0	H	32.5
1750.0	40.2	74.0	H	33.8
2125.0	38.5	74.0	V	35.5
12991.8	47.5	74.0	V	26.5
14899.7	50.1	74.0	V	23.9

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
1059.5	23.2	54.0	H	30.8
1108.0	28.4	54.0	H	25.6
1499.9	36.2	54.0	H	17.8
1750.0	34.1	54.0	H	19.9
2125.0	28.3	54.0	V	25.7
12991.8	34.3	54.0	V	19.7
14899.7	36.4	54.0	V	17.6

No other emissions are found above noise floor or closer than 20 dB from limit. Margin to noise floor is at least 15 dB.

6 CONDUCTED BAND EDGE MEASUREMENT

Date of test:	2016-07-12	Test location:	Stora Hallen
EUT Serial:	No serial on EUT	Ambient temp:	23°C
Tested by:	Matti Virkki	Relative humidity:	52 %
Test result:	Pass	Margin:	5.9 dB

6.1 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.
 The EUT was set up in order to emit maximum disturbances.

6.2 Test conditions

Detector: Peak,
 RBW: 100 kHz
 VBW: 300 kHz
 Span: 50 MHz

6.3 Requirement

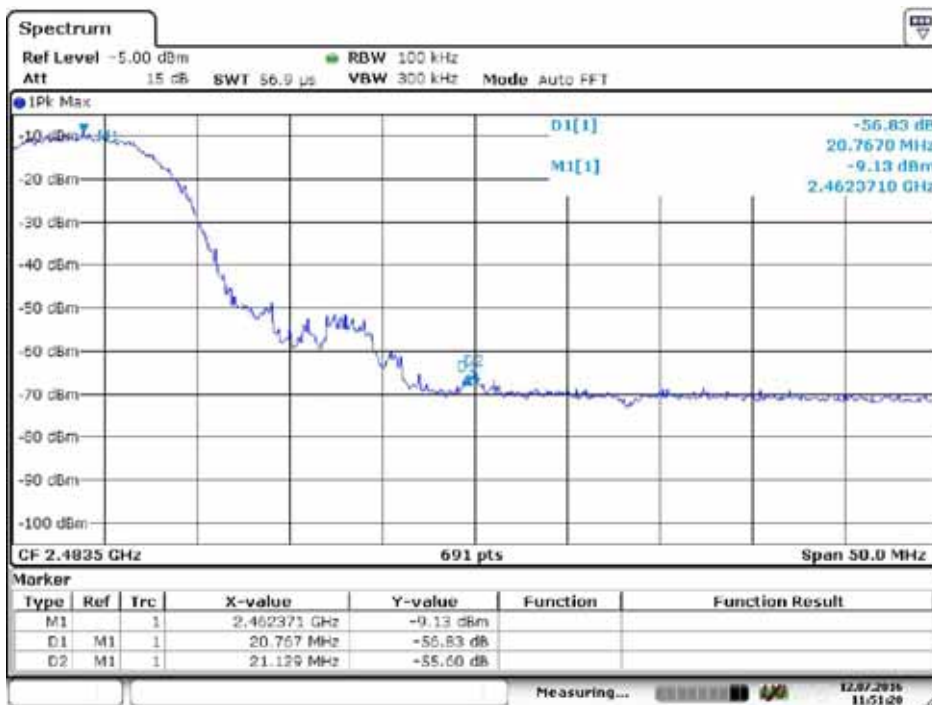
Reference: CFR 47 §15.247(d), RSS-247 5.5,
 In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest 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.

6.4 Test results



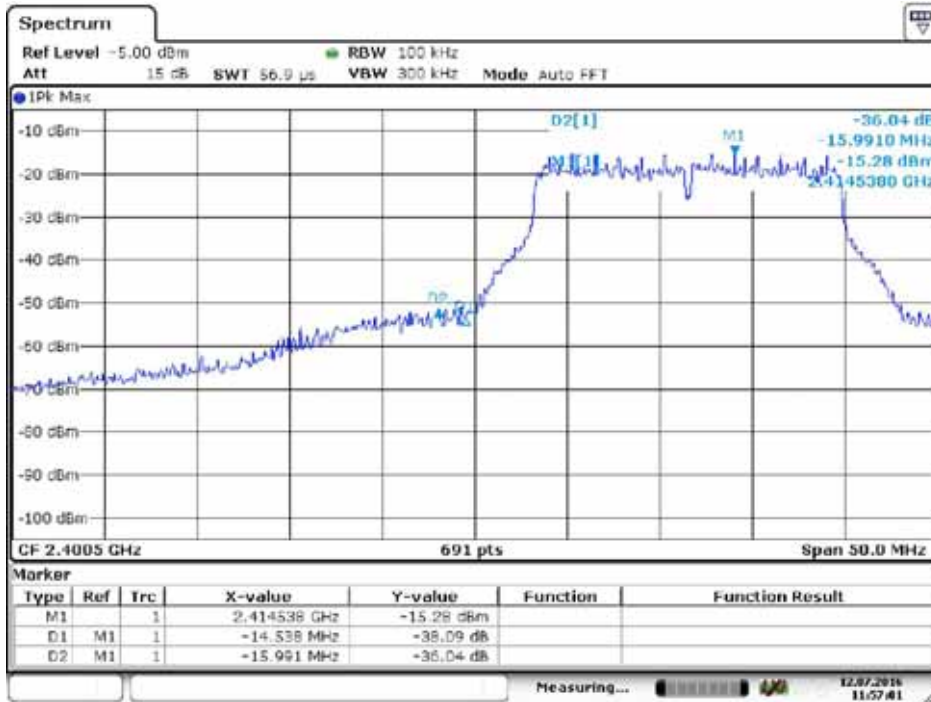
Date: 12 JUL 2016 11:47:58

Screenshot: Lower band edge, b mode



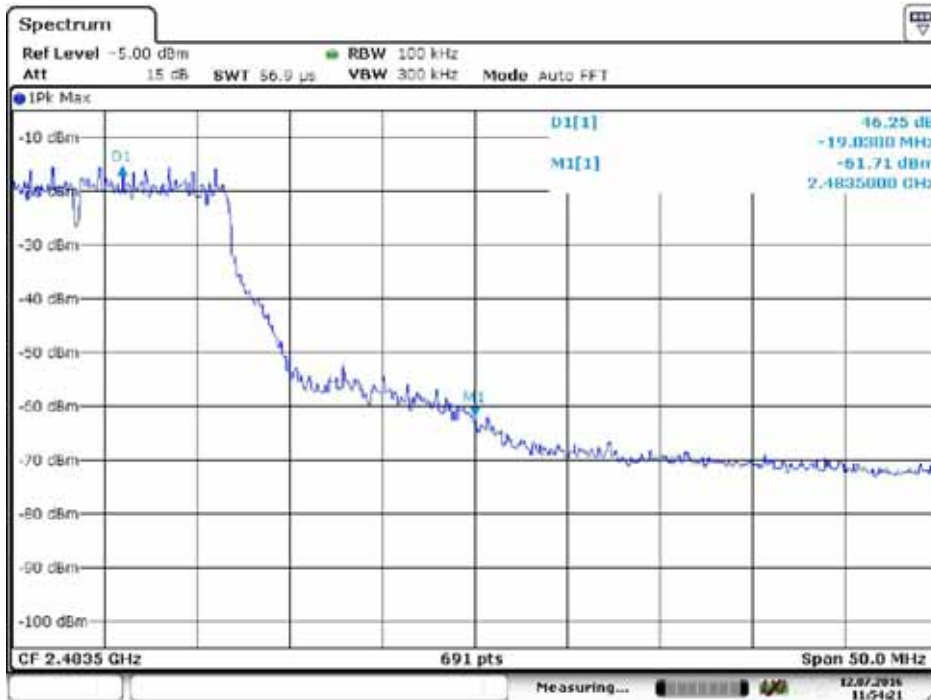
Date: 12 JUL 2016 11:51:20

Screenshot: upper band edge, b mode



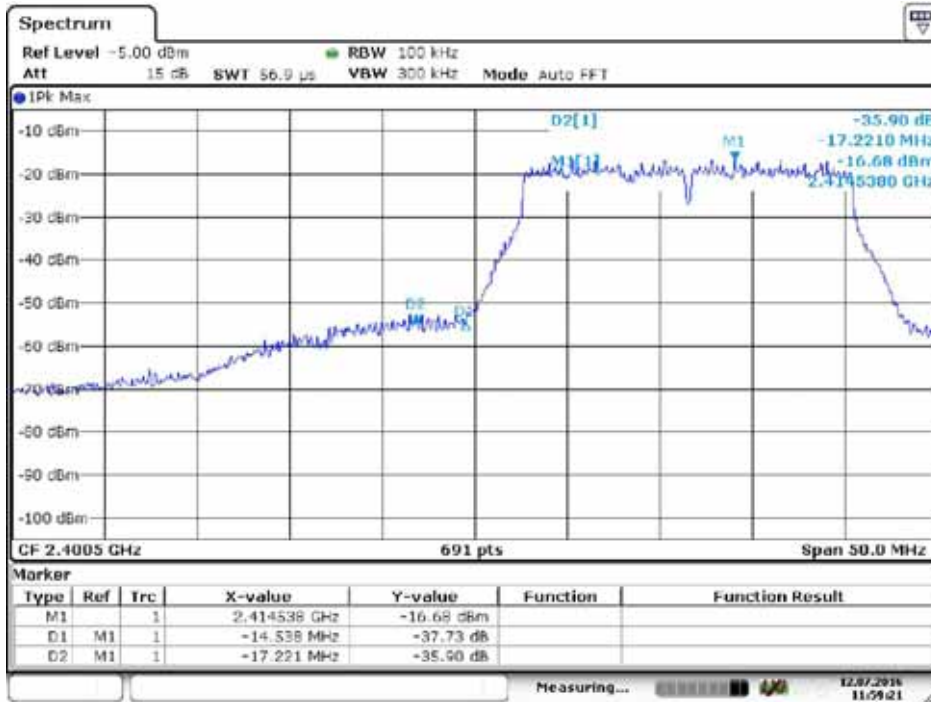
Date: 12 JUL 2016 11:57:01

Screenshot: lower band edge g mode



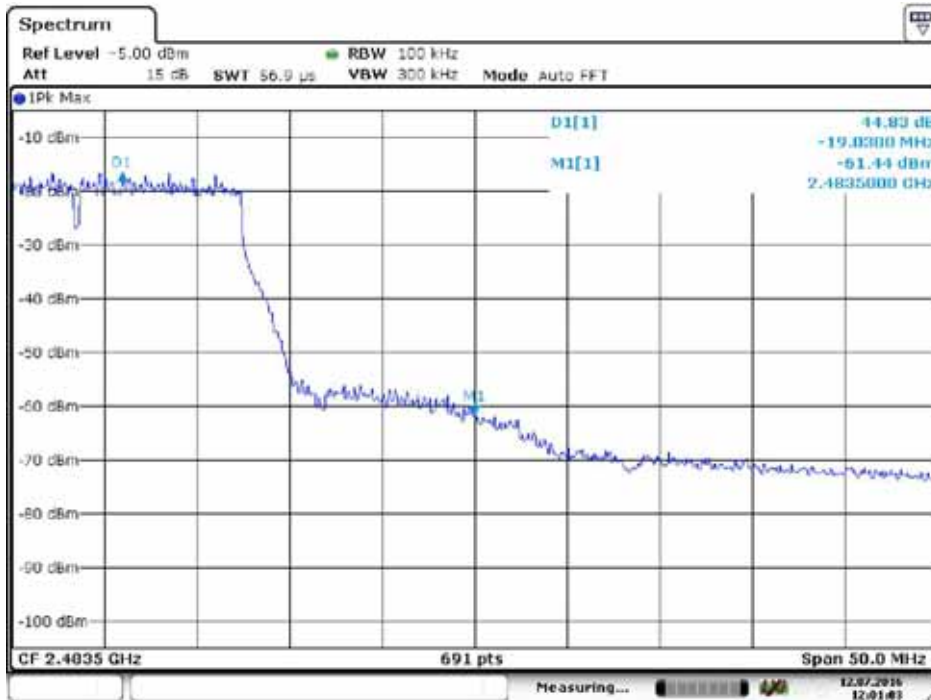
Date: 12 JUL 2016 11:54:22

Screenshot: Upper Screenshot: upper band edge g mode



Date: 12 JUL 2016 11:59:21

Screenshot: lower band edge n mode



Date: 12 JUL 2016 12:01:03

Screenshot: upper band edge n mode

Test results

Band edge	Delta [dBc]	Limit [dBc]	Margin [dB]
Lower	48.5	30	18.5
Upper	55.6	30	25.6

Band edge	Delta [dBc]	Limit [dBc]	Margin [dB]
Lower	36.0	30	6.0
Upper	46.3	30	16.3

Band edge	Delta [dBc]	Limit [dBc]	Margin [dB]
Lower	35.9	30.0	5.9
Upper	44.8	30.0	14.8

7 CONDUCTED OUTPUT POWER

Date of test:	2016-07-12	Test location:	Stora Hallen
EUT Serial:	No serial on EUT	Ambient temp:	23°C
Tested by:	Matti Virkki	Relative humidity:	52 %
Test result:	Pass	Margin:	13.5 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: 1% OBW
 VBW: 3 x RBW
 Span: >3 x OBW

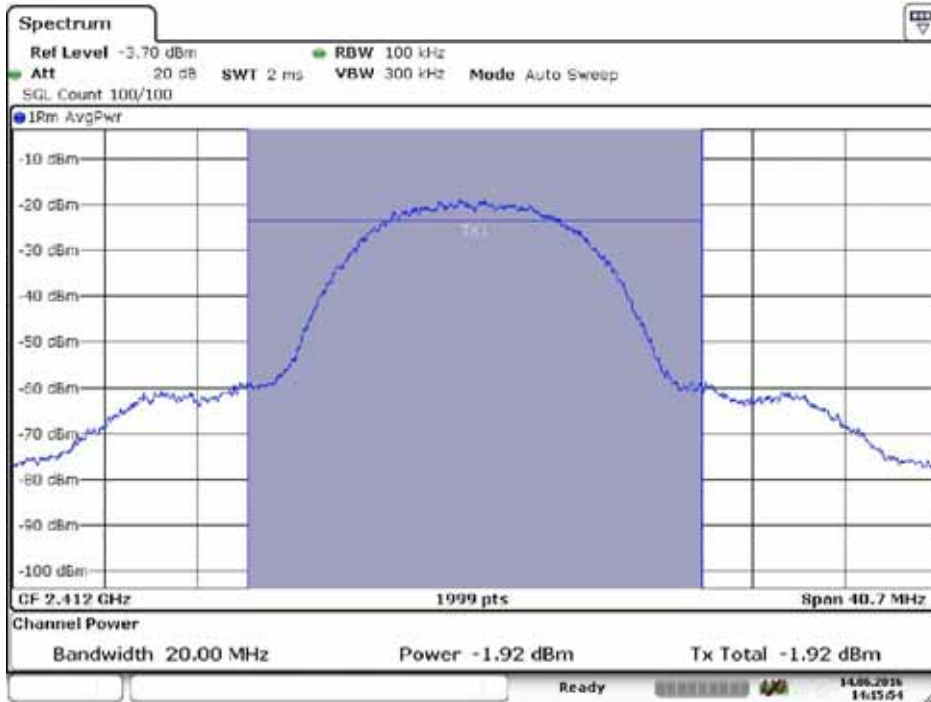
The EUT was set up in order to emit maximum disturbances.

7.3 Requirements

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

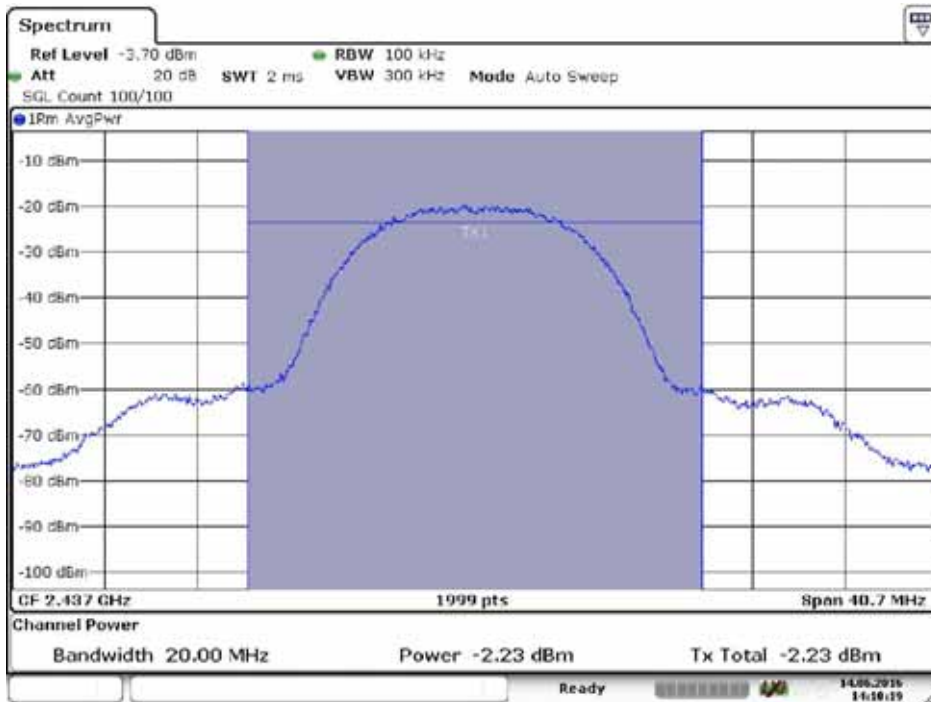
For DTSs employing digital modulation techniques operating in the bands 902 – 128 MHz, 2400 – 2483.5 MHz and 5725 – 5850 MHz, the maximum peak conducted output power shall not exceed 1W.

7.4 Test results



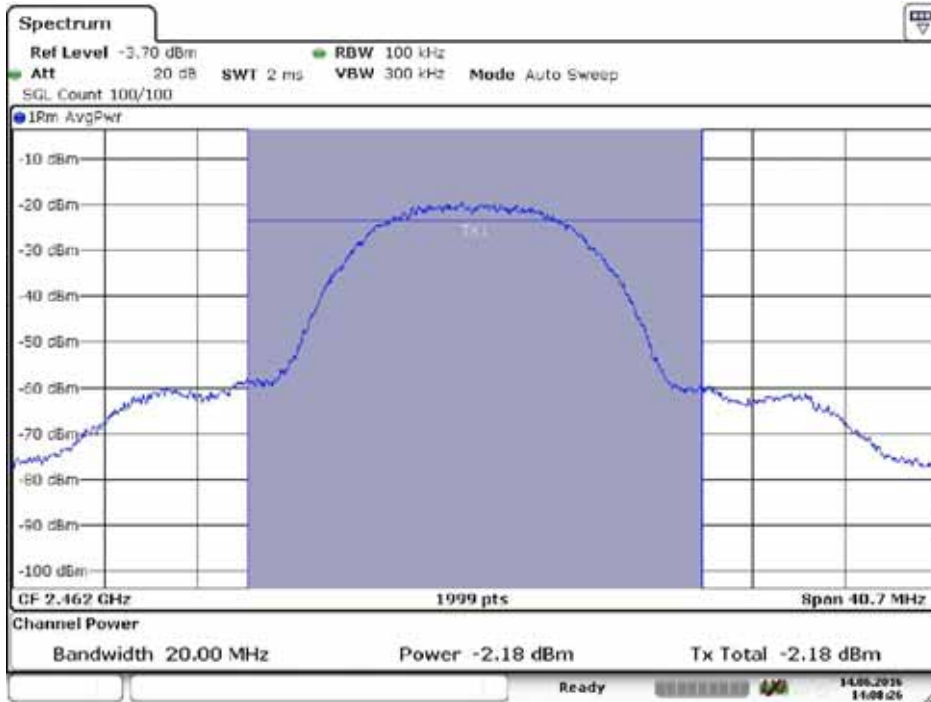
Date: 14 JUN 2016 14:15:54

Screenshot: Output power, low channel b mode



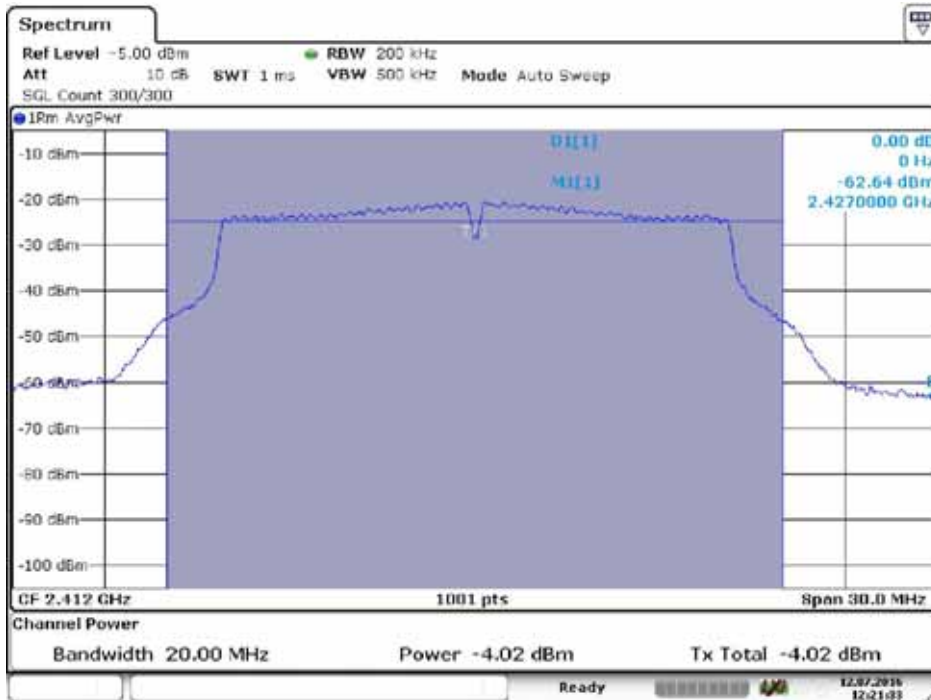
Date: 14 JUN 2016 14:16:20

Screenshot: Output power, middle channel b mode



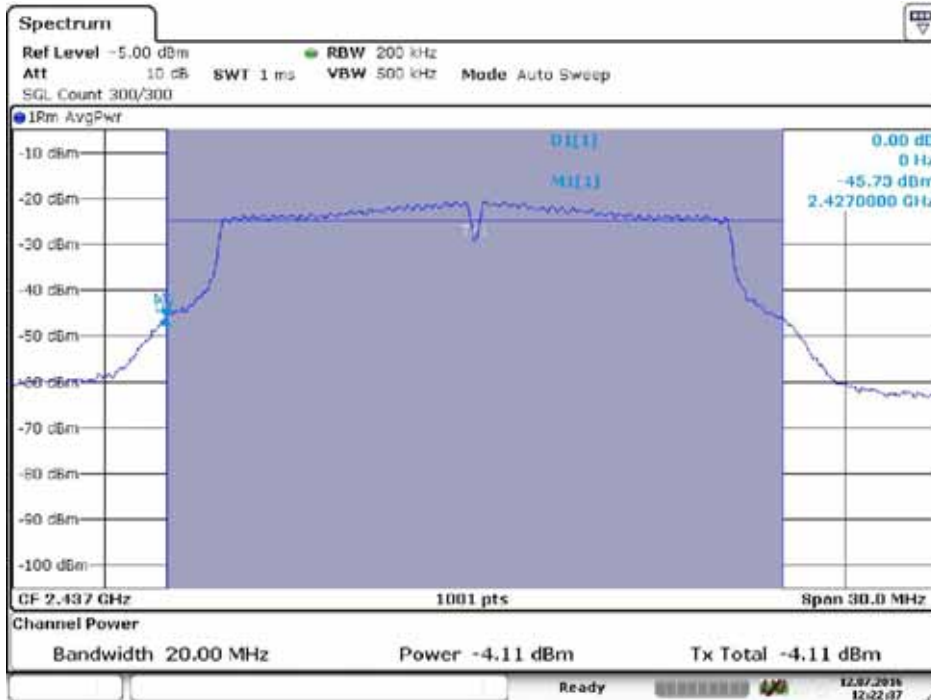
Date: 14 JUN 2016 14:08:26

Screenshot: Output power, high channel b mode



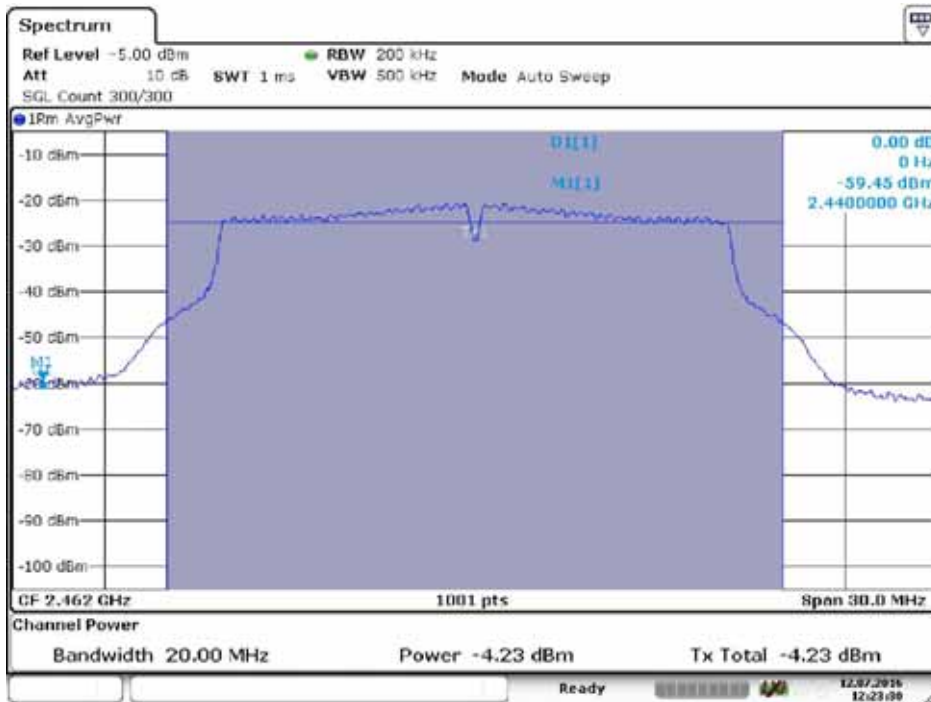
Date: 12 JUL 2016 12:21:33

Screenshot: Output power, low channel g mode



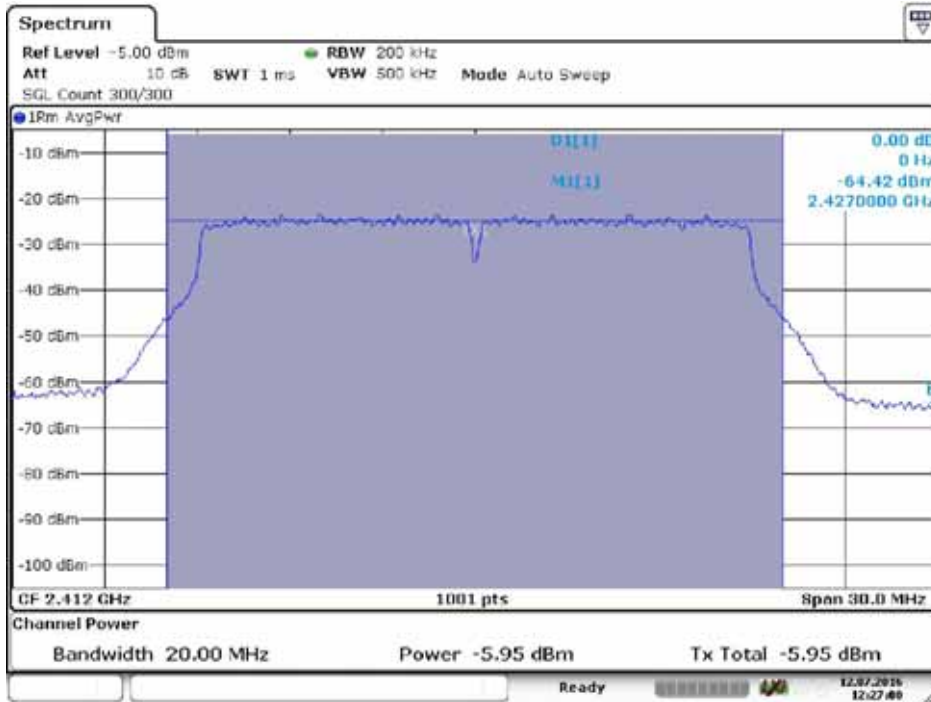
Date: 12 JUL 2016 12:22:37

Screenshot: Output power, middle channel g mode



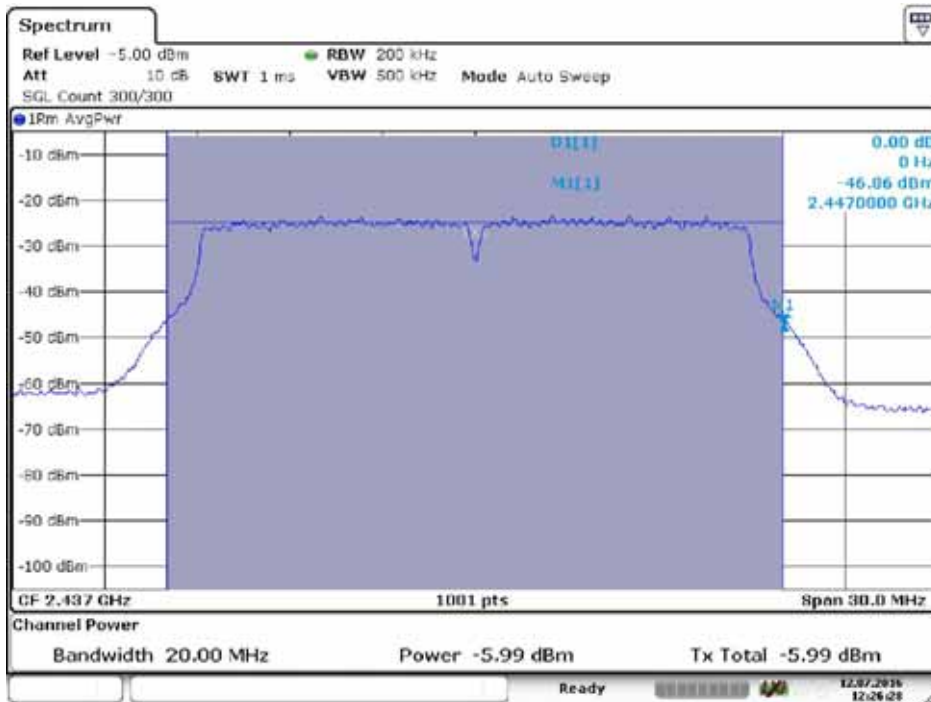
Date: 12 JUL 2016 12:23:30

Screenshot: Output power, high channel g mode



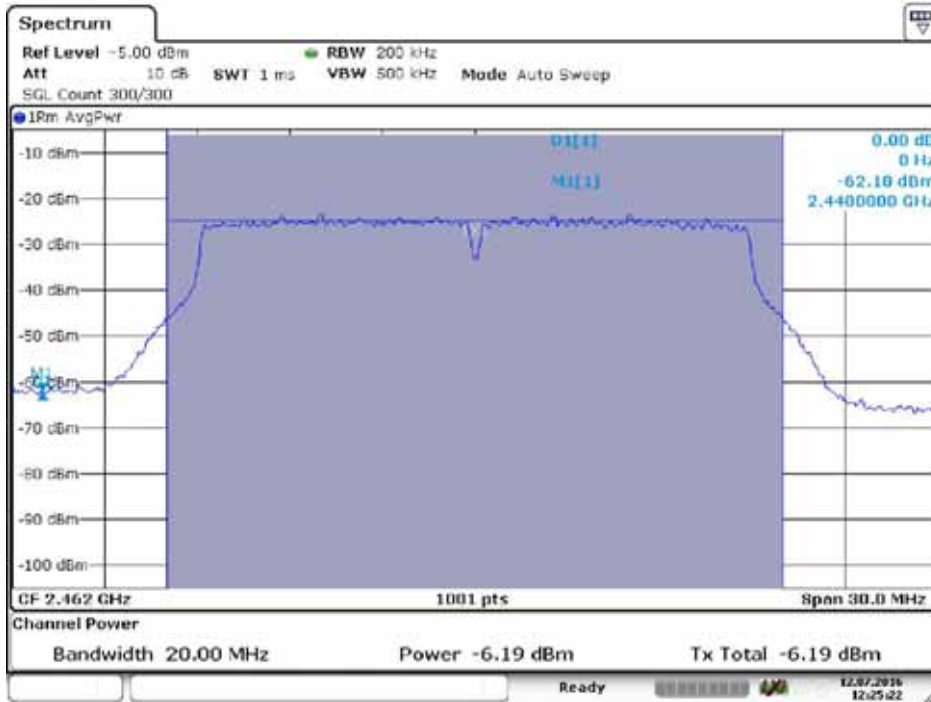
Date: 12 JUL 2016 12:27:01

Screenshot: Output power, low channel n mode



Date: 12 JUL 2016 12:26:29

Screenshot: Output power, middle channel n mode



Date: 12 JUL 2016 12:25:22

Screenshot: Output power, high channel n mode

Test result

b mode

Channel [MHz]	SA reading [dBm]	Path loss [dB]	Output power [dBm]	Limit [dBm]	Margin [dB]
2412	-1.92	18.4	16.5	30.0	13.5
2437	-2.23	18.4	16.2	30.0	13.7
2463	-2.18	18.4	16.2	30.0	13.7

g mode

Channel [MHz]	SA reading [dBm]	Path loss [dB]	Output power [dBm]	Limit [dBm]	Margin [dB]
2412	-4.02	18.4	14.4	30.0	15.6
2437	-4.11	18.4	14.3	30.0	15.7
2463	-4.23	18.4	14.2	30.0	15.8

n mode

Channel [MHz]	SA reading [dBm]	Path loss [dB]	Output power [dBm]	Limit [dBm]	Margin [dB]
2412	-5.95	18.4	12.4	30.0	17.6
2437	-5.99	18.4	12.4	30.0	17.6
2463	-6.19	18.4	12.2	30.0	17.8

8 OCCUPIED 6 DB BANDWIDTH

Date of test:	2016-06-14	Test location:	Wireless Center
EUT Serial:	No serial on eut	Ambient temp:	22 °C
Tested by:	Matti Virkki	Relative humidity:	36 %
Test result:	Pass	Margin:	7374 kHz

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

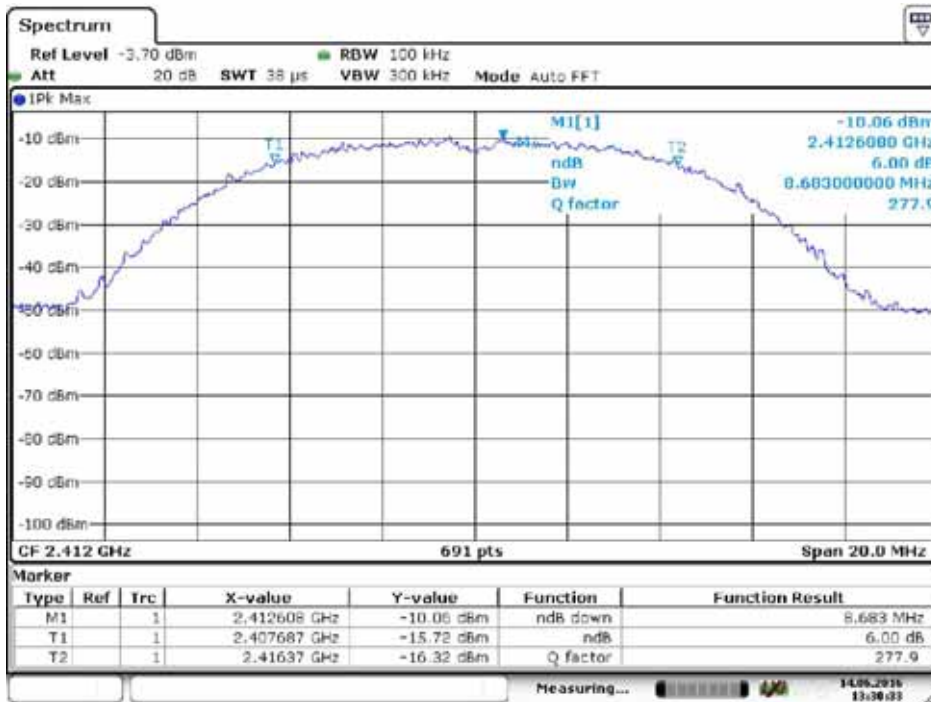
Detector: Peak,
 RBW: 100 kHz
 VBW: 3 x RBW
 Span: >1,5 x OBW

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

8.3 Requirements

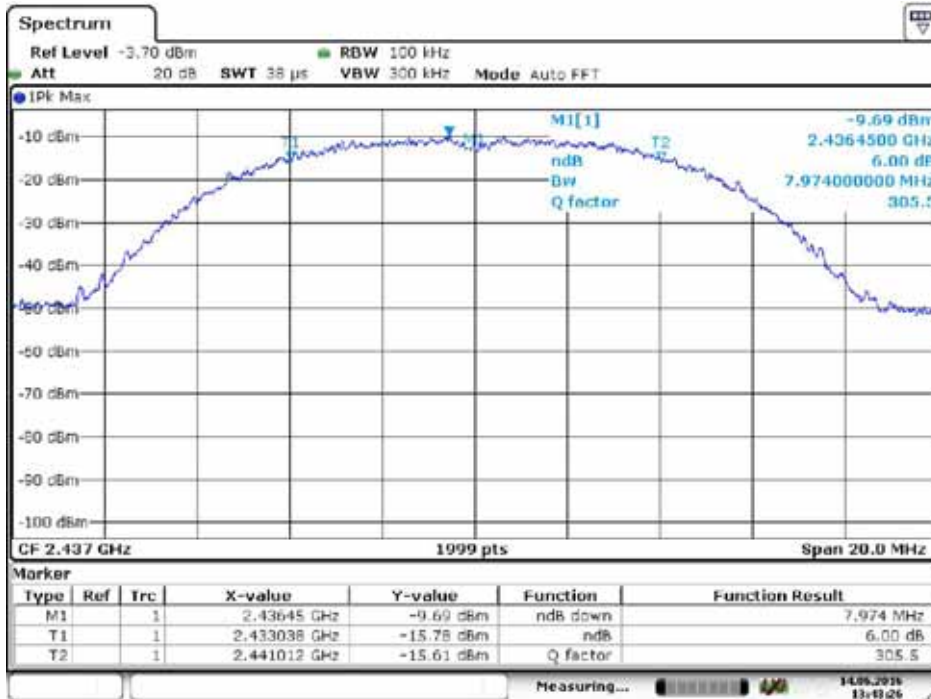
Reference: CFR 47§15.247(a)(2), RSS-247 5.2(1)
 The minimum 6 dB bandwidth shall be 500 kHz.

8.4 Test results



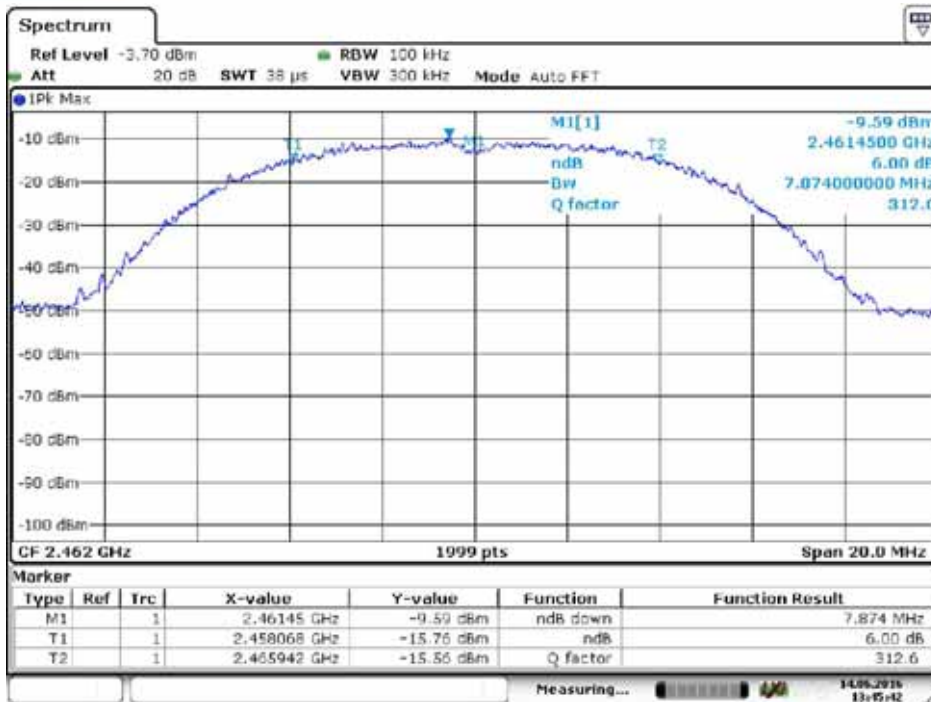
Date: 14 JUN 2016 13:30:34

Screenshot: Occupied 6 dB bandwidth Measurement, low channel b mode



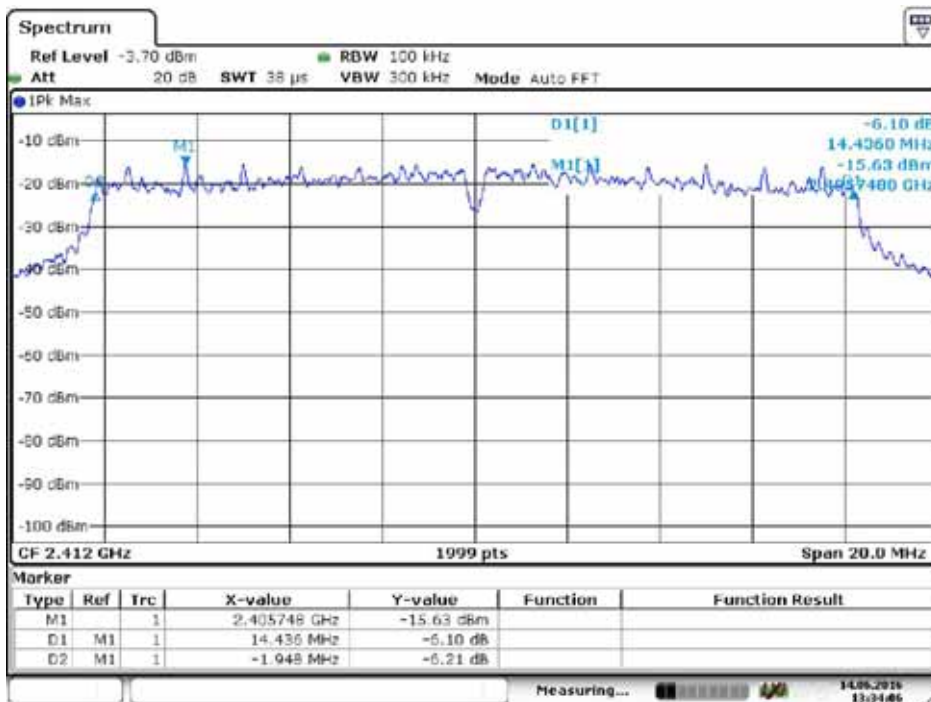
Date: 14 JUN 2016 13:43:26

Screenshot: Occupied 6 dB bandwidth Measurement, middle channel b mode



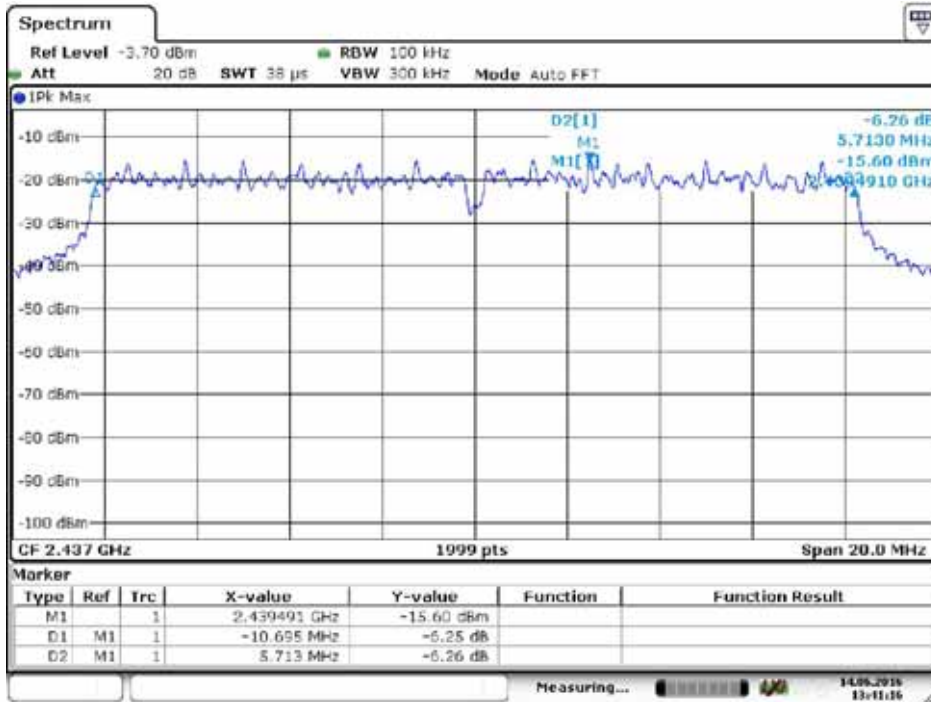
Date: 14 JUN 2016 13:45:42

Screenshot: Occupied 6 dB bandwidth Measurement, high channel b mode



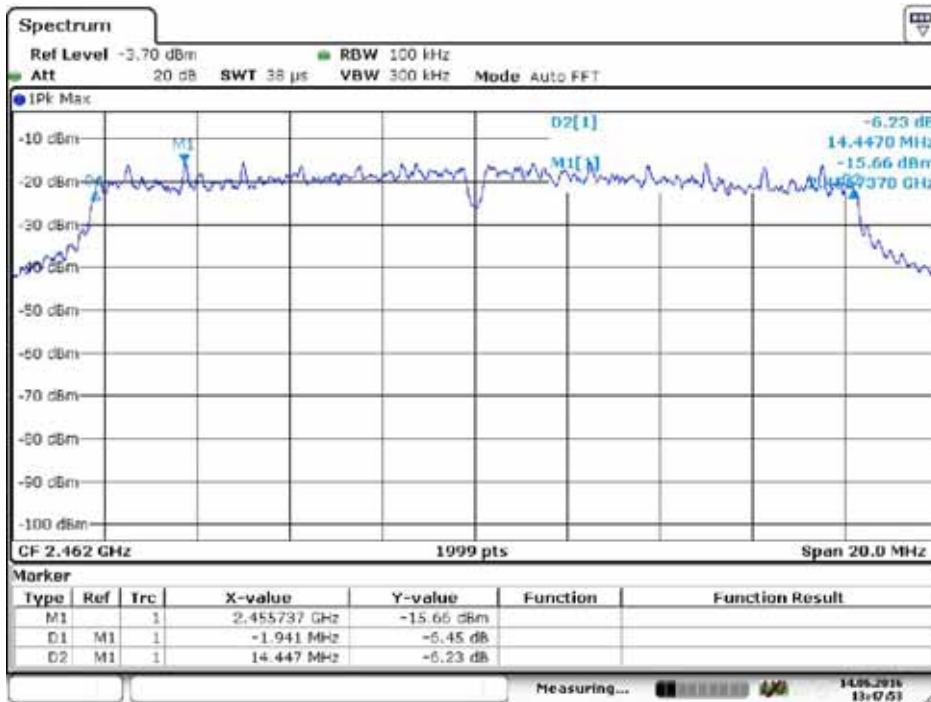
Date: 14 JUN 2016 13:34:06

Screenshot: Occupied 6 dB bandwidth Measurement, low channel g mode



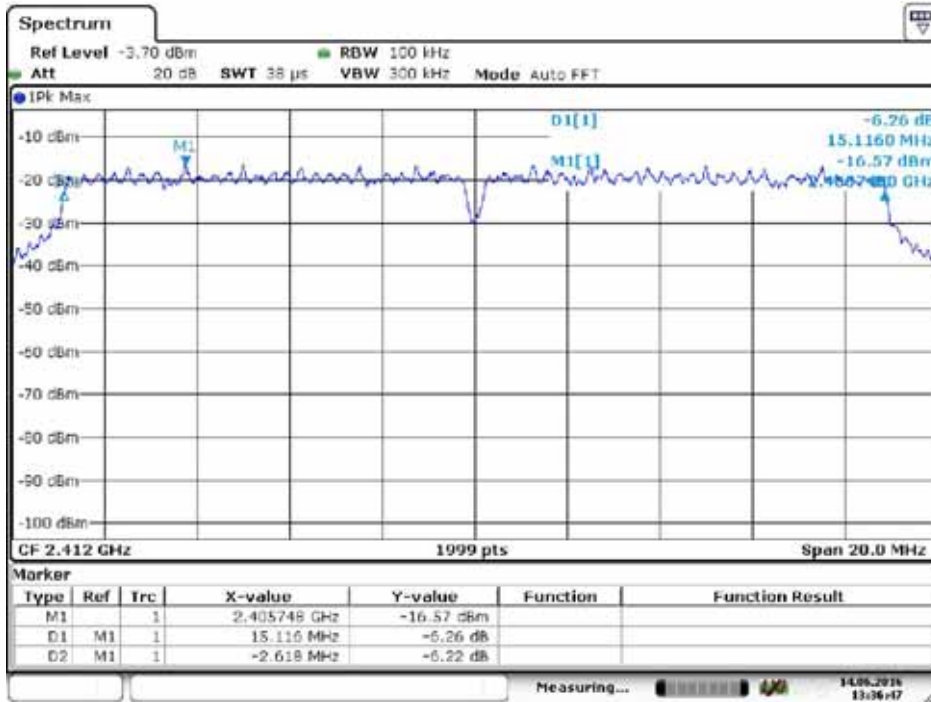
Date: 14 JUN 2016 13:11:17

Screenshot: Occupied 6 dB bandwidth Measurement, middle channel g mode



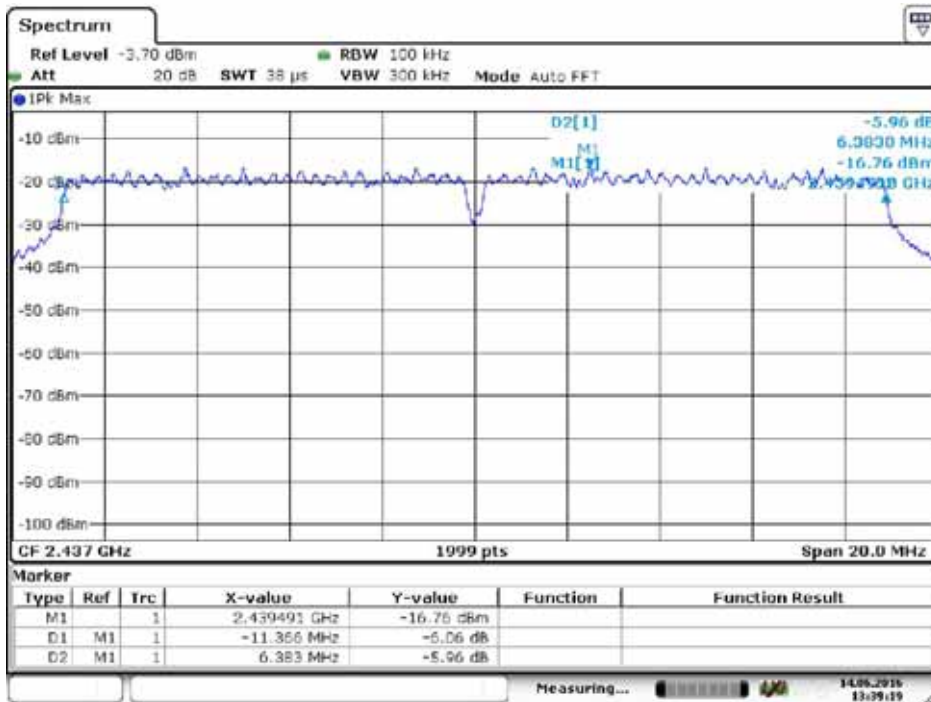
Date: 14 JUN 2016 13:47:53

Screenshot: Occupied 6 dB bandwidth Measurement, high channel g mode



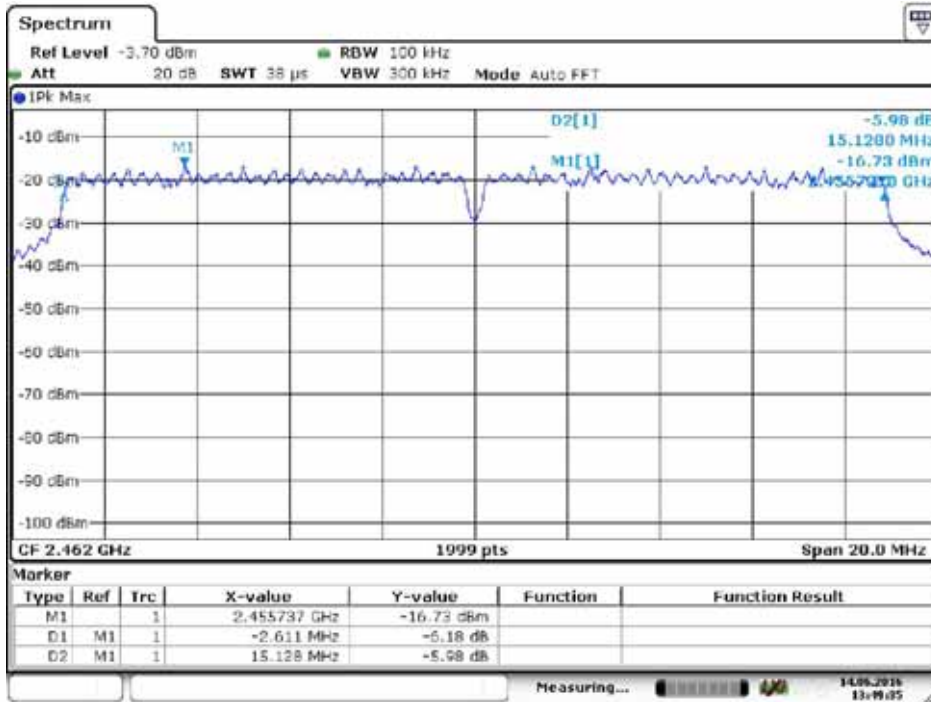
Date: 14 JUN 2016 13:36:47

Screenshot: Occupied 6 dB bandwidth Measurement, low channel n mode



Date: 14 JUN 2016 13:39:19

Screenshot: Occupied 6 dB bandwidth Measurement, middle channel n mode



Date: 14 JUN 2016 13:49:36

Screenshot: Occupied 6 dB bandwidth Measurement, high channel n mode

Test result

Channel [MHz]	6 dB BW [MHz]	Limit [kHz]	Margin [kHz]
2412	8.683	500	8383
2437	7.974	500	7474
2462	7.874	500	7374

Channel [MHz]	6 dB BW [MHz]	Limit [kHz]	Margin [kHz]
2412	16.384	500	15884
2437	16.408	500	15908
2462	16.388	500	15888

Channel [MHz]	6 dB BW [MHz]	Limit [kHz]	Margin [kHz]
2412	17.734	500	17234
2437	17.749	500	17249
2462	17.739	500	17239

9 POWER SPECTRAL DENSITY

Date of test:	2016-06-14	Test location:	Wireless Center
EUT number:	No serial on eut	Ambient temp:	22 °C
Tested by:	Matti Virkki	Relative humidity:	36 %
Test result:	Pass	Margin:	21.8 dB

9.1 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.

9.2 Test conditions

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

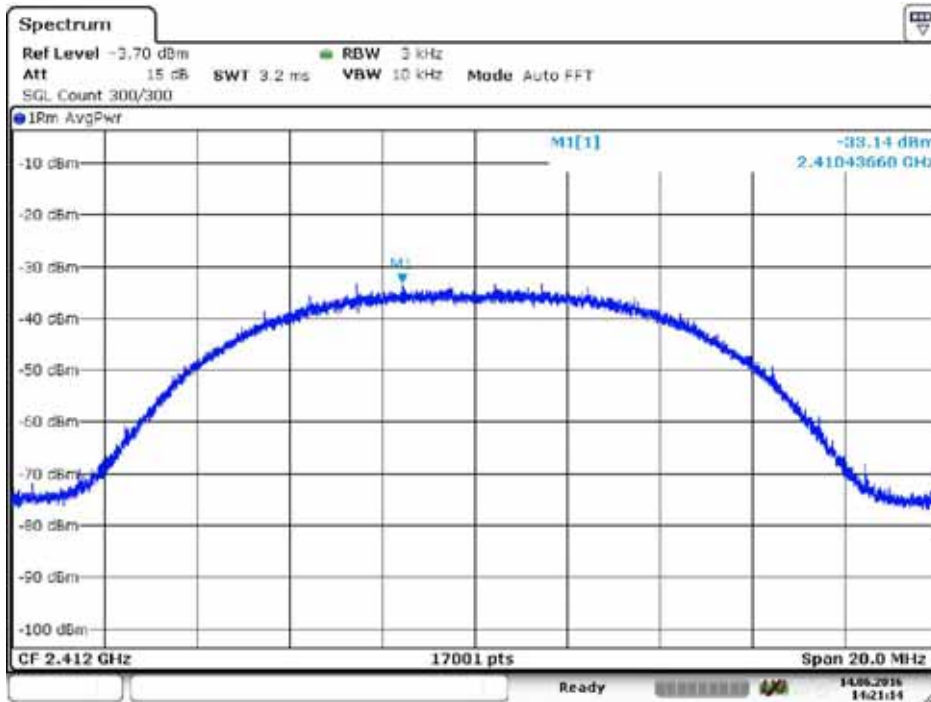
The EUT was set up in order to emit maximum disturbances.

9.3 Requirements

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

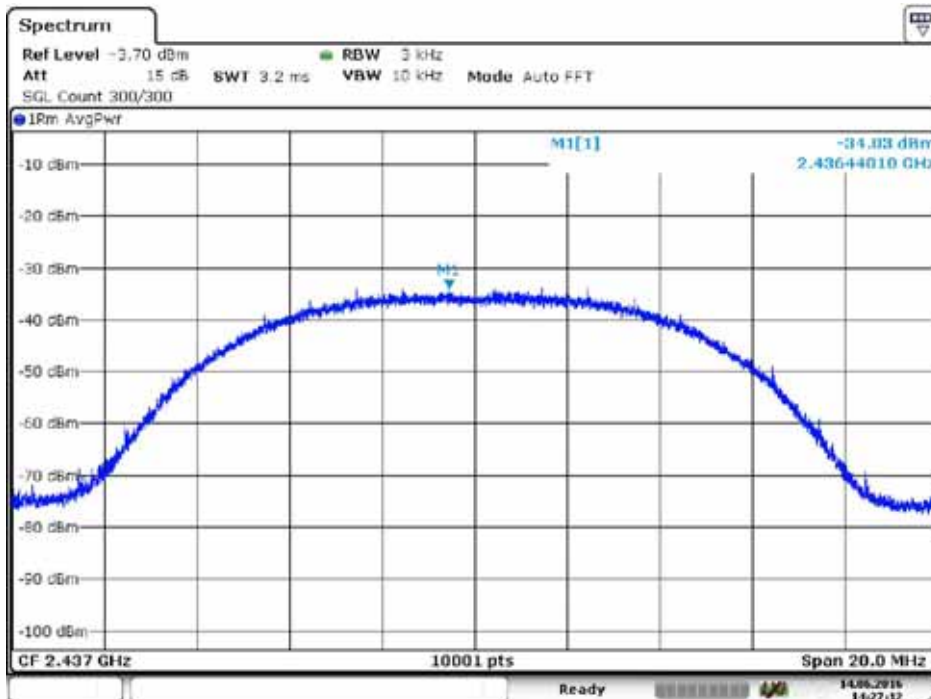
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

9.4 Test results



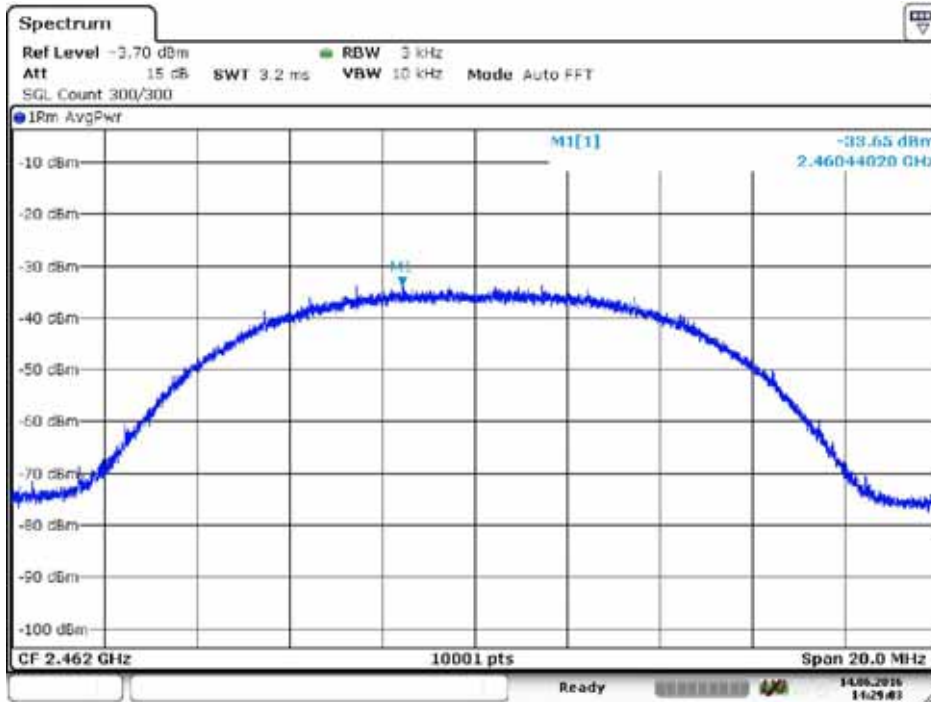
Date: 14 JUN 2016 14:21:14

Screenshot: Peak power spectral density, low channel b mode



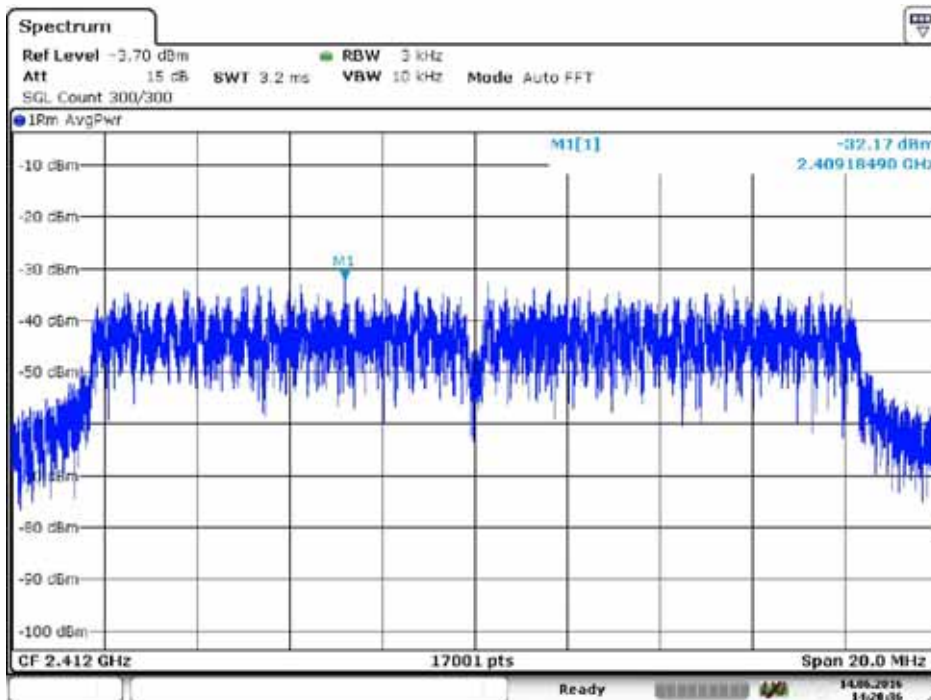
Date: 14 JUN 2016 14:27:13

Screenshot: Peak power spectral density, middle channel b mode



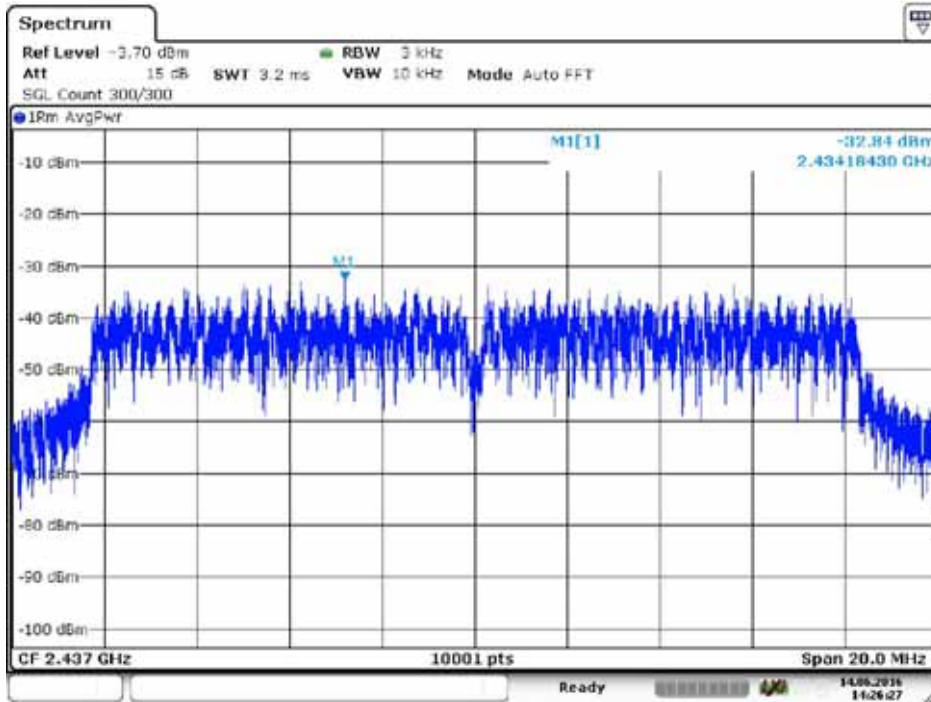
Date: 14 JUN 2016 14:29:03

Screenshot: Peak power spectral density, high channel b mode



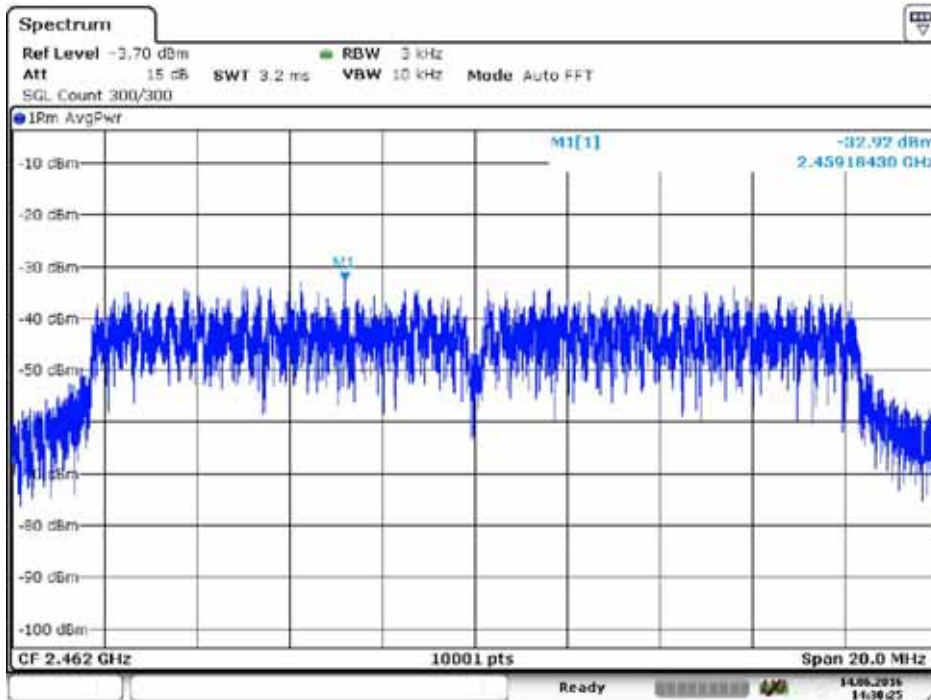
Date: 14 JUN 2016 14:20:37

Screenshot: Peak power spectral density, low channel g mode



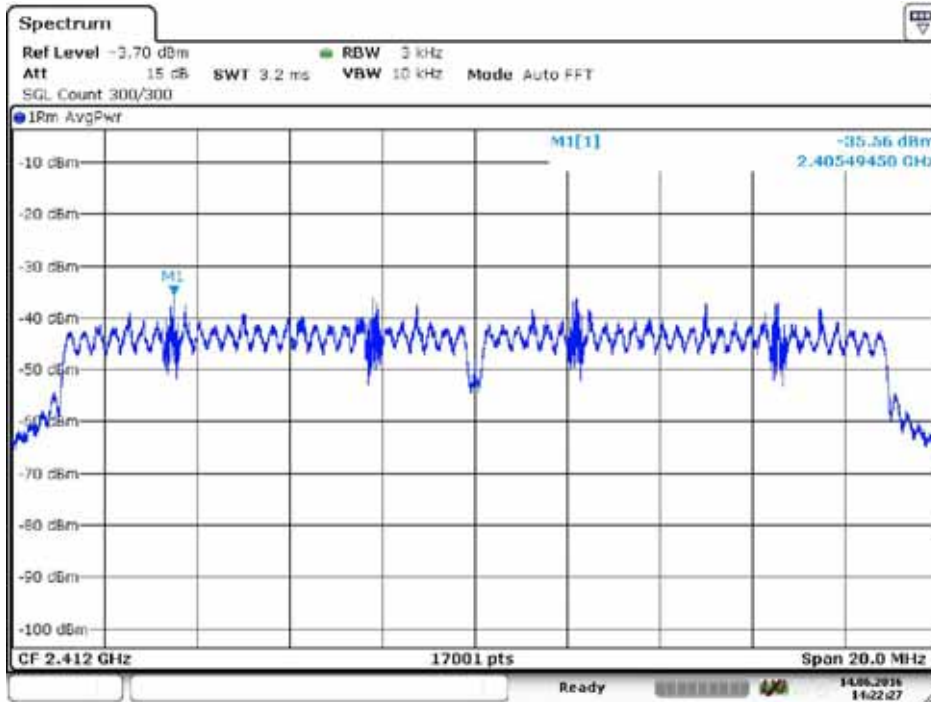
Date: 14 JUN 2016 14:26:26

Screenshot: Peak power spectral density, middle channel g mode



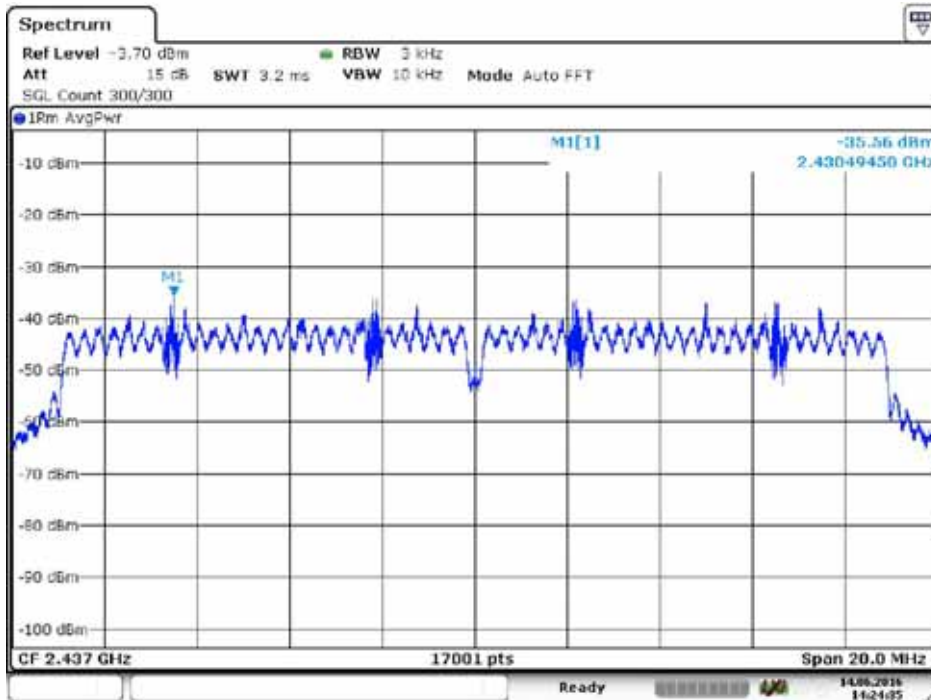
Date: 14 JUN 2016 14:30:25

Screenshot: Peak power spectral density, high channel g mode



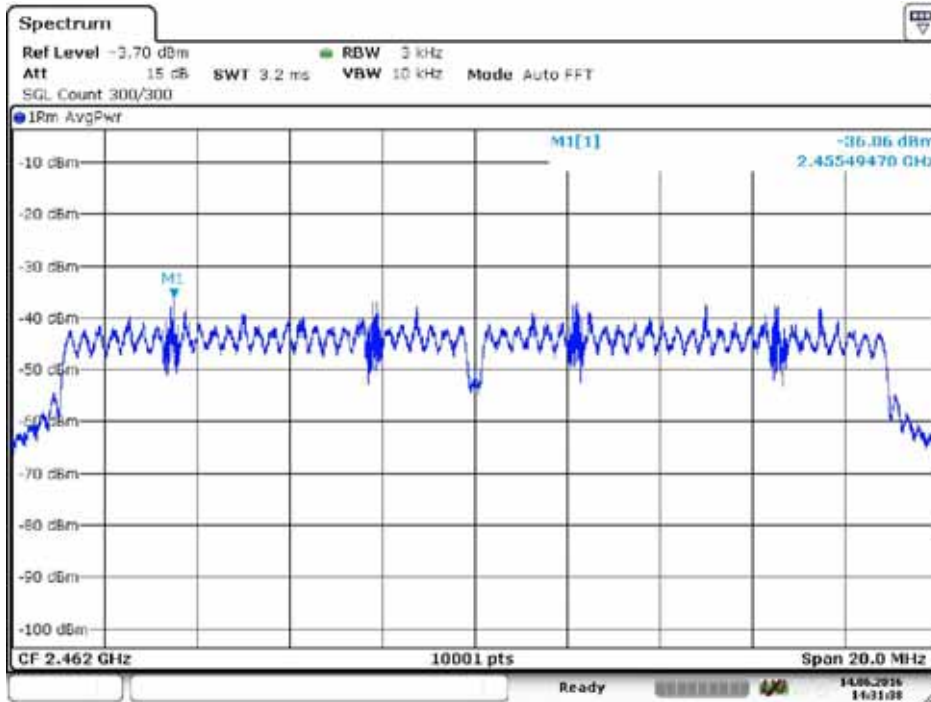
Date: 14 JUN 2016 14:22:28

Screenshot: Peak power spectral density, low channel n mode



Date: 14 JUN 2016 14:24:36

Screenshot: Peak power spectral density, middle channel n mode



Date: 14 JUN 2016 14:31:38

Screenshot: Peak power spectral density, high channel n mode

Test result

Channel [MHz]	SA reading [dBm]	Path loss [dB]	PSD [dBm/3kHz]	Limit [dBm]	Margin [dB]
2412	-33.14	18.4	-14.7	8	22.7
2437	-34.03	18.4	-15.6	8	23.6
2462	-33.63	18.4	-15.2	8	23.2

Channel [MHz]	SA reading [dBm]	Path loss [dB]	PSD [dBm/3kHz]	Limit [dBm]	Margin [dB]
2412	-32.17	18.4	-13.8	8	21.8
2437	-32.84	18.4	-15.4	8	23.4
2462	-32.97	18.4	-14.6	8	22.6

Channel [MHz]	SA reading [dBm]	Path loss [dB]	PSD [dBm/3kHz]	Limit [dBm]	Margin [dB]
2412	-35.56	18.4	-17.2	8	25.2
2437	-35.56	18.4	-17.2	8	25.2
2462	-36.06	18.4	-17.7	8	25.7

10 TEST EQUIPMENT

Conducted emission test site BUR 3

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde & Schwarz	EMC32 - Version 8.51	--	--	--
Receiver	Rohde & Schwarz	ESCI	31686	2015-07-04	1 year
AMN / LISN	Rohde & Schwarz	ESH3-Z5	2727	7/2014	3 years

Stora Hallen

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde & Schwarz	EMC32 - 8.51	--	--	--
Receiver	Rohde & Schwarz	ESU 8	12866	7/2015	1 year
Receiver	Rohde & Schwarz	ESU 40	13178	7/2015	1 year
BiLog antenna	Chase	CBL6110A	971	7/2015	3 years
Preamplifier	Semko	AM1331	30366	6/2016	1 year
Horn antenna	Rohde & Schwarz	HF907	31245	11/2013	3 years
Preamplifier	BONN	BLMA 0118-M	31246	7/2015	1 year
2,4 GHz band reject filter:	K&L MICROWAVE INC	6N45-2450/T100-0/0	12389	7/2015	1 year
4 GHz high pass filter	K&L MICROWAVE INC	4410-X4500/18000-0/0	5133	7/2015	1 year

Wireless Center and 3m FAC

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde & Schwarz	EMC32 - Version	--	--	--
Signal analyzer	Rohde & Schwarz	FSIQ 40	12793	7/2015	1 year
Measurement cable	Huber+Suhner	Sucoflex 104 PE	39070	7/2015	1 year
Measurement cable	Huber+Suhner	Sucoflex 104 PE	39079	7/2015	1 year
Measurement cable	Huber+Suhner	Sucoflex 104	5191	7/2015	1 year
Pre amplifier	Sangus	00101400-23-10P -6-S ; AFS44-12002400-32-10P -44	12335	7/2015	1 year
Horn antenna	EMCO	3160-09	30101	8/2013	3 years
Signal analyzer:	Rohde & Schwarz	FSV	32594	7/2015	1 year
Signal analyzer	Rohde & Schwarz	FSIQ 40	12793	7/2015	1 year
10 dB Attenuator:	Huber+Suhner	5910_N-50-010	32696	7/2015	1 year

11 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 %.

12 TEST SET UP AND EUT PHOTOS

EUT photos are in separate document 1610783STOSTO-004 Annex 1.

Test set up photos are in separate document 1610783STOSTO-004 Annex 2.