

Test Report



INTENTIONAL RADIATOR TESTS ACCORDING TO FCC PART 15 C and INDUSTRY CANADA REQUIREMENTS

Equipment Under Test: Throwable wireless 2.4GHz microphone system receiver

Model: Catchbox 2.4 Receiver

Type: -

Manufacturer: Trick Technologies Oy
Betonimiehenkuja 3D
02150 ESPOO
FINLAND

Customer: Trick Technologies Oy
Betonimiehenkuja 3D
02150 ESPOO
FINLAND

FCC Rule Part: 15.247: 2013
IC Rule Part: RSS-210, Issue 8, 2010
RSS-GEN Issue 3, 2010

KDB: Guidance for Performing Compliance
Measurements on Digital Transmission Systems
(DTS) Operating Under §15.247 (April 9, 2013)

Date: 17.6.2014

Issued by:

A blue ink signature of Niko Kotsalo.

Niko Kotsalo
Test Engineer

Date: 17.6.2014

Checked by:

A blue ink signature of Jari Merikari.

Jari Merikari
Technical Manager

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Equipment Under Test (EUT)

Catchbox 2.4 Throwable wireless microphone receiver
 Model: Catchbox 2.4 Receiver
 Type: -
 Serial no: -
 HW version: CB24RX001
 SW version: Catchbox Basic RX
 FCC ID: 2AB78CB24RX001
 IC: -

Description of the EUT

The EUT is a receiver for a wireless microphone system operating in the 2.4 GHz frequency band. Microphone system is intended to be used in small and medium sized events. The test results for transmitter microphone are located in SGS Fimko test report with reference number 274725-2-1.

Classification of the device

Fixed device	<input type="checkbox"/>
Mobile Device (Human body distance > 20cm)	<input checked="" type="checkbox"/>
Portable Device (Human body distance < 20cm)	<input type="checkbox"/>

Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing

Ratings and declarations

Operating Frequency Range (OFR): 2402 – 2480 MHz
 Channels: 18
 Channel separation: 4 MHz
 Channel bandwidth: 3.965267728 MHz
 Effective conducted power: 8.27 dBm
 Transmission technique: Digital Transmission
 Modulation: 8FSK
 Integral Antenna gain: 2.2 dBi

Power Supply

AC/DC adapter 5.0 VDC / 100-240 VAC, 50-60 Hz

Mechanical Size of the EUT

Height: 3.5 cm	Width: 12.5 cm	Length: 13 cm
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Samples

A commercial sample was used in the tests. During the tests the EUT was set into continuous transmit mode with Texas Instruments PurePath Wireless Commander computer software. Hopping was stopped into the channel under test. Normal test modulation and maximum transmit power was used in all tests. No modifications were done during the tests.

Disclaimer

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Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only. This document cannot be reproduced except in full, without prior approval of the Company.

SUMMARY OF TESTING

Test Specification	Description of Test	Result
§15.247(b)(3) / RSS-210 A8.4	Maximum Peak Conducted Output Power	PASS
§15.247(a)(2) / RSS-210 A8.2	6 dB Bandwidth	PASS
§15.247(e) / RSS-210 A8.2	Power Spectral Density	PASS
RSS-GEN 4.6.1	99% Occupied Bandwidth	PASS
§15.247(d) / RSS-210 A8.5	100 kHz Bandwidth of Frequency Band Edges and Conducted Spurious Emissions	PASS
§15.209(a), §15.247(d) / RSS-210 A8.5	Radiated Emissions Within The Restricted Bands	PASS
§15.109 / RSS-GEN 7.2.3.2	Unintentional Radiated Emissions	PASS

EUT Test Conditions During Testing

The EUT was in continuous transmit mode during all tests. Hopping was stopped and the EUT was configured into the wanted channel. Normal modulation and 98 % duty cycle was applied in all tests. Normal duty cycle of the EUT was measured and it was 2.01 % which is the highest possible duty cycle in normal mode.

Average values for transmitter radiated emissions were calculated from measured peak pulse amplitude and by determining the duty cycle correction factor of the pulse modulation. The duty cycle correction expressed in dB was determined as follows:

$$\text{Duty Cycle Correction} = 20\log(\text{Dwell Time}/100\text{ms})$$

Calculated Duty Cycle Correction for the EUT is - 34.0 dB

Following channels were used during the tests when the hopping was stopped:

Channel Low (Ch 1) = 2406 MHz

Channel Mid (Ch 9) = 2442 MHz

Channel High (Ch 18) = 2474 MHz

Test Facility

<input type="checkbox"/> Testing Location / address: FCC registration number: 90598	SGS Fimko Ltd Särkiniementie 3 FI-00210, HELSINKI FINLAND
<input checked="" type="checkbox"/> Testing Location / address: FCC registration number: 178986 Industry Canada registration number: 8708A-2	SGS Fimko Ltd Karakaarenkuja 4 FI-02610, ESPOO FINLAND

Conducted Emissions In The Frequency Range 150 kHz - 30 MHz.

Standard: ANSI C63.10 (2009)
Tested by: NKO
Date: 12.6.2014
Temperature: 23 °C
Humidity: 49 % RH
Barometric pressure: 1010.3 hPa
Measurement uncertainty: ± 2.9 dB Level of confidence 95 % (k = 2)

FCC Rule: 15.207 (a)

Conducted disturbance voltage was measured with an artificial main network from 150 kHz to 30 MHz with 4.5 kHz steps and a resolution bandwidth of 9 kHz. Measurements were carried out with peak and average detectors.

During the test the EUT was powered from the separate power supply (115VAC / 60 Hz) through the LISN.

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

Conducted Emissions In The Frequency Range 150 kHz – 30 MHz

Conducted Emission Mains FCC Part 15 Class B with ESH3-Z5 8019

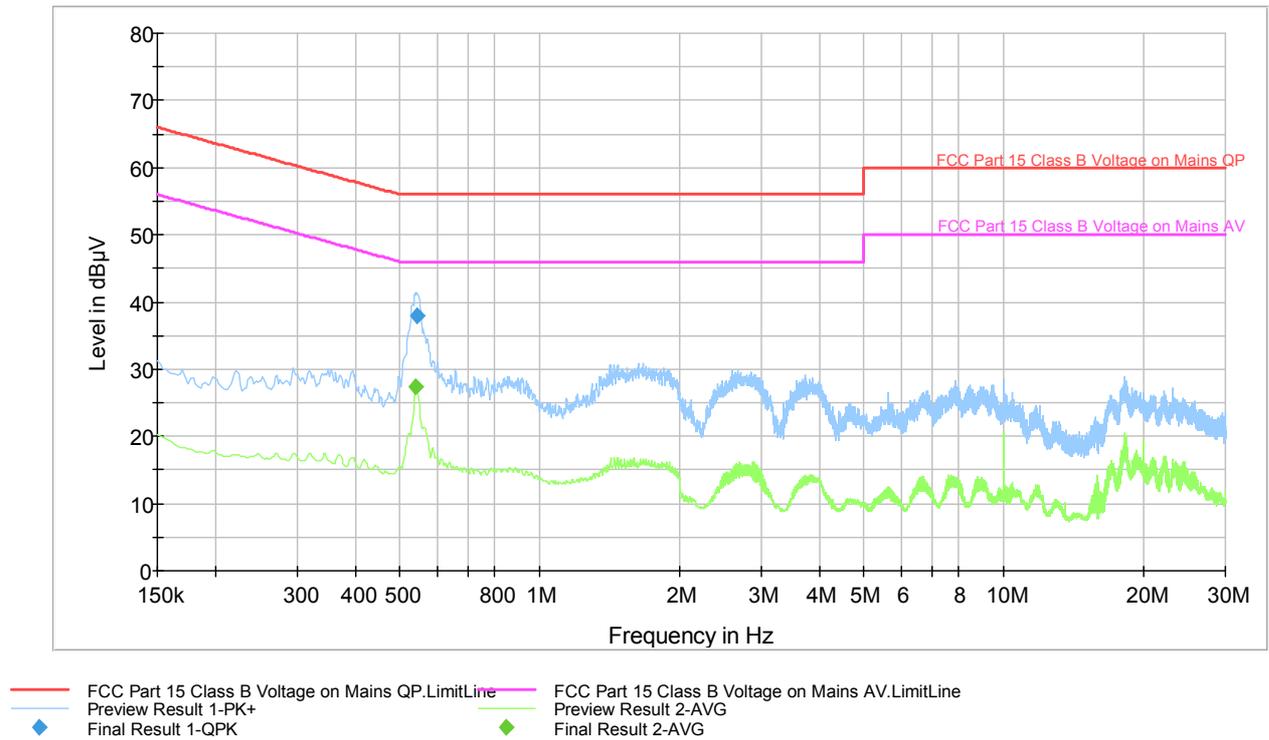


Figure 1. The measured curves with peak- and average detector

Final measurements from the worst frequencies

Table 1. Final QuasiPeak results

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.543750	37.9	1000.0	9.000	GN	N	10.1	18.1	56.0	

Table 2. Final Average results

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.541500	27.4	1000.0	9.000	GN	L1	10.1	18.6	46.0	

Maximum Peak Conducted Output Power

Standard: ANSI C63.10 (2009)
Tested by: NKO
Date: 6.6.2014
Humidity: 48%
Temperature: 24.8 °C
Measurement uncertainty ± 2,87dB Level of confidence 95 % (k = 2)

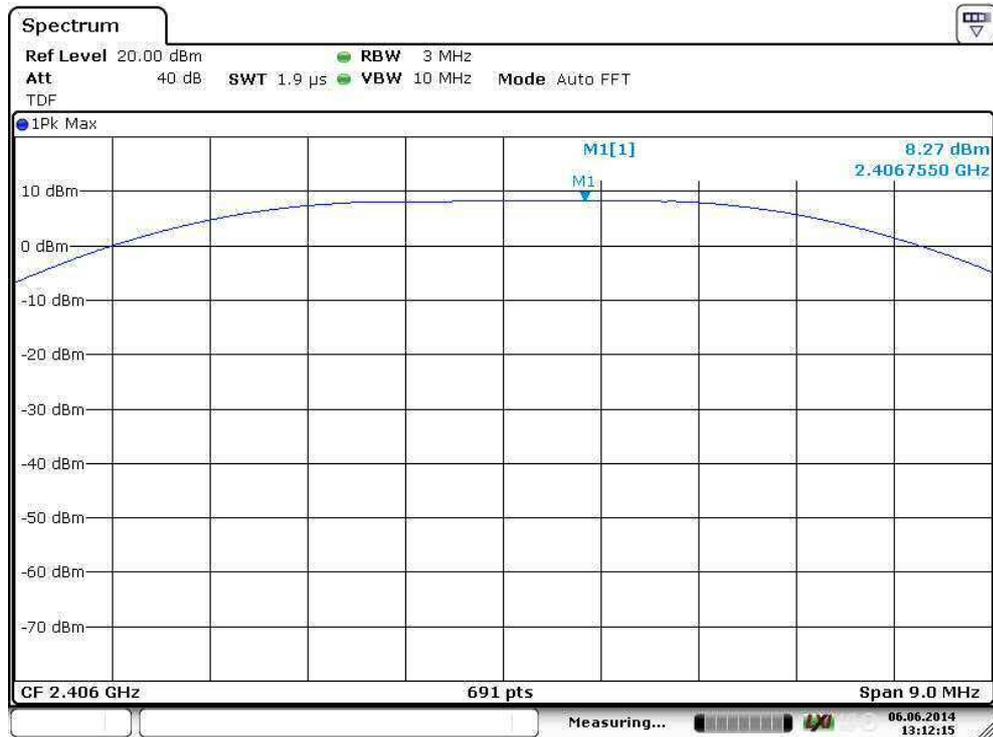
FCC Rule: 15.247(b)(3)

For systems using digital modulation in the 2400-2483.5 MHz bands the limit is 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power.

Results:

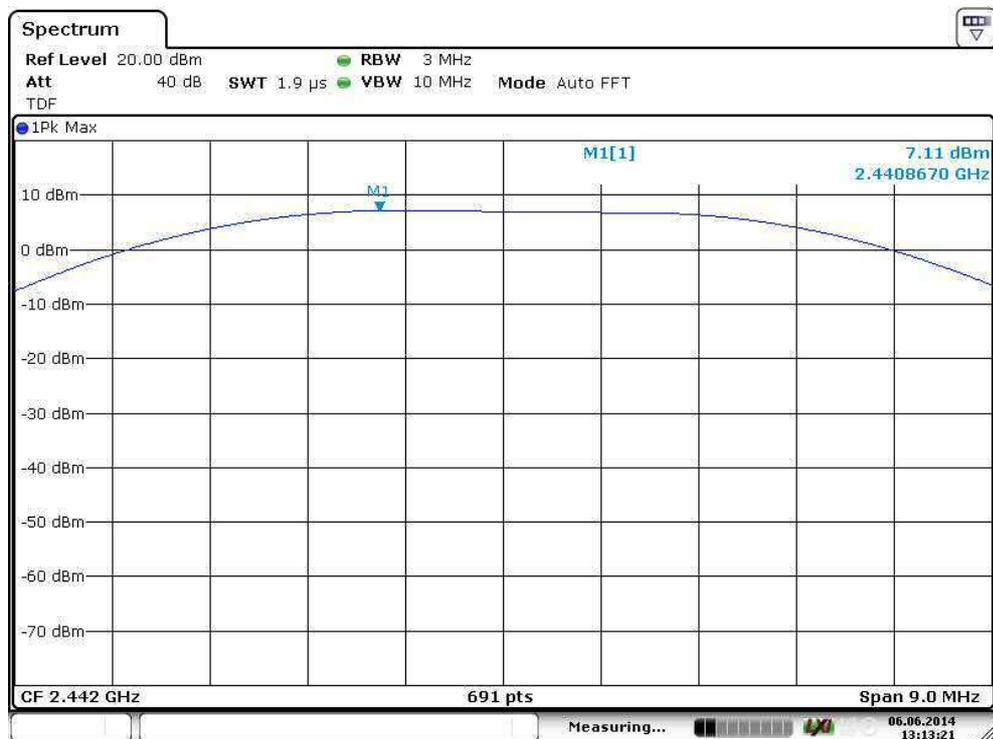
Channel	Conducted Power [dBm]	Limit [dBm]	Margin [dBm]	Result
Low	8.27	30	21.73	PASS
Mid	7.11	30	22.89	PASS
High	6.61	30	23.39	PASS

Conducted Output Power Test



Date: 6.JUN.2014 13:12:15

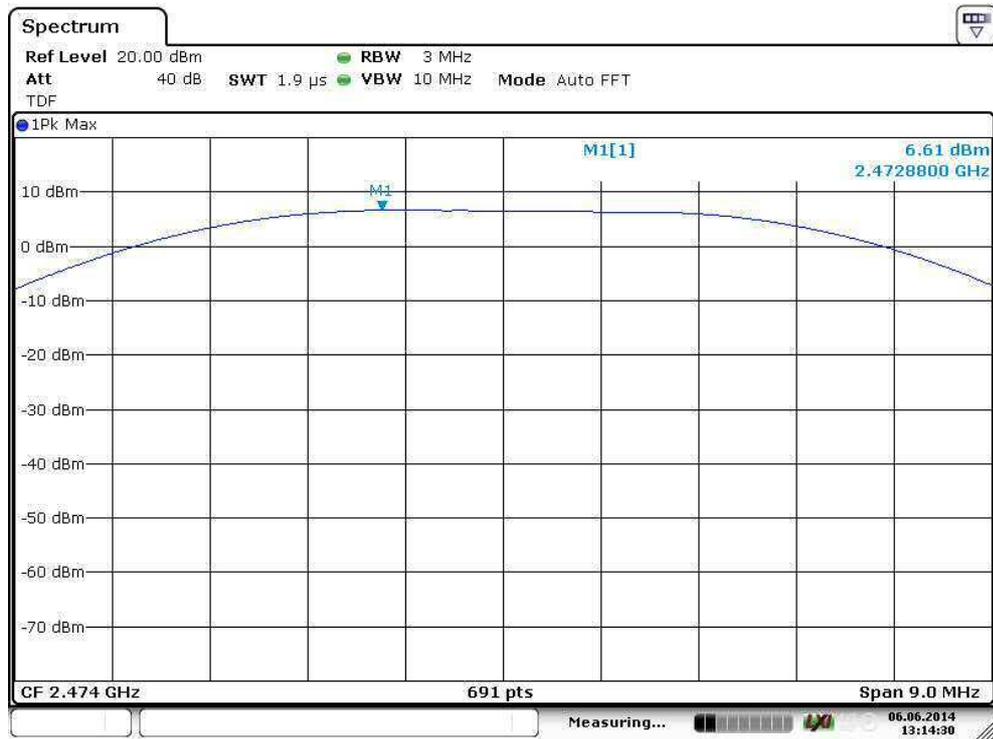
Figure 2. Channel Low.



Date: 6.JUN.2014 13:13:21

Figure 3. Channel Mid.

Conducted Output Power Test



Date: 6.JUN.2014 13:14:30

Figure 4. Channel High.

Transmitter Radiated Spurious Emissions 30 – 1000 MHz

Standard:	ANSI C63.10	(2009)
Tested by:	NKO	
Date:	17.4. – 20.5.2014	
Humidity:	20 – 46.5 %	
Temperature:	22.0 – 25.6 °C	
Measurement uncertainty	± 4.51 dB	Level of confidence 95 % (k = 2)

FCC Rule: 15.247(d), 15.209(a)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

The correction factor in the final result table contains the sum of the transducers (antenna + amplifier + cables). The QuasiPeak value is the measured value corrected with the correction factor.

Measured Peak Values In The Frequency Range 30 MHz - 1000 MHz.

FCC Part 15 Class B Spurious Emission 30-1000MHz 3m

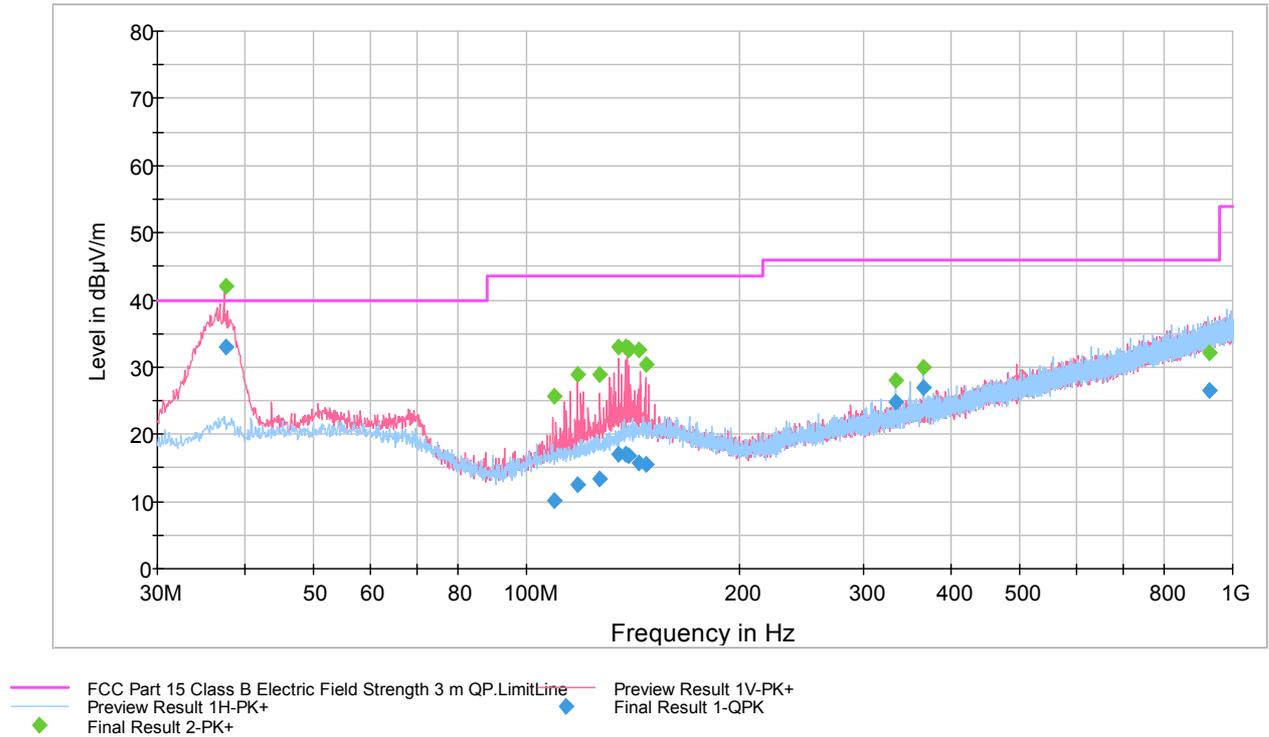


Figure 5. Measured curve with peak-detector. Channel Low.

Final measurements from the worst frequencies

Table 3. Final results.

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
37.535000	33.0	1000.0	120.000	100.0	V	50.0	14.5	7.0	40.0	
109.178000	10.1	1000.0	120.000	138.0	V	274.0	11.1	33.4	43.5	
117.916000	12.5	1000.0	120.000	121.0	V	218.0	11.7	31.0	43.5	
126.620000	13.3	1000.0	120.000	167.0	V	304.0	12.5	30.2	43.5	
135.197000	17.0	1000.0	120.000	100.0	V	351.0	13.5	26.5	43.5	
137.864000	17.0	1000.0	120.000	121.0	V	-4.0	13.9	26.5	43.5	
139.177000	16.8	1000.0	120.000	100.0	V	227.0	14.0	26.7	43.5	
139.496000	16.8	1000.0	120.000	100.0	V	17.0	14.1	26.7	43.5	
144.445000	15.8	1000.0	120.000	100.0	V	279.0	14.5	27.7	43.5	
147.550000	15.5	1000.0	120.000	100.0	V	249.0	14.7	28.0	43.5	
333.633000	24.8	1000.0	120.000	100.0	H	285.0	16.9	21.2	46.0	
365.466000	27.0	1000.0	120.000	100.0	H	288.0	17.8	19.0	46.0	
924.657000	26.6	1000.0	120.000	152.0	H	191.0	27.9	19.4	46.0	

FCC Part 15 Class B Spurious Emission 30-1000MHz 3m

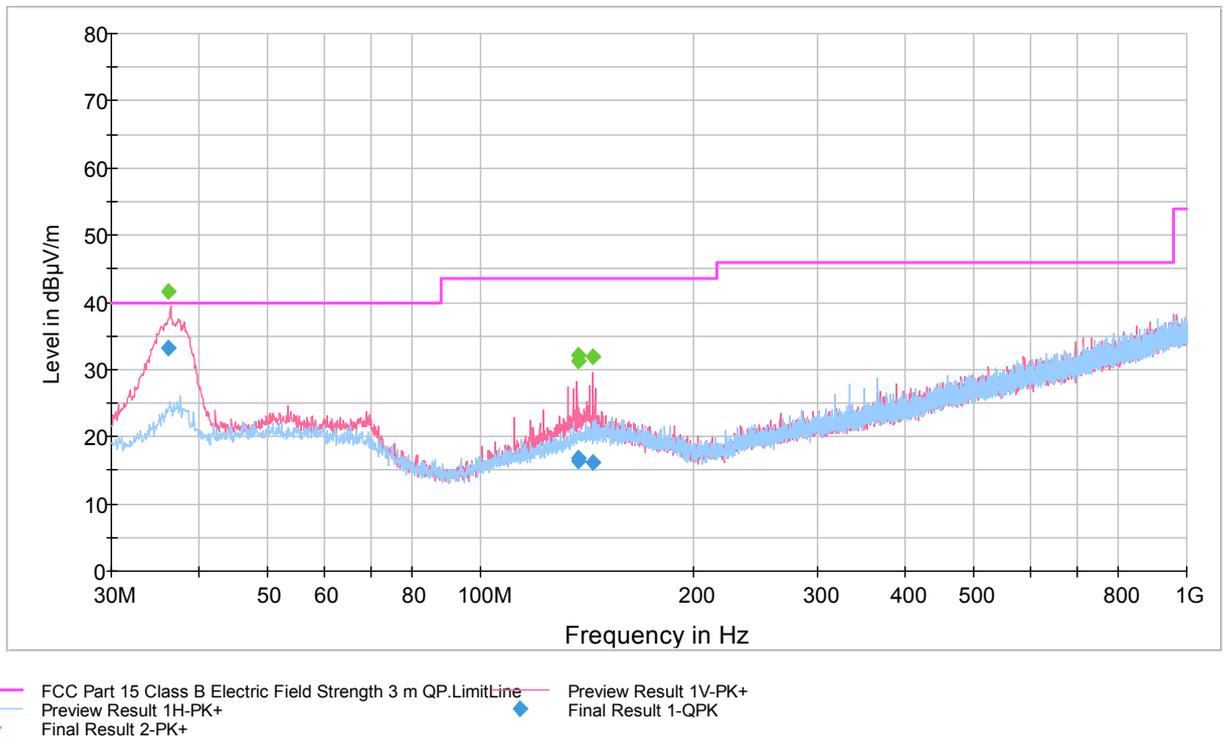


Figure 6. Measured curve with peak-detector. Channel Mid.

Final measurements from the worst frequencies

Table 4. Final QuasiPeak results

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
36.082000	33.1	1000.0	120.000	100.0	V	-5.0	14.5	6.9	40.0	
137.277000	16.4	1000.0	120.000	100.0	V	265.0	13.8	27.1	43.5	
137.525000	16.7	1000.0	120.000	100.0	V	248.0	13.8	26.8	43.5	
144.120000	16.1	1000.0	120.000	100.0	V	313.0	14.5	27.4	43.5	

FCC Part 15 Class B Spurious Emission 30-1000MHz 3m

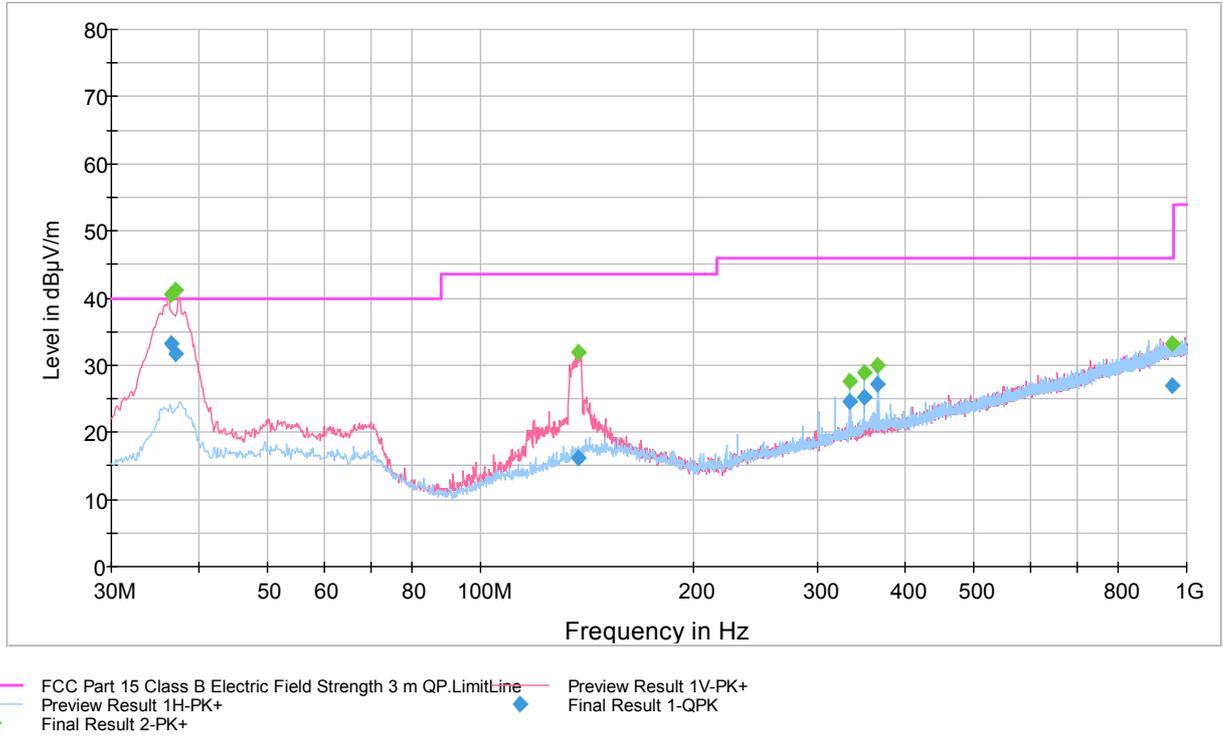


Figure 7. Measured curve with peak-detector. Channel High.

Final measurements from the worst frequencies

Table 5. Final QuasiPeak results

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
36.455000	33.2	1000.0	120.000	100.0	V	324.0	14.5	6.8	40.0	
36.905000	31.8	1000.0	120.000	132.0	V	89.0	14.5	8.2	40.0	
137.605000	16.2	1000.0	120.000	110.0	V	231.0	13.8	27.3	43.5	
333.675000	24.7	1000.0	120.000	100.0	H	278.0	16.9	21.3	46.0	
349.585000	25.3	1000.0	120.000	100.0	H	285.0	17.3	20.7	46.0	
365.475000	27.2	1000.0	120.000	100.0	H	289.0	17.8	18.8	46.0	
955.545000	27.0	1000.0	120.000	132.0	H	186.0	28.2	19.0	46.0	

Transmitter Radiated Spurious Emissions 1 000 – 26 500 MHz

Measured Peak and Average Values In The Frequency Range 1 000 MHz – 4 000 MHz.

The correction factor in the final result tables contains the sum of the transducers (antenna + amplifier + cables). The Max Peak and Average values are measured values corrected with the correction factor.

FCC Part 15 Class B Spurious Emission 1-4GHz 3m (optimized 2.4 GHz TX)

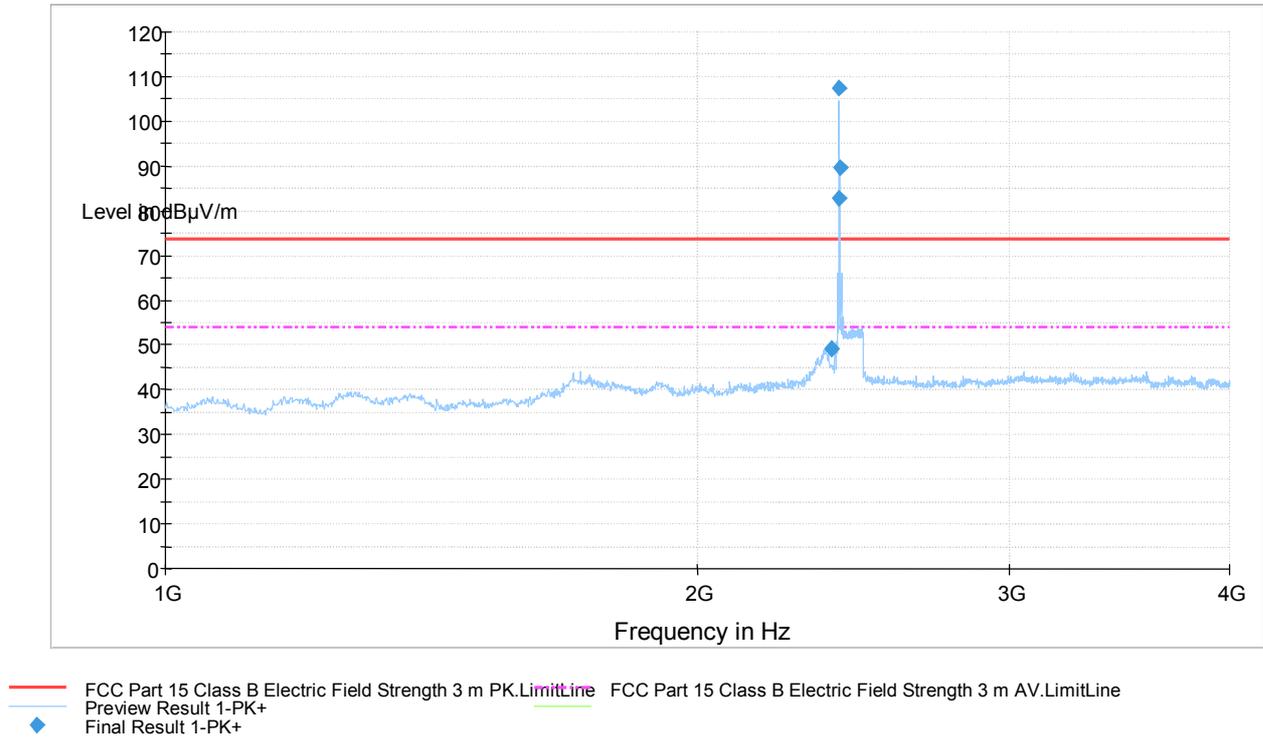


Figure 8. Measured curve with peak detector. Channel Low.

Final measurements from the worst frequencies

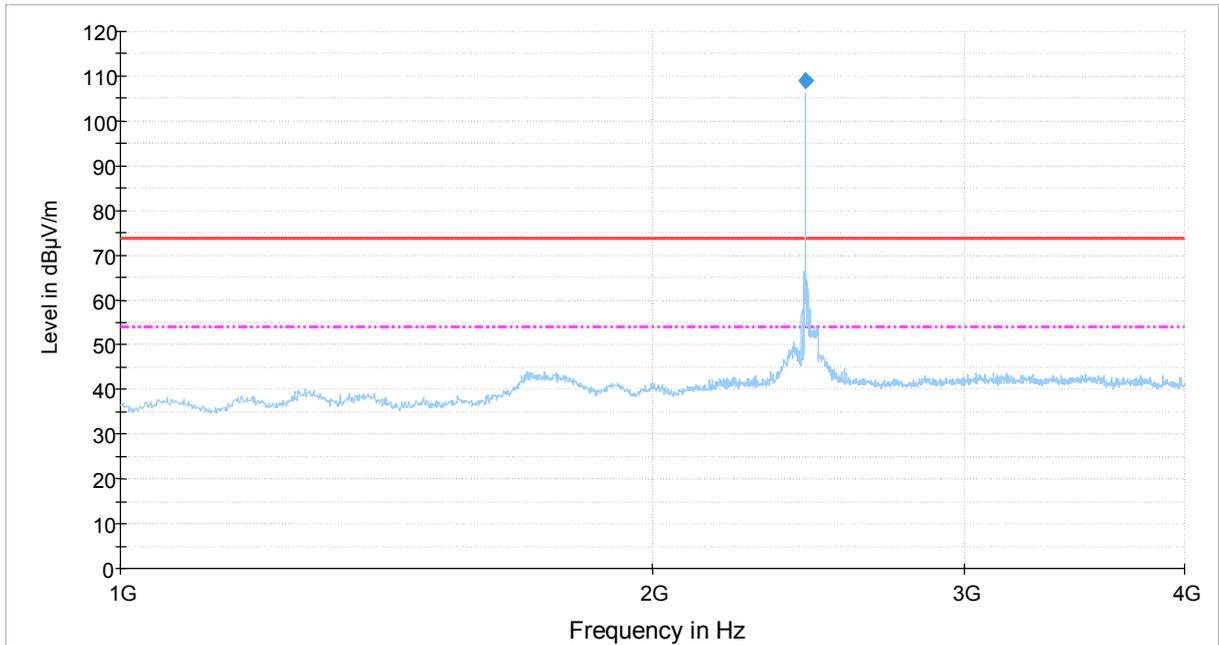
Table 6. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)	Comment
2381.000000	49.1	1000.0	1000.000	122.0	V	195.0	24.8	73.9	
2406.000000	107.4	1000.0	1000.000	122.0	V	204.0	-33.5	73.9	Carrier

Table 7. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Margin (dB)	Limit (dBµV/m)	Comment
2381.000000	15.1	38.8	53.9	
2406.000000	73	-19.9	53.9	Carrier

FCC Part 15 Class B Spurious Emission 1-4GHz 3m (optimized 2.4 GHz TX)



— FCC Part 15 Class B Electric Field Strength 3 m PK.LimitLine
- - - FCC Part 15 Class B Electric Field Strength 3 m AV.LimitLine
— Preview Result 1-PK+
◆ Final Result 1-PK+

Figure 9. Measured curve with peak detector. Channel Mid.

Final measurements from the worst frequencies

Table 8. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)	Comment
2442.000000	108.9	1000.0	1000.000	120.0	V	193.0	-35.0	73.9	Carrier

Table 9. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Margin (dB)	Limit (dBµV/m)	Comment
2442.000000	74.9	-21	53.9	Carrier

FCC Part 15 Class B Spurious Emission 1-4GHz 3m (optimized 2.4 GHz TX)

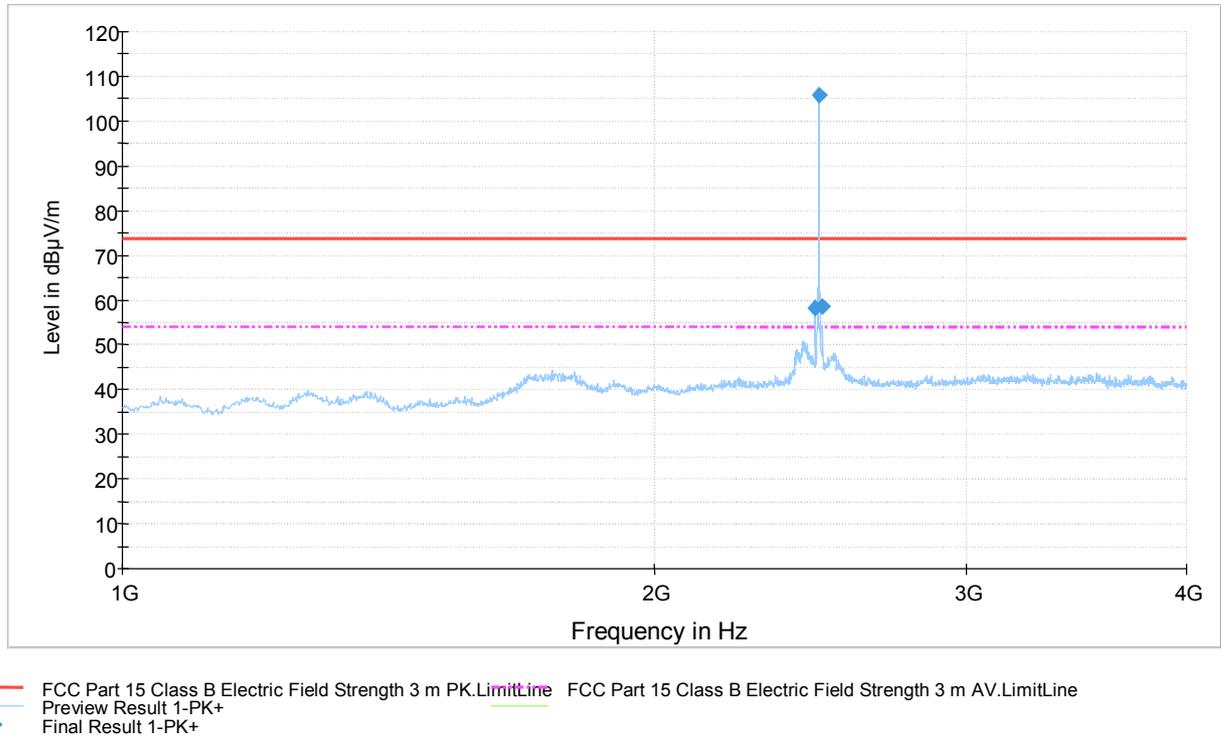


Figure 10. Measured curve with peak detector. Channel High.

Final measurements from the worst frequencies

Table 10. Final Max Peak results.

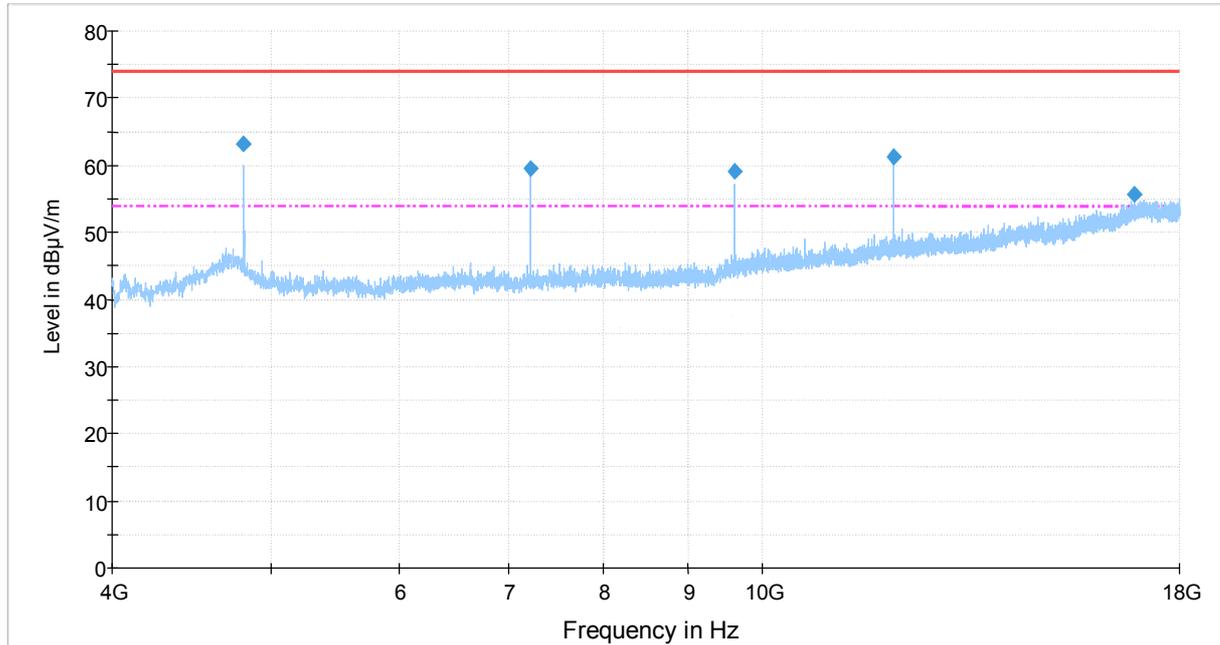
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2478.200000	105.7	1000.0	1000.000	100.0	V	104.0	4.7	-31.8	73.9	Carrier
2490.100000	58.5	1000.0	1000.000	122.0	V	201.0	4.8	15.4	73.9	

Table 11. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Margin (dB)	Limit (dBµV/m)	Comment
2478.200000	71.7	-17.8	53.9	Carrier
2490.100000	24.5	29.4	53.9	

Measured Peak and Average Values In The Frequency Range 4 000 MHz – 18 000 MHz.

FCC Part 15 Class B Spurious Emission 4-18GHz 3m



— FCC Part 15 Class B Electric Field Strength 3 m PK.LimitLine
- - - FCC Part 15 Class B Electric Field Strength 3 m AV.LimitLine
◆ Preview Result 1-PK+
◆ Final Result 1-PK+

Figure 11. Measured curve with peak detector. Channel Low.

Final measurements from the worst frequencies

Table 12. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)	Comment
4812.200000	63.3	1000.0	1000.000	100.0	V	0.0	10.6	73.9	
7218.200000	59.6	1000.0	1000.000	114.0	V	244.0	14.3	73.9	
9624.400000	59.0	1000.0	1000.000	100.0	V	171.0	14.9	73.9	
12030.400000	61.3	1000.0	1000.000	105.0	V	176.0	12.6	73.9	
16885.400000	55.6	1000.0	1000.000	321.0	V	92.0	18.3	73.9	

Table 13. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Margin (dB)	Limit (dBµV/m)	Comment
4812.200000	29.3	24.6	53.9	
7218.200000	25.6	28.3	53.9	
9624.400000	25	28.9	53.9	
12030.400000	27.3	26.6	53.9	
16885.400000	21.6	32.3	53.9	

FCC Part 15 Class B Spurious Emission 4-18GHz 3m

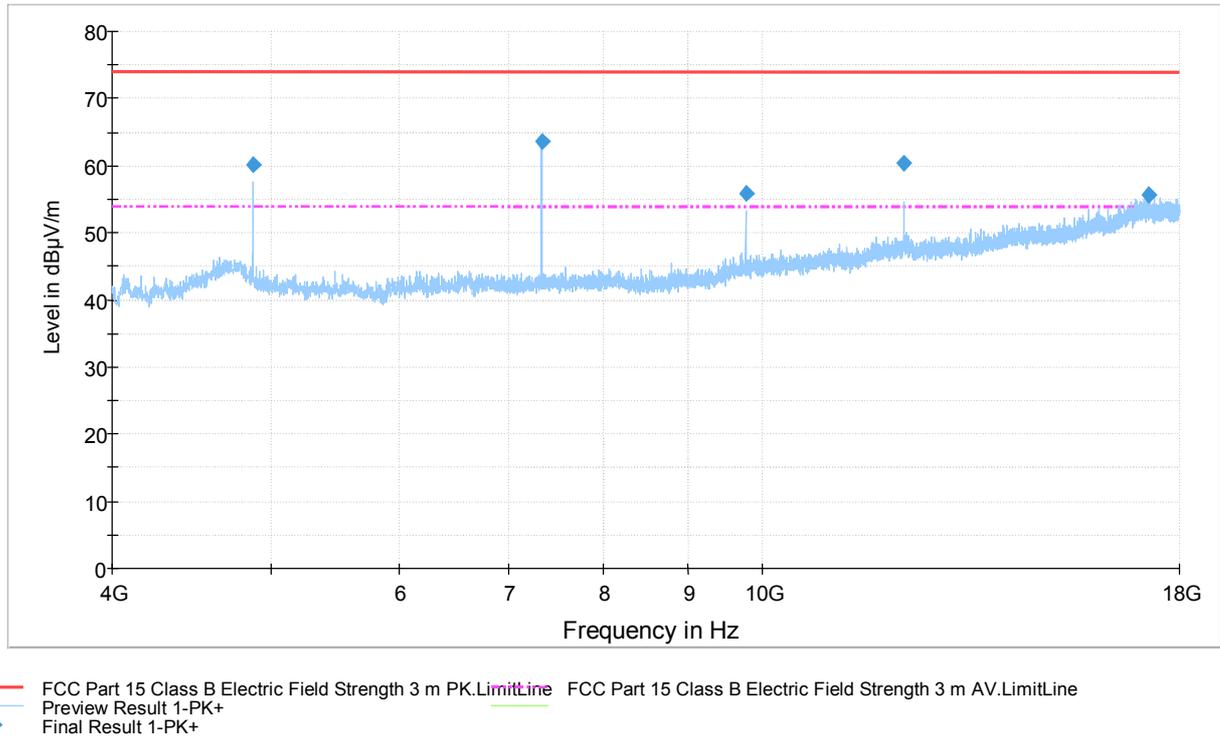


Figure 12. Measured curve with peak detector. Channel Mid.

Final measurements from the worst frequencies

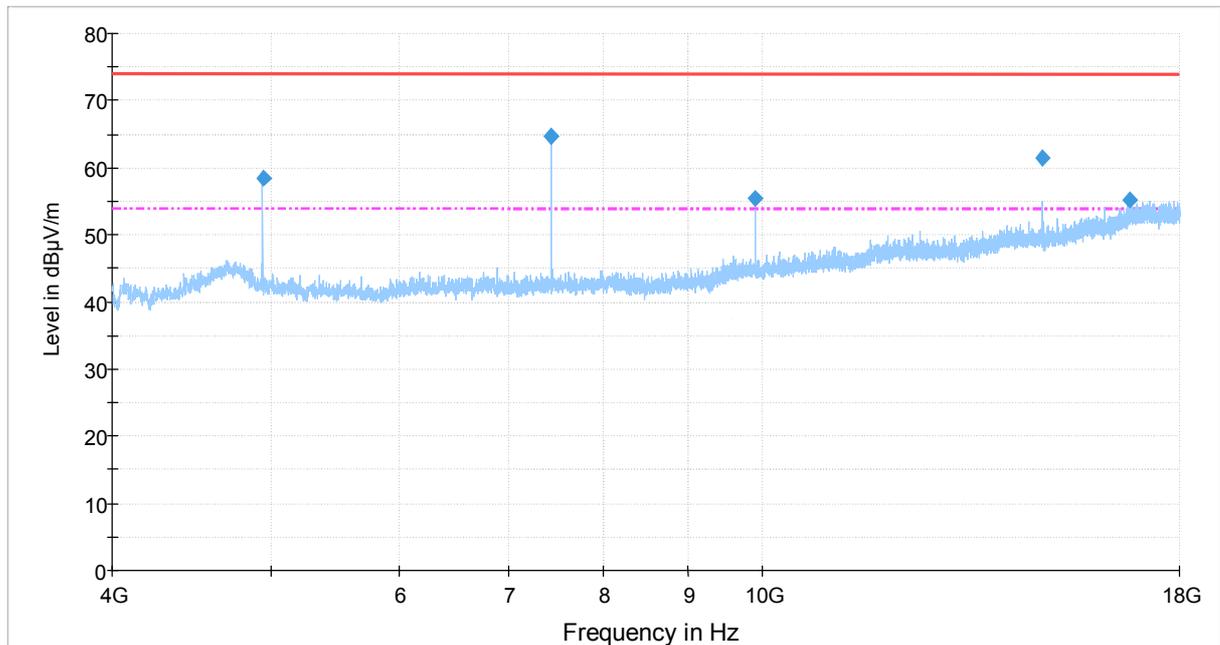
Table 14. Final Max Peak results

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)	Comment
4884.200000	60.1	1000.0	1000.000	146.0	V	2.0	13.8	73.9	
7326.200000	63.6	1000.0	1000.000	105.0	V	206.0	10.3	73.9	
9768.400000	55.9	1000.0	1000.000	100.0	V	139.0	18.0	73.9	
12210.400000	60.4	1000.0	1000.000	146.0	V	187.0	13.5	73.9	
17252.800000	55.6	1000.0	1000.000	298.0	H	15.0	18.3	73.9	

Table 15. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Margin (dB)	Limit (dBµV/m)	Comment
4884.200000	26.1	27.8	53.9	
7326.200000	29.6	24.3	53.9	
9768.400000	21.9	32	53.9	
12210.400000	26.4	27.5	53.9	
17252.800000	21.6	32.3	53.9	

FCC Part 15 Class B Spurious Emission 4-18GHz 3m



— FCC Part 15 Class B Electric Field Strength 3 m PK.LimitLine
 - - - FCC Part 15 Class B Electric Field Strength 3 m AV.LimitLine
— Preview Result 1-PK+
◆ Final Result 1-PK+

Figure 13. Measured curve with peak- detector. Channel High.

Final measurements from the worst frequencies

Table 16. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)	Comment
4948.200000	58.4	1000.0	1000.000	154.0	V	-5.0	15.5	73.9	
7422.200000	64.7	1000.0	1000.000	105.0	V	198.0	9.2	73.9	
9896.400000	55.4	1000.0	1000.000	100.0	V	132.0	18.5	73.9	
14844.600000	61.4	1000.0	1000.000	130.0	H	-4.0	12.5	73.9	
16801.200000	55.2	1000.0	1000.000	369.0	V	109.0	18.7	73.9	

Table 17. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Margin (dB)	Limit (dBµV/m)	Comment
4948.200000	24.4	29.5	53.9	
7422.200000	30.7	23.2	53.9	
9896.400000	21.4	32.5	53.9	
14844.600000	27.4	26.5	53.9	
16801.200000	21.2	32.7	53.9	

Measured Peak and Average Values In The Frequency Range 18 000 MHz – 26 500 MHz.

FCC Part 15 Class B Spurious Emission 18-26.5GHz 3m

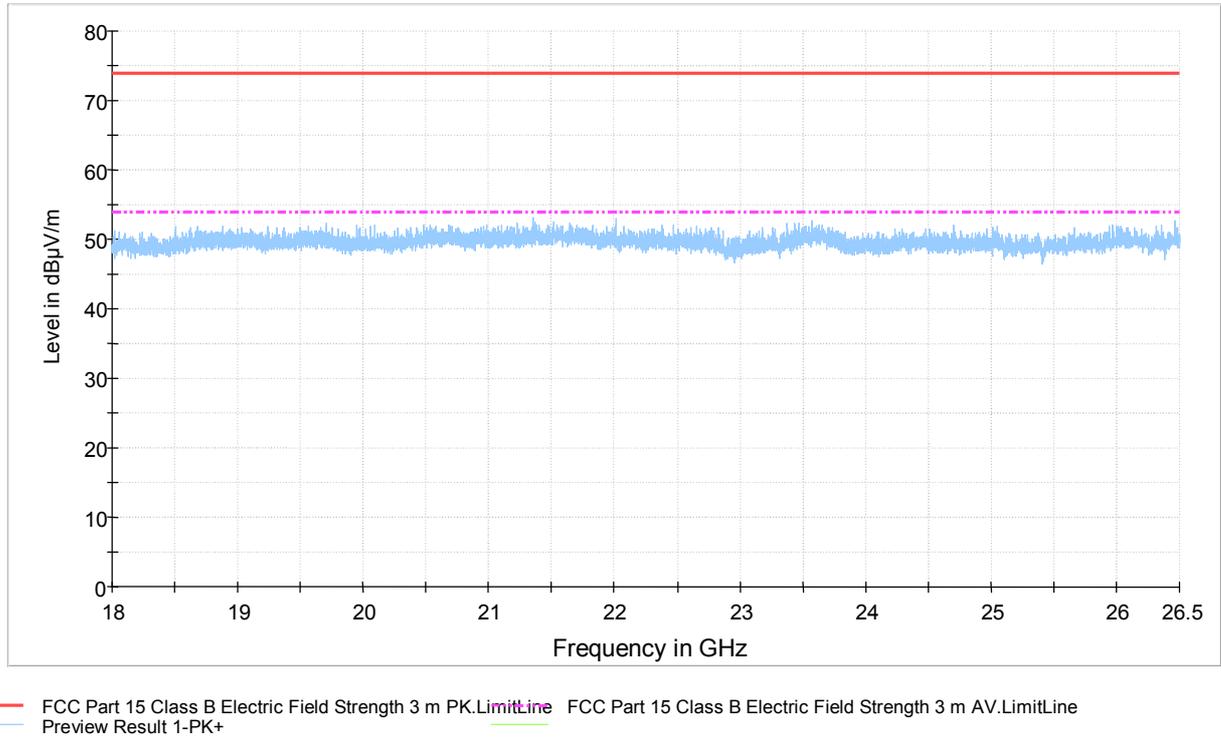
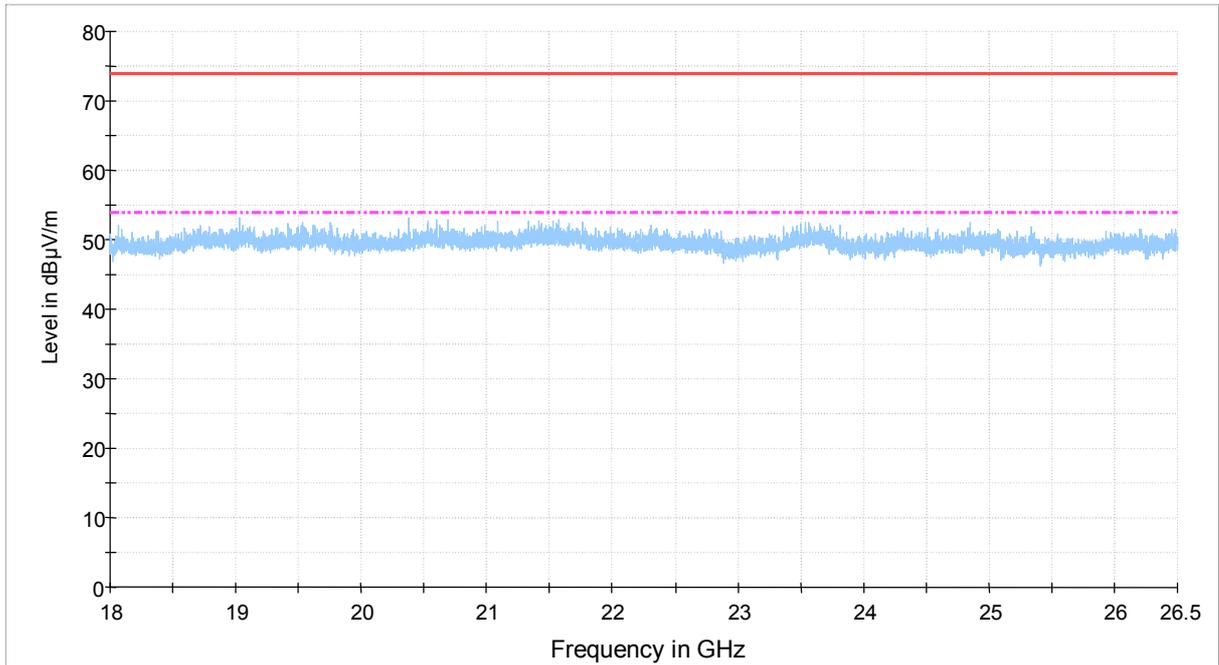


Figure 14. Measured curve with peak- and average detector. Channel Low.

Final measurements from the worst frequencies

Due to the low emission level no final measurements were made.

FCC Part 15 Class B Spurious Emission 18-26.5GHz 3m



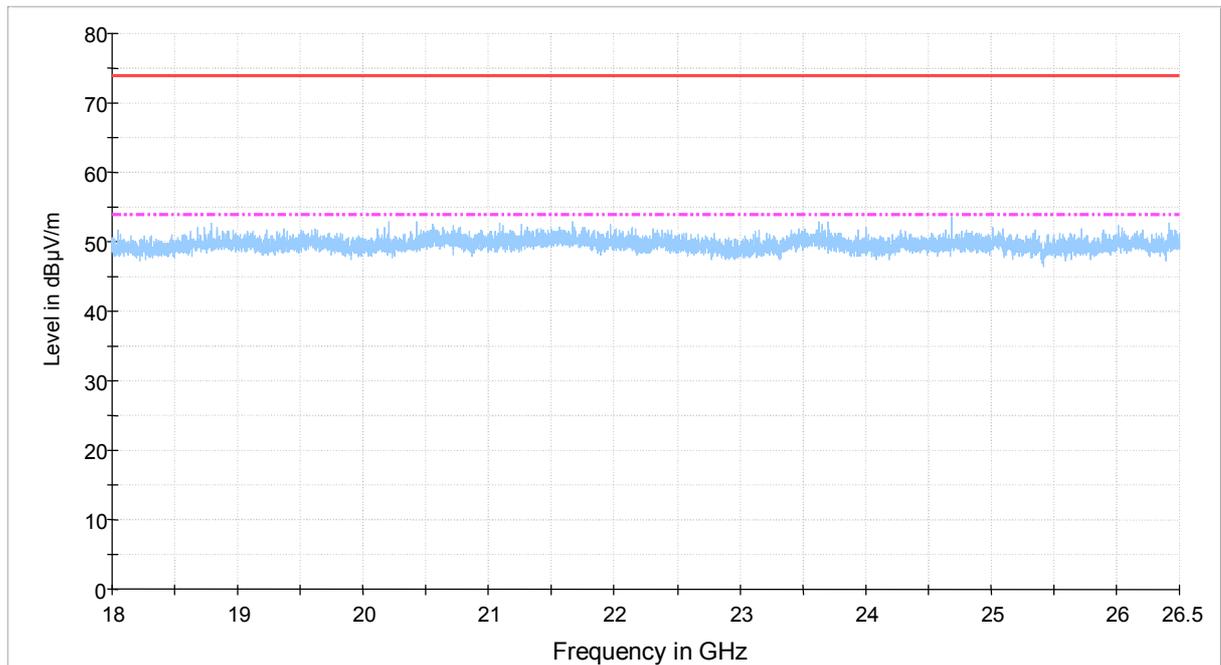
— FCC Part 15 Class B Electric Field Strength 3 m PK.LimitLine
- - - FCC Part 15 Class B Electric Field Strength 3 m AV.LimitLine
— Preview Result 1-PK+

Figure 15. Measured curve with peak- and average detector. Channel Mid.

Final measurements from the worst frequencies

Due to the low emission level no final measurements were made.

FCC Part 15 Class B Spurious Emission 18-26.5GHz 3m



— FCC Part 15 Class B Electric Field Strength 3 m PK.LimitLine
 - - - FCC Part 15 Class B Electric Field Strength 3 m AV.LimitLine
— Preview Result 1-PK+

Figure 16. Measured curve with peak- and average detector. Channel High.

Final measurements from the worst frequencies

Due to the low emission level no final measurements were made.

Radiated band edge measurement results

FCC Part 15 Class B Spurious Emission 1-4GHz 3m (optimized 2.4 GHz TX)

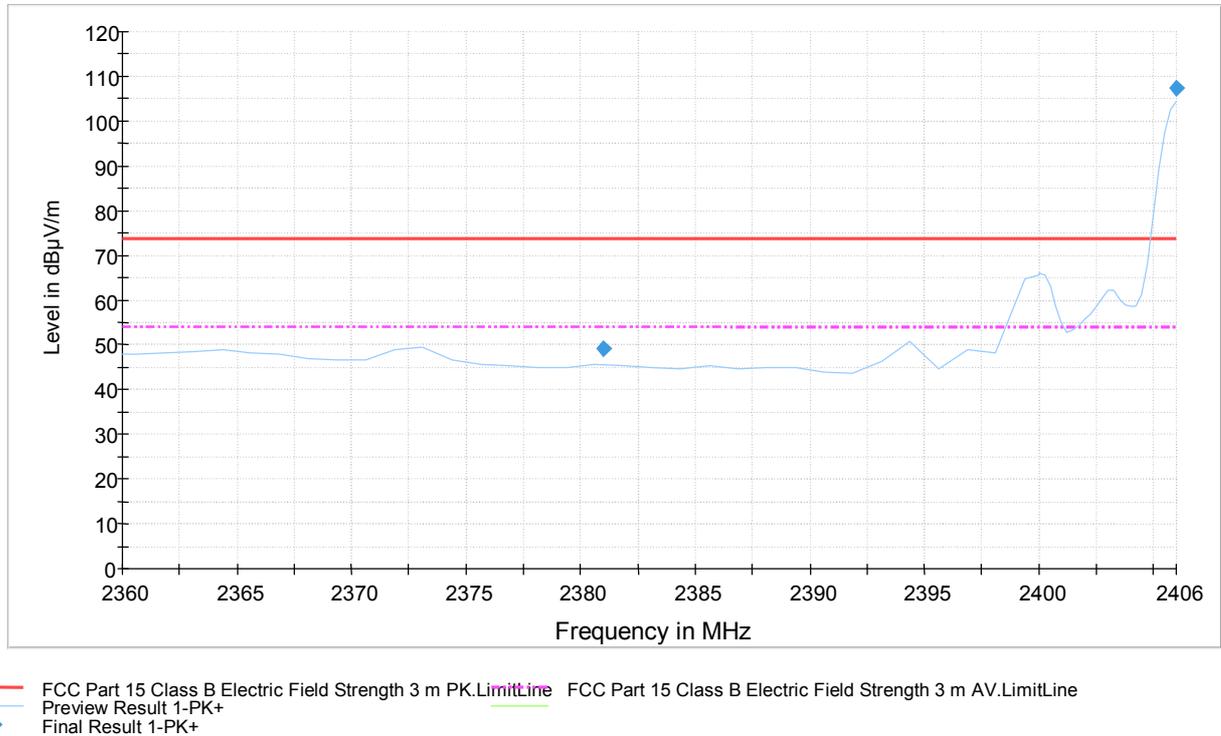


Figure 17. Measured curve with peak- and average detector. Lower band edge.

Final measurements from the worst frequencies

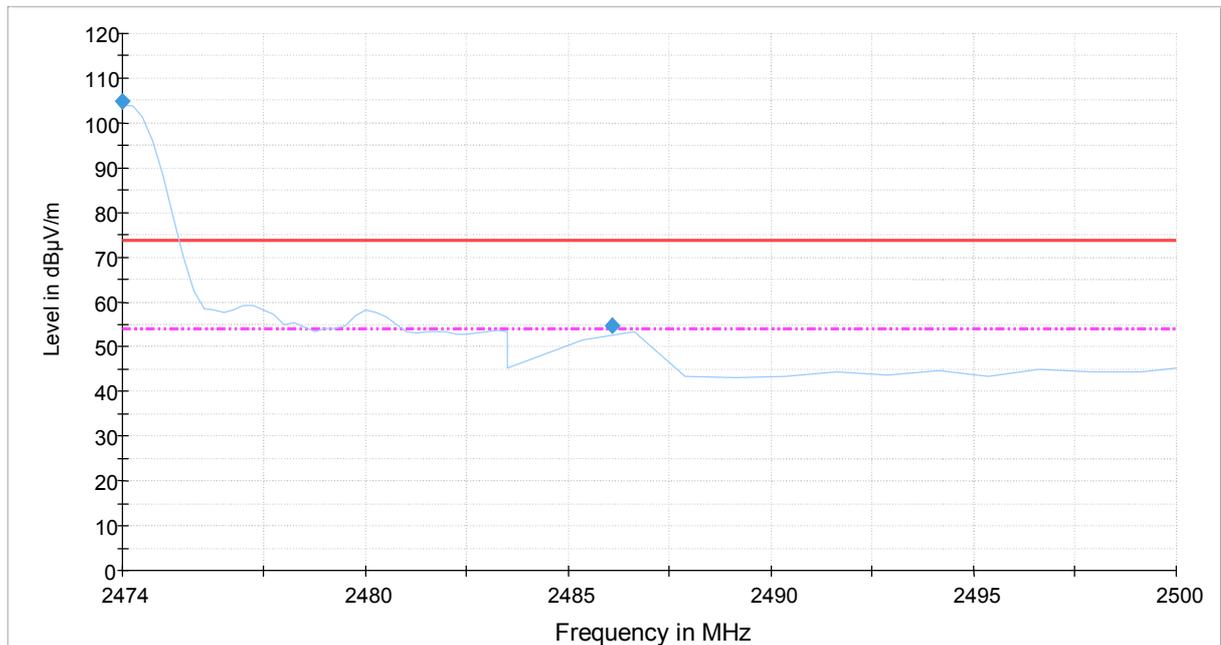
Table 18. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)	Comment
2381.000000	49.1	1000.0	1000.000	122.0	V	195.0	24.8	73.9	
2406.000000	107.4	1000.0	1000.000	122.0	V	204.0	-33.5	73.9	Carrier

Table 19. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Margin (dB)	Limit (dBµV/m)	Comment
2381.000000	15.1	38.8	53.9	
2406.000000	73	-19.9	53.9	Carrier

FCC Part 15 Class B Spurious Emission 1-4GHz 3m (optimized 2.4 GHz TX)



— FCC Part 15 Class B Electric Field Strength 3 m PK.LimitLine
— Preview Result 1-PK+
- - - FCC Part 15 Class B Electric Field Strength 3 m AV.LimitLine
- - - Preview Result 2-AVG
◆ Final Result 1-PK+
◆ Final Result 2-AVG

Figure 18. Measured curve with peak- and average detector. Upper band edge.

Final measurements from the worst frequencies

Table 20. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2478.200000	105.7	1000.0	1000.000	100.0	V	104.0	4.7	-31.8	73.9	Carrier
2490.100000	58.5	1000.0	1000.000	122.0	V	201.0	4.8	15.4	73.9	

Table 21. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Margin (dB)	Limit (dBµV/m)	Comment
2478.200000	71.7	-17.8	53.9	Carrier
2490.100000	24.5	29.4	53.9	

Transmitter Band Edge Measurement and Conducted Spurious Emissions

Transmitter Band Edge Measurement and Conducted Spurious Emissions

Standard: ANSI C63.10 (2009)
Tested by: NKO
Date: 6.6.2014
Humidity: 48 %
Temperature: 24.8 °C
Measurement uncertainty ± 2.87 dB Level of confidence 95 % (k = 2)

FCC Rule: 15.247(d), 15.209(a)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Table 22. Band edge attenuation.

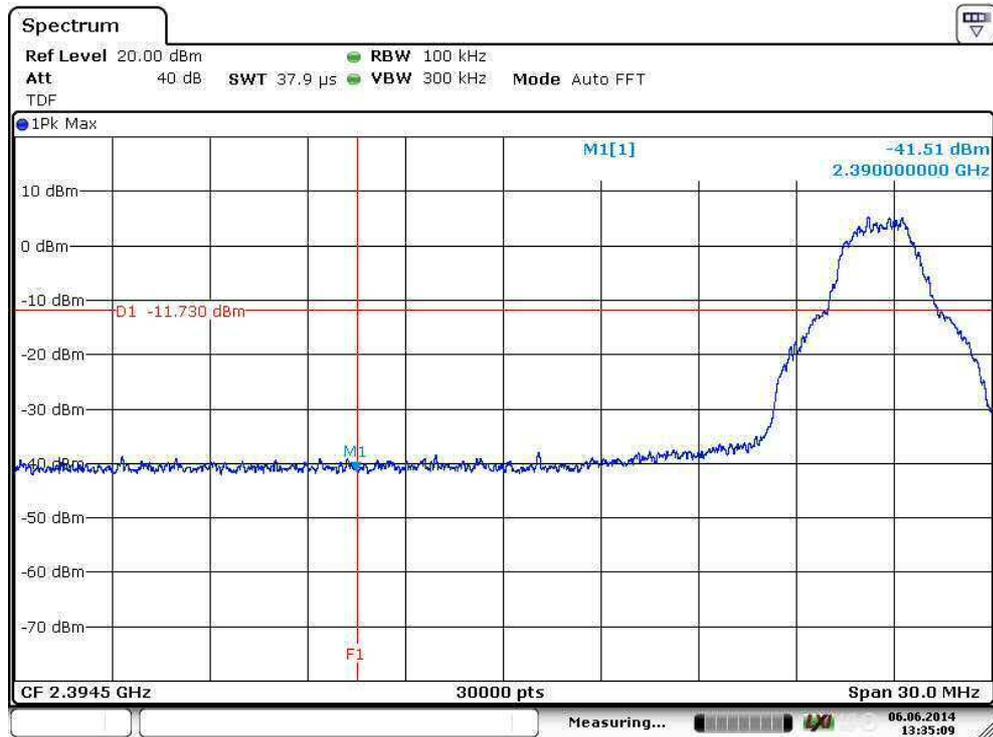
Band Edge Attenuation	
Lower Band Edge	Upper Band Edge
-49.78 dBc	-48.23 dBc
Limit: -20dBc	

Table 23. Conducted spurious emissions.

Conducted Spurious Emissions				
Channel	Measured Attenuation [dB]	Limit [dBc]	Margin [dB]	Result
Low	-	-20.0	-	-
Mid	-	-20.0	-	-
High	-	-20.0	-	-

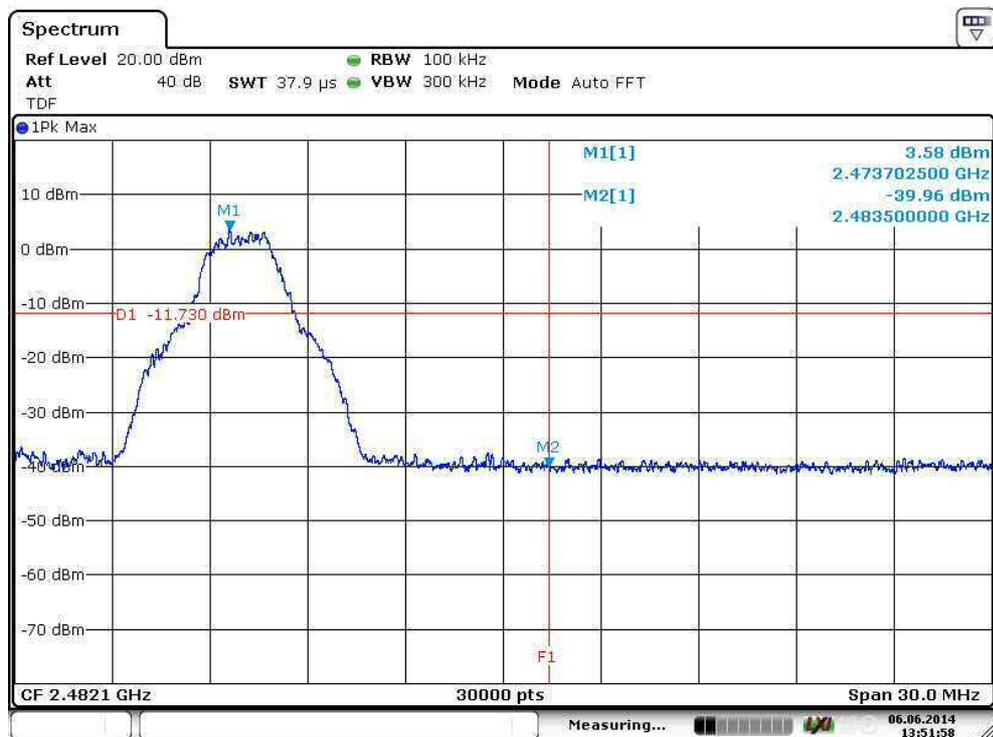
No significant emissions were detected close to the limit.

Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 6.JUN.2014 13:35:09

Figure 19. Lower Band Edge.



Date: 6.JUN.2014 13:51:58

Figure 20. Upper Band Edge.

Transmitter Band Edge Measurement and Conducted Spurious Emissions

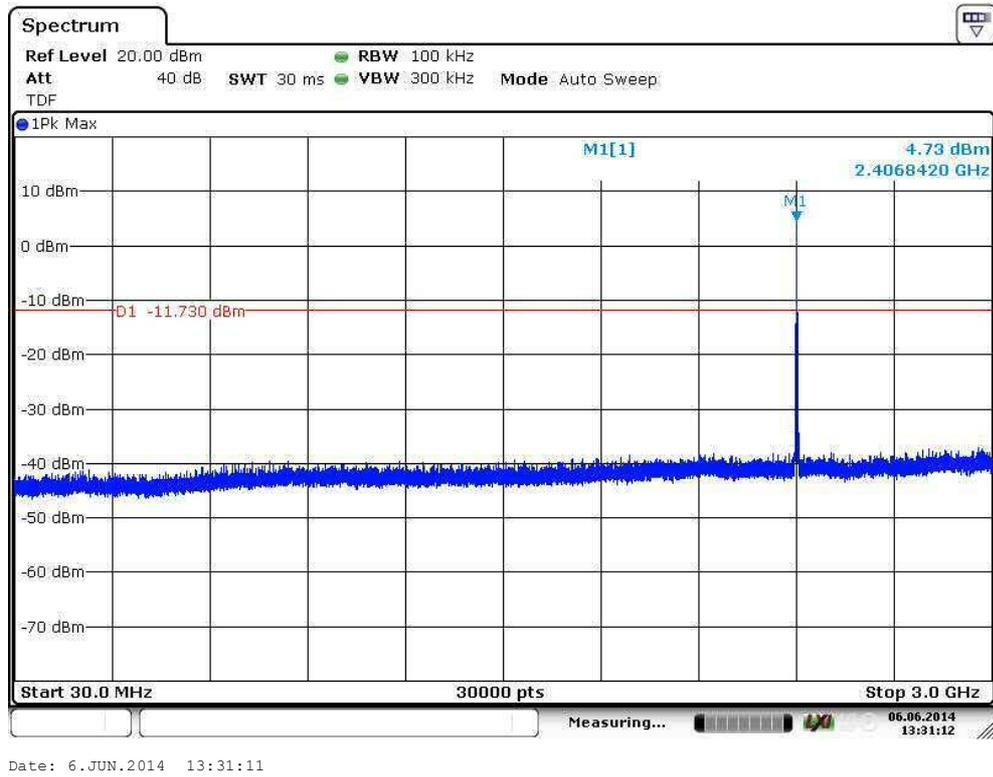


Figure 21. Conducted Spurious Emissions 30 – 3 000 MHz. Channel Low.

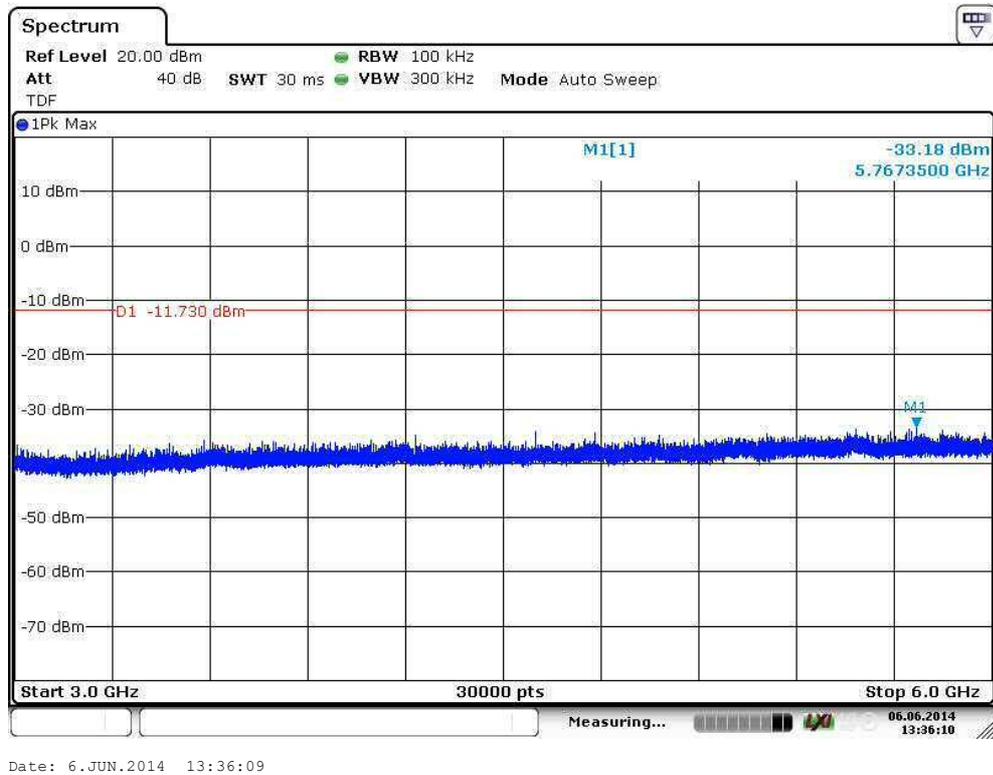
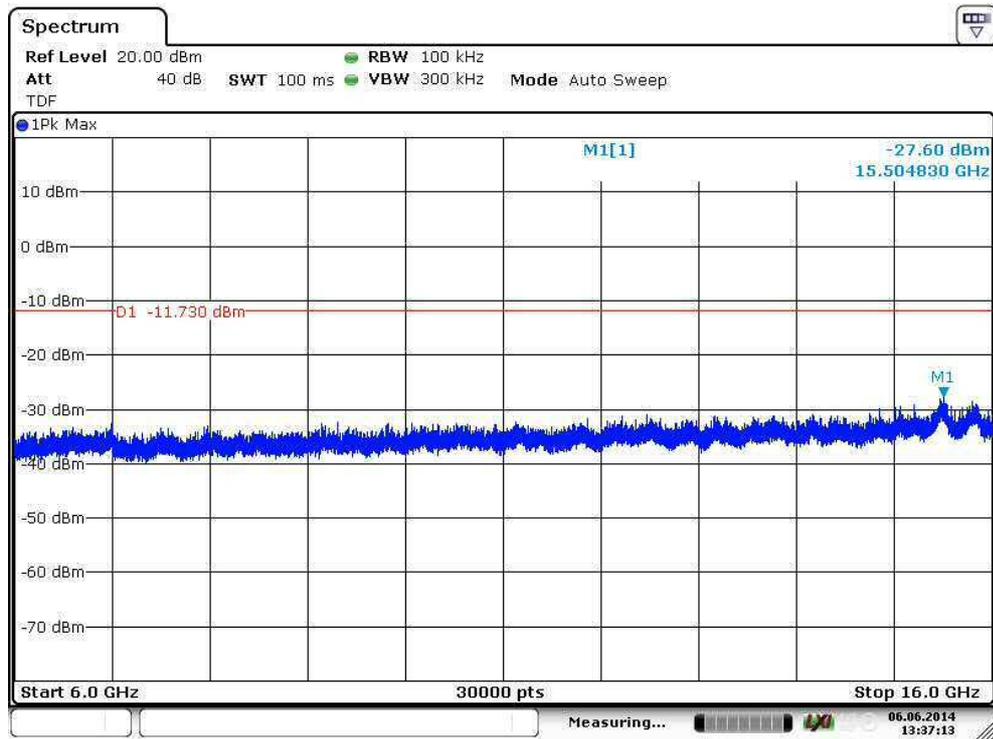


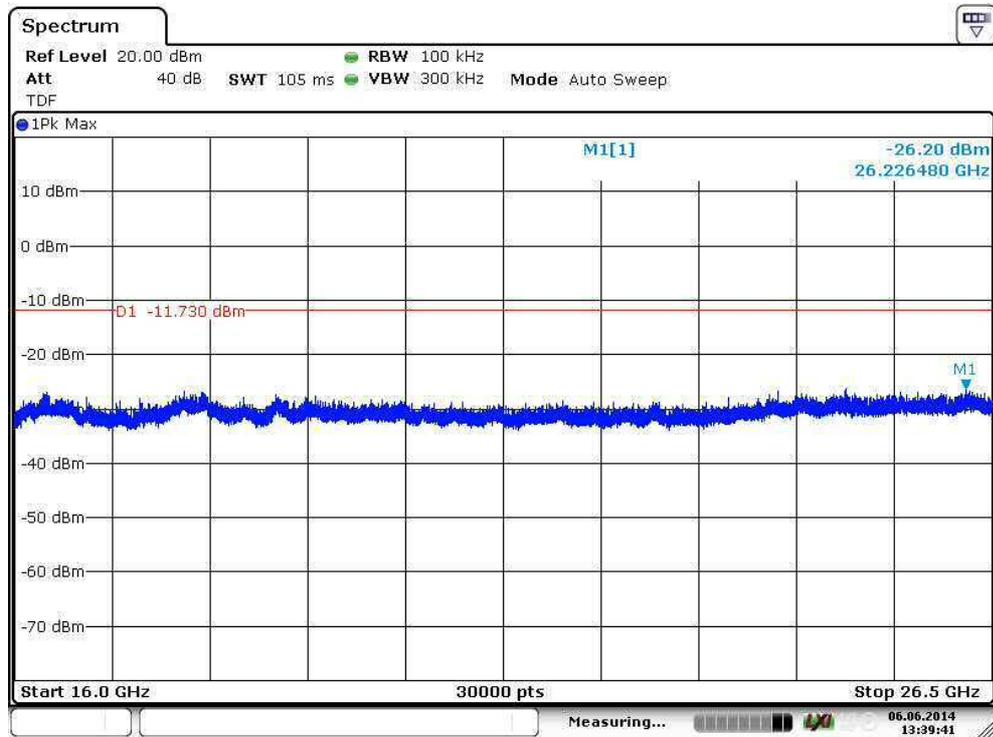
Figure 22. Conducted Spurious Emissions 3 000 – 6 000 MHz. Channel Low.

Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 6. JUN.2014 13:37:13

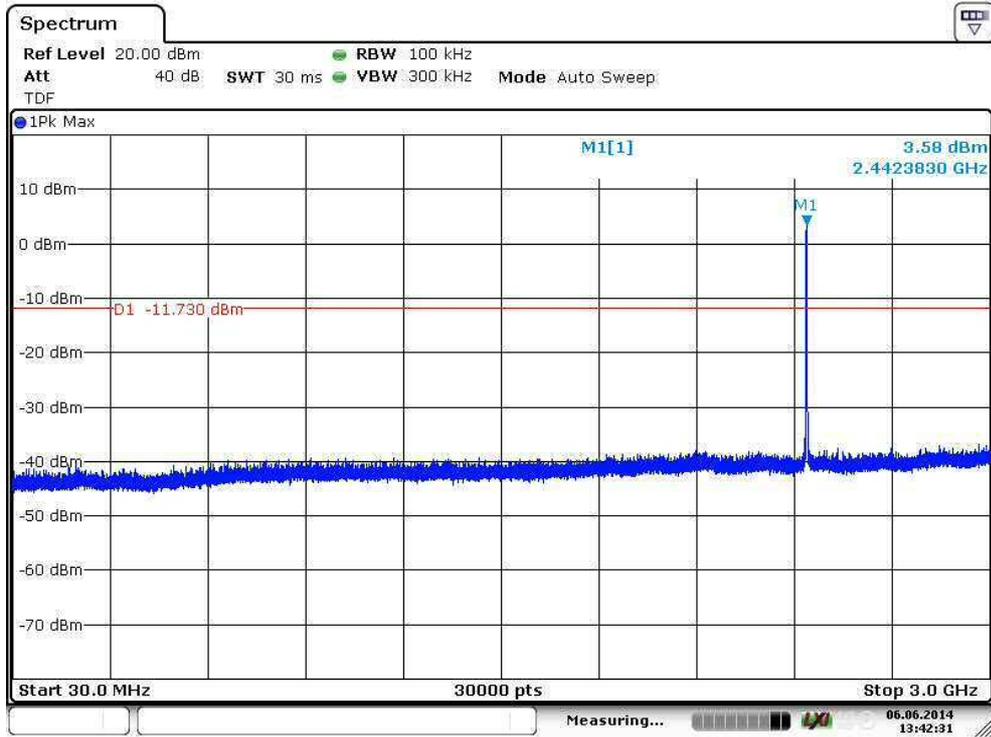
Figure 23. Conducted Spurious Emissions 6 000 – 16 000 MHz. Channel Low.



Date: 6. JUN.2014 13:39:40

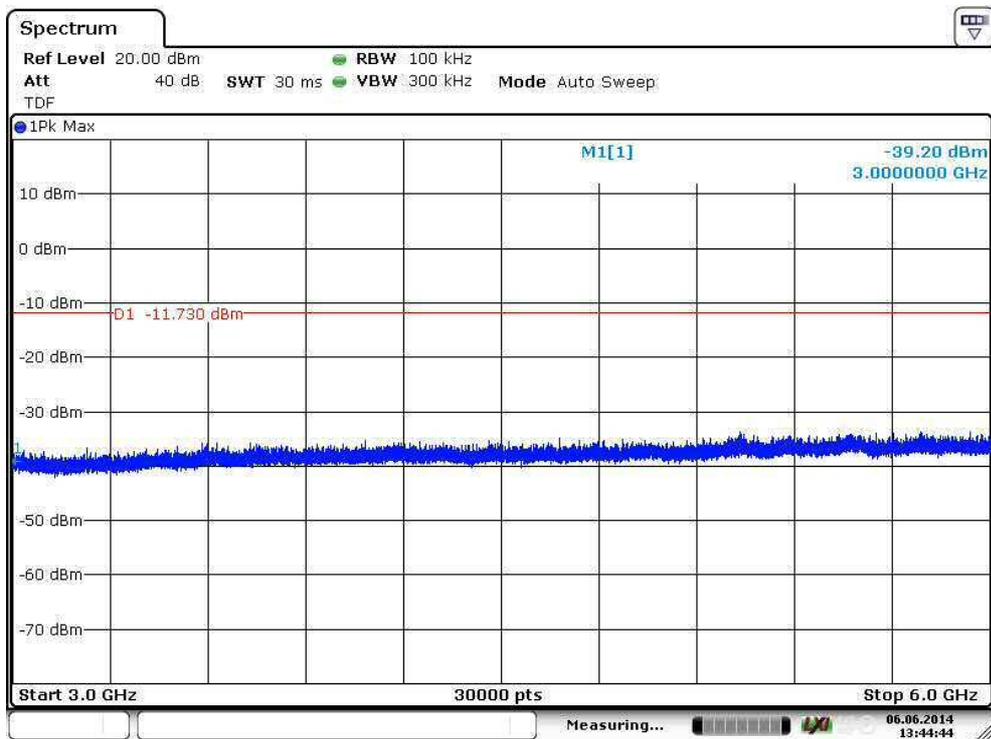
Figure 24. Conducted Spurious Emissions 16 000 – 26 500 MHz. Channel Low.

Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 6. JUN. 2014 13:42:32

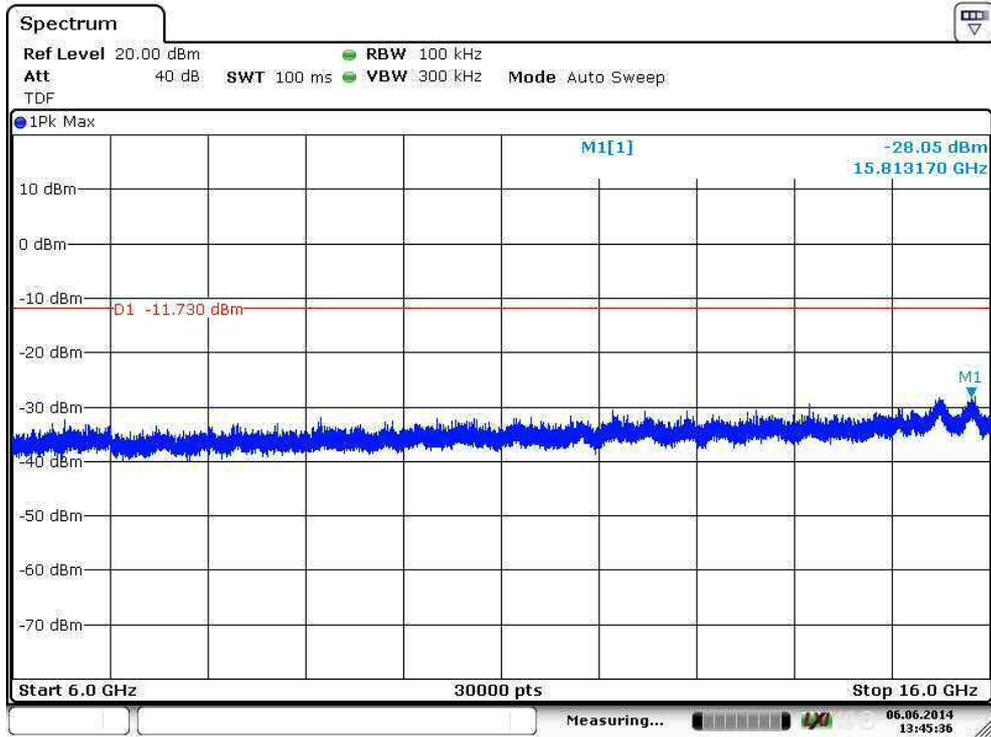
Figure 25. Conducted Spurious Emissions 30 – 3 000 MHz. Channel Mid.



Date: 6. JUN. 2014 13:44:45

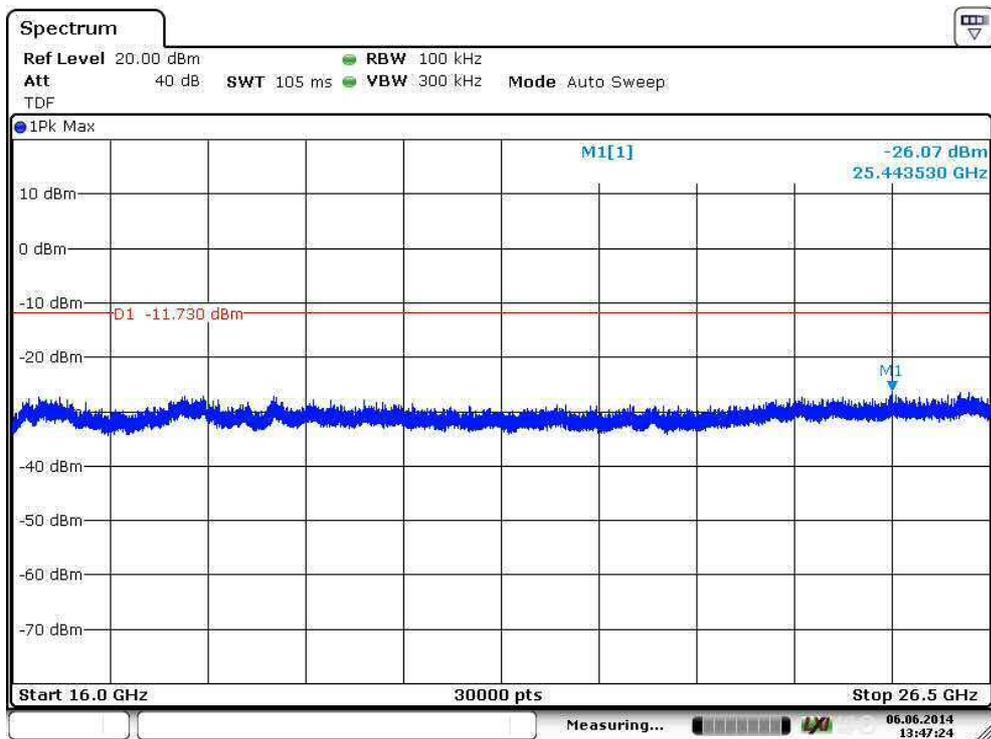
Figure 26. Conducted Spurious Emissions 3 000 – 6 000 MHz. Channel Mid.

Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 6.JUN.2014 13:45:36

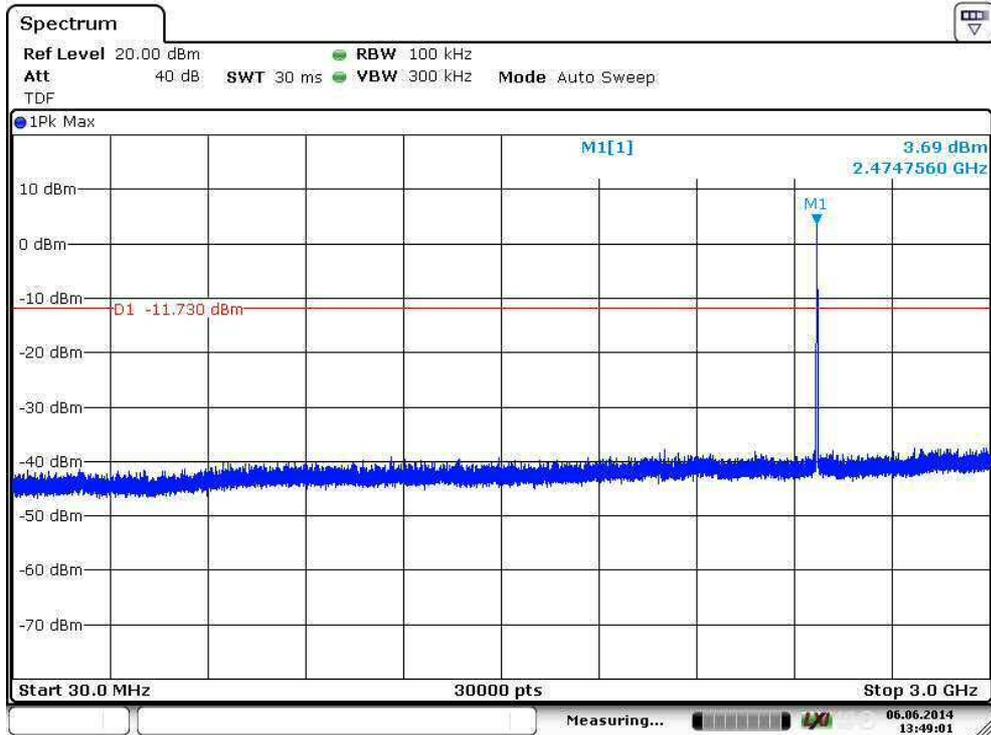
Figure 27. Conducted Spurious Emissions 6 000 – 16 000 MHz. Channel Mid.



Date: 6.JUN.2014 13:47:24

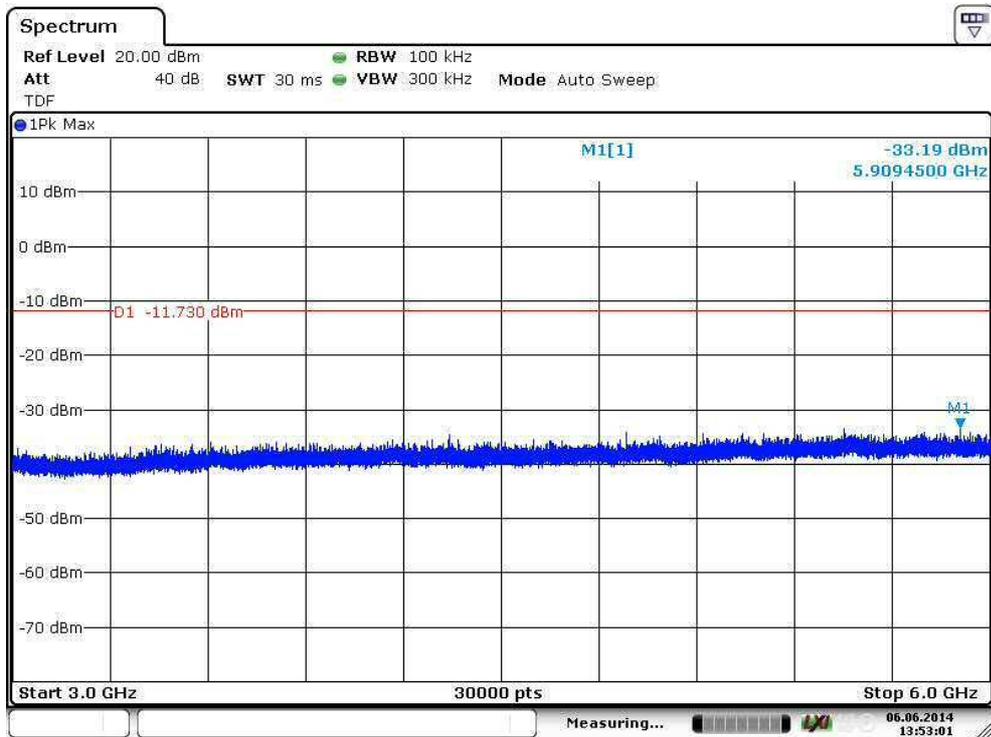
Figure 28. Conducted Spurious Emissions 16 000 – 26 500 MHz. Channel Mid.

Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 6.JUN.2014 13:49:00

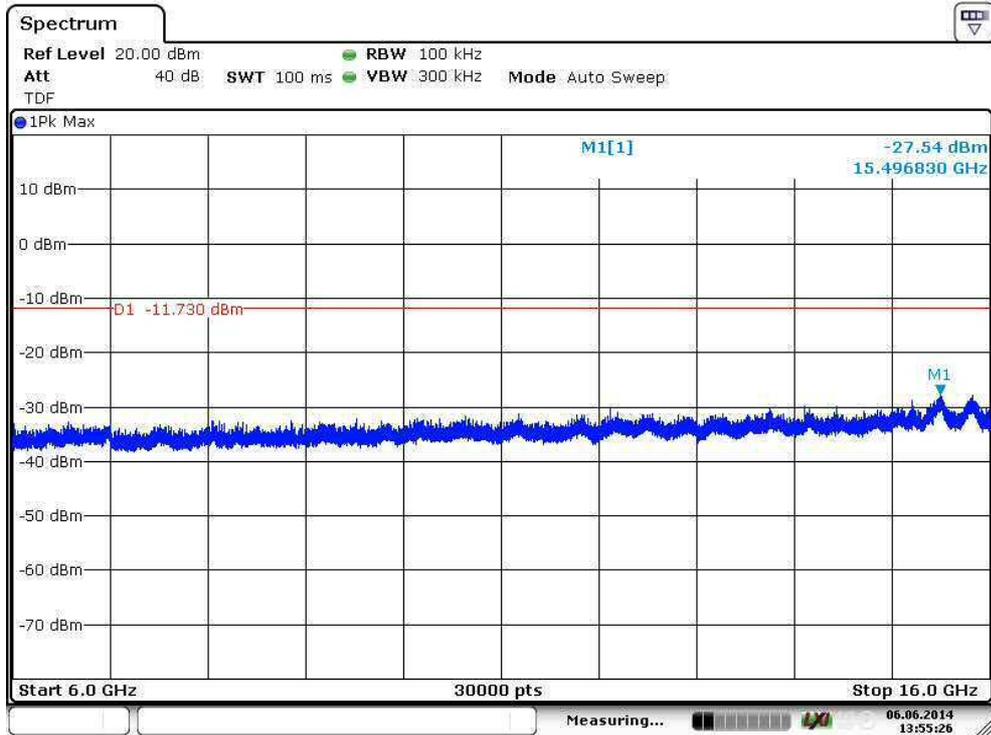
Figure 29. Conducted Spurious Emissions 30 – 3 000 MHz. Channel High.



Date: 6.JUN.2014 13:53:00

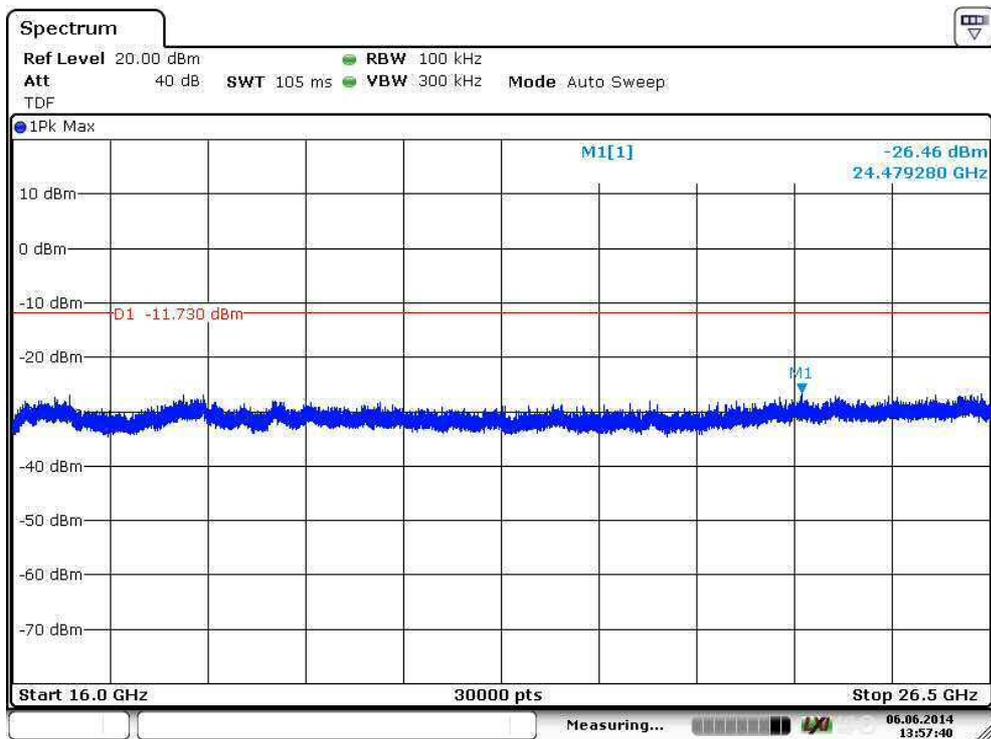
Figure 30. Conducted Spurious Emissions 3 000 – 6 000 MHz. Channel High.

Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 6.JUN.2014 13:55:26

Figure 31. Conducted Spurious Emissions 6 000 – 16 000 MHz. Channel High.



Date: 6.JUN.2014 13:57:40

Figure 32. Conducted Spurious Emissions 16 000 – 26 500 MHz. Channel High.

6 dB Bandwidth of the Channel

Standard: ANSI C63.10 (2009)
Tested by: NKO
Date: 6.6.2014
Humidity: 48 %
Temperature: 24.8 °C

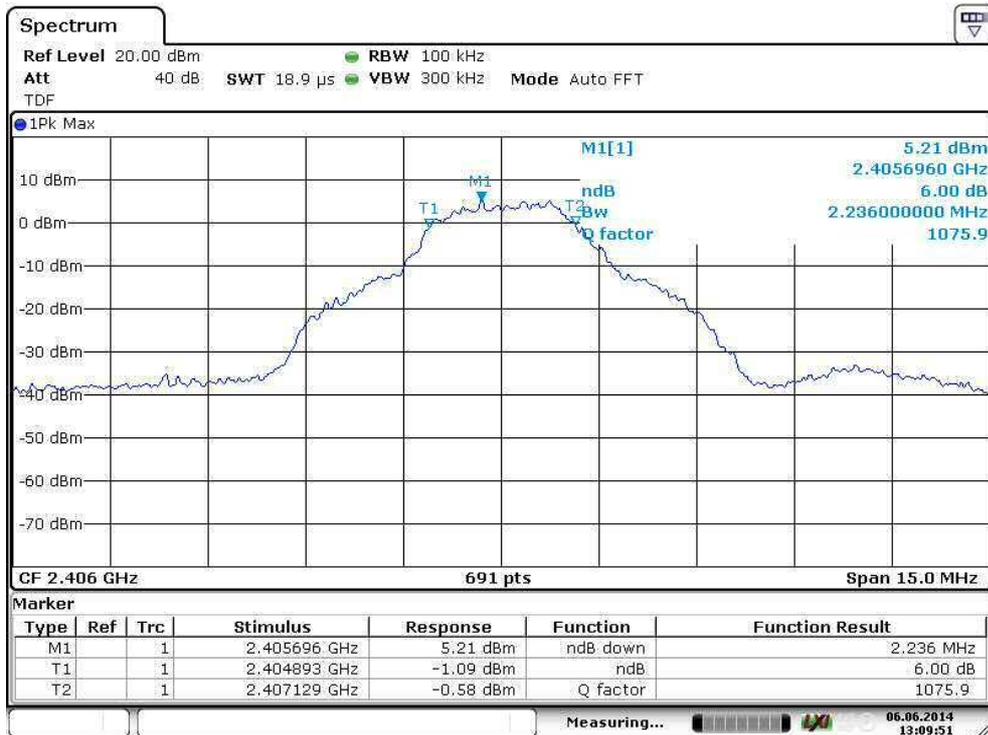
FCC Rule: 15.247(a)(2)
RSS-210 A8.2

Results:

Table 24. 6 dB bandwidth test results.

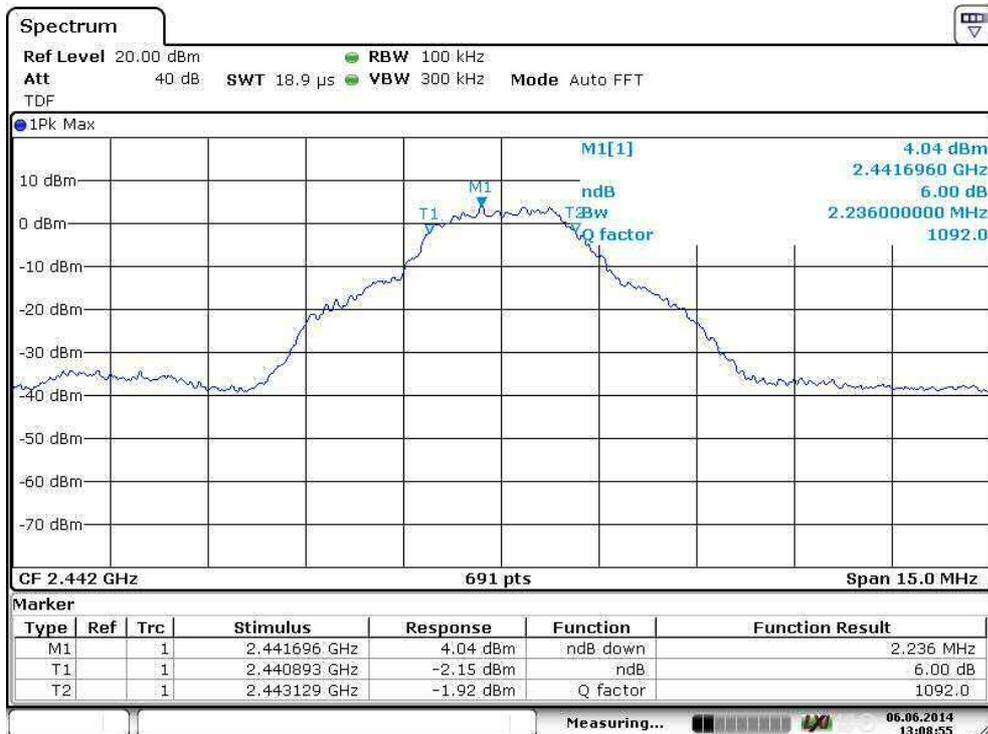
Channel	6 dB BW [kHz]	Minimum limit [kHz]
Low	2360.0	500
Mid	2236.0	
High	2236.0	

6 dB Bandwidth of the Channel



Date: 6.JUN.2014 13:09:51

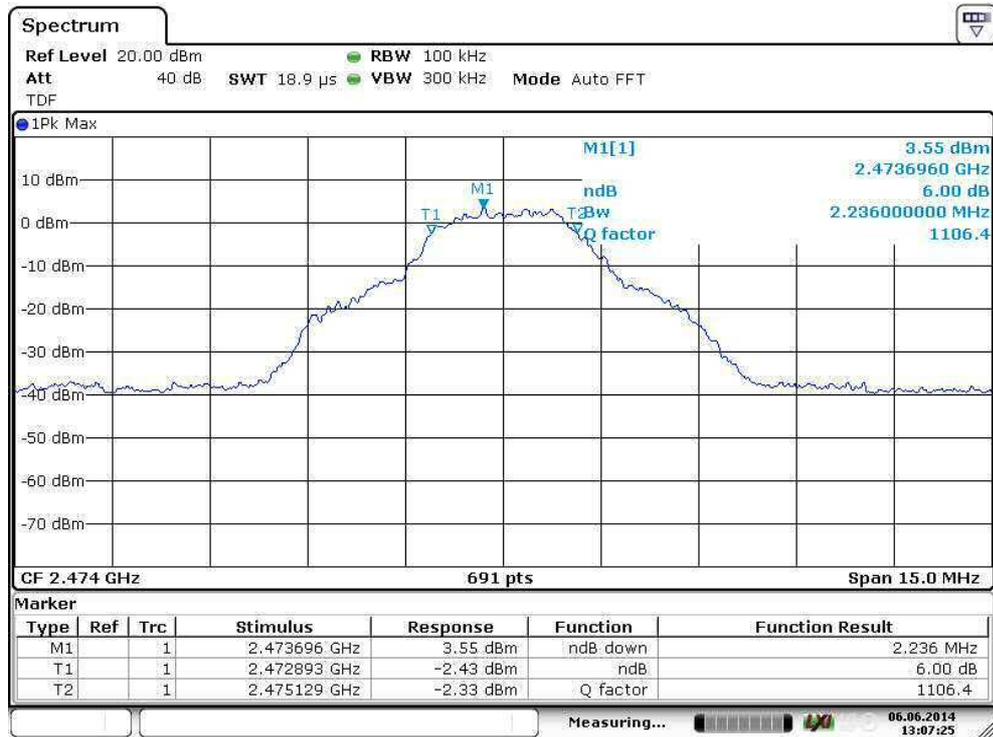
Figure 33. 6 dB bandwidth of the channel Low.



Date: 6.JUN.2014 13:08:55

Figure 34. 6 dB bandwidth of the channel Mid.

6 dB Bandwidth of the Channel



Date: 6.JUN.2014 13:07:26

Figure 35. 6 dB bandwidth of the channel High.

Power Spectral Density

Standard: ANSI C63.10 (2009)
Tested by: NKO
Date: 6.6.2014
Humidity: 48%
Temperature: 24.8°C

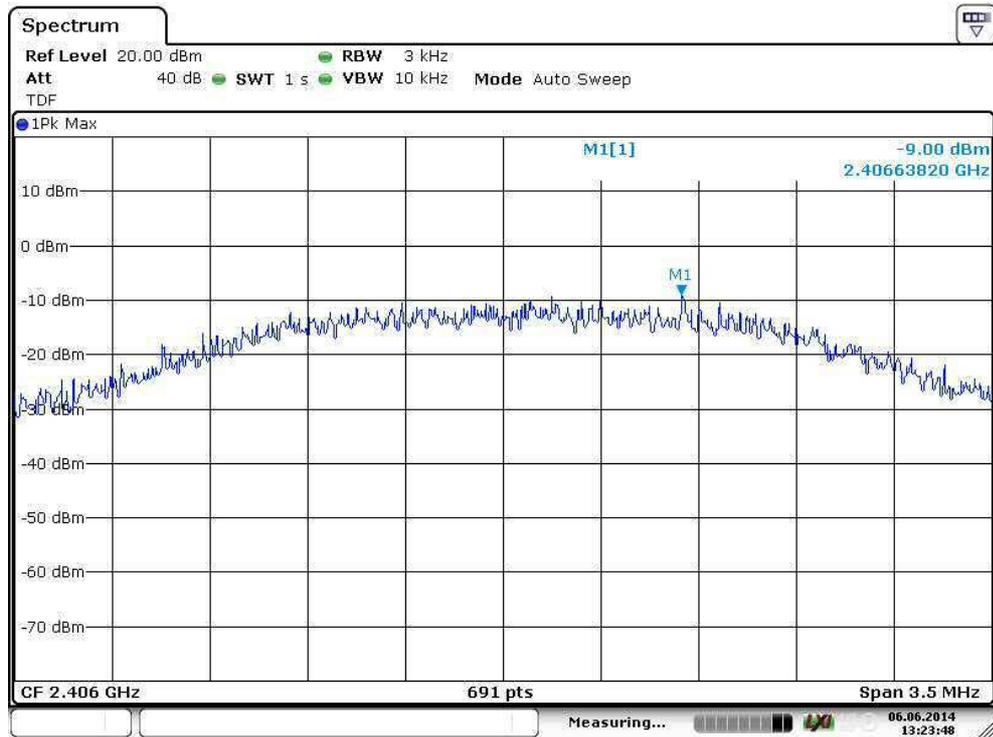
FCC Rule: 15.247(e)
RSS-210 A8.2

Results:

Table 25. Power Spectral Density test results.

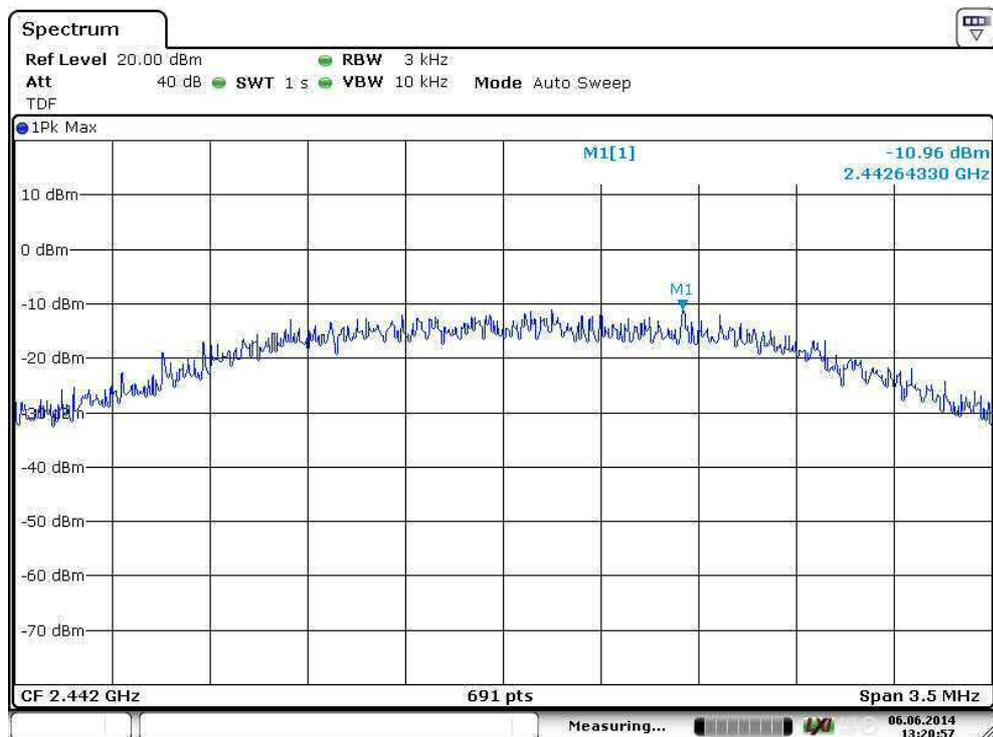
Channel	PSD dBm/3 kHz	Maximum limit [dBm/3kHz]
Low	-9.00	+8.00
Mid	-10.96	
High	-11.13	

Power Spectral Density



Date: 6.JUN.2014 13:23:49

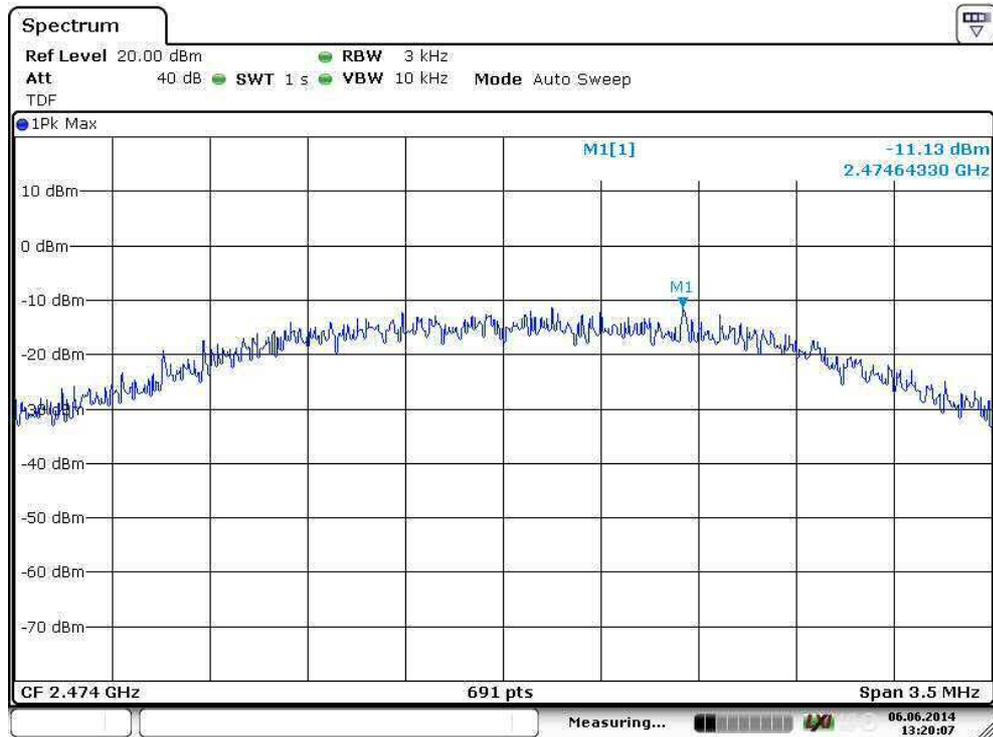
Figure 36. Power Spectral Density of the channel Low.



Date: 6.JUN.2014 13:20:57

Figure 37. Power Spectral Density of the channel Mid.

Power Spectral Density



Date: 6.JUN.2014 13:20:06

Figure 38. Power Spectral Density of the channel High.

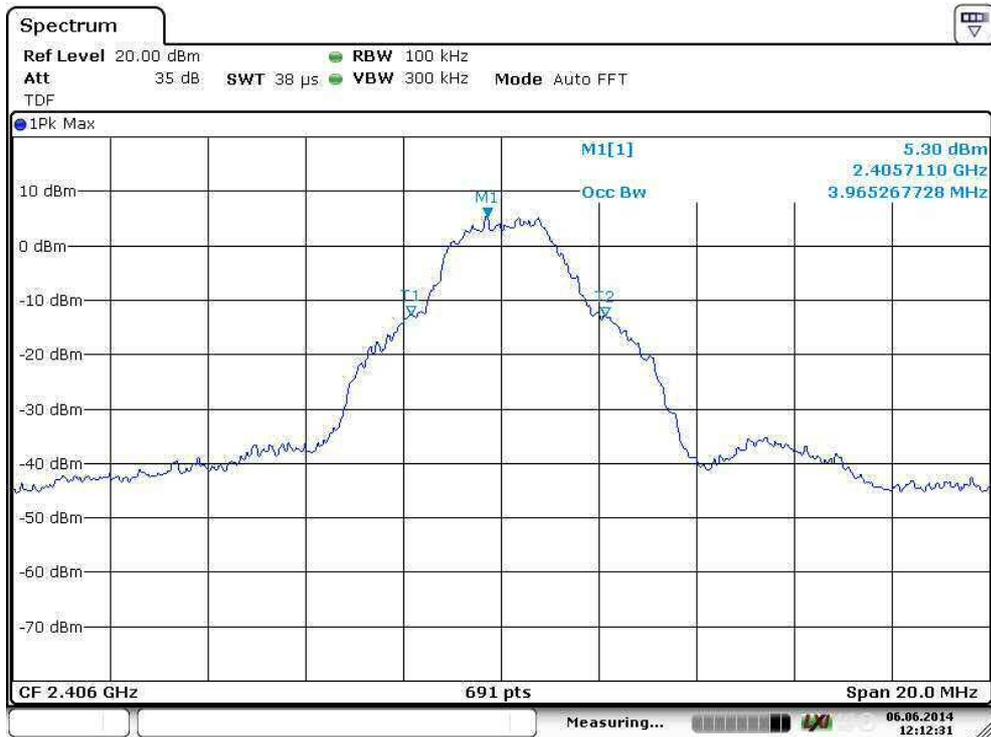
99% Occupied Bandwidth

Standard: RSS-GEN (2010)
Tested by: NKO
Date: 6.6.2014
Humidity: 48%
Temperature: 24.8°C

RSS-GEN 4.7

Table 26. 99 % OBW test results.

Channel	Limit	99 % BW [MHz]	Result
Low	-	3.965267728	PASS
Mid	-	3.936324168	PASS
High	-	3.936324168	PASS



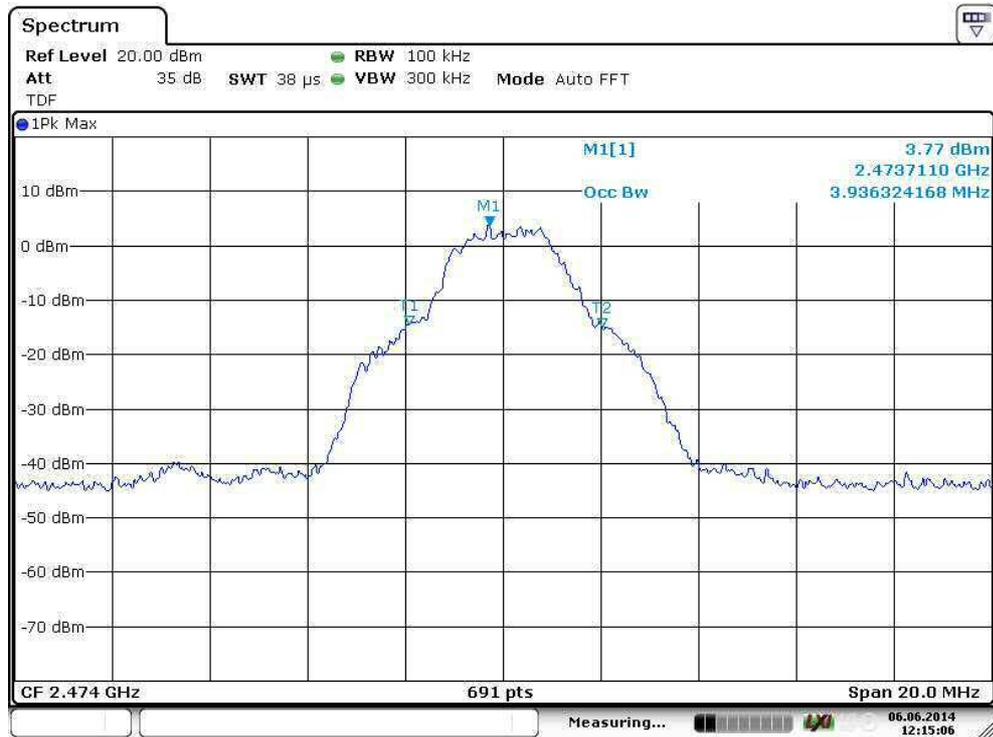
Date: 6.JUN.2014 12:12:30

Figure 39. 99 % OBW. Channel Low.



Date: 6.JUN.2014 12:14:21

Figure 40. 99 % OBW. Channel Mid.



Date: 6.JUN.2014 12:15:06

Figure 41. 99 % OBW. Channel High.

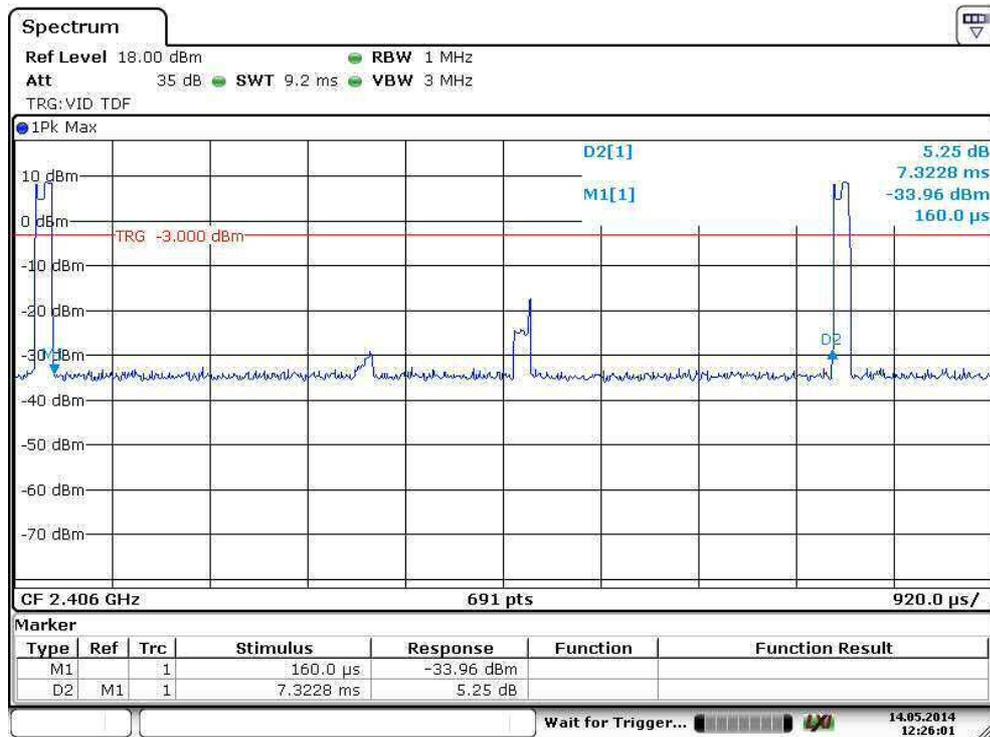
Time Of Occupancy (Dwell Time)

Standard: ANSI C63.10 (2009)
Tested by: NKO
Date: 14.5.2014
Humidity: 22 %
Temperature: 21.5 °C
Measurement uncertainty ± 2.87 dB Level of confidence 95 % (k = 2)

FCC Rule: 15.247(a)

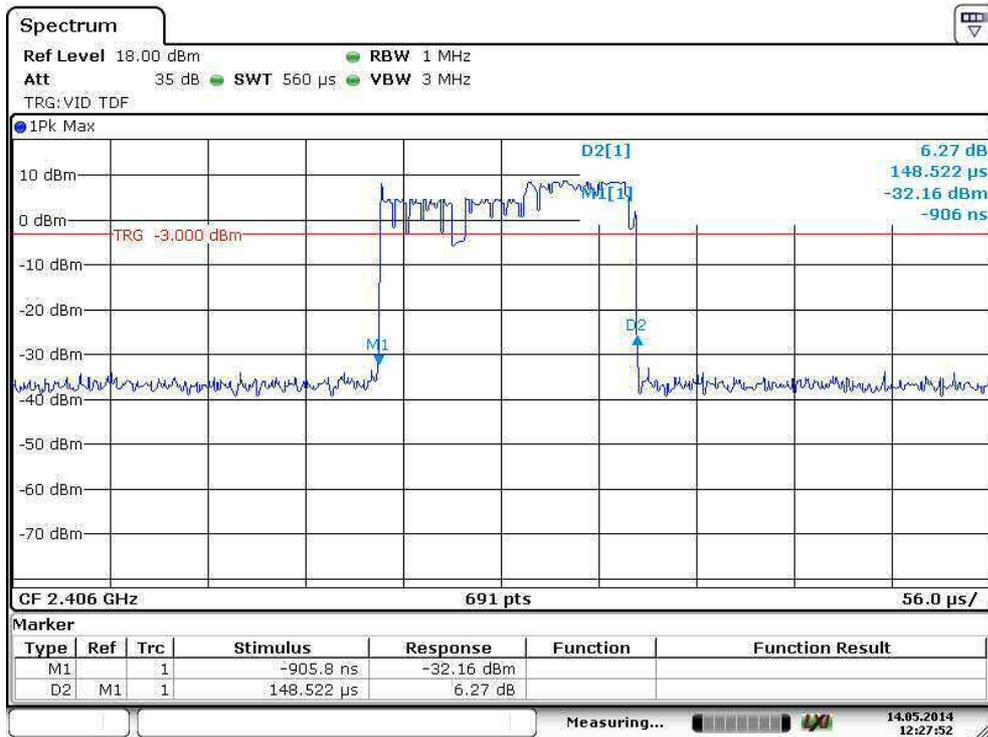
Table 27. Dwell time of the lowest channel.

Channel	Dwell Time [ms]	Tx off [ms]	Comment
Low	0.148522	7.3228	



Date: 14.MAY.2014 12:26:01

Figure 42. Tx off time Channel Low.



Date: 14.MAY.2014 12:27:52

Figure 43. Dwell Time Channel Low

List of test equipments

Manufacturer	Type	Serial no	Inv. no
ROHDE & SCHWARZ			
Spectrum Analyzer	FSV 40	101068	9093
EMI Test receiver	ESU 26	100185	8453
Test software	EMC32	-	-
DAVIS			
Weather station	Vantage Pro	-	5297
ETS-LINDGREN			
Antenna (18 GHz – 26 GHz)	3160-09	28535	7294
EMCO			
Antenna (1 - 18 GHz)	3117	29617	7293
SCHWARZBECK			
Antenna (30 MHz - 1 GHz)	VULB 9168	9168-503	8911
HEWLETT- PACKARD			
Microwave amplifier	83017A	-	5226
HUBER-+ SUHNER			
Attenuator 10dB	6810.17B	-	-
DEISEL			
Antenna mast	MA 240	240/455	7896
Turntable	DS 430	-	-
WAINWRIGHT			
High Pass Filter	WHKX	10	8267

All used measurement equipment was calibrated (if required).