SGS

Test Report

FINAS
Finnish Accreditation Service
T004 (EN ISO/IEC 17025)

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

Equipment Under Test:	Bluetooth Low Energy Beacon for Indoor Positioning and Navigation
Model:	SenionLab
Type:	-
Manufacturer:	SenionLab AB Teknikringen 7 SE-583 30 Linköping SWEDEN
Customer:	SenionLab AB Teknikringen 7 SE-583 30 Linköping SWEDEN
FCC Rule Part: IC Rule Part	15.247: 2014 RSS-247, Issue 1, 2015 RSS-GEN Issue 4, 2014

Date: 19 August 2015
Issued by:
Rauno Repo
Testing Engineer

Date: 20 August 2015
Checked by:
Janne Nyman
Compliance Specialist

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Equipment Under Test (EUT)

Bluetooth Low Energy Beacon for Indoor Positioning and Navigation

Model:	SenionLab
Type:	-
Serial no:	-

Description of the EUT

EUT is a Bluetooth Low Energy beacon for indoor positioning and navigation. EUT is battery powered. The EUT is using Texas Instruments Bluetooth 4.0 Low energy chip (2.4 GHz).

Classification of the device

Fixed device	☐
Mobile Device (Human body distance > 20cm)	☒
Portable Device (Human body distance < 20cm)	☐

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:	40
Channel separation:	2 MHz
Channel bandwidth:	1.20 MHz
Maximum peak conducted output power:	2.61 dBm
Transmission technique:	Digital Transmission
Modulation:	GFSK
Integral Antenna gain:	4.0 dBi

Mechanical Size of the EUT

Height:	30 mm	Width:	75 mm	Depth:	40 mm

Power Supply

Battery operated	
Operating voltage range	1.8 – 3.8 VDC
Normal input voltage:	ER14505 3.6V AA lithium battery

Samples

Two samples were used in tests. One sample for radiated spurious tests and one sample for conductive antenna port measurements. Modulated TX signal was possible to set at low, middle and high channels. Receiving operation was also possible to set at the same channels. The EUT is powered via battery (3.6 VDC). Antenna port measurements were made with a laboratory power source.

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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-247 5.4	Maximum Peak Conducted Output Power	PASS
§15.247(a)(2) / RSS-247 5.2	6 dB Bandwidth	PASS
§15.247(e) / RSS-247 5.2	Power Spectral Density	PASS
RSS-GEN 6.6	99% Occupied Bandwidth	PASS
§15.247(d) / RSS-247 5.5	100 kHz Bandwidth of Frequency Band Edges and Conducted Spurious Emissions	PASS
§15.209(a), §15.247(d) / RSS-247 5.5	Radiated Emissions Within The Restricted Bands	PASS
§15.109 / RSS-GEN 6.13	Unintentional Radiated Emissions	PASS

EUT Test Conditions during Testing

The EUT was in continuous transmit mode during all the tests. The hopping was stopped and the EUT was configured into the wanted channel.

During the radiated measurements the EUT was on 150 cm high Styrofoam table. New battery was installed before the measurements.

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

Channel Low (Ch 0) = 2402 MHz

Channel Mid (Ch 19) = 2440 MHz

Channel High (Ch 39) = 2480 MHz

Test Facility

☐	Testing Location / address: FCC registration number: **90598**	SGS Fimko Ltd Särkiniementie 3 FI-00210, HELSINKI FINLAND
☒	Testing Location / address: FCC registration number: **178986** Industry Canada registration number: **8708A-2**	SGS Fimko Ltd Karakaarenkuja 4 FI-02610, ESPOO FINLAND

Maximum Peak Conducted Output Power

Standard:	ANSI C63.10	(2013)
Tested by:	RRE	
Date:	12 August 2015	
Temperature:	19 °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	2.61	30	27.39	PASS
Mid	2.44	30	27.56	PASS
High	1.87	30	28.13	PASS

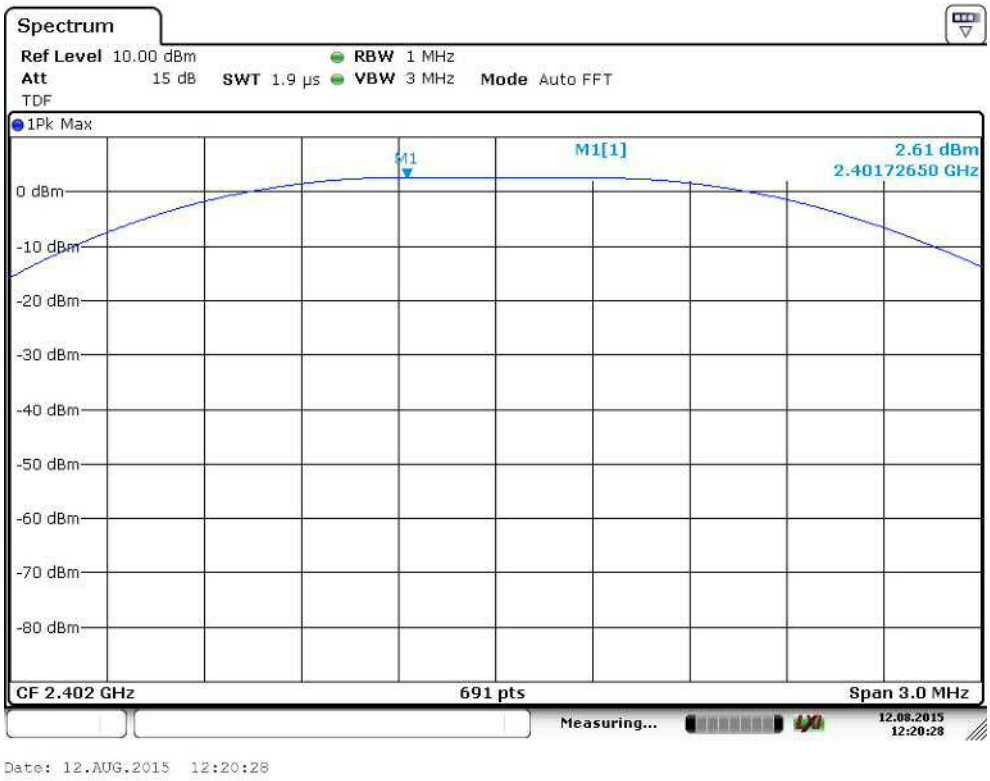


Figure 1. Low channel.

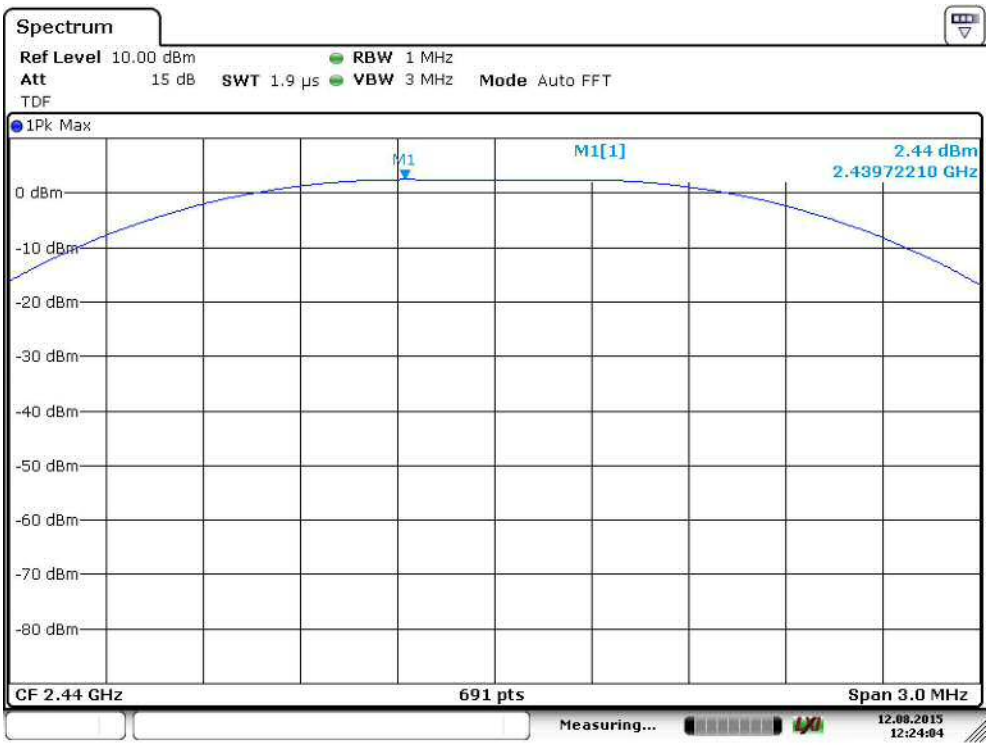


Figure 2. Mid channel.

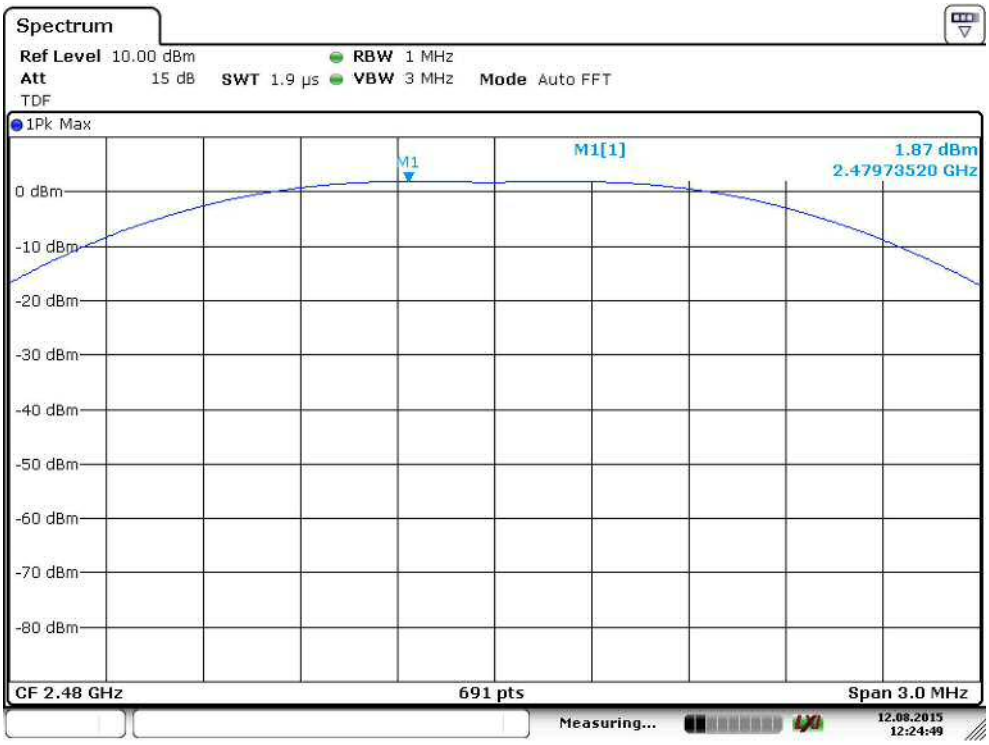


Figure 3. High channel.

Transmitter Radiated Spurious Emissions 30 – 1000 MHz

Standard:	ANSI C63.10	(2013)
Tested by:	RRE	
Date:	10 – 11 August 2015	
Temperature:	18 °C	
Humidity:	51 to 54 % RH	
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.

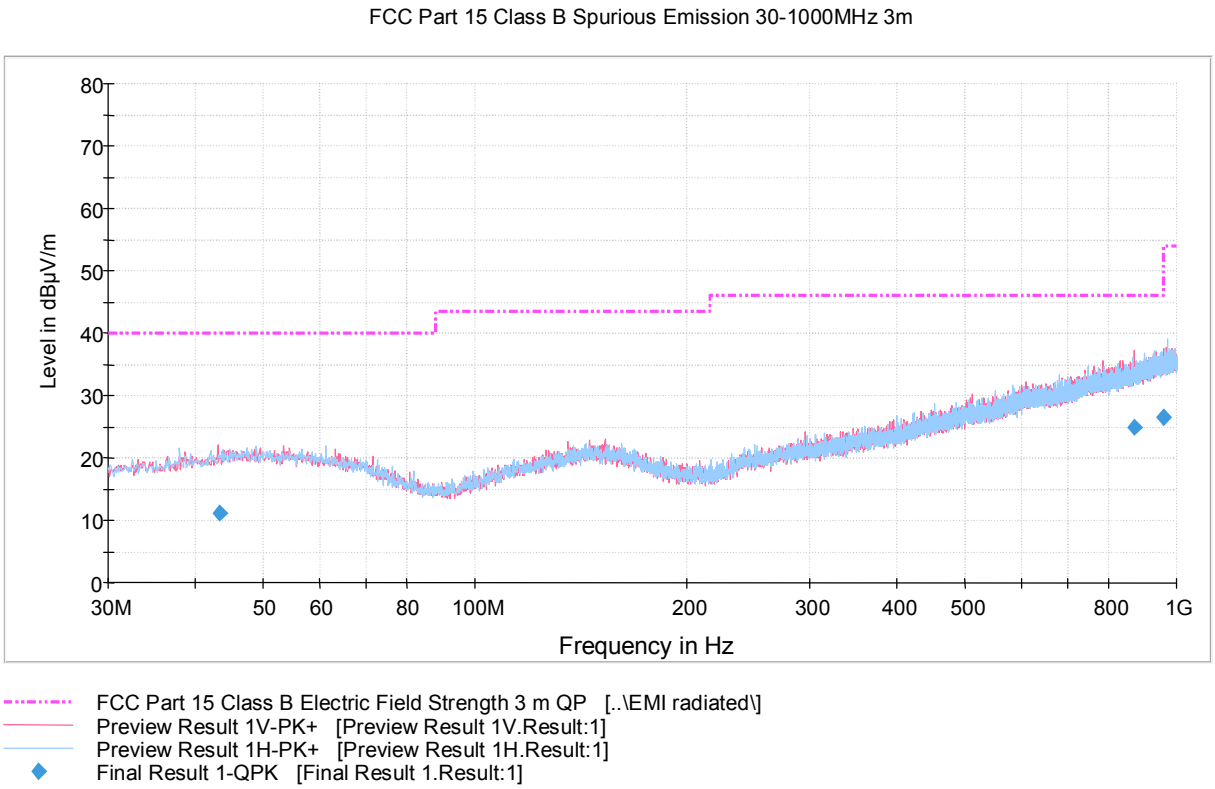


Figure 4. Measured curve with peak-detector. Low channel.

Final measurements from the worst frequencies

Table 1. 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
43.278000	11.1	1000.0	120.000	100.0	V	127.0	14.3	28.9	40.0	
871.863000	24.9	1000.0	120.000	231.0	V	192.0	26.1	21.1	46.0	
957.326000	26.5	1000.0	120.000	243.0	V	340.0	27.5	19.5	46.0	

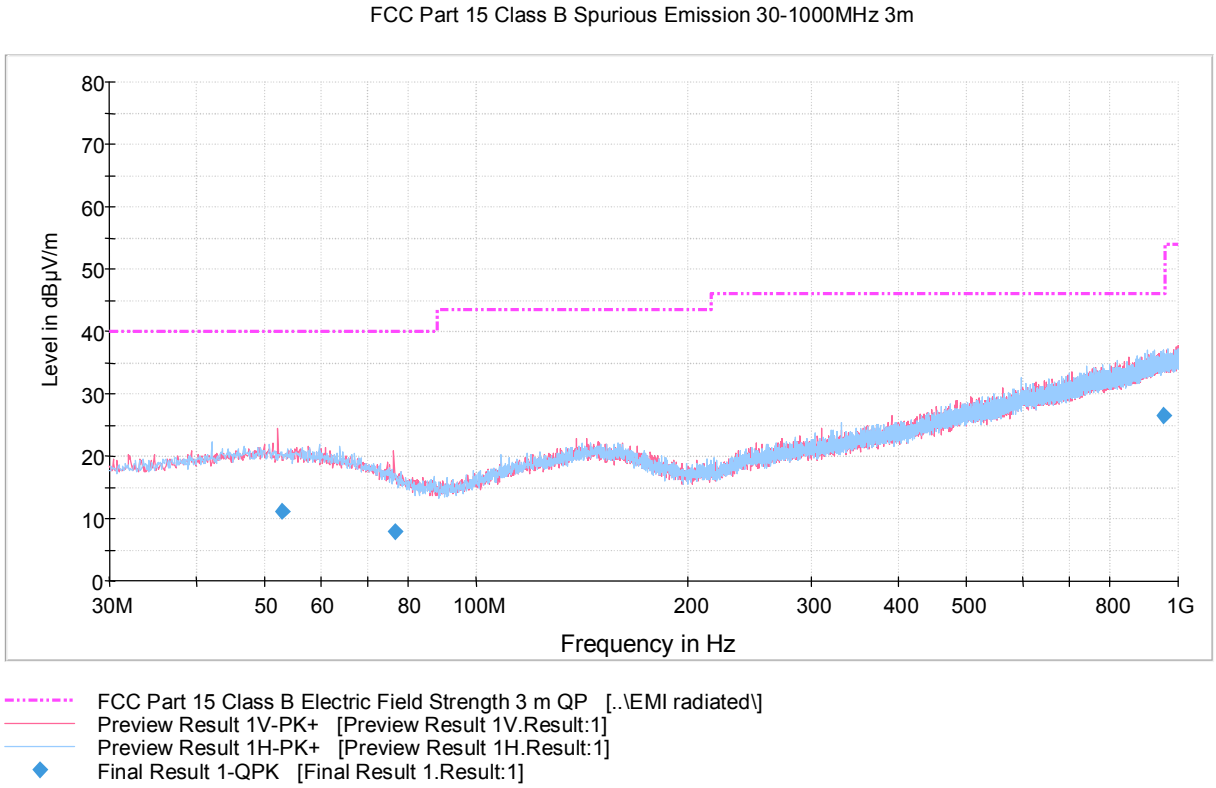


Figure 5. Measured curve with peak-detector. Mid channel.

Final measurements from the worst frequencies

Table 2. 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
52.813000	11.1	1000.0	120.000	169.0	V	171.0	14.5	28.9	40.0	
76.586000	7.9	1000.0	120.000	246.0	V	147.0	10.7	32.1	40.0	
954.228000	26.6	1000.0	120.000	260.0	H	88.0	27.5	19.4	46.0	

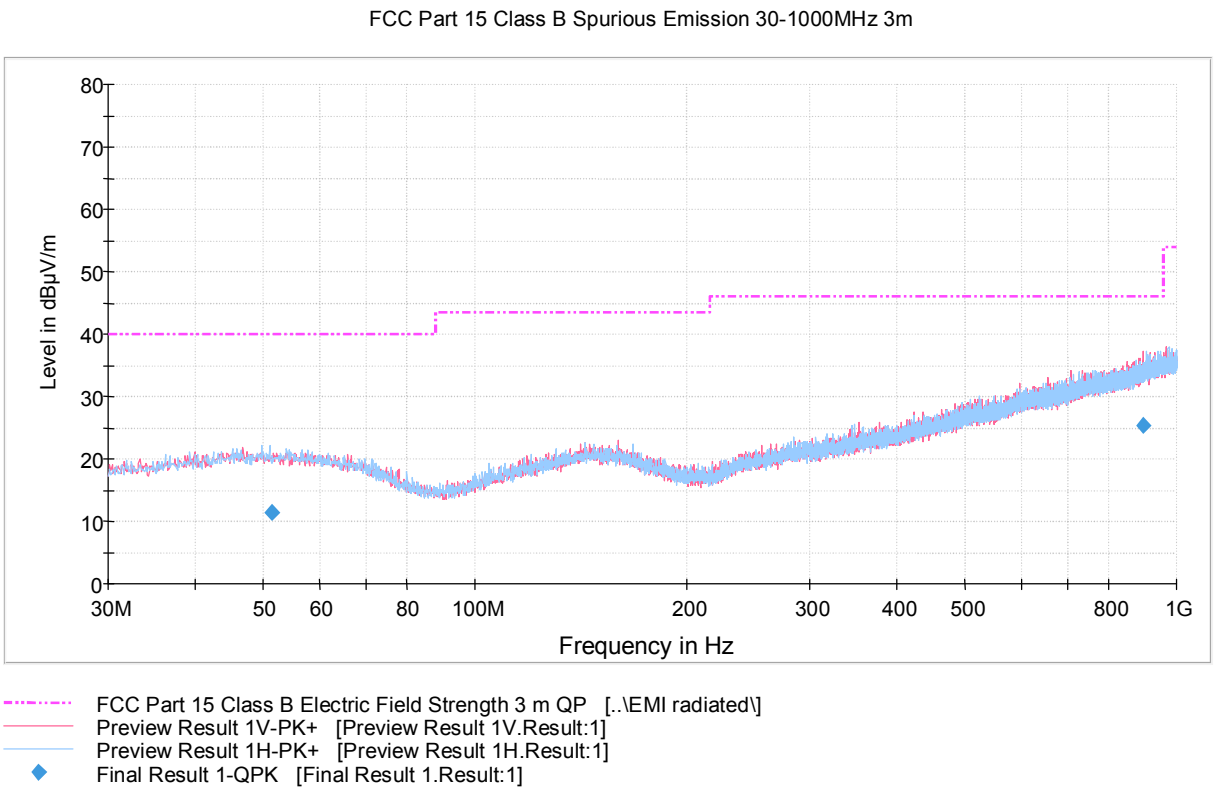


Figure 6. Measured curve with peak-detector. High channel.

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
51.329000	11.4	1000.0	120.000	246.0	H	172.0	14.5	28.6	40.0	
894.761000	25.5	1000.0	120.000	166.0	V	0.0	26.6	20.5	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.

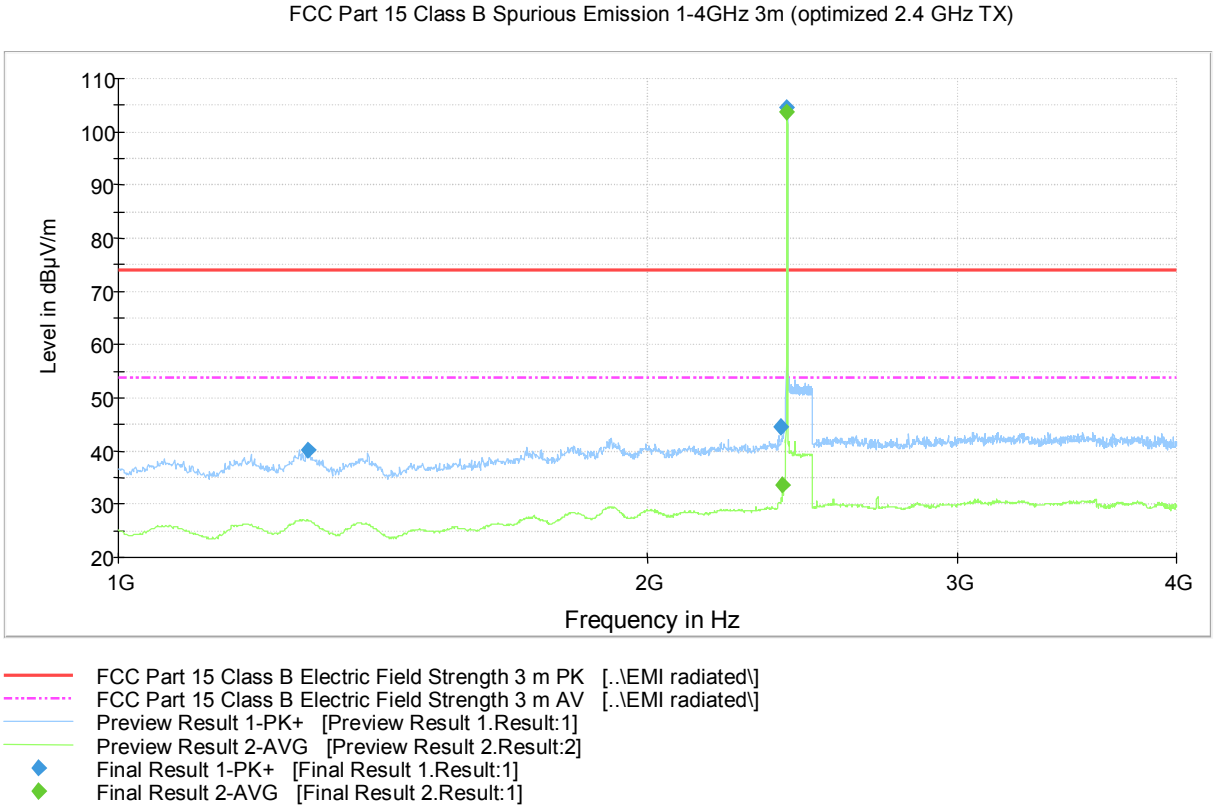


Figure 7. Measured curve with peak- and average detector. Low channel.

Final measurements from the worst frequencies

Table 4. 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
1281.925000	40.2	1000.0	1000.000	288.0	H	334.0	-2.8	33.7	73.9	
2383.600000	44.6	1000.0	1000.000	217.0	H	171.0	3.8	29.3	73.9	
2402.200000	104.5	1000.0	1000.000	218.0	H	168.0	3.9	-	N/A	Carrier

Table 5. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2388.400000	33.7	1000.0	1000.000	241.0	H	164.0	3.8	20.2	53.9	
2402.000000	103.7	1000.0	1000.000	216.0	H	164.0	3.9	-	N/A	Carrier

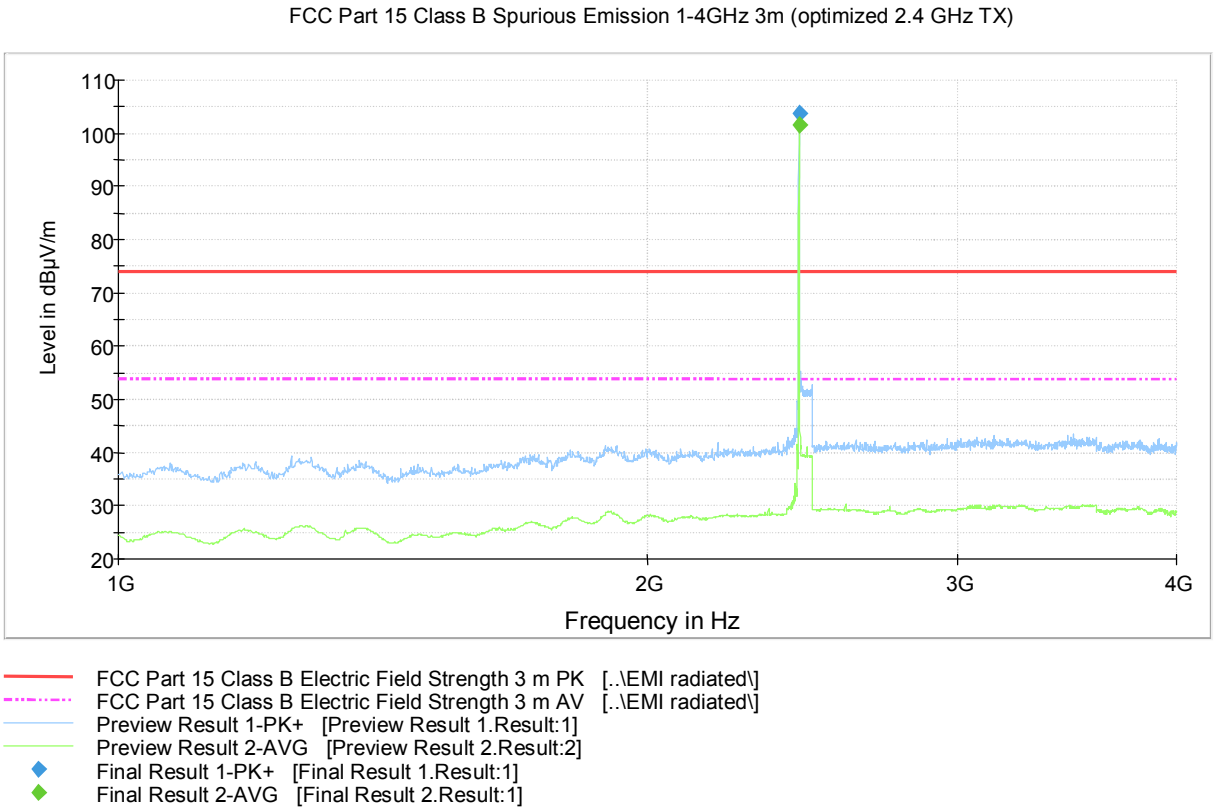


Figure 8. Measured curve with peak- and average detector. Mid channel.

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)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2439.750000	103.8	1000.0	1000.000	234.0	H	150.0	3.9	-	N/A	Carrier

Table 7. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2440.000000	101.4	1000.0	1000.000	239.0	H	152.0	3.9	-	N/A	Carrier

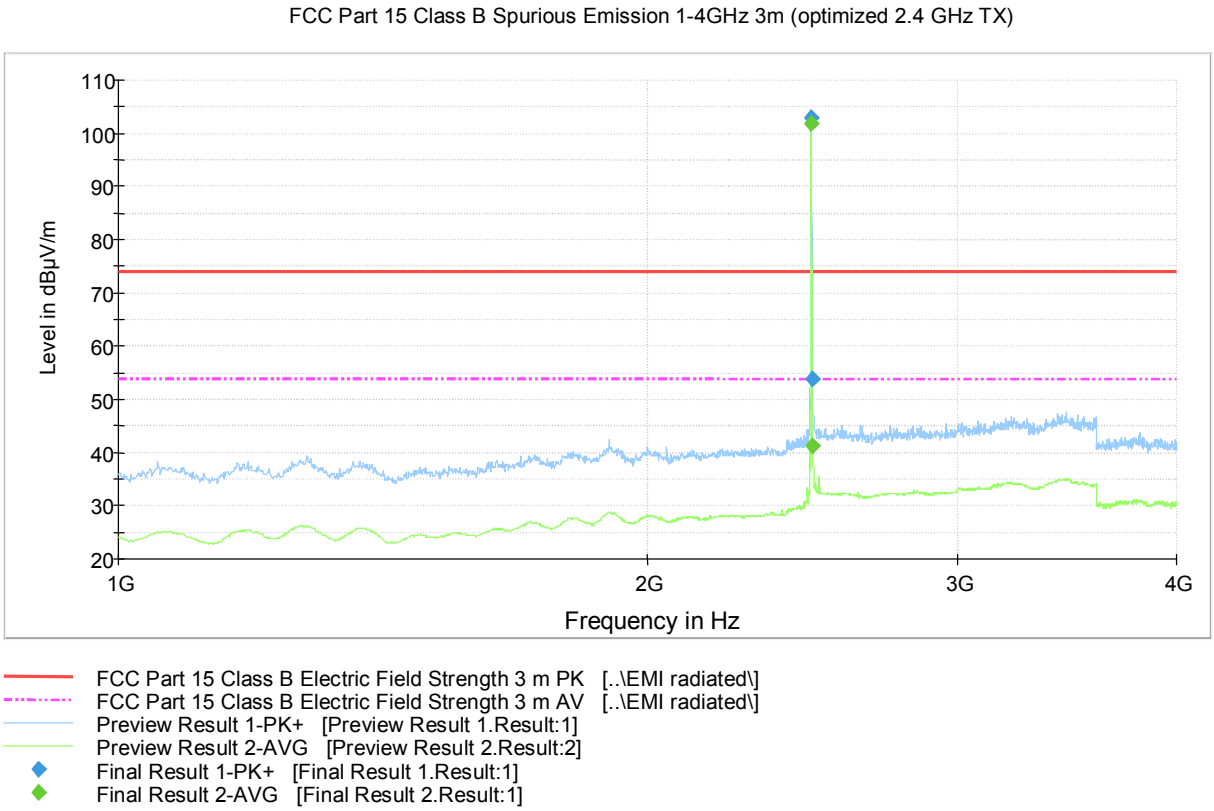


Figure 9. Measured curve with peak- and average detector. High channel.

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)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2479.750000	102.8	1000.0	1000.000	208.0	H	151.0	4.2	-	N/A	Carrier
2484.100000	53.9	1000.0	1000.000	161.0	H	172.0	4.2	20.0	73.9	

Table 9. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2480.000000	101.7	1000.0	1000.000	208.0	H	151.0	4.2	-	N/A	Carrier
2483.500000	41.2	1000.0	1000.000	258.0	H	152.0	4.2	12.7	53.9	

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

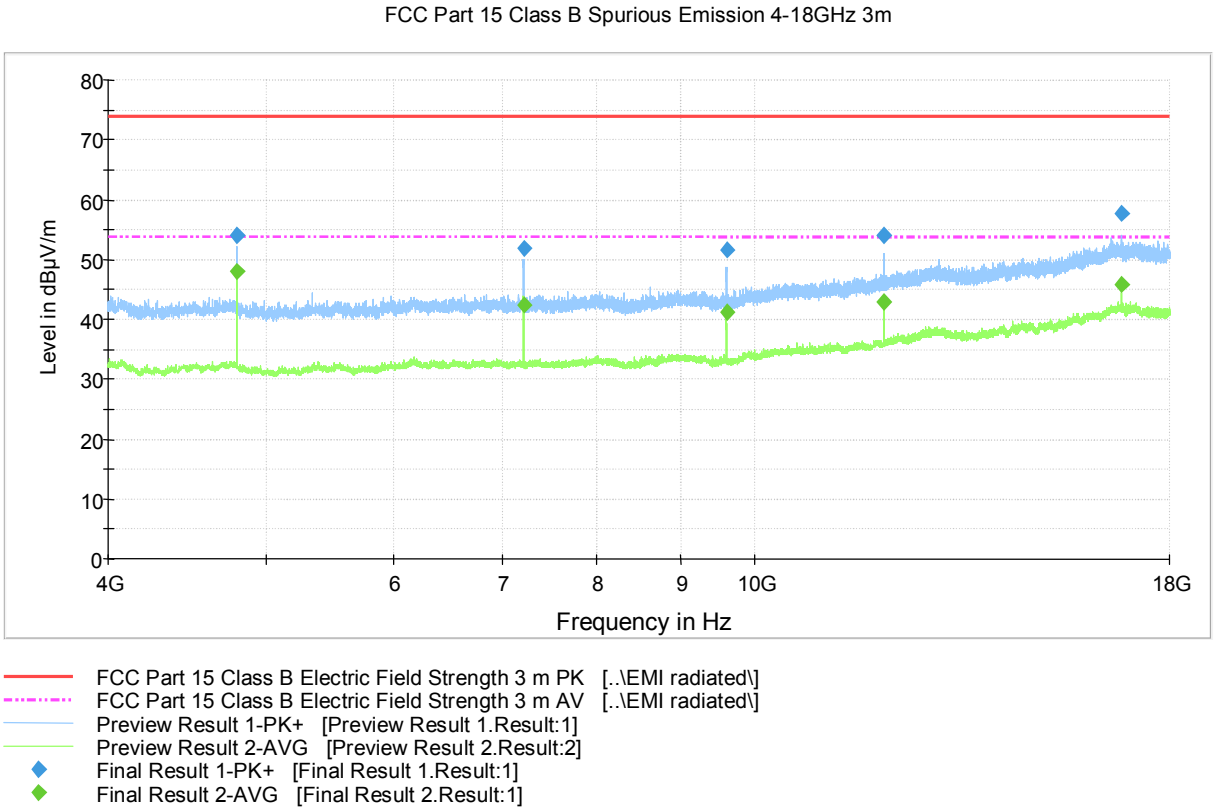


Figure 10. Measured curve with peak- and average detector. Low channel.

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
4803.500000	54.2	1000.0	1000.000	172.0	V	89.0	10.0	19.7	73.9	
7206.700000	51.9	1000.0	1000.000	176.0	V	161.0	12.3	22.0	73.9	
9609.000000	51.7	1000.0	1000.000	100.0	H	293.0	14.9	22.2	73.9	
12008.700000	54.0	1000.0	1000.000	100.0	H	90.0	18.5	19.9	73.9	
16815.800000	57.7	1000.0	1000.000	200.0	V	220.0	25.5	16.2	73.9	

Table 11. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4804.000000	48.1	1000.0	1000.000	145.0	V	86.0	10.0	5.8	53.9	
7206.500000	42.3	1000.0	1000.000	223.0	H	218.0	12.3	11.6	53.9	
9608.800000	41.2	1000.0	1000.000	100.0	H	289.0	14.9	12.7	53.9	
12011.100000	42.8	1000.0	1000.000	105.0	V	145.0	18.5	11.1	53.9	
16815.600000	45.8	1000.0	1000.000	199.0	V	220.0	25.5	8.1	53.9	

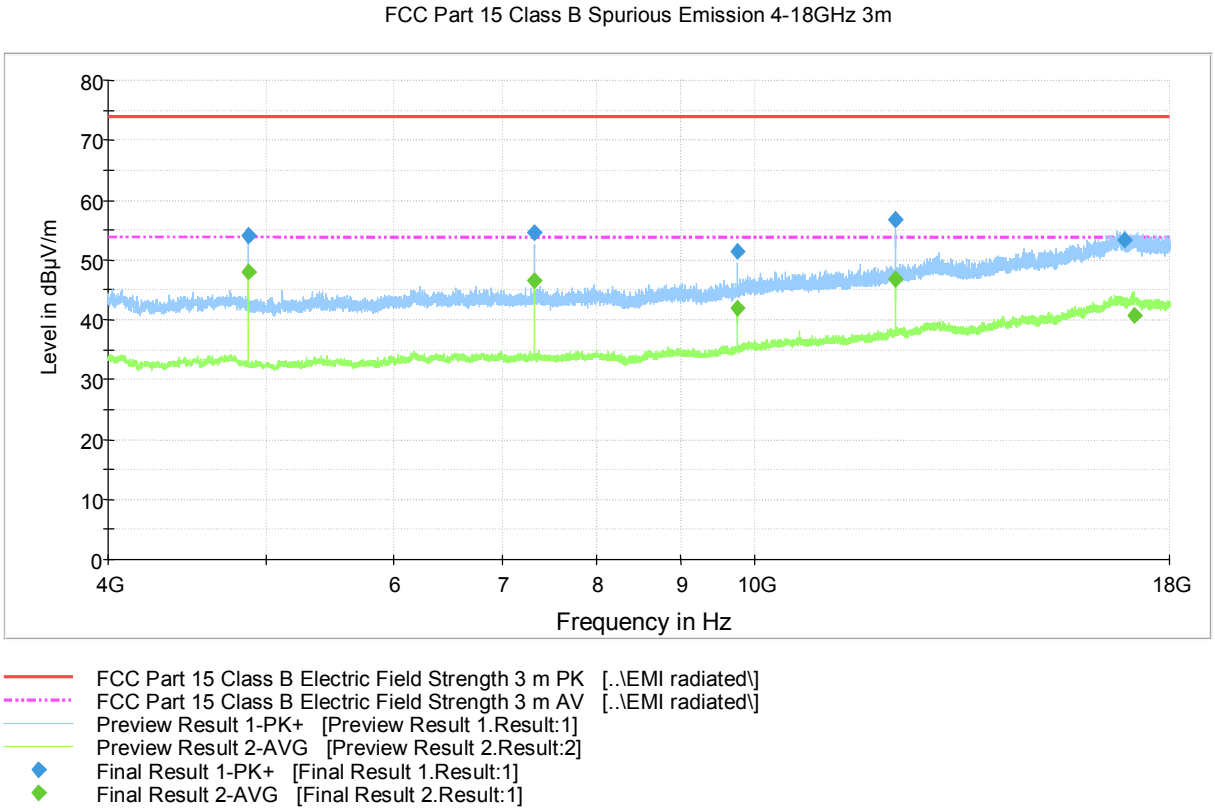


Figure 11. Measured curve with peak- and average detector. Mid channel.

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)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4880.500000	54.0	1000.0	1000.000	137.0	V	93.0	10.0	19.9	73.9	
7320.800000	54.7	1000.0	1000.000	216.0	V	157.0	12.3	19.2	73.9	
9758.900000	51.4	1000.0	1000.000	200.0	V	136.0	14.9	22.5	73.9	
12198.700000	56.7	1000.0	1000.000	100.0	H	94.0	19.1	17.2	73.9	
16875.700000	53.4	1000.0	1000.000	279.0	V	122.0	25.4	20.5	73.9	

Table 13. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4879.900000	47.9	1000.0	1000.000	145.0	V	85.0	10.0	6.0	53.9	
7320.600000	46.5	1000.0	1000.000	224.0	V	156.0	12.3	7.4	53.9	
9760.900000	41.8	1000.0	1000.000	200.0	H	224.0	15.0	12.1	53.9	
12201.100000	46.8	1000.0	1000.000	100.0	H	94.0	19.1	7.1	53.9	
17140.900000	40.7	1000.0	1000.000	364.0	V	30.0	25.9	13.2	53.9	

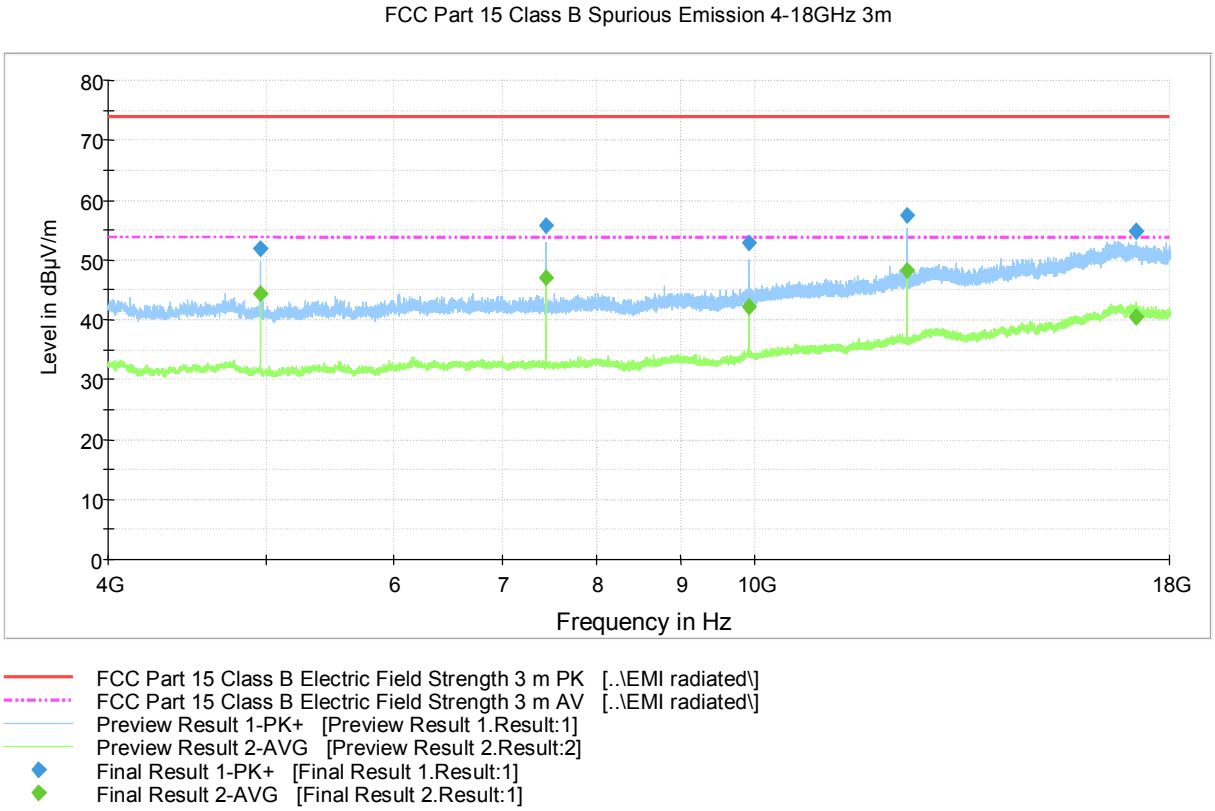


Figure 12. Measured curve with peak- and average detector. High channel.

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)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4959.500000	51.8	1000.0	1000.000	129.0	H	45.0	9.9	22.1	73.9	
7440.700000	55.8	1000.0	1000.000	216.0	V	144.0	12.3	18.1	73.9	
9921.000000	52.8	1000.0	1000.000	201.0	H	219.0	15.6	21.1	73.9	
12398.600000	57.5	1000.0	1000.000	100.0	H	86.0	19.2	16.4	73.9	
17171.300000	54.7	1000.0	1000.000	360.0	V	4.0	25.7	19.2	73.9	

Table 15. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4960.100000	44.3	1000.0	1000.000	129.0	H	39.0	9.9	9.6	53.9	
7439.300000	47.1	1000.0	1000.000	217.0	V	152.0	12.3	6.8	53.9	
9920.800000	42.2	1000.0	1000.000	209.0	V	135.0	15.6	11.7	53.9	
12398.800000	48.2	1000.0	1000.000	100.0	H	91.0	19.2	5.7	53.9	
17171.000000	40.5	1000.0	1000.000	400.0	H	128.0	25.7	13.4	53.9	

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

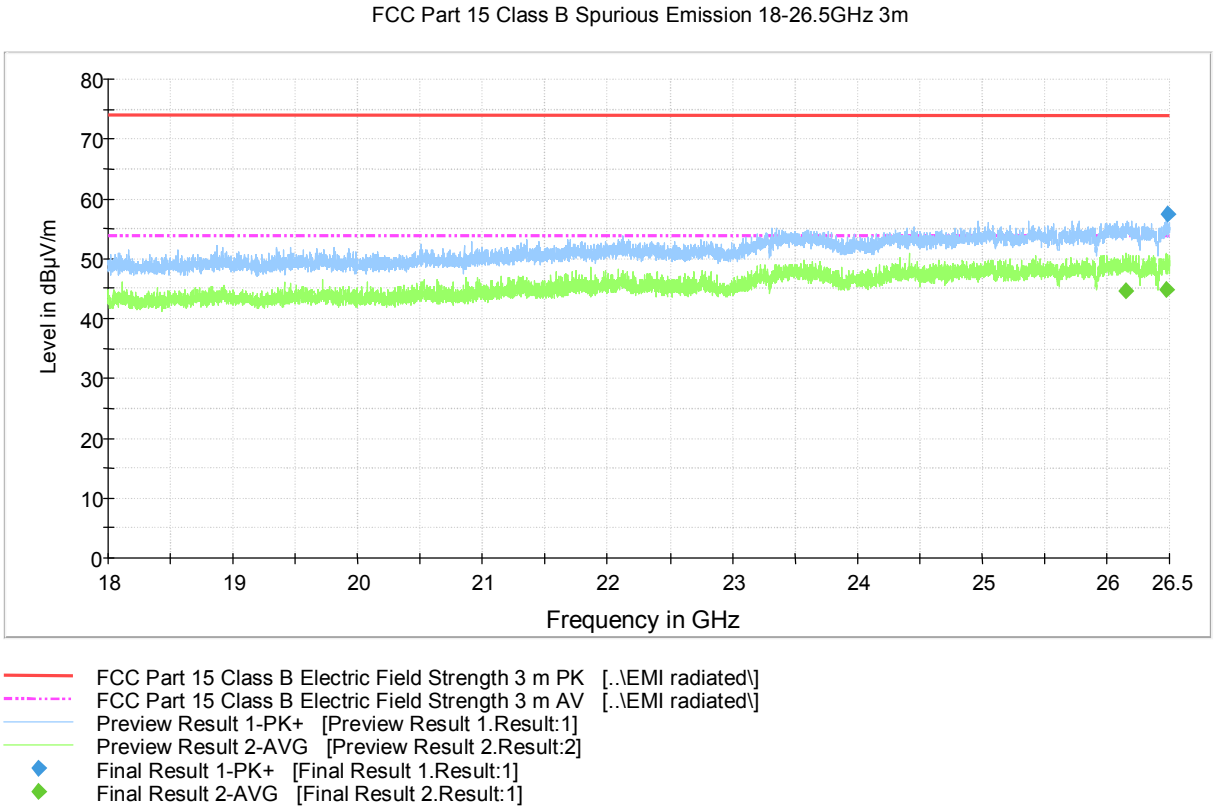


Figure 13. Measured curve with peak- and average detector. Low channel.

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)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
26484.700000	57.4	1000.0	1000.000	362.0	V	317.0	35.8	16.5	73.9	

Table 17. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
26157.100000	44.6	1000.0	1000.000	100.0	V	303.0	35.2	9.3	53.9	
26479.150000	44.9	1000.0	1000.000	216.0	H	190.0	35.8	9.0	53.9	

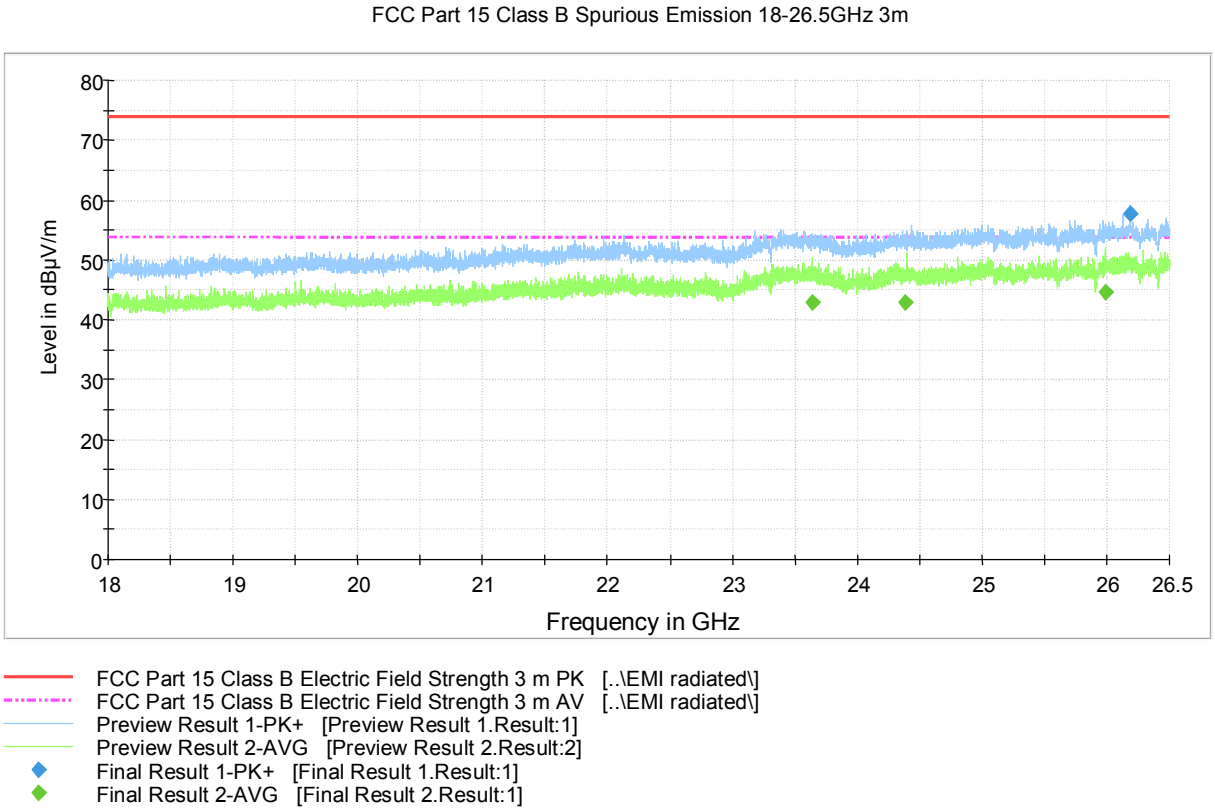


Figure 14. Measured curve with peak- and average detector. Mid channel.

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)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
26184.600000	57.7	1000.0	1000.000	145.0	H	125.0	35.3	16.2	73.9	

Table 19. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
23641.000000	42.9	1000.0	1000.000	100.0	H	37.0	31.9	11.0	53.9	
24391.250000	43.0	1000.0	1000.000	317.0	H	87.0	32.3	10.9	53.9	
25988.050000	44.5	1000.0	1000.000	319.0	H	118.0	34.7	9.4	53.9	

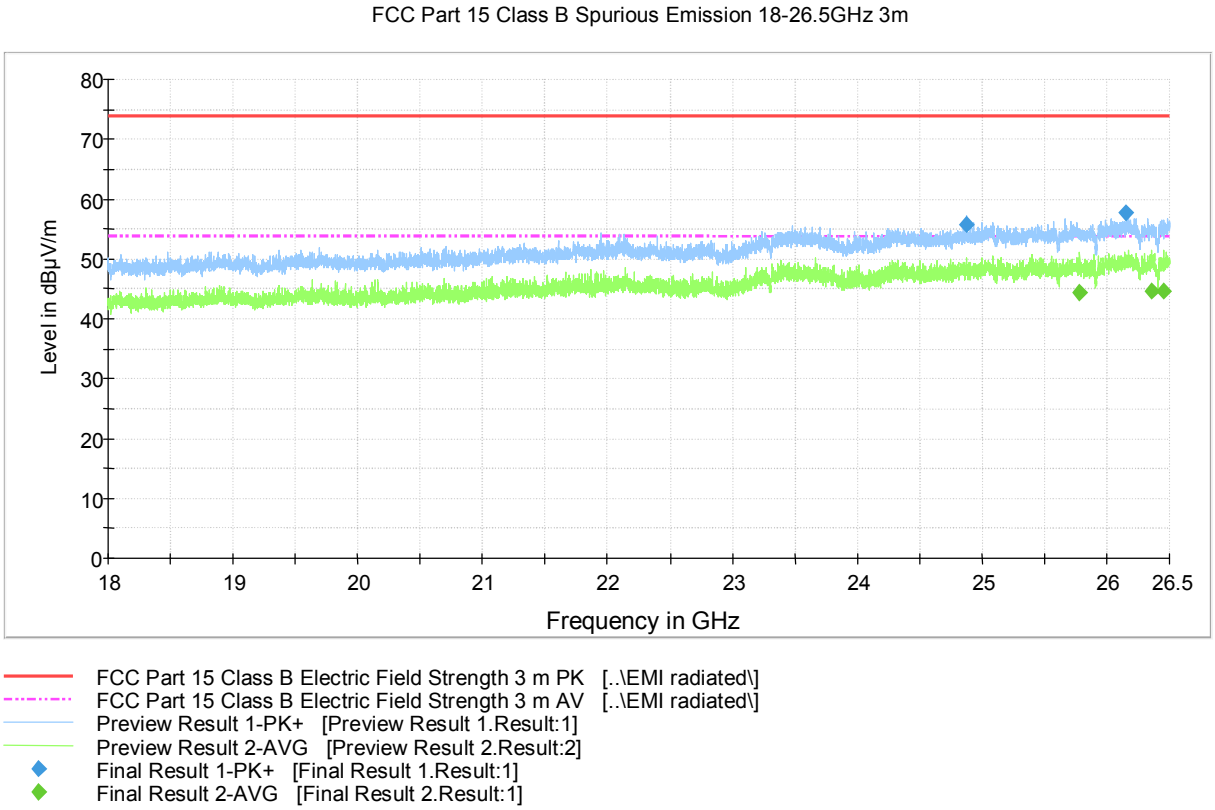


Figure 15. Measured curve with peak- and average detector. High channel.

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
24874.000000	55.7	1000.0	1000.000	264.0	H	99.0	32.6	18.2	73.9	
26155.050000	57.7	1000.0	1000.000	364.0	V	285.0	35.1	16.2	73.9	

Table 21. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
25784.750000	44.3	1000.0	1000.000	208.0	H	303.0	34.5	9.6	53.9	
26362.050000	44.5	1000.0	1000.000	193.0	H	103.0	35.6	9.4	53.9	
26455.150000	44.6	1000.0	1000.000	102.0	V	272.0	35.8	9.3	53.9	

Radiated band edge measurement results

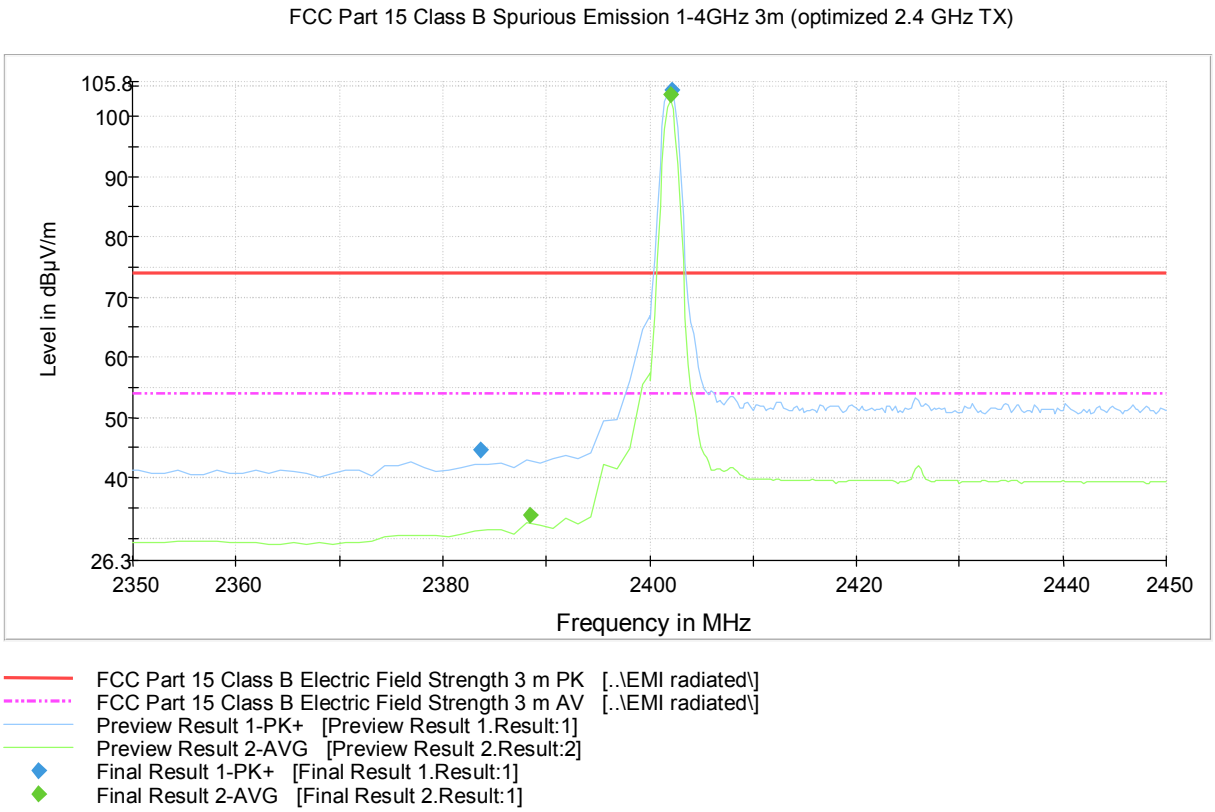


Figure 16. Measured curve with peak- and average detector. Lower band edge.

Final measurements from the worst frequencies

Table 22. 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
2383.600000	44.6	1000.0	1000.000	217.0	H	171.0	3.8	29.3	73.9	

Table 23. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2388.400000	33.7	1000.0	1000.000	241.0	H	164.0	3.8	20.2	53.9	

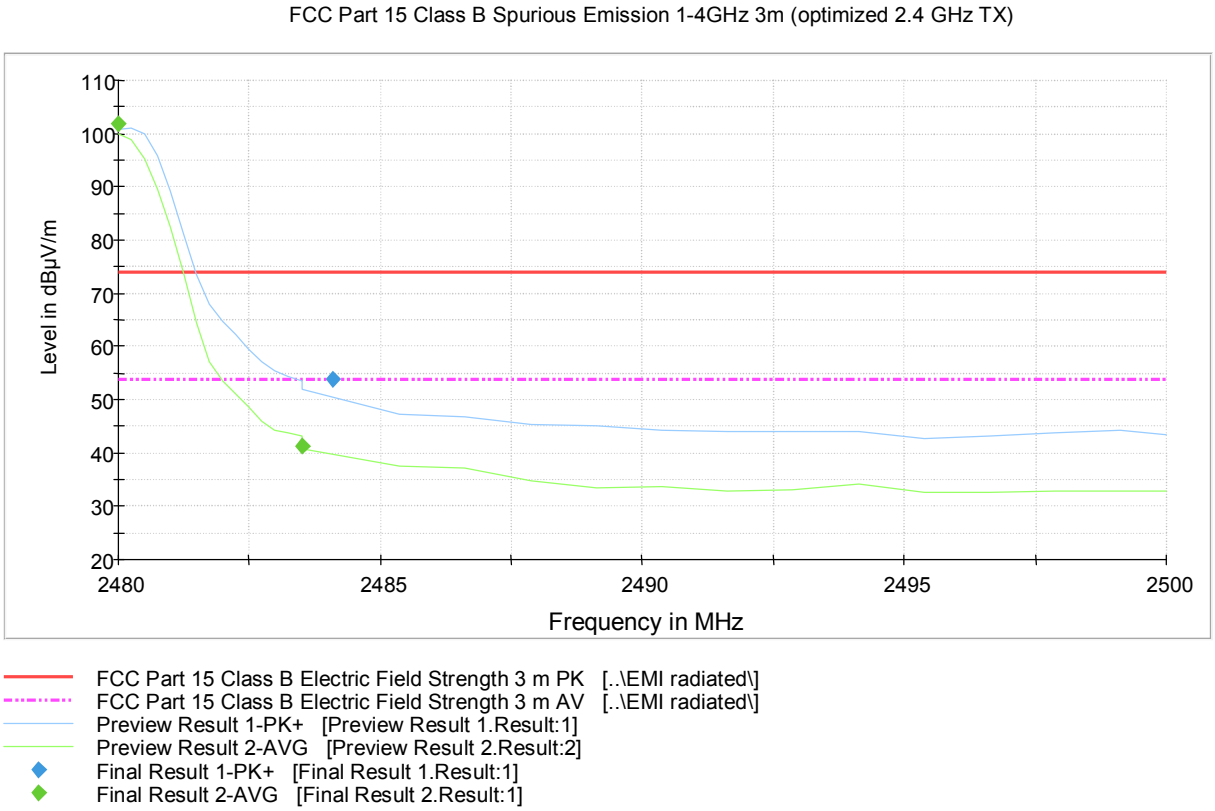


Figure 17. Measured curve with peak- and average detector. Upper band edge.

Final measurements from the worst frequencies

Table 24. 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
2484.100000	53.9	1000.0	1000.000	161.0	H	172.0	4.2	20.0	73.9	

Table 25. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2483.500000	41.2	1000.0	1000.000	258.0	H	152.0	4.2	12.7	53.9	

Transmitter Band Edge Measurement and Conducted Spurious Emissions

Standard:	ANSI C63.10	(2013)
Tested by:	RRE	
Date:	12 August 2015	
Temperature:	21 °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)).

Band Edge Attenuation	
Lower Band Edge	Upper Band Edge
-47.01 dBc	-52.79 dBc
Limit: -20dBc	

Table 26. Band edge attenuation.

Table 27. 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.

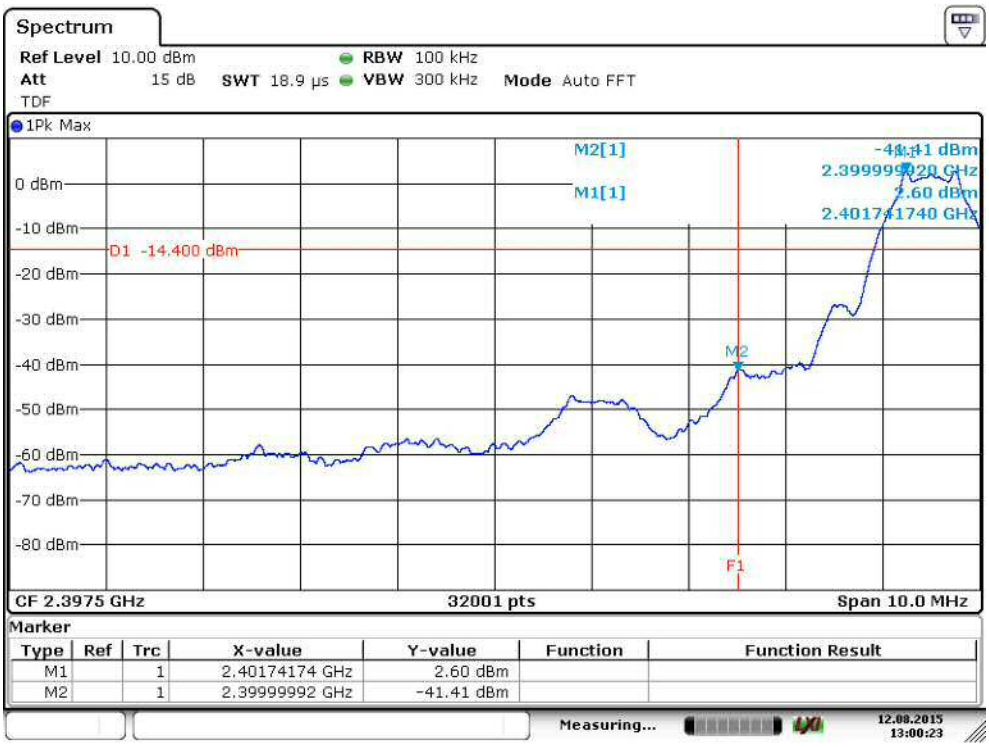


Figure 18. Lower Band Edge.

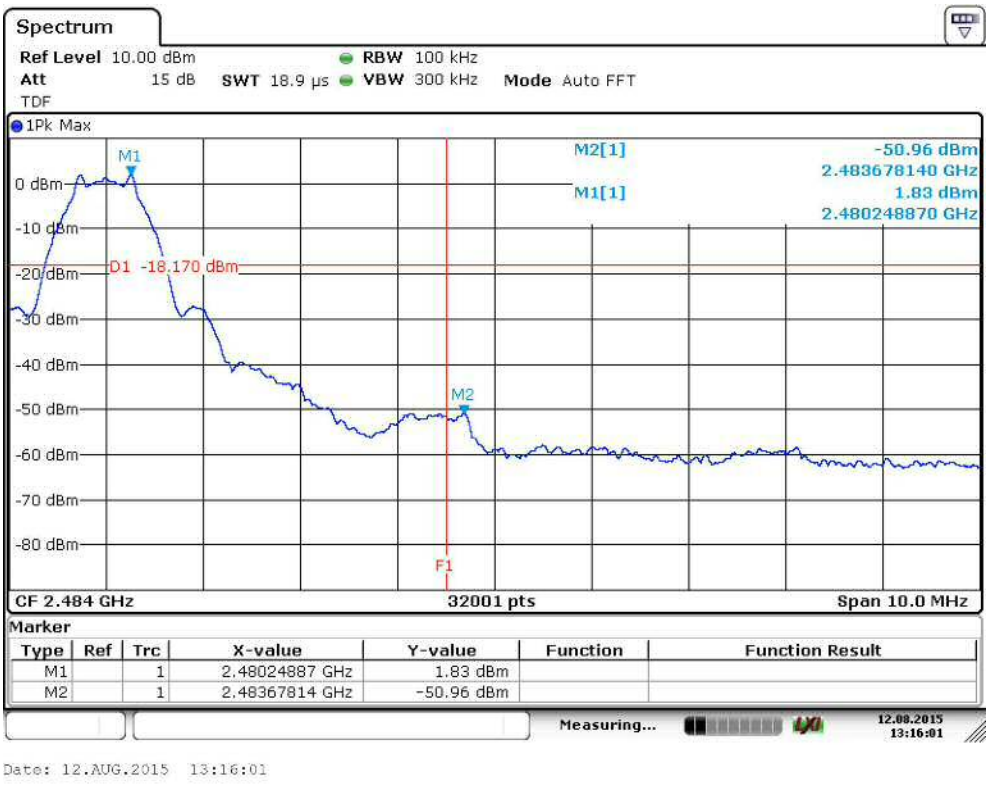
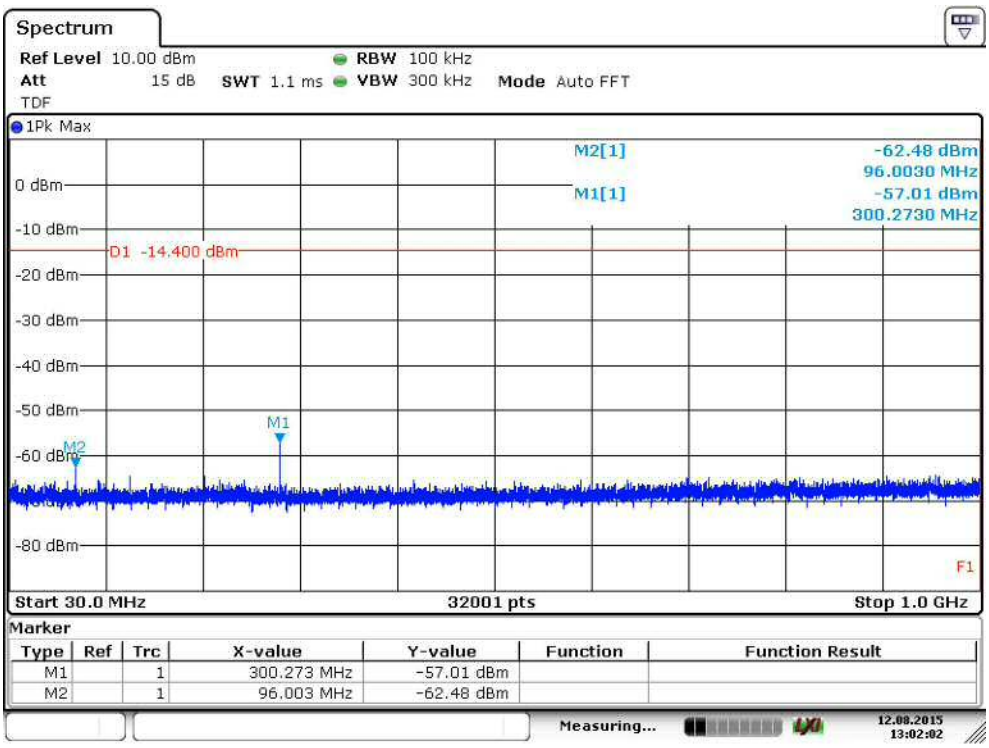
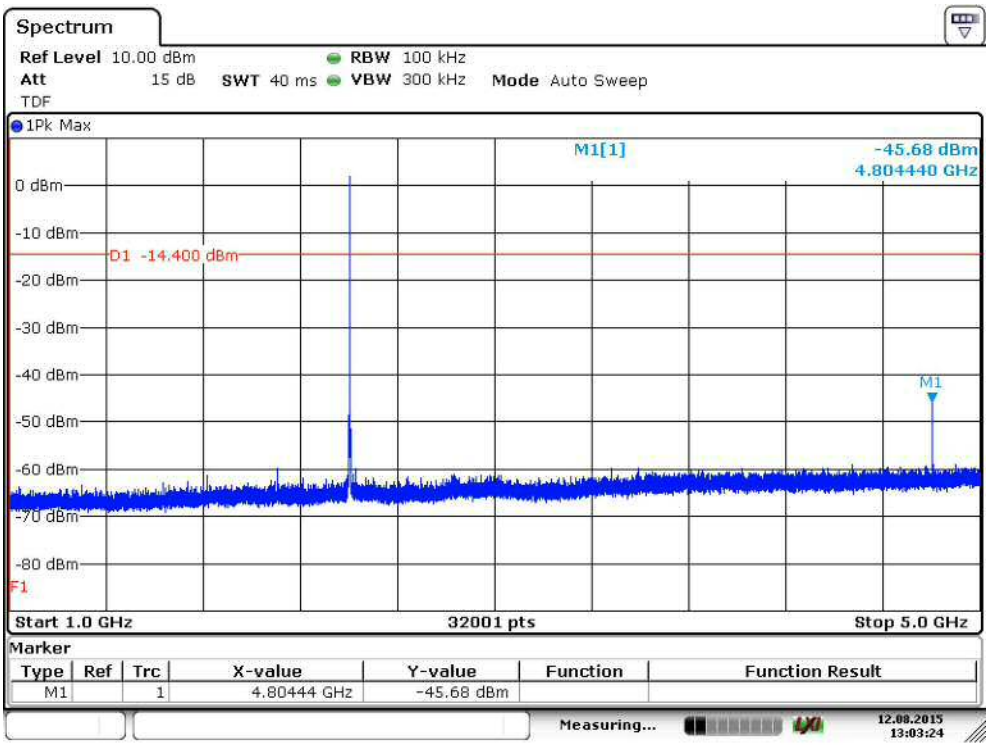


Figure 19. Upper Band Edge.



Date: 12.AUG.2015 13:02:01

Figure 20. Conducted Spurious Emissions 30 – 1 000 MHz. Low channel.



Date: 12.AUG.2015 13:03:23

Figure 21. Conducted Spurious Emissions 1 000 – 5 000 MHz. Low channel.

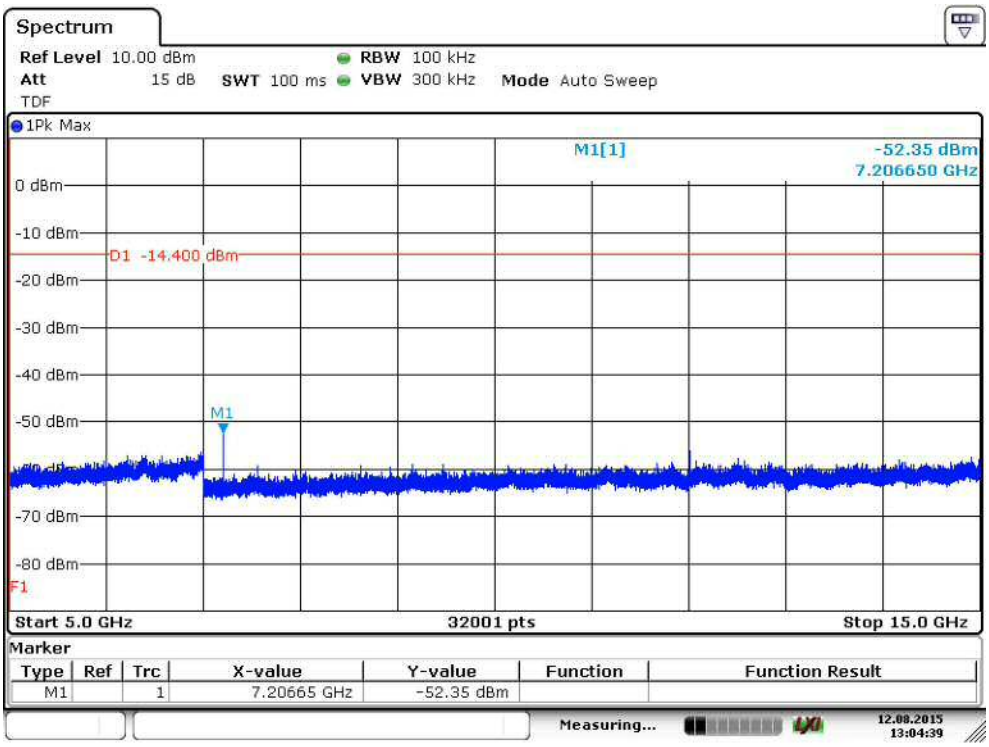


Figure 22. Conducted Spurious Emissions 5 000 – 15 000 MHz. Low channel.

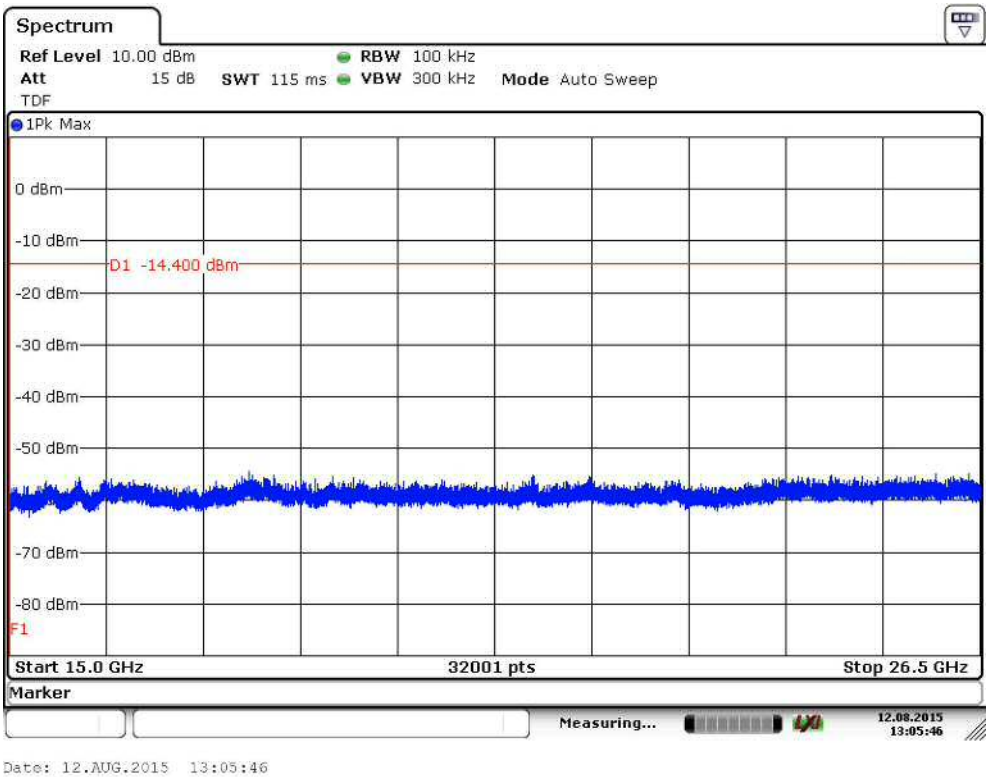


Figure 23. Conducted Spurious Emissions 15 000 – 26 500 MHz. Low channel.

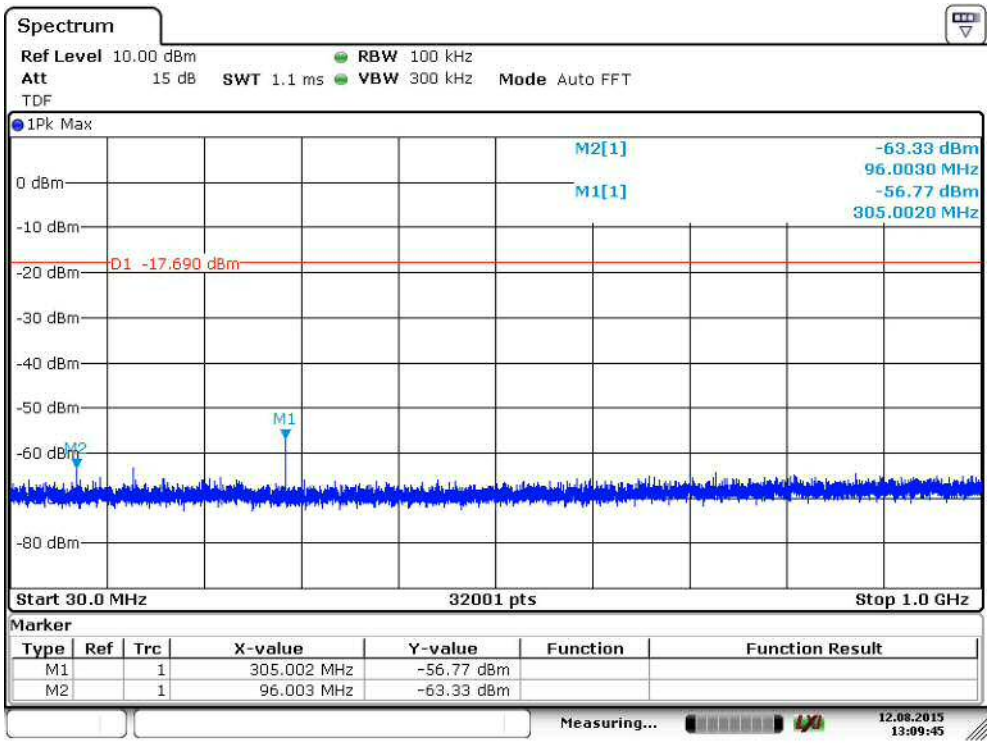


Figure 24. Conducted Spurious Emissions 30 – 1 000 MHz. Mid channel.

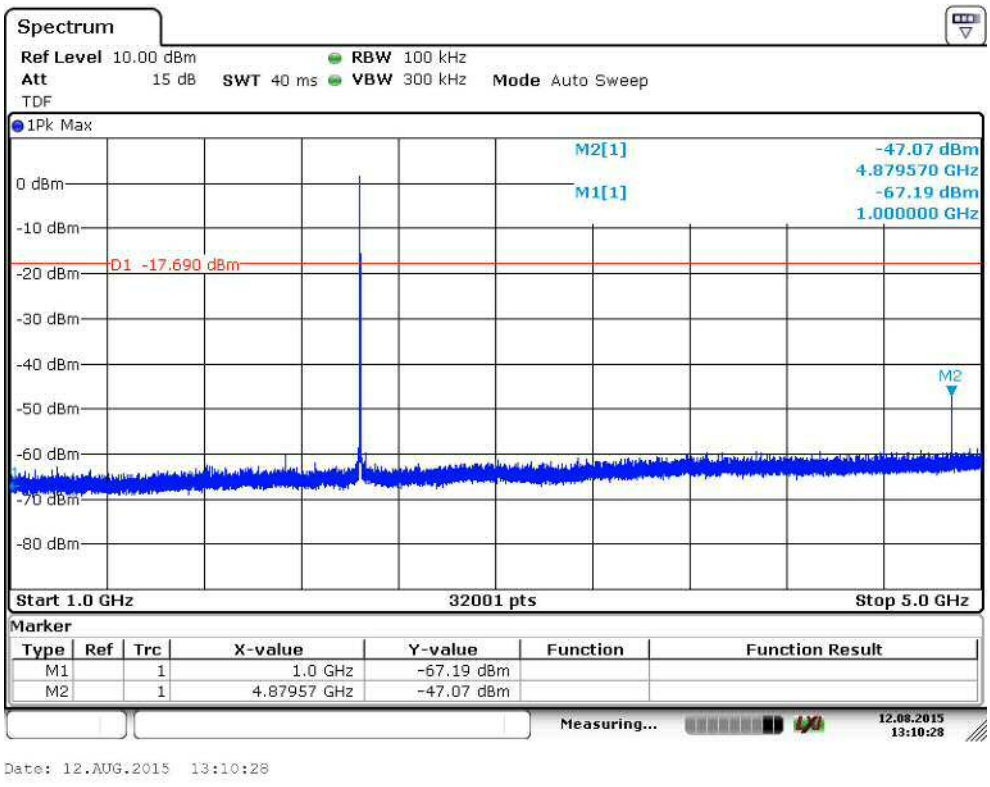


Figure 25. Conducted Spurious Emissions 1 000 – 5 000 MHz. Mid channel.

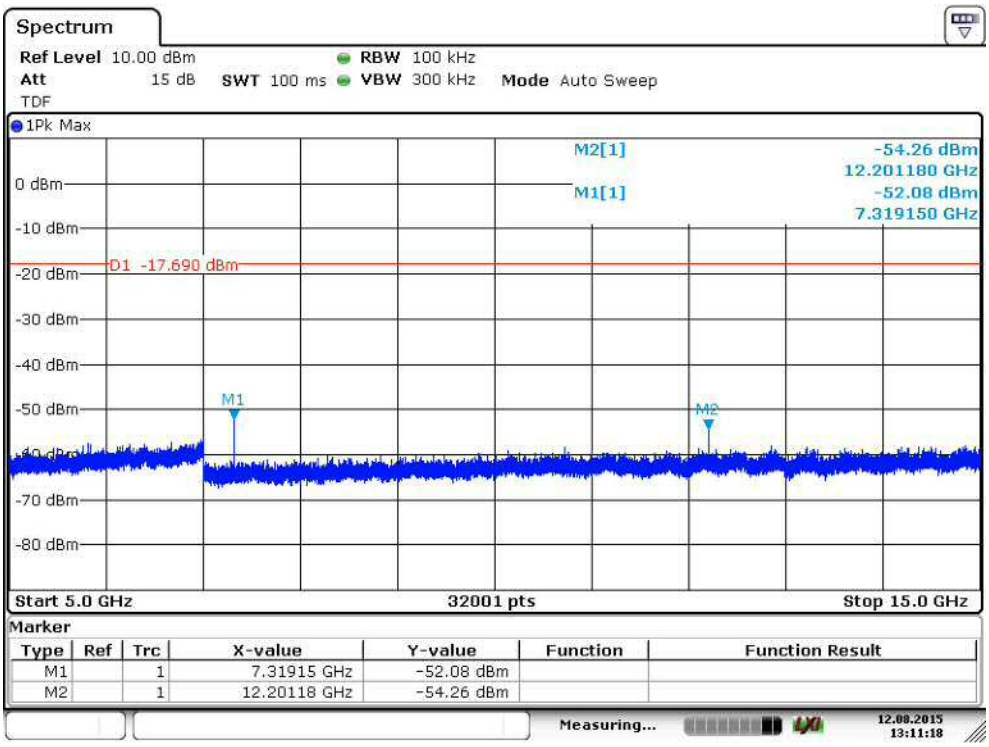


Figure 26. Conducted Spurious Emissions 5 000 – 15 000 MHz. Mid channel.

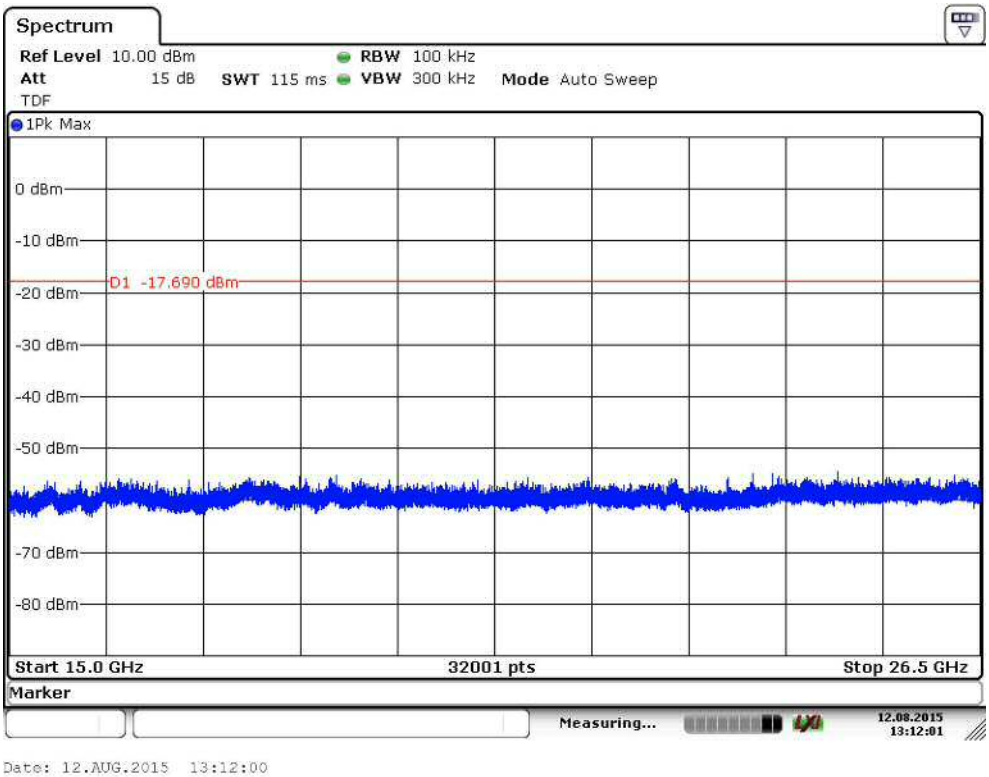


Figure 27. Conducted Spurious Emissions 15 000 – 26 500 MHz. Mid channel.

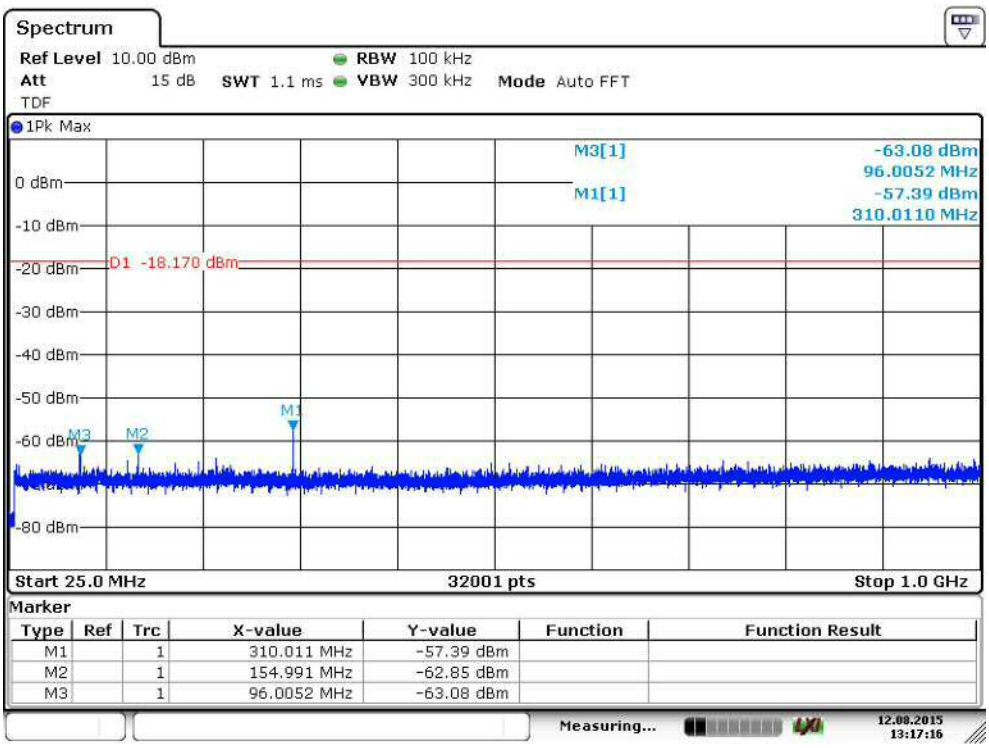


Figure 28. Conducted Spurious Emissions 30 – 1 000 MHz. High channel.

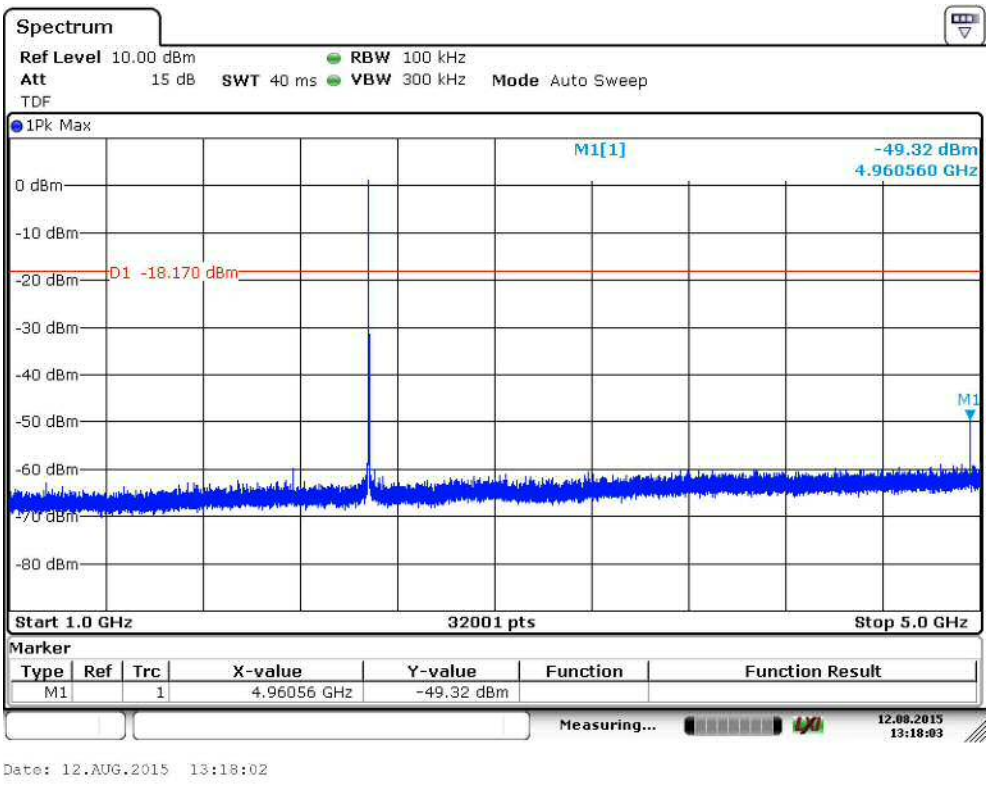


Figure 29. Conducted Spurious Emissions 1 000 – 5 000 MHz. Channel High.

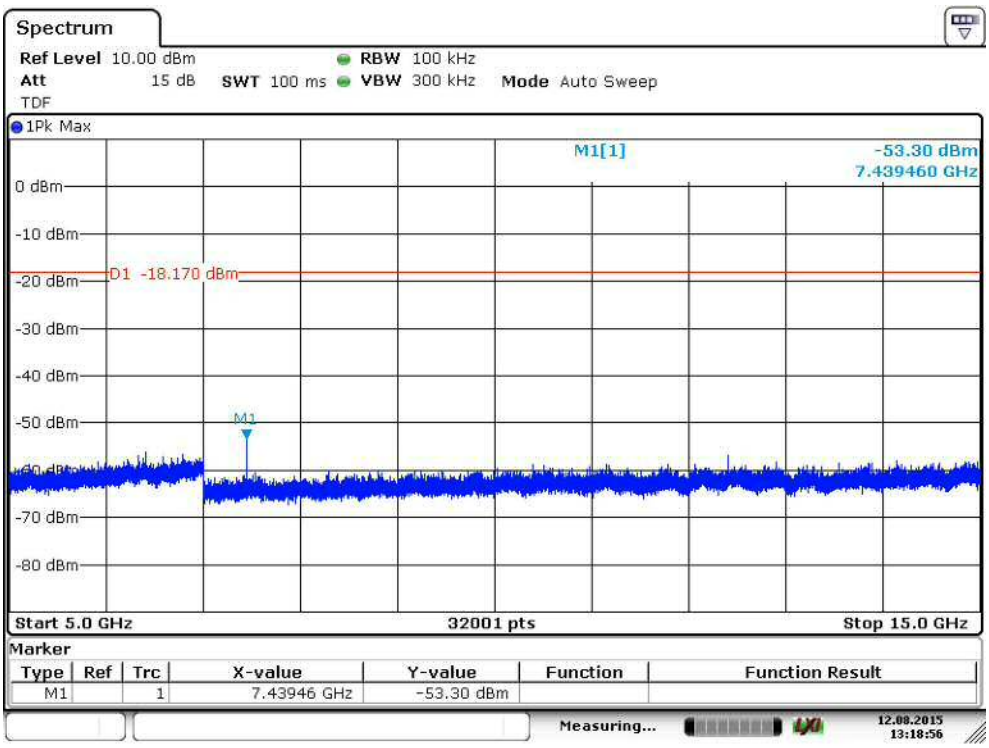


Figure 30. Conducted Spurious Emissions 5 000 – 15 000 MHz. High channel.

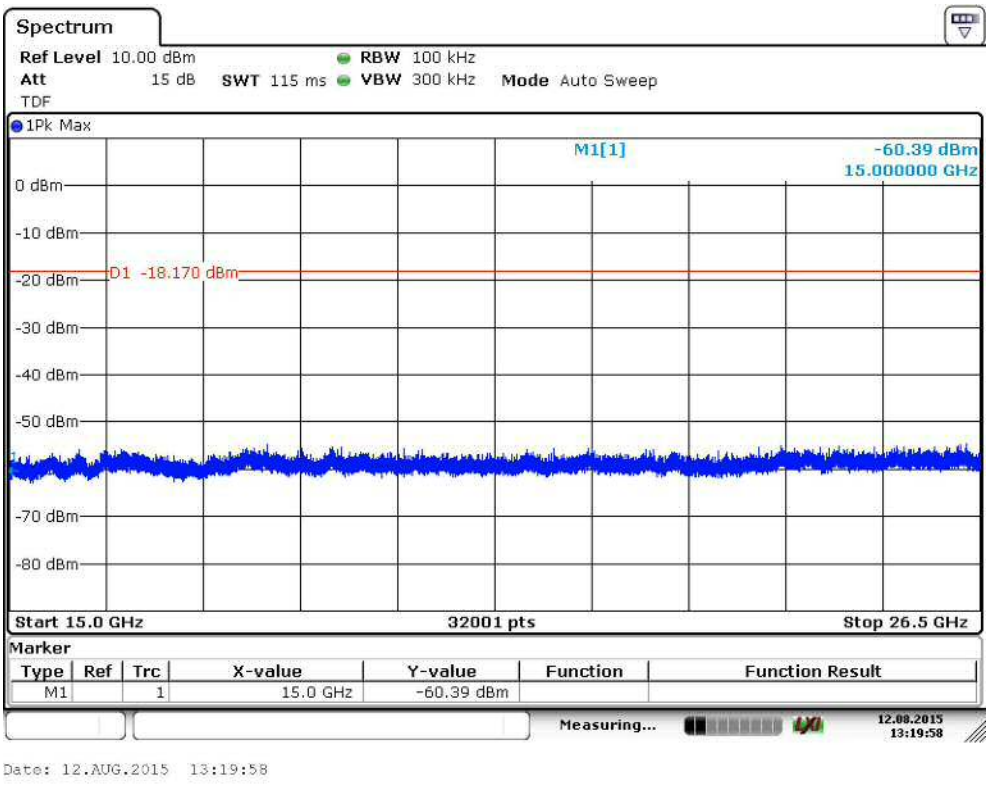


Figure 31. Conducted Spurious Emissions 15 000 – 26 500 MHz. High channel.

6 dB Bandwidth of the Channel

Standard:	ANSI C63.10	(2013)
Tested by:	RRE	
Date:	12 August 2015	
Temperature:	21 °C	

FCC Rule: 15.247(a)(2)
RSS-247 5.2

Results:

Table 28. 6 dB bandwidth test results.

Channel	6 dB BW [kHz]	Minimum limit [kHz]
Low	712.00	500
Mid	716.40	
High	725.00	

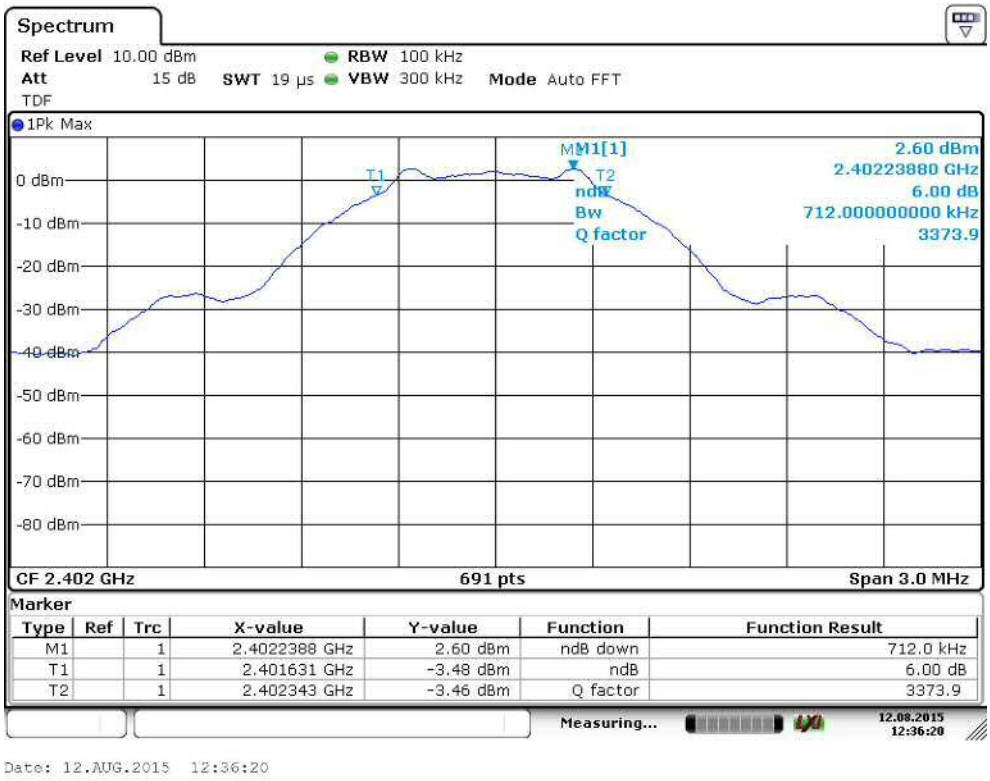


Figure 32. 6 dB bandwidth of the Low channel.

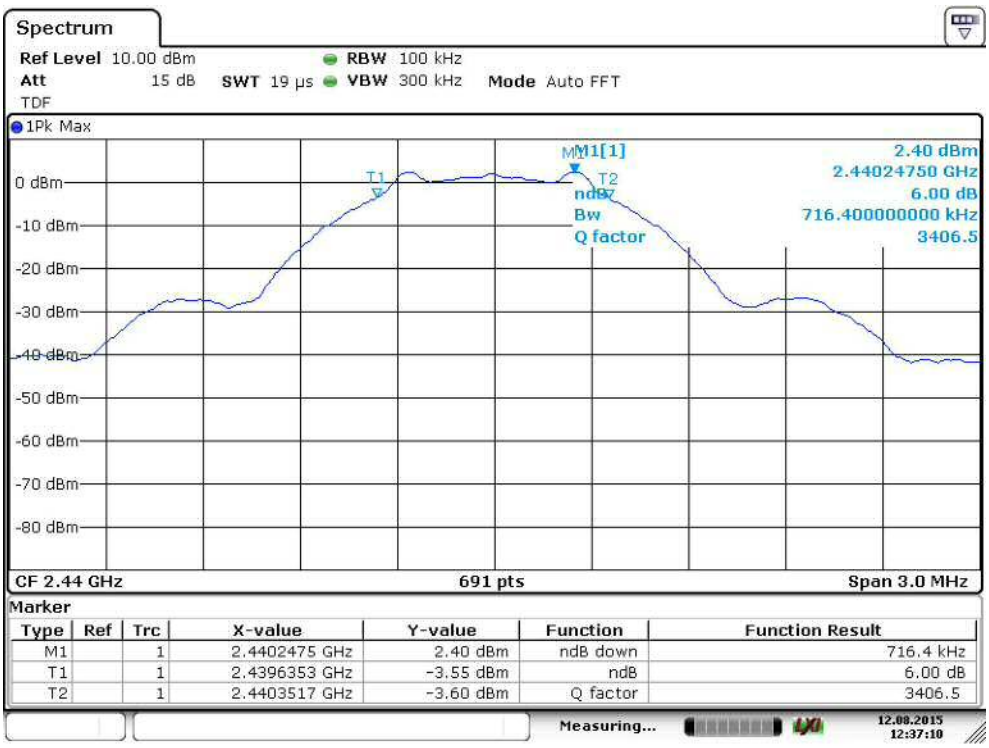


Figure 33. 6 dB bandwidth of the Mid channel.

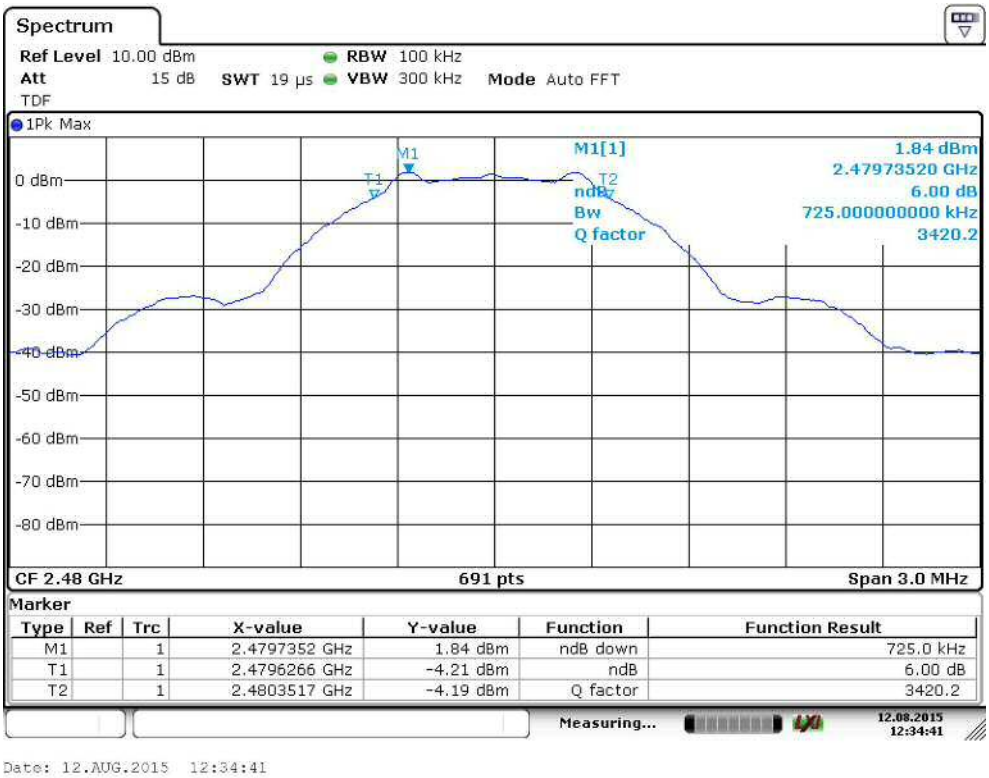


Figure 34. 6 dB bandwidth of the High channel.

Power Spectral Density

Standard:	ANSI C63.10	(2013)
Tested by:	RRE	
Date:	12 August 2015	
Temperature:	21 °C	

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

Results:

Table 29. Power Spectral Density test results.

Channel	PSD dBm/3 kHz	Maximum limit [dBm/3kHz]
Low	-7.25	+8.00
Mid	-7.29	
High	-7.92	

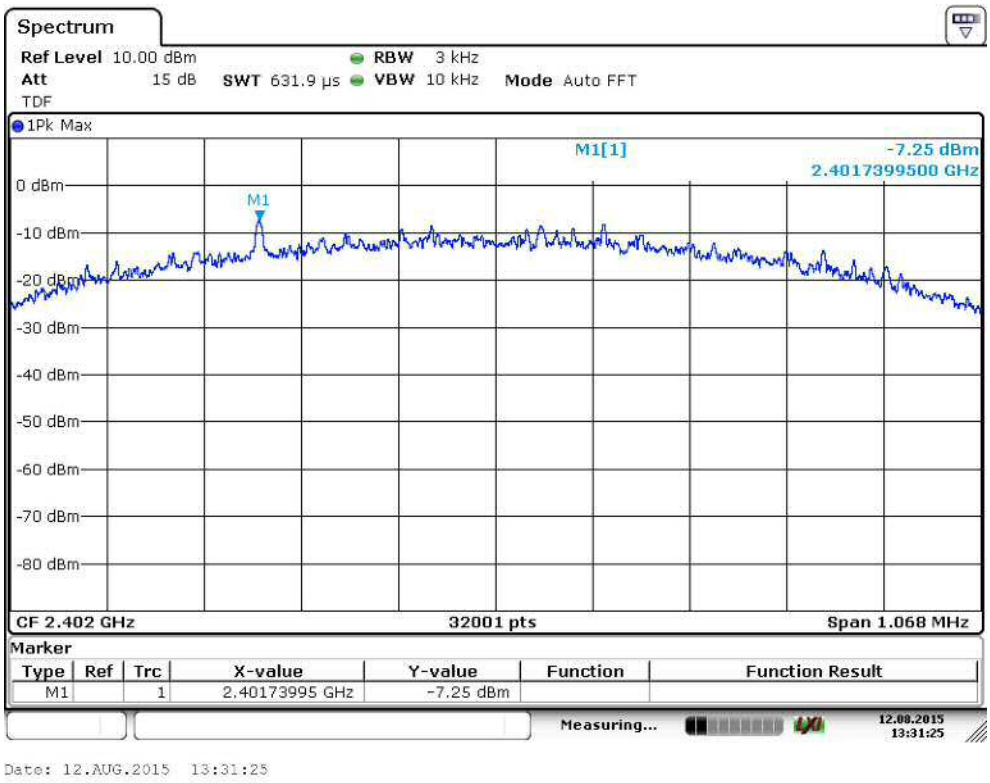


Figure 35. Power Spectral Density of the Low channel.

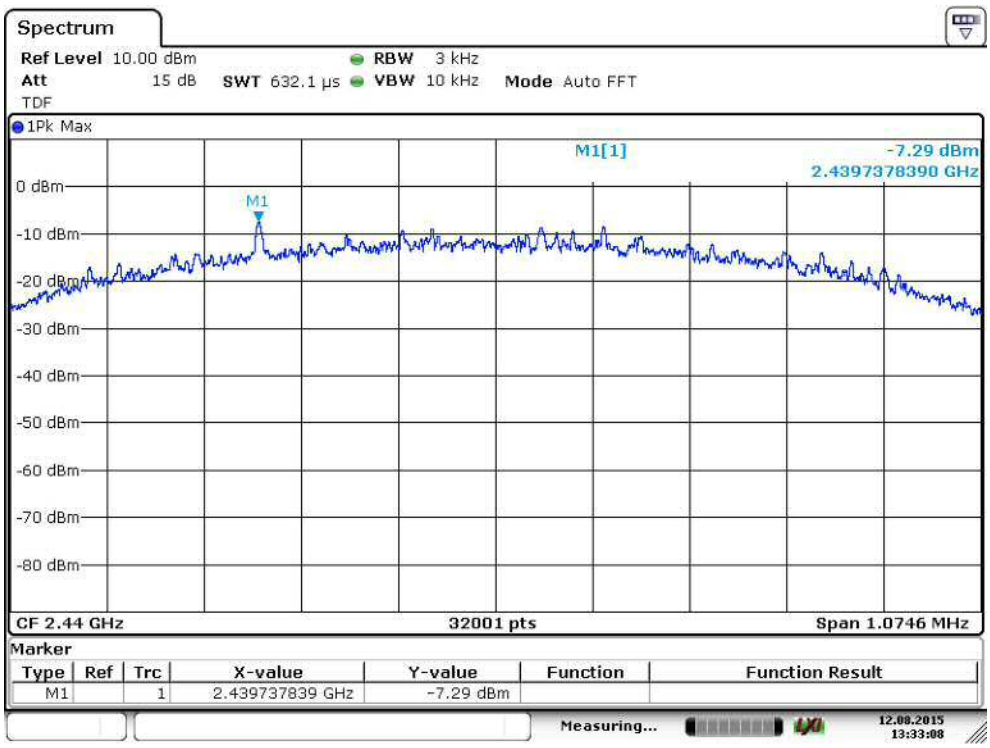


Figure 36. Power Spectral Density of the Mid channel.

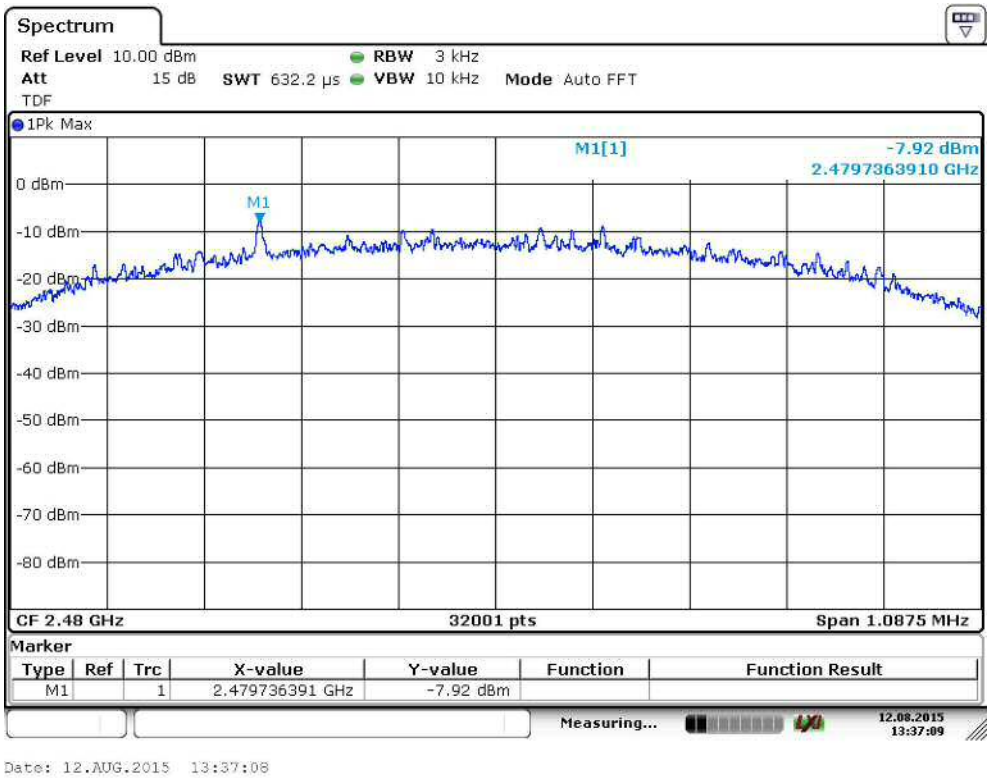


Figure 37. Power Spectral Density of the High channel.

99% Occupied Bandwidth

Standard: RSS-GEN (2014)
Tested by: RRE
Date: 12 August 2015
Temperature: 21 °C

RSS-GEN 6.6

Table 30. 99 % OBW test results.

Channel	Limit	99 % BW [MHz]	Result
Low	-	1.068091622	PASS
Mid	-	1.069341583	PASS
High	-	1.069966564	PASS

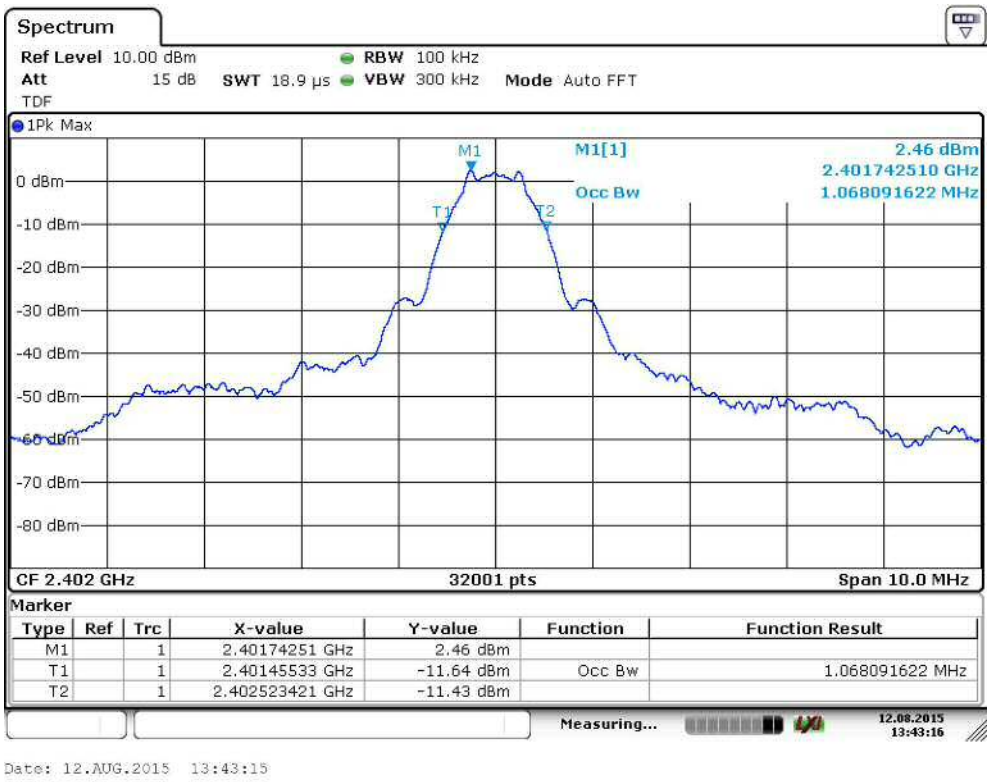


Figure 38. 99 % OBW. Low channel.

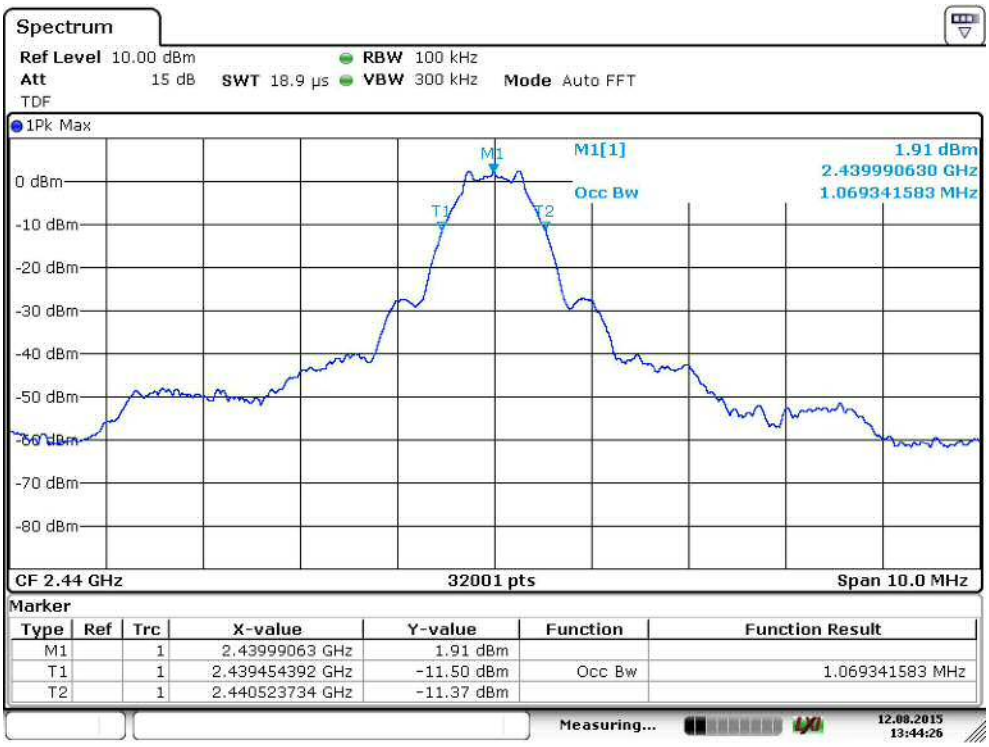


Figure 39. 99 % OBW. Mid channel.

Figure 40. 99 % OBW. High channel.

List of Test Equipment

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).