

Test Report



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

Equipment Under Test: Bluetooth Low Energy Module

Model: BLE121LR-A-M256K

Type: -

Manufacturer: Bluegiga Technologies Oy
PO. BOX 120
FI-02631 ESPOO
FINLAND

Customer: Bluegiga Technologies Oy
PO. BOX 120
FI-02631 ESPOO
FINLAND

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

Date: 26.5.2014

Issued by:

A blue ink signature of Niko Kotsalo.

Niko Kotsalo
Test Engineer

Date: 26.5.2014

Checked by:

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Jari Merikari
Technical Manager

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Equipment Under Test (EUT)

Bluetooth Low Energy Module

Model: BLE121LR-A-M256K
Type: -
Serial no: -
HW version:
SW version:
FCC ID: QOQBLE121LR
IC: 5123A-BGTBLE121LR

Description of the EUT

The EUT is a Bluetooth Low Energy single mode module targeted for low power accessories. Device can be used with batteries or from DC power supply.

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: 1.099855282 MHz
Effective conducted power: 8.32 dBm
Transmission technique: Digital Transmission
Modulation: GFSK
Integral Antenna gain: 0 dBi

Power Supply

Operating voltage range 2.0 – 3.6 VDC

Mechanical Size of the EUT

Height: 1.8 mm	Width: 13.0 mm	Depth: 14.7 mm
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Samples

Two samples were used in the tests. One normal sample with integral antenna for radiated emissions and one sample with antenna removed and replaced with coaxial cable with SMA-connector for conducted RF tests. During the tests the EUT was set into continuous transmit and 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 the tests. The hopping was stopped and the EUT was configured into the wanted channel. Normal modulation and duty cycle was applied in all the tests. Duty cycle of the EUT was measured and it was 63.6% which is the highest possible duty cycle that the EUT is capable of.

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

Channel Low (Ch 0) = 2402 MHz

Channel Mid (Ch 20) = 2442 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 (2009)
Tested by: NKO
Date: 14.5.2014
Humidity: 22 %
Temperature: 21.5 °C
Measurement uncertainty $\pm 2,87\text{dB}$ 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	8.32	30	21.68	PASS
Mid	7.82	30	22.18	PASS
High	7.11	30	22.89	PASS

Conducted Output Power Test

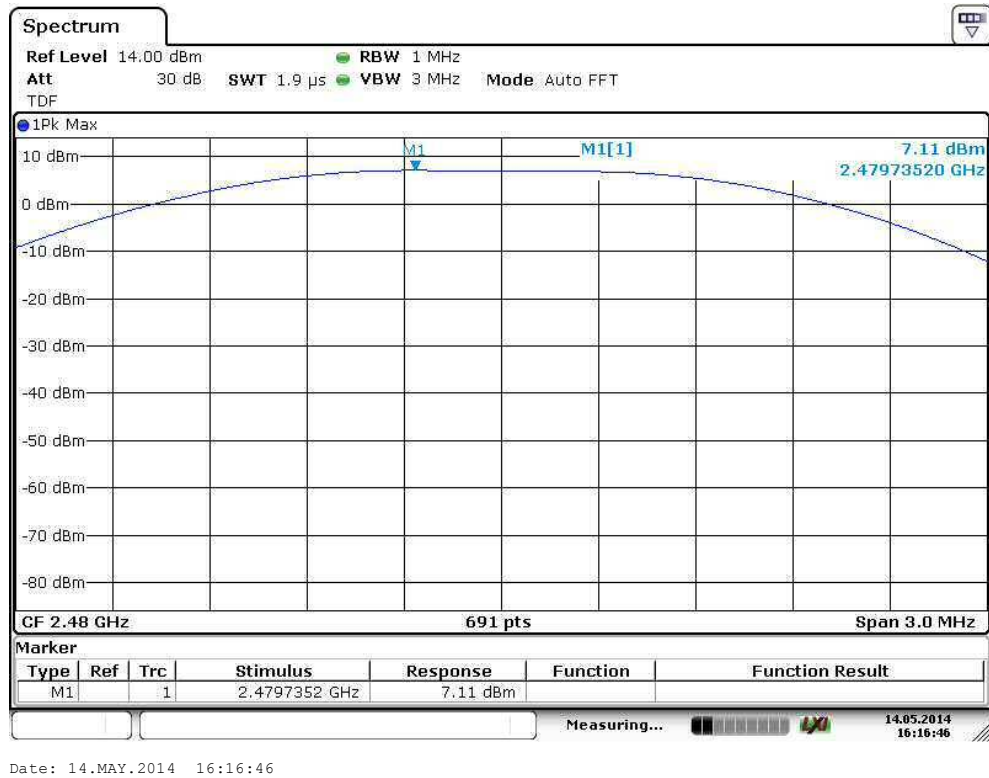


Figure 1. Channel Low.

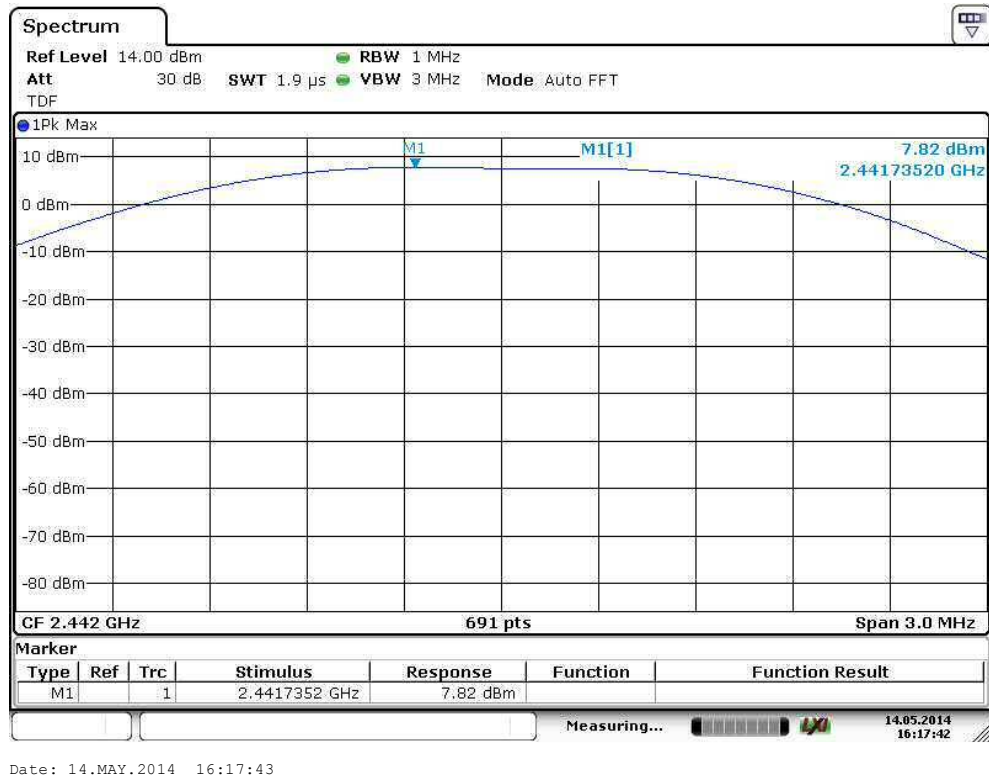
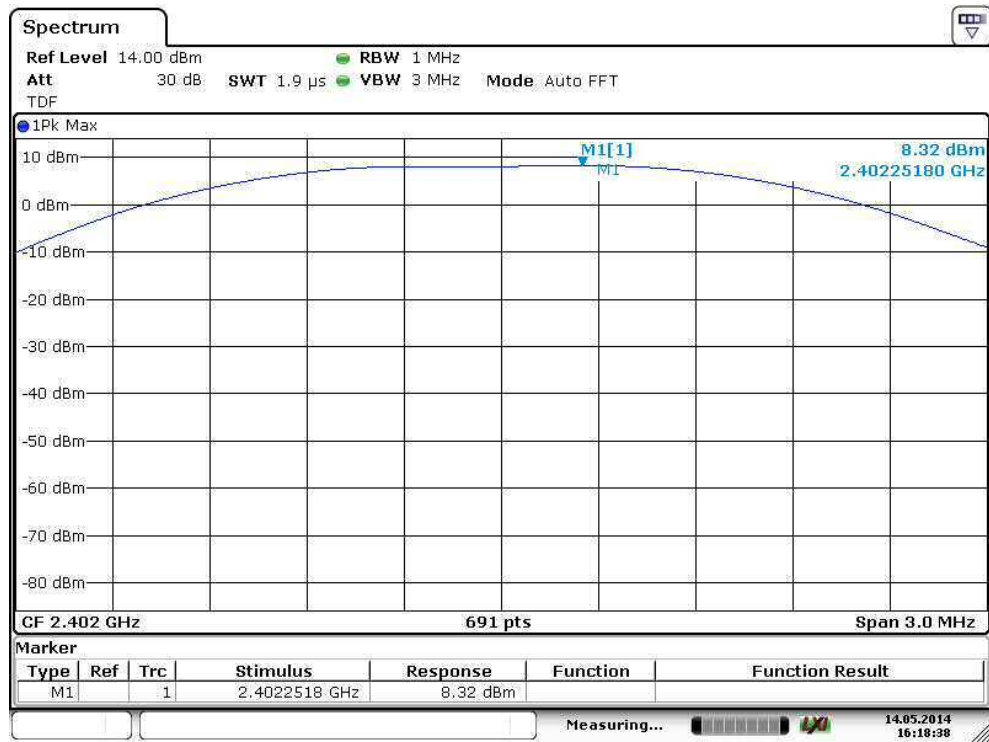


Figure 2. Channel Mid.

Conducted Output Power Test



Date: 14.MAY.2014 16:18:38

Figure 3. Channel High.

Transmitter Radiated Spurious Emissions 30 – 1000 MHz

Standard:	ANSI C63.10	(2009)
Tested by:	NKO	
Date:	7.5. – 13.5.2014	
Humidity:	20 – 38 %	
Temperature:	23.2 – 25 °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.

Radiated Spurious Emissions

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

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

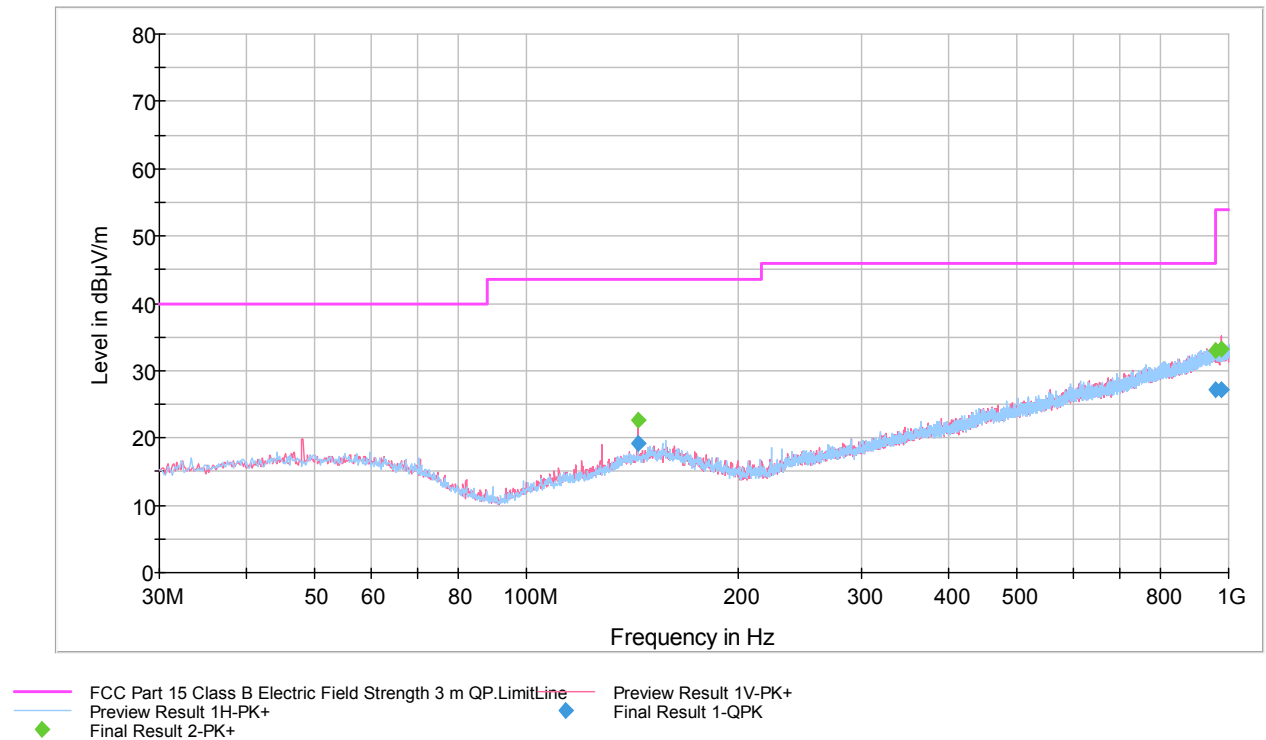


Figure 4. Measured curve with peak-detector. Channel Low.

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
144.015000	19.2	1000.0	120.000	122.0	V	264.0	14.5	24.3	43.5	
956.985000	27.1	1000.0	120.000	151.0	V	191.0	28.2	18.9	46.0	
974.505000	27.1	1000.0	120.000	179.0	V	236.0	28.2	26.8	53.9	

Radiated Spurious Emissions

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

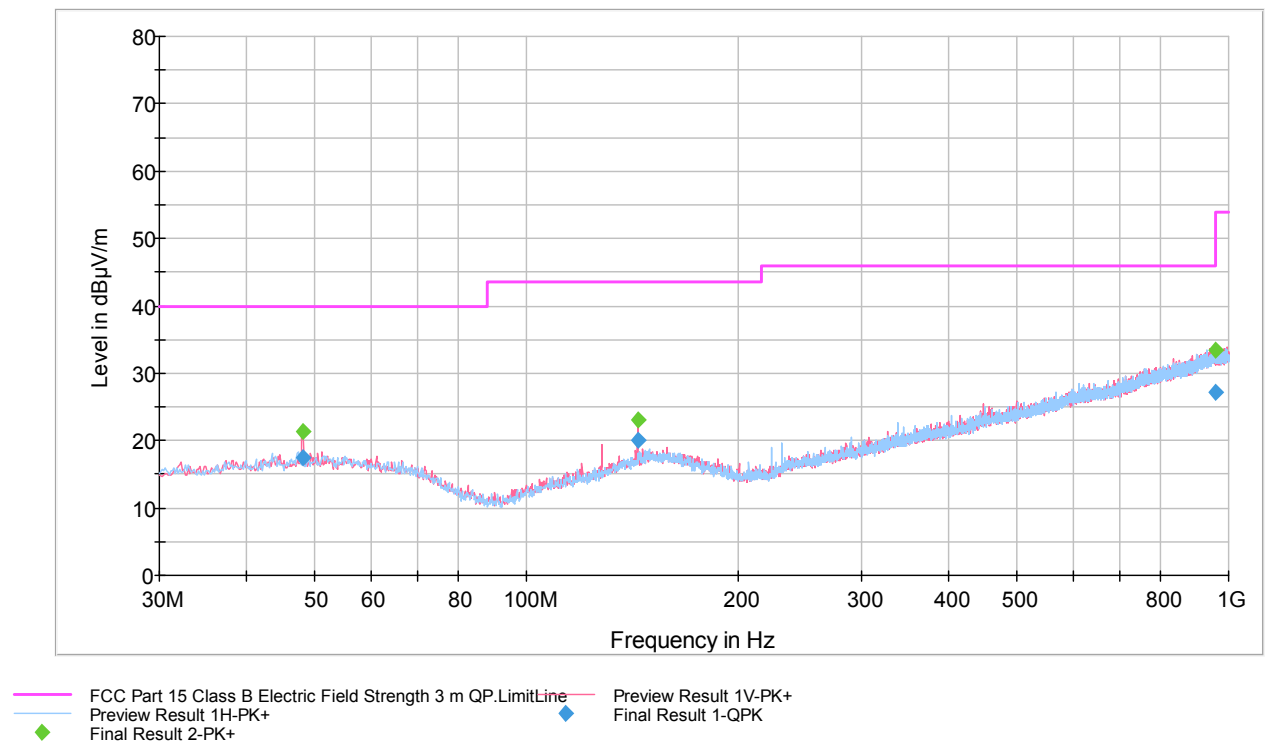


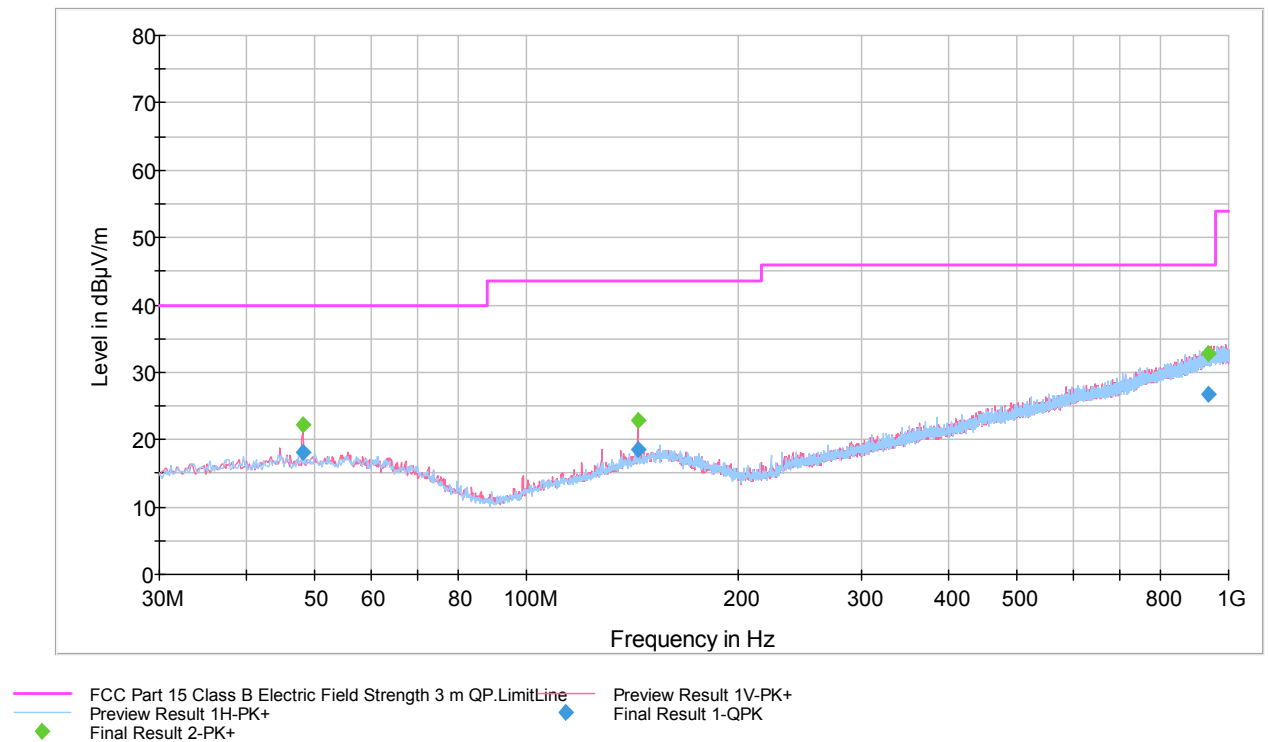
Figure 5. Measured curve with peak-detector. Channel Mid.

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
47.995000	17.6	1000.0	120.000	100.0	V	211.0	15.2	22.4	40.0	
143.995000	20.0	1000.0	120.000	110.0	V	235.0	14.5	23.5	43.5	
956.075000	27.1	1000.0	120.000	100.0	H	228.0	28.2	18.9	46.0	

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


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

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
47.995000	18.1	1000.0	120.000	100.0	V	29.0	15.2	21.9	40.0	
144.015000	18.6	1000.0	120.000	110.0	V	39.0	14.5	24.9	43.5	
937.725000	26.7	1000.0	120.000	292.0	V	279.0	27.9	19.3	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)

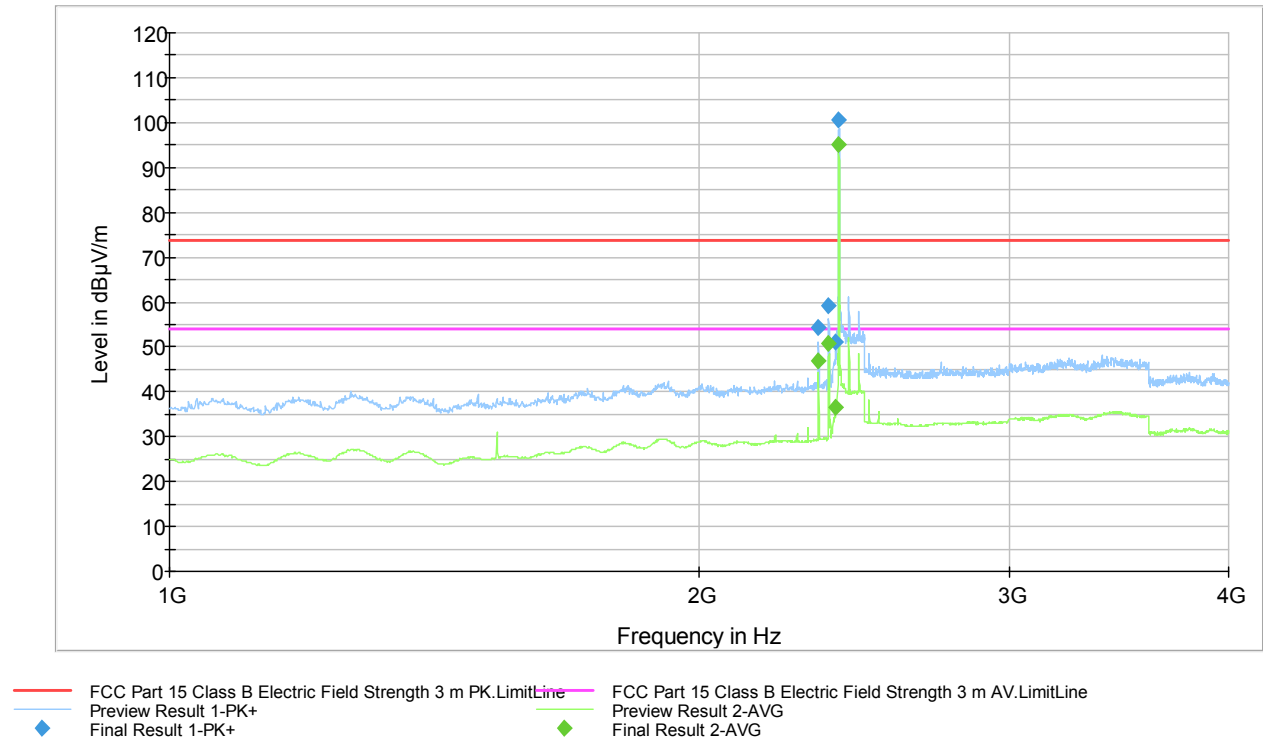


Figure 7. Measured curve with peak- and average detector. Channel Low.

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
2337.725000	54.2	1000.0	1000.000	227.0	H	12.0	3.9	19.7	73.9	
2369.775000	59.1	1000.0	1000.000	227.0	H	-5.0	4.2	14.8	73.9	
2389.200000	51.0	1000.0	1000.000	221.0	H	-5.0	4.4	22.9	73.9	
2402.200000	100.5	1000.0	1000.000	101.0	H	21.0	4.5	-26.6	73.9	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
2337.925000	47.0	1000.0	1000.000	226.0	H	-4.0	3.9	6.9	53.9	
2370.025000	50.8	1000.0	1000.000	222.0	H	19.0	4.2	3.1	53.9	
2389.800000	36.7	1000.0	1000.000	220.0	H	13.0	4.4	17.2	53.9	
2402.000000	95.2	1000.0	1000.000	220.0	H	20.0	4.5	-41.3	53.9	Carrier

Radiated Spurious Emissions

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

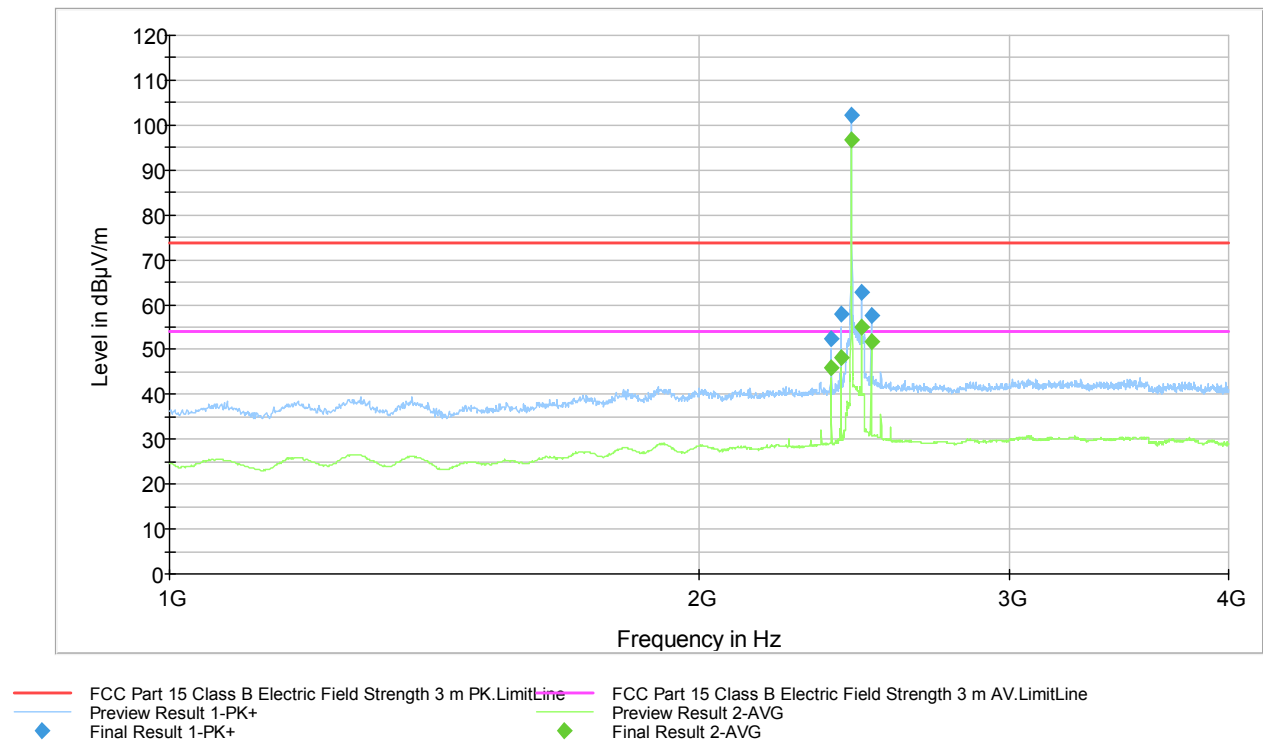


Figure 8. Measured curve with peak- and average detector. Channel Mid.

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
2377.725000	52.3	1000.0	1000.000	219.0	H	18.0	4.3	21.6	73.9	
2410.250000	58.0	1000.0	1000.000	221.0	H	15.0	4.5	15.9	73.9	
2441.750000	102.1	1000.0	1000.000	211.0	H	21.0	4.4	-28.2	73.9	Carrier
2474.250000	62.9	1000.0	1000.000	211.0	H	17.0	4.7	11.0	73.9	
2506.225000	57.4	1000.0	1000.000	205.0	H	21.0	4.9	16.5	73.9	

Table 7. Final Average results.

Frequency (MHz)	MaxPeak-ClearWrite (dBμV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
2378.125000	50.1	105.0	H	0.0	4.3	23.8	73.9	
2410.250000	55.1	105.0	H	0.0	4.5	18.8	73.9	
2441.750000	100.8	105.0	H	0.0	4.4	-26.9	73.9	Carrier
2474.250000	62.2	105.0	H	0.0	4.7	11.7	73.9	
2506.625000	56.7	105.0	H	0.0	4.9	17.2	73.9	

Radiated Spurious Emissions

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

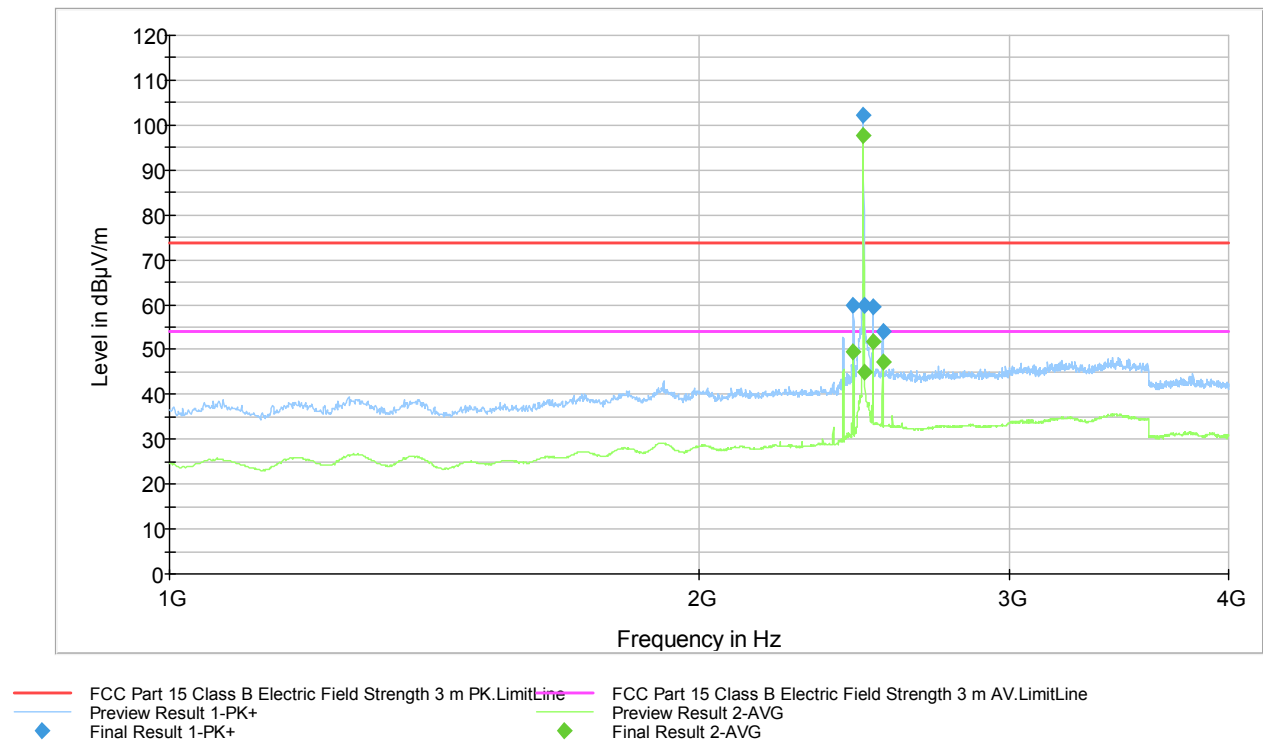


Figure 9. Measured curve with peak- and average detector. Channel HIGH.

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
2448.250000	59.9	1000.0	1000.000	211.0	H	15.0	4.4	14.0	73.9	
2479.750000	102.3	1000.0	1000.000	203.0	H	18.0	4.7	-28.4	73.9	Carrier
2485.100000	59.7	1000.0	1000.000	100.0	H	21.0	4.8	14.2	73.9	
2512.275000	59.6	1000.0	1000.000	100.0	H	21.0	4.9	14.3	73.9	
2544.125000	54.2	1000.0	1000.000	198.0	H	-5.0	4.9	19.7	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
2448.000000	49.6	1000.0	1000.000	211.0	H	-4.0	4.4	4.3	53.9	
2480.000000	97.6	1000.0	1000.000	208.0	H	21.0	4.7	-43.7	53.9	Carrier
2483.700000	44.8	1000.0	1000.000	207.0	H	21.0	4.8	9.1	53.9	
2512.025000	51.8	1000.0	1000.000	205.0	H	21.0	4.9	2.1	53.9	
2543.925000	47.1	1000.0	1000.000	243.0	H	-4.0	4.9	6.8	53.9	

Radiated Spurious Emissions

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

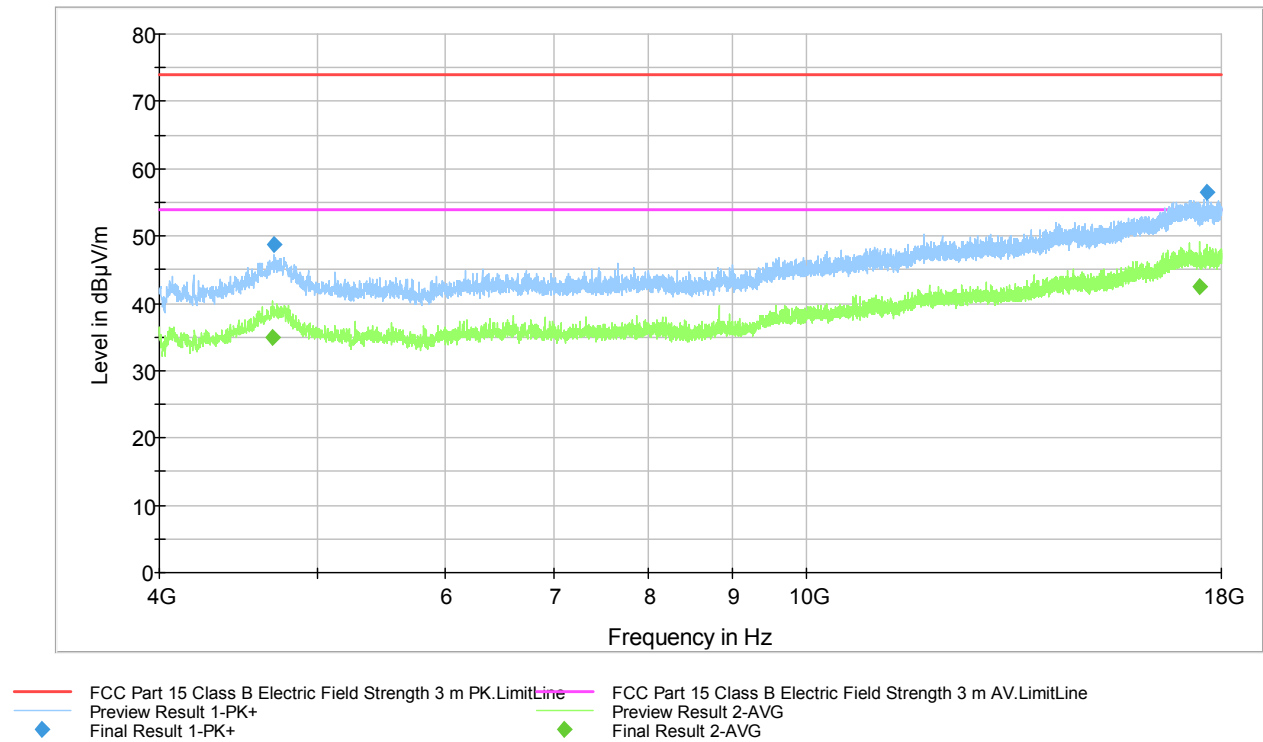


Figure 10. Measured curve with peak- and average detector. Channel Low.

Final measurements from the worst frequencies

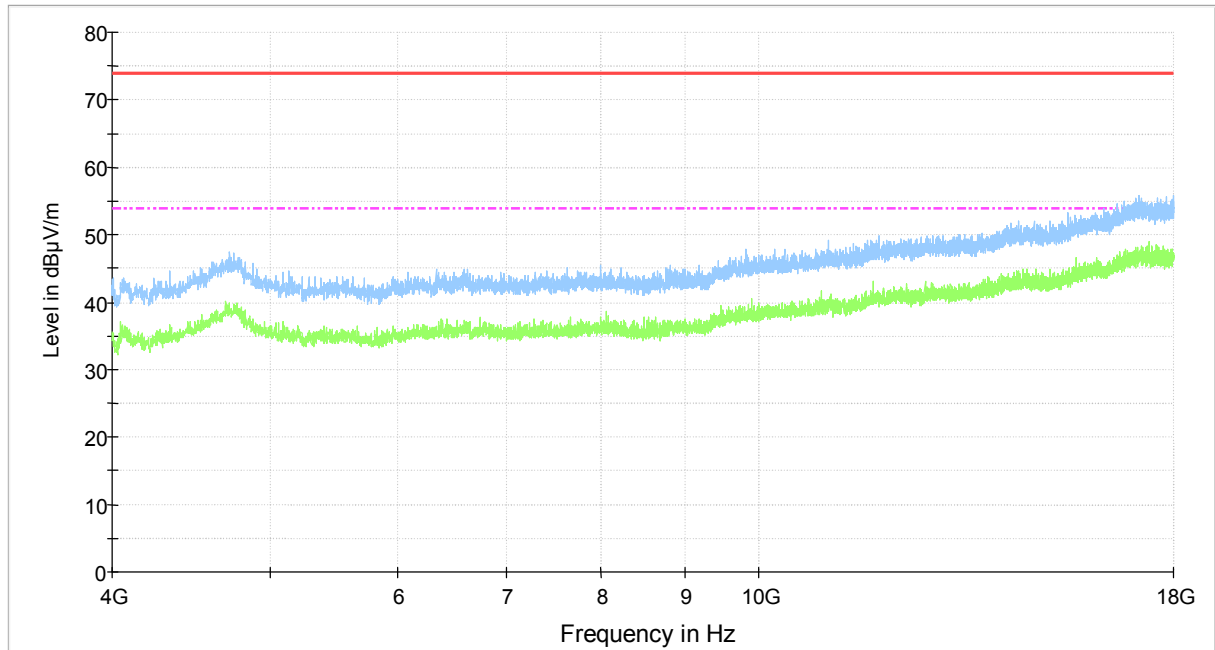
Table 10. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4706.200000	48.8	1000.0	1000.000	130.0	V	105.0	14.3	25.1	73.9	
17630.600000	56.5	1000.0	1000.000	247.0	V	315.0	28.3	17.4	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
4697.800000	35.0	1000.0	1000.000	100.0	V	181.0	14.3	18.9	53.9	
17447.800000	42.5	1000.0	1000.000	105.0	H	334.0	28.2	11.4	53.9	

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



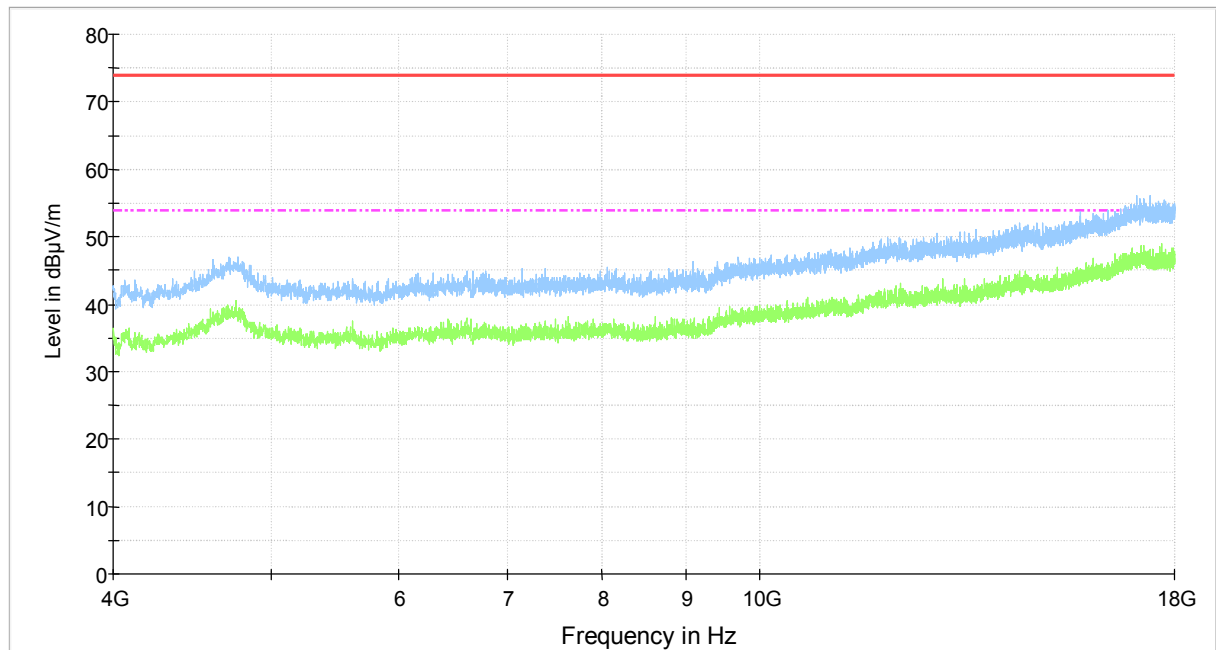
— FCC Part 15 Class B Electric Field Strength 3 m PK.LimitLine - - - FCC Part 15 Class B Electric Field Strength 3 m AV.LimitLine
— Preview Result 1-PK+ — Preview Result 2-AVG
◆ Final Result 2-AVG

Figure 11. 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 4-18GHz 3m



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

Figure 12. 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.

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

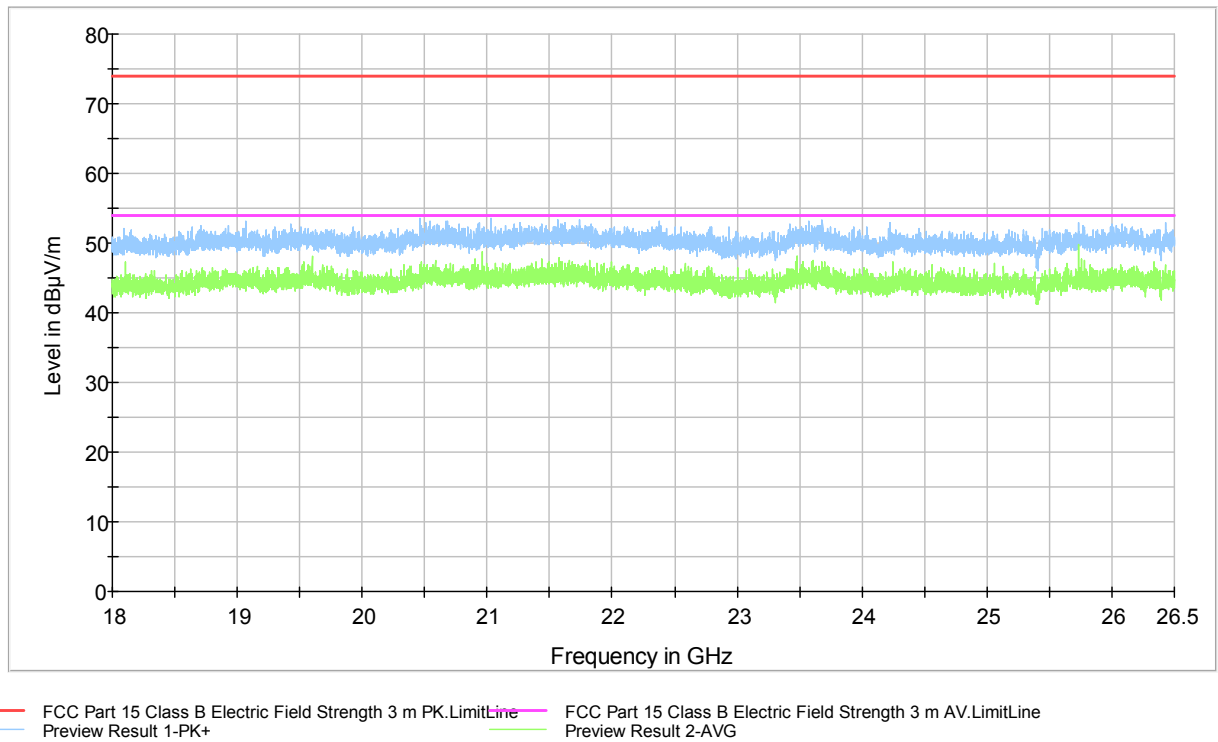


Figure 13. Measured curve with peak- and average detector. Channel Low.

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

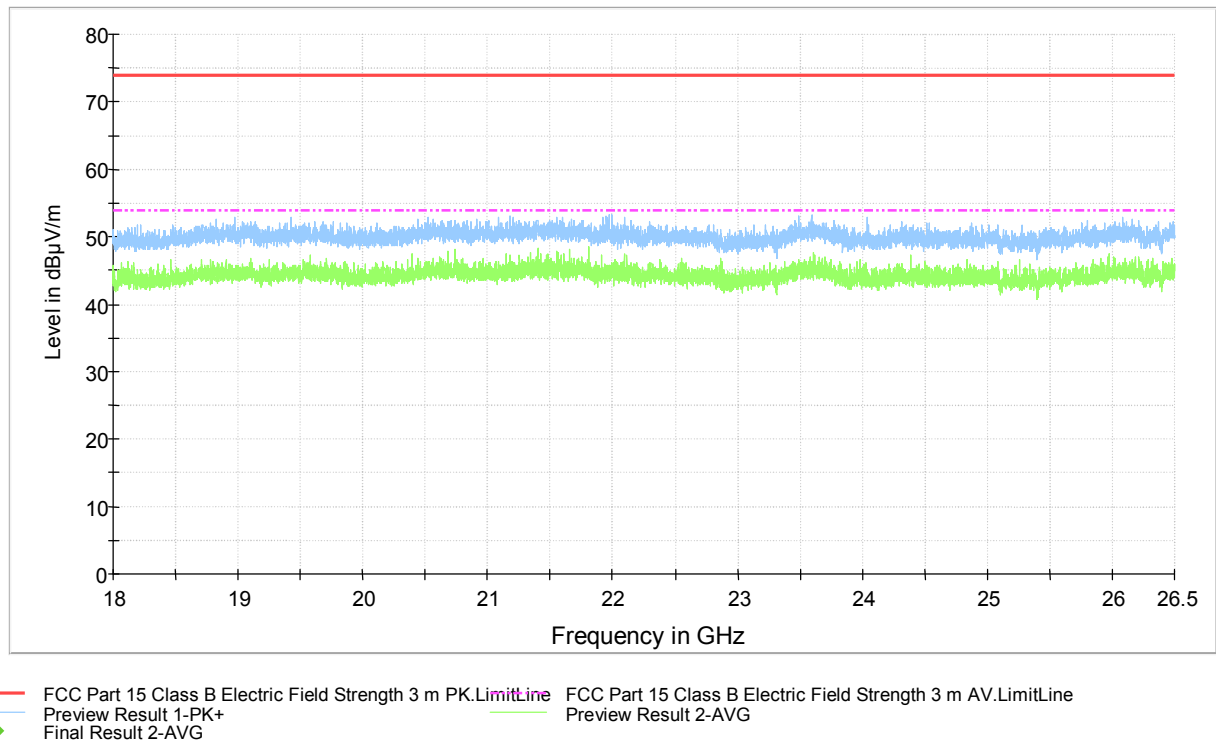


Figure 14. Measured curve with peak- and average detector. Channel Mid.

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

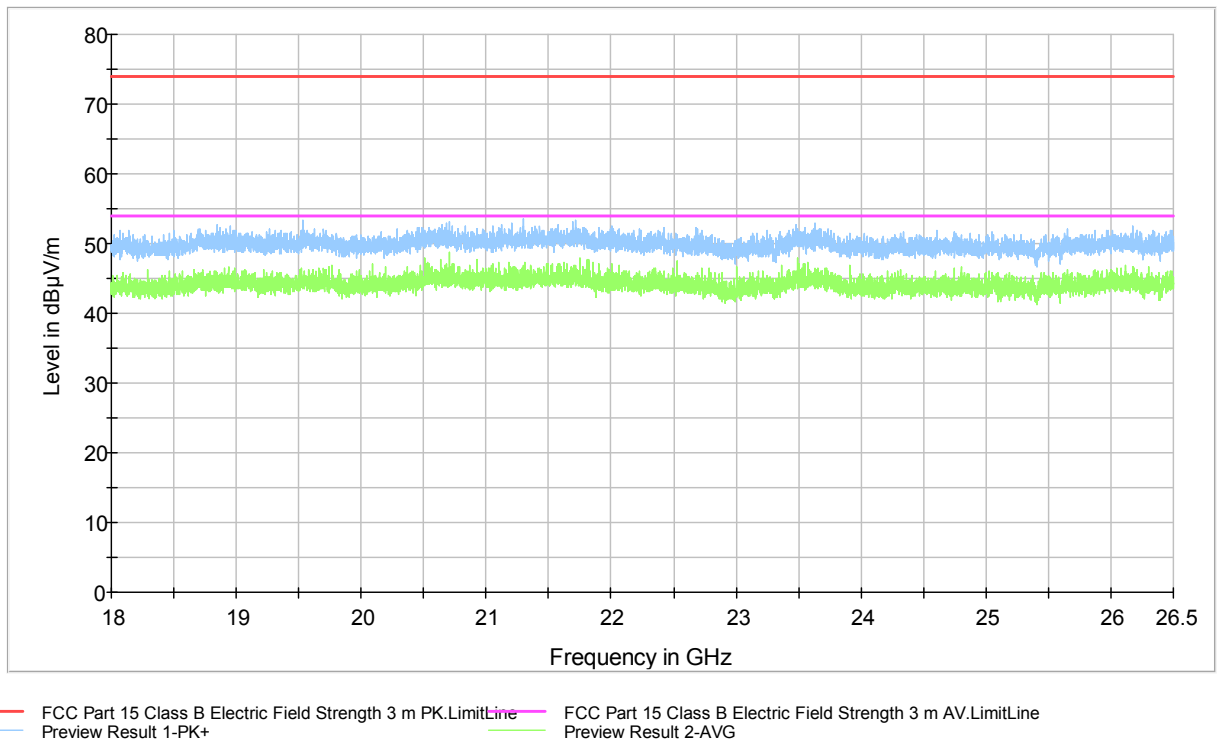


Figure 15. Measured curve with peak- and average detector. Channel High.

Final measurements from the worst frequencies

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

Radiated Spurious Emissions

Radiated band edge measurement results

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

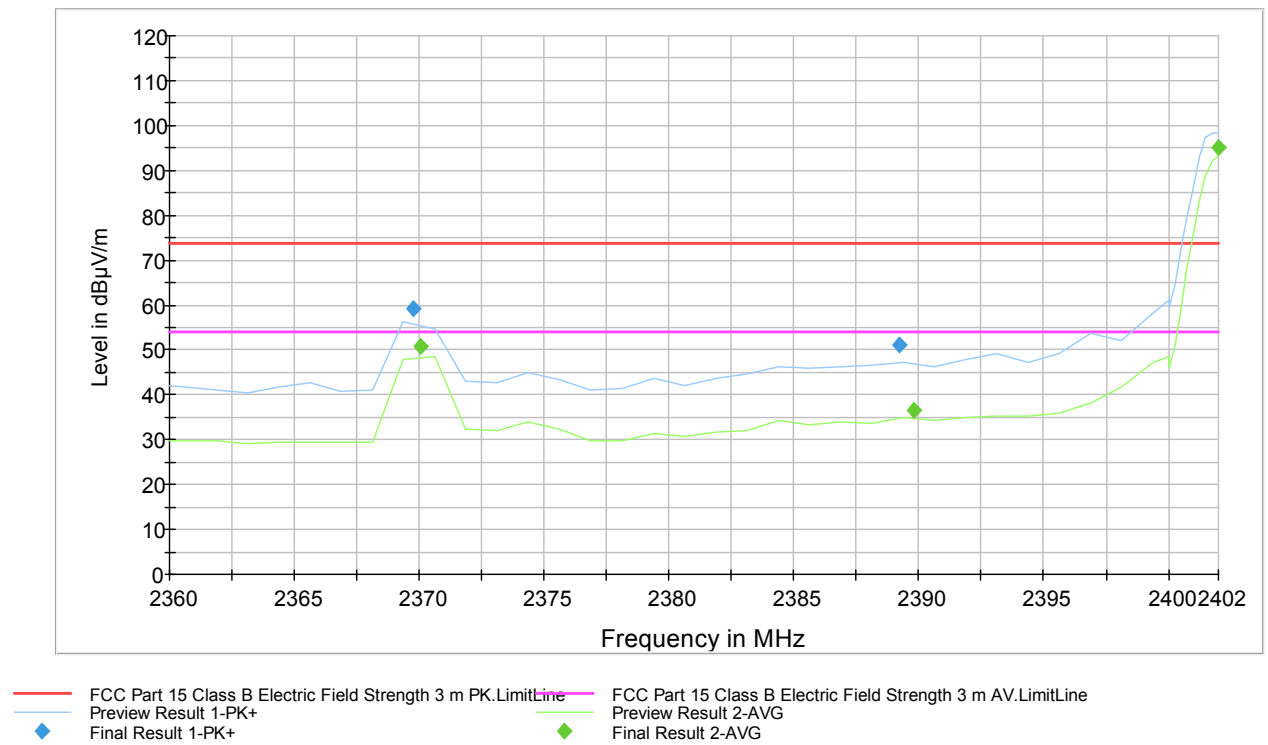


Figure 16. Measured curve with peak- and average detector. Lower band edge.

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
2369.775000	59.1	1000.0	1000.000	227.0	H	-5.0	4.2	14.8	73.9	
2389.200000	51.0	1000.0	1000.000	221.0	H	-5.0	4.4	22.9	73.9	
2402.200000	100.5	1000.0	1000.000	101.0	H	21.0	4.5	-26.6	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
2370.025000	50.8	1000.0	1000.000	222.0	H	19.0	4.2	3.1	53.9	
2389.800000	36.7	1000.0	1000.000	220.0	H	13.0	4.4	17.2	53.9	
2402.000000	95.2	1000.0	1000.000	220.0	H	20.0	4.5	-41.3	53.9	

Radiated Spurious Emissions

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

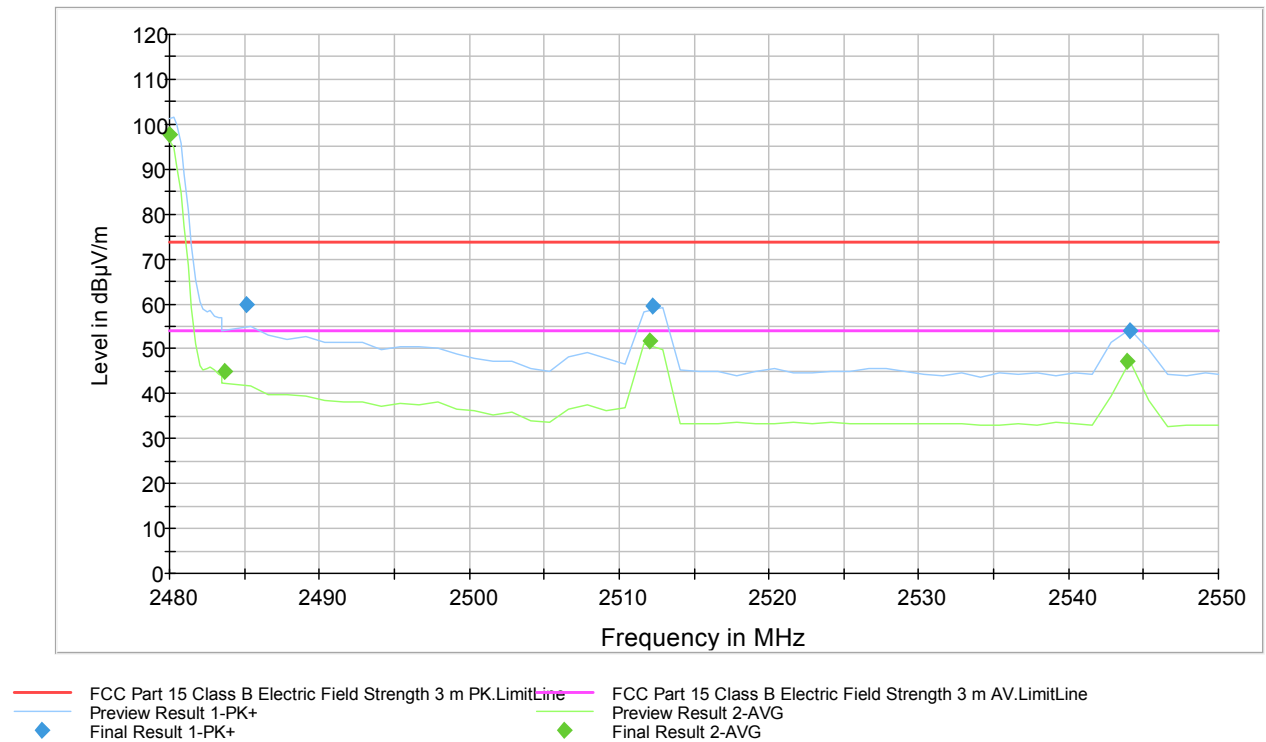


Figure 17. Measured curve with peak- and average detector. Upper band edge.

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
2479.750000	102.3	1000.0	1000.000	203.0	H	18.0	4.7	-28.4	73.9	
2485.100000	59.7	1000.0	1000.000	100.0	H	21.0	4.8	14.2	73.9	
2512.275000	59.6	1000.0	1000.000	100.0	H	21.0	4.9	14.3	73.9	
2544.125000	54.2	1000.0	1000.000	198.0	H	-5.0	4.9	19.7	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
2480.000000	97.6	1000.0	1000.000	208.0	H	21.0	4.7	-43.7	53.9	
2483.700000	44.8	1000.0	1000.000	207.0	H	21.0	4.8	9.1	53.9	
2512.025000	51.8	1000.0	1000.000	205.0	H	21.0	4.9	2.1	53.9	
2543.925000	47.1	1000.0	1000.000	243.0	H	-4.0	4.9	6.8	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: 14.5.2014
Humidity: 22 %
Temperature: 21.5 °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 16. Band edge attenuation.

Band Edge Attenuation	
Lower Band Edge	Upper Band Edge
-53.36 dBc	-48.05 dBc
Limit: -20dBc	

Table 17. 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

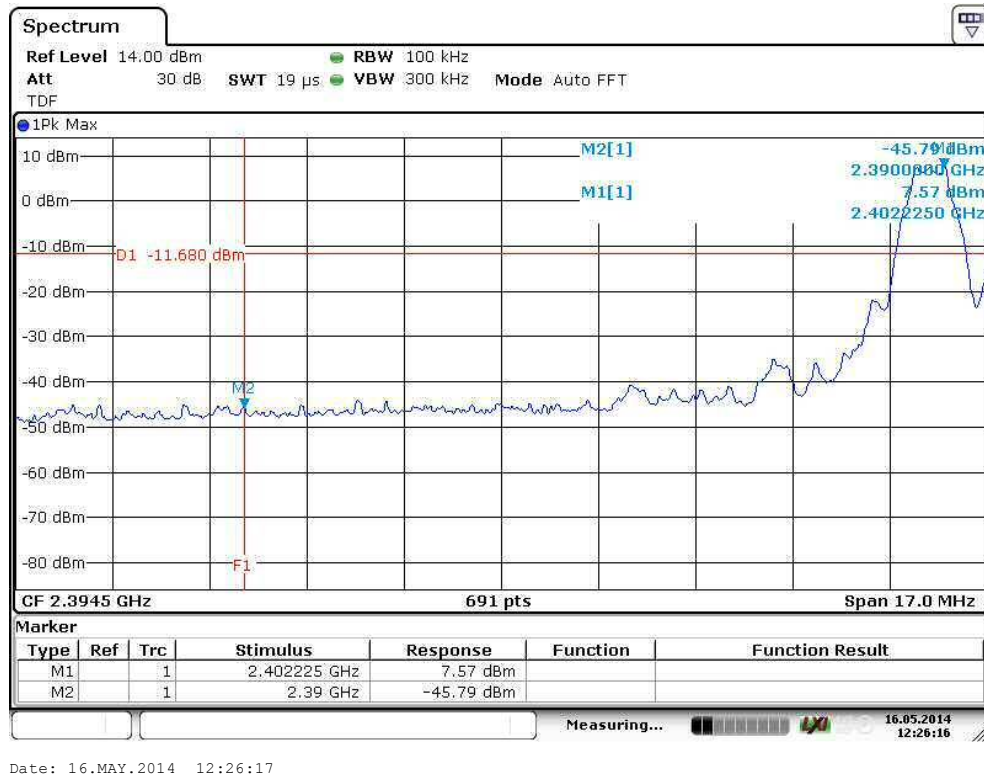


Figure 18. Lower Band Edge.

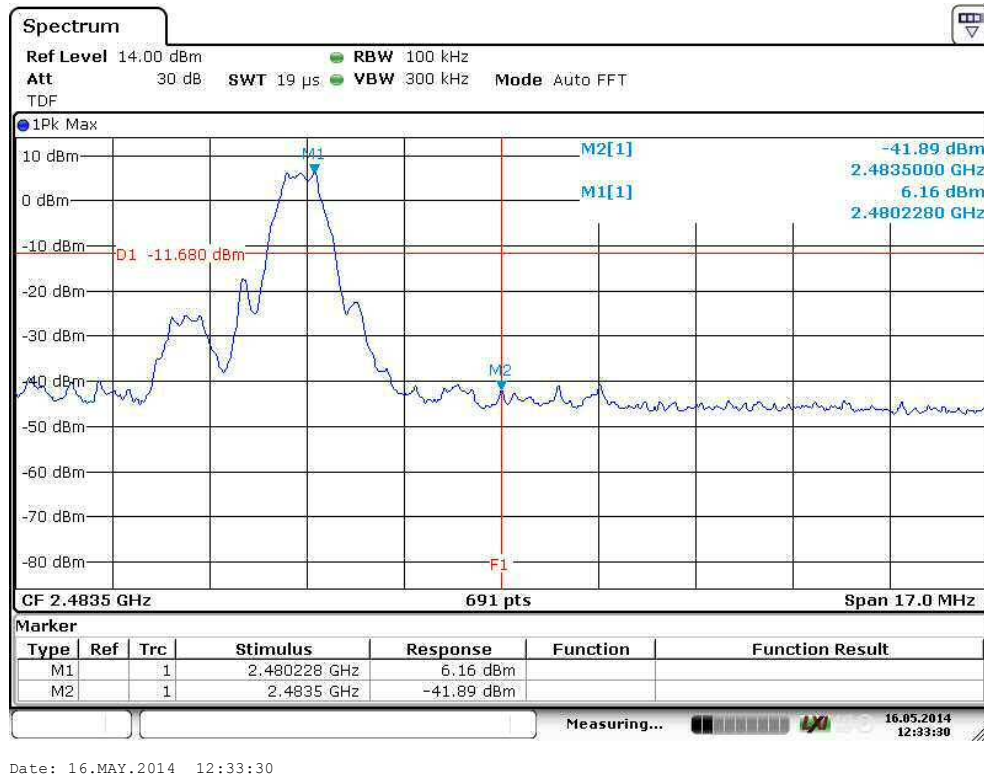


Figure 19. Upper Band Edge.

Transmitter Band Edge Measurement and Conducted Spurious Emissions

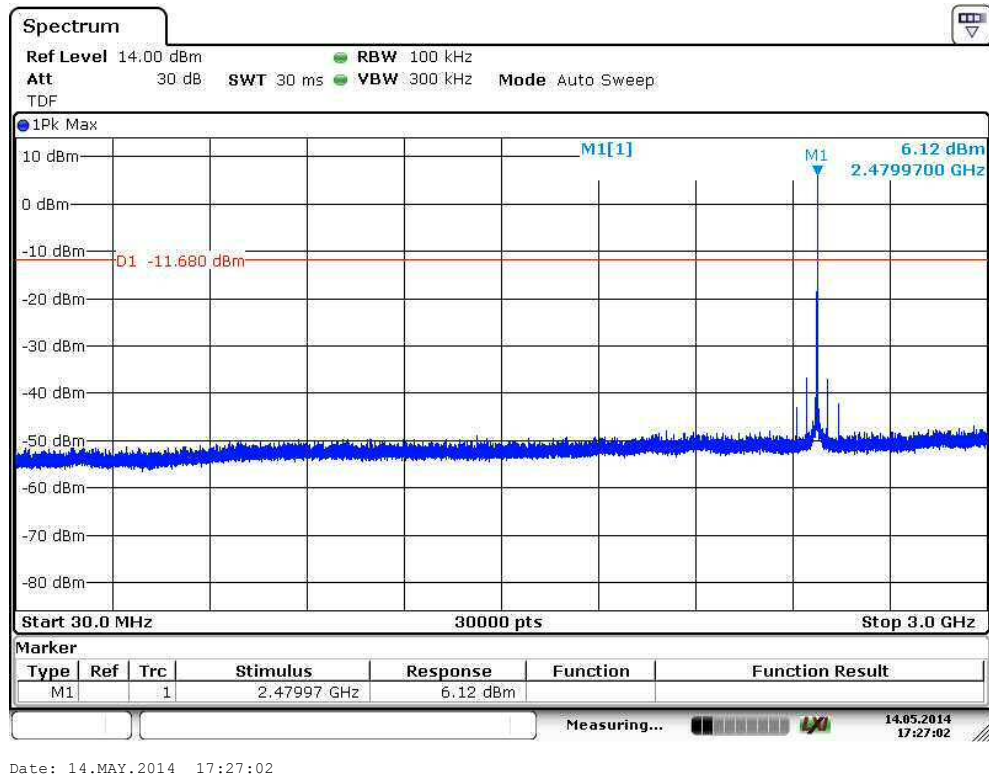


Figure 20. Conducted Spurious Emissions 30 – 3 000 MHz. Channel Low.

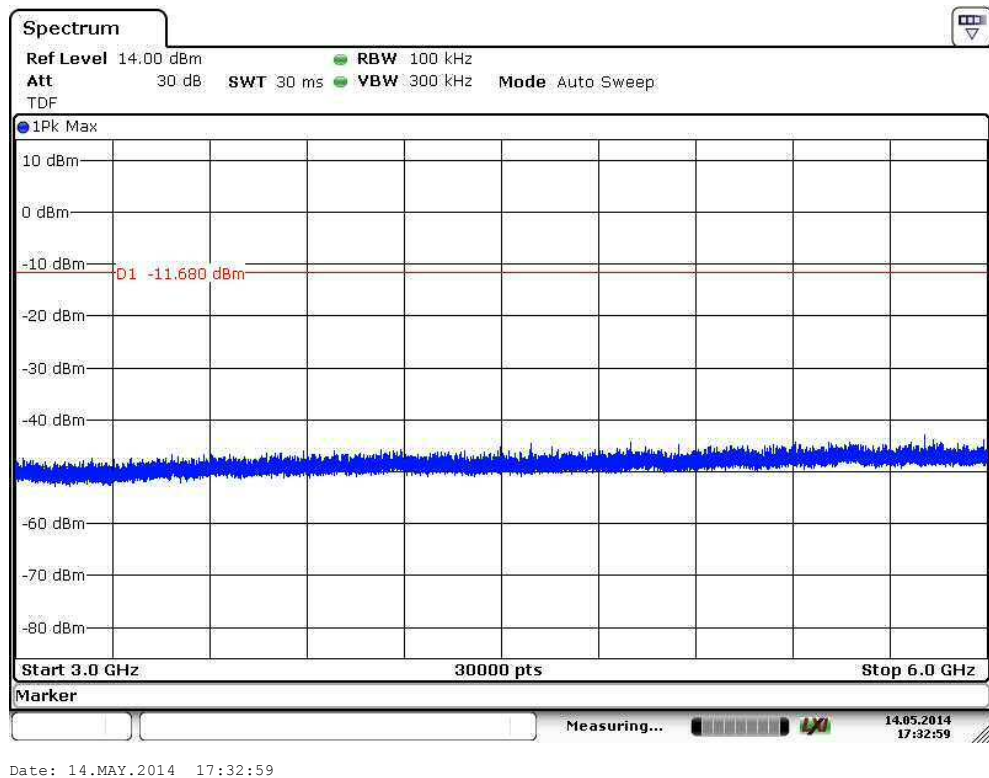


Figure 21. Conducted Spurious Emissions 3 000 – 6 000 MHz. Channel Low.

Transmitter Band Edge Measurement and Conducted Spurious Emissions

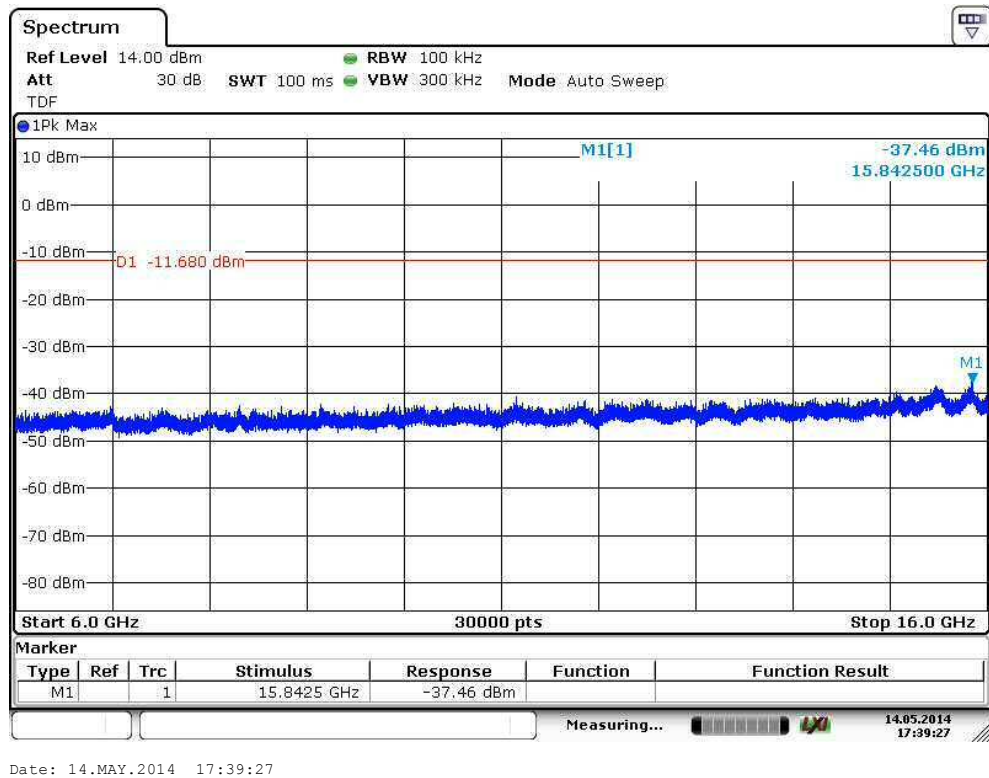


Figure 22. Conducted Spurious Emissions 6 000 – 16 000 MHz. Channel Low.

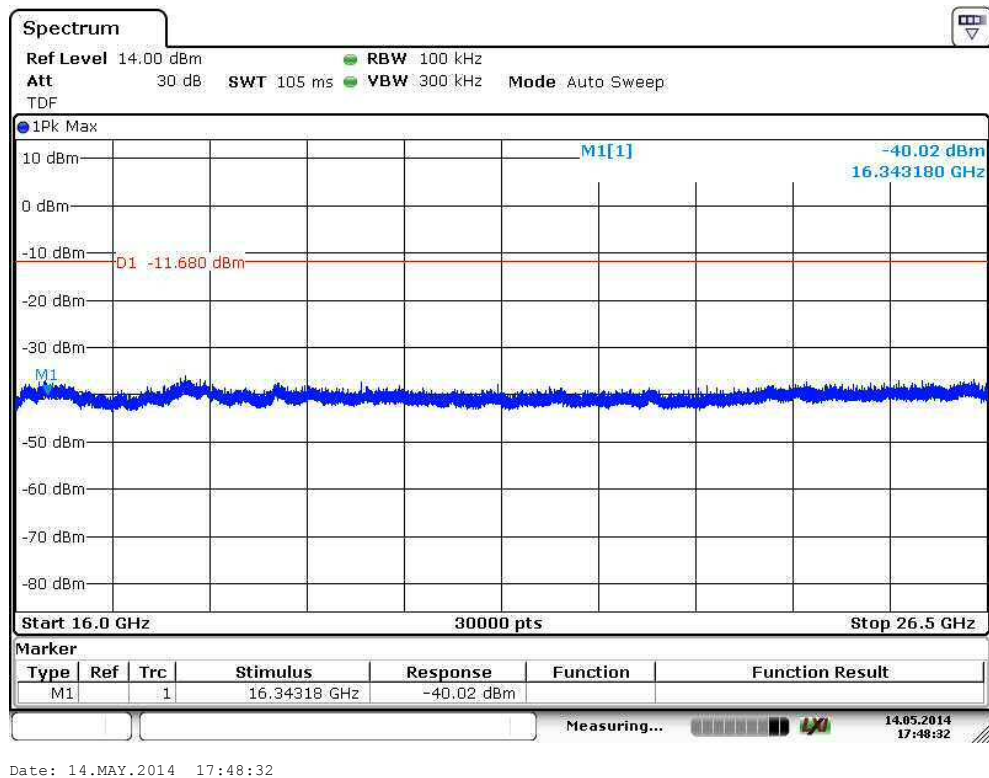


Figure 23. Conducted Spurious Emissions 16 000 – 26 500 MHz. Channel Low.

Transmitter Band Edge Measurement and Conducted Spurious Emissions

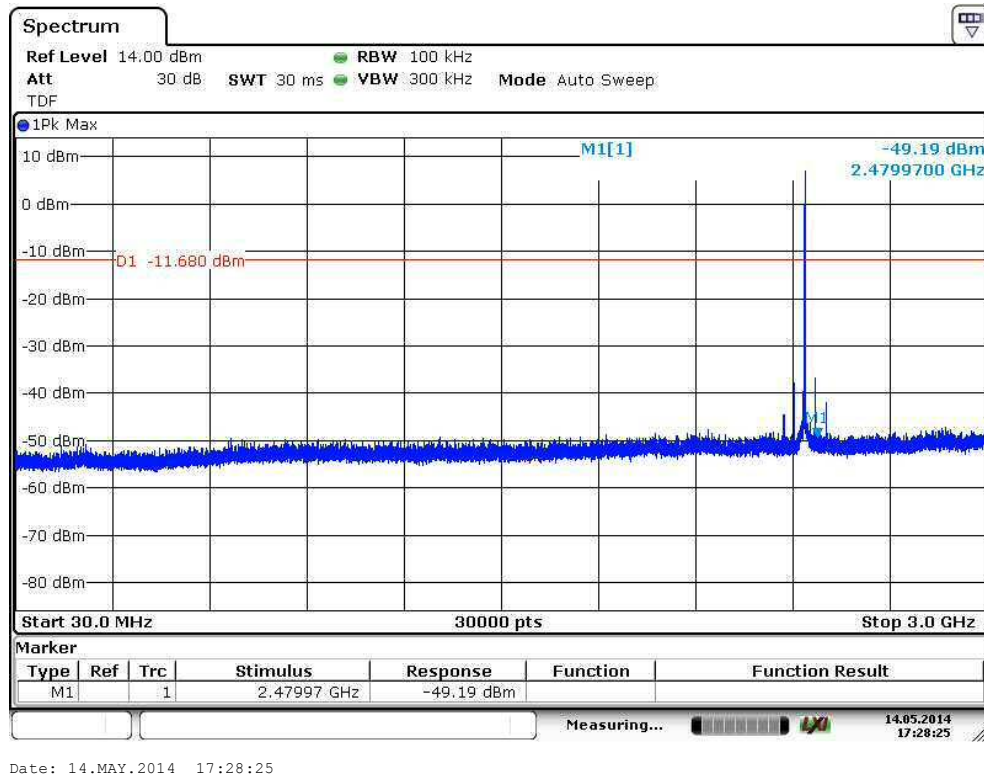


Figure 24. Conducted Spurious Emissions 30 – 3 000 MHz. Channel Mid.

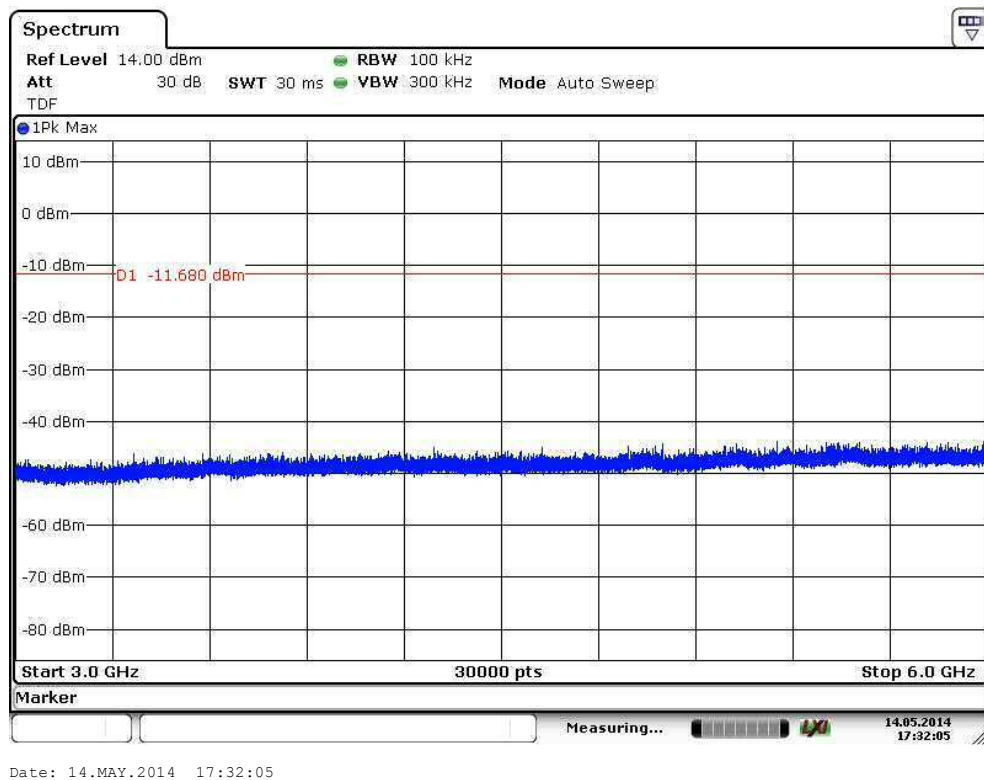


Figure 25. Conducted Spurious Emissions 3 000 – 6 000 MHz. Channel Mid.

Transmitter Band Edge Measurement and Conducted Spurious Emissions

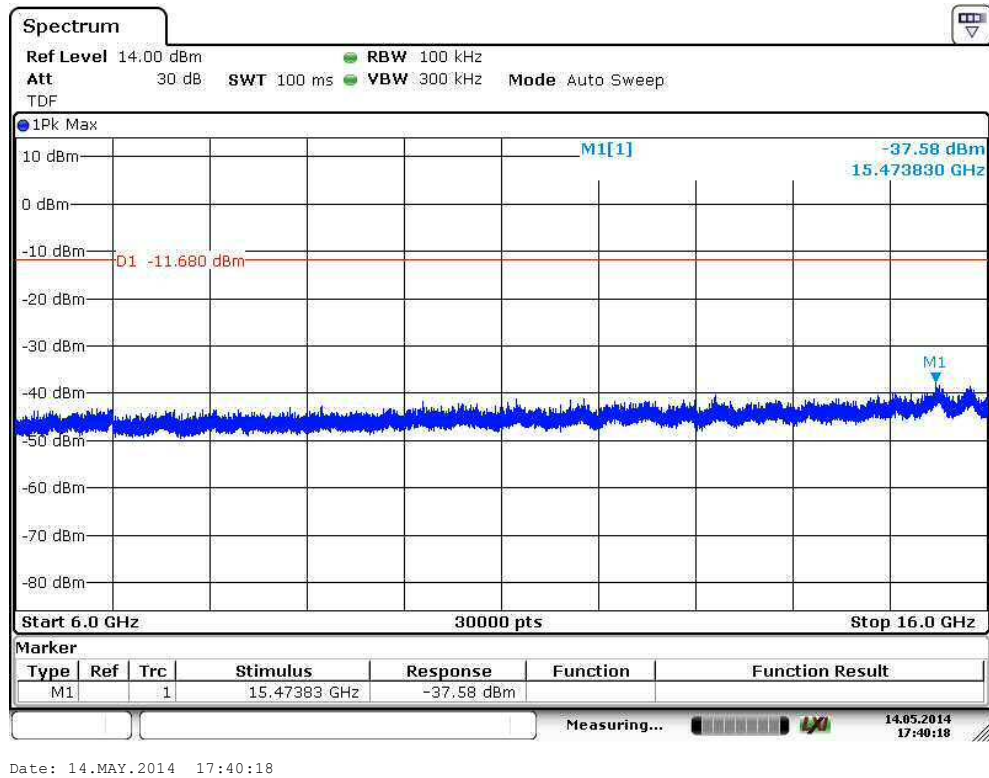


Figure 26. Conducted Spurious Emissions 6 000 – 16 000 MHz. Channel Mid.

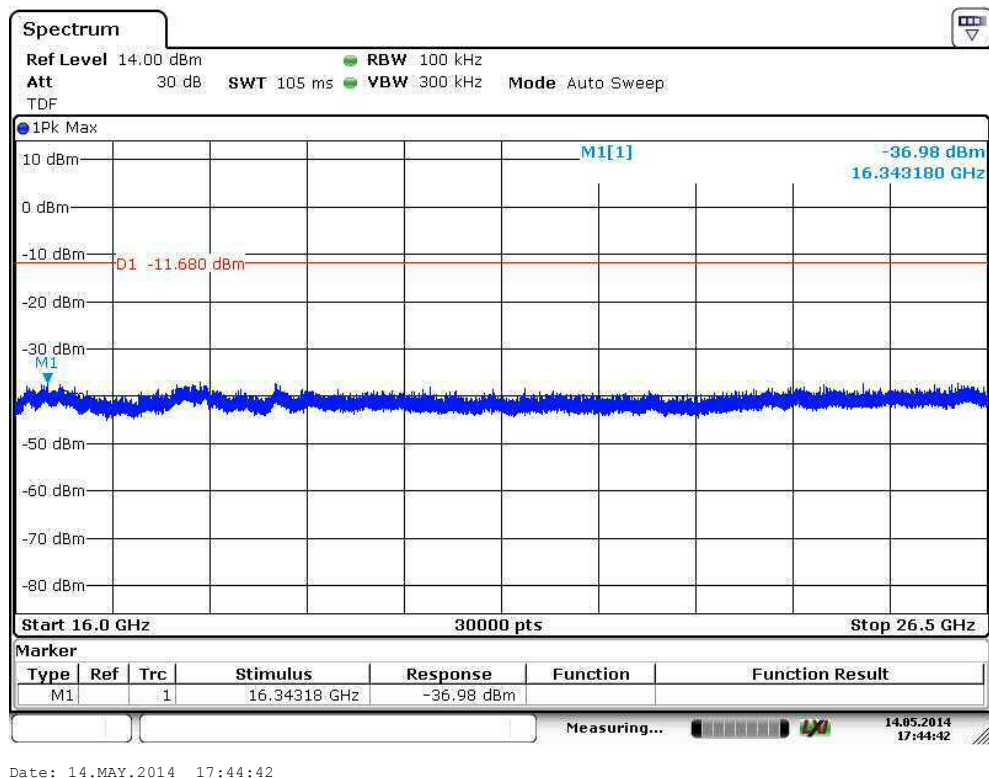


Figure 27. Conducted Spurious Emissions 16 000 – 26 500 MHz. Channel Mid.

Transmitter Band Edge Measurement and Conducted Spurious Emissions

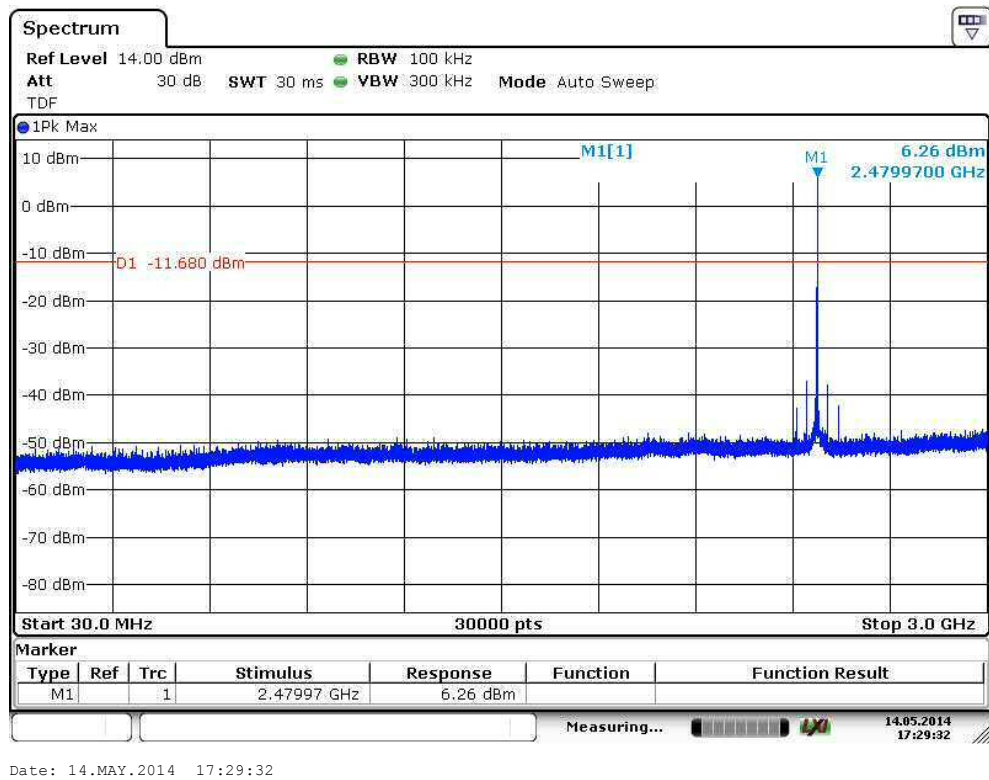


Figure 28. Conducted Spurious Emissions 30 – 3 000 MHz. Channel High.

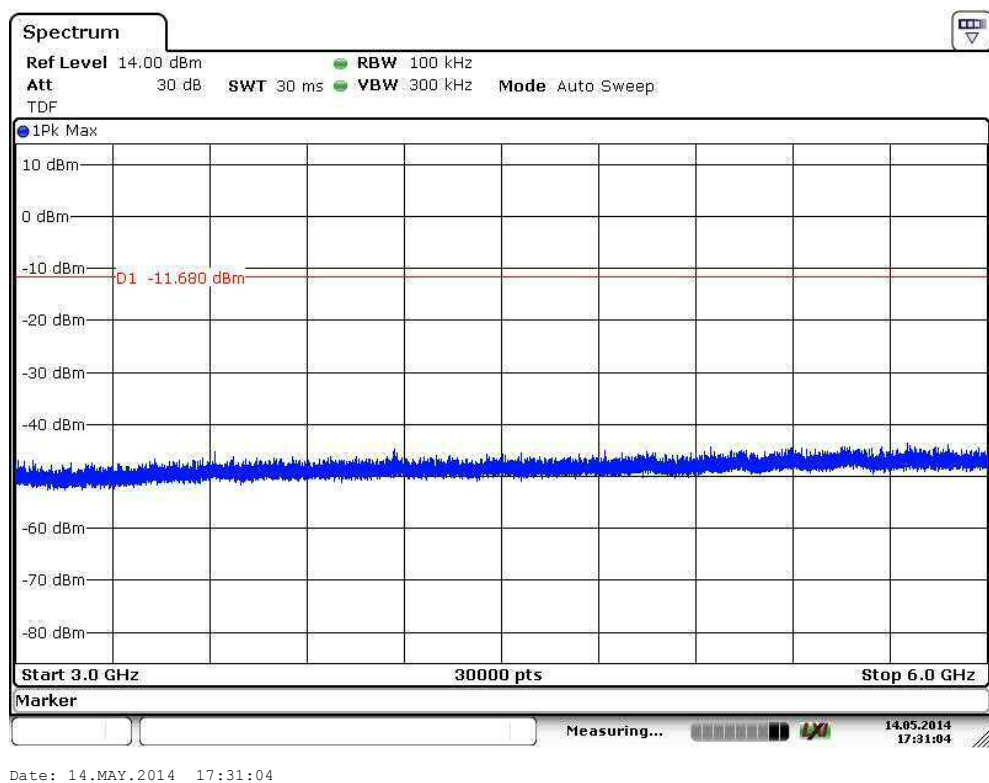


Figure 29. Conducted Spurious Emissions 3 000 – 6 000 MHz. Channel High.

Transmitter Band Edge Measurement and Conducted Spurious Emissions

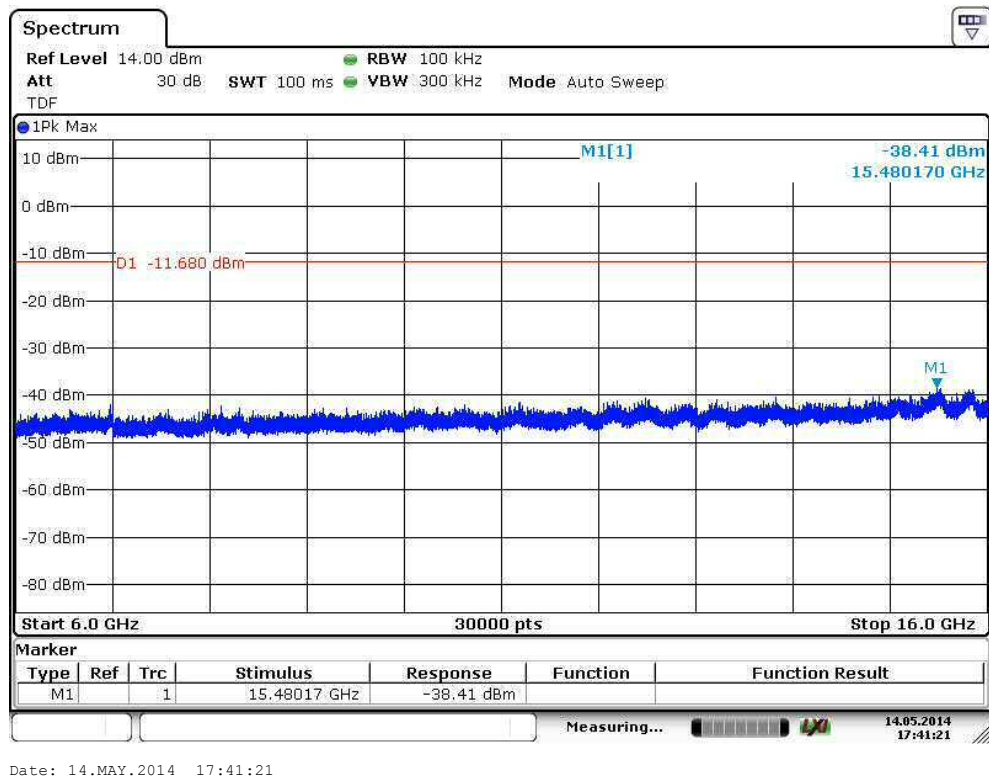


Figure 30. Conducted Spurious Emissions 6 000 – 16 000 MHz. Channel High.

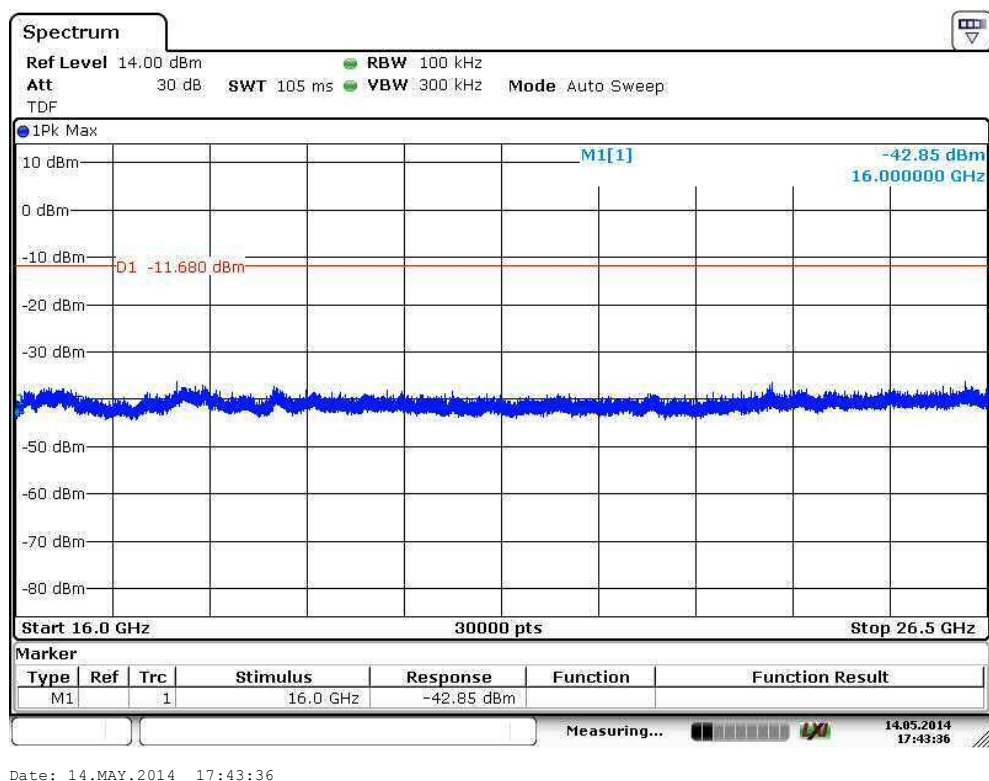


Figure 31. Conducted Spurious Emissions 16 000 – 26 500 MHz. Channel High.

6 dB Bandwidth of the Channel

Standard: ANSI C63.10 (2009)
Tested by: NKO
Date: 14.5.2014
Humidity: 22 %
Temperature: 21.5 °C

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

Results:

Table 18. 6 dB bandwidth test results.

Channel	6 dB BW [kHz]	Minimum limit [kHz]
Low	730.800	500
Mid	730.800	
High	730.800	

6 dB Bandwidth of the Channel

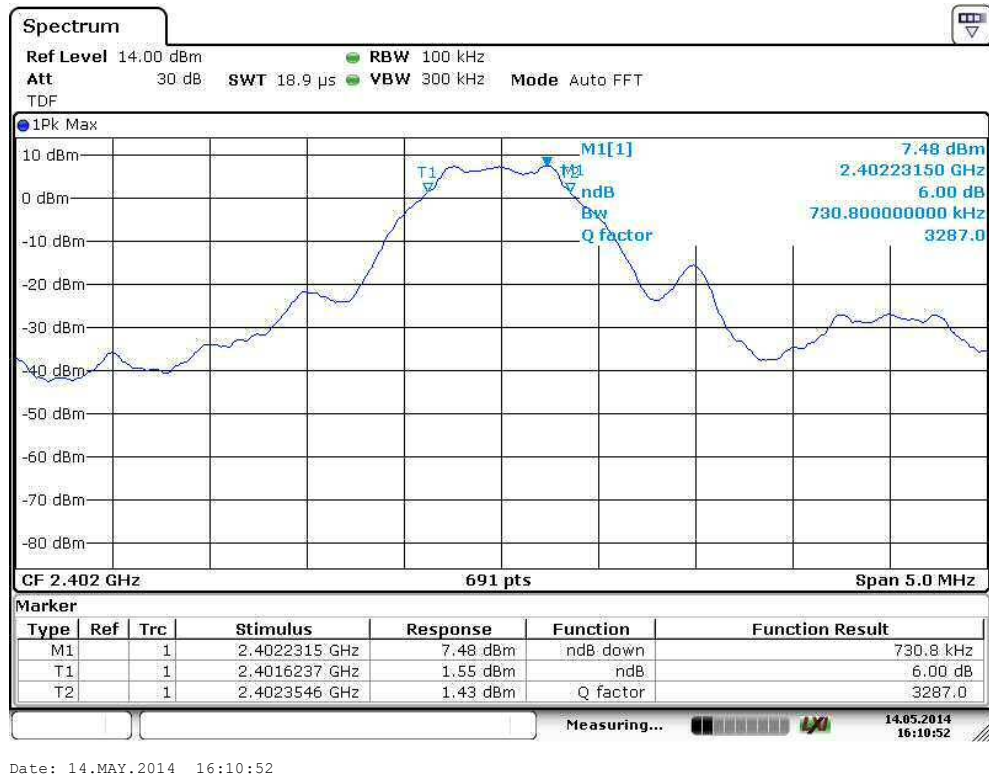


Figure 32. 6 dB bandwidth of the channel Low.

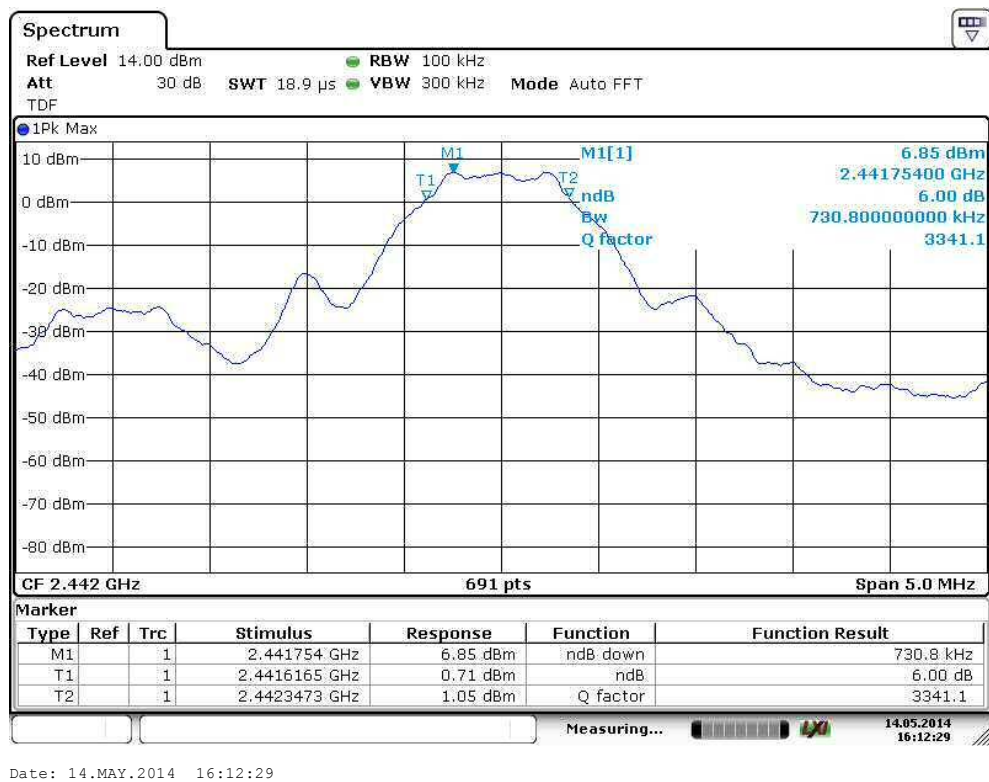
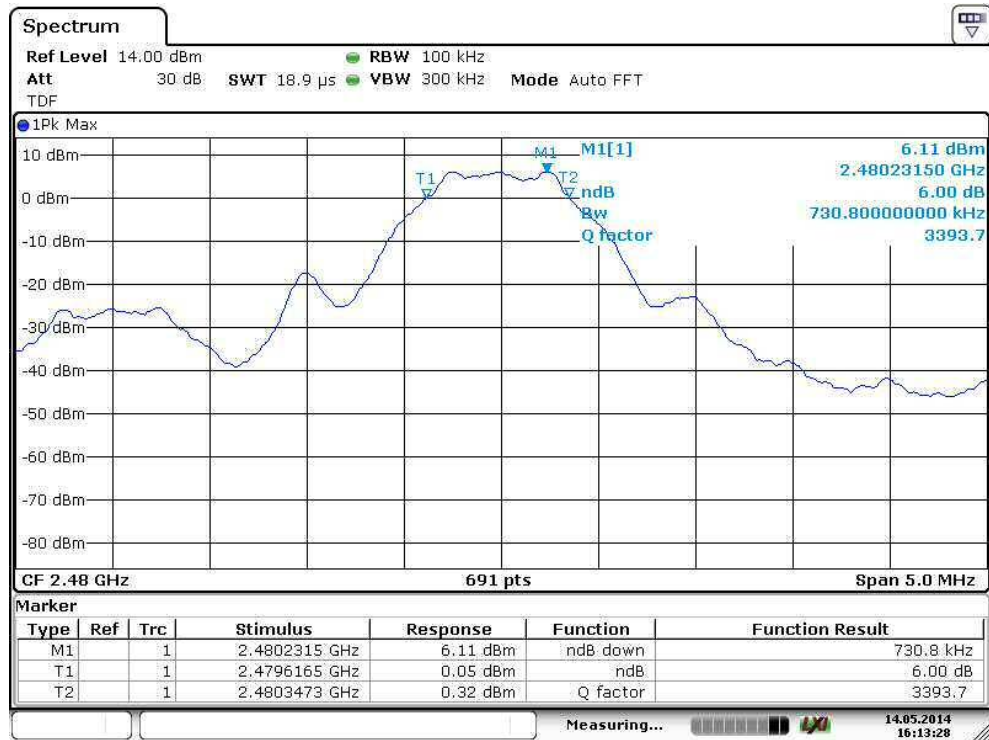


Figure 33. 6 dB bandwidth of the channel Mid.

6 dB Bandwidth of the Channel



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Figure 34. 6 dB bandwidth of the channel High.

Power Spectral Density

Standard: ANSI C63.10 (2009)
Tested by: NKO
Date: 14.5.2014
Humidity: 22 %
Temperature: 21.5 °C

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

Results:

Table 19. Power Spectral Density test results.

Channel	PSD dBm/3 kHz	Maximum limit [dBm/3kHz]
Low	-6.89	+8.00
Mid	-7.35	
High	-8.22	

Power Spectral Density

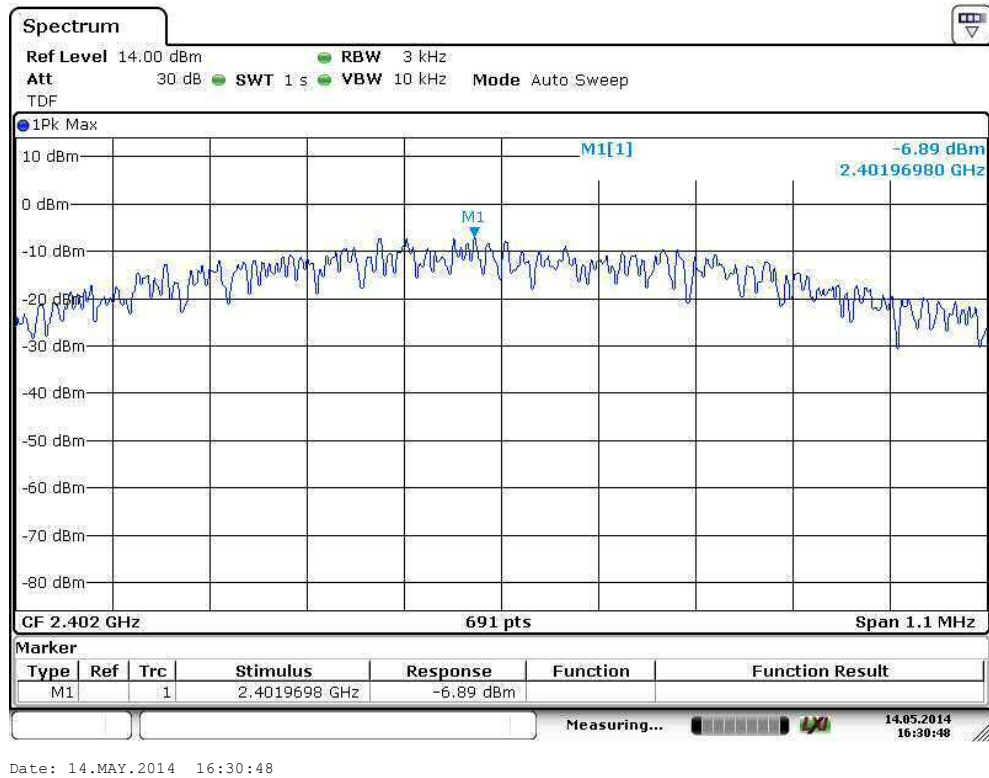


Figure 35. Power Spectral Density of the channel Low.

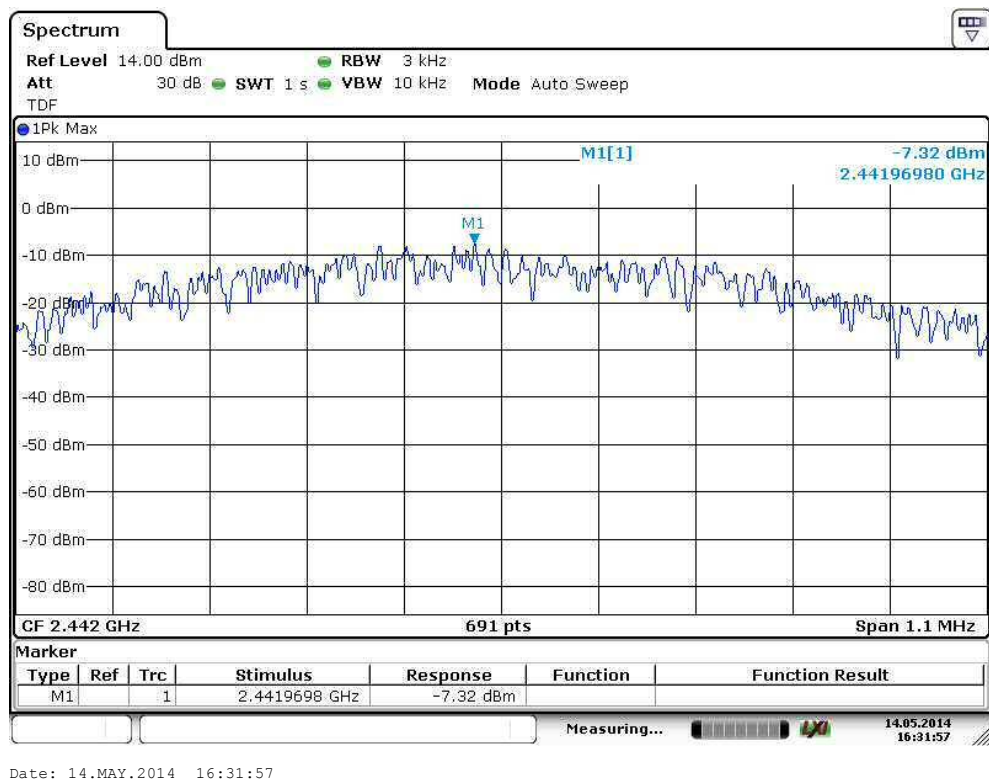
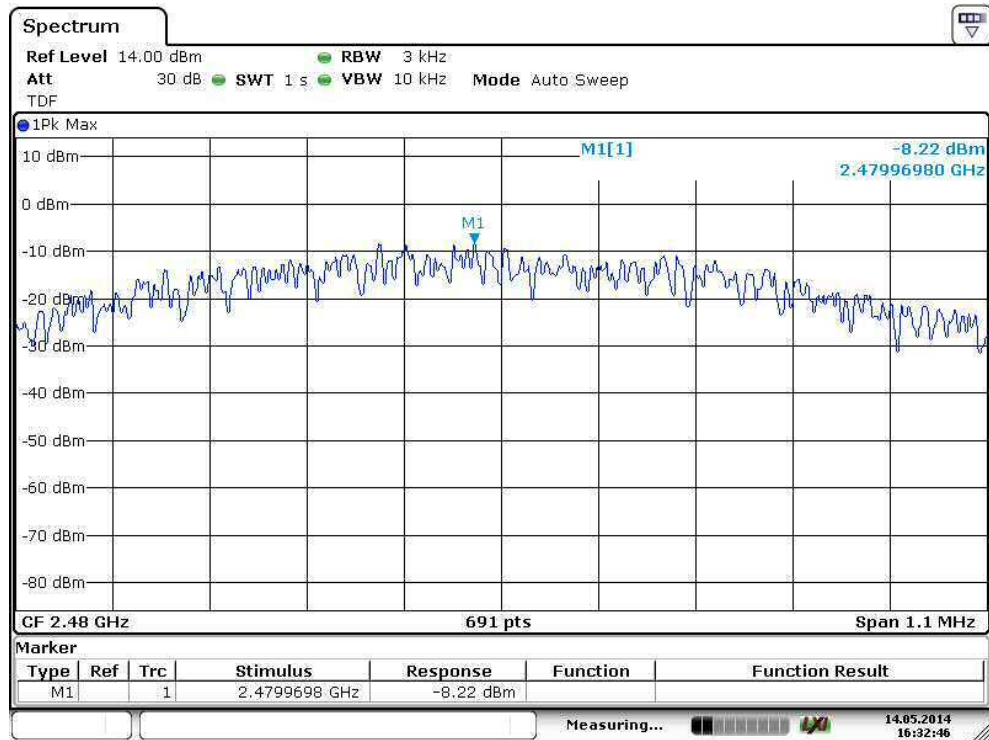


Figure 36. Power Spectral Density of the channel Mid.

Power Spectral Density



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Figure 37. Power Spectral Density of the channel High.

99% Occupied Bandwidth

Standard: RSS-GEN (2010)
Tested by: NKO
Date: 16.5.2014
Humidity: 25 %
Temperature: 22.1 °C

RSS-GEN 4.7

Table 20. 99 % OBW test results.

Channel	Limit	99 % BW [MHz]	Result
Low	-	1.099855282	PASS
Mid	-	1.099855282	PASS
High	-	1.099855282	PASS

99 % Occupied Bandwidth

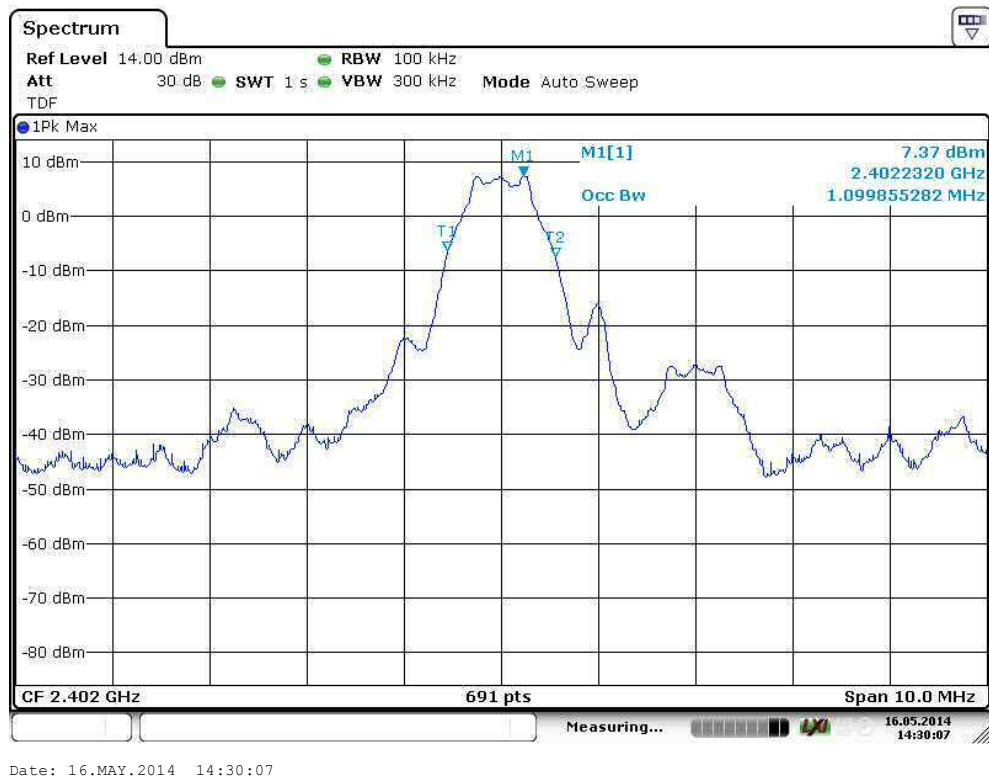


Figure 38. 99 % OBW. Channel Low.

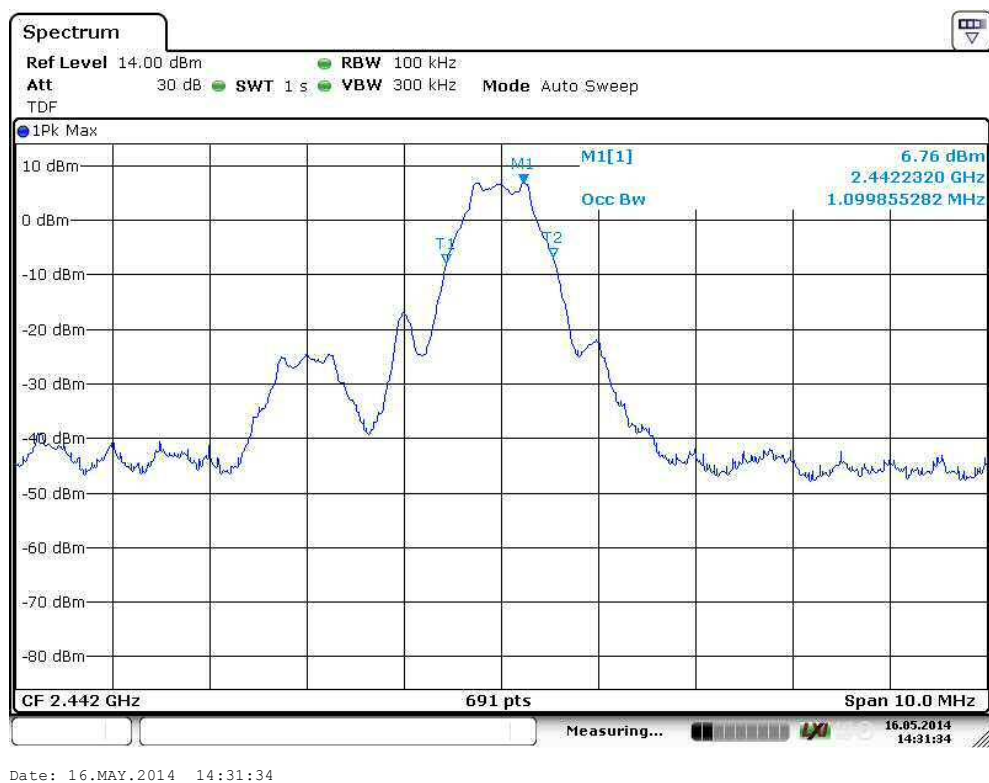
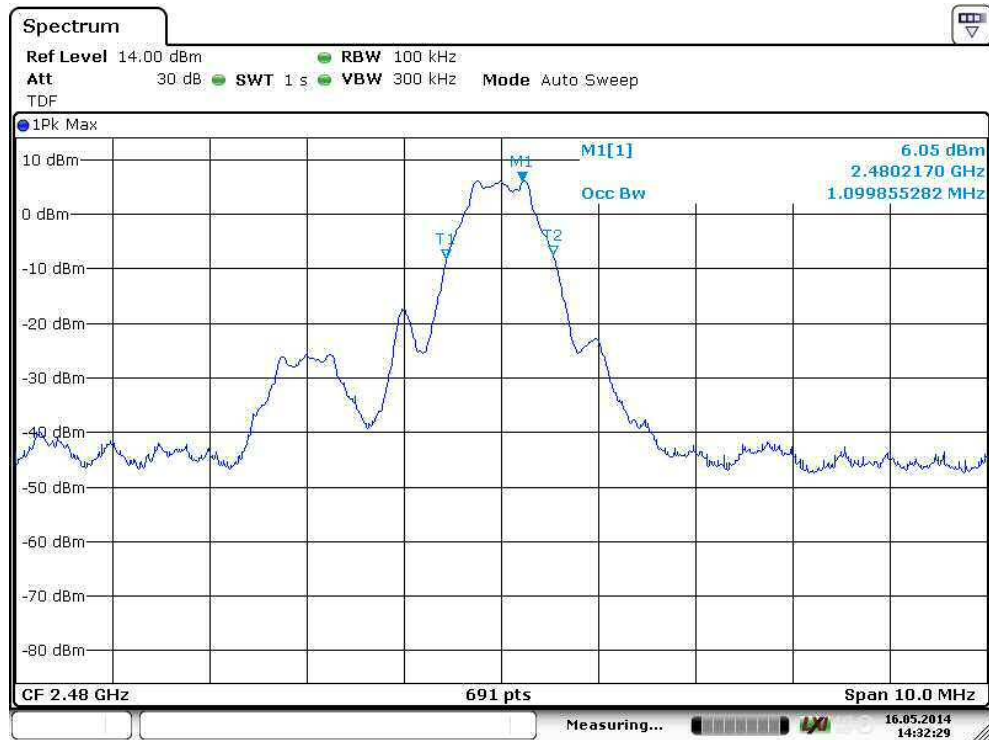


Figure 39. 99 % OBW. Channel Mid.



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Figure 40. 99 % OBW. Channel High.

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).