

# Test Report



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

Equipment Under Test: Bluetooth Low Energy Beacon for indoor positioning

Model: SenionBeacon

Type: -

Manufacturer: SenionLab AB  
Teknikringen 7  
58330 Linköping  
Sweden

Customer: SenionLab AB  
Teknikringen 7  
58330 Linköping  
Sweden

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

Date: 30.01.2014

Issued by:

  
Niko Kotsalo  
Testing Engineer

Date: 30.01.2014

Checked by:

  
Jari Merikari  
Technical Manager

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## Equipment Under Test (EUT)

Bluetooth Low Energy beacon for indoor positioning

Model: SenionBeacon

Type: -

Serial no: -

HW version: 1.0

SW version: 1.0

FCC ID: 2ABSF-SB201301

IC: 11586A-SB201301

## Description of the EUT

EUT is a Bluetooth Low Energy beacon for indoor positioning and navigation. EUT is battery powered.

## 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: 40  
Channel separation: 2 MHz  
Channel bandwidth: 1.20 MHz  
Effective conducted power: 3.28 dBm  
Transmission technique: Digital Transmission  
Modulation: GFSK  
Antenna connector type: U.FL connector  
Integral Antenna gain: 0 dBi

## Power Supply

Battery operated  
Operating voltage range: 3.0 – 3.9 VDC  
Normal input voltage: ER14505 3.6V AA lithium battery

## Mechanical Size of the EUT

Height: 20 mm	Width:100 mm	Depth: 39 mm
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## Samples

Several samples were used in the tests. There were separate units for each channel (low, mid and high) and for conductive measurements there were units with U.FL antenna port connectors. 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.

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## 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 13.4% 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

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

**Maximum Peak Conducted Output Power**

**Standard:** ANSI C63.10 (2009)  
**Tested by:** NKO  
**Date:** 15.1.2014  
**Humidity:** 9 %  
**Temperature:** 20.1 °C  
**Measurement uncertainty** ± 2,87dB Level of confidence 95 % (k = 2)

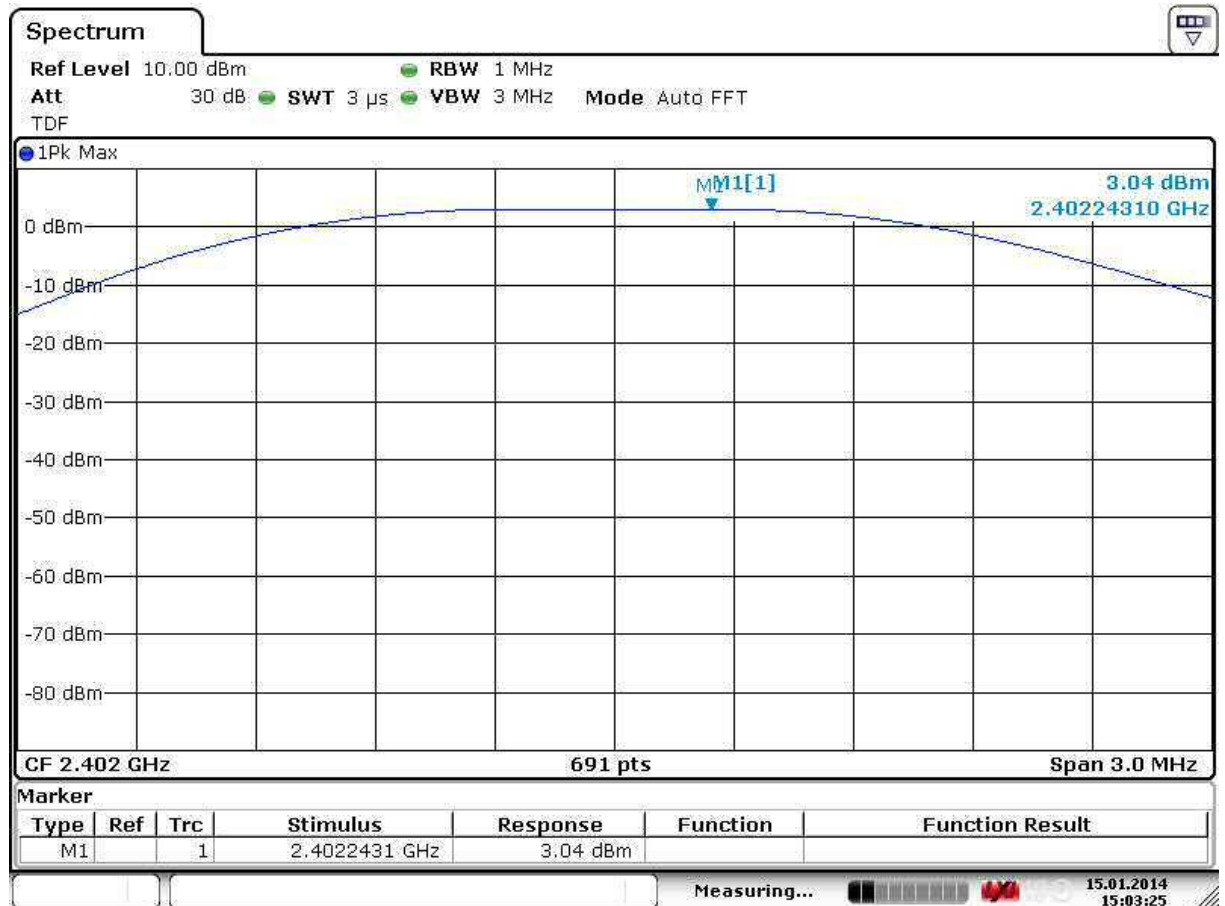
**FCC Rule: 15.247(b)(3)**

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	3.04	30	26.96	PASS
Mid	3.14	30	26.86	PASS
High	3.28	30	26.72	PASS

## Conducted Output Power Test

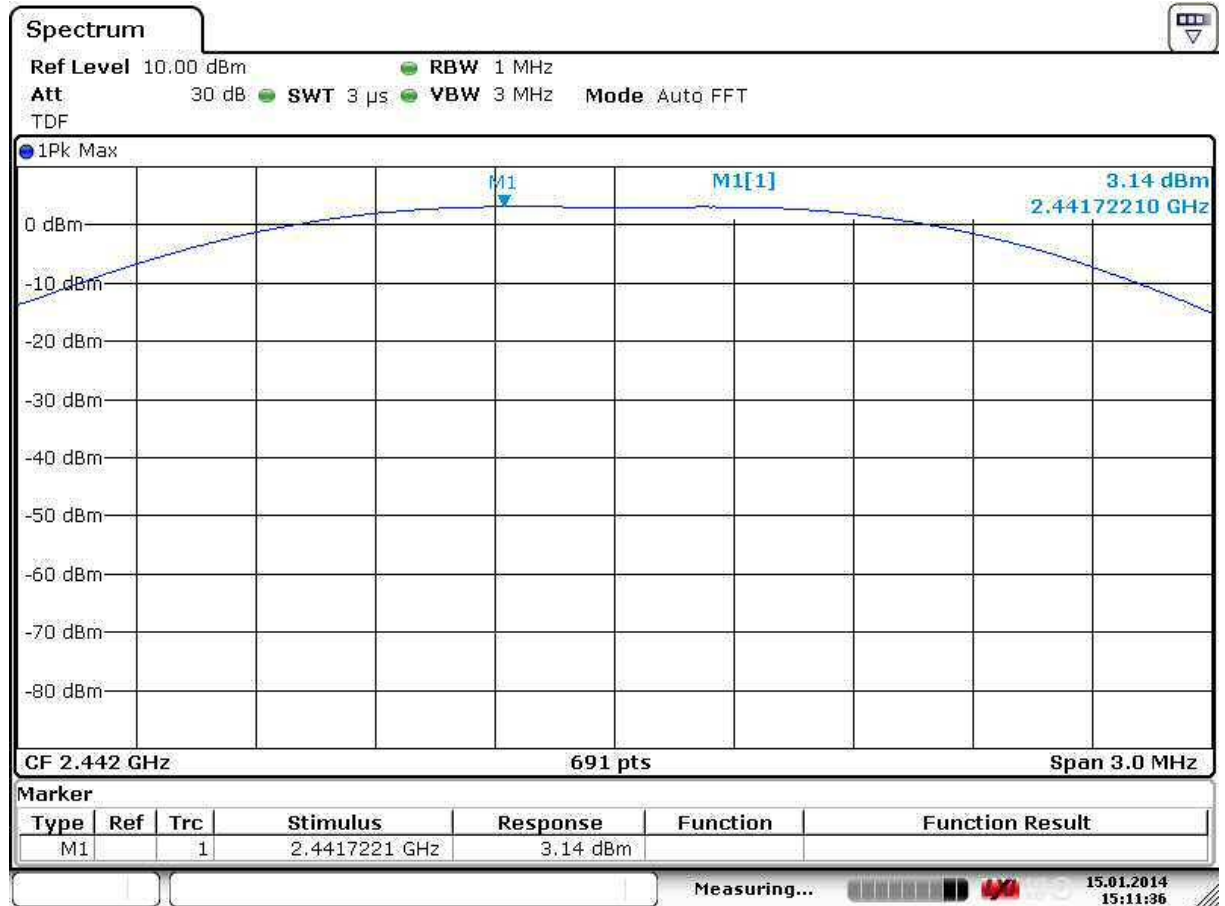


Date: 15.JAN.2014 15:03:25

**Figure 1.** Channel Low.



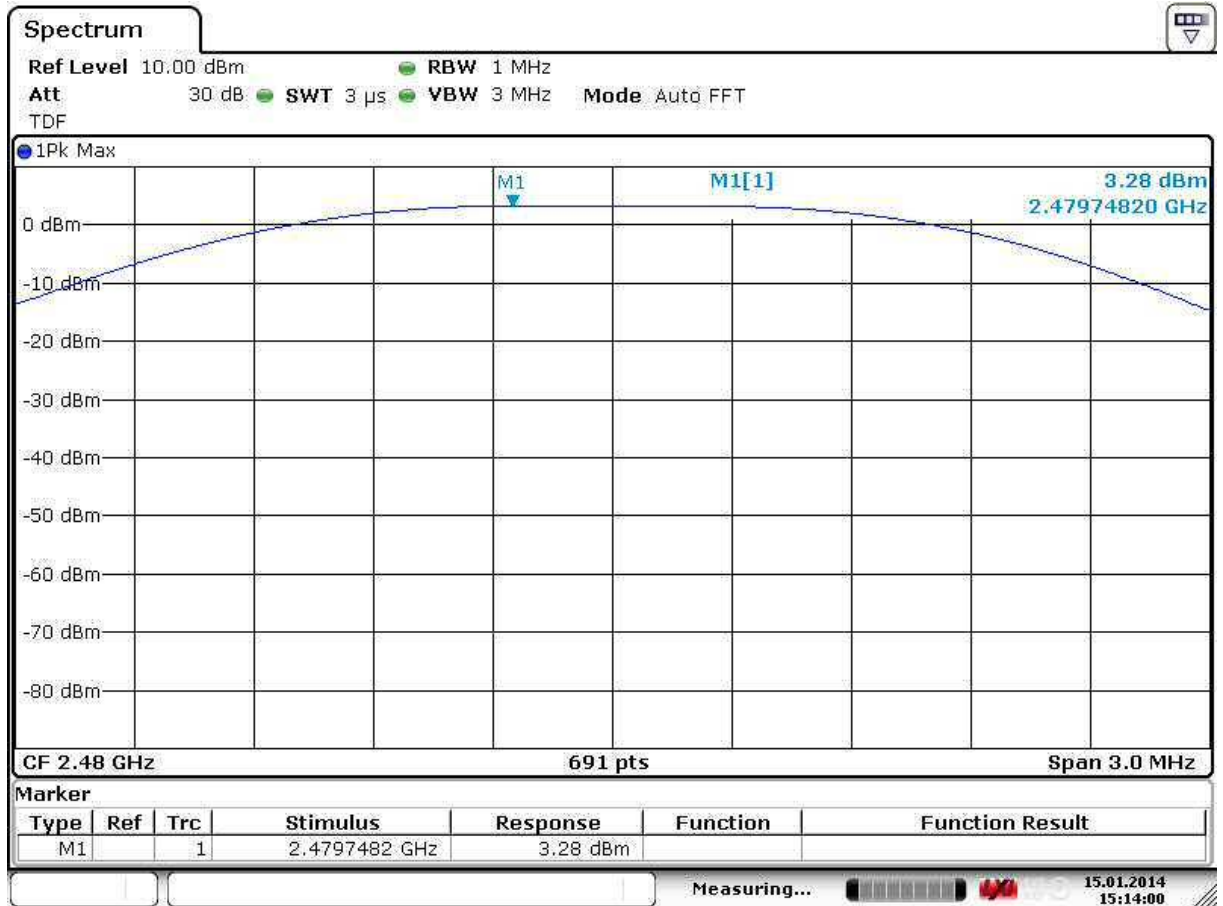
## Conducted Output Power Test



Date: 15.JAN.2014 15:11:36

**Figure 2.** Channel Mid.

## Conducted Output Power Test



Date: 15.JAN.2014 15:14:01

**Figure 3.** Channel High.

**Transmitter Radiated Spurious Emissions 30 – 1000 MHz**

<b>Standard:</b>	ANSI C63.10	(2009)
<b>Tested by:</b>	NKO	
<b>Date:</b>	16.1. - 17.1.2014	
<b>Humidity:</b>	15 – 16 %	
<b>Temperature:</b>	18.1 – 18.5 °C	
<b>Measurement uncertainty</b>	± 4.51 dB	Level of confidence 95 % (k = 2)

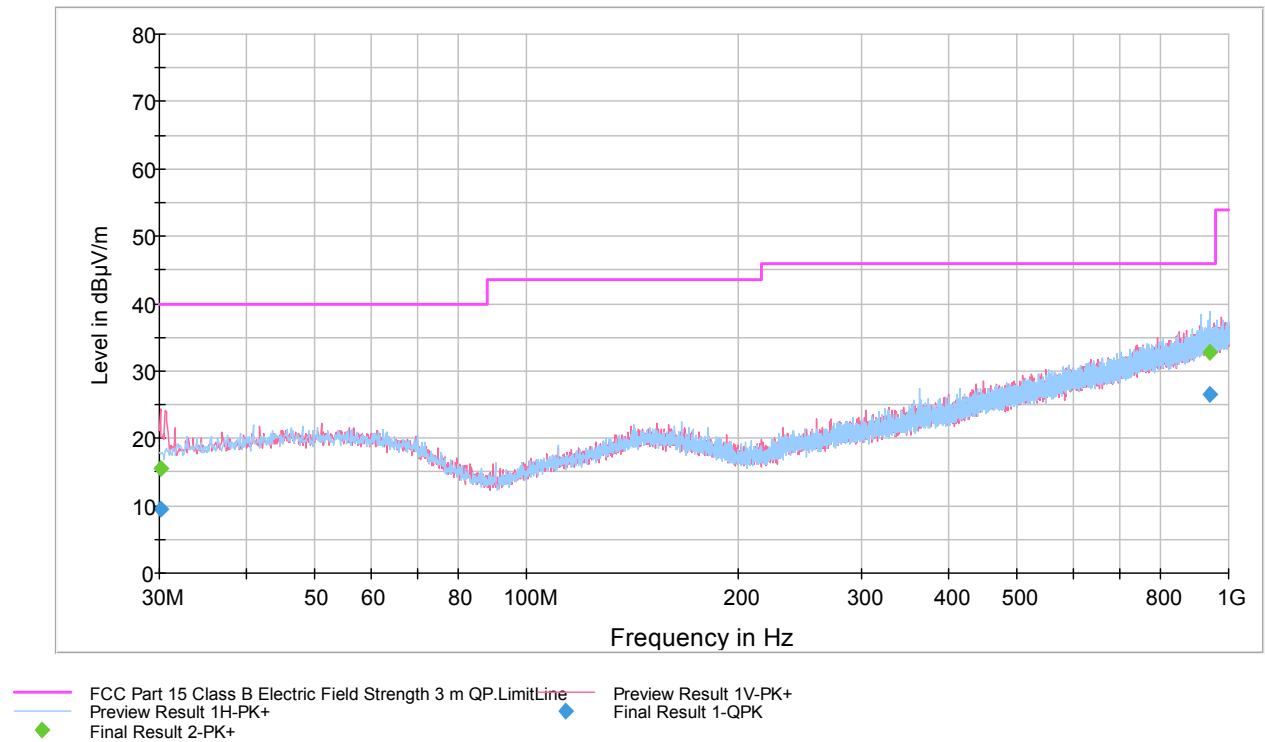
**FCC Rule: 15.247(d), 15.209(a)**

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.**

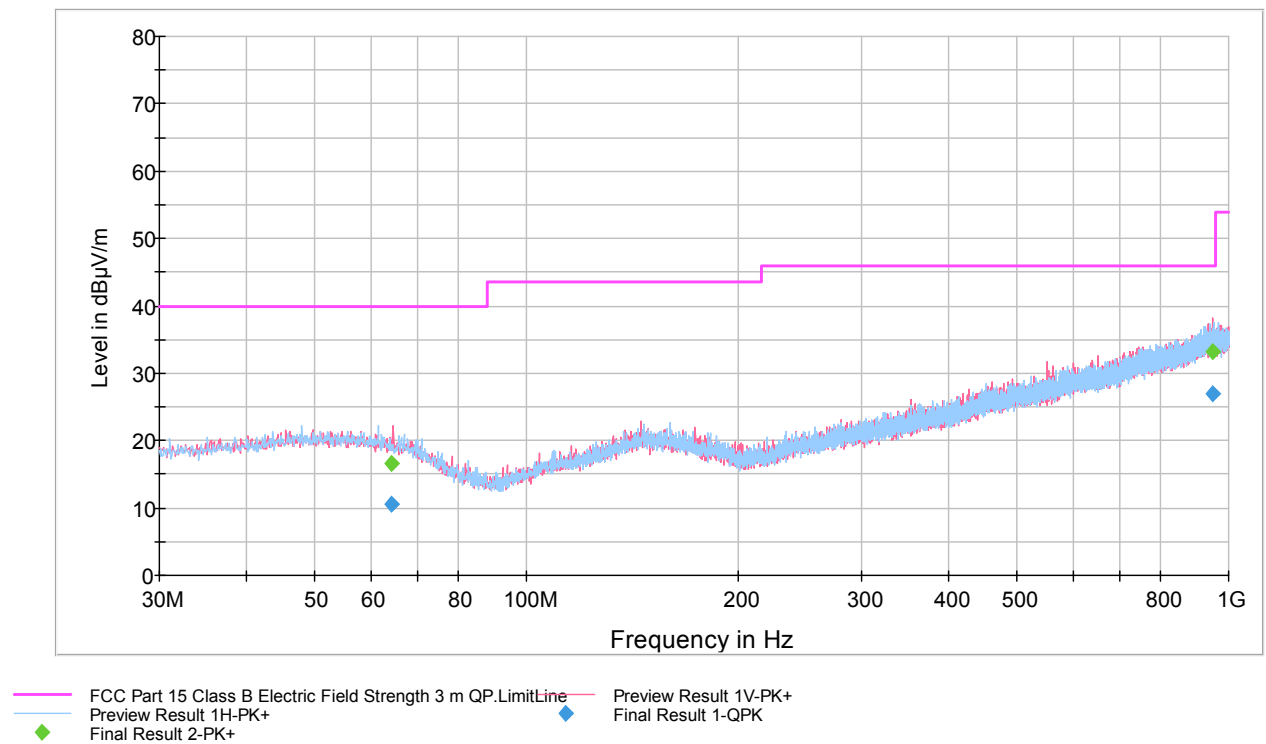
FCC Part 15 Class B Spurious Emission 30-1000MHz 3m

**Figure 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)	Margin (dB)	Limit (dBμV/m)	Comment
30.100000	9.5	1000.0	120.000	365.0	V	27.0	30.5	40.0	
939.922000	26.4	1000.0	120.000	121.0	H	87.0	19.6	46.0	

## Radiated Spurious Emissions

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



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

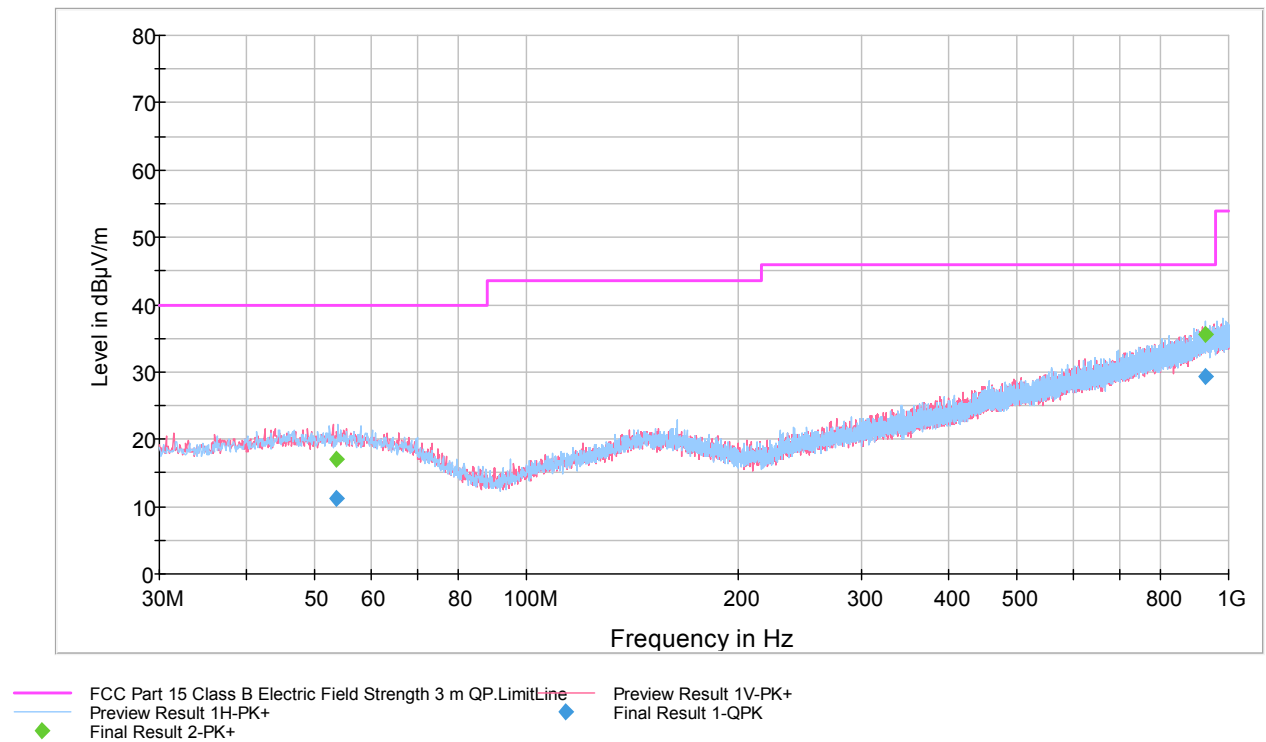
### Final measurements from the worst frequencies

**Table 2.** Final results.

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)	Comment
64.209000	10.5	1000.0	120.000	301.0	V	127.0	29.5	40.0	
950.040000	26.9	1000.0	120.000	306.0	V	272.0	19.2	46.0	

## Radiated Spurious Emissions

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.

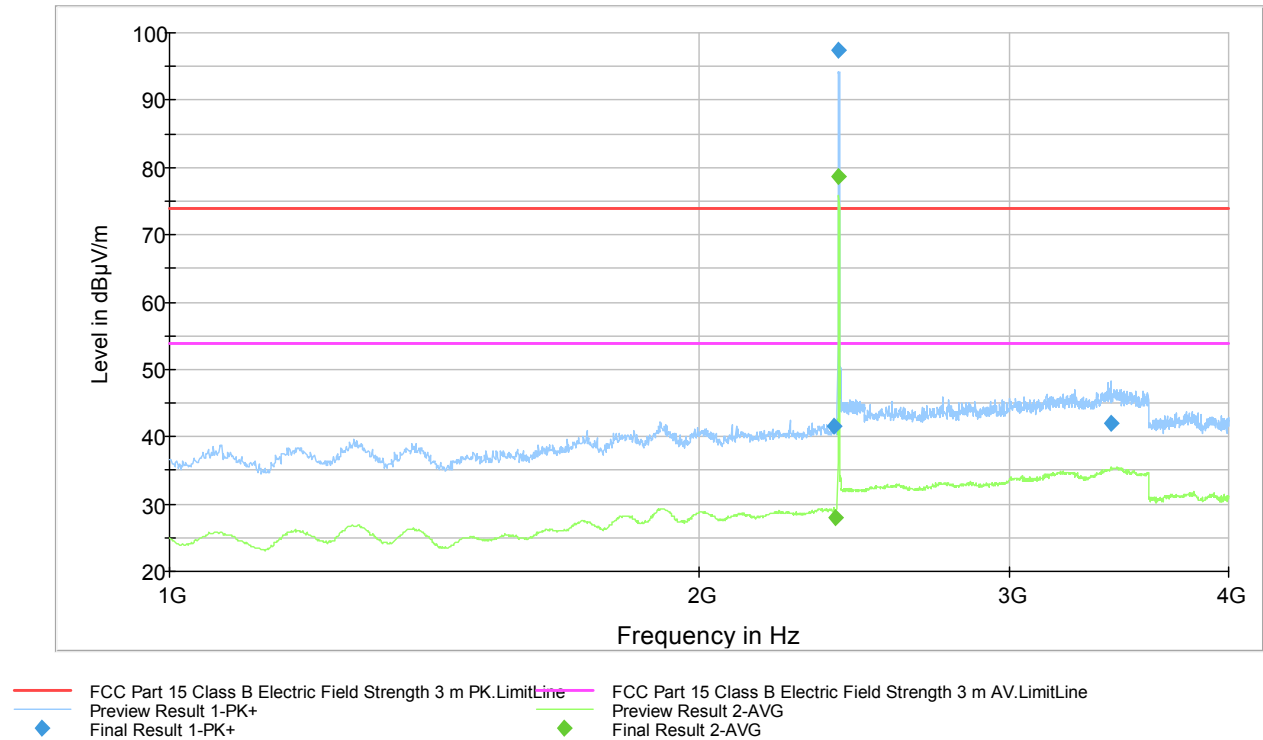
Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
53.559000	11.2	1000.0	120.000	400.0	H	116.0	15.1	28.8	40.0	
927.053000	29.3	1000.0	120.000	374.0	H	131.0	27.9	16.7	46.0	

## 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.

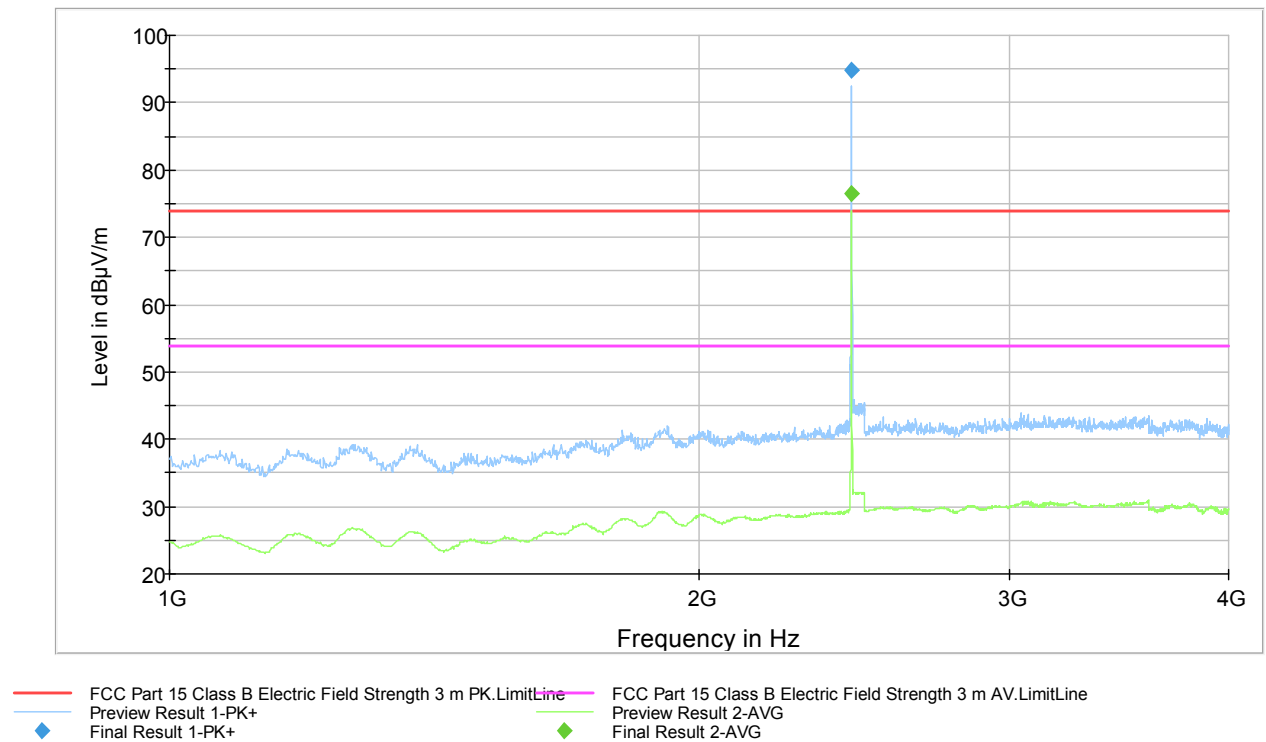
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)	Comment
2385.600000	41.6	1000.0	1000.000	238.0	V	9.0	32.3	73.9	
2401.800000	97.3	1000.0	1000.000	181.0	H	164.0	-23.4	73.9	
3432.375000	42.0	1000.0	1000.000	105.0	V	27.0	31.9	73.9	

**Table 5.** Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)	Comment
2390.000000	28.0	1000.0	1000.000	175.0	V	3.0	25.9	53.9	
2402.000000	78.7	1000.0	1000.000	211.0	H	164.0	-24.8	53.9	

## 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)	Margin (dB)	Limit (dBµV/m)	Comment
2441.750000	94.8	1000.0	1000.000	211.0	H	158.0	-20.9	73.9	

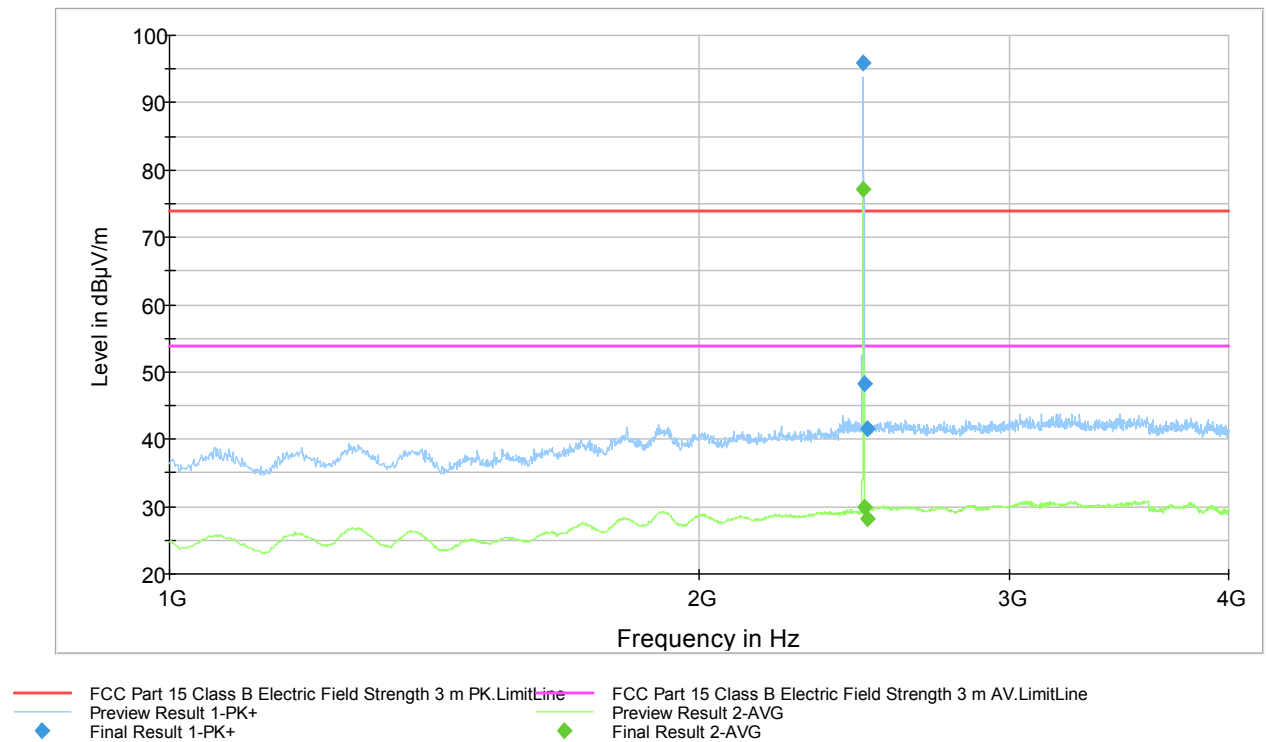
**Table 7.** Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)	Comment
2442.000000	76.4	1000.0	1000.000	209.0	H	160.0	-22.5	53.9	



## 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)	Margin (dB)	Limit (dBµV/m)	Comment
2479.750000	95.9	1000.0	1000.000	201.0	H	44.0	-22.0	73.9	
2483.700000	48.3	1000.0	1000.000	199.0	H	39.0	25.6	73.9	
2490.700000	41.7	1000.0	1000.000	100.0	V	26.0	32.2	73.9	

**Table 9.** Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)	Comment
2480.000000	77.2	1000.0	1000.000	206.0	H	47.0	-23.3	53.9	
2483.500000	30.0	1000.0	1000.000	203.0	H	44.0	23.9	53.9	
2491.300000	28.1	1000.0	1000.000	105.0	V	29.0	25.8	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

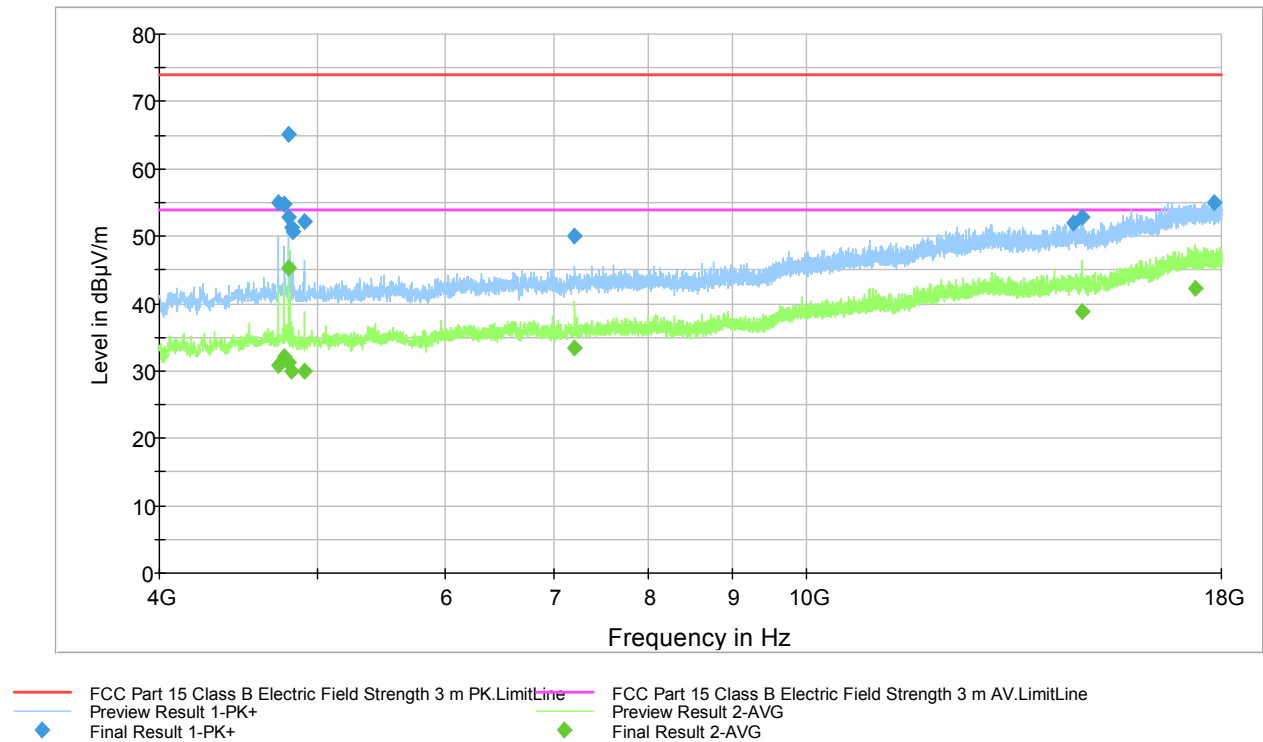


Figure 10. Measured curve with peak- and average detector. Channel Low.

Final measurements from the worst frequencies

Table 10. Final Max Peak results.

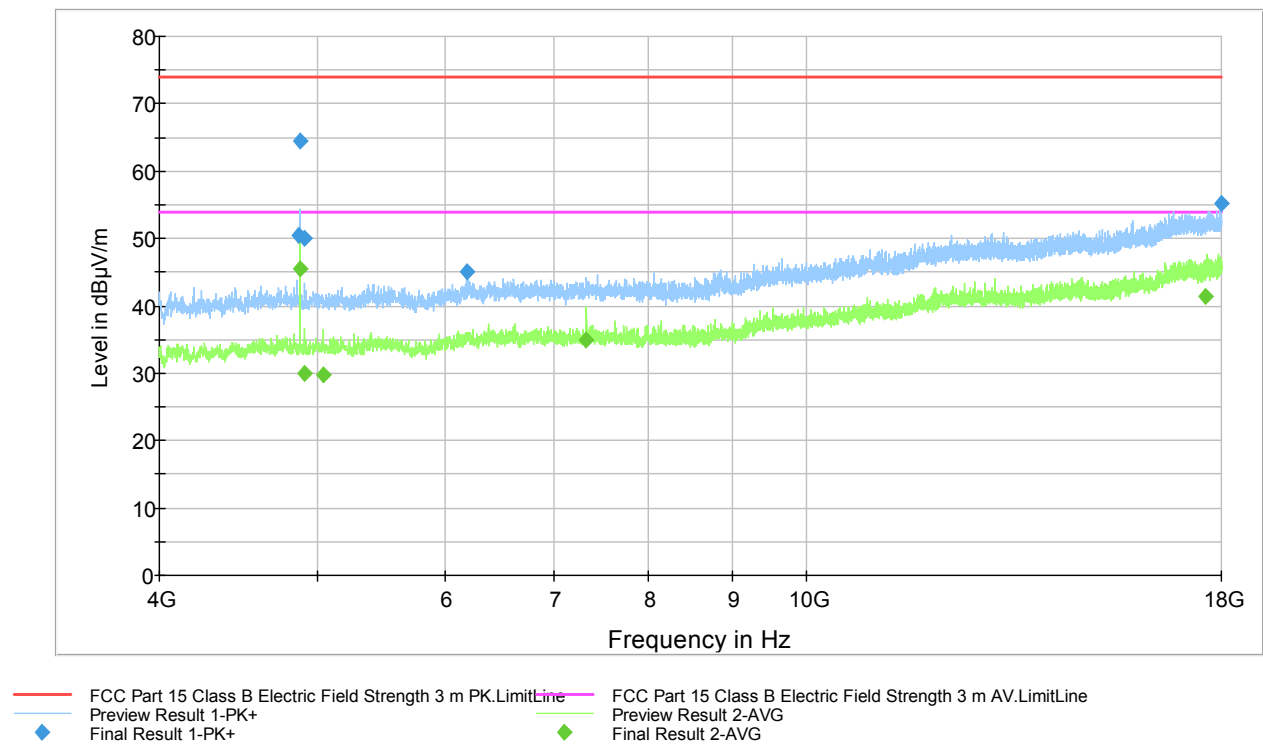
Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBμV/m)	Comment
4776.000000	54.8	1000.0	1000.000	186.0	H	189.0	19.1	73.9	
4803.600000	65.1	1000.0	1000.000	210.0	H	171.0	8.8	73.9	
4807.000000	52.7	1000.0	1000.000	181.0	H	185.0	21.2	73.9	
4822.600000	51.4	1000.0	1000.000	171.0	H	166.0	22.5	73.9	
4831.600000	50.7	1000.0	1000.000	167.0	H	149.0	23.2	73.9	
4910.000000	52.2	1000.0	1000.000	178.0	H	185.0	21.7	73.9	
7206.400000	50.0	1000.0	1000.000	154.0	V	263.0	23.9	73.9	
14603.000000	52.0	1000.0	1000.000	322.0	H	334.0	21.9	73.9	
14790.200000	52.9	1000.0	1000.000	302.0	H	46.0	21.0	73.9	
17823.400000	55.0	1000.0	1000.000	100.0	H	313.0	18.9	73.9	

Table 11. Final Average results.

Frequency (MHz)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBμV/m)	Comment
4776.000000	32.2	1000.0	1000.000	182.0	H	194.0	21.7	53.9	
4803.800000	45.4	1000.0	1000.000	210.0	H	171.0	8.5	53.9	
4807.000000	31.3	1000.0	1000.000	186.0	H	185.0	22.6	53.9	
4822.600000	30.1	1000.0	1000.000	162.0	H	131.0	23.8	53.9	
4911.400000	30.0	1000.0	1000.000	158.0	H	191.0	23.9	53.9	
7205.400000	33.4	1000.0	1000.000	152.0	V	276.0	20.5	53.9	
14788.600000	38.7	1000.0	1000.000	100.0	H	118.0	15.2	53.9	
17350.400000	42.3	1000.0	1000.000	122.0	H	19.0	11.6	53.9	

## Radiated Spurious Emissions

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



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

### Final measurements from the worst frequencies

**Table 12.** Final Max Peak results.

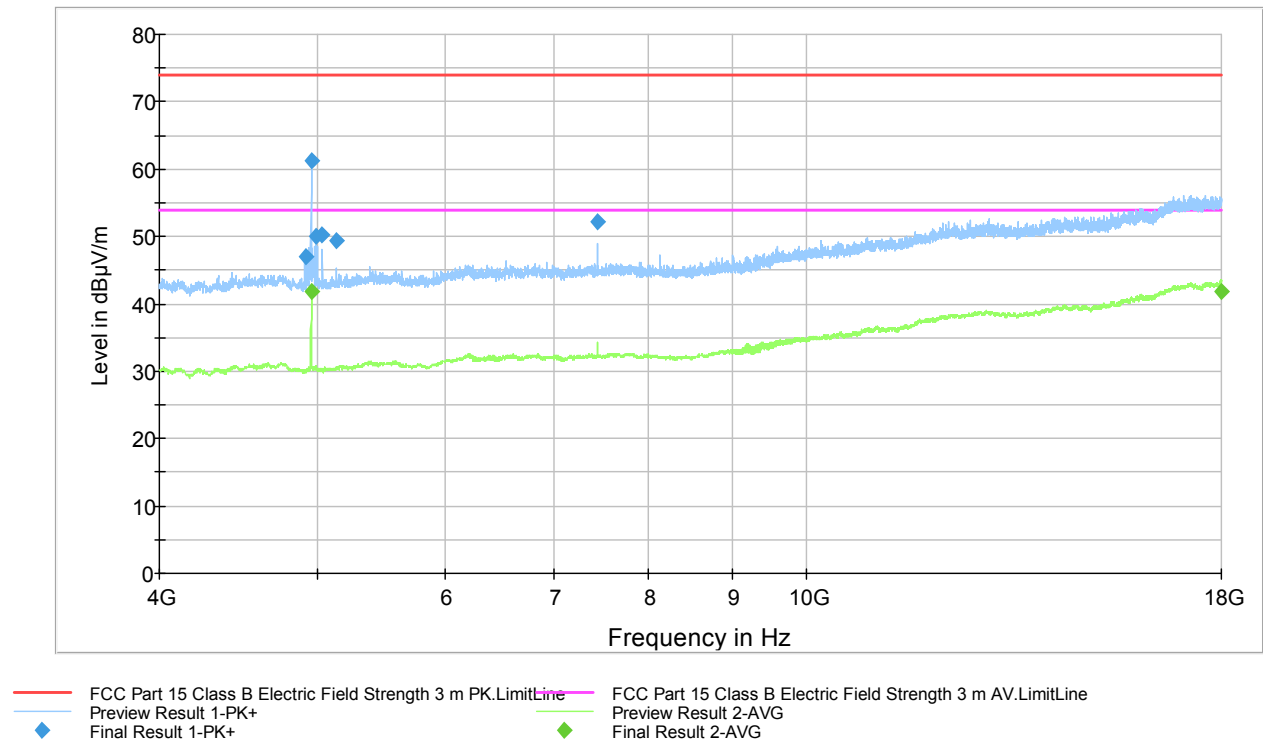
Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBμV/m)	Comment
4868.200000	50.5	1000.0	1000.000	178.0	H	189.0	23.4	73.9	
4883.600000	64.5	1000.0	1000.000	186.0	V	10.0	9.4	73.9	
4910.000000	50.1	1000.0	1000.000	195.0	H	190.0	23.8	73.9	
6182.200000	45.2	1000.0	1000.000	391.0	H	84.0	28.7	73.9	
17983.000000	55.3	1000.0	1000.000	268.0	H	197.0	18.6	73.9	

**Table 13.** Final Average results.

Frequency (MHz)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBμV/m)	Comment
4883.800000	45.6	1000.0	1000.000	211.0	H	45.0	8.3	53.9	
4913.400000	30.0	1000.0	1000.000	178.0	H	179.0	23.9	53.9	
5049.400000	29.8	1000.0	1000.000	105.0	V	305.0	24.1	53.9	
7325.400000	34.9	1000.0	1000.000	162.0	V	224.0	19.0	53.9	
17615.000000	41.4	1000.0	1000.000	130.0	V	18.0	12.5	53.9	

## Radiated Spurious Emissions

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



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

### Final measurements from the worst frequencies

**Table 14.** Final Max Peak results.

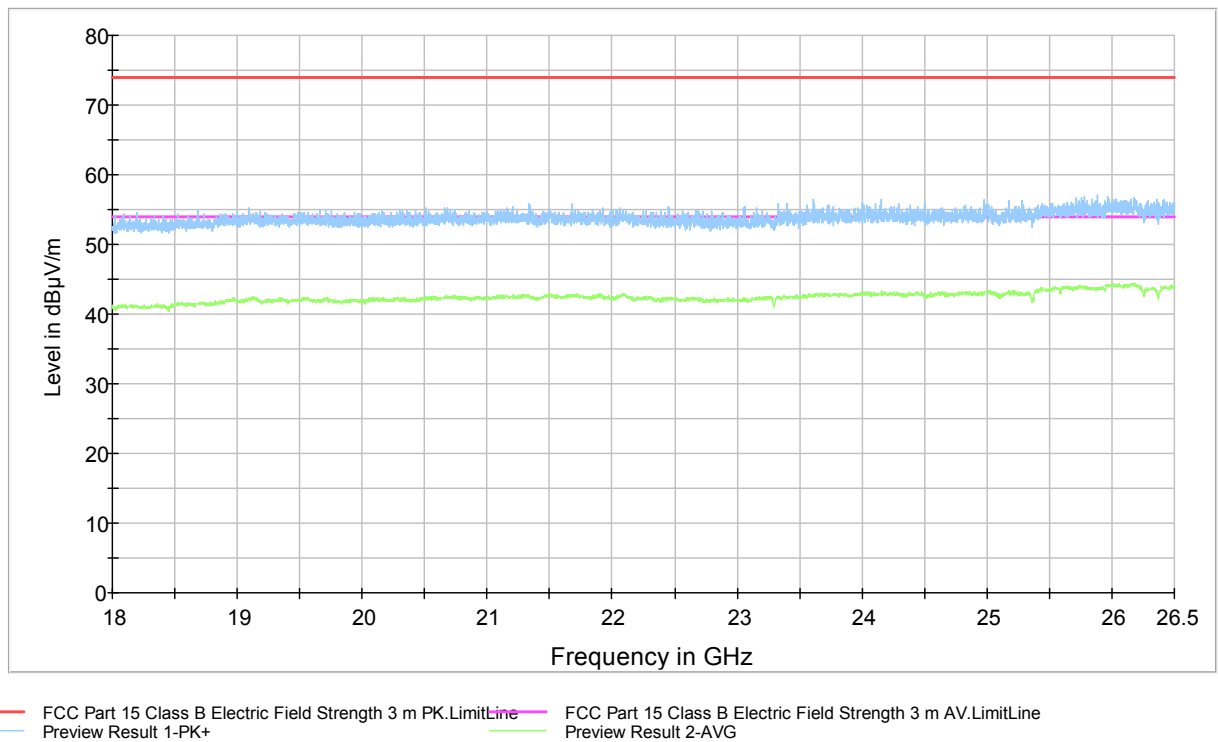
Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBμV/m)	Comment
4917.725000	47.0	1000.0	1000.000	100.0	V	219.0	26.9	73.9	
4959.625000	61.3	1000.0	1000.000	205.0	H	46.0	12.6	73.9	
4990.425000	50.1	1000.0	1000.000	187.0	H	190.0	23.8	73.9	
5039.575000	50.3	1000.0	1000.000	186.0	H	191.0	23.6	73.9	
5139.325000	49.3	1000.0	1000.000	187.0	H	176.0	24.6	73.9	
7439.225000	52.2	1000.0	1000.000	154.0	V	208.0	21.7	73.9	

**Table 15.** Final Average results

Frequency (MHz)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBμV/m)	Comment
4959.775000	41.8	1000.0	1000.000	203.0	H	46.0	12.1	53.9	
17993.725000	41.9	1000.0	1000.000	259.0	V	46.0	12.0	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



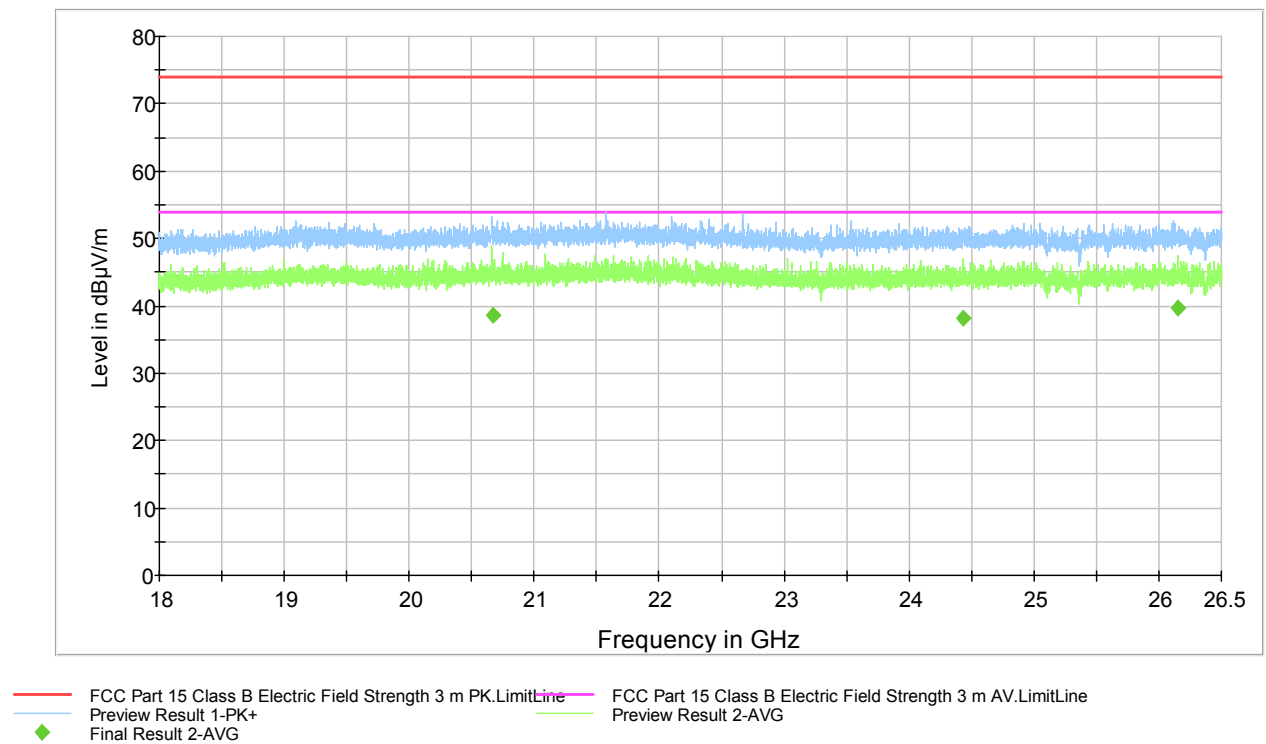
**Figure 13.** Measured curve with peak- and average detector. Channel Low.

### Final measurements from the worst frequencies

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

## Radiated Spurious Emissions

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



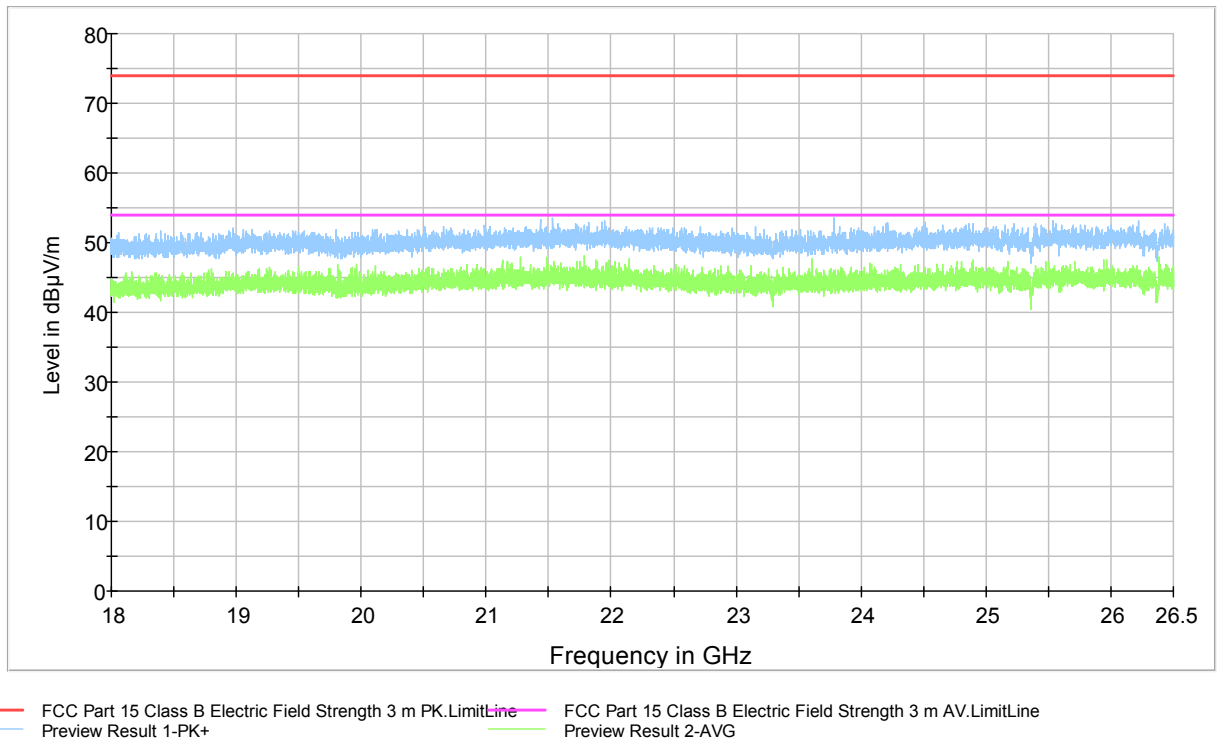
**Figure 14.** Measured curve with peak- and average detector. Channel Mid.

### Final measurements from the worst frequencies

**Table 16.** Final Average results.

Frequency (MHz)	Average (dB $\mu$ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dB $\mu$ V/m)	Comment
20666.150000	38.5	1000.0	1000.000	162.0	H	318.0	15.4	53.9	
24438.250000	38.3	1000.0	1000.000	100.0	V	148.0	15.6	53.9	
26154.050000	39.6	1000.0	1000.000	211.0	H	81.0	14.3	53.9	

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



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

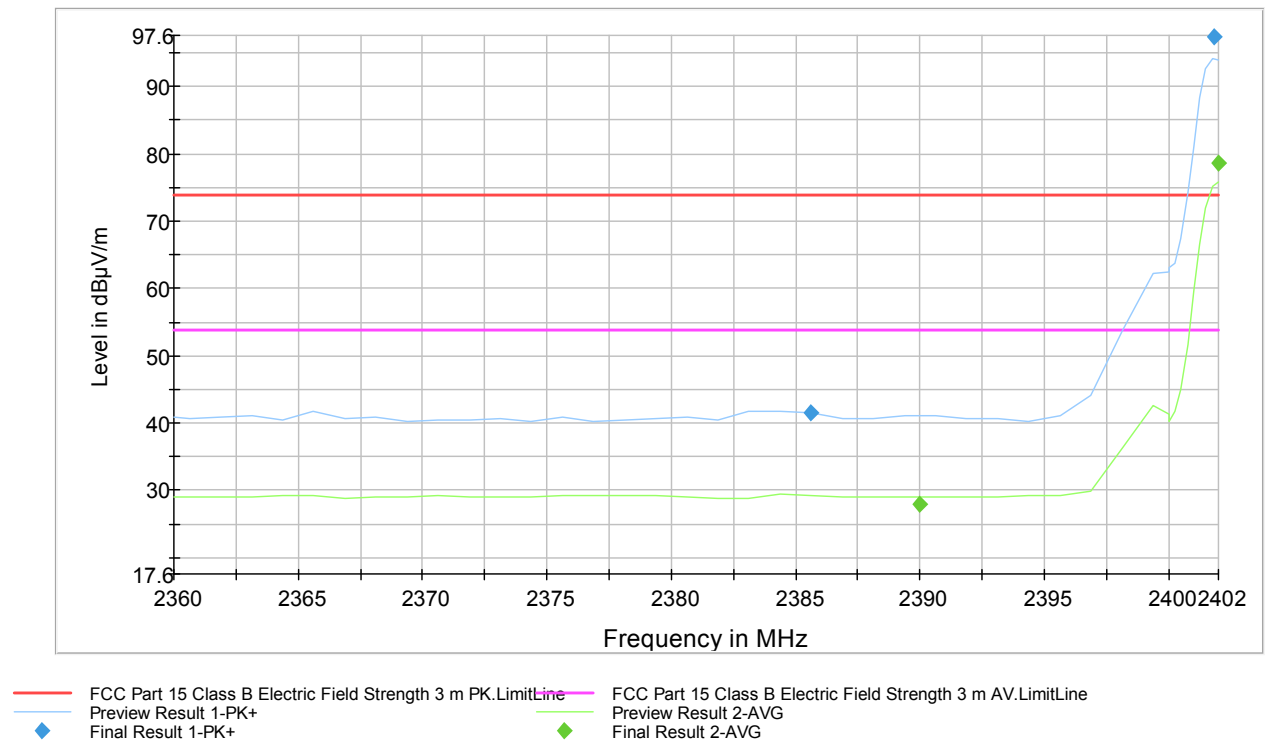
**Final measurements from the worst frequencies**

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 17.** 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
2385.600000	41.6	1000.0	1000.000	238.0	V	9.0	32.3	73.9	
2401.800000	97.3	1000.0	1000.000	181.0	H	164.0	-23.4	73.9	
3432.375000	42.0	1000.0	1000.000	105.0	V	27.0	31.9	73.9	

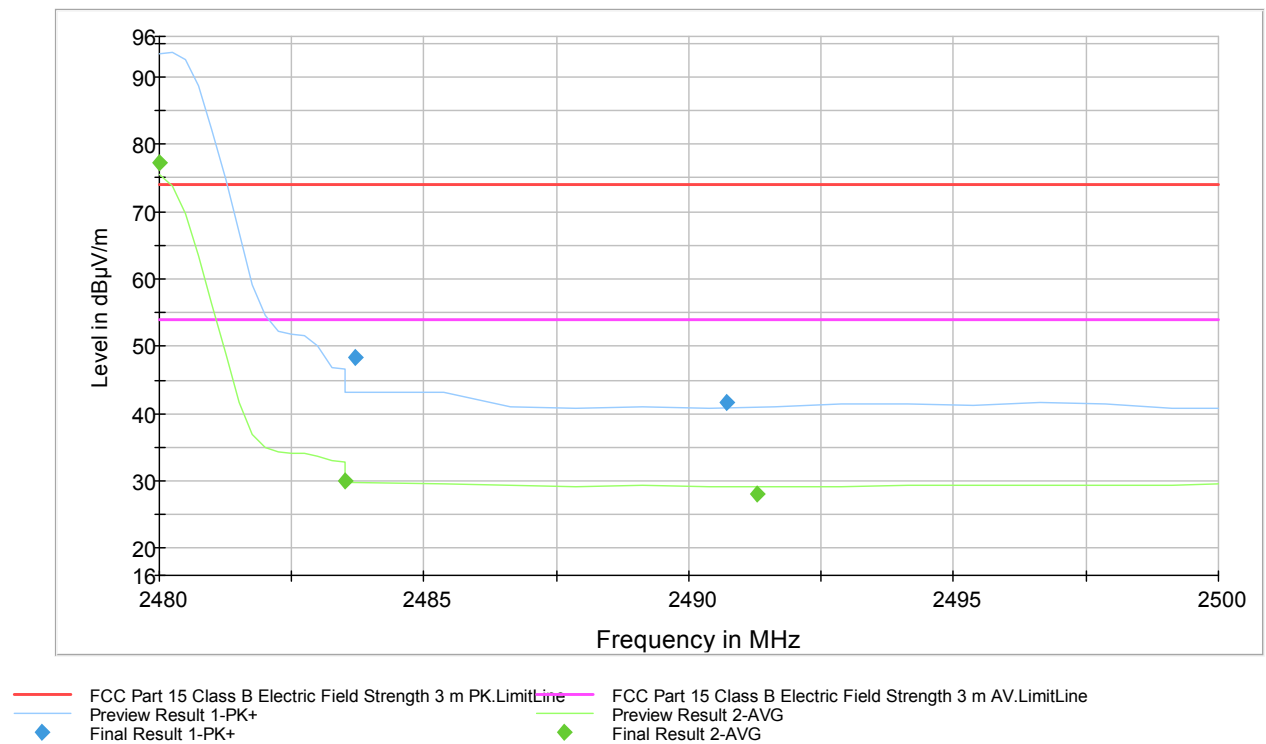
**Table 18.** Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)	Comment
2390.000000	28.0	1000.0	1000.000	175.0	V	3.0	25.9	53.9	
2402.000000	78.7	1000.0	1000.000	211.0	H	164.0	-24.8	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 19.** 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
2479.750000	95.9	1000.0	1000.000	201.0	H	44.0	-22.0	73.9	
2483.700000	48.3	1000.0	1000.000	199.0	H	39.0	25.6	73.9	
2490.700000	41.7	1000.0	1000.000	100.0	V	26.0	32.2	73.9	

**Table 20.** Final Average results.

Frequency (MHz)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBμV/m)	Comment
2480.000000	77.2	1000.0	1000.000	206.0	H	47.0	-23.3	53.9	
2483.500000	30.0	1000.0	1000.000	203.0	H	44.0	23.9	53.9	
2491.300000	28.1	1000.0	1000.000	105.0	V	29.0	25.8	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:** 20.1.2014  
**Humidity:** 9 %  
**Temperature:** 18.2 °C  
**Measurement uncertainty**  $\pm 2.87$  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
-44.63 dBc	-42.25 dBc
Limit: -20dBc	

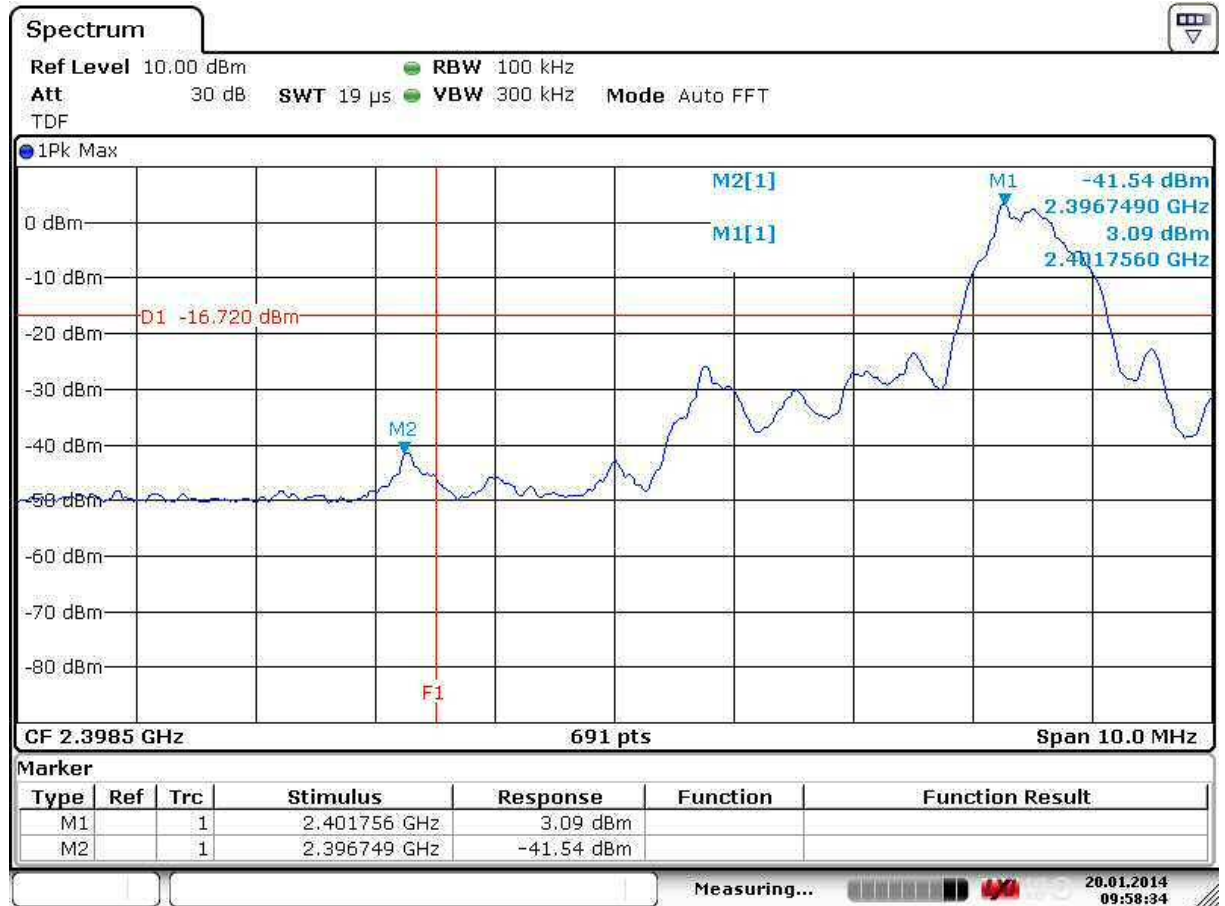
**Table 21.** Band edge attenuation.

**Table 22.** 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.**

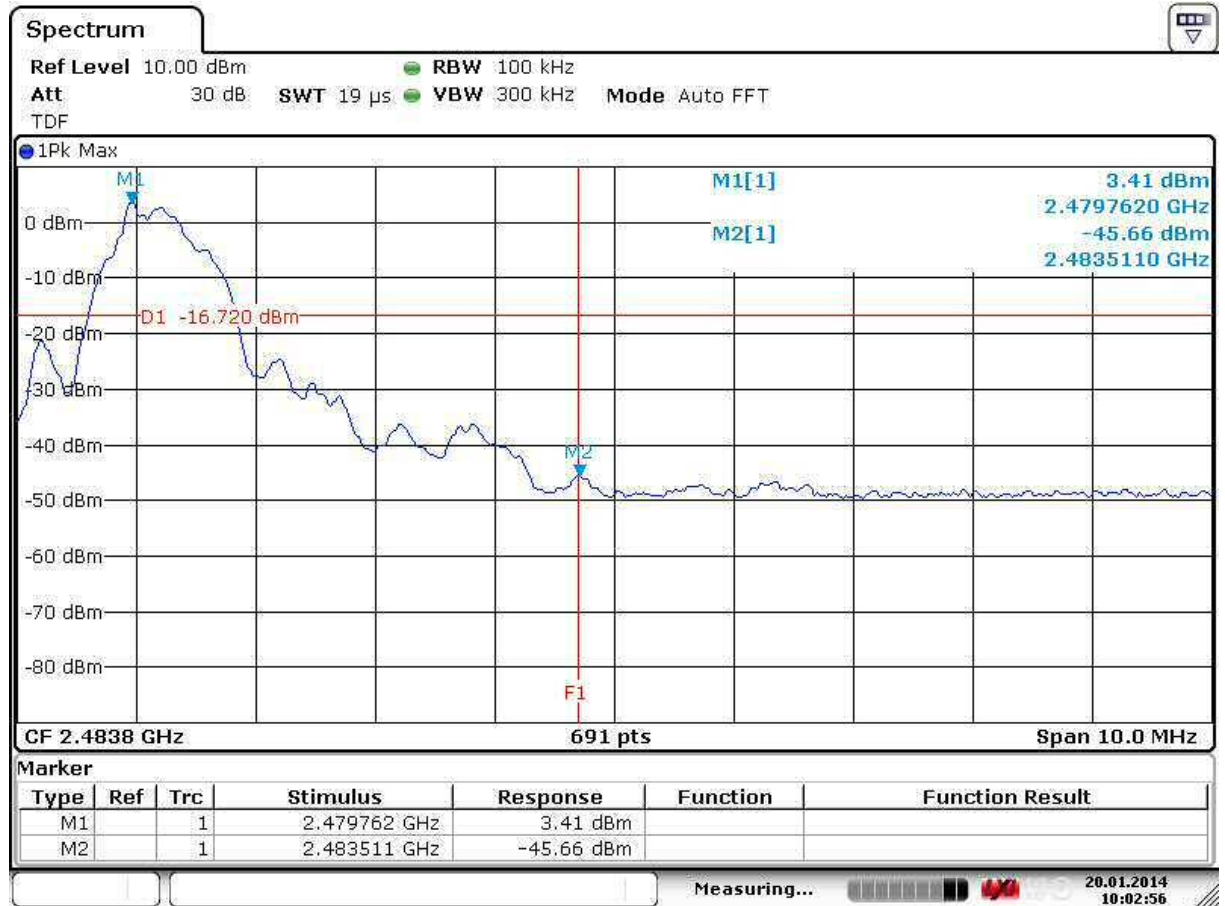
## Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 20.JAN.2014 09:58:34

**Figure 18.** Lower Band Edge.

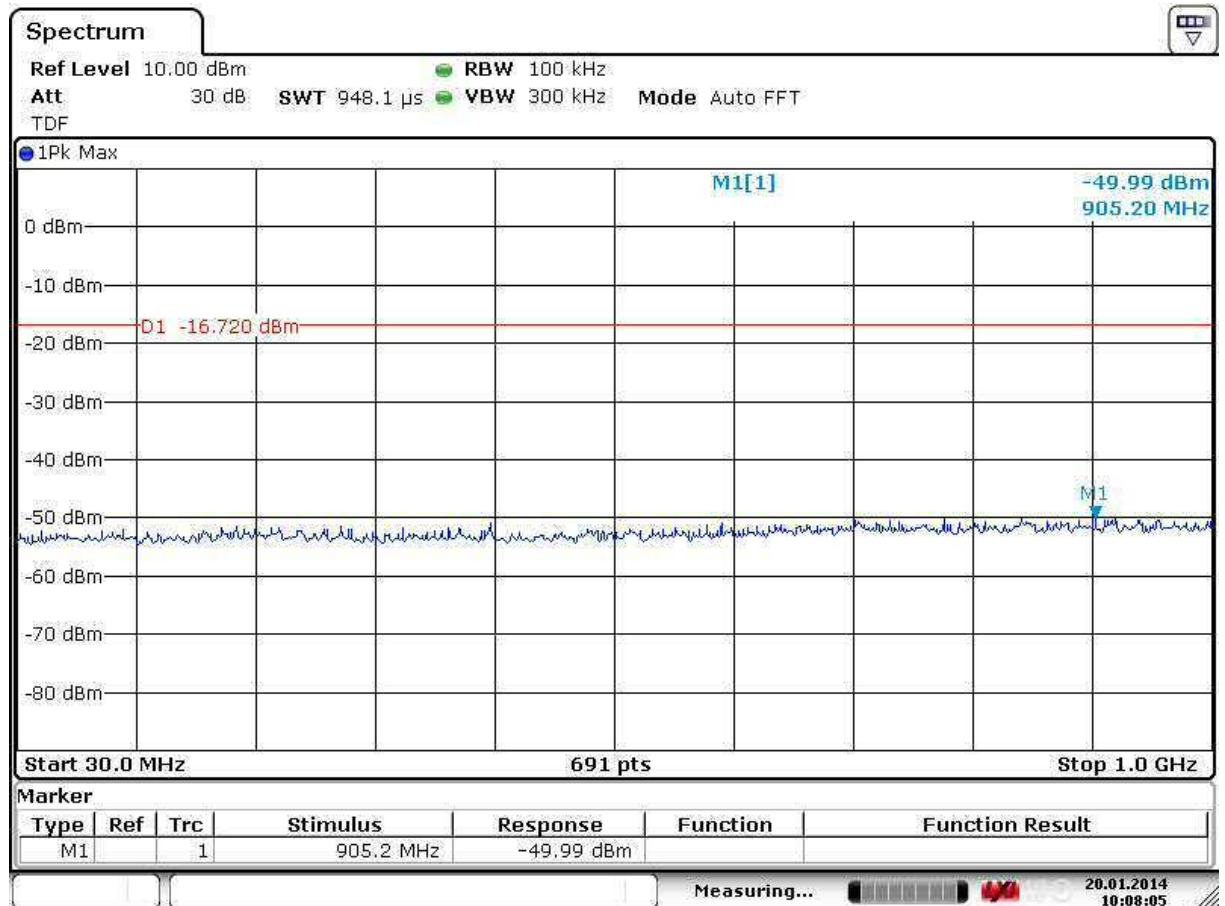
## Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 20.JAN.2014 10:02:56

**Figure 19.** Upper Band Edge.

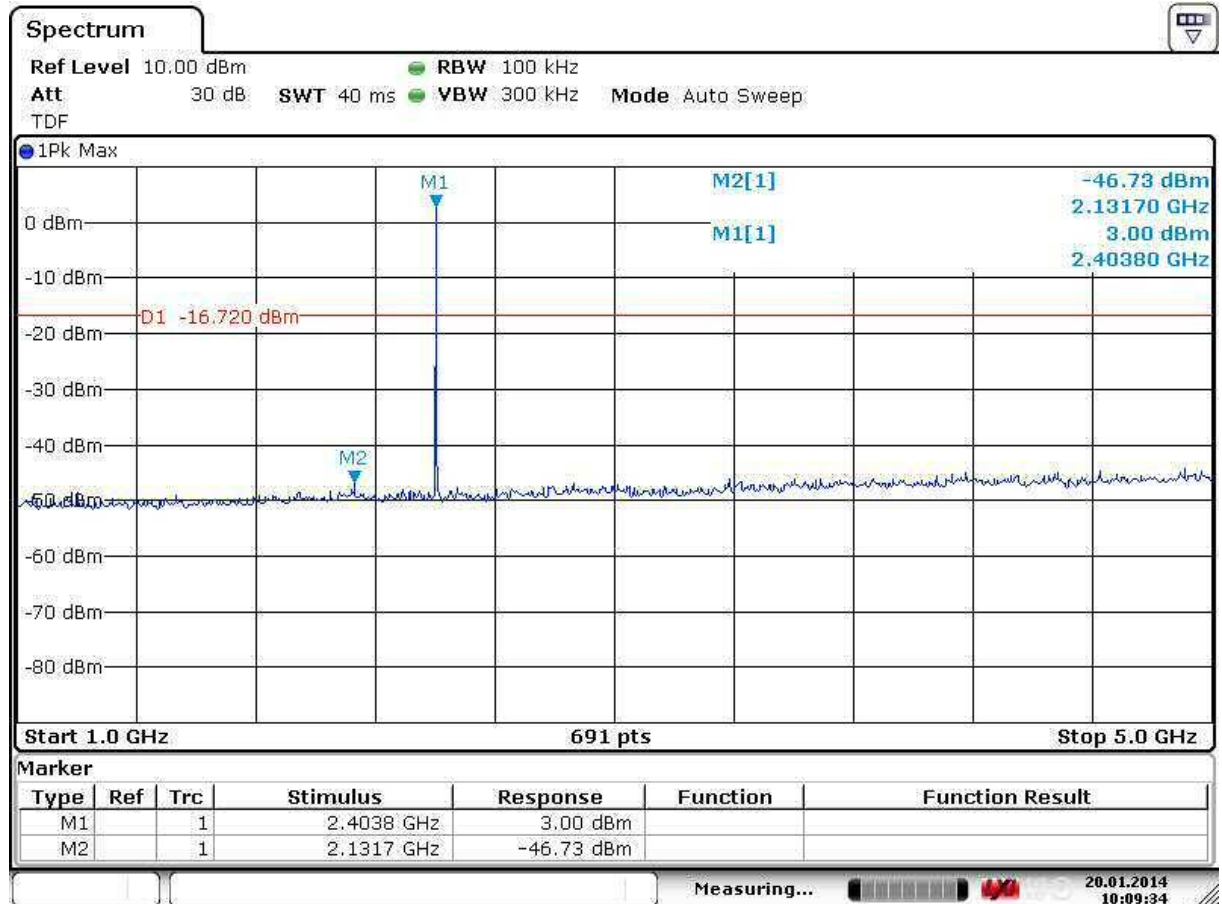
## Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 20.JAN.2014 10:08:05

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

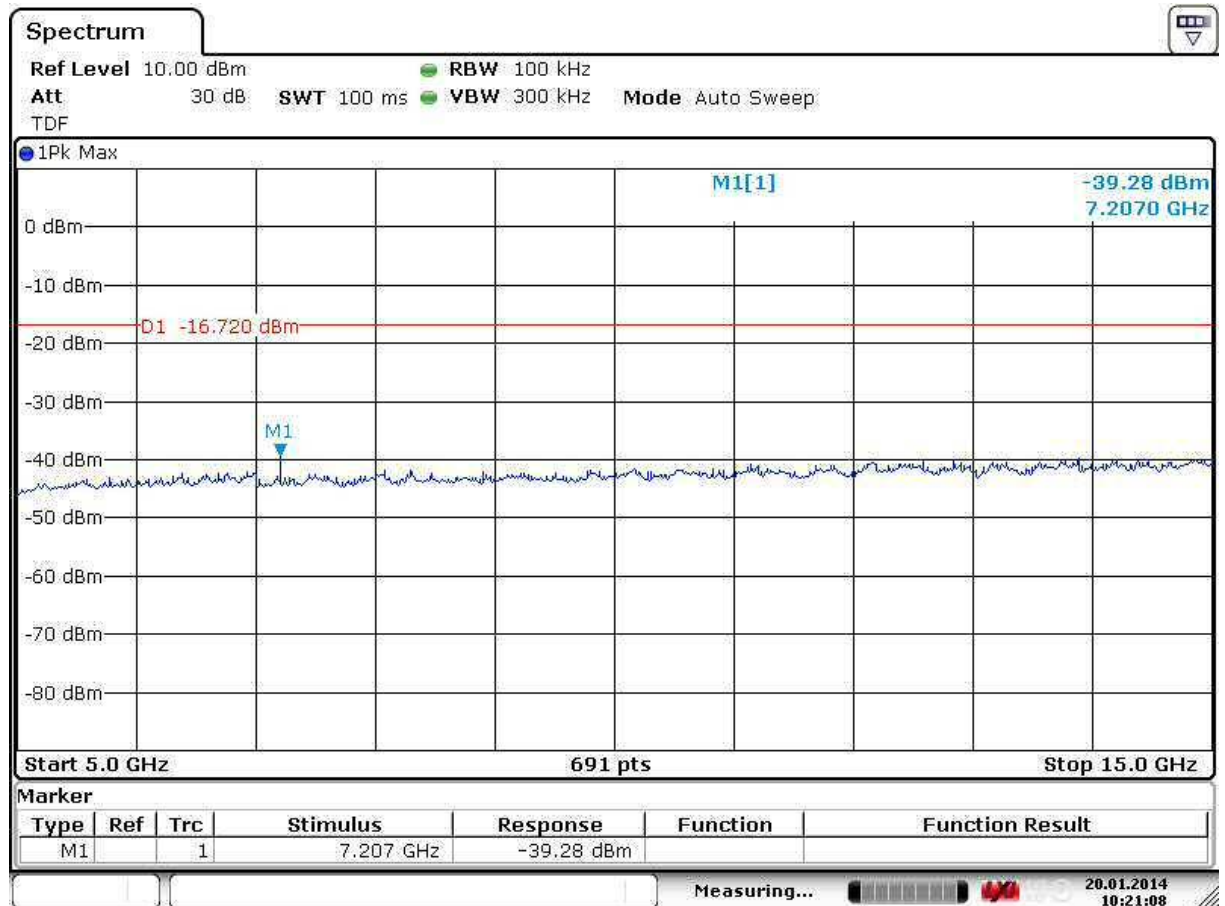
## Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 20.JAN.2014 10:09:34

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

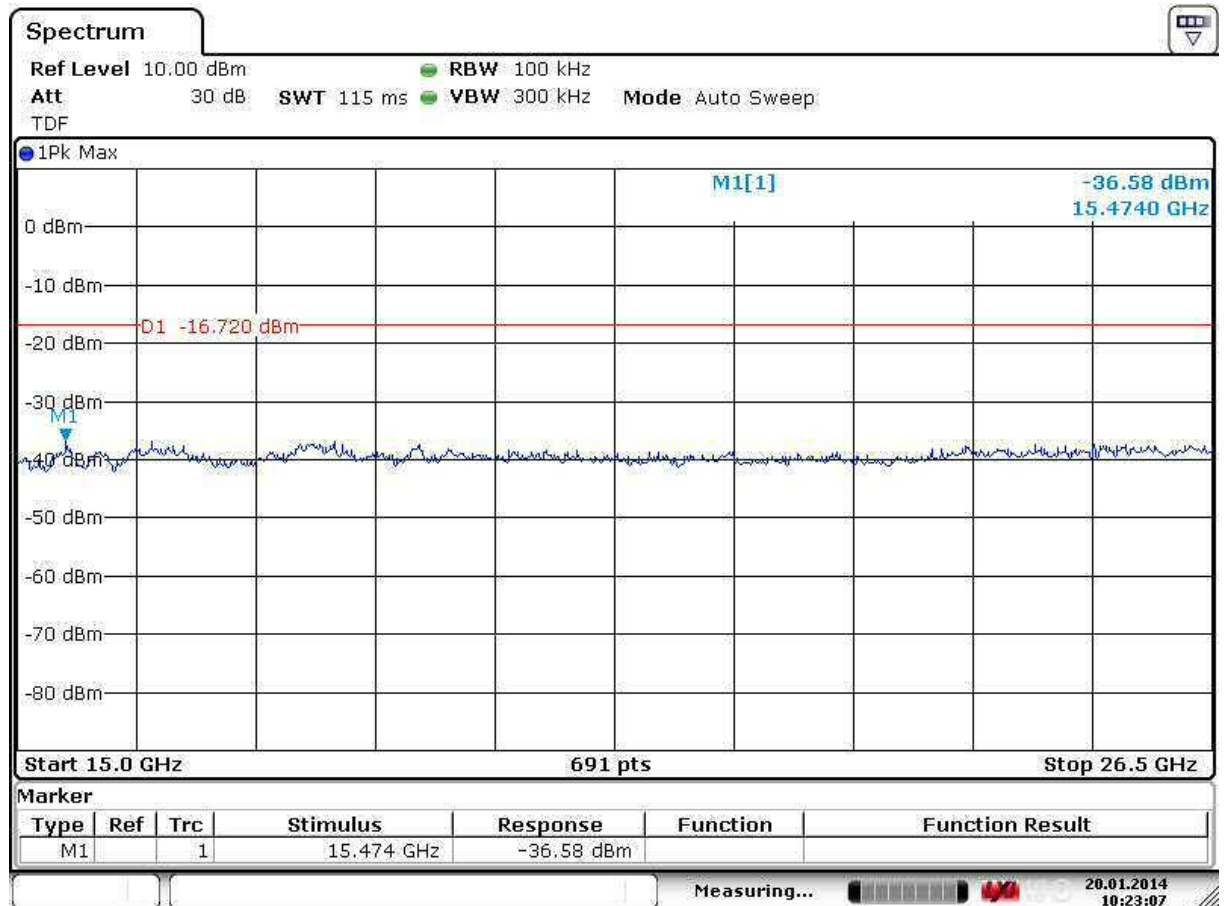
## Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 20.JAN.2014 10:21:08

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

## Transmitter Band Edge Measurement and Conducted Spurious Emissions

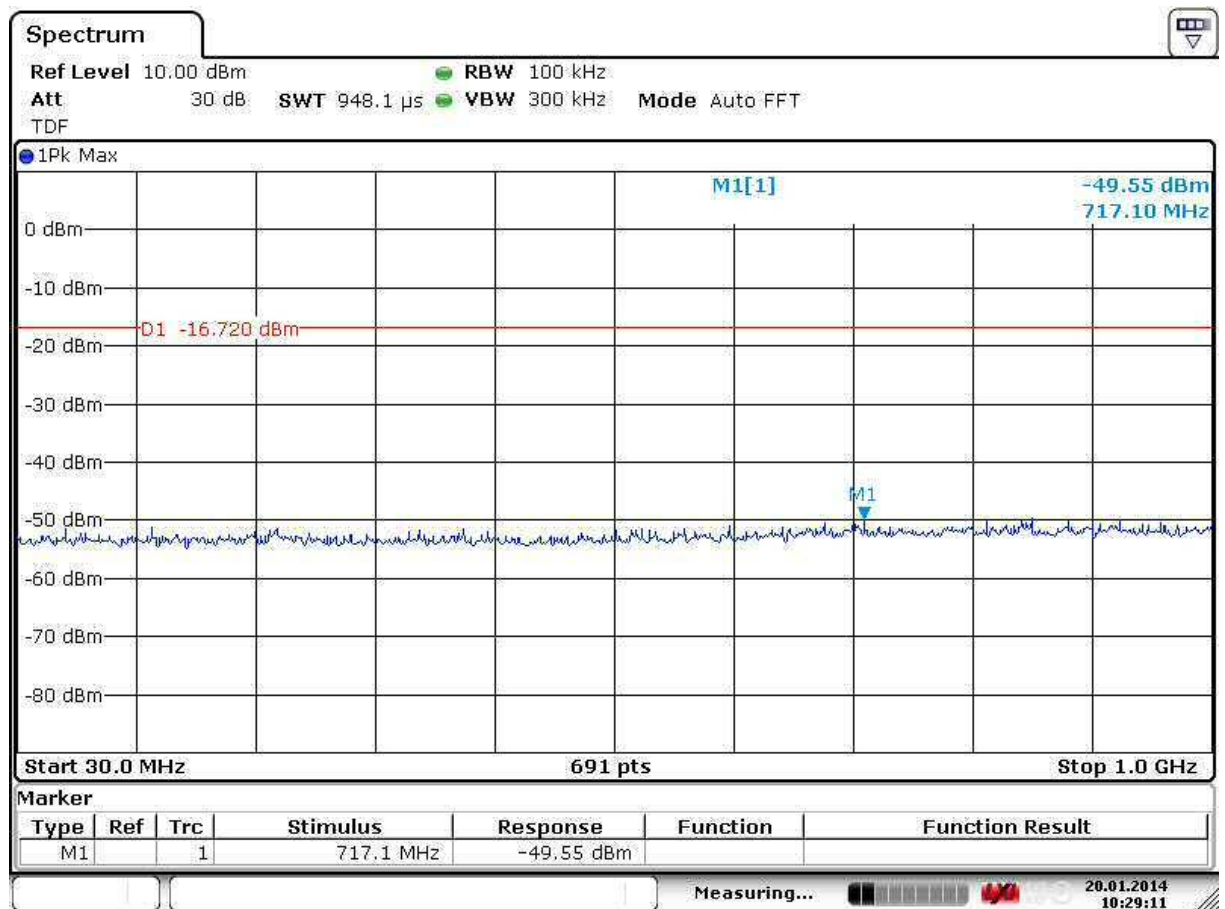


Date: 20.JAN.2014 10:23:07

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



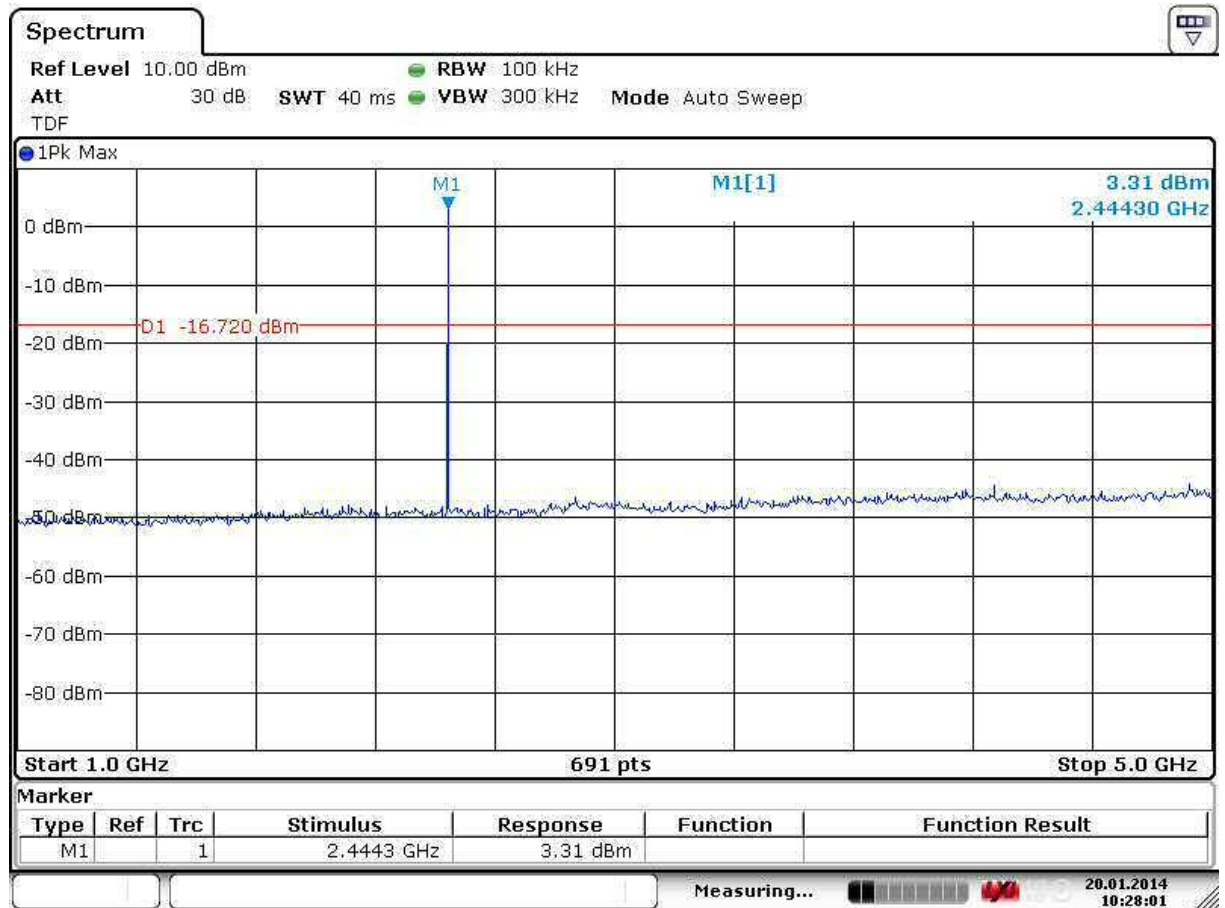
## Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 20.JAN.2014 10:29:11

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

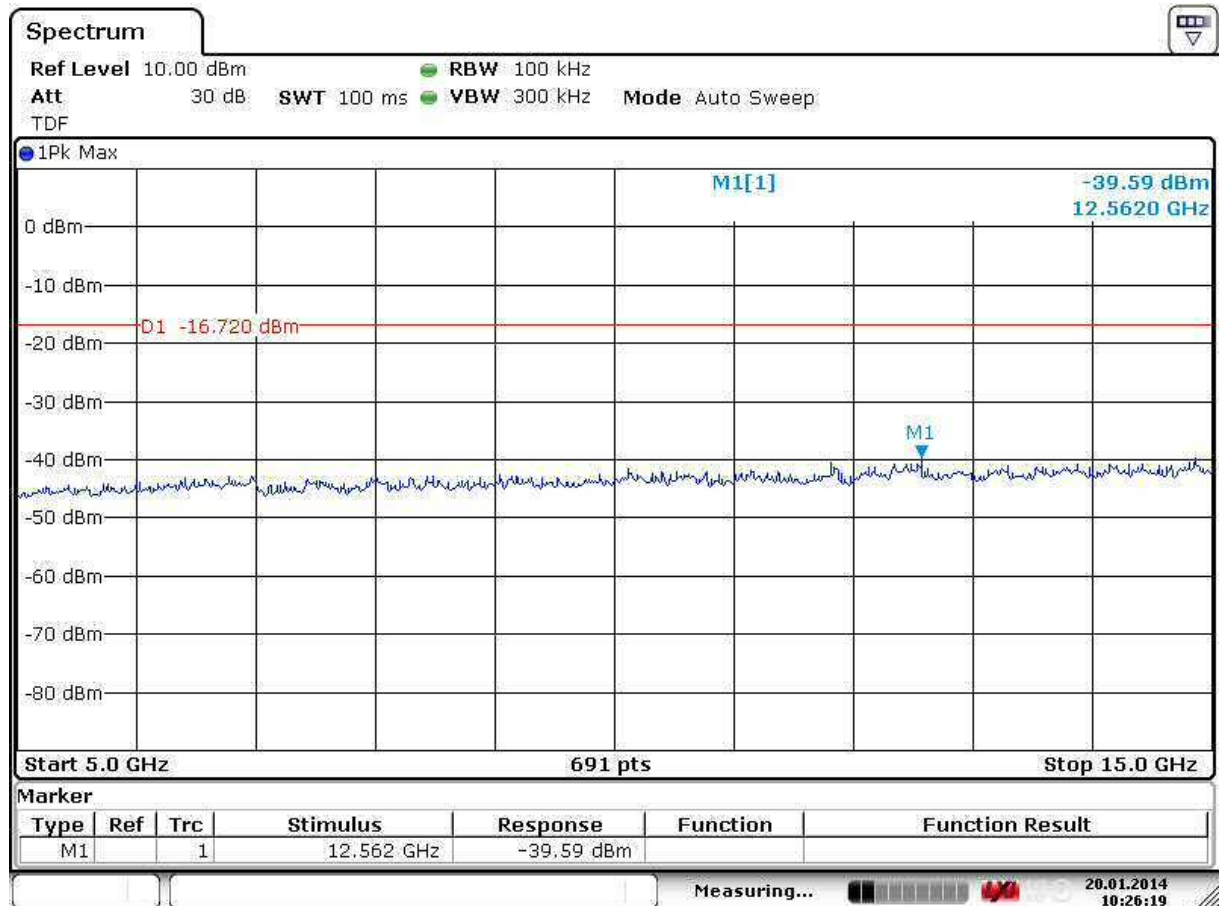
## Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 20.JAN.2014 10:28:01

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

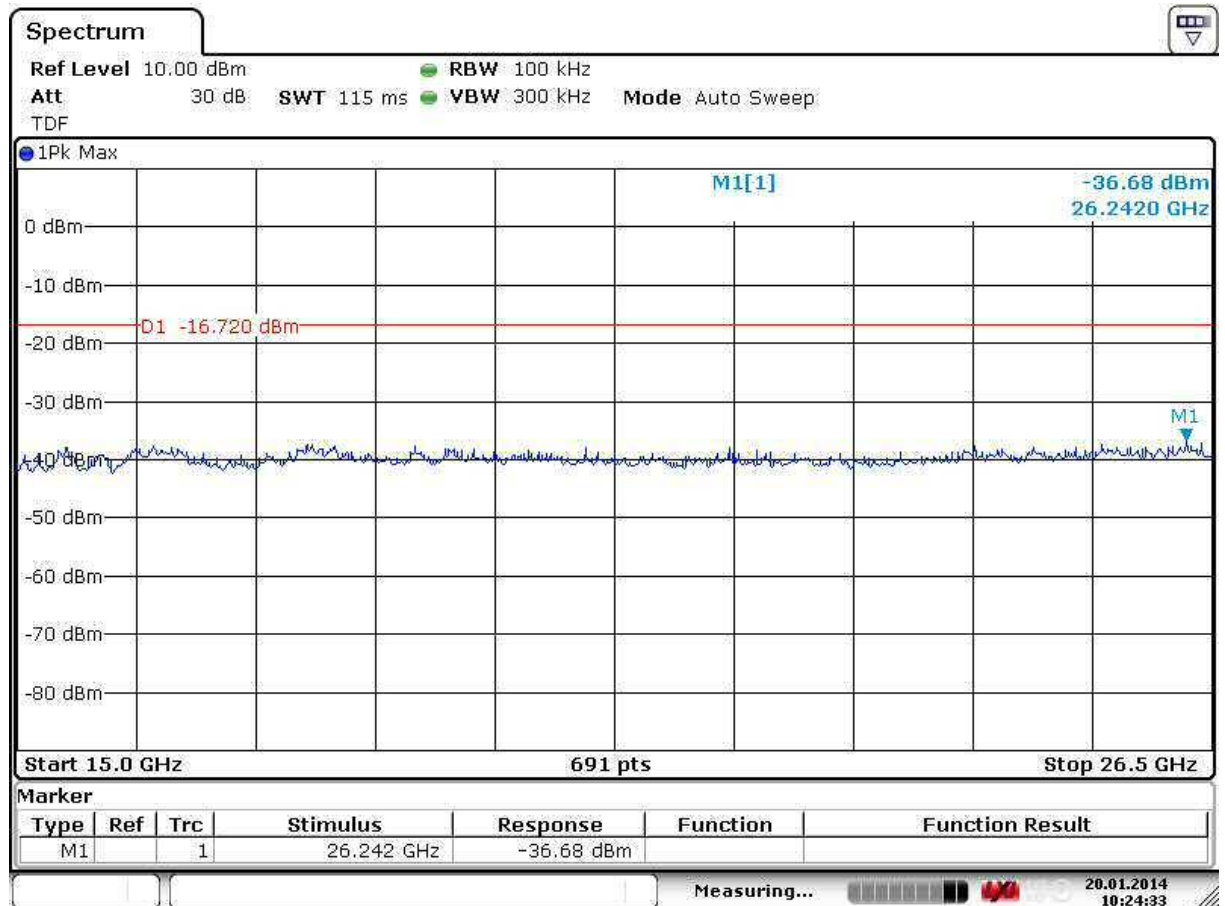
## Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 20.JAN.2014 10:26:19

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

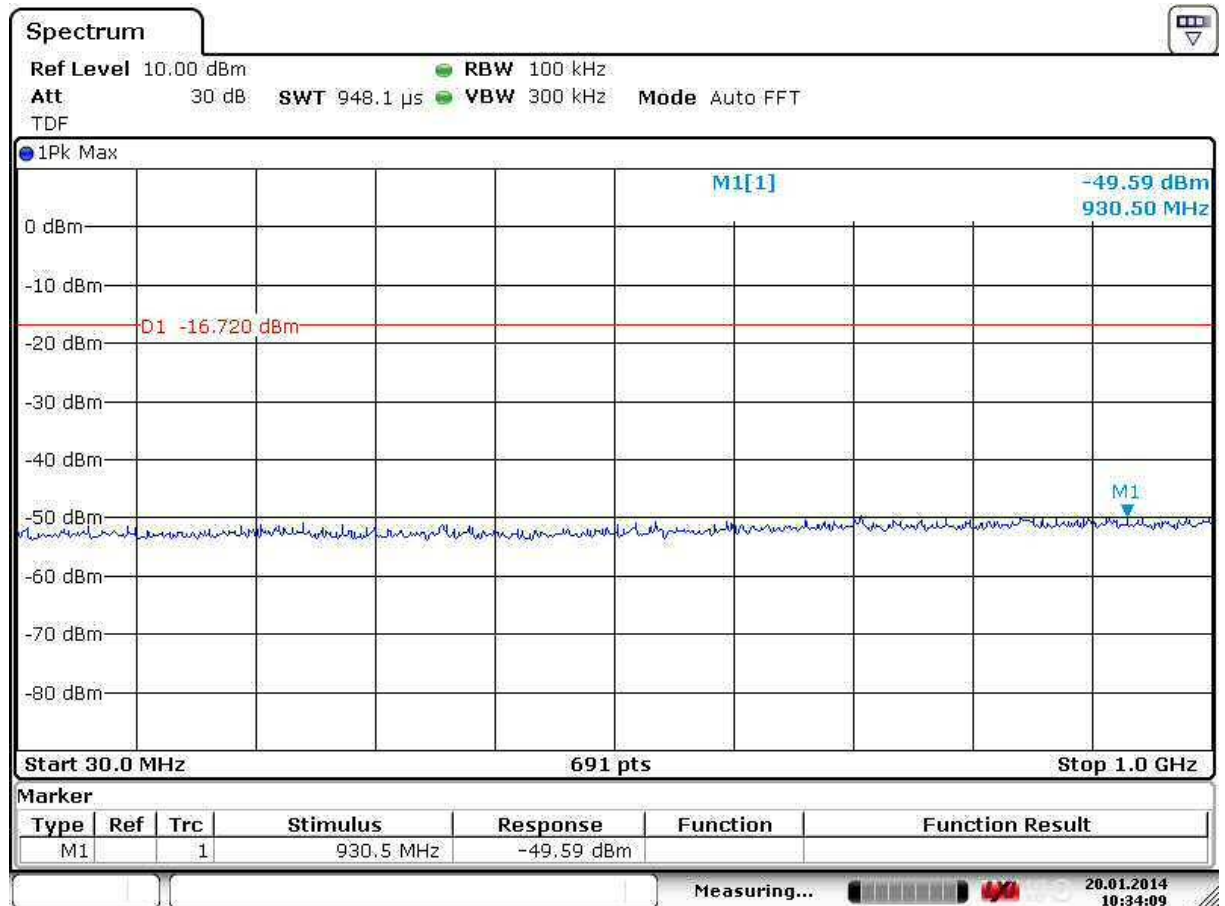
## Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 20.JAN.2014 10:24:33

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

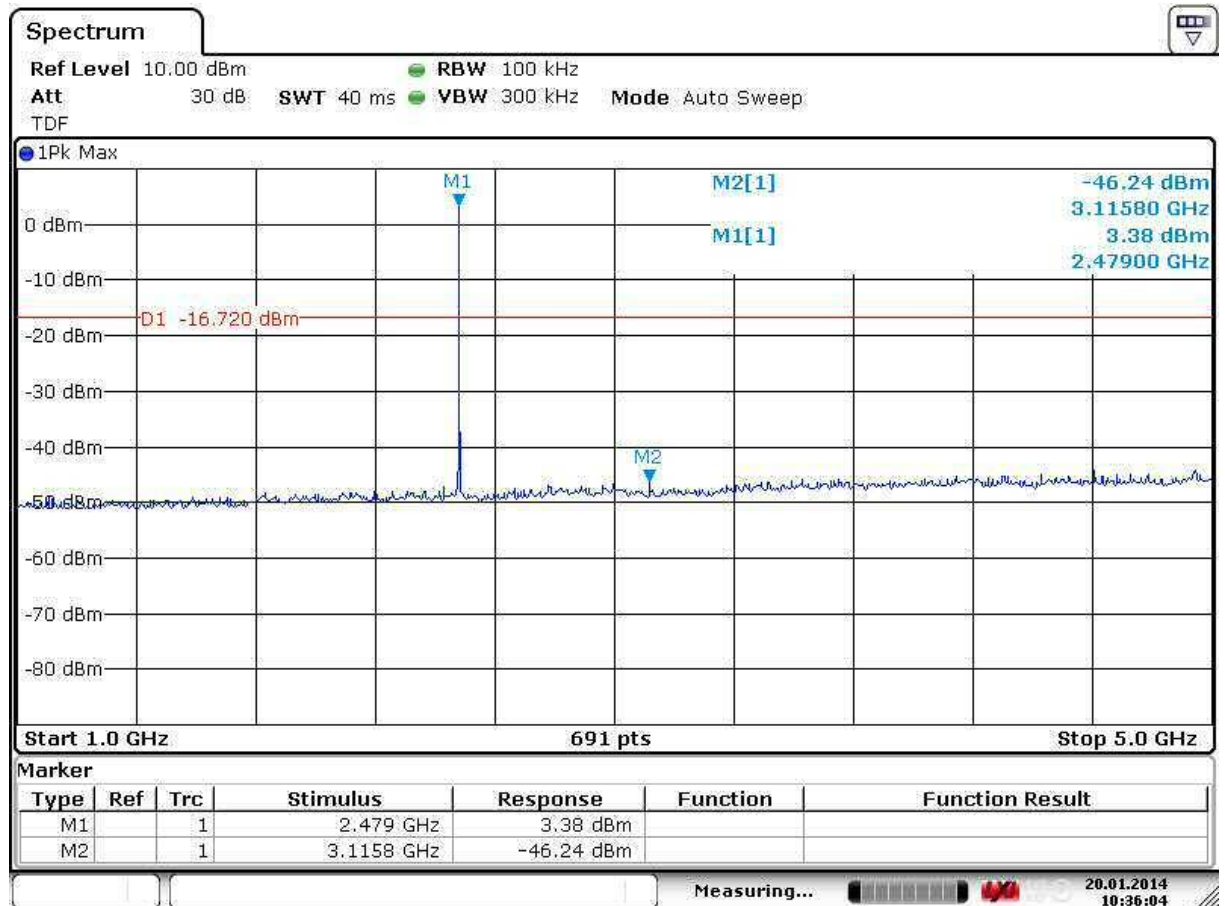
## Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 20.JAN.2014 10:34:09

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

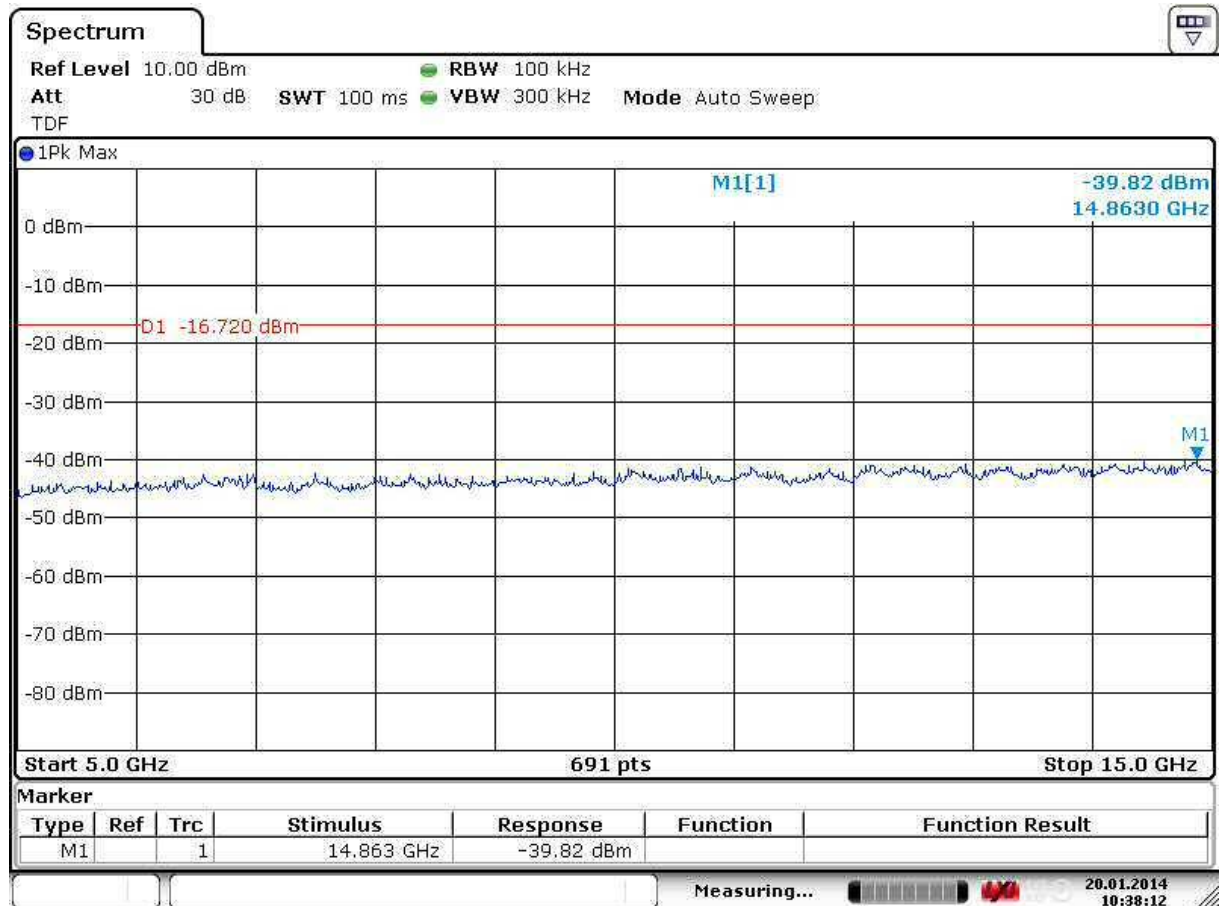
## Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 20.JAN.2014 10:36:05

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

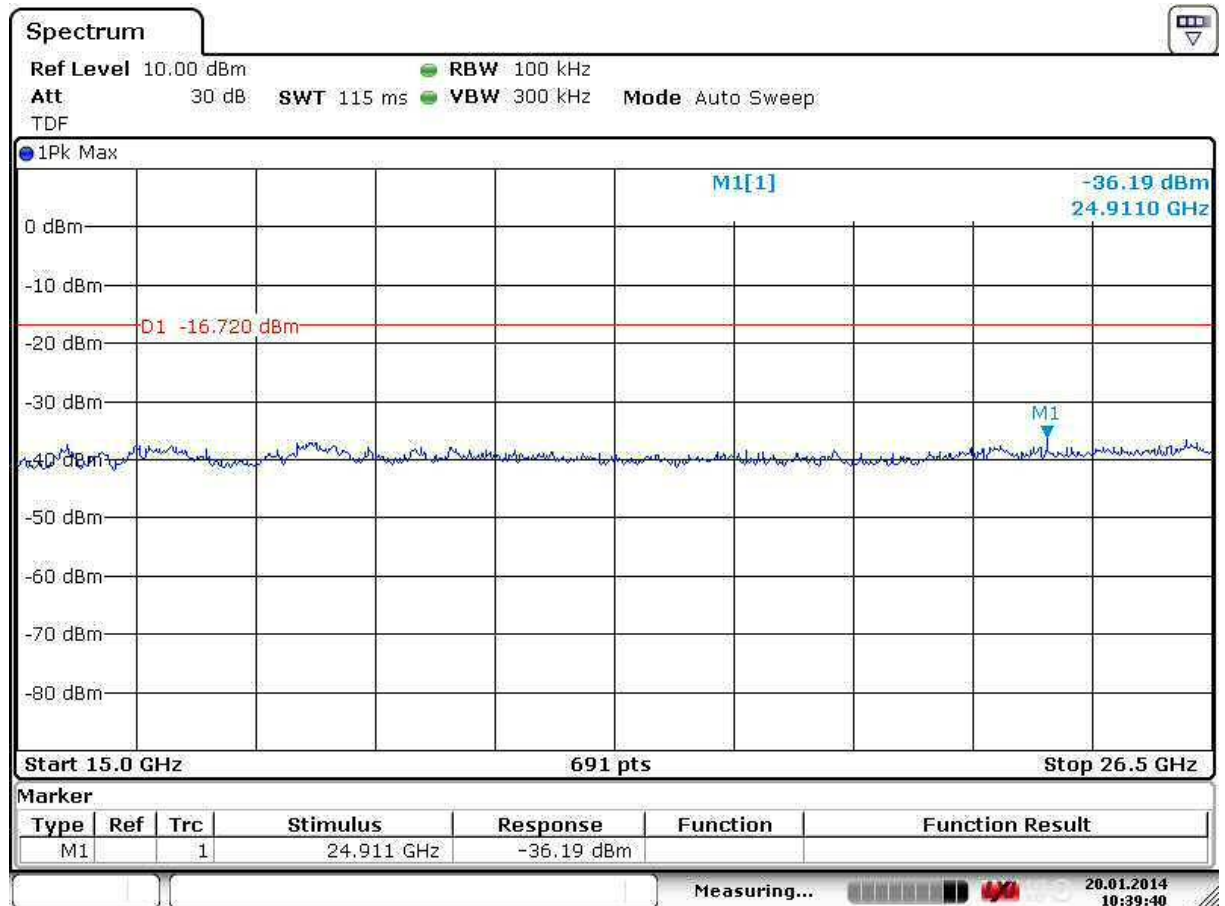
## Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 20.JAN.2014 10:38:12

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

## Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 20.JAN.2014 10:39:40

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



## 6 dB Bandwidth of the Channel

**Standard:** ANSI C63.10 (2009)  
**Tested by:** NKO  
**Date:** 15.1.2014  
**Humidity:** 9 %  
**Temperature:** 20.1 °C

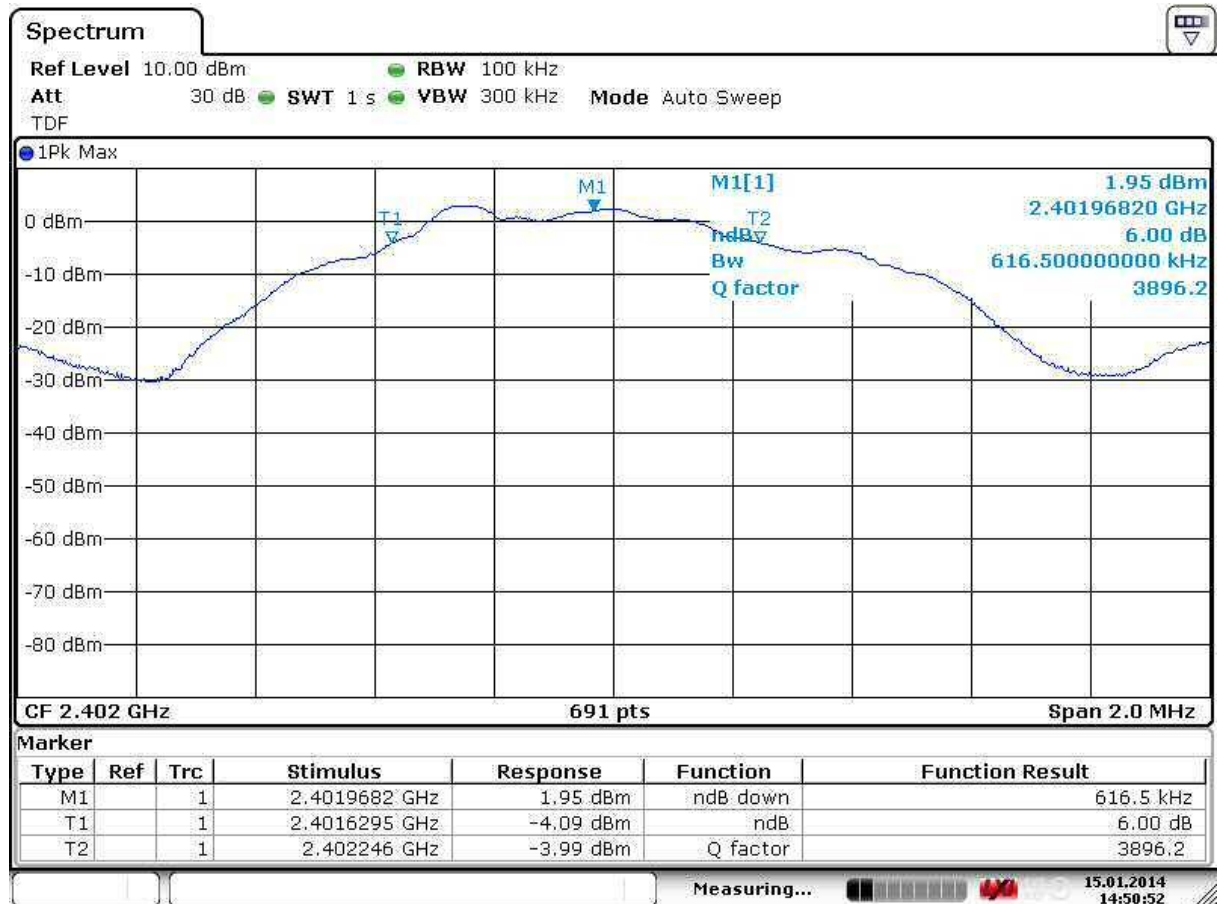
**FCC Rule:** 15.247(a)(2)  
**RSS-210 A8.2**

### Results:

**Table 23.** 6 dB bandwidth test results.

Channel	6 dB BW [kHz]	Minimum limit [kHz]
Low	616.500	500
Mid	544.100	
High	526.800	

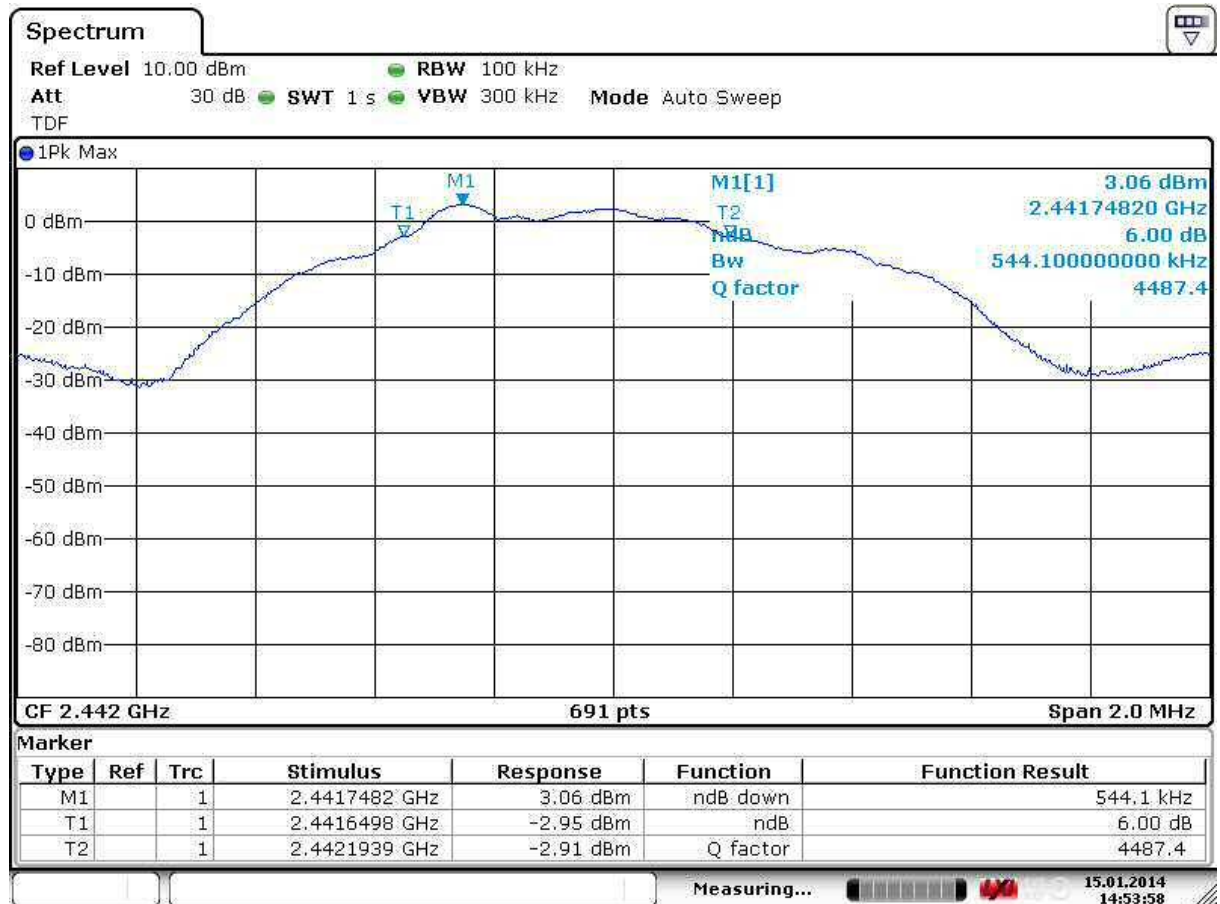
## 6 dB Bandwidth of the Channel



Date: 15.JAN.2014 14:50:52

Figure 32. 6 dB bandwidth of the channel Low.

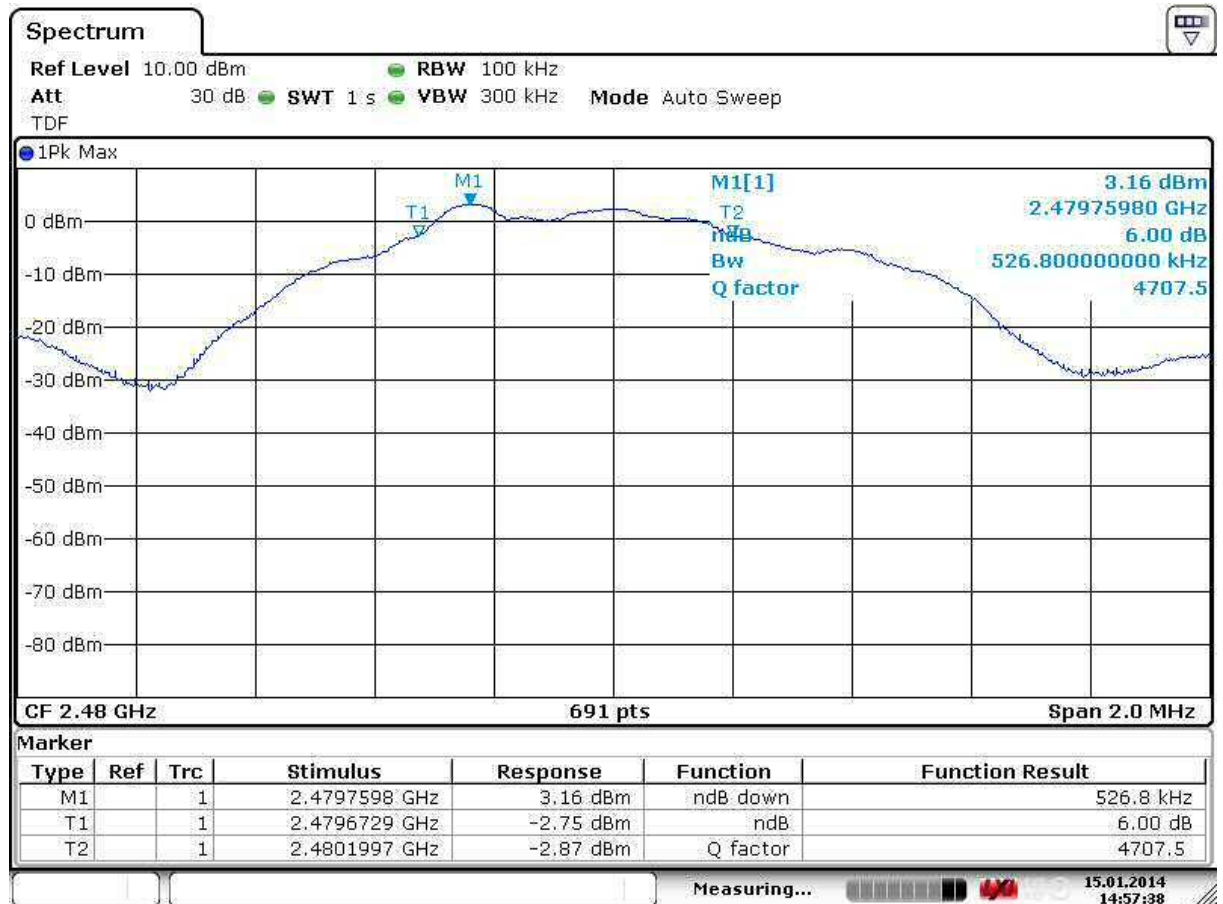
## 6 dB Bandwidth of the Channel



Date: 15.JAN.2014 14:53:58

**Figure 33.** 6 dB bandwidth of the channel Mid.

## 6 dB Bandwidth of the Channel



Date: 15.JAN.2014 14:57:39

**Figure 34.** 6 dB bandwidth of the channel High.

## Power Spectral Density

**Standard:** ANSI C63.10 (2009)  
**Tested by:** NKO  
**Date:** 15.1.2014  
**Humidity:** 9 %  
**Temperature:** 20.1 °C

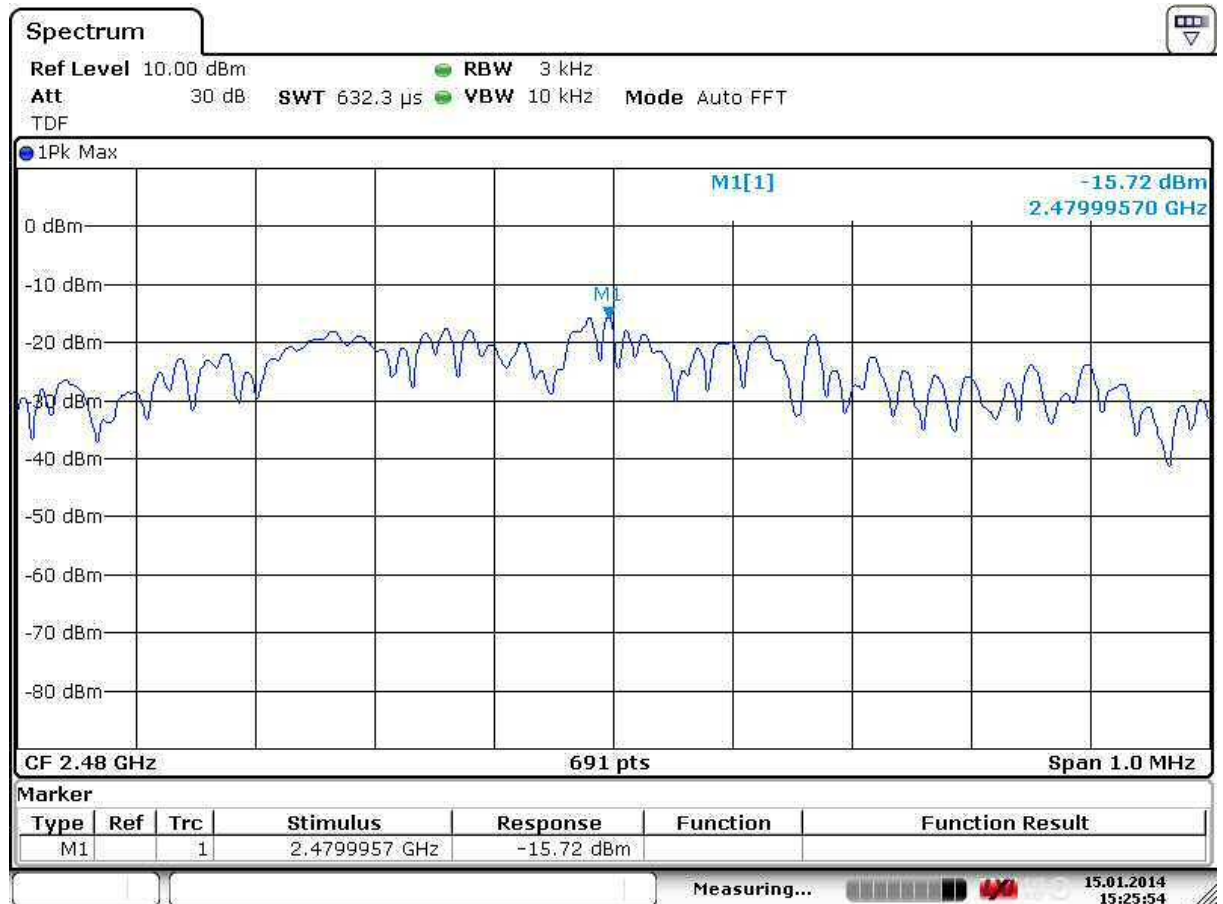
**FCC Rule: 15.247(e)**  
**RSS-210 A8.2**

### Results:

**Table 24.** Power Spectral Density test results.

Channel	PSD dBm/3 kHz	Maximum limit [dBm/3kHz]
Low	-15.72	+8.00
Mid	-15.89	
High	-15.84	

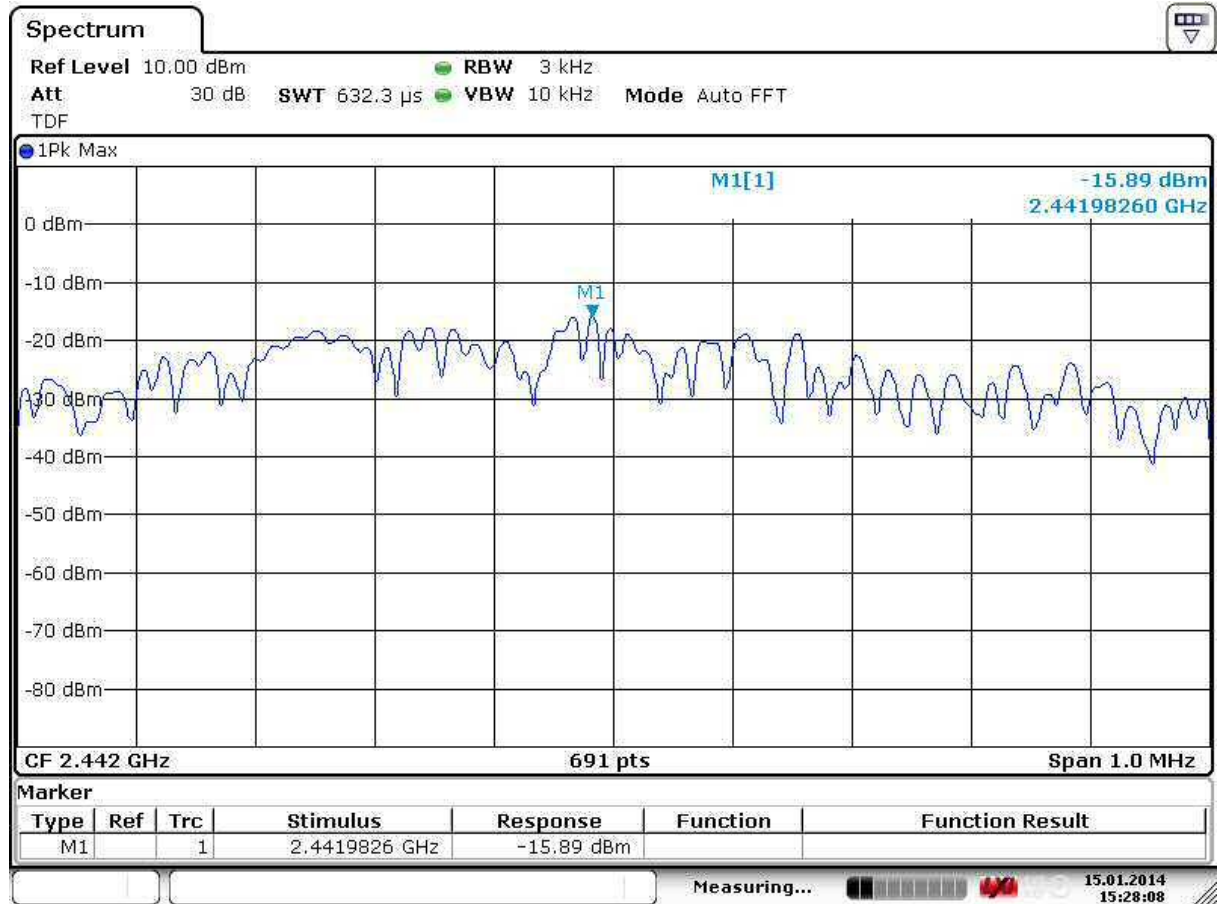
## Power Spectral Density



Date: 15.JAN.2014 15:25:54

**Figure 35.** Power Spectral Density of the channel Low.

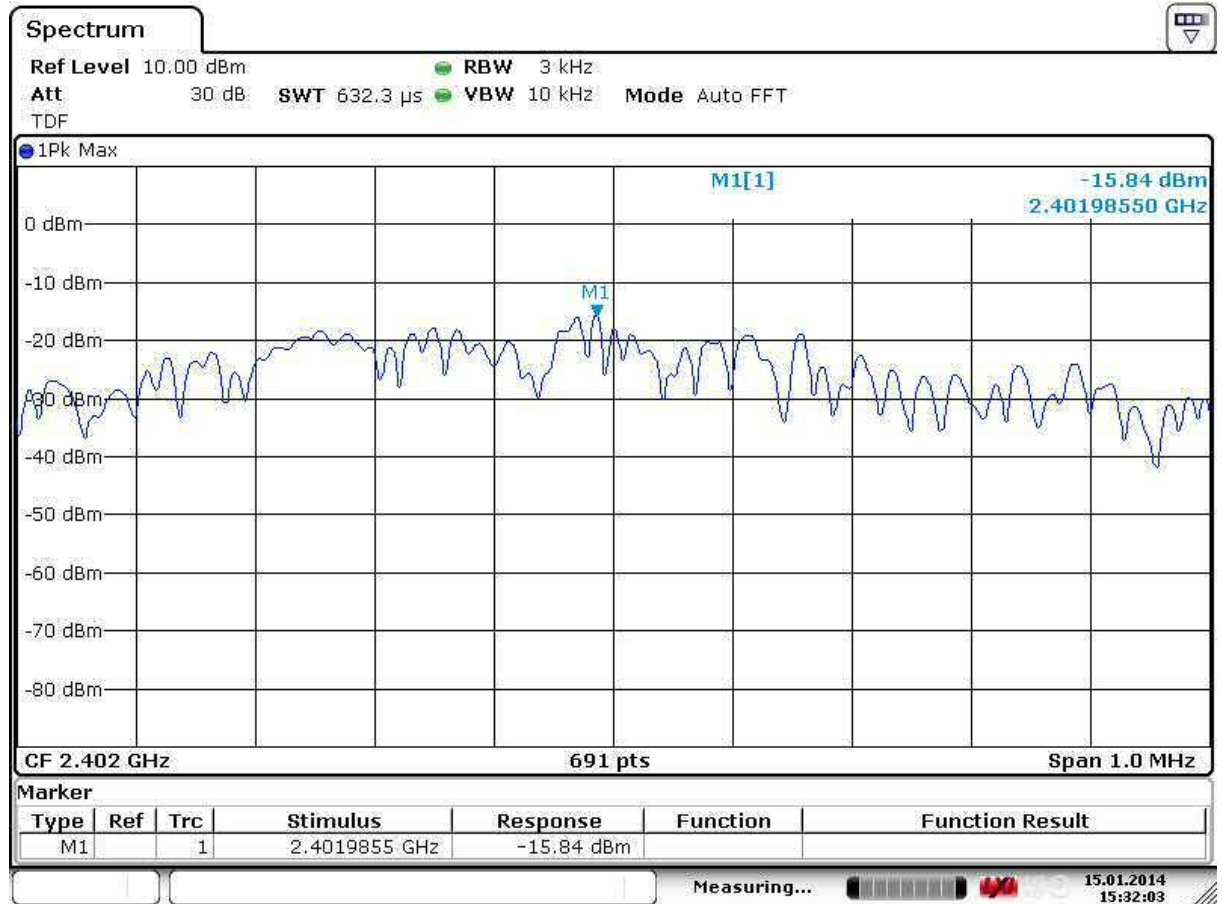
## Power Spectral Density



Date: 15.JAN.2014 15:28:09

**Figure 36.** Power Spectral Density of the channel Mid.

## Power Spectral Density



Date: 15.JAN.2014 15:32:04

**Figure 37.** Power Spectral Density of the channel High.

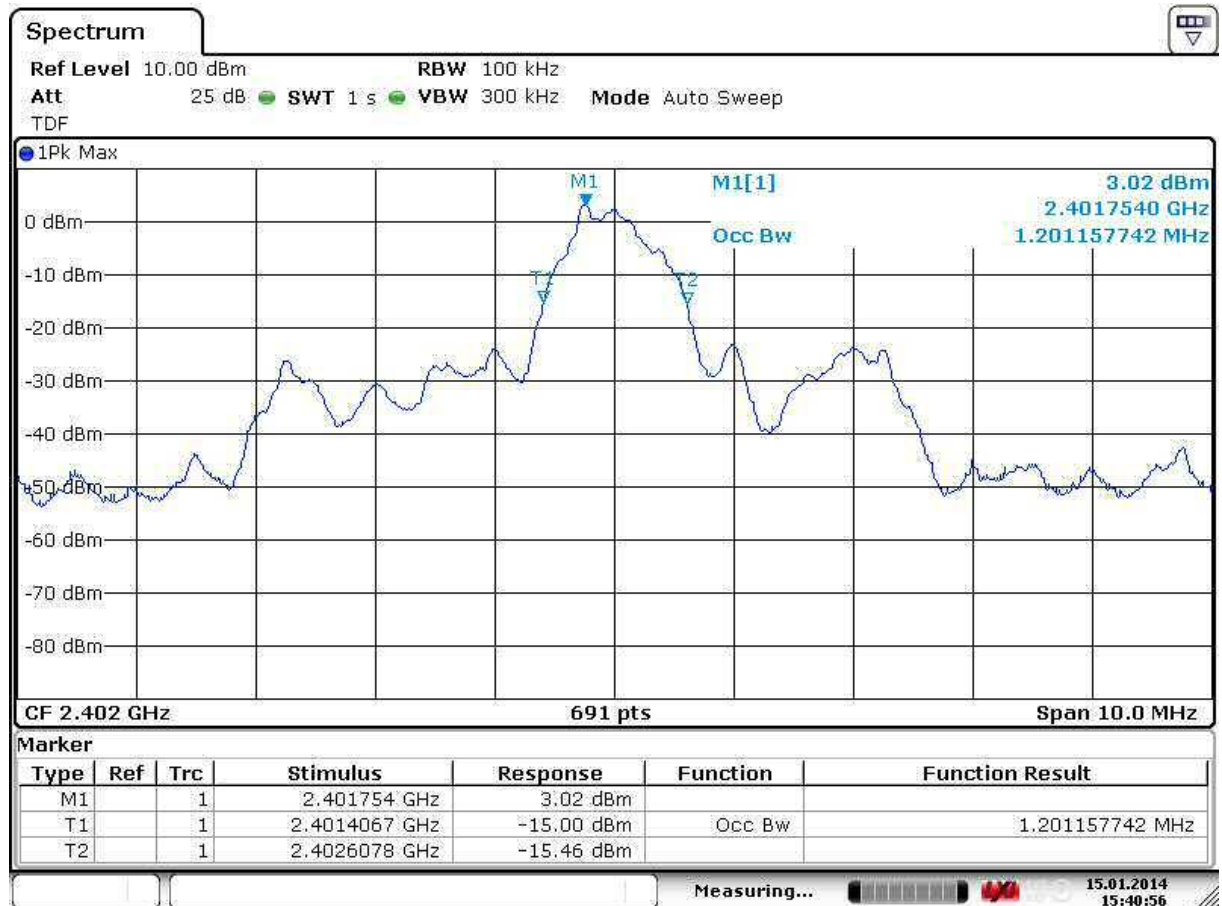


**99% Occupied Bandwidth**

**Standard:** RSS-GEN (2010)  
**Tested by:** NKO  
**Date:** 15.1.2014  
**Humidity:** 9 %  
**Temperature:** 20.1 °C

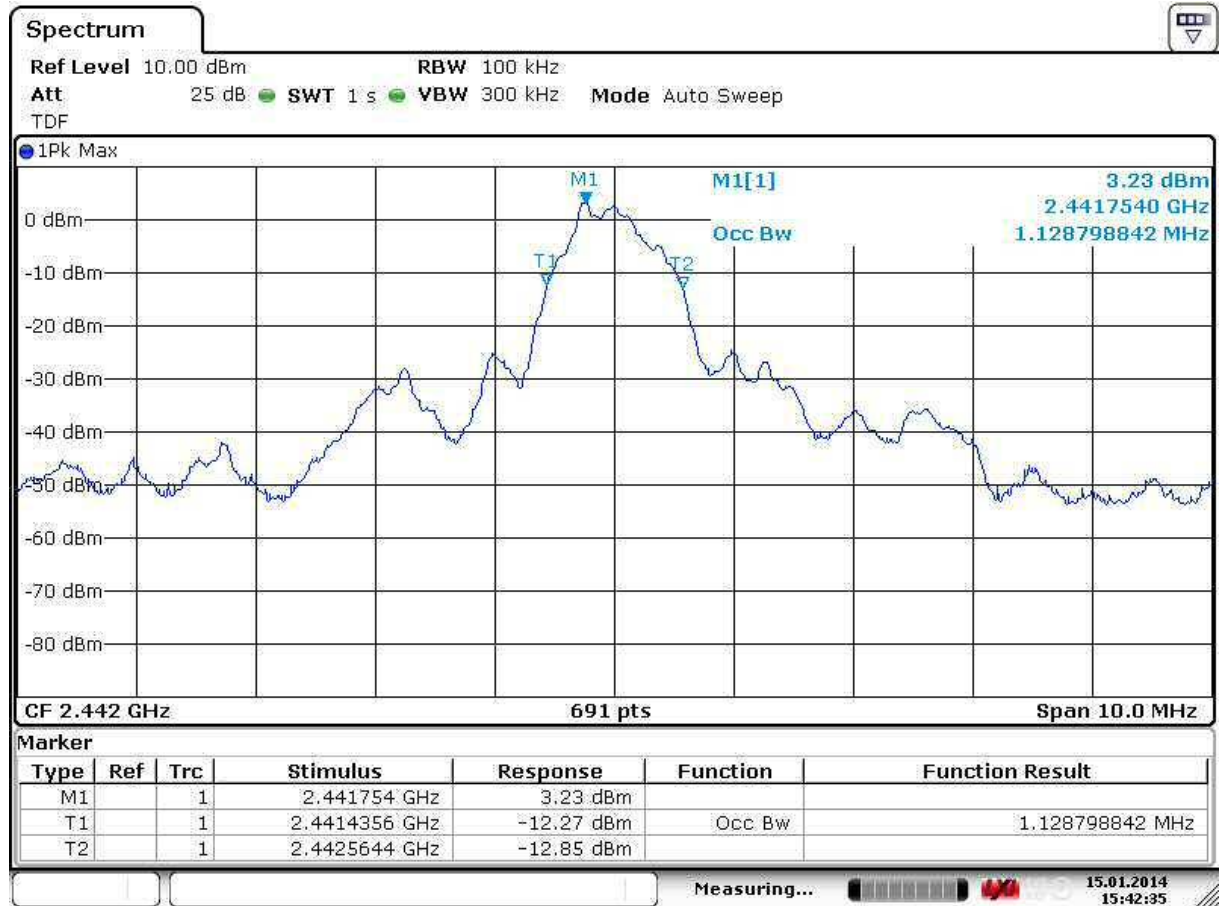
**RSS-GEN 4.7****Table 25.** 99 % OBW test results.

Channel	Limit	99 % BW [MHz]	Result
Low	-	1.201157742	PASS
Mid	-	1.128798842	PASS
High	-	1.128798842	PASS



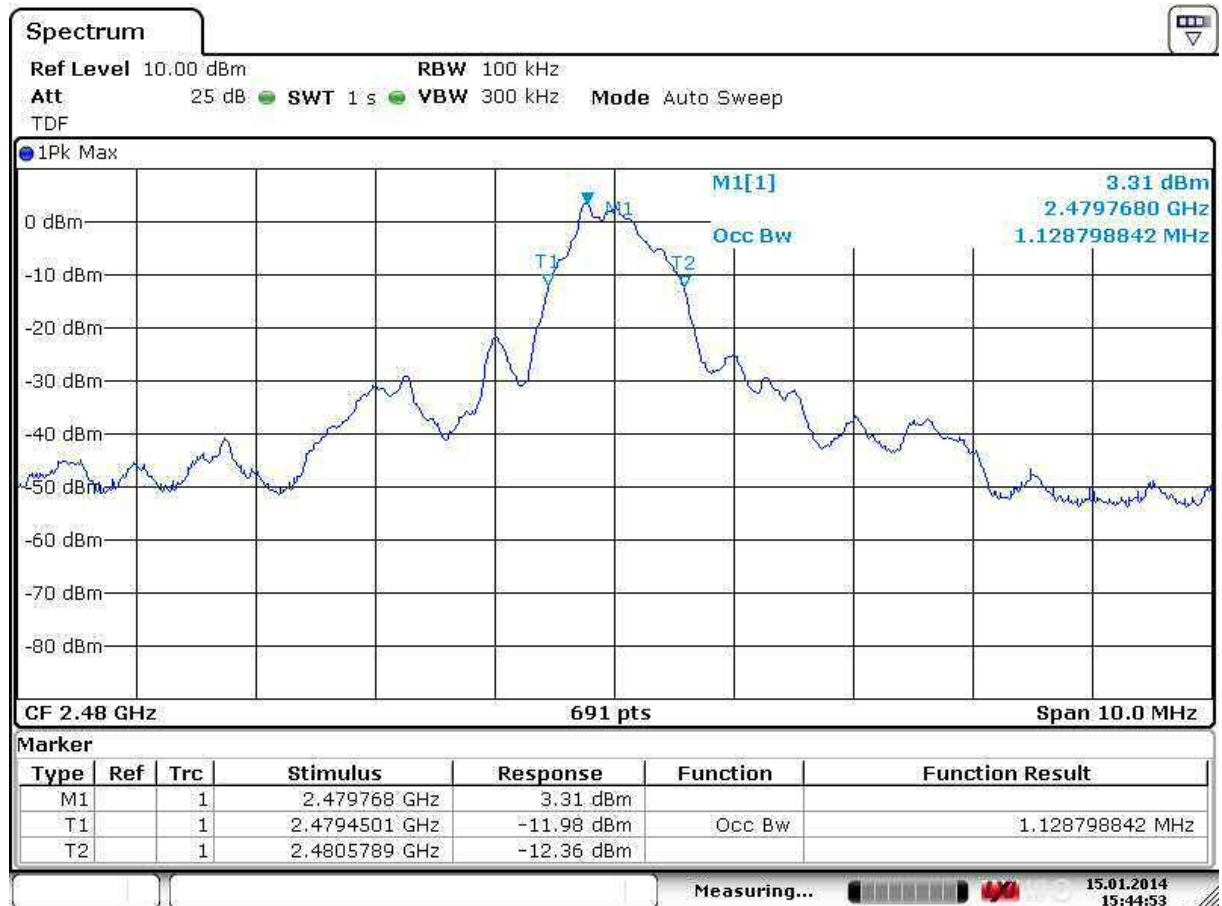
Date: 15.JAN.2014 15:40:57

Figure 38. 99 % OBW. Channel Low.



Date: 15.JAN.2014 15:42:35

**Figure 39.** 99 % OBW. Channel Mid.



Date: 15.JAN.2014 15:44:53

Figure 40. 99 % OBW. Channel High.

**List of test equipments**

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

All used measurement equipment was calibrated (if required).