

Test Report



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

Equipment Under Test: Bluetooth dongle
Model: BLED112
Type: -
Manufacturer: Bluegiga Oy
Sinikalliontie 5 A
FI-02630 ESPOO
Finland
Customer: Bluegiga Oy
Sinikalliontie 5 A
FI-02630 ESPOO
Finland
FCC Rule Part: 15.247: 2010
IC Rule Part: RSS-210, Issue 8, 2010
RSS-GEN Issue 3, 2010

Date: 09.09.2011

Issued by:

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Jari Merikari
Technical Manager

Date: 09.09.2011

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Ari Honkala
Product Line Manager

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Equipment Under Test (EUT)

Bluetooth module
 Model: BLED112
 Type: -
 Serial no: -
 HW version:
 SW version: 1.0
 FCC ID number: QOQBLED112
 Industry Canada number: 5123A-BGTBLED112

Description of the EUT

The EUT is a Bluetooth low energy dongle designed to be used in the USB port of the PC.

Classification of the device

Fixed device	<input type="checkbox"/>
Mobile Device (Human body distance > 20cm)	<input type="checkbox"/>
Portable Device (Human body distance < 20cm)	<input checked="" 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: 666.7 kHz
 Conducted power: -1.7 dBm
 Transmission technique: Digital Transmission
 Modulation: GFSK
 Antenna connector type: Internal antenna
 Antenna gain: 0 dBi

Power Supply

Powered from the USB port of the computer
 Tested by using the IBM 30 laptop

Mechanical Size of the EUT

Height: 7.0 mm	Width: 13.5 mm	Depth: 18.0 mm
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Peripherals**Peripheral**

Laptop IBM 30

Samples

All tests were performed with two samples.

Sample A: equipped with 50Ω connector

Sample B: normal construction.

All conducted measurements were made to sample A, and radiated measurements to sample B.

No modifications were done during the tests.

Disclaimer

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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
§15.207 / RSS-GEN 7.2.2	Conducted 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.

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

Channel LOW (CH 0) = 2402 MHz

Channel MID (CH 20) = 2440 MHz

Channel HIGH (CH 39) = 2480 MHz

Test Facility

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

Maximum Peak Conducted Output Power

Standard: ANSI C63.10 (2009)
Tested by: JJM
Date: 24.5.2011
Humidity: 38 %
Temperature: 21 °C
Measurement uncertainty ± 2,87dB Level of confidence 95 % (k = 2)

FCC Rule: 15.247(b) (1)

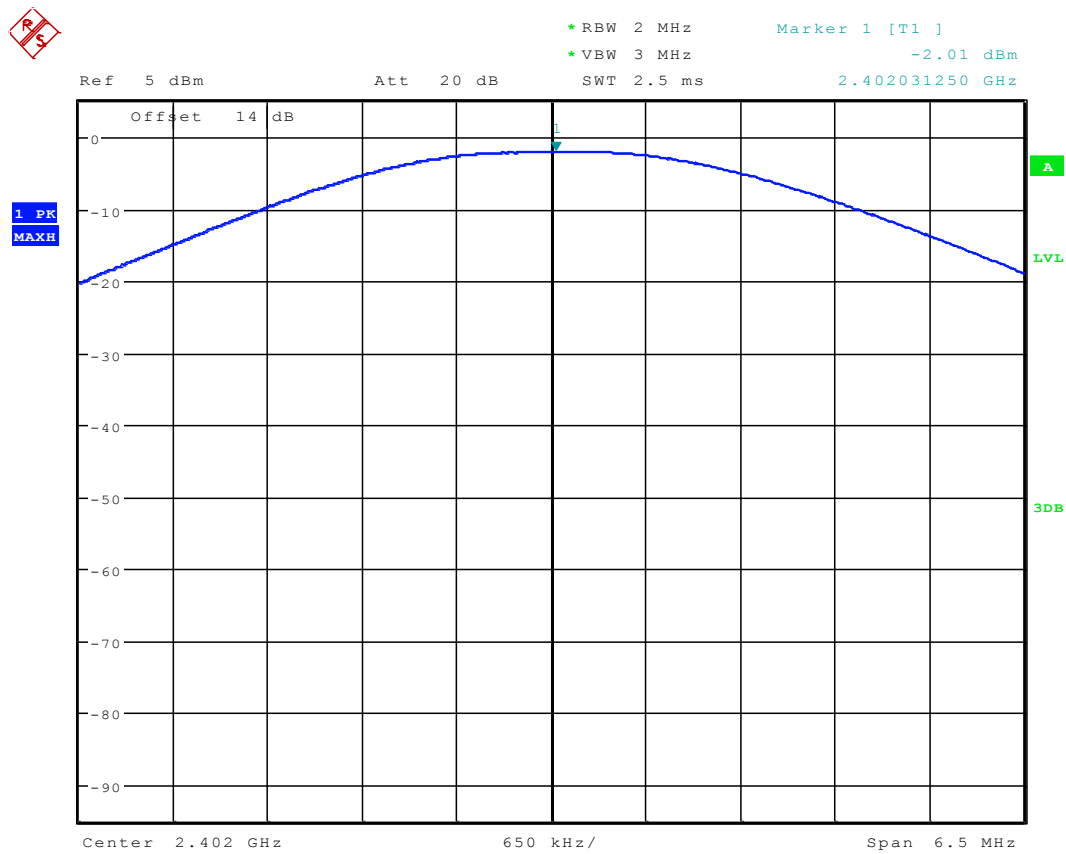
For frequency hopping systems operating in the 2400-2483.5 MHz, employing less than 75 channels limit is 0.125 Watt. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

Results:

Channel	Conducted Power [dBm]	Limit [dBm]	Margin [dBm]	Result
Low	-2.01	30	32.01	PASS
Mid	-1.70	30	31.70	PASS
High	-2.13	30	32.13	PASS

The attenuation of the measurement cable and the attenuator was added as an offset 10.5 dB to correct the measurement result.

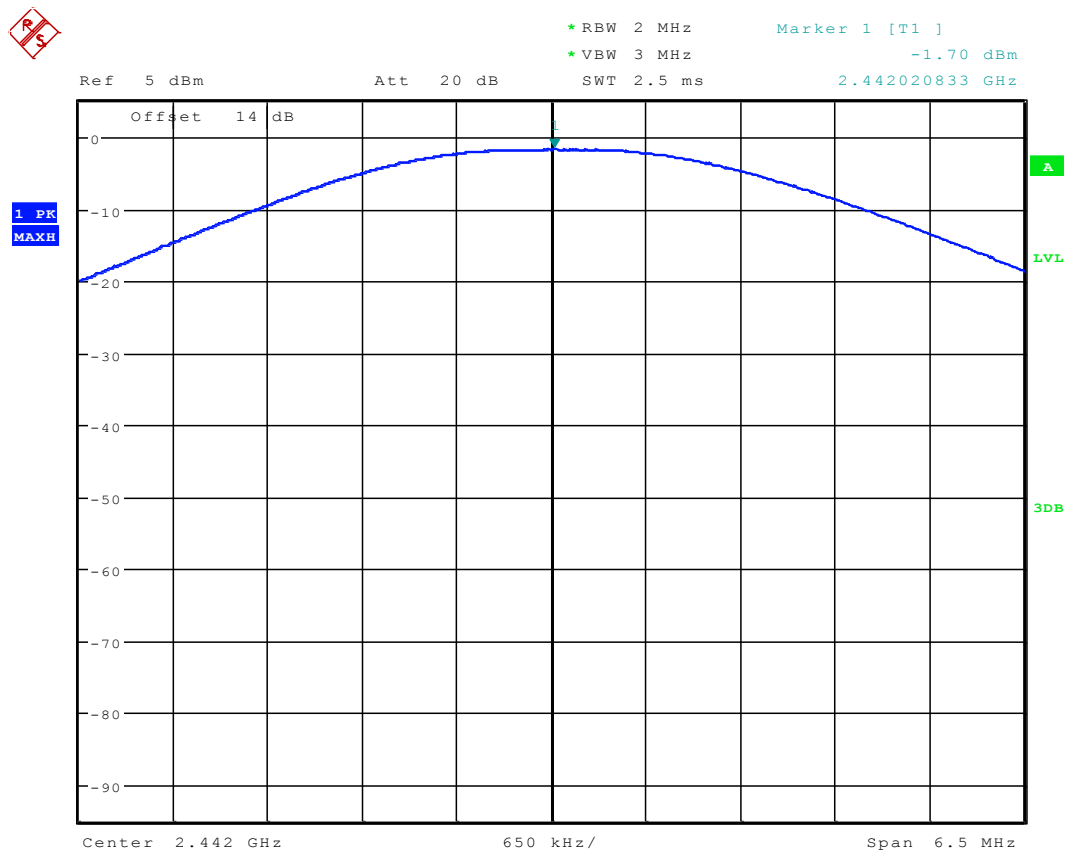
Conducted Output Power Test



Date: 24.MAY.2011 08:46:35

Figure 1. Channel LOW.

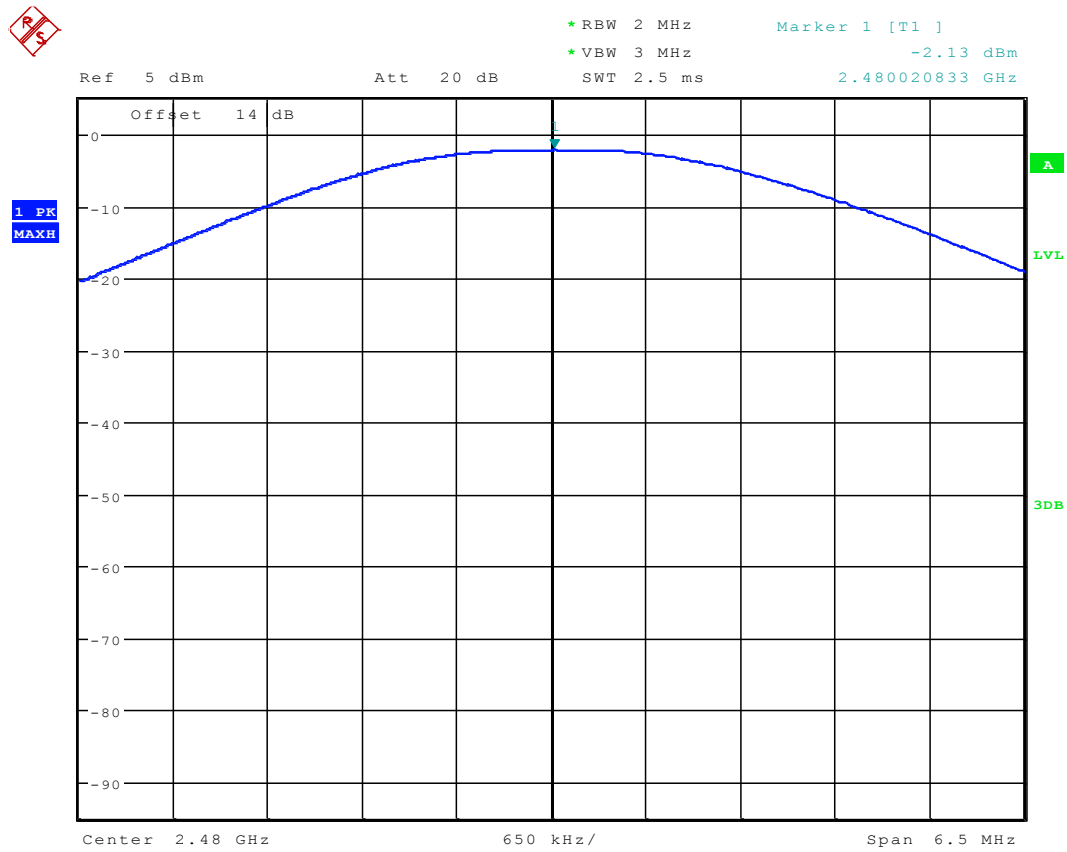
Conducted Output Power Test



Date: 24.MAY.2011 08:45:12

Figure 2. Channel MID.

Conducted Output Power Test



Date: 24.MAY.2011 08:47:43

Figure 3. Channel HIGH.

Transmitter Radiated Emissions 30 – 1000 MHz

Standard:	ANSI C63.10	(2009)
Tested by:	NTO	
Date:	27 – 30.6.2011	
Humidity:	55 - 61%	
Temperature:	19 - 20 °C	
Measurement uncertainty	± 4.51 dB	Level of confidence 95 % (k = 2)

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

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

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

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

Copy of Radiated Emission FCC Part 15 Class B 30-1000MHz 3m

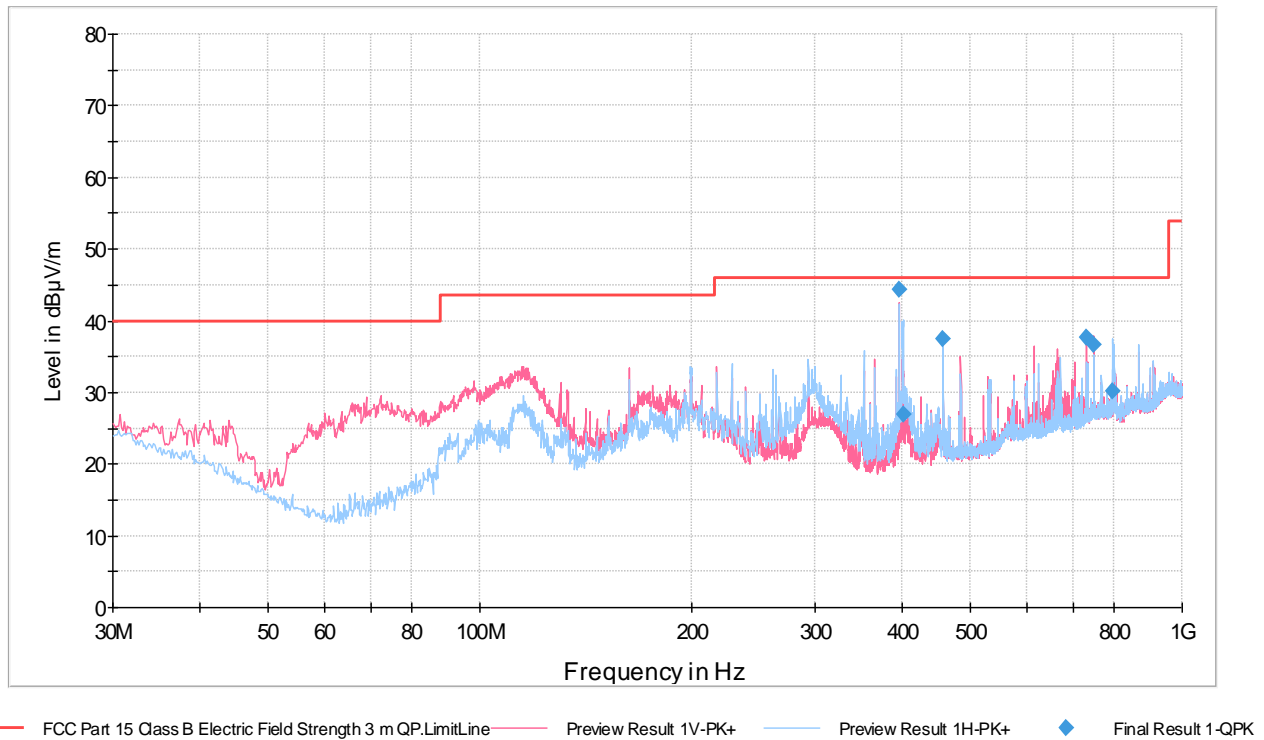


Figure 4. Measured curve with peak-detector. Channel LOW.

Final measurements from the worst frequencies

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
395.995000	44.4	1000.0	120.000	126.0	V	330.0	-5.3	1.6	46.0	
400.425000	26.9	1000.0	120.000	309.0	H	81.0	-5.0	19.1	46.0	
456.765000	37.4	1000.0	120.000	215.0	H	120.0	-4.2	8.6	46.0	
729.015000	37.7	1000.0	120.000	100.0	V	313.0	1.5	8.3	46.0	
747.995000	36.7	1000.0	120.000	253.0	V	75.0	2.1	9.3	46.0	
797.595000	30.1	1000.0	120.000	112.0	H	69.0	2.4	15.9	46.0	

Table 1. Final results.

Copy of Radiated Emission FCC Part 15 Class B 30-1000MHz 3m

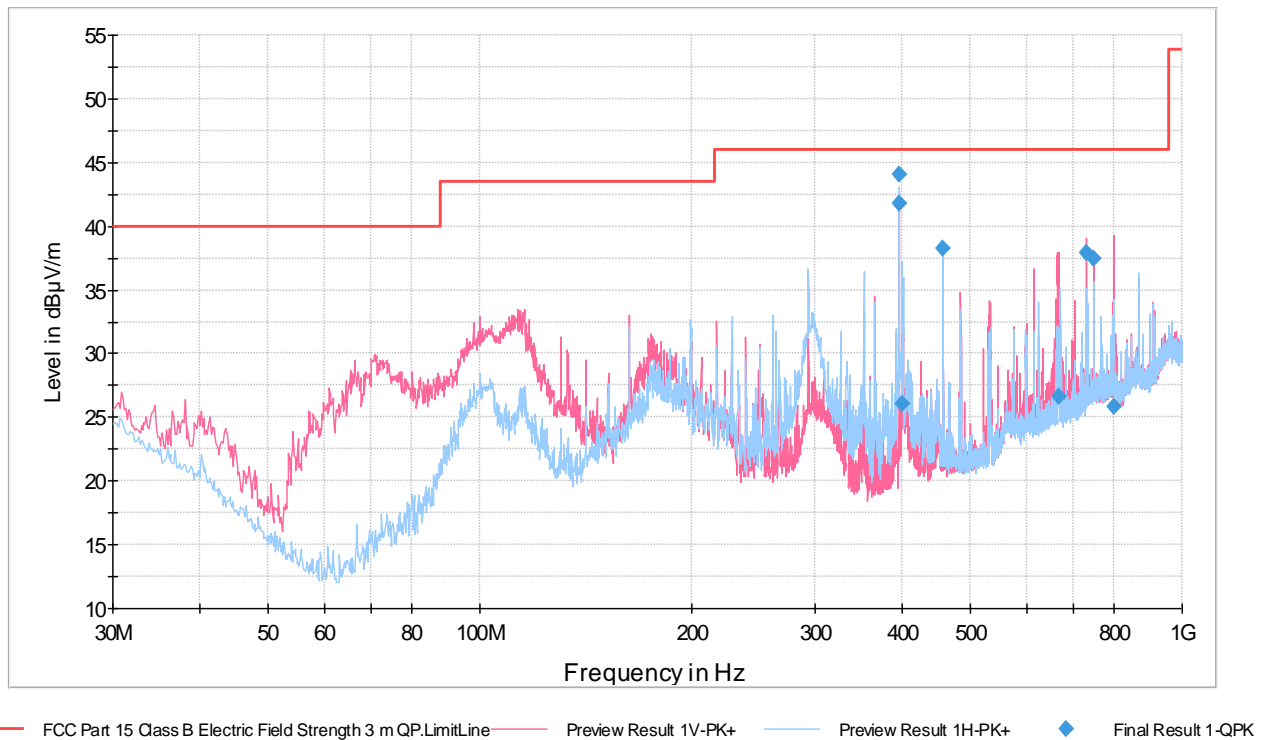


Figure 5. Measured curve with peak-detector. Channel MID.

Final measurements from the worst frequencies

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
395.995000	44.1	1000.0	120.000	133.0	V	324.0	-5.3	1.9	46.0	
395.995000	41.8	1000.0	120.000	100.0	H	185.0	-5.3	4.2	46.0	
399.665000	26.0	1000.0	120.000	100.0	H	120.0	-5.1	20.0	46.0	
456.765000	38.3	1000.0	120.000	216.0	H	125.0	-4.2	7.7	46.0	
666.185000	26.7	1000.0	120.000	100.0	V	25.0	0.0	19.3	46.0	
728.995000	37.9	1000.0	120.000	100.0	V	30.0	1.5	8.1	46.0	
747.995000	37.4	1000.0	120.000	223.0	V	155.0	2.1	8.6	46.0	
797.965000	25.8	1000.0	120.000	100.0	V	17.0	2.4	20.2	46.0	

Table 2. Final results.

Copy of Radiated Emission FCC Part 15 Class B 30-1000MHz 3m

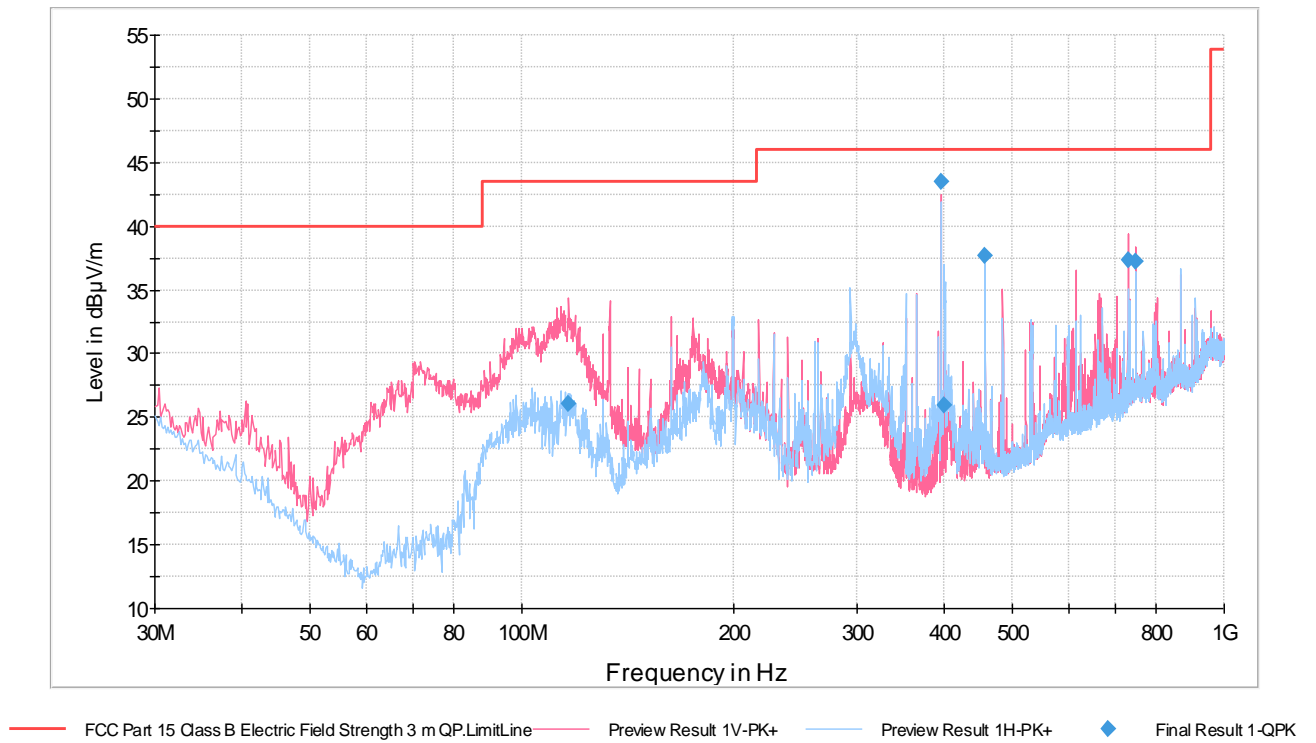


Figure 6. Measured curve with peak-detector. Channel HIGH.

Final measurements from the worst frequencies

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
116.265000	26.1	1000.0	120.000	100.0	V	95.0	-11.7	17.4	43.5	
395.995000	43.5	1000.0	120.000	128.0	V	321.0	-5.3	2.5	46.0	
399.485000	25.9	1000.0	120.000	100.0	H	85.0	-5.1	20.1	46.0	
456.765000	37.7	1000.0	120.000	206.0	H	120.0	-4.2	8.3	46.0	
729.015000	37.3	1000.0	120.000	100.0	V	305.0	1.5	8.7	46.0	
747.995000	37.2	1000.0	120.000	236.0	V	73.0	2.1	8.8	46.0	

Table 3. Final results.

Transmitter Radiated 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.

Copy of Radiated Emission FCC Part 15 Class B 1-4GHz 3m

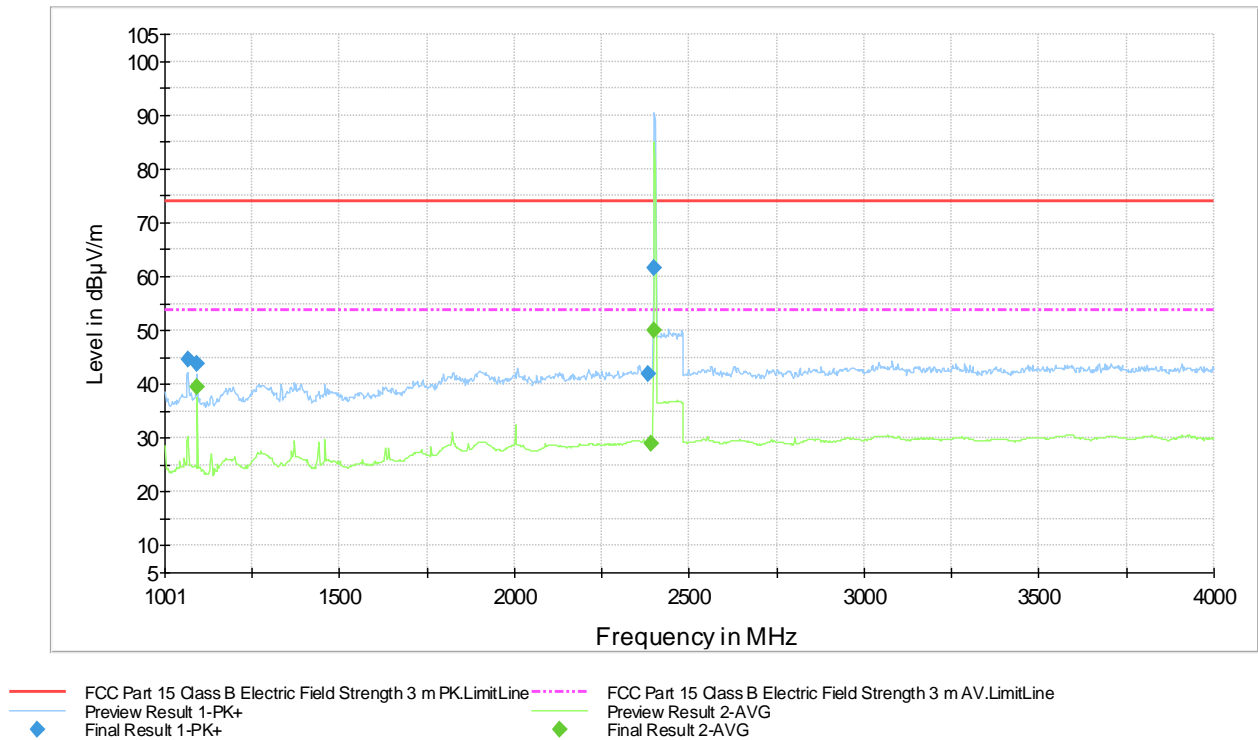


Figure 7. Measured curve with peak- and average detector. Channel LOW.

Final measurements from the worst frequencies

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
1067.050000	44.7	1000.0	1000.000	154.0	V	166.0	-5.1	29.2	73.9	
1093.550000	43.9	1000.0	1000.000	172.0	V	183.0	-4.8	30.0	73.9	
2381.800000	41.8	1000.0	1000.000	235.0	V	183.0	4.4	32.1	73.9	
2400.000000	61.7	1000.0	1000.000	175.0	H	296.0	4.4	12.2	73.9	

Table 4. Final Max Peak results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
1000.400000	30.2	1000.0	1000.000	180.0	V	159.0	-4.0	23.7	53.9	
1093.550000	39.5	1000.0	1000.000	251.0	V	182.0	-4.8	14.4	53.9	
2389.800000	29.1	1000.0	1000.000	175.0	H	297.0	4.4	24.8	53.9	
2399.400000	49.9	1000.0	1000.000	175.0	H	298.0	4.4	4.0	53.9	

Table 5. Final Average results.

Copy of Radiated Emission FCC Part 15 Class B 1-4GHz 3m

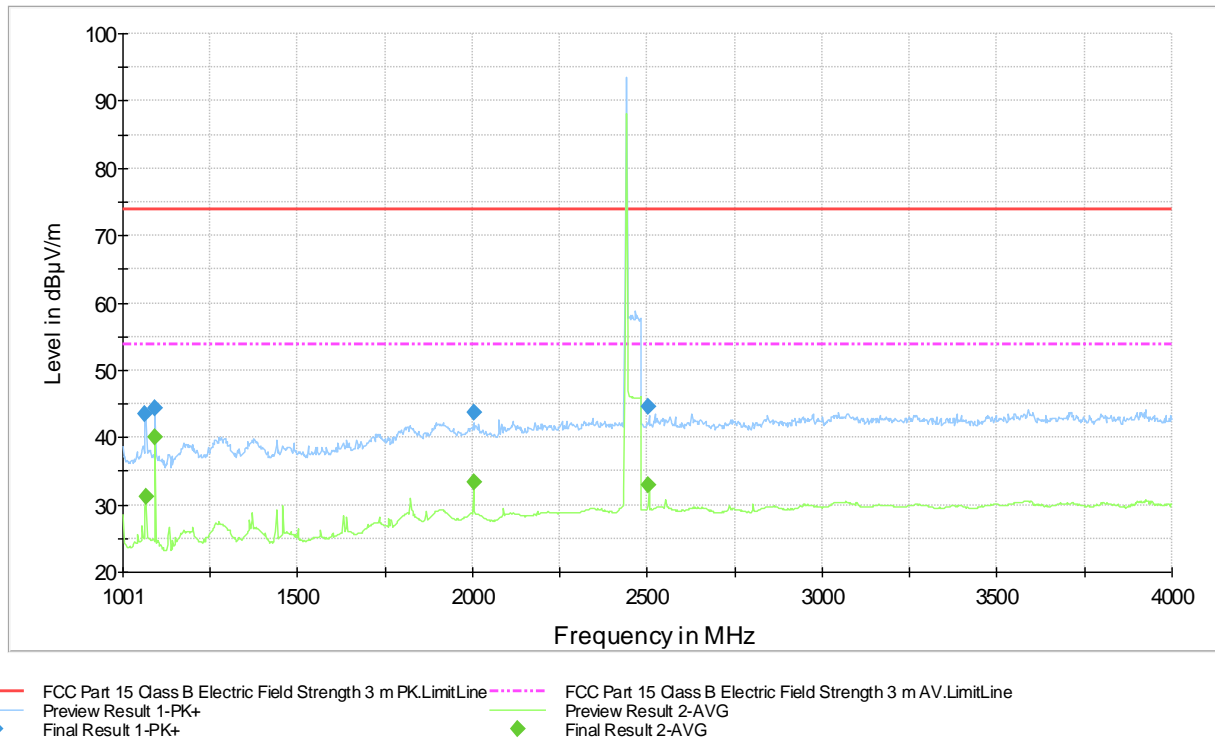


Figure 8. Measured curve with peak- and average detector. Channel MID.

Final measurements from the worst frequencies

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
1065.050000	43.6	1000.0	1000.000	149.0	V	157.0	-5.1	30.3	73.9	
1093.550000	44.4	1000.0	1000.000	162.0	V	185.0	-4.8	29.5	73.9	
2004.150000	43.8	1000.0	1000.000	152.0	V	8.0	2.5	30.1	73.9	
2504.150000	44.6	1000.0	1000.000	201.0	H	297.0	4.7	29.3	73.9	

Table 6. Final Max Peak results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
1000.400000	30.4	1000.0	1000.000	196.0	V	161.0	-4.0	23.5	53.9	
1067.050000	31.2	1000.0	1000.000	100.0	V	169.0	-5.1	22.7	53.9	
1093.550000	40.1	1000.0	1000.000	182.0	V	180.0	-4.8	13.8	53.9	
2004.150000	33.3	1000.0	1000.000	152.0	V	0.0	2.5	20.6	53.9	
2503.950000	32.9	1000.0	1000.000	204.0	H	297.0	4.7	21.0	53.9	

Table 7. Final Average results.

Copy of Radiated Emission FCC Part 15 Class B 1-4GHz 3m

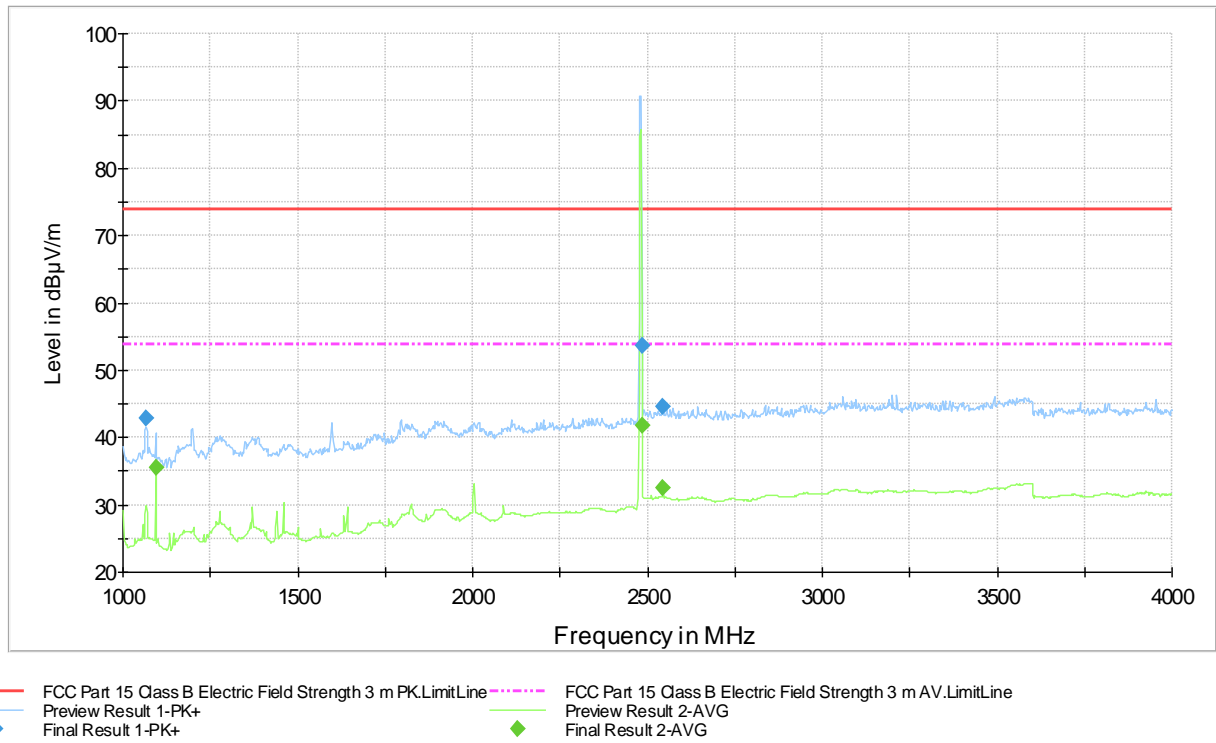


Figure 9. Measured curve with peak- and average detector. Channel HIGH.

Final measurements from the worst frequencies

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
1067.250000	42.8	1000.0	1000.000	167.0	V	183.0	-5.1	31.1	73.9	
2483.500000	53.7	1000.0	1000.000	113.0	H	290.0	4.7	20.2	73.9	
2543.950000	44.5	1000.0	1000.000	138.0	H	315.0	4.6	29.4	73.9	

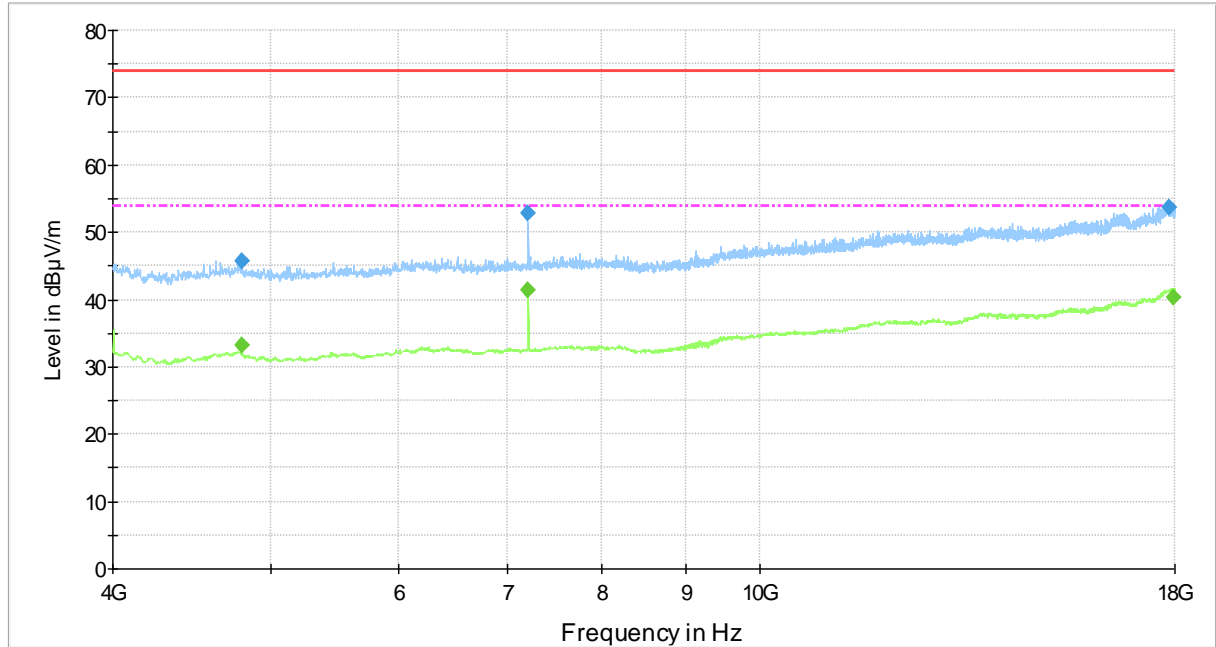
Table 8. Final Max Peak results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
1093.550000	35.6	1000.0	1000.000	215.0	V	133.0	-4.8	18.3	53.9	
2483.500000	41.8	1000.0	1000.000	175.0	H	292.0	4.7	12.1	53.9	
2543.950000	32.5	1000.0	1000.000	134.0	H	311.0	4.6	21.4	53.9	

Table 9. Final Average results.

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

Copy of Radiated Emission FCC Part 15 Class B 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 1-PK+
 ◆ Final Result 2-AVG

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

Final measurements from the worst frequencies

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4806.150000	45.7	1000.0	1000.000	106.0	H	55.0	10.5	28.2	73.9	
7205.350000	52.8	1000.0	1000.000	106.0	H	0.0	12.3	21.1	73.9	
17866.550000	53.8	1000.0	1000.000	262.0	H	304.0	25.7	20.1	73.9	

Table 10. Final Max Peak results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4805.950000	33.3	1000.0	1000.000	109.0	H	64.0	10.5	20.6	53.9	
7205.350000	41.4	1000.0	1000.000	106.0	H	3.0	12.3	12.5	53.9	
17955.250000	40.2	1000.0	1000.000	100.0	V	16.0	25.8	13.7	53.9	

Table 11. Final Average results.

Copy of Radiated Emission FCC Part 15 Class B 4-18GHz 3m

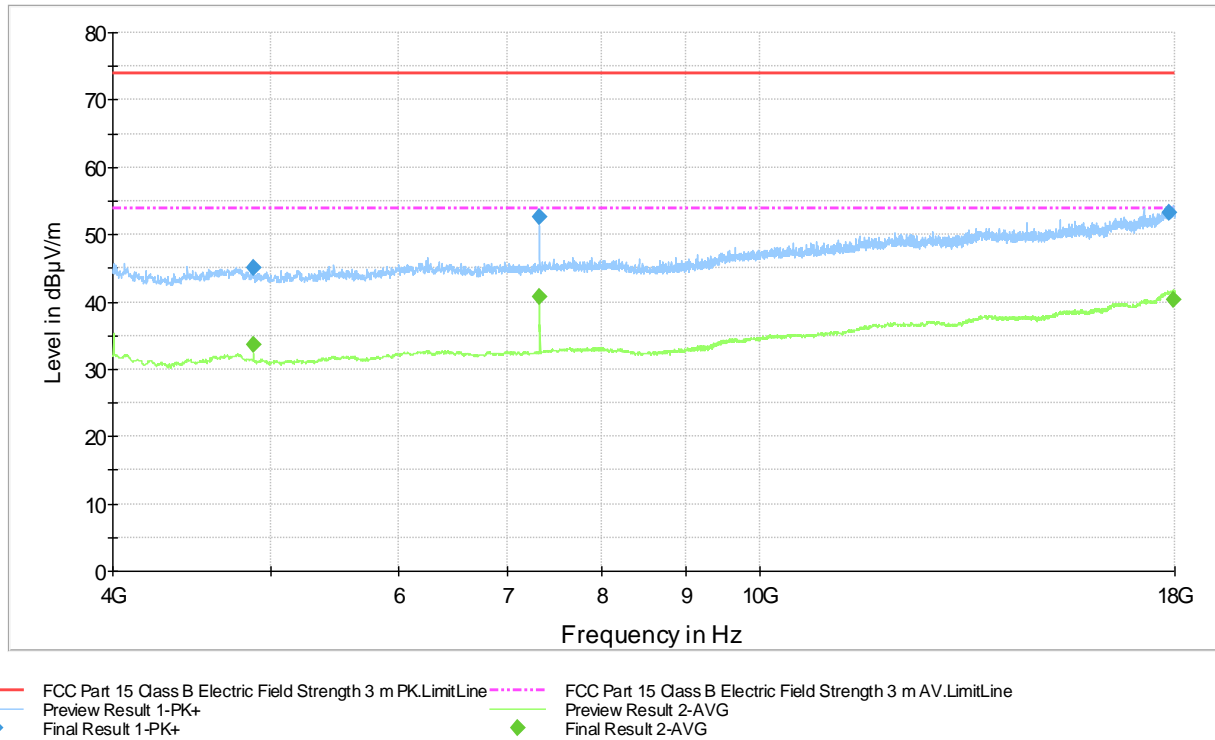


Figure 11. Measured curve with peak- and average detector. Channel MID.

Final measurements from the worst frequencies

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4884.050000	45.2	1000.0	1000.000	144.0	H	56.0	10.5	28.7	73.9	
7319.350000	52.5	1000.0	1000.000	100.0	H	9.0	12.5	21.4	73.9	
17866.150000	53.3	1000.0	1000.000	112.0	H	119.0	25.7	20.6	73.9	

Table 12. Final Max Peak results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4882.050000	33.5	1000.0	1000.000	106.0	H	57.0	10.5	20.4	53.9	
7319.350000	40.8	1000.0	1000.000	100.0	H	0.0	12.5	13.1	53.9	
17958.750000	40.2	1000.0	1000.000	105.0	V	15.0	25.8	13.7	53.9	

Table 13. Final Average results.

Copy of Radiated Emission FCC Part 15 Class B 4-18GHz 3m

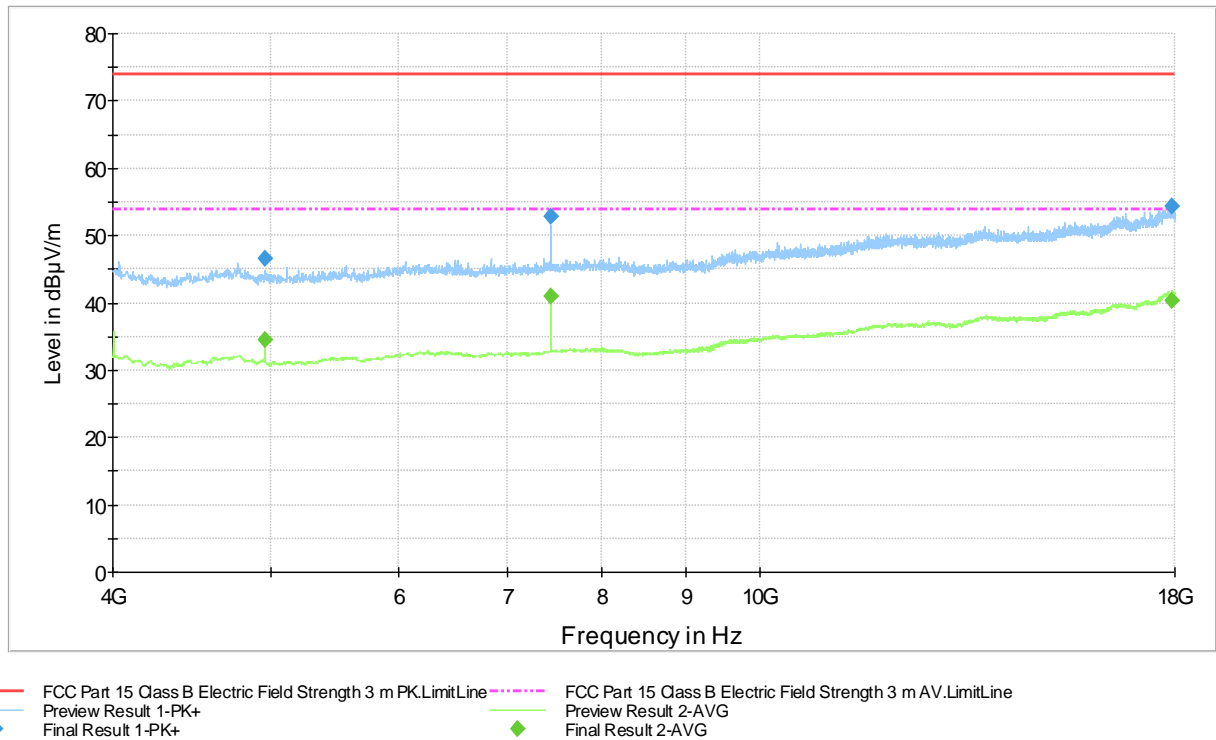


Figure 12. Measured curve with peak- and average detector. Channel HIGH.

Final measurements from the worst frequencies

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4962.050000	46.5	1000.0	1000.000	100.0	H	297.0	10.4	27.4	73.9	
7440.750000	52.9	1000.0	1000.000	100.0	H	9.0	12.8	21.0	73.9	
17924.550000	54.4	1000.0	1000.000	136.0	V	12.0	25.8	19.5	73.9	

Table 14. Final Max Peak results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4962.050000	34.5	1000.0	1000.000	100.0	H	319.0	10.4	19.4	53.9	
7439.350000	40.9	1000.0	1000.000	100.0	H	9.0	12.8	13.0	53.9	
17918.250000	40.3	1000.0	1000.000	100.0	V	35.0	25.8	13.6	53.9	

Table 15. Final Average results.

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

Copy of Radiated Emission FCC Part 15 Class B 18-26.5GHz at 3m

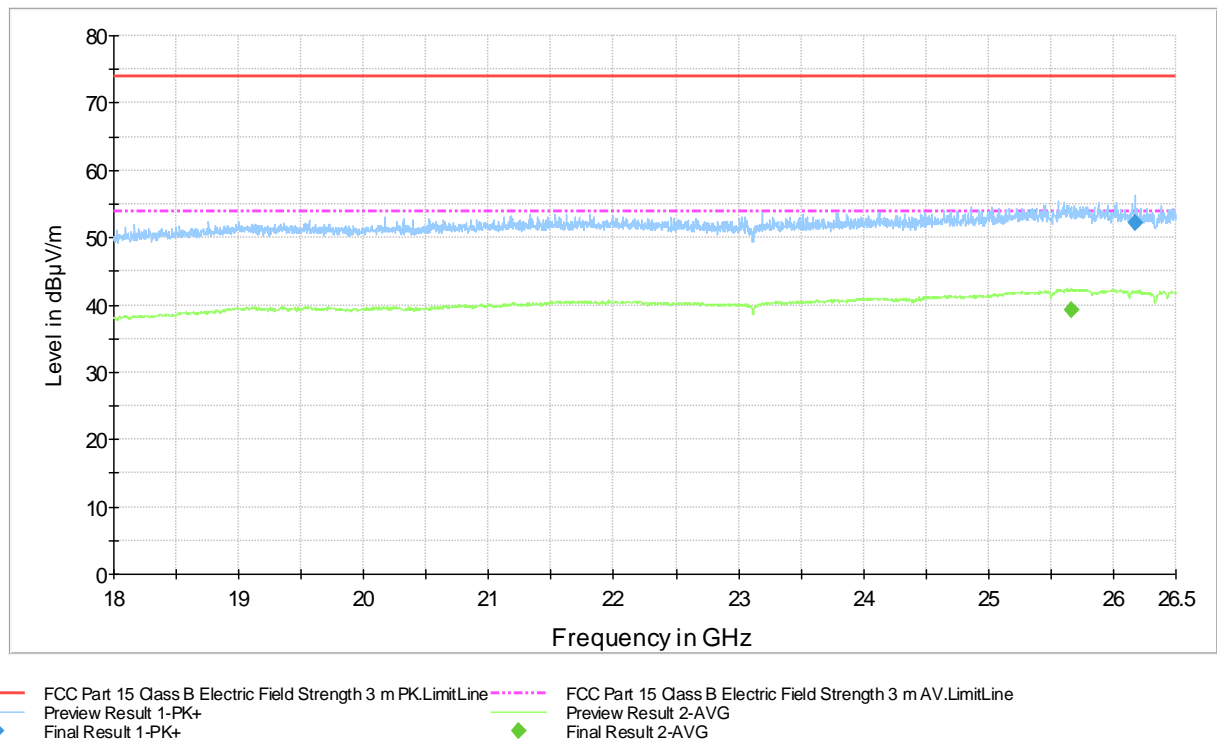


Figure 13. Measured curve with peak- and average detector. Channel LOW.

Final measurements from the worst frequencies

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
26174.350000	52.1	1000.0	1000.000	141.0	V	5.0	28.1	21.8	73.9	

Table 16. Final Max Peak results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
25664.850000	39.3	1000.0	1000.000	100.0	V	3.0	27.9	14.6	53.9	

Table 17. Final Average results.

Copy of Radiated Emission FCC Part 15 Class B 18-26.5GHz at 3m

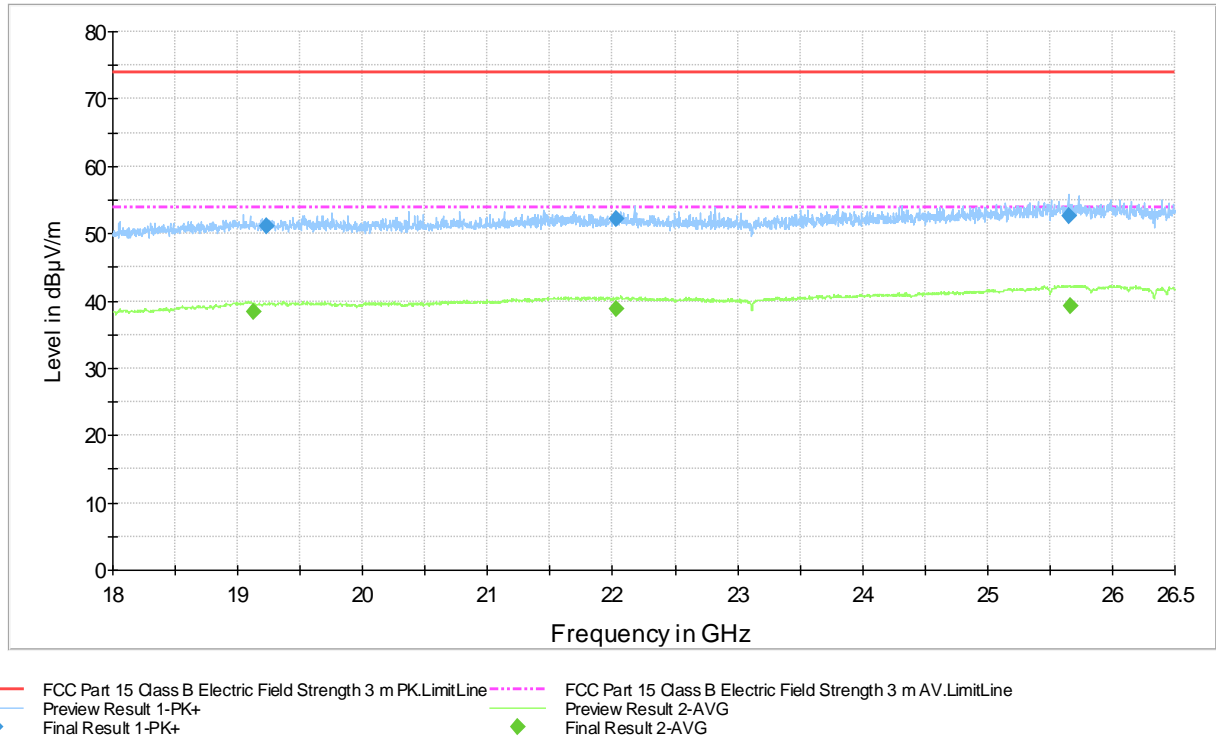


Figure 14. Measured curve with peak- and average detector. Channel MID.

Final measurements from the worst frequencies

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
19236.350000	51.2	1000.0	1000.000	134.0	V	10.0	23.7	22.7	73.9	
22027.050000	52.2	1000.0	1000.000	135.0	V	7.0	25.4	21.7	73.9	
25650.950000	52.6	1000.0	1000.000	131.0	V	21.0	27.9	21.3	73.9	

Table 18. Final Max Peak results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
19127.050000	38.3	1000.0	1000.000	100.0	V	21.0	23.7	15.6	53.9	
22033.750000	38.7	1000.0	1000.000	100.0	V	9.0	25.4	15.2	53.9	
25664.450000	39.2	1000.0	1000.000	100.0	V	6.0	27.9	14.7	53.9	

Table 19. Final Average results.

Copy of Radiated Emission FCC Part 15 Class B 18-26.5GHz at 3m

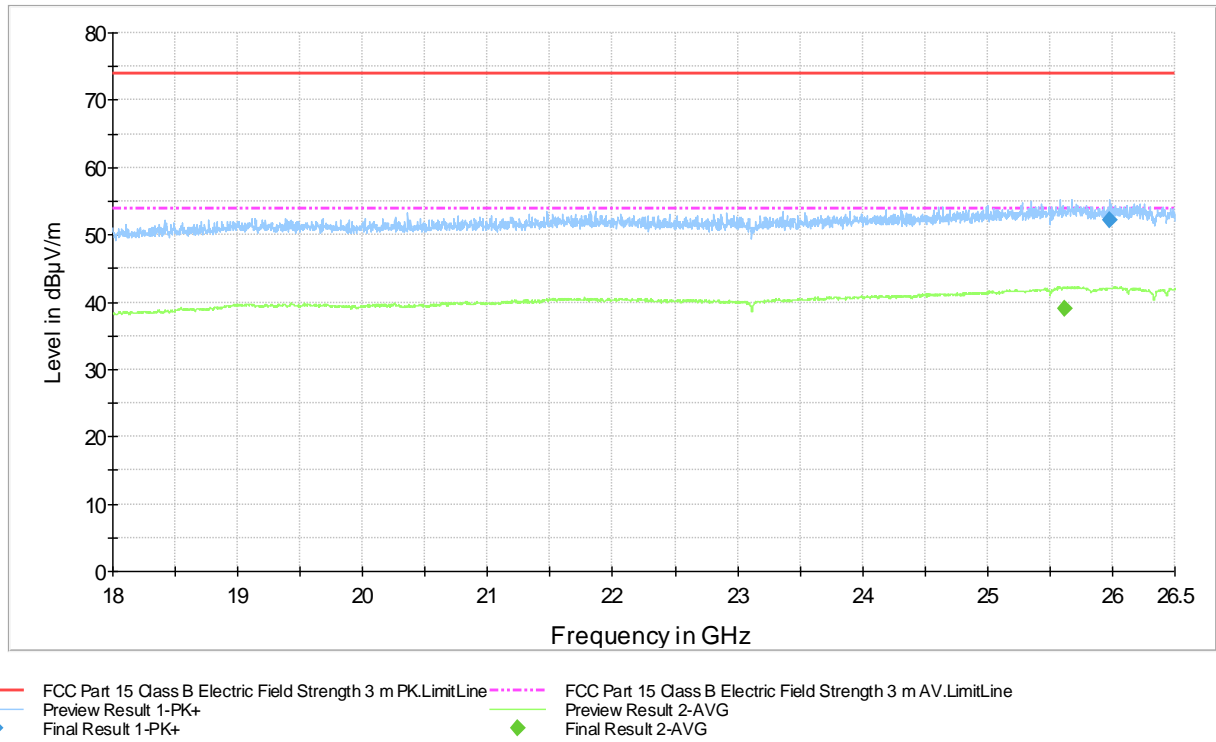


Figure 15. Measured curve with peak- and average detector. Channel HIGH.

Final measurements from the worst frequencies

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
25976.150000	52.3	1000.0	1000.000	125.0	V	17.0	28.0	21.6	73.9	

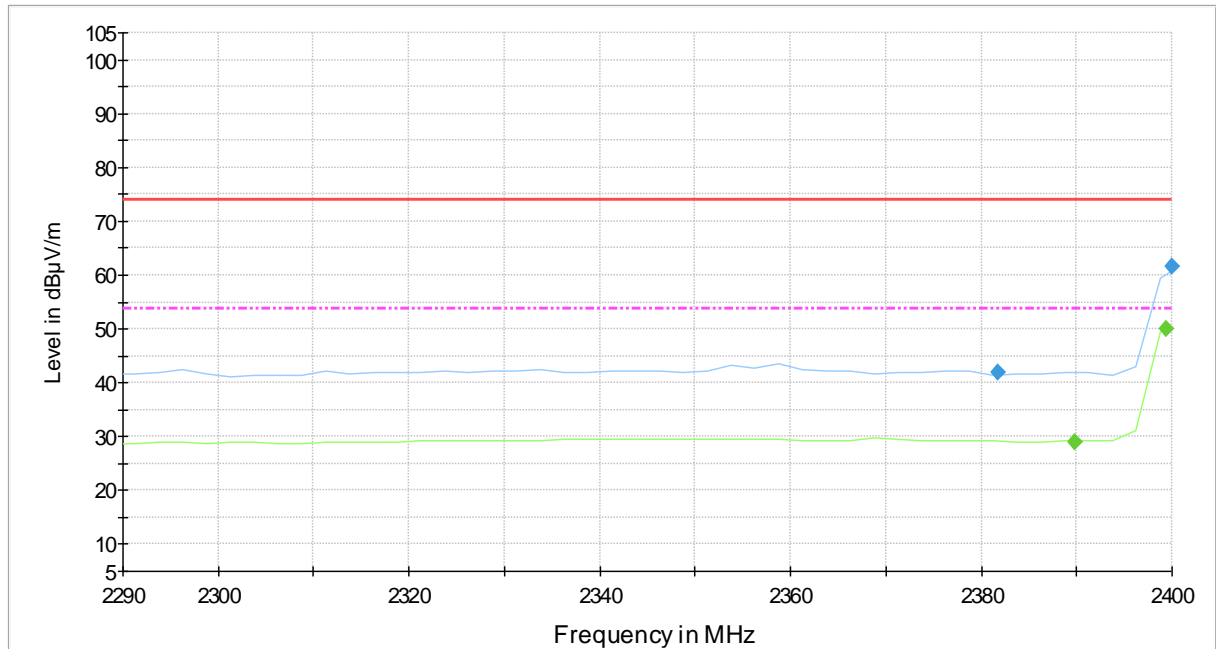
Table 20. Final Max Peak results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
25619.950000	39.1	1000.0	1000.000	100.0	V	0.0	27.9	14.8	53.9	

Table 21. Final Average results.

Radiated band edge measurement results

Copy of Copy of Radiated Emission FCC Part 15 Class B 1-4GHz 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 1-PK+
◆ Final Result 2-AVG

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

Final measurements from the worst frequencies

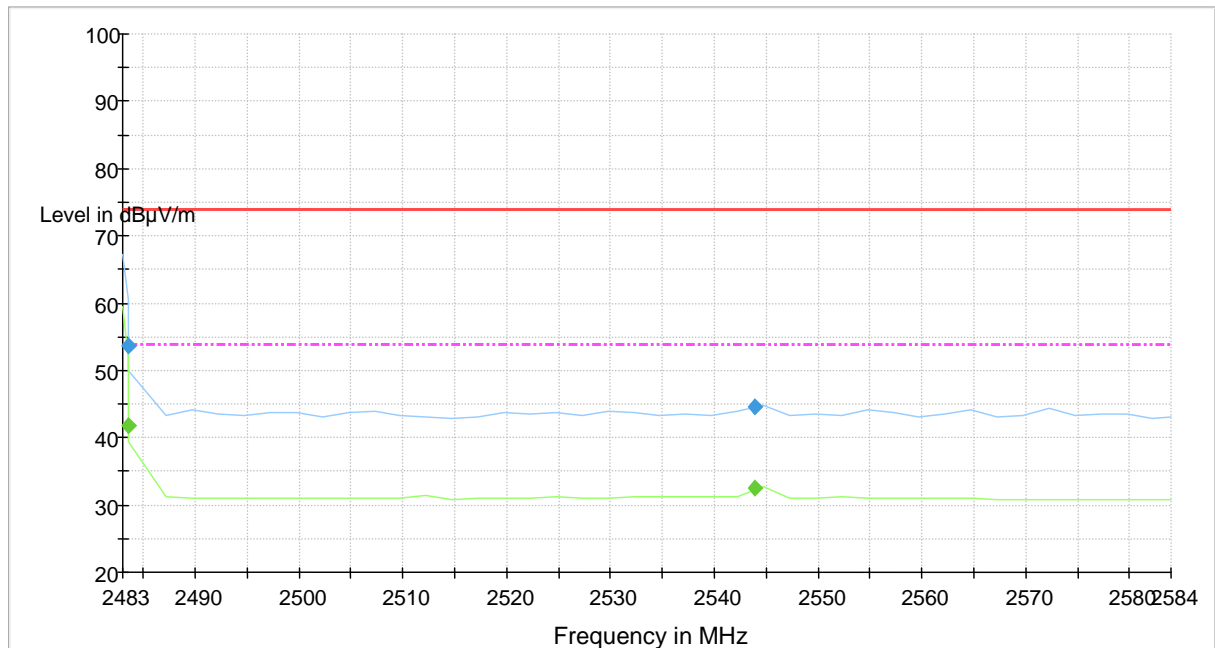
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2381.800000	41.8	1000.0	1000.000	235.0	V	183.0	4.4	32.1	73.9	
2400.000000	61.7	1000.0	1000.000	175.0	H	296.0	4.4	12.2	73.9	

Table 22. Final Max Peak results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2389.800000	29.1	1000.0	1000.000	175.0	H	297.0	4.4	24.8	53.9	
2399.400000	49.9	1000.0	1000.000	175.0	H	298.0	4.4	4.0	53.9	

Table 23. Final Average results.

Copy of Radiated Emission FCC Part 15 Class B 1-4GHz 3m



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

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

Final measurements from the worst frequencies

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2483.500000	53.7	1000.0	1000.000	113.0	H	290.0	4.7	20.2	73.9	
2543.950000	44.5	1000.0	1000.000	138.0	H	315.0	4.6	29.4	73.9	

Table 24. Final Max Peak results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2483.500000	41.8	1000.0	1000.000	175.0	H	292.0	4.7	12.1	53.9	
2543.950000	32.5	1000.0	1000.000	134.0	H	311.0	4.6	21.4	53.9	

Table 25. Final Average results.

Transmitter Band Edge Measurement and Conducted Spurious Emissions

Transmitter Band Edge Measurement and Conducted Spurious Emissions

Standard:	ANSI C63.10	(2009)
Tested by:	JJM	
Date:	25.5.2011	
Humidity:	35 %	
Temperature:	22 °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
-28.61 dBc	-43.66 dBc
Limit: -20dBc	

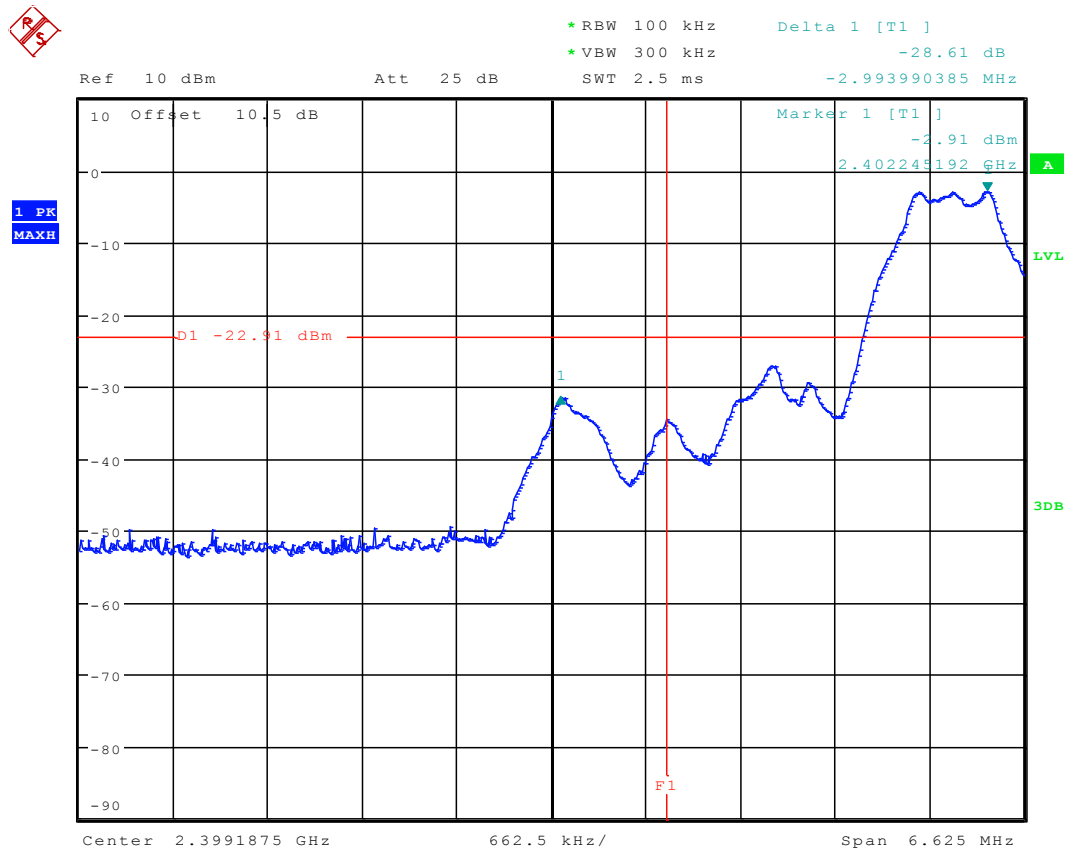
Table 26. Band edge attenuation.

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

Table 27. Conducted spurious emissions.

No significant emissions were detected close to the limit.

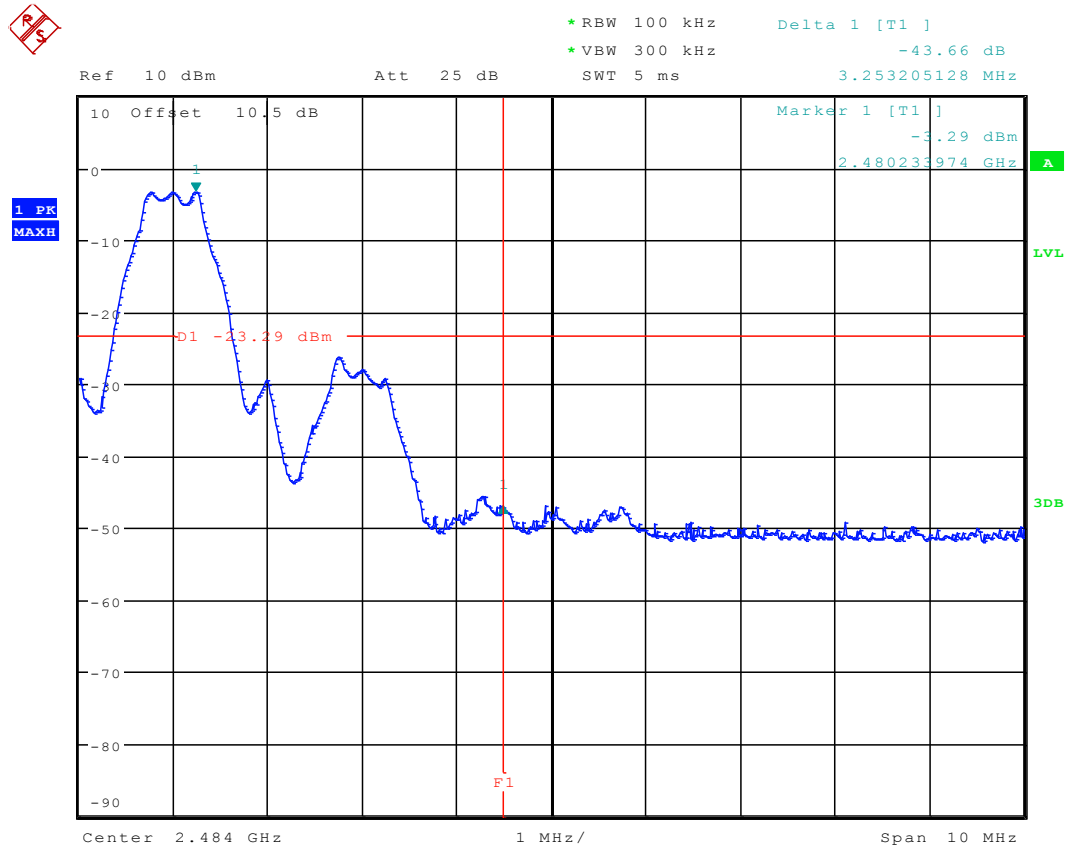
Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 25.MAY.2011 14:10:15

Figure 18. Lower Band Edge.

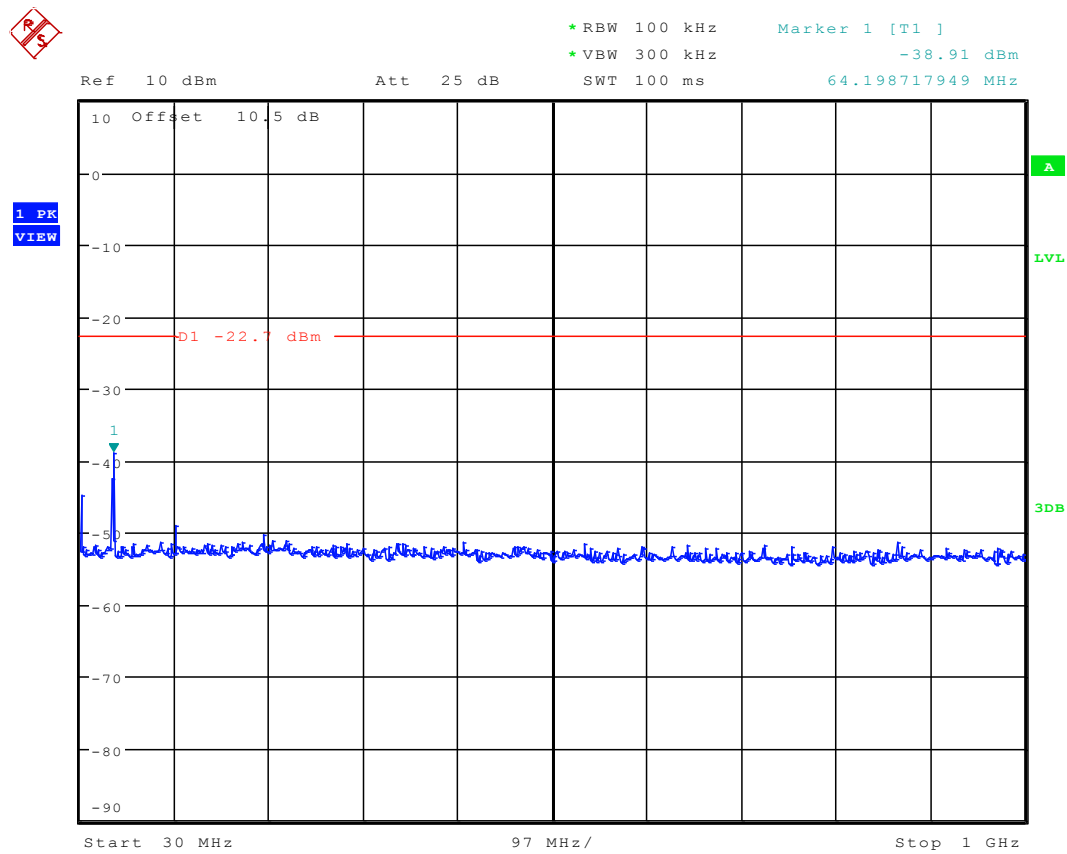
Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 25.MAY.2011 14:07:27

Figure 19. Upper Band Edge.

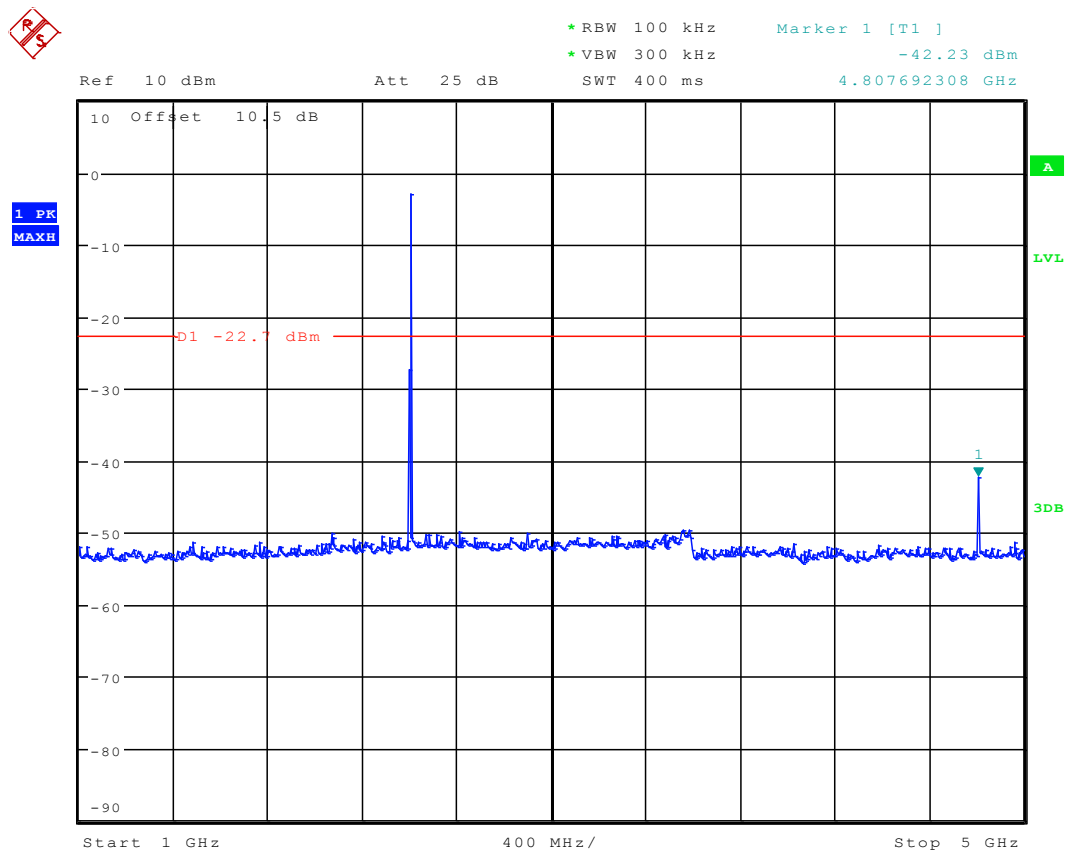
Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 25.MAY.2011 13:35:16

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

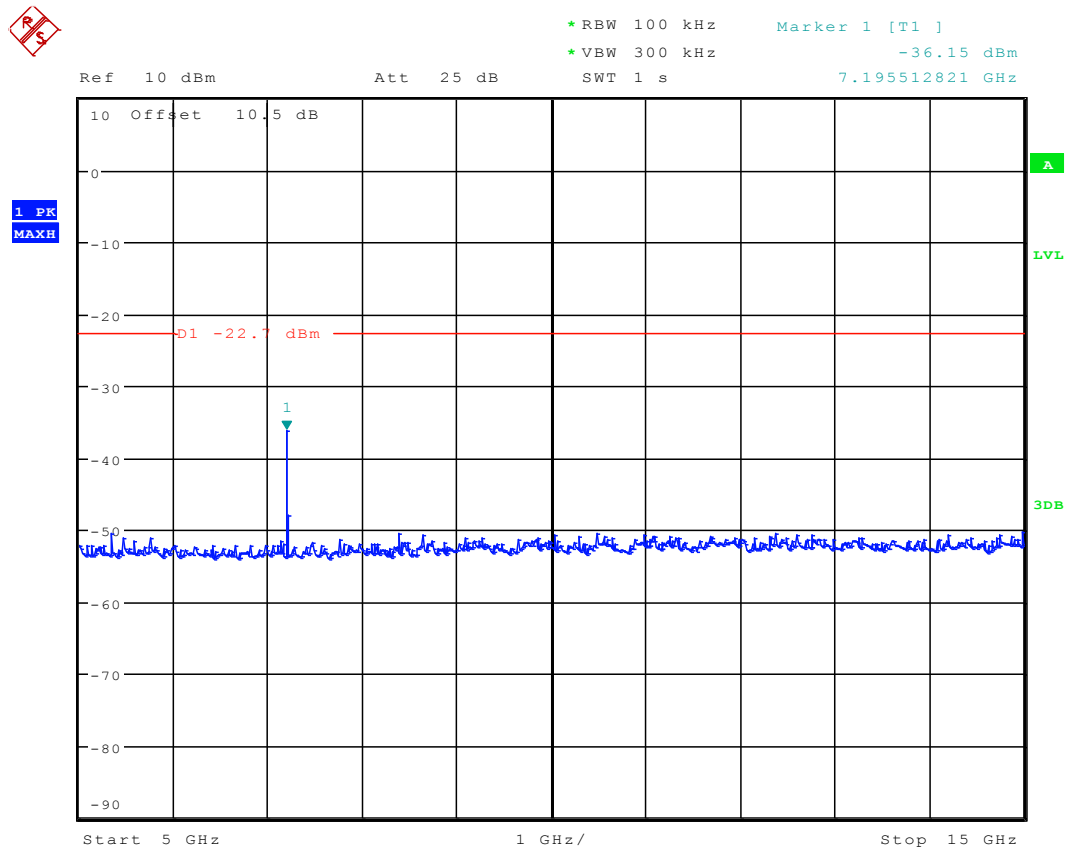
Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 25.MAY.2011 13:09:19

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

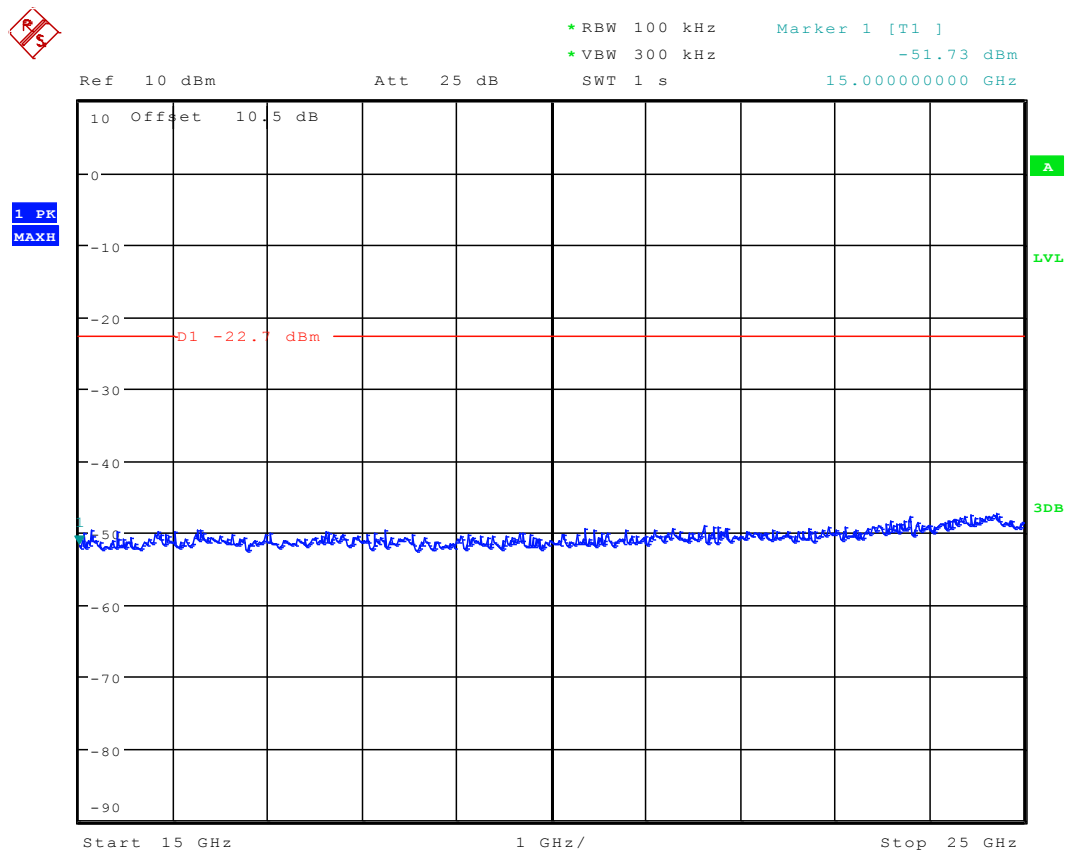
Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 25.MAY.2011 13:10:06

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

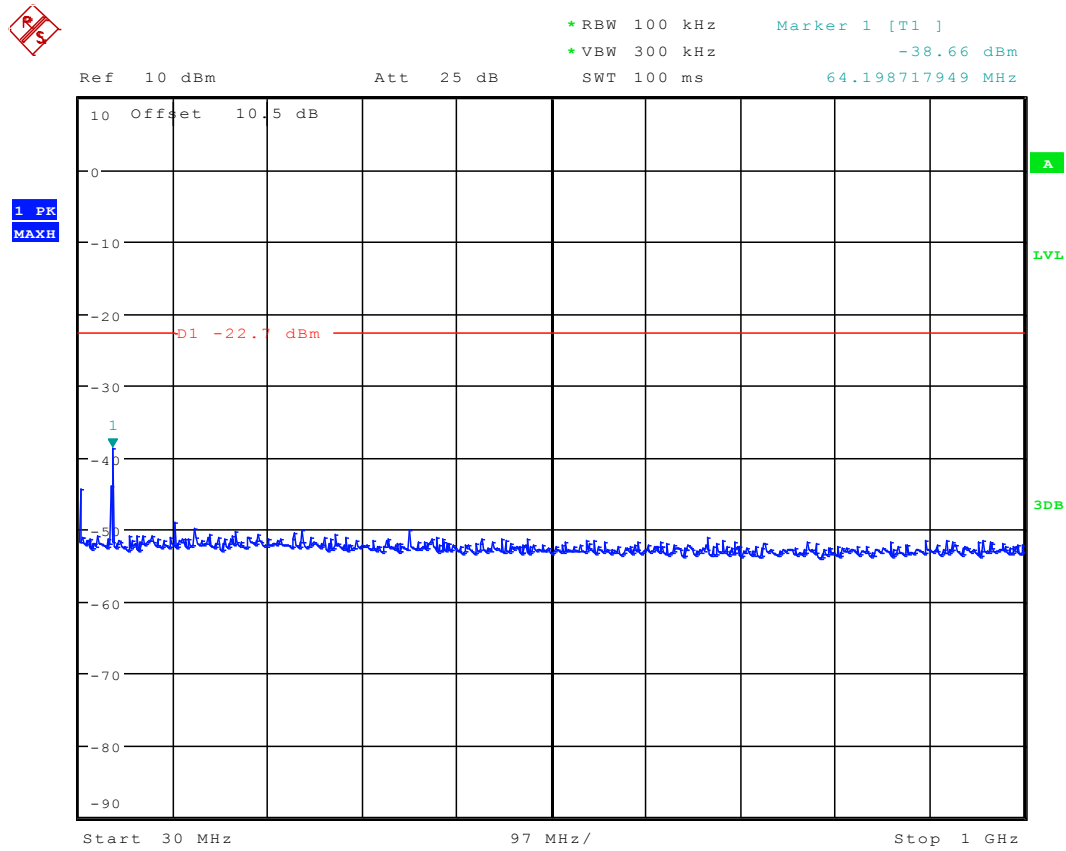
Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 25.MAY.2011 13:11:12

Figure 23. Conducted Spurious Emissions 15 000 – 25 000 MHz. Channel LOW.

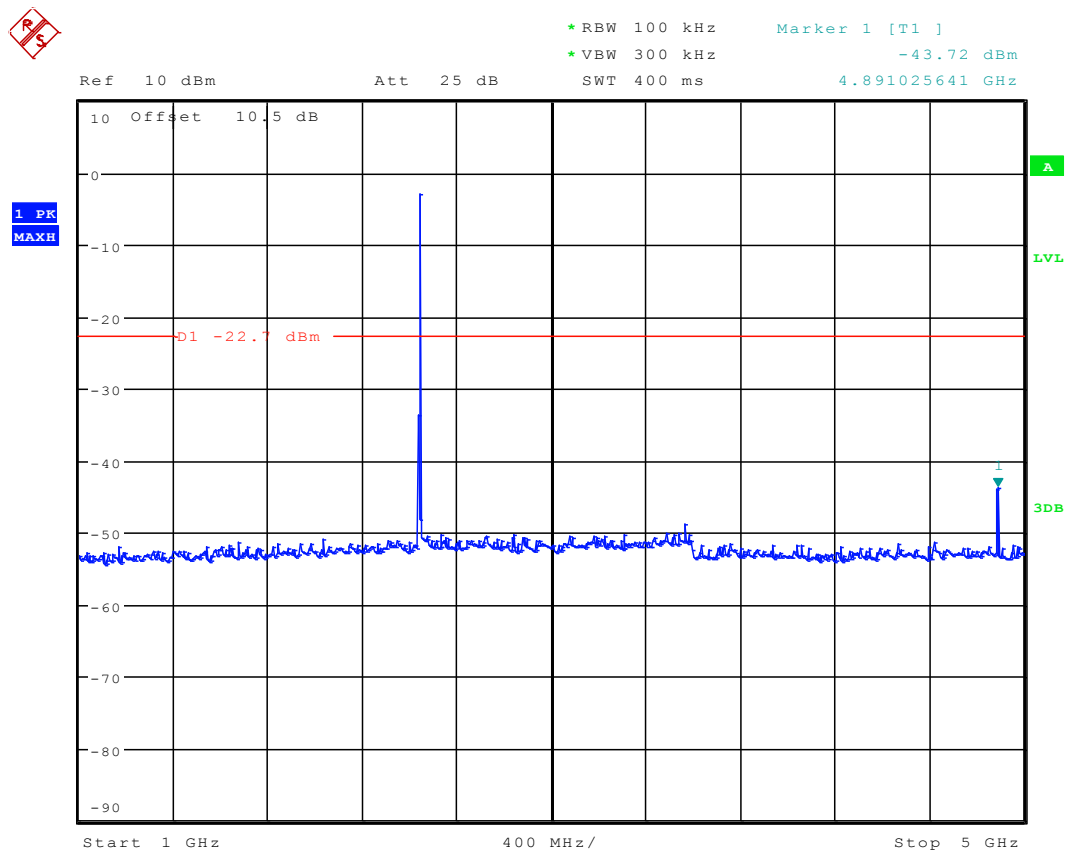
Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 25.MAY.2011 13:12:51

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

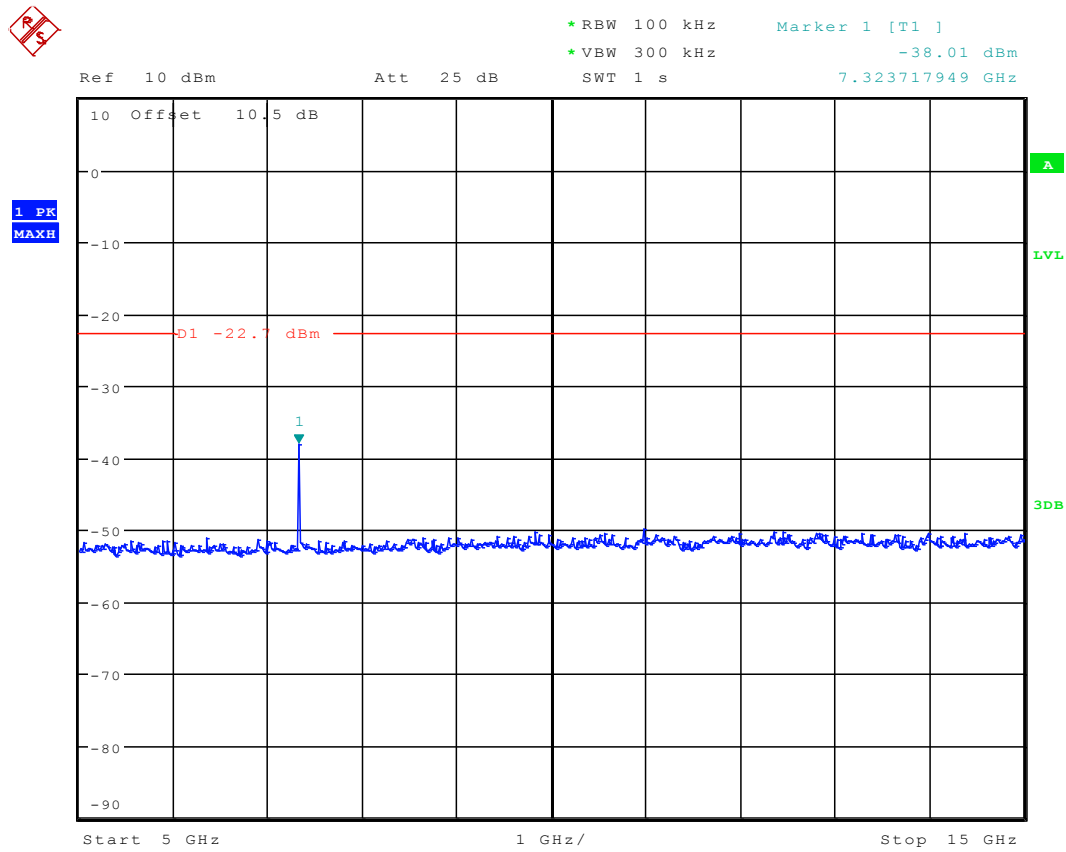
Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 25.MAY.2011 13:13:51

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

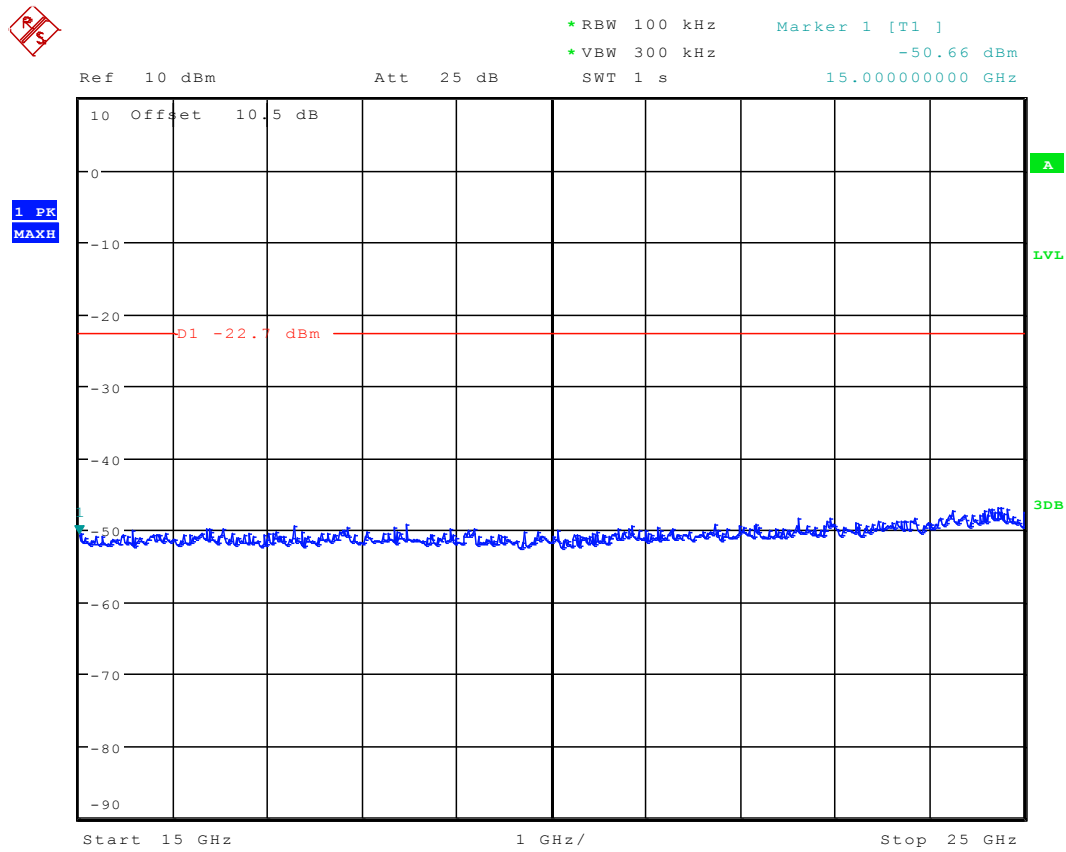
Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 25.MAY.2011 13:17:30

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

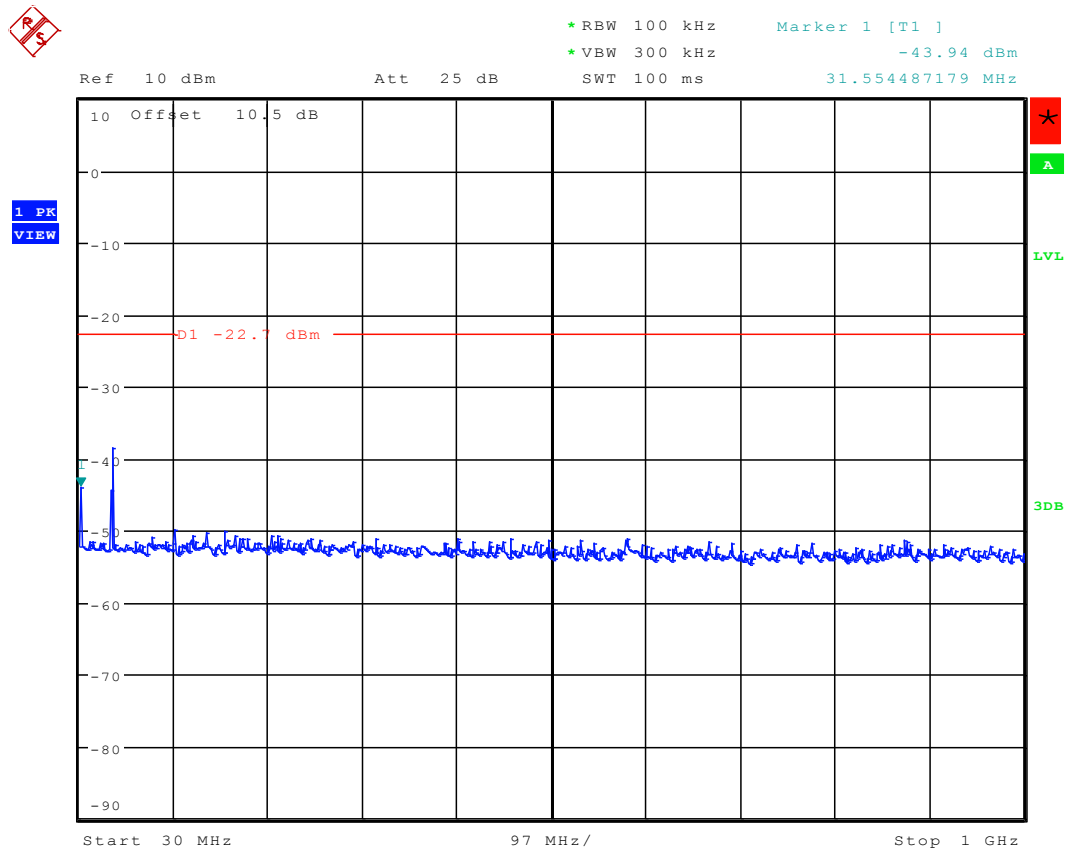
Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 25.MAY.2011 13:17:59

Figure 27. Conducted Spurious Emissions 15 000 – 25 000 MHz. Channel MID.

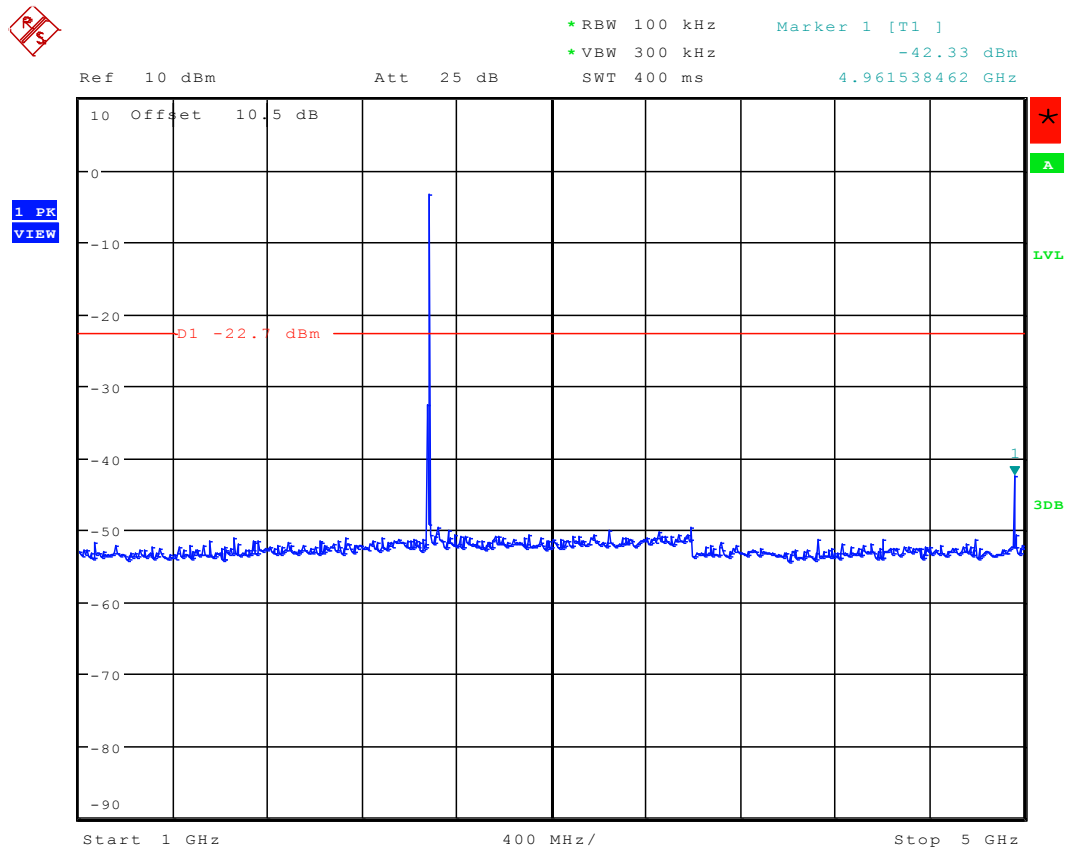
Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 25.MAY.2011 13:23:41

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

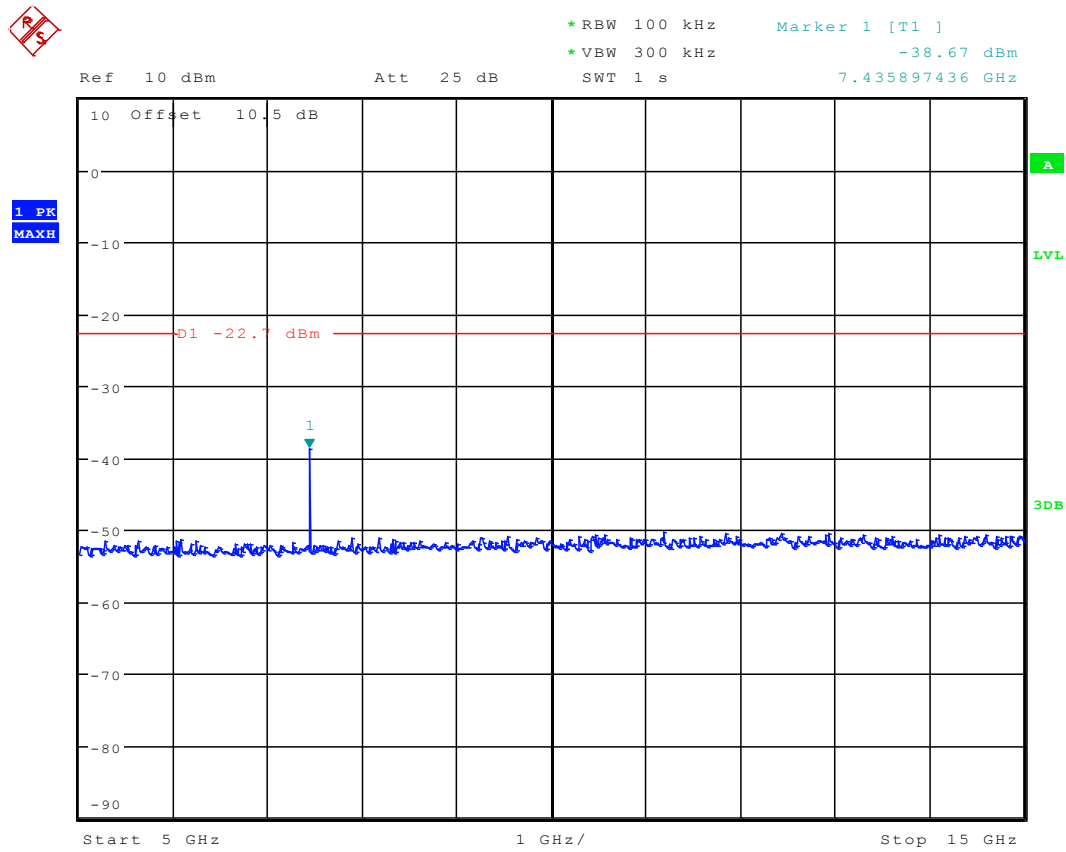
Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 25.MAY.2011 13:22:26

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

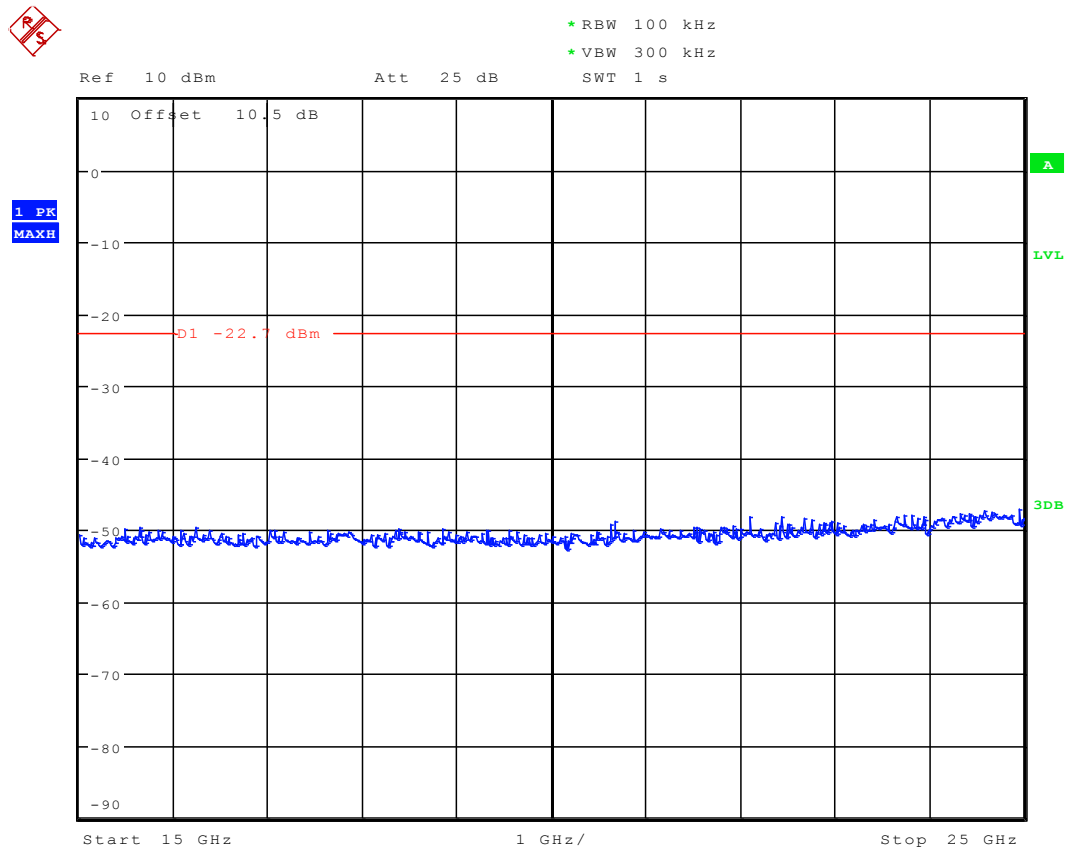
Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 25.MAY.2011 13:29:49

Figure 30. Conducted Spurious Emissions 10 000 – 15 000 MHz. Channel HIGH.

Transmitter Band Edge Measurement and Conducted Spurious Emissions



Date: 25.MAY.2011 13:30:33

Figure 31. Conducted Spurious Emissions 15 000 – 25 000 MHz. Channel HIGH.

6 dB Bandwidth of the Channel

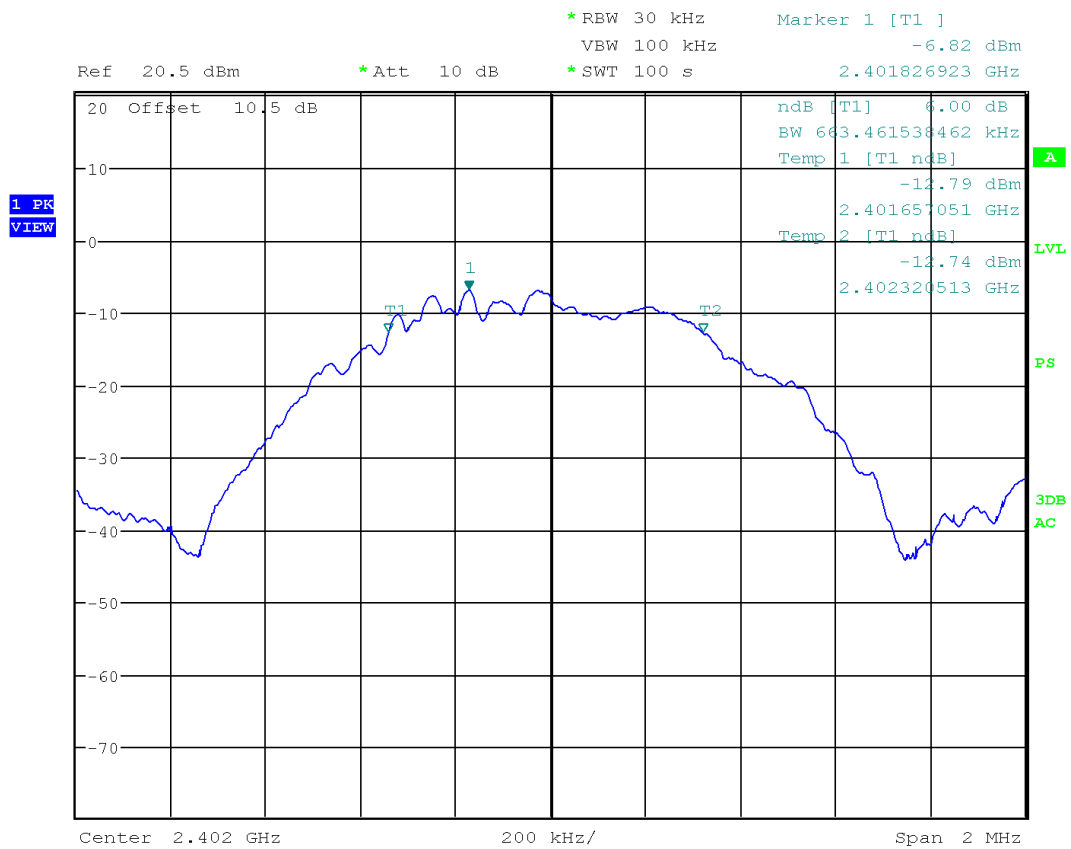
Standard: ANSI C63.10 (2009)
Tested by: NTO
Date: 12.7.2011
Humidity: 56 %
Temperature: 22 °C

FCC Rule: 15.247(a)(2)

Results:

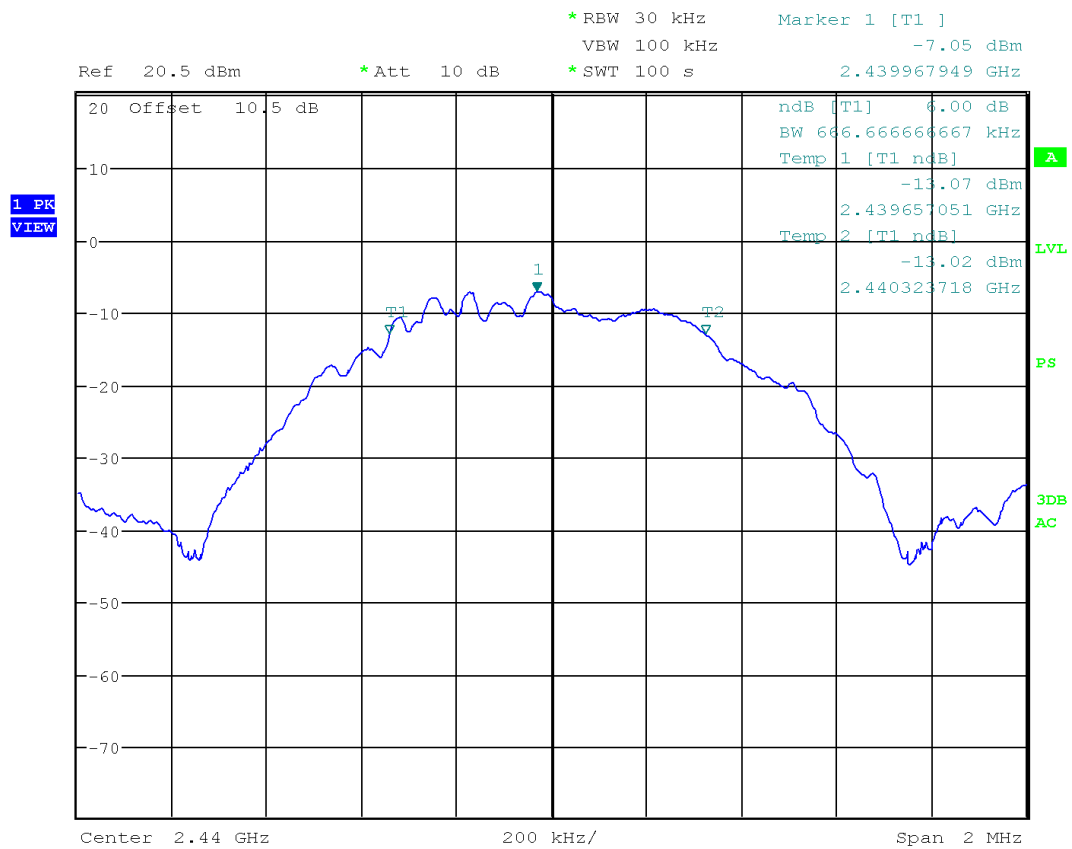
Channel	6 dB BW [kHz]	Minimum limit [kHz]
Low	663.462	500
Mid	666.667	
High	663.462	

Table 28. 6 dB bandwidth test results.



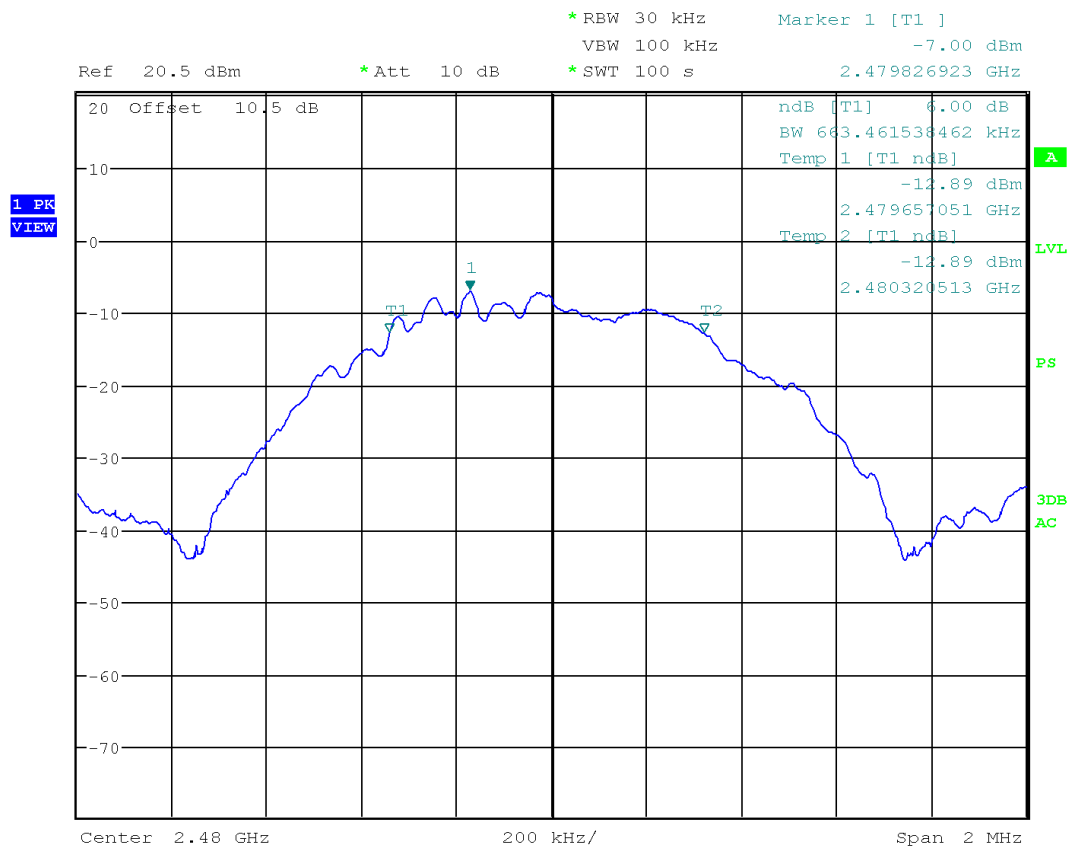
Date: 12.JUL.2011 14:34:27

Figure 32. 6 dB channel BW. Channel LOW



Date: 12.JUL.2011 14:41:38

Figure 33. 6 dB channel BW. Channel MID.



Date: 12.JUL.2011 14:47:34

Figure 34. 6 dB channel BW. Channel HIGH

Power Spectral Density

Standard: ANSI C63.10 (2009)
Tested by: NTO
Date: 12.7.2011
Humidity: 56 %
Temperature: 22 °C

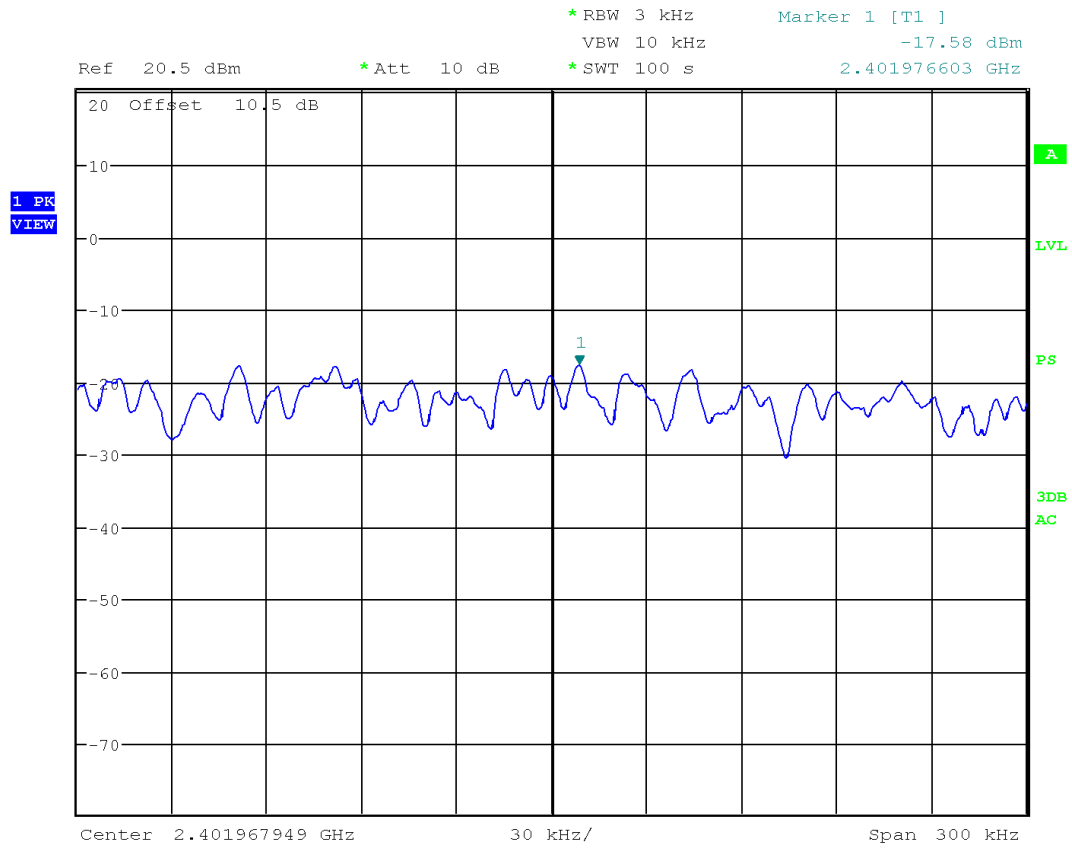
FCC Rule: 15.247(e)
RSS-210 A8.2

Results:

Channel	PSD dBm/3 kHz	Maximum limit [dBm/3kHz]
Low	-17.58	+8.00
Mid	-17.75	
High	-17.89	

Table 29. Power Spectral Density test results.

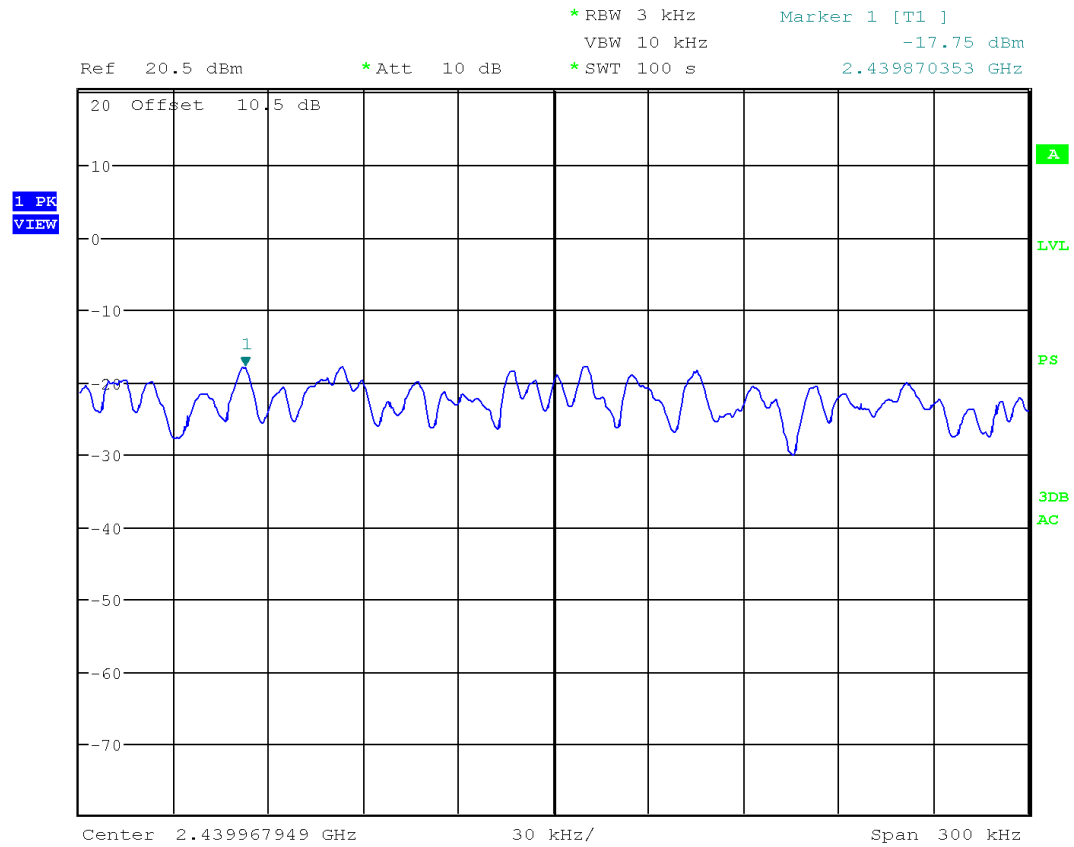
Power Spectral Density



Date: 12.JUL.2011 15:00:48

Figure 35. Power Spectral Density of the channel LOW.

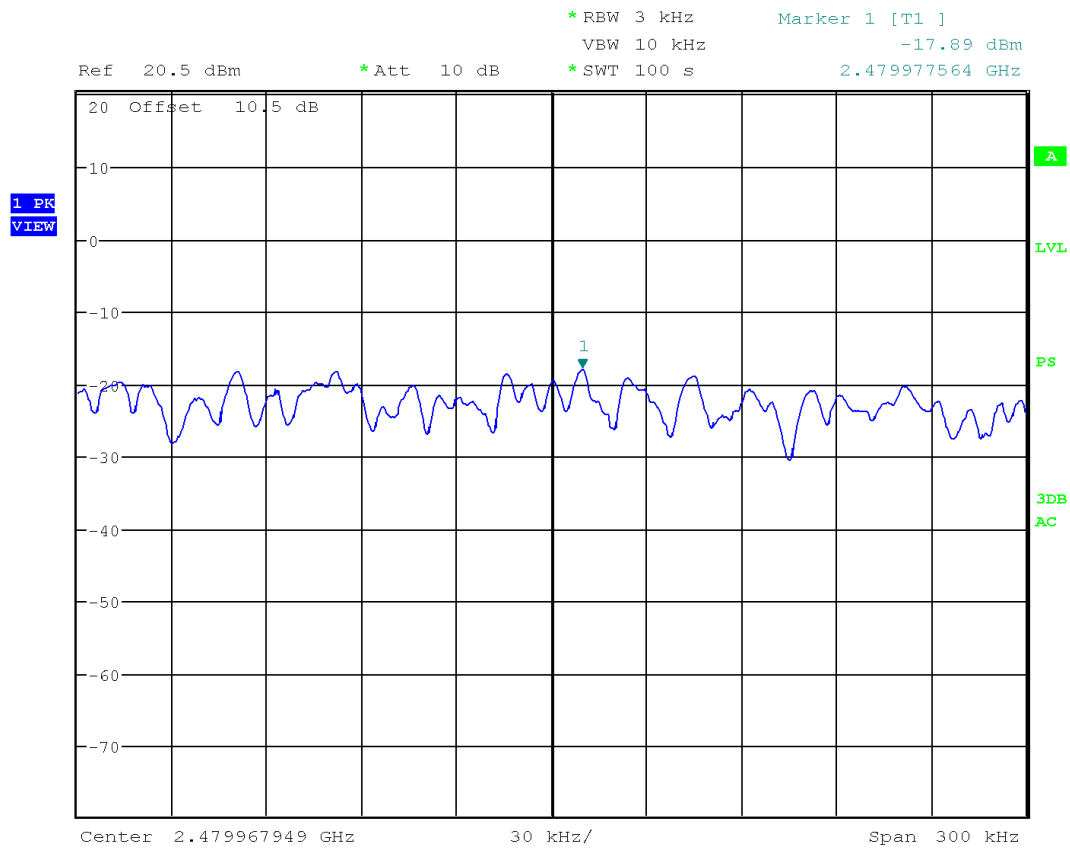
Power Spectral Density



Date: 12.JUL.2011 15:04:48

Figure 36. Power Spectral Density of the channel MID.

Power Spectral Density



Date: 12.JUL.2011 15:07:47

Figure 37. Power Spectral Density of the channel HIGH.

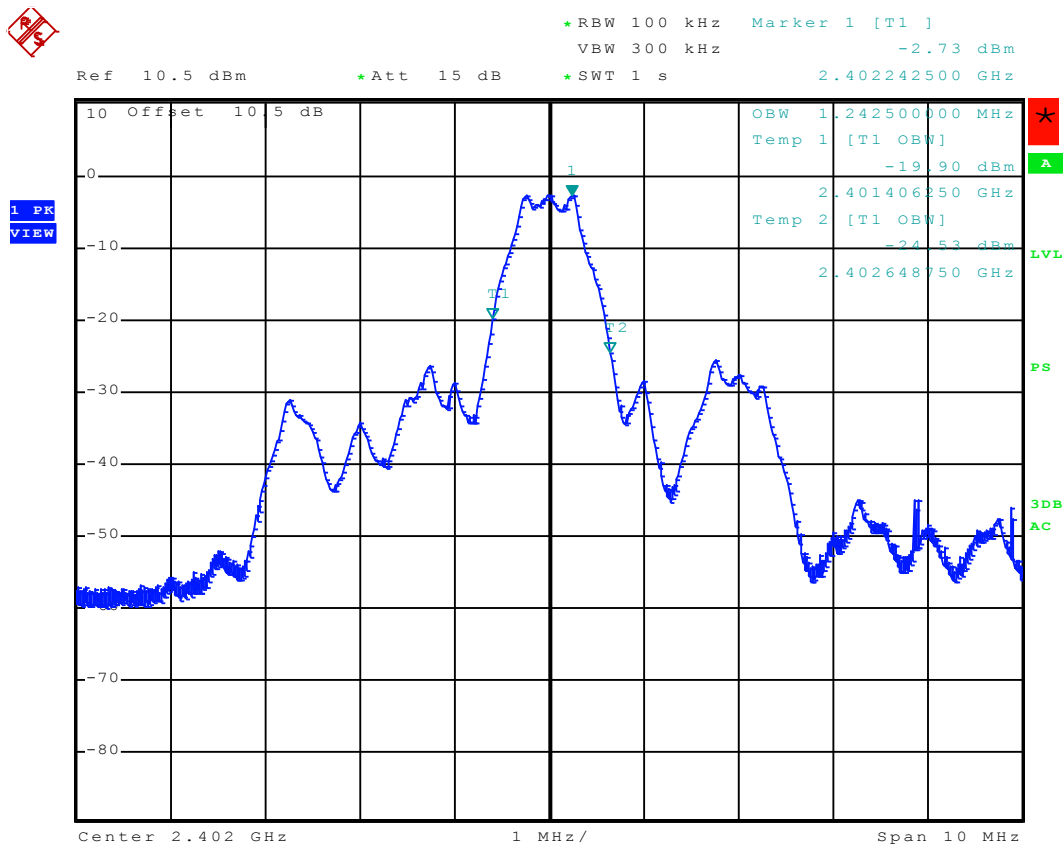
99% Occupied Bandwidth

Standard: RSS-GEN (2010)
Tested by: JJM
Date: 30.6.2011
Humidity: 51 %
Temperature: 20 °C

RSS-GEN 4.7

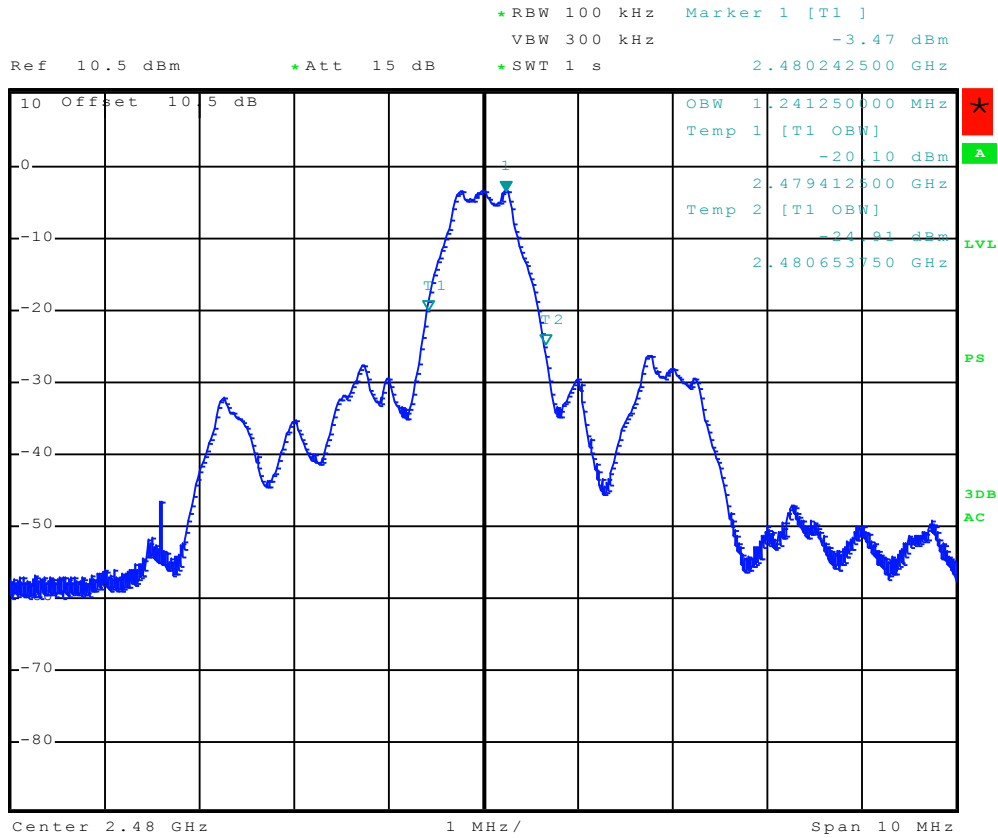
Channel	Limit	99 % BW [MHz]	Result
Low	-	1.24250	PASS
Mid	-	1.13375	PASS
High	-	1.24125	PASS

Table 30. 99 % OBW test results.



Date: 30.JUN.2011 08:21:34

Figure 38. 99 % OBW. Channel low.



Date: 30.JUN.2011 08:33:39

Figure 40. 99 % OBW. Channel high.

Receiver Radiated Emissions 30 – 26 500 MHz

Standard: ANSI C63.10 (2009)
Tested by: JJM
Date: 30.5.2011
Humidity: 37 %
Temperature: 21.0 °C
Measurement uncertainty ± 4.51 dB Level of confidence 95 % (k = 2)

FCC Rule: 15.109

The EUT was in a receiving mode and measurement was performed on middle channel only. 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.

Copy of Radiated Emission FCC Part 15 Class B 30-1000MHz 3m

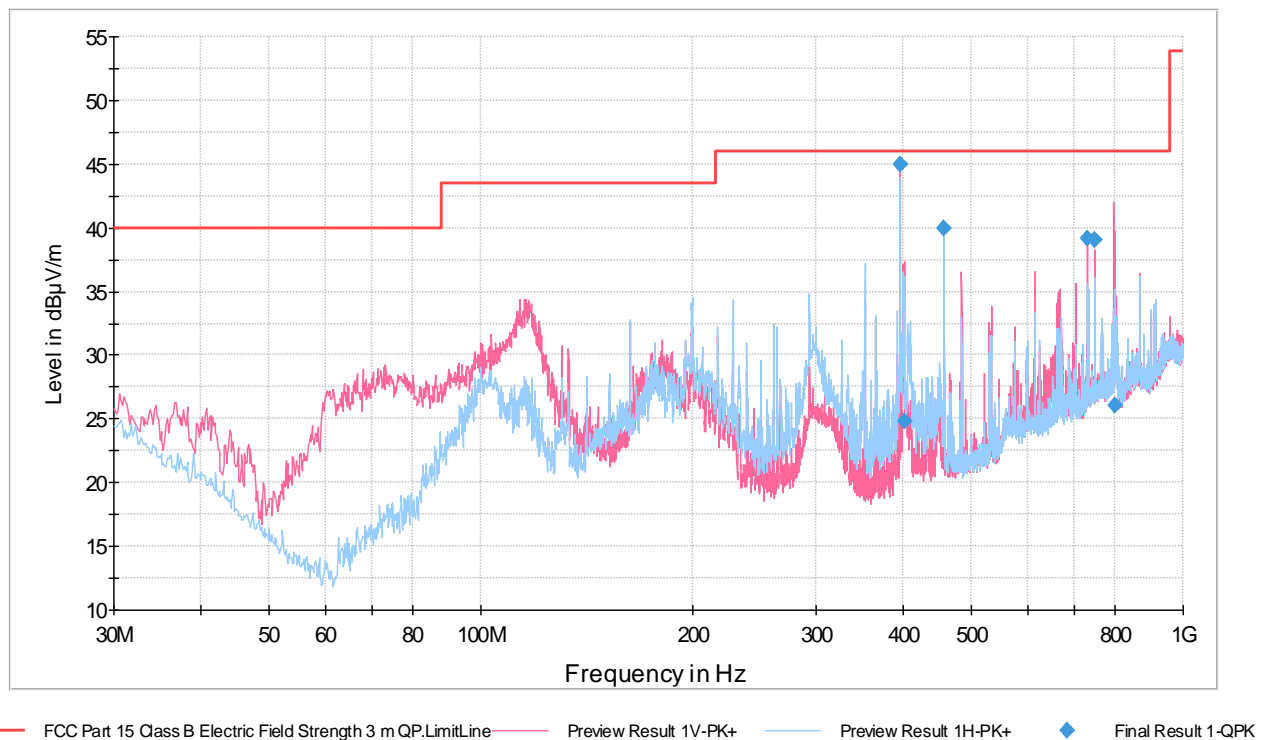


Figure 41. Measured curve with peak-detector.

Final measurements from the worst frequencies

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
395.995000	45.0	1000.0	120.000	125.0	V	354.0	-5.3	1.0	46.0	
400.175000	24.8	1000.0	120.000	252.0	V	13.0	-5.1	21.2	46.0	
456.765000	39.9	1000.0	120.000	211.0	H	125.0	-4.2	6.1	46.0	
729.015000	39.2	1000.0	120.000	100.0	V	25.0	1.5	6.8	46.0	
747.995000	39.0	1000.0	120.000	175.0	V	349.0	2.1	7.0	46.0	
797.725000	26.1	1000.0	120.000	100.0	V	354.0	2.4	19.9	46.0	

Table 31. Final results.

Measured Peak Values In The Frequency Range 1 000 MHz – 18 000 MHz.

Copy of Radiated Emission FCC Part 15 Class B 1-18GHz 3m

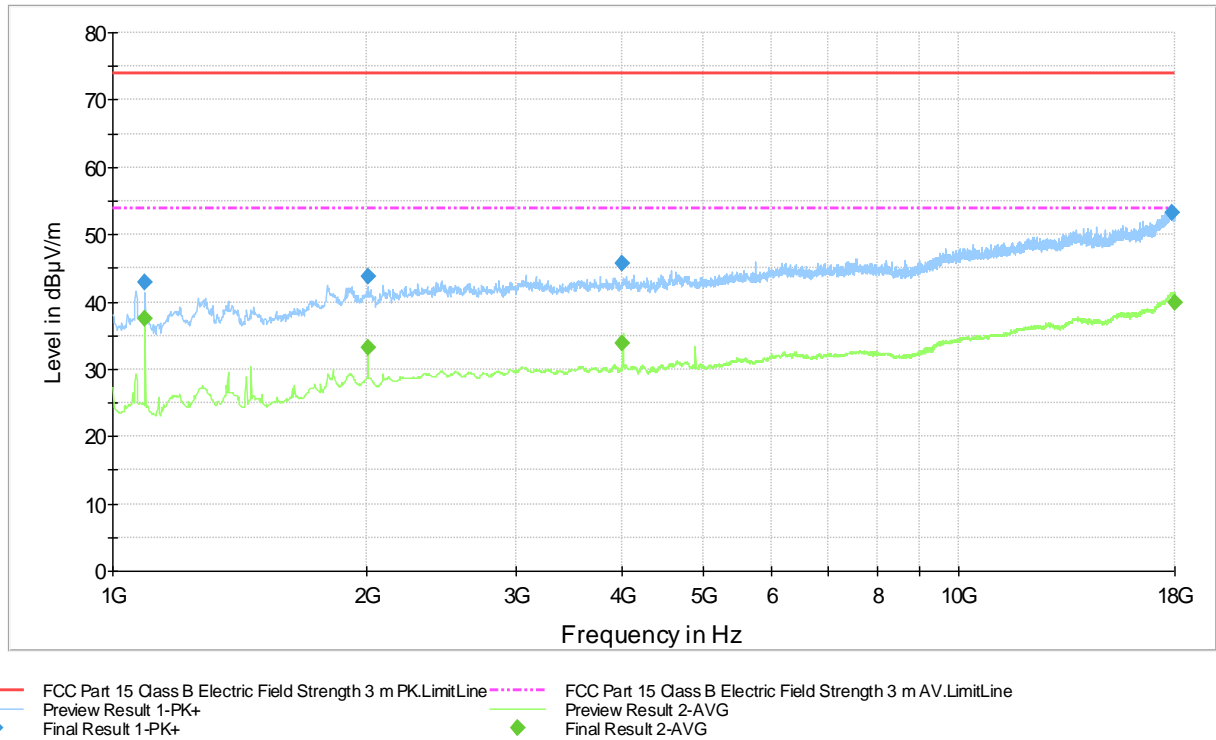


Figure 42. Measured curve with peak-and average detector.

Final measurements from the worst frequencies

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
1093.350000	42.9	1000.0	1000.000	252.0	V	138.0	-4.8	31.0	73.9	
2004.150000	43.8	1000.0	1000.000	100.0	V	356.0	2.5	30.1	73.9	
4008.150000	45.7	1000.0	1000.000	125.0	V	141.0	8.1	28.2	73.9	
17855.850000	53.3	1000.0	1000.000	105.0	V	14.0	25.1	20.6	73.9	

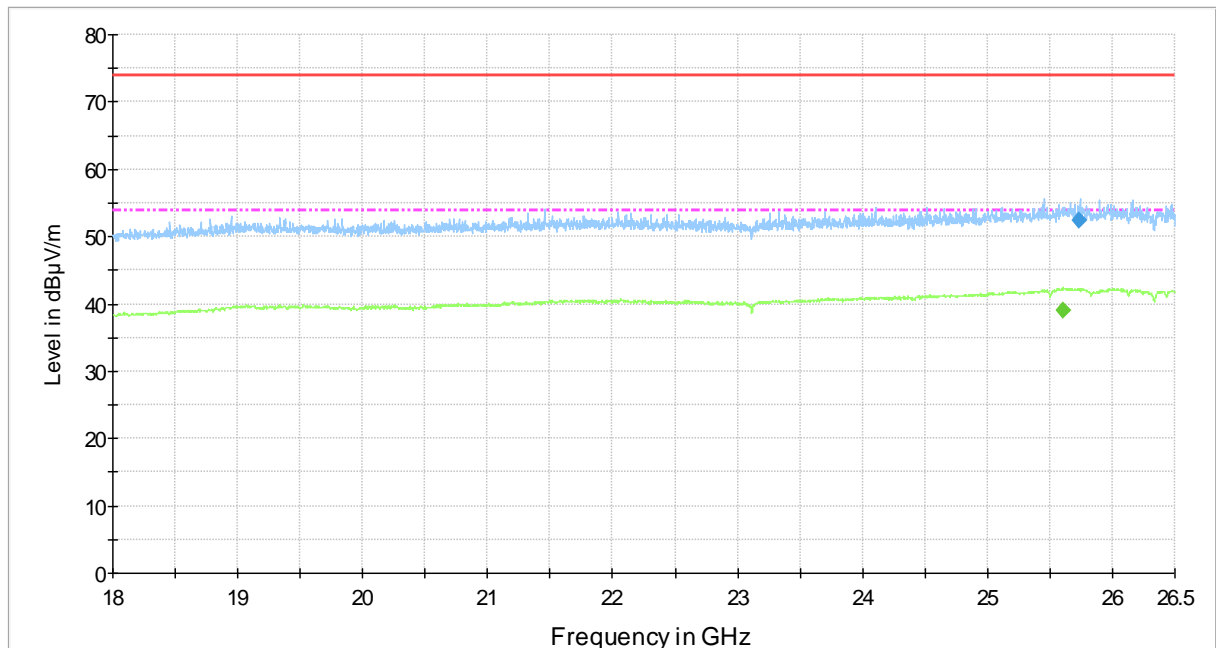
Table 32. Final MaxPeak results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
1093.550000	37.6	1000.0	1000.000	231.0	V	142.0	-4.8	16.3	53.9	
2004.150000	33.2	1000.0	1000.000	100.0	V	350.0	2.5	20.7	53.9	
4008.350000	33.8	1000.0	1000.000	200.0	V	136.0	8.1	20.1	53.9	
17983.550000	39.9	1000.0	1000.000	100.0	V	31.0	25.2	14.0	53.9	

Table 33. Final Average results.

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

Copy of Radiated Emission FCC Part 15 Class B 18-26.5GHz at 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 1-PK+ ◆ Final Result 2-AVG

Figure 43. Measured curve with peak-and average detector.

Final measurements from the worst frequencies

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
25738.250000	52.5	1000.0	1000.000	141.0	V	11.0	28.0	21.4	73.9	

Table 34. Final MaxPeak results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
25610.450000	39.0	1000.0	1000.000	100.0	V	1.0	27.8	14.9	53.9	

Table 35. Final Average results.

Conducted emissions

Standard: ANSI C63.10 (2009)
Tested by: JJM
Date: 29.6.2011
Humidity: 49 %
Temperature: 24 °C
Measurement uncertainty ± 2,87 dB Level of confidence 95 % (k = 2)

FCC Rule: 15.207

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

During the test the EUT was powered from the separate AC / DC power supply which was connected to the LISN. The supply voltage through the LISN to the power supply was 115 VAC / 60 Hz.

Test results

FCC Part 15 Class B Voltage on Mains 2-Line-LISN

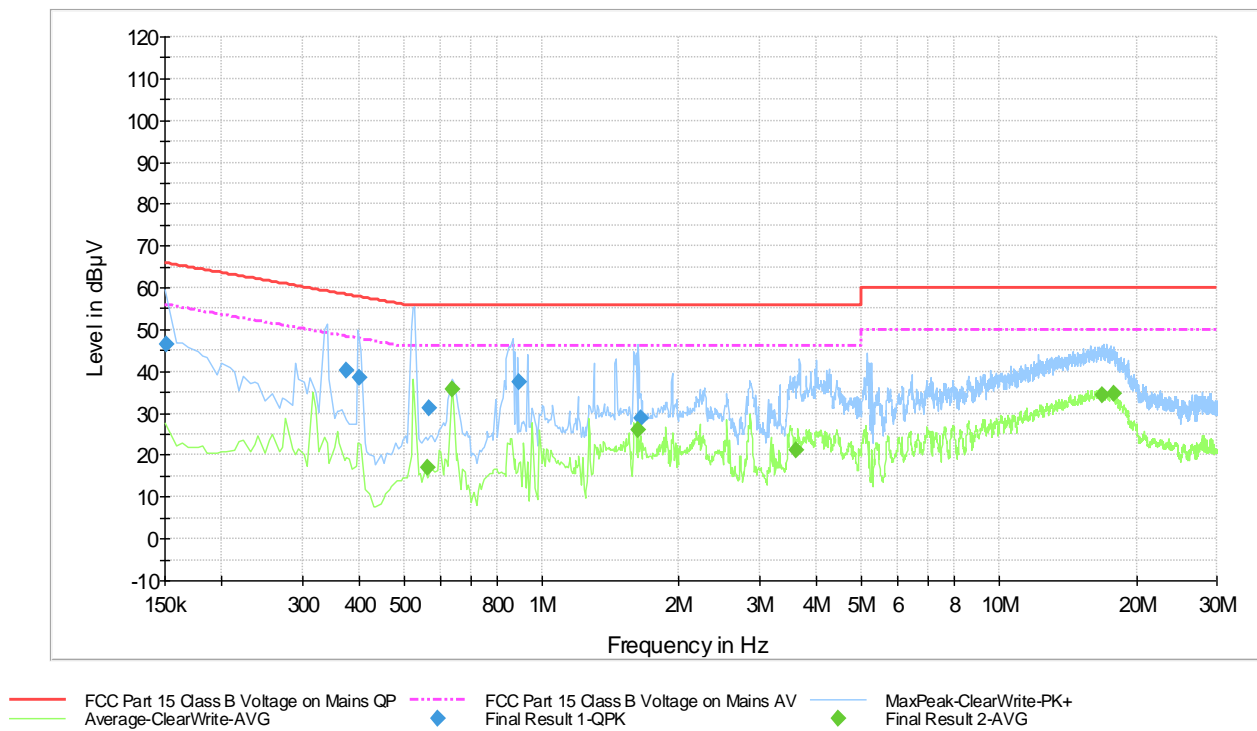


Figure 44. The measured curves with peak- and average-detectors

Final measurements from the worst frequencies

Frequency (MHz)	QuasiPeak (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)	Comment
0.151501	46.5	15000.0	9.000	GN	N	10.1	19.4	65.9	
0.373501	40.3	15000.0	9.000	GN	L1	10.2	18.1	58.4	
0.400501	38.5	15000.0	9.000	GN	L1	10.2	19.3	57.8	
0.567001	31.2	15000.0	9.000	GN	N	10.1	24.8	56.0	
0.894001	37.6	15000.0	9.000	GN	N	10.2	18.4	56.0	
1.654501	28.9	15000.0	9.000	GN	N	10.3	27.1	56.0	

Table 36. Final quasi-peak measurements from the worst frequencies

Frequency (MHz)	Average (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)	Comment
0.564001	16.9	15000.0	9.000	GN	N	10.1	29.1	46.0	
0.636001	35.9	15000.0	9.000	GN	N	10.2	10.1	46.0	
1.624501	26.1	15000.0	9.000	GN	N	10.2	19.9	46.0	
3.595501	21.1	15000.0	9.000	GN	N	10.4	24.9	46.0	
16.816501	34.4	15000.0	9.000	GN	L1	11.4	15.6	50.0	
17.896501	34.8	15000.0	9.000	GN	L1	11.4	15.2	50.0	

Table 37. Final average measurements from the worst frequencies

The correction factor in the final result tables contains the sum of the transducers (cables + transient limiter + LISN).

The QuasiPeak and Average values are the measured values corrected with the correction factor.

List of test equipments

Manufacturer	Type	Serial no	Inv. no
ROHDE & SCHWARZ			
EMI Test receiver	ESCI 3	100885	8264
EMI Test receiver	ESU 26	100185	8453
Test software	EMC32	Ver. 8.30.0	-
LISN	ESH2-Z5		4126
Transient limiter	ESH3-Z2		
DAVIS			
Weather station	Vantage Pro	-	5297
EMCO			
Antenna (1 - 18 GHz)	3117	29617	7293
CHASE			
Antenna (30 MHz - 1 GHz)	6141A	4102	7895
HEWLETT- PACKARD			
Microwave amplifier	83017A	-	5226
HUBER-+ SUHNER			
Attenuator 10dB	6810.17B	-	-
DEISEL			
Antenna mast	MA 240 T	240/394/96	5017
Tilt option	KE 220	220/307/96	-
Controller	HD 100	100/413/96	5018
Turntable	DS 420	420/420/96	5015
WAINWRIGHT			
High Pass Filter	WHKX	10	8267