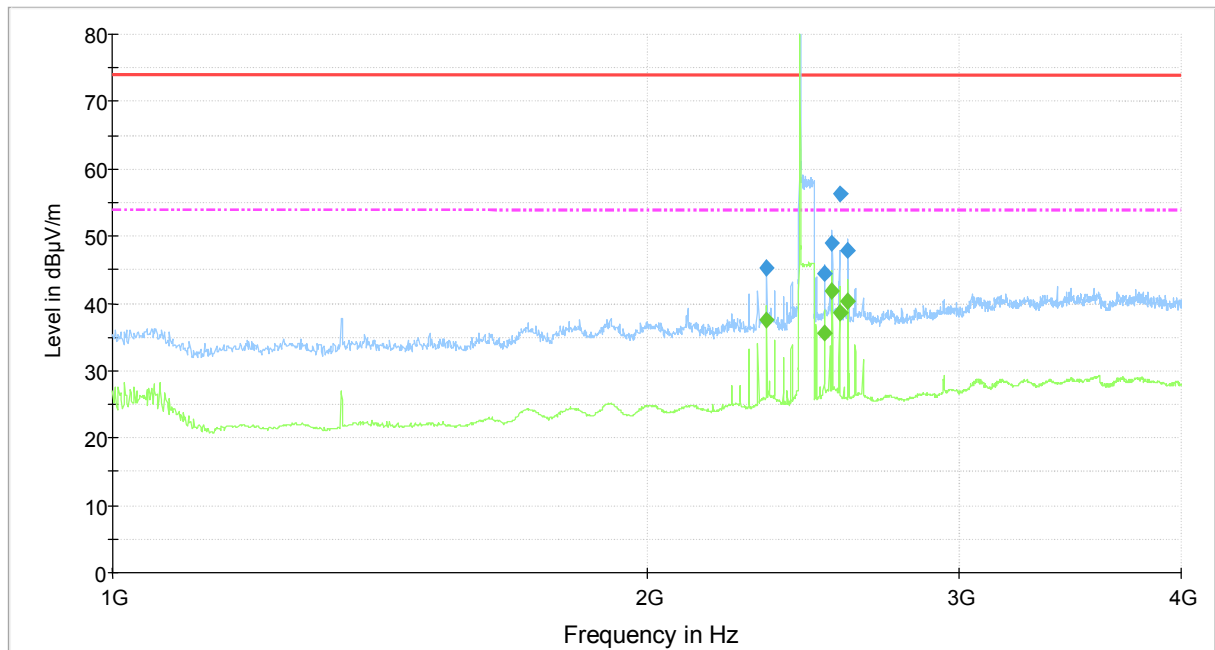


FCC Part 15 Class B Spurious Emission 1-4GHz 3m (optimized 2.4 GHz TX)



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

**Figure 24.** Measured curve with peak- and average detector. Channel MID.

**Final measurements from the worst frequencies**

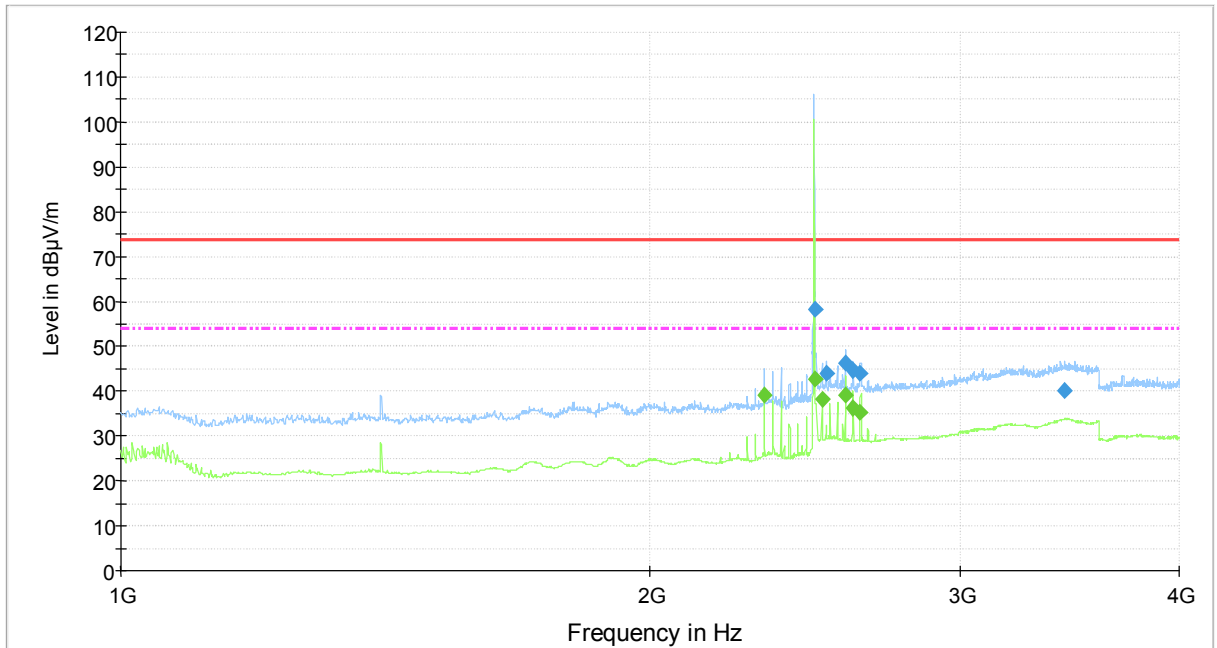
**Table 23.** Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2336.225000	45.3	1000.0	1000.000	184.0	V	10.0	0.3	28.6	73.9	
2439.750000	105.1	1000.0	1000.000	114.0	V	321.0	0.6	-	-	Carrier
2517.875000	44.4	1000.0	1000.000	100.0	V	-4.0	1.2	29.5	73.9	
2543.725000	49.0	1000.0	1000.000	100.0	V	300.0	1.3	24.9	73.9	
2569.575000	56.3	1000.0	1000.000	114.0	V	325.0	1.4	17.6	73.9	
2595.775000	47.8	1000.0	1000.000	100.0	V	217.0	1.5	26.1	73.9	

**Table 24.** Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2335.825000	37.5	1000.0	1000.000	155.0	V	3.0	0.3	16.4	53.9	
2440.000000	99.8	1000.0	1000.000	114.0	V	320.0	0.6	-	-	Carrier
2518.075000	35.6	1000.0	1000.000	130.0	V	236.0	1.2	18.3	53.9	
2543.925000	41.8	1000.0	1000.000	105.0	V	242.0	1.3	12.1	53.9	
2570.175000	38.6	1000.0	1000.000	100.0	V	300.0	1.4	15.3	53.9	
2596.025000	40.2	1000.0	1000.000	100.0	V	354.0	1.5	13.7	53.9	

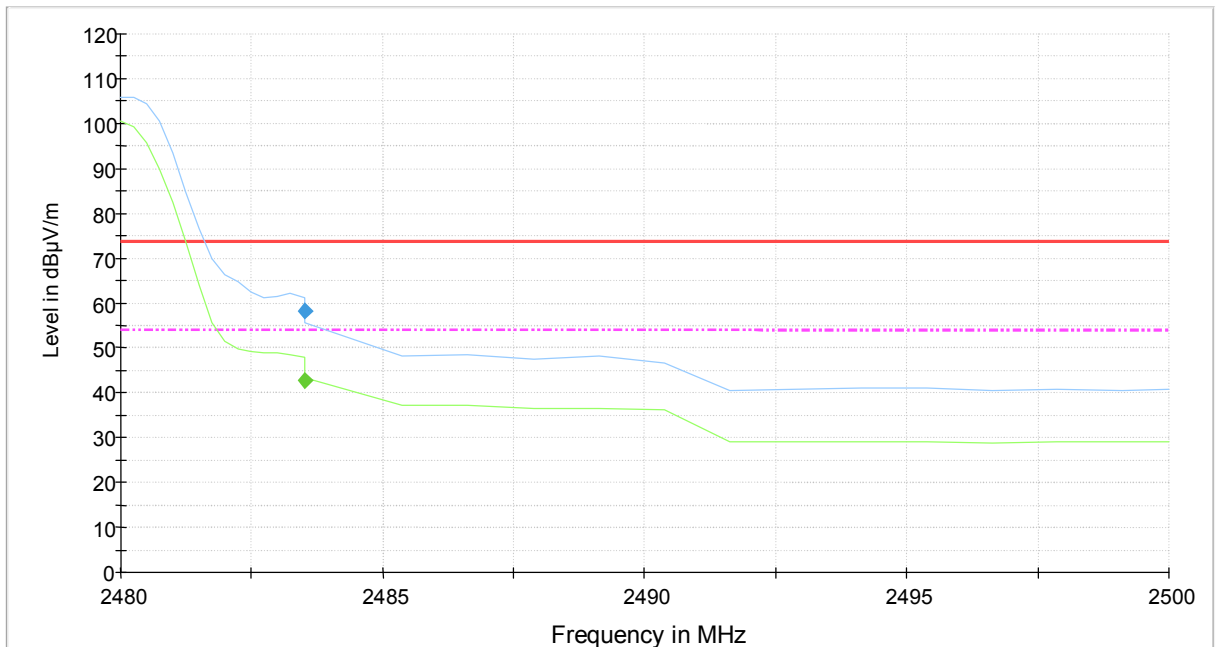
FCC Part 15 Class B Spurious Emission 1-4GHz 3m (optimized 2.4 GHz TX)



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

**Figure 25.** Measured curve with peak- and average detector. Channel HIGH.

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



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

**Figure 26.** High channel band edge.

**Final measurements from the worst frequencies**

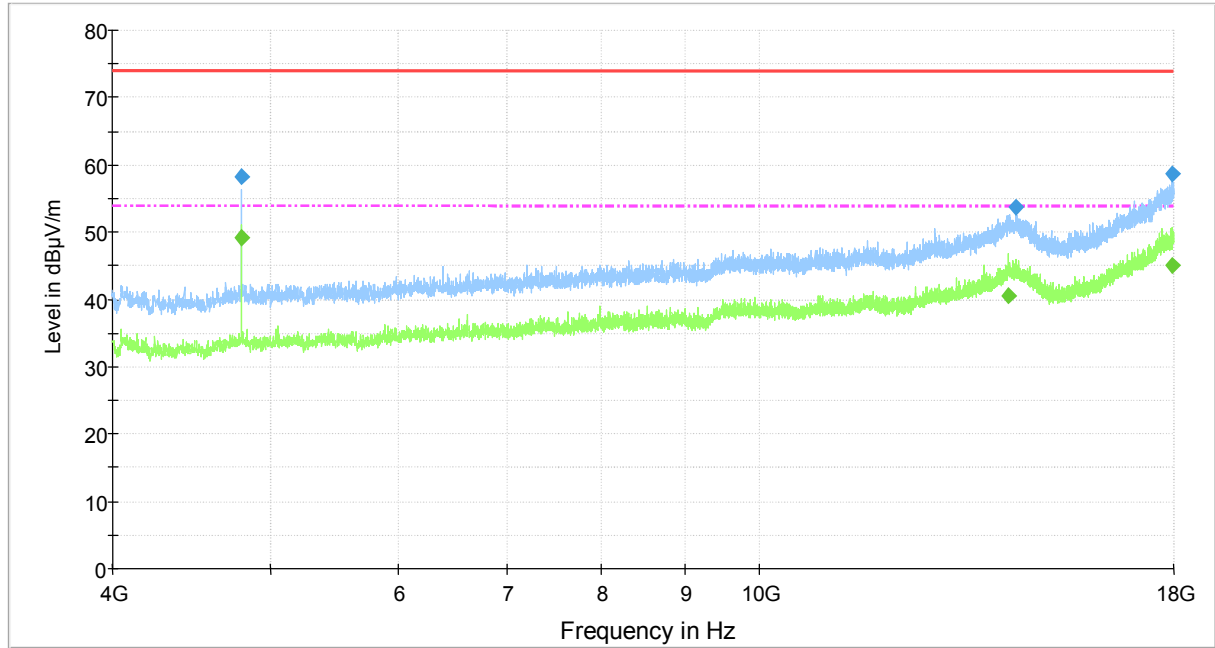
**Table 25.** Final Max Peak results.

Frequency (MHz)	MaxPeak (dB $\mu$ V/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)	Comment
2483.500000	58.1	1000.0	1000.000	114.0	V	344.0	1.0	15.8	73.9	
2519.975000	44.0	1000.0	1000.000	100.0	V	9.0	1.2	29.9	73.9	
2583.725000	46.3	1000.0	1000.000	100.0	V	320.0	1.5	27.6	73.9	
2610.175000	44.6	1000.0	1000.000	187.0	V	224.0	1.5	29.3	73.9	
2636.225000	44.1	1000.0	1000.000	100.0	V	26.0	1.4	29.8	73.9	
3444.675000	40.1	1000.0	1000.000	235.0	V	235.0	4.7	33.8	73.9	

**Table 26.** Final Average results.

Frequency (MHz)	Average (dB $\mu$ V/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)	Comment
2323.975000	39.1	1000.0	1000.000	131.0	V	32.0	0.2	14.8	53.9	
2483.500000	42.6	1000.0	1000.000	115.0	V	32.0	1.0	11.3	53.9	
2506.025000	38.2	1000.0	1000.000	139.0	V	236.0	1.2	15.7	53.9	
2583.925000	39.1	1000.0	1000.000	100.0	V	7.0	1.5	14.8	53.9	
2609.975000	36.2	1000.0	1000.000	100.0	V	321.0	1.5	17.7	53.9	
2635.825000	35.3	1000.0	1000.000	100.0	V	344.0	1.4	18.6	53.9	

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

**Figure 27.** Measured curve with peak- and average detector. Channel LOW.

**Final measurements from the worst frequencies**

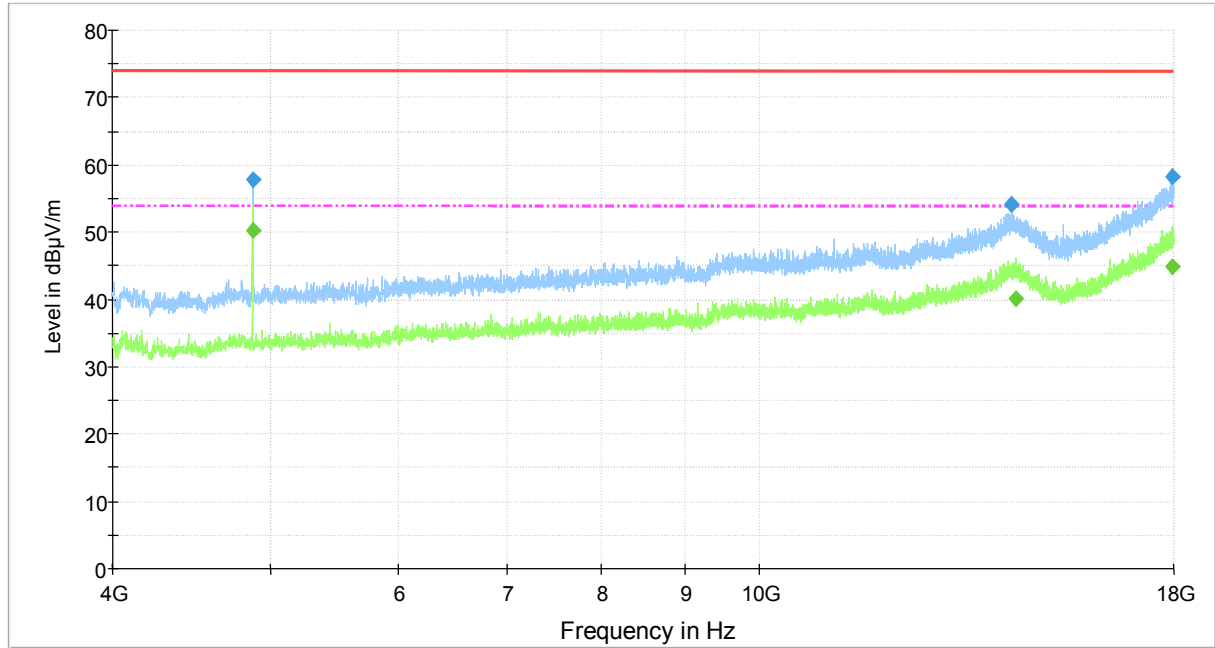
**Table 27.** Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4804.600000	58.1	1000.0	1000.000	100.0	H	17.0	9.3	15.8	73.9	
14394.000000	53.7	1000.0	1000.000	269.0	V	349.0	24.5	20.3	73.9	
17980.400000	58.6	1000.0	1000.000	179.0	V	0.0	30.5	15.3	73.9	

**Table 28.** Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4804.000000	49.2	1000.0	1000.000	100.0	H	17.0	9.3	4.7	53.9	
14239.000000	40.5	1000.0	1000.000	105.0	V	181.0	24.5	13.4	53.9	
17969.800000	45.0	1000.0	1000.000	105.0	H	94.0	30.4	8.9	53.9	

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+ — 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 28.** Measured curve with peak- and average detector. Channel MID.

**Final measurements from the worst frequencies**

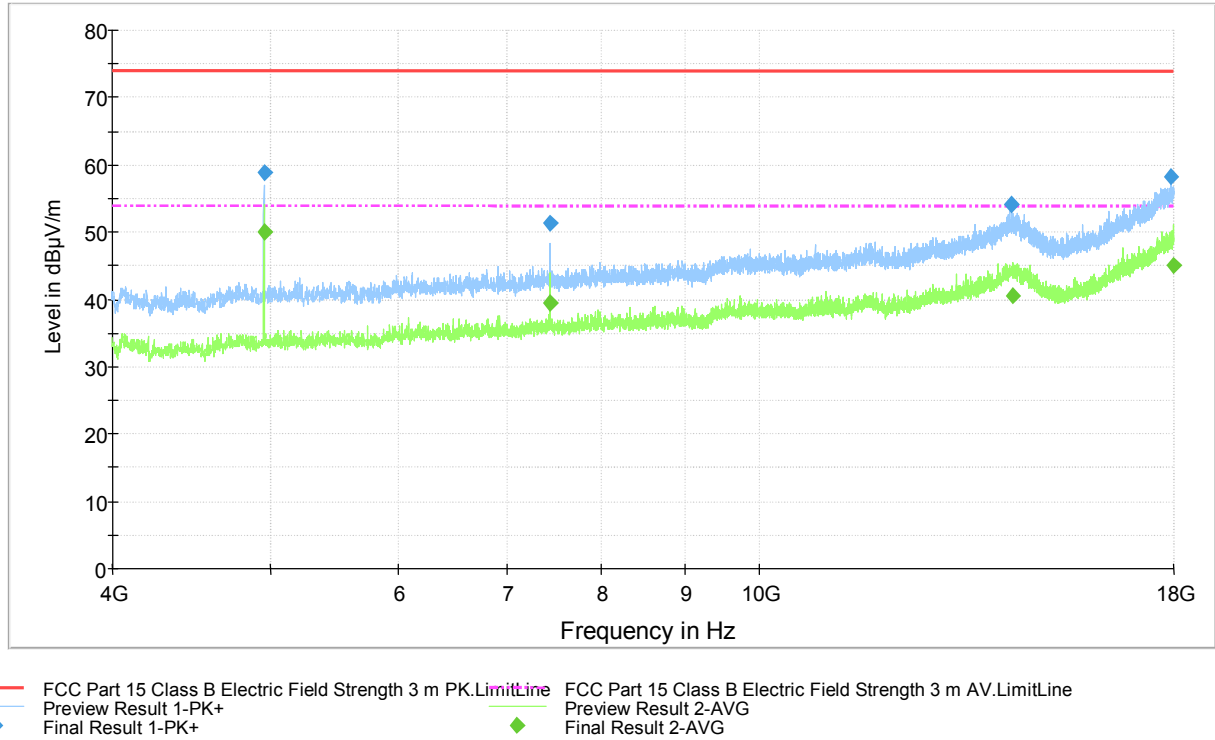
**Table 29.** Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4879.600000	57.7	1000.0	1000.000	100.0	H	27.0	9.4	16.2	73.9	
14301.000000	54.1	1000.0	1000.000	377.0	H	42.0	24.8	19.8	73.9	
17946.800000	58.2	1000.0	1000.000	315.0	H	79.0	30.3	15.7	73.9	

**Table 30.** Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4880.000000	50.3	1000.0	1000.000	114.0	H	34.0	9.4	3.6	53.9	
14391.400000	40.0	1000.0	1000.000	105.0	H	34.0	24.5	13.9	53.9	
17969.600000	44.9	1000.0	1000.000	227.0	V	122.0	30.4	9.0	53.9	

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



**Figure 29.** Measured curve with peak- and average detector. Channel HIGH.

### Final measurements from the worst frequencies

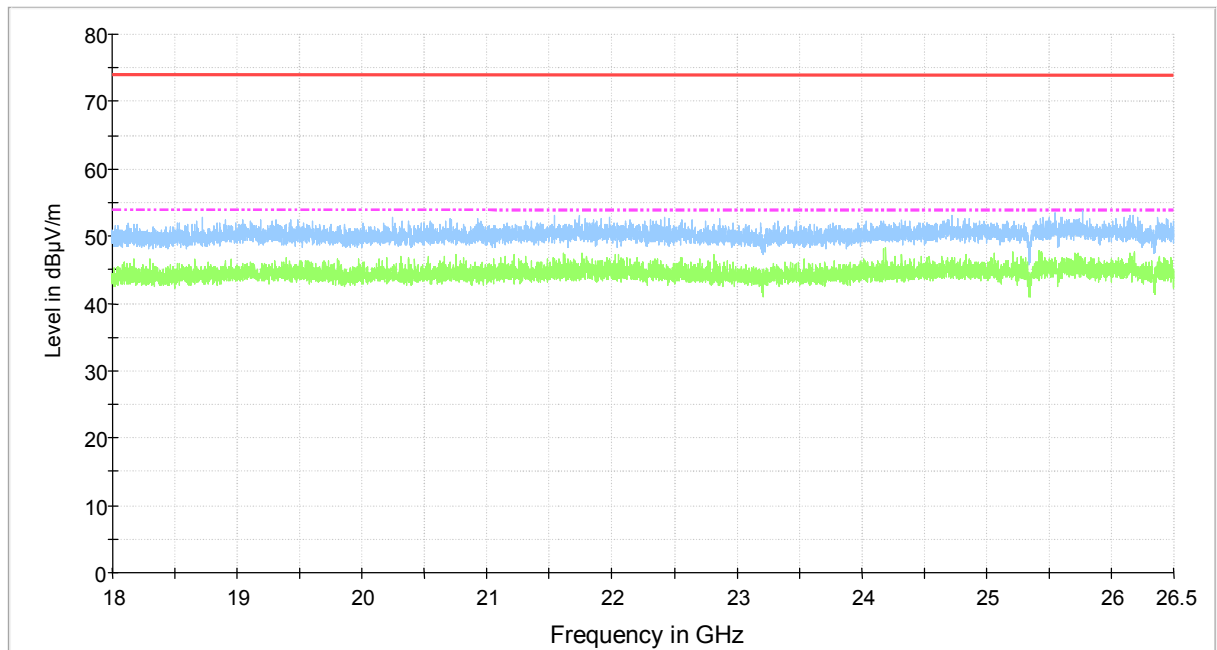
**Table 31.** Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4960.000000	58.8	1000.0	1000.000	114.0	H	329.0	9.5	15.1	73.9	
7439.200000	51.4	1000.0	1000.000	100.0	V	240.0	13.2	22.5	73.9	
14300.400000	54.2	1000.0	1000.000	130.0	V	352.0	24.8	19.7	73.9	
17908.600000	58.3	1000.0	1000.000	254.0	H	204.0	30.3	15.6	73.9	

**Table 32.** Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4960.000000	50.0	1000.0	1000.000	114.0	H	323.0	9.5	3.9	53.9	
7439.400000	39.4	1000.0	1000.000	105.0	V	240.0	13.2	14.5	53.9	
14316.800000	40.6	1000.0	1000.000	105.0	V	103.0	24.7	13.3	53.9	
17992.800000	45.1	1000.0	1000.000	219.0	H	100.0	30.6	8.8	53.9	

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



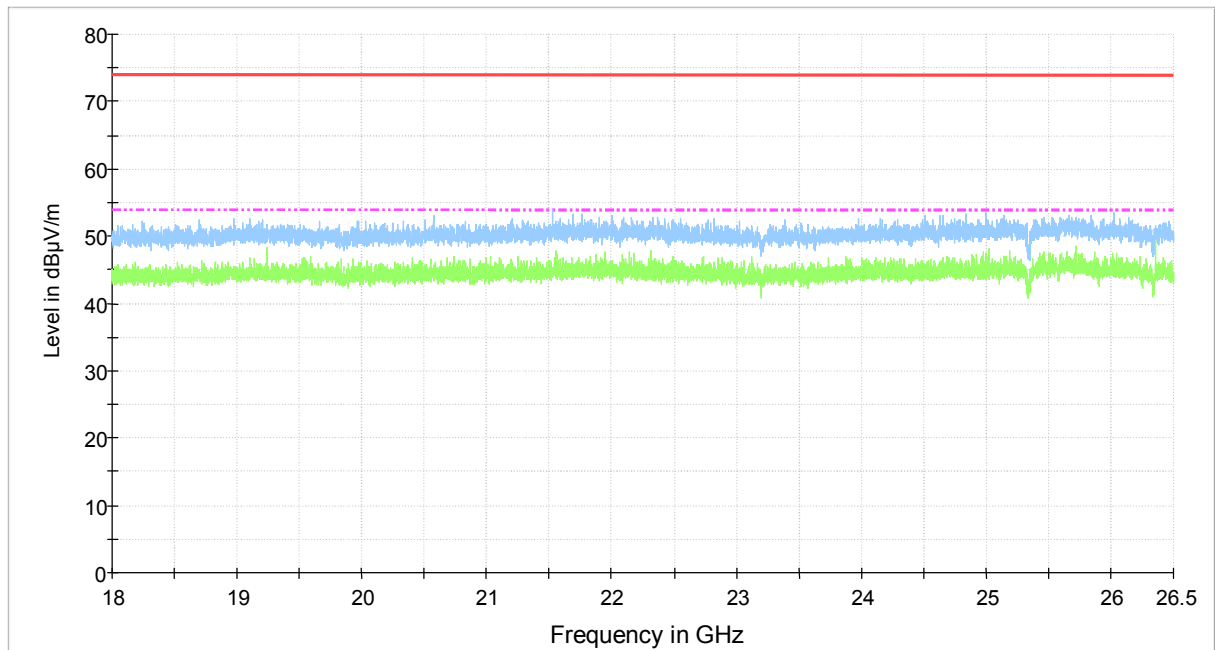
— FCC Part 15 Class B Electric Field Strength 3 m PK.LimitLine   
 - - - FCC Part 15 Class B Electric Field Strength 3 m AV.LimitLine  
— Preview Result 1-PK+   
 — Preview Result 2-AVG

**Figure 30.** Measured curve with peak- and average detector. Channel LOW.

**Final measurements from the worst frequencies**

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

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



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

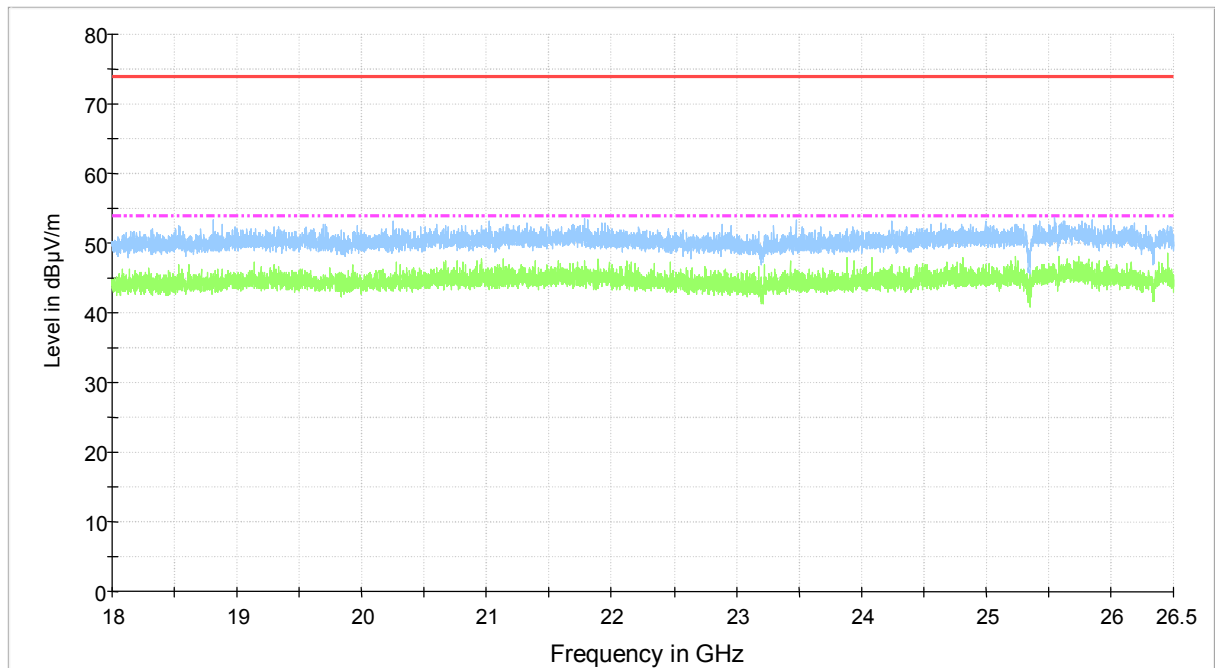
**Figure 31.** Measured curve with peak- and average detector. Channel MID.

**Final measurements from the worst frequencies**

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



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



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

**Figure 32.** 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.

**Receiver Radiated Emissions 30 MHz to 26.5 GHz**

<b>Standard:</b>	ANSI C63.10	(2009)
<b>Tested by:</b>	RRE, NKA, JJM	
<b>Date:</b>	6.2.- 24.4.2013	
<b>Temperature:</b>	18 - 20 °C	
<b>Humidity:</b>	20 - 30 % RH	
<b>Measurement uncertainty</b>	± 4.51 dB	Level of confidence 95 % (k = 2)

**FCC Rule: 15.109**

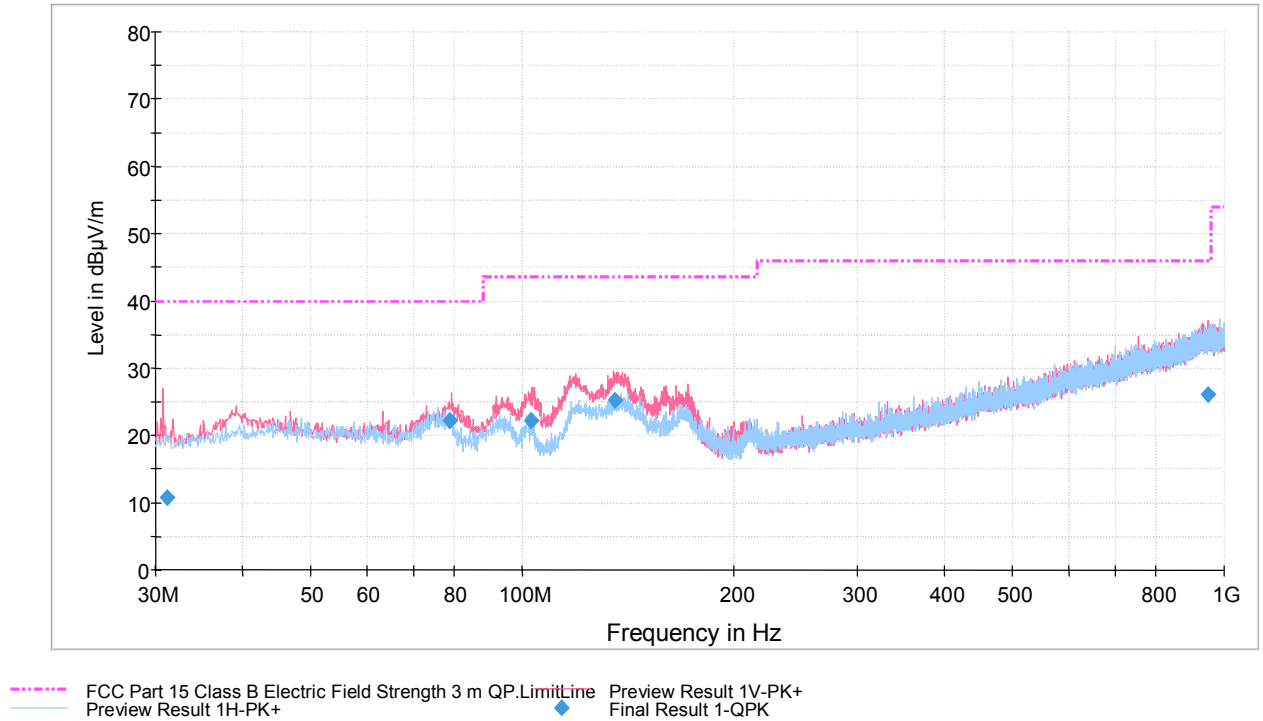
The EUT was in a receiving mode and measurement was performed on middle channel only.

The correction factor in the final result table contains the sum of the transducers (antenna + amplifier + cables).

The result value is the measured value corrected with the correction factor.

**Test results with integrated antenna**

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



**Figure 33.** Measured curve with peak-detector.

**Final measurements from the worst frequencies**

**Table 33.** Final Quasi Peak results.

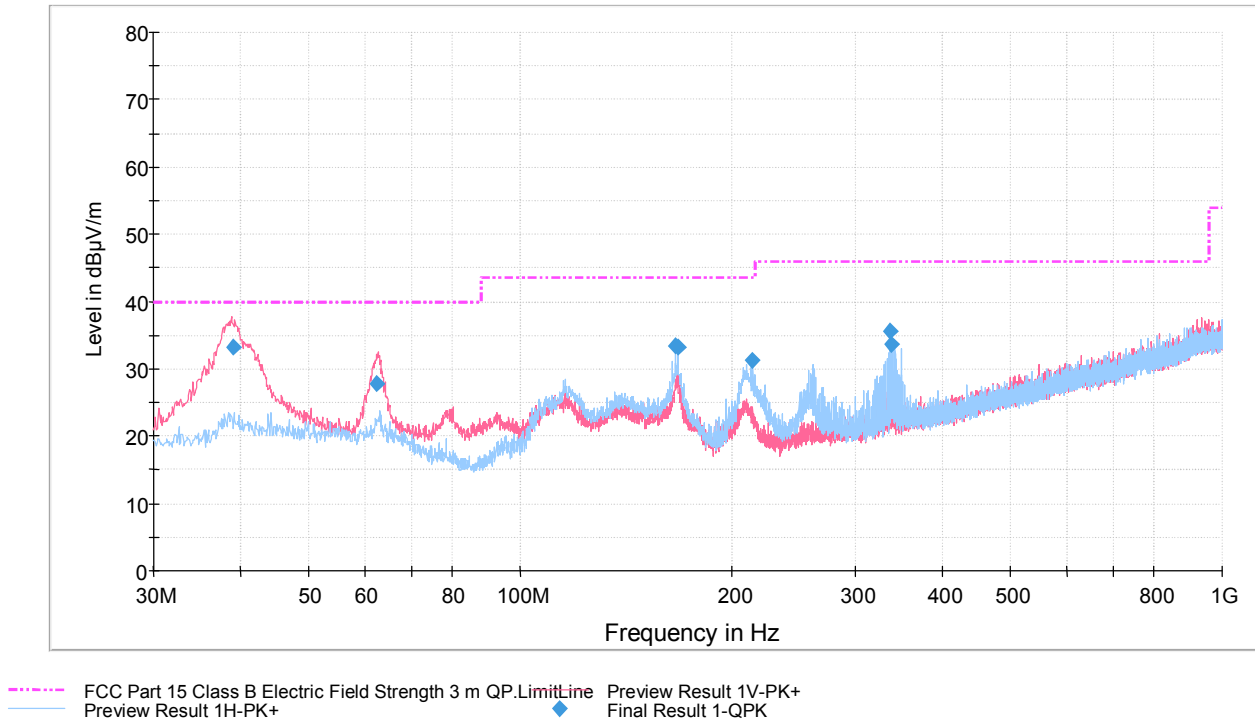
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
31.216000	10.7	1000.0	120.000	361.0	V	230.0	14.4	29.3	40.0	
78.959000	22.1	1000.0	120.000	332.0	V	204.0	11.0	17.9	40.0	
102.878000	22.2	1000.0	120.000	100.0	V	234.0	11.2	21.3	43.5	
135.431000	25.3	1000.0	120.000	100.0	V	245.0	14.5	18.2	43.5	
950.682000	26.1	1000.0	120.000	168.0	V	235.0	27.1	19.9	46.0	





**Test results with external antenna**

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

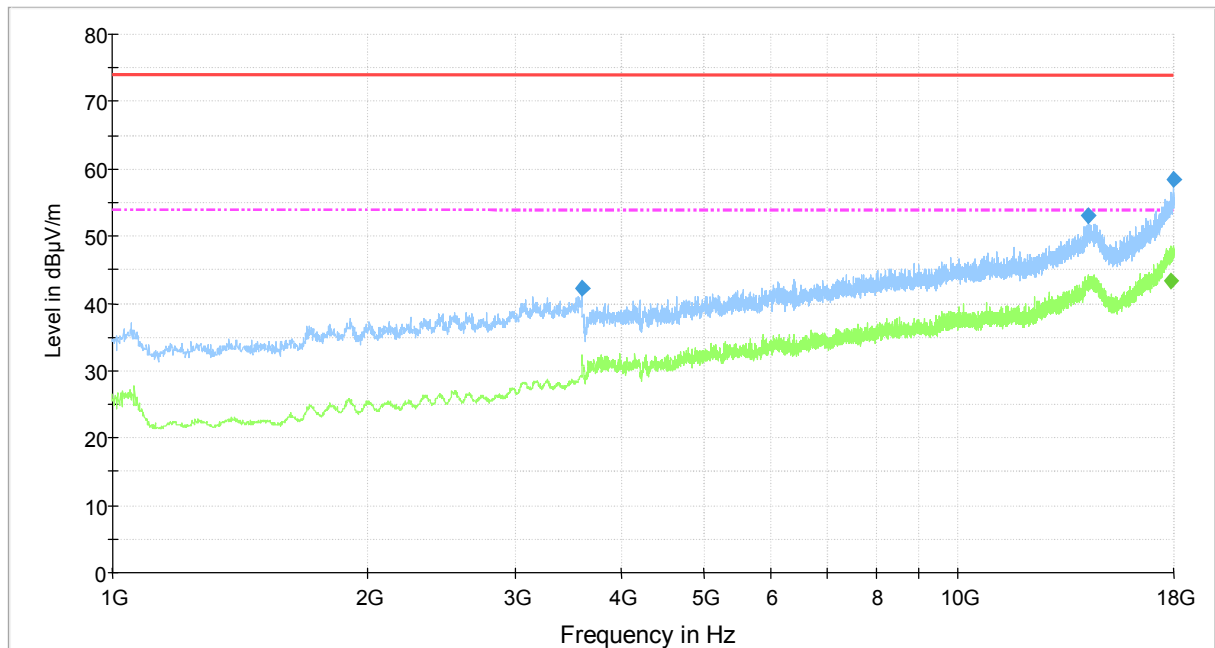


**Figure 36.** Measured curve with peak-detector.

**Table 34.** Final Quasi Peak results.

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
38.950000	33.1	1000.0	120.000	100.0	V	56.0	15.1	6.9	40.0	
62.312000	27.7	1000.0	120.000	100.0	V	298.0	14.1	12.3	40.0	
166.479000	33.3	1000.0	120.000	172.0	H	81.0	14.7	10.2	43.5	
168.014000	33.2	1000.0	120.000	166.0	H	102.0	14.6	10.3	43.5	
214.454000	31.3	1000.0	120.000	149.0	H	96.0	11.8	12.2	43.5	
335.975000	35.5	1000.0	120.000	100.0	H	149.0	16.1	10.5	46.0	
337.470000	33.6	1000.0	120.000	100.0	H	137.0	16.1	12.4	46.0	

### FCC Part 15 Class B Spurious Emission 1-18GHz 3m Rx



— 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 37.** Measured curve with peak- and average detector.

### Final measurements from the worst frequencies

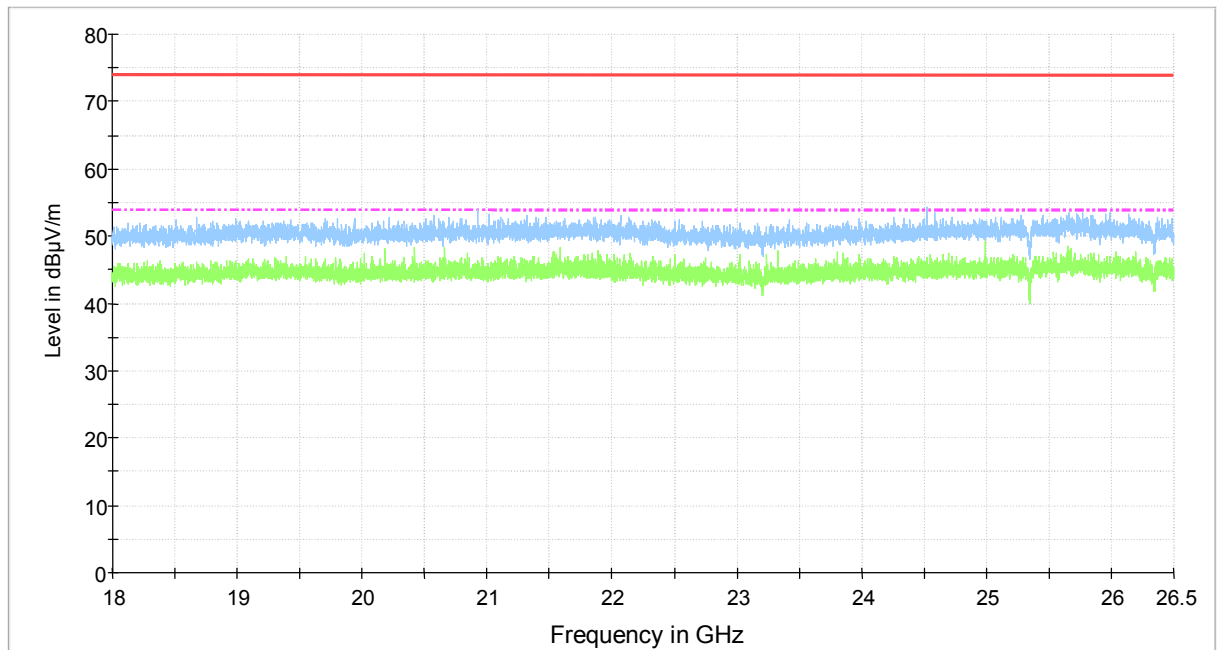
**Table 35.** Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
3587.700000	42.2	1000.0	1000.000	293.0	V	28.0	5.4	31.7	73.9	
14273.500000	53.0	1000.0	1000.000	146.0	H	112.0	23.9	20.9	73.9	
17989.800000	58.4	1000.0	1000.000	100.0	H	21.0	29.6	15.5	73.9	

**Table 36.** Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
17883.900000	43.4	1000.0	1000.000	285.0	V	343.0	29.1	10.5	53.9	

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



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

**Figure 38.** Measured curve with peak-and average detector.

**Final measurements from the worst frequencies**

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

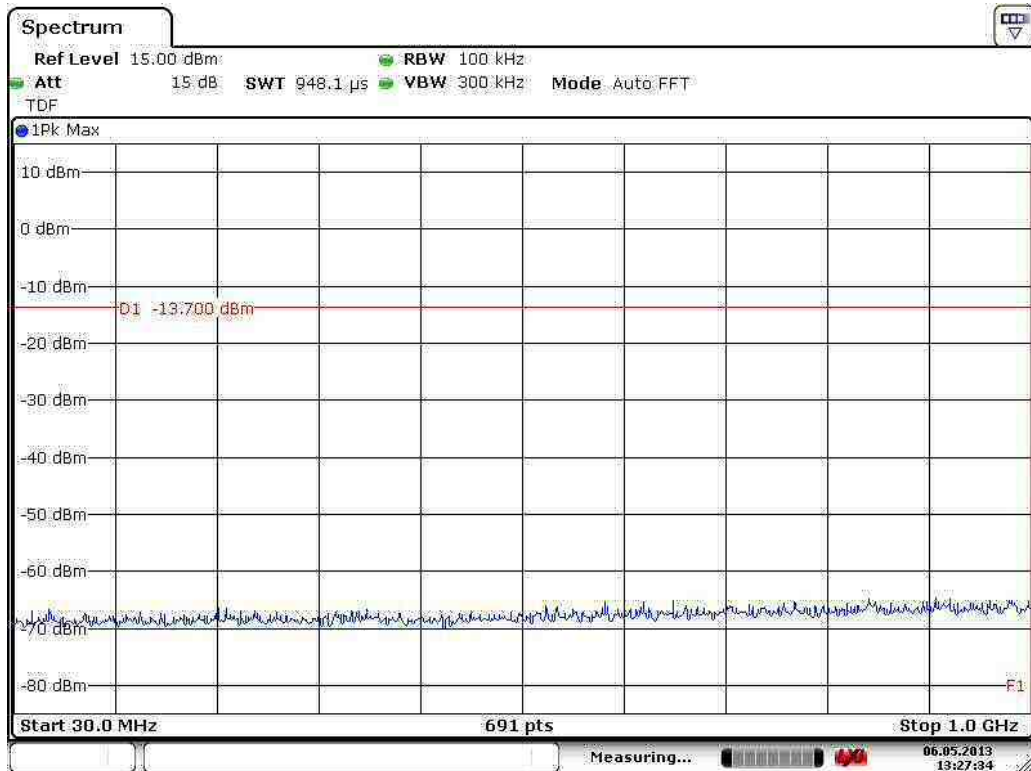


Conducted Spurious Emission 30 MHz to 26.5 GHz and Band Edge

Conducted Spurious Emissions 30 MHz to 26.5 GHz and Band Edge

Standard: ANSI C63.10 (2009)  
 Tested by: RRE  
 Date: 6.5.2013  
 Temperature: 22 °C  
 Humidity: 20 % RH

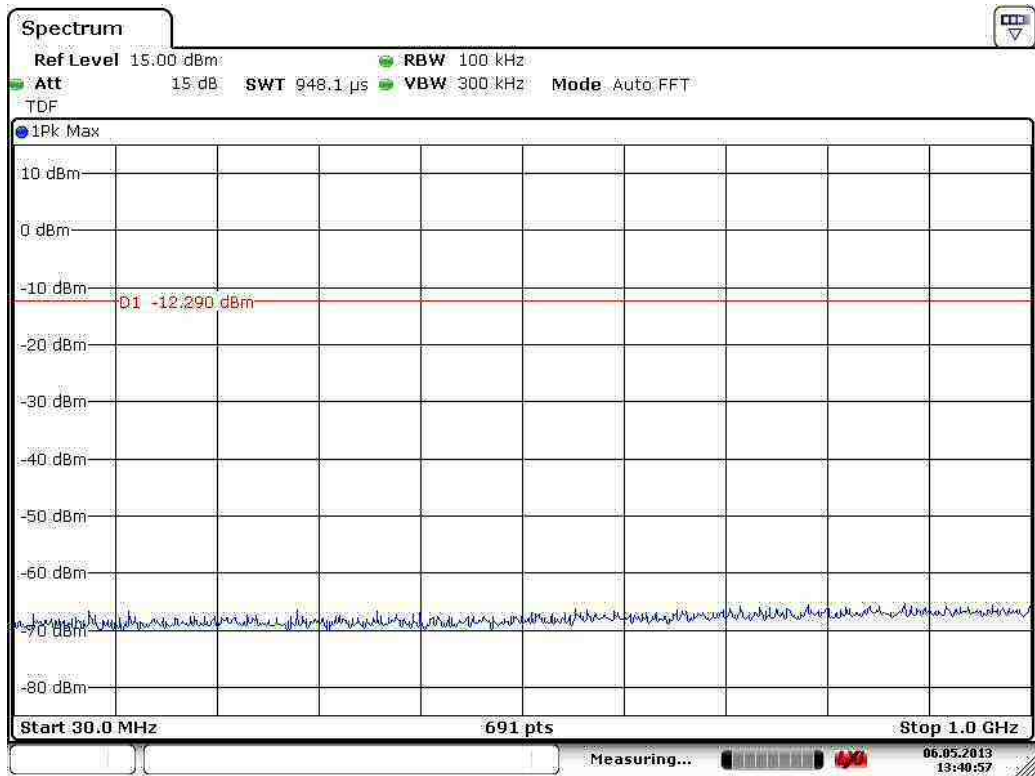
FCC Rule: 15.247 (d)



Date: 6.MAY.2013 13:27:33

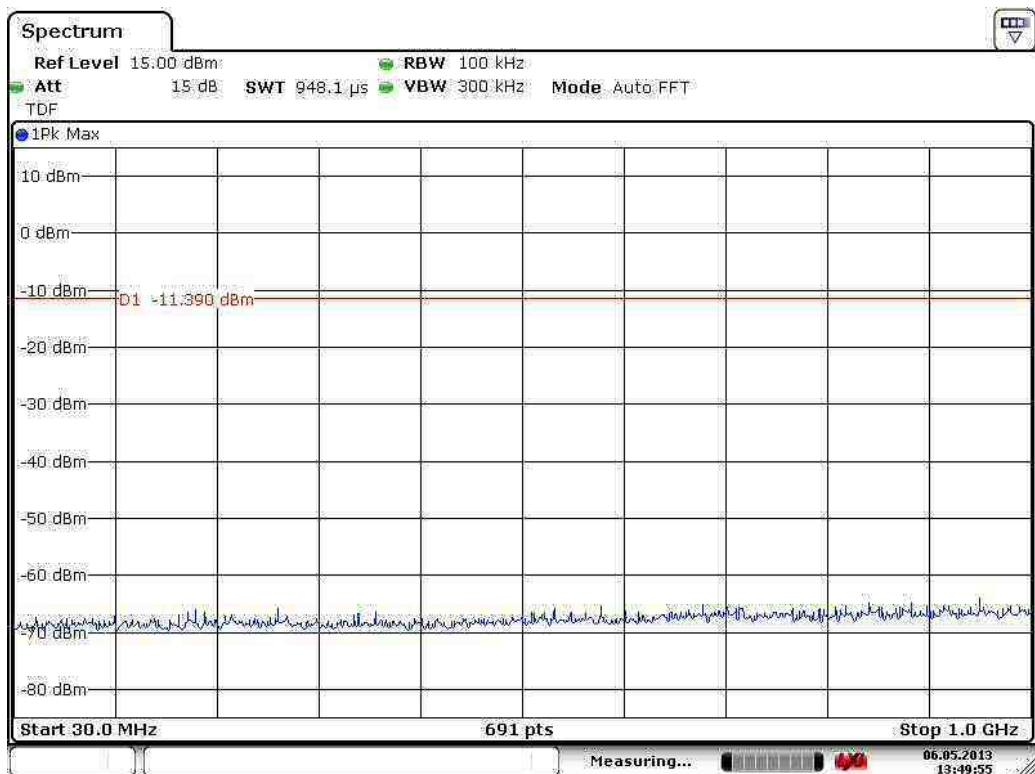
Figure 39. Low channel conductive emission 30 MHz to 1000 MHz.

## Conducted Spurious Emission 30 MHz to 26.5 GHz and Band Edge



Date: 6.MAY.2013 13:40:56

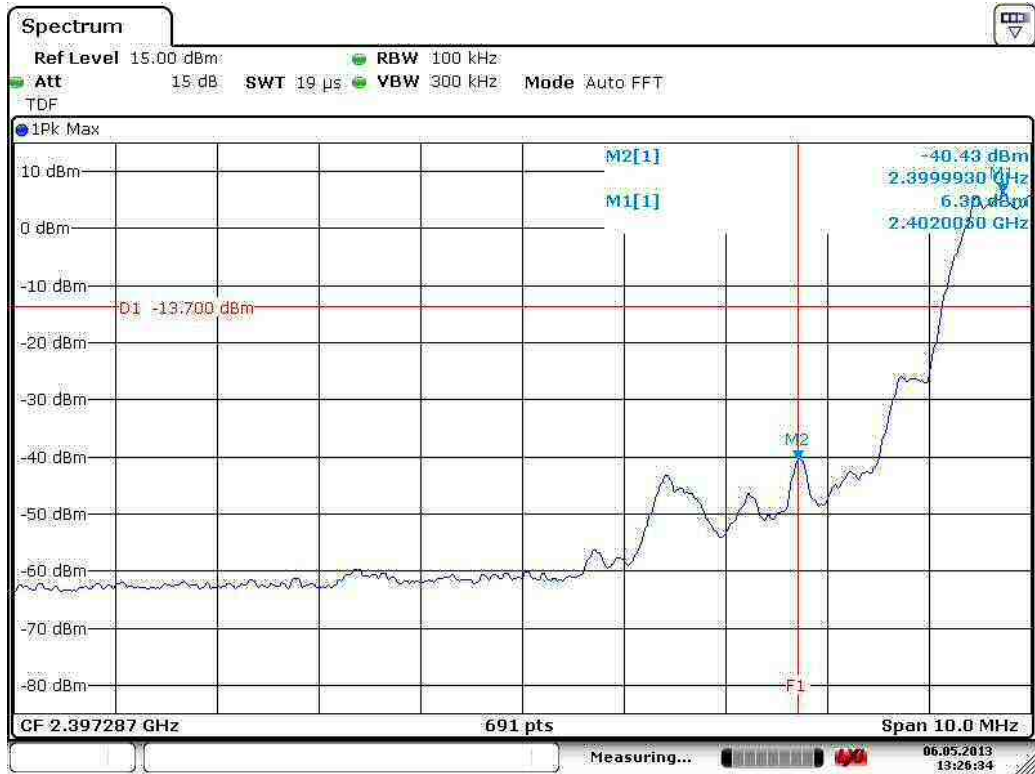
**Figure 40.** Mid channel conductive emission 30 MHz to 1000 MHz.



Date: 6.MAY.2013 13:49:54

**Figure 41.** High channel conductive emission 30 MHz to 1000 MHz.

## Conducted Spurious Emission 30 MHz to 26.5 GHz and Band Edge



Date: 6.MAY.2013 13:26:33

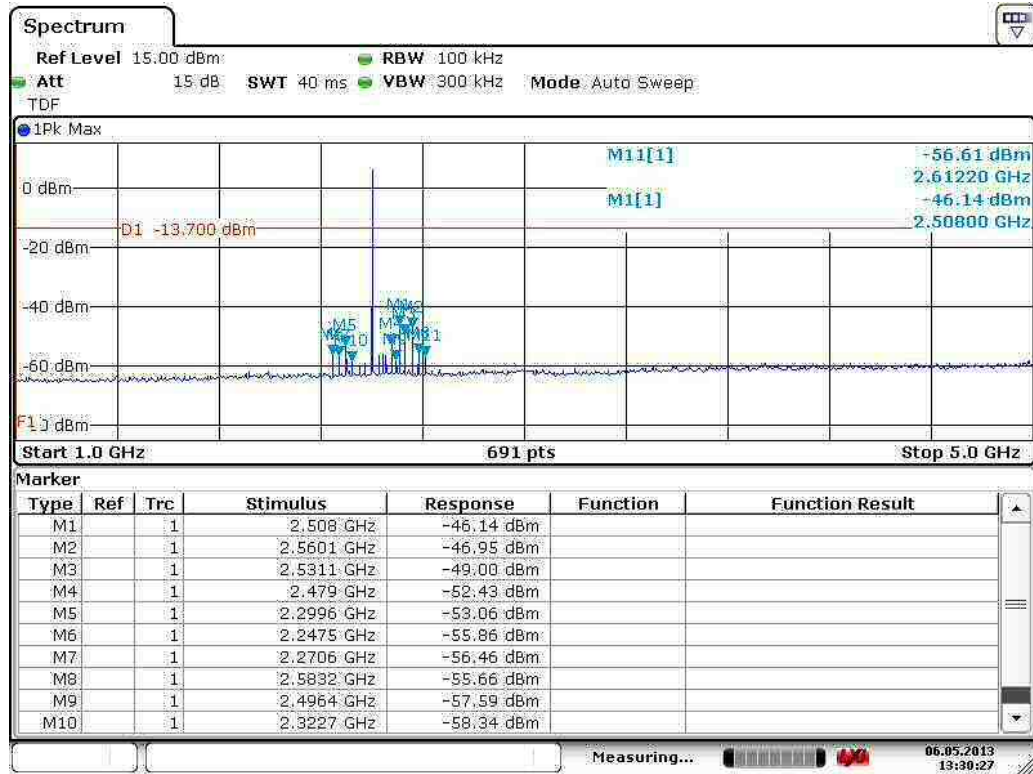
**Figure 42.** Low channel conductive emission at low band edge.



Date: 6.MAY.2013 13:43:59

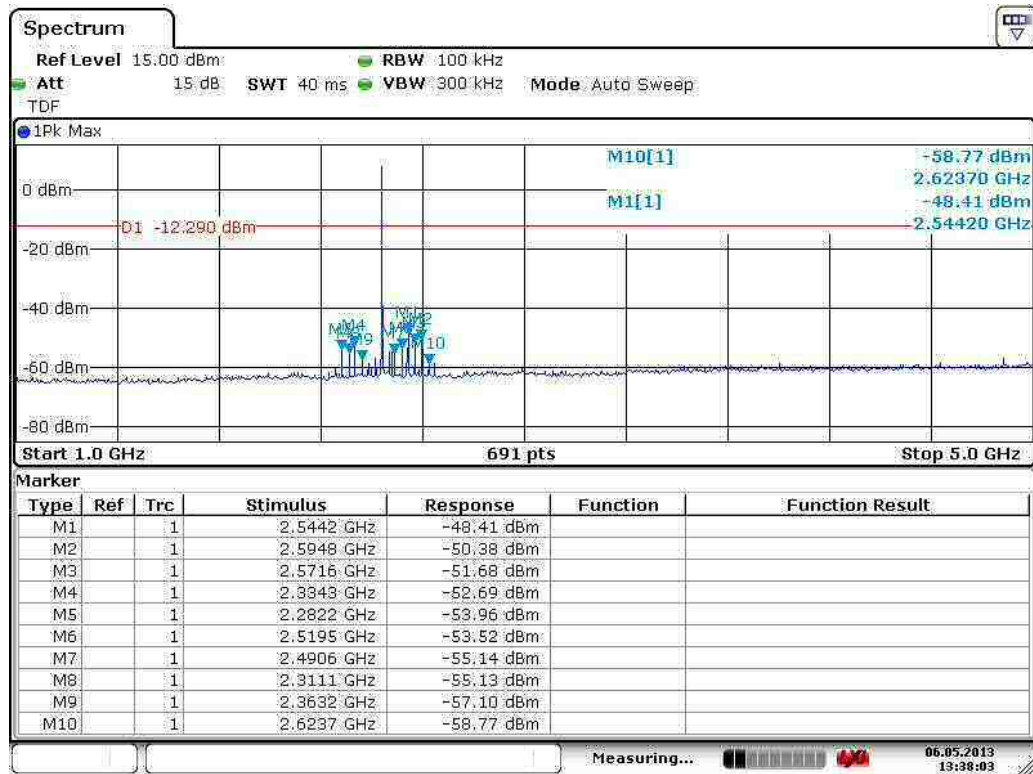
**Figure 43.** High channel conductive emission at high band edge.

## Conducted Spurious Emission 30 MHz to 26.5 GHz and Band Edge



Date: 6.MAY.2013 13:30:26

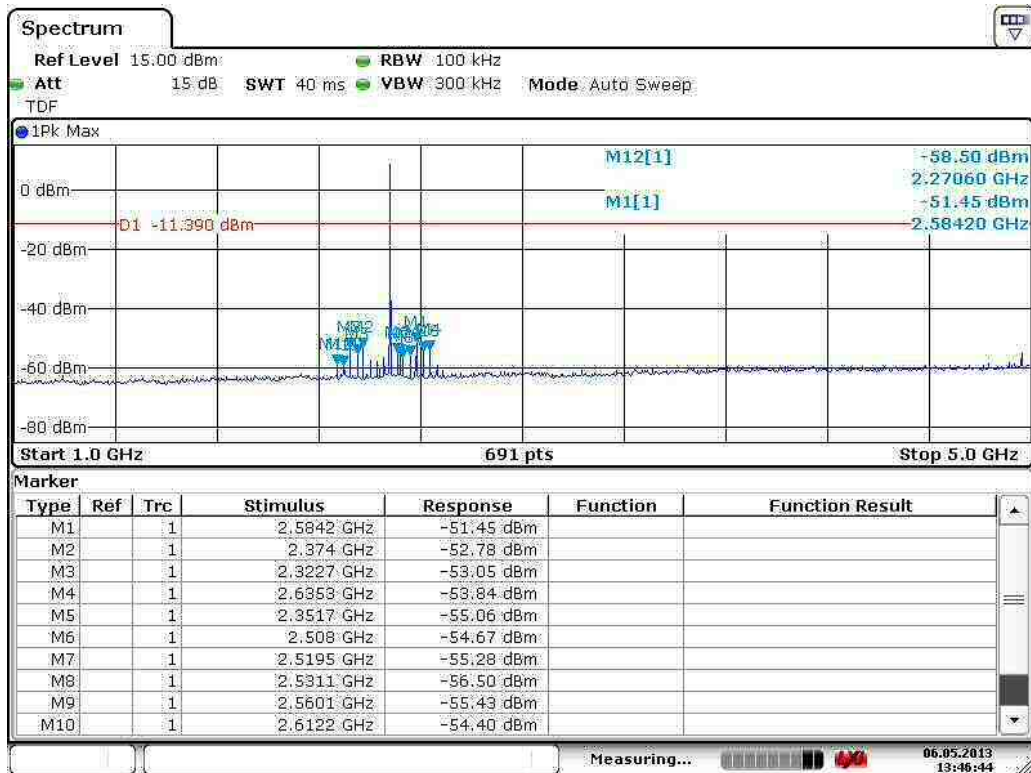
Figure 44. Low channel conductive emission 1 GHz to 5 GHz.



Date: 6.MAY.2013 13:38:02

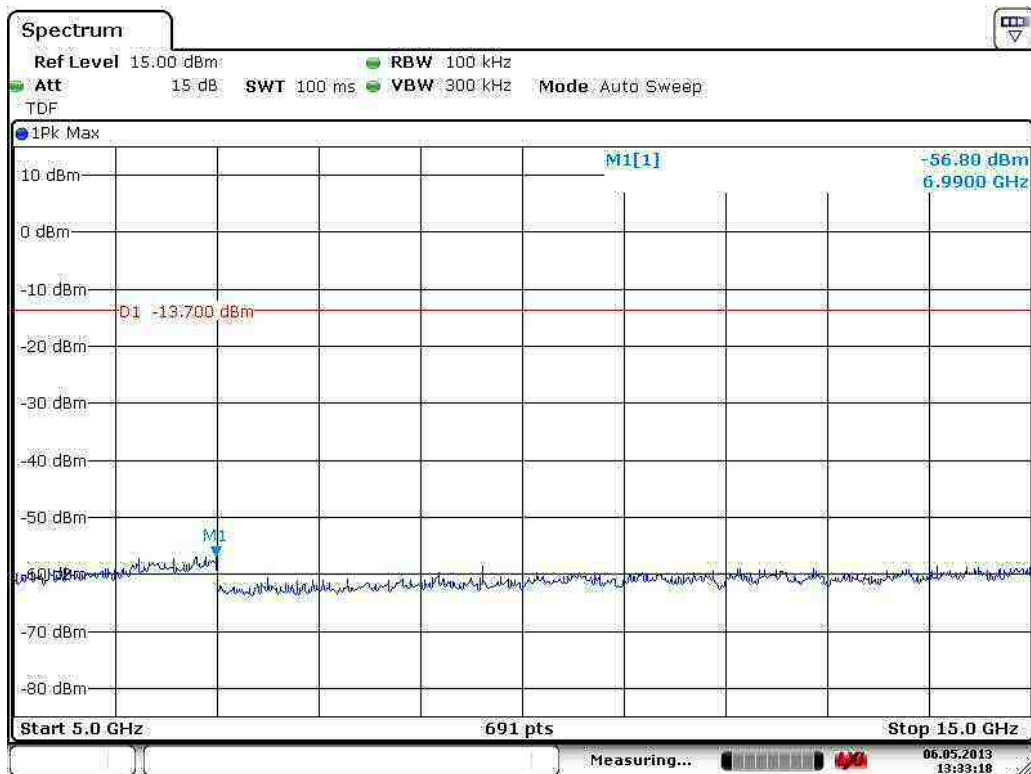
Figure 45. Mid channel conductive emission 1 GHz to 5 GHz.

## Conducted Spurious Emission 30 MHz to 26.5 GHz and Band Edge



Date: 6.MAY.2013 13:46:43

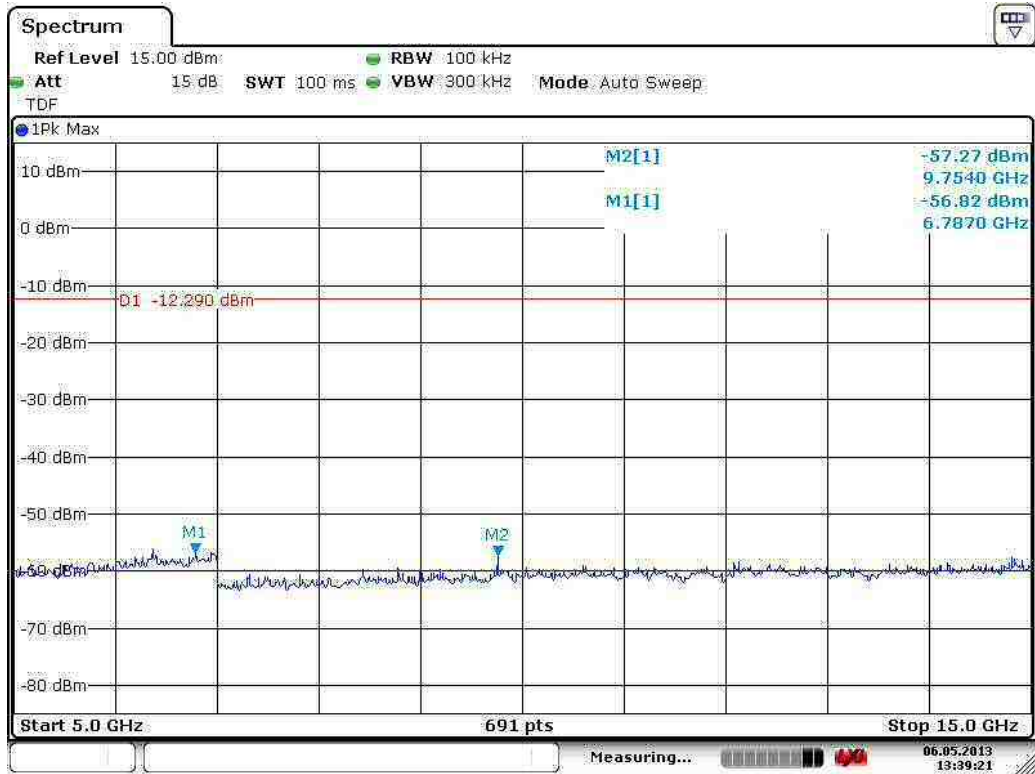
Figure 46. High channel conductive emission 1 GHz to 5 GHz.



Date: 6.MAY.2013 13:33:17

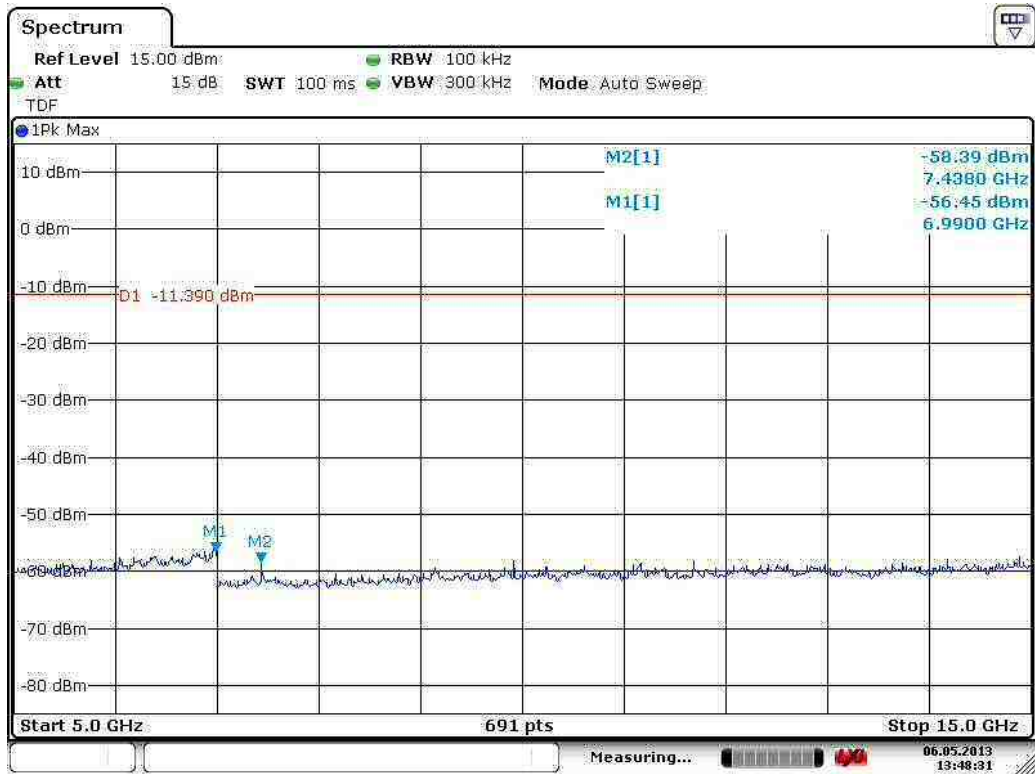
Figure 47. Low channel conductive emission 5 GHz to 15 GHz.

## Conducted Spurious Emission 30 MHz to 26.5 GHz and Band Edge



Date: 6.MAY.2013 13:39:20

**Figure 48.** Mid channel conductive emission 5 GHz to 15 GHz.

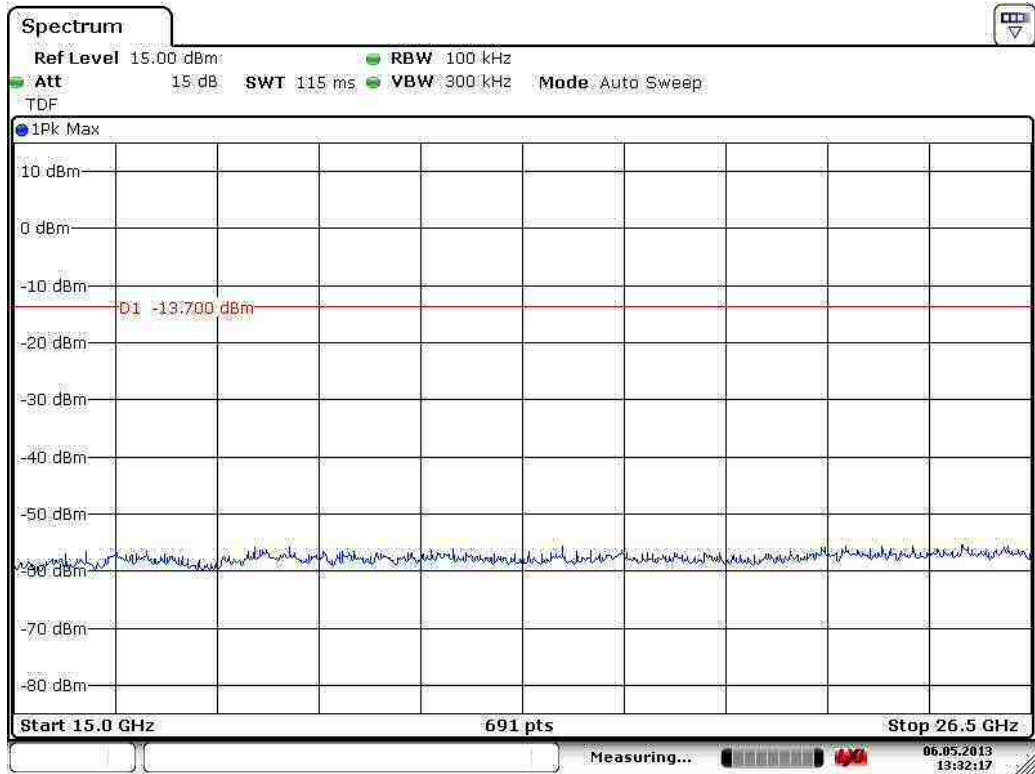


Date: 6.MAY.2013 13:48:30

**Figure 49.** High channel conductive emission 5 GHz to 15 GHz.

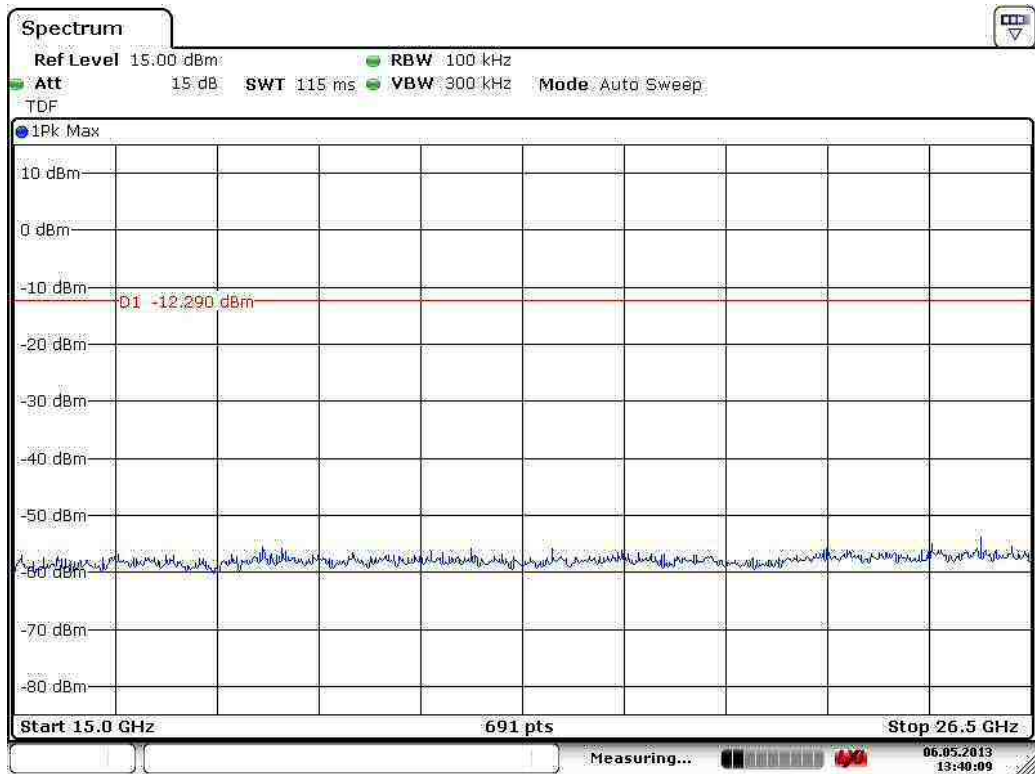


## Conducted Spurious Emission 30 MHz to 26.5 GHz and Band Edge



Date: 6.MAY.2013 13:32:16

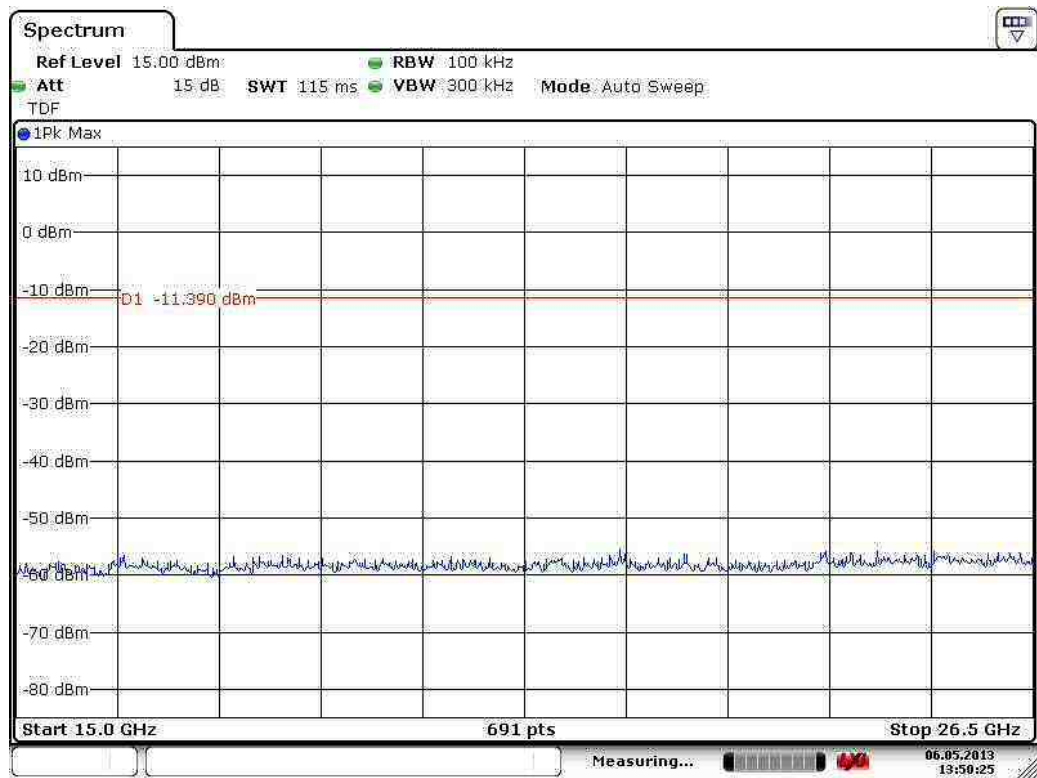
**Figure 50.** Low channel conductive emission 15 GHz to 26.5 GHz.



Date: 6.MAY.2013 13:40:08

**Figure 51.** Mid channel conductive emission 15 GHz to 26.5 GHz.

**Conducted Spurious Emission 30 MHz to 26.5 GHz and Band Edge**



Date: 6.MAY.2013 13:50:24

**Figure 52.** High channel conductive emission 15 GHz to 26.5 GHz.



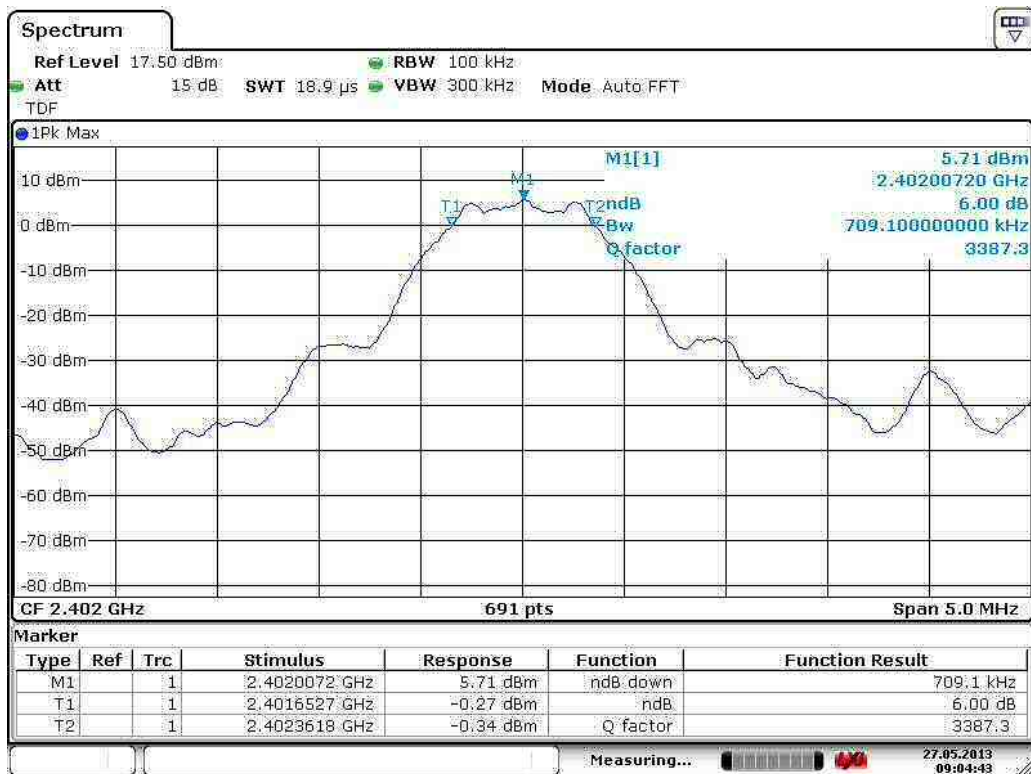
### 6 dB Bandwidth of the Channel

Standard: ANSI C63.10 (2009)  
 Tested by: RRE  
 Date: 27.5.2013  
 Temperature: 23 °C  
 Humidity: 46 % RH

FCC Rule: 15.247 (a) (2)

Table 37. 6 dB bandwidth test results

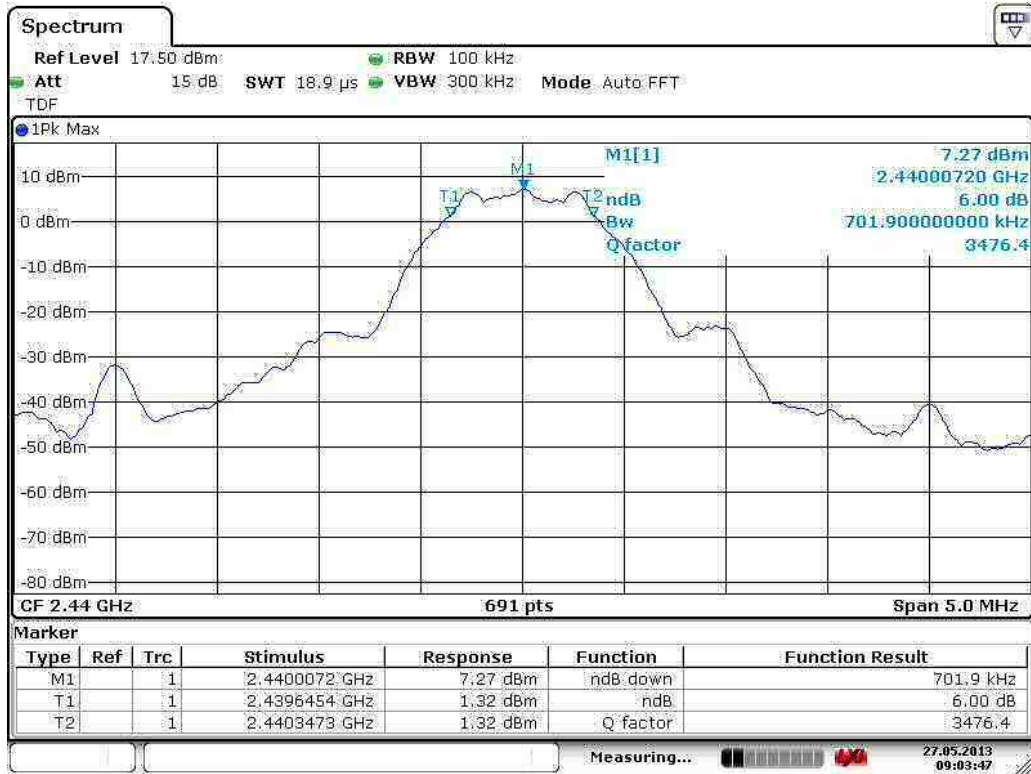
Channel	6 dB BW [kHz]	Minimum limit [kHz]
Low	709.1	500
Mid	701.9	
High	716.4	



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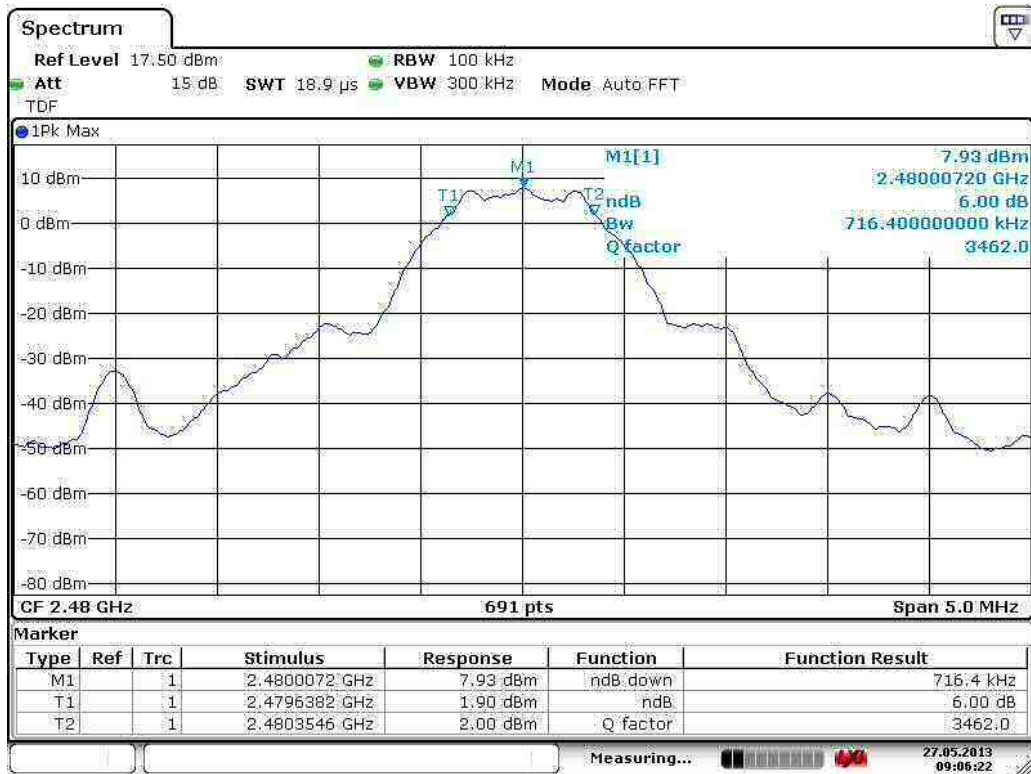
Figure 53. Low channel 6 dB bandwidth.

## 6 dB Bandwidth of the Channel



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Figure 54. Mid channel 6 dB bandwidth.



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Figure 55. High channel 6 dB bandwidth.

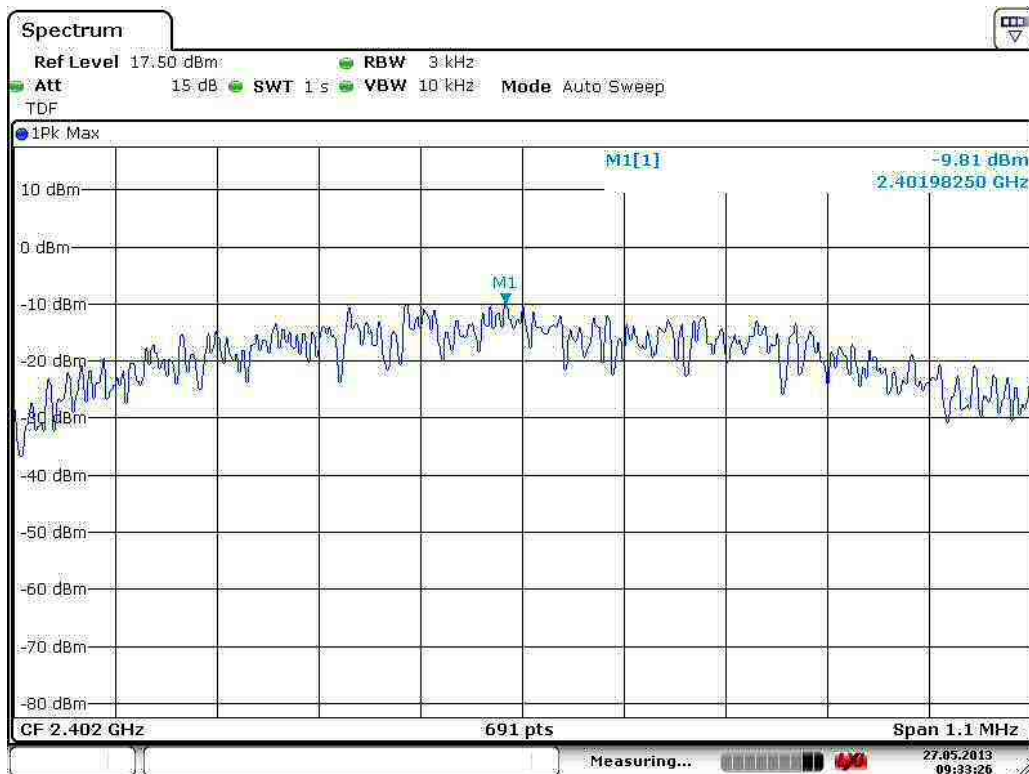
### Power Spectral Density

**Standard:** ANSI C63.10 (2009)  
**Tested by:** RRE  
**Date:** 27.5.2013  
**Temperature:** 23 °C  
**Humidity:** 46 % RH

FCC Rule: 15.247 (e)

**Table 38.** Power Spectral Density Results.

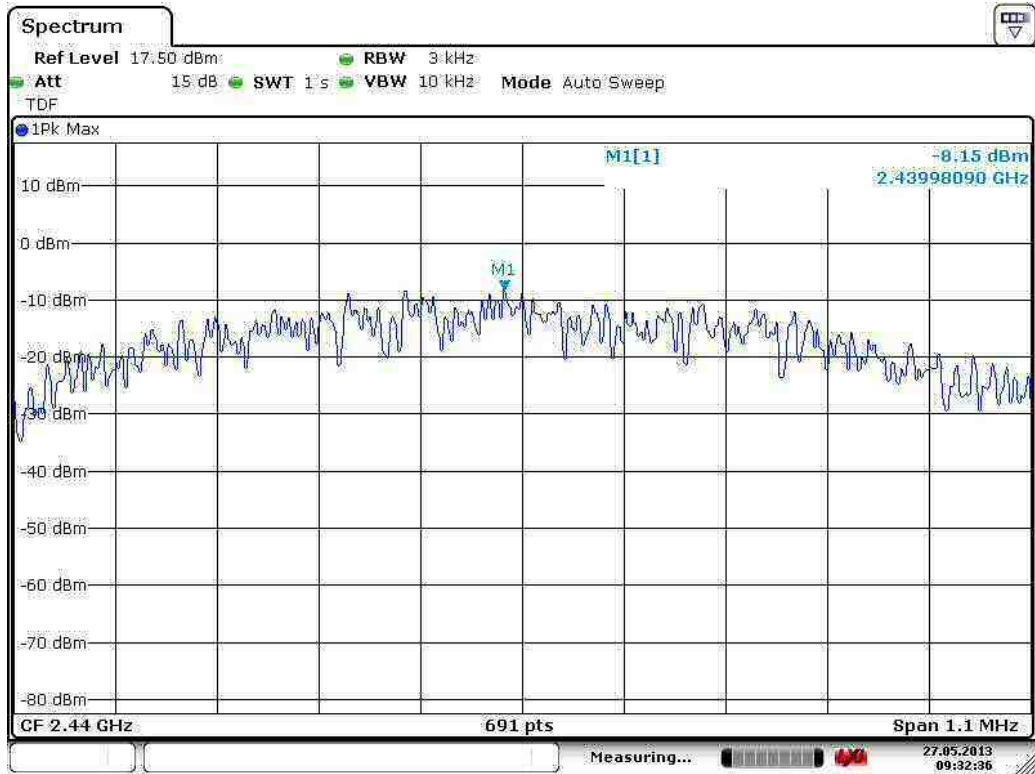
Channel	PSD [dBm/3 kHz]	Maximum limit [dBm/3 kHz]
Low	-9.81	+8.00
Mid	-8.15	
High	-7.48	



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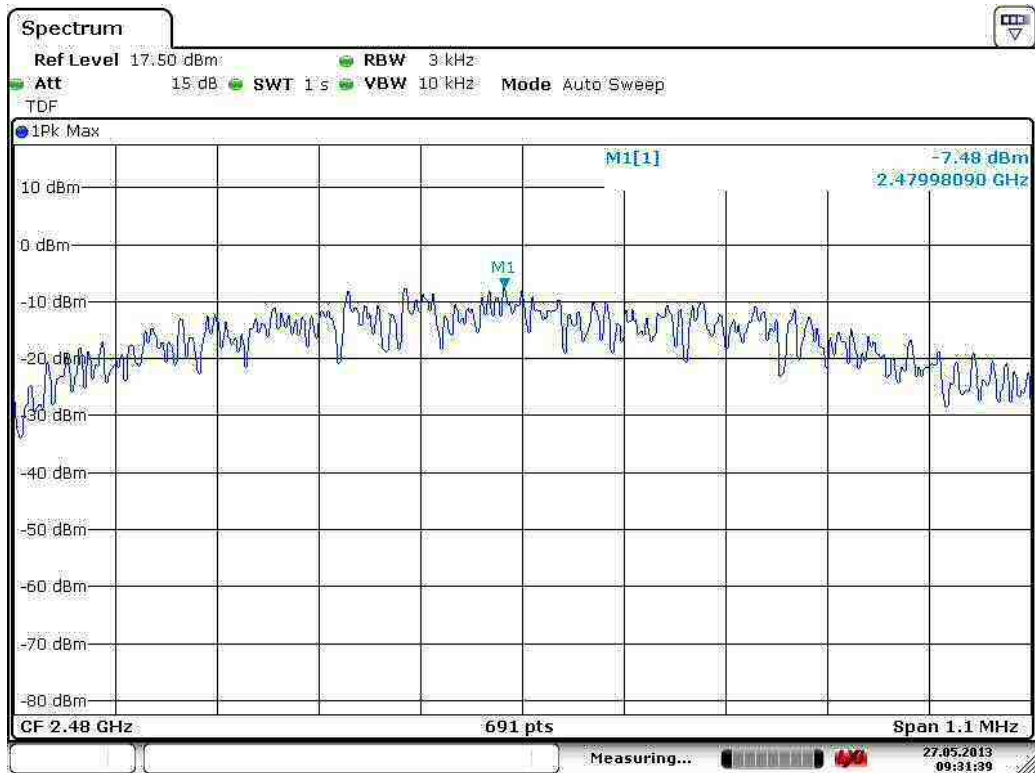
**Figure 56.** Low channel Power Spectral Density.

## Power Spectral Density



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**Figure 57.** Mid channel Power Spectral Density.



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**Figure 58.** High channel Power Spectral Density.

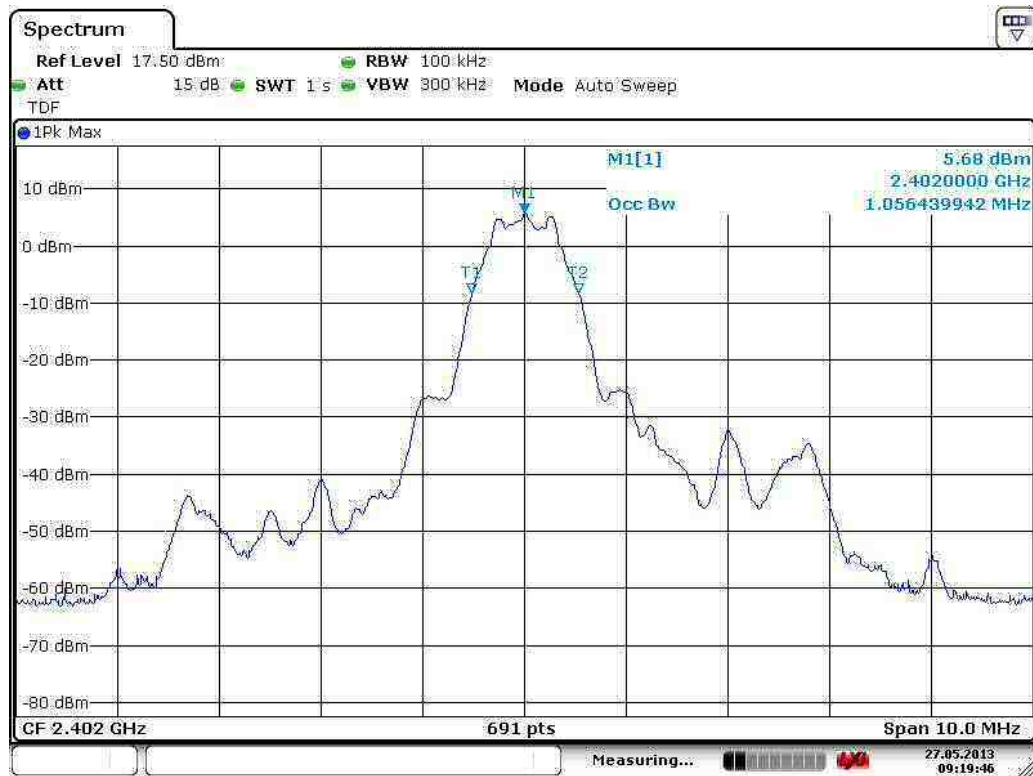
### 99% Occupied Power Bandwidth

Standard: RSS-GEN (2010)  
 Tested by: RRE  
 Date: 27.5.2013  
 Temperature: 23 °C  
 Humidity: 46 % RH

#### RSS-GEN 4.7.

Table 39. 99% Occupied Power Bandwidth results.

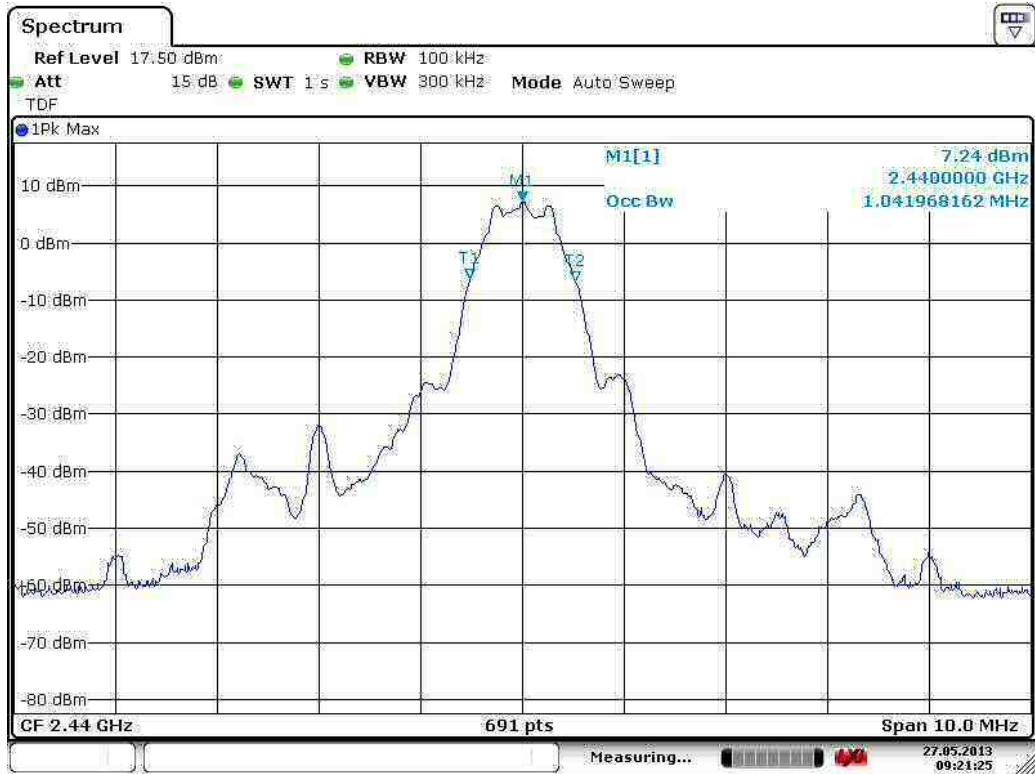
Channel	99% BW [MHz]	Limit	Result
Low	1.056439942	-	PASS
Mid	1.041968162	-	PASS
High	1.056439942	-	PASS



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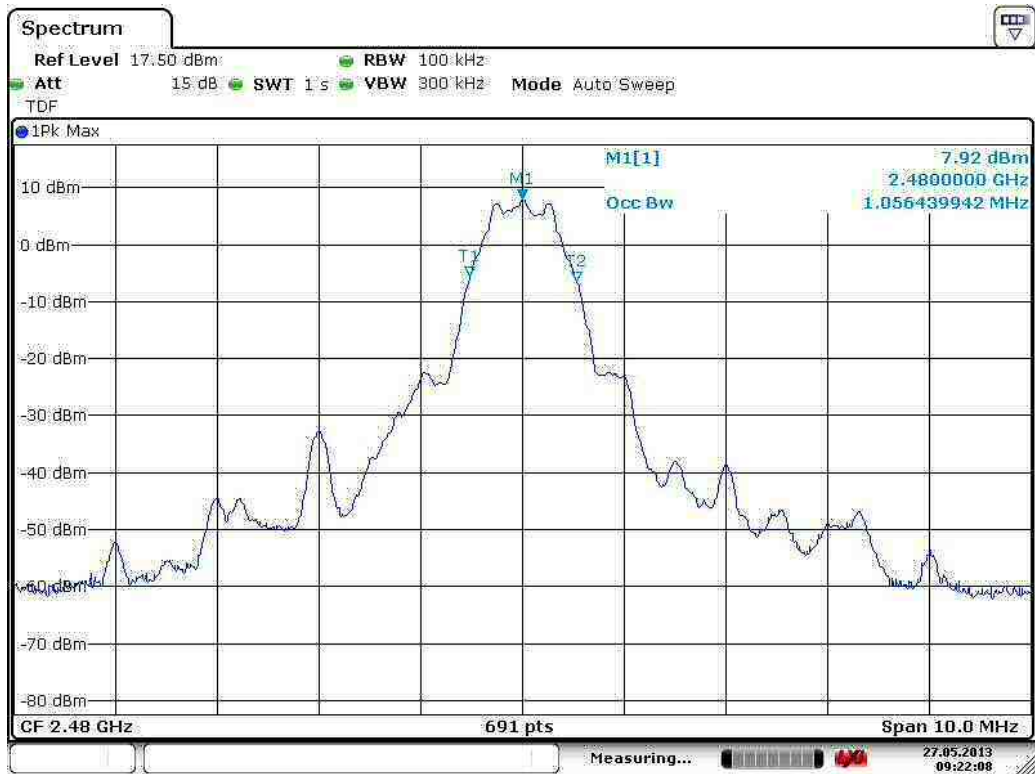
Figure 59. Low channel 99% Occupied Power Bandwidth.

## 99% Occupied Power Bandwidth



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Figure 60. Mid channel 99% Occupied Power Bandwidth.



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Figure 61. High channel 99% Occupied Power Bandwidth.

**LIST OF TEST EQUIPMENT**

<b>Manufacturer</b>	<b>Type</b>	<b>Serial no</b>	<b>Inv. no</b>
<b>ROHDE &amp; SCHWARZ</b>			
Signal Analyzer	FSV40	101068	9093
EMI Test receiver	ESU 26	100185	8453
Test software	EMC32	-	-
<b>DAVIS</b>			
Weather station	Vantage Pro	-	5297
<b>EMCO</b>			
Antenna (1 - 18 GHz)	3117	29617	7293
<b>ETS-LINDGREN</b>			
Antenna (18 GHz – 26 GHz)	3160-09	28535	7294
<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).