

## 5.5 Spurious Emission, Band Edge, and Restricted bands

### 5.5.1 Regulation

According to §15.247(d), 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)).

According to §15.209(a), Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength ( $\mu\text{V}/\text{m}$ )	Measurement distance (m)
0.009 - 0.490	2 400/F(kHz)	300
0.490 - 1.705	24 000/F(kHz)	30
1.705 - 30	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

\*\*Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

According to § 15.205(a) and (b), only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.009 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505	16.694 75 - 16.695 25	608 - 614	5.35 - 5.46
2.173 5 - 2.190 5	16.804 25 - 16.804 75	960 - 1 240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1 300 - 1 427	8.025 - 8.5
4.177 25 - 4.177 75	37.5 - 38.25	1 435 - 1 626.5	9.0 - 9.2
4.207 25 - 4.207 75	73 - 74.6	1 645.5 - 1 646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1 660 - 1 710	10.6 - 12.7
6.267 75 - 6.268 25	108 - 121.94	1 718.8 - 1 722.2	13.25 - 13.4
6.311 75 - 6.312 25	123 - 138	2 200 - 2 300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2 310 - 2 390	15.35 - 16.2
8.362 - 8.366	156.524 75 - 156.525 25	2 483.5 - 2 500	17.7 - 21.4
8.376 25 - 8.386 75	156.7 - 156.9	2 690 - 2 900	22.01 - 23.12
8.414 25 - 8.414 75	162.012 5 - 167.17	3 260 - 3 267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3 332 - 3 339	31.2 - 31.8
12.519 75 - 12.520 25	240 - 285	3 345.8 - 3 358	36.43 - 36.5
12.576 75 - 12.577 25	322 - 335.4	3 600 - 4 400	Above 38.6
13.36 - 13.41			

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1 000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1 000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

## 5.5.2 Measurement Procedure

### 5.5.2.1 Band-edge Compliance of RF Conducted Emissions

#### 5.5.2.1.1 Reference Level Measurement

Establish a reference level by using the following procedure:

- 1) Set instrument center frequency to DTS channel center frequency.
- 2) Set the span to  $\geq 1.5$  times the DTS bandwidth.
- 3) Set the RBW = 100 kHz.
- 4) Set the VBW  $\geq 3 \times$  RBW.
- 5) Detector = peak.
- 6) Sweep time = auto couple.
- 7) Trace mode = max hold.
- 8) Allow trace to fully stabilize.
- 9) Use the peak marker function to determine the maximum PSD level.

#### 5.5.2.1.2 Emissions Level Measurement

- 1) Set the center frequency and span to encompass frequency range to be measured.
- 2) Set the RBW = 100 kHz.
- 3) Set the VBW  $\geq 3 \times$  RBW.
- 4) Detector = peak.
- 5) Ensure that the number of measurement points  $\geq$  span/RBW
- 6) Sweep time = auto couple.
- 7) Trace mode = max hold.
- 8) Allow trace to fully stabilize.
- 9) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in 11.1 a) or 11.1 b). Report the three highest emissions relative to the limit.

### 5.5.2.2 Conducted Spurious Emissions

Set the spectrum analyzer as follows:

- 1) Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic.  
Typically, several plots are required to cover this entire span.
- 2) RBW = 100 kHz
- 3) VBW  $\geq$  RBW
- 4) Sweep = auto
- 5) Detector function = peak
- 6) Trace = max hold
- 7) Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
- 8) Each frequency found during preliminary measurements was re-examined and investigated.  
The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.

### 5.5.2.3 Radiated Spurious Emissions

- 1) The preliminary and final radiated measurements were performed to determine the frequency producing the maximum emissions in a 10m anechoic chamber. The EUT was tested at a distance 3 meters.
- 2) The EUT was placed on the top of the 0.8-meter height, 1  $\times$  1.5 meter non-metallic table. To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated 360°.
- 3) The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 9 kHz to 30 MHz using the loop antenna, and from 30 to 1 000 MHz using the TRILOG broadband antenna, and from 1 000 MHz to 26 500 MHz using the horn antenna.
- 4) Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.

#### Note

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1 kHz ( $\geq 1/T$ ) for Average detection (AV) at frequency above 1 GHz. (where T = pulse width)

### 5.5.3 Test Result

- Complied

1. Band-edge & Conducted Spurious Emissions was shown in figure 3.  
Note: We took the insertion loss of the cable into consideration within the measuring instrument.
2. Measured value of the Field strength of spurious Emissions (Radiated)

**\* Below 1 GHz data (worst-case: 802. 11g)**

#### High channel (2 462 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB( $\mu$ V)]	Factor [dB]	Result [dB( $\mu$ V/m)]	Limit [dB( $\mu$ V/m)]	Margin [dB]
<b>Quasi-Peak DATA. Emissions below 30 MHz</b>							
Below 30.00	Not Detected	-	-	-	-	-	-
<b>Quasi-Peak DATA. Emissions below 1 GHz</b>							
34.97	120	V	45.7	-16.0	29.7	40.0	10.3
54.37	120	H	37.9	-13.5	24.4	40.0	15.6
71.71	120	V	43.7	-18.1	25.6	40.0	14.4
269.95	120	H	38.3	-12.4	25.9	46.0	20.1
477.66	120	H	42.1	-7.6	34.5	46.0	11.5
830.01	120	V	36.1	-1.3	34.8	46.0	11.2
Above 900.00	Not Detected	-					

\* Above 1 GHz data

**802.11b\_Low channel (2 412 MHz)**

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB( $\mu$ V)]	Factor [dB]	Result [dB( $\mu$ V/m)]	Limit [dB( $\mu$ V/m)]	Margin [dB]
<b>Peak DATA. Emissions above 1 GHz</b>							
*2 379.38	1 000	V	44.4	4.4	48.8	74.0	25.2
*4 824.00	1 000	V	39.4	7.8	47.2	74.0	26.8
Above 8 000.00	Not Detected	-	-	-	-	-	-
<b>Average DATA. Emissions above 1 GHz</b>							
*2 379.38	1 000	V	33.0	4.4	37.4	54.0	16.6
*4 824.00	1 000	V	38.1	7.8	45.9	54.0	8.1
Above 8 000.00	Not Detected	-	-	-	-	-	-

\* This asterisk means restricted band.

**802.11b\_Middle channel (2 437 MHz)**

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB( $\mu$ V)]	Factor [dB]	Result [dB( $\mu$ V/m)]	Limit [dB( $\mu$ V/m)]	Margin [dB]
<b>Peak DATA. Emissions above 1 GHz</b>							
*4 874.00	1 000	V	40.4	7.9	48.3	74.0	25.7
Above 8 000.00	Not Detected	-	-	-	-	-	-
<b>Average DATA. Emissions above 1 GHz</b>							
*4 874.00	1 000	V	36.8	7.9	44.7	54.0	9.3
Above 8 000.00	Not Detected	-	-	-	-	-	-

\* This asterisk means restricted band.

**802.11b\_High channel (2 462 MHz)**

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB( $\mu$ V)]	Factor [dB]	Result [dB( $\mu$ V/m)]	Limit [dB( $\mu$ V/m)]	Margin [dB]
<b>Peak DATA. Emissions above 1 GHz</b>							
*2 483.65	1 000	V	43.7	4.2	47.9	74.0	26.1
*4 924.00	1 000	V	39.5	8.0	47.5	74.0	26.5
Above 8 000.00	Not Detected	-	-	-	-	-	-
<b>Average DATA. Emissions above 1 GHz</b>							
*2 483.65	1 000	V	31.7	4.2	35.9	54.0	18.1
*4 924.00	1 000	V	38.6	8.0	46.6	54.0	7.4
Above 8 000.00	Not Detected	-	-	-	-	-	-

\* This asterisk means restricted band.

**802.11g\_Low channel (2 412 MHz)**

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB( $\mu$ V)]	Factor [dB]	Result [dB( $\mu$ V/m)]	Limit [dB( $\mu$ V/m)]	Margin [dB]
<b>Peak DATA. Emissions above 1 GHz</b>							
*2 374.88	1 000	V	43.8	4.4	48.2	74.0	25.8
*4 824.00	1 000	V	39.4	7.8	47.2	74.0	26.8
Above 8 000.00	Not Detected	-	-	-	-	-	-
<b>Average DATA. Emissions above 1 GHz</b>							
*2 374.88	1 000	V	38.7	4.4	43.1	54.0	10.9
*4 824.00	1 000	V	36.7	7.8	44.5	54.0	9.5
Above 8 000.00	Not Detected	-	-	-	-	-	-

\* This asterisk means restricted band.

**802.11g\_Middle channel (2 437 MHz)**

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB( $\mu$ V)]	Factor [dB]	Result [dB( $\mu$ V/m)]	Limit [dB( $\mu$ V/m)]	Margin [dB]
<b>Peak DATA. Emissions above 1 GHz</b>							
*4 874.00	1 000	V	40.9	7.9	48.8	74.0	25.2
Above 8 000.00	Not Detected	-	-	-	-	-	-
<b>Average DATA. Emissions above 1 GHz</b>							
*4 874.00	1 000	V	38.8	7.9	46.7	54.0	7.3
Above 8 000.00	Not Detected	-	-	-	-	-	-

\* This asterisk means restricted band.

**802.11g\_High channel (2 462 MHz)**

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB( $\mu$ V)]	Factor [dB]	Result [dB( $\mu$ V/m)]	Limit [dB( $\mu$ V/m)]	Margin [dB]
<b>Peak DATA. Emissions above 1 GHz</b>							
*2 493.88	1 000	V	42.7	4.2	46.9	74.0	27.1
4 972.00	1 000	V	40.1	3.2	43.3	74.0	30.7
Above 8 000.00	Not Detected	-	-	-	-	-	-
<b>Average DATA. Emissions above 1 GHz</b>							
*2 493.88	1 000	V	43.8	4.2	48.0	54.0	6.0
4 972.00	1 000	V	33.5	3.2	36.7	54.0	17.3
Above 8 000.00	Not Detected	-	-	-	-	-	-

\* This asterisk means restricted band.



**802.11n HT20\_Low channel (2 412 MHz)\_ANT 1**

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB( $\mu$ V)]	Factor [dB]	Result [dB( $\mu$ V/m)]	Limit [dB( $\mu$ V/m)]	Margin [dB]
<b>Peak DATA. Emissions above 1 GHz</b>							
*2 390.00	1 000	V	56.3	4.4	60.7	74.0	13.3
*4 824.00	1 000	V	40.1	7.8	47.9	74.0	26.1
Above 8 000.00	Not Detected	-	-	-	-	-	-
<b>Average DATA. Emissions above 1 GHz</b>							
*2 390.00	1 000	V	45.8	4.4	50.2	54.0	3.8
*4 824.00	1 000	V	35.0	7.8	42.8	54.0	11.2
Above 8 000.00	Not Detected	-	-	-	-	-	-

\* This asterisk means restricted band.

**802.11n HT20\_Middle channel (2 437 MHz)\_ANT 1**

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB( $\mu$ V)]	Factor [dB]	Result [dB( $\mu$ V/m)]	Limit [dB( $\mu$ V/m)]	Margin [dB]
<b>Peak DATA. Emissions above 1 GHz</b>							
*4 874.00	1 000	V	39.3	7.9	47.2	74.0	26.8
Above 8 000.00	Not Detected	-	-	-	-	-	-
<b>Average DATA. Emissions above 1 GHz</b>							
*4 874.00	1 000	V	39.3	7.9	47.2	54.0	6.8
Above 8 000.00	Not Detected	-	-	-	-	-	-

\* This asterisk means restricted band.

**802.11n HT20\_High channel (2 462 MHz)\_ANT 1**

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(μV)]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
<b>Peak DATA. Emissions above 1 GHz</b>							
*2 483.75	1 000	V	53.5	4.2	57.7	74.0	16.3
*4 962.00	1 000	V	39.4	7.8	47.2	74.0	26.8
Above 8 000.00	Not Detected	-	-	-	-	-	-
<b>Average DATA. Emissions above 1 GHz</b>							
*2 483.75	1 000	V	46.4	4.2	50.6	54.0	3.4
*4 962.00	1 000	V	33.4	7.8	41.2	54.0	12.8
Above 8 000.00	Not Detected	-	-	-	-	-	-

\* This asterisk means restricted band.

**802.11n HT20\_Low channel (2 412 MHz)\_MIMO(ANT 1+2)**

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(μV)]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
<b>Peak DATA. Emissions above 1 GHz</b>							
*2 390.00	1 000	V	57.5	4.4	61.9	74.0	12.1
*4 824.00	1 000	V	39.4	7.8	47.2	74.0	26.8
Above 8 000.00	Not Detected	-	-	-	-	-	-
<b>Average DATA. Emissions above 1 GHz</b>							
*2 390.00	1 000	V	45.9	4.4	50.3	54.0	3.7
*4 824.00	1 000	V	33.7	7.8	41.5	54.0	12.5
Above 8 000.00	Not Detected	-	-	-	-	-	-

\* This asterisk means restricted band.

**802.11n HT20\_ Middle channel (2 437 Mhz) MIMO(ANT 1+2)**

Frequency [Mhz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB( $\mu$ V)]	Factor [dB]	Result [dB( $\mu$ V/m)]	Limit [dB( $\mu$ V/m)]	Margin [dB]
<b>Peak DATA. Emissions above 1 GHz</b>							
*4 874.00	1 000	V	39.6	7.9	47.5	74.0	26.5
Above 8 000.00	Not Detected	-	-	-	-	-	-
<b>Average DATA. Emissions above 1 GHz</b>							
*4 874.00	1 000	V	33.5	7.9	41.4	54.0	12.6
Above 8 000.00	Not Detected	-	-	-	-	-	-

\* This asterisk means restricted band.

**802.11n HT20\_ High channel (2 462 Mhz) MIMO(ANT 1+2)**

Frequency [Mhz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB( $\mu$ V)]	Factor [dB]	Result [dB( $\mu$ V/m)]	Limit [dB( $\mu$ V/m)]	Margin [dB]
<b>Peak DATA. Emissions above 1 GHz</b>							
*2 483.75	1 000	V	58.1	4.2	62.3	74.0	11.7
*4 924.00	1 000	V	41.2	8.0	49.2	74.0	24.8
Above 8 000.00	Not Detected	-	-	-	-	-	-
<b>Average DATA. Emissions above 1 GHz</b>							
*2 483.75	1 000	V	41.9	4.2	46.1	54.0	7.9
*4 924.00	1 000	V	34.6	8.0	42.6	54.0	11.4
Above 8 000.00	Not Detected	-	-	-	-	-	-

\* This asterisk means restricted band.

**802.11n HT40\_Low channel (2 422 MHz)\_ANT 1**

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB( $\mu$ V)]	Factor [dB]	Result [dB( $\mu$ V/m)]	Limit [dB( $\mu$ V/m)]	Margin [dB]
<b>Peak DATA. Emissions above 1 GHz</b>							
2 382.50	1 000	V	62.8	4.4	67.2	74.0	6.8
*4 824.00	1 000	V	38.6	4.2	42.8	74.0	31.2
Above 8 000.00	Not Detected	-	-	-	-	-	-
<b>Average DATA. Emissions above 1 GHz</b>							
2 382.50	1 000	V	41.6	4.4	46.0	54.0	8.0
*4 824.00	1 000	V	39.6	4.2	43.8	54.0	10.2
Above 8 000.00	Not Detected	-	-	-	-	-	-

\* This asterisk means restricted band.

**802.11n HT40\_Middle channel (2 437 MHz)\_ANT 1**

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB( $\mu$ V)]	Factor [dB]	Result [dB( $\mu$ V/m)]	Limit [dB( $\mu$ V/m)]	Margin [dB]
<b>Peak DATA. Emissions above 1 GHz</b>							
*4 874.00	1 000	V	38.7	7.9	46.6	74.0	27.4
Above 8 000.00	Not Detected	-	-	-	-	-	-
<b>Average DATA. Emissions above 1 GHz</b>							
*4 874.00	1 000	V	33.4	7.9	41.3	54.0	12.7
Above 8 000.00	Not Detected	-	-	-	-	-	-

\* This asterisk means restricted band.

**802.11n HT40\_High channel (2 452 MHz)\_ANT 1**

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB( $\mu$ V)]	Factor [dB]	Result [dB( $\mu$ V/m)]	Limit [dB( $\mu$ V/m)]	Margin [dB]
<b>Peak DATA. Emissions above 1 GHz</b>							
*2 484.25	1 000	V	65.3	4.2	69.5	74.0	4.5
*4 904.00	1 000	V	40.3	8.0	48.3	74.0	25.7
Above 8 000.00	Not Detected	-	-	-	-	-	-
<b>Average DATA. Emissions above 1 GHz</b>							
*2 483.75	1 000	V	44.3	4.2	48.5	54.0	5.5
*4 824.00	1 000	V	35.4	8.0	43.4	54.0	10.6
Above 8 000.00	Not Detected	-	-	-	-	-	-

\* This asterisk means restricted band.

**802.11n HT40\_Low channel (2 422 MHz)\_MIMO**

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB( $\mu$ V)]	Factor [dB]	Result [dB( $\mu$ V/m)]	Limit [dB( $\mu$ V/m)]	Margin [dB]
<b>Peak DATA. Emissions above 1 GHz</b>							
*2 376.50	1 000	V	61.7	4.4	66.1	74.0	7.9
*4 976.00	1 000	V	38.8	8.1	46.9	74.0	27.1
Above 8 000.00	Not Detected	-	-	-	-	-	-
<b>Average DATA. Emissions above 1 GHz</b>							
*2 376.50	1 000	V	41.2	4.4	45.6	54.0	8.4
*4 976.00	1 000	V	37.3	8.1	45.4	54.0	8.6
Above 8 000.00	Not Detected	-	-	-	-	-	-

\* This asterisk means restricted band.

**802.11n HT40\_ Middle channel (2 437 Mhz)\_MIMO**

Frequency [Mhz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB( $\mu$ V)]	Factor [dB]	Result [dB( $\mu$ V/m)]	Limit [dB( $\mu$ V/m)]	Margin [dB]
<b>Peak DATA. Emissions above 1 GHz</b>							
*4 874.00	1 000	V	39.6	7.9	47.5	74.0	26.5
Above 8 000.00	Not Detected	-	-	-	-	-	-
<b>Average DATA. Emissions above 1 GHz</b>							
*4 874.00	1 000	V	35.6	7.9	43.5	54.0	10.5
Above 8 000.00	Not Detected	-	-	-	-	-	-

\* This asterisk means restricted band.

**802.11n HT40\_ High channel (2 452 Mhz)\_MIMO**

Frequency [Mhz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB( $\mu$ V)]	Factor [dB]	Result [dB( $\mu$ V/m)]	Limit [dB( $\mu$ V/m)]	Margin [dB]
<b>Peak DATA. Emissions above 1 GHz</b>							
*2 484.50	1 000	V	65.1	4.2	69.3	74.0	4.7
*4 904.00	1 000	V	39.4	8.0	47.4	74.0	26.6
Above 8 000.00	Not Detected	-	-	-	-	-	-
<b>Average DATA. Emissions above 1 GHz</b>							
*2 484.50	1 000	V	46.7	4.2	50.9	54.0	3.1
*4 904.00	1 000	V	34.7	8.0	42.7	54.0	11.3
Above 8 000.00	Not Detected	-	-	-	-	-	-

\* This asterisk means restricted band.

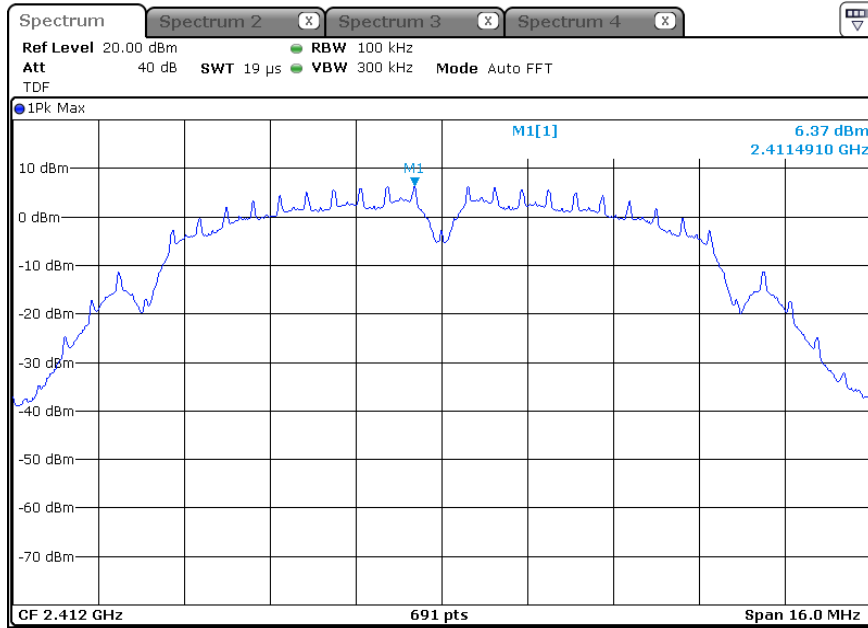
### 5.5.4 Test Plot

Figure 3. Plot of the Band-edge & Conducted Spurious Emissions

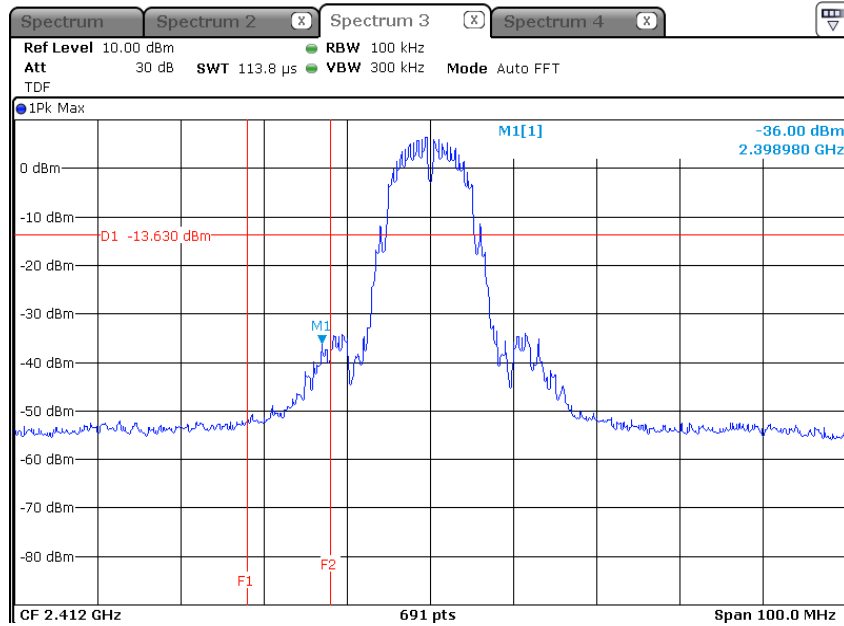
\* 802.11b

Lowest Channel (2 412 MHz)

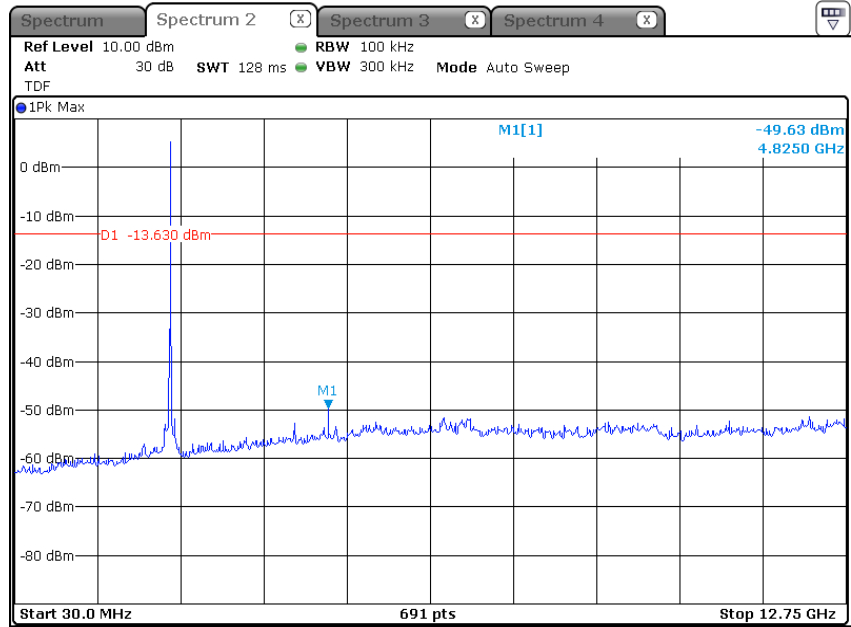
#### Reference



#### Band-edge



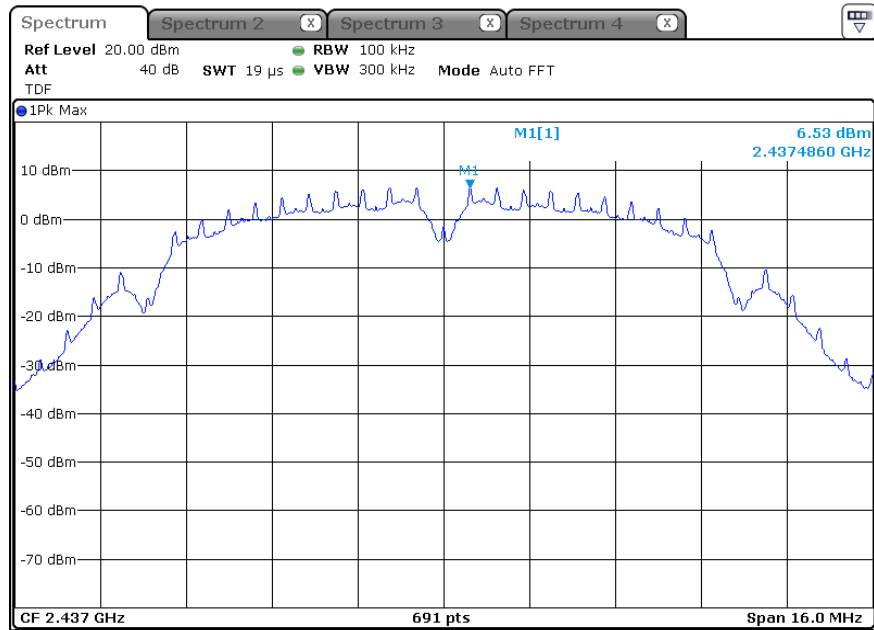
**Conducted Spurious Emissions**



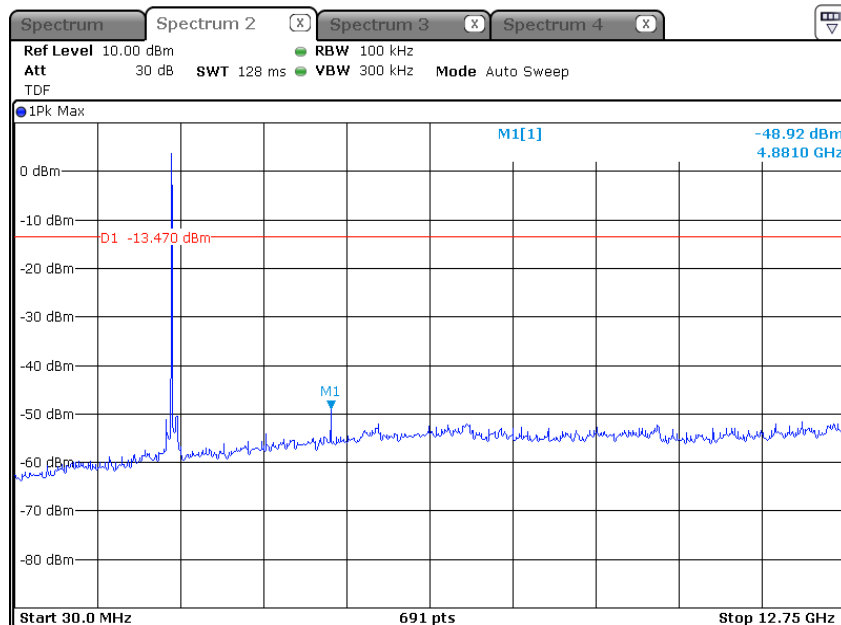


Middle Channel (2 437 MHz)

**Reference**

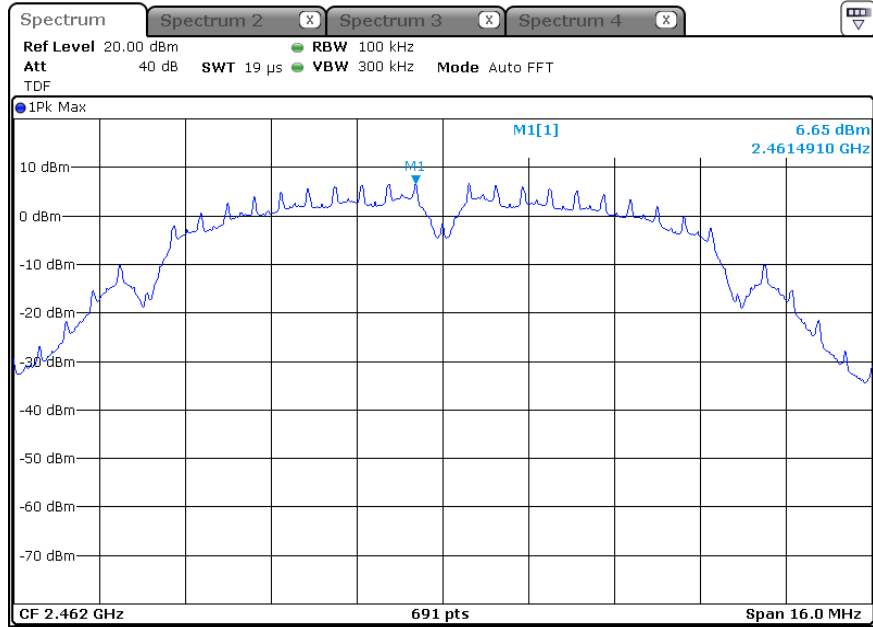


**Conducted Spurious Emissions**

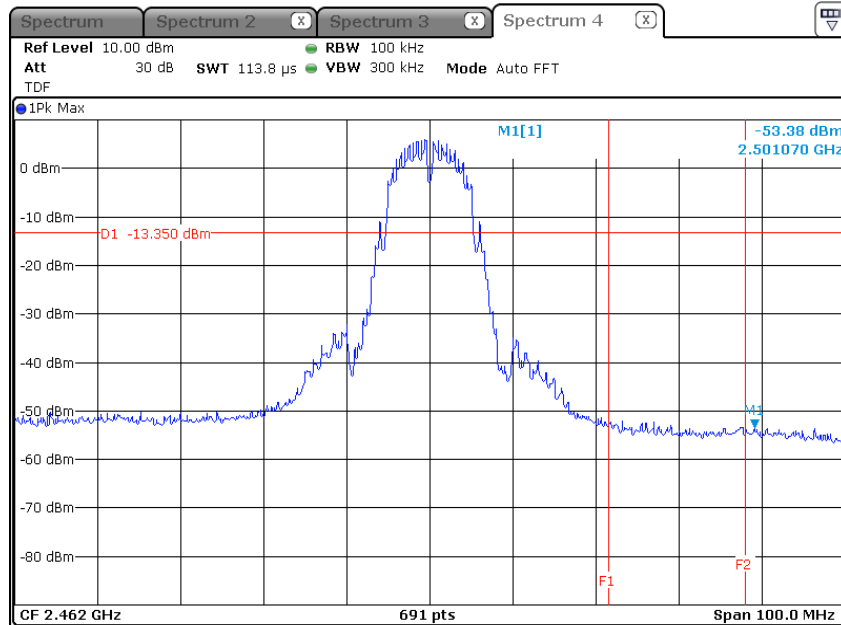


Highest Channel (2.462 MHz)

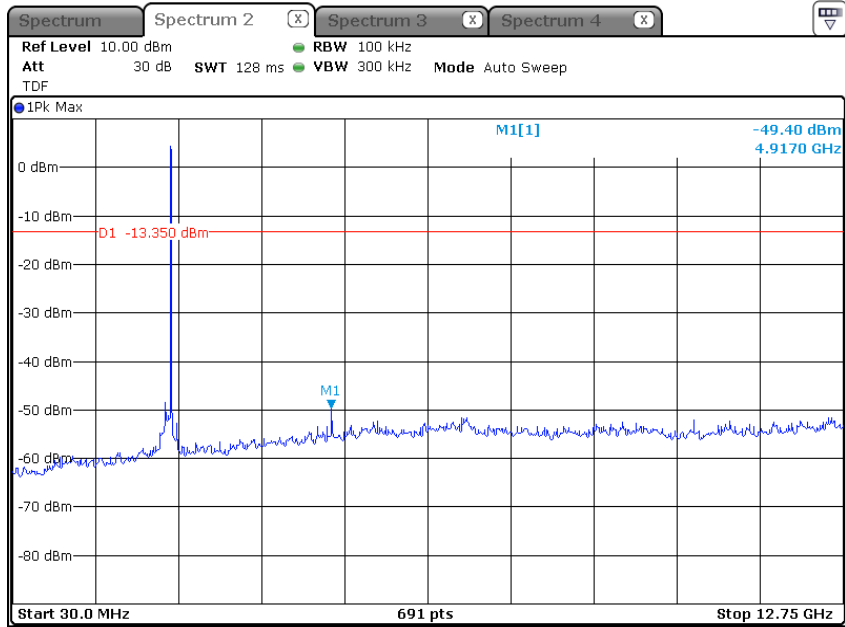
**Reference**



**Band-edge**



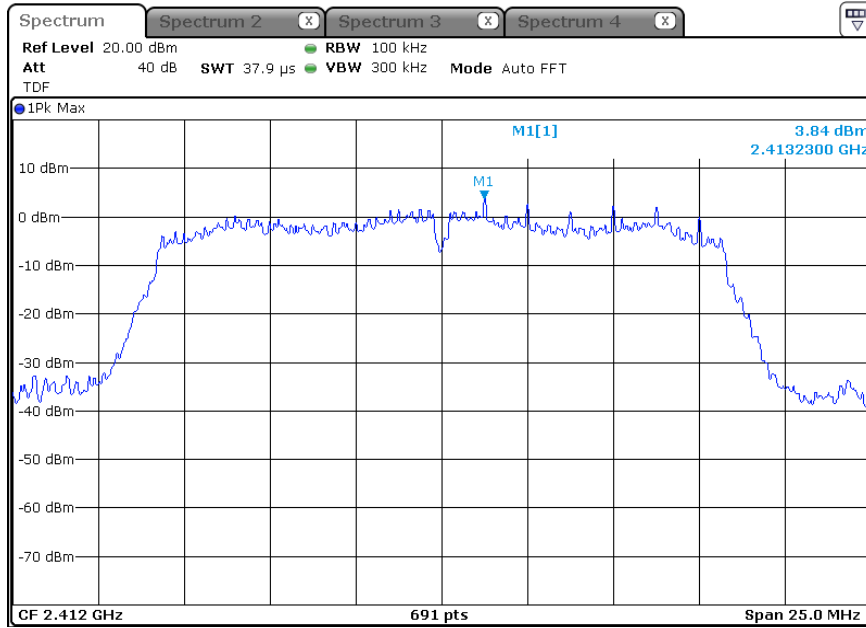
**Conducted Spurious Emissions**



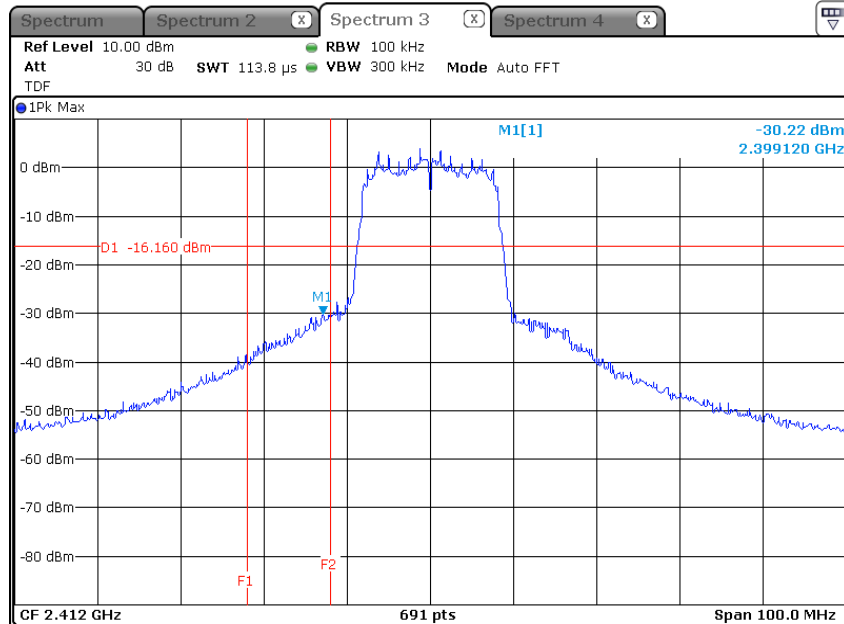
**\* 802.11g**

Lowest Channel (2 412 MHz)

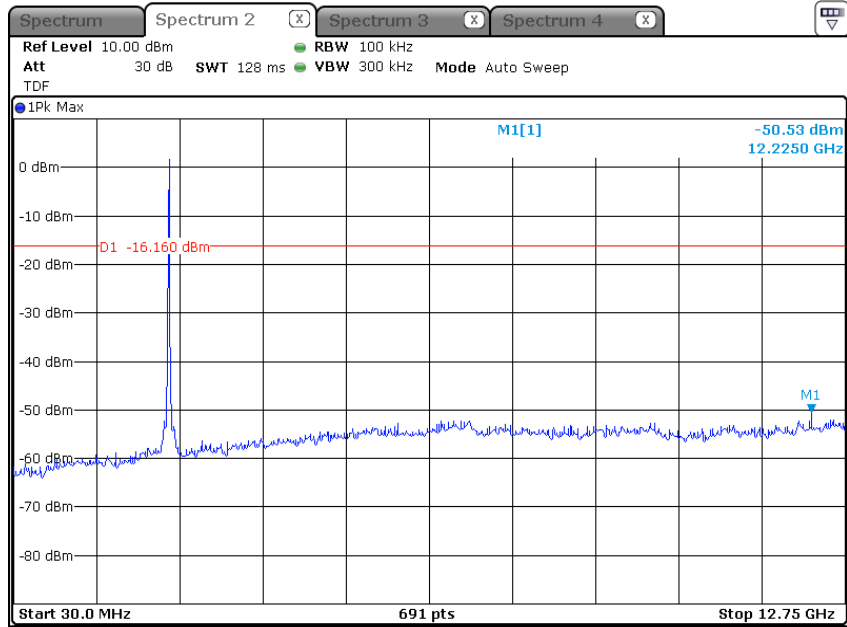
**Reference**



**Band-edge**

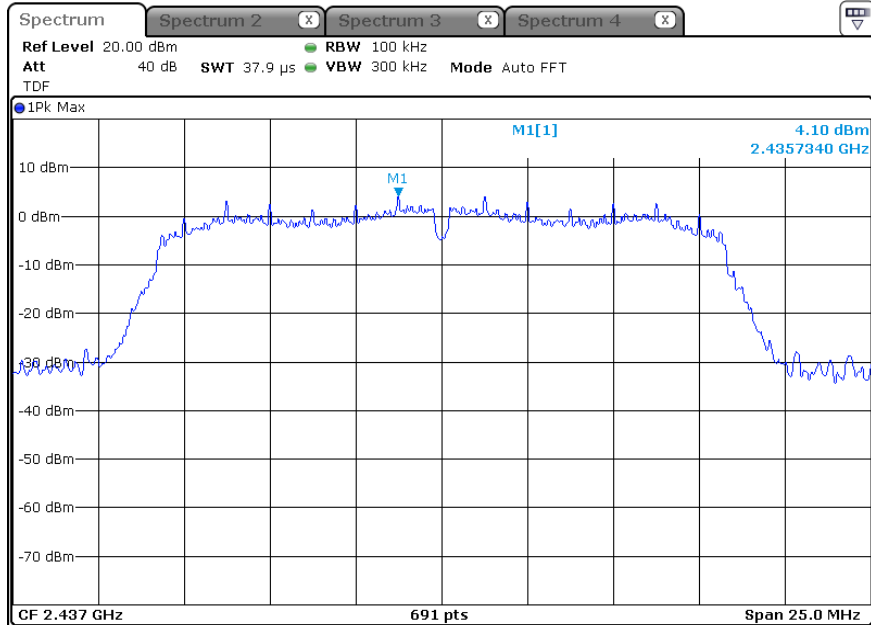


**Conducted Spurious Emissions**

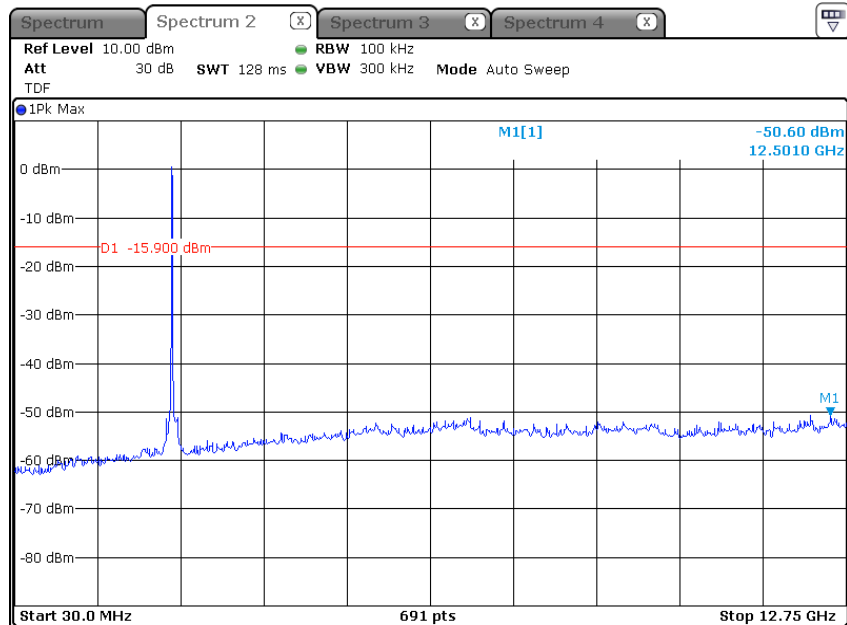


Middle Channel (2 437 MHz)

Reference

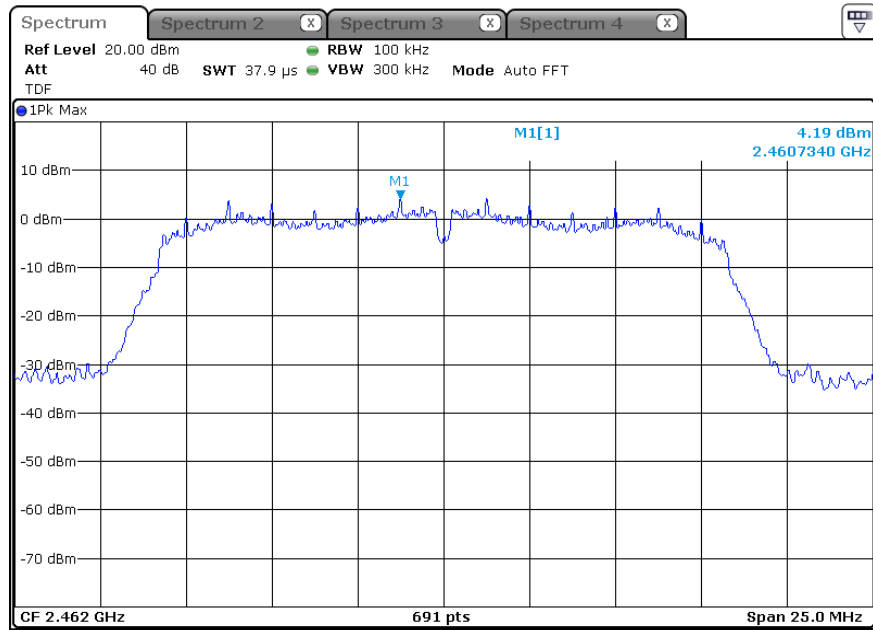


Conducted Spurious Emissions

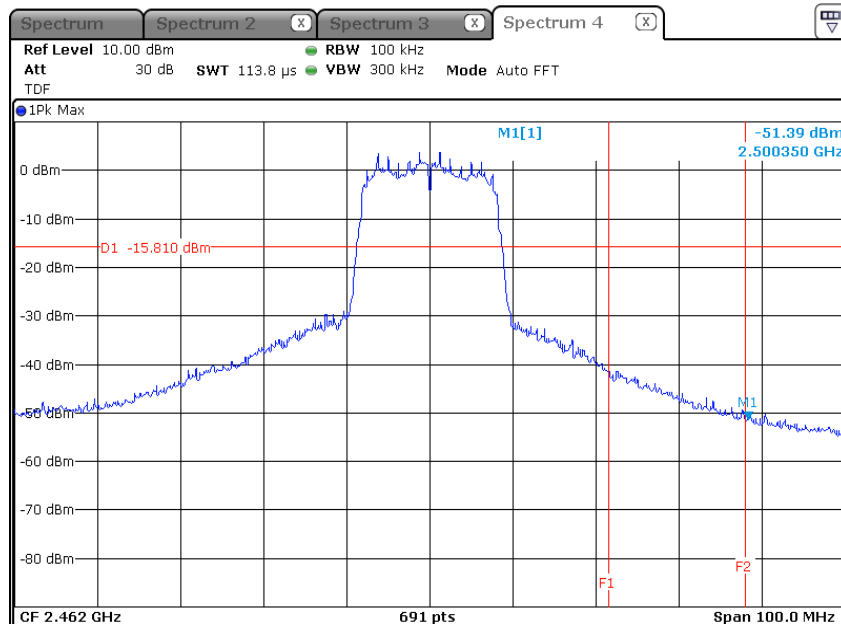


Highest Channel (2 462 MHz)

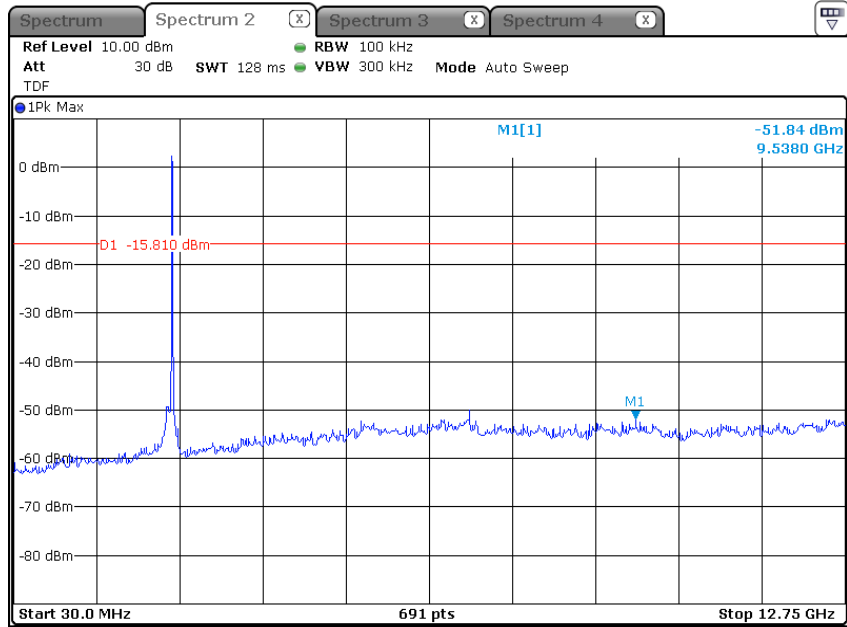
Reference



Band-edge



**Conducted Spurious Emissions**

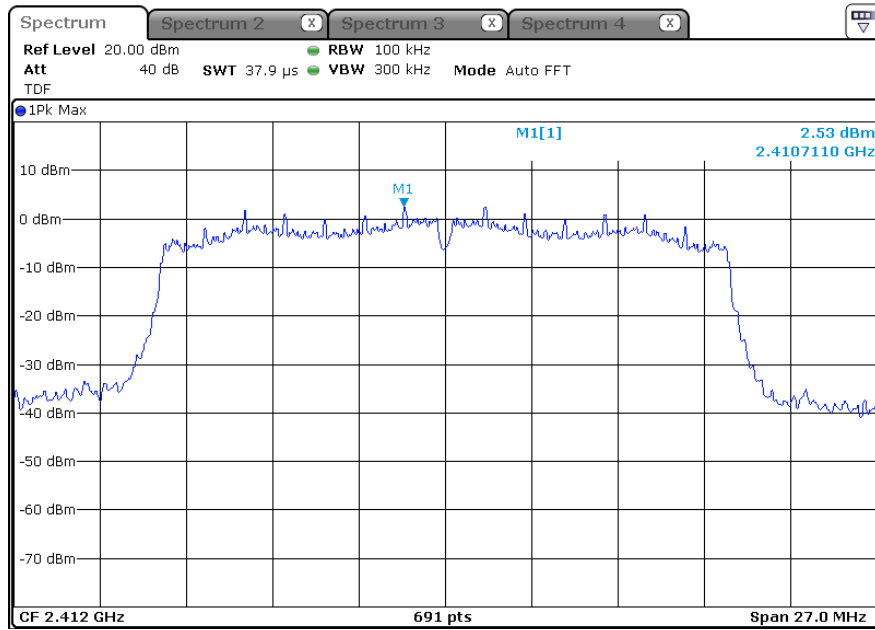




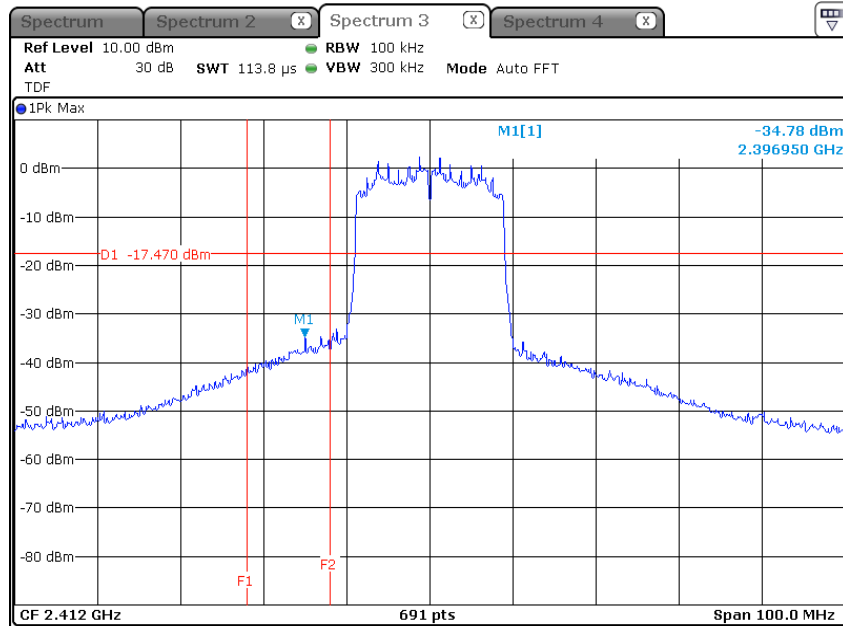
**\* 802.11n HT20\_ANT 1**

Lowest Channel (2 412 MHz)

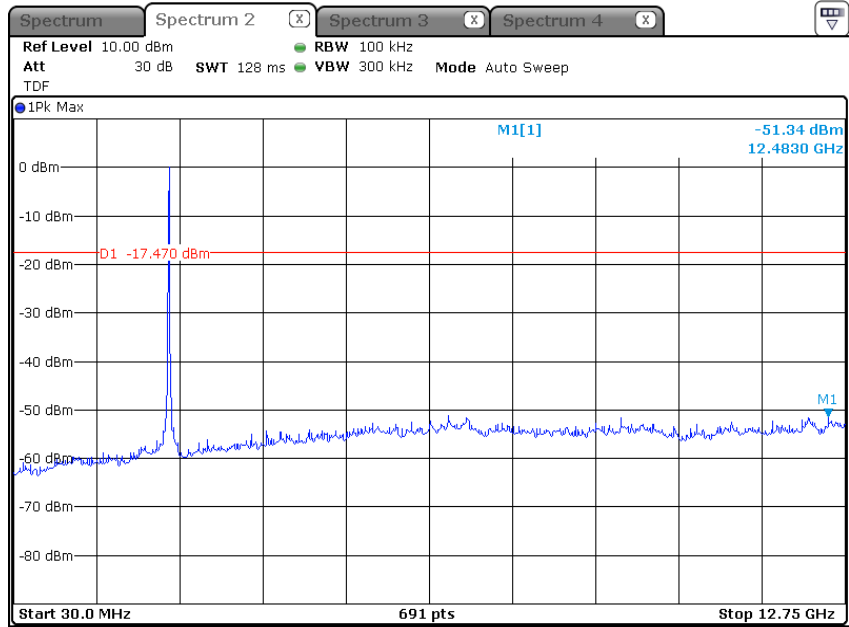
Reference



Band-edge

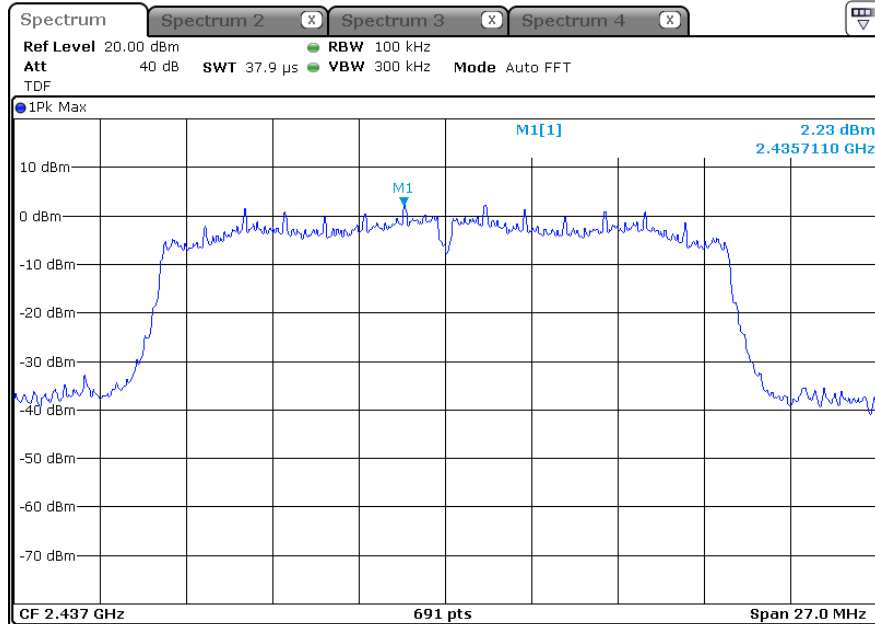


**Conducted Spurious Emissions**

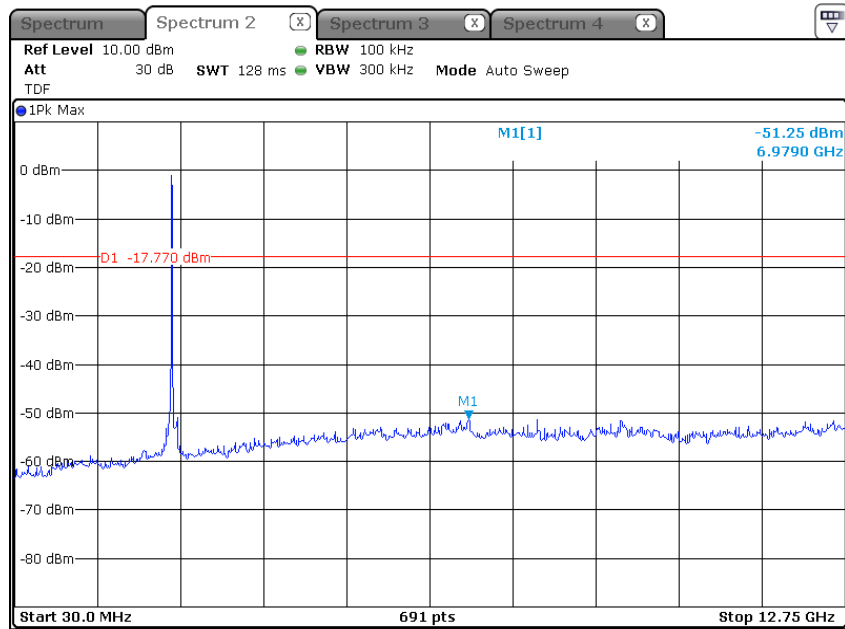


Middle Channel (2 437 MHz)

**Reference**

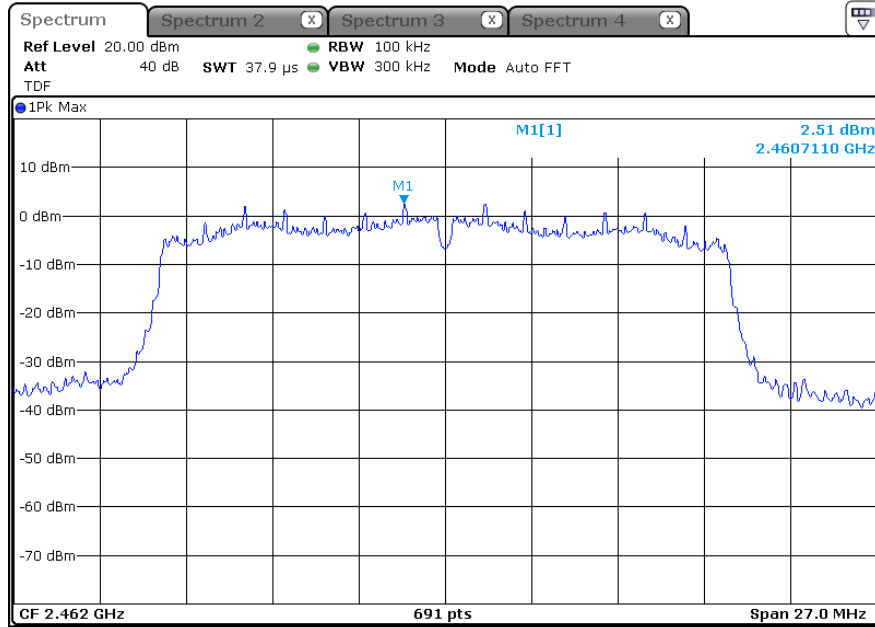


**Conducted Spurious Emissions**

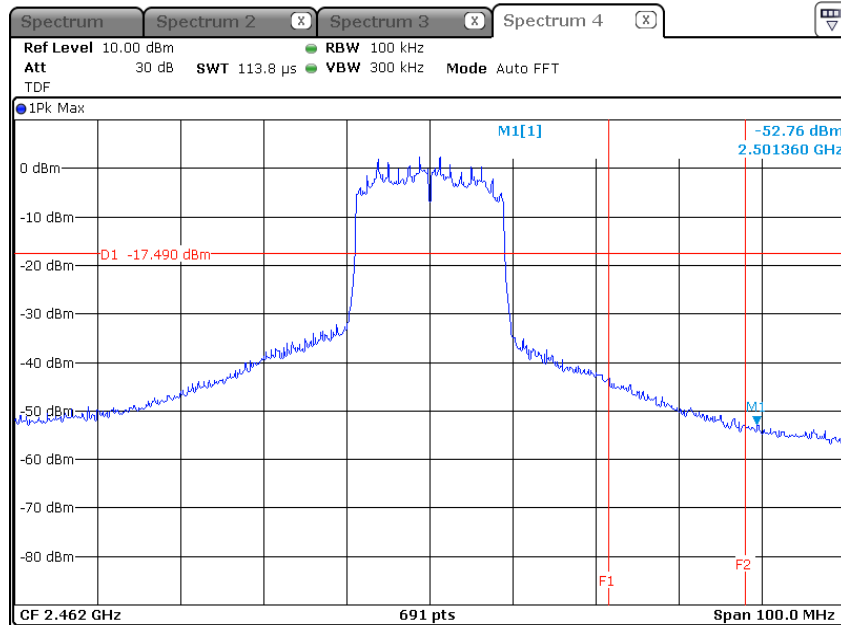


Highest Channel (2 462 MHz)

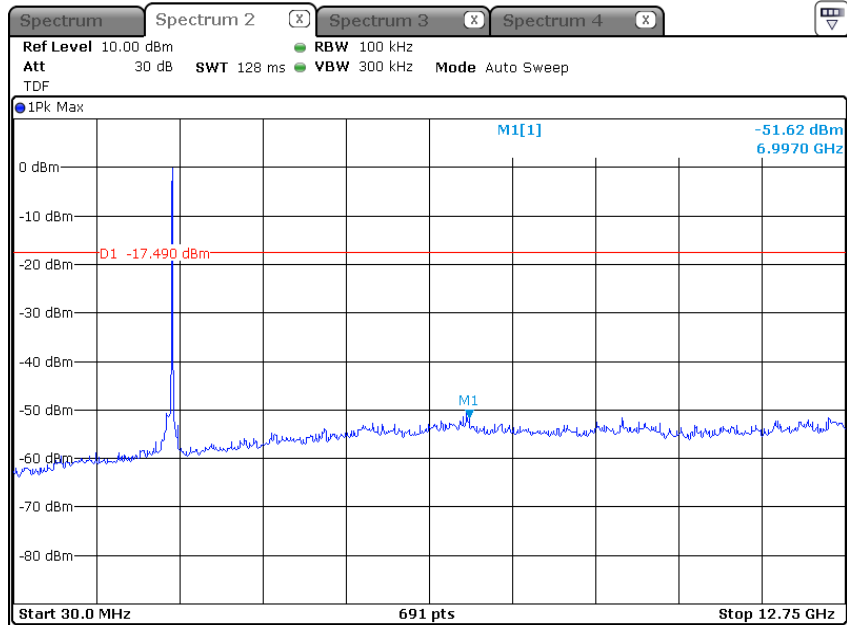
Reference



Band-edge



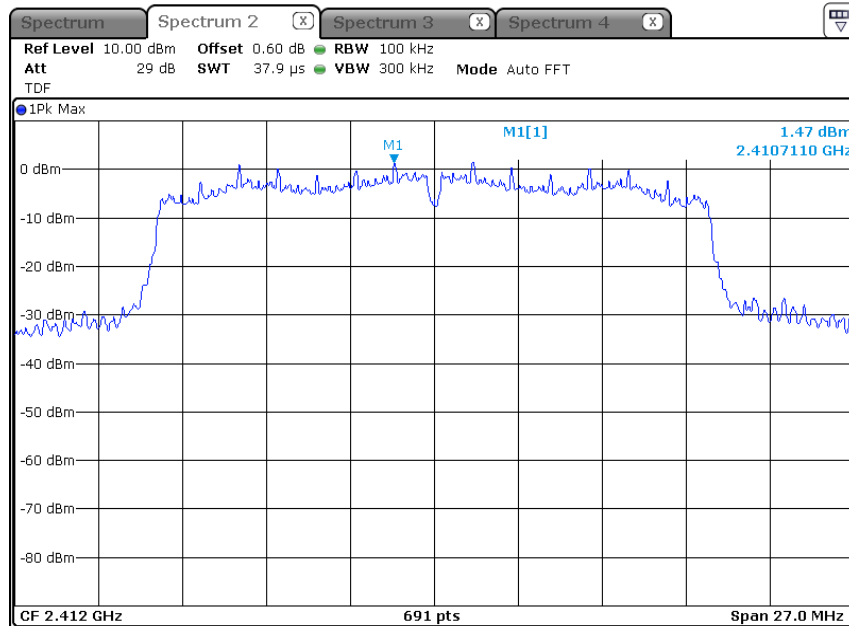
**Conducted Spurious Emissions**



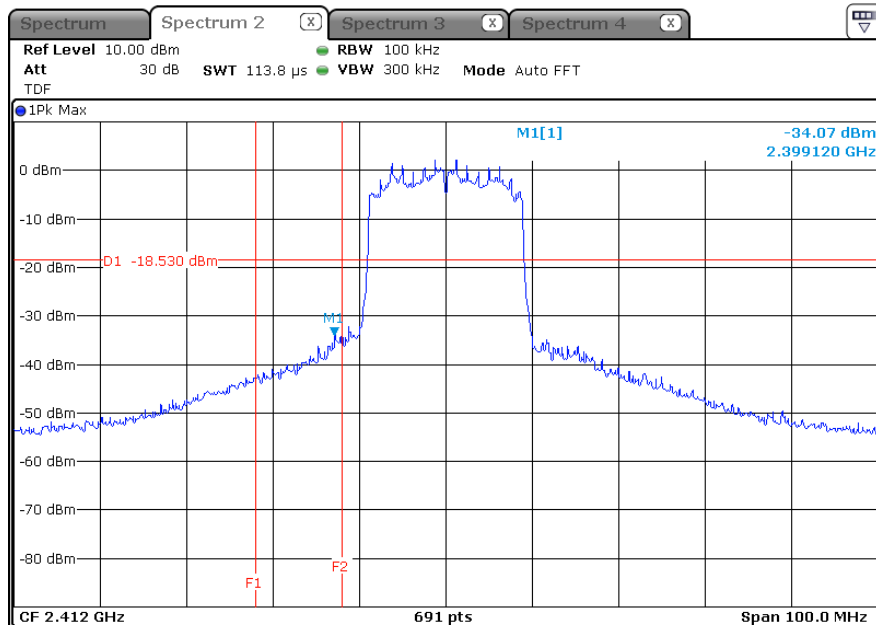
**\* 802.11n HT20\_MIMO (ANT 1)**

Lowest Channel (2 412 MHz)

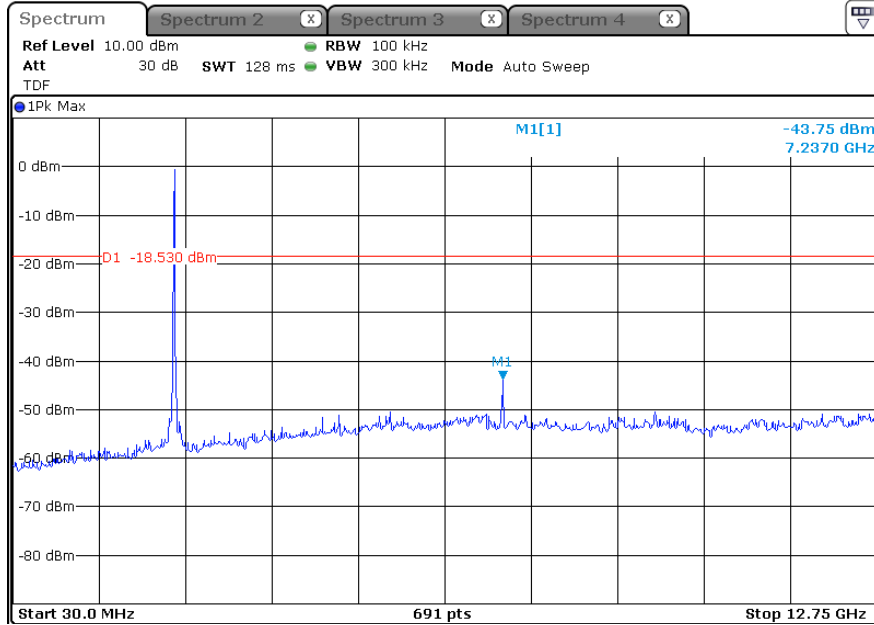
**Reference**



**Band-edge**

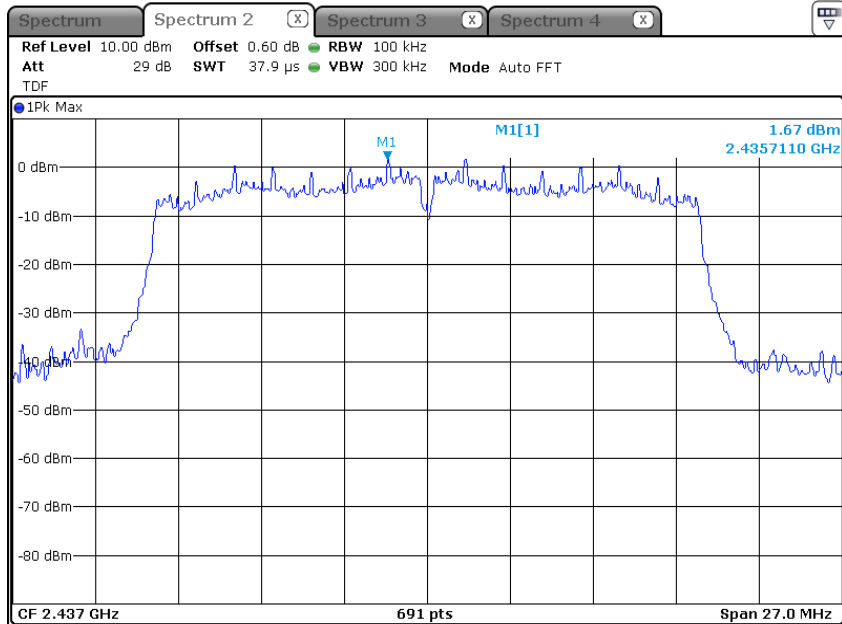


**Conducted Spurious Emissions**

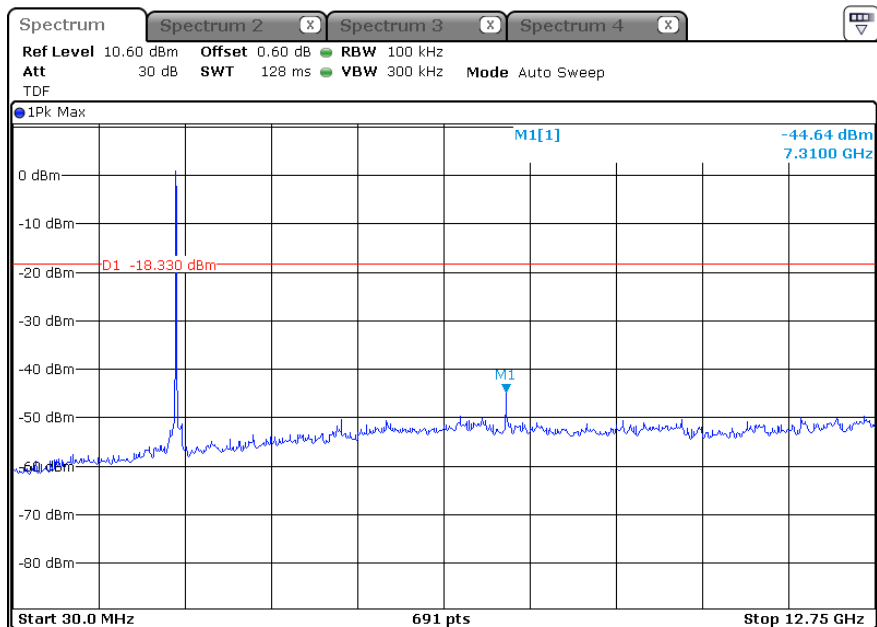


Middle Channel (2 437 MHz)

**Reference**



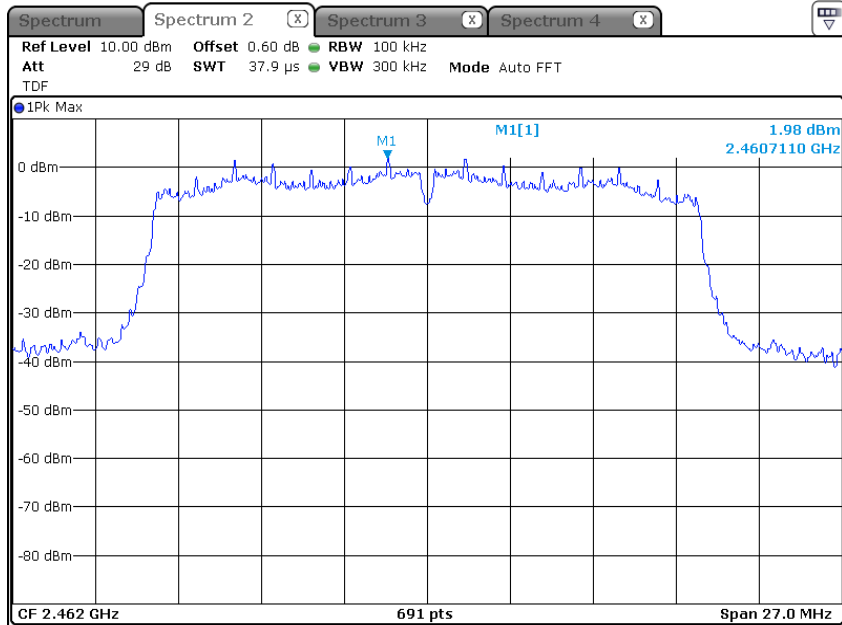
**Conducted Spurious Emissions**



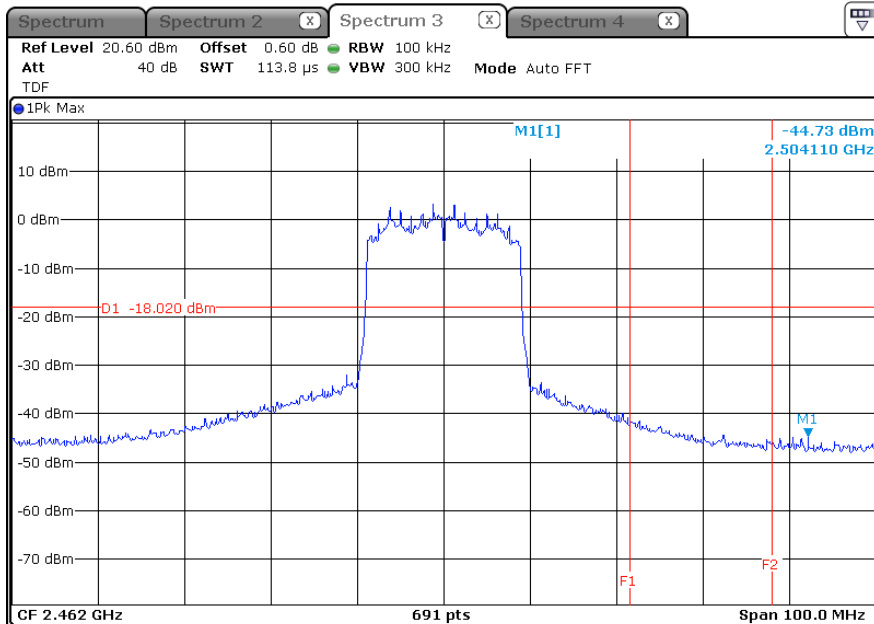


Highest Channel (2 462 MHz)

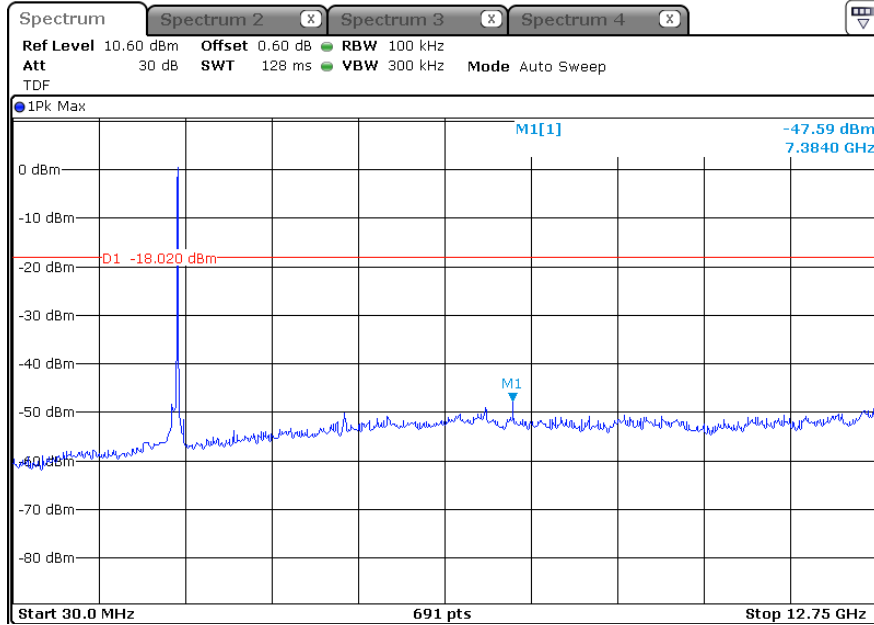
Reference



Band-edge



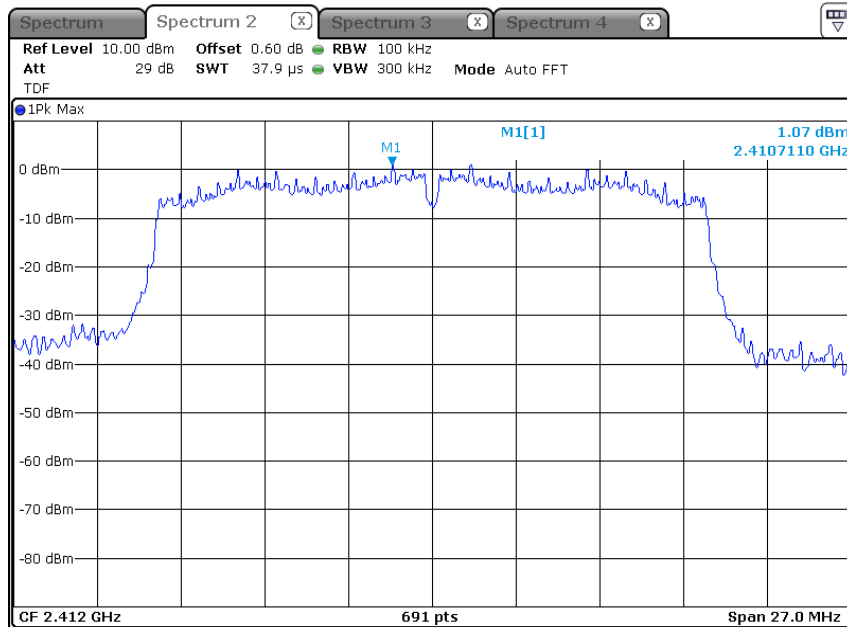
**Conducted Spurious Emissions**



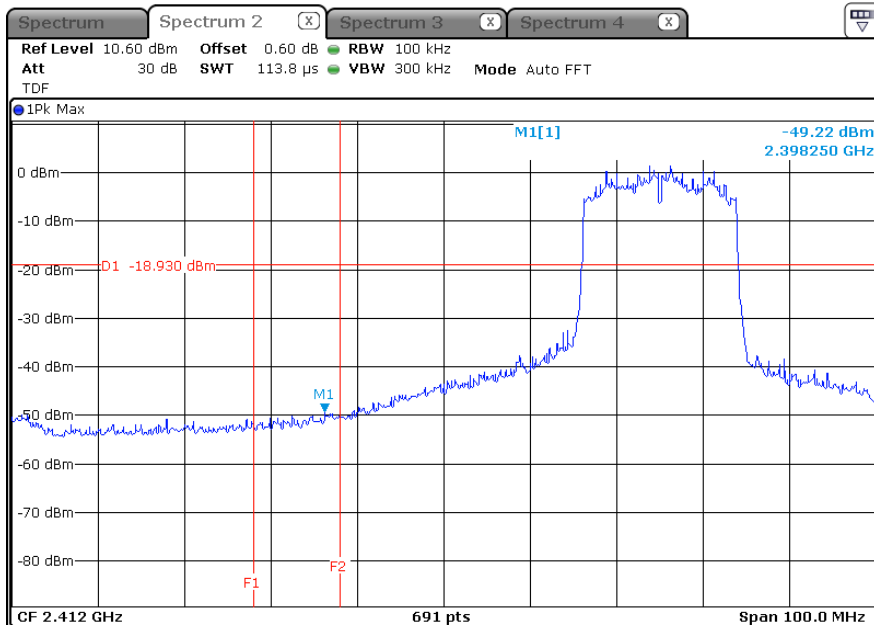
**\* 802.11n HT20\_MIMO(ANT 2)**

Lowest Channel (2 412 MHz)

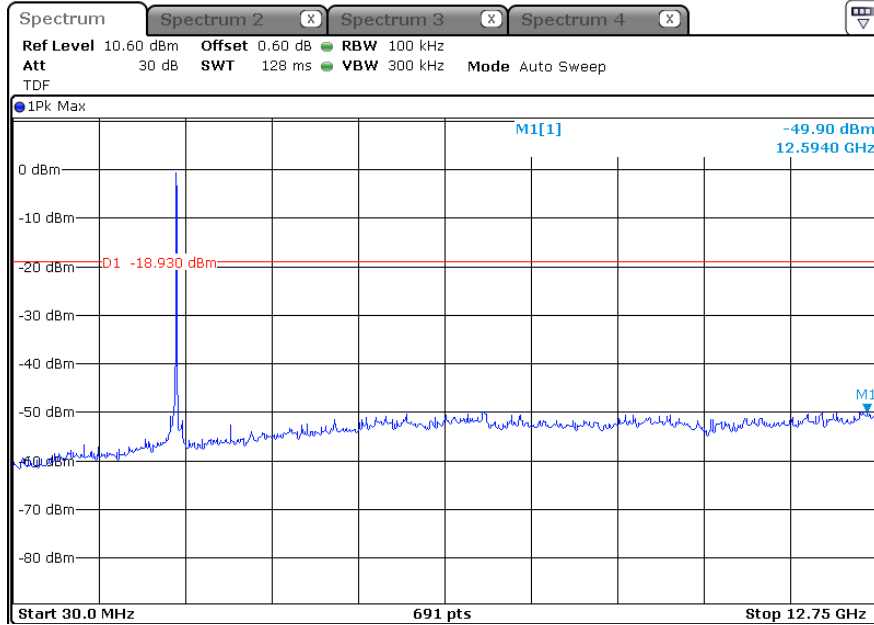
**Reference**



**Band-edge**

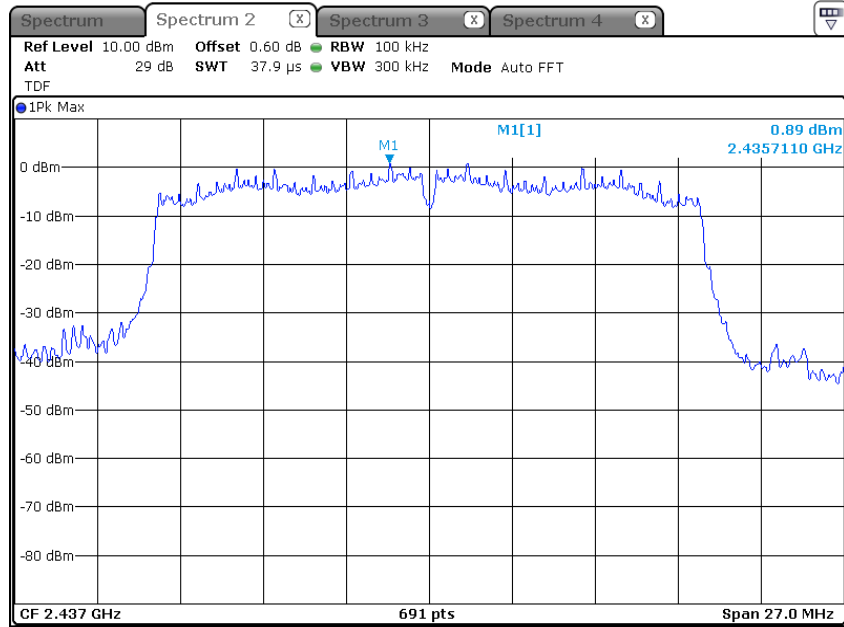


**Conducted Spurious Emissions**

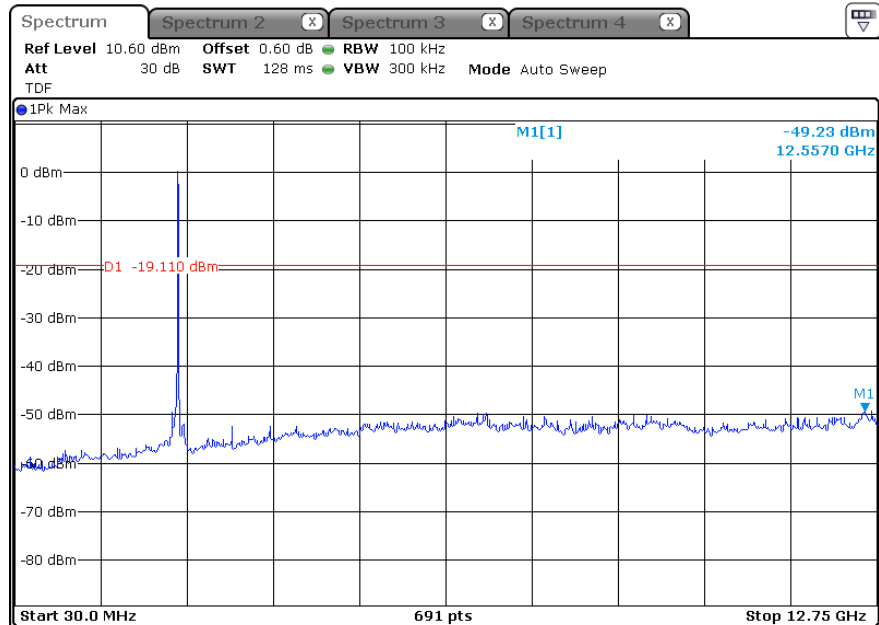


Middle Channel (2 437 MHz)

Reference

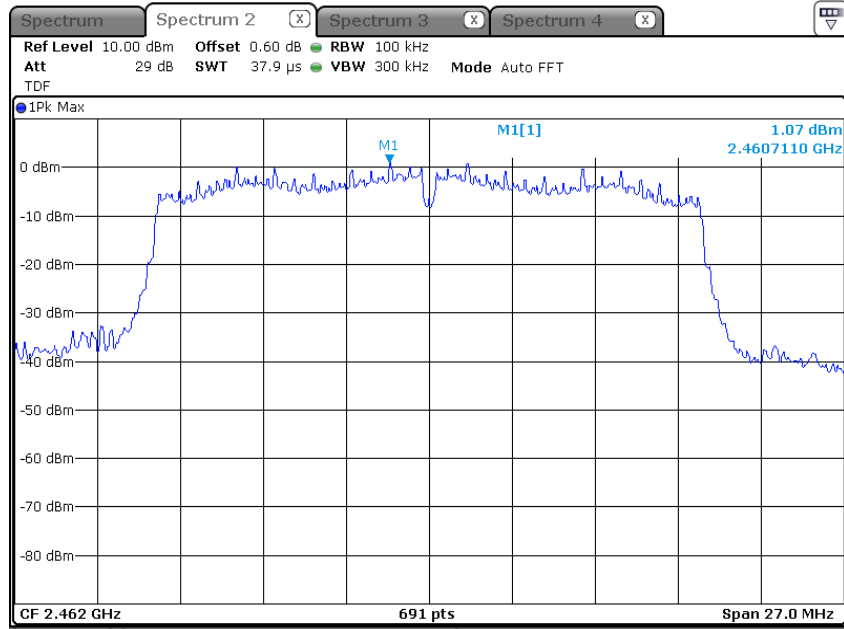


Conducted Spurious Emissions

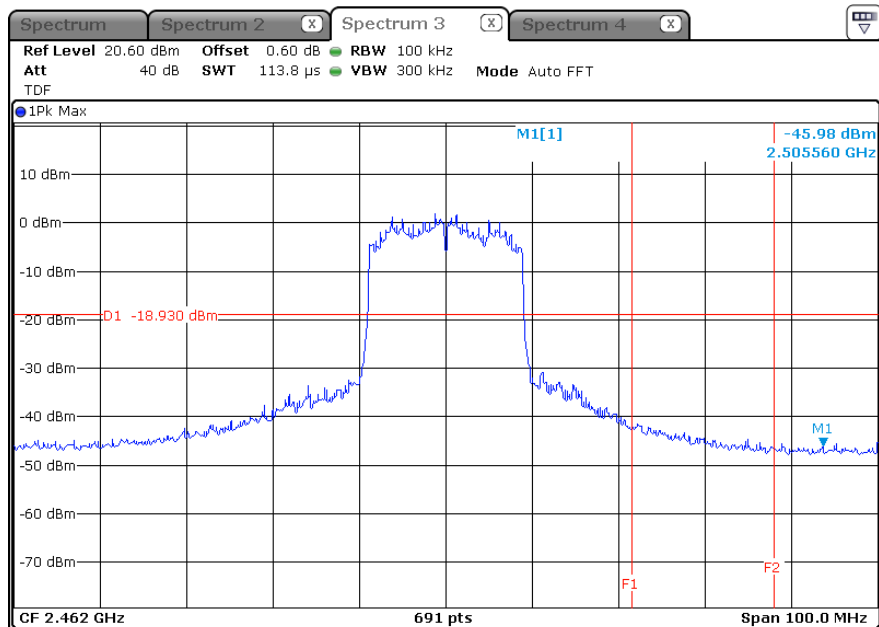


Highest Channel (2 462 MHz)

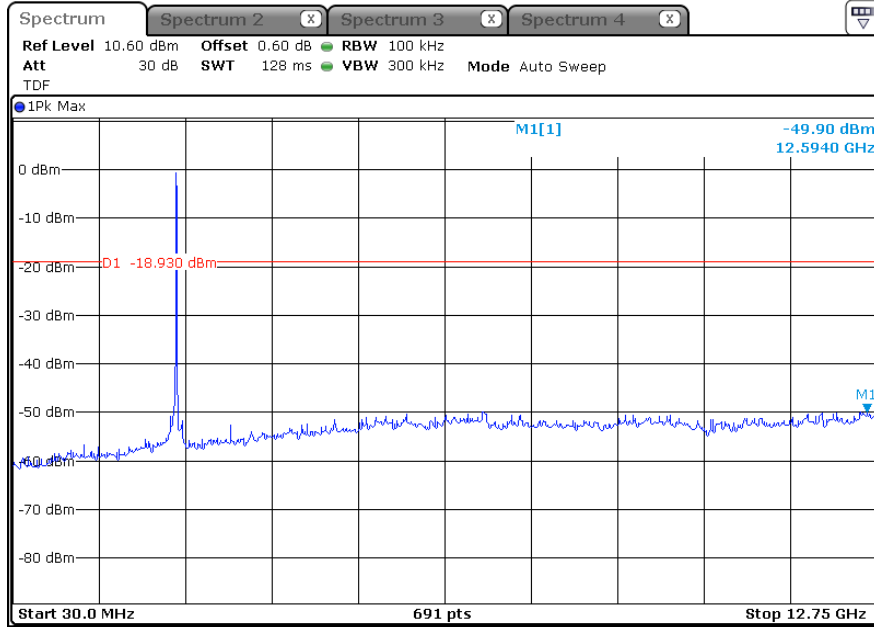
Reference



Band-edge



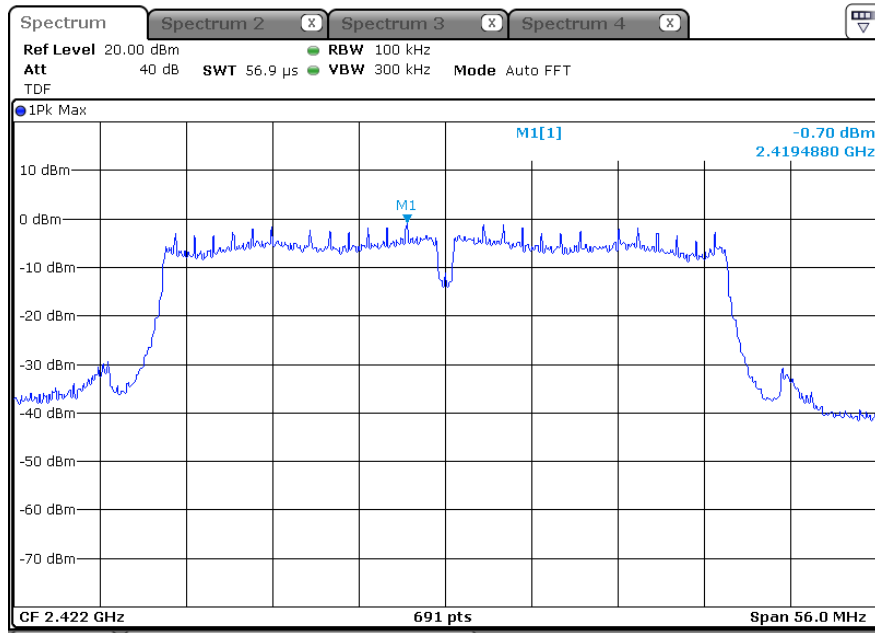
**Conducted Spurious Emissions**



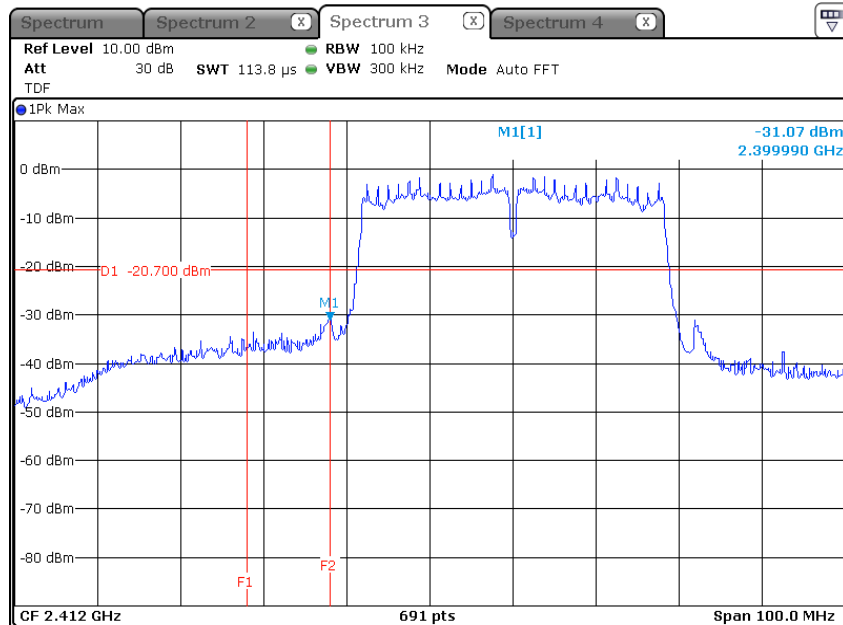
**\* 802.11n HT40\_ANT 1**

Lowest Channel (2 422 MHz)

**Reference**

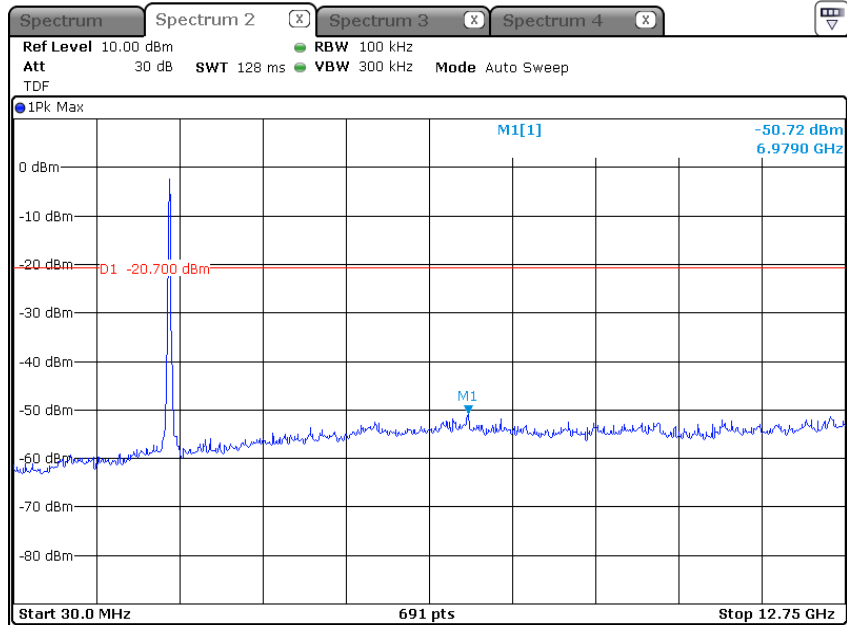


**Band-edge**



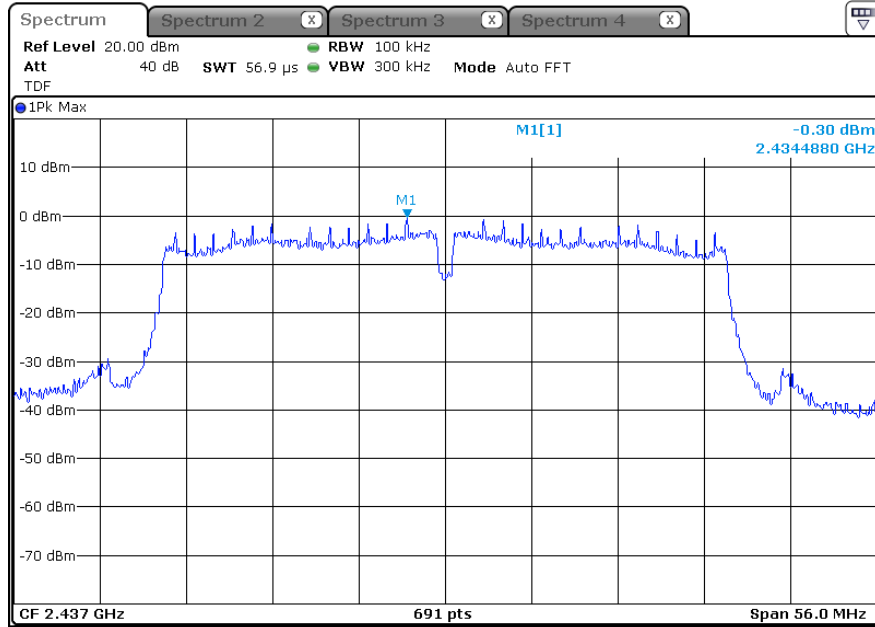


**Conducted Spurious Emissions**

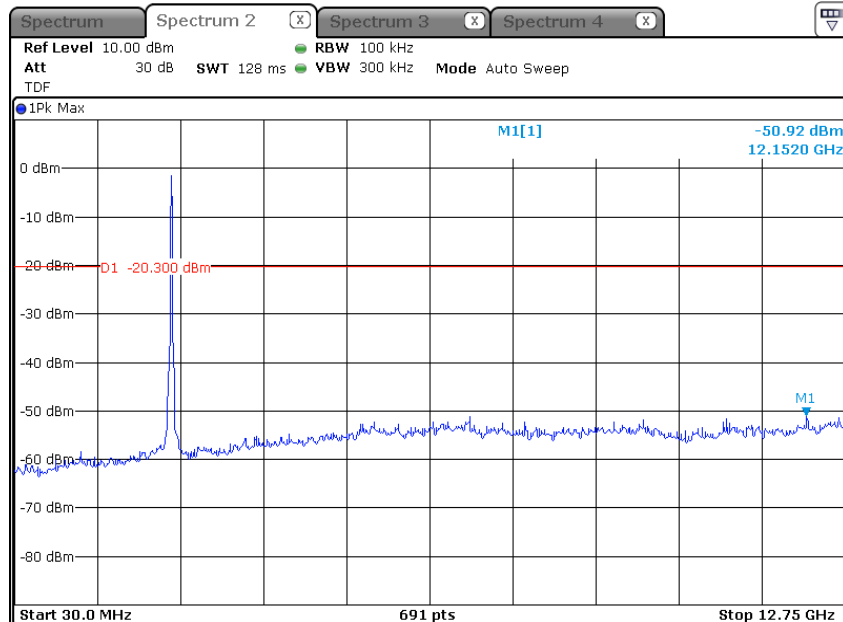


Middle Channel (2 437 MHz)

Reference

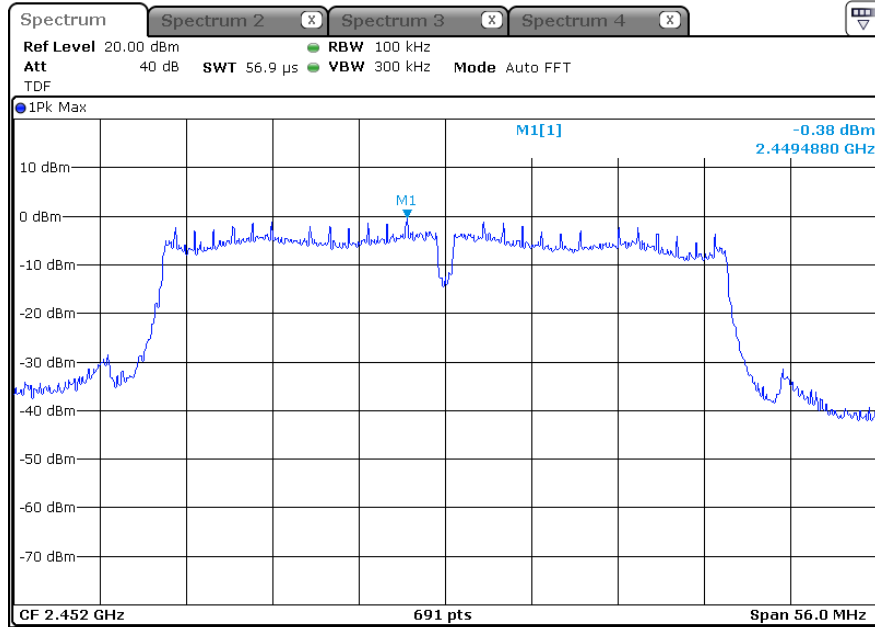


Conducted Spurious Emissions

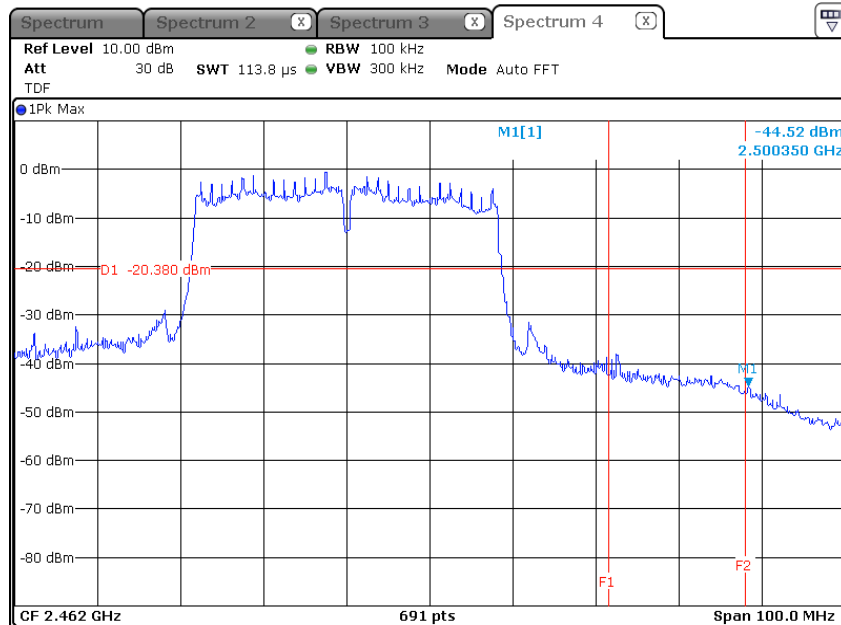


Highest Channel (2 452 MHz)

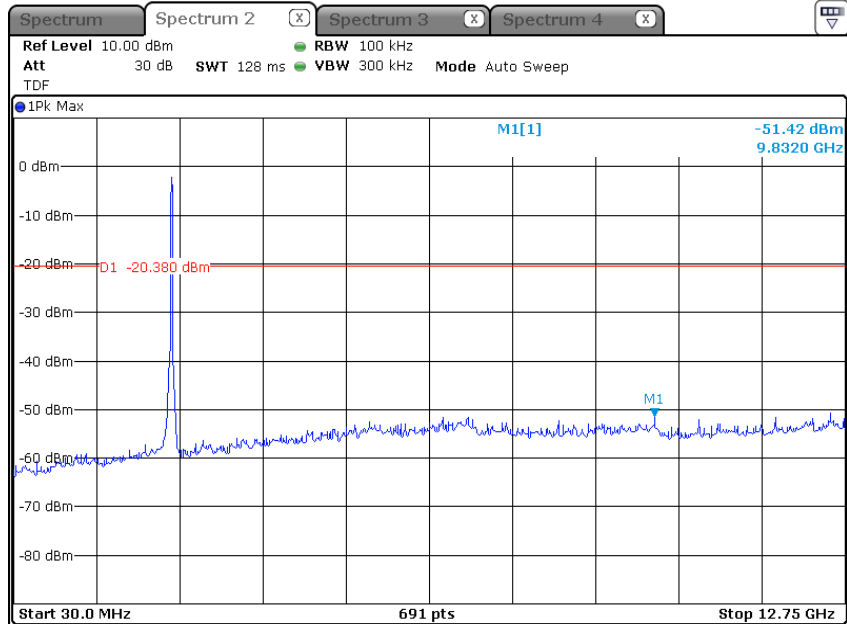
Reference



Band-edge



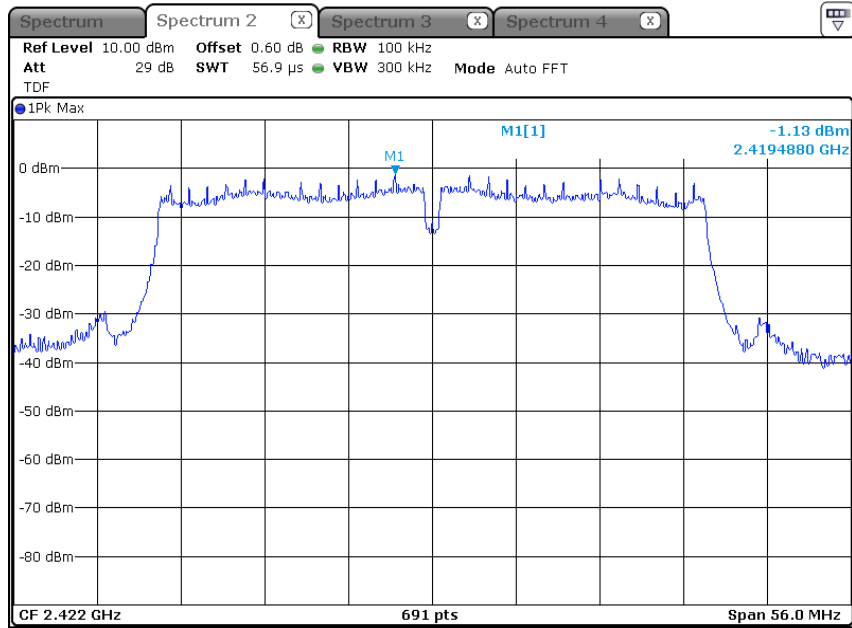
**Conducted Spurious Emissions**



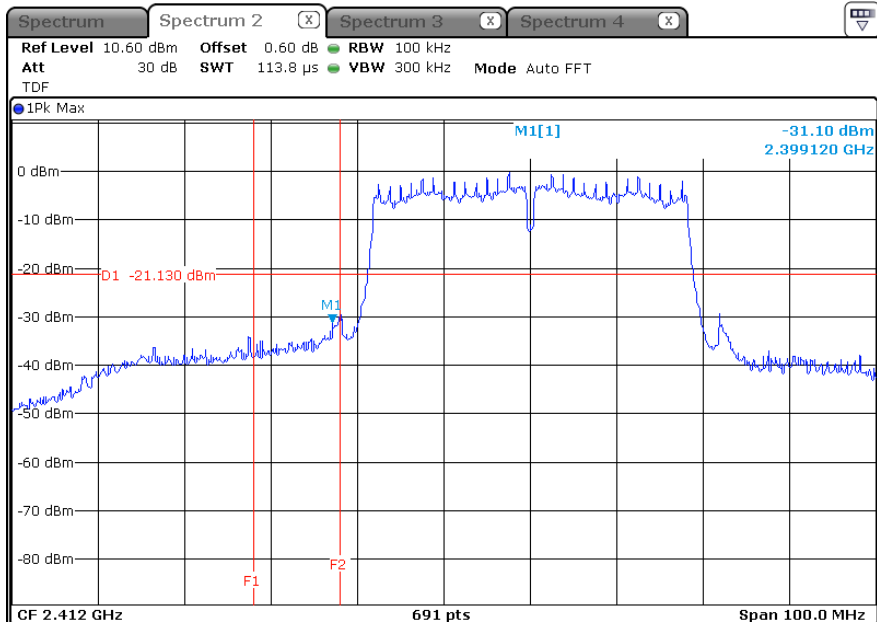
**\* 802.11n HT40\_MIMO (ANT 1)**

Lowest Channel (2 422 MHz)

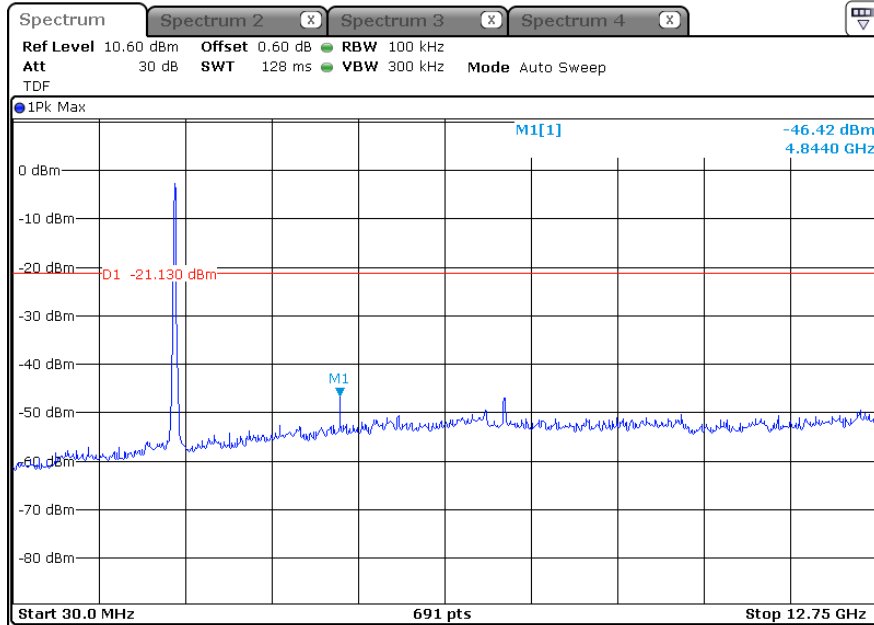
Reference



Band-edge

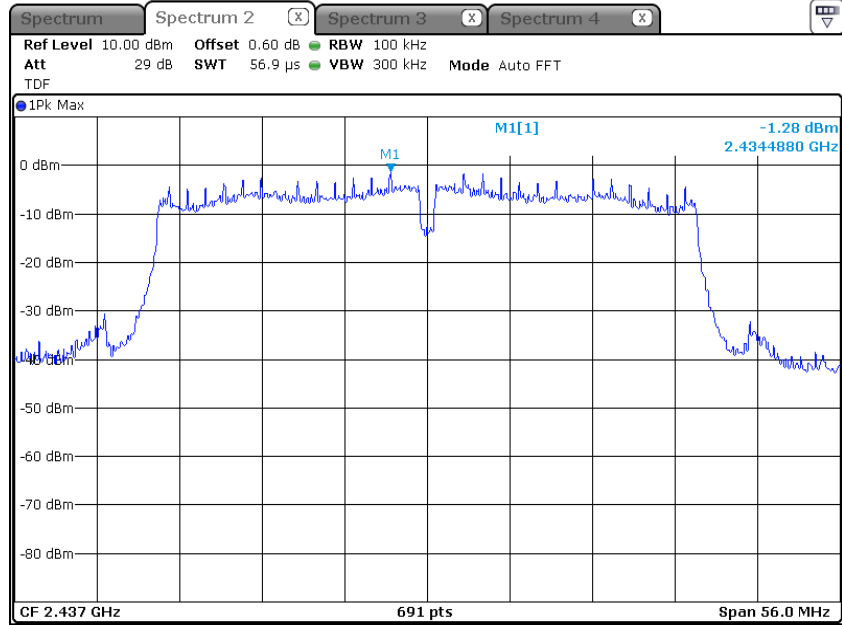


**Conducted Spurious Emissions**

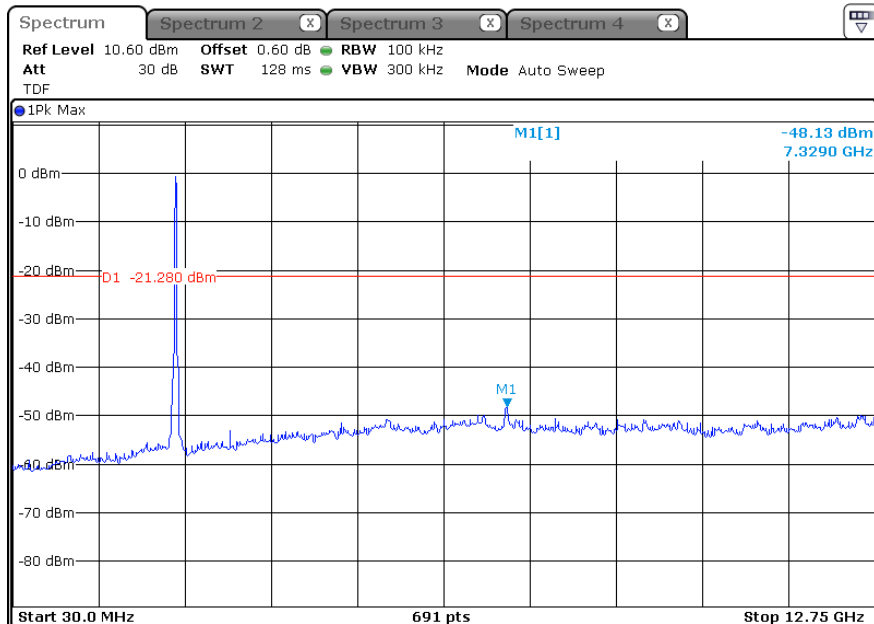


Middle Channel (2 437 MHz)

Reference

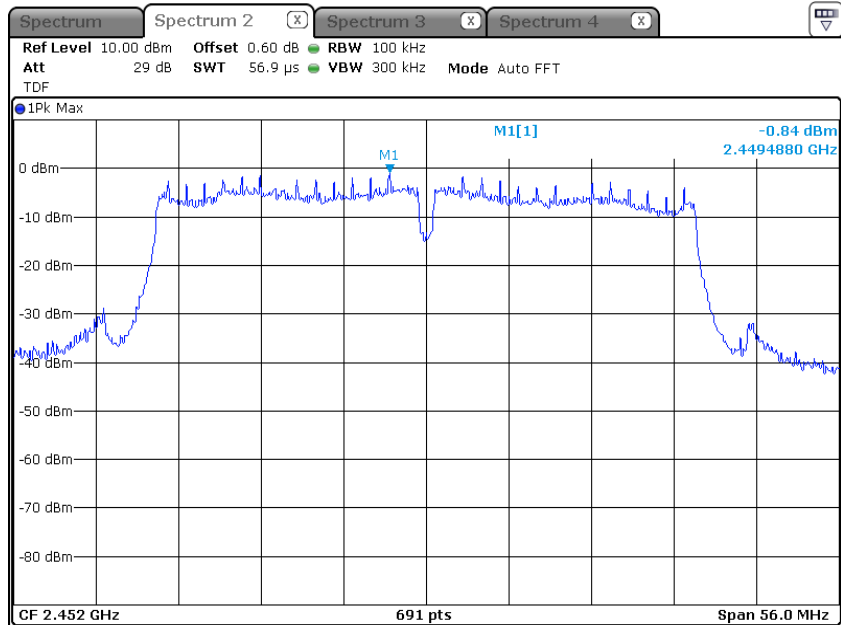


Conducted Spurious Emissions

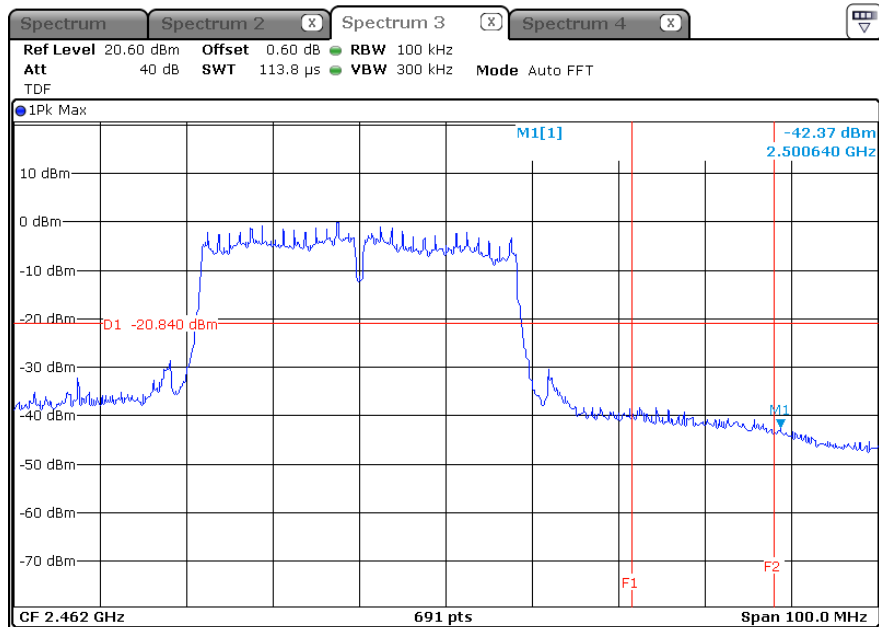


Highest Channel (2 452 MHz)

**Reference**

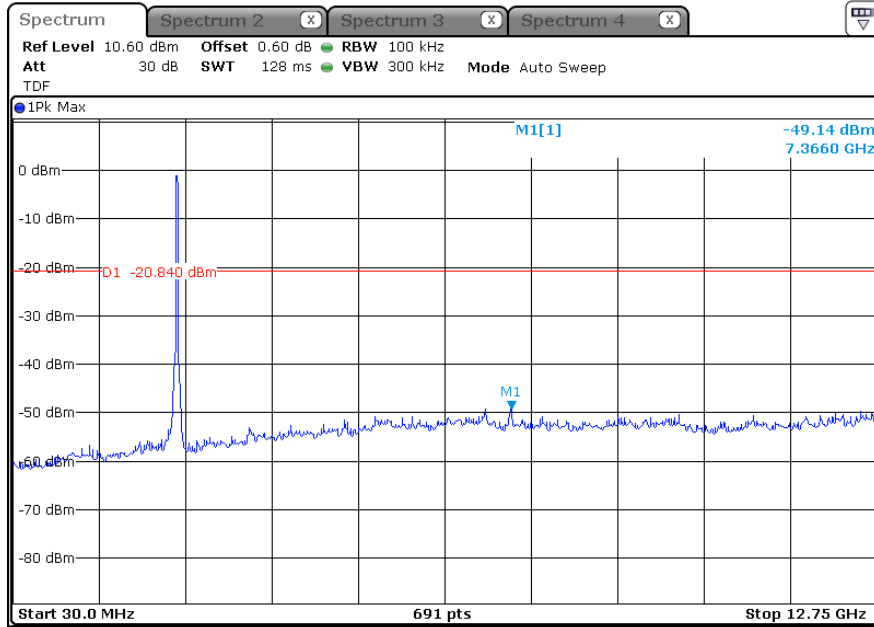


**Band-edge**





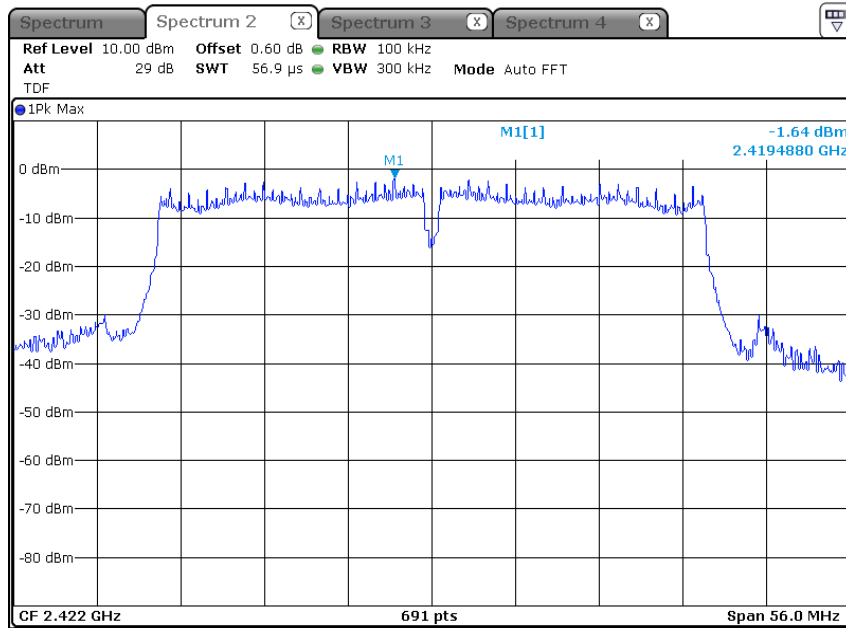
**Conducted Spurious Emissions**



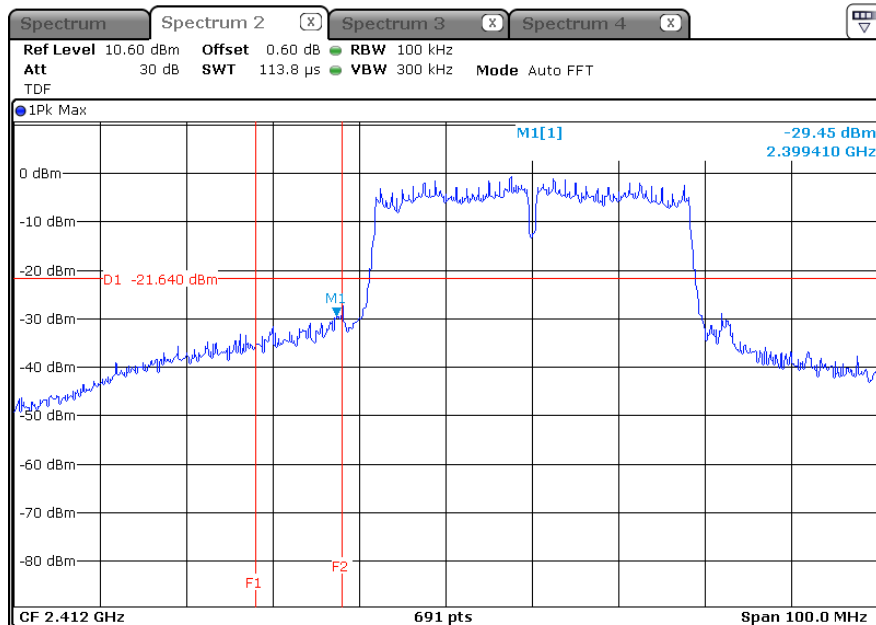
**\* 802.11n HT40\_MIMO (ANT 2)**

Lowest Channel (2 422 MHz)

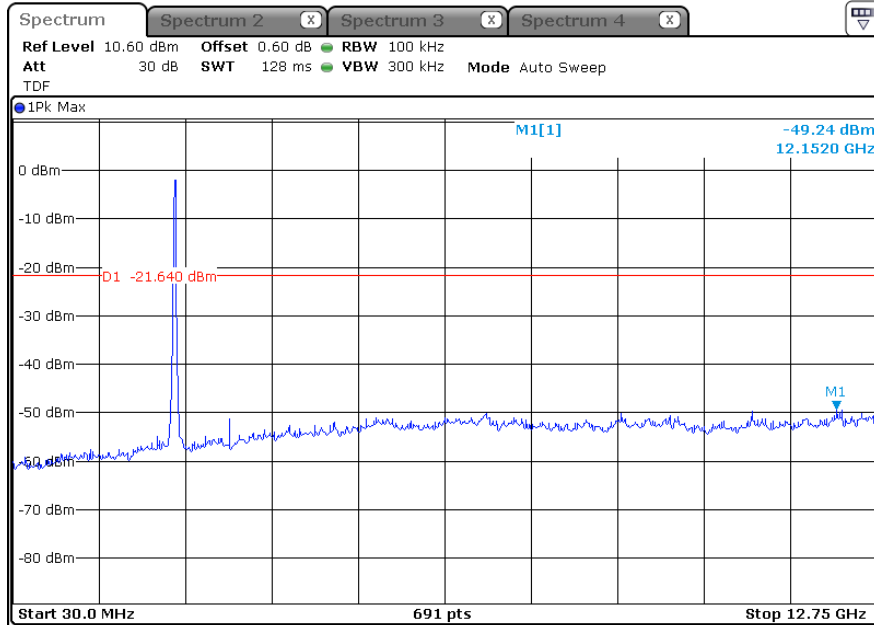
Reference



Band-edge

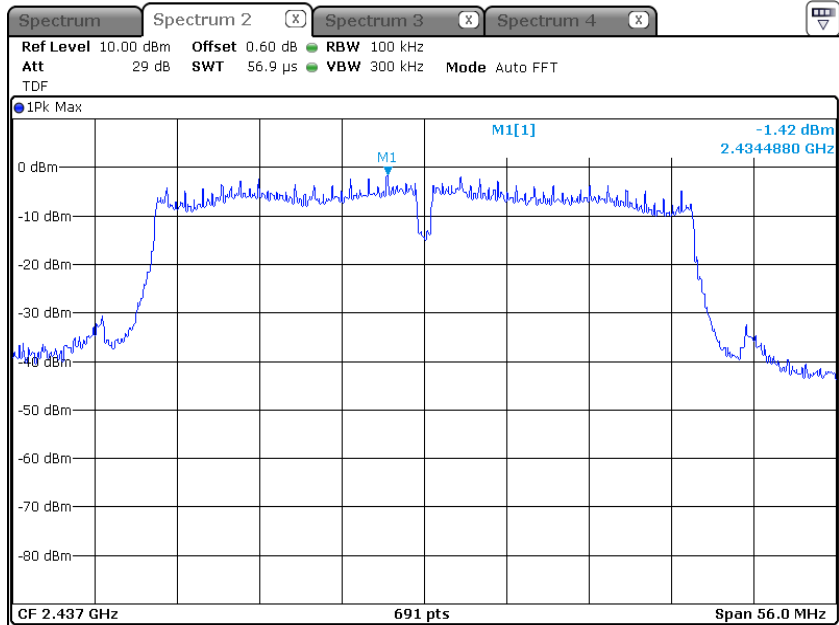


**Conducted Spurious Emissions**

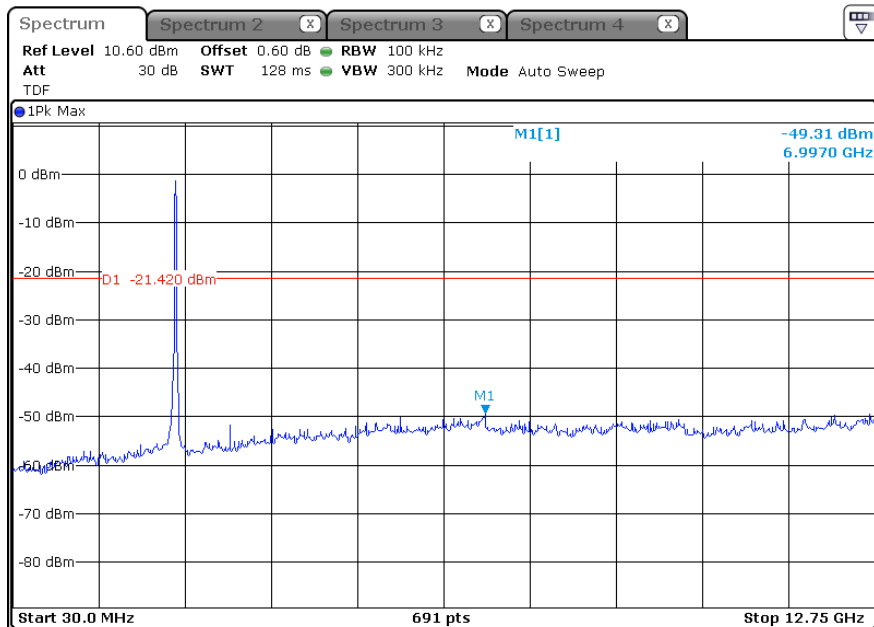


Middle Channel (2 437 MHz)

**Reference**

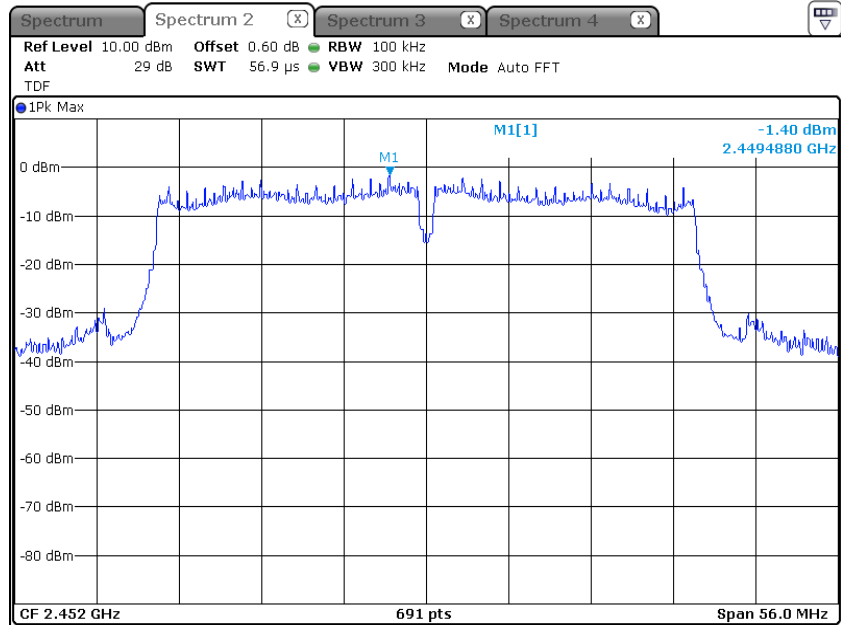


**Conducted Spurious Emissions**

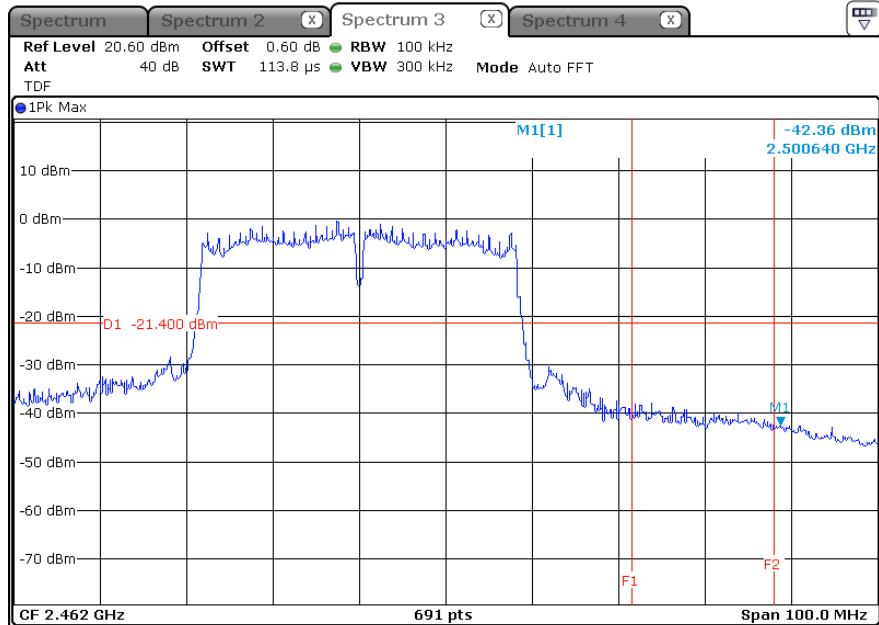


Highest Channel (2 452 MHz)

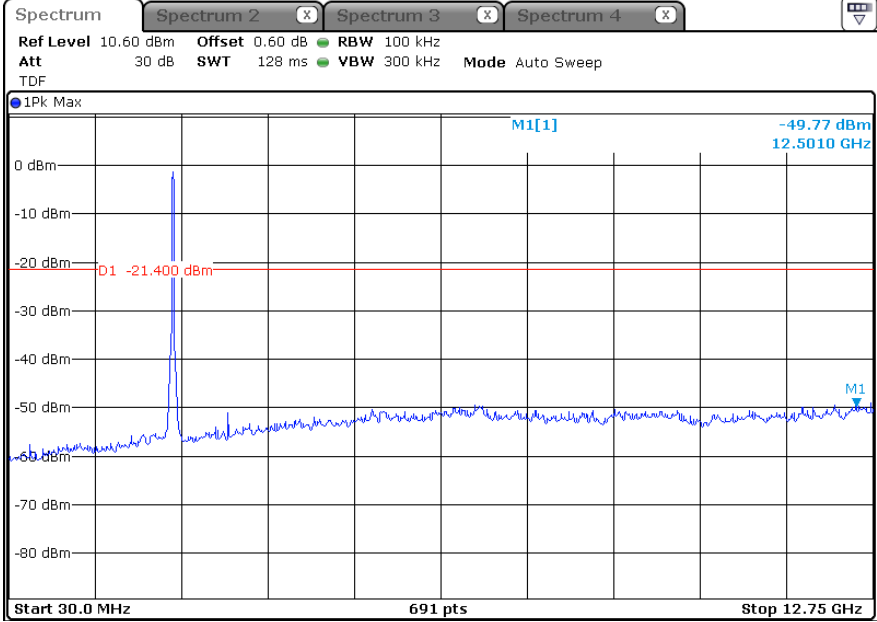
Reference



Band-edge



**Conducted Spurious Emissions**



## 5.6 Conducted Emission

### 5.6.1 Regulation

According to §15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50  $\Omega$  line impedance stabilization network (LISN).

Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 – 30	60	50

\* Decreases with the logarithm of the frequency.

According to §15.107(a), for unintentional device, except for Class A digital devices, line conducted emission limits are the same as the above table.

## 5.6.2 Measurement Procedure

- 1) The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 cm in which is located 40 cm away from the vertical wall and 1.5m away from the side wall of the shielded room.
- 2) Each current-carrying conductor of the EUT power cord was individually connected through a 50 $\Omega$ /50 $\mu$ H LISN, which is an input transducer to a Spectrum Analyzer or an EMI/Field Intensity Meter, to the input power source.
- 3) Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
- 4) The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment in the system) was then performed over the frequency range of 0.15 MHz to 30 MHz.
- 5) The measurements were made with the detector set to PEAK amplitude within a bandwidth of 10 kHz or to QUASI-PEAK and AVERAGE within a bandwidth of 9 kHz. The EUT was in transmitting mode during the measurements.

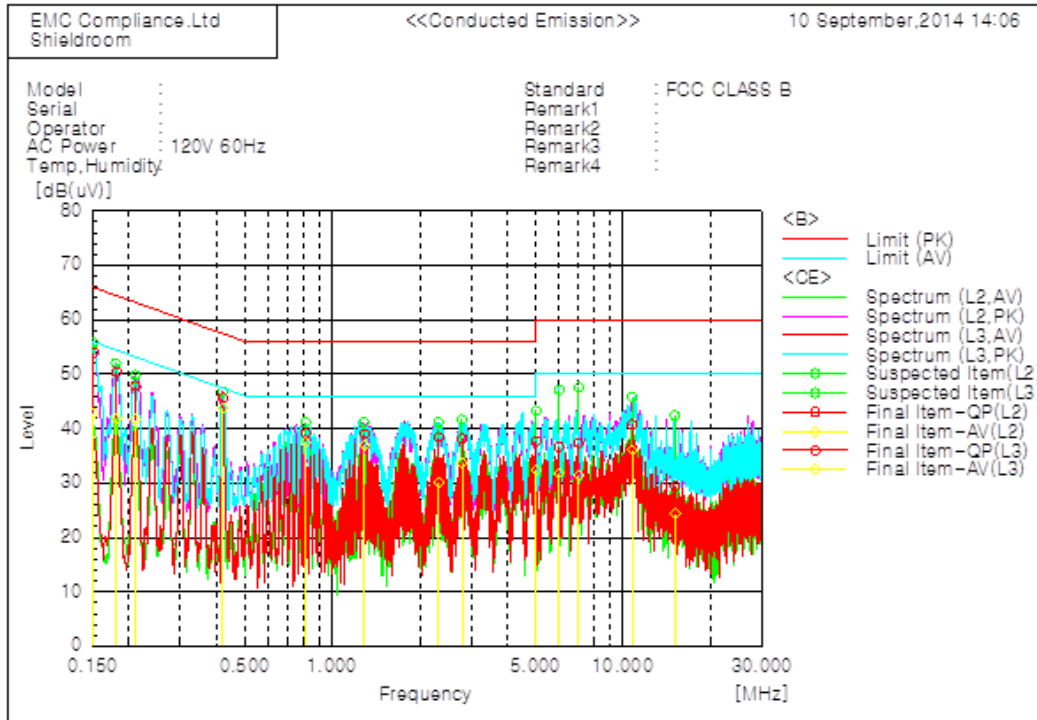


5.6.3 Test Result

- Complied

Figure 4. Plot of Conducted Emission

\*Conducted worst-case data : 802.11g\_Highest Channel (2 462 MHz)



Final Result

--- L2 Phase ---										
No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading QAV [dB(uV)]	o.f [dB]	Result QP [dB(uV)]	Result QAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin QAV [dB]
1	0.15105	45.1	32.0	10.9	54.0	42.9	55.9	55.9	11.9	13.0
2	0.16104	59.7	51.1	10.7	50.4	41.8	54.4	54.4	14.0	12.6
3	0.21081	37.2	31.0	10.7	47.9	41.7	53.2	53.2	15.6	11.5
4	0.31149	26.6	27.0	10.5	39.1	37.5	56.0	46.0	16.9	8.5
5	1.29286	26.8	26.6	10.3	39.1	38.9	56.0	46.0	16.9	9.1
6	2.32725	26.1	19.8	10.3	38.4	30.1	56.0	46.0	17.6	15.9
7	2.79932	27.9	23.5	10.3	38.2	33.8	56.0	46.0	17.8	12.2
8	5.02797	27.1	21.7	10.6	37.7	32.5	60.0	50.0	22.3	17.7
9	6.04077	25.6	21.0	10.8	36.6	31.8	60.0	50.0	23.4	16.2
10	7.04595	26.4	20.5	11.0	37.4	31.5	60.0	50.0	22.6	16.5
11	10.79334	26.8	24.1	12.0	40.8	36.1	60.0	50.0	19.2	13.9
12	15.0925	15.9	10.9	13.5	29.4	24.4	60.0	50.0	30.6	25.6

--- L3 Phase ---										
No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading QAV [dB(uV)]	o.f [dB]	Result QP [dB(uV)]	Result QAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin QAV [dB]
1	0.42038	35.1	33.5	10.5	45.6	43.8	57.4	47.4	11.8	3.8

## 6. Test equipment used for test

	Description	Manufacture	Model No.	Serial No.	Next Cal Date.
■	Temp & humidity chamber	ESPEC CORP.	SH-641	92005476	14.12.23
■	DC Power Supply	AGILENT	E3632A	MY40004399	15.01.09
■	Signal Generator	R&S	SMB 100A	176206	15.06.10
■	Spectrum Analyzer	R&S	FSV30	100914	15.08.05
■	EMI Test Receiver	R&S	ESCI	100001	15.07.14
■	Amplifier	SONOMA INSTRUMENT	310	293004	15.09.25
■	Loop Antenna	R&S	HFH2-Z2	100355	15.06.19
■	Bi-Log Antenna	SCHWARZBECK	VULB9163	552	16.06.14
■	Horn antenna	ETS.lindgren	3116	86632	15.10.20
■	Horn antenna	ETS.lindgren	3117	155787	15.02.26
■	Wideband Power Sensor	R&S	NRP-Z81	100677	15.05.28
■	Broadband Preamplifier	SCHWARZBECK	BBV9718	233	15.04.22
■	Broadband Preamplifier	SCHWARZBECK	BBV9721	2	15.05.09
■	Attenuator	HP	8491A	MY52460424	15.07.23
■	Two-Line V-Network	R&S	ENV216	101352	15.10.13
■	Line Impedance Stabilisation Network	Schwarzbeck	NNLK8121	8121-472	15.06.24
■	Turn Table	Innco Systems	DT2000S	N/A	-
■	Antenna Mast	Innco Systems	MA4000-EP	N/A	-