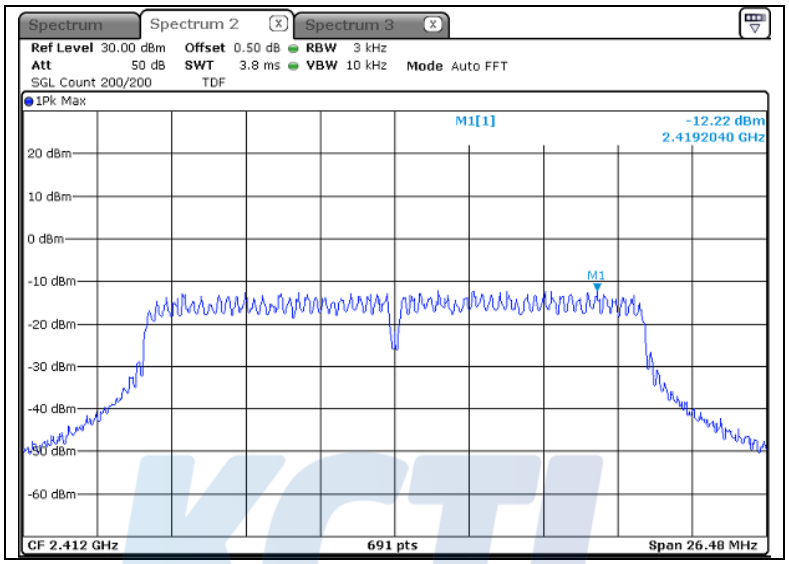
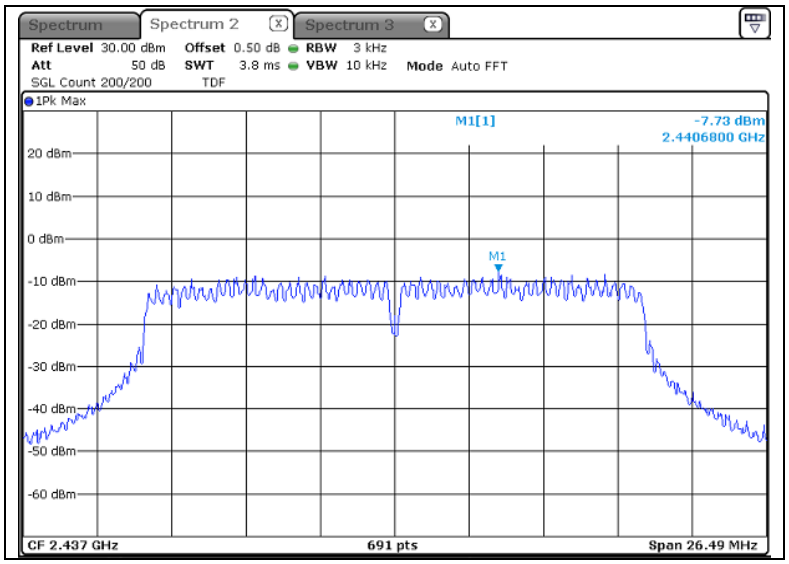
- MIMO 2 Tx (ANT 1)

- 802.11n HT20

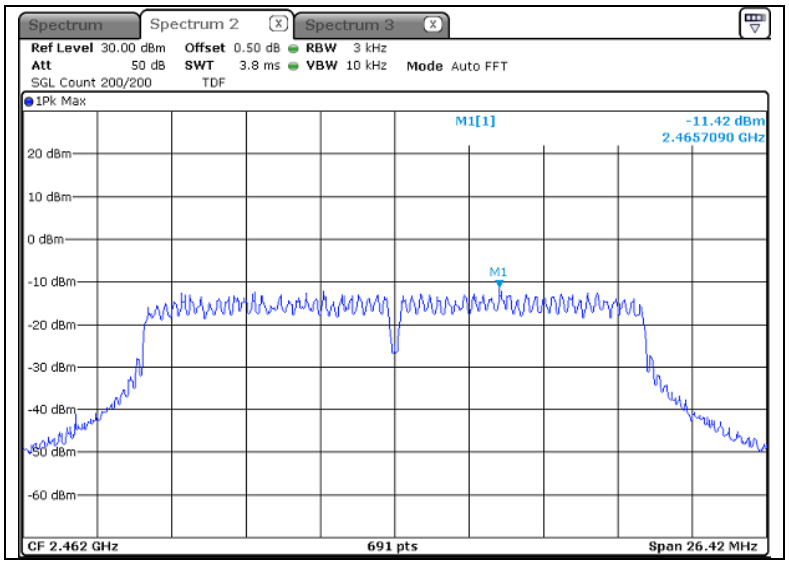
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

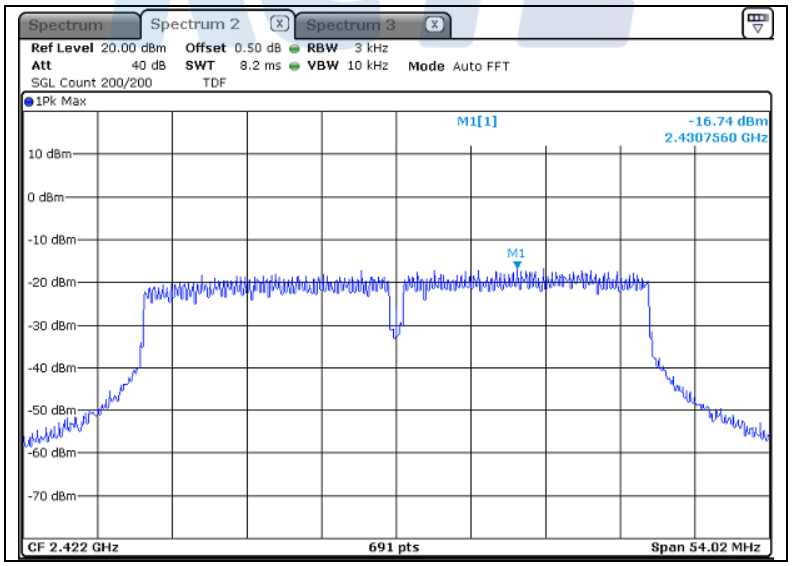


Highest Channel (2 462 ㎒)

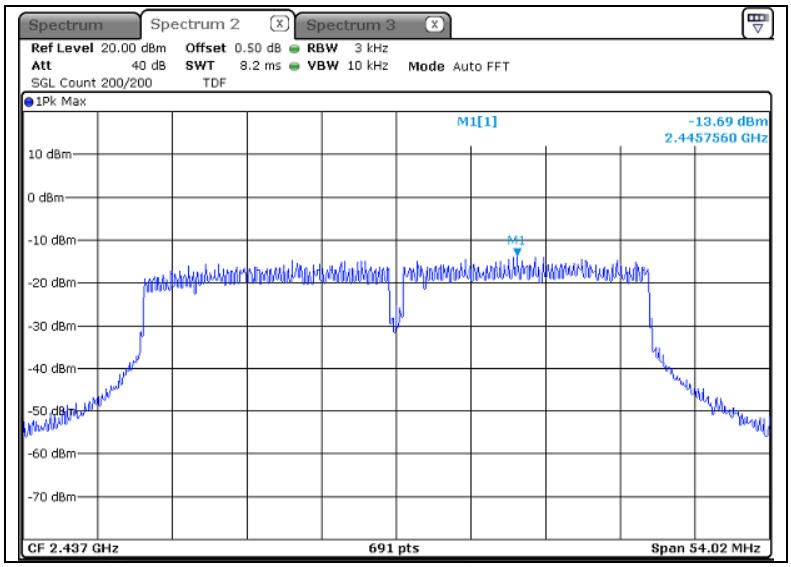


- 802.11n HT40

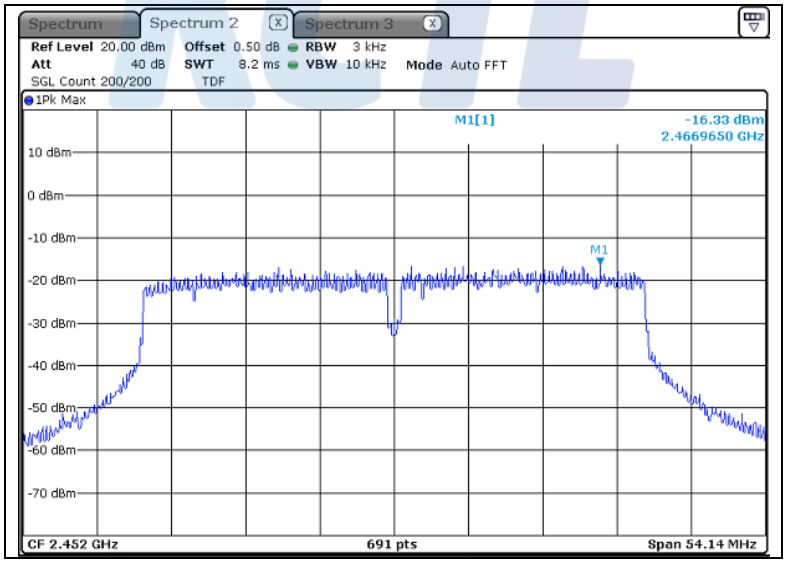
Lowest Channel (2 422 ㎒)



Middle Channel (2 437 ㎒)



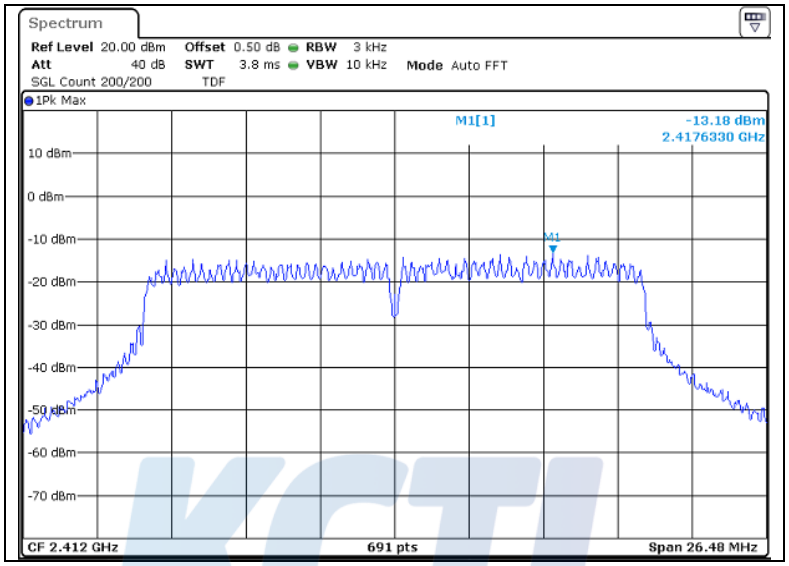
Highest Channel (2 452 ㎒)



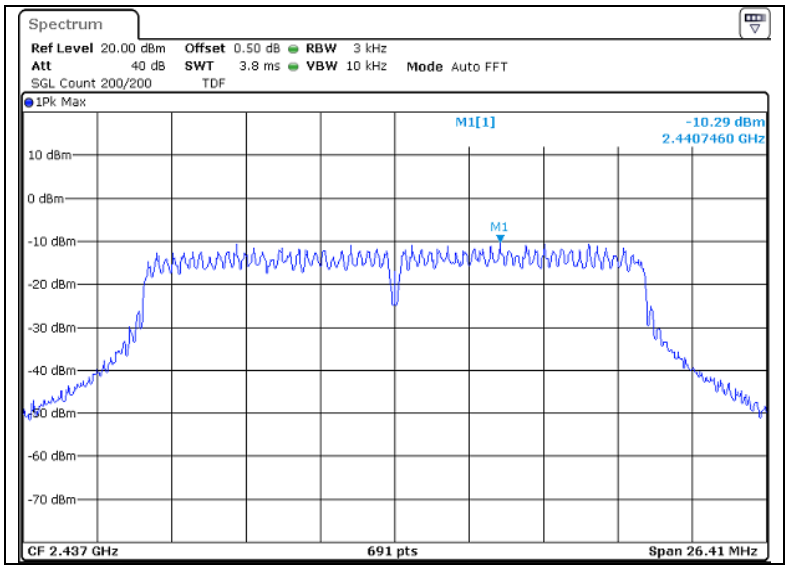
- MIMO 3 Tx (ANT 0)

- 802.11n HT20

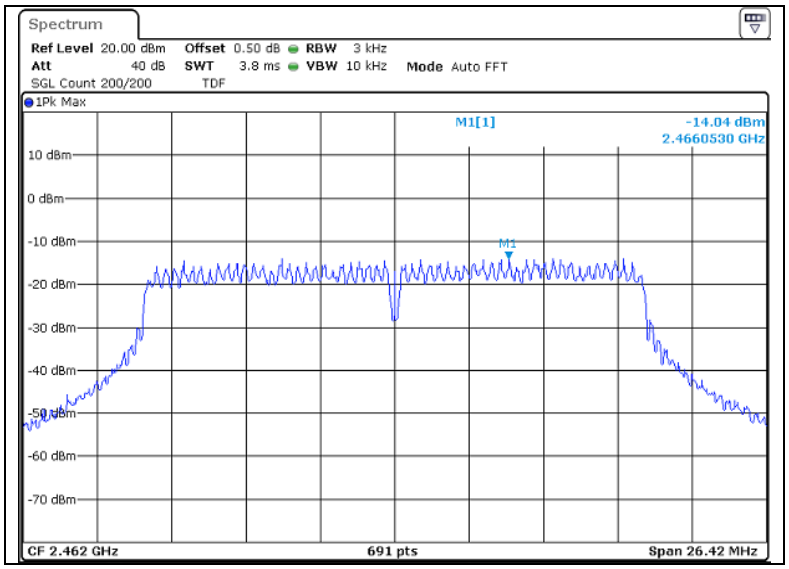
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

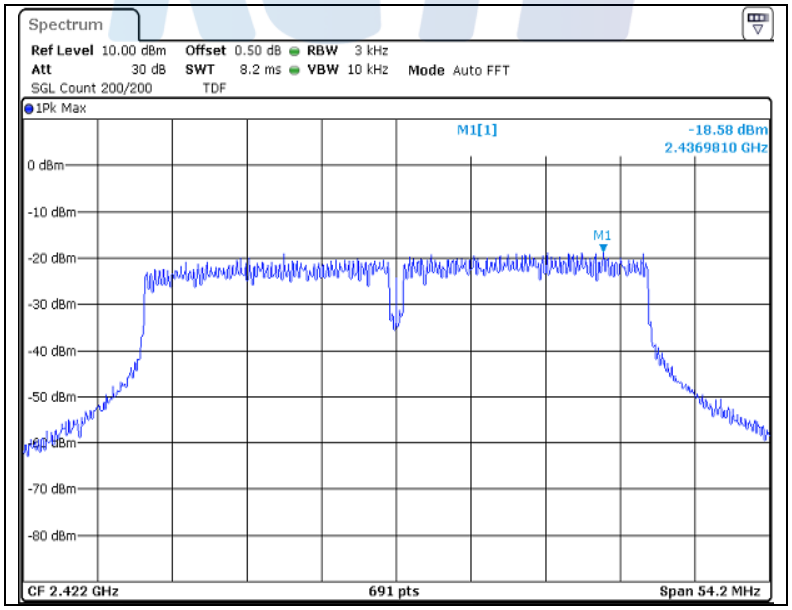


Highest Channel (2 462 ㎒)

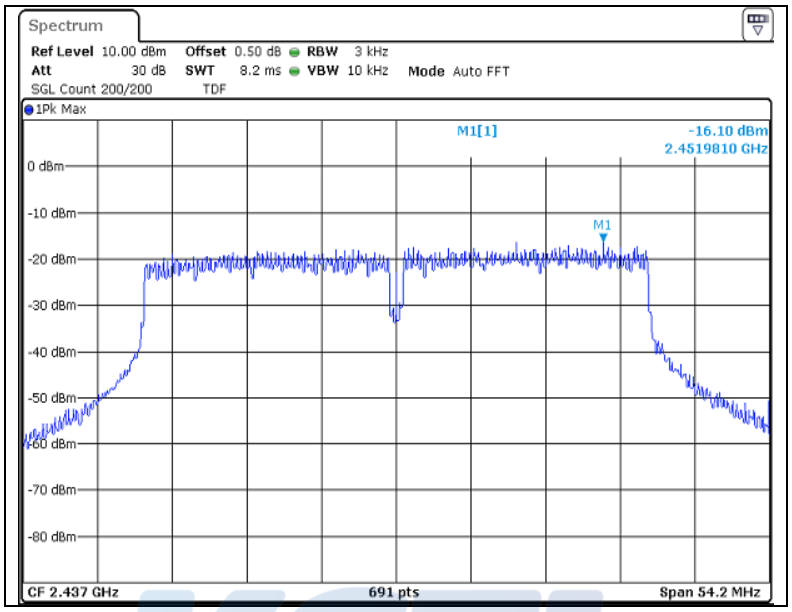


- 802.11n HT40

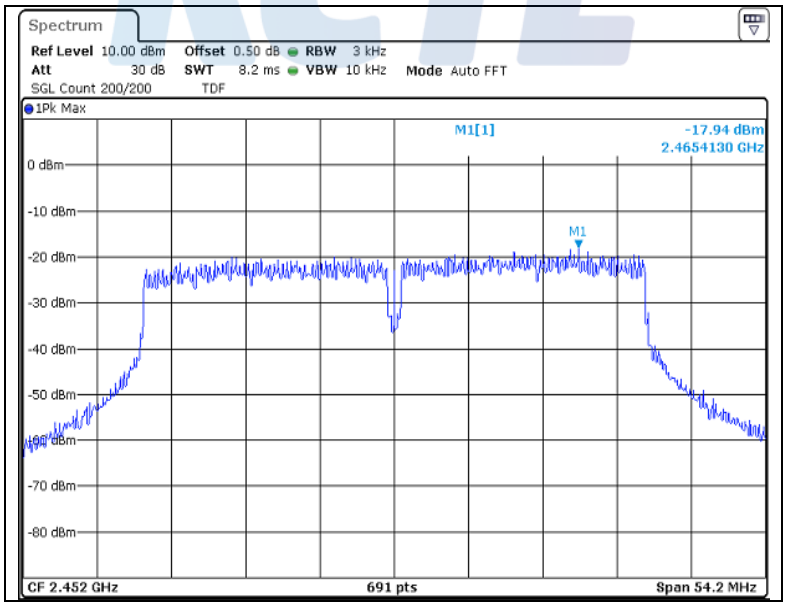
Lowest Channel (2 422 ㎒)



Middle Channel (2 437 ㎒)



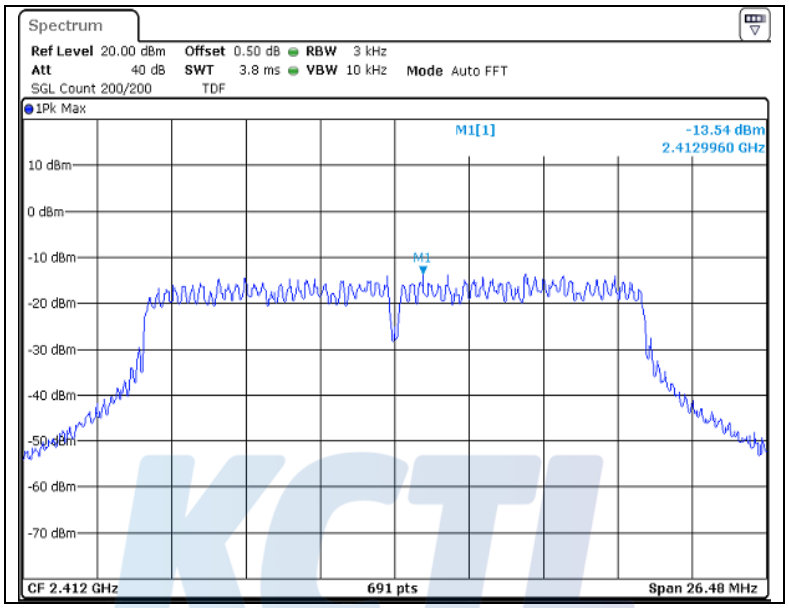
Highest Channel (2 452 ㎒)



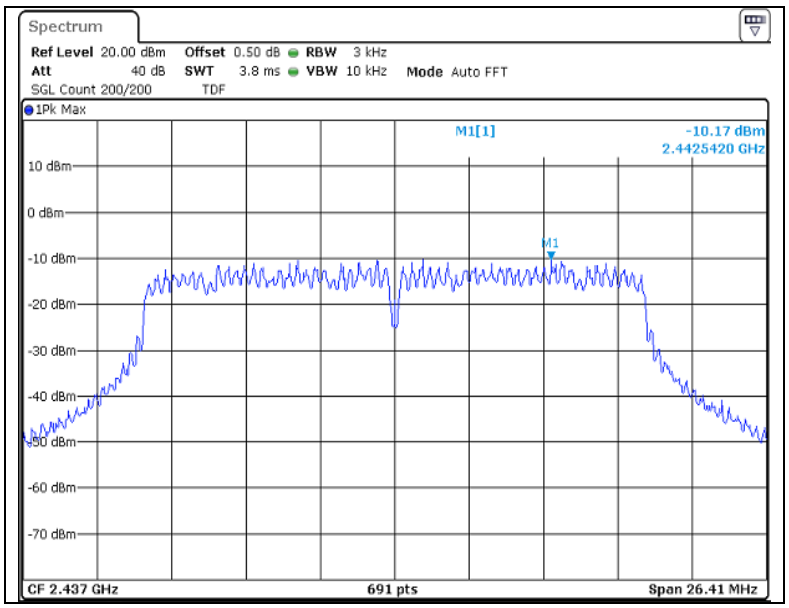
- MIMO 3 Tx (ANT 1)

- 802.11n HT20

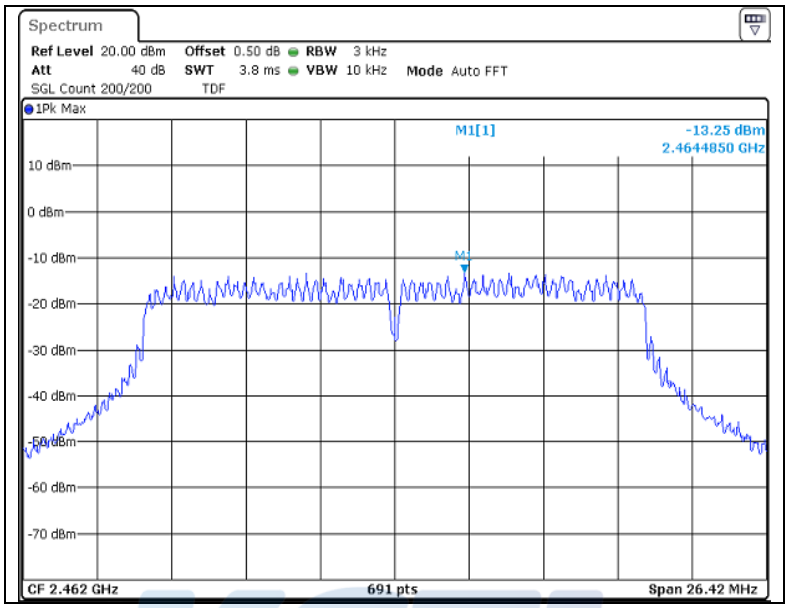
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

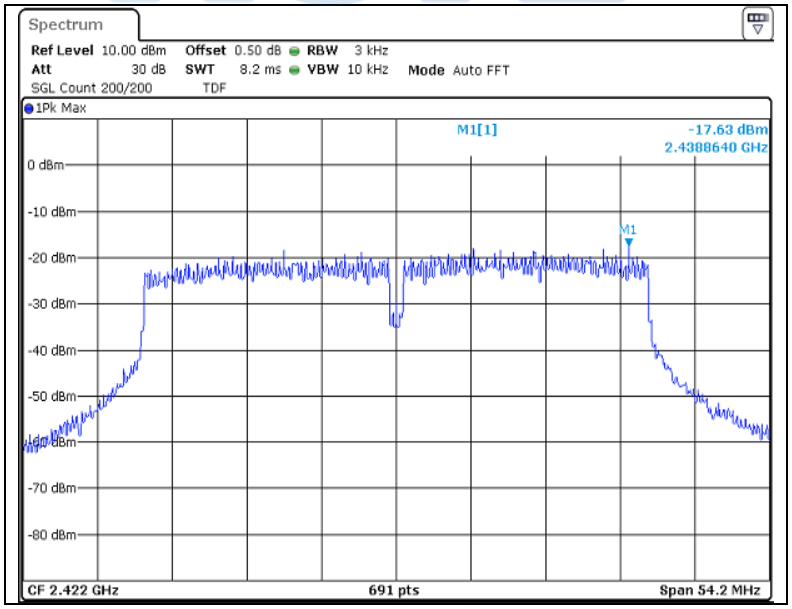


Highest Channel (2 462 ㎒)

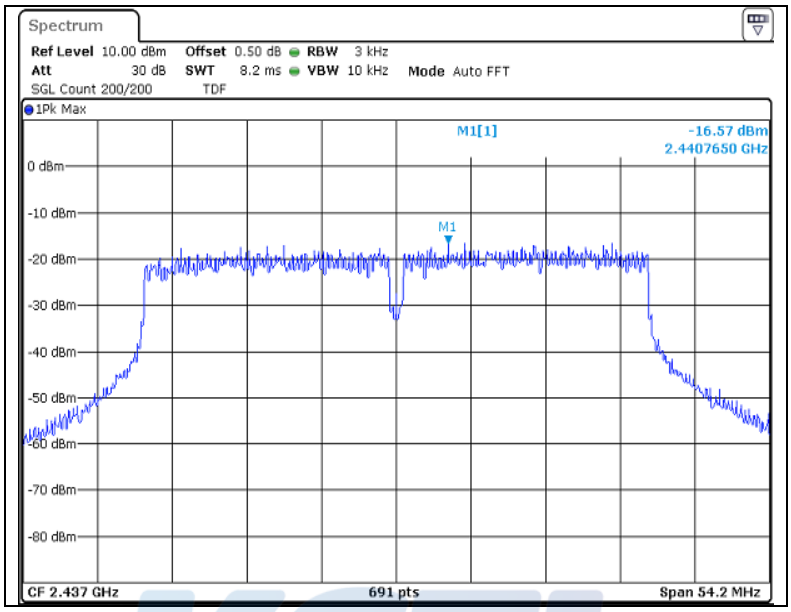


- 802.11n HT40

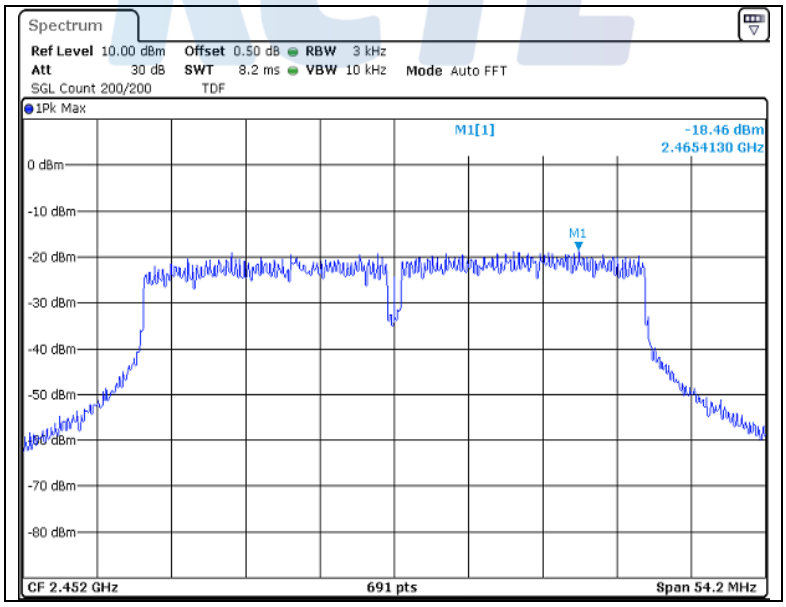
Lowest Channel (2 422 ㎒)



Middle Channel (2 437 ㎒)



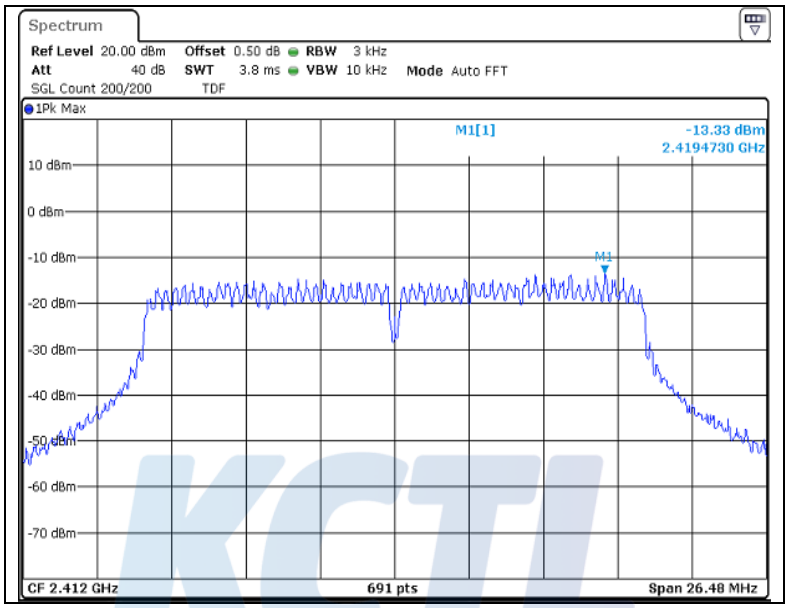
Highest Channel (2 452 ㎒)



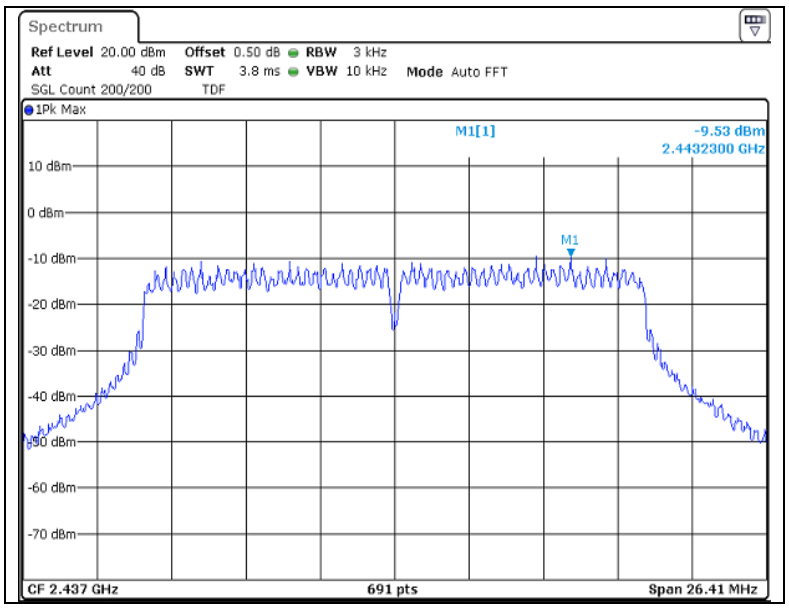
- MIMO 3 Tx (ANT 2)

- 802.11n HT20

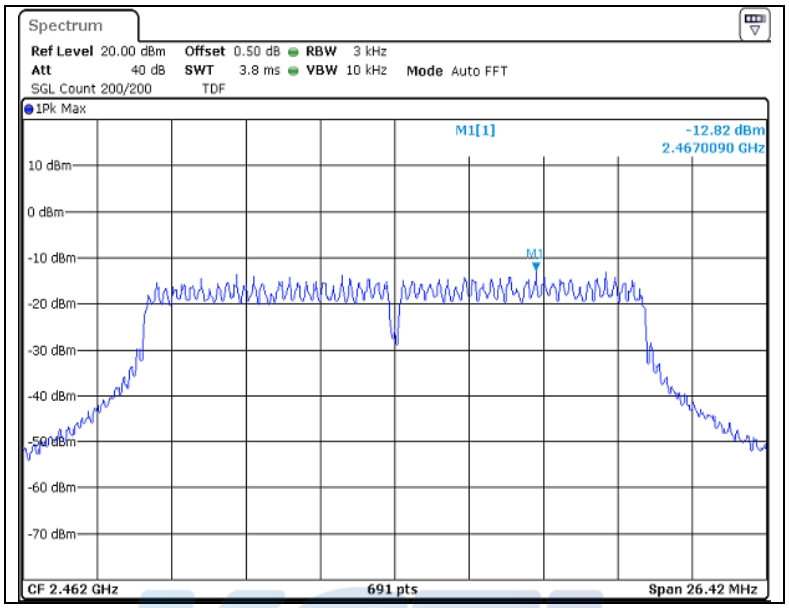
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

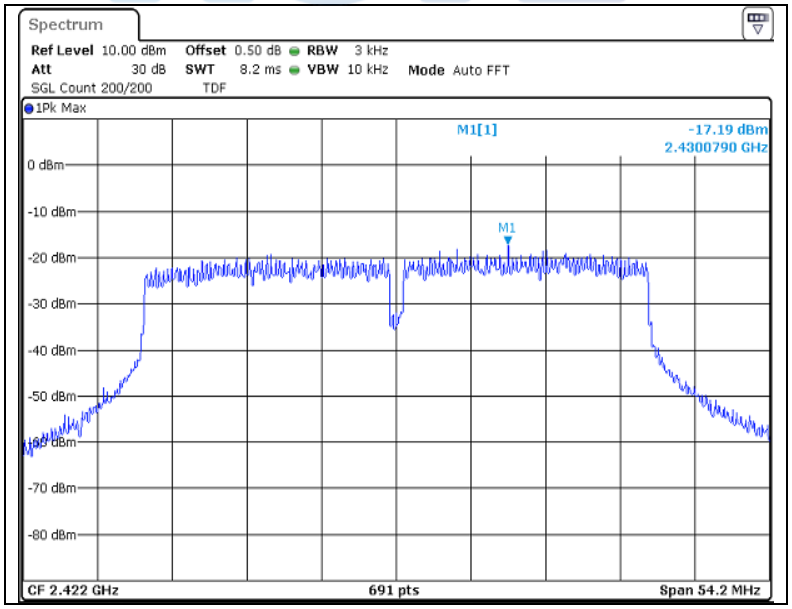


Highest Channel (2 462 ㎒)

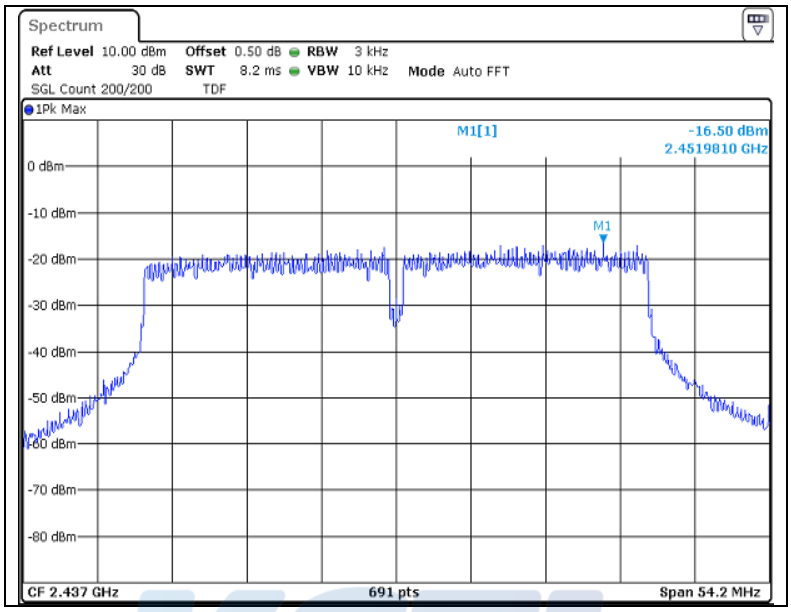


- 802.11n HT40

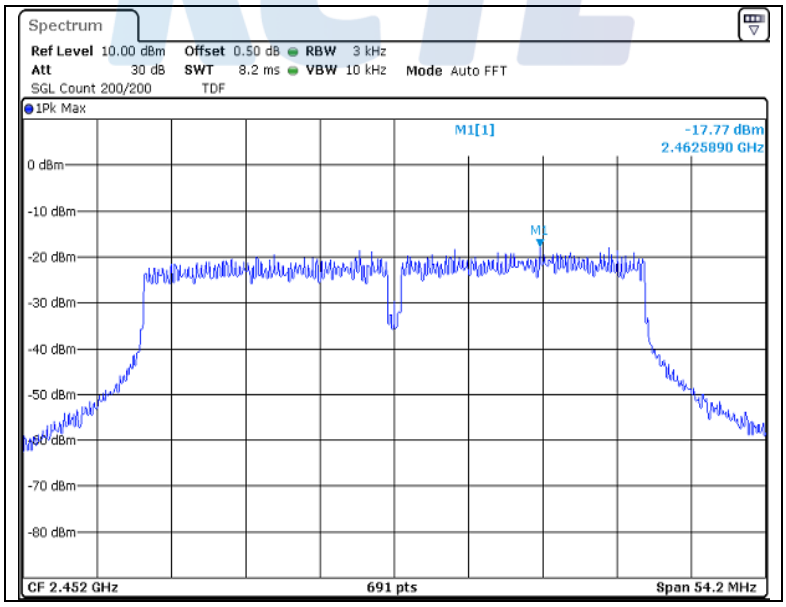
Lowest Channel (2 422 ㎒)



Middle Channel (2 437 ㎒)



Highest Channel (2 452 ㎒)



5.4 6 dB Bandwidth(DTS Channel Bandwidth)

5.4.1 Regulation

According to §15.247(a)(2) Systems using digital modulation techniques may operate in the 902–928 ㎒, 2 400–2 483.5 ㎒, and 5 725–5 850 ㎒ bands. The minimum 6 ㏈ bandwidth shall be at least 500 ㎑.

5.4.2 Measurement Procedure

These test measurement settings are specified in section 8.0 of 558074 D01 DTS Meas Guidance.

5.4.2.1 DTS Channel Bandwidth-Option 1

1) Set RBW = 100 ㎑.
2) Set the video bandwidth (VBW) ≥ 3 x RBW.
3) Detector = Peak.
4) Trace mode = max hold.
5) Sweep = auto couple.
6) Allow the trace to stabilize.
7) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 ㏈ relative to the maximum level measured in the fundamental emission.

5.4.2.2 DTS Channel Bandwidth Measurement Procedure-Option 2

The automatic bandwidth measurement capability of an instrument may be employed using the X ㏈ bandwidth mode with X set to 6 ㏈, if the functionality described above (i.e., RBW = 100 ㎑, VBW ≥ 3 x RBW, peak detector with maximum hold) is implemented by the instrumentation function.
When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 ㏈.

5.4.3 Test Result

- Complied

- ANT 0

- 802.11b

Channel	Frequency [㎒]	6 ㏈ Bandwidth [㎒]	Min. Limit [㎒]	Occupied Bandwidth (99 % BW) [㎒]
Lowest	2 412	7.99	0.50	11.35
Middle	2 437	7.99	0.50	11.29
Highest	2 462	7.99	0.50	11.35

- 802.11g

Channel	Frequency [㎒]	6 ㏈ Bandwidth [㎒]	Min. Limit [㎒]	Occupied Bandwidth (99 % BW) [㎒]
Lowest	2 412	16.44	0.50	16.44
Middle	2 437	16.45	0.50	16.44
Highest	2 462	16.45	0.50	16.44

- 802.11n HT20

Channel	Frequency [㎒]	6 ㏈ Bandwidth [㎒]	Min. Limit [㎒]	Occupied Bandwidth (99 % BW) [㎒]
Lowest	2 412	17.54	0.50	17.66
Middle	2 437	17.54	0.50	17.66
Highest	2 462	17.55	0.50	17.66

- 802.11n HT40

Channel	Frequency [㎒]	6 ㏈ Bandwidth [㎒]	Min. Limit [㎒]	Occupied Bandwidth (99 % BW) [㎒]
Lowest	2 422	36.24	0.50	36.12
Middle	2 437	36.01	0.50	36.01
Highest	2 452	36.01	0.50	36.12

- ANT 1

- 802.11b

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Min. Limit [MHz]	Occupied Bandwidth (99 % BW) [MHz]
Lowest	2 412	7.99	0.50	11.23
Middle	2 437	7.99	0.50	11.35
Highest	2 462	7.99	0.50	11.35

- 802.11g

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Min. Limit [MHz]	Occupied Bandwidth (99 % BW) [MHz]
Lowest	2 412	16.44	0.50	16.44
Middle	2 437	16.45	0.50	16.50
Highest	2 462	16.45	0.50	16.44

- 802.11n HT20

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Min. Limit [MHz]	Occupied Bandwidth (99 % BW) [MHz]
Lowest	2 412	17.54	0.50	17.60
Middle	2 437	17.54	0.50	17.77
Highest	2 462	17.55	0.50	16.44

- 802.11n HT40

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Min. Limit [MHz]	Occupied Bandwidth (99 % BW) [MHz]
Lowest	2 422	36.01	0.50	36.24
Middle	2 437	36.01	0.50	36.01
Highest	2 452	36.12	0.50	36.01

- ANT 2

- 802.11b

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Min. Limit [MHz]	Occupied Bandwidth (99 % BW) [MHz]
Lowest	2 412	7.99	0.50	11.52
Middle	2 437	7.99	0.50	11.52
Highest	2 462	7.99	0.50	11.52

- 802.11g

Channel	Frequency [㎒]	6 ㏈ Bandwidth [㎒]	Min. Limit [㎒]	Occupied Bandwidth (99 % BW) [㎒]
Lowest	2 412	16.44	0.50	16.44
Middle	2 437	16.45	0.50	16.50
Highest	2 462	16.45	0.50	16.44

- 802.11n HT20

Channel	Frequency [㎒]	6 ㏈ Bandwidth [㎒]	Min. Limit [㎒]	Occupied Bandwidth (99 % BW) [㎒]
Lowest	2 412	17.54	0.50	16.44
Middle	2 437	17.54	0.50	17.66
Highest	2 462	17.55	0.50	16.44

- 802.11n HT40

Channel	Frequency [㎒]	6 ㏈ Bandwidth [㎒]	Min. Limit [㎒]	Occupied Bandwidth (99 % BW) [㎒]
Lowest	2 422	36.24	0.50	36.12
Middle	2 437	36.01	0.50	36.01
Highest	2 452	36.01	0.50	36.24

- MIMO (ANT 0+1)

- 802.11n HT20

Channel	Frequency [㎒]	6 ㏈ Bandwidth [㎒]	Min. Limit [㎒]	Occupied Bandwidth (99 % BW) [㎒]
Lowest	2 412	17.66	0.50	17.60
Middle	2 437	17.66	0.50	17.60
Highest	2 462	17.61	0.50	17.60

- 802.11n HT40

Channel	Frequency [㎒]	6 ㏈ Bandwidth [㎒]	Min. Limit [㎒]	Occupied Bandwidth (99 % BW) [㎒]
Lowest	2 422	36.01	0.50	36.12
Middle	2 437	36.01	0.50	36.01
Highest	2 452	36.09	0.50	36.24

- MIMO (ANT 0+1+2)

- 802.11n HT20

Channel	Frequency [㎒]	6 ㏈ Bandwidth [㎒]	Min. Limit [㎒]	Occupied Bandwidth (99 % BW) [㎒]
Lowest	2 412	17.66	0.50	17.60
Middle	2 437	17.61	0.50	17.60
Highest	2 462	17.61	0.50	17.66

- 802.11n HT40

Channel	Frequency [㎒]	6 ㏈ Bandwidth [㎒]	Min. Limit [㎒]	Occupied Bandwidth (99 % BW) [㎒]
Lowest	2 422	36.01	0.50	36.12
Middle	2 437	36.01	0.50	36.01
Highest	2 452	36.01	0.50	36.12

NOTE:
1. We took the insertion loss of the cable loss into consideration within the measuring instrument.

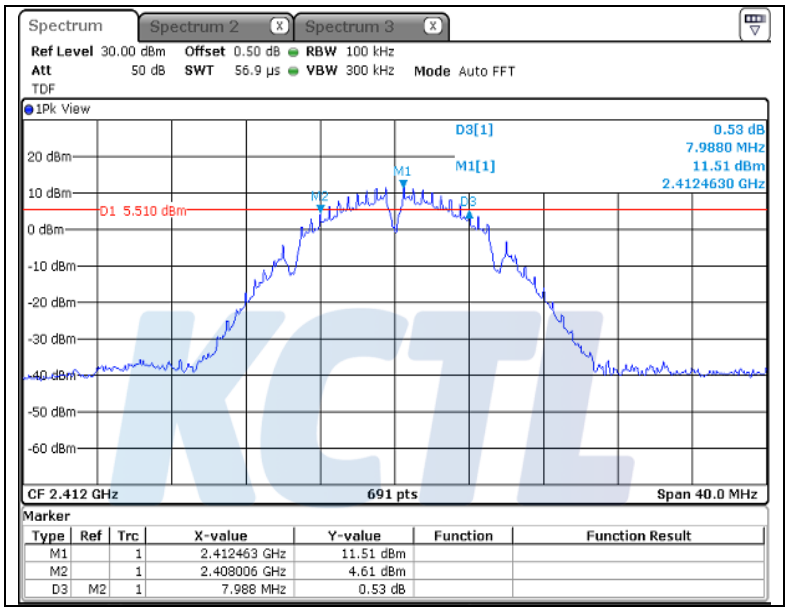
5.4.4 Test Plot

Figure 2. Plot of the 6 ㏈ Bandwidth & Occupied Bandwidth

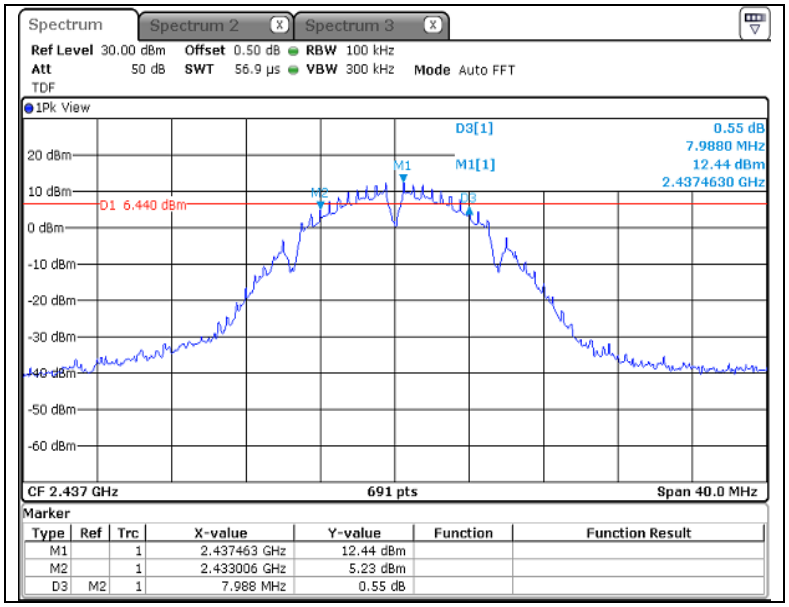
- ANT 0

- 802.11b_6 ㏈ Bandwidth

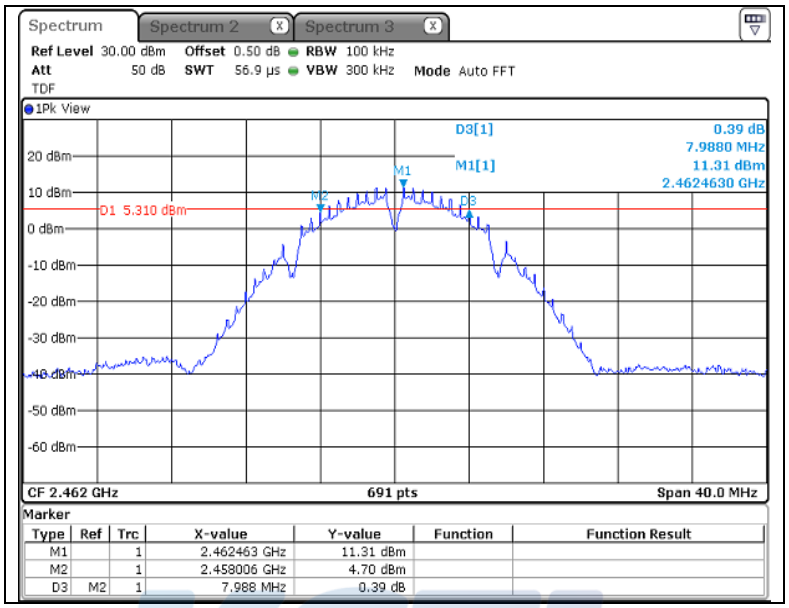
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

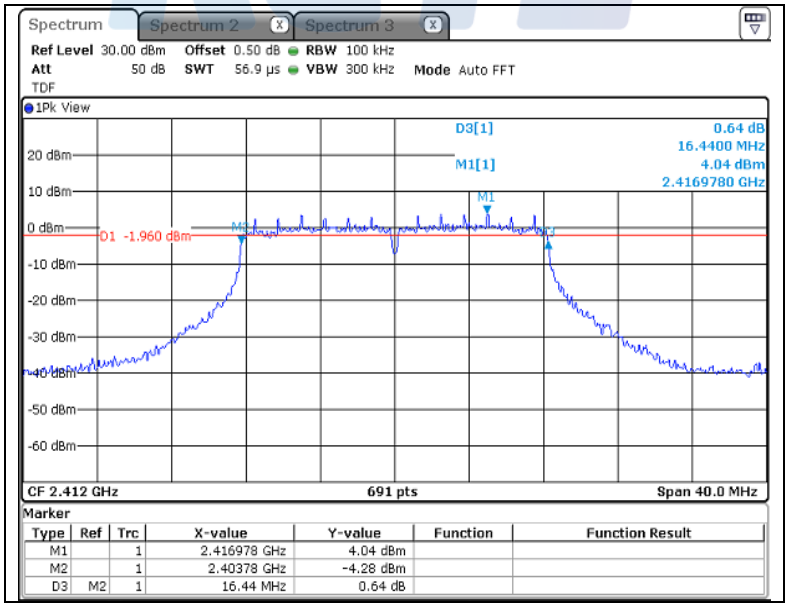


Highest Channel (2 462 ㎒)

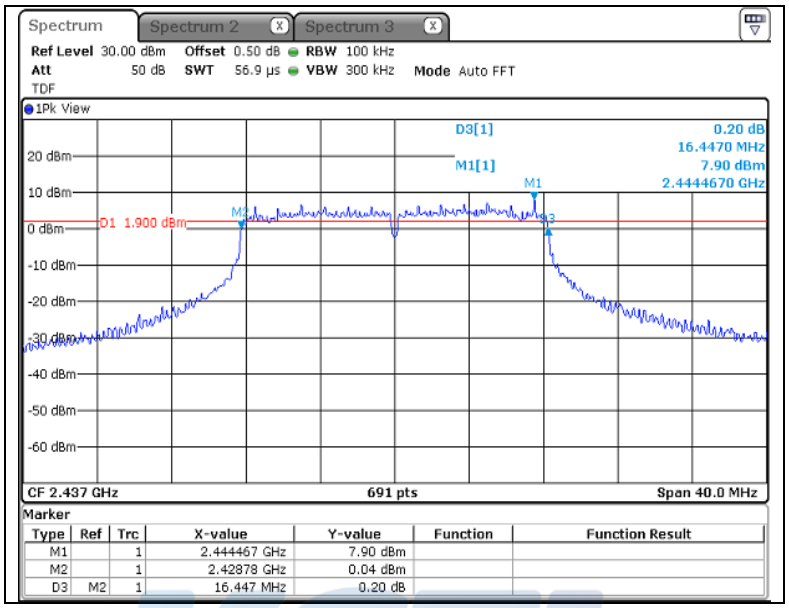


- 802.11g_6 ㏈ Bandwidth

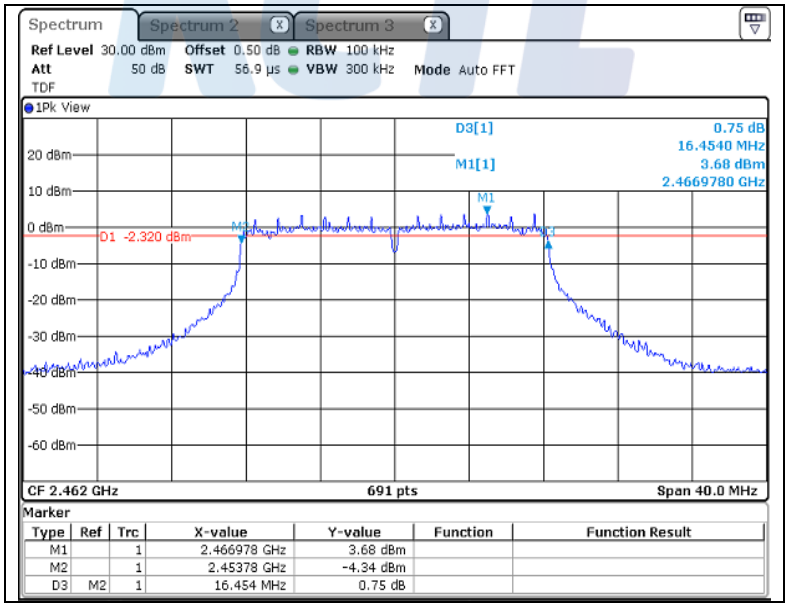
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

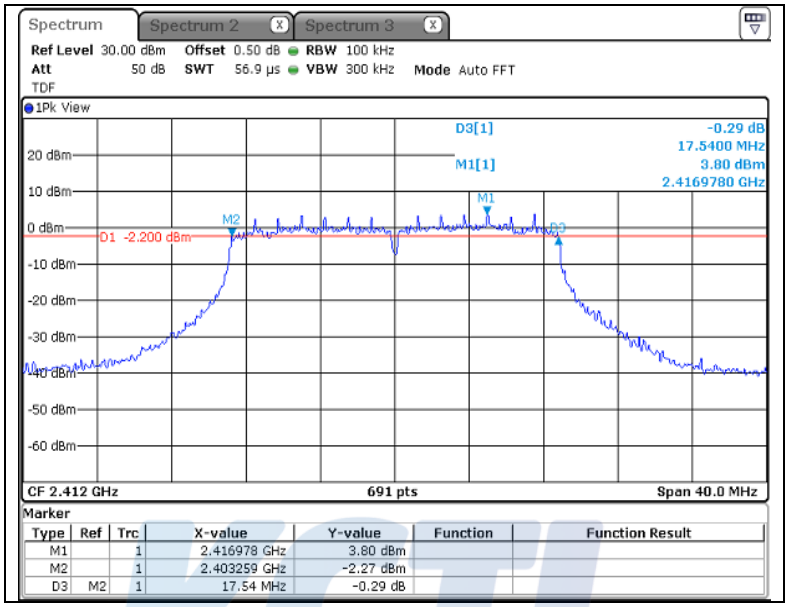


Highest Channel (2 462 ㎒)

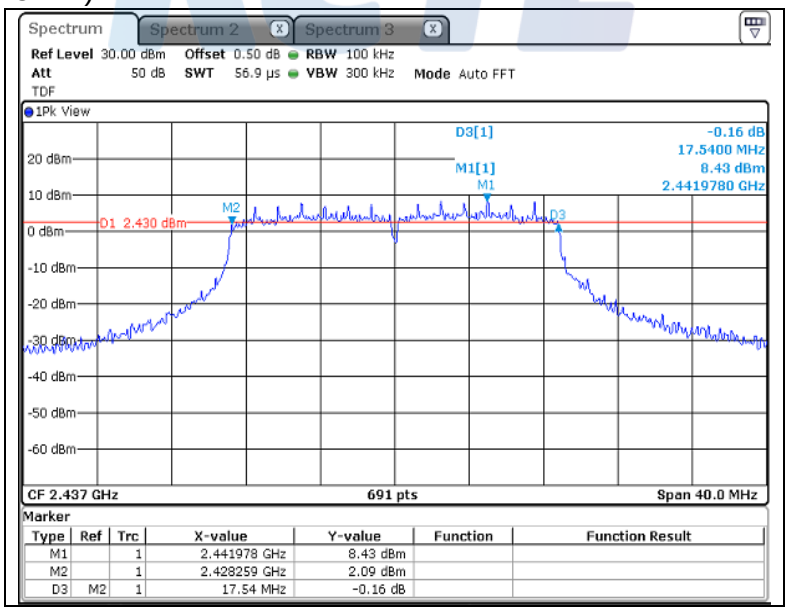


- 802.11n HT20_6 dB Bandwidth

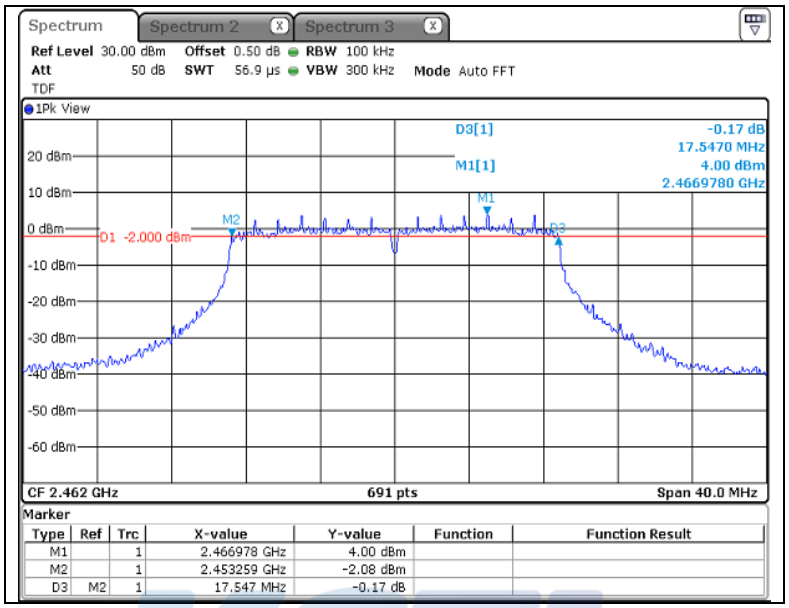
Lowest Channel (2 412 MHz)



Middle Channel (2 437 MHz)

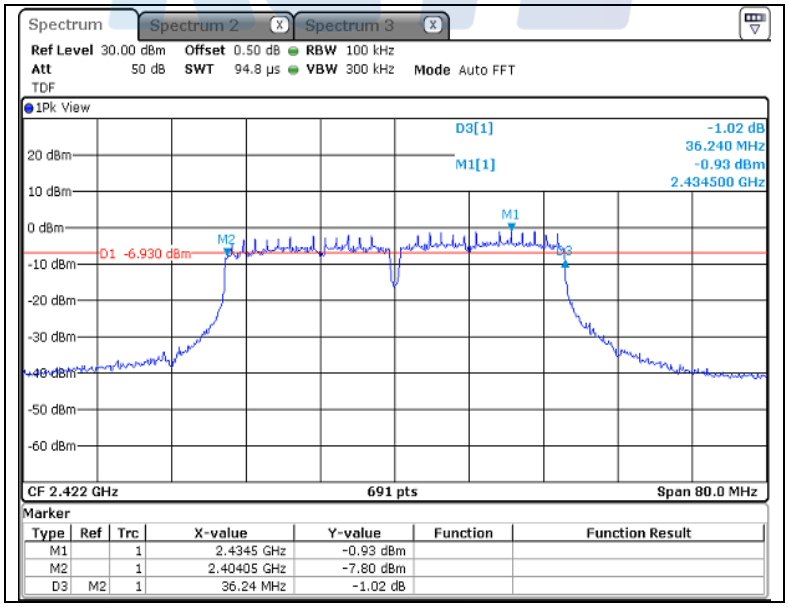


Highest Channel (2 462 ㎒)

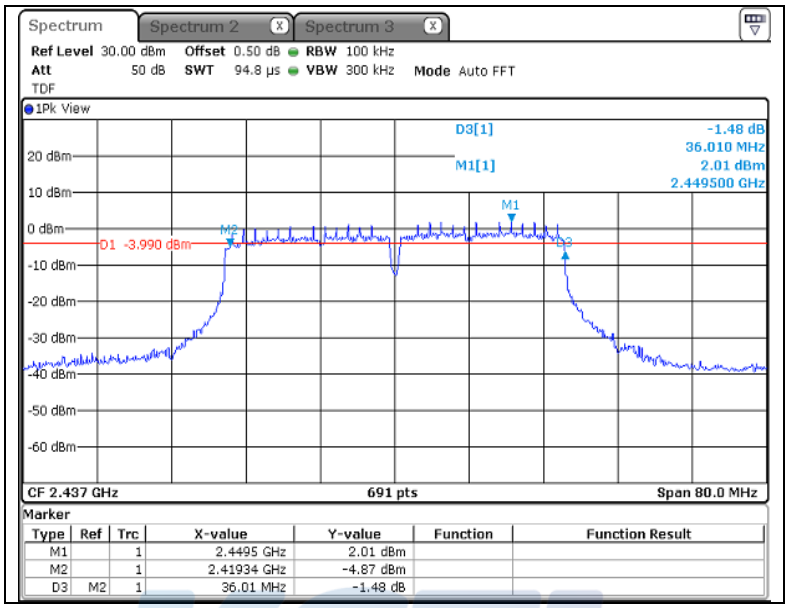


- 802.11n HT40_6 ㏈ Bandwidth

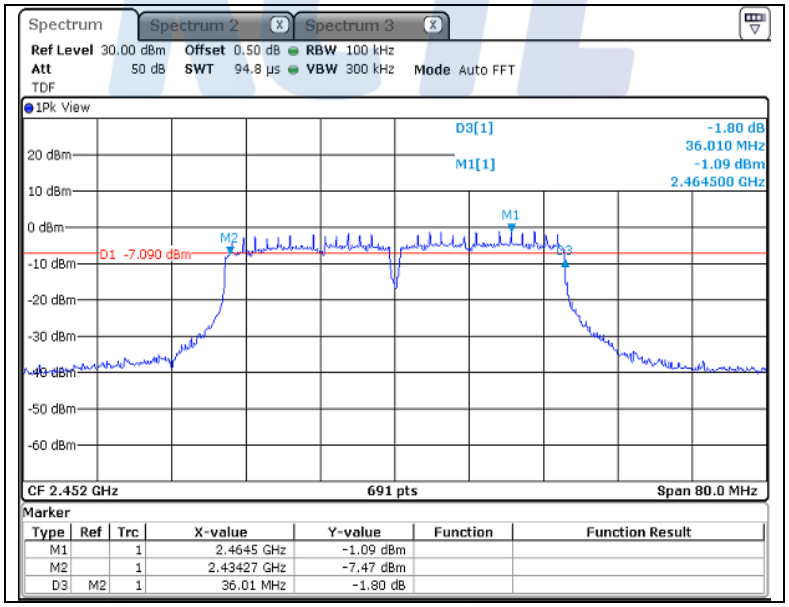
Lowest Channel (2 422 ㎒)



Middle Channel (2 437 ㎒)



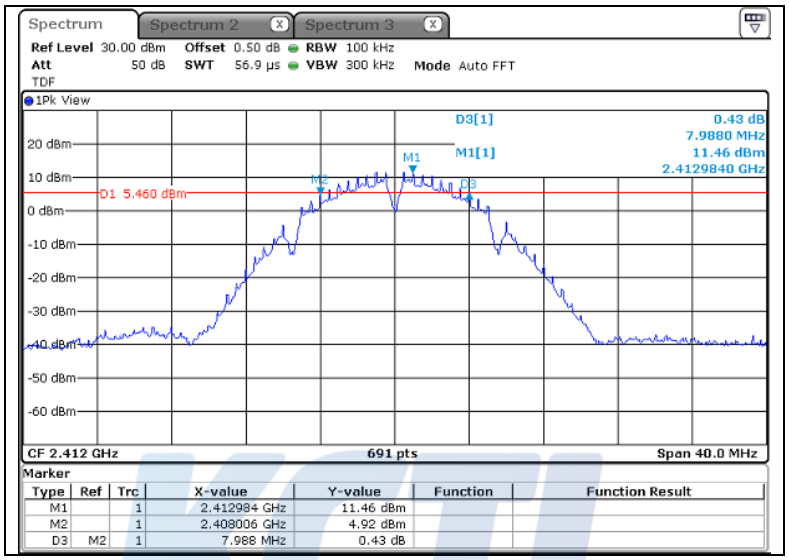
Highest Channel (2 452 ㎒)



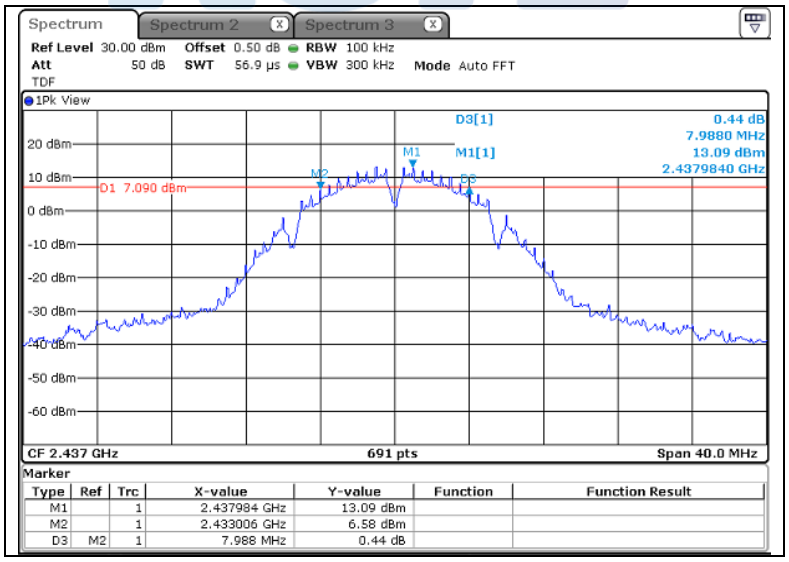
- ANT 1

- 802.11b_6 dB Bandwidth

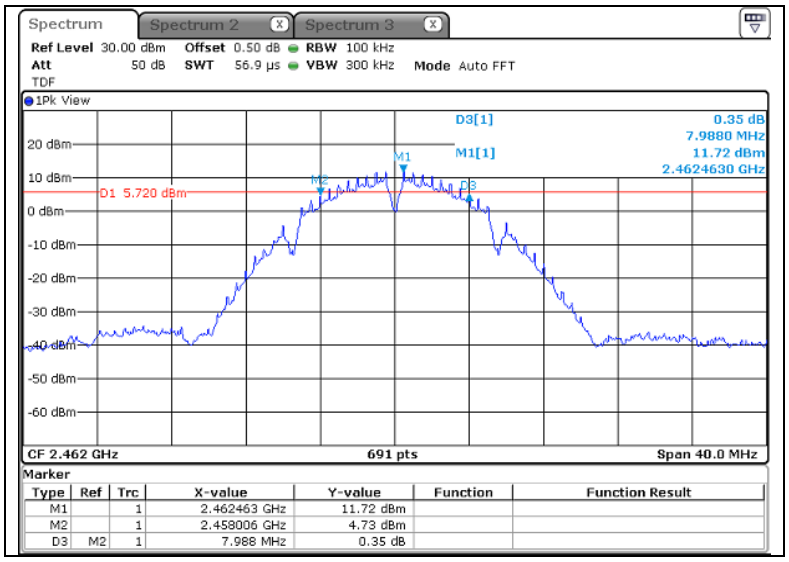
Lowest Channel (2 412 MHz)



Middle Channel (2 437 MHz)

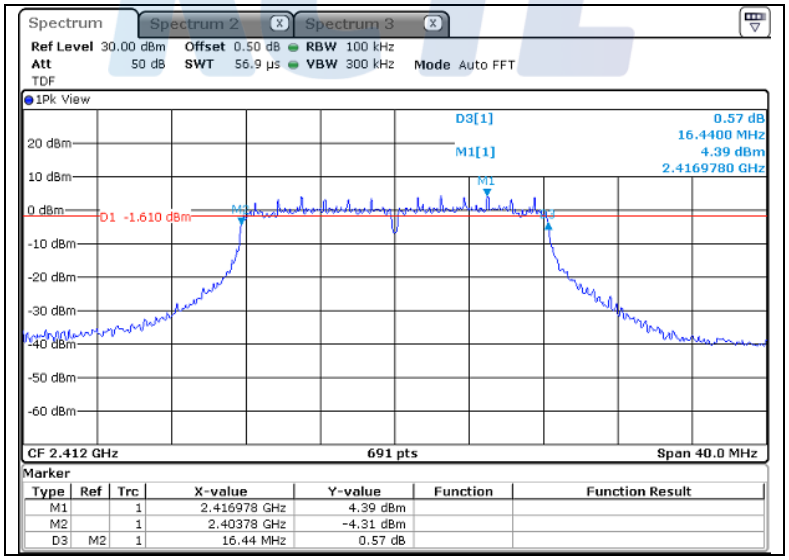


Highest Channel (2 462 ㎒)

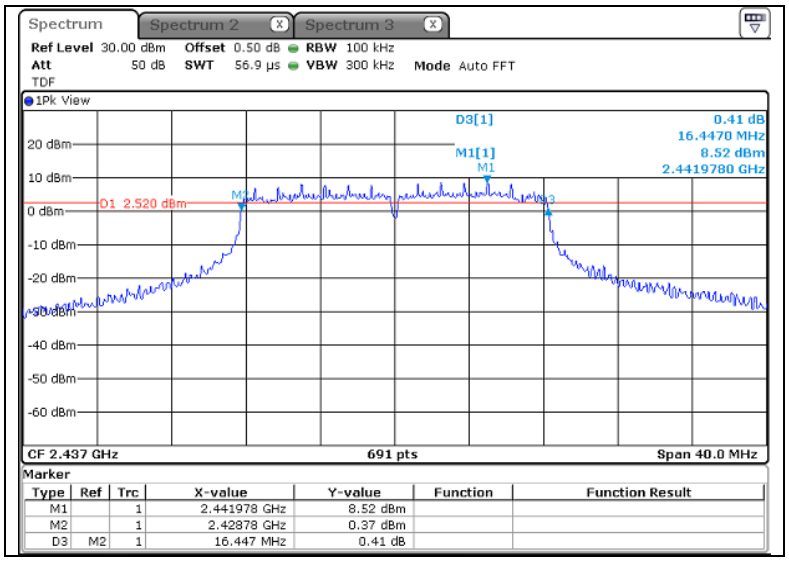


- 802.11g_6 ㏈ Bandwidth

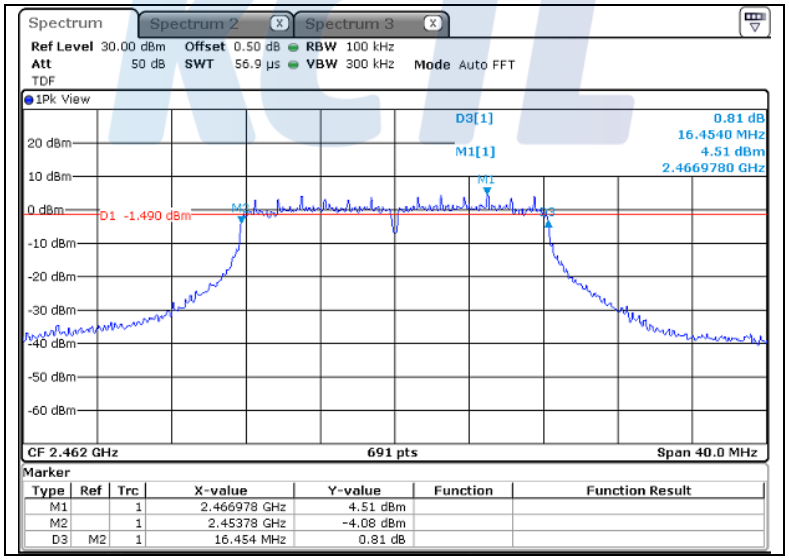
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

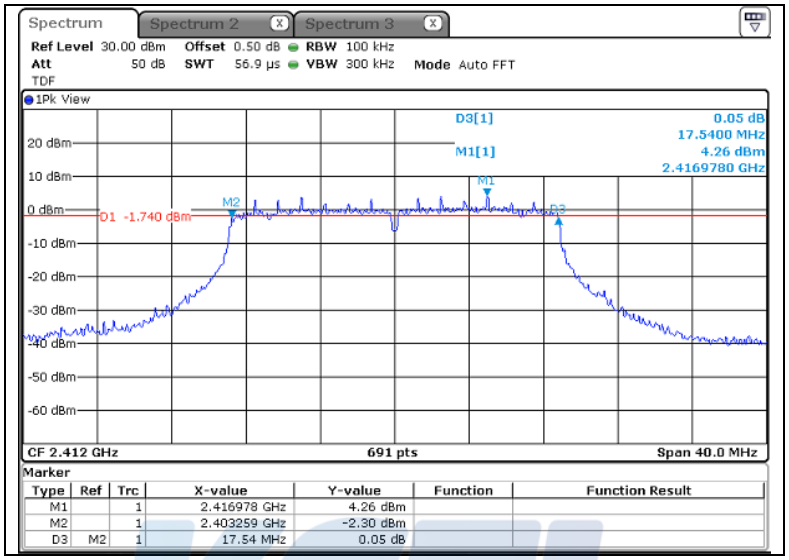


Highest Channel (2 462 ㎒)

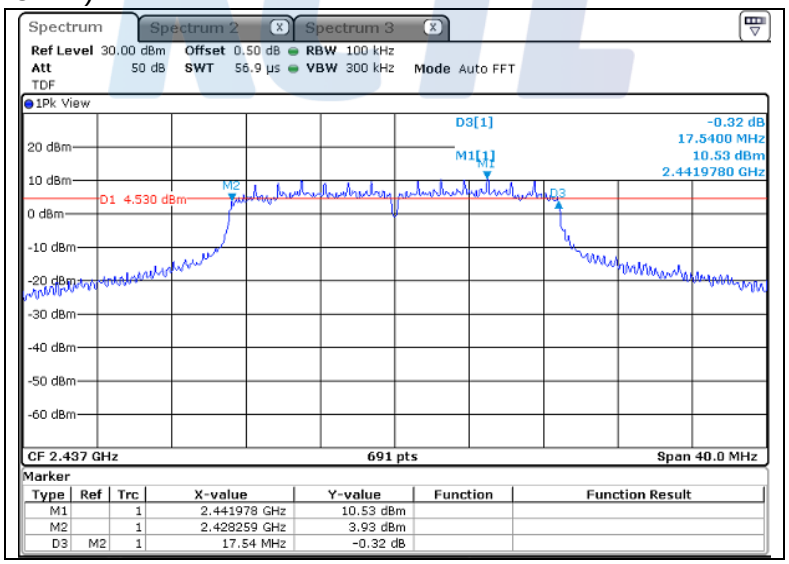


- 802.11n HT20_6 ㏈ Bandwidth

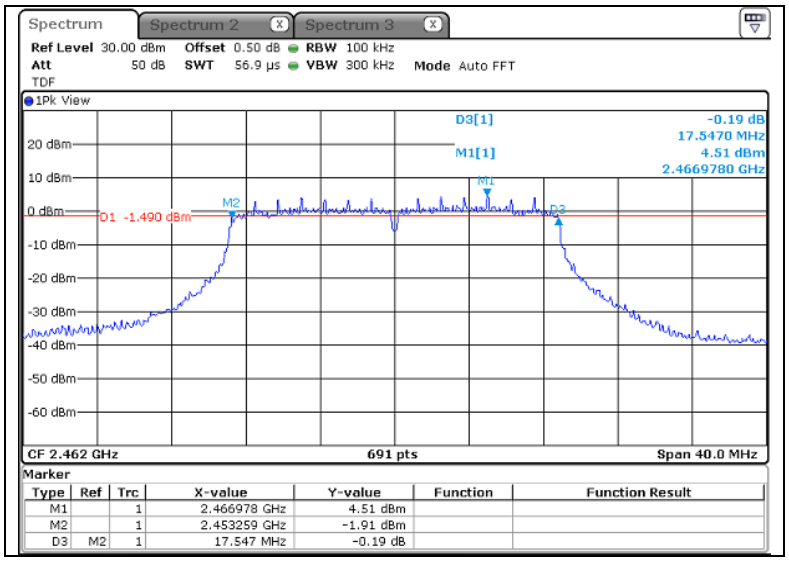
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

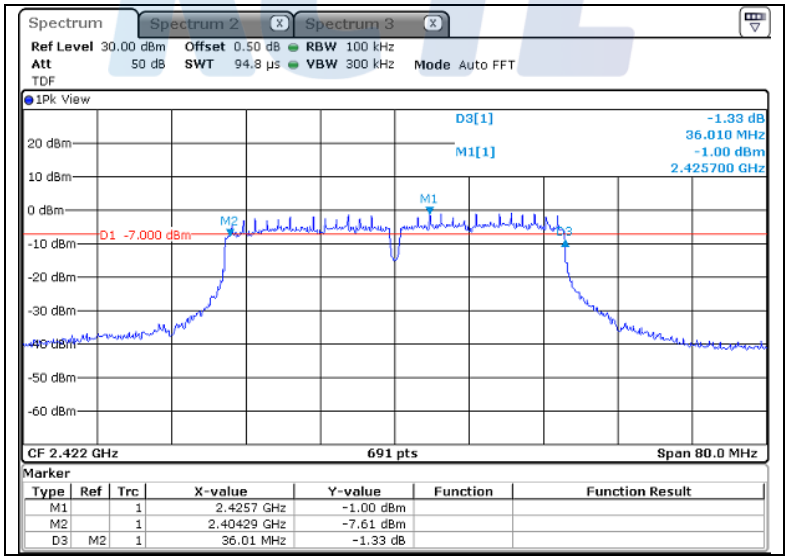


Highest Channel (2 462 ㎒)

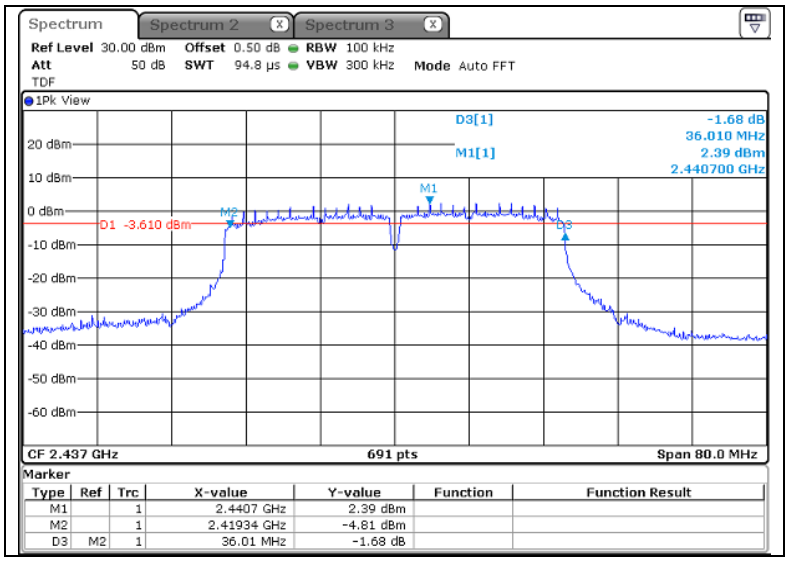


- 802.11n HT40_6 ㏈ Bandwidth

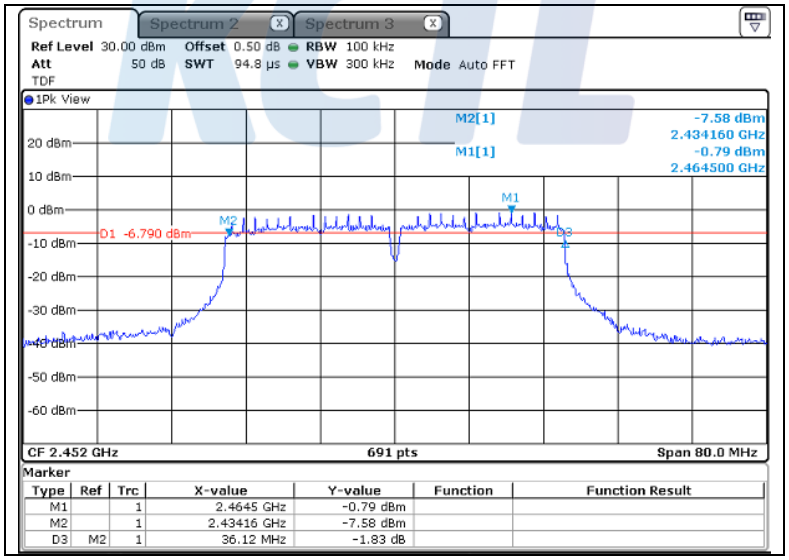
Lowest Channel (2 422 ㎒)



Middle Channel (2 437 ㎒)



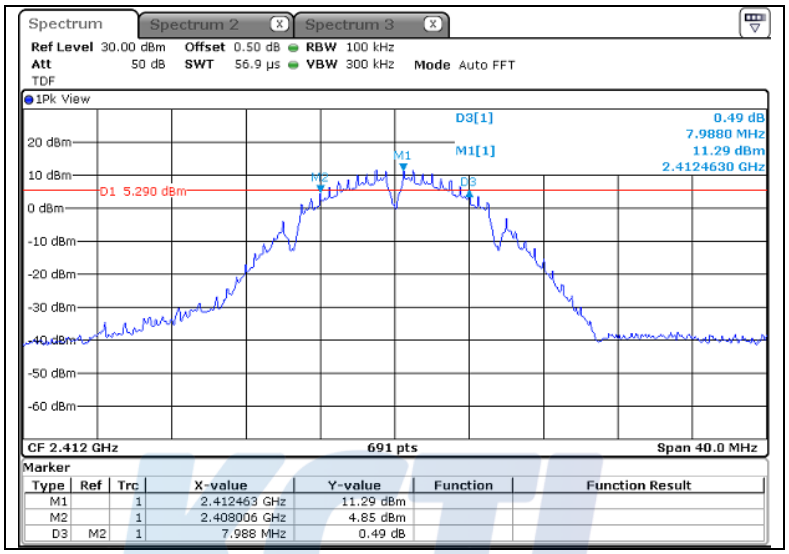
Highest Channel (2 452 ㎒)



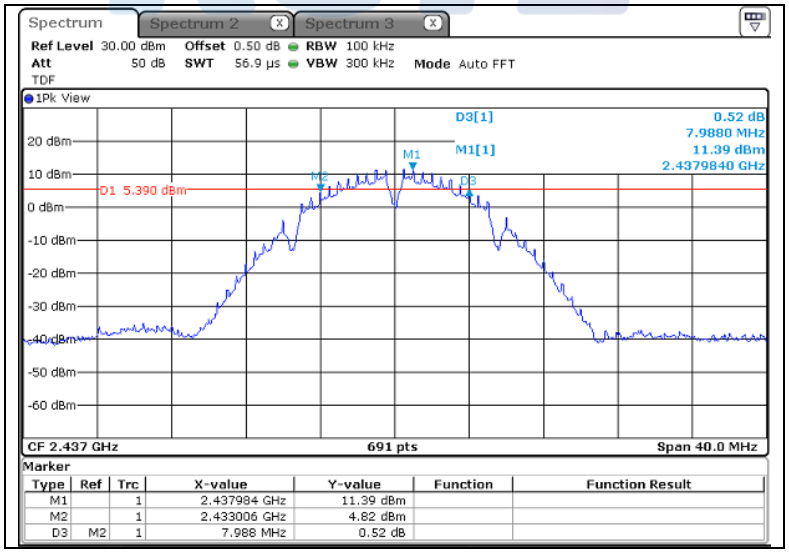
- ANT 2

- 802.11b_6 ㏈ Bandwidth

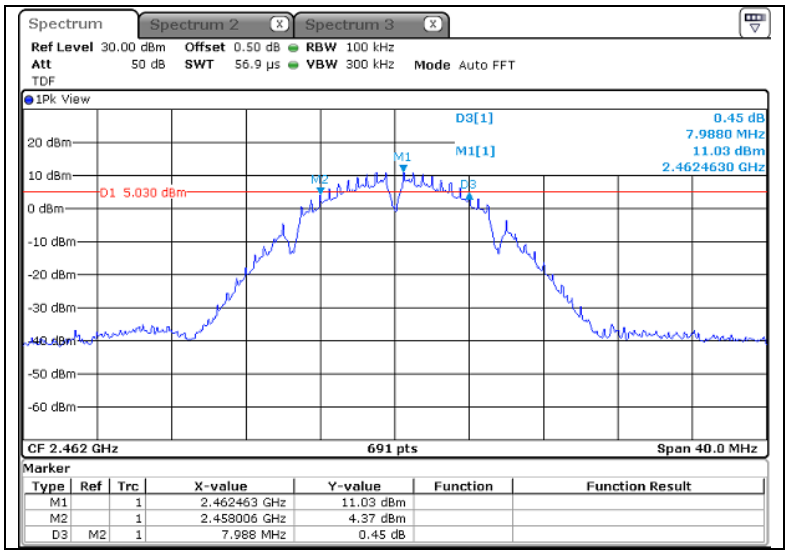
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

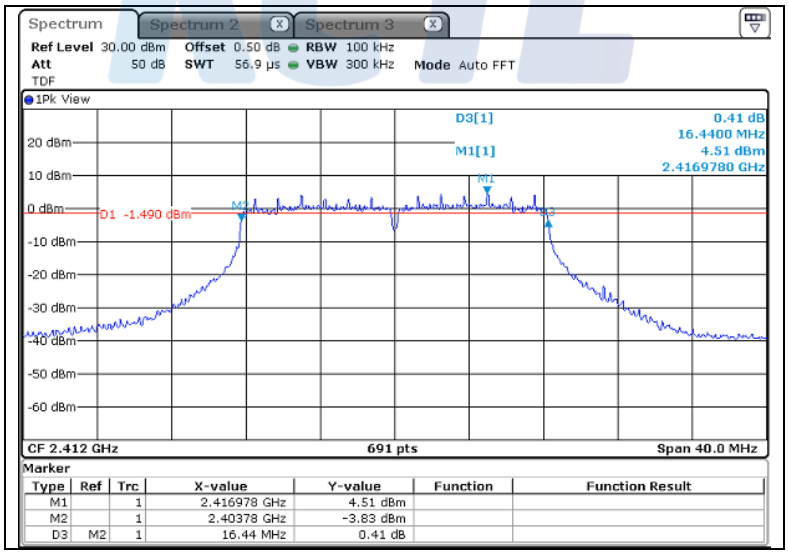


Highest Channel (2 462 ㎒)

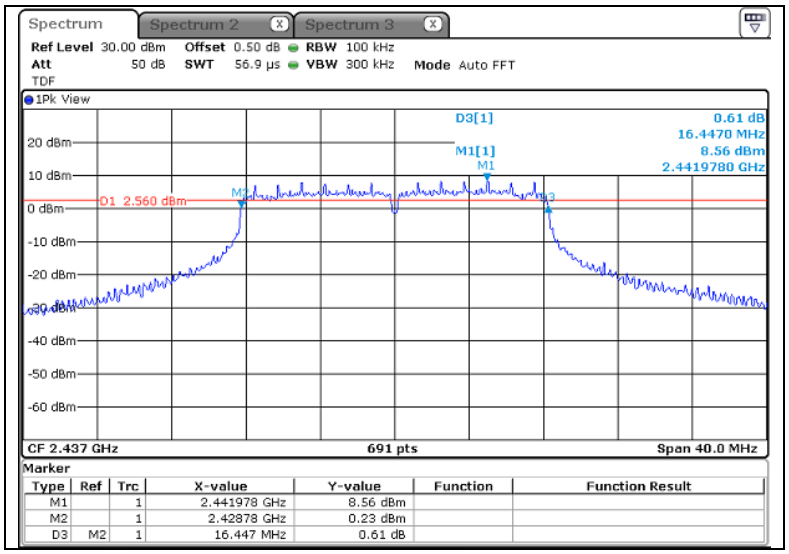


- 802.11g_6 ㏈ Bandwidth

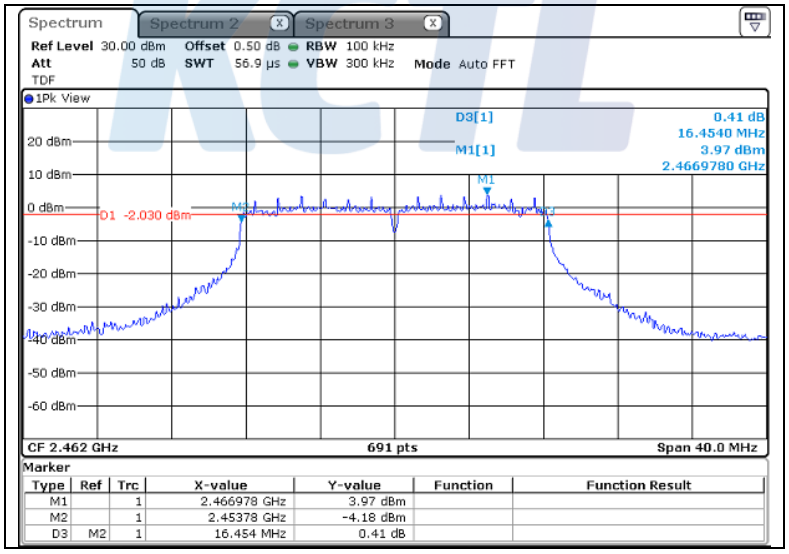
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

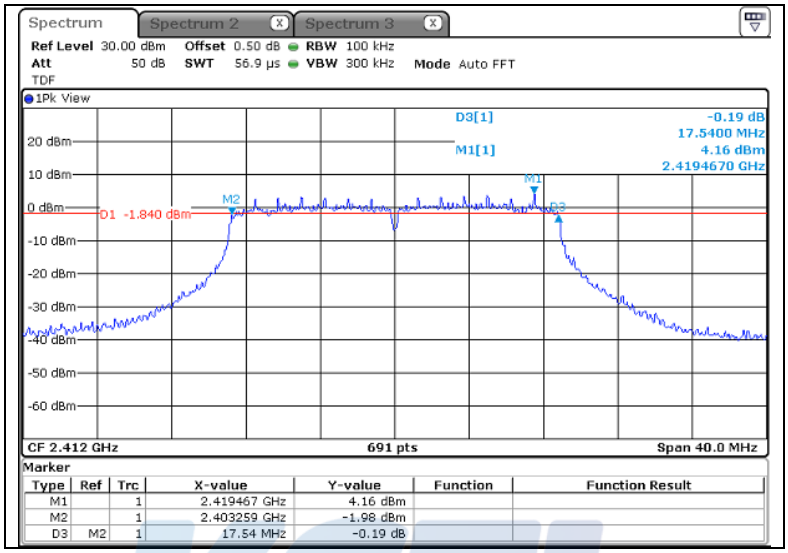


Highest Channel (2 462 ㎒)

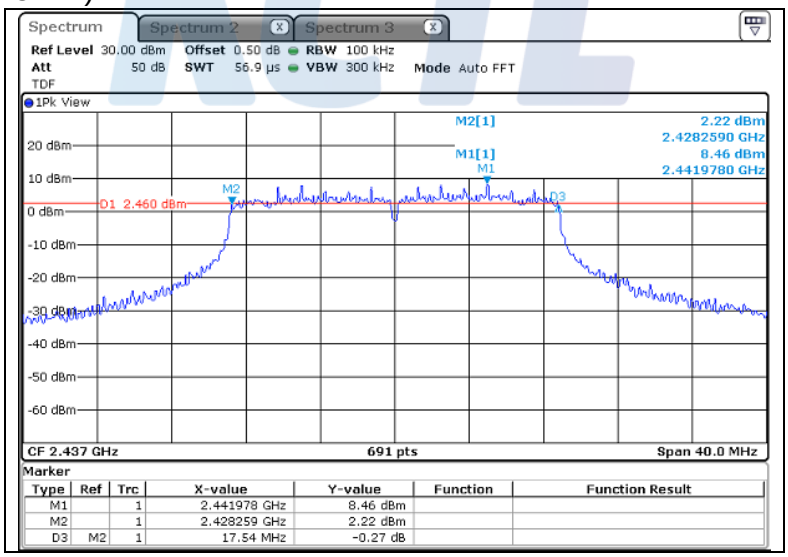


- 802.11n HT20_6 ㏈ Bandwidth

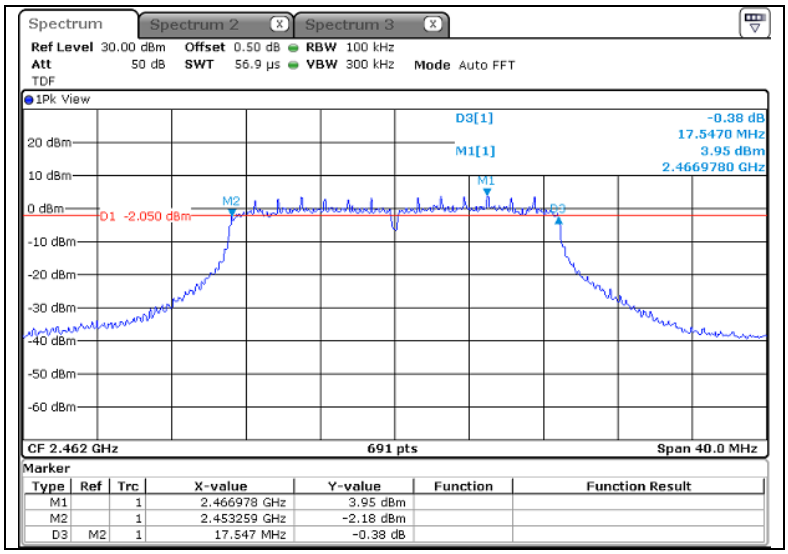
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

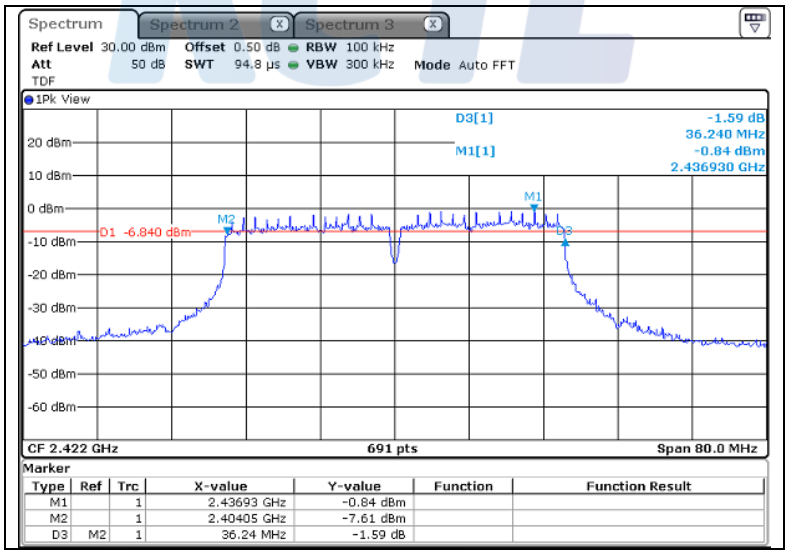


Highest Channel (2 462 ㎒)

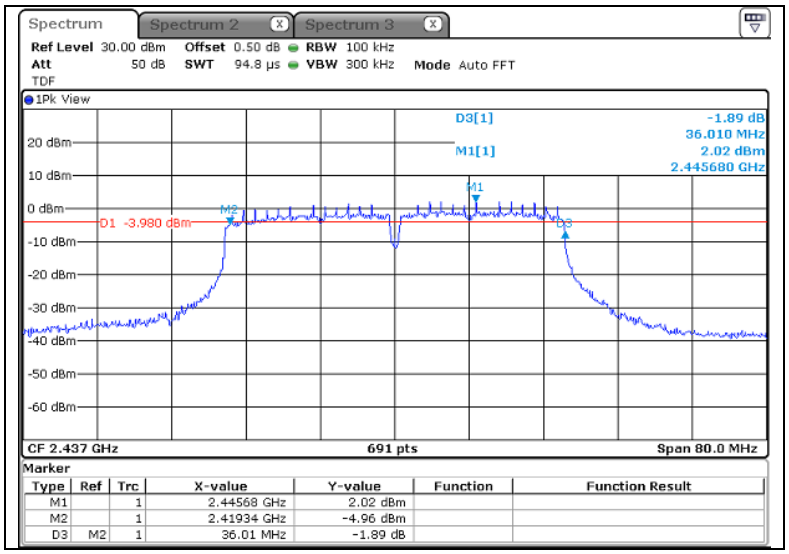


- 802.11n HT40_6 ㏈ Bandwidth

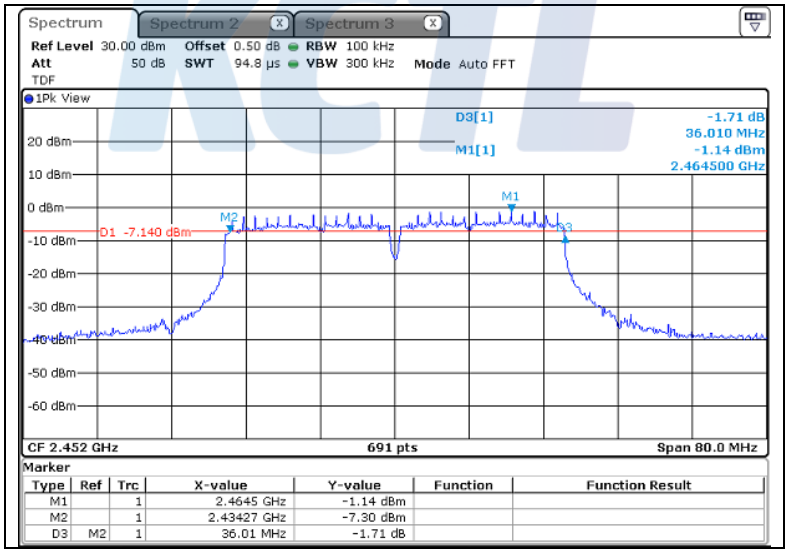
Lowest Channel (2 422 ㎒)



Middle Channel (2 437 ㎒)



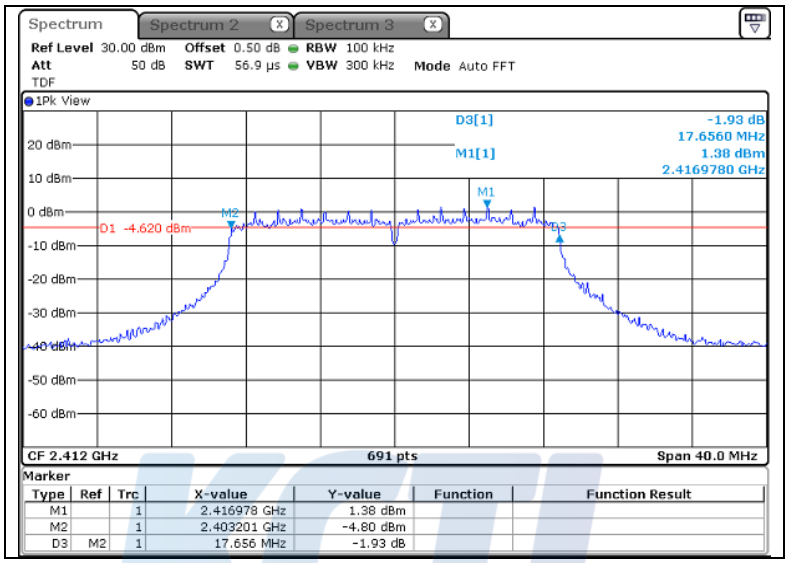
Highest Channel (2 452 ㎒)



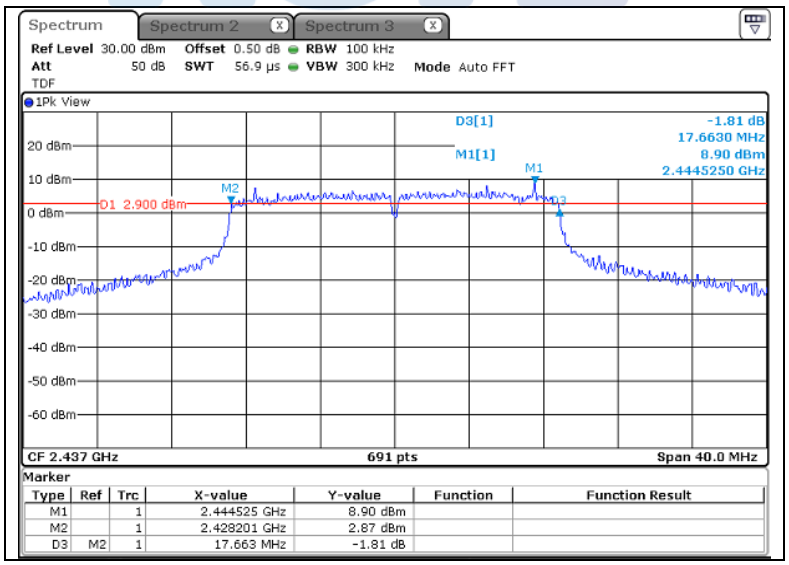
- MIMO (ANT 0+1)

- 802.11n HT20_6 ㏈ Bandwidth

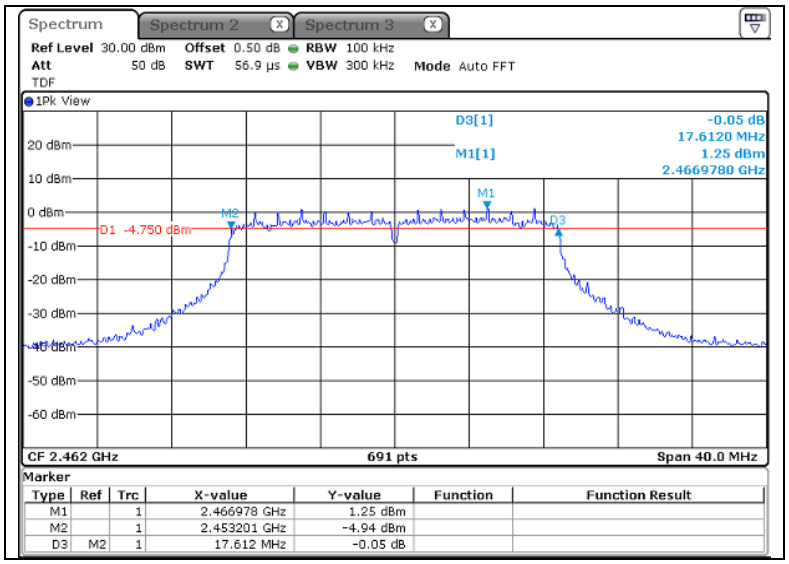
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

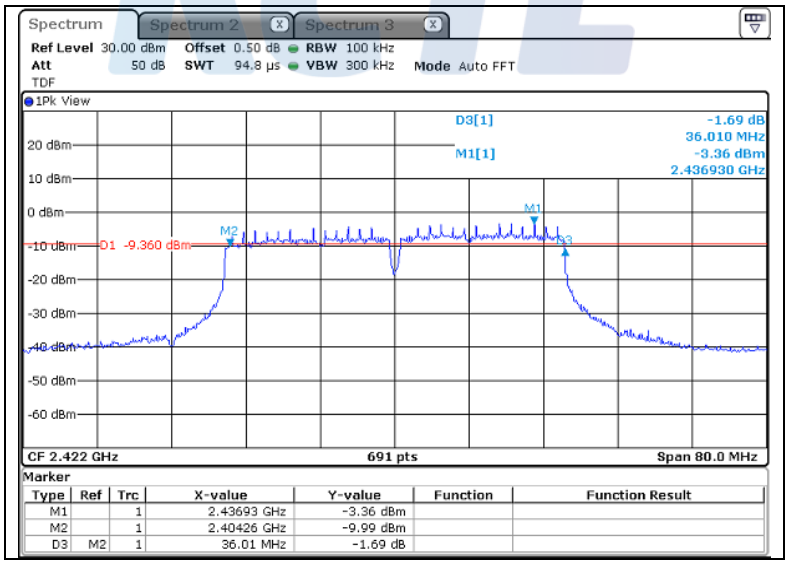


Highest Channel (2 462 ㎒)

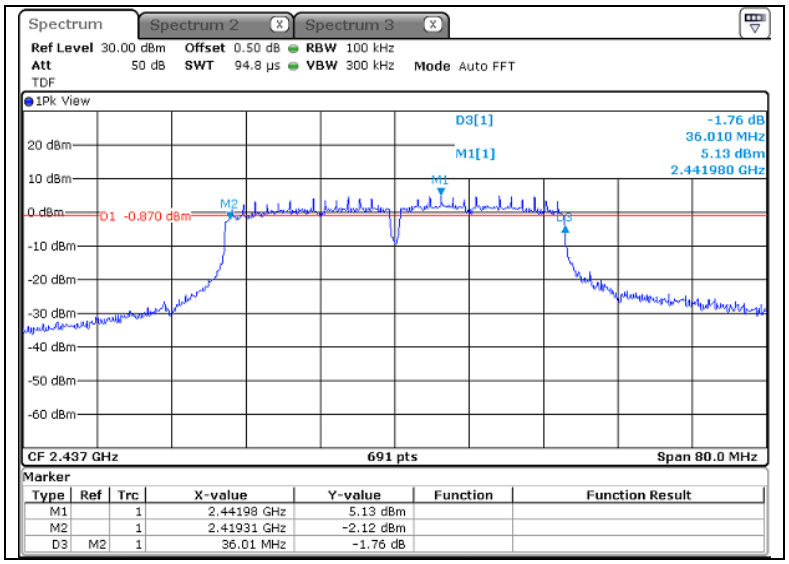


- 802.11n HT40_6 ㏈ Bandwidth

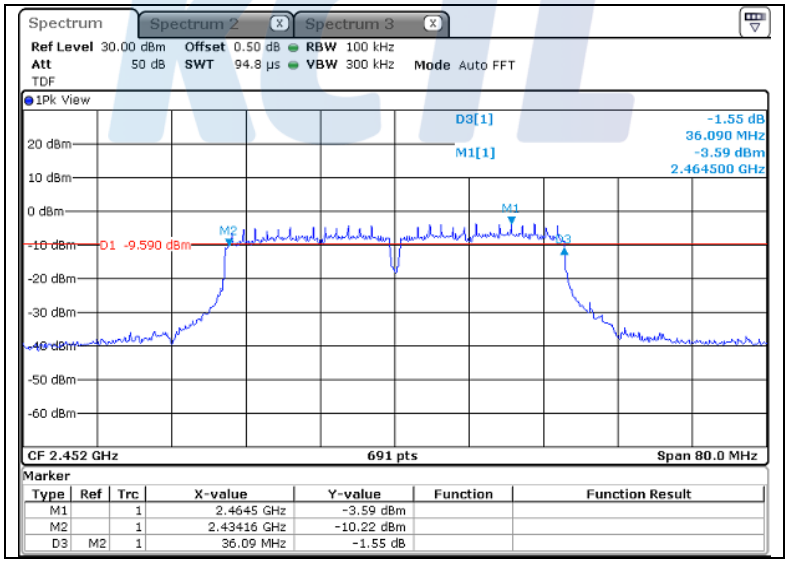
Lowest Channel (2 422 ㎒)



Middle Channel (2 437 ㎒)



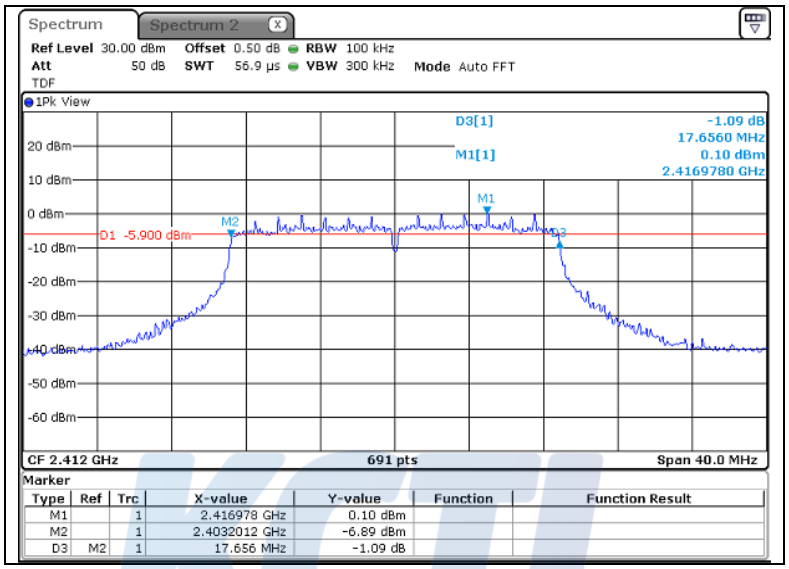
Highest Channel (2 452 ㎒)



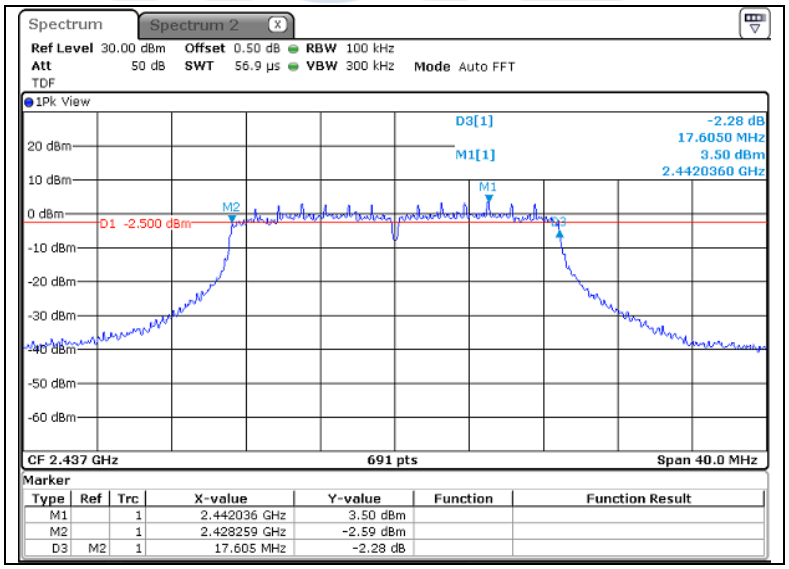
- MIMO (ANT 0+1+2)

- 802.11n HT20_6 ㏈ Bandwidth

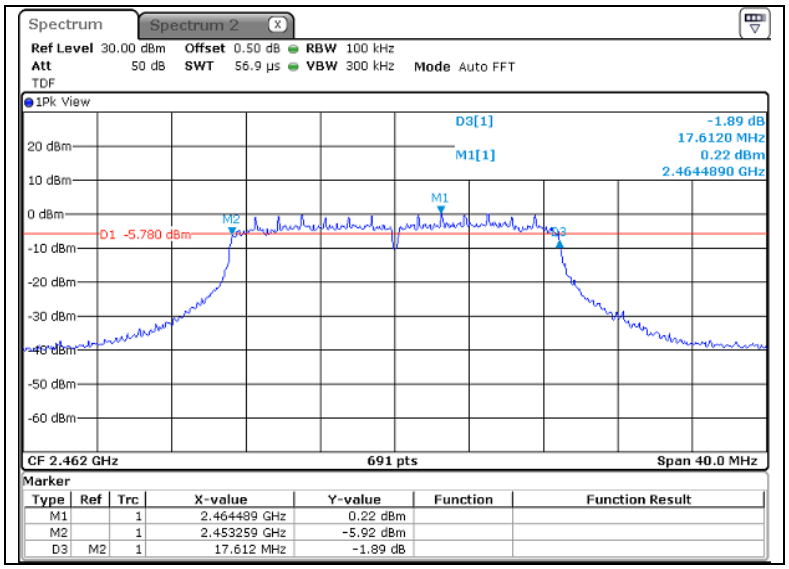
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

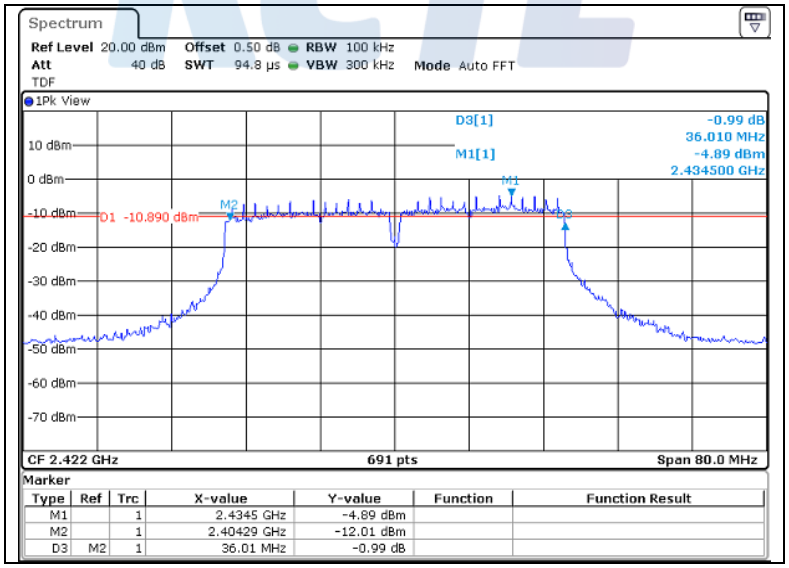


Highest Channel (2 462 ㎒)

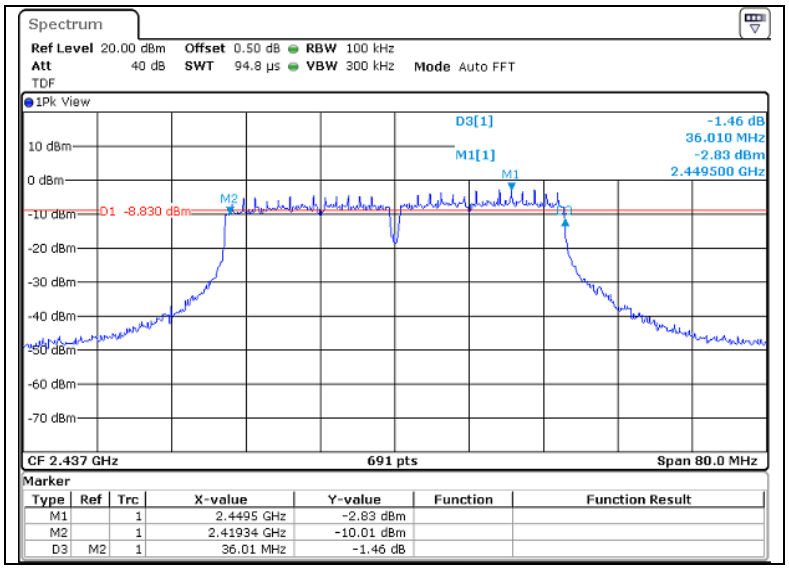


- 802.11n HT40_6 ㏈ Bandwidth

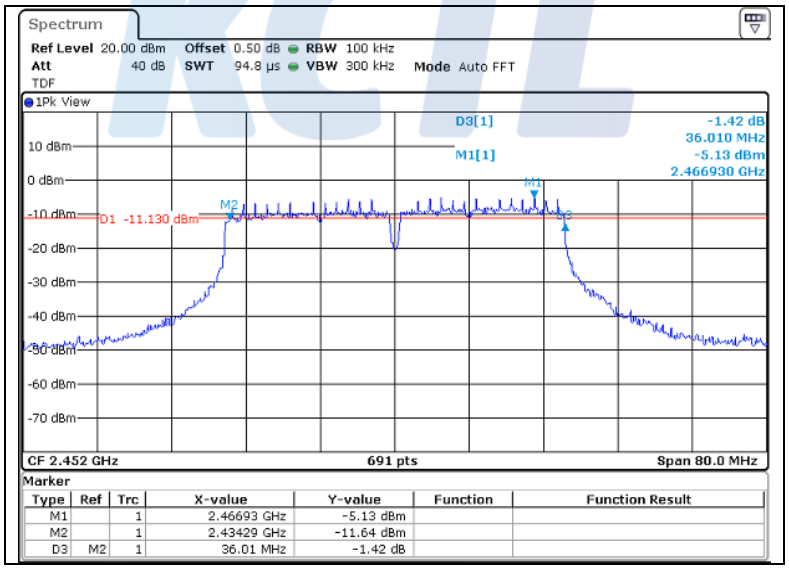
Lowest Channel (2 422 ㎒)



Middle Channel (2 437 ㎒)



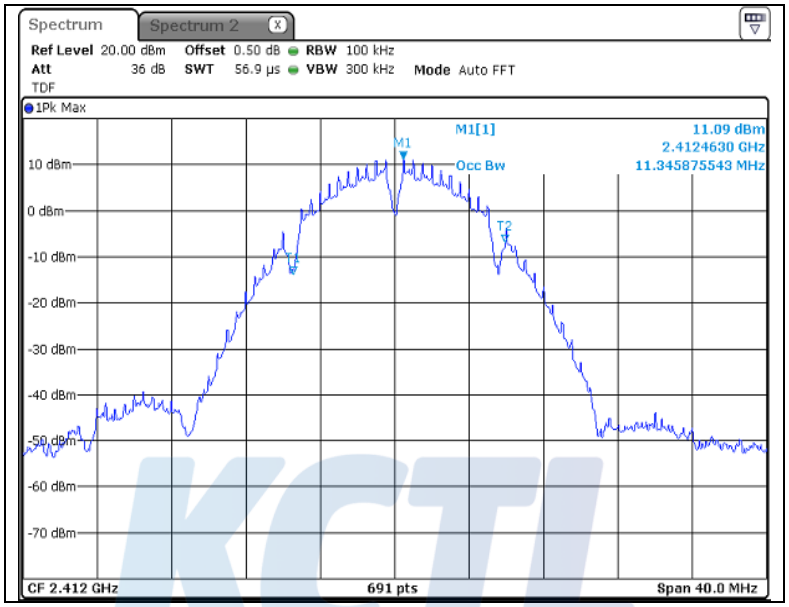
Highest Channel (2 452 ㎒)



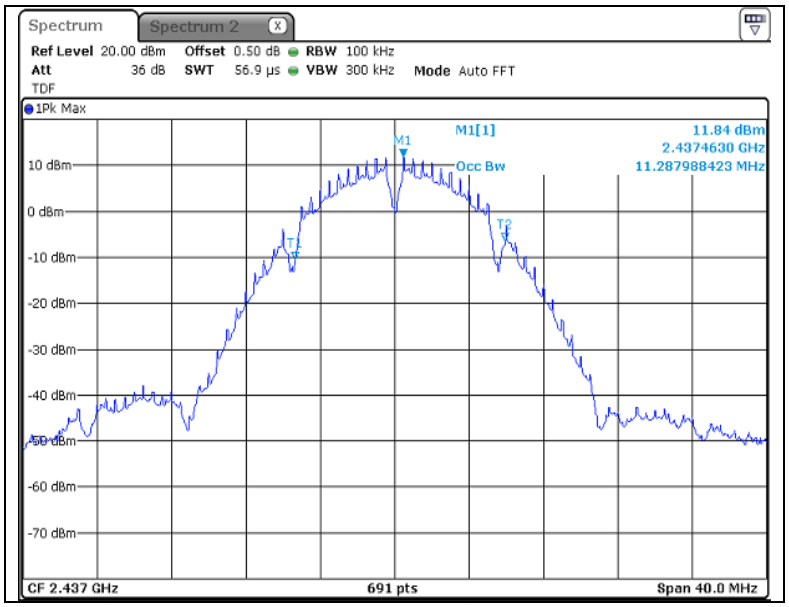
- ANT 0

- 802.11b_Occupied Bandwidth

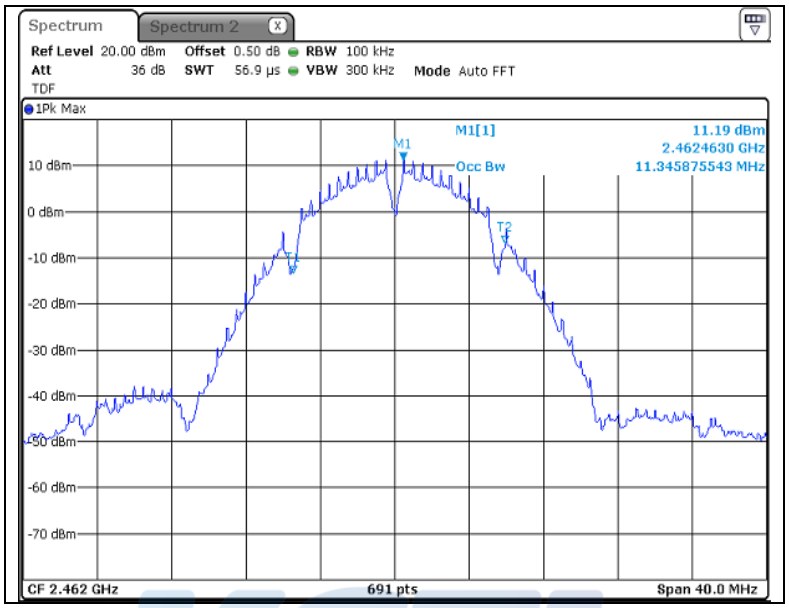
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

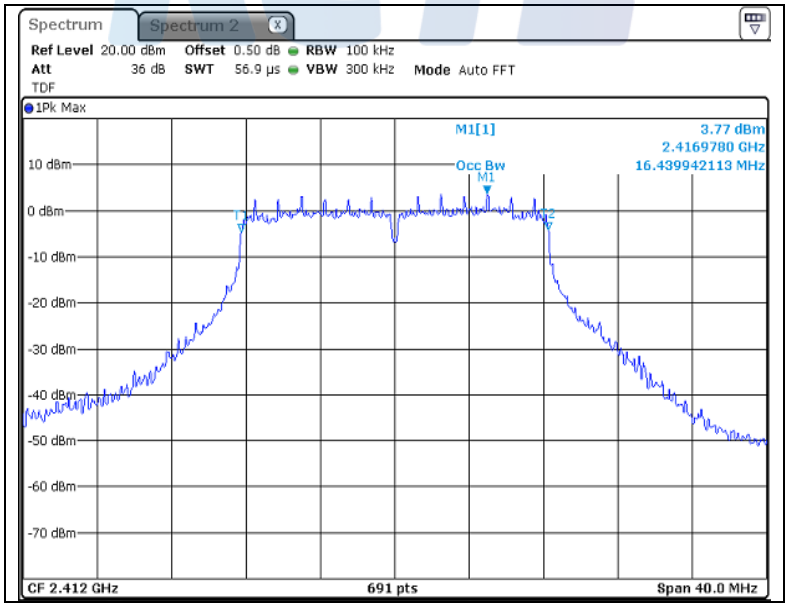


Highest Channel (2 462 ㎒)

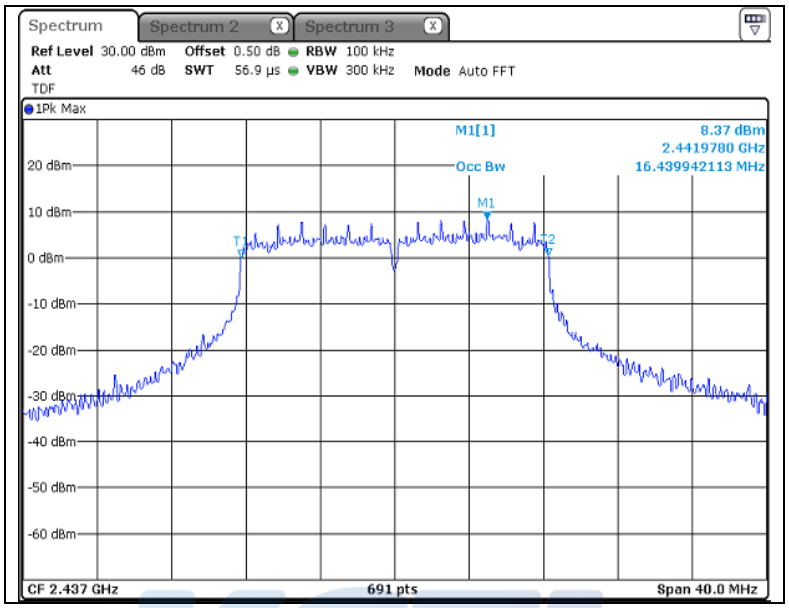


- 802.11g_Occupied Bandwidth

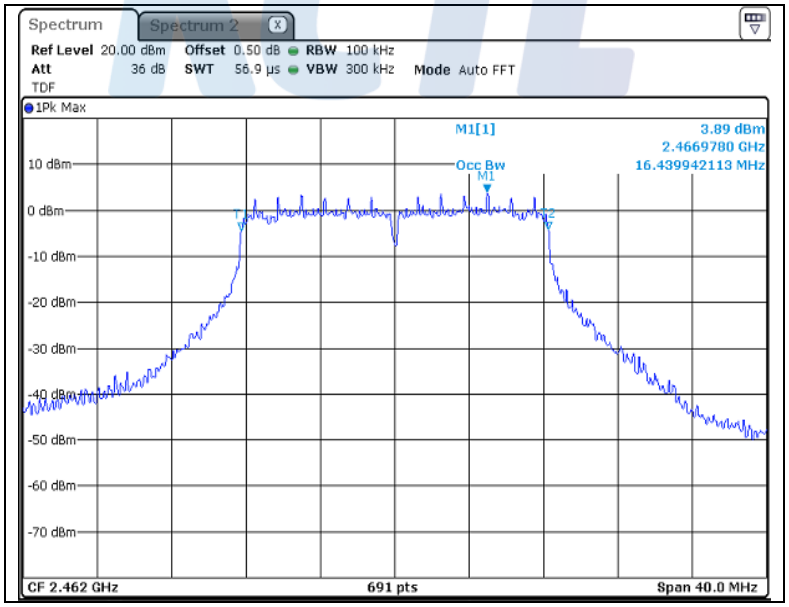
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

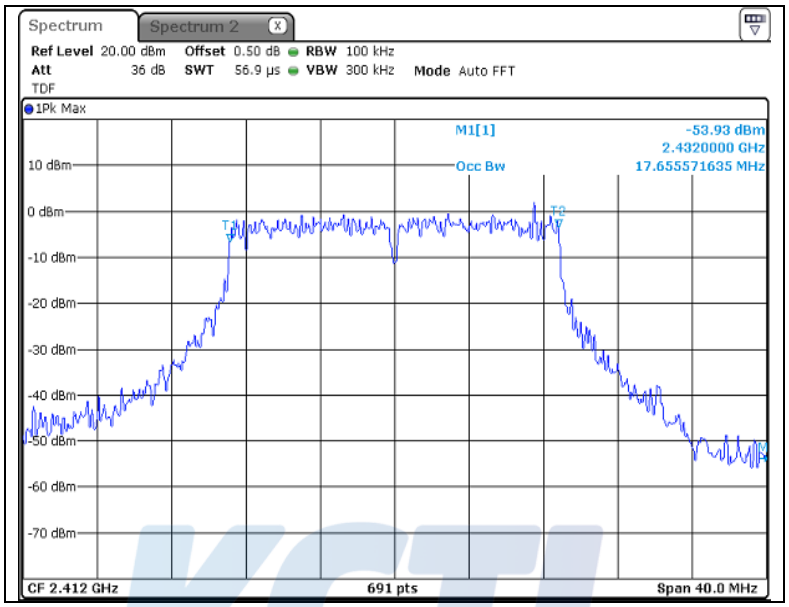


Highest Channel (2 462 ㎒)

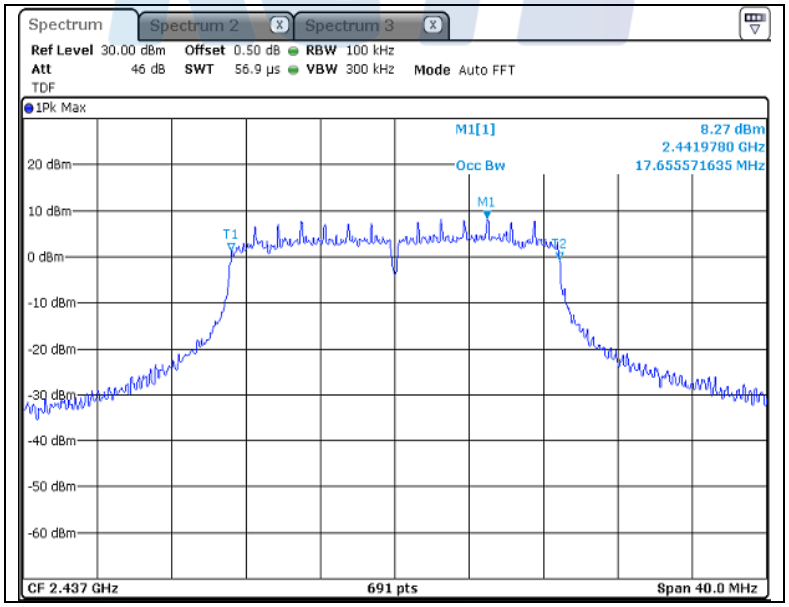


- 802.11n HT20_Occupied Bandwidth

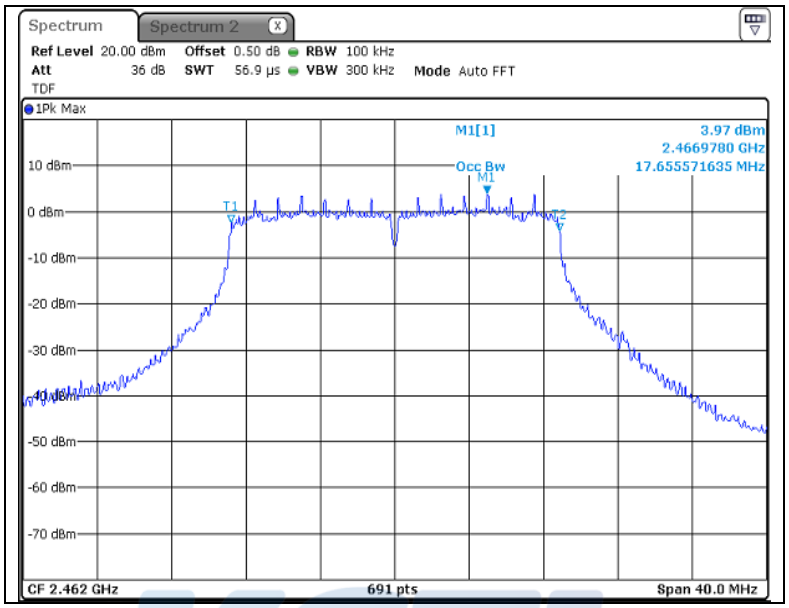
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

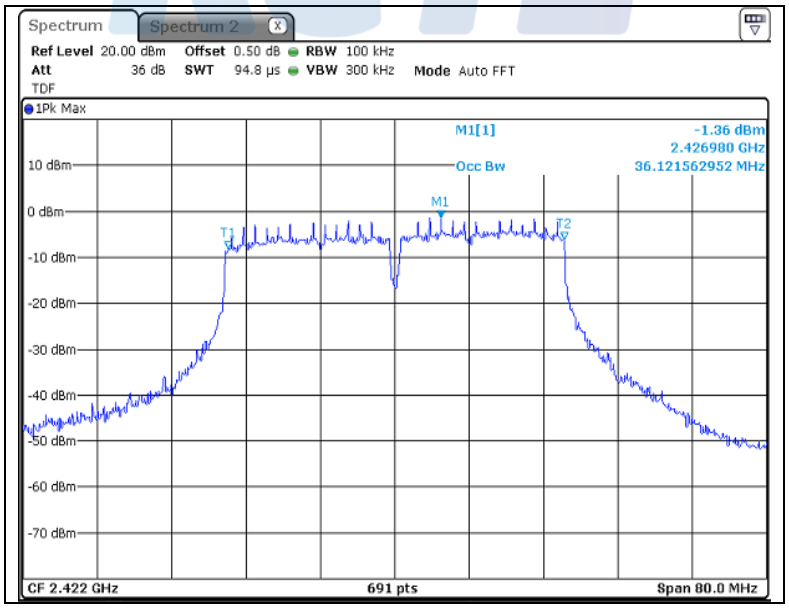


Highest Channel (2 462 ㎒)

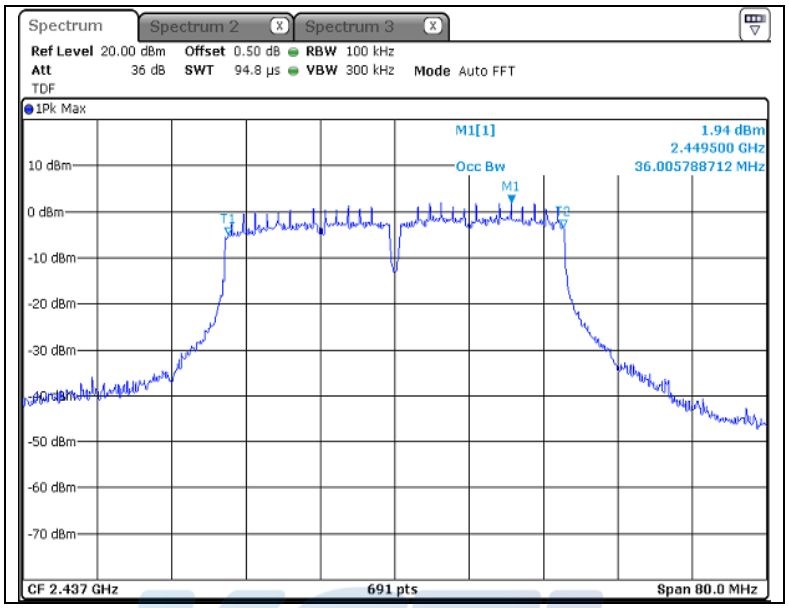


- 802.11n HT40_Occupied Bandwidth

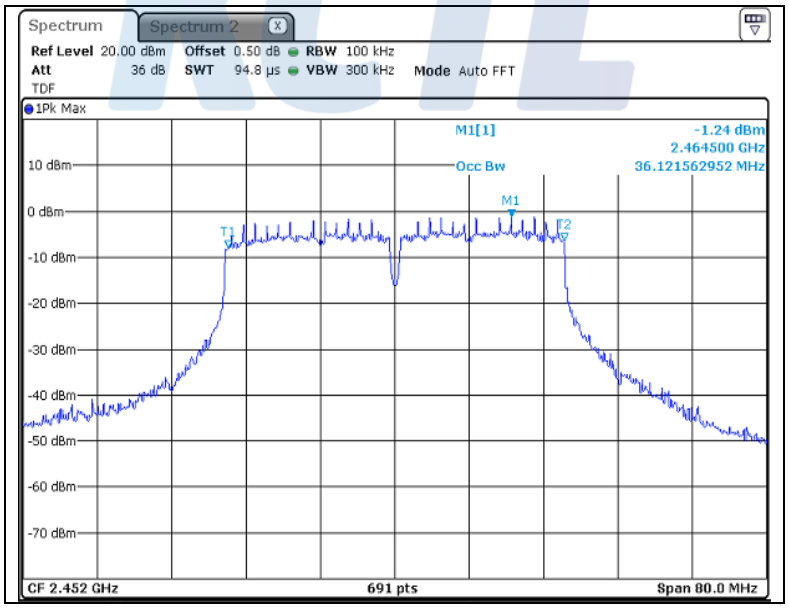
Lowest Channel (2 422 ㎒)



Middle Channel (2 437 ㎒)



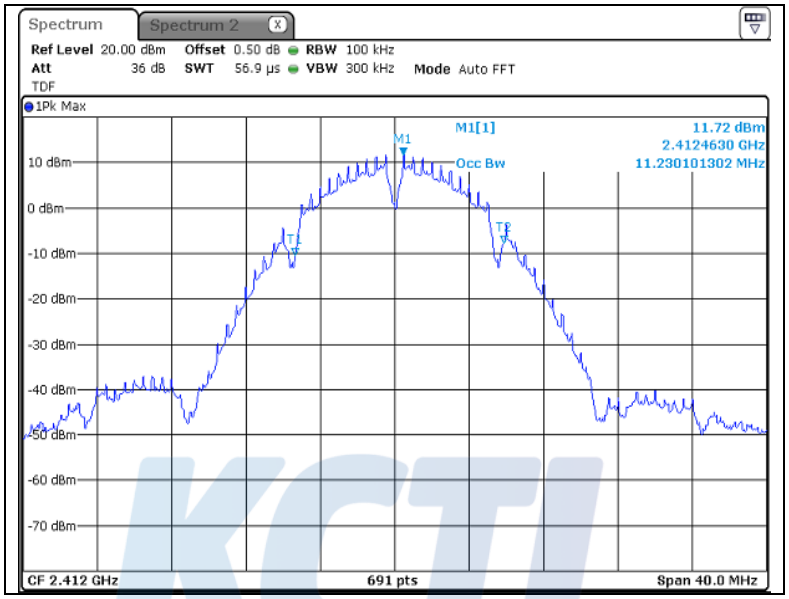
Highest Channel (2 452 ㎒)



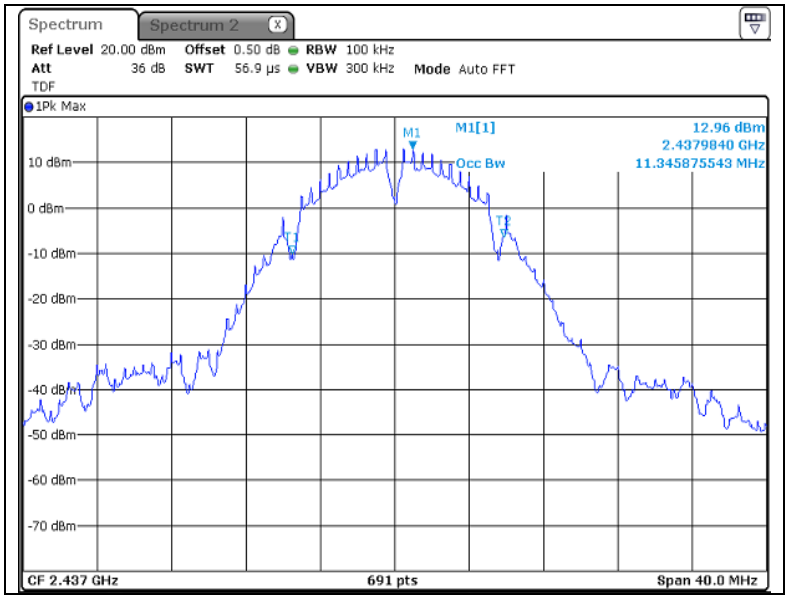
- ANT 1

- 802.11b_Occupied Bandwidth

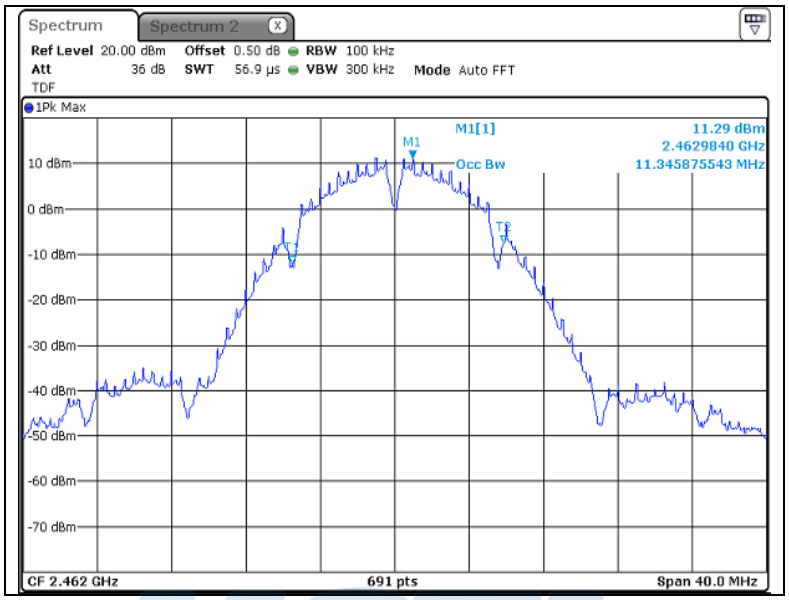
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

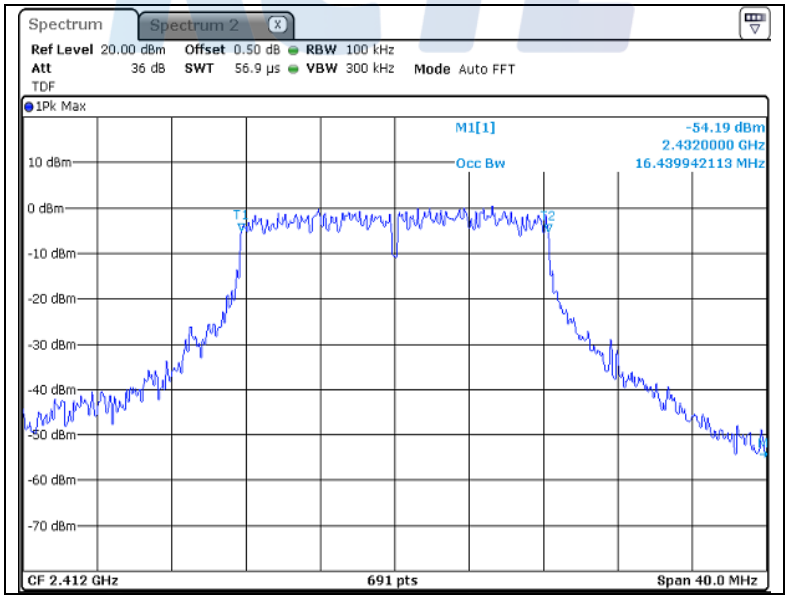


Highest Channel (2 462 ㎒)

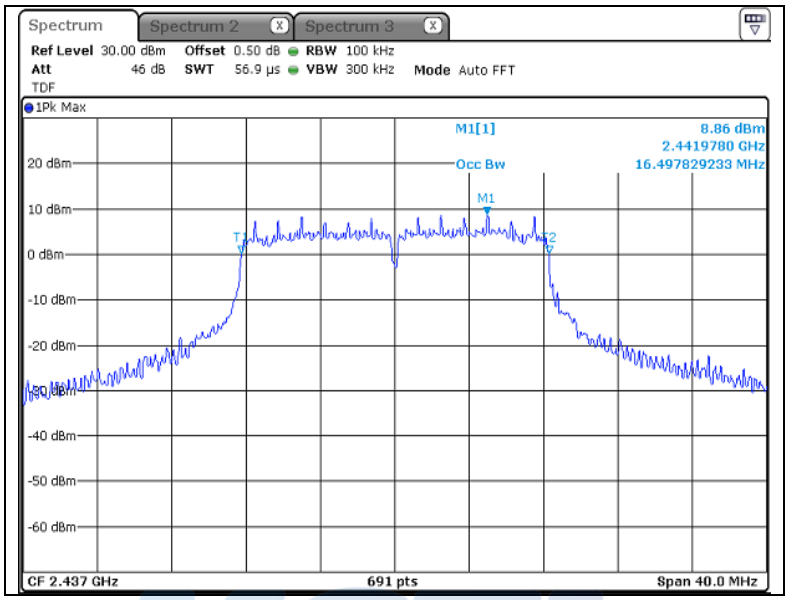


- 802.11g_Occupied Bandwidth

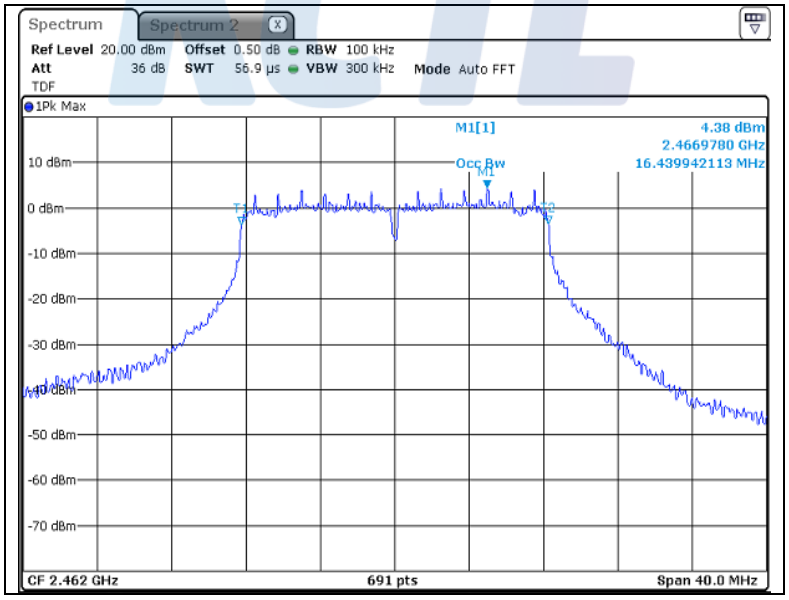
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

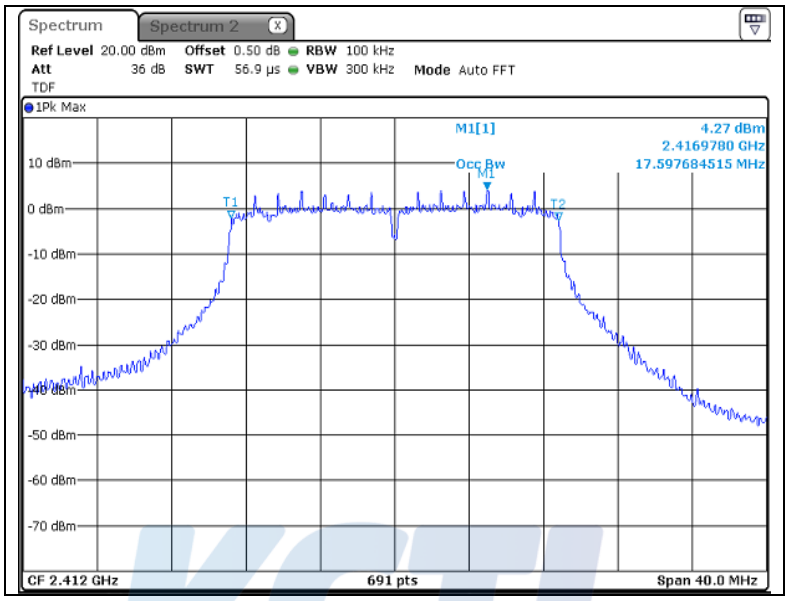


Highest Channel (2 462 ㎒)

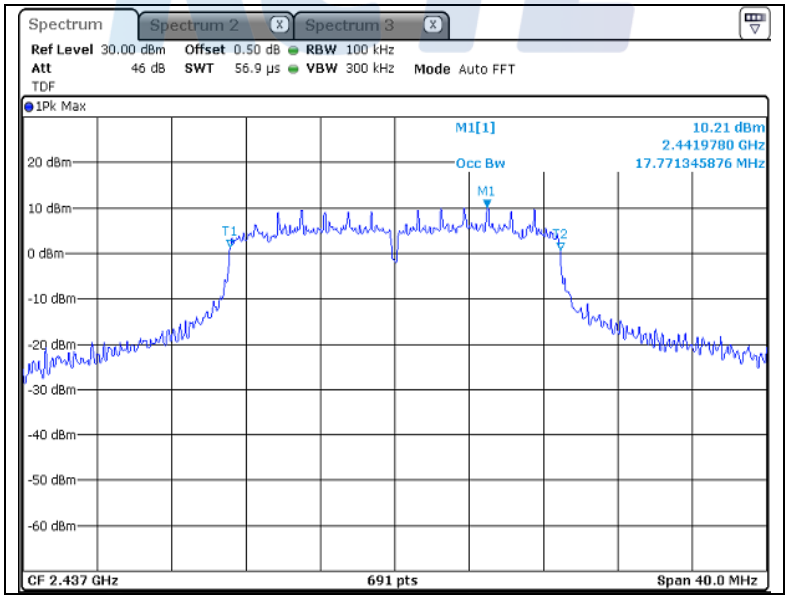


- 802.11n HT20_Occupied Bandwidth

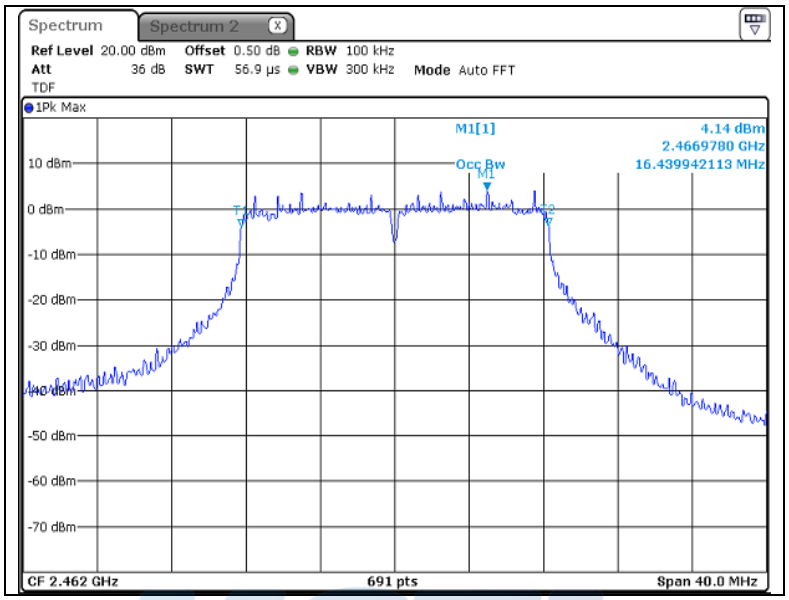
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

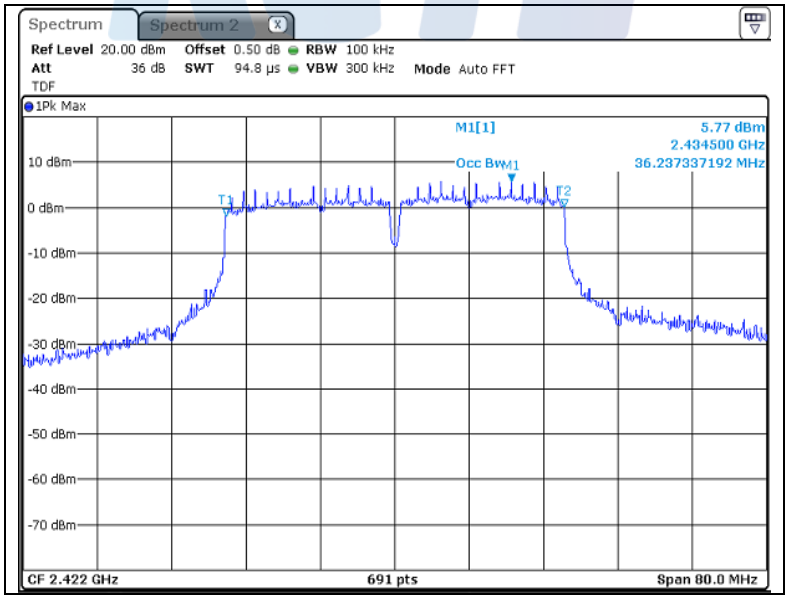


Highest Channel (2 462 ㎒)

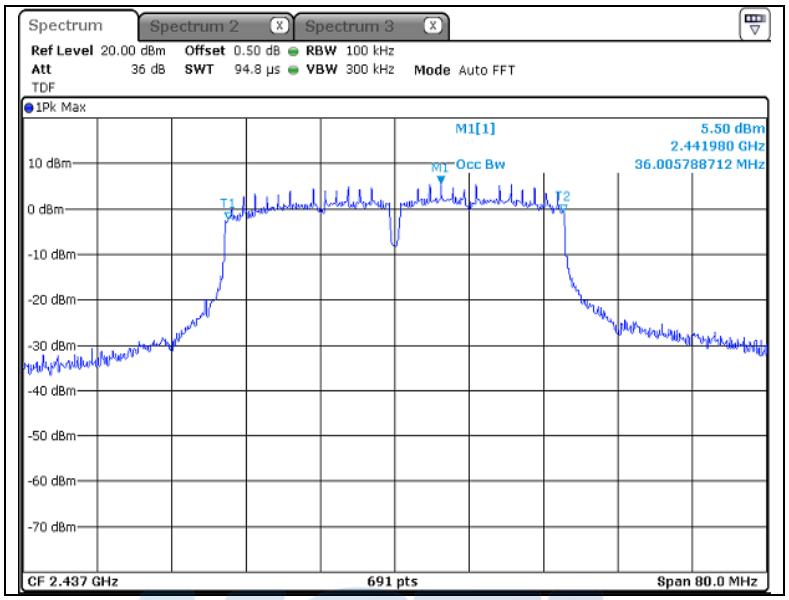


- 802.11n HT40_Occupied Bandwidth

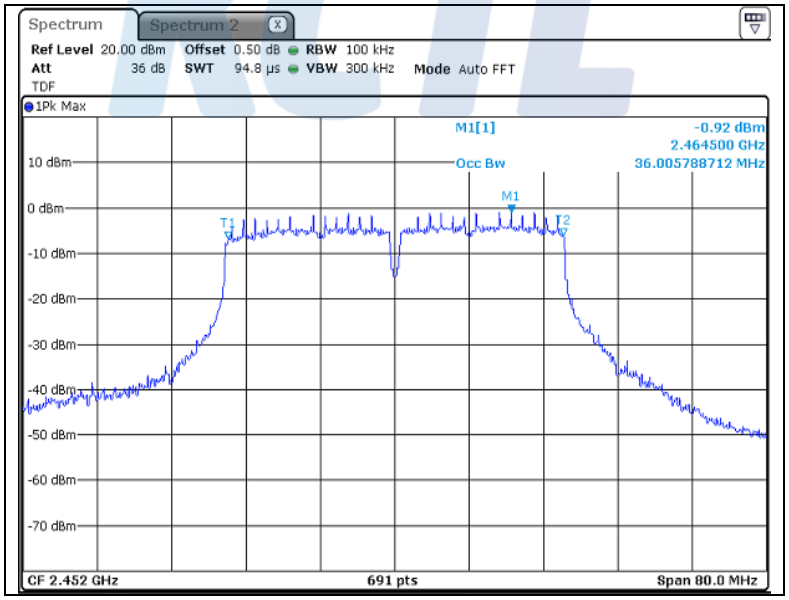
Lowest Channel (2 422 ㎒)



Middle Channel (2 437 ㎒)



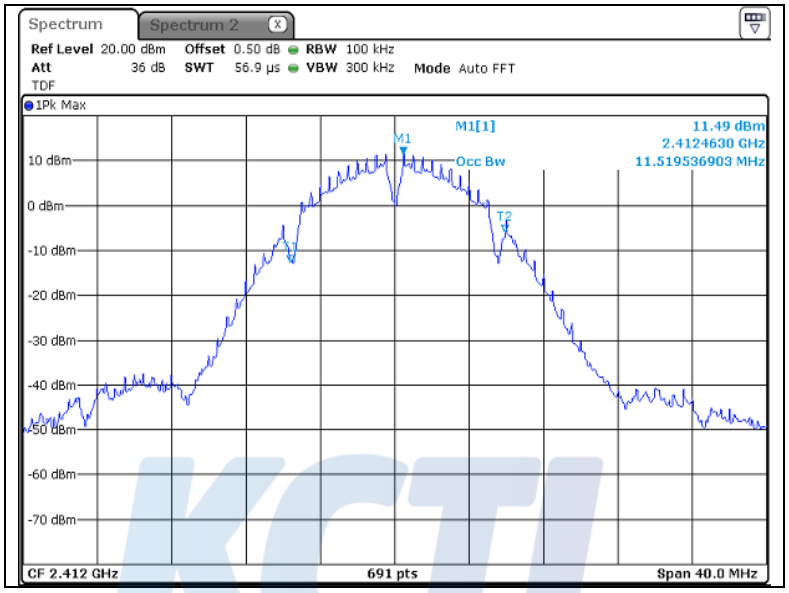
Highest Channel (2 452 ㎒)



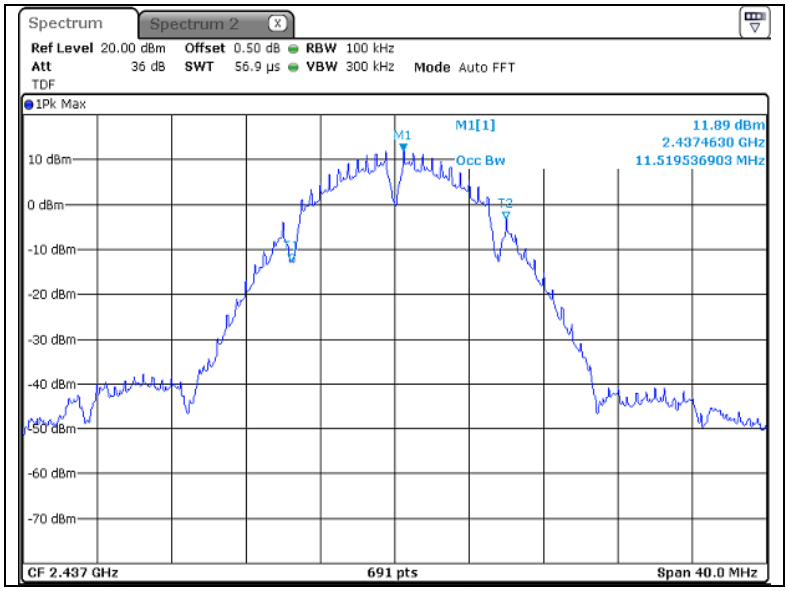
- ANT 2

- 802.11b_Occupied Bandwidth

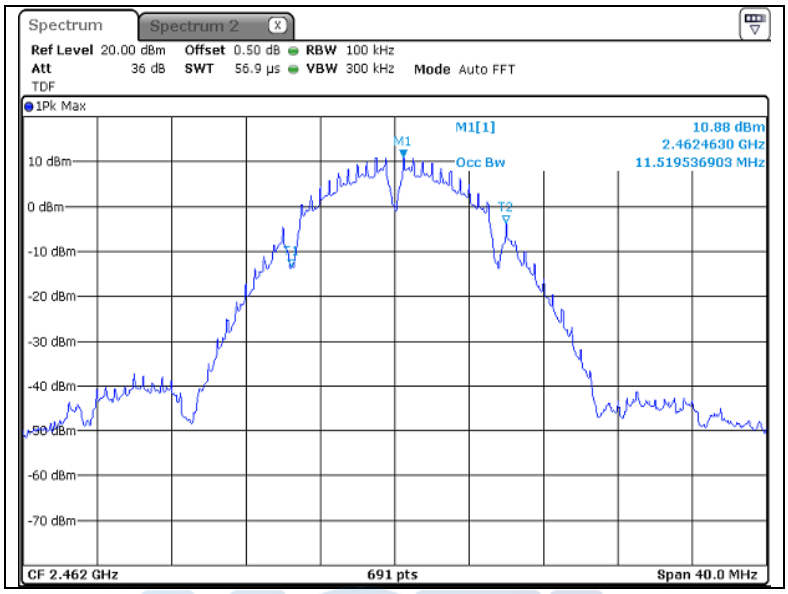
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

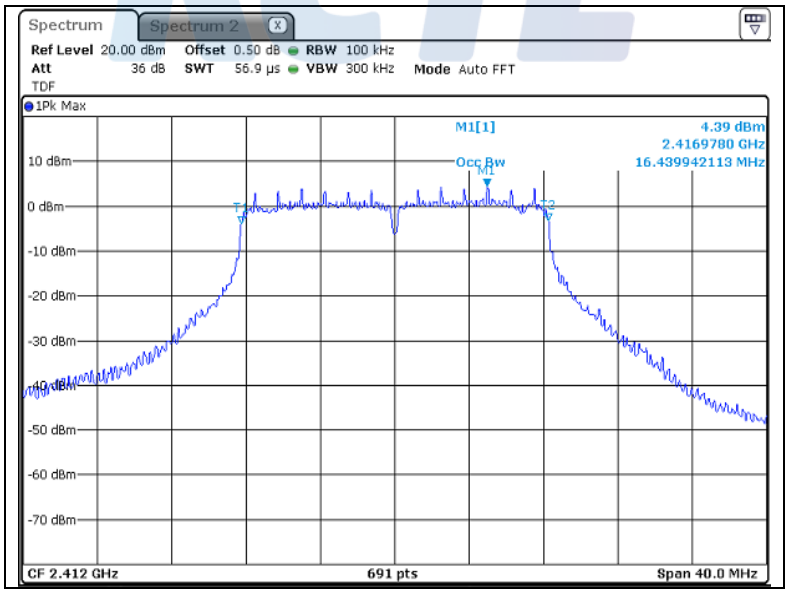


Highest Channel (2 462 ㎒)

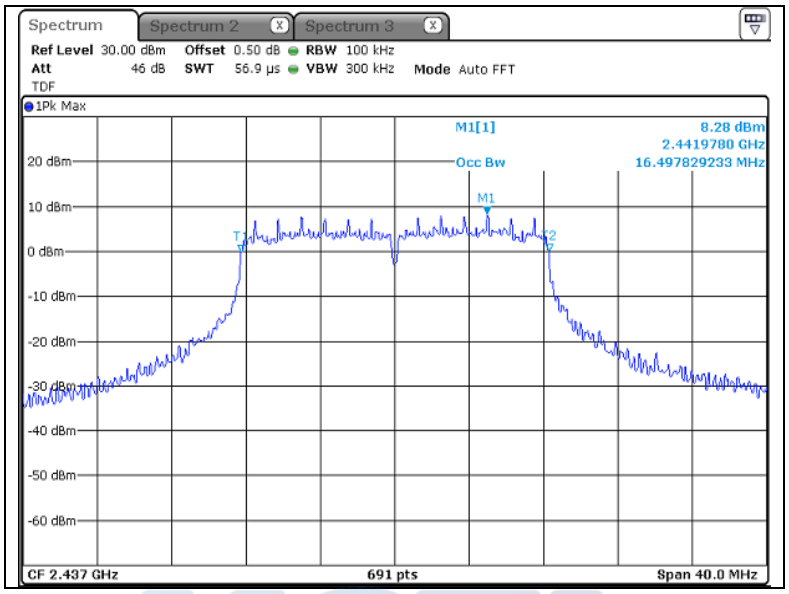


- 802.11g_Occupied Bandwidth

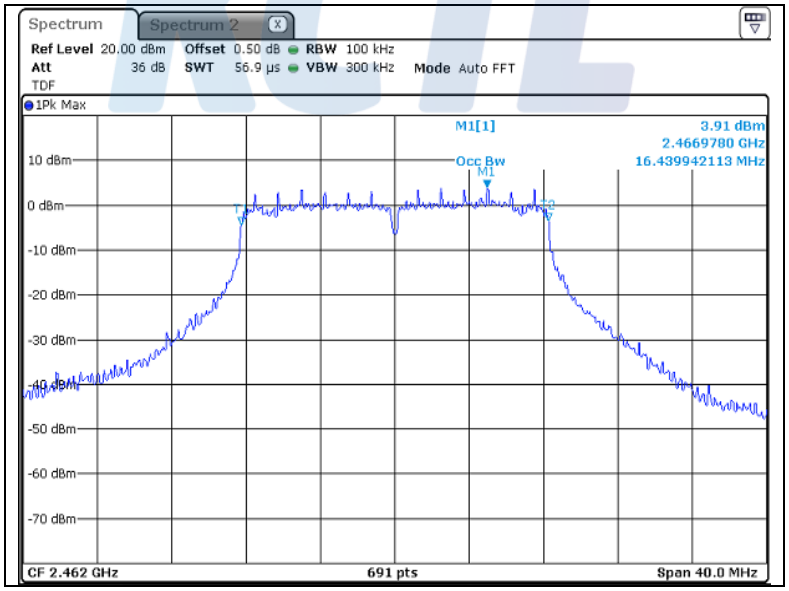
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

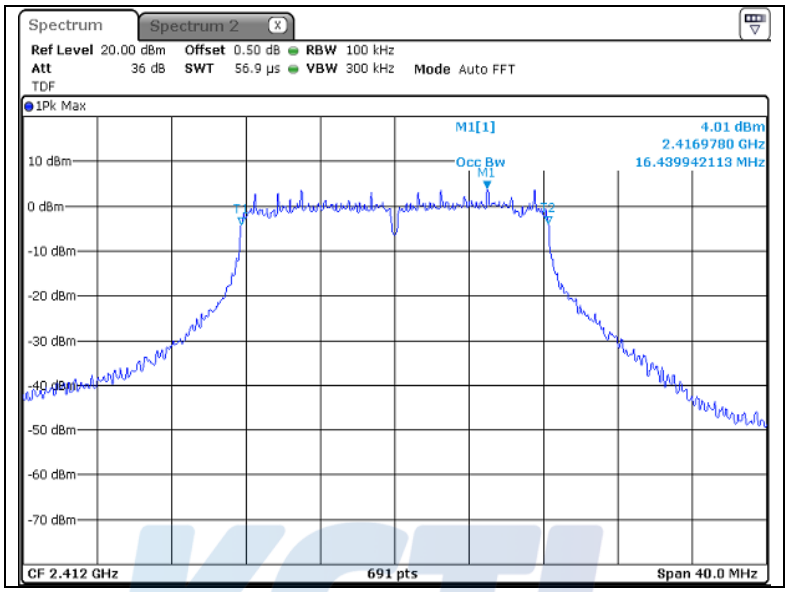


Highest Channel (2 462 ㎒)

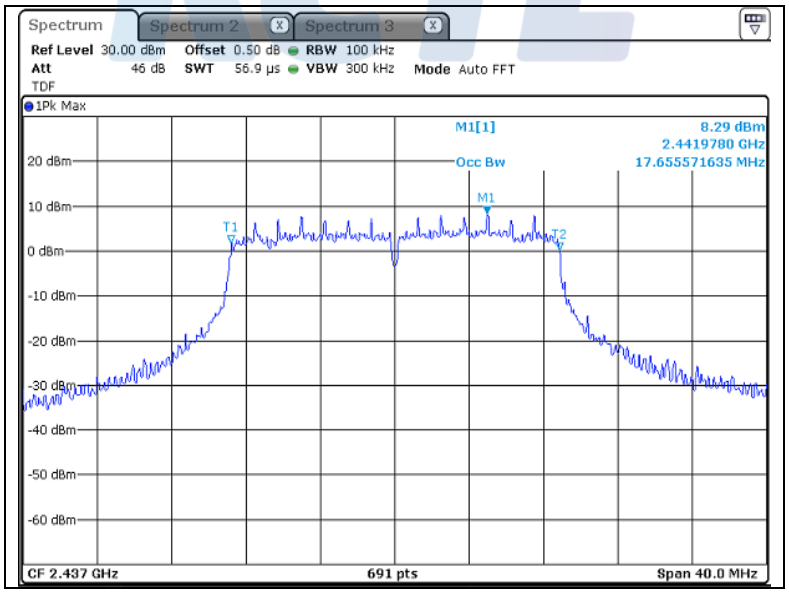


- 802.11n HT20_Occupied Bandwidth

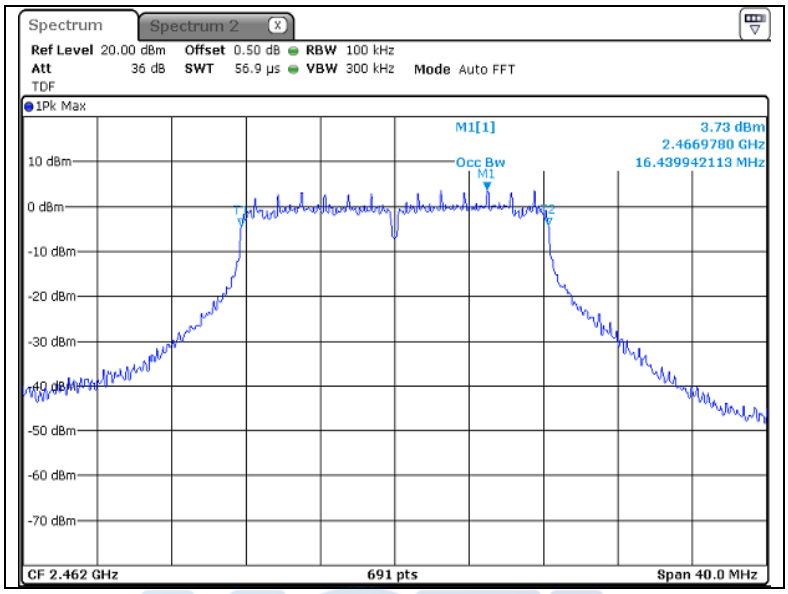
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

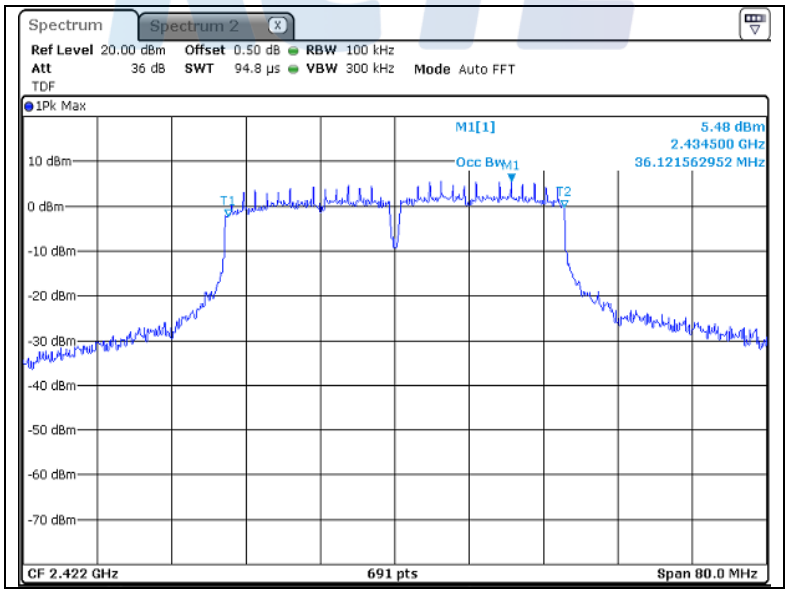


Highest Channel (2 462 ㎒)

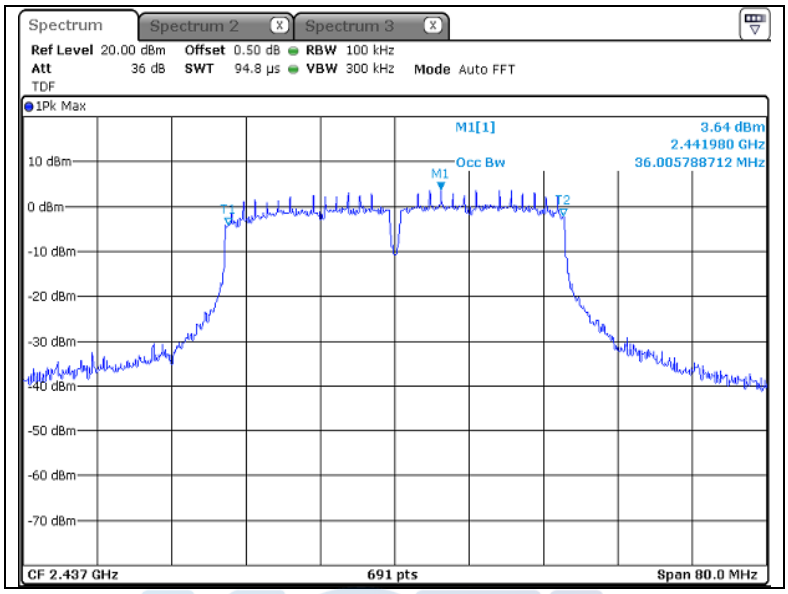


- 802.11n HT40_Occupied Bandwidth

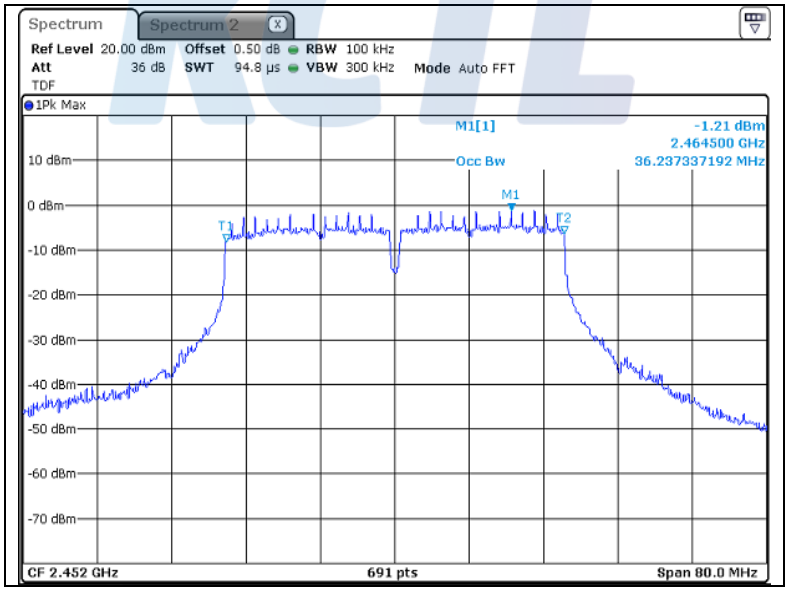
Lowest Channel (2 422 ㎒)



Middle Channel (2 437 ㎒)



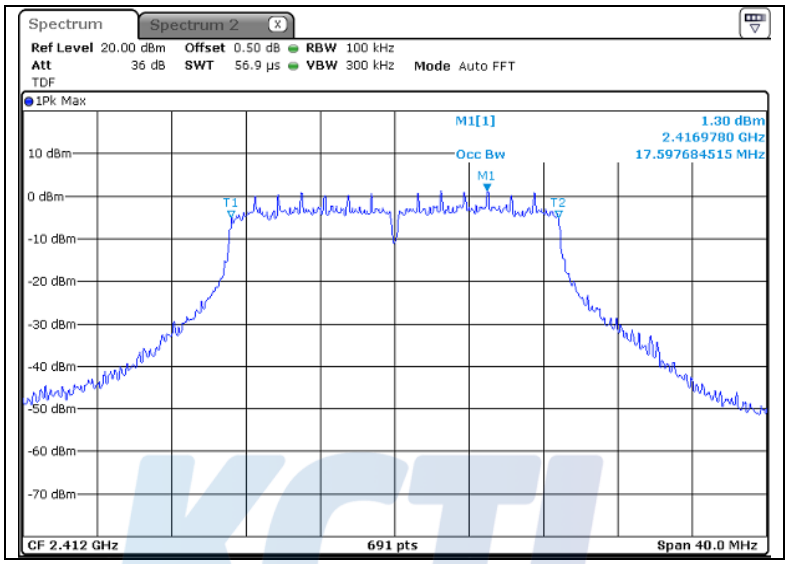
Highest Channel (2 452 ㎒)



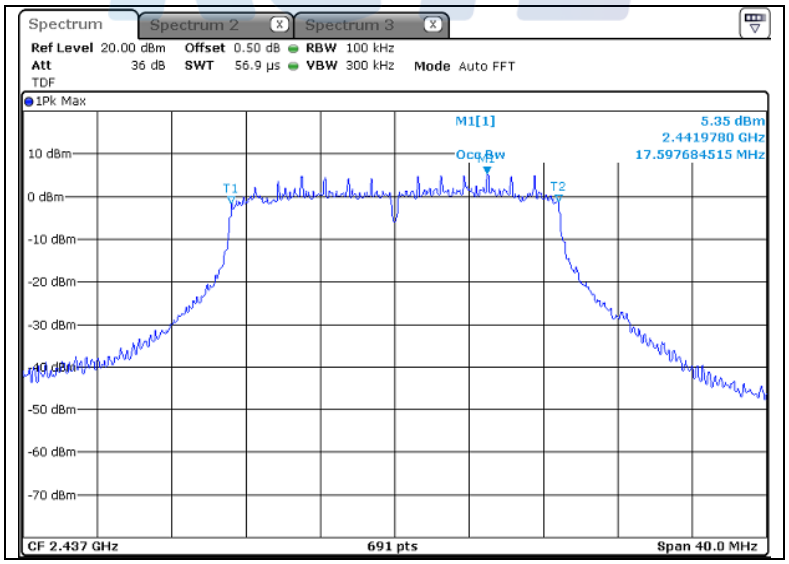
- MIMO (ANT 0+1)

- 802.11n HT20_Occupied Bandwidth

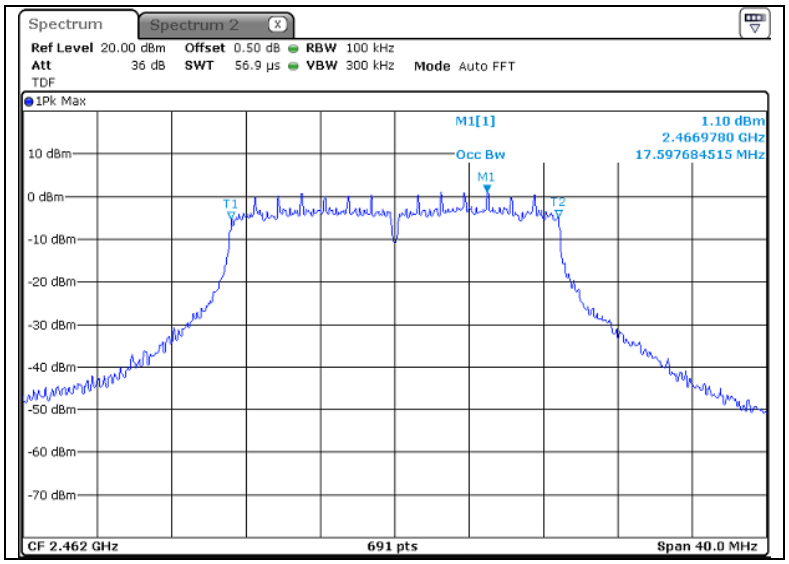
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

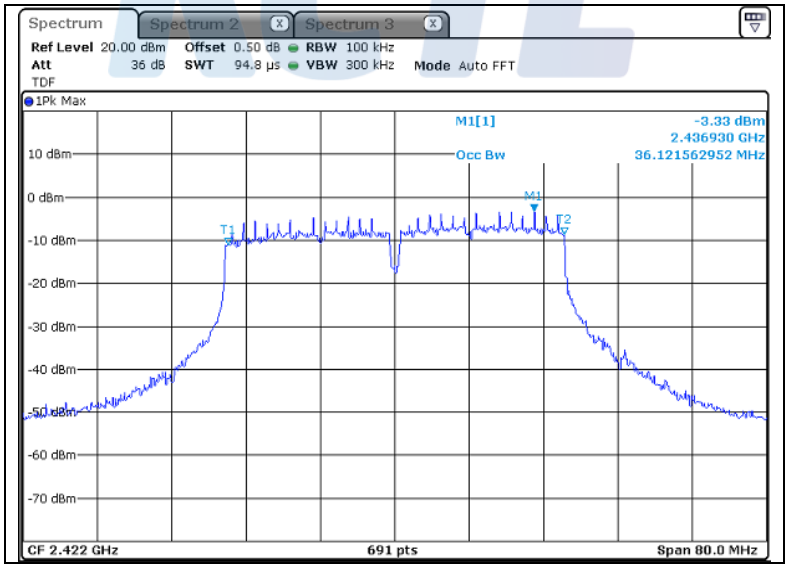


Highest Channel (2 462 ㎒)

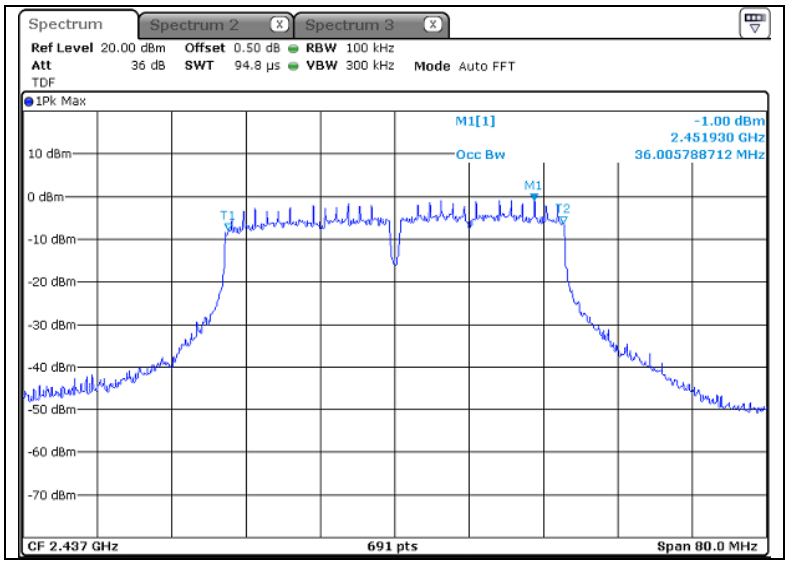


- 802.11n HT40_Occupied Bandwidth

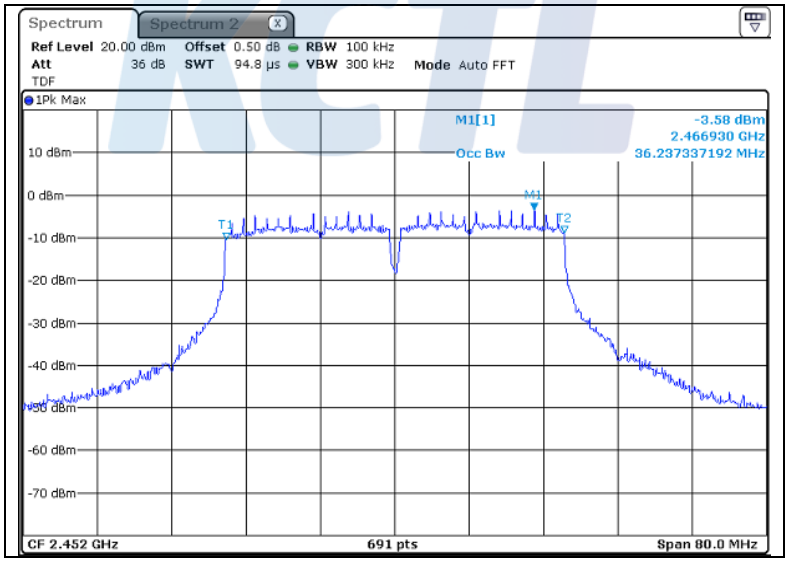
Lowest Channel (2 422 ㎒)



Middle Channel (2 437 ㎒)



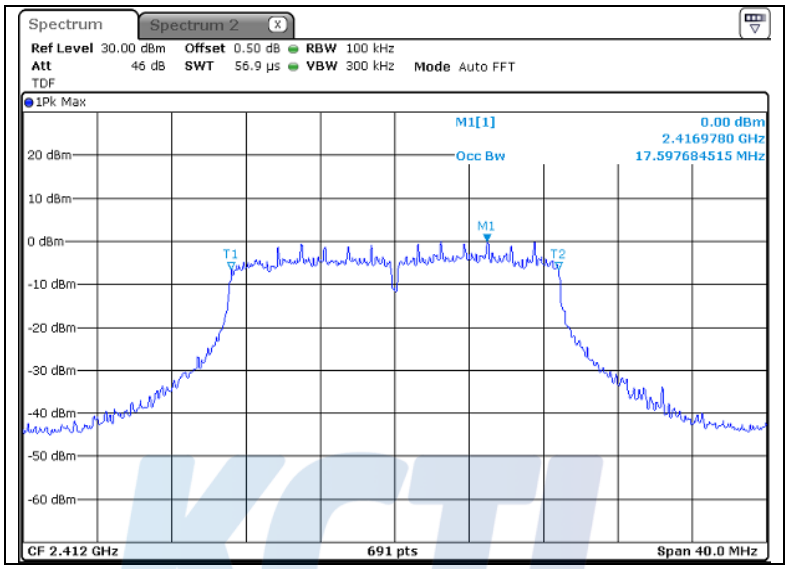
Highest Channel (2 452 ㎒)



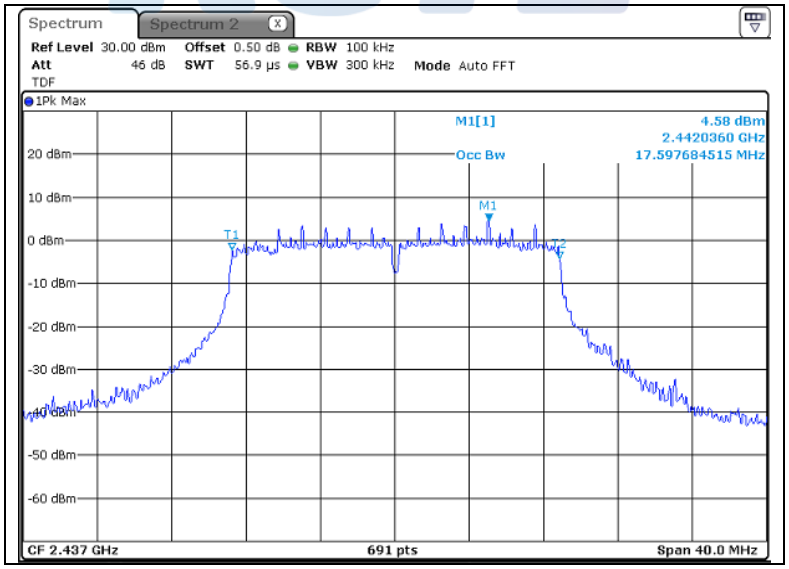
- MIMO (ANT 0+1+2)

- 802.11n HT20_Occupied Bandwidth

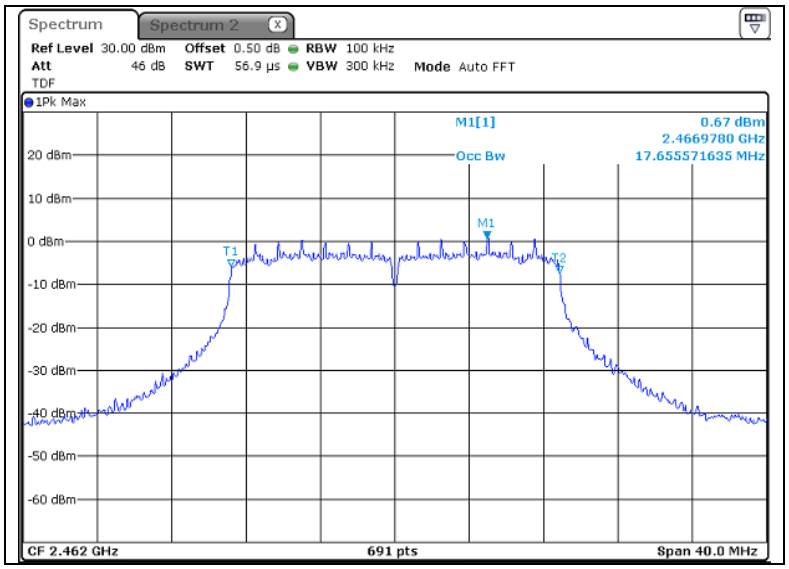
Lowest Channel (2 412 ㎒)



Middle Channel (2 437 ㎒)

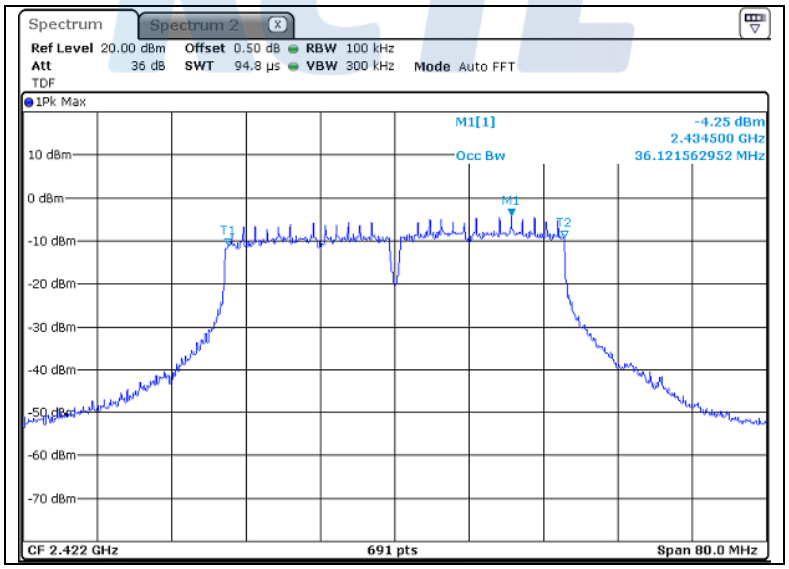


Highest Channel (2 462 ㎒)

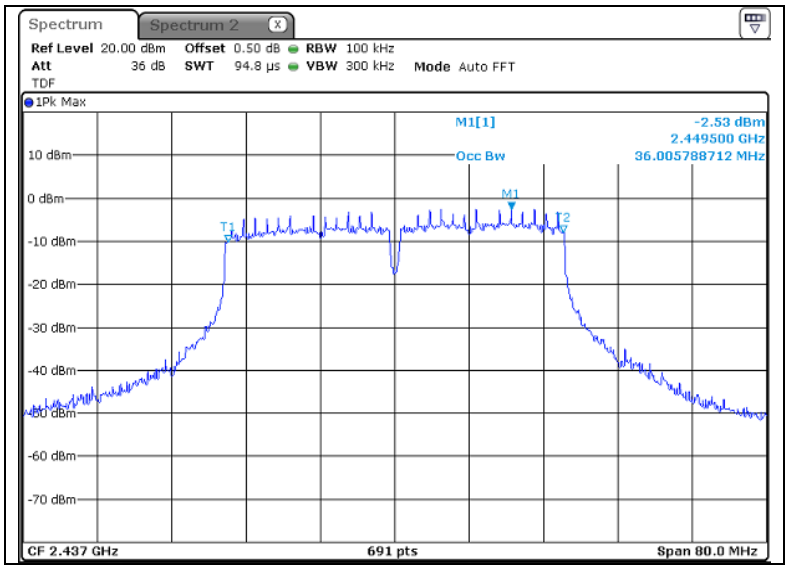


- 802.11n HT40_Occupied Bandwidth

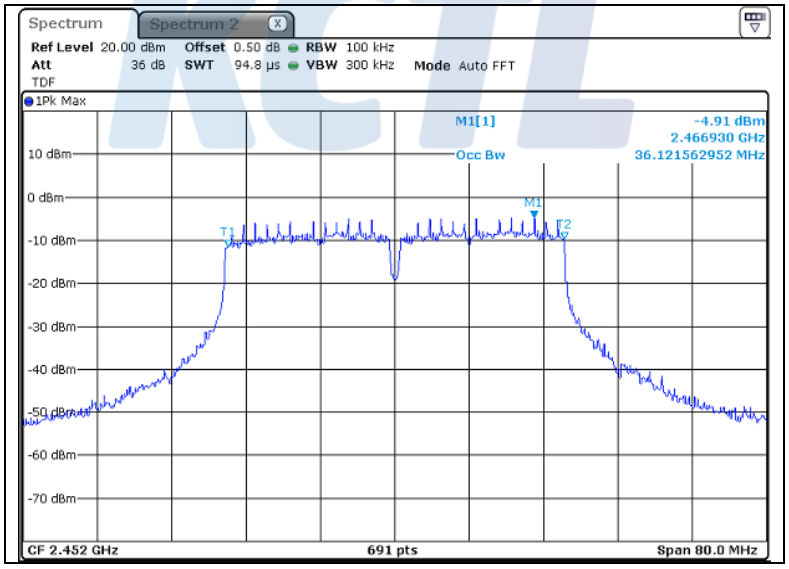
Lowest Channel (2 422 ㎒)



Middle Channel (2 437 ㎒)



Highest Channel (2 452 ㎒)



5.5 Spurious Emission, Band Edge, and Restricted bands

5.5.1 Regulation

According to §15.247(d), in any 100 ㎑ 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 ㏈ below that in the 100 ㎑ 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 ㏈ instead of 20 ㏈. 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 notexceed the field strength levels specified in the following table:

Frequency (㎒)	Field strength (㎛/m)	Measurement distance (m)
0.009 - 0.490	2 400/F(㎑)	300
0.490 - 1.705	24 000/F(㎑)	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 ㎒, 76–88 ㎒, 174–216 ㎒ or 470–806 ㎒. However, operation within these frequency bands is permltted 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 0.495 - 0.505 2.173 5 - 2.190 5 4.125 - 4.128 4.177 25 - 4.177 75 4.207 25 - 4.207 75 6.215 - 6.218 6.267 75 - 6.268 25 6.311 75 - 6.312 25 8.291 - 8.294 8.362 - 8.366 8.376 25 - 8.386 75 8.414 25 - 8.414 75 12.29 - 12.293 12.519 75 - 12.520 25 12.576 75 - 12.577 25 13.36 - 13.41	16.42 - 16.423 16.694 75 - 16.695 25 16.804 25 - 16.804 75 25.5 - 25.67 37.5 - 38.25 73 - 74.6 74.8 - 75.2 108 - 121.94 123 - 138 149.9 - 150.05 156.524 75 - 156.525 25 156.7 - 156.9 162.012 5 - 167.17 167.72 - 173.2 240 - 285 322 - 335.4	399.9 - 410 608 - 614 960 – 1 240 1 300 – 1 427 1 435 – 1 626.5 1 645.5 – 1 646.5 1 660 – 1 710 1 718.8 – 1 722.2 2 200 – 2 300 2 310 – 2 390 2 483.5 – 2 500 2 690 – 2 900 3 260 – 3 267 3 332 – 3 339 3 345.8 – 3 358 3 600 – 4 400	4.5 - 5.15 5.35 - 5.46 7.25 - 7.75 8.025 - 8.5 9.0 - 9.2 9.3 - 9.5 10.6 - 12.7 13.25 - 13.4 14.47 - 14.5 15.35 - 16.2 17.7 - 21.4 22.01 - 23.12 23.6 - 24.0 31.2 - 31.8 36.43 - 36.5 Above 38.6

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.

5.5.2Measurement 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 ≥ 1.5 times the DTS bandwidth.
3) Set the RBW = 100 ㎑.
4) Set the VBW ≥ 3 x 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 ㎑.
3) Set the VBW ≥ 3 x RBW.
4) Detector = peak.
5) Ensure that the number of measurement points ≥ 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 ㎑
3) VBW ≥ 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 rdiated measurements were performed to determine the frequency producing the maximum emissions in at 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 × 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 ㎑ to 30 ㎒ using the loop antenna, and from 30 to 1 000 ㎒ using the TRILOG broadband antenna, and from 1 000 ㎒ to 26 500 ㎒ 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.
5) The 0.8m height is for below 1 G testing, and 1.5m is for above 1G testing.

Note

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 ㎑ for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1 ㎓.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 ㎒ for Peak detection and frequency above 1 ㎓.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 ㎒ and the video bandwidth is 3 ㎒ for Average detection (AV) at frequency above 1 ㎓. (Detector = RMS, Averaging type = power)
   In case of duty cycle less than 98%, a duty cycle correction factor has to be added to the measurement result.