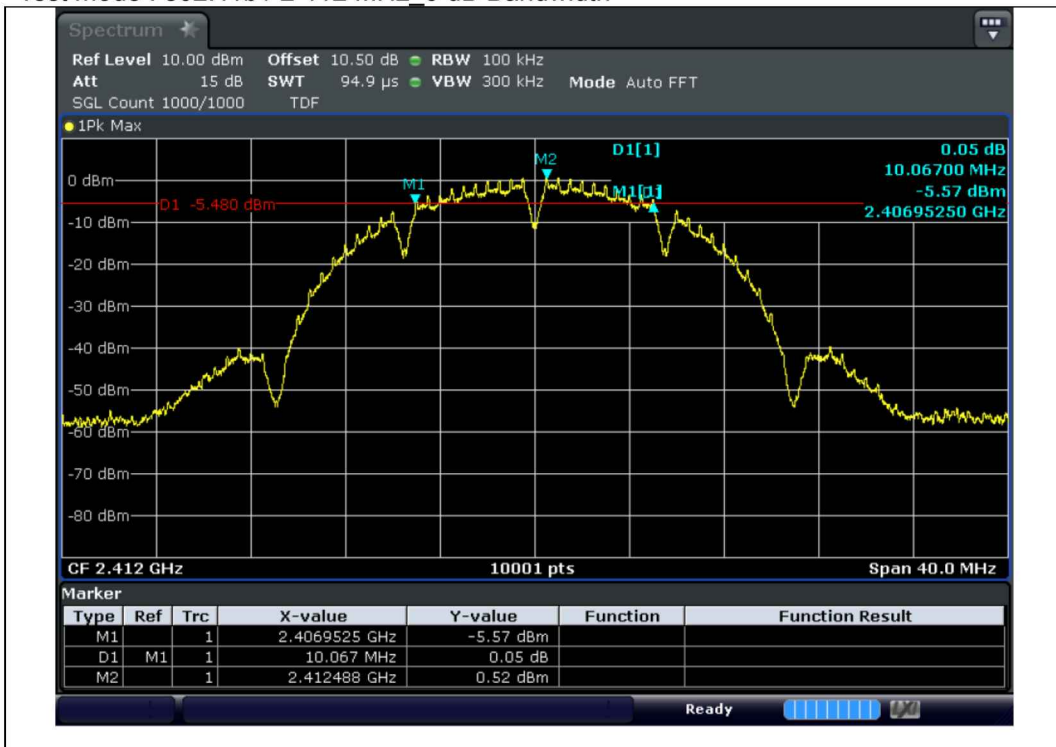
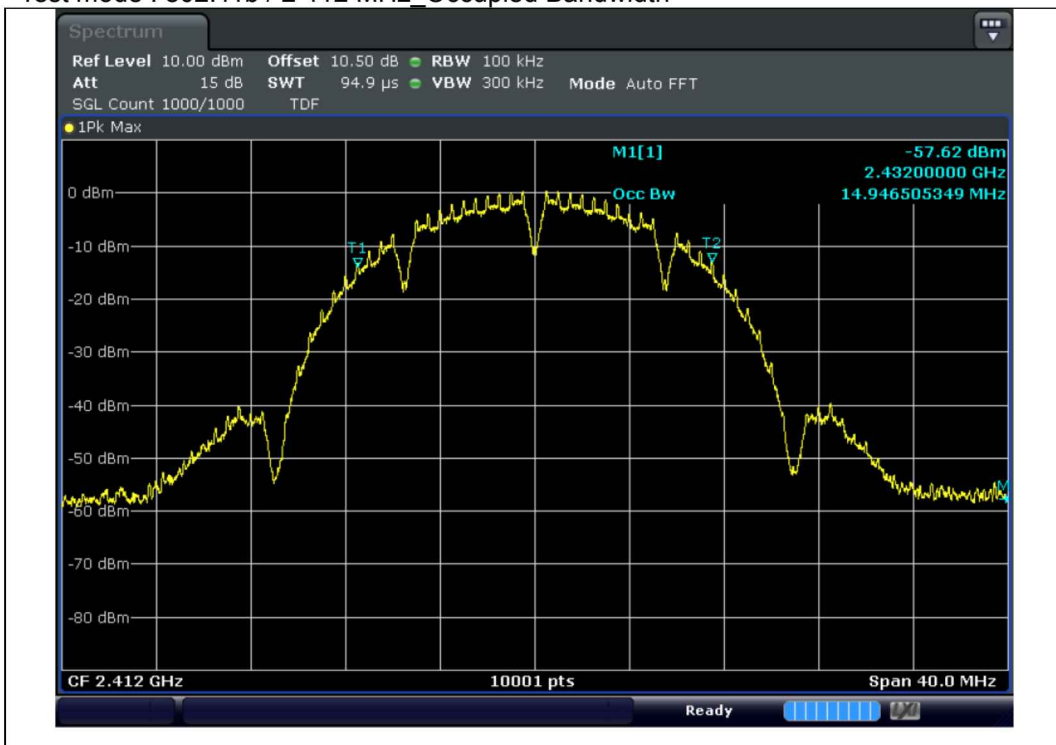


4.4.4.5 Test Plot

Test mode : 802.11b / 2 412 MHz_ 6 dB Bandwidth



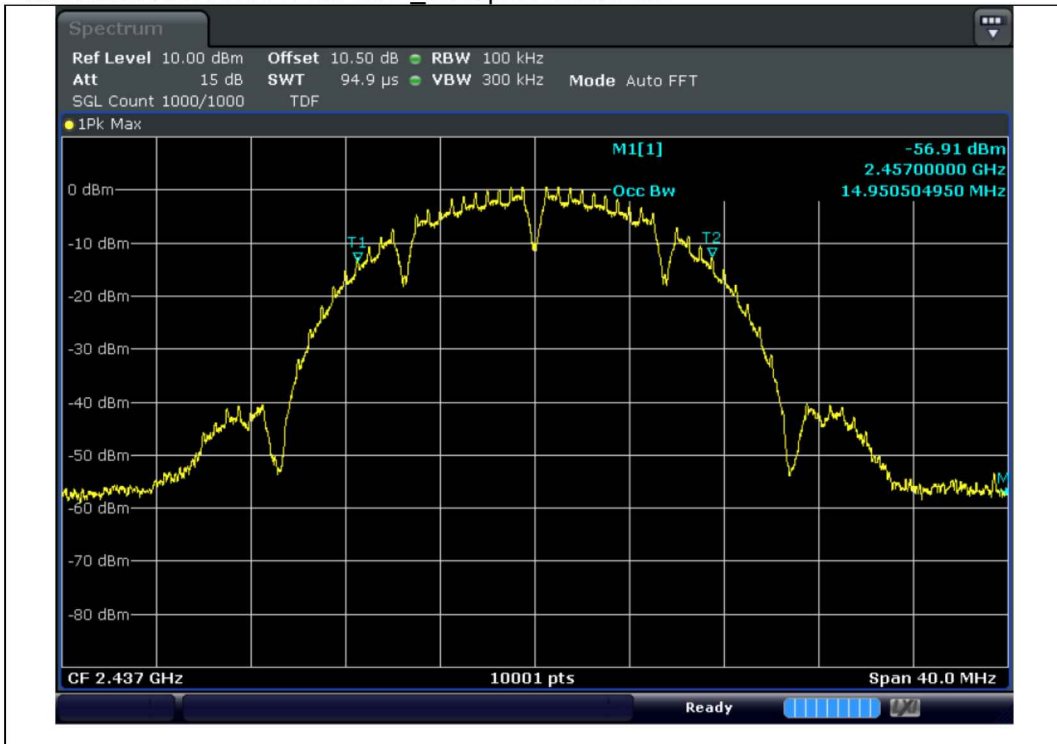
Test mode : 802.11b / 2 412 MHz_ Occupied Bandwidth



Test mode : 802.11b / 2 437 MHz_ 6 dB Bandwidth



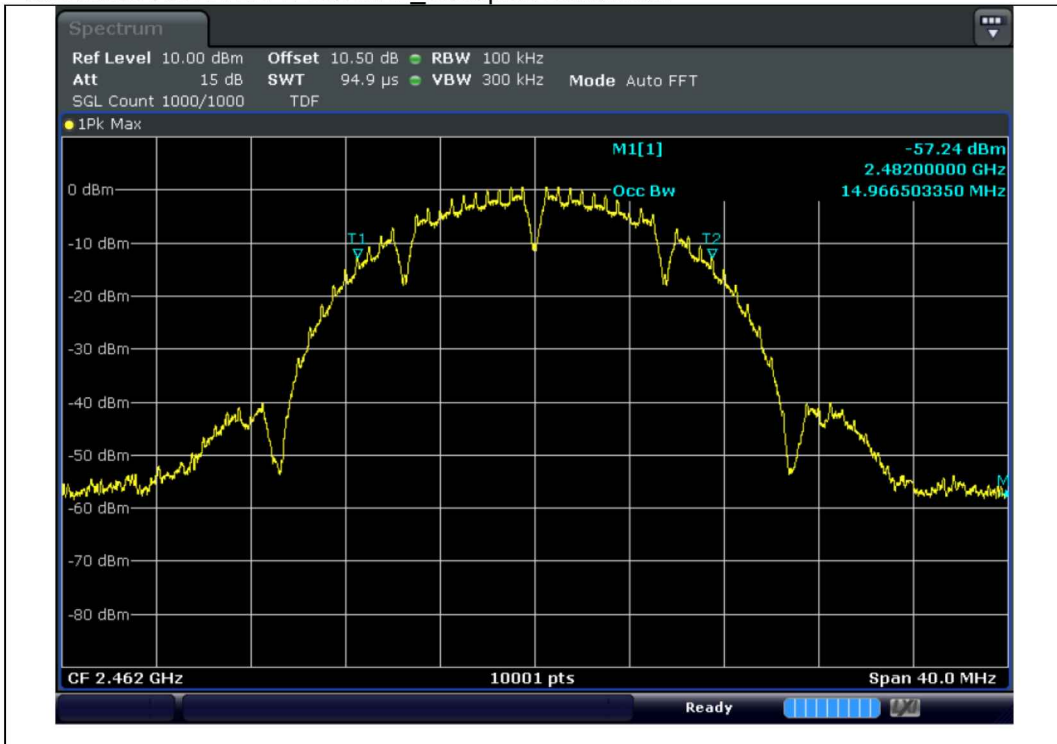
Test mode : 802.11b / 2 437 MHz_ Occupied Bandwidth



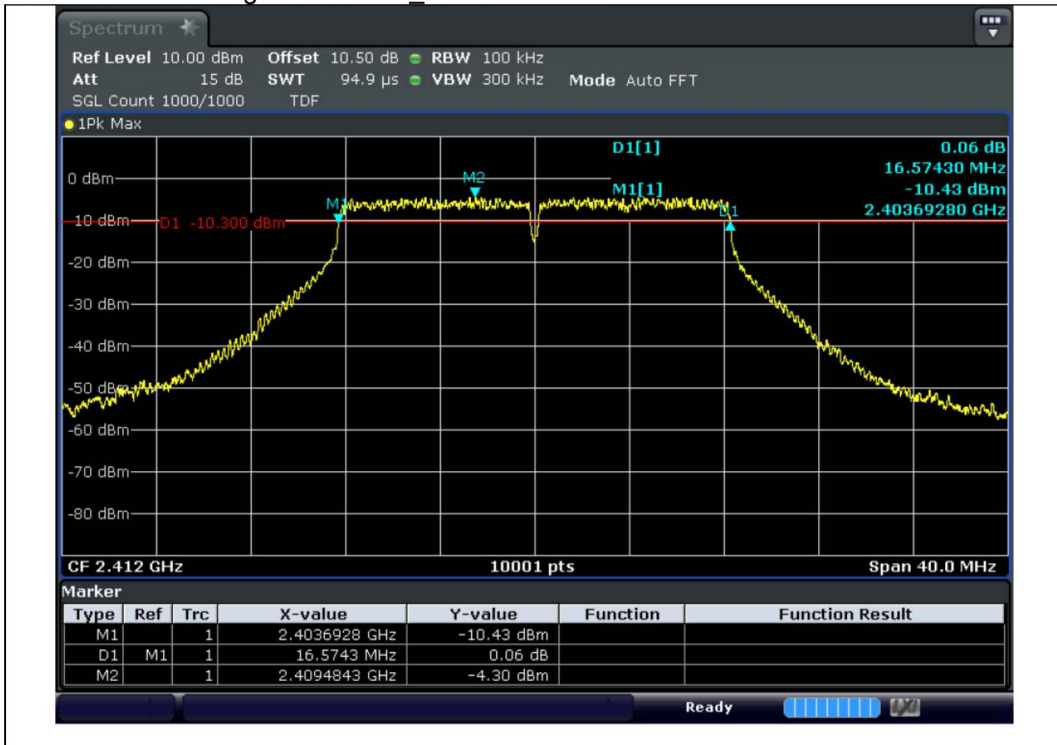
Test mode : 802.11b / 2 462 MHz_ 6 dB Bandwidth



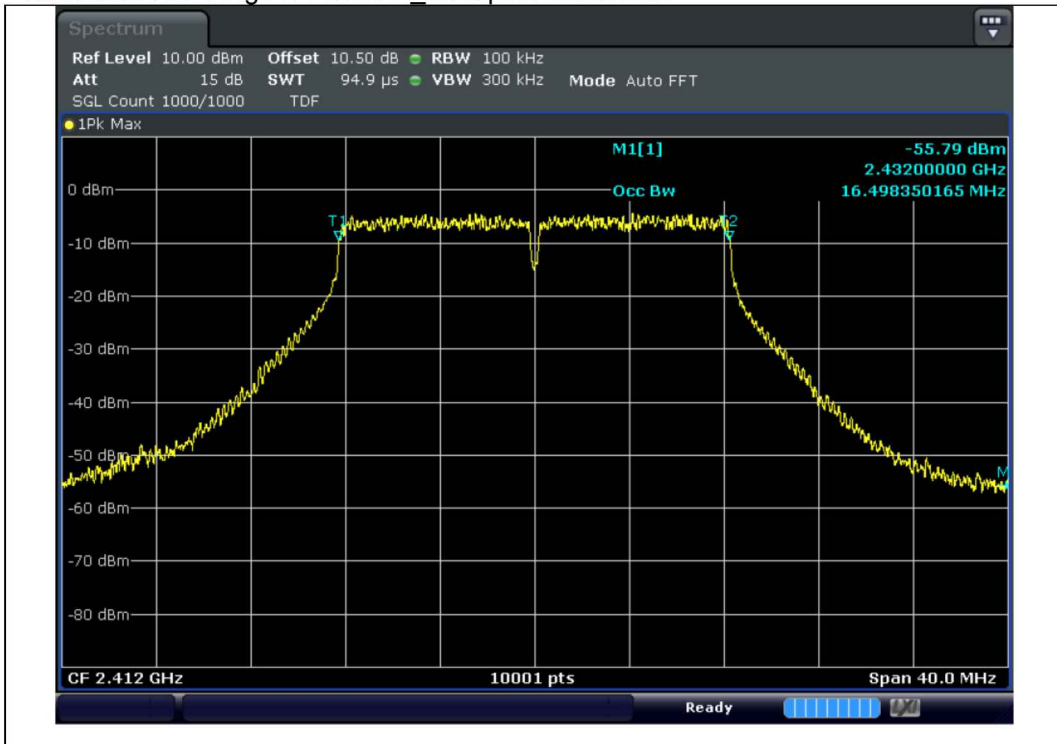
Test mode : 802.11b / 2 462 MHz_ Occupied Bandwidth



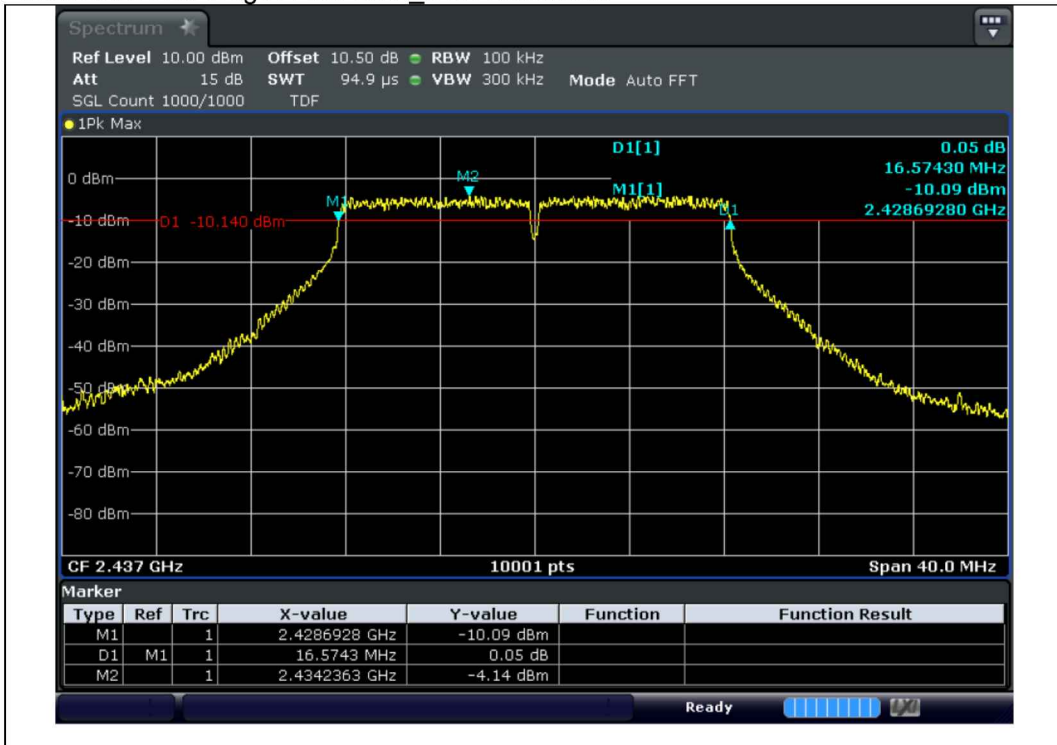
Test mode : 802.11g / 2 412 MHz_6 dB Bandwidth



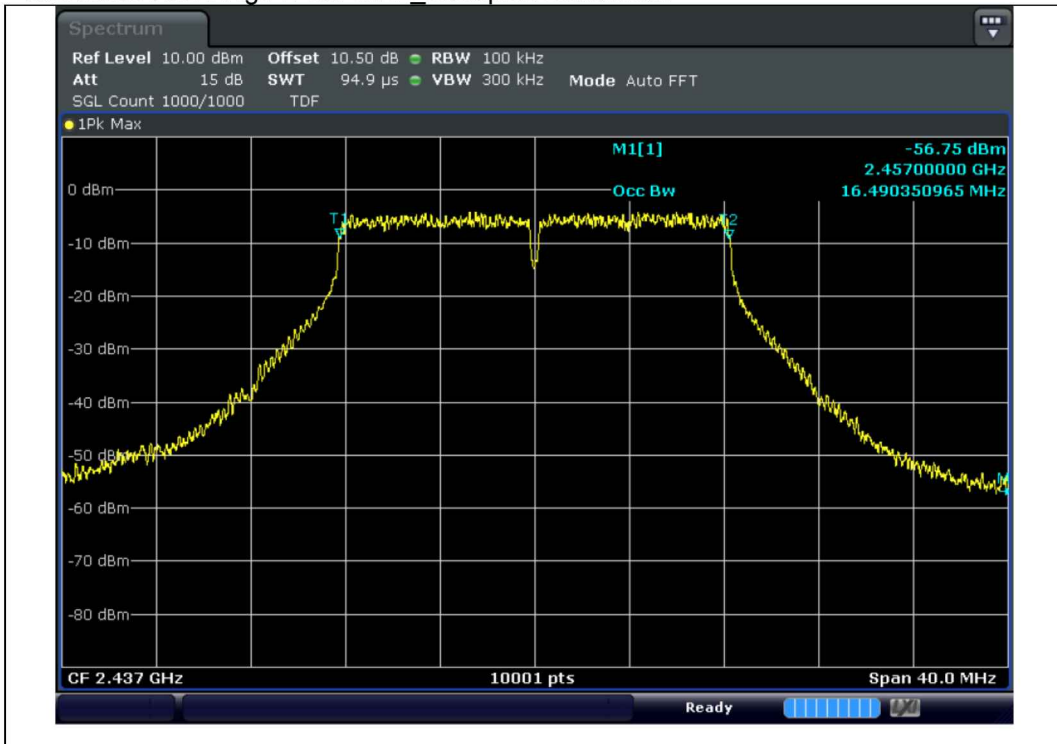
Test mode : 802.11g / 2 412 MHz_Occupied Bandwidth



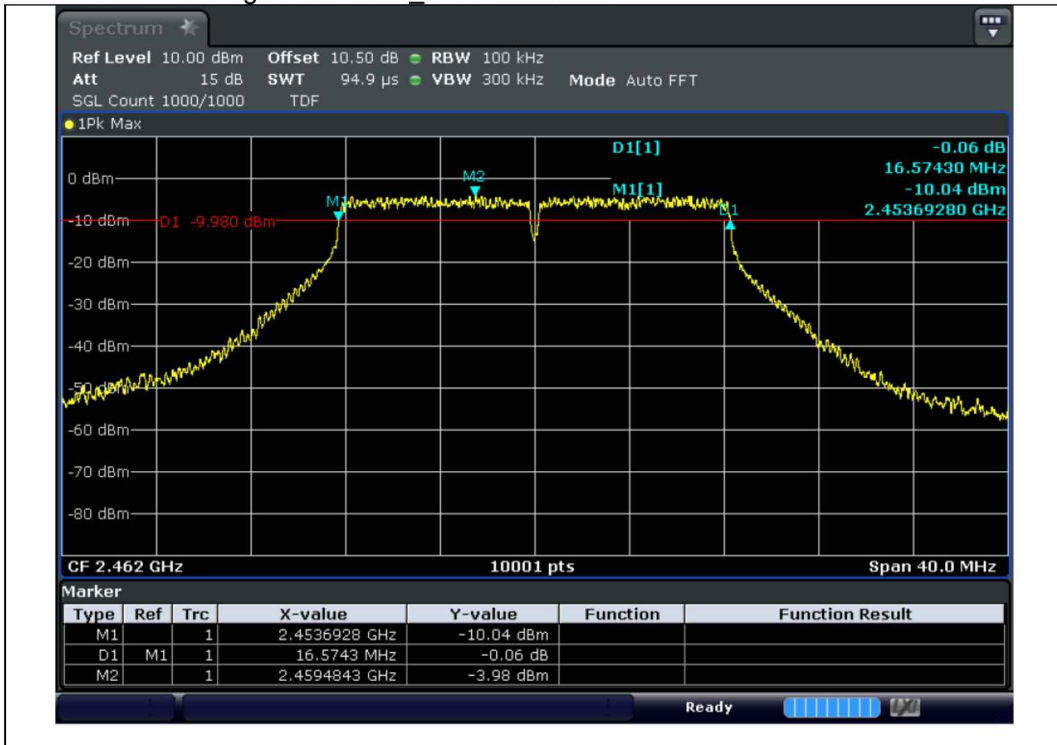
Test mode : 802.11g / 2 437 MHz_6 dB Bandwidth



Test mode : 802.11g / 2 437 MHz_Occupied Bandwidth



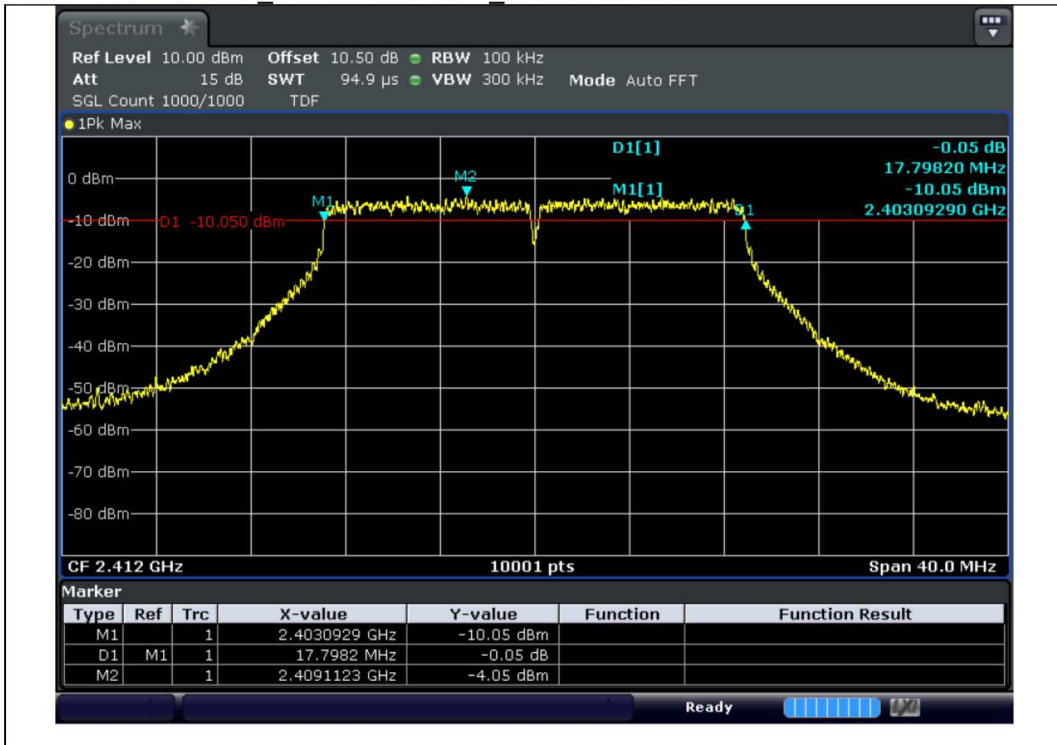
Test mode : 802.11g / 2 462 MHz_6 dB Bandwidth



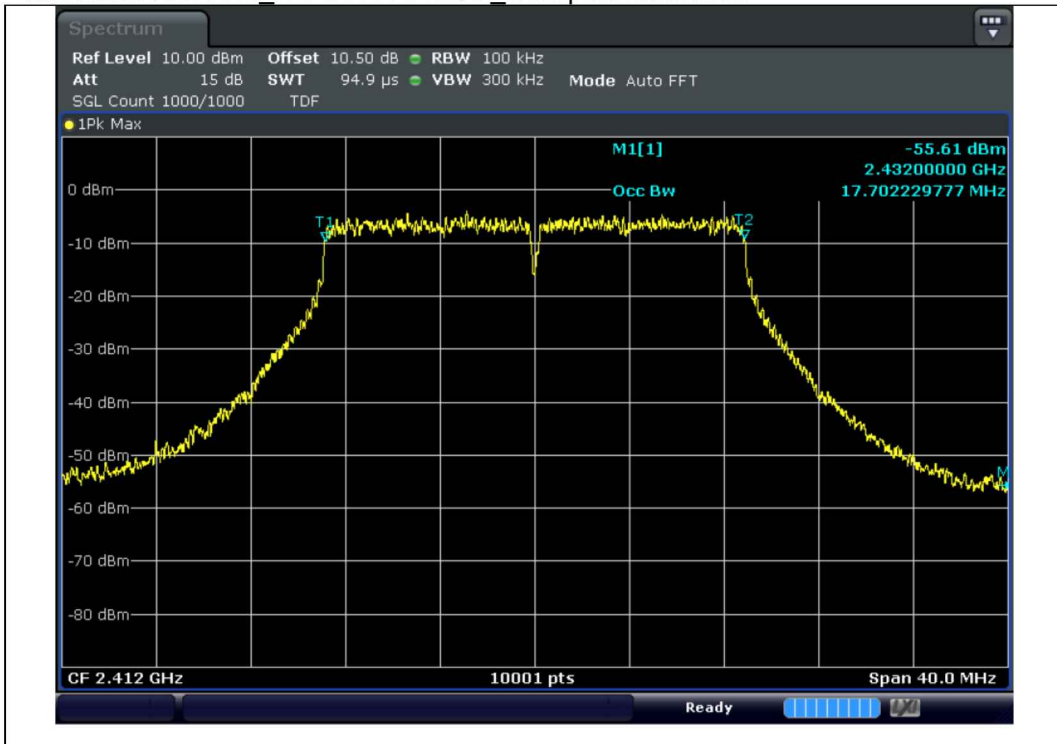
Test mode : 802.11g / 2 462 MHz_Occupied Bandwidth



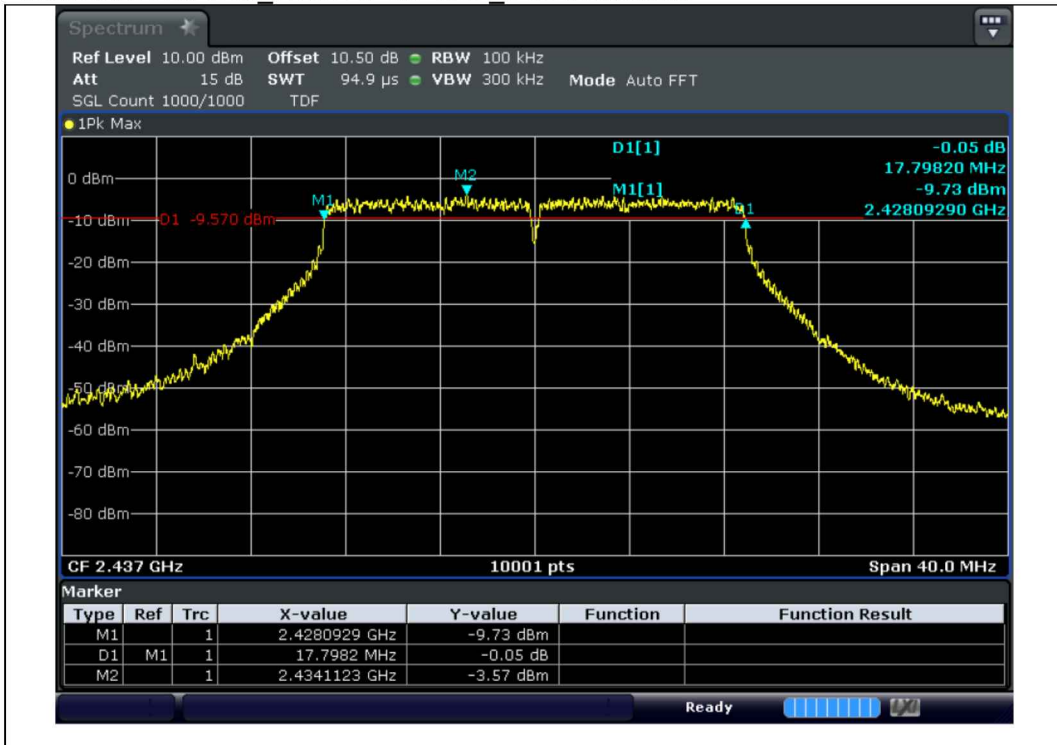
Test mode : 802.11n_HT20 / 2.412 MHz_6 dB Bandwidth



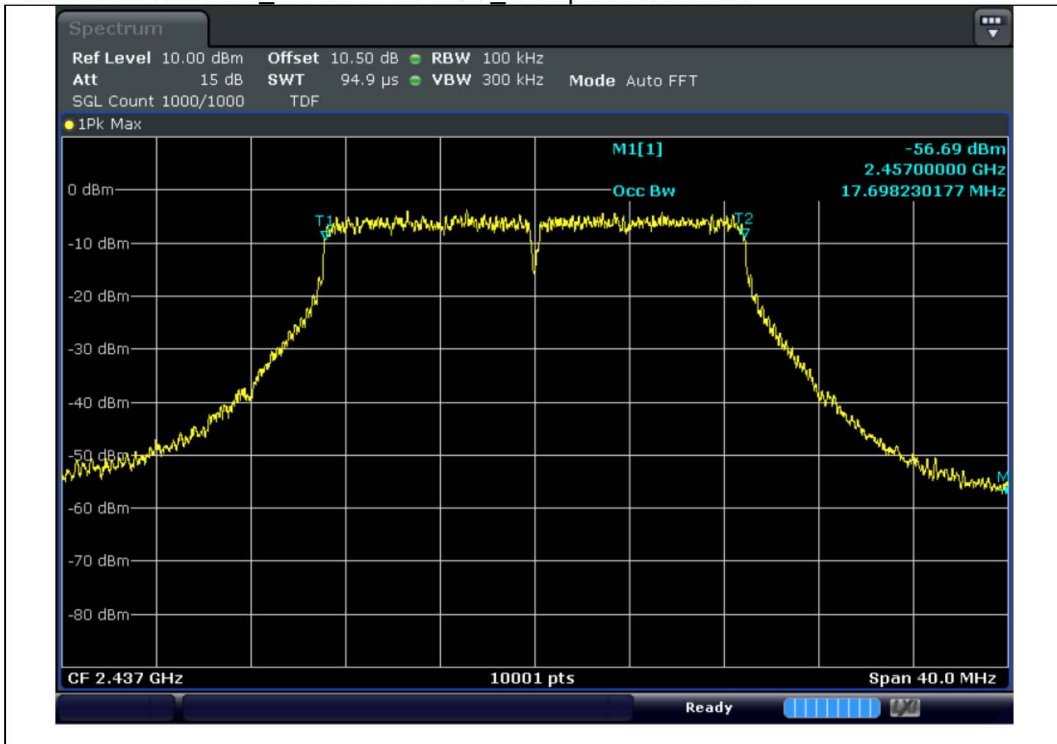
Test mode : 802.11n_HT20 / 2.412 MHz_Occupied Bandwidth



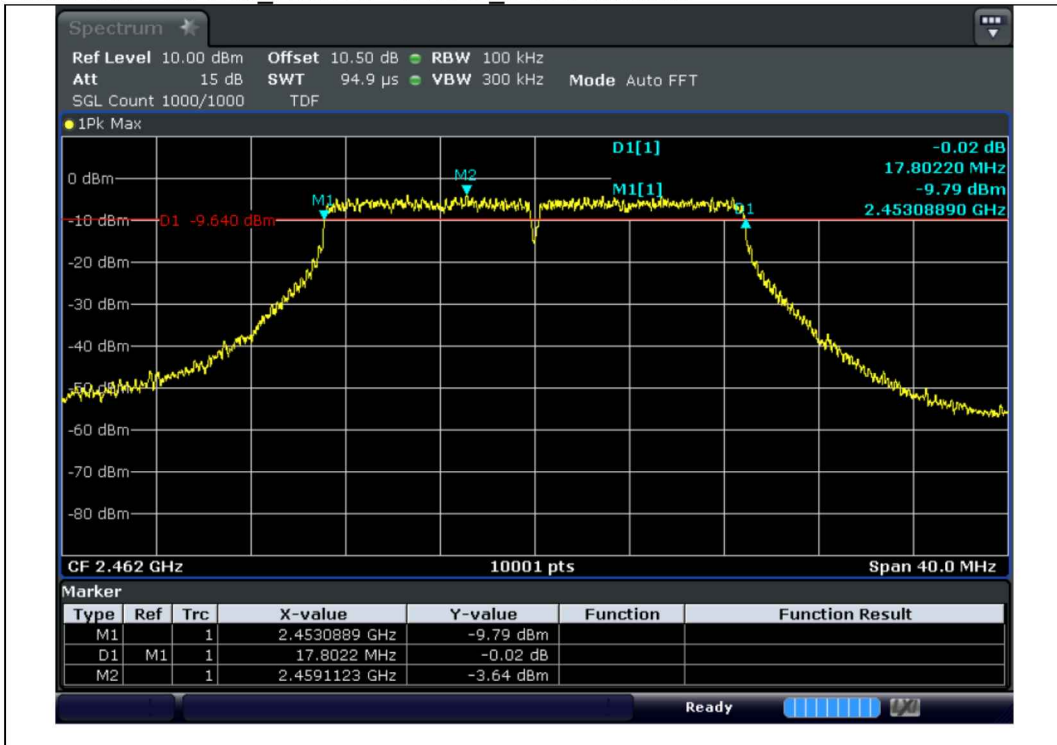
Test mode : 802.11n_HT20 / 2.437 MHz_6 dB Bandwidth



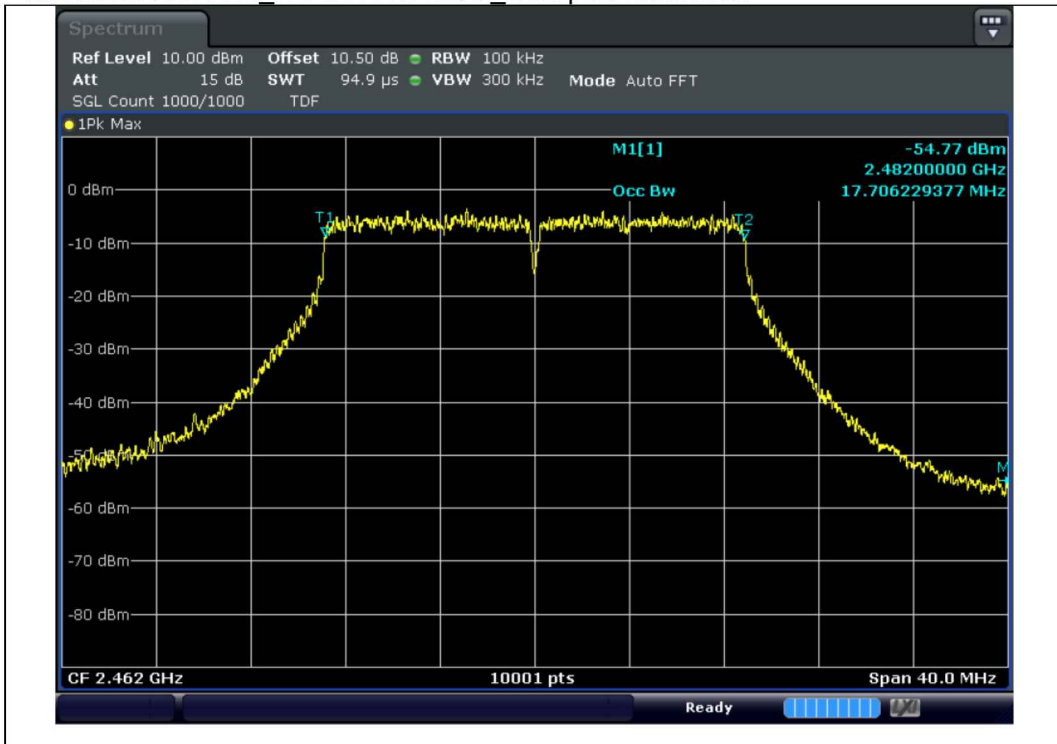
Test mode : 802.11n_HT20 / 2.437 MHz_Occupied Bandwidth



Test mode : 802.11n_HT20 / 2.462 MHz_6 dB Bandwidth



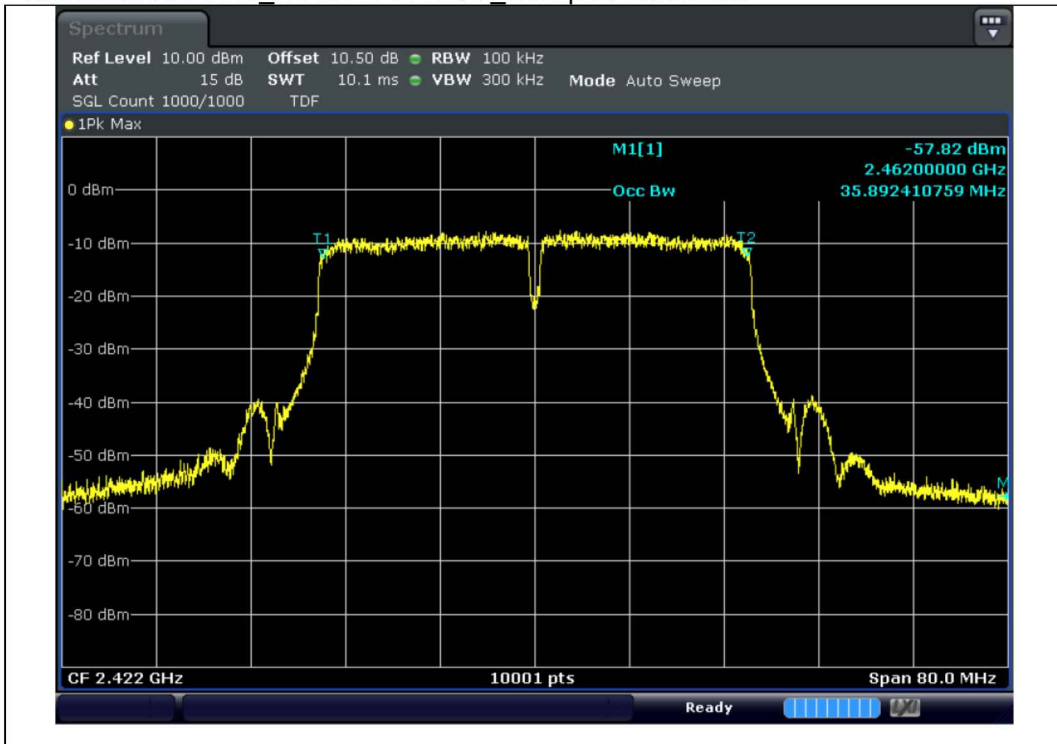
Test mode : 802.11n_HT20 / 2.462 MHz_Occupied Bandwidth



Test mode : 802.11n_HT40 / 2.422 MHz_6 dB Bandwidth



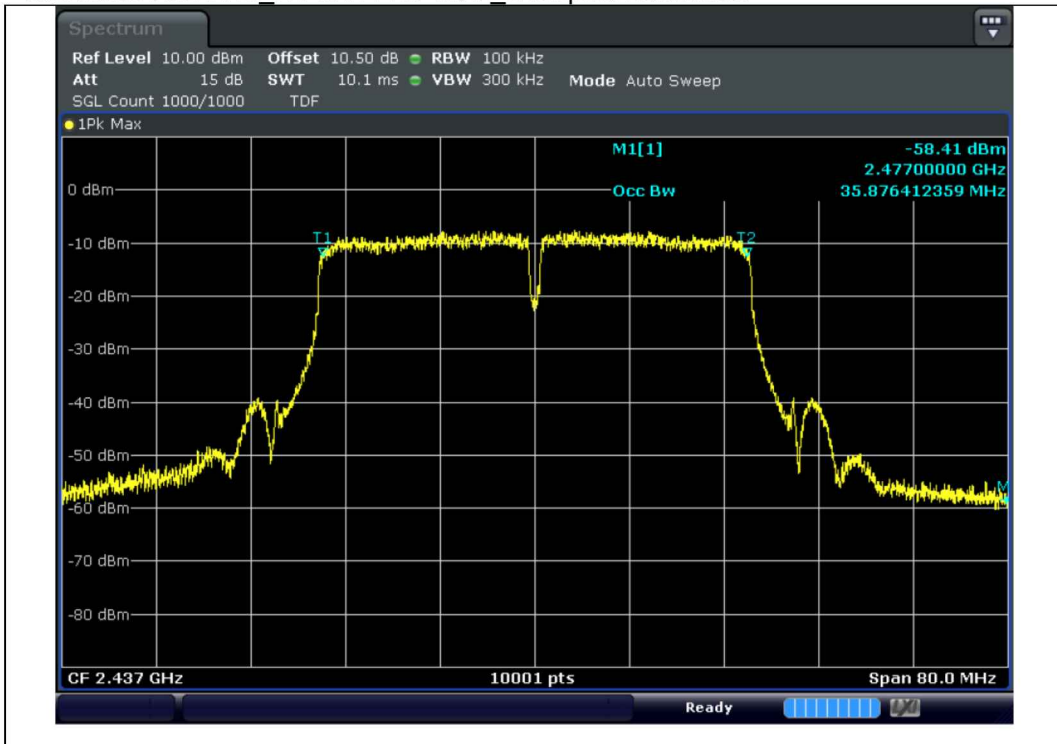
Test mode : 802.11n_HT40 / 2.422 MHz_Occupied Bandwidth



Test mode : 802.11n_HT40 / 2.437 MHz_6 dB Bandwidth



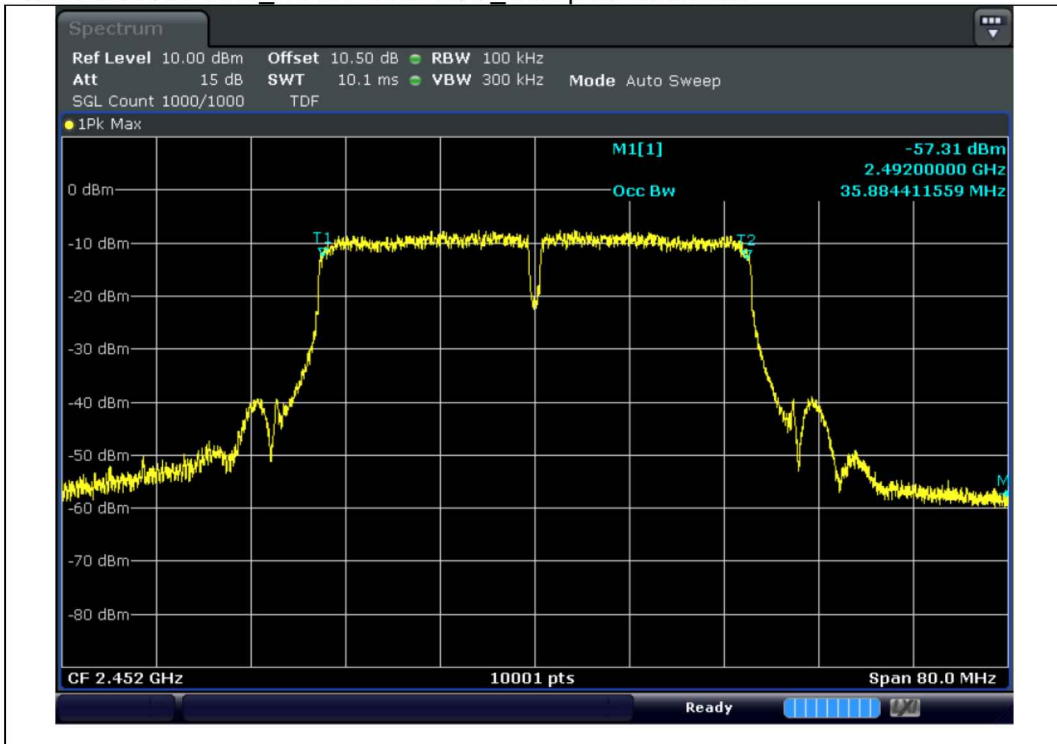
Test mode : 802.11n_HT40 / 2.437 MHz_Occupied Bandwidth



Test mode : 802.11n_HT40 / 2.452 MHz_ 6 dB Bandwidth



Test mode : 802.11n_HT40 / 2.452 MHz_Occupied Bandwidth



4.4.5 Spurious Emission, Band Edge, and Restricted bands

4.4.5.1 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(microvolts/meter)	Measurement distance(meters)
0.009 - 0.490	2 400/F(kHz)	300
0.490 - 1.705	24 000/F(kHz)	30
1.705 - 30.0	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 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 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 measurement

4.4.5.2 Measurement Procedure

4.4.5.2.1 Band-edge Compliance of RF Conducted Emissions

4.4.5.2.1.1 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 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.

4.4.5.2.1.2 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.

4.4.5.2.2 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 $\geq 3 \times$ 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.

4.4.5.2.3 Radiated Spurious Emissions

- 1) The preliminary and final radiated 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 m height or 1.5 m height 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.

NOTE1 : 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.

NOTE2 : The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1 GHz.
The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1 kHz(1/T) for Average detection (AV) at frequency above 1 GHz. (where T= pulse width)

NOTE3 : The 0.8 m height is for below 1 GHz testing, and 1.5 m is for above 1 GHz testing

4.4.5.3 Result

Comply (measurement data : refer to the next page)

4.4.5.4 Measurement data_Radiated Spurious Emissions

Test mode : Below 1 GHz (Worst case : 802.11g / Highest Frequency)

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dB μ V)	Ant Factor (dB)	Loss (dB)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
36.79	QP	V	46.50	11.50	-23.70	34.30	40.00	5.70
46.01	QP	V	49.00	12.00	-23.40	37.60	40.00	2.40
80.93	QP	V	49.60	8.20	-23.10	34.70	40.00	5.30
184.23	QP	V	46.00	10.60	-21.90	34.70	43.50	8.80
258.07	QP	H	46.70	12.00	-21.50	37.20	46.00	8.80
324.99	QP	H	46.20	14.000	-21.10	39.10	46.00	6.90
454.97	QP	H	41.40	17.00	-21.00	37.40	46.00	8.60
796.59	QP	H	33.10	22.90	-20.40	35.60	46.00	10.40
910.11	QP	H	37.50	23.90	-29.00	42.40	46.00	3.60

Note 1 : Loss : Cable loss - Amp gain

Note 2 : Result : Reading + Ant Factor + Loss

Note 3 : Below 30MHz is not detected.

Test mode : 802.11b_ Above 1 GHz / Lowest Frequency

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBμV)	Ant Factor (dB)	Loss	Dutycycle Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2 385.98	PK	H	48.70	32.10	-25.50	-	55.30	83.54	28.24
2 385.98	PK	V	41.90	32.10	-25.50		48.50	83.54	35.04
Above 3 GHz	Not Detected	-	-	-	-	-	-	-	

Note 1 : Loss : Cable loss - Amp gain + site factor

Note 2 : Peak Result : Reading + Ant Factor + Loss

Note 3 : Average Reasult : Reading + Ant Factor + Loss + Dutycycle Factor

 Dutycycle Factor : $20\log(\text{Dutycycle})$ * Refer to 4.4.5.7

Note 4 : Below 1 GHz Measured distance : 3 m, Above 1 GHz Measured distance : 1 m

 Above 1 GHz Distance Factor = $20\log(1 / 3) = -9.54$

 Above 1 GHz Limit Peak = $74 - (-9.54) = 83.54$

 Above 1 GHz Limit Average = $54 - (-9.54) = 63.54$

Note 5 : Average measurement did not take place because the peak data did not exceed Average Limit.

Note 6 : Not Detected means that peak data does not exceed the average limit

Test mode : 802.11b_ Above 1 GHz / Middle Frequency

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBμV)	Ant Factor (dB)	Loss	Dutycycle Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Above 1 GHz	Not Detected	-	-	-	-	-	-	-	

Note 1 : Loss : Cable loss - Amp gain + site factor

Note 2 : Peak Result : Reading + Ant Factor + Loss

Note 3 : Average Reasult : Reading + Ant Factor + Loss + Dutycycle Factor

 Dutycycle Factor : $20\log(\text{Dutycycle})$ * Refer to 4.4.5.7

Note 4 : Below 1 GHz Measured distance : 3 m, Above 1 GHz Measured distance : 1 m

 Above 1 GHz Distance Factor = $20\log(1 / 3) = -9.54$

 Above 1 GHz Limit Peak = $74 - (-9.54) = 83.54$

 Above 1 GHz Limit Average = $54 - (-9.54) = 63.54$

Note 5 : Average measurement did not take place because the peak data did not exceed Average Limit.

Note 6 : Not Detected means that peak data does not exceed the average limit

Test mode : 802.11b_ Above 1 GHz / Highest Frequency

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBμV)	Ant Factor (dB)	Loss	Dutycycle Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2 483.91	PK	H	41.40	32.20	-25.30	-	48.30	83.54	35.24
2 483.91	PK	V	42.90	32.20	-25.30	-	49.80	83.54	33.74
Above 3 GHz	Not Detected	-	-	-	-	-	-	-	

Note 1 : Loss : Cable loss - Amp gain + site factor

Note 2 : Peak Result : Reading + Ant Factor + Loss

Note 3 : Average Reasult : Reading + Ant Factor + Loss + Dutycycle Factor

 Dutycycle Factor : $20\log(\text{Dutycycle})$ * Refer to 4.4.5.7

Note 4 : Below 1 GHz Measured distance : 3 m, Above 1 GHz Measured distance : 1 m

 Above 1 GHz Distance Factor = $20\log(1 / 3) = -9.54$

 Above 1 GHz Limit Peak = $74 - (-9.54) = 83.54$

 Above 1 GHz Limit Average = $54 - (-9.54) = 63.54$

Note 5 : Average measurement did not take place because the peak data did not exceed Average Limit.

Note 6 : Not Detected means that peak data does not exceed the average limit