RF TEST REPORT

Test Equipment	:	xPON ONT
Model Name	:	H660GM
FCC ID	:	PJZH660GM
IC	:	3691A-H660GM
Date of receipt	:	2020-05-25
Test duration	:	2020-07-07 ~ 2020-10-27
Date of issue	:	2020-10-28

Applicant(FCC)	:	DASAN Zhone Solutions, Inc. 1350 South Loop Rd. Suite 130, Alameda, California 94502 United States
Applicant(IC)	:	DASAN Zhone Solutions, Inc. 7195 Oakport Street Oakland CA 94621 United States Of America
Test Laboratory	:	Lab-T, Inc. 2182-42 Baegok-daero, Mohyeon-myeon, Cheoin-gu Yongin-si, Gyeonggi-do 17036, South Korea
Test specification	:	FCC Part 15 Subpart C 15.247 RSS-247 Issue 2 (2017-02), RSS-GEN Issue 5 (2019-03)
RF Output Power	:	25.96 dBm
Test result	:	Pass

The above equipment was tested by Lab-T Testing Laboratory for compliance with the requirements of FCC,IC Rules and Regulations.
The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose.
This test report shall not be reproduced except in full, without the written approval of Lab-T, Inc

Tested by:

Engineer
SungSin Kim

Reviewed by:

Technical Manager
SangHoon Yu

CONTENTS

1. Applicant Information

Applicant(FCC)	:	DASAN Zhone Solutions, Inc.
Address	:	1350 South Loop Rd. Suite 130, Alameda, California, 94502 United States
Applicant(IC)	:	DASAN Zhone Solutions, Inc.
Address	:	7195 Oakport Street Oakland CA 94621 United States Of America
Telephone No.	:	+1 510-777-7000
Fax No.	:	+1 510-777-7001
Person in charge		Keith Nauman / KNauman@zhone.com
Manufacturer	:	DASAN Zhone Solutions, Inc.
Address	:	1350 South Loop Rd. Suite 130, Alameda, California, 94502 United States

2. Laboratory Information

Corporate name	Lab-T, Inc.
Representative	Jong-Young Kim
Address	2182-42 Baegok-daero, Mohyeon-myeon, Cheoin-gu, Yongin-si Gyeonggi-do, 17036 South Korea
Telephone	+82-31-322-6767
Fax	+82-31-322-6768
E-mail	info@lab-t.net
FCC Designation No.	KR0159
FCC Registration No.	133186

Test Location

Test building	used	Address
Building T	☒	2182-42 Baegok-daero, Mohyeon-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17036, Korea
Building L	☒	2182-40 Baegok-daero, Mohyeon-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17036, Korea
Building A	☐	2182-44 Baegok-daero, Mohyeon-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17036, Korea

3. Information About Test Equipment

3.1 Equipment Information

Equipment type	xPON ONT
Equipment model name	H660GM
Variant model name[Note2]	H660GM-EU, H660GM-NA, H660GM-UK
Frequency range	2 412 MHz ~ 2 462 MHz / 2 422 MHz ~ 2 452 MHz
Modulation type	CCK, OFDM
Power supply	DC 12 V
H/W version	DS-K3-899-A1
S/W version	1.16-0115

Note1: The above EUT information was declared by the manufacturer.
Note2: The only difference is model number due to marketing or trading purposes.

3.2 Antenna Information

	Antenna 1	Antenna 2
Type	Dipole Antenna	
Gain	4.99 dBi	4.99 dBi

3.3 Test Frequency

Test mode	Test frequency (MHz)		
	Lowest frequency	Middle frequency	Highest frequency
802.11b	2 412	2 437	2 462
802.11g	2 412	2 437	2 462
802.11n_HT20	2 412	2 437	2 462
802.11n_HT40	2 422	2 437	2 452

3.3 Worst case

802.11b	802.11g	802.11n_HT20	802.11n_HT20 MIMO
1 Mbps	6 Mbps	MCS0	MCS8
802.11n_HT40	802.11n_HT40 MIMO	-	-
MCS0	MCS8	-	-

Note 1 : The power measurement has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates.
Note 2 : The test was performed as follows. MIMO: ANT 1+2, Other mode(SISO): ANT 1

3.4 Tested Companion Device Information

Type	Manufacturer	Model	Note
AC/DC ADAPTER	DOKOCOM	LPL-P24120200Z	Used conducted emission Input : 100-240V~50/60Hz Output : 12V 2A
-	-	-	-

3.5 Operating conditions for the EUT

Firmware state		1.16-0115
Test software name(version)		-
Test power setting(Avg.)		802.11b : 16.5 dBm 802.11g : 16 dBm 802.11n_HT20 : 15.5 dBm 802.11n_HT40 : 15.5 dBm
Serial number (Setup mode)	EUT #1	#1 (Conducted / Radiated Emission)

4. Test Report

4.1 Summary

FCC Part 15				
FCC Rule	IC Rule	Parameter	Clause	Status
Transmitter Requirements				
15.203 15.247(b)(4)	RSS-247 5.4(f)	Antenna Requirement	4.4.1	C
15.247(b)(3)	RSS-247 5.4(d)	Maximum Peak Output Power	4.4.2	C
15.247(e)	RSS-247 5.2(b)	Peak Power Spectral Density	4.4.3	C
15.247(a)(2)	RSS-247 5.2(a)	6 dB Channel Bandwidth	4.4.4	C
-	RSS-GEN 6.7	Occupied Bandwidth	4.4.4	C
15.247(d) 15.205(a) 15.209(a)	RSS-247 5.5 RSS-GEN 8.9 RSS-GEN 8.10	Spurious Emission, Band Edge and Restricted bands	4.4.5	C
15.207(a)	RSS-GEN 8.8	Conducted Emissions	4.4.6	C
NOTE 1 : C = Comply N/C = Not Comply N/T = Not Tested N/A = Not Applicable : .				

* The general test methods used to test this device is ANSI C63.10:2013

4.2 Measurement Uncertainty

Mesurement items	Expanded Uncertainty	
RF Output Power	0.76 dB	(The confidence level is about 95 %, *k*=2)
Power Spectral Density	1.05 dB	(The confidence level is about 95 %, *k*=2)
Occupied Channel Bandwidth	14.60 kHz	(The confidence level is about 95 %, *k*=2)
Conducted Spurious Emissions	0.50 dB	(The confidence level is about 95 %, *k*=2)
Radiated Spurious Emissions (1 GHz under)	4.80 dB	(The confidence level is about 95 %, *k*=2)
Radiated Spurious Emissions (Above 1 GHz)	5.96 dB	(The confidence level is about 95 %, *k*=2)
Conducted emission	2.36 dB	(The confidence level is about 95 %, *k*=2)

4.3 Test Report Version

Test Report No.	Date	Description
TRRFCC20-0013	2020-10-27	Initial issue

4.4 Transmitter Requirements

4.4.1 Antenna Requirement

4.4.1.1 Regulation

Accoding to §15.203 An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Accoding to §15.247(b)(4) e conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Accoding to §RSS-247 5.4(f)(ii) If the transmitter employs an antenna system that emits multiple directional beams, but does not emit multiple directional beams simultaneously, the total output power conducted to the array or arrays that comprise the device (i.e. the sum of the power supplied to all antennas, antenna elements, staves, etc., and summed across all carriers or frequency channels) shall not exceed the applicable output power limit specified in sections 5.4(b) and 5.4(d). However, the total conducted output power shall be reduced by 1 dB below the specified limits for each 3 dB that the directional gain of the antenna/antenna array exceeds 6 dBi. The directional antenna gain shall be computed as the sum of 10 log (number of array elements or staves) plus the directional gain of the element or stave having the highest gain.

4.4.1.2 Result

Comply

	Antenna 1	Antenna 2
Type	Dipole Antenna	
Connector type	U.FL	
Gain	4.99 dBi	4.99 dBi

Antenna	Directional Gain For Power (dBi)	Directional Gain For PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
1	4.99	4.99	0.00	0.00
1+2	4.99	8.00	0.00	2.00

Note 1 : In case of siso, it works only antenna 1

4.4.2 Maximum Peak Output Power

4.4.2.1 Regulation

According to §15.247(b)(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to §15.247(b)(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.4.2.2 Measurement Procedure

These test measurement settings are specified in section 9.0 of 558074 D01 DTS Meas Guidance.

4.4.2.2.1 PKPM1 Peak power meter method

The maximum peak conducted output power may be measured using a broadband peak RF power meter.
The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector

4.4.2.3 Result

Comply (measurement data : refer to the next page)

4.4.2.4 Measurement data

Test mode : 802.11b

Maximum Peak Output Power								
Antenna	Freq. (MHz)	ANT1 (dBm)	ANT1 (mW)	ANT2 (dBm)	ANT2 (mW)	Result (dBm)	Result (mW)	Limit (dBm)
1	2412	20.16	103.75	-	-	20.16	103.75	30.00
1	2437	19.34	85.90	-	-	19.34	85.90	30.00
1	2462	19.80	95.50	-	-	19.80	95.50	30.00

Note 1 : refer to 4.4.1 for information on limit reduction.
Note 2 : We took the insertion loss of the cable loss into consideration within the measuring instrument.
Note 3 : Result : Measured Value(ANT1 + ANT2)

Test mode : 802.11g

Maximum Peak Output Power								
Antenna	Freq. (MHz)	ANT1 (dBm)	ANT1 (mW)	ANT2 (dBm)	ANT2 (mW)	Result (dBm)	Result (mW)	Limit (dBm)
1	2412	25.36	343.56	-	-	25.36	343.56	30.00
1	2437	25.05	319.89	-	-	25.05	319.89	30.00
1	2462	25.31	339.63	-	-	25.31	339.63	30.00

Note 1 : refer to 4.4.1 for information on limit reduction.
Note 2 : We took the insertion loss of the cable loss into consideration within the measuring instrument.
Note 3 : Result : Measured Value(ANT1 + ANT2)

Test mode : 802.11n_HT20

Maximum Peak Output Power								
Antenna	Freq. (MHz)	ANT1 (dBm)	ANT1 (mW)	ANT2 (dBm)	ANT2 (mW)	Result (dBm)	Result (mW)	Limit (dBm)
1	2412	25.16	328.10	-	-	25.16	328.10	30.00
1	2437	24.98	314.77	-	-	24.98	314.77	30.00
1	2462	25.25	334.97	-	-	25.25	334.97	30.00
1+2	2412	22.55	179.89	21.65	146.22	25.13	326.10	30.00
1+2	2437	22.42	174.58	22.28	169.04	25.36	343.63	30.00
1+2	2462	22.71	186.64	23.11	204.64	25.92	391.28	30.00

Note 1 : refer to 4.4.1 for information on limit reduction.
Note 2 : We took the insertion loss of the cable loss into consideration within the measuring instrument.
Note 3 : Result : Measured Value(ANT1 + ANT2)

Test mode : 802.11n_HT40

Maximum Peak Output Power								
Antenna	Freq. (MHz)	ANT1 (dBm)	ANT1 (mW)	ANT2 (dBm)	ANT2 (mW)	Result (dBm)	Result (mW)	Limit (dBm)
1	2422	25.19	330.37	-	-	25.19	330.37	30.00
1	2437	24.98	314.77	-	-	24.98	314.77	30.00
1	2452	25.10	323.59	-	-	25.10	323.59	30.00
1+2	2422	23.33	215.28	22.88	194.09	26.12	409.37	30.00
1+2	2437	22.84	192.31	22.83	191.87	25.85	384.18	30.00
1+2	2452	22.98	198.61	22.91	195.43	25.96	394.04	30.00

Note 1 : refer to 4.4.1 for information on limit reduction.
Note 2 : We took the insertion loss of the cable loss into consideration within the measuring instrument.
Note 3 : Result : Measured Value(ANT1 + ANT2)

Test mode : 802.11b

Average Output Power								
Antenna	Freq. (MHz)	ANT1 (dBm)	ANT1 (mW)	ANT2 (dBm)	ANT2 (mW)	Result (dBm)	Result (mW)	Limit (dBm)
1	2412	16.92	49.20	-	-	17.13	49.20	30.00
1	2437	16.21	41.78	-	-	16.42	41.78	30.00
1	2462	16.63	46.03	-	-	16.84	46.03	30.00

Note 1 : refer to 4.4.1 for information on limit reduction.
Note 2 : We took the insertion loss of the cable loss into consideration within the measuring instrument.
Note 3 : Result : Measured Value(ANT1 + ANT2) + Duty cycle Factor
Note 4 : Duty cycle Factor : 10*log(1/(on-time/Period)) refer to 4.4.5.7

Test mode : 802.11g

Average Output Power								
Antenna	Freq. (MHz)	ANT1 (dBm)	ANT1 (mW)	ANT2 (dBm)	ANT2 (mW)	Result (dBm)	Result (mW)	Limit (dBm)
1	2412	15.76	37.67	-	-	16.72	37.67	30.00
1	2437	14.89	30.83	-	-	15.85	30.83	30.00
1	2462	15.54	35.81	-	-	16.50	35.81	30.00

Note 1 : refer to 4.4.1 for information on limit reduction.
Note 2 : We took the insertion loss of the cable loss into consideration within the measuring instrument.
Note 3 : Result : Measured Value(ANT1 + ANT2) + Duty cycle Factor
Note 4 : Duty cycle Factor : 10*log(1/(on-time/Period)) refer to 4.4.5.7

Test mode : 802.11n_HT20

Average Output Power								
Antenna	Freq. (MHz)	ANT1 (dBm)	ANT1 (mW)	ANT2 (dBm)	ANT2 (mW)	Result (dBm)	Result (mW)	Limit (dBm)
1	2412	15.16	32.81	-	-	16.19	32.81	30.00
1	2437	14.82	30.34	-	-	15.85	30.34	30.00
1	2462	15.29	33.81	-	-	16.32	33.81	30.00
1+2	2412	11.03	12.68	9.73	9.40	15.22	33.26	30.00
1+2	2437	10.08	10.19	10.07	10.16	14.87	30.66	30.00
1+2	2462	10.73	11.83	10.49	11.19	15.40	34.70	30.00

Note 1 : refer to 4.4.1 for information on limit reduction.
Note 2 : We took the insertion loss of the cable loss into consideration within the measuring instrument.
Note 3 : Result : Measured Value(ANT1 + ANT2) + Duty cycle Factor
Note 4 : Duty cycle Factor : 10*log(1/(on-time/Period)) refer to 4.4.5.7

Test mode : 802.11n_HT40

Average Output Power								
Antenna	Freq. (MHz)	ANT1 (dBm)	ANT1 (mW)	ANT2 (dBm)	ANT2 (mW)	Result (dBm)	Result (mW)	Limit (dBm)
1	2422	14.63	29.04	-	-	16.48	29.04	30.00
1	2437	14.18	26.18	-	-	16.03	26.18	30.00
1	2452	14.63	29.04	-	-	16.48	29.04	30.00
1+2	2422	9.64	9.20	8.89	7.74	15.26	33.57	30.00
1+2	2437	9.55	9.02	8.83	7.64	15.18	32.98	30.00
1+2	2452	9.62	9.16	9.11	8.15	15.35	34.28	30.00

Note 1 : refer to 4.4.1 for information on limit reduction.
Note 2 : We took the insertion loss of the cable loss into consideration within the measuring instrument.
Note 3 : Result : Measured Value(ANT1 + ANT2) + Duty cycle Factor
Note 4 : Duty cycle Factor : 10*log(1/(on-time/Period)) refer to 4.4.5.7

4.4.3 Peak Power Spectral Density

4.4.3.1 Regulation

According to §15.247(e) and RSS-247 §5.2(b) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

4.4.3.2 Measurement Procedure

These test measurement settings are specified in section 10.0 of 558074 D01 DTS Meas Guidance.

4.4.3.2.1 Method PKPSD (peak PSD)

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance, and is optional if the maximum conducted (average) output power was used to demonstrate compliance.

a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ 3 RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

4.4.3.3 Result

Comply (measurement data : refer to the next page)

4.4.3.4 Measurement data

Test mode : 802.11b

Peak Power Spectral Density					
Antenna	Freq. (MHz)	ANT1 (dBm)	ANT2 (dBm)	Result (dBm)	Limit (dBm)
1	2412	6.64	-	6.64	8.00
1	2437	5.64	-	5.64	8.00
1	2462	6.14	-	6.14	8.00

Note 1 : refer to 4.4.1 for information on limit reduction.
Note 2 : We took the insertion loss of the cable loss into consideration within the measuring instrument.
Note 3 : Result : Measured Value(ANT1 + ANT2)

Test mode : 802.11g

Peak Power Spectral Density					
Antenna	Freq. (MHz)	ANT1 (dBm)	ANT2 (dBm)	Result (dBm)	Limit (dBm)
1	2412	-8.43	-	-8.43	8.00
1	2437	-9.96	-	-9.96	8.00
1	2462	-8.57	-	-8.57	8.00

Note 1 : refer to 4.4.1 for information on limit reduction.
Note 2 : We took the insertion loss of the cable loss into consideration within the measuring instrument.
Note 3 : Result : Measured Value(ANT1 + ANT2)

Test mode : 802.11n_HT20

Peak Power Spectral Density					
Antenna	Freq. (MHz)	ANT1 (dBm)	ANT2 (dBm)	Result (dBm)	Limit (dBm)
1	2412	-8.09	-	-8.09	8.00
1	2437	-8.72	-	-8.72	8.00
1	2462	-7.10	-	-7.10	8.00
1+2	2412	-12.06	-13.08	-9.53	6.00
1+2	2437	-13.12	-12.72	-9.91	6.00
1+2	2462	-12.22	-12.36	-9.28	6.00

Note 1 : refer to 4.4.1 for information on limit reduction.
Note 2 : We took the insertion loss of the cable loss into consideration within the measuring instrument.
Note 3 : Result : Measured Value(ANT1 + ANT2)

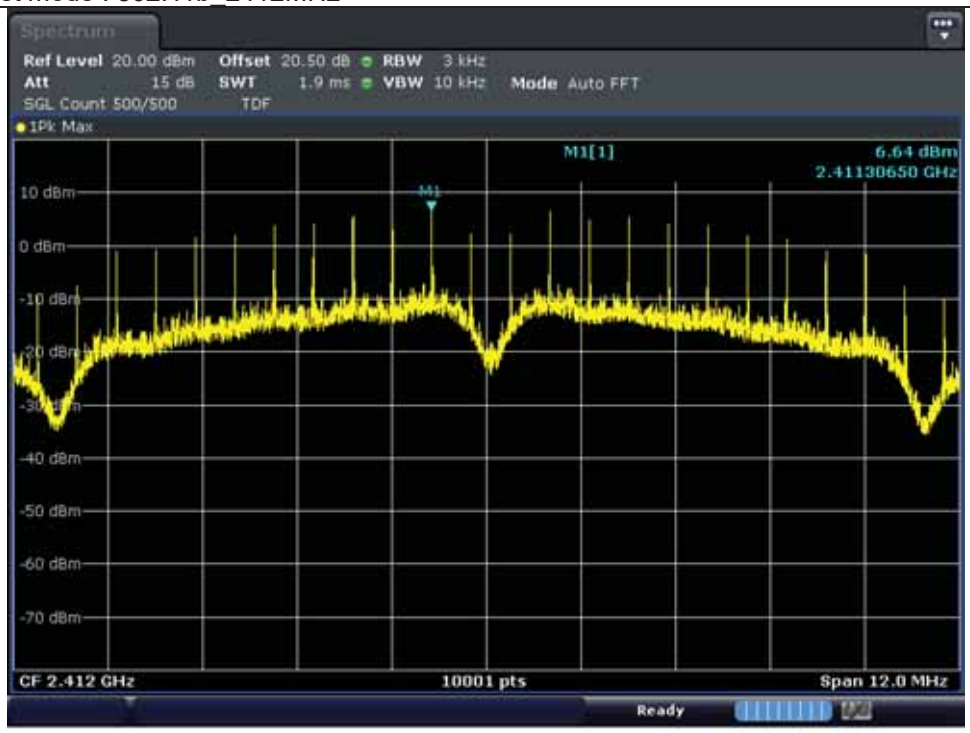
Test mode : 802.11n_HT40

Peak Power Spectral Density					
Antenna	Freq. (MHz)	ANT1 (dBm)	ANT2 (dBm)	Result (dBm)	Limit (dBm)
1	2422	-10.87	-	-10.87	8.00
1	2437	-10.32	-	-10.32	8.00
1	2452	-11.07	-	-11.07	8.00
1+2	2422	-14.35	-14.13	-11.23	6.00
1+2	2437	-15.56	-13.72	-11.53	6.00
1+2	2452	-14.99	-15.23	-12.09	6.00

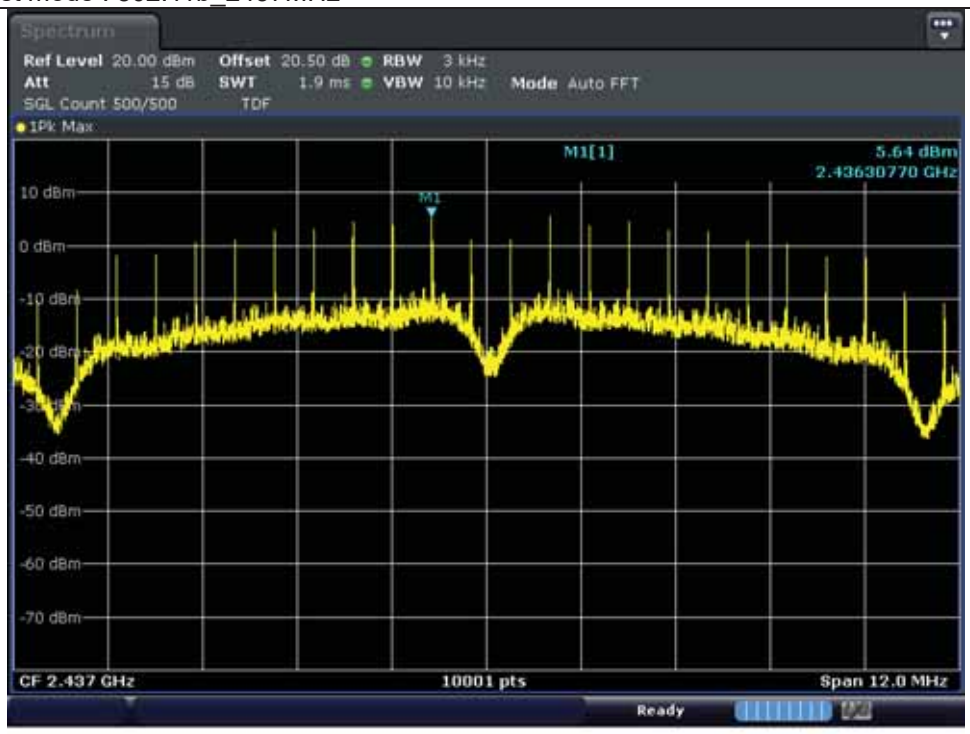
Note 1 : refer to 4.4.1 for information on limit reduction.
Note 2 : We took the insertion loss of the cable loss into consideration within the measuring instrument.
Note 3 : Result : Measured Value(ANT1 + ANT2)

4.4.3.5 Test Plot

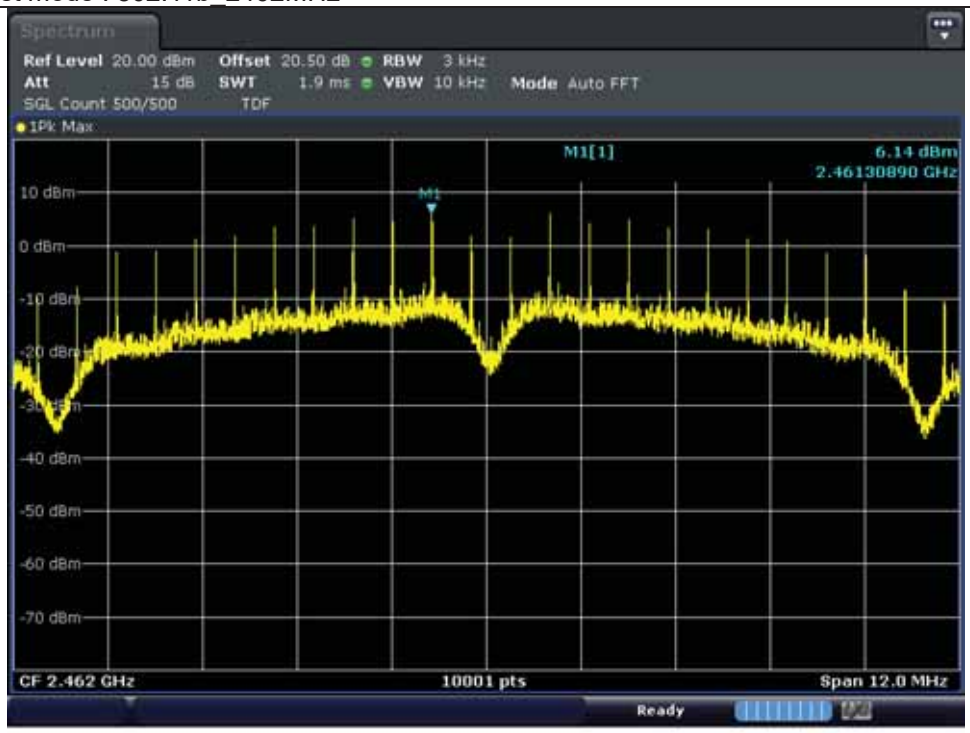
Test mode : 802.11b_2412MHz



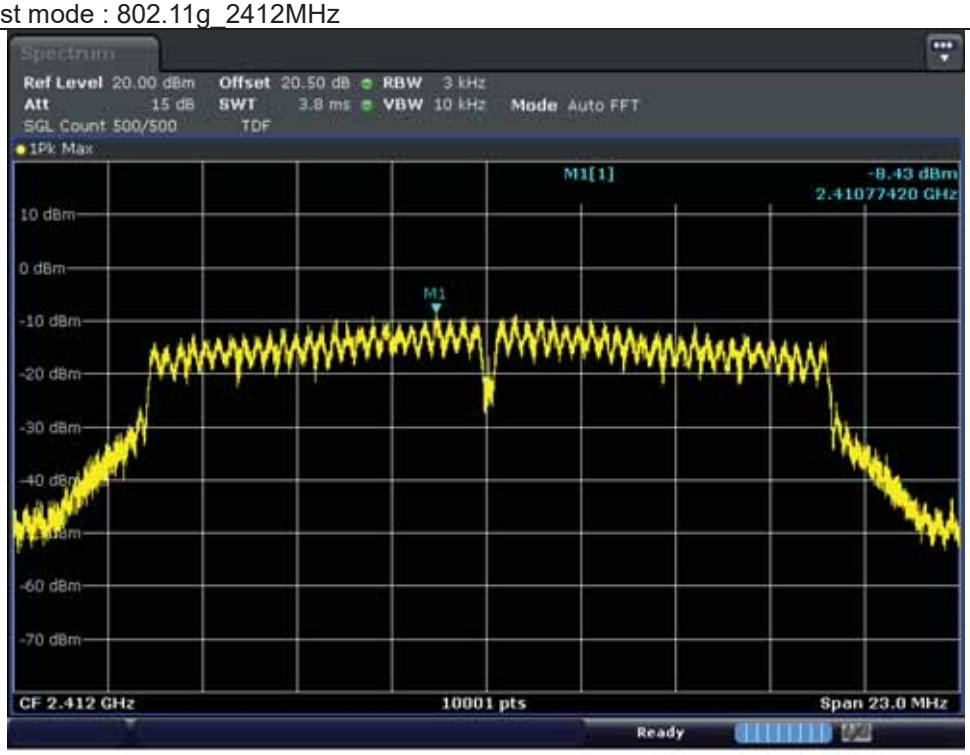
Test mode : 802.11b_2437MHz



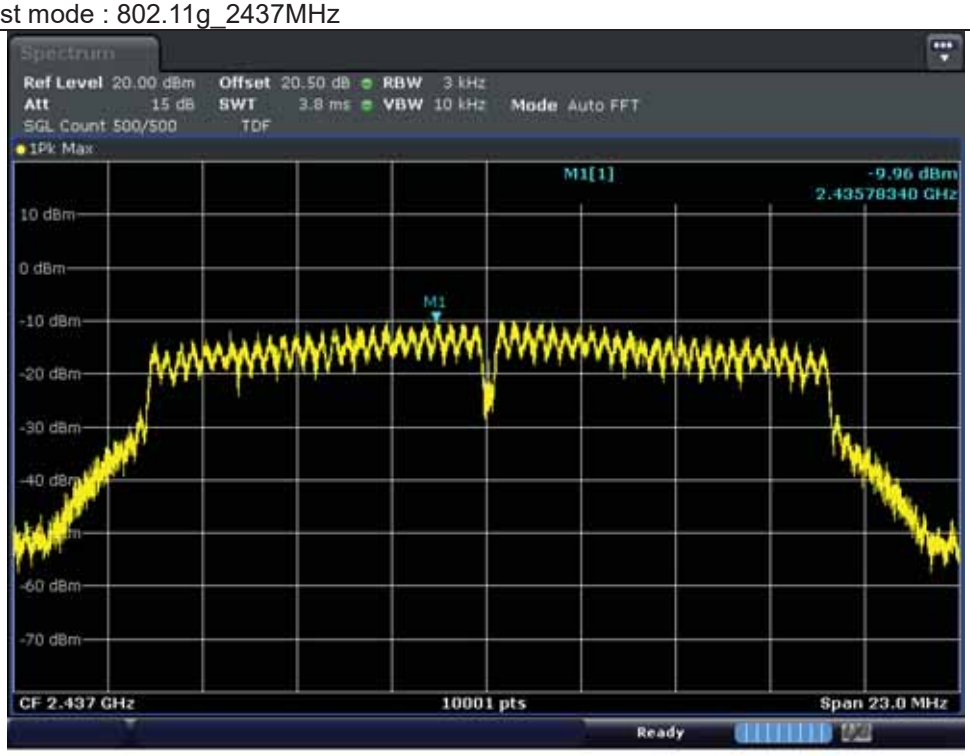
Test mode : 802.11b_2462MHz



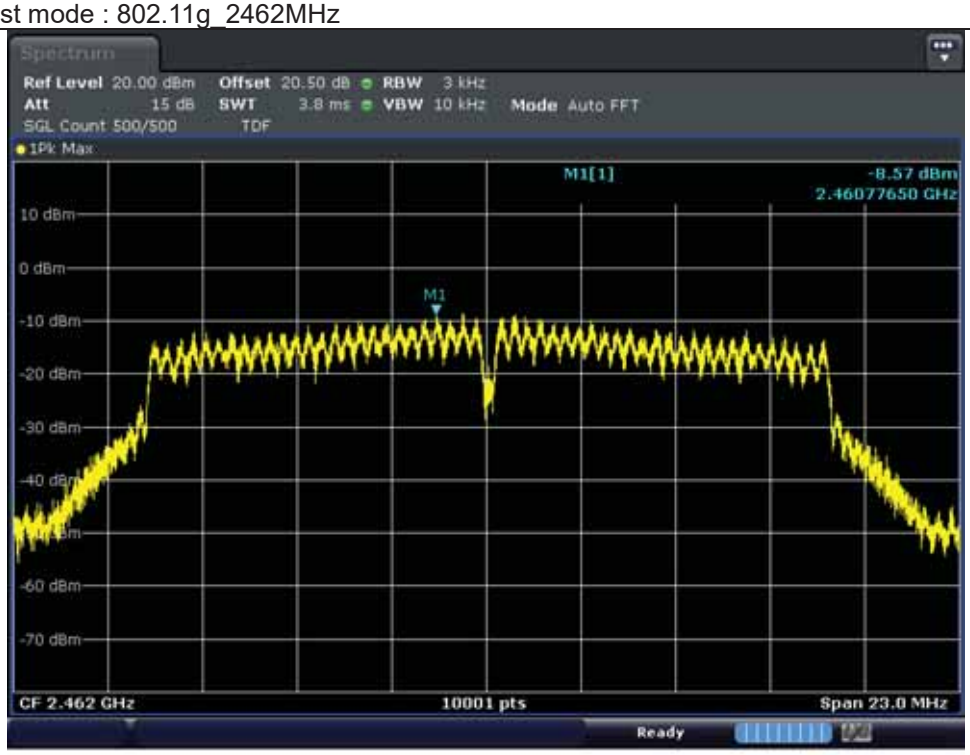
Test mode : 802.11g_2412MHz



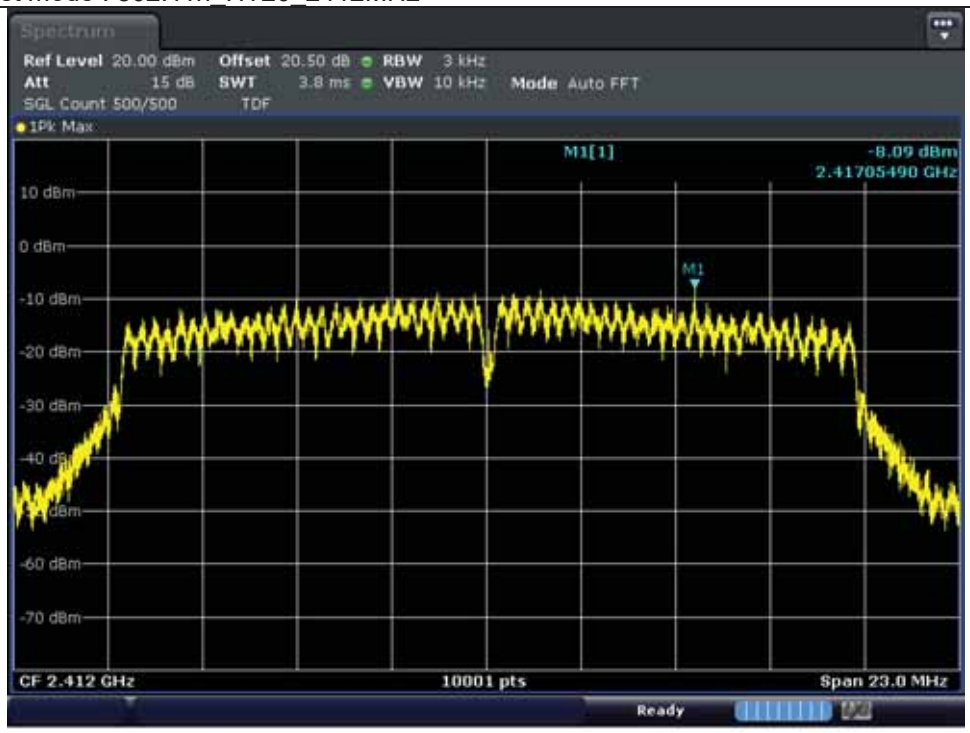
Test mode : 802.11g_2437MHz



Test mode : 802.11g_2462MHz



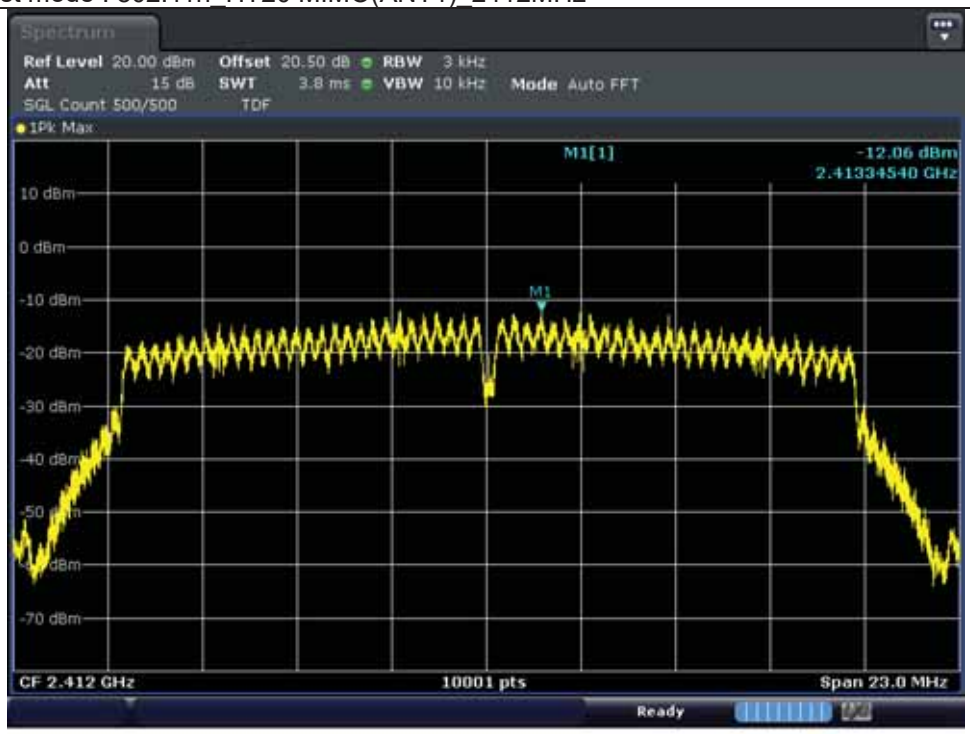
Test mode : 802.11n_HT20_2412MHz



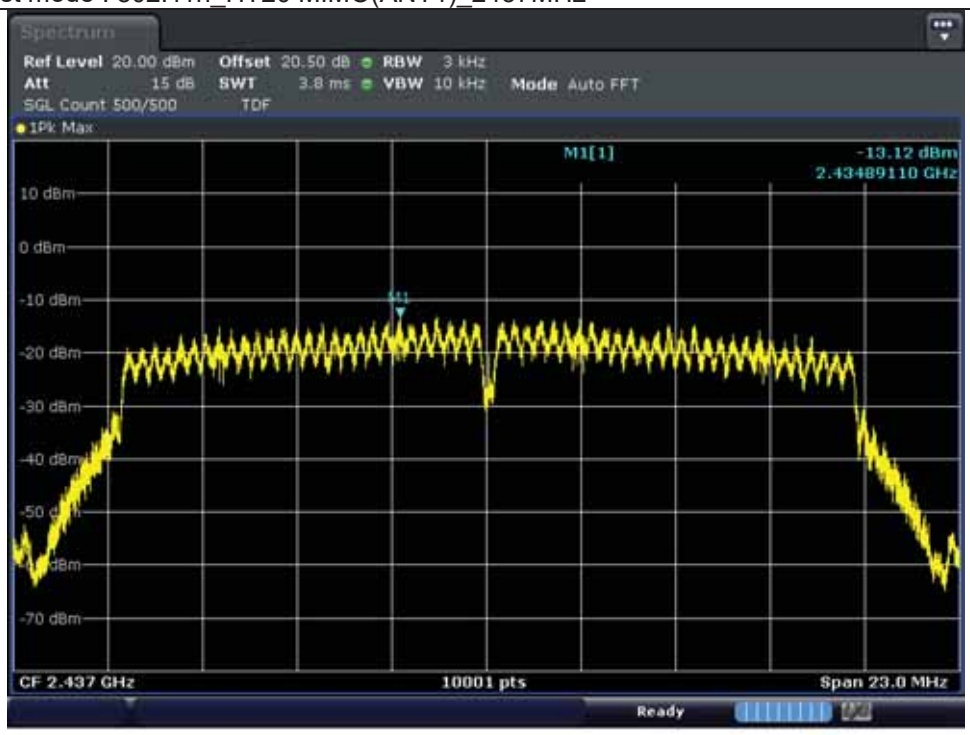
Test mode : 802.11n_HT20_2437MHz

Test mode : 802.11n_HT20_2462MHz

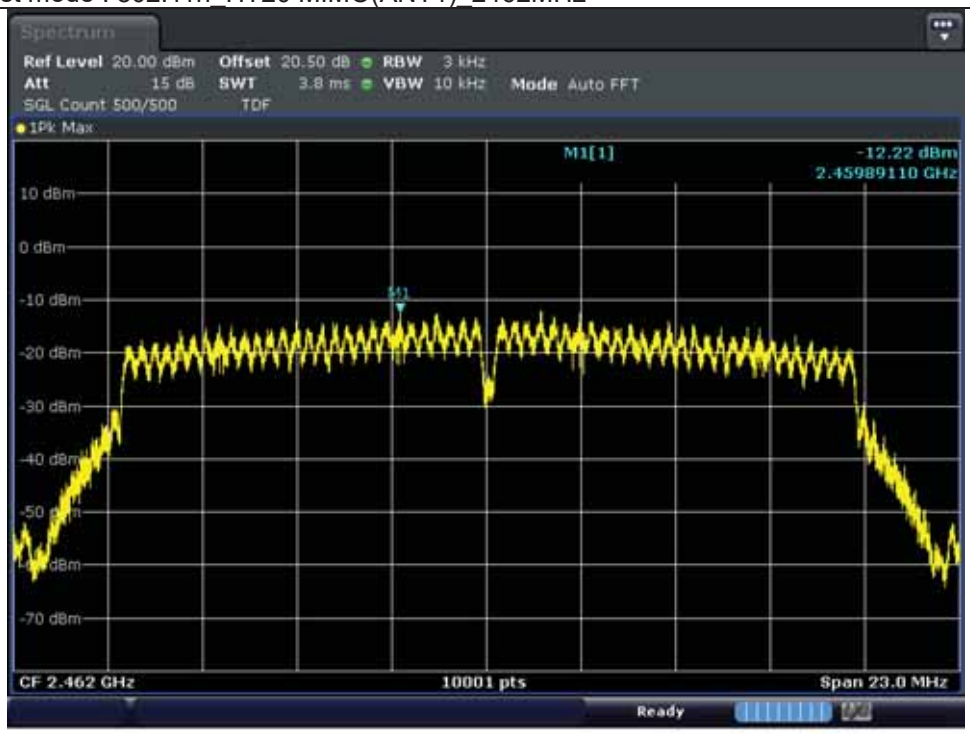
Test mode : 802.11n_HT20 MIMO(ANT1)_2412MHz



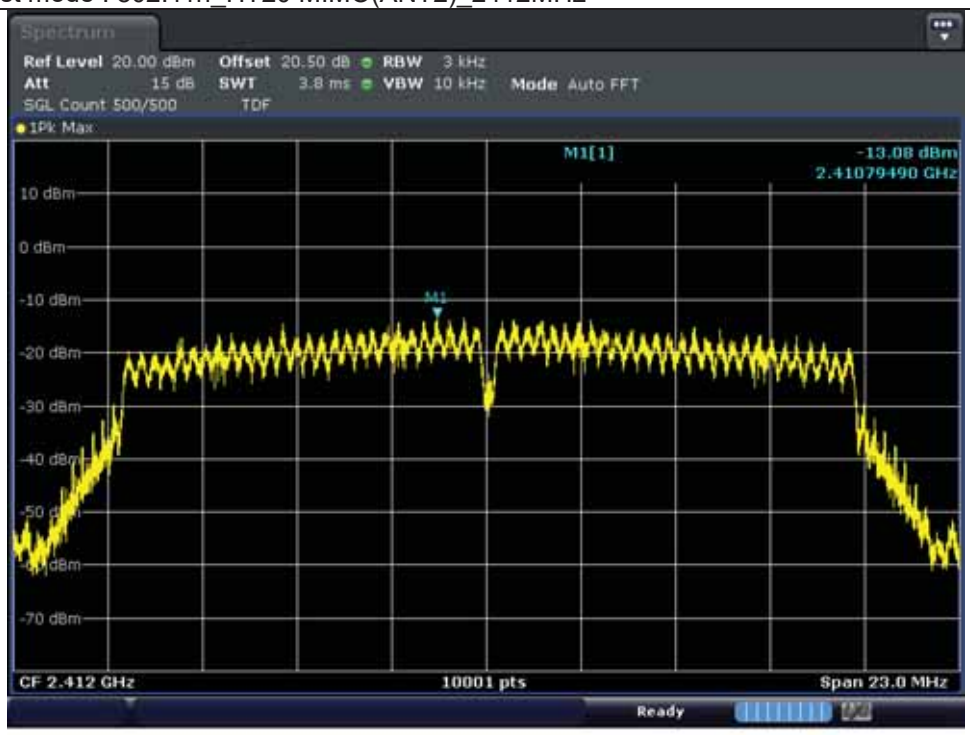
Test mode : 802.11n_HT20 MIMO(ANT1)_2437MHz



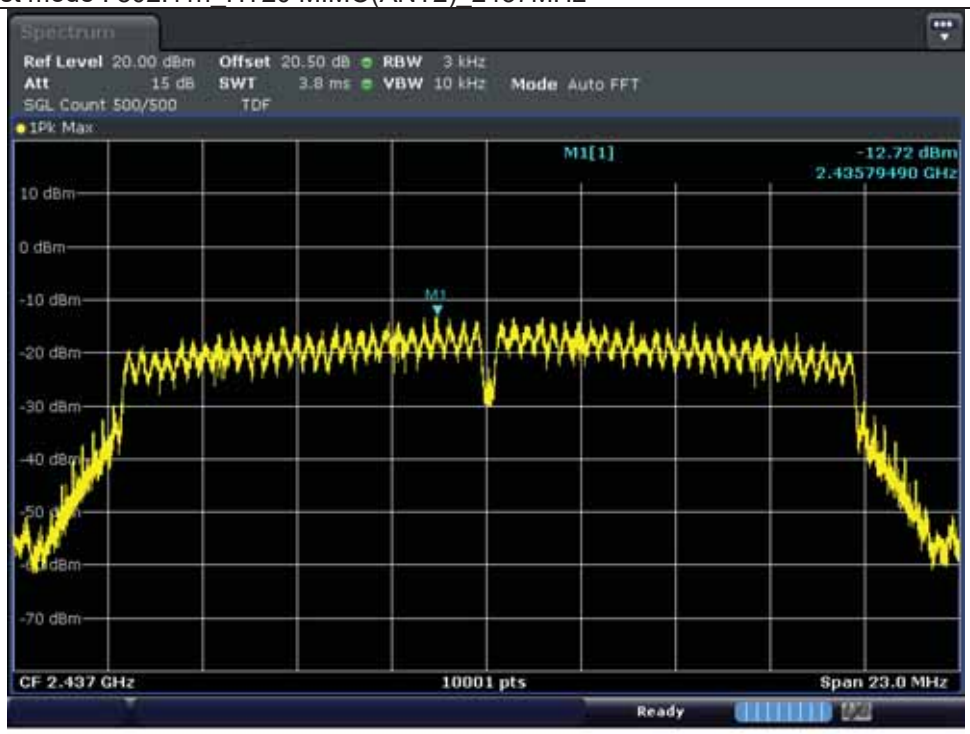
Test mode : 802.11n_HT20 MIMO(ANT1)_2462MHz



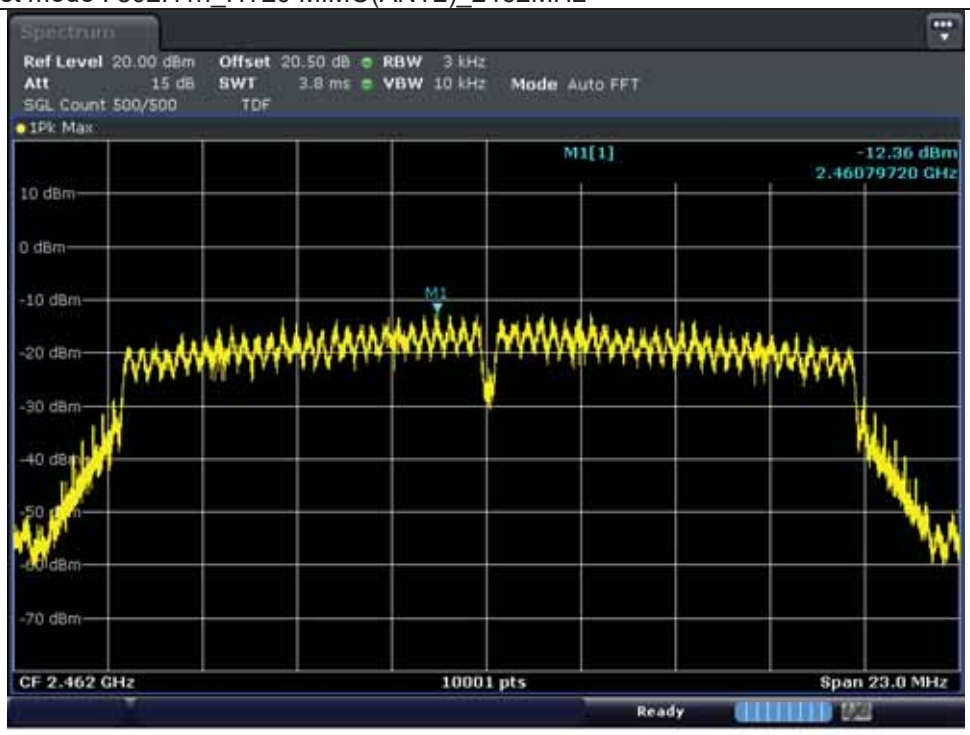
Test mode : 802.11n_HT20 MIMO(ANT2)_2412MHz



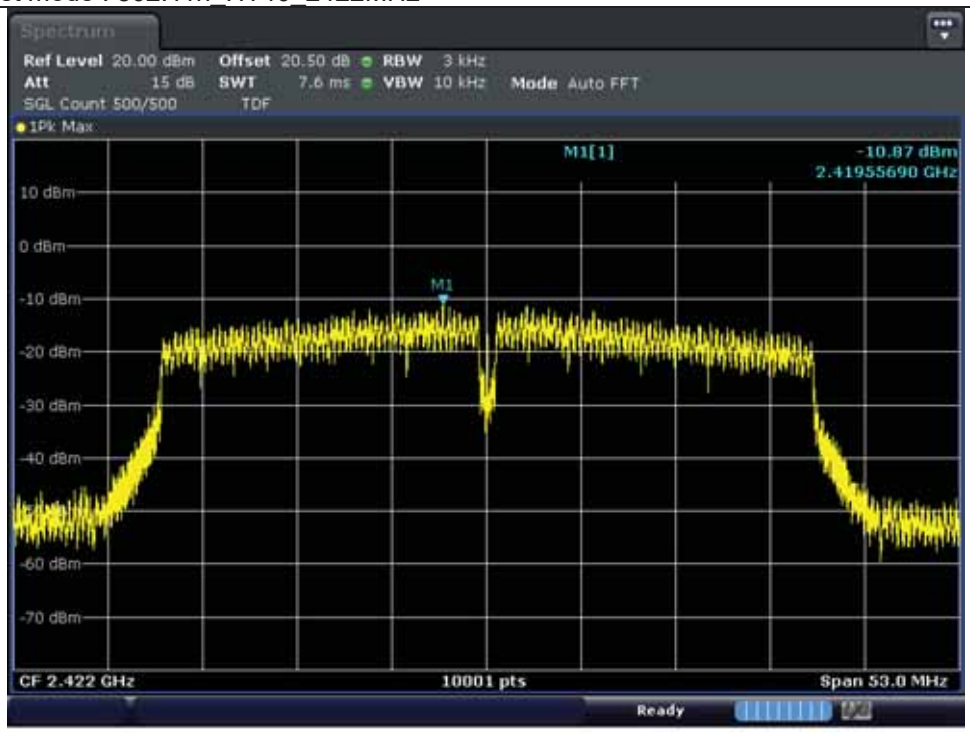
Test mode : 802.11n_HT20 MIMO(ANT2)_2437MHz



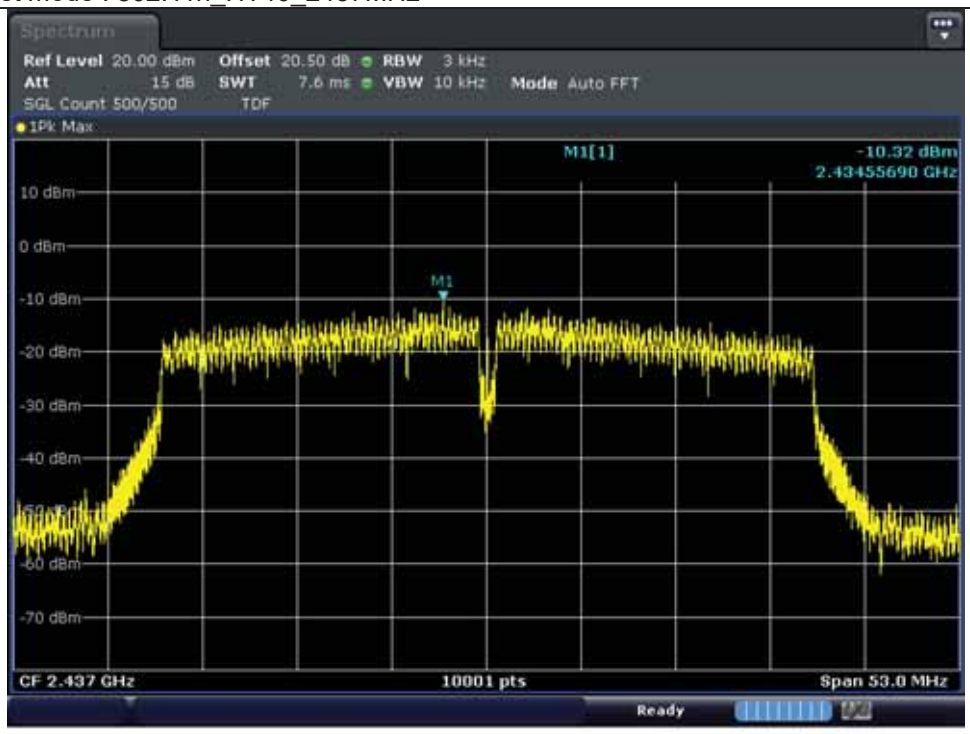
Test mode : 802.11n_HT20 MIMO(ANT2)_2462MHz



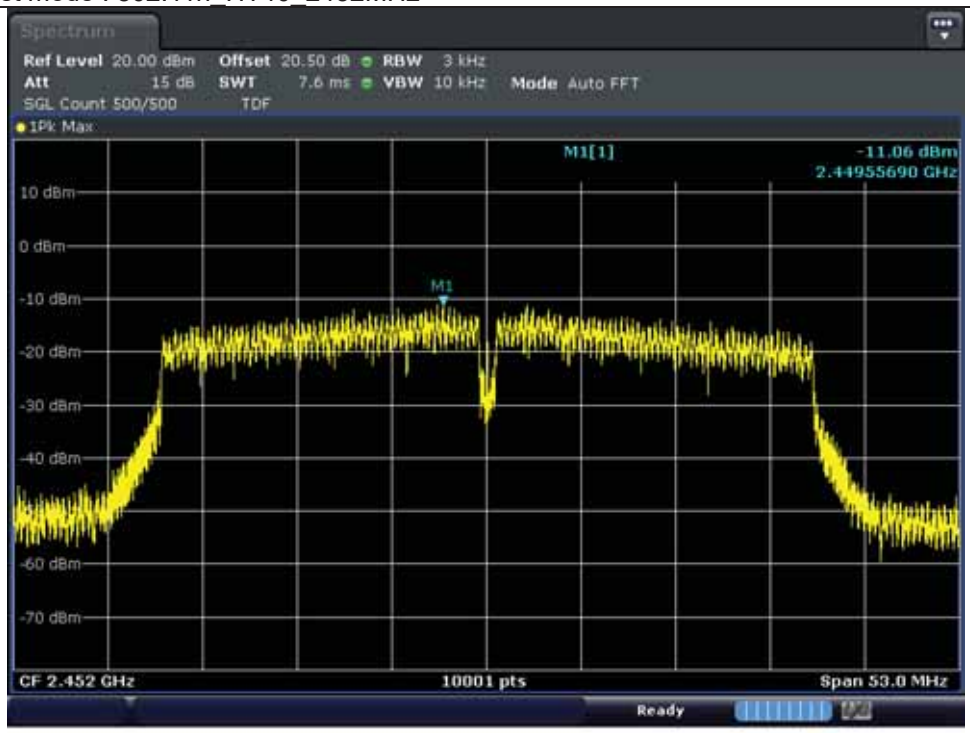
Test mode : 802.11n_HT40_2422MHz



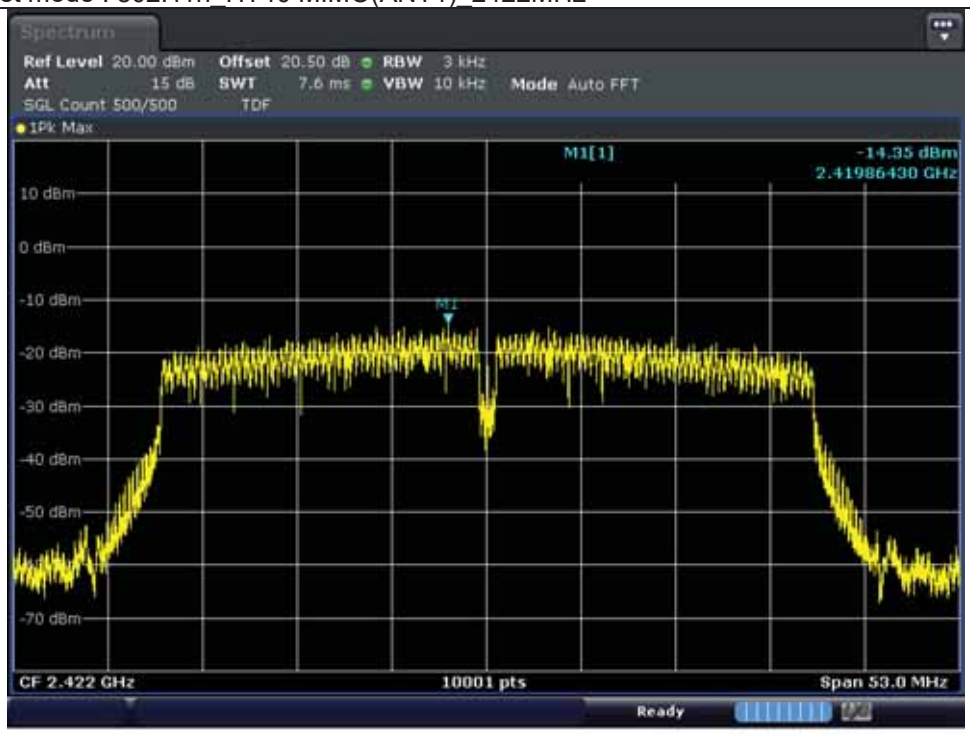
Test mode : 802.11n_HT40_2437MHz



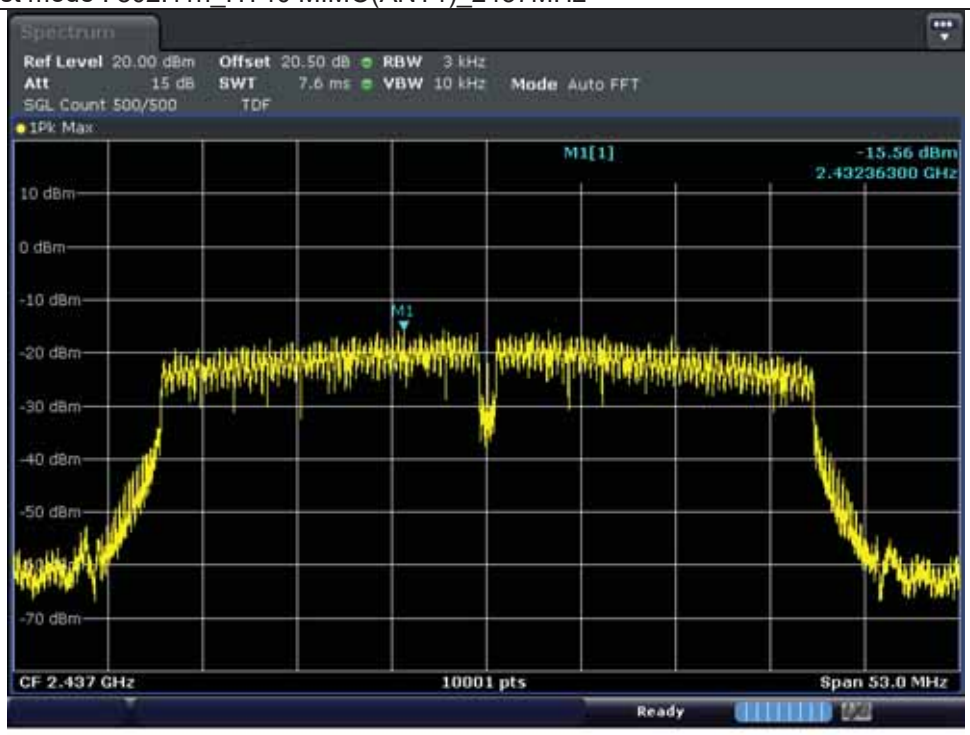
Test mode : 802.11n_HT40_2452MHz



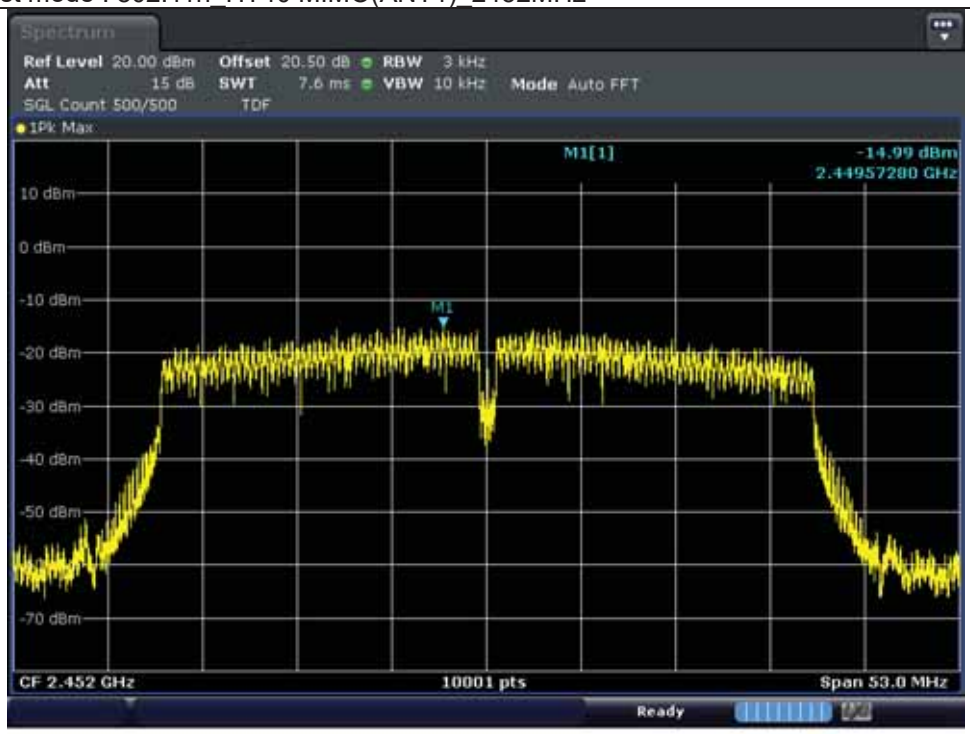
Test mode : 802.11n_HT40 MIMO(ANT1)_2422MHz



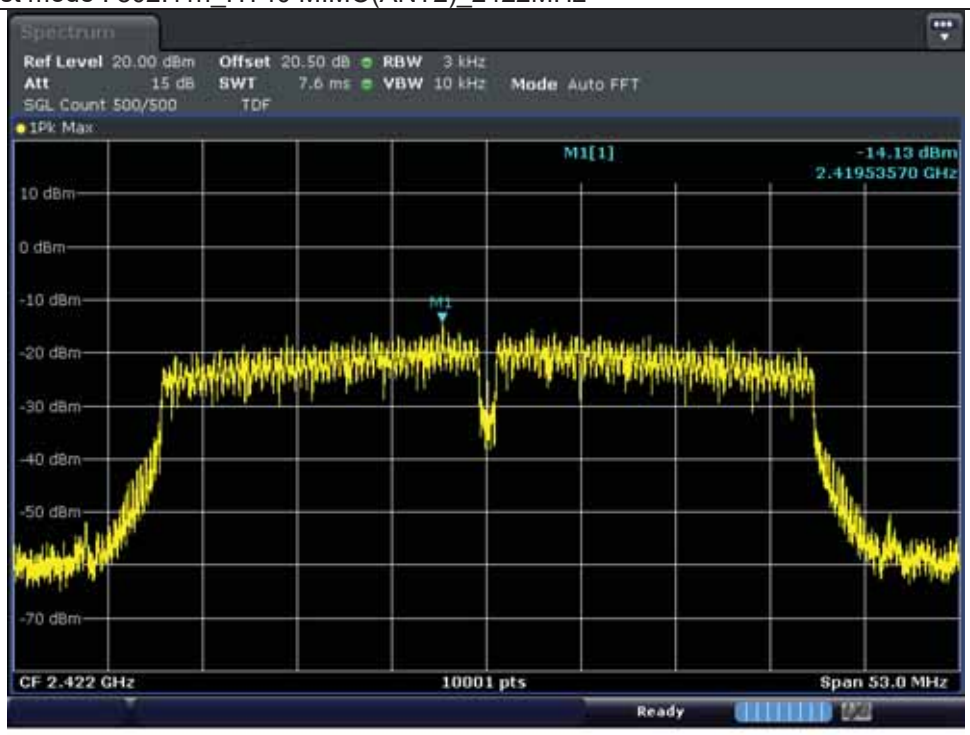
Test mode : 802.11n_HT40 MIMO(ANT1)_2437MHz



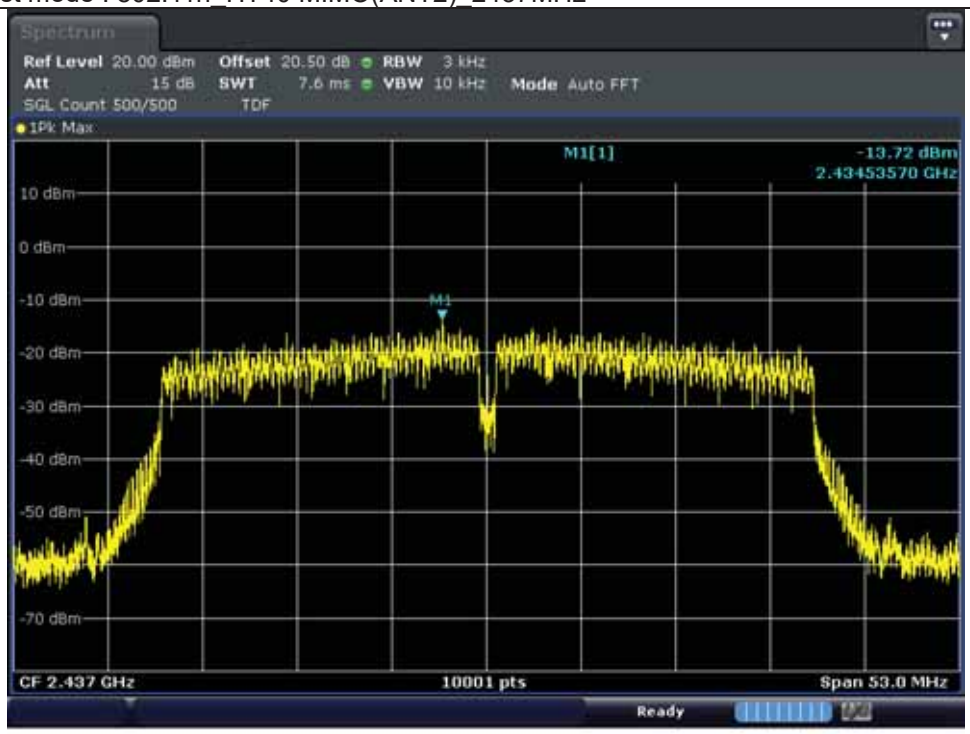
Test mode : 802.11n_HT40 MIMO(ANT1)_2452MHz



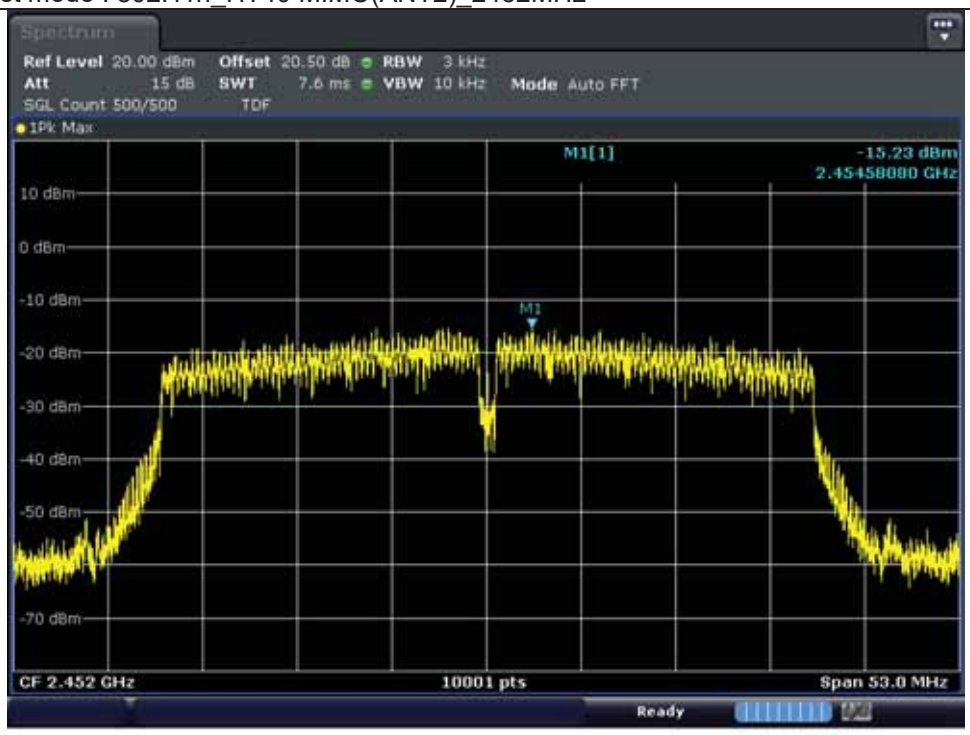
Test mode : 802.11n_HT40 MIMO(ANT2)_2422MHz



Test mode : 802.11n_HT40 MIMO(ANT2)_2437MHz



Test mode : 802.11n_HT40 MIMO(ANT2)_2452MHz



4.4.4 6 dB Bandwidth(DTS Bandwidth)

4.4.4.1 Regulation

According to §15.247(e) and RSS-247 §5.2(a) Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

4.4.4.2 Measurement Procedure

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

4.4.4.2.1 DTS Channel Bandwidth-Option 1

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) 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 dB relative to the maximum level measured in the fundamental emission.

4.4.4.2.2 DTS Channel Bandwidth Measurement Procedure-Option 2

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above (i.e., RBW = 100 kHz, VBW ≥3 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 dB.

4.4.4.3 Result

Comply (measurement data : refer to the next page)

4.4.4.4 Measurement data

Test mode : 802.11b

Antenna	Frequency (MHz)	6 dB Bandwidth (MHz)	Min. Limit (MHz)	Occupied Bandwidth (MHz)
1	2412	7.55	0.50	12.40
1	2437	7.53	0.50	12.43
1	2462	7.53	0.50	12.40

Test mode : 802.11g

Antenna	Frequency (MHz)	6 dB Bandwidth (MHz)	Min. Limit (MHz)	Occupied Bandwidth (MHz)
1	2412	15.09	0.50	16.32
1	2437	15.11	0.50	16.31
1	2462	15.10	0.50	16.33

Test mode : 802.11n_HT20

Antenna	Frequency (MHz)	6 dB Bandwidth (MHz)	Min. Limit (MHz)	Occupied Bandwidth (MHz)
1	2412	15.01	0.50	17.48
1	2437	15.08	0.50	17.49
1	2462	15.10	0.50	17.51
1+2	2412	15.11	0.50	17.50
1+2	2437	15.13	0.50	17.48
1+2	2462	15.11	0.50	17.48

Test mode : 802.11n_HT40

Antenna	Frequency (MHz)	6 dB Bandwidth (MHz)	Min. Limit (MHz)	Occupied Bandwidth (MHz)
1	2422	35.09	0.50	35.76
1	2437	35.09	0.50	35.75
1	2452	35.10	0.50	35.77
1+2	2422	35.10	0.50	35.71
1+2	2437	35.10	0.50	35.71
1+2	2452	35.09	0.50	35.71

4.4.4.5 Test Plot

Test mode : 802.11b_2 412 MHz_6 dB Bandwidth

Test mode : 802.11b_2 437 MHz_6 dB Bandwidth

Test mode : 802.11b_2 462 MHz_6 dB Bandwidth

Test mode : 802.11g_2 412 MHz_6 dB Bandwidth

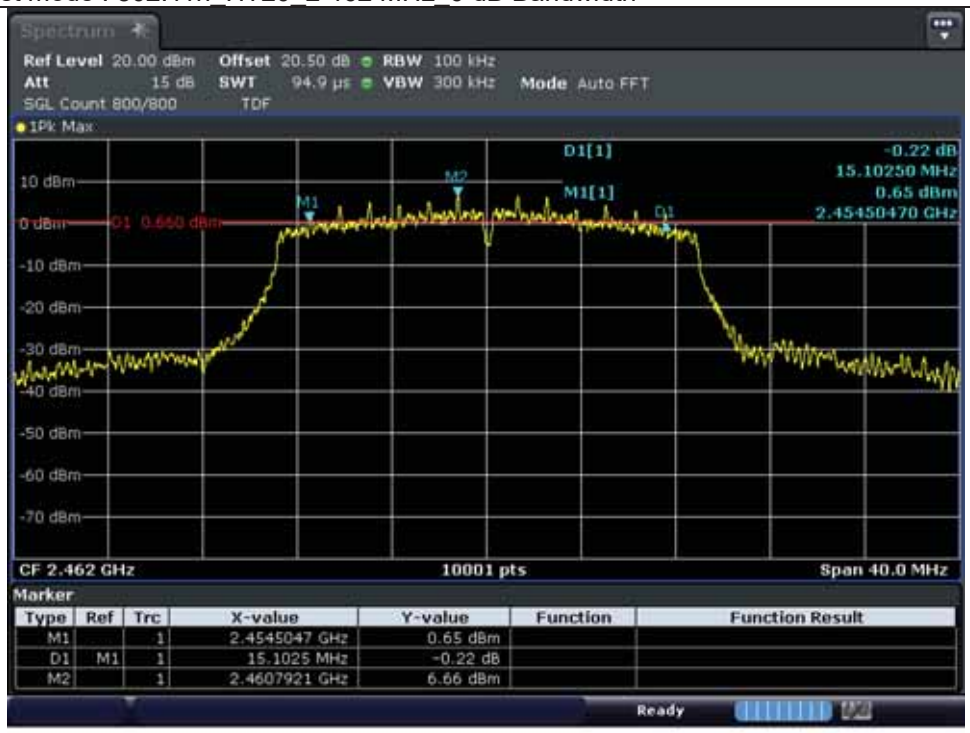
Test mode : 802.11g_2 437 MHz_6 dB Bandwidth

Test mode : 802.11g_2 462 MHz_6 dB Bandwidth

Test mode : 802.11n_HT20_2 412 MHz_6 dB Bandwidth

Test mode : 802.11n_HT20_2 437 MHz_6 dB Bandwidth

Test mode : 802.11n_HT20_2 462 MHz_6 dB Bandwidth

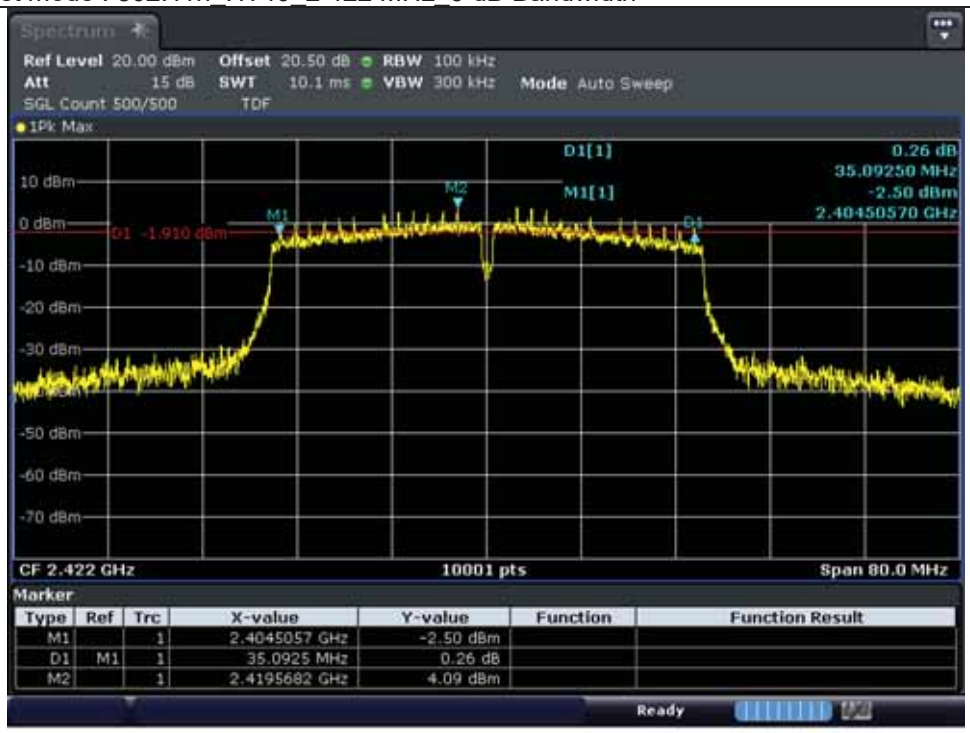


Test mode : 802.11n_HT20 MIMO_2 412 MHz_6 dB Bandwidth

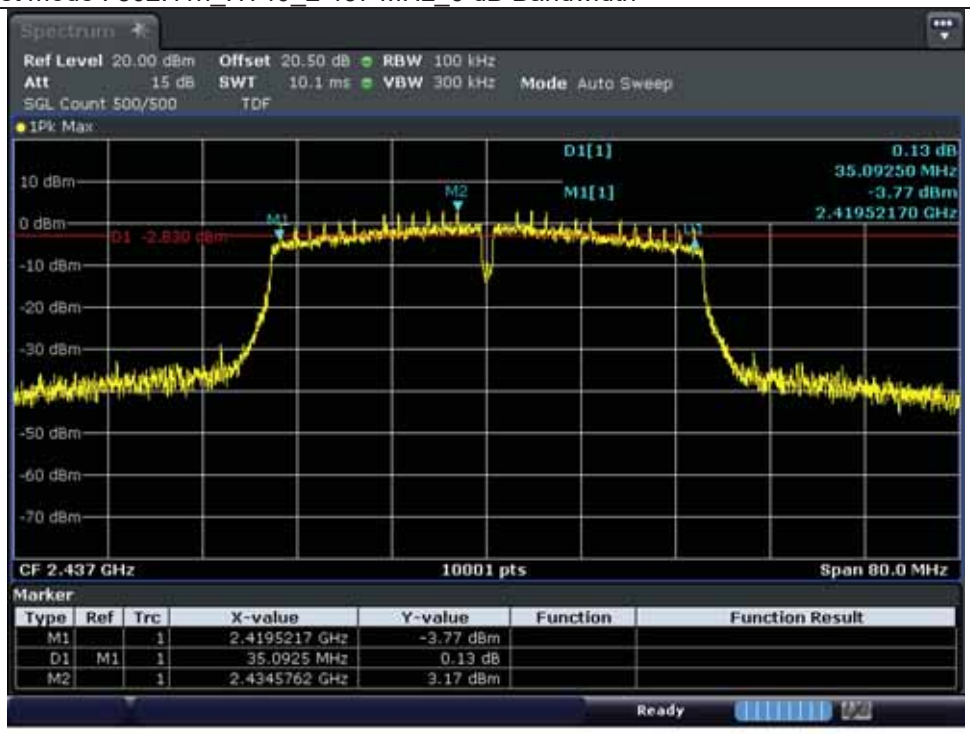
Test mode : 802.11n_HT20 MIMO_2 437 MHz_6 dB Bandwidth

Test mode : 802.11n_HT20 MIMO_2 462 MHz_6 dB Bandwidth

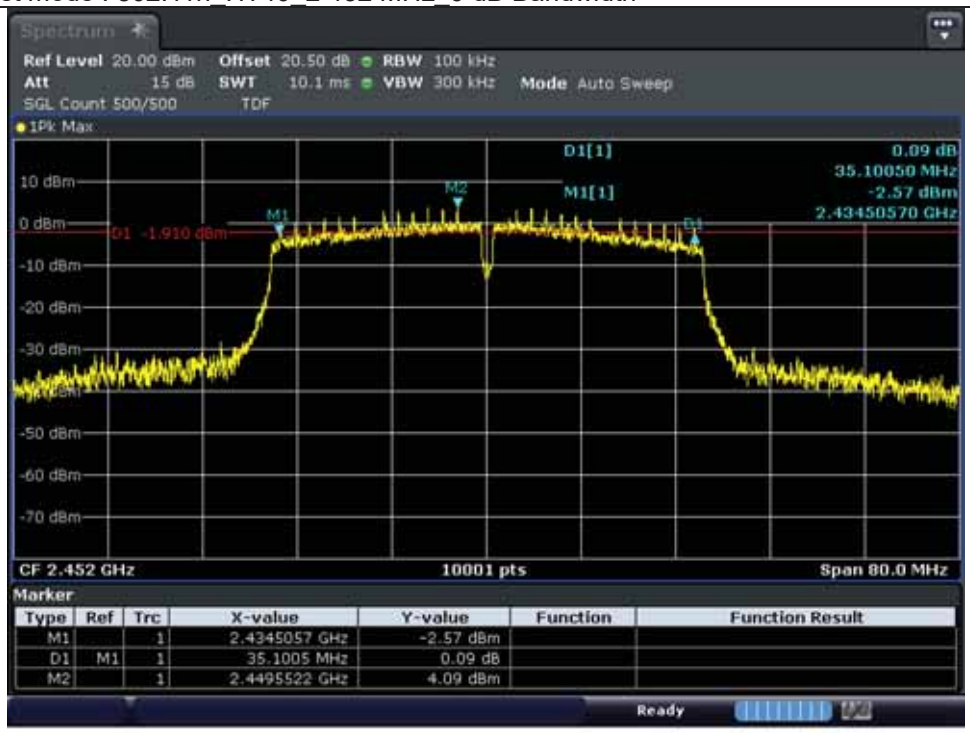
Test mode : 802.11n_HT40_2 422 MHz_6 dB Bandwidth



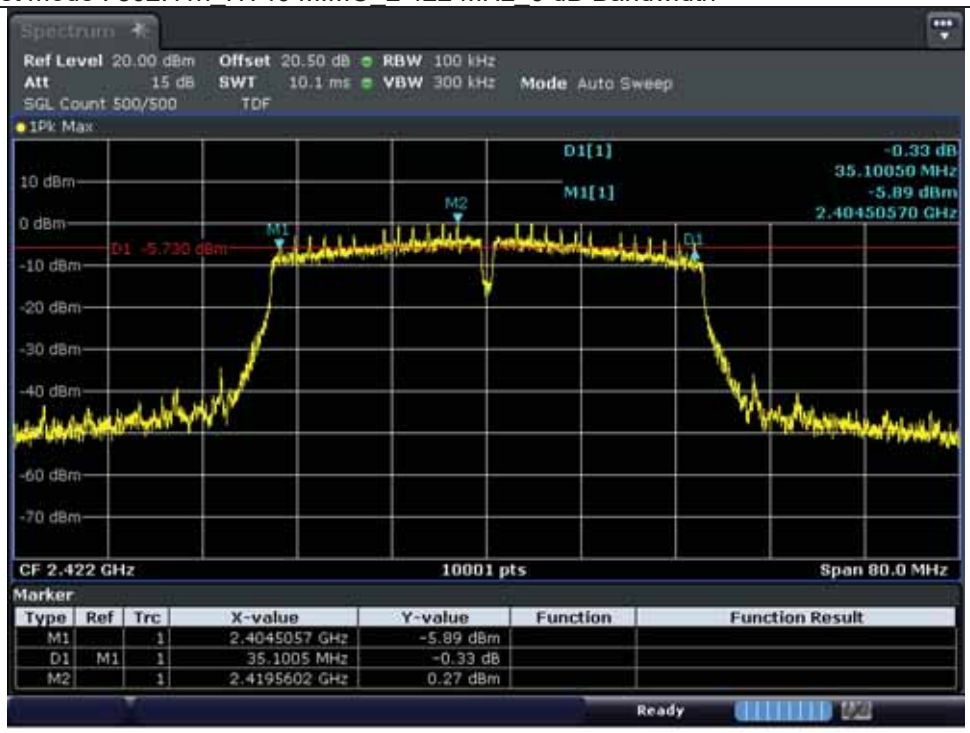
Test mode : 802.11n_HT40_2 437 MHz_6 dB Bandwidth



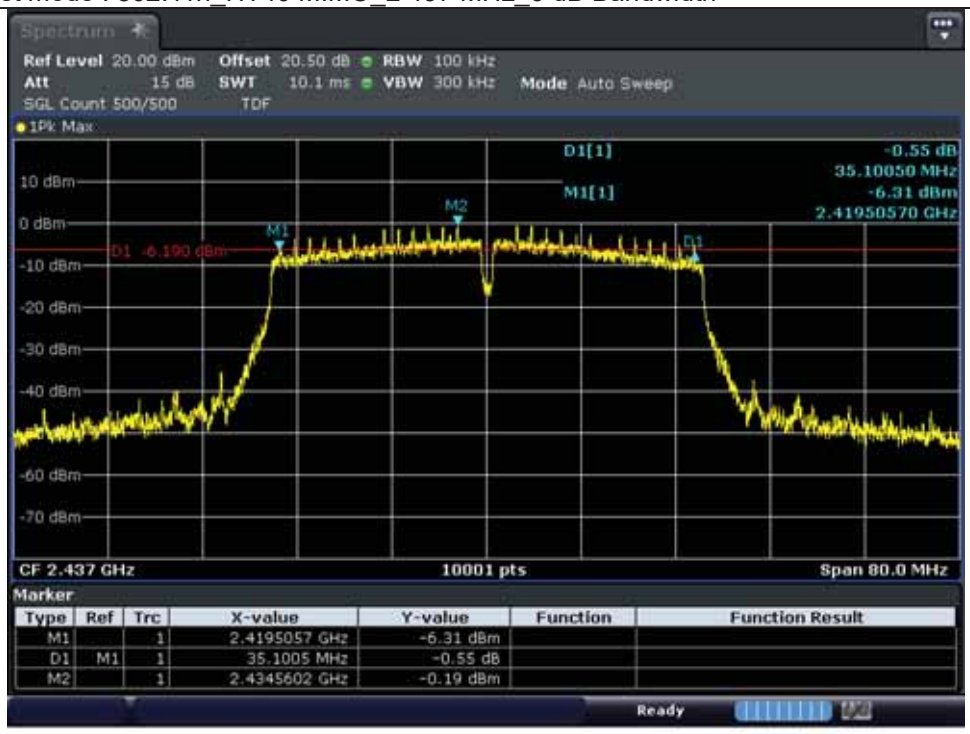
Test mode : 802.11n_HT40_2 452 MHz_6 dB Bandwidth



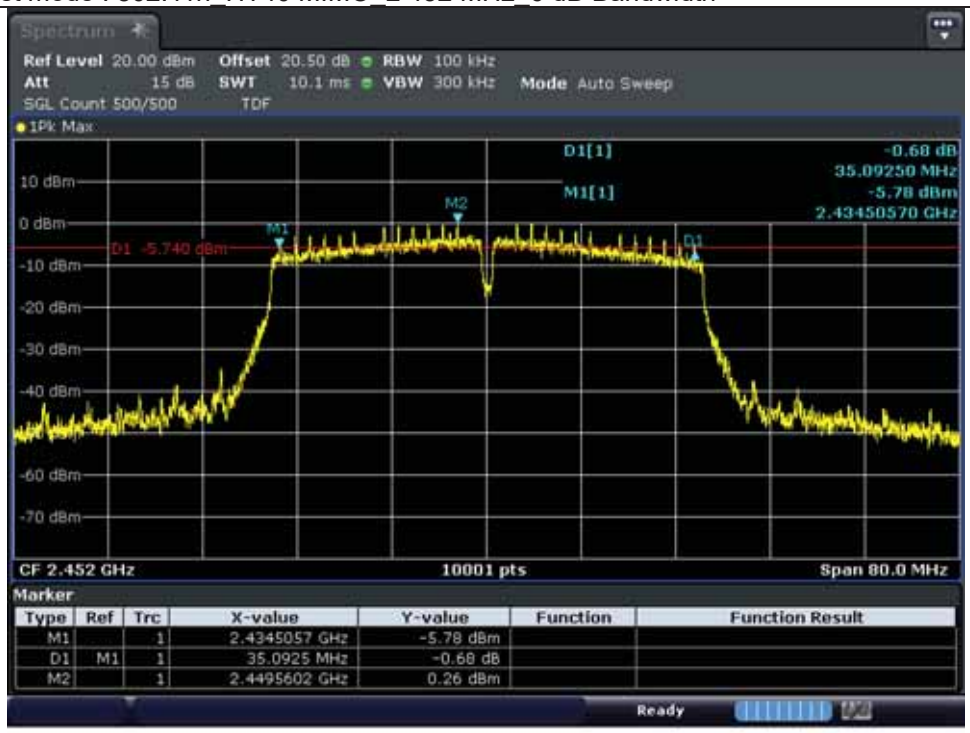
Test mode : 802.11n_HT40 MIMO_2 422 MHz_6 dB Bandwidth



Test mode : 802.11n_HT40 MIMO_2 437 MHz_6 dB Bandwidth

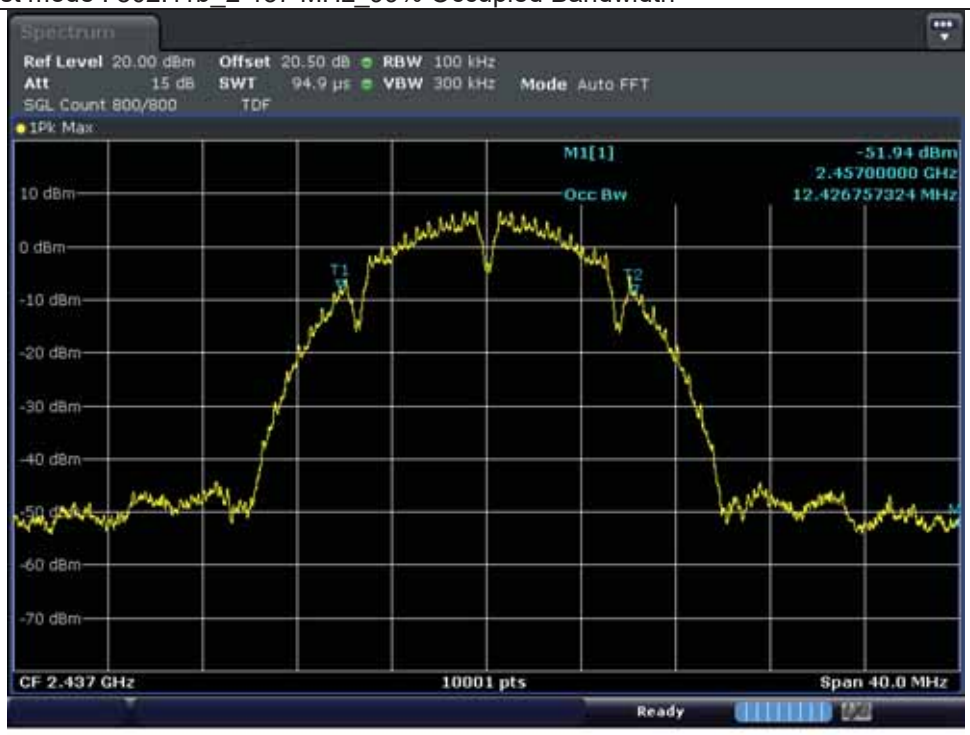


Test mode : 802.11n_HT40 MIMO_2 452 MHz_6 dB Bandwidth



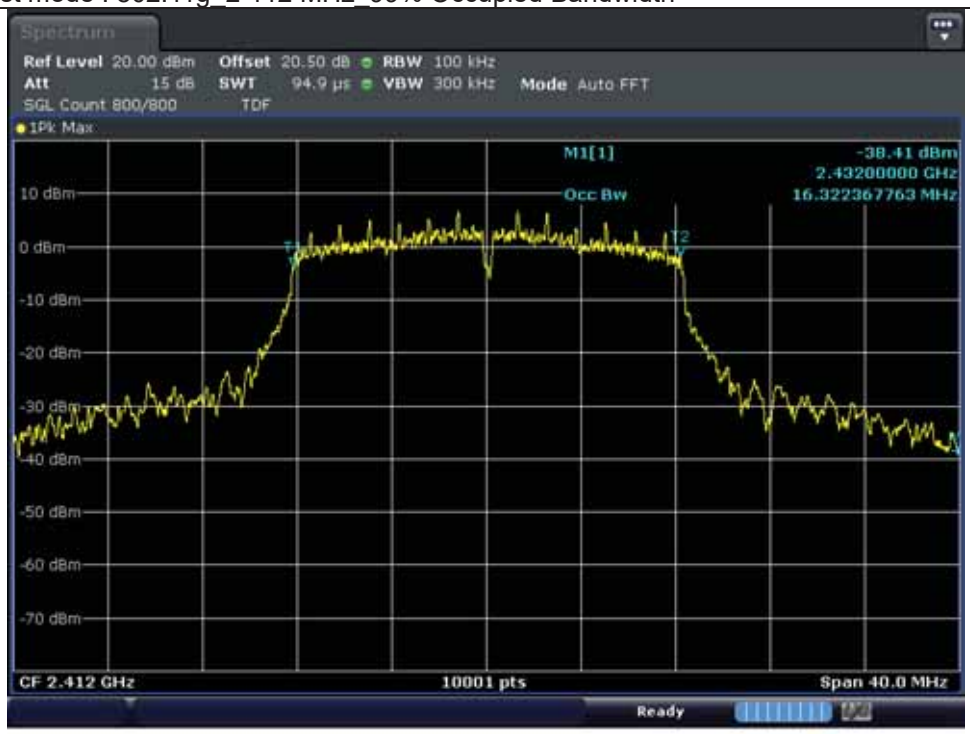
Test mode : 802.11b_2 412 MHz_99% Occupied Bandwidth

Test mode : 802.11b_2 437 MHz_99% Occupied Bandwidth

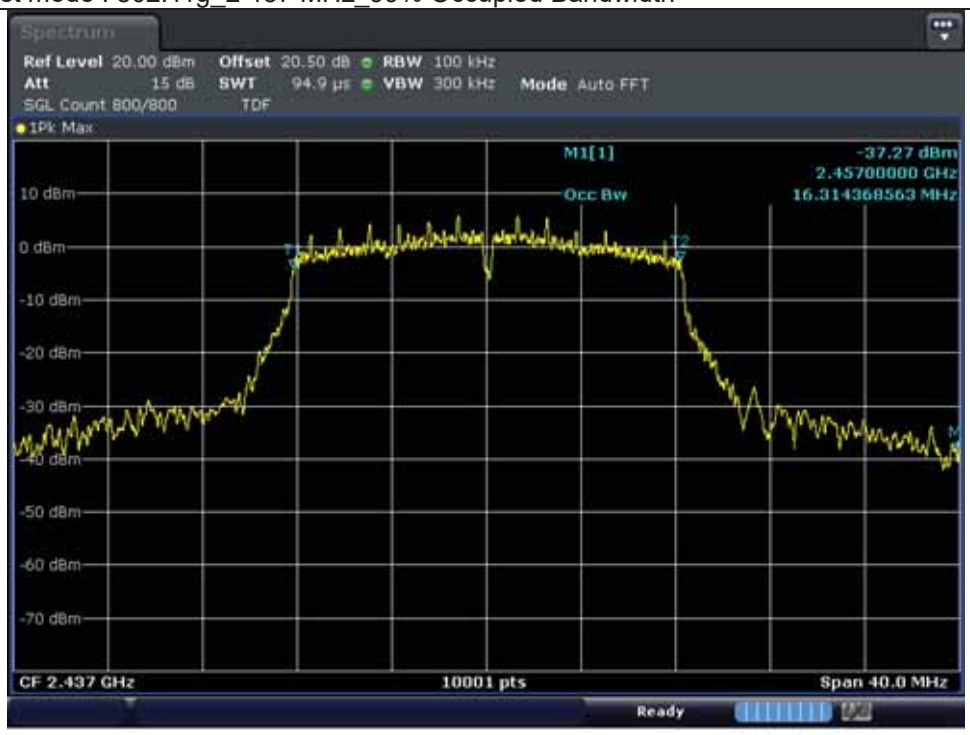


Test mode : 802.11b_2 462 MHz_99% Occupied Bandwidth

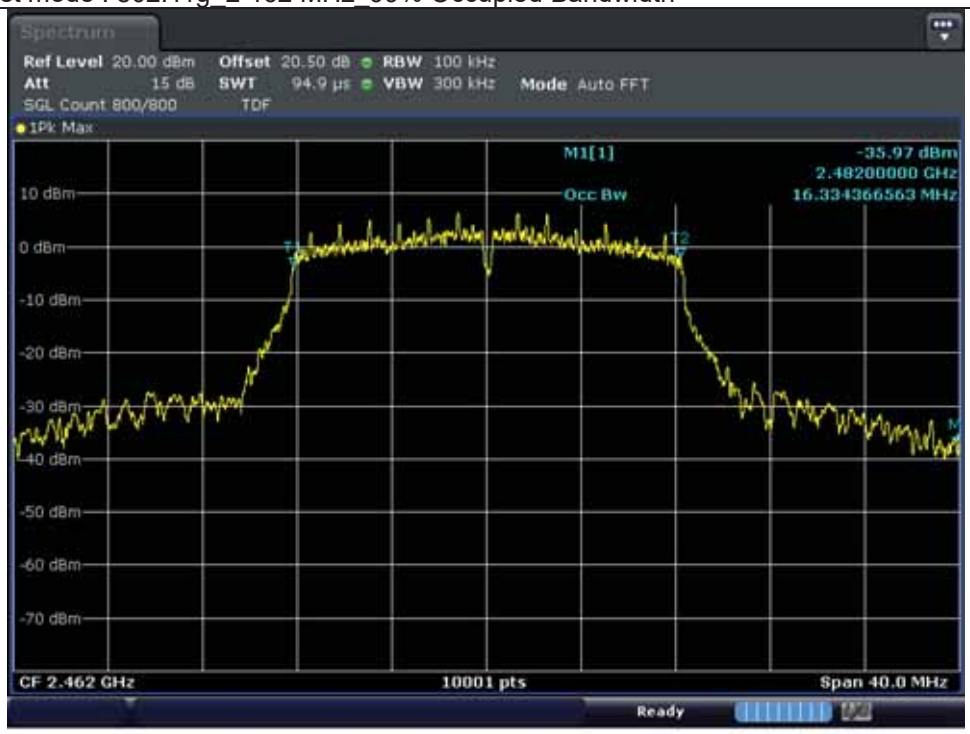
Test mode : 802.11g_2 412 MHz_99% Occupied Bandwidth



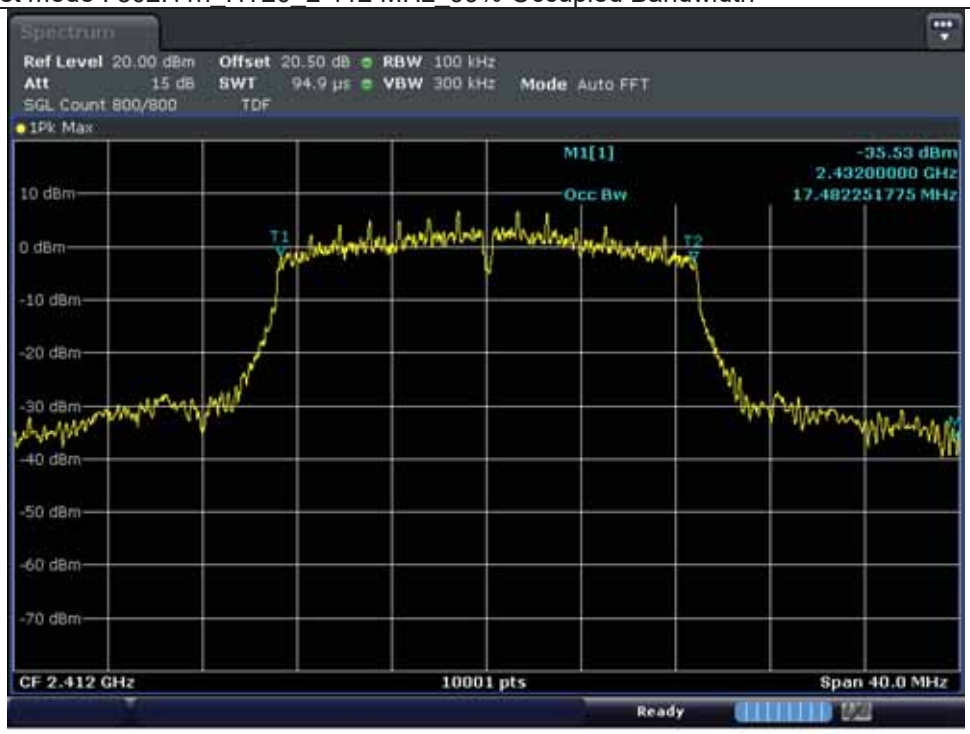
Test mode : 802.11g_2 437 MHz_99% Occupied Bandwidth



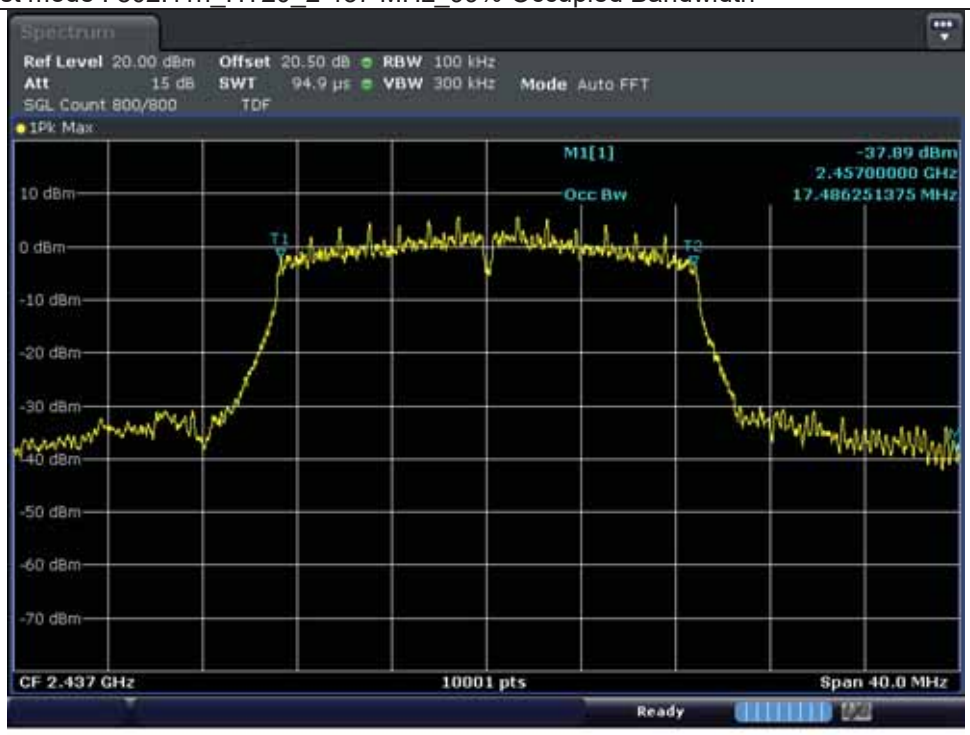
Test mode : 802.11g_2 462 MHz_99% Occupied Bandwidth



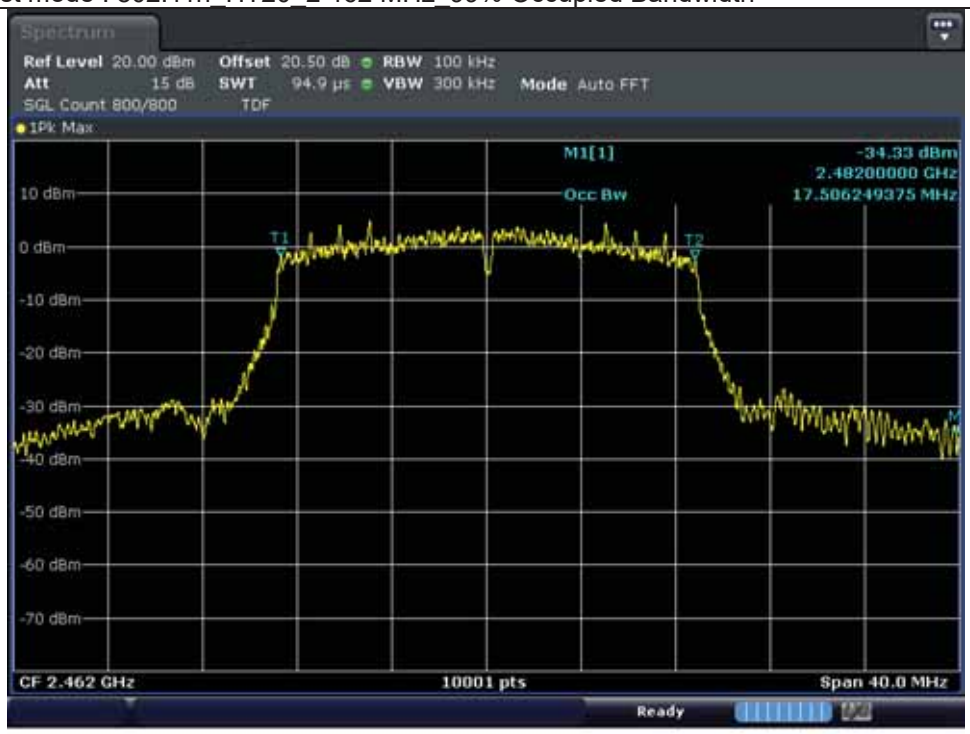
Test mode : 802.11n_HT20_2 412 MHz_99% Occupied Bandwidth



Test mode : 802.11n_HT20_2 437 MHz_99% Occupied Bandwidth

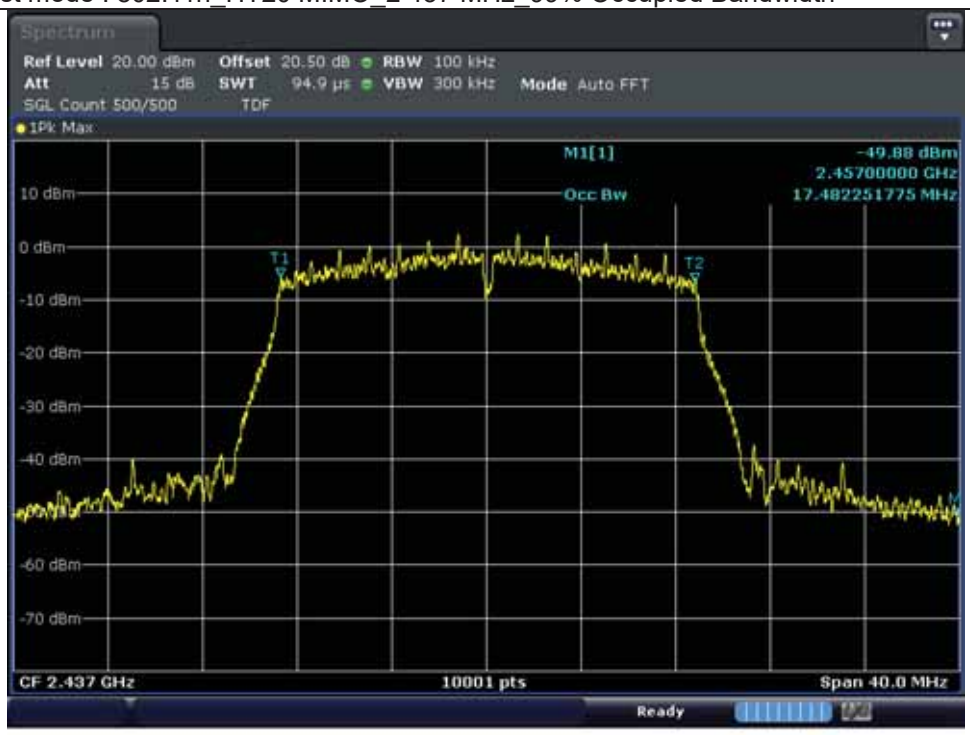


Test mode : 802.11n_HT20_2 462 MHz_99% Occupied Bandwidth

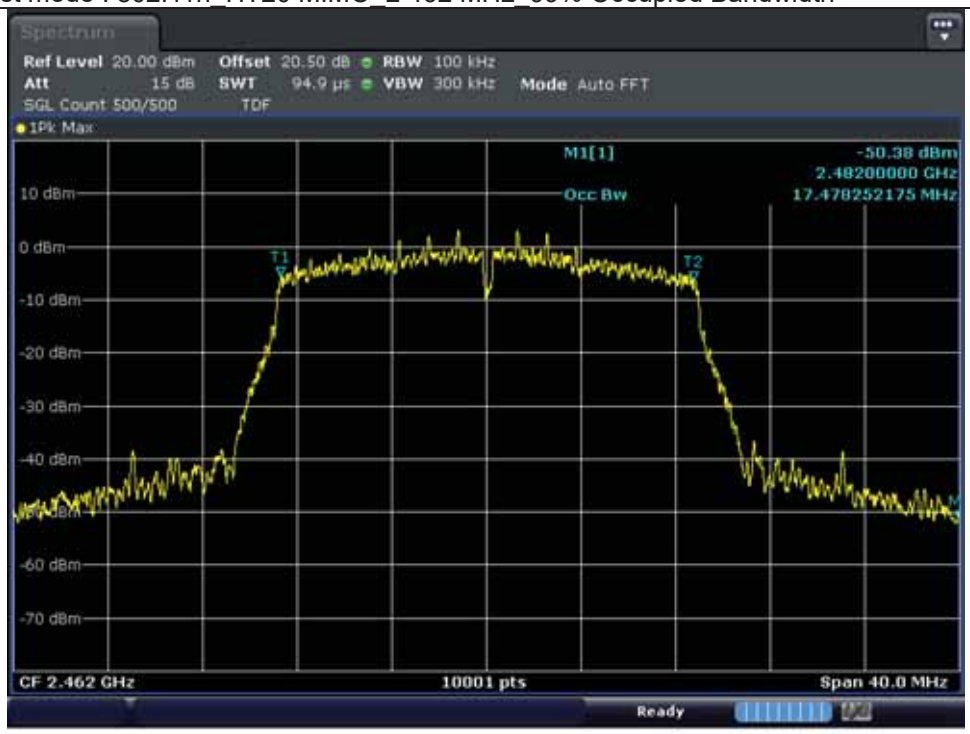


Test mode : 802.11n_HT20 MIMO_2 412 MHz_99% Occupied Bandwidth

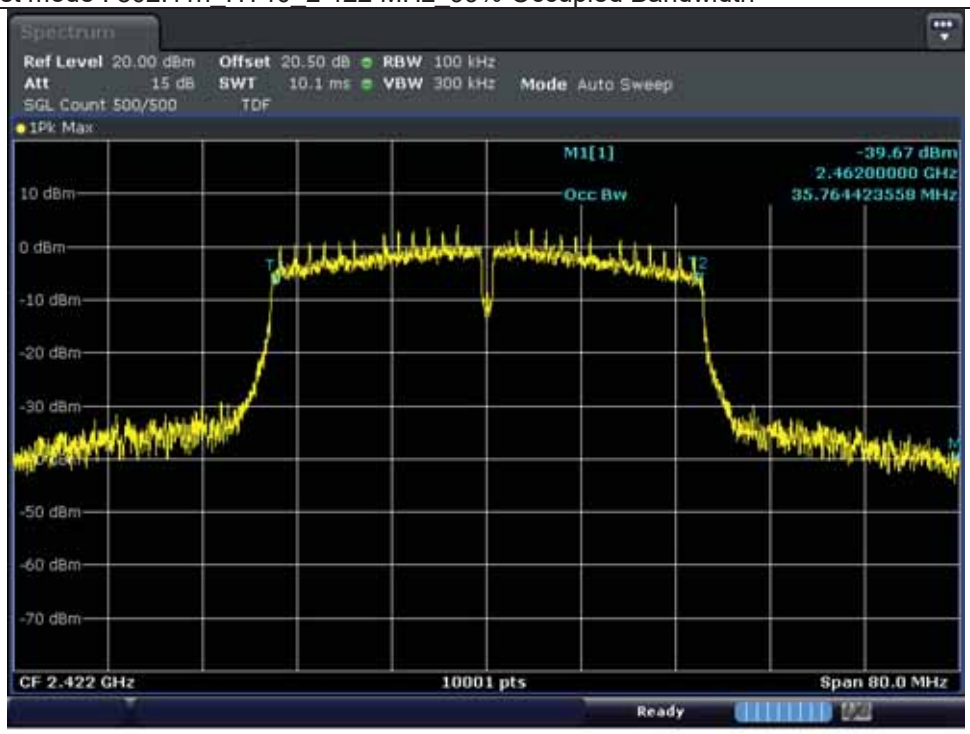
Test mode : 802.11n_HT20 MIMO_2 437 MHz_99% Occupied Bandwidth



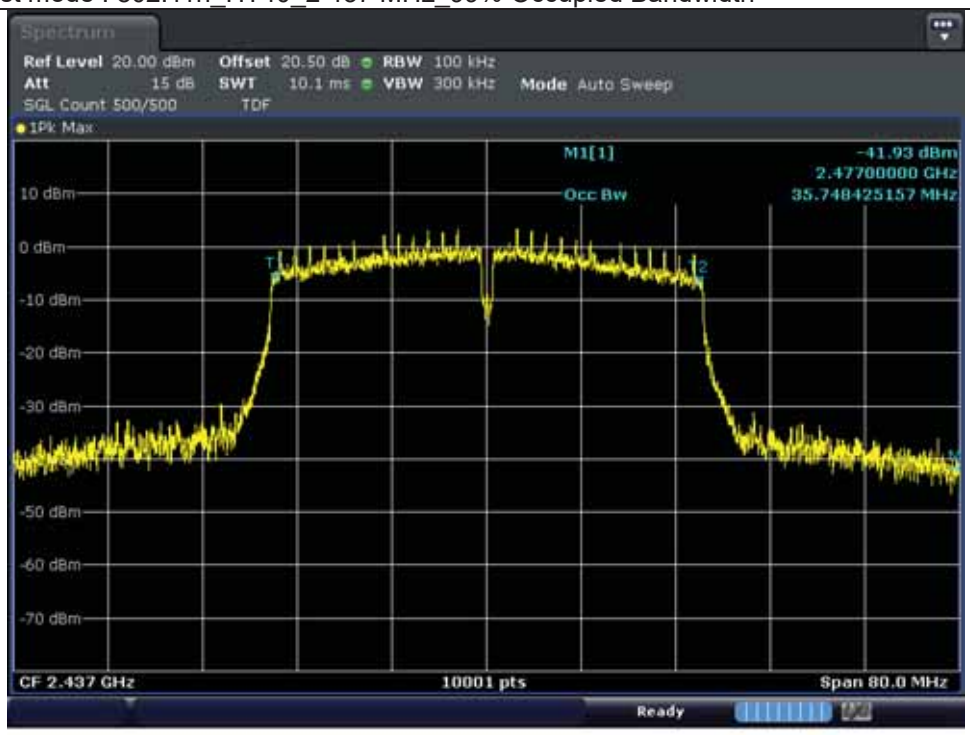
Test mode : 802.11n_HT20 MIMO_2 462 MHz_99% Occupied Bandwidth



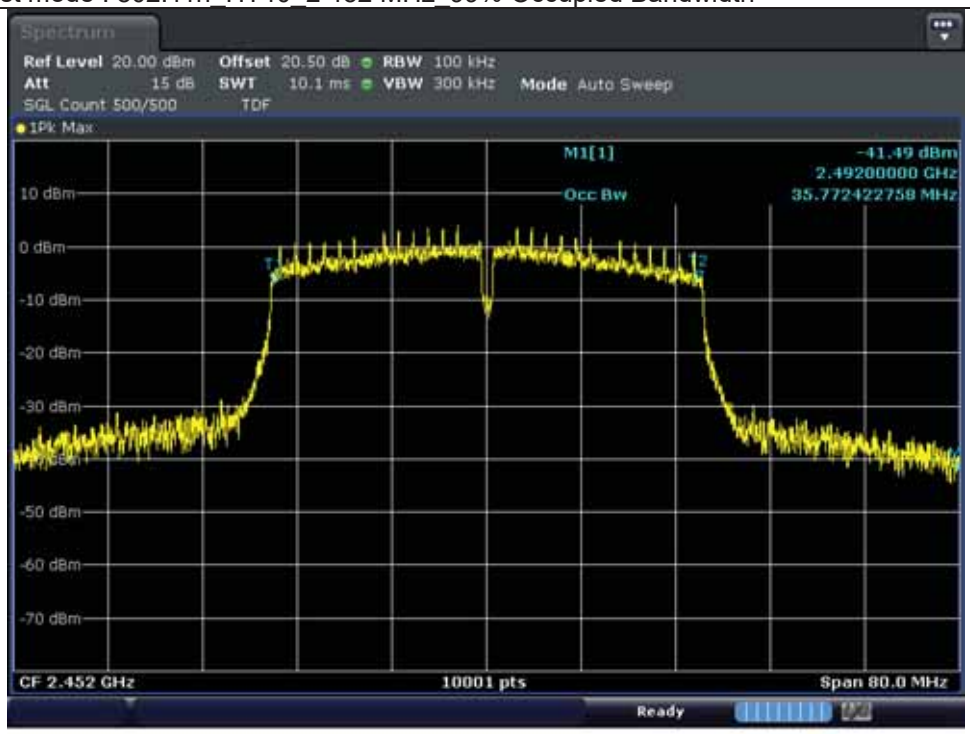
Test mode : 802.11n_HT40_2 422 MHz_99% Occupied Bandwidth



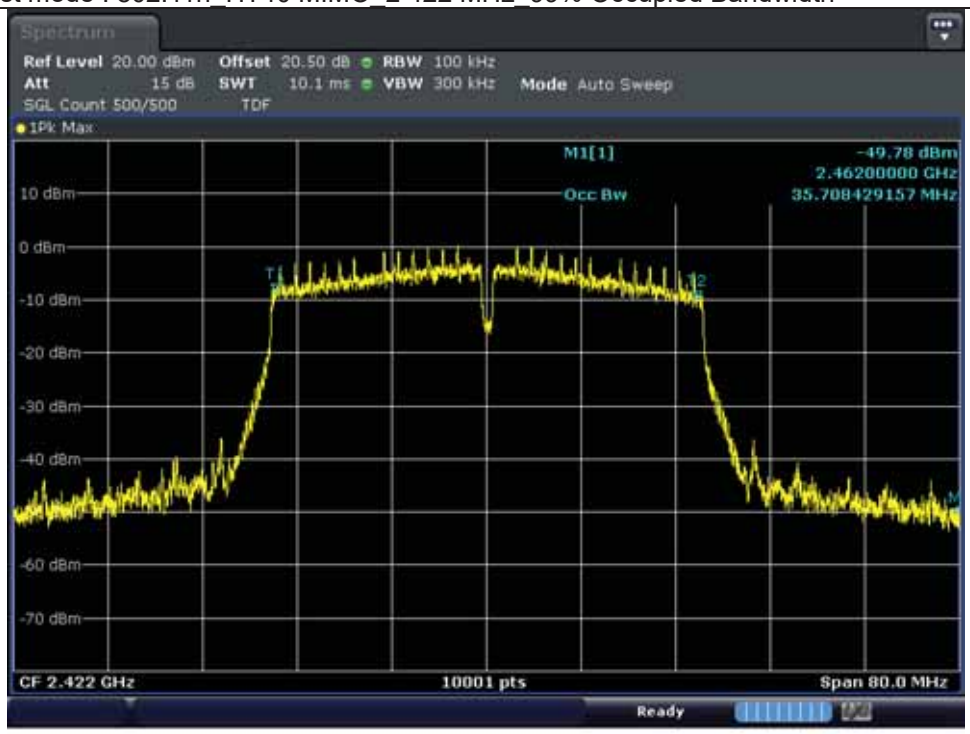
Test mode : 802.11n_HT40_2 437 MHz_99% Occupied Bandwidth



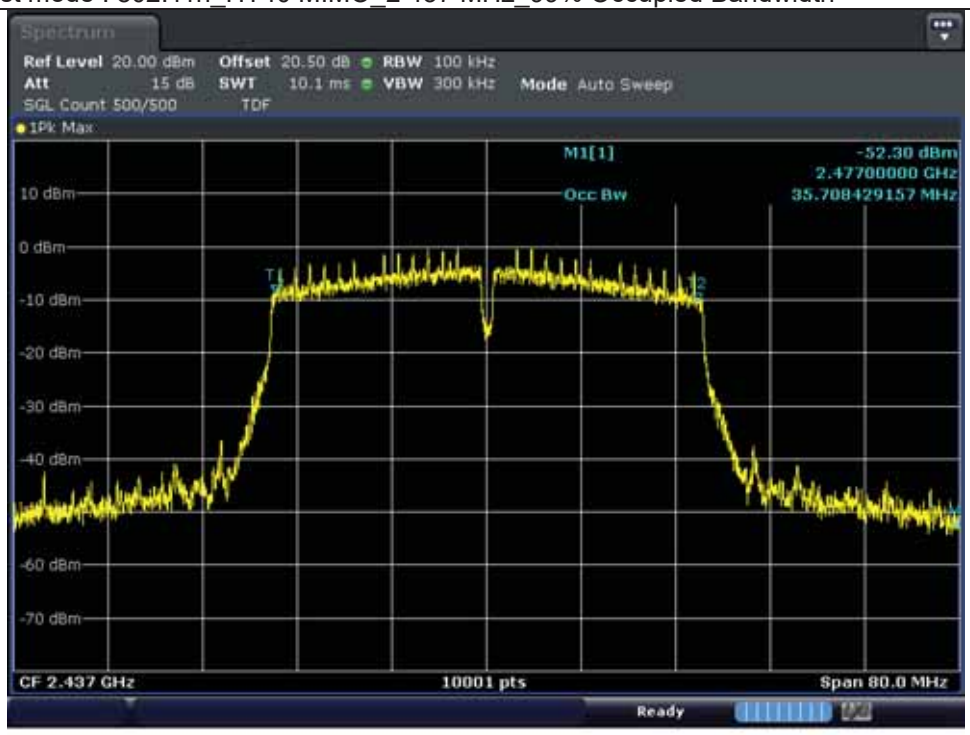
Test mode : 802.11n_HT40_2 452 MHz_99% Occupied Bandwidth



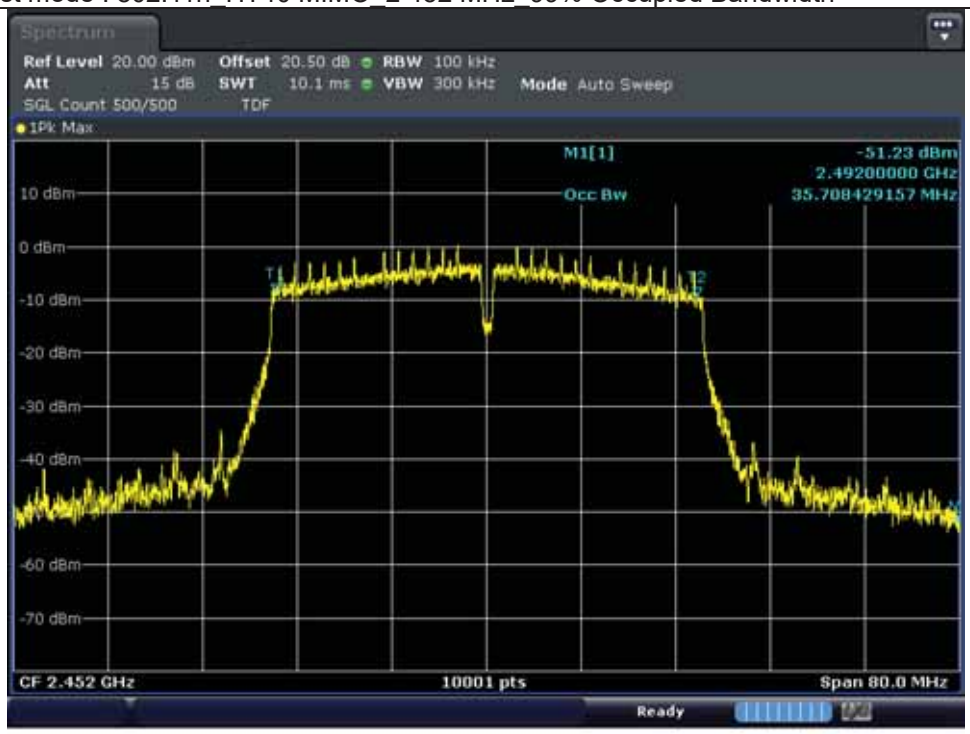
Test mode : 802.11n_HT40 MIMO_2 422 MHz_99% Occupied Bandwidth



Test mode : 802.11n_HT40 MIMO_2 437 MHz_99% Occupied Bandwidth



Test mode : 802.11n_HT40 MIMO_2 452 MHz_99% Occupied Bandwidth



4.4.5 Spurious Emission, Band Edge, and Restricted bands

4.4.5.1 Regulation

According to §15.247(d) and RSS-247 5.5 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) and RSS-GEN 8.9 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(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 shallnot 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

According to RSS-GEN 8.10(c) Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

MHz	MHz	MHz	GHz
0.009 - 0.110	13.36 – 13.41	960 – 1427	9.0 – 9.2
0.495 - 0.505	16.42 – 16.423	1435 – 1626.5	9.3 – 9.5
2.173 5 - 2.190 5	16.69475 – 16.69525	1660 – 1710	10.6 – 12.7
3.020 – 3.026	16.80425 - 16.80475	1718.8 – 1722.2	13.25 – 13.4
4.125 – 4.128	25.5 – 25.67	2200 – 2300	14.47 – 14.5
4.17725 – 1.17775	37.5 – 38.25	2310 - 2390	15.35 – 16.2
4.20725 – 4.20775	73 – 74.6	2483.5 – 2500	17.7 – 21.4
5.677 – 5.683	74.8 – 75.2	2655 – 2900	22.01 – 23.12
6.215 – 6.218	108 – 138	3260 – 3267	23.6 – 24.0
6.266775 – 6.26825	149.9 – 150.05	3332 – 3339	31.2 – 31.8
6.31175 – 6.31225	156.52475 – 156.52525	3345.8 - 3358	36.43 – 36.5
8.291 – 8.294	156.7 – 156.9	3500 – 4400	Above 38.6
8.363 – 8.366	162.0125 – 167.17	4500 – 5150	-
8.37625 – 8.38675	167.75 – 173.2	5350 – 5460	-
8.41425 – 8.41475	240 – 285	7250 - 7750	-
12.29 – 12.293	322 – 335.4	8025 – 8500	-
12.51975 – 12.52025	399.9 – 410	-	-
12.57675 – 12.57725	608 – 614	-	-

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 ≥ 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.

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 ≥ 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.

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 ≥ 3 x 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 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 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 vide 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 Note

- Below 1GHz

Note 1 : Measured the worst case. * Refer to 3.4
Note 2 : Loss : Cable loss - Amp gain
Note 3 : Result : Reading + Ant Factor + Loss
Note 4 : Measured distance : 3 m

- Above 1GHz

Note 1 : Measured the worst case. * Refer to 3.4
Note 2 : Factor : Ant Factor + Cable loss - Amp gain + Distance Factor
Note 3 : Peak Result : Reading + Factor
Note 4 : Average Reasult : Average Reading + Factor + Average Factor
Note 5 : Average Factor : 10log(1/Dutycycle) * Refer to 4.4.5.8
Note 6 : Measured distance : 1 m, Distance Factor = 20log(1 / 3) = -9.54
Note 7 : Average measurement did not take place because the peak data did not exceed Average Limit.
Note 8 : Not Detected means that peak data does not exceed the average limit.

4.4.5.4 Result

Comply (measurement data : refer to the next page)

4.4.5.5 Measurement data_Radiated Spurious Emissions

Test mode : Below 1 GHz (Worst case : 802.11n_HT40 MIMO_2422 MHz)

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBµV)	Ant Factor (dB)	Loss (dB)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
36.31	QP	V	41.10	17.30	-29.30	29.10	40.00	10.90
57.52	QP	V	41.60	18.00	-28.90	30.70	40.00	9.30
134.52	QP	H	37.20	18.60	-27.80	28.00	43.50	15.50
380.52	QP	H	43.40	21.40	-26.60	38.20	46.00	7.80
832.98	QP	V	32.00	28.90	-25.40	35.50	46.00	10.50

Test mode : 802.11b_2 412 MHz

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBμV)	Factor (dB)	Dutycycle Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2382.01	PK	H	46.20	-4.70	-	41.46	74.00	32.54
	AV	H	44.60	-4.70	0.21	40.07	54.00	13.93
2382.01	PK	V	58.90	-4.70	-	54.16	74.00	19.84
	AV	V	44.10	-4.70	0.21	39.57	54.00	14.43

Test mode : 802.11b_2 437 MHz

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBμV)	Factor (dB)	Dutycycle Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
			Not Detected					

Test mode : 802.11b_2 462 MHz

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBμV)	Factor (dB)	Dutycycle Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2378.36	PK	V	59.80	-4.70	-	55.06	74.00	18.94
	AV	V	49.00	-4.70	0.21	44.47	54.00	9.53
2484.29	PK	H	43.60	-4.30	-	39.26	74.00	34.74
	AV	H	42.00	-4.30	0.21	37.87	54.00	16.13
2484.29	PK	V	58.40	-4.30	-	54.06	74.00	19.94
	AV	V	30.40	-4.30	0.21	26.27	54.00	27.73

Test mode : 802.11g_2 412 MHz

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBμV)	Factor (dB)	Dutycycle Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2327.50	PK	V	61.70	-4.90	-	56.76	74.00	17.24
	AV	V	45.30	-4.90	0.96	41.32	54.00	12.68
2389.00	PK	H	60.60	-4.70	-	55.86	74.00	18.14
	AV	H	51.70	-4.70	0.96	47.92	54.00	6.08
2389.50	PK	V	73.70	-4.70	-	68.96	74.00	5.04
	AV	V	40.60	-4.70	0.96	36.82	54.00	17.18

Test mode : 802.11g_2 437 MHz

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBμV)	Factor (dB)	Dutycycle Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2322.02	PK	V	59.10	-4.90	-	54.16	74.00	19.84
	AV	V	39.90	-4.90	0.96	35.92	54.00	18.08
2357.55	PK	V	60.40	-4.80	-	55.56	74.00	18.44
	AV	V	41.20	-4.80	0.96	37.32	54.00	16.68

Test mode : 802.11g_2 437 MHz

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBμV)	Factor (dB)	Dutycycle Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2355.00	PK	V	59.90	-4.80	-	55.06	74.00	18.94
	AV	V	40.70	-4.80	0.96	36.82	54.00	17.18
2378.27	PK	V	59.90	-4.70	-	55.16	74.00	18.84
	AV	V	40.50	-4.70	0.96	36.72	54.00	17.28
2483.74	PK	H	57.60	-4.30	-	53.26	74.00	20.74
	AV	H	35.30	-4.30	0.96	31.92	54.00	22.08
2483.74	PK	V	75.80	-4.30	-	71.46	74.00	2.54
	AV	V	52.10	-4.30	0.96	48.72	54.00	5.28

Test mode : 802.11n_HT20_2 412 MHz

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBμV)	Factor (dB)	Dutycycle Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2330.26	PK	V	61.00	-4.90	-	56.06	74.00	17.94
	AV	V	41.20	-4.90	1.78	38.04	54.00	15.96
2388.93	PK	V	68.40	-4.70	-	63.66	74.00	10.34
	AV	V	43.30	-4.70	1.78	40.34	54.00	13.66
2388.93	PK	H	47.30	-4.70	-	42.56	74.00	31.44
	AV	H	37.50	-4.70	1.78	34.54	54.00	19.46

Test mode : 802.11n_HT20_2 437 MHz

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBμV)	Factor (dB)	Dutycycle Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2358.44	PK	V	60.70	-4.80	-	55.86	74.00	18.14
	AV	V	38.40	-4.80	1.78	35.34	54.00	18.66

Test mode : 802.11n_HT20_2 462 MHz

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBμV)	Factor (dB)	Dutycycle Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2484.50	PK	H	43.00	-4.30	-	38.66	74.00	35.34
	AV	H	25.90	-4.30	1.78	23.34	54.00	30.66
2484.50	PK	V	62.30	-4.30	-	57.96	74.00	16.04
	AV	V	43.30	-4.30	1.78	40.74	54.00	13.26

Test mode : 802.11n_HT40_2 422 MHz

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBμV)	Factor (dB)	Dutycycle Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2389.99	PK	H	49.70	-4.70	-	44.96	74.00	29.04
	AV	H	40.20	-4.70	2.97	38.43	54.00	15.57
2389.99	PK	V	71.60	-4.70	-	66.86	74.00	7.14
	AV	V	51.20	-4.70	2.97	49.43	54.00	4.57

Test mode : 802.11n_HT40_2 437 MHz

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBµV)	Factor (dB)	Dutycycle Factor (dB)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2373.76	PK	V	60.70	-4.70	-	55.96	74.00	18.04
	AV	V	46.80	-4.70	2.97	45.03	54.00	8.97
2484.00	PK	V	59.30	-4.30	-	54.96	74.00	19.04
	AV	V	46.50	-4.30	2.97	45.13	54.00	8.87

Test mode : 802.11n_HT40_2 452 MHz

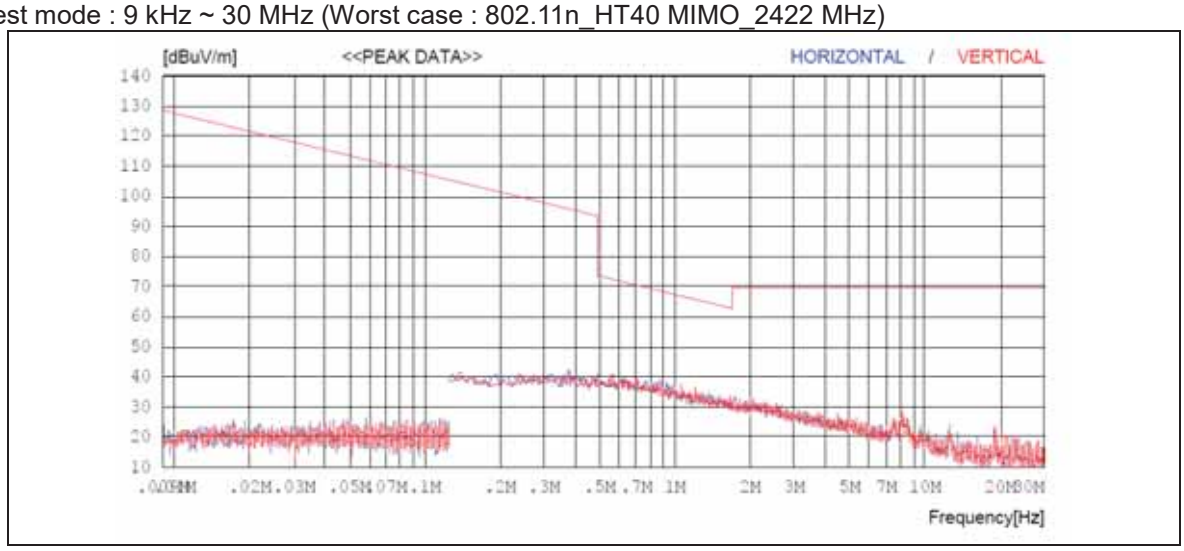
Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBµV)	Factor (dB)	Dutycycle Factor (dB)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2385.25	PK	V	60.60	-4.70	-	55.86	74.00	18.14
	AV	V	40.80	-4.70	2.97	39.03	54.00	14.97
2484.74	PK	H	47.20	-4.30	-	42.86	74.00	31.14
	AV	H	35.20	-4.30	2.97	33.83	54.00	20.17
2484.74	PK	V	69.30	-4.30	-	64.96	74.00	9.04
	AV	V	45.80	-4.30	2.97	44.43	54.00	9.57
2662.76	PK	V	59.40	-3.80	-	55.56	74.00	18.44
	AV	V	49.90	-3.80	2.97	49.03	54.00	4.97

Test mode : 802.11n_HT20_2412 MHz + 802.11a_5200 MHz

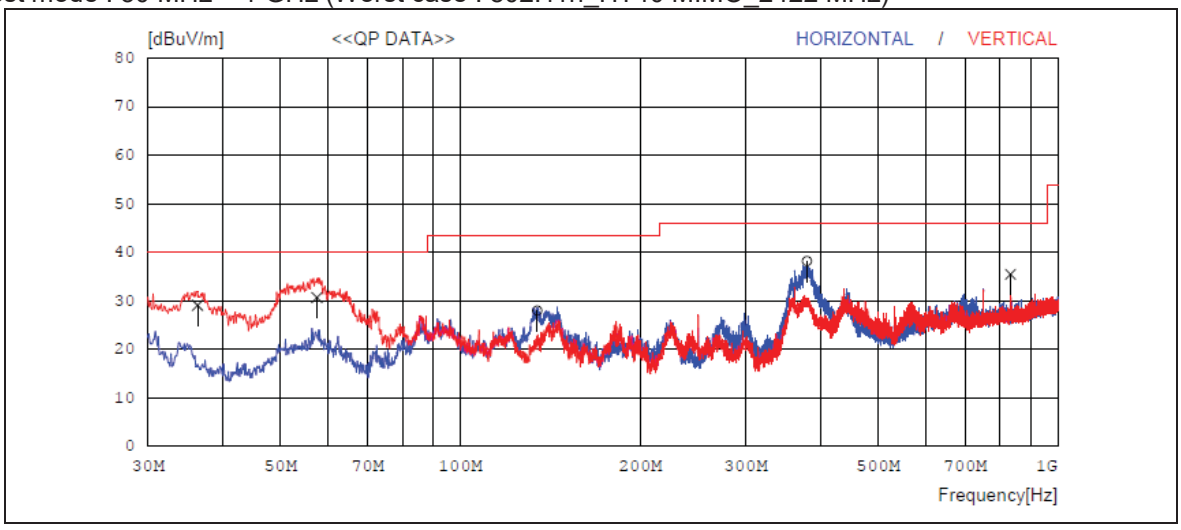
Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBµV)	Factor (dB)	Average Factor (dB)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2389.99	PK	H	49.67	-4.70	-	44.93	74.00	29.07
	AV	H	38.36	-4.70	2.97	36.59	54.00	17.41
2389.99	PK	V	70.69	-4.70	-	65.95	74.00	8.05
	AV	V	50.92	-4.70	2.97	49.15	54.00	4.85
5142.25	PK	H	40.64	1.00	-	41.60	74.00	32.40
	AV	H	27.62	1.00	4.85	33.43	54.00	20.57
5142.25	PK	V	55.12	1.00	-	56.08	74.00	17.92
	AV	V	40.92	1.00	4.85	46.73	54.00	7.27
5354.82	PK	H	41.36	1.60	-	42.92	74.00	31.08
	AV	H	30.32	1.60	4.85	36.73	54.00	17.27
5354.82	PK	V	55.54	1.60	-	57.10	74.00	16.90
	AV	V	40.12	1.60	4.85	46.53	54.00	7.47

4.4.5.6 Measurement Plot_Radiated Spurious Emissions

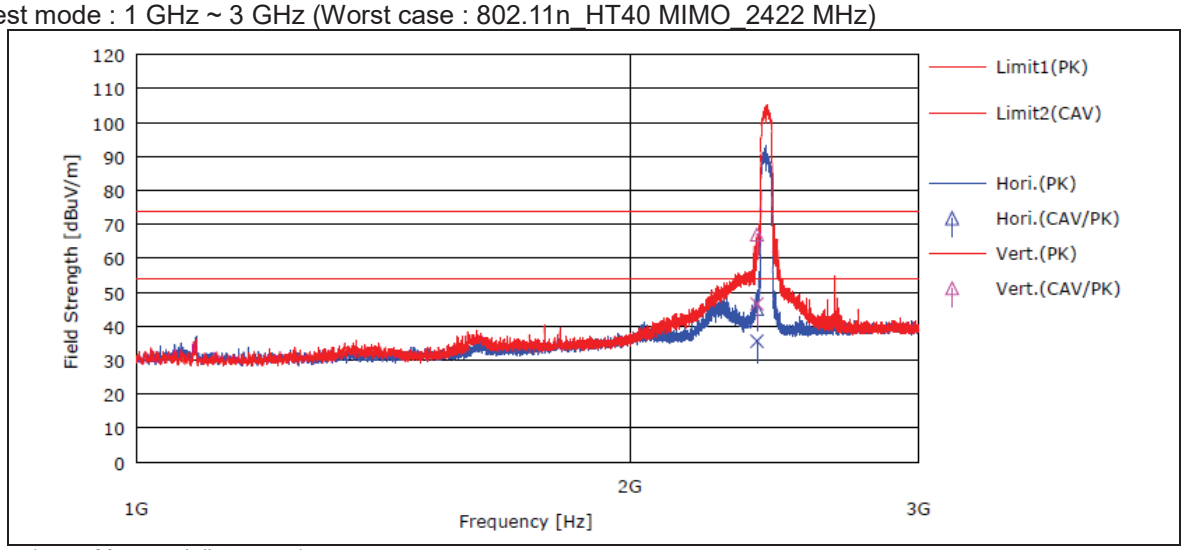
Test mode : 9 kHz ~ 30 MHz (Worst case : 802.11n_HT40 MIMO_2422 MHz)



Test mode : 30 MHz ~ 1 GHz (Worst case : 802.11n_HT40 MIMO_2422 MHz)

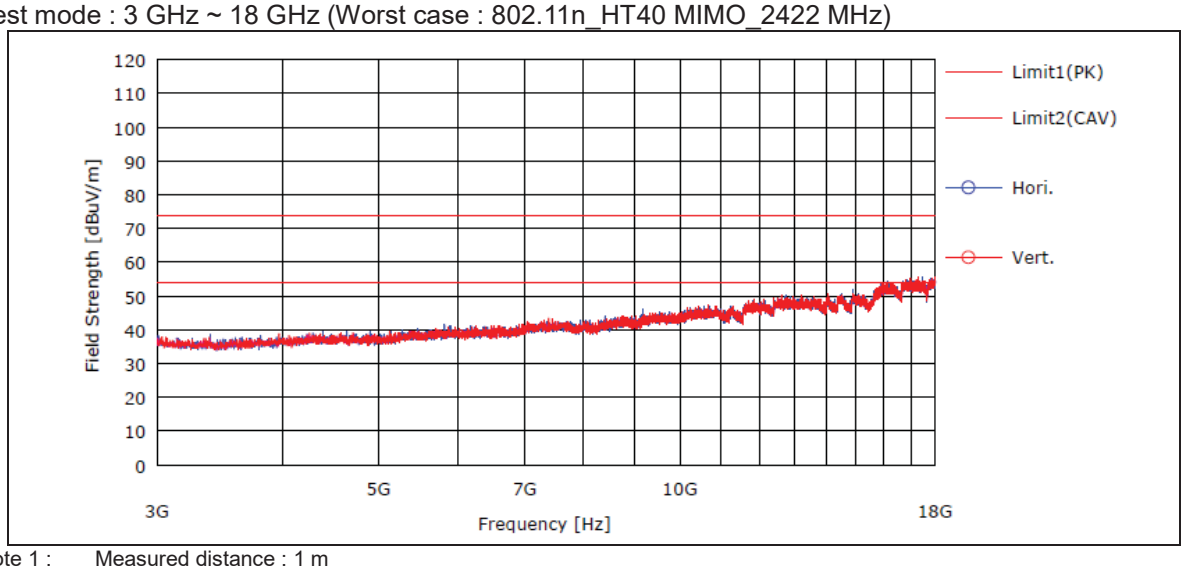


Test mode : 1 GHz ~ 3 GHz (Worst case : 802.11n_HT40 MIMO_2422 MHz)



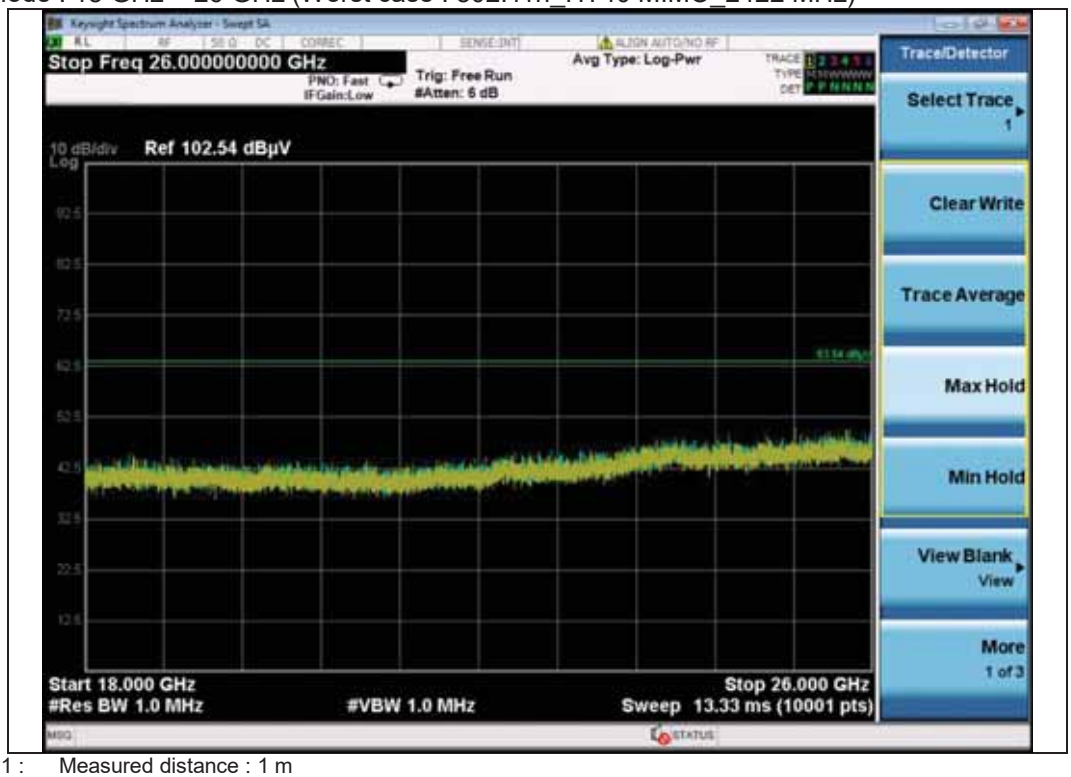
Note 1 : Measured distance : 1 m
Note 2 : Limit : Peak : 74 dBµV/m, Average : 54 dBµV/m

Test mode : 3 GHz ~ 18 GHz (Worst case : 802.11n_HT40 MIMO_2422 MHz)



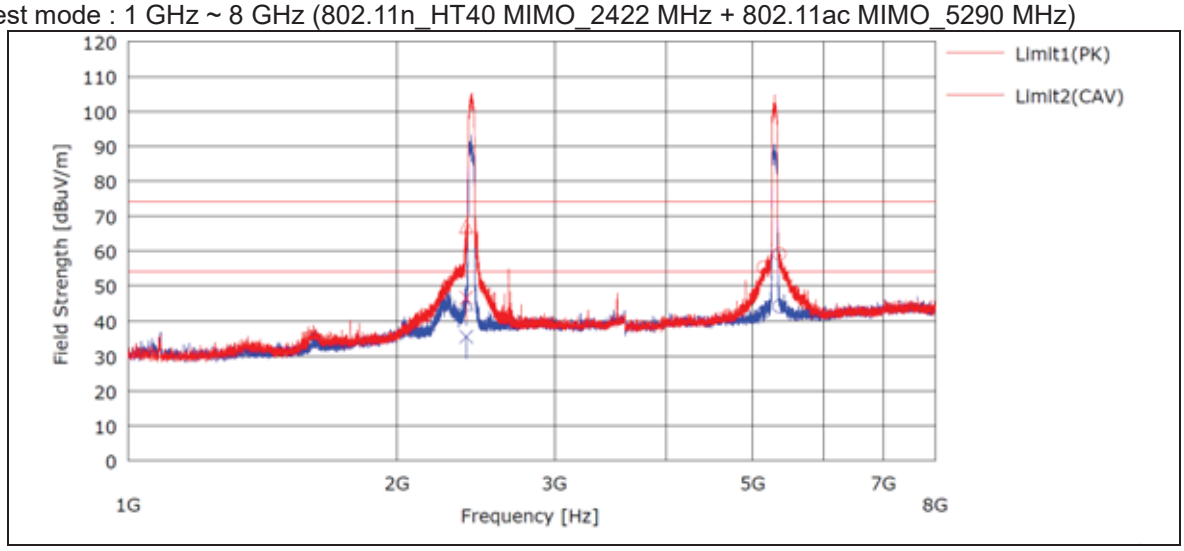
Note 1 : Measured distance : 1 m
Note 2 : Limit : Peak : 74 dBµV/m, Average : 54 dBµV/m

Test mode : 18 GHz ~ 26 GHz (Worst case : 802.11n_HT40 MIMO_2422 MHz)



NOTE 1 : Measured distance : 1 m
NOTE 2 : Limit : Peak : 83.54 dBµV/m, Average : 63.54 dBµV/m

Test mode : 1 GHz ~ 8 GHz (802.11n_HT40 MIMO_2422 MHz + 802.11ac MIMO_5290 MHz)

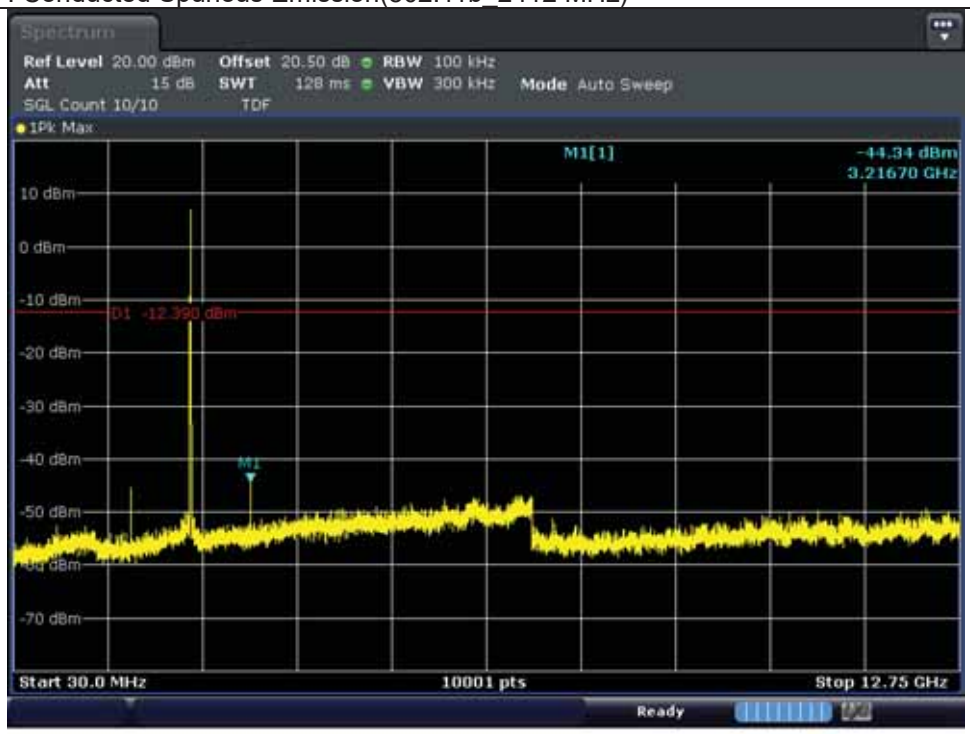


4.4.5.7 Measurement data_Conducted Spurious Emissions

Test mode : Reference(802.11b_2412 MHz)

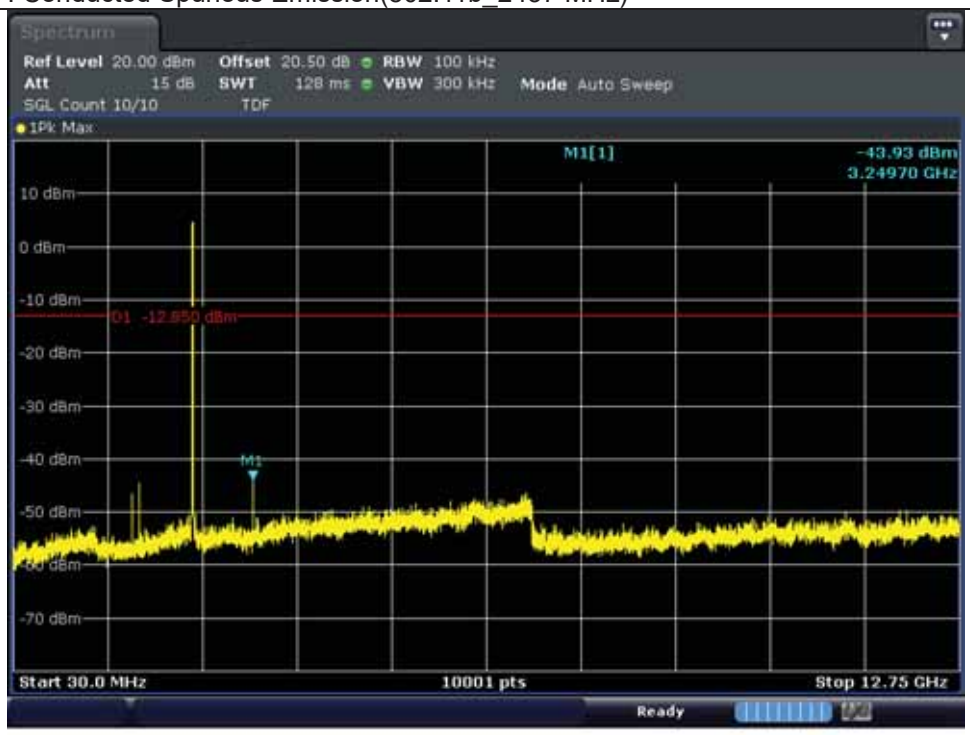
Test mode : Bandedge(802.11b_2412 MHz)

Test mode : Conducted Spurious Emission(802.11b_2412 MHz)



Test mode : Reference(802.11b_2437 MHz)

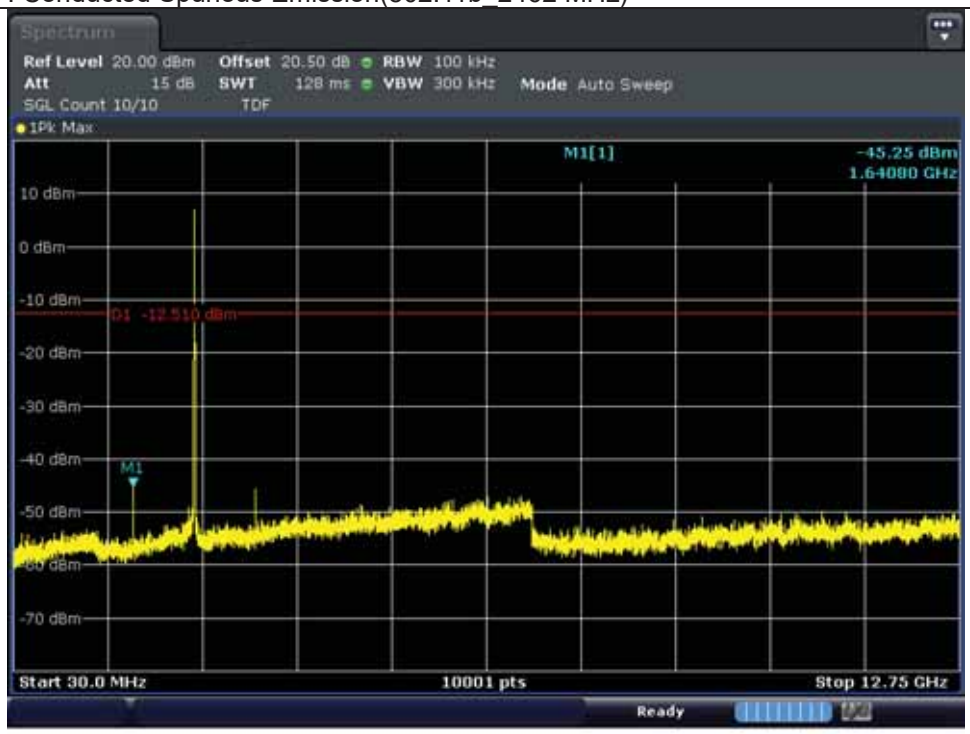
Test mode : Conducted Spurious Emission(802.11b_2437 MHz)



Test mode : Reference(802.11b_2462 MHz)

Test mode : Bandedge(802.11b_2462 MHz)

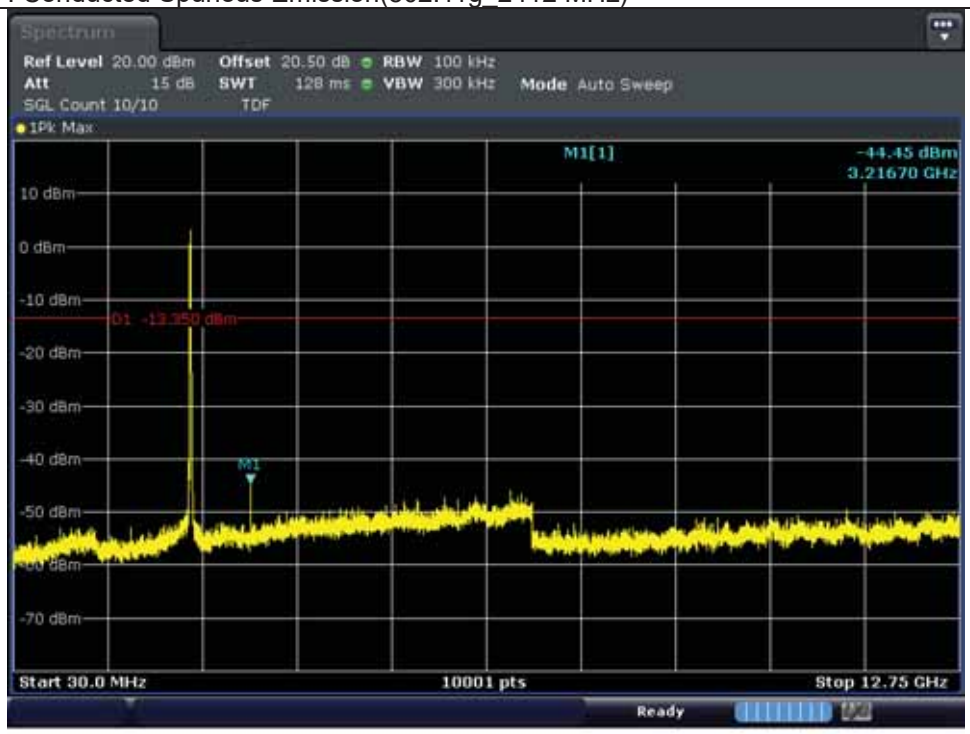
Test mode : Conducted Spurious Emission(802.11b_2462 MHz)



Test mode : Reference(802.11g_2412 MHz)

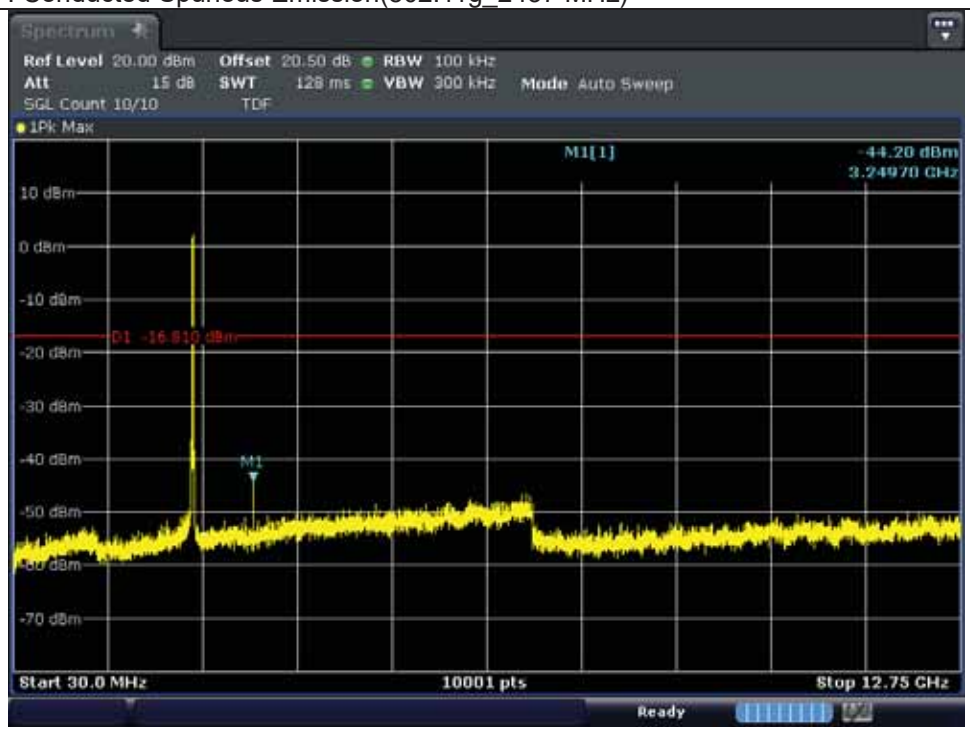
Test mode : Bandedge(802.11g_2412 MHz)

Test mode : Conducted Spurious Emission(802.11g_2412 MHz)



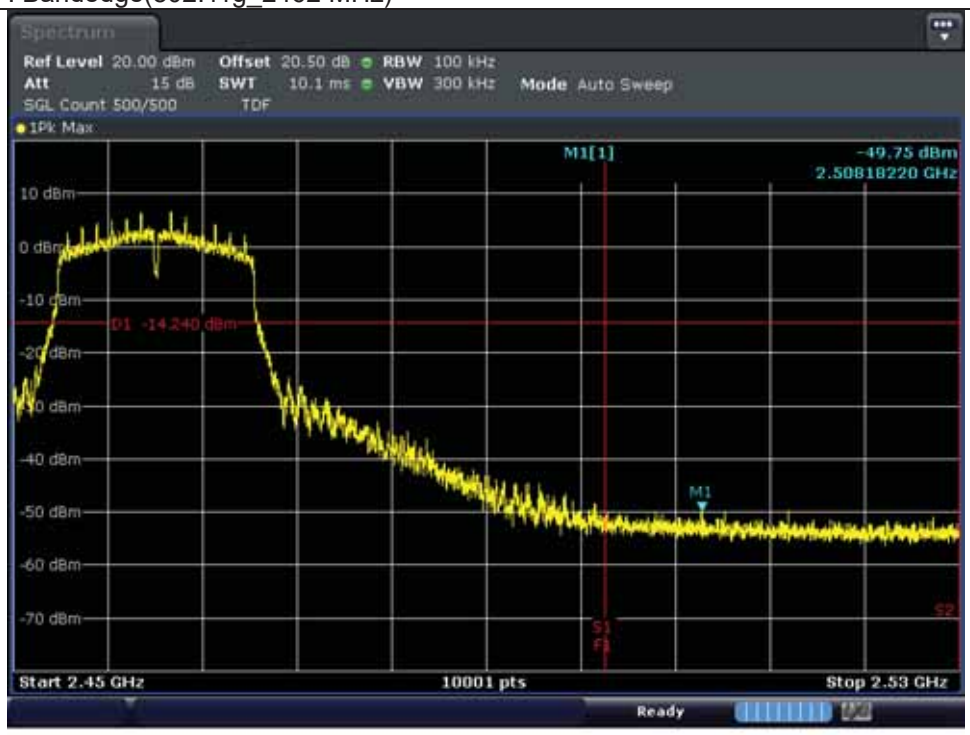
Test mode : Reference(802.11g_2437 MHz)

Test mode : Conducted Spurious Emission(802.11g_2437 MHz)

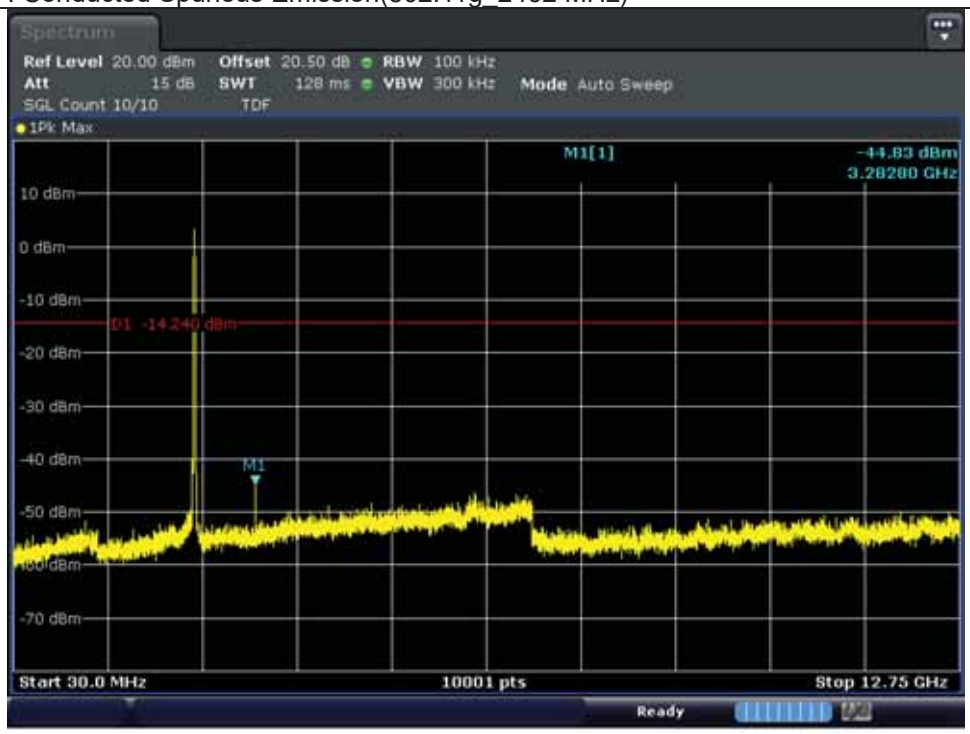


Test mode : Reference(802.11g_2462 MHz)

Test mode : Bandedge(802.11g_2462 MHz)

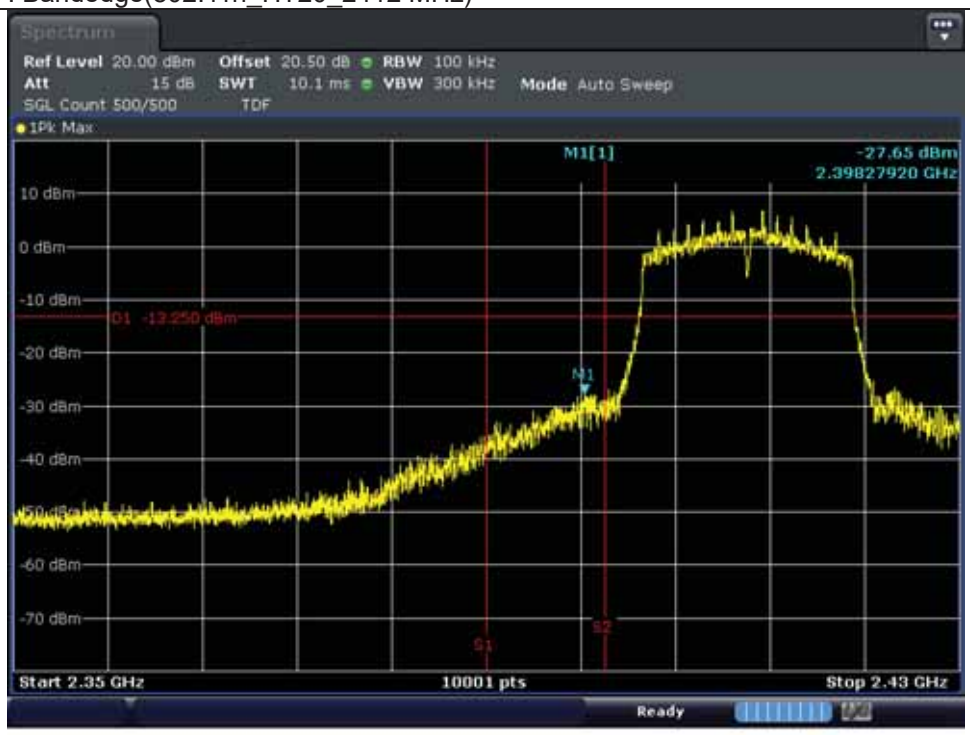


Test mode : Conducted Spurious Emission(802.11g_2462 MHz)

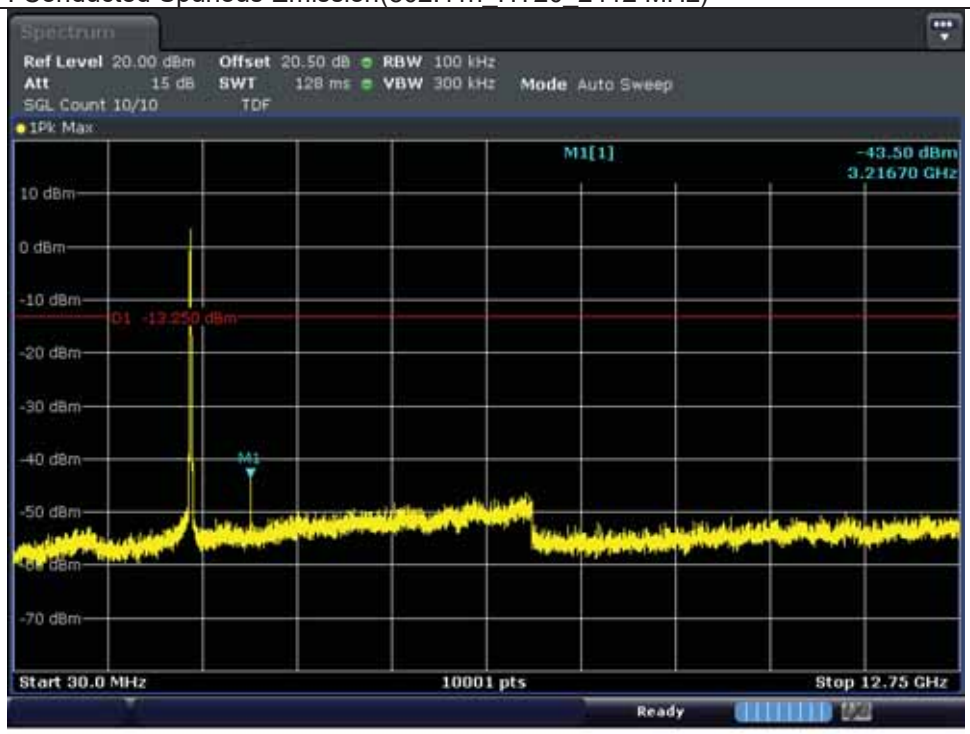


Test mode : Reference(802.11n_HT20_2412 MHz)

Test mode : Bandedge(802.11n_HT20_2412 MHz)

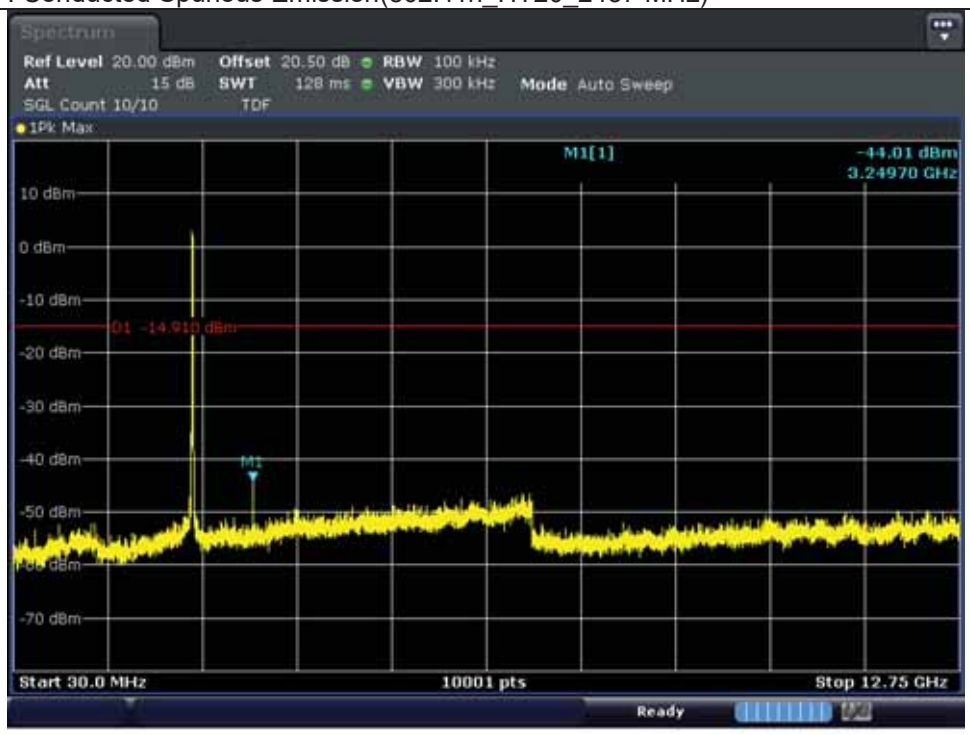


Test mode : Conducted Spurious Emission(802.11n_HT20_2412 MHz)



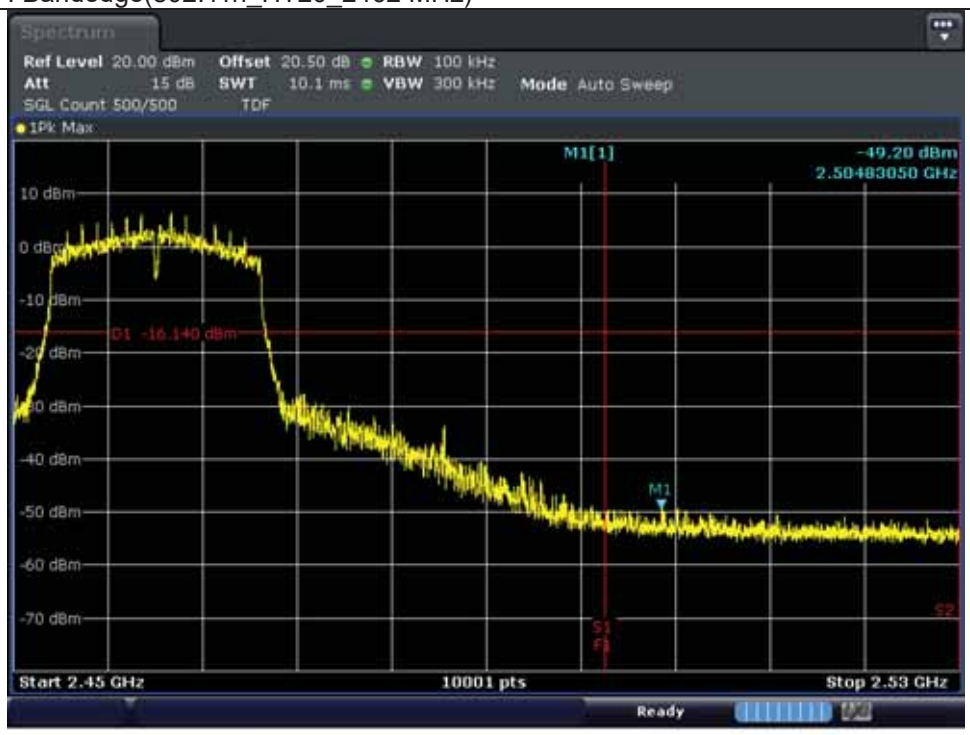
Test mode : Reference(802.11n_HT20_2437 MHz)

Test mode : Conducted Spurious Emission(802.11n_HT20_2437 MHz)

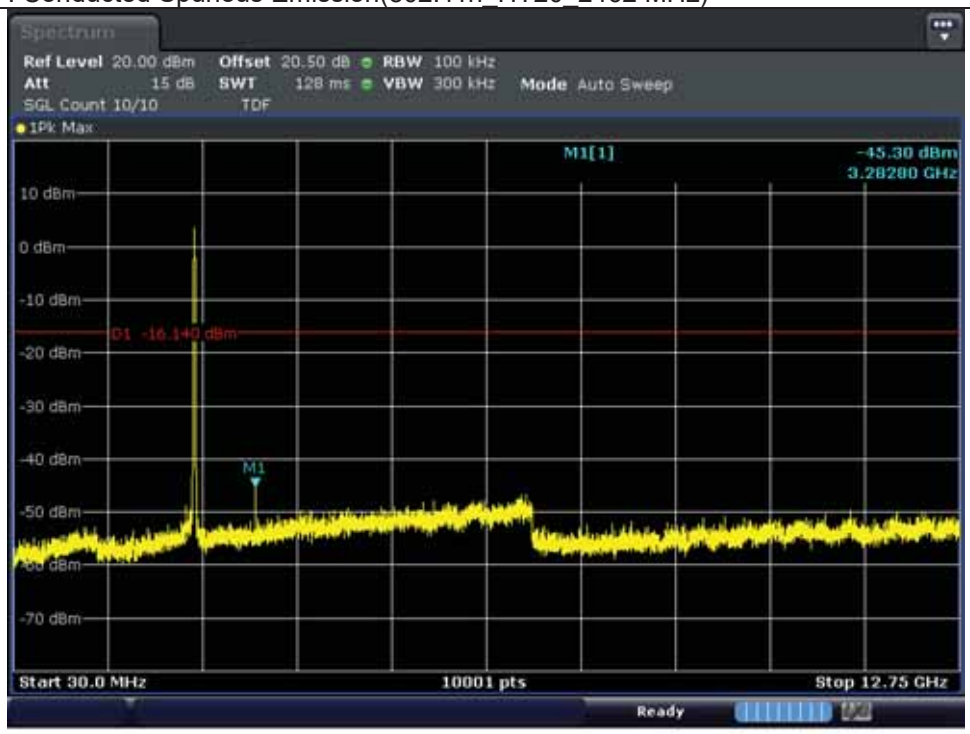


Test mode : Reference(802.11n_HT20_2462 MHz)

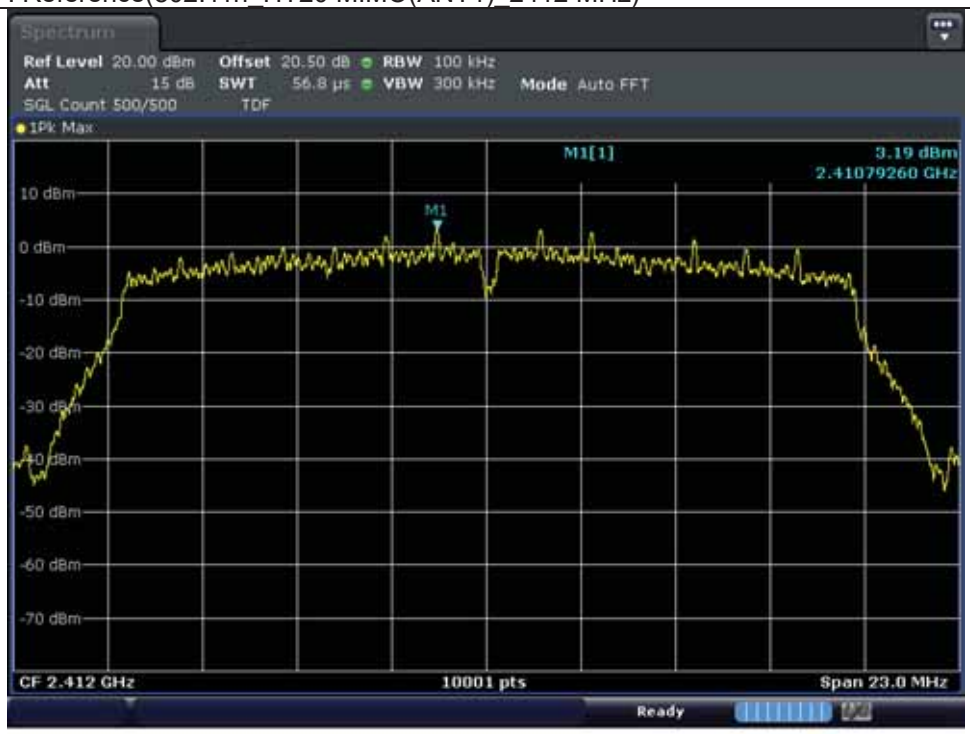
Test mode : Bandedge(802.11n_HT20_2462 MHz)



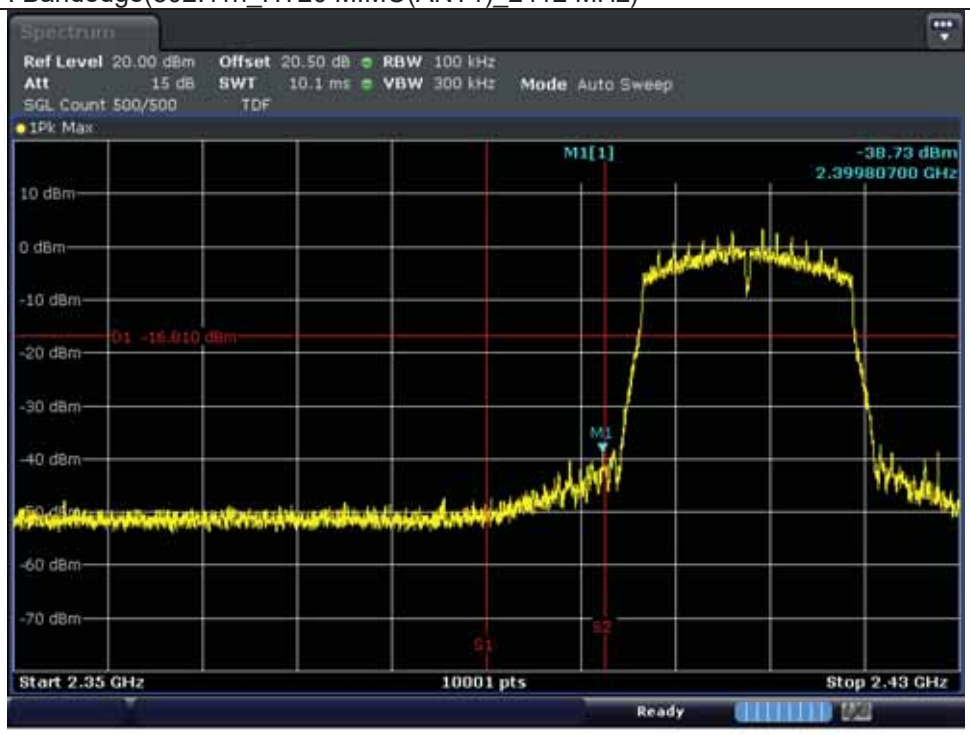
Test mode : Conducted Spurious Emission(802.11n_HT20_2462 MHz)



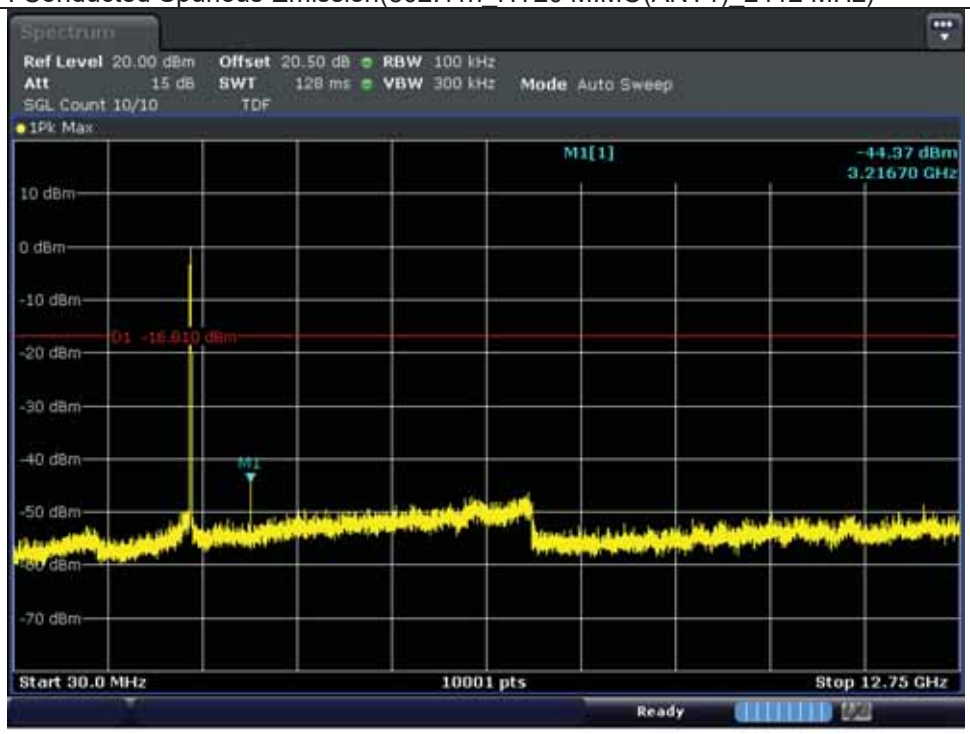
Test mode : Reference(802.11n_HT20 MIMO(ANT1)_2412 MHz)



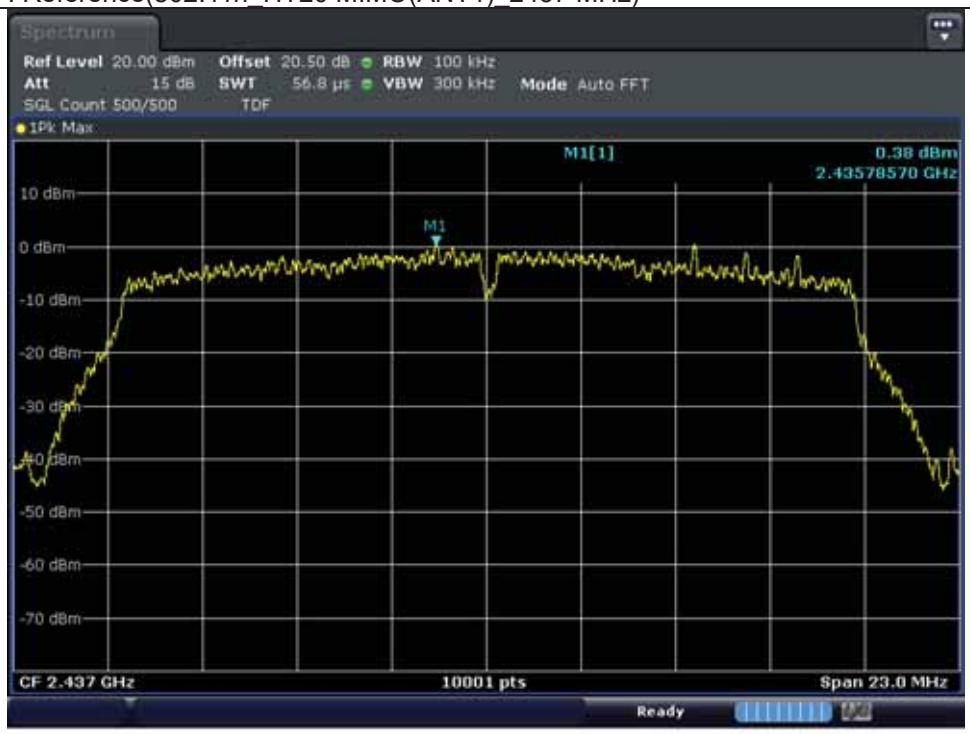
Test mode : Bandedge(802.11n_HT20 MIMO(ANT1)_2412 MHz)



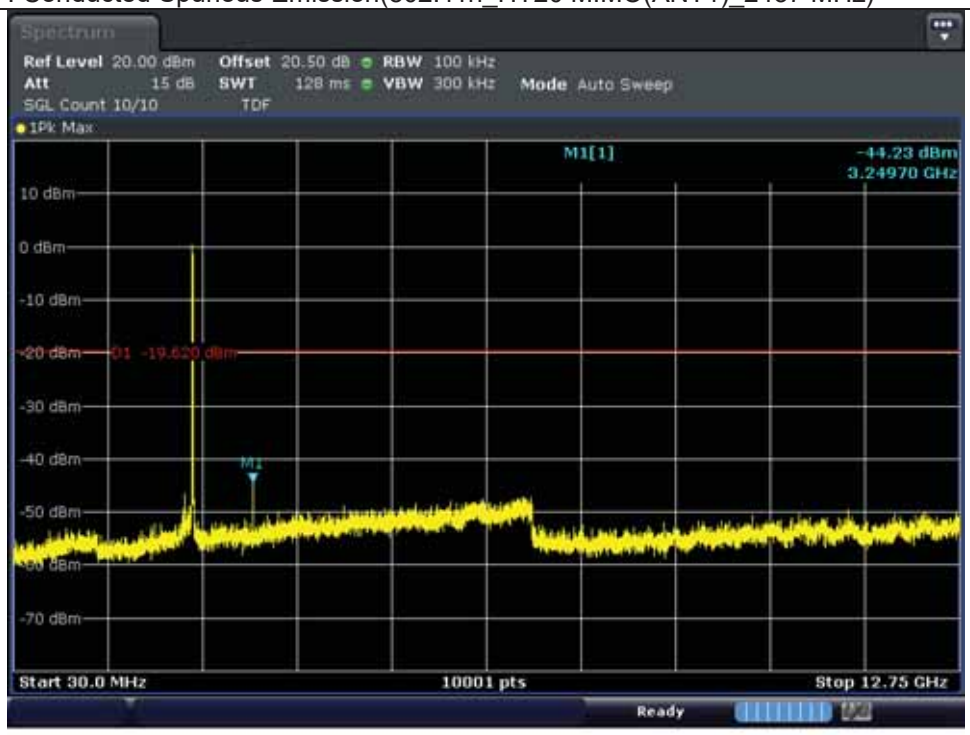
Test mode : Conducted Spurious Emission(802.11n_HT20 MIMO(ANT1)_2412 MHz)



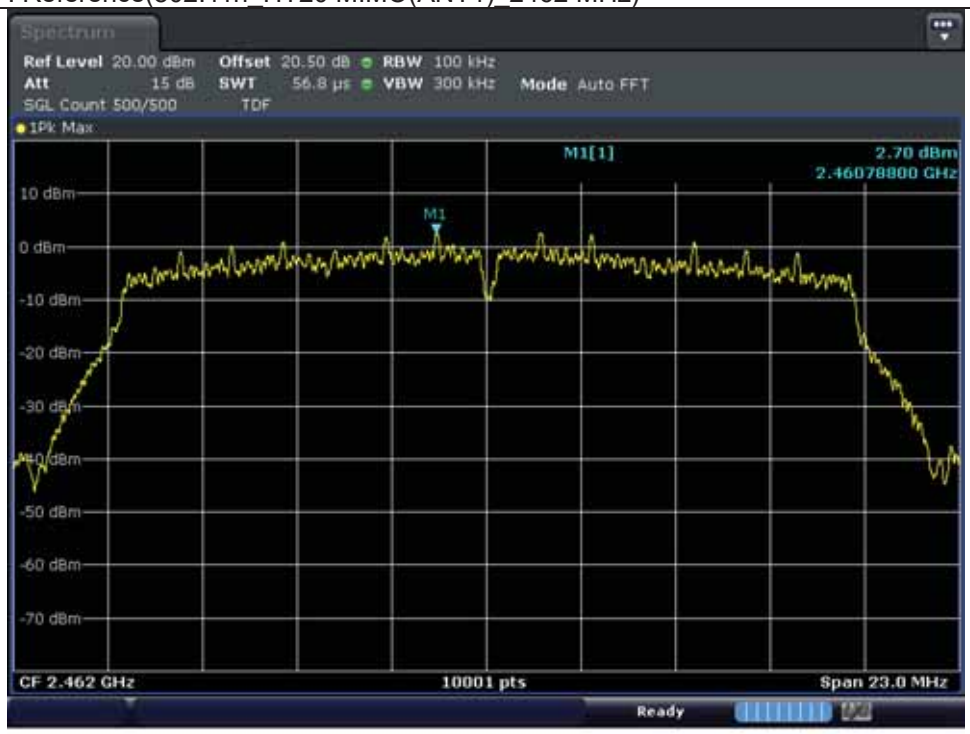
Test mode : Reference(802.11n_HT20 MIMO(ANT1)_2437 MHz)



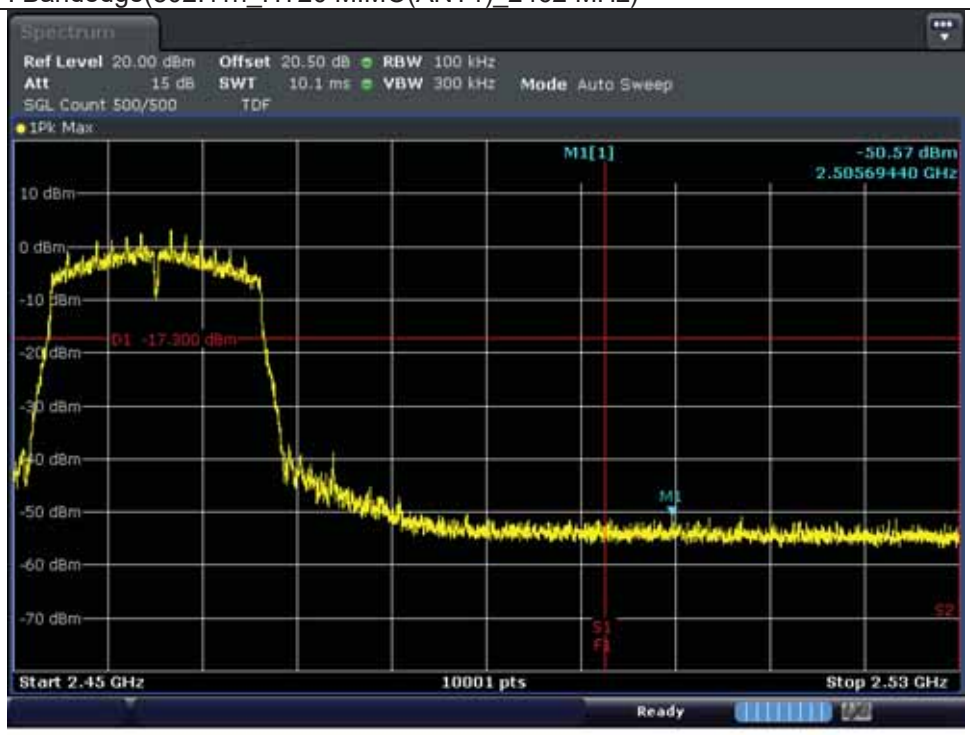
Test mode : Conducted Spurious Emission(802.11n_HT20 MIMO(ANT1)_2437 MHz)



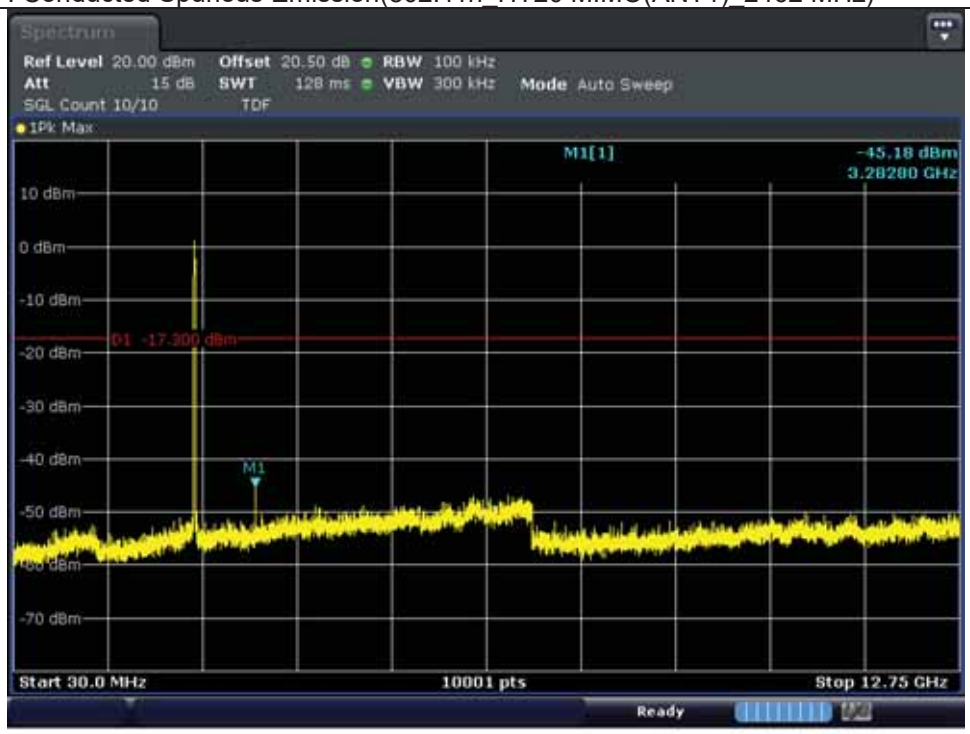
Test mode : Reference(802.11n_HT20 MIMO(ANT1)_2462 MHz)



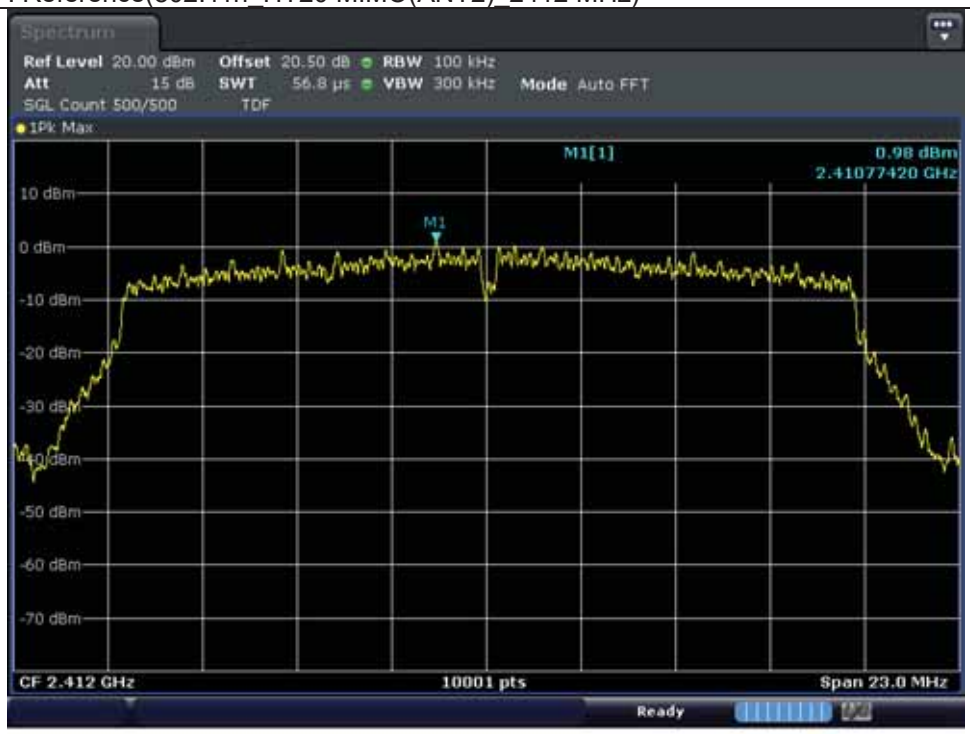
Test mode : Bandedge(802.11n_HT20 MIMO(ANT1)_2462 MHz)



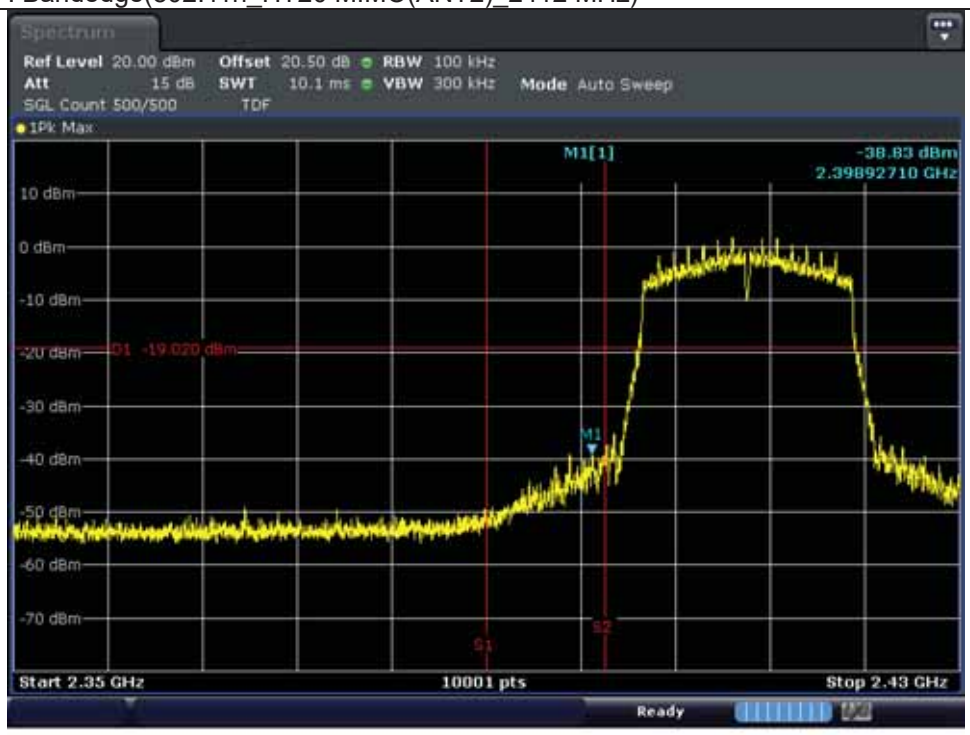
Test mode : Conducted Spurious Emission(802.11n_HT20 MIMO(ANT1)_2462 MHz)



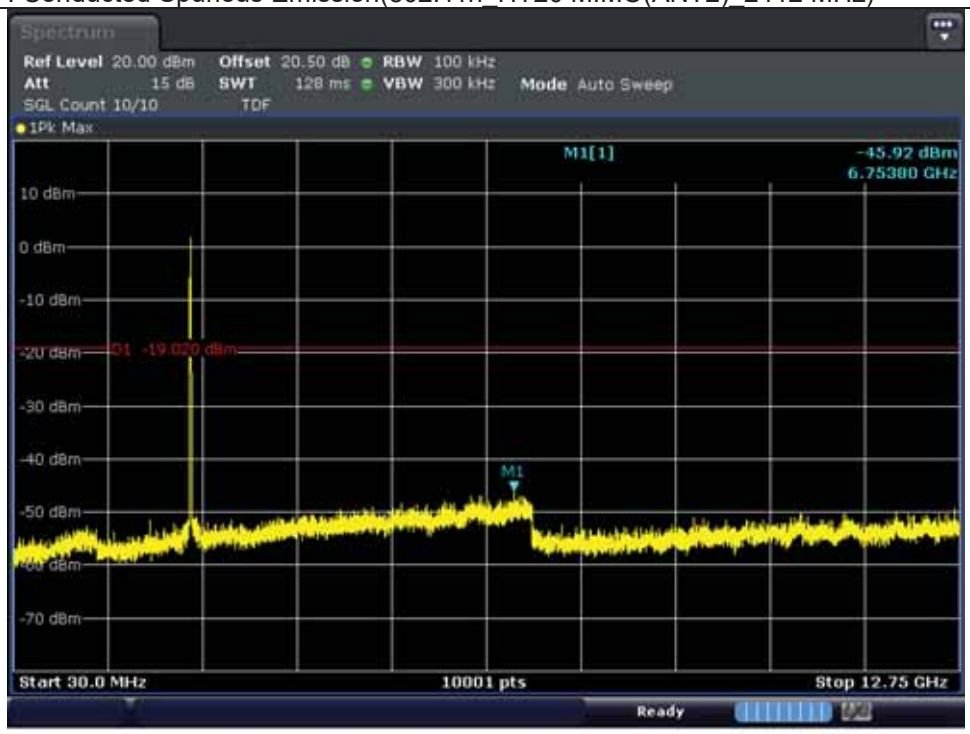
Test mode : Reference(802.11n_HT20 MIMO(ANT2)_2412 MHz)



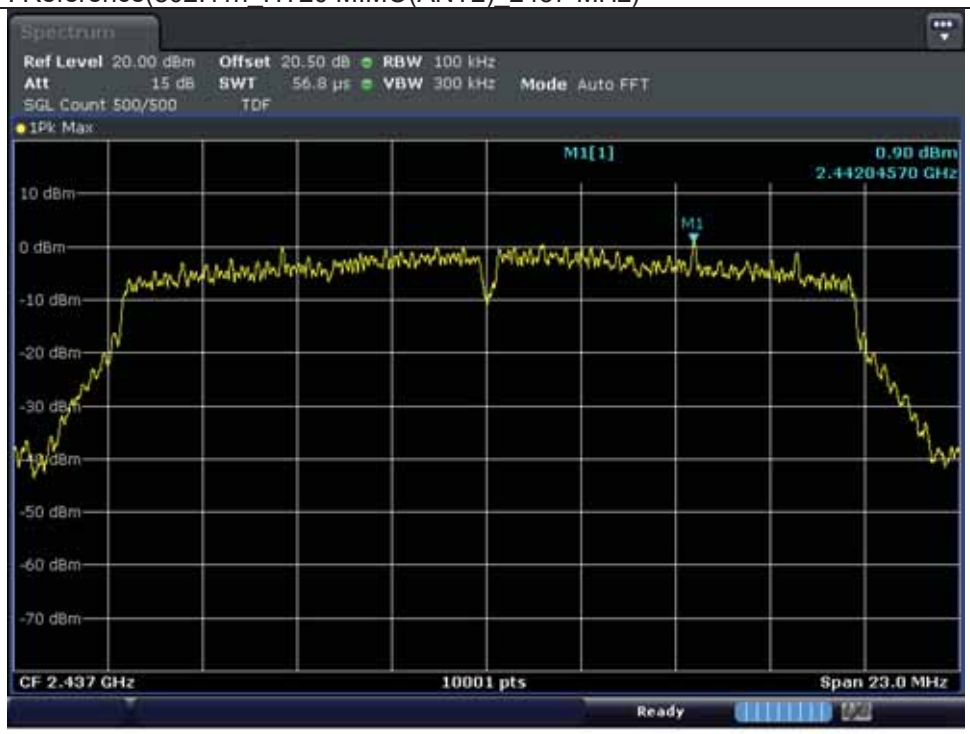
Test mode : Bandedge(802.11n_HT20 MIMO(ANT2)_2412 MHz)



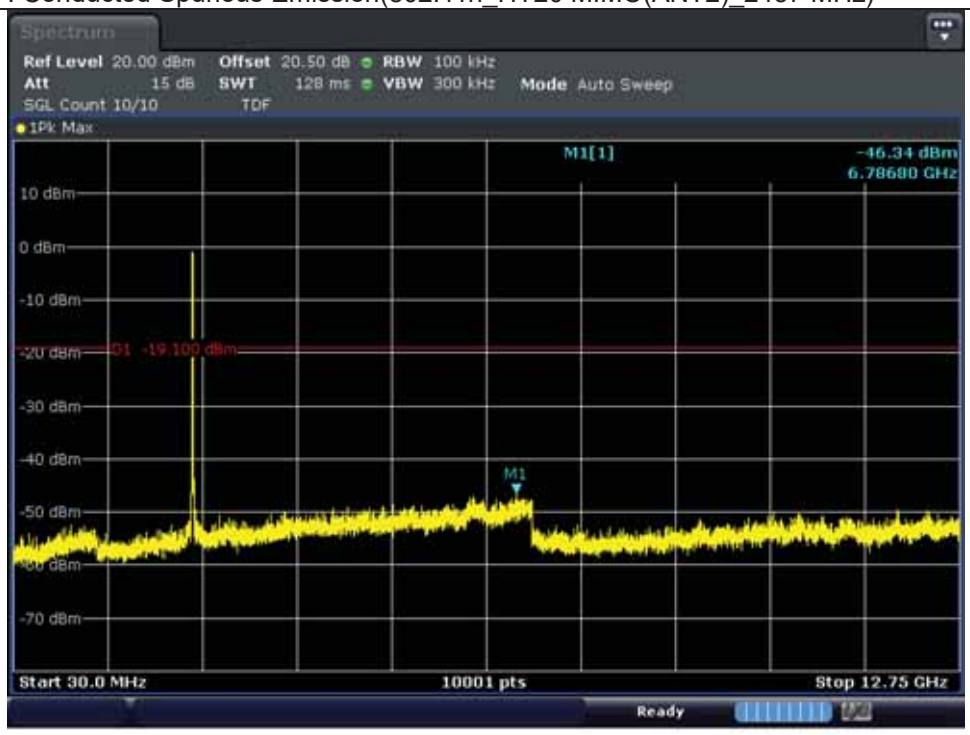
Test mode : Conducted Spurious Emission(802.11n_HT20 MIMO(ANT2)_2412 MHz)



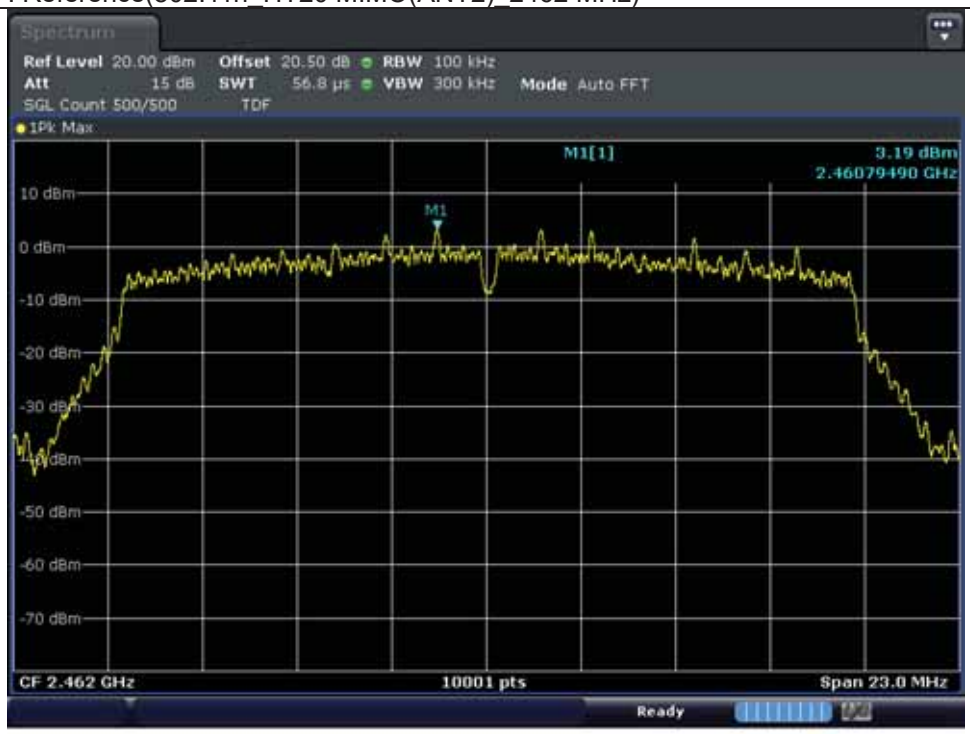
Test mode : Reference(802.11n_HT20 MIMO(ANT2)_2437 MHz)



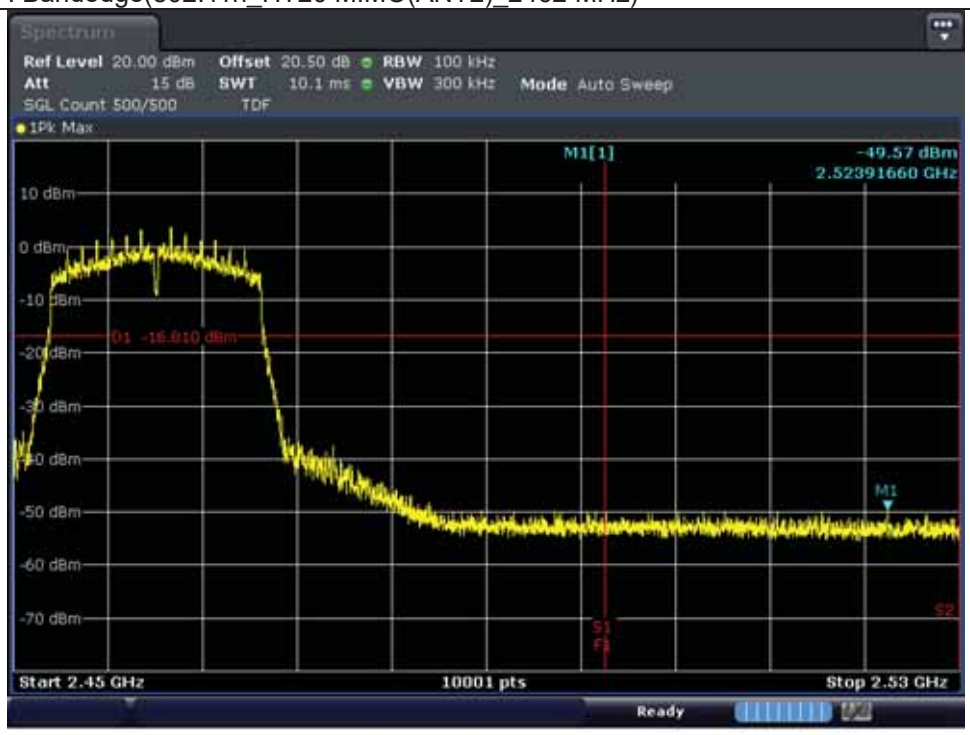
Test mode : Conducted Spurious Emission(802.11n_HT20 MIMO(ANT2)_2437 MHz)



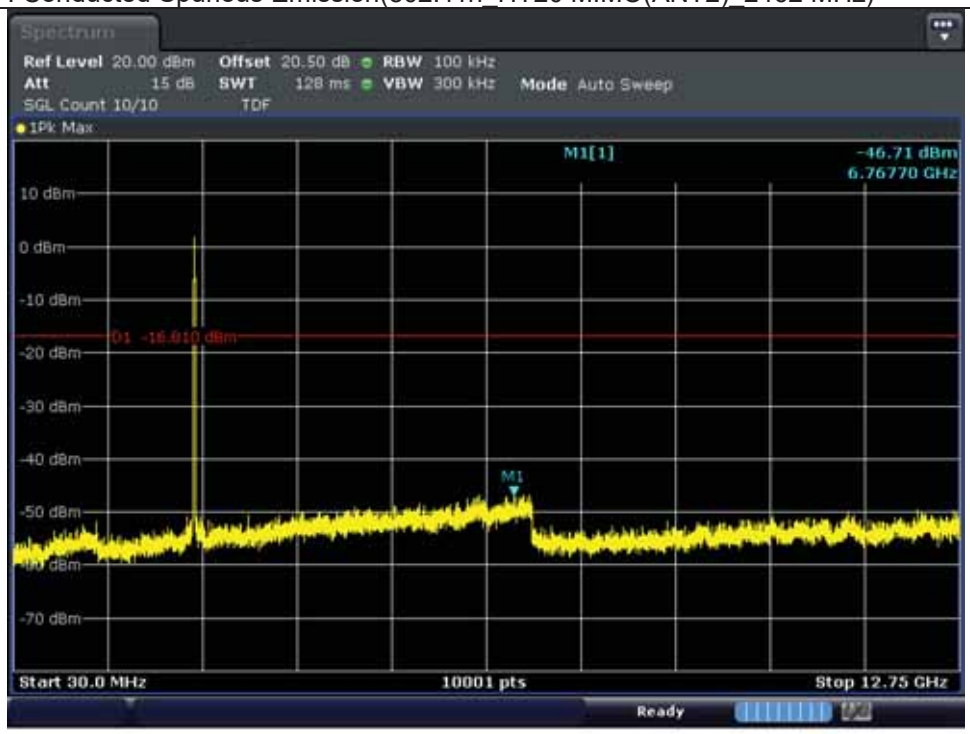
Test mode : Reference(802.11n_HT20 MIMO(ANT2)_2462 MHz)



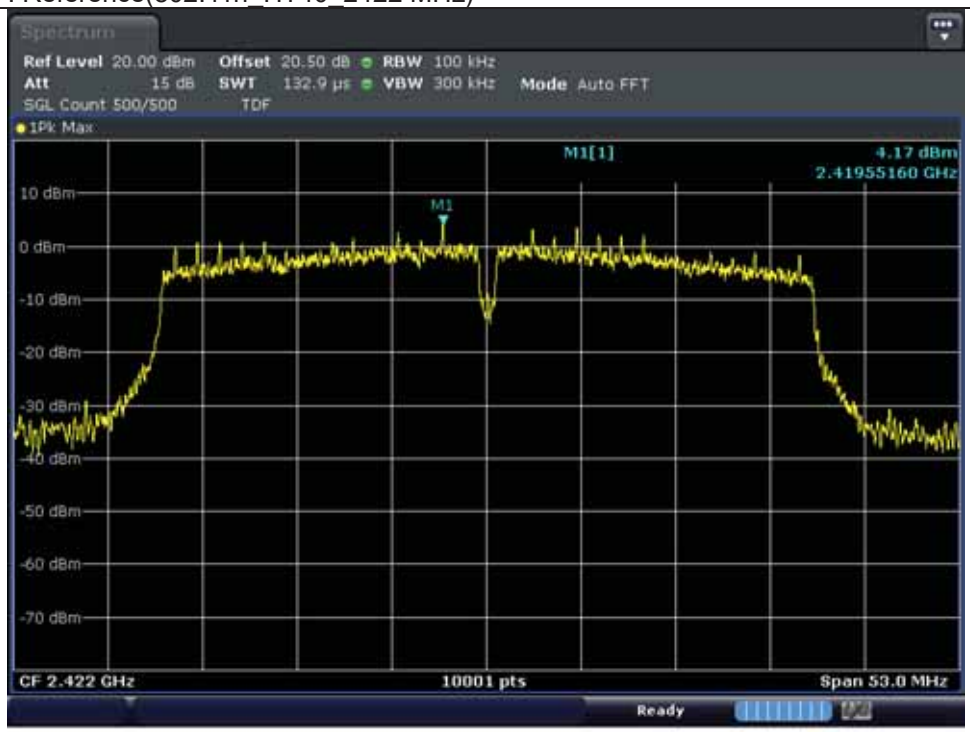
Test mode : Bandedge(802.11n_HT20 MIMO(ANT2)_2462 MHz)



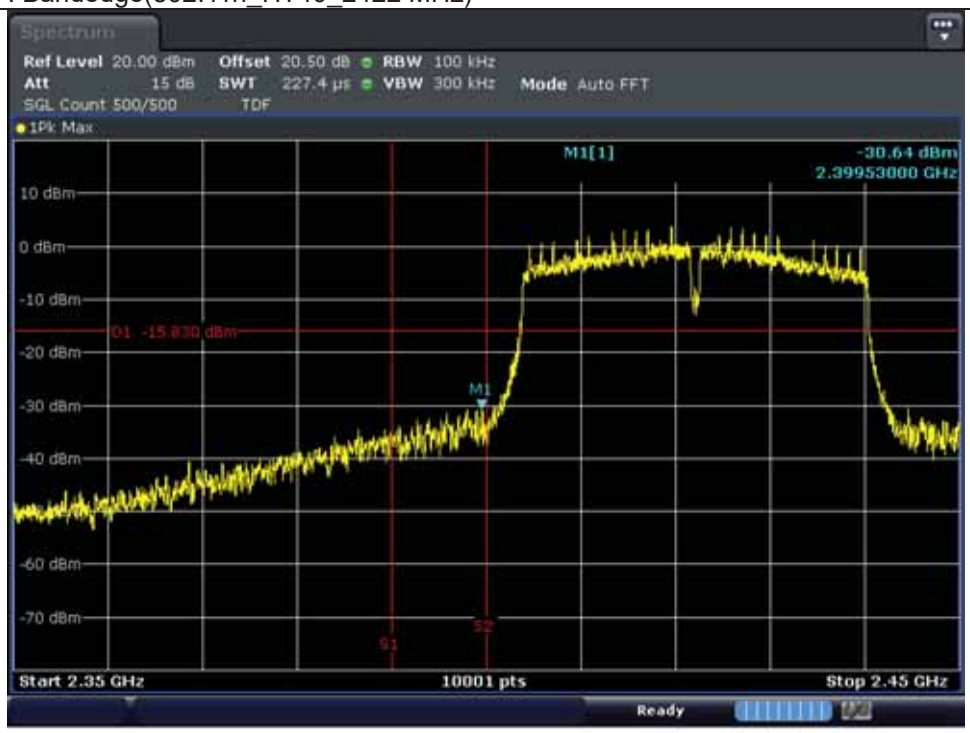
Test mode : Conducted Spurious Emission(802.11n_HT20 MIMO(ANT2)_2462 MHz)



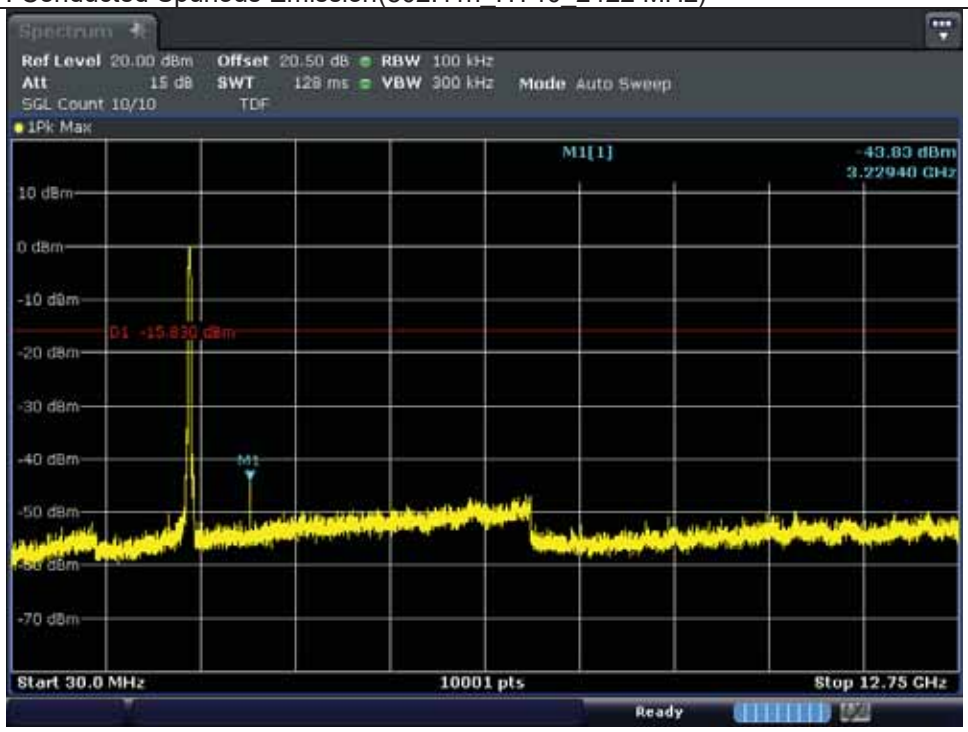
Test mode : Reference(802.11n_HT40_2422 MHz)



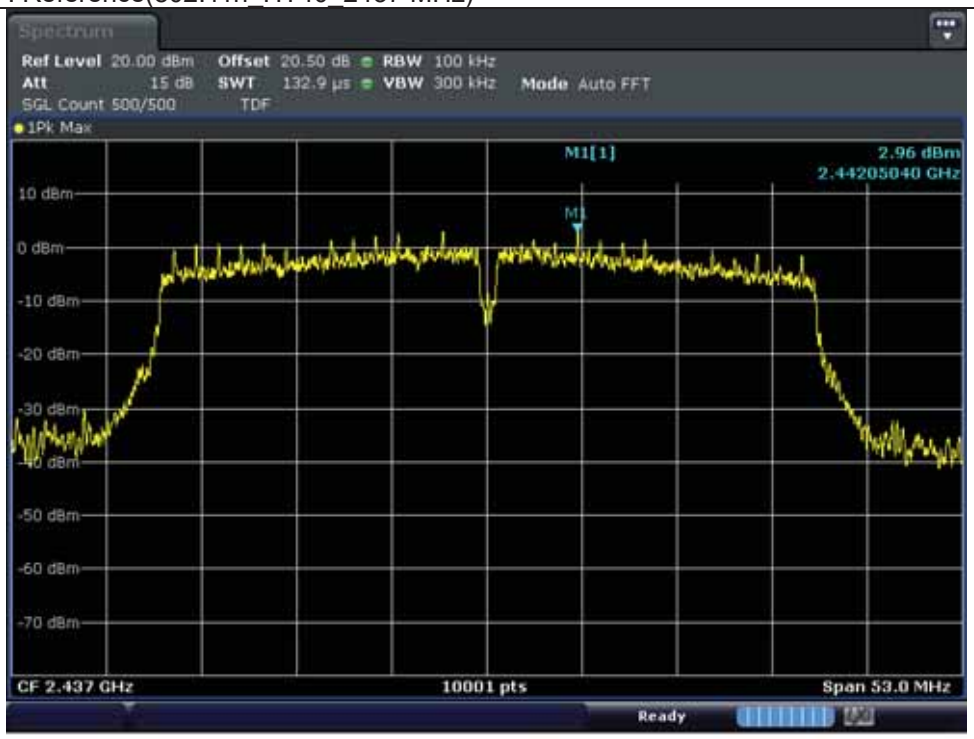
Test mode : Bandedge(802.11n_HT40_2422 MHz)



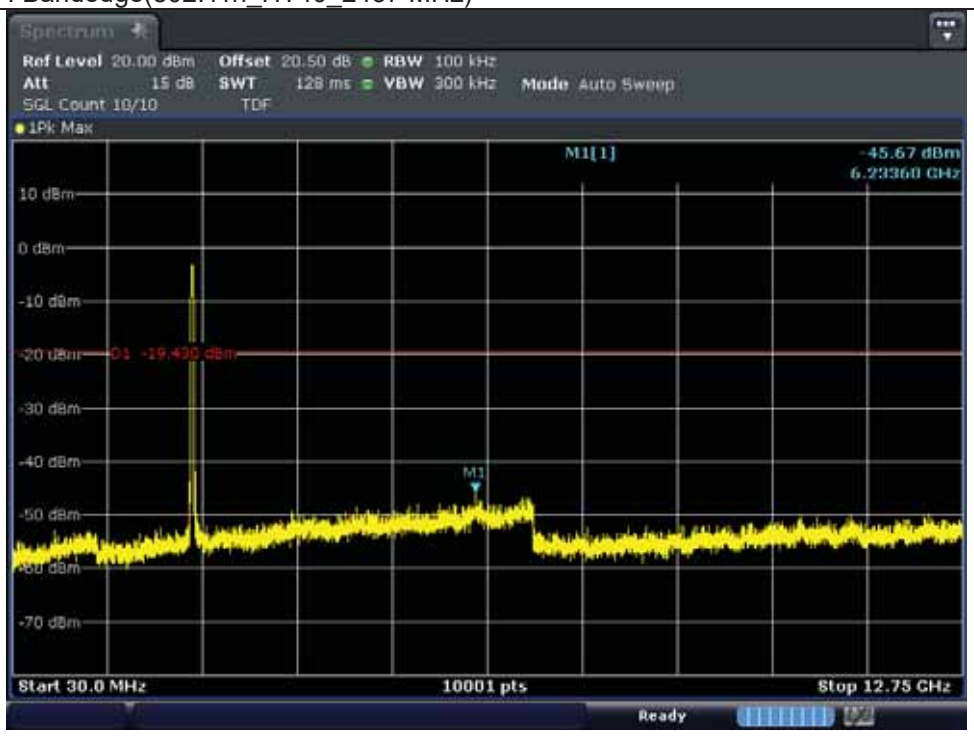
Test mode : Conducted Spurious Emission(802.11n_HT40_2422 MHz)



Test mode : Reference(802.11n_HT40_2437 MHz)

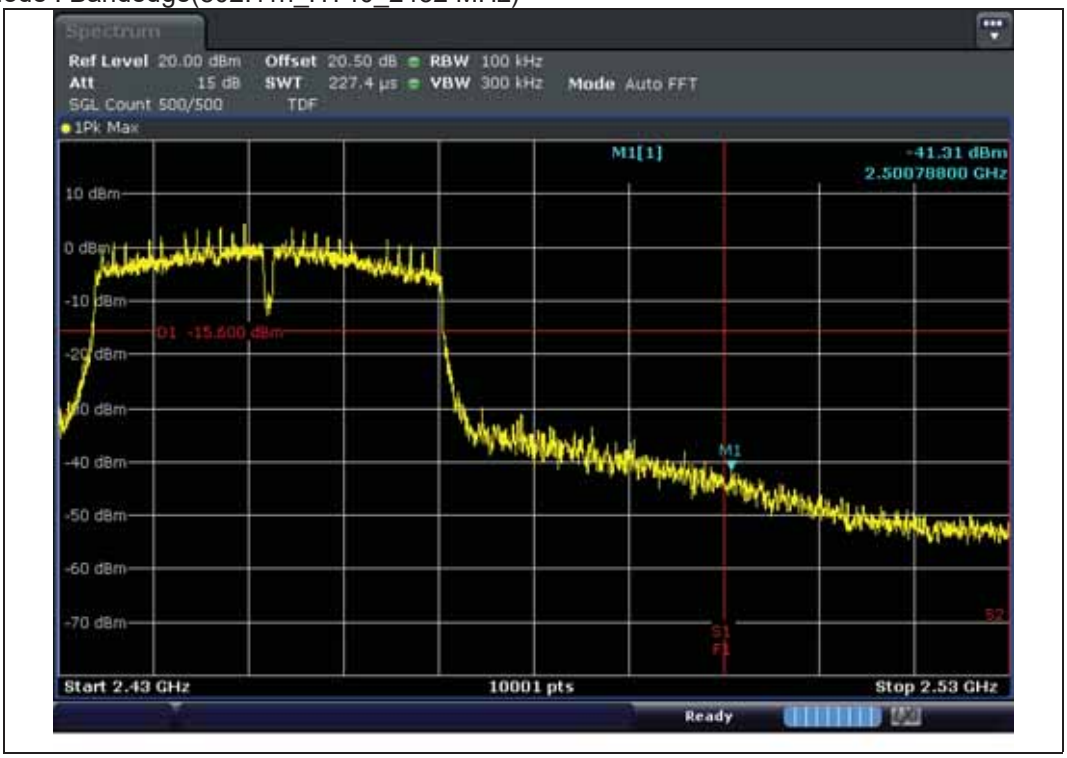


Test mode : Bandedge(802.11n_HT40_2437 MHz)

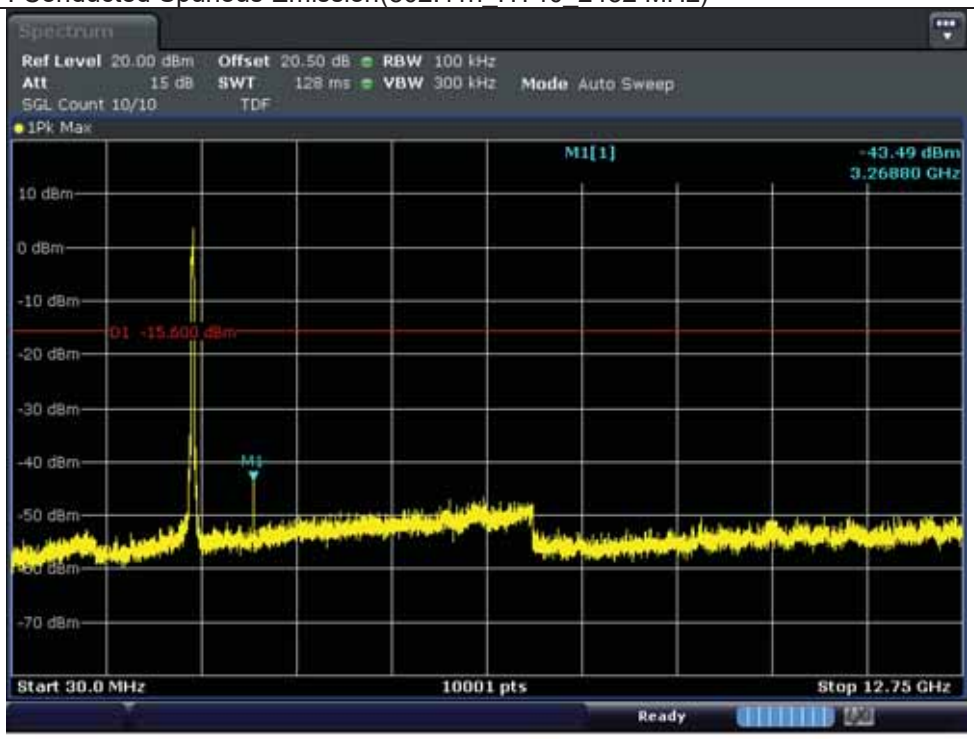


Test mode : Reference(802.11n_HT40_2452 MHz)

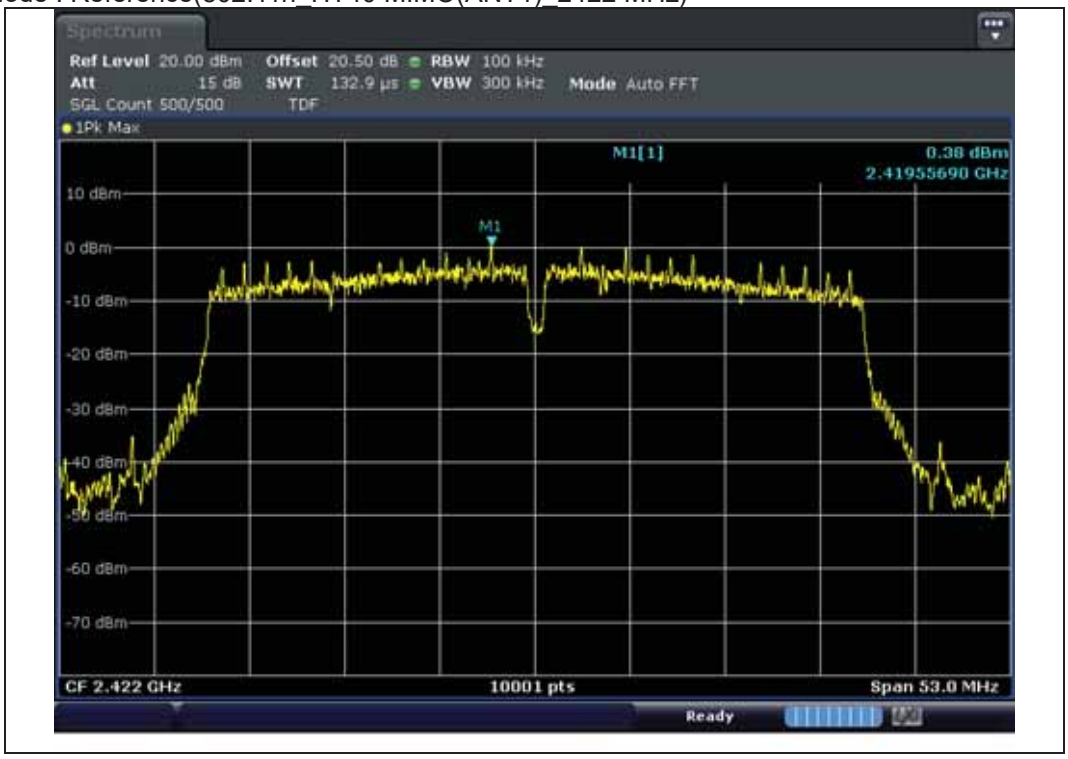
Test mode : Bandedge(802.11n_HT40_2452 MHz)



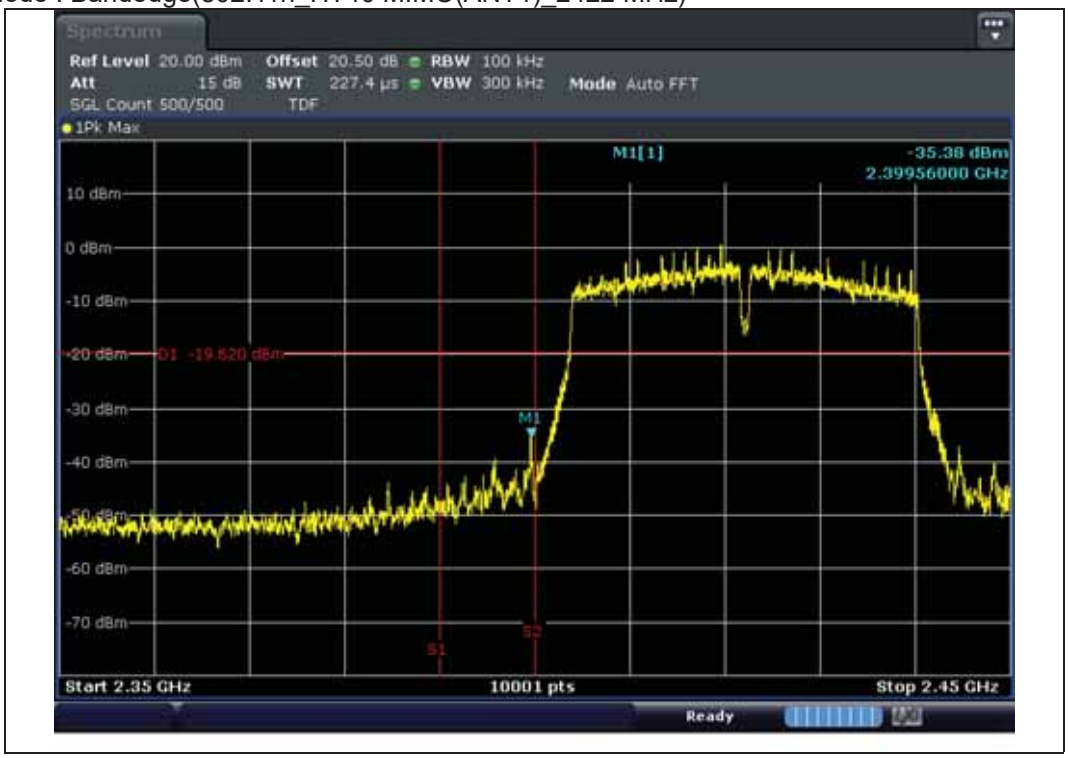
Test mode : Conducted Spurious Emission(802.11n_HT40_2452 MHz)



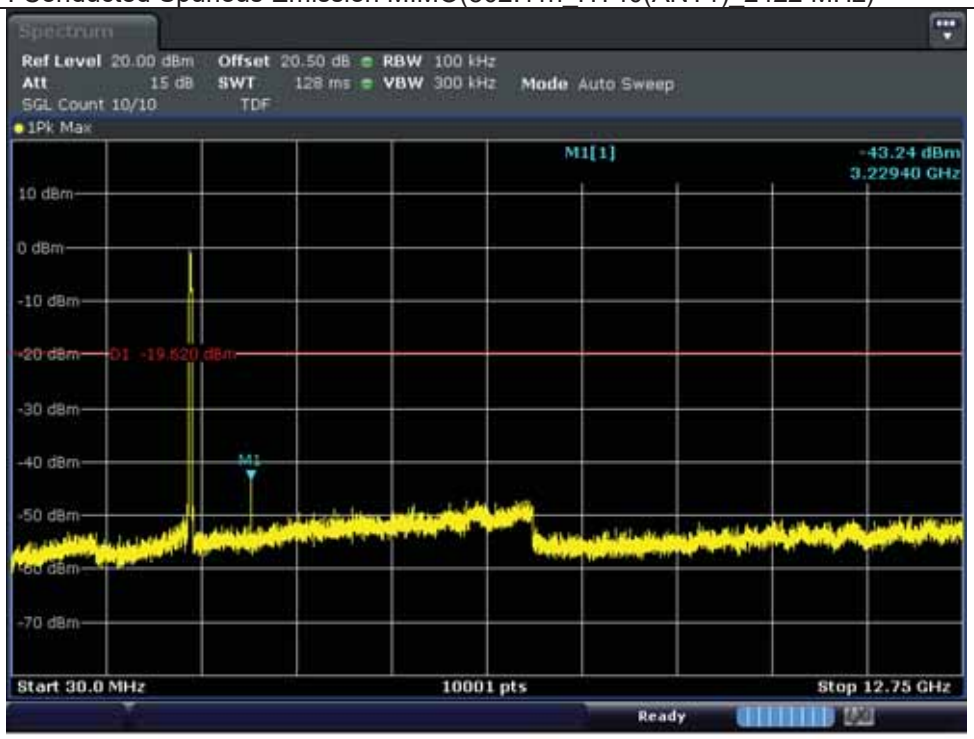
Test mode : Reference(802.11n_HT40 MIMO(ANT1)_2422 MHz)



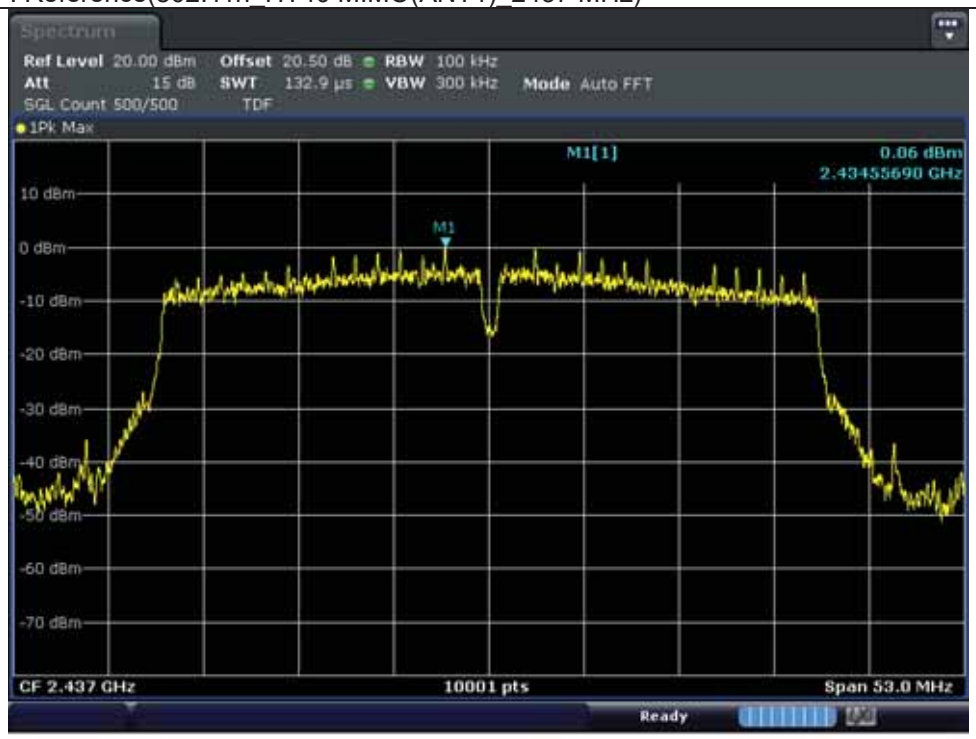
Test mode : Bandedge(802.11n_HT40 MIMO(ANT1)_2422 MHz)



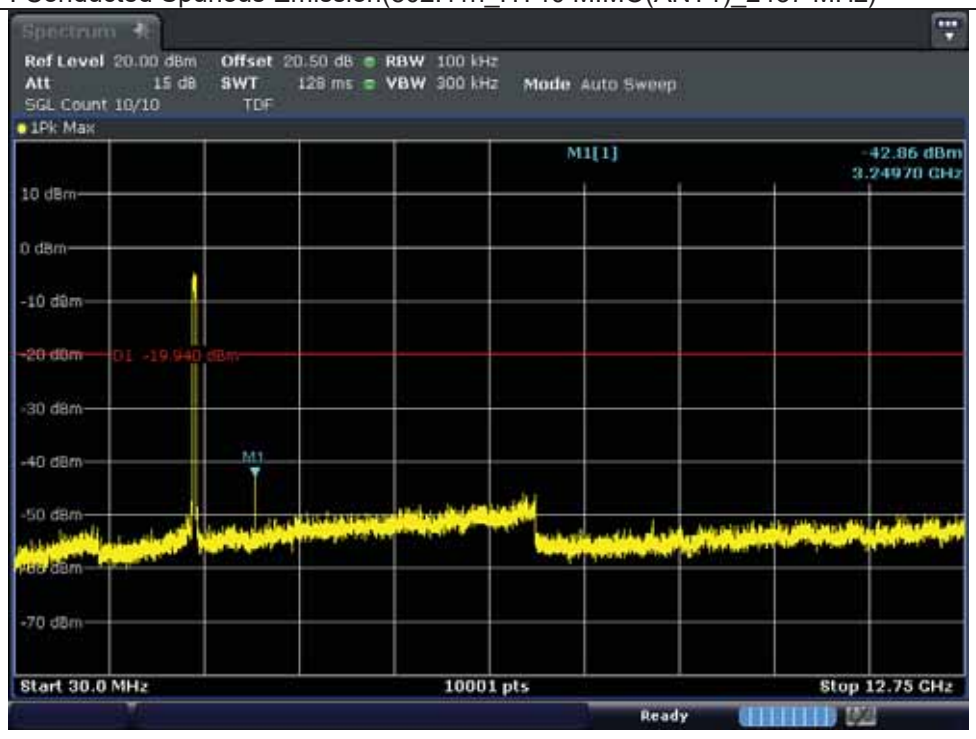
Test mode : Conducted Spurious Emission MIMO(802.11n_HT40(ANT1)_2422 MHz)



Test mode : Reference(802.11n_HT40 MIMO(ANT1)_2437 MHz)

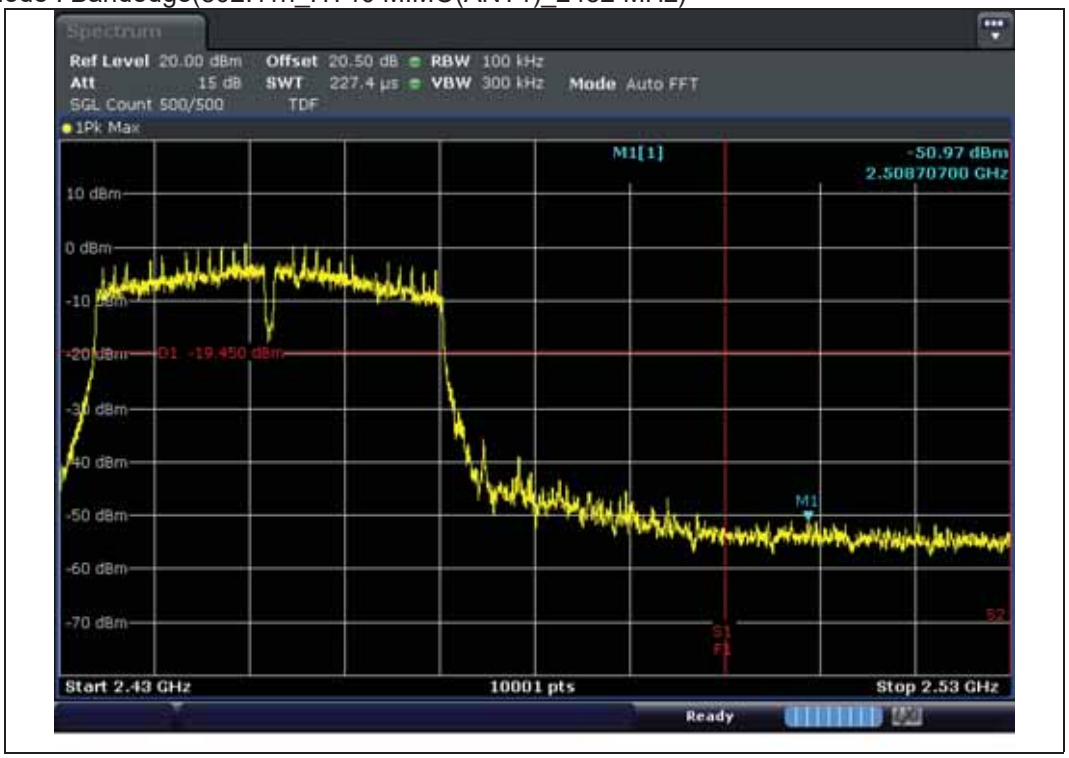


Test mode : Conducted Spurious Emission(802.11n_HT40 MIMO(ANT1)_2437 MHz)

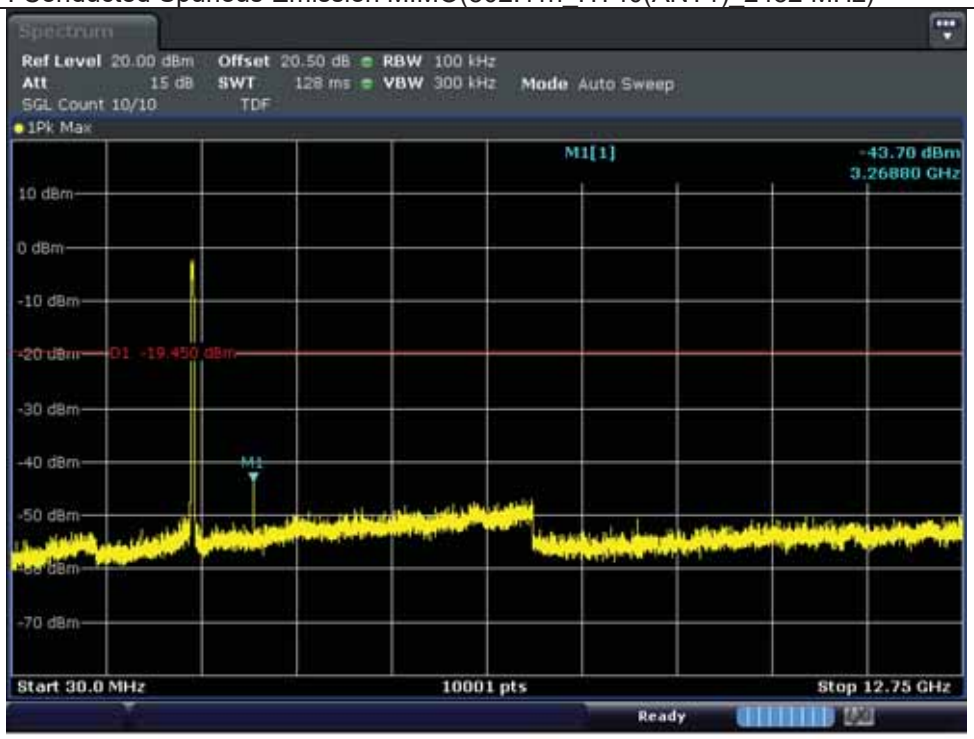


Test mode : Reference(802.11n_HT40 MIMO(ANT1)_2452 MHz)

Test mode : Bandedge(802.11n_HT40 MIMO(ANT1)_2452 MHz)



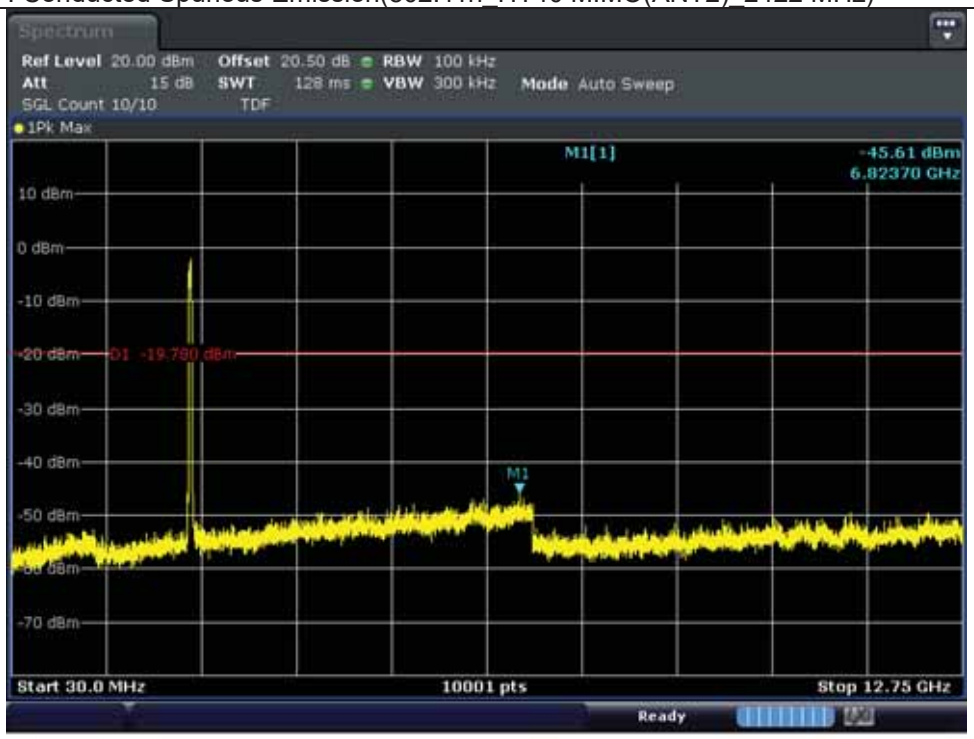
Test mode : Conducted Spurious Emission MIMO(802.11n_HT40(ANT1)_2452 MHz)



Test mode : Reference(802.11n_HT40 MIMO(ANT2)_2422 MHz)

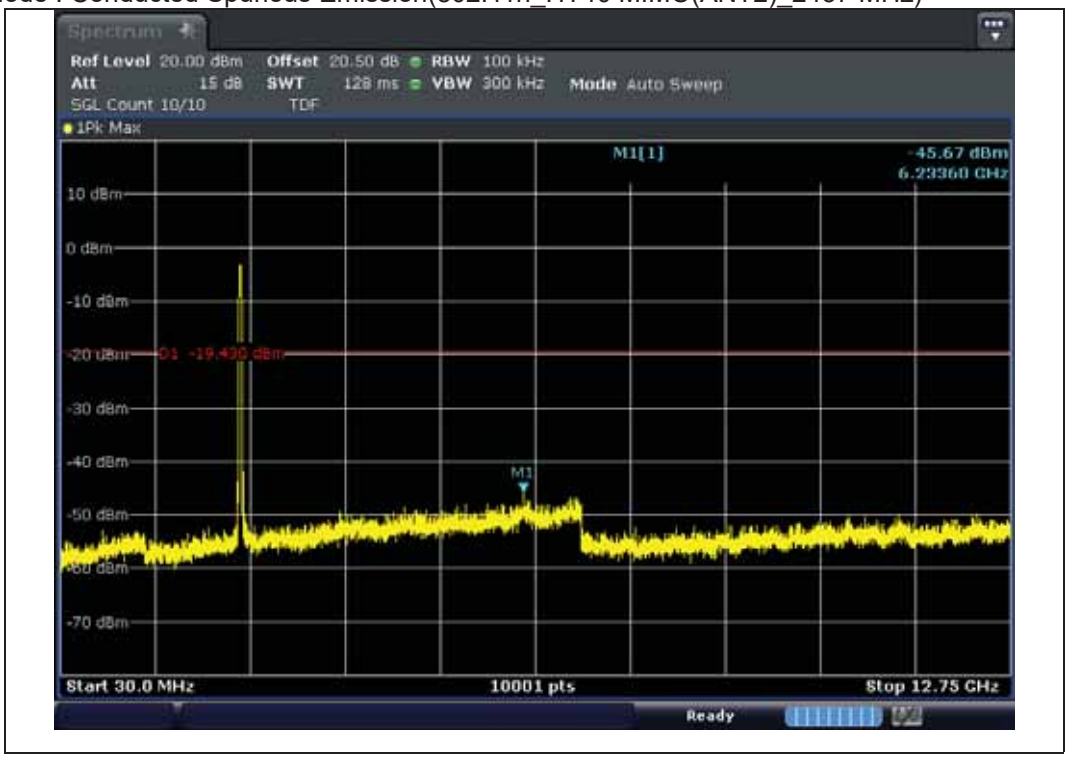
Test mode : Bandedge(802.11n_HT40 MIMO(ANT2)_2422 MHz)

Test mode : Conducted Spurious Emission(802.11n_HT40 MIMO(ANT2)_2422 MHz)



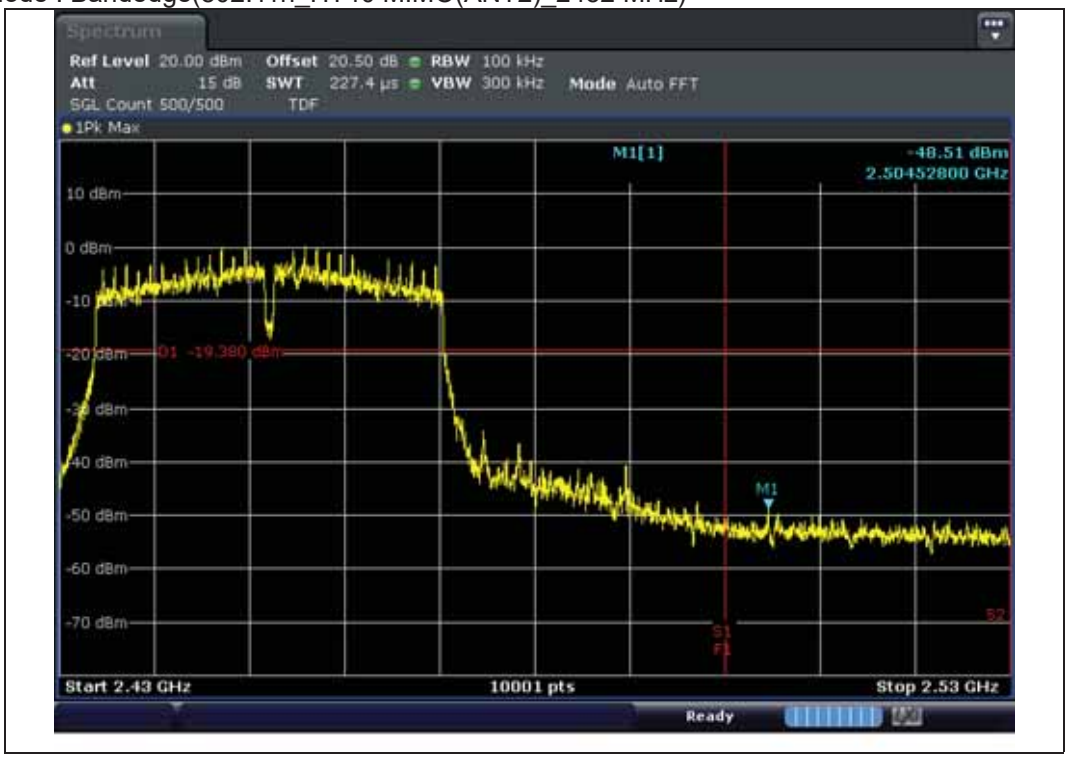
Test mode : Reference(802.11n_HT40 MIMO(ANT2)_2437 MHz)

Test mode : Conducted Spurious Emission(802.11n_HT40 MIMO(ANT2)_2437 MHz)

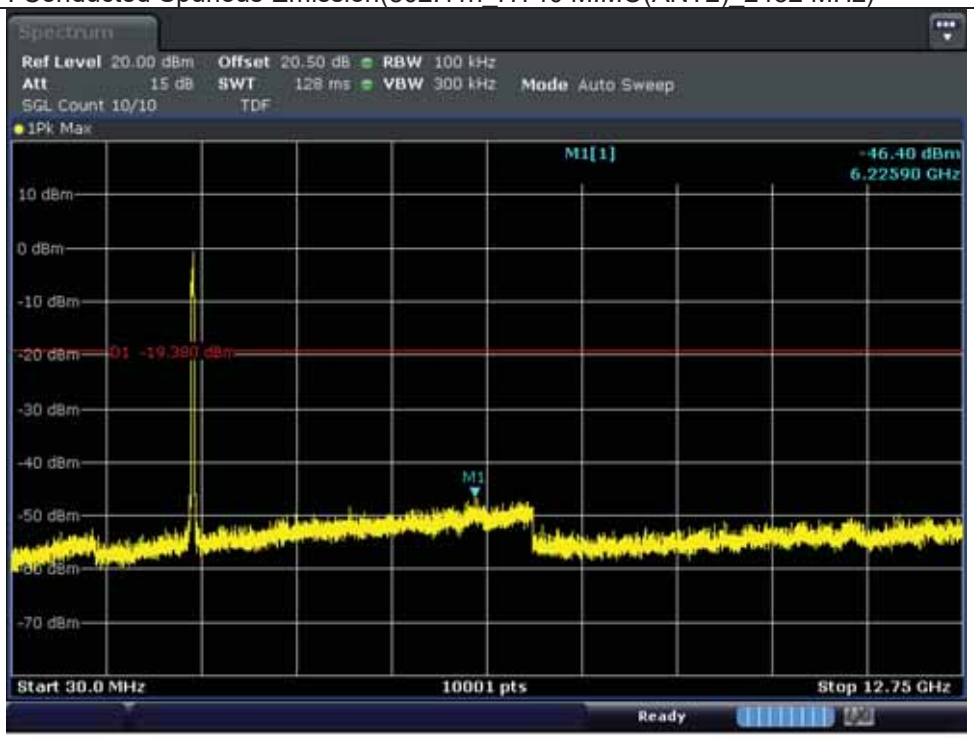


Test mode : Reference(802.11n_HT40 MIMO(ANT2)_2452 MHz)

Test mode : Bandedge(802.11n_HT40 MIMO(ANT2)_2452 MHz)



Test mode : Conducted Spurious Emission(802.11n_HT40 MIMO(ANT2)_2452 MHz)

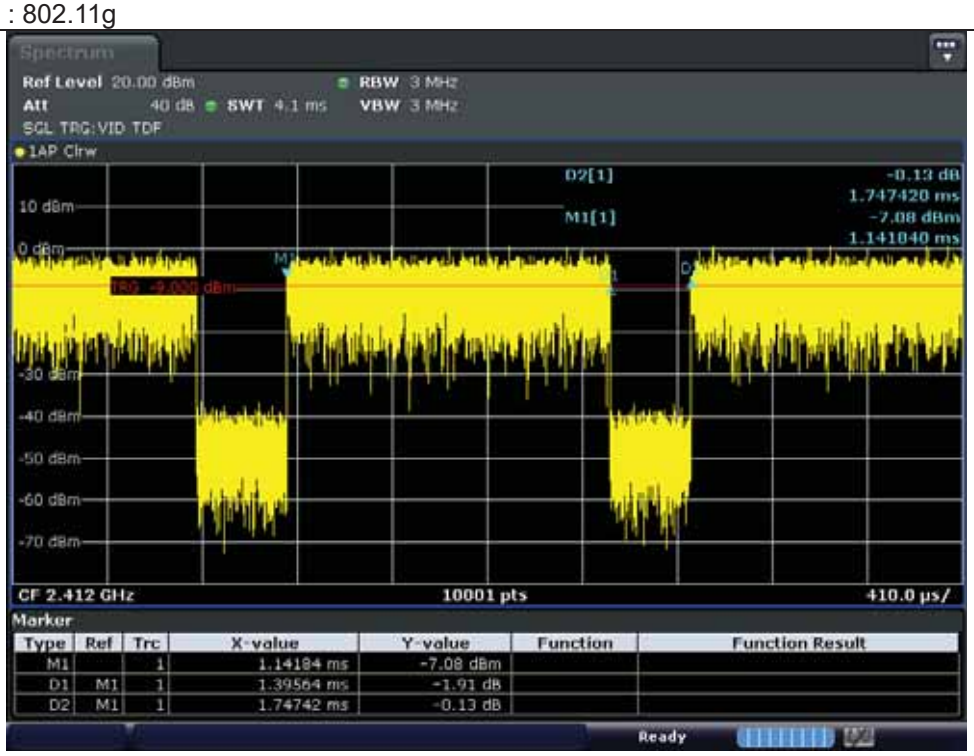


4.4.5.8 Measurement data_Duty Cycle

Test mode : 802.11b

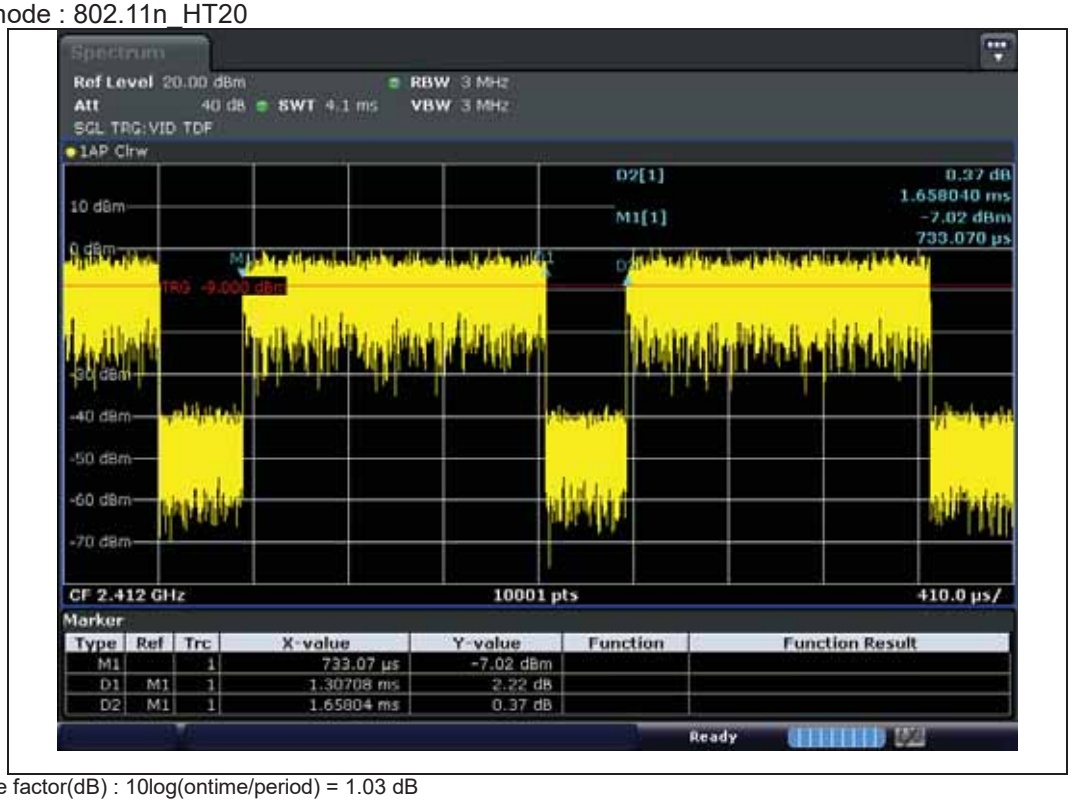
Average factor(dB) : 10log(ontime/period) = 0.21 dB

Test mode : 802.11g



Average factor(dB) : 10log(ontime/period) = 0.96 dB

Test mode : 802.11n_HT20



Average factor(dB) : 10log(ontime/period) = 1.03 dB

Test mode : 802.11n_HT20 MIMO

Average factor(dB) : 10log(ontime/period) = 1.78 dB

Test mode : 802.11n_HT40

Average factor(dB) : 10log(ontime/period) = 1.85 dB

Test mode : 802.11n_HT40 MIMO

Average factor(dB) : 10log(ontime/period) = 2.97 dB

4.4.6 Conducted Emission

4.4.6.1 Regulation

According to §15.207(a), and RSS-GEN 8.8 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 μH/50 Ω 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 (dBμV)	
	Qausi-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.

4.4.6.2 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 1.5 m 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 Ω/50 μH 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 is the system) was then performed over the frequency range of 0.15 MHz to 30 MHz.

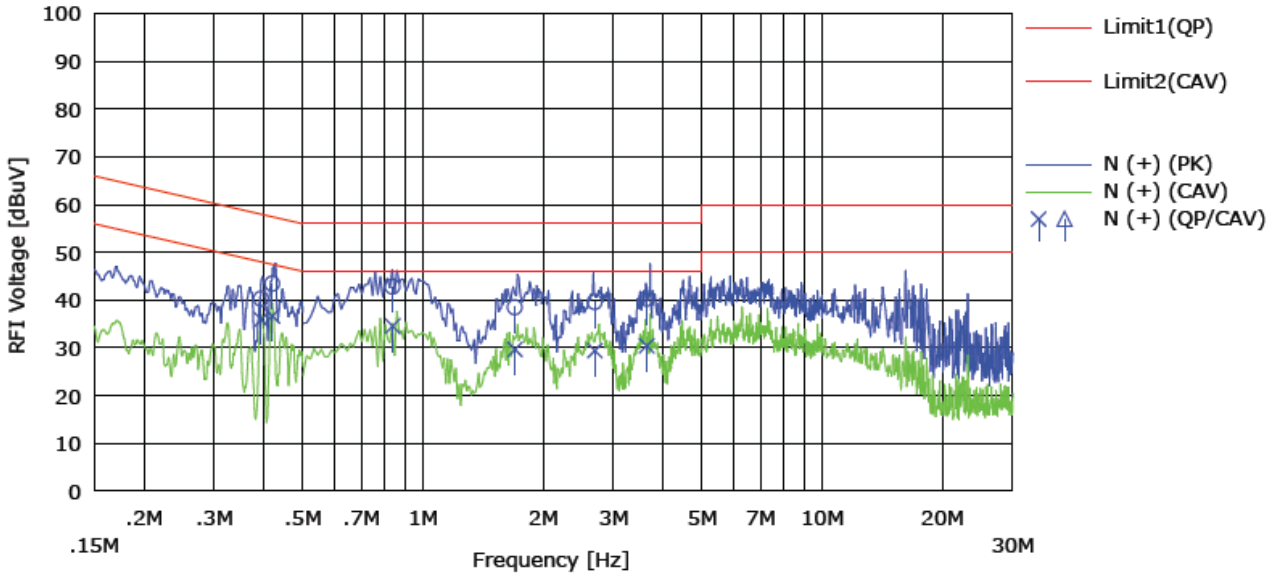
5) The measurements were made with the detector set to PEAK amplitude within a bandwidth of 10 kHz or to QUASIPEAK and AVERAGE within a bandwidth of 9 kHz. The EUT was in transmitting mode during the measurements.

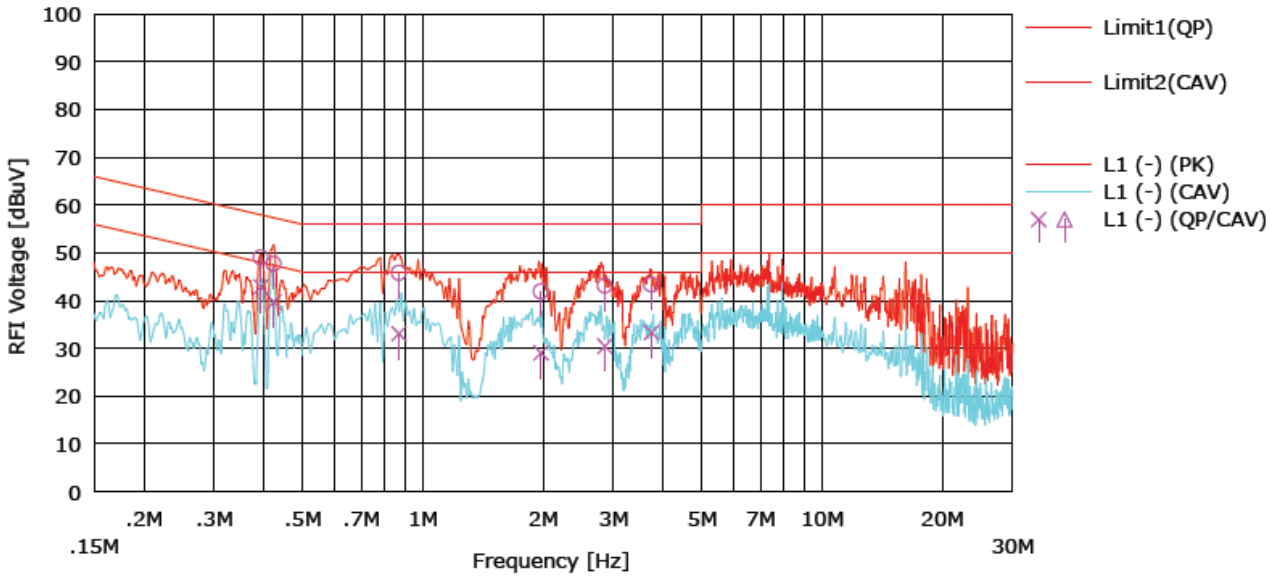
4.4.6.3 Result

Comply (measurement data : refer to the next page)

4.4.6.4 Measurement data

Test mode : 802.11n_HT40 MIMO_2422 MHz + 802.11ac MIMO_5290 MHz





NO	FREQ	READING QP	READING CAV	C.FACTOR	RESULT QP	RESULT CAV	LIMIT QP	LIMIT CAV	MARGIN QP	MARGIN CAV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.39301	20.0	15.7	20.2	40.2	35.9	58.0	48.0	17.8	12.1	N (+)
2	0.41959	23.1	16.4	20.3	43.4	36.7	57.5	47.5	14.1	10.8	N (+)
3	0.83937	22.7	14.5	20.1	42.8	34.6	56.0	46.0	13.2	11.4	N (+)
4	1.69957	18.4	9.7	20.0	38.5	29.7	56.0	46.0	17.5	16.3	N (+)
5	2.69494	19.5	9.4	20.0	39.5	29.4	56.0	46.0	16.5	16.6	N (+)
6	3.63218	20.2	10.4	20.1	40.3	30.5	56.0	46.0	15.7	15.5	N (+)
7	0.39264	28.8	22.6	20.3	49.1	42.9	58.0	48.0	8.9	5.1	L1 (-)
8	0.42292	27.4	19.4	20.3	47.7	39.7	57.4	47.4	9.7	7.7	L1 (-)
9	0.87093	25.7	13.0	20.1	45.8	33.1	56.0	46.0	10.2	12.9	L1 (-)
10	1.97444	21.9	9.0	20.1	41.9	29.1	56.0	46.0	14.1	16.9	L1 (-)
11	2.85585	23.0	10.4	20.1	43.1	30.5	56.0	46.0	12.9	15.5	L1 (-)
12	3.73393	23.2	13.2	20.1	43.3	33.3	56.0	46.0	12.7	12.7	L1 (-)

APPENDIX I

TEST EQUIPMENT USED FOR TESTS

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment.

Equipment	Manufacturer	Model	Serial No.	Cal. Date (yy.mm.dd)	Next Cal.Date (yy.mm.dd)
FSV Signal Analyzer	ROHDE&SCHWARZ	FSV40	101010	2020-04-23	2021-04-23
Power Sensor	KEYSIGHT	U2022XA	MY55320008	2020-08-21	2021-08-21
DC Power Supply	AGILENT	E3632A	MY51160055	2020-04-23	2021-04-23
Digital MultiMeter	HP	34401A	US36025428	2020-01-14	2021-01-14
ATTENUATOR	INMET	26A-20	TR010	2020-10-12	2021-10-12
Signal Generator	ROHDE&SCHWARZ	SMB100A	178384	2020-10-13	2021-10-13
EMI Test Receiver	ROHDE&SCHWARZ	ESU40	100445	2019-12-13	2020-12-13
BiLog Antenna	Schwarzbeck	VULB9160	9160-3381	2019-06-14	2021-06-14
Attenuator	JFW	50FPE-006N	-	2020-04-22	2021-04-22
Preamplifier	TSJ	MLA-10k01-b01-27	1870369	2020-04-22	2021-04-22
Antenna Mast(10 m)	TOKIN	5977	-	-	-
Antenna Mast(10 m)	Innco	MA4640-XPET-0800	578	-	-
Controller(10 m)	TOKIN	5909L	141909L-1	-	-
Controller(10 m)	Innco	CO3000	40040217	-	-
Turn Table(10 m)	TOKIN	5983-1.5	-	-	-
10 m Semi-Anechoic Chamber	SY CORPORATION	-	-	-	-
Active Loop H-Field	ETS	6502	00150598	2019-05-24	2021-05-24
Double Ridege Horn Antenna	ETS	3117	00168719	2019-08-29	2021-08-29
Double Ridege Horn Antenna	A.H Systems, Inc	SAS-574	465	2019-04-25	2021-04-25
PREAMPLIFIER	Agilent	8449B	3008A02110	2020-01-10	2021-01-10
PREAMPLIFIER	A.H Systems, Inc	PAM-1840VH	166	2020-01-10	2021-01-10
EMI Test Receiver	ROHDE&SCHWARZ	ESR7	101440	2019-12-13	2020-12-13
LISN	ROHDE&SCHWARZ	ENV216	101883	2020-04-22	2021-04-22
Pulse Limiter	Schwarzbeck	VTSD 9561-F	9561-F189	2020-04-22	2021-04-22
PXA Signal Analyzer	KEYSIGHT	N9030A	MY54410264	2020-01-10	2021-01-10
High pass filter	Wainwright Instruments GmbH	WHKX10-2580-3000-18000-60SS	14	2020-01-10	2021-01-10