




TEST REPORT

Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 www.kctl.co.kr	Report No.: KR22-SRF0169 Page (1) of (173)	 KCTL
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1. Client

- Name : Samsung Electronics Co., Ltd.
- Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
- Date of Receipt : 2022-09-05

2. Use of Report : Certification

3. Name of Product / Model : Notebook PC / NP345XNA

4. Manufacturer / Country of Origin : Samsung Electronics Co., Ltd. / Vietnam

5. FCC ID : A3LNP345XNA

6. Date of Test : 2022-09-15 to 2022-10-26

7. Location of Test : Permanent Testing Lab On Site Testing
 (Address: 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)

8. Test method used : FCC Part 15 Subpart C, 15.247
 RSS-247 Issue 2 February 2017
 RSS-Gen Issue 5 February 2021

9. Test Result : Refer to the test result in the test report

Affirmation	Tested by Name : Kwonse Kim (Signature)	Technical Manager Name : Seungyong Kim (Signature)
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2022-10-28

Eurofins KCTL Co.,Ltd.

As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by Eurofins KCTL Co.,Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
2022-10-28	Originally issued	-

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General remarks for test reports

Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:

Procedure number, issue date and title:

Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

Statement not required by the standard or client used for type testing

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1. General information

Client : Samsung Electronics Co., Ltd.
Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Manufacturer : Samsung Electronics Co., Ltd.
Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Factory : SAMSUNG ELECTRONICS VIETNAM CO.,LTD.(SEV)
Address : Khu Cong nghiep Ten Phong 1, Yen Trung, Yen Phong, Bac Ninh, Vietnam
Laboratory : Eurofins KCTL Co.,Ltd.
Address : 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Accreditations : FCC Site Designation No: KR0040, FCC Site Registration No: 687132
VCCI Registration No. : R-20080, G-20078, C-20059, T-20056
CAB Identifier: KR0040
ISED Number: 8035A
KOLAS No.: KT231

2. Device information

Equipment under test : Notebook PC
Model : NP345XNA
Modulation technique : WIFI(802.11b/g/n/ac/ax) : DSSS, OFDM, OFDMA
Number of channels : 13 ch (20 MHz)
Power source : DC 7.72 V
Antenna specification : Antenna 1 : FPCB Antenna
Antenna 2 : FPCB Antenna
Antenna gain : Antenna 1 : -3.12 dBi
Antenna 2 : -3.04 dBi
Frequency range : 2 412 MHz ~ 2 472 MHz (802.11b/g/n/ac/ax_HT20/VHT20/HE20)
Software version : NP345XNA.001
Hardware version : REV0.3
Test device serial No. : Conducted : KCUQ930T9006402
Radiated : KCUQ930T900637M
Operation temperature : -20 °C ~ 60 °C

2.1. Frequency/channel operations

This device contains the following capabilities:

WLAN (11a/b/g/n/ac/ax), Bluetooth (BDR/EDR/BLE), NR N5/66, LTE B2/4/5/12/13/17/26/41/66, WCDMA 850/1700/1900

Ch.	Frequency (MHz)
01	2 412
.	.
06	2 437
.	.
11	2 462
12	2 467
13	2 472

Table 2.1-1. 802.11b/g/n/ac_HT20/VHT20 mode

2.2. Simultaneous Tx Condition

The device supports simultaneous transmission operation, which allows for two channels to operate independent of one another in the Bluetooth, 2.4 GHz, 5 GHz, or 6 GHz bands simultaneously on each antenna.

Simultaneous Tx condition – not RSDB

Mode	# of TX	WLAN 6 GHz		WLAN 5 GHz		WLAN 2.4 GHz		Bluetooth	Report
		ANT 1	ANT 2	ANT 1	ANT 2	ANT 1	ANT 2	ANT 1	
Bluetooth + WLAN	3	O	O	-	-	-	-	O	
	3	-	-	O	O	-	-	O	
	2	-	-	-	-	-	O	O	√

Notes.

Simultaneous condition was performed as a worst case which is configured as a combination of lowest margin for each mode during radiated spurious emission.

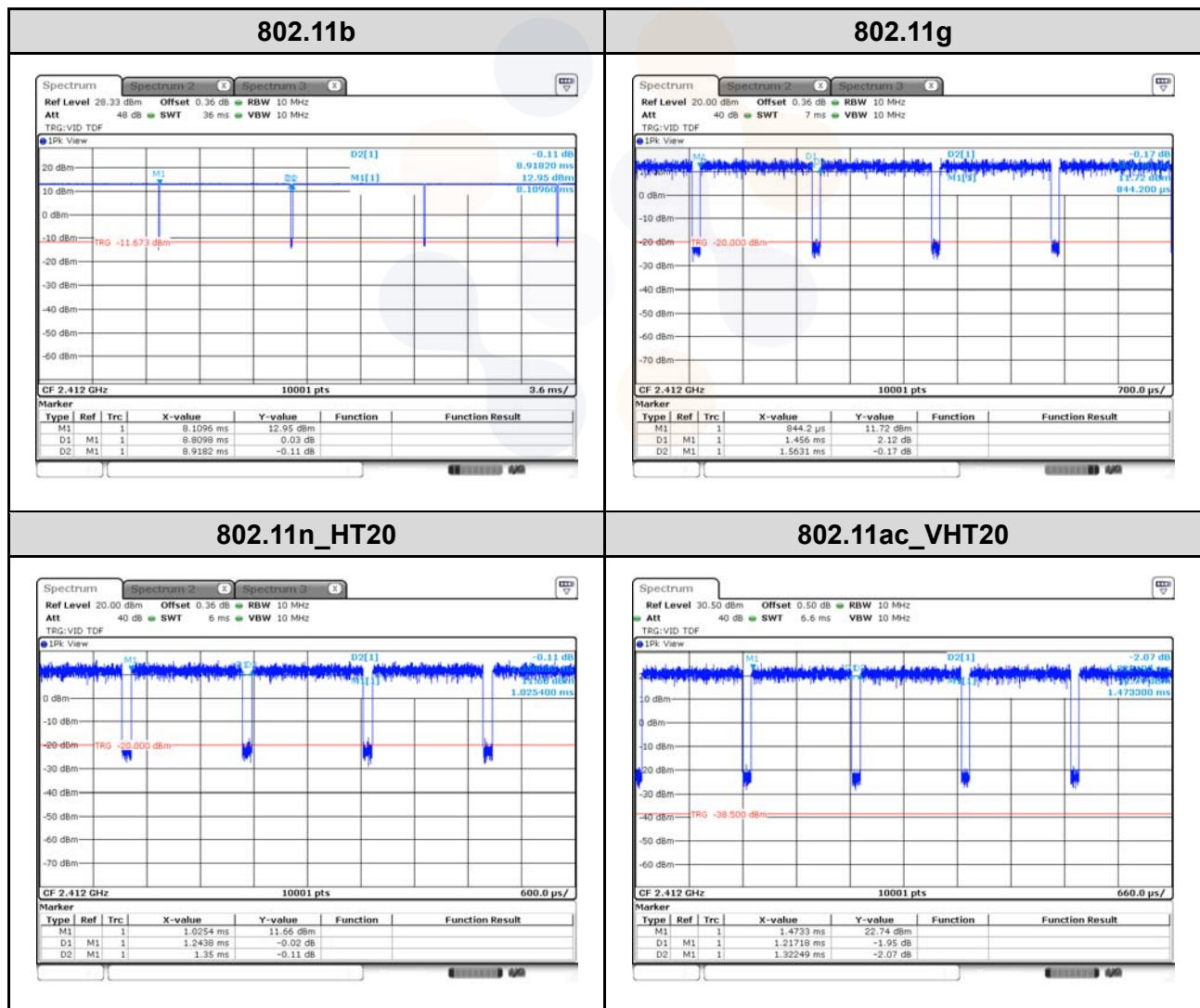
2.3. Duty Cycle Factor

SISO

Test mode	Period (ms)	On time (ms)	Duty cycle		Duty Cycle Factor (dB)
			(Linear)	(%)	
802.11b	8.918	8.810	0.987 9	98.79	0.05
802.11g	1.563	1.456	0.931 5	93.15	0.31
802.11n_HT20	1.350	1.244	0.921 5	92.15	0.36
802.11ac_VHT20	1.322	1.217	0.920 6	92.06	0.36

Notes.

1. Duty cycle (Linear) = Ton time / Period
2. DCF(Duty cycle factor) = $10\log(1/\text{duty cycle})$
3. DCF is not compensated to Average result if duty cycle is more than 98%

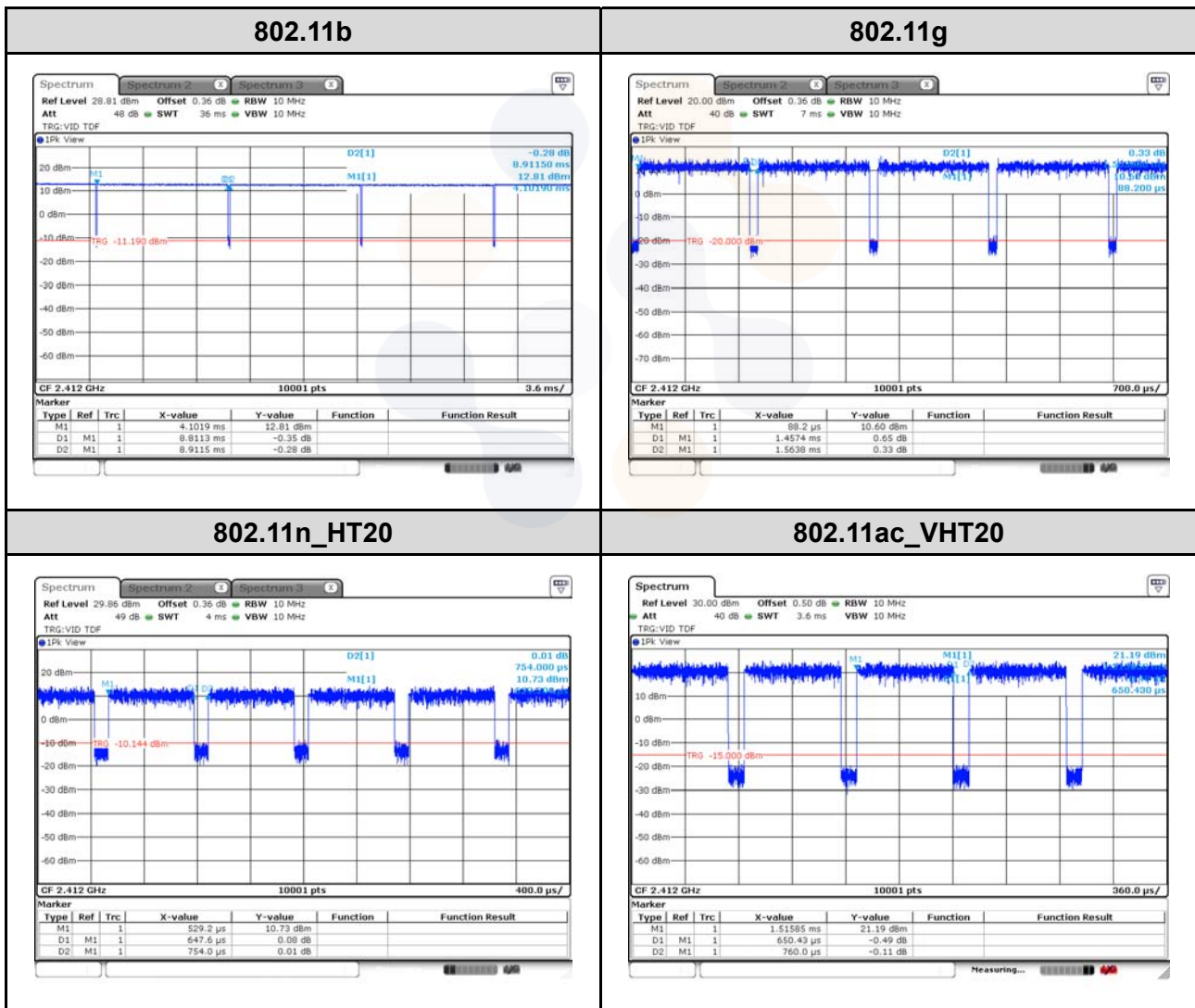




MIMO

Test mode	Period (ms)	On time (ms)	Duty cycle		Duty Cycle Factor (dB)
			(Linear)	(%)	
802.11b	8.912	8.811	0.988 7	98.87	0.05
802.11g	1.564	1.457	0.931 6	93.16	0.31
802.11n_HT20	0.754	0.648	0.859 4	85.94	0.66
802.11ac_VHT20	0.760	0.650	0.855 3	85.53	0.68

Notes.

1. Duty cycle (Linear) = Ton time / Period
2. DCF(Duty cycle factor) = $10\log(1/\text{duty cycle})$
3. DCF is not compensated to Average result if duty cycle is more than 98%



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3. Antenna requirement

Requirement of FCC part section 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.

Requirement of RSS-Gen Section 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

- The transmitter has permanently attached FPCB Antenna (Internal antenna) on board.
- The E.U.T Complies with the requirement of §15.203, §15.247.

3.1 Antenna information

Mode	SISO		CDD	MIMO
	ANT 1	ANT 2	ANT 1 + 2	ANT 1 + 2
802.11b	X	√	√	√
802.11g	X	√	√	√
802.11n HT20	X	√	√	√
802.11ac VHT20	X	√	√	√

√ = Support, X= Not support

3.2 Directional Gain Calculations

According to clause F), 2), d), (i) of KDB 662911 D01 Multiple Transmitter Output, Directional gain may be calculated by using the formulas as below.

Directional Antenna Gain

ANT 1 Gain (dBi)	ANT 2 Gain (dBi)	Combined Gain (dBi)
-3.12	-3.04	-0.07

Note.

Unequal antenna gains, with equal transmit powers. For antenna gains given by G_1, G_2, \dots, G_N dBi
 Directional gain = $10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{ANT}]$ dB i

Sample calculation

Directional gain = $10 \log[(10^{-3.12/20} + 10^{-3.04/20})^2 / 2] = -0.07$ dB i

4. Summary of tests

FCC Part section(s)	IC Rule Referene	Parameter	Test Condition	Test results
15.247(b)(3)	RSS-247 (5.4)(d)	Maximum peak output power	Conducted	Pass
15.247(e)	RSS-247 (5.2)(b)	Peak power spectral density		Pass
15.247(a)(2)	RSS-247 (5.2)(a)	6 dB channel bandwidth		Pass
-	RSS-Gen (6.7)	Occupied Bandwidth		Pass
15.207(a)	RSS-Gen (8.8)	AC Conducted Emissions		Pass
15.247(d)	RSS-247 (5.5)	Conducted Spurious Emissions		Pass
15.205(a), 15.209(a)	RSS-Gen (8.9), (8.10)	Spurious emission	Radiated	Pass
		Band-edge, restricted band		Pass

Notes:

- All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- According to exploratory test no any obvious emission were detected from 9 kHz to 30 MHz. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
- The orthogonal plan is configured as x-axis because the device operates as desktop device in standard laptop mode. Therefore, all final radiated testing was performed with the EUT in X orientation.
- All the radiated tests have been performed several case. (Stand-alone, with accessories (TA etc.))
Worst case: stand-alone
- The test procedure(s) in this report were performed in accordance as following.
 - ◆ ANSI C63.10-2013
 - ◆ KDB 558074 D01 v05r02
 - ◆ KDB 662911 D01 v02r01
- The worst-case data rate were:
 - 802.11b mode: 1Mbps
 - 802.11g mode: 6Mbps
 - 802.11n_HT20 mode: MCS8
 - 802.11ac_VHT20 mode: MCS0

5. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of $k=2$ to indicated a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded uncertainty (\pm)	
Conducted RF power	0.9 dB	
Conducted spurious emissions	1.1 dB	
Radiated spurious emissions	Below 30 MHz:	2.4 dB
	30 MHz ~ 1 000 MHz	2.3 dB
	1 000 MHz ~ 18 000 MHz	5.6 dB
	Above 18 000 MHz	5.7 dB
Conducted emissions	9 kHz ~ 150 kHz	1.6 dB
	150 kHz ~ 30 MHz	1.7 dB

6. Measurement results explanation example

The offset level is set in the spectrum analyzer to compensate the RF cable loss factor between EUT conducted output port and spectrum analyzer.

With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

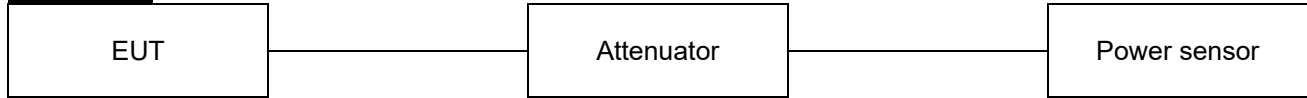
Frequency (MHz)	Factor(dB)	Frequency (MHz)	Factor(dB)
30	9.64	9 000	11.63
50	9.93	10 000	11.85
100	10.22	11 000	11.62
200	10.26	12 000	11.74
300	10.34	13 000	12.35
400	10.40	14 000	12.26
500	10.64	15 000	12.08
600	10.71	16 000	12.67
700	10.75	17 000	12.27
800	10.75	18 000	12.53
900	10.83	19 000	12.68
1 000	10.84	20 000	12.56
2 000	11.48	21 000	13.33
3 000	11.80	22 000	13.18
4 000	12.03	23 000	12.95
5 000	12.61	24 000	13.28
6 000	13.00	25 000	13.09
7 000	11.20	26 000	13.96
8 000	11.34	26 500	13.15

Note : Offset(dB) = RF cable loss(dB) + Attenuator(dB)

7. Test results

7.1. Maximum peak output power

Test setup



Limit

FCC

According to §15.247(b)(3), For systems using digital modulation in the 902-928 MHz, 2 400-2 483.5 MHz, and 5 725-5 850 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.


IC

According to RSS-247 5.4(d), For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

Test procedure

ANSI C63.10 - Section 11.9

Used test method is section 11.9.1.3 and 11.9.2.3.1

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Test settings

General

Section 15.247 permits the maximum conducted (average) output power to be measured as an alternative to the maximum peak conducted output power for demonstrating compliance to the limit. When this option is exercised, the measured power is to be referenced to the OBW rather than the DTS bandwidth (see ANSI C63.10 for measurement guidance).

When using a spectrum analyzer or EMI receiver to perform these measurements, it shall be capable of utilizing a number of measurement points in each sweep that is greater than or equal to twice the span/RBW to set a bin-to-bin spacing of $\leq RBW/2$ so that narrowband signals are not lost between frequency bins.

If possible, configure or modify the operation of the EUT so that it transmits continuously at its maximum power control level. The intent is to test at 100 % duty cycle; however a small reduction in duty cycle (to no lower than 98 %) is permitted, if required by the EUT for amplitude control purposes. Manufacturers are expected to provide software to the test lab to permit such continuous operation.

If continuous transmission (or at least 98 % duty cycle) cannot be achieved due to hardware limitations (e.g., overheating), the EUT shall be operated at its maximum power control level, with the transmit duration as long as possible, and the duty cycle as high as possible during which sweep triggering/signal gating techniques may be used to perform the measurement over the transmission duration.

11.9.1. Maximum peak conducted output power

One of the following procedures may be used to determine the maximum peak conducted output power of a DTS EUT.


11.9.1.1. RBW \geq DTS bandwidth

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

- a) Set the RBW \geq DTS bandwidth.
- b) Set VBW $\geq [3 \times RBW]$.
- c) Set span $\geq [3 \times RBW]$.
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

11.9.1.3. 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 use a fast-responding diode detector.

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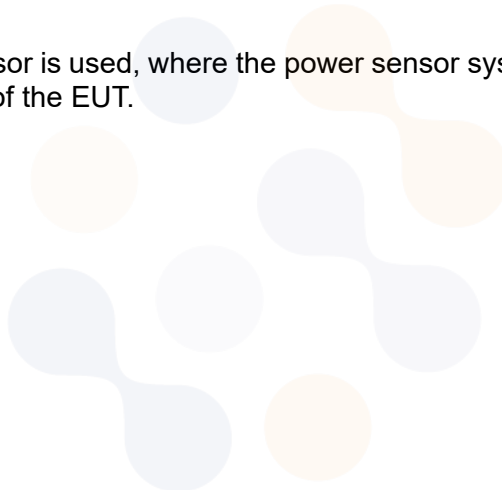
11.9.2.3.1. Measurement using a power meter (PM)

Method AVGPM is a measurement using an RF average power meter, as follows:

- a) As an alternative to spectrum analyzer or EMI receiver measurements, measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied:
 - 1) The EUT is configured to transmit continuously, or to transmit with a constant duty cycle.
 - 2) At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.
 - 3) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
- b) If the transmitter does not transmit continuously, measure the duty cycle, D, of the transmitter output signal as described in 11.6.
- c) Measure the average power of the transmitter. This measurement is an average over both the ON and OFF periods of the transmitter.
- d) Adjust the measurement in dBm by adding $[10 \log(1/D)]$, where D is the duty cycle

Notes:

A peak responding power sensor is used, where the power sensor system video bandwidth is greater than the occupied bandwidth of the EUT.



Test results

**SISO_ANT2
Conducted Output Power**

Test mode	Frequency (MHz)	Measured output power					Limit (dBm)
		Reading (dBm)		DCF (dB)	Result (dBm)		
		Peak	Average		Peak	Average	
802.11b	2412	20.22	17.50	-	20.22	17.50	30
	2437	20.41	17.73		20.41	17.73	
	2462	20.42	17.77		20.42	17.77	
	2467	8.11	5.46		8.11	5.46	
	2472	4.16	1.23		4.16	1.23	
802.11g	2412	22.67	15.75	0.31	22.67	16.06	
	2437	22.45	15.78		22.45	16.09	
	2462	20.53	13.52		20.53	13.83	
	2467	11.47	4.60		11.47	4.91	
	2472	7.17	-0.02		7.17	0.29	
802.11n HT20	2412	20.32	13.22	0.36	20.32	13.58	
	2437	21.59	14.58		21.59	14.94	
	2462	19.64	12.48		19.64	12.84	
	2467	11.25	4.40		11.25	4.76	
	2472	7.05	-0.37		7.05	-0.01	
802.11ac VHT20	2412	21.27	14.16	0.36	21.27	14.52	
	2437	21.47	14.40		21.47	14.76	
	2462	19.65	12.60		19.65	12.96	
	2467	12.58	5.29		12.58	5.65	
	2472	6.99	-0.48		6.99	-0.12	

Notes:

1. Average result(dB m) = Average Reading (dB m) + DCF(dB)

E.I.R.P.

Test mode	Frequency (MHz)	Measured output power					Max. e.i.r.p Limit (dBm)
		Conducted Output Power (dBm)		ANT Gain (dBi)	Max.e.i.r.p (dBm)		
		Peak	Average		Peak	Average	
802.11b	2412	20.22	17.50	-3.04	17.08	14.36	36.02
	2437	20.41	17.73		17.27	14.59	
	2462	20.42	17.77		17.28	14.63	
	2467	8.11	5.46		4.97	2.32	
	2472	4.16	1.23		1.02	-1.91	
802.11g	2412	22.67	16.06		19.53	12.92	
	2437	22.45	16.09		19.31	12.95	
	2462	20.53	13.83		17.39	10.69	
	2467	11.47	4.91		8.33	1.77	
	2472	7.17	0.29		4.03	-2.85	
802.11n HT20	2412	20.32	13.58		17.18	10.44	
	2437	21.59	14.94		18.45	11.80	
	2462	19.64	12.84		16.50	9.70	
	2467	11.25	4.76		8.11	1.62	
	2472	7.05	-0.01		3.91	-3.15	
802.11ac VHT20	2 412	21.27	14.52	18.13	11.38		
	2 437	21.47	14.76	18.33	11.62		
	2 462	19.65	12.96	16.51	9.82		
	2 467	12.58	5.65	9.44	2.51		
	2 472	6.99	-0.12	3.85	-3.26		

Notes:

1. E.I.R.P. Calculation:

$$\text{E.I.R.P. (dBm)} = \text{Conducted output power (dBm)} + \text{Antenna gain (dBi)}$$

MIMO_ANT1+ANT2
Conducted Output Power

Test mode	Frequency (MHz)	Measured output power							Limit (dBm)
		Reading (dBm)				DCF (dB)	Result (dBm)		
		Peak		Average			Peak	Average	
		ANT 1	ANT 2	ANT 1	ANT 2		ANT1 + ANT2	ANT1 + ANT2	
802.11b	2412	20.01	19.94	17.47	17.40	-	22.99	20.45	30
	2437	20.57	20.36	17.90	17.61		23.48	20.77	
	2462	19.70	20.24	17.18	17.65		22.99	20.43	
	2467	7.72	8.11	5.08	5.50		10.93	8.31	
	2472	10.44	4.05	0.39	1.26		11.34	3.86	
802.11g	2412	21.71	21.55	15.59	15.29	0.31	24.64	18.76	
	2437	22.86	22.47	16.03	15.59		25.68	19.13	
	2462	18.74	18.82	12.44	12.44		21.79	15.76	
	2467	11.66	11.19	4.48	4.38		14.44	7.75	
	2472	6.88	7.08	-0.31	-0.13		9.99	3.10	
802.11n HT20	2412	19.47	19.48	13.02	13.04	0.66	22.49	16.70	
	2437	22.97	22.08	15.49	14.91		25.56	18.88	
	2462	18.50	18.62	12.15	12.27		21.57	15.88	
	2467	12.20	12.24	4.81	4.85		15.23	8.50	
	2472	6.62	6.55	-1.01	-0.88		9.60	2.72	
802.11ac VHT20	2412	19.30	19.60	12.64	12.87	0.68	22.46	16.44	
	2437	20.48	20.41	13.17	13.15		23.46	16.85	
	2462	18.58	19.10	12.03	12.41		21.86	15.91	
	2467	10.96	11.12	3.84	4.09		14.05	7.65	
	2472	6.61	6.74	-1.19	-0.61		9.69	2.80	

Notes:

1. Result(dB m) = 10log(10^(ANT1/10)+10^(ANT2/10)) (dB m)

E.I.R.P.

Test mode	Frequency (MHz)	Measured output power					Max e.i.r.p Limit (dBm)
		Conducted Output Power (dBm)		ANT Gain (dBi)	Max.e.i.r.p (dBm)		
		Peak	Average		Peak	Average	
802.11b	2412	22.99	20.45	-0.07	22.92	20.38	36.02
	2437	23.48	20.77		23.41	20.70	
	2462	22.99	20.43		22.92	20.36	
	2467	10.93	8.31		10.86	8.24	
	2472	11.34	3.86		11.27	3.79	
802.11g	2412	24.64	18.76		24.57	18.69	
	2437	25.68	19.13		25.61	19.06	
	2462	21.79	15.76		21.72	15.69	
	2467	14.44	7.75		14.37	7.68	
	2472	9.99	3.10		9.92	3.03	
802.11n HT20	2412	22.49	16.70		22.42	16.63	
	2437	25.56	18.88		25.49	18.81	
	2462	21.57	15.88		21.50	15.81	
	2467	15.23	8.50		15.16	8.43	
	2472	9.60	2.72		9.53	2.65	
802.11ac VHT20	2 412	22.46	16.44	22.39	16.37		
	2 437	23.46	16.85	23.39	16.78		
	2 462	21.86	15.91	21.79	15.84		
	2 467	14.05	7.65	13.98	7.58		
	2 472	9.69	2.80	9.62	2.73		

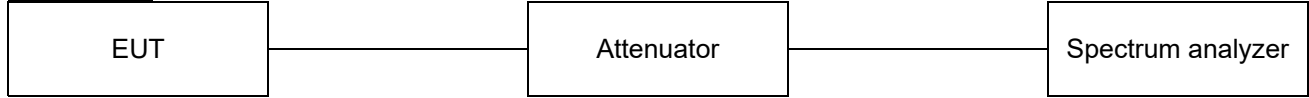
Notes:

1. E.I.R.P. Calculation:

$$\text{E.I.R.P. (dBm)} = \text{Conducted output power (dBm)} + \text{Antenna gain (dBi)}$$

7.2. Peak Power Spectral Density

Test setup



Limit

According to §15.247(e) and RSS-247(5.2), 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.

Test procedure

ANSI C63.10 - Section 11.10.2

Test settings

Method PKPSD (peak PSD)

The following procedure shall be used if maximum peak conducted output power was used to determine compliance, and it is optional if the maximum conducted (average) output power was used to determine compliance:

- 1) Set analyzer center frequency to DTS channel center frequency.
- 2) Set the span to 1.5 times the DTS bandwidth.
- 3) Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- 4) Set the VBW $\geq 3 \times \text{RBW}$.
- 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 amplitude level within the RBW.
- 10) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Test results

SISO_ANT2

Test mode	Frequency (MHz)	Result (dBm/ 3kHz)	Limit (dBm/ 3kHz)
802.11b	2412	-5.46	8.00
	2437	-4.98	
	2462	-4.92	
	2467	-16.90	
	2472	-21.12	
802.11g	2412	-11.51	
	2437	-9.95	
	2462	-12.91	
	2467	-22.08	
	2472	-26.31	
802.11n HT20	2412	-13.20	
	2437	-12.34	
	2462	-12.86	
	2467	-21.61	
	2472	-25.41	
802.11ac VHT20	2412	-12.09	
	2437	-12.38	
	2462	-13.09	
	2467	-21.28	
	2472	-26.29	

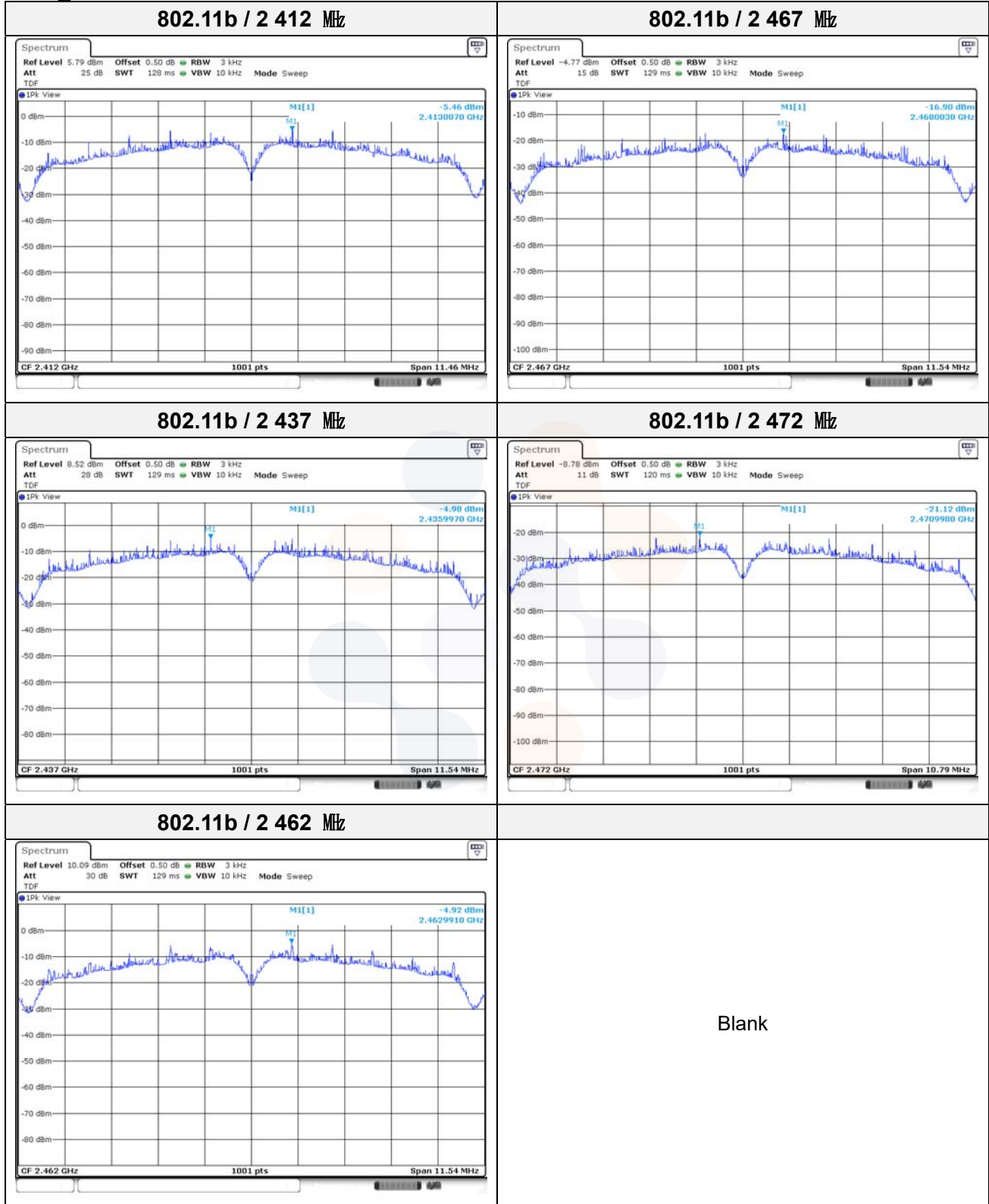
MIMO_ANT1+ANT2

Test mode	Frequency (MHz)	Reading (dBm/ 3kHz)		Result (dBm/ 3kHz)	Limit (dBm/ 3kHz)
		ANT 1	ANT 2		
802.11b	2412	-4.67	-5.08	-1.86	8.00
	2437	-4.05	-5.28	-1.61	
	2462	-4.65	-4.82	-1.72	
	2467	-17.28	-17.29	-14.27	
	2472	-22.14	-20.80	-18.41	
802.11g	2412	-11.69	-10.85	-8.24	
	2437	-10.25	-10.70	-7.46	
	2462	-14.86	-12.93	-10.78	
	2467	-21.77	-21.93	-18.84	
	2472	-26.36	-25.63	-22.97	
802.11n HT20	2412	-13.63	-12.15	-9.82	
	2437	-8.98	-9.41	-6.18	
	2462	-14.30	-12.49	-10.29	
	2467	-20.48	-21.11	-17.77	
	2472	-26.80	-25.13	-22.87	
802.11ac VHT20	2412	-13.74	-12.99	-10.34	
	2437	-13.41	-12.56	-9.95	
	2462	-14.17	-11.96	-9.92	
	2467	-21.92	-21.84	-18.87	
	2472	-26.46	-25.43	-22.90	

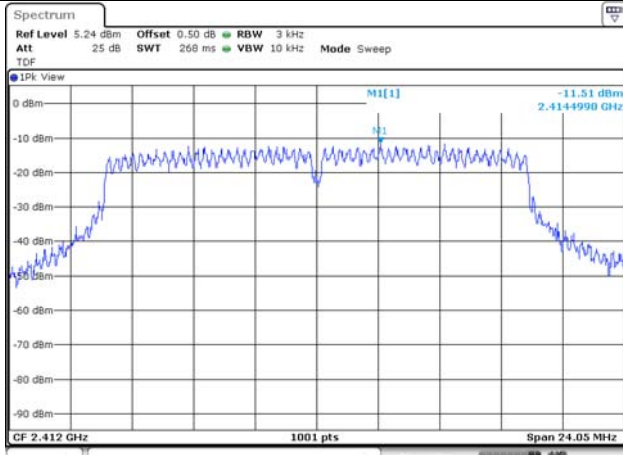
Notes:

1. Result(dB m) = $10\log(10^{(Ant1/10)}+10^{(ant2/10)})$ (dB m)

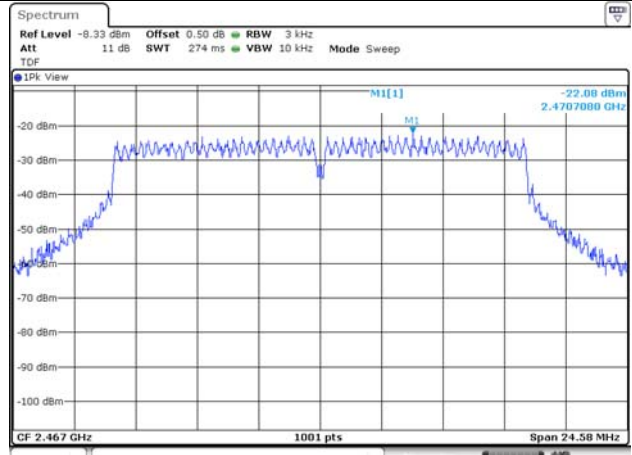
SISO_ANT2



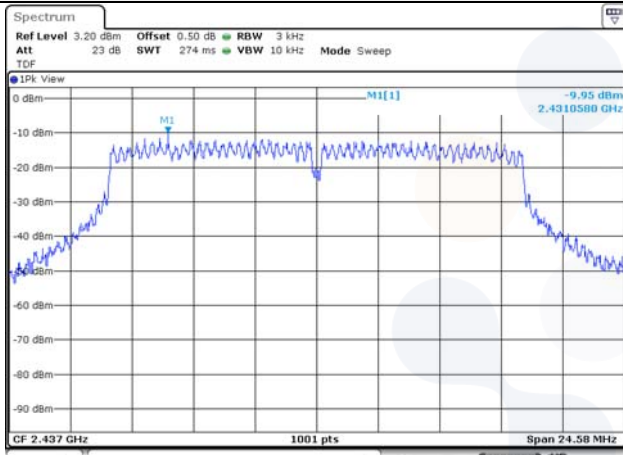
802.11g / 2 412 MHz



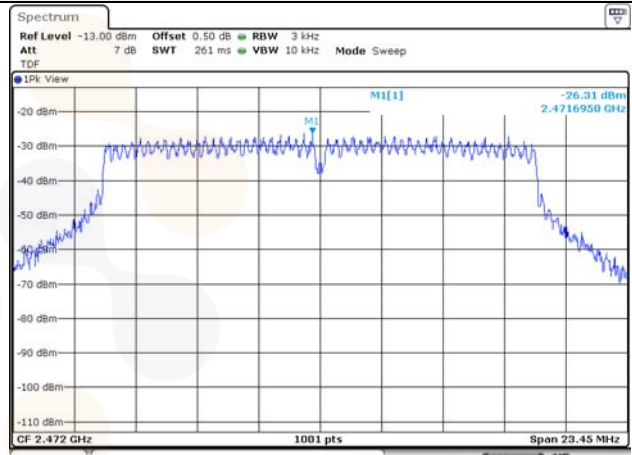
802.11g / 2 467 MHz



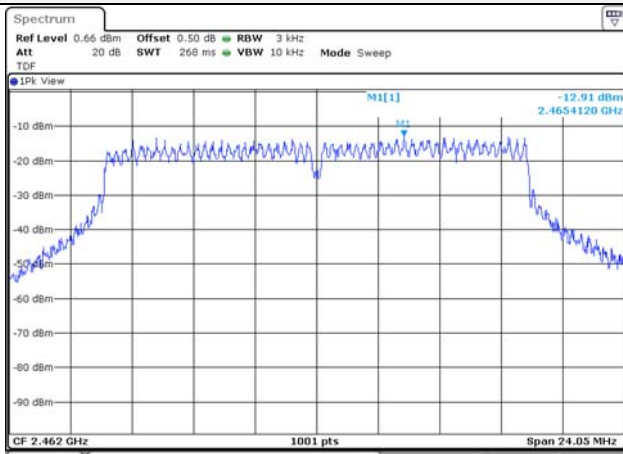
802.11g / 2 437 MHz



802.11g / 2 472 MHz

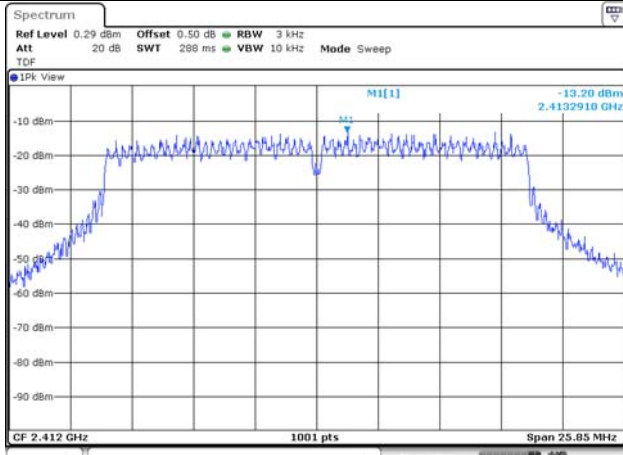


802.11g / 2 462 MHz

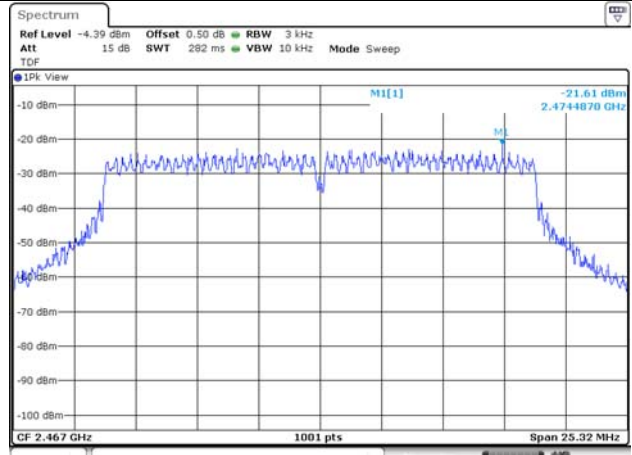


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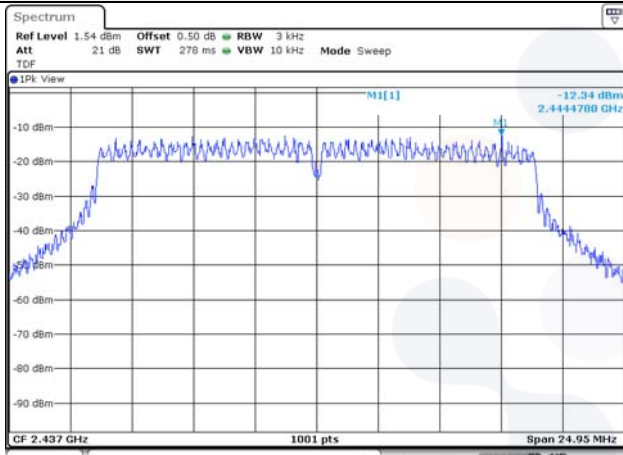
802.11n HT20 / 2 412 MHz



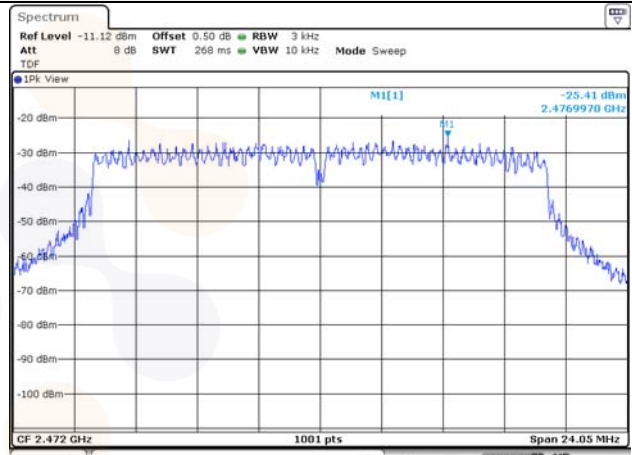
802.11n HT20 / 2 467 MHz



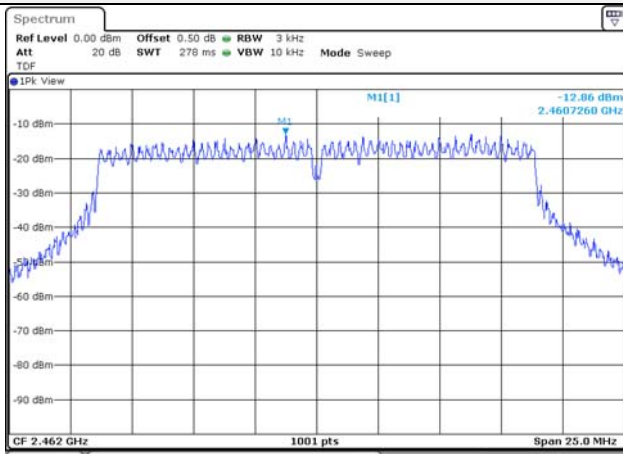
802.11n HT20 / 2 437 MHz



802.11n HT20 / 2 472 MHz

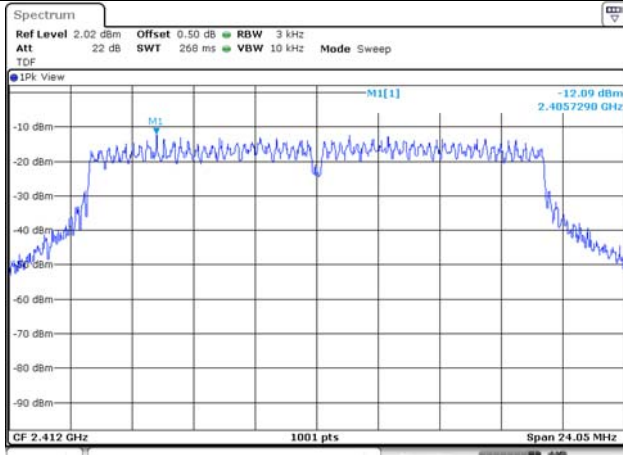


802.11n HT20 / 2 462 MHz

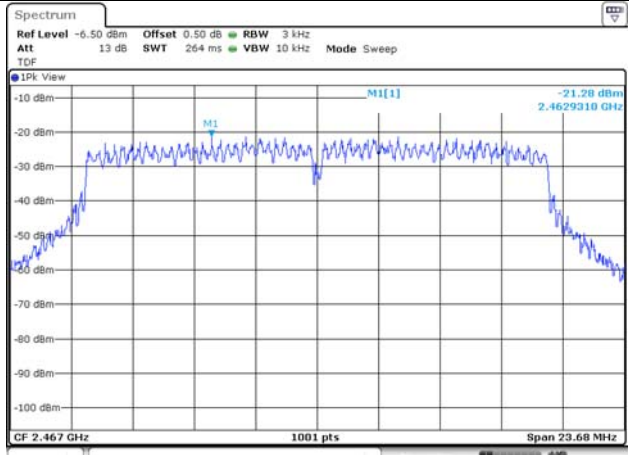


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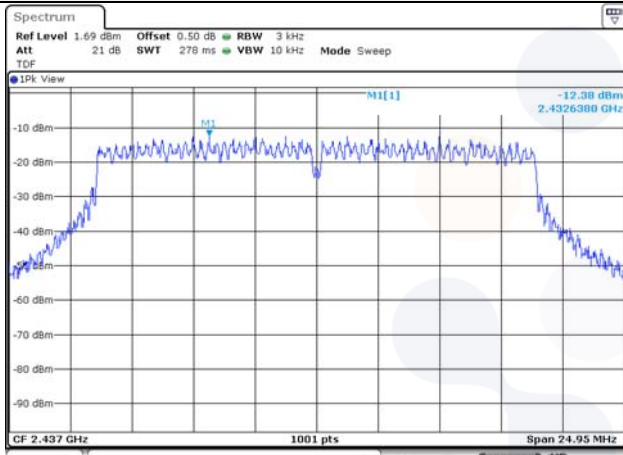
802.11ac VHT20 / 2 412 MHz



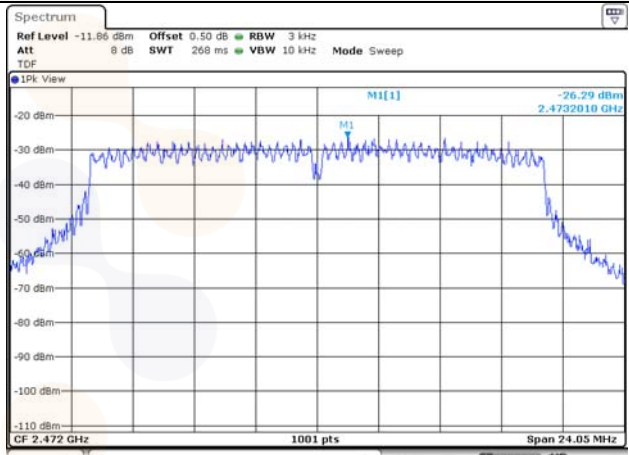
802.11ac VHT20 / 2 467 MHz



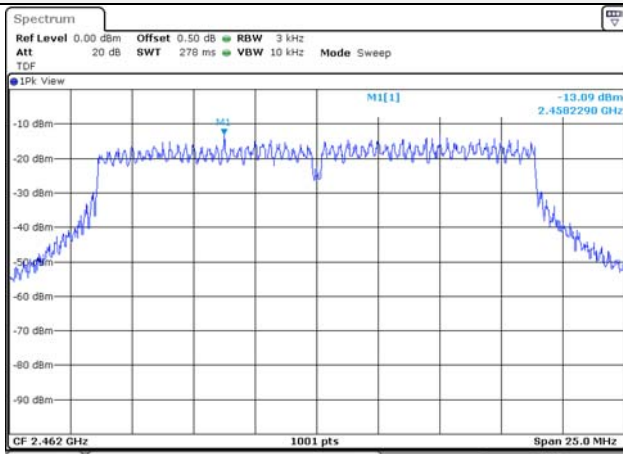
802.11ac VHT20 / 2 437 MHz



802.11ac VHT20 / 2 472 MHz



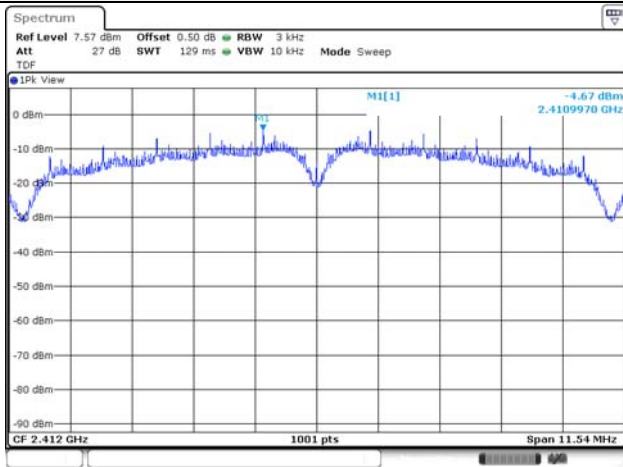
802.11ac VHT20 / 2 462 MHz



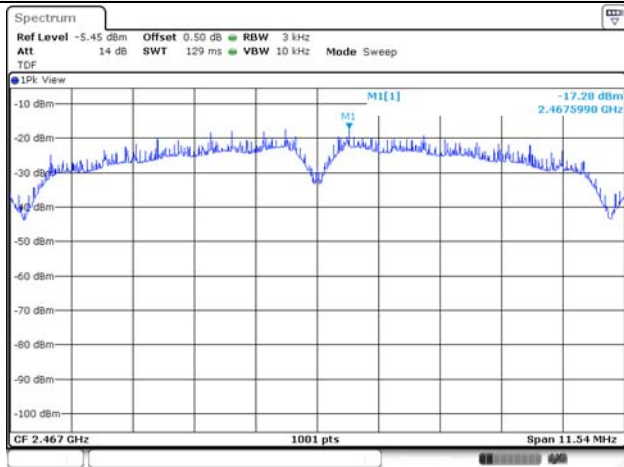
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MIMO_ANT1

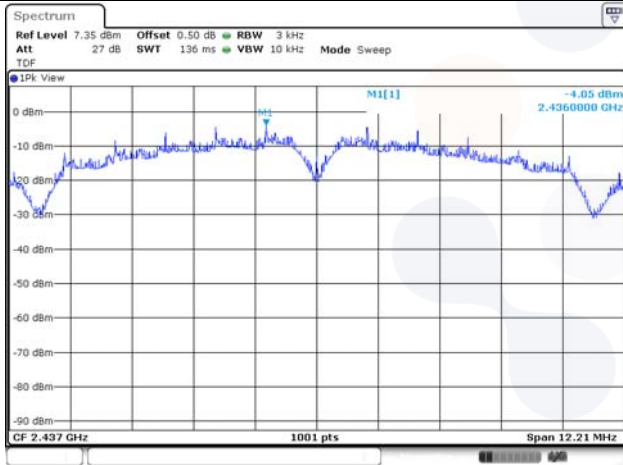
802.11b / 2 412 MHz



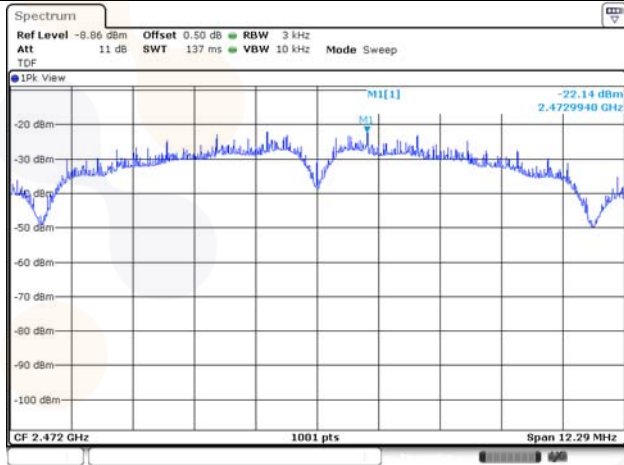
802.11b / 2 467 MHz



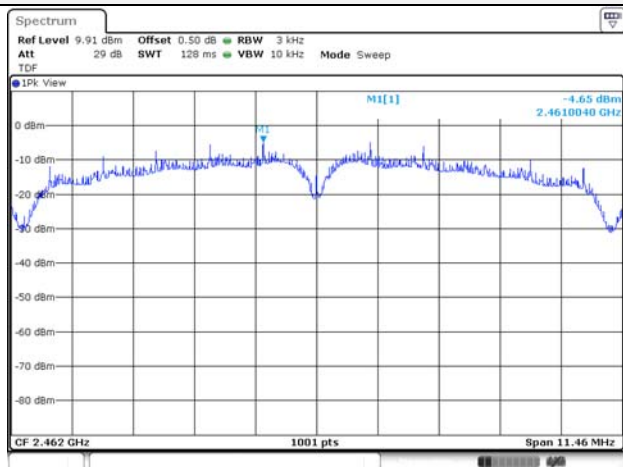
802.11b / 2 437 MHz



802.11b / 2 472 MHz

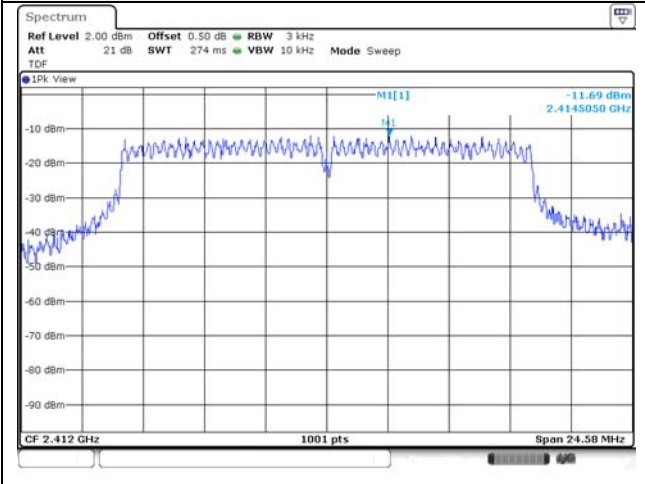


802.11b / 2 462 MHz

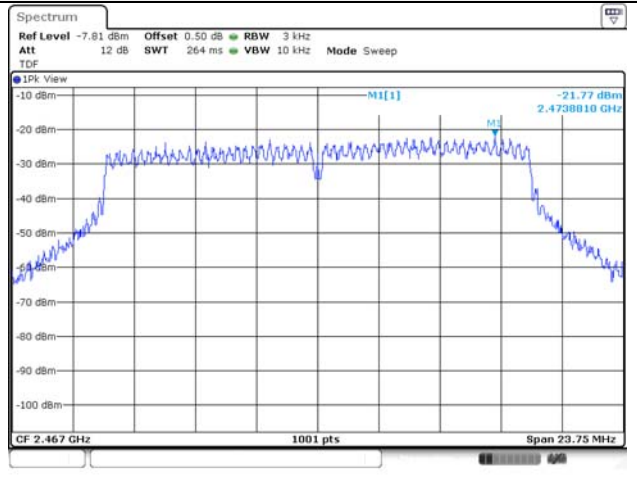


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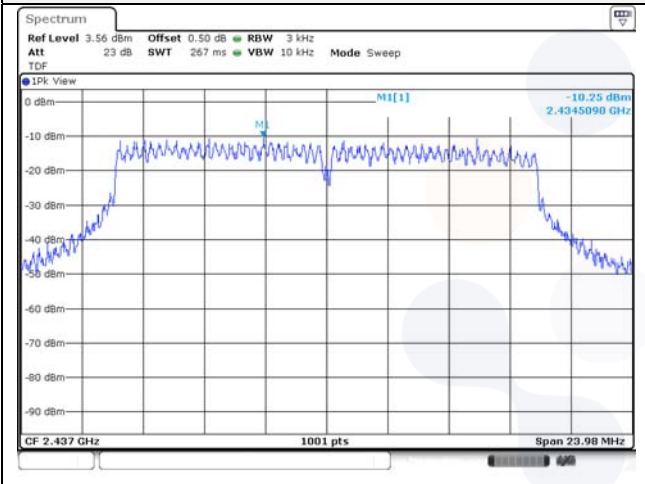
802.11g / 2 412 MHz



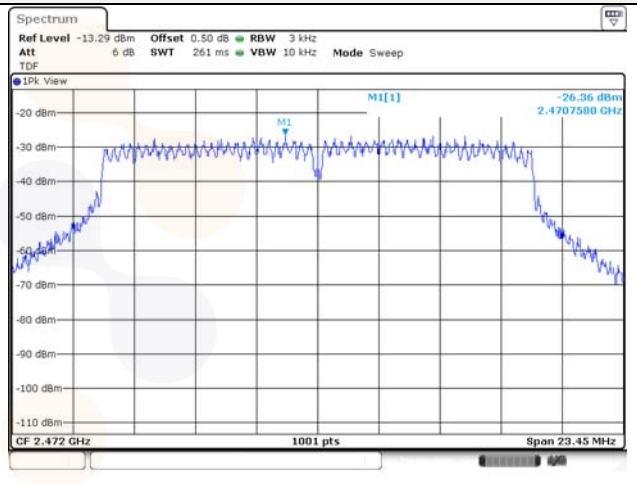
802.11g / 2 467 MHz



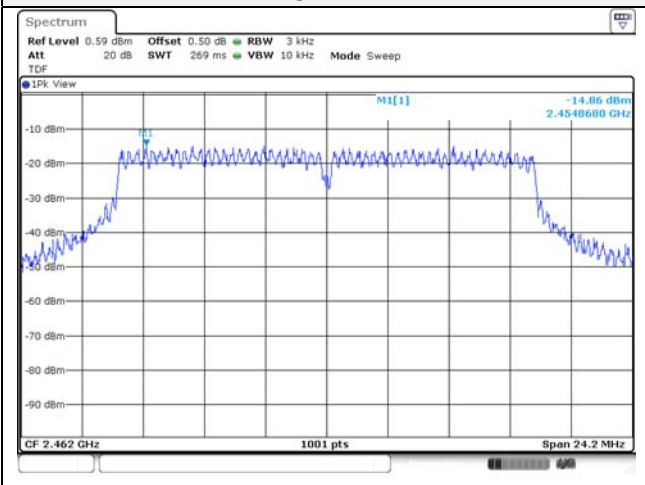
802.11g / 2 437 MHz



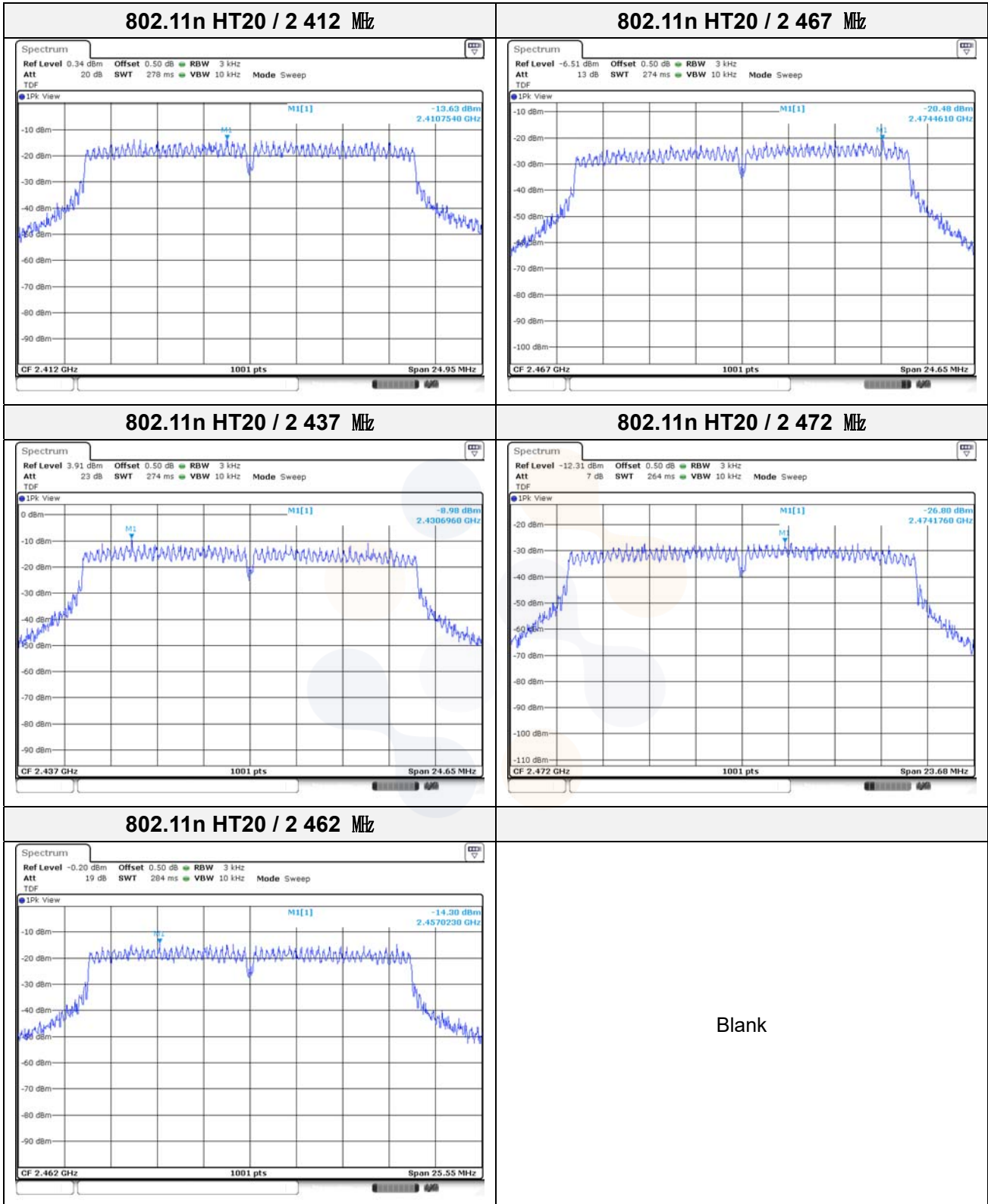
802.11g / 2 472 MHz



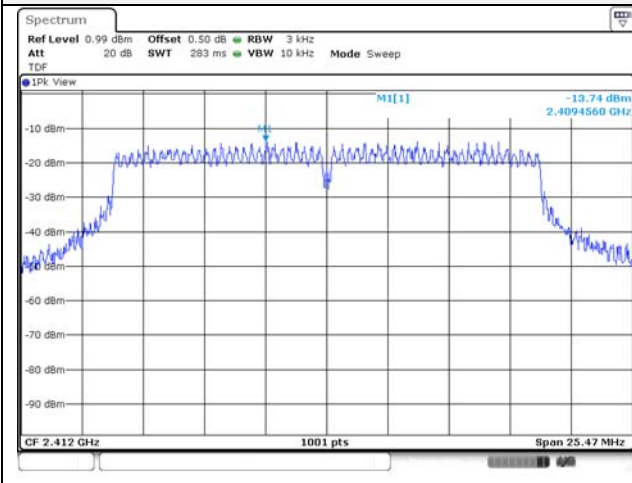
802.11g / 2 462 MHz



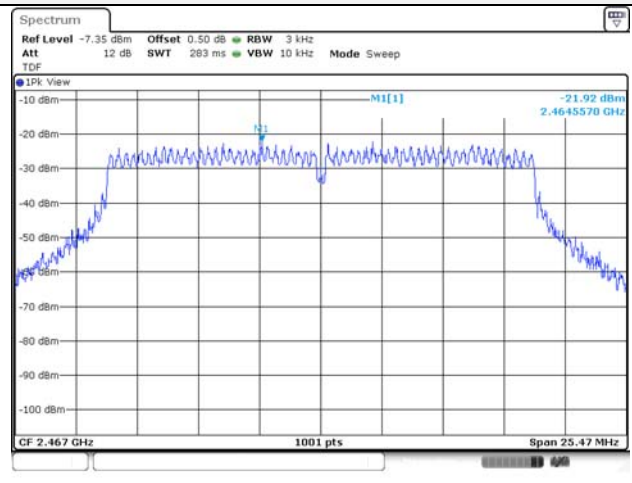
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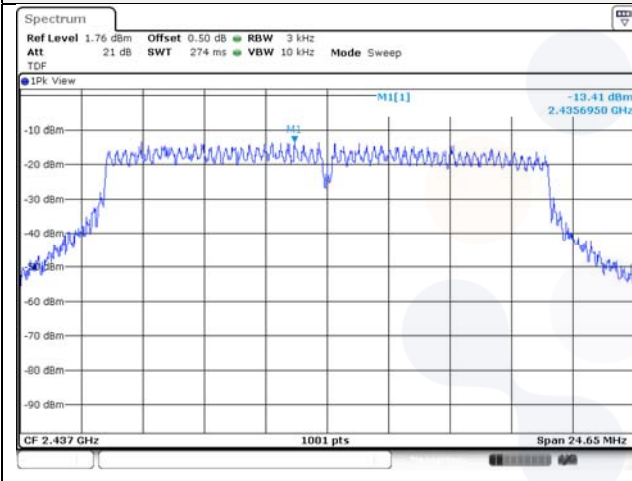
802.11ac VHT20 / 2 412 MHz



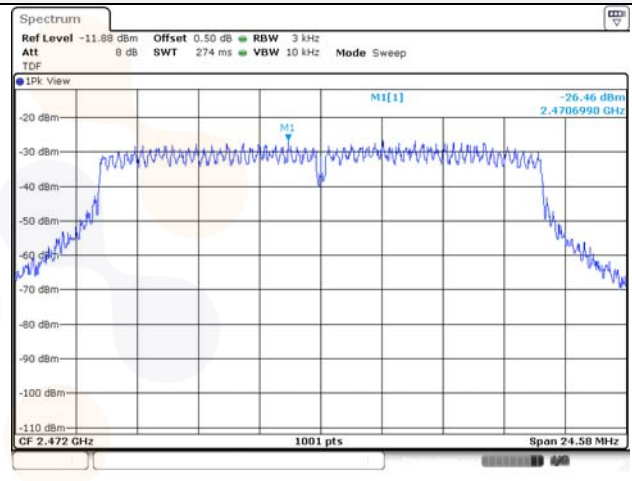
802.11ac VHT20 / 2 467 MHz



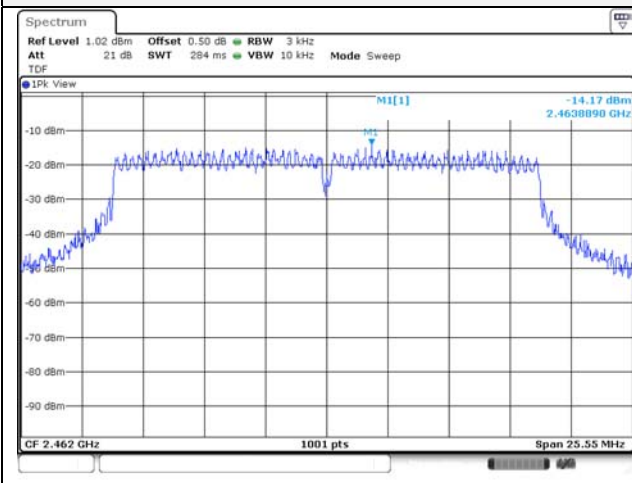
802.11ac VHT20 / 2 437 MHz



802.11ac VHT20 / 2 472 MHz



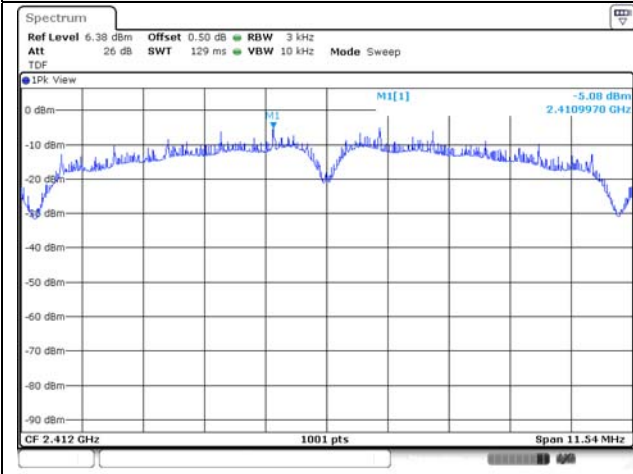
802.11ac VHT20 / 2 462 MHz



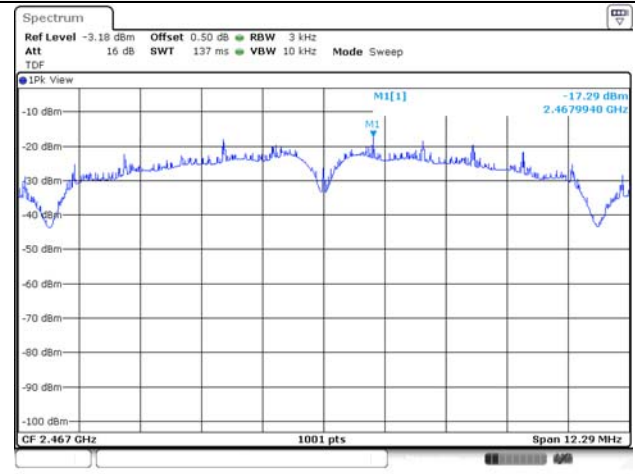
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MIMO_ANT2

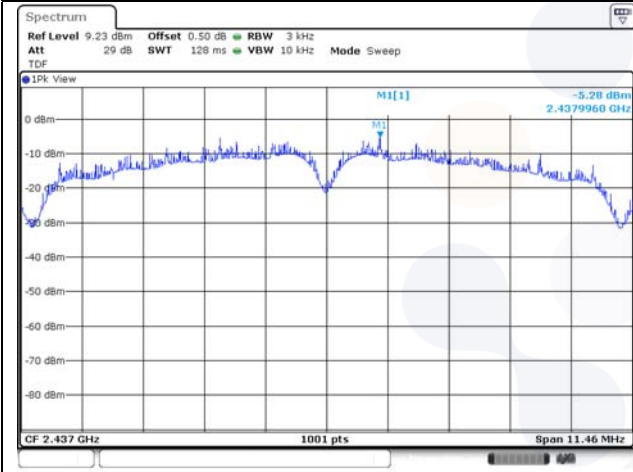
802.11b / 2 412 MHz



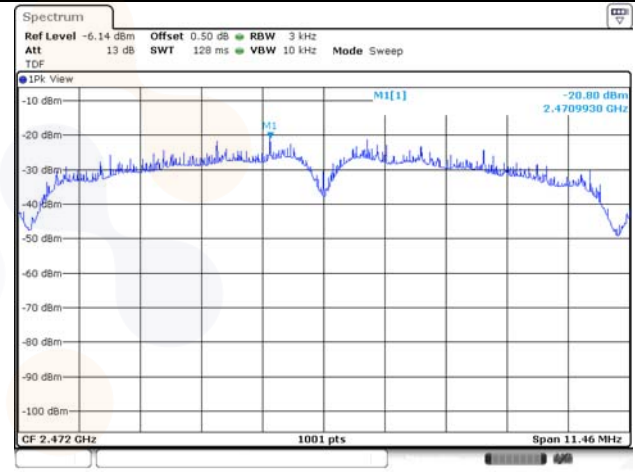
802.11b / 2 467 MHz



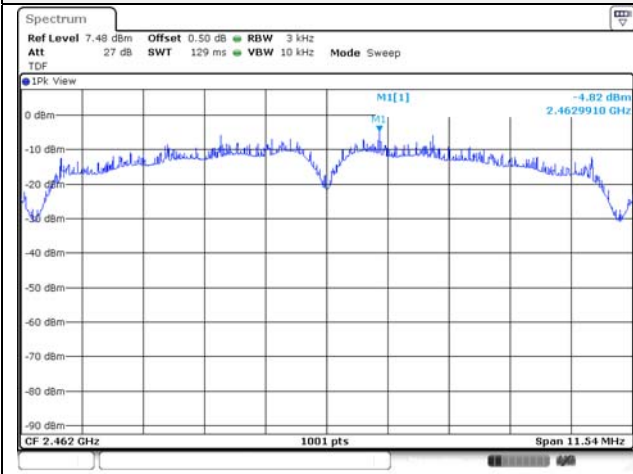
802.11b / 2 437 MHz



802.11b / 2 472 MHz

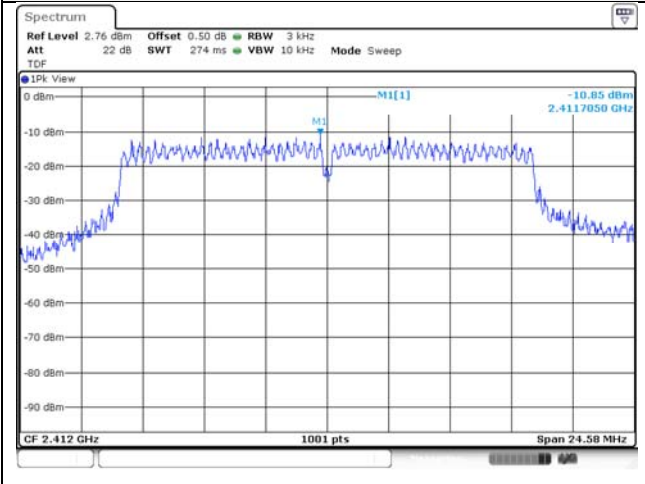


802.11b / 2 462 MHz

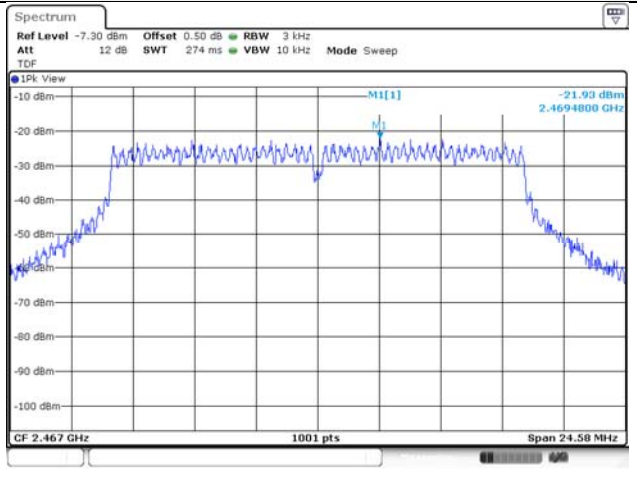


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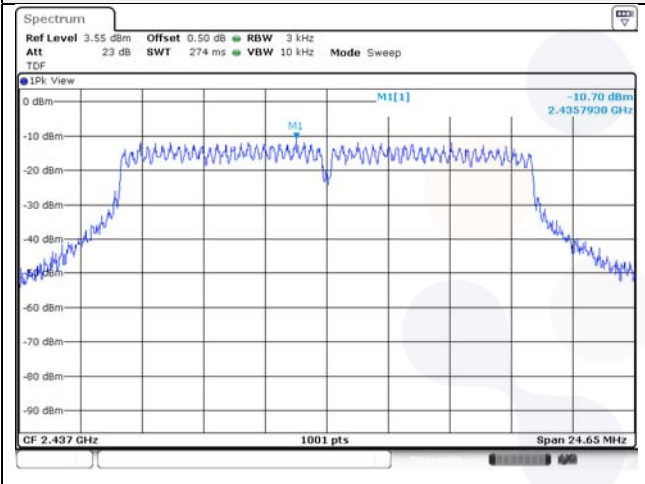
802.11g / 2 412 MHz



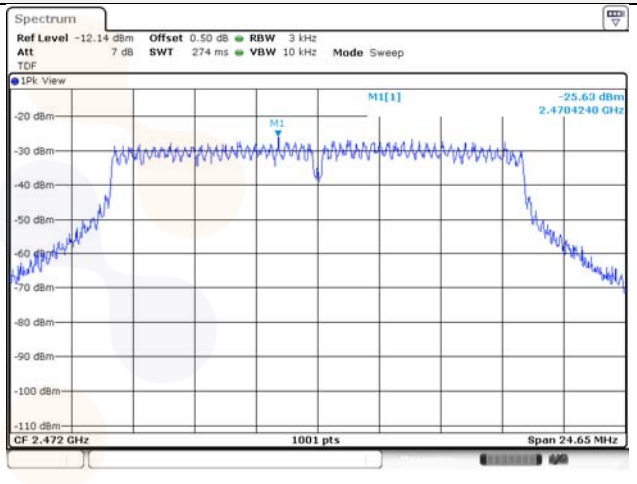
802.11g / 2 467 MHz



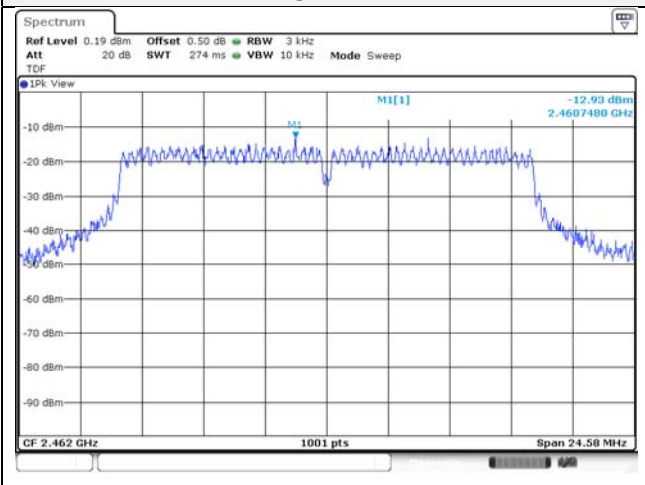
802.11g / 2 437 MHz



802.11g / 2 472 MHz

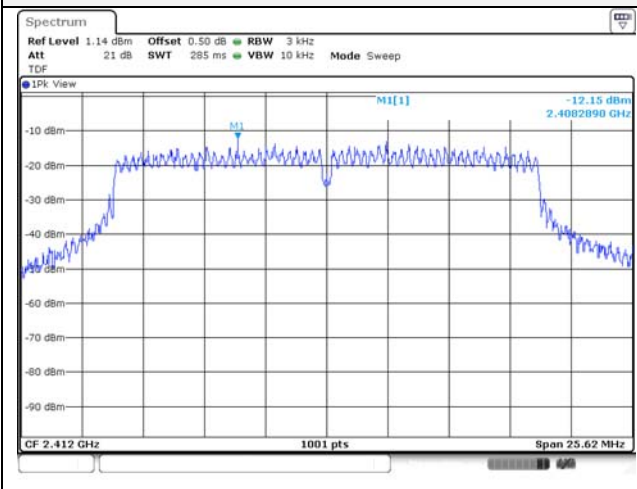


802.11g / 2 462 MHz

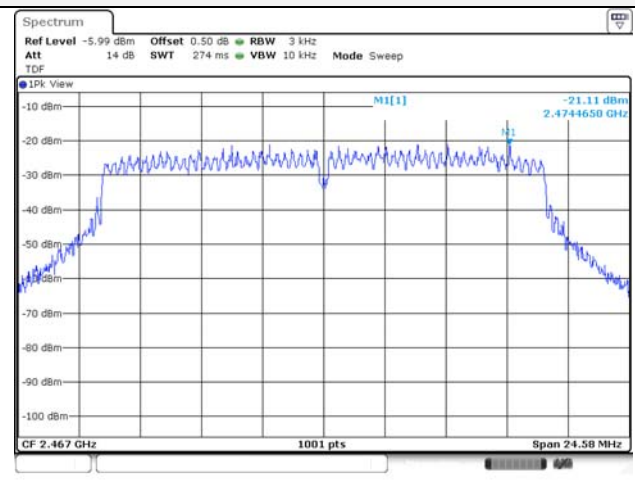


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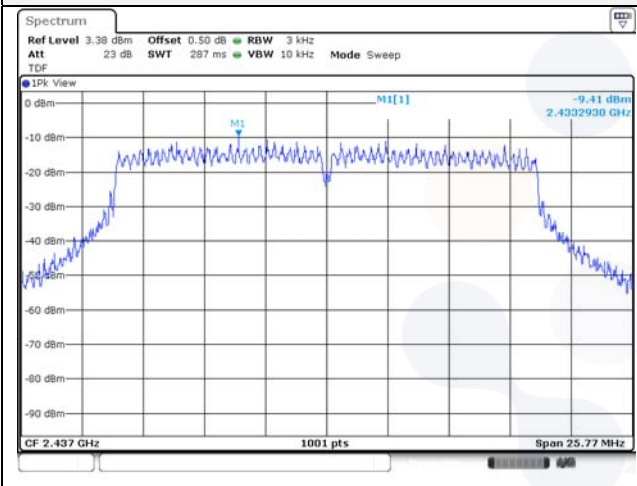
802.11n HT20 / 2 412 MHz



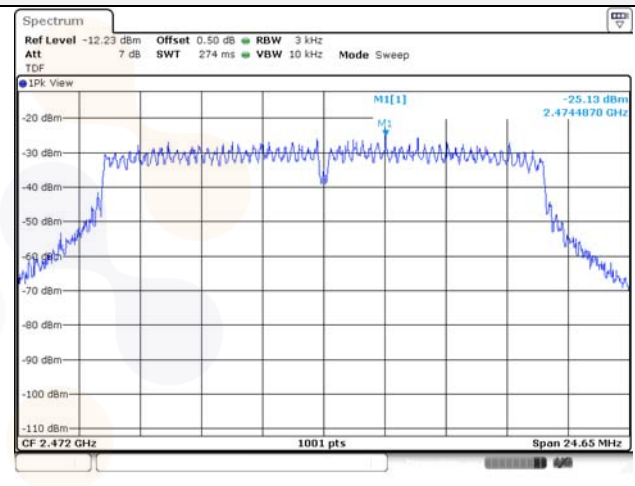
802.11n HT20 / 2 467 MHz



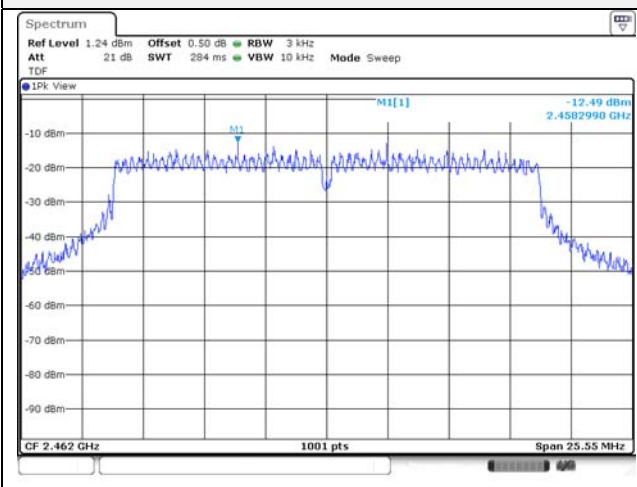
802.11n HT20 / 2 437 MHz



802.11n HT20 / 2 472 MHz

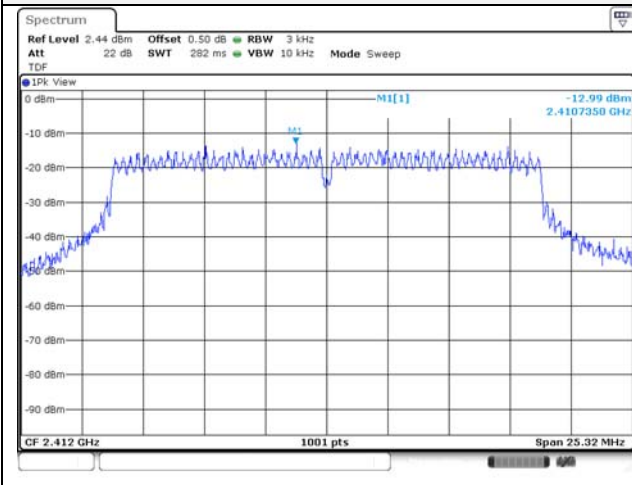


802.11n HT20 / 2 462 MHz

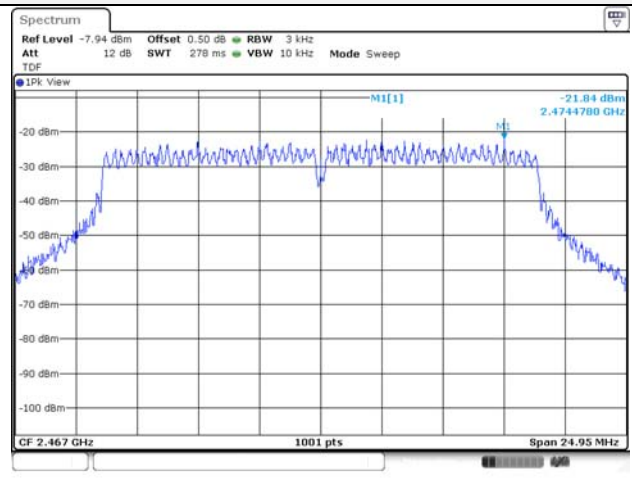


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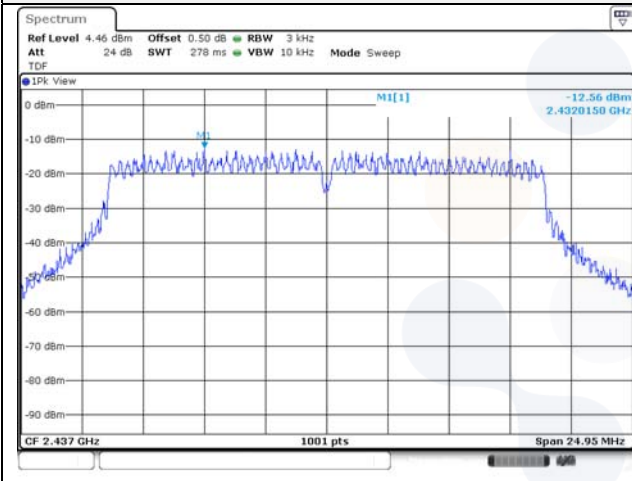
802.11ac VHT20 / 2 412 MHz



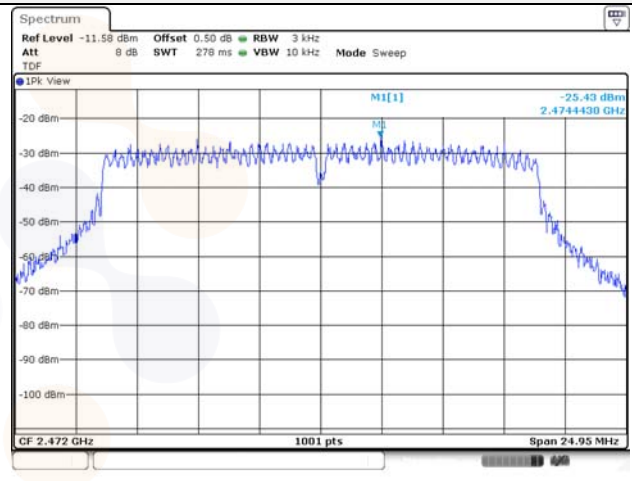
802.11ac VHT20 / 2 467 MHz



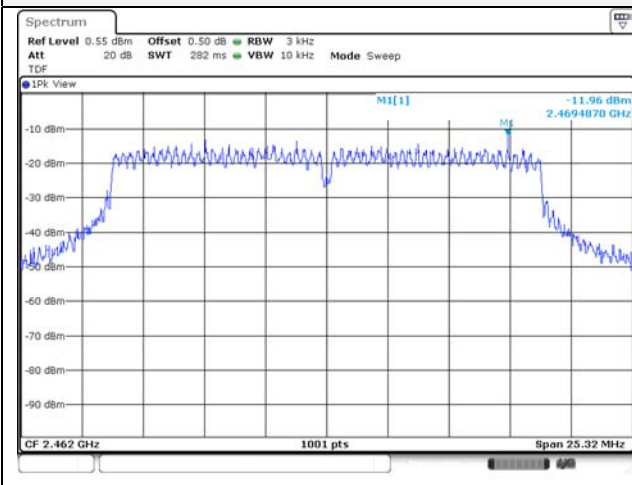
802.11ac VHT20 / 2 437 MHz



802.11ac VHT20 / 2 472 MHz



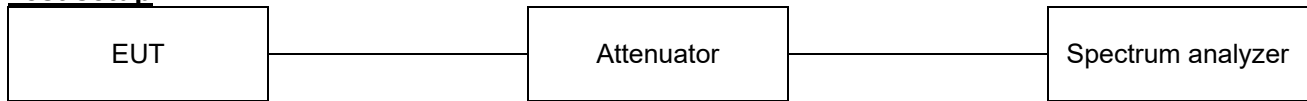
802.11ac VHT20 / 2 462 MHz



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7.3. 6 dB Bandwidth(DTS Channel Bandwidth) & 99% Bandwidth

Test setup



Limit

According to §15.247(a)(2) and RSS-247(5.2), Systems using digital modulation techniques may operate in the 902–928 MHz, 2 400–2 483.5 MHz, and 5 725–5 850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test procedure

ANSI C63.10 - Section 11.8.2

Test settings

DTS bandwidth



One of the following procedures may be used to determine the modulated DTS bandwidth.

Option 1

- 1) Set RBW = 100 kHz.
- 2) Set the video bandwidth (VBW) $\geq 3 \times$ 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 dB relative to the maximum level measured in the fundamental emission.

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 in 11.8.1 (i.e., RBW = 100 kHz, VBW $\geq 3 \times$ RBW, and 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.

<p>Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 www.kctl.co.kr</p>	<p>Report No.: KR22-SRF0169 Page (36) of (173)</p>	 
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Occupied bandwidth (or 99% emission bandwidth)

- ♦ The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- ♦ The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emissions skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- ♦ The detector of the spectrum analyzer shall be set to “Sample”. However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or “Max hold”) may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
- ♦ The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted

Notes: it may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms, The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

Test results

SISO_ANT2

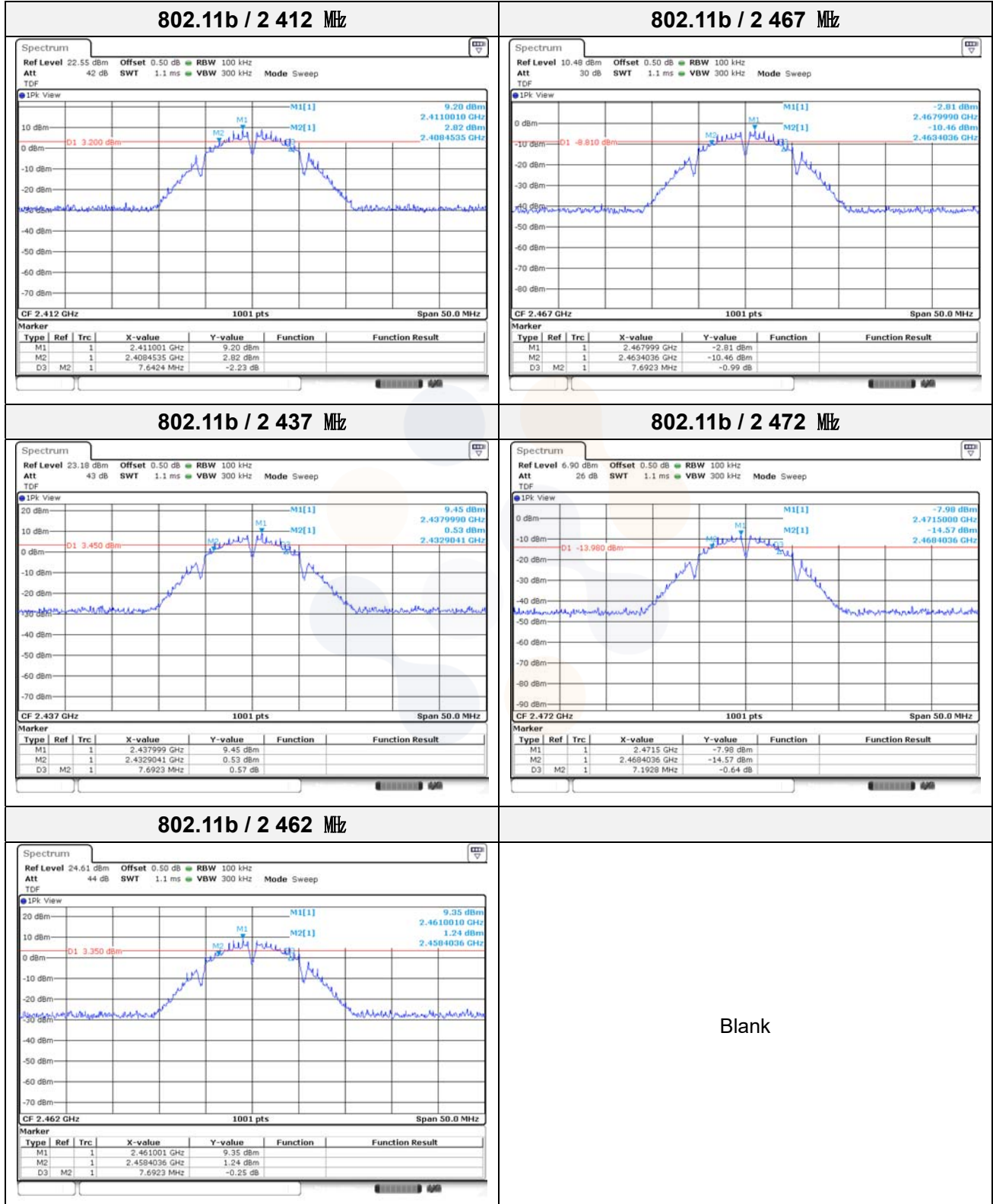
Test mode	Frequency(MHz)	6 dB Bandwidth(MHz)	99% Bandwidth(MHz)
802.11b	2412	7.64	13.74
	2437	7.69	13.69
	2462	7.69	13.84
	2467	7.69	14.24
	2472	7.19	13.64
802.11g	2412	16.03	16.48
	2437	16.38	16.48
	2462	16.03	16.53
	2467	16.38	16.53
	2472	15.63	16.43
802.11n HT20	2412	17.23	17.68
	2437	16.63	17.68
	2462	16.38	17.73
	2467	16.88	17.68
	2472	16.03	17.63
802.11ac VHT20	2412	16.03	17.68
	2437	16.63	17.68
	2462	16.33	17.68
	2467	15.78	17.58
	2472	16.03	17.63

MIMO_ANT1+ANT2

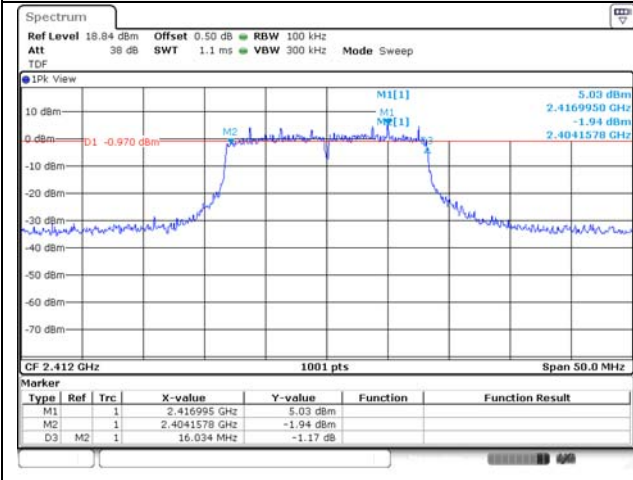
Test mode	Frequency(MHz)	6 dB Bandwidth(MHz)		99% Bandwidth(MHz)	
		ANT 1	ANT 2	ANT 1	ANT 2
802.11b	2412	7.69	7.69	14.34	14.44
	2437	8.14	7.64	14.04	13.69
	2462	7.64	7.69	14.59	14.54
	2467	7.69	8.19	14.14	14.14
	2472	8.19	7.64	13.64	13.64
802.11g	2412	16.38	16.38	16.83	16.78
	2437	15.98	16.43	16.53	16.48
	2462	16.13	16.38	16.63	16.58
	2467	15.83	16.38	16.48	16.53
	2472	15.63	16.43	16.43	16.48
802.11n HT20	2412	16.63	17.08	17.73	17.73
	2437	16.43	17.18	17.68	17.68
	2462	17.03	17.03	17.78	17.78
	2467	16.43	16.38	17.63	17.63
	2472	15.78	16.43	17.63	17.63
802.11ac VHT20	2412	16.98	16.88	17.73	17.73
	2437	16.43	16.63	17.63	17.68
	2462	17.03	16.88	17.78	17.78
	2467	16.98	16.63	17.68	17.68
	2472	16.38	16.63	17.63	17.63

SISO ANT2

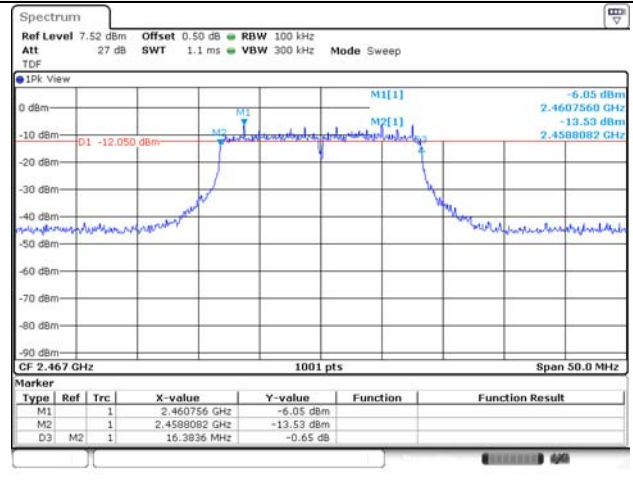
6 dB bandwidth



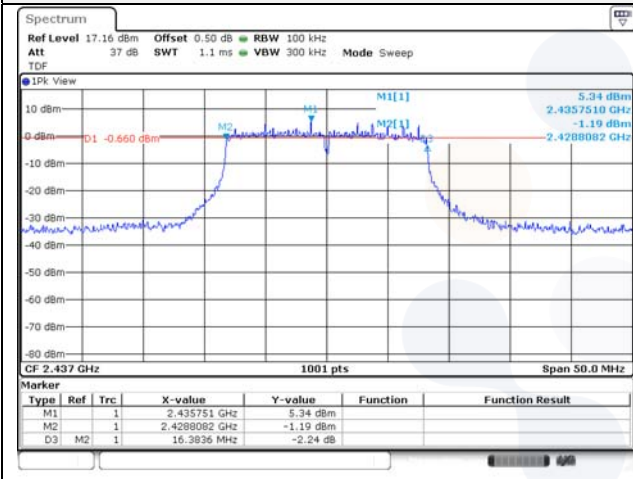
802.11g / 2 412 MHz



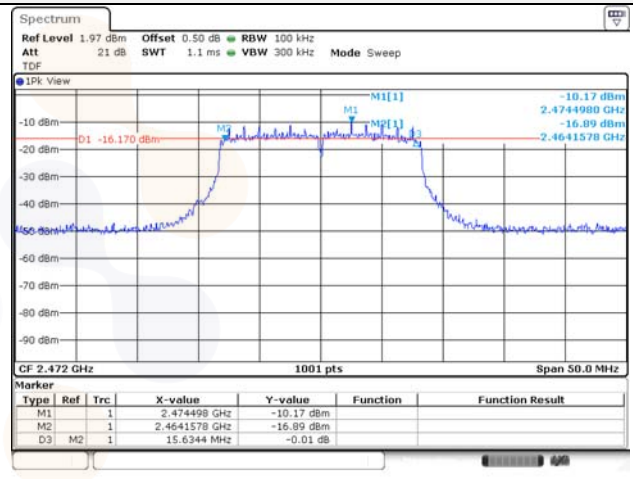
802.11g / 2 467 MHz



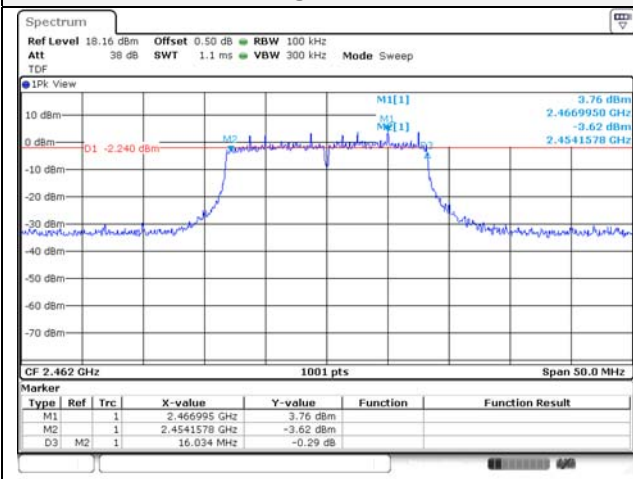
802.11g / 2 437 MHz



802.11g / 2 472 MHz

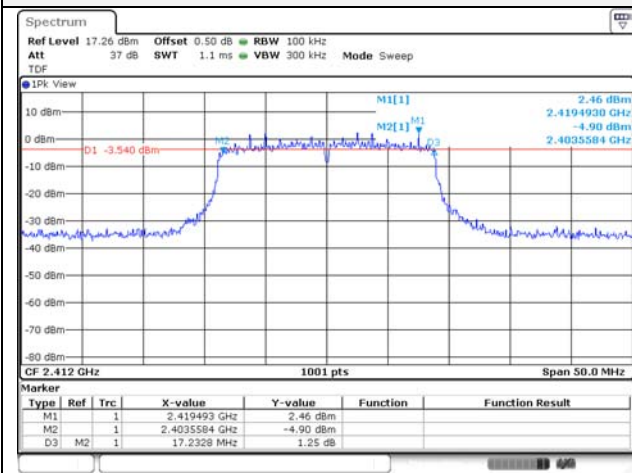


802.11g / 2 462 MHz

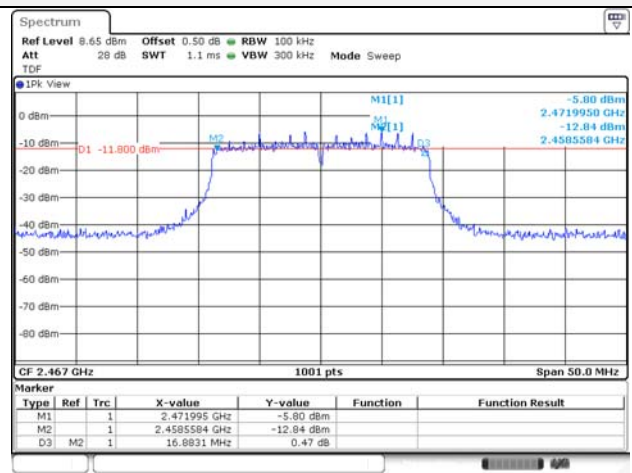


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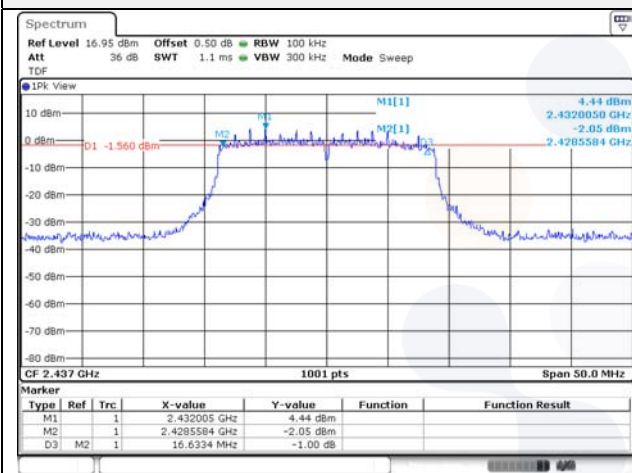
802.11n HT20 / 2 412 MHz



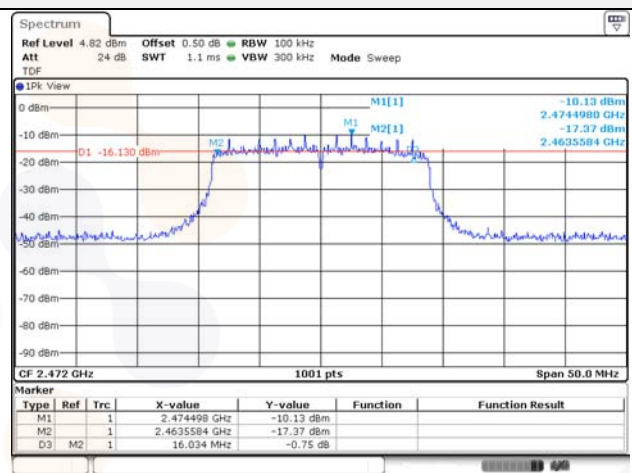
802.11n HT20 / 2 467 MHz



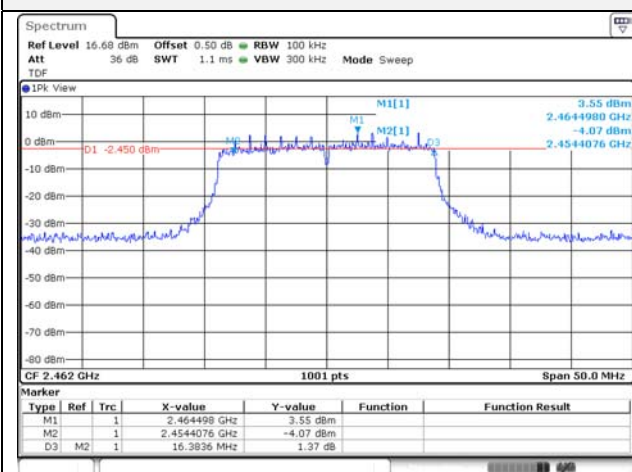
802.11n HT20 / 2 437 MHz



802.11n HT20 / 2 472 MHz

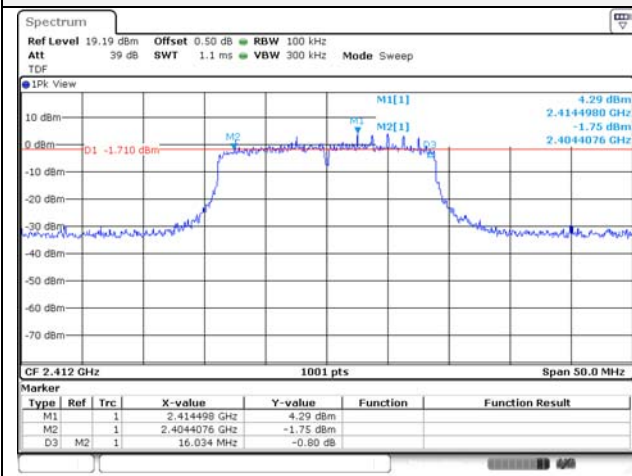


802.11n HT20 / 2 462 MHz

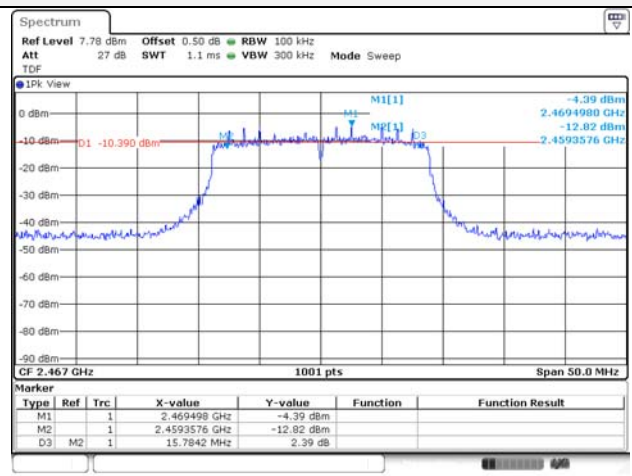


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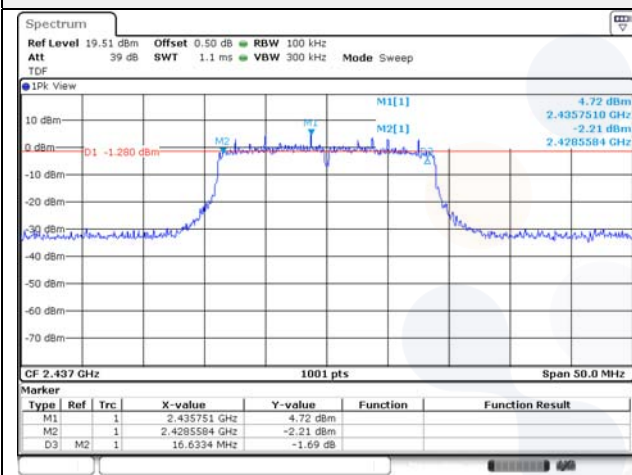
802.11ac VHT20 / 2 412 MHz



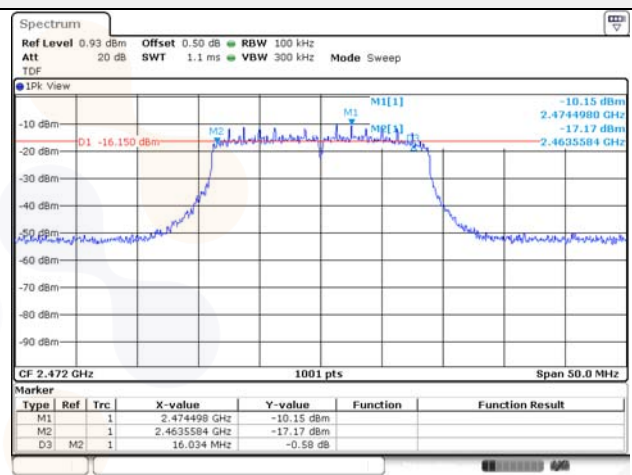
802.11ac VHT20 / 2 467 MHz



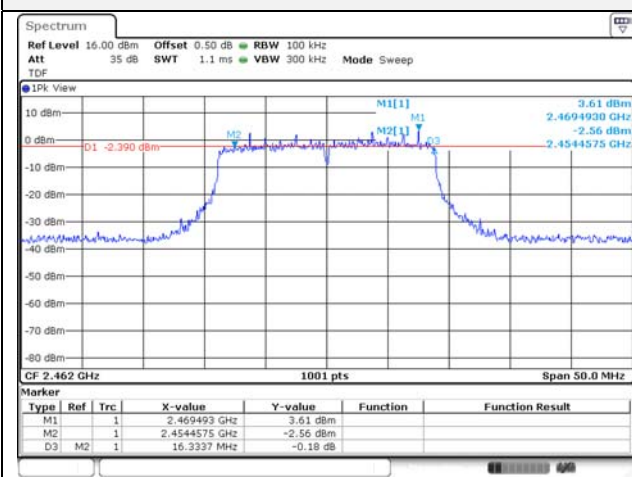
802.11ac VHT20 / 2 437 MHz



802.11ac VHT20 / 2 472 MHz

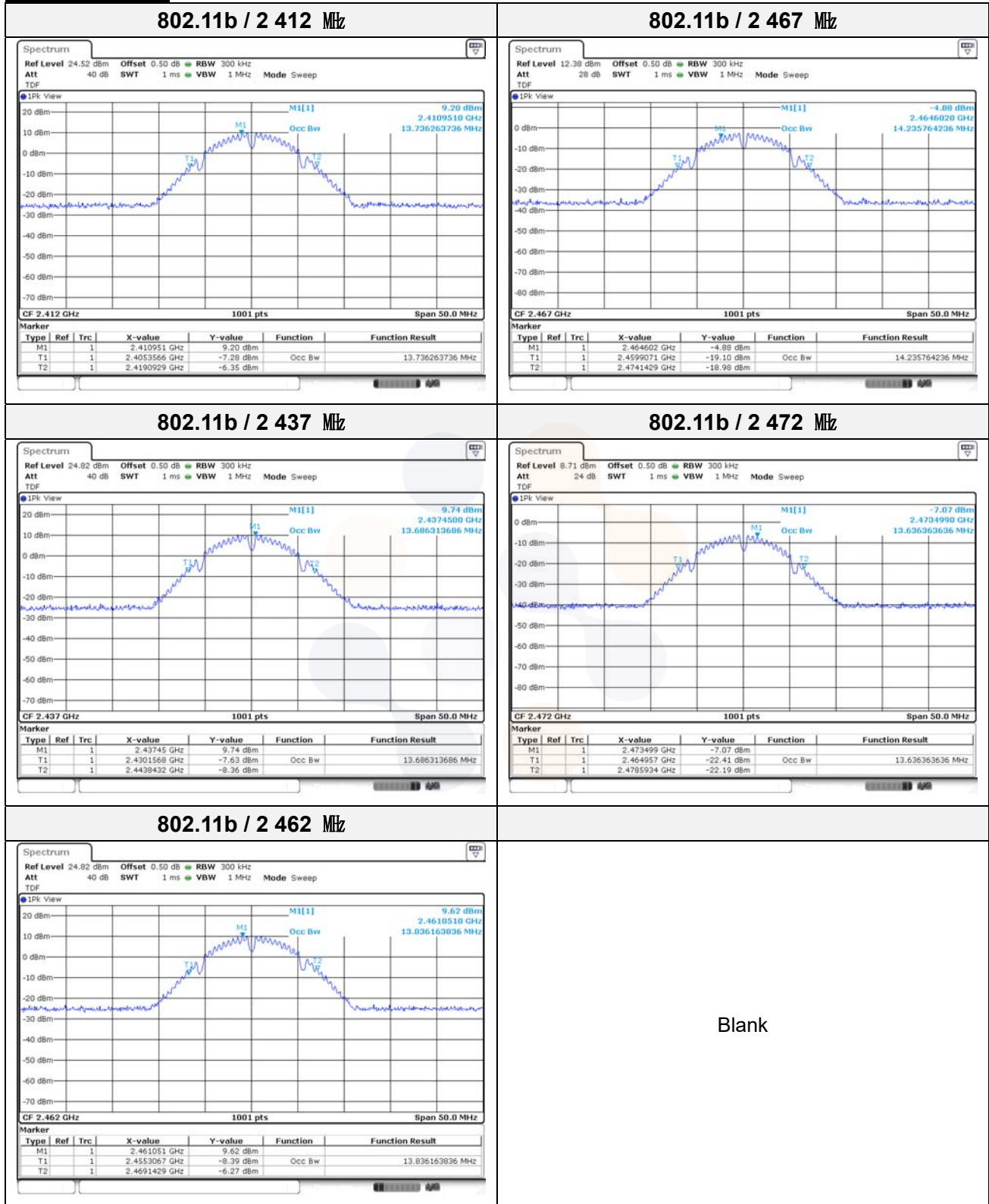


802.11ac VHT20 / 2 462 MHz

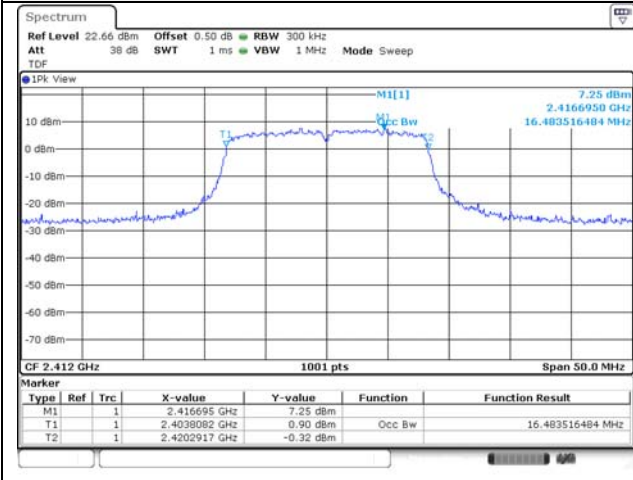


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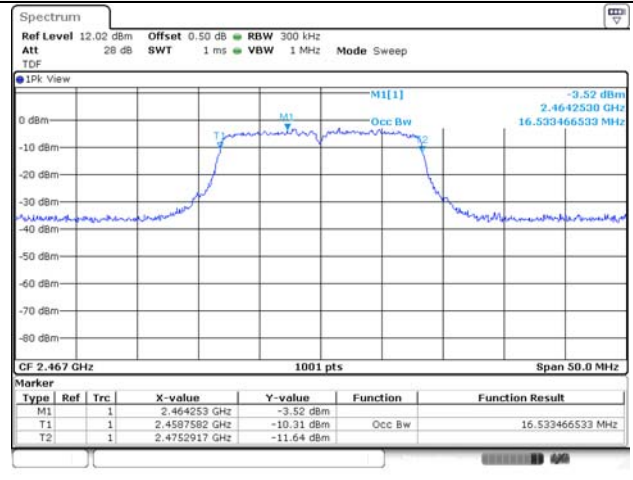
99% Bandwidth



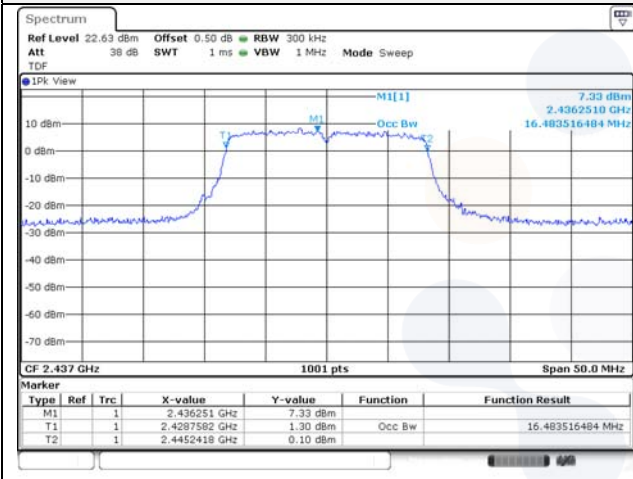
802.11g / 2 412 MHz



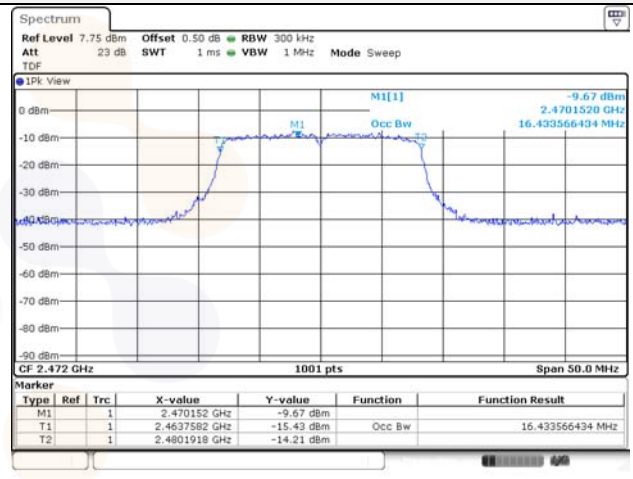
802.11g / 2 467 MHz



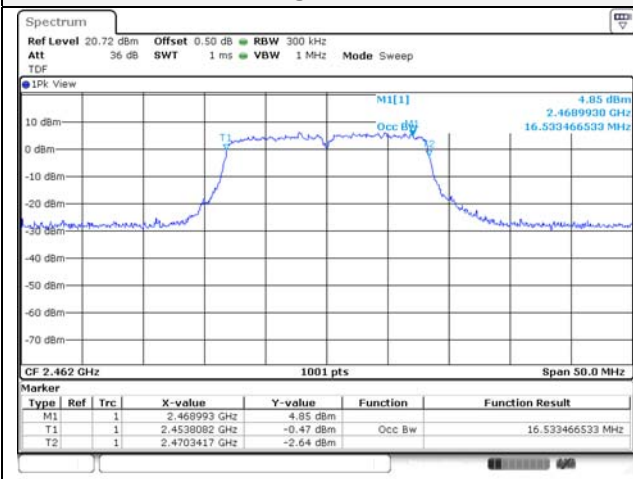
802.11g / 2 437 MHz



802.11g / 2 472 MHz

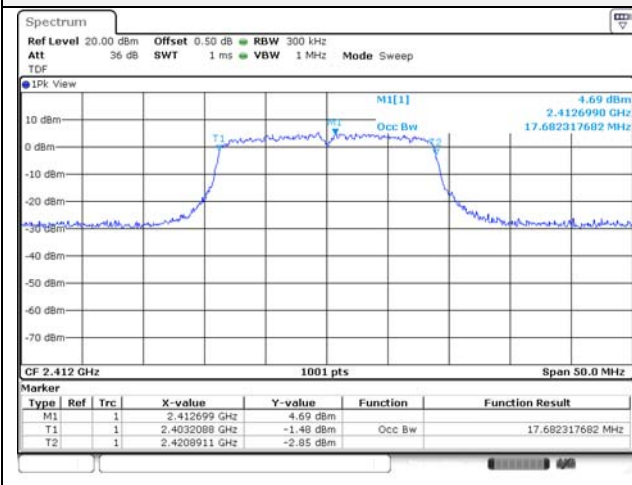


802.11g / 2 462 MHz

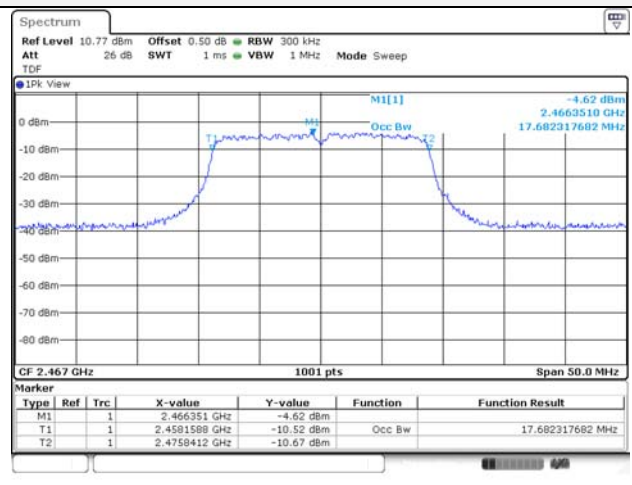


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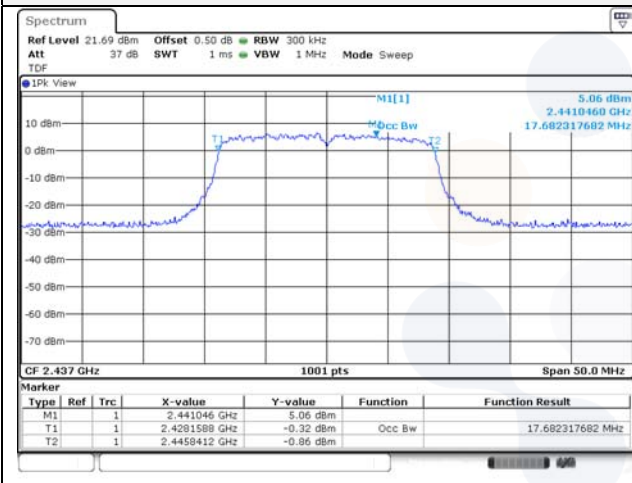
802.11n HT20 / 2 412 MHz



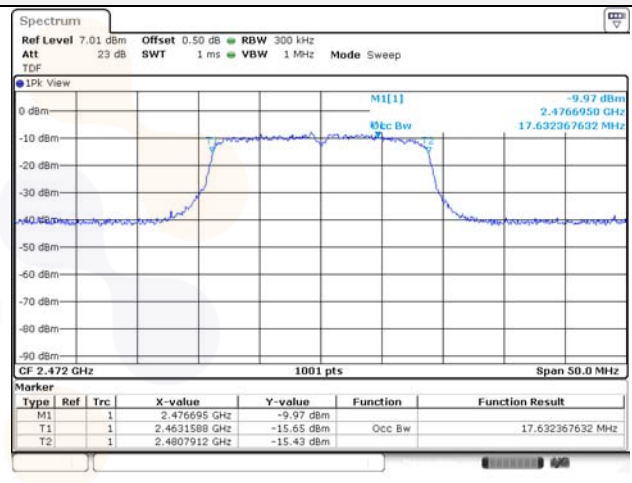
802.11n HT20 / 2 467 MHz



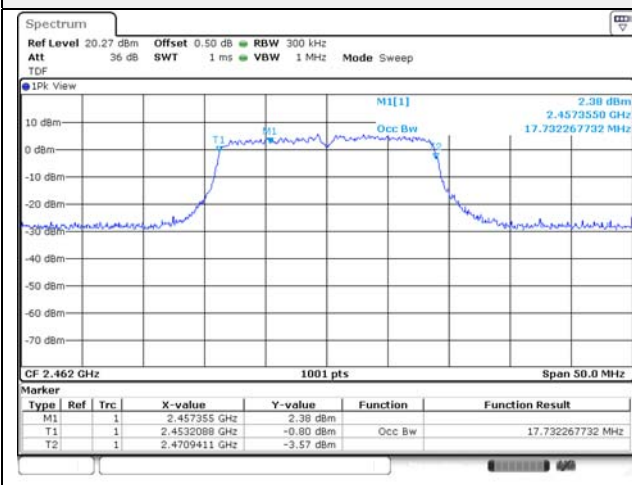
802.11n HT20 / 2 437 MHz



802.11n HT20 / 2 472 MHz

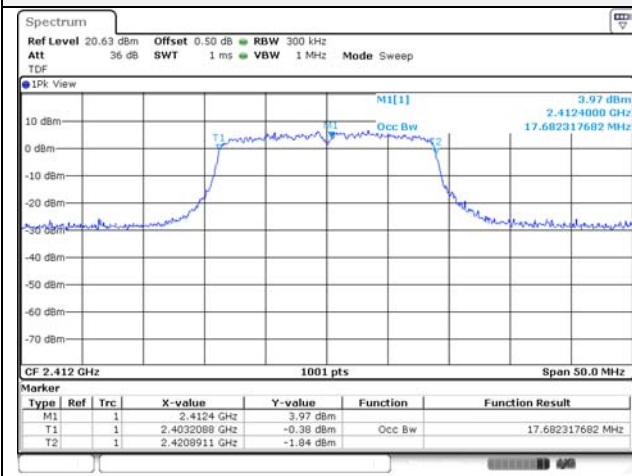


802.11n HT20 / 2 462 MHz

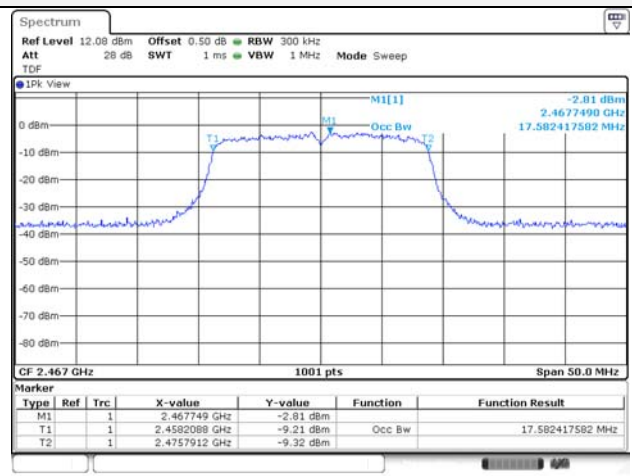


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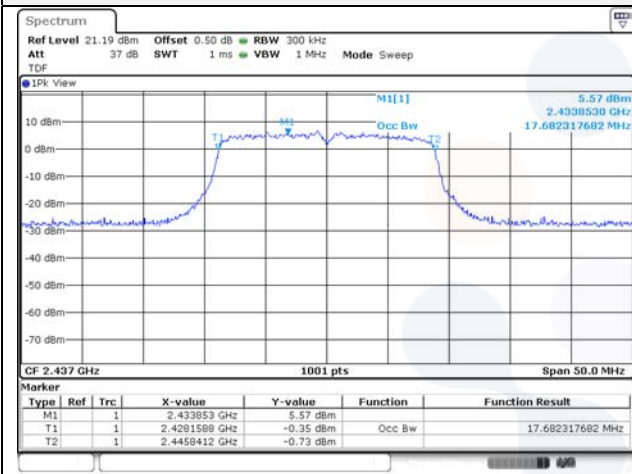
802.11ac VHT20 / 2 412 MHz



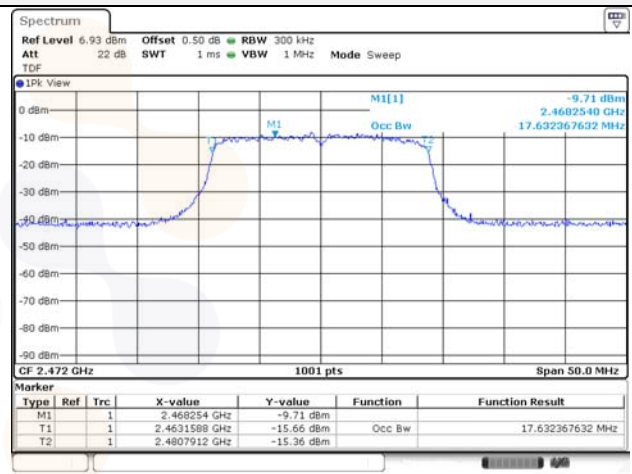
802.11ac VHT20 / 2 467 MHz



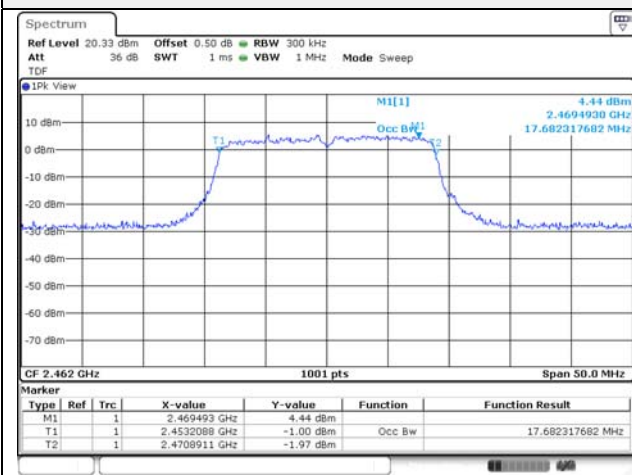
802.11ac VHT20 / 2 437 MHz



802.11ac VHT20 / 2 472 MHz



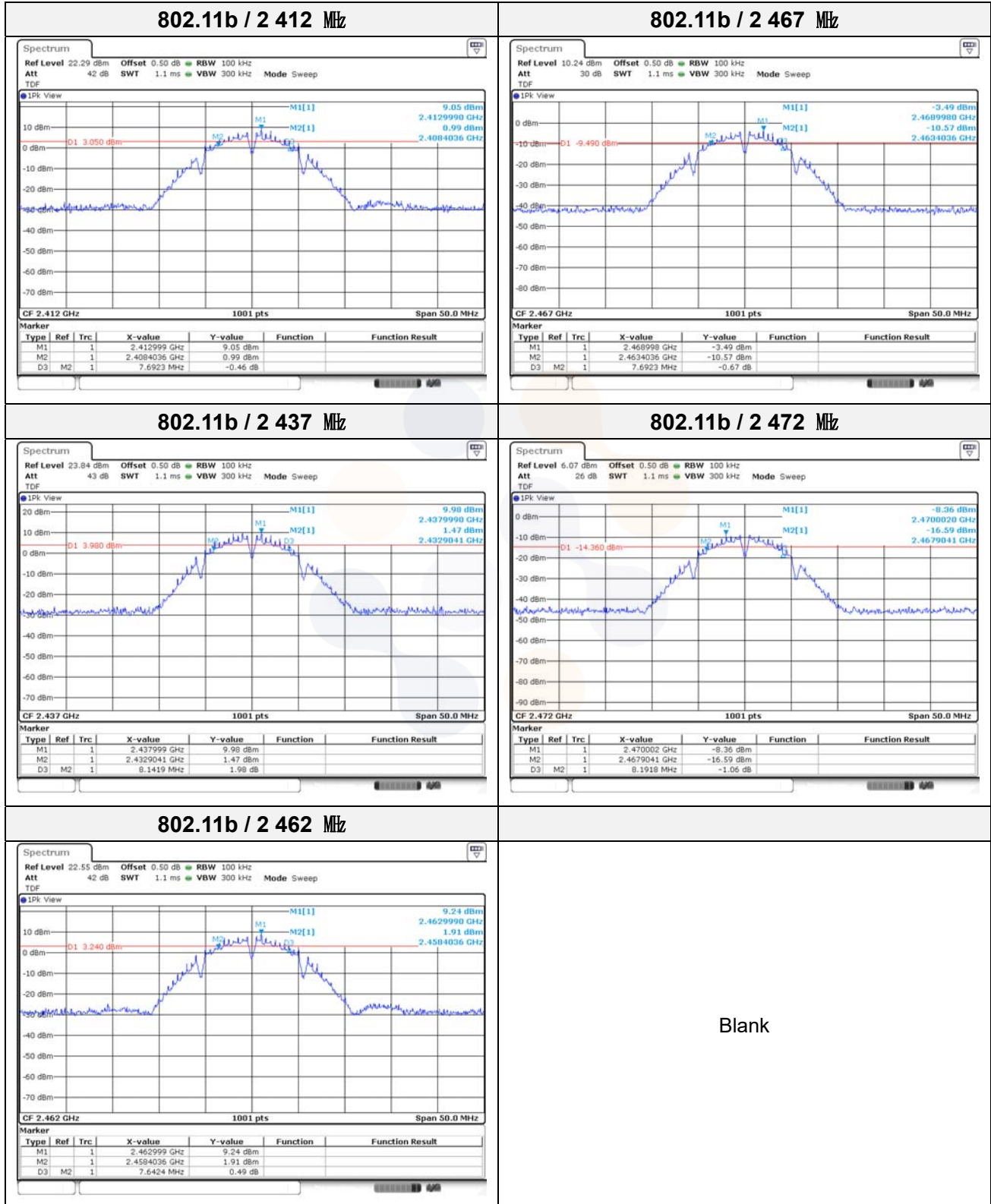
802.11ac VHT20 / 2 462 MHz



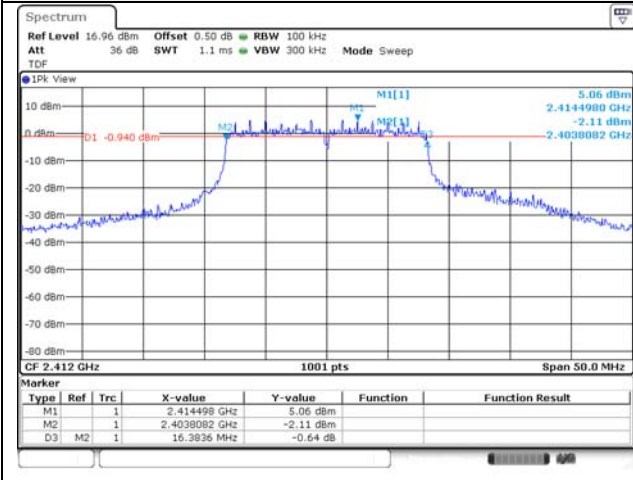
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MIMO ANT1

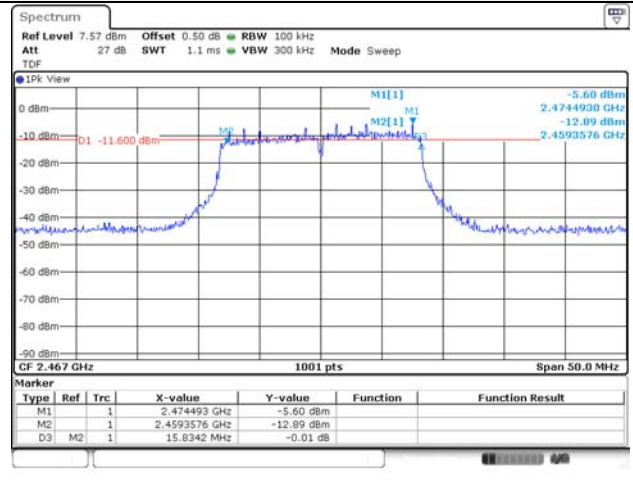
6 dB Bandwidth



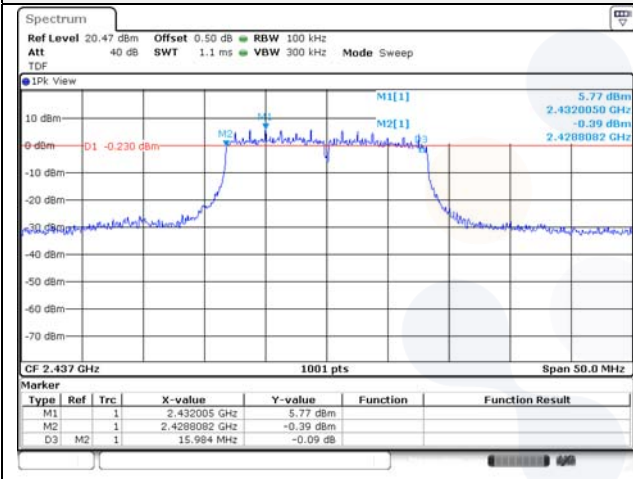
802.11g / 2 412 MHz



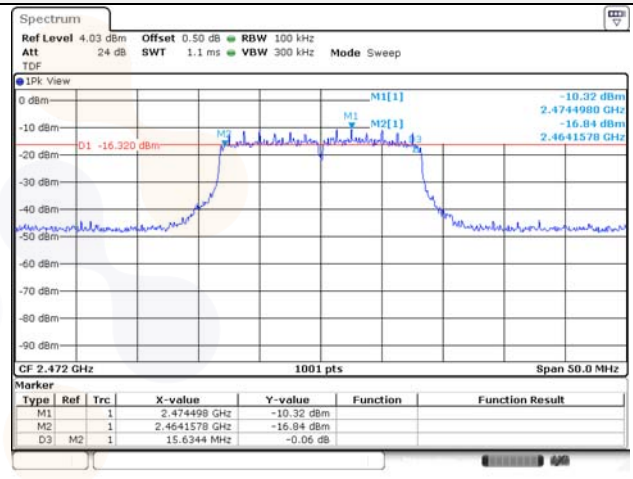
802.11g / 2 467 MHz



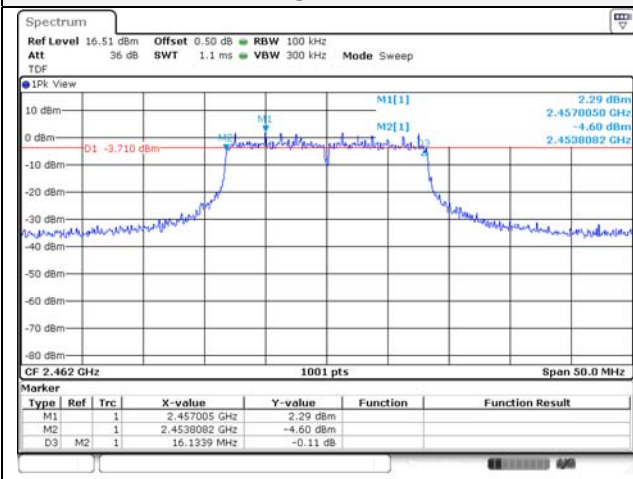
802.11g / 2 437 MHz



802.11g / 2 472 MHz



802.11g / 2 462 MHz



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