



RADIO TEST REPORT

Product : ParSEC (Parallel Shelf Edge Camera)
Model Name : SEC01DL
FCC ID : 2A8EI-SEC01
Test Regulation : FCC 47 CFR Part 15 Subpart C (Section 15.247)
Received Date : 2022/6/17
Test Date : 2022/06/17 ~ 2022/06/24
Issued Date : 2022/8/22

Applicant : Target Corporation
1000 Nicollet Mall, TPN-0715 Minneapolis Minnesota 55403
United States
Issued By : Underwriters Laboratories Taiwan Co., Ltd.
Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd.,
Zhudong Township, Hsinchu County, Taiwan



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Doc No: 17-EM-F0876 / 6.0



REVISION HISTORY

Original Test Report No.: 4790441603-US-R0-V0

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Table of Contents

1. Attestation of Test Results	4
2. Summary of Test Results	5
3. Test Methodology and Reference Procedures.....	6
4. Facilities and Accreditation.....	6
5. Measurement Uncertainty	7
6. Equipment under Test	8
6.1. Description of EUT	8
6.2. Channel List	10
6.3. Test Condition.....	11
6.4. Description of Available Antennas	11
6.5. Test Mode Applicability and Tested Channel Detail.....	12
6.6. Duty cycle	13
7. Test Equipment.....	14
8. Description of Test Setup.....	15
9. Test Results.....	16
9.1. 6dB Bandwidth	16
9.2. Conducted Output Power	21
9.3. Power Spectral Density.....	24
9.4. Conducted Out of Band Emission.....	29
9.5. Radiated Spurious Emission	42

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1. Attestation of Test Results

APPLICANT: Target Corporation
1000 Nicollet Mall, TPN-0715 Minneapolis Minnesota 55403 United States

MANUFACTURER: Target Corporation
1000 Nicollet Mall, TPN-0715 Minneapolis Minnesota 55403 United States

EUT DESCRIPTION: ParSEC (Parallel Shelf Edge Camera)

BRAND: TARGET

MODEL: SEC01DL

SAMPLE STAGE: Pilot-run Verification Test sample

DATE of TESTED: 2022/06/17 ~ 2022/06/24

APPLICABLE STANDARDS	
STANDARD	Test Results
FCC 47 CFR PART 15 Subpart C (Section 15.247)	PASS

Underwriters Laboratories Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:

Sally Lu
Project Handler

Date : 2022/8/22

Approved and Authorized By:

Eric Lee
Senior Laboratory Engineer

Date : 2022/8/22

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2. Summary of Test Results

Summary of Test Results		
FCC Clause	Test Items	Result
15.247(a)(2)	6dB Bandwidth	PASS
15.247(b)	Conducted Output Power	PASS
15.247(e)	Power Spectral Density	PASS
15.247(d)	Antenna Port Emission	PASS
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS
15.207	AC Power Conducted Emission	NA
15.203	Antenna Requirement	PASS

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3. Test Methodology and Reference Procedures

The tests documented in this report were performed in accordance with 47 CFR FCC Part 2, KDB558074 D01 Meas Guidance v05r02, KDB414788 D01 Radiated Test Site v01r01, ANSI C63.10-2013.

4. Facilities and Accreditation

Test Location	Underwriters Laboratories Taiwan Co., Ltd.
Address	Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Accreditation Certificate	Underwriters Laboratories Taiwan Co., Ltd. is accredited by TAF, Laboratory Code 3398.

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5. Measurement Uncertainty

For statement of conformity, accuracy method (Section 8.2.4 and 8.2.5 of ISO Guide 98-4) was applied as decision rule for measurement in this test report.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor k=2.

Measurement	Frequency	Uncertainty
Conducted disturbance at mains terminals ports	150kHz ~ 30MHz	±2.9 dB
RF Conducted	9 kHz - 40GHz	±2.4 dB
Radiated disturbance below 30MHz	9 kHz - 30 MHz	±1.9 dB
Radiated disturbance below 1 GHz	30MHz ~ 1GHz	±5.8 dB
Radiated disturbance above 1 GHz	1GHz ~ 40GHz	±4.8 dB

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6. Equipment under Test

6.1. Description of EUT

Product	ParSEC (Parallel Shelf Edge Camera)
Brand Name	TARGET
Model Name	SEC01DL
Operating Frequency	2412MHz ~ 2462MHz
Modulation	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Transfer Rate	802.11b: up to 11 Mbps 802.11g: up to 54 Mbps 802.11n: up to MCS7
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20) 7 for 802.11n (HT40)
Maximum Output Power	802.11b: 16.77 dBm 802.11g: 17.64 dBm 802.11n (HT20): 18.04 dBm 802.11n (HT40): 17.47 dBm
Nominal Voltage	4.5Vdc from battery
S/N	Conducted Test: SEC01DL21110013 Radiated Test: SEC01DL21110015
Sample ID	Conducted Test: 5068948 Radiated Test: 5068950

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Note:

1. The product has two enclosure types (MK1 & MK2) - both are specified with same model number. The difference is only enclosure and the change in enclosure is for appearance purpose.
2. The EUT incorporates a SISO function. Physically, the EUT provides one completed transmitter and one receiver.

Modulation Mode	Tx,Rx Function
802.11b	1TX,1RX
802.11g	1TX,1RX
802.11n (HT20)	1TX,1RX
802.11n (HT40)	1TX,1RX

3. The EUT could be supplied with rechargeable battery as the following table:

Brand Name	Model	Description
Energizer	L91	1.5Vdc, 3500 mAh

4. The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer's or user's manual.

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6.2. Channel List

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437	-	-

7 channels are provided for 802.11n (HT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
3	2422	7	2442
4	2427	8	2447
5	2432	9	2452
6	2437	-	-

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6.3. Test Condition

Test Item	Test Site No.	Environmental Condition	Input Power	Test Date	Tested by
Antenna Port Conducted Measurement	SR4	23~25°C/ 60~65% RH	4.5Vdc	2022/06/17~ 2022/06/24	Patrick Kuan
Radiated Spurious Emission	966-2	23~25°C/ 60~65% RH	4.5Vdc	2022/06/17~ 2022/06/24	Patrick Kuan

FCC Test Firm Registration Number: 498077

6.4. Description of Available Antennas

Ant. No.	Transmitter Circuit	Brand Name	Ant. Type	Maximum Gain (dBi)
1	Chain (0)	Espressif	PCB	3.42

Note: The above antenna information was provided from customer and for more detailed features description, please refer the manufacturer's specification or user's manual.

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6.5. Test Mode Applicability and Tested Channel Detail

- The EUT power source type: 4.5Vdc from battery. Therefore only the test data of the 4.5Vdc was recorded in this report.
- The fundamental of the EUT was investigated in three orthogonal axes X-Y/Y-Z/X-Z, it was determined that X-Z plane was worst-case. Therefore, all final radiated testing was performed with the EUT in X-Z plane.
- For Antenna Port Conducted Measurement, it includes all test results for each mode.
- For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel), parallel and perpendicular are the worst orientations, therefore testing was performed on these two orientations only.
- Since the EUT has been evaluated low, middle, and high channels for radiated emission of above 1GHz. Based on this condition, we only choose the worst mode to test radiated emission of below 1GHz.
- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Test Item	Mode	Modulation Technology	Modulation Type	Available Channel	Test Channel	Data Rate
Radiated Emissions (Above 1GHz)	802.11b	DSSS	DBPSK	1 to 11	1,6,11	1 Mbps
	802.11g	OFDM	BPSK	1 to 11	1,6,11	6 Mbps
	802.11n20	OFDM	BPSK	1 to 11	1,6,11	MCS0
	802.11n40	OFDM	BPSK	3 to 9	3,6,9	MCS0
Radiated Emissions (Below 1GHz)	802.11n20	OFDM	BPSK	1 to 11	1	MCS0
*Antenna Port Conducted Measurement	802.11b	DSSS	DBPSK	1 to 11	1,6,11	1 Mbps
	802.11g	OFDM	BPSK	1 to 11	1,6,11	6 Mbps
	802.11n20	OFDM	BPSK	1 to 11	1,6,11	MCS0
	802.11n40	OFDM	BPSK	3 to 9	3,6,9	MCS0

*Note: For Antenna Port Conducted Measurement item, Inner channels only test Power and Conducted Out of Band Emission.

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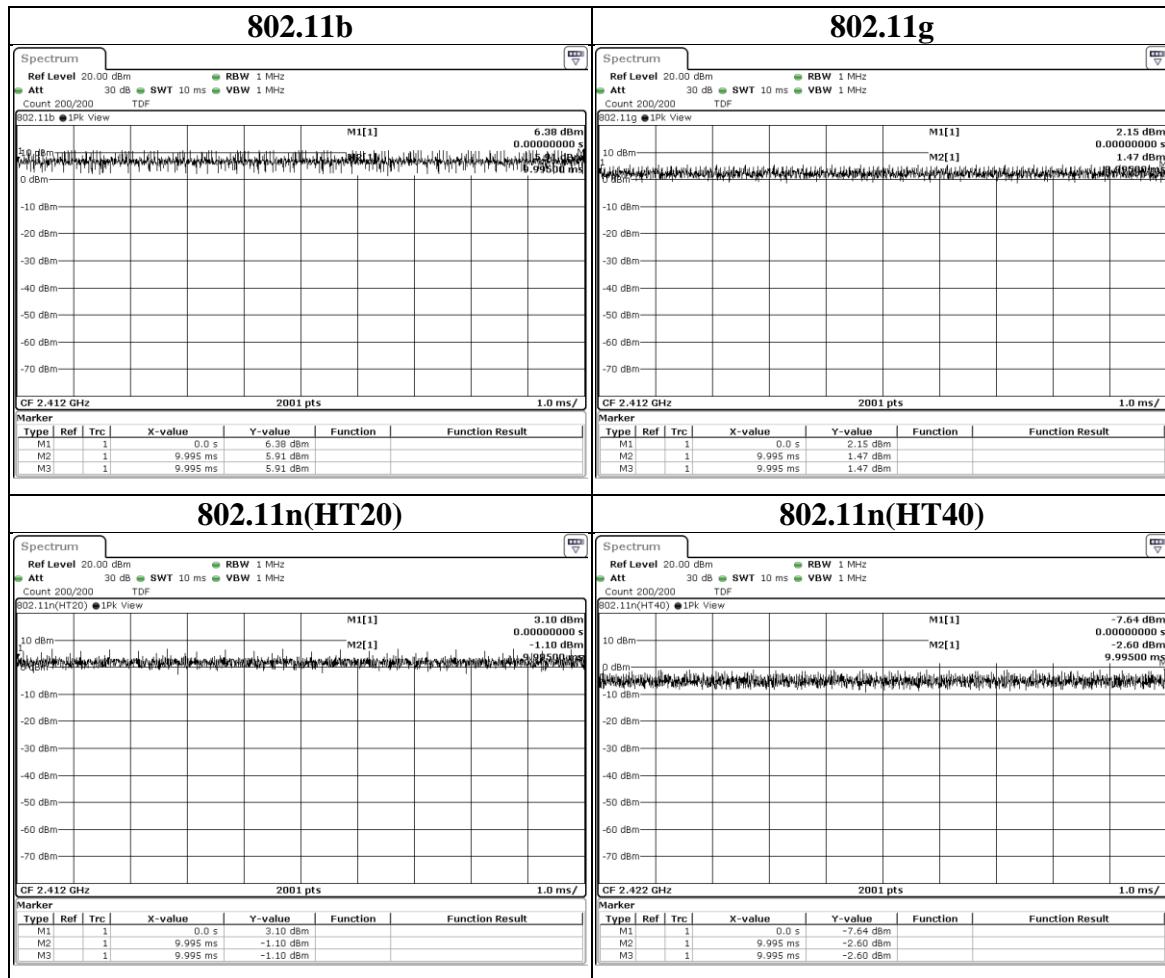
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6.6. Duty cycle

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle	Duty Factor (dB)	VBW Set (above 1GHz)
802.11b	9.995	9.995	1.0000	N/A	10Hz
802.11g	9.995	9.995	1.0000	N/A	10Hz
802.11n(HT20)	9.995	9.995	1.0000	N/A	10Hz
802.11n(HT40)	9.995	9.995	1.0000	N/A	10Hz



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7. Test Equipment

Test Equipment List					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Expired date
Radiated Spurious Emission					
Spectrum Analyzer	Keysight	N9010A	MY56070827	2021/11/9	2022/11/8
EMI Test Receiver	Rohde & Schwarz	ESR7	101754	2021/12/10	2022/12/9
Loop Antenna	ETS lindgren	6502	00213440	2021/12/23	2022/12/22
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck & EMCI	VULB 9168 & N-6-05	774 & AT-N0538	2022/2/8	2023/2/7
Horn Antenna (1-18 GHz)	Schwarzbeck	BBHA 9120 D	01690	2021/12/13	2022/12/12
Horn Antenna (18-40 GHz)	Schwarzbeck	BBHA 9170	781	2021/12/17	2022/12/16
Preamplifier (30-1000 MHz)	EMCI	EMC330E	980405	2022/6/7	2023/6/6
Preamplifier (1-18 GHz)	EMCI	EMC051835BE	980406	2022/2/16	2023/2/15
Preamplifier (18-40GHz)	EMCI	EMC184040SEE	980426	2022/5/17	2023/5/16
Cables	Hanyitek	K1K50-UP0264-K1K50-2500	170214-4 & 170425-2	2021/12/3	2022/12/2
Cables	Hanyitek	K1K50-UP0264-K1K50-2500	170214-1 & 170214-2	2021/12/3	2022/12/2
Antenna Port Conducted Measurement					
Spectrum Analyzer	Keysight	N9010A	MY56070834	2021/10/29	2022/10/28
Pulse Power Sensor	Anritsu	MA2411B	1531202	2021/12/22	2022/12/21
Power Meter	Anritsu	ML2495A	1645002	2021/12/22	2022/12/21

UL Software		
Description	Name	Version
Radiated measurement	e3	6.191211 (V6)
Conducted measurement	RF-Conducted-FCC 15247	ver 1.0

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8. Description of Test Setup

Support Equipment

ID	Equipment	Brand Name	Model Name	S/N	Remark
A	USB to UART Dongle	N/A	N/A	N/A	Provide by Client
B	Laptop	Lenovo	T460	PC0FWU5Y	Provide by lab

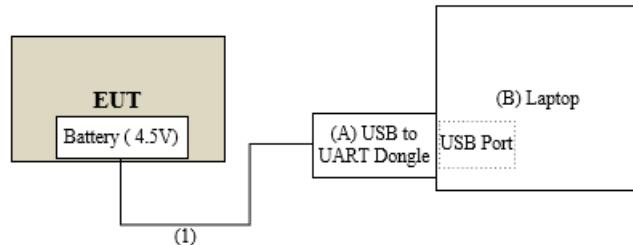
I/O Cable

ID	Equipment	Brand Name	Model Name	Length (m)	Remark
1	Dupont Cable	N/A	N/A	0.2	Provide by Client

Test Setup

Controlled using a bespoke application (EspRFTestTool_v2.8) on a test Notebook. The application was used to enable a continuous transmission mode and to select the test channels, data rates, modulation schemes and power setting as required.

Setup Diagram for Test



Under Table

Remote Site

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9. Test Results

9.1. 6dB Bandwidth

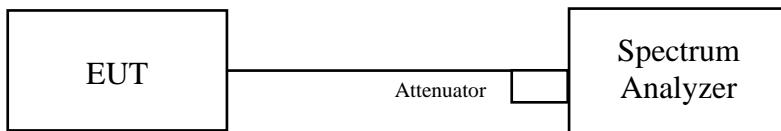
Requirements

The minimum 6 dB bandwidth shall be at least 500 kHz.

Test procedure

- a. Set resolution bandwidth (RBW) = 100kHz.
- b. Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- c. Trace mode = max hold.
- d. Sweep = auto couple.
- e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Test Setup



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

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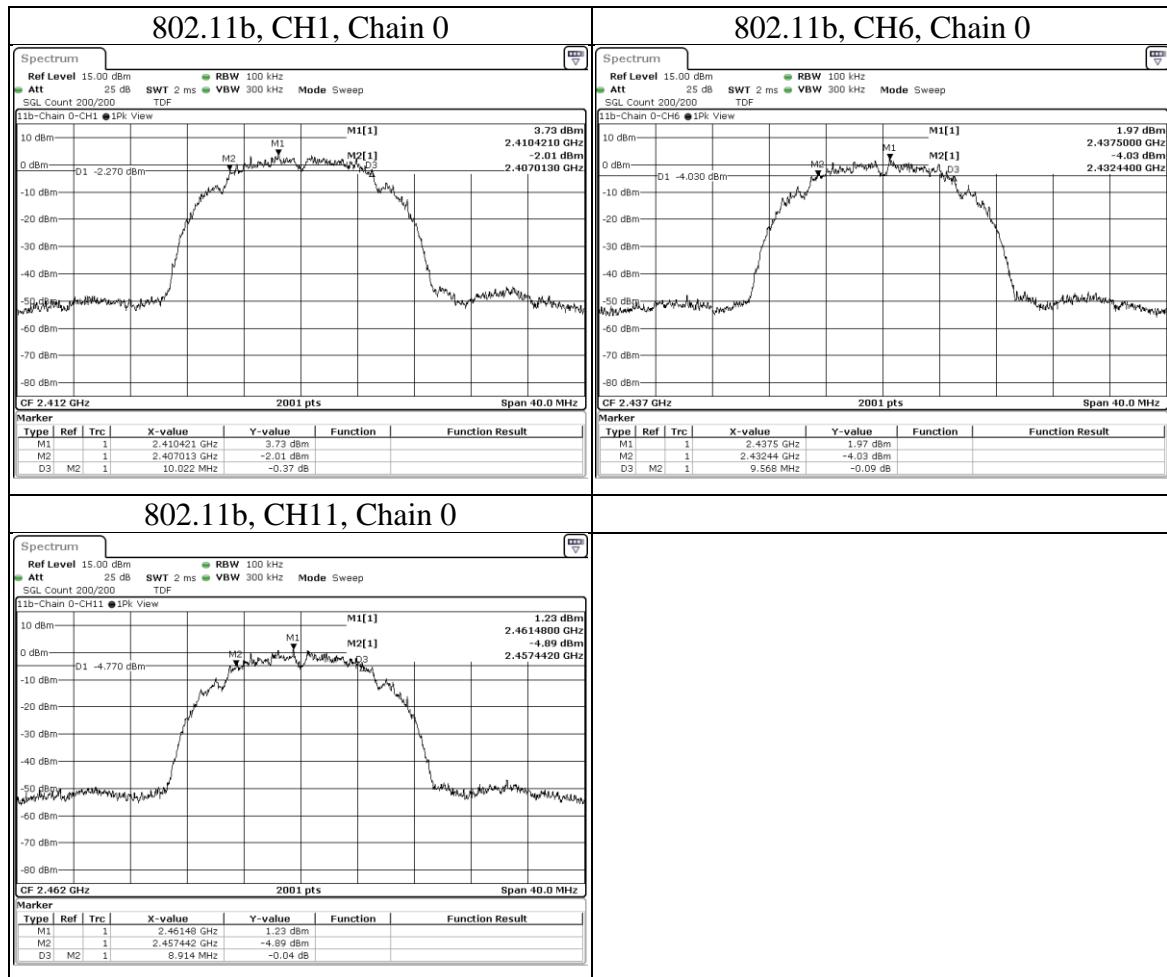
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Test Data

Mode	CH	Freq (MHz)	6dB BW (MHz)	Limit (MHz)	Result
			Chain 0		
802.11b	1	2412	10.022	0.5	Pass
	6	2437	9.568	0.5	Pass
	11	2462	8.914	0.5	Pass



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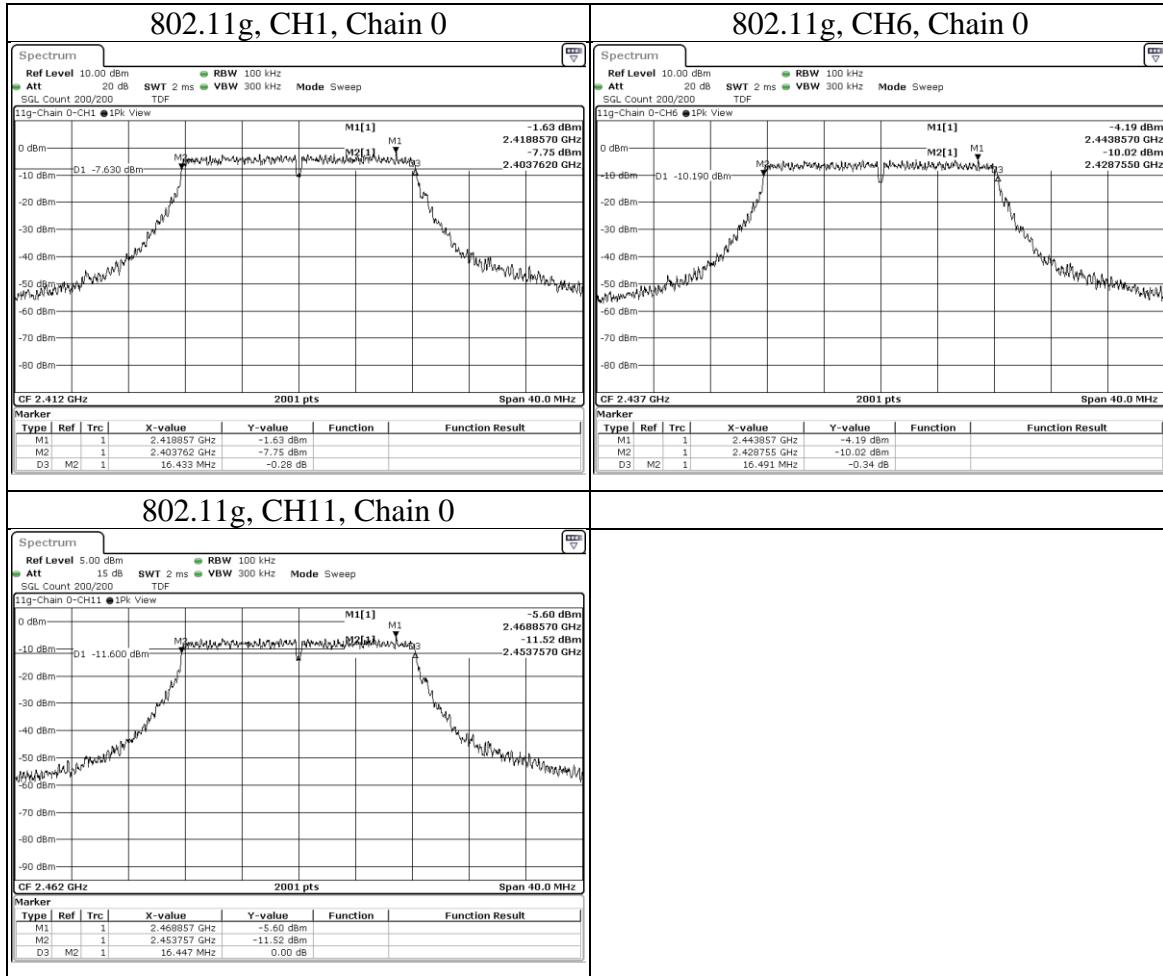
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Mode	CH	Freq (MHz)	6dB BW (MHz)	Limit (MHz)	Result
			Chain 0		
802.11g	1	2412	16.433	0.5	Pass
	6	2437	16.491	0.5	Pass
	11	2462	16.447	0.5	Pass



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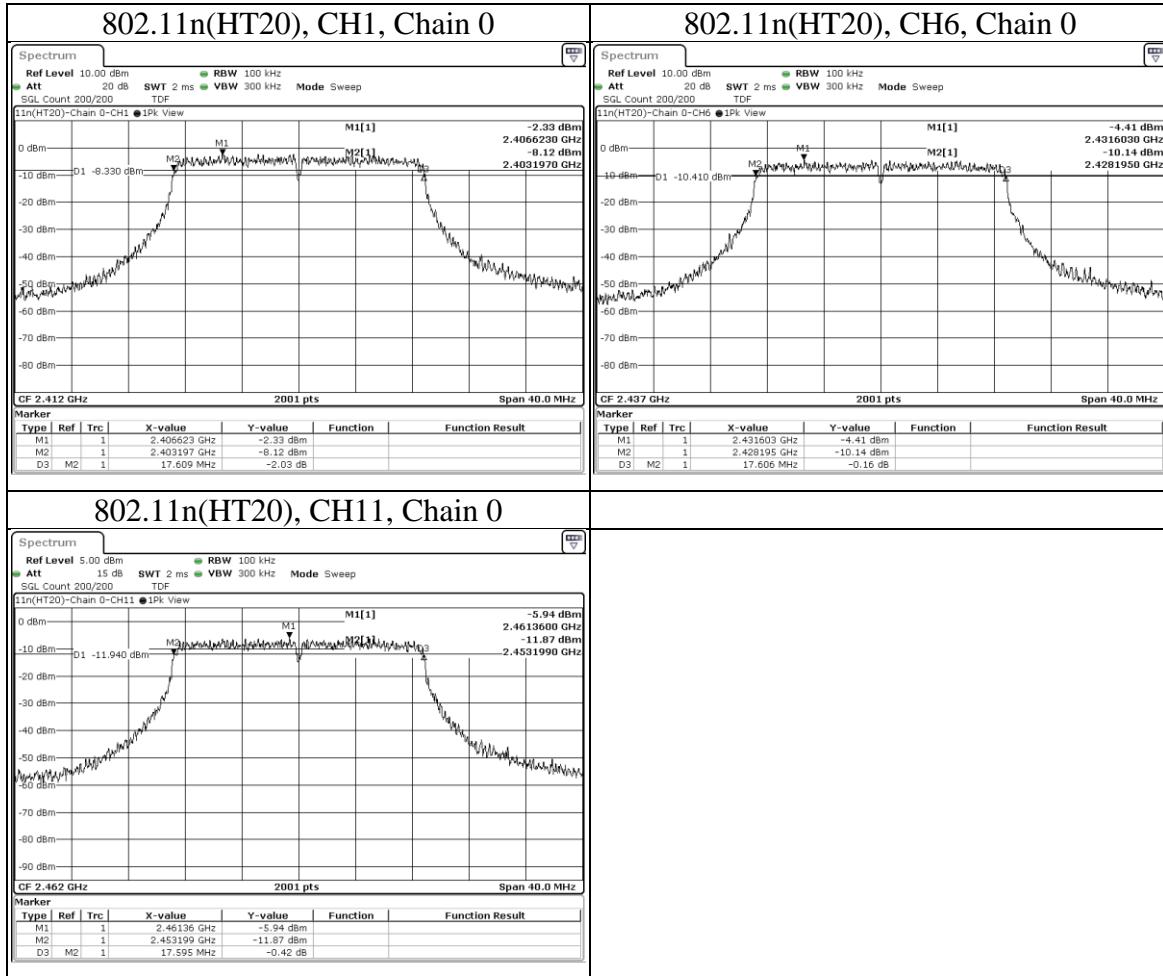
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Mode	CH	Freq (MHz)	6dB BW (MHz)	Limit (MHz)	Result
			Chain 0		
802.11n(HT20)	1	2412	17.609	0.5	Pass
	6	2437	17.606	0.5	Pass
	11	2462	17.595	0.5	Pass



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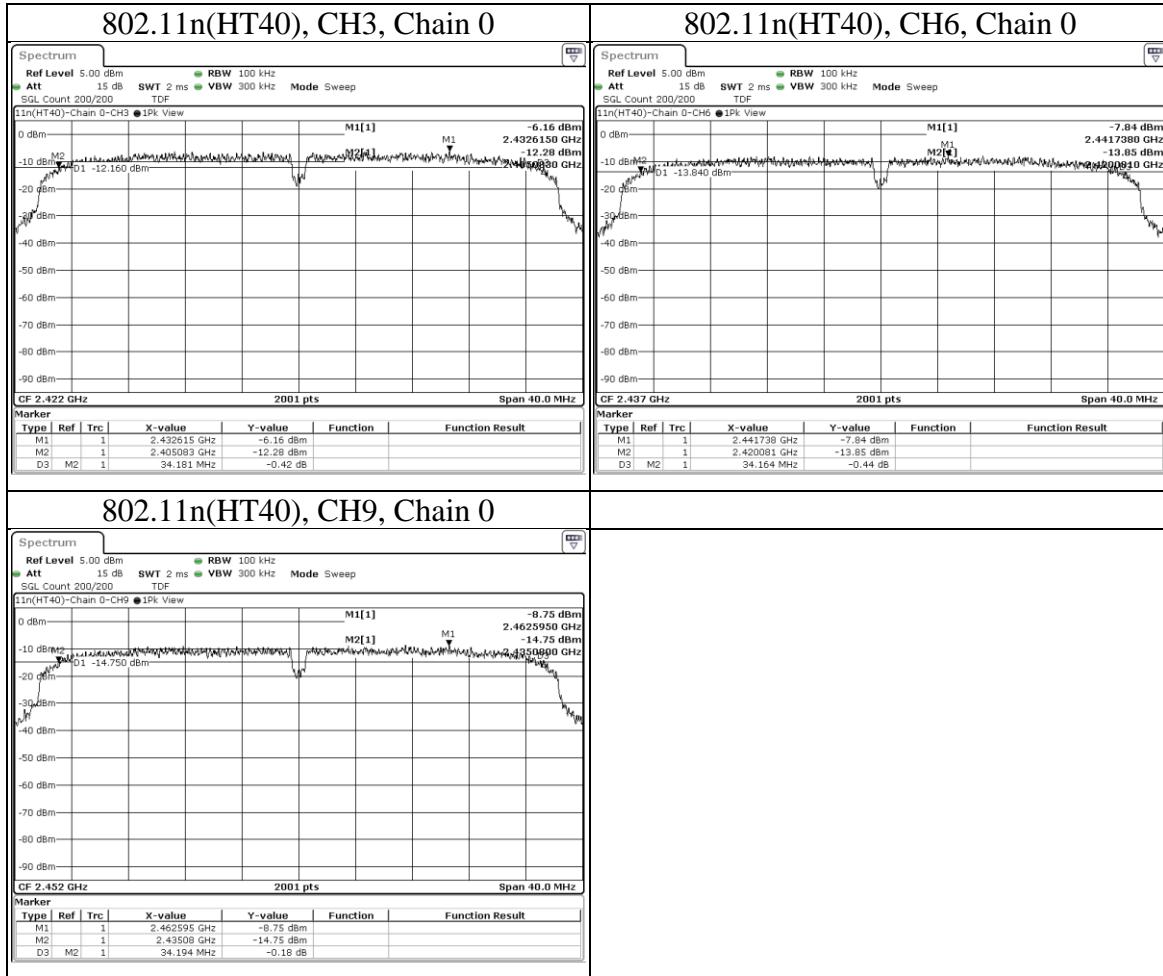
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Mode	CH	Freq (MHz)	6dB BW (MHz)	Limit (MHz)	Result
			Chain 0		
802.11n(HT40)	3	2422	34.181	0.5	Pass
	6	2437	34.164	0.5	Pass
	9	2452	34.194	0.5	Pass



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9.2. Conducted Output Power

Requirements

For systems using digital modulation in the 2400-2483.5 MHz bands: 1 Watt.

Note:

1. Directional Gain = $G_{\text{ant}} + 10 \log (N_{\text{ant}}) \text{ dBi}$.

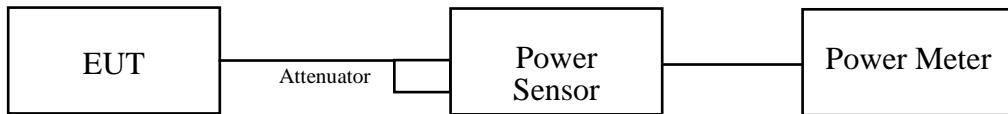
N_{ant} : Number of Transmit Antennas

G_1, G_2, \dots, G_n : Gain of Individual Antennas (Same for Each Antenna)

Test Procedure

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

Test Setup



The loss between RF output port of the EUT and the input port of the Power Meter has been taken into consideration.

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Test Data

Peak Power

802.11b

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	47.534	16.77	30	PASS
6	2437	30.549	14.85	30	PASS
11	2462	20.701	13.16	30	PASS

802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	58.076	17.64	30	PASS
6	2437	39.537	15.97	30	PASS
11	2462	26.122	14.17	30	PASS

802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	63.68	18.04	30	PASS
6	2437	41.976	16.23	30	PASS
11	2462	28.708	14.58	30	PASS

802.11n (HT40)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
3	2422	55.847	17.47	30	PASS
6	2437	36.898	15.67	30	PASS
9	2452	23.121	13.64	30	PASS

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Average Power (Reference Only)

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	23.988	13.80
6	2437	15.136	11.80
11	2462	10.304	10.13

802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	16.032	12.05
6	2437	10.864	10.36
11	2462	7.047	8.48

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	15.276	11.84
6	2437	10.304	10.13
11	2462	6.792	8.32

802.11n (HT40)

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
3	2422	14.028	11.47
6	2437	9.333	9.70
9	2452	6.026	7.80

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9.3. Power Spectral Density

Requirements

The Maximum of Power Spectral Density Measurement is 8dBm in any 3 kHz (If $G_{TX} > 6$ dBi, then $PSD = 8 - (G_{TX} - 6)$).

Note:

1. PSD = Power Spectral Density, it should be measured using the final conducted output power, and the power spectral density in dBm/MHz.
2. G_{TX} = the maximum transmitting antenna directional gain in dBi.
3. Directional Gain = $G_{ant} + 10 \log (N_{ant})$ dBi.

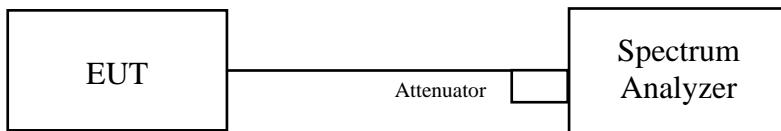
N_{ant} : Number of Transmit Antennas

$G1, G2, \dots, Gn$: Gain of Individual Antennas (Same for Each Antenna)

Test procedure

- 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: $3 \text{ kHz} \leq RBW \leq 100 \text{ kHz}$.
- d. Set the VBW $\geq 3 \times RBW$.
- 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.

Test Setup



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

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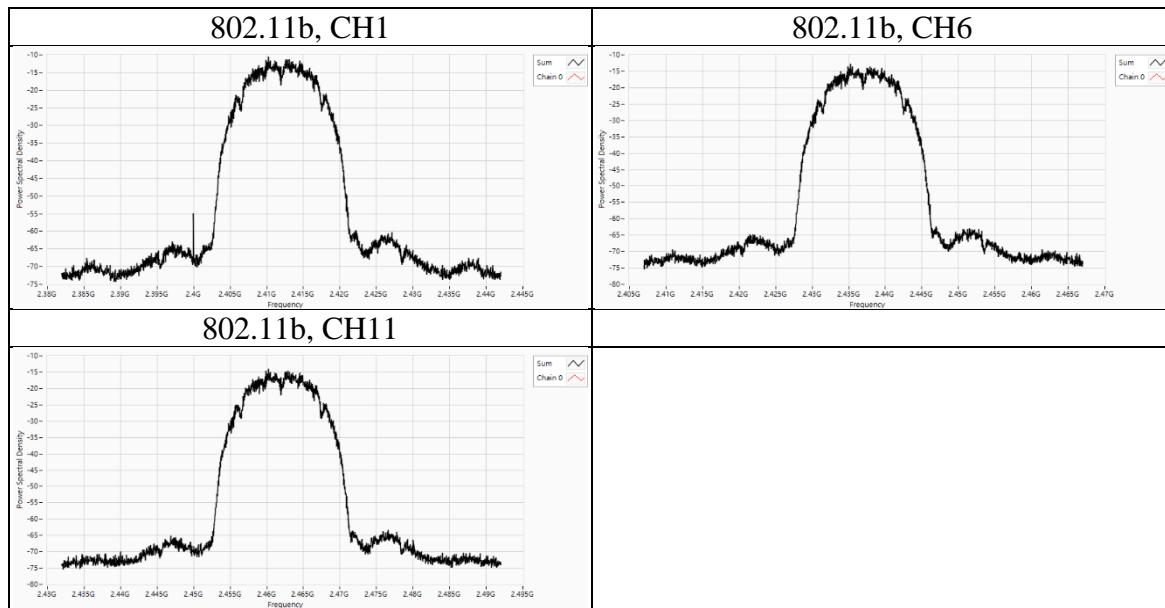
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Test Data

Mode	CH	Freq (MHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Directional Gain (dBi)	Result
802.11b	1	2412	-10.54	8	3.42	Pass
	6	2437	-12.8	8	3.42	Pass
	11	2462	-13.96	8	3.42	Pass



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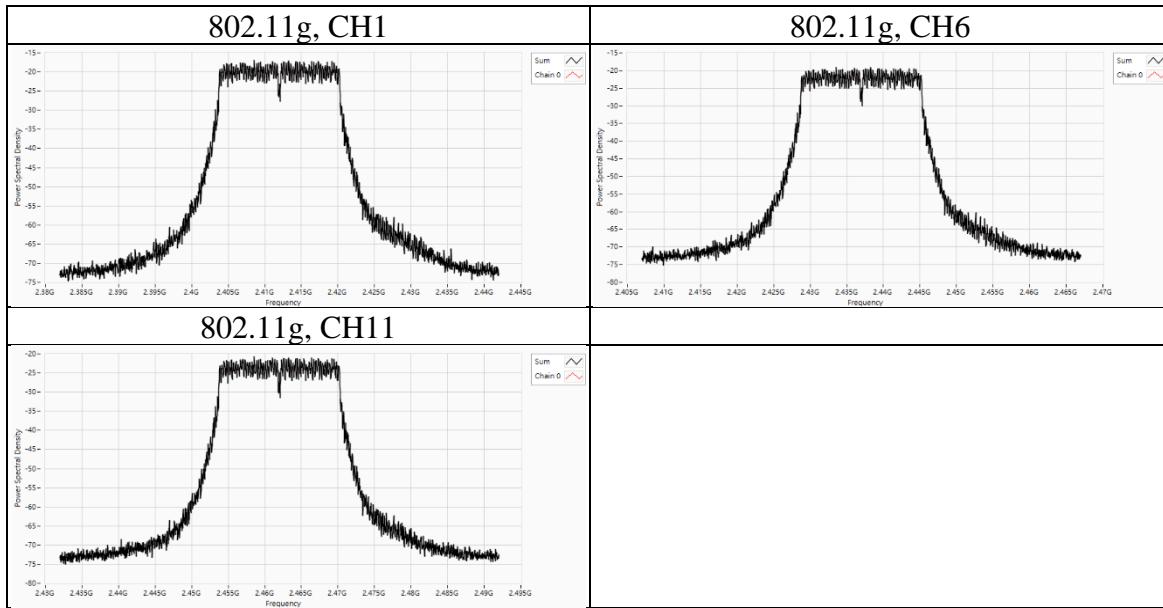
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Doc No: 17-EM-F0876 / 6.0

Mode	CH	Freq (MHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Directional Gain (dBi)	Result
802.11g	1	2412	-16.96	8	3.42	Pass
	6	2437	-19.11	8	3.42	Pass
	11	2462	-20.72	8	3.42	Pass



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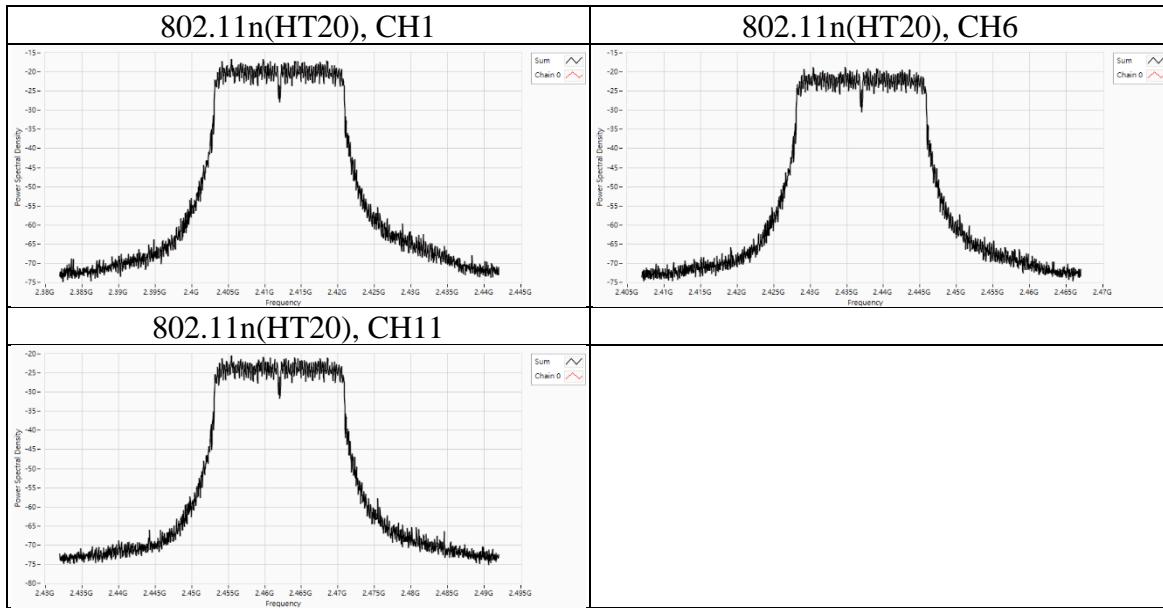
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Mode	CH	Freq (MHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Directional Gain (dBi)	Result
802.11n(HT20)	1	2412	-16.64	8	3.42	Pass
	6	2437	-18.74	8	3.42	Pass
	11	2462	-20.44	8	3.42	Pass



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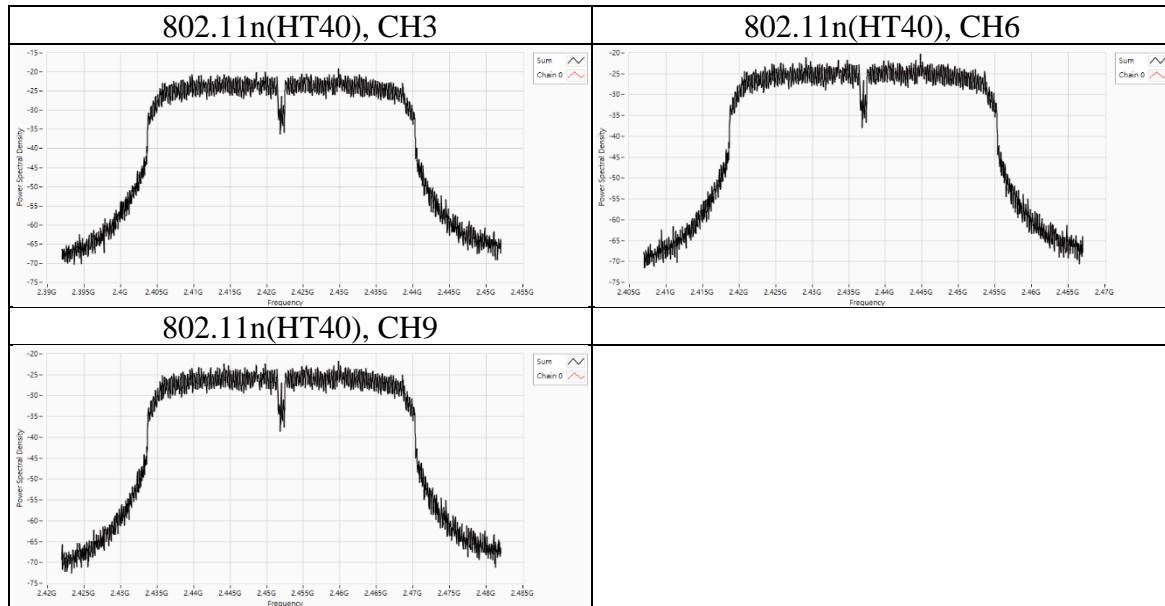
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



Mode	CH	Freq (MHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Directional Gain (dBi)	Result
802.11n(HT40)	3	2422	-19.13	8	3.42	Pass
	6	2437	-20.26	8	3.42	Pass
	9	2452	-21.8	8	3.42	Pass



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9.4. Conducted Out of Band Emission

Requirements

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 §15.209 (a) is not required.

Test procedure

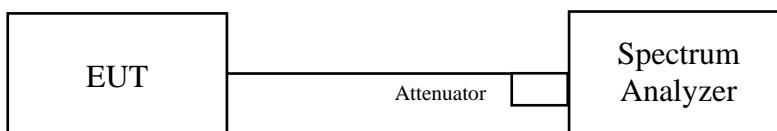
Measurement Procedure REF

1. Set the RBW = 100 kHz.
2. Set the VBW \geq 300 kHz.
3. Set the span to 1.5 times the DTS bandwidth.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

Measurement Procedure OOBE

1. Set RBW = 100 kHz.
2. Set VBW \geq 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

Test Setup



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

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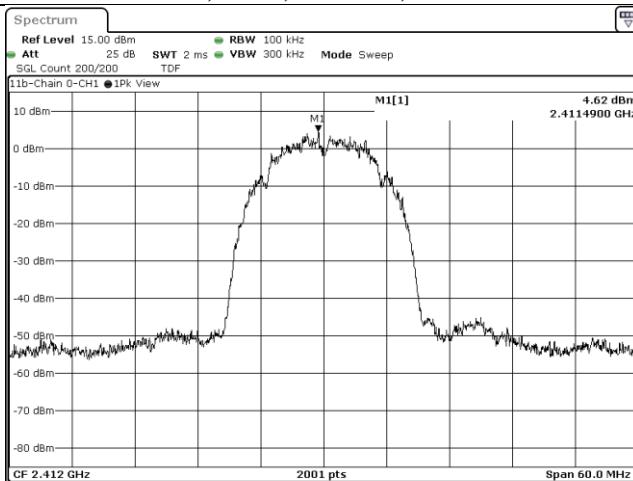
Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

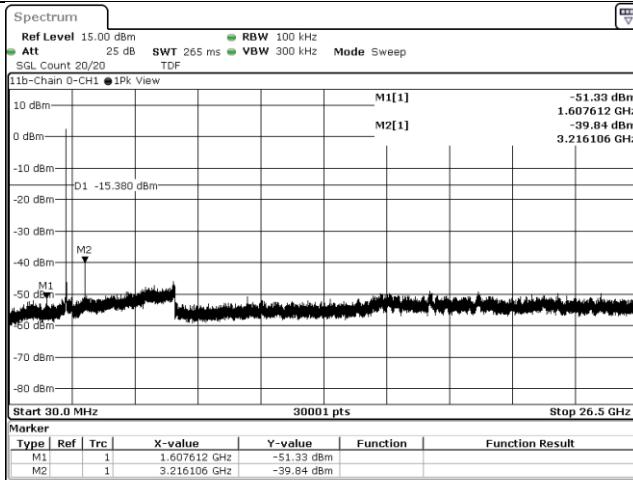
Doc No: 17-EM-F0876 / 6.0

Test Data

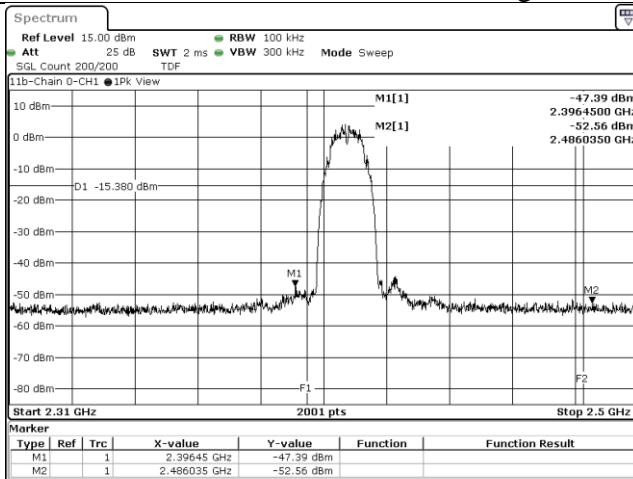
802.11b, CH1, Chain 0, Reference



802.11b, CH1, Chain 0, Conducted Emission



802.11b, CH1, Chain 0, Band edge



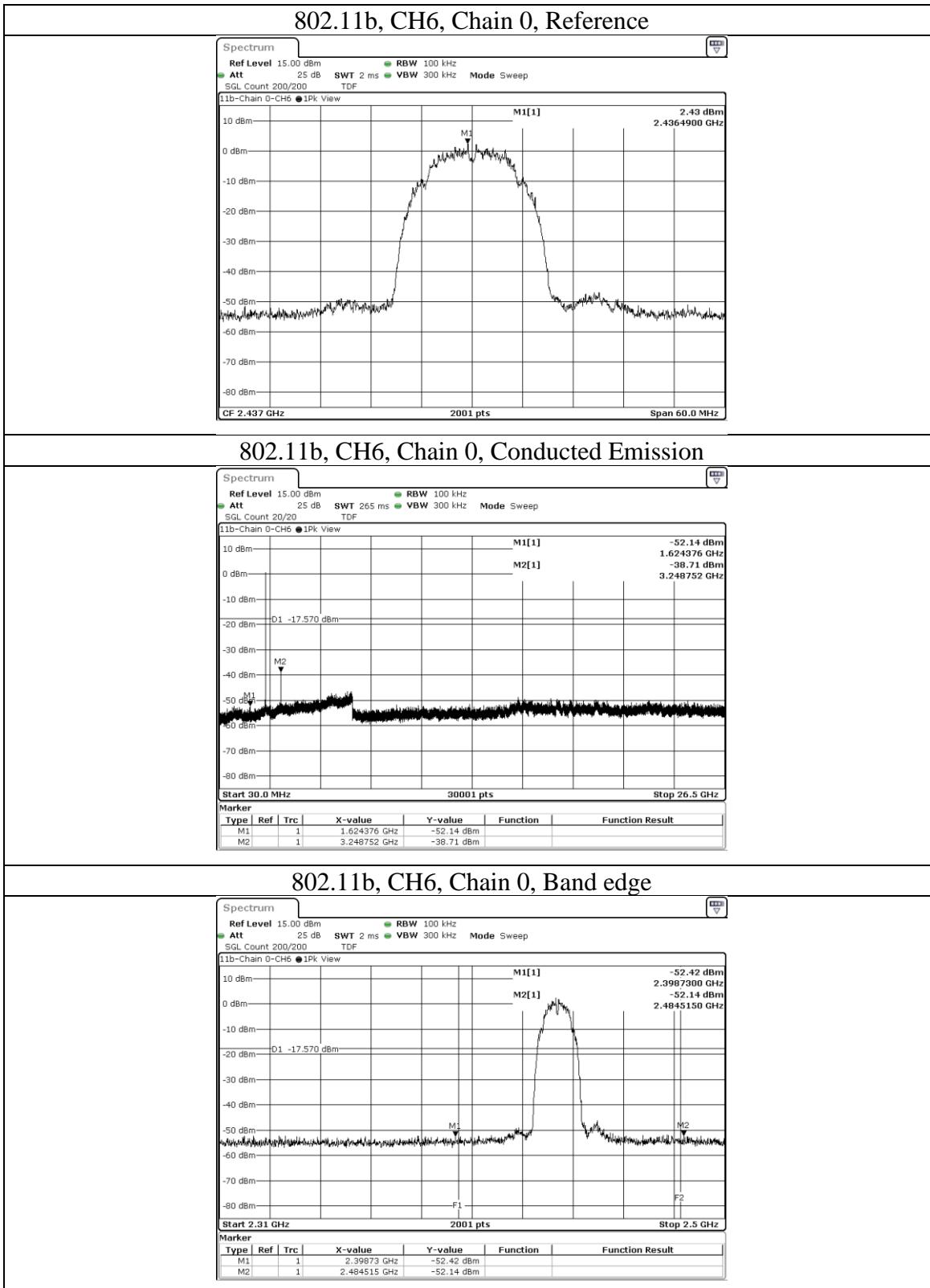
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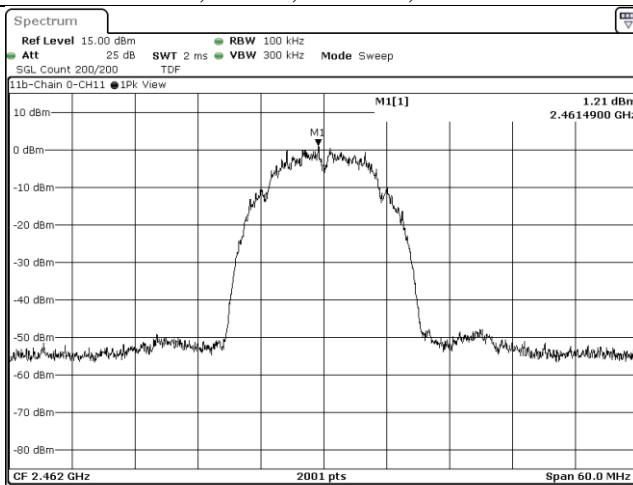
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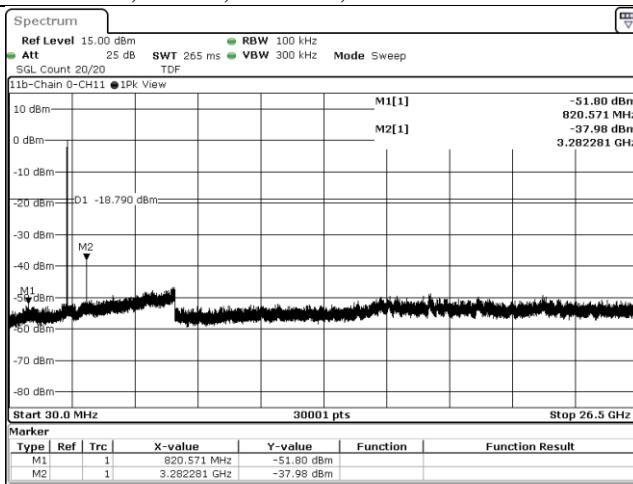
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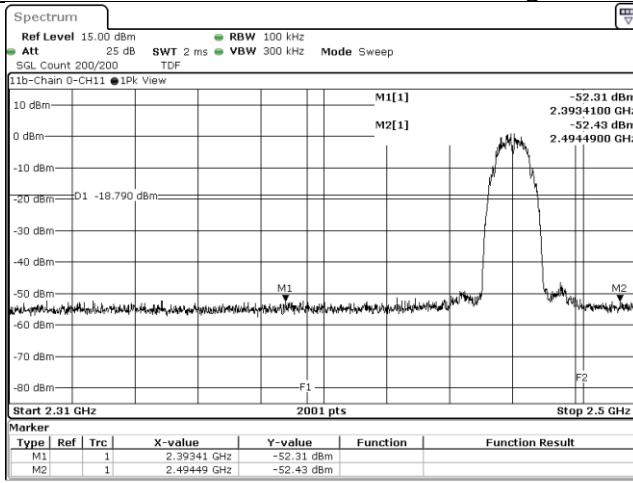
802.11b, CH11, Chain 0, Reference



802.11b, CH11, Chain 0, Conducted Emission



802.11b, CH11, Chain 0, Band edge



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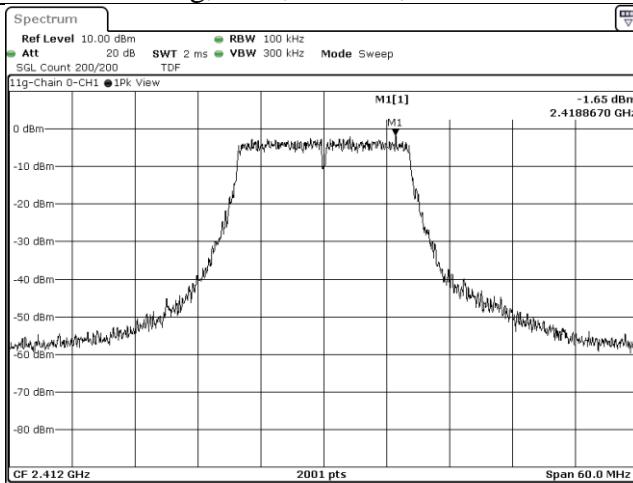
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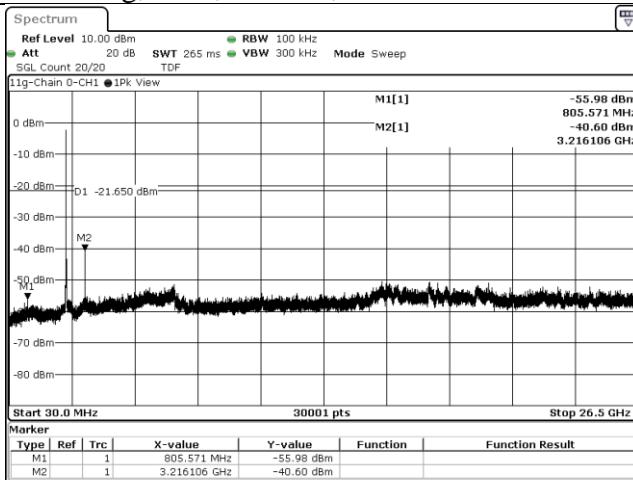
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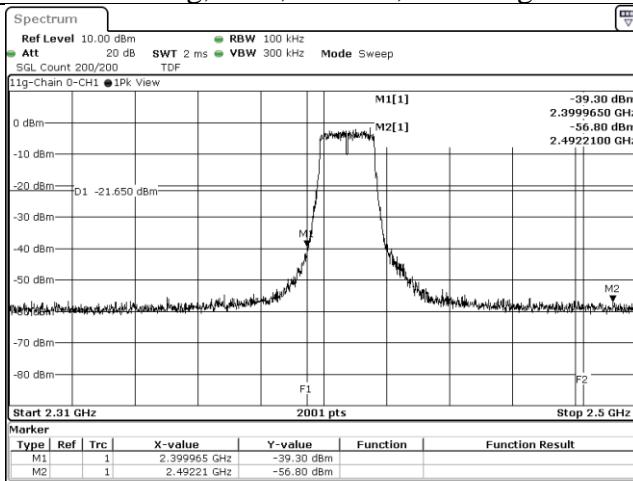
802.11g, CH1, Chain 0, Reference



802.11g, CH1, Chain 0, Conducted Emission



802.11g, CH1, Chain 0, Band edge



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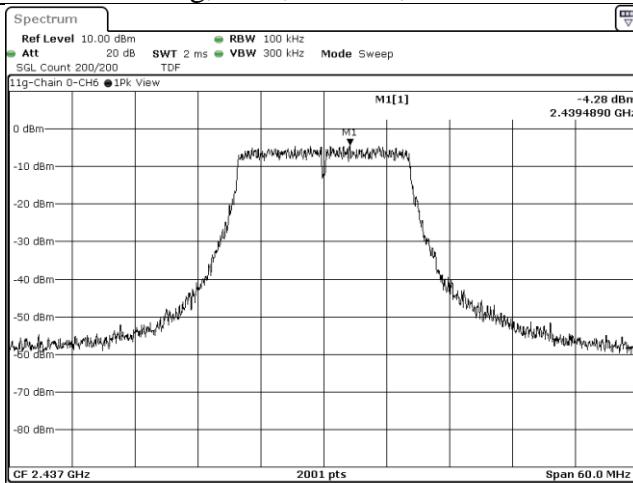
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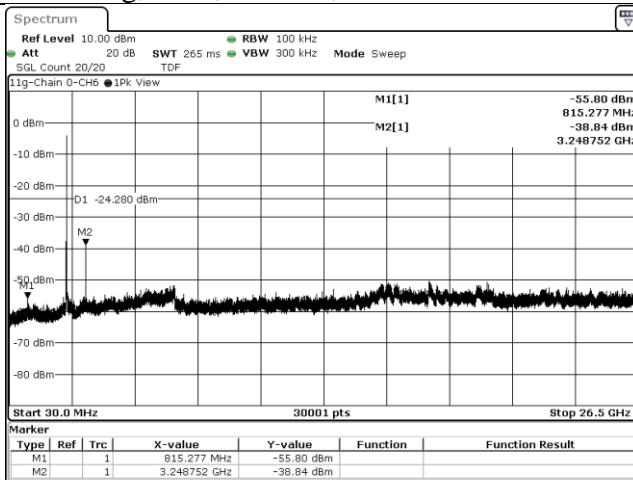
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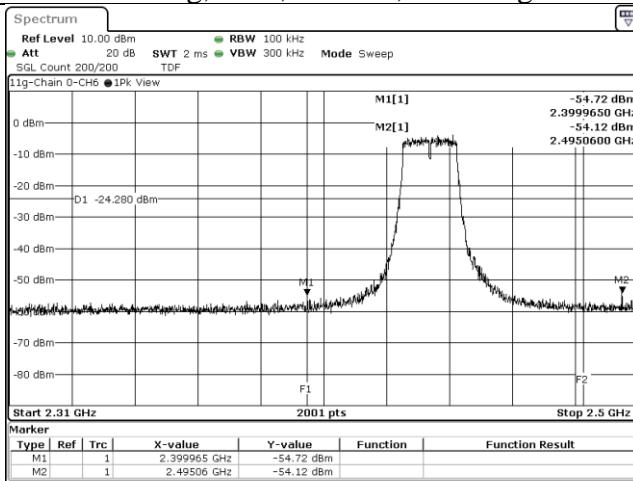
802.11g, CH6, Chain 0, Reference



802.11g, CH6, Chain 0, Conducted Emission



802.11g, CH6, Chain 0, Band edge



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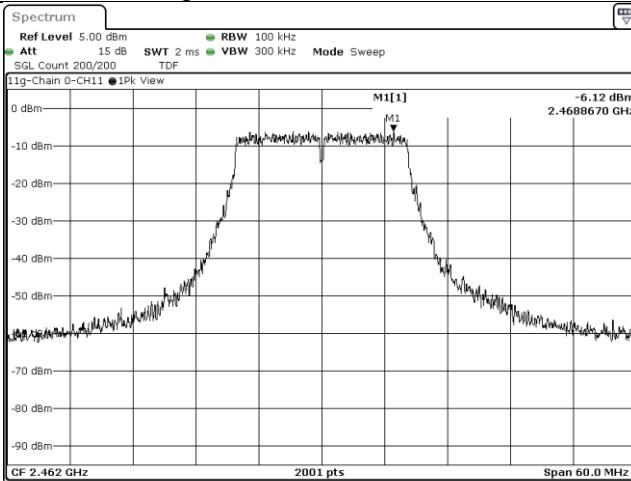
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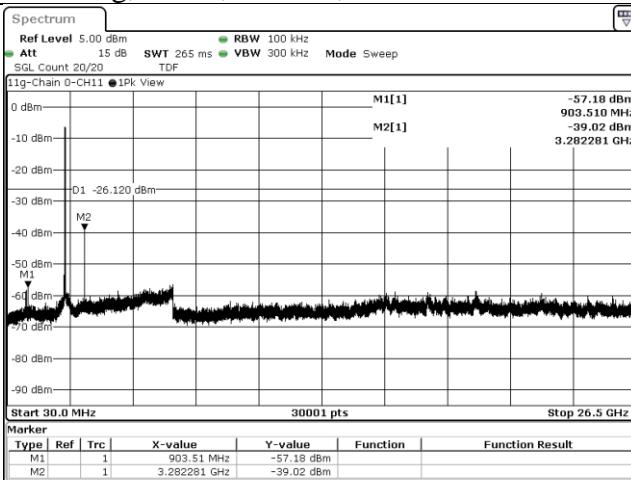
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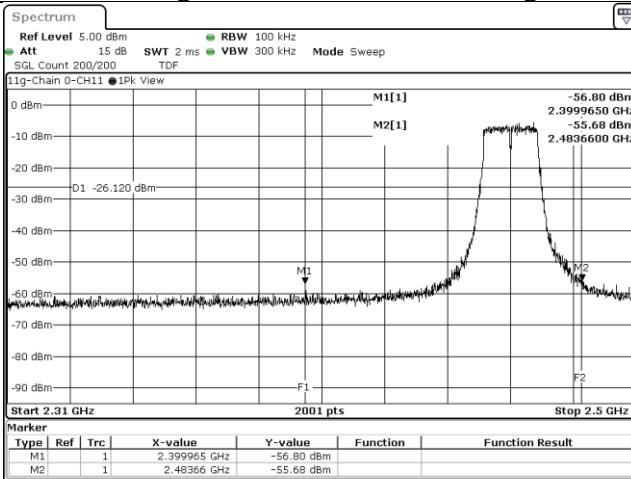
802.11g, CH11, Chain 0, Reference



802.11g, CH11, Chain 0, Conducted Emission



802.11g, CH11, Chain 0, Band edge



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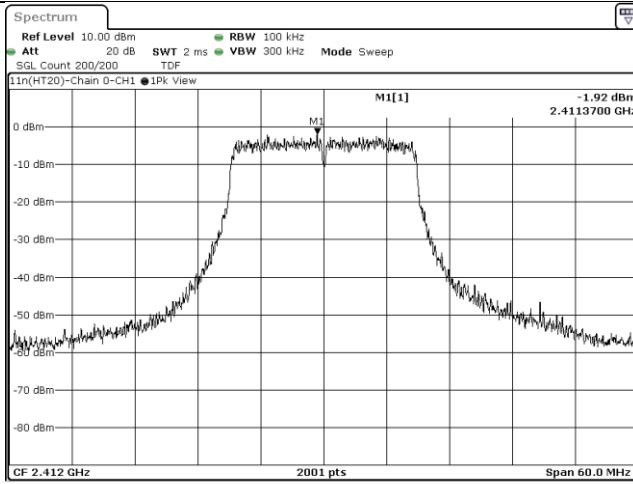
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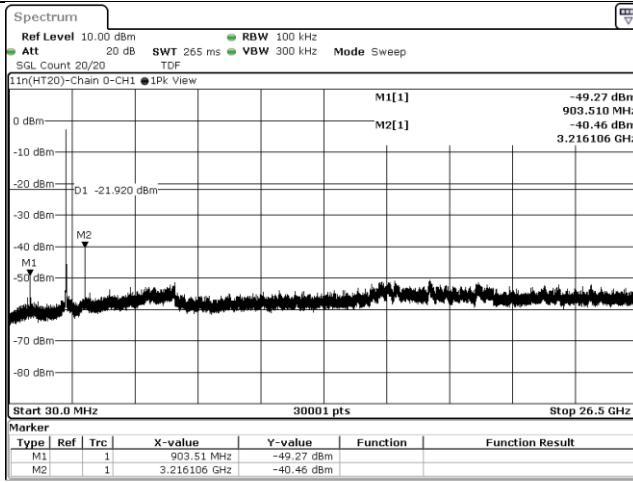
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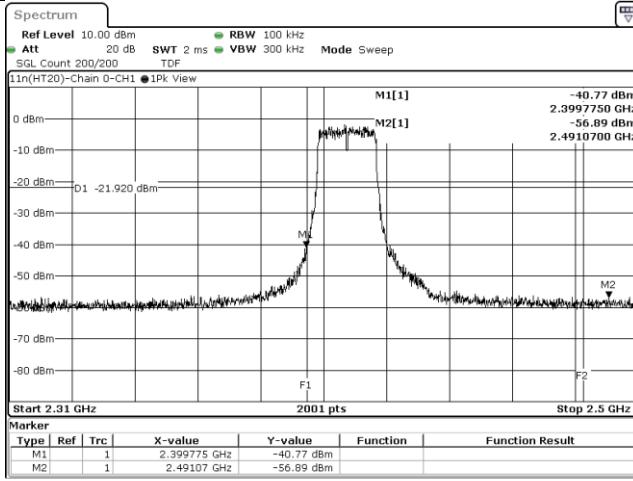
802.11n(HT20), CH1, Chain 0, Reference



802.11n(HT20), CH1, Chain 0, Conducted Emission



802.11n(HT20), CH1, Chain 0, Band edge



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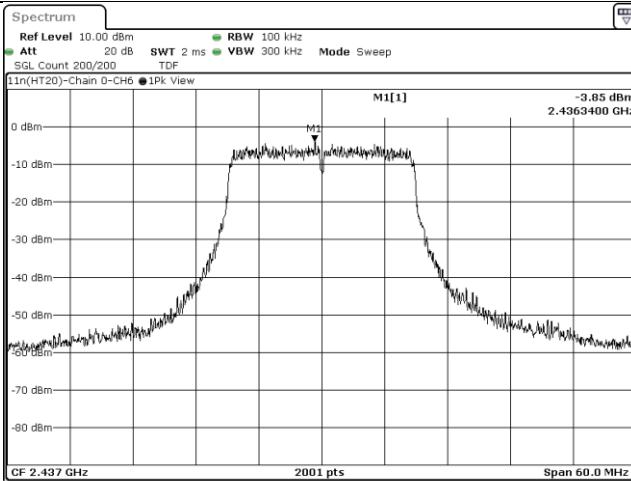
Telephone :+886-2-7737-3000

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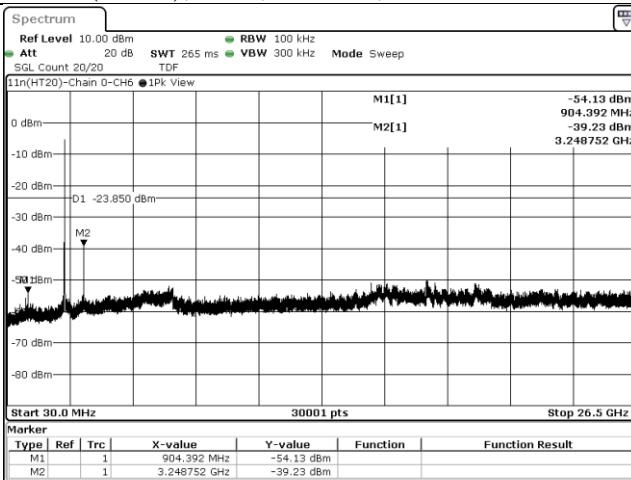
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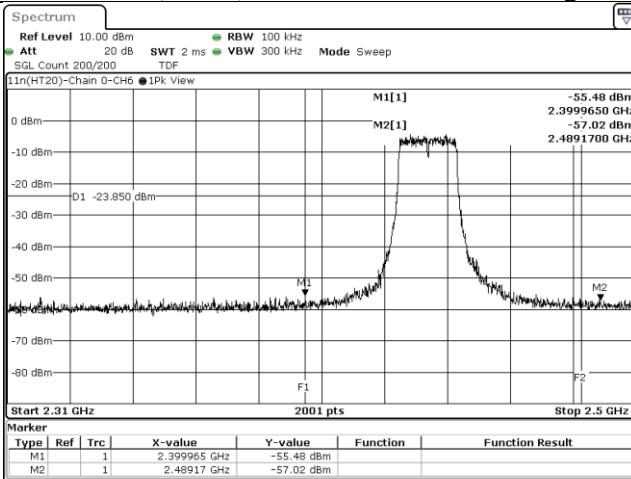
802.11n(HT20), CH6, Chain 0, Reference



802.11n(HT20), CH6, Chain 0, Conducted Emission



802.11n(HT20), CH6, Chain 0, Band edge



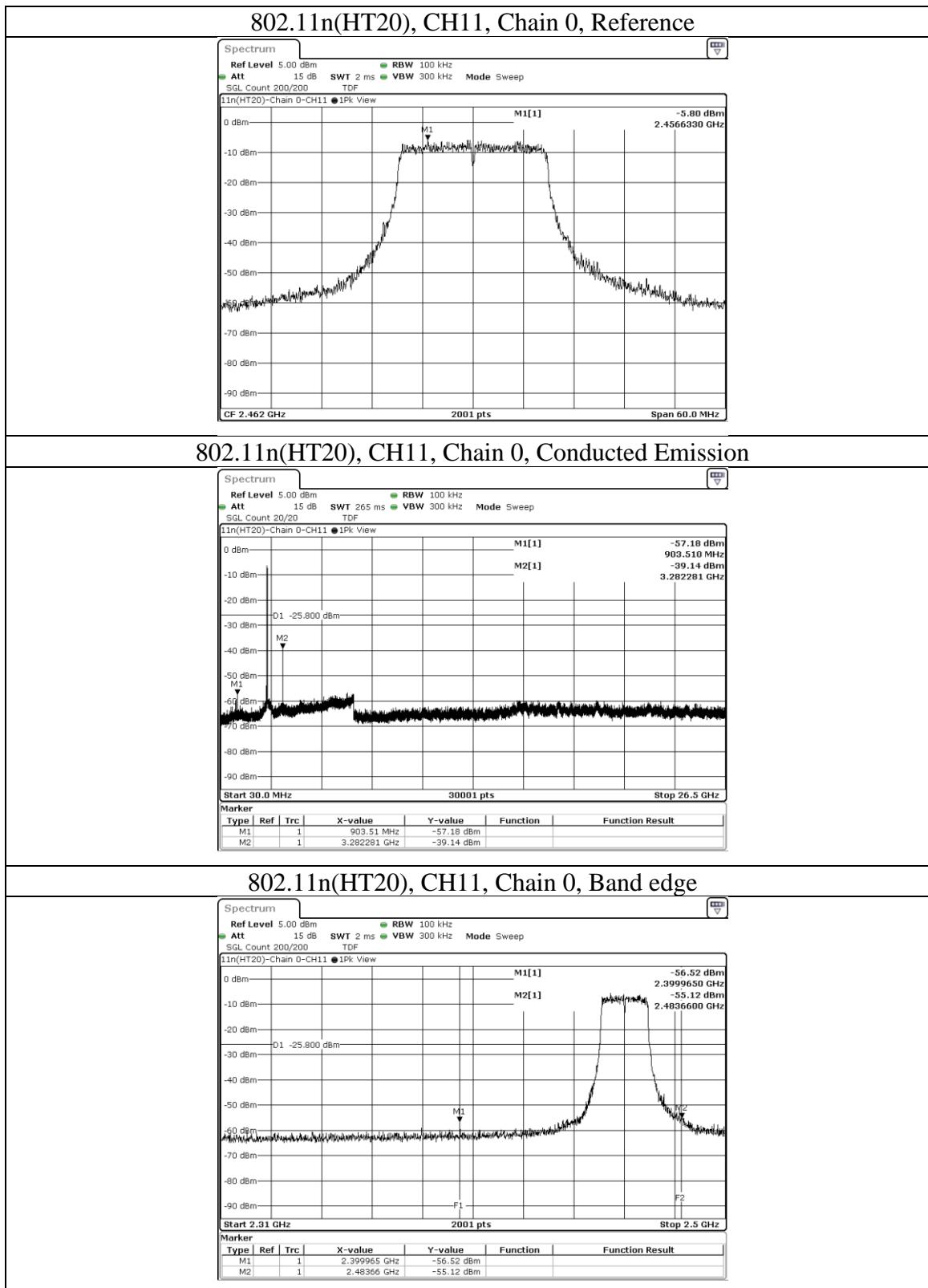
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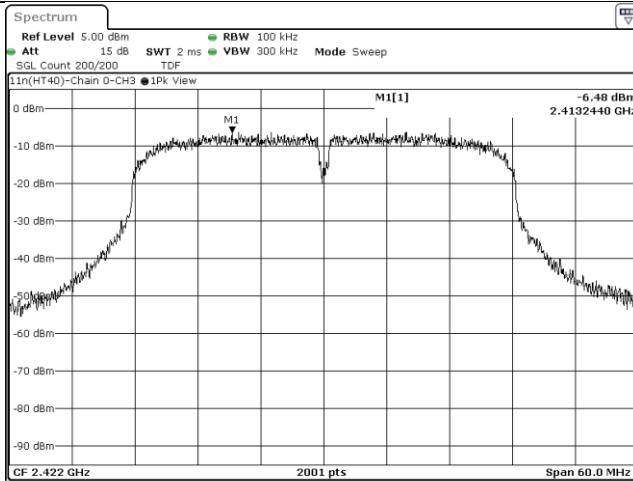
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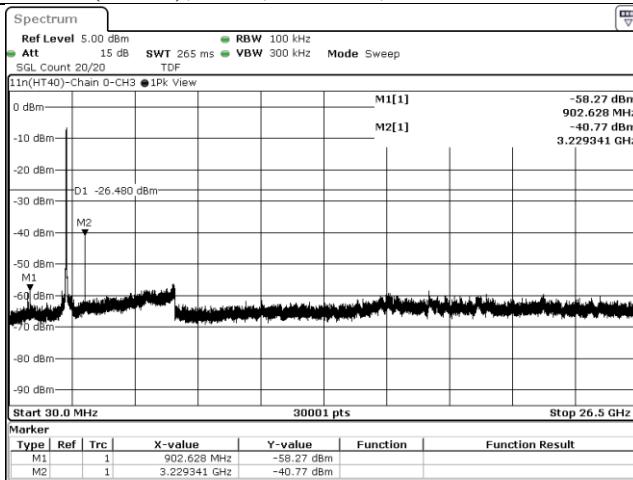
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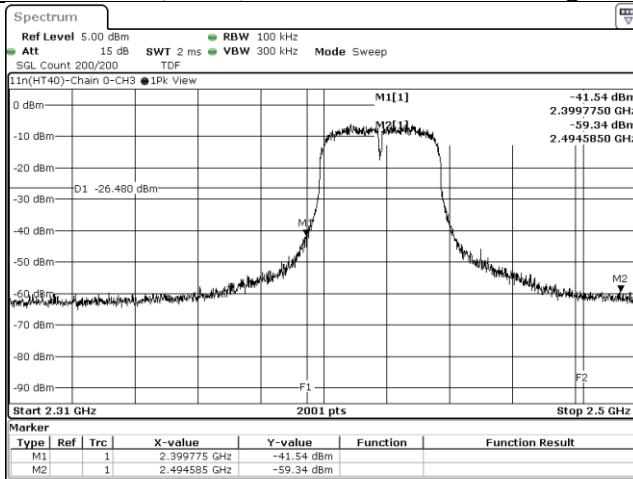
802.11n(HT40), CH3, Chain 0, Reference



802.11n(HT40), CH3, Chain 0, Conducted Emission



802.11n(HT40), CH3, Chain 0, Band edge



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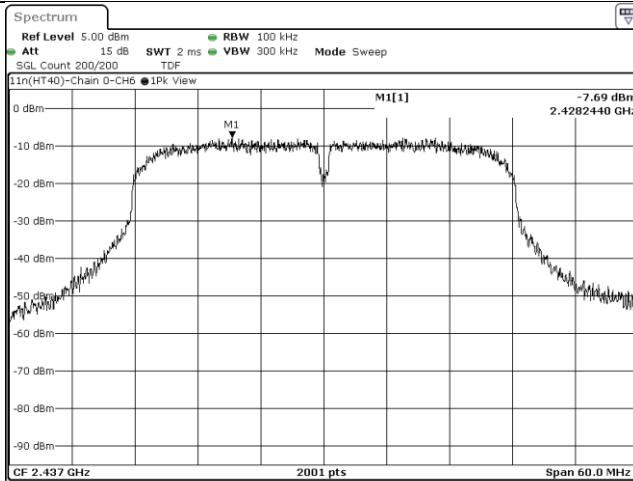
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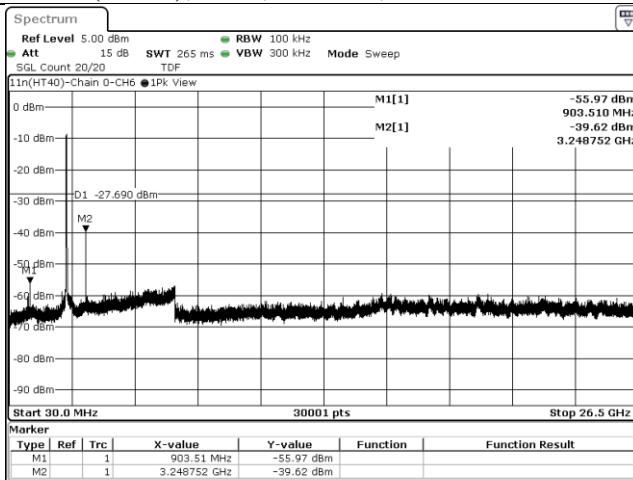
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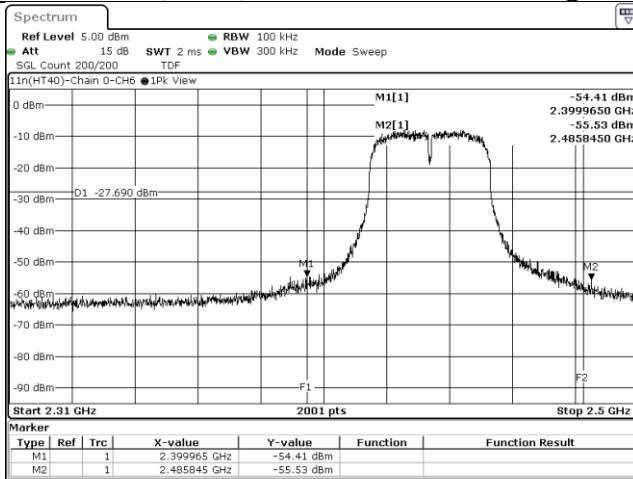
802.11n(HT40), CH6, Chain 0, Reference



802.11n(HT40), CH6, Chain 0, Conducted Emission



802.11n(HT40), CH6, Chain 0, Band edge



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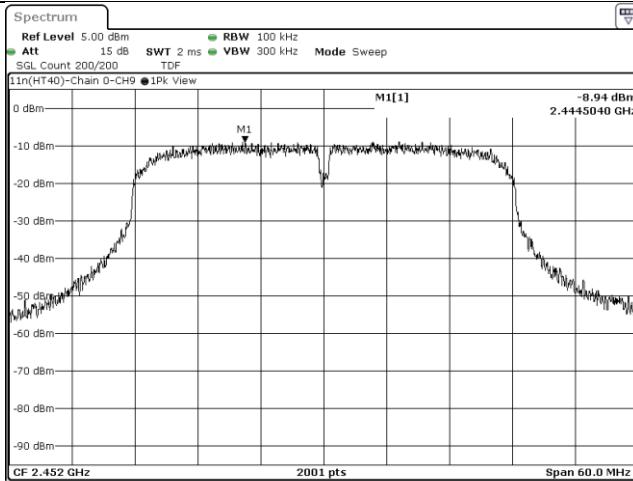
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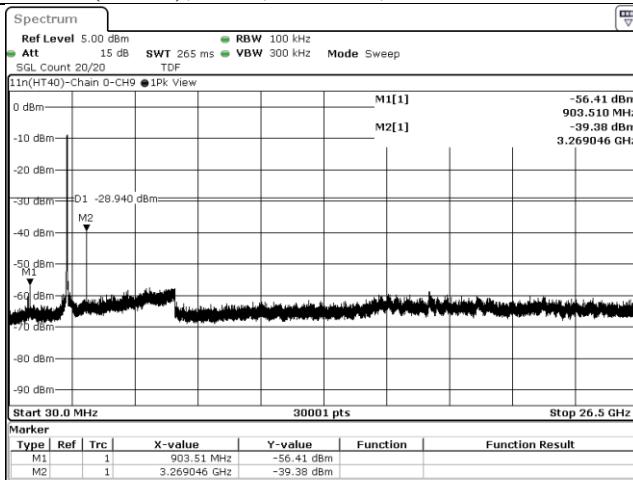
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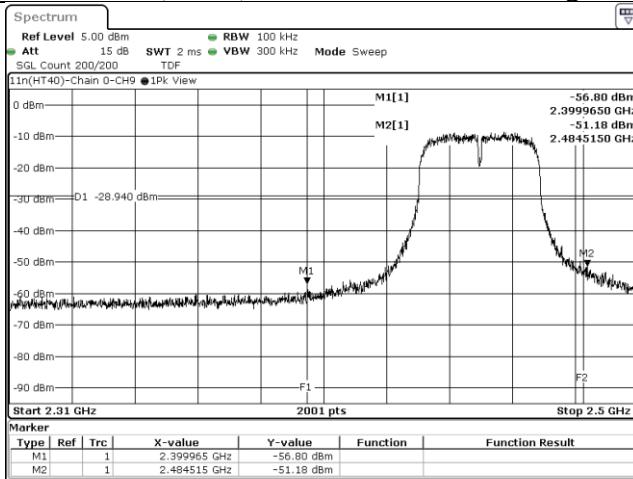
802.11n(HT40), CH9, Chain 0, Reference



802.11n(HT40), CH9, Chain 0, Conducted Emission



802.11n(HT40), CH9, Chain 0, Band edge



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