



Test report No. : 4790420462-US-R0-V0
Page : 1 of 84
Issued date : 2022/7/26
FCC ID : 2APLE18300422

RADIO TEST REPORT

Product : Pro 5 Wire-Free Spotlight Camera

Model Name : VMC4060P

FCC ID : 2APLE18300422

Test Regulation : FCC 47 CFR Part 15 Subpart C (Section 15.247)

Received Date : 2022/6/21

Test Date : 2022/6/24 ~ 2022/6/30

Issued Date : 2022/7/26

Applicant : Arlo Technologies Inc
2200 Faraday Avenue, Suite 150, Carlsbad, CA 92008, USA

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



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REVISION HISTORY

Original Test Report No.: 4790420462-US-R0-V0

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1. Attestation of Test Results

APPLICANT: Arlo Technologies Inc
2200 Faraday Avenue, Suite 150, Carlsbad, CA 92008, USA

MANUFACTURER: FUYU PRECISION COMPONENT CO.,LTD.
Lot M1 & Lot F, Quang Chau Industrial Park, Van Trung Commune,
Viet Yen District, Bac Giang Province, Vietnam

EUT DESCRIPTION: Pro 5 Wire-Free Spotlight Camera

BRAND: Arlo

MODEL: VMC4060P

SAMPLE STAGE: Engineering Verification Test sample

DATE of TESTED: 2022/6/24 ~ 2022/6/30

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:

Cindy Hsin
Project Handler

Date : 2022/7/26

Approved and Authorized By:

Eric Lee
Senior Laboratory Engineer

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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	PASS
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	Pro 5 Wire-Free Spotlight Camera
Brand Name	Arlo
Model Name	VMC4060P
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)
Maximum Output Power	802.11b: 28.46 dBm 802.11g: 28.51 dBm 802.11n (HT20): 28.40 dBm
Normal Voltage	5Vdc from adapter 3.85Vdc for battery
Sample ID	Conducted Test: 5079774 Radiated Test: 5079774

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Note:

1. The EUT incorporates a SISO function. Physically, the EUT provides one completed transmitters and one receivers.

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

2. The EUT contains following accessory devices:

Product	Brand	Model	Description
AC Adapter	PIE	AD2158	Input: 100-240V, 50/60Hz, 0.3A, Output: 5.0V, 2A
AC Adapter	CWT	2AEA010	Input: 100-240V, 50/60Hz, 0.3A, Output: 5.0V, 2A
USB Cable	Nienyi	310-50012-04	Length: 0.9m
Battery	Arlo	A-4a	4800mAh,3.85V, 18.48WH

3. 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	-	-

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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	22~24°C/ 62~68%RH	120Vac/ 60Hz	2022/06/24~ 2022/06/30	WaterNil Guan/ Patrick Kuan
Radiated Spurious Emission	966-2	22~24°C/ 57~68%RH	120Vac/ 60Hz	2022/06/24~ 2022/06/30	WaterNil Guan/ Rex Chen
AC power Line Conducted Emission	SR1	22~24°C/ 63~66%RH	120Vac/ 60Hz	2022/06/24~ 2022/06/29	Patrick Kuan

FCC Test Firm Registration Number: 498077

6.4. Description of Available Antennas

Ant. No.	Transmitter Circuit	Brand Name	Model Name	Ant. Type	Frequency Band (MHz)	Maximum Gain (dBi)
1	Chain (0)	N/A	N/A	Metal	2400~2500	2.1
					5150~5850	4.5

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 has two Adapter types: 2AEA010 and AD2158 , above two types was pre-tested, the worst case was found in the 2AEA010. Therefore only the test data of the 2AEA010c was recorded in this report.
- For Antenna Port Conducted Measurement, this item includes all test value of each mode, but only includes spectrum plot of worst value of 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.
- For below 1 GHz radiated emission and AC power line conducted emission have performed all modes of operation were investigated and the worst-case emissions are reported.
- 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	1,2,6,10,11	6 Mbps
	802.11n(HT20)	OFDM	BPSK	1 to 11	1,2,6,10,11	MCS0
Radiated Emissions (Below 1GHz)	802.11g	OFDM	BPSK	1 to 11	6	6 Mbps
AC Power Line Conducted Emission	802.11g	OFDM	BPSK	1 to 11	6	6 Mbps
*Antenna Port Conducted Measurement	802.11b	DSSS	DBPSK	1 to 11	1,6,11	1 Mbps
	802.11g	OFDM	BPSK	1 to 11	1,2,6,10,11	6 Mbps
	802.11n(HT20)	OFDM	BPSK	1 to 11	1,2,6,10,11	MCS0

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

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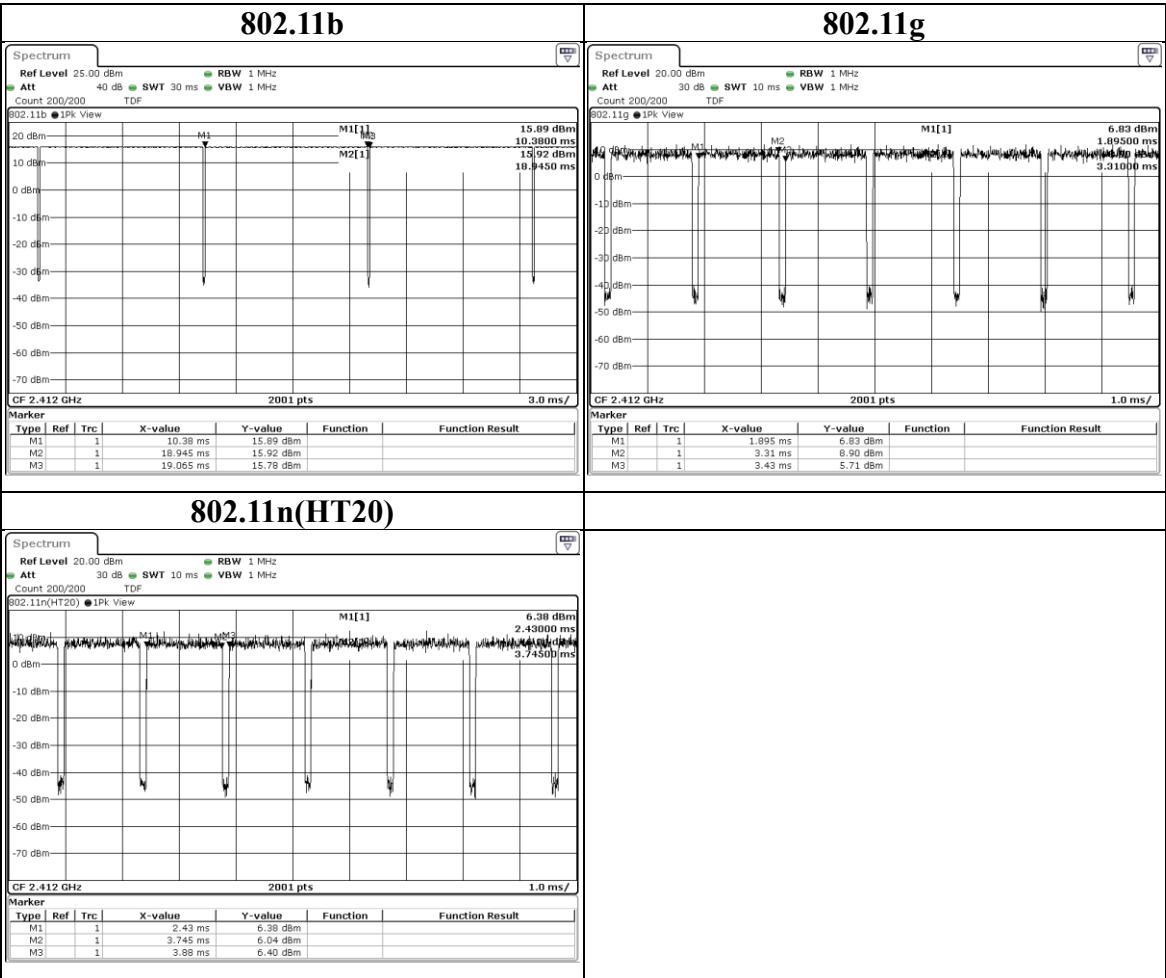
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6.6. Duty cycle

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle	Duty Factor (dB)	VBW Set (above 1GHz)
802.11b	8.565	8.685	0.9862	N/A	10Hz
802.11g	1.415	1.535	0.9218	0.35	1kHz
802.11n(HT20)	1.315	1.450	0.9069	0.42	1kHz





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

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Test Equipment List					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Expired date
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
AC power Line Conducted Emission					
EMI Test Receiver	Rohde & Schwarz	ESR7	101753	2021/11/15	2022/11/14
Two-Line V-Network	Rohde & Schwarz	ENV216	102136	2021/8/30	2022/8/29
Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	2021/8/26	2022/8/25
Cables	TITAN	CFD200	T0732ACFD20 020A300-1	2022/3/16	2023/3/15

UL Software		
Description	Name	Version
Radiated measurement	e3	6.191211 (V6)
Conducted measurement	RF-Conducted-FCC 15247	ver 1.0
AC power Line Conducted Emission	EZ_EMC	UL-3A1.2

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8. Description of Test Setup

Support Equipment

ID	Equipment	Brand Name	Model Name	S/N	Remark
A	AC Adapter	CWT	2AEA010BA3B	332-50108-02	Provided by Client
B	Laptop	DELL	Latitude E5470	CXSKWF2	Provided by Lab

I/O Cables

ID	Equipment	Brand Name	Model Name	Length (m)	Remark
1	Magnetic USB Cable	Nienyi	310-50012-04	0.9	Provided by Client
2	Micro USB Cable	WONDER	WA-W07UA	0.8	Provided by Lab

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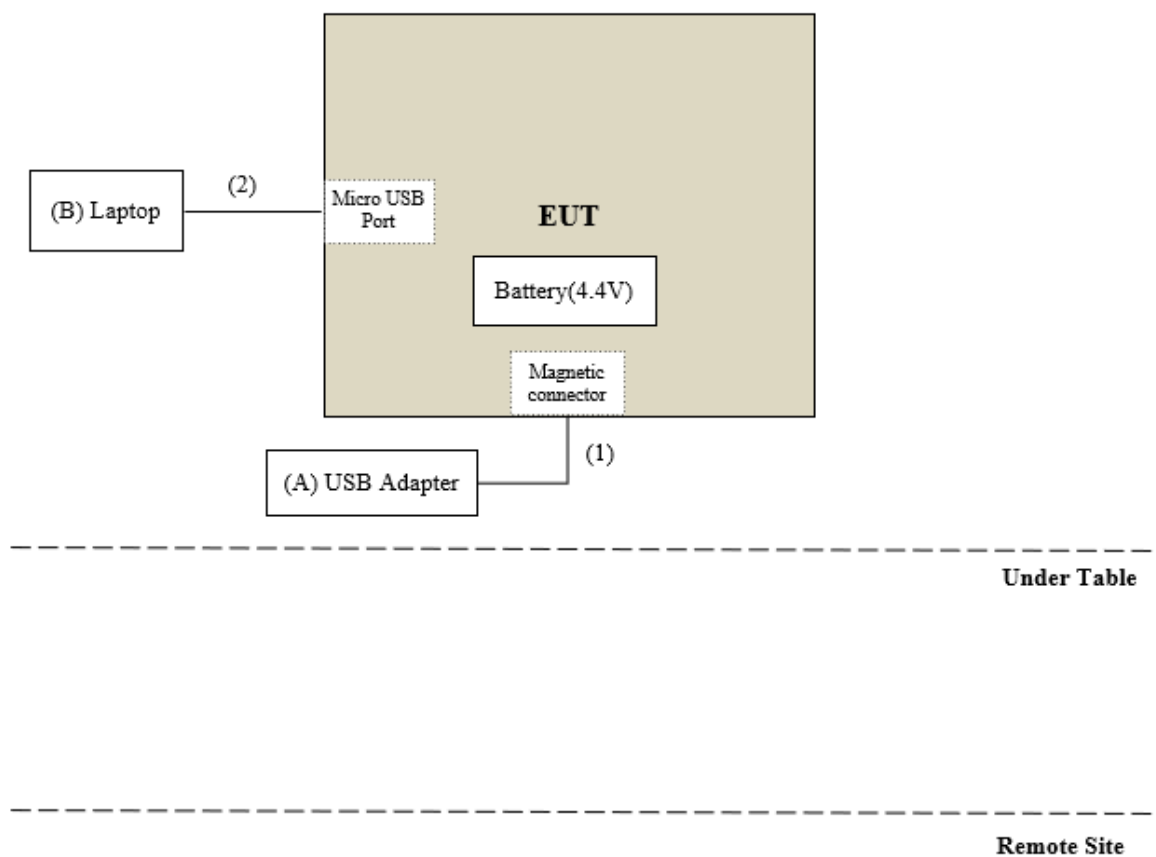
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Test Setup

Controlled using a bespoke application (Typing RF command by terminal tool(Putty version 0.62)) 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



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9. Test Results

9.1. 6dB Bandwidth

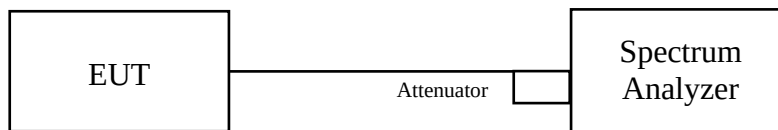
Requirements

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

Test procedure

- Set resolution bandwidth (RBW) = 100kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- 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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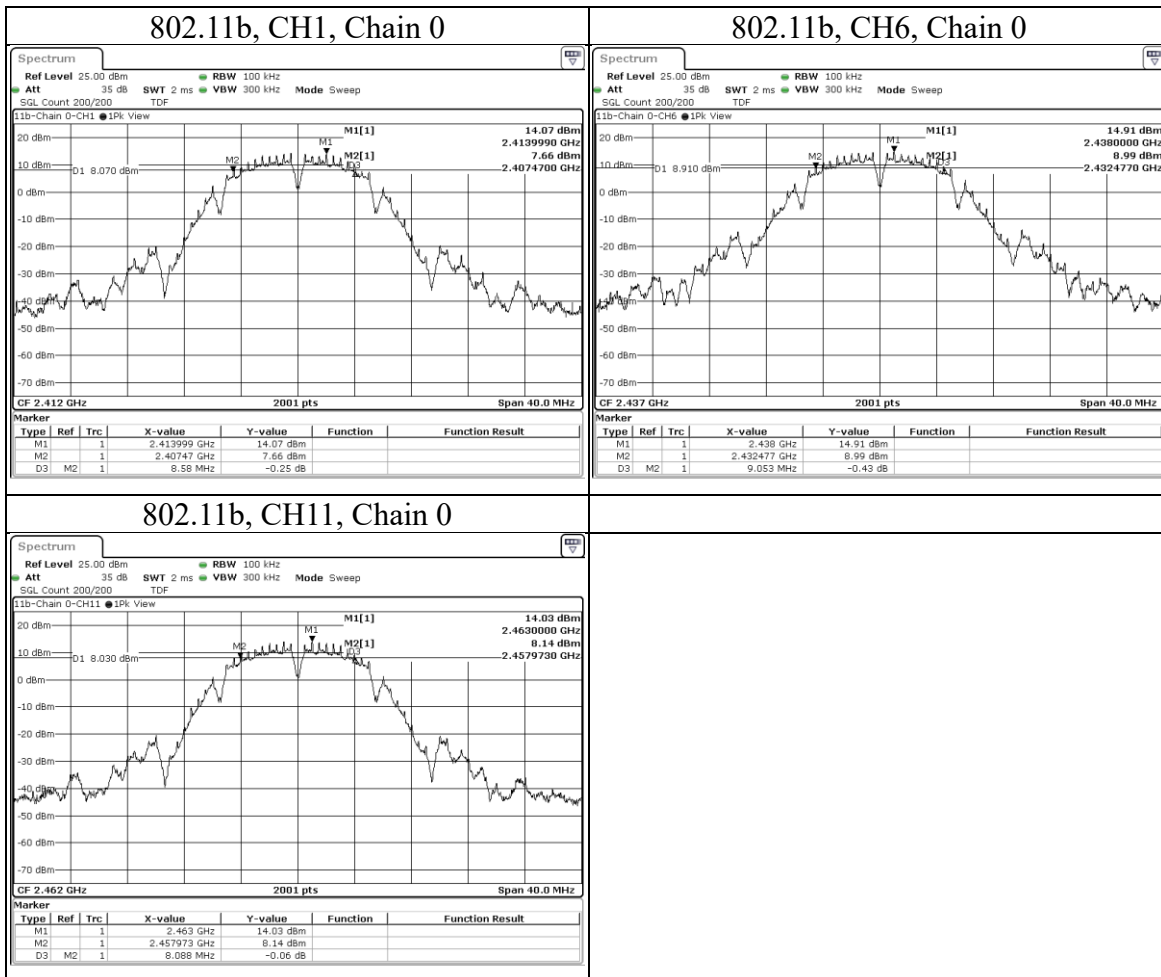
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Test Data

Mode	CH	Freq (MHz)	6dB BW (MHz)	Limit (MHz)	Result
			Chain 0		
802.11b	1	2412	8.580	0.5	Pass
	6	2437	9.053	0.5	Pass
	11	2462	8.088	0.5	Pass



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Mode	CH	Freq (MHz)	6dB BW (MHz)	Limit (MHz)	Result
			Chain 0		
802.11g	1	2412	16.374	0.5	Pass
	2	2417	16.380	0.5	Pass
	6	2437	16.366	0.5	Pass
	10	2457	16.363	0.5	Pass
	11	2462	16.373	0.5	Pass

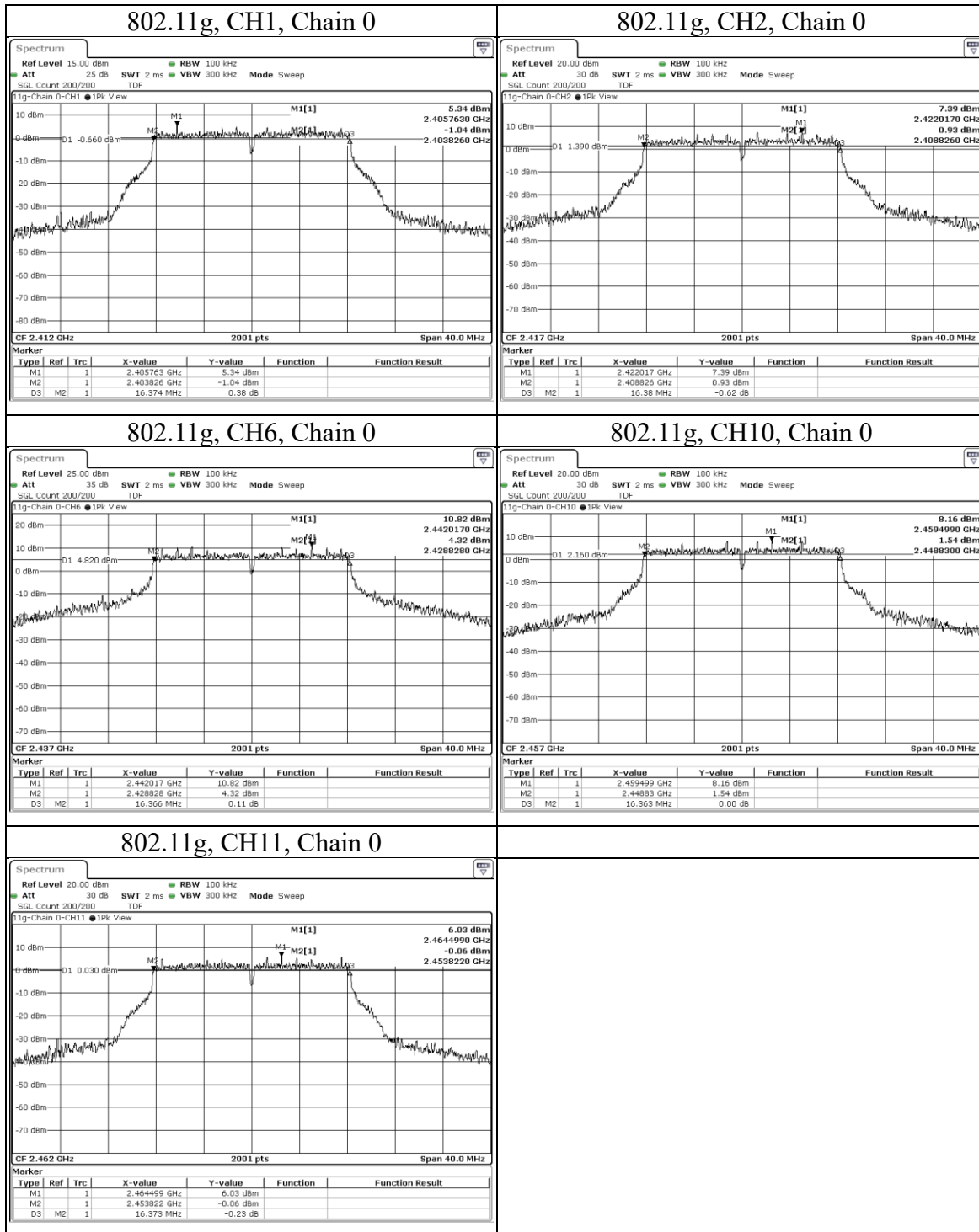
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Mode	CH	Freq (MHz)	6dB BW (MHz)	Limit (MHz)	Result
			Chain 0		
802.11n(HT20)	1	2412	17.608	0.5	Pass
	2	2417	17.613	0.5	Pass
	6	2437	17.599	0.5	Pass
	10	2457	17.600	0.5	Pass
	11	2462	17.603	0.5	Pass

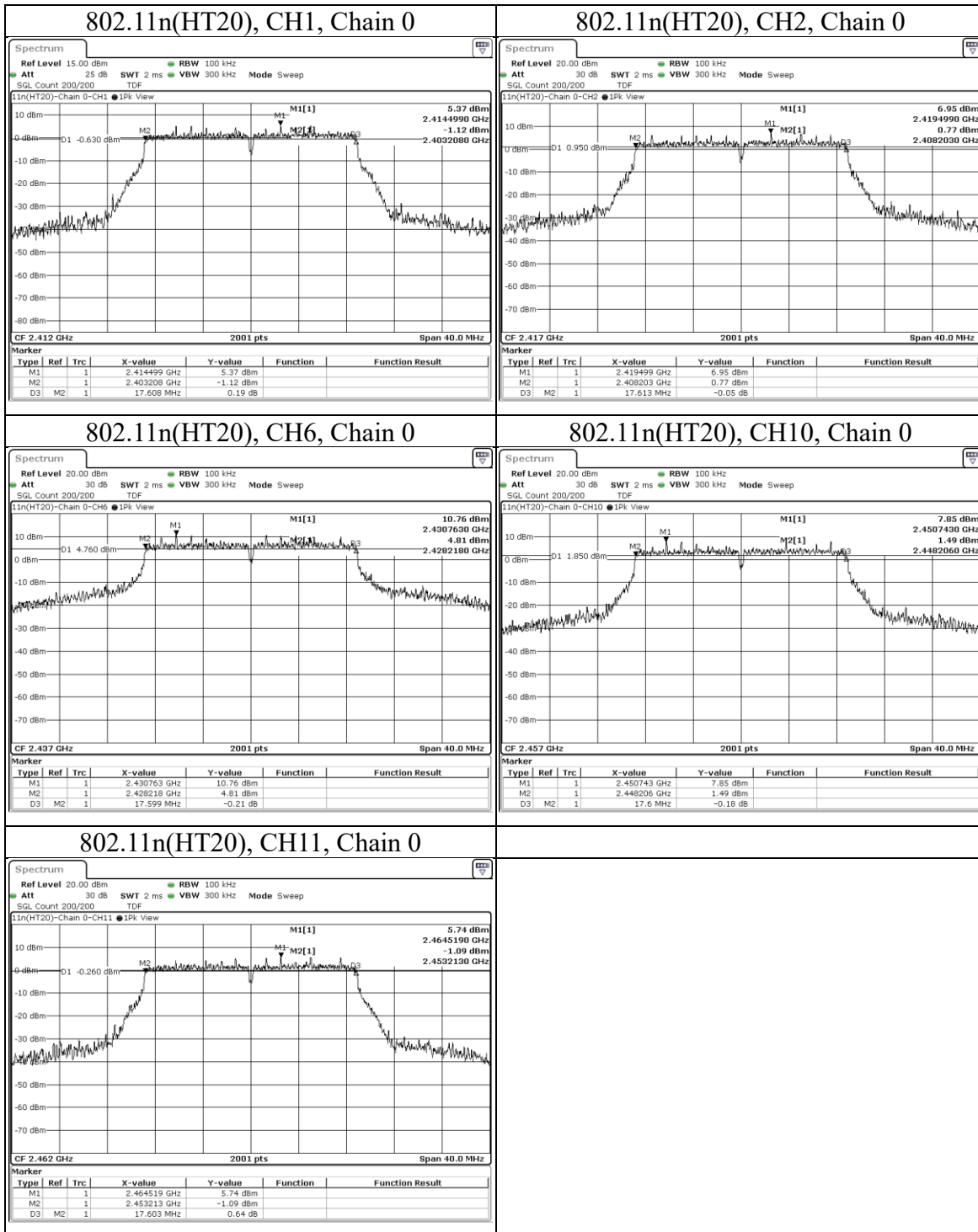
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9.2. Conducted Output Power

Requirements

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

Note:

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

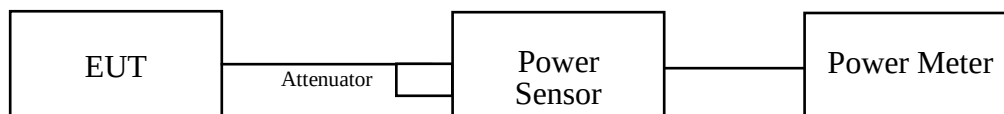
N_{ant} : Number of Transmit Antennas

$G_1, G_2, \dots, G_n$: 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	416.869	26.20	30	PASS
6	2437	527.23	27.22	30	PASS
11	2462	701.455	28.46	30	PASS

802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	504.661	27.03	30	PASS
2	2417	625.173	27.96	30	PASS
6	2437	709.578	28.51	30	PASS
10	2457	619.441	27.92	30	PASS
11	2462	526.017	27.21	30	PASS

802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	439.542	26.43	30	PASS
2	2417	601.174	27.79	30	PASS
6	2437	691.831	28.40	30	PASS
10	2457	616.595	27.90	30	PASS
11	2462	483.059	26.84	30	PASS

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Average Power (Reference Only)

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	211.836	23.26
6	2437	288.403	24.60
11	2462	216.77	23.36

802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	66.527	18.23
2	2417	106.66	20.28
6	2437	207.014	23.16
10	2457	119.95	20.79
11	2462	72.277	18.59

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	66.527	18.23
2	2417	97.051	19.87
6	2437	211.836	23.26
10	2457	115.611	20.63
11	2462	72.946	18.63

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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 that he same method as used to determine the conducted output power shall be used to determine the power spectral density. And 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.

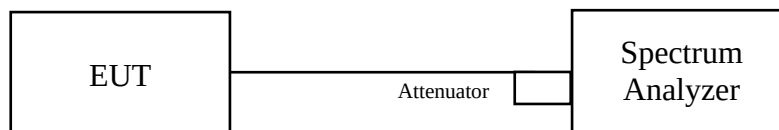
N_{ant} : Number of Transmit Antennas

$G_1, G_2, \dots, G_n$: 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: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d. Set the VBW $\geq 3 \times \text{RBW}$.
- 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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Test Data

Mode	CH	Freq (MHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Directional Gain (dBi)	Result
802.11b	1	2412	0.34	8	2.1	Pass
	6	2437	1.64	8	2.1	Pass
	11	2462	0.13	8	2.1	Pass

Mode	CH	Freq (MHz)	PSD per Chain (dBm/3kHz) Chain 0
802.11b	1	2412	0.341
	6	2437	1.636
	11	2462	0.126

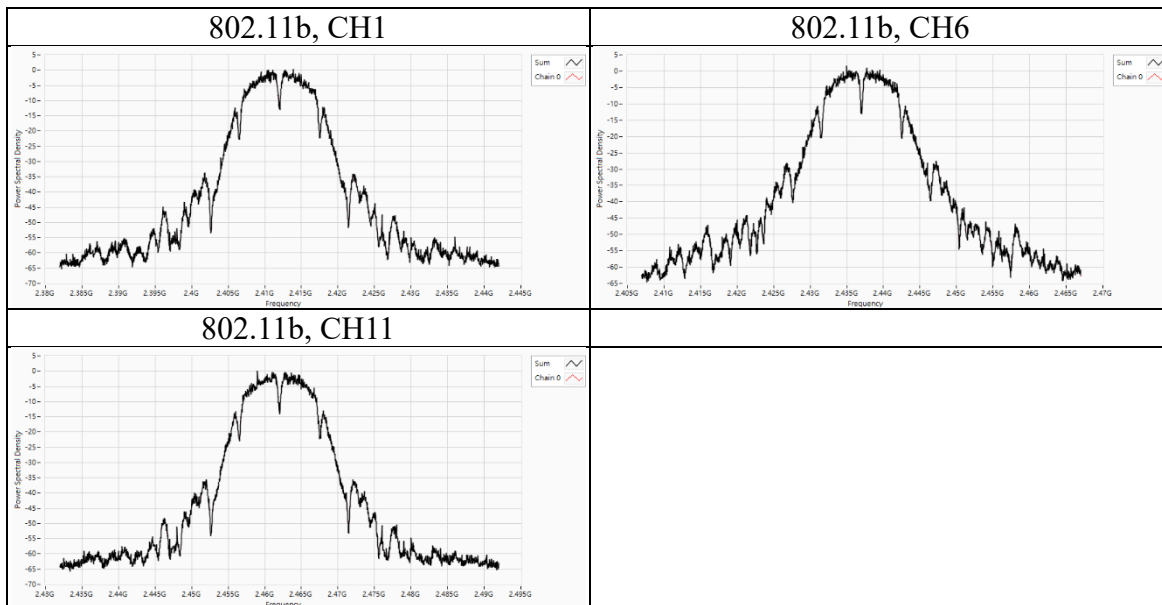
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Mode	CH	Freq (MHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Directional Gain (dBi)	Result
802.11g	1	2412	-7.96	8	2.1	Pass
	2	2417	-5.59	8	2.1	Pass
	6	2437	-2.89	8	2.1	Pass
	10	2457	-5.02	8	2.1	Pass
	11	2462	-7.4	8	2.1	Pass

Mode	CH	Freq (MHz)	PSD per Chain (dBm/3kHz)
			Chain 0
802.11g	1	2412	-7.958
	2	2417	-5.595
	6	2437	-2.887
	10	2457	-5.016
	11	2462	-7.405

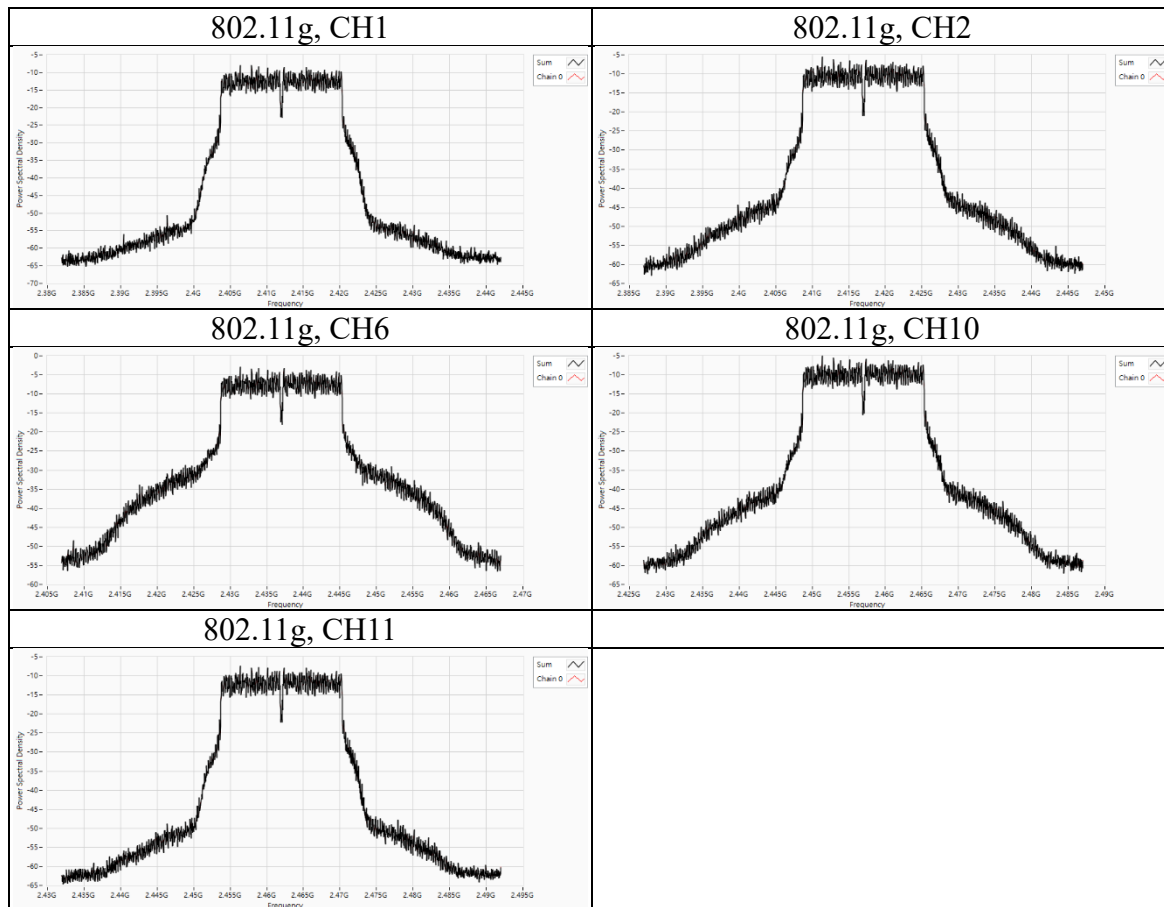
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Mode	CH	Freq (MHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Directional Gain (dBi)	Result
802.11n(HT20)	1	2412	-8.42	8	2.1	Pass
	2	2417	-6.03	8	2.1	Pass
	6	2437	-2.97	8	2.1	Pass
	10	2457	-5.91	8	2.1	Pass
	11	2462	-7.82	8	2.1	Pass

Mode	CH	Freq (MHz)	PSD per Chain (dBm/3kHz)
			Chain 0
802.11n(HT20)	1	2412	-8.417
	2	2417	-6.032
	6	2437	-2.973
	10	2457	-5.91
	11	2462	-7.823

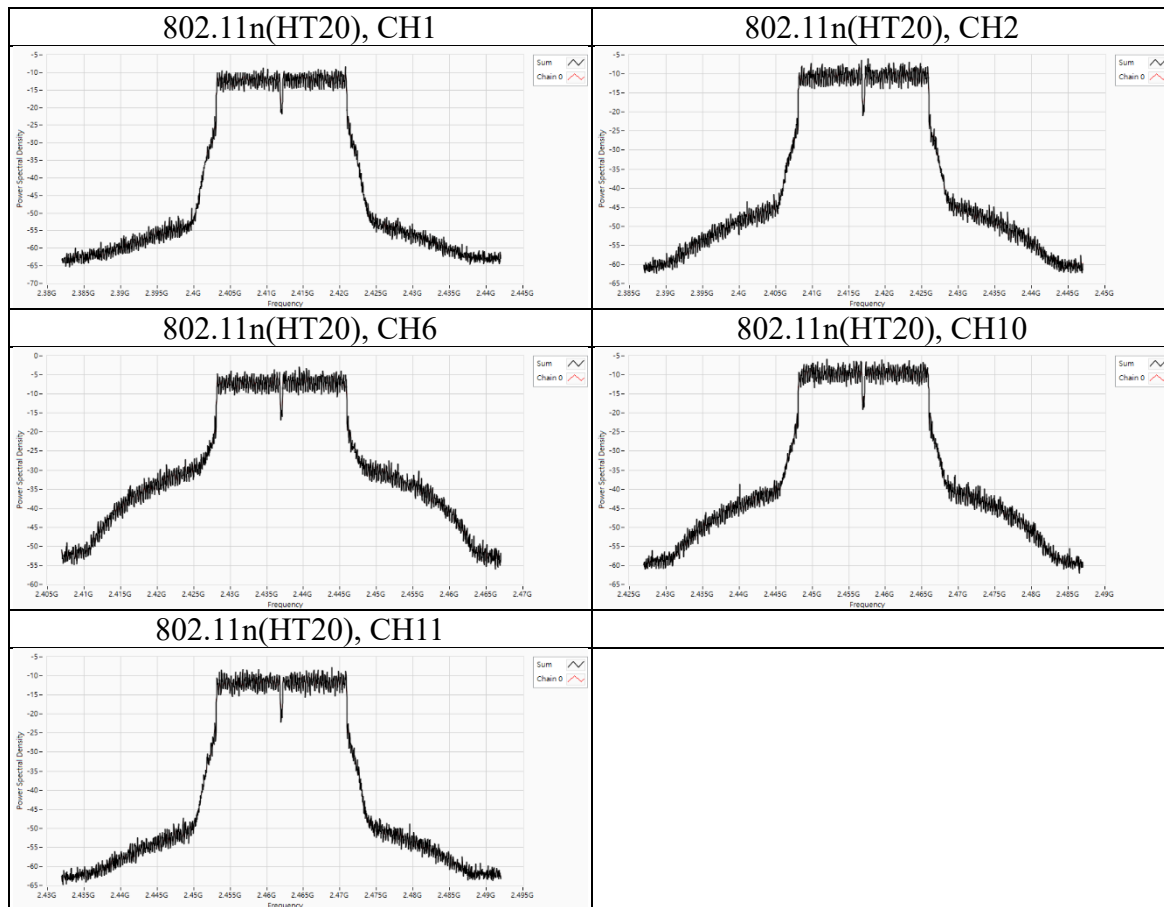
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9.4. Conducted Out of Band Emission

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

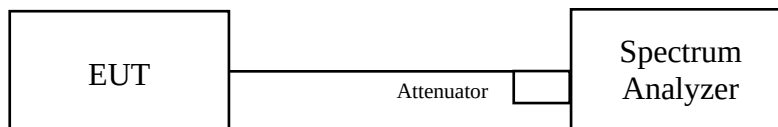
Measurement Procedure REF

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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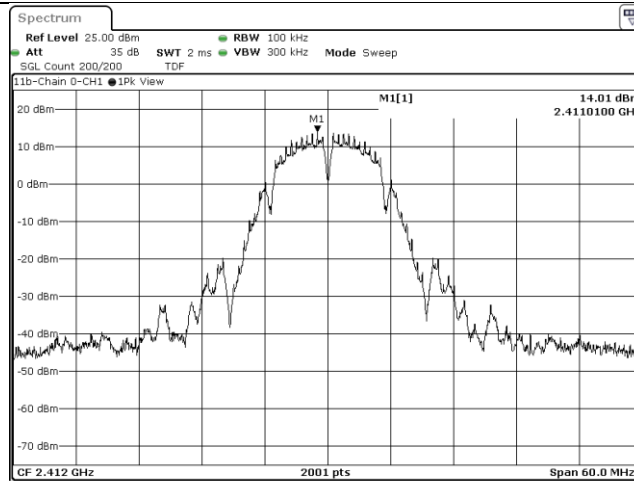
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Doc No: 17-EM-F0876 / 6.0

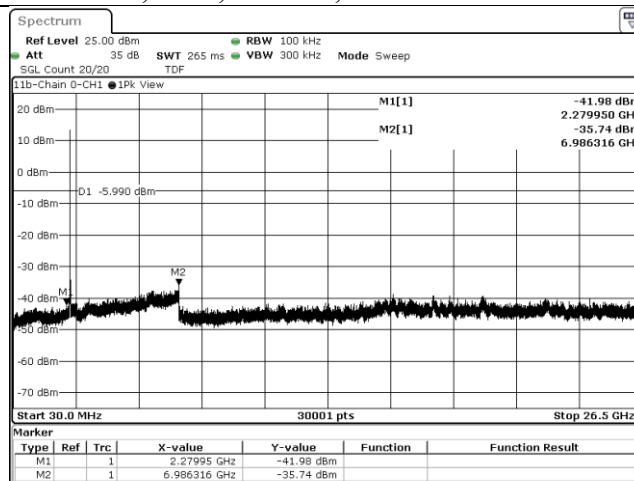


Test Data

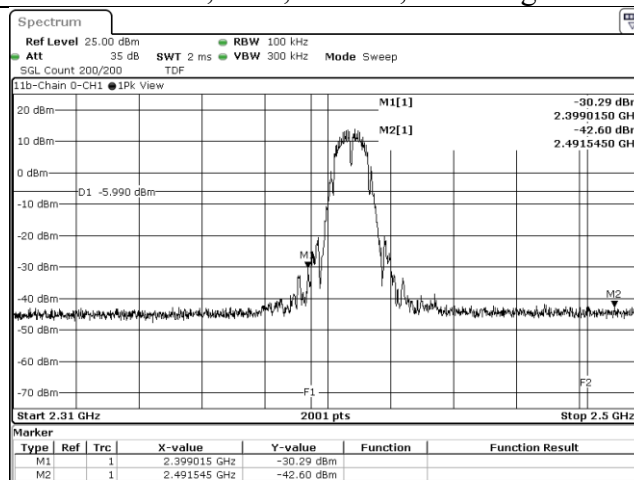
802.11b, CH1, Chain 0, Reference



802.11b, CH1, Chain 0, Conducted Emission



802.11b, CH1, Chain 0, Band edge



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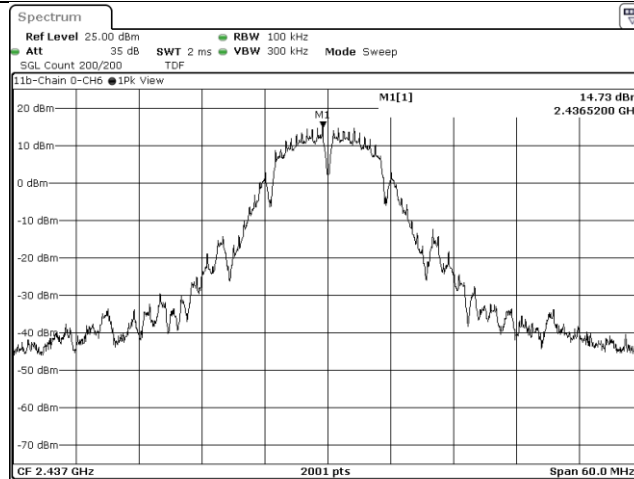
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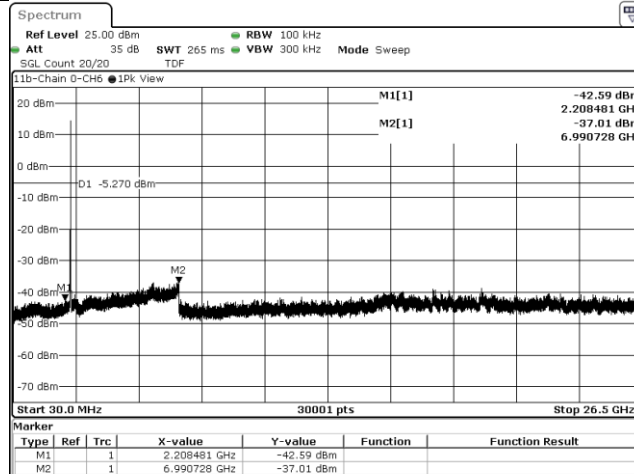
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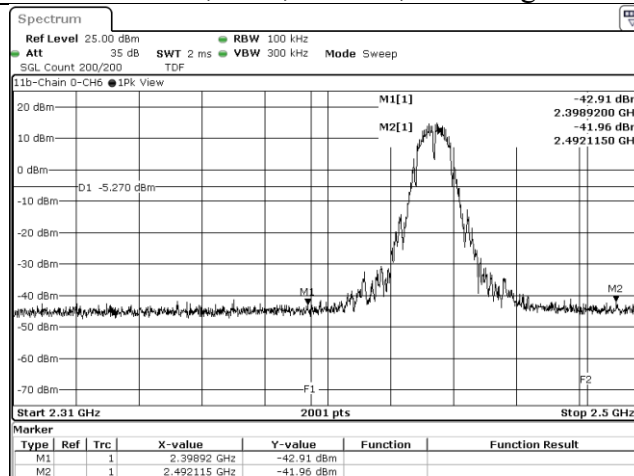
802.11b, CH6, Chain 0, Reference



802.11b, CH6, Chain 0, Conducted Emission



802.11b, CH6, Chain 0, Band edge



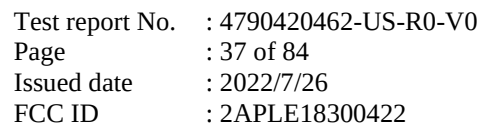
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Spectrum

Ref Level 25.00 dBm
 Att 35 dB
 SGL Count 200/200
 TDF

RBW 100 kHz
 VBW 300 kHz
 Mode Sweep

11b-Chain 0-CH11 ● 1Pk View

20 dBm
 10 dBm
 0 dBm
 -10 dBm
 -20 dBm
 -30 dBm
 -40 dBm
 -50 dBm
 -60 dBm
 -70 dBm

M3
 M1[1]

13.48 dBm
 2.4614900 GHz

CF 2.462 GHz
 2001 pts
 Span 60.0 MHz

Spectrum

Ref Level 25.00 dBm
 Att 35 dB
 SGL Count 20/20
 TDF

RBW 100 kHz
 VBW 300 kHz
 Mode Sweep

11b-Chain 0-CH11 ● 1Pk View

20 dBm
 10 dBm
 0 dBm
 -10 dBm
 -20 dBm
 -30 dBm
 -40 dBm
 -50 dBm
 -60 dBm
 -70 dBm

M1[1] -41.97 dBm
 2.193481 GHz
 M2[1] -35.89 dBm
 6.891024 GHz

D1 -6.520 dBm

Start 30.0 MHz
 30001 pts
 Stop 26.5 GHz

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1	1	2.193481 GHz	-41.97 dBm		
M2	1	1	6.891024 GHz	-35.89 dBm		

Spectrum

Ref Level 25.00 dBm
Att 35 dB
SGL Count 200/200
RBW 100 kHz
SWT 2 ms
VBW 300 kHz
TDF
Mode Sweep

11b-Chain 0-CH11 ● 1Pk View

20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm

M1[1] -42.63 dBm
2.9911300 GHz -41.63 dBm
M2[1] 2.4850850 GHz -41.63 dBm

D1 -6.520 dBm

M1
M2

F1
F2

Start 2.31 GHz
2001 pts
Stop 2.5 GHz

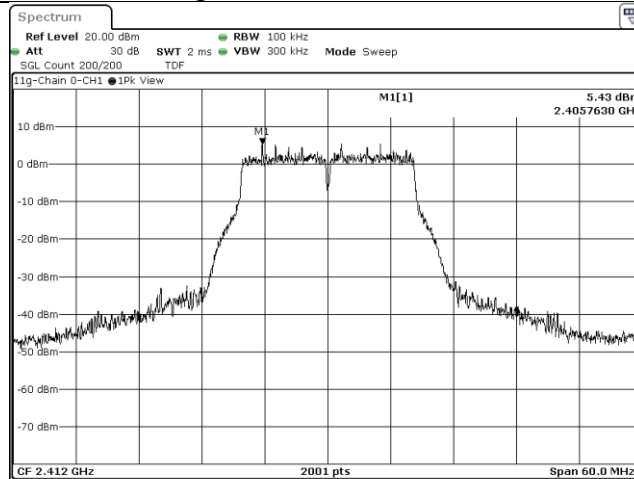
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.99113 GHz	-42.63 dBm		
M2		1	2.485085 GHz	-41.63 dBm		

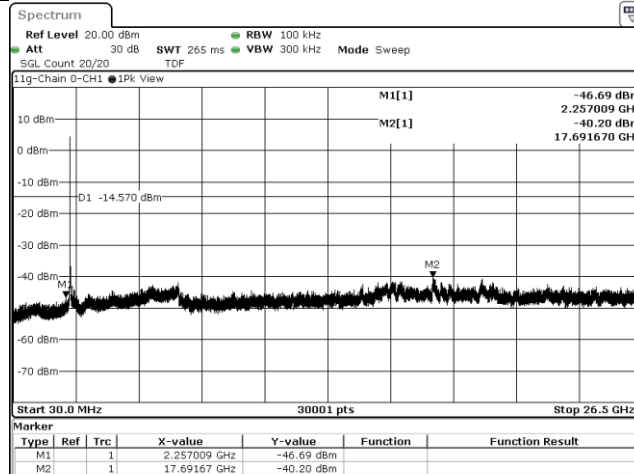
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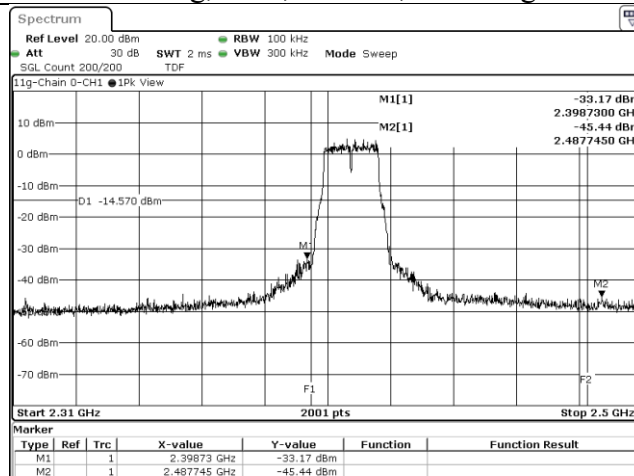
802.11g, CH1, Chain 0, Reference



802.11g, CH1, Chain 0, Conducted Emission



802.11g, CH1, Chain 0, Band edge



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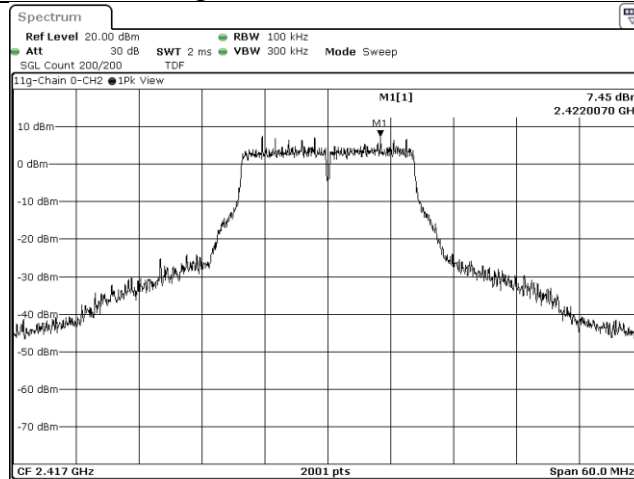
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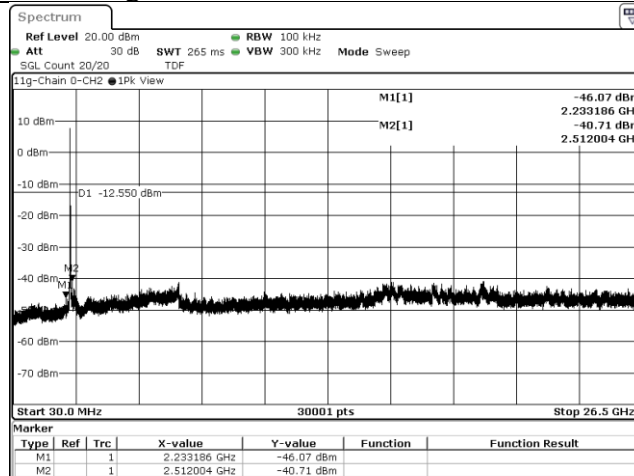
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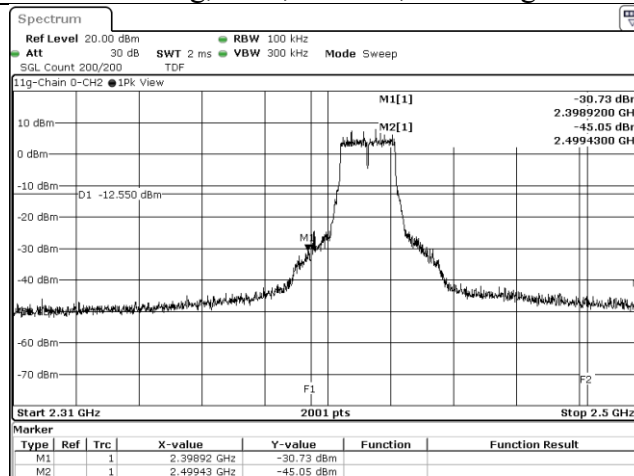
802.11g, CH2, Chain 0, Reference



802.11g, CH2, Chain 0, Conducted Emission



802.11g, CH2, Chain 0, Band edge



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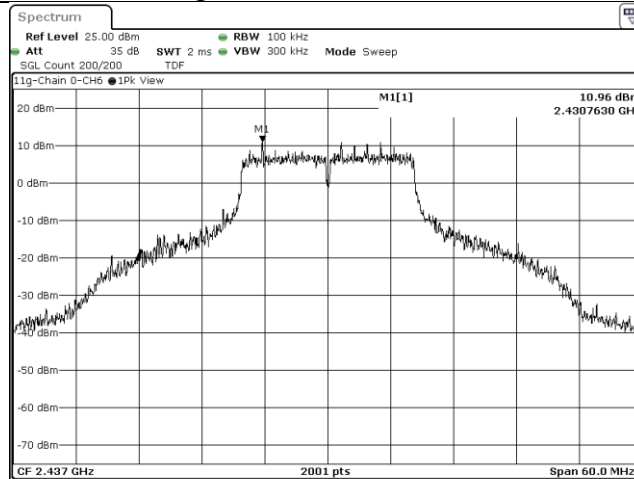
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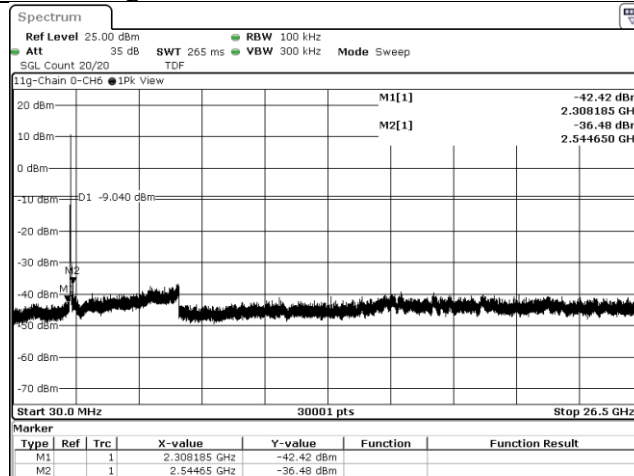
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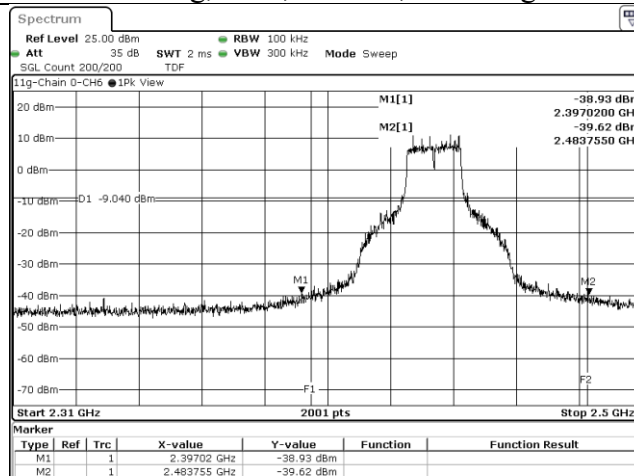
802.11g, CH6, Chain 0, Reference



802.11g, CH6, Chain 0, Conducted Emission



802.11g, CH6, Chain 0, Band edge



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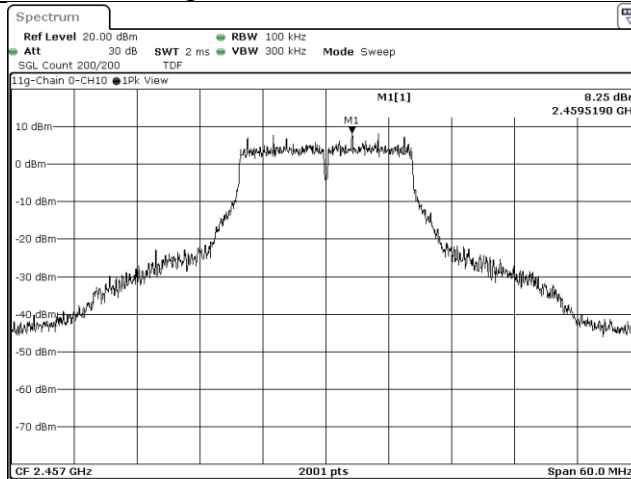
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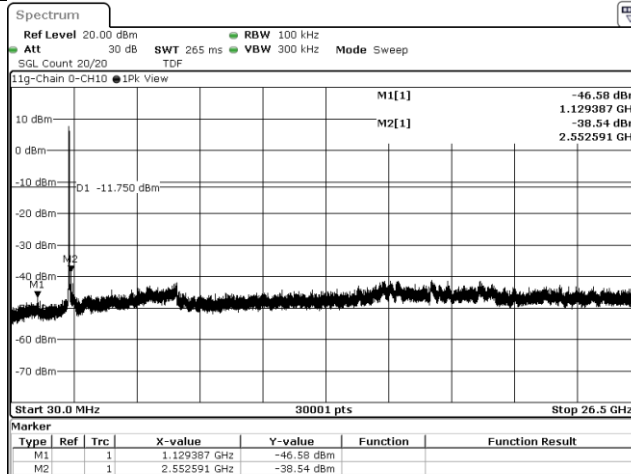
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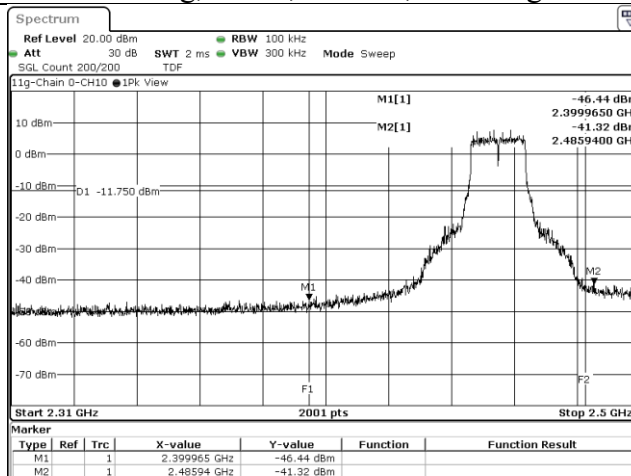
802.11g, CH10, Chain 0, Reference



802.11g, CH10, Chain 0, Conducted Emission



802.11g, CH10, Chain 0, Band edge



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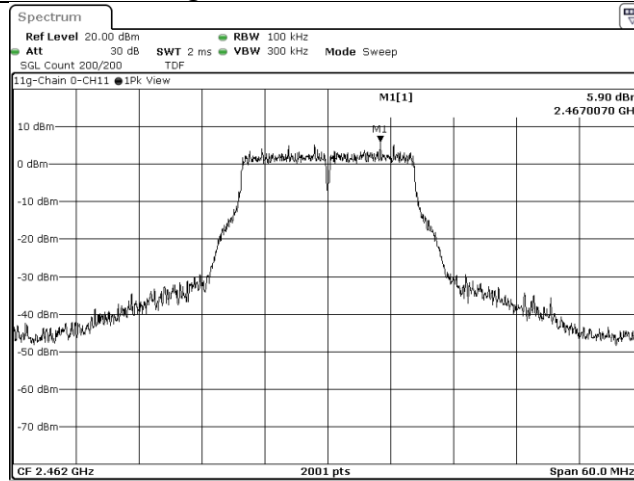
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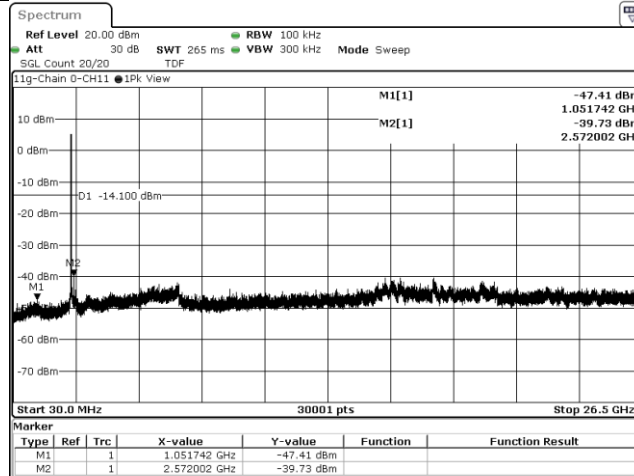
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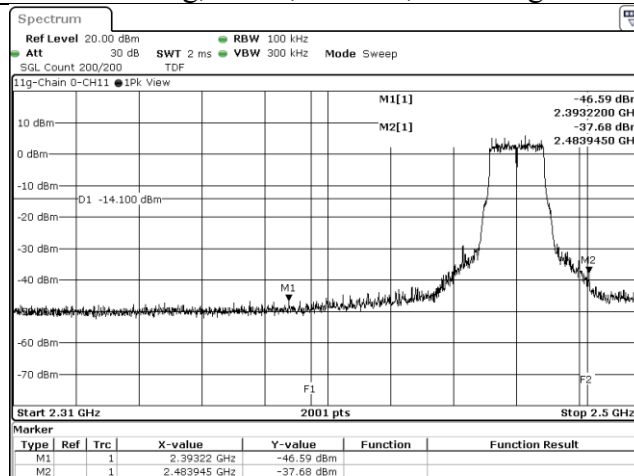
802.11g, CH11, Chain 0, Reference



802.11g, CH11, Chain 0, Conducted Emission



802.11g, CH11, Chain 0, Band edge



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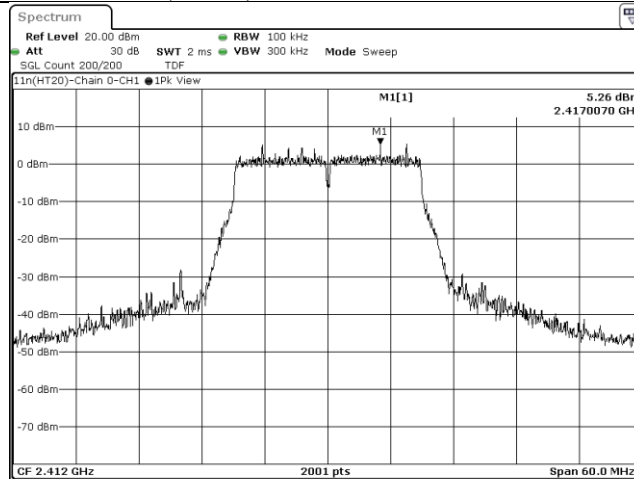
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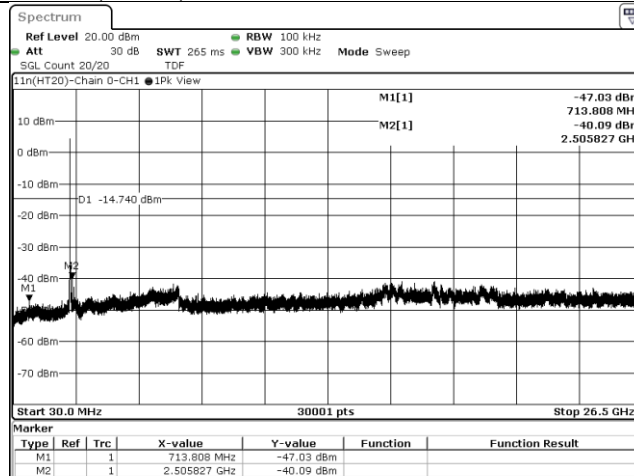
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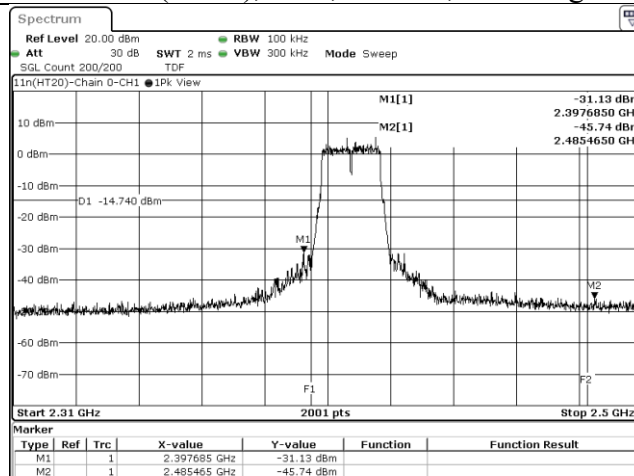
802.11n(HT20), CH1, Chain 0, Reference



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



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



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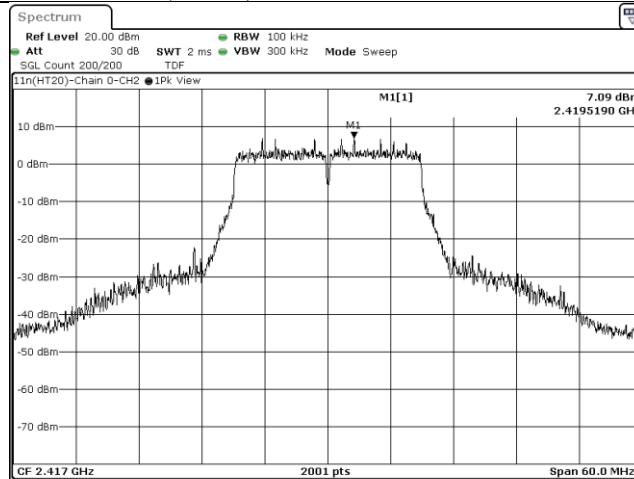
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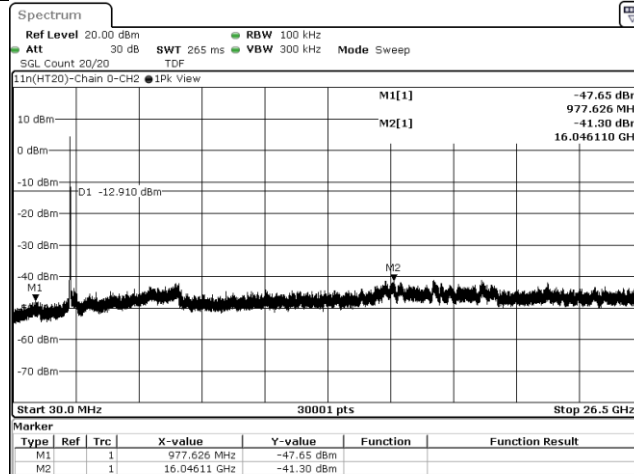
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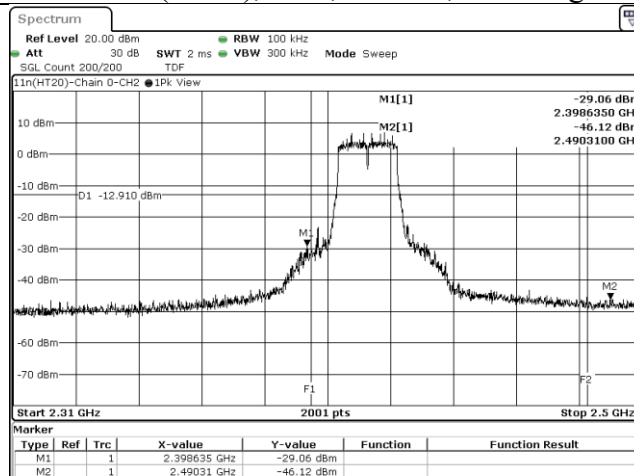
802.11n(HT20), CH2, Chain 0, Reference



802.11n(HT20), CH2, Chain 0, Conducted Emission



802.11n(HT20), CH2, Chain 0, Band edge



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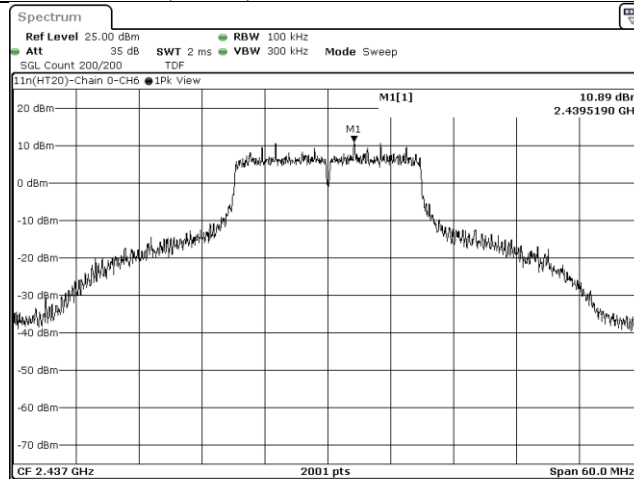
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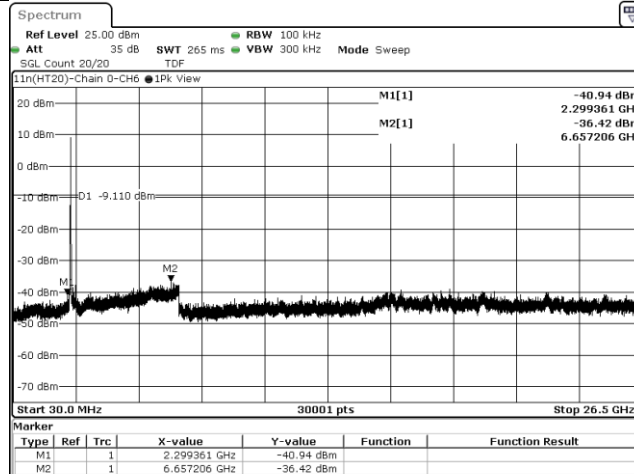
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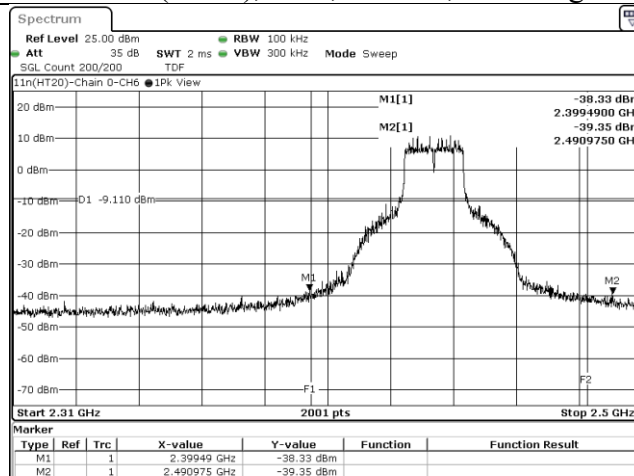
802.11n(HT20), CH6, Chain 0, Reference



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



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



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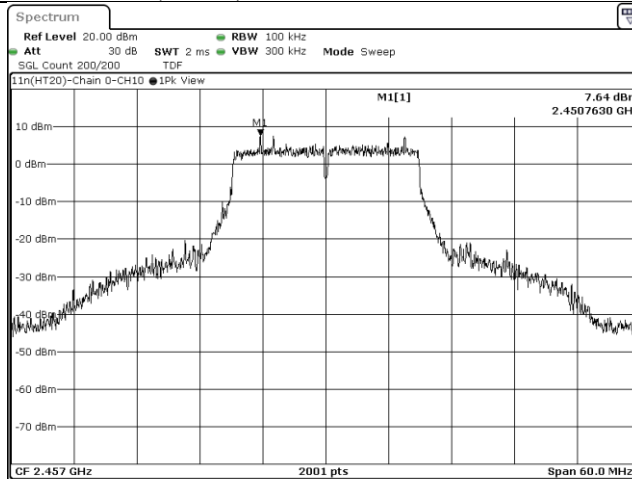
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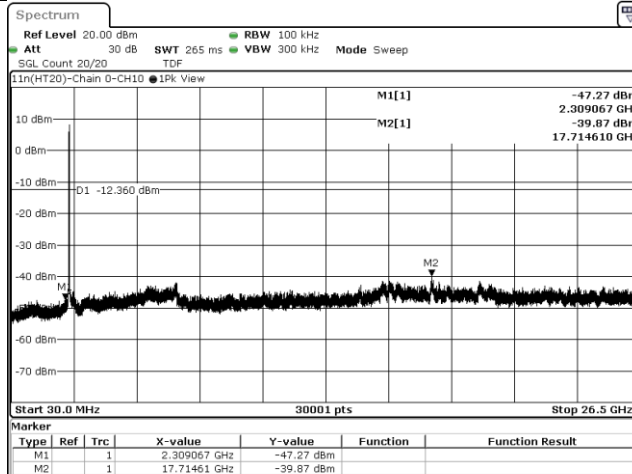
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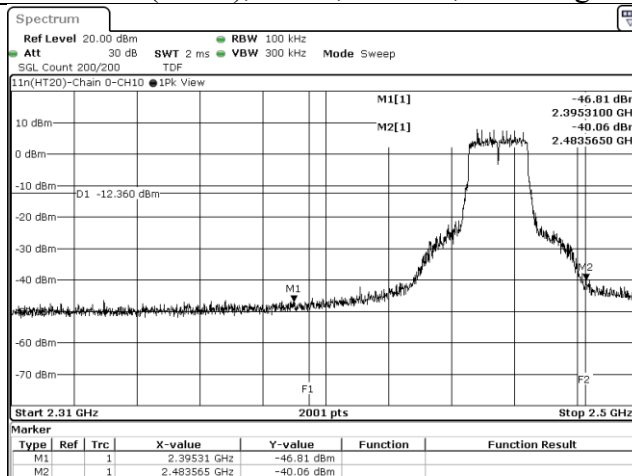
802.11n(HT20), CH10, Chain 0, Reference



802.11n(HT20), CH10, Chain 0, Conducted Emission



802.11n(HT20), CH10, Chain 0, Band edge



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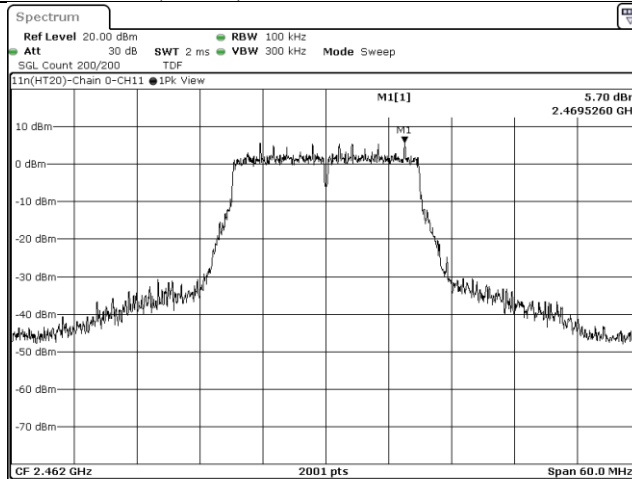
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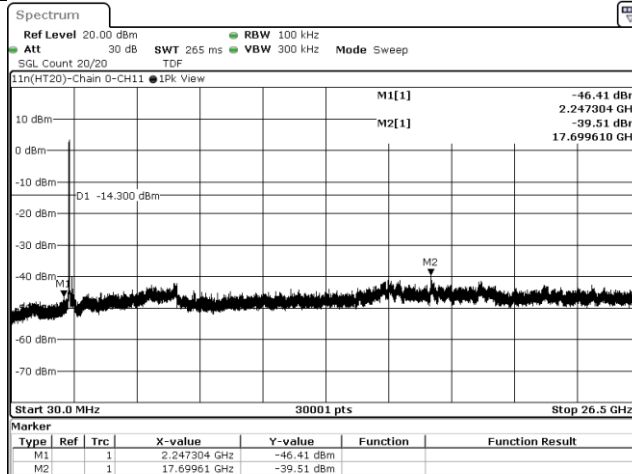
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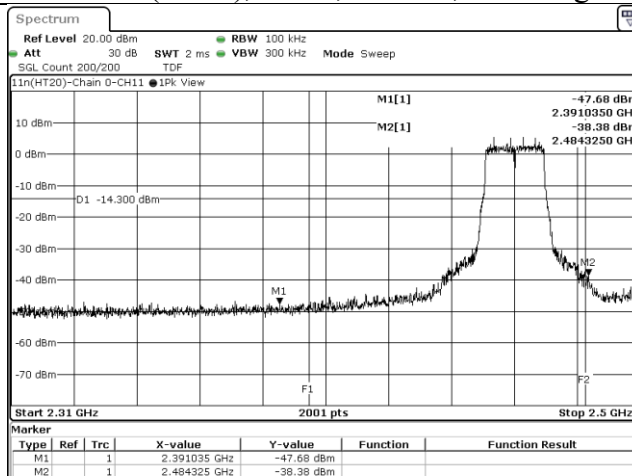
802.11n(HT20), CH11, Chain 0, Reference



802.11n(HT20), CH11, Chain 0, Conducted Emission



802.11n(HT20), CH11, Chain 0, Band edge



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9.5. Radiated Spurious Emission

Requirements

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequency(MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/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

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

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Test Procedures

[For 9 kHz ~ 30 MHz]

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. For measurement below 30MHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

[For above 30 MHz]

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
- f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

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Note:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
- The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle $< 98\%$) or 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.

Configuration	Average	
	RBW	VBW
802.11b	1MHz	Refer to section 6.6 for duty cycle
802.11g		
802.11n (HT20)		

Note: Refer to section 6.6 for duty cycle.

- All modes of operation were investigated (includes all external accessories) and the worst-case emissions are reported, the other emission levels were low against the limit.
- Test data of Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
- Test data of Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
- Test data of Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) - Preamp Factor (dB).
- Test data of Notation "@" = Fundamental Frequency
- Test data of Notation "*" = The peak result under 20 dB above and complies with AVG limit, AVG result is deemed to comply with AVG limit.

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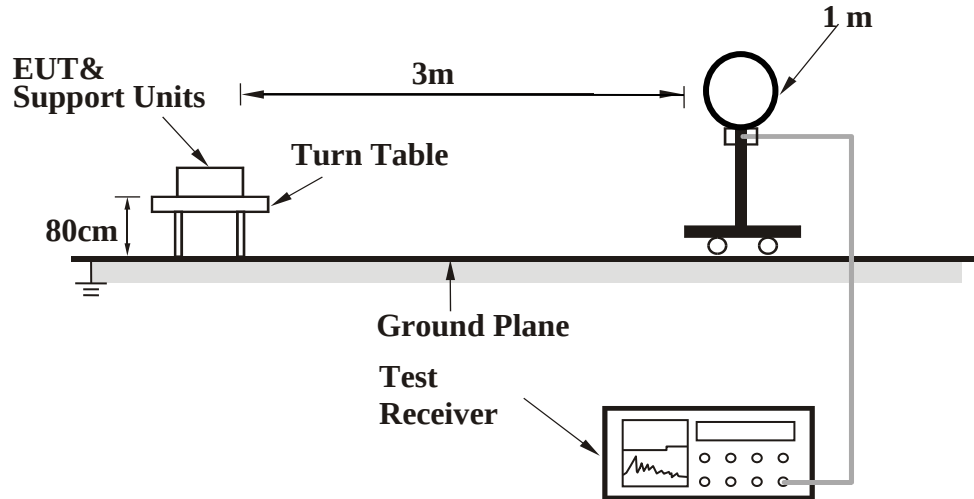
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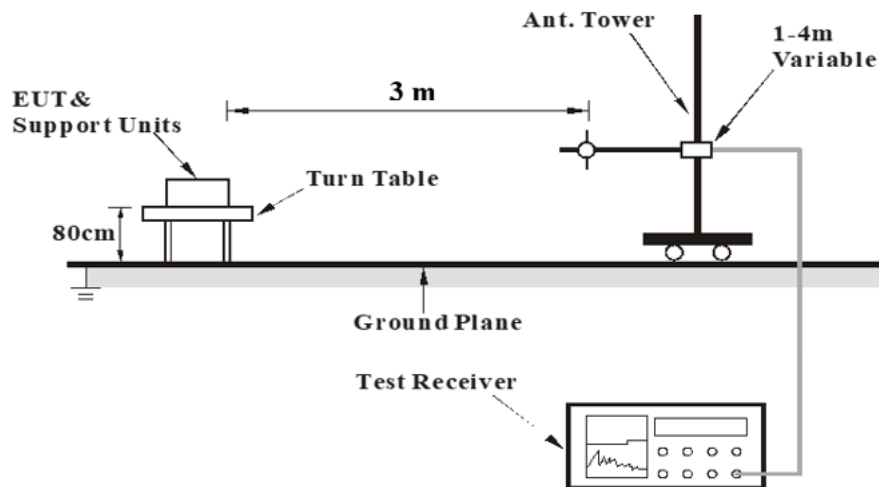
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Test Setup

<Frequency Range 9 kHz ~ 30 MHz>



<Frequency Range 30 MHz ~ 1 GHz >



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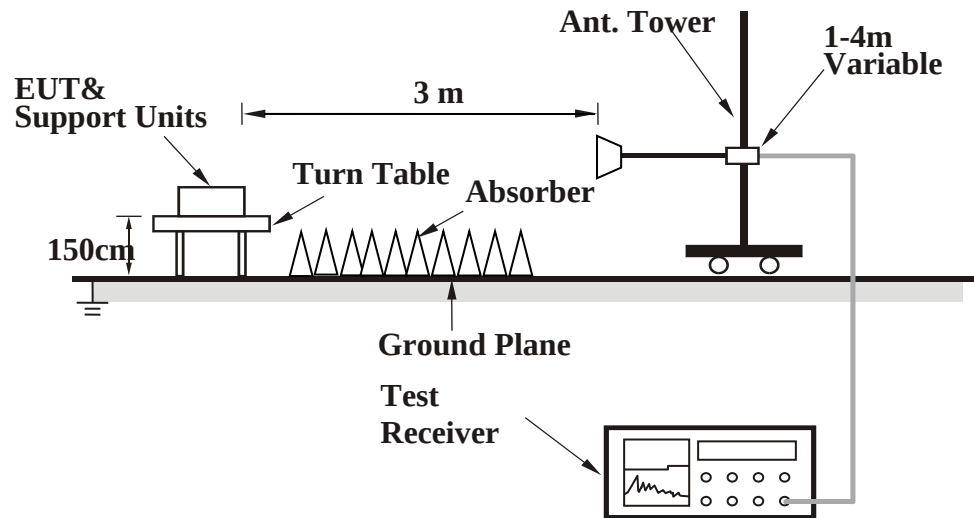
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<Frequency Range above 1 GHz>



For the actual test configuration, please refer to the Setup Configurations.



Test Data

Above 1 GHz

Mode	802.11b	Channel	1
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Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2389.8	43.18	15.82	59	74	-15	PK
		2389.99	37.14	15.82	52.96	54	-1.04	AVG
	@	2412	95.55	15.83	111.38	N/A	N/A	PK
	@	2412	91.85	15.83	107.68	N/A	N/A	AVG
	*	4824	45.53	2.35	47.88	74	-26.12	PK
Vertical		2376.12	45.56	15.85	61.41	74	-12.59	PK
		2389.99	38.16	15.82	53.98	54	-0.02	AVG
	@	2412	98.02	15.83	113.85	N/A	N/A	PK
	@	2412	93.97	15.83	109.8	N/A	N/A	AVG
	*	4824	46.5	2.35	48.85	74	-25.15	PK

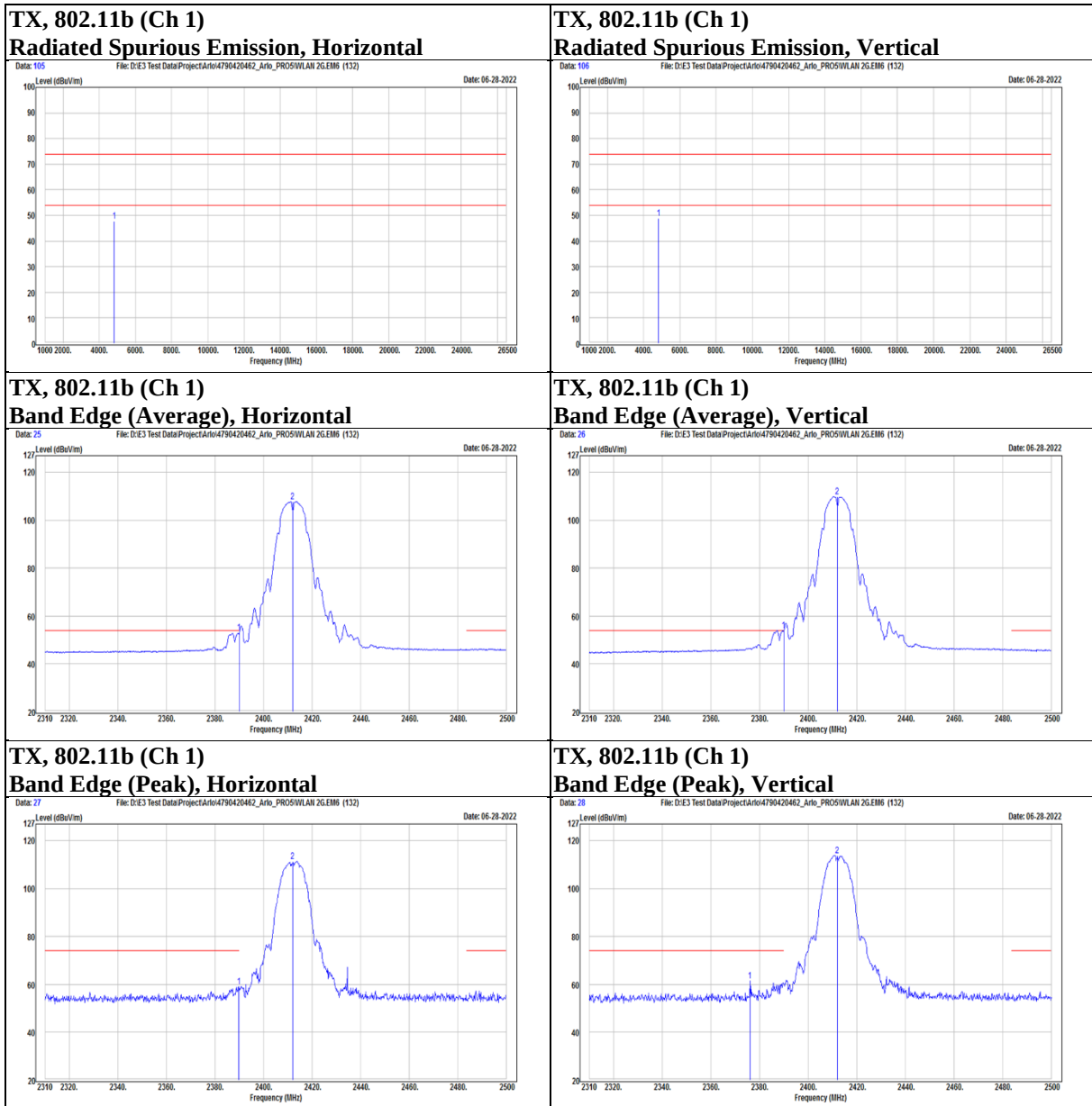
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Mode	802.11b	Channel	6
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Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2339.64	41.87	15.89	57.76	74	-16.24	PK
		2388.66	29.67	15.82	45.49	54	-8.51	AVG
	@	2437	96.59	15.92	112.51	N/A	N/A	PK
	@	2437	92.51	15.92	108.43	N/A	N/A	AVG
		2483.85	31.42	15.68	47.1	54	-6.9	AVG
		2484.99	40.99	15.67	56.66	74	-17.34	PK
	*	4874	45.08	2.4	47.48	74	-26.52	PK
		2353.89	42.37	15.89	58.26	74	-15.74	PK
Vertical		2389.8	30.44	15.82	46.26	54	-7.74	AVG
	@	2437	99.38	15.92	115.3	N/A	N/A	PK
	@	2437	95.68	15.92	111.6	N/A	N/A	AVG
		2484.23	30.95	15.68	46.63	54	-7.37	AVG
		2489.93	40.73	15.63	56.36	74	-17.64	PK
	*	4874	46.27	2.4	48.67	74	-25.33	PK

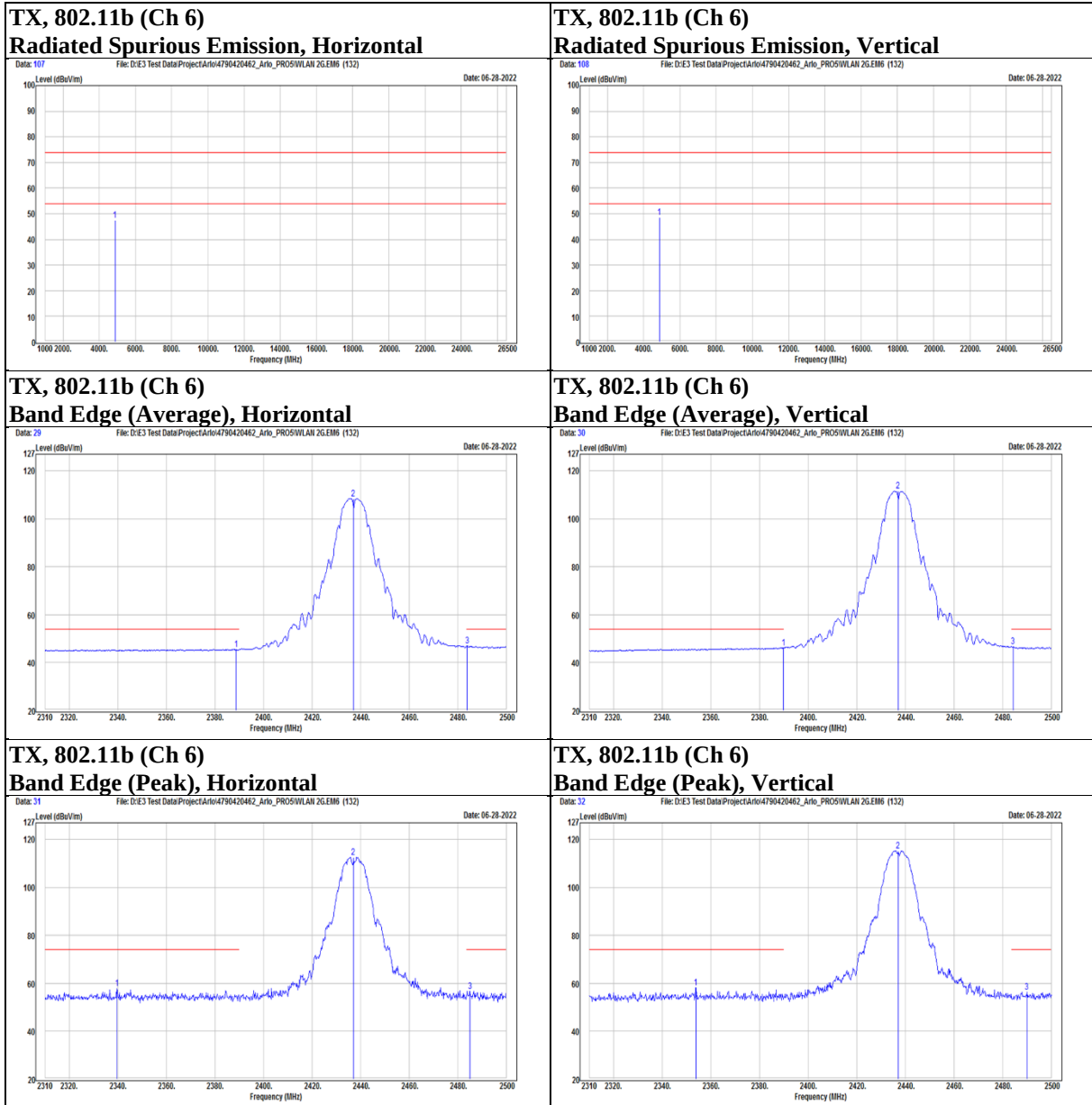
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Mode	802.11b	Channel	11
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Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	@	2462	97.71	15.87	113.58	N/A	N/A	PK
	@	2462	93.94	15.87	109.81	N/A	N/A	AVG
		2483.66	37.8	15.68	53.48	54	-0.52	AVG
		2497.53	46.28	15.57	61.85	74	-12.15	PK
	*	4924	44.27	2.4	46.67	74	-27.33	PK
Vertical	@	2462	97.32	15.87	113.19	N/A	N/A	PK
	@	2462	93.5	15.87	109.37	N/A	N/A	AVG
		2483.66	36.24	15.68	51.92	54	-2.08	AVG
		2496.2	45.32	15.58	60.9	74	-13.1	PK
	*	4924	45.92	2.4	48.32	74	-25.68	PK

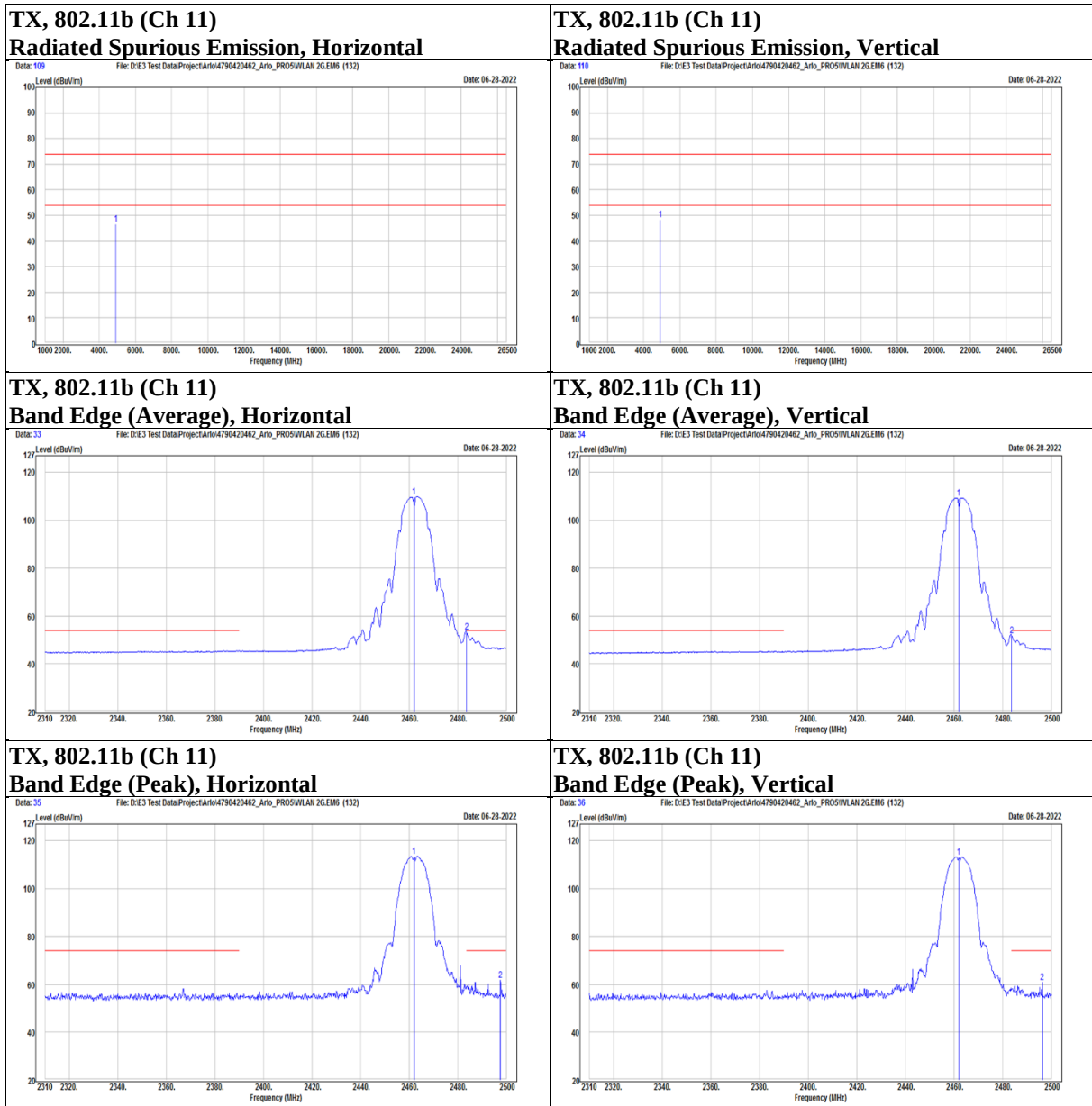
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FCC ID : 2APLE18300422

Mode	802.11g	Channel	1
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Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2389.04	45.28	15.81	61.09	74	-12.91	PK
		2389.8	35.19	15.82	51.01	54	-2.99	AVG
	@	2412	91.39	15.83	107.22	N/A	N/A	PK
	@	2412	82.86	15.83	98.69	N/A	N/A	AVG
	*	4824	35.69	2.35	38.04	74	-35.96	PK
Vertical		2389.8	54.13	15.82	69.95	74	-4.05	PK
		2389.99	37.65	15.82	53.47	54	-0.53	AVG
	@	2412	93.78	15.83	109.61	N/A	N/A	PK
	@	2412	84.88	15.83	100.71	N/A	N/A	AVG
	*	4824	38.08	2.35	40.43	74	-33.57	PK

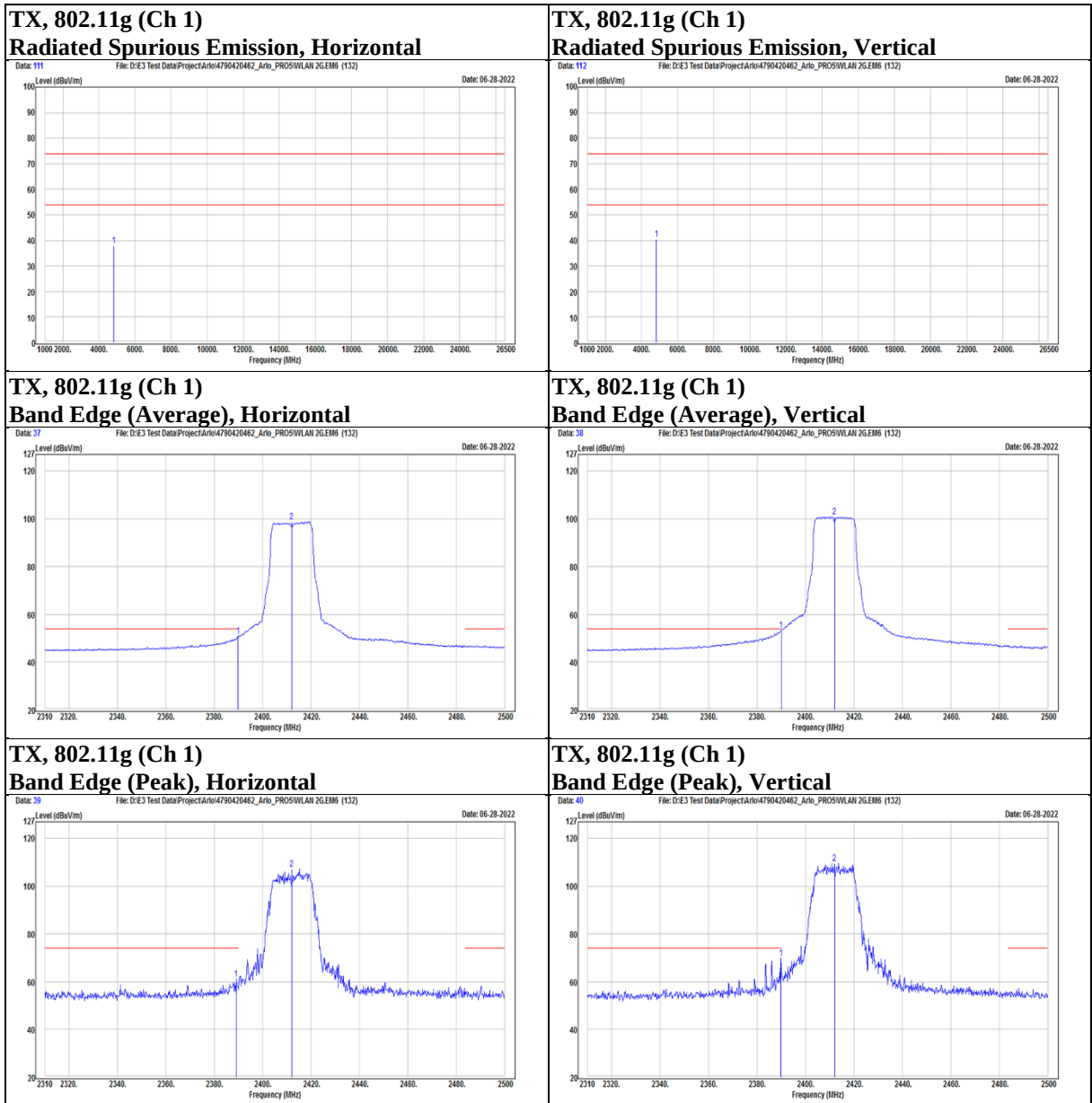
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Mode	802.11g	Channel	2
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Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2389.42	53.15	15.82	68.97	74	-5.03	PK
		2389.99	37.92	15.82	53.74	54	-0.26	AVG
	@	2417	94.95	15.84	110.79	N/A	N/A	PK
	@	2417	86.27	15.84	102.11	N/A	N/A	AVG
	*	4834	38.36	2.36	40.72	74	-33.28	PK
Vertical		2388.85	50.31	15.81	66.12	74	-7.88	PK
		2389.8	36.85	15.82	52.67	54	-1.33	AVG
	@	2417	96.8	15.84	112.64	N/A	N/A	PK
	@	2417	87.58	15.84	103.42	N/A	N/A	AVG
	*	4834	39.7	2.36	42.06	74	-31.94	PK

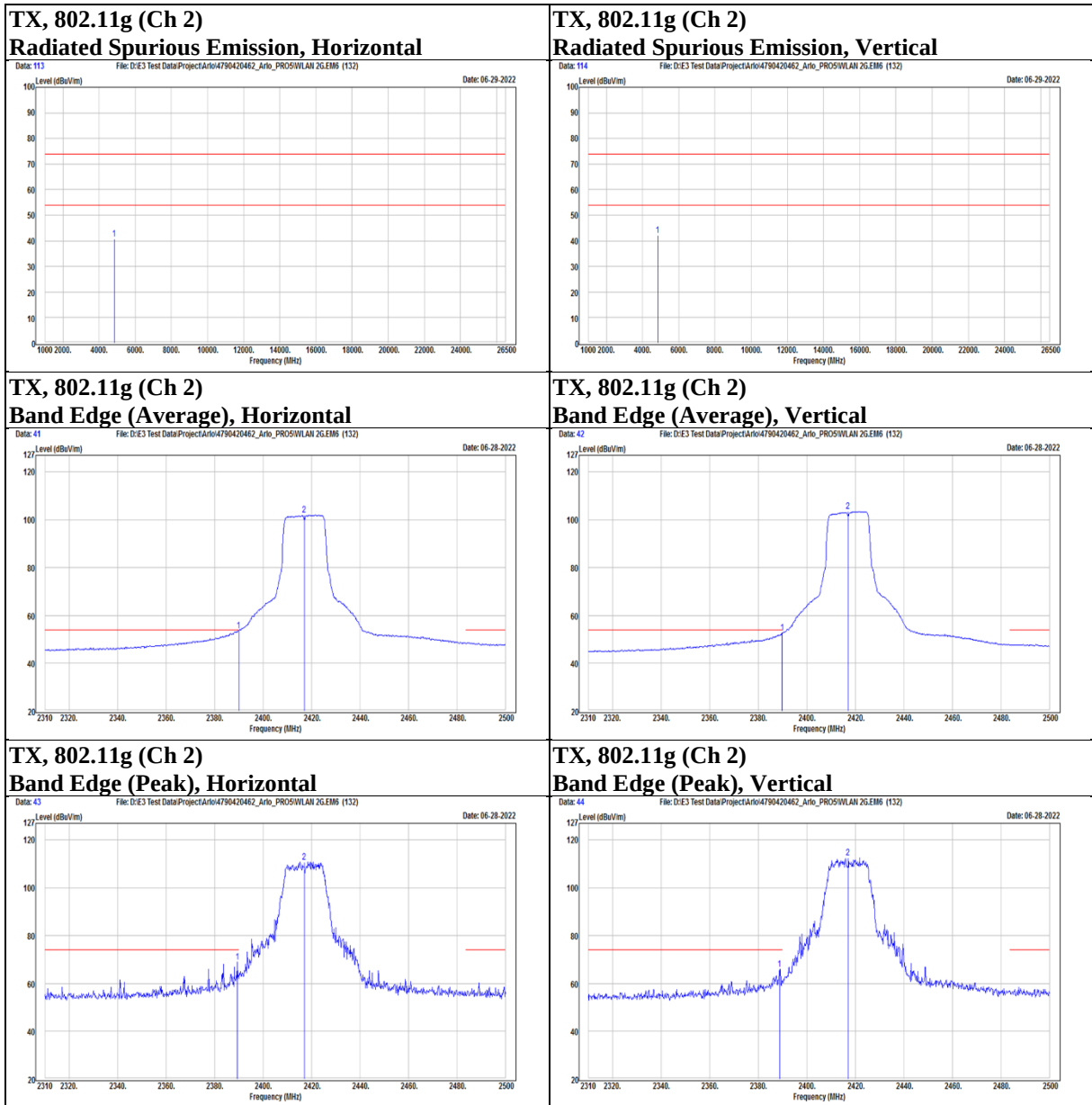
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Mode	802.11g	Channel	6
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Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2388.85	36.37	15.81	52.18	54	-1.82	AVG
		2389.8	48.12	15.82	63.94	74	-10.06	PK
	@	2437	98.12	15.92	114.04	N/A	N/A	PK
	@	2437	89.1	15.92	105.02	N/A	N/A	AVG
		2484.04	37.92	15.68	53.6	54	-0.4	AVG
		2489.74	47.69	15.63	63.32	74	-10.68	PK
	*	4874	37.29	2.4	39.69	74	-34.31	PK
		2388.47	35.29	15.82	51.11	54	-2.89	AVG
Vertical		2389.42	50.94	15.82	66.76	74	-7.24	PK
	@	2437	98.78	15.92	114.7	N/A	N/A	PK
	@	2437	89.61	15.92	105.53	N/A	N/A	AVG
		2483.66	36.72	15.68	52.4	54	-1.6	AVG
		2486.51	46.78	15.66	62.44	74	-11.56	PK
	*	4874	39.07	2.4	41.47	74	-32.53	PK

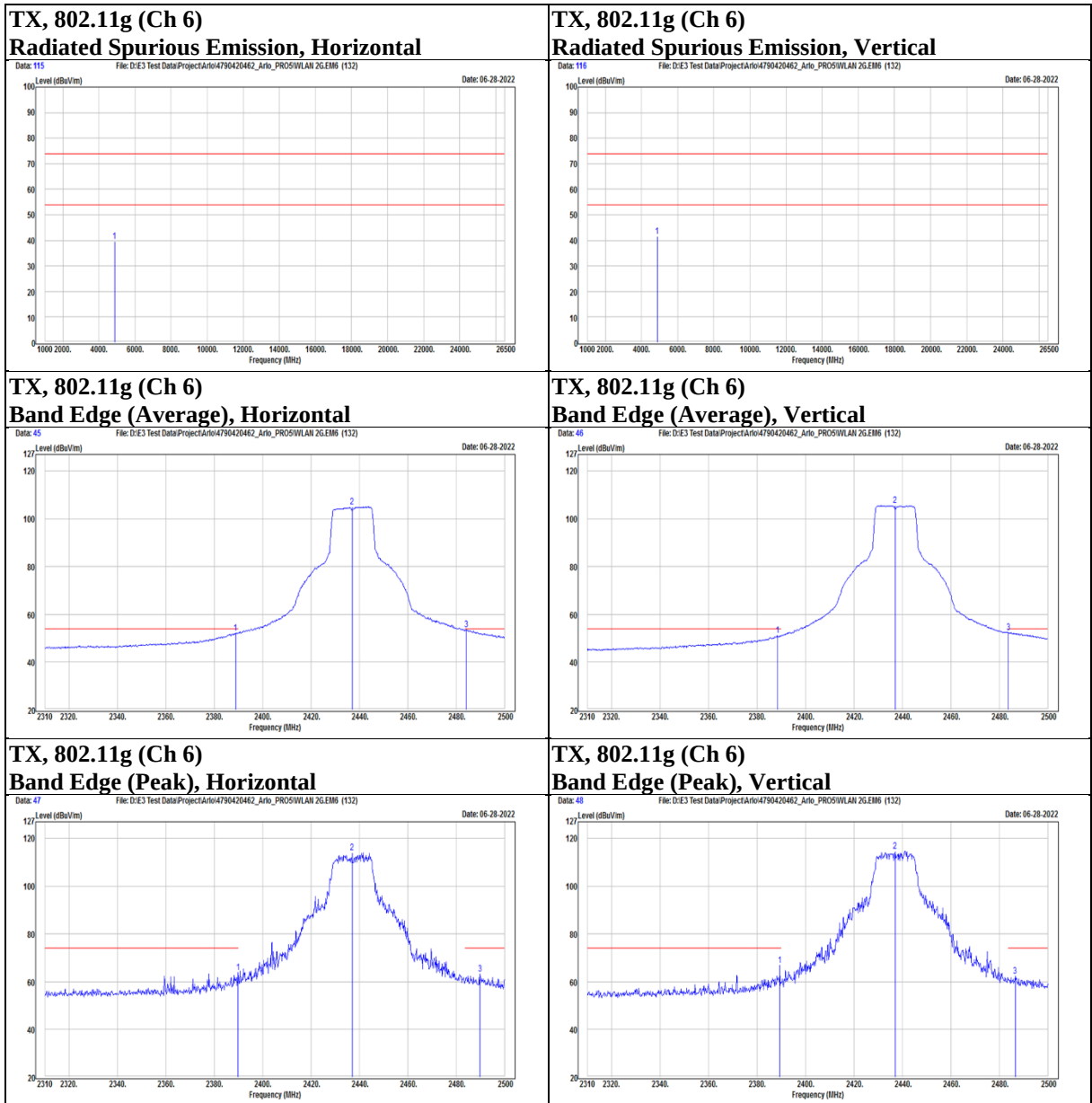
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