

RADIO TEST REPORT

Product : Wi-Fi 7 AIW-173 module

Model Name : AIW-173BQ-GI1

Series Model : AIW-173LQ-GI1, AIW-173LQ-GI2, AIW-173BQ-GI2,
AIW-173HQ-GI1, AIW-173HQ-GI2

FCC ID : M82-AIW-173

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

Received Date : 2024/9/18

Test Date : 2024/9/19 ~ 2025/2/10

Issued Date : 2025/4/7

Applicant : Advantech Co Ltd
No. 1, Alley 20, Lane 26, Rueiguang Road Neihu District,
Taipei, Taiwan 114

Issued By : Underwriters Laboratories Taiwan Co., Ltd.
Building A, B and E, No. 372-7, Sec. 4, Zhongxing Rd.,
Zhudong Township, Hsinchu County, Taiwan



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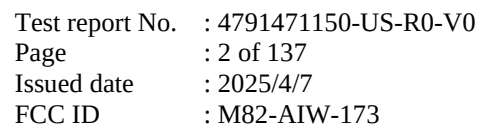


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1. Attestation of Test Results

APPLICANT: Advantech Co Ltd
No. 1, Alley 20, Lane 26, Rueiguang Road Neihu District, Taipei,
Taiwan 114

MANUFACTURER: Advantech Co Ltd
No. 1, Alley 20, Lane 26, Rueiguang Road Neihu District, Taipei,
Taiwan 114

EUT DESCRIPTION: Wi-Fi 7 AIW-173 module

BRAND: ADVANTECH

MODEL: AIW-173BQ-GI1

SERIES MODEL: AIW-173LQ-GI1, AIW-173LQ-GI2, AIW-173BQ-GI2,
AIW-173HQ-GI1, AIW-173HQ-GI2

SAMPLE STAGE: Design Verification Test Sample

DATE of TESTED: 2024/9/19 ~ 2025/2/10

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 : 2025/4/7

Approved and Authorized By:



Eric Lee

Senior Laboratory Engineer

Date : 2025/4/7

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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 and KDB 662911 D01 Multiple Transmitter Output v02r01.

4. Facilities and Accreditation

Test Location	Underwriters Laboratories Taiwan Co., Ltd.
Address	Building A, B and 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, Simple acceptance (Section 3.1.4 of IEC Guide 115) 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 $k=2$.

Determining compliance based on the results of the compliance measurement, not considering measurement instrumentation uncertainty.

Measurement	Frequency	Uncertainty
Conducted disturbance at mains terminals ports	150kHz ~ 30MHz	3.1 dB
RF Conducted	9 kHz - 40GHz	2.3 dB
Radiated disturbance below 30MHz	9 kHz - 30 MHz	3.2 dB
Radiated disturbance below 1 GHz	30MHz ~ 1GHz	6.1 dB
Radiated disturbance above 1 GHz	1GHz ~ 40GHz	5.1 dB

6. Equipment under Test

6.1. Description of EUT

Product	Wi-Fi 7 AIW-173 module
Brand Name	ADVANTECH
Model Name	AIW-173BQ-GI1
Series Model	AIW-173LQ-GI1, AIW-173LQ-GI2, AIW-173BQ-GI2, AIW-173HQ-GI1, AIW-173HQ-GI2
Normal Voltage	3.3Vdc

Operating Frequency	2412MHz ~ 2462MHz
Modulation	CCK, DQPSK, DBPSK for DSSS 4096QAM, 1024QAM, 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM / OFDMA
Transfer Rate	802.11b: up to 11 Mbps 802.11g: up to 54 Mbps 802.11n: up to MCS15 802.11ac: up to MCS9 802.11ax: up to MCS11 802.11be: up to MCS13
Maximum Output Power	2412MHz ~ 2462MHz: 28.52 dBm
Sample ID	Conducted Test:7620396 Radiated Test:7620396

Note:

1. The models difference table as below:

Model	Different	
	Type	Bluetooth Interface
AIW-173LQ-GI1	LGA Module	Bluetooth USB control
AIW-173LQ-GI2		Bluetooth UART control
AIW-173BQ-GI1	M.2 type PCB board + LGA Module	Bluetooth USB control
AIW-173BQ-GI2		Bluetooth UART control
AIW-173HQ-GI1	PCIE type PCB board + LGA Module	Bluetooth USB control
AIW-173HQ-GI2		Bluetooth UART control

Remark:

- There are no circuit or layout differences in the LGA Module part across the three types.
- AIW-173LQ-GI1 and AIW-173LQ-GI2 have identical electrical characteristics.
- AIW-173BQ-GI1 and AIW-173BQ-GI2 have identical electrical characteristics.
- AIW-173HQ-GI1 and AIW-173HQ-GI2 have identical electrical characteristics.

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2. EUT provides a complete 2Tx port and 2Rx port. Please refer to the following working transmission conditions:

Modulation Mode	Tx/Rx Function	
802.11b	2Tx	2Rx
802.11g	2Tx	2Rx
802.11n(HT20)	2Tx	2Rx
802.11n(HT40)	2Tx	2Rx
802.11ac(VHT20)	2Tx	2Rx
802.11ac(VHT40)	2Tx	2Rx
802.11ax(HE20)	2Tx	2Rx
802.11ax(HE40)	2Tx	2Rx
802.11be(EHT20)	2Tx	2Rx
802.11be(EHT40)	2Tx	2Rx

*The modulation and bandwidth are similar for 802.11n mode for HT20 / HT40 and 802.11ac mode for VHT20 / VHT40, therefore investigated one worst case to representative mode in test report.

*The modulation and bandwidth are similar for 802.11ax mode for HE20 / HE40 and 802.11be mode for EHT20 / EHT40, therefore investigated one worst case to representative mode in test report.

3. The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer's or user's manual, the laboratory shall not be held responsible.

6.2. Channel List

11 channels are provided for WLAN 20MHz bandwidth system:

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 WLAN 40MHz bandwidth system:

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	Input Power	Test Date	Tested by
Antenna Port Conducted Measurement	SR4	20~25°C/ 56~69%RH	3.3Vdc	2024/09/23~ 2025/01/20	WaterNil Guan
Radiated Spurious Emission	966-2	22~26°C/ 62~68%RH	3.3Vdc	2024/09/19~ 2025/02/10	WaterNil Guan
AC power Line Conducted Emission	SR1	22°C/ 53%RH	120Vac/ 60Hz	2025/02/05	WaterNil Guan

Sample Calculation:

Antenna Port Conducted Measurement:

- Where relevant, the follow sample calculation is provided:
Result Value (dBm) = Reading Value (dBm) + Attenuator Factor (dB) + Cable Loss (dB).
Example: Result Value (10dBm) = Reading Value (-2dBm) + Attenuator Factor (10dB) + Cable Loss(2dB).
*Test plot only shown the “Result Value”.

Radiated Spurious Emission:

- Where relevant, the follow sample calculation is provided:
Result Value (dBuV/m) = Reading Value (dBuV) + Correction Factor (dB/m).
Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) - Preamp Factor (dB).
Example: Result Value (34.5dBuV/m) = Reading Value (40.1dBuV) + Antenna Factor (18.7dB/m) + Cable Loss (4.2dB) - Preamp Factor (28.5dB).

AC power Line Conducted Emission:

- Where relevant, the follow sample calculation is provided:
Result Value (dBuV) = Reading Value (dBuV) + Correction Factor (dB).
Correction Factor (dB) = Insertion loss(dB) + Cable loss(dB).
Example: Result Value (53.7dBuV) = Reading Value (35.1dBuV) + Insertion loss(18.1dB) + Cable loss(0.5dB).

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6.4. Description of Available Antennas

Ant. No.	Transmitter Circuit	Brand Name	Model Name	Maximum Gain (dBi)	Ant. Type	Connector Type
1	Chain0+1	Advantech	AIW-512-C (1751000460-01)	2.87 dBi : 2400 ~ 2500 MHz 3.11 dBi : 5150 ~ 5850 MHz 3.22 dBi : 5925 ~ 7125 MHz	Dipole	RP-SMA Male
2	Chain0+1	Advantech	AIW-512-I (1751000651-01)	2.87 dBi : 2400 ~ 2500 MHz 3.11 dBi : 5150 ~ 5850 MHz 3.22 dBi : 5925 ~ 7125 MHz	Dipole	RP-SMA Male
3	Chain0+1	Advantech	1751000642-01	1.61 dBi : 2400 ~ 2500 MHz 3.68 dBi : 5150 ~ 5850 MHz 4.06 dBi : 5925 ~ 7125 MHz	Dipole	RP-SMA Male
4	Chain0+1	Advantech	AIW-511 (1751000342-01)	2.28 dBi : 2400 ~ 2500 MHz 2.64 dBi : 5150 ~ 5850 MHz 3.28 dBi : 5925 ~ 7125 MHz	Dipole	RP-SMA Male
5	Chain0+1	Advantech	AIW-513 (1751000717-01)	1.48 dBi : 2400 ~ 2500 MHz 3.58 dBi : 5150 ~ 5850 MHz 4.04 dBi : 5925 ~ 7125 MHz	Dipole	RP-SMA Male
6	Chain0+1	Advantech	AIW-514	ANT0: 2.59 dBi @ 2400 – 2500 MHz 3.58 dBi @ 5150 – 5850 MHz 3.94 dBi @ 5925 – 7125 MHz ANT1: 2.60 dBi @ 2400 – 2500 MHz 3.51 dBi @ 5150 – 5850 MHz 3.91 dBi @ 5925 – 7125 MHz	Dipole	RP-SMA-Male

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, the laboratory shall not be held responsible.

6.5. Test Mode Applicability and Tested Channel Detail

Test Item	Mode	Modulation Technology	Modulation Type	Available Channel	Test Channel	Data Rate
Radiated Bandedge	802.11b	DSSS	DBPSK	1 to 11	1,6,11	1 Mbps
	802.11g	OFDM	BPSK	1 to 11	1,6,11	6 Mbps
	802.11ac20	OFDM	BPSK	1 to 11	1,2,6,10,11	MCS0 Nss1
	802.11ac40	OFDM	BPSK	3 to 9	3,4,6,8,9	MCS0 Nss1
	802.11be20	OFDM	BPSK	1 to 11	1,2,6,10,11	MCS0 Nss1
	802.11be40	OFDM	BPSK	3 to 9	3,4,6,8,9	MCS0 Nss1
Radiated Emissions (Above 1GHz)	802.11b	DSSS	DBPSK	1 to 11	1,6,11	1 Mbps
	802.11ac20	OFDM	BPSK	1 to 11	1,2,6,10,11	MCS0 Nss1
Radiated Emissions (Below 1GHz)	802.11b	DSSS	DBPSK	1 to 11	1	1 Mbps
AC Power Line Conducted Emission	802.11be20	OFDM	BPSK	1 to 11	6	MCS0 Nss1
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
	802.11ac20	OFDM	BPSK	1 to 11	1,2,6,10,11	MCS0 Nss1
	802.11ac40	OFDM	BPSK	3 to 9	3,4,6,8,9	MCS0 Nss1
	802.11be20	OFDM	BPSK	1 to 11	1,2,6,10,11	MCS0 Nss1
	802.11be40	OFDM	BPSK	3 to 9	3,4,6,8,9	MCS0 Nss1

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

- The EUT consists of six different models, all of which share the same LGA Module. Consequently, the fundamental level of the EUT was investigated across these six models. It was determined that the AIW-173BQ-GI1 represented the worst-case scenario and was selected as the representative test model documented in this report.
- The antennas No.1/ No.2 has the same highest gain at 2.4GHz band, therefore, the fundamental of the EUT was investigated in two antennas, it was determined antenna No.2 was worst-case, the Antenna No.2 was selected for the final test.
- The antennas No.2 has the highest and worst gain at 2.4GHz band and the antennas No.3 has the highest gain at 5GHz/6GHz band, therefore, the Radiated Emissions of the EUT was tested in two antennas, and it was found antenna No.2 have worst-case, and thus, the Antenna No.2 was selected representative test data documented in this report.
- The fundamental of the dipole antenna was investigated in two orthogonal (lay and stand), it was determined that stand mode was worst-case. Therefore, all final radiated testing was performed with the dipole antenna in stand mode.
- For radiated emissions below 1 GHz, the worst-case mode was determined from all series. It was found that the AIW-173BQ-GI1 represented the worst-case. Therefore, this model was selected for the final test.
- The radiated spurious emission test was performed in all test modes. The worst case was 802.11b and 802.11ac20, and therefore, only the worst case data is shown in this report to represent all test modes.

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- In the transmit mode, 802.11be20 channel 6 has the highest RF output power. Therefore, the AC conduction were performed using this worst-case mode.
- In the transmit mode, 802.11b channel 1 has the worst case of Tx spurious emission (above 1GHz). Therefore, all final tests for the spurious emission (below 1GHz) were performed using this worst-case mode.
- 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.
- 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).

Simultaneously transmission condition:

Condition	Technology		
1	WLAN (2.4GHz)	WLAN (5GHz)	-
2	WLAN (2.4GHz)	WLAN (6GHz)	-
3	BT	WLAN (2.4GHz)	-
4	BT	WLAN (2.4GHz)	WLAN (5GHz)
5	BT	WLAN (2.4GHz)	WLAN (6GHz)

Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.

6.6. Duty cycle

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle	Duty Factor (dB)	VBW Set (above 1GHz)
802.11b	1.390	1.410	0.9858	N/A	10Hz
802.11g	2.085	2.120	0.9835	N/A	10Hz
802.11ac(VHT20)	5.400	5.440	0.9926	N/A	10Hz
802.11ac(VHT40)	5.340	5.380	0.9926	N/A	10Hz
802.11be(EHT20)	5.330	5.370	0.9926	N/A	10Hz
802.11be(EHT40)	5.310	5.370	0.9888	N/A	10Hz

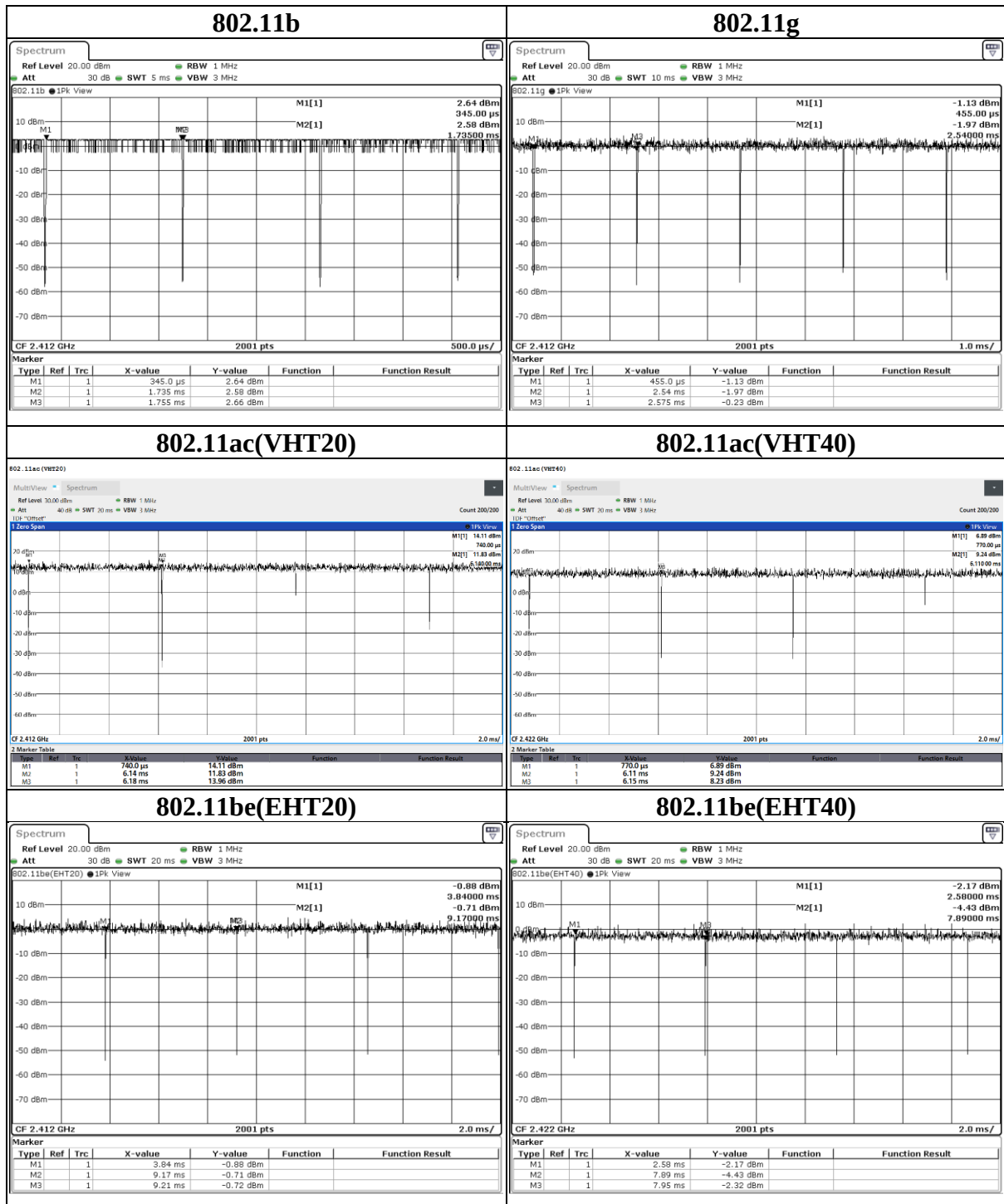
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7. Test Equipment

Test Equipment List					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Expired date
Radiated Spurious Emission					
Spectrum Analyzer	Keysight	N9010A	MY56070827	2024/3/29	2025/3/28
EMI Test Receiver	Rohde & Schwarz	ESR7	101754	2023/11/22	2024/11/21
				2024/12/24	2025/12/23
Loop Antenna	ETS lindgren	6502	00213440	2023/12/13	2024/12/12
				2024/12/11	2025/12/10
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck & EMCI	VULB 9168 & N-6-05	774 & AT-N0538	2024/1/5	2025/1/4
				2024/12/30	2025/12/29
Horn Antenna (1-18 GHz)	Schwarzbeck	BBHA 9120 D	01690	2023/12/8	2024/12/7
				2024/11/27	2025/11/26
Horn Antenna (18-40 GHz)	Schwarzbeck	BBHA 9170	781	2023/12/27	2024/12/26
				2024/12/18	2025/12/17
Preamplifier (30-1000 MHz)	EMCI	EMC330E	980405	2024/5/28	2025/5/27
Preamplifier (1-18 GHz)	EMCI	EMC051835BE	980406	2024/1/23	2025/1/22
				2025/1/13	2026/1/12
Preamplifier (18-40GHz)	EMCI	EMC184040SEE	980426	2024/4/16	2025/4/15
Cables (9k-18 GHz)	Hanyitek	K1K50-UP0264-K1K50-2500	170214-4 & 170425-2	2023/11/29	2024/11/28
				2024/11/22	2025/11/21
Cables (18-40GHz)	Hanyitek	K1K50-UP0264-K1K50-2500	170214-1 & 170214-2	2023/11/29	2024/11/28
				2024/11/22	2025/11/21

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Test Equipment List					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Expired date
Antenna Port Conducted Measurement					
Signal Analyzer	Rohde & Schwarz	FSVA3044	101281	2024/3/18	2025/3/17
Signal Analyzer	Rohde & Schwarz	FSV40	101490	2024/7/1	2025/6/30
Attenuator	EMCI	EMC-40ATK2W10	17002	2023/11/15	2024/11/14
				2024/11/13	2025/11/12
USB Power Sensor	Anritsu	MA24408A	12031	2024/7/13	2025/7/12
Temperature & Humidity Test Chamber	GIANT FORCE	GTH-150- 40-CP-AR	MAA1701-010	2024/3/6	2025/3/5
AC power Line Conducted Emission					
EMI Test Receiver	Rohde & Schwarz	ESR7	101753	2024/10/1	2025/9/30
Two-Line V-Network	Rohde & Schwarz	ENV216	102136	2024/5/14	2025/5/13
Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	2024/8/29	2025/8/28
Cables	TITAN	CFD200	T0732ACFD 20020A300-2	2024/5/14	2025/5/13

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_EMG	UL-3A1.2

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8. Description of Test Setup

Tx Mode

Support Equipment

ID	Equipment	Brand Name	Model Name	S/N	Remark
A	Host	Advantech	AIMB-219	N/A	Supplied by Client
B	Test Tool (console board)	Advantech	Advantech	N/A	Supplied by Client

I/O Cables

ID	Equipment	Brand Name	Model Name	Length (m)	Remark
1	Cable	ADTLink	R11SF-F	0.5	Supplied by Client
2	Test Tool (console cable)	Advantech	Advantech	0.5	Supplied by Client

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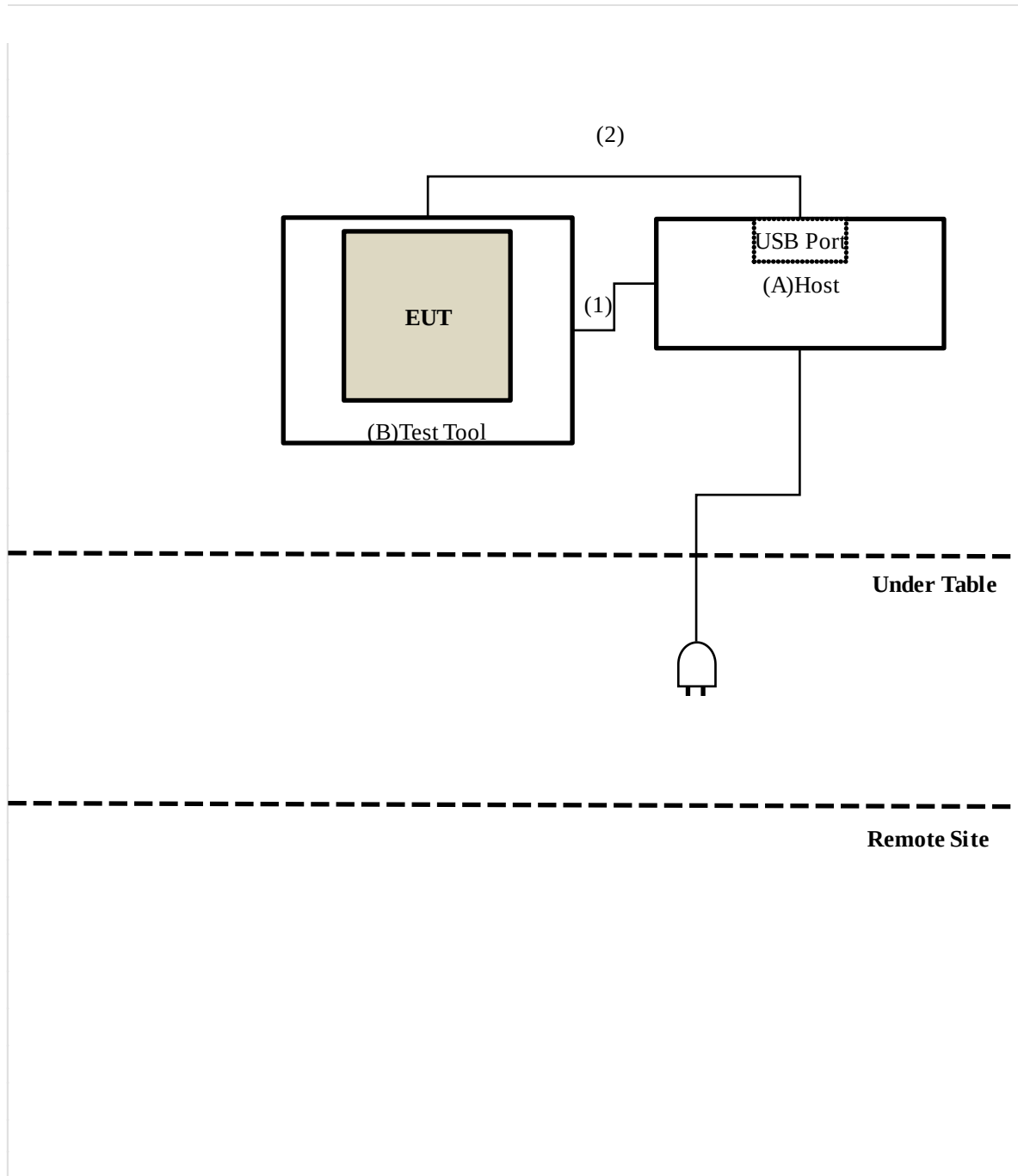
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Test Setup

Controlled using a bespoke application (QRCT version 4.0.2.11.0) 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

Tx Mode



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Doc No: Form-ULID-004737 (DCS:17-EM-F0876) / 6.1

9. Test Results

9.1. 6dB Bandwidth

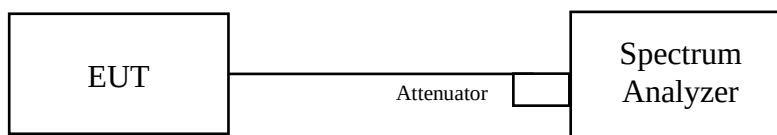
Requirements

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

Test procedure

- Set resolution bandwidth (RBW) = 100kHz.
- Set the video bandwidth (VBW) $\geq 3 \times \text{RBW}$, 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.

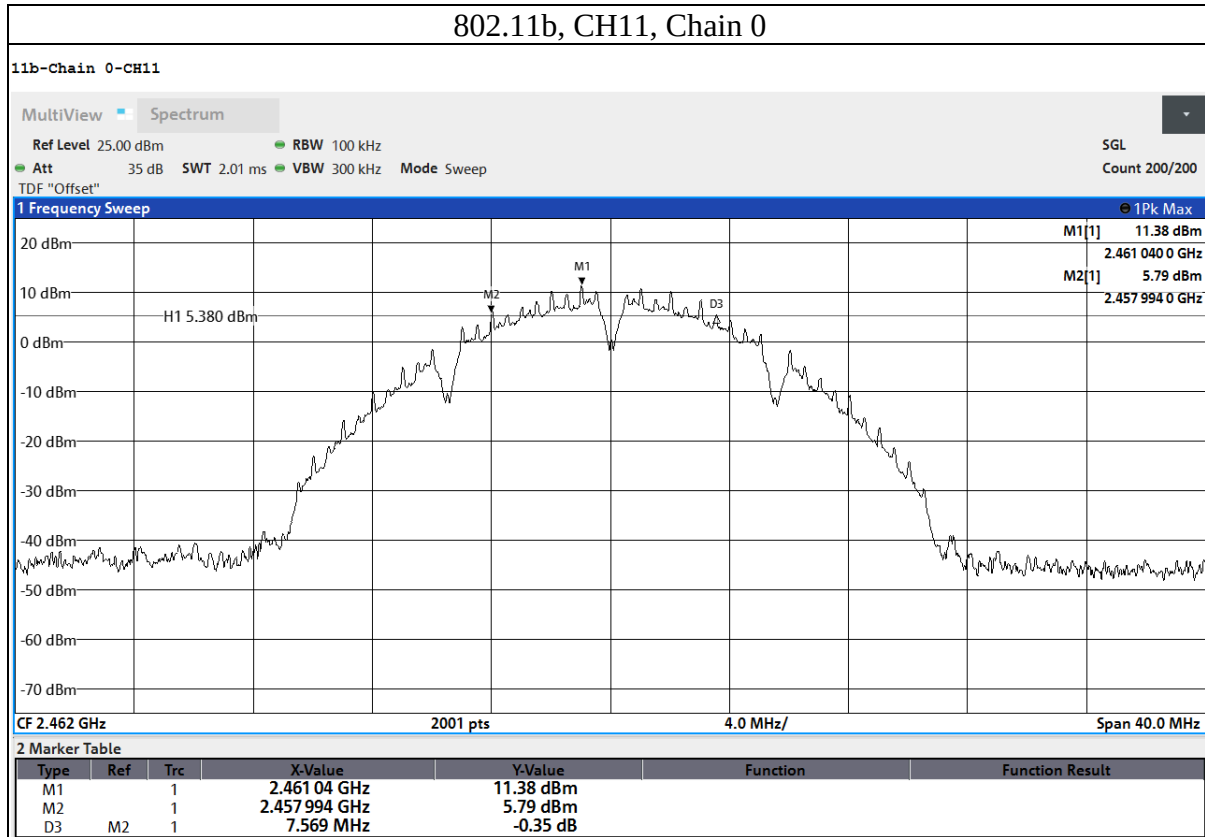
Test Setup



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

Test Data

Mode	CH	Freq (MHz)	6dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11b	1	2412	7.589	8.048	0.5	PASS
	6	2437	8.099	8.057	0.5	PASS
	11	2462	7.569	8.053	0.5	PASS



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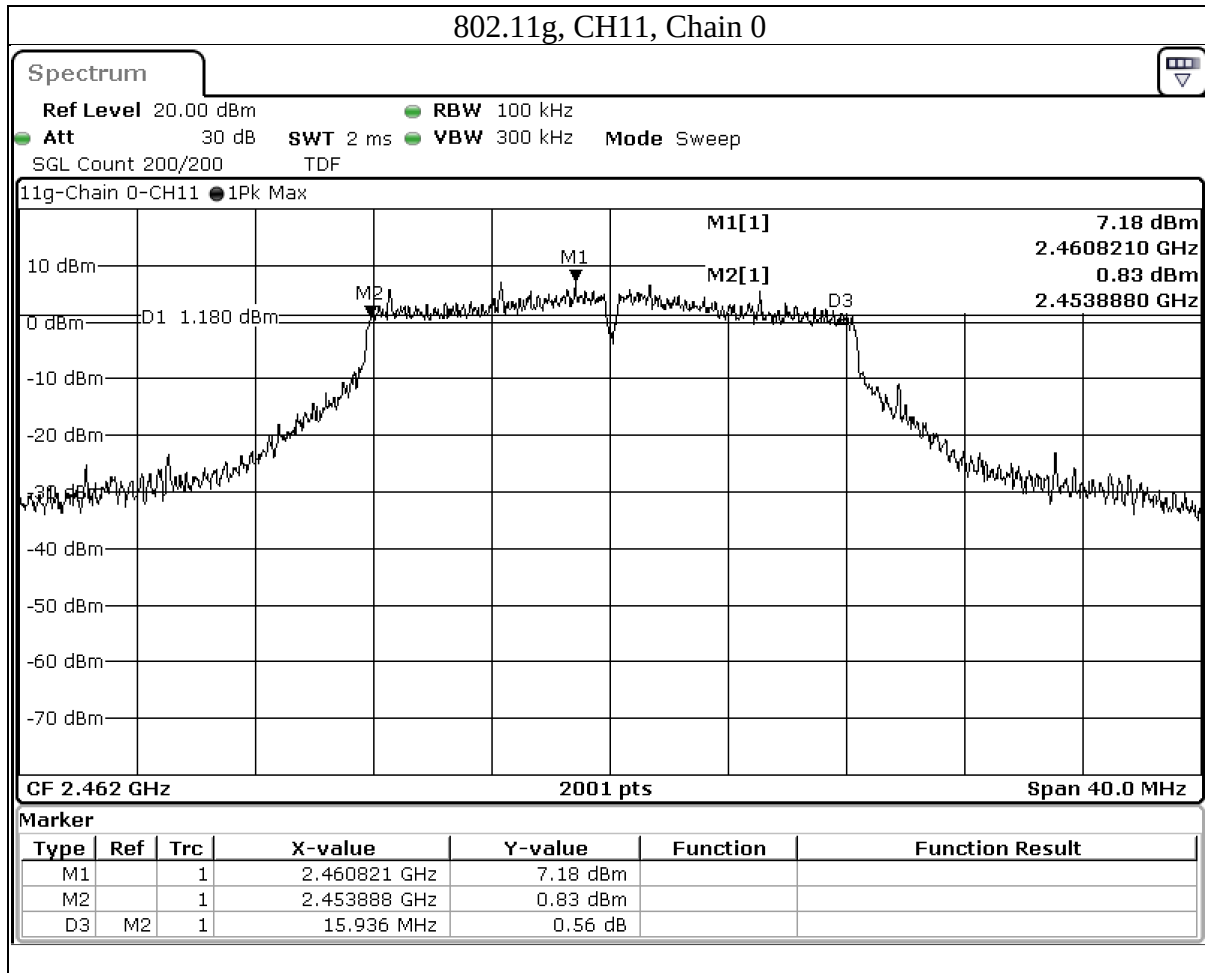
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Mode	CH	Freq (MHz)	6dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11g	1	2412	15.948	15.955	0.5	PASS
	6	2437	16.329	16.346	0.5	PASS
	11	2462	15.936	16.104	0.5	PASS



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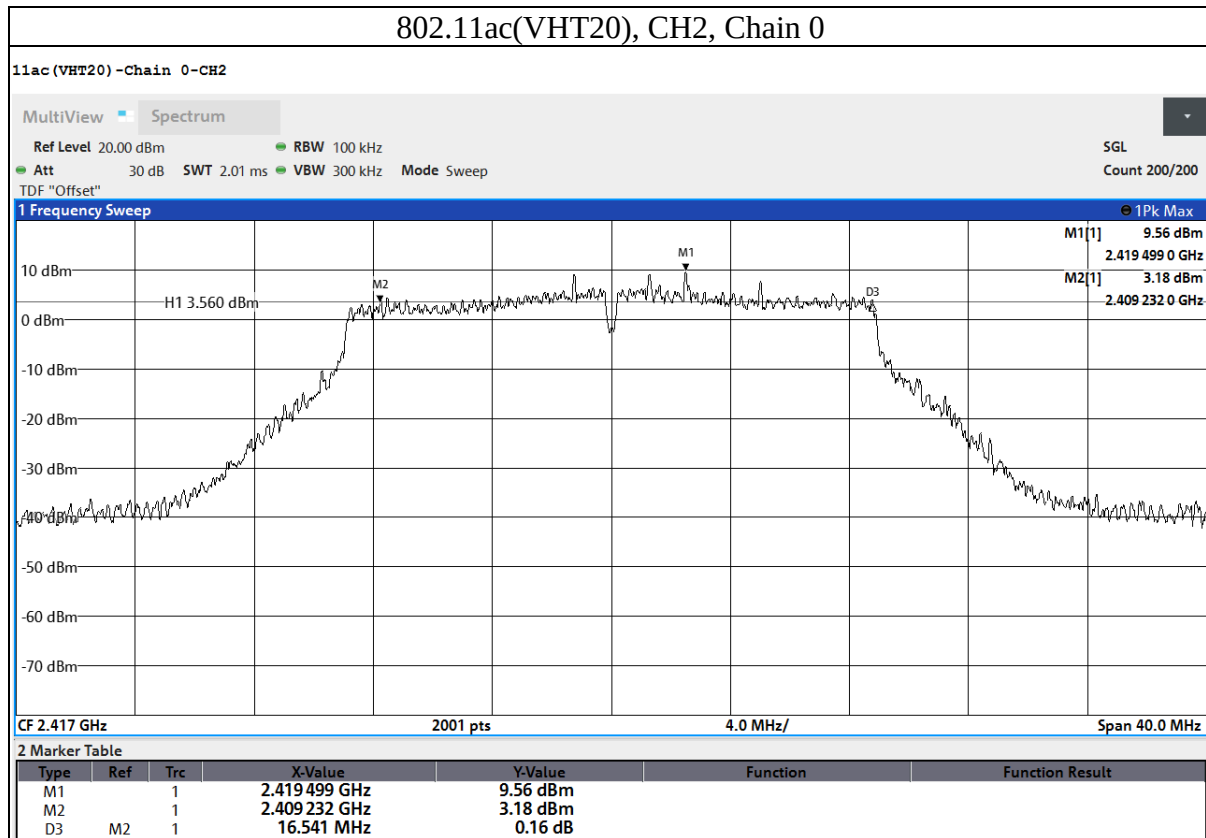
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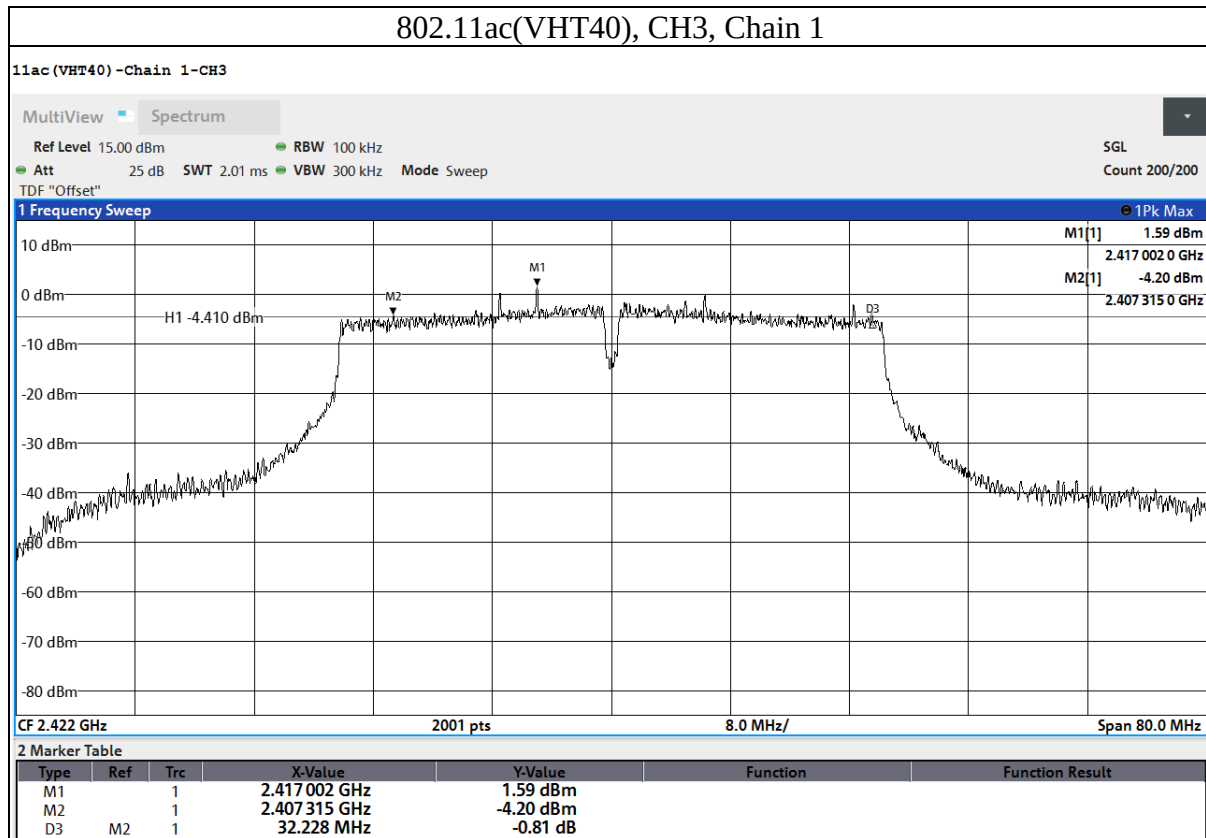
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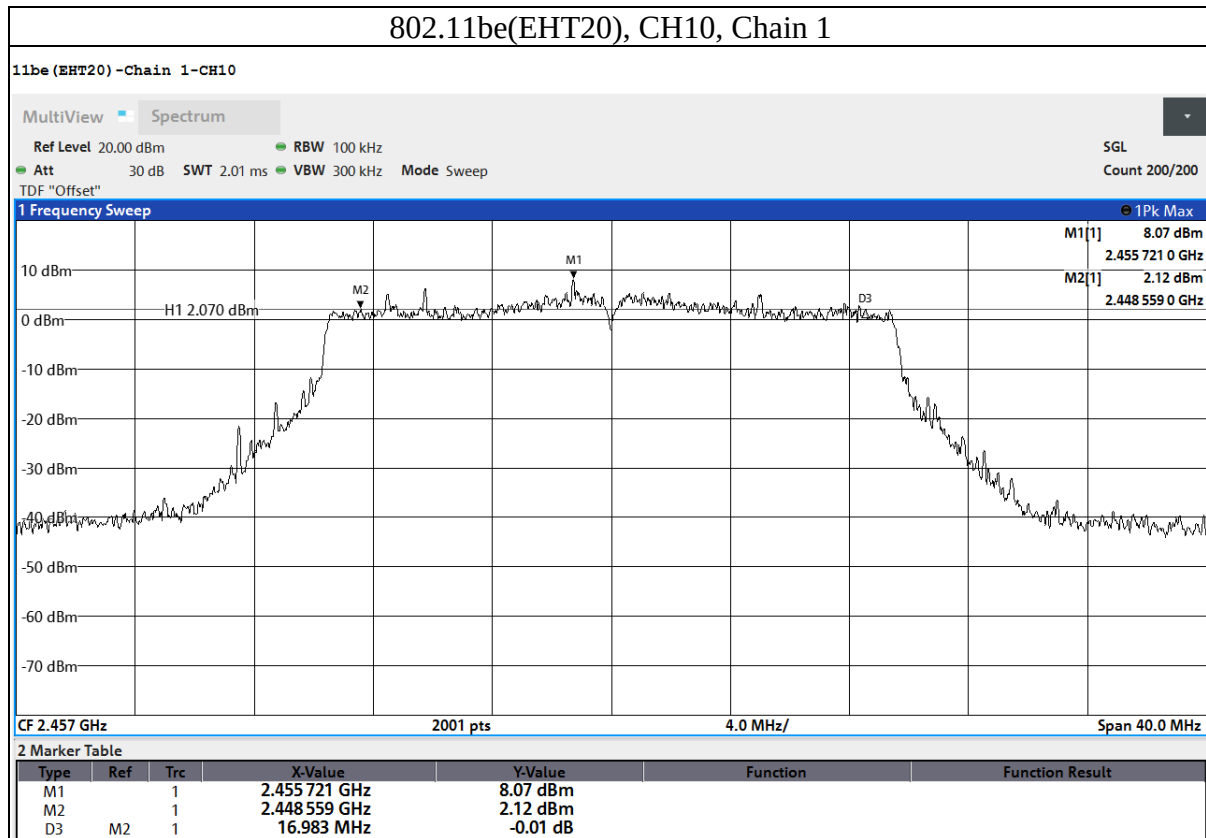
Mode	CH	Freq (MHz)	6dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ac(VHT20)	1	2412	17.597	17.608	0.5	PASS
	2	2417	16.541	17.614	0.5	PASS
	6	2437	17.313	17.577	0.5	PASS
	10	2457	17.595	17.580	0.5	PASS
	11	2462	17.310	17.607	0.5	PASS



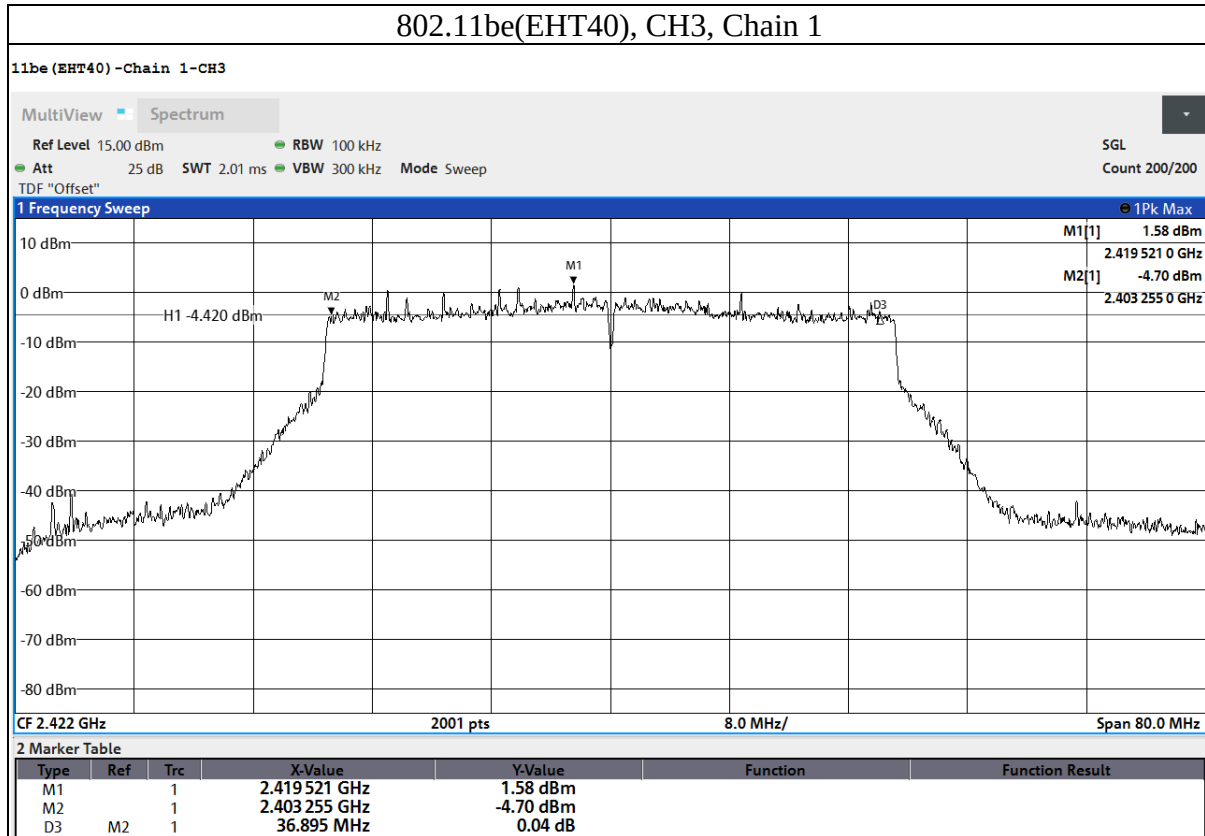
Mode	CH	Freq (MHz)	6dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ac(VHT40)	3	2422	35.713	32.228	0.5	PASS
	4	2427	36.392	36.055	0.5	PASS
	6	2437	36.393	36.351	0.5	PASS
	8	2447	36.395	36.375	0.5	PASS
	9	2452	36.344	35.763	0.5	PASS



Mode	CH	Freq (MHz)	6dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11be(EHT20)	1	2412	19.002	18.593	0.5	PASS
	2	2417	18.935	18.494	0.5	PASS
	6	2437	18.611	18.503	0.5	PASS
	10	2457	18.664	16.983	0.5	PASS
	11	2462	17.485	18.950	0.5	PASS



Mode	CH	Freq (MHz)	6dB BW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11be(EHT40)	3	2422	37.775	36.895	0.5	PASS
	4	2427	37.884	37.606	0.5	PASS
	6	2437	38.062	38.246	0.5	PASS
	8	2447	38.134	38.180	0.5	PASS
	9	2452	37.801	38.121	0.5	PASS



9.2. Conducted Output Power

Requirements

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

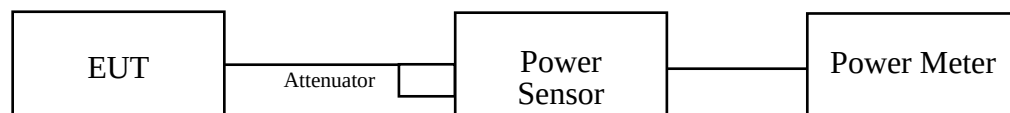
Note:

1. P_{Out} = maximum conducted output power in dBm, G_{TX} = the maximum transmitting antenna directional gain in dBi, B is the 26 dB emission bandwidth in megahertz
2. If EUT with Multiple Transmitter Output:
 - a. Directional Gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{Gn/20})^2 / Nant]$ dBi.
Nant: Number of Transmit Antennas
G1, G2,..., Gn: Gain of Individual Antennas
Example: two antenna and gain 5 dBi / 3dBi, so if it was used for TxBF power measurement
Directional Gain = $10 \log[(105/20 + 103/20)^2 / 2]$ dBi = 7.07 dBi
 - b. Per KDB 662911 Method of conducted output power measurement on IEEE 802.11 devices, CDD
Array Gain = 0 dB (i.e., no array gain) for $NANT \leq 4$;
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any NANT;
Array Gain = $5 \log(NANT/NSS)$ dB or 3 dB, whichever is less for 20-MHz channel widths with $NANT \geq 5$.
Example: Maximum antenna gain = 5 dBi and $NANT \leq 4$, so if it was used for CDD power measurement
Directional Gain = 5 dBi + Array Gain = 5 dBi + 0 dB = 5 dBi
 - c. For power measurement of KDB 662911 is used with multiple transmitter output. Total conducted power is the sum of the conducted power levels measured at the various output ports.

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.

Test Data

Peak Power

802.11b

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	21.43	21.18	270.396	24.32	30	PASS
6	2437	21.89	22.24	322.107	25.08	30	PASS
11	2462	21.71	21.59	292.415	24.66	30	PASS

802.11g

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	23.46	23.63	452.898	26.56	30	PASS
6	2437	23.67	23.84	475.335	26.77	30	PASS
11	2462	22.79	22.85	382.825	25.83	30	PASS

802.11ac (VHT20)

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	23.35	23.87	460.257	26.63	30	PASS
2	2417	24.74	25.05	618.016	27.91	30	PASS
6	2437	25.26	25.73	709.578	28.51	30	PASS
10	2457	23.02	23.37	417.83	26.21	30	PASS
11	2462	20.36	20.55	222.331	23.47	30	PASS

802.11ac (VHT40)

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	19.19	19.95	181.97	22.60	30	PASS
4	2427	19.99	20.21	204.644	23.11	30	PASS
6	2437	23.67	23.77	470.977	26.73	30	PASS
8	2447	20.29	21.13	236.592	23.74	30	PASS
9	2452	19.29	19.83	181.134	22.58	30	PASS

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802.11be (EHT20)

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	23.52	23.96	474.242	26.76	30	PASS
2	2417	24.89	25.11	632.412	28.01	30	PASS
6	2437	25.24	25.77	711.214	28.52	30	PASS
10	2457	23.45	23.82	462.381	26.65	30	PASS
11	2462	20.83	21.06	248.886	23.96	30	PASS

802.11be (EHT40)

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	19.56	19.79	185.78	22.69	30	PASS
4	2427	20.02	20.22	205.589	23.13	30	PASS
6	2437	23.72	23.78	474.242	26.76	30	PASS
8	2447	20.30	21.12	236.592	23.74	30	PASS
9	2452	19.57	19.85	187.068	22.72	30	PASS

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Average Power (Reference Only)

802.11b

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	19.35	19.18	169.044	22.28
6	2437	19.06	19.57	171.002	22.33
11	2462	19.28	19.15	167.109	22.23

802.11g

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	18.56	18.93	149.968	21.76
6	2437	19.29	19.46	173.38	22.39
11	2462	17.78	17.64	118.032	20.72

802.11ac (VHT20)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	17.73	18.12	124.165	20.94
2	2417	18.70	19.26	158.489	22.00
6	2437	19.96	20.14	202.302	23.06
10	2457	17.35	17.93	116.413	20.66
11	2462	14.35	15.14	59.841	17.77

802.11ac (VHT40)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
3	2422	13.92	14.53	53.088	17.25
4	2427	14.52	15.01	59.979	17.78
6	2437	17.78	18.17	125.603	20.99
8	2447	14.78	15.73	67.453	18.29
9	2452	13.69	14.40	50.933	17.07

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802.11be (EHT20)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	17.79	18.11	124.738	20.96
2	2417	18.73	19.39	161.436	22.08
6	2437	19.72	20.36	202.302	23.06
10	2457	17.53	18.03	120.226	20.80
11	2462	15.44	15.65	71.779	18.56

802.11be (EHT40)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
3	2422	14.07	14.45	53.333	17.27
4	2427	14.50	15.03	59.979	17.78
6	2437	17.87	18.34	129.42	21.12
8	2447	14.81	15.72	67.608	18.30
9	2452	14.62	14.98	60.395	17.81

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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 $PSD = 8 - (G_{TX} - 6)$).

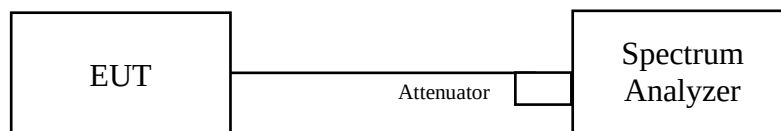
Note:

1. PSD = power spectral density that the 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. If EUT with Multiple Transmitter Output:
 - a. Directional Gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{Gn/20})^2 / Nant]$ dBi.
Nant: Number of Transmit Antennas
 $G1, G2, \dots, Gn$: Gain of Individual Antennas
Example: two antenna and gain 5 dBi / 3dBi, so if it was used for power density measurement
Directional Gain = $10 \log[(10^{5/20} + 10^{3/20})^2 / 2]$ dBi = 7.07 dBi
 - b. "PSD per chain" of the report shown is maximum value for each chain, at the "Total PSD" is summing entire spectra across corresponding frequency bins on the various outputs by computer, refer KDB 662911 Method a) for calculating total power density.
 - c. Method a) of power density measurement of KDB 662911 is used for calculating total power density with multiple transmitter output. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.

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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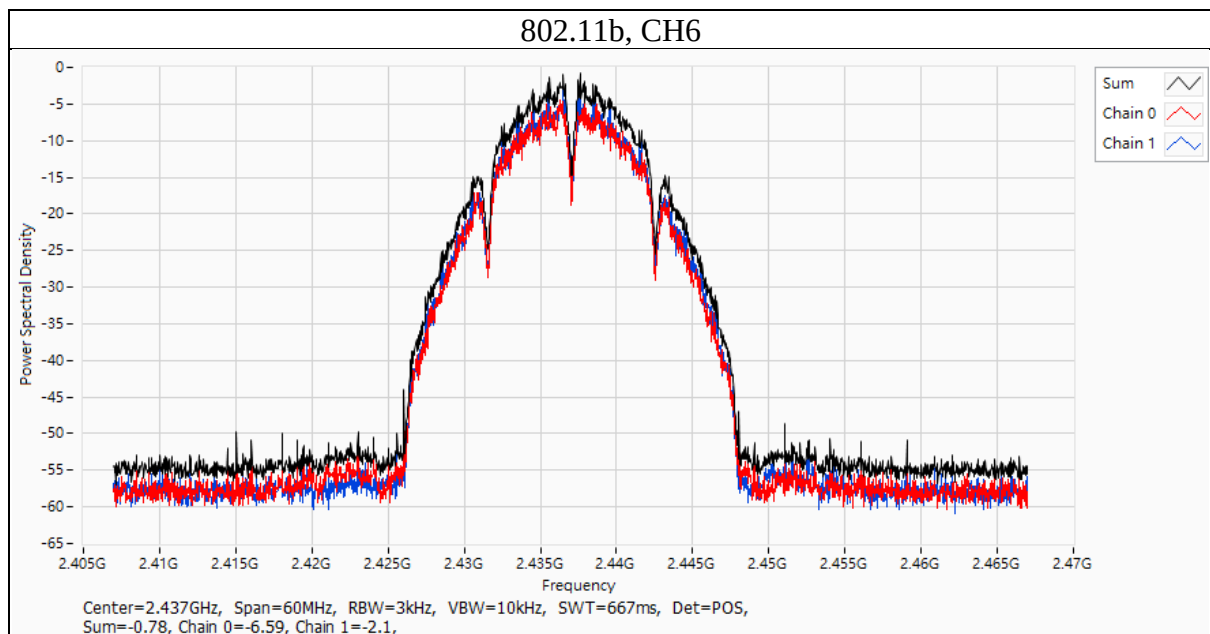
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Test Data

Mode	CH	Freq (MHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Directional Gain (dBi)	Result
802.11b	1	2412	-1.12	8	5.88	PASS
	6	2437	-0.78	8	5.88	PASS
	11	2462	-1.04	8	5.88	PASS

Mode	CH	Freq (MHz)	PSD per Chain (dBm/3kHz)	
			Chain 0	Chain 1
802.11b	1	2412	-3.11	-3.44
	6	2437	-4.48	-2.1
	11	2462	-3.24	-3.38



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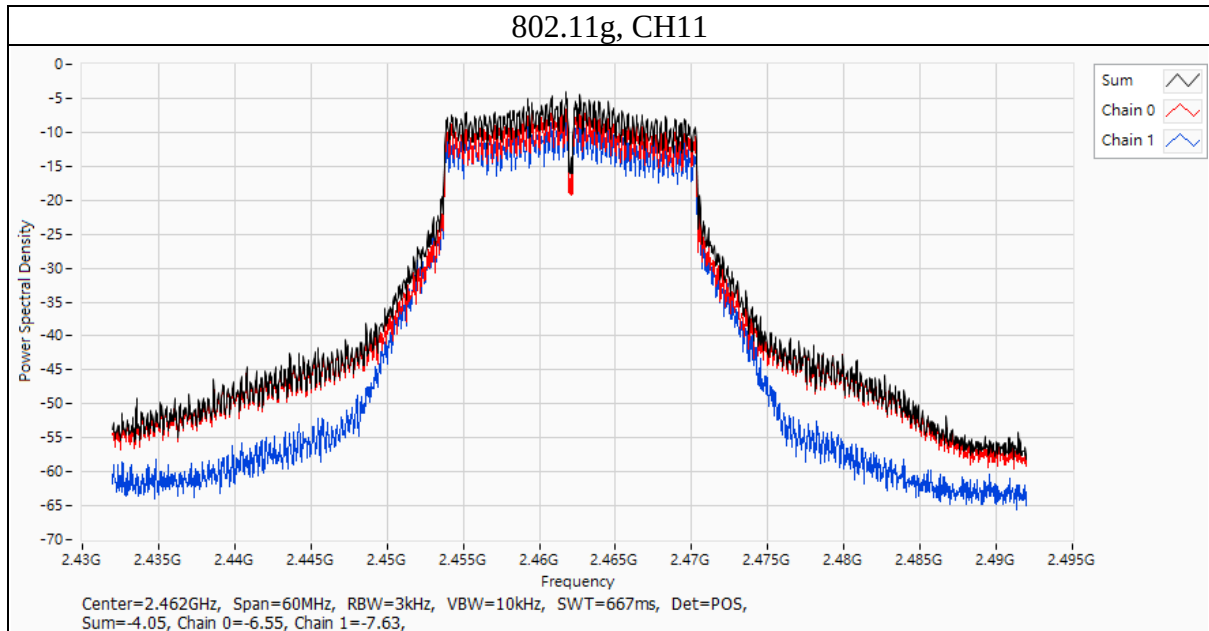
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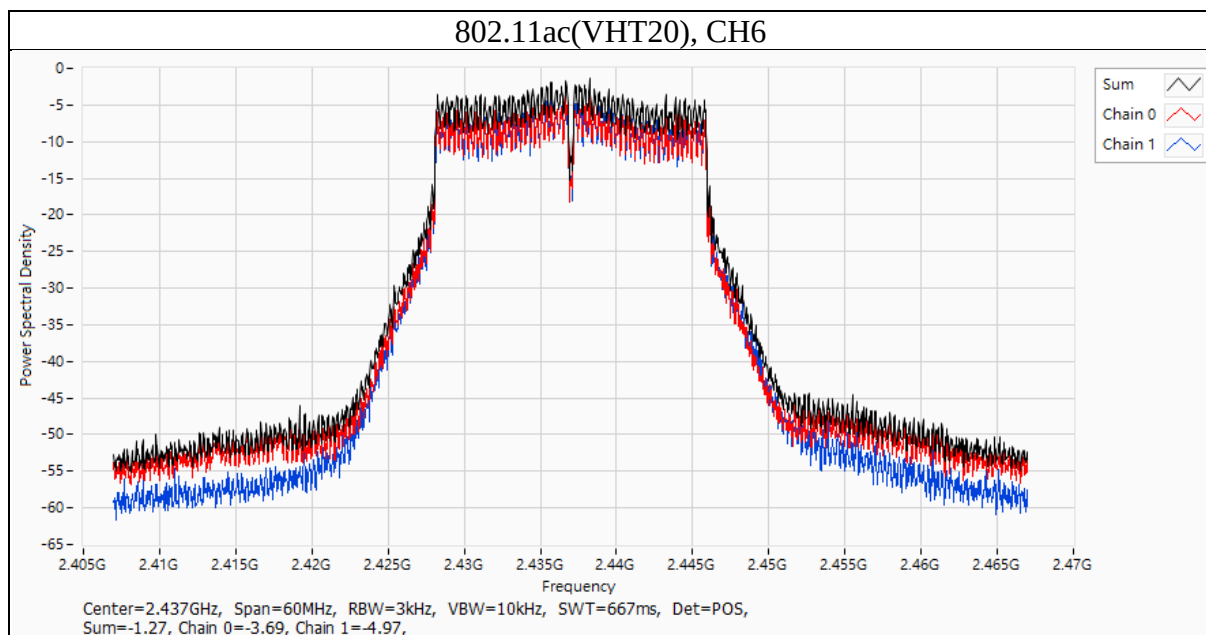
Mode	CH	Freq (MHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Directional Gain (dBi)	Result
802.11g	1	2412	-4.49	8	5.88	PASS
	6	2437	-4.62	8	5.88	PASS
	11	2462	-4.05	8	5.88	PASS

Mode	CH	Freq (MHz)	PSD per Chain (dBm/3kHz)	
			Chain 0	Chain 1
802.11g	1	2412	-7.66	-6.86
	6	2437	-7.39	-6.54
	11	2462	-6.07	-7.63



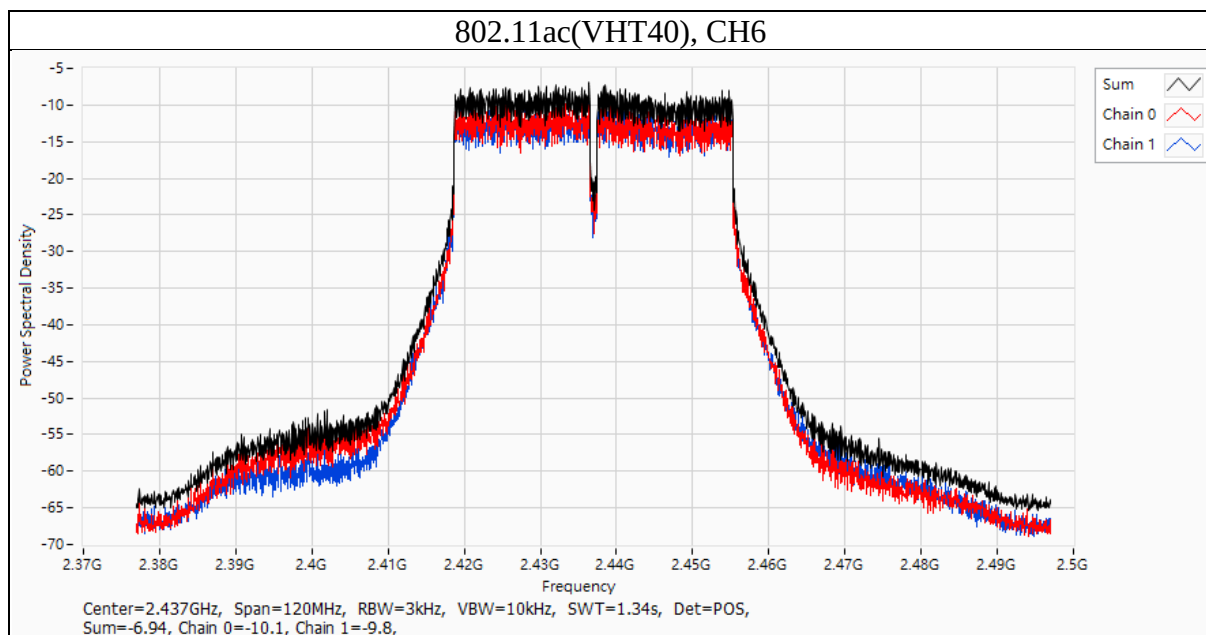
Mode	CH	Freq (MHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Directional Gain (dBi)	Result
802.11ac(VHT20)	1	2412	-3.39	8	5.88	PASS
	2	2417	-2.71	8	5.88	PASS
	6	2437	-1.27	8	5.88	PASS
	10	2457	-3.62	8	5.88	PASS
	11	2462	-6.6	8	5.88	PASS

Mode	CH	Freq (MHz)	PSD per Chain (dBm/3kHz)	
			Chain 0	Chain 1
802.11ac(VHT20)	1	2412	-5.14	-6.54
	2	2417	-5.17	-4.59
	6	2437	-3.59	-4.27
	10	2457	-5.52	-6.1
	11	2462	-8.27	-9.87



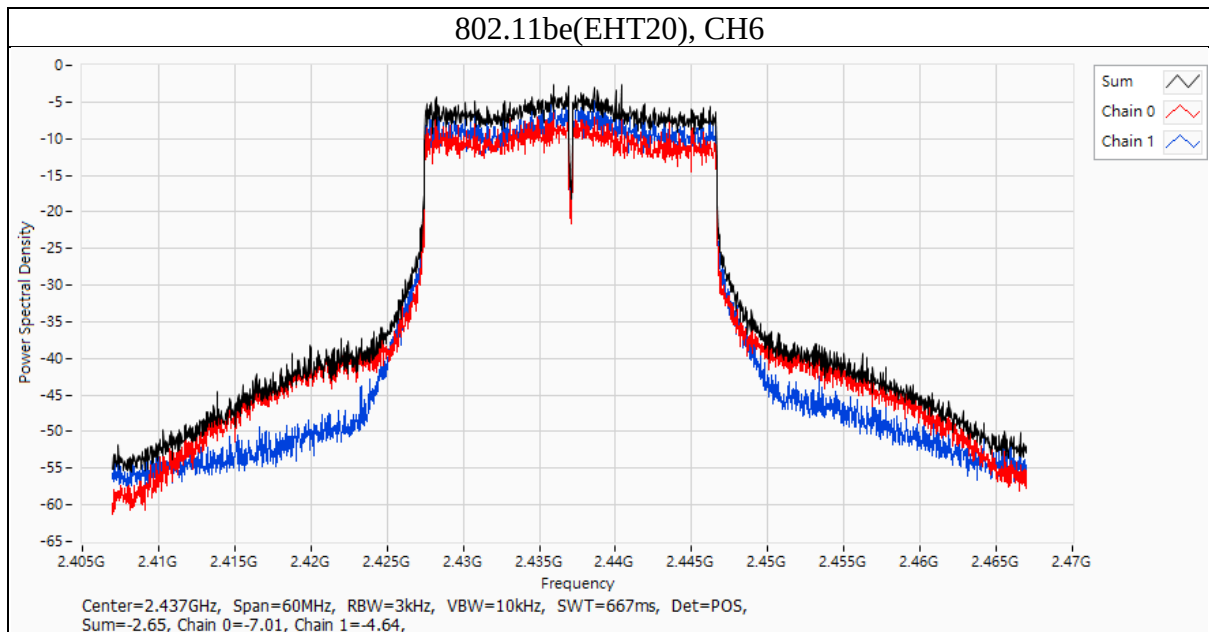
Mode	CH	Freq (MHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Directional Gain (dBi)	Result
802.11ac(VHT40)	3	2422	-9.77	8	5.88	PASS
	4	2427	-9.73	8	5.88	PASS
	6	2437	-6.94	8	5.88	PASS
	8	2447	-9.74	8	5.88	PASS
	9	2452	-10.75	8	5.88	PASS

Mode	CH	Freq (MHz)	PSD per Chain (dBm/3kHz)	
			Chain 0	Chain 1
802.11ac(VHT40)	3	2422	-11.15	-12.75
	4	2427	-11.63	-11.74
	6	2437	-9.4	-9.06
	8	2447	-12.36	-12.5
	9	2452	-12.53	-13.2



Mode	CH	Freq (MHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Directional Gain (dBi)	Result
802.11be(EHT20)	1	2412	-4.8	8	5.88	PASS
	2	2417	-3.58	8	5.88	PASS
	6	2437	-2.65	8	5.88	PASS
	10	2457	-4.26	8	5.88	PASS
	11	2462	-7.64	8	5.88	PASS

Mode	CH	Freq (MHz)	PSD per Chain (dBm/3kHz)	
			Chain 0	Chain 1
802.11be(EHT20)	1	2412	-7.97	-6.51
	2	2417	-5.16	-6.62
	6	2437	-5.67	-4.18
	10	2457	-7.3	-6.76
	11	2462	-10.53	-9.45



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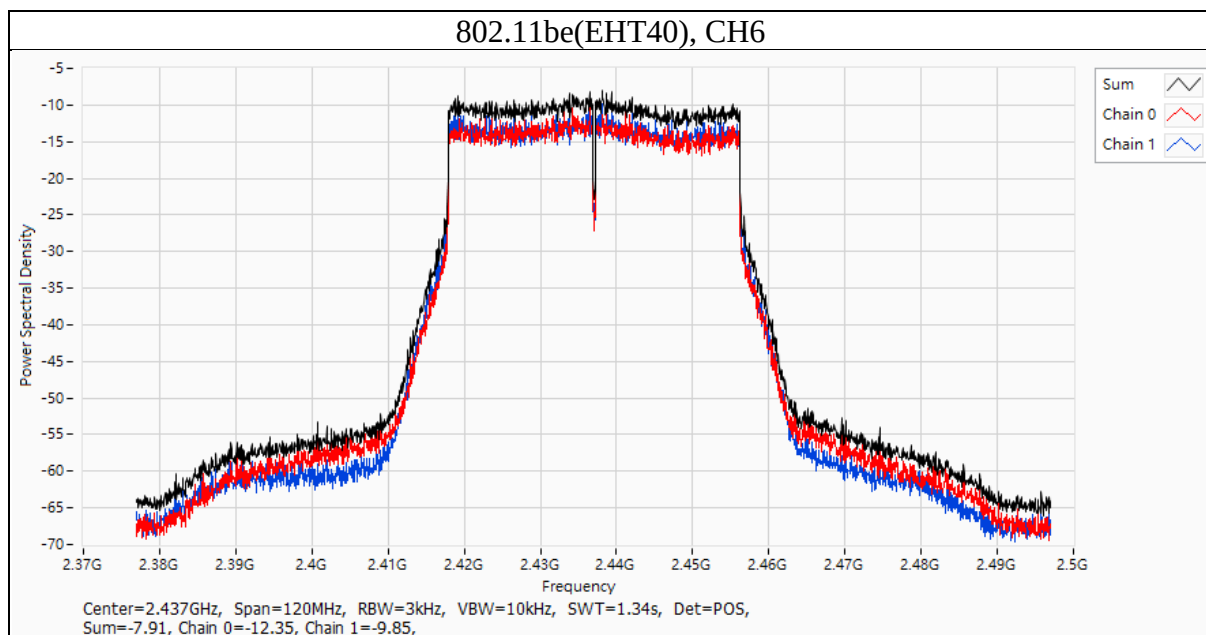
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Mode	CH	Freq (MHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Directional Gain (dBi)	Result
802.11be(EHT40)	3	2422	-11.34	8	5.88	PASS
	4	2427	-10.03	8	5.88	PASS
	6	2437	-7.91	8	5.88	PASS
	8	2447	-10.46	8	5.88	PASS
	9	2452	-11.87	8	5.88	PASS

Mode	CH	Freq (MHz)	PSD per Chain (dBm/3kHz)	
			Chain 0	Chain 1
802.11be(EHT40)	3	2422	-13.54	-13.29
	4	2427	-12	-12.88
	6	2437	-10.19	-9.85
	8	2447	-12.38	-12.3
	9	2452	-14.49	-13.93



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

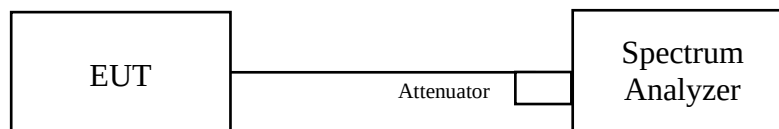
Measurement Procedure REF

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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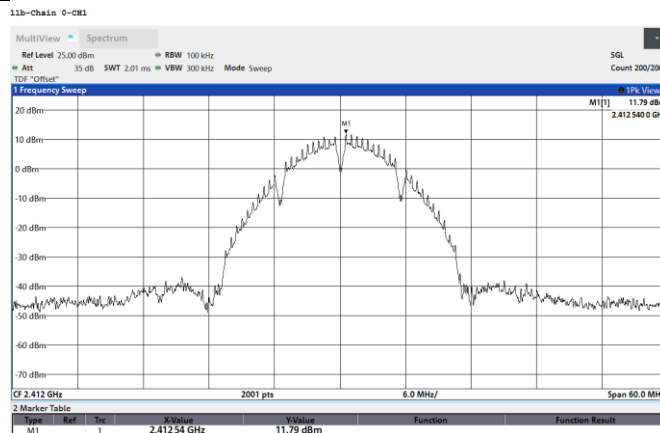
Telephone : +886-2-7737-3000

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

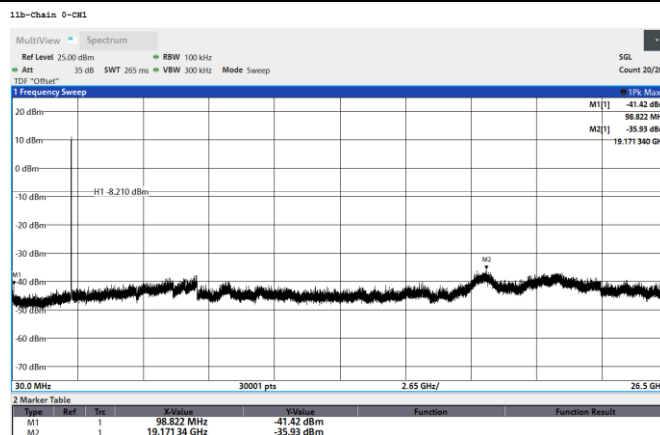
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Test Data

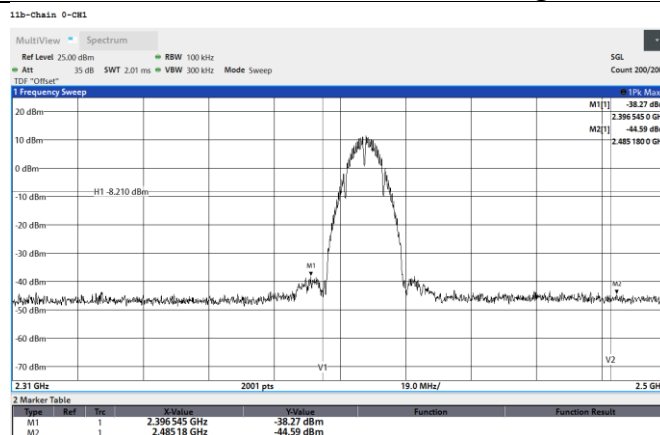
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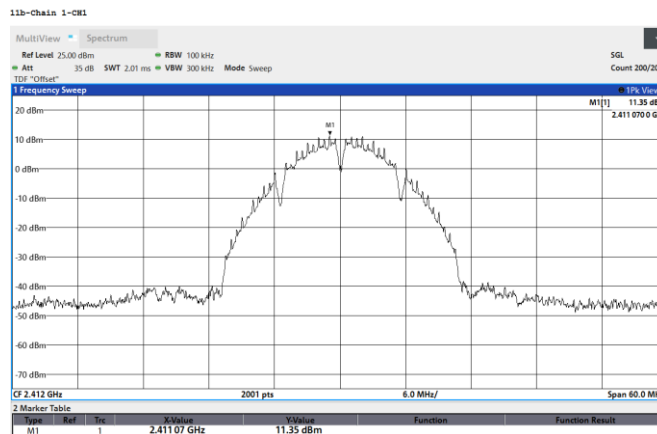
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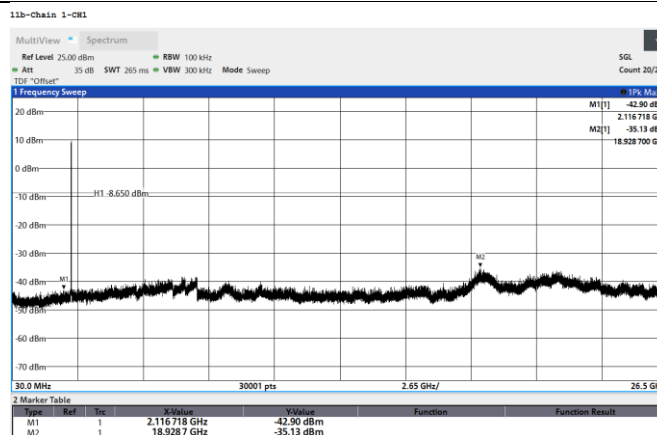
802.11b, CH1, Chain 0, Band edge



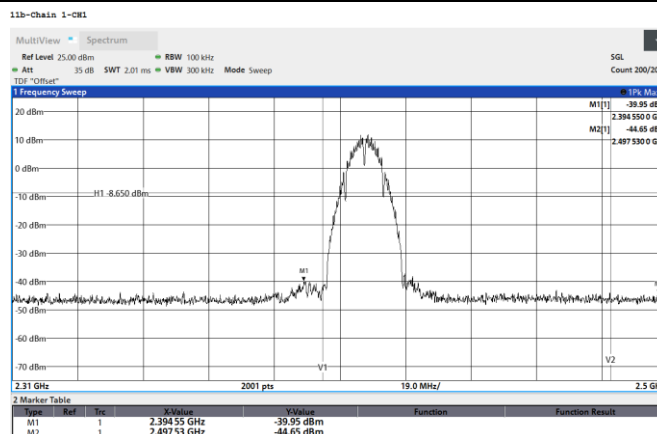
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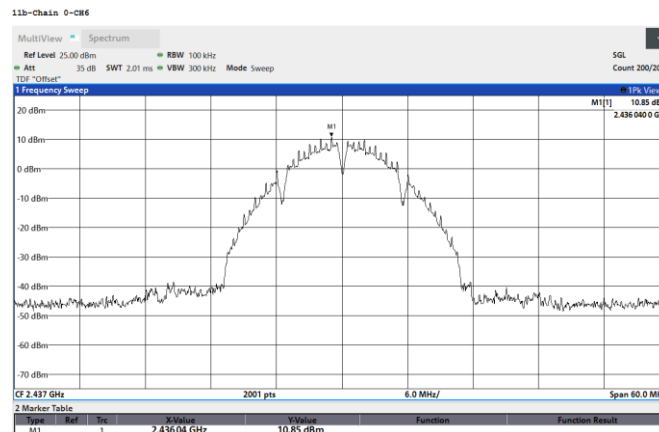
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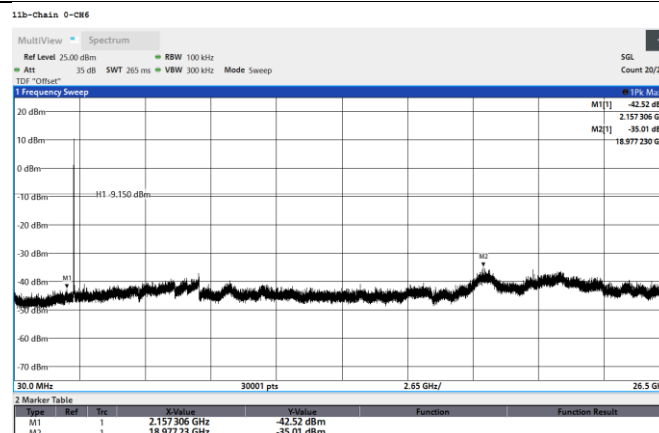
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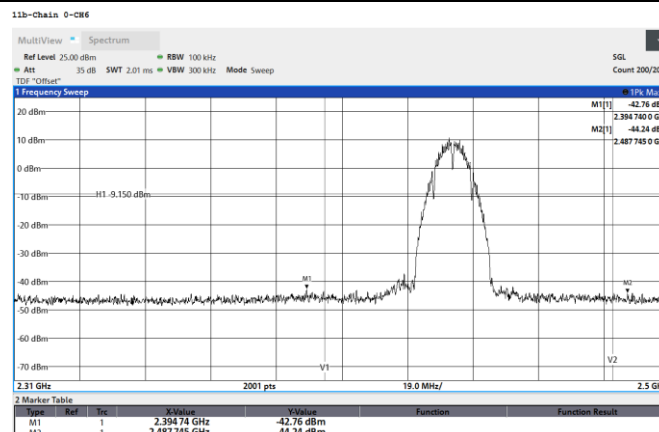
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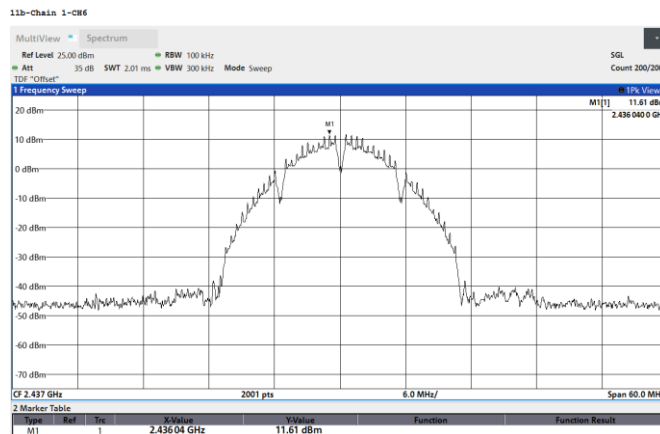
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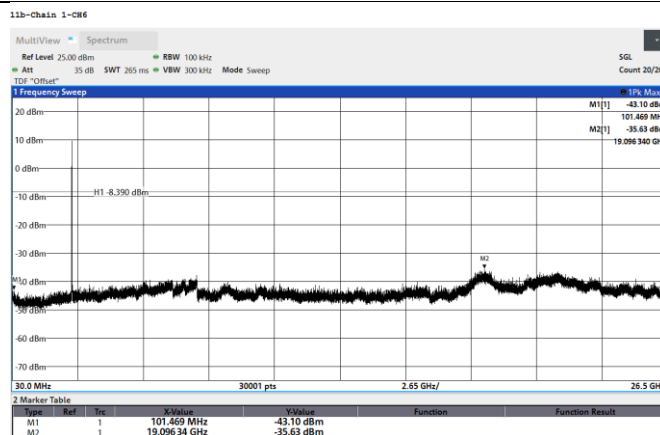
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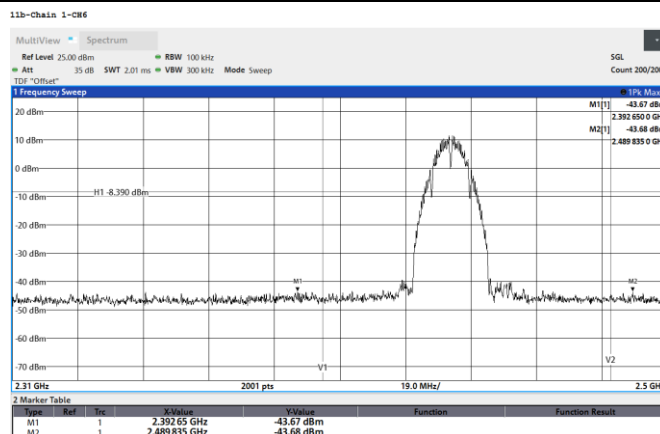
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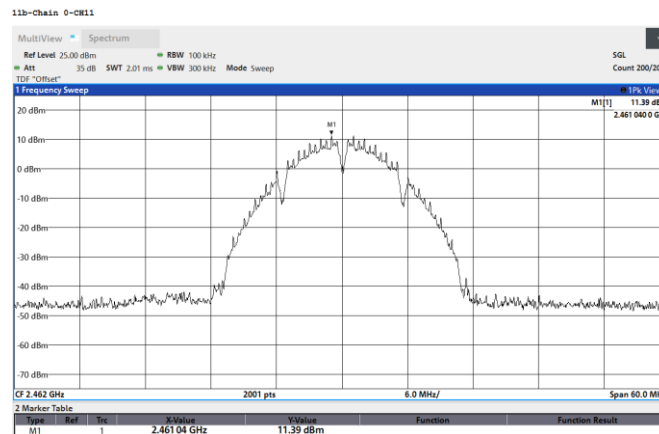
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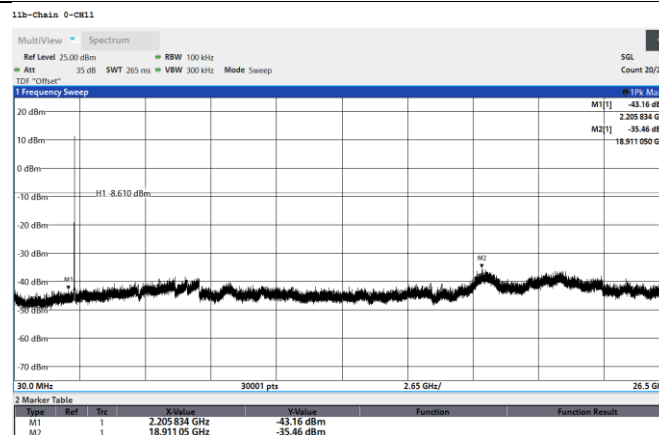
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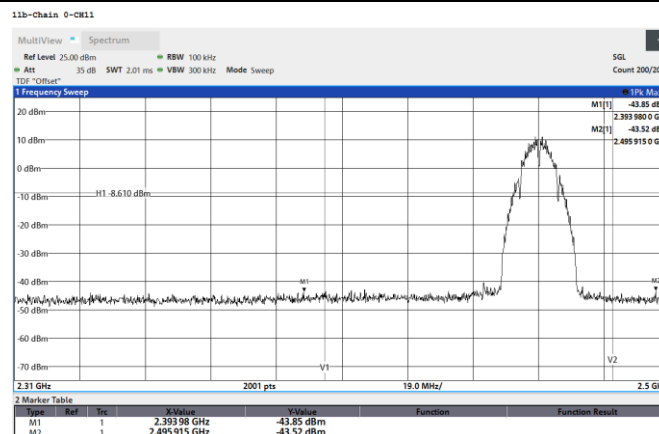
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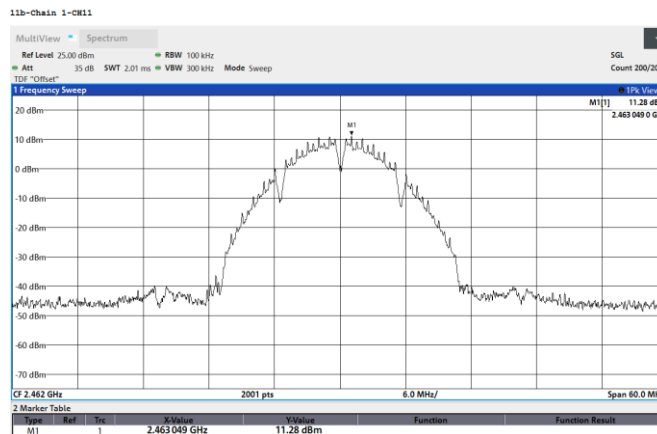
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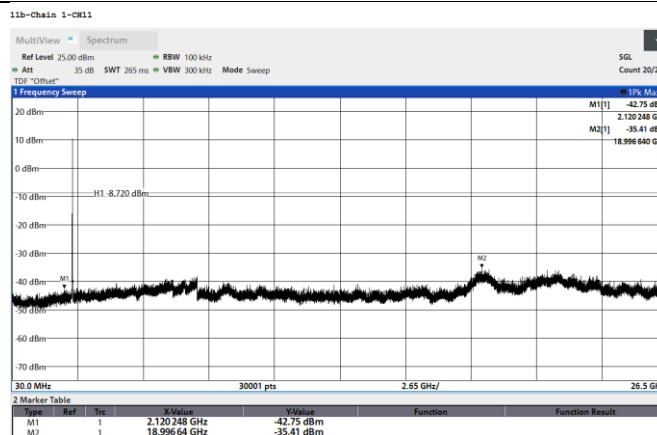
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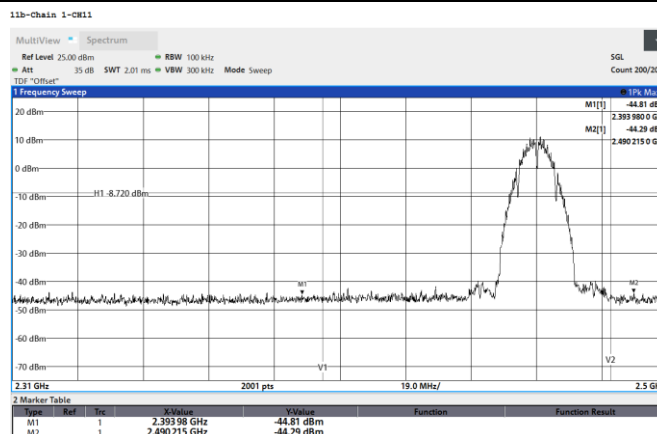
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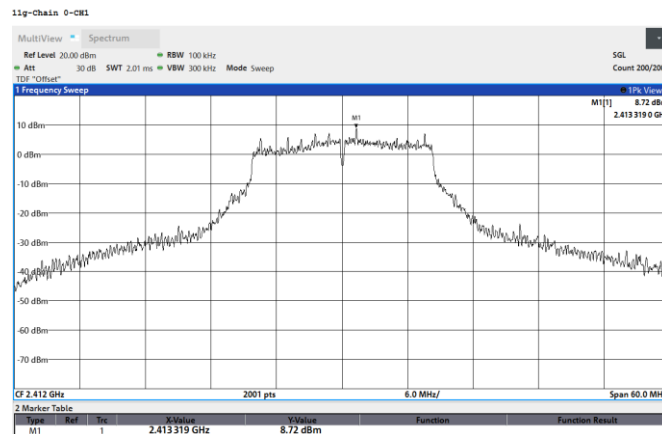
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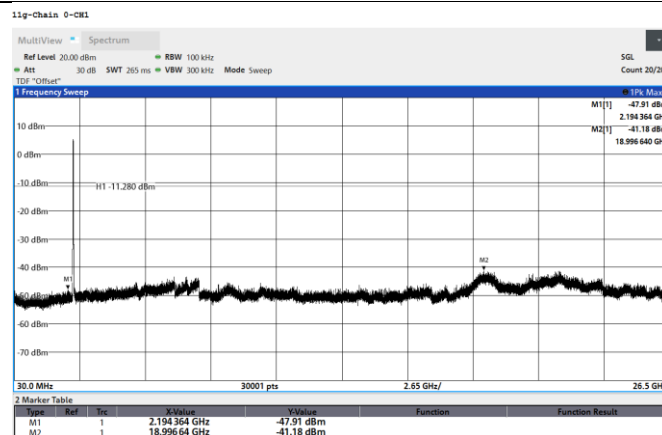
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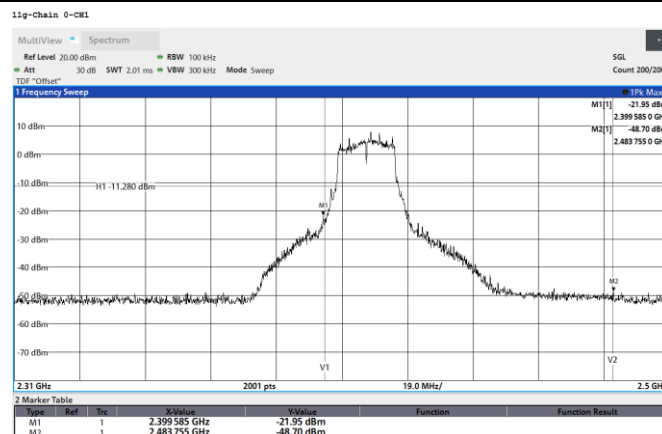
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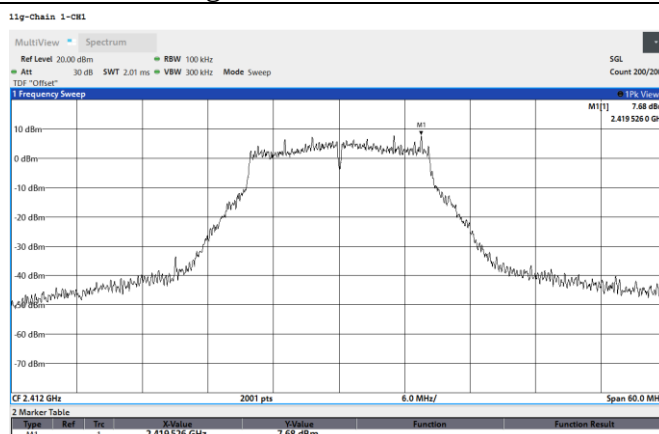
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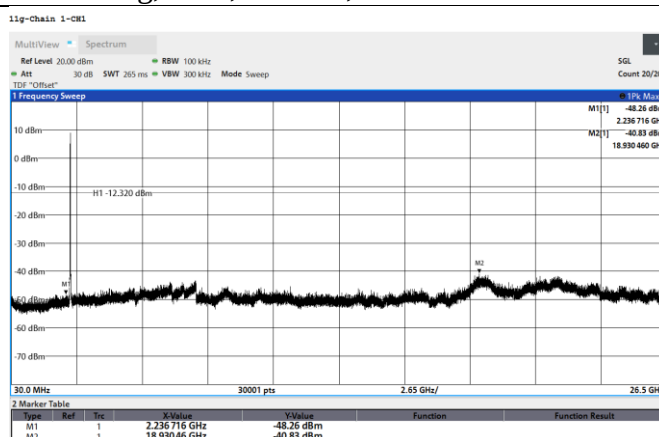
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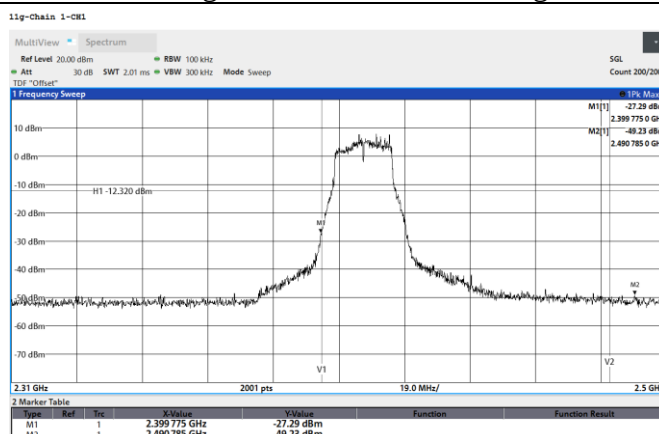
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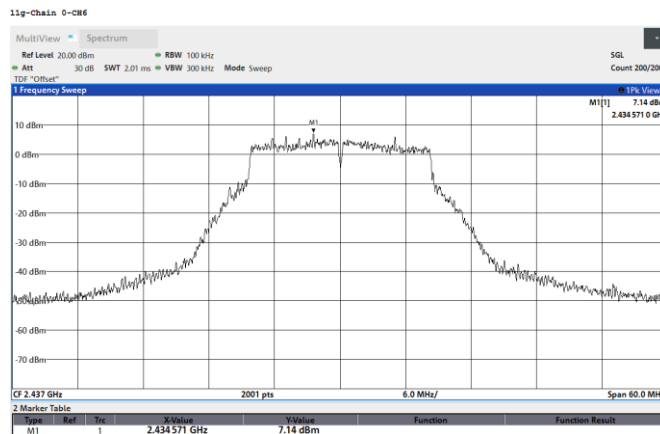
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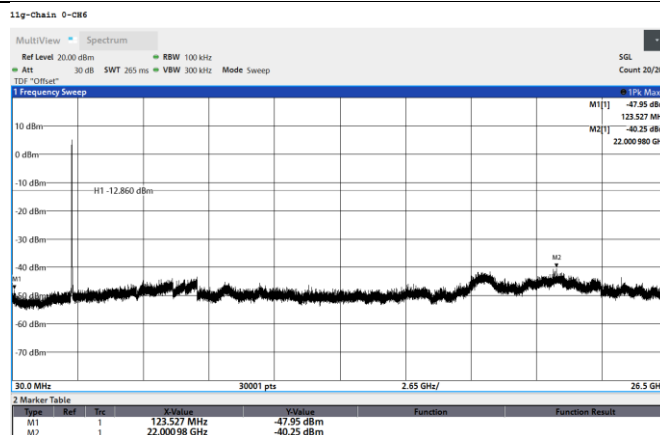
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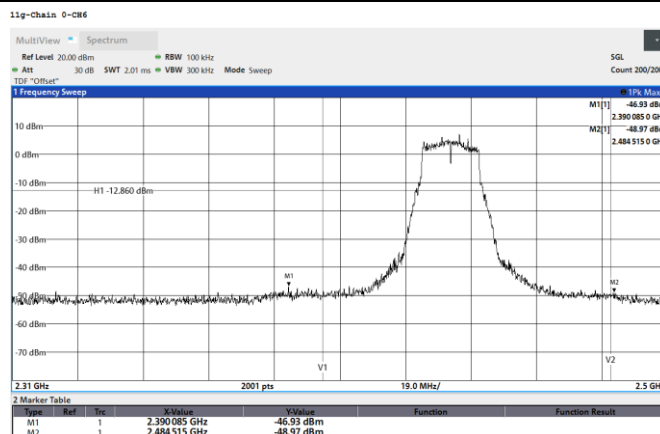
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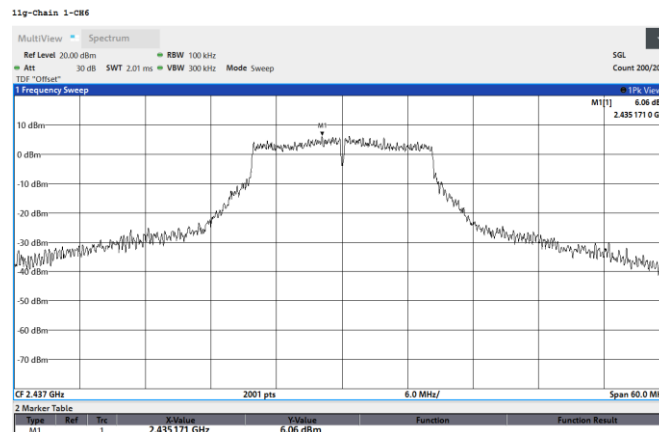
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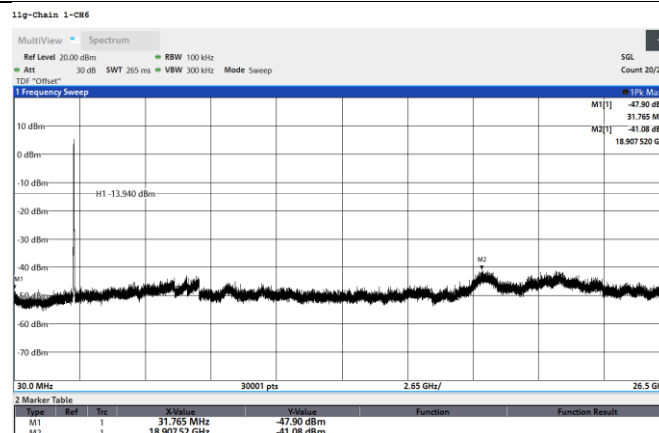
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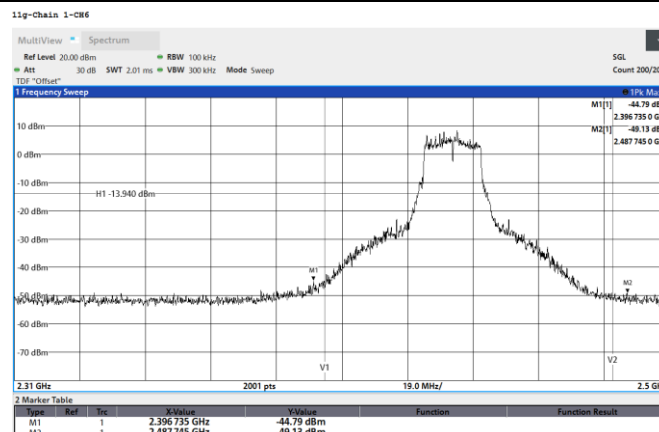
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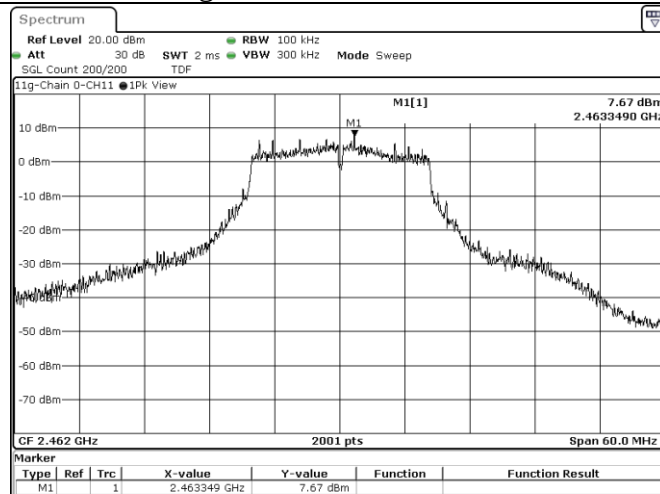
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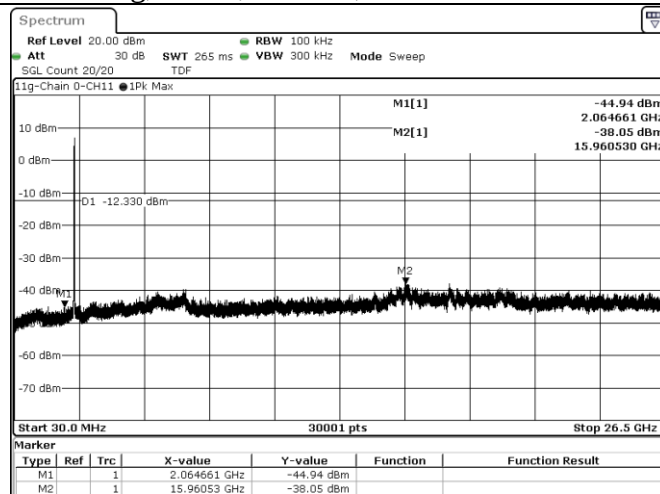
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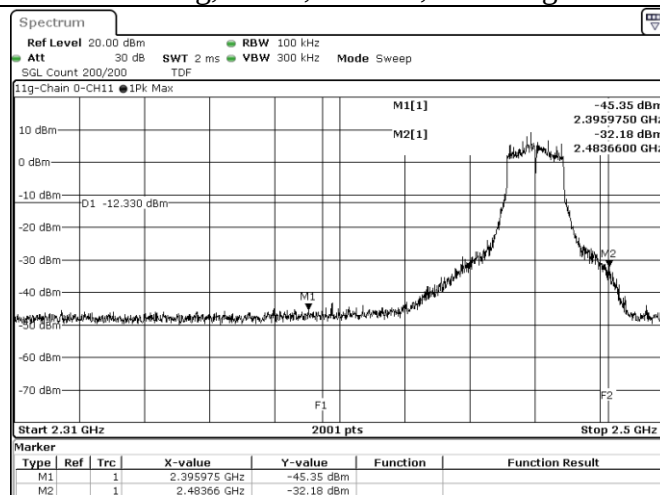
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802.11g, CH11, Chain 0, Conducted Emission



802.11g, CH11, Chain 0, Band edge



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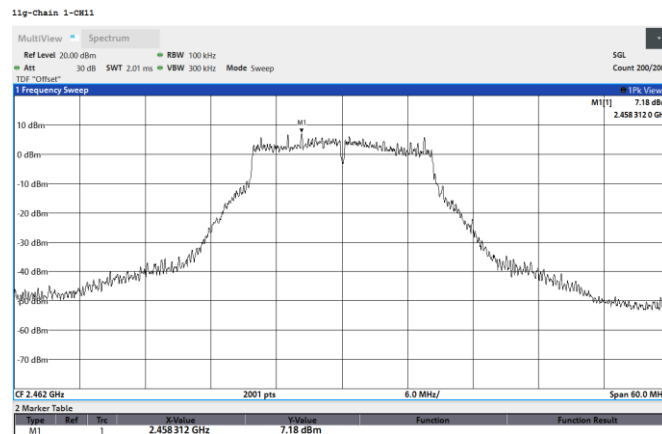
Building A, B and E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

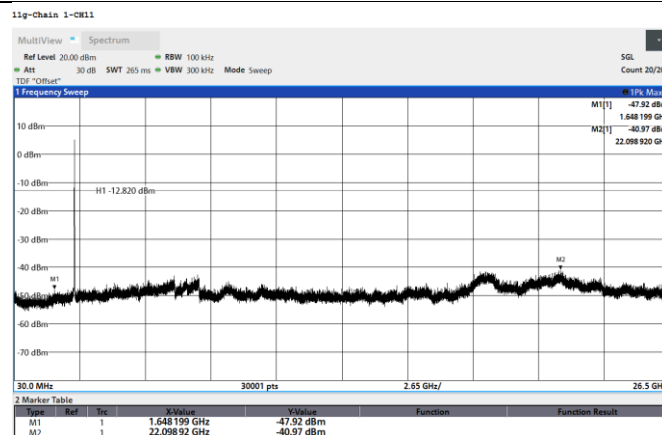
Facsimile (FAX) : +886-3-583-7948

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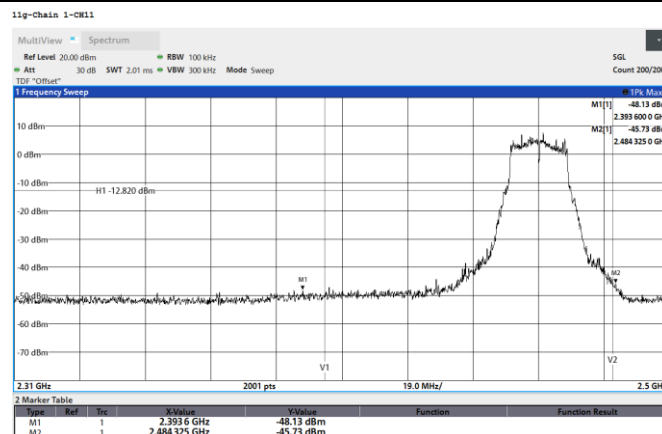
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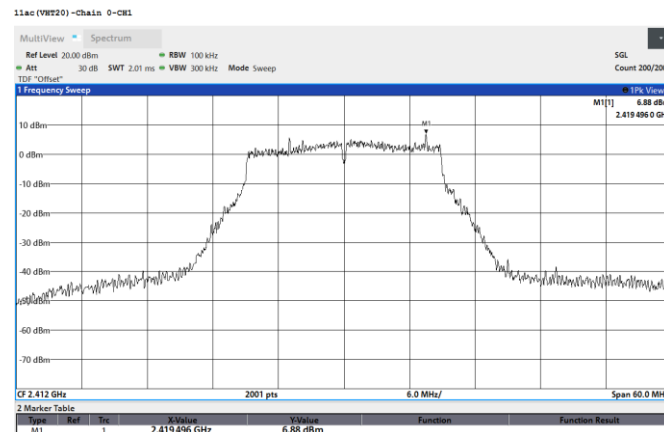
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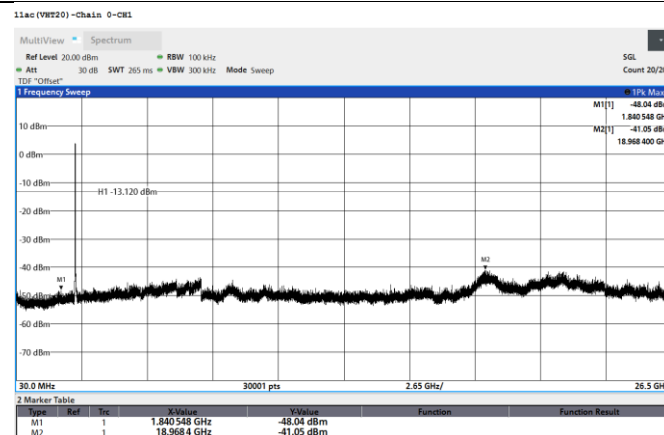
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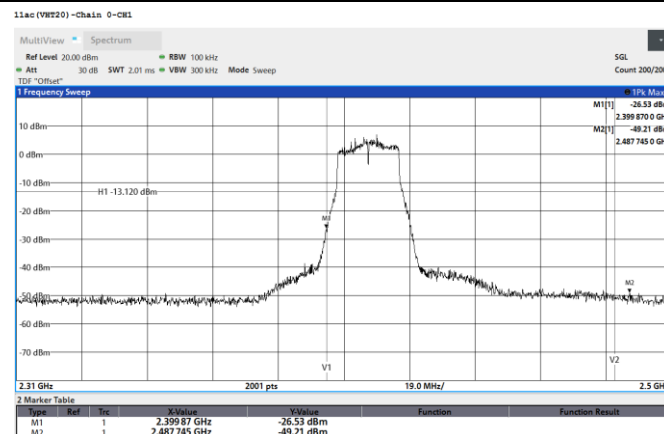
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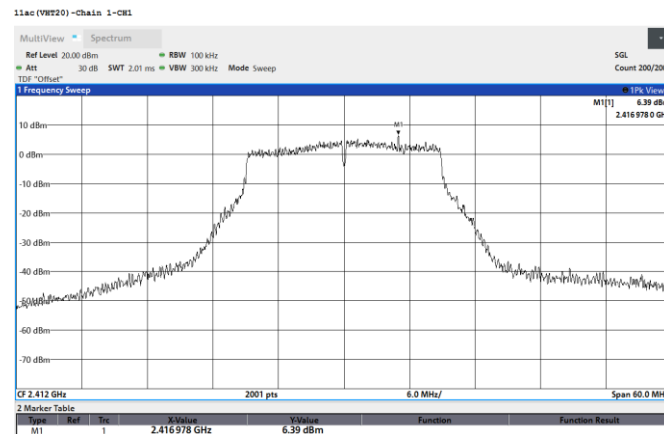
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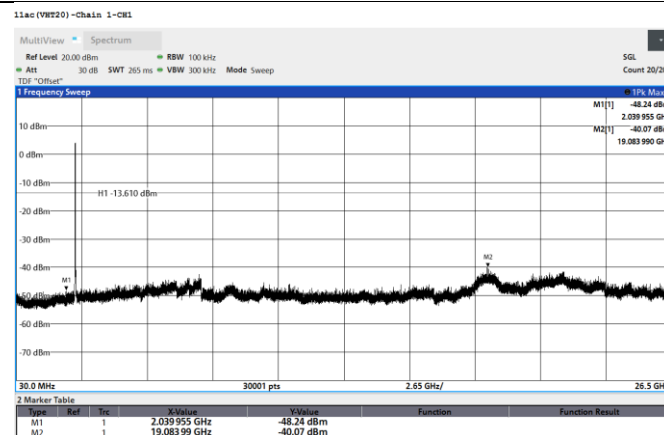
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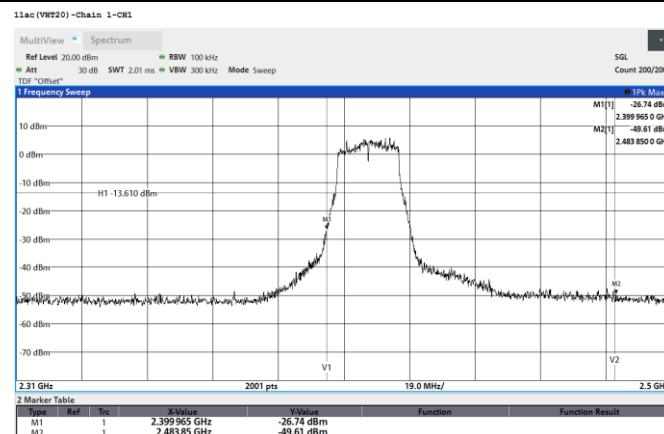
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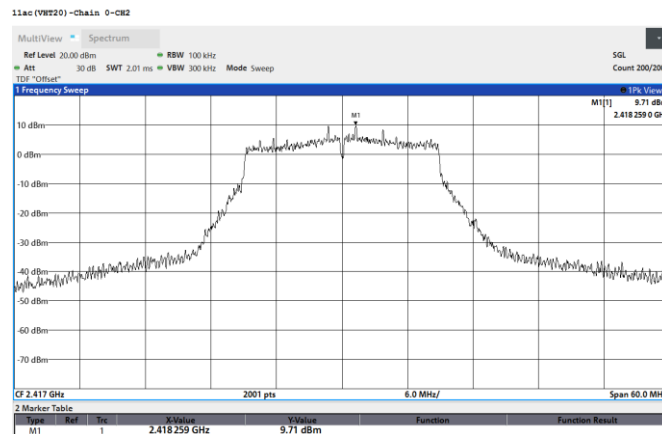
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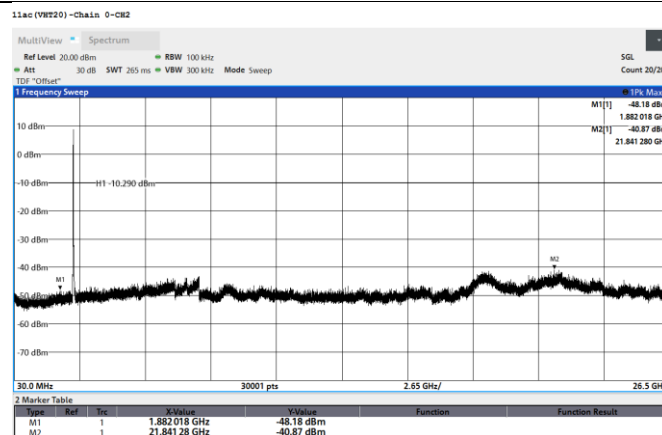
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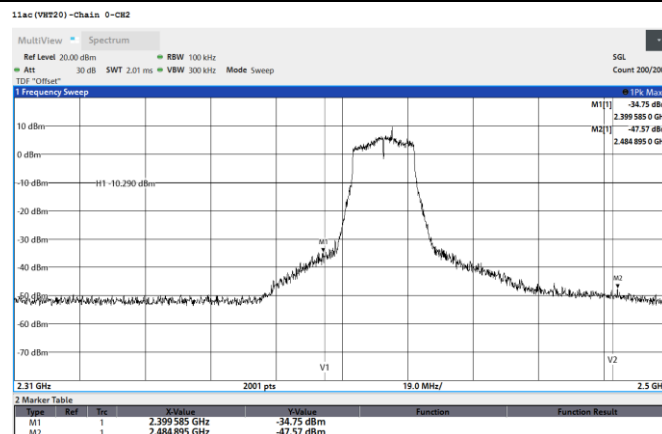
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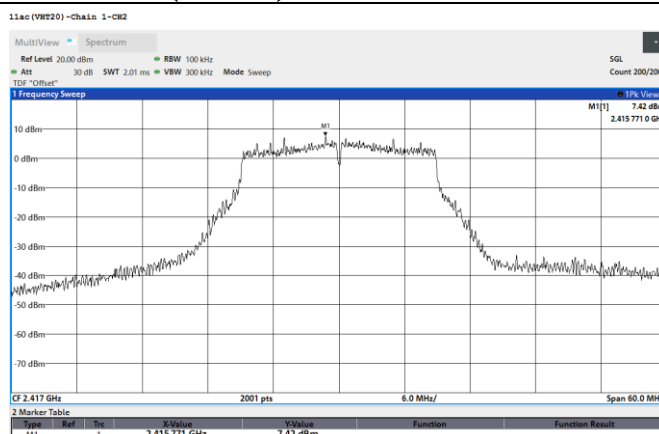
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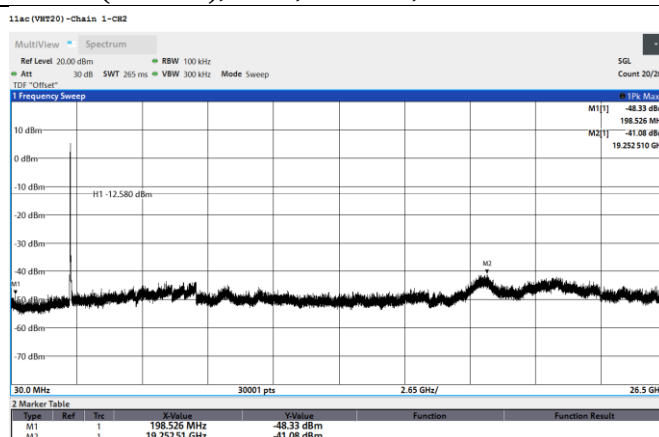
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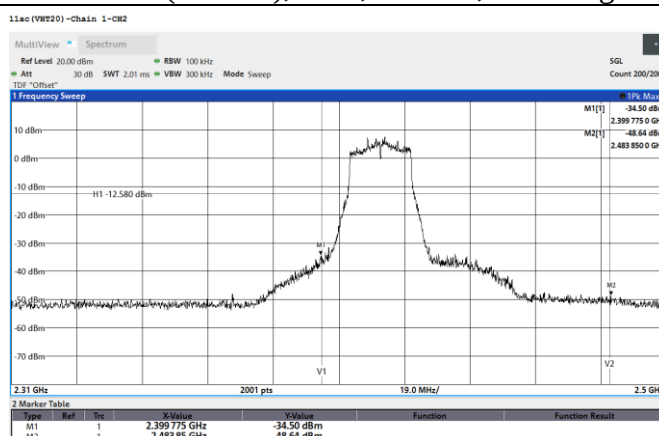
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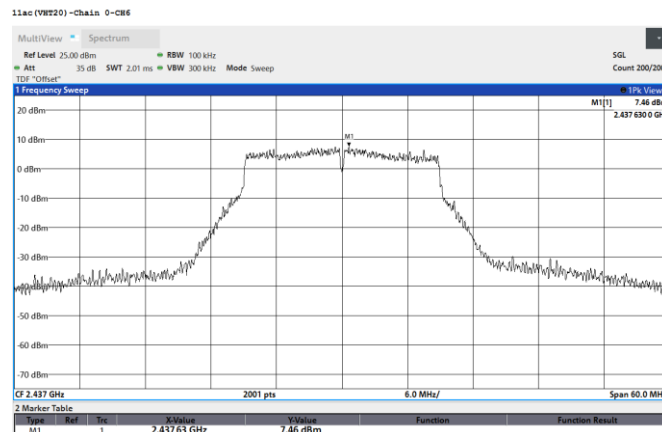
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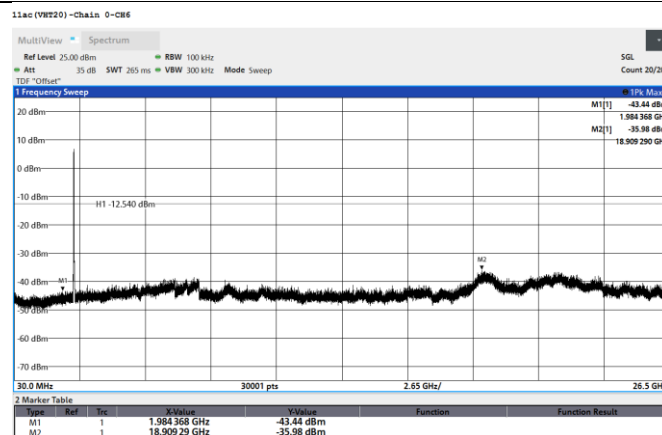
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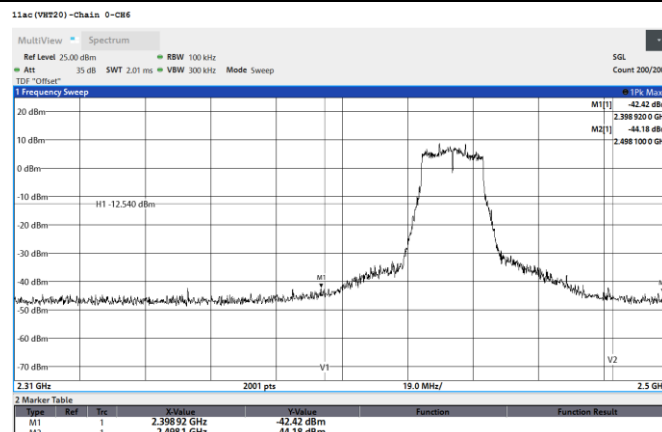
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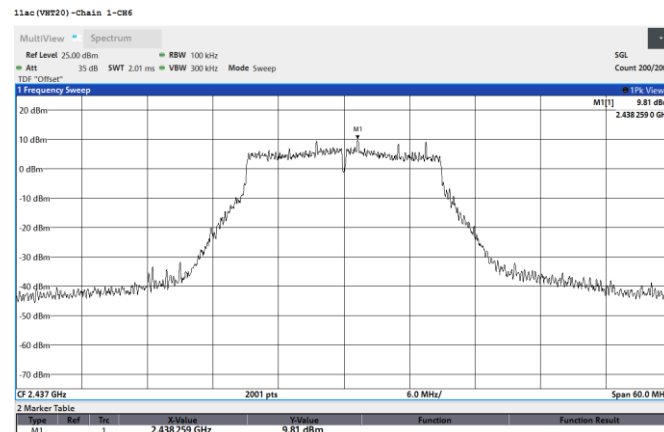
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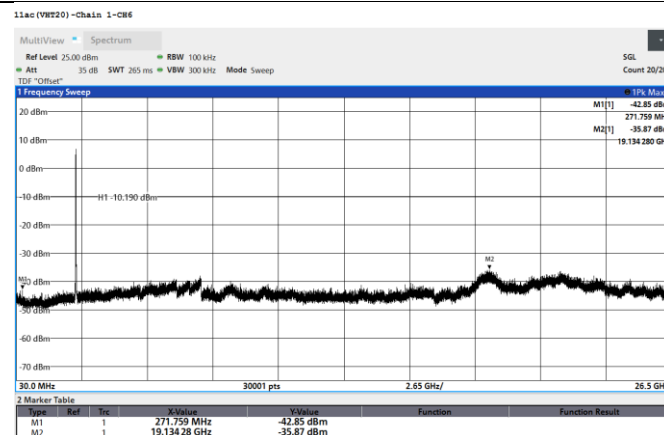
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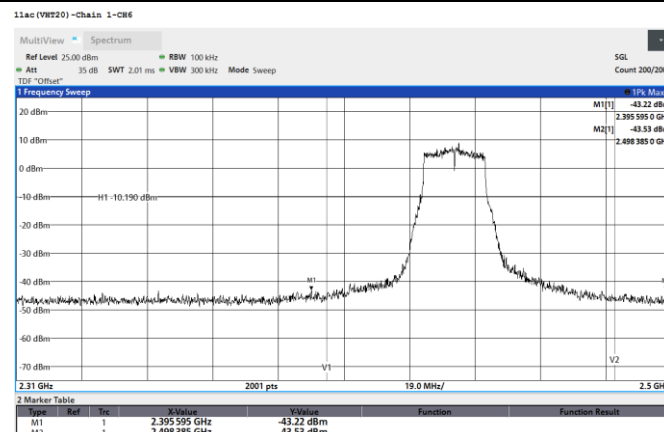
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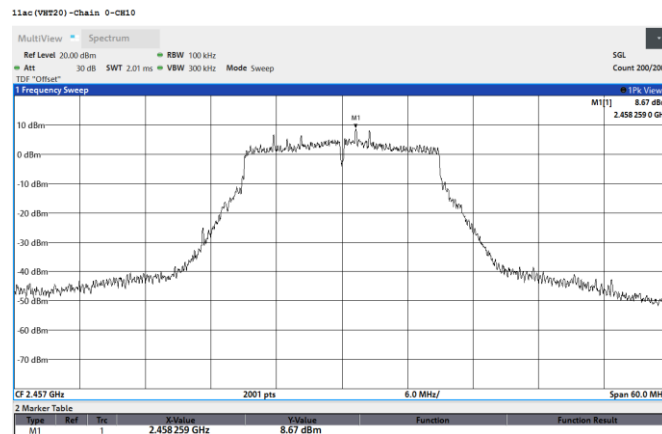
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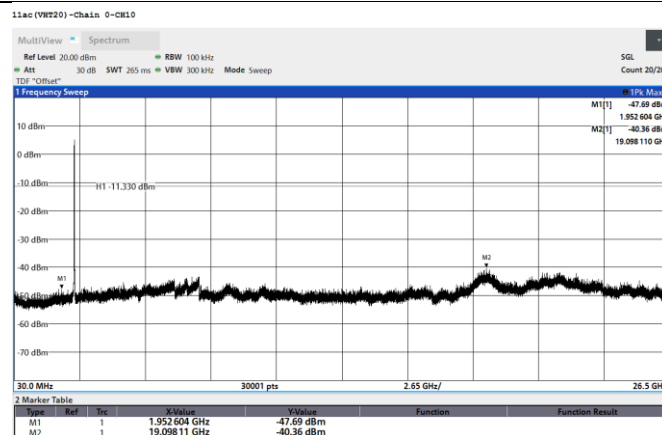
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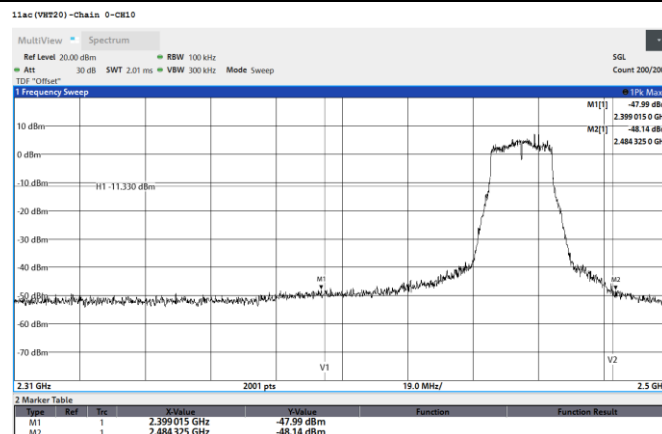
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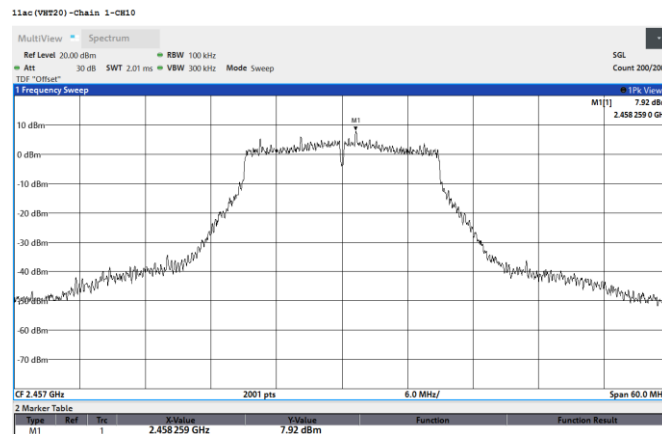
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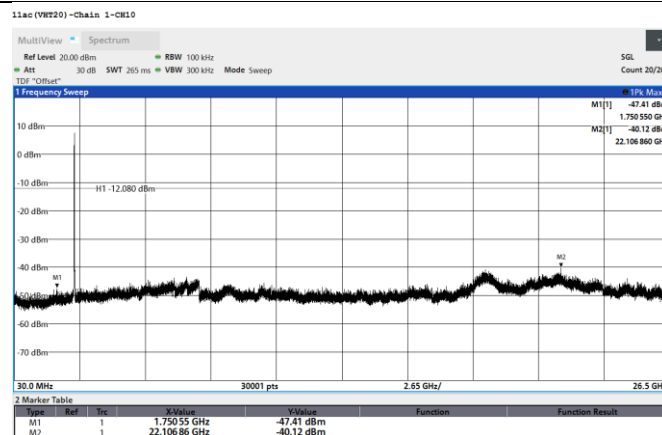
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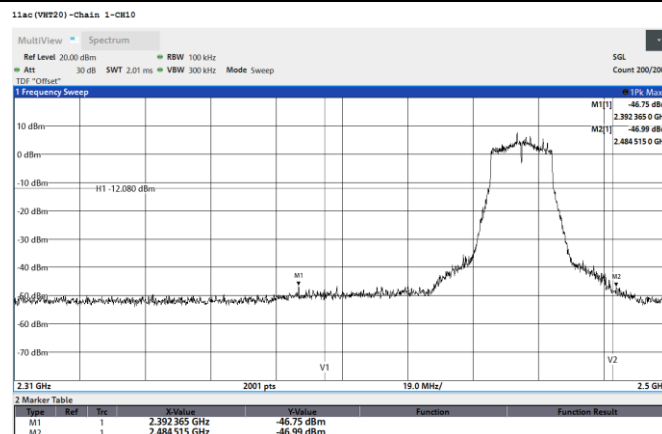
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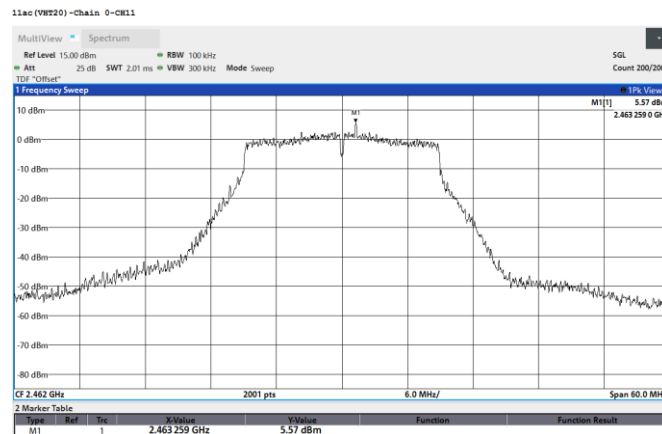
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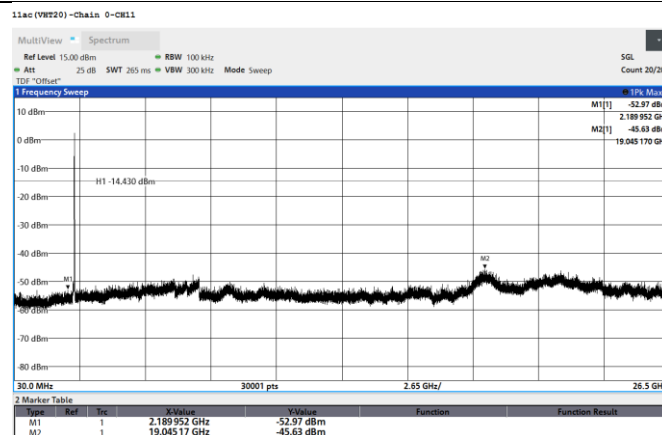
802.11ac(VHT20), CH10, Chain 1, Band edge



802.11ac(VHT20), CH11, Chain 0, Reference



802.11ac(VHT20), CH11, Chain 0, Conducted Emission



802.11ac(VHT20), CH11, Chain 0, Band edge

