RADIO TEST REPORT

Product	:	WiFi Module
Model Name	:	AOLB-230
FCC ID	:	SERAOLB230
Test Regulation	:	FCC 47 CFR Part 15 Subpart C (Section 15.247)
Received Date	:	2025/6/11
Test Date	:	2025/6/12 ~ 2025/6/17
Issued Date	:	2025/9/1
Applicant	:	Sintai Optical (Shenzhen) Co., Ltd. Qiwei Ind Sec,1st,2nd,&3Rd Bldg,Lisonglang Village, Gongming Town,Bao an District, Shenzhen,Guangdong, China
Issued By	:	Underwriters Laboratories Taiwan Co., Ltd. Building A, B and E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Testing Laboratory
3398

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REVISION HISTORY

Original Test Report No.: 4791700614A-US-R0-V0

Revision	Test report No.	Date	Page revised	Contents
Original	4791700614A-US-R0-V0	2025/9/1	-	Initial issue

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1. Attestation of Test Results

APPLICANT:	Sintai Optical (Shenzhen) Co., Ltd. Qiwei Ind Sec,1st,2nd,&3Rd Bldg,Lisonglang Village, Gongming Town,Bao an District, Shenzhen,Guangdong, China
MANUFACTURER:	Sintai Optical (Shenzhen) Co., Ltd. Qiwei Ind Sec,1st,2nd,&3Rd Bldg,Lisonglang Village, Gongming Town,Bao an District, Shenzhen,Guangdong, China
EUT DESCRIPTION:	WiFi Module
BRAND:	Sintai
MODEL:	AOLB-230
SAMPLE STAGE:	Mass-Production
DATE of TESTED:	2025/6/12 ~ 2025/6/17

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 Date : 2025/9/1
Project Handler

Approved and Authorized By:

Eric Lee Date : 2025/9/1
Senior Laboratory Engineer

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

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 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.

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	3.0 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	5.6 dB
Radiated disturbance above 1 GHz	1GHz ~ 40GHz	4.6 dB

6. Equipment under Test

6.1. Description of EUT

Product	WiFi Module
Brand Name	Sintai
Model Name	AOLB-230
Normal Voltage	3.3Vdc from host equipment

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
Maximum Output Power	2412MHz ~ 2462MHz: 21.28 dBm
Sample ID	Conducted Test:8575948
	Radiated Test:8575949

Note:

1. EUT provides a complete 1Tx port and 1Rx port. Please refer to the following working transmission conditions:

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

*The modulation and bandwidth are similar for 802.11n mode, for 20MHz, 40MHz, bandwidth system, therefore investigated one worst case to representative mode in test report.

2. 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	-	-

6.3. Test Condition

Test Item	Test Site No.	Environmental	Input Power	Test Date	Tested by
Antenna Port Conducted Measurement	SR4	24℃/ 66%RH	3.3Vdc	2025/06/17	Eric Peng
Radiated Spurious Emission	966-2	22~26℃/ 62~68%RH	3.3Vdc	2025/06/12~ 2025/06/13	Eric Peng
AC power Line Conducted Emission	SR1	23℃/ 63%RH	120Vsc/60Hz	2025/06/17	Eric Peng

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).

6.4. Description of Available Antennas

Ant. No.	Transmitter Circuit	Frequency Range	Brand Name	Model Name	Maximum Gain (dBi)	Ant. Type	Connector Type
1	Chain0	2.4~2.4835GHz	PSA	RFANT5220110A0T	2.66	chip	none (like solder)

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	Available Channel	Test Channel	Data Rate
Radiated Bandedge	802.11b	DSSS	1 to 11	1,6,11	1 Mbps
	802.11g	OFDM	1 to 11	1,6,11	6 Mbps
	802.11n (HT20)	OFDM	1 to 11	1,6,11	MCS0
	802.11n (HT40)	OFDM	3 to 9	3,6,9	MCS0
Radiated Emissions (Above 1GHz)	802.11b	DSSS	1 to 11	1,6,11	1 Mbps
	802.11g	OFDM	1 to 11	1,6,11	6 Mbps
Radiated Emissions (Below 1GHz)	802.11b	DSSS	1 to 11	6	1 Mbps
AC Power Line Conducted Emission	802.11g	OFDM	1 to 11	6	6 Mbps
Antenna Port Conducted Measurement	802.11b	DSSS	1 to 11	1,2,3,4,5,6,7,8,9,10,11	1 Mbps
	802.11g	OFDM	1 to 11	1,2,3,4,5,6,7,8,9,10,11	6 Mbps
	802.11n (HT20)	OFDM	1 to 11	1,2,3,4,5,6,7,8,9,10,11	MCS0
	802.11n (HT40)	OFDM	3 to 9	3,4,5,6,7,8,9	MCS0

- The fundamental of the EUT was investigated in three orthogonal axes X-Y/Y-Z/X-Z, it was determined that X-Y plane was worst-case. Therefore, all final radiated testing was performed with the EUT in X-Y plane.

- The radiated spurious emission test was performed in all test modes. The worst case was 802.11b and 802.11g, and therefore, only the worst case data is shown in this report to represent all test modes.

- In the transmit mode, 802.11g 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 6 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.

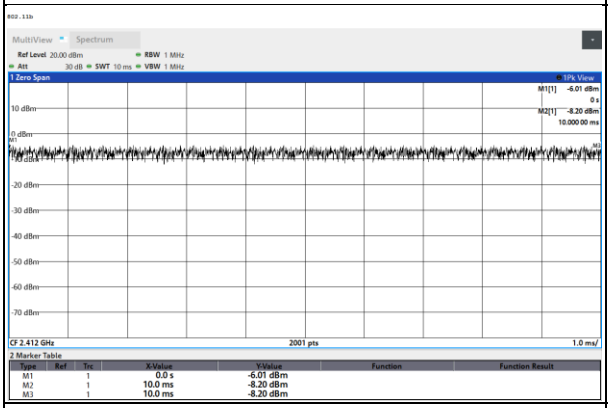
- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

- For antenna port conducted measurement that regardless of the modulation technique, the conducted output power of the inner channels(11b/g/n20 Ch02~Ch05 & Ch07~Ch10, 11n40 Ch04~Ch05 & Ch07~Ch08) did not exceed that of Ch06. Therefore, these channels were represented by conducted output power measurements only and documented in the report. The evaluations for 6 dBc Bandwidth, Power Spectral Density (PSD), and Conducted Spurious Emission (CSE) were conducted only for the following channels:
  802.11b/g/n20: Ch01, Ch06, Ch11
  802.11n40: Ch03, Ch06, Ch09

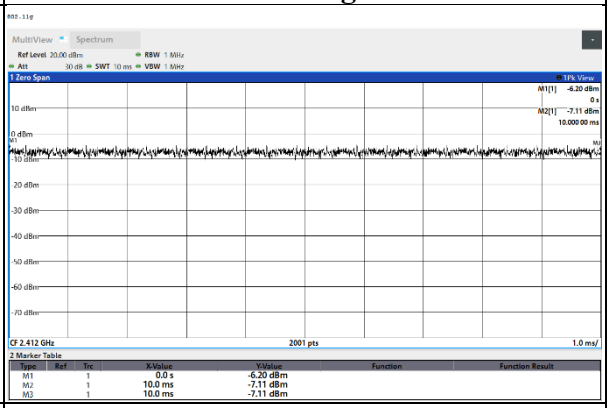
6.6. Duty cycle

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle	Duty Factor (dB)	VBW Set (above 1GHz)
802.11b	10.000	10.000	1.0000	N/A	10Hz
802.11g	10.000	10.000	1.0000	N/A	10Hz
802.11n(HT20)	10.000	10.000	1.0000	N/A	10Hz
802.11n(HT40)	10.000	10.000	1.0000	N/A	10Hz

802.11b

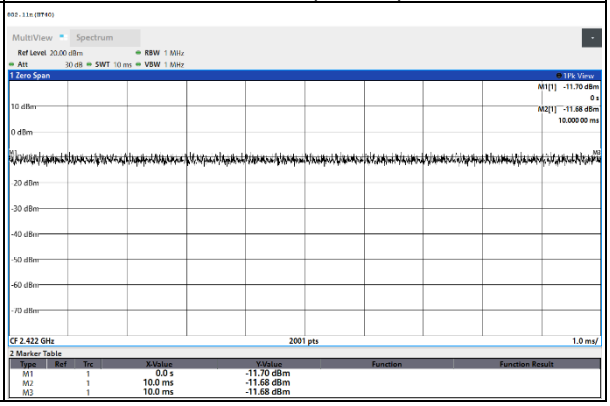


802.11g



802.11n(HT20)

802.11n(HT40)



7. Test Equipment

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Expired date**
Radiated Spurious Emission					
Spectrum Analyzer	Keysight	N9010A	MY56070818	2025/3/12	2026/3/11
EMI Test Receiver	Rohde & Schwarz	ESR7	101754	2024/12/24	2025/12/23
Loop Antenna	ETS lindgren	6502	00213440	2024/12/11	2025/12/10
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck & EMCI	VULB 9168 & N-6-05	774 & AT-N0538	2024/12/30	2025/12/29
Horn Antenna (1-18 GHz)	Schwarzbeck	BBHA 9120 D	01690	2024/11/27	2025/11/26
Horn Antenna (18-40 GHz)	Schwarzbeck	BBHA 9170	781	2024/12/18	2025/12/17
Preamplifier (30-1000 MHz)	EMCI	EMC330E	980405	2025/5/12	2026/5/11
Preamplifier (1-18 GHz)	EMCI	EMC051835BE	980406	2025/1/13	2026/1/12
Preamplifier (18-40GHz)	EMCI	EMC184040SEE	980426	2025/4/7	2026/4/6
Cables (9k-18 GHz)	Hanyitek	K1K50-UP0264-K1K50-2500	170214-4 & 170425-2	2024/11/22	2025/11/21
Cables (18-40GHz)	Hanyitek	K1K50-UP0264-K1K50-2500	170214-1 & 170214-2	2024/11/22	2025/11/21

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Expired date**
Antenna Port Conducted Measurement					
Signal Analyzer	Rohde & Schwarz	FSVA3044	101281	2025/3/5	2026/3/4
Signal Analyzer	Rohde & Schwarz	FSV40	101490	2024/7/1	2025/6/30
Attenuator	EMCI	EMC-40ATK2W10	17002	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	2025/2/25	2026/2/24
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	2025/5/27	2026/5/26
Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	2024/8/29	2025/8/28
Cables	TITAN	CFD200	T0732ACFD 20020A300-2	2025/4/21	2026/4/20

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

8. Description of Test Setup

Tx Mode

Support Equipment

ID	Equipment	Brand Name	Model Name	S/N	Remark
A	Filter board	N/A	N/A	N/A	Supplied by Client
B	AC Adapter	Shenzhen Cyclelong Power-Tech Co., Ltd	GAC-03-CN	N/A	Supplied by Client

I/O Cables

ID	Equipment	Brand Name	Model Name	Length (m)	Remark
1	USB Cable	N/A	N/A	0.3	Supplied by Client

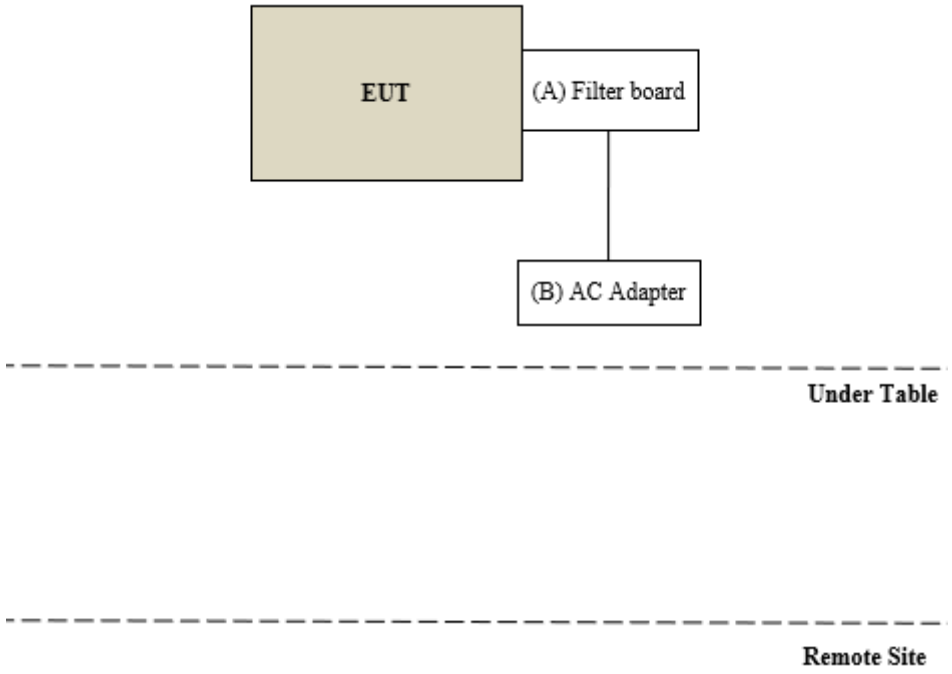
Test Setup

The EUT was worked in engineering mode to transmit signal.

Controlled using a bespoke application (Continuous transmission is achieved by loading commands from the SD card.) 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



9. Test Results

9.1. 6dB Bandwidth

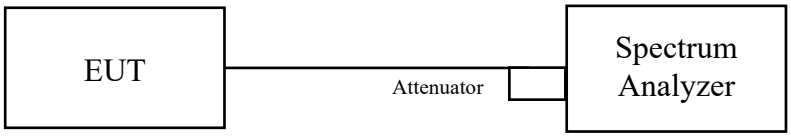
Requirements

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

Test procedure

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

Test Setup

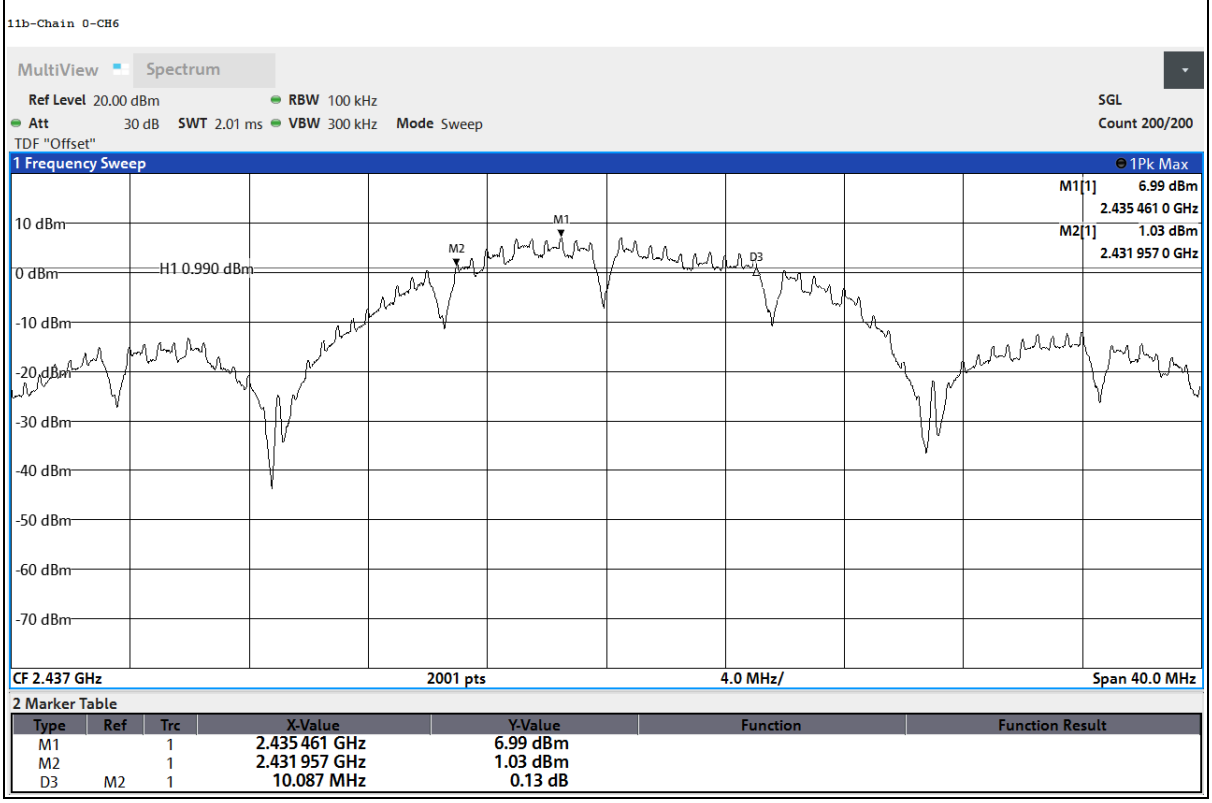


The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

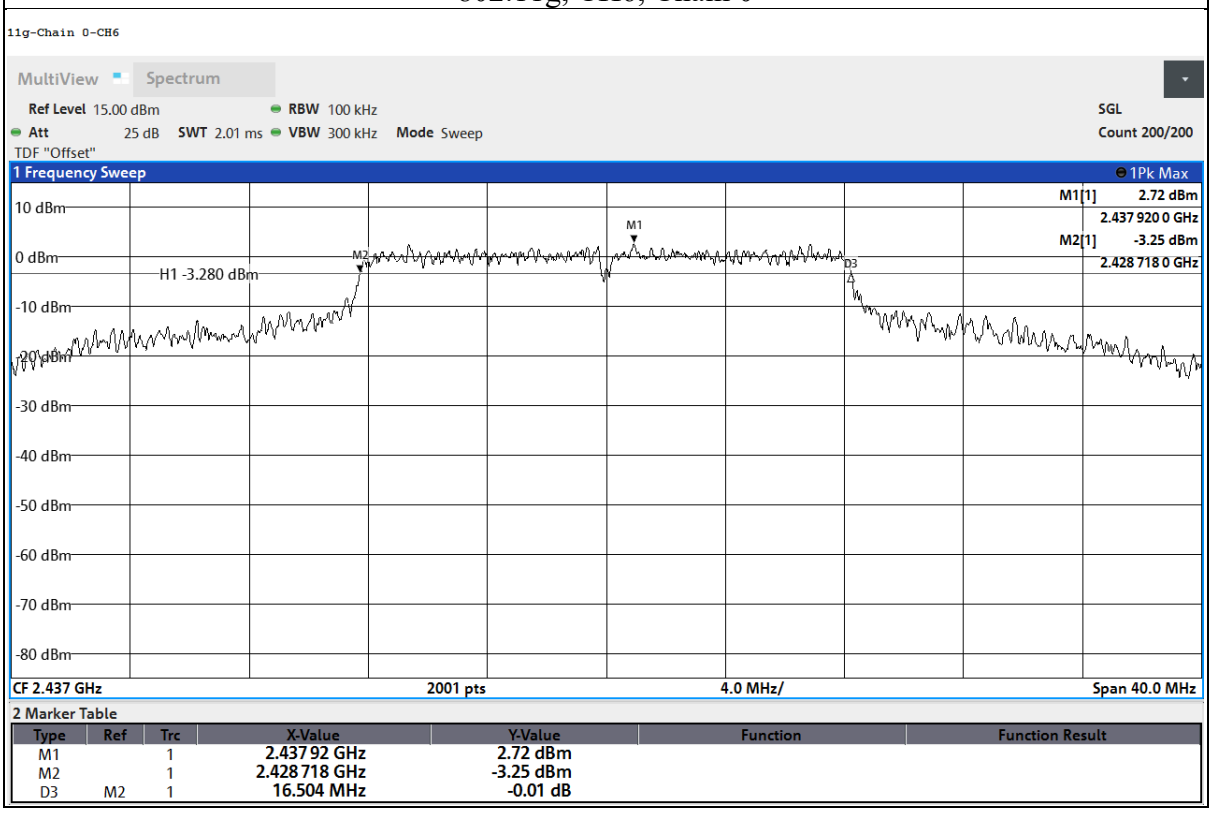
Mode	CH	Freq (MHz)	6dB BW (MHz)	Limit (MHz)	Result
			Chain 0		
802.11b	1	2412	10.092	0.5	PASS
	6	2437	10.087	0.5	PASS
	11	2462	10.097	0.5	PASS

802.11b, CH6, Chain 0



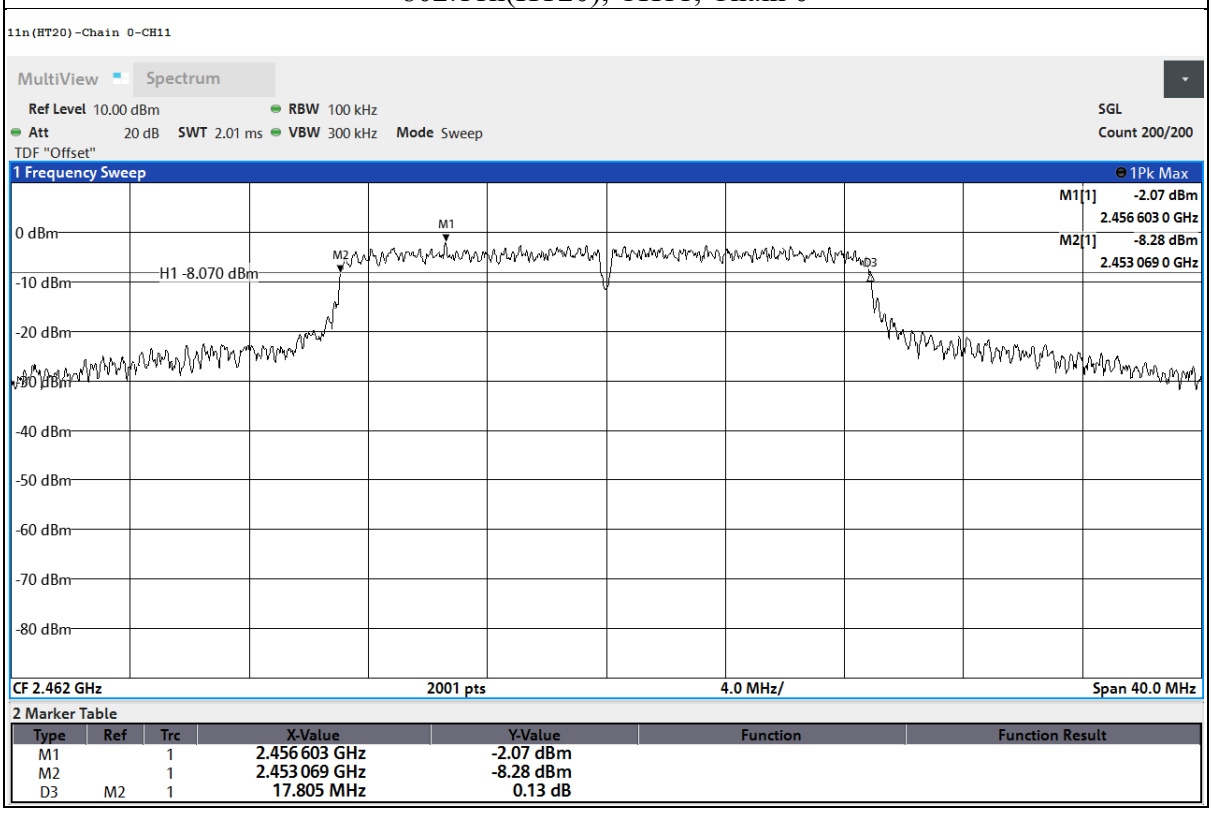
Mode	CH	Freq (MHz)	6dB BW (MHz) Chain 0	Limit (MHz)	Result
802.11g	1	2412	16.564	0.5	PASS
	6	2437	16.504	0.5	PASS
	11	2462	16.553	0.5	PASS

802.11g, CH6, Chain 0



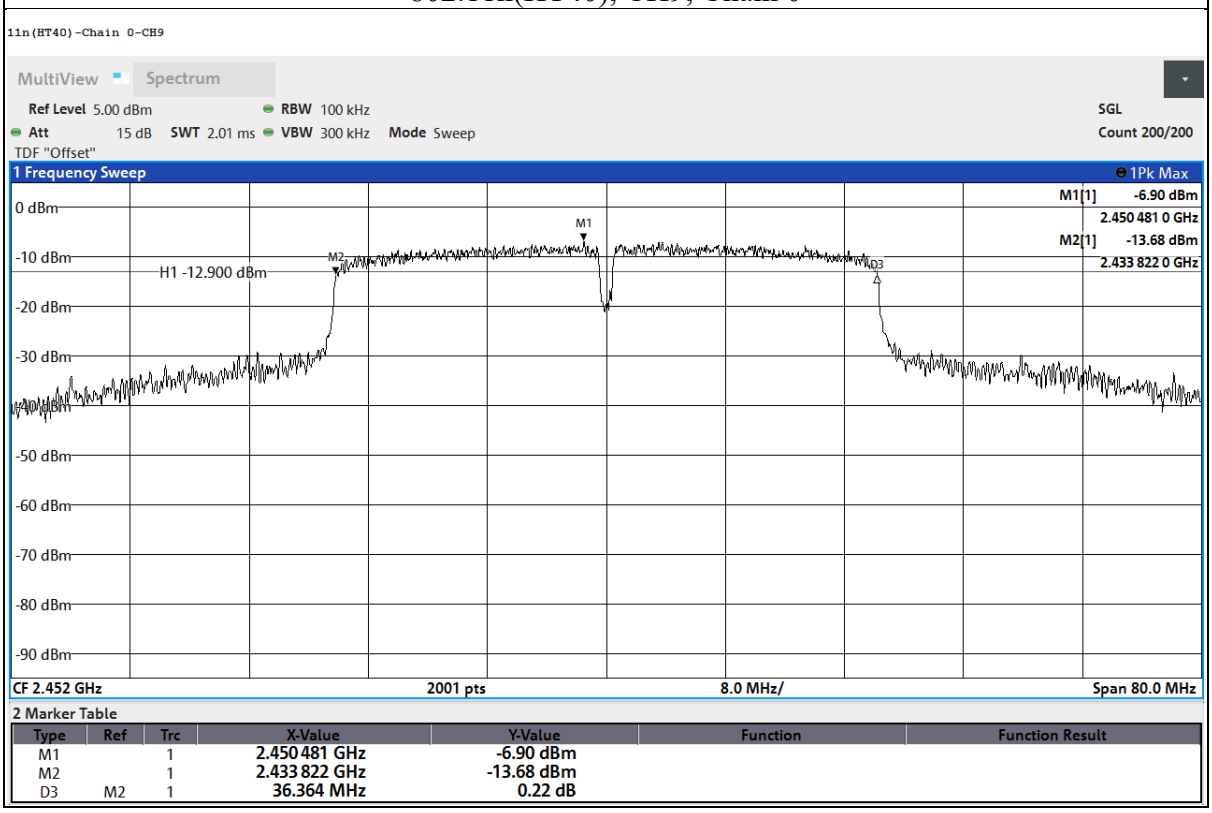
Mode	CH	Freq (MHz)	6dB BW (MHz)	Limit (MHz)	Result
			Chain 0		
802.11n(HT20)	1	2412	17.825	0.5	PASS
	6	2437	17.878	0.5	PASS
	11	2462	17.805	0.5	PASS

802.11n(HT20), CH11, Chain 0



Mode	CH	Freq (MHz)	6dB BW (MHz)	Limit (MHz)	Result
			Chain 0		
802.11n(HT40)	3	2422	36.375	0.5	PASS
	6	2437	36.367	0.5	PASS
	9	2452	36.364	0.5	PASS

802.11n(HT40), CH9, Chain 0



9.2. Conducted Output Power

Requirements

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

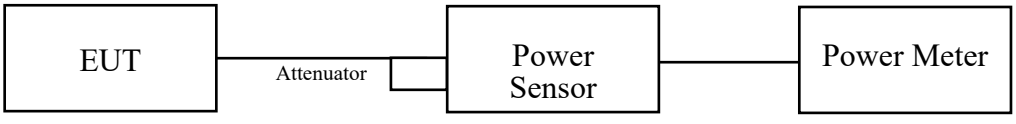
Note:
1. P_{Out} = maximum conducted output power in dBm, G_{TX} = the maximum transmitting antenna directional gain in dBi, B is the 26 dB emission bandwidth in megahertz
2. If EUT with Multiple Transmitter Output:
   a. Directional Gain = 10 log[($10^{G1/20}$ + $10^{G2/20}$ +...+$10^{Gn/20}$)^2 / Nant] dBi.
   Nαnt: 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 ≤ 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 ≥ 5.
   Example: Maximum antenna gain = 5 dBi and NANT ≤ 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.

a. Set the RBW ≥ DTS bandwidth.
b. Set VBW ≥ 3 × RBW.
c. Set span ≥ 3 x RBW.
d. Sweep time = auto couple.
e. Detector = peak.
f. Trace mode = max hold.
g. Allow trace to fully stabilize.
h. Use peak marker function to determine the peak amplitude level.

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

Mode	CH	Freq. (MHz)	Peak Power (dBm) Chain 0	Total PK Power (mW)	Total PK Power (dBm)	AVG Power (dBm) Chain 0	Total Power (mW)	Total Power (dBm)	Limit (dBm)	Result
802.11b	1	2412	18.37	68.707	18.37	12.61	18.239	12.61	30	PASS
	2	2417	17.89	61.518	17.89	12.23	16.711	12.23	30	PASS
	3	2422	18.10	64.565	18.10	12.26	16.827	12.26	30	PASS
	4	2427	17.86	61.094	17.86	12.28	16.904	12.28	30	PASS
	5	2432	17.98	62.806	17.98	12.31	17.022	12.31	30	PASS
	6	2437	19.89	97.499	19.89	14.53	28.379	14.53	30	PASS
	7	2442	17.10	51.286	17.10	11.03	12.677	11.03	30	PASS
	8	2447	17.05	50.699	17.05	11.06	12.764	11.06	30	PASS
	9	2452	17.09	51.168	17.09	11.08	12.823	11.08	30	PASS
	10	2457	17.11	51.404	17.11	11.05	12.735	11.05	30	PASS
	11	2462	17.28	53.456	17.28	11.12	12.942	11.12	30	PASS
802.11g	1	2412	18.82	76.208	18.82	12.83	19.187	12.83	30	PASS
	2	2417	18.72	74.473	18.72	12.58	18.113	12.58	30	PASS
	3	2422	18.67	73.621	18.67	12.64	18.365	12.64	30	PASS
	4	2427	18.78	75.509	18.78	12.68	18.535	12.68	30	PASS
	5	2432	18.79	75.683	18.79	12.69	18.578	12.69	30	PASS
	6	2437	21.28	134.276	21.28	15.97	39.537	15.97	30	PASS
	7	2442	18.51	70.958	18.51	12.24	16.749	12.24	30	PASS
	8	2447	18.31	67.764	18.31	12.34	17.14	12.34	30	PASS
	9	2452	18.43	69.663	18.43	12.31	17.022	12.31	30	PASS
	10	2457	18.49	70.632	18.49	12.37	17.258	12.37	30	PASS
	11	2462	18.63	72.946	18.63	12.45	17.579	12.45	30	PASS
802.11n(HT20)	1	2412	17.97	62.661	17.97	12.79	19.011	12.79	30	PASS
	2	2417	17.78	59.979	17.78	12.54	17.947	12.54	30	PASS
	3	2422	17.88	61.376	17.88	12.49	17.742	12.49	30	PASS
	4	2427	17.81	60.395	17.81	12.51	17.824	12.51	30	PASS
	5	2432	17.85	60.954	17.85	12.47	17.66	12.47	30	PASS
	6	2437	20.43	110.408	20.43	15.88	38.726	15.88	30	PASS
	7	2442	17.34	54.2	17.34	12.17	16.482	12.17	30	PASS
	8	2447	17.33	54.075	17.33	12.24	16.749	12.24	30	PASS
	9	2452	17.28	53.456	17.28	12.21	16.634	12.21	30	PASS
	10	2457	17.39	54.828	17.39	12.28	16.904	12.28	30	PASS
	11	2462	17.46	55.719	17.46	12.39	17.338	12.39	30	PASS
802.11n(HT40)	3	2422	17.3	53.703	17.3	11.67	14.689	11.67	30	PASS
	4	2427	17.21	52.602	17.21	11.56	14.322	11.56	30	PASS
	5	2432	17.28	53.456	17.28	11.45	13.964	11.45	30	PASS
	6	2437	17.89	61.518	17.89	12.26	16.827	12.26	30	PASS
	7	2442	16.56	45.29	16.56	11.02	12.647	11.02	30	PASS
	8	2447	16.59	45.604	16.59	11.01	12.618	11.01	30	PASS
	9	2452	16.75	47.315	16.75	11.04	12.706	11.04	30	PASS

Note: Average Power is for reference Only.

9.3. Power Spectral Density

Requirements

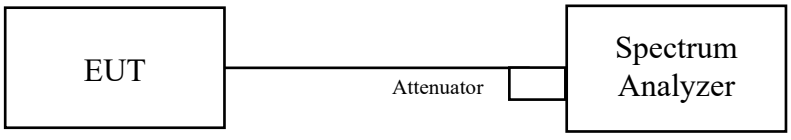
The Maximum of Power Spectral Density Measurement is 8dBm in any 3 kHz (If G_{TX} > 6 dBi, then PSD = 8 – (G_{TX} – 6)).

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. If EUT with Multiple Transmitter Output:
   a. Directional Gain = 10 log[($10^{G1/20}$ + $10^{G2/20}$ +...+$10^{Gn/20}$)^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 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 kHz ≤ RBW ≤ 100 kHz.
d. Set the VBW ≥ 3 × RBW.
e. Detector = peak.
f. Sweep time = auto couple.
g. Trace mode = max hold.
h. Allow trace to fully stabilize.
i. Use the peak marker function to determine the maximum amplitude level within the RBW.

Test Setup



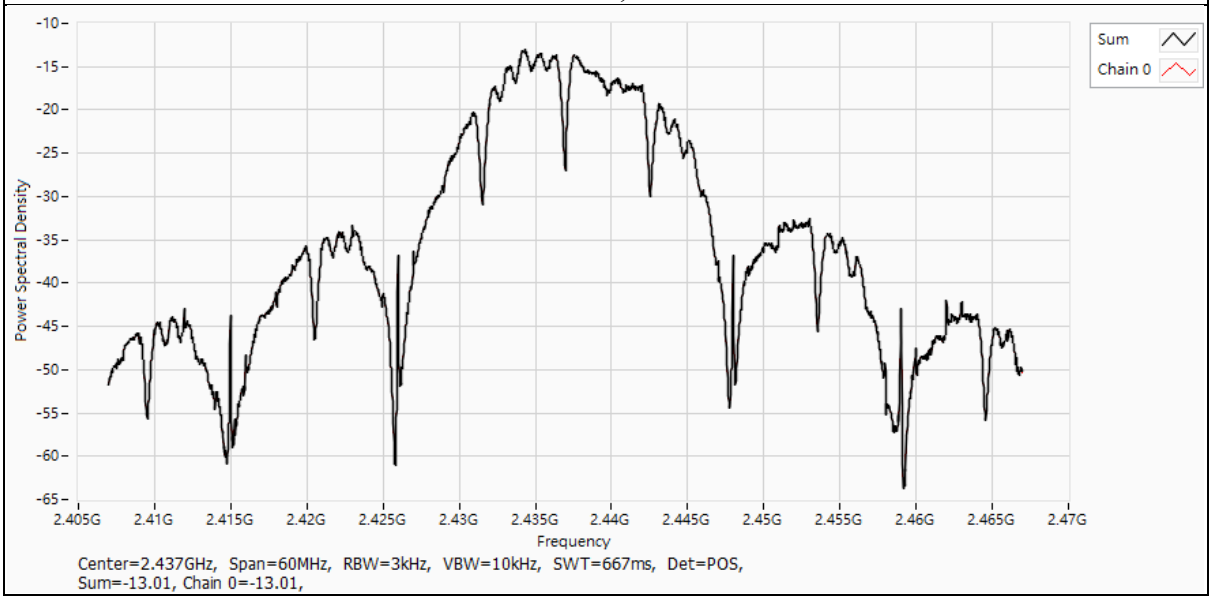
The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

Mode	CH	Freq (MHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Directional Gain (dBi)	Result
802.11b	1	2412	-14	8	2	PASS
	6	2437	-13.01	8	2	PASS
	11	2462	-15.32	8	2	PASS

Mode	CH	Freq (MHz)	PSD per Chain (dBm/3kHz) Chain 0
802.11b	1	2412	-14
	6	2437	-13.01
	11	2462	-15.32

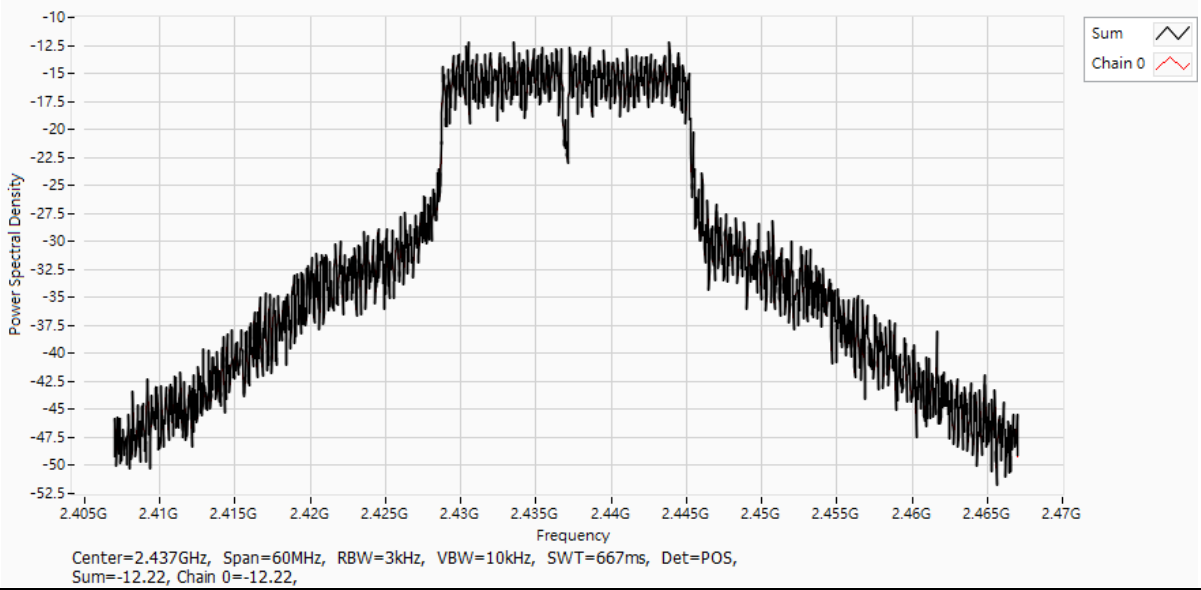
802.11b, CH6



Mode	CH	Freq (MHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Directional Gain (dBi)	Result
802.11g	1	2412	-15.51	8	2	PASS
	6	2437	-12.22	8	2	PASS
	11	2462	-16.04	8	2	PASS

Mode	CH	Freq (MHz)	PSD per Chain (dBm/3kHz)
			Chain 0
802.11g	1	2412	-15.51
	6	2437	-12.22
	11	2462	-16.04

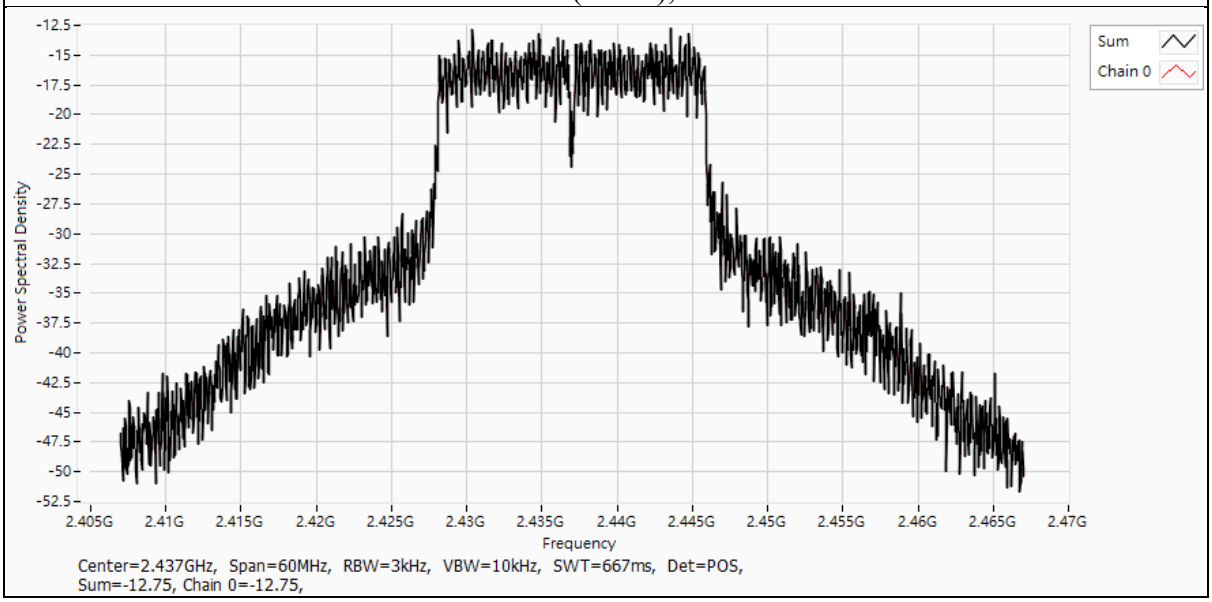
802.11g, CH6



Mode	CH	Freq (MHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Directional Gain (dBi)	Result
802.11n(HT20)	1	2412	-16	8	2	PASS
	6	2437	-12.75	8	2	PASS
	11	2462	-16.43	8	2	PASS

Mode	CH	Freq (MHz)	PSD per Chain (dBm/3kHz)
			Chain 0
802.11n(HT20)	1	2412	-16
	6	2437	-12.75
	11	2462	-16.43

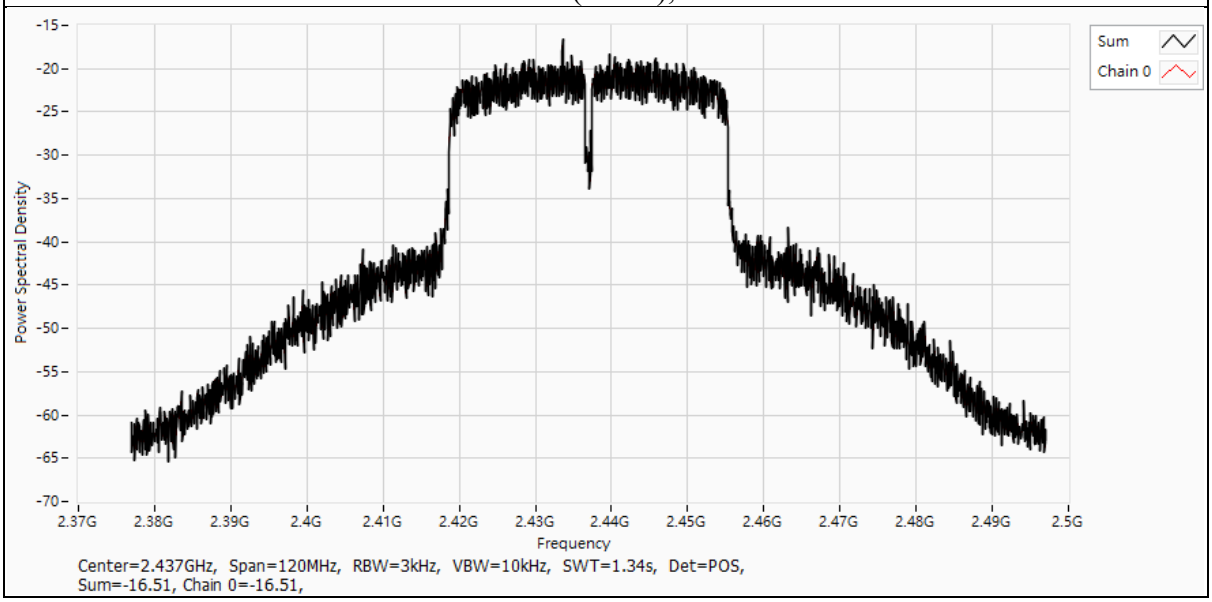
802.11n(HT20), CH6



Mode	CH	Freq (MHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Directional Gain (dBi)	Result
802.11n(HT40)	3	2422	-18.16	8	2	PASS
	6	2437	-16.51	8	2	PASS
	9	2452	-20.17	8	2	PASS

Mode	CH	Freq (MHz)	PSD per Chain (dBm/3kHz)
			Chain 0
802.11n(HT40)	3	2422	-18.16
	6	2437	-16.51
	9	2452	-20.17

802.11n(HT40), CH6



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

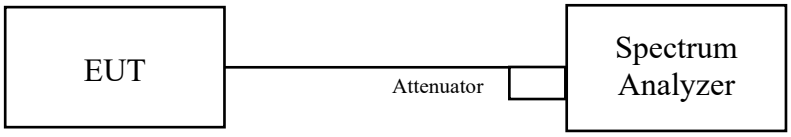
Measurement Procedure REF

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 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 ≥ 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.

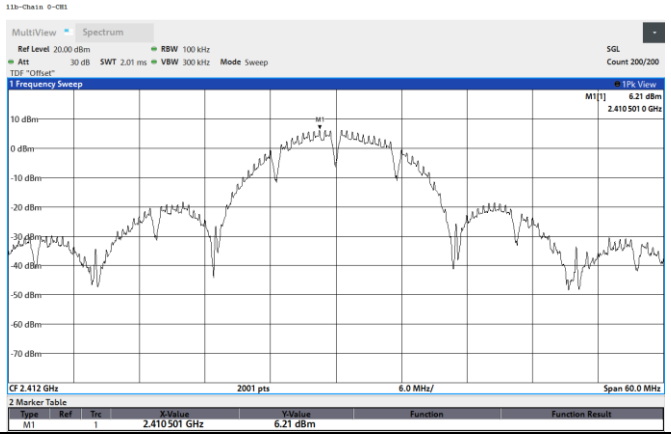
Test Setup



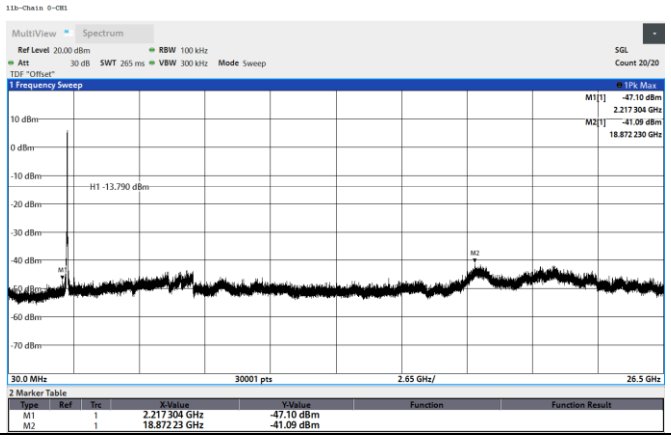
The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

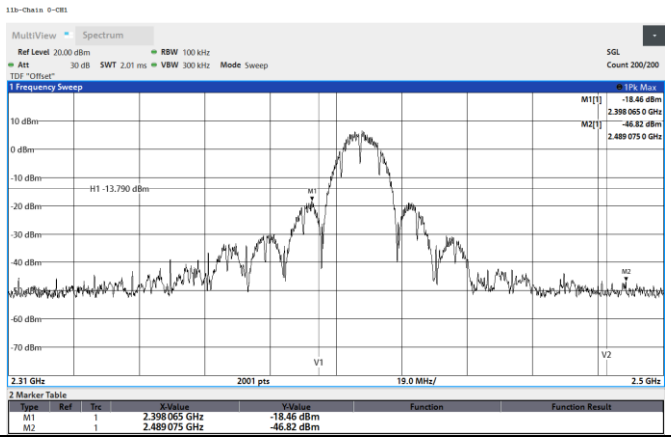
802.11b, CH1, Chain 0, Reference



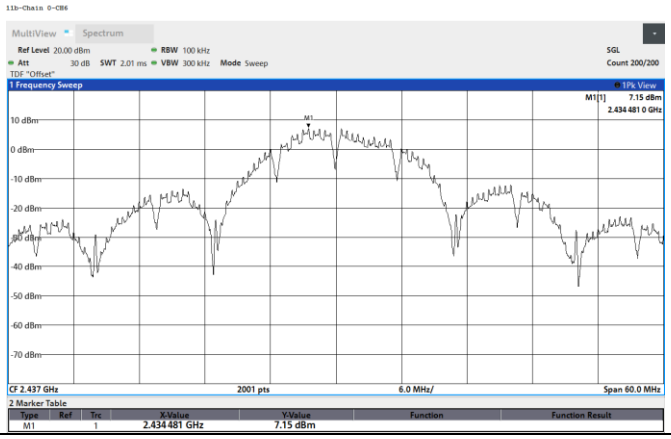
802.11b, CH1, Chain 0, Conducted Emission



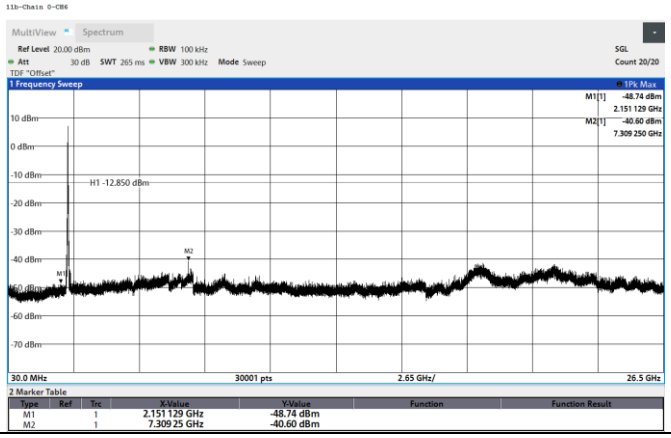
802.11b, CH1, Chain 0, Band edge



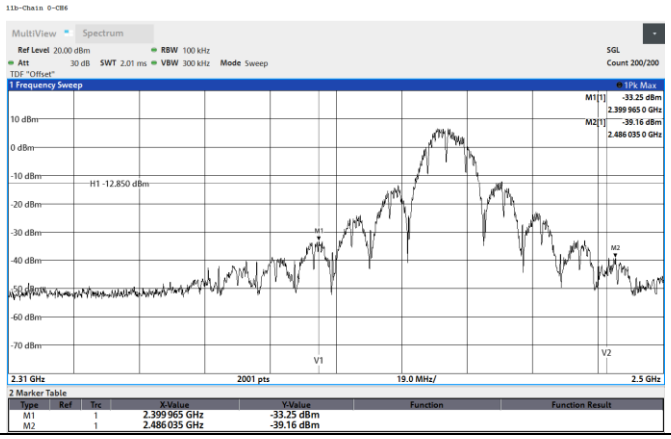
802.11b, CH6, Chain 0, Reference



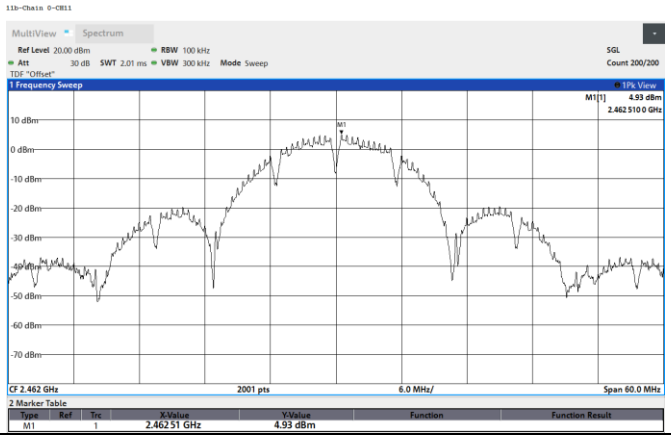
802.11b, CH6, Chain 0, Conducted Emission



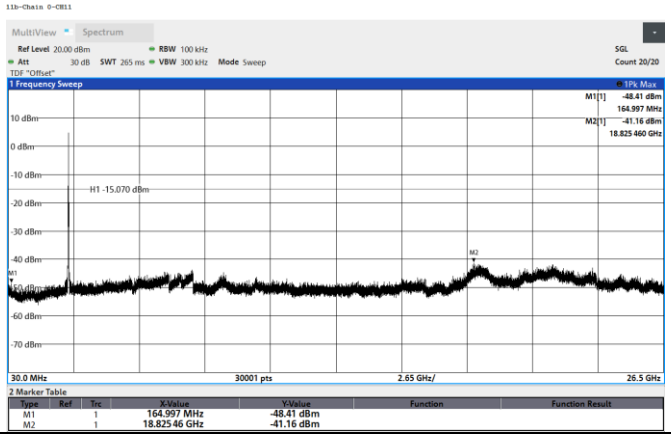
802.11b, CH6, Chain 0, Band edge



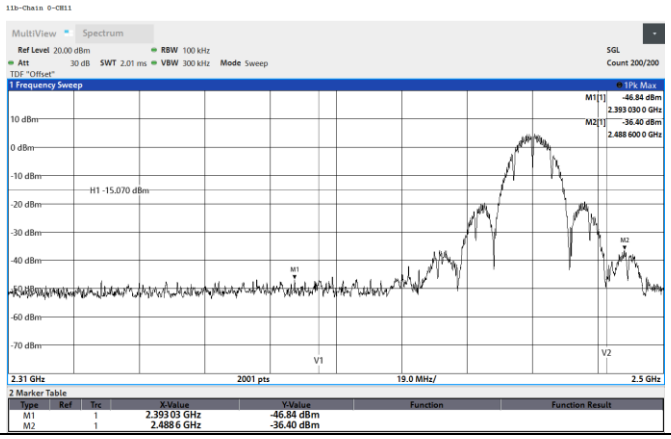
802.11b, CH11, Chain 0, Reference



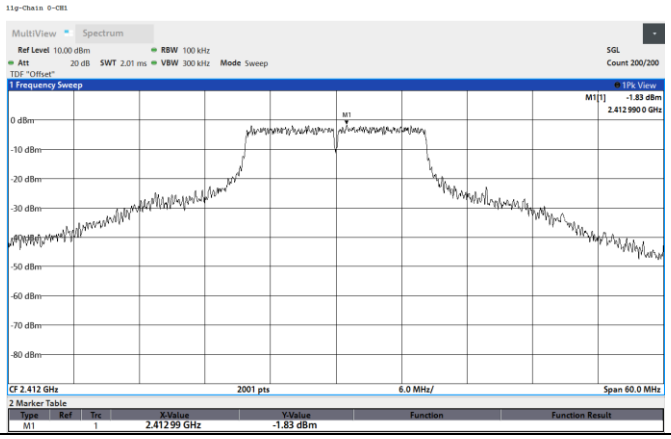
802.11b, CH11, Chain 0, Conducted Emission



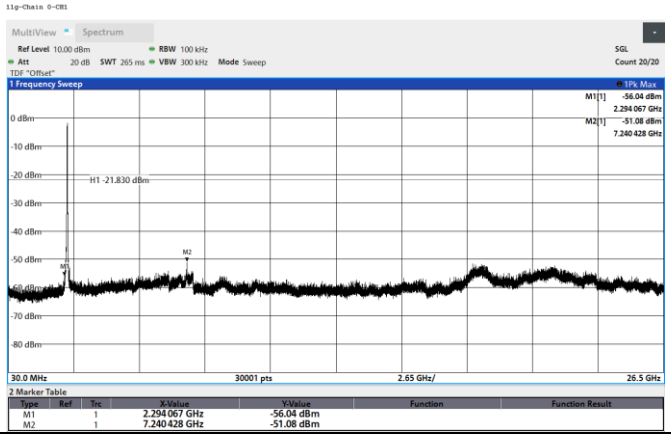
802.11b, CH11, Chain 0, Band edge



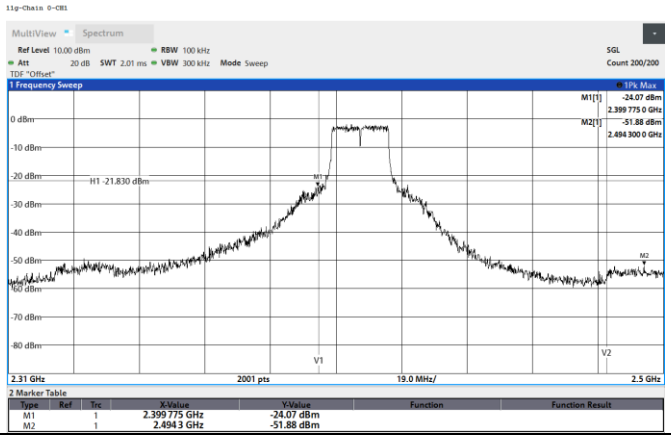
802.11g, CH1, Chain 0, Reference



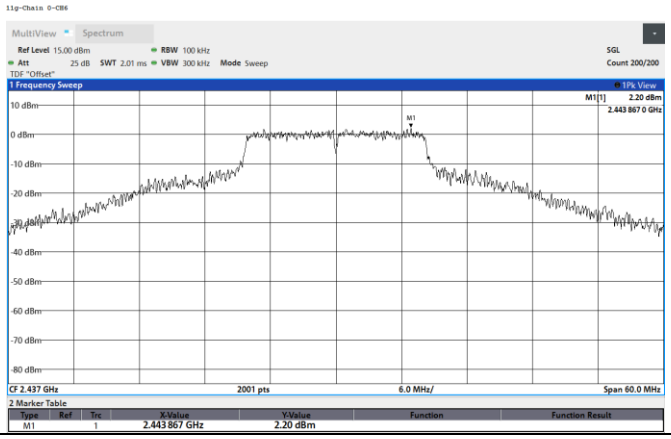
802.11g, CH1, Chain 0, Conducted Emission



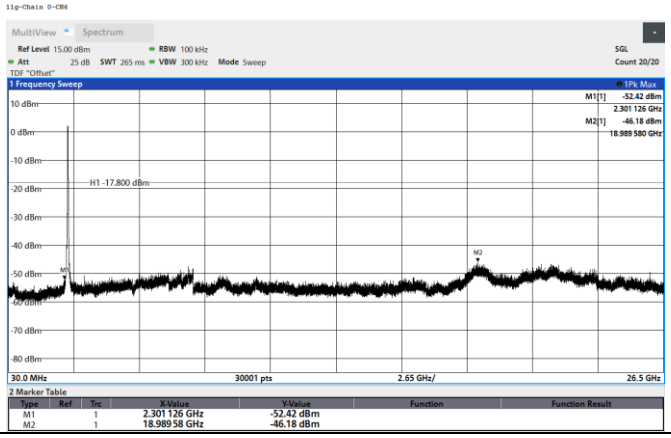
802.11g, CH1, Chain 0, Band edge



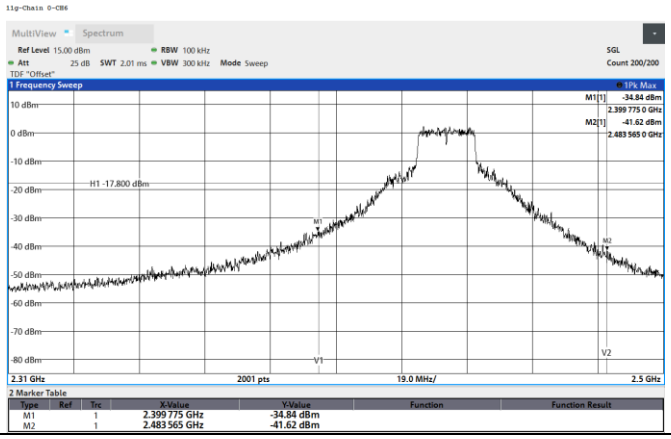
802.11g, CH6, Chain 0, Reference



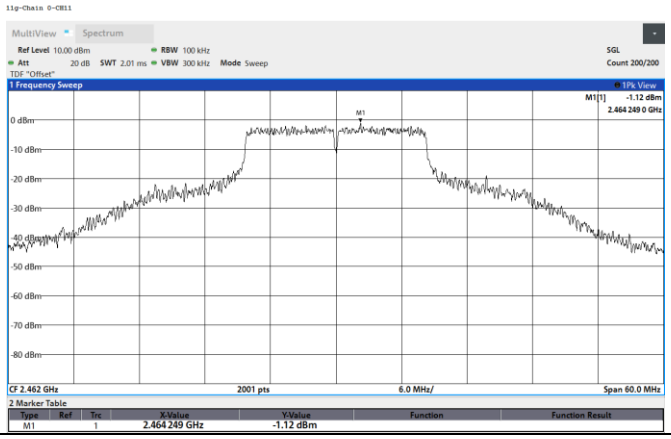
802.11g, CH6, Chain 0, Conducted Emission



802.11g, CH6, Chain 0, Band edge



802.11g, CH11, Chain 0, Reference



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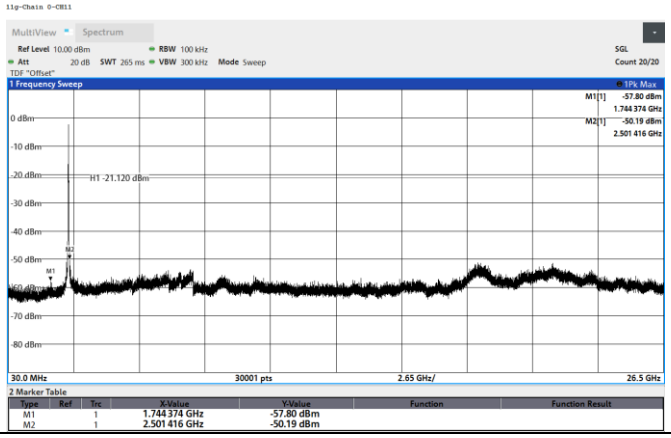
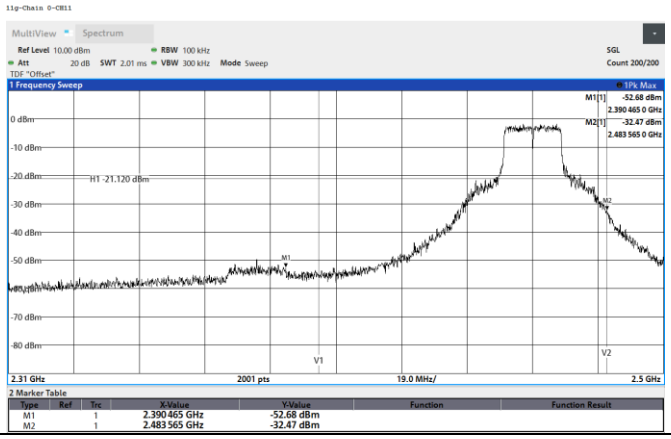
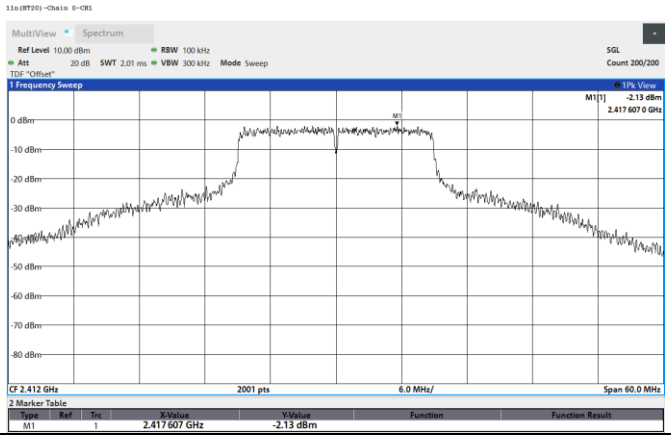


802.11g, CH11, Chain 0, Band edge



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



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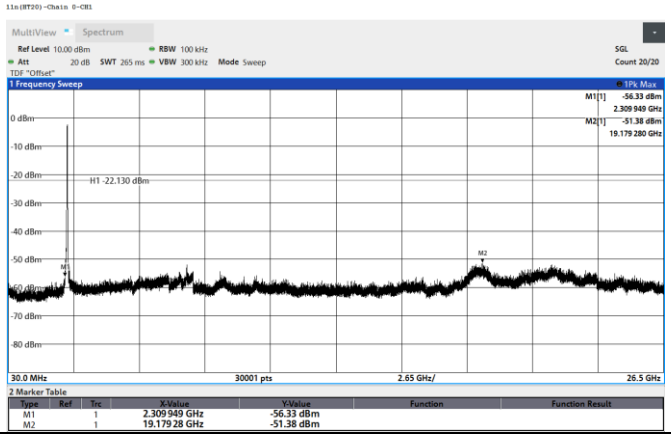
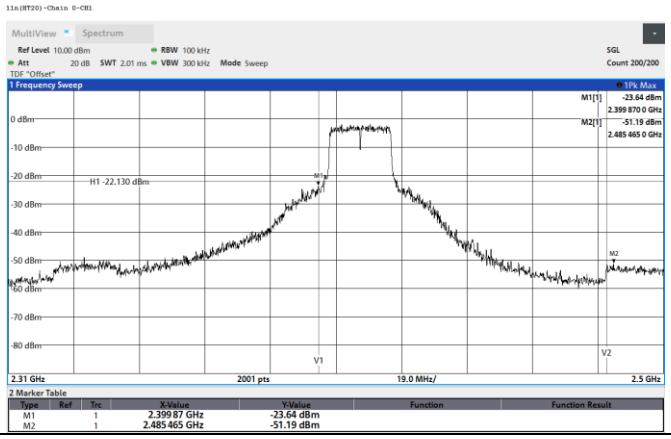
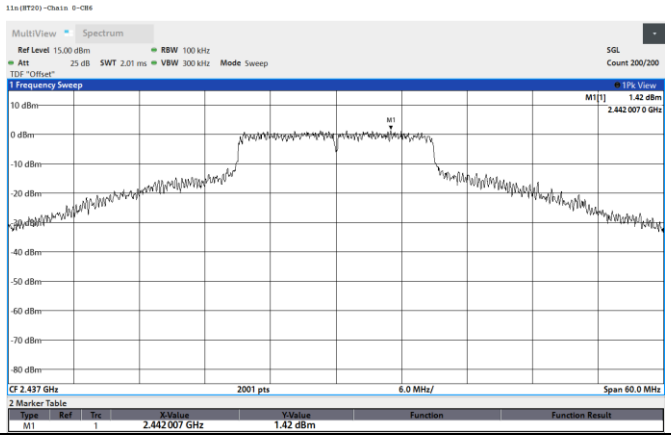


802.11n(HT20), CH1, Chain 0, Band edge



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



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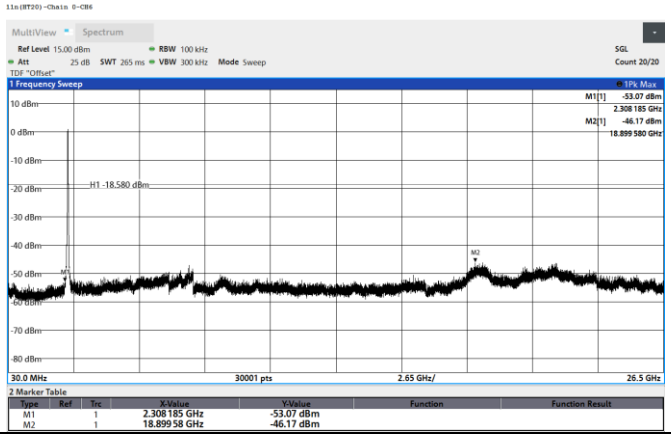

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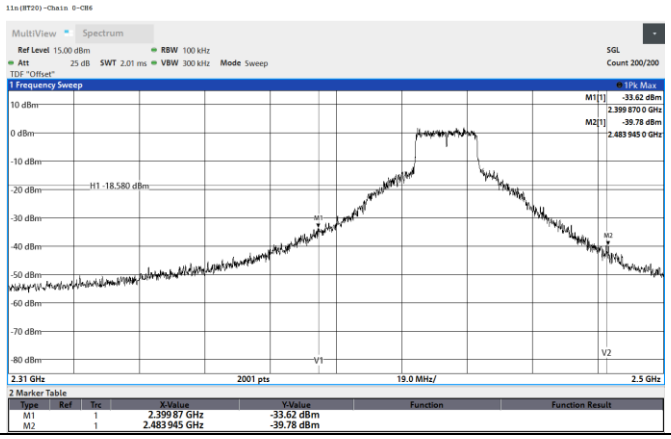

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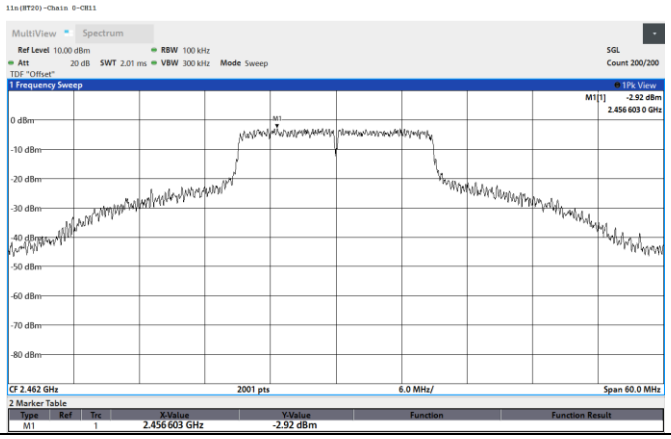

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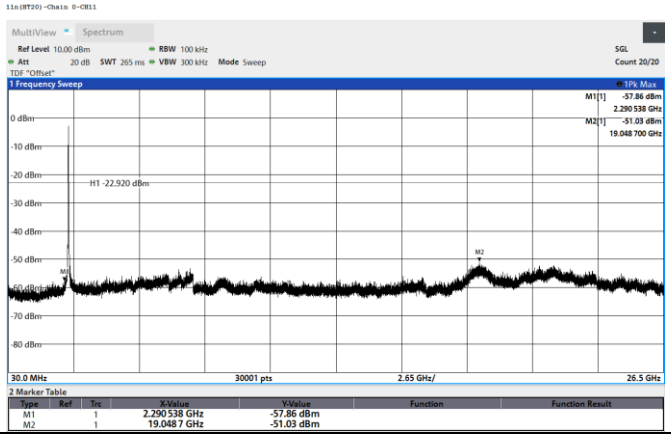

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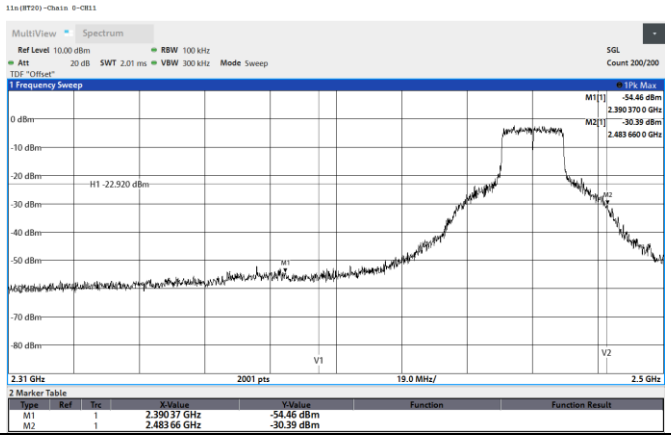
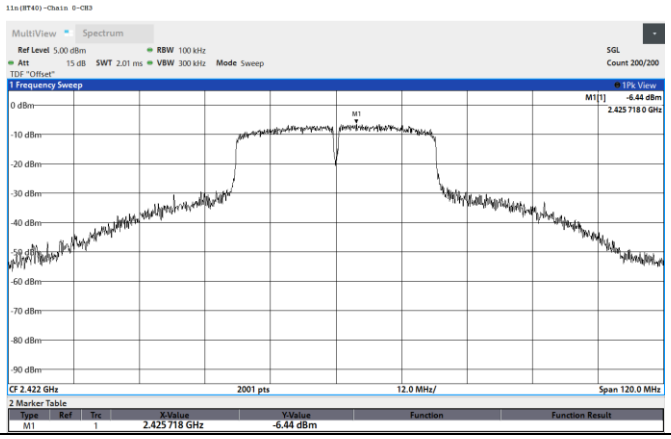
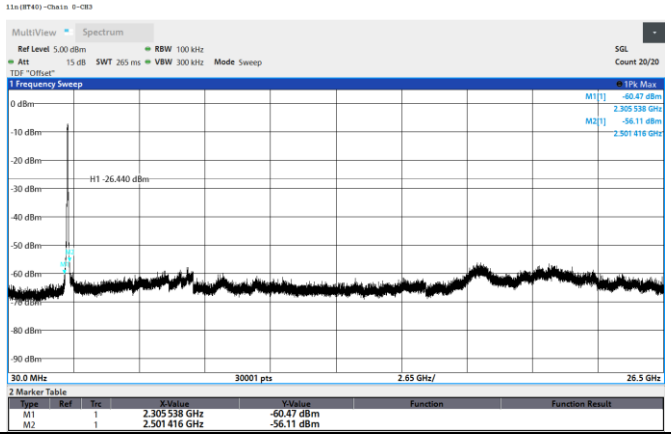


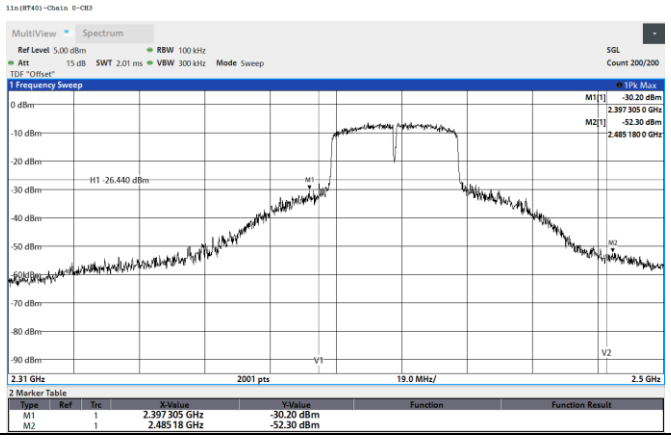
802.11n(HT40), CH3, Chain 0, Reference



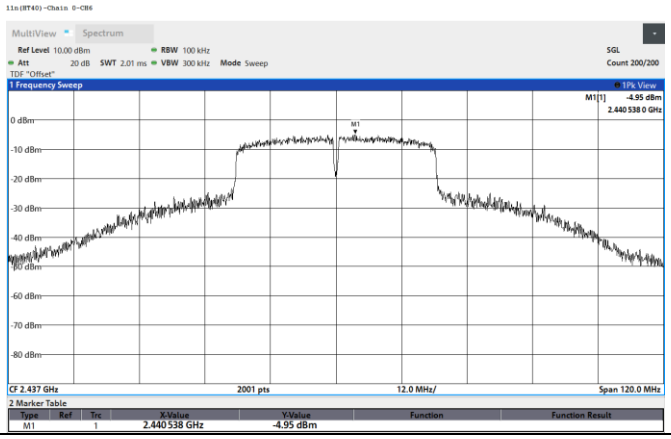
802.11n(HT40), CH3, Chain 0, Conducted Emission



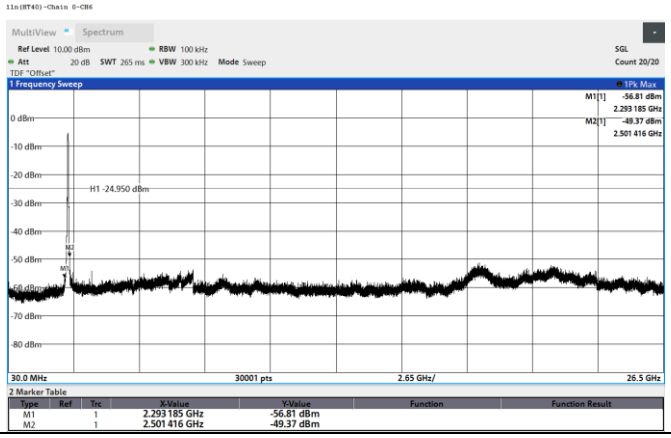
802.11n(HT40), CH3, Chain 0, Band edge



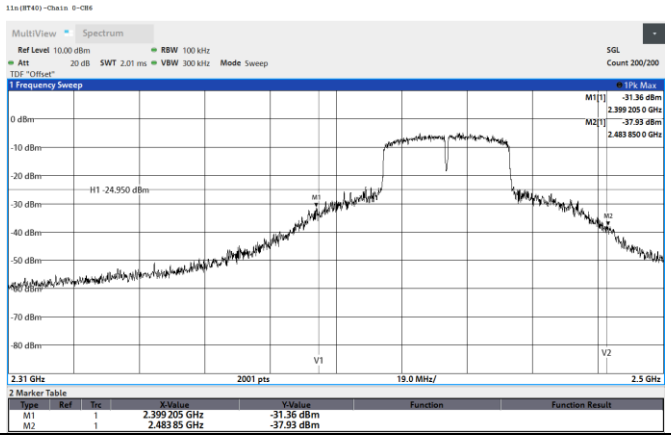
802.11n(HT40), CH6, Chain 0, Reference



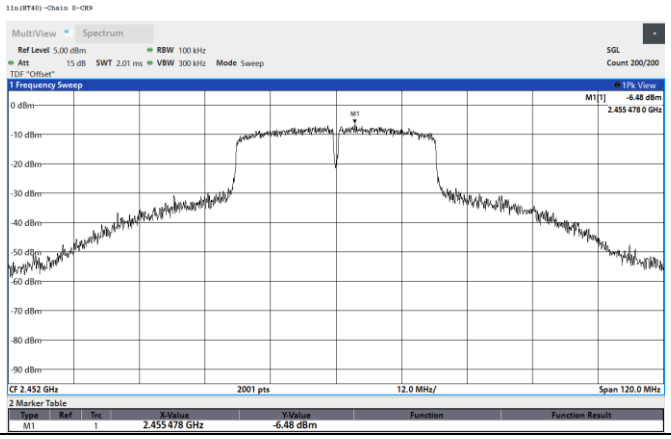
802.11n(HT40), CH6, Chain 0, Conducted Emission



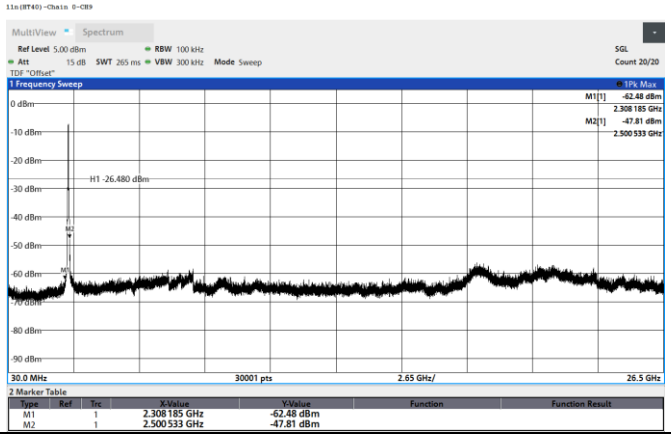
802.11n(HT40), CH6, Chain 0, Band edge



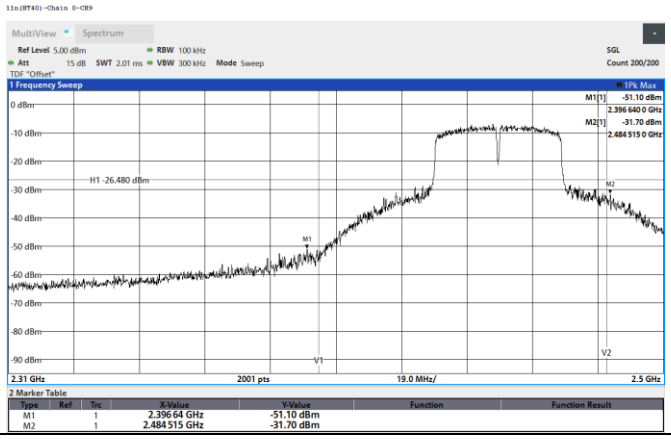
802.11n(HT40), CH9, Chain 0, Reference



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



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



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.

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.

Note:

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

Peak

Frequency	RBW	VBW
9 kHz~150 kHz	200 Hz	600 Hz
150 kHz~30 MHz	10 kHz	30 kHz
30 MHz~1 GHz	120 kHz	360 kHz
Above 1GHz	1 MHz	3 MHz

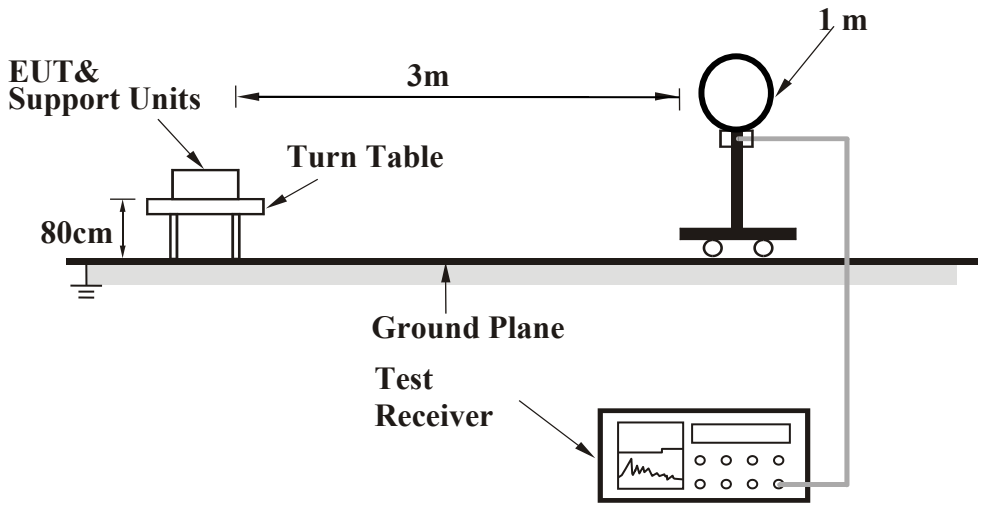
Average for above 1GHz

RBW	VBW
1MHz	Refer to section 6.6 for duty cycle.

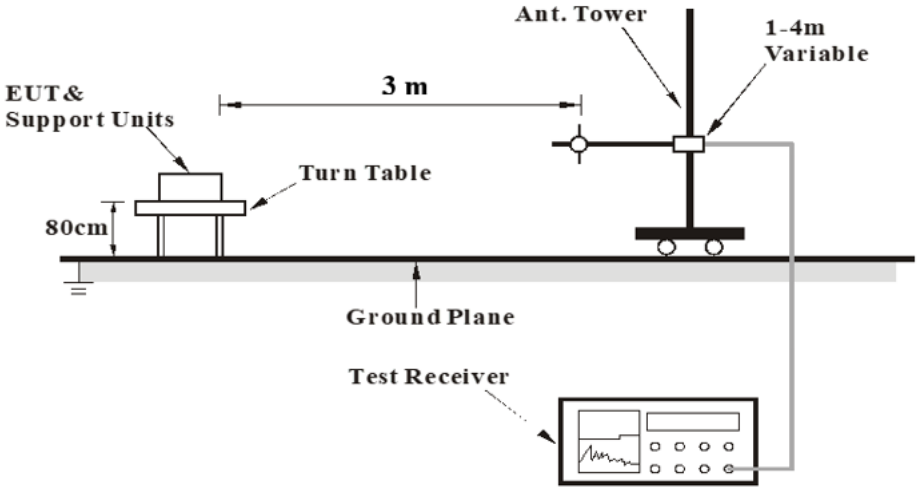
d. All modes of operation were investigated (includes all external accessories) and the worst-case emissions are reported, the other emission levels were low against the limit.
e. Test data of Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
f. Test data of Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
g. Test data of Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) - Preamp Factor (dB).
h. Test data of Notation "@" = Fundamental Frequency
i. 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.

Test Setup

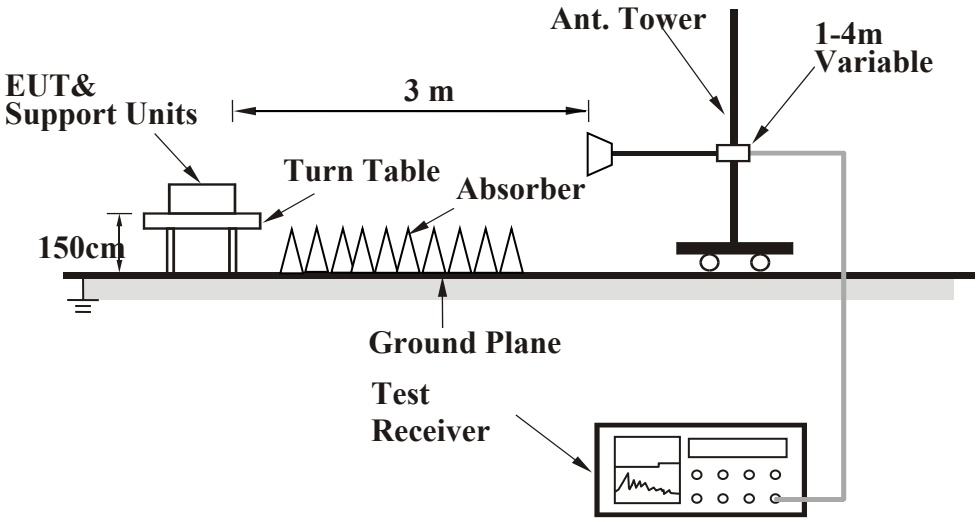
<Frequency Range 9 kHz ~ 30 MHz>



<Frequency Range 30 MHz ~ 1 GHz >



<Frequency Range above 1 GHz>



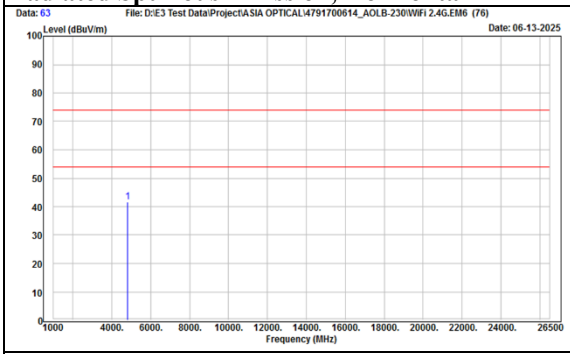
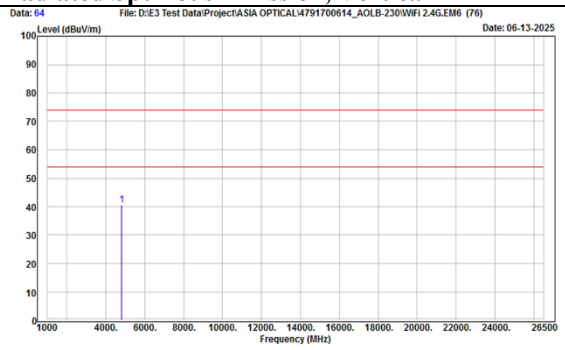
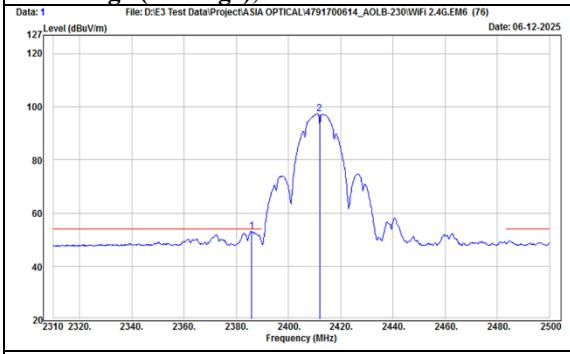
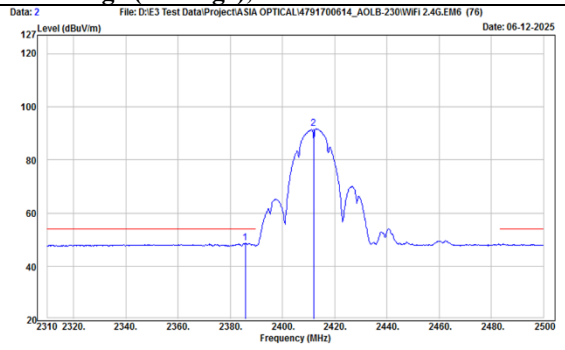
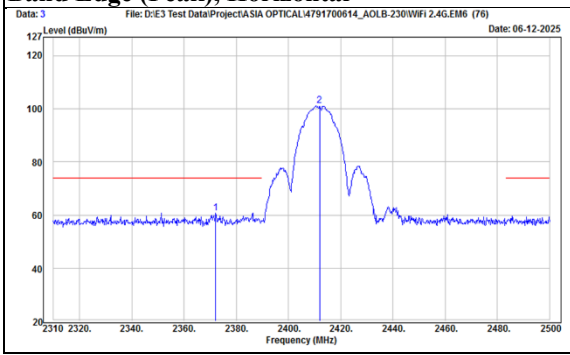
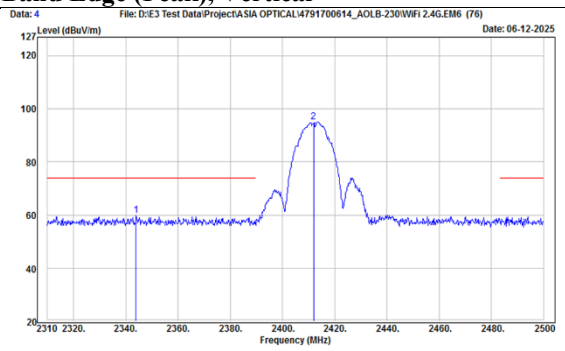
For the actual test configuration, please refer to the Setup Configurations.

Test Data

Above 1 GHz

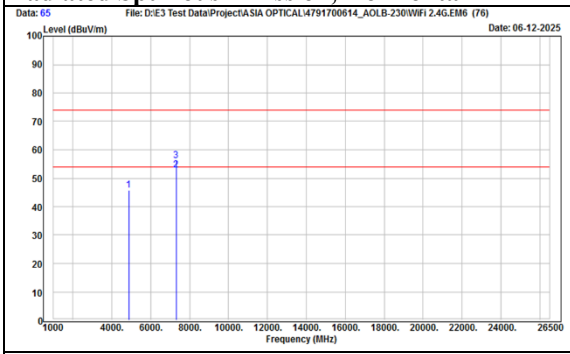
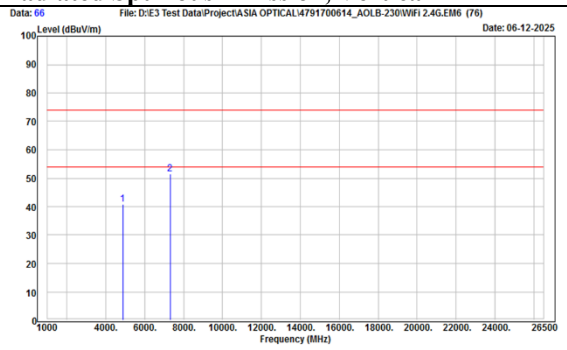
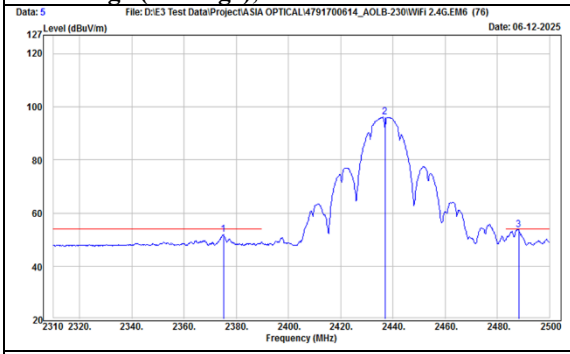
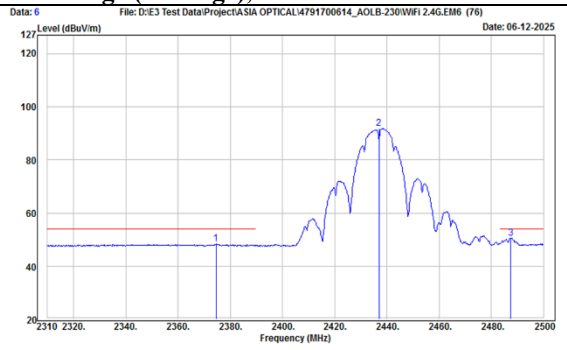
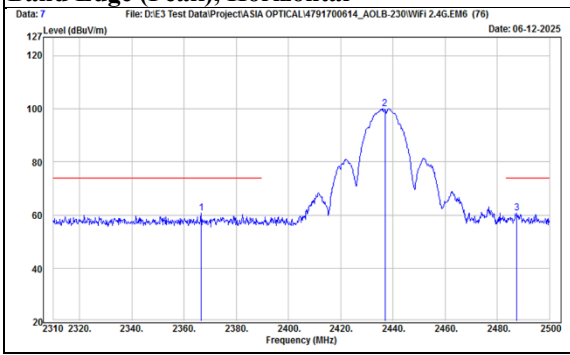
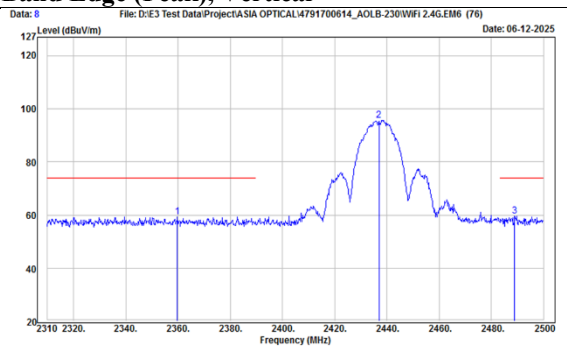
Mode	802.11b	Channel	1

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2372.13	41.54	19.28	60.82	74	-13.18	PK
		2386	34.07	19.19	53.26	54	-0.74	AVG
	@	2412	81.95	19.14	101.09	N/A	N/A	PK
	@	2412	78.24	19.14	97.38	N/A	N/A	AVG
	*	4824	38.95	2.63	41.58	74	-32.42	PK
Vertical		2344.01	40.49	19.39	59.88	74	-14.12	PK
		2385.81	29.43	19.19	48.62	54	-5.38	AVG
	@	2412	75.99	19.14	95.13	N/A	N/A	PK
	@	2412	72.6	19.14	91.74	N/A	N/A	AVG
	*	4824	37.81	2.63	40.44	74	-33.56	PK

TX, 802.11b (Ch 1) Radiated Spurious Emission, Horizontal	TX, 802.11b (Ch 1) Radiated Spurious Emission, Vertical
	
TX, 802.11b (Ch 1) Band Edge (Average), Horizontal	**TX, 802.11b (Ch 1) Band Edge (Average), Vertical**
	
TX, 802.11b (Ch 1) Band Edge (Peak), Horizontal	**TX, 802.11b (Ch 1) Band Edge (Peak), Vertical**
	

Mode	802.11b	Channel	6

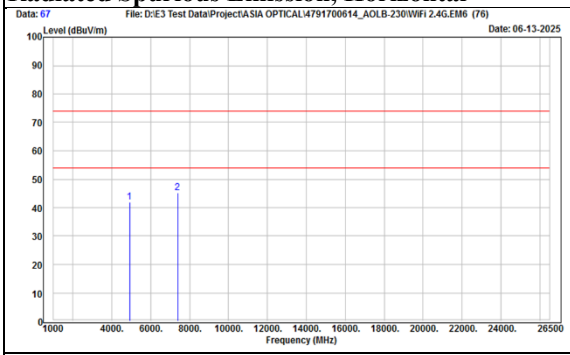
Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2366.62	41.33	19.31	60.64	74	-13.36	PK
		2375.17	32.65	19.26	51.91	54	-2.09	AVG
	@	2437	80.86	19.18	100.04	N/A	N/A	PK
	@	2437	76.92	19.18	96.1	N/A	N/A	AVG
		2487.46	41.4	19.2	60.6	74	-13.4	PK
		2488.22	34.58	19.19	53.77	54	-0.23	AVG
	*	4874	42.96	2.66	45.62	74	-28.38	PK
		7311	45.47	10.57	56.04	74	-17.96	PK
		7311	42.17	10.57	52.74	54	-1.26	AVG
Vertical		2359.78	40.05	19.35	59.4	74	-14.6	PK
		2374.6	29.2	19.26	48.46	54	-5.54	AVG
	@	2437	76.57	19.18	95.75	N/A	N/A	PK
	@	2437	72.59	19.18	91.77	N/A	N/A	AVG
		2487.46	31.29	19.2	50.49	54	-3.51	AVG
		2488.98	40.42	19.19	59.61	74	-14.39	PK
	*	4874	38.19	2.66	40.85	74	-33.15	PK
	*	7311	41.02	10.57	51.59	74	-22.41	PK

TX, 802.11b (Ch 6) **Radiated Spurious Emission, Horizontal**	**TX, 802.11b (Ch 6)** **Radiated Spurious Emission, Vertical**
	
TX, 802.11b (Ch 6) **Band Edge (Average), Horizontal**	**TX, 802.11b (Ch 6)** **Band Edge (Average), Vertical**
	
TX, 802.11b (Ch 6) **Band Edge (Peak), Horizontal**	**TX, 802.11b (Ch 6)** **Band Edge (Peak), Vertical**
	

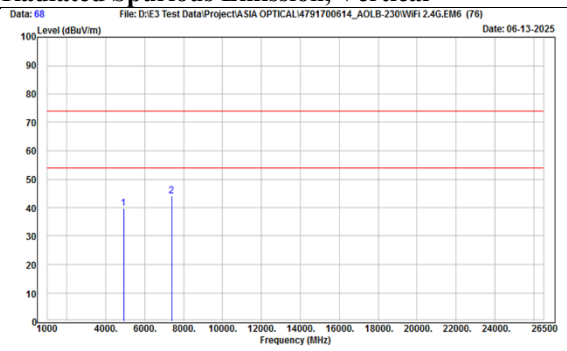
Mode	802.11b	Channel	11

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	@	2462	78.38	19.19	97.57	N/A	N/A	PK
	@	2462	74.64	19.19	93.83	N/A	N/A	AVG
		2483.66	40.88	19.19	60.07	74	-13.93	PK
		2486.7	33.86	19.19	53.05	54	-0.95	AVG
	*	4924	39.24	2.72	41.96	74	-32.04	PK
	*	7386	34.6	10.71	45.31	74	-28.69	PK
Vertical	@	2462	69.28	19.19	88.47	N/A	N/A	AVG
		2486.51	29.83	19.19	49.02	54	-4.98	AVG
	*	4924	37.04	2.72	39.76	74	-34.24	PK
	*	7386	33.36	10.71	44.07	74	-29.93	PK

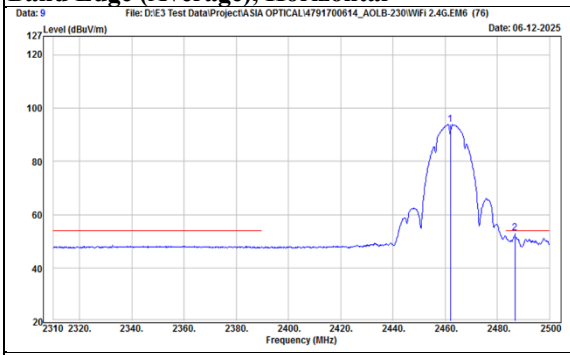
TX, 802.11b (Ch 11)
Radiated Spurious Emission, Horizontal



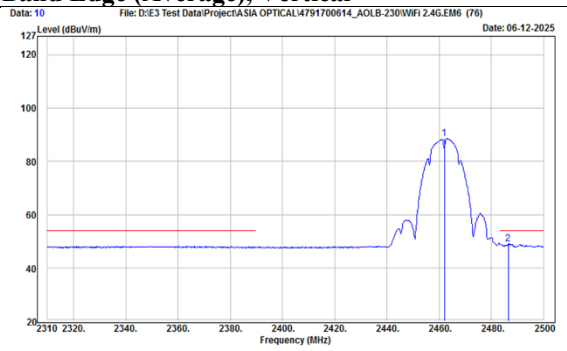
TX, 802.11b (Ch 11)
Radiated Spurious Emission, Vertical



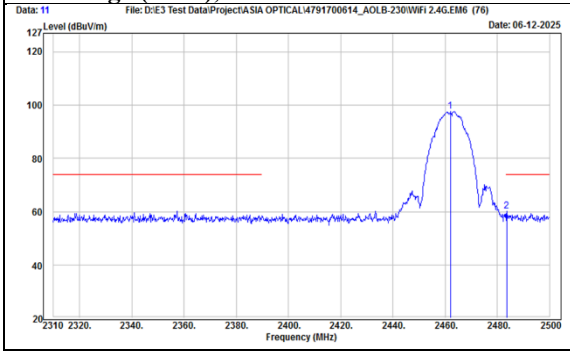
TX, 802.11b (Ch 11)
Band Edge (Average), Horizontal



TX, 802.11b (Ch 11)
Band Edge (Average), Vertical



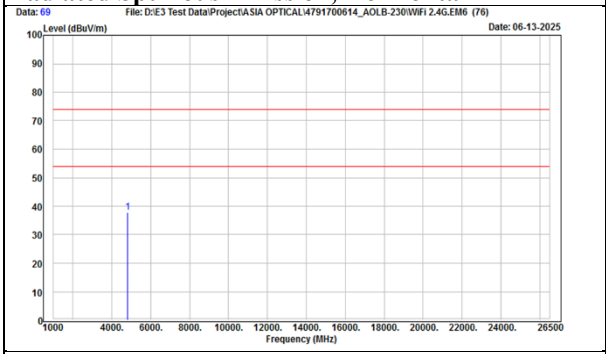
TX, 802.11b (Ch 11)
Band Edge (Peak), Horizontal



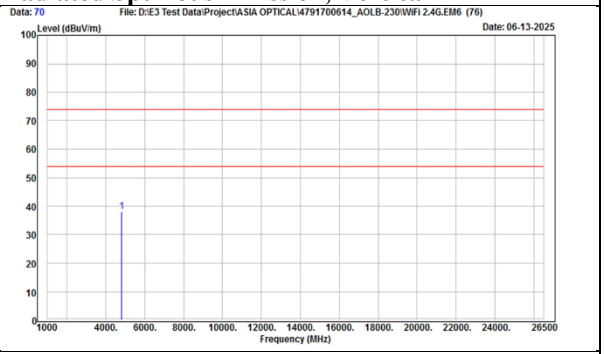
Mode	802.11g	Channel	1

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2389.61	45.78	19.17	64.95	74	-9.05	PK
		2389.99	34.01	19.17	53.18	54	-0.82	AVG
	@	2412	78.61	19.14	97.75	N/A	N/A	PK
	@	2412	70.39	19.14	89.53	N/A	N/A	AVG
	*	4824	35.2	2.63	37.83	74	-36.17	PK
Vertical		2379.54	40.39	19.23	59.62	74	-14.38	PK
		2389.99	29.65	19.17	48.82	54	-5.18	AVG
	@	2412	72.93	19.14	92.07	N/A	N/A	PK
	@	2412	64.12	19.14	83.26	N/A	N/A	AVG
	*	4824	35.49	2.63	38.12	74	-35.88	PK

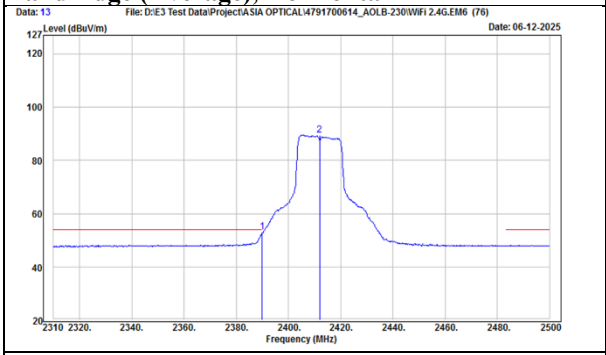
TX, 802.11g (Ch 1)
Radiated Spurious Emission, Horizontal



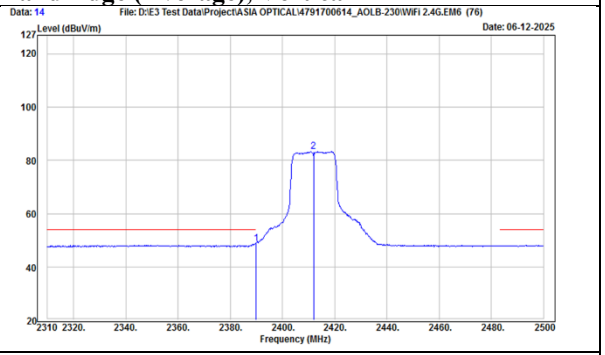
TX, 802.11g (Ch 1)
Radiated Spurious Emission, Vertical



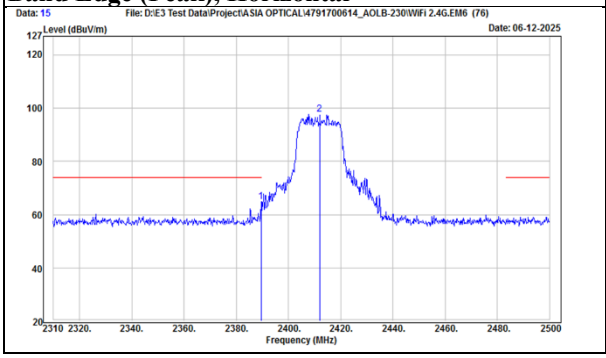
TX, 802.11g (Ch 1)
Band Edge (Average), Horizontal



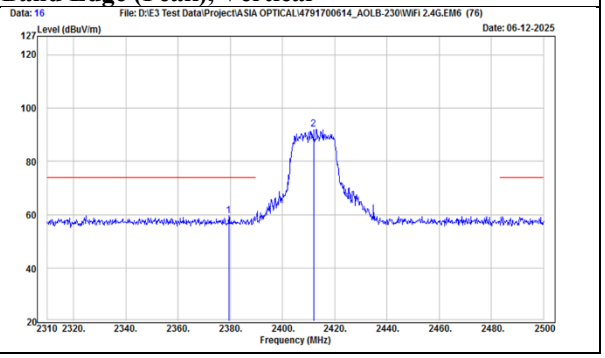
TX, 802.11g (Ch 1)
Band Edge (Average), Vertical



TX, 802.11g (Ch 1)
Band Edge (Peak), Horizontal

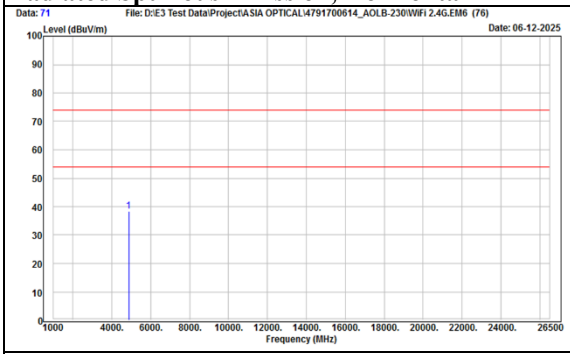
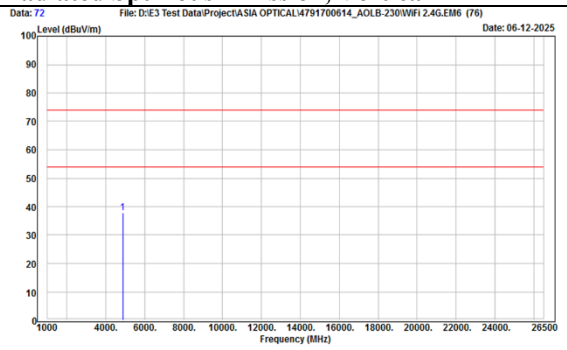
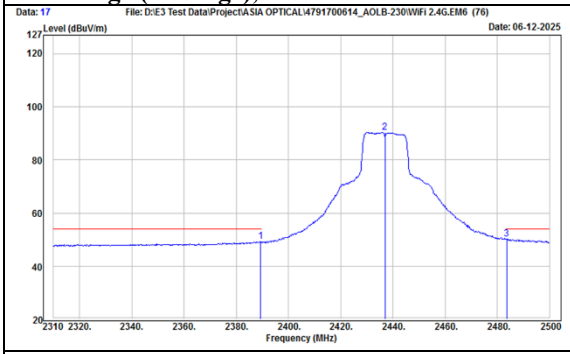
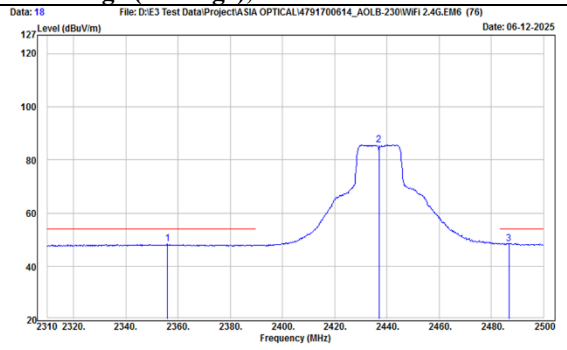


TX, 802.11g (Ch 1)
Band Edge (Peak), Vertical



Mode	802.11g	Channel	6

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2389.42	30.06	19.17	49.23	54	-4.77	AVG
		2389.61	41.83	19.17	61	74	-13	PK
	@	2437	79.79	19.18	98.97	N/A	N/A	PK
	@	2437	71.21	19.18	90.39	N/A	N/A	AVG
		2483.66	30.91	19.19	50.1	54	-3.9	AVG
		2487.84	41.23	19.19	60.42	74	-13.58	PK
	*	4874	35.81	2.66	38.47	74	-35.53	PK
Vertical		2338.12	39.99	19.38	59.37	74	-14.63	PK
		2355.98	28.93	19.37	48.3	54	-5.7	AVG
	@	2437	74.77	19.18	93.95	N/A	N/A	PK
	@	2437	66.52	19.18	85.7	N/A	N/A	AVG
		2486.7	29.32	19.19	48.51	54	-5.49	AVG
		2492.02	40.75	19.19	59.94	74	-14.06	PK
	*	4874	35.03	2.66	37.69	74	-36.31	PK

TX, 802.11g (Ch 6) **Radiated Spurious Emission, Horizontal**	**TX, 802.11g (Ch 6)** **Radiated Spurious Emission, Vertical**
	
TX, 802.11g (Ch 6) **Band Edge (Average), Horizontal**	**TX, 802.11g (Ch 6)** **Band Edge (Average), Vertical**
	
TX, 802.11g (Ch 6) **Band Edge (Peak), Horizontal**	**TX, 802.11g (Ch 6)** **Band Edge (Peak), Vertical**