FCC Test Report

Report No: WD-RF-R-230102-A0

Product Name	:	Projector
Model Name	:	X2
FCC ID	:	2BAIL-X70805
Applicant	:	UVISION INNOVATION CO., LTD
Received Date	:	Mar. 09, 2023
Tested Date	:	Mar. 13, 2023 ~ Apr. 20, 2023
Applicable Standard	:	47 CFR FCC Part 15, Subpart C (Section 15.247) KDB 558074 D01 DTS Meas. Guidance v05 ANSI C63.10 : 2013

Testing Laboratory
2965

Wendell Industrial Co., Ltd
Wendell EMC & RF Laboratory

Caution:
This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted.
The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment.
Please note that the measurement uncertainty are provided for informational purpose only and are not used in determining the Pass/Fail results.
This report must not be used to claim product endorsement by TAF or any agency of the government.
The test report shall not be reproduced without the written approval of Wendell Industrial Co., Ltd..

Test Report

Issued Date: April 20, 2023

Project No.: 23Q030901

Product Name	Projector
Trade Name	UVISION
Model Name	X2
FCC ID	2BAIL-X70805
Applicant	UVISION INNOVATION CO., LTD
Manufacturer	UVISION INNOVATION CO., LTD
EUT Rated Voltage	AC 120V / 60Hz
EUT Test Voltage	AC 120V / 60Hz
EUT Supports Radios Application	WLAN 802.11b/g WLAN 802.11n (HT20/HT40)
Applicable Standard	47 CFR FCC Part 15, Subpart C (Section 15.247) KDB 558074 D01 DTS Meas. Guidance v05 ANSI C63.10 : 2013
Output Power	18.32 dBm
Test Result	Complied

Documented : Emma Lu

(Specialist / Emma Lu)

Technical Engineer : Jack Chang

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Approved : Gary Wu

(Project Manager / Gary Wu)

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Attachment 2: EUT Detailed Photographs

Document Revision History

Report No.	Issue date	Description
WD-RF-R-230102-A0	April 20, 2023	Initial report

Summary of Test Result

Ref. Std. Clause	Test Items	Result
15.203 15.247(C)	Antenna Requirement	Pass
15.247(b)	Peak Output Power	Pass
15.247(a)(2)	6dB Bandwidth	Pass
15.247(e)	Power Spectral Density	Pass
15.247(d)	Conducted Band Edges and Conducted Spurious Emission	Pass
15.247(d)	Radiated Band Edges and Radiated Spurious Emission	Pass
15.207	AC Conducted Emission	Pass

1 Generation Information

1.1 Applicant

UVISION INNOVATION CO., LTD
4F., No. 17, Aly. 16, Ln. 125, Xinxing St., Luzhu Dist., Taoyuan City 338 , Taiwan (R.O.C.)

1.2 Manufacturer

UVISION INNOVATION CO., LTD
4F., No. 17, Aly. 16, Ln. 125, Xinxing St., Luzhu Dist., Taoyuan City 338 , Taiwan (R.O.C.)

1.3 Description of Equipment under Test

Product Name	Projector
Model No.	X2
FCC ID	2BAIL-X70805
Frequency Range	802.11b/g/n-20MHz: 2412~2462MHz 802.11n-40MHz: 2422~2452MHz
Number of Channels	802.11b/g/n-20MHz: 11, n-40MHz: 7
Data Rate	802.11b: 1-11Mbps, 802.11g: 6-54Mbps, 802.11n: up to 150Mbps
Channel separation	802.11b/g/n: 5 MHz
Type of Modulation	802.11b:DSSS (DBPSK, DQPSK, CCK) 802.11g/n:OFDM (BPSK, QPSK, 16QAM, 64QAM)
Antenna Information	Refer to the table “Antenna List”
EUT Supports Radios Application	WLAN 802.11b/g WLAN 802.11n (HT20/HT40)
EUT Rated Voltage	AC 120V / 60Hz
EUT Test Voltage	AC 120V / 60Hz

Antenna List

No.	Manufacturer	Model No.	Antenna Type	Peak Gain
1	Dongguan SongHui Co.,Ltd.	SL186P.300033.P01	Monopole antenna	2.88 dBi for 2.4GHz

Remark: The antenna of EUT is conforming to FCC 15.203

Channel List

802.11b/g/n HT20		802.11n HT40	
Channel	**Frequency(MHz)**	**Channel**	**Frequency(MHz)**
01	2412	--	--
02	2417	--	--
03	2422	03	2422
04	2427	04	2427
05	2432	05	2432
06	2437	06	2437
07	2442	07	2442
08	2447	08	2447
09	2452	09	2452
10	2457	--	--
11	2462	--	--

Test Frequencies in each operating band

Frequency range over which the device operates in each operating band (Note 1)	Number of test frequencies required	Location of test frequencies inside the operating frequency range (Note 1,2)
≤ 1 MHz	1	near center
> 1 MHz and ≤ 10 MHz	2	1 near high end, 1 near low end
> 10 MHz	3	1 near high end, 1 near center, and 1 near low end

Note 1: The frequency range over which the device operates in a given operating band is the difference between the highest and lowest frequencies on which the device can be tuned within that given operating band. The frequency range can be smaller than or equal to the operating band, but cannot be greater than the operating band.

Note 2: In the third column of table 1, “near” means as close as possible to or at the center / low end / high end of the frequency range over which the device operates.

Firmware / Software Version

1	**Product Name**	Projector
2	**Model No.**	X2
3	**Test SW Version**	REALTEK 11n 8188FU USB WLAN MP 1.25.20170609
4	**RF power setting in TEST SW**	☐ RF power setting was not able to alter during testing. ☒ RF power setting was able to alter during testing. (See the following table)

Parameters of test software setting

Type of Modulation	Channel	Frequency (MHz)	Set Value
802.11b	01	2412	35
	06	2437	34
	11	2462	29
802.11g	01	2412	45
	06	2437	45
	11	2462	45
802.11n HT20	01	2412	43
	06	2437	43
	11	2462	43
802.11n HT40	03	2422	42
	06	2437	42
	09	2452	40

1.4 Test Mode Applicability And Tested Channel Detail

1. This device is a Projector with a built-in Wi-Fi transceiver.
2. These tests were performed on a sample of equipment to demonstrate compliance with 47 CFR FCC Part 15, Subpart C (Section 15.247).
3. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports.
4. The worst case was found when positioned on X axis for radiated emission. Following test modes were selected for the final test, and the final worst case is recorded in the report:

EUT Configure Mode	RE < 1G	RE ≥ 1G	ACM	ACP	Description
--	☒	☒	☒	☐	Transmit WIFI
--	☐	☐	☐	☒	Normal Mode

Note : RE<1G: Radiated Emission below 1GHz RE≥1G: Radiated Emission above 1GHz
ACM: Antenna Port Conducted Measurement ACP: AC Power Line Conducted Emission

Following channel(s) was (were) selected for the final test as listed below:

Radiated Spurious Emission Measurement(Below 1GHz):

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
--	802.11g	1 ~ 11	06	DSSS	1

Radiated Spurious Emission Measurement(Above 1GHz):

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
--	802.11b	1 ~ 11	01, 06, 11	DSSS	1
--	802.11g	1 ~ 11	01, 06, 11	OFDM	6
--	802.11n HT20	1 ~ 11	01, 06, 11	OFDM	6.5
--	802.11n HT40	3 ~ 9	03, 06, 09	OFDM	13.5

Radiated Band Edge Emission Measurement(Above 1GHz):

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
--	802.11b	1 ~ 11	01, 11	DSSS	1
--	802.11g	1 ~ 11	01, 11	OFDM	6
--	802.11n HT20	1 ~ 11	01, 11	OFDM	6.5
--	802.11n HT40	3 ~ 9	03, 09	OFDM	13.5

Peak Output Power, 6dB Bandwidth, Power Spectral Density, Conducted Spurious Emission:

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
--	802.11b	1 ~ 11	01, 06, 11	DSSS	1
--	802.11g	1 ~ 11	01, 06, 11	OFDM	6
--	802.11n HT20	1 ~ 11	01, 06, 11	OFDM	6.5
--	802.11n HT40	3 ~ 9	03, 06, 09	OFDM	13.5

Conducted Band Edges:

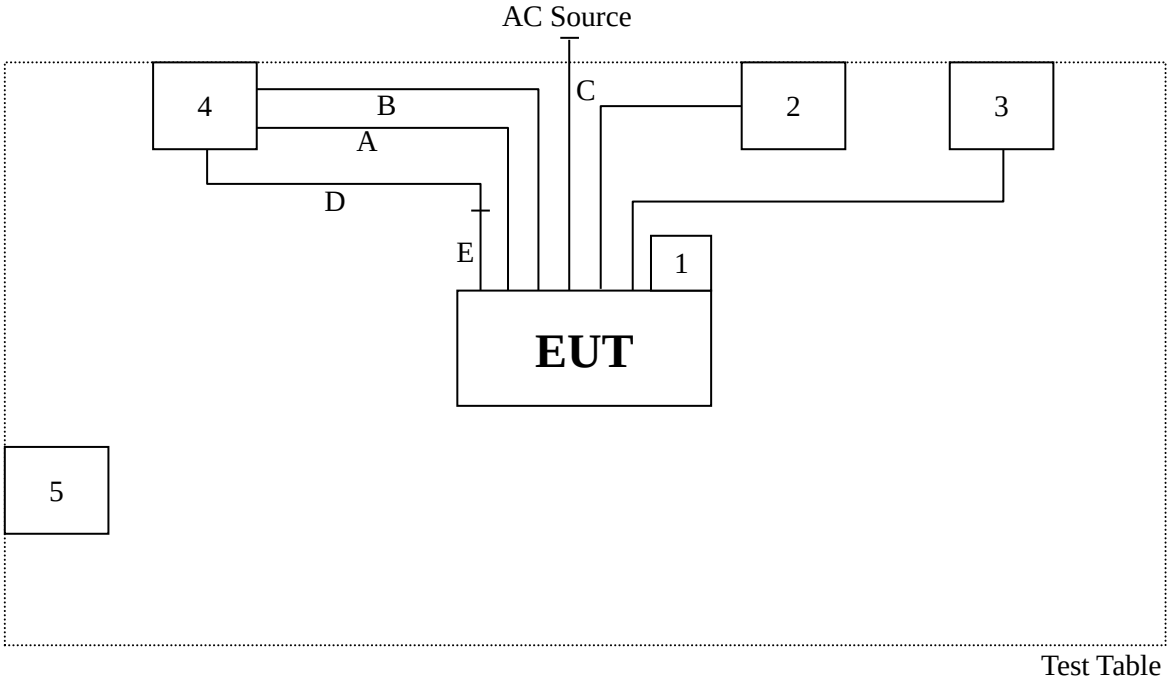
EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
--	802.11b	1 ~ 11	01, 11	DSSS	1
--	802.11g	1 ~ 11	01, 11	OFDM	6
--	802.11n HT20	1 ~ 11	01, 11	OFDM	6.5
--	802.11n HT40	3 ~ 9	03, 09	OFDM	13.5

AC Conducted Emission:

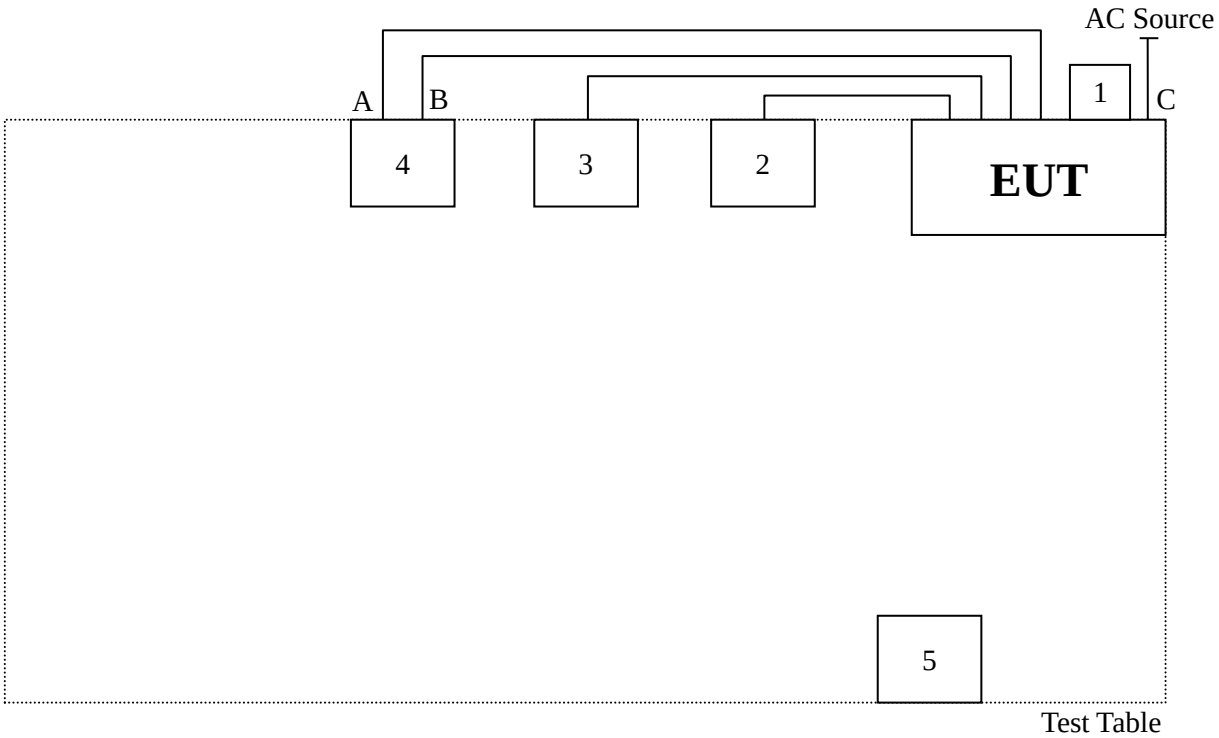
EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
--	802.11b	1 ~ 11	06	DSSS	1

1.5 Configuration of Tested System

Radiation



AC Conduction



1.6 EUT Exercise Software

1. Setup the EUT as shown in Section 1.5
2. Execute software “REALTEK 11n 8188FU USB WLAN MP 1.25.20170609”.
3. Configure the test mode, the test channel, and the data rate.
4. Press “OK” to start the continuous transmit.
5. Verify that the EUT works properly.

1.7 Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

No.	Product	Manufacturer	Model No.	Serial No.	Power Cord
1	Flash drive	SanDisk	SDCZ50-008G	N/A	N/A
2	Earphone & Microphone	WD	EarMic-01	N/A	Non-shielded, Non-Core, 1m
3	USB Mouse	Lemel	M83	201707K31002387	Non-shielded, Non-Core, 1.5m
4	Notebook PC	acer	N16Q1	NXVF4TA023742254147600	N/A
5	Remote Control	UVISION	X2RC	N/A	N/A

No.	Signal Cable Type	Signal cable Description
A	3.5mm Audio Cable	Non-shielded, 2 Core, 1.5m
B	HDMI Cable	Shielded, Non-Core, 1.2m
C	Power Cable	Non-shielded, Non-Core, 1.8m
D	Data Cable	Non-shielded, Non-Core, 0.3m
E	Data Cable	Non-shielded, Non-Core, 0.05m

1.8 Test Facility

Items	Required (IEC 60068-1)
Temperature (°C)	15-35
Humidity (% RH)	25-75
Barometric pressure (mbar)	860-1060

Description: Accredited by TAF
Accredited Number: 2965

Issued by: Wendell Industrial Co., Ltd

Lab Address: 6F/6F-1, No.188, Baoqiao Rd., Xindian Dist.,
New Taipei City 23145, Taiwan R.O.C

Test Lab: Wendell EMC & RF Laboratory

Test Location: No. 119, Wugong 3rd Rd., Wugu Dist.,
New Taipei City 248, Taiwan (R.O.C.)

Designation Number: TW0025

Test Firm Registration Number: 665221

1.9 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence (level based on a coverage factor K=2)

Measurement Project	Condition	Expended Uncertainty
AC Conducted Emission	0.150 ~ 30 MHz	± 2.64 dB
Radiated Emission	0.009 ~ 30 MHz	± 3.7 dB
	30 ~ 1000 MHz	± 3.9 dB
	1000 ~ 18000 MHz	± 4.5 dB
	18000 ~ 40000 MHz	± 4.3 dB
RF Power, Conducted	Conducted Measuring	± 0.75 dB
Occupied Bandwidth	Conducted Measuring	± 2.4 %
Power Density	Conducted Measuring	± 1.2 dB
Duty Cycle and Dwell Time	Conducted Measuring	± 0.9 %
Conducted Unwanted Emission Strength	Conducted Measuring	± 1.4 dB
DC Power Supply	--	± 2.0 %
Temperature	--	± 0.55 °C
Humidity	--	± 3.1 %

Note: Please note that the measurement uncertainty are provided for informational purpose only and are not used in determining the Pass/Fail results.

1.10 List of Test Equipment

For Conducted measurements / W08-Conducted Measurement

Equipment		Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
✓	Spectrum analyzer	Keysight	N9010A	SG50420005	2022/08/01	2023/07/31
✓	Wideband Peak Power Meter	Anritsu	ML2495A	1733007	2022/09/06	2023/09/05
✓	Pulse Power Sensor + Precision Adaptor	Anritsu	MA2411B	1726022	2022/09/06	2023/09/05
	Temperature Chamber	TAICHY	MHK-225LK	1061121	2022/04/22	2023/04/21
	Wireless Connectivity Tester	R&S	CMW270	101307	2022/05/23	2023/05/22
✓	Attenuator	MVE	MVE2211-10	CT-9-056	2022/08/10	2023/08/09
	Attenuator	MVE	MVE2211-20	CT-9-057	2022/08/10	2023/08/09
	Attenuator	MVE	MVE2211-30	CT-9-058	2022/08/10	2023/08/09
	Power Divider	MVE	MVE8546	170826003	2022/08/10	2023/08/09
	Power Splitter	MVE	MVE8547	170302047	2022/08/11	2023/08/10
	DC Power Supply	GW INSTEK	GPC-3060D	GER817636	2022/08/09	2023/08/08

Remark:

1. All equipments are calibrated every one year.
2. The test instruments marked with "✓" are used to measure the final test results.

For AC Conduction measurements / W08-CE

Equipment		Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
✓	EMI Test Receiver	R&S	ESR3	102309	2022/6/15	2023/6/14
✓	2-Line V-Network LISN	R&S	ENV216	101185	2022/6/20	2023/6/19
✓	LISN	SCHWARZBECK	NSLK 8127RC	05028	2022/6/20	2023/6/19
✓	Transient Limiter	EM Electronics Corporation	EM-7600	857	2022/6/20	2023/6/19
✓	50ohm Cable	EMCI	EMCCFD300-BM-BM-5000	170612	2022/6/17	2023/6/16
✓	50 ohm terminal impedance	HUBER+SUHNER	50 ohm terminal impedance	CT-1-109-1	2022/6/17	2023/6/16

Remark:

1. All equipments are calibrated every one year.
2. The test instruments marked with "✓" are used to measure the final test results.
3. Test Software version: FARAD EZ-EMC Ver.EMC-CON 3A1

For Radiated measurements / W08-996-2

Equipment		Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
✓	EMI Receiver	Keysight	N9038A	MY51210173	2022/08/17	2023/08/16
✓	Spectrum Analyzer	Keysight	N9010A	MY52220228	2022/08/16	2023/08/15
✓	Loop Antenna	EMCI	LPA600	277	2022/08/22	2023/08/21
✓	TRILOG super broad Antenna	Schwarzbeck	VULB 9168	VULB 9168-700 & 20E03	2022/08/12	2023/08/11
✓	Horn Antenna	Schwarzbeck	BBHA 9120D	01767	2022/08/24	2023/08/23
✓	Horn Antenna	Schwarzbeck	BBHA 9170	703	2022/08/29	2023/08/28
✓	Pre-Amplifier	EM	EMC330	060774	2022/08/17	2023/08/16
✓	Pre-Amplifier	EMEC	EM01G18G	060648	2022/08/18	2023/08/17
✓	Pre-Amplifier	JPT	JPA0118-55-303K	1910001800055003	2022/08/18	2023/08/17
✓	Pre-Amplifier	EMCI	EMC184045SE	980515	2022/08/18	2023/08/17
✓	Cable	EMEC	EM-CB400	105060103	2022/08/18	2023/08/17
✓	Cable	EMEC	EM-CB400	105060102	2022/08/18	2023/08/17
✓	Cable	EMEC	EM-CB400	105060101	2022/08/18	2023/08/17
✓	RF Cable	HUBER+SUHNER	SF102	MY2752/2	2022/08/17	2023/08/16
✓	RF Cable	MVE	280280.LL266.1200	B60028C	2022/08/17	2023/08/16
✓	RF Cable	EMCI	EMC102-KM-KM-600	190646	2022/08/17	2023/08/16
✓	RF Cable	MVE	140140.LL404.700	B90014C	2022/07/28	2023/07/27
✓	RF Cable	MVE	140140.LL404.300	B90006C	2022/08/17	2023/08/16
✓	RF Filter	EMEC	BRF-2400-2500	002	2022/08/17	2023/08/16
	RF Filter	EMEC	BRF-5150-5350	104	2022/08/17	2023/08/16
	RF Filter	EMEC	BRF-5470-5725	092	2022/08/17	2023/08/16
	RF Filter	EMEC	BRF-5725-5875	091	2022/08/17	2023/08/16
✓	RF Filter	EMEC	HPF-2800	002	2022/08/17	2023/08/16
	RF Filter	EMEC	HPF-5850	059	2022/08/17	2023/08/16
	SMA Notch Filter	MVE	MFN-902.928.S1	190604001	2022/08/17	2023/08/16

Remark:

1. All equipments are calibrated every one year.

2. The test instruments marked with "✓" are used to measure the final test results.
3. Test Software version: FARAD EZ-EMC Ver.WD-03A1-1

2 Test Result

2.1 Antenna Requirement

2.1.1 Applicable Standard

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

An intentional radiator shall be designed to ensure that no antenna other than as furnished by the responsible party shall be used with the device. If transmitting antennas of directional gain greater than 6dBi are using the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi, for compliance to FCC 47CFR 15.247 (c) requirements.

2.1.2 Antenna Connected Construction

Non-standard antenna connector is used.

2.1.3 Antenna Gain

No.	Manufacturer	Model No.	Antenna Type	Peak Gain
1	Dongguan SongHui Co.,Ltd.	SL186P.300033.P01	Monopole antenna	2.88 dBi for 2.4GHz

Description of the operating transmit modes：

∗ 802.11b：Only one Antenna mode, this port is Ant-1

∗ 802.11g：Only one Antenna mode, this port is Ant-1

∗ 802.11n_HT20：Only one Antenna mode, this port is Ant-1

∗ 802.11n_HT40：Only one Antenna mode, this port is Ant-1

Directional gain calculation & Conducted Output Power limit after correction：

∗802.11b：Gain = 2.88 dBi ≤ 6dBi；

∗802.11g：Gain = 2.88 dBi ≤ 6dBi；

∗802.11n_HT20：Gain = 2.88 dBi ≤ 6dBi；

∗802.11n_HT40：Gain = 2.88 dBi ≤ 6dBi；

Directional gain calculation & Power Spectral Density limit after correction：

∗802.11b：Gain = 2.88 dBi ≤ 6dBi；

∗802.11g：Gain = 2.88 dBi ≤ 6dBi；

∗802.11n_HT20：Gain = 2.88 dBi ≤ 6dBi；

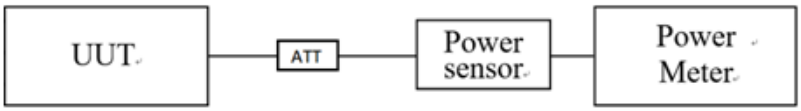
∗802.11n_HT40：Gain = 2.88 dBi ≤ 6dBi；

2.2 Peak Output Power Measurement

2.2.1 Limit

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 1W. If transmitting antenna of directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

2.2.2 Test Setup



2.2.3 Test Procedure

1. Reference ANSI C63.10 : 2013 chapter 11.9.1.3
2. Enable the EUT transmit continuously.
3. Let EUT be connected to the power meter, and record the max. reading.
4. Measurement using a gated RF average power meter, since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.

2.2.4 Test Result

Mode	Frequency (MHz)	Peak power (dBm)			Limit (dBm)	Result
		Chain A	Chain B	Total		
802.11b	2412	11.48	--	--	≤ 30	Pass
	2437	12.03	--	--	≤ 30	Pass
	2462	11.03	--	--	≤ 30	Pass
802.11g	2412	18.03	--	--	≤ 30	Pass
	2437	18.32	--	--	≤ 30	Pass
	2462	18.19	--	--	≤ 30	Pass
802.11n HT20	2412	17.34	--	--	≤ 30	Pass
	2437	17.42	--	--	≤ 30	Pass
	2462	17.26	--	--	≤ 30	Pass
802.11n HT40	2422	17.32	--	--	≤ 30	Pass
	2437	17.42	--	--	≤ 30	Pass
	2452	15.48	--	--	≤ 30	Pass

Remark:

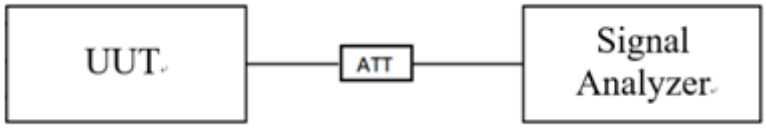
1. Peak Power = Reading value on power meter + cable loss
2. 10 Log(X/mW) = dBm, X=1 watt (Limit)
   1 watt = 30 dBm

2.3 6dB Bandwidth Measurement

2.3.1 Limit

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

2.3.2 Test Setup



2.3.3 Test Procedure

1. Reference ANSI C63.10 : 2013 chapter 11.8.2
2. Enable the EUT transmit continuously.
3. Spectrum analyzer set:
   a) RBW = 100 kHz
   b) VBW ≥ 3 RBW
   c) Detector = peak
   d) Sweep time = auto couple
   e) Trace mode = max hold.

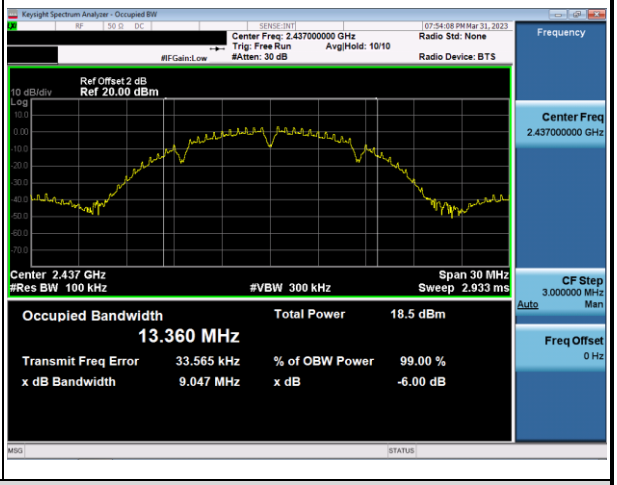
2.3.4 Test Result

802.11b

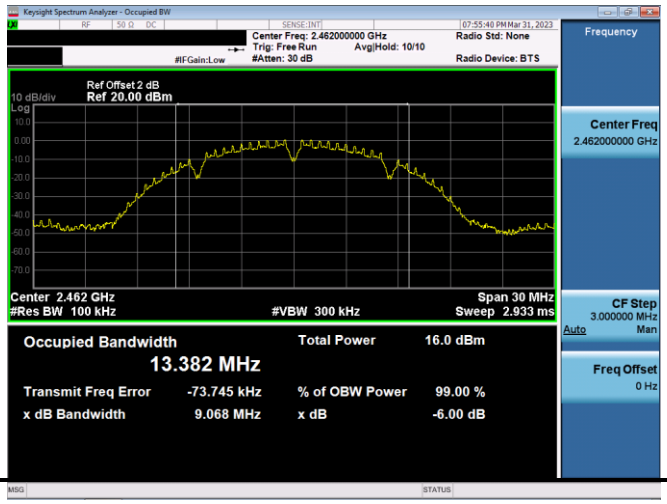
Frequency (MHz)	6dB BW (kHz)		Limit (kHz)	Result
	Chain A	Chain B		
2412	9059	--	≥ 500	Pass
2437	9047	--	≥ 500	Pass
2462	9068	--	≥ 500	Pass

WLAN 802.11b (2412 MHz)

WLAN 802.11b (2437 MHz)



WLAN 802.11b (2462 MHz)



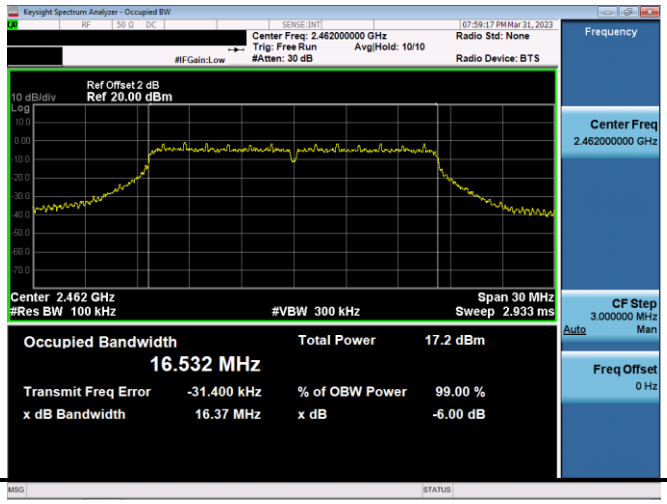
802.11g

Frequency (MHz)	6dB BW (kHz)		Limit (kHz)	Result
	Chain A	Chain B		
2412	16360	--	≥ 500	Pass
2437	16380	--	≥ 500	Pass
2462	16370	--	≥ 500	Pass

WLAN 802.11g (2412 MHz)

WLAN 802.11g (2437 MHz)

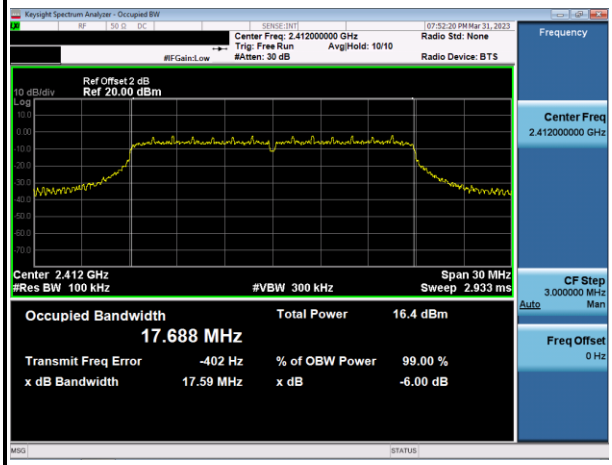
WLAN 802.11g (2462 MHz)



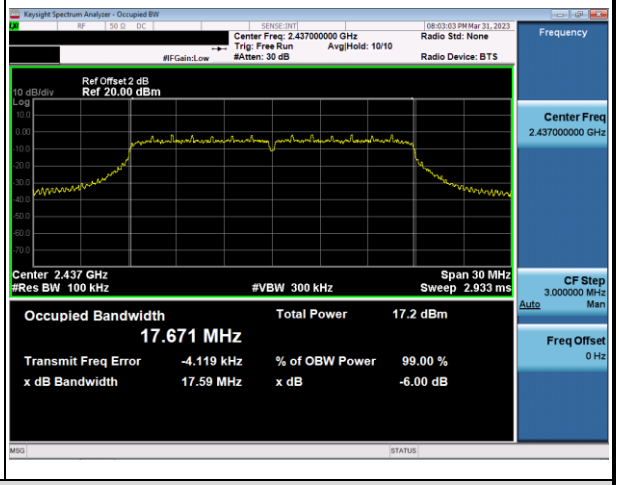
802.11n HT20

Frequency (MHz)	6dB BW (kHz)		Limit (kHz)	Result
	Chain A	Chain B		
2412	17590	--	≥ 500	Pass
2437	17590	--	≥ 500	Pass
2462	17570	--	≥ 500	Pass

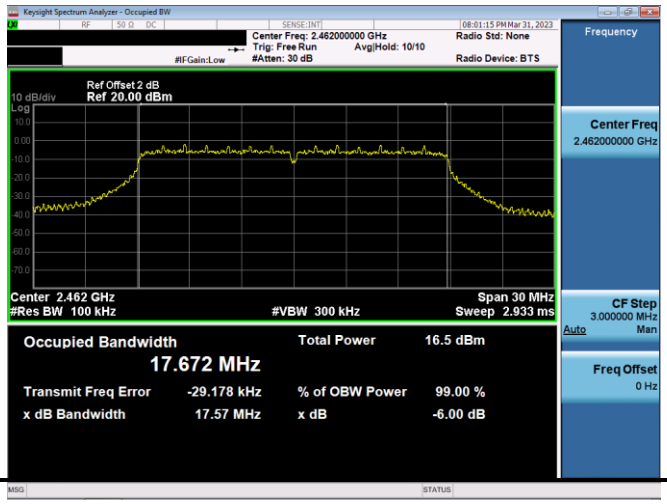
WLAN 802.11n HT20 (2412 MHz)



WLAN 802.11n HT20 (2437 MHz)



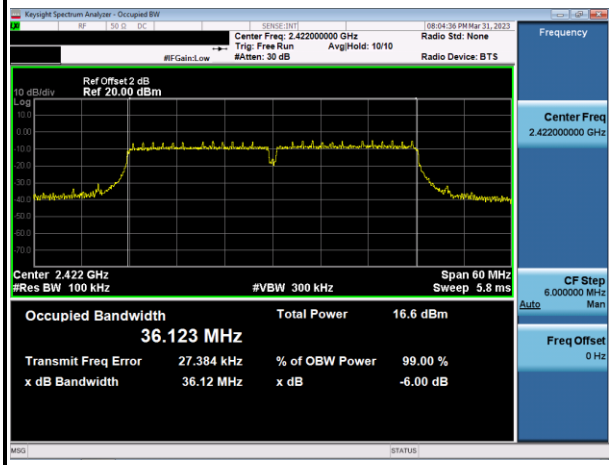
WLAN 802.11n HT20 (2462 MHz)



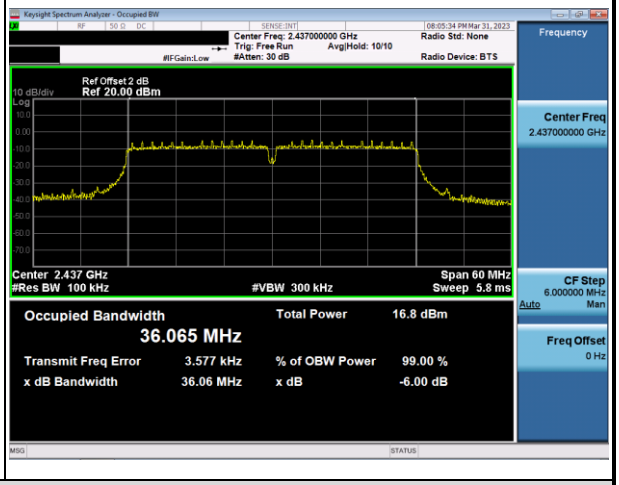
802.11n HT40

Frequency (MHz)	6dB BW (kHz)		Limit (kHz)	Result
	Chain A	Chain B		
2422	36120	--	≥ 500	Pass
2437	36060	--	≥ 500	Pass
2452	36080	--	≥ 500	Pass

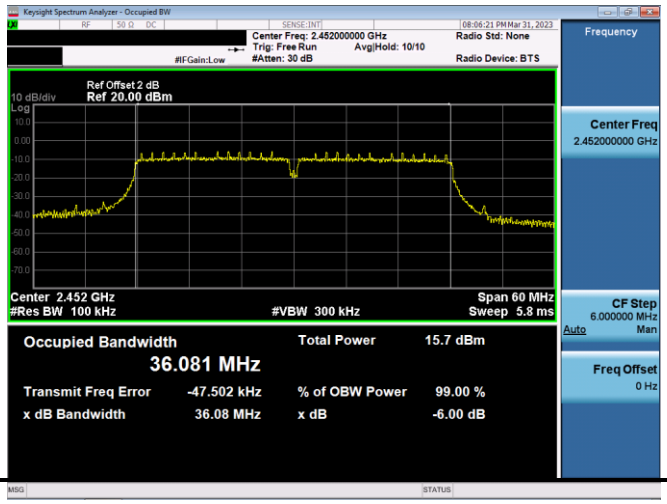
WLAN 802.11n HT40 (2422 MHz)



WLAN 802.11n HT40 (2437 MHz)



WLAN 802.11n HT40 (2452 MHz)

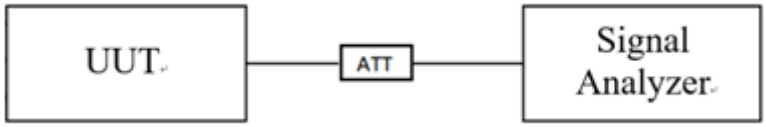


2.4 Power Spectral Density Measurement

2.4.1 Limit

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

2.4.2 Test Setup



2.4.3 Test Procedure

1. Reference ANSI C63.10 : 2013 chapter 11.10.2
2. Enable the EUT transmit continuously.
3. Spectrum analyzer set:
   a) RBW = 3 kHz ~ 100 kHz
   b) VBW ≥ 3 RBW
   c) Span = 1.5 times DTS Channel 6dB Bandwidth
   d) Detector = peak
   e) Sweep time = auto couple
   f) Trace mode = max hold.

2.4.4 Test Result

802.11b

Frequency (MHz)	Power Spectral Density (dBm)			Limit (dBm)	Result
	Chain A	Chain B	Total		
2412	-9.573	--	--	≤ 8	Pass
2437	-9.357	--	--	≤ 8	Pass
2462	-11.660	--	--	≤ 8	Pass

Remark: PSD = Reading value on spectrum analyzer + cable loss

WLAN 802.11b (2412 MHz)

WLAN 802.11b (2437 MHz)

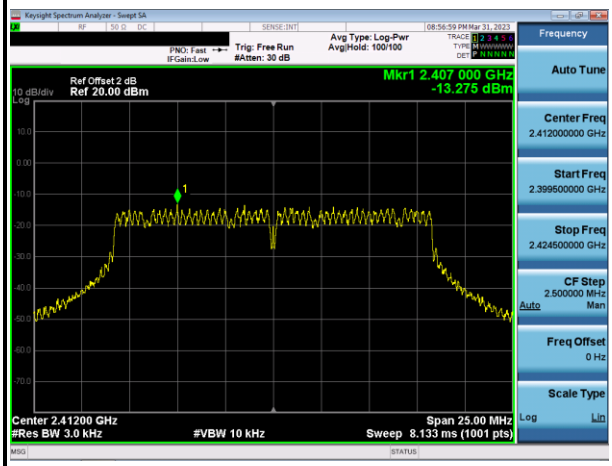
WLAN 802.11b (2462 MHz)

802.11g

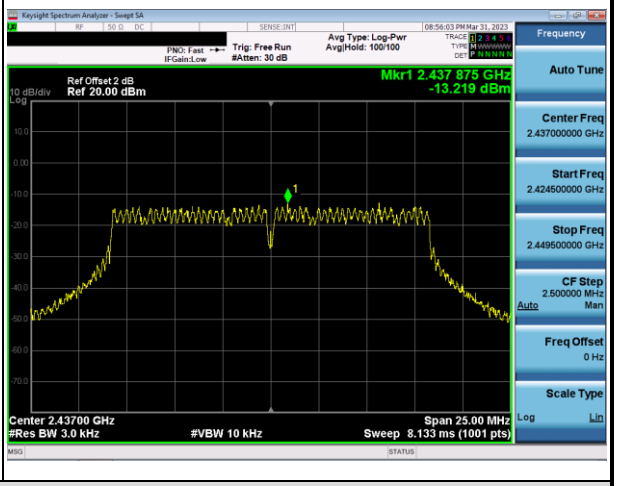
Frequency (MHz)	Power Spectral Density (dBm)			Limit (dBm)	Result
	Chain A	Chain B	Total		
2412	-13.275	--	--	≤ 8	Pass
2437	-13.219	--	--	≤ 8	Pass
2462	-13.133	--	--	≤ 8	Pass

Remark: PSD = Reading value on spectrum analyzer + cable loss

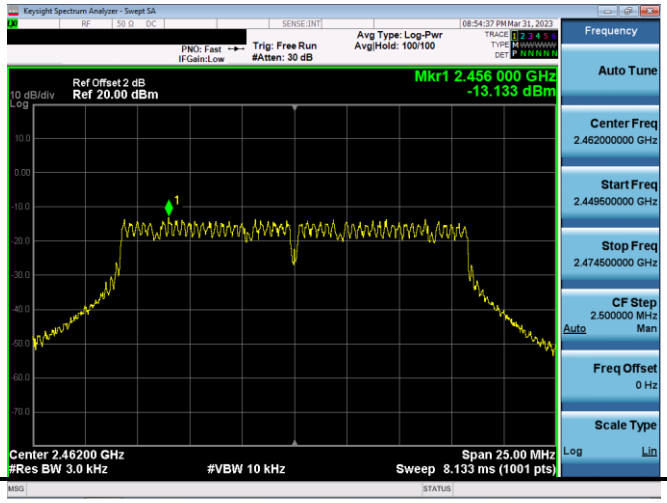
WLAN 802.11g (2412 MHz)



WLAN 802.11g (2437 MHz)



WLAN 802.11g (2462 MHz)

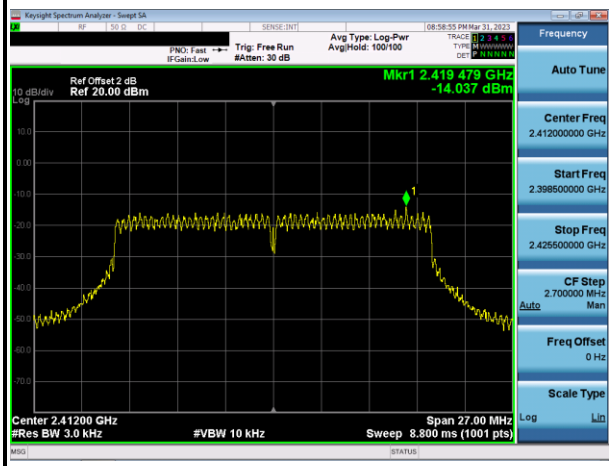


802.11n HT20

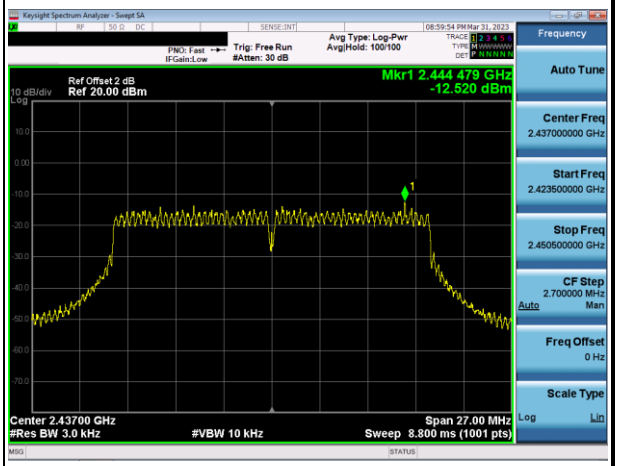
Frequency (MHz)	Power Spectral Density (dBm)			Limit (dBm)	Result
	Chain A	Chain B	Total		
2412	-14.037	--	--	≤ 8	Pass
2437	-12.520	--	--	≤ 8	Pass
2462	-14.019	--	--	≤ 8	Pass

Remark: PSD = Reading value on spectrum analyzer + cable loss

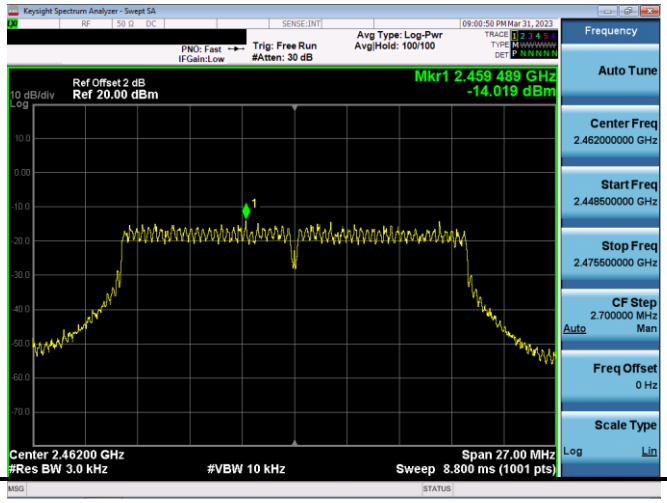
WLAN 802.11n HT20 (2412 MHz)



WLAN 802.11n HT20 (2437 MHz)



WLAN 802.11n HT20 (2462 MHz)

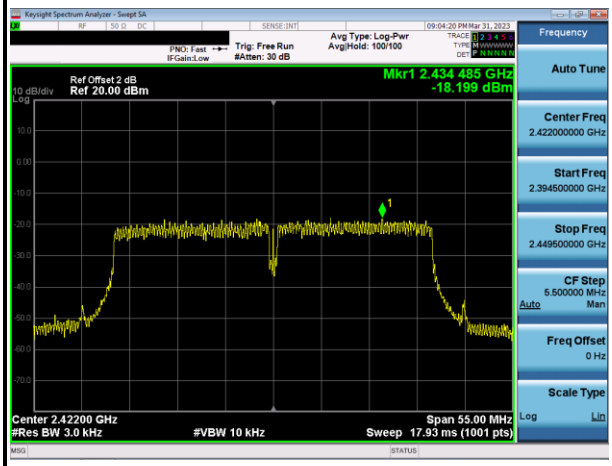


802.11n HT40

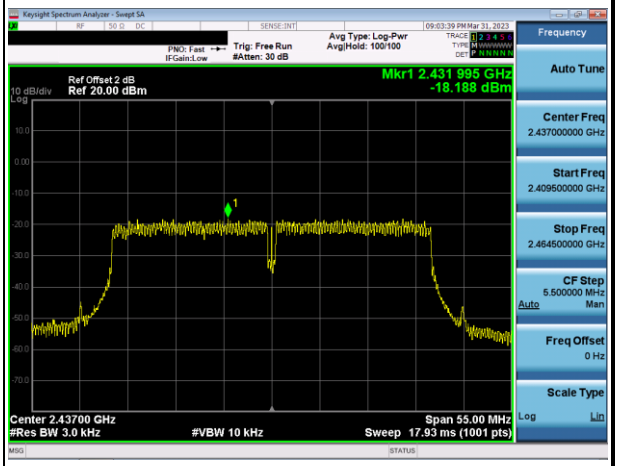
Frequency (MHz)	Power Spectral Density (dBm)			Limit (dBm)	Result
	Chain A	Chain B	Total		
2422	-18.199	--	--	≤ 8	Pass
2437	-18.188	--	--	≤ 8	Pass
2452	-17.994	--	--	≤ 8	Pass

Remark: PSD = Reading value on spectrum analyzer + cable loss

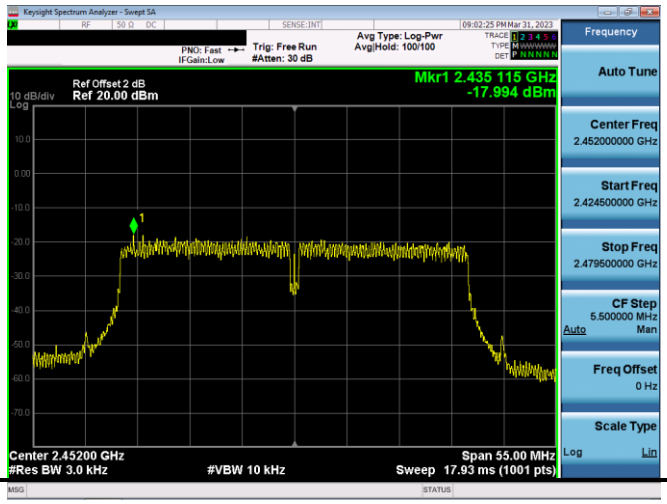
WLAN 802.11n HT40 (2422 MHz)



WLAN 802.11n HT40 (2437 MHz)



WLAN 802.11n HT40 (2452 MHz)

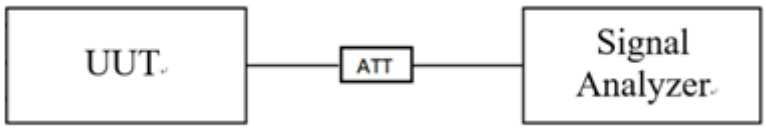


2.5 Conducted Band Edges and Spurious Emission Measurement

2.5.1 Limit

In any 100 KHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in must also comply with the radiated emission limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB

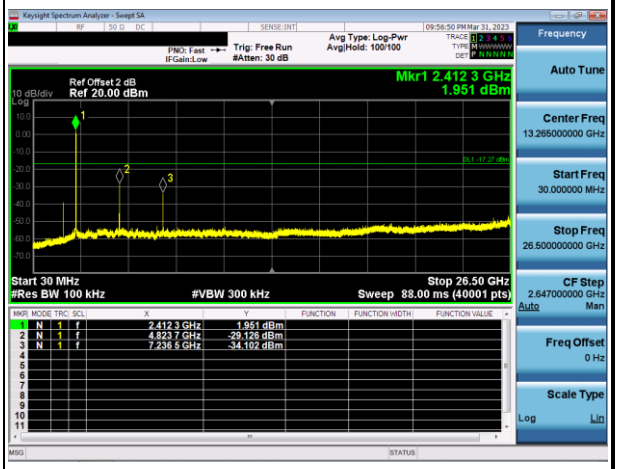
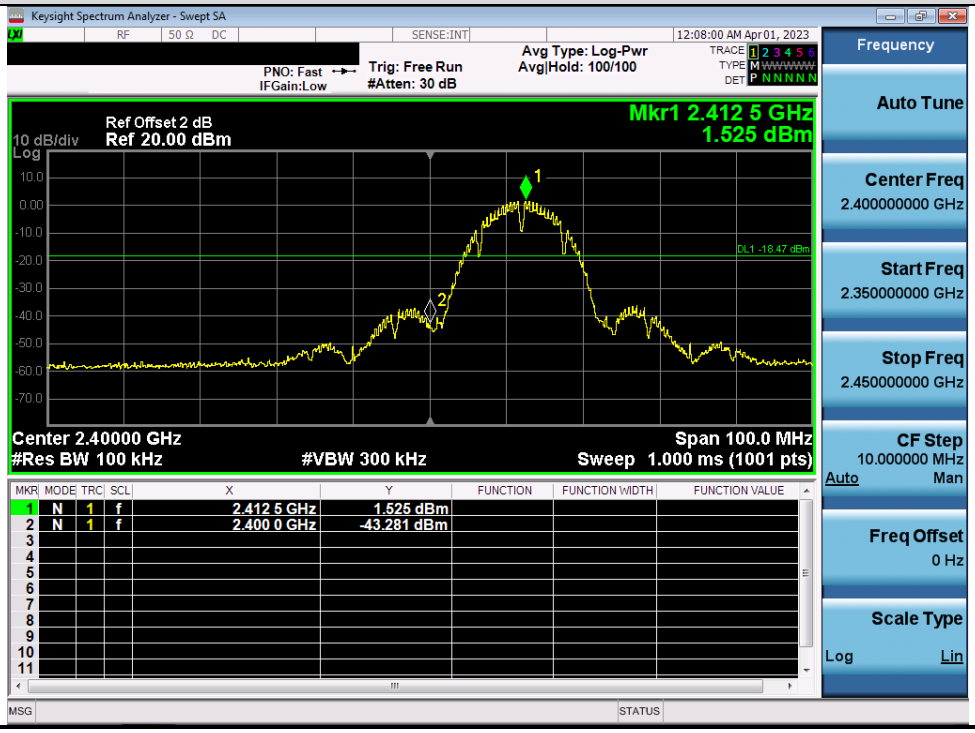
2.5.2 Test Setup

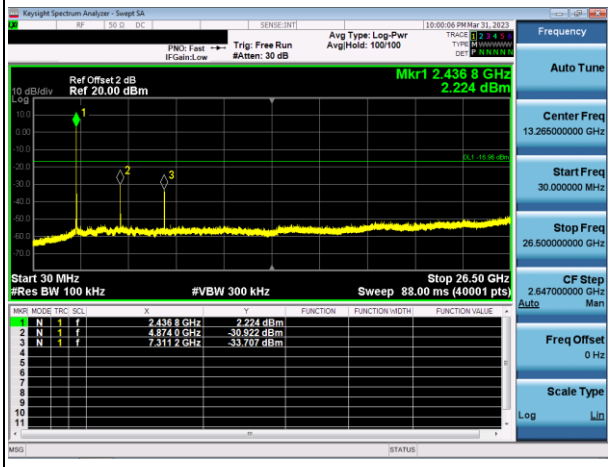


2.5.3 Test Procedure

1. Reference ANSI C63.10 : 2013 chapter 6.10
2. Enable the EUT transmit continuously.
3. Spectrum analyzer set :
   a) RBW = 100 kHz
   b) VBW ≥ 3 RBW
   c) Detector = peak
   d) Sweep time = auto couple
   e) Trace mode = max hold.

2.5.4 Test Result

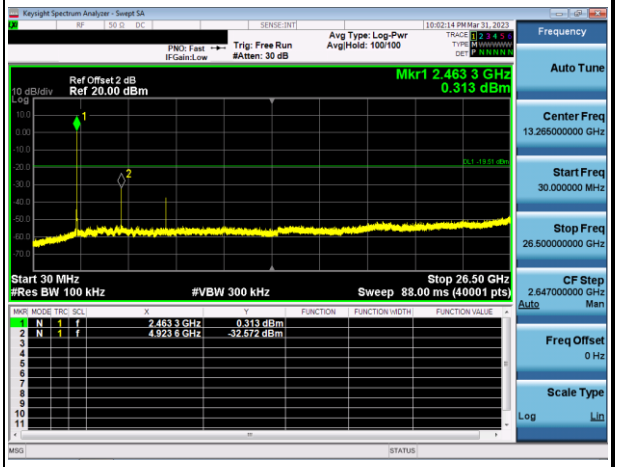
WLAN 802.11b channel 01 (2412 MHz)	
Reference Level	**Spurious Emission**
	
Band Edge	
	

WLAN 802.11b channel 06 (2437 MHz)	
Reference Level	**Spurious Emission**
	

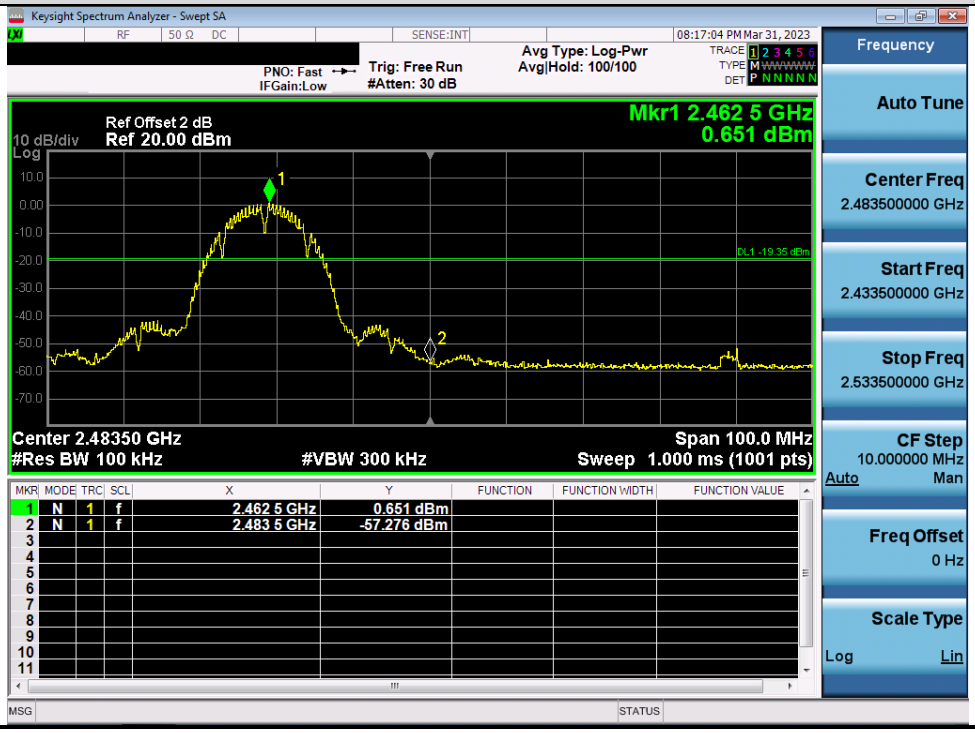
WLAN 802.11b channel 11 (2462MHz)

Reference Level

Spurious Emission

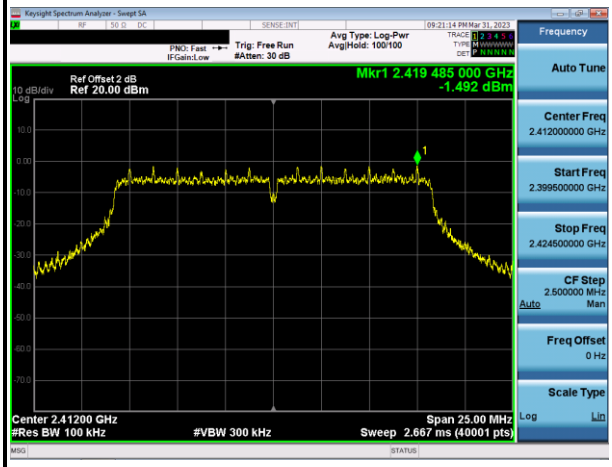


Band Edge

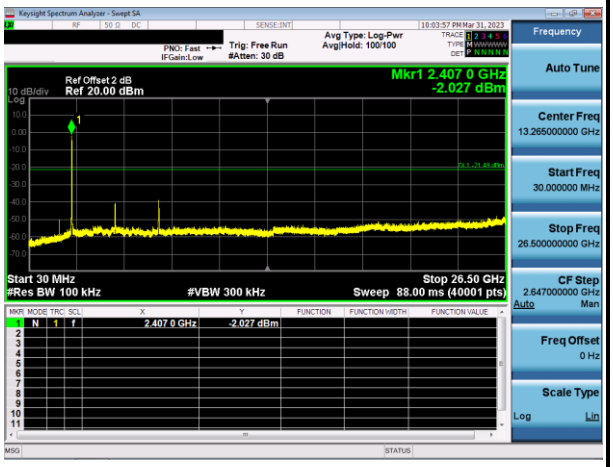


WLAN 802.11g channel 01 (2412 MHz)

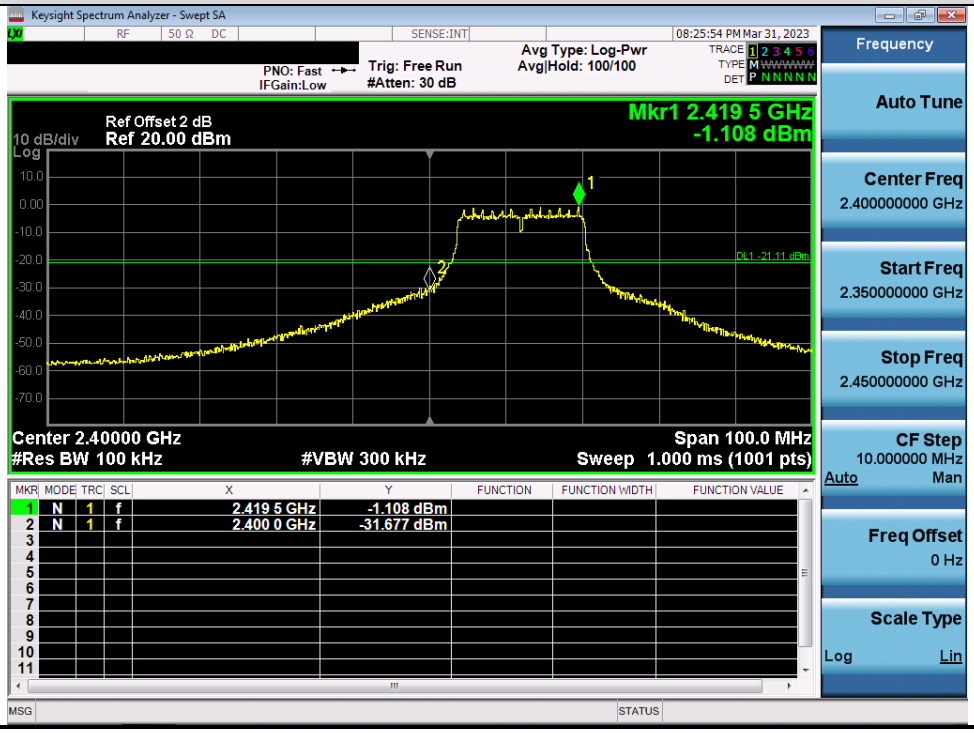
Reference Level

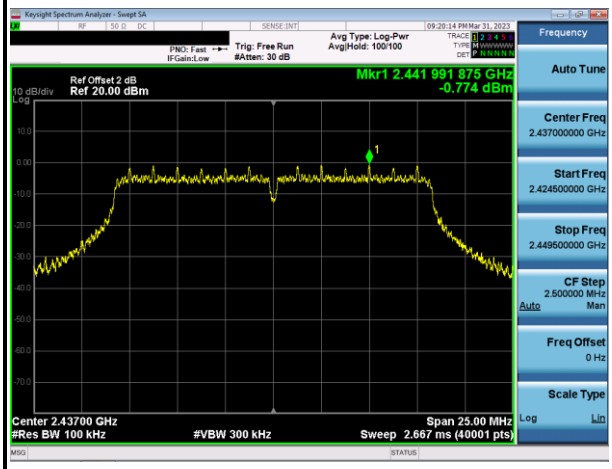
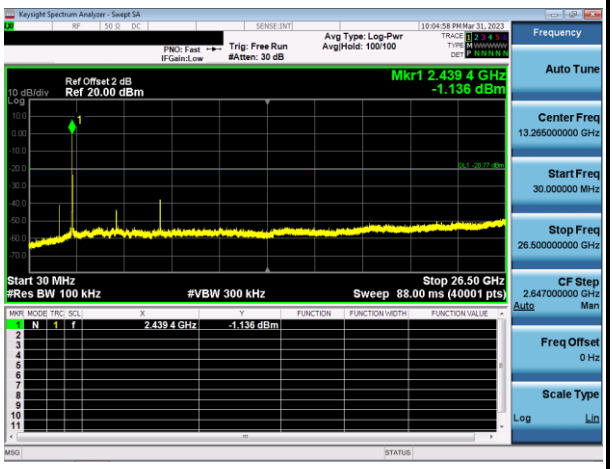


Spurious Emission



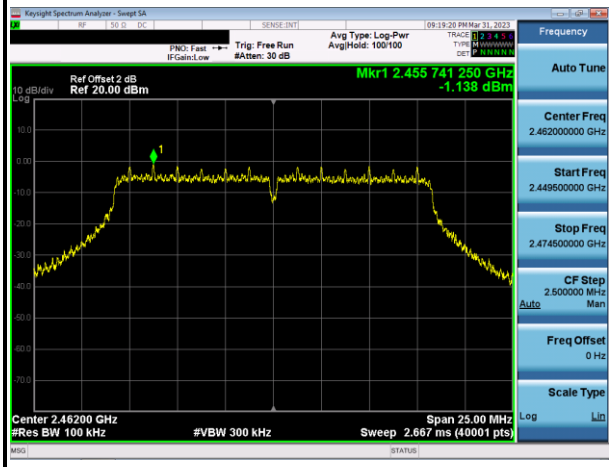
Band Edge



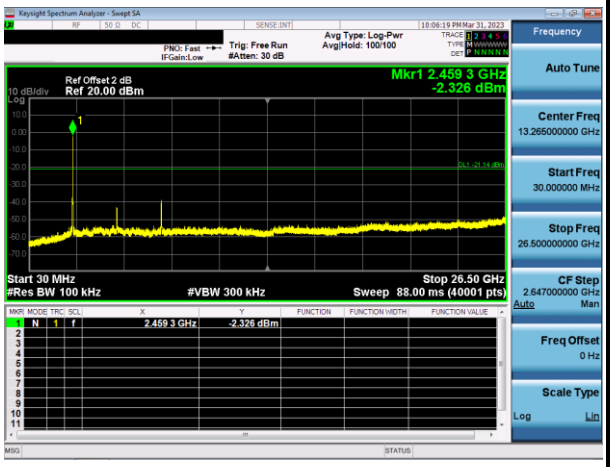
WLAN 802.11g channel 06 (2437 MHz)	
Reference Level	**Spurious Emission**
	

WLAN 802.11g channel 11 (2462MHz)

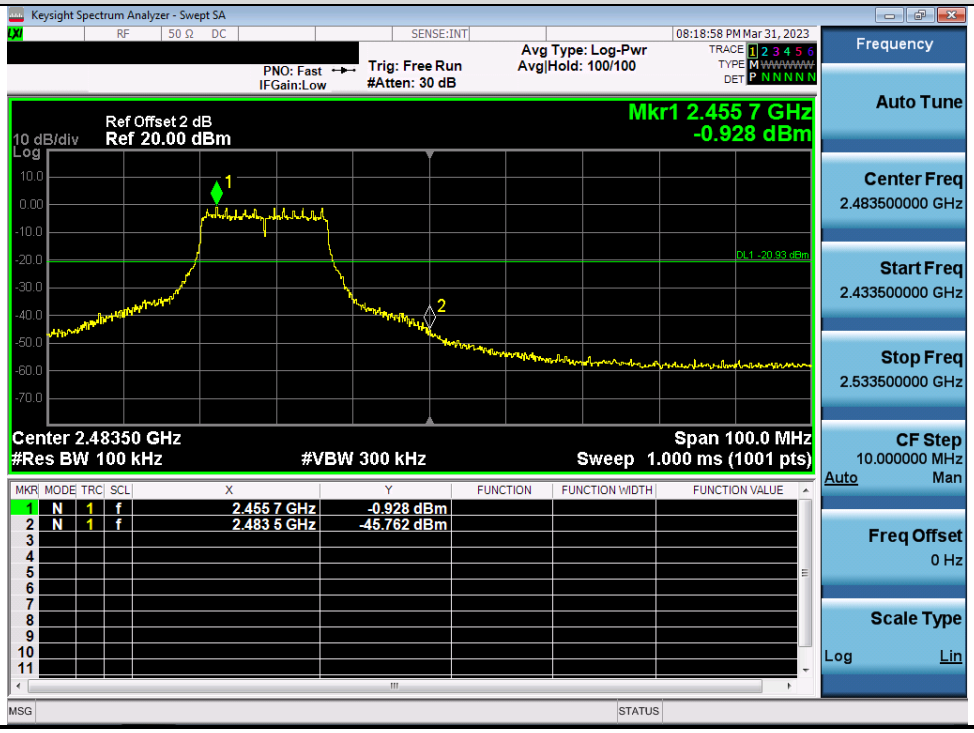
Reference Level

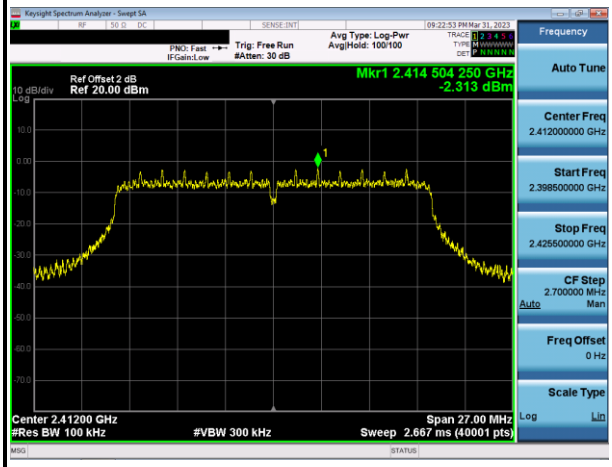
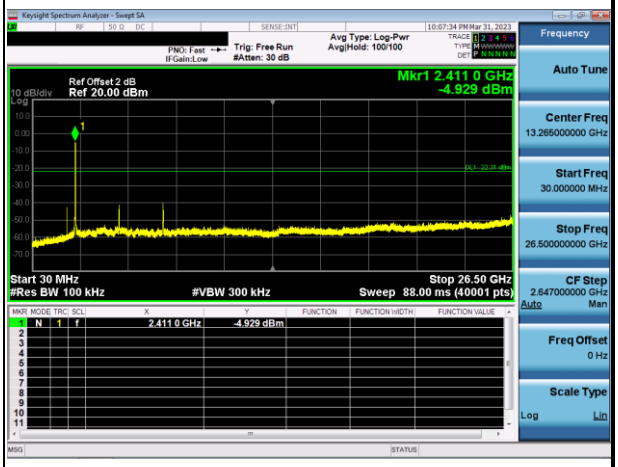
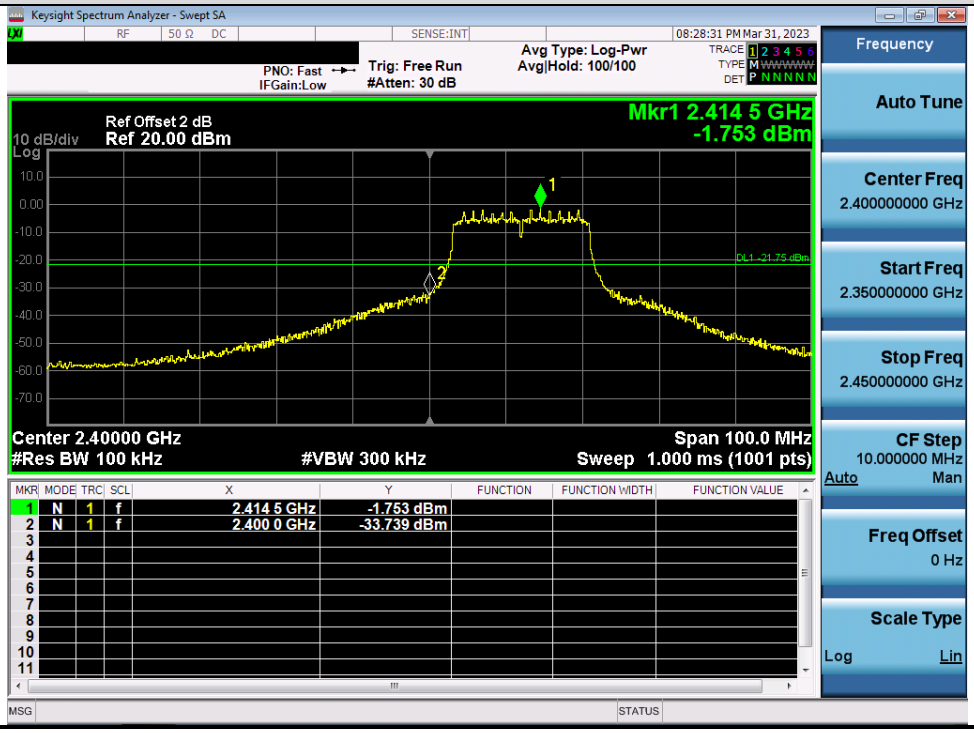


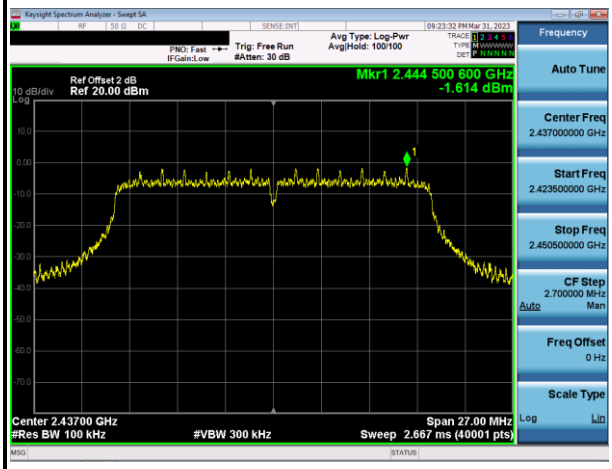
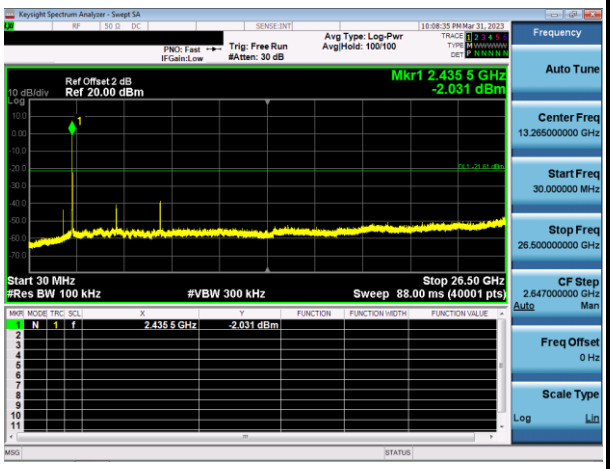
Spurious Emission



Band Edge

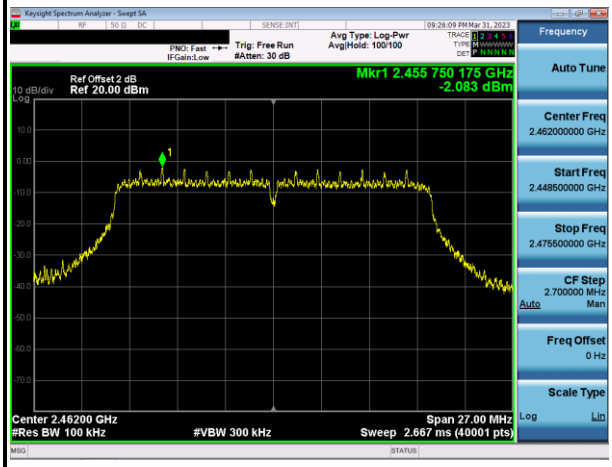


WLAN 802.11n HT20 channel 01 (2412 MHz)	
Reference Level	**Spurious Emission**
	
Band Edge	
	

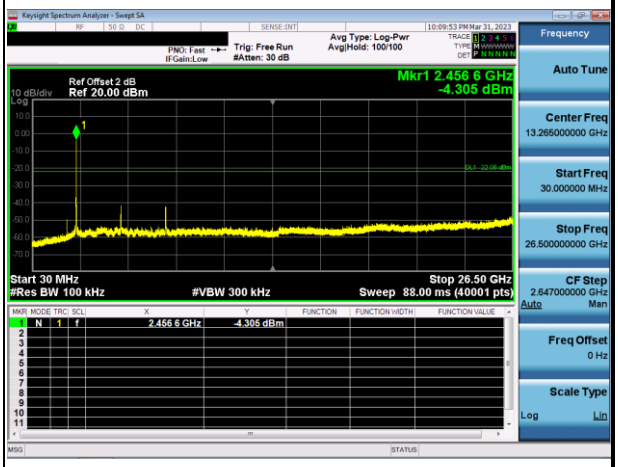
WLAN 802.11n HT20 channel 06 (2437 MHz)	
Reference Level	**Spurious Emission**
	

WLAN 802.11n HT20 channel 11 (2462MHz)

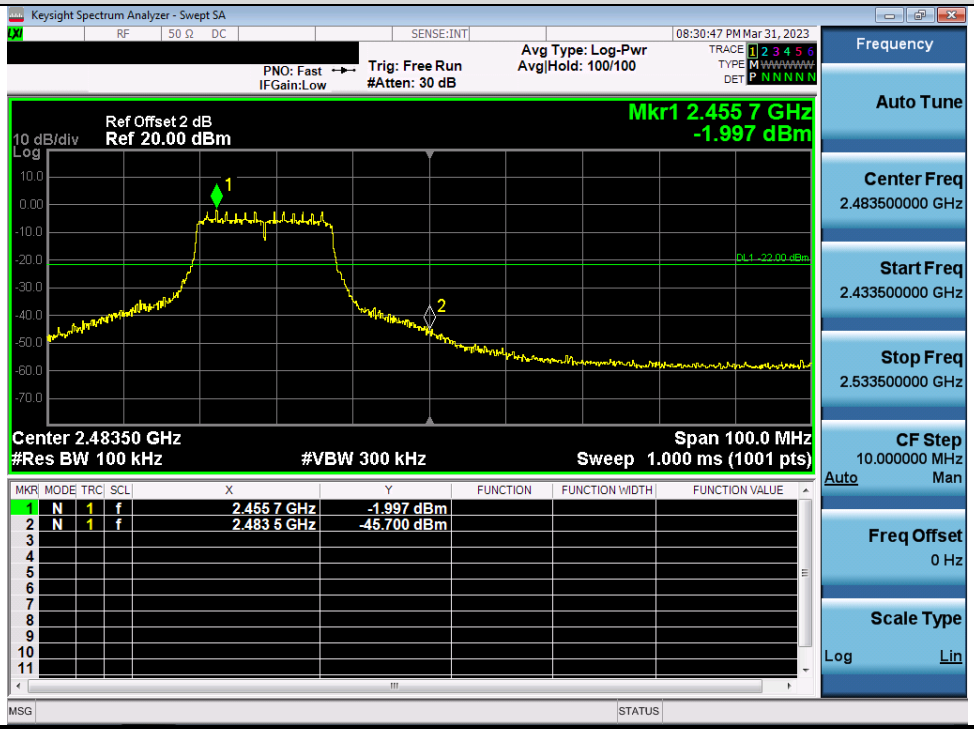
Reference Level



Spurious Emission

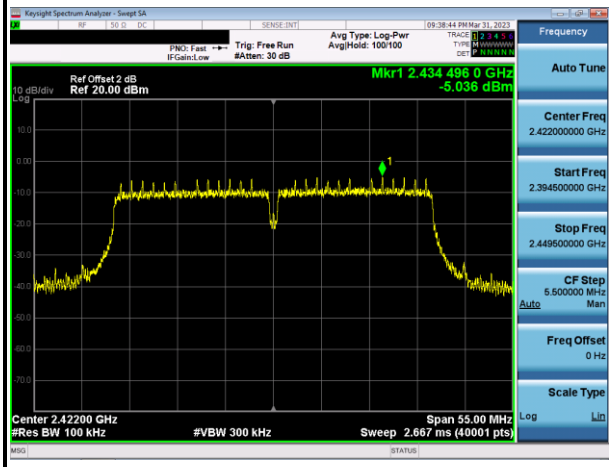


Band Edge

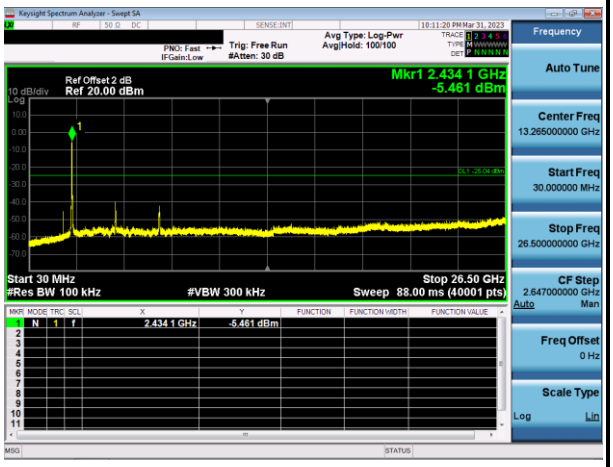


WLAN 802.11n HT40 channel 03 (2422 MHz)

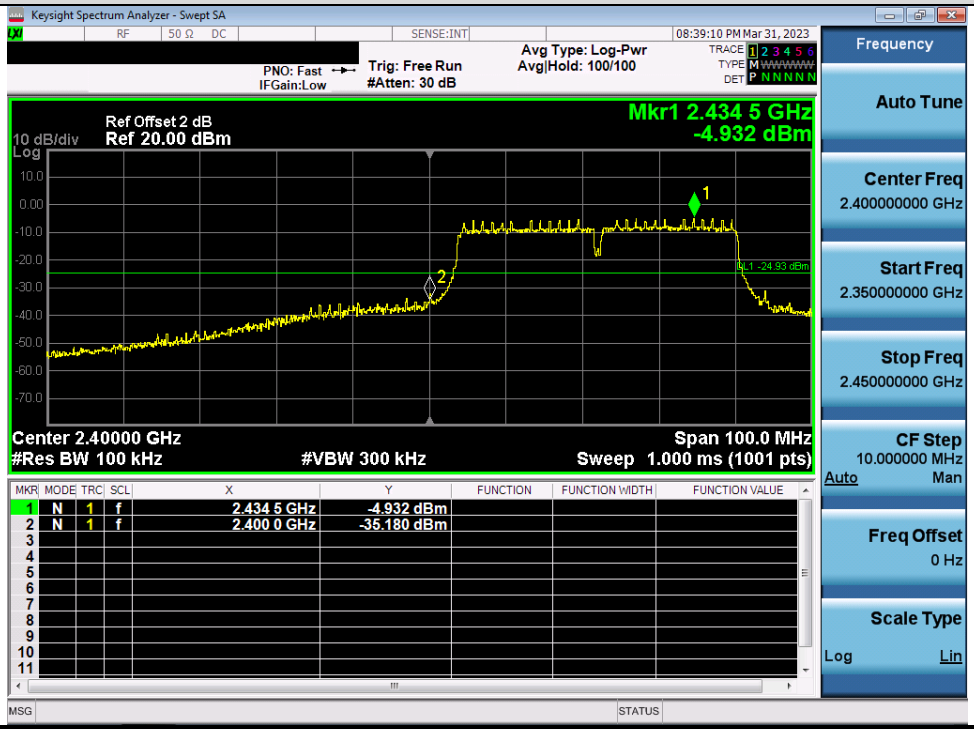
Reference Level



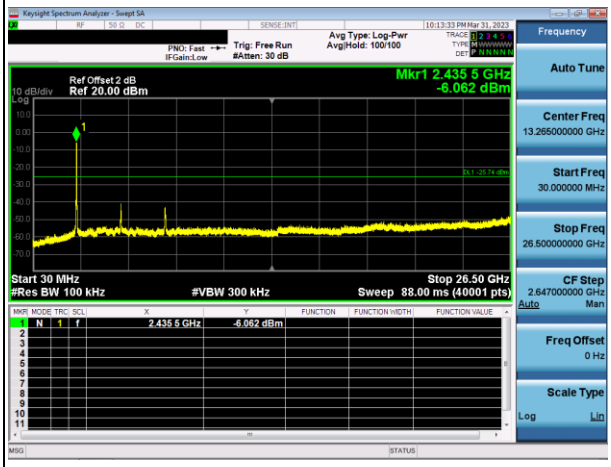
Spurious Emission



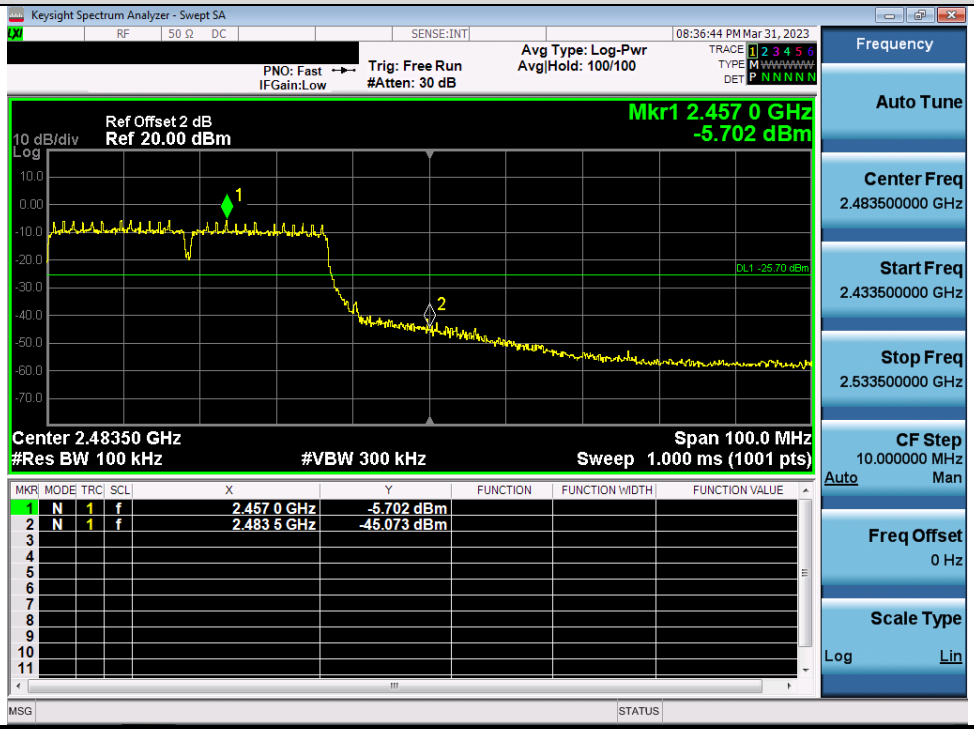
Band Edge



WLAN 802.11n HT40 channel 06 (2437 MHz)	
Reference Level	**Spurious Emission**

WLAN 802.11n HT40 channel 9 (2452MHz)	
Reference Level	**Spurious Emission**
	

Band Edge



2.6 Radiated Band Edges and Spurious Emission Measurement

2.6.1 Limit

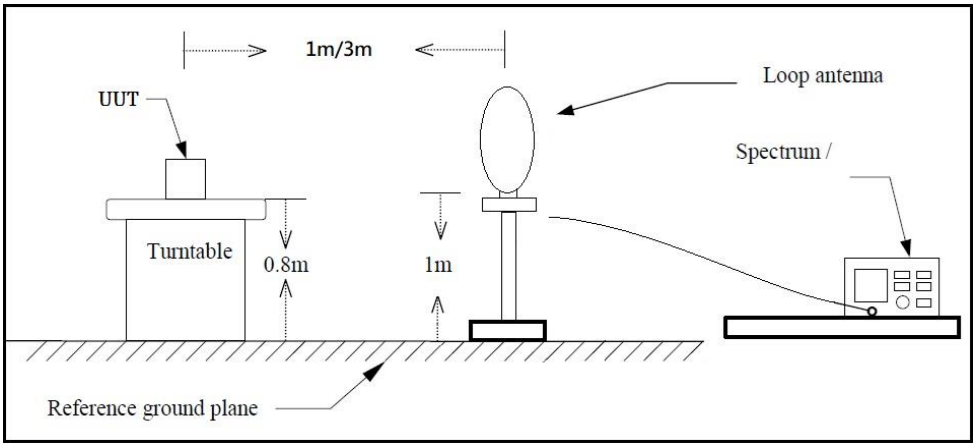
Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

Remarks:

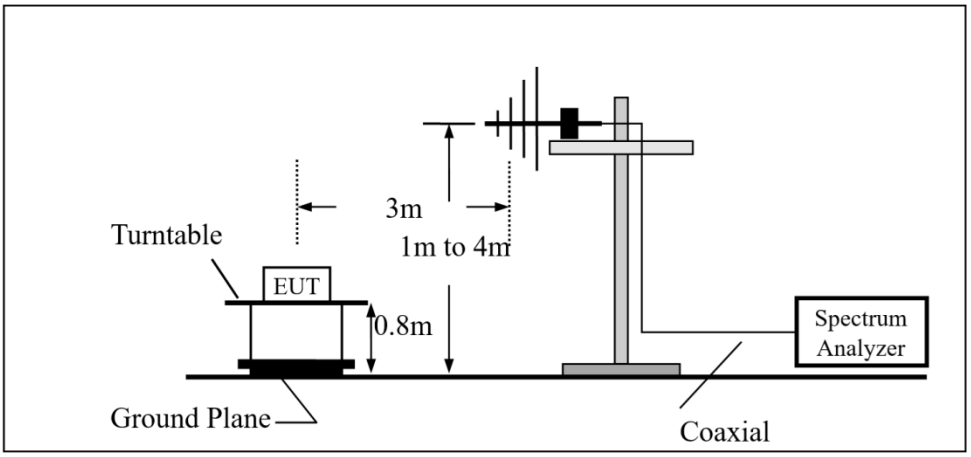
1. RF Voltage (dBuV) = 20 log RF Voltage(uV)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

2.6.2 Test Setup

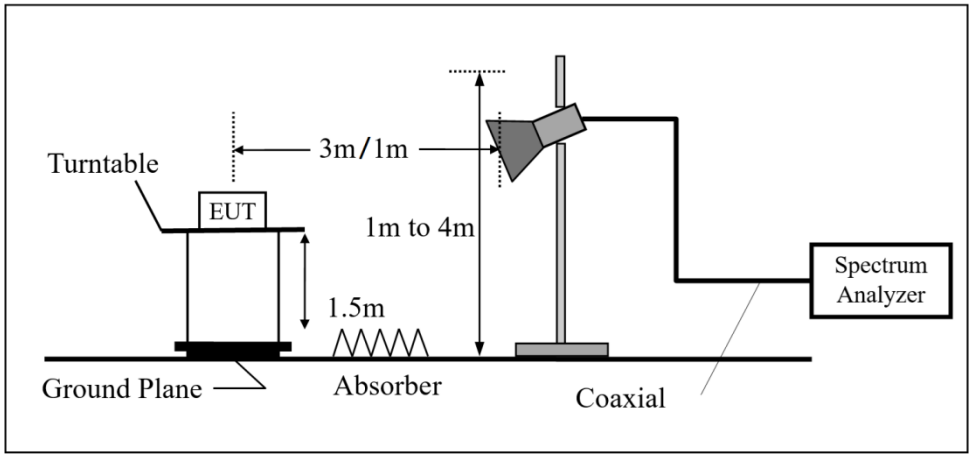
Below 30MHz



30MHz~1GHz



Above 1GHz



2.6.3 Test Procedure

The EUT was setup according to ANSI C63.10 : 2013 chapter 6.4, 6.5, 6.6 and tested according test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements.

(1) The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meters chamber room for the test. The table was rotated 360 degrees to determine the position of the highest radiation.

(2) The EUT was set 3 meters away from the interference-receiving antenna, the height of the antenna is varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength.

(3) Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

(4) 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.

(5) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

(6) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets the average limit, measurement with the average detector is unnecessary.

Remarks:

(a) The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.

(b) The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection 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.

(d) All modes of operation were investigated and the worst-case emissions are reported.

For Radiated emission below 30MHz

(1) The EUT was placed on the top of a rotating table 0.8 meters above the ground in a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

(2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

(3) Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

(4) 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.

(5) The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

For Radiated emission Above 30MHz

(7) The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for the test. The table was rotated 360 degrees to determine the position of the highest radiation.

(8) The EUT was set 3 meters away from the interference-receiving antenna, the height of the antenna is varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength.

(9) Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

(10) 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.

(11) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

(12) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets the average limit, measurement with the average detector is unnecessary.

2.6.4 Duty Cycle

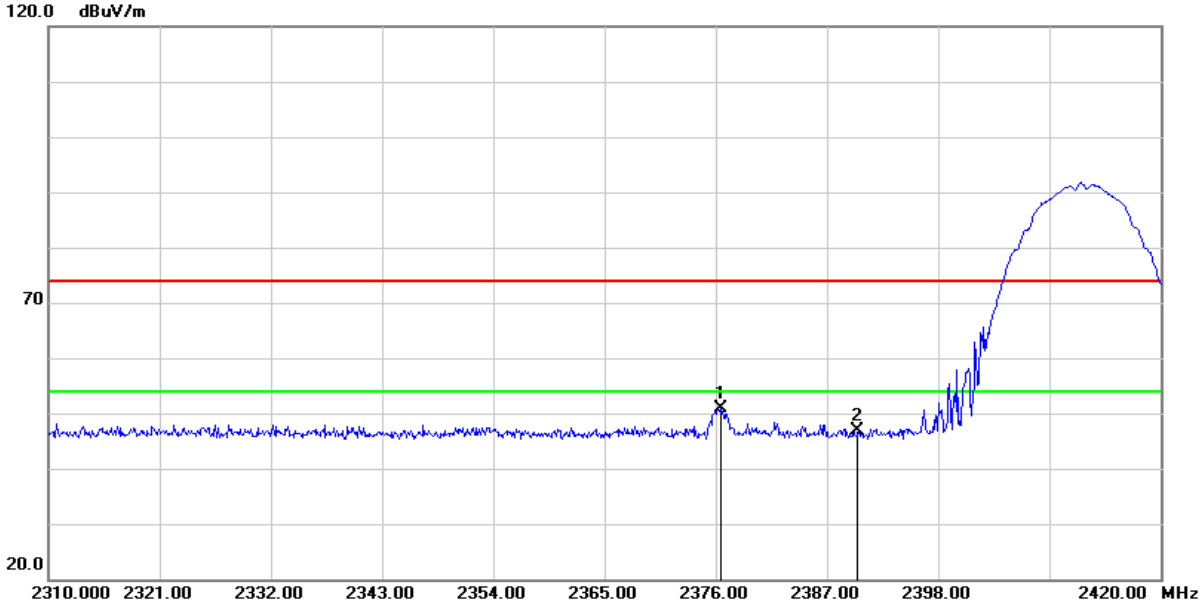
Mode	Frequency (MHz)	on time (ms)	on+off time (ms)	Duty cycle	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11b	2412	8.240	8.360	0.986	0.063	0.010
802.11g	2412	1.376	1.489	0.924	0.343	0.727
802.11n HT20	2412	1.286	1.373	0.937	0.284	0.778
802.11n HT40	2422	0.641	0.705	0.909	0.413	1.560

2.6.5 Test Result of Radiated Band Edge Measurement

The following tables for radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X axis) were recorded in this report.

Test Frequency		
RF	**802.11b / 802.11g / 802.11n HT20**	**802.11n HT40**
Tx	CH01 (2412MHz) CH11 (2462MHz)	CH03 (2422MHz) CH09 (2452MHz)

Test Mode :	Transmit(802.11b)	**Test Date :**	2023/03/31
Test Channel :	CH01(2412MHz)	**Temperature :**	23.4 °C
Polarization :	Horizontal	**Relative Humidity :**	58 %



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2376.440	57.16	-6.34	50.82	74.00	-23.18	peak
2	2390.000	53.15	-6.35	46.80	74.00	-27.20	peak

Remark：

1. Correction Factor = Antenna factor + Cable loss – Amplifier gain
2. Result Value = Reading Level + Correct Factor
3. Margin Level = Result Value – Limit Value
4. The other emission levels were very low against the limit