

Partial FCC Test Report

Report No.: RF201027C01-2

FCC ID: PPD-QCNFA324

Test Model: QCNFA324

Received Date: Oct. 27, 2020

Test Date: Nov. 11 ~ Dec. 01, 2020

Issued Date: Dec. 07, 2020

Applicant: Qualcomm Atheros, Inc.

Address: 1700 Technology Drive, San Jose, CA 95110 , U.S.A

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lin Kou Laboratories

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Test Location: No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City
33383, Taiwan

FCC Registration /
Designation Number: 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RF201027C01-2	Original Release	Dec. 07, 2020

1 Certificate of Conformity

Product: 2x2 802.11A/B/G/N/AC WIFI + BLUETOOTH MODULE

Brand: Qualcomm Atheros

Test Model: QCNFA324

Sample Status: Engineering Sample

Applicant: Qualcomm Atheros, Inc.

Test Date: Nov. 11 ~ Dec. 01, 2020

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Gina Liu, **Date:** Dec. 07, 2020
Gina Liu / Specialist

Approved by : Dylan Chiou, **Date:** Dec. 07, 2020
Dylan Chiou / Senior Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -11.19 dB at 0.15391 MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.31 dB at 56.19 MHz.
15.247(d)	Antenna Port Emission	N/A	Refer to Note
15.247(a)(2)	6 dB Bandwidth	N/A	Refer to Note
---	Occupied Bandwidth Measurement	N/A	Refer to Note
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	N/A	Refer to Note
15.203	Antenna Requirement	N/A	No antenna connector is used.

Note:

1. This report is a partial report, only test item of Conducted Emission, Radiated Emissions and Maximum Peak Output Power were performed for this report. Other testing data please refer to BV CPS report no.: RF140808E04 for module (Brand: Qualcomm Atheros, Model: QCNFA324).
2. For 2.4G band compliance with rule 15.247(d) of the band-edge items, the test plots were recorded in Annex A. Test Procedures refer to report 4.1.3.
3. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) ($\pm$)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.79 dB
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	2x2 802.11A/B/G/N/AC WIFI + BLUETOOTH MODULE
Brand	Qualcomm Atheros
Test Model	QCNFA324
Status of EUT	Engineering Sample
Power Supply Rating	3.3Vdc form host equipment
Modulation Type	CCK, DQPSK, DBPSK for DSSS 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: 11.0 / 5.5 / 2.0 / 1.0 Mbps 802.11g: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps 802.11n: up to 300.0 Mbps
Operating Frequency	2412 ~ 2462 MHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20) / (VHT20) 7 for 802.11n (HT40) / (VHT40)
Output Power	421.697 mW
Antenna Type	Refer to Note as below
Antenna Connector	N/A
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

1. The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and two receivers.

Modulation Mode	Tx Function
802.11b	2TX
802.11g	2TX
802.11n (HT20) / (VHT20)	2TX
802.11n (HT40) / (VHT40)	2TX

* The modulation and bandwidth are similar for 802.11n mode for HT20 / HT40 / VHT20 / VHT40, therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

2. The EUT was installed in a specific End-product.

Equipment Name	Brand Name	Model Name
Tarantino (11.6"/Chromebook x 360)	HP	TPN-Q259

3. The antenna information is listed as below.

Antenna Type	Manufacturer	Parts Number	Mode	Antenna Gain			
				BT / WLAN 2.4 GHz	WLAN 5.15~5.35 GHz	WLAN 5.47~5.725 GHz	WLAN 5.725~5.85 GHz
PIFA	High-Tek Electronics Co., Ltd	Tx1/ Rx1 (Ant. 1): DQ60ACQD091 (0ACQD020015N)	Tablet	TX1: -2.97 TX2: -0.93	TX1: -2.73 TX2: -2.26	TX1: -2.71 TX2: -2.76	TX1:-2.25 TX2: -3.61
		Tx2/ Rx2 (Ant. 2): DQ60ACQD091 (0ACQD020015N)	Laptop	TX1: -0.11 TX2: 1.15	TX1: 1.01 TX2: -1.83	TX1: -1.40 TX2: -2.36	TX1:-1.40 TX2: -2.73
	Wistron Neweb Corporation	Tx1 (Ant. 1): DQ6B15GC100 (81EABB15.GC1)	Tablet	TX1: -0.54 TX2: -1.32	TX1: -1.10 TX2: -0.74	TX1: -0.72 TX2: -1.06	TX1:-1.43 TX2: -2.07
		Tx2 (Ant. 2): DQ6B15GC100 (81EABB15.GC1)	Laptop	TX1: 0.24 TX2: 1.56	TX1: 0.31 TX2: 1.04	TX1: -0.29 TX2: -0.03	TX1:-2.24 TX2: -1.38
		*The WNC antenna of Laptop mode were chosen for final test.					

4. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

5. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or User's Manual.

3.2 Description of Test Modes

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20) / (VHT20):

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

7 channels are provided for 802.11n (HT40) / (VHT40):

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE $\geq$ 1G	RE<1G	PLC	Power	
-	√	√	√	√	-

Where **RE $\geq$ 1G**: Radiated Emission above 1 GHz

RE<1G: Radiated Emission below 1 GHz

PLC: Power Line Conducted Emission

Power: Maximum Output Power Measurement

NOTE: "-" means no effect.

Radiated Emission Test (Above 1 GHz):

- ☒ 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).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	802.11n (VHT20)	1 to 11	1, 6, 11	OFDM	BPSK	7.2
-	802.11n (VHT40)	3 to 9	3, 6, 9	OFDM	BPSK	15.0

Radiated Emission Test (Below 1 GHz):

- ☒ 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).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11b	1 to 11	11	DSSS	DBPSK	1.0

Power Line Conducted Emission Test:

- ☒ 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).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11b	1 to 11	11	DSSS	DBPSK	1.0

Maximum Output Power Measurement:

- ☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- ☒ 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).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	802.11n (VHT20)	1 to 11	1, 6, 11	OFDM	BPSK	7.2
-	802.11n (VHT40)	3 to 9	3, 6, 9	OFDM	BPSK	15.0

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Tim Chen
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Cyril Chen
PLC	25 deg. C, 65 % RH	120 Vac, 60 Hz	Cyril Chen
Power	25 deg. C, 65 % RH	120 Vac, 60 Hz	Jisyong Wang

3.3 Description of Support Units

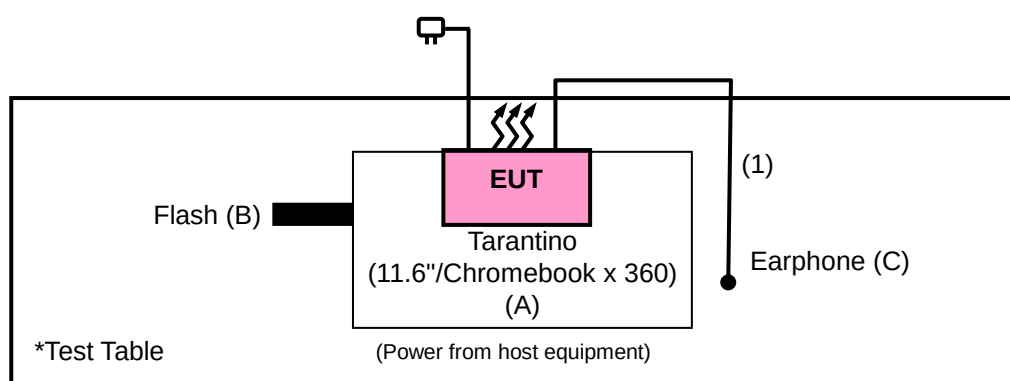
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Tarantino (11.6"/Chromebook x 360)	HP	TPN-Q259	N/A	N/A	Provided by client
B.	USB 2.0 FLASH	HP	v250W	N/A	N/A	--
C.	Earphone	AIWA	EW101BK	N/A	N/A	--

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Earphone Cable	1	12	N	0	-

Note: All power cords of the above support units are non-shielded (1.8m).

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards and References

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

Test Standard:

FCC Part 15, Subpart C (15.247)

ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

References Test Guidance:

KDB 558074 D01 Meas Guidance v05r02

KDB 662911 D01 Multiple Transmitter Output v02r01

All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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 20 dB below the highest level of the desired power:

Frequencies (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 1000 MHz, 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 20 dB under any condition of modulation.

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210203	Mar. 18, 2020	Mar. 17, 2021
Spectrum Analyzer Agilent	N9010A	MY52220314	Dec. 12, 2019	Dec. 11, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 16, 2020	Apr. 15, 2021
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 24, 2019 Nov. 22, 2020	Nov. 23, 2020 Nov. 21, 2021
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Nov. 06, 2020	Nov. 05, 2021
Fixed Attenuator WORKEN	MDCS18N-10	MDCS18N-10-01	Apr. 14, 2020	Apr. 13, 2021
Loop Antenna	EM-6879	269	Sep. 17, 2020	Sep. 16, 2021
Preamplifier EMCI	EMC 330H	980112	Oct. 07, 2020	Oct. 06, 2021
Power Meter Anritsu	ML2495A	1012010	Sep. 01, 2020	Aug. 31, 2021
Power Sensor Anritsu	MA2411B	1315050	Sep. 01, 2020	Aug. 31, 2021
RF Coaxial Cable EMCI	EMC104-SM-SM-8000	171005	Oct. 07, 2020	Oct. 06, 2021
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1000(140807)	Oct. 07, 2020	Oct. 06, 2021
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Oct. 07, 2020	Oct. 06, 2021
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA

- NOTE:**
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in HwaYa Chamber 10.

4.1.3 Test Procedures

For Radiated Emission below 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. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

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

For Radiated Emission above 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) / 1.5 meters (for above 1 GHz) 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. 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.
- f. The test-receiver system was set to peak and average detected 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:

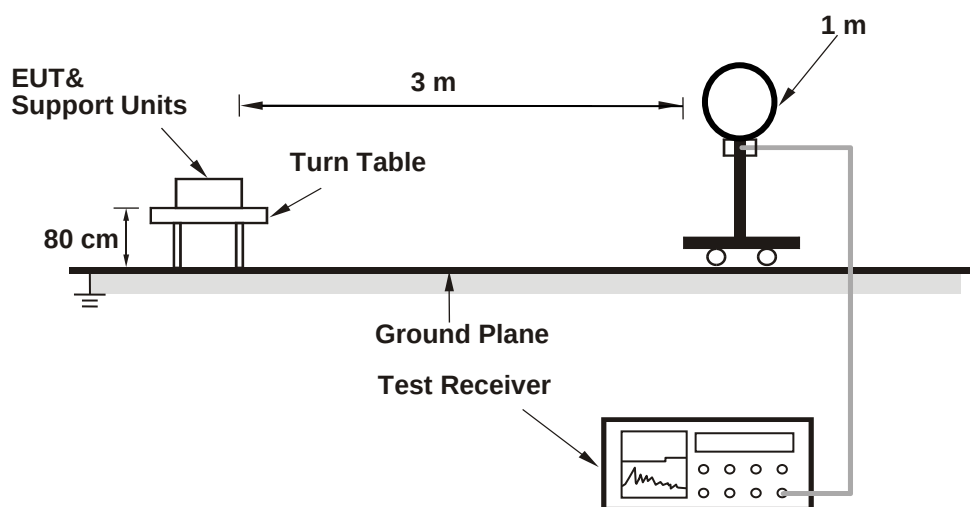
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK)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

4.1.4 Deviation from Test Standard

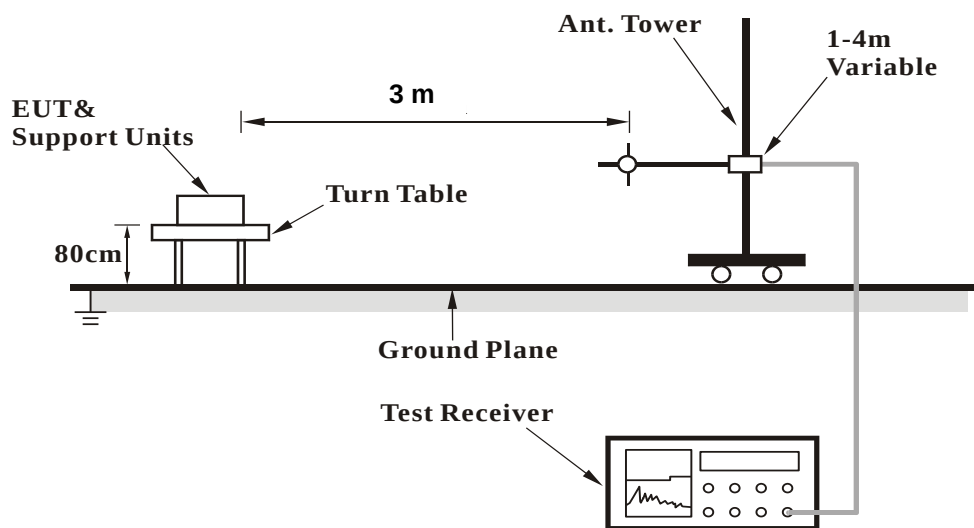
No deviation.

4.1.5 Test Set Up

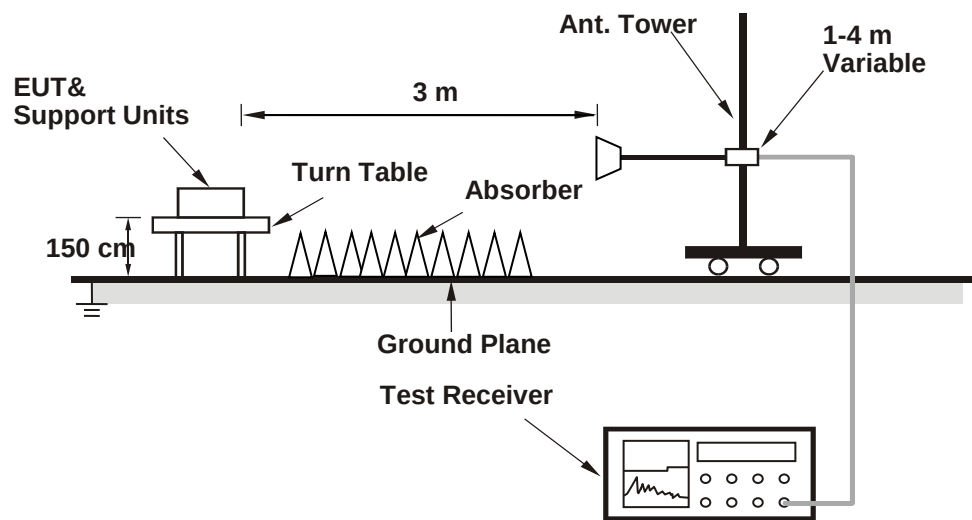
<Radiated Emission below 30 MHz>



<Radiated Emission 30 MHz to 1 GHz>



<Radiated Emission above 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

- Placed the EUT on a testing table.
- Use the software to control the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

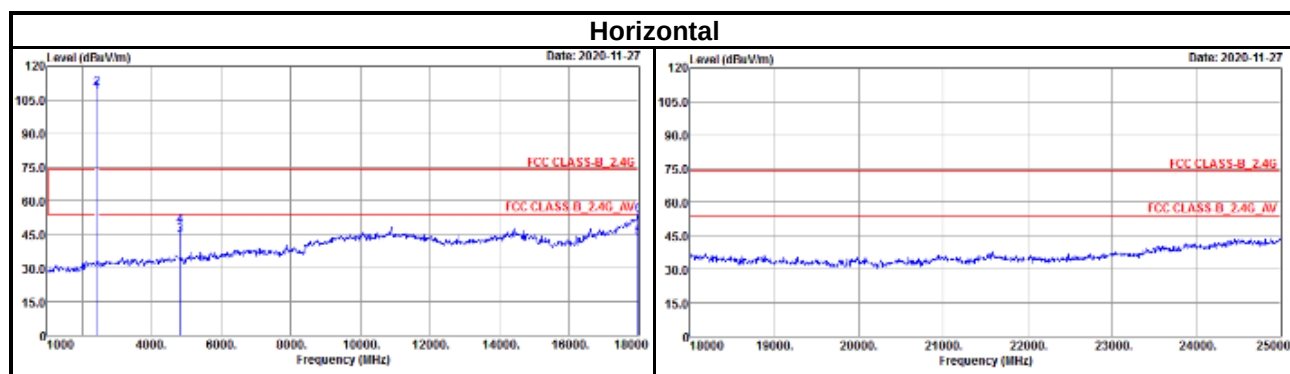
Above 1 GHz Data :
802.11b

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen

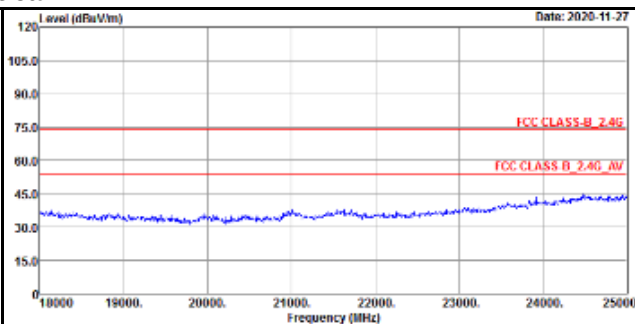
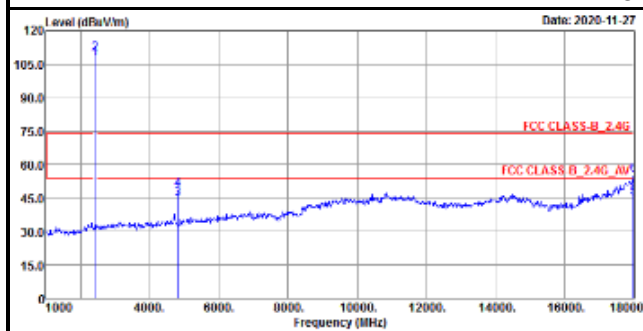
Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2386.194	47.01	52.91	-5.9	54	-6.99	103	233	Average
2386.194	54.87	60.77	-5.9	74	-19.13	103	233	Peak
2412	108.51	114.46	-5.95	-----	-----	103	233	Average
2412	110.05	116	-5.95	-----	-----	103	233	Peak
4824	44.9	60.52	-15.62	54	-9.1	112	288	Average
4824	48.78	64.4	-15.62	74	-25.22	112	288	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2387.01	46.32	52.21	-5.89	54	-7.68	275	96	Average
2387.01	53.78	59.67	-5.89	74	-20.22	275	96	Peak
2412	107.75	113.7	-5.95	-----	-----	275	96	Average
2412	109.82	115.77	-5.95	-----	-----	275	96	Peak
4830	44.81	60.42	-15.61	54	-9.19	186	270	Average
4830	48.92	64.53	-15.61	74	-25.08	186	270	Peak

Remarks:

1. Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
2. 2412 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.



Vertical

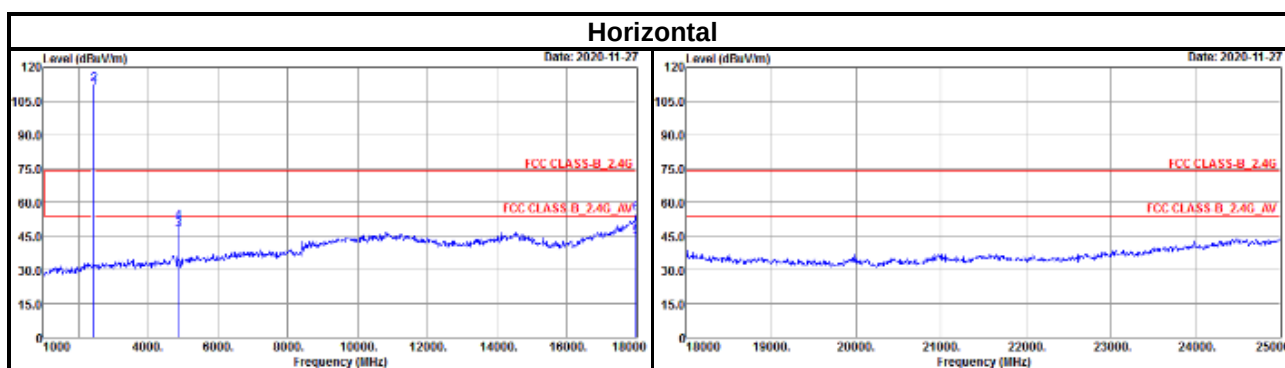


EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen

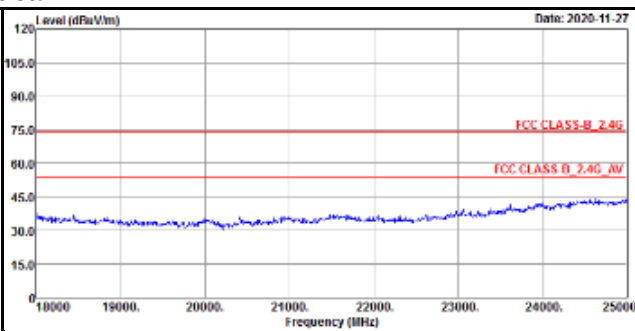
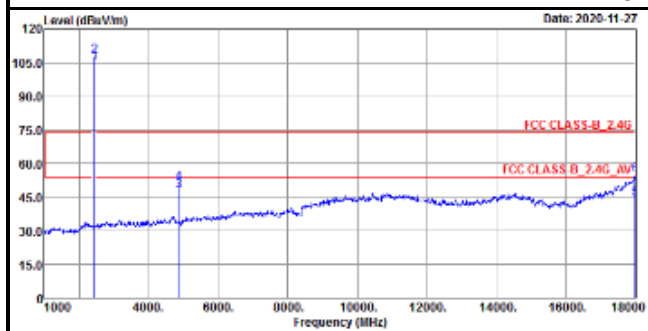
Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	41.86	47.78	-5.92	54	-12.14	145	299	Average
2390	50.66	56.58	-5.92	74	-23.34	145	299	Peak
2437	110.48	116.37	-5.89	-----	-----	145	299	Average
2437	112.59	118.48	-5.89	-----	-----	145	299	Peak
2483.5	43	48.7	-5.7	54	-11	145	299	Average
2483.5	52.19	57.89	-5.7	74	-21.81	145	299	Peak
4874	47.86	63.42	-15.56	54	-6.14	100	247	Average
4874	51.29	66.85	-15.56	74	-22.71	100	247	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	39.67	45.59	-5.92	54	-14.33	100	0	Average
2390	47.81	53.73	-5.92	74	-26.19	100	0	Peak
2437	104.91	110.8	-5.89	-----	-----	100	0	Average
2437	107.97	113.86	-5.89	-----	-----	100	0	Peak
2483.5	39.51	45.21	-5.7	54	-14.49	100	0	Average
2483.5	48.73	54.43	-5.7	74	-25.27	100	0	Peak
4874	47.71	63.27	-15.56	54	-6.29	184	263	Average
4874	51.16	66.72	-15.56	74	-22.84	184	263	Peak

Remarks:

1. Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
2. 2437 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.



Vertical

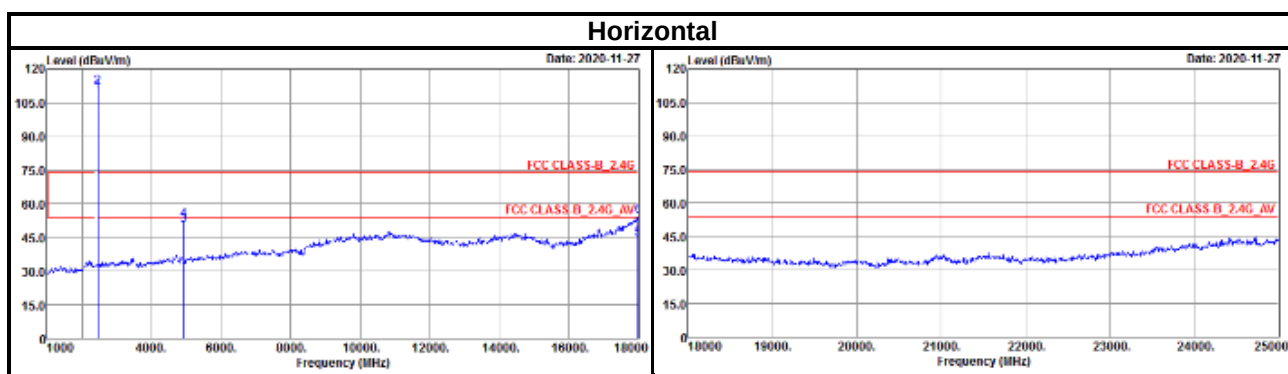


EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen

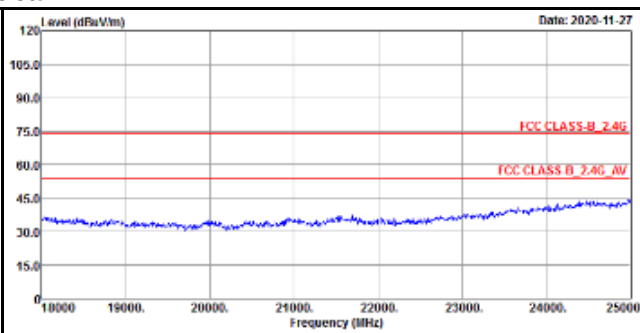
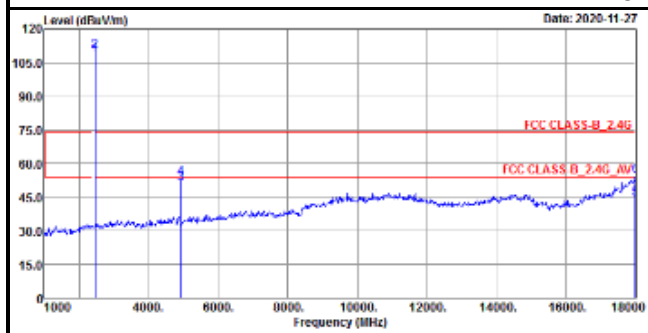
Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	110.13	115.94	-5.81	-----	-----	125	294	Average
2462	112.13	117.94	-5.81	-----	-----	125	294	Peak
2483.5	48.94	54.64	-5.7	54	-5.06	125	294	Average
2483.5	56.62	62.32	-5.7	74	-17.38	125	294	Peak
4924	50.42	65.93	-15.51	54	-3.58	107	246	Average
4924	52.85	68.36	-15.51	74	-21.15	107	246	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	108.59	114.4	-5.81	-----	-----	264	89	Average
2462	110.39	116.2	-5.81	-----	-----	264	89	Peak
2483.5	50.04	55.74	-5.7	54	-3.96	264	89	Average
2483.5	56.91	62.61	-5.7	74	-17.09	264	89	Peak
4924	50.85	66.36	-15.51	54	-3.15	241	267	Average
4924	53.41	68.92	-15.51	74	-20.59	241	267	Peak

Remarks:

- Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
- 2462 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.



Vertical



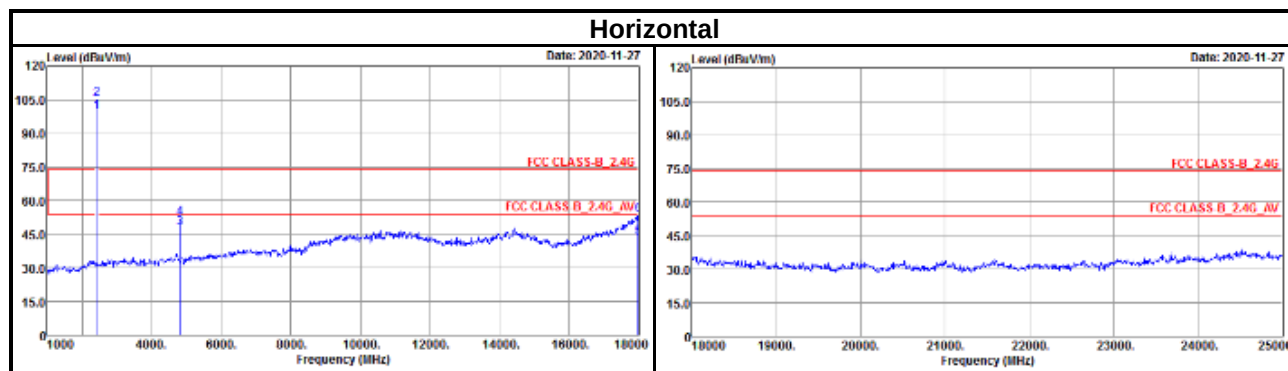
802.11g

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen

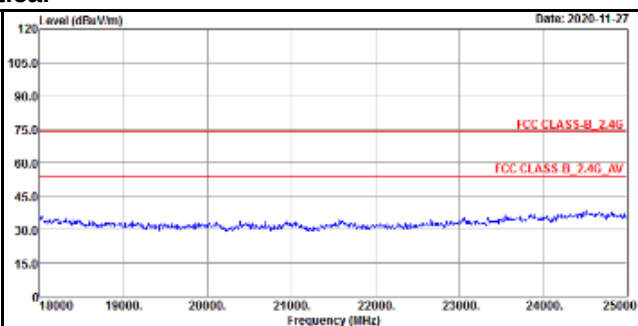
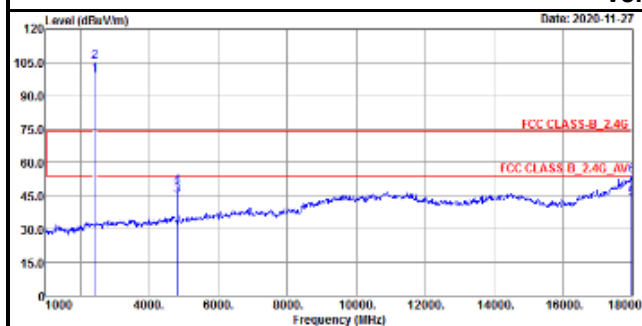
Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	45.53	51.45	-5.92	54	-8.47	100	233	Average
2390	54.77	60.69	-5.92	74	-19.23	100	233	Peak
2412	99.41	105.36	-5.95	-----	-----	100	233	Average
2412	105.37	111.32	-5.95	-----	-----	100	233	Peak
4824	47.92	63.54	-15.62	54	-6.08	111	207	Average
4824	52.42	68.04	-15.62	74	-21.58	111	207	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	45.13	51.05	-5.92	54	-8.87	271	82	Average
2390	54.56	60.48	-5.92	74	-19.44	271	82	Peak
2412	99.27	105.22	-5.95	-----	-----	271	82	Average
2412	105.24	111.19	-5.95	-----	-----	271	82	Peak
4824	45.22	60.84	-15.62	54	-8.78	105	263	Average
4824	48.99	64.61	-15.62	74	-25.01	105	263	Peak

Remarks:

- Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
- 2412 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.



Vertical

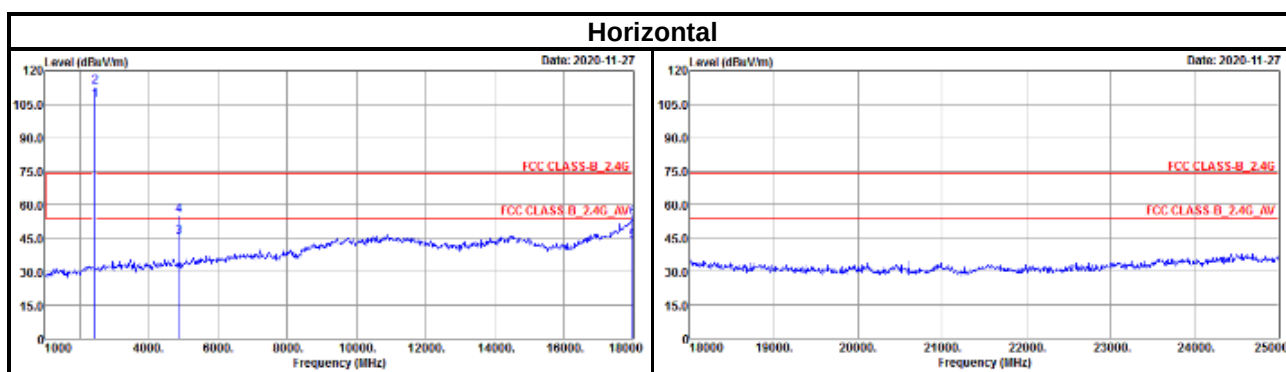


EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen

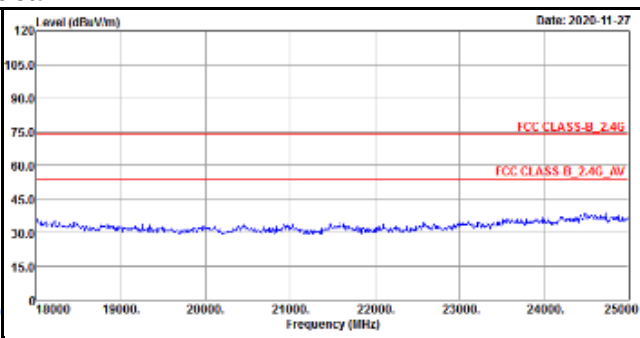
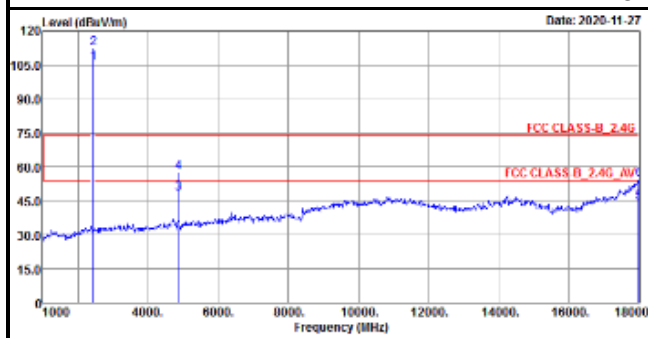
Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	41.91	47.83	-5.92	54	-12.09	142	298	Average
2390	50.59	56.51	-5.92	74	-23.41	142	298	Peak
2437	106.67	112.56	-5.89	-----	-----	142	298	Average
2437	112.8	118.69	-5.89	-----	-----	142	298	Peak
2483.5	43.24	48.94	-5.7	54	-10.76	142	298	Average
2483.5	52.02	57.72	-5.7	74	-21.98	142	298	Peak
4874	45.82	61.38	-15.56	54	-8.18	128	271	Average
4874	55.55	71.11	-15.56	74	-18.45	128	271	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	41.46	47.38	-5.92	54	-12.54	270	95	Average
2390	49.83	55.75	-5.92	74	-24.17	270	95	Peak
2437	105.71	111.6	-5.89	-----	-----	270	95	Average
2437	112.66	118.55	-5.89	-----	-----	270	95	Peak
2483.5	42.96	48.66	-5.7	54	-11.04	270	95	Average
2483.5	51.53	57.23	-5.7	74	-22.47	270	95	Peak
4874	48.07	63.63	-15.56	54	-5.93	163	247	Average
4874	57.52	73.08	-15.56	74	-16.48	163	247	Peak

Remarks:

1. Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
2. 2437 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.



Vertical



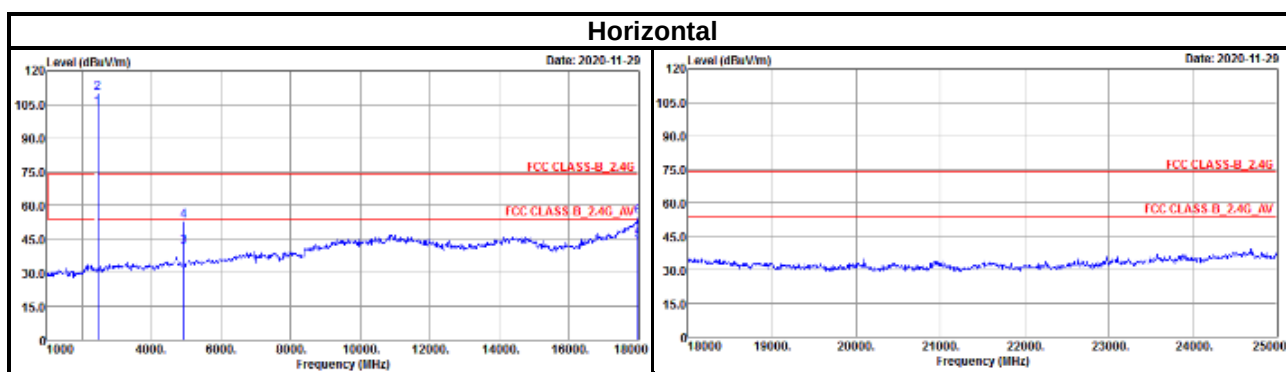
EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	103.82	109.63	-5.81	-----	-----	124	298	Average
2462	110.12	115.93	-5.81	-----	-----	124	298	Peak
2483.5	47.07	52.77	-5.7	54	-6.93	124	298	Average
2483.5	56.64	62.34	-5.7	74	-17.36	124	298	Peak
4924	41.81	57.32	-15.51	54	-12.19	117	247	Average
4924	53.33	68.84	-15.51	74	-20.67	117	247	Peak

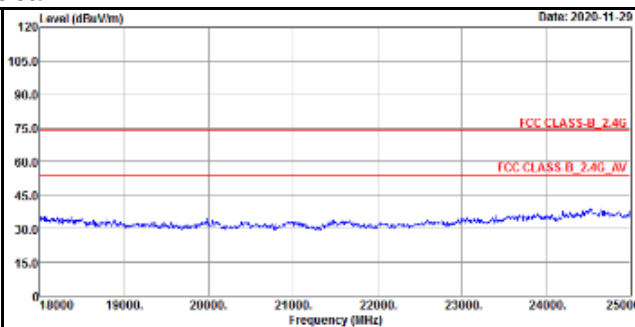
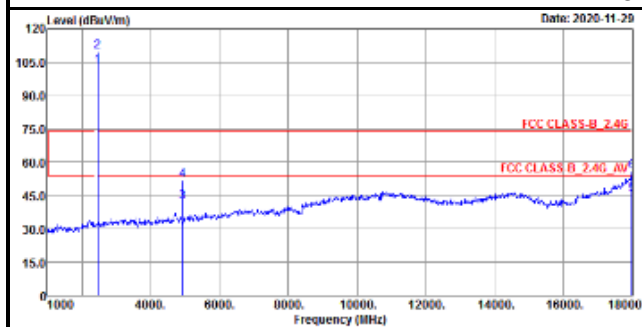
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	103.02	108.83	-5.81	-----	-----	228	264	Average
2462	110	115.81	-5.81	-----	-----	228	264	Peak
2483.5	47.21	52.91	-5.7	54	-6.79	229	264	Average
2483.5	57.5	63.2	-5.7	74	-16.5	229	264	Peak
4924	41.86	57.37	-15.51	54	-12.14	241	265	Average
4924	51.85	67.36	-15.51	74	-22.15	241	265	Peak

Remarks:

- Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
- 2462 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.



Vertical



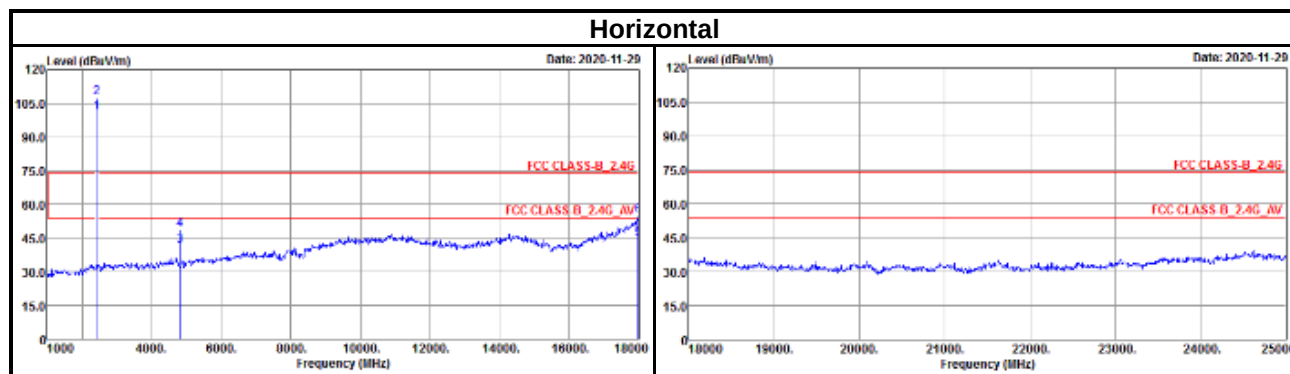
802.11n (VHT20)

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen

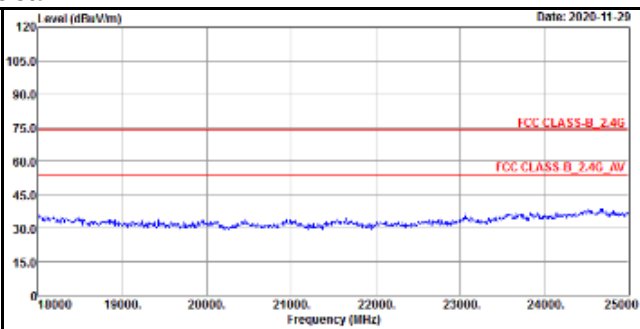
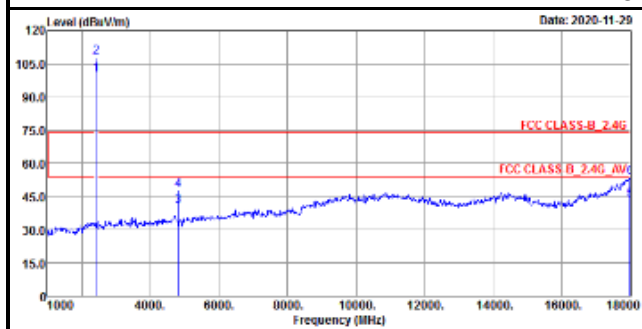
Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	47.88	53.8	-5.92	54	-6.12	102	230	Average
2390	58.77	64.69	-5.92	74	-15.23	102	230	Peak
2412	101	106.95	-5.95	-----	-----	102	230	Average
2412	107.45	113.4	-5.95	-----	-----	102	230	Peak
4824	41.54	57.16	-15.62	54	-12.46	276	192	Average
4824	48.68	64.3	-15.62	74	-25.32	276	192	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	45.18	51.1	-5.92	54	-8.82	277	97	Average
2390	55.2	61.12	-5.92	74	-18.8	277	97	Peak
2412	100.06	106.01	-5.95	-----	-----	277	97	Average
2412	107.86	113.81	-5.95	-----	-----	277	97	Peak
4824	40.87	56.49	-15.62	54	-13.13	134	269	Average
4824	47.75	63.37	-15.62	74	-26.25	134	269	Peak

Remarks:

1. Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
2. 2412 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.



Vertical

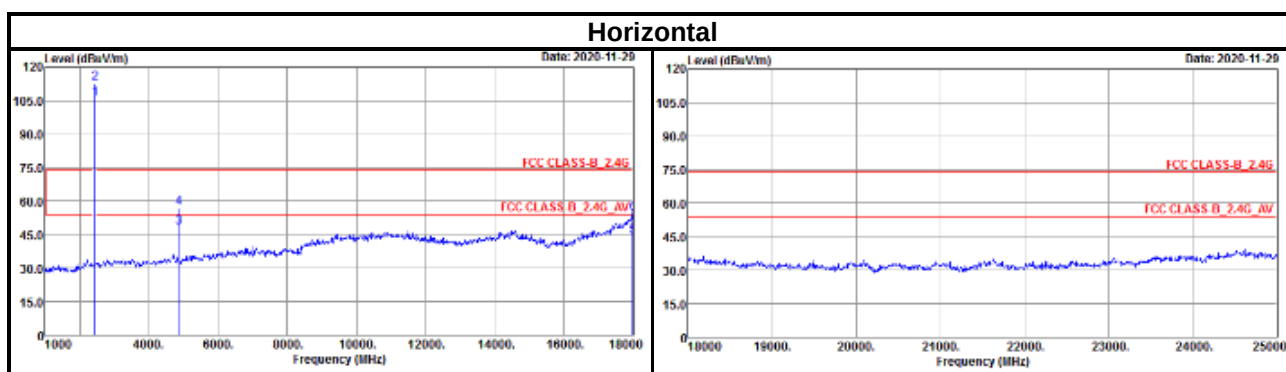


EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen

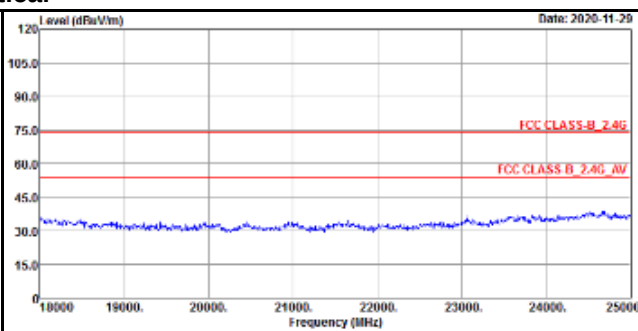
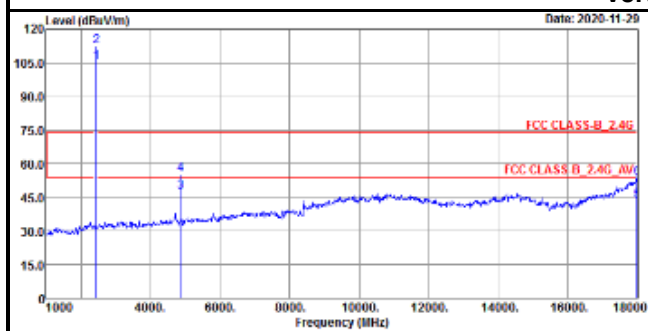
Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	41.76	47.68	-5.92	54	-12.24	100	228	Average
2390	50.19	56.11	-5.92	74	-23.81	100	228	Peak
2437	105.71	111.6	-5.89	-----	-----	100	228	Average
2437	112.72	118.61	-5.89	-----	-----	100	228	Peak
2483.5	43.28	48.98	-5.7	54	-10.72	100	228	Average
2483.5	51.77	57.47	-5.7	74	-22.23	100	228	Peak
4874	48.48	64.04	-15.56	54	-5.52	197	283	Average
4874	57.29	72.85	-15.56	74	-16.71	197	283	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	42.48	48.4	-5.92	54	-11.52	298	98	Average
2390	51.12	57.04	-5.92	74	-22.88	298	98	Peak
2437	105.52	111.41	-5.89	-----	-----	298	98	Average
2437	112.49	118.38	-5.89	-----	-----	298	98	Peak
2483.5	42.7	48.4	-5.7	54	-11.3	298	98	Average
2483.5	50.71	56.41	-5.7	74	-23.29	298	98	Peak
4874	47.27	62.83	-15.56	54	-6.73	105	178	Average
4874	55.48	71.04	-15.56	74	-18.52	105	178	Peak

Remarks:

1. Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
2. 2437 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.



Vertical

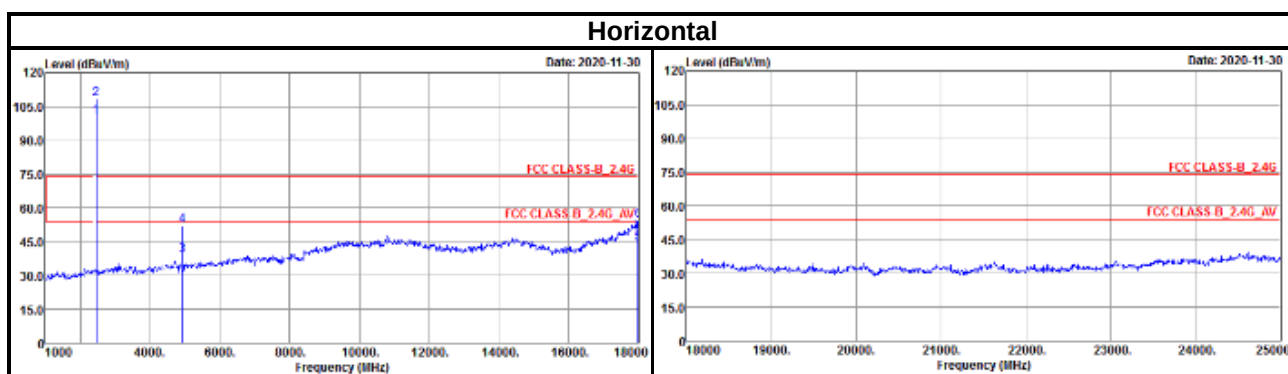


EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen

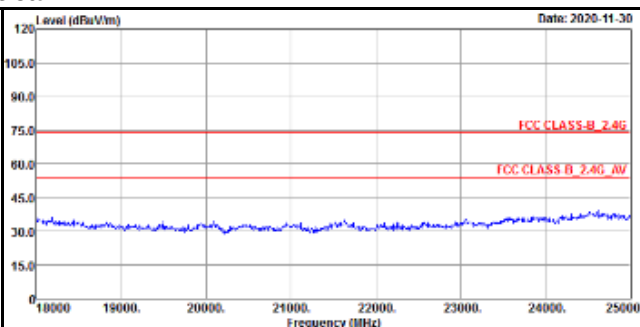
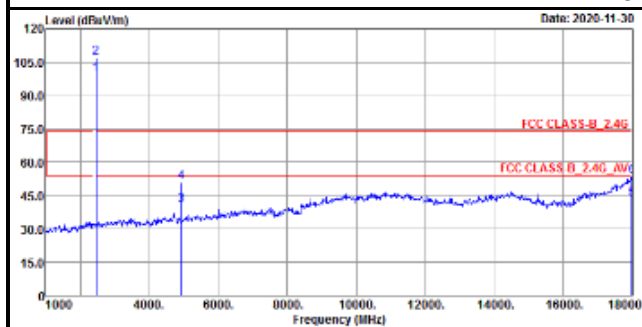
Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	100.68	106.49	-5.81	-----	-----	127	297	Average
2462	108.67	114.48	-5.81	-----	-----	127	297	Peak
2483.5	45.62	51.32	-5.7	54	-8.38	127	297	Average
2483.5	56.07	61.77	-5.7	74	-17.93	127	297	Peak
4924	39.08	54.59	-15.51	54	-14.92	106	249	Average
4924	52.1	67.61	-15.51	74	-21.9	106	249	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	99.57	105.38	-5.81	-----	-----	238	86	Average
2462	107.08	112.89	-5.81	-----	-----	238	86	Peak
2483.5	44.71	50.41	-5.7	54	-9.29	238	86	Average
2483.5	55.46	61.16	-5.7	74	-18.54	238	86	Peak
4924	40.89	56.4	-15.51	54	-13.11	236	277	Average
4924	51.1	66.61	-15.51	74	-22.9	236	277	Peak

Remarks:

1. Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
2. 2462 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.



Vertical



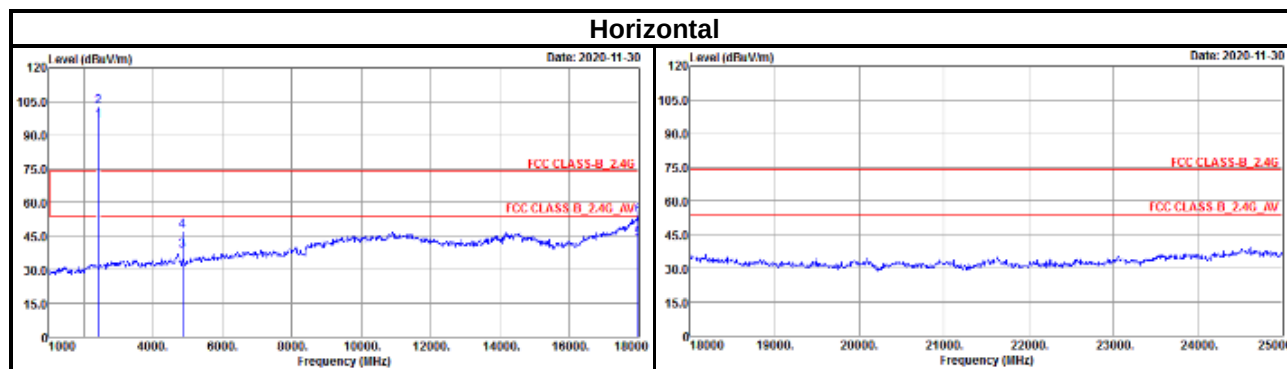
802.11n (VHT40)

EUT Test Condition		Measurement Detail	
Channel	Channel 3	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen

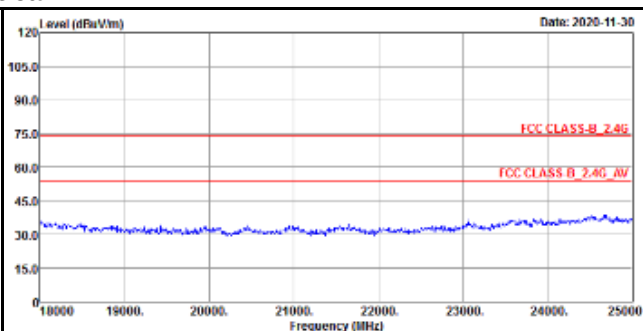
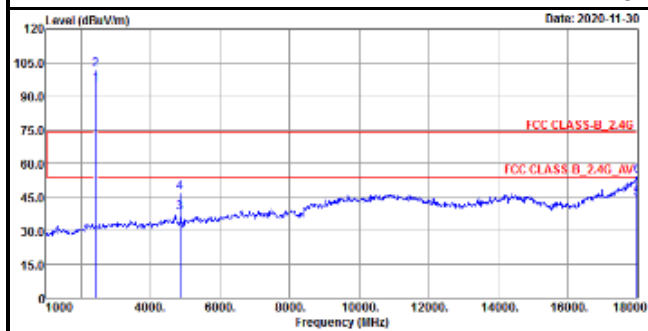
Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	50.08	56	-5.92	54	-3.92	150	302	Average
2390	65.2	71.12	-5.92	74	-8.8	150	302	Peak
2422	96.53	102.41	-5.88	-----	-----	150	302	Average
2422	102.6	108.48	-5.88	-----	-----	150	302	Peak
2483.5	44.01	49.71	-5.7	54	-9.99	150	302	Average
2483.5	57.19	62.89	-5.7	74	-16.81	150	302	Peak
4844	38.46	54.05	-15.59	54	-15.54	104	247	Average
4844	47.6	63.19	-15.59	74	-26.4	104	247	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	48.62	54.54	-5.92	54	-5.38	236	276	Average
2390	65.12	71.04	-5.92	74	-8.88	236	276	Peak
2422	95.16	101.04	-5.88	-----	-----	236	276	Average
2422	101.75	107.63	-5.88	-----	-----	236	276	Peak
2483.5	43.22	48.92	-5.7	54	-10.78	236	276	Average
2483.5	58.43	64.13	-5.7	74	-15.57	236	276	Peak
4844	38.03	53.62	-15.59	54	-15.97	207	269	Average
4844	46.99	62.58	-15.59	74	-27.01	207	269	Peak

Remarks:

- Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
- 2422 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.



Vertical

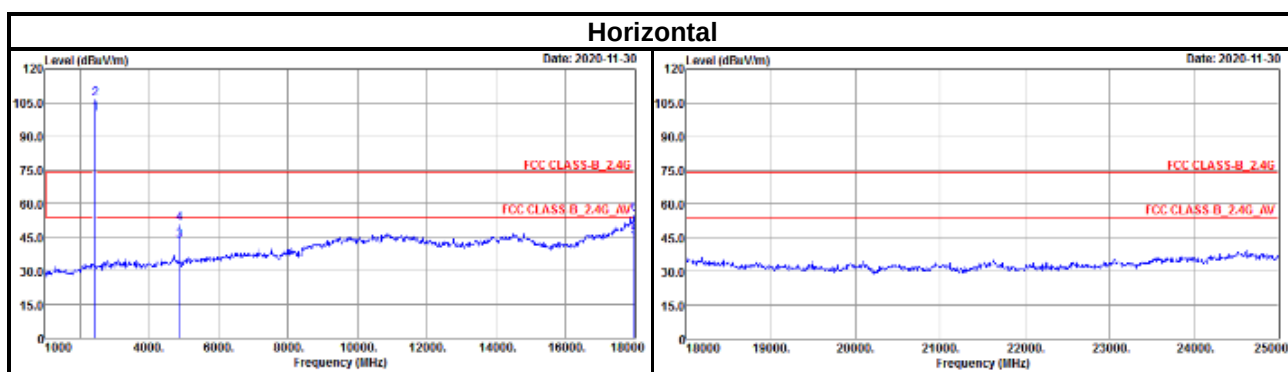


EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen

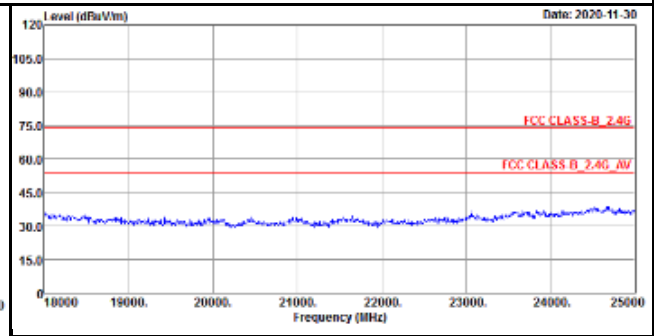
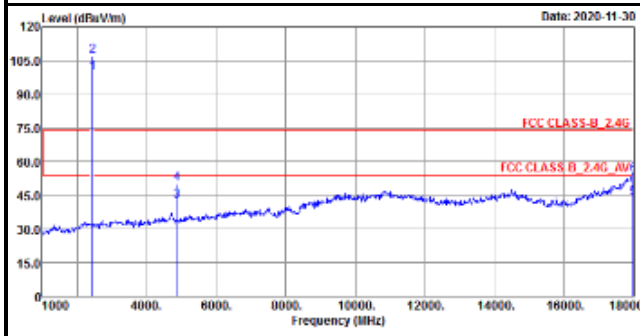
Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	48.21	54.13	-5.92	54	-5.79	140	296	Average
2390	65.61	71.53	-5.92	74	-8.39	140	296	Peak
2437	100	105.89	-5.89	-----	-----	140	296	Average
2437	106.89	112.78	-5.89	-----	-----	140	296	Peak
2483.5	47.59	53.29	-5.7	54	-6.41	140	296	Average
2483.5	63.3	69	-5.7	74	-10.7	140	296	Peak
4874	43.43	58.99	-15.56	54	-10.57	156	234	Average
4874	50.78	66.34	-15.56	74	-23.22	156	234	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	49.3	55.22	-5.92	54	-4.7	266	265	Average
2390	65.41	71.33	-5.92	74	-8.59	266	265	Peak
2437	99.58	105.47	-5.89	-----	-----	266	265	Average
2437	107.24	113.13	-5.89	-----	-----	266	265	Peak
2483.5	47.42	53.12	-5.7	54	-6.58	266	265	Average
2483.5	61.15	66.85	-5.7	74	-12.85	266	265	Peak
4874	42.4	57.96	-15.56	54	-11.6	264	89	Average
4874	50.1	65.66	-15.56	74	-23.9	264	89	Peak

Remarks:

1. Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
2. 2437 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.



Vertical

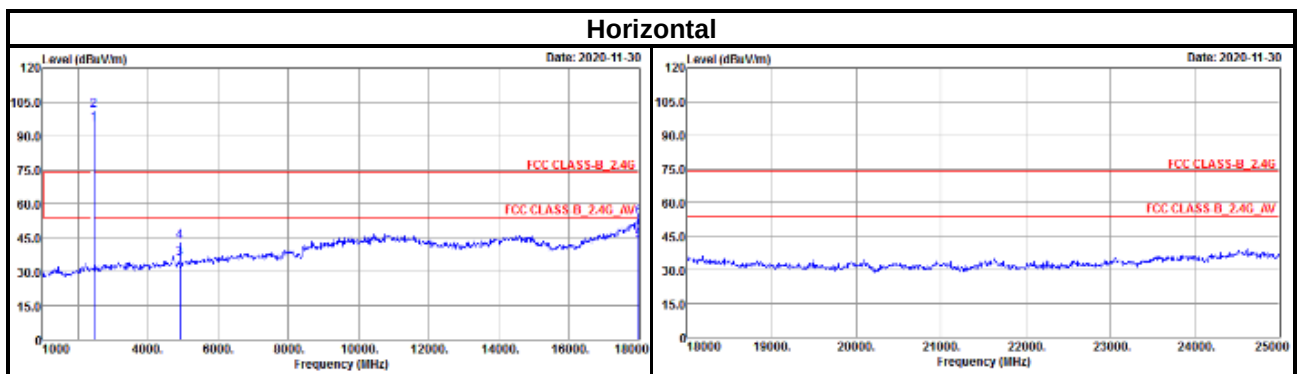


EUT Test Condition		Measurement Detail	
Channel	Channel 9	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen

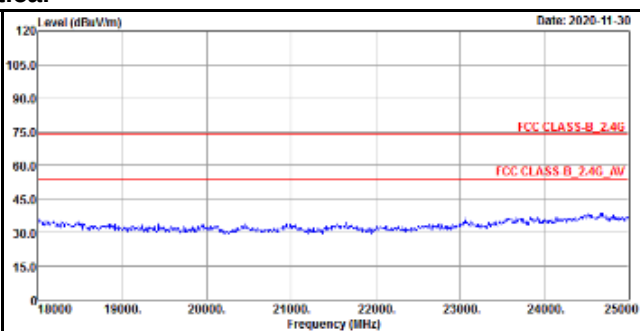
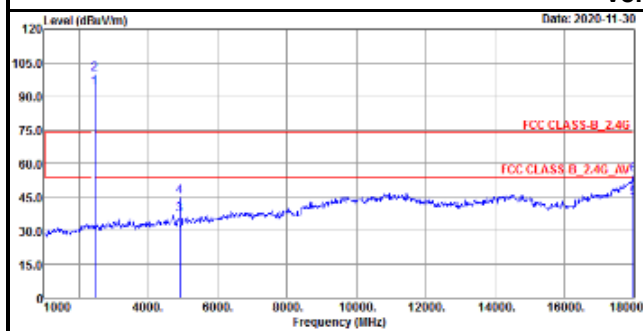
Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	42.47	48.39	-5.92	54	-11.53	129	293	Average
2390	57.72	63.64	-5.92	74	-16.28	129	293	Peak
2452	95.23	101.05	-5.82	-----	-----	129	293	Average
2452	101.33	107.15	-5.82	-----	-----	129	293	Peak
2483.5	47.14	52.84	-5.7	54	-6.86	129	293	Average
2483.5	63.81	69.51	-5.7	74	-10.19	129	293	Peak
4904	35.8	51.35	-15.55	54	-18.2	128	236	Average
4904	43.59	59.14	-15.55	74	-30.41	128	236	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	40.96	46.88	-5.92	54	-13.04	299	102	Average
2390	56.58	62.5	-5.92	74	-17.42	299	102	Peak
2452	94.01	99.83	-5.82	-----	-----	299	102	Average
2452	100.17	105.99	-5.82	-----	-----	299	102	Peak
2483.5	44.57	50.27	-5.7	54	-9.43	299	102	Average
2483.5	61.25	66.95	-5.7	74	-12.75	299	102	Peak
4904	37.15	52.7	-15.55	54	-16.85	198	302	Average
4904	45	60.55	-15.55	74	-29	198	302	Peak

Remarks:

1. Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
2. 2452 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.



Vertical



9 kHz ~ 30 MHz Data:

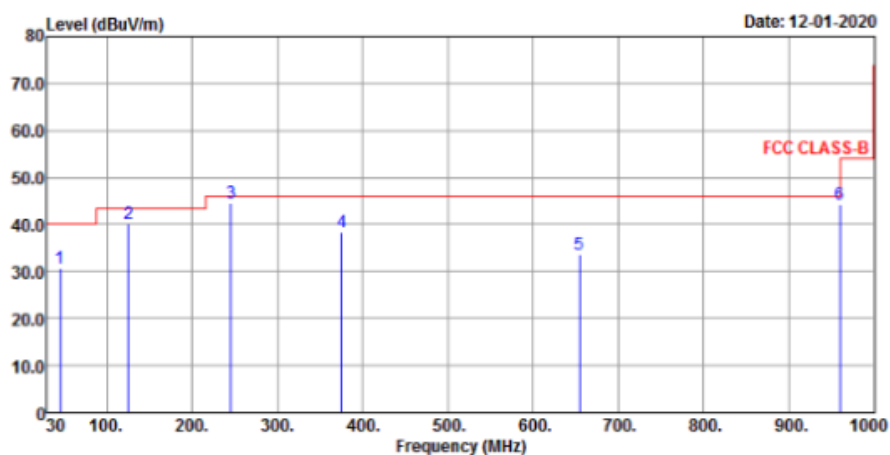
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

30 MHz ~ 1 GHz Worst-Case Data:

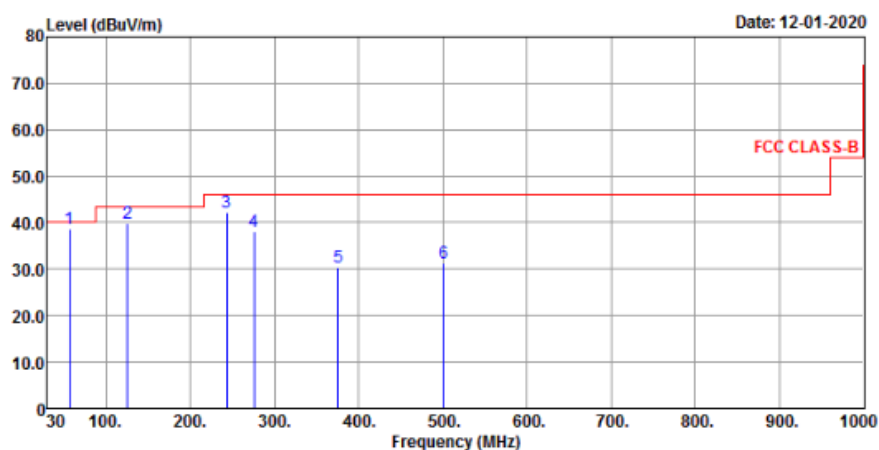
802.11b

EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Cyril Chen

Horizontal



Vertical



Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
44.55	30.57	42.44	-11.87	40	-9.43	177	160	QP
125.06	40.27	53.62	-13.35	43.5	-3.23	188	165	QP
245.34	44.56	57.71	-13.15	46	-1.44	154	215	QP
375.32	38.31	47.15	-8.84	46	-7.69	133	247	QP
654.68	33.76	35.3	-1.54	46	-12.24	159	48	QP
960.23	44.14	40.43	3.71	54	-9.86	162	215	QP
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
56.19	38.69	50.63	-11.94	40	-1.31	124	168	QP
125.06	39.93	53.28	-13.35	43.5	-3.57	119	154	QP
243.4	42.28	55.5	-13.22	46	-3.72	157	143	QP
275.41	38.01	49.91	-11.9	46	-7.99	133	125	QP
375.32	30.5	39.34	-8.84	46	-15.5	159	174	QP
500.45	31.41	36.85	-5.44	46	-14.59	144	132	QP

Remarks:

- Emission Level = Read Level + Factor
Margin value = Emission level – Limit value.
- The emission levels of other frequencies were very low against the limit.

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

- Note: 1. The lower limit shall apply at the transition frequencies.
 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Dec. 11, 2019	Dec. 10, 2020
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 04, 2020	Sep. 03, 2021
LISN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 20, 2020	Feb. 19, 2021
LISN/AMN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 28, 2020	Aug. 27, 2021
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	NA	NA

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in HwaYa Shielded Room 1 (Conduction 1).
 3. The VCCI Site Registration No. is C-12040.

4.2.3 Test Procedures

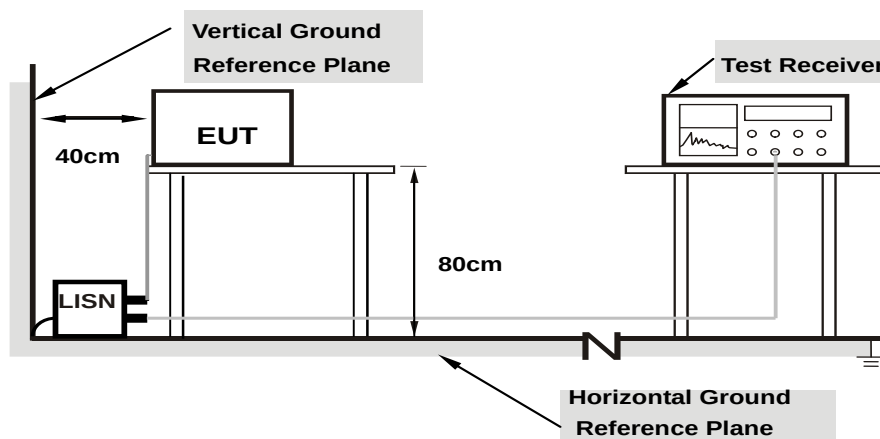
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

Note: The resolution bandwidth and video bandwidth of test receiver is 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz – 30 MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Conditions

- Placed the EUT on a testing table.
- Use the software to control the EUT under transmission condition continuously at specific channel frequency.

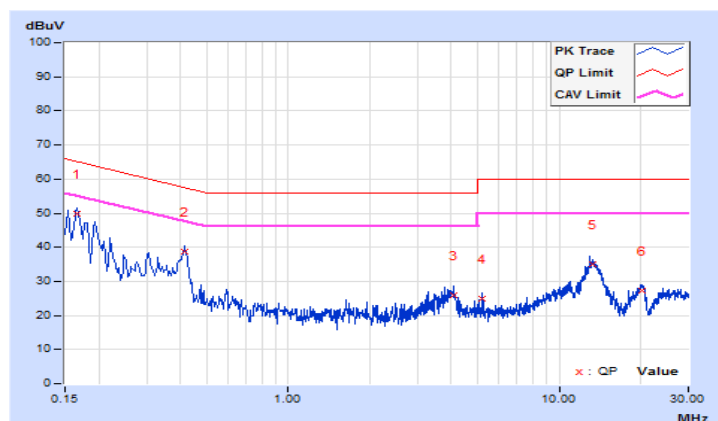
4.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	21°C, 65%RH
Tested by	Cyril Chen	Test Date	2020/12/1

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16564	9.65	40.34	33.95	49.99	43.60	65.18	55.18	-15.19	-11.58
2	0.41560	9.66	29.19	21.63	38.85	31.29	57.54	47.54	-18.69	-16.25
3	4.07173	9.74	16.15	9.06	25.89	18.80	56.00	46.00	-30.11	-27.20
4	5.17435	9.75	15.15	10.82	24.90	20.57	60.00	50.00	-35.10	-29.43
5	13.28760	9.83	25.26	18.79	35.09	28.62	60.00	50.00	-24.91	-21.38
6	20.33733	9.86	17.35	8.91	27.21	18.77	60.00	50.00	-32.79	-31.23

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

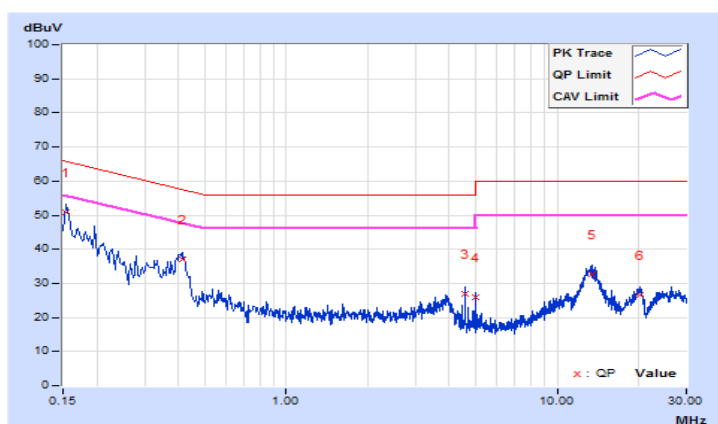


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	21°C, 65%RH
Tested by	Cyril Chen	Test Date	2020/12/1

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	9.68	41.03	34.92	50.71	44.60	65.79	55.79	-15.08	-11.19
2	0.41560	9.68	27.31	19.19	36.99	28.87	57.54	47.54	-20.55	-18.67
3	4.57612	9.78	17.01	10.86	26.79	20.64	56.00	46.00	-29.21	-25.36
4	4.97103	9.78	15.98	9.47	25.76	19.25	56.00	46.00	-30.24	-26.75
5	13.42445	9.90	22.68	15.04	32.58	24.94	60.00	50.00	-27.42	-25.06
6	20.36079	9.98	16.62	9.16	26.60	19.14	60.00	50.00	-33.40	-30.86

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



4.3 Conducted Output Power Measurement

4.3.1 Limits of Conducted Output Power Measurement

For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30 dBm)

Per KDB 662911 D01 Multiple Transmitter Output Method of conducted output power measurement on IEEE 802.11 devices,

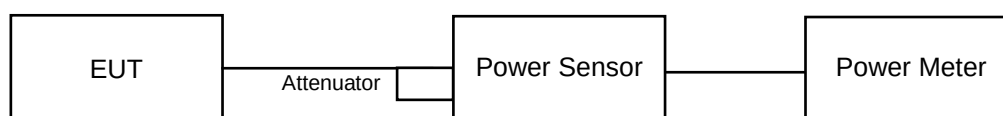
Array Gain = 0 dB (i.e., no array gain) for $NANT \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any NANT;

Array Gain = $5 \log(NANT/NSS)$ dB or 3 dB, whichever is less for 20 MHz channel widths with $NANT \geq 5$.

For power measurements on all other devices: Array Gain = $10 \log(NANT/NSS)$ dB.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedures

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.

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.3.7 Test Results

Peak Power

802.11b

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	19.69	20.08	194.984	22.90	30	Pass
6	2437	20.62	20.63	231.206	23.64	30	Pass
11	2462	20.66	20.95	240.991	23.82	30	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	19.70	19.18	176.198	22.46	30	Pass
6	2437	23.09	23.23	414.000	26.17	30	Pass
11	2462	19.68	19.63	184.927	22.67	30	Pass

802.11n (VHT20)

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	18.87	18.60	149.624	21.75	30	Pass
6	2437	23.21	23.26	421.697	26.25	30	Pass
11	2462	18.60	18.31	140.281	21.47	30	Pass

802.11n (VHT40)

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	17.41	17.25	108.143	20.34	30	Pass
6	2437	20.66	21.15	246.604	23.92	30	Pass
9	2452	14.56	14.30	55.463	17.44	30	Pass

Average Power

802.11b

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Pass / Fail
		Chain 0	Chain 1			
1	2412	17.37	17.80	114.815	20.60	Pass
6	2437	18.33	18.38	137.088	21.37	Pass
11	2462	18.44	18.64	142.889	21.55	Pass

802.11g

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Pass / Fail
		Chain 0	Chain 1			
1	2412	13.58	13.21	43.752	16.41	Pass
6	2437	17.93	18.09	126.474	21.02	Pass
11	2462	13.44	13.52	44.566	16.49	Pass

802.11n (VHT20)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Pass / Fail
		Chain 0	Chain 1			
1	2412	12.73	12.55	36.728	15.65	Pass
6	2437	17.85	17.91	122.744	20.89	Pass
11	2462	12.31	12.30	34.041	15.32	Pass

802.11n (VHT40)

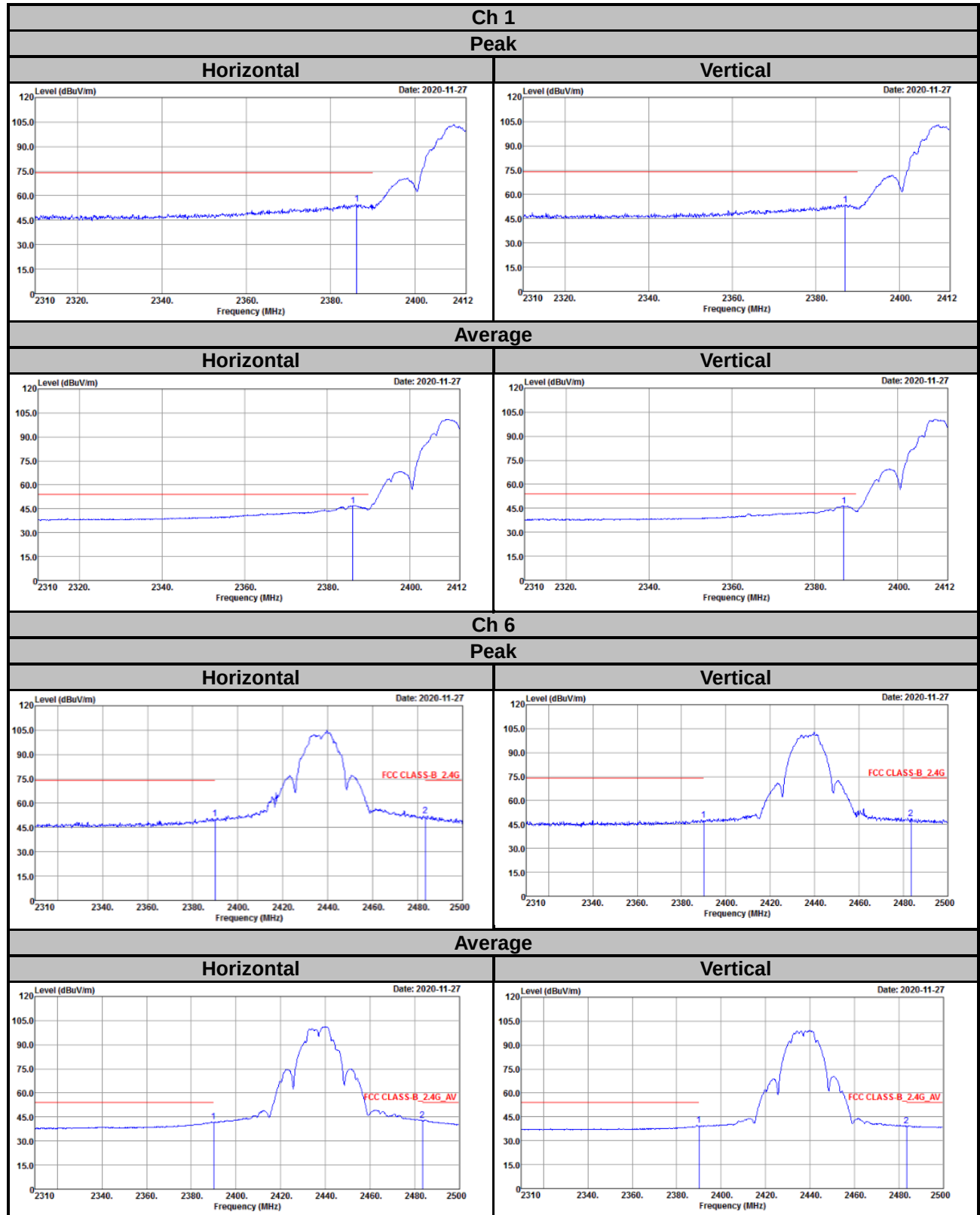
Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Pass / Fail
		Chain 0	Chain 1			
3	2422	10.81	10.80	24.099	13.82	Pass
6	2437	14.36	14.57	55.976	17.48	Pass
9	2452	8.26	8.21	13.335	11.25	Pass

5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Annex A- Band Edge Measurement

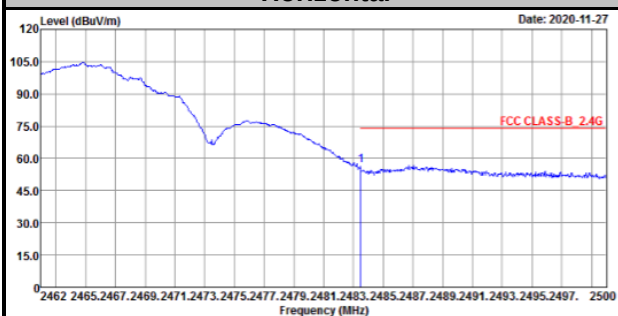
802.11b



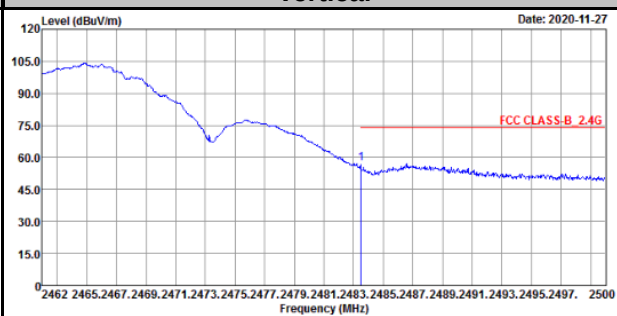
Ch 11

Peak

Horizontal

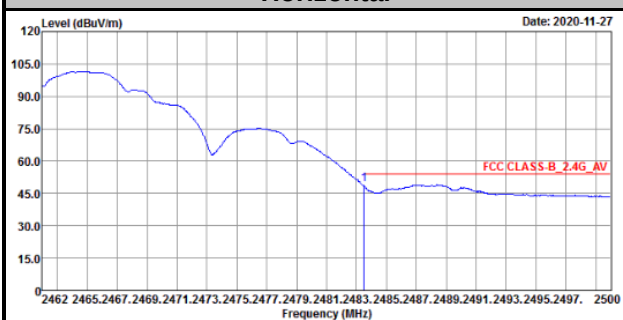


Vertical

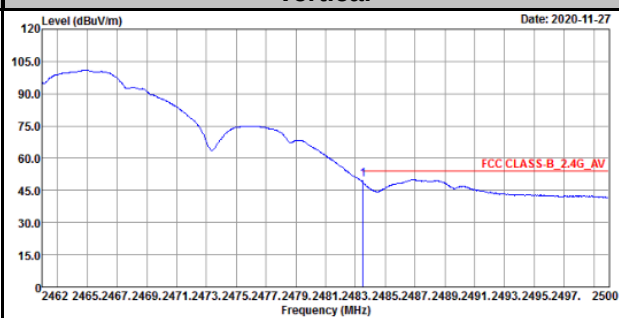


Average

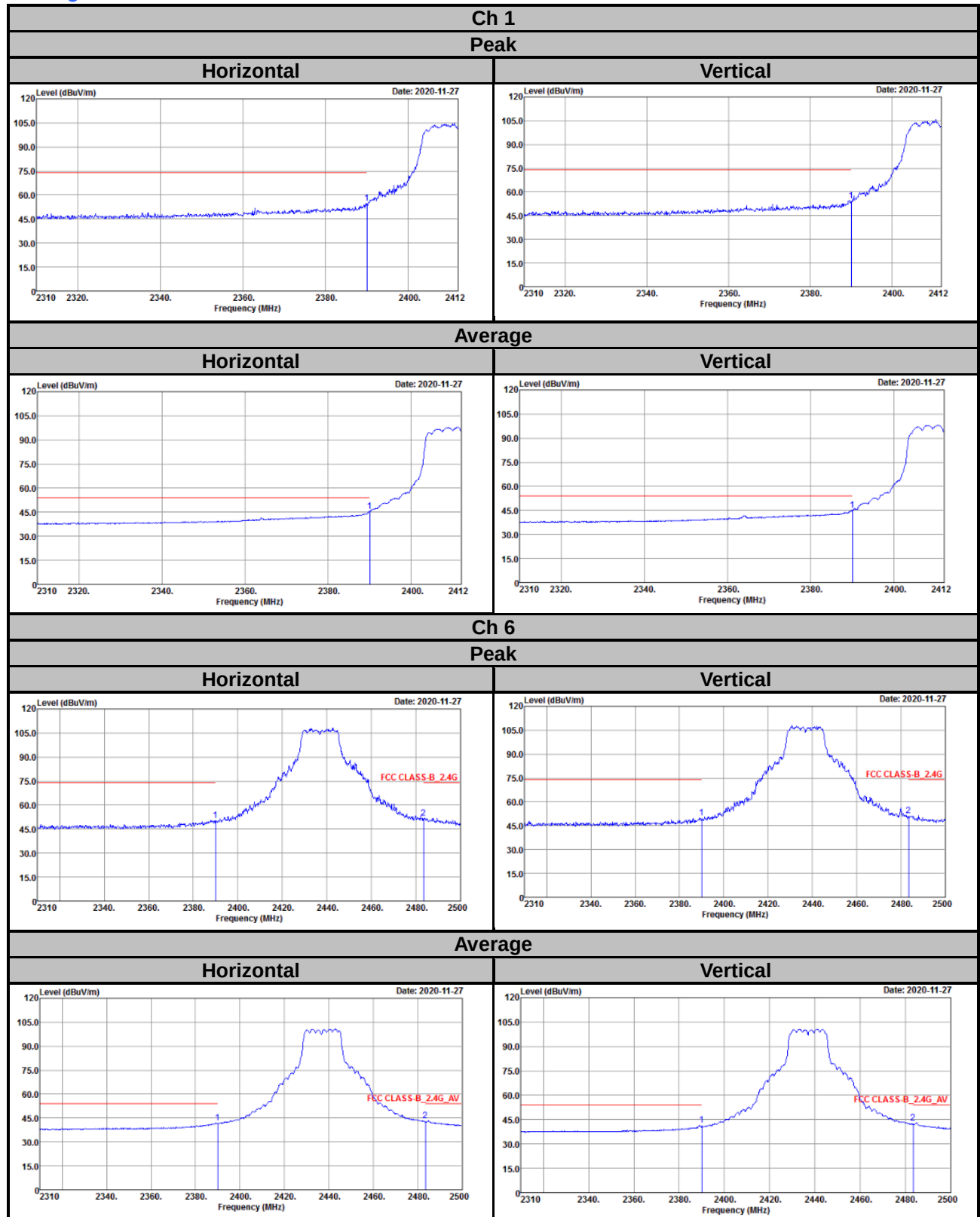
Horizontal



Vertical



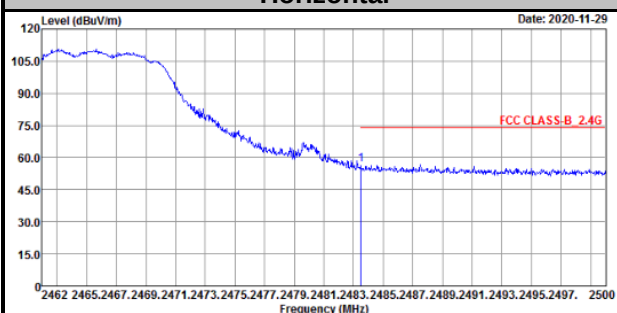
802.11g



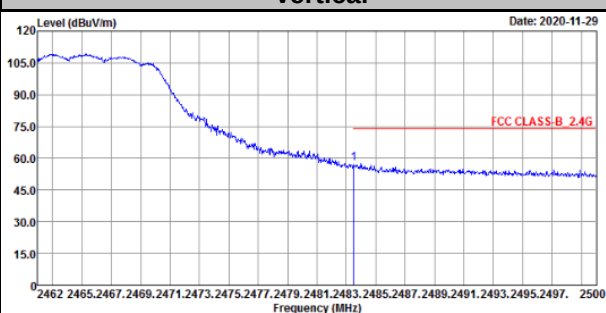
Ch 11

Peak

Horizontal

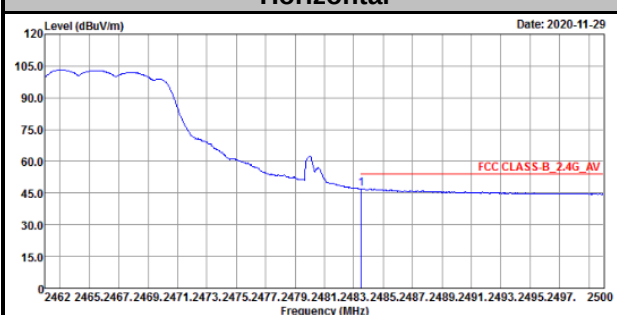


Vertical

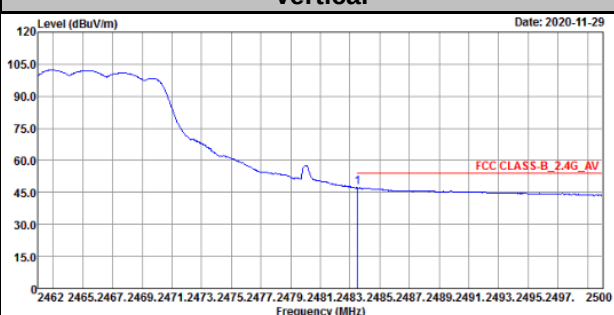


Average

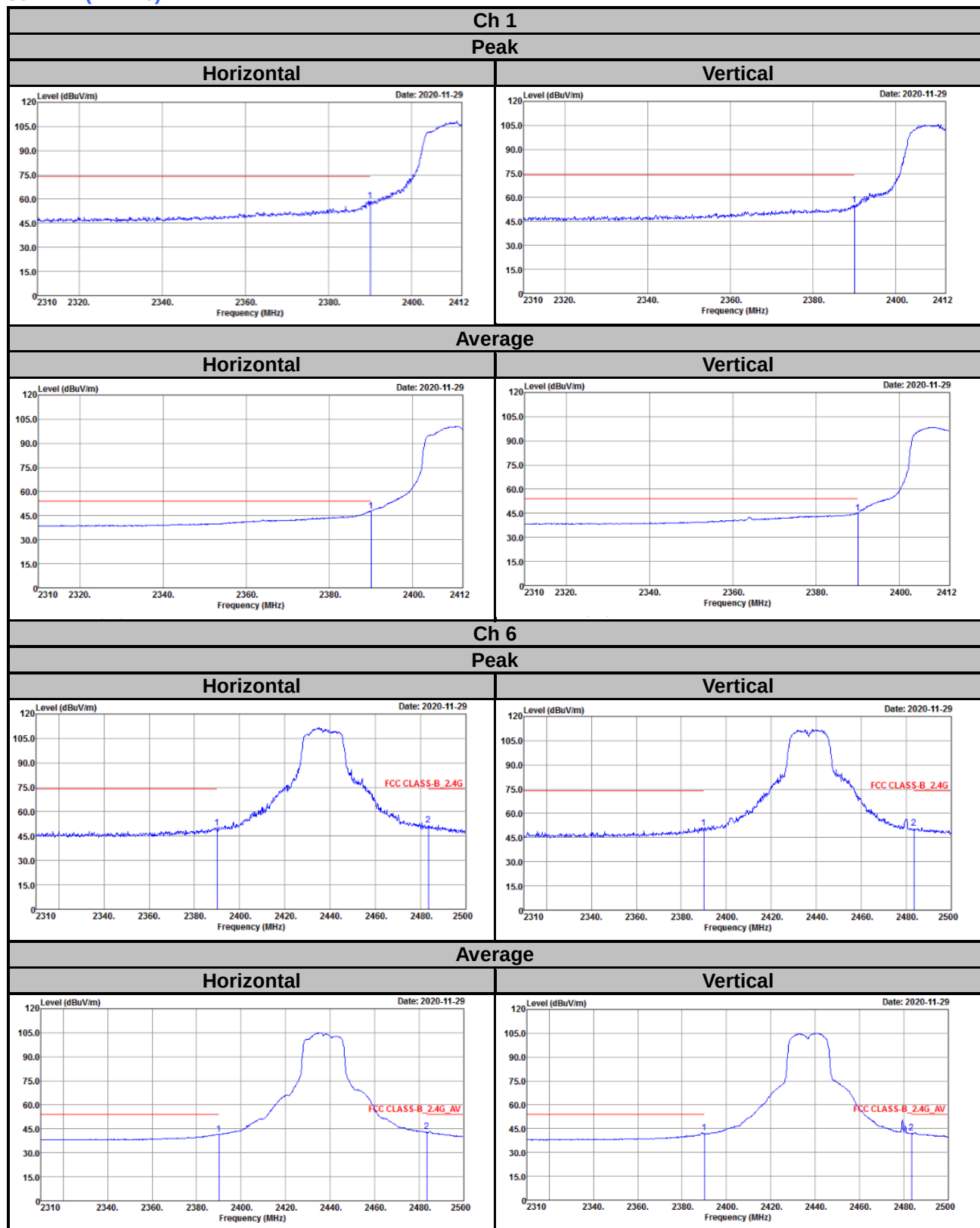
Horizontal



Vertical



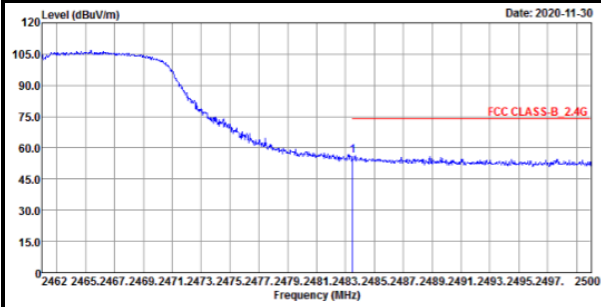
802.11n (VHT20)



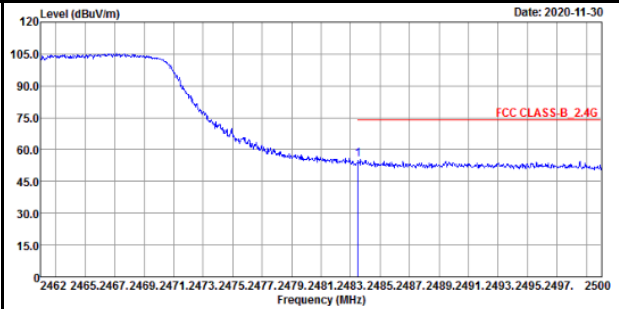
Ch 11

Peak

Horizontal

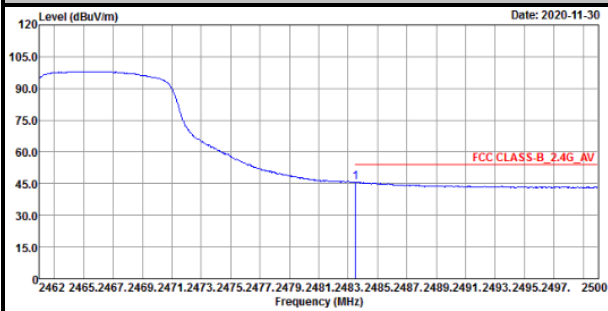


Vertical

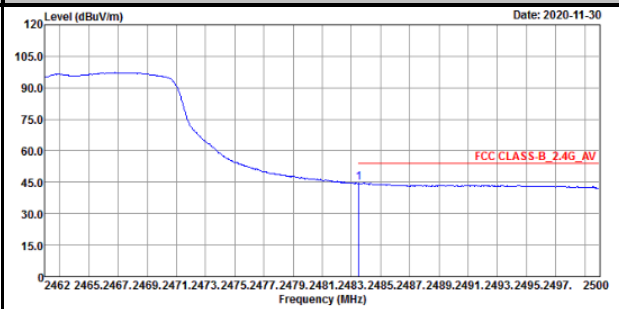


Average

Horizontal



Vertical

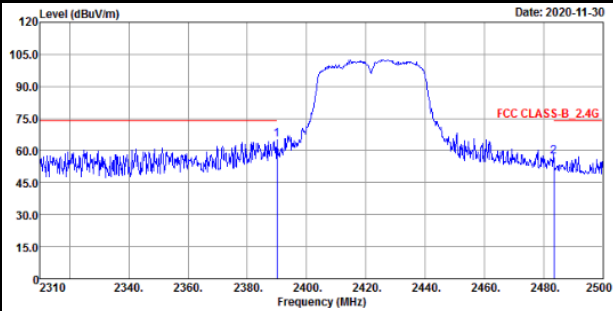


802.11n (VHT40)

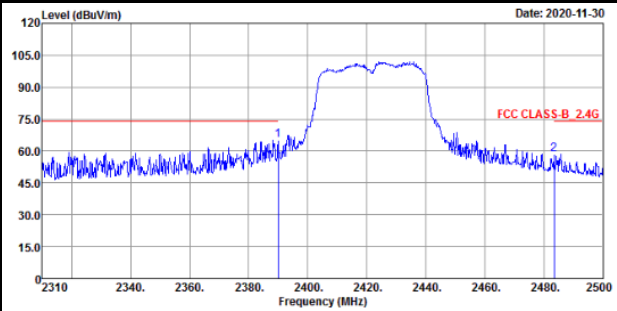
Ch 3

Peak

Horizontal

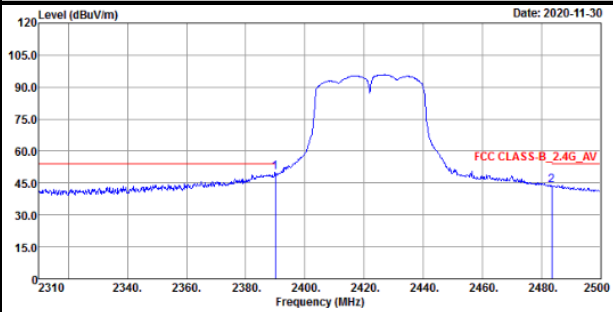


Vertical

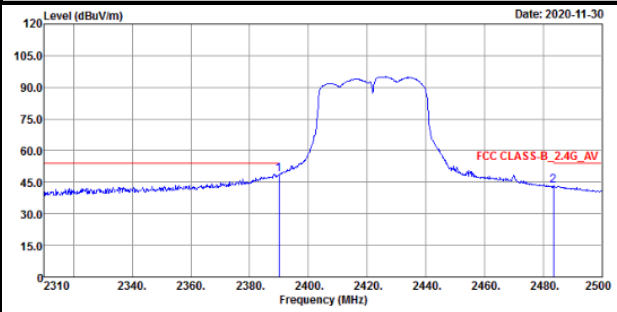


Average

Horizontal



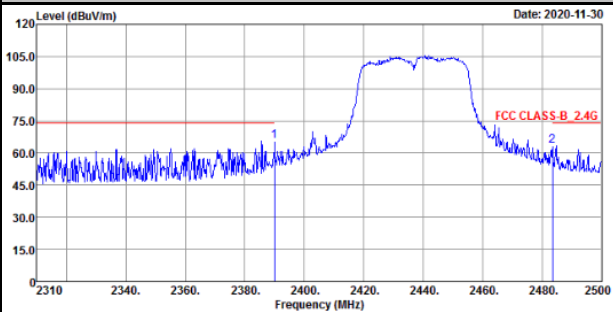
Vertical



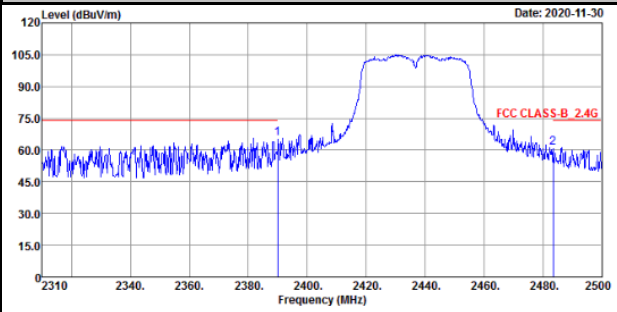
Ch 6

Peak

Horizontal

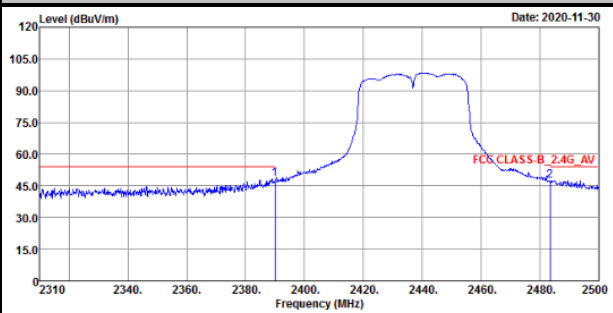


Vertical

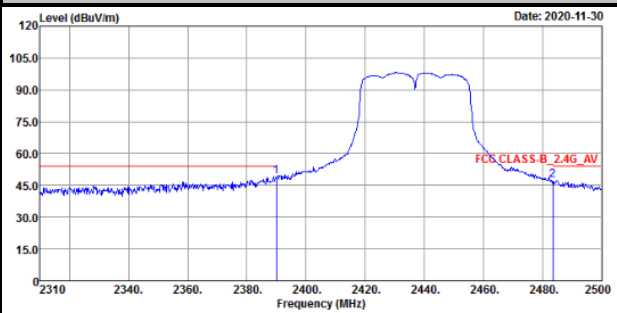


Average

Horizontal



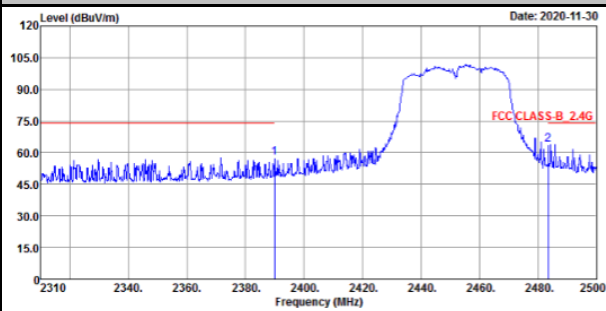
Vertical



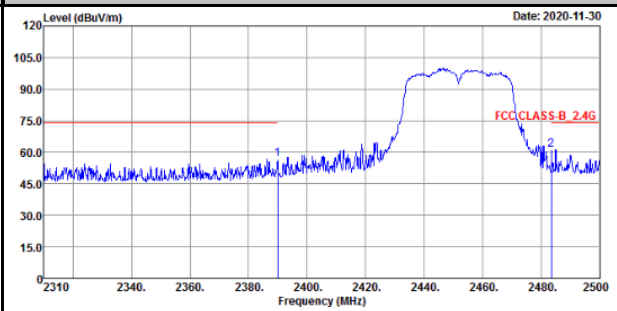
Ch 9

Peak

Horizontal

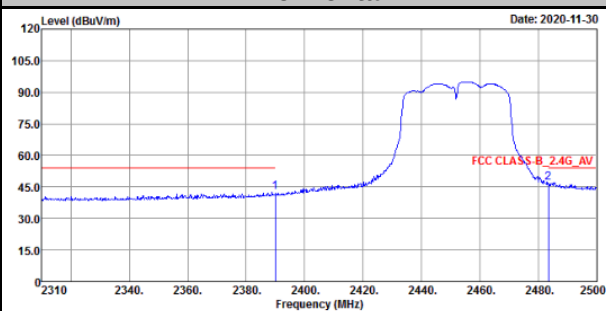


Vertical

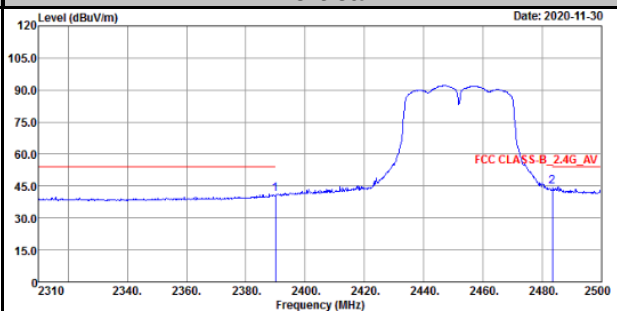


Average

Horizontal



Vertical



Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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