Variant FCC Test Report

Report No.:	RFBAYS-WTW-P20110319A-2
FCC ID:	W23-WMU62XX
Test Model:	WMU6202
Series Model:	WMU6203, WMU6204, WMU6205, WMU6206, WMU6207
Received Date:	Apr. 14, 2021
Test Date:	Apr. 22 ~ Apr. 27, 2021
Issued Date:	May 14, 2021
Applicant:	jjPlus Corporation
Address:	15F-7, No. 2, Jianba Road, Zhonghe Dist., New Taipei City, Taiwan (R.O.C.)
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:	B2F., No.215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan
FCC Registration / Designation Number:	427177 / TW0011

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Release Control Record

Issue No.	Description	Date Issued
RFBAYS-WTW-P20110319A-2	Original Release	May 14, 2021

1 Certificate of Conformity

Product:	11ac 2T2R WIFI & BT Module
Brand:	jjPlus
Test Model:	WMU6202
Series Model:	WMU6203, WMU6204, WMU6205, WMU6206, WMU6207
Sample Status:	wifi module
Applicant:	jjPlus Corporation
Test Date:	Apr. 22 ~ Apr. 27, 2021
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10:2013

This report is issued as a supplementary report to BV CPS report no.: RF181127C08-2. This report shall be used by combining with its original report.

Prepared by : _____ , **Date:** May 14, 2021

Gina Liu / Specialist

Approved by : _____ , **Date:** May 14, 2021

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	N/A	Refer to Note
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -5.12 dB at 2483.5 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	N/A	Refer to Note
15.247(e)	Power Spectral Density	N/A	Refer to Note
15.203	Antenna Requirement	Pass	Antenna connector is U.FLx2 not a standard connector.

Note:

1. Only Radiated Emissions test was performed for this addendum. Refer to original report for other test data.
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) (±)**
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	2.0153 dB
	200 MHz ~ 1000 MHz	2.0224 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	1.0121 dB
	18 GHz ~ 40 GHz	1.1508 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	11ac 2T2R WIFI & BT Module
Brand	jjPlus
Test Model	WMU6202
Series Model	WMU6203, WMU6204, WMU6205, WMU6206, WMU6207
Status of EUT	wifi module
Power Supply Rating	3.3 Vdc (host equipment)
Modulation Type	CCK, DQPSK, DBPSK for DSSS 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) 7 for 802.11n (HT40)
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

1. This report is prepared for FCC class II permissive change. This report is issued as a supplementary report to BV CPS report no. RF181127C08-2. The difference compared with original report is adding new Antennas. Therefore, only Radiated Emissions re-test and recorded in this report.
2. The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and two receivers.

Modulation Mode	Tx Function
802.11b	1TX
802.11g	1TX
802.11n (HT20)	2TX
802.11n (HT40)	2TX

3. All models and antennas are listed as below.

Test Mode	Model	RF Chip	RF Design	Interface	Antenna type	Antenna connector
v	WMU6202	RTL8822BU	The Same	mPCIe	Dipole PIFA	U.FLx2
	WMU6203			M.2		MHF4
	WMU6204			USB Type-A		U.FLx2
	WMU6205			4Pin Wafer		U.FLx2
	WMU6206			USB Type-A	PCB Antenna x2	none (like solder)
	WMU6207			4Pin Wafer		none (like solder)

*The difference Models are pre-tested, because the connector and interface are difference with difference Model, and selected the worst Model for testing.

4. The antennas information is listed as below. (New antenna is marked in boldface.)

Antenna Type	Brand	Model	Antenna Gain (dBi)		
			BT	2.4G	5G
Dipole	LYNwave	AOA160-221020-000000	3.0	3.0	2.0
	LYNwave	AOA160-221034-000000	3.0	3.0	3.0
	LYNwave	AOA160-221050-000000	5.0	5.0	5.0
PCB	N/A	N/A	3.6	3.6	5.3
	N/A	N/A	3.6	3.6	4.7
PIFA	**SINBON**	**A9706632**	**4.1**	**4.1**	**3.5**
	SINBON	**A9706633**	**4.8**	**4.8**	**4.1**

5. 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.
6. 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):

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):

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≥1G	RE<1G	
-	√	√	-

Where **RE≥1G:** Radiated Emission above 1 GHz **RE<1G:** Radiated Emission below 1 GHz
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 (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

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)
-	802.11g	1 to 11	11	OFDM	BPSK	6.0

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE≥1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Charles Hsiao
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Karl Lee

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.

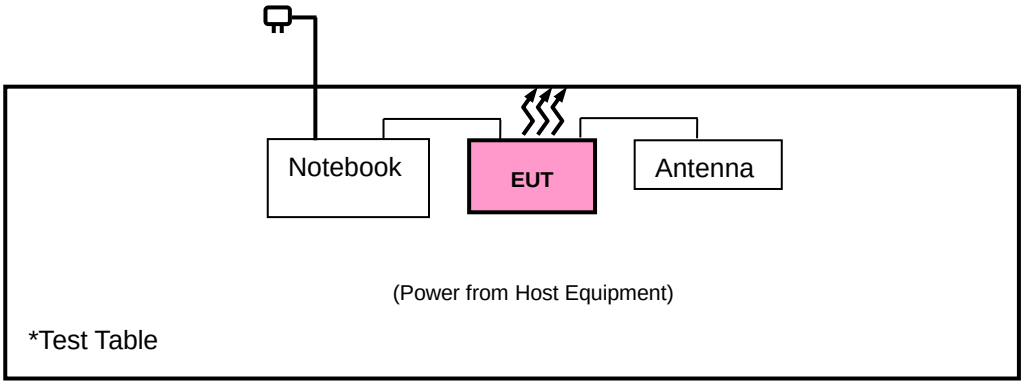
No.	Product	Brand	Model No.	Serial No.	FCC ID
A.	Notebook	DELL	E6420	D3T96R1	N/A

No.	Signal Cable Description of The Above Support Units
1.	N/A

Note:

1. 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 Technologies	N9038A	MY52260177	Aug. 24, 2020	Aug. 23, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 12, 2021	Apr. 11, 2022
HORN Antenna ETS-Lindgren	3117	00143293	Nov. 22, 2020	Nov. 21, 2021
BILOG Antenna SCHWARZBECK	VULB 9168	9168-616	Nov. 09, 2020	Nov. 08, 2021
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Nov. 22, 2020	Nov. 21, 2021
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 13, 2021	Apr. 12, 2022
Loop Antenna	EM-6879	269	Sep. 17, 2020	Sep. 16, 2021
MXG Vector signal generator Agilent	N5182B	MY53050430	Nov. 25, 2020	Nov. 24, 2021
Preamplifier Agilent	310N	187226	Jun. 17, 2020	Jun. 16, 2021
Preamplifier Agilent	83017A	MY39501357	Jun. 17, 2020	Jun. 16, 2021
Preamplifier EMCI	EMC 184045	980116	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 signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-400)	Jun. 17, 2020	Jun. 16, 2021
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(RFC-SMS-100-SMS-24)	Jun. 17, 2020	Jun. 17, 2021
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 8.130425b	NA	NA	NA
Antenna Tower MF	NA	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 HsinTien Chamber 1.

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:

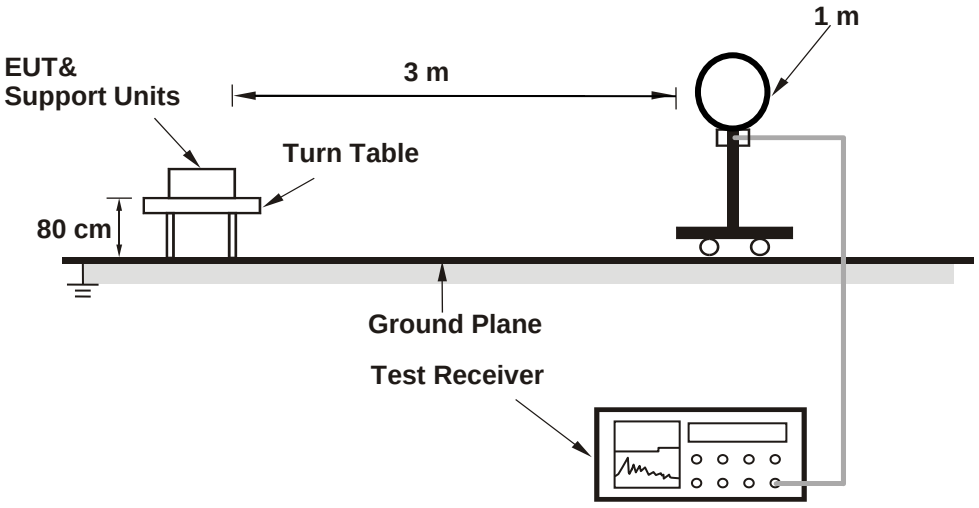
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98 %) or 10 Hz (Duty cycle ≥ 98 %) for Average detection (AV) at frequency above 1 GHz. (11b: RBW = 1 MHz, VBW =300 Hz ; 11g: RBW = 1 MHz, VBW = 1 kHz ;
4. 11n (HT20): RBW = 1 MHz, VBW = 3 kHz ; 11n (HT40): RBW = 1 MHz, VBW = 10 kHz)
5. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

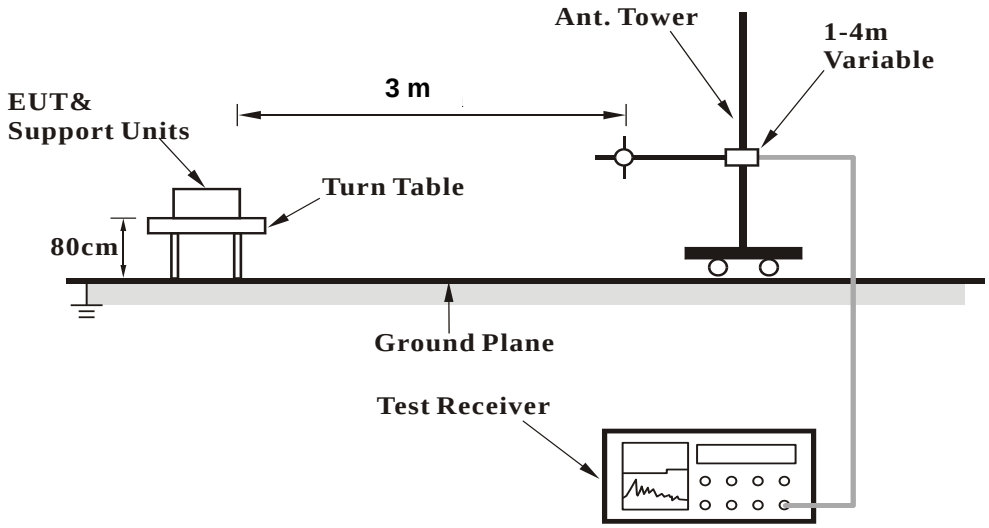
No deviation.

4.1.5 Test Set Up

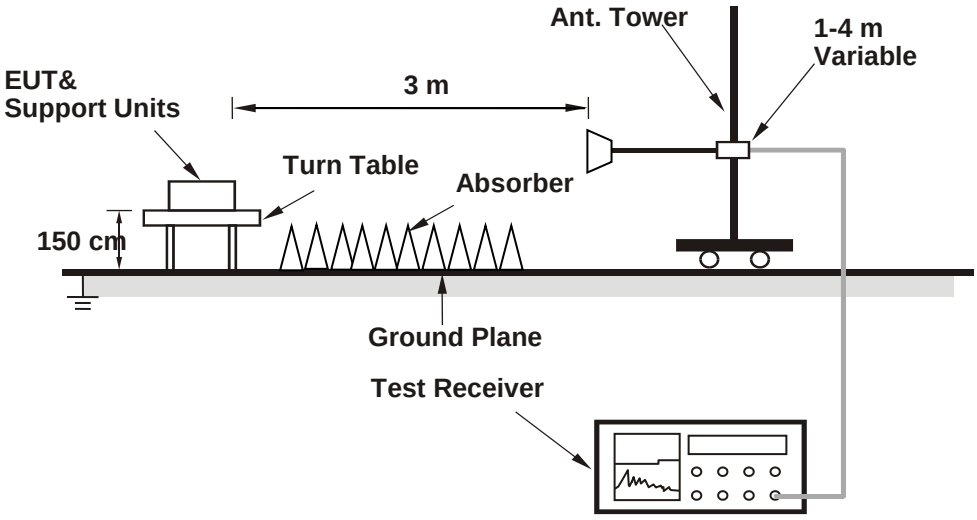
<Radiated Emission below 30 MHz>



<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

a. Placed the EUT on a testing table.
b. 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**	Charles Hsiao

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	40.74	36.24	4.5	54	-13.26	299	234	Average
2390	51.79	47.29	4.5	74	-22.21	299	234	Peak
2412	94.78	90.23	4.55			299	234	Average
2412	97.81	93.26	4.55			299	234	Peak
4824	42.74	32.45	10.29	54	-11.26	271	136	Average
4824	48.94	38.65	10.29	74	-25.06	271	136	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	41.83	37.33	4.5	54	-12.17	236	85	Average
2390	52.6	48.1	4.5	74	-21.4	236	85	Peak
2412	96.59	92.04	4.55			236	85	Average
2412	99.22	94.67	4.55			236	85	Peak
4824	42.19	31.9	10.29	54	-11.81	162	228	Average
4824	48.71	38.42	10.29	74	-25.29	162	228	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.

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**	Charles Hsiao

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	40.69	36.19	4.5	54	-13.31	299	234	Average
2390	52.93	48.43	4.5	74	-21.07	299	234	Peak
2437	94.95	90.36	4.59			299	234	Average
2437	97.88	93.29	4.59			299	234	Peak
2483.5	41.61	36.95	4.66	54	-12.39	299	234	Average
2483.5	52.47	47.81	4.66	74	-21.53	299	234	Peak
4874	43.49	33.28	10.21	54	-10.51	126	90	Average
4874	49.99	39.78	10.21	74	-24.01	126	90	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	40.67	36.17	4.5	54	-13.33	236	85	Average
2390	52.37	47.87	4.5	74	-21.63	236	85	Peak
2437	96.35	91.76	4.59			236	85	Average
2437	99.02	94.43	4.59			236	85	Peak
2483.5	41.42	36.76	4.66	54	-12.58	236	85	Average
2483.5	52.37	47.71	4.66	74	-21.63	236	85	Peak
4874	42.04	31.83	10.21	54	-11.96	116	294	Average
4874	48.27	38.06	10.21	74	-25.73	116	294	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.

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**	Charles Hsiao

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	96.75	92.13	4.62			299	234	Average
2462	99.76	95.14	4.62			299	234	Peak
2483.5	42.05	37.39	4.66	54	-11.95	299	234	Average
2483.5	53.84	49.18	4.66	74	-20.16	299	234	Peak
4924	42.75	32.5	10.25	54	-11.25	206	38	Average
4924	50	39.75	10.25	74	-24	206	38	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	97.84	93.22	4.62			236	85	Average
2462	100.8	96.18	4.62			236	85	Peak
2483.5	42.07	37.41	4.66	54	-11.93	236	85	Average
2483.5	53.11	48.45	4.66	74	-20.89	236	85	Peak
4924	42.53	32.28	10.25	54	-11.47	151	178	Average
4924	48.81	38.56	10.25	74	-25.19	151	178	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.

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**	Charles Hsiao

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	42.4	37.9	4.5	54	-11.6	299	234	Average
2390	54.15	49.65	4.5	74	-19.85	299	234	Peak
2412	91.72	87.17	4.55			299	234	Average
2412	98.04	93.49	4.55			299	234	Peak
4824	41.63	31.34	10.29	54	-12.37	129	68	Average
4824	47.85	37.56	10.29	74	-26.15	129	68	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	42.68	38.18	4.5	54	-11.32	236	85	Average
2390	55.42	50.92	4.5	74	-18.58	236	85	Peak
2412	92.58	88.03	4.55			236	85	Average
2412	99.53	94.98	4.55			236	85	Peak
4824	42.24	31.95	10.29	54	-11.76	161	205	Average
4824	48.6	38.31	10.29	74	-25.4	161	205	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.

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**	Charles Hsiao

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	40.62	36.12	4.5	54	-13.38	299	234	Average
2390	51.93	47.43	4.5	74	-22.07	299	234	Peak
2437	92.39	87.8	4.59			299	234	Average
2437	99.17	94.58	4.59			299	234	Peak
2483.5	41.53	36.87	4.66	54	-12.47	299	234	Average
2483.5	53.34	48.68	4.66	74	-20.66	299	234	Peak
4874	41.95	31.74	10.21	54	-12.05	101	157	Average
4874	48.14	37.93	10.21	74	-25.86	101	157	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	40.62	36.12	4.5	54	-13.38	236	85	Average
2390	52.38	47.88	4.5	74	-21.62	236	85	Peak
2437	94.47	89.88	4.59			236	85	Average
2437	101.28	96.69	4.59			236	85	Peak
2483.5	41.42	36.76	4.66	54	-12.58	236	85	Average
2483.5	52.54	47.88	4.66	74	-21.46	236	85	Peak
4874	42.37	32.16	10.21	54	-11.63	263	149	Average
4874	48.67	38.46	10.21	74	-25.33	263	149	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.

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**	Charles Hsiao

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	94.57	89.95	4.62			299	234	Average
2462	101.17	96.55	4.62			299	234	Peak
2483.5	47.48	42.82	4.66	54	-6.52	299	234	Average
2483.5	63.4	58.74	4.66	74	-10.6	299	234	Peak
4924	42.19	31.94	10.25	54	-11.81	121	176	Average
4924	48.57	38.32	10.25	74	-25.43	121	176	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	95.67	91.05	4.62			236	85	Average
2462	102.82	98.2	4.62			236	85	Peak
2483.5	**48.88**	**44.22**	**4.66**	**54**	**-5.12**	**236**	**85**	**Average**
2483.5	63.08	58.42	4.66	74	-10.92	236	85	Peak
4924	42.37	32.12	10.25	54	-11.63	131	72	Average
4924	49.08	38.83	10.25	74	-24.92	131	72	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.

802.11n (HT20)

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**	Charles Hsiao

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	41.11	36.61	4.5	54	-12.89	219	73	Average
2390	51.89	47.39	4.5	74	-22.11	219	73	Peak
2412	93.68	89.13	4.55			219	73	Average
2412	100.07	95.52	4.55			219	73	Peak
4824	42.29	32	10.29	54	-11.71	129	235	Average
4824	48.42	38.13	10.29	74	-25.58	129	235	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	41.15	36.65	4.5	54	-12.85	133	348	Average
2390	53.04	48.54	4.5	74	-20.96	133	348	Peak
2412	92.84	88.29	4.55			133	348	Average
2412	99.84	95.29	4.55			133	348	Peak
4824	41.95	31.66	10.29	54	-12.05	161	197	Average
4824	48.27	37.98	10.29	74	-25.73	161	197	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.

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**	Charles Hsiao

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	40.52	36.02	4.5	54	-13.48	250	320	Average
2390	51.66	47.16	4.5	74	-22.34	250	320	Peak
2437	93.57	88.98	4.59			250	320	Average
2437	100.03	95.44	4.59			250	320	Peak
2483.5	41.09	36.43	4.66	54	-12.91	250	320	Average
2483.5	51.81	47.15	4.66	74	-22.19	250	320	Peak
4874	41.68	31.47	10.21	54	-12.32	304	182	Average
4874	47.94	37.73	10.21	74	-26.06	304	182	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	40.7	36.2	4.5	54	-13.3	133	348	Average
2390	52.31	47.81	4.5	74	-21.69	133	348	Peak
2437	92.59	88	4.59			133	348	Average
2437	99.38	94.79	4.59			133	348	Peak
2483.5	41.13	36.47	4.66	54	-12.87	133	348	Average
2483.5	52.95	48.29	4.66	74	-21.05	133	348	Peak
4874	42.19	31.98	10.21	54	-11.81	223	14	Average
4874	48.48	38.27	10.21	74	-25.52	223	14	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.

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**	Charles Hsiao

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	92.63	88.01	4.62			202	320	Average
2462	99.07	94.45	4.62			202	320	Peak
2483.5	41.92	37.26	4.66	54	-12.08	202	320	Average
2483.5	54.42	49.76	4.66	74	-19.58	202	320	Peak
4924	42.59	32.34	10.25	54	-11.41	247	243	Average
4924	48.72	38.47	10.25	74	-25.28	247	243	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	91.15	86.53	4.62			133	348	Average
2462	98.1	93.48	4.62			133	348	Peak
2483.5	42.65	37.99	4.66	54	-11.35	133	348	Average
2483.5	55.48	50.82	4.66	74	-18.52	133	348	Peak
4924	41.34	31.09	10.25	54	-12.66	137	250	Average
4924	47.73	37.48	10.25	74	-26.27	137	250	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.

802.11n (HT40)

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**	Charles Hsiao

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	48.6	44.1	4.5	54	-5.4	231	73	Average
2390	60.01	55.51	4.5	74	-13.99	231	73	Peak
2422	91.55	86.99	4.56			219	72	Average
2422	98.35	93.79	4.56			219	72	Peak
2483.5	41.5	36.84	4.66	54	-12.5	231	73	Average
2483.5	52.35	47.69	4.66	74	-21.65	231	73	Peak
4844	41.87	31.64	10.23	54	-12.13	139	74	Average
4844	48.11	37.88	10.23	74	-25.89	139	74	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	46.74	42.24	4.5	54	-7.26	133	348	Average
2390	59.47	54.97	4.5	74	-14.53	133	348	Peak
2422	90.84	86.28	4.56			133	348	Average
2422	97.61	93.05	4.56			133	348	Peak
2483.5	41.56	36.9	4.66	54	-12.44	133	348	Average
2483.5	52.57	47.91	4.66	74	-21.43	133	348	Peak
4844	42.26	32.03	10.23	54	-11.74	228	172	Average
4844	48.47	38.24	10.23	74	-25.53	228	172	Peak

Remarks:

1. Emission Level = Read Level + Factor
   Margin value = Emission level – Limit value
2. 2422 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.

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**	Charles Hsiao

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	43.43	38.93	4.5	54	-10.57	250	320	Average
2390	55	50.5	4.5	74	-19	250	320	Peak
2437	92.84	88.25	4.59			250	320	Average
2437	99.81	95.22	4.59			250	320	Peak
2483.5	41.93	37.27	4.66	54	-12.07	250	320	Average
2483.5	53.24	48.58	4.66	74	-20.76	250	320	Peak
4874	41.96	31.75	10.21	54	-12.04	247	106	Average
4874	48.2	37.99	10.21	74	-25.8	247	106	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	44.1	39.6	4.5	54	-9.9	133	348	Average
2390	55.33	50.83	4.5	74	-18.67	133	348	Peak
2437	91.5	86.91	4.59			133	348	Average
2437	98.33	93.74	4.59			133	348	Peak
2483.5	43.59	38.93	4.66	54	-10.41	133	348	Average
2483.5	56.48	51.82	4.66	74	-17.52	133	348	Peak
4874	41.46	31.25	10.21	54	-12.54	165	199	Average
4874	47.72	37.51	10.21	74	-26.28	165	199	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.

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**	Charles Hsiao

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	41.13	36.63	4.5	54	-12.87	202	320	Average
2390	52.44	47.94	4.5	74	-21.56	202	320	Peak
2452	90.84	86.24	4.6			202	320	Average
2452	97.06	92.46	4.6			202	320	Peak
2483.5	44.92	40.26	4.66	54	-9.08	202	320	Average
2483.5	57.3	52.64	4.66	74	-16.7	202	320	Peak
4904	42.46	32.32	10.14	54	-11.54	204	173	Average
4904	48.59	38.45	10.14	74	-25.41	204	173	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	40.99	36.49	4.5	54	-13.01	133	348	Average
2390	52.47	47.97	4.5	74	-21.53	133	348	Peak
2452	89.87	85.27	4.6			133	348	Average
2452	96.15	91.55	4.6			133	348	Peak
2483.5	46.46	41.8	4.66	54	-7.54	133	348	Average
2483.5	58.33	53.67	4.66	74	-15.67	133	348	Peak
4904	42.61	32.47	10.14	54	-11.39	216	107	Average
4904	48.86	38.72	10.14	74	-25.14	216	107	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.

9 kHz ~ 30 MHz Data:

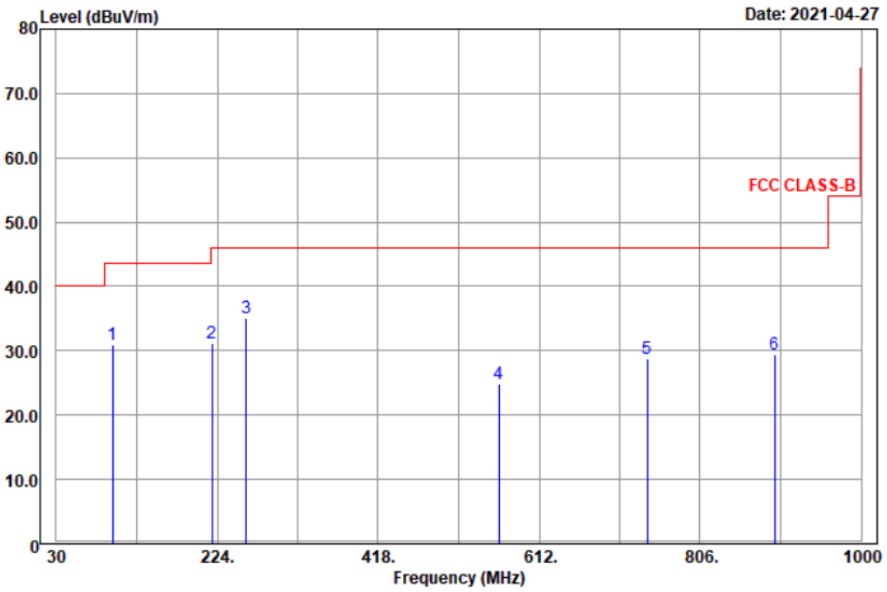
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

30 MHz ~ 1 GHz Worst-Case Data:

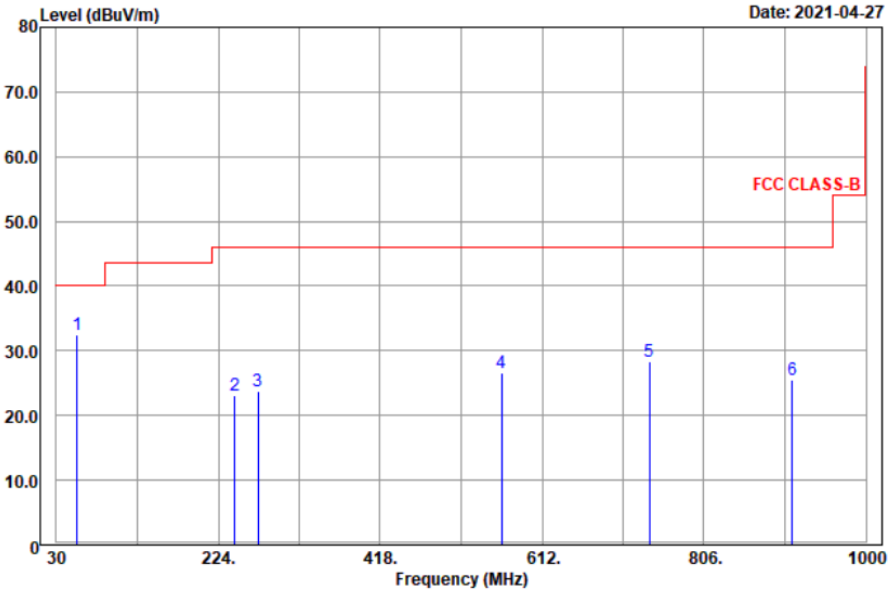
802.11g

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**	Karl Lee

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
98.31	30.93	48.39	-17.46	43.5	-12.57	121	214	Peak
217.65	31.13	49.05	-17.92	46	-14.87	105	285	Peak
259.23	35.16	51.85	-16.69	46	-10.84	166	196	Peak
563.9	24.83	36.13	-11.3	46	-21.17	105	226	Peak
742.4	28.67	37.21	-8.54	46	-17.33	193	26	Peak
895.7	29.39	35.38	-5.99	46	-16.61	124	166	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
54.57	32.37	47.8	-15.43	40	-7.63	157	17	Peak
243.57	23.14	40.11	-16.97	46	-22.86	105	162	Peak
271.92	23.74	40.26	-16.52	46	-22.26	124	17	Peak
563.9	26.55	37.85	-11.3	46	-19.45	199	262	Peak
741	28.33	36.87	-8.54	46	-17.67	105	288	Peak
911.8	25.6	31.35	-5.75	46	-20.4	127	44	Peak

Remarks:

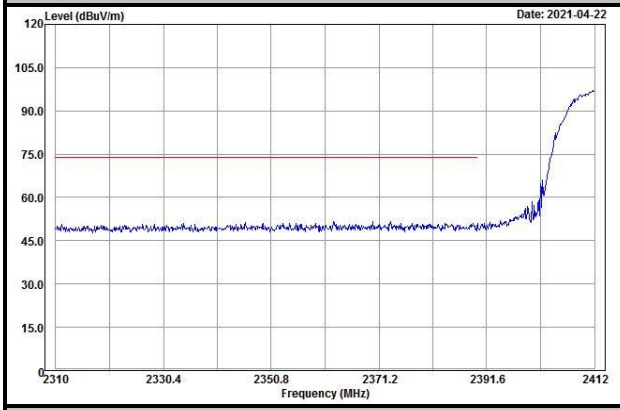
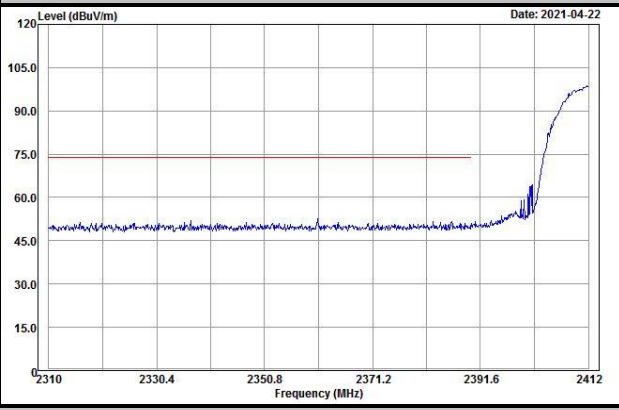
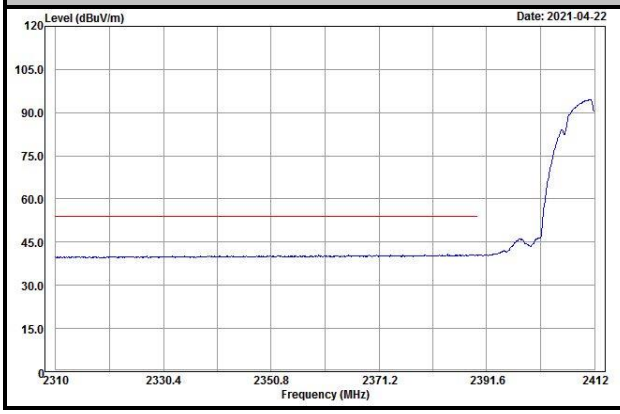
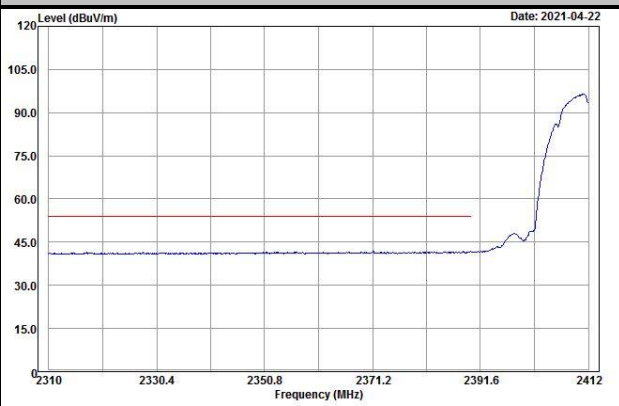
1. Emission Level = Read Level + Factor
   Margin value = Emission level – Limit value.
2. The emission levels of other frequencies were very low against the limit.

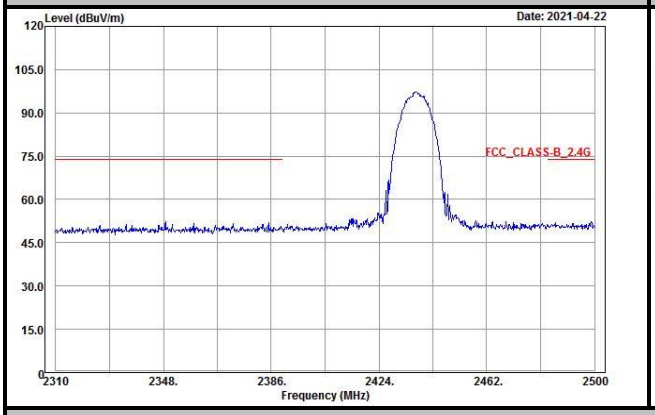
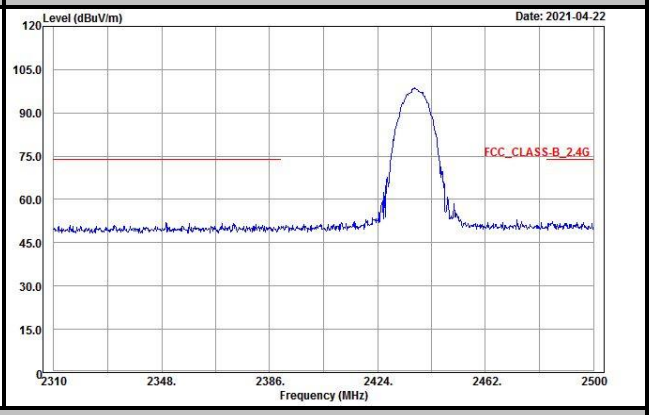
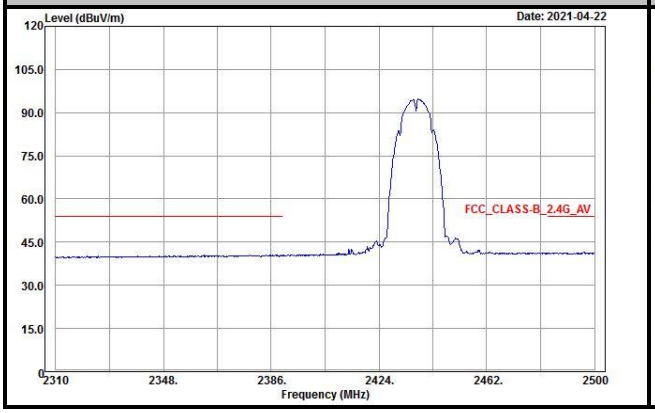
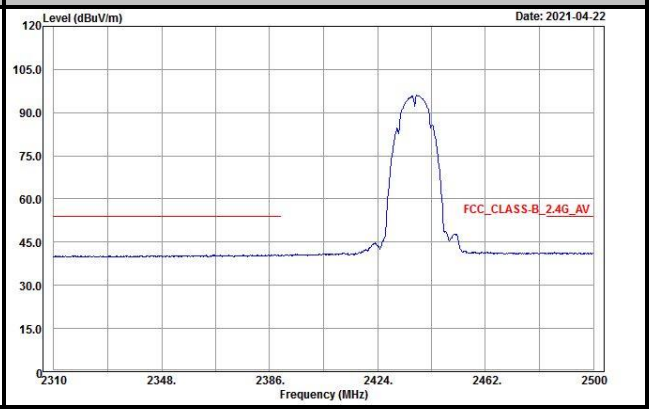
5 Pictures of Test Arrangements

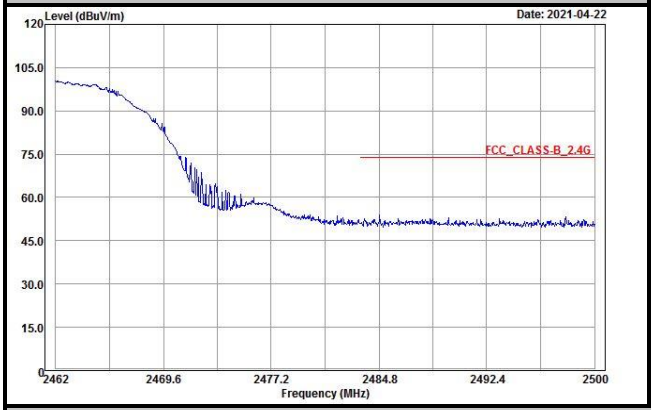
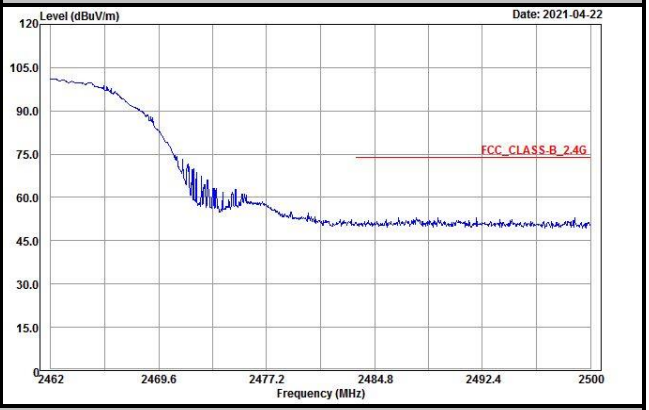
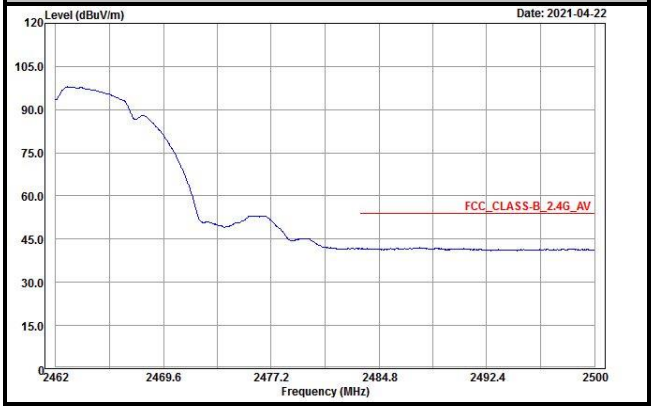
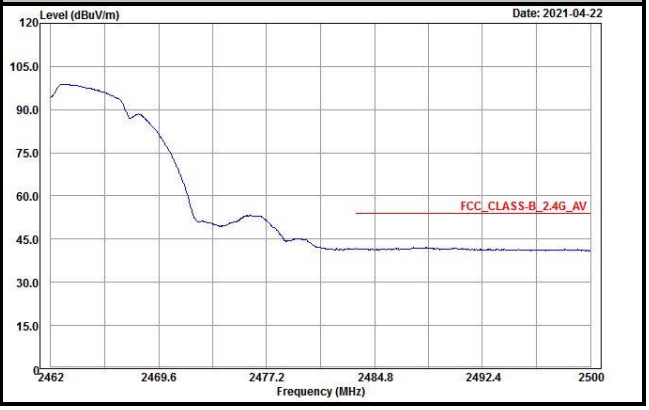
Please refer to the attached file (Test Setup Photo).

Annex A- Band Edge Measurement

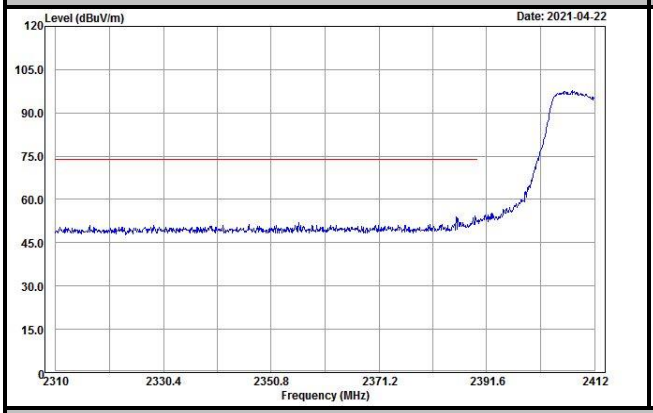
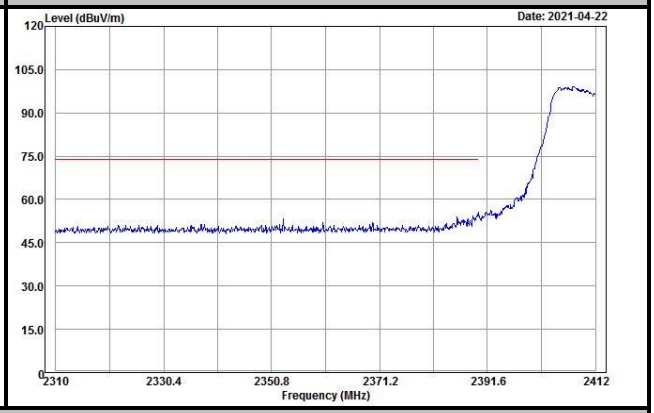
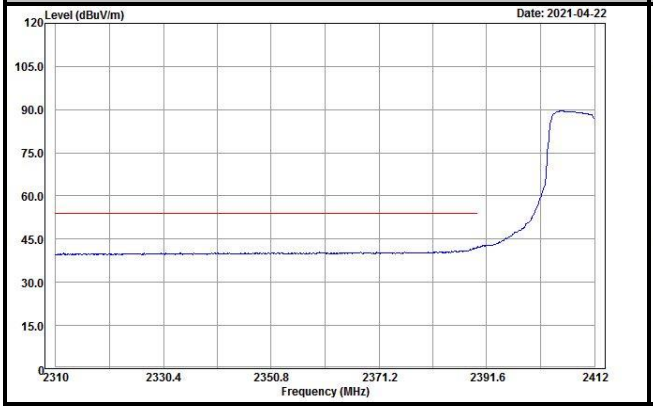
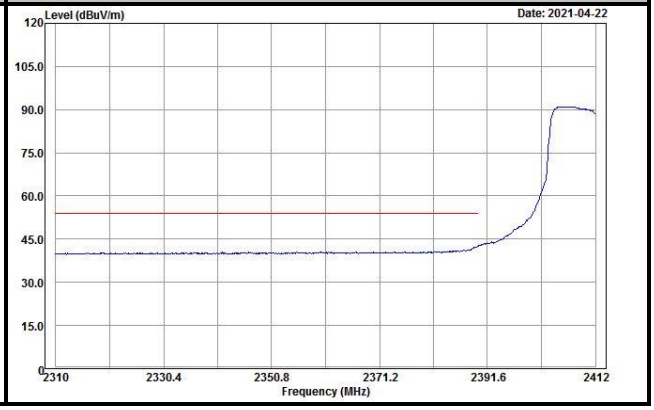
802.11b

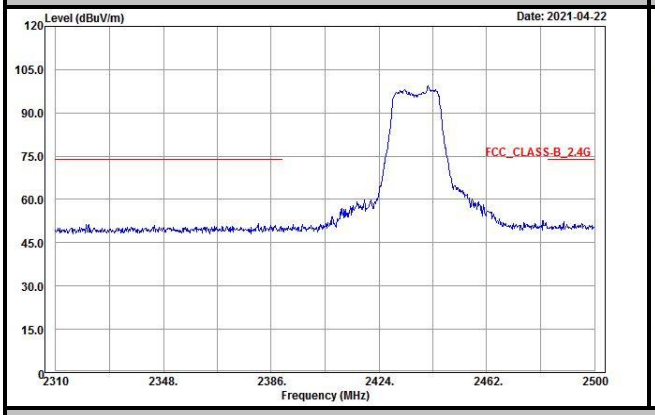
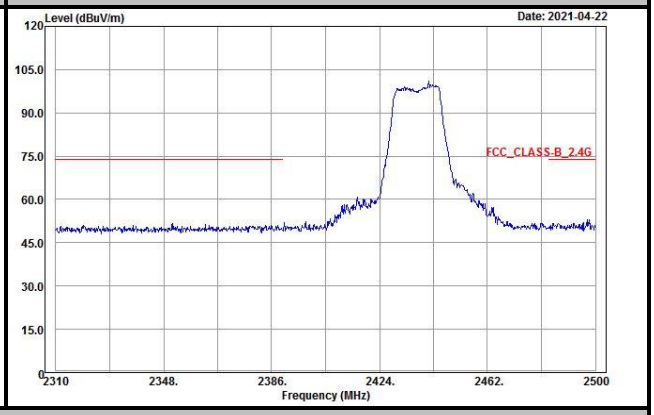
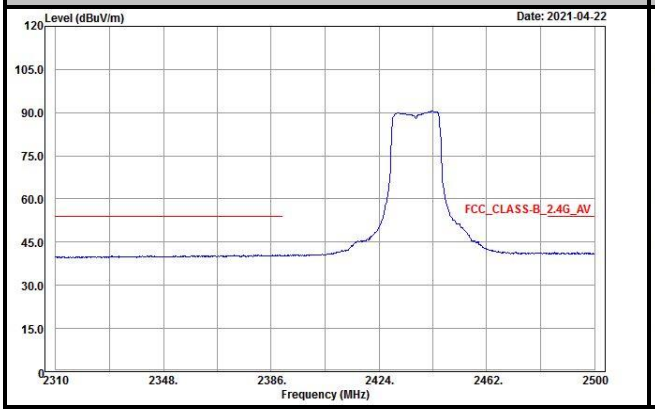
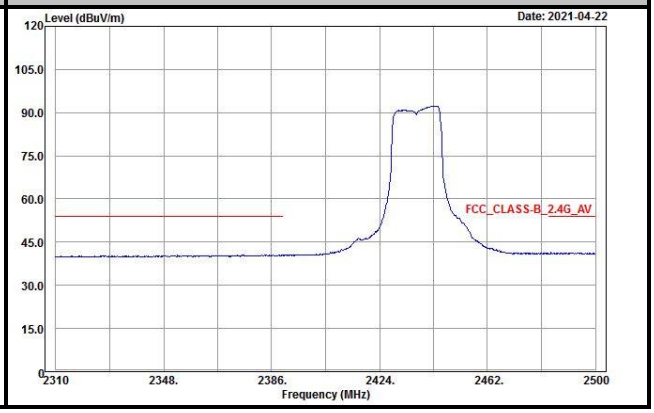
Ch 1	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	

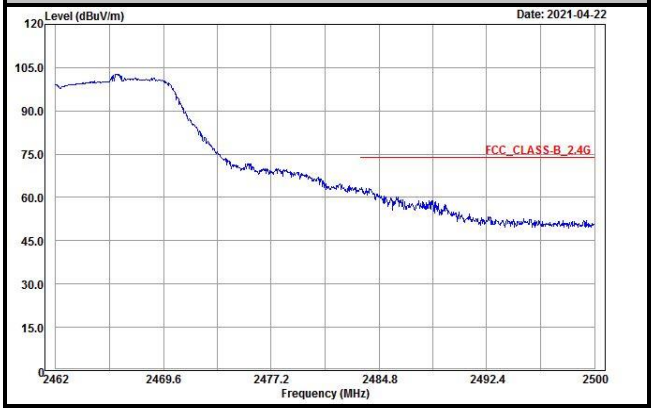
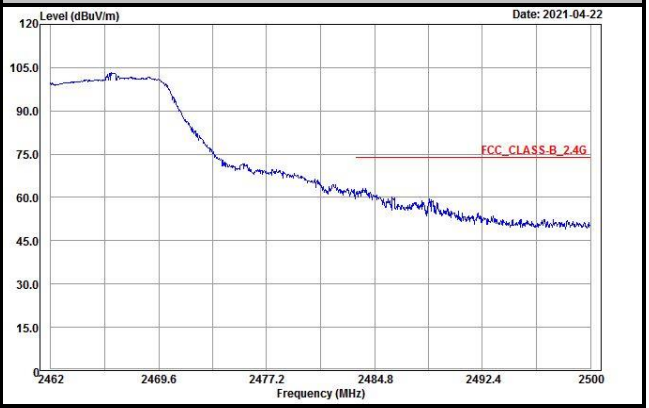
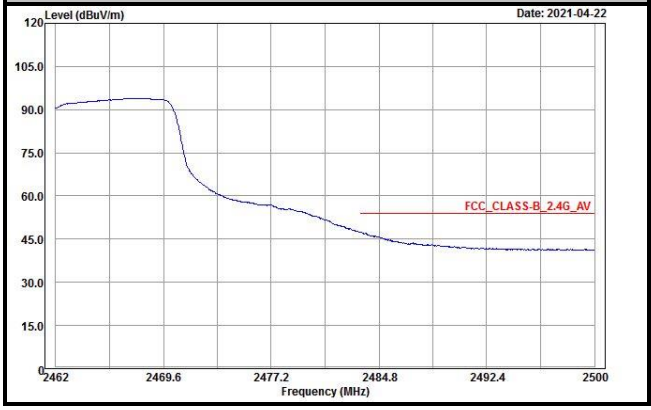
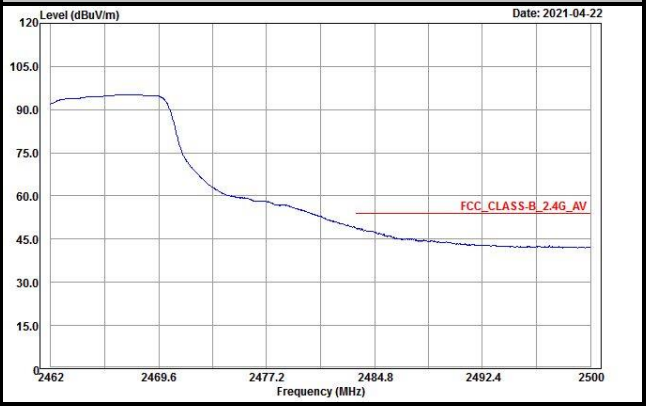
Ch 6	
Peak	
Horizontal	Vertical
	
Average	
Horizontal	Vertical
	

Ch 11	
Peak	
Horizontal	Vertical
	
Average	
Horizontal	Vertical
	

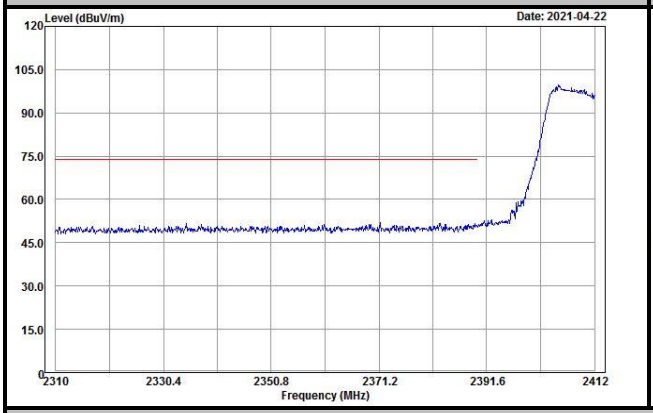
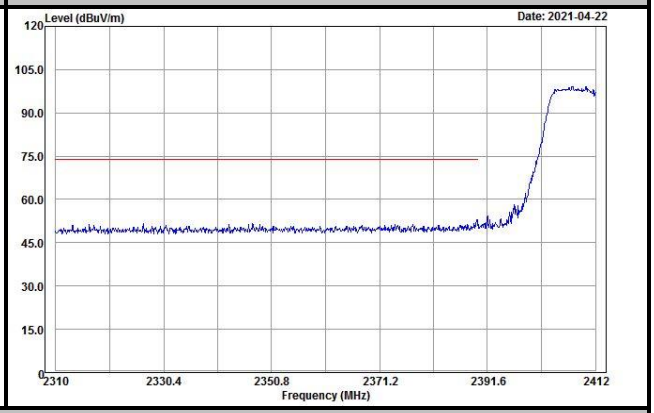
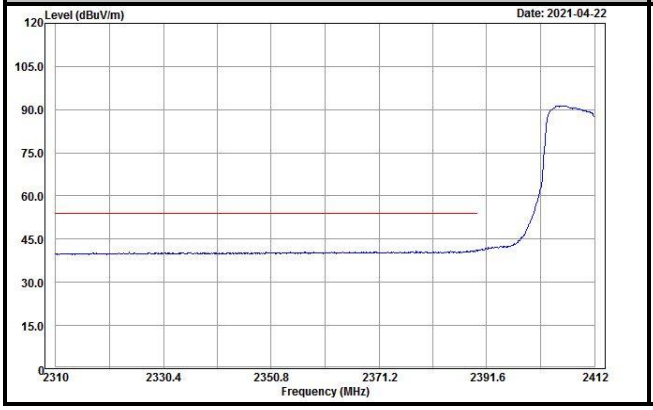
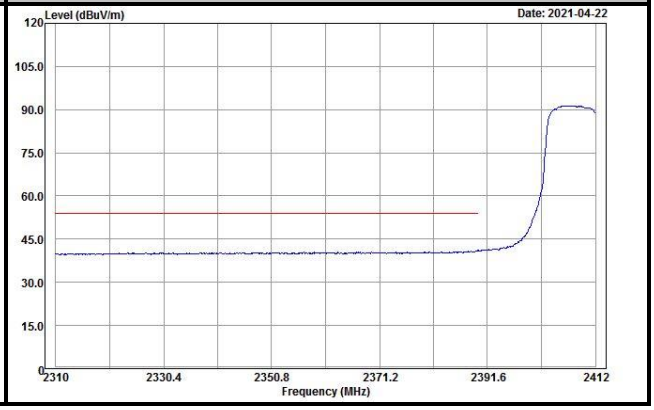
802.11g

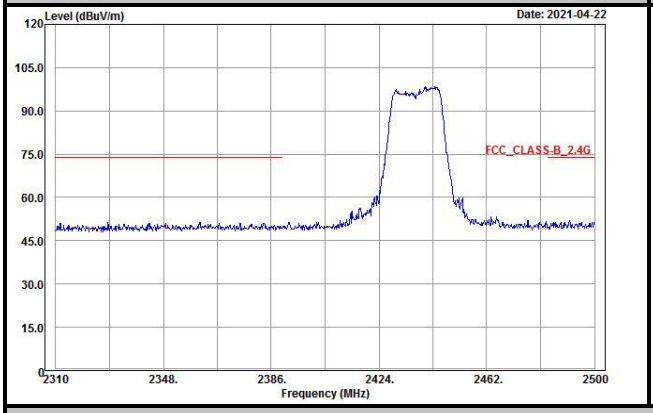
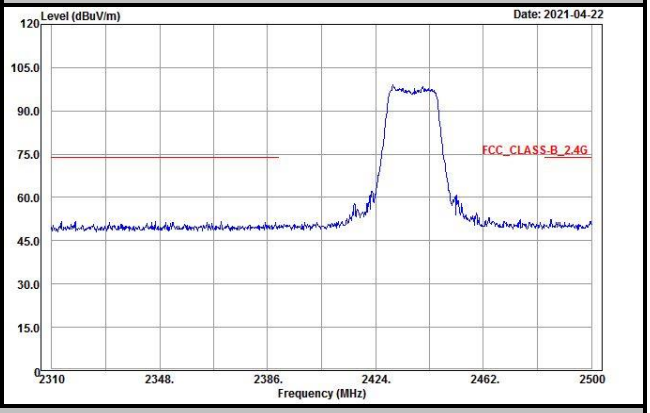
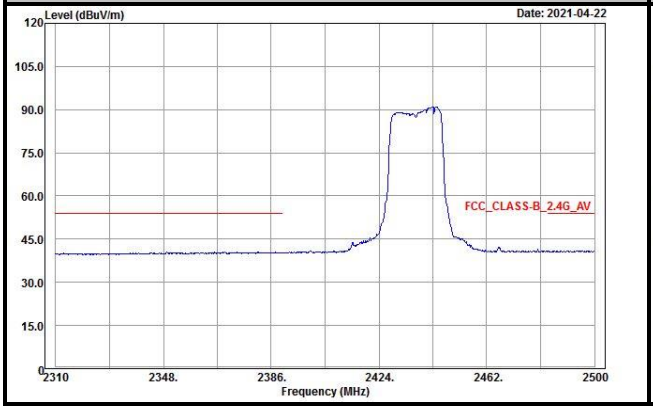
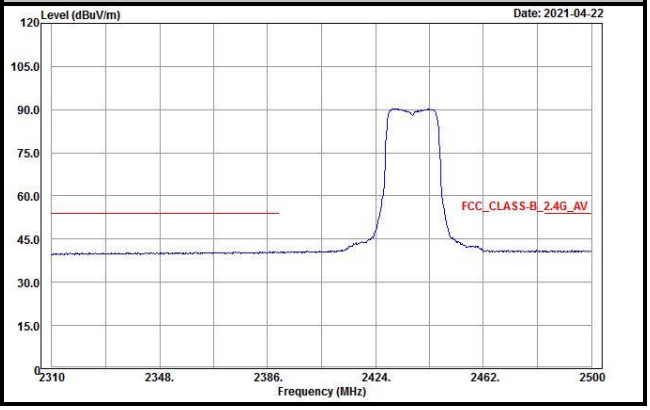
Ch 1	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	

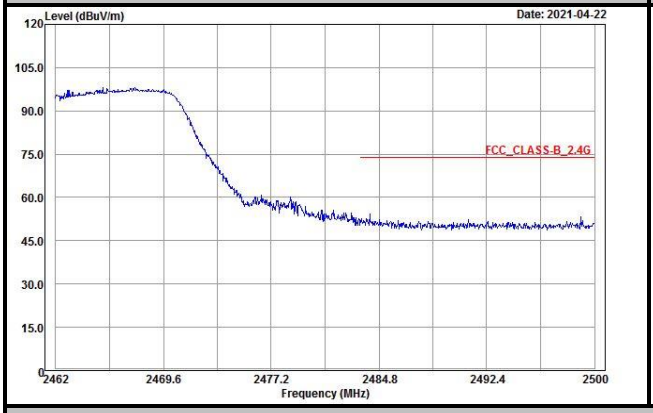
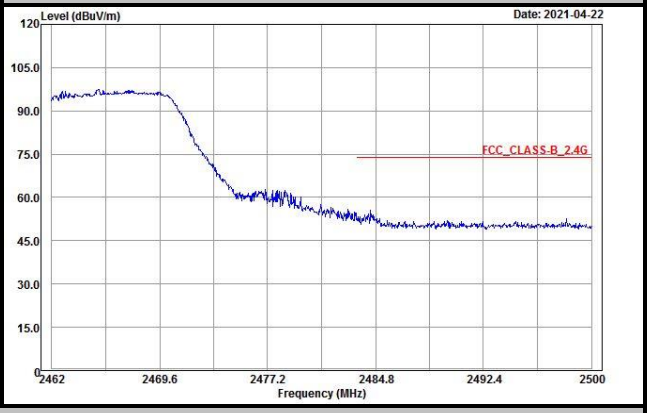
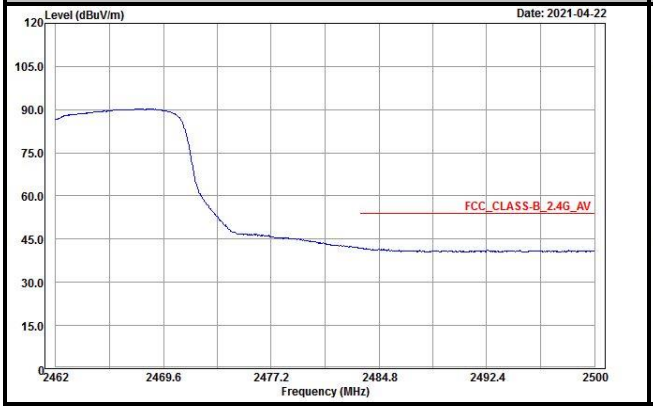
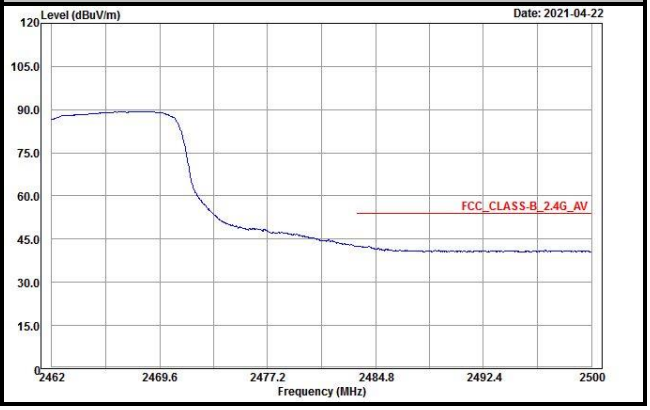
Ch 6	
Peak	
Horizontal	Vertical
	
Average	
Horizontal	Vertical
	

Ch 11	
Peak	
Horizontal	Vertical
	
Average	
Horizontal	Vertical
	

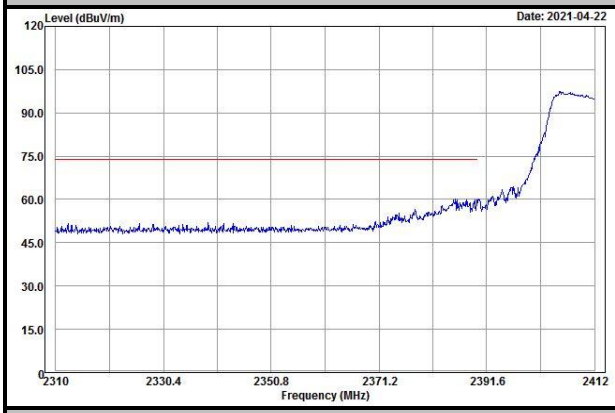
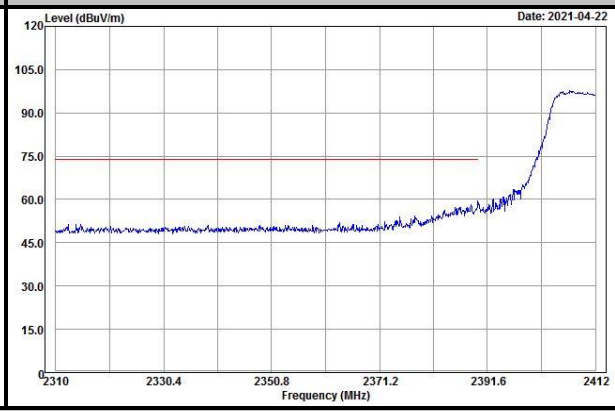
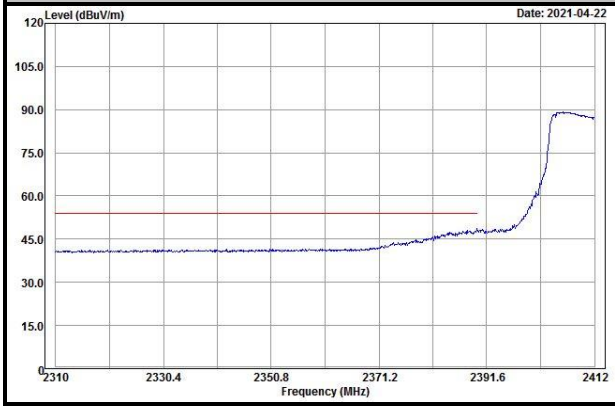
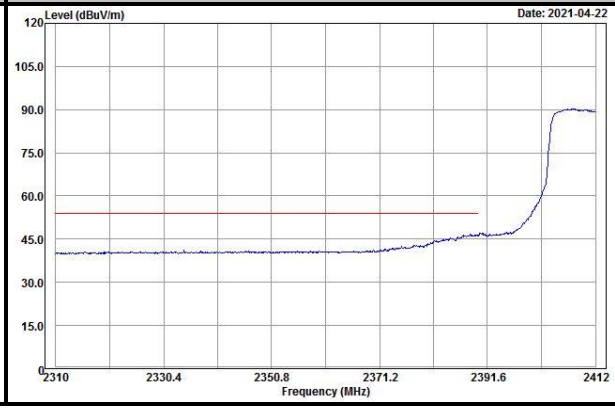
802.11n (HT20)

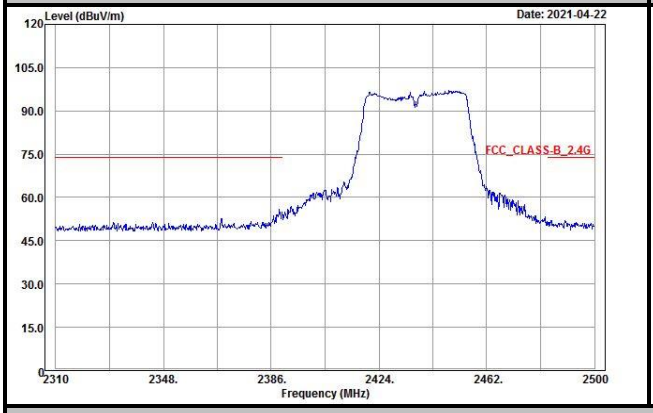
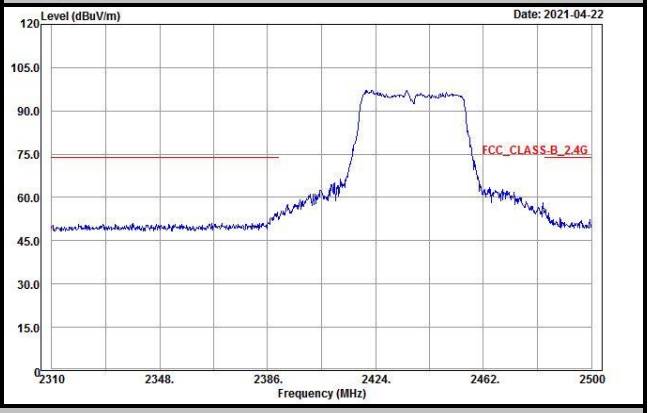
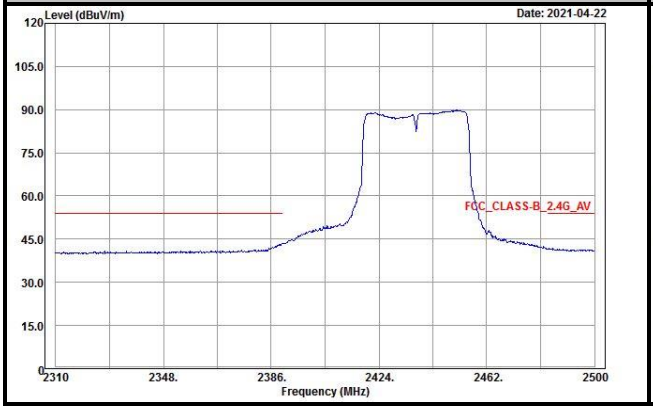
Ch 1	
Peak	
Horizontal	**Vertical**
	
Average	
Horizontal	**Vertical**
	

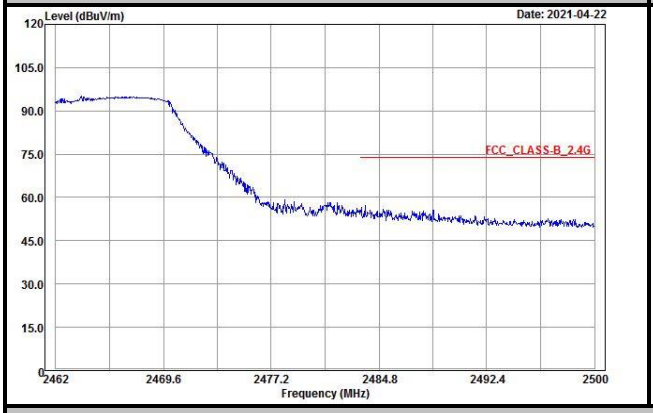
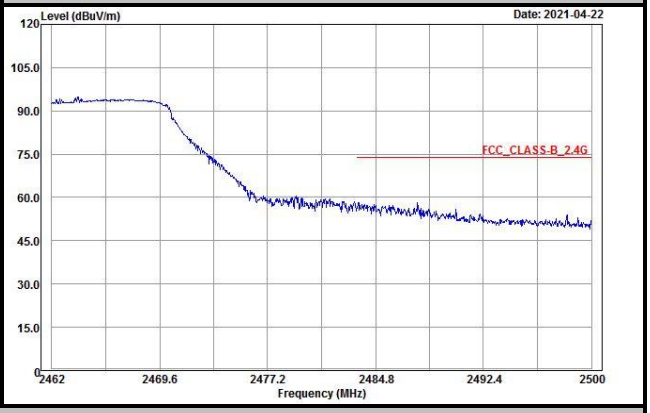
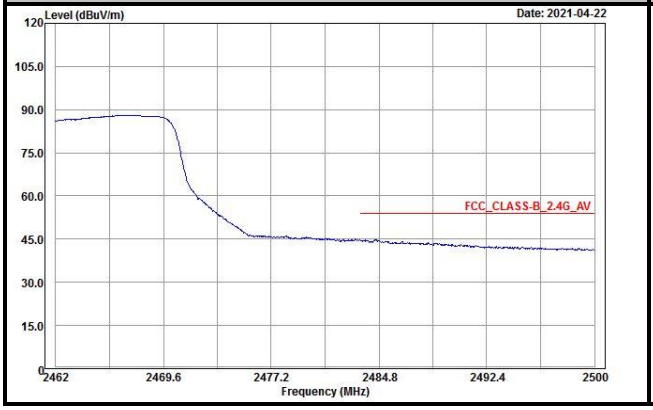
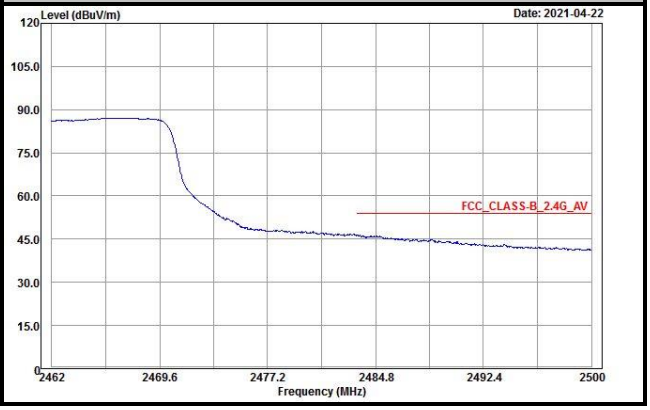
Ch 6	
Peak	
Horizontal	Vertical
	
Average	
Horizontal	Vertical
	

Ch 11	
Peak	
Horizontal	Vertical
	
Average	
Horizontal	Vertical
	

802.11n (HT40)

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:

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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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