

## FCC Test Report

**Report No.:** RFBHPY-WTW-P20110791-7

**FCC ID:** PVH0965

**Test Model:** ODIN-W2

**Received Date:** Nov. 20, 2020

**Test Date:** Feb. 02, 2021 ~ Feb. 05, 2021

**Issued Date:** Feb. 09, 2021

**Applicant:** u-blox Malmö AB

**Address:** Östra Varvsgatan 4, 5tr Malmo SE-211 75 Sweden

**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
RFBHPY-WTW-P20110791-7	Original Release	Feb. 09, 2021

## 1 Certificate of Conformity

**Product:** WLAN and Bluetooth Module

**Brand:** u-blox Malmö AB

**Test Model:** ODIN-W2

**Sample Status:** Identical Prototype


**Applicant:** u-blox Malmö AB

**Test Date:** Feb. 02, 2021 ~ Feb. 05, 2021

**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 :** \_\_\_\_\_, **Date:** Feb. 09, 2021  
Lena Wang / Specialist

  
**Approved by :** \_\_\_\_\_, **Date:** Feb. 09, 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 -3.64 dB at 719.67 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	N/A	Refer to note

### Note:

1. This report is a partial report. Only Radiated Emissions was verified and recorded in this report. Other testing data please refer to the original PHOENIX TESTLAB report no.: F151496E5 (WLAN and Bluetooth Module, Brand: u-blox Malmö AB, Model: ODIN-W2, FCC ID: PVH0965).
2. 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) (±)
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

<b>Product</b>	WLAN and Bluetooth Module
<b>Brand</b>	u-blox Malmö AB
<b>Test Model</b>	ODIN-W2
<b>Status of EUT</b>	Identical Prototype
<b>Power Supply Rating</b>	12 or 24 Vdc (DC Power Supply)
<b>Modulation Type</b>	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
<b>Modulation Technology</b>	DSSS, OFDM
<b>Transfer Rate</b>	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 144.4 Mbps
<b>Operating Frequency</b>	2412 ~ 2462 MHz
<b>Number of Channel</b>	11 for 802.11b, 802.11g, 802.11n (HT20)
<b>Antenna Type</b>	Patch antenna with 3 dBi gain
<b>Antenna Connector</b>	N/A
<b>Accessory Device</b>	Refer to Note as below
<b>Data Cable Supplied</b>	Refer to Note as below

Note:

1. This report is prepared for FCC class II permissive change. This report is a partial report. Only Radiated Emissions was verified and recorded in this report. Other testing data please refer to the original PHOENIX TESTLAB report no.: F151496E5 (WLAN and Bluetooth Module, Brand: u-blox Malmö AB, Model: ODIN-W2, FCC ID: PVH0965).
2. The EUT was installed in E-log and Fleet Management Device (Brand: Rand McNally, Model: DC210).
3. The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and two receivers.

<b>Modulation Mode</b>	<b>Tx Function</b>
<b>802.11b</b>	1TX
<b>802.11g</b>	1TX
<b>802.11n (HT20)</b>	2TX

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.
6. Software disable WLAN 5G.

### 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		

### 3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	-	-	-

Where **RE≥1G**: Radiated Emission above 1 GHz  
**PLC**: Power Line Conducted Emission

**RE<1G**: Radiated Emission below 1 GHz  
**APCM**: Antenna Port Conducted Measurement

**NOTE**: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z-plane**.  
**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

#### **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	1	DSSS	DBPSK	1.0

#### **Test Condition:**

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



### 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.

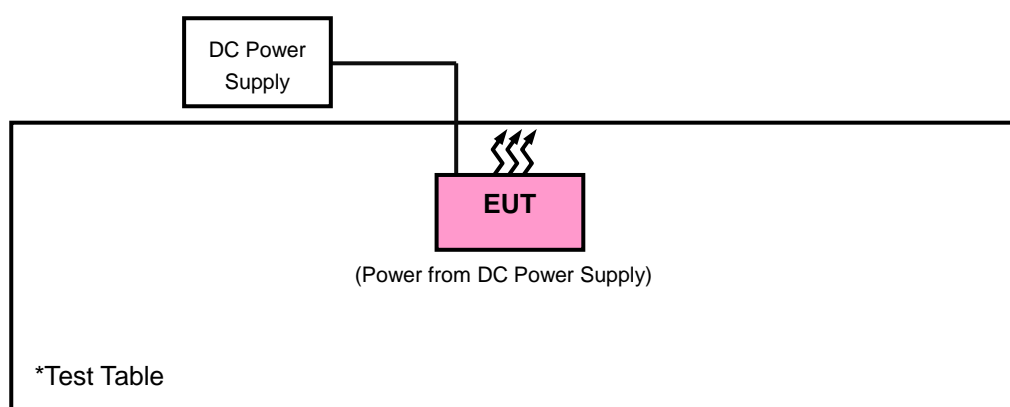
No.	Product	Brand	Model No.	Serial No.	FCC ID
A	DC power supply	Keysight	U8002A	MY56330015	N/A

No.	Signal Cable Description Of The Above Support Units
1.	DC Cable: 2.38m

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	N9038A	MY51210203	Mar. 18, 2020	Mar. 17, 2021
Spectrum Analyzer Agilent	N9010A	MY52220314	Dec. 07, 2020	Dec. 06, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 16, 2020	Apr. 15, 2021
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 22, 2020	Nov. 21, 2021
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Nov. 06, 2020	Nov. 05, 2021
Fixed Attenuator WOKEN	MDCS18N-10	MDCS18N-10-01	Apr. 14, 2020	Apr. 13, 2021
Loop Antenna	EM-6879	269	Sep. 17, 2020	Sep. 16, 2021
Preamplifier EMCI	EMC001340	980201	Oct. 21, 2020	Oct. 20, 2021
Preamplifier EMCI	EMC 012645	980115	Oct. 07, 2020	Oct. 06, 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 WOKEN	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

- 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:**

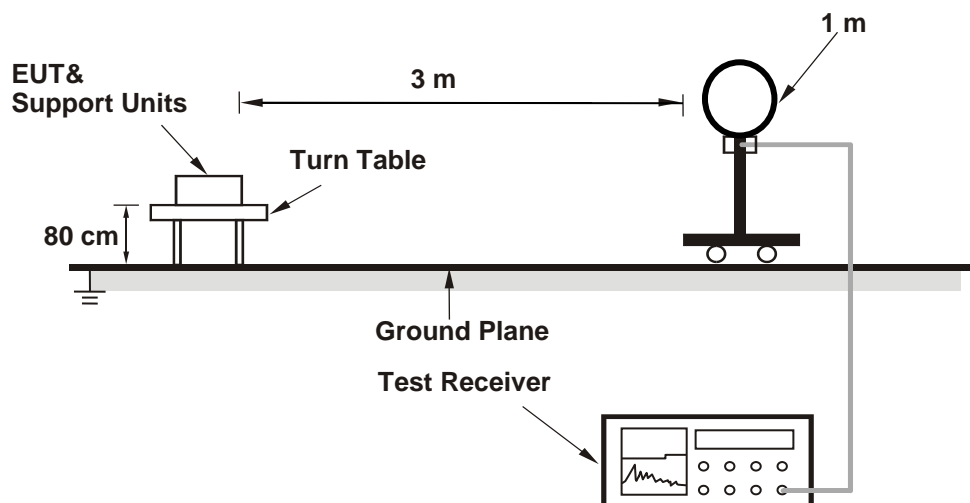
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK)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

#### 4.1.4 Deviation from Test Standard

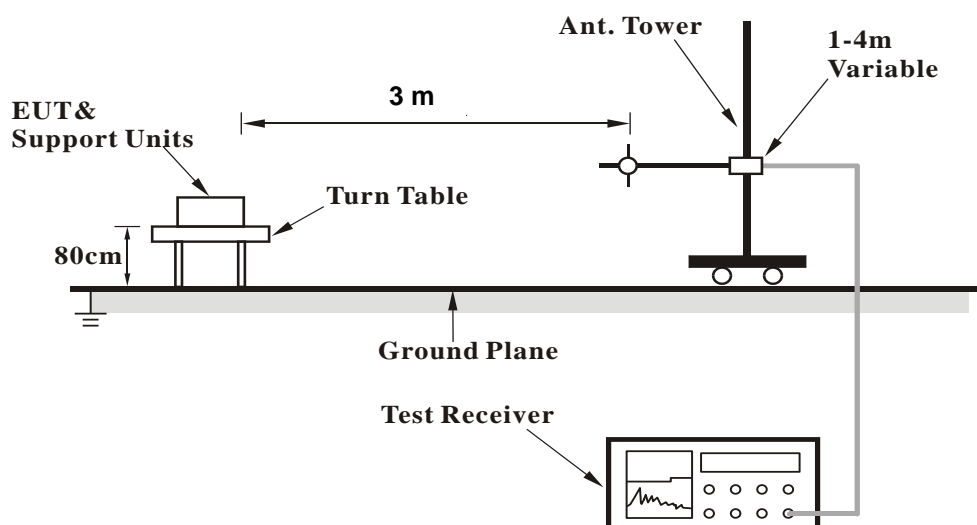
No deviation.

#### 4.1.5 Test Set Up

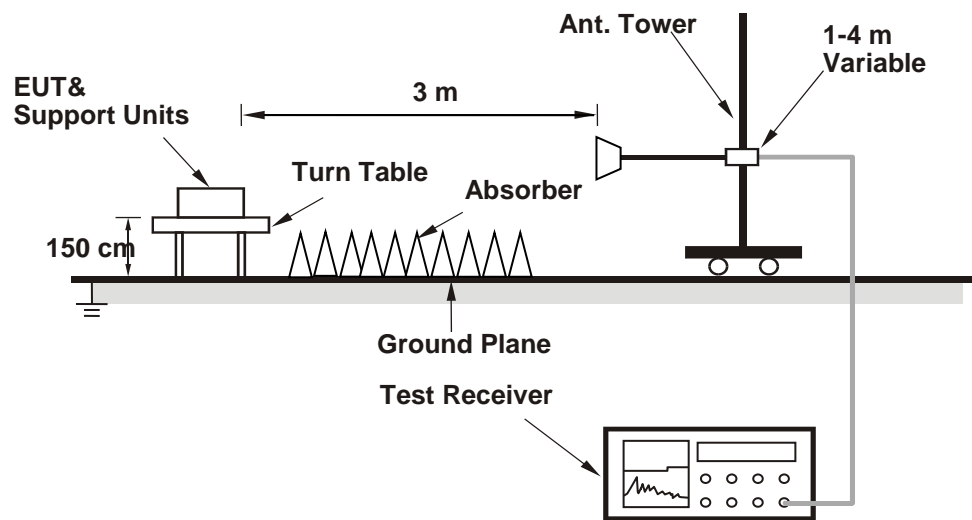
##### <Radiated Emission below 30 MHz>



##### <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
2387.01	41.76	48.79	-7.03	54	-12.24	141	36	Average
2387.01	48.21	55.24	-7.03	74	-25.79	141	36	Peak
2412	91.17	98.22	-7.05	-----	-----	141	36	Average
2412	92.82	99.87	-7.05	-----	-----	141	36	Peak
4824	45.9	61.75	-15.85	54	-8.1	129	36	Average
4824	49.31	65.16	-15.85	74	-24.69	129	36	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
2386.806	38.81	45.84	-7.03	54	-15.19	112	121	Average
2386.806	45.69	52.72	-7.03	74	-28.31	112	121	Peak
2412	88.48	95.53	-7.05	-----	-----	112	121	Average
2412	90.15	97.2	-7.05	-----	-----	112	121	Peak
4824	42.18	58.03	-15.85	54	-11.82	234	3	Average
4824	47.22	63.07	-15.85	74	-26.78	234	3	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.

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	35.86	42.91	-7.05	54	-18.14	161	35	Average
2390	45.25	52.3	-7.05	74	-28.75	161	35	Peak
2437	91.14	98.14	-7	-----	-----	161	35	Average
2437	93.19	100.19	-7	-----	-----	161	35	Peak
2483.5	35.45	42.31	-6.86	54	-18.55	161	35	Average
2483.5	44.75	51.61	-6.86	74	-29.25	161	35	Peak
4874	44.24	60.18	-15.94	54	-9.76	149	37	Average
4874	48.13	64.07	-15.94	74	-25.87	149	37	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	34.87	41.92	-7.05	54	-19.13	108	356	Average
2390	45.48	52.53	-7.05	74	-28.52	108	356	Peak
2437	87.51	94.51	-7	-----	-----	108	356	Average
2437	89.25	96.25	-7	-----	-----	108	356	Peak
2483.5	34.93	41.79	-6.86	54	-19.07	108	356	Average
2483.5	44.07	50.93	-6.86	74	-29.93	108	356	Peak
4874	41.6	57.54	-15.94	54	-12.4	113	23	Average
4874	46.32	62.26	-15.94	74	-27.68	113	23	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	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	89.44	96.37	-6.93	-----	-----	155	35	Average
2462	91.22	98.15	-6.93	-----	-----	155	35	Peak
2483.5	35.63	42.49	-6.86	54	-18.37	155	35	Average
2483.5	45.53	52.39	-6.86	74	-28.47	155	35	Peak
4924	36.54	52.41	-15.87	54	-17.46	132	67	Average
4924	42.86	58.73	-15.87	74	-31.14	132	67	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	84.11	91.04	-6.93	-----	-----	104	356	Average
2462	85.92	92.85	-6.93	-----	-----	104	356	Peak
2483.5	34.87	41.73	-6.86	54	-19.13	104	356	Average
2483.5	45.27	52.13	-6.86	74	-28.73	104	356	Peak
4924	35.36	51.23	-15.87	54	-18.64	136	254	Average
4924	40.94	56.81	-15.87	74	-33.06	136	254	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.

# 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	45.02	52.07	-7.05	54	-8.98	165	36	Average
2390	58.86	65.91	-7.05	74	-15.14	165	36	Peak
2412	89.97	97.02	-7.05	-----	-----	165	36	Average
2412	96.78	103.83	-7.05	-----	-----	165	36	Peak
4824	42.83	58.68	-15.85	54	-11.17	116	101	Average
4824	48.97	64.82	-15.85	74	-25.03	116	101	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	38.54	45.59	-7.05	54	-15.46	114	357	Average
2390	51.13	58.18	-7.05	74	-22.87	114	357	Peak
2412	83.09	90.14	-7.05	-----	-----	114	357	Average
2412	89.59	96.64	-7.05	-----	-----	114	357	Peak
4824	39.87	55.72	-15.85	54	-14.13	134	52	Average
4824	45.25	61.1	-15.85	74	-28.75	134	52	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.

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	38.07	45.12	-7.05	54	-15.93	161	35	Average
2390	48.74	55.79	-7.05	74	-25.26	161	35	Peak
2437	90.69	97.69	-7	-----	-----	161	35	Average
2437	97.52	104.52	-7	-----	-----	161	35	Peak
2483.5	35.81	42.67	-6.86	54	-18.19	161	35	Average
2483.5	45.47	52.33	-6.86	74	-28.53	161	35	Peak
4874	40.4	56.34	-15.94	54	-13.6	124	104	Average
4874	45.63	61.57	-15.94	74	-28.37	124	104	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	35.24	42.29	-7.05	54	-18.76	108	356	Average
2390	45.53	52.58	-7.05	74	-28.47	108	356	Peak
2437	84.64	91.64	-7	-----	-----	108	356	Average
2437	91.17	98.17	-7	-----	-----	108	356	Peak
2483.5	35.04	41.9	-6.86	54	-18.96	108	356	Average
2483.5	44.24	51.1	-6.86	74	-29.76	108	356	Peak
4874	37.17	53.11	-15.94	54	-16.83	105	24	Average
4874	43.7	59.64	-15.94	74	-30.3	105	24	Peak

Remarks:

- Emission Level = Read Level + Factor  
Margin value = Emission level – Limit value
- 2437 MHz: Fundamental frequency.
- 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	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	86.11	93.04	-6.93	-----	-----	154	34	Average
2462	92.62	99.55	-6.93	-----	-----	154	34	Peak
2483.5	41.13	47.99	-6.86	54	-12.87	154	34	Average
2483.5	56.89	63.75	-6.86	74	-17.11	154	34	Peak
4924	36	51.87	-15.87	54	-18	119	302	Average
4924	43.09	58.96	-15.87	74	-30.91	119	302	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	81.82	88.75	-6.93	-----	-----	104	356	Average
2462	88.11	95.04	-6.93	-----	-----	104	356	Peak
2483.5	38.5	45.36	-6.86	54	-15.5	104	356	Average
2483.5	52.9	59.76	-6.86	74	-21.1	104	356	Peak
4924	34.16	50.03	-15.87	54	-19.84	101	102	Average
4924	41.06	56.93	-15.87	74	-32.94	101	102	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.

# 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	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	44.52	51.57	-7.05	54	-9.48	166	37	Average
2390	59.66	66.71	-7.05	74	-14.34	166	37	Peak
2412	88.24	95.29	-7.05	-----	-----	166	37	Average
2412	95.89	102.94	-7.05	-----	-----	166	37	Peak
4824	36.95	52.8	-15.85	54	-17.05	132	151	Average
4824	43.14	58.99	-15.85	74	-30.86	132	151	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	39.46	46.51	-7.05	54	-14.54	117	359	Average
2390	52.61	59.66	-7.05	74	-21.39	117	359	Peak
2412	82.7	89.75	-7.05	-----	-----	117	359	Average
2412	89.99	97.04	-7.05	-----	-----	117	359	Peak
4824	35.79	51.64	-15.85	54	-18.21	108	197	Average
4824	40.26	56.11	-15.85	74	-33.74	108	197	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.

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	36.36	43.41	-7.05	54	-17.64	161	35	Average
2390	46.17	53.22	-7.05	74	-27.83	161	35	Peak
2437	88.07	95.07	-7	-----	-----	161	35	Average
2437	96.08	103.08	-7	-----	-----	161	35	Peak
2483.5	35.78	42.64	-6.86	54	-18.22	161	35	Average
2483.5	45.7	52.56	-6.86	74	-28.3	161	35	Peak
4874	38.22	54.16	-15.94	54	-15.78	102	135	Average
4874	44.11	60.05	-15.94	74	-29.89	102	135	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	35.06	42.11	-7.05	54	-18.94	112	358	Average
2390	44.34	51.39	-7.05	74	-29.66	112	358	Peak
2437	81.79	88.79	-7	-----	-----	112	358	Average
2437	88.38	95.38	-7	-----	-----	112	358	Peak
2483.5	35.29	42.15	-6.86	54	-18.71	112	358	Average
2483.5	44.01	50.87	-6.86	74	-29.99	112	358	Peak
4874	36.65	52.59	-15.94	54	-17.35	104	332	Average
4874	41.64	57.58	-15.94	74	-32.36	104	332	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	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	87.52	94.45	-6.93	-----	-----	155	35	Average
2462	94.52	101.45	-6.93	-----	-----	155	35	Peak
2483.5	42.77	49.63	-6.86	54	-11.23	155	35	Average
2483.5	55.9	62.76	-6.86	74	-18.1	155	35	Peak
4924	35.16	51.03	-15.87	54	-18.84	163	231	Average
4924	41.33	57.2	-15.87	74	-32.67	163	231	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	80.99	87.92	-6.93	-----	-----	107	358	Average
2462	87.96	94.89	-6.93	-----	-----	107	358	Peak
2483.5	38.57	45.43	-6.86	54	-15.43	107	358	Average
2483.5	51.95	58.81	-6.86	74	-22.05	107	358	Peak
4924	35.5	51.37	-15.87	54	-18.5	124	151	Average
4924	40.58	56.45	-15.87	74	-33.42	124	151	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.

### 9 kHz ~ 30 MHz Data:

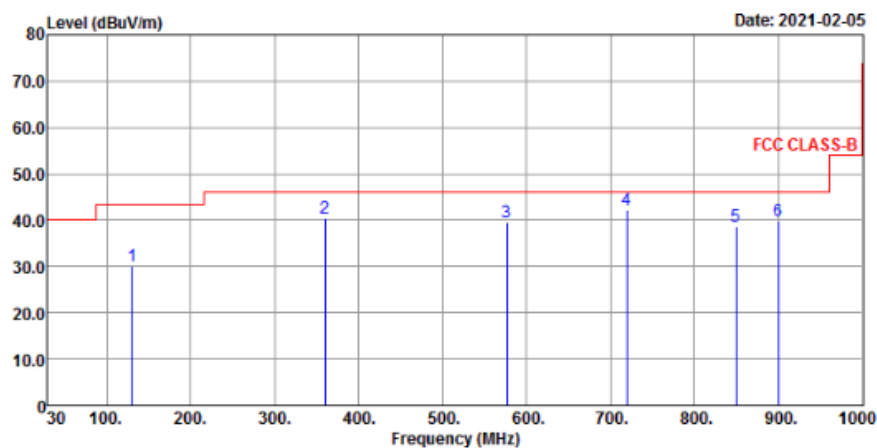
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

### 30 MHz ~ 1 GHz Worst-Case Data:

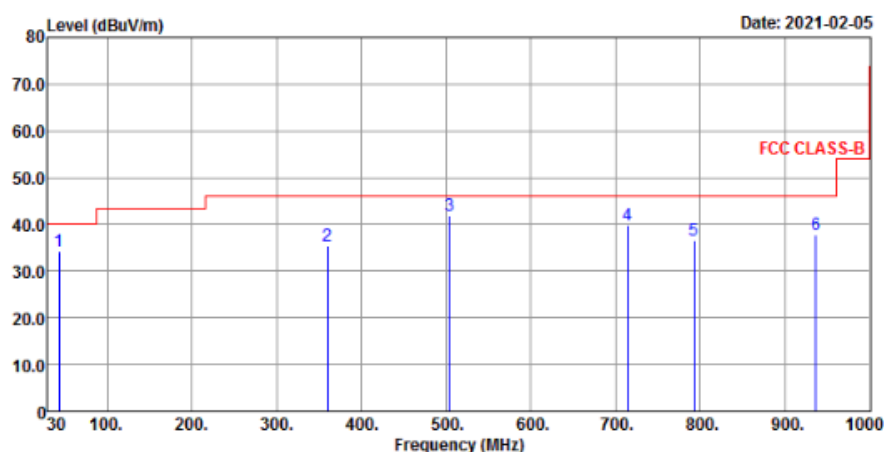
#### 802.11b

EUT Test Condition		Measurement Detail	
Channel	Channel 1	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	Tim 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
129.91	30.07	43.14	-13.07	43.5	-13.43	102	242	QP
359.8	40.47	50.2	-9.73	46	-5.53	133	175	QP
576.11	39.64	43.16	-3.52	46	-6.36	128	288	QP
719.67	42.36	43.29	-0.93	46	-3.64	183	130	QP
849.65	38.75	37.32	1.43	46	-7.25	121	267	QP
900.09	39.91	37.76	2.15	46	-6.09	108	321	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
43.58	34.37	46.95	-12.58	40	-5.63	136	144	QP
359.8	35.54	45.27	-9.73	46	-10.46	100	85	QP
504.33	41.92	47.46	-5.54	46	-4.08	129	279	QP
714.82	39.75	40.69	-0.94	46	-6.25	118	343	QP
792.42	36.61	36.2	0.41	46	-9.39	133	192	QP
935.98	37.68	34.68	3	46	-8.32	108	255	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.

## 5 Pictures of Test Arrangements

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

## 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](mailto:service.adt@tw.bureauveritas.com)

**Web Site:** [www.bureauveritas-adt.com](http://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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