

# TEST REPORT

## CERTIFICATE OF CONFORMITY

**Standard:** 47 CFR FCC Part 15, Subpart C (Section 15.249)

**Report No.:** RFBDKX-WTW-P24110275

**FCC ID:** EMJDAW311WLD

**Product:** Dongle

**Brand:** ASUS

**Model No.:** AW311WLD

**Received Date:** 2024/11/12

**Test Date:** 2024/11/21 ~ 2024/11/28

**Issued Date:** 2025/1/3

**Applicant:** PRIMAX ELECTRONICS LTD.

**Address:** No. 669, Ruey Kuang Road, Neihu, Taipei, 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:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

**FCC Registration /** 198487 / TW2021

**Designation Number:**

**Approved by:**



**, Date:**

2025/1/3

Jeremy Lin / Project Engineer

This test report consists of 31 pages in total. It may be duplicated completely for legal use with the approval of the applicant. It should not be reproduced except in full, without the written approval of our laboratory. The test results in the report only apply to the tested sample. The test results in this report are traceable to the national or international standards.

Prepared by : Annie Chang / Senior Specialist



This report is governed by, and incorporates by reference, the Conditions of Testing as posted at the date of issuance of this report at <http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions/> and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. Statements of conformity are based on simple acceptance criteria without taking measurement uncertainty into account, unless otherwise requested in writing. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.

## Table of Contents

<b>Release Control Record .....</b>	<b>3</b>
<b>1      Certificate.....</b>	<b>4</b>
<b>2      Summary of Test Results .....</b>	<b>5</b>
2.1    Measurement Uncertainty .....	5
2.2    Supplementary Information .....	5
<b>3      General Information .....</b>	<b>6</b>
3.1    General Description.....	6
3.2    Antenna Description of EUT .....	6
3.3    Channel List.....	7
3.4    Test Mode Applicability and Tested Channel Detail.....	8
3.5    Duty Cycle of Test Signal.....	8
3.6    Test Program Used and Operation Descriptions .....	9
3.7    Connection Diagram of EUT and Peripheral Devices .....	9
3.8    Configuration of Peripheral Devices and Cable Connections .....	9
<b>4      Test Instruments .....</b>	<b>10</b>
4.1    AC Power Conducted Emissions .....	10
4.2    Radiated Emissions below 1 GHz .....	11
4.3    Radiated Emissions above 1 GHz.....	12
4.4    20 dB Bandwidth .....	13
<b>5      Limits of Test Items.....</b>	<b>14</b>
5.1    AC Power Conducted Emissions .....	14
5.2    Radiated Emissions below 1 GHz .....	14
5.3    Radiated Emissions above 1 GHz.....	15
5.4    20 dB Bandwidth .....	15
<b>6      Test Arrangements.....</b>	<b>16</b>
6.1    AC Power Conducted Emissions .....	16
6.1.1    Test Setup .....	16
6.1.2    Test Procedure.....	16
6.2    Radiated Emissions below 1 GHz .....	17
6.2.1    Test Setup .....	17
6.2.2    Test Procedure.....	18
6.3    Radiated Emissions above 1 GHz.....	19
6.3.1    Test Setup .....	19
6.3.2    Test Procedure.....	19
6.4    20 dB Bandwidth .....	20
6.4.1    Test Setup .....	20
6.4.2    Test Procedure.....	20
<b>7      Test Results of Test Item .....</b>	<b>21</b>
7.1    AC Power Conducted Emissions .....	21
7.2    Radiated Emissions below 1 GHz .....	23
7.3    Radiated Emissions above 1 GHz.....	25
7.4    20 dB Bandwidth .....	29
<b>8      Pictures of Test Arrangements .....</b>	<b>30</b>
<b>9      Information of the Testing Laboratories .....</b>	<b>31</b>

## Release Control Record

Issue No.	Description	Date Issued
RFBDKX-WTW-P24110275	Original release.	2025/1/3

## 1 Certificate

**Product:** Dongle

**Brand:** ASUS

**Test Model:** AW311WLD

**Sample Status:** Engineering sample

**Applicant:** PRIMAX ELECTRONICS LTD.

**Test Date:** 2024/11/21 ~ 2024/11/28

**Standard:** 47 CFR FCC Part 15, Subpart C (Section 15.249)

**Measurement procedure:** 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.

## 2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.249)			
Standard / Clause	Test Item	Result	Remark
15.207	AC Power Conducted Emissions	Pass	Minimum passing margin is -8.85 dB at 0.15781 MHz
15.209 / 15.249(d)	Radiated Emissions below 1 GHz	Pass	Minimum passing margin is -14.2 dB at 634.89 MHz
15.209 / 15.249(a) / 15.249(d) / 15.249(e)	Radiated Emissions above 1 GHz	Pass	Minimum passing margin is -11.9 dB at 2400.00 MHz
15.215 (c)	20 dB Bandwidth	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

Note: 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	Specification	Expanded Uncertainty (k=2) (±)
AC Power Conducted Emissions	9 kHz ~ 30 MHz	2.90 dB
Radiated Emissions below 1 GHz	9 kHz ~ 30 MHz	2.85 dB
	30 MHz ~ 1 GHz	5.7 dB
Radiated Emissions above 1 GHz	1 GHz ~ 6 GHz	3.06 dB
	6 GHz ~ 18 GHz	3.06 dB
	18 GHz ~ 40 GHz	3.29 dB
20 dB Bandwidth	-	960 Hz

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

### 2.2 Supplementary Information

There is not any deviation from the test standards for the test method, and no modifications required for compliance.

### 3 General Information

#### 3.1 General Description

Product	Dongle
Brand	ASUS
Test Model	AW311WLD
Status of EUT	Engineering sample
Power Supply Rating	5Vdc from host equipment
Modulation Type	GFSK
Transfer Rate	1 Mbps
Operating Frequency	2.405 GHz ~ 2.474 GHz
Number of Channel	70
Field Strength Of Fundamental	63.5 dBuV/m (Average) at 3 meters

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

#### 3.2 Antenna Description of EUT

The antenna information is listed as below.

Gain (dBi)	Antenna Type	Connector Type
1.09	PIFA	NA

\* Due to radiated measurements are made and the antenna gain is already accounted for this device, so provide an antenna datasheet and/or antenna measurement report is not required. The antenna dimensions and pictures (include antenna wire length if have) are stated in EUT photo exhibit.

### 3.3 Channel List

70 channels are provided to this EUT:

Channel	Frequency (MHz)						
1	2405	21	2425	41	2445	61	2465
2	2406	22	2426	42	2446	62	2466
3	2407	23	2427	43	2447	63	2467
4	2408	24	2428	44	2448	64	2468
5	2409	25	2429	45	2449	65	2469
6	2410	26	2430	46	2450	66	2470
7	2411	27	2431	47	2451	67	2471
8	2412	28	2432	48	2452	68	2472
9	2413	29	2433	49	2453	69	2473
10	2414	30	2434	50	2454	70	2474
11	2415	31	2435	51	2455		
12	2416	32	2436	52	2456		
13	2417	33	2437	53	2457		
14	2418	34	2438	54	2458		
15	2419	35	2439	55	2459		
16	2420	36	2440	56	2460		
17	2421	37	2441	57	2461		
18	2422	38	2442	58	2462		
19	2423	39	2443	59	2463		
20	2424	40	2444	60	2464		

### 3.4 Test Mode Applicability and Tested Channel Detail

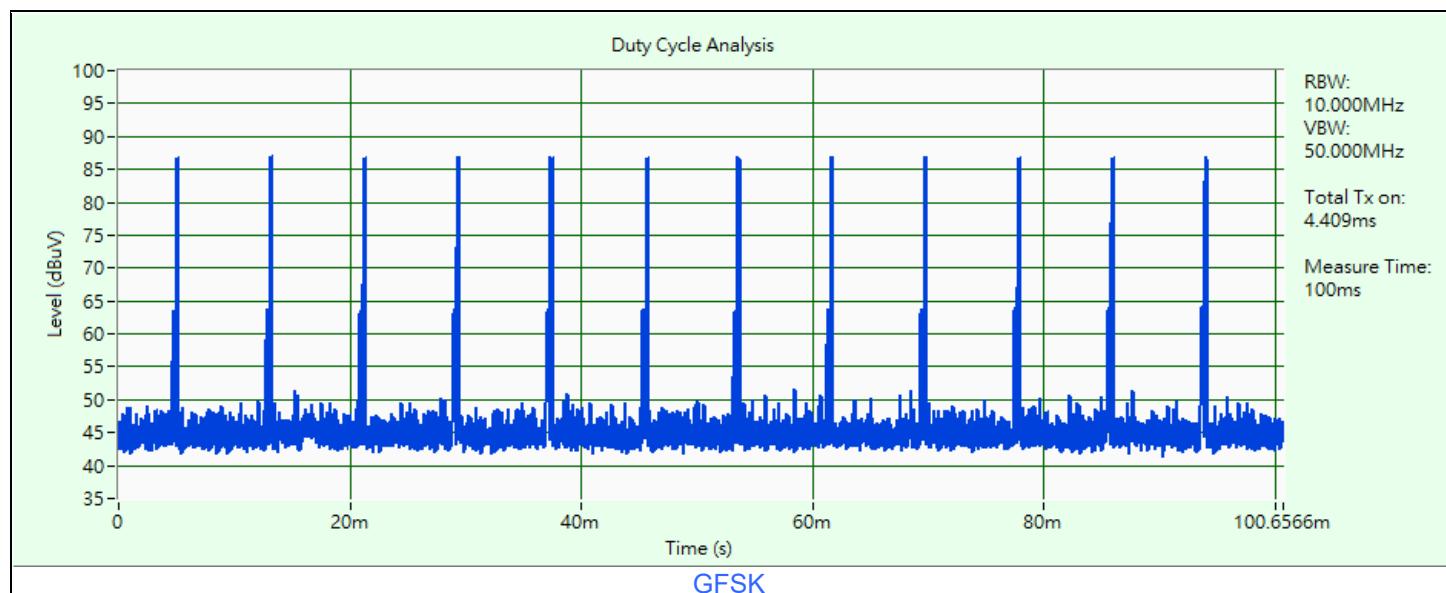
Pre-Scan:	1. EUT can be used in the following ways: X-axis/ Y-axis/ Z-axis. Pre-scan these ways and find the worst case as a representative test condition.
Worst Case:	1. X-axis/ Y-axis/ Z-axis Worst Condition: X-axis.

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

Test Item	Tested Channel	Modulation	Data Rate Parameter
AC Power Conducted Emissions	70	GFSK	1Mb/s
20 dB Bandwidth	1, 35, 70	GFSK	1Mb/s
Radiated Emissions below 1 GHz	70	GFSK	1Mb/s
Radiated Emissions above 1 GHz	1, 35, 70	GFSK	1Mb/s

### 3.5 Duty Cycle of Test Signal

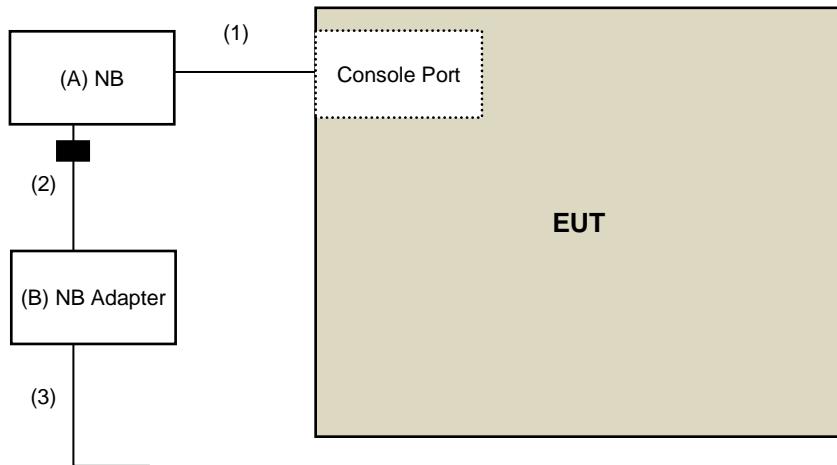
**GFSK:** Duty cycle =  $4.409 \text{ ms} / 100 \text{ ms} \times 100\% = 4.4\%$



### 3.6 Test Program Used and Operation Descriptions

Controlling software (EMI\_Test\_V1.2.12) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

### 3.7 Connection Diagram of EUT and Peripheral Devices



### 3.8 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	NB	Dell	P90F	N/A	N/A	Provided by Lab
B	NB Adapter	Dell	LA65NS2-01	N/A	N/A	Provided by Lab

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	USB A to A	1	1	Y	0	Provided by Lab
2	DC cable	1	1.9	N	1	Provided by Lab
3	AC cable	1	0.8	N	0	Provided by Lab

## 4 Test Instruments

The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

### 4.1 AC Power Conducted Emissions

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
* Isolation Transformer Erika Fiedler	D-65396	46	2023/4/20	2025/4/19
50 ohm terminal resistance LYNICS	0900510	E1-011484	2024/8/12	2025/8/11
50 ohm terminal resistance SUHNER	65BNC-5001	E1-010773	2024/3/13	2025/3/12
EMI Test Receiver R&S	ESCI	100412	2024/9/3	2025/9/2
Fixed Attenuator STI	STI02-2200-10	NO.1	2024/9/12	2025/9/11
Isolation Transformer Erika Fiedler	D-65396	017	2024/9/18	2025/9/17
LISN R&S	ENV216	100024	2024/9/6	2025/9/5
		101196	2024/5/22	2025/5/21
		101197	2024/7/11	2025/7/10
LISN Schwarzbeck	NNLK 8121	8121-731	2024/6/12	2025/6/11
		8121-808	2024/4/26	2025/4/25
	NNLK 8129	8129229	2024/10/14	2025/10/13
RF Coaxial Cable PEWC	5D-FB	Cable-CO10-01	2024/2/7	2025/2/6
Software BVADT	Cond_V7.4.1.0	N/A	N/A	N/A
V-LISN Schwarzbeck	NNBL 8226-2	8226-142	2024/8/28	2025/8/27

Notes:

- \* The calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA
- The test was performed in Linkou Conduction 10.
- Tested Date: 2024/11/22

## 4.2 Radiated Emissions below 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Bi_Log Antenna Schwarzbeck	VULB 9168	137	2024/10/9	2025/10/8
Coupling / Decoupling Network Schwarzbeck	CDNE-M2	00097	2024/5/28	2025/5/27
	CDNE-M3	00091	2024/5/28	2025/5/27
MXE EMI Receiver Agilent	N9038A	MY51210129	2024/3/22	2025/3/21
Preamplifier Agilent	8447D	2944A11064	2024/2/15	2025/2/14
Preamplifier EMCI	EMC001340	980269	2024/6/25	2025/6/24
Radiating Loop Antenna TESEQ	RLA 6120-20	80002	2024/7/30	2025/7/29
RF Coaxial Cable Pacific	8D-FB	Cable-CH6-02	2024/6/25	2025/6/24
Signal Analyzer R&S	FSV40	101544	2024/6/20	2025/6/19
Software BVADT	Radiated_V8.7.08	N/A	N/A	N/A
Tower ADT	AT100	0306	N/A	N/A
Turn Table ADT	TT100	0306	N/A	N/A

### Notes:

1. The test was performed in Linkou 966 Chamber 6 (CH 6).
2. Tested Date: 2024/11/21

#### 4.3 Radiated Emissions above 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Boresight antenna tower fixture BV	BAF-02	6	N/A	N/A
High Pass Filter Wainwright	WHK 3.1/18G-10SS	SN 8	2024/5/24	2025/5/23
Horn Antenna EMCO	3115	00028257	2024/11/10	2025/11/9
Horn Antenna ETS-Lindgren	3117-PA	00215857	2024/11/10	2025/11/9
Horn Antenna Schwarzbeck	BBHA 9170	212	2024/10/18	2025/10/17
		BBHA9170241	2024/10/18	2025/10/17
MXE EMI Receiver Agilent	N9038A	MY51210129	2024/3/22	2025/3/21
Notch Filter Micro-Tronics	BRC50703-01	010	2024/5/24	2025/5/23
	BRM17690	005	2024/5/24	2025/5/23
Preamplifier EMCI	EMC0126545	980076	2024/2/15	2025/2/14
	EMC184045B	980175	2024/8/25	2025/8/24
		980235	2024/2/15	2025/2/14
Preamplifier HP	8449B	3008A01201	2024/2/15	2025/2/14
RF Coaxial Cable EMCI	EMC104	190801	2024/7/5	2025/7/4
		190804	2024/7/5	2025/7/4
RF Coaxial Cable EMEC	EM102-KMKM-100	02	2024/7/5	2025/7/4
RF Coaxial Cable HUBER+SUHNER	SF-104	Cable-CH6-01	2024/7/5	2025/7/4
Signal Analyzer R&S	FSV40	101042	2024/9/12	2025/9/11
		101544	2024/6/20	2025/6/19
Software BVADT	Radiated_V7.7.1.1.1	N/A	N/A	N/A
Tower ADT	AT100	0306	N/A	N/A
Turn Table ADT	TT100	0306	N/A	N/A

Notes:

1. The test was performed in Linkou 966 Chamber 6 (CH 6).
2. Tested Date: 2024/11/21

#### 4.4 20 dB Bandwidth

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
PXA Signal Analyzer Keysight	N9030A	MY54490260	2024/7/17	2025/7/16
Signal Analyzer R&S	FSV40	101042	2024/9/12	2025/9/11
Software	ADT_RF Test Software V6.6.5.4	N/A	N/A	N/A

##### Notes:

1. The test was performed in LK - Oven
2. Tested Date: 2024/11/28

## 5 Limits of Test Items

### 5.1 AC Power Conducted Emissions

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

Notes:

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.

### 5.2 Radiated Emissions below 1 GHz

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

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

Notes:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).

### 5.3 Radiated Emissions above 1 GHz

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following.

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
2400 ~ 2483.5 MHz	50	500

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits as below table, whichever is the lesser attenuation.

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
Above 960	500	3

Notes:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dB<sub>u</sub>V/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.

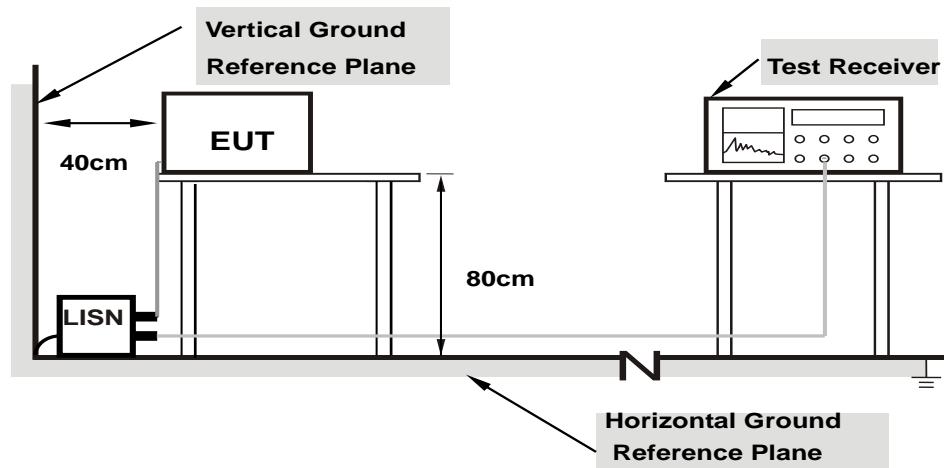
### 5.4 20 dB Bandwidth

The 20dB bandwidth shall be specified in operating frequency band.

## 6 Test Arrangements

### 6.1 AC Power Conducted Emissions

#### 6.1.1 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).

#### 6.1.2 Test Procedure

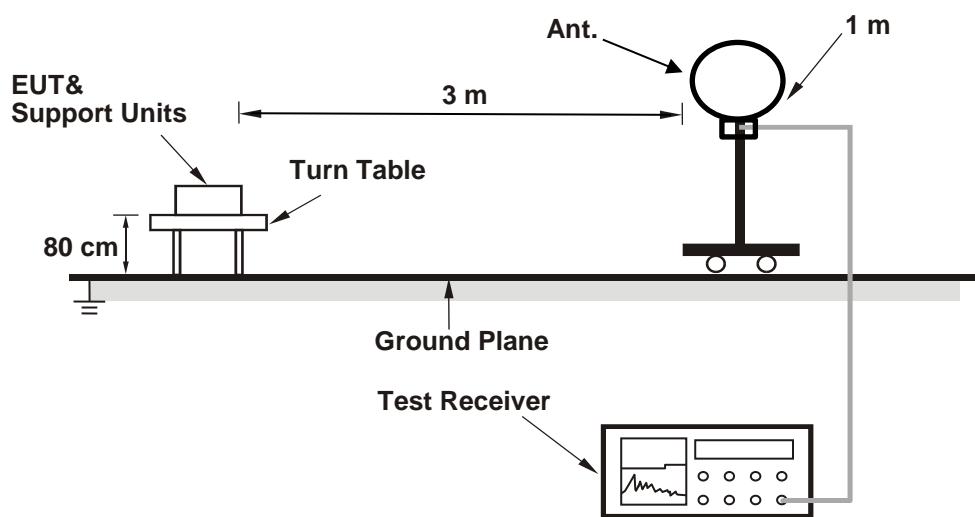
- The EUT was placed on a 0.8 meter to the top of table and placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The 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.

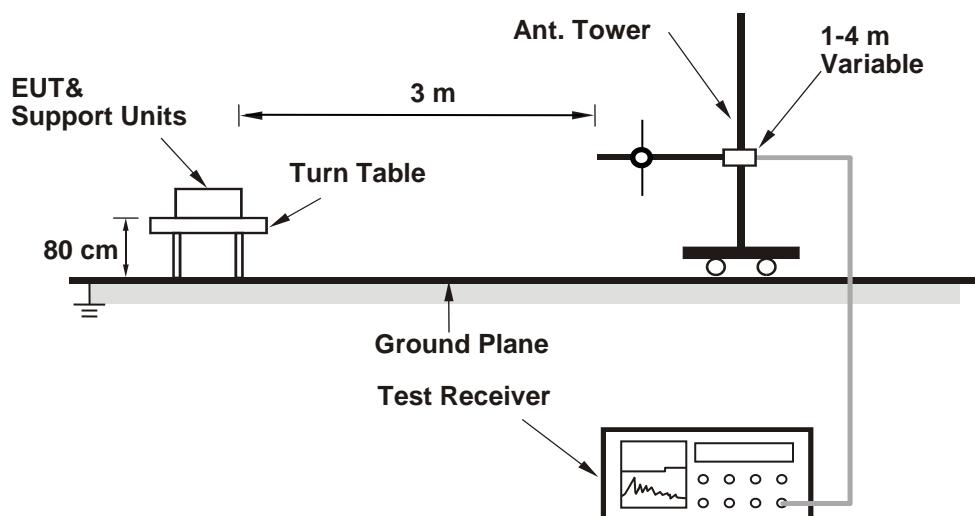
## 6.2 Radiated Emissions below 1 GHz

### 6.2.1 Test Setup

#### For Radiated emission below 30 MHz



#### For Radiated emission above 30 MHz



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

## 6.2.2 Test Procedure

### 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 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. 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, except for the frequency band (9 kHz to 90 kHz and 110 kHz to 490 kHz) set to average detect function and peak detect function.

Notes:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 200 Hz at frequency below 150 kHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz or 10 kHz at frequency (150 kHz to 30 MHz).
3. All modes of operation were investigated and the worst-case emissions are reported.

### For Radiated emission above 30 MHz

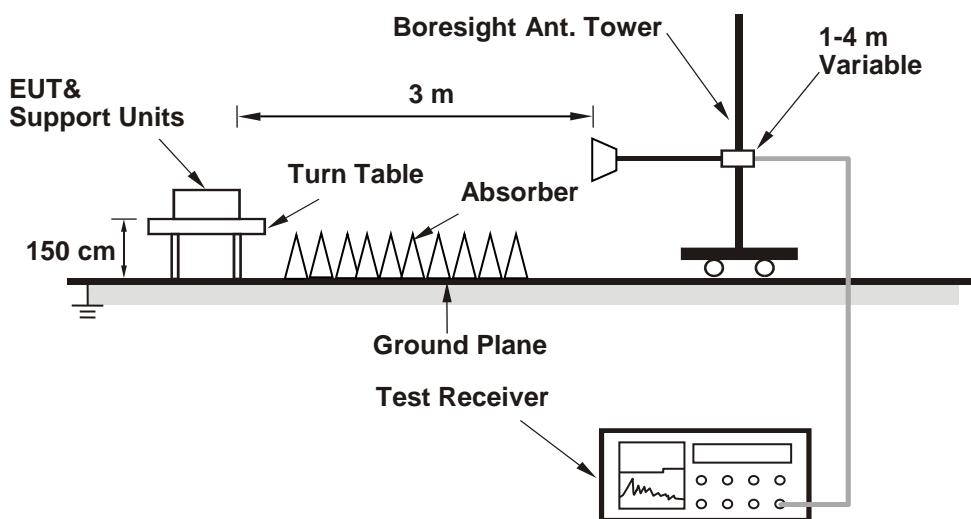
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the 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.

Notes:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. All modes of operation were investigated and the worst-case emissions are reported.

## 6.3 Radiated Emissions above 1 GHz

### 6.3.1 Test Setup



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

### 6.3.2 Test Procedure

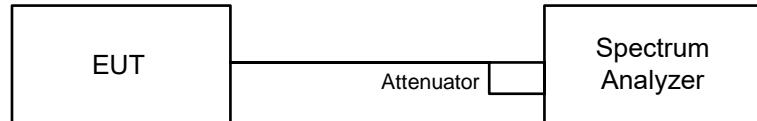
- a. The EUT was placed on the top of a rotating table 1.5 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the 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 peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Notes:

1. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) and Average detection (AV) at frequency above 1 GHz.
2. According to ANSI C63.10 section 6.6.4 and 4.1.4.2.2. For fundamental and harmonic signal measurement, according to ANSI C63.10 section 7.5, the average value = peak value + duty cycle correction factor. For duty cycle correction factor values, see the Test Signal Duty Cycle section in this report.
3. All modes of operation were investigated and the worst-case emissions are reported.

## 6.4 20 dB Bandwidth

### 6.4.1 Test Setup



### 6.4.2 Test Procedure

- a. Set resolution bandwidth (RBW) = 1% to 5% of the OBW.
- b. Set the video bandwidth (VBW)  $\geq 3 \times$  RBW, Detector = Peak.
- c. Trace mode = max hold.
- d. Sweep = auto couple.
- e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

## 7 Test Results of Test Item

### 7.1 AC Power Conducted Emissions

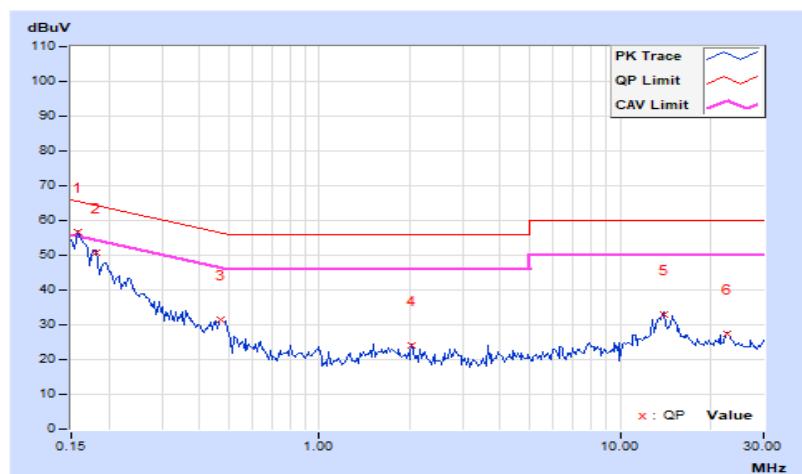
<b>RF Mode</b>	GFSK		<b>Channel</b>	CH 70 : 2474 MHz		
<b>Frequency Range</b>	150 kHz ~ 30 MHz		<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9 kHz		
<b>Input Power</b>	120 Vac, 60 Hz		<b>Environmental Conditions</b>	25 °C, 75 % RH		
<b>Tested By</b>	Jed Wu					

#### 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	<b>0.15781</b>	<b>9.63</b>	<b>47.10</b>	<b>25.87</b>	<b>56.73</b>	<b>35.50</b>	<b>65.58</b>	<b>55.58</b>	<b>-8.85</b>	<b>-20.08</b>
2	0.18125	9.62	41.30	21.57	50.92	31.19	64.43	54.43	-13.51	-23.24
3	0.47031	9.63	21.77	14.95	31.40	24.58	56.51	46.51	-25.11	-21.93
4	2.03125	9.65	14.33	8.47	23.98	18.12	56.00	46.00	-32.02	-27.88
5	13.93359	9.95	23.12	17.88	33.07	27.83	60.00	50.00	-26.93	-22.17
6	22.63281	10.18	17.17	12.44	27.35	22.62	60.00	50.00	-32.65	-27.38

#### 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



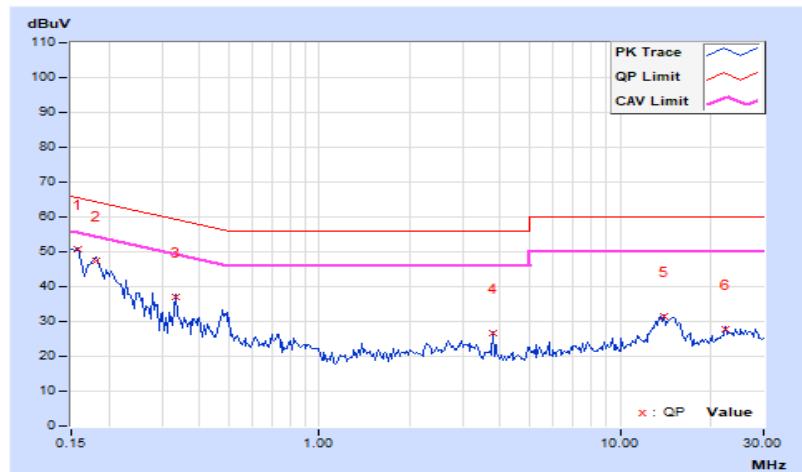
<b>RF Mode</b>	GFSK	<b>Channel</b>	CH 70 : 2474 MHz
<b>Frequency Range</b>	150 kHz ~ 30 MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9 kHz
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	25 °C, 75 % RH
<b>Tested By</b>	Jed Wu		

**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	0.15781	9.62	41.08	23.16	50.70	32.78	65.58	55.58	-14.88	-22.80
2	0.18125	9.61	37.91	19.49	47.52	29.10	64.43	54.43	-16.91	-25.33
3	0.33359	9.60	27.57	15.39	37.17	24.99	59.36	49.36	-22.19	-24.37
4	3.76563	9.68	16.84	11.94	26.52	21.62	56.00	46.00	-29.48	-24.38
5	14.04297	9.96	21.56	15.28	31.52	25.24	60.00	50.00	-28.48	-24.76
6	22.30859	10.19	17.66	12.66	27.85	22.85	60.00	50.00	-32.15	-27.15

**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



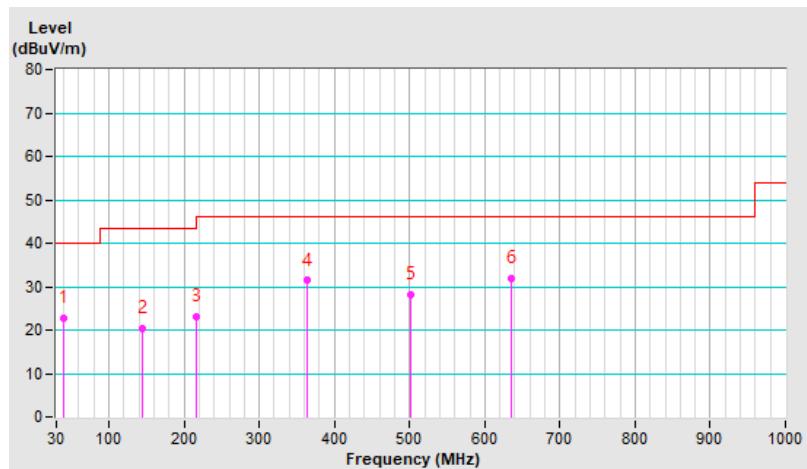
## 7.2 Radiated Emissions below 1 GHz

<b>RF Mode</b>	GFSK	<b>Channel</b>	CH 70 : 2474 MHz
<b>Frequency Range</b>	30 MHz ~ 1 GHz	<b>Detector Function &amp; Bandwidth</b>	QP: RB=120kHz, DET=Quasi-Peak
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	25 °C, 75 % RH
<b>Tested By</b>	Jed Wu		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	39.22	22.7 QP	40.0	-17.3	1.58 H	17	32.4	-9.7
2	143.54	20.5 QP	43.5	-23.0	1.47 H	291	28.7	-8.2
3	216.00	23.0 QP	43.5	-20.5	1.63 H	239	32.9	-9.9
4	363.29	31.4 QP	46.0	-14.6	1.29 H	360	35.7	-4.3
5	500.60	28.2 QP	46.0	-17.8	1.18 H	162	29.4	-1.2
<b>6</b>	<b>634.89</b>	<b>31.8 QP</b>	<b>46.0</b>	<b>-14.2</b>	<b>1.08 H</b>	<b>192</b>	<b>29.5</b>	<b>2.3</b>

### Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

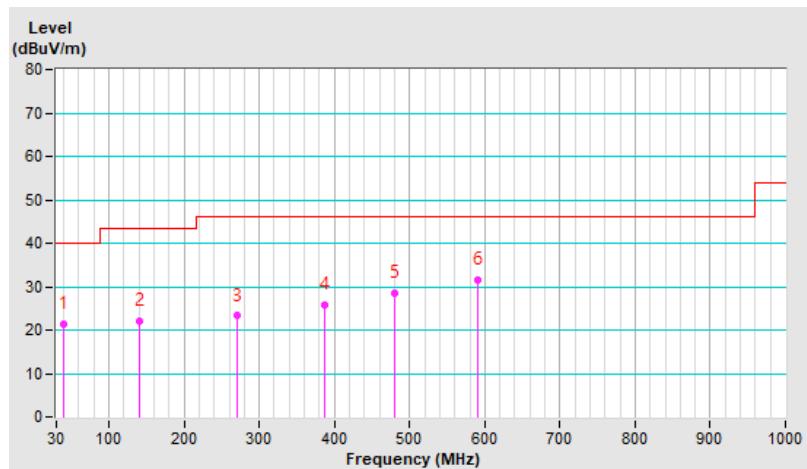


<b>RF Mode</b>	GFSK	<b>Channel</b>	CH 70 : 2474 MHz
<b>Frequency Range</b>	30 MHz ~ 1 GHz	<b>Detector Function &amp; Bandwidth</b>	QP: RB=120kHz, DET=Quasi-Peak
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	25 °C, 75 % RH
<b>Tested By</b>	Jed Wu		

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	40.33	21.3 QP	40.0	-18.7	1.86 V	274	30.6	-9.3
2	141.31	22.2 QP	43.5	-21.3	1.42 V	159	30.5	-8.3
3	270.32	23.3 QP	46.0	-22.7	1.73 V	204	29.7	-6.4
4	387.25	25.9 QP	46.0	-20.1	1.26 V	204	29.5	-3.6
5	480.56	28.4 QP	46.0	-17.6	1.05 V	353	29.9	-1.5
6	591.48	31.5 QP	46.0	-14.5	1.98 V	191	30.4	1.1

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.



### 7.3 Radiated Emissions above 1 GHz

<b>RF Mode</b>	GFSK	<b>Channel</b>	CH 1 : 2405 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	25 °C, 75 % RH
<b>Tested By</b>	Jed Wu		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	53.4 PK	74.0	-20.6	1.77 H	126	54.0	-0.6
2	2390.00	41.0 AV	54.0	-13.0	1.77 H	126	41.6	-0.6
3	2400.00	61.8 PK	74.0	-12.2	1.77 H	126	62.5	-0.7
4	2400.00	34.7 AV	54.0	-19.3	1.77 H	126	35.4	-0.7
5	*2405.00	88.0 PK	114.0	-26.0	1.77 H	126	88.7	-0.7
6	*2405.00	60.9 AV	94.0	-33.1	1.77 H	126	61.6	-0.7
7	4810.00	45.9 PK	74.0	-28.1	1.98 H	141	38.0	7.9
8	4810.00	18.8 AV	54.0	-35.2	1.98 H	141	10.9	7.9
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	54.3 PK	74.0	-19.7	1.00 V	170	54.9	-0.6
2	2390.00	41.2 AV	54.0	-12.8	1.00 V	170	41.8	-0.6
3	<b>2400.00</b>	<b>62.1 PK</b>	<b>74.0</b>	<b>-11.9</b>	<b>1.00 V</b>	<b>170</b>	<b>62.8</b>	<b>-0.7</b>
4	2400.00	35.0 AV	54.0	-19.0	1.00 V	170	35.7	-0.7
5	*2405.00	88.9 PK	114.0	-25.1	1.00 V	170	89.6	-0.7
6	*2405.00	61.8 AV	94.0	-32.2	1.00 V	170	62.5	-0.7
7	4810.00	46.5 PK	74.0	-27.5	1.21 V	196	38.6	7.9
8	4810.00	19.4 AV	54.0	-34.6	1.21 V	196	11.5	7.9

#### Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " \* ": Fundamental frequency.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:  

$$20 \log(\text{Duty cycle}) = 20 \log(4.409 \text{ ms} / 100 \text{ ms}) = -27.1 \text{ dB}$$

<b>RF Mode</b>	GFSK	<b>Channel</b>	CH 35 : 2439 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	25 °C, 75 % RH
<b>Tested By</b>	Jed Wu		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2439.00	88.0 PK	114.0	-26.0	2.02 H	66	88.5	-0.5
2	*2439.00	60.9 AV	94.0	-33.1	2.02 H	66	61.4	-0.5
3	4878.00	46.2 PK	74.0	-27.8	2.23 H	81	37.8	8.4
4	4878.00	19.1 AV	54.0	-34.9	2.23 H	81	10.7	8.4
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2439.00	88.9 PK	114.0	-25.1	1.25 V	110	89.4	-0.5
2	*2439.00	61.8 AV	94.0	-32.2	1.25 V	110	62.3	-0.5
3	4878.00	46.8 PK	74.0	-27.2	1.46 V	136	38.4	8.4
4	4878.00	19.7 AV	54.0	-34.3	1.46 V	136	11.3	8.4

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " \* ": Fundamental frequency.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:  

$$20 \log(\text{Duty cycle}) = 20 \log(4.409 \text{ ms} / 100 \text{ ms}) = -27.1 \text{ dB}$$



BUREAU  
VERITAS

<b>RF Mode</b>	GFSK	<b>Channel</b>	CH 70 : 2474 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	25 °C, 75 % RH
<b>Tested By</b>	Jed Wu		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2474.00	89.6 PK	114.0	-24.4	3.31 H	151	89.8	-0.2
2	*2474.00	62.5 AV	94.0	-31.5	3.31 H	151	62.7	-0.2
3	2483.50	56.7 PK	74.0	-17.3	3.31 H	151	56.9	-0.2
4	2483.50	29.6 AV	54.0	-24.4	3.31 H	151	29.8	-0.2
5	4948.00	47.6 PK	74.0	-26.4	3.52 H	166	39.1	8.5
6	4948.00	20.5 AV	54.0	-33.5	3.52 H	166	12.0	8.5
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2474.00	90.6 PK	114.0	-23.4	1.02 V	169	90.8	-0.2
2	*2474.00	63.5 AV	94.0	-30.5	1.02 V	169	63.7	-0.2
3	2483.50	57.6 PK	74.0	-16.4	1.02 V	169	57.8	-0.2
4	2483.50	30.5 AV	54.0	-23.5	1.02 V	169	30.7	-0.2
5	4948.00	48.2 PK	74.0	-25.8	1.23 V	197	39.7	8.5
6	4948.00	21.1 AV	54.0	-32.9	1.23 V	197	12.6	8.5

**Remarks:**

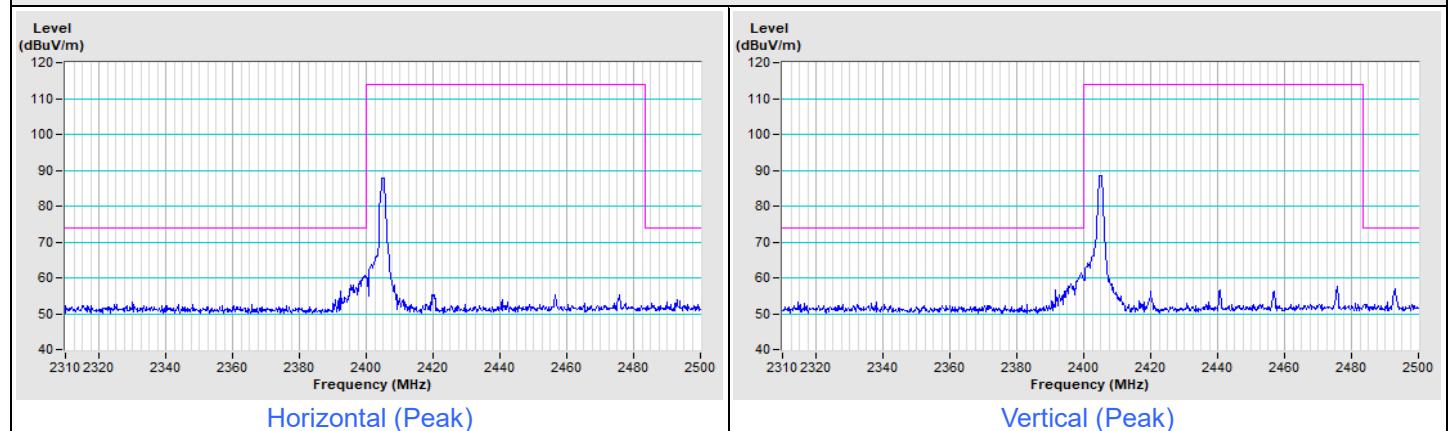
1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " \* ": Fundamental frequency.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:  

$$20 \log(\text{Duty cycle}) = 20 \log(4.409 \text{ ms} / 100 \text{ ms}) = -27.1 \text{ dB}$$

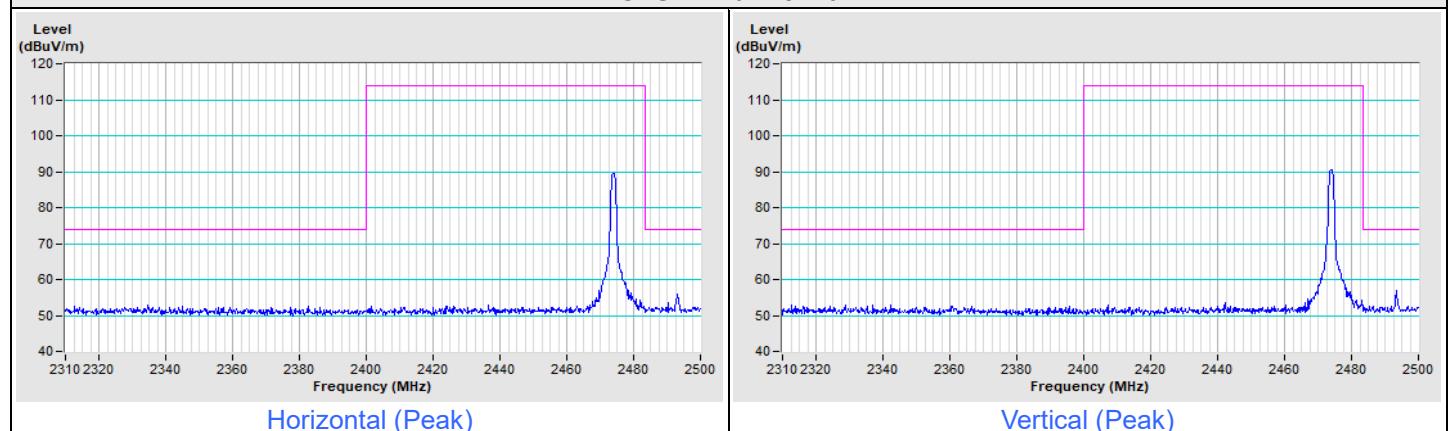
## Plot of Band Edge

Frequency Range	2.31 GHz ~ 2.5 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak
-----------------	--------------------	-------------------------------	----------------------------------

### GFSK Channel 1



### GFSK Channel 70



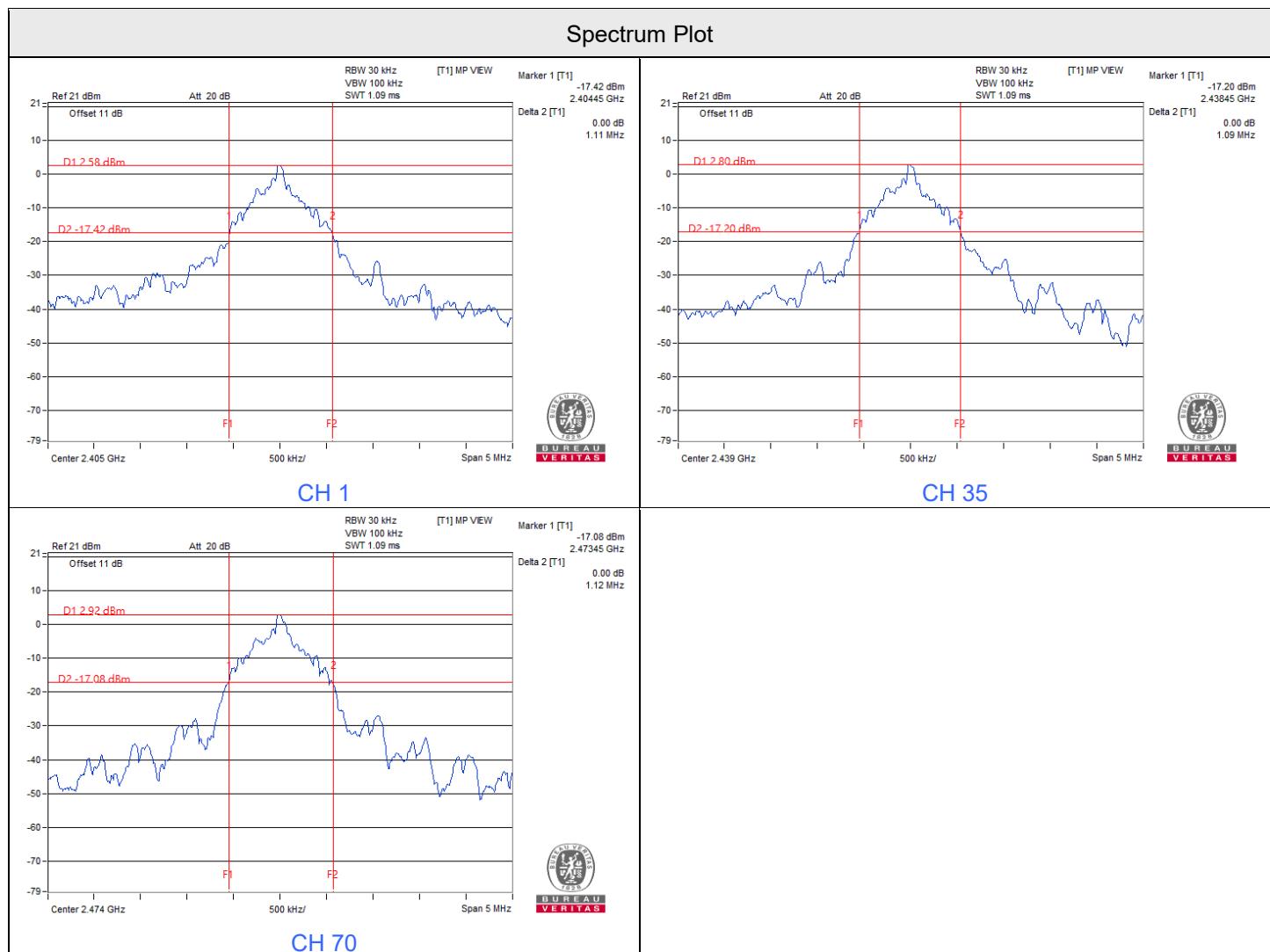
## 7.4 20 dB Bandwidth

Input Power:	120 Vac, 60 Hz	Environmental Conditions:	25°C, 76% RH	Tested By:	Waydi Tuan
--------------	----------------	---------------------------	--------------	------------	------------

Channel	Channel Frequency (MHz)	20 dB Bandwidth (MHz)	Measured Frequencies		Operating Frequency Band (MHz)	Test Result
			FL (MHz)	FH (MHz)		
1	2405	1.11	2404.45	2405.56	2400 ~ 2483.5	Pass
35	2439	1.09	2438.45	2439.54		Pass
70	2474	1.12	2473.45	2474.57		Pass

### Notes:

1. FL is the lowest frequency of the 20 dB bandwidth of power envelope.
2. FH is the highest frequency of the 20 dB bandwidth of power envelope.



## 8 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo)

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

**Web Site:** <http://ee.bureauveritas.com.tw>

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

--- END ---