

TEST REPORT

CERTIFICATE OF CONFORMITY

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

Report No.: RFBDKX-WTW-P24110276

FCC ID: EMJKAW311WLKB

Product: Keyboard

Brand: ASUS

Model No.: AW311WLKB

Received Date: 2024/11/12

Test Date: 2024/11/20 ~ 2024/12/5

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: Jeremy Lin, **Date:** 2025/1/3
Jeremy Lin / Project Engineer

This test report consists of 26 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 : Ivy Lin / 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

| | |
|--|-----------|
| Release Control Record | 3 |
| 1 Certificate..... | 4 |
| 2 Summary of Test Results | 5 |
| 2.1 Measurement Uncertainty | 5 |
| 2.2 Supplementary Information | 5 |
| 3 General Information | 6 |
| 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 |
| 4 Test Instruments | 10 |
| 4.1 Radiated Emissions below 1 GHz..... | 10 |
| 4.2 Radiated Emissions above 1 GHz..... | 11 |
| 4.3 20 dB Bandwidth | 12 |
| 5 Limits of Test Items..... | 13 |
| 5.1 Radiated Emissions below 1 GHz..... | 13 |
| 5.2 Radiated Emissions above 1 GHz..... | 13 |
| 5.3 20 dB Bandwidth | 13 |
| 6 Test Arrangements..... | 14 |
| 6.1 Radiated Emissions below 1 GHz..... | 14 |
| 6.1.1 Test Setup | 14 |
| 6.1.2 Test Procedure..... | 15 |
| 6.2 Radiated Emissions above 1 GHz..... | 16 |
| 6.2.1 Test Setup | 16 |
| 6.2.2 Test Procedure..... | 16 |
| 6.3 20 dB Bandwidth | 17 |
| 6.3.1 Test Setup | 17 |
| 6.3.2 Test Procedure..... | 17 |
| 7 Test Results of Test Item..... | 18 |
| 7.1 Radiated Emissions below 1 GHz..... | 18 |
| 7.2 Radiated Emissions above 1 GHz..... | 20 |
| 7.3 20 dB Bandwidth | 24 |
| 8 Pictures of Test Arrangements | 25 |
| 9 Information of the Testing Laboratories | 26 |



Release Control Record

| Issue No. | Description | Date Issued |
|----------------------|-------------------|-------------|
| RFBDKX-WTW-P24110276 | Original release. | 2025/1/3 |

1 Certificate

Product: Keyboard

Brand: ASUS

Test Model: AW311WLKB

Sample Status: Engineering sample

Applicant: PRIMAX ELECTRONICS LTD.

Test Date: 2024/11/20 ~ 2024/12/5

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 | N/A | Power supply is from battery. |
| 15.209 / 15.249(d) | Radiated Emissions below 1 GHz | Pass | Minimum passing margin is -15.0 dB at 622.48 MHz |
| 15.209 / 15.249(a) / 15.249(d) / 15.249(e) | Radiated Emissions above 1 GHz | Pass | Minimum passing margin is -3.1 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) (±) |
|--------------------------------|-----------------|-----------------------------------|
| 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 | Keyboard |
| Brand | ASUS |
| Test Model | AW311WLKB |
| Status of EUT | Engineering sample |
| Power Supply Rating | 3Vdc from batteries (AAA x 2) |
| Modulation Type | GFSK |
| Transfer Rate | 1 Mbps |
| Operating Frequency | 2.405 GHz ~ 2.474 GHz |
| Number of Channel | 70 |
| Field Strength Of Fundamental | 71.6 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

1. The antenna information is listed as below.

| Gain (dBi) | Antenna Type | Connector Type |
|------------|--------------|----------------|
| 2.2 | 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 | | |

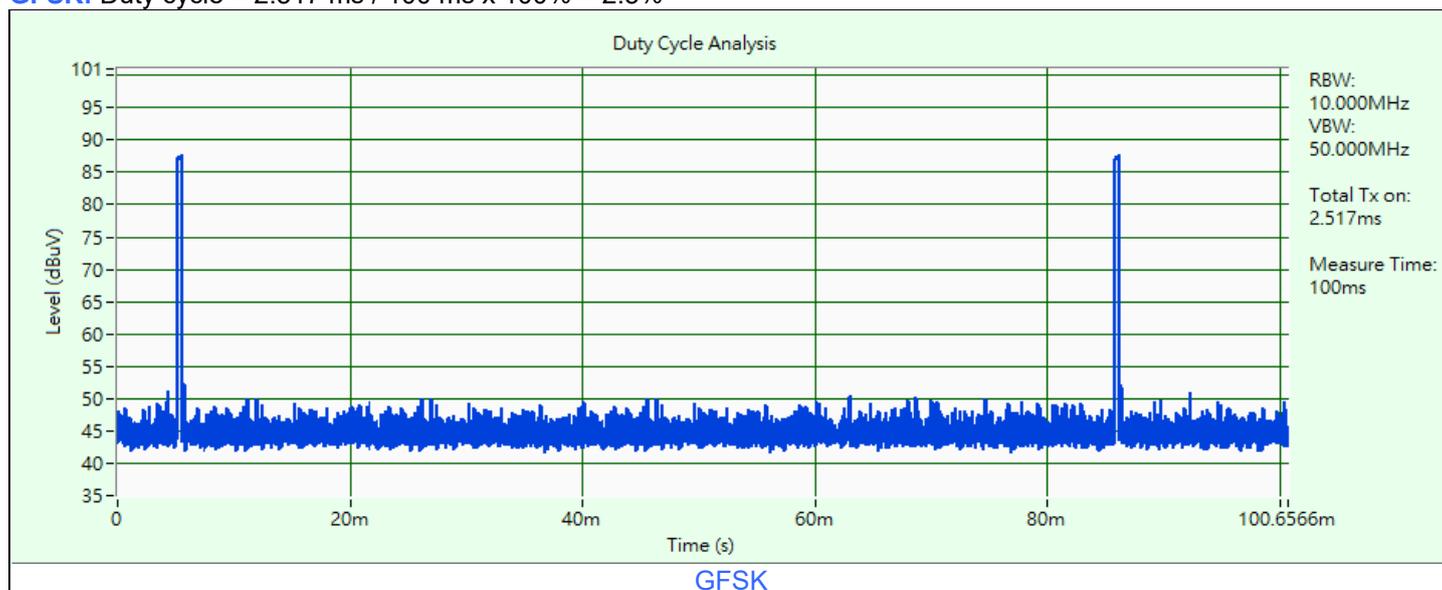
3.4 Test Mode Applicability and Tested Channel Detail

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

| Test Item | Tested Channel | Modulation | Data Rate Parameter |
|--------------------------------|----------------|------------|---------------------|
| 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

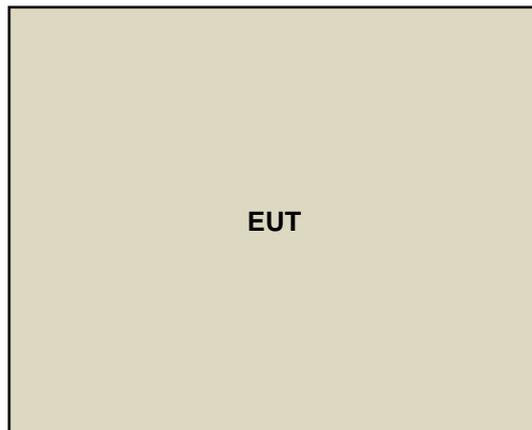
GFSK: Duty cycle = 2.517 ms / 100 ms x 100% = 2.5%



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



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 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

4.2 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 |
| | | 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: 2024/11/20

4.3 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: 2024/12/5

5 Limits of Test Items

5.1 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).

5.2 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 (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.

5.3 20 dB Bandwidth

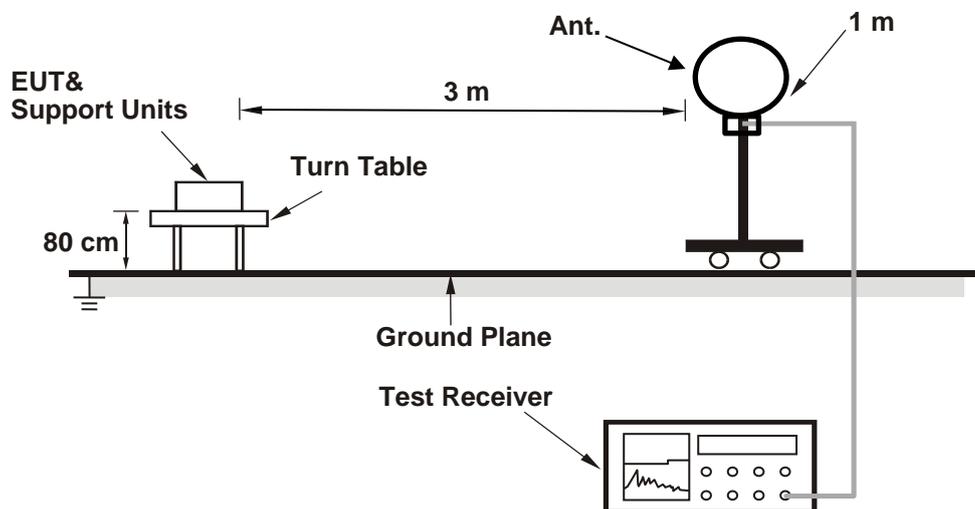
The 20dB bandwidth shall be specified in operating frequency band.

6 Test Arrangements

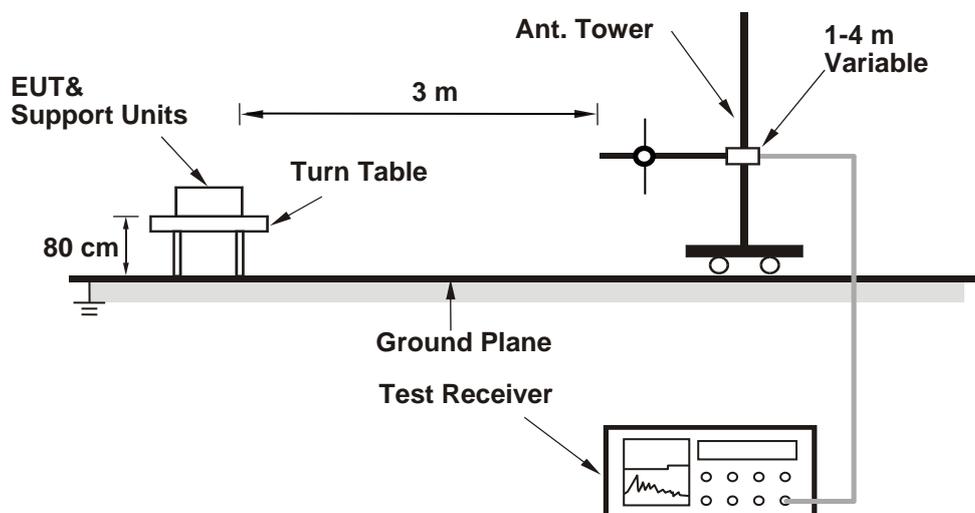
6.1 Radiated Emissions below 1 GHz

6.1.1 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).

6.1.2 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

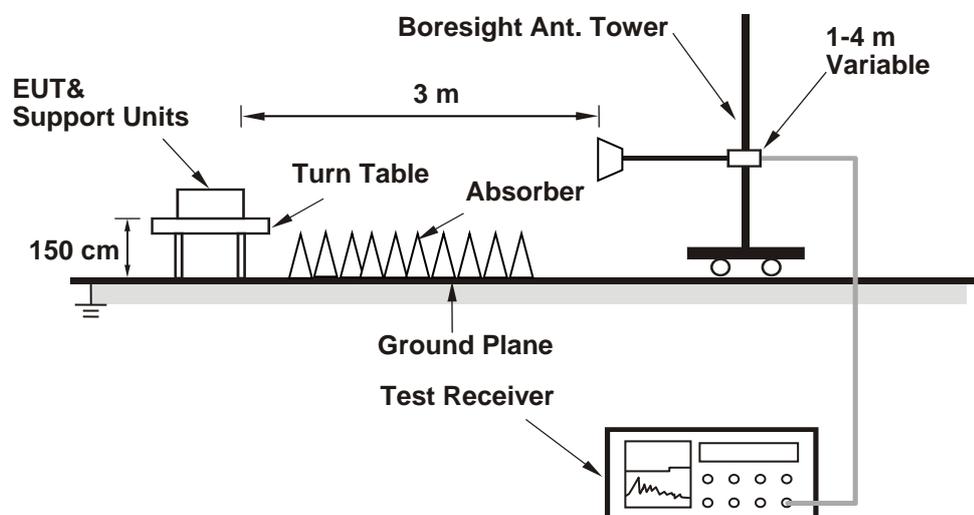
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the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

6.2 Radiated Emissions above 1 GHz

6.2.1 Test Setup



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

6.2.2 Test Procedure

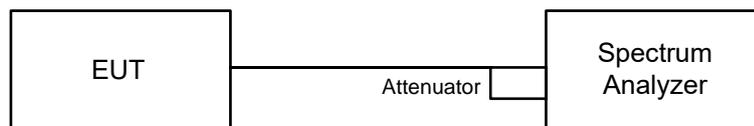
- The EUT was placed on the top of a rotating table 1.5 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- 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:

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

6.3 20 dB Bandwidth

6.3.1 Test Setup



6.3.2 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 Radiated Emissions below 1 GHz

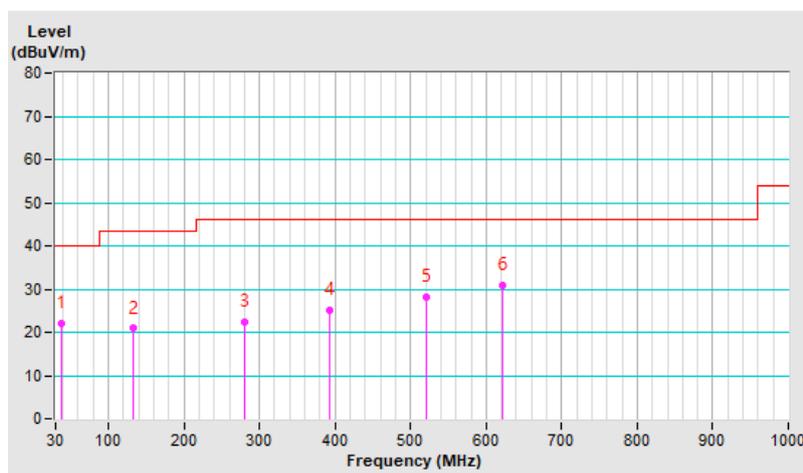
| | | | |
|-----------------|----------------|-------------------------------|-------------------------------|
| RF Mode | GFSK | Channel | CH 70 : 2474 MHz |
| Frequency Range | 30 MHz ~ 1 GHz | Detector Function & Bandwidth | QP: RB=120kHz, DET=Quasi-Peak |
| Input Power | 3 Vdc | Environmental Conditions | 25 °C, 75 % RH |
| Tested By | 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 | 38.29 | 22.0 QP | 40.0 | -18.0 | 1.86 H | 162 | 31.7 | -9.7 |
| 2 | 133.26 | 20.9 QP | 43.5 | -22.6 | 1.75 H | 185 | 29.8 | -8.9 |
| 3 | 280.02 | 22.4 QP | 46.0 | -23.6 | 1.49 H | 42 | 28.3 | -5.9 |
| 4 | 392.73 | 25.1 QP | 46.0 | -20.9 | 1.32 H | 30 | 28.7 | -3.6 |
| 5 | 520.53 | 28.2 QP | 46.0 | -17.8 | 1.26 H | 329 | 29.1 | -0.9 |
| 6 | 622.48 | 31.0 QP | 46.0 | -15.0 | 1.60 H | 111 | 29.1 | 1.9 |

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 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.

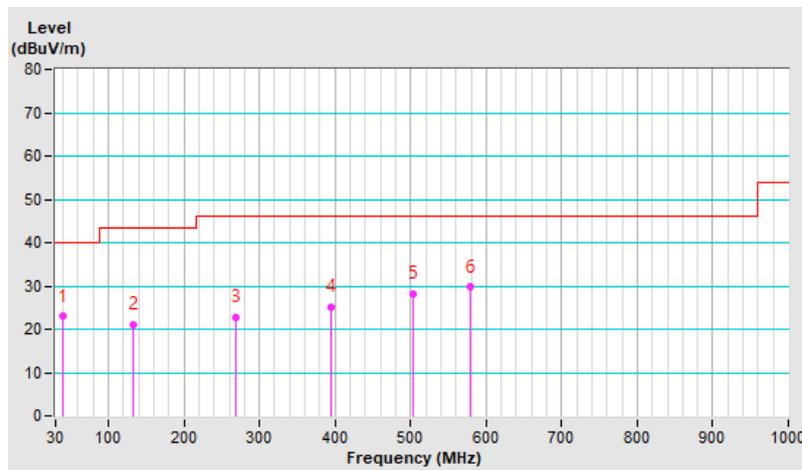


| | | | |
|------------------------|----------------|--|-------------------------------|
| RF Mode | GFSK | Channel | CH 70 : 2474 MHz |
| Frequency Range | 30 MHz ~ 1 GHz | Detector Function & Bandwidth | QP: RB=120kHz, DET=Quasi-Peak |
| Input Power | 3 Vdc | Environmental Conditions | 25 °C, 75 % RH |
| Tested By | 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 | 39.22 | 22.9 QP | 40.0 | -17.1 | 1.58 V | 134 | 32.6 | -9.7 |
| 2 | 133.31 | 21.1 QP | 43.5 | -22.4 | 1.24 V | 306 | 30.0 | -8.9 |
| 3 | 269.06 | 22.7 QP | 46.0 | -23.3 | 1.37 V | 256 | 29.3 | -6.6 |
| 4 | 393.75 | 25.2 QP | 46.0 | -20.8 | 1.67 V | 221 | 28.8 | -3.6 |
| 5 | 502.44 | 28.1 QP | 46.0 | -17.9 | 1.18 V | 139 | 29.2 | -1.1 |
| 6 | 578.73 | 29.7 QP | 46.0 | -16.3 | 1.85 V | 152 | 29.0 | 0.7 |

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.



7.2 Radiated Emissions above 1 GHz

| | | | |
|------------------------|----------------|--|---|
| RF Mode | GFSK | Channel | CH 1 : 2405 MHz |
| Frequency Range | 1 GHz ~ 25 GHz | Detector Function & Bandwidth | PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS |
| Input Power | 3 Vdc | Environmental Conditions | 25 °C, 75 % RH |
| Tested By | 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 | 60.7 PK | 74.0 | -13.3 | 1.95 H | 217 | 61.3 | -0.6 |
| 2 | 2390.00 | 41.3 AV | 54.0 | -12.7 | 1.95 H | 217 | 41.9 | -0.6 |
| 3 | 2400.00 | 70.9 PK | 74.0 | -3.1 | 1.95 H | 217 | 71.6 | -0.7 |
| 4 | 2400.00 | 38.9 AV | 54.0 | -15.1 | 1.95 H | 217 | 39.6 | -0.7 |
| 5 | *2405.00 | 102.5 PK | 114.0 | -11.5 | 1.95 H | 217 | 103.2 | -0.7 |
| 6 | *2405.00 | 70.5 AV | 94.0 | -23.5 | 1.95 H | 217 | 71.2 | -0.7 |
| 7 | 4810.00 | 48.5 PK | 74.0 | -25.5 | 1.97 H | 286 | 40.6 | 7.9 |
| 8 | 4810.00 | 16.5 AV | 54.0 | -37.5 | 1.97 H | 286 | 8.6 | 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 | 57.3 PK | 74.0 | -16.7 | 3.98 V | 176 | 57.9 | -0.6 |
| 2 | 2390.00 | 41.0 AV | 54.0 | -13.0 | 3.98 V | 176 | 41.6 | -0.6 |
| 3 | 2400.00 | 66.3 PK | 74.0 | -7.7 | 3.98 V | 176 | 67.0 | -0.7 |
| 4 | 2400.00 | 34.3 AV | 54.0 | -19.7 | 3.98 V | 176 | 35.0 | -0.7 |
| 5 | *2405.00 | 97.2 PK | 114.0 | -16.8 | 3.98 V | 176 | 97.9 | -0.7 |
| 6 | *2405.00 | 65.2 AV | 94.0 | -28.8 | 3.98 V | 176 | 65.9 | -0.7 |
| 7 | 4810.00 | 46.4 PK | 74.0 | -27.6 | 3.56 V | 154 | 38.5 | 7.9 |
| 8 | 4810.00 | 14.4 AV | 54.0 | -39.6 | 3.56 V | 154 | 6.5 | 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:

$$20 \log(\text{Duty cycle}) = 20 \log(2.517 \text{ ms} / 100 \text{ ms}) = -32.0 \text{ dB}$$



| | | | |
|------------------------|----------------|--|---|
| RF Mode | GFSK | Channel | CH 35 : 2439 MHz |
| Frequency Range | 1 GHz ~ 25 GHz | Detector Function & Bandwidth | PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS |
| Input Power | 3 Vdc | Environmental Conditions | 25 °C, 75 % RH |
| Tested By | 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 | 102.1 PK | 114.0 | -11.9 | 1.89 H | 216 | 102.6 | -0.5 |
| 2 | *2439.00 | 70.1 AV | 94.0 | -23.9 | 1.89 H | 216 | 70.6 | -0.5 |
| 3 | 4878.00 | 48.4 PK | 74.0 | -25.6 | 1.91 H | 287 | 40.0 | 8.4 |
| 4 | 4878.00 | 16.4 AV | 54.0 | -37.6 | 1.91 H | 287 | 8.0 | 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 | 96.8 PK | 114.0 | -17.2 | 3.92 V | 175 | 97.3 | -0.5 |
| 2 | *2439.00 | 64.8 AV | 94.0 | -29.2 | 3.92 V | 175 | 65.3 | -0.5 |
| 3 | 4878.00 | 46.3 PK | 74.0 | -27.7 | 3.50 V | 153 | 37.9 | 8.4 |
| 4 | 4878.00 | 14.3 AV | 54.0 | -39.7 | 3.50 V | 153 | 5.9 | 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:
 $20 \log(\text{Duty cycle}) = 20 \log(2.517 \text{ ms} / 100 \text{ ms}) = -32.0 \text{ dB}$



| | | | |
|------------------------|----------------|--|---|
| RF Mode | GFSK | Channel | CH 70 : 2474 MHz |
| Frequency Range | 1 GHz ~ 25 GHz | Detector Function & Bandwidth | PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS |
| Input Power | 3 Vdc | Environmental Conditions | 25 °C, 75 % RH |
| Tested By | 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 | 103.6 PK | 114.0 | -10.4 | 1.05 H | 213 | 103.8 | -0.2 |
| 2 | *2474.00 | 71.6 AV | 94.0 | -22.4 | 1.05 H | 213 | 71.8 | -0.2 |
| 3 | 2483.50 | 66.6 PK | 74.0 | -7.4 | 1.05 H | 213 | 66.8 | -0.2 |
| 4 | 2483.50 | 34.6 AV | 54.0 | -19.4 | 1.05 H | 213 | 34.8 | -0.2 |
| 5 | 4948.00 | 49.7 PK | 74.0 | -24.3 | 1.07 H | 282 | 41.2 | 8.5 |
| 6 | 4948.00 | 17.7 AV | 54.0 | -36.3 | 1.07 H | 282 | 9.2 | 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 | 98.4 PK | 114.0 | -15.6 | 3.08 V | 172 | 98.6 | -0.2 |
| 2 | *2474.00 | 66.4 AV | 94.0 | -27.6 | 3.08 V | 172 | 66.6 | -0.2 |
| 3 | 2483.50 | 62.7 PK | 74.0 | -11.3 | 3.08 V | 172 | 62.9 | -0.2 |
| 4 | 2483.50 | 30.7 AV | 54.0 | -23.3 | 3.08 V | 172 | 30.9 | -0.2 |
| 5 | 4948.00 | 47.6 PK | 74.0 | -26.4 | 2.66 V | 150 | 39.1 | 8.5 |
| 6 | 4948.00 | 15.6 AV | 54.0 | -38.4 | 2.66 V | 150 | 7.1 | 8.5 |

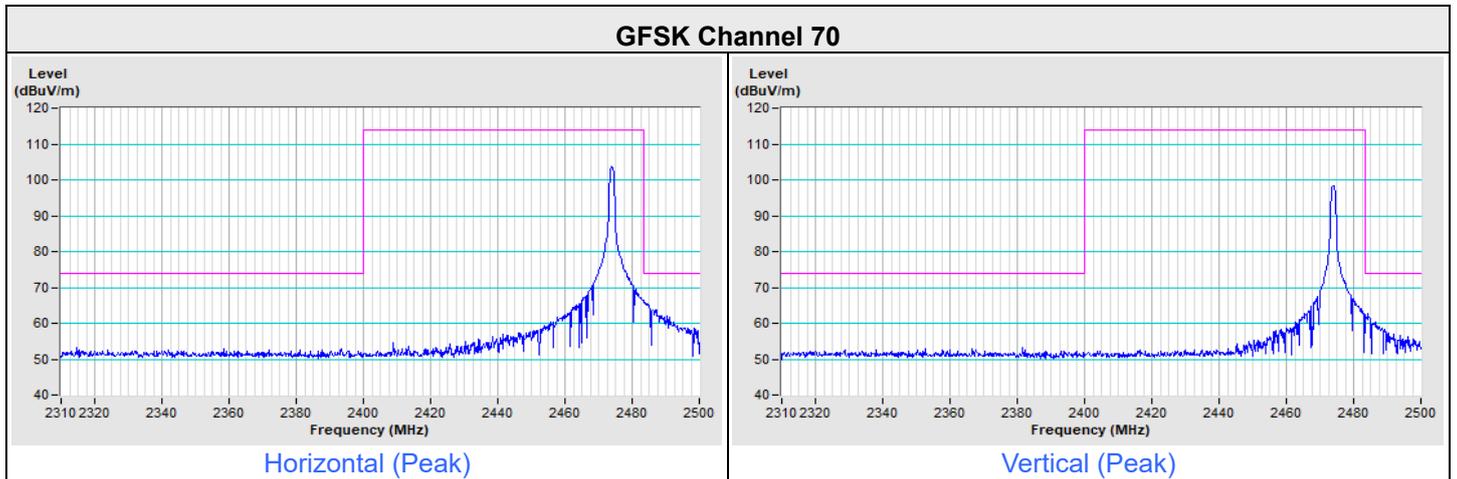
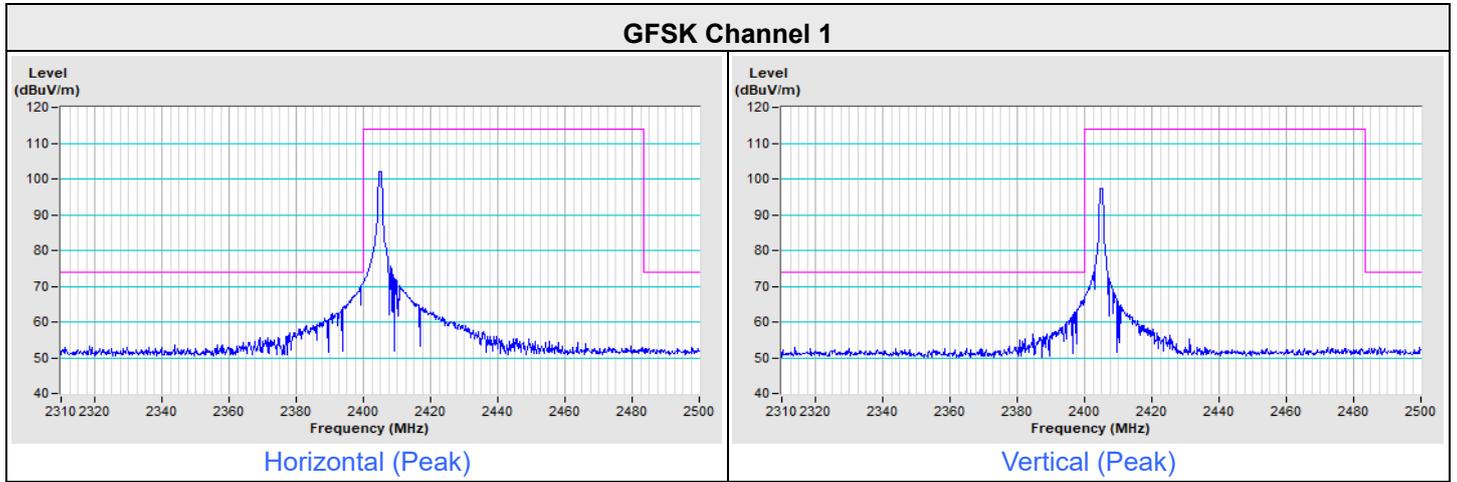
Remarks:

- Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
- Margin value = Emission Level – Limit value
- The other emission levels were very low against the limit.
- " * " : Fundamental frequency.
- 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:

$$20 \log(\text{Duty cycle}) = 20 \log(2.517 \text{ ms} / 100 \text{ ms}) = -32.0 \text{ dB}$$

Plot of Band Edge

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



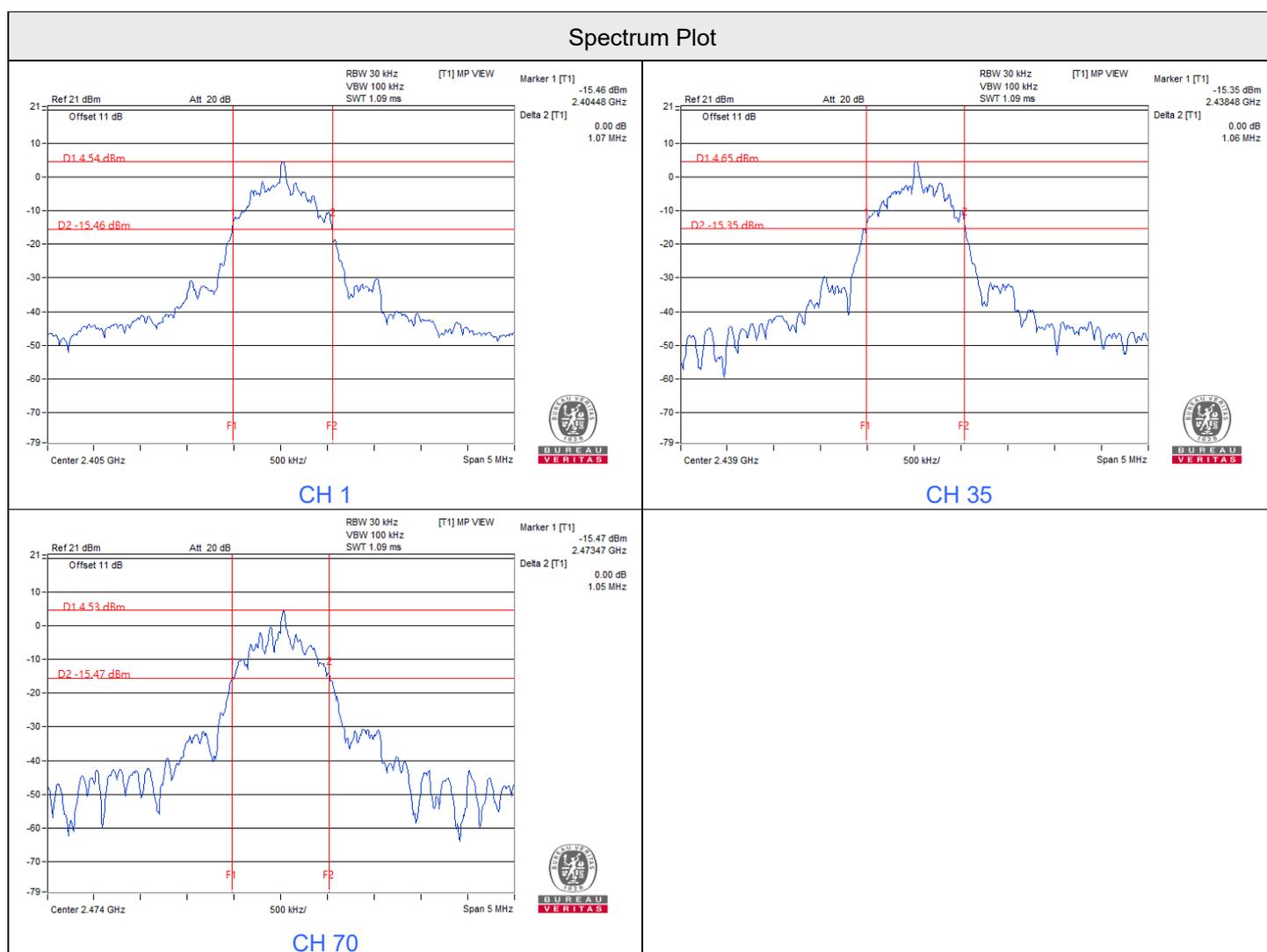
7.3 20 dB Bandwidth

| | | | | | |
|--------------|-------|---------------------------|--------------|------------|------------|
| Input Power: | 3 Vdc | 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 | 1.07 | 2404.48 | 2405.55 | 2400 ~ 2483.5 | Pass |
| 35 | 2439 | 1.06 | 2438.48 | 2439.54 | | Pass |
| 70 | 2474 | 1.05 | 2473.47 | 2474.52 | | 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

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 ---