

## FCC Test Report

**Report No.:** RFCBVX-WTW-P22051015

**FCC ID:** YUQ-P991MV01

**Test Model:** P991MV-01

**Received Date:** May 31, 2022

**Test Date:** Jun. 07, 2022 ~ Jun. 09, 2022

**Issued Date:** Jul. 20, 2022

**Applicant:** Citizen Watch CO., LTD.

**Address:** 6-1-12 TANASHICHO, NISHITOKYO-SHI, TOKYO 188--8511, JAPAN

**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



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.

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### Release Control Record

| Issue No.            | Description      | Date Issued   |
|----------------------|------------------|---------------|
| RFCBVX-WTW-P22051015 | Original Release | Jul. 20, 2022 |

## 1 Certificate of Conformity

**Product:** CZ Smart

**Brand:** Citizen

**Test Model:** P991MV-01

**Sample Status:** Engineering Sample

**Applicant:** Citizen Watch CO., LTD.

**Test Date:** Jun. 07, 2022 ~ Jun. 09, 2022

**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 :**                     *Vera Huang*                    , **Date:**                     Jul. 20, 2022                      
Vera Huang / Specialist

**Approved by :**                     *Jeremy Lin*                    , **Date:**                     Jul. 20, 2022                      
Jeremy Lin / Project Engineer

## 2 Summary of Test Results

| 47 CFR FCC Part 15, Subpart C (Section 15.247) |   |        |   |
|--|---|--------|---|
| FCC Clause                                     | Test Item   | Result | Remarks   |
| 15.207   | AC Power Conducted Emission   | Pass   | Meet the requirement of limit.<br>Minimum passing margin is -15.72 dB at 0.15000 MHz. |
| 15.247(a)(1)(iii)                              | Number of Hopping Frequency Used  | N/A    | Refer to Note 1   |
| 15.247(a)(1)(iii)                              | Dwell Time on Each Channel  | N/A    | Refer to Note 1   |
| 15.247(a)(1)                                   | 1. Hopping Channel Separation<br>2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System | N/A    | Refer to Note 1   |
| 15.247(a) (1)                                  | Maximum Peak Output Power   | N/A    | Refer to Note 1   |
| ---  | Occupied Bandwidth Measurement  | N/A    | Refer to Note 1   |
| 15.205 & 209                                   | Radiated Emissions  | Pass   | Meet the requirement of limit.<br>Minimum passing margin is -5.3 dB at 2390.00 MHz.   |
| 15.247(d)                                      | Band Edge Measurement   | N/A    | Refer to Note 1   |
| 15.247(d)                                      | Antenna Port Emission   | N/A    | Refer to Note 1   |
| 15.203   | Antenna Requirement   | N/A    | Refer to Note 1   |

### Note:

1. Only worst mode of conducted emission and radiated emissions tests were performed for this addendum. Refer to original report for other test data.
2. For 2.4G band compliance with rule 15.247(d) of the band-edge items, the test plots were recorded in Annex A. Test Procedures refer to report 4.1.3.
3. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

## 2.1 Measurement Uncertainty

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

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

## 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

|                            |  |
|----------------------------|--|
| <b>Product</b>             | CZ Smart   |
| <b>Brand</b>               | Citizen  |
| <b>Test Model</b>          | P991MV-01  |
| <b>Status of EUT</b>       | Engineering Sample   |
| <b>Power Supply Rating</b> | 5.0 Vdc (adapter or host equipment)<br>3.88 Vdc (Li-ion battery) |
| <b>Modulation Type</b>     | GFSK, $\pi/4$ -DQPSK, 8DPSK                                      |
| <b>Transfer Rate</b>       | 1/2/3 Mbps   |
| <b>Operating Frequency</b> | 2402 ~ 2480 MHz  |
| <b>Number of Channel</b>   | 79   |
| <b>Antenna Type</b>        | PIFA antenna with -5.72 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. The difference compared with the original report (BV CPS report no.: RFBHJP-WTW-P21010398) are changing applicant, brand name, model name, product name, appearance, and antenna gain. Therefore, only worst mode of conducted emission and radiated emissions were verified and recorded in this report.
2. The EUT contains following accessory devices.

| Product       | Brand  | Model           | Description   |
|---------------|--------|-----------------|---|
| Charging Dock | Simula | CB407D-6040-202 | Voltage Rating: 5V<br>0.95m shielded cable w/o core |
| Battery       | Lishen | DAGP382427SA    | 3.88 Vdc, 300 mAh                                   |

3. The above Antenna information refers to the manufacturer's antenna specifications, the laboratory shall not be held responsible.
4. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or User's Manual.

### 3.2 Description of Test Modes

79 channels are provided to this EUT:

| Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|---------|-------------|---------|-------------|---------|-------------|---------|-------------|
| 0       | 2402        | 20      | 2422        | 40      | 2442        | 60      | 2462        |
| 1       | 2403        | 21      | 2423        | 41      | 2443        | 61      | 2463        |
| 2       | 2404        | 22      | 2424        | 42      | 2444        | 62      | 2464        |
| 3       | 2405        | 23      | 2425        | 43      | 2445        | 63      | 2465        |
| 4       | 2406        | 24      | 2426        | 44      | 2446        | 64      | 2466        |
| 5       | 2407        | 25      | 2427        | 45      | 2447        | 65      | 2467        |
| 6       | 2408        | 26      | 2428        | 46      | 2448        | 66      | 2468        |
| 7       | 2409        | 27      | 2429        | 47      | 2449        | 67      | 2469        |
| 8       | 2410        | 28      | 2430        | 48      | 2450        | 68      | 2470        |
| 9       | 2411        | 29      | 2431        | 49      | 2451        | 69      | 2471        |
| 10      | 2412        | 30      | 2432        | 50      | 2452        | 70      | 2472        |
| 11      | 2413        | 31      | 2433        | 51      | 2453        | 71      | 2473        |
| 12      | 2414        | 32      | 2434        | 52      | 2454        | 72      | 2474        |
| 13      | 2415        | 33      | 2435        | 53      | 2455        | 73      | 2475        |
| 14      | 2416        | 34      | 2436        | 54      | 2456        | 74      | 2476        |
| 15      | 2417        | 35      | 2437        | 55      | 2457        | 75      | 2477        |
| 16      | 2418        | 36      | 2438        | 56      | 2458        | 76      | 2478        |
| 17      | 2419        | 37      | 2439        | 57      | 2459        | 77      | 2479        |
| 18      | 2420        | 38      | 2440        | 58      | 2460        | 78      | 2480        |
| 19      | 2421        | 39      | 2441        | 59      | 2461        |         |             |



### 3.2.1 Test Mode Applicability and Tested Channel Detail

| EUT Configure Mode | Applicable To |           |     |      | Description    |
|--------------------|---------------|-----------|-----|------|----------------|
|                    | RE $\geq$ 1G  | RE $<$ 1G | PLC | APCM |                |
| A                  | √             | √         | √   | -    | EUT + Adapter  |
| B                  | -             | -         | √   | -    | EUT + Notebook |

Where **RE $\geq$ 1G**: Radiated Emission above 1 GHz      **RE $<$ 1G**: Radiated Emission below 1 GHz  
**PLC**: Power Line Conducted Emission      **APCM**: Antenna Port Conducted Measurement

**Note:**

1. For Radiated emission test, pre-tested GFSK,  $\pi/4$ -DQPSK, 8DPSK modulation type and found GFSK was the worse, therefore chosen for the final test and presented in the test report.
2. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z-plane**.
3. "-" 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 | Available Channel | Tested Channel | Modulation Technology | Modulation Type | Packet Type |
|--------------------|-------------------|----------------|-----------------------|-----------------|-------------|
| A                  | 0 to 78           | 0              | FHSS                  | GFSK            | DH5         |

**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 | Available Channel | Tested Channel | Modulation Technology | Modulation Type | Packet Type |
|--------------------|-------------------|----------------|-----------------------|-----------------|-------------|
| A                  | 0 to 78           | 0              | FHSS                  | GFSK            | DH5         |

**Power Line Conducted Emission Test:**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

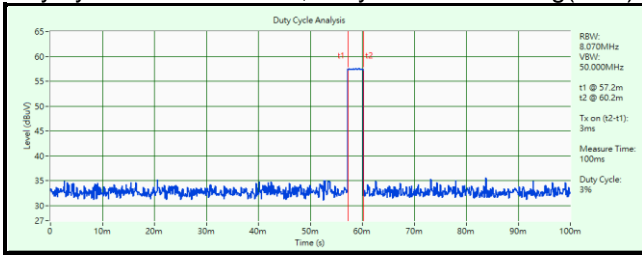
| EUT Configure Mode | Available Channel | Tested Channel | Modulation Technology | Modulation Type | Packet Type |
|--------------------|-------------------|----------------|-----------------------|-----------------|-------------|
| A, B               | 0 to 78           | 0              | FHSS                  | GFSK            | DH5         |

**Test Condition:**

| Applicable To | Environmental Conditions | Input Power    | Tested by    |
|---------------|--------------------------|----------------|--------------|
| RE $\geq$ 1G  | 21 deg. C, 71 % RH       | 120 Vac, 60 Hz | Thomas Cheng |
| RE $<$ 1G     | 21 deg. C, 68 % RH       | 120 Vac, 60 Hz | Thomas Cheng |
| PLC           | 23 deg. C, 68 % RH       | 120 Vac, 60 Hz | Thomas Cheng |

### 3.3 Duty Cycle of Test Signal

Duty cycle =  $3/100 = 0.03$ , Duty factor =  $20 * \log(0.03) = -30.4$



### 3.4 Description of Support Units

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

| ID | Product          | Brand  | Model No. | Serial No. | FCC ID | Remarks         |
|----|------------------|--------|-----------|------------|--------|-----------------|
| A  | Adapter          | ASUS   | AD827M    | NA         | NA     | Provided by Lab |
| B  | Notebook         | Lenovo | 80Q7      | PF0KUGU6   | NA     | Provided by Lab |
| C  | Bluetooth Tester | R&S    | CBT       | 100946     | NA     | Provided by Lab |

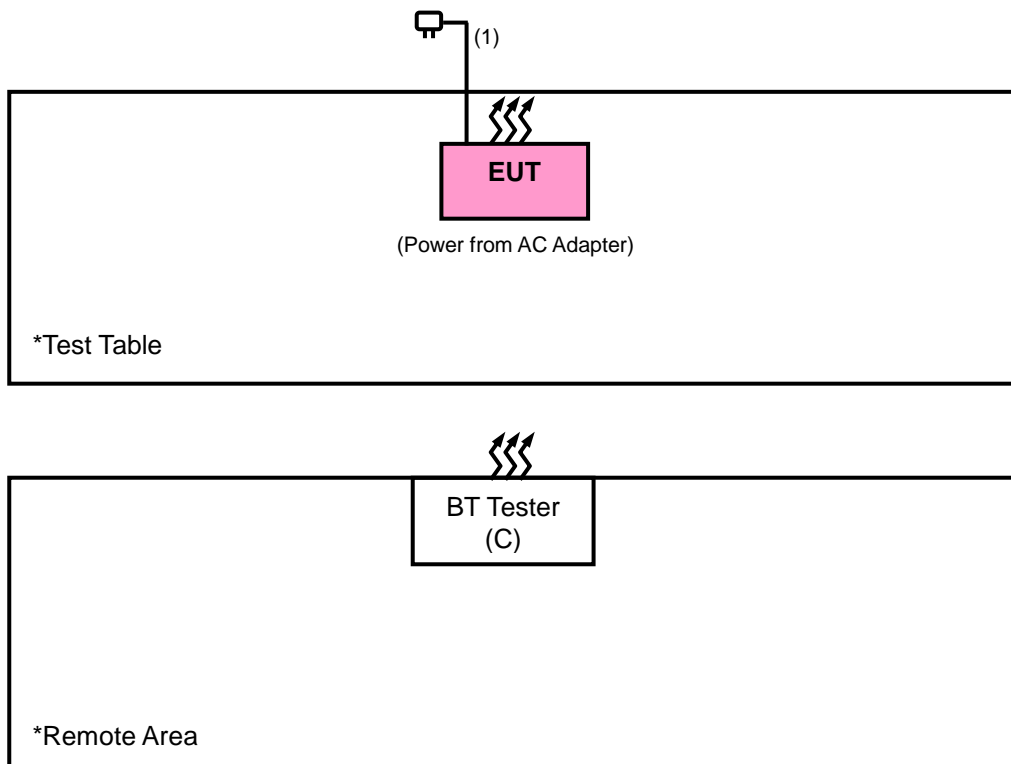
Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item C acted as a communication partner to transfer data.

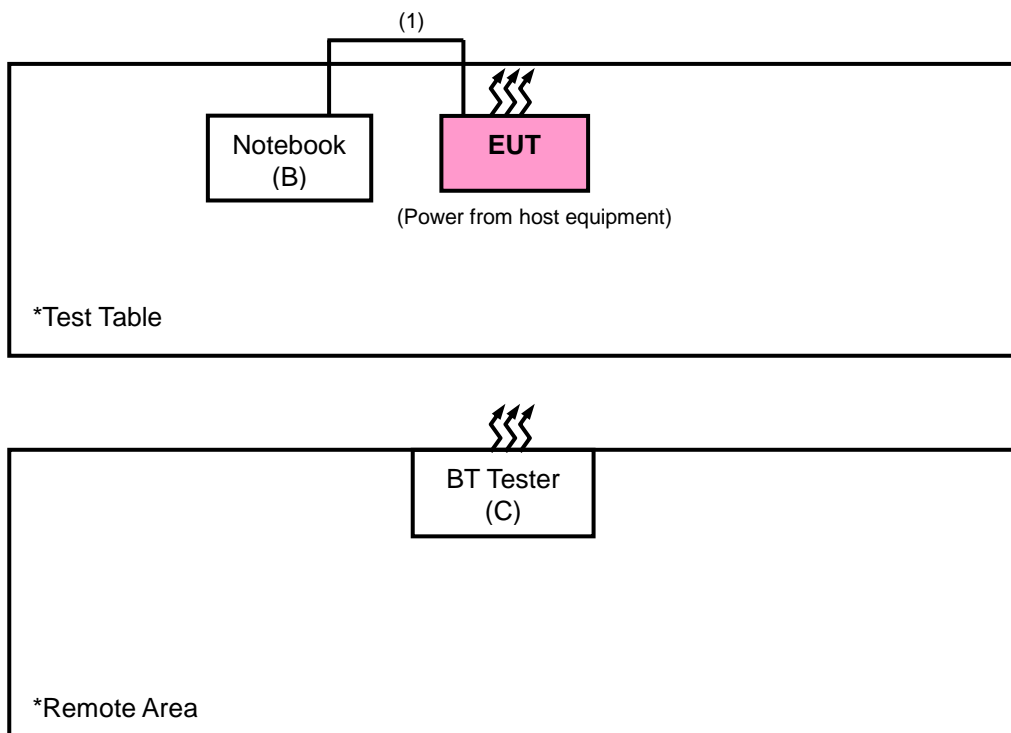
| ID | Descriptions   | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks              |
|----|----------------|------|------------|--------------------|--------------|----------------------|
| 1. | Charging Cable | 1    | 0.95       | Y                  | 0            | Accessory of the EUT |

### 3.4.1 Configuration of System under Test

#### Mode A



#### Mode B



### **3.5 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 15.247 Meas Guidance v05r02**

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:**

- a. The lower limit shall apply at the transition frequencies.
- b. Emission level (dBuV/m) = 20 log Emission level (uV/m).
- c. 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 |
|--|-------------------|---------------------------|---------------------|-------------------------|
| Spectrum Analyzer<br>Agilent                   | N9038A            | MY51210203                | Sep. 22, 2021       | Sep. 21, 2022           |
| Spectrum Analyzer<br>Agilent                   | N9010A            | MY52220207                | Jan. 06, 2022       | Jan. 05, 2023           |
| HORN Antenna<br>SCHWARZBECK                    | BBHA 9170         | 9170-480                  | Nov. 14, 2021       | Nov. 13, 2022           |
| HORN Antenna<br>SCHWARZBECK                    | BBHA 9120D        | 9120D-969                 | Nov. 14, 2021       | Nov. 13, 2022           |
| BILOG Antenna<br>SCHWARZBECK                   | VULB 9168         | 9168-472                  | Oct. 28, 2021       | Oct. 27, 2022           |
| Fixed Attenuator<br>WOKEN                      | MDCS18N-10        | MDCS18N-10-01             | Apr. 05, 2022       | Apr. 04, 2023           |
| Loop Antenna                                   | EM-6879           | 269                       | Sep. 16, 2021       | Sep. 15, 2022           |
| Preamplifier<br>EMCI                           | EMC001340         | 980201                    | Sep. 15, 2021       | Sep. 14, 2022           |
| Preamplifier<br>EMCI                           | EMC 012645        | 980115                    | Oct. 05, 2021       | Oct. 04, 2022           |
| Preamplifier<br>EMCI                           | EMC 330H          | 980112                    | Oct. 05, 2021       | Oct. 04, 2022           |
| RF Coaxial Cable<br>EMCI                       | EMC104-SM-SM-8000 | 171005                    | Oct. 05, 2021       | Oct. 04, 2022           |
| RF Coaxial Cable<br>HUBER+SUHNNER              | SUCOFLEX 104      | EMC104-SM-SM-1000(140807) | Oct. 05, 2021       | Oct. 04, 2022           |
| RF Coaxial Cable<br>WOKEN                      | 8D-FB             | Cable-Ch10-01             | Oct. 05, 2021       | Oct. 04, 2022           |
| Boresight Antenna Fixture                      | FBA-01            | FBA-SIP01                 | NA                  | NA                      |
| Software<br>BV ADT                             | E3<br>6.120103    | NA                        | NA                  | NA                      |
| Antenna Tower<br>MF                            | MFA-440H          | NA                        | NA                  | NA                      |
| Turn Table<br>MF                               | MFT-201SS         | NA                        | NA                  | NA                      |
| Antenna Tower & Turn Table<br>Controller<br>MF | MF-7802           | NA                        | NA                  | NA                      |
| Bluetooth Tester                               | CBT               | 100946                    | Aug. 06, 2020       | Aug. 05, 2022           |

- Note: 1. The calibration interval of the above test instruments is 12/24 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:**

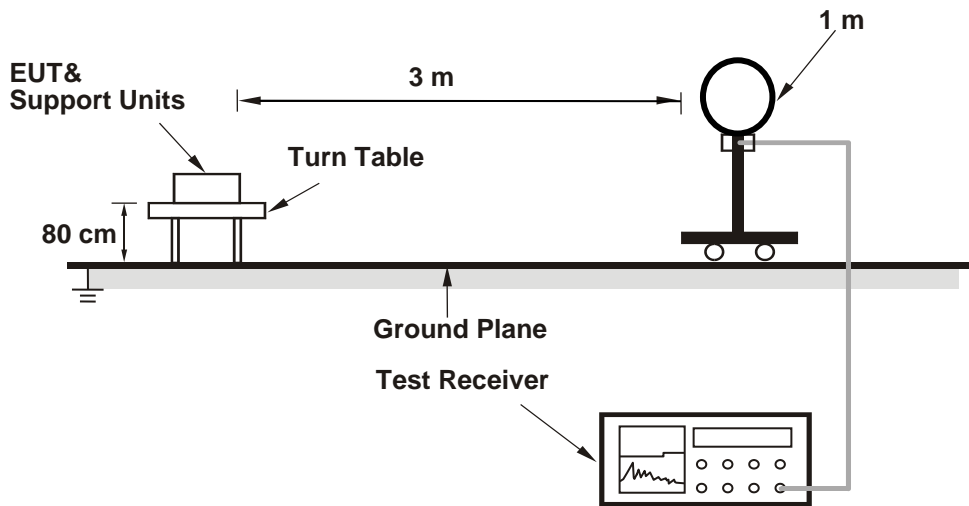
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) and Average detection (AV) at frequency above 1 GHz.
3. For Fundamental frequency and band edge & harmonic:  
The average value of fundamental frequency is : average value = peak value +  $20 \cdot \log(\text{Duty cycle})$  where the duty cycle correction factor is calculated from following formula:  
 $20 \cdot \log(\text{Duty cycle}) = 20 \cdot \log(3 \text{ ms}/100) = -30.4 \text{ dB}$ , please refer to the plotted duty (see section 3.3)
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

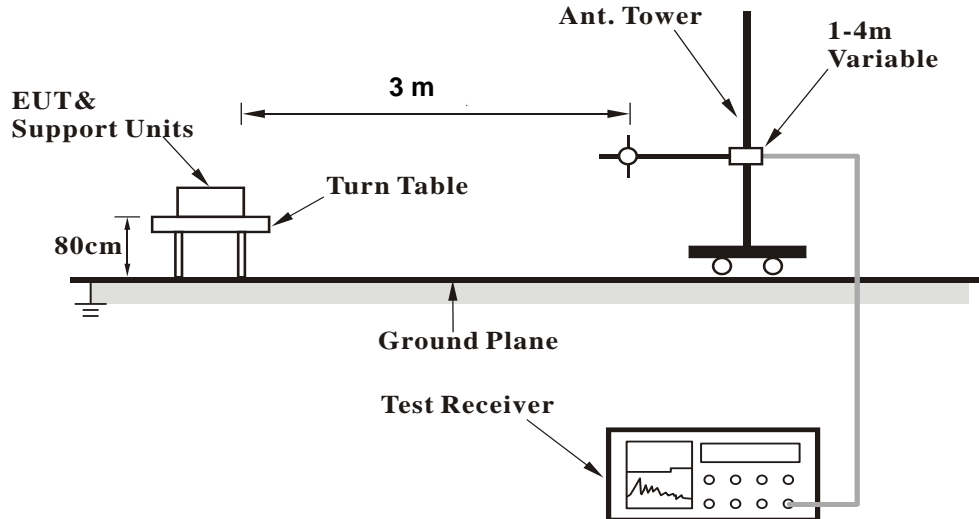
No deviation.

4.1.5 Test Set Up

<Radiated Emission below 30 MHz>

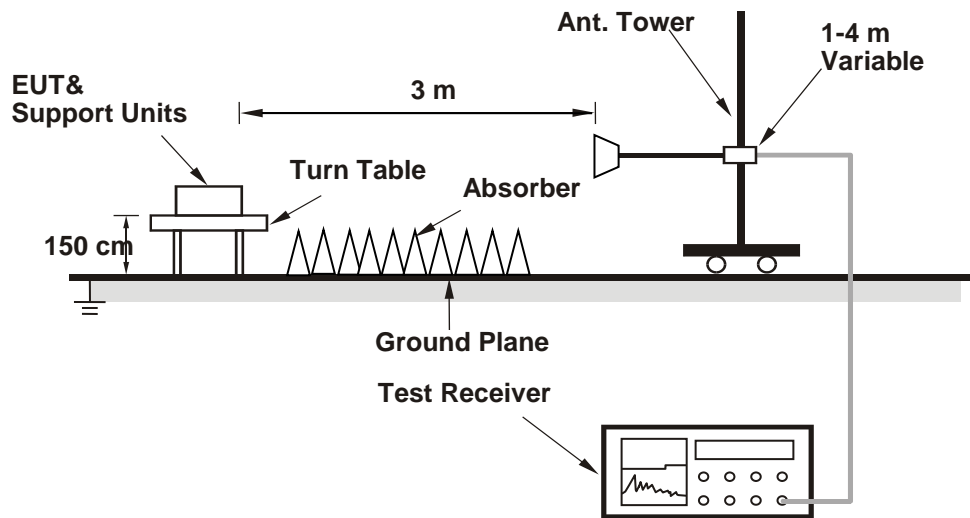


<Radiated Emission 30 MHz to 1 GHz>





**<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**

Set the EUT under transmission condition continuously at specific channel frequency.

#### 4.1.7 Test Results

##### Above 1 GHz Data:

|                 |              |                   |                           |
|-----------------|--------------|-------------------|---------------------------|
| RF Mode         | TX BT_GFSK   | Channel           | CH 0 : 2402 MHz           |
| Frequency Range | 1GHz ~ 25GHz | Detector Function | Peak (PK)<br>Average (AV) |

| 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         | 58.0 PK                 | 74.0           | -16.0       | 1.28 H             | 92                   | 26.8             | 31.2                     |
| 2  | <b>2390.00</b>  | <b>48.7 AV</b>          | <b>54.0</b>    | <b>-5.3</b> | <b>1.28 H</b>      | <b>92</b>            | <b>17.5</b>      | <b>31.2</b>              |
| 3  | *2402.00        | 97.7 PK                 |                |             | 1.28 H             | 92                   | 66.6             | 31.1                     |
| 4  | *2402.00        | 67.3 AV                 |                |             | 1.28 H             | 92                   | 36.2             | 31.1                     |
| 5  | 4804.00         | 43.3 PK                 | 74.0           | -30.7       | 1.85 H             | 130                  | 59.3             | -16.0                    |
| 6  | 4804.00         | 12.9 AV                 | 54.0           | -41.1       | 1.85 H             | 130                  | 28.9             | -16.0                    |
| 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       | 1.18 V             | 236                  | 26.1             | 31.2                     |
| 2  | 2390.00         | 48.6 AV                 | 54.0           | -5.4        | 1.18 V             | 236                  | 17.4             | 31.2                     |
| 3  | *2402.00        | 94.2 PK                 |                |             | 1.18 V             | 236                  | 63.1             | 31.1                     |
| 4  | *2402.00        | 63.8 AV                 |                |             | 1.18 V             | 236                  | 32.7             | 31.1                     |
| 5  | 4804.00         | 43.1 PK                 | 74.0           | -30.9       | 2.56 V             | 292                  | 59.1             | -16.0                    |
| 6  | 4804.00         | 12.7 AV                 | 54.0           | -41.3       | 2.56 V             | 292                  | 28.7             | -16.0                    |

##### 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.

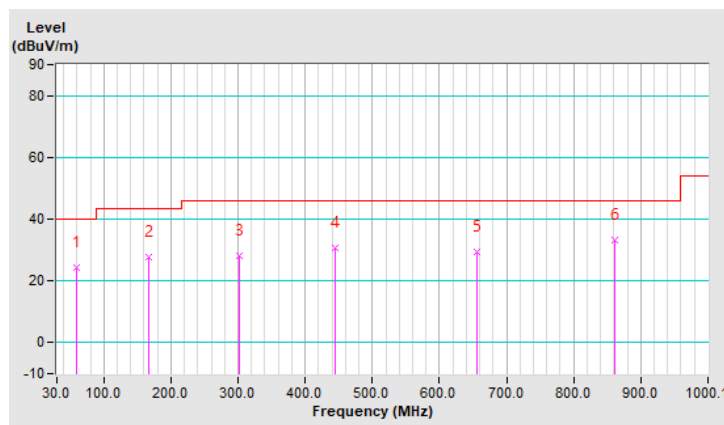
**Below 1 GHz Worst-Case Data:**

|                 |             |                   |                 |
|-----------------|-------------|-------------------|-----------------|
| RF Mode         | TX BT_GFSK  | Channel           | CH 0 : 2402 MHz |
| Frequency Range | 9kHz ~ 1GHz | Detector Function | Quasi-Peak (QP) |

| 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  | 60.07           | 24.3 QP                 | 40.0           | -15.7       | 1.75 H             | 336                  | 37.7             | -13.4                    |
| 2  | 166.78          | 27.8 QP                 | 43.5           | -15.7       | 1.77 H             | 319                  | 40.7             | -12.9                    |
| 3  | 301.63          | 28.3 QP                 | 46.0           | -17.7       | 1.51 H             | 70                   | 40.4             | -12.1                    |
| 4  | 445.20          | 30.6 QP                 | 46.0           | -15.4       | 3.68 H             | 224                  | 38.1             | -7.5                     |
| 5  | 656.68          | 29.4 QP                 | 46.0           | -16.6       | 1.10 H             | 253                  | 32.0             | -2.6                     |
| 6  | 861.38          | 33.4 QP                 | 46.0           | -12.6       | 2.98 H             | 341                  | 32.2             | 1.2                      |

**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 emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

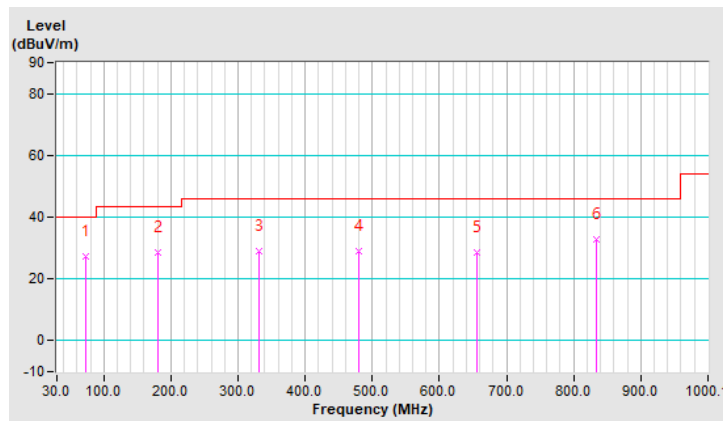


|                 |             |                   |                 |
|-----------------|-------------|-------------------|-----------------|
| RF Mode         | TX BT_GFSK  | Channel           | CH 0 : 2402 MHz |
| Frequency Range | 9kHz ~ 1GHz | Detector Function | Quasi-Peak (QP) |

| 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  | 73.65           | 27.5 QP                 | 40.0           | -12.5       | 1.08 V             | 151                  | 43.4             | -15.9                    |
| 2  | 181.34          | 28.4 QP                 | 43.5           | -15.1       | 3.20 V             | 63                   | 42.9             | -14.5                    |
| 3  | 330.73          | 28.9 QP                 | 46.0           | -17.1       | 1.26 V             | 131                  | 39.8             | -10.9                    |
| 4  | 480.13          | 29.1 QP                 | 46.0           | -16.9       | 3.38 V             | 290                  | 35.9             | -6.8                     |
| 5  | 655.71          | 28.7 QP                 | 46.0           | -17.3       | 2.36 V             | 40                   | 31.3             | -2.6                     |
| 6  | 833.24          | 32.6 QP                 | 46.0           | -13.4       | 1.80 V             | 280                  | 31.6             | 1.0                      |

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 emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



## 4.2 Conducted Emission Measurement

### 4.2.1 Limits of Conducted Emission Measurement

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

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

### 4.2.2 Test Instruments

| Description & Manufacturer                  | Model No.                | Serial No.     | Date of Calibration | Due Date of Calibration |
|---|--------------------------|----------------|---------------------|-------------------------|
| Test Receiver<br>ROHDE & SCHWARZ            | ESR3                     | 102783         | Dec. 20, 2021       | Dec. 19, 2022           |
| RF signal cable (with<br>10dB PAD)<br>Woken | 5D-FB                    | Cable-cond2-01 | Sep. 04, 2021       | Sep. 03, 2022           |
| LISN/AMN<br>ROHDE & SCHWARZ<br>(EUT)        | ESH2-Z5                  | 100100         | Feb. 17, 2022       | Feb. 16, 2023           |
| LISN/AMN<br>ROHDE & SCHWARZ<br>(Peripheral) | ESH3-Z5                  | 100312         | Sep. 17, 2021       | Sep. 16, 2022           |
| Software<br>ADT                             | BV ADT_Cond_<br>V7.3.7.4 | NA             | NA                  | NA                      |

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
 2. The test was performed in HwaYa Shielded Room 2.  
 3. The VCCI Site Registration No. is C-12047.

#### 4.2.3 Test Procedures

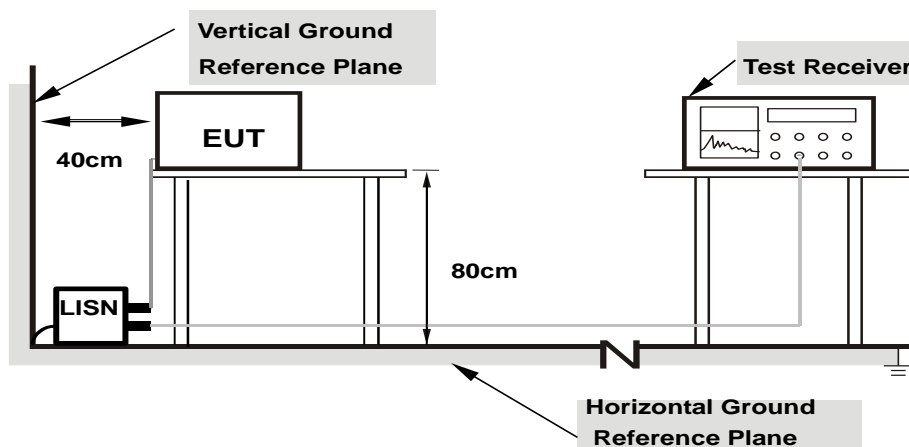
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50 uH of coupling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

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

#### 4.2.4 Deviation from Test Standard

No deviation.

#### 4.2.5 Test Setup



- Note:**
- Support units were connected to second LISN.
  - Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

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

#### 4.2.6 EUT Operating Condition

Set the EUT under transmission condition continuously at specific channel frequency.

#### 4.2.7 Test Results

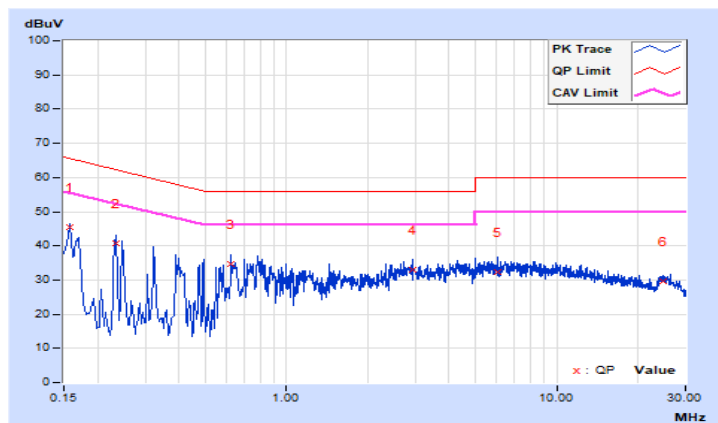
Mode A

|                 |                  |  |                                      |
|-----------------|------------------|--|--------------------------------------|
| Frequency Range | 150 kHz ~ 30 MHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
| Input Power     | 120 Vac, 60 Hz   | Environmental Conditions                 | 23°C, 68% RH                         |
| Tested by       | Thomas Cheng     |  |                                      |

| Phase Of Power : Line (L) |                 |                        |                      |       |                       |       |              |       |             |        |
|---------------------------|-----------------|------------------------|----------------------|-------|-----------------------|-------|--------------|-------|-------------|--------|
| No                        | Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) |       | Emission Level (dBuV) |       | Limit (dBuV) |       | Margin (dB) |        |
|                           |                 |                        | Q.P.                 | AV.   | Q.P.                  | AV.   | Q.P.         | AV.   | Q.P.        | AV.    |
| 1                         | 0.15800         | 10.13                  | 35.31                | 22.70 | 45.44                 | 32.83 | 65.57        | 55.57 | -20.13      | -22.74 |
| 2                         | 0.23400         | 10.17                  | 30.61                | 11.48 | 40.78                 | 21.65 | 62.31        | 52.31 | -21.53      | -30.66 |
| 3                         | 0.62550         | 10.26                  | 24.28                | 9.82  | 34.54                 | 20.08 | 56.00        | 46.00 | -21.46      | -25.92 |
| 4                         | 2.93000         | 10.38                  | 22.46                | 10.32 | 32.84                 | 20.70 | 56.00        | 46.00 | -23.16      | -25.30 |
| 5                         | 6.05000         | 10.42                  | 22.02                | 11.32 | 32.44                 | 21.74 | 60.00        | 50.00 | -27.56      | -28.26 |
| 6                         | 24.79800        | 10.47                  | 19.08                | 7.31  | 29.55                 | 17.78 | 60.00        | 50.00 | -30.45      | -32.22 |

Remarks:

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

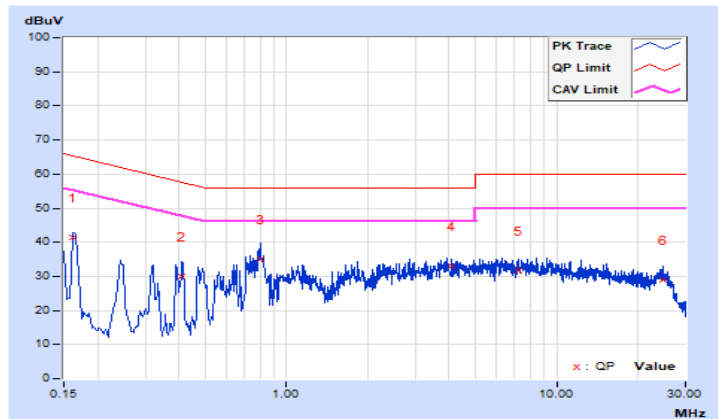


|                 |                  |  |                                      |
|-----------------|------------------|--|--------------------------------------|
| Frequency Range | 150 kHz ~ 30 MHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
| Input Power     | 120 Vac, 60 Hz   | Environmental Conditions                 | 23°C, 68% RH                         |
| Tested by       | Thomas Cheng     |  |                                      |

| 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                            | 0.16200         | 10.15                  | 31.33                | 19.24 | 41.48                 | 29.39 | 65.36        | 55.36 | -23.88      | -25.97 |
| 2                            | 0.41000         | 10.26                  | 19.86                | 7.83  | 30.12                 | 18.09 | 57.65        | 47.65 | -27.53      | -29.56 |
| 3                            | 0.80200         | 10.29                  | 24.86                | 16.35 | 35.15                 | 26.64 | 56.00        | 46.00 | -20.85      | -19.36 |
| 4                            | 4.08600         | 10.40                  | 22.47                | 11.73 | 32.87                 | 22.13 | 56.00        | 46.00 | -23.13      | -23.87 |
| 5                            | 7.20200         | 10.46                  | 21.05                | 9.43  | 31.51                 | 19.89 | 60.00        | 50.00 | -28.49      | -30.11 |
| 6                            | 24.64200        | 10.61                  | 18.49                | 6.90  | 29.10                 | 17.51 | 60.00        | 50.00 | -30.90      | -32.49 |

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





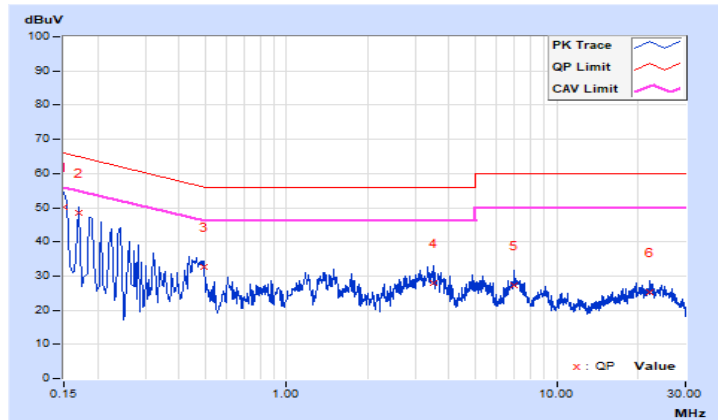
Mode B

|                 |                  |  |                                      |
|-----------------|------------------|--|--------------------------------------|
| Frequency Range | 150 kHz ~ 30 MHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
| Input Power     | 120 Vac, 60 Hz   | Environmental Conditions                 | 23°C, 68% RH                         |
| Tested by       | Thomas Cheng     |  |                                      |

| 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.           |
| <b>1</b>                  | <b>0.15000</b>  | <b>10.13</b>           | <b>40.15</b>         | <b>19.78</b> | <b>50.28</b>          | <b>29.91</b> | <b>66.00</b> | <b>56.00</b> | <b>-15.72</b> | <b>-26.09</b> |
| 2                         | 0.17000         | 10.13                  | 38.33                | 19.49        | 48.46                 | 29.62        | 64.96        | 54.96        | -16.50        | -25.34        |
| 3                         | 0.49800         | 10.16                  | 22.56                | 16.75        | 32.72                 | 26.91        | 56.03        | 46.03        | -23.31        | -19.12        |
| 4                         | 3.51400         | 10.24                  | 17.60                | 7.66         | 27.84                 | 17.90        | 56.00        | 46.00        | -28.16        | -28.10        |
| 5                         | 6.97000         | 10.27                  | 16.88                | 7.58         | 27.15                 | 17.85        | 60.00        | 50.00        | -32.85        | -32.15        |
| 6                         | 22.08200        | 10.33                  | 14.90                | 4.39         | 25.23                 | 14.72        | 60.00        | 50.00        | -34.77        | -35.28        |

Remarks:

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

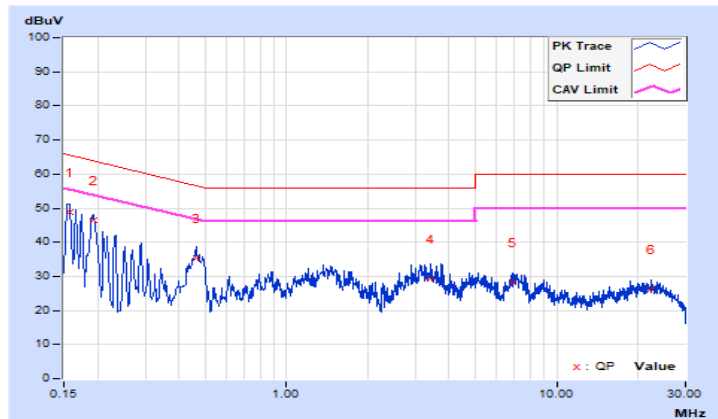


|                 |                  |  |                                      |
|-----------------|------------------|--|--------------------------------------|
| Frequency Range | 150 kHz ~ 30 MHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
| Input Power     | 120 Vac, 60 Hz   | Environmental Conditions                 | 23°C, 68% RH                         |
| Tested by       | Thomas Cheng     |  |                                      |

| 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                            | 0.15687         | 10.14                  | 38.66                | 19.15 | 48.80                 | 29.29 | 65.63        | 55.63 | -16.83      | -26.34 |
| 2                            | 0.19316         | 10.15                  | 36.18                | 17.69 | 46.33                 | 27.84 | 63.90        | 53.90 | -17.57      | -26.06 |
| 3                            | 0.46200         | 10.17                  | 25.02                | 14.97 | 35.19                 | 25.14 | 56.66        | 46.66 | -21.47      | -21.52 |
| 4                            | 3.43400         | 10.26                  | 19.01                | 8.94  | 29.27                 | 19.20 | 56.00        | 46.00 | -26.73      | -26.80 |
| 5                            | 6.85400         | 10.31                  | 17.89                | 8.57  | 28.20                 | 18.88 | 60.00        | 50.00 | -31.80      | -31.12 |
| 6                            | 22.48200        | 10.46                  | 15.65                | 5.18  | 26.11                 | 15.64 | 60.00        | 50.00 | -33.89      | -34.36 |

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



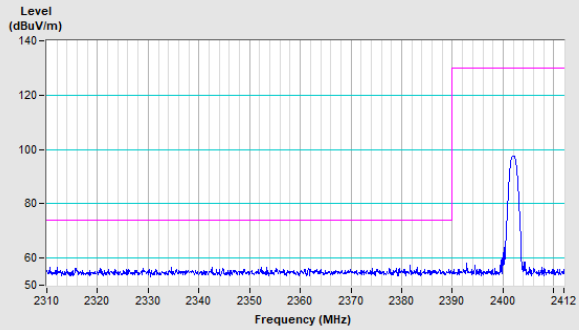
## 5 Pictures of Test Arrangements

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

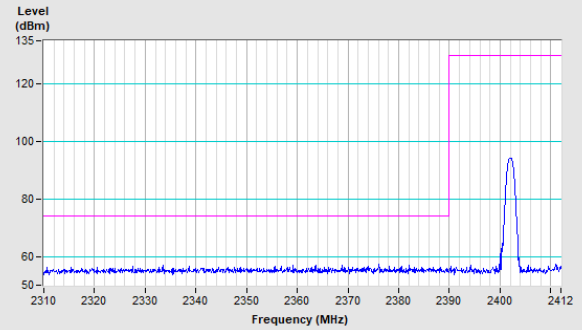
## Annex A- Band Edge Measurement

### BT GFSK Channel 0

Horizontal (Peak)



Vertical (Peak)



## 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.

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

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