

# **Partial FCC Test Report**

Report No.: RFBEAD-WTW-P21050937A

FCC ID: M82-WISE2410

Test Model: WISE-2410B

Series Model: WISE-2410Bxxxxxxxx (where "X" may be any alphanumeric character or blank or "-")

Received Date: Sep. 16, 2022

Test Date: Oct. 06 ~ Nov. 20, 2022

Issued Date: Nov. 25, 2022

Applicant: ADVANTECH CO., LTD

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FCC Registration / 788550 / TW0003 Designation Number (1):

FCC Registration / 281270 / TW0032 Designation Number (2):



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## **Release Control Record**

| Issue No.             | Description      | Date Issued   |
|-----------------------|------------------|---------------|
| RFBEAD-WTW-P21050937A | Original release | Nov. 25, 2022 |



## 1 Certificate of Conformity

| Product:       | WISE-2410B LoRa board  |
|----------------|--|
| Brand:         | ADVANTECH  |
| Test Model:    | WISE-2410B   |
| Series Model:  | WISE-2410Bxxxxxxxxxx (where "X" may be any alphanumeric character or blank or "-") |
| Sample Status: | Engineering sample   |
| Applicant:     | ADVANTECH CO., LTD   |
| Test Date:     | Oct. 06 ~ Nov. 20, 2022  |
| Standards:     | 47 CFR FCC Part 15, Subpart C (Section 15.247)<br>ANSI C63.10-2013                 |

This report is issued as a duplicate report of RF190520C05. This report shall be used combined together with its original report.

| Prepared by : _ | Polly Chien / Specialist                    | , Date:  | Nov. 25, 2022 |  |
|-----------------|---|----------|---------------|--|
| Approved by : _ | Jeremy Lin<br>Jeremy Lin / Project Engineer | _, Date: | Nov. 25, 2022 |  |

Note: The conducted power, radiated emission and conducted emission test items are performed for the addendum. Refer to original report for the other test data.



## 2 Summary of Test Results

| 47 CFR FCC Part 15, Subpart C (Section 15.247) |  |        |   |  |  |  |  |  |
|--|--|--------|---|--|--|--|--|--|
| FCC<br>Clause                                  | Test Item  | Result | Remarks   |  |  |  |  |  |
| 15.207   | AC Power Conducted Emission  | Pass   | Meet the requirement of limit.<br>Minimum passing margin is -9.37dB<br>at 0.17000MHz. |  |  |  |  |  |
| 15.247(a)(1)(i)                                | Number of Hopping Frequency<br>Used  | N/A    | Refer to Note 1   |  |  |  |  |  |
| 15.247(a)(1)(i)                                | Dwell Time on Each Channel   | N/A    | Refer to Note 1   |  |  |  |  |  |
| 15.247(a)(1)                                   | <ol> <li>Hopping Channel Separation</li> <li>Spectrum Bandwidth of a<br/>Frequency Hopping Sequence</li> <li>Spread Spectrum System</li> </ol> | N/A    | Refer to Note 1   |  |  |  |  |  |
| 15.247(b)(2)                                   | Maximum Peak Output Power  | Pass   | Meet the requirement of limit.  |  |  |  |  |  |
| 15.205 / 15.209<br>/ 15.247(d)                 | Radiated Emissions and Band<br>Edge Measurement  | Pass   | Meet the requirement of limit.<br>Minimum passing margin is<br>-3.3dB at 7319.20MHz.  |  |  |  |  |  |
| 15.247(d)                                      | Antenna Port Emission  | N/A    | Refer to Note 1   |  |  |  |  |  |
| 15.203   | Antenna Requirement  | Pass   | No antenna connector is used.   |  |  |  |  |  |

Note:

1. The conducted power, radiated emission and conducted emission test items are performed for the addendum. Refer to original report for the other test data.

2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

## 2.1 Measurement Uncertainty

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

| Measurement                        | Frequency       | Expanded Uncertainty<br>(k=2) (±) |
|------------------------------------|-----------------|-----------------------------------|
| Conducted Emissions at mains ports | 150kHz ~ 30MHz  | 2.79 dB                           |
|                                    | 9kHz ~ 30MHz    | 3.00 dB                           |
| Radiated Emissions up to 1 GHz     | 30MHz ~ 200MHz  | 2.91 dB                           |
|                                    | 200MHz ~1000MHz | 2.93 dB                           |
| Padiated Emissions above 1 CHz     | 1GHz ~ 18GHz    | 1.76 dB                           |
| Radiated Emissions above 1 GHz     | 18GHz ~ 40GHz   | 1.77 dB                           |

## 2.2 Modification Record

There were no modifications required for compliance.



## 3 General Information

### 3.1 General Description of EUT

| Product               | WISE-2410B LoRa board   |  |  |  |  |  |
|-----------------------|---|--|--|--|--|--|
| Brand                 | ADVANTECH   |  |  |  |  |  |
| Test Model            | WISE-2410B  |  |  |  |  |  |
| Series Model          | WISE-2410Bxxxxxxxxxxx (where "X" may be any alphanumeric character or blank or "-") |  |  |  |  |  |
| Model Difference      | Refer to note for more details  |  |  |  |  |  |
| Sample Status         | Engineering sample  |  |  |  |  |  |
| Test Software Version | Com Tool  |  |  |  |  |  |
| S/N                   | LKD0218077  |  |  |  |  |  |
| Dowor Supply Poting   | 5Vdc from host equipment  |  |  |  |  |  |
|                       | 3.7Vdc from battery   |  |  |  |  |  |
| Modulation Type       | chirp spread spectrum (CSS)   |  |  |  |  |  |
| Transfer Rate         | 980bps ~ 5.47kbps   |  |  |  |  |  |
| Operating Frequency   | 902.3 ~ 914.9MHz  |  |  |  |  |  |
| Number of Channel     | 64  |  |  |  |  |  |
| Channel Spacing       | 0.2MHz  |  |  |  |  |  |
| Output Power          | 57.280mW  |  |  |  |  |  |
| Antenna Type          | Refer to Note   |  |  |  |  |  |
| Antenna Connector     | Refer to Note   |  |  |  |  |  |
| Accessory Device      | N/A   |  |  |  |  |  |
| Cable Supplied        | N/A   |  |  |  |  |  |

Note:

1. This report is prepared for FCC class II permissive change. This report is issued as a supplementary report to the original BV CPS report no.: RF190520C05. The difference compared with original report is adding an antenna. Therefore, only conducted power, radiated emission and conducted emission test items are performed for the addendum. Refer to original report for the other test data.

2. The following models are provided to this EUT.

| Brand     | Model                   | Description                                    |  |  |  |
|-----------|-------------------------|--|--|--|--|
|           | WISE-2410B (Main test)  | Where "X" may be any alphanumeric character or |  |  |  |
| ADVANTECH | WISE-2410Bxxxxxxxxxxxxx | blank or "-" for marketing purpose only.       |  |  |  |

## 3. The following antennas were provided to the EUT. (Antenna 2 is the new antenna)

| No. | Туре     | Connector | Gain (dBi) |
|-----|----------|-----------|------------|
| 1   | Chip     | NA        | 1.00       |
| 2   | Monopole | NA        | -0.90      |

\* Detail antenna specification please refer to antenna datasheet and/an antenna gain measurement report.

4. The transmitter module is authorized for use in specific End-product (LoRaWAN Smart Condition Monitoring Sensor, Brand: Advantech, Model: WISE-2410).



# 3.2 Description of Test Modes

64 channels are provided (125kHz Bandwidth):

| Channel | Freq. (MHz) |
|---------|-------------|---------|-------------|---------|-------------|---------|-------------|
| 0       | 902.3       | 16      | 905.5       | 32      | 908.7       | 48      | 911.9       |
| 1       | 902.5       | 17      | 905.7       | 33      | 908.9       | 49      | 912.1       |
| 2       | 902.7       | 18      | 905.9       | 34      | 909.1       | 50      | 912.3       |
| 3       | 902.9       | 19      | 906.1       | 35      | 909.3       | 51      | 912.5       |
| 4       | 903.1       | 20      | 906.3       | 36      | 909.5       | 52      | 912.7       |
| 5       | 903.3       | 21      | 906.5       | 37      | 909.7       | 53      | 912.9       |
| 6       | 903.5       | 22      | 906.7       | 38      | 909.9       | 54      | 913.1       |
| 7       | 903.7       | 23      | 906.9       | 39      | 910.1       | 55      | 913.3       |
| 8       | 903.9       | 24      | 907.1       | 40      | 910.3       | 56      | 913.5       |
| 9       | 904.1       | 25      | 907.3       | 41      | 910.5       | 57      | 913.7       |
| 10      | 904.3       | 26      | 907.5       | 42      | 910.7       | 58      | 913.9       |
| 11      | 904.5       | 27      | 907.7       | 43      | 910.9       | 59      | 914.1       |
| 12      | 904.7       | 28      | 907.9       | 44      | 911.1       | 60      | 914.3       |
| 13      | 904.9       | 29      | 908.1       | 45      | 911.3       | 61      | 914.5       |
| 14      | 905.1       | 30      | 908.3       | 46      | 911.5       | 62      | 914.7       |
| 15      | 905.3       | 31      | 908.5       | 47      | 911.7       | 63      | 914.9       |



# 3.2.1 Test Mode Applicability and Tested Channel Detail

| EUT Configure   | Applicable to  |   |  |  |                      | Description   |                       |  |  |  |
|---|--|---|--|--|----------------------|---|-----------------------|--|--|--|
| Mode  | RE≥10  | G RE<1G   | PLC  | Power  |                      |   | Descrip               | ntion                                    |  |  |
| -   | $\checkmark$   | $\checkmark$  | $\checkmark$   | $\checkmark$                                   | -                    |   |                       |  |  |  |
| Where RE≥1<br>Meas<br>PLC:  | Where       RE≥1G: Radiated Emission above 1GHz & Bandedge       RE<1G: Radiated Emission below 1GHz   |   |  |  |                      |   |                       |  |  |  |
| Note: The EUT ha  | Note: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on X-plane.   |   |  |  |                      |   |                       |  |  |  |
| Radiated Emi  | ssion Te   | est (Above 1GH  | <u>lz):</u>  |  |                      |   |                       |  |  |  |
| Pre-Scan<br>between a   | has bee<br>available   | en conducted to<br>modulations, da  | determine tl<br>ata rates an                               | he worst-cas<br>d antenna po<br>the final test | se r<br>orts         | node from all p<br>(if EUT with ar                      | ossible<br>ntenna (   | combinations<br>diversity architecture). |  |  |
|   | Mode   | Available Chapt   |  | ted Channel                                    | . as                 | Modulation T  | ime                   | Doto Boto                                |  |  |
| EUI Configure   | wode   | Available Chann   | 101 103  |  |                      |   | уре                   |  |  |  |
| -   |  | 0 10 03   |  | 0, 01, 00                                      |                      | 000   |                       | 9000h9                                   |  |  |
| Radiated EmisImage: Second structureImage: Second structure <th><u>ssion Te</u><br/>has bee<br/>available<br/>channe</th> <th>est (Below 1GH<br/>en conducted to<br/>e modulations, da<br/>l(s) was (were) s</th> <th><b>z):</b><br/>determine tl<br/>ata rates an<br/>selected for</th> <th>he worst-cas<br/>d antenna po<br/>the final test</th> <th>se r<br/>orts<br/>t as</th> <th>node from all p<br/>s (if EUT with ar<br/>s listed below.</th> <th>ossible<br/>ntenna (</th> <th>combinations<br/>diversity architecture).</th> | <u>ssion Te</u><br>has bee<br>available<br>channe  | est (Below 1GH<br>en conducted to<br>e modulations, da<br>l(s) was (were) s | <b>z):</b><br>determine tl<br>ata rates an<br>selected for | he worst-cas<br>d antenna po<br>the final test | se r<br>orts<br>t as | node from all p<br>s (if EUT with ar<br>s listed below. | ossible<br>ntenna (   | combinations<br>diversity architecture). |  |  |
| EUT Configure   | Mode   | Available Chann   | nel Te:  | sted Channel                                   |                      | Modulation T  | ype                   | Data Rate                                |  |  |
| -   |  | 0 to 63   |  | 0, 31, 63                                      |                      | CSS   |                       | 980bps                                   |  |  |
| <ul> <li>Pre-Scan</li> <li>between a</li> <li>Following</li> </ul>  | has bee<br>available<br>channe   | en conducted to<br>e modulations, da<br>I(s) was (were) s                   | determine ti<br>ata rates an<br>selected for               | he worst-cas<br>d antenna po<br>the final test | se r<br>orts<br>t as | node from all p<br>s (if EUT with ar<br>s listed below. | ossible<br>ntenna (   | combinations<br>diversity architecture). |  |  |
| EUT Configure   | Mode   | Available Chanr   | nel Te:  | sted Channel                                   |                      | Modulation T  | уре                   | Data Rate                                |  |  |
| -   |  | 0 to 63   |  | 63   |                      | CSS   |                       | 980bps                                   |  |  |
| Conducted Or<br>☐ This item<br>mode.<br>☐ Pre-Scan<br>between a<br>☐ Following  | <ul> <li>Conducted Output Power Measurement:</li> <li>This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.</li> <li>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).</li> <li>Following channel(s) was (were) selected for the final test as listed below.</li> </ul> |   |  |  |                      |   |                       |  |  |  |
| EUT Configure   | Mode   | Available Chanr   | nel Te:  | sted Channel                                   |                      | Modulation T  | уре                   | Data Rate                                |  |  |
| -   |  | 0 to 63   |  | 0, 31, 63                                      |                      | CSS   |                       | 980bps                                   |  |  |
| Test Condition  | <u>n:</u>  |   |  |  |                      |   |                       |  |  |  |
| Applicable  | to   | Environmen  | tal Conditions   | s Inpu   | out Power (System)   |   |                       | Tested by                                |  |  |
| RE≥1G   |  | 23 deg. (   | C, 68% RH  |  | 120                  | )Vac, 60Hz  |                       | Greg Lin                                 |  |  |
| RE<1G   |  | 23 deg. (   | C, 70% RH  |  | 120                  | )Vac, 60Hz  | Randy Wu,<br>Greg Lin |  |  |  |
| PLC   |  | 25 deg. (   | C, 75% RH  |  | 120                  | Vac, 60Hz   |                       | Edsion Lee                               |  |  |
| Power   |  | 25 deg. (   | C, 60% RH  |  | 120                  | Vac, 60Hz   |                       | Tim Chen                                 |  |  |
|   |  |   |  |  |                      |   |                       |  |  |  |



# 3.3 Duty Cycle of Test Signal

Duty cycle of test signal is 100%, duty factor is not required.

|        | Duty Cycle Analysis |    |       |       |      |      |       |      |      |      |       |                        |
|--------|---------------------|----|-------|-------|------|------|-------|------|------|------|-------|------------------------|
|        | 130-                |    |       |       |      |      |       |      |      |      |       | RBW:<br>8.000MHz       |
|        | 120-                |    |       |       |      |      |       |      |      |      |       | VBW:<br>8.000MHz       |
|        | 100-                |    |       |       |      |      |       |      |      |      |       | Total Tx on:           |
| S      | 90-                 |    |       |       |      |      |       |      |      |      |       | 100ms                  |
| l (dBu | 80-                 |    |       |       |      |      |       |      |      |      |       | Measure Time:<br>100ms |
| - Pere | 70-                 |    |       |       |      |      |       |      |      |      |       | Duty Cycle:            |
|        | 60-                 |    |       |       |      |      |       |      |      |      |       | 100%                   |
|        | 50-                 |    |       |       |      |      |       |      |      |      |       |                        |
|        | 40-                 |    |       |       |      |      |       |      |      |      |       |                        |
|        | 30-                 | 10 | )m 21 | )m 30 | m 40 | m 50 | m 60  | m 70 | m 80 | m 90 | m 100 | m                      |
|        |                     |    |       |       |      | Time | e (s) |      |      |      |       |                        |



## 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               |
|----|--|-----------|----------------|------------|------------------|-----------------------|
| Α. | Notebook                                     | Lenovo    | 20J4 MD A003TW | PF-11H9AK  | FCC DoC Approved | Provided by Lab       |
| В. | LoRaWAN Smart Condition<br>Monitoring Sensor | ADVANTECH | WISE-2410      | NA         | NA               | Supplied by applicant |
| C. | Battery x 2                                  | Tekcell   | SB-AA11        | NA         | NA               | -                     |

Note:

1. All power cords of the above support units are non-shielded (1.8m).

2. Item A acted as a communication partner to transfer data.

| ID | Descriptions    | Qty. | Length (m) | Shielding<br>(Yes/No) | Cores (Qty.) | Remarks         |
|----|-----------------|------|------------|-----------------------|--------------|-----------------|
| 1. | Micro USB Cable | 1    | 2          | Y                     | 0            | Provided by Lab |

## 3.4.1 Configuration of System under Test



#### 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:

#### 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 20dB below the highest level of the desired power:

| Frequencies (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|-------------------|-----------------------------------|-------------------------------|
| 0.009 ~ 0.490     | 2400/F(kHz)                       | 300                           |
| 0.490 ~ 1.705     | 24000/F(kHz)                      | 30                            |
| 1.705 ~ 30.0      | 30                                | 30                            |
| 30 ~ 88           | 100                               | 3                             |
| 88 ~ 216          | 150                               | 3                             |
| 216 ~ 960         | 200                               | 3                             |
| Above 960         | 500                               | 3                             |

Note:

- 1. The lower limit shall apply at the transition frequencies.
- 2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
- 3. For frequencies above 1000MHz, 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 20dB under any condition of modulation.



## 4.1.2 Test Instruments

| Description & Manufacturer        | Model No.                           | Serial No.                | Cal. Date                      | Cal. Due                       |
|-----------------------------------|-------------------------------------|---------------------------|--------------------------------|--------------------------------|
| Test Receiver<br>KEYSIGHT         | N9038B                              | MY60180018                | Feb. 18, 2022                  | Feb. 17, 2023                  |
| Spectrum Analyzer<br>KEYSIGHT     | N9020B                              | MY60110513                | Dec. 24, 2021                  | Dec. 23, 2022                  |
| BILOG Antenna<br>SCHWARZBECK      | VULB9168                            | 9168-1214                 | Oct. 27, 2021<br>Oct. 20, 2022 | Oct. 26, 2022<br>Oct. 19, 2023 |
| HORN Antenna<br>RF SPIN           | DRH18-E                             | 210101A18E                | Nov. 14, 2021<br>Nov. 13, 2022 | Nov. 13, 2022<br>Nov. 12, 2023 |
| HORN Antenna<br>SCHWARZBECK       | BBHA 9170                           | 9170-1048                 | Nov. 14, 2021<br>Nov. 13, 2022 | Nov. 13, 2022<br>Nov. 12, 2023 |
| Loop Antenna<br>EMCI              | EM-6879                             | 269                       | Sep. 19, 2022                  | Sep. 18, 2023                  |
| Loop Antenna<br>TESEQ             | HLA 6121                            | 45745                     | Jul. 27, 2022                  | Jul. 26, 2023                  |
| Preamplifier<br>EMCI              | EMC330N                             | 980798                    | Jan. 17, 2022                  | Jan. 16, 2023                  |
| Preamplifier<br>EMCI              | EMC118A45SE                         | 980809                    | Dec. 30, 2021                  | Dec. 29, 2022                  |
| Preamplifier<br>EMCI              | EMC184045SE                         | 980786                    | Jan. 17, 2022                  | Jan. 16, 2023                  |
| RF signal cable<br>EMCI           | EMC104-SM-SM-(90<br>00+3000+1000)   | 201244+ 201232+<br>210103 | Jan. 17, 2022                  | Jan. 16, 2023                  |
| RF signal cable<br>EMCI           | EMCCFD400-NM-N<br>M-(9000+3000+500) | 201251+ 201249+<br>201248 | Jan. 17, 2022                  | Jan. 16, 2023                  |
| RF signal cable<br>EMCI           | EMC101G-KM-KM-(5<br>000+3000+2000)  | 201261+201258+<br>201255  | Jan. 17, 2022                  | Jan. 16, 2023                  |
| Software<br>BV ADT                | ADT_Radiated_V7.6.<br>15.9.5        | NA                        | NA                             | NA                             |
| Antenna Tower<br>Max-Full         | MFA-515BSN                          | NA                        | NA                             | NA                             |
| Turn Table<br>Max-Full            | MFT-201SS                           | NA                        | NA                             | NA                             |
| Turn Table Controller<br>Max-Full | MF-7802BS                           | MF780208676               | NA                             | NA                             |
| Wideband Power Sensor<br>KEYSIGHT | N1923A                              | MY58020002                | Jan. 17, 2022                  | Jan. 16, 2023                  |
| Peak Power Analyzer<br>KEYSIGHT   | 8990B                               | MY51000485                | Jan. 18, 2022                  | Jan. 17, 2023                  |

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 WM Chamber 9.



#### 4.1.3 Test Procedures

#### For Radiated emission below 30MHz

- 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 9kHz at frequency below 30MHz.

#### For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) 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 detect 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 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 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 detector (AV) at frequency above 1GHz.
- 3. 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 Setup







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

## 4.1.6 EUT Operating Conditions

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



## 4.1.7 Test Results

| CHANNEL         | TX Channel 0    | DETECTOR |                 |
|-----------------|-----------------|----------|-----------------|
| FREQUENCY RANGE | 902MHz ~ 928MHz | FUNCTION | Quasi-Peak (QP) |

|     | Antenna Polarity & Test Distance : Horizontal at 3 m |                               |                   |             |                       |                         |                     |                             |  |  |  |  |  |
|-----|--|-------------------------------|-------------------|-------------|-----------------------|-------------------------|---------------------|-----------------------------|--|--|--|--|--|
| No. | Frequency<br>(MHz)                                   | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin (dB) | Antenna<br>Height (m) | Table Angle<br>(Degree) | Raw Value<br>(dBuV) | Correction<br>Factor (dB/m) |  |  |  |  |  |
| 1   | 902.00   | 55.4 QP                       | 88.9              | -33.5       | 1.00 H                | 155                     | 25.6                | 29.8                        |  |  |  |  |  |
| 2   | *902.30  | 108.9 QP                      |                   |             | 1.00 H                | 155                     | 79.0                | 29.9                        |  |  |  |  |  |

- 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. The other emission levels were very low against the limit.
- 4. Margin value = Emission Level Limit value.
- 5. " \* ": Fundamental frequency.





| CHANNEL         | TX Channel 0    | DETECTOR | Quasi Back (QD) |
|-----------------|-----------------|----------|-----------------|
| FREQUENCY RANGE | 902MHz ~ 928MHz | FUNCTION | Quasi-Peak (QP) |

|     | Antenna Polarity & Test Distance : Vertical at 3 m |                               |                   |             |                       |                         |                     |                             |  |  |  |  |
|-----|--|-------------------------------|-------------------|-------------|-----------------------|-------------------------|---------------------|-----------------------------|--|--|--|--|
| No. | Frequency<br>(MHz)                                 | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin (dB) | Antenna<br>Height (m) | Table Angle<br>(Degree) | Raw Value<br>(dBuV) | Correction<br>Factor (dB/m) |  |  |  |  |
| 1   | 902.00   | 61.2 QP                       | 94.7              | -33.5       | 1.18 V                | 310                     | 31.4                | 29.8                        |  |  |  |  |
| 2   | *902.30  | 114.7 QP                      |                   |             | 1.18 V                | 310                     | 84.8                | 29.9                        |  |  |  |  |

- 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. The other emission levels were very low against the limit.
- 4. Margin value = Emission Level Limit value.
- 5. " \* ": Fundamental frequency.





| CHANNEL         | TX Channel 31   | DETECTOR | Ouesi Bask (OD) |
|-----------------|-----------------|----------|-----------------|
| FREQUENCY RANGE | 902MHz ~ 928MHz | FUNCTION | Quasi-Peak (QP) |

|     | Antenna Polarity & Test Distance : Horizontal at 3 m |                               |                   |             |                       |                         |                     |                             |  |  |  |  |
|-----|--|-------------------------------|-------------------|-------------|-----------------------|-------------------------|---------------------|-----------------------------|--|--|--|--|
| No. | Frequency<br>(MHz)                                   | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin (dB) | Antenna<br>Height (m) | Table Angle<br>(Degree) | Raw Value<br>(dBuV) | Correction<br>Factor (dB/m) |  |  |  |  |
| 1   | *908.50  | 109.6 QP                      |                   |             | 1.00 H                | 153                     | 79.5                | 30.1                        |  |  |  |  |

- 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. The other emission levels were very low against the limit.
- 4. Margin value = Emission Level Limit value.
- 5. " \* ": Fundamental frequency.





| CHANNEL         | TX Channel 31   | DETECTOR | Quesi Bask (QD) |
|-----------------|-----------------|----------|-----------------|
| FREQUENCY RANGE | 902MHz ~ 928MHz | FUNCTION | Quasi-Peak (QP) |

|     | Antenna Polarity & Test Distance : Vertical at 3 m |                               |                   |             |                       |                         |                     |                             |  |  |  |  |
|-----|--|-------------------------------|-------------------|-------------|-----------------------|-------------------------|---------------------|-----------------------------|--|--|--|--|
| No. | Frequency<br>(MHz)                                 | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin (dB) | Antenna<br>Height (m) | Table Angle<br>(Degree) | Raw Value<br>(dBuV) | Correction<br>Factor (dB/m) |  |  |  |  |
| 1   | *908.50  | 115.5 QP                      |                   |             | 1.27 V                | 311                     | 85.4                | 30.1                        |  |  |  |  |

- 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. The other emission levels were very low against the limit.
- 4. Margin value = Emission Level Limit value.
- 5. " \* ": Fundamental frequency.





| CHANNEL         | TX Channel 63   | DETECTOR |                 |
|-----------------|-----------------|----------|-----------------|
| FREQUENCY RANGE | 902MHz ~ 928MHz | FUNCTION | Quasi-Peak (QP) |

|     | Antenna Polarity & Test Distance : Horizontal at 3 m |                               |                   |             |                       |                         |                     |                             |  |
|-----|--|-------------------------------|-------------------|-------------|-----------------------|-------------------------|---------------------|-----------------------------|--|
| No. | Frequency<br>(MHz)                                   | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin (dB) | Antenna<br>Height (m) | Table Angle<br>(Degree) | Raw Value<br>(dBuV) | Correction<br>Factor (dB/m) |  |
| 1   | *914.90  | 108.6 QP                      |                   |             | 1.00 H                | 156                     | 78.4                | 30.2                        |  |
| 2   | 928.00   | 34.0 QP                       | 88.6              | 54.6        | 1.00 H                | 156                     | 3.6                 | 30.4                        |  |

- 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. The other emission levels were very low against the limit.
- 4. Margin value = Emission Level Limit value.
- 5. " \* ": Fundamental frequency.





| CHANNEL         | TX Channel 63   | DETECTOR |                 |
|-----------------|-----------------|----------|-----------------|
| FREQUENCY RANGE | 902MHz ~ 928MHz | FUNCTION | Quasi-Peak (QP) |

|     | Antenna Polarity & Test Distance : Vertical at 3 m |                               |                   |             |                       |                         |                     |                             |
|-----|--|-------------------------------|-------------------|-------------|-----------------------|-------------------------|---------------------|-----------------------------|
| No. | Frequency<br>(MHz)                                 | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin (dB) | Antenna<br>Height (m) | Table Angle<br>(Degree) | Raw Value<br>(dBuV) | Correction<br>Factor (dB/m) |
| 1   | *914.90  | 114.8 QP                      |                   |             | 1.22 V                | 311                     | 84.6                | 30.2                        |
| 2   | 928.00   | 34.8 QP                       | 94.8              | -60.0       | 1.22 V                | 311                     | 4.4                 | 30.4                        |

- 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. The other emission levels were very low against the limit.
- 4. Margin value = Emission Level Limit value.
- 5. " \* ": Fundamental frequency.





## Above 1GHz Data:

| CHANNEL         | TX Channel 0 | DETECTOR | Peak (PK)    |
|-----------------|--------------|----------|--------------|
| FREQUENCY RANGE | 1GHz ~ 10GHz | FUNCTION | Average (AV) |

|     |                    |                               | Antenna Pola      | rity & Test Dista | ance : Horizonta      | al at 3 m               |                     |                             |
|-----|--------------------|-------------------------------|-------------------|-------------------|-----------------------|-------------------------|---------------------|-----------------------------|
| No. | Frequency<br>(MHz) | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin (dB)       | Antenna<br>Height (m) | Table Angle<br>(Degree) | Raw Value<br>(dBuV) | Correction<br>Factor (dB/m) |
| 1   | 2706.90            | 52.3 PK                       | 74.0              | -21.7             | 2.74 H                | 281                     | 55.3                | -3.0                        |
| 2   | 2706.90            | 49.7 AV                       | 54.0              | -4.3              | 2.74 H                | 281                     | 52.7                | -3.0                        |
| 3   | 7218.40            | 57.2 PK                       | 74.0              | -16.8             | 2.17 H                | 198                     | 49.5                | 7.7                         |
| 4   | 7218.40            | 50.1 AV                       | 54.0              | -3.9              | 2.17 H                | 198                     | 42.4                | 7.7                         |
| 5   | 8120.70            | 54.4 PK                       | 74.0              | -19.6             | 1.98 H                | 216                     | 47.3                | 7.1                         |
| 6   | 8120.70            | 43.9 AV                       | 54.0              | -10.1             | 1.98 H                | 216                     | 36.8                | 7.1                         |
|     |                    |                               | Antenna Pol       | arity & Test Dis  | tance : Vertical      | at 3 m                  |                     |                             |
| No. | Frequency<br>(MHz) | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin (dB)       | Antenna<br>Height (m) | Table Angle<br>(Degree) | Raw Value<br>(dBuV) | Correction<br>Factor (dB/m) |
| 1   | 2706.90            | 52.3 PK                       | 74.0              | -21.7             | 1.48 V                | 243                     | 55.3                | -3.0                        |
| 2   | 2706.90            | 49.4 AV                       | 54.0              | -4.6              | 1.48 V                | 243                     | 52.4                | -3.0                        |
| 3   | 7218.40            | 56.7 PK                       | 74.0              | -17.3             | 2.94 V                | 353                     | 49.0                | 7.7                         |
| 4   | 7218.40            | 48.5 AV                       | 54.0              | -5.5              | 2.94 V                | 353                     | 40.8                | 7.7                         |
| 5   | 8120.70            | 54.0 PK                       | 74.0              | -20.0             | 2.02 V                | 72                      | 46.9                | 7.1                         |
| 6   | 8120.70            | 44.7 AV                       | 54.0              | -9.3              | 2.02 V                | 72                      | 37.6                | 7.1                         |

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. The other emission levels were very low against the limit.

4. Margin value = Emission Level – Limit value.

5. The EUT was tested by a test tool (provided by manufacturer), please refer to section 3.3 for duty cycle spectrum plot.



| CHANNEL         | TX Channel 31 | DETECTOR | Peak (PK)    |
|-----------------|---------------|----------|--------------|
| FREQUENCY RANGE | 1GHz ~ 10GHz  | FUNCTION | Average (AV) |

|     |                    |                               | Antenna Pola      | rity & Test Dista | ance : Horizonta      | al at 3 m               |                     |                             |
|-----|--------------------|-------------------------------|-------------------|-------------------|-----------------------|-------------------------|---------------------|-----------------------------|
| No. | Frequency<br>(MHz) | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin (dB)       | Antenna<br>Height (m) | Table Angle<br>(Degree) | Raw Value<br>(dBuV) | Correction<br>Factor (dB/m) |
| 1   | 2725.50            | 52.6 PK                       | 74.0              | -21.4             | 2.62 H                | 291                     | 55.5                | -2.9                        |
| 2   | 2725.50            | 50.3 AV                       | 54.0              | -3.7              | 2.62 H                | 291                     | 53.2                | -2.9                        |
| 3   | 7268.00            | 57.5 PK                       | 74.0              | -16.5             | 2.19 H                | 201                     | 49.6                | 7.9                         |
| 4   | 7268.00            | 50.3 AV                       | 54.0              | -3.7              | 2.19 H                | 201                     | 42.4                | 7.9                         |
| 5   | 8176.50            | 53.9 PK                       | 74.0              | -20.1             | 1.93 H                | 215                     | 46.6                | 7.3                         |
| 6   | 8176.50            | 44.2 AV                       | 54.0              | -9.8              | 1.93 H                | 215                     | 36.9                | 7.3                         |
|     |                    |                               | Antenna Pol       | arity & Test Dis  | tance : Vertical      | at 3 m                  |                     |                             |
| No. | Frequency<br>(MHz) | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin (dB)       | Antenna<br>Height (m) | Table Angle<br>(Degree) | Raw Value<br>(dBuV) | Correction<br>Factor (dB/m) |
| 1   | 2725.50            | 52.5 PK                       | 74.0              | -21.5             | 1.41 V                | 238                     | 55.4                | -2.9                        |
| 2   | 2725.50            | 49.7 AV                       | 54.0              | -4.3              | 1.41 V                | 238                     | 52.6                | -2.9                        |
| 3   | 7268.00            | 56.7 PK                       | 74.0              | -17.3             | 2.93 V                | 352                     | 48.8                | 7.9                         |
| 4   | 7268.00            | 48.7 AV                       | 54.0              | -5.3              | 2.93 V                | 352                     | 40.8                | 7.9                         |
| 5   | 8176.50            | 54.7 PK                       | 74.0              | -19.3             | 1.91 V                | 68                      | 47.4                | 7.3                         |
| 6   | 8176.50            | 45.6 AV                       | 54.0              | -8.4              | 1.91 V                | 68                      | 38.3                | 7.3                         |

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. The other emission levels were very low against the limit.

4. Margin value = Emission Level – Limit value.

5. The EUT was tested by a test tool (provided by manufacturer), please refer to section 3.3 for duty cycle spectrum plot.



| CHANNEL         | TX Channel 63 | DETECTOR | Peak (PK)    |
|-----------------|---------------|----------|--------------|
| FREQUENCY RANGE | 1GHz ~ 10GHz  | FUNCTION | Average (AV) |

|     |                    |                               | Antenna Pola      | rity & Test Dista | ance : Horizonta      | al at 3 m               |                     |                             |
|-----|--------------------|-------------------------------|-------------------|-------------------|-----------------------|-------------------------|---------------------|-----------------------------|
| No. | Frequency<br>(MHz) | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin (dB)       | Antenna<br>Height (m) | Table Angle<br>(Degree) | Raw Value<br>(dBuV) | Correction<br>Factor (dB/m) |
| 1   | 2744.70            | 52.9 PK                       | 74.0              | -21.1             | 2.69 H                | 284                     | 55.7                | -2.8                        |
| 2   | 2744.70            | 50.3 AV                       | 54.0              | -3.7              | 2.69 H                | 284                     | 53.1                | -2.8                        |
| 3   | 7319.20            | 57.7 PK                       | 74.0              | -16.3             | 2.22 H                | 203                     | 49.7                | 8.0                         |
| 4   | 7319.20            | 50.7 AV                       | 54.0              | -3.3              | 2.22 H                | 203                     | 42.7                | 8.0                         |
| 5   | 8234.10            | 54.3 PK                       | 74.0              | -19.7             | 1.95 H                | 210                     | 46.9                | 7.4                         |
| 6   | 8234.10            | 44.1 AV                       | 54.0              | -9.9              | 1.95 H                | 210                     | 36.7                | 7.4                         |
|     |                    |                               | Antenna Pol       | larity & Test Dis | tance : Vertical      | at 3 m                  |                     |                             |
| No. | Frequency<br>(MHz) | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin (dB)       | Antenna<br>Height (m) | Table Angle<br>(Degree) | Raw Value<br>(dBuV) | Correction<br>Factor (dB/m) |
| 1   | 2744.70            | 52.7 PK                       | 74.0              | -21.3             | 1.44 V                | 236                     | 55.5                | -2.8                        |
| 2   | 2744.70            | 49.9 AV                       | 54.0              | -4.1              | 1.44 V                | 236                     | 52.7                | -2.8                        |
| 3   | 7319.20            | 57.1 PK                       | 74.0              | -16.9             | 2.87 V                | 357                     | 49.1                | 8.0                         |
| 4   | 7319.20            | 48.6 AV                       | 54.0              | -5.4              | 2.87 V                | 357                     | 40.6                | 8.0                         |
| 5   | 8234.10            | 54.6 PK                       | 74.0              | -19.4             | 1.92 V                | 60                      | 47.2                | 7.4                         |
| 6   | 8234.10            | 45.4 AV                       | 54.0              | -8.6              | 1.92 V                | 60                      | 38.0                | 7.4                         |

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. The other emission levels were very low against the limit.

4. Margin value = Emission Level – Limit value.

5. The EUT was tested by a test tool (provided by manufacturer), please refer to section 3.3 for duty cycle spectrum plot.



## Below 1GHz Data:

| CHANNEL         | TX Channel 0 | DETECTOR | Ouesi Beak (OD) |
|-----------------|--------------|----------|-----------------|
| FREQUENCY RANGE | 9kHz ~ 1GHz  | FUNCTION | Quasi-Peak (QP) |

|     | Antenna Polarity & Test Distance : Horizontal at 3 m |                               |                   |             |                       |                         |                     |                             |  |
|-----|--|-------------------------------|-------------------|-------------|-----------------------|-------------------------|---------------------|-----------------------------|--|
| No. | Frequency<br>(MHz)                                   | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin (dB) | Antenna<br>Height (m) | Table Angle<br>(Degree) | Raw Value<br>(dBuV) | Correction<br>Factor (dB/m) |  |
| 1   | 30.00  | 28.2 QP                       | 40.0              | -11.8       | 1.25 H                | 44                      | 42.6                | -14.4                       |  |
| 2   | 107.60   | 31.2 QP                       | 43.5              | -12.3       | 1.00 H                | 156                     | 47.6                | -16.4                       |  |
| 3   | 287.10   | 35.2 QP                       | 46.0              | -10.8       | 1.50 H                | 62                      | 48.0                | -12.8                       |  |
| 4   | 383.10   | 36.6 QP                       | 46.0              | -9.4        | 1.25 H                | 26                      | 47.1                | -10.5                       |  |
| 5   | 479.10   | 28.8 QP                       | 46.0              | -17.2       | 1.50 H                | 293                     | 37.0                | -8.2                        |  |
| 6   | 935.00   | 31.9 QP                       | 46.0              | -14.1       | 1.00 H                | 27                      | 32.7                | -0.8                        |  |

- 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. The other emission levels were very low against the limit.
- 4. Margin value = Emission Level Limit value.
- 5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz :the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.





| CHANNEL         | TX Channel 0 | DETECTOR | Quasi Dack (QD) |
|-----------------|--------------|----------|-----------------|
| FREQUENCY RANGE | 9kHz ~ 1GHz  | FUNCTION | Quasi-Peak (QP) |

|     | Antenna Polarity & Test Distance : Vertical at 3 m |                               |                   |             |                       |                         |                     |                             |  |  |  |  |
|-----|--|-------------------------------|-------------------|-------------|-----------------------|-------------------------|---------------------|-----------------------------|--|--|--|--|
| No. | Frequency<br>(MHz)                                 | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin (dB) | Antenna<br>Height (m) | Table Angle<br>(Degree) | Raw Value<br>(dBuV) | Correction<br>Factor (dB/m) |  |  |  |  |
| 1   | 30.00  | 33.2 QP                       | 40.0              | -6.8        | 1.25 V                | 316                     | 47.6                | -14.4                       |  |  |  |  |
| 2   | 80.40  | 33.0 QP                       | 40.0              | -7.0        | 1.00 V                | 206                     | 51.1                | -18.1                       |  |  |  |  |
| 3   | 148.30   | 27.1 QP                       | 43.5              | -16.4       | 1.50 V                | 319                     | 40.3                | -13.2                       |  |  |  |  |
| 4   | 383.10   | 31.3 QP                       | 46.0              | -14.7       | 1.25 V                | 102                     | 41.8                | -10.5                       |  |  |  |  |
| 5   | 575.10   | 30.8 QP                       | 46.0              | -15.2       | 1.00 V                | 79                      | 37.1                | -6.3                        |  |  |  |  |
| 6   | 930.20   | 34.1 QP                       | 46.0              | -11.9       | 1.50 V                | 316                     | 35.0                | -0.9                        |  |  |  |  |

- 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. The other emission levels were very low against the limit.
- 4. Margin value = Emission Level Limit value.
- 5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz :the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.





| CHANNEL         | TX Channel 31 | DETECTOR | Quasi Dook (QD) |
|-----------------|---------------|----------|-----------------|
| FREQUENCY RANGE | 9kHz ~ 1GHz   | FUNCTION | Quasi-Peak (QP) |

|     | Antenna Polarity & Test Distance : Horizontal at 3 m |                               |                   |             |                       |                         |                     |                             |  |  |  |  |
|-----|--|-------------------------------|-------------------|-------------|-----------------------|-------------------------|---------------------|-----------------------------|--|--|--|--|
| No. | Frequency<br>(MHz)                                   | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin (dB) | Antenna<br>Height (m) | Table Angle<br>(Degree) | Raw Value<br>(dBuV) | Correction<br>Factor (dB/m) |  |  |  |  |
| 1   | 46.50  | 28.0 QP                       | 40.0              | -12.0       | 1.25 H                | 182                     | 41.1                | -13.1                       |  |  |  |  |
| 2   | 96.00  | 30.3 QP                       | 43.5              | -13.2       | 1.00 H                | 172                     | 48.9                | -18.6                       |  |  |  |  |
| 3   | 288.00   | 35.4 QP                       | 46.0              | -10.6       | 1.50 H                | 56                      | 48.2                | -12.8                       |  |  |  |  |
| 4   | 412.20   | 34.8 QP                       | 46.0              | -11.2       | 1.25 H                | 226                     | 44.7                | -9.9                        |  |  |  |  |
| 5   | 693.50   | 29.2 QP                       | 46.0              | -16.8       | 1.00 H                | 258                     | 33.3                | -4.1                        |  |  |  |  |
| 6   | 933.10   | 35.0 QP                       | 46.0              | -11.0       | 1.50 H                | 245                     | 35.8                | -0.8                        |  |  |  |  |

- 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. The other emission levels were very low against the limit.
- 4. Margin value = Emission Level Limit value.
- 5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz :the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.





| CHANNEL         | TX Channel 31 | DETECTOR | Quasi Daak (QD) |
|-----------------|---------------|----------|-----------------|
| FREQUENCY RANGE | 9kHz ~ 1GHz   | FUNCTION | Quasi-Peak (QP) |

|     | Antenna Polarity & Test Distance : Vertical at 3 m |                               |                   |             |                       |                         |                     |                             |  |  |  |  |
|-----|--|-------------------------------|-------------------|-------------|-----------------------|-------------------------|---------------------|-----------------------------|--|--|--|--|
| No. | Frequency<br>(MHz)                                 | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin (dB) | Antenna<br>Height (m) | Table Angle<br>(Degree) | Raw Value<br>(dBuV) | Correction<br>Factor (dB/m) |  |  |  |  |
| 1   | 30.00  | 32.4 QP                       | 40.0              | -7.6        | 1.25 V                | 342                     | 46.8                | -14.4                       |  |  |  |  |
| 2   | 80.40  | 35.3 QP                       | 40.0              | -4.7        | 1.00 V                | 339                     | 53.4                | -18.1                       |  |  |  |  |
| 3   | 263.80   | 20.9 QP                       | 46.0              | -25.1       | 1.50 V                | 100                     | 34.8                | -13.9                       |  |  |  |  |
| 4   | 383.10   | 30.8 QP                       | 46.0              | -15.2       | 1.00 V                | 95                      | 41.3                | -10.5                       |  |  |  |  |
| 5   | 575.10   | 30.6 QP                       | 46.0              | -15.4       | 1.00 V                | 68                      | 36.9                | -6.3                        |  |  |  |  |
| 6   | 930.20   | 32.2 QP                       | 46.0              | -13.8       | 1.25 V                | 178                     | 33.1                | -0.9                        |  |  |  |  |

- 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. The other emission levels were very low against the limit.
- 4. Margin value = Emission Level Limit value.
- 5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz :the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.





| CHANNEL         | TX Channel 63 | DETECTOR | Quasi Dook (QD) |
|-----------------|---------------|----------|-----------------|
| FREQUENCY RANGE | 9kHz ~ 1GHz   | FUNCTION | Quasi-Peak (QP) |

|     | Antenna Polarity & Test Distance : Horizontal at 3 m |                               |                   |             |                       |                         |                     |                             |  |  |  |  |
|-----|--|-------------------------------|-------------------|-------------|-----------------------|-------------------------|---------------------|-----------------------------|--|--|--|--|
| No. | Frequency<br>(MHz)                                   | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin (dB) | Antenna<br>Height (m) | Table Angle<br>(Degree) | Raw Value<br>(dBuV) | Correction<br>Factor (dB/m) |  |  |  |  |
| 1   | 30.00  | 28.7 QP                       | 40.0              | -11.3       | 1.25 H                | 127                     | 43.1                | -14.4                       |  |  |  |  |
| 2   | 120.20   | 38.0 QP                       | 43.5              | -5.5        | 1.00 H                | 197                     | 53.3                | -15.3                       |  |  |  |  |
| 3   | 263.80   | 31.7 QP                       | 46.0              | -14.3       | 1.00 H                | 213                     | 45.6                | -13.9                       |  |  |  |  |
| 4   | 398.60   | 36.1 QP                       | 46.0              | -9.9        | 1.50 H                | 224                     | 46.3                | -10.2                       |  |  |  |  |
| 5   | 673.10   | 28.4 QP                       | 46.0              | -17.6       | 1.00 H                | 255                     | 33.1                | -4.7                        |  |  |  |  |
| 6   | 800.20   | 39.7 QP                       | 46.0              | -6.3        | 1.50 H                | 60                      | 42.4                | -2.7                        |  |  |  |  |

- 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. The other emission levels were very low against the limit.
- 4. Margin value = Emission Level Limit value.
- 5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz :the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.





| CHANNEL         | TX Channel 63 | DETECTOR | Quasi Dook (QD) |
|-----------------|---------------|----------|-----------------|
| FREQUENCY RANGE | 9kHz ~ 1GHz   | FUNCTION | Quasi-Peak (QP) |

|     | Antenna Polarity & Test Distance : Vertical at 3 m |                               |                   |             |                       |                         |                     |                             |  |  |  |  |
|-----|--|-------------------------------|-------------------|-------------|-----------------------|-------------------------|---------------------|-----------------------------|--|--|--|--|
| No. | Frequency<br>(MHz)                                 | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin (dB) | Antenna<br>Height (m) | Table Angle<br>(Degree) | Raw Value<br>(dBuV) | Correction<br>Factor (dB/m) |  |  |  |  |
| 1   | 48.40  | 34.9 QP                       | 40.0              | -5.1        | 1.25 V                | 275                     | 47.9                | -13.0                       |  |  |  |  |
| 2   | 148.30   | 29.3 QP                       | 43.5              | -14.2       | 1.00 V                | 4                       | 42.5                | -13.2                       |  |  |  |  |
| 3   | 288.00   | 24.3 QP                       | 46.0              | -21.7       | 1.50 V                | 98                      | 37.1                | -12.8                       |  |  |  |  |
| 4   | 415.10   | 27.6 QP                       | 46.0              | -18.4       | 1.25 V                | 236                     | 37.5                | -9.9                        |  |  |  |  |
| 5   | 599.40   | 28.2 QP                       | 46.0              | -17.8       | 1.00 V                | 72                      | 33.6                | -5.4                        |  |  |  |  |
| 6   | 937.90   | 31.8 QP                       | 46.0              | -14.2       | 1.50 V                | 15                      | 32.5                | -0.7                        |  |  |  |  |

- 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. The other emission levels were very low against the limit.
- 4. Margin value = Emission Level Limit value.
- 5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz :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 0.50MHz.

### 4.2.2 Test Instruments

| Description & Manufacturer                  | Model No.                | Serial No.     | Cal. Date     | Cal. Due      |
|---|--------------------------|----------------|---------------|---------------|
| Test Receiver<br>ROHDE & SCHWARZ            | ESCI                     | 100613         | Dec. 03, 2021 | Dec. 02, 2022 |
| RF signal cable<br>Woken                    | 5D-FB                    | Cable-cond1-01 | Jan. 15, 2022 | Jan. 14, 2023 |
| LISN/AMN<br>ROHDE & SCHWARZ<br>(EUT)        | ENV216                   | 101826         | Mar. 14, 2022 | Mar. 13, 2023 |
| LISN/AMN<br>ROHDE & SCHWARZ<br>(Peripheral) | ESH3-Z5                  | 100311         | Sep. 12, 2022 | Sep. 11, 2023 |
| 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 1 (Conduction 1).

3. The VCCI Site Registration No. is C-12040.

4. Tested date: Oct. 07, 2022



### 4.2.3 Test Procedures

- a. 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/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit 20dB) was not recorded.
- Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

### 4.2.4 Deviation from Test Standard

No deviation.

#### 4.2.5 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).

#### 4.2.6 EUT Operating Conditions

Same as 4.1.6.



## 4.2.7 Test Results

#### Worst-case data:

| Phase |          |       | Line (L) |         |         | Detector Function |       | Quasi-Peak (QP) /<br>Average (AV) |        |        |
|-------|----------|-------|----------|---------|---------|-------------------|-------|-----------------------------------|--------|--------|
|       |          |       |          |         |         |                   |       |                                   |        |        |
| No    | Freq.    | Corr. | Readin   | g Value | Emissio | on Level          | Lir   | nit                               | Ma     | rgin   |
|       |          | Facto | r [dB    | (uV)]   | [dB     | (uV)]             | [dB ( | [uV)]                             | (d     | B)     |
|       | [MHz]    | (dB)  | Q.P.     | AV.     | Q.P.    | AV.               | Q.P.  | AV.                               | Q.P.   | AV.    |
| 1     | 0.17000  | 9.63  | 45.96    | 32.32   | 55.59   | 41.95             | 64.96 | 54.96                             | -9.37  | -13.01 |
| 2     | 0.22200  | 9.65  | 36.84    | 21.25   | 46.49   | 30.90             | 62.74 | 52.74                             | -16.25 | -21.84 |
| 3     | 0.35800  | 9.68  | 27.20    | 10.39   | 36.88   | 20.07             | 58.77 | 48.77                             | -21.89 | -28.70 |
| 4     | 2.36200  | 9.73  | 26.63    | 19.75   | 36.36   | 29.48             | 56.00 | 46.00                             | -19.64 | -16.52 |
| 5     | 5.59000  | 9.77  | 19.53    | 13.70   | 29.30   | 23.47             | 60.00 | 50.00                             | -30.70 | -26.53 |
| 6     | 14.57800 | 9.84  | 20.08    | 14.25   | 29.92   | 24.09             | 60.00 | 50.00                             | -30.08 | -25.91 |

- 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.





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.





## 4.3 Conducted Output Power Measurement

### 4.3.1 Limits of Conducted Output Power Measurement

For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels.

#### 4.3.2 Test Setup



### 4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

#### 4.3.4 Test Procedure

For Peak Power

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

#### For Average Power

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

#### 4.3.5 Deviation from Test Standard

No deviation.

## 4.3.6 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

#### 4.3.7 Test Results

#### For Peak Power

| Channel | Frequency (MHz) | Peak Power<br>(mW) | Peak Power<br>(dBm) | Power Limit<br>(dBm) | Pass / Fail |
|---------|-----------------|--------------------|---------------------|----------------------|-------------|
| 0       | 902.3           | 56.754             | 17.54               | 30.00                | Pass        |
| 31      | 908.5           | 57.148             | 17.57               | 30.00                | Pass        |
| 63      | 914.9           | 57.280             | 17.58               | 30.00                | Pass        |

#### For Average Power

| Channel | Frequency<br>(MHz) | Output Power (mW) | Output Power (dBm) |
|---------|--------------------|-------------------|--------------------|
| 0       | 902.3              | 56.105            | 17.49              |
| 31      | 908.5              | 56.234            | 17.50              |
| 63      | 914.9              | 56.105            | 17.49              |



## 5 Pictures of Test Arrangements

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



### Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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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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