

## Canada Test Report (Co-Located)

**Report No.:** IC181217C37-6 R2

**IC:** 10395A-H2A

**Model Name:** H2A

**Received Date:** Dec. 17, 2018

**Test Date:** Mar. 19, 2019 ~ Mar. 21, 2019

**Issued Date:** May 08, 2019

**Applicant:** Google LLC

**Address:** 1600 Amphitheatre Parkway, Mountain View, CA 94043, USA

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

**Lab Address:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C.)

**Test Location:** No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)

**ISED CAB Identifier:** TW2021



This report is 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. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, 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. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

## Table of Contents

|                                                                  |           |
|------------------------------------------------------------------|-----------|
| <b>Release Control Record .....</b>                              | <b>3</b>  |
| <b>1 Certificate of Conformity .....</b>                         | <b>4</b>  |
| <b>2 Summary of Test Results .....</b>                           | <b>5</b>  |
| 2.1 Measurement Uncertainty .....                                | 5         |
| 2.2 Modification Record .....                                    | 5         |
| <b>3 General Information.....</b>                                | <b>6</b>  |
| 3.1 General Description of EUT .....                             | 6         |
| 3.2 Description of Test Modes .....                              | 8         |
| 3.2.1 Test Mode Applicability and Tested Channel Detail .....    | 11        |
| 3.3 Description of Support Units .....                           | 12        |
| 3.3.1 Configuration of System under Test .....                   | 12        |
| 3.4 General Description of Applied Standards .....               | 12        |
| <b>4 Test Types and Results .....</b>                            | <b>13</b> |
| 4.1 Radiated Emission and Bandedge Measurement.....              | 13        |
| 4.1.1 Limits of Radiated Emission and Bandedge Measurement ..... | 13        |
| 4.1.2 Test Instruments .....                                     | 14        |
| 4.1.3 Test Procedures.....                                       | 15        |
| 4.1.4 Deviation from Test Standard .....                         | 16        |
| 4.1.5 Test Setup.....                                            | 16        |
| 4.1.6 EUT Operating Conditions.....                              | 17        |
| 4.1.7 Test Results .....                                         | 18        |
| 4.2 Conducted Out of Band Emission Measurement.....              | 25        |
| 4.2.1 Limits of Conducted Out of Band Emission Measurement.....  | 25        |
| 4.2.2 Test Setup.....                                            | 25        |
| 4.2.3 Test Instruments .....                                     | 25        |
| 4.2.4 Test Procedure .....                                       | 25        |
| 4.2.5 Deviation from Test Standard .....                         | 25        |
| 4.2.6 EUT Operating Condition .....                              | 25        |
| 4.2.7 Test Results .....                                         | 26        |
| <b>5 Pictures of Test Arrangements .....</b>                     | <b>27</b> |
| <b>Annex A- Band-edge measurement .....</b>                      | <b>28</b> |
| <b>Appendix – Information on the Testing Laboratories .....</b>  | <b>29</b> |

### Release Control Record

| Issue No.        | Description                                                                                                                 | Date Issued   |
|------------------|-----------------------------------------------------------------------------------------------------------------------------|---------------|
| IC181217C37-6    | Original Release                                                                                                            | Mar. 22, 2019 |
| IC181217C37-6 R1 | Update test instrument date of calibration                                                                                  | Apr. 19, 2019 |
| IC181217C37-6 R2 | Update the BT harmonic test method and report to leverage the duty cycle relaxation factor to improve the compliance margin | May 08, 2019  |

## 1 Certificate of Conformity

**Product:** Interactive Video Streaming Device

**Model Name:** H2A

**Sample Status:** Engineering Sample

**Applicant:** Google LLC

**Test Date:** Mar. 19, 2019 ~ Mar. 21, 2019

**Standards:** Canada RSS-247 Issue 2 (2017-02)

Canada RSS-Gen Issue 5 (2018-4)

ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

**Prepared by :**



**Date:**

May 08, 2019

Gina Liu / Specialist

**Approved by :**



**Date:**

May 08, 2019

Dylan Chiou / Project Engineer

## 2 Summary of Test Results

|                                                            |                                                                     |        |                                                                                 |
|------------------------------------------------------------|---------------------------------------------------------------------|--------|---------------------------------------------------------------------------------|
| Applied Standard:                                          | Canada RSS-247 Issue 2 (2017-02)<br>Canada RSS-Gen Issue 5 (2018-4) |        |                                                                                 |
| Canada Clause                                              | Test Item                                                           | Result | Remarks                                                                         |
| RSS-247<br>5.5<br>6.2.1.2<br>6.2.2.2<br>6.2.3.2<br>6.2.4.2 | Radiated Emissions                                                  | Pass   | Meet the requirement of limit.<br>Minimum passing margin is -7.3dB at 11570MHz. |

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

### 2.1 Measurement Uncertainty

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

| Measurement                        | Frequency          | Expanded Uncertainty (k=2) ( $\pm$ ) |
|------------------------------------|--------------------|--------------------------------------|
| Conducted Emissions at mains ports | 150 kHz ~ 30 MHz   | 2.44 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

|                     |                                    |                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product             | Interactive Video Streaming Device |                                                                                                                                                                                                                                                                                                                                                                                                              |
| Model Name          | H2A                                |                                                                                                                                                                                                                                                                                                                                                                                                              |
| Status of EUT       | Engineering Sample                 |                                                                                                                                                                                                                                                                                                                                                                                                              |
| Power Supply Rating | 24.0 Vdc (adapter)                 |                                                                                                                                                                                                                                                                                                                                                                                                              |
| Modulation Type     | WLAN                               | 256QAM, 64QAM, 16QAM, QPSK, BPSK                                                                                                                                                                                                                                                                                                                                                                             |
|                     | Bluetooth EDR                      | GFSK, $\pi/4$ -DQPSK, 8DPSK                                                                                                                                                                                                                                                                                                                                                                                  |
| Transfer Rate       | WLAN                               | 802.11a: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0 Mbps<br>802.11n: up to 150.0 Mbps<br>802.11ac: up to 433.3 Mbps                                                                                                                                                                                                                                                                                        |
|                     | Bluetooth EDR                      | 1/2/3 Mbps                                                                                                                                                                                                                                                                                                                                                                                                   |
| Operating Frequency | WLAN                               | 5180 ~ 5240 MHz, 5260 ~ 5320 MHz, 5500 ~ 5720 MHz, 5745 ~ 5825 MHz                                                                                                                                                                                                                                                                                                                                           |
|                     | Bluetooth EDR                      | 2402 ~ 2480 MHz                                                                                                                                                                                                                                                                                                                                                                                              |
| Number of Channel   | WLAN                               | 5180 ~ 5240 MHz: 4 for 802.11a, 802.11n (HT20)<br>2 for 802.11n (HT40)<br>1 for 802.11ac (VHT80)<br>5260 ~ 5320 MHz: 4 for 802.11a, 802.11n (HT20)<br>2 for 802.11n (HT40)<br>1 for 802.11ac (VHT80)<br>5500 ~ 5720 MHz: 9 for 802.11a, 802.11n (HT20)<br>4 for 802.11n (HT40)<br>2 for 802.11ac (VHT80)<br>5745 ~ 5825 MHz: 5 for 802.11a, 802.11n (HT20)<br>2 for 802.11n (HT40)<br>1 for 802.11ac (VHT80) |
|                     | Bluetooth EDR                      | 79                                                                                                                                                                                                                                                                                                                                                                                                           |
| Output Power        | WLAN                               | 47.098 mW for 5180 ~ 5240 MHz<br>76.208 mW for 5260 ~ 5320 MHz<br>75.162 mW for 5500 ~ 5720 MHz<br>78.343 mW for 5745 ~ 5825 MHz                                                                                                                                                                                                                                                                             |
|                     | Bluetooth EDR                      | 7.379 mW                                                                                                                                                                                                                                                                                                                                                                                                     |
| Antenna Type        | WLAN                               | PIFA antenna with 5 dBi gain                                                                                                                                                                                                                                                                                                                                                                                 |
|                     | Bluetooth EDR                      | PIFA antenna with 1.7 dBi gain                                                                                                                                                                                                                                                                                                                                                                               |
| Antenna Connector   | i-pex(MHF)                         |                                                                                                                                                                                                                                                                                                                                                                                                              |
| Product HW Version  | EVT                                |                                                                                                                                                                                                                                                                                                                                                                                                              |
| Product SW Version  | 173539                             |                                                                                                                                                                                                                                                                                                                                                                                                              |
| Radio HW Version    | EVT                                |                                                                                                                                                                                                                                                                                                                                                                                                              |
| Radio SW Version    | 173539                             |                                                                                                                                                                                                                                                                                                                                                                                                              |
| Accessory Device    | Refer to Note as below             |                                                                                                                                                                                                                                                                                                                                                                                                              |
| Cable Supplied      | Refer to Note as below             |                                                                                                                                                                                                                                                                                                                                                                                                              |

Note:

1. The EUT provides one completed transmitter and one receiver.

| Modulation Mode  | Tx Function |
|------------------|-------------|
| 802.11a          | 1TX         |
| 802.11n (HT20)   | 1TX         |
| 802.11n (HT40)   | 1TX         |
| 802.11ac (VHT20) | 1TX         |
| 802.11ac (VHT40) | 1TX         |
| 802.11ac (VHT80) | 1TX         |

\* The modulation and bandwidth are similar for 802.11n mode for HT20 / HT40 and 802.11ac mode for VHT20 / VHT40, therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

2. The EUT accessories list refers to EUT Photo.pdf.

### 3.2 Description of Test Modes

#### For 5180 ~ 5240 MHz

4 channels are provided for 802.11a, 802.11n (HT20):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 36      | 5180            | 44      | 5220            |
| 40      | 5200            | 48      | 5240            |

2 channels are provided for 802.11n (HT40):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 38      | 5190            | 46      | 5230            |

1 channel is provided for 802.11ac (VHT80):

| Channel | Frequency (MHz) |
|---------|-----------------|
| 42      | 5210            |

#### For 5260 ~ 5320 MHz

4 channels are provided for 802.11a, 802.11n (HT20):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 52      | 5260            | 60      | 5300            |
| 56      | 5280            | 64      | 5320            |

2 channels are provided for 802.11n (HT40):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 54      | 5270            | 62      | 5310            |

1 channel is provided for 802.11ac (VHT80):

| Channel | Frequency (MHz) |
|---------|-----------------|
| 58      | 5290            |

#### For 5500 ~ 5720 MHz

9 channels are provided for 802.11a, 802.11n (HT20):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 100     | 5500            | 132     | 5660            |
| 104     | 5520            | 136     | 5680            |
| 108     | 5540            | 140     | 5700            |
| 112     | 5560            | 144     | 5720            |
| 116     | 5580            |         |                 |

4 channels are provided for 802.11n (HT40):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 102     | 5510            | 134     | 5670            |
| 110     | 5550            | 142     | 5710            |

2 channels are provided for 802.11ac (VHT80):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 106     | 5530            | 138     | 5690            |

#### For 5745 ~ 5825 MHz:

5 channels are provided for 802.11a, 802.11n (HT20):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 149     | 5745            | 161     | 5805            |
| 153     | 5765            | 165     | 5825            |
| 157     | 5785            |         |                 |

2 channels are provided for 802.11n (HT40):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 151     | 5755            | 159     | 5795            |

1 channel is provided for 802.11ac (VHT80):

| Channel | Frequency (MHz) |
|---------|-----------------|
| 155     | 5775            |

# For Bluetooth EDR:

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 | OB |             |
| -                  | √             | √     | √  | -           |

Where **RE $\geq$ 1G:** Radiated Emission above 1 GHz **RE<1G:** Radiated Emission below 1 GHz

**OB:** Conducted Out-Band Emission Measurement

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

#### Radiated Emission Test (Above 1GHz):

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

| EUT Configure Mode | Mode             | Freq. Range (MHz) | Available Channel | Tested Channel | Modulation Technology |
|--------------------|------------------|-------------------|-------------------|----------------|-----------------------|
| -                  | BT EDR + 802.11a | 2402 ~ 2480       | 0 to 78           | 78 + 157       | FHSS                  |
|                    |                  | 5745 ~ 5825       | 149 to 165        |                | BPSK                  |

#### Radiated Emission Test (Below 1GHz):

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

| EUT Configure Mode | Mode             | Freq. Range (MHz) | Available Channel | Tested Channel | Modulation Technology |
|--------------------|------------------|-------------------|-------------------|----------------|-----------------------|
| -                  | BT EDR + 802.11a | 2402 ~ 2480       | 0 to 78           | 78 + 157       | FHSS                  |
|                    |                  | 5745 ~ 5825       | 149 to 165        |                | BPSK                  |

#### Conducted Out-Band Emission Measurement

- ☒ 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.

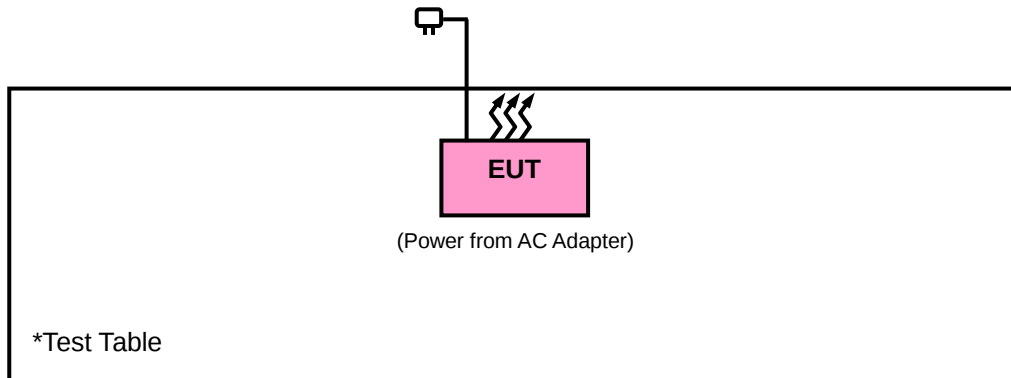
#### Test Condition:

| Applicable to                | Environmental Conditions | Input Power  | Tested by  |
|------------------------------|--------------------------|--------------|------------|
| <b>RE<math>\geq</math>1G</b> | 25 deg. C, 65 % RH       | 120Vac, 60Hz | Thomas Wei |
| <b>RE&lt;1G</b>              | 25 deg. C, 65 % RH       | 120Vac, 60Hz | Thomas Wei |
| <b>OB</b>                    | 25 deg. C, 65 % RH       | 120Vac, 60Hz | Thomas Wei |

### 3.3 Description of Support Units

The EUT has been tested as an independent unit.

#### 3.3.1 Configuration of System under Test



### 3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specification of the EUT declared by the manufacturer, it must comply with the requirements of the following standards:

**Canada RSS-247 Issue 2 (2017-02)**

**Canada RSS-Gen Issue 5 (2018-4)**

**KDB 789033 D02 General UNII Test Procedure New Rules v02r01**

**ANSI C63.10-2013**

All test items have been performed and recorded as per the above standards.

## 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 30dB 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.

Limits of unwanted emission out of the restricted bands

| Applicable To                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                 | Limit                                                                                                                               |                                                                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 789033 D02 General UNII Test Procedure<br>New Rules v02r01                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 | Field Strength at 3m                                                                                                                |                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                 | PK:74 (dBμV/m)                                                                                                                      | AV:54 (dBμV/m)                                                                                                                          |
| Applicable To                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                 | EIRP Limit                                                                                                                          | Equivalent Field Strength at 3m                                                                                                         |
| 5150~5250 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | RSS-247 6.2.1.2 | PK:-27 (dBm/MHz)                                                                                                                    | PK:68.2(dBμV/m)                                                                                                                         |
| 5250~5350 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | RSS-247 6.2.2.2 |                                                                                                                                     |                                                                                                                                         |
| 5470~5725 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | RSS-247 6.2.3.2 |                                                                                                                                     |                                                                                                                                         |
| 5725~5850 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | RSS-247 6.2.4.2 | PK:-27 (dBm/MHz) <sup>*d</sup><br>PK:10 (dBm/MHz) <sup>*c</sup><br>PK:15.6 (dBm/MHz) <sup>*b</sup><br>PK:27 (dBm/MHz) <sup>*a</sup> | PK: 68.2(dBμV/m) <sup>*d</sup><br>PK:105.2 (dBμV/m) <sup>*c</sup><br>PK: 110.8(dBμV/m) <sup>*b</sup><br>PK:122.2 (dBμV/m) <sup>*a</sup> |
| a. 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 Bm/MHz at 5 MHz above or below the band edges;<br>b. 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges;<br>c. 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges; and<br>d. -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges. |                 |                                                                                                                                     |                                                                                                                                         |

Note: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3} \text{ } \mu\text{V/m, where P is the eirp (Watts).}$$

#### 4.1.2 Test Instruments

| Description & Manufacturer                     | Model No.                  | Serial No.                    | Date of Calibration | Due Date of Calibration |
|------------------------------------------------|----------------------------|-------------------------------|---------------------|-------------------------|
| Test Receiver<br>Agilent                       | N9038A                     | MY51210203                    | Mar. 16, 2018       | Mar. 15, 2019           |
|                                                |                            |                               | Mar. 18, 2019       | Mar. 17, 2020           |
| Spectrum Analyzer<br>Agilent                   | N9010A                     | MY52220314                    | Dec. 13, 2018       | Dec. 12, 2019           |
| Spectrum Analyzer<br>ROHDE & SCHWARZ           | FSU43                      | 100115                        | Jan. 21, 2019       | Jan. 20, 2020           |
| BILOG Antenna<br>SCHWARZBECK                   | VULB 9168                  | 9168-472                      | Nov. 23, 2018       | Nov. 22, 2019           |
| Horn Antenna<br>SCHWARZBECK                    | BBHA 9120D                 | 9120D-969                     | Nov. 25, 2018       | Nov. 24, 2019           |
| HORN Antenna<br>SCHWARZBECK                    | BBHA 9170                  | 9170-480                      | Nov. 25, 2018       | Nov. 24, 2019           |
| Loop Antenna                                   | HLA 6121                   | 45745                         | Jun. 14, 2018       | May 18, 2019            |
| Preamplifier<br>EMCI                           | EMC 012645                 | 980115                        | Oct. 12, 2018       | Oct. 11, 2019           |
| Preamplifier<br>EMCI                           | EMC 184045                 | 980116                        | Oct. 12, 2018       | Oct. 11, 2019           |
| Preamplifier<br>EMCI                           | EMC 330H                   | 980112                        | Oct. 12, 2018       | Oct. 11, 2019           |
| Preamplifier<br>EMCI                           | EMC001340                  | 980201                        | Oct. 12, 2018       | Oct. 11, 2019           |
| RF Coaxial Cable<br>HUBER+SUHNNER              | EMC104-SM-SM-8<br>000&3000 | 140811+170717                 | Oct. 12, 2018       | Oct. 11, 2019           |
| Power Meter<br>Anritsu                         | ML2495A                    | 1012010                       | Sep. 05, 2018       | Sep. 04, 2019           |
| Power Sensor<br>Anritsu                        | MA2411B                    | 1315050                       | Sep. 04, 2018       | Sep. 03, 2019           |
| RF Coaxial Cable<br>HUBER+SUHNNER              | SUCOFLEX 104               | EMC104-SM-SM-<br>1000(140807) | Oct. 12, 2018       | Oct. 11, 2019           |
| RF Coaxial Cable<br>WOKEN                      | 8D-FB                      | Cable-Ch10-01                 | Oct. 12, 2018       | Oct. 11, 2019           |
| 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<br>Table Controller<br>MF | MF-7802                    | NA                            | NA                  | NA                      |

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 10.
3. The horn antenna and preamplifier (model: EMC 184045) are used only for the measurement of emission frequency above 1 GHz if tested.
4. The IC Site Registration No. is 7450F-10.

#### 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:

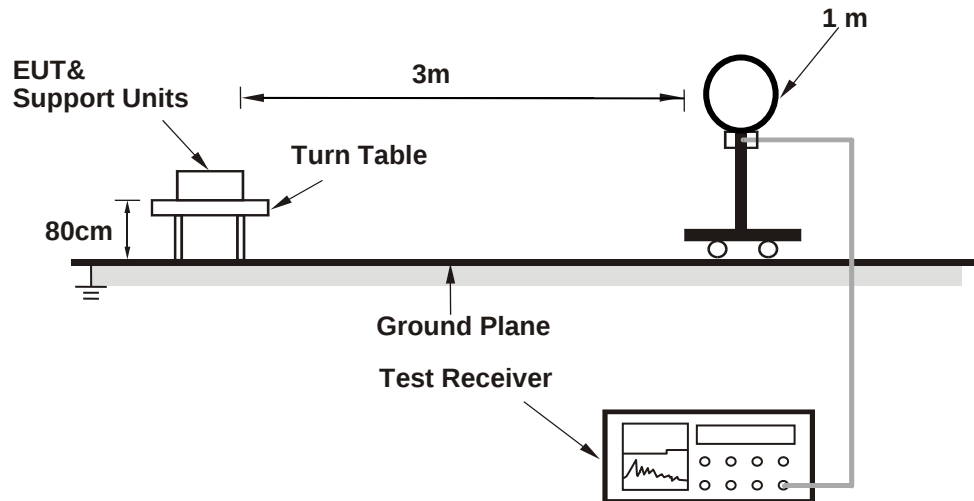
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. For WLAN 5G test, the resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98%) or 10Hz (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1GHz.
4. For BT test, the minimum hopping channels are 15 for GFSK, QPSK and 8PSK. The max duration time (on time) for each channel is 2.98 ms.  $2.98 \times 15 = 44.7$  ms. Therefore, the max pulse number for each channel shall be 3 within 100ms. The duty cycle relaxation factor =  $20 \times \log(2.98 \times 3 / 100) = -20.97$  dB.
5. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.4 Deviation from Test Standard

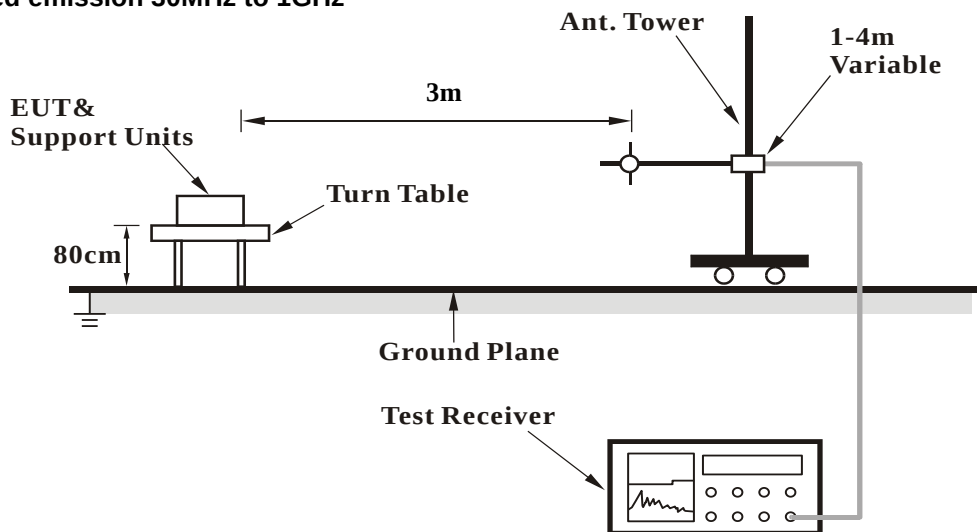
No deviation.

#### 4.1.5 Test Setup

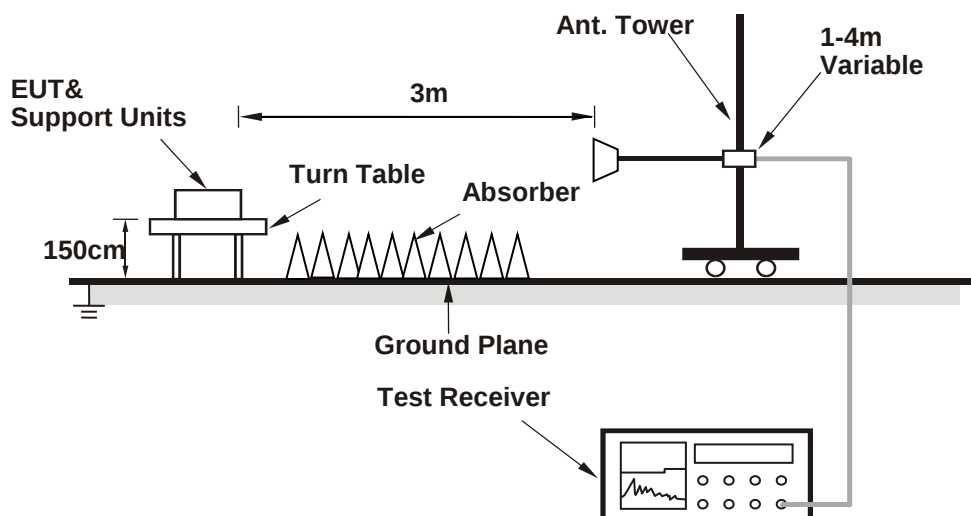
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



### For Radiated emission above 1GHz



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

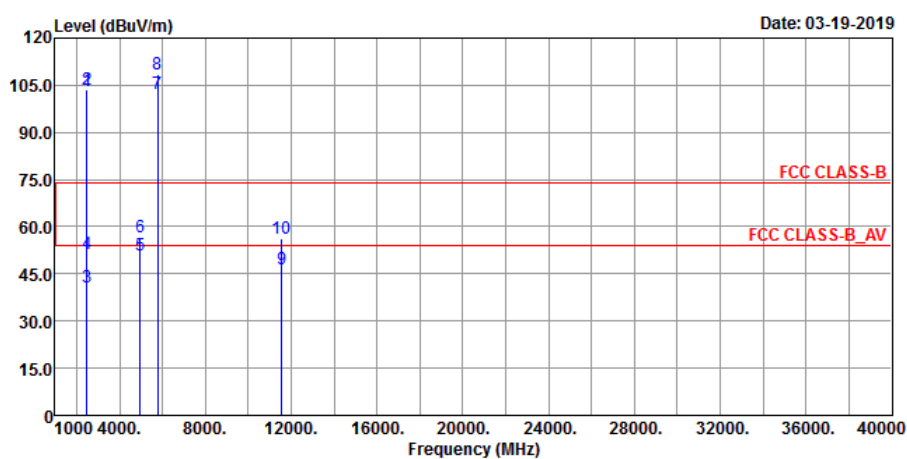
Above 1 GHz Data :

BT EDR + 802.11a

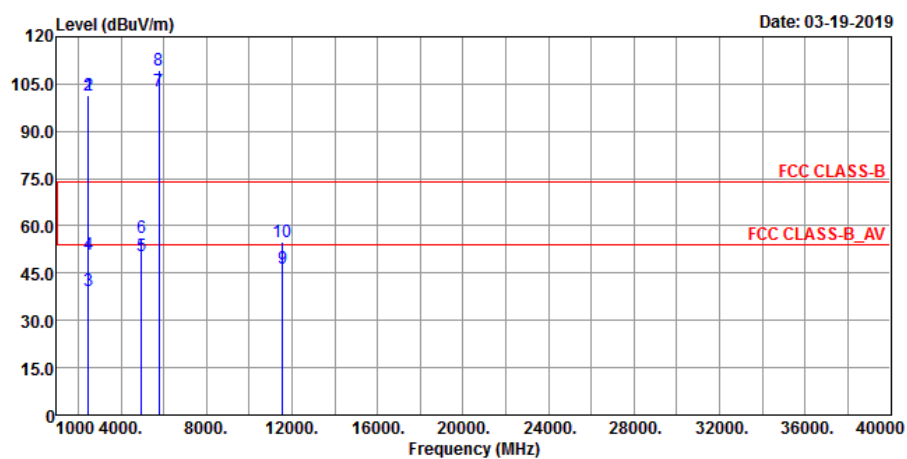
| EUT Test Condition       |                    | Measurement Detail |                           |
|--------------------------|--------------------|--------------------|---------------------------|
| Channel                  | CH 78 + CH 157     | Frequency Range    | 1 GHz ~ 40 GHz            |
| Input Power              | 120 Vac, 60 Hz     | Detector Function  | Peak (PK)<br>Average (AV) |
| Environmental Conditions | 25 deg. C, 65 % RH | Tested By          | Thomas Wei                |

#### <Spurious Emission>

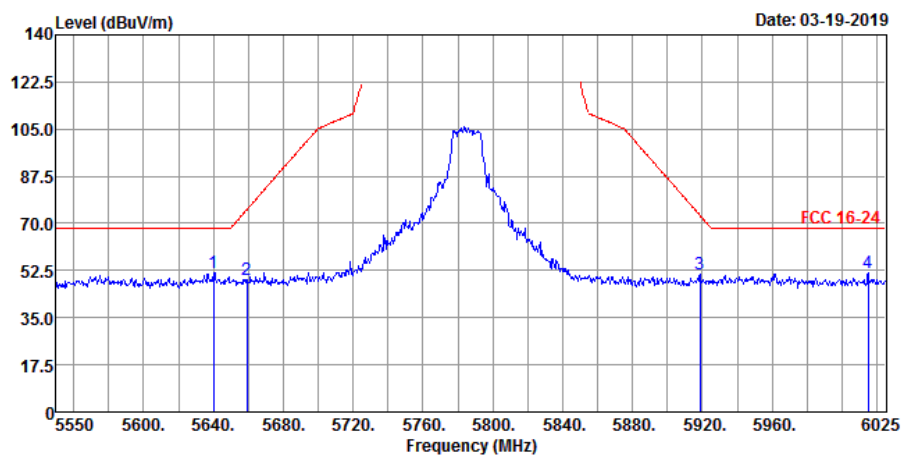
##### Horizontal



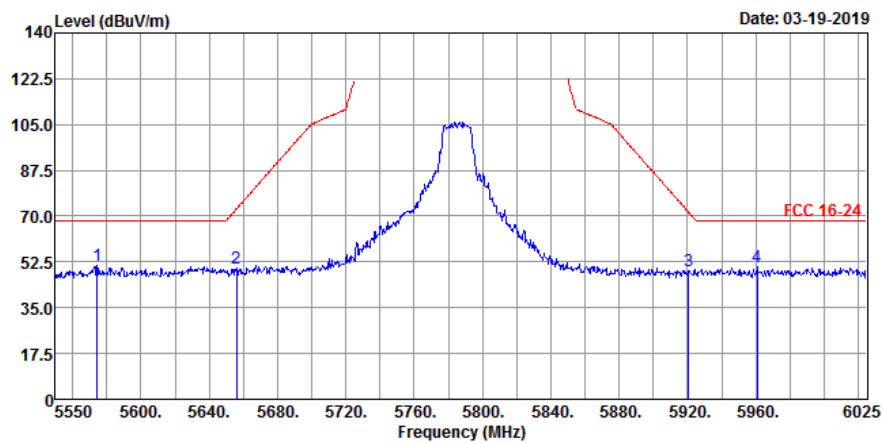
##### Vertical



# <Out of Band Emission (OOBE)> Horizontal



## Vertical



# <Spurious Emission>

## Antenna Polarity & Test Distance: Horizontal at 3 m

| Frequency (MHz) | Emission Level (dBuV/m) | Read Level (dBuV) | Limit (dBuV/m) | Margin (dB) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark  |
|-----------------|-------------------------|-------------------|----------------|-------------|-----------------------|-----------------|--------------------|---------------------|----------------------|---------|
| 2480            | 82.62                   | 87.98             |                |             | 27.53                 | 4.43            | 37.32              | 179                 | 186                  | Average |
| 2480            | 103.59                  | 108.95            |                |             | 27.53                 | 4.43            | 37.32              | 179                 | 186                  | Peak    |
| 2483.6          | 30.61                   | 35.97             | 54             | -23.39      | 27.53                 | 4.43            | 37.32              | 179                 | 186                  | Average |
| 2483.6          | 51.58                   | 56.94             | 74             | -22.42      | 27.53                 | 4.43            | 37.32              | 179                 | 186                  | Peak    |
| 4960            | 35.81                   | 50.43             | 54             | -18.19      | 31.4                  | 6.9             | 52.92              | 130                 | 195                  | Average |
| 4960            | 56.78                   | 71.4              | 74             | -17.22      | 31.4                  | 6.9             | 52.92              | 130                 | 195                  | Peak    |
| 5785            | 102.09                  | 100.55            |                |             | 32.26                 | 6.82            | 37.54              | 226                 | 146                  | Average |
| 5785            | 108.65                  | 107.11            |                |             | 32.26                 | 6.82            | 37.54              | 226                 | 146                  | Peak    |
| 11570           | 46.54                   | 48.66             | 54             | -7.46       | 40.13                 | 10.76           | 53.01              | 162                 | 219                  | Average |
| 11570           | 56.26                   | 58.38             | 74             | -17.74      | 40.13                 | 10.76           | 53.01              | 162                 | 219                  | Peak    |

## Antenna Polarity & Test Distance: Vertical at 3 m

| Frequency (MHz) | Emission Level (dBuV/m) | Read Level (dBuV) | Limit (dBuV/m) | Margin (dB) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark  |
|-----------------|-------------------------|-------------------|----------------|-------------|-----------------------|-----------------|--------------------|---------------------|----------------------|---------|
| 2480            | 80.63                   | 85.99             |                |             | 27.53                 | 4.43            | 37.32              | 229                 | 290                  | Average |
| 2480            | 101.6                   | 106.96            |                |             | 27.53                 | 4.43            | 37.32              | 229                 | 290                  | Peak    |
| 2483.64         | 30.09                   | 35.45             | 54             | -23.91      | 27.53                 | 4.43            | 37.32              | 229                 | 290                  | Average |
| 2483.64         | 51.06                   | 56.42             | 74             | -22.94      | 27.53                 | 4.43            | 37.32              | 229                 | 290                  | Peak    |
| 4960            | 35.28                   | 49.9              | 54             | -18.72      | 31.4                  | 6.9             | 52.92              | 159                 | 61                   | Average |
| 4960            | 56.25                   | 70.87             | 74             | -17.75      | 31.4                  | 6.9             | 52.92              | 159                 | 61                   | Peak    |
| 5785            | 102.95                  | 101.41            |                |             | 32.26                 | 6.82            | 37.54              | 145                 | 48                   | Average |
| 5785            | 109.34                  | 107.8             |                |             | 32.26                 | 6.82            | 37.54              | 145                 | 48                   | Peak    |
| 11570           | 46.7                    | 48.82             | 54             | -7.3        | 40.13                 | 10.76           | 53.01              | 146                 | 115                  | Average |
| 11570           | 55.04                   | 57.16             | 74             | -18.96      | 40.13                 | 10.76           | 53.01              | 146                 | 115                  | Peak    |

# <Out of Band Emission (OOBE)>

| Antenna Polarity & Test Distance: Horizontal at 3 m |                         |                   |                |             |                       |                 |                    |                     |                      |        |
|-----------------------------------------------------|-------------------------|-------------------|----------------|-------------|-----------------------|-----------------|--------------------|---------------------|----------------------|--------|
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Limit (dBuV/m) | Margin (dB) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark |
| 5640.25                                             | 51.44                   | 49.98             | 68.2           | -16.76      | 32.04                 | 6.7             | 37.28              | 226                 | 146                  | Peak   |
| 5659.25                                             | 49.29                   | 47.86             | 75.07          | -25.78      | 32.06                 | 6.71            | 37.34              | 226                 | 146                  | Peak   |
| 5918.6                                              | 50.95                   | 49.1              | 72.92          | -21.97      | 32.49                 | 6.86            | 37.5               | 226                 | 146                  | Peak   |
| 6015.025                                            | 51.44                   | 49.37             | 68.2           | -16.76      | 32.67                 | 6.9             | 37.5               | 226                 | 146                  | Peak   |
| Antenna Polarity & Test Distance: Vertical at 3 m   |                         |                   |                |             |                       |                 |                    |                     |                      |        |
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Limit (dBuV/m) | Margin (dB) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark |
| 5574.225                                            | 51.11                   | 49.67             | 68.2           | -17.09      | 31.92                 | 6.64            | 37.12              | 145                 | 48                   | Peak   |
| 5655.925                                            | 49.97                   | 48.54             | 72.6           | -22.63      | 32.06                 | 6.71            | 37.34              | 145                 | 48                   | Peak   |
| 5920.5                                              | 49.33                   | 47.48             | 71.52          | -22.19      | 32.49                 | 6.86            | 37.5               | 145                 | 48                   | Peak   |
| 5960.875                                            | 50.59                   | 48.66             | 68.2           | -17.61      | 32.57                 | 6.87            | 37.51              | 145                 | 48                   | Peak   |

## Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2480 MHz & 5785 MHz: Fundamental Frequency
- \*: Out of Restricted Band
- The emission levels of other frequencies were very low against the limit
- For Bluetooth test, the average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:  
20 log (Duty cycle) = 20 log (2.98 ms \*3 / 100 ms) = -20.97 dB  
Please refer to the plotted duty

### 9 kHz ~ 30 MHz Data:

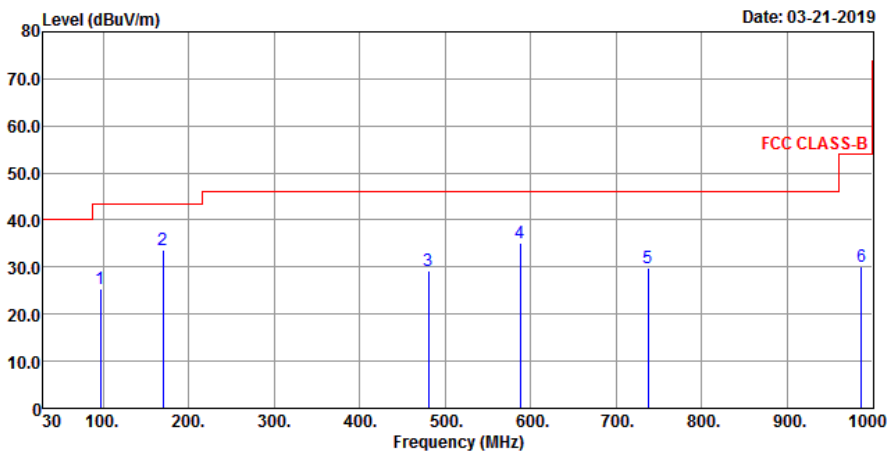
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

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

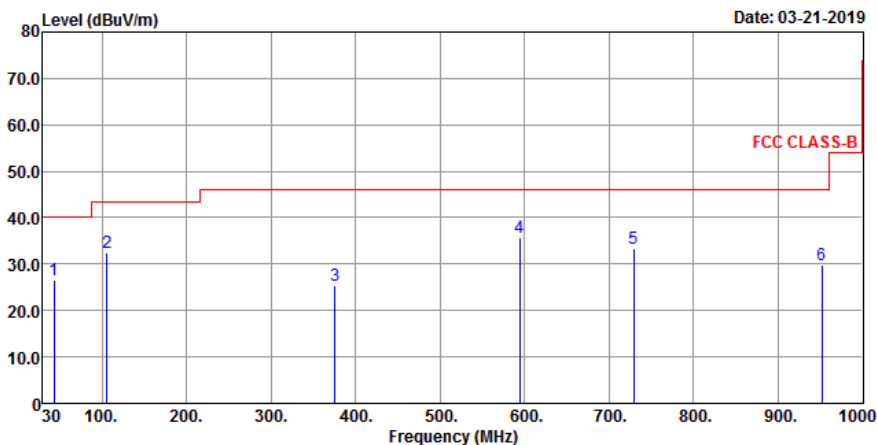
#### BT EDR + 802.11a

| EUT Test Condition       |                    | Measurement Detail |                              |
|--------------------------|--------------------|--------------------|------------------------------|
| Channel                  | CH 78 + CH 157     | Frequency Range    | 30 MHz ~ 1 GHz               |
| Input Power              | 120 Vac, 60 Hz     | Detector Function  | Peak (PK)<br>Quasi-peak (QP) |
| Environmental Conditions | 25 deg. C, 65 % RH | Tested By          | Jisyong Wang                 |

#### Horizontal



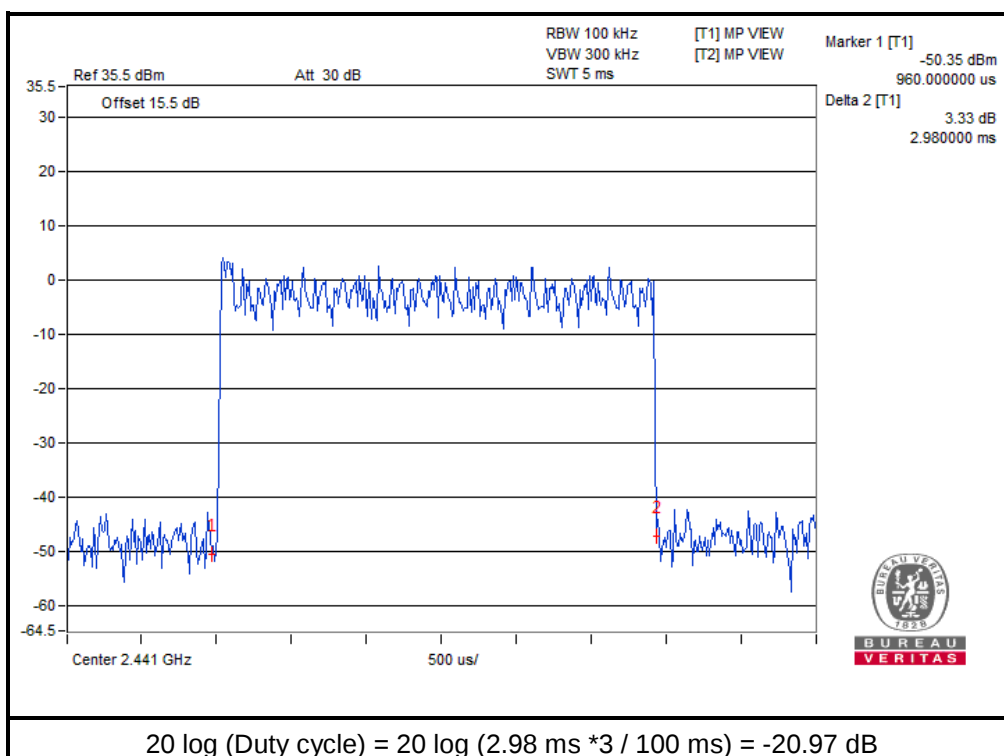
#### Vertical



| Antenna Polarity & Test Distance: Horizontal at 3 m |                         |                   |                |             |                       |                 |                    |                     |                      |        |
|-----------------------------------------------------|-------------------------|-------------------|----------------|-------------|-----------------------|-----------------|--------------------|---------------------|----------------------|--------|
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Limit (dBuV/m) | Margin (dB) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark |
| 96.93                                               | 25.32                   | 47.71             | 43.5           | -18.18      | 8.83                  | 0.74            | 31.96              | 156                 | 251                  | Peak   |
| 169.68                                              | 33.73                   | 52.63             | 43.5           | -9.77       | 11.76                 | 1.07            | 31.73              | 165                 | 231                  | Peak   |
| 480.08                                              | 29.31                   | 41.82             | 46             | -16.69      | 16.93                 | 2.41            | 31.85              | 147                 | 152                  | Peak   |
| 587.75                                              | 35.15                   | 45.13             | 46             | -10.85      | 19.32                 | 2.84            | 32.14              | 165                 | 295                  | Peak   |
| 737.13                                              | 29.9                    | 36.61             | 46             | -16.1       | 21.34                 | 3.46            | 31.51              | 111                 | 152                  | Peak   |
| 986.42                                              | 30                      | 33.37             | 54             | -24         | 23.99                 | 4.39            | 31.75              | 165                 | 231                  | Peak   |
| Antenna Polarity & Test Distance: Vertical at 3 m   |                         |                   |                |             |                       |                 |                    |                     |                      |        |
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Limit (dBuV/m) | Margin (dB) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark |
| 43.58                                               | 26.69                   | 43.71             | 40             | -13.31      | 13.59                 | 0.5             | 31.11              | 165                 | 253                  | Peak   |
| 105.66                                              | 32.5                    | 54                | 43.5           | -11         | 9.62                  | 0.77            | 31.89              | 111                 | 162                  | Peak   |
| 375.32                                              | 25.35                   | 40.55             | 46             | -20.65      | 14.75                 | 1.99            | 31.94              | 145                 | 251                  | Peak   |
| 594.54                                              | 35.68                   | 45.51             | 46             | -10.32      | 19.48                 | 2.88            | 32.19              | 165                 | 231                  | Peak   |
| 729.37                                              | 33.22                   | 40.16             | 46             | -12.78      | 21.23                 | 3.43            | 31.6               | 198                 | 265                  | Peak   |
| 951.5                                               | 29.87                   | 33.67             | 46             | -16.13      | 23.8                  | 4.24            | 31.84              | 165                 | 231                  | Peak   |

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- The emission levels of other frequencies were very low against the limit

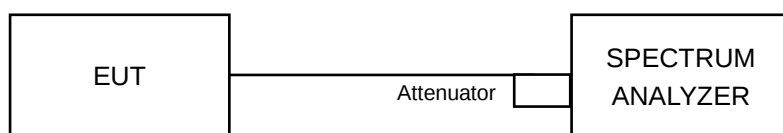


## 4.2 Conducted Out of Band Emission Measurement

### 4.2.1 Limits of Conducted Out of Band Emission Measurement

Below 20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

### 4.2.2 Test Setup



### 4.2.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.2.4 Test Procedure

#### MEASUREMENT PROCEDURE REF

- Set the RBW = 100 kHz.
- Set the VBW  $\geq$  300 kHz.
- Detector = average.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

#### MEASUREMENT PROCEDURE OOB

- Set RBW = 100 kHz.
- Set VBW  $\geq$  300 kHz.
- Detector = average.
- Sweep = auto couple.
- Trace Mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level.

### 4.2.5 Deviation from Test Standard

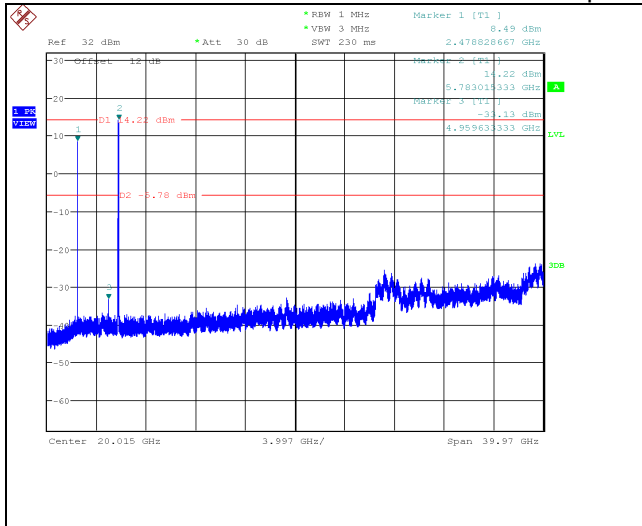
No deviation.

### 4.2.6 EUT Operating Condition

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

## 4.2.7 Test Results

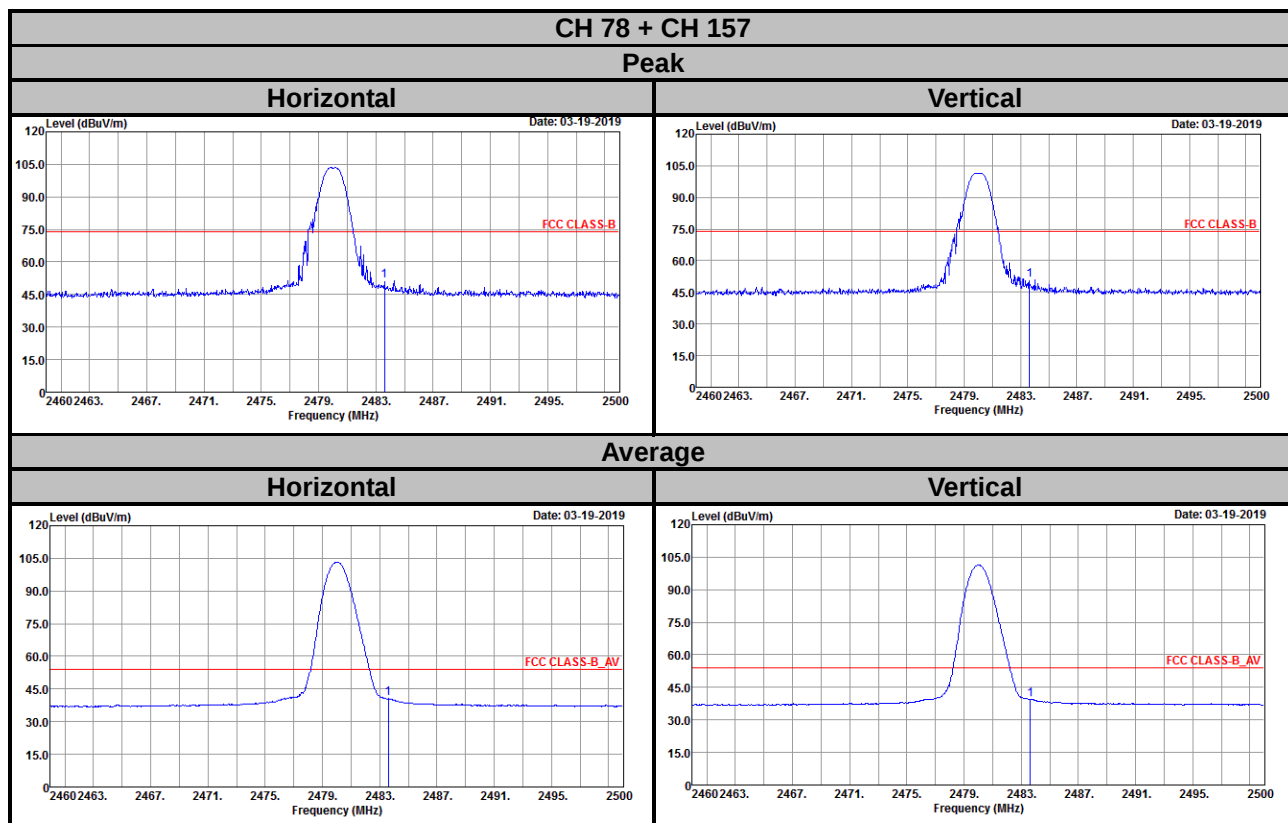
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.



## 5 Pictures of Test Arrangements

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

## Annex A- Band-edge measurement



## Appendix – Information on 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:

### Linko EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

### Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

### Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

**Email:** [service.adt@tw.bureauveritas.com](mailto:service.adt@tw.bureauveritas.com)

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

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

--- END ---