

# **FCC Test Report**

(Co-Located)

Report No.: RF200619C17-3

FCC ID: 2AWUU6040001

Test Model: AD31-HW

Received Date: Jun. 19, 2020

Test Date: Jul. 08 ~ Jul. 11, 2020

**Issued Date:** Aug. 17, 2020

Applicant: Verkada Inc.

Address: 405 E. 4th Ave., San Mateo, CA 94401, USA

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

Lin Kou Laboratories

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33383, TAIWAN

FCC Registration / 788550 / TW0003

**Designation Number:** 





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### **Release Control Record**

| Issue No.     | Description      | Date Issued   |
|---------------|------------------|---------------|
| RF200619C17-3 | Original Release | Aug. 17, 2020 |



### 1 Certificate of Conformity

Product: Verkada Reader

Brand: Verkada

Test Model: AD31-HW

Sample Status: Engineering Sample

Applicant: Verkada Inc.

**Test Date:** Jul. 08 ~ Jul. 11, 2020

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)

47 CFR FCC Part 15, Subpart C (Section 15.225)47 CFR FCC Part 15, Subpart C (Section 15.215)47 CFR FCC Part 15, Subpart C (Section 15.209)

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 : | Lena Wa            | ng    | , Date: | Aug. 17, 2020 |
|---------------|--------------------|-------|---------|---------------|
| _             | Lena Wang / Specia | alist |         | -             |

Dylan Chiou / Senior Project Engineer



### 2 Summary of Test Results

|  | 47 CFR FCC Part 15, Subpart C (Section 15.247) |      |   |  |  |
|--|--|------|---|--|--|
| Applied  | 47 CFR FCC Part 15, Subpart C (Section 15.225) |      |   |  |  |
| Standard:  | 47 CFR FCC Part 15, Subpart C (Section 15.215) |      |   |  |  |
|  | 47 CFR FCC Part 15, Subpart C (Section 15.209) |      |   |  |  |
| FCC<br>Clause  | l lest Item                                    |      | Remarks   |  |  |
| 15.205 / 15.209<br>/<br>15.247(d)<br>(1/2/3/4(i/ii)/6) | Radiated Emissions                             | Pass | Meet the requirement of limit. Minimum passing margin is -4.09dB at 7206 MHz. |  |  |

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) (±) |
|---------------------------------|-----------------|--------------------------------|
|                                 | 9 kHz ~ 30 MHz  | 3.04 dB                        |
| Radiated Emissions up to 1 GHz  | 30MHz ~ 200MHz  | 3.86 dB                        |
|                                 | 200MHz ~1000MHz | 3.87 dB                        |
| Radiated Emissions above 1 GHz  | 1GHz ~ 18GHz    | 2.29 dB                        |
| Radiated Effissions above 1 GHZ | 18GHz ~ 40GHz   | 2.29 dB                        |

### 2.2 Modification Record

There were no modifications required for compliance.



### 3 General Information

### 3.1 General Description of EUT

| Product             | Verkada Reader                    |                                |  |  |
|---------------------|-----------------------------------|--------------------------------|--|--|
| Brand               | Verkada                           |                                |  |  |
| Test Model          | AD31-HW                           |                                |  |  |
| Sample Status       | Engineering sam                   | nple                           |  |  |
| Power Supply rating | 12.0 Vdc (adapte                  | er)                            |  |  |
|                     | BT LE                             | GFSK                           |  |  |
| Modulation Type     | NFC                               | ASK                            |  |  |
|                     | RFID                              | FSK                            |  |  |
|                     | BT LE                             | 1 Mbps                         |  |  |
| Transfer Rate       | NFC                               | Type A: 106 kbit/s             |  |  |
| Transfer Rate       |                                   | Type F: 212 kbit/s, 424 kbit/s |  |  |
|                     | RFID                              | 2Kbit/s                        |  |  |
| On a ratio a        | BT LE                             | 2402 ~ 2480 MHz                |  |  |
| Operating           | NFC                               | 13.56 MHz                      |  |  |
| Frequency           | RFID                              | 129.42kHz                      |  |  |
| Output Power        | BT LE                             | 4.178 mW                       |  |  |
| Field Strength      | NFC                               | 51.23 dBuV/m (3m)              |  |  |
| (Maximum)           | RFID                              | 70.52 dBuV/m (3m)              |  |  |
| Antenna Type        | Refer to Note as below            |                                |  |  |
| Antenna Connector   | N/A                               |                                |  |  |
| Accessory Device    | N/A                               |                                |  |  |
| Cable Supplied      | olied 0.17m cable attached on EUT |                                |  |  |

### Note:

1. The following antennas were provided to the EUT.

|         | Ant. No. | Ant. No. Model name Ant. Type |                    | Gain (dBi)     |
|---------|----------|-------------------------------|--------------------|----------------|
| Antenna | 1        | NFC (125KHz)                  | Coil and capacitor | Not applicable |
| Spec.   | 2        | NFC (13.56MHz)                | PCB                | Not applicable |
|         | 3        | BLE (2.4G)                    | PCB                | 0              |

2. The test support units which provided by client is listed as below.

| Product | Brand | Model                   | Description                       |
|---------|-------|-------------------------|-----------------------------------|
|         |       |                         | I/P: 100-240 Vac, 50/60 Hz, 0.5 A |
| Adapter | DVE   | DSA-12PFT-12 FUS 120100 | O/P: 12 Vdc, 1 A                  |
|         |       |                         | 1.47m power cable without core    |

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



## 3.2 Description of Test Modes

### BT LE:

40 channels are provided provided to this EUT:

| Channel | Freq. (MHz) |
|---------|-------------|---------|-------------|---------|-------------|---------|-------------|
| 0       | 2402        | 10      | 2422        | 20      | 2442        | 30      | 2462        |
| 1       | 2404        | 11      | 2424        | 21      | 2444        | 31      | 2464        |
| 2       | 2406        | 12      | 2426        | 22      | 2446        | 32      | 2466        |
| 3       | 2408        | 13      | 2428        | 23      | 2448        | 33      | 2468        |
| 4       | 2410        | 14      | 2430        | 24      | 2450        | 34      | 2470        |
| 5       | 2412        | 15      | 2432        | 25      | 2452        | 35      | 2472        |
| 6       | 2414        | 16      | 2434        | 26      | 2454        | 36      | 2474        |
| 7       | 2416        | 17      | 2436        | 27      | 2456        | 37      | 2476        |
| 8       | 2418        | 18      | 2438        | 28      | 2458        | 38      | 2478        |
| 9       | 2420        | 19      | 2440        | 29      | 2460        | 39      | 2480        |

### NFC:

1 channel was provided to this EUT:

| Channel | Frequency (MHz) |
|---------|-----------------|
| 1       | 13.56           |

### RFID:

1 channel is provided to this EUT:

| charmer is provided to this 2011 |                 |  |
|----------------------------------|-----------------|--|
| Channel                          | Frequency (kHz) |  |
| 1                                | 129.42          |  |



#### 3.2.1 **Test Mode Applicability and Tested Channel Detail**

| EUT Configure | Applic | able to | D           |
|---------------|--------|---------|-------------|
| Mode          | RE≥1G  | RE<1G   | Description |
| -             | √      | √       | -           |

Where

RE≥1G: Radiated Emission above 1GHz & Bandedge

Measurement

RE<1G: Radiated Emission below 1GHz

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

NOTE: "-"means no effect.

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

 $\bowtie$ 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<br>Configure<br>Mode | Mode               | Freq. Range     | Available Channel | Tested Channel | Modulation<br>Technology |
|--------------------------|--------------------|-----------------|-------------------|----------------|--------------------------|
|                          | BT LE + NFC + RFID | 2402 ~ 2480 MHz | 0, 19, 39         |                | GFSK                     |
| -                        |                    | 13.56 MHz       | 1                 | 0 + 1 + 1      | ASK                      |
|                          |                    | 129.42kHz       | 1                 |                | FSK                      |

### 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<br>Configure<br>Mode | Mode               | Freq. Range<br>(MHz) | Available Channel | Tested Channel | Modulation<br>Technology |  |
|--------------------------|--------------------|----------------------|-------------------|----------------|--------------------------|--|
|                          |                    | 2402 ~ 2480 MHz      | 0, 19, 39         |                | GFSK                     |  |
| -                        | BT LE + NFC + RFID | 13.56 MHz            | 1                 | 0 + 1 + 1      | ASK                      |  |
|                          |                    | 129.42kHz            | 1                 |                | FSK                      |  |

### **Test Condition:**

| Applicable to | Environmental Conditions | Input Power (System) | Tested by |  |
|---------------|--------------------------|----------------------|-----------|--|
| RE≥1G         | 23 deg. C, 67% RH        | 120 Vac, 60 Hz       | Tim Chen  |  |
| RE<1G         | 23 deg. C, 67% RH        | 120 Vac, 60 Hz       | Tim Chen  |  |



### 3.3 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.

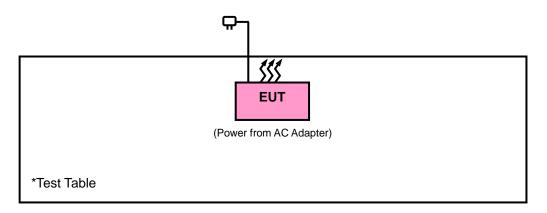
| ID | Product | Brand | Model No.               | Serial No. | FCC ID |
|----|---------|-------|-------------------------|------------|--------|
| A. | Adapter | DVE   | DSA-12PFT-12 FUS 120100 | N/A        | N/A    |

#### Note:

- 1. All power cords of the above support units are non-shielded (1.8m).
- 2. Item A acted as communication partner to transfer data.
- 3. Items B was provided by client.

| ID | Cable Descriptions | Qty. | Length (m) | Shielding<br>(Yes/No) | Cores (Qty.) | Remarks |
|----|--------------------|------|------------|-----------------------|--------------|---------|
| 1. | Power Cable        | 1    | 1.47       | N                     | 0            | -       |

### 3.3.1 Configuration of System under Test



### 3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

#### **Test Standard:**

**FCC Part 15, Subpart C (15.247)** 

FCC Part 15, Subpart C (15.225)

**FCC Part 15, Subpart C (15.215)** 

FCC Part 15, Subpart C (15.209)

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

KDB 414788 D01 Radiated Test Site v01r01

All test items have been performed as a reference to the above KDB test guidance.

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### 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   | dure Field Strength at 3m |   | ngth at 3m      |  |  |
|               | New Rules v02r01   |                           | PK: 74 (dBµV/m)   | AV: 54 (dBμV/m) |  |  |
|               | *1 beyond 75 MHz or more above of the band   | edge.                     | below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above.                        |                 |  |  |
|               | *3 below the band edge increasing linearly to a level<br>of 15.6 dBm/MHz at 5 MHz above. |                           | *4 from 5 MHz above or below the band edge<br>increasing linearly to a level of 27 dBm/MHz at |                 |  |  |

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

the band edge.

$$E = \frac{1000000\sqrt{30P}}{3}$$
 µV/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. 18, 2020       | Mar. 17, 2021           |
| Spectrum Analyzer<br>Agilent                  | N9010A                     | MY52220314                    | Dec. 12, 2019       | Dec. 11, 2020           |
| Spectrum Analyzer<br>ROHDE & SCHWARZ          | FSU43                      | 101261                        | Apr. 16, 2020       | Apr. 15, 2021           |
| HORN Antenna<br>SCHWARZBECK                   | BBHA 9120D                 | 9120D-969                     | Nov. 24, 2019       | Nov. 23, 2020           |
| BILOG Antenna<br>SCHWARZBECK                  | VULB 9168                  | 9168-472                      | Nov. 08, 2019       | Nov. 07, 2020           |
| Fixed Attenuator<br>WORKEN                    | MDCS18N-10                 | MDCS18N-10-01                 | Apr. 14, 2020       | Apr. 13, 2021           |
| Loop Antenna                                  | EM-6879                    | 269                           | Sep. 16, 2019       | Sep. 15, 2020           |
| Preamplifier<br>EMCI                          | EMC001340                  | 980201                        | Oct. 14, 2019       | Oct. 13, 2020           |
| Preamplifier<br>EMCI                          | EMC 012645                 | 980115                        | Oct. 08, 2019       | Oct. 07, 2020           |
| Power Meter<br>Anritsu                        | ML2495A                    | 1012010                       | Sep. 04, 2019       | Sep. 03, 2020           |
| Power Sensor<br>Anritsu                       | MA2411B                    | 1315050                       | Sep. 04, 2019       | Sep. 03, 2020           |
| RF Coaxial Cable<br>HUBER+SUHNNER             | EMC104-SM-SM-<br>8000&3000 | 140811+170717                 | Oct. 08, 2019       | Oct. 07, 2020           |
| RF Coaxial Cable<br>HUBER+SUHNNER             | SUCOFLEX 104               | EMC104-SM-SM-<br>1000(140807) | Oct. 08, 2019       | Oct. 07, 2020           |
| RF Coaxial Cable<br>Worken                    | 8D-FB                      | Cable-Ch10-01                 | Oct. 08, 2019       | Oct. 07, 2020           |
| Boresight Antenna Fixture                     | FBA-01                     | FBA-SIP01                     | NA                  | NA                      |
| Software<br>BV ADT                            | E3<br>6.120103             | NA                            | NA                  | NA                      |
| Antenna Tower<br>MF                           | MFA-440H                   | NA                            | NA                  | NA                      |
| Turn Table<br>MF                              | MFT-201SS                  | NA                            | NA                  | NA                      |
| Antenna Tower &Turn<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.



### 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.
- 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.
- 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. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
- 4. All modes of operation were investigated and the worst-case emissions are reported.

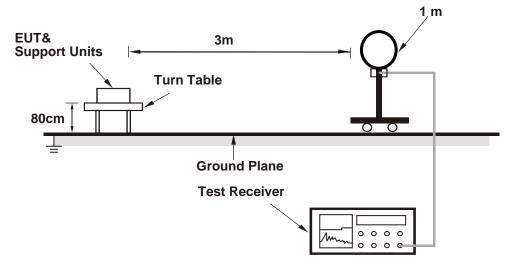
### 4.1.4 Deviation from Test Standard

No deviation.

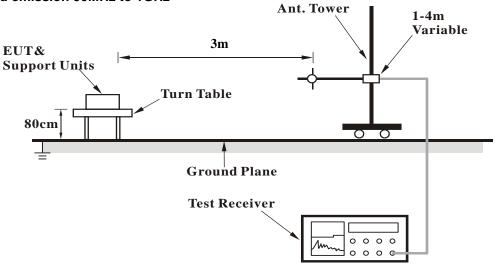


### 4.1.5 Test Setup

### For Radiated emission below 30MHz

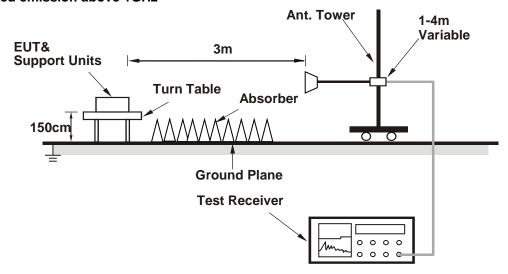


### For Radiated emission 30MHz to 1GHz





### 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. Placed the EUT on the testing table.
- b. Prepared a notebook to act as a communication partner and placed it outside of testing area.
- c. The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- d. The communication partner sent data to EUT by command "PING".



### 4.1.7 Test Results

Above 1GHz Data:

BT LE + NFC +RFID:

| EUT Test Condition       |                    | Measurement Detail |                           |  |
|--------------------------|--------------------|--------------------|---------------------------|--|
| Channel                  | Channel 0          | Frequency Range    | 1 GHz ~ 25 GHz            |  |
| Input Power              | 120 Vac, 60 Hz     | Detector Function  | Peak (PK)<br>Average (AV) |  |
| Environmental Conditions | 25 deg. C, 65 % RH | Tested By          | Tim Chen                  |  |

|  | Antenna Polarity & Test Distance: Horizontal at 3 m |   |   |                        |                                    |  |  |  |  |
|--|---|---|---|------------------------|------------------------------------|--|--|--|--|
| Frequency<br>(MHz)                               | Emission<br>Level<br>(dBuV/m)                       | Read Level<br>(dBuV)                              | Factor<br>(dB/m)                                  | Limit<br>(dBuV/m)      | Margin (dB)                        | Antenna<br>Height (cm)                 | Table Angle<br>(Degree)                | Remark                                 |  |
| 2390   | 36.05   | 41.97   | -5.92   | 54                     | -17.95                             | 100                                    | 187                                    | Average                                |  |
| 2390   | 45.89   | 51.81   | -5.92   | 74                     | -28.11                             | 100                                    | 187                                    | Peak                                   |  |
| 2402   | 98.7  | 104.64  | -5.94   |                        |                                    | 100                                    | 187                                    | Average                                |  |
| 2402   | 100.12  | 106.06  | -5.94   |                        |                                    | 100                                    | 187                                    | Peak                                   |  |
| 2426   | 99.7  | 105.59  | -5.89   |                        |                                    | 100                                    | 187                                    | Average                                |  |
| 2426   | 100.24  | 106.13  | -5.89   |                        |                                    | 100                                    | 187                                    | Peak                                   |  |
| 2480   | 97.34   | 103.04  | -5.7  |                        |                                    | 100                                    | 187                                    | Average                                |  |
| 2480   | 98.41   | 104.11  | -5.7  |                        |                                    | 100                                    | 187                                    | Peak                                   |  |
| 2483.5   | 35.79   | 41.49   | -5.7  | 54                     | -18.21                             | 100                                    | 187                                    | Average                                |  |
| 2483.5   | 50.32   | 56.02   | -5.7  | 74                     | -23.68                             | 100                                    | 187                                    | Peak                                   |  |
| 4804   | 38.81   | 54.45   | -15.64  | 54                     | -15.19                             | 154                                    | 284                                    | Average                                |  |
| 4804   | 43.01   | 58.65   | -15.64  | 74                     | -30.99                             | 154                                    | 284                                    | Peak                                   |  |
| 7206   | 49.91   | 58.47   | -8.56   | 54                     | -4.09                              | 154                                    | 284                                    | Average                                |  |
| 7206   | 57.63   | 66.19   | -8.56   | 74                     | -16.37                             | 154                                    | 284                                    | Peak                                   |  |
|  |   | Antenn  | a Polarity &                                      | Test Dista             | nce: Vertica                       | l at 3 m                               |  |  |  |
| Frequency<br>(MHz)                               | Emission<br>Level<br>(dBuV/m)                       | Read Level<br>(dBuV)                              | Factor<br>(dB/m)                                  | Limit<br>(dBuV/m)      | Margin (dB)                        | Antenna<br>Height (cm)                 | Table Angle<br>(Degree)                | Remark                                 |  |
| 2390   | 36.29   | 42.21   | -5.92   | 54                     | -17.71                             | 182                                    | 288                                    | Average                                |  |
| 2390   | 46.22   | 52.14   | -5.92   | 74                     | -27.78                             | 182                                    | 288                                    | Peak                                   |  |
| 2402   | 94.13   | 62.55   | 31.58   |                        |                                    | 182                                    | 288                                    | Average                                |  |
| 2402   | 95.04   | 63.46   | 31.58   |                        |                                    | 182                                    | 288                                    | Peak                                   |  |
| 2426   |   |   |   |                        |                                    |  |  | A                                      |  |
| 2420   | 93.09   | 61.52   | 31.57   |                        |                                    | 182                                    | 288                                    | Average                                |  |
| 2426   | 93.09<br>93.97                                      | 61.52<br>62.4                                     | 31.57<br>31.57                                    |                        |                                    | 182<br>182                             | 288<br>288                             | Peak                                   |  |
|  |   |   |   |                        |                                    |  |  |  |  |
| 2426   | 93.97   | 62.4  | 31.57   |                        |                                    | 182                                    | 288                                    | Peak                                   |  |
| 2426<br>2480                                     | 93.97<br>92.1                                       | 62.4<br>60.48                                     | 31.57<br>31.62                                    |                        |                                    | 182<br>182                             | 288<br>288                             | Peak<br>Average                        |  |
| 2426<br>2480<br>2480                             | 93.97<br>92.1<br>93.24                              | 62.4<br>60.48<br>61.62                            | 31.57<br>31.62<br>31.62                           |                        |                                    | 182<br>182<br>182                      | 288<br>288<br>288                      | Peak<br>Average<br>Peak                |  |
| 2426<br>2480<br>2480<br>2483.5                   | 93.97<br>92.1<br>93.24<br>35.48                     | 62.4<br>60.48<br>61.62<br>41.18                   | 31.57<br>31.62<br>31.62<br>-5.7                   | <br><br>54             | <br><br>-18.52                     | 182<br>182<br>182<br>182               | 288<br>288<br>288<br>288               | Peak<br>Average<br>Peak<br>Average     |  |
| 2426<br>2480<br>2480<br>2483.5<br>2483.5         | 93.97<br>92.1<br>93.24<br>35.48<br>45.55            | 62.4<br>60.48<br>61.62<br>41.18<br>51.25          | 31.57<br>31.62<br>31.62<br>-5.7<br>-5.7           | <br><br>54<br>74       | <br><br>-18.52<br>-28.45           | 182<br>182<br>182<br>182<br>182        | 288<br>288<br>288<br>288<br>288        | Peak Average Peak Average Peak         |  |
| 2426<br>2480<br>2480<br>2483.5<br>2483.5<br>4804 | 93.97<br>92.1<br>93.24<br>35.48<br>45.55<br>40.61   | 62.4<br>60.48<br>61.62<br>41.18<br>51.25<br>56.25 | 31.57<br>31.62<br>31.62<br>-5.7<br>-5.7<br>-15.64 | <br><br>54<br>74<br>54 | <br><br>-18.52<br>-28.45<br>-13.39 | 182<br>182<br>182<br>182<br>182<br>172 | 288<br>288<br>288<br>288<br>288<br>221 | Peak Average Peak Average Peak Average |  |

### Remarks:

- Emission Level = Read Level + Factor
   Margin value = Emission level Limit value
- 2. 2402 MHz: Fundamental frequency.
- 3. The emission levels of other frequencies were very low against the limit.



### BT LE + NFC +RFID:

| EUT Test Condition |                    | Measurement Detail |                |  |
|--------------------|--------------------|--------------------|----------------|--|
| Input Power        | 120 Vac, 60 Hz     | Frequency Range    | 0.009 ~ 30 MHz |  |
| Environmental      | 25 deg. C, 65 % RH | Detector Function  | Average        |  |
| Conditions         | 25 deg. C, 05 % KH | Detector i unction | Quasi-Peak     |  |
| Tested By          | Tim Chen           |                    |                |  |

|                    | Antenna Polarity & Test Distance: Parallel at 3 m |                      |               |                   |                  |                        |                         |         |
|--------------------|---|----------------------|---------------|-------------------|------------------|------------------------|-------------------------|---------|
| Frequency<br>(MHz) | Emission<br>Level<br>(dBuV/m)                     | Read Level<br>(dBuV) | Factor (dB/m) | Limit<br>(dBuV/m) | Margin (dB)      | Antenna<br>Height (cm) | Table Angle<br>(Degree) | Remark  |
| 0.12974            | 70.86   | 57.17                | 13.69         | 105.34            | -34.48           | 100                    | 0                       | Average |
| 0.25948            | 33.24   | 24.62                | 8.62          | 99.32             | -66.08           | 100                    | 0                       | Average |
| 0.38922            | 38.05   | 32.26                | 5.79          | 95.8              | -57.75           | 100                    | 0                       | Average |
| 13.56              | 51.17   | 55.08                | -3.91         | 69.54             | -18.37           | 100                    | 0                       | QP      |
| 22.322             | 33.68   | 38.34                | -4.66         | 69.54             | -35.86           | 100                    | 0                       | QP      |
| 27.12              | 26.88   | 30.52                | -3.64         | 69.54             | -42.66           | 100                    | 0                       | QP      |
|                    |   | Antenna P            | olarity & Te  | st Distance       | : Perpendic      | ular at 3 m            |                         |         |
| Frequency<br>(MHz) | Emission<br>Level<br>(dBuV/m)                     | Read Level<br>(dBuV) | Factor (dB/m) | Limit<br>(dBuV/m) | Margin (dB)      | Antenna<br>Height (cm) | Table Angle<br>(Degree) | Remark  |
| 0.12974            | 64.58   | 50.89                | 13.69         | 105.34            | -40.76           | 100                    | 0                       | Average |
| 0.25948            | 31.29   | 22.67                | 8.62          | 99.32             | -68.03           | 100                    | 0                       | Average |
| 0.38922            | 35.86   | 30.07                | 5.79          | 95.8              | -59.94           | 100                    | 0                       | Average |
| 13.56              | 47.93   | 51.84                | -3.91         | 69.54             | -21.61           | 100                    | 0                       | QP      |
| 21.752             | 36.27   | 41.11                | -4.84         | 69.54             | -33.27           | 100                    | 0                       | QP      |
| 27.12              | 26.28   | 29.92                | -3.64         | 69.54             | -43.26           | 100                    | 0                       | QP      |
|                    |   | Antenna Po           | larity & Tes  | t Distance:       | <b>Ground-pa</b> | rallel at 3 m          | l                       |         |
| Frequency<br>(MHz) | Emission<br>Level<br>(dBuV/m)                     | Read Level<br>(dBuV) | Factor (dB/m) | Limit<br>(dBuV/m) | Margin (dB)      | Antenna<br>Height (cm) | Table Angle<br>(Degree) | Remark  |
| 0.12974            | 55.04   | 41.35                | 13.69         | 105.34            | -50.3            | 100                    | 0                       | Average |
| 0.25948            | 30.25   | 21.63                | 8.62          | 99.32             | -69.07           | 100                    | 0                       | Average |
| 0.38922            | 34.97   | 29.18                | 5.79          | 95.8              | -60.83           | 100                    | 0                       | Average |
| 13.56              | 39.36   | 43.27                | -3.91         | 69.54             | -30.18           | 100                    | 0                       | QP      |
| 22.172             | 38.21   | 42.92                | -4.71         | 69.54             | -31.33           | 100                    | 0                       | QP      |
| 27.12              | 22.64   | 26.28                | -3.64         | 69.54             | -46.9            | 100                    | 0                       | QP      |

### Remarks:

- 1. Emission level (dBuV/m) = Raw Value (dBuV) + Factor (dB/m)
- 2. The other emission levels were very low against the limit.
- 3. Margin value = Emission level Limit value.
- 4. Above limits have been translated by the formula

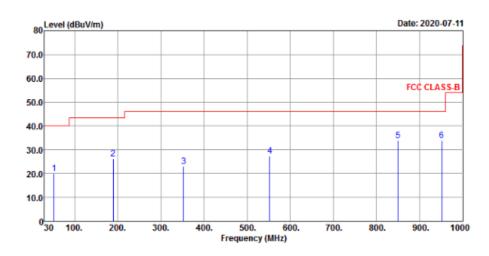


### Below 1GHz data

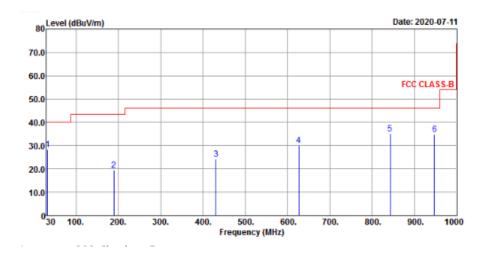
### BT LE + NFC +RFID:

| EUT Test Condition       |                    | Measurement Detail |                              |  |  |
|--------------------------|--------------------|--------------------|------------------------------|--|--|
| Channel                  | Channel 0          | 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          | Tim Chen                     |  |  |

### Horizontal



### Vertical





| Antenna Polarity & Test Distance: Horizontal at 3 m |                               |                      |                  |                   |              |                        |                         |        |  |  |
|---|-------------------------------|----------------------|------------------|-------------------|--------------|------------------------|-------------------------|--------|--|--|
| Frequency<br>(MHz)                                  | Emission<br>Level<br>(dBuV/m) | Read Level<br>(dBuV) | Factor<br>(dB/m) | Limit<br>(dBuV/m) | Margin (dB)  | Antenna<br>Height (cm) | Table Angle<br>(Degree) | Remark |  |  |
| 52.31   | 20.14                         | 31.96                | -11.82           | 40                | -19.86       | 173                    | 332                     | Peak   |  |  |
| 189.84  | 26.42                         | 40.99                | -14.57           | 43.5              | -17.08       | 113                    | 303                     | Peak   |  |  |
| 353.01  | 23.12                         | 32.79                | -9.67            | 46                | -22.88       | 156                    | 194                     | Peak   |  |  |
| 552.83  | 27.51                         | 31.89                | -4.38            | 46                | -18.49       | 112                    | 86                      | Peak   |  |  |
| 850.62  | 34.05                         | 31.6                 | 2.45             | 46                | -11.95       | 124                    | 73                      | Peak   |  |  |
| 951.5   | 34.03                         | 30.34                | 3.69             | 46                | -11.97       | 139                    | 113                     | Peak   |  |  |
|   |                               | Antenn               | a Polarity &     | Test Dista        | nce: Vertica | l at 3 m               |                         |        |  |  |
| Frequency<br>(MHz)                                  | Emission<br>Level<br>(dBuV/m) | Read Level<br>(dBuV) | Factor<br>(dB/m) | Limit<br>(dBuV/m) | Margin (dB)  | Antenna<br>Height (cm) | Table Angle<br>(Degree) | Remark |  |  |
| 32.91   | 28.21                         | 41.16                | -12.95           | 40                | -11.79       | 137                    | 273                     | Peak   |  |  |
| 189.84  | 19.35                         | 33.92                | -14.57           | 43.5              | -24.15       | 123                    | 319                     | Peak   |  |  |
| 430.61  | 24.18                         | 31.25                | -7.07            | 46                | -21.82       | 121                    | 198                     | Peak   |  |  |
| 626.55  | 30.13                         | 31.99                | -1.86            | 46                | -15.87       | 146                    | 91                      | Peak   |  |  |
| 842.86  | 35.04                         | 32.64                | 2.4              | 46                | -10.96       | 103                    | 165                     | Peak   |  |  |
| 947.62  | 34.88                         | 31.21                | 3.67             | 46                | -11.12       | 155                    | 99                      | Peak   |  |  |

### Remarks:

- Emission Level = Read Level + Factor
   Margin value = Emission level Limit value
- 2. The emission levels of other frequencies were very low against the limit.



| 5 Pictures of Test Arrangements                       |  |  |  |  |  |  |  |  |
|---|--|--|--|--|--|--|--|--|
| Please refer to the attached file (Test Setup Photo). |  |  |  |  |  |  |  |  |
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### 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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