

# ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

**Test Report No.** : OT-181-RWD-017

**AGR No.** : A17DA-067

**Applicant** : Technology Solutions (UK) Ltd  
**Address** : Suite A, Loughborough Technology Centre Epinal Way, Leicestershire.  
Loughborough LE11 3GE United Kingdom

**Manufacturer** : Technology Solutions (UK) Ltd  
**Address** : Suite A, Loughborough Technology Centre Epinal Way, Leicestershire.  
Loughborough LE11 3GE United Kingdom

**Type of Equipment** : 2128 Bluetooth Handheld RFID Reader

**FCC ID.** : S6J2128

**Model Name** : 2128-AS0

**Multiple Model Name** : 2128-AX0, IH21A0014, 1190-A-EPL-CASE, IH21-EPL-D75E, 2128-CRD-01-KIT,  
IH21-CB-1, 1192-A-EPL-CASE, IH21-EPL-CT50

**Serial number** : N/A

**Total page of Report** : 48 pages (including this page)

**Date of Incoming** : December 01, 2017

**Date of issue** : January 11, 2018

## SUMMARY

The equipment complies with the regulation; **FCC PART 15 SUBPART C Section 15.247**

This test report only contains the result of a single test of the sample supplied for the examination.

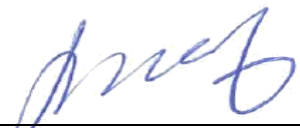
It is not a generally valid assessment of the features of the respective products of the mass-production.

Reviewed by:



Jae-Ho Lee / Chief Engineer  
ONETECH Corp.

Approved by:



Keun-Young, Choi / Vice President  
ONETECH Corp.

## CONTENTS

### PAGE

|                                                                         |           |
|-------------------------------------------------------------------------|-----------|
| <b>1. VERIFICATION OF COMPLIANCE .....</b>                              | <b>6</b>  |
| <b>2. TEST SUMMARY .....</b>                                            | <b>7</b>  |
| 2.1 TEST ITEMS AND RESULTS .....                                        | 7         |
| 2.2 ADDITIONS, DEVIATIONS, EXCLUSIONS FROM STANDARDS.....               | 7         |
| 2.3 RELATED SUBMITTAL(S) / GRANT(S) .....                               | 7         |
| 2.4 PURPOSE OF THE TEST .....                                           | 7         |
| 2.5 TEST METHODOLOGY.....                                               | 7         |
| 2.6 TEST FACILITY.....                                                  | 8         |
| <b>3. GENERAL INFORMATION.....</b>                                      | <b>9</b>  |
| 3.1 PRODUCT DESCRIPTION.....                                            | 9         |
| 3.2 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT..... | 10        |
| <b>4. EUT MODIFICATIONS.....</b>                                        | <b>10</b> |
| <b>5. SYSTEM TEST CONFIGURATION .....</b>                               | <b>11</b> |
| 5.1 JUSTIFICATION.....                                                  | 11        |
| 5.2 PERIPHERAL EQUIPMENT .....                                          | 11        |
| 5.3 MODE OF OPERATION DURING THE TEST .....                             | 11        |
| 5.4 CONFIGURATION OF TEST SYSTEM.....                                   | 12        |
| 5.5 ANTENNA REQUIREMENT .....                                           | 12        |
| <b>6. PRELIMINARY TEST .....</b>                                        | <b>13</b> |
| 6.1 AC POWER LINE CONDUCTED EMISSIONS TESTS.....                        | 13        |
| 6.2 GENERAL RADIATED EMISSIONS TESTS .....                              | 13        |
| <b>7. MINIMUM 20 DB BANDWIDTH.....</b>                                  | <b>14</b> |
| 7.1 OPERATING ENVIRONMENT .....                                         | 14        |
| 7.2 TEST SET-UP .....                                                   | 14        |
| 7.3 TEST EQUIPMENT USED .....                                           | 14        |
| 7.4 TEST DATA.....                                                      | 15        |
| <b>8. HOPPING FREQUENCY SEPARATION.....</b>                             | <b>17</b> |
| 8.1 OPERATING ENVIRONMENT .....                                         | 17        |
| 8.2 TEST SET-UP .....                                                   | 17        |
| 8.3 TEST EQUIPMENT USED .....                                           | 17        |
| 8.4 TEST DATA.....                                                      | 18        |

|                                                                           |           |
|---------------------------------------------------------------------------|-----------|
| <b>9. NUMBER OF HOPPING CHANNELS .....</b>                                | <b>19</b> |
| <b>9.1 OPERATING ENVIRONMENT .....</b>                                    | <b>19</b> |
| <b>9.2 TEST SET-UP .....</b>                                              | <b>19</b> |
| <b>9.3 TEST EQUIPMENT USED .....</b>                                      | <b>19</b> |
| <b>9.4 TEST DATA .....</b>                                                | <b>20</b> |
| <b>10. TIME OF OCCUPANCY .....</b>                                        | <b>23</b> |
| <b>10.1 OPERATING ENVIRONMENT .....</b>                                   | <b>23</b> |
| <b>10.2 TEST SET-UP .....</b>                                             | <b>23</b> |
| <b>10.3 TEST EQUIPMENT USED .....</b>                                     | <b>23</b> |
| <b>10.4 TEST DATA .....</b>                                               | <b>24</b> |
| <b>11. MAXIMUM PEAK OUTPUT POWER .....</b>                                | <b>26</b> |
| <b>11.1 OPERATING ENVIRONMENT .....</b>                                   | <b>26</b> |
| <b>11.2 TEST SET-UP .....</b>                                             | <b>26</b> |
| <b>11.3 TEST EQUIPMENT USED .....</b>                                     | <b>26</b> |
| <b>11.4 TEST DATA .....</b>                                               | <b>27</b> |
| <b>12. 100 KHZ BANDWIDTH OUTSIDE THE FREQUENCY BAND .....</b>             | <b>29</b> |
| <b>12.1 OPERATING ENVIRONMENT .....</b>                                   | <b>29</b> |
| <b>12.2 TEST SET-UP FOR CONDUCTED MEASUREMENT .....</b>                   | <b>29</b> |
| <b>12.3 TEST SET-UP FOR RADIATED MEASUREMENT .....</b>                    | <b>29</b> |
| <b>12.4 TEST EQUIPMENT USED .....</b>                                     | <b>29</b> |
| <b>12.5 TEST DATA FOR CONDUCTED EMISSION .....</b>                        | <b>30</b> |
| <b>12.6 TEST DATA FOR RADIATED EMISSION AT TRANSMITTING MODE .....</b>    | <b>36</b> |
| <b>12.6.1 Radiated Emission which fall in the Restricted Band .....</b>   | <b>36</b> |
| <b>12.6.2 Spurious &amp; Harmonic Radiated Emission above 1 GHz .....</b> | <b>37</b> |
| <b>13. RADIATED EMISSION TEST .....</b>                                   | <b>38</b> |
| <b>13.1 OPERATING ENVIRONMENT .....</b>                                   | <b>38</b> |
| <b>13.2 TEST SET-UP .....</b>                                             | <b>38</b> |
| <b>13.3 TEST EQUIPMENT USED .....</b>                                     | <b>38</b> |
| <b>13.4 TEST DATA .....</b>                                               | <b>39</b> |
| <b>13.4.1 Test data for Charging Mode .....</b>                           | <b>39</b> |
| <b>13.4.2 Test data for RFID Mode .....</b>                               | <b>41</b> |
| <b>13.4.3 Test data for RFID+BT Mode .....</b>                            | <b>43</b> |
| <b>14. CONDUCTED EMISSION TEST .....</b>                                  | <b>46</b> |
| <b>14.1 OPERATING ENVIRONMENT .....</b>                                   | <b>46</b> |
| <b>14.2 TEST SET-UP .....</b>                                             | <b>46</b> |

---

|                                              |           |
|----------------------------------------------|-----------|
| <b>14.3 TEST EQUIPMENT USED.....</b>         | <b>46</b> |
| <b>14.4 TEST DATA FOR CHARGING MODE.....</b> | <b>47</b> |

### Revision History

| Issued Report No. | Issued Date      | Revisions     | Effect Section |
|-------------------|------------------|---------------|----------------|
| OT-181-RWD-017    | January 11, 2018 | Initial Issue | All            |
|                   |                  |               |                |
|                   |                  |               |                |

### DOCUMENT HISTORY

| Revision No. | Issued Date       | Revisions                        | Effect Section                       |
|--------------|-------------------|----------------------------------|--------------------------------------|
| Original     | January 11, 2018  | Initial Issue                    | -                                    |
| Revision 01  | February 20, 2018 | Added Test data for RFID+BT Mode | 13.4.3 Test data for<br>RFID+BT Mode |
|              |                   |                                  |                                      |

## 1. VERIFICATION OF COMPLIANCE

APPLICANT : Technology Solutions (UK) Ltd  
ADDRESS : Suite A, Loughborough Technology Centre Epinal Way, Leicestershire. Loughborough LE11 3GE  
United Kingdom  
CONTACT PERSON : David Evans / Managing Director  
TELEPHONE NO : +441509238248  
FCC ID : S6J2128  
MODEL NAME : 2128-AS0  
SERIAL NUMBER : N/A  
DATE : January 11, 2018

|                                                         |                                                  |
|---------------------------------------------------------|--------------------------------------------------|
| EQUIPMENT CLASS                                         | <b>DSS – PART 15 SPREAD SPECTRUM TRANSMITTER</b> |
| KIND OF EQUIPMENT                                       | 2128 Bluetooth Handheld RFID Reader              |
| THIS REPORT CONCERNS                                    | Original Grant                                   |
| MEASUREMENT PROCEDURES                                  | ANSI C63.10: 2013                                |
| TYPE OF EQUIPMENT TESTED                                | Pre-Production                                   |
| KIND OF EQUIPMENT<br>AUTHORIZATION REQUESTED            | Certification                                    |
| EQUIPMENT WILL BE OPERATED<br>UNDER FCC RULES PART(S)   | FCC PART 15 SUBPART C Section 15.247             |
| MODIFICATIONS ON THE EQUIPMENT<br>TO ACHIEVE COMPLIANCE | None                                             |
| FINAL TEST WAS CONDUCTED ON                             | 3 m, Semi Anechoic Chamber                       |

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

## 2. TEST SUMMARY

### 2.1 Test items and results

| SECTION              | TEST ITEMS                                          | RESULTS                |
|----------------------|-----------------------------------------------------|------------------------|
| 15.247 (a) (1)       | Carrier Frequency Separation                        | Met the Limit / PASS   |
| 15.247 (a) (1) (iii) | Minimum Number of Hopping Channels                  | Met the Limit / PASS   |
| 15.247 (a) (1) (iii) | Average Time of Occupancy                           | Met the Limit / PASS   |
| 15.247 (b) (1)       | Maximum Peak Conducted Output Power                 | Met the Limit / PASS   |
| 15.247 (d)           | 100 kHz Bandwidth Outside the Frequency Band        | Met the Limit / PASS   |
| 15.247 (d)           | Radiated Emission which fall in the Restricted Band | Met the Limit / PASS   |
| 15.209               | Radiated Emission Limits, General Requirement       | Met the Limit / PASS   |
| 15.207               | Conducted Limits                                    | Met the Limit / PASS   |
| 15.203               | Antenna Requirement                                 | Met requirement / PASS |

### 2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

### 2.3 Related Submittal(s) / Grant(s)

Original submittal only

### 2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART C Section 15.247

### 2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

## 2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-4112/ C-14617/ G-10666 / T-1842

IC (Industry Canada) – Registration No. Site# 3736A-3

-. Site Accreditation:

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

### 3. GENERAL INFORMATION

#### 3.1 Product Description

The Technology Solutions (UK) Ltd, Model 2128-AS0 (referred to as the EUT in this report) is a 2128 Bluetooth Handheld RFID Reader. The product specification described herein was obtained from product data sheet or user's manual.

|                                                      |                                     |
|------------------------------------------------------|-------------------------------------|
| DEVICE TYPE                                          | 2128 Bluetooth Handheld RFID Reader |
| OPERATING FREQUENCY                                  | 902.75 MHz ~ 927.25 MHz             |
| RF OUTPUT POWER                                      | 27.84 dBm (0.608 W)                 |
| NUMBER OF CHANNEL                                    | 50 Channels                         |
| MODULATION TYPE                                      | ASK                                 |
| ANTENNA TYPE                                         | PCB Antenna                         |
| ANTENNA GAIN                                         | 3.0 dBi                             |
| LIST OF EACH OSC. OR CRYSTAL.<br>FREQ.(FREQ.>=1 MHz) | 8 MHz, 18.432 MHz, 24 MHz, 48 MHz   |
| RATED SUPPLY VOLTAGE                                 | DC 3.7 V                            |

### 3.2 Alternative type(s)/model(s); also covered by this test report.

-. The following lists consist of the added model and their differences.

| Model Name      | Differences                                                                                                                   | Tested                              |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| 2128-AS0        | Basic Model (RFID reader with barcode imager)                                                                                 | <input checked="" type="checkbox"/> |
| 2128-AX0        | This model is identical to the basic model except that the barcode module is removed. (RFID reader plastic highlights yellow) | <input type="checkbox"/>            |
| IH21A0014       | This model is identical to the basic model except that the barcode module is removed. (RFID reader plastic highlights red)    | <input type="checkbox"/>            |
| 1190-A-EPL-CASE | This model is identical to the basic model except that it comes with accessory (Honeywell D75e) to connect to the Reader.     | <input type="checkbox"/>            |
| IH21-EPL-D75E   | This model is identical to the basic model except that it comes with accessory (Honeywell D75e) to connect to the Reader.     | <input type="checkbox"/>            |
| 2128-CRD-01-KIT | This model is identical to the base model except that it comes with a Charge dock(plastic highlights yellow) for the Reader.  | <input type="checkbox"/>            |
| IH21-CB-1       | This model is identical to the base model except that it comes with a Charge dock(plastic highlights red) for the Reader.     | <input type="checkbox"/>            |
| 1192-A-EPL-CASE | This model is identical to the basic model except that it comes with accessory (Honeywell CT50) to connect to the Reader.     | <input type="checkbox"/>            |
| IH21-EPL-CT50   | This model is identical to the basic model except that it comes with accessory (Honeywell CT50) to connect to the Reader.     | <input type="checkbox"/>            |

Note: 1. Applicant consigns only basic model to test. Therefore this test report just guarantees the units, which have been tested.

2. The Applicant/manufacture is responsible for the compliance of all variants.

### 4. EUT MODIFICATIONS

-. None

## 5. SYSTEM TEST CONFIGURATION

### 5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

| DEVICE TYPE           | MANUFACTURER                    | MODEL/PART NUMBER       | FCC ID   |
|-----------------------|---------------------------------|-------------------------|----------|
| Main Board            | N/A                             | 1191A V1.4              | N/A      |
| Sub Board             | N/A                             | 1191B V1.2              | N/A      |
| Switch Board          | N/A                             | N/A                     | N/A      |
| Camera Board          | N/A                             | N/A                     | N/A      |
| Charging Board        | N/A                             | 1191N V1.0              | N/A      |
| RFID Sub Board        | N/A                             | TSL 1128D V2.30         | N/A      |
| RFID Antenna          | N/A                             | AQUA866S_6015_TSL1128_B | N/A      |
| RFID Antenna CN Board | N/A                             | 1191F V1.0              | N/A      |
| CN Board 1            | N/A                             | TSL 1128C V2.30         | N/A      |
| CN Board 2            | Technology Solutions UK Ltd     | 1191D V1.10             | N/A      |
| Charging Jack         | N/A                             | 1191E V1.10             | N/A      |
| Battery               | VARTA Storage GmbH              | EZPack XL               | N/A      |
| BT Module             | Silicon Laboratories Finland Oy | BT121                   | QOQVT121 |

### 5.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

| Model | Manufacturer | Description | Connected to |
|-------|--------------|-------------|--------------|
| N/A   | N/A          | N/A         | N/A          |

### 5.3 Mode of operation during the test

- . EUT does not transmitting mode during charging
- . Charging mode: The pin connector on the EUT was connected to the adapter and PDA,  
then the EUT was continuously charged during the test.
- . Transmitting mode: Software of PDA used to control the EUT for staying in continuous transmitting mode is programmed.
- . For final testing, EUT was set at Low Channel (902.75 MHz), Middle Channel (915.25 MHz), and High Channel (927.25 MHz).

## 5.4 Configuration of Test System

**Line Conducted Test:** The EUT was tested in a charging mode and transmitting mode. The EUT was connected to adapter and PDA. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions

**Radiated Emission Test:** Preliminary radiated emissions test were conducted using the procedure in ANSI 63.10: 2013 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 m semi anechoic chamber. The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

## 5.5 Antenna Requirement

According to the rule, FCC Part 15C Section 15.203 the transmitter antenna shall be integral with the device, or the antenna coupling be so designed that no antenna other than that furnished by the party responsible for compliance shall be used.

**Antenna Construction:**

The transmitter antenna of the EUT is a PCB Antenna, so no consideration of replacement by the user.

## 6. PRELIMINARY TEST

### 6.1 AC Power line Conducted Emissions Tests

During Preliminary Tests, the following operating mode was investigated

| Operation Mode | The Worse operating condition (Please check one only) |
|----------------|-------------------------------------------------------|
| Charging Mode  | X                                                     |

### 6.2 General Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated

| Operation Mode    | The Worse operating condition (Please check one only) |
|-------------------|-------------------------------------------------------|
| Charging Mode     | -                                                     |
| Transmitting Mode | X                                                     |

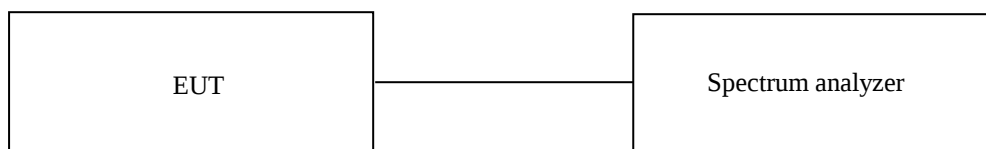
## 7. MINIMUM 20 dB BANDWIDTH

### 7.1 Operating environment

Temperature : 23 °C  
Relative humidity : 44 % R.H.

### 7.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 10 kHz, and peak detection was used. The 20 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 20 dB.



### 7.3 Test equipment used

|     | Model Number | Manufacturer    | Description     | Serial Number | Last Cal.         |
|-----|--------------|-----------------|-----------------|---------------|-------------------|
| ■ - | FSV30        | Rohde & Schwarz | Signal Analyzer | 101200        | Oct.26, 2017 (1Y) |

All test equipment used is calibrated on a regular basis.

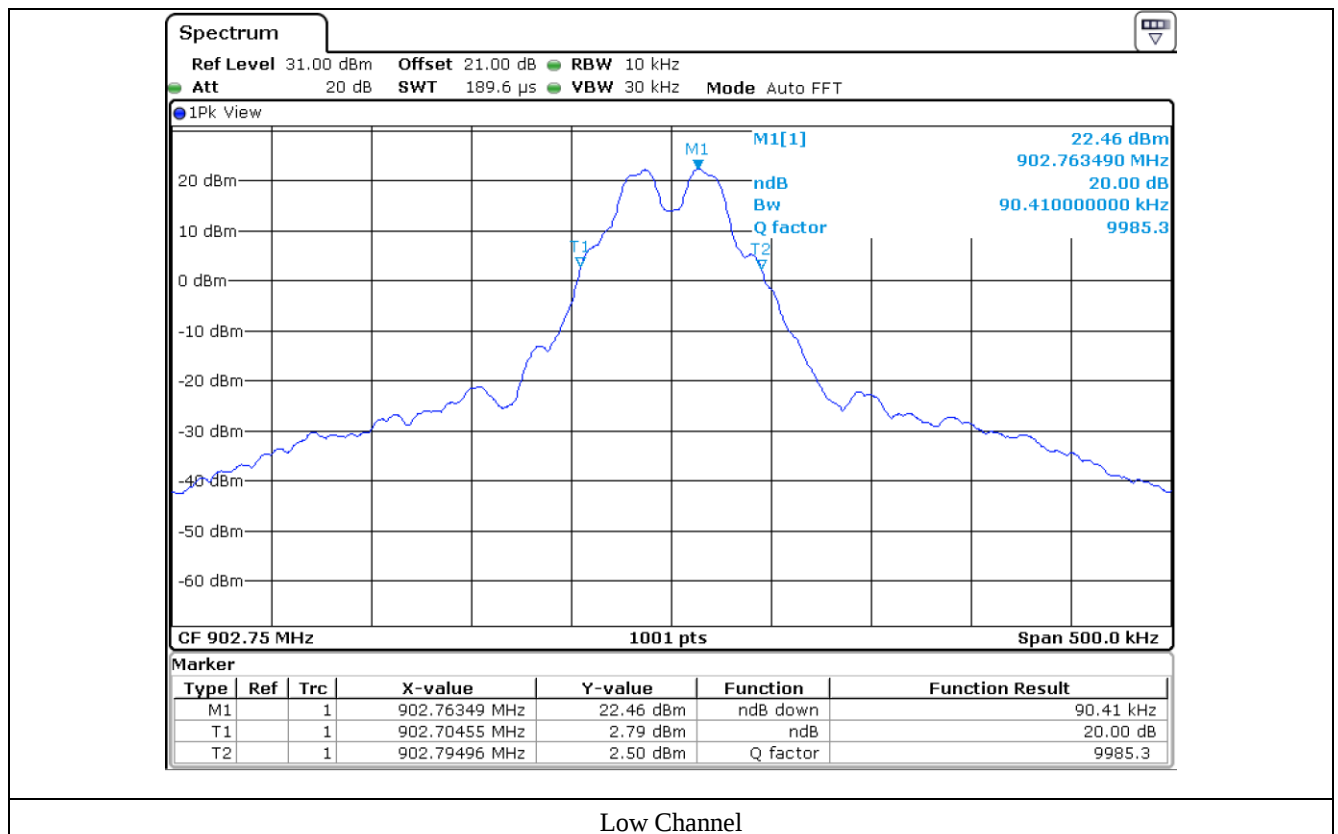
## 7.4 Test data

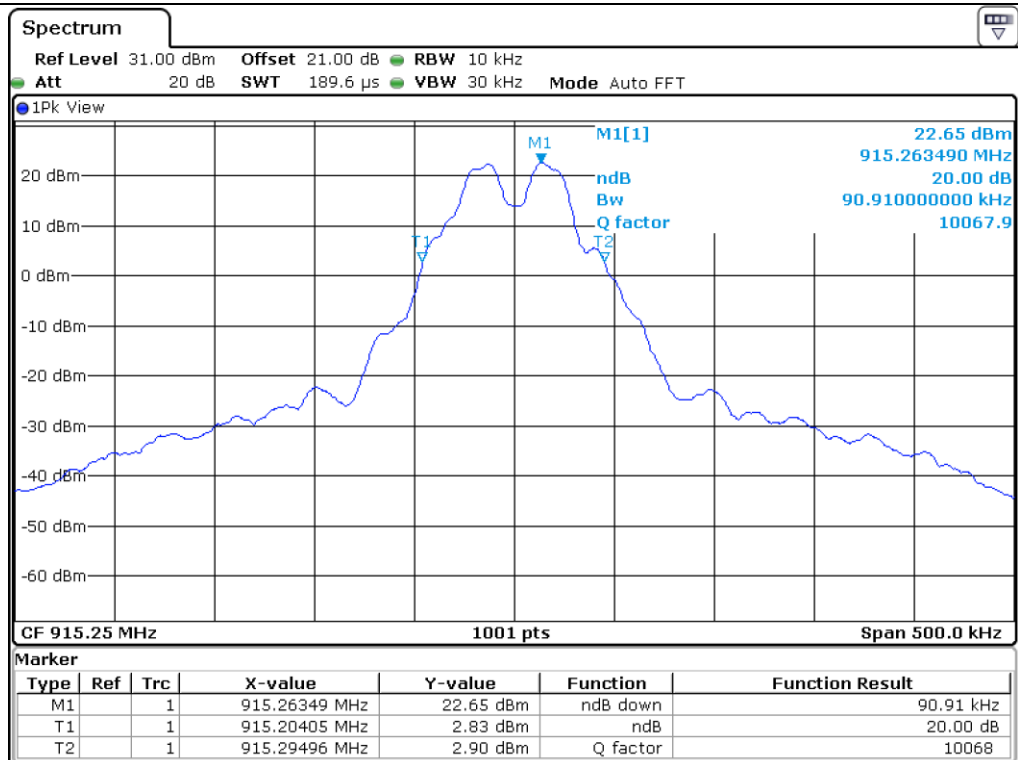
-. Test Date : December 13, 2017

| CHANNEL | FREQUENCY (MHz) | 20 dB Bandwidth (kHz) | Limits(kHz) |
|---------|-----------------|-----------------------|-------------|
| Low     | 902.75          | 90.41                 | 250         |
| Middle  | 915.25          | 90.91                 |             |
| High    | 927.25          | 93.41                 |             |

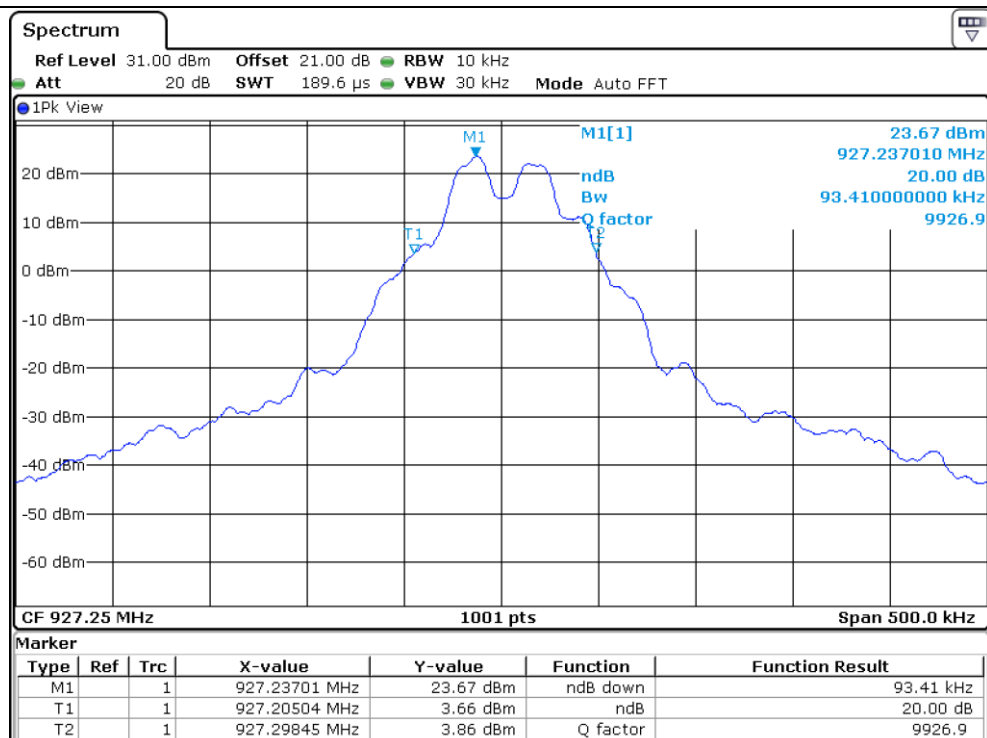


Tested by: Min-Gu Ji / Assistant Manager





### Middle Channel



### High Channel

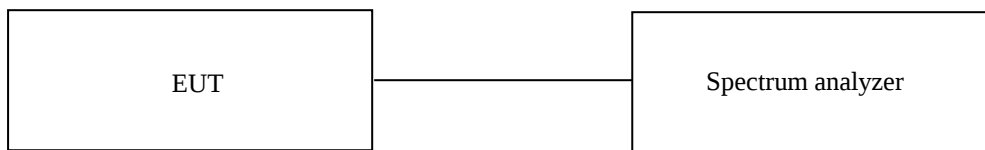
## 8. HOPPING FREQUENCY SEPARATION

### 8.1 Operating environment

Temperature : 23 °C  
Relative humidity : 44 % R.H.

### 8.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The frequency span is set to 5 MHz. The analyzer is set to peak hold then a pseudo-random hopping sequence of the transmitter is captured. The mark delta function was used to measure the frequency separation between two adjacent hopping channels.



### 8.3 Test equipment used

|     | Model Number | Manufacturer    | Description     | Serial Number | Last Cal.         |
|-----|--------------|-----------------|-----------------|---------------|-------------------|
| ■ - | FSV30        | Rohde & Schwarz | Signal Analyzer | 101200        | Oct.26, 2017 (1Y) |

All test equipment used is calibrated on a regular basis.

## 8.4 Test data

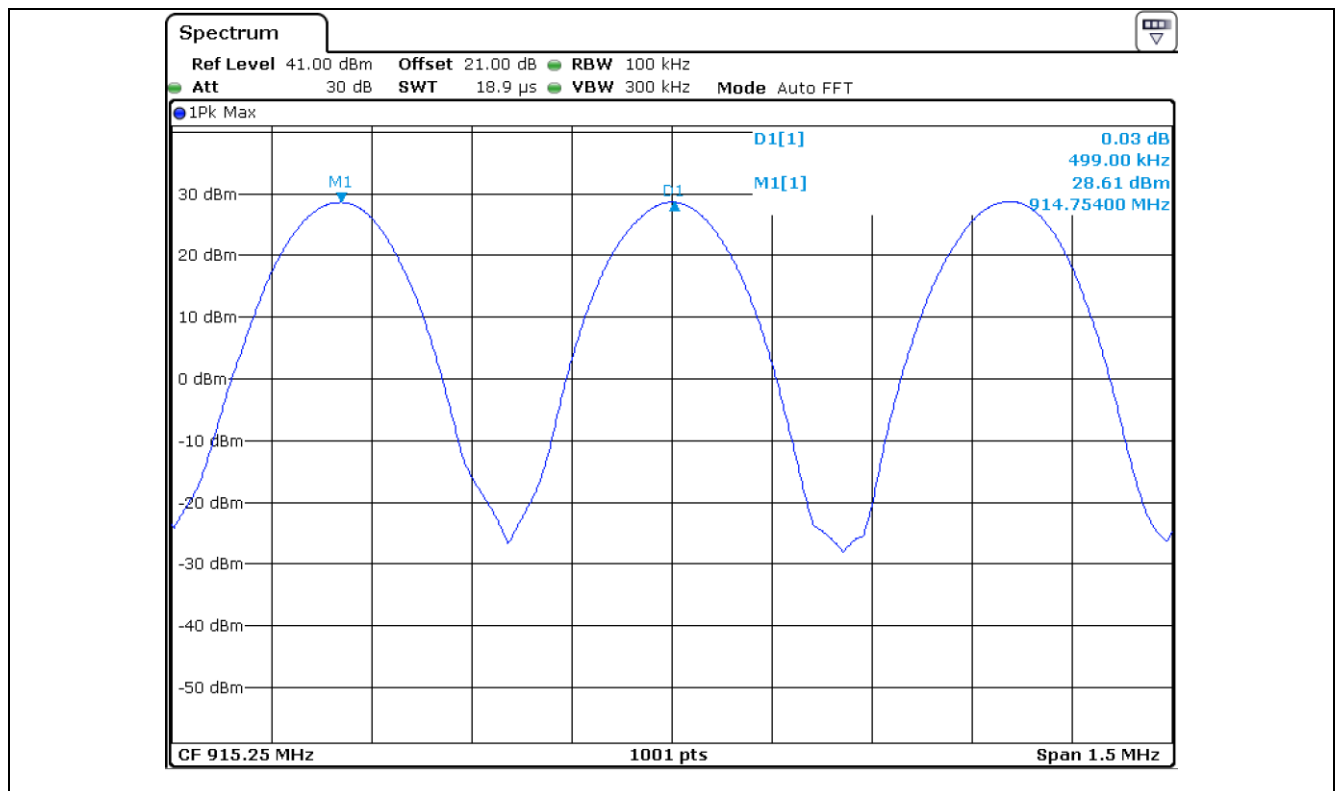
-. Test Date : December 13, 2017

-. Test Result : Pass

| Frequency (MHz) | Measured Value (kHz) | LIMIT                                    |
|-----------------|----------------------|------------------------------------------|
| 915.25          | 499.00               | Minimum of 25 kHz or the 20 dB Bandwidth |



Tested by: Min-Gu Ji / Assistant Manager



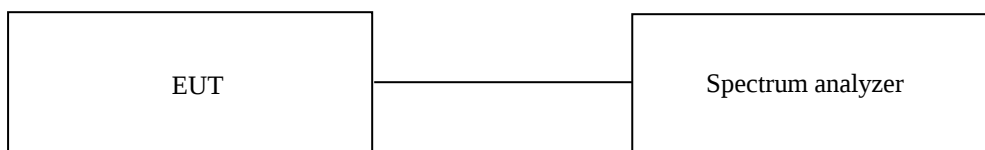
## 9. NUMBER OF HOPPING CHANNELS

### 9.1 Operating environment

Temperature : 23 °C  
Relative humidity : 44 % R.H.

### 9.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The frequency span is set to frequency band of operation and the resolution bandwidth is set to 100 kHz. The analyzer is set to peak hold and then complete pseudo-random hopping sequence of the transmitter is captured.



### 9.3 Test equipment used

|     | Model Number | Manufacturer    | Description     | Serial Number | Last Cal.         |
|-----|--------------|-----------------|-----------------|---------------|-------------------|
| ■ - | FSV30        | Rohde & Schwarz | Signal Analyzer | 101200        | Oct.26, 2017 (1Y) |

All test equipment used is calibrated on a regular basis.

## 9.4 Test data

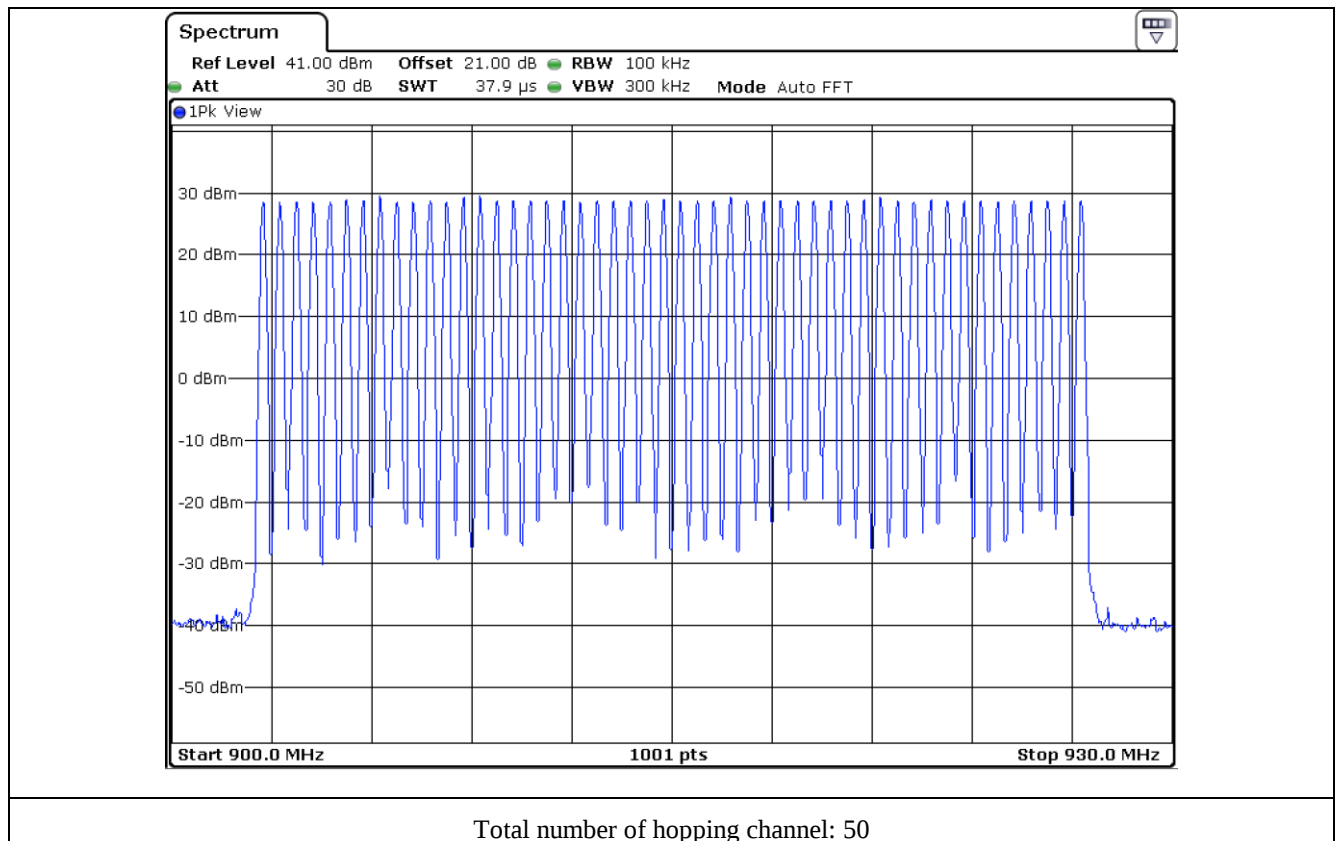
-. Test Date : December 13, 2017

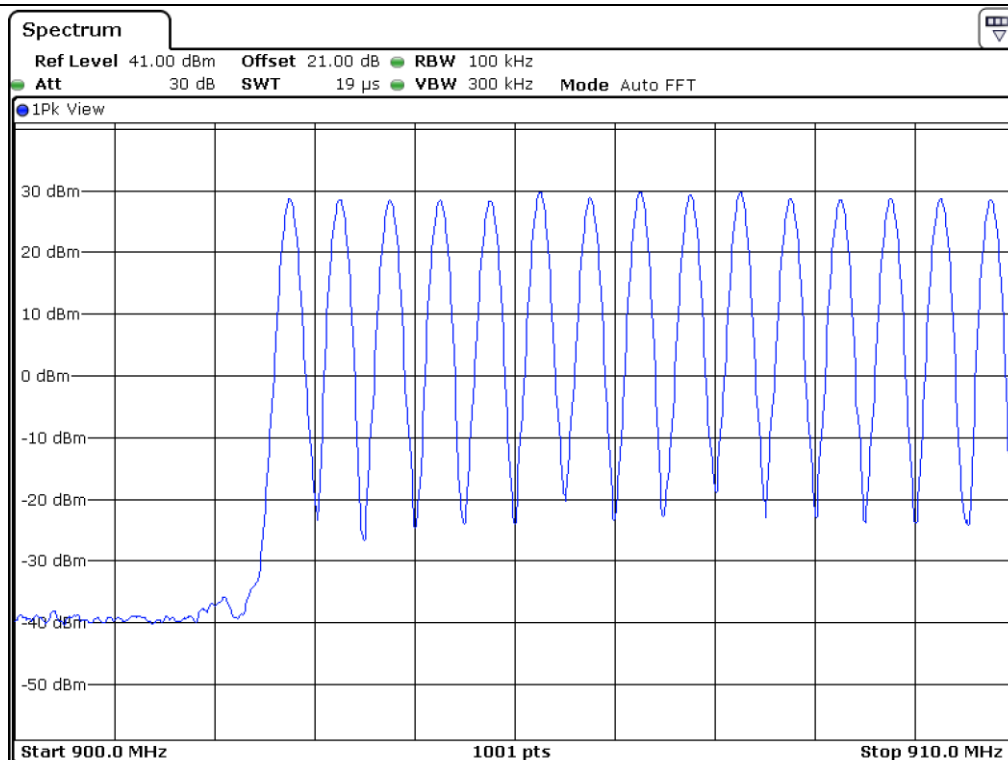
-. Test Result : Pass

| Frequency Range (MHz) | Measured value (Number) | 20 dB Bandwidth (kHz) | Limit |
|-----------------------|-------------------------|-----------------------|-------|
| 902.75 ~ 927.25       | 50                      | < 250                 | ≥ 50  |

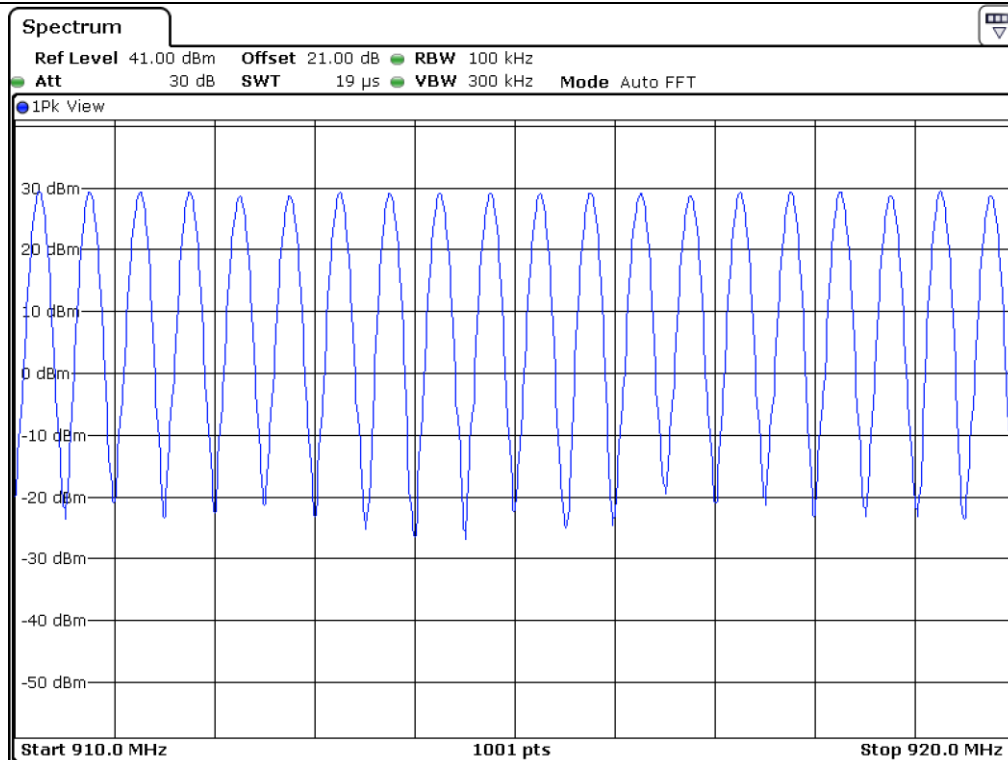


Tested by: Min-Gu Ji / Assistant Manager

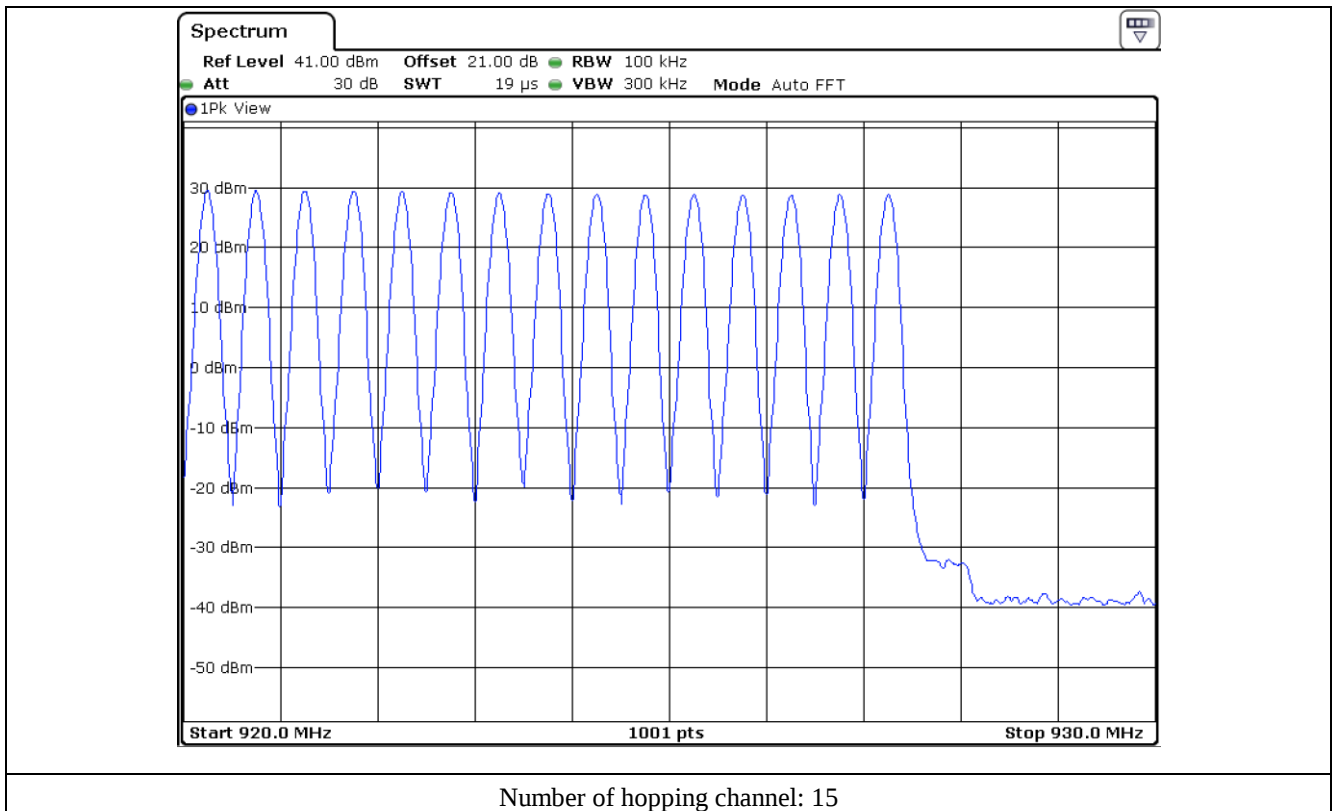




Number of hopping channel: 15



Number of hopping channel: 20



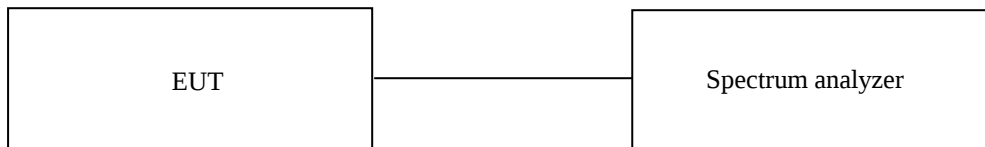
## 10. TIME OF OCCUPANCY

### 10.1 Operating environment

Temperature : 23 °C  
Relative humidity : 44 % R.H.

### 10.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The transmitter is set to operate in its normal frequency hopping mode. The center frequency of the spectrum analyzer is set to one of hopping channels near the center of the operating band and span is set to zero Hz. The sweep time is set to display one complete pulse. The mark delta function is used to measure the duration of the pulses.



### 10.3 Test equipment used

| Model Number | Manufacturer    | Description     | Serial Number | Last Cal.         |
|--------------|-----------------|-----------------|---------------|-------------------|
| ■ - FSV30    | Rohde & Schwarz | Signal Analyzer | 101200        | Oct.26, 2017 (1Y) |

All test equipment used is calibrated on a regular basis.

#### 10.4 Test data

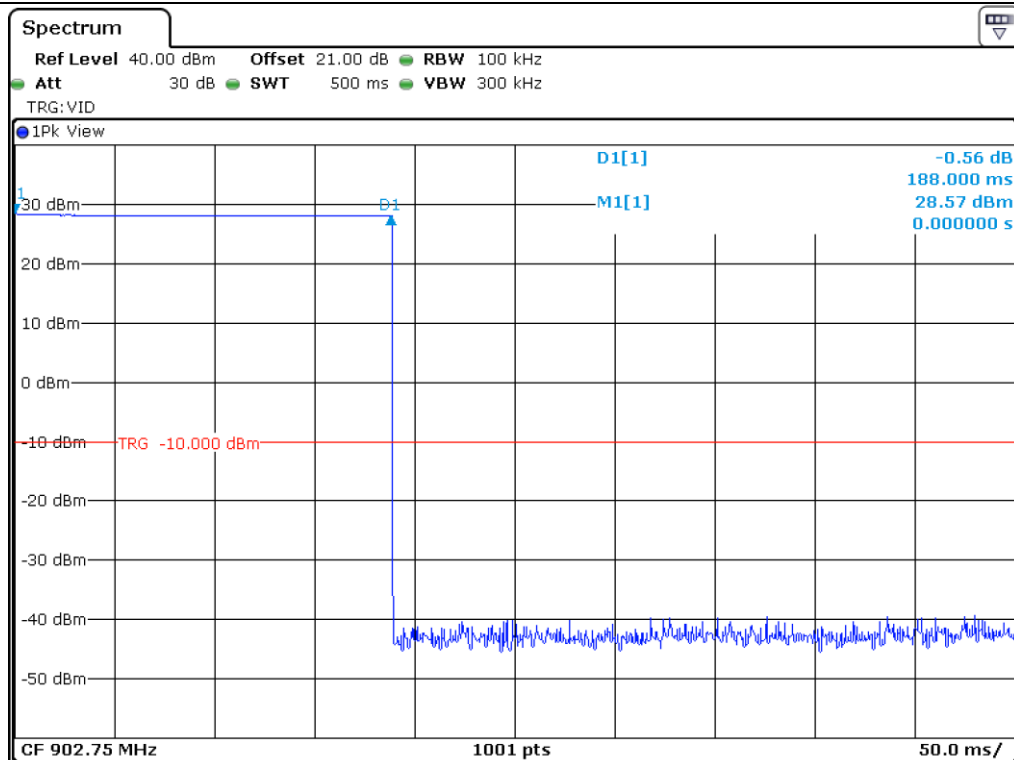
-. Test Date : December 13, 2017

| Frequency Range<br>(MHz) | Pulse Time<br>(ms) | Number of Pulse in<br>20 seconds | Average Occupancy Time<br>(ms) | Limit<br>(ms) |
|--------------------------|--------------------|----------------------------------|--------------------------------|---------------|
| 902.75 ~ 927.25          | 188.0              | 2                                | 376.0                          | 400           |

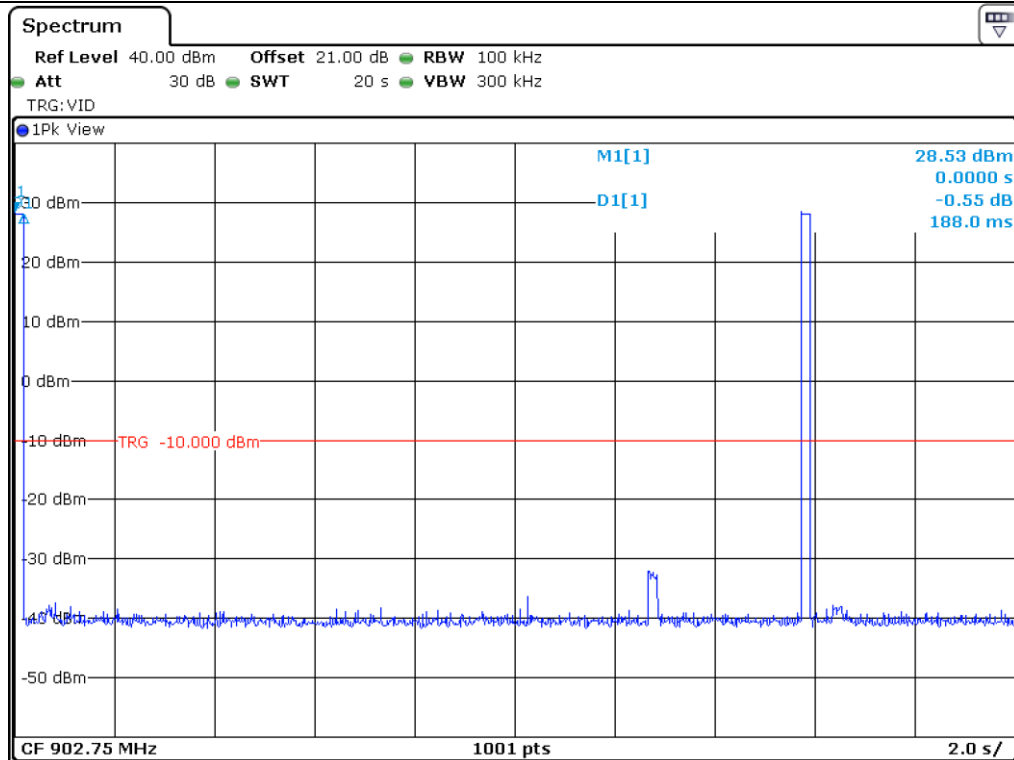
Note: Average Occupancy Time = Pulse Time \* Number of Pulse in 20 seconds



Tested by: Min-Gu Ji / Assistant Manager



Pulse Time



Number of Transmissions during a 20 second period

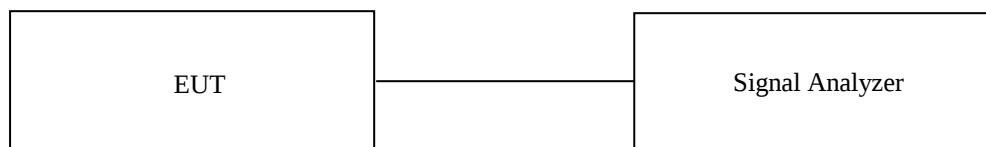
## 11. MAXIMUM PEAK OUTPUT POWER

### 11.1 Operating environment

Temperature : 23 °C  
Relative humidity : 44 % R.H

### 11.2 Test set-up

The maximum peak output power was measured with the spectrum analyzer connected to the antenna output of the EUT.  
The EUT was operating in transmit mode at the appropriate center frequency.



### 11.3 Test equipment used

| Model Number | Manufacturer    | Description     | Serial Number | Last Cal.         |
|--------------|-----------------|-----------------|---------------|-------------------|
| ■ - FSV30    | Rohde & Schwarz | Signal Analyzer | 101200        | Oct.26, 2017 (1Y) |

All test equipment used is calibrated on a regular basis.

#### 11.4 Test data

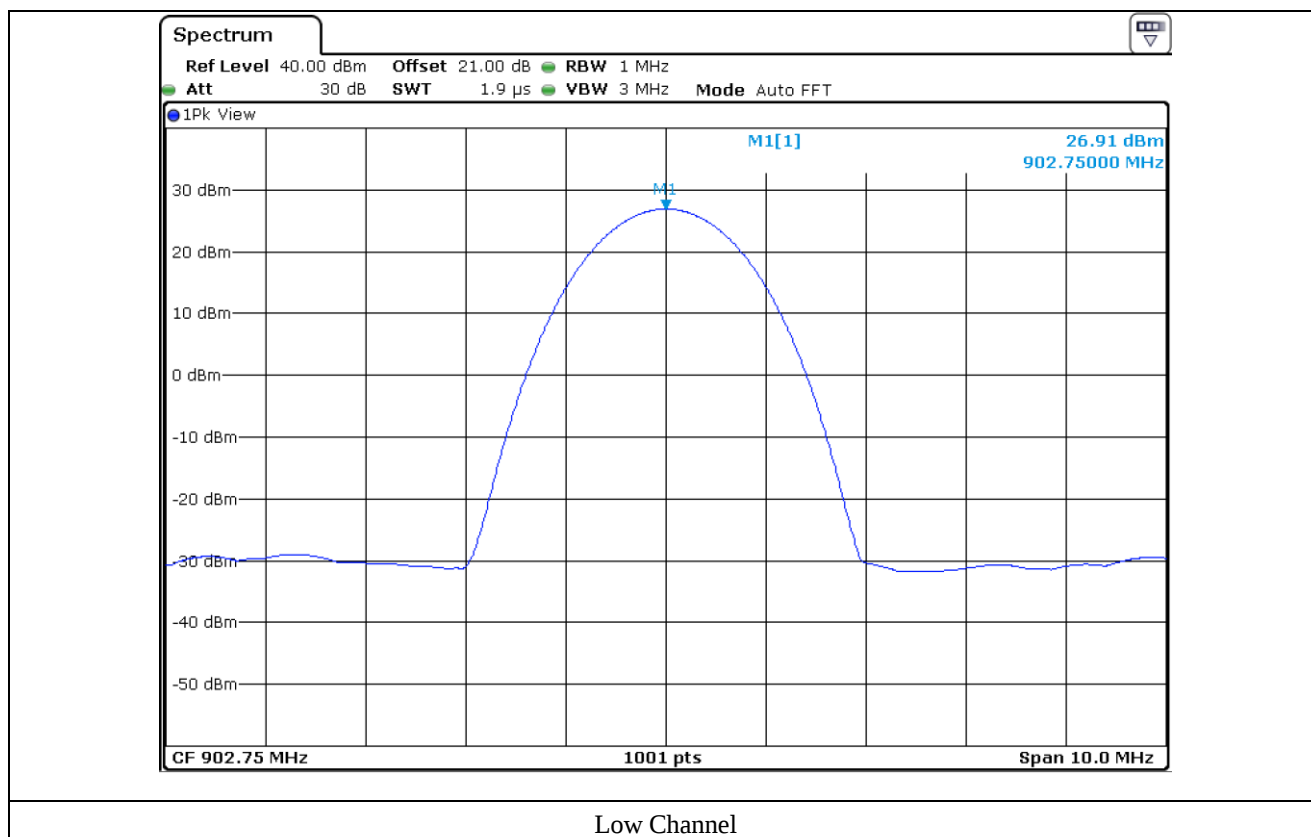
-. Test Date : December 13, 2017

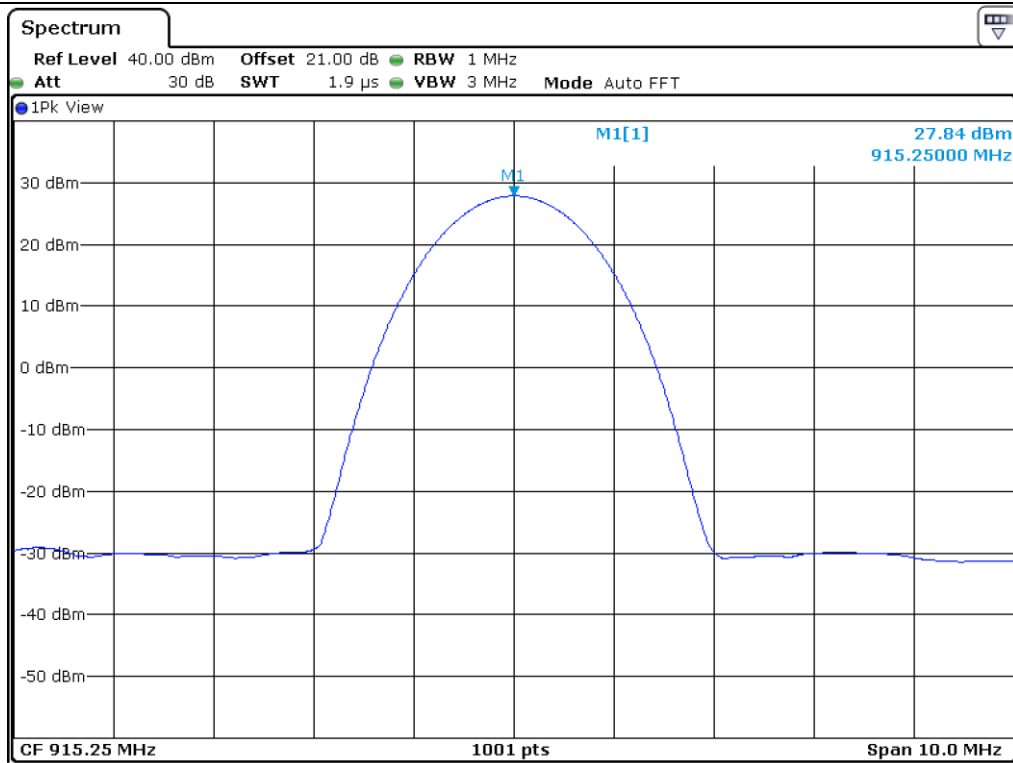
-. Test Result : Pass

| CHANNEL | FREQUENCY<br>(MHz) | MEASURED VALUE<br>(dBm) | LIMIT<br>(dBm) | MARGIN<br>(dB) |
|---------|--------------------|-------------------------|----------------|----------------|
| Low     | 902.75             | 26.91                   | 30.00          | 3.09           |
| Middle  | 915.25             | 27.84                   | 30.00          | 2.16           |
| High    | 927.25             | 27.63                   | 30.00          | 2.37           |

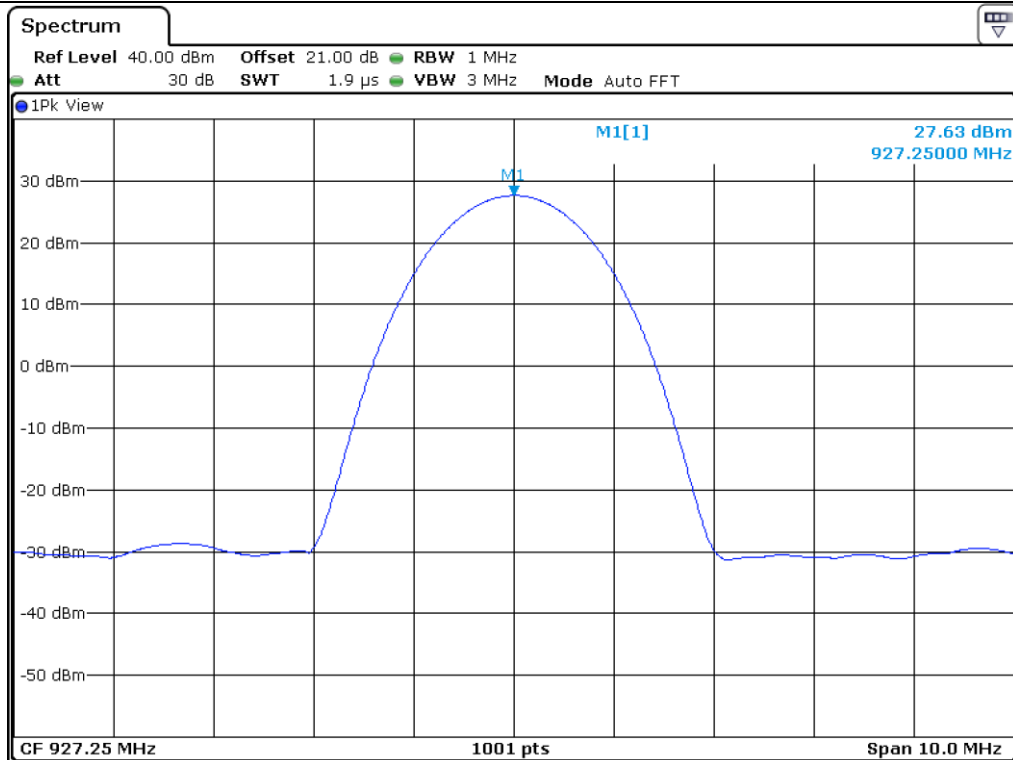


Tested by: Min-Gu Ji / Assistant Manager





Middle Channel



High Channel

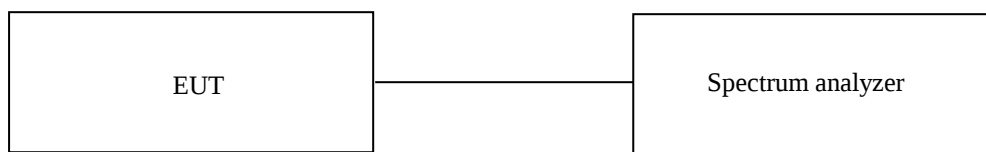
## 12. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

### 12.1 Operating environment

Temperature : 23 °C  
Relative humidity : 44 % R.H

### 12.2 Test set-up for conducted measurement

The antenna output of the EUT was connected to the spectrum analyzer. The resolution and video bandwidth is set to 100 kHz, and peak detection was used.



### 12.3 Test set-up for radiated measurement

The radiated emissions measurements were performed on the 3 m semi anechoic chamber. The EUT was placed on a non-conductive turntable approximately 0.8 m above the ground plane.

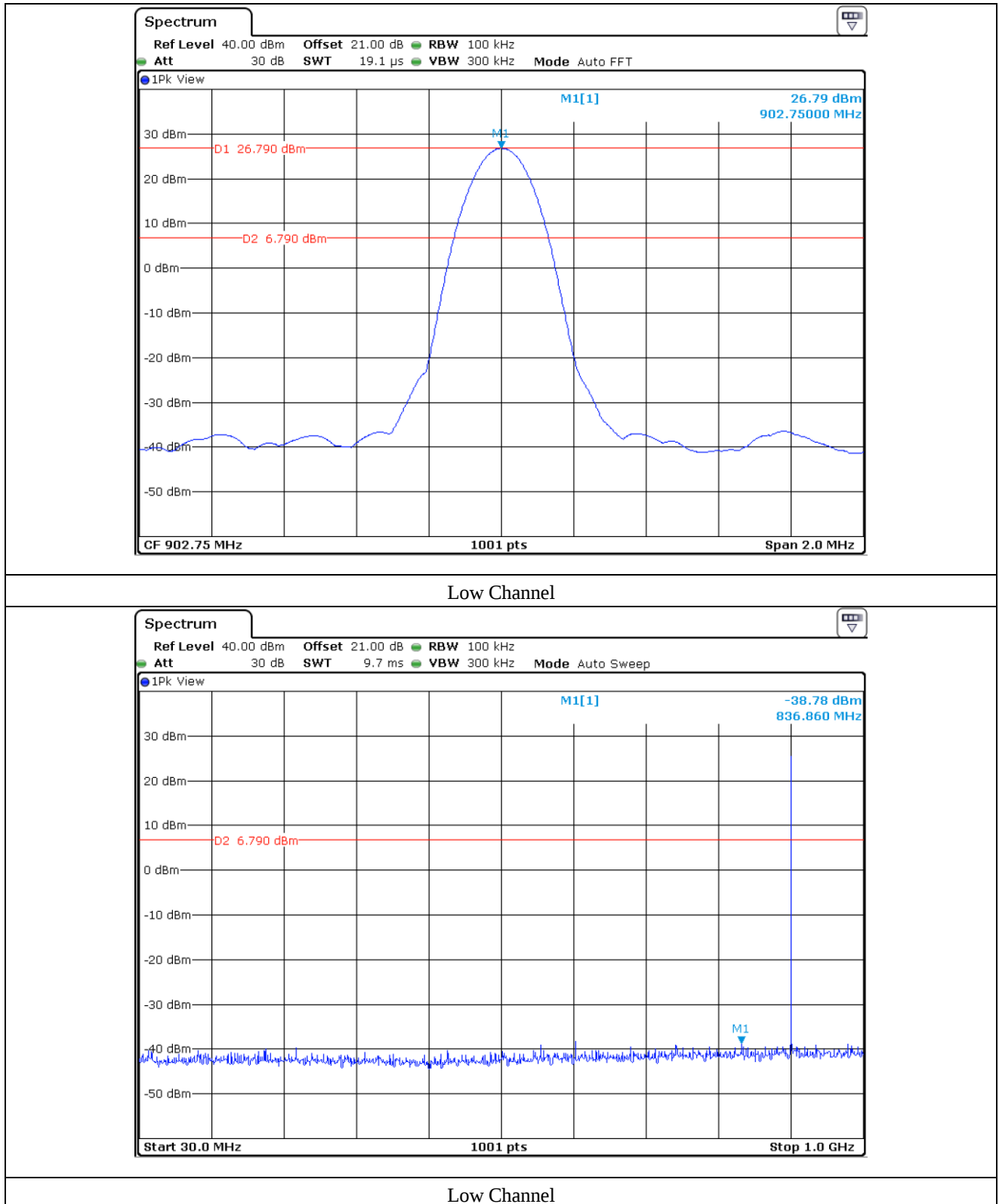
The frequency spectrum from 30 MHz to 10 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

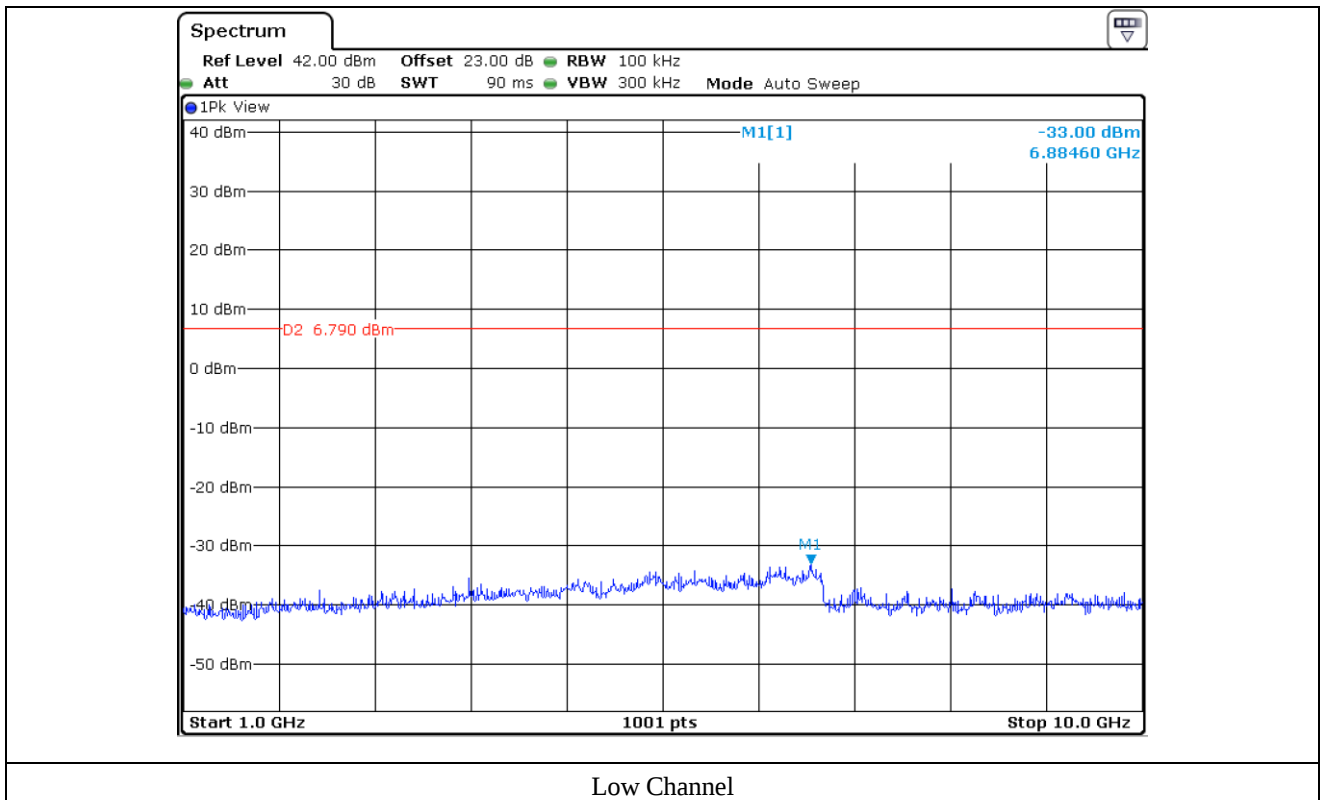
### 12.4 Test equipment used

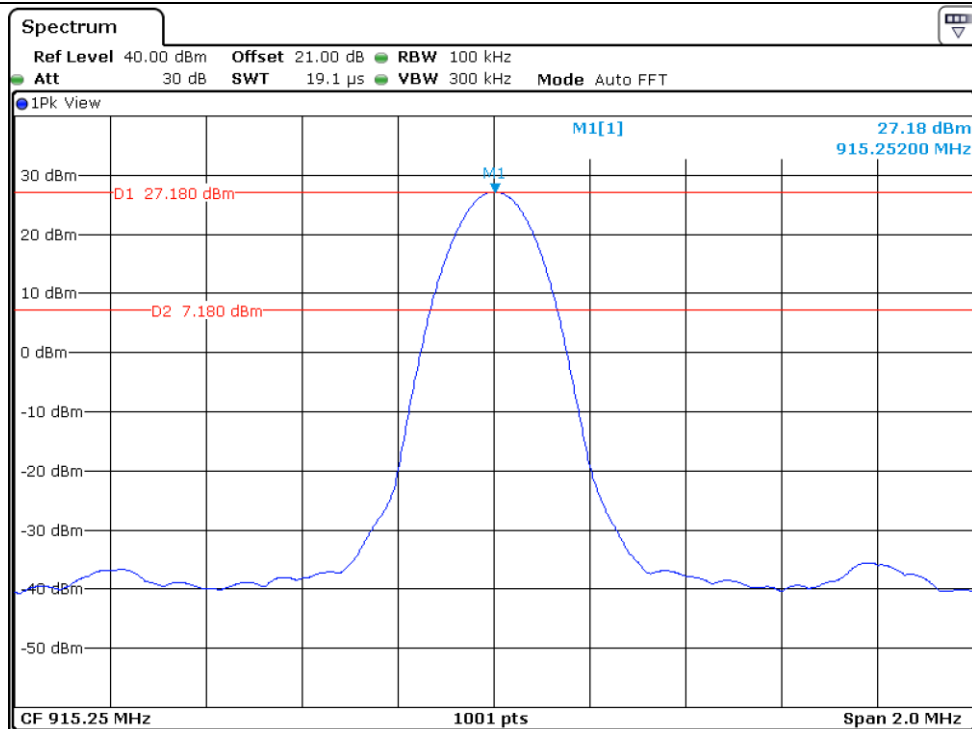
|     | Model Number | Manufacturer       | Description              | Serial Number | Last Cal. (Interval) |
|-----|--------------|--------------------|--------------------------|---------------|----------------------|
| □ - | ESCI         | Rohde & Schwarz    | EMI Test Receiver        | 101012        | Oct. 27, 2017 (1Y)   |
| ■ - | ESR          | Rohde & Schwarz    | EMI Test Receiver        | 101470        | Oct. 27, 2017 (1Y)   |
| □ - | FSP          | Rohde & Schwarz    | Spectrum Analyzer        | 100017        | Sep. 04, 2017 (1Y)   |
| ■ - | 310N         | Sonoma Instrument  | AMPLIFIER                | 312544        | Apr. 04, 2017 (1Y)   |
| ■ - | FSV30        | Rohde & Schwarz    | Signal Analyzer          | 101200        | Oct. 26, 2017 (1Y)   |
| ■ - | SCU-18       | Rohde & Schwarz    | Pre-Amplifier            | 102346        | Oct. 24, 2017 (1Y)   |
| ■ - | MA-4000XPET  | Innco Systems GmbH | Antenna Master           | MA4000/509    | N/A                  |
| □ - | HD100        | HD GmbH            | Position Controller      | N/A           | N/A                  |
| ■ - | DT3000-3t    | Innco Systems GmbH | Turn Table               | N/A           | N/A                  |
| □ - | FMZB 1513    | Schwarzbeck        | LOOP ANTENNA             | 1513-235      | Jun. 10, 2016 (2Y)   |
| ■ - | VULB9163     | Schwarzbeck        | TRILOG Broadband Antenna | 9163-255      | May 20, 2016 (2Y)    |
| ■ - | BBHA9120D    | Schwarzbeck        | Horn Antenna             | BBHA9120D295  | Aug. 16, 2017 (2Y)   |
| ■ - | BBHA9170     | Schwarzbeck        | Horn Antenna             | BBHA91700179  | Jul. 28, 2017 (2Y)   |
| ■ - | SCU40A       | Rohde & Schwarz    | Pre-Amplifier            | 100436        | Apr. 04, 2017 (1Y)   |

All test equipment used is calibrated on a regular basis.

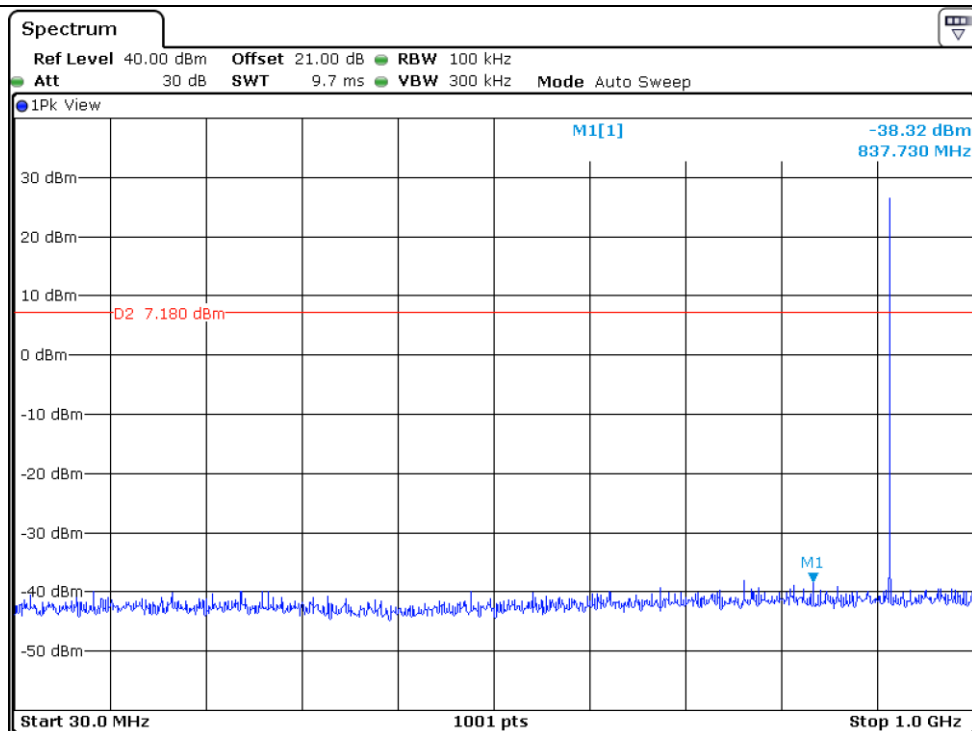
## 12.5 Test data for conducted emission



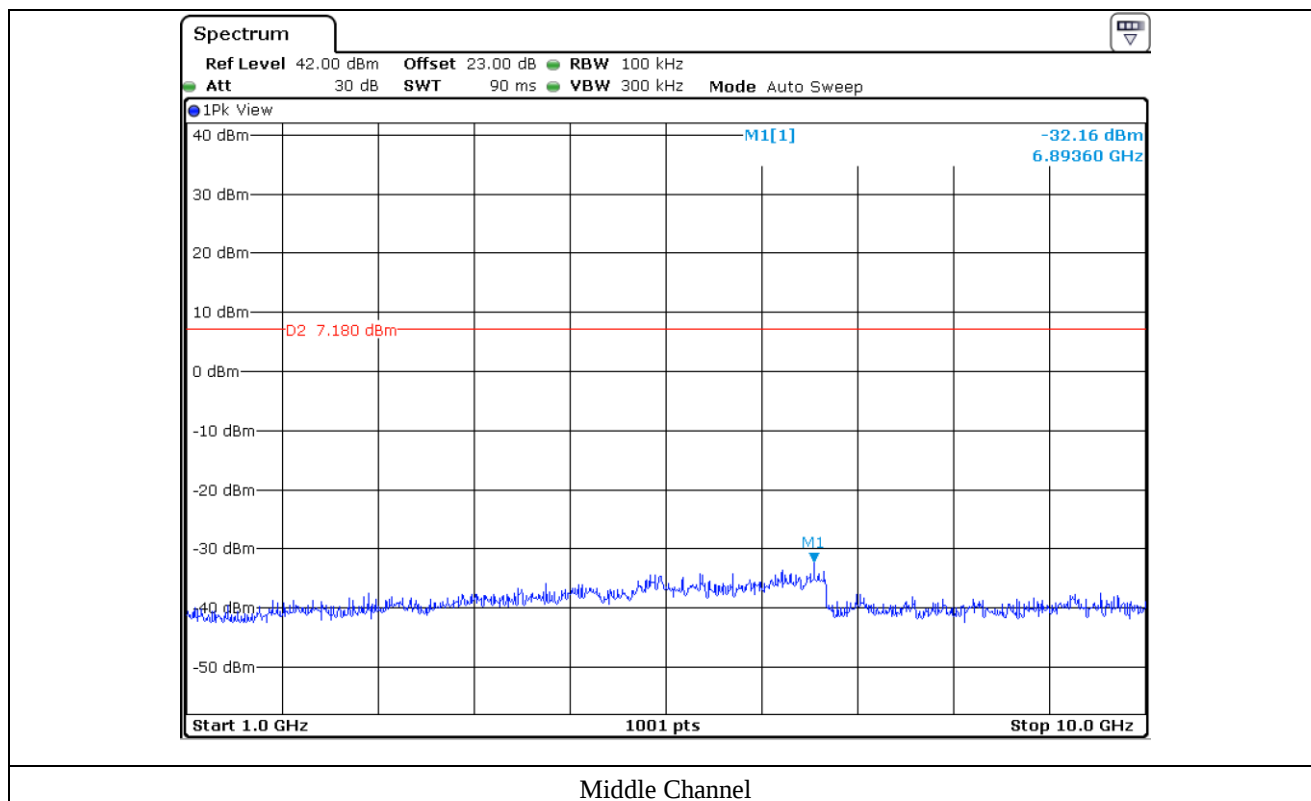


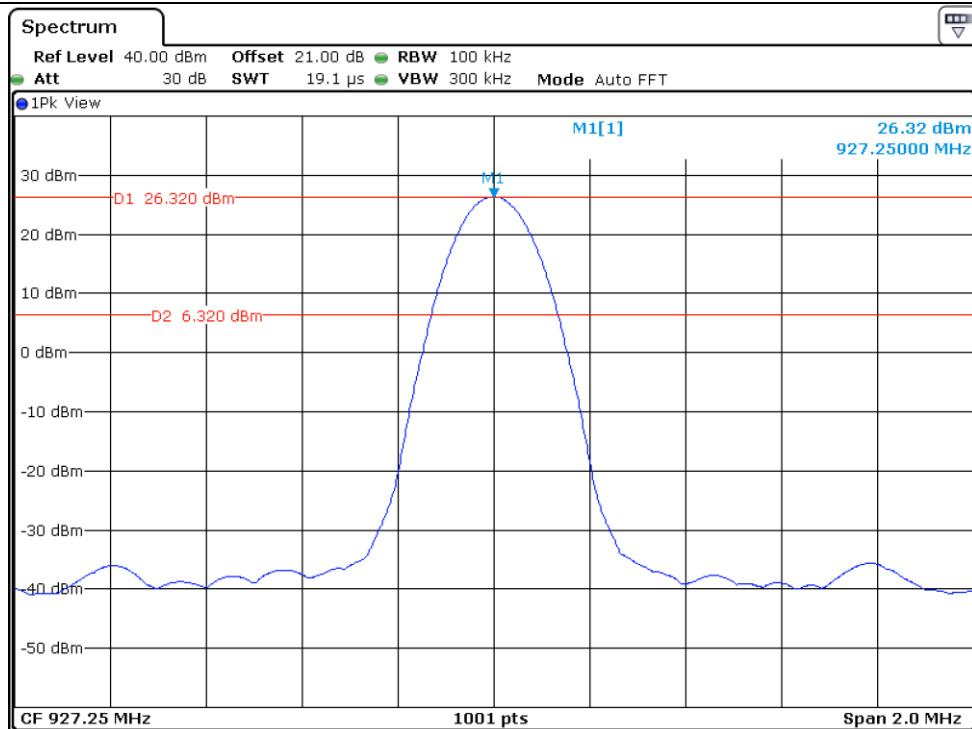


Middle Channel

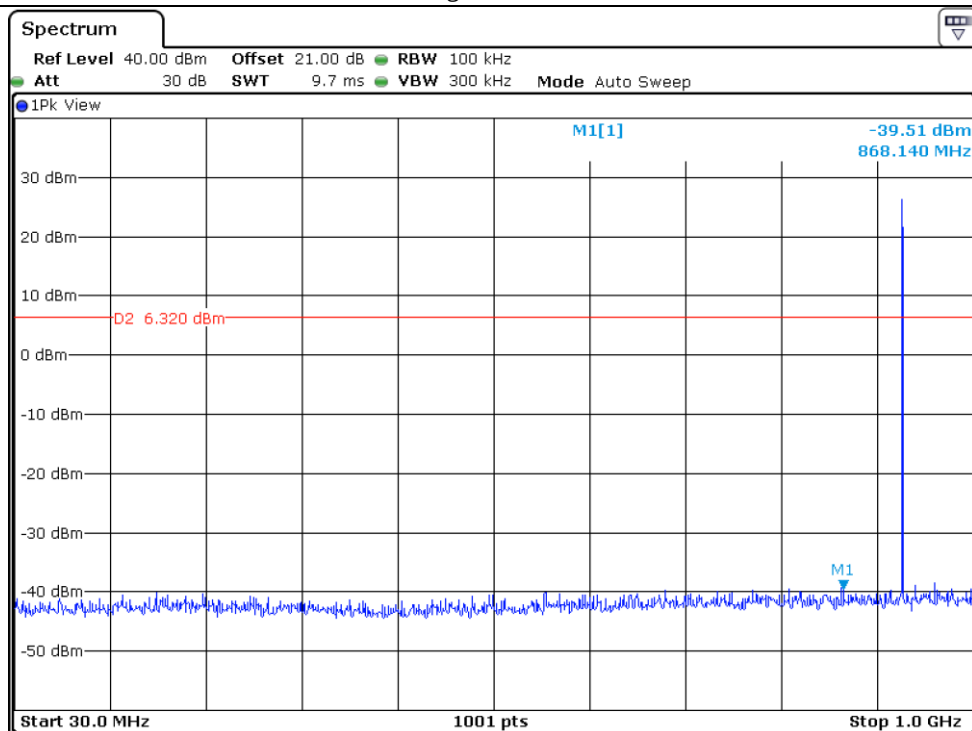


Middle Channel

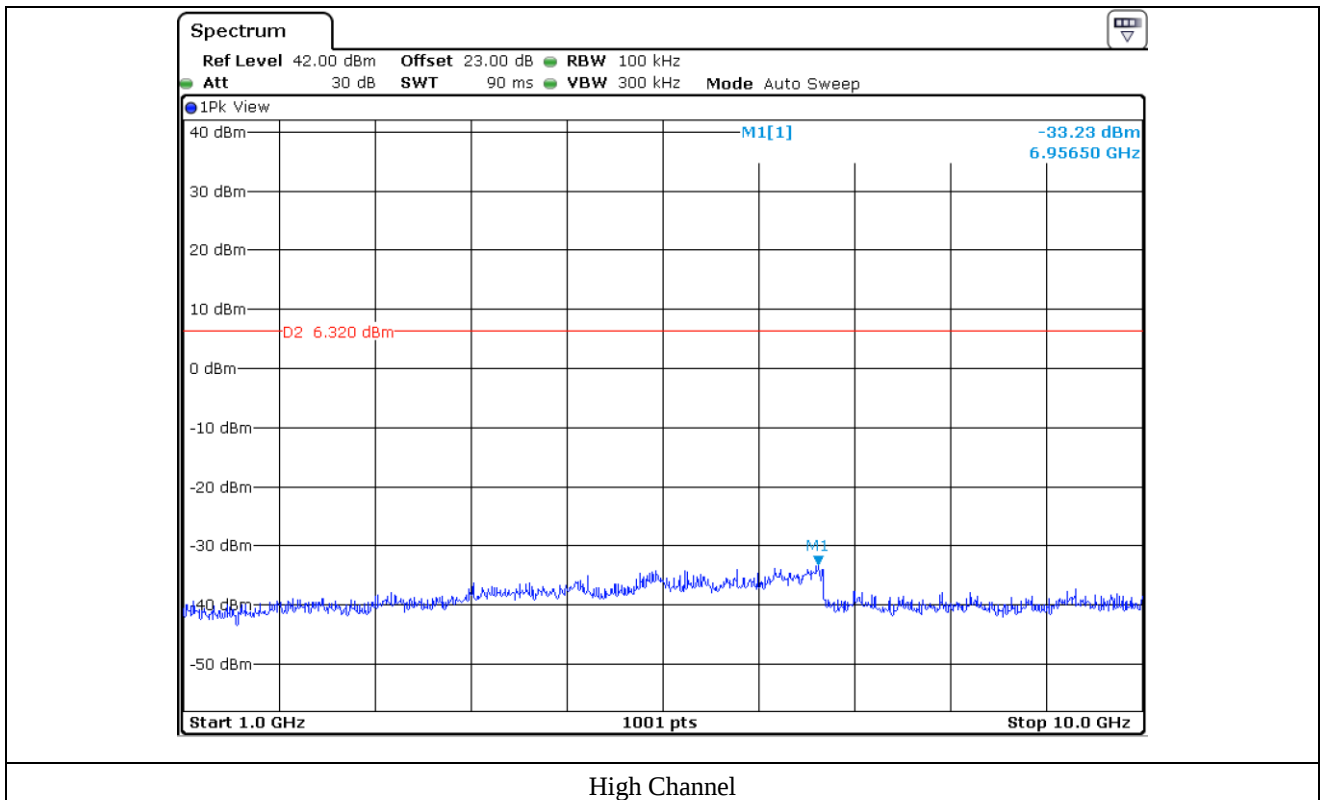




High Channel



High Channel



## 12.6 Test data for radiated emission at Transmitting Mode

### 12.6.1 Radiated Emission which fall in the Restricted Band

- . Test Date : December 15, 2017
- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Detector : Peak Mode(Peak), Average Mode(RMS)
- . Measurement distance : 3 m
- . Result : PASSED

| Frequency<br>(MHz)           | Reading<br>(dBμV) | Detector<br>Mode | Ant. Pol.<br>(H/V) | Ant.<br>Factor | Cable<br>Loss | Amp<br>Gain | Total<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) |
|------------------------------|-------------------|------------------|--------------------|----------------|---------------|-------------|-------------------|--------------------|----------------|
| Test Data for Low Channel    |                   |                  |                    |                |               |             |                   |                    |                |
| 2 668.48                     | 41.57             | Peak             | H                  | 28.10          | 10.30         | 29.40       | 50.57             | 74.00              | 23.43          |
| 2 779.97                     | 30.58             | Average          | H                  |                |               |             | 39.58             | 54.00              | 14.42          |
| 2 842.91                     | 42.08             | Peak             | V                  |                |               |             | 51.08             | 74.00              | 22.92          |
| 2 839.91                     | 30.59             | Average          | V                  |                |               |             | 39.59             | 54.00              | 14.41          |
| Test Data for Middle Channel |                   |                  |                    |                |               |             |                   |                    |                |
| 2 827.32                     | 41.46             | Peak             | H                  | 28.10          | 10.30         | 29.40       | 50.46             | 74.00              | 23.54          |
| 2 824.93                     | 30.54             | Average          | H                  |                |               |             | 39.54             | 54.00              | 14.46          |
| 2 887.56                     | 41.34             | Peak             | V                  |                |               |             | 50.34             | 74.00              | 23.66          |
| 2 779.97                     | 30.90             | Average          | V                  |                |               |             | 39.90             | 54.00              | 14.10          |
| Test Data for High Channel   |                   |                  |                    |                |               |             |                   |                    |                |
| 2 770.08                     | 42.47             | Peak             | H                  | 28.10          | 10.30         | 29.40       | 51.47             | 74.00              | 22.53          |
| 2 825.82                     | 30.46             | Average          | H                  |                |               |             | 39.46             | 54.00              | 14.54          |
| 2 887.86                     | 41.72             | Peak             | V                  |                |               |             | 50.72             | 74.00              | 23.28          |
| 2 667.28                     | 30.69             | Average          | V                  |                |               |             | 39.69             | 54.00              | 14.31          |

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dBμV/m)} - \text{Total Level (dBμV/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$



Tested by: Min-Gu Ji / Assistant Manager

## 12.6.2 Spurious & Harmonic Radiated Emission above 1 GHz

-. Test Date : December 15, 2017  
 -. Resolution bandwidth : 1 MHz for Peak and Average Mode  
 -. Video bandwidth : 3 MHz for Peak and Average Mode  
 -. Detector : Peak Mode(Peak), Average Mode(RMS)  
 -. Frequency range : 1 GHz ~ 26.5 GHz  
 -. Measurement distance : 3 m  
 -. Result : PASSED

| Frequency<br>(GHz)           | Reading<br>(dBμV) | Detector<br>Mode | Ant. Pol.<br>(H/V) | Ant.<br>Factor | Cable<br>Loss | Amp<br>Gain | Total<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) |
|------------------------------|-------------------|------------------|--------------------|----------------|---------------|-------------|-------------------|--------------------|----------------|
| Test Data for Low Channel    |                   |                  |                    |                |               |             |                   |                    |                |
| 1 805.50                     | 43.23             | Peak             | H                  | 24.90          | 9.30          | 31.50       | 45.93             | 74.00              | 28.07          |
|                              | 30.72             | Average          | H                  |                |               |             | 33.42             | 54.00              | 20.58          |
|                              | 42.23             | Peak             | V                  |                |               |             | 44.93             | 74.00              | 29.07          |
|                              | 30.22             | Average          | V                  |                |               |             | 32.92             | 54.00              | 21.08          |
| Test Data for Middle Channel |                   |                  |                    |                |               |             |                   |                    |                |
| 1 830.50                     | 42.21             | Peak             | H                  | 24.90          | 9.40          | 31.60       | 44.91             | 74.00              | 29.09          |
|                              | 29.40             | Average          | H                  |                |               |             | 32.10             | 54.00              | 21.90          |
|                              | 41.90             | Peak             | V                  |                |               |             | 44.60             | 74.00              | 29.40          |
|                              | 29.36             | Average          | V                  |                |               |             | 32.06             | 54.00              | 21.94          |
| Test Data for High Channel   |                   |                  |                    |                |               |             |                   |                    |                |
| 1 854.50                     | 42.79             | Peak             | H                  | 25.00          | 9.50          | 31.70       | 45.59             | 74.00              | 28.41          |
|                              | 29.68             | Average          | H                  |                |               |             | 32.48             | 54.00              | 21.52          |
|                              | 42.67             | Peak             | V                  |                |               |             | 45.47             | 74.00              | 28.53          |
|                              | 30.07             | Average          | V                  |                |               |             | 32.87             | 54.00              | 21.13          |

Tabulated test data for Spurious & Harmonic

Remark: "H": Horizontal, "V": Vertical, "\*" Frequency fall in restricted band



**Tested by: Min-Gu Ji / Assistant Manager**

## 13. RADIATED EMISSION TEST

### 13.1 Operating environment

Temperature : 23 °C  
Relative humidity : 48 % R.H

### 13.2 Test set-up

The radiated emissions measurements were on the 3 m, semi anechoic chamber. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30 MHz to 1 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

### 13.3 Test equipment used

|     | Model Number | Manufacturer       | Description              | Serial Number | Last Cal. (Interval) |
|-----|--------------|--------------------|--------------------------|---------------|----------------------|
| □ - | ESCI         | Rohde & Schwarz    | EMI Test Receiver        | 101012        | Oct. 27, 2017 (1Y)   |
| ■ - | ESR          | Rohde & Schwarz    | EMI Test Receiver        | 101470        | Oct. 27, 2017 (1Y)   |
| □ - | FSP          | Rohde & Schwarz    | Spectrum Analyzer        | 100017        | Sep. 04, 2017 (1Y)   |
| ■ - | 310N         | Sonoma Instrument  | AMPLIFIER                | 312544        | Apr. 04, 2017 (1Y)   |
| ■ - | FSV30        | Rohde & Schwarz    | Signal Analyzer          | 101200        | Oct. 26, 2017 (1Y)   |
| ■ - | SCU-18       | Rohde & Schwarz    | Pre-Amplifier            | 102346        | Oct. 24, 2017 (1Y)   |
| ■ - | MA-4000XPET  | Innco Systems GmbH | Antenna Master           | MA4000/509    | N/A                  |
| □ - | HD100        | HD GmbH            | Position Controller      | N/A           | N/A                  |
| ■ - | DT3000-3t    | Innco Systems GmbH | Turn Table               | N/A           | N/A                  |
| □ - | FMZB 1513    | Schwarzbeck        | LOOP ANTENNA             | 1513-235      | Jun. 10, 2016 (2Y)   |
| ■ - | VULB9163     | Schwarzbeck        | TRILOG Broadband Antenna | 9163-255      | May 20, 2016 (2Y)    |
| ■ - | BBHA9120D    | Schwarzbeck        | Horn Antenna             | BBHA9120D295  | Aug. 16, 2017 (2Y)   |
| ■ - | BBHA9170     | Schwarzbeck        | Horn Antenna             | BBHA91700179  | Jul. 28, 2017 (2Y)   |
| ■ - | SCU40A       | Rohde & Schwarz    | Pre-Amplifier            | 100436        | Apr. 04, 2017 (1Y)   |

All test equipment used is calibrated on a regular basis.

## 13.4 Test data

### 13.4.1 Test data for Charging Mode

#### 13.4.1.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 48 % R.H.

Temperature: 23 °C

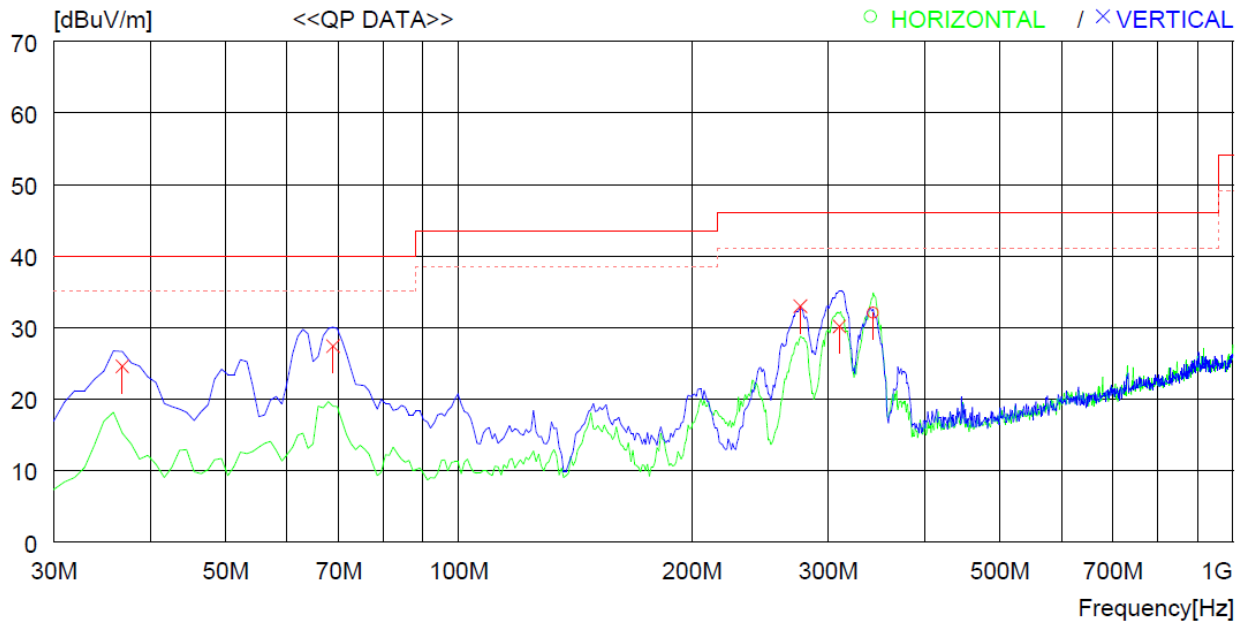
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : 2128 Bluetooth Handheld RFID Reader

Date: December 15, 2017

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)



| No.                    | FREQ    | READING | ANT    | LOSS | GAIN | RESULT   | LIMIT    | MARGIN | ANTENNA | TABLE |
|------------------------|---------|---------|--------|------|------|----------|----------|--------|---------|-------|
|                        | [MHz]   | QP      | FACTOR | [dB] | [dB] | [dBuV/m] | [dBuV/m] | [dB]   | [cm]    | [DEG] |
| ----- Horizontal ----- |         |         |        |      |      |          |          |        |         |       |
| 1                      | 343.310 | 46.2    | 14.6   | 4.3  | 33.1 | 32.0     | 46.0     | 14.0   | 100     | 121   |
| ----- Vertical -----   |         |         |        |      |      |          |          |        |         |       |
| 2                      | 36.790  | 42.5    | 13.6   | 1.5  | 33.1 | 24.5     | 40.0     | 15.5   | 100     | 5     |
| 3                      | 68.800  | 48.7    | 9.8    | 2.0  | 33.1 | 27.4     | 40.0     | 12.6   | 200     | 38    |
| 4                      | 276.380 | 49.1    | 12.9   | 3.9  | 33.0 | 32.9     | 46.0     | 13.1   | 200     | 348   |
| 5                      | 310.330 | 45.3    | 13.7   | 4.1  | 33.0 | 30.1     | 46.0     | 15.9   | 200     | 359   |

Tested by: Min-Gu Ji / Assistant Manager

#### 13.4.1.2 Test data for Below 30 MHz

- . Test Date : December 15, 2017
- . Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- . Frequency range : 9 kHz ~ 30 MHz
- . Measurement distance : 3 m
- . Operating Condition : Charging Mode
- . Result : PASSED

| Frequency (MHz)                               | Reading (dBμV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|-----------------------------------------------|----------------|-----------------|-----------------|-----------|--------------------|------------|------------------------|-----------------|-------------|
| Any emissions were not observed from the EUT. |                |                 |                 |           |                    |            |                        |                 |             |

#### 13.4.1.3 Test data for above 1 GHz

- . Test Date : December 15, 2017
- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Operating Condition : Charging Mode
- . Result : PASSED

| Frequency (MHz)                               | Reading (dBμV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|-----------------------------------------------|----------------|-----------------|-----------------|-----------|--------------------|------------|------------------------|-----------------|-------------|
| Any emissions were not observed from the EUT. |                |                 |                 |           |                    |            |                        |                 |             |



Tested by: Min-Gu Ji / Assistant Manager

### 13.4.2 Test data for RFID Mode

#### 13.4.2.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 48 % R.H.

Temperature: 23 °C

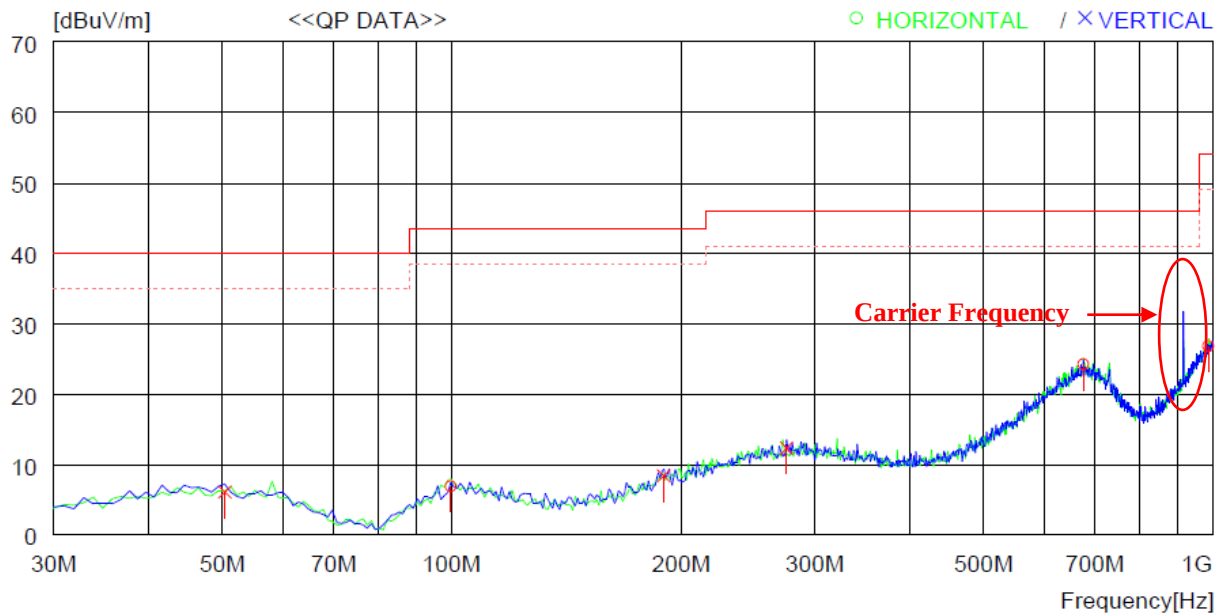
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : 2128 Bluetooth Handheld RFID Reader

Date: December 15, 2017

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)



| No.                    | FREQ<br>[MHz] | READING<br>QP<br>[dBuV] | ANT<br>FACTOR<br>[dB] | LOSS<br>[dB] | GAIN<br>[dB] | RESULT<br>[dBuV/m] | LIMIT<br>[dBuV/m] | MARGIN<br>[dB] | ANTENNA TABLE<br>[cm] | TABLE<br>[DEG] |
|------------------------|---------------|-------------------------|-----------------------|--------------|--------------|--------------------|-------------------|----------------|-----------------------|----------------|
| ----- Horizontal ----- |               |                         |                       |              |              |                    |                   |                |                       |                |
| 1                      | 99.840        | 25.1                    | 12.4                  | 2.4          | 33.0         | 6.9                | 43.5              | 36.6           | 200                   | 0              |
| 2                      | 676.016       | 32.1                    | 19.6                  | 6.0          | 33.5         | 24.2               | 46.0              | 21.8           | 200                   | 199            |
| 3                      | 986.406       | 28.7                    | 22.5                  | 7.3          | 31.7         | 26.8               | 54.0              | 27.2           | 400                   | 238            |
| ----- Vertical -----   |               |                         |                       |              |              |                    |                   |                |                       |                |
| 4                      | 50.370        | 23.4                    | 14.1                  | 1.7          | 33.1         | 6.1                | 40.0              | 33.9           | 100                   | 209            |
| 5                      | 190.050       | 27.2                    | 11.0                  | 3.3          | 33.1         | 8.4                | 43.5              | 35.1           | 100                   | 0              |
| 6                      | 275.410       | 28.5                    | 12.9                  | 3.9          | 33.0         | 12.3               | 46.0              | 33.7           | 200                   | 308            |

*DL*

Tested by: Min-Gu Ji / Assistant Manager

### 13.4.2.2 Test data for Below 30 MHz

- . Test Date : December 15, 2017
- . Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- . Frequency range : 9 kHz ~ 30 MHz
- . Measurement distance : 3 m
- . Operating Condition : RFID Mode
- . Result : PASSED

| Frequency<br>(MHz)                            | Reading<br>(dBμV) | Ant. Pol.<br>(H/V) | Ant. Factor<br>(dB/m) | Cable<br>Loss | Amp<br>Gain | Emission<br>Level(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) |
|-----------------------------------------------|-------------------|--------------------|-----------------------|---------------|-------------|---------------------------|--------------------|----------------|
| Any emissions were not observed from the EUT. |                   |                    |                       |               |             |                           |                    |                |

### 13.4.2.3 Test data for above 1 GHz

- . Test Date : December 15, 2017
- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Operating Condition : RFID Mode
- . Result : PASSED

| Frequency<br>(MHz)                            | Reading<br>(dBμV) | Ant. Pol.<br>(H/V) | Ant.<br>Height (m) | Angle<br>(°) | Ant. Factor<br>(dB/m) | Cable<br>Loss | Emission<br>Level(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) |
|-----------------------------------------------|-------------------|--------------------|--------------------|--------------|-----------------------|---------------|---------------------------|--------------------|----------------|
| Any emissions were not observed from the EUT. |                   |                    |                    |              |                       |               |                           |                    |                |



Tested by: Min-Gu Ji / Assistant Manager

### 13.4.3 Test data for RFID+BT Mode

#### 13.4.3.1 Test data for Below 30 MHz

- . Test Date : December 15, 2017
- . Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- . Frequency range : 9 kHz ~ 30 MHz
- . Measurement distance : 3 m
- . Operating Condition : RFID+BT Mode
- . Result : PASSED

| Frequency<br>(MHz)                            | Reading<br>(dB $\mu$ V) | Ant. Pol.<br>(H/V) | Ant. Factor<br>(dB/m) | Cable<br>Loss | Amp<br>Gain | Emission<br>Level(dB $\mu$ V/m) | Limits<br>(dB $\mu$ V/m) | Margin<br>(dB) |
|-----------------------------------------------|-------------------------|--------------------|-----------------------|---------------|-------------|---------------------------------|--------------------------|----------------|
| Any emissions were not observed from the EUT. |                         |                    |                       |               |             |                                 |                          |                |



Tested by: Min-Gu Ji / Assistant Manager

### 13.4.3.2 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 48 % R.H.

Temperature: 23 °C

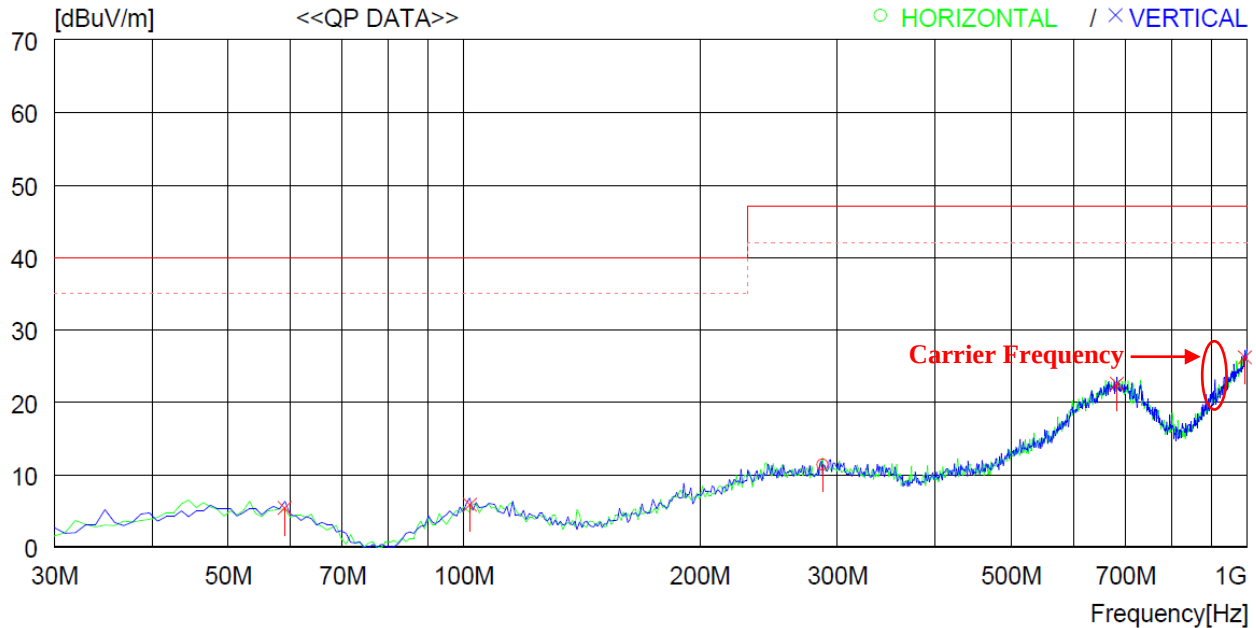
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : 2128 Bluetooth Handheld RFID Reader

Date: December 15, 2017

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)



| No.                    | FREQ    | READING | ANT    | LOSS | GAIN | RESULT   | LIMIT    | MARGIN | ANTENNA | TABLE |
|------------------------|---------|---------|--------|------|------|----------|----------|--------|---------|-------|
|                        | [MHz]   | QF      | FACTOR | [dB] | [dB] | [dBuV/m] | [dBuV/m] | [dB]   | [cm]    | [DEG] |
| ----- Horizontal ----- |         |         |        |      |      |          |          |        |         |       |
| 1                      | 287.050 | 27.7    | 12.8   | 3.9  | 33.0 | 11.4     | 47.0     | 35.6   | 400     | 0     |
| ----- Vertical -----   |         |         |        |      |      |          |          |        |         |       |
| 2                      | 59.100  | 23.2    | 13.4   | 1.9  | 33.1 | 5.4      | 40.0     | 34.6   | 300     | 0     |
| 3                      | 101.780 | 24.5    | 12.0   | 2.4  | 33.0 | 5.9      | 40.0     | 34.1   | 400     | 19    |
| 4                      | 681.835 | 30.8    | 19.3   | 6.0  | 33.5 | 22.6     | 47.0     | 24.4   | 200     | 352   |
| 5                      | 994.166 | 27.8    | 22.7   | 7.3  | 31.6 | 26.2     | 47.0     | 20.8   | 100     | 220   |

*Signature*

Tested by: Min-Gu Ji / Assistant Manager

### 13.4.3.3 Test data for above 1 GHz

Humidity Level : 48 % R.H.

Temperature: 23 °C

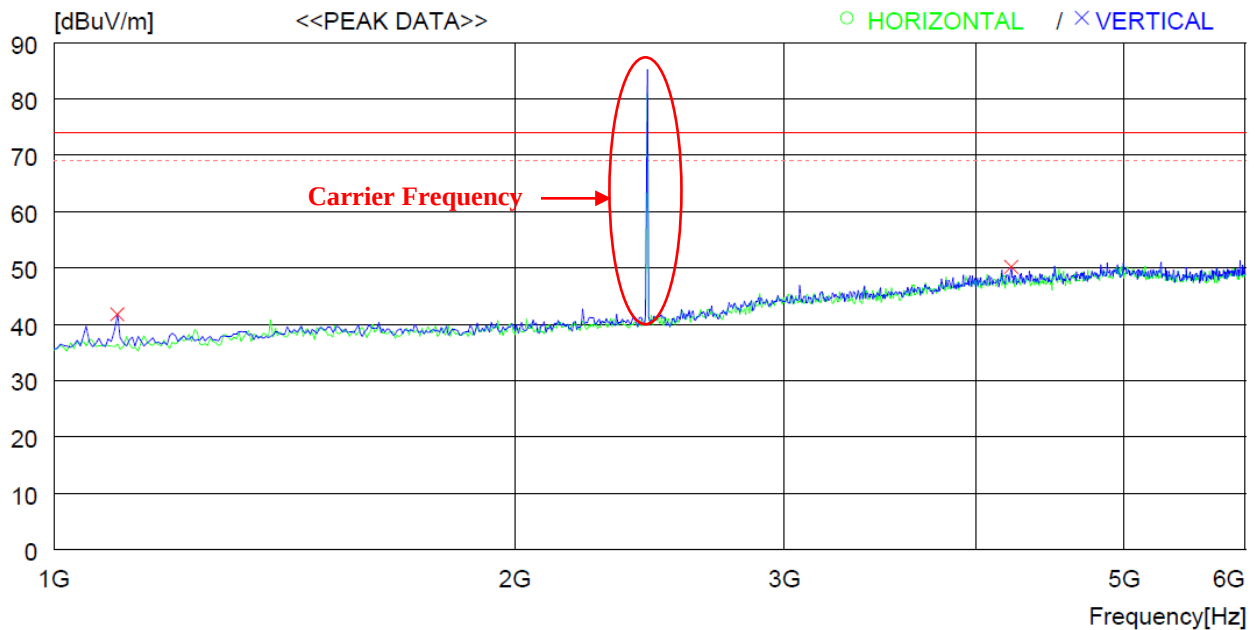
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : 2128 Bluetooth Handheld RFID Reader

Date: December 15, 2017

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)



| No.                  | FREQ<br>[MHz] | READING<br>PEAK<br>[dBuV] | ANT<br>FACTOR<br>[dB] | LOSS<br>[dB] | GAIN<br>[dB] | RESULT<br>[dBuV/m] | LIMIT<br>[dBuV/m] | MARGIN<br>[dB] | ANTENNA<br>[cm] | TABLE<br>[DEG] |
|----------------------|---------------|---------------------------|-----------------------|--------------|--------------|--------------------|-------------------|----------------|-----------------|----------------|
| ----- Vertical ----- |               |                           |                       |              |              |                    |                   |                |                 |                |
| 1                    | 1100.000      | 45.8                      | 24.9                  | 6.8          | 35.7         | 41.8               | 74.0              | 32.2           | 100             | 359            |
| 2                    | 4220.000      | 41.3                      | 30.0                  | 12.0         | 33.1         | 50.2               | 74.0              | 23.8           | 100             | 359            |

*DL*

Tested by: Min-Gu Ji / Assistant Manager

## 14. CONDUCTED EMISSION TEST

### 14.1 Operating environment

Temperature : 23 °C  
Relative humidity : 45 % R.H

### 14.2 Test set-up

The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a 50  $\Omega$  / 50  $\mu$ H + 5  $\Omega$  Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

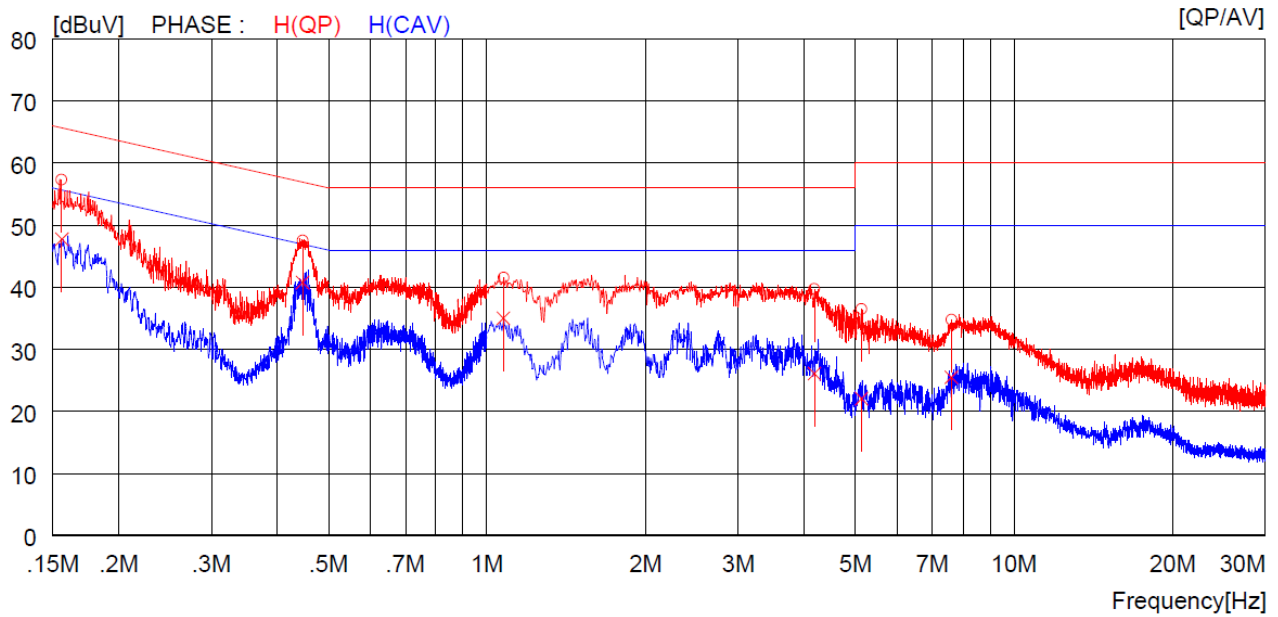
### 14.3 Test equipment used

|     | Model Number | Manufacturer    | Description       | Serial Number | Last Cal. (Interval) |
|-----|--------------|-----------------|-------------------|---------------|----------------------|
| ■ - | ESCI         | Rohde & Schwarz | EMI Test Receiver | 101012        | Oct. 27, 2017 (1Y)   |
| □ - | ESHS10       | Rohde & Schwarz | EMI Test Receiver | 834467/007    | Apr. 03, 2017 (1Y)   |
| ■ - | NSLK8128     | Schwarzbeck     | AMN               | 8128-216      | Apr. 05, 2017 (1Y)   |
| □ - | NSLK8126     | Schwarzbeck     | AMN               | 8126-404      | Apr. 03, 2017 (1Y)   |
| □ - | 3825/2       | EMCO            | AMN               | 9109-1869     | Apr. 06, 2017 (1Y)   |

All test equipment used is calibrated on a regular basis.

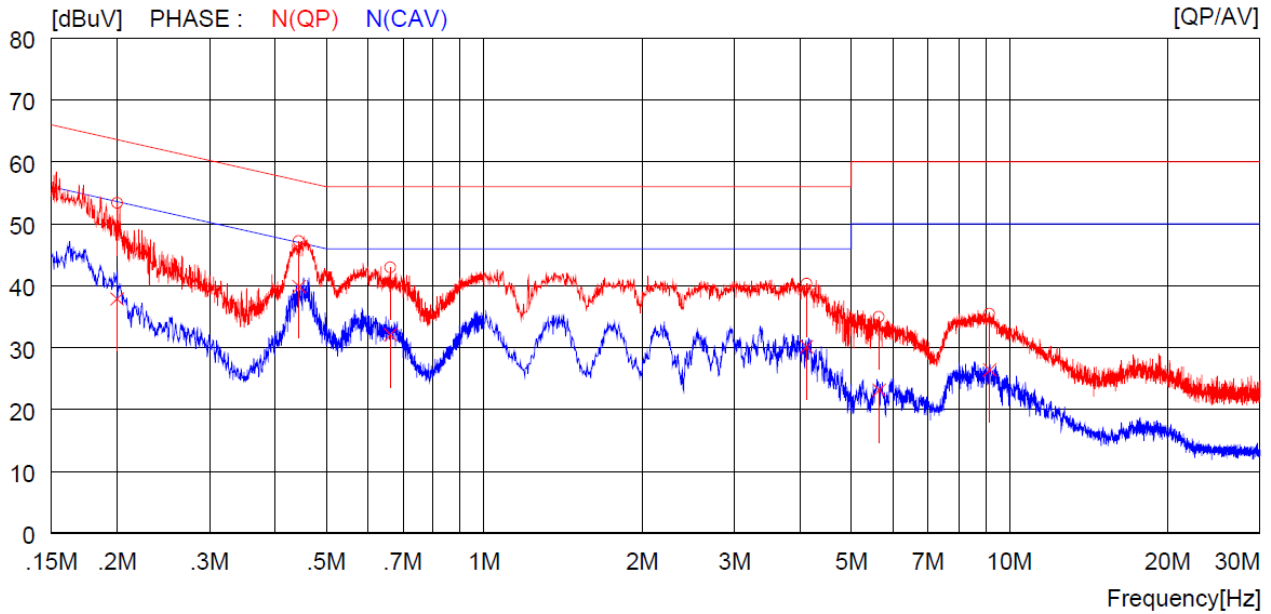
#### 14.4 Test data for Charging Mode

- Test Date : December 15, 2017
- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Tested Line : HOT LINE



| NO | FREQ<br>[MHz] | READING      |              | C.FACTOR<br>[dB] | RESULT       |              | LIMIT        |              | MARGIN       |              | PHASE   |
|----|---------------|--------------|--------------|------------------|--------------|--------------|--------------|--------------|--------------|--------------|---------|
|    |               | QP<br>[dBuV] | AV<br>[dBuV] |                  | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dBuV] | AV<br>[dBuV] |         |
| 1  | 0.15600       | 47.3         | ----         | 10.0             | 57.3         | ----         | 65.7         | ----         | 8.4          | ----         | H (QP)  |
| 2  | 0.44700       | 37.5         | ----         | 10.0             | 47.5         | ----         | 56.9         | ----         | 9.4          | ----         | H (QP)  |
| 3  | 1.07600       | 31.4         | ----         | 10.1             | 41.5         | ----         | 56.0         | ----         | 14.5         | ----         | H (QP)  |
| 4  | 4.18000       | 29.5         | ----         | 10.2             | 39.7         | ----         | 56.0         | ----         | 16.3         | ----         | H (QP)  |
| 5  | 5.14000       | 26.3         | ----         | 10.2             | 36.5         | ----         | 60.0         | ----         | 23.5         | ----         | H (QP)  |
| 6  | 7.61500       | 24.5         | ----         | 10.3             | 34.8         | ----         | 60.0         | ----         | 25.2         | ----         | H (QP)  |
| 7  | 0.15600       | ----         | 37.7         | 10.0             | ----         | 47.7         | ----         | 55.7         | ----         | 8.0          | H (CAV) |
| 8  | 0.44700       | ----         | 30.8         | 10.0             | ----         | 40.8         | ----         | 46.9         | ----         | 6.1          | H (CAV) |
| 9  | 1.07600       | ----         | 24.9         | 10.1             | ----         | 35.0         | ----         | 46.0         | ----         | 11.0         | H (CAV) |
| 10 | 4.18000       | ----         | 15.9         | 10.2             | ----         | 26.1         | ----         | 46.0         | ----         | 19.9         | H (CAV) |
| 11 | 5.14000       | ----         | 11.9         | 10.2             | ----         | 22.1         | ----         | 50.0         | ----         | 27.9         | H (CAV) |
| 12 | 7.61500       | ----         | 15.2         | 10.3             | ----         | 25.5         | ----         | 50.0         | ----         | 24.5         | H (CAV) |

-. Tested Line : NEUTRAL LINE



| NO | FREQ<br>[MHz] | READING      |              | C.FACTOR<br>[dB] | RESULT       |              | LIMIT        |              | MARGIN       |              | PHASE   |
|----|---------------|--------------|--------------|------------------|--------------|--------------|--------------|--------------|--------------|--------------|---------|
|    |               | QP<br>[dBuV] | AV<br>[dBuV] |                  | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dBuV] | AV<br>[dBuV] |         |
| 1  | 0.20000       | 43.3         | ----         | 10.0             | 53.3         | ----         | 63.6         | ----         | 10.3         | ----         | N (QP)  |
| 2  | 0.44400       | 37.2         | ----         | 10.0             | 47.2         | ----         | 57.0         | ----         | 9.8          | ----         | N (QP)  |
| 3  | 0.66300       | 32.9         | ----         | 10.1             | 43.0         | ----         | 56.0         | ----         | 13.0         | ----         | N (QP)  |
| 4  | 4.11200       | 30.1         | ----         | 10.2             | 40.3         | ----         | 56.0         | ----         | 15.7         | ----         | N (QP)  |
| 5  | 5.64500       | 24.8         | ----         | 10.2             | 35.0         | ----         | 60.0         | ----         | 25.0         | ----         | N (QP)  |
| 6  | 9.16500       | 25.1         | ----         | 10.4             | 35.5         | ----         | 60.0         | ----         | 24.5         | ----         | N (QP)  |
| 7  | 0.20000       | ----         | 27.9         | 10.0             | ----         | 37.9         | ----         | 53.6         | ----         | 15.7         | N (CAV) |
| 8  | 0.44400       | ----         | 29.9         | 10.0             | ----         | 39.9         | ----         | 47.0         | ----         | 7.1          | N (CAV) |
| 9  | 0.66300       | ----         | 22.0         | 10.1             | ----         | 32.1         | ----         | 46.0         | ----         | 13.9         | N (CAV) |
| 10 | 4.11200       | ----         | 20.0         | 10.2             | ----         | 30.2         | ----         | 46.0         | ----         | 15.8         | N (CAV) |
| 11 | 5.64500       | ----         | 13.0         | 10.2             | ----         | 23.2         | ----         | 50.0         | ----         | 26.8         | N (CAV) |
| 12 | 9.16500       | ----         | 16.0         | 10.4             | ----         | 26.4         | ----         | 50.0         | ----         | 23.6         | N (CAV) |

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

  
Tested by: Min-Gu Ji / Assistant Manager