



# RF TEST REPORT

**Report No.:** SET2019-07969

**Product Name:** Mobile Data Terminal

**FCC ID:** 2AC6AC71B

**Model No. :** C71

**Applicant:** Shenzhen Chainway Information Technology Co.,Ltd.

**Address:** 9/F, Building 2, Daqian Industrial Park, Longchang Rd., District 67,  
Bao'an, Shenzhen, China.

**Dates of Testing:** 07/01/2019 — 09/16/2019

**Issued by:** CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.

**Lab Location:** Building 28/29, East of Shigu Xili Industrial Zone, Nanshan District  
Shenzhen, Guangdong 518055, China.

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## Test Report

**Product Name** .....: Mobile Data Terminal

**Brand Name** .....: CHAINWAY

**Trade Name** .....: CHAINWAY

**Applicant**.....: Shenzhen Chainway Information Technology Co.,Ltd.

**Applicant Address**.....: 9/F, Building 2, Daqian Industrial Park, Longchang Rd.,  
District 67, Bao'an, Shenzhen China.

**Manufacturer** .....: Shenzhen Chainway Information Technology Co.,Ltd.

**Manufacturer Address** .....: 9/F, Building 2, Daqian Industrial Park, Longchang Rd.,  
District 67, Bao'an, Shenzhen China.

**Test Standards**.....: 47 CFR Part 15 Subpart C  
ANSI C63.10:2013

**Test Result** .....: PASS

**Tested by** .....: Robin Luo 2019.07.09  
Robin Luo, Test Engineer

**Reviewed by** .....: Chris You 2019.07.09  
Chris You, Senior Engineer

**Approved by** .....: Shuangwen Zhang 2019.07.09  
Shuangwen Zhang, Manager

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| Change History |            |                   |
|----------------|------------|-------------------|
| Issue          | Date       | Reason for change |
| 1.0            | 2019.09.16 | First edition     |
|                |            |                   |
|                |            |                   |

## 1. General Information

### 1.1. EUT Description

|                   |                      |
|-------------------|----------------------|
| EUT Type          | Mobile Data Terminal |
| Power Supply      | DC 3.8V              |
| Frequency Range   | 902MHz~928MHz        |
| Operating Range   | 902.75MHz~927.25MHz  |
| Number of channel | 50                   |
| Modulation Type   | DSB-ASK              |
| Antenna Type      | Internal Antenna     |
| Antenna Gain      | 0dBi                 |

Note: the model C71 have 4 kinds appearance(color), not impact the device RF parameters and Electrical characteristics.

## 1.2. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C (ISM band radiators) for the EUT FCC ID Certification:

| No. | Identity                         | Document Title                                                        |
|-----|----------------------------------|-----------------------------------------------------------------------|
| 1   | 47 CFR Part 15<br>Subpart C 2017 | Radio Frequency Devices                                               |
| 2   | ANSI C63.10 2013                 | American National Standard for Testing<br>Unlicensed Wireless Devices |

Test detailed items/section required by FCC rules and results are as below:

| No. | Standard(s) Section | Description                                  | Result |
|-----|---------------------|----------------------------------------------|--------|
|     | FCC                 |                                              |        |
| 1   | 15.203              | Antenna Requirement                          | PASS   |
| 2   | 15.247(a)           | Number of Hopping Frequency                  | PASS   |
| 3   | 15.247(b)           | Peak Output Power                            | PASS   |
| 4   | 15.247(a)           | Bandwidth                                    | PASS   |
| 5   | 15.247(a)           | Carrier Frequency Separation                 | PASS   |
| 6   | 15.247(a)           | Time of Occupancy (Dwell time)               | PASS   |
| 7   | 15.247(d)           | Conducted Spurious Emission                  | PASS   |
| 8   | 15.247(d)           | Conducted Band Edge                          | PASS   |
| 9   | 15.207              | Conducted Emission                           | PASS   |
| 10  | 15.209<br>15.247(c) | Radiated Band Edges and Spurious<br>Emission | PASS   |

Note 1: The test of Radiated Emission was performed according to the method of measurements prescribed in ANSI C63.10 2013.

### 1.3. Description of Test Mode

| Channel | Frequency(MHz) | Channel | Frequency(MHz) |
|---------|----------------|---------|----------------|
| 1       | 902.75         | 26      | 915.25         |
| 2       | 903.25         | 27      | 915.75         |
| 3       | 903.75         | 28      | 916.25         |
| 4       | 904.25         | 29      | 916.75         |
| 5       | 904.75         | 30      | 917.25         |
| 6       | 905.25         | 31      | 917.75         |
| 7       | 905.75         | 32      | 918.25         |
| 8       | 906.25         | 33      | 918.75         |
| 9       | 906.75         | 34      | 919.25         |
| 10      | 907.25         | 35      | 919.75         |
| 11      | 907.75         | 36      | 920.25         |
| 12      | 908.25         | 37      | 920.75         |
| 13      | 908.75         | 38      | 921.25         |
| 14      | 909.25         | 39      | 921.75         |
| 15      | 909.75         | 40      | 922.25         |
| 16      | 910.25         | 41      | 922.75         |
| 17      | 910.75         | 42      | 923.25         |
| 18      | 911.25         | 43      | 923.75         |
| 19      | 911.75         | 44      | 924.25         |
| 20      | 912.25         | 45      | 924.75         |
| 21      | 912.75         | 46      | 925.25         |
| 22      | 913.25         | 47      | 925.75         |
| 23      | 913.75         | 48      | 926.25         |
| 24      | 914.25         | 49      | 926.75         |
| 25      | 914.75         | 50      | 927.25         |

Test channel: 1channel, 26 channel, 50channel

## 1.4. Facilities and Accreditations

### 1.4.1. Facilities

#### **CNAS-Lab Code: L1659**

CCIC-SET is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L1659.

#### **FCC-Registration No.: CN5031**

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Designation Number: CN5031, valid time is until December 31, 2018.

#### **ISED Registration: 11185A-1**

#### **CAB identifier:CN0064**

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 11185A-1 on Aug. 04, 2016, valid time is until Dec. 31, 2019.

#### **NVLAP Lab Code: 201008-0**

CCIC-SET is a third party testing organization accredited by NVLAP according to ISO/IEC 17025. The accreditation certificate number is 201008-0.

### Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

|                             |              |
|-----------------------------|--------------|
| Temperature (°C):           | 15 - 35      |
| Relative Humidity (%):      | 30 -60       |
| Atmospheric Pressure (kPa): | 86KPa-106KPa |

## 2. 47 CFR Part 15C Requirements

### 2.1. Antenna requirement

#### 2.1.1. Applicable Standard

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

And according to FCC 47 CFR Section 15.247(c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

#### 2.1.2. Antenna Information

**Antenna Category:** Internal Antenna

**Antenna General Information:**

| No. | EUT                  | Ant. Type        | Gain(dBi) |
|-----|----------------------|------------------|-----------|
| 1   | Mobile Data Terminal | Internal Antenna | 0         |

#### 2.1.3. Result: comply

The EUT has a unique antenna connector. Please refer to the EUT internal photos.

## 2.2. Number of Hopping Frequency

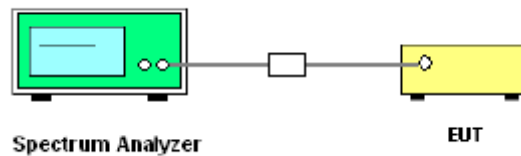
### 2.2.1. Limit of Number of Hopping Frequency

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies

### 2.2.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

### 2.2.3. Test Setup



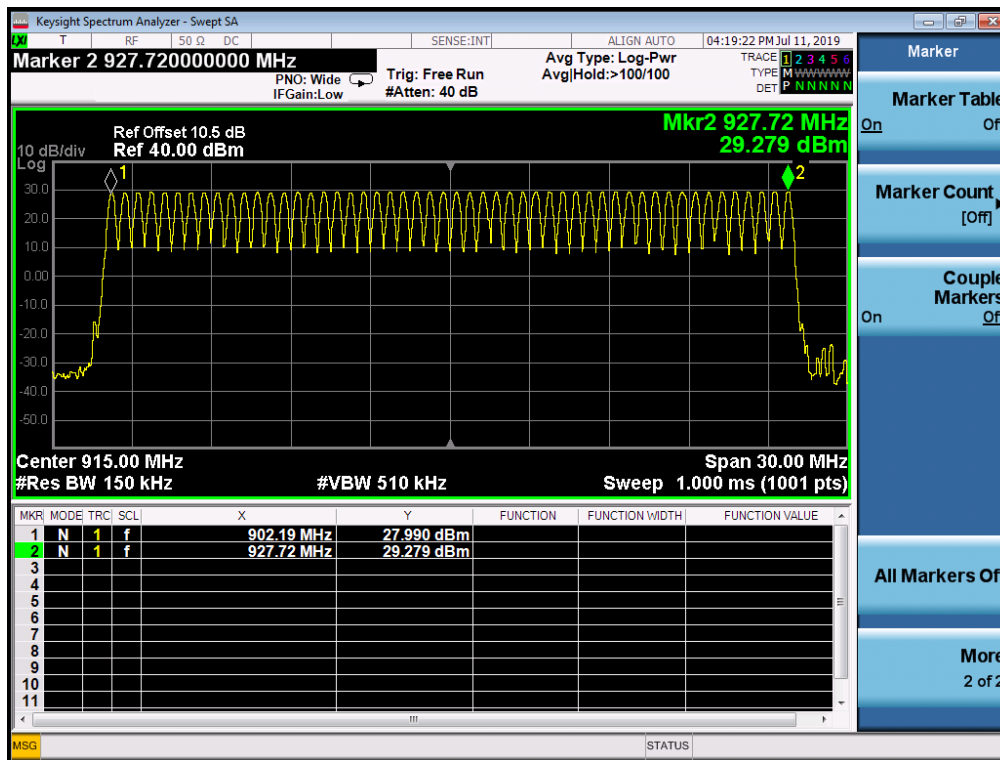
### 2.2.4. Test Procedure

1. The testing follows ANSI C63.10-2013 Clause 7.8.3
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = the frequency band of operation; Set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.  $VBW \geq RBW$ , Trace = max hold Sweep=auto, Detector function=peak.
6. The number of hopping frequency used is defined as the number of total channel.
7. Record the measurement data derived from spectrum analyzer.

### 2.2.5. Test Results of Number of Hopping Frequency

| Frequency (MHz) | Measured Channel Numbers | Min. Limit | Verdict |
|-----------------|--------------------------|------------|---------|
| 902 - 928       | 50                       | 50         | PASS    |

### 2.2.6. Test Results (plots) of Number of Hopping Frequency



## 2.3. Peak Output Power

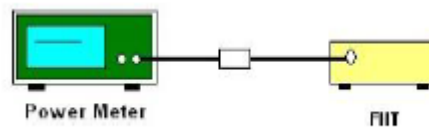
### 2.3.1. Limit of Peak Output Power

Section 15.247 (B)(2) For frequency hopping systems operating in the 902~928MHz band: 1 watt for systems employing at least 50 hopping channels.

### 2.3.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

### 2.3.3. Test Setup



### 2.3.4. Test Procedures

1. The testing follows ANSI C63.10-2013 Clause 7.8.5
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power with cable loss and record the results in the test report.
5. Measure and record the results in the test report.

### 2.3.5. Test Result of Output Power

| Channel | Frequency (MHz) | Measured Output Peak Power (dBm) | Limit (dBm) | Verdict |
|---------|-----------------|----------------------------------|-------------|---------|
| 1       | 902.75          | 28.34                            | 30          | PASS    |
| 26      | 915.25          | 28.71                            |             | PASS    |
| 50      | 927.25          | 28.88                            |             | PASS    |

## 2.4. Bandwidth

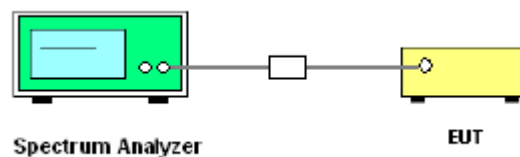
### 2.4.1. Definition

According to FCC §15.247(a)(1), the 20dB bandwidth is known as the 99% emission bandwidth, or 20dB bandwidth ( $10 \cdot \log 1\% = 20\text{dB}$ ) taking the total RF output power.

### 2.4.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

### 2.4.3. Test Setup



### 2.4.4. Test Procedure

1. The testing follows ANSI C63.10-2013 Clause 6.9.2
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Use the following spectrum analyzer settings for 20dB Bandwidth measurement.

Span = approximately 2 to 5 times the OBW, centered on a hopping channel;

RBW  $\geq$  1% to 5% of the OBW; VBW shall be approximately three times RBW; Sweep = auto; Detector function = peak; Trace = max hold.

5. Measure and record the results in the test report.

**2.4.5. Test Results of 20dB Bandwidth**

| Channel | Frequency (MHz) | 20dB Bandwidth (kHz) |
|---------|-----------------|----------------------|
| 1       | 902.75          | 249.1                |
| 26      | 915.25          | 243.9                |
| 50      | 927.25          | 165.9                |

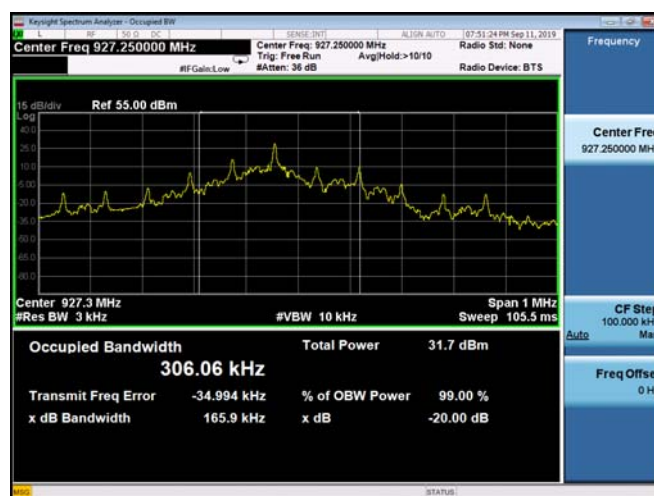
## 2.4.6. Test Results (plots) of Bandwidth



1 channel



26 channel



50 channel

## 2.5. Carried Frequency Separation

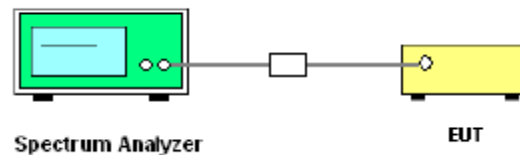
### 2.5.1. Limit of Carried Frequency Separation

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or 20dB bandwidth of the hopping channel, whichever is greater.

### 2.5.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

### 2.5.3. Test Setup



### 2.5.4. Test Procedure

1. The testing follows ANSI C63.10-2013 Clause 7.8.2.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.

The path loss was compensated to the results for each measurement.

3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels; RBW: Start with the RBW set to approximately 30% of the channel spacing;

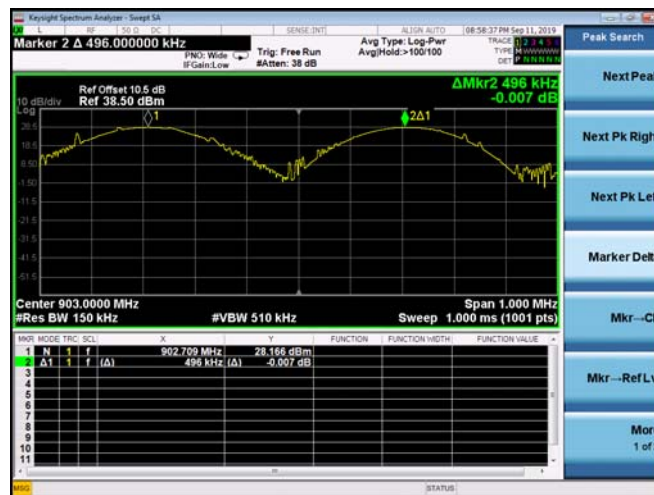
$VBW \geq RBW$ ; Sweep = auto; Detector function = peak; Trace = max hold.

6. Measure and record the results in the test report.

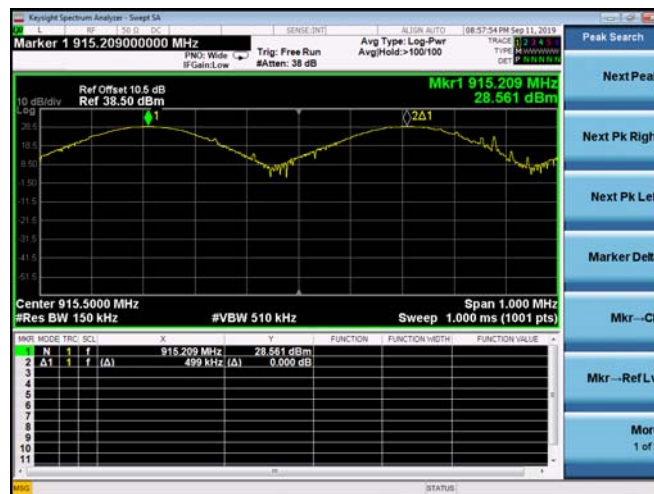
### 2.5.5. Test Results of Carried Frequency Separation

| Frequency Separation(kHz) | (20dB BW)<br>Limits (kHz) | Verdict |
|---------------------------|---------------------------|---------|
| 499                       | 496                       | PASS    |
| 506                       | 499                       | PASS    |
| 500                       | 498                       | PASS    |

### 2.5.6. Test Results (plots) of Carried Frequency Separation



L channel



M channel



H channel

## 2.6. Dwell time

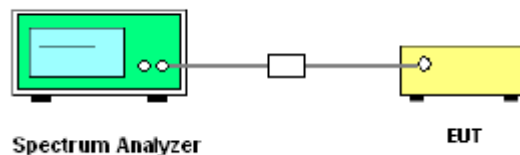
### 2.6.1. Limit of Dwell Time

the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period

### 2.6.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

### 2.6.3. Test Setup



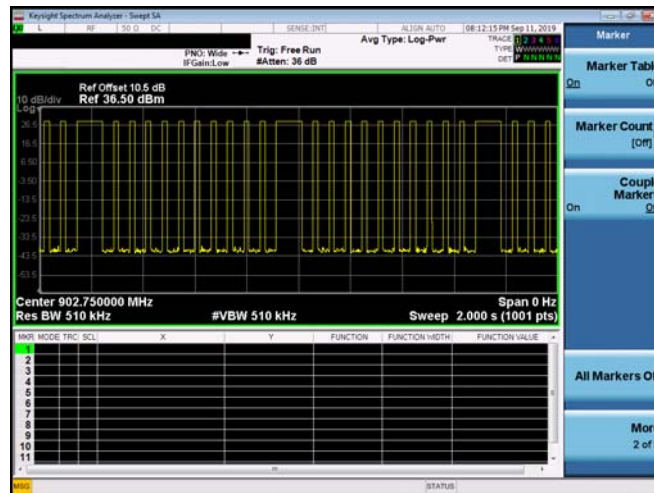
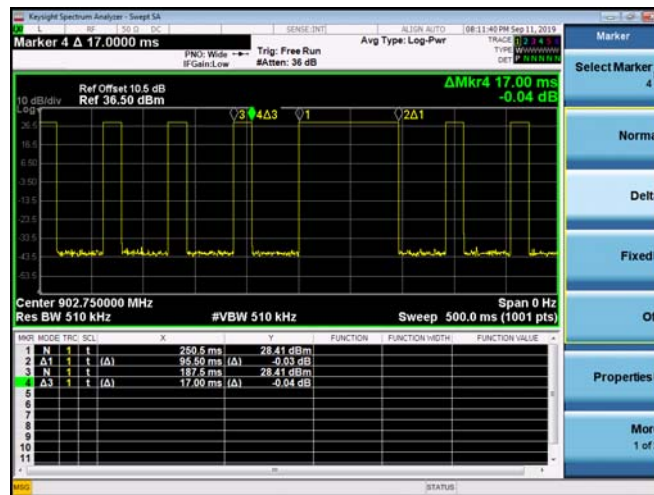
### 2.6.4. Test Procedure

1. The testing follows ANSI C63.10-2013 Clause 7.8.4.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.  
The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW shall be  $\leq$  channel spacing and where possible RBW should be set  $\gg 1 / T$ , where T is the expected dwell time per channel; VBW  $\geq$  RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

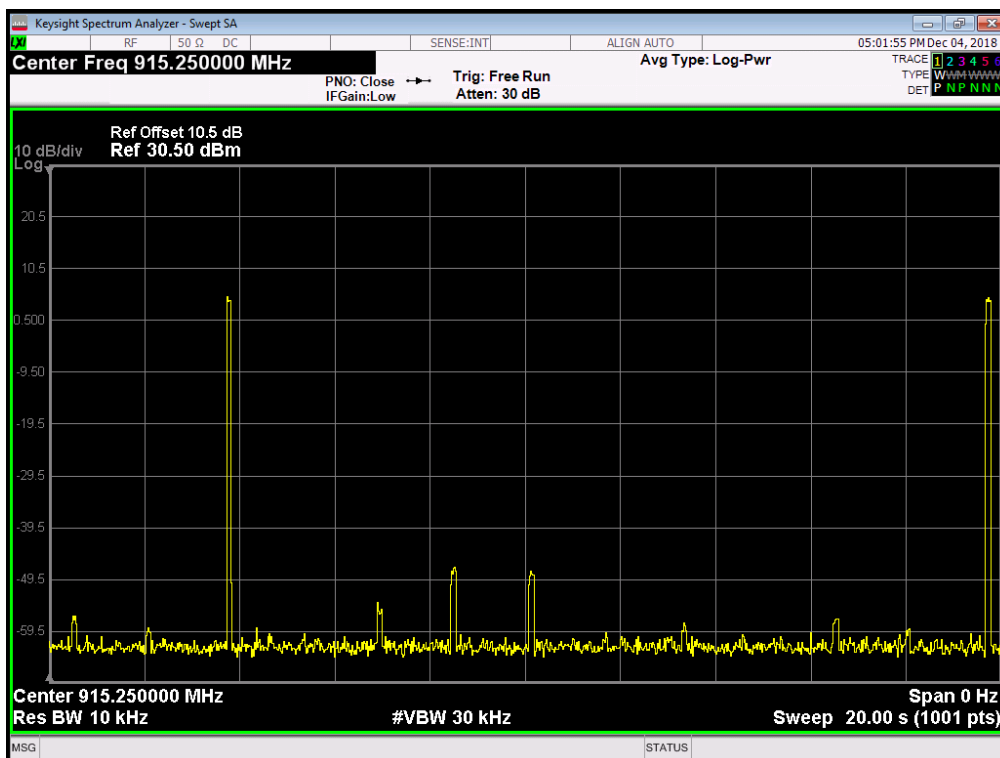
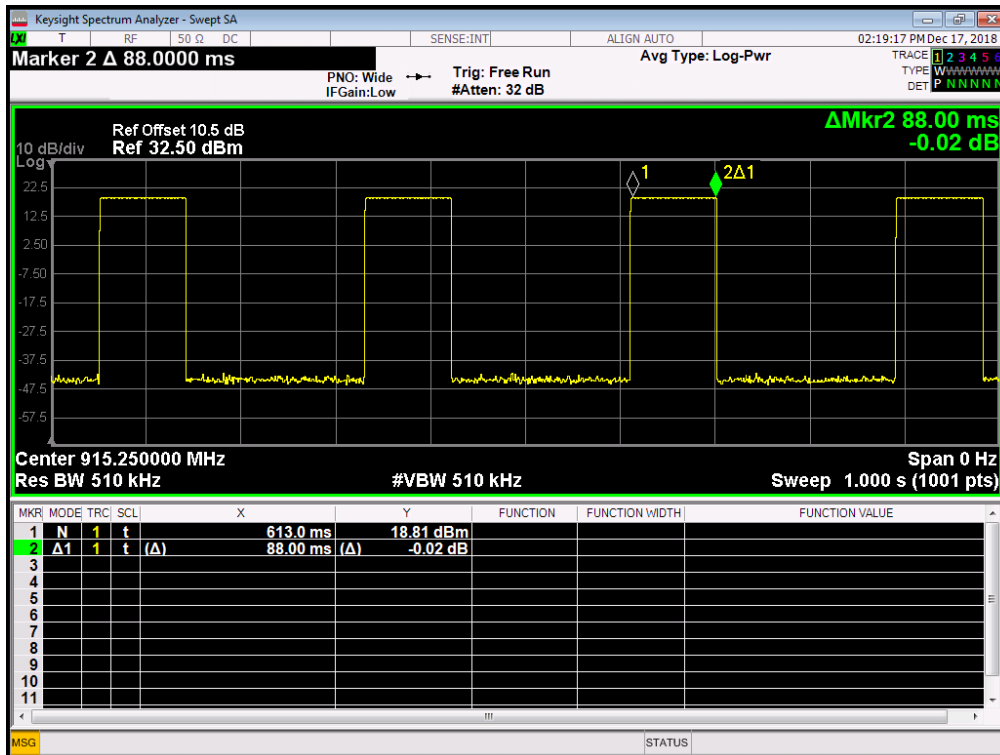
**2.6.5. Test Results of Dwell Time**

| Frequency<br>(MHz) | Length<br>(ms) | Number | Dwell Time<br>(ms) | Limit (ms) | Verdict |
|--------------------|----------------|--------|--------------------|------------|---------|
| 902.75             | 89             | 2      | 178                | 400        | PASS    |
| 915.25             | 88             | 2      | 176                |            | PASS    |
| 927.25             | 90             | 2      | 180                |            | PASS    |

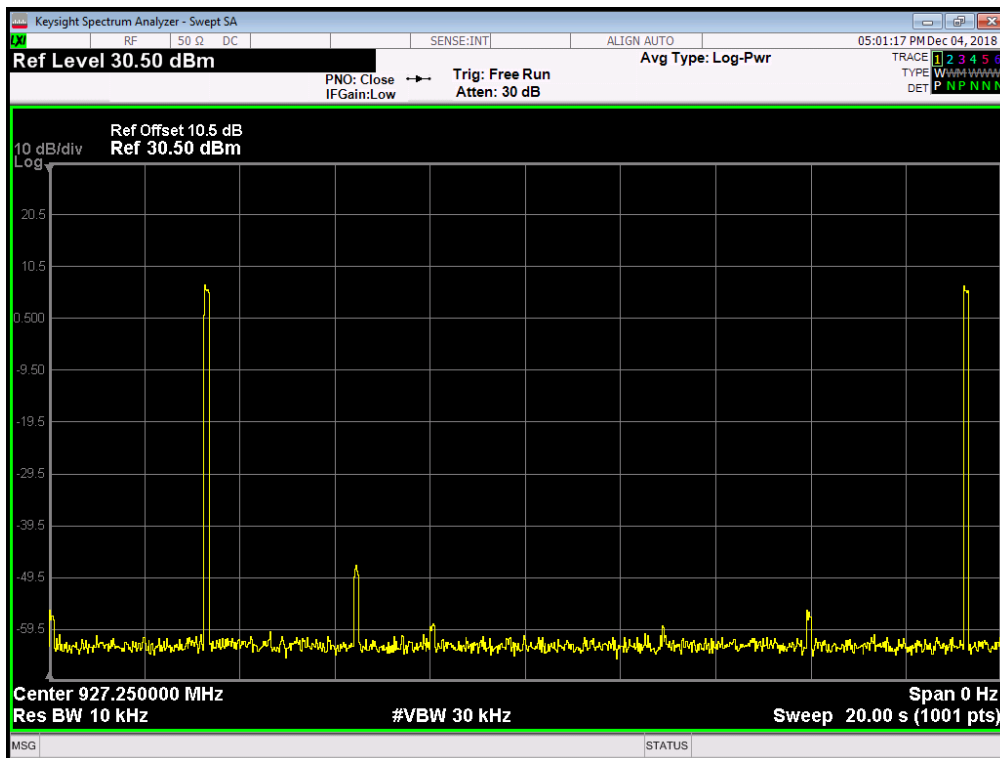
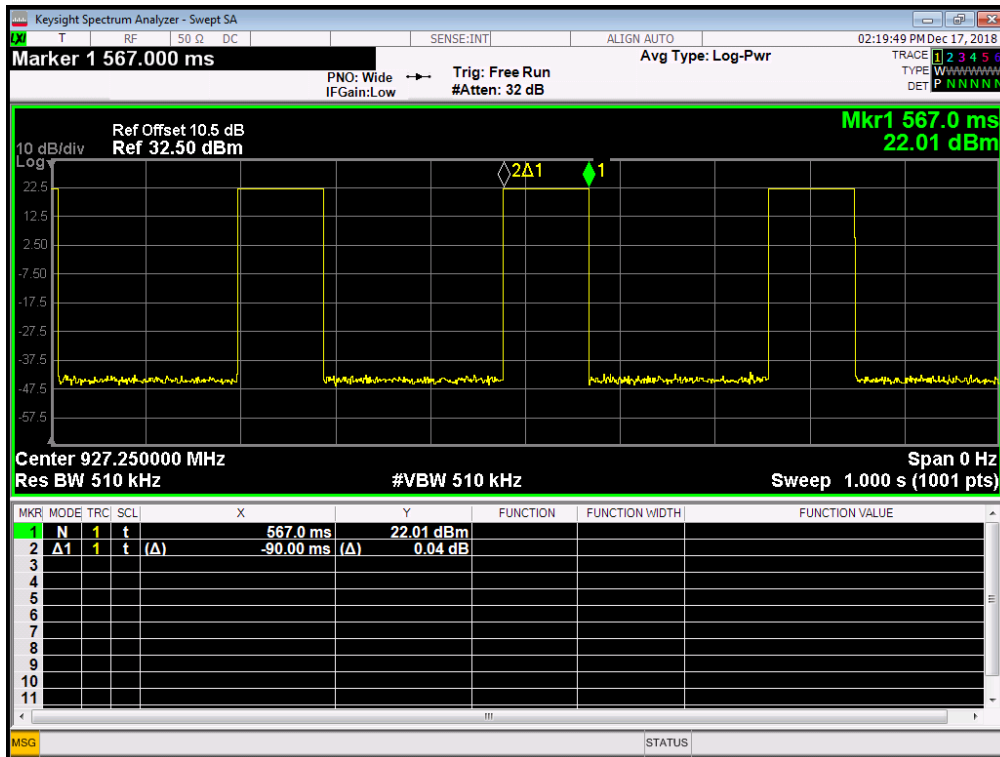
## 2.6.6. Test Results (plots) of Dwell Time



L channel



M channel



H channel

## 2.7. Conducted Spurious Emissions

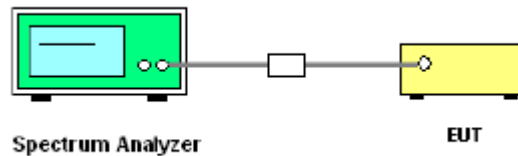
### 2.7.1. Limit of Spurious Emission

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

### 2.7.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

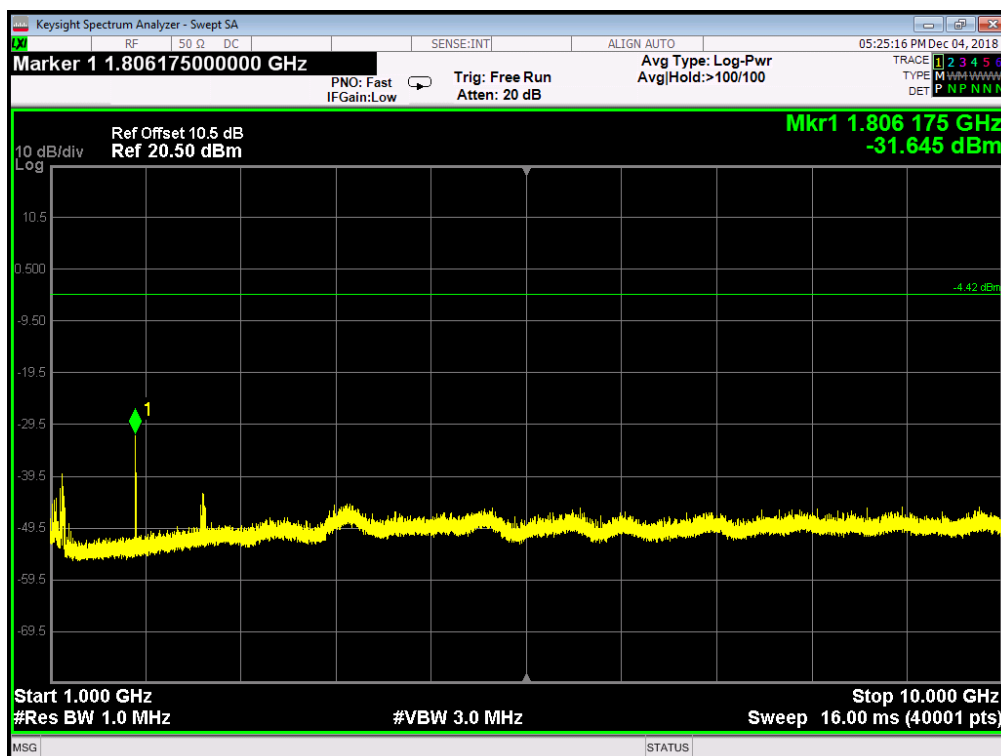
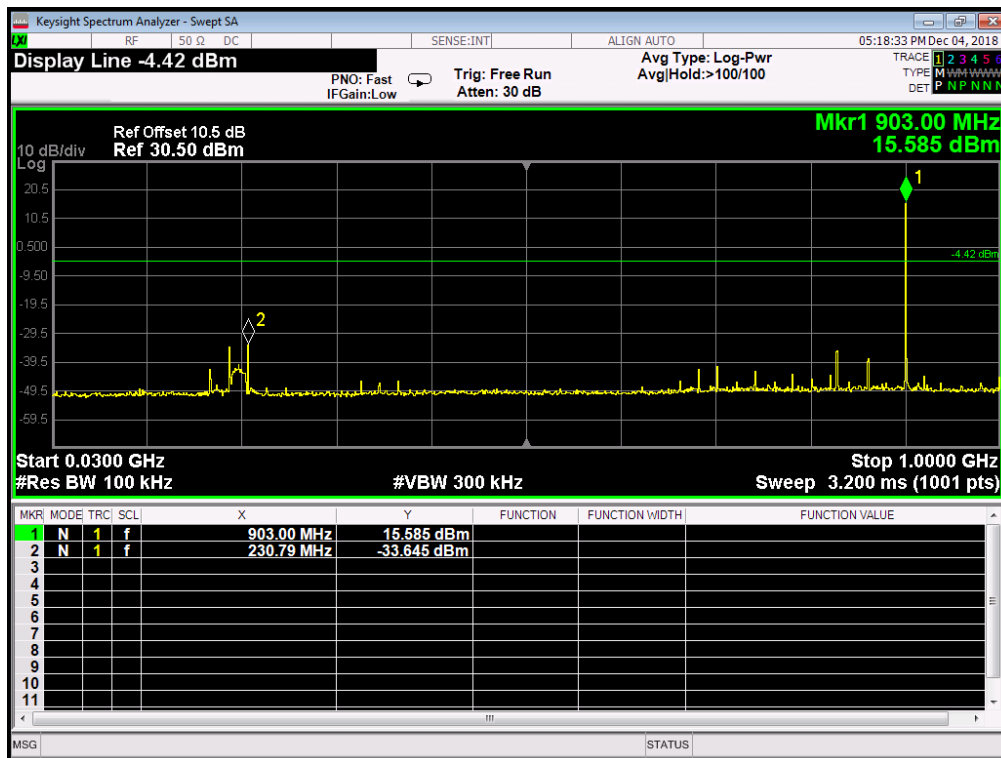
### 2.7.3. Test Setup



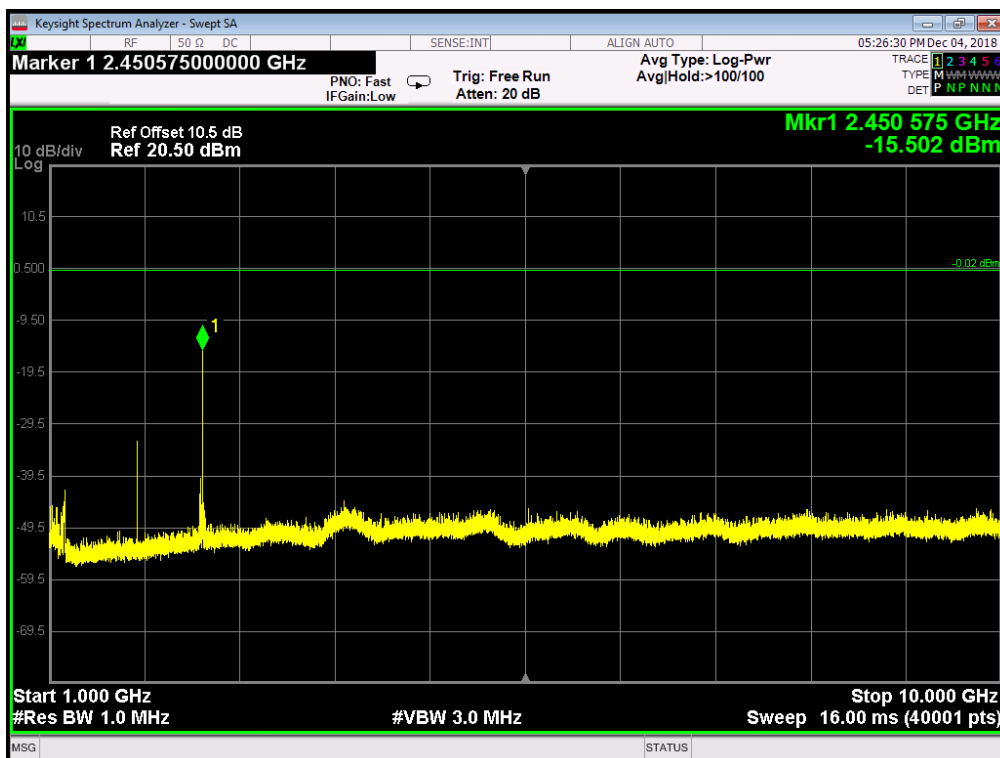
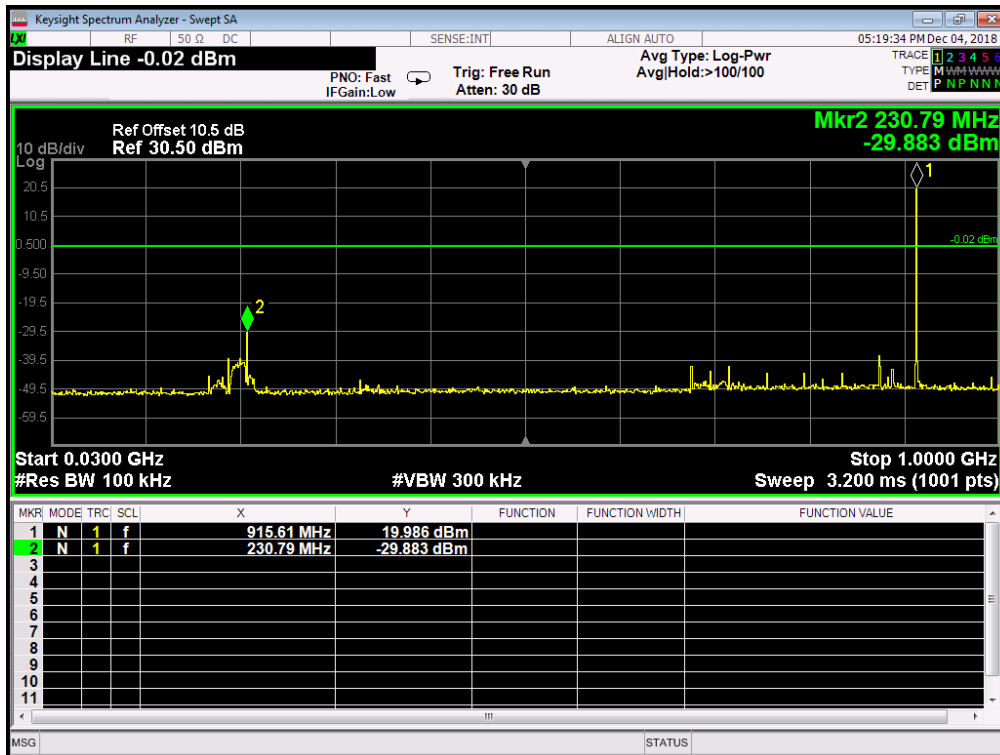
### 2.7.4. Test Procedure

1. The testing follows ANSI C63.10-2013 Clause 7.8.8.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW = 300 kHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

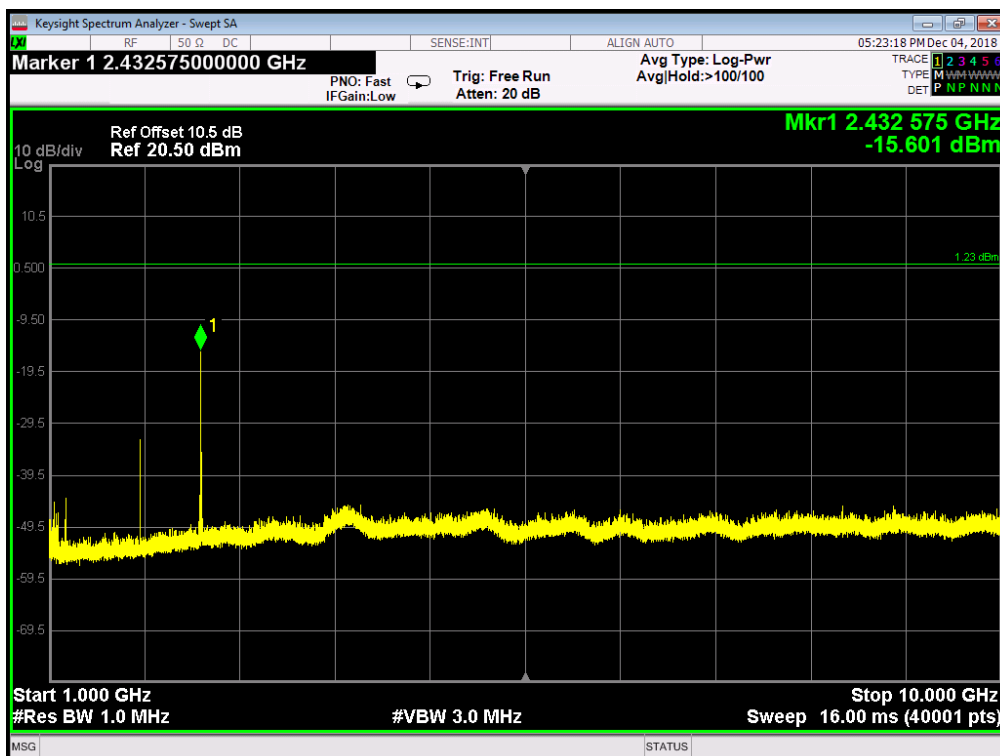
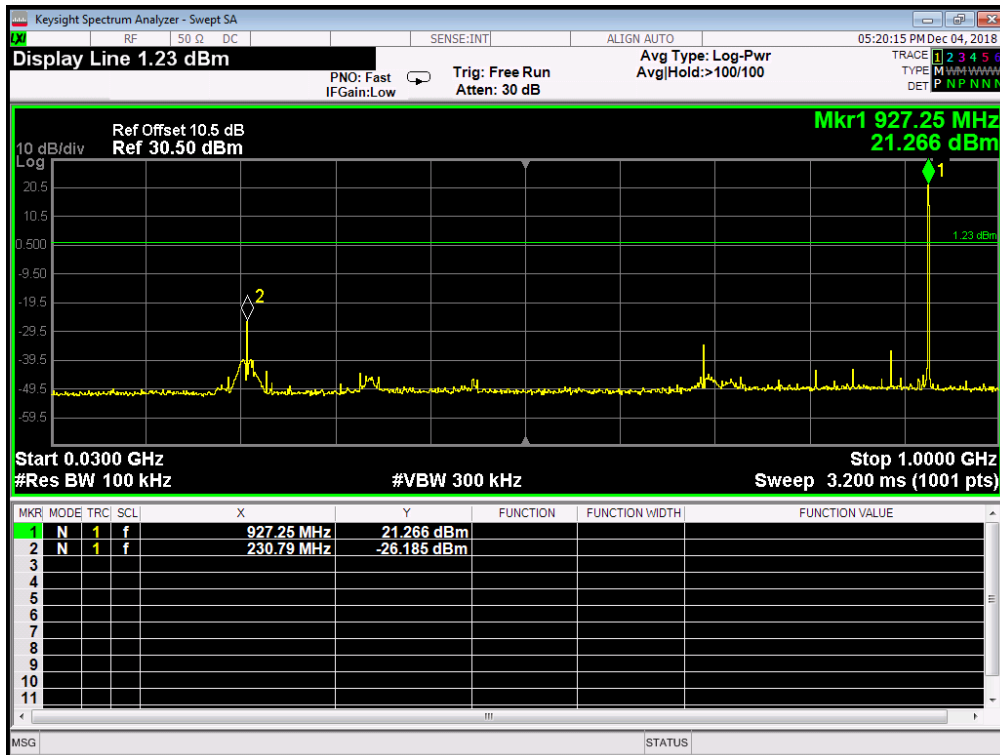
## 2.7.5. Test Results of Conducted Spurious Emissions



L channel



M channel



H channel

## 2.8. Conducted Band Edge

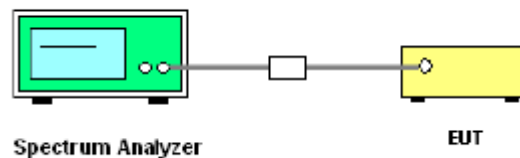
### 2.8.1. Limit of Band Edges

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

### 2.8.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

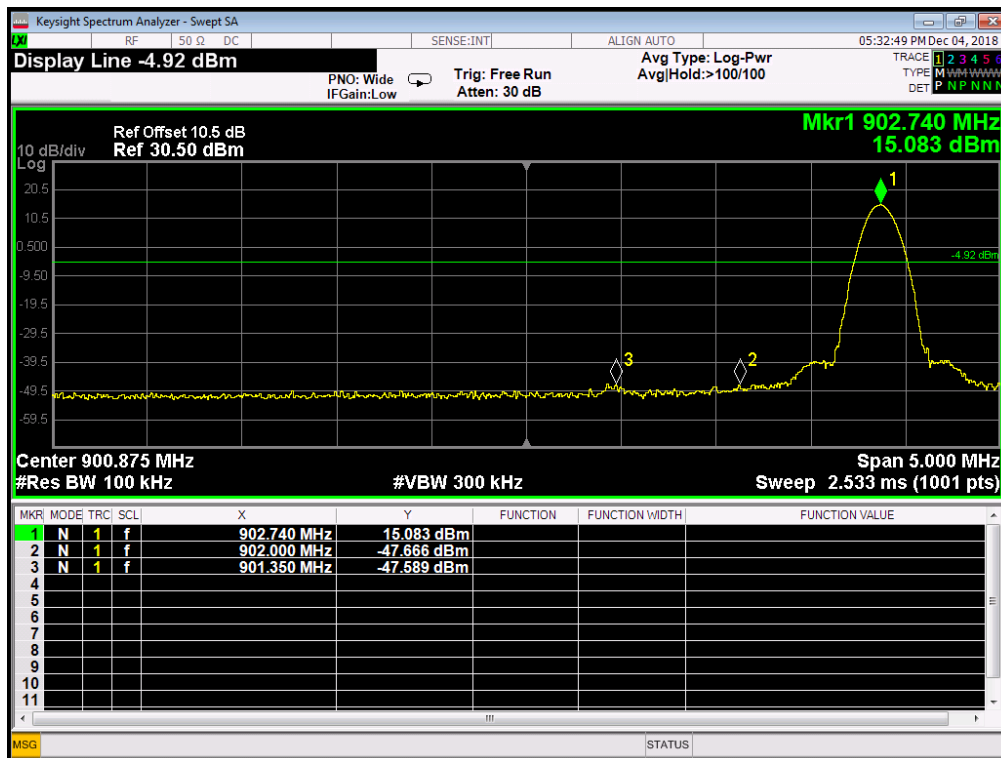
### 2.8.3. Test Setup



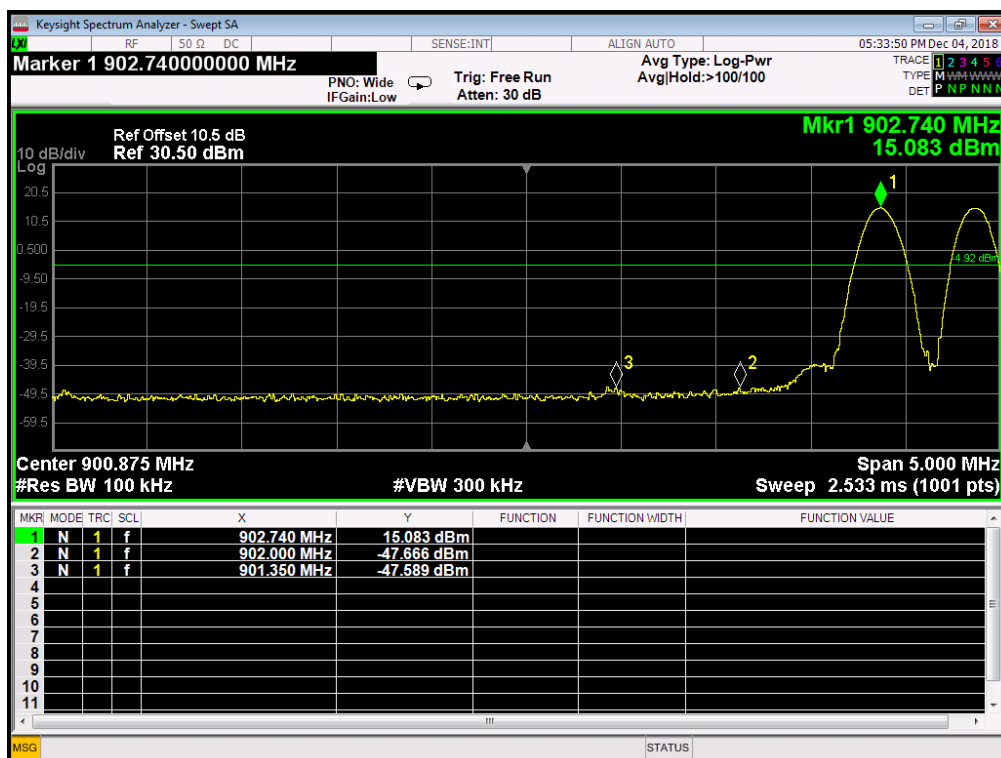
#### 2.8.1. Test Procedure

1. The testing follows ANSI C63.10-2013 Clause 7.8.6.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Set RBW = 100kHz ( $\geq 1\%$  span=5MHz ), VBW = 300kHz ( $\geq$ RBW). Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.
4. Enable hopping function of the EUT and then repeat step 2. and 3.
5. Measure and record the results in the test report.

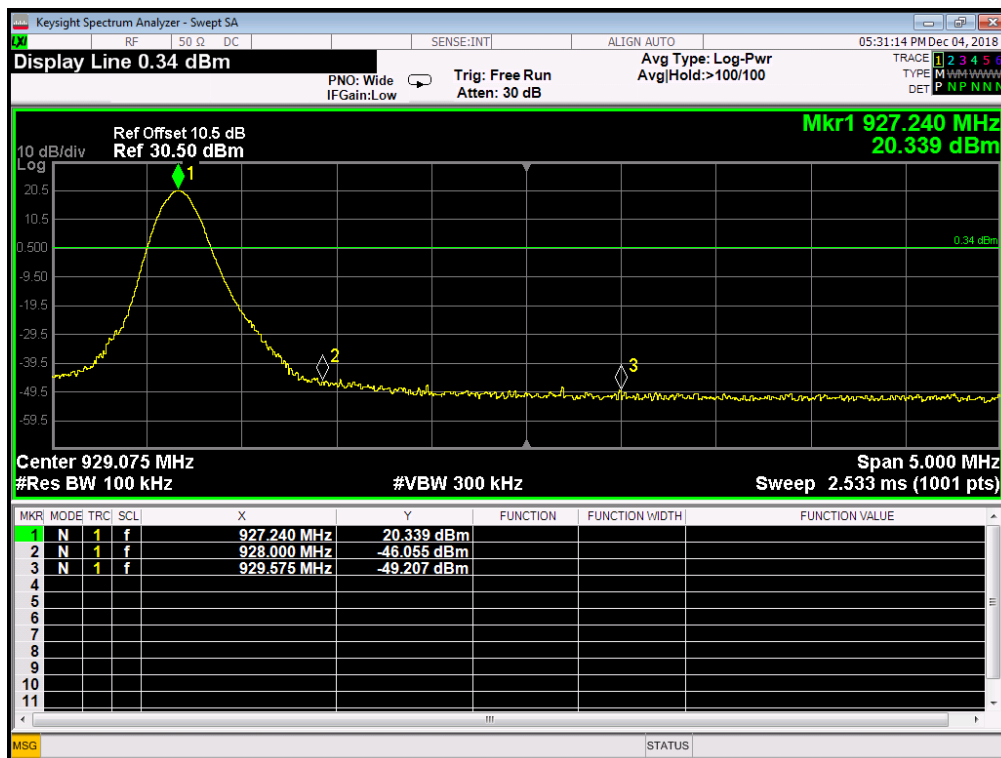
## 2.8.2. Test Results of Conducted Band Edge



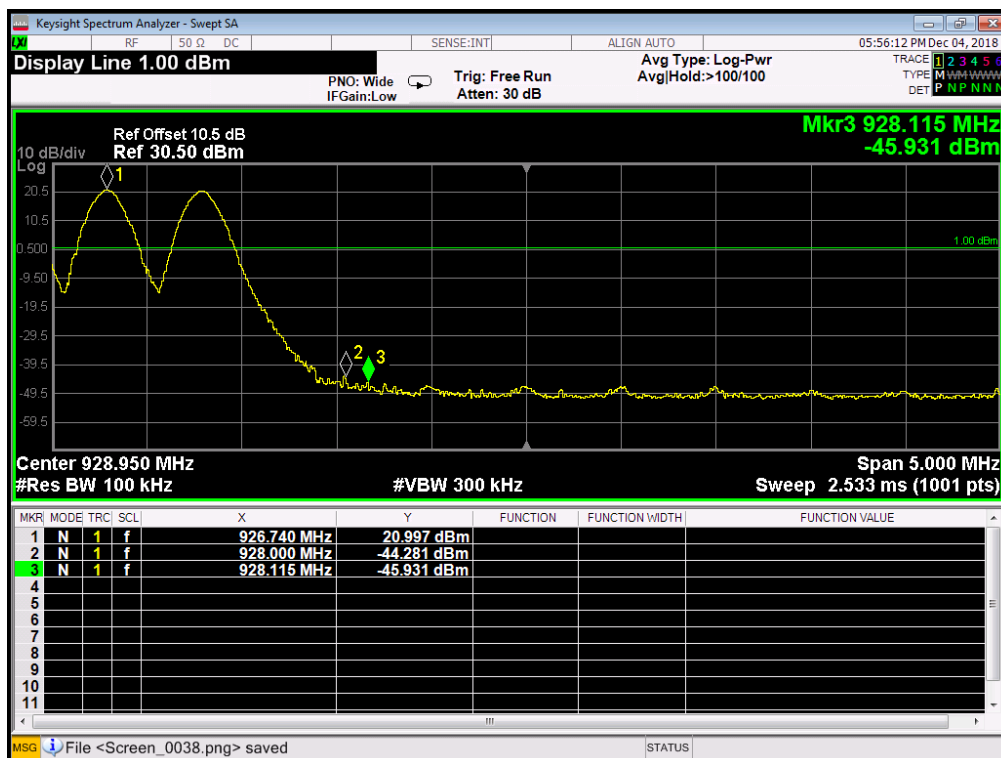
L channel



L channel Hopping Mode



H channel



H channel Hopping Mode

## 2.9. Conducted Emission

### 2.9.1. Limit of Conducted Emission

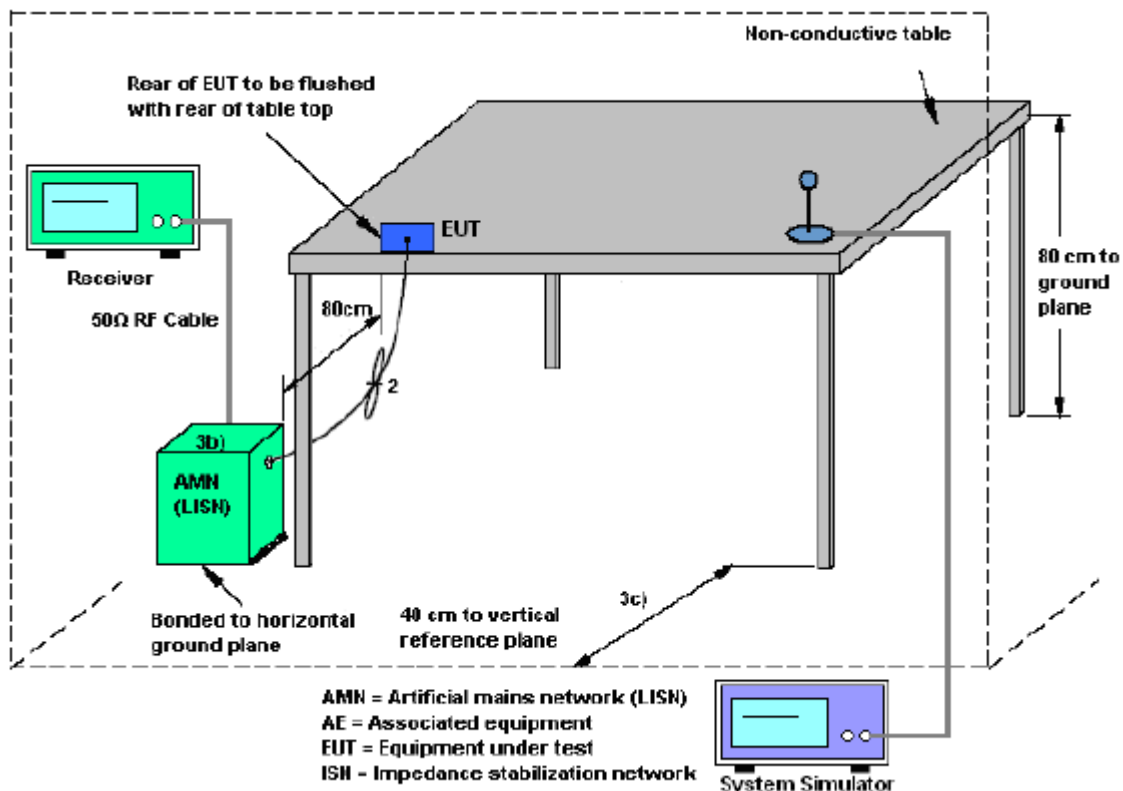
For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

| Frequency range (MHz) | Conducted Limit (dB $\mu$ V) |          |
|-----------------------|------------------------------|----------|
|                       | Quai-peak                    | Average  |
| 0.15 - 0.50           | 66 to 56                     | 56 to 46 |
| 0.50 - 5              | 56                           | 46       |
| 0.50 - 30             | 60                           | 50       |

### 2.9.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

### 2.9.3. Test Setup



#### 2.9.4. Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 micrometry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

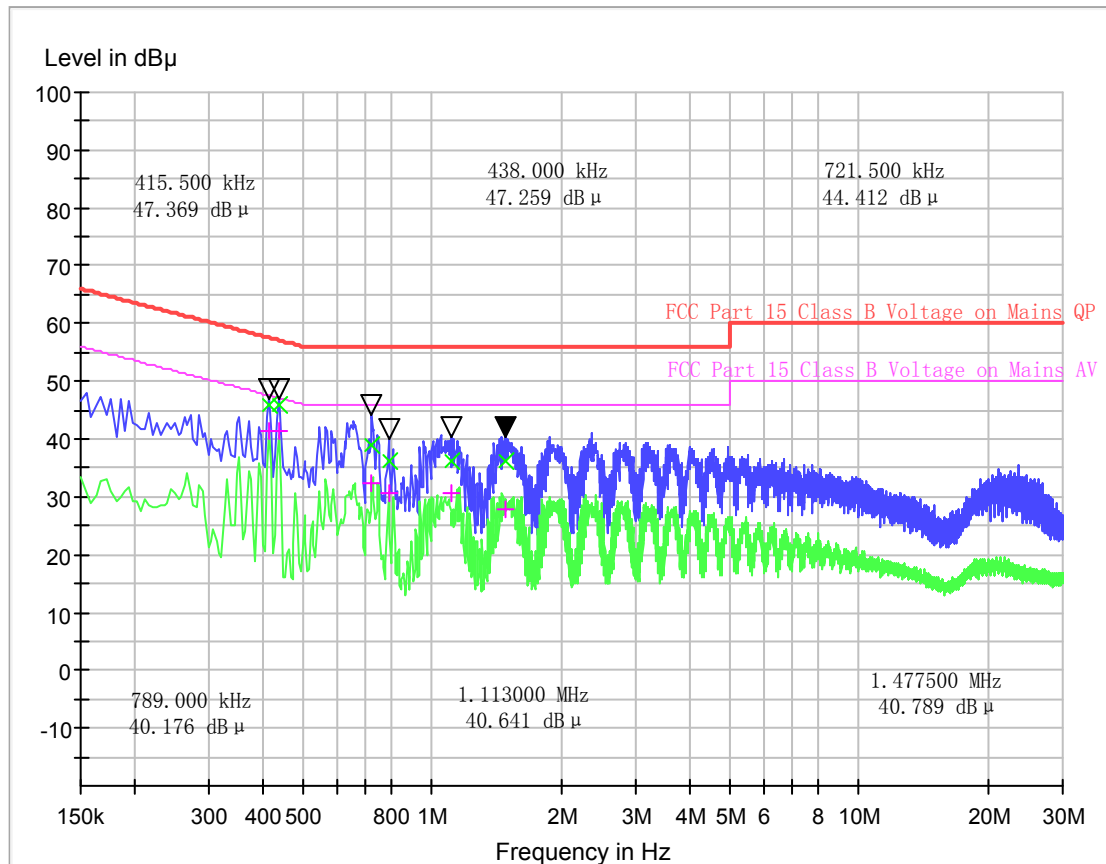
#### REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor
2. Correction Factor(dB) = Attenuator (dB)+ Cable loss(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Limit value - Emission Level

Note: Correction factor=Cabel loss+ attenuation factor  
attenuation factor=10dB

Note: the test plots show the PK value

### 2.9.3. Test Results of Conducted Emission

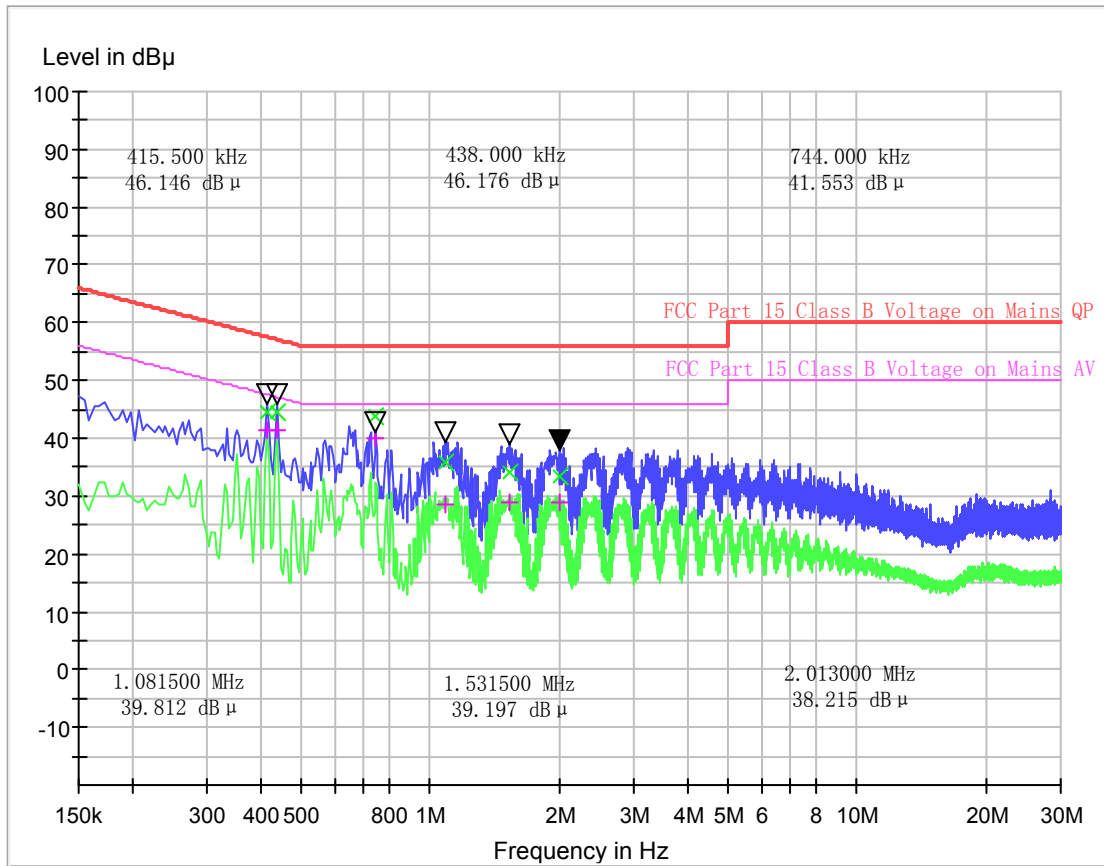


(Plot A: L Phase)

#### Conducted Disturbance at Mains Terminals

##### L Test Data

| QP              |               |                          |                 |                  | AV              |               |                          |
|-----------------|---------------|--------------------------|-----------------|------------------|-----------------|---------------|--------------------------|
| Frequency (MHz) | Limits (dBμV) | Measurement Value (dBμV) | Cable Loss (dB) | Cor. Factor (dB) | Frequency (MHz) | Limits (dBμV) | Measurement Value (dBμV) |
| 0.415500        | 57.5          | 45.97                    | 0.2             | 20.8             | 0.415500        | 47.5          | 41.29                    |
| 0.438000        | 57.1          | 46.00                    | 0.2             | 20.8             | 0.438000        | 47.1          | 41.31                    |
| 0.721500        | 56.0          | 38.92                    | 0.5             | 20.5             | 0.721500        | 46.0          | 32.31                    |
| 0.789000        | 56.0          | 36.35                    | 0.5             | 20.4             | 0.789000        | 46.0          | 30.47                    |
| 1.113000        | 56.0          | 36.28                    | 0.8             | 20.4             | 1.113000        | 46.0          | 30.53                    |
| 1.477500        | 56.0          | 36.03                    | 1.1             | 20.2             | 1.477500        | 46.0          | 28.03                    |



(Plot B: N Phase)

### Conducted Disturbance at Mains Terminals

#### N Test Data

| QP              |               |                          |                 |                  | AV              |               |                          |
|-----------------|---------------|--------------------------|-----------------|------------------|-----------------|---------------|--------------------------|
| Frequency (MHz) | Limits (dBμV) | Measurement Value (dBμV) | Cable Loss (dB) | Cor. Factor (dB) | Frequency (MHz) | Limits (dBμV) | Measurement Value (dBμV) |
| 0.415500        | 57.5          | 44.35                    | 0.5             | 20.7             | 0.415500        | 47.5          | 41.28                    |
| 0.438000        | 57.1          | 44.36                    | 0.5             | 20.7             | 0.438000        | 47.1          | 41.31                    |
| 0.744000        | 56.0          | 43.67                    | 0.4             | 20.7             | 0.744000        | 46.0          | 40.09                    |
| 1.081500        | 56.0          | 35.88                    | 0.8             | 20.1             | 1.081500        | 46.0          | 28.63                    |
| 1.531500        | 56.0          | 34.27                    | 1.1             | 20.0             | 1.531500        | 46.0          | 28.86                    |
| 2.013000        | 56.0          | 33.30                    | 1.2             | 19.9             | 2.013000        | 46.0          | 29.02                    |

**Test Result: PASS**

## 2.10. Radiated Band Edges and Spurious Emission

### 2.10.1. Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

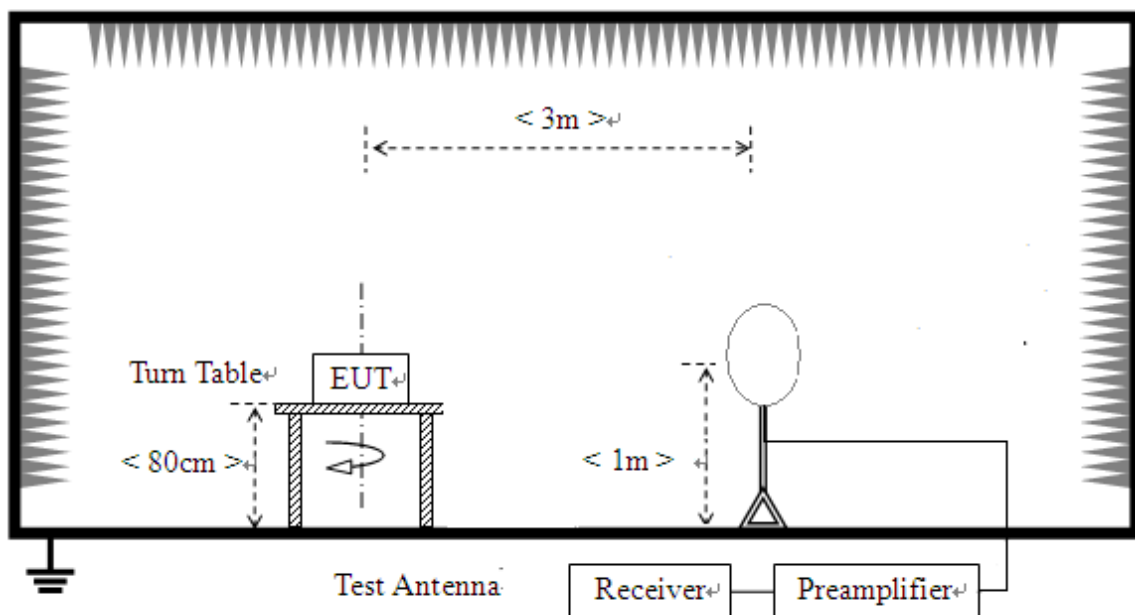
| Frequency (MHz) | Field Strength ( $\mu\text{V/m}$ ) | Measurement Distance (m) |
|-----------------|------------------------------------|--------------------------|
| 0.009 - 0.490   | $2400/F(\text{kHz})$               | 300                      |
| 0.490 - 1.705   | $24000/F(\text{kHz})$              | 30                       |
| 1.705 - 30.0    | 30                                 | 30                       |
| 30 - 88         | 100                                | 3                        |
| 88 - 216        | 150                                | 3                        |
| 216 - 960       | 200                                | 3                        |
| Above 960       | 500                                | 3                        |

### 2.10.2. Measuring Instruments

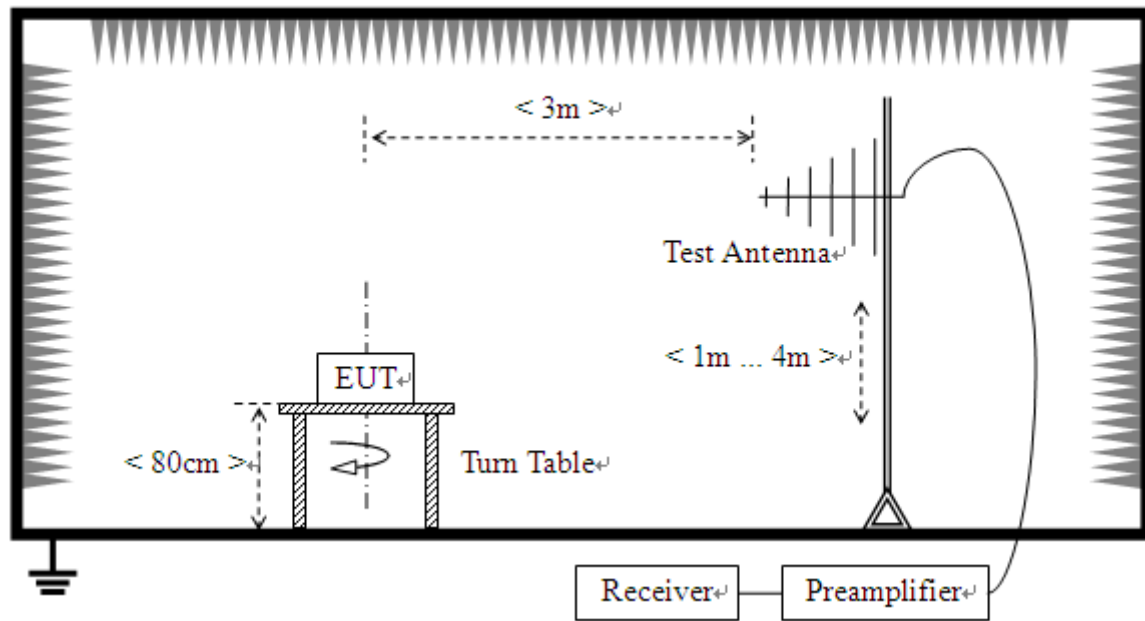
The measuring equipment is listed in the section 3 of this test report.

### 2.10.3. Test Setup

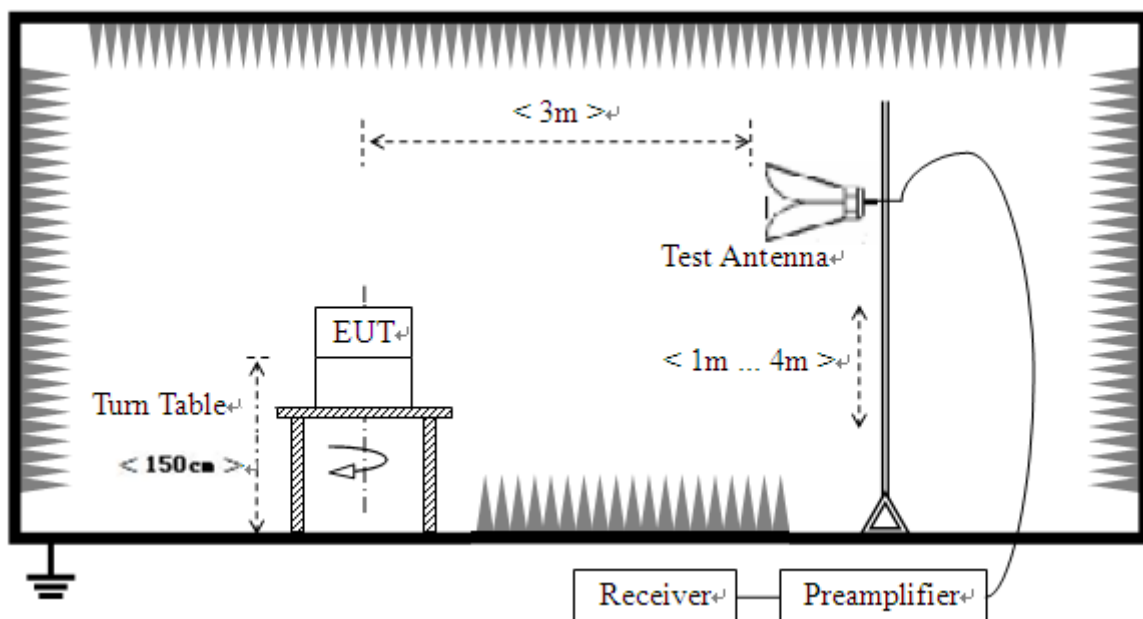
- 1) For radiated emissions from 9kHz to 30MHz



- 2) For radiated emissions from 30MHz to 1GHz



- 3) For radiated emissions above 1GHz



#### 2.10.4. Test Procedure

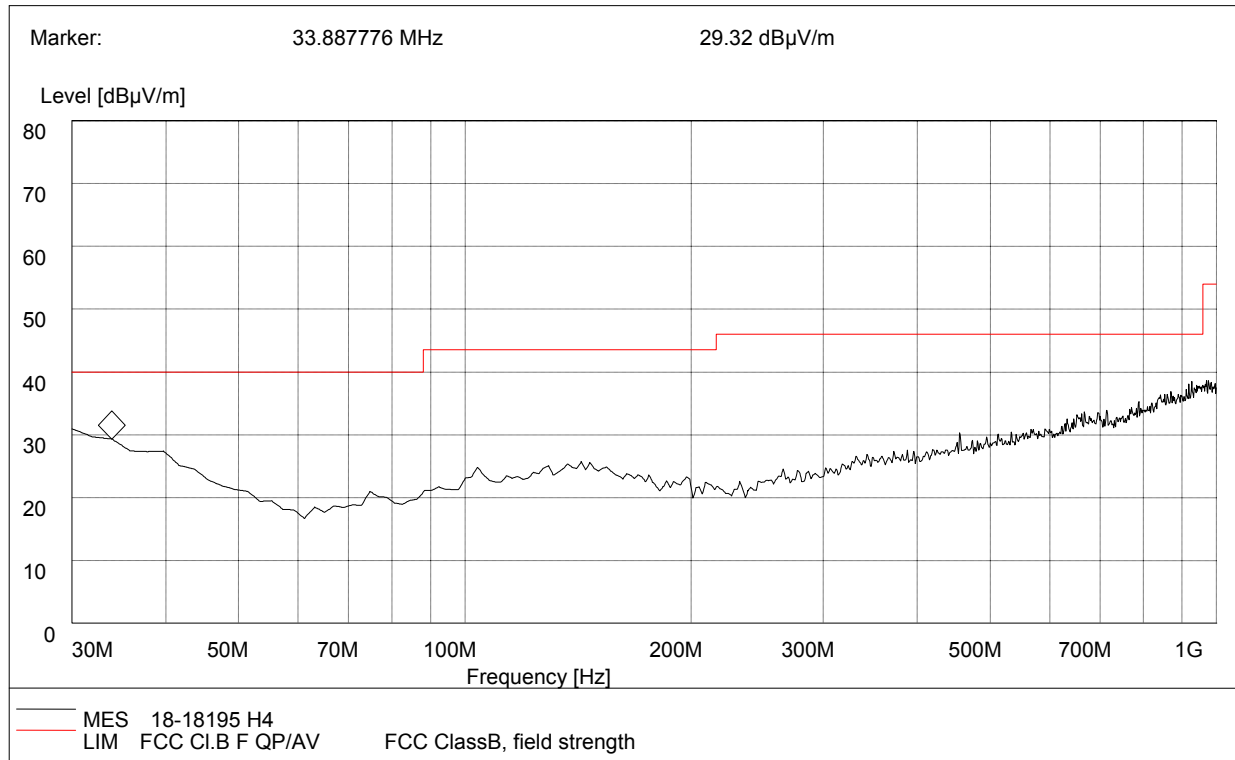
1. The EUT was placed on a turntable with 0.8m below 1GHz 1.5m above 1GHz above the ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. Use the following spectrum analyzer settings:
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Set RBW=100 kHz for  $f < 1 \text{ GHz}$ , RBW=1MHz for  $f > 1\text{GHz}$  ; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
  - (3) For average measurement: use duty cycle correction factor method per 15.35(c).  
Duty cycle = On time/100 milliseconds  
On time =  $N_1 * L_1 + N_2 * L_2 + \dots + N_{n-1} * L_{N_{n-1}} + N_n * L_n$   
Where  $N_1$  is number of type 1 pulses,  $L_1$  is length of type 1 pulses, etc.  
Average Emission Level = Peak Emission Level +  $20 * \log(\text{Duty cycle})$
6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
7. Device under transmit mode and filter the fundamental .

## 2.10.5. Test Results of Radiated Band Edge and Spurious Emission

### For 9 KHz to 30MHz

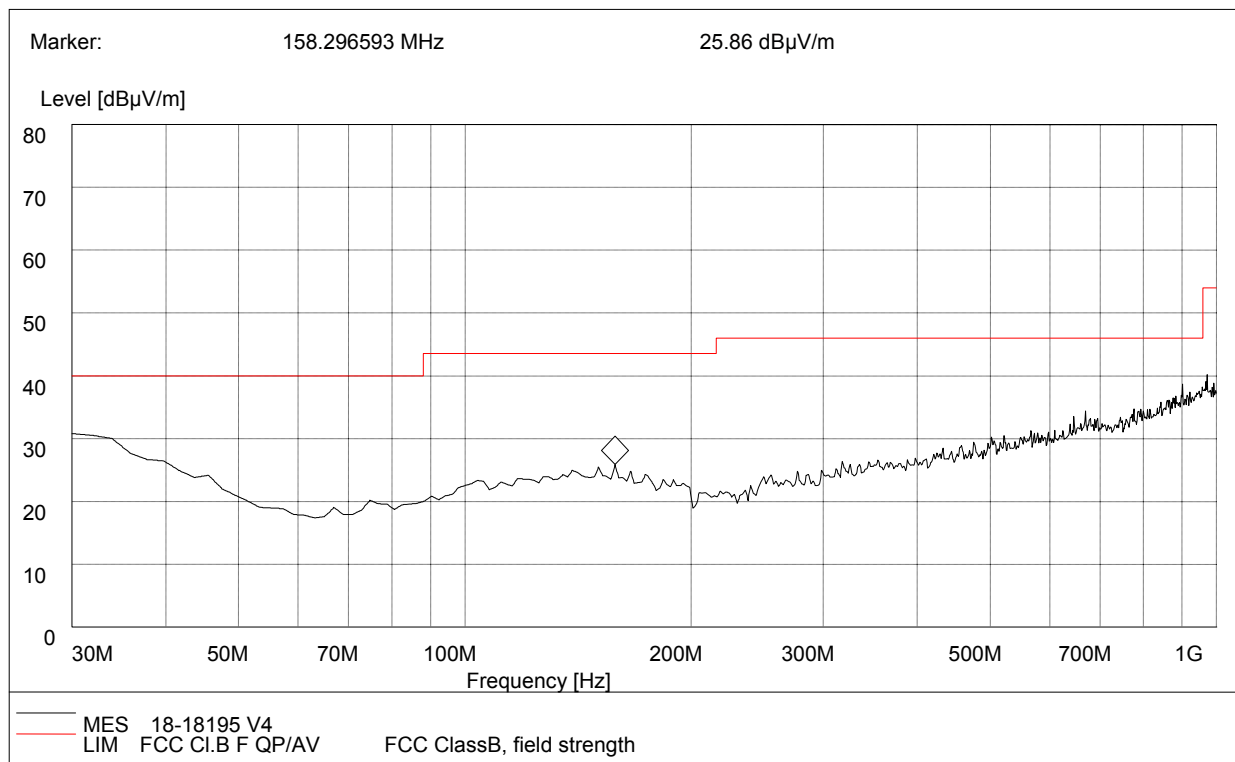
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

### For 30MHz to 1000MHz



| Frequency (MHz) | QuasiPeak (dB $\mu$ V/m) | Bandwidth (kHz) | Cor. Factor | Antenna height (cm) | Limit (dB $\mu$ V/m) | Antenna    | Verdict |
|-----------------|--------------------------|-----------------|-------------|---------------------|----------------------|------------|---------|
| 33.88           | 29.32                    | 120.000         | 28.87       | 100.0               | 40.0                 | Horizontal | Pass    |
| 51.25           | 19.63                    | 120.000         | 28.89       | 150.0               | 40.0                 | Horizontal | Pass    |
| 93.46           | 22.30                    | 120.000         | 29.00       | 150.0               | 43.5                 | Horizontal | Pass    |
| 149.20          | 25.38                    | 120.000         | 29.20       | 150.0               | 43.5                 | Horizontal | Pass    |
| 566.75          | 30.26                    | 120.000         | 29.8        | 100.0               | 46.0                 | Horizontal | Pass    |
| 950.15          | 35.29                    | 120.000         | 30.2        | 100.0               | 46.0                 | Horizontal | Pass    |

(30MHz to 1GHz, Antenna Horizontal)



| Frequency (MHz) | QuasiPeak (dB $\mu$ V/m) | Bandwidth (kHz) | Cor. Factor | Antenna height (cm) | Limit (dB $\mu$ V/m) | Antenna  | Verdict |
|-----------------|--------------------------|-----------------|-------------|---------------------|----------------------|----------|---------|
| 30.00           | 31.26                    | 120.000         | 28.87       | 120.0               | 40.0                 | Vertical | Pass    |
| 49.99           | 25.53                    | 120.000         | 28.89       | 150.0               | 40.0                 | Vertical | Pass    |
| 77.35           | 26.49                    | 120.000         | 29.00       | 150.0               | 40.0                 | Vertical | Pass    |
| 158.29          | 25.86                    | 120.000         | 29.20       | 150.0               | 43.5                 | Vertical | Pass    |
| 502.32          | 29.58                    | 120.000         | 29.8        | 150.0               | 46.0                 | Vertical | Pass    |
| 950.18          | 38.92                    | 120.000         | 30.2        | 150.0               | 46.0                 | Vertical | Pass    |

(30MHz to 1GHz, Antenna Vertical)

**Above 1GHz Data:**
**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (1CH\_902.75MHz)**

| No. | Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV/m) | Correction Factor (dB/m) |
|-----|-----------------|-------------------------|----|----------------|-------------|--------------------|----------------------|--------------------|--------------------------|
| 1   | 1802.7007       | 43.98                   | PK | 74             | -30.02      | 1.50H              | 120                  | 32.83              | 11.15                    |
| 2   | 1805.2013       | 37.09                   | AV | 54             | -16.91      | 1.50H              | 120                  | 25.92              | 11.17                    |
| 3   | 2707.9270       | 54.31                   | PK | 74             | -19.69      | 1.50H              | 100                  | 38.31              | 16.00                    |
| 4   | 2707.9270       | 50.37                   | AV | 54             | -3.63       | 1.50H              | 100                  | 34.37              | 16.00                    |
| 5   | 3610.6527       | 56.07                   | PK | 74             | -17.93      | 1.50H              | 100                  | 36.93              | 19.14                    |
| 6   | 3610.6527       | 51.63                   | AV | 54             | -2.37       | 1.50H              | 100                  | 32.49              | 19.14                    |

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (1CH\_902.75MHz)**

| No. | Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV/m) | Correction Factor (dB/m) |
|-----|-----------------|-------------------------|----|----------------|-------------|--------------------|----------------------|--------------------|--------------------------|
| 1   | 1805.2013       | 44.66                   | PK | 74             | -29.34      | 1.80V              | 180                  | 33.49              | 11.17                    |
| 2   | 1805.2013       | 38.22                   | AV | 54             | -15.78      | 1.80V              | 180                  | 27.05              | 11.17                    |
| 3   | 2707.9270       | 47.21                   | PK | 74             | -22.37      | 1.80V              | 360                  | 31.21              | 16.00                    |
| 4   | 2707.9270       | 51.63                   | AV | 54             | -6.79       | 1.80V              | 360                  | 35.63              | 16.00                    |
| 5   | 3610.6527       | 55.73                   | PK | 74             | -18.27      | 1.80V              | 320                  | 36.59              | 19.14                    |
| 6   | 3610.6527       | 51.44                   | AV | 54             | -2.56       | 1.80V              | 320                  | 32.30              | 19.14                    |

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (26CH\_915.25MHz)**

| No. | Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV/m) | Correction Factor (dB/m) |
|-----|-----------------|-------------------------|----|----------------|-------------|--------------------|----------------------|--------------------|--------------------------|
| 1   | 1722.6807       | 42.02                   | PK | 74             | -31.98      | 1.00H              | 100                  | 31.60              | 10.42                    |
| 2   | 1722.6807       | 33.26                   | AV | 54             | -20.74      | 1.00H              | 100                  | 22.84              | 10.42                    |
| 3   | 2782.9457       | 48.28                   | PK | 74             | -25.72      | 2.00H              | 0                    | 31.88              | 16.40                    |
| 4   | 2787.9470       | 38.62                   | AV | 54             | -15.38      | 2.00H              | 0                    | 22.19              | 16.43                    |
| 5   | 3223.0558       | 51.55                   | PK | 74             | -22.45      | 2.00H              | 320                  | 33.43              | 18.12                    |
| 6   | 3229.3073       | 39.87                   | AV | 54             | -14.13      | 2.00H              | 320                  | 21.72              | 18.15                    |

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (26CH\_915.25MHz)**

| No. | Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV/m) | Correction Factor (dB/m) |
|-----|-----------------|-------------------------|----|----------------|-------------|--------------------|----------------------|--------------------|--------------------------|
| 1   | 1711.4279       | 41.65                   | PK | 74             | -32.35      | 1.00V              | 360                  | 31.33              | 10.32                    |
| 2   | 1712.6782       | 34.78                   | AV | 54             | -19.22      | 1.00V              | 360                  | 24.45              | 10.33                    |
| 3   | 2696.6742       | 47.89                   | PK | 74             | -26.11      | 1.50V              | 150                  | 31.95              | 15.94                    |
| 4   | 2704.1760       | 38.96                   | AV | 54             | -15.04      | 1.50V              | 150                  | 22.98              | 15.98                    |
| 5   | 3626.9067       | 52.20                   | PK | 74             | -21.80      | 1.50V              | 150                  | 32.90              | 19.30                    |
| 6   | 3638.1595       | 42.74                   | AV | 54             | -11.26      | 1.50V              | 150                  | 23.33              | 19.41                    |

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (50CH\_927.25MHz)**

| No. | Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV/m) | Correction Factor (dB/m) |
|-----|-----------------|-------------------------|----|----------------|-------------|--------------------|----------------------|--------------------|--------------------------|
| 1   | 1760.1900       | 44.38                   | PK | 74             | -29.62      | 2.00 H             | 180                  | 33.62              | 10.76                    |
| 2   | 1762.6907       | 33.45                   | AV | 54             | -20.55      | 2.00 H             | 180                  | 22.66              | 10.79                    |
| 3   | 2781.6954       | 55.16                   | PK | 74             | -18.84      | 2.00H              | 120                  | 38.77              | 16.39                    |
| 4   | 2781.6954       | 51.11                   | AV | 54             | -2.89       | 2.00H              | 120                  | 34.72              | 16.39                    |
| 5   | 3996.9993       | 54.15                   | PK | 74             | -19.85      | 2.00H              | 150                  | 33.31              | 20.84                    |
| 6   | 4000.7502       | 43.30                   | AV | 54             | -10.70      | 2.00H              | 150                  | 22.44              | 20.86                    |

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (50CH\_927.25MHz)**

| No. | Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV/m) | Correction Factor (dB/m) |
|-----|-----------------|-------------------------|----|----------------|-------------|--------------------|----------------------|--------------------|--------------------------|
| 1   | 1427.6069       | 40.44                   | PK | 74             | -21.53      | 2.00V              | 150                  | 32.29              | 8.13                     |
| 2   | 1431.3578       | 32.45                   | AV | 54             | -33.56      | 2.00V              | 150                  | 24.34              | 8.15                     |
| 3   | 1885.2213       | 46.03                   | PK | 74             | -27.97      | 1.50V              | 100                  | 34.21              | 11.82                    |
| 4   | 1892.7232       | 34.09                   | AV | 54             | -19.91      | 1.50V              | 100                  | 22.21              | 11.88                    |
| 5   | 2781.6954       | 48.85                   | PK | 74             | -25.15      | 1.50V              | 100                  | 32.45              | 16.39                    |
| 6   | 2782.9457       | 42.57                   | AV | 54             | -11.43      | 1.50V              | 100                  | 26.18              | 16.40                    |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. This device tested in a engineer 'steady-state' CW mode.

### 3. List of measuring equipment

| Item | Test Equipment                  | Manufacturer                              | Model No.    | Serial No. | Cal Date   | Due Date   |
|------|---------------------------------|-------------------------------------------|--------------|------------|------------|------------|
| 1    | EMI TEST RECEIVER               | R&S                                       | ESW26        | A180502935 | 2018.11.01 | 2019.10.31 |
| 2    | TURNTABLE                       | ETS                                       | 2088         | 2149       | N/A        | N/A        |
| 3    | ANTENNA MAST                    | ETS                                       | 2075         | 2346       | N/A        | N/A        |
| 4    | EMI TEST Software               | R&S                                       | ESK1         | N/A        | N/A        | N/A        |
| 5    | Horn antenna<br>(18GHz~26.5GHz) | AR                                        | AT4002A      | 305753     | 2017.11.10 | 2020.11.09 |
| 6    | Amplifier                       | MILMEGA                                   | 80RF1000-250 | A140901925 | 2017.10.09 | 2020.10.08 |
| 7    | JS amplifier                    | AR                                        | 25S1G4AM1    | A0304248   | 2017.10.09 | 2020.10.08 |
| 8    | High pass filter                | Compliance<br>Direction<br>systems        | BSU-6        | 34202      | 2018.11.11 | 2019.11.10 |
| 9    | Horn Antenna                    | ShwarzBeck                                | 9120D        | 1012       | 2018.11.11 | 2019.11.10 |
| 13   | Horn Antenna                    | ShwarzBeck                                | BBHA9170     | 25841      | 2018.11.11 | 2019.11.10 |
| 14   | ULTRA-BROADBAND ANTENNA         | R&S                                       | HL562        | A0304224   | 2017.07.14 | 2020.07.13 |
| 15   | Passive Loop Antenna            | R&S                                       | HFH2-Z2      | 100047     | 2019.04.26 | 2022.04.25 |
| 16   | Temperature chamber             | Dongguan<br>gaoda<br>instrument<br>CO.LTD | GD-7005-100  | 130130101  | 2019.04.22 | 2020.04.21 |
| 17   | Spectrum Analyzer               | Keysight                                  | N9030A       | A160702554 | 2018.11.15 | 2019.11.14 |
| 18   | Power Supply                    | R&S                                       | NGMO1        | 101037     | 2019.07.31 | 2020.07.30 |

**\*\* END OF REPORT \*\***