



REPORT No. : SZ14120215W05

# FCC RF TEST REPORT

**APPLICANT** : Shenzhen Renqing Technology Co.,Ltd  
**PRODUCT NAME** : ihave X  
**MODEL NAME** : iz0107  
**TRADE NAME** : ihave  
**BRAND NAME** : ihave  
**FCC ID** : 2ADYI-IZ0107  
**STANDARD(S)** : 47 CFR Part 15 Subpart C  
**ISSUE DATE** : 2015-1-29



**SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd.**

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| Change History |           |                   |
|----------------|-----------|-------------------|
| Issue          | Date      | Reason for change |
| 1.0            | 2015-1-29 | First edition     |
|                |           |                   |



REPORT No. : SZ14120215W05

**TEST REPORT DECLARATION**

|                      |                                                                                       |
|----------------------|---------------------------------------------------------------------------------------|
| Applicant            | Shenzhen Renqing Technology Co.,Ltd                                                   |
| Applicant Address    | Room#2001,Modern International Building,No.3038,Jintian Road,Futian District,Shenzhen |
| Manufacturer         | ZhongXing Electronics Industrial Limited                                              |
| Manufacturer Address | 509, Building 2,ZhuGuang Innovative Technology Parks, Xili, Nanshan, Shenzhen, China  |
| Product Name         | ihave X                                                                               |
| Model Name           | iz0107                                                                                |
| Brand Name           | ihave                                                                                 |
| HW Version           | V1.0                                                                                  |
| SW Version           | V1.0                                                                                  |
| Test Standards       | 47 CFR Part 15 Subpart C                                                              |
| Test Date            | 2015-1-14 to 2015-1-23                                                                |
| Test Result          | PASS                                                                                  |

Tested by : Wu Jianwu  
Wu Jianwu

Reviewed by : Qiu xiaojun  
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Approved by : Zeng Dexin  
Zeng Dexin



## 1. TECHNICAL INFORMATION

Note: Provide by applicant.

### 1.1 Applicant Information

|          |                                                                                       |
|----------|---------------------------------------------------------------------------------------|
| Company: | Shenzhen Renqing Technology Co.,Ltd                                                   |
| Address: | Room#2001,Modern International Building,No.3038,Jintian Road,Futian District,Shenzhen |

### 1.2 Equipment under Test (EUT) Description

|                    |                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Brand Name:        | ihave                                                                                                                              |
| Trade Name:        | ihave                                                                                                                              |
| Model Name:        | iz0107                                                                                                                             |
| Frequency Range:   | The frequency range used is 2402MHz – 2480MHz (79 channels, at intervals of 1MHz);<br>The frequency block is 2400MHz to 2483.5MHz. |
| Modulation Type:   | Bluetooth: FHSS (GFSK,1Mbps)                                                                                                       |
| Bluetooth Version: | 3.0 without EDR                                                                                                                    |
| Antenna Type:      | PCB Antenna                                                                                                                        |
| Antenna Gain:      | 1.7dBi                                                                                                                             |

#### NOTE:

The EUT is ihave X , it contains Bluetooth Module operating at 2.4GHz ISM band; the frequencies allocated for the Bluetooth Module is  $F(\text{MHz})=2402+1*n$  ( $0 \leq n \leq 78$ ). The lowest, middle, highest channel numbers of the Bluetooth Module used and tested in this report are separately 0 (2402MHz), 39 (2441MHz) and 78 (2480MHz).

For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

Bluetooth signal have different packet types ,such as DH1, DH3 and DH5. DH5 is the largest package, so we test type DH5 in this report. For Dwell time, we are test all the packet types to verify the longest Occupancy time.

#### 1.2.1 Identification of all used EUTs

The EUT identity consists of numerical and letter characters, the letter character indicates the test sample, and the following two numerical characters indicate the software version of the test sample.

| EUT Identity | Hardware Version | Software Version |
|--------------|------------------|------------------|
| A01          | V1.0             | V1.0             |



### 1.3 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C (Bluetooth, 2.4GHz ISM band radiators) for the EUT FCC ID Certification:

| No. | Identity                            | Document Title          |
|-----|-------------------------------------|-------------------------|
| 1   | 47 CFR Part 15<br>(10-1-13 Edition) | Radio Frequency Devices |

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

| No. | Section in CFR 47             | Description                    | Result      |
|-----|-------------------------------|--------------------------------|-------------|
| 1   | 15.203                        | Antenna Requirement            | <u>PASS</u> |
| 2   | 15.247(a)                     | Number of Hopping Frequency    | <u>PASS</u> |
| 3   | 15.247(b)                     | Peak Output Power              | <u>PASS</u> |
| 4   | 15.247(a)                     | 20dB Bandwidth                 | <u>PASS</u> |
| 5   | 15.247(a)                     | Carrier Frequency Separation   | <u>PASS</u> |
| 6   | 15.247(a)                     | Time of Occupancy (Dwell time) | <u>PASS</u> |
| 7   | 15.247(d)                     | Conducted Spurious Emission    | <u>PASS</u> |
| 8   | 15.247(d)                     | Restricted Frequency Bands     | <u>PASS</u> |
| 9   | 15.207                        | Conducted Emission             | <u>N.A</u>  |
| 10  | 15.209<br>15.247(d)           | Radiated Emission              | <u>PASS</u> |
| 11  | 15.247(i), 1.1307 &<br>2.1093 | RF exposure evaluation         | <u>PASS</u> |

**NOTE:** The tests were performed according to the method of measurements prescribed in DA-00-705, ANSI C63.4-2003 and ANSI C63.10-2009.

#### 1.3.1 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): | 86-106  |

## 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.

#### 2.1.2 Result: Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

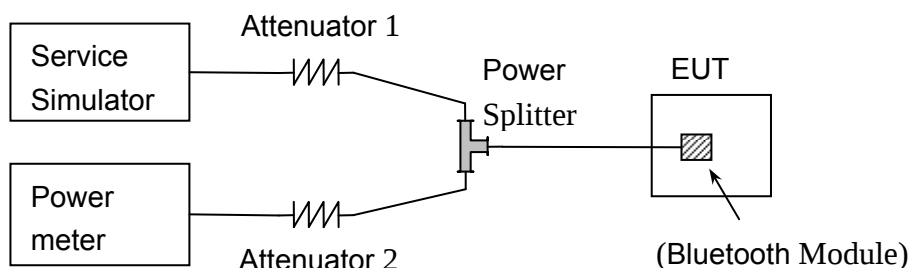
### 2.2 Number of Hopping Frequency

#### 2.2.1 Requirement

According to FCC §15.247(a)(1)(iii), frequency hopping systems operating in the 2400MHz to 2483.5MHz bands shall use at least 15 hopping frequencies.

#### 2.2.2 Test Description

##### A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Service Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

##### B. Equipments List:

Please reference ANNEX A(1.4).



### 2.2.3 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = the frequency band of operation

RBW  $\geq$  1% of the span

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

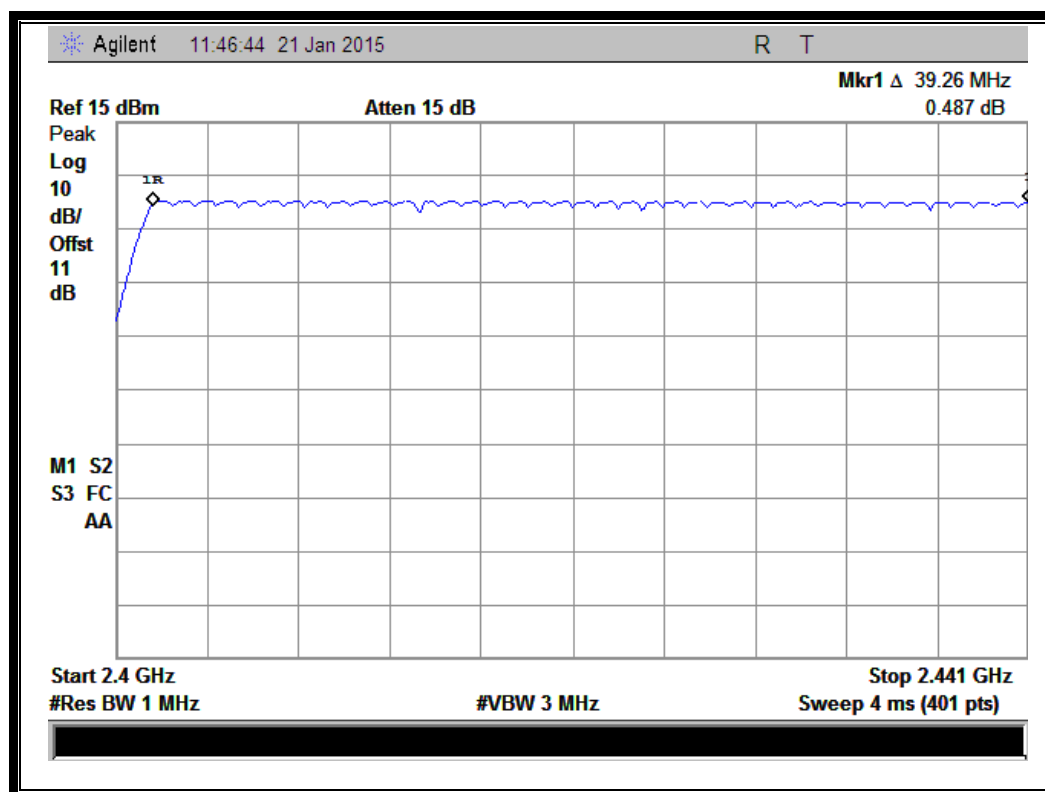
### 2.2.4 Test Result

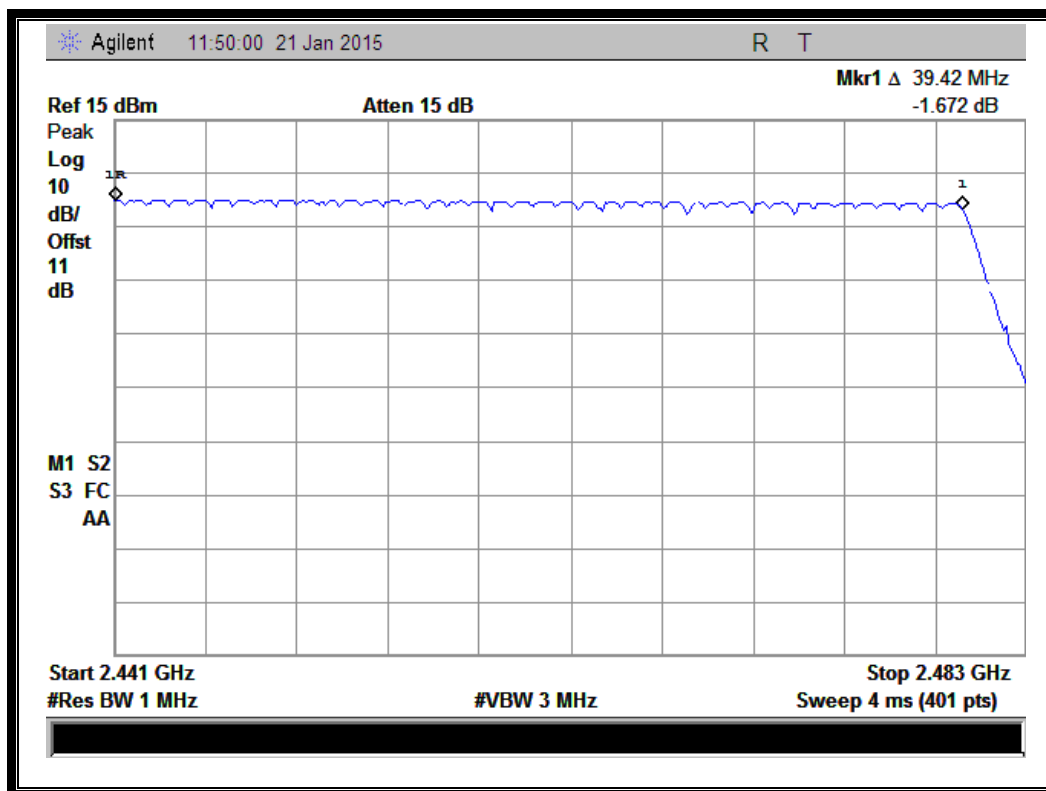
The Bluetooth Module operates at hopping-on test mode; the frequencies number employed is counted to verify the Module's using the number of hopping frequency.

#### A. Test Verdict:

| Test Mode | Frequency Block (MHz) | Measured Channel Numbers | Min. Limit | Refer to Plot | Verdict |
|-----------|-----------------------|--------------------------|------------|---------------|---------|
| GFSK      | 2400 - 2483.5         | 79                       | 15         | Plot A        | PASS    |

#### B. Test Plots:





(Plot A: GFSK)

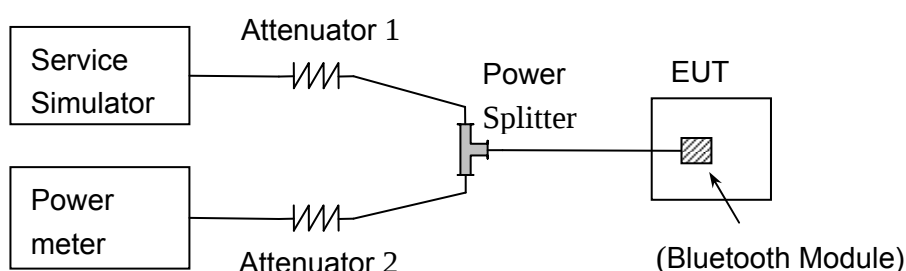
## 2.3 Peak Output Power

### 2.3.1 Requirement

According to FCC §15.247(b)(1), for frequency hopping systems that operates in the 2400MHz to 2483.5MHz band employing at least 75 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt. For all other frequency hopping systems in the 2400MHz to 2483.5MHz band, it is 0.125Watts.

### 2.3.2 Test Description

#### A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Power meter and the Bluetooth Service Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

#### B. Equipments List:

Please reference ANNEX A(1.4).

### 2.3.3 Test Result

The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the module. The lowest, middle and highest channel were tested by power meter.

#### 2.3.3.1 GFSK Mode

#### A. Test Verdict:

| Channel | Frequency (MHz) | Measured Output Peak Power |          | Limit |       | Verdict |
|---------|-----------------|----------------------------|----------|-------|-------|---------|
|         |                 | dBm                        | W        | dBm   | W     |         |
| 0       | 2402            | 1.812                      | 0.001518 | 20.97 | 0.125 | PASS    |
| 39      | 2441            | 1.059                      | 0.001276 |       |       | PASS    |
| 78      | 2480            | -0.176                     | 0.000960 |       |       | PASS    |

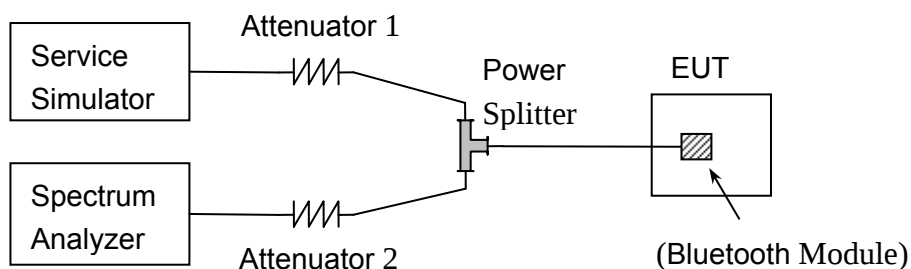
## 2.4 20dB Bandwidth

### 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 Test Description

#### A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Service Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

#### B. Equipments List:

Please reference ANNEX A(1.4).

### 2.4.3 Test Procedure

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

RBW  $\geq$  1% of the 20 dB bandwidth

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

### 2.4.4 Test Result

The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to record the 20dB bandwidth of the Module.



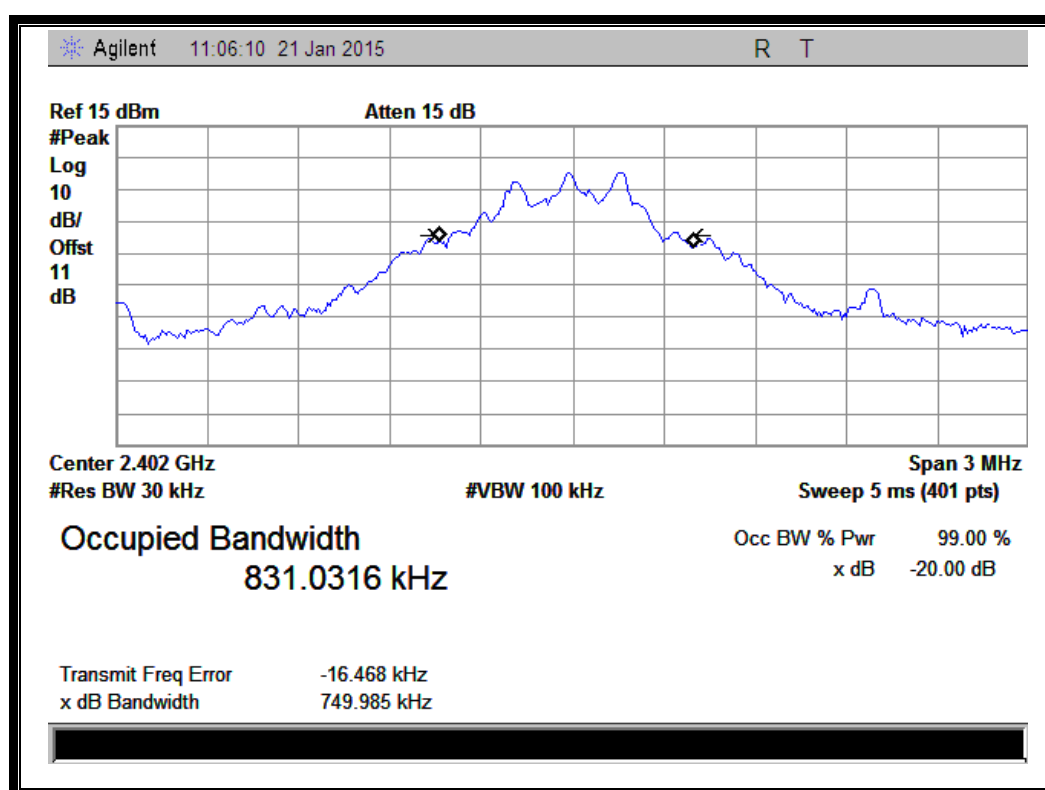
#### 2.4.4.1 GFSK Mode

##### A. Test Verdict:

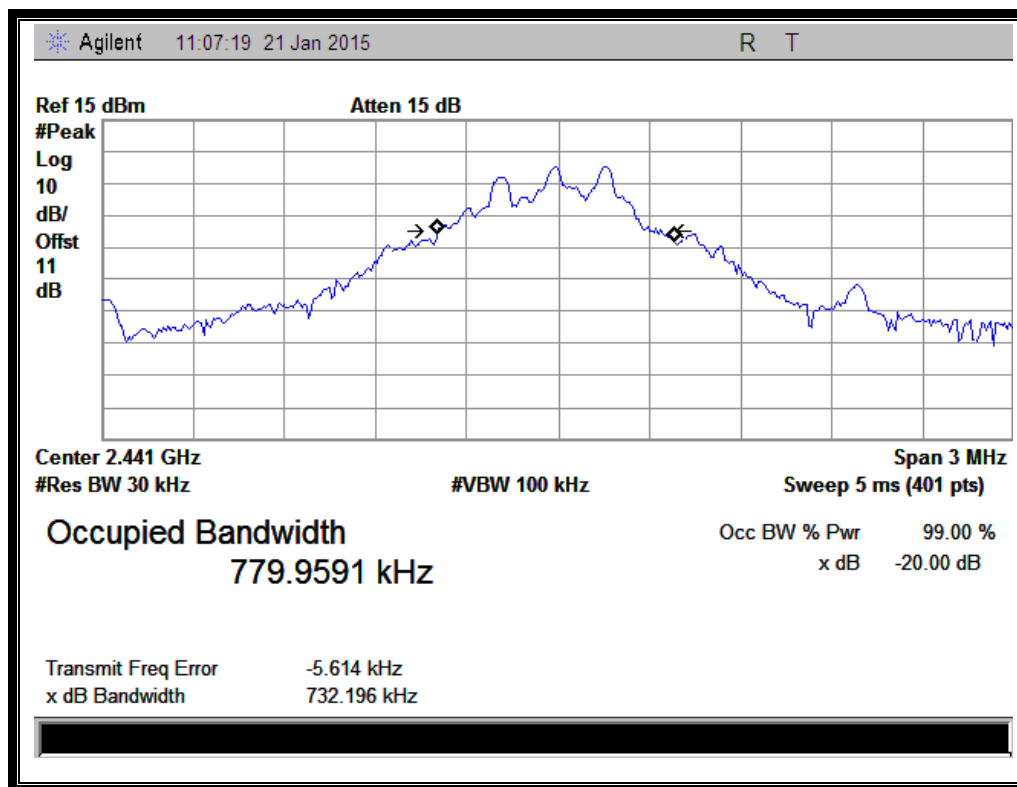
The maximum 20dB bandwidth measured is 0.760MHz according to the table below.

| Channel | Frequency (MHz) | 20dB Bandwidth (MHz) | Refer to Plot |
|---------|-----------------|----------------------|---------------|
| 0       | 2402            | 0.75                 | Plot A        |
| 39      | 2441            | 0.73                 | Plot B        |
| 78      | 2480            | 0.76                 | Plot C        |

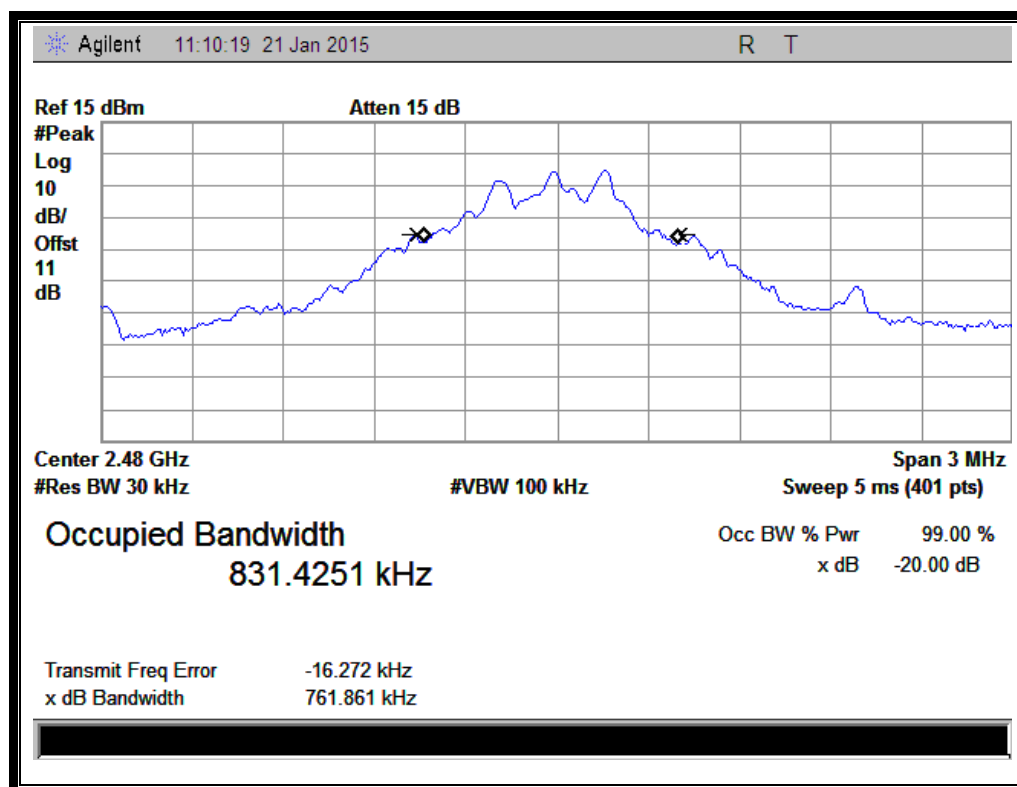
##### B. Test Plots:



(Plot A: Channel = 2402 @ GFSK)



(Plot B: Channel = 2441 @ GFSK)



(Plot C: Channel = 2480 @ GFSK)

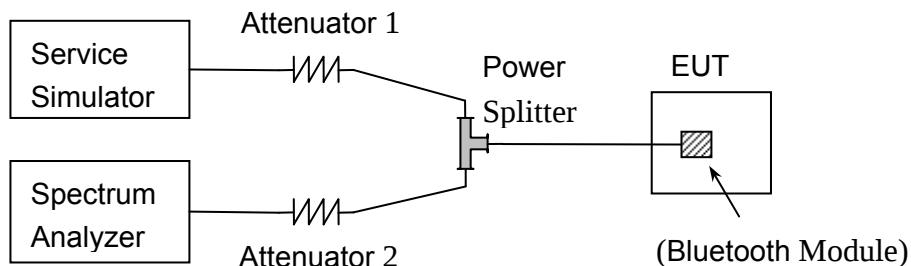
## 2.5 Carried Frequency Separation

### 2.5.1 Definition

According to FCC §15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

### 2.5.2 Test Description

#### A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Service Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

#### B. Equipments List:

Please reference ANNEX A(1.4).

### 2.5.3 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW)  $\geq 1\%$  of the span

Video (or Average) Bandwidth (VBW)  $\geq$  RBW

Sweep = auto

Detector function = peak

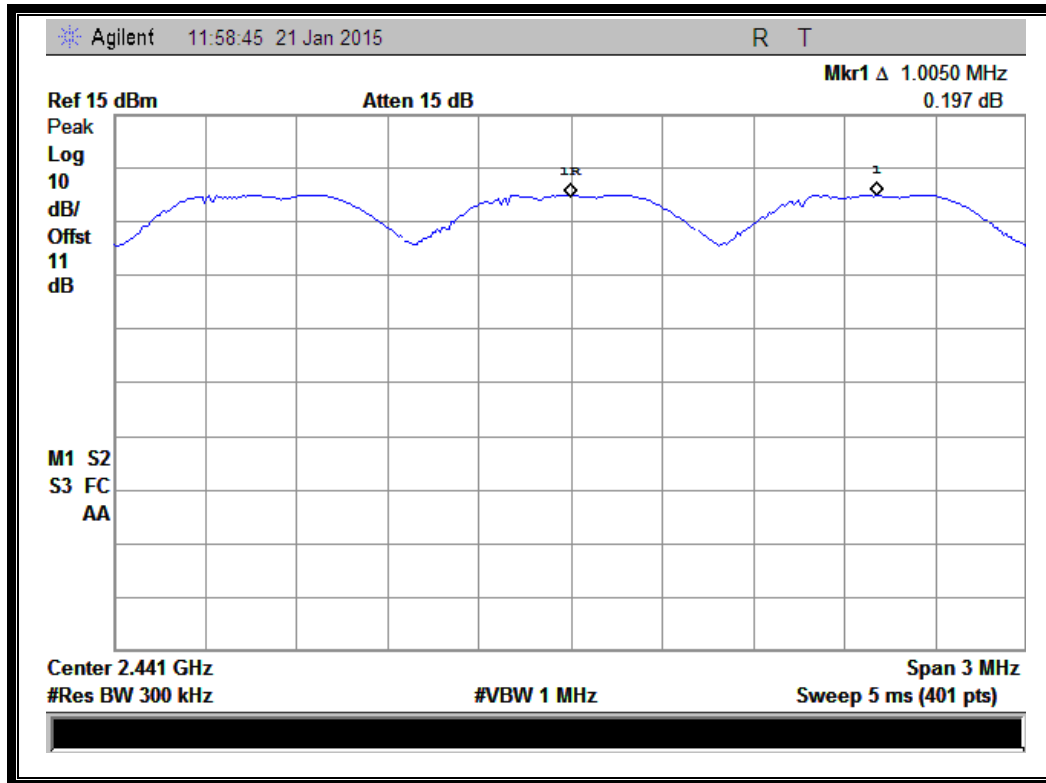
Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.



#### 2.5.4 Test Result

The Bluetooth Module operates at hopping-on test mode. For any adjacent channels (e.g. the channel 39 and 40 as showed in the Plot A), the Module does have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel (refer to section 0), whichever is greater. So, the verdict is PASSING



(Plot A: GFSK)

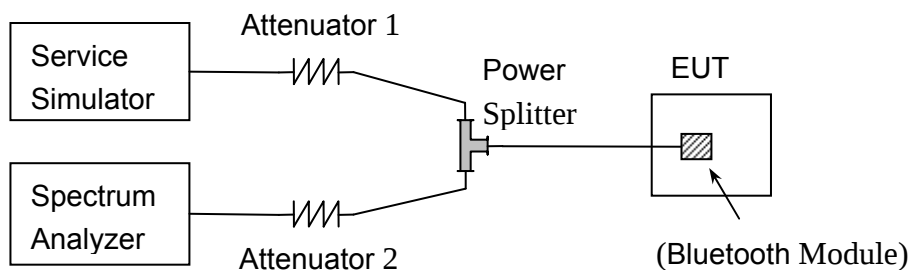
## 2.6 Time of Occupancy (Dwell time)

### 2.6.1 Requirement

According to FCC §15.247(a) (1) (iii), frequency hopping systems in the 2400 - 2483.5MHz band shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### 2.6.2 Test Description

#### A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Service Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

#### B. Equipments List:

Please reference ANNEX A(1.4).

### 2.6.3 Test Procedure

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channel \* 0.4 s) is equal to  $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{pulse width}$ .



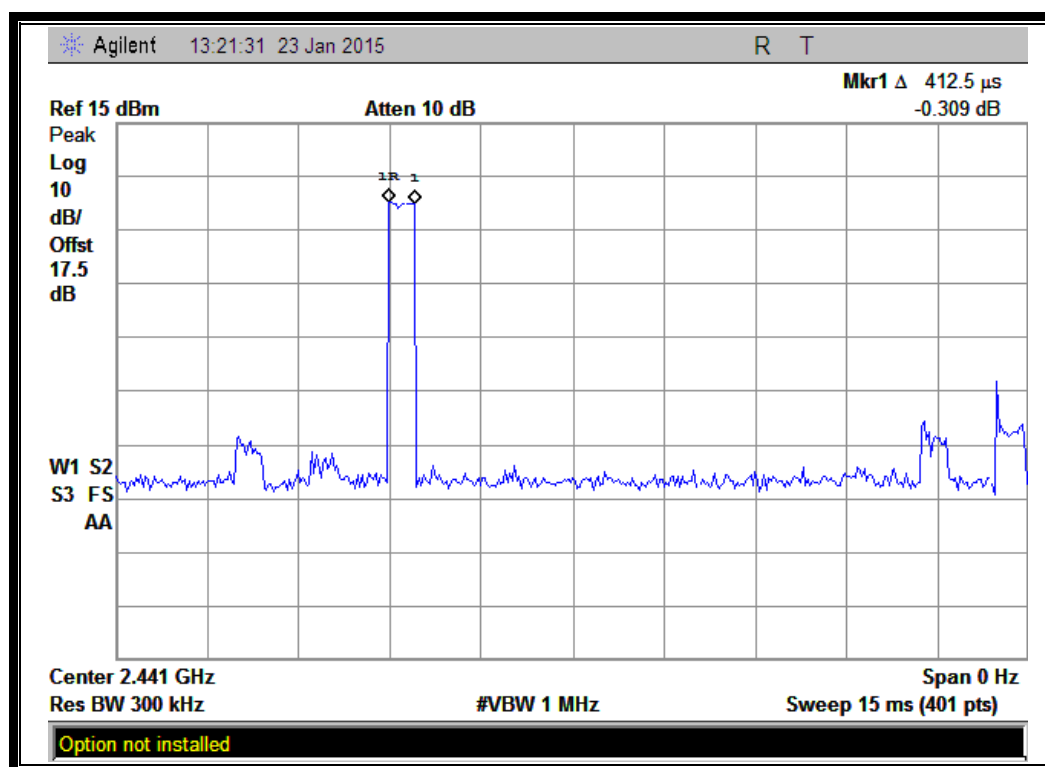
## 2.6.4 Test Result

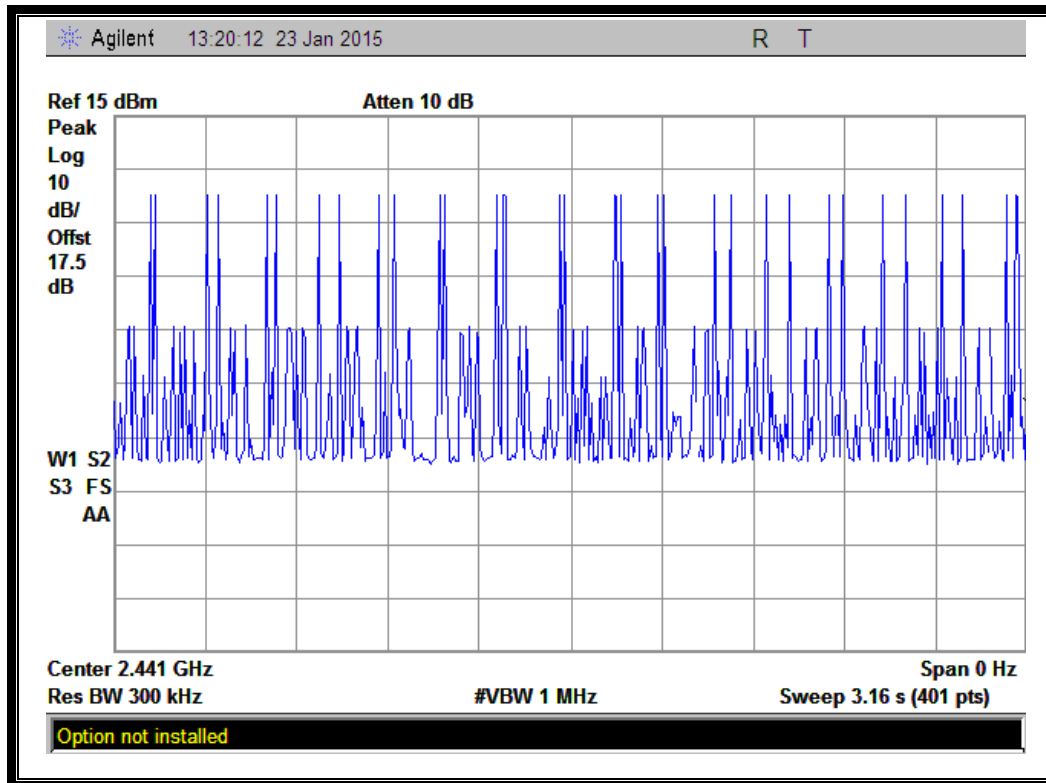
### 2.6.4.1 GFSK Mode

#### A. Test Verdict:

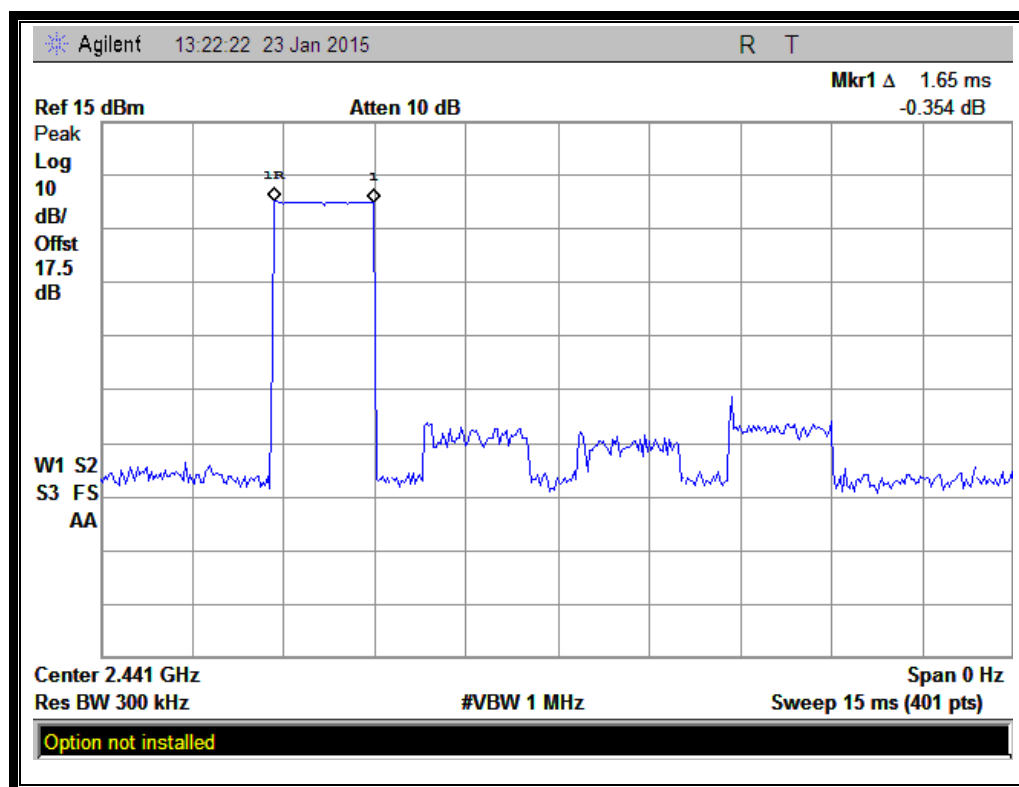
| DH Packet | Pulse Width (msec) | Number of pulse in 3.16 seconds | Refer to Plot | Average Time of Occupancy (sec) | Limit (sec) | Verdict |
|-----------|--------------------|---------------------------------|---------------|---------------------------------|-------------|---------|
| DH1       | 0.412              | 32                              | Plot A        | 0.132                           | 0.4         | PASS    |
| DH3       | 1.650              | 16                              | Plot B        | 0.264                           |             | PASS    |
| DH5       | 2.925              | 11                              | Plot C        | 0.322                           |             | PASS    |

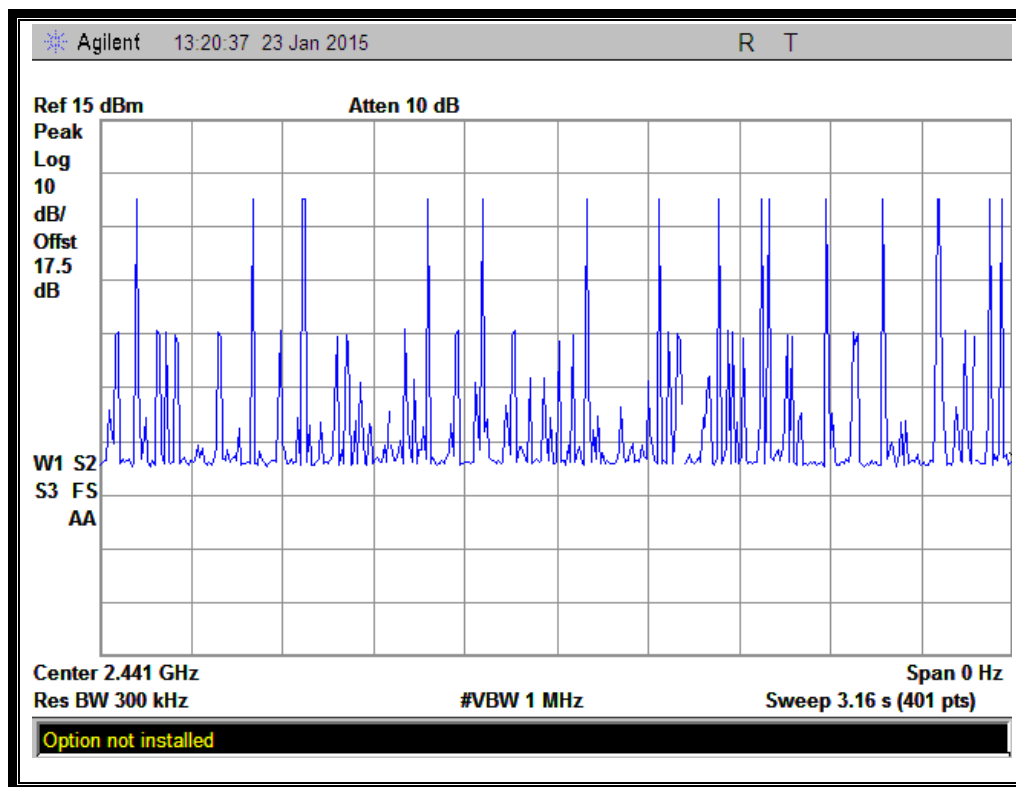
#### B. Test Plots:



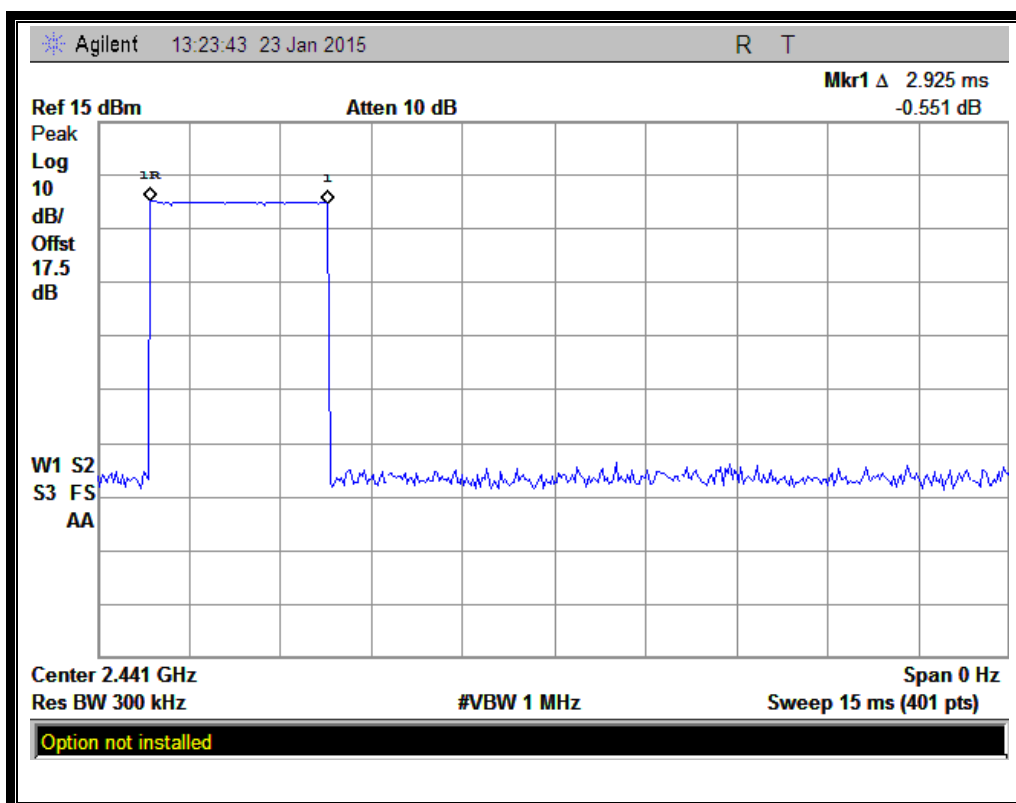


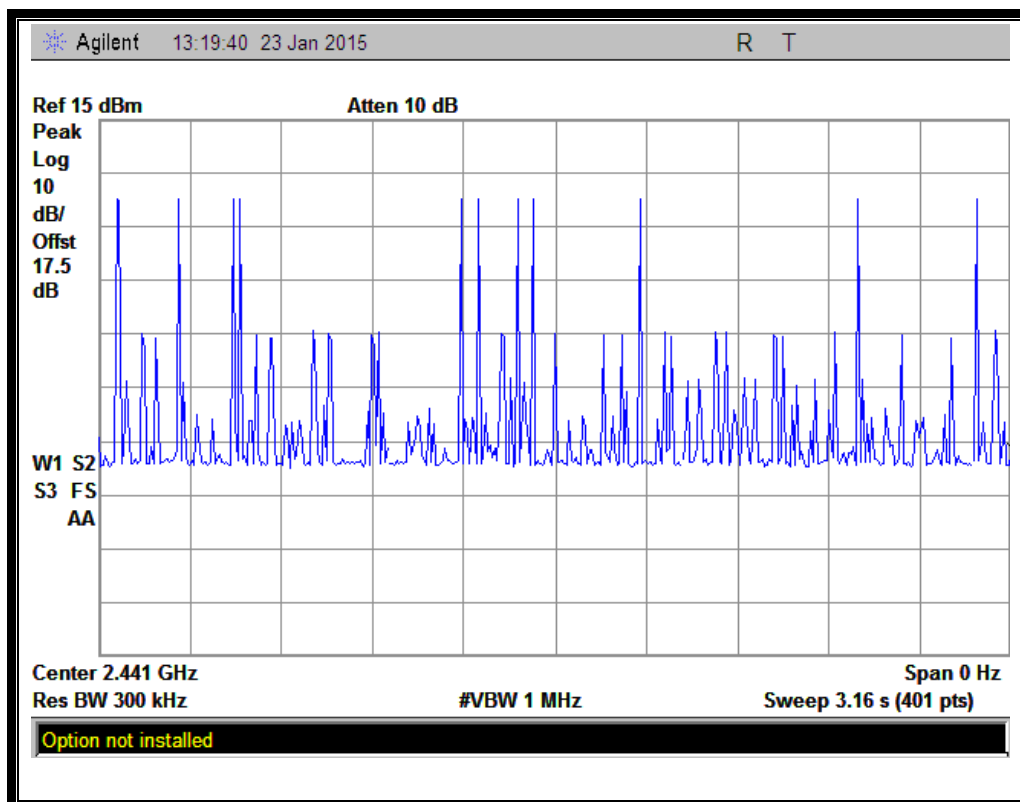
(Plot A: DH1 @ GFSK)





(Plot B: DH3 @ GFSK)





(Plot C: DH5 @ GFSK)

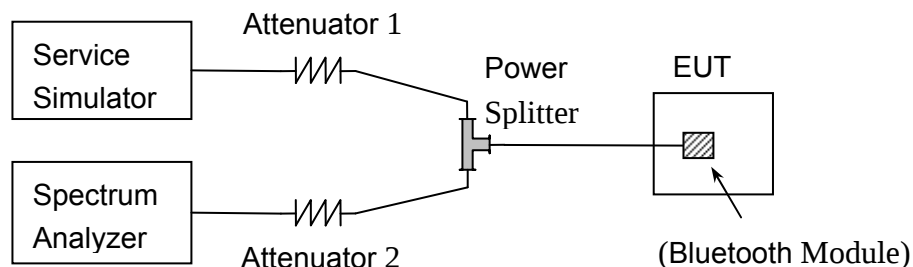
## 2.7 Conducted Spurious Emissions

### 2.7.1 Requirement

According to FCC §15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

### 2.7.2 Test Description

#### A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Service Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

#### B. Equipments List:

Please reference ANNEX A(1.4).

### 2.7.3 Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 100 kHz

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize.

## 2.7.4 Test Result

The Bluetooth Module operates at hopping-off test mode. The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions.

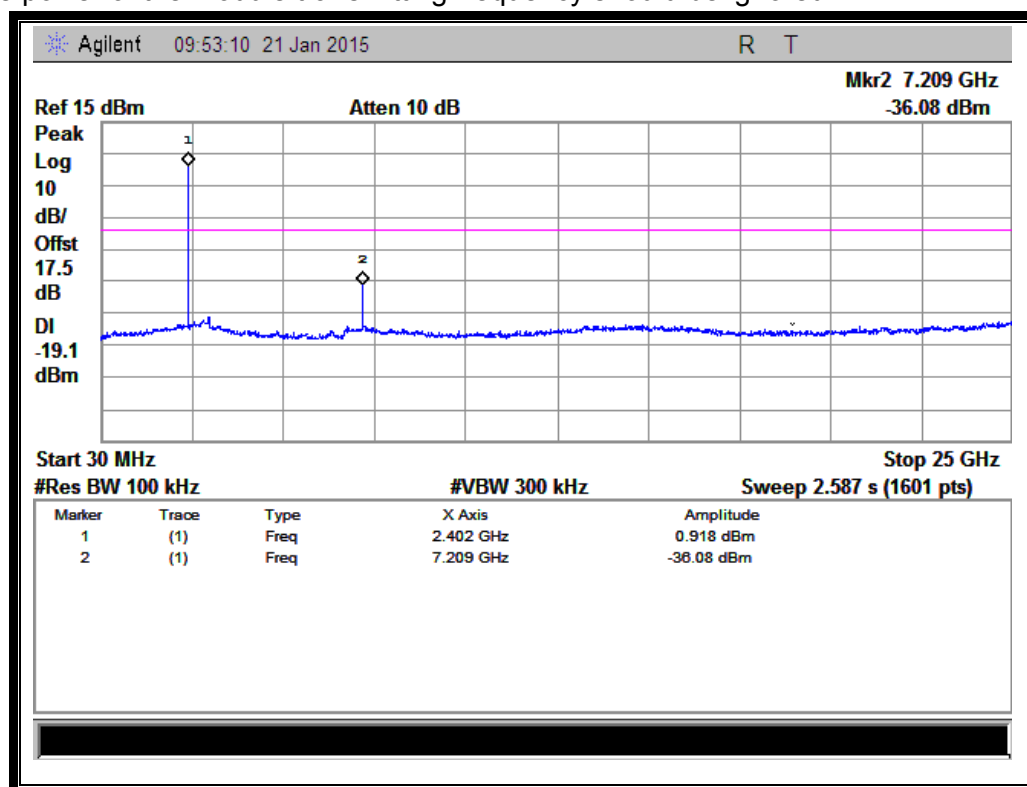
### 2.7.4.1 GFSK Mode

#### A. Test Verdict:

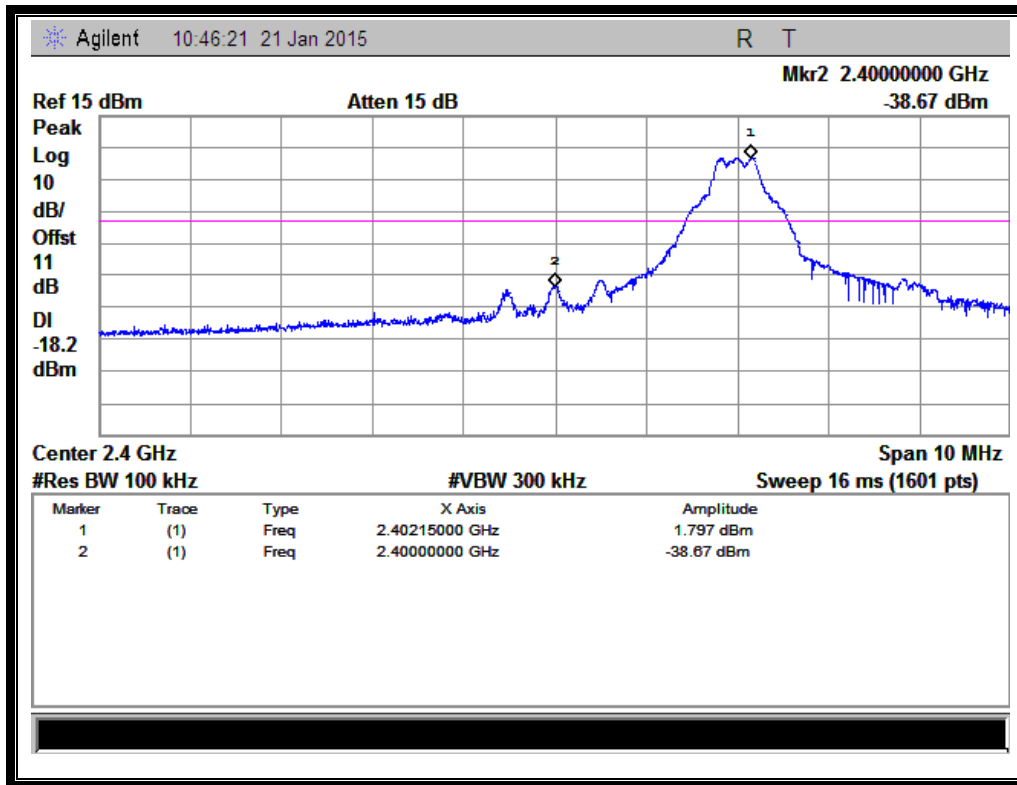
| Channel | Frequency (MHz) | Measured Max. Out of Band Emission (dBm) | Refer to Plot | Limit (dBm)   |                         | Verdict |
|---------|-----------------|------------------------------------------|---------------|---------------|-------------------------|---------|
|         |                 |                                          |               | Carrier Level | Calculated -20dBc Limit |         |
| 0       | 2402            | -36.08                                   | Plot A.1      | 0.918         | -19.1                   | PASS    |
| 39      | 2441            | -36.76                                   | Plot B.1      | 0.302         | -19.7                   | PASS    |
| 78      | 2480            | -41.33                                   | Plot C.1      | -1.829        | -21.8                   | PASS    |

#### B. Test Plots:

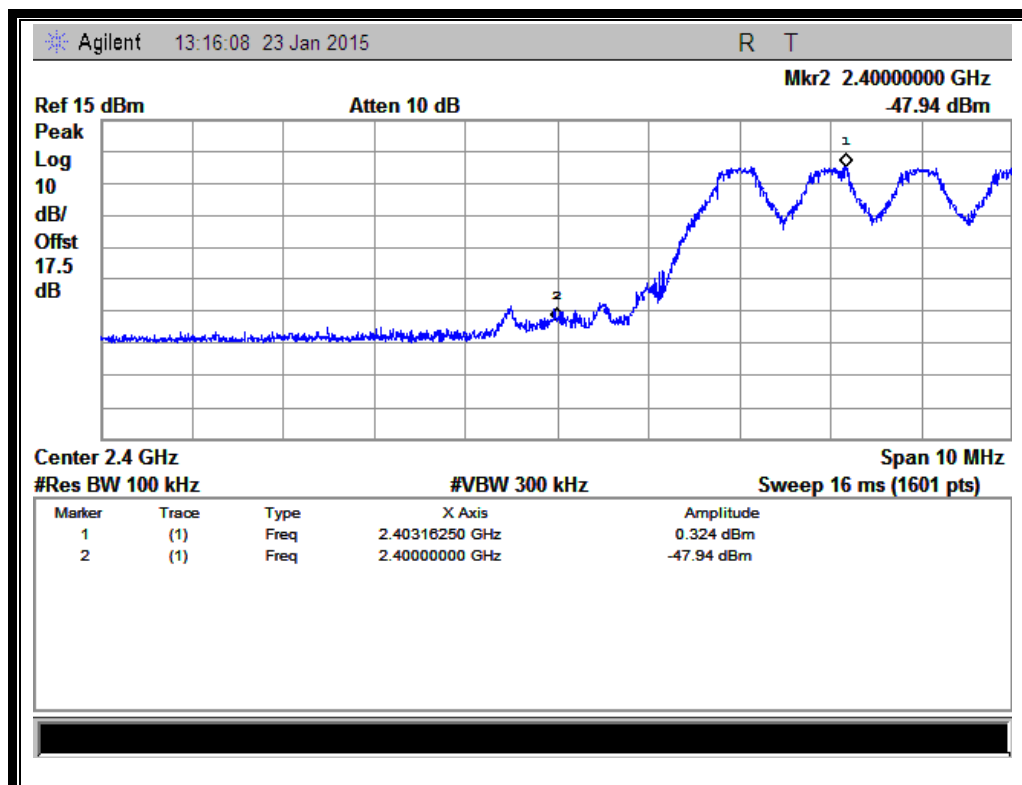
**Note:** the power of the Module transmitting frequency should be ignored.



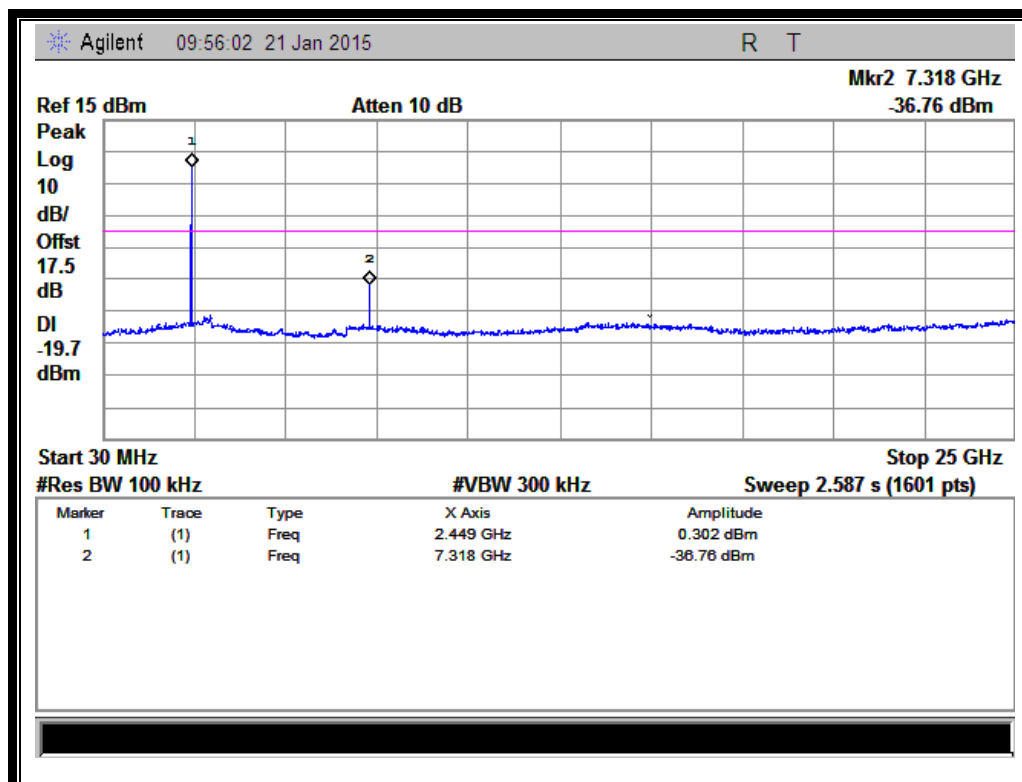
(Plot A.1: Channel = 0, 30MHz to 25GHz @ GFSK Mode)



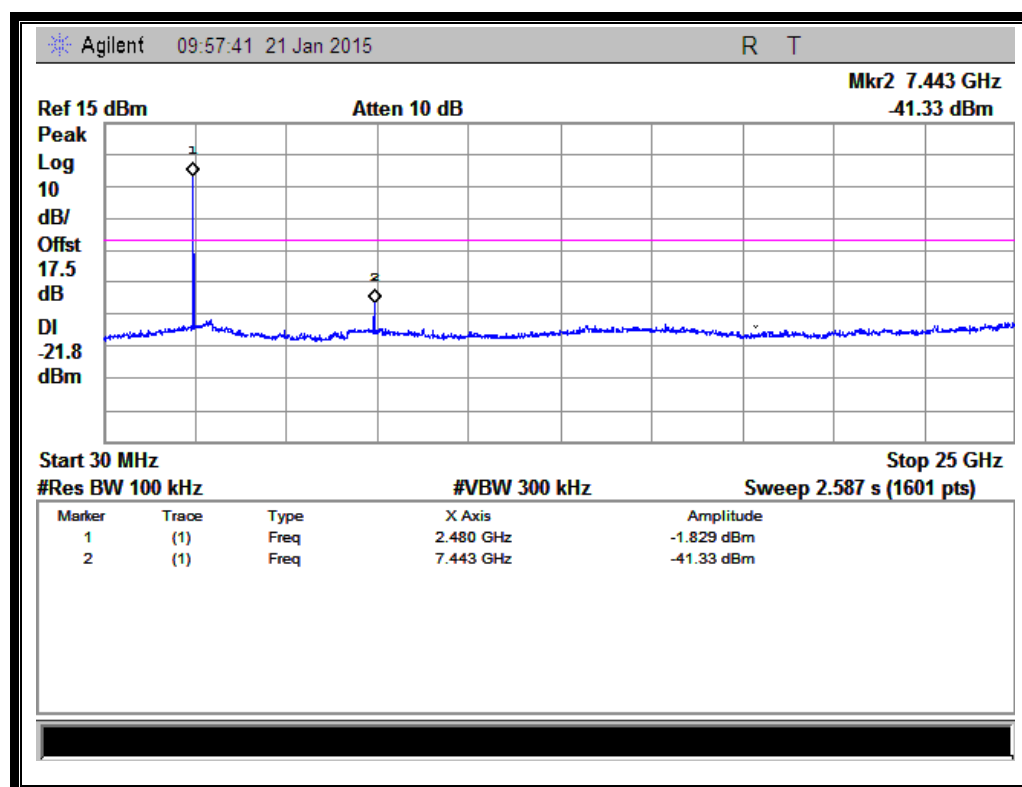
(Channel = 0, Band edge @ GFSK Mode)



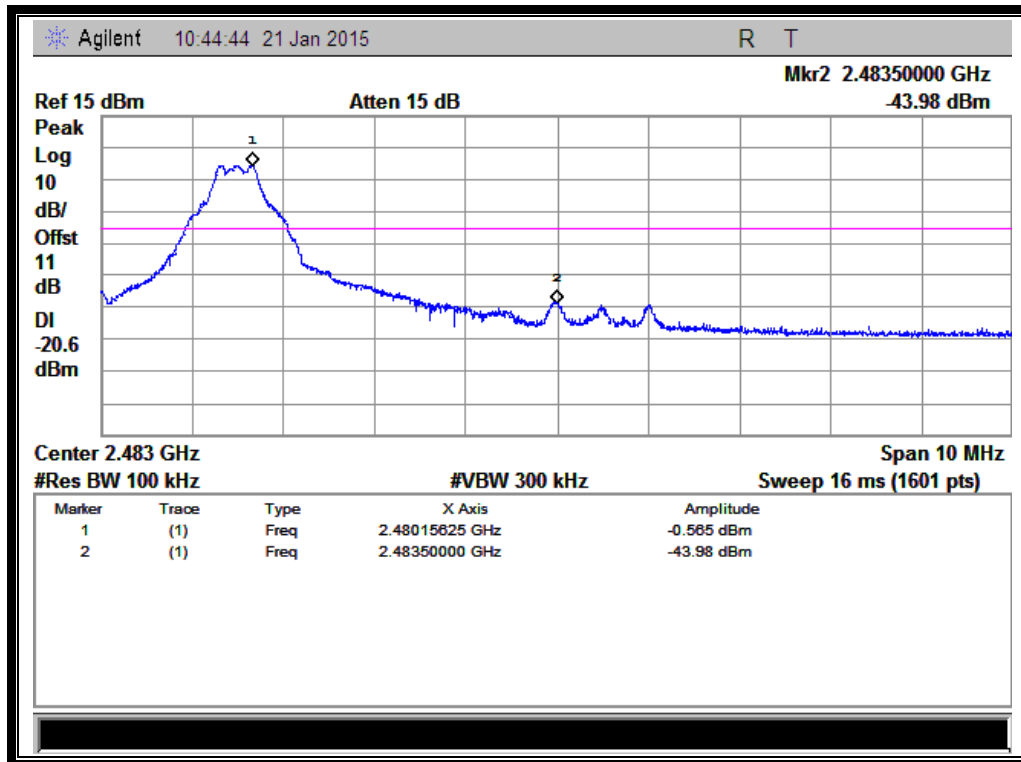
(Channel = 0, Band edge with hopping on @ GFSK Mode)



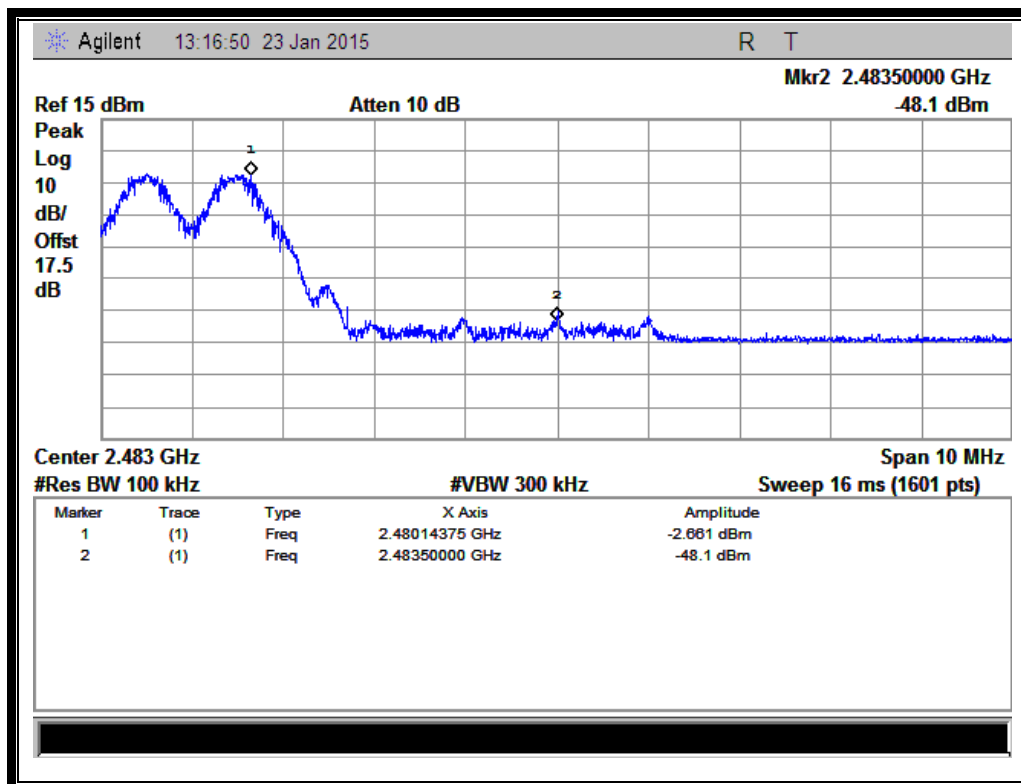
(Plot B.1: Channel = 39, 30MHz to 25GHz @ GFSK Mode)



(Plot C.1: Channel = 78, 30MHz to 25GHz @ GFSK Mode)



(Channel = 78, Band edge @ GFSK Mode)



(Channel = 78, Band edge with hopping on @ GFSK Mode)

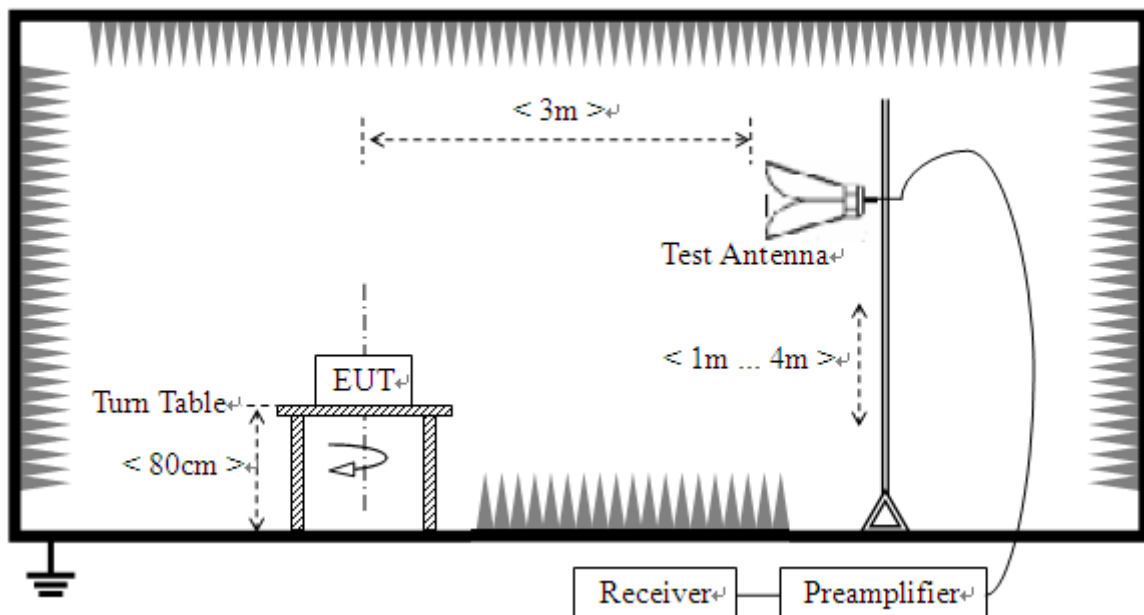
## 2.8 Restricted Frequency Bands

### 2.8.1 Requirement

According to FCC section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

### 2.8.2 Test Description

#### A. Test Setup:



The Module is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading. During the measurement, the Bluetooth Module is activated and controlled by the Bluetooth Service Supplier (SS) via a Common Antenna, and is set to operate under hopping-on test mode transmitting 339 bytes DH5 packages at maximum power.

For the Test Antenna:

Horn Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.

**B. Equipments List:**

Please reference ANNEX A(1.4).

**2.8.3 Test Procedure**

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for  $f \geq 1\text{GHz}$ , 100 KHz for  $f < 1\text{GHz}$

VBW = 3 MHz for peak and 10Hz for average

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize.

**2.8.4 Test Result**

The lowest and highest channels are tested to verify Restricted Frequency Bands.

The measurement results are obtained as below:

$E [\text{dB}\mu\text{V/m}] = \text{UR} + \text{AT} + \text{AFactor} [\text{dB}]; \text{AT} = \text{LCable loss} [\text{dB}] - \text{Gpreamp} [\text{dB}]$

AT: Total correction Factor except Antenna

UR: Receiver Reading

Gpreamp: Preamplifier Gain

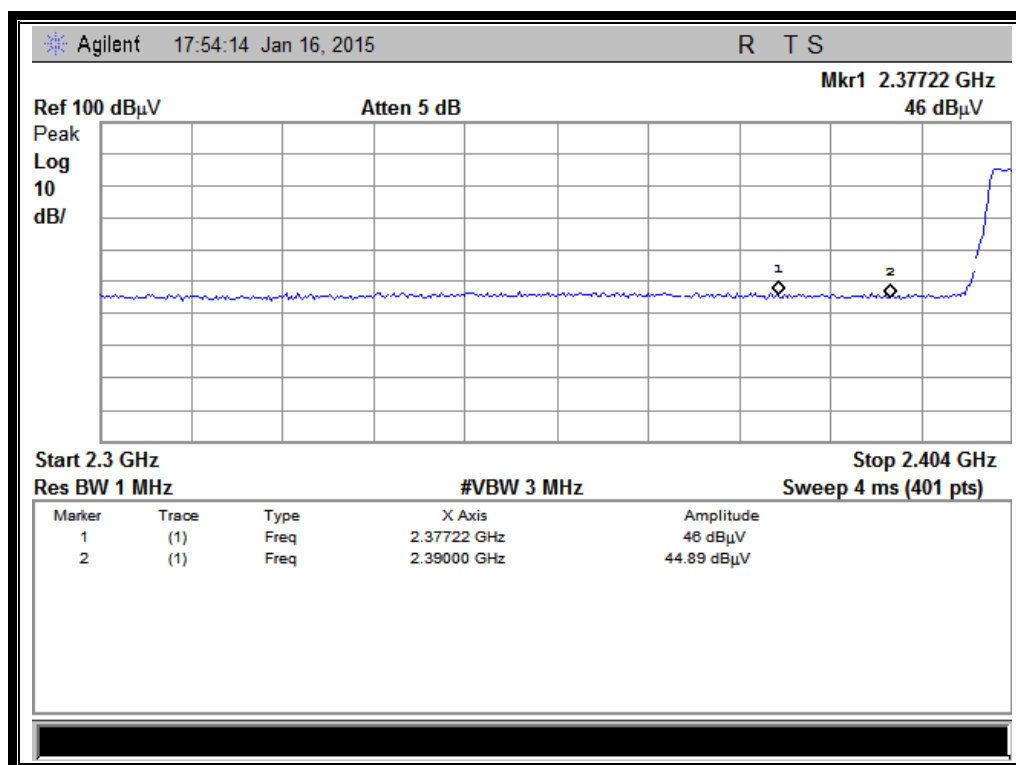
AFactor: Antenna Factor at 3m

**Note:** Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

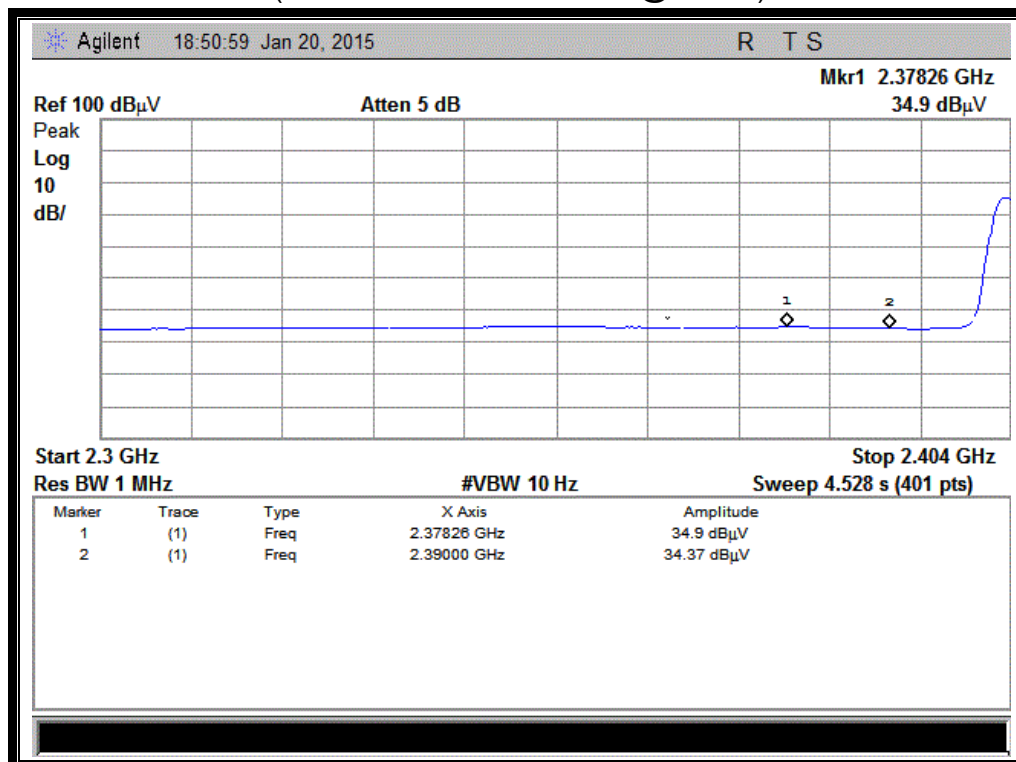
**2.8.4.1 GFSK Mode****A. Test Verdict:**

| Channel | Frequency (MHz) | Detector | Receiver Reading UR (dBuV) | AT (dB) | AFactor (dB@3m) | Max. Emission E (dBuV/m) | Limit (dBuV/m) | Verdict |
|---------|-----------------|----------|----------------------------|---------|-----------------|--------------------------|----------------|---------|
|         |                 | PK/ AV   |                            |         |                 |                          |                |         |
| 0       | 2377.22         | PK       | 46.00                      | -33.63  | 32.56           | 44.93                    | 74             | Pass    |
| 0       | 2378.26         | AV       | 34.90                      | -33.63  | 32.56           | 33.83                    | 54             | Pass    |
| 78      | 2483.50         | PK       | 50.67                      | -33.18  | 32.5            | 49.99                    | 74             | Pass    |
| 78      | 2483.50         | AV       | 36.83                      | -33.18  | 32.5            | 36.15                    | 54             | Pass    |

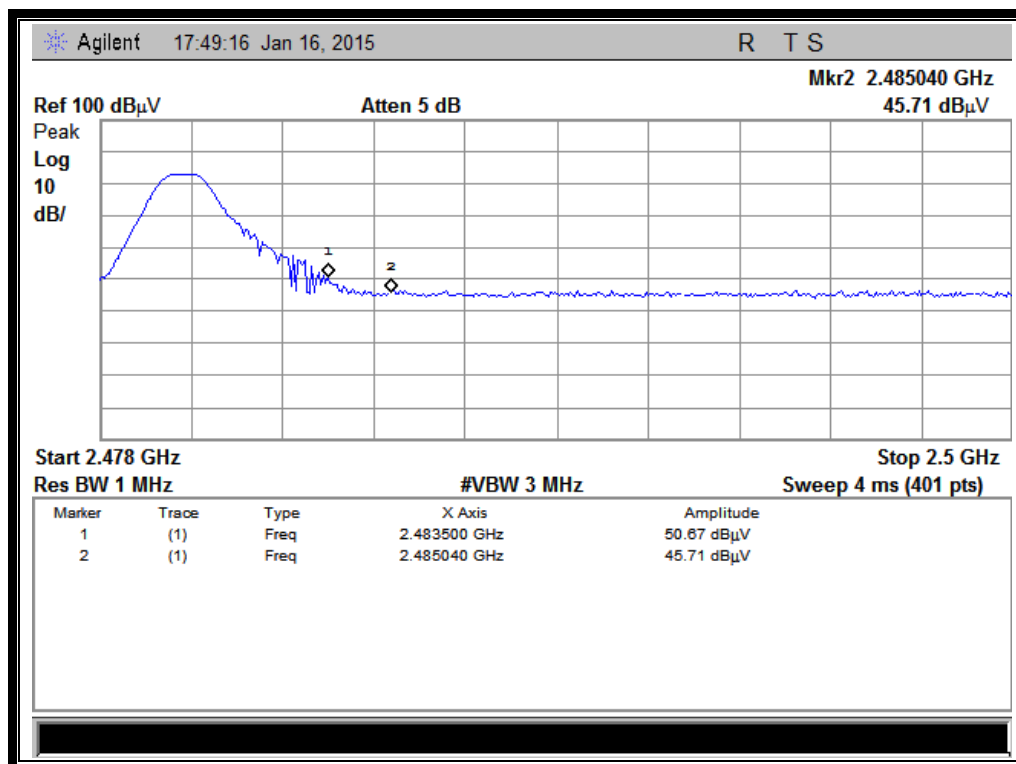
## B. Test Plots:



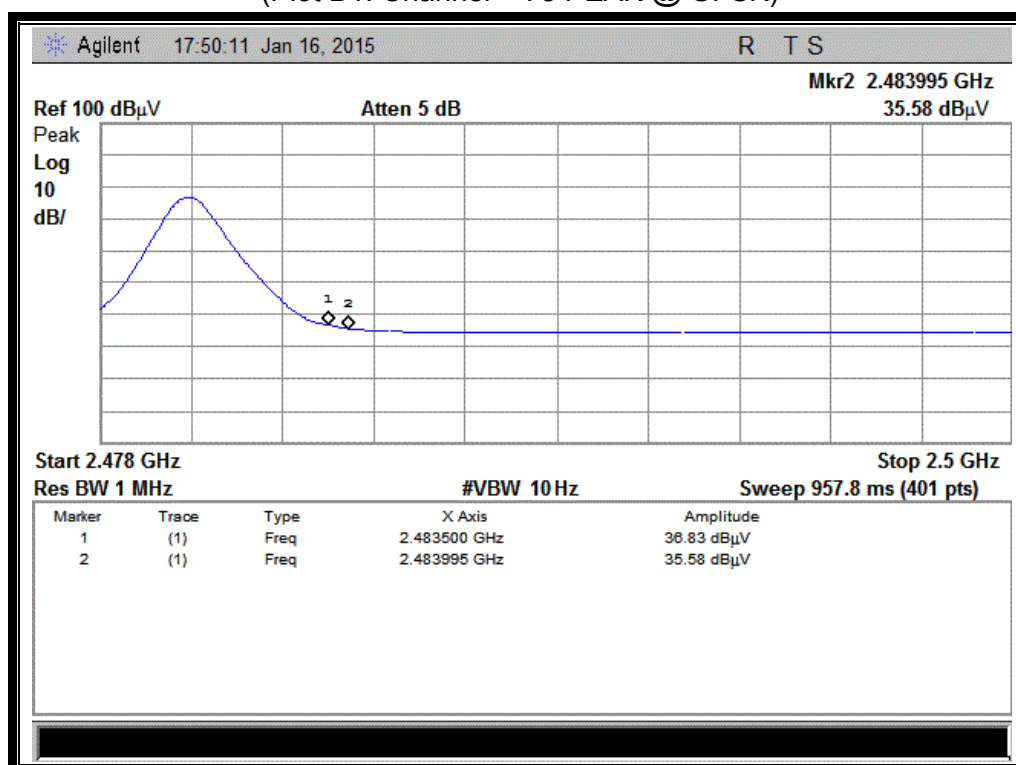
(Plot A1:Channel = 0 PEAK @ GFSK)



(Plot A2:Channel = 0 AVERAGE @ GFSK)



(Plot B1: Channel = 78 PEAK @ GFSK)



(Plot B2: Channel = 78 AVERAGE @ GFSK)

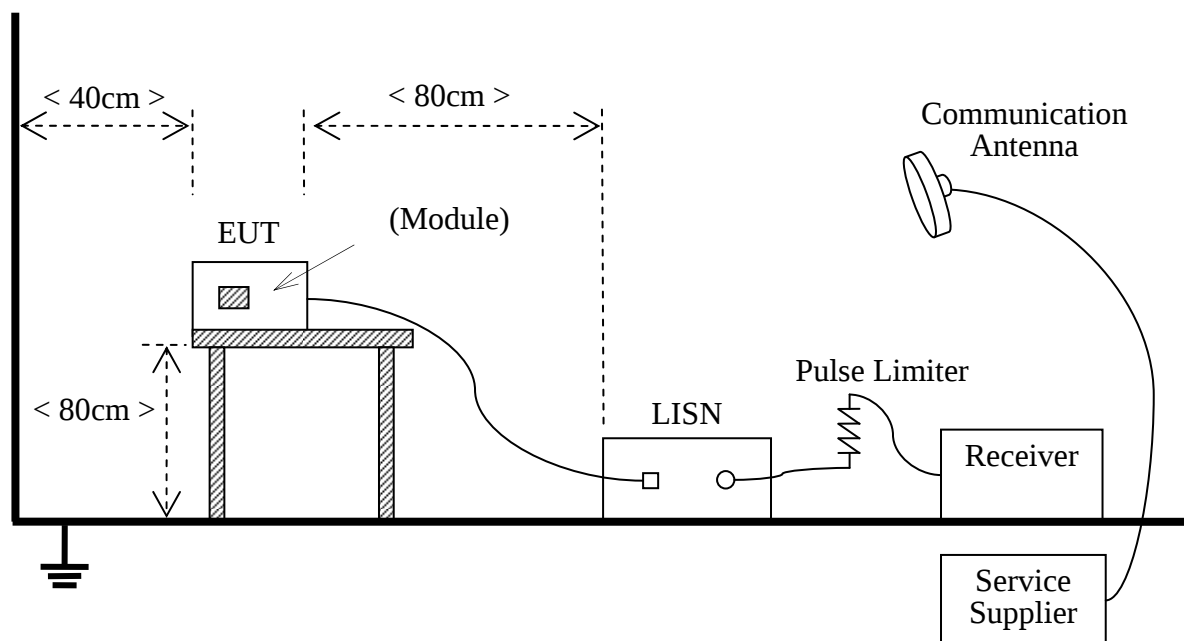
## 2.9 Conducted Emission

### 2.9.1 Requirement

According to FCC section 15.207, for an intentional radiator 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 within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 $\mu$ H/50 $\Omega$  line impedance stabilization network (LISN).

### 2.9.2 Test Description

#### Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.4:2009

### 2.9.3 Test Result

This EUT designed can not to be connected to the public utility(AC) power line,so conducted emission is unnecessary.

## 2.10 Radiated Emission

### 2.10.1 Requirement

According to FCC section 15.247(d) and RSS-A8.5, radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

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

**Note:**

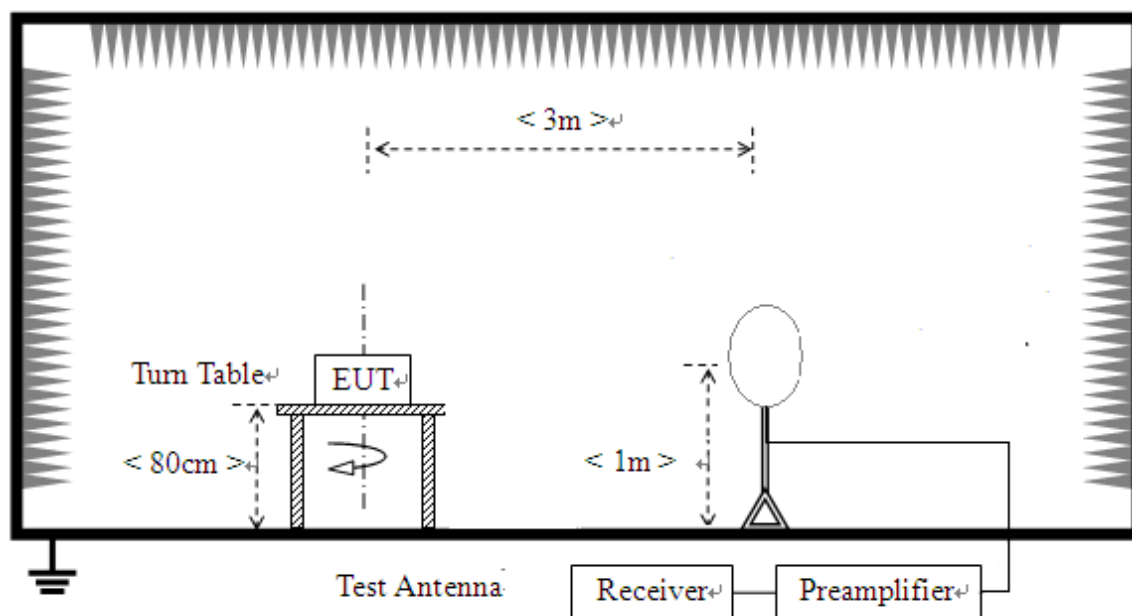
1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK)

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)

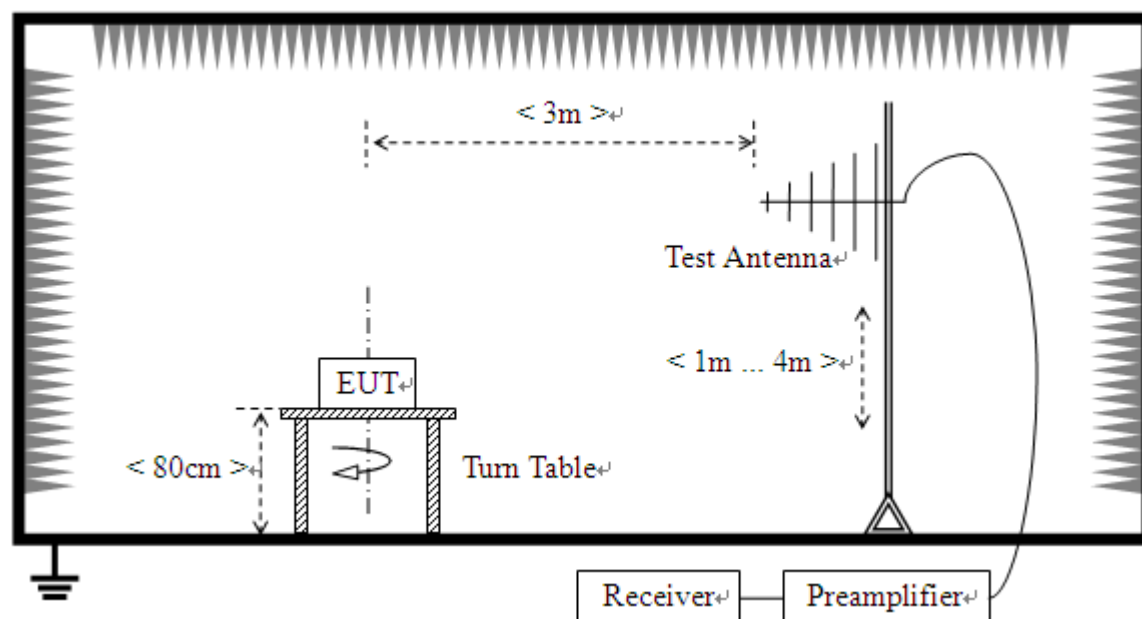
## 2.10.2 Test Description

### A. Test Setup:

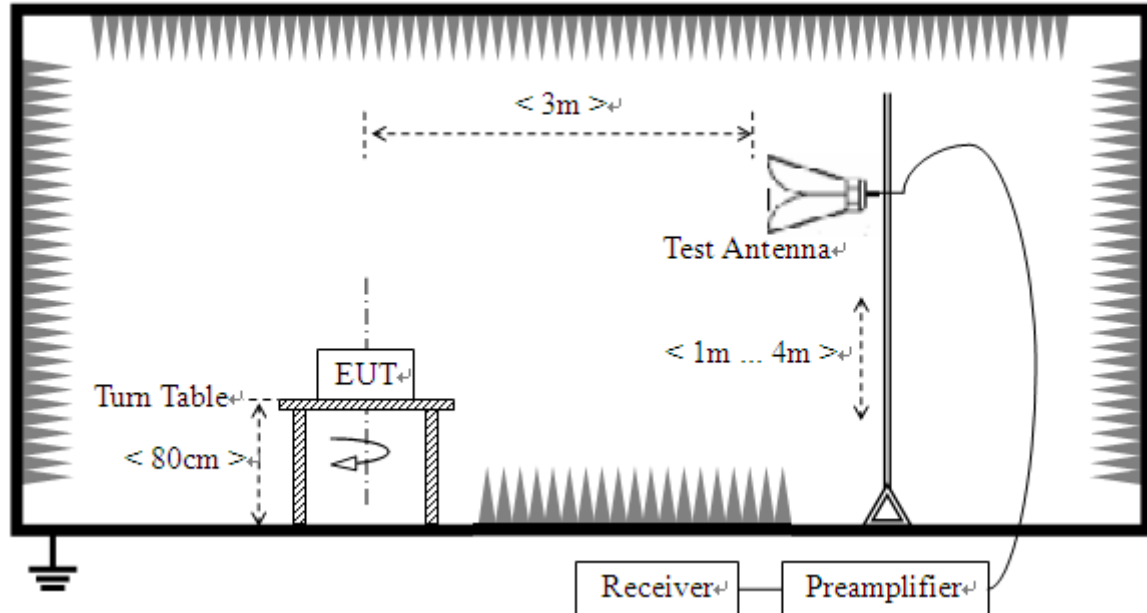
- 1) For radiated emissions from 9kHz to 30MHz



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



### 3) For radiated emissions above 1GHz



The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4 (2009). The EUT was set-up on insulator 80cm above the Ground Plane. The set-up and test methods were according to ANSI C63.4.

The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading.

For the Test Antenna:

- In the frequency range of 9kHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

**B. Equipments List:**

Please reference ANNEX A(1.4).

**2.10.3 Test Procedure**

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for  $f \geq 1$  GHz, 100 kHz for  $f < 1$  GHz

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

**2.10.4 Test Result**

According to ANSI C63.4 selection 4.2.2, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak limit, it is unnecessary to perform an quasi-peak measurement.

The measurement results are obtained as below:

$$E [\text{dB}\mu\text{V/m}] = U_R + A_T + A_{\text{Factor}} [\text{dB}]; A_T = L_{\text{Cable loss}} [\text{dB}] - G_{\text{preamp}} [\text{dB}]$$

$A_T$ : Total correction Factor except Antenna

$U_R$ : Receiver Reading

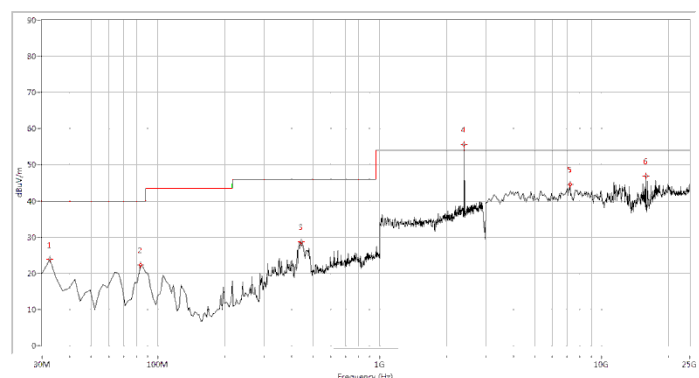
$G_{\text{preamp}}$ : Preamplifier Gain

$A_{\text{Factor}}$ : Antenna Factor at 3m

During the test, the total correction Factor  $A_T$  and  $A_{\text{Factor}}$  were built in test software.

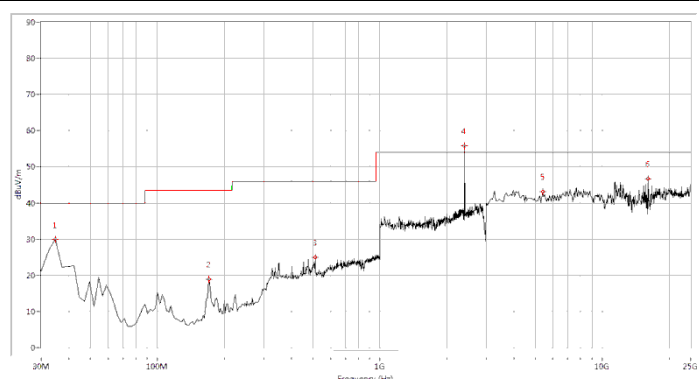
**Note:** All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

The low frequency, which started from 9KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

**2.10.4.1 GFSK Mode:****A. Test Plots for the Whole Measurement Frequency Range:**Plots for Channel = 0

| Fre.(MHz) | Pk    | QP  | AV  | Limit-PK | Limit-QP | Limit-AV | Antenna    | Verdict |
|-----------|-------|-----|-----|----------|----------|----------|------------|---------|
| 32.419    | 23.91 | N.A | N.A | N.A      | 40.0     | N.A      | Horizontal | PASS    |
| 83.217    | 22.19 | N.A | N.A | N.A      | 40.0     | N.A      | Horizontal | PASS    |
| 441.222   | 28.72 | N.A | N.A | N.A      | 46.0     | N.A      | Horizontal | PASS    |
| 2402.000  | 55.65 | N.A | N.A | N.A      | N.A      | N.A      | Horizontal | N.A     |
| 7224.439  | 44.58 | N.A | N.A | 74.0     | N.A      | 54.0     | Horizontal | PASS    |
| 15837.905 | 46.94 | N.A | N.A | 74.0     | N.A      | 54.0     | Horizontal | PASS    |

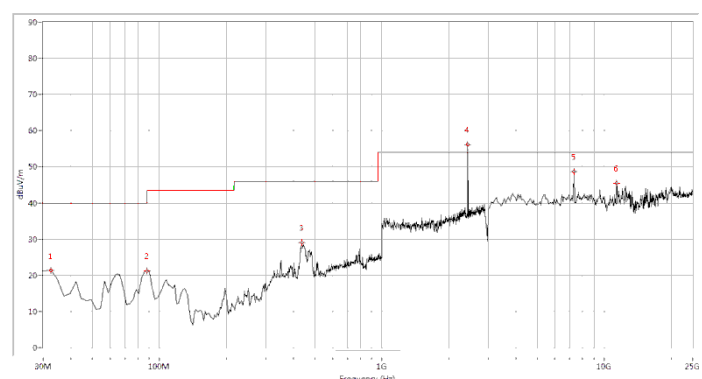
(30MHz to 25GHz, Antenna Horizontal @ GFSK, channel 0)



| Fre.(MHz) | Pk    | QP  | AV  | Limit-PK | Limit-QP | Limit-AV | Antenna  | Verdict |
|-----------|-------|-----|-----|----------|----------|----------|----------|---------|
| 34.838    | 29.86 | N.A | N.A | N.A      | 40.0     | N.A      | Vertical | PASS    |
| 170.299   | 18.86 | N.A | N.A | N.A      | 43.5     | N.A      | Vertical | PASS    |
| 511.372   | 25.01 | N.A | N.A | N.A      | 46.0     | N.A      | Vertical | PASS    |
| 2402.000  | N.A   | N.A | N.A | N.A      | N.A      | N.A      | Vertical | N.A     |
| 5413.965  | 43.12 | N.A | N.A | 74.0     | N.A      | 54.0     | Vertical | PASS    |
| 16112.219 | 46.64 | N.A | N.A | 74.0     | N.A      | 54.0     | Vertical | PASS    |

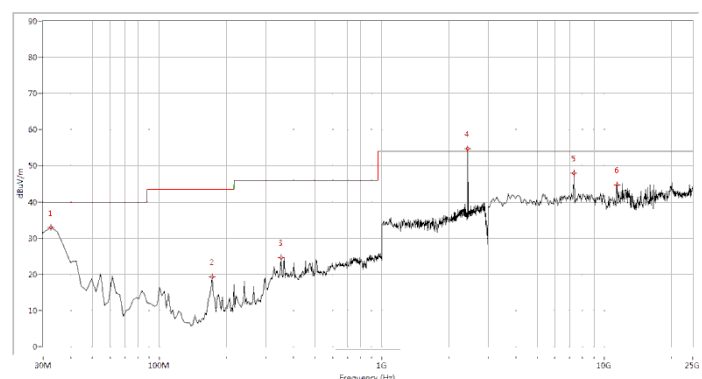
(30MHz to 25GHz, Antenna Vertical @ GFSK, channel 0)

### Plot for Channel = 39



| Fre. (MHz) | Pk    | QP  | AV  | Limit-PK | Limit-QP | Limit-AV | Antenna    | Verdict |
|------------|-------|-----|-----|----------|----------|----------|------------|---------|
| 32.419     | 21.44 | N.A | N.A | N.A      | 40.0     | N.A      | Horizontal | PASS    |
| 88.055     | 21.29 | N.A | N.A | N.A      | 43.5     | N.A      | Horizontal | PASS    |
| 436.384    | 29.00 | N.A | N.A | N.A      | 46.0     | N.A      | Horizontal | PASS    |
| 2441.000   | 56.16 | N.A | N.A | N.A      | N.A      | N.A      | Horizontal | N.A     |
| 7334.165   | 48.74 | N.A | N.A | 74.0     | N.A      | 54.0     | Horizontal | PASS    |
| 11394.015  | 45.41 | N.A | N.A | 74.0     | N.A      | 54.0     | Horizontal | PASS    |

(30MHz to 25GHz, Antenna Horizontal @ GFSK, channel 39)

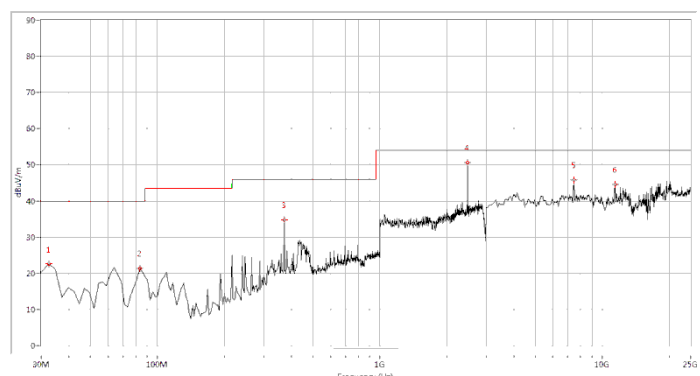


| Fre. (MHz) | Pk    | QP  | AV  | Limit-PK | Limit-QP | Limit-AV | Antenna  | Verdict |
|------------|-------|-----|-----|----------|----------|----------|----------|---------|
| 32.419     | 33.02 | N.A | N.A | N.A      | 40.0     | N.A      | Vertical | PASS    |
| 172.718    | 19.32 | N.A | N.A | N.A      | 43.5     | N.A      | Vertical | PASS    |
| 351.721    | 24.51 | N.A | N.A | N.A      | 46.0     | N.A      | Vertical | PASS    |
| 2441.000   | 54.76 | N.A | N.A | N.A      | N.A      | N.A      | Vertical | N.A     |
| 7334.165   | 47.87 | N.A | N.A | 74.0     | N.A      | 54.0     | Vertical | PASS    |
| 11448.878  | 44.66 | N.A | N.A | 74.0     | N.A      | 54.0     | Vertical | PASS    |

(30MHz to 25GHz, Antenna Vertical @ GFSK, channel 39)

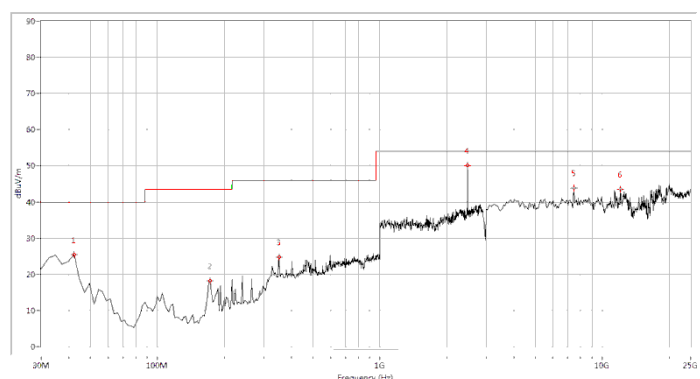


Plot for Channel = 78



| Fre.(MHz) | Pk    | QP  | AV  | Limit-PK | Limit-QP | Limit-AV | Antenna    | Verdict |
|-----------|-------|-----|-----|----------|----------|----------|------------|---------|
| 32.419    | 22.68 | N.A | N.A | N.A      | 40.0     | N.A      | Horizontal | PASS    |
| 83.217    | 21.30 | N.A | N.A | N.A      | 40.0     | N.A      | Horizontal | PASS    |
| 371.072   | 34.78 | N.A | N.A | N.A      | 46.0     | N.A      | Horizontal | PASS    |
| 2480.000  | 50.54 | N.A | N.A | N.A      | N.A      | N.A      | Horizontal | N.A     |
| 7443.890  | 45.81 | N.A | N.A | 74.0     | N.A      | 54.0     | Horizontal | PASS    |
| 11448.878 | 44.49 | N.A | N.A | 74.0     | N.A      | 54.0     | Horizontal | PASS    |

(30MHz to 25GHz, Antenna Horizontal @ GFSK, channel 78)



| Fre.(MHz) | Pk    | QP  | AV  | Limit-PK | Limit-QP | Limit-AV | Antenna  | Verdict |
|-----------|-------|-----|-----|----------|----------|----------|----------|---------|
| 42.095    | 25.41 | N.A | N.A | N.A      | 40.0     | N.A      | Vertical | PASS    |
| 172.718   | 18.20 | N.A | N.A | N.A      | 43.5     | N.A      | Vertical | PASS    |
| 351.721   | 24.80 | N.A | N.A | N.A      | 46.0     | N.A      | Vertical | PASS    |
| 2480.000  | 50.15 | N.A | N.A | N.A      | N.A      | N.A      | Vertical | N.A     |
| 7443.890  | 43.84 | N.A | N.A | 74.0     | N.A      | 54.0     | Vertical | PASS    |
| 12107.232 | 43.52 | N.A | N.A | 74.0     | N.A      | 54.0     | Vertical | PASS    |

(30MHz to 25GHz, Antenna Vertical @ GFSK, channel 78)

## 2.11 RF exposure evaluation

According to § 1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of Commission's guideline.

According to 447498 D01 General RF Exposure Guidance v05, exclusion threshold values at selected frequencies and distances table as following.

| MHz  | 5   | 10  | 15  | 20  | 25  | mm                                      |
|------|-----|-----|-----|-----|-----|-----------------------------------------|
| 150  | 39  | 77  | 116 | 155 | 194 | SAR Test<br>Exclusion<br>Threshold (mW) |
| 300  | 27  | 55  | 82  | 110 | 137 |                                         |
| 450  | 22  | 45  | 67  | 89  | 112 |                                         |
| 835  | 16  | 33  | 49  | 66  | 82  |                                         |
| 900  | 16  | 32  | 47  | 63  | 79  |                                         |
| 1500 | 12  | 24  | 37  | 49  | 61  |                                         |
| 1900 | 11  | 22  | 33  | 44  | 54  |                                         |
| 2450 | 10  | 19  | 29  | 38  | 48  |                                         |
| 3600 | 8   | 16  | 24  | 32  | 40  |                                         |
| 5200 | 7   | 13  | 20  | 26  | 33  |                                         |
| 5400 | 6   | 13  | 19  | 26  | 32  |                                         |
| 5800 | 6   | 12  | 19  | 25  | 31  |                                         |
|      |     |     |     |     |     |                                         |
| MHz  | 30  | 35  | 40  | 45  | 50  | mm                                      |
| 150  | 232 | 271 | 310 | 349 | 387 | SAR Test<br>Exclusion<br>Threshold (mW) |
| 300  | 164 | 192 | 219 | 246 | 274 |                                         |
| 450  | 134 | 157 | 179 | 201 | 224 |                                         |
| 835  | 98  | 115 | 131 | 148 | 164 |                                         |
| 900  | 95  | 111 | 126 | 142 | 158 |                                         |
| 1500 | 73  | 86  | 98  | 110 | 122 |                                         |
| 1900 | 65  | 76  | 87  | 98  | 109 |                                         |
| 2450 | 57  | 67  | 77  | 86  | 96  |                                         |
| 3600 | 47  | 55  | 63  | 71  | 79  |                                         |
| 5200 | 39  | 46  | 53  | 59  | 66  |                                         |
| 5400 | 39  | 45  | 52  | 58  | 65  |                                         |
| 5800 | 37  | 44  | 50  | 56  | 62  |                                         |

3.

Routine SAR evaluation refers to the specifically required by § 2.1093, using measurements or computer simulation. When routine SAR evolution is not required, the portable transmitters with output power greater than the applicable low threshold SAR evolution to qualify for TCB approval.

### Result:

This is portable device and the Max conducted peak output power is -0.176dBm, the maximum gain of antenna is-3.5dBi, the maximum output power is -0.176dBm (0.960mW). which is lower than the exclusion threshold 10mW, at frequency 2450MHz, and distance is 5mm.

The SAR measurement is not required.



## ANNEX A GENERAL INFORMATION

### 1.1 Identification of the Responsible Testing Laboratory

|                               |                                                                                                                                  |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Company Name:                 | Shenzhen Morlab Communications Technology Co., Ltd.                                                                              |
| Department:                   | Morlab Laboratory                                                                                                                |
| Address:                      | FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China |
| Responsible Test Lab Manager: | Mr. Su Feng                                                                                                                      |
| Telephone:                    | +86 755 36698555                                                                                                                 |
| Facsimile:                    | +86 755 36698525                                                                                                                 |

### 1.2 Identification of the Responsible Testing Location

|          |                                                                                                                                  |
|----------|----------------------------------------------------------------------------------------------------------------------------------|
| Name:    | Shenzhen Morlab Communications Technology Co., Ltd.<br>Morlab Laboratory                                                         |
| Address: | FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China |

### 1.3 Facilities and Accreditations

Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L3572.

All measurement facilities used to collect the measurement data are located at FL.1, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10 2009, ANSI C63.4 2009 and CISPR Publication 22; the FCC registration number is 695796.

The IC registration number is 7183A-2.

**1.4 Test Equipments Utilized****1.4.1 Conducted Test Equipments****Conducted Test Equipment**

| No. | Equipment Name      | Serial No. | Type    | Manufacturer | Cal. Date  | Cal. Due   |
|-----|---------------------|------------|---------|--------------|------------|------------|
| 1   | System Simulator    | 6K00006210 | MT8852B | Anritsu      | 2014.02.26 | 2015.02.25 |
| 2   | Spectrum Analyzer   | MY45101810 | E4407B  | Agilent      | 2014.02.26 | 2015.02.25 |
| 3   | Power Splitter      | NW521      | 1506A   | Weinschel    | 2014.02.26 | 2015.02.25 |
| 4   | Attenuator 1        | (n.a.)     | 10dB    | Resnet       | 2014.02.26 | 2015.02.25 |
| 5   | Attenuator 2        | (n.a.)     | 3dB     | Resnet       | 2014.02.26 | 2015.02.25 |
| 6   | EXA Signal Analyzer | MY51440152 | N9010A  | Agilent      | 2014.02.26 | 2015.02.25 |
| 7   | RF cable            | CB01       | RF01    | Morlab       | N/A        | N/A        |
| 8   | Coaxial cable       | CB02       | RF02    | Morlab       | N/A        | N/A        |
| 9   | SMA connector       | CN01       | RF03    | HUBER-SUHNER | N/A        | N/A        |

**1.4.2 Conducted Emission Test Equipments****Conducted Emission Test Equipments**

| No. | Equipment Name          | Serial No. | Type           | Manufacturer | Cal. Date  | Cal. Due   |
|-----|-------------------------|------------|----------------|--------------|------------|------------|
| 1   | Receiver                | US44210471 | E7405A         | Agilent      | 2014.02.26 | 2015.02.25 |
| 2   | LISN                    | 812744     | NSLK 8127      | Schwarzbeck  | 2014.02.26 | 2015.02.25 |
| 3   | Service Supplier        | 100448     | CMU200         | R&S          | 2014.02.26 | 2015.02.25 |
| 4   | Pulse Limiter<br>(20dB) | 9391       | VTSD<br>9561-D | Schwarzbeck  | 2014.02.26 | 2015.02.25 |
| 5   | Coaxial cable(BNC)      | CB01       | EMC01          | Morlab       | N/A        | N/A        |



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### 1.4.3 Radiated Test Equipments

| Radiated Test Equipments |                        |            |            |              |            |              |
|--------------------------|------------------------|------------|------------|--------------|------------|--------------|
| No.                      | Equipment Name         | Serial No. | Type       | Manufacturer | Cal. Date  | Cal.Due Date |
| 1                        | System Simulator       | 100448     | CMU200     | R&S          | 2014.02.26 | 2015.02.25   |
| 2                        | Receiver               | US44210471 | E7405A     | Agilent      | 2014.02.26 | 2015.02.25   |
| 3                        | Test Antenna - Bi-Log  | 9163-274   | 9m*6m*6m   | Albatross    | 2014.02.26 | 2015.02.25   |
| 4                        | Test Antenna - Horn    | 9120D-963  | VULB 9163  | Schwarzbeck  | 2014.02.26 | 2015.02.25   |
| 5                        | Test Antenna - Horn    | 71688      | BBHA 9120D | Schwarzbeck  | 2014.02.26 | 2015.02.25   |
| 6                        | Test Antenna - Loop    | 1519-022   | HL050S7    | R&S          | 2014.02.26 | 2015.02.25   |
| 7                        | Coaxial cable (N male) | CB02       | EMC02      | Morlab       | N/A        | N/A          |
| 8                        | Coaxial cable (N male) | CB03       | EMC03      | Morlab       | N/A        | N/A          |

### 1.4.4 Climate Chamber

| Climate Chamber |                 |            |         |              |            |              |
|-----------------|-----------------|------------|---------|--------------|------------|--------------|
| No.             | Equipment Name  | Serial No. | Type    | Manufacturer | Cal.Date   | Cal.Due Date |
| 1               | Climate Chamber | 2004012    | HL4003T | Yinhe        | 2014.02.26 | 2015.02.25   |

### 1.4.5 Vibration Table

| Vibration Table |                 |            |               |              |            |              |
|-----------------|-----------------|------------|---------------|--------------|------------|--------------|
| No.             | Equipment Name  | Serial No. | Type          | Manufacturer | Cal.Date   | Cal.Due Date |
| 1               | Vibration Table | N/A        | ACT2000-S015L | CMI-COM      | 2014.02.26 | 2015.02.25   |

### 1.4.6 Anechoic Chamber

| Anechoic Chamber |                  |            |          |              |            |              |
|------------------|------------------|------------|----------|--------------|------------|--------------|
| No.              | Equipment Name   | Serial No. | Type     | Manufacturer | Cal.Date   | Cal.Due Date |
| 1                | Anechoic Chamber | N/A        | 9m*6m*6m | Albatross    | 2014.02.26 | 2015.02.25   |

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