

# FCC Test Report

Report No.: AGC03576180501FE08

**FCC ID** : 2APJY-TT201  
**APPLICATION PURPOSE** : Original Equipment  
**PRODUCT DESIGNATION** : Travis Touch  
**BRAND NAME** : Travis  
**MODEL NAME** : TT201  
**CLIENT** : Travis GT b.v.  
**DATE OF ISSUE** : July 03, 2018  
**STANDARD(S)** : FCC Part 15.247  
**TEST PROCEDURE(S)** : KDB 558074 D01 DTS Meas Guidance v04  
**REPORT VERSION** : V1.0

**Attestation of Global Compliance (Shenzhen) Co., Ltd**

**CAUTION:**

This report shall not be reproduced except in full without the written permission of the test laboratory and shall not be quoted out of context.



The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

### Report Revise Record

| Report Version | Revise Time | Issued Date   | Valid Version | Notes           |
|----------------|-------------|---------------|---------------|-----------------|
| V1.0           | /           | July 03, 2018 | Valid         | Original Report |

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

## TABLE OF CONTENTS

|                                                                 |           |
|-----------------------------------------------------------------|-----------|
| <b>1. VERIFICATION OF COMPLIANCE.....</b>                       | <b>5</b>  |
| <b>2.GENERAL INFORMATION.....</b>                               | <b>6</b>  |
| 2.1PRODUCT DESCRIPTION .....                                    | 6         |
| 2.2 RELATED SUBMITTAL(S)/GRANT(S) .....                         | 6         |
| 2.3TEST METHODOLOGY .....                                       | 6         |
| 2.4 TEST FACILITY .....                                         | 7         |
| 2.5 SPECIAL ACCESSORIES .....                                   | 7         |
| 2.6 EQUIPMENT MODIFICATIONS .....                               | 7         |
| <b>3. MEASUREMENT UNCERTAINTY .....</b>                         | <b>8</b>  |
| <b>4. SYSTEM TEST CONFIGURATION .....</b>                       | <b>9</b>  |
| 4.1 CONFIGURATION OF TESTED SYSTEM .....                        | 9         |
| 4.2 EQUIPMENT USED IN TESTED SYSTEM.....                        | 9         |
| <b>5. SUMMARY OF TEST RESULTS .....</b>                         | <b>11</b> |
| <b>6. DESCRIPTION OF TEST MODES .....</b>                       | <b>12</b> |
| <b>7. RADIATED EMISSION .....</b>                               | <b>13</b> |
| 7.1 MEASUREMENT PROCEDURE .....                                 | 13        |
| 7.2 TEST SETUP.....                                             | 14        |
| 7.3 LIMITS AND MEASUREMENT RESULT .....                         | 15        |
| 7.4 TEST RESULT .....                                           | 16        |
| <b>8. BAND EDGE EMISSION .....</b>                              | <b>19</b> |
| 8.1. MEASUREMENT PROCEDURE .....                                | 19        |
| 8.2. TEST SET-UP .....                                          | 19        |
| 8.3. RADIATED TEST RESULT .....                                 | 20        |
| 8.4. CONDUCTED TEST RESULT .....                                | 21        |
| <b>9.6DB BANDWIDTH.....</b>                                     | <b>22</b> |
| 9.1. TEST PROCEDURE .....                                       | 22        |
| 9.2. SUMMARY OF TEST RESULTS/PLOTS.....                         | 22        |
| <b>10. CONDUCTED OUTPUT POWER.....</b>                          | <b>23</b> |
| 10.1. MEASUREMENT PROCEDURE .....                               | 23        |
| 10.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION).....         | 23        |
| 10.3. LIMITS AND MEASUREMENT RESULT .....                       | 24        |
| <b>11. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY.....</b> | <b>25</b> |
| 11.1 MEASUREMENT PROCEDURE .....                                | 25        |
| 11.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION).....          | 25        |

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.



|                                                          |           |
|----------------------------------------------------------|-----------|
| 11.3 LIMITS AND MEASUREMENT RESULT .....                 | 26        |
| <b>12. FCC LINE CONDUCTED EMISSION TEST .....</b>        | <b>27</b> |
| 12.1 LIMITS .....                                        | 27        |
| 12.2 TEST SETUP .....                                    | 27        |
| 12.3 PRELIMINARY PROCEDURE .....                         | 28        |
| 12.4 FINAL TEST PROCEDURE .....                          | 28        |
| 12.5 TEST RESULT OF POWER LINE .....                     | 29        |
| <b>13. CONDUCTED SPURIOUS EMISSION .....</b>             | <b>31</b> |
| 13.1. MEASUREMENT PROCEDURE .....                        | 31        |
| 13.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) ..... | 32        |
| 13.3. MEASUREMENT EQUIPMENT USED .....                   | 32        |
| 13.4. LIMITS AND MEASUREMENT RESULT .....                | 32        |
| <b>APPENDIX A: PHOTOGRAPHS OF TEST SETUP .....</b>       | <b>35</b> |

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

## 1. VERIFICATION OF COMPLIANCE

|                                 |                                                                                      |
|---------------------------------|--------------------------------------------------------------------------------------|
| <b>Applicant</b>                | Travis GT b.v.                                                                       |
| <b>Address</b>                  | Stationsplein 45, 3013 AK Rotterdam, The Netherlands, Rotterdam, Netherlands         |
| <b>Manufacturer</b>             | Huano International Technology Limited                                               |
| <b>Address</b>                  | 29th Floor, Yinglong Building, # 6025 ShenNan Road, FuTian District, Shenzhen, China |
| <b>Product Designation</b>      | Travis Touch                                                                         |
| <b>Brand Name</b>               | Travis                                                                               |
| <b>Test Model</b>               | TT201                                                                                |
| <b>Date of test</b>             | June 13, 2018~July 03, 2018                                                          |
| <b>Deviation</b>                | None                                                                                 |
| <b>Condition of Test Sample</b> | Normal                                                                               |
| <b>Report Template</b>          | AGCRT-US-BLE/RF                                                                      |

We hereby certify that:

The above equipment was tested by Attestation of Global Compliance(Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with requirement of FCC Part 15 Rules requirement.

The test results of this report relate only to the tested sample identified in this report.

Tested By

*Nice.xie*

Nice Xie(Xie xiaosong)

July 03, 2018

Reviewed By

*Bart.xie*

Bart Xie(Xie Xiaobin)

July 03, 2018

Approved By

*Forrest.lei*

Forrest Lei(Lei Yonggang)  
Authorized Officer

July 03, 2018

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.



## 2.GENERAL INFORMATION

### 2.1PRODUCT DESCRIPTION

The EUT is designed as "Travis Touch". It is designed by way of utilizing the FHSS technology to achieve the system operation.

A major technical description of EUT is described as following:

|                     |                                                      |
|---------------------|------------------------------------------------------|
| Operation Frequency | 2.402 GHz to 2.480GHz                                |
| Bluetooth Version   | V4.0                                                 |
| Modulation          | GFSK                                                 |
| Number of channels  | 40 Channel(37 Hopping Channel,3 advertising Channel) |
| Antenna Designation | Built - in antenna                                   |
| Antenna Gain        | 1.0dBi                                               |
| Hardware Version    | F01_MB_V1.11                                         |
| Software Version    | V2.0.0                                               |
| Power Supply        | DC3.8V by Built-in Li-ion Battery                    |

### 2.2 RELATED SUBMITTAL(S)/GRANT(S)

This submittal(s) (test report) is intended for **FCC ID: 2APJY-TT201** filing to comply with Section 15.247of the FCC Part 15, Subpart C Rules.

### 2.3TEST METHODOLOGY

All measurements contained in this report were conducted with KDB 558074, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions. The EUT was tested in all three orthogonal planes and the worse case was showed.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

## 2.4 TEST FACILITY

|                           |                                                                                                                                                                                                                  |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Site</b>               | Attestation of Global Compliance (Shenzhen) Co., Ltd                                                                                                                                                             |
| <b>Location</b>           | 1-2F., Bldg.2, No.1-4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang, Bao'an District B112-B113, Bldg.12, Baoan Bldg Materials Center, No.1 of Xixiang Inner Ring Road, Baoan District, Shenzhen 518012 |
| <b>NVLAP LAB CODE</b>     | 600153-0                                                                                                                                                                                                         |
| <b>Designation Number</b> | CN5028                                                                                                                                                                                                           |
| <b>Description</b>        | Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by National Voluntary Laboratory Accreditation program, NVLAP Code 600153-0                                                                    |

## 2.5 SPECIAL ACCESSORIES

Refer to section 2.2.

## 2.6 EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

### 3. MEASUREMENT UNCERTAINTY

- Uncertainty of Conducted Emission,  $U_c = \pm 3.2\text{dB}$
- Uncertainty of Radiated Emission below 1GHz,  $U_c \pm 3.9\text{dB}$
- Uncertainty of Radiated Emission above 1GHz,  $U_c \pm 4.8\text{dB}$

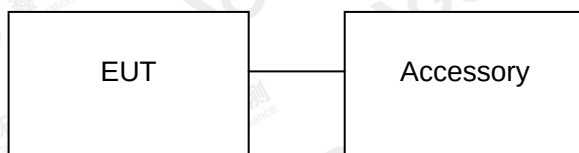
The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.



## 4. SYSTEM TEST CONFIGURATION

### 4.1 CONFIGURATION OF TESTED SYSTEM

Configuration:



### 4.2 EQUIPMENT USED IN TESTED SYSTEM

| Item | Equipment    | Model No.    | ID or Specification | Remark    |
|------|--------------|--------------|---------------------|-----------|
| 1    | Travis Touch | TT201        | 2APJY-TT201         | EUT       |
| 2    | Battery      | FHP K664060P | DC3.8V/ 2500mAh     | Accessory |
| 3    | USB          | N/A          | N/A                 | Accessory |

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

**ALL TEST EQUIPMENT LIST**

| Equipment                    | Manufacturer | Model       | S/N        | Cal. Date     | Cal. Due      |
|------------------------------|--------------|-------------|------------|---------------|---------------|
| TEST RECEIVER                | R&S          | ESPI        | 101206     | Jun.12, 2018  | Jun.11, 2019  |
| LISN                         | R&S          | ESH2-Z5     | 100086     | Aug.21, 2017  | Aug.20, 2018  |
| TEST RECEIVER                | R&S          | ESCI        | 10096      | Jun.12, 2018  | Jun.11, 2019  |
| EXA Signal Analyzer          | Agilent      | N9010A      | MY53470504 | Dec.08, 2017  | Dec.07, 2018  |
| Horn antenna                 | SCHWARZBECK  | BBHA 9170   | #768       | Sep.20, 2017  | Sep.19, 2018  |
| preamplifier                 | ChengYi      | EMC184045SE | 980508     | Sep.15, 2017  | Sep.14, 2018  |
| Double-Ridged Waveguide Horn | ETS LINDGREN | 3117        | 00034609   | May.18, 2017  | May.17, 2019  |
| Broadband Preamplifier       | SCHWARZBECK  | BBV 9718    | 9718-205   | Jun.12, 2018  | Jun.11, 2019  |
| ANTENNA                      | SCHWARZBECK  | VULB9168    | D69250     | Sep.28, 2017  | Sep.27, 2018  |
| SIGNAL ANALYZER              | Agilent      | N9020A      | MY52090123 | Sep. 21, 2017 | Sep. 20, 2018 |
| LOOP ANTENNA                 | A.H          | SAS-562B    | /          | Mar.01,2018   | Feb.28, 2019  |

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

## 5. SUMMARY OF TEST RESULTS

| FCC RULES             | DESCRIPTION OF TEST                             | RESULT    |
|-----------------------|-------------------------------------------------|-----------|
| §15.203               | Antenna Requirement                             | Compliant |
| §15.209<br>§15.247(d) | Radiated Emission                               | Compliant |
| §15.247(d)            | Band Edges                                      | Compliant |
| §15.247               | 6 dB Bandwidth                                  | Compliant |
| §15.247(b)            | Conducted Power                                 | Compliant |
| §15.247(e)            | Maximum Conducted Output Power SPECTRAL Density | Compliant |
| §15.207               | Line Conduction Emission                        | Compliant |
| §15.207               | Conduction Emission                             | Compliant |

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.



## 6. DESCRIPTION OF TEST MODES

The EUT has been operated in three modulations: GFSK independently.

| NO. | TEST MODE DESCRIPTION |
|-----|-----------------------|
| 1   | Low channel TX        |
| 2   | Middle channel TX     |
| 3   | High channel TX       |
| 4   | Normal Operating (BT) |

Note:

1. All the test modes can be supply by Built-in Li-ion battery, only the result of the worst case was recorded in the report if no any records.
2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
3. EUT is operating at its maximum duty cycle>or equal 98%

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

## 7. RADIATED EMISSION

### 7.1 MEASUREMENT PROCEDURE

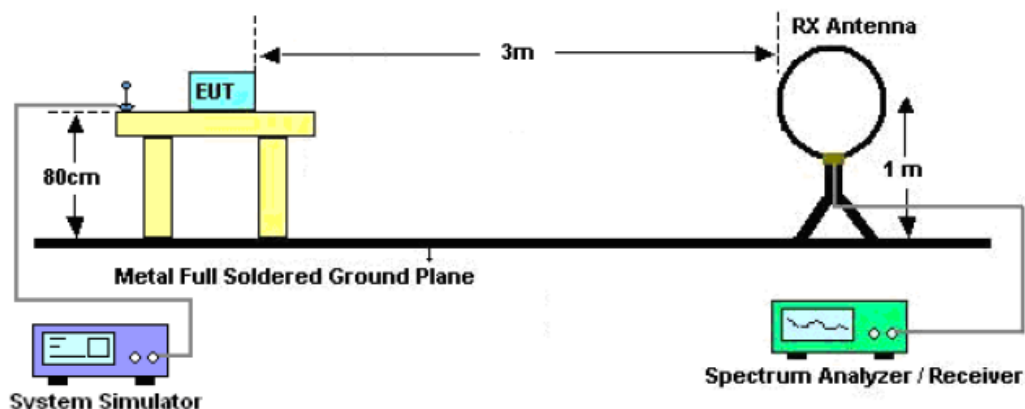
1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

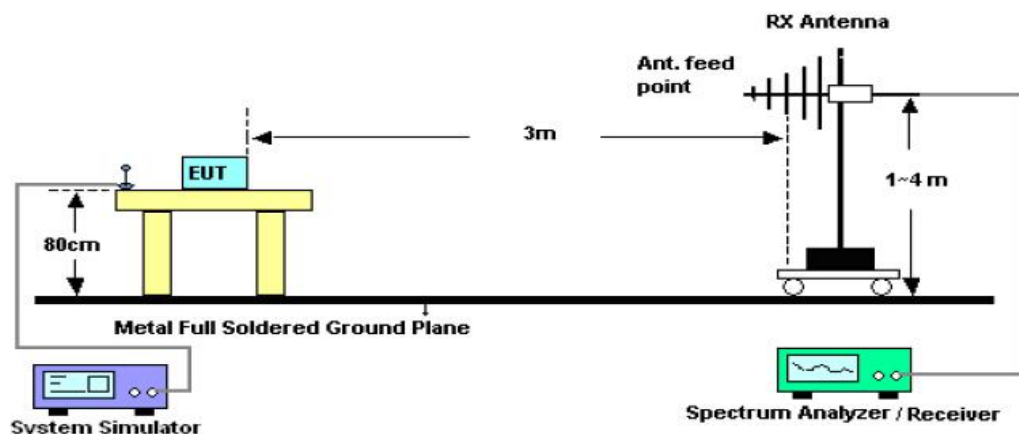


## 7.2 TEST SETUP

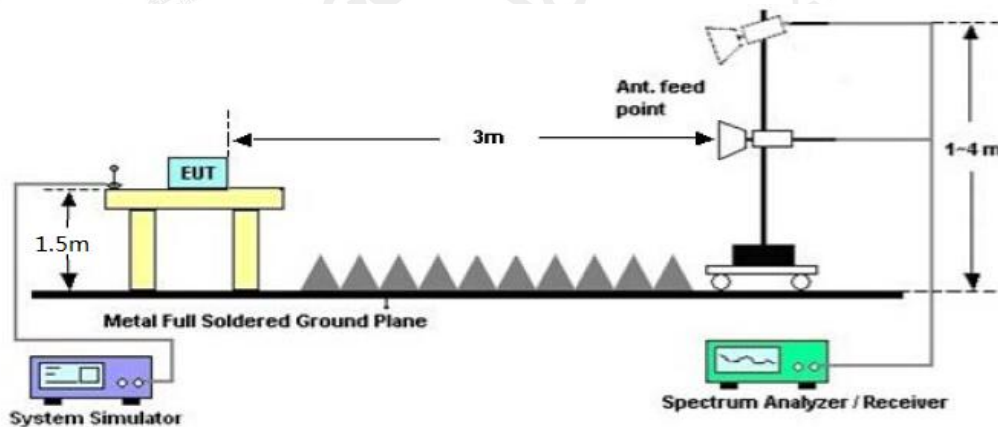
### Radiated Emission Test-Setup Frequency Below 30MHz



### RADIATED EMISSION TEST SETUP 30MHz-1000MHz



### RADIATED EMISSION TEST SETUP ABOVE 1000MHz



The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.



### 7.3 LIMITS AND MEASUREMENT RESULT

15.209 Limit in the below table has to be followed

| Frequencies<br>(MHz) | Field Strength<br>(micorvolts/meter) | Measurement Distance<br>(meters) |
|----------------------|--------------------------------------|----------------------------------|
| 0.009~0.490          | 2400/F(KHz)                          | 300                              |
| 0.490~1.705          | 24000/F(KHz)                         | 30                               |
| 1.705~30.0           | 30                                   | 30                               |
| 30~88                | 100                                  | 3                                |
| 88~216               | 150                                  | 3                                |
| 216~960              | 200                                  | 3                                |
| Above 960            | 500                                  | 3                                |

Note: All modes were tested For restricted band radiated emission,  
 the test records reported below are the worst result compared to other modes.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

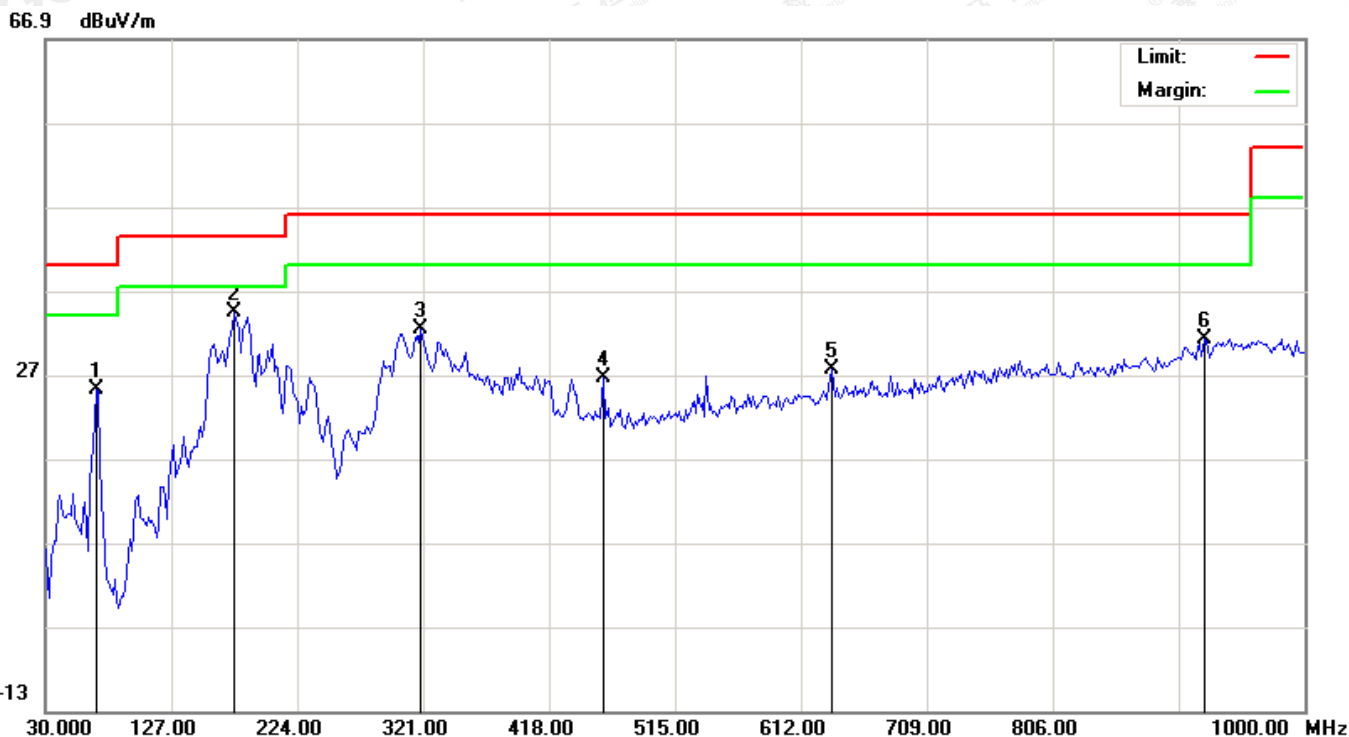
## 7.4 TEST RESULT

### RADIATED EMISSION BELOW 30MHZ

No emission found between lowest internal used/generated frequencies to 30MHz.

### RADIATED EMISSION BELOW 1GHZ

#### RADIATED EMISSION TEST- (30MHZ-1GHZ) -HORIZONTAL



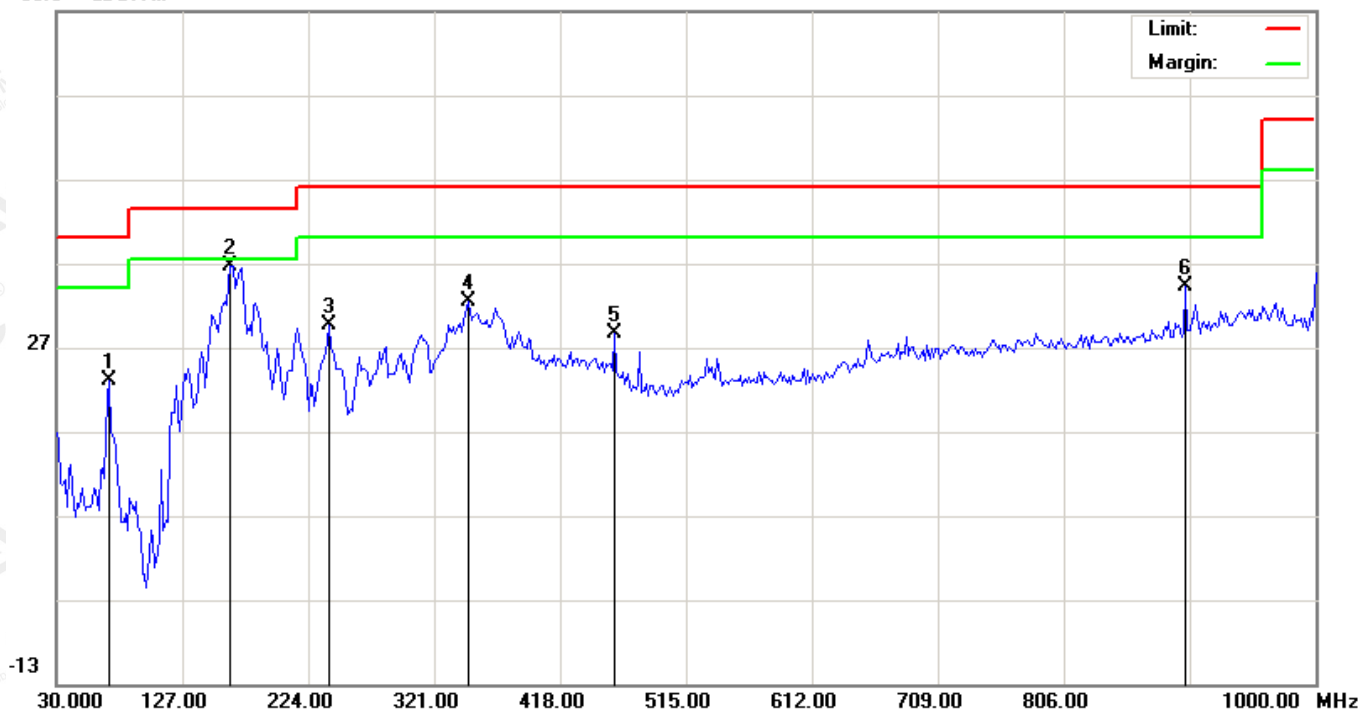
| No. | Mk | Freq.    | Reading | Factor | Measurement | Limit  | Over   | Detector | Antenna Height | Table Degree | Comment |
|-----|----|----------|---------|--------|-------------|--------|--------|----------|----------------|--------------|---------|
|     |    | MHz      | dBuV    | dB/m   | dBuV/m      | dBuV/m | dB     |          | cm             | degree       |         |
| 1   |    | 68.8000  | 16.05   | 9.09   | 25.14       | 40.00  | -14.86 | peak     |                |              |         |
| 2   | *  | 175.5000 | 23.52   | 10.90  | 34.42       | 43.50  | -9.08  | peak     |                |              |         |
| 3   |    | 319.3833 | 15.79   | 16.70  | 32.49       | 46.00  | -13.51 | peak     |                |              |         |
| 4   |    | 460.0333 | 5.86    | 20.70  | 26.56       | 46.00  | -19.44 | peak     |                |              |         |
| 5   |    | 636.2500 | 3.86    | 23.82  | 27.68       | 46.00  | -18.32 | peak     |                |              |         |
| 6   |    | 922.4000 | 2.02    | 29.23  | 31.25       | 46.00  | -14.75 | peak     |                |              |         |

**RESULT: PASS**

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

RADIATED EMISSION TEST- (30MHZ-1GHZ) -VERTICAL

66.9 dBuV/m



| No. | Mk | Freq.    | Reading | Factor | Measurement | Limit  | Over   | Detector | Antenna Height | Table Degree | Comment |
|-----|----|----------|---------|--------|-------------|--------|--------|----------|----------------|--------------|---------|
|     |    | MHz      | dBuV    | dB/m   | dBuV/m      | dBuV/m | dB     |          | cm             | degree       |         |
| 1   |    | 70.4167  | 18.93   | 4.16   | 23.09       | 40.00  | -16.91 | peak     |                |              |         |
| 2   | *  | 164.1833 | 21.59   | 15.07  | 36.66       | 43.50  | -6.84  | peak     |                |              |         |
| 3   |    | 240.1667 | 16.72   | 12.94  | 29.66       | 46.00  | -16.34 | peak     |                |              |         |
| 4   |    | 346.8667 | 13.85   | 18.53  | 32.38       | 46.00  | -13.62 | peak     |                |              |         |
| 5   |    | 460.0333 | 7.85    | 20.70  | 28.55       | 46.00  | -17.45 | peak     |                |              |         |
| 6   |    | 899.7667 | 5.68    | 28.60  | 34.28       | 46.00  | -11.72 | peak     |                |              |         |

**RESULT: PASS**

**Note:** 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

2. The "Factor" value can be calculated automatically by software of measurement system.

3. All test modes for different EUT are pre-tested. The low channel for GFSK mode is the worst case and recorded in the report.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.



**RADIATED EMISSION ABOVE 1GHZ**

| Frequency               | Emission Level | Limits   | Margin | Detector | Comment    |
|-------------------------|----------------|----------|--------|----------|------------|
| (MHz)                   | (dBμV/m)       | (dBμV/m) | (dB)   | Type     |            |
| Low Channel (2402 MHz)  |                |          |        |          |            |
| 4804                    | 38.70          | 74       | -35.30 | Pk       | Vertical   |
| 4804                    | 40.45          | 54       | -13.55 | AV       | Vertical   |
| 4804                    | 41.73          | 74       | -32.27 | Pk       | Horizontal |
| 4804                    | 42.77          | 54       | -11.23 | AV       | Horizontal |
| Mid Channel (2440 MHz)  |                |          |        |          |            |
| 4880                    | 38.38          | 74       | -35.62 | Pk       | Vertical   |
| 4880                    | 40.66          | 54       | -13.34 | AV       | Vertical   |
| 4880                    | 41.67          | 74       | -32.33 | Pk       | Horizontal |
| 4880                    | 42.57          | 54       | -11.43 | AV       | Horizontal |
| High Channel (2480 MHz) |                |          |        |          |            |
| 4960                    | 38.59          | 74       | -35.41 | pk       | Vertical   |
| 4960                    | 40.43          | 54       | -13.57 | AV       | Vertical   |
| 4960                    | 41.54          | 74       | -32.46 | pk       | Horizontal |
| 4960                    | 42.43          | 54       | -11.57 | AV       | Horizontal |

**RESULT: PASS**

**Note:** 1~25GHz scan with GFSK. No recording in the test report at least have 20dB margin.

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Emission Level = Meter Reading + Factor

Margin = Emission - Level Limit

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

## 8. BAND EDGE EMISSION

### 8.1. MEASUREMENT PROCEDURE

#### 1) Radiated restricted band edge measurements

The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting

#### 2) Conducted Emissions at the band edge

a) The transmitter output was connected to the spectrum analyzer

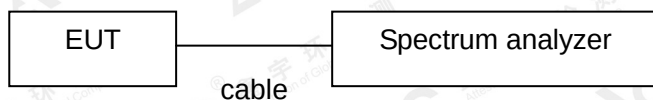
b) Set RBW=100kHz, VBW=300kHz

c) Suitable frequency span including 100kHz bandwidth from band edge

### 8.2. TEST SET-UP

Radiated same as 6.2

Conducted set up



The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

### 8.3. RADIATED TEST RESULT

| Frequency | Emission Level | Limits   | Margin | Detector | Comment    |
|-----------|----------------|----------|--------|----------|------------|
| (MHz)     | (dBμV/m)       | (dBμV/m) | (dB)   | Type     |            |
| GFSK      |                |          |        |          |            |
| 2399.9    | 52.58          | 74       | -21.42 | peak     | Vertical   |
| 2399.9    | 39.44          | 54       | -14.56 | AVG      | Vertical   |
| 2399.9    | 49.36          | 74       | -24.64 | peak     | Horizontal |
| 2399.9    | 38.31          | 54       | -15.69 | AVG      | Horizontal |
| 2483.6    | 50.25          | 74       | -23.75 | peak     | Vertical   |
| 2483.6    | 39.27          | 54       | -14.73 | AVG      | Vertical   |
| 2483.6    | 49.46          | 74       | -24.54 | peak     | Horizontal |
| 2483.6    | 37.67          | 54       | -16.33 | AVG      | Horizontal |

### RESULT: PASS

**Note:** Factor=Antenna Factor + Cable loss - Amplifier gain,

Emission Level = Meter Reading + Factor

Margin= Emission Level -Limit.

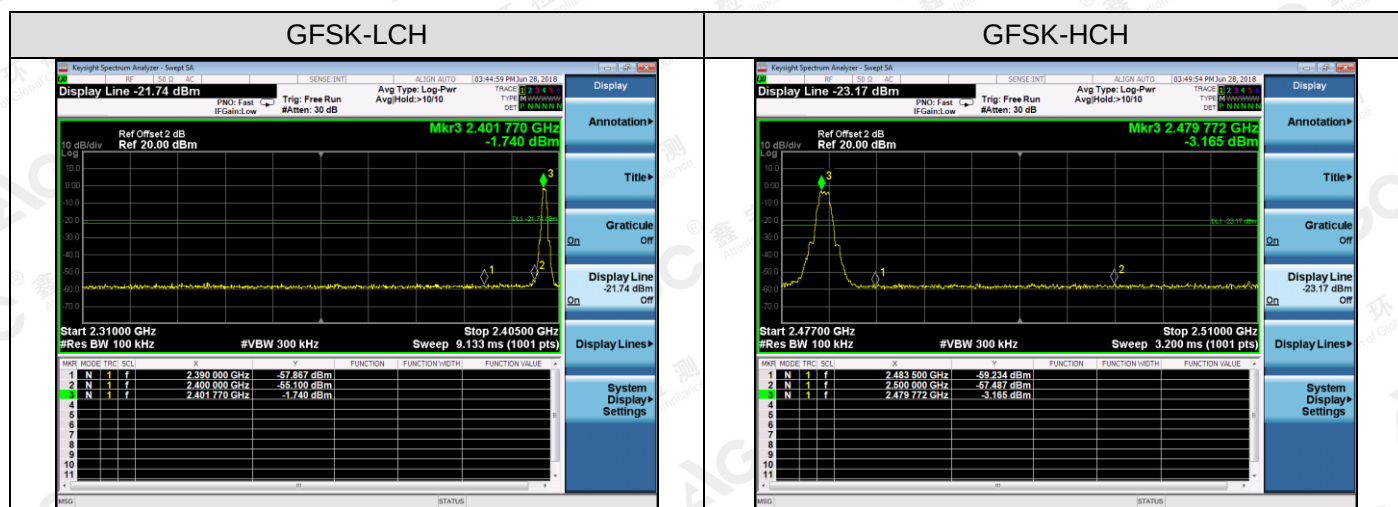
The "Factor" value can be calculated automatically by software of measurement system.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.



## 8.4. CONDUCTED TEST RESULT

### Test Graph



The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

## 9.6DB BANDWIDTH

### 9.1. TEST PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 KHz, VBW $\geq$ RBW.
4. Set SPA Trace 1 Max hold, then View.

### 9.2. SUMMARY OF TEST RESULTS/PLOTS

| Mode | Channel | 6dB Bandwidth [KHz] | Verdict |
|------|---------|---------------------|---------|
| BLE  | LCH     | 615.6               | PASS    |
| BLE  | MCH     | 642.1               | PASS    |
| BLE  | HCH     | 713.6               | PASS    |

### Test Graph



The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

## 10. CONDUCTED OUTPUT POWER

### 10.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, middle and the bottom operation frequency individually.
3. Use the following spectrum analyzer settings:

Set the RBW  $\geq$  DTS bandwidth

Set the VBW  $\geq$  3 x RBW

Set the span  $\geq$  3 x RBW

Detector = peak

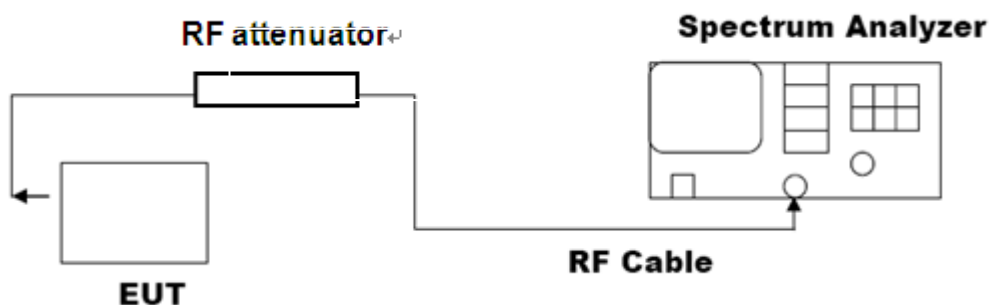
Sweep time = auto couple

Trace mode = max hold

4. Allow the trace to stabilize. Use peak marker function to determine the peak amplitude level
5. Record the result from the Spectrum Analyzer.

**Note:** The EUT was tested according to KDB 558074 for compliance to FCC 47CFR 15.247 requirements.

### 10.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.



### 10.3. LIMITS AND MEASUREMENT RESULT

| Channel        | Peak Power (dBm) | Applicable Limits (dBm) | Pass/Fail |
|----------------|------------------|-------------------------|-----------|
| Low Channel    | -0.929           | 30                      | Pass      |
| Middle Channel | -2.862           | 30                      | Pass      |
| High Channel   | -2.275           | 30                      | Pass      |

### Test Graph



The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

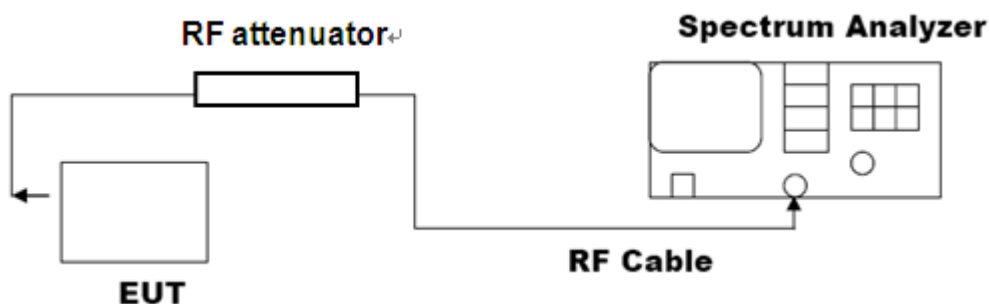
## 11. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY

### 11.1 MEASUREMENT PROCEDURE

- (1). Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- (2). Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- (3). Set SPA Trace 1 Max hold, then View.

**Note:** The EUT was tested according to KDB 558074 for compliance to FCC 47CFR 15.247 requirements.

### 11.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

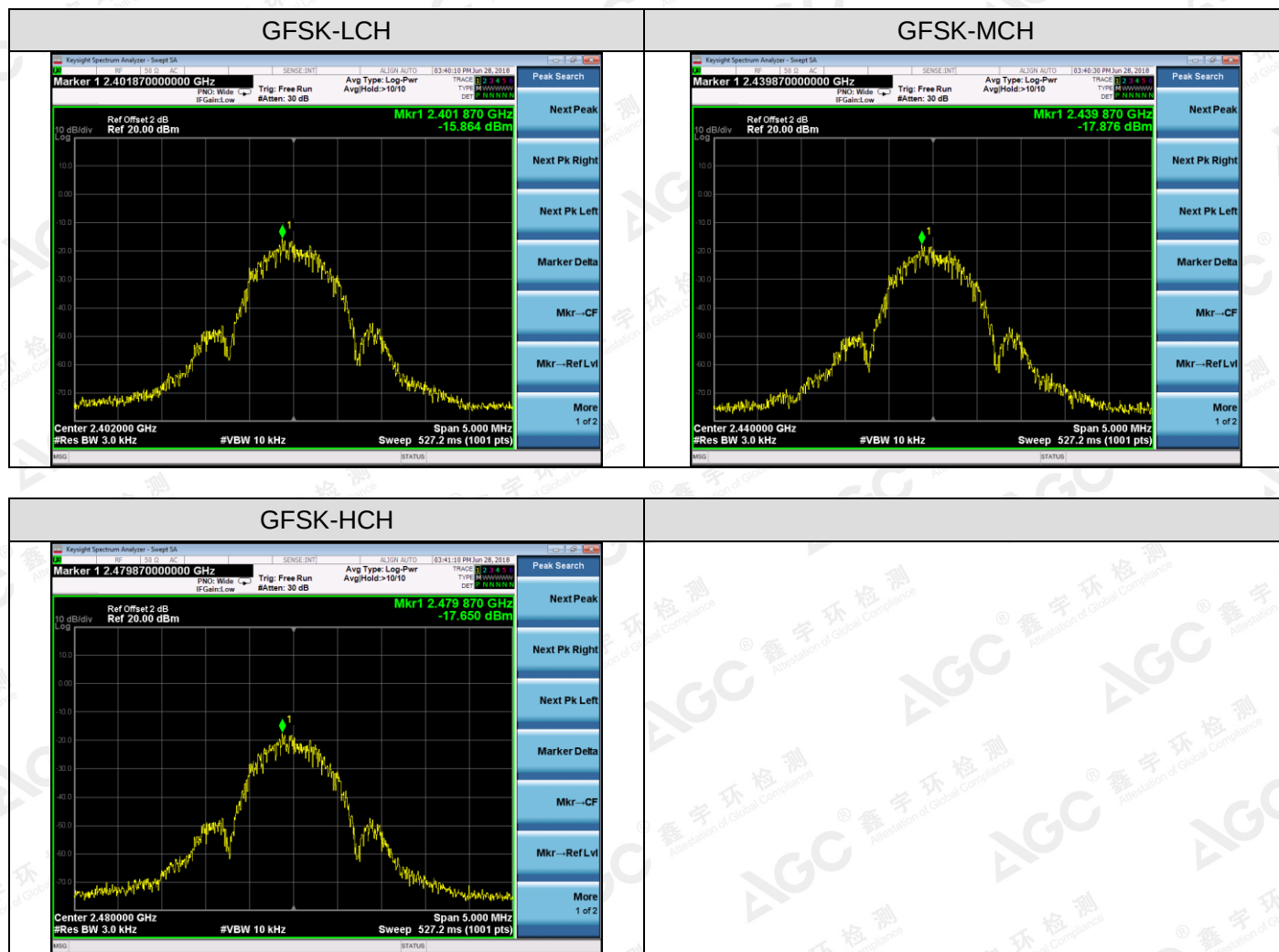


The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

### 11.3 LIMITS AND MEASUREMENT RESULT

| Mode | Channel | PSD [dBm/3kHz] | Limit[dBm/3kHz] | Verdict |
|------|---------|----------------|-----------------|---------|
| BLE  | LCH     | -15.864        | 8               | PASS    |
| BLE  | MCH     | -17.876        | 8               | PASS    |
| BLE  | HCH     | -17.650        | 8               | PASS    |

### Test Graph



The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.



## 12. FCC LINE CONDUCTED EMISSION TEST

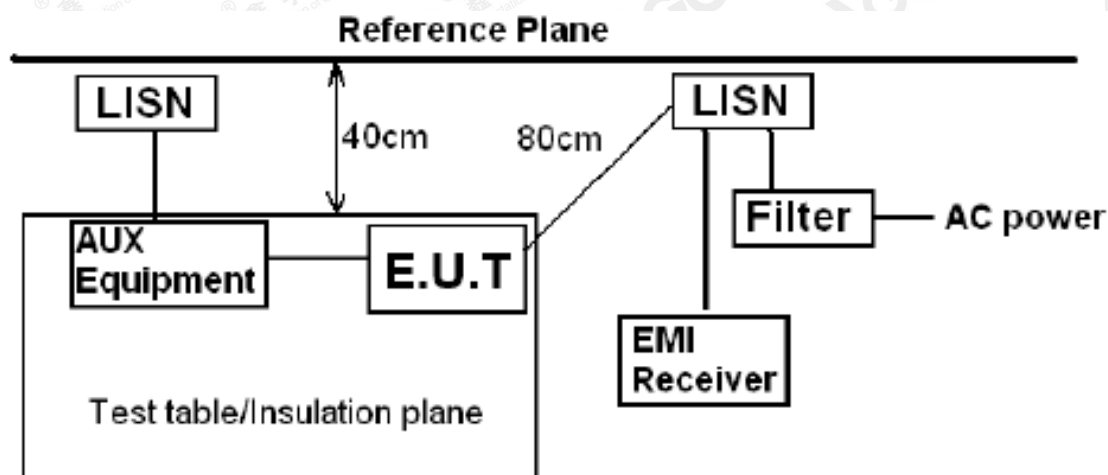
### 12.1 LIMITS

| Frequency     | Maximum RF Line Voltage |                |
|---------------|-------------------------|----------------|
|               | Q.P.( dBuV)             | Average( dBuV) |
| 150kHz~500kHz | 66-56                   | 56-46          |
| 500kHz~5MHz   | 56                      | 46             |
| 5MHz~30MHz    | 60                      | 50             |

**\*\*Note:** 1. The lower limit shall apply at the transition frequency.

2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz

### 12.2 TEST SETUP



*Remark*

*E.U.T: Equipment Under Test*

*LISN: Line Impedance Stabilization Network*

*Test table height=0.8m*

### 12.3 PRELIMINARY PROCEDURE

- 1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- 2) Support equipment, if needed, was placed as per ANSI C63.10.
- 3) All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
- 4) All support equipments received AC120V/60Hz power from a LISN, if any.
- 5) The EUT received power by adapter which received power by a LISN.
- 6) The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7) Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
- 8) During the above scans, the emissions were maximized by cable manipulation.
- 9) The following test mode(s) were scanned during the preliminary test.  
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

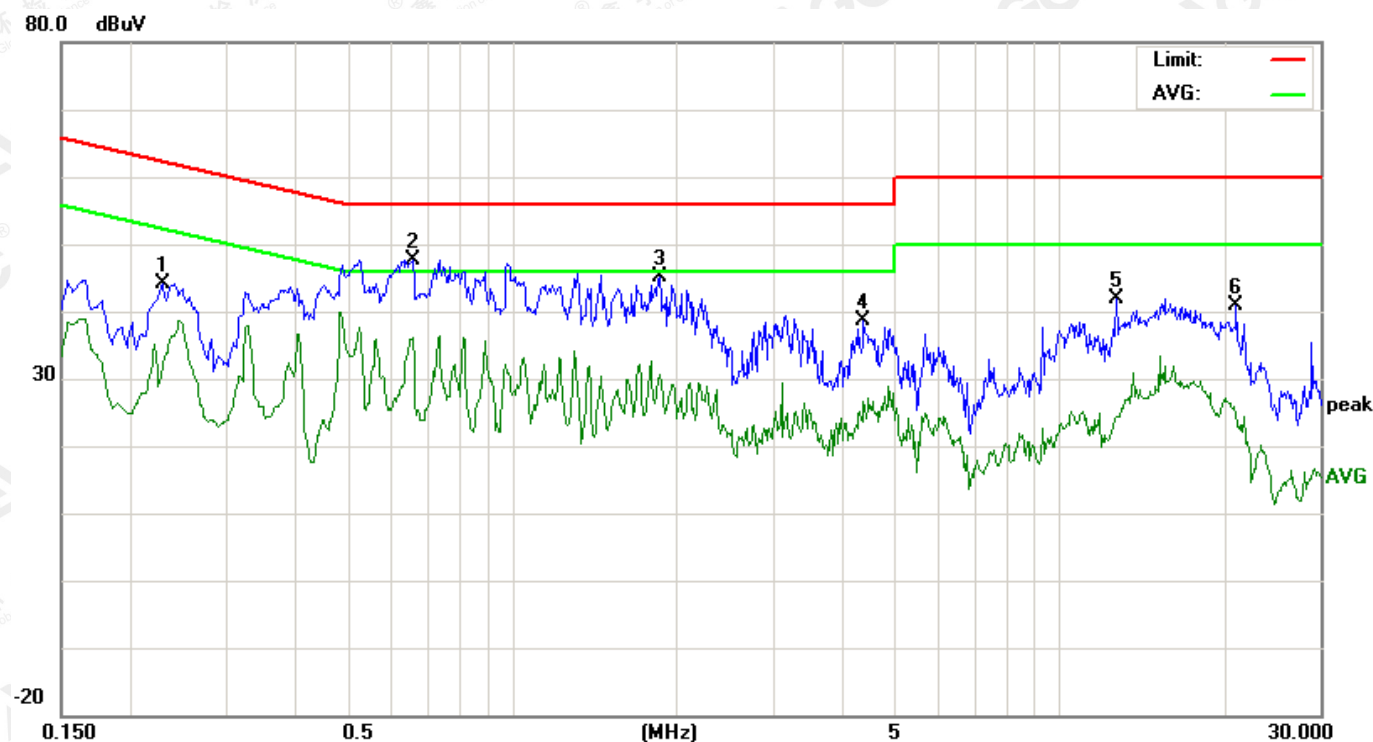
### 12.4 FINAL TEST PROCEDURE

- 1) EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
- 2) A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less -2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
- 3) The test data of the worst case condition(s) was reported on the Summary Data page.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

## 12.5 TEST RESULT OF POWER LINE

### Line Conducted Emission Test Line 1-L

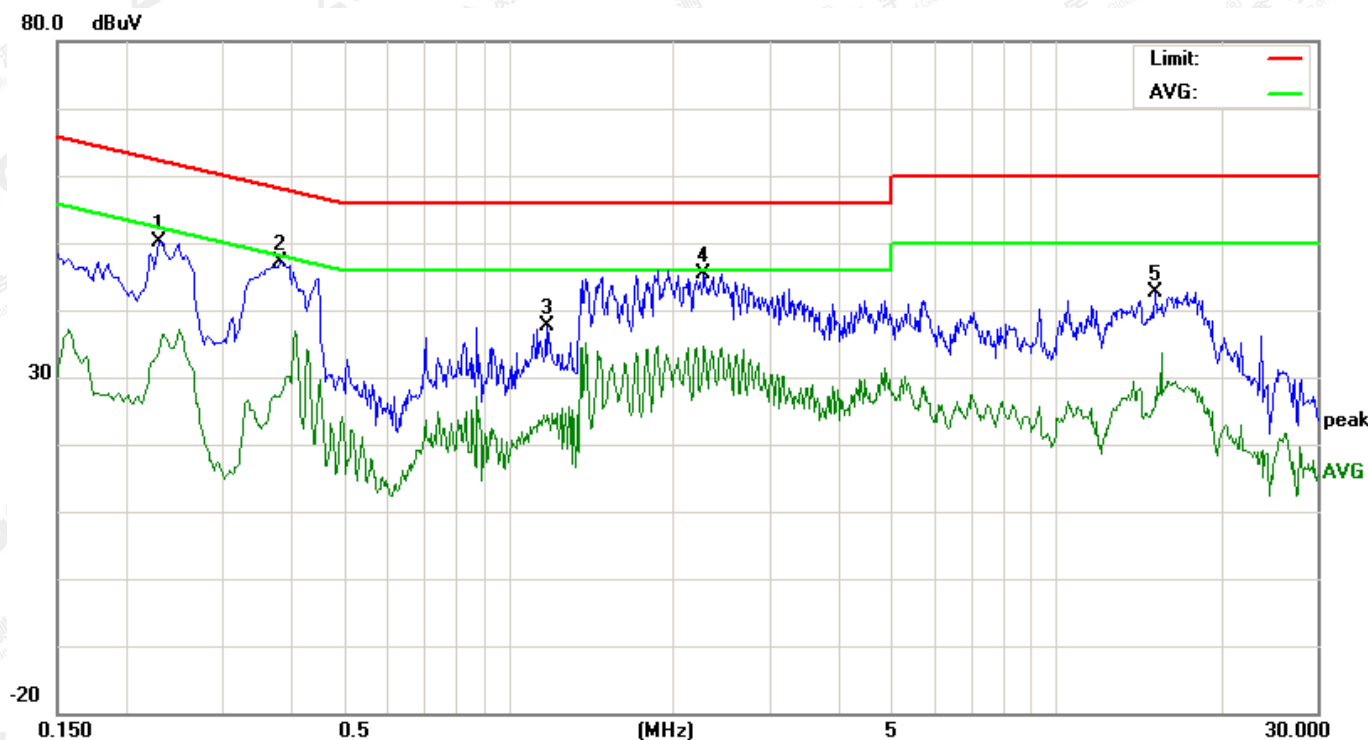


| No. | Freq. (MHz) | Reading Level (dBuV) |    |       | Correct Factor (dB) | Measurement (dBuV) |    |       | Limit (dBuV) |       | Margin (dB) |        | P/F | Comment |
|-----|-------------|----------------------|----|-------|---------------------|--------------------|----|-------|--------------|-------|-------------|--------|-----|---------|
|     |             | Peak                 | QP | AVG   |                     | Peak               | QP | AVG   | QP           | AVG   | QP          | AVG    |     |         |
| 1   | 0.2300      | 33.99                |    | 21.87 | 10.25               | 44.24              |    | 32.12 | 62.45        | 52.45 | -18.21      | -20.33 | P   |         |
| 2   | 0.6580      | 37.35                |    | 25.71 | 10.33               | 47.68              |    | 36.04 | 56.00        | 46.00 | -8.32       | -9.96  | P   |         |
| 3   | 1.8620      | 34.78                |    | 20.43 | 10.26               | 45.04              |    | 30.69 | 56.00        | 46.00 | -10.96      | -15.31 | P   |         |
| 4   | 4.4019      | 28.35                |    | 16.29 | 10.25               | 38.60              |    | 26.54 | 56.00        | 46.00 | -17.40      | -19.46 | P   |         |
| 5   | 12.7499     | 31.67                |    | 14.33 | 10.14               | 41.81              |    | 24.47 | 60.00        | 50.00 | -18.19      | -25.53 | P   |         |
| 6   | 21.1380     | 30.81                |    | 14.85 | 10.13               | 40.94              |    | 24.98 | 60.00        | 50.00 | -19.06      | -25.02 | P   |         |

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.



Line Conducted Emission Test Line 1-N



| No. | Freq. (MHz) | Reading Level (dBuV) |    |       | Correct Factor (dB) | Measurement (dBuV) |    |       | Limit (dBuV) |       | Margin (dB) |        | P/F | Comment |
|-----|-------------|----------------------|----|-------|---------------------|--------------------|----|-------|--------------|-------|-------------|--------|-----|---------|
|     |             | Peak                 | QP | AVG   |                     | Peak               | QP | AVG   | QP           | AVG   | QP          | AVG    |     |         |
| 1   | 0.2300      | 39.89                |    | 23.66 | 10.25               | 50.14              |    | 33.91 | 62.45        | 52.45 | -12.31      | -18.54 | P   |         |
| 2   | 0.3820      | 36.80                |    | 16.70 | 10.32               | 47.12              |    | 27.02 | 58.23        | 48.23 | -11.11      | -21.21 | P   |         |
| 3   | 1.1778      | 27.36                |    | 13.22 | 10.37               | 37.73              |    | 23.59 | 56.00        | 46.00 | -18.27      | -22.41 | P   |         |
| 4   | 2.2780      | 35.04                |    | 24.30 | 10.34               | 45.38              |    | 34.64 | 56.00        | 46.00 | -10.62      | -11.36 | P   |         |
| 5   | 15.1937     | 32.60                |    | 15.82 | 10.12               | 42.72              |    | 25.94 | 60.00        | 50.00 | -17.28      | -24.06 | P   |         |

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

### 13. CONDUCTED SPURIOUS EMISSION

#### 13.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the Middle and the bottom operation frequency individually.
3. Set the Span = wide enough to capture the peak level of the in-band emission and all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic.  
RBW = 100 kHz; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak.
4. Set SPA Trace 1 Max hold, then View.

**Note:** The EUT was tested according to DA000705 for compliance to FCC 47CFR 15.247 requirements. Owing to satisfy the requirements of the number of measurement points, we set the RBW=1MHz, VBW>RBW, scan up through 10th harmonic, and consider the tested results as the worst case, if the tested results conform to the requirement, we can deem that the real tested results(set the RBW=100KHz, VBW>RBW) are conform to the requirement.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

### 13.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 8.2

### 13.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

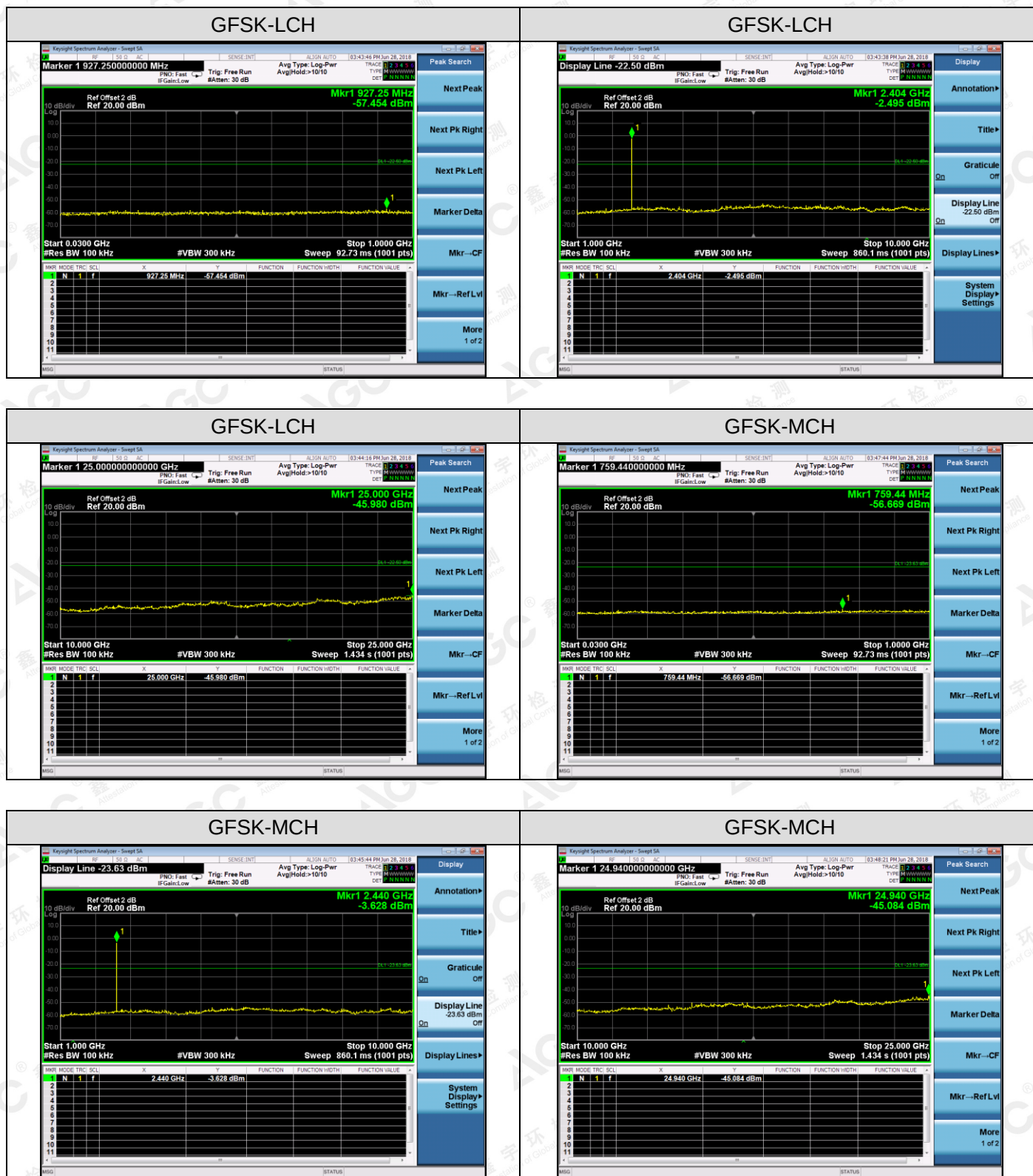
### 13.4. LIMITS AND MEASUREMENT RESULT

| LIMITS AND MEASUREMENT RESULT                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|----------|
| Applicable Limits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Measurement Result                                             |          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Test Data                                                      | Criteria |
| In any 100 KHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power.<br>In addition, radiation 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)) | At least -20dBc than the limit Specified on the BOTTOM Channel | PASS     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | At least -20dBc than the limit Specified on the TOP Channel    | PASS     |

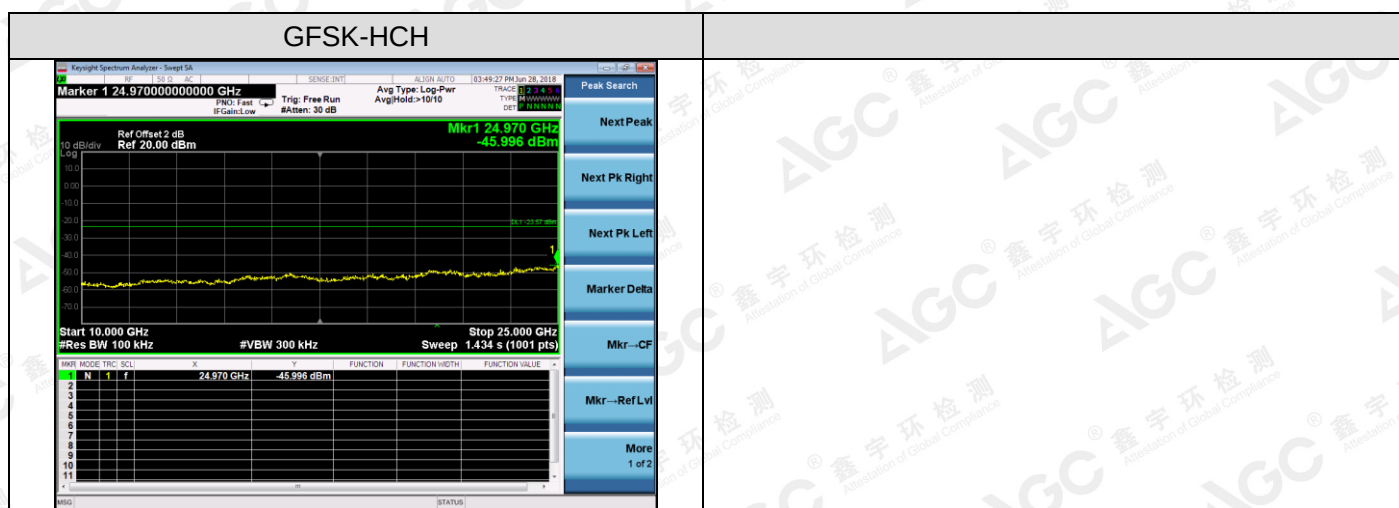
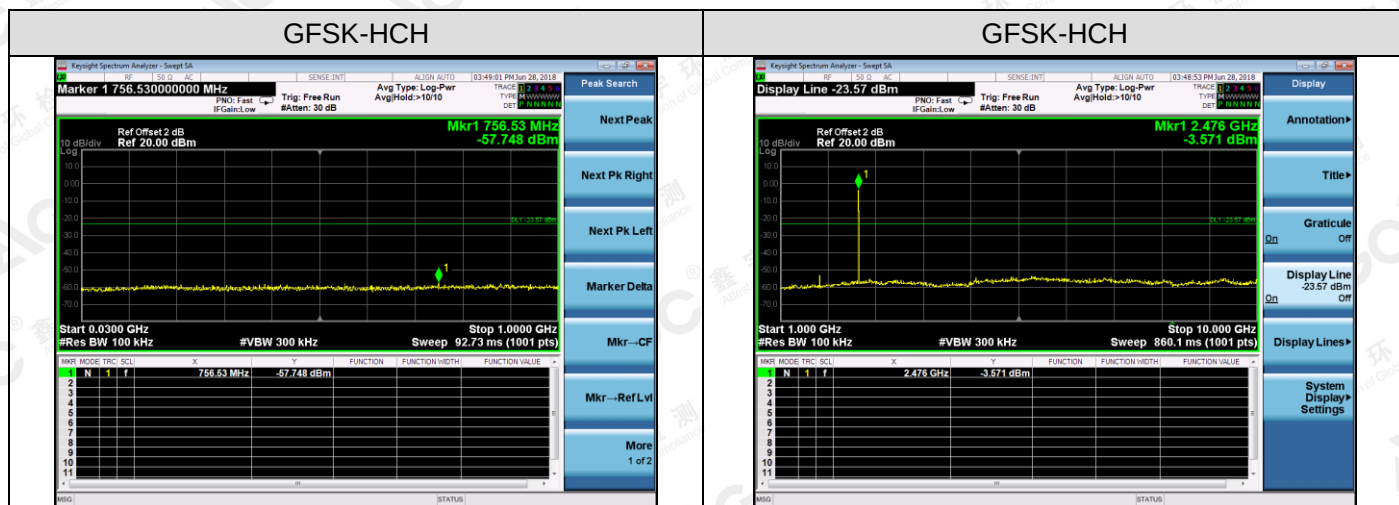
The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.



## Test Graph



The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.



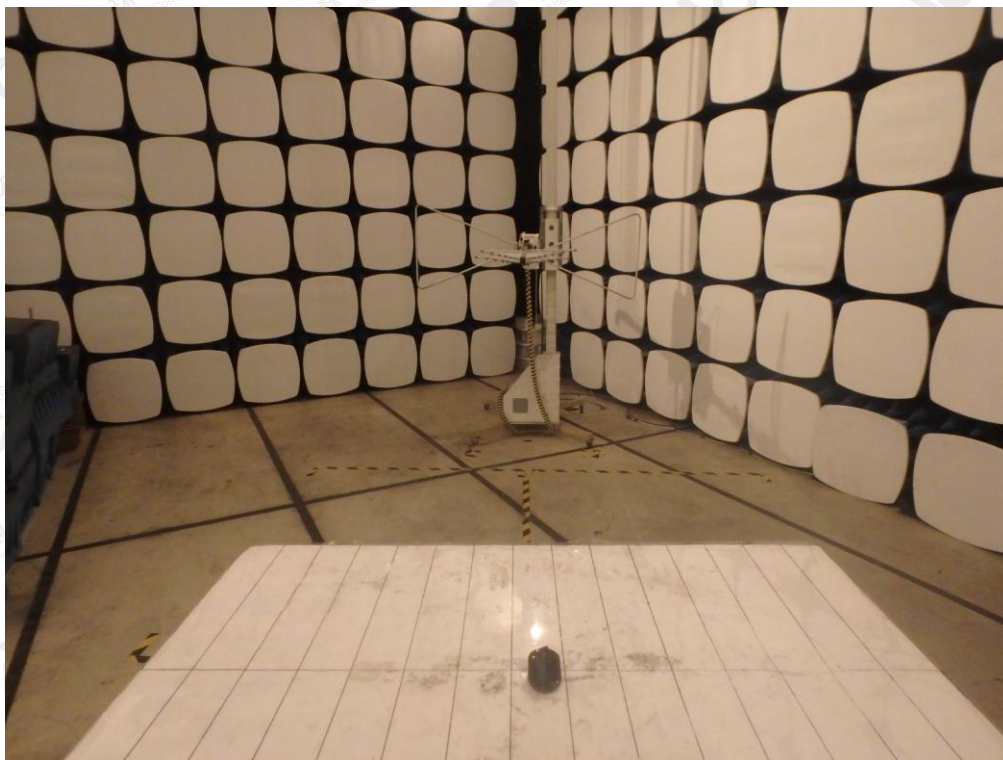
The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.



**APPENDIX A: PHOTOGRAPHS OF TEST SETUP**  
**LINE CONDUCTED EMISSION TEST SETUP**



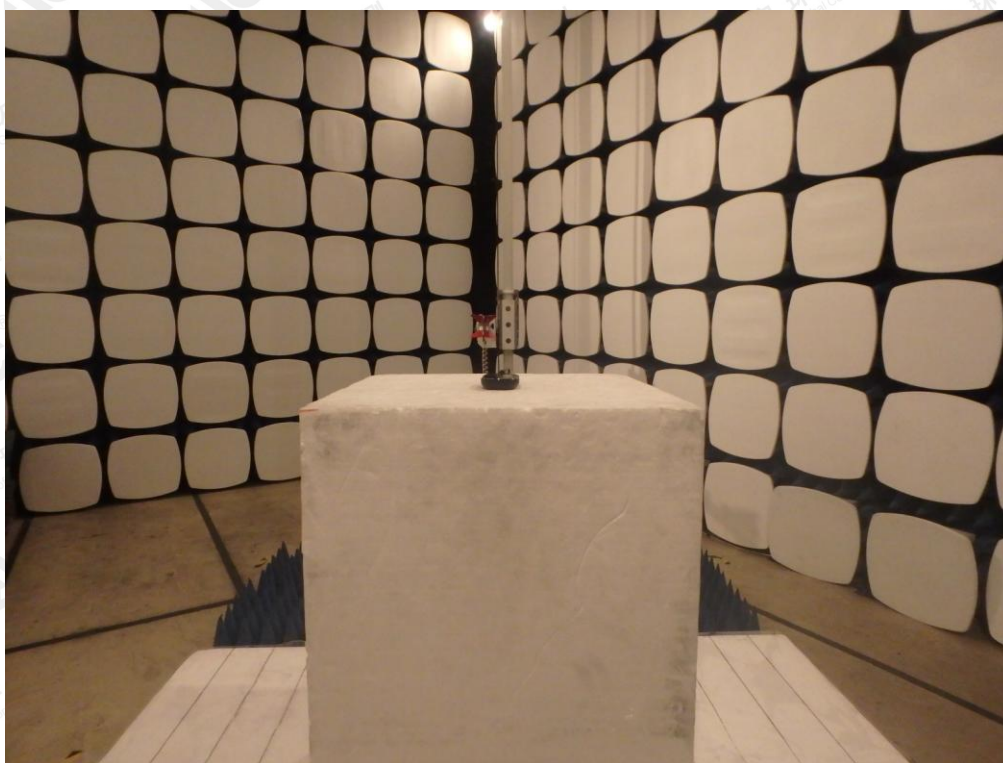
**RADIATED EMISSION TEST SETUP**



The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.



RADIATED EMISSION ABOVE 1G TEST SETUP



----END OF REPORT----

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.