



# FCC RADIO TEST REPORT

Applicant : KALI AUDIO INC.  
Address : 1455 BLAIRWOOD AVE.CHULA VISTA, CA 91913  
USA  
Equipment : Bluetooth Input Module  
Model No. : MV-BT  
Trademark : KALI  
FCC ID : 2ATSDBTBOX

## I HEREBY CERTIFY THAT :

The sample was received on May 20, 2019 and the testing was carried out on Jun. 26, 2019 at Cerpass Technology Corp. The test result refers exclusively to the test presented test model / sample. Without written approval of Cerpass Technology Corp., the test report shall not be reproduced except in full.

Approved by:

Tested by:

Mark Liao / Assistant Manager

Amos Zhang/ Engineer

Laboratory Accreditation:



Cerpass Technology Corporation Test Laboratory

TAF LAB Code:

1439



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## History of this test report

☒ Original.

☐ Additional attachment as following record:

| Attachment No. | Issue Date    | Description |
|----------------|---------------|-------------|
| TEFQ1905222    | Jun. 26, 2019 | Original    |
|                |               |             |
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| Report Type                         |                   | Description |
|-------------------------------------|-------------------|-------------|
| <input checked="" type="checkbox"/> | Original report   | NA          |
| <input type="checkbox"/>            | Derivative Report | NA          |



## 1. Summary of Test Procedure and Test Results

### 1.1 Applicable Standards

ANSI C63.10: 2013

KDB 558074 D01 DTS Meas Guidance v05r02

FCC Rules and Regulations Part 15 Subpart C §15.247

| FCC Rule                                                                                              | Description of Test              | Result |
|-------------------------------------------------------------------------------------------------------|----------------------------------|--------|
| FCC CFR Title 47 Part 15 Subpart C:<br>Section 15.203/15.247 (b)                                      | Antenna Requirement              | Pass   |
| FCC CFR Title 47 Part 15 Subpart C:<br>Section 15.207                                                 | AC Power Line Conducted Emission | Pass   |
| FCC CFR Title 47 Part 15 Subpart C:<br>Section 15.205/15.209;<br>Part2 section 2.1051, 2.1053, 2.1057 | Spurious Emission(Radiated)      | Pass   |
| FCC CFR Title 47 Part 15 Subpart C:<br>Section 15.247(d);<br>Part2 section 2.1051 and 2.1057          | Spurious Emission(Conducted)     | Pass   |
| FCC CFR Title 47 Part 15 Subpart C:<br>Section 15.247(a)(2);<br>Part2 section 2.1049                  | 6dB Bandwidth                    | Pass   |
| FCC CFR Title 47 Part 15 Subpart C:<br>Section 15.247(b);<br>Part2 section 2.1046                     | Maximum Peak Output Power        | Pass   |
| FCC CFR Title 47 Part 15 Subpart C:<br>Section 15.247(e)                                              | Power Spectral Density           | Pass   |



## 2. Test Configuration of Equipment under Test

### 2.2 Feature of Equipment under Test

|                    |                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product            | Bluetooth Input Module                                                                                                                                               |
| Test Model         | MV-BT                                                                                                                                                                |
| Frequency Range    | 2402~2480MHz                                                                                                                                                         |
| Number of Channels | 40                                                                                                                                                                   |
| Modulation         | GFSK (Bluetooth low energy)                                                                                                                                          |
| Data Rates         | Bluetooth Low Energy: 1Mbps                                                                                                                                          |
| Antenna Type       | PCB antenna                                                                                                                                                          |
| EUT Power Rating:  | Input: 5VDC, 1A supplied by adapter                                                                                                                                  |
| Adapter Spec.      | Model: GPE053A-V050100-1<br>Input: 100-240V~50/60Hz 0.2A<br>Output: 5.0V  1000mA 5W |

Note: for more details, please refer to the User's manual of the EUT.

### 2.3 Test Mode & Test Software

| Channel    | Frequency (MHz) | Channel    | Frequency (MHz) | Channel    | Frequency (MHz) |
|------------|-----------------|------------|-----------------|------------|-----------------|
| <b>*00</b> | <b>2402</b>     | 14         | 2430            | 28         | 2458            |
| 01         | 2404            | 15         | 2432            | 29         | 2460            |
| 02         | 2406            | 16         | 2434            | 30         | 2462            |
| 03         | 2408            | 17         | 2436            | 31         | 2464            |
| 04         | 2410            | 18         | 2438            | 32         | 2466            |
| 05         | 2412            | <b>*19</b> | <b>2440</b>     | 33         | 2468            |
| 06         | 2414            | 20         | 2442            | 34         | 2470            |
| 07         | 2416            | 21         | 2444            | 35         | 2472            |
| 08         | 2418            | 22         | 2446            | 36         | 2474            |
| 09         | 2420            | 23         | 2448            | 37         | 2476            |
| 10         | 2422            | 24         | 2450            | 38         | 2478            |
| 11         | 2424            | 25         | 2452            | <b>*39</b> | <b>2480</b>     |
| 12         | 2426            | 26         | 2454            | --         | --              |
| 13         | 2428            | 27         | 2456            | --         | --              |

Note: Channels remarked \* are selected to perform test.



## 2.4 Test Manner

| Test Manner |                                                                                                                                                                                                                      |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a           | During testing, the interface cables and equipment positions were varied according to 47 CFR, Part 2, Part 15                                                                                                        |
| b           | An executive program, “ <b>Blue Test3.exe</b> ”, under WIN 7 was executed to transmit and receive data via Bluetooth.<br>Adjust the EUT at the test mode and the test channel. Then test.<br>Test Mode: Mode 1: GFSK |

## 2.5 Description of Test System

| No | Device   | Manufacturer | Model No.  | Description |
|----|----------|--------------|------------|-------------|
| 1  | Notebook | SONY         | PCG-71811P | R33021      |

Use Cable:

| No. | Cable     | Quantity | Description        |
|-----|-----------|----------|--------------------|
| A   | DC Cable  | 1        | 1.0m Non Shielding |
| B   | USB Cable | 1        | 1.5m Shielding     |



## 2.6 General Information of Test

|                               |           |                                                                                                                                                                                                                                                                                                                |
|-------------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ☒                             | Test Site | <b>Cerpass Technology Corporation Test Laboratory</b><br>Address: No.10, Ln. 2, Lianfu St., Luzhu Dist., Taoyuan City 33848, Taiwan (R.O.C.)<br>Tel:+886-3-3226-888<br>Fax:+886-3-3226-881<br>Address: No.68-1, Shihbachongsi, Shihding Township, New Taipei City 223, Taiwan, R.O.C.<br>Tel: +886-2-2663-8582 |
|                               | FCC       | TW1079, TW1061, TW1439                                                                                                                                                                                                                                                                                         |
|                               | IC        | 4934E-1, 4934E-2                                                                                                                                                                                                                                                                                               |
|                               | VCCI      | T-2205 for Telecommunication Test<br>C-4663 for Conducted emission test<br>R-4399,R-4218 for Radiated emission test<br>G-10812, G-10813 for radiated disturbance above 1GHz                                                                                                                                    |
| Frequency Range Investigated: |           | Conducted: from 150kHz to 30 MHz<br>Radiation: from 30 MHz to 25000MHz                                                                                                                                                                                                                                         |
| Test Distance:                |           | The test distance of radiated emission from antenna to EUT is 3 M.                                                                                                                                                                                                                                             |

## 2.7 Measurement Uncertainty

| Measurement Item                         | Uncertainty |
|------------------------------------------|-------------|
| Radiated Spurious Emission(9KHz~30MHz)   | ±5.007dB    |
| Radiated Spurious Emission(30MHz~1GHz)   | ±5.157dB    |
| Radiated Spurious Emission(1GHz~18GHz)   | ±6.383dB    |
| Radiated Spurious Emission(18GHz~40GHz)  | ±6.648dB    |
| Conducted Spurious Emission              | ±1.253dB    |
| 6dB Bandwidth                            | ±6.89%      |
| Power Spectral Density                   | ±0.630dB    |
| 26 dB Occupied Bandwidth                 | ±6.10%      |
| Frequency Stability                      | ±375KHz     |
| Channel Frequencies Separation           | ±6.10%      |
| 20dB Bandwidth                           | ±6.12%      |
| Dwell Time                               | ±1.34%      |
| Peak Output Power(Conducted Power Meter) | ±0.86dB     |
| Temperature                              | ±1.2°C      |
| Humidity                                 | ±2.7%       |
| Channel Move Time                        | ±4.53%      |
| Channel Closing Transmission Time        | ±6.61%      |
| Threshold                                | ±0.631dB    |
| Non occupancy period                     | ±1.17%      |





### 3. Test Equipment and Ancillaries Used for Tests

| Instrument                  | Manufacturer         | Model No                 | Serial No   | Calibration Date | Valid Date |
|-----------------------------|----------------------|--------------------------|-------------|------------------|------------|
| EMI Receiver                | R&S                  | ESCI3                    | 100821      | 2018/09/12       | 2019/09/11 |
| LISN                        | Schwarzbeck          | NSLK 8127                | 8127-516    | 2018/09/11       | 2019/09/10 |
| Pulse Limiter               | R&S                  | ESH3-Z2                  | 101933      | 2018/09/04       | 2019/09/03 |
| Bilog Antenna               | Schwarzbeck          | VULB9168                 | 275         | 2018/09/17       | 2019/09/16 |
| Active Loop Antenna         | EMCO                 | 6507                     | 40855       | 2019/5/24        | 2020/5/23  |
| Horn Antenna                | EMCO                 | 3115                     | 31601       | 2018/09/26       | 2019/09/25 |
| Horn Antenna                | EMCO                 | 3116                     | 31974       | 2018/09/07       | 2019/09/06 |
| Preamplifier                | EM Electronics corp. | EM330                    | 60658       | 2018/10/04       | 2019/10/03 |
| Preamplifier                | EMC INSTRUMENTS      | EMC051845SE              | 980333      | 2018/09/18       | 2019/09/17 |
| Preamplifier                | EMC INSTRUMENTS      | EMC184045                | 980065      | 2018/10/31       | 2019/10/30 |
| MXG Vector Signal Generator | KEYSIGHT             | N5182A                   | MY50141551  | 2018/10/07       | 2019/10/06 |
| Spectrum Analyzer           | R&S                  | FSP40                    | 100219      | 2018/07/03       | 2019/07/02 |
| Bluetooth Test Set          | Anritsu              | MT8852B                  | 6261903476  | 2018/12/26       | 2019/12/25 |
| Attenuator                  | KEYSIGHT             | 8491B                    | MY39250705  | 2018/09/04       | 2019/09/03 |
| Temp & Humi chamber         | T-MACHINE            | TMJ-9712                 | T-12-040111 | 2018/08/30       | 2019/08/29 |
| Software                    | Farad                | Ez-EMC                   | ver.ct3a1   | N/A              | N/A        |
| Software                    | AUDIX                | E3                       | V8.2014-8-6 | N/A              | N/A        |
| Software                    | Keysight             | N7607B Signal Studio     | V3.0.0.0    | N/A              | N/A        |
| Software                    | Keysight             | Inservice MonitorUtility | N/A         | N/A              | N/A        |



## 4. Antenna Requirements

### 4.8 Standard Applicable

For intentional device, according to FCC 47 CFR Section 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.

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

### 4.9 Antenna Construction and Directional Gain

| Antenna     | Peak Gain |
|-------------|-----------|
| PCB Antenna | 0dBi      |



## 5.10 Test Limit

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHZ on the 120 VAC power and return leads of the EUT according to the methods defined in ANSI C63.10-2013. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 6.2.2. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

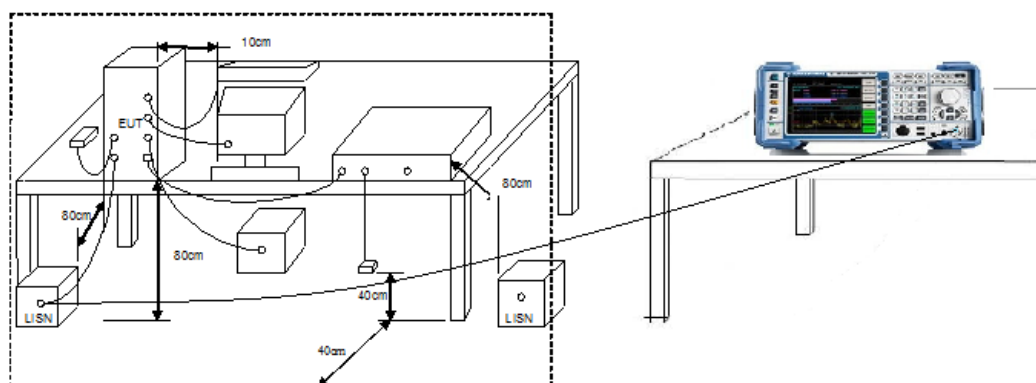
| Frequency<br>(MHz) | Quasi Peak<br>(dB $\mu$ V) | Average<br>(dB $\mu$ V) |
|--------------------|----------------------------|-------------------------|
| 0.15 – 0.5         | 66-56*                     | 56-46*                  |
| 0.5 – 5.0          | 56                         | 46                      |
| 5.0 – 30.0         | 60                         | 50                      |

\*Decreases with the logarithm of the frequency.

## 5.11 Test Procedures

The EUT was setup according to ANSI C63.10, 2013 and tested according to DTS test procedure of Oct 2014 KDB558074 for compliance to FCC 47CFR 15.247 requirements. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs) Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

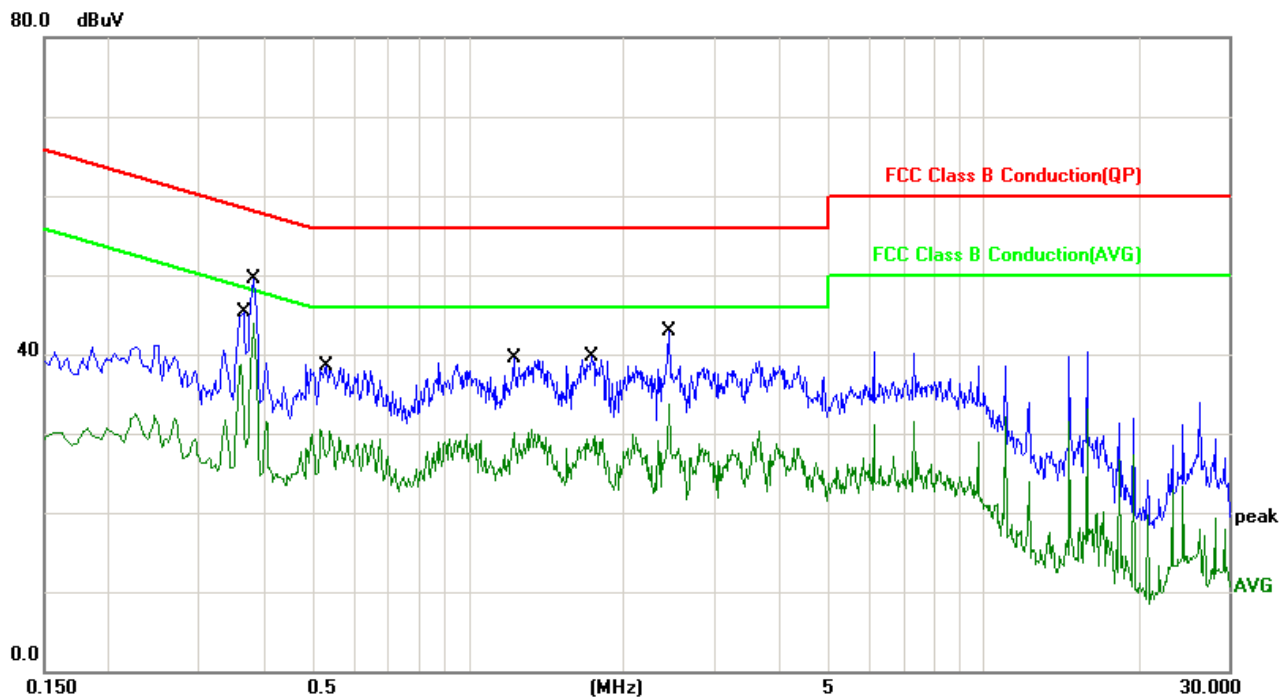
## 5.12 Typical Test Setup





### 5.13 Test Result and Data

|                 |             |           |              |
|-----------------|-------------|-----------|--------------|
| Test Mode :     | Normal Link | Phase :   | Line         |
| Temperature :   | 20°C        | Humidity: | 51%          |
| Pressur(mbar) : | 1002        | Date:     | May 24, 2019 |

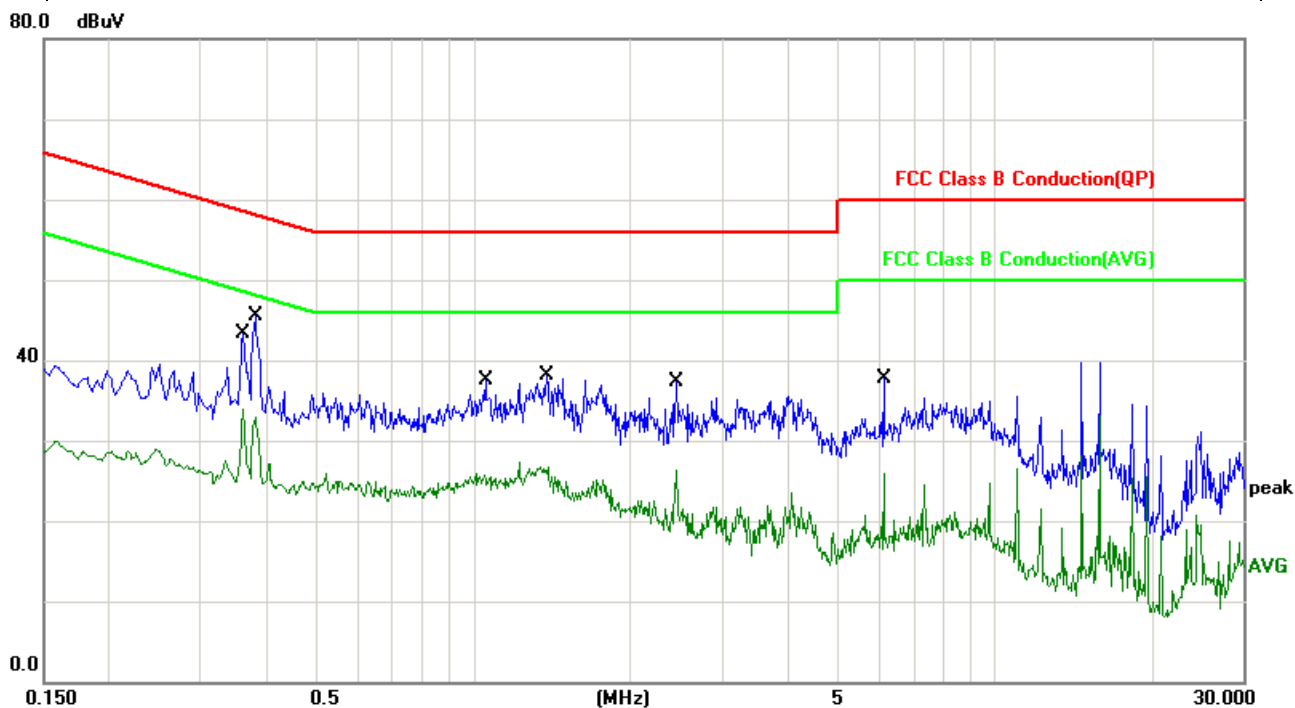


| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector |
|-----|-----------------|-------------|----------------|--------------|--------------|-------------|----------|
| 1   | 0.3660          | 9.97        | 29.23          | 39.20        | 58.59        | -19.39      | QP       |
| 2   | 0.3660          | 9.97        | 21.15          | 31.12        | 48.59        | -17.47      | AVG      |
| 3   | 0.3820          | 9.96        | 37.64          | 47.60        | 58.23        | -10.63      | QP       |
| 4   | 0.3820          | 9.96        | 33.48          | 43.44        | 48.23        | -4.79       | AVG      |
| 5   | 0.5299          | 9.92        | 21.95          | 31.87        | 56.00        | -24.13      | QP       |
| 6   | 0.5299          | 9.92        | 16.17          | 26.09        | 46.00        | -19.91      | AVG      |
| 7   | 1.2260          | 10.34       | 25.35          | 35.69        | 56.00        | -20.31      | QP       |
| 8   | 1.2260          | 10.34       | 19.54          | 29.88        | 46.00        | -16.12      | AVG      |
| 9   | 1.7380          | 10.81       | 22.64          | 33.45        | 56.00        | -22.55      | QP       |
| 10  | 1.7380          | 10.81       | 16.05          | 26.86        | 46.00        | -19.14      | AVG      |
| 11  | 2.4500          | 10.94       | 28.39          | 39.33        | 56.00        | -16.67      | QP       |
| 12  | 2.4500          | 10.94       | 20.79          | 31.73        | 46.00        | -14.27      | AVG      |

Note: Measurement Level = Reading Level + Correct Factor+ Attenuator



|                 |             |           |              |
|-----------------|-------------|-----------|--------------|
| Test Mode :     | Normal Link | Phase :   | Neutral      |
| Temperature :   | 20°C        | Humidity: | 51%          |
| Pressur(mbar) : | 1002        | Date:     | May 24, 2019 |



| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector |
|-----|-----------------|-------------|----------------|--------------|--------------|-------------|----------|
| 1   | 0.3620          | 9.97        | 29.48          | 39.45        | 58.68        | -19.23      | QP       |
| 2   | 0.3620          | 9.97        | 21.02          | 30.99        | 48.68        | -17.69      | AVG      |
| 3   | 0.3820          | 9.96        | 33.12          | 43.08        | 58.23        | -15.15      | QP       |
| 4   | 0.3820          | 9.96        | 25.13          | 35.09        | 48.23        | -13.14      | AVG      |
| 5   | 1.0580          | 10.13       | 20.58          | 30.71        | 56.00        | -25.29      | QP       |
| 6   | 1.0580          | 10.13       | 14.83          | 24.96        | 46.00        | -21.04      | AVG      |
| 7   | 1.3820          | 10.14       | 19.86          | 30.00        | 56.00        | -26.00      | QP       |
| 8   | 1.3820          | 10.14       | 13.95          | 24.09        | 46.00        | -21.91      | AVG      |
| 9   | 2.4539          | 10.18       | 22.76          | 32.94        | 56.00        | -23.06      | QP       |
| 10  | 2.4539          | 10.18       | 15.04          | 25.22        | 46.00        | -20.78      | AVG      |
| 11  | 6.1259          | 10.24       | 23.20          | 33.44        | 60.00        | -26.56      | QP       |
| 12  | 6.1259          | 10.24       | 15.94          | 26.18        | 50.00        | -23.82      | AVG      |

Note: Measurement Level = Reading Level + Correct Factor+ Attenuator



## 6. Test of Radiated Emission

### 6.1 Test Limit

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. If the transmitter measurement is based on the maximum conducted output power, the attenuation required under this paragraph shall be 30dB instead of 20dB. In addition, radiated emissions which fall in section 15.205(a) the restricted bands must also comply with the radiated emission limit specified in section 15.209(a).

| Frequency (MHz) | Field Strength (microvolt/meter) | Measurement Distance (meters) |
|-----------------|----------------------------------|-------------------------------|
| 0.009 ~ 0.490   | 2400/F(kHz)                      | 300                           |
| 0.490 ~ 1.705   | 24000/F(kHz)                     | 30                            |
| 1.705 ~ 30.0    | 30                               | 30                            |
| 30 ~ 88         | 100                              | 3                             |
| 88 ~ 216        | 150                              | 3                             |
| 216 ~ 960       | 200                              | 3                             |
| Above 960       | 500                              | 3                             |

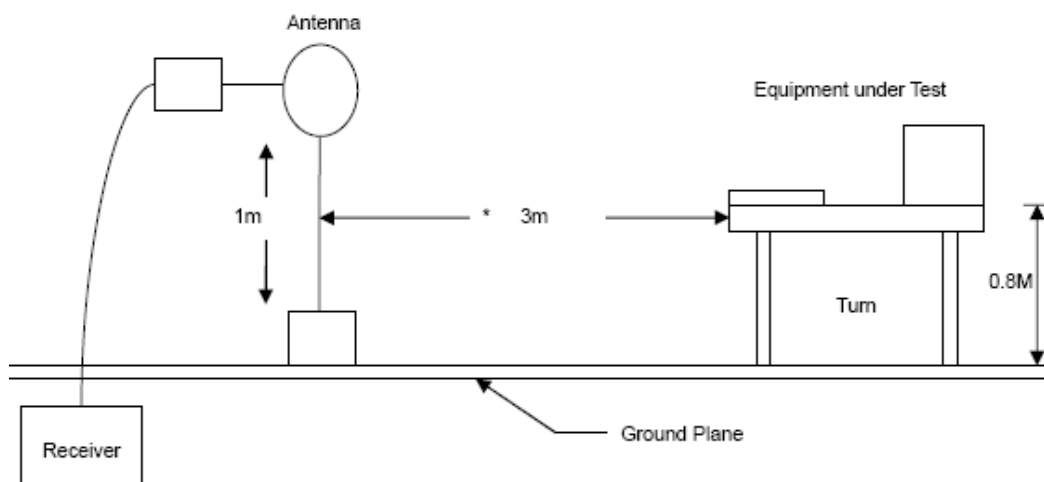
### 6.2 Test Procedures

- The EUT was placed on a rotatable table top 0.8 meter above ground.
- The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- The table was rotated 360 degrees to determine the position of the highest radiation.
- The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 3 dB lower than the 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 and reported.
- For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission 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.
- "Cone of radiation" has been considered to be 3dB bandwidth of the measurement antenna.

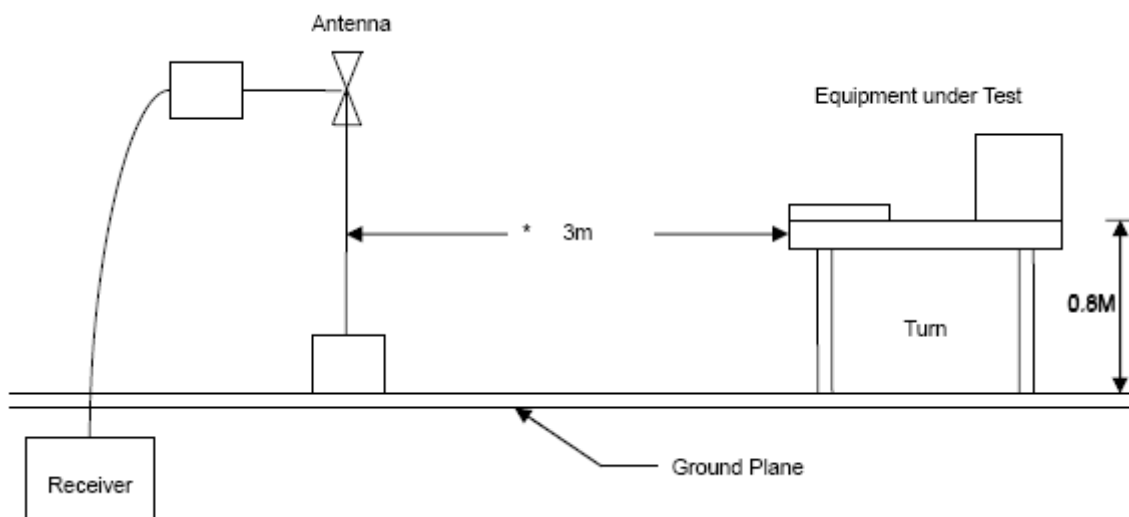


### 6.3 Typical Test Setup

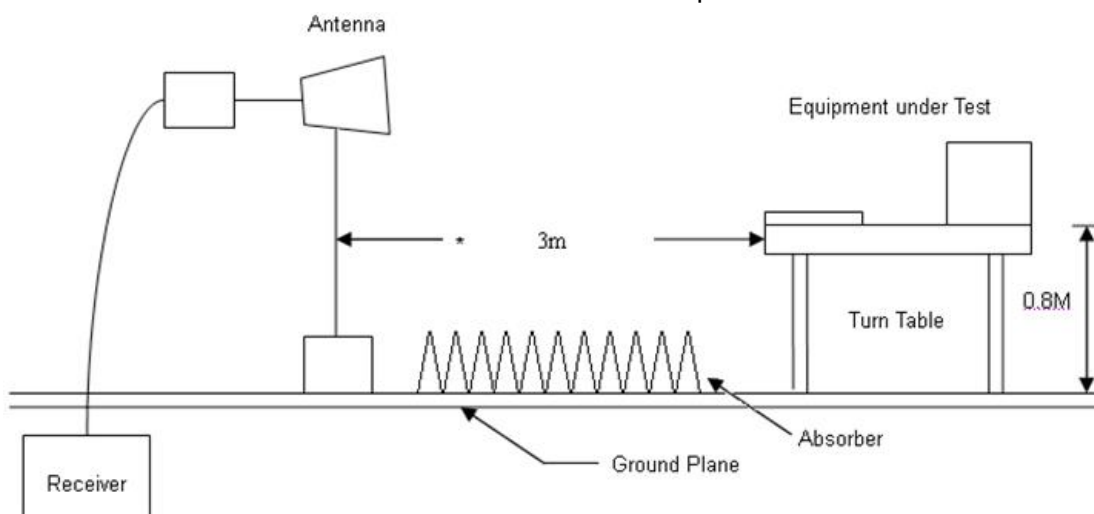
Below 30MHz Test Setup



30M - 1GHz Test Setup



Above 1GHz Test Setup





#### 6.4 Test Result and Data (9KHz ~ 30MHz)

The 9kHz-30MHz spurious emission is under limit 20dB more.

#### 6.5 Test Result and Data (30MHz ~ 1GHz)

|           |   |               |                      |   |          |
|-----------|---|---------------|----------------------|---|----------|
| Power     | : | AC 120V/60Hz  | Temperature          | : | 24 °C    |
| Test Mode | : | Normal Link   | Humidity             | : | 54 %     |
| Test date | : | Jun. 08, 2019 | Atmospheric Pressure | : | 1010 hpa |

| Frequency<br>(MHz) | AntPol.<br>H/V | Correct<br>Factor<br>(dB) | Reading<br>level<br>(dBuV) | Measure<br>Level<br>(dBuV/m) | Limit 3m<br>(dBuV/m) | Safe<br>Margin<br>(dB) | Detector<br>mode<br>(PK/QP) |
|--------------------|----------------|---------------------------|----------------------------|------------------------------|----------------------|------------------------|-----------------------------|
| 179.3799           | H              | -13.91                    | 47.55                      | 33.64                        | 43.50                | -9.86                  | peak                        |
| 275.4100           | H              | -10.75                    | 47.18                      | 36.43                        | 46.00                | -9.57                  | peak                        |
| 323.9100           | H              | -7.32                     | 44.38                      | 37.06                        | 46.00                | -8.94                  | peak                        |
| 371.4399           | H              | -6.17                     | 41.23                      | 35.06                        | 46.00                | -10.94                 | peak                        |
| 396.6600           | H              | -6.57                     | 40.88                      | 34.31                        | 46.00                | -11.69                 | peak                        |
| 475.2300           | H              | -2.15                     | 35.65                      | 33.50                        | 46.00                | -12.50                 | peak                        |
|                    |                |                           |                            |                              |                      |                        |                             |
| 72.6800            | V              | -16.88                    | 51.68                      | 34.80                        | 40.00                | -5.20                  | QP                          |
| 152.2198           | V              | -13.36                    | 51.35                      | 37.99                        | 43.50                | -5.51                  | QP                          |
| 179.3799           | V              | -13.91                    | 50.57                      | 36.66                        | 43.50                | -6.84                  | peak                        |
| 275.4100           | V              | -10.75                    | 45.90                      | 35.15                        | 46.00                | -10.85                 | peak                        |
| 299.6600           | V              | -10.49                    | 46.21                      | 35.72                        | 46.00                | -10.28                 | peak                        |
| 479.1100           | V              | -1.96                     | 36.81                      | 34.85                        | 46.00                | -11.15                 | peak                        |

Note: Level = Reading + Factor

Margin = Level – Limit

Factor= Antenna Factor + Cable Loss - Amplifier Factor



**6.6 Test Result and Data (1GHz ~ 25GHz)**

|            |                 |                      |            |
|------------|-----------------|----------------------|------------|
| Power      | : AC 120V/60Hz  | Temperature          | : 24 °C    |
| Test Mode1 | 2402MHz         | Humidity             | : 54 %     |
| Test date  | : Jun. 08, 2019 | Atmospheric Pressure | : 1010 hpa |

| Frequency<br>(MHz) | AntPol.<br>H/V | Correct<br>Factor<br>(dB) | Reading<br>level<br>(dBuV) | Measure<br>Level<br>(dBuV/m) | Limit 3m<br>(dBuV/m) | Safe<br>Margin<br>(dB) | Detector<br>mode<br>(PK/AV) |
|--------------------|----------------|---------------------------|----------------------------|------------------------------|----------------------|------------------------|-----------------------------|
| 3125.000           | H              | -5.57                     | 47.31                      | 41.74                        | 74.00                | -32.26                 | peak                        |
| 4003.333           | H              | -1.87                     | 40.50                      | 38.63                        | 74.00                | -35.37                 | peak                        |
| 4804.000           | H              | 1.23                      | 40.65                      | 41.88                        | 74.00                | -32.12                 | peak                        |
| 5901.667           | H              | 3.02                      | 39.00                      | 42.02                        | 74.00                | -31.98                 | peak                        |
| 6355.000           | H              | 3.40                      | 37.82                      | 41.22                        | 74.00                | -32.78                 | peak                        |
| 7206.000           | H              | 5.88                      | 38.92                      | 44.80                        | 74.00                | -29.20                 | peak                        |
|                    |                |                           |                            |                              |                      |                        |                             |
| 3125.000           | V              | -5.57                     | 46.03                      | 40.46                        | 74.00                | -33.54                 | peak                        |
| 3521.667           | V              | -3.53                     | 42.14                      | 38.61                        | 74.00                | -35.39                 | peak                        |
| 4804.000           | V              | 1.23                      | 41.95                      | 43.18                        | 74.00                | -30.82                 | peak                        |
| 5675.000           | V              | 2.45                      | 38.23                      | 40.68                        | 74.00                | -33.32                 | peak                        |
| 6128.333           | V              | 3.31                      | 38.31                      | 41.62                        | 74.00                | -32.38                 | peak                        |
| 7206.000           | V              | 5.88                      | 40.68                      | 46.56                        | 74.00                | -27.44                 | peak                        |

Note: Level = Reading + Factor

Margin = Level – Limit

Factor= Antenna Factor + Cable Loss - Amplifier Factor



|            |                 |                      |            |
|------------|-----------------|----------------------|------------|
| Power      | : AC 120V/60Hz  | Temperature          | : 24 °C    |
| Test Mode1 | 2440MHz         | Humidity             | : 54 %     |
| Test date  | : Jun. 08, 2019 | Atmospheric Pressure | : 1010 hpa |

| Frequency<br>(MHz) | AntPol.<br>H/V | Correct<br>Factor<br>(dB) | Reading<br>level<br>(dBuV) | Measure<br>Level<br>(dBuV/m) | Limit 3m<br>(dBuV/m) | Safe<br>Margin<br>(dB) | Detector<br>mode<br>(PK/AV) |
|--------------------|----------------|---------------------------|----------------------------|------------------------------|----------------------|------------------------|-----------------------------|
| 3493.333           | H              | -3.64                     | 42.29                      | 38.65                        | 74.00                | -35.35                 | peak                        |
| 4343.333           | H              | -0.14                     | 39.95                      | 39.81                        | 74.00                | -34.19                 | peak                        |
| 4880.000           | H              | 1.37                      | 38.70                      | 40.07                        | 74.00                | -33.93                 | peak                        |
| 6100.000           | H              | 3.30                      | 38.09                      | 41.39                        | 74.00                | -32.61                 | peak                        |
| 6496.667           | H              | 3.46                      | 38.70                      | 42.16                        | 74.00                | -31.84                 | peak                        |
| 7320.000           | H              | 6.33                      | 38.34                      | 44.67                        | 74.00                | -29.33                 | peak                        |
|                    |                |                           |                            |                              |                      |                        |                             |
| 3125.000           | V              | -5.57                     | 44.50                      | 38.93                        | 74.00                | -35.07                 | peak                        |
| 4230.000           | V              | -0.72                     | 40.10                      | 39.38                        | 74.00                | -34.62                 | peak                        |
| 4880.000           | V              | 1.37                      | 40.34                      | 41.71                        | 74.00                | -32.29                 | peak                        |
| 5958.333           | V              | 3.16                      | 37.97                      | 41.13                        | 74.00                | -32.87                 | peak                        |
| 6553.333           | V              | 3.63                      | 37.49                      | 41.12                        | 74.00                | -32.88                 | peak                        |
| 7320.000           | V              | 6.33                      | 42.23                      | 48.56                        | 74.00                | -25.44                 | peak                        |

Note: Level = Reading + Factor

Margin = Level – Limit

Factor= Antenna Factor + Cable Loss - Amplifier Factor



|            |                 |                      |            |
|------------|-----------------|----------------------|------------|
| Power      | : AC 120V/60Hz  | Temperature          | : 24 °C    |
| Test Mode1 | 2480MHz         | Humidity             | : 54 %     |
| Test date  | : Jun. 08, 2019 | Atmospheric Pressure | : 1010 hpa |

| Frequency<br>(MHz) | AntPol.<br>H/V | Correct<br>Factor<br>(dB) | Reading<br>level<br>(dBuV) | Measure<br>Level<br>(dBuV/m) | Limit 3m<br>(dBuV/m) | Safe<br>Margin<br>(dB) | Detector<br>mode<br>(PK/AV) |
|--------------------|----------------|---------------------------|----------------------------|------------------------------|----------------------|------------------------|-----------------------------|
| 3153.333           | H              | -5.42                     | 43.47                      | 38.05                        | 74.00                | -35.95                 | peak                        |
| 4343.333           | H              | -0.14                     | 40.27                      | 40.13                        | 74.00                | -33.87                 | peak                        |
| 4960.000           | H              | 1.52                      | 39.52                      | 41.04                        | 74.00                | -32.96                 | peak                        |
| 5816.667           | H              | 2.81                      | 37.54                      | 40.35                        | 74.00                | -33.65                 | peak                        |
| 6468.333           | H              | 3.45                      | 36.59                      | 40.04                        | 74.00                | -33.96                 | peak                        |
| 7440.000           | H              | 6.80                      | 38.56                      | 45.36                        | 74.00                | -28.64                 | peak                        |
|                    |                |                           |                            |                              |                      |                        |                             |
| 3465.000           | V              | -3.78                     | 42.81                      | 39.03                        | 74.00                | -34.97                 | peak                        |
| 4343.333           | V              | -0.14                     | 39.15                      | 39.01                        | 74.00                | -34.99                 | peak                        |
| 4960.000           | V              | 1.52                      | 37.96                      | 39.48                        | 74.00                | -34.52                 | peak                        |
| 5731.667           | V              | 2.59                      | 37.03                      | 39.62                        | 74.00                | -34.38                 | peak                        |
| 6355.000           | V              | 3.40                      | 36.32                      | 39.72                        | 74.00                | -34.28                 | peak                        |
| 7440.000           | V              | 6.80                      | 39.58                      | 46.38                        | 74.00                | -27.62                 | peak                        |

Note: Level = Reading + Factor

Margin = Level – Limit

Factor= Antenna Factor + Cable Loss - Amplifier Factor



## 6.7 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                 | MHz                   | MHz             | GHz             |
|---------------------|-----------------------|-----------------|-----------------|
| 0.09000 – 0.11000   | 16.42000 – 16.42300   | 399.9 – 410.0   | 4.500 – 5.250   |
| 0.49500 – 0.505**   | 16.69475 – 16.69525   | 608.0 – 614.0   | 5.350 – 5.460   |
| 2.17350 – 2.19050   | 16.80425 – 16.80475   | 960.0 – 1240.0  | 7.250 – 7.750   |
| 4.12500 – 4.12800   | 25.50000 – 25.67000   | 1300.0 – 1427.0 | 8.025 – 8.500   |
| 4.17725 – 4.17775   | 37.50000 – 38.25000   | 1435.0 – 1626.5 | 9.000 – 9.200   |
| 4.20725 – 4.20775   | 73.00000 – 74.60000   | 1645.5 – 1646.5 | 9.300 – 9.500   |
| 6.21500 – 6.21800   | 74.80000 – 75.20000   | 1660.0 – 1710.0 | 10.600 – 12.700 |
| 6.26775 – 6.26825   | 108.00000 – 121.94000 | 1718.8 – 1722.2 | 13.250 – 13.400 |
| 6.31175 – 6.31225   | 123.00000 – 138.00000 | 2200.0 – 2300.0 | 14.470 – 14.500 |
| 8.29100 – 8.29400   | 149.90000 – 150.05000 | 2310.0 – 2390.0 | 15.350 – 16.200 |
| 8.36200 – 8.36600   | 156.52475 – 156.52525 | 2483.5 – 2500.0 | 17.700 – 21.400 |
| 8.37625 – 8.38675   | 156.70000 – 156.90000 | 2655.0 – 2900.0 | 22.010 – 23.120 |
| 8.41425 – 8.41475   | 162.01250 – 167.17000 | 3260.0 – 3267.0 | 23.600 – 24.000 |
| 12.29000 – 12.29300 | 167.72000 – 173.20000 | 3332.0 – 3339.0 | 31.200 – 31.800 |
| 12.51975 – 12.52025 | 240.00000 – 285.00000 | 3345.8 – 3358.0 | 36.430 – 36.500 |
| 12.57675 – 12.57725 | 322.00000 – 335.40000 | 3600.0 – 4400.0 | Above 38.6      |
| 13.36000 – 13.41000 |                       |                 |                 |

\*\* : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz



## 6.8 Restrict Band Emission Measurement Data

Test Date : Jun. 08, 2019  
Temperature : 24 °C  
Humidity : 52 %  
Atmospheric Pressure : 1023 hPa

Modulation Standard:GFSK

| Channel 00      |               |                |                | Fundamental Frequency: 2402 MHz |             |      |             |
|-----------------|---------------|----------------|----------------|---------------------------------|-------------|------|-------------|
| Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m)                  | Margin (dB) | Det. | Ant-Pol H/V |
| 2390.000        | -10.05        | 48.15          | 38.10          | 74.00                           | -35.90      | peak | H           |
| 2390.000        | -10.05        | 35.93          | 25.88          | 54.00                           | -28.12      | AVG  | H           |
| 2390.000        | -10.05        | 47.91          | 37.86          | 74.00                           | -36.14      | peak | V           |
| 2390.000        | -10.05        | 35.71          | 25.66          | 54.00                           | -28.34      | AVG  | V           |
| Channel 39      |               |                |                | Fundamental Frequency: 2480 MHz |             |      |             |
| 2483.500        | -9.65         | 49.66          | 40.01          | 74.00                           | -33.99      | peak | H           |
| 2483.500        | -9.65         | 35.97          | 26.32          | 54.00                           | -27.68      | AVG  | H           |
| 2483.500        | -9.65         | 47.67          | 38.02          | 74.00                           | -35.98      | peak | V           |
| 2483.500        | -9.65         | 35.61          | 25.96          | 54.00                           | -28.04      | AVG  | V           |

Notes:

1. Result = Meter Reading + Factor
2. Factor = Antenna Factor + Cable Loss – Amplifier
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3 MHz (detector peak mode) for Peak detection at frequency above 1GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3 MHz (detector sample mode) for Average detection at frequency above 1GHz



## 7. Test of Spurious Emission (Conducted)

### 7.9 Test Limit

Below 30dB of the highest emission level of operating band (In 100 kHz Resolution Bandwidth)

### 7.10 Test Procedure

KDB 558074 D01 DTS Meas Guidance v03r05

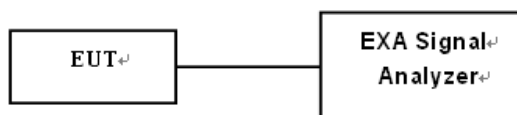
#### 1. Reference level measurement

- (a) Set instrument center frequency to DTS channel center frequency
- (b) Set the span to  $\geq 1.5$  times the DTS bandwidth
- (c) Set the RBW = 100 kHz
- (d) Set the VBW  $\geq 3 \times$  RBW
- (e) Detector = peak
- (f) Sweep time = auto couple
- (g) Trace mode = max hold
- (h) Allow trace to fully stabilize

#### 2. Emission level measurement

- (a) Set the center frequency and span to encompass frequency range to be measured
- (b) RBW = 100kHz
- (c) VBW = 300kHz
- (d) Detector = Peak
- (e) Trace mode = max hold
- (f) Sweep time = auto couple
- (g) The trace was allowed to stabilize

### 7.11 Test Setup Layout

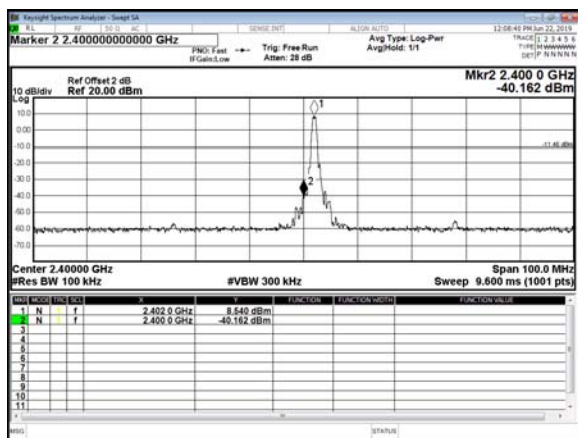


### 7.12 Test Result and Data

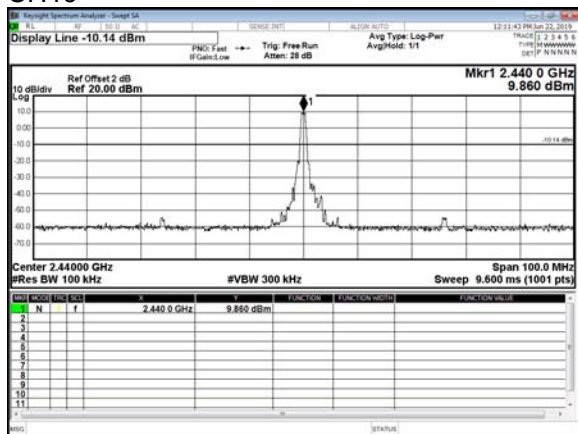
| Modulation Standard | Channel | Frequency (MHz) | Test Result |
|---------------------|---------|-----------------|-------------|
| GFSK                | 01      | 2402            | PASS        |
|                     | 40      | 2480            | PASS        |



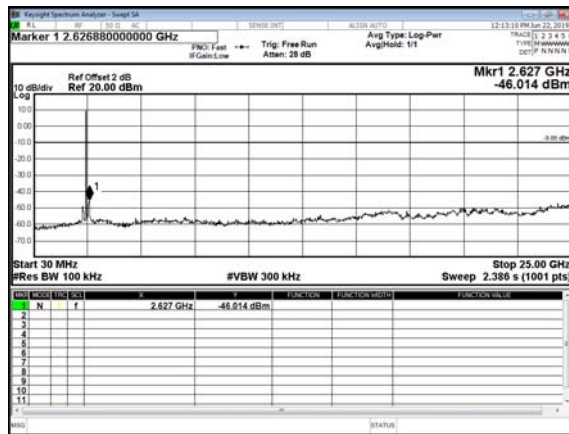
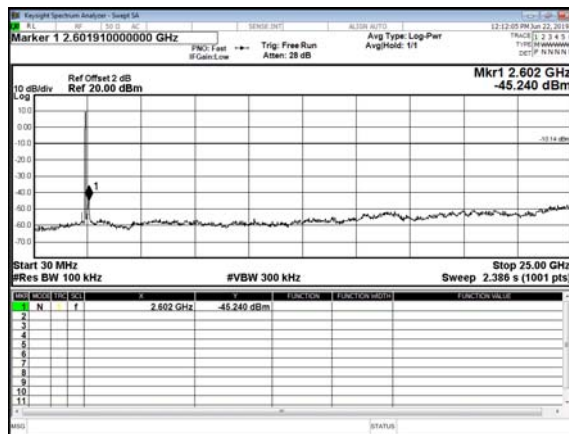
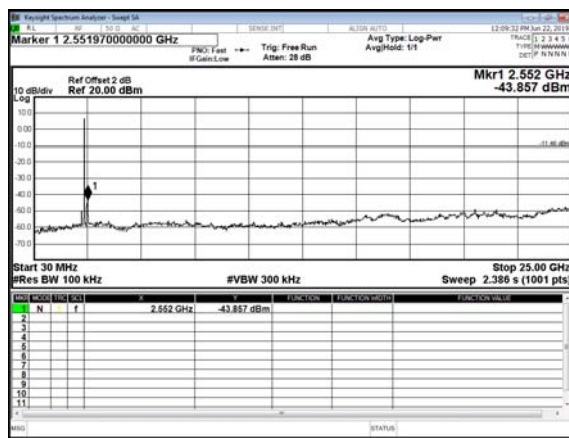
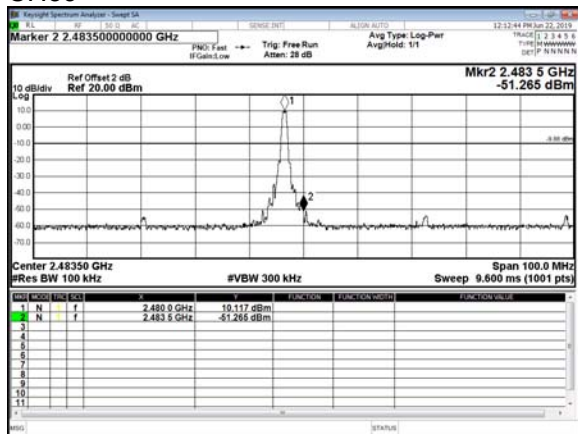
Modulation Type: GFSK  
Channel 00



CH19



CH39





## 8. 6dB Bandwidth Measurement Data

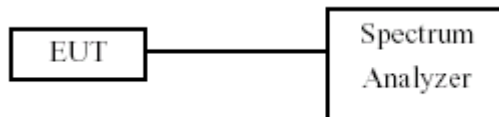
### 8.1 Test Limit

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

### 8.2 Test Procedures

- The transmitter output was connected to the spectrum analyzer.
- Set RBW of spectrum analyzer to 100 KHz and VBW to 300 KHz.
- Set spectrum analyzer X dB to 6 dB.
- Set spectrum analyzer peak detector with maximum hold.

### 8.3 Test Setup Layout







## 8.4 Test Result and Data

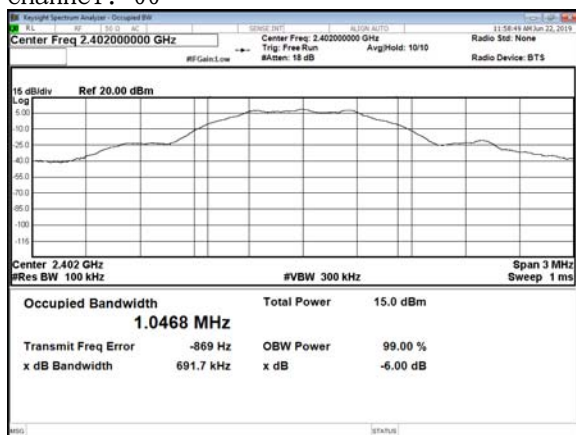
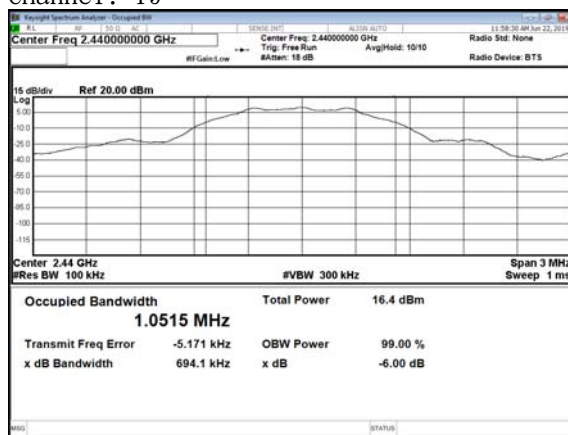
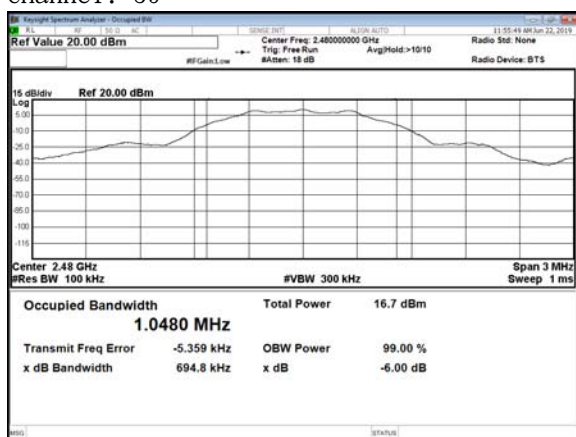
Test Date: Jun. 22, 2019

Temperature: 23 °C

Atmospheric pressure: 1087 hPa

Humidity: 54 %

| Modulation Type | Channel | Frequency (MHz) | 6dB Bandwidth (KHz) |
|-----------------|---------|-----------------|---------------------|
| GFSK            | 00      | 2402            | 692                 |
|                 | 19      | 2440            | 694                 |
|                 | 39      | 2480            | 695                 |

Modulation Standard: GFSK (1Mbps)  
Channel: 00Modulation Standard: GFSK (1Mbps)  
Channel: 19Modulation Standard: GFSK (1Mbps)  
Channel: 39



## 9. Maximum Peak Output Power

### 9.1 Test Limit

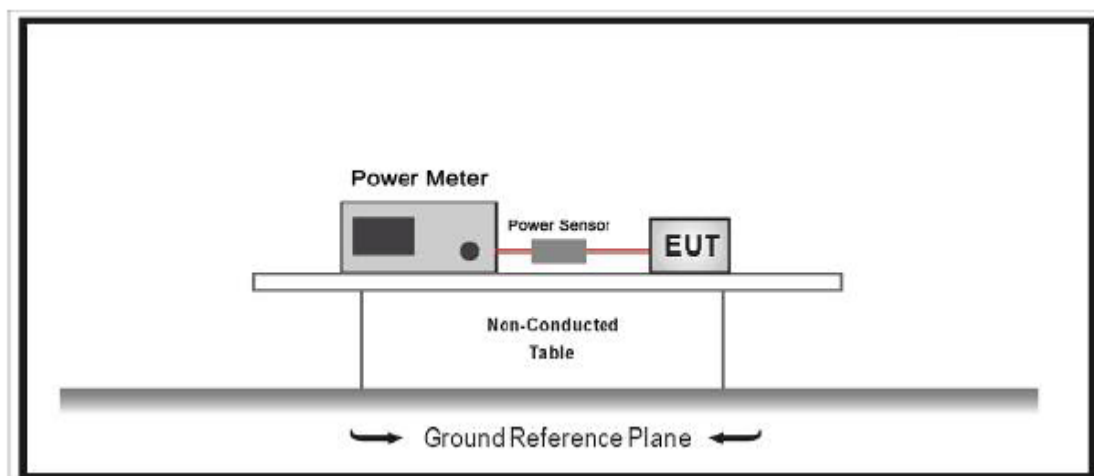
The Maximum Peak Output Power Measurement is 30dBm.

### 9.2 Test Procedure

Test procedure refers to KDB 558074 D01 DTS Meas Guidance v03r05 Peak power meter method.

The antenna port (RF output) of the EUT was connected to the input (RF input) of a power meter. Power was read directly from the meter and cable loss connection was added to the reading to obtain power at the EUT antenna terminal. The EUT Output Power was set to maximum to produce the worse case test result.

### 9.3 Test Setup Layout



**9.4 Test Result and Data**

Test Date: Jun. 22, 2019

Temperature: 23°C

Atmospheric pressure: 1087 hPa

Humidity: 54%

| Modulation Standard | Channel | Frequency (MHz) | Power Output (dBm) | Peak Power Output (mW) |
|---------------------|---------|-----------------|--------------------|------------------------|
| GFSK                | 00      | 2402            | 9.75               | 9.441                  |
|                     | 19      | 2440            | 11.16              | 13.062                 |
|                     | 39      | 2480            | 11.39              | 13.772                 |



## 10. Power Spectral Density

### 10.1 Test Limit

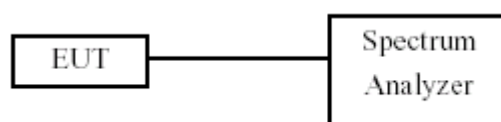
The Maximum of Power Spectral Density Measurement is 8dBm.

### 10.2 Test Procedure

Test procedure refers to section 10.3 Method AVGPSD-1.

- a) Set instrument center frequency to DTS channel center frequency.
- b) Set span to at least 1.5 times the OBW.
- c) Set RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- d) Set VBW  $\geq 3 \times \text{RBW}$ .
- e) Detector = power averaging (RMS) or sample detector (when RMS not available).
- f) Ensure that the number of measurement points in the sweep  $\geq 2 \times \text{span}/\text{RBW}$ .
- g) Sweep time = auto couple.
- h) Employ trace averaging (RMS) mode over a minimum of 100 traces.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span in order to meet the minimum measurement point requirement as the RBW is reduced).

### 10.3 Test Setup Layout





## 10.4 Test Result and Data

Test Date: Jun. 22, 2019

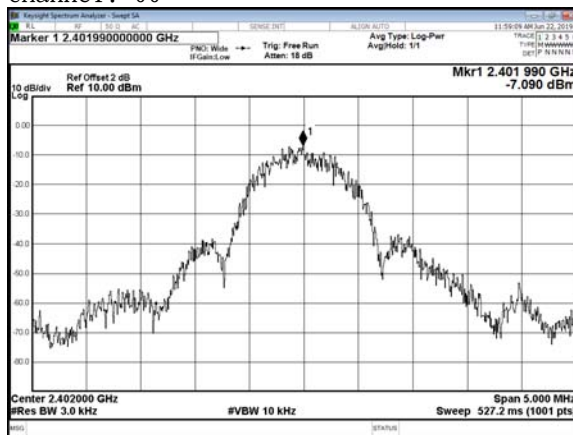
Temperature: 23°C

Atmospheric pressure: 1087 hPa

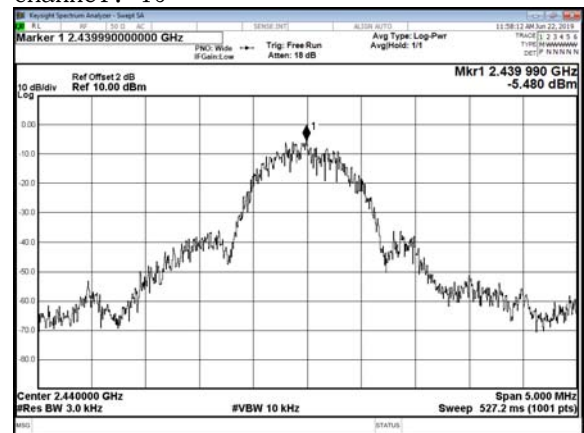
Humidity: 54%

| Modulation Standard | Channel | Frequency (MHz) | Maximum Power Density of 3 kHz Bandwidth (dBm) |
|---------------------|---------|-----------------|------------------------------------------------|
| GFSK                | 00      | 2402            | -7.09                                          |
|                     | 19      | 2440            | -5.48                                          |
|                     | 39      | 2480            | -5.37                                          |

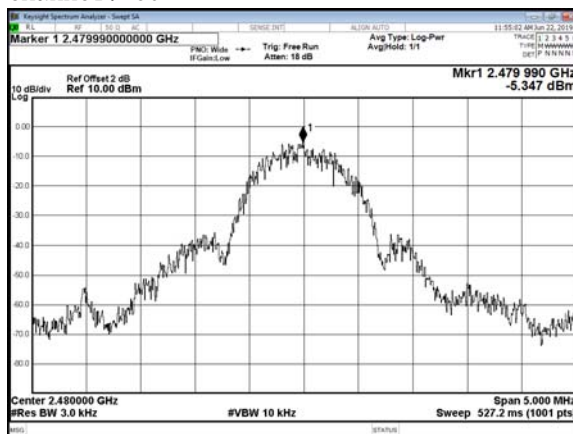
Modulation Standard: GFSK (1Mbps)  
Channel: 00



Modulation Standard: GFSK (1Mbps)  
Channel: 19



Modulation Standard: GFSK (1Mbps)  
Channel: 39



----- End of the report -----