



## FCC Test Report (BLE)

**FCC ID** : **A8IVOOMBOX-ONGO**

**Applicant** : Shenzhen DIVOOM Technology Co., Ltd.  
A3, 2nd Floor, Block A, Zhengxing Building, No. 33 Taizi Road,  
Shekou, Nanshan District, Guangdong, China

### Sample Description

**Product Name** : **Bluetooth Speaker**

**Model No.** : Voombox-ongo

**Serial No.** : N/A

**Trademark** : DIVOOM

**Receipt Date** : 2014-07-09

**Test Date** : 2014-07-09 to 2014-07-29

**Issue Date** : 2014-07-29

**Test Standard(s)** : **FCC CFR Title 47 Part 15 Subpart C Section 15.247**

**Conclusions** : **PASSED\***

\*In the configuration tested, the EUT complied with the standards specified above.

**Test/Witness Engineer** : *Jason Deng*

**Approved & Authorized** : *Winkay Wang*

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.



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## 1. General Information

### 1.1. Client Information

|              |   |                                                                                                           |
|--------------|---|-----------------------------------------------------------------------------------------------------------|
| Applicant    | : | Shenzhen DIVOOM Technology Co., Ltd.                                                                      |
| Address      | : | A3, 2nd Floor, Block A, Zhengxing Building, No. 33 Taizi Road, Shekou, Nanshan District, Guangdong, China |
| Manufacturer | : | Shenzhen DIVOOM Technology Co., Ltd.                                                                      |
| Address      | : | A3, 2nd Floor, Block A, Zhengxing Building, No. 33 Taizi Road, Shekou, Nanshan District, Guangdong, China |

### 1.2. General Description of EUT (Equipment Under Test)

|                     |   |                                                |                      |
|---------------------|---|------------------------------------------------|----------------------|
| Product Name        | : | Bluetooth Speaker                              |                      |
| Models No.          | : | Voombox-ongo                                   |                      |
| Serial No.          | : | N/A                                            |                      |
| Trademark           | : | DIVOOM                                         |                      |
| Product Description | : | Operation Frequency:                           | 2402MHz~2480MHz      |
|                     |   | Transfer Rate:                                 | 1 Mbits/s            |
|                     |   | Number of Channel:                             | 40 Channels          |
|                     |   | Modulation Type:                               | GFSK                 |
|                     |   | Modulation Technology:                         | FHSS                 |
|                     |   | Antenna Type:                                  | Integral PCB Antenna |
|                     |   | Antenna Gain:                                  | 0 dBi                |
| Power Supply        | : | USB DC 5V from PC, DC 3.7V from Li-ion battery |                      |

#### Note:

(1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

(2) Channel List:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|---------|-----------------|
| 00      | 2402            | 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            | 19      | 2440            | 33      | 2468            |



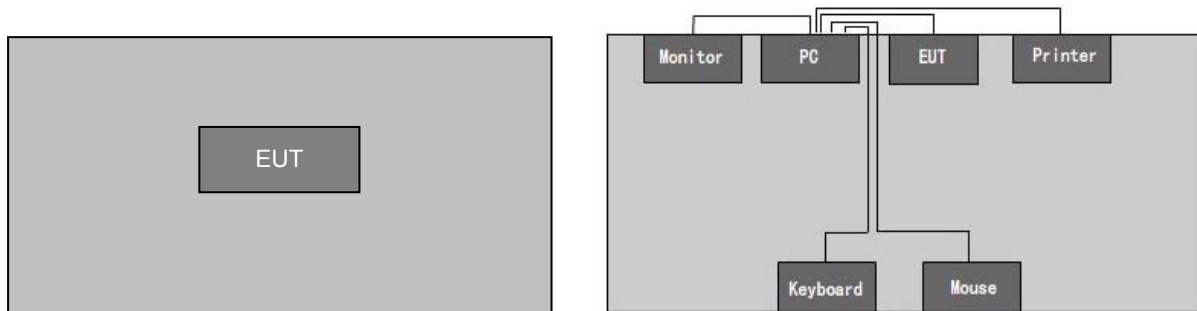
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|                                                      |      |    |      |    |      |
|------------------------------------------------------|------|----|------|----|------|
| 06                                                   | 2414 | 20 | 2442 | 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 | 39 | 2480 |
| 12                                                   | 2426 | 26 | 2454 |    |      |
| 13                                                   | 2428 | 27 | 2456 |    |      |
| <b>Remark:</b> Channel 0, 20 & 39 selected for GFSK. |      |    |      |    |      |

## 1.3. Block Diagram Showing The Configuration of System Tested



## 1.4. Description of Support Units

| Name        | Model        | Serial Number          | Manufacturer |
|-------------|--------------|------------------------|--------------|
| Printer     | HP1020       | CNCJ410726             | HP           |
| LCD Monitor | G205HV       | 10306738385            | ACER         |
| PC          | ASPIREM1830  | PTSF90C00305005CAC3000 | ACER         |
| Keyboard    | SK-9625      | KBUSB1580500037E0100   | ACER         |
| Mouse       | MS.11200.014 | M-UAY-ACR2             | ACER         |

## 1.5. External I/O Cable

| Cable Description                   | Length(m) | From/ Port | To          |
|-------------------------------------|-----------|------------|-------------|
| Shielding Detachable USB Cable      | 1.5       | Host PC    | Mouse       |
| Shielding Detachable K/B Cable      | 1.5       | Host PC    | Keyboard    |
| Shielding Detachable serial Cable   | 1.5       | Host PC    | Printer     |
| Shielding Detachable VGA Cable      | 1.5       | Host PC    | LCD Monitor |
| Unshielding Detachable USB&AV Cable | 0.5       | EUT        | Host PC     |



## 1.6. Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

| Test Mode               | Description                            |
|-------------------------|----------------------------------------|
| Charging & Playing mode | Keep the EUT in Charging& Playing mode |
| Transmitting mode       | Keep the EUT in Transmitting mode      |

**Remark:** The sample was placed 0.8m above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

## 1.7. Test Instruments List

| Item | Test Equipment                     | Manufacturer                         | Model No.                   | Cal. Date     | Cal. Due date |
|------|------------------------------------|--------------------------------------|-----------------------------|---------------|---------------|
| 1    | Bilog Antenna                      | SCHWARZBECK<br>MESS-ELEKTRONIK       | VULB9163                    | Mar. 28, 2014 | Mar. 27, 2015 |
| 2    | Double -ridged<br>waveguide horn   | SCHWARZBECK<br>MESS-ELEKTRONIK       | BBHA9120D                   | Mar. 28, 2014 | Mar. 27, 2015 |
| 3    | Coaxial Cable                      | N/A                                  | N/A                         | Mar. 28, 2014 | Mar. 27, 2015 |
| 4    | Coaxial Cable                      | N/A                                  | N/A                         | Mar. 28, 2014 | Mar. 27, 2015 |
| 5    | Coaxial cable                      | N/A                                  | N/A                         | Mar. 28, 2014 | Mar. 27, 2015 |
| 6    | Coaxial Cable                      | N/A                                  | N/A                         | Mar. 28, 2014 | Mar. 27, 2015 |
| 7    | Coaxial Cable                      | N/A                                  | N/A                         | Mar. 28, 2014 | Mar. 27, 2015 |
| 8    | Amplifier<br>(10kHz-1.3GHz)        | HP                                   | 8447D                       | Mar. 28, 2014 | Mar. 27, 2015 |
| 9    | Amplifier<br>(1GHz-18GHz)          | Compliance Direction<br>Systems Inc. | PAP-1G18                    | Mar. 28, 2014 | Mar. 27, 2015 |
| 10   | Pre-amplifier<br>(18-26GHz)        | Rohde & Schwarz                      | AFS33-18002<br>650-30-8P-44 | Mar. 28, 2014 | Mar. 27, 2015 |
| 11   | Horn Antenna                       | ETS-LINDGREN                         | 3160                        | Mar. 28, 2014 | Mar. 27, 2015 |
| 12   | Positioning<br>Controller          | UC                                   | UC3000                      | N/A           | N/A           |
| 13   | Spectrum<br>analyzer<br>9kHz-30GHz | Rohde & Schwarz                      | FSP                         | Mar. 28, 2014 | Mar. 27, 2015 |



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|    |                                      |                      |         |               |               |
|----|--------------------------------------|----------------------|---------|---------------|---------------|
| 14 | EMI Test Receiver                    | Rohde & Schwarz      | ESPI    | Mar. 28, 2014 | Mar. 27, 2015 |
| 15 | Loop antenna                         | Laplace instrument   | RF300   | Mar. 28, 2014 | Mar. 27, 2015 |
| 16 | Universal radio communication tester | Rhode & Schwarz      | CMU200  | Mar. 28, 2014 | Mar. 27, 2015 |
| 17 | Signal Analyzer                      | Rohde & Schwarz      | FSIQ3   | Mar. 28, 2014 | Mar. 27, 2015 |
| 18 | EMI Test Receiver                    | Rohde & Schwarz ESCI | ESCI    | Mar. 28, 2014 | Mar. 27, 2015 |
| 19 | LISN                                 | CHASE                | MN2050D | Mar. 28, 2014 | Mar. 27, 2015 |

## 1.8. Laboratory Location

Shenzhen Certification Technology Service Co., Ltd.

Address: 2F, Building B, East Area of Nanchang Second Industrial Zone, Gushu 2nd Road, Bao'an District, Shenzhen 518126, P.R. China

At the time of testing, the Laboratory is accredited. It is listed in the United States of American Federal Communications Commission (FCC), and the registration number is 197647.

Tel: 86-755-86375552 Fax: 86-755-26736857



## 2. Test Summary

| Standard Section                                            | Test Item                   | Judgment |
|-------------------------------------------------------------|-----------------------------|----------|
| 15.203/15.247(c)                                            | Antenna Requirement         | PASSED   |
| 15.207                                                      | Conducted Emission          | PASSED   |
| 15.247(b)(3)                                                | Conducted Peak Output Power | PASSED   |
| 15.247(a)(2)                                                | 6dB Occupied Bandwidth      | PASSED   |
| 15.247(e)                                                   | Power Spectral Density      | PASSED   |
| 15.205/15.209                                               | Spurious Emission           | PASSED   |
| 15.247(d)                                                   | Band Edge                   | PASSED   |
| <b>Remark:</b> "N/A" is an abbreviation for Not Applicable. |                             |          |

## 3. Antenna Requirement

### 3.1. Standard Requirement

#### 3.1.1 Test standard

FCC Part15 Section 15.203 /247(c)

#### 3.1.2 Requirement

##### 1) 15.203 requirement:

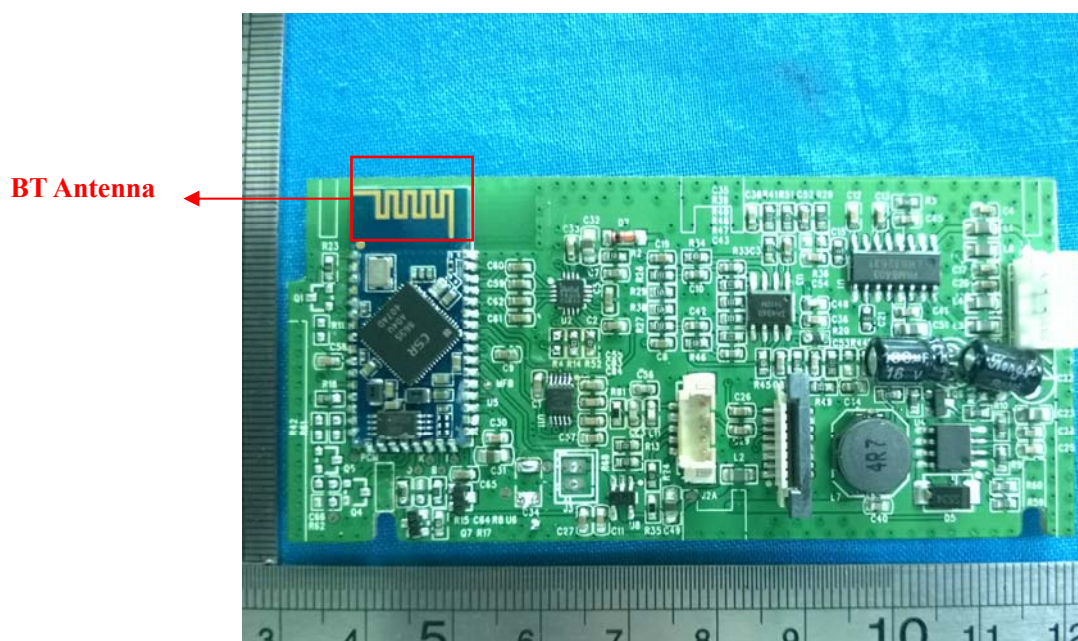
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

##### 2) 15.247(c) (1)(i) requirement:

Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

### 3.2. Antenna Connected Construction

The bluetooth antenna is an integral antenna which permanently attached, and the best case gain of the antenna is 0 dBi. It complies with the standard requirement.



## 4. Conducted Emission Test

### 4.1. Test Standard and Limit

#### 4.1.1 Test Standard

FCC Part15 Section 15.207

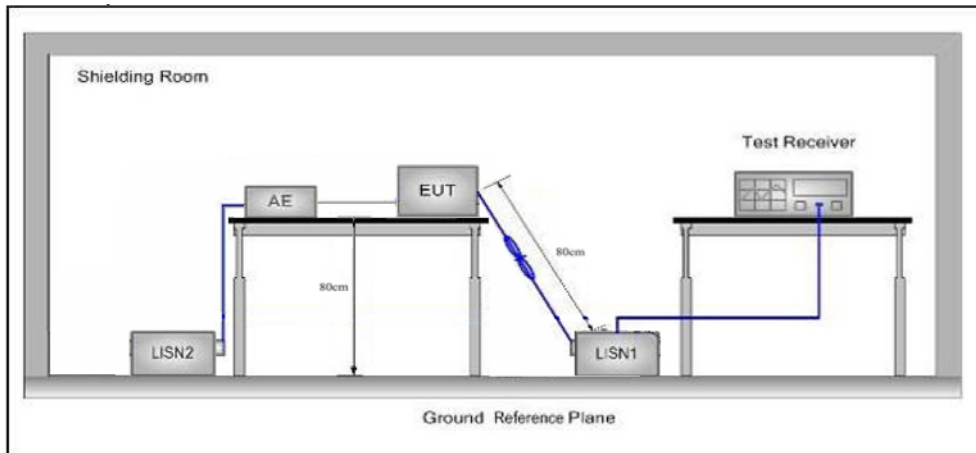
#### 4.1.2 Test Limit

Conducted Emission Test Limit

| Frequency     | Maximum RF Line Voltage (dB $\mu$ V) |               |
|---------------|--------------------------------------|---------------|
|               | Quasi-peak Level                     | Average Level |
| 150kHz~500kHz | 66 ~ 56 *                            | 56 ~ 46 *     |
| 500kHz~5MHz   | 56                                   | 46            |
| 5MHz~30MHz    | 60                                   | 50            |

Remark: (1) \*Decreasing linearly with logarithm of the frequency.  
(2) The lower limit shall apply at the transition frequencies.

### 4.2. Test Setup



### 4.3. Test Procedure

- 1) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a  $50\ \Omega / 50\mu\text{H} + 5\ \Omega$  linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 2) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.

The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal



ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

The Test Receiver setup: RBW=9kHz, VBW=30kHz, Sweep time= auto

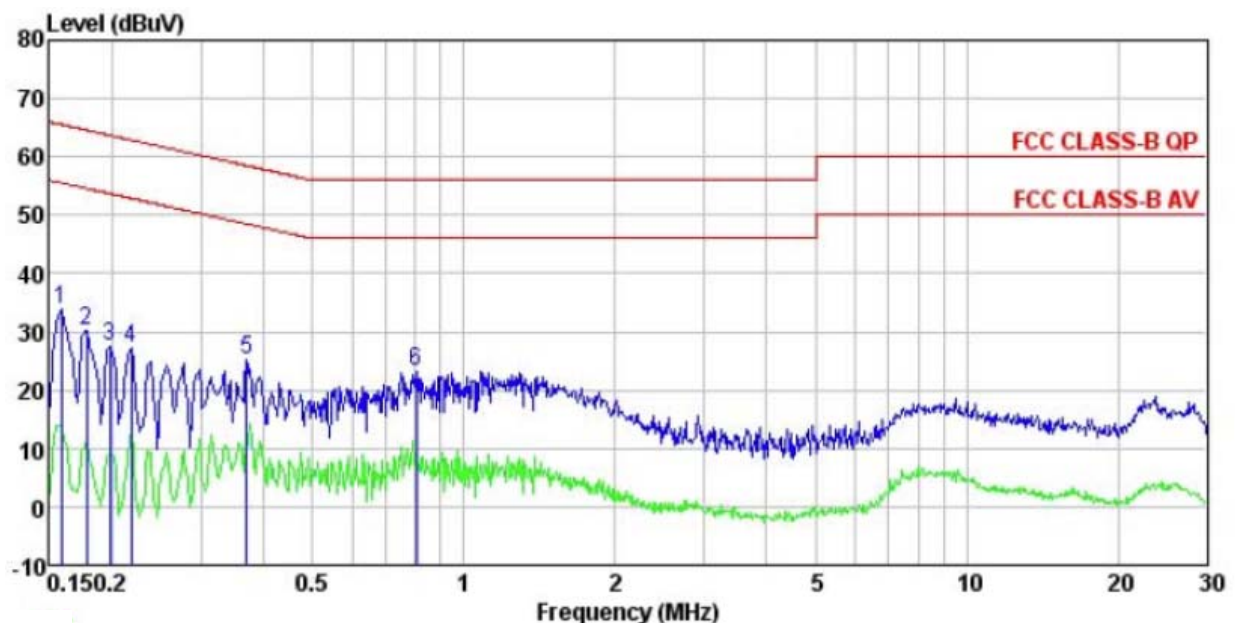
#### 4.4. Test Data

Please to see the following pages



## Conducted Emission Test Data

EUT: Bluetooth Speaker M/N: Voombox-ongo  
Operating Condition: Charging & Playing mode  
Test Site: Shielded room  
Operator: Jason  
Test Specification: AC120V/60Hz  
Polarization: Line  
Note Tem:25°C Hum:50%

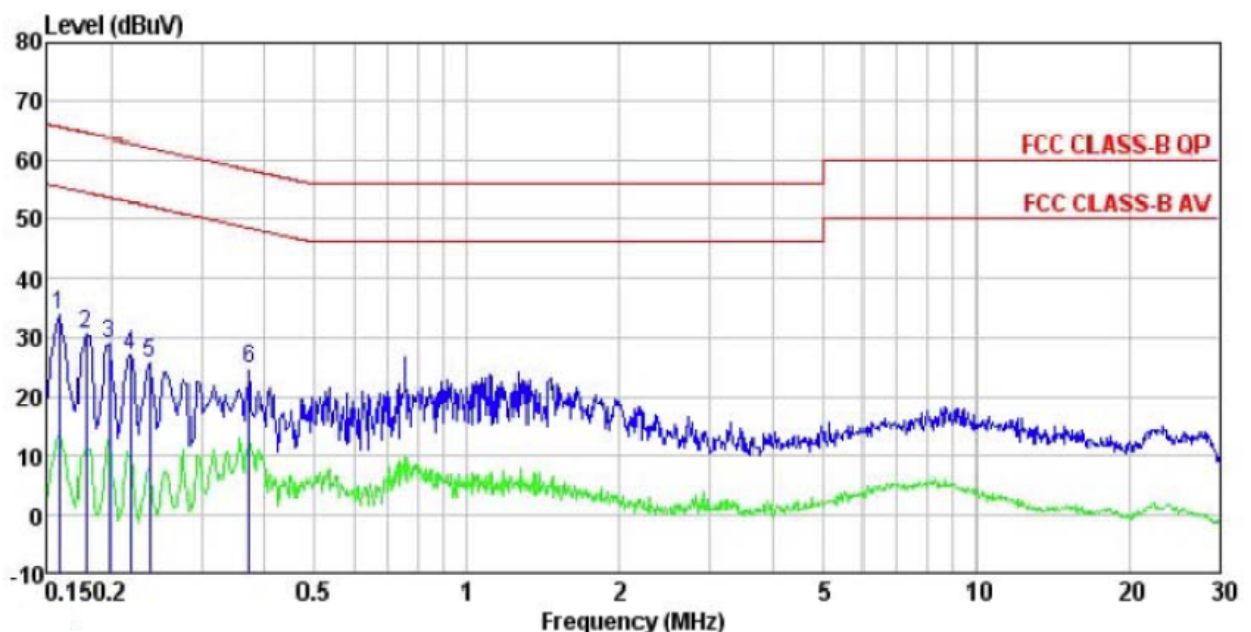


|   | Freq  | Read Level | LISN Factor | Cable Loss | Level | Limit Line | Over Limit | Remark |
|---|-------|------------|-------------|------------|-------|------------|------------|--------|
|   | MHz   | dBuV       | dB          | dB         | dBuV  | dBuV       | dB         |        |
| 1 | 0.158 | 33.62      | 0.25        | 0.00       | 33.87 | 65.56      | -31.69     | Peak   |
| 2 | 0.178 | 30.08      | 0.25        | 0.00       | 30.33 | 64.59      | -34.26     | Peak   |
| 3 | 0.198 | 27.39      | 0.25        | 0.00       | 27.64 | 63.71      | -36.07     | Peak   |
| 4 | 0.219 | 27.04      | 0.25        | 0.00       | 27.29 | 62.88      | -35.59     | Peak   |
| 5 | 0.369 | 24.91      | 0.25        | 0.00       | 25.16 | 58.52      | -33.36     | Peak   |
| 6 | 0.804 | 22.91      | 0.20        | 0.00       | 23.11 | 56.00      | -32.89     | Peak   |



## Conducted Emission Test Data

EUT: Bluetooth Speaker M/N: Voombox-ongo  
Operating Condition: Charging & Playing mode  
Test Site: Shielded room  
Operator: Jason  
Test Specification: AC 120V/60Hz  
Polarization: Neutral  
Note Tem:25°C Hum:50%



|   | Freq  | Read Level | LISN Factor | Cable Loss | Level | Limit Line | Over Limit | Remark |
|---|-------|------------|-------------|------------|-------|------------|------------|--------|
|   | MHz   | dBuV       | dB          | dB         | dBuV  | dBuV       | dB         |        |
| 1 | 0.158 | 33.53      | 0.27        | 0.00       | 33.80 | 65.56      | -31.76     | Peak   |
| 2 | 0.178 | 30.28      | 0.28        | 0.00       | 30.56 | 64.59      | -34.03     | Peak   |
| 3 | 0.198 | 28.41      | 0.28        | 0.00       | 28.69 | 63.71      | -35.02     | Peak   |
| 4 | 0.219 | 26.73      | 0.28        | 0.00       | 27.01 | 62.88      | -35.87     | Peak   |
| 5 | 0.238 | 25.42      | 0.27        | 0.00       | 25.69 | 62.17      | -36.48     | Peak   |
| 6 | 0.373 | 24.12      | 0.28        | 0.00       | 24.40 | 58.43      | -34.03     | Peak   |



## 5. Conducted Peak Output Power Test

### 5.1. Test Standard and Limit

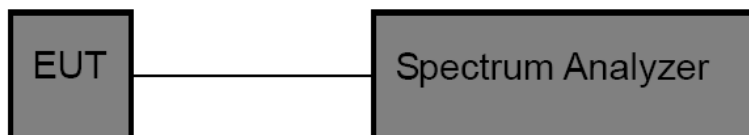
#### 5.1.1 Test Standard

FCC Part15 C Section 15.247 (b)(3); KDB558074

#### 5.1.2 Test Limit

| FCC Part 15 Subpart C(15.247) |       |                       |
|-------------------------------|-------|-----------------------|
| Test Item                     | Limit | Frequency Range (MHz) |
| Peak Output Power             | 30dBm | 2400~2483.5           |

### 5.2. Test Setup



### 5.3. Test Procedure

Refer to KDB558074 v03r01 (DTS Measure Guidance) Section 9.1.

### 5.4. Test Data

| Channel Number               | Channel Frequency (MHz) | Test Result (dBm) | Limit (dBm) | Judgment |
|------------------------------|-------------------------|-------------------|-------------|----------|
| CH 00                        | 2402                    | -7.29             | 30          | PASSED   |
| CH 20                        | 2442                    | -6.83             | 30          | PASSED   |
| CH 39                        | 2480                    | -6.88             | 30          | PASSED   |
| Remark: Test plot as follows |                         |                   |             |          |



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| Modulation mode | GFSK mode                                                                                                                                                                         |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2402MHz         | <p>Ref 10.5 dBm Att 20 dB RBW 1 MHz VBW 3 MHz SWT 2.5 ms Marker 1 [T1] -7.29 dBm 2.402100000 GHz</p> <p>Center 2.402 GHz 1 MHz/ Span 10 MHz</p> <p>Date: 13.JUL.2014 11:44:14</p> |
| 2442MHz         | <p>Ref 10.5 dBm Att 20 dB RBW 1 MHz VBW 3 MHz SWT 2.5 ms Marker 1 [T1] -6.83 dBm 2.442200000 GHz</p> <p>Center 2.442 GHz 1 MHz/ Span 10 MHz</p> <p>Date: 13.JUL.2014 11:45:08</p> |
| 2480MHz         | <p>Ref 10.5 dBm Att 20 dB RBW 1 MHz VBW 3 MHz SWT 2.5 ms Marker 1 [T1] -6.88 dBm 2.480160000 GHz</p> <p>Center 2.48 GHz 1 MHz/ Span 10 MHz</p> <p>Date: 13.JUL.2014 11:45:43</p>  |



## 6. Occupy Bandwidth Test

### 6.1. Test Standard and Limit

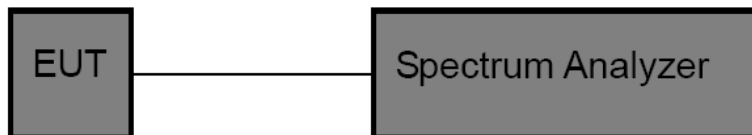
#### 6.1.1 Test Standard

FCC Part15 C Section 15.247 (a)(2); KDB558074

#### 6.1.2 Test Limit

| FCC Part 15 Subpart C(15.247) |         |                       |
|-------------------------------|---------|-----------------------|
| Test Item                     | Limit   | Frequency Range (MHz) |
| Bandwidth                     | >500kHz | 2400~2483.5           |

### 6.2. Test Setup



### 6.3. Test Procedure

Refer to KDB558074 v03r01 (DTS Measure Guidance) Section 8.0

### 6.4. Test Data

| Channel Number               | Channel Frequency | 6dB Bandwidth (kHz) | Limit(kHz) | Judgment |
|------------------------------|-------------------|---------------------|------------|----------|
| CH 00                        | 2402(MHz)         | 720                 | >500       | PASSED   |
| CH 20                        | 2442(MHz)         | 700                 | >500       | PASSED   |
| CH 39                        | 2480(MHz)         | 700                 | >500       | PASSED   |
| Remark: Test plot as follows |                   |                     |            |          |

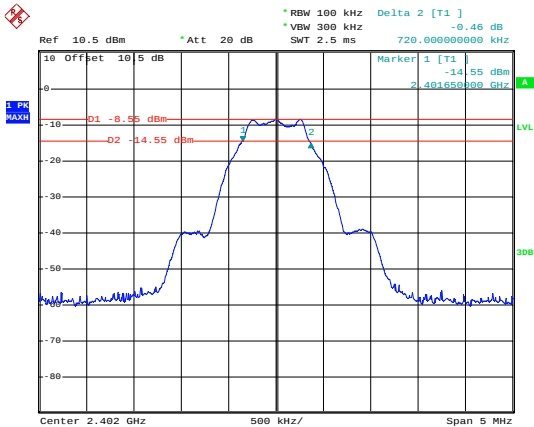
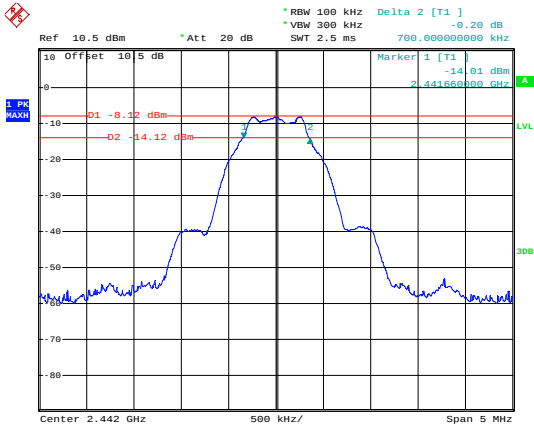
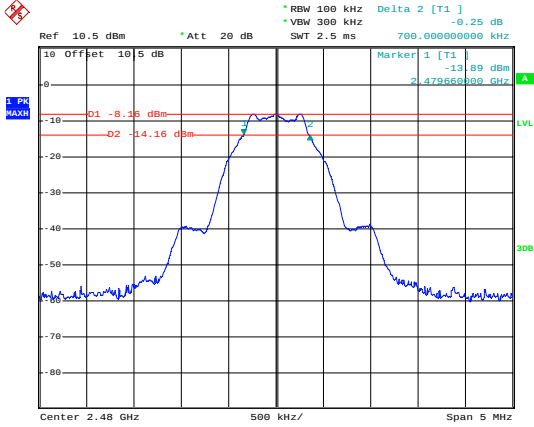
| Channel Number               | Channel Frequency | 99% Occupy Bandwidth (kHz) | Limit(kHz) | Judgment |
|------------------------------|-------------------|----------------------------|------------|----------|
| CH 00                        | 2402(MHz)         | 1030                       | /          | /        |
| CH 20                        | 2442(MHz)         | 1040                       | /          | /        |
| CH 39                        | 2480(MHz)         | 1040                       | /          | /        |
| Remark: Test plot as follows |                   |                            |            |          |



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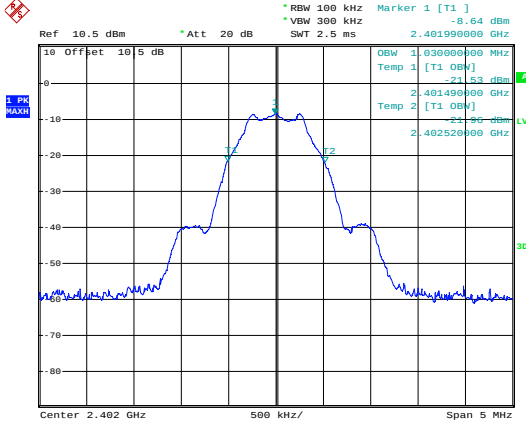
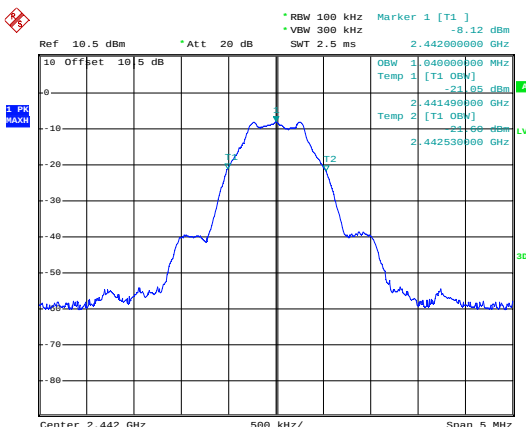
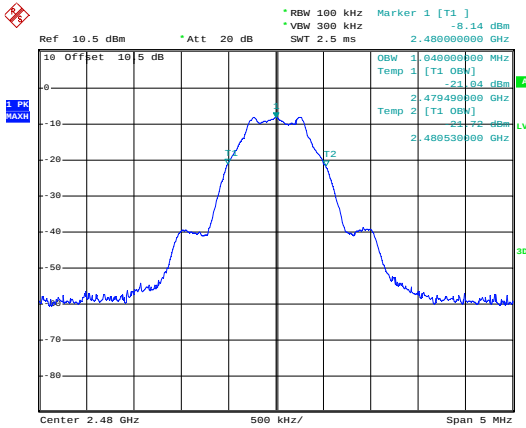
| 6dB EBW Modulation mode | GFSK mode                                                                                                              |
|-------------------------|------------------------------------------------------------------------------------------------------------------------|
| 2402MHz                 |  <p>Date: 13.JUL.2014 11:51:00</p>   |
| 2442MHz                 |  <p>Date: 13.JUL.2014 11:49:03</p>  |
| 2480MHz                 |  <p>Date: 13.JUL.2014 11:46:10</p> |



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| 99% OBW Modulation mode | GFSK                                                                                                                   |
|-------------------------|------------------------------------------------------------------------------------------------------------------------|
| 2402MHz                 |  <p>Date: 13.JUL.2014 11:50:35</p>   |
| 2442MHz                 |  <p>Date: 13.JUL.2014 11:49:53</p>  |
| 2480MHz                 |  <p>Date: 13.JUL.2014 11:50:15</p> |



## 7. Power Spectral Density Test

### 7.1. Test Standard and Limit

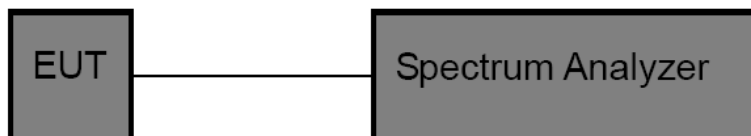
#### 7.1.1 Test Standard

FCC Part15 C Section 15.247 (e); KDB558074

#### 7.1.2 Test Limit

| FCC Part 15 Subpart C(15.247) |                             |       |
|-------------------------------|-----------------------------|-------|
| Section                       | Test Item                   | Limit |
| 15.247(e)                     | Power Spectral Density Test | 8dBm  |

### 7.2. Test Setup



### 7.3. Test Procedure

Refer to KDB558074 v03r01 (DTS Measure Guidance) Section 10.0

### 7.4. Test Data

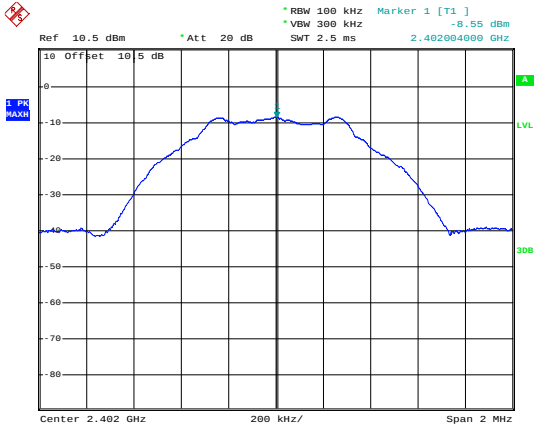
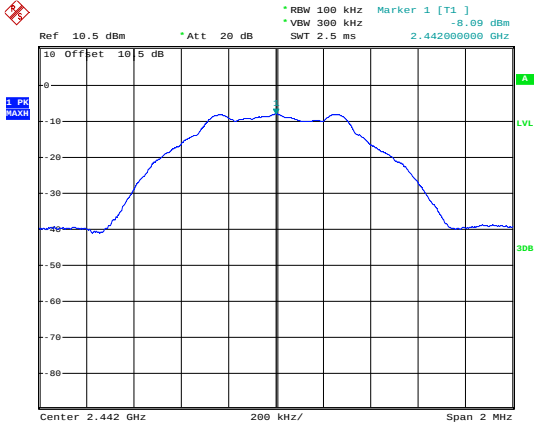
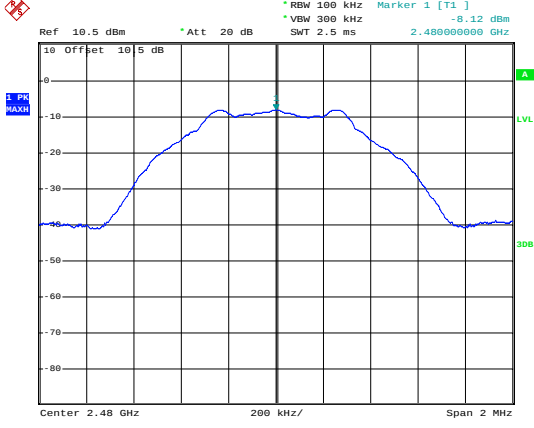
| Channel Number               | Channel Frequency | Power Spectral Density (dBm) | Limit (dBm) | Judgment |
|------------------------------|-------------------|------------------------------|-------------|----------|
| CH 00                        | 2402(MHz)         | -8.55                        | 8.0         | PASSED   |
| CH 20                        | 2442(MHz)         | -8.09                        | 8.0         | PASSED   |
| CH 39                        | 2480(MHz)         | -8.12                        | 8.0         | PASSED   |
| Remark: Test plot as follows |                   |                              |             |          |



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| Modulation mode | GFSK mode                                                                                                              |
|-----------------|------------------------------------------------------------------------------------------------------------------------|
| 2402MHz         |  <p>Date: 13.JUL.2014 11:51:16</p>   |
| 2442MHz         |  <p>Date: 13.JUL.2014 11:49:25</p>  |
| 2480MHz         |  <p>Date: 13.JUL.2014 11:46:28</p> |



## 8. Band Edge Requirement (Conducted Emission Method)

### 8.1. Test Standard and Limit

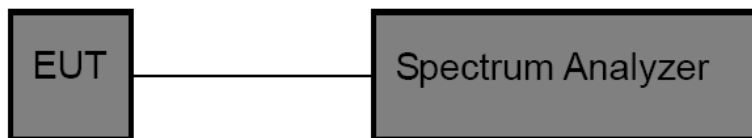
#### 8.1.1 Test Standard

FCC Part15 C Section 15.247 (d); KDB558074

#### 8.1.2 Test Limit

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

### 8.2. Test Setup



### 8.3. Test Procedure

Refer to KDB558074 v03r01 (DTS Measure Guidance) Section 12.0

### 8.4. Test Data

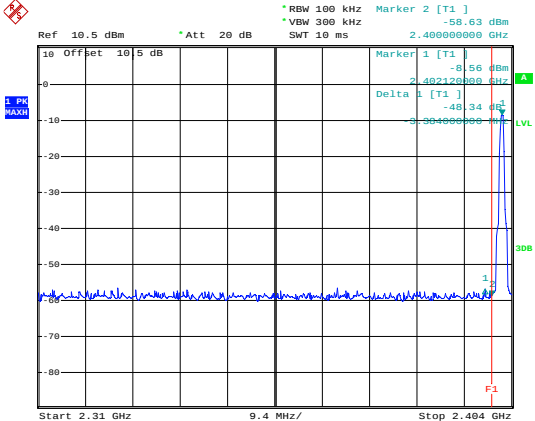
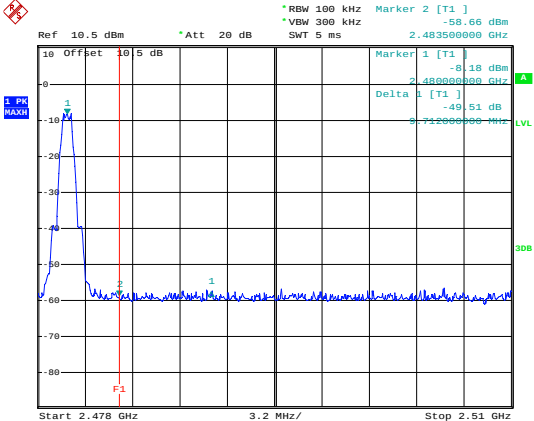
Test plot as follows



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| Modulation mode                                                                                                                                                                                                                                                                                                                                                                                            | GFSK                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div><p>Ref 10.5 dBm *Att 20 dB<br/>*RBW 100 kHz Marker 2 [T1]<br/>*VBW 300 kHz -58.63 dBm<br/>SWT 10 ms 2.400000000 GHz</p><p>Marker 1 [T1] -8.56 dBm<br/>2.402128889 GHz<br/>Delta 1 [T1] -48.34 dB<br/>3.304000000 GHz<br/>LVL</p><p>Start 2.31 GHz 9.4 MHz/ Stop 2.404 GHz</p><p>Date: 13.JUL.2014 11:51:40</p></div> | <div><p>Ref 10.5 dBm *Att 20 dB<br/>*RBW 100 kHz Marker 2 [T1]<br/>*VBW 300 kHz -58.66 dBm<br/>SWT 5 ms 2.483590000 GHz</p><p>Marker 1 [T1] -8.18 dBm<br/>2.483590000 GHz<br/>Delta 1 [T1] -49.51 dB<br/>3.712000000 MHz<br/>LVL</p><p>Start 2.478 GHz 3.2 MHz/ Stop 2.51 GHz</p><p>Date: 13.JUL.2014 11:46:48</p></div> |
| Lowest                                                                                                                                                                                                                                                                                                                                                                                                     | Highest                                                                                                                                                                                                                                                                                                                                                                                                    |

## 9. Band Edge Requirement (Radiated Emission Method)

### 9.1. Test Standard and Limit

#### 9.1.1 Test Standard

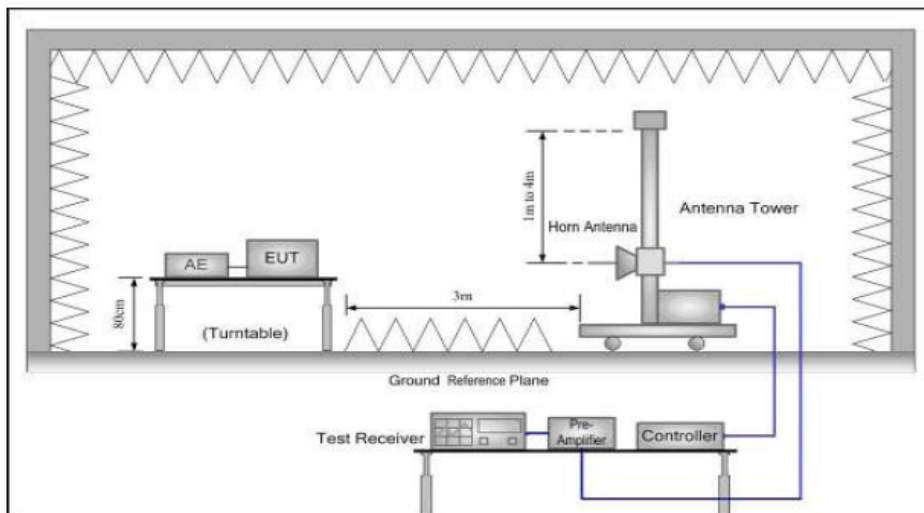
FCC Part15 C Section 15.209 and 15.205

#### 9.1.2 Test Limit

**Radiated Emission Test Limit**

| Frequency  | Limit (dB $\mu$ V/m @3m) | Remark        |
|------------|--------------------------|---------------|
| Above 1GHz | 54.00                    | Average value |
|            | 74.00                    | Peak value    |

### 9.2. Test Setup



### 9.3. Test Procedure

- 1) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 3) The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. Peak Value: RBW=1MHz, VBW=3MHz; Average value: RBW=1MHz, VBW=10Hz



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- 6) If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

## 9.4. Test Data

Remark:

1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis is the worst case.

| Test mode: GFSK |                   |                       |                 |                          | Test channel: Lowest  |                |                 |      |       |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|-----------------------|----------------|-----------------|------|-------|
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m)        | Limit (dBuV/m) | Over Limit (dB) | Pol. | Level |
| 2400.00         | 24.79             | 27.58                 | 5.67            | 0.00                     | 58.04                 | 74.00          | -15.96          | H    | PEAK  |
| 2400.00         | 26.16             | 27.58                 | 5.67            | 0.00                     | 59.41                 | 74.00          | -14.59          | V    | PEAK  |
| 2400.00         | 14.25             | 27.58                 | 5.67            | 0.00                     | 47.50                 | 54.00          | -6.50           | H    | AVG.  |
| 2400.00         | 15.32             | 27.58                 | 5.67            | 0.00                     | 48.57                 | 54.00          | -5.43           | V    | AVG.  |
| Test mode: GFSK |                   |                       |                 |                          | Test channel: Highest |                |                 |      |       |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m)        | Limit (dBuV/m) | Over Limit (dB) | Pol. | Level |
| 2483.50         | 27.39             | 27.52                 | 5.70            | 0.00                     | 60.61                 | 74.00          | -13.39          | H    | PEAK  |
| 2483.50         | 26.56             | 27.52                 | 5.70            | 0.00                     | 59.78                 | 74.00          | -14.22          | V    | PEAK  |
| 2483.50         | 19.32             | 27.52                 | 5.70            | 0.00                     | 52.54                 | 54.00          | -1.46           | H    | AVG.  |
| 2483.50         | 18.25             | 27.52                 | 5.70            | 0.00                     | 51.47                 | 54.00          | -2.53           | V    | AVG.  |

Remark:

- Final Level = Read Level + Antenna Factor + Cable Loss - Preamplifier Factor
- The emission levels of other frequencies are very lower than the limit and not show in test report.



## 10. Spurious Emission (Conducted Emission Method)

### 10.1. Test Standard and Limit

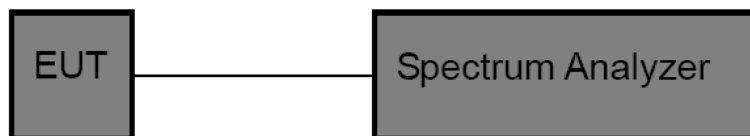
#### 10.1.1 Test Standard

FCC Part15 C Section 15.247 (d); KDB558074

#### 10.1.2 Test Limit

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

### 10.2. Test Setup



### 10.3. Test Procedure

Refer to KDB558074 v03r01 (DTS Measure Guidance) Section 11.0

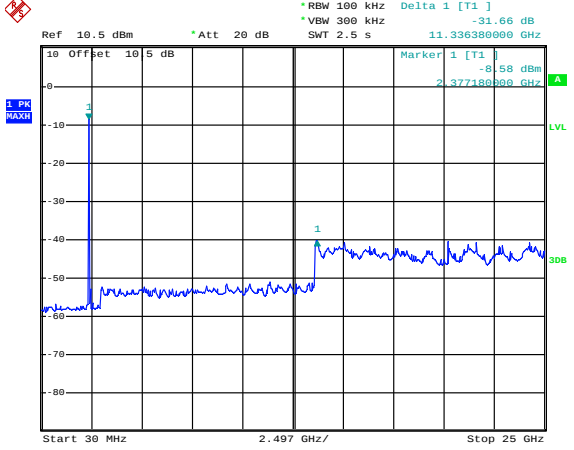
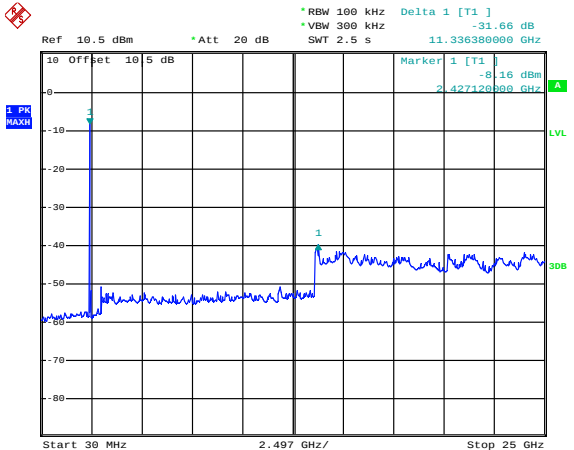
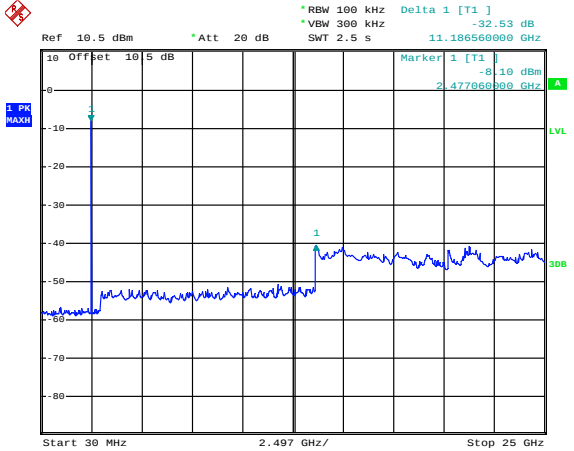
### 10.4. Test Data



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| Modulation mode | GFSK                                                                                 | Frequency range | 30MHz~25GHz |
|-----------------|--------------------------------------------------------------------------------------|-----------------|-------------|
| Lowest          |    |                 |             |
| Middle          |   |                 |             |
| Highest         |  |                 |             |

## 11. Spurious Emission (Radiated Emission Method)

### 11.1. Test Standard and Limit

#### 11.1.1 Test Standard

FCC Part15 C Section 15.209 and 15.205

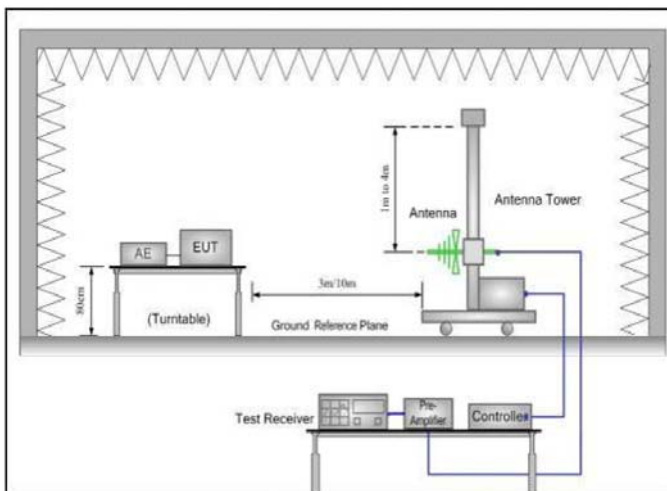
#### 11.1.2 Test Limit

| Frequency<br>(MHz) | Limit (dB $\mu$ V/m) |            |
|--------------------|----------------------|------------|
|                    | At 3m Distance       |            |
| 30MHz~88MHz        | 40                   | Quasi-peak |
| 88MHz~216MHz       | 43.5                 | Quasi-peak |
| 216MHz~960MHz      | 46                   | Quasi-peak |
| 960MHz~1000MHz     | 54                   | Quasi-peak |
| Above 1000MHz      | 54                   | Average    |
|                    | 74                   | Peak       |

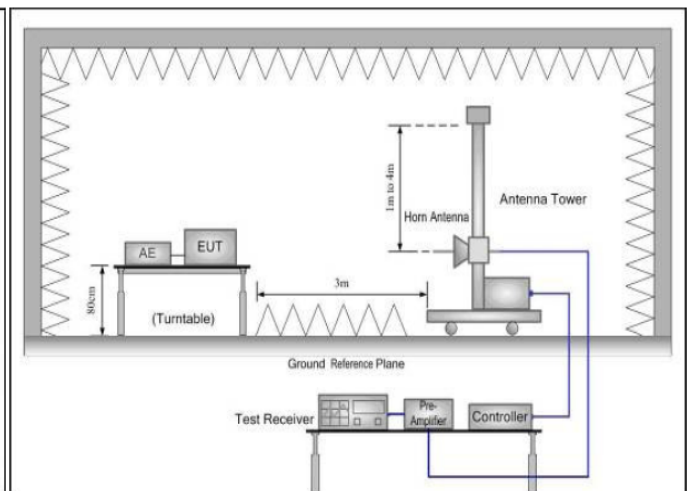
**Remark:** 1. The lower limit shall apply at the transition frequency.

### 11.2. Test Setup

#### Below 1GHz



#### Above 1GHz



### 11.3. Test Procedure

- 1) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 3) The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set



to make the measurement.

- 4) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Peak value: RBW=1MHz, VBW=3MHz;

Average value: RBW=1MHz, VBW=10Hz;

QP Value: RBW=120kHz, VBW=300kHz

- 6) If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

## 11.4. Test Data

Remark:

1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis is the worst case.
2. 9 kHz to 30 MHz is noise floor, so only shows the data of above 30MHz in this report.

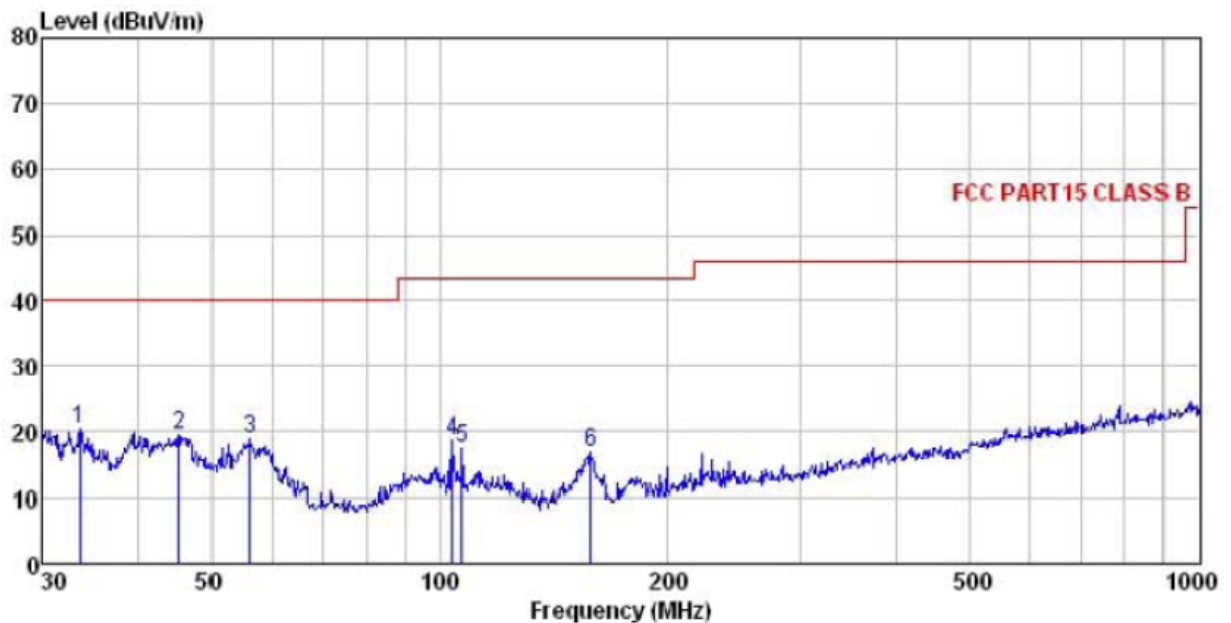


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## Radiated Emission Test Data (Below 1GHz)

EUT: Bluetooth Speaker M/N: Voombox-ongo  
Operating Condition: Bluetooth TX mode  
Test Site: 3m chamber  
Operator: Jason  
Test Specification: AC120V/60Hz  
Polarization: Horizontal  
Note Tem:23°C Hum:50%



|   | Freq    | ReadAntenna | Cable | Preamp |       | Limit  | Over   |           |
|---|---------|-------------|-------|--------|-------|--------|--------|-----------|
|   | Level   | Factor      | Loss  | Factor | Level | Line   | Limit  | Remark    |
|   | MHz     | dBuV        | dB/m  | dB     | dB    | dBuV/m | dBuV/m | dB        |
| 1 | 33.562  | 33.75       | 12.31 | 0.98   | 26.65 | 20.39  | 40.00  | -19.61 QP |
| 2 | 45.375  | 32.59       | 13.54 | 1.29   | 27.83 | 19.59  | 40.00  | -20.41 QP |
| 3 | 56.197  | 33.44       | 12.95 | 1.36   | 28.87 | 18.88  | 40.00  | -21.12 QP |
| 4 | 104.170 | 33.88       | 12.78 | 1.99   | 30.00 | 18.65  | 43.50  | -24.85 QP |
| 5 | 107.134 | 32.88       | 12.49 | 2.02   | 29.94 | 17.45  | 43.50  | -26.05 QP |
| 6 | 158.112 | 35.53       | 8.58  | 2.57   | 29.82 | 16.86  | 43.50  | -26.64 QP |

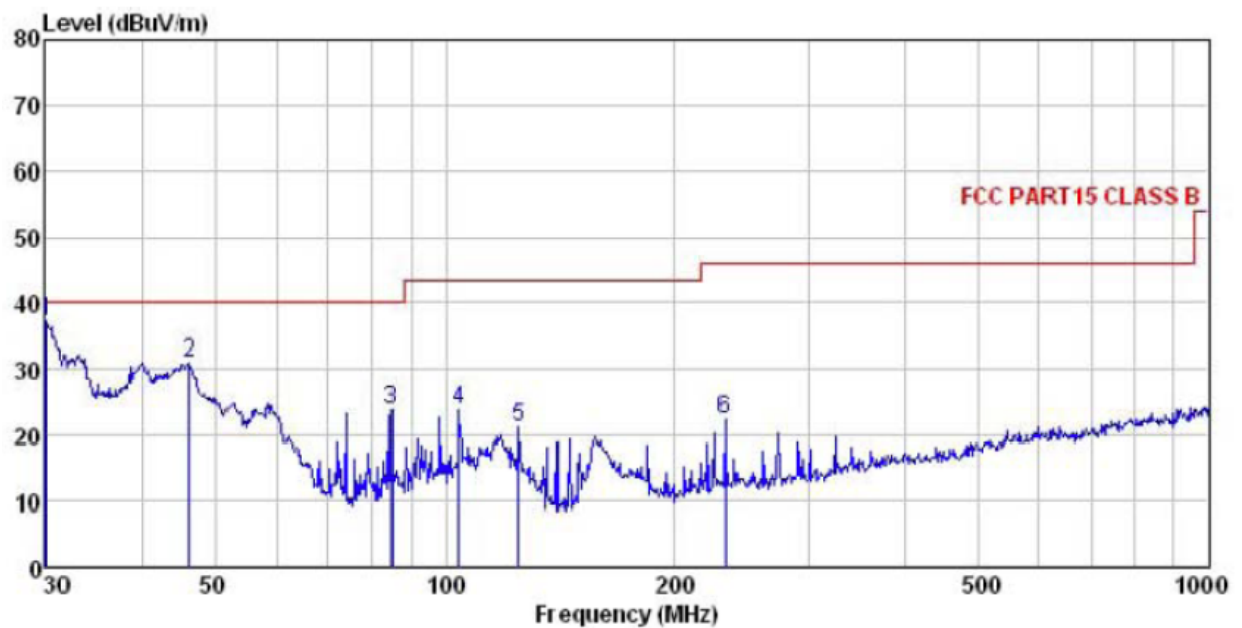


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## Radiated Emission Test Data (Below 1GHz)

EUT: Bluetooth Speaker M/N: Voombox-ongo  
Operating Condition: Bluetooth TX mode  
Test Site: 3m chamber  
Operator: Jason  
Test Specification: AC120V/60Hz  
Polarization: Vertical  
Note Tem:23°C Hum:50%



|   | Freq    | ReadAntenna | Cable | Preamp |       | Limit  | Over   |        |
|---|---------|-------------|-------|--------|-------|--------|--------|--------|
|   | Level   | Factor      | Loss  | Factor | Level | Line   | Limit  | Remark |
|   | MHz     | dBuV        | dB/m  | dB     | dB    | dBuV/m | dBuV/m | dB     |
| 1 | 30.105  | 50.50       | 12.33 | 0.72   | 26.28 | 37.27  | 40.00  | -2.73  |
| 2 | 46.178  | 44.05       | 13.48 | 1.28   | 27.92 | 30.89  | 40.00  | -9.11  |
| 3 | 84.999  | 41.96       | 10.31 | 1.83   | 30.10 | 24.00  | 40.00  | -16.00 |
| 4 | 104.170 | 39.16       | 12.78 | 1.99   | 30.00 | 23.93  | 43.50  | -19.57 |
| 5 | 125.007 | 38.95       | 9.70  | 2.22   | 29.62 | 21.25  | 43.50  | -22.25 |
| 6 | 231.718 | 37.54       | 11.72 | 2.83   | 29.67 | 22.42  | 46.00  | -23.58 |



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## Radiated Emission Test Data (Above 1GHz)

| Test mode: GFSK |                   |                       |                 |                          | Test channel: Lowest |                |                 |      |       |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|----------------------|----------------|-----------------|------|-------|
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m)       | Limit (dBuV/m) | Over Limit (dB) | Pol. | Level |
| 4804.00         | 58.28             | 31.53                 | 8.90            | 40.24                    | 58.47                | 74.00          | -15.53          | V    | PEAK  |
| 7206.00         | 50.36             | 36.47                 | 10.59           | 41.24                    | 56.18                | 74.00          | -17.82          | V    | PEAK  |
| 9608.00         | *                 |                       |                 |                          |                      | 74.00          |                 | V    | PEAK  |
| 12010.00        | *                 |                       |                 |                          |                      | 74.00          |                 | V    | PEAK  |
| 14412.00        | *                 |                       |                 |                          |                      | 74.00          |                 | V    | PEAK  |
| 16814.00        | *                 |                       |                 |                          |                      | 74.00          |                 | V    | PEAK  |
| 4804.00         | 58.67             | 31.53                 | 8.90            | 40.24                    | 58.86                | 74.00          | -15.14          | H    | PEAK  |
| 7206.00         | 51.27             | 36.47                 | 10.59           | 41.24                    | 57.09                | 74.00          | -16.91          | H    | PEAK  |
| 9608.00         | *                 |                       |                 |                          |                      | 74.00          |                 | H    | PEAK  |
| 12010.00        | *                 |                       |                 |                          |                      | 74.00          |                 | H    | PEAK  |
| 14412.00        | *                 |                       |                 |                          |                      | 74.00          |                 | H    | PEAK  |
| 16814.00        | *                 |                       |                 |                          |                      | 74.00          |                 | H    | PEAK  |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m)       | Limit (dBuV/m) | Over Limit (dB) | Pol. | Level |
| 4804.00         | 47.26             | 31.53                 | 8.90            | 40.24                    | 47.45                | 54.00          | -6.55           | V    | AVG.  |
| 7206.00         | 39.14             | 36.47                 | 10.59           | 41.24                    | 44.96                | 54.00          | -9.04           | V    | AVG.  |
| 9608.00         | *                 |                       |                 |                          |                      | 54.00          |                 | V    | AVG.  |
| 12010.00        | *                 |                       |                 |                          |                      | 54.00          |                 | V    | AVG.  |
| 14412.00        | *                 |                       |                 |                          |                      | 54.00          |                 | V    | AVG.  |
| 16814.00        | *                 |                       |                 |                          |                      | 54.00          |                 | V    | AVG.  |
| 4804.00         | 46.38             | 31.53                 | 8.90            | 40.24                    | 46.57                | 54.00          | -7.43           | H    | AVG.  |
| 7206.00         | 39.24             | 36.47                 | 10.59           | 41.24                    | 45.06                | 54.00          | -8.94           | H    | AVG.  |
| 9608.00         | *                 |                       |                 |                          |                      | 54.00          |                 | H    | AVG.  |
| 12010.00        | *                 |                       |                 |                          |                      | 54.00          |                 | H    | AVG.  |
| 14412.00        | *                 |                       |                 |                          |                      | 54.00          |                 | H    | AVG.  |
| 16814.00        | *                 |                       |                 |                          |                      | 54.00          |                 | H    | AVG.  |

### Remark:

1. Final Level = Read Level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “\*”, means this data is the too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.



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## Radiated Emission Test Data (Above 1GHz)

| Test mode: GFSK |                   |                       |                 |                          | Test channel: Middle |                |                 |      |       |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|----------------------|----------------|-----------------|------|-------|
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m)       | Limit (dBuV/m) | Over Limit (dB) | Pol. | Level |
| 4884.00         | 56.28             | 31.58                 | 8.98            | 40.15                    | 56.69                | 74.00          | -17.31          | V    | PEAK  |
| 7326.00         | 52.18             | 36.47                 | 10.69           | 41.15                    | 58.19                | 74.00          | -15.81          | V    | PEAK  |
| 9768.00         | *                 |                       |                 |                          |                      | 74.00          |                 | V    | PEAK  |
| 12210.00        | *                 |                       |                 |                          |                      | 74.00          |                 | V    | PEAK  |
| 14652.00        | *                 |                       |                 |                          |                      | 74.00          |                 | V    | PEAK  |
| 17094.00        | *                 |                       |                 |                          |                      | 74.00          |                 | V    | PEAK  |
| 4884.00         | 57.21             | 31.58                 | 8.98            | 40.15                    | 57.62                | 74.00          | -16.38          | H    | PEAK  |
| 7326.00         | 52.09             | 36.47                 | 10.69           | 41.15                    | 58.10                | 74.00          | -15.90          | H    | PEAK  |
| 9768.00         | *                 |                       |                 |                          |                      | 74.00          |                 | H    | PEAK  |
| 12210.00        | *                 |                       |                 |                          |                      | 74.00          |                 | H    | PEAK  |
| 14652.00        | *                 |                       |                 |                          |                      | 74.00          |                 | H    | PEAK  |
| 17094.00        | *                 |                       |                 |                          |                      | 74.00          |                 | H    | PEAK  |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m)       | Limit (dBuV/m) | Over Limit (dB) | Pol. | Level |
| 4884.00         | 44.35             | 31.58                 | 8.98            | 40.15                    | 44.76                | 54.00          | -9.24           | V    | AVG.  |
| 7326.00         | 41.09             | 36.47                 | 10.69           | 41.15                    | 47.10                | 54.00          | -6.90           | V    | AVG.  |
| 9768.00         | *                 |                       |                 |                          |                      | 54.00          |                 | V    | AVG.  |
| 12210.00        | *                 |                       |                 |                          |                      | 54.00          |                 | V    | AVG.  |
| 14652.00        | *                 |                       |                 |                          |                      | 54.00          |                 | V    | AVG.  |
| 17094.00        | *                 |                       |                 |                          |                      | 54.00          |                 | V    | AVG.  |
| 4884.00         | 45.23             | 31.58                 | 8.98            | 40.15                    | 45.64                | 54.00          | -8.36           | H    | AVG.  |
| 7326.00         | 41.28             | 36.47                 | 10.69           | 41.15                    | 47.29                | 54.00          | -6.71           | H    | AVG.  |
| 9768.00         | *                 |                       |                 |                          |                      | 54.00          |                 | H    | AVG.  |
| 12210.00        | *                 |                       |                 |                          |                      | 54.00          |                 | H    | AVG.  |
| 14652.00        | *                 |                       |                 |                          |                      | 54.00          |                 | H    | AVG.  |
| 17094.00        | *                 |                       |                 |                          |                      | 54.00          |                 | H    | AVG.  |

### Remark:

1. Final Level = Read Level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “\*”, means this data is the too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.



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## Radiated Emission Test Data (Above 1GHz)

| Test mode: GFSK |                   |                       |                 |                          | Test channel: Highest |                |                 |      |       |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|-----------------------|----------------|-----------------|------|-------|
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m)        | Limit (dBuV/m) | Over Limit (dB) | Pol. | Level |
| 4960.00         | 57.28             | 31.69                 | 9.08            | 40.03                    | 58.02                 | 74.00          | -15.98          | V    | PEAK  |
| 7440.00         | 49.70             | 36.60                 | 10.80           | 41.05                    | 56.05                 | 74.00          | -17.95          | V    | PEAK  |
| 9920.00         | *                 |                       |                 |                          |                       | 74.00          |                 | V    | PEAK  |
| 12400.00        | *                 |                       |                 |                          |                       | 74.00          |                 | V    | PEAK  |
| 14880.00        | *                 |                       |                 |                          |                       | 74.00          |                 | V    | PEAK  |
| 17360.00        | *                 |                       |                 |                          |                       | 74.00          |                 | V    | PEAK  |
| 4960.00         | 57.32             | 31.69                 | 9.08            | 40.03                    | 58.06                 | 74.00          | -15.94          | H    | PEAK  |
| 7440.00         | 48.71             | 36.60                 | 10.80           | 41.05                    | 55.06                 | 74.00          | -18.94          | H    | PEAK  |
| 9920.00         |                   |                       |                 |                          |                       | 74.00          |                 | H    | PEAK  |
| 12400.00        | *                 |                       |                 |                          |                       | 74.00          |                 | H    | PEAK  |
| 14880.00        | *                 |                       |                 |                          |                       | 74.00          |                 | H    | PEAK  |
| 17360.00        | *                 |                       |                 |                          |                       | 74.00          |                 | H    | PEAK  |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m)        | Limit (dBuV/m) | Over Limit (dB) | Pol. | Level |
| 4960.00         | 47.21             | 31.69                 | 9.08            | 40.03                    | 47.95                 | 54.00          | -6.05           | V    | AVG.  |
| 7440.00         | 39.67             | 36.60                 | 10.80           | 41.05                    | 46.02                 | 54.00          | -7.98           | V    | AVG.  |
| 9920.00         | *                 |                       |                 |                          |                       | 54.00          |                 | V    | AVG.  |
| 12400.00        | *                 |                       |                 |                          |                       | 54.00          |                 | V    | AVG.  |
| 14880.00        | *                 |                       |                 |                          |                       | 54.00          |                 | V    | AVG.  |
| 17360.00        | *                 |                       |                 |                          |                       | 54.00          |                 | V    | AVG.  |
| 4960.00         | 48.00             | 31.69                 | 9.08            | 40.03                    | 48.74                 | 54.00          | -5.26           | H    | AVG.  |
| 7440.00         | 38.67             | 36.60                 | 10.80           | 41.05                    | 45.02                 | 54.00          | -8.98           | H    | AVG.  |
| 9920.00         | *                 |                       |                 |                          |                       | 54.00          |                 | H    | AVG.  |
| 12400.00        | *                 |                       |                 |                          |                       | 54.00          |                 | H    | AVG.  |
| 14880.00        | *                 |                       |                 |                          |                       | 54.00          |                 | H    | AVG.  |
| 17360.00        | *                 |                       |                 |                          |                       | 54.00          |                 | H    | AVG.  |

### Remark:

1. Final Level = Read Level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “\*”, means this data is the too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.