

Issuing Laboratory:  
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## TEST REPORT

Report No.: 13051332HKG-003

Hip Shing Electronics Ltd.

Application  
For  
Certification  
(Original Grant)  
(FCC ID: BZAABT2000W)

Transceiver

Prepared and Checked by:

Approved by:

Handwritten signature of Wong Cheuk Ho, Herbert.

Wong Cheuk Ho, Herbert  
Lead Engineer

Handwritten signature of Chan Chi Hung, Terry.

Chan Chi Hung, Terry  
Assistant Supervisor  
Date: July 03, 2013

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Intertek Testing Services Hong Kong Ltd.

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## GENERAL INFORMATION

**Hip Shing Electronics Ltd.**  
**BRAND NAME: AUVIO, MODEL: 4000464**

**FCC ID: BZAABT2000W**

|                           |  |
|---------------------------|--|
| Grantee:                  | Hip Shing Electronics Ltd.   |
| Grantee Address:          | Units 1,2&3, 20/F., New Treasure Centre,<br>10 Ng Fong Street, San Po Kong,<br>Kowloon, Hong Kong. |
| Contact Person:           | Holman Lok   |
| Tel:                      | (852) 2328 7981  |
| Fax:                      | (852) 2352 0714  |
| e-mail:                   | N/A  |
| Manufacturer:             | Dongguan Zhi Cheng Electronic Products Co., Ltd.   |
| Manufacturer Address:     | 188 Ind. Zone, Ping San,<br>Tangxia, Dongguanshi, China.   |
| Brand Name:               | AUVIO  |
| Model:                    | 4000464  |
| Type of EUT:              | Transceiver  |
| Description of EUT:       | Bluetooth Speaker  |
| Serial Number:            | N/A  |
| FCC ID:                   | BZAABT2000W  |
| Date of Sample Submitted: | May 24, 2013   |
| Date of Test:             | June 29, 2013  |
| Report No.:               | 13051332HKG-003  |
| Report Date:              | July 03, 2013  |
| Environmental Conditions: | Temperature: +10 to 40°C<br>Humidity: 10 to 90%  |

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## SUMMARY OF TEST RESULT

**Hip Shing Electronics Ltd.**  
**BRAND NAME: AUVIO, MODEL: 4000464**

**FCC ID: BZAABT2000W**

| TEST SPECIFICATION                                   | REFERENCE | RESULTS |
|--|-----------|---------|
| Transmitter Power Line Conducted Emissions           | 15.207    | Pass    |
| Transmitter Field Strength and Bandwidth Requirement | 15.249    | Pass    |

The equipment under test is found to be complying with the following standards:  
FCC Part 15, October 1, 2011 Edition

- Note: 1. The EUT uses a permanently attached antenna which, in accordance to section 15.203, is considered sufficient to comply with the provisions of this section.
2. Pursuant to FCC part 15 Section 15.215(c), the 20 dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered.

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## 1.0 General Description

### 1.1 Product Description

The Equipment Under Test (EUT) is a 2.4GHz Bluetooth speaker with Aux in / USB charging. The EUT can accept line in analog audio source. The USB output 5VDC / 1A for charging only. The Bluetooth portion is operating between 2402MHz and 2480MHz (79 channels with 1MHz channel spacing). The EUT is powered by 100-240VAC. When the EUT is switched ON in Bluetooth mode, the light will be flashing. The corresponding Bluetooth device would be searched and connected to the EUT before playing audio. After pairing, the light will stay lit. The EUT is using non-adaptive frequency hopping as declared by applicant.

Antenna Type : Internal, Integral

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

### 1.2 Related Submittal(s) Grants

This is a single application for certification of a transceiver.

### 1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (2009). All radiated measurements were performed in an Open Area Test Site. Preliminary scans were performed in the Open Area Test Site only to determine worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the “**Justification Section**” of this Application.

### 1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong. This test facility and site measurement data have been placed on file with the FCC.

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## 2.0 **System Test Configuration**

### 2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (2009).

The device was powered by 120VAC.

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The rear of unit shall be flushed with the rear of the table.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was mounted to a plastic stand if necessary and placed on the wooden turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

### 2.2 EUT Exercising Software

There was no special software to exercise the device. Once the unit is powered up, it transmits the RF signal continuously.

### 2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

### 2.4 Equipment Modification

Any modifications installed previous to testing by Hip Shing Electronics Ltd. will be incorporated in each production model sold/leased in the United States.

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## 2.5 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

## 2.6 Support Equipment List and Description

1. iPad
2. Sliding Resistor (EW-1260)
3. 1 x 75cm shielded USB cable
4. 1 x 1.0m audio cable  
(Provided by Intertek)
5. Software: Bluetooth Test 3  
(Provided by Applicant)

### 3.0 Emission Results

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

#### 3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any), Average Factor (optional) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG - AV$$

where            FS = Field Strength in dB $\mu$ V/m  
                    RA = Receiver Amplitude (including preamplifier) in dB $\mu$ V  
                    CF = Cable Attenuation Factor in dB  
                    AF = Antenna Factor in dB  
                    AG = Amplifier Gain in dB  
                    AV = Average Factor in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

$$FS = RR + LF$$

where            FS = Field Strength in dB $\mu$ V/m  
                    RR = RA - AG - AV in dB $\mu$ V  
                    LF = CF + AF in dB

Assume a receiver reading of 52.0 dB $\mu$ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB and average factor of 5 dB are subtracted, giving a field strength of 27 dB $\mu$ V/m. This value in dB $\mu$ V/m was converted to its corresponding level in  $\mu$ V/m.

$$\begin{aligned} RA &= 52.0 \text{ dB}\mu\text{V/m} \\ AF &= 7.4 \text{ dB} & RR &= 18.0 \text{ dB}\mu\text{V} \\ CF &= 1.6 \text{ dB} & LF &= 9.0 \text{ dB} \\ AG &= 29.0 \text{ dB} \\ AV &= 5.0 \text{ dB} \\ FS &= RR + LF \\ FS &= 18 + 9 = 27 \text{ dB}\mu\text{V/m} \end{aligned}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(27 \text{ dB}\mu\text{V/m})/20] = 22.4 \mu\text{V/m}$$



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### 3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 2480.000 MHz

For electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

### 3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgment: Passed by 10.1 dB

### 3.4 Conducted Emission Configuration Photograph

The worst case in line-conducted emission was found at 0.438 MHz

For electronic filing, the worst case line-conducted configuration photographs are saved with filename: conducted photo.pdf.

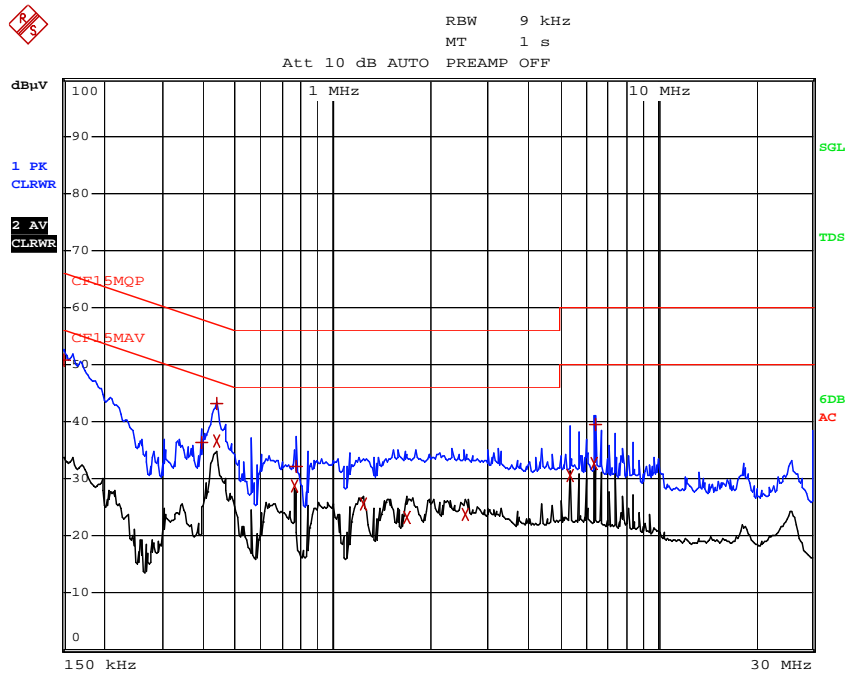
### 3.5 Conducted Emission Data

The graph and data table of conducted emission is shown as below:

Judgment: Pass by 10.41 dB

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Date: 9.JUN.2013 13:39:49

**EDIT PEAK LIST (Final Measurement Results)**

Trace1: CF15MQP  
Trace2: CF15MAV  
Trace3: ---

| TRACE           | FREQUENCY  | LEVEL dBµV | DELTA LIMIT dB |
|-----------------|------------|------------|----------------|
| 1 Quasi Peak    | 150 kHz    | 50.90 N    | -15.09         |
| 1 Quasi Peak    | 393 kHz    | 36.43 N    | -21.56         |
| 1 Quasi Peak    | 438 kHz    | 43.05 N    | -14.04         |
| 2 CISPR Average | 438 kHz    | 36.68 N    | -10.41         |
| 2 CISPR Average | 766.5 kHz  | 28.82 L1   | -17.17         |
| 1 Quasi Peak    | 771 kHz    | 32.14 N    | -23.85         |
| 2 CISPR Average | 1.239 MHz  | 25.46 N    | -20.53         |
| 2 CISPR Average | 1.689 MHz  | 23.12 L1   | -22.87         |
| 2 CISPR Average | 2.5665 MHz | 23.83 N    | -22.16         |
| 2 CISPR Average | 5.406 MHz  | 30.57 L1   | -19.42         |
| 2 CISPR Average | 6.414 MHz  | 32.60 N    | -17.39         |
| 1 Quasi Peak    | 6.4185 MHz | 39.53 L1   | -20.46         |

Date: 9.JUN.2013 13:39:21

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Applicant: Hip Shing Electronics Ltd.  
Model: 4000464  
Worst-Case Operating Mode: Transmitting (Bluetooth)

Date of Test: June 29, 2013

Table 1

**Radiated Emissions  
Pursuant to FCC Part 15 Section 15.249 Requirement**

**Lowest Channel**

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Average Factor (dB) | Calculated at 3m (dBμV/m) | Average Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|-----------------|----------------|-------------------|---------------------|---------------------------|---------------------|---------------------------|------------------------------|-------------|
| H            | 2402.000        | 107.1          | 33                | 29.4                | 103.5                     | 30.1                | 73.4                      | 94.0                         | -20.6       |
| V            | 4804.000        | 53.5           | 33                | 34.9                | 55.4                      | 30.1                | 25.3                      | 54.0                         | -28.7       |
| H            | 7206.000        | 44.0           | 33                | 37.9                | 48.9                      | 30.1                | 18.8                      | 54.0                         | -35.2       |
| H            | 9608.000        | 43.5           | 33                | 40.4                | 50.9                      | 30.1                | 20.8                      | 54.0                         | -33.2       |
| H            | 12010.000       | 44.3           | 33                | 40.5                | 51.8                      | 30.1                | 21.7                      | 54.0                         | -32.3       |
| H            | 14412.000       | 45.6           | 33                | 40.0                | 52.6                      | 30.1                | 22.5                      | 54.0                         | -31.5       |

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Peak Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|-----------------|----------------|-------------------|---------------------|---------------------------|---------------------------|-------------|
| H            | 2402.000        | 107.1          | 33                | 29.4                | 103.5                     | 114.0                     | -10.5       |
| V            | 4804.000        | 53.5           | 33                | 34.9                | 55.4                      | 74.0                      | -18.6       |
| H            | 7206.000        | 44.0           | 33                | 37.9                | 48.9                      | 74.0                      | -25.1       |
| H            | 9608.000        | 43.5           | 33                | 40.4                | 50.9                      | 74.0                      | -23.1       |
| H            | 12010.000       | 44.3           | 33                | 40.5                | 51.8                      | 74.0                      | -22.2       |
| H            | 14412.000       | 45.6           | 33                | 40.0                | 52.6                      | 74.0                      | -21.4       |

- NOTES: 1. Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative sign in the column shows value below limit.
4. Horn antenna is used for the emission over 1000MHz.

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Applicant: Hip Shing Electronics Ltd.  
Model: 4000464  
Worst-Case Operating Mode: Transmitting (Bluetooth)

Date of Test: June 29, 2013

Table 2

**Radiated Emissions  
Pursuant to FCC Part 15 Section 15.249 Requirement**

Middle Channel

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Average Factor (dB) | Calculated at 3m (dBμV/m) | Average Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|-----------------|----------------|-------------------|---------------------|---------------------------|---------------------|---------------------------|------------------------------|-------------|
| H            | 2441.000        | 107.4          | 33                | 29.4                | 103.8                     | 30.1                | 73.7                      | 94.0                         | -20.3       |
| V            | 4882.000        | 54.1           | 33                | 34.9                | 56.0                      | 30.1                | 25.9                      | 54.0                         | -28.1       |
| H            | 7323.000        | 43.8           | 33                | 37.9                | 48.7                      | 30.1                | 18.6                      | 54.0                         | -35.4       |
| H            | 9764.000        | 43.0           | 33                | 40.4                | 50.4                      | 30.1                | 20.3                      | 54.0                         | -33.7       |
| H            | 12205.000       | 44.4           | 33                | 40.5                | 51.9                      | 30.1                | 21.8                      | 54.0                         | -32.2       |
| H            | 14646.000       | 47.5           | 33                | 38.4                | 52.9                      | 30.1                | 22.8                      | 54.0                         | -31.2       |

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Peak Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|-----------------|----------------|-------------------|---------------------|---------------------------|---------------------------|-------------|
| H            | 2441.000        | 107.4          | 33                | 29.4                | 103.8                     | 114.0                     | -10.2       |
| V            | 4882.000        | 54.1           | 33                | 34.9                | 56.0                      | 74.0                      | -18.0       |
| H            | 7323.000        | 43.8           | 33                | 37.9                | 48.7                      | 74.0                      | -25.3       |
| H            | 9764.000        | 43.0           | 33                | 40.4                | 50.4                      | 74.0                      | -23.6       |
| H            | 12205.000       | 44.4           | 33                | 40.5                | 51.9                      | 74.0                      | -22.1       |
| H            | 14646.000       | 47.5           | 33                | 38.4                | 52.9                      | 74.0                      | -21.1       |

- NOTES: 1. Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative sign in the column shows value below limit.
4. Horn antenna is used for the emission over 1000MHz.

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Applicant: Hip Shing Electronics Ltd.

Date of Test: June 29, 2013

Model: 4000464

Worst-Case Operating Mode: Transmitting (Bluetooth)

Table 3

**Radiated Emissions  
Pursuant to FCC Part 15 Section 15.249 Requirement**

**Highest Channel**

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Average Factor (dB) | Calculated at 3m (dBμV/m) | Average Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|-----------------|----------------|-------------------|---------------------|---------------------------|---------------------|---------------------------|------------------------------|-------------|
| H            | 2480.000        | 107.5          | 33                | 29.4                | 103.9                     | 30.1                | 73.8                      | 94.0                         | -20.2       |
| V            | 4960.000        | 53.9           | 33                | 34.9                | 55.8                      | 30.1                | 25.7                      | 54.0                         | -28.3       |
| H            | 7440.000        | 43.5           | 33                | 37.9                | 48.4                      | 30.1                | 18.3                      | 54.0                         | -35.7       |
| H            | 9920.000        | 43.3           | 33                | 40.4                | 50.7                      | 30.1                | 20.6                      | 54.0                         | -33.4       |
| H            | 12400.000       | 43.9           | 33                | 40.5                | 51.4                      | 30.1                | 21.3                      | 54.0                         | -32.7       |
| H            | 14880.000       | 47.0           | 33                | 38.4                | 52.4                      | 30.1                | 22.3                      | 54.0                         | -31.7       |

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Peak Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|-----------------|----------------|-------------------|---------------------|---------------------------|---------------------------|-------------|
| H            | 2480.000        | 107.5          | 33                | 29.4                | 103.9                     | 114.0                     | -10.1       |
| V            | 4960.000        | 53.9           | 33                | 34.9                | 55.8                      | 74.0                      | -18.2       |
| H            | 7440.000        | 43.5           | 33                | 37.9                | 48.4                      | 74.0                      | -25.6       |
| H            | 9920.000        | 43.3           | 33                | 40.4                | 50.7                      | 74.0                      | -23.3       |
| H            | 12400.000       | 43.9           | 33                | 40.5                | 51.4                      | 74.0                      | -22.6       |
| H            | 14880.000       | 47.0           | 33                | 38.4                | 52.4                      | 74.0                      | -21.6       |

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

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#### 4.0 **Equipment Photographs**

For electronic filing, the photographs are saved with filename: external photos.pdf and internal photos.pdf.

#### 5.0 **Product Labelling**

For electronics filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

#### 6.0 **Technical Specifications**

For electronic filing, the block diagram and schematic of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

#### 7.0 **Instruction Manual**

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

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## 8.0 **Miscellaneous Information**

The miscellaneous information includes details of the test procedure and measured bandwidth / calculation of factor such as pulse desensitization and averaging factor (calculation and timing diagram).

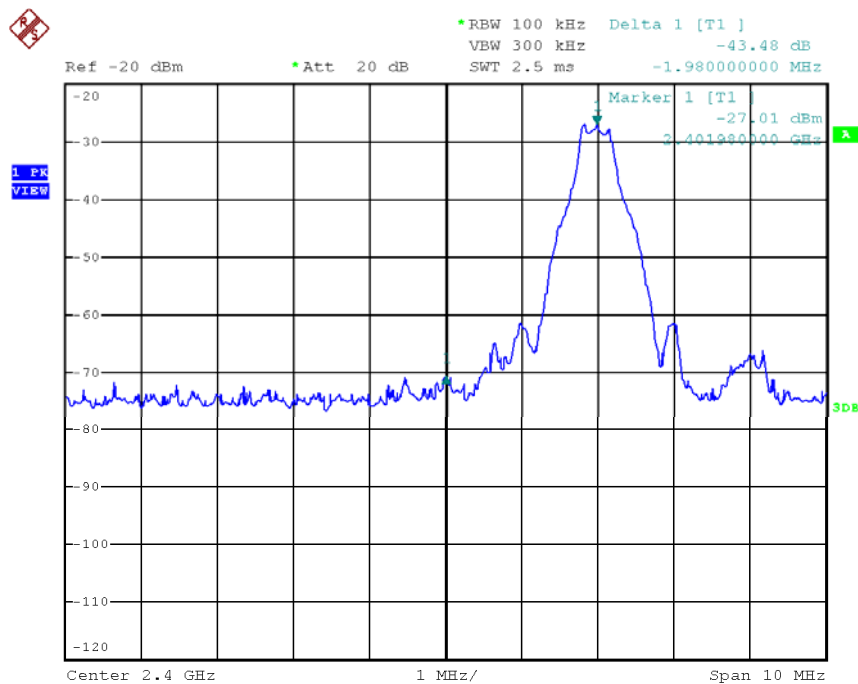
### 8.1 Measured Bandwidth

From the following plots, they show that the fundamental emissions are confined in the specified band (2400MHz to 2483.5MHz). In case of the fundamental emissions are within two standard bandwidths from the bandedge, the delta measurement technique is used for determining bandedge compliance. Standard bandwidth is the bandwidth specified by ANSI C63.4 (2009) for frequency being measured.

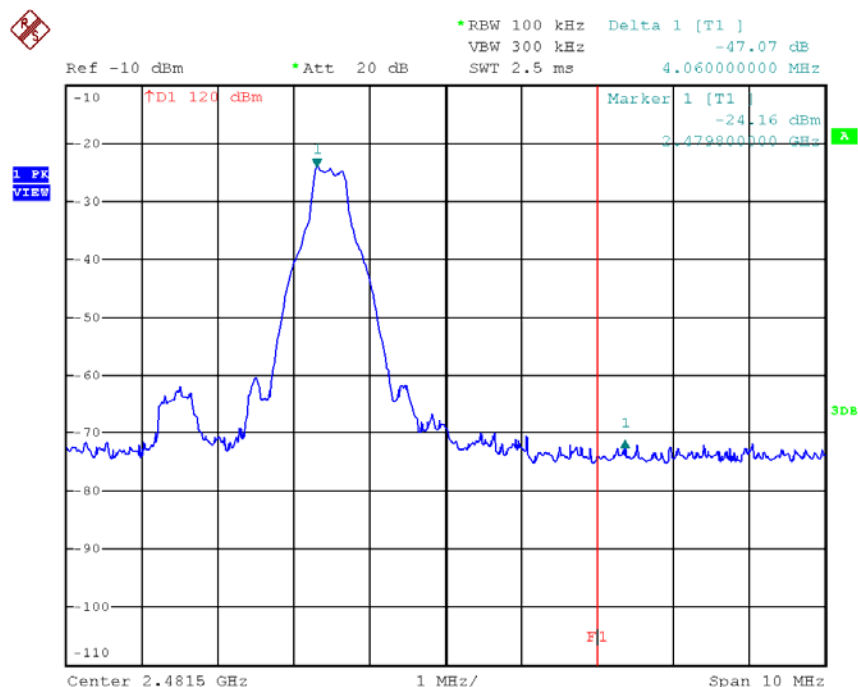
Emissions radiated outside of the specified frequency bands, except harmonics, are attenuated by 50dB below the level of the fundamental or to the general radiated emissions limits in Section 15.209, whichever is the lesser attenuation, which meet the requirement of part 15.249(d).

Issuing Laboratory:  
Intertek Testing Services Hong Kong Limited

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Date: 4.JUN.2013 16:03:58



Date: 4.JUN.2013 16:06:56



Issuing Laboratory:  
Intertek Testing Services Hong Kong Limited

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Peak Measurement

Bandedge compliance is determined by applying marker-delta method, i.e. (Bandedge Plot).

Lower bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

$$\begin{aligned} &= 103.5 \text{ dB}\mu\text{V/m} - 43.5 \text{ dB} \\ &= 60.0 \text{ dB}\mu\text{V/m} \end{aligned}$$

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

$$\begin{aligned} &= 73.4 \text{ dB}\mu\text{V/m} - 43.5 \text{ dB} \\ &= 29.9 \text{ dB}\mu\text{V/m} \end{aligned}$$

Upper bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

$$\begin{aligned} &= 103.9 \text{ dB}\mu\text{V/m} - 47.1 \text{ dB} \\ &= 56.8 \text{ dB}\mu\text{V/m} \end{aligned}$$

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

$$\begin{aligned} &= 73.8 \text{ dB}\mu\text{V/m} - 47.1 \text{ dB} \\ &= 26.7 \text{ dB}\mu\text{V/m} \end{aligned}$$

The resultant field strength meets the general radiated emission limit in section 15.209, which does not exceed 74 dB $\mu$ V/m (Peak Limit) and 54 dB $\mu$ V/m (Average Limit).

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## 8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. The effective period ( $T_{eff}$ ) is approximately 3.125ms for a digital “1” bit which illustrated on technical specification, with a resolution bandwidth (3dB) of 1MHz, so the pulse desensitivity factor is 0dB.

## 8.3 Calculation of Average Factor

Based on the Bluetooth Specification Version 2.1 + EDR, the transmitter ON time for each timeslot of Bluetooth is 625 $\mu$ s. DH5 has the maximum duty cycle, which consists of 5 continuous Tx slots and 1 Rx slot. Therefore one hopset take  $(5+1) \times 625\mu\text{s} = 3.75\text{ms}$ . For one period for a pseudo-random hopping through all 79 RF channels, it takes:  $79 \times 3.75\text{ms} = 296.25\text{ms}$ .

The dwell time for DH5 is  $5 \times 625\mu\text{s} = 3.125\text{ms}$ .

Therefore,

$$\begin{aligned}\text{Duty Cycle (DC)} &= \text{Maximum On time in } 100\text{ms}/100\text{ms} \\ &= 3.125\text{ms}/100\text{ms} \\ &= 0.03125\end{aligned}$$

$$\begin{aligned}\text{Average Factor (AF) of Bluetooth in dB} &= 20 \log_{10} (0.03125) \\ &= -30.1 \text{ dB}\end{aligned}$$

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#### 8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of transmitter operating under the Part 15, Subpart C rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 (2009). A typical or an unmodulated CW signal at the operating frequency of the EUT has been supplied to the EUT for all measurements. Such a signal is supplied by a signal generator and an antenna in close proximity to the EUT. The signal level is sufficient to stabilize the local oscillator of the EUT.

The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the ground plane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjusted through all three orthogonal axis to obtain maximum emission levels. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line conducted emissions, the range scanned is 150 kHz to 30 MHz.

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#### 8.4 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements were made as described in ANSI C63.4 (2009).

The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.1). Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.

#### 9.0 Confidentiality Request

For electronic filing, a preliminary copy of the confidentiality request is saved with filename: request.pdf.

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## 10.0 Equipment List

### 1) Radiated Emissions Test

| Equipment            | EMI Test Receiver | Biconical Antenna | Log Periodic Antenna |
|----------------------|-------------------|-------------------|----------------------|
| Registration No.     | EW-2500           | EW-0954           | EW-0447              |
| Manufacturer         | R&S               | EMCO              | EMCO                 |
| Model No.            | ESCI              | 3104C             | 3146                 |
| Calibration Date     | Mar. 22, 2013     | Apr. 30, 2013     | Feb. 08, 2012        |
| Calibration Due Date | Feb. 28, 2014     | Oct. 30, 2014     | Aug. 08, 2013        |

| Equipment            | Spectrum Analyzer | Double Ridged Guide Antenna |
|----------------------|-------------------|-----------------------------|
| Registration No.     | EW-2188           | EW-1133                     |
| Manufacturer         | AGILENTTECH       | EMCO                        |
| Model No.            | E4407B            | 3115                        |
| Calibration Date     | Nov. 05, 2012     | Oct. 05, 2012               |
| Calibration Due Date | Nov. 05, 2013     | Apr. 05, 2014               |

### 2) Conducted Emissions Test

| Equipment            | EMI Test Receiver | LISN          |
|----------------------|-------------------|---------------|
| Registration No.     | EW-2500           | EW-2874       |
| Manufacturer         | R&S               | R&S           |
| Model No.            | ESCI              | ENV-216       |
| Calibration Date     | Mar. 22, 2013     | Aug. 15, 2012 |
| Calibration Due Date | Feb. 28, 2014     | Aug. 15, 2013 |

### 3) Bandedge Measurement

| Equipment            | Spectrum Analyzer |
|----------------------|-------------------|
| Registration No.     | EW-2249           |
| Manufacturer         | R&S               |
| Model No.            | FSP30             |
| Calibration Date     | Oct. 04, 2012     |
| Calibration Due Date | Oct. 04, 2013     |