CMA Testing and Certification Laboratories
廠商會檢定中心

# TEST REPORT

| | | | | |
|---|---|---|---|---|
| Report No. | : | AS0049260(0) | Date : | 18 Aug 2014 |
| Application No. | : | LS027207(7) | | |
| Applicant | : | Hulu Robotics Technology Company Limited<br>Unit A, 3/F, Cheong Sun Tower, 116-118 Wing Lok Street,<br>Sheung Wan, Hong Kong | | |
| Client | : | Maker Works Technology Co., Ltd<br>No. 4266, F/4, Gonglehuating Business Building, Xinhu Road,<br>Xixiang Sub-district, Bao'An District, Shenzhen, China | | |
| Sample Description | : | One(1) item of submitted sample stated to be Makeblock Bluetooth Module of model No. 13002 applicable only for product Makeblock Starter Robot Kit (Bluetooth Version), Makeblock Ultimate Robot Kit (Bluetooth Version) and Makeblock Inventor Electronic Kit (Bluetooth Version) | | |
| Product No. | : | 90020, 90021, 90024, 90025 and 94004 | | |
| Buyer SKU No. | : | 2770245 Robot Starter Kit Bluetooth Version, 2770246 Inventor Ultimate Robot Kit, 2770247 Inventor Electronic Kit | | |
| | | Sample registration No. : RS033606-001 | | |
| | | Radio Frequency : 2402MHz ~ 2480MHz Transceiver | | |
| | | Rating : DC 5V | | |
| Date Received | : | 08 Aug 2014 | | |
| Test Period | : | 08 Aug 2014 to 15 Aug 2014 | | |
| Test Requested | : | FCC Part 15 Certificate | | |
| Test Method | : | 47 CFR Part 15 (10-1-12 Edition), ANSI C63.4 – 2009,<br>FCC Public Notice DA 00-705 | | |
| Test Engineer | : | Mr. LEUNG Shu-kan, Ken | | |
| Test Result | : | See attached sheet(s) from page 2 to 46. | | |
| Conclusion | : | The submitted sample was found to comply with requirement of FCC Part 15 Subpart B and C. | | |
| Remark | : | The Bluetooth Module used in five products is same in electronic circuitry, PCB layout and components. Therefore single Bluetooth unit was chosen to tested unit. This report is for Bluetooth 3.0 testing | | |

*For and on behalf of*
CMA Industrial Development Foundation Limited

Authorized Signature : _____ Page 1 of 46

Mr. WONG Lap-pong, Andrew
Manager
Electrical Division

FCC ID: 2ACWW13002

# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

**Table of Contents**







CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## 1 General Information

### 1.1 General Description

Me Bluetooth（Dual Mode）is designed to communicate with devices with Bluetooth function through specific software. It is compatible with Bluetooth 2.0 and 4.0, provides a simple way to communicate with other Bluetooth device(such as smart phones). The Bluetooth module provides TTL level UART interface. It acts like a normal UART module in an embedded system(such as Arduino), communicating with other Bluetooth device is as easy as operating a serial port.

The ELET114A Bluetooth Dual-Mode Module is integrated MCU (ARM Cortex-M0 32-BIT MICROCONTROLLER) and Bluetooth radio device, follow BT2.1+EDR/3.0/4.0(BLE) specification, support SPP protocol and so on. It supports UART, SPI, I2C, interfaces, contains four PWM ports, channels and several GPIOs, with high integration, low cost, low power consumption, and excellent Radio performance. It achieves the perfect compatibility of iOS(MAC), Android and other operating system.

This Bluetooth Module is not capable to connect any product(s) other than Makeblock Starter Robot Kit (Bluetooth Version), Makeblock Ultimate Robot Kit (Bluetooth Version) and Makeblock Inventor Electronic Kit (Bluetooth Version). A non standard terminal with unique pin assignment has been used to limit user operation.

**Pseudorandom frequency hopping sequence**
The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF Channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master; the phase in the hopping sequence is determined by the Bluetooth clock of the master. The channel is divided into time slots where each slot corresponds to an RF hop frequency. Consecutive hops correspond to different RF hop frequencies. The nominal hop rate is 1600 hops/s.
Example of a 79 hopping sequence in data mode: 40, 21, 44, 23, 42, 53, 46, 55, 48, 33, 52, 35, 50, 65, 54…

**Equal Hopping Frequency Use**
All Bluetooth units participating in the piconet are time and hop-synchronized to the channel.

**System Receiver Input Bandwidth**
The input bandwidth of the receiver is 1 MHz. In every connection one Bluetooth device is the master and the other one is slave. The aster determines the hopping sequence. The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master. Additionally the type of connection (e.g. single multisport (packet) is set up at the beginning of the





CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings. Repeating of a packet has no influence on the hopping sequence.. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

**Equipment Description**

15.247(g): In accordance with the Bluetooth Industry Standard, the system is designed to comply With all of The regulations in Section 15.247 when the transmitter is presented with a continuous data (or information) system.

15.247(h): In accordance with the Bluetooth Industry Standard, the system does not coordinate it channels selection/ hopping sequence with other frequency hopping systems for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters.

The brief circuit description is listed as follows:

- U2 and its associated circuit act as Bluetooth module
- U1 and its associated circuit act as power regulator

Antenna type : PCB Antenna
Antenna gain : 1.5dBi
Modulation technique : GFSK, Π/4-DQPSK, 8PSK
Number of channel : 79 channels





CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

**1.2 Location of the test site**

FCC Registered Test Site Number: 552221

Radiated emissions measurements are investigated and taken pursuant to the procedures of ANSI C63.4 – 2009. A Semi-Anechoic Chamber Testing Site is set up for investigation and located at:

Ground Floor, Yan Hing Centre,
9 – 13 Wong Chuk Yeung Street,
Fo Tan, Shatin,
New Territories,
Hong Kong.

Conducted emissions measurements are investigated and also taken pursuant to the procedures of ANSI C63.4 – 2009. A shielded room is located at :

Ground Floor, Yan Hing Centre,
9 – 13 Wong Chuk Yeung Street,
Fo Tan, Shatin,
New Territories,
Hong Kong.





CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

### 1.3 List of measuring equipment

| Equipment | Manufacturer | Model No. | Serial No. | Calibration Due Date | Calibration Period |
|---|---|---|---|---|---|
| EMI Test Receiver | R&S | ESCS30 | 100001 | 21 Nov 2014 | 1Year |
| Spectrum Analyzer | R&S | FSV40 | 100964 | 17 Dec 2014 | 1Year |
| Broadband Antenna | Schaffner | CBL6112B | 2718 | 06 Jan 2015 | 1Year |
| Loop Antenna | EMCO | 6502 | 00056620 | 28 Oct 2015 | 1Year |
| Horn Antenna | Schwarzbeck | BBHA 9120D | 9120D-531 | 09 Oct 2014 | 1Year |
| Horn Antenna | Schwarzbeck | BBHA 9170 | BBHA9170442 | 17 Jun 2015 | 2Years |
| Broadband Pre-Amplifier | Schwarzbeck | BBV 9718 | 9718-119 | 09 Oct 2014 | 1Year |
| Broadband Pre-Amplifier | Schwarzbeck | BBV 9719 | 9719-010 | 17 Jun 2015 | 2Years |
| Coaxial Cable | Schaffner | RG 213/U | N/A | 06 Jan 2015 | 1Year |
| Coaxial Cable | Suhner | RG 214/U | N/A | 06 Jan 2015 | 1Year |
| Coaxial Cable | Suhner | Sucoflex_102 | N/A | 09 Oct 2014 | 1Year |





CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## 1.4 Measurement Uncertainty

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

Radiated emissions

| Frequency | Uncertainty ($U_{lab}$) |
|---|---|
| 30MHz ~ 200MHz (Horizontal) | 4.63dB |
| 30MHz ~ 200MHz (Vertical) | 4.65dB |
| 200MHz ~1000MHz (Horizontal) | 4.45dB |
| 200MHz ~1000MHz (Vertical) | 4.41dB |

Conducted emissions

| Frequency | Uncertainty ($U_{lab}$) |
|---|---|
| 150kHz~30MHz | 2.47dB |





CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

## 2 Description of the radiated emission test

### 2.1 Test Procedure

Radiated emissions measurements are investigated and taken pursuant to the procedures of ANSI C63.4 – 2009 and DA 00-705.

The equipment under test (EUT) was placed on a non-conductive turntable with dimensions of 1.5m x 1m and 0.8m high above the ground. 3m from the EUT, a broadband antenna mounting on the mast received the signal strength. The turntable was rotated to maximize the emission level. The antenna was then moving along the mast from 1m up to 4m until no more higher value was found. Both horizontal and vertical polarization of the antenna were placed and investigated.

For below 30MHz, a loop antenna with its vertical plane is placed 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1 m above the ground.

For 30MHz to 1GHz, broadband antenna with its vertical and horizontal plane is placed 3m from the EUT and rotated about its vertical and horizontal axis for maximum response at each azimuth about the EUT. And the reference point of antenna shall be 1 m above the ground.

For above 1GHz, horn antenna with its vertical and horizontal plane is placed 3m from the EUT and rotated about its vertical and horizontal axis for maximum response at each azimuth about the EUT. Preamplifier and High Pass filter was used for measurements. The reference point of antenna shall be 1 m above the ground.

The device was rotated through three orthogonal axes to determine which attitude and configuration produce the highest emission during measurement for Radiated Emission measurement.





CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## 2.2 Test Result

Summary

| Section in FCC part 15 | Description | Result |
|---|---|---|
| 15.205(a), 15.209, 15.247(d) | Transmitter radiated spurious field strength and other emissions | Page 11 |
| 15.209 | Receiver emissions | Page 12 |
| 15.247 (a)(1), Part 2.1 and DA-00705 | Hopping sequence | Page 26, 27 |
| 15.247 (a)(1) | 20dB bandwidth and 99% bandwidth | Page 28, 29, 30 |
| 15.247 (a)(1) | Channel Spacing (Frequency separation) | Page 31, 32 |
| 15.247 (a)(1)(iii) | Number of hopping frequency | Page 33 |
| 15.247 (d) | Band Edge | Page 34, 35 |
| 15.247 (a)(1)(iii) | Dwell Time (Bluetooth Average On Time) | Page 36-44 |
| 15.247 (b)(1) | Maximum Peak output power | Page 10, 45, 46 |

Subpart C:
Peak Detector and Average Detector data were measured unless otherwise stated.

"#" means emissions appear within the restricted bands shall follow the requirement of section 15.205.

The harmonic emissions meet the requirement of section 15.209 are based on measurements employing the CISPR quasi-peak detector below 1000MHz and average detector for frequencies above 1000MHz.

Subpart B:
The emissions meet the requirement of section 15.109 are based on measurements employing the CISPR quasi-peak detector below 1000MHz and average detector for frequencies above 1000MHz.

The frequencies from 30MHz to 1000MHz were investigated, and emissions more 20dB below limit were not reported. Thus, those highest emissions were presented in next page (section 2.3).

It was found that the EUT meet the FCC requirement.





CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## 2.3 Maximum peak output power

**Conductive measurements**

**pursuant to**

**the requirement of FCC Part 15 subpart C**

Environmental conditions:

| Parameter | Recorded value | |
|---|---|---|
| Ambient temperature: | 26 | ° C |
| Relative humidity: | 60 | % |

Operation Mode: Transmission

| Channel | Frequency (MHz) | Reading (dBm) | Reading (mW) | Limit (mW) | Margin (mW) |
|---|---|---|---|---|---|
| 00 | 2402.094 | - 11.20 | 0.076 | 1000.0 | - 999.924 |

| Channel | Frequency (MHz) | Reading (dBm) | Reading (mW) | Limit (mW) | Margin (mW) |
|---|---|---|---|---|---|
| 39 | 2441.108 | - 12.13 | 0.061 | 1000.0 | - 999.939 |

| Channel | Frequency (MHz) | Reading (dBm) | Reading (mW) | Limit (mW) | Margin (mW) |
|---|---|---|---|---|---|
| 78 | 2480.094 | - 12.19 | 0.060 | 1000.0 | - 999.940 |

The plot saved in TestRpt8.pdf shows the transmission power was less than 1 watt.

Remark
All data rate and modulation were tested, the worst case result are represented





CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## 2.4 Radiated Emission Measurement Data

**Radiated emission**

**pursuant to**

**the requirement of FCC Part 15 subpart C**

Environmental conditions:

| Parameter | Recorded value | |
|---|---|---|
| Ambient temperature: | 27 | ° C |
| Relative humidity: | 65 | % |

Detector: Peak RBW: 1MHz VBW: 3MHz Testing frequency range: 9kHz to 25GHz
Data rate: 1MHz, Modulation: GFSK

| Channel | Frequency (MHz) | Polarity (H/V) | Reading at 3m (dBμV) | Transducer Factor (dB/m) | Field Strength at 3m (dBμV/m) | Limit at 3m (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| 00 | 2402.869 | H | 91.6 | - 6.3 | 85.3 | 114.0 | - 28.7 |
| | #4803.610 | V | 48.7 | 2.4 | 51.1 | 74.0 | - 22.9 |
| | #4803.933 | H | 48.5 | 2.4 | 50.9 | 74.0 | - 23.1 |
| | 7206.636 | H | 31.1 | 10.8 | 41.9 | 74.0 | - 32.1 |
| 39 | 2441.094 | H | 92.9 | - 6.3 | 86.6 | 114.0 | - 27.4 |
| | #4881.608 | H | 48.3 | 2.4 | 50.7 | 74.0 | - 23.3 |
| | #4882.208 | V | 48.5 | 2.4 | 50.9 | 74.0 | - 23.1 |
| | #7322.869 | H | 32.0 | 10.8 | 42.8 | 74.0 | - 31.2 |
| 78 | 2480.102 | H | 93.3 | - 6.3 | 87.0 | 114.0 | - 27.0 |
| | #4959.194 | V | 50.4 | 2.4 | 52.8 | 74.0 | - 21.2 |
| | #4960.188 | H | 49.2 | 2.4 | 51.6 | 74.0 | - 22.1 |
| | #7439.832 | H | 32.2 | 10.8 | 43.0 | 74.0 | - 31.0 |

Remark: Peak measurement values are lower than average limit, therefore average measurement is not necessary.
Other emissions more than 20dB below the limit are not reported.
All data rate and modulation were tested, the worst case result are represented.



FCC ID: 2ACWW13002



CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## 2.4 Radiated Emission Measurement Data (Con't)

**Radiated emission**

**pursuant to**

**the requirement of FCC Part 15 subpart B**

Environmental conditions:

| Parameter | Recorded value | |
|---|---|---|
| Ambient temperature: | 27 | ° C |
| Relative humidity: | 65 | % |

Detector: Quasi-peak
RBW: 120kHz VBW: 300kHz, Operation Mode: Receiver mode, Testing frequency range: 9kHz to 25GHz
Data rate: 1MHz, Modulation: GFSK

| Frequency (MHz) | Polarity (H/V) | Reading at 3m (dBμV) | Antenna Factor and Cable Loss (dB/m) | Field Strength at 3m (dBμV/m) | Limit at 3m (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 97.469 | H | 22.7 | 9.7 | 32.4 | 43.5 | - 11.1 |
| 97.491 | V | 28.3 | 9.7 | 38.0 | 43.5 | - 5.5 |
| 102.535 | H | 19.9 | 12.2 | 32.1 | 43.5 | - 11.4 |
| 120.664 | V | 19.3 | 14.4 | 33.7 | 43.5 | - 9.8 |
| 162.496 | V | 26.7 | 11.9 | 38.6 | 43.5 | - 4.4 |
| 227.477 | H | 22.1 | 11.8 | 33.9 | 46.0 | - 12.1 |
| 292.502 | H | 22.7 | 15.4 | 38.1 | 46.0 | - 7.9 |

Remark: Other emissions more than 20dB below the limit are not reported.
All data rate and modulation were tested, the worst case result are represented





CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

## 3 Description of the Line-conducted Test

### 3.1 Test Procedure

Conducted emissions measurements are investigated and also taken pursuant to the procedures of ANSI C63.4 – 2009. The EUT was setup as described in the procedures, and both lines were measured.

### 3.2 Test Result

No measurement is required as the EUT is a DC-operated product.

### 3.3 Graph and Table of Conducted Emission Measurement Data

Not Applicable





CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## 4 Photograph

### 4.1 Photographs of the Test Setup for Radiated Emission and Conducted Emission

For electronic filing, the photos are saved with filename TSup1.jpg to TSup7.jpg.

### 4.2 Photographs of the External and Internal Configurations of the EUT

For electronic filing, the photos are saved with filename ExPho1.jpg to ExPho2.jpg and InPho1.jpg to InPho2.jpg.





CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## 5 Supplementary document

The following document were submitted by applicant, and for electronic filing, the document are saved with the following filenames:

| Document | Filename |
|---|---|
| ID Label/Location | LabelSmp.jpg |
| Block Diagram | BlkDia.pdf |
| Schematic Diagram | Schem.pdf |
| Users Manual | UserMan.pdf |
| Operational Description | OpDes.pdf |

## 5.1 Bandwidth

Bluetooth:

The plot saved in TestRpt3.pdf shows the 20dB bandwidth and 99% bandwidth:

| Frequency Channel (MHz) | 20dB bandwidth (kHz) | 99% bandwidth (kHz) |
|---|---|---|
| 2402 | 1120.1 | 963.8 |
| 2441 | 1123.0 | 960.9 |
| 2480 | 1125.9 | 963.8 |

The plot saved in TestRpt4.pdf shows the channel spacing has minimum 25 kHz or two-third of 20dB bandwidth of hopping channel.

| Frequency (MHz) | Channel spacing (kHz) | Two-third of 20dB bandwidth (kHz) | Minimum bandwidth (kHz) |
|---|---|---|---|
| 2402 | 1005.8 | 746.3 | 25 |
| 2441 | 1005.8 | 748.7 | 25 |
| 2480 | 1005.8 | 750.6 | 25 |

The plot saved in TestRpt5.pdf shows the frequency hopping channel over 75 hopping frequency.

The plot saved in TestRpt6.pdf shows the fundamental emission is confined in the specified band. It shows the 20dB bandwidth and band edge meet the 15.247(d) and 15.205 requirement.





CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

**5.2 Duty cycle**

Not Applicable

**5.3 Transmission time**

Not Applicable

**5.4 Power Spectral Density**

Not Applicable

**5.5 Hopping sequence**

The plot saved in TestRpt2.pdf shows the hopping sequence is pseudorandom randomly distributed. Four example of continuous fundamental frequency hopping pattern was as below:

The 1st example of fundamental frequency = 2.470150GHz
The 2nd example of fundamental frequency = 2.424590GHz
The 3rd example of fundamental frequency = 2.463260GHz
The 4th example of fundamental frequency =2.404050GHz

Result:
Fc 1 – Fc 2 = +45.56MHz
Fc 2 – Fc 3 = -38.67MHz
Fc 3 – Fc 4 = +59.21MHz

It was found the hopping pattern is pseudorandom random.





CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

**5.6 Average on time**

The plot saved in TestRpt7.pdf shows the average on time for frequency hopping channel is within 0.4 seconds.

The calculation for average on time as below:

Average hopping channel = Number of transmitted carrier / Sweep time

Average on time = Packet on time x Average hopping channel

Dwell time = Average on time x Total frequency hopping channel x 0.4

Test result:

| Frequency Channel (MHz) | Packet | Dwell Time (Seconds) | Limit (Seconds) | Margin (Seconds) |
|---|---|---|---|---|
| 2402 | DH1 | 0.204 | 0.4 | - 0.196 |
| 2402 | DH3 | 0.293 | 0.4 | - 0.107 |
| 2402 | DH5 | 0.353 | 0.4 | - 0.047 |
| 2441 | DH1 | 0.184 | 0.4 | - 0.216 |
| 2441 | DH3 | 0.262 | 0.4 | - 0.138 |
| 2441 | DH5 | 0.376 | 0.4 | - 0.024 |
| 2480 | DH1 | 0.185 | 0.4 | - 0.215 |
| 2450 | DH3 | 0.281 | 0.4 | - 0.119 |
| 2480 | DH5 | 0.374 | 0.4 | - 0.026 |





CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## 6 Appendices

| | | | |
|---|---|---|---|
| A1 | Photos of the set-up of Radiated Emissions | 4 | pages |
| A2 | Photos of External Configurations | 1 | page |
| A3 | Photos of Internal Configurations | 1 | page |
| A4 | ID Label/Location | 1 | page |
| A5 | Hopping sequence | 2 | pages |
| A6 | 20 dB bandwidth and 99% bandwidth | 3 | pages |
| A7 | Bluetooth Channel Spacing | 2 | pages |
| A8 | Bluetooth Hopping Channel | 1 | page |
| A9 | Bluetooth Band Edge | 2 | pages |
| A10 | Bluetooth Average on time | 9 | pages |
| A11 | Transmission Power | 2 | pages |



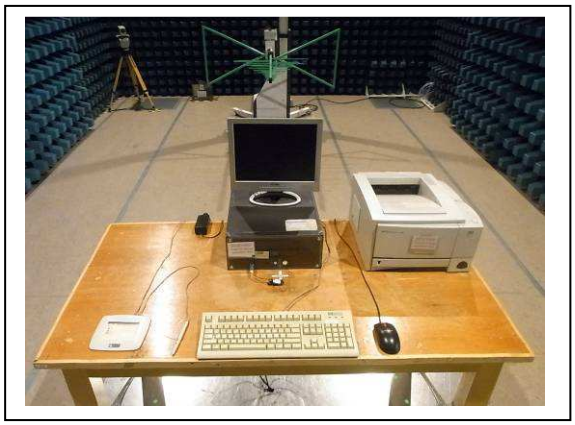


CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

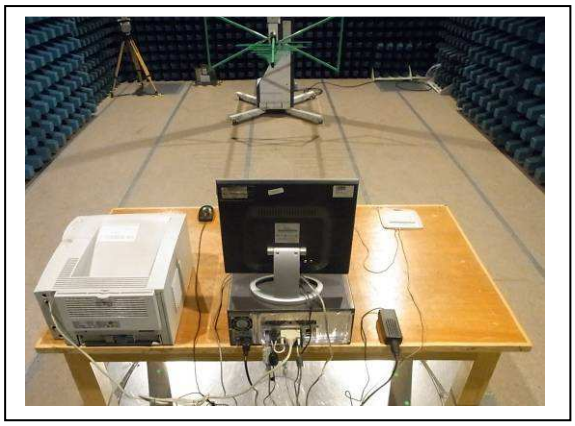
# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## A1. Photos of the set-up of Radiated Emissions



(Front view, 30MHz – 1GHz)



(Back view, 30MHz – 1GHz)

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew



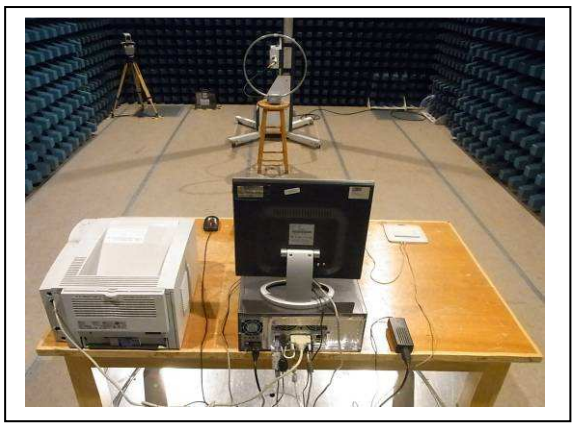


CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

(Front view, 9KHz – 30MHz)



(Back view, 9KHz – 30MHz)

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002



CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

(front view, 1GHz – 25GHz)

(rear view, 1GHz – 25GHz)

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew



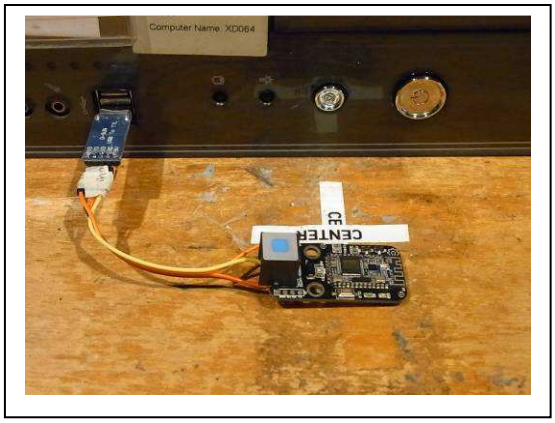
FCC ID: 2ACWW13002



CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014




Position of EUT

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002

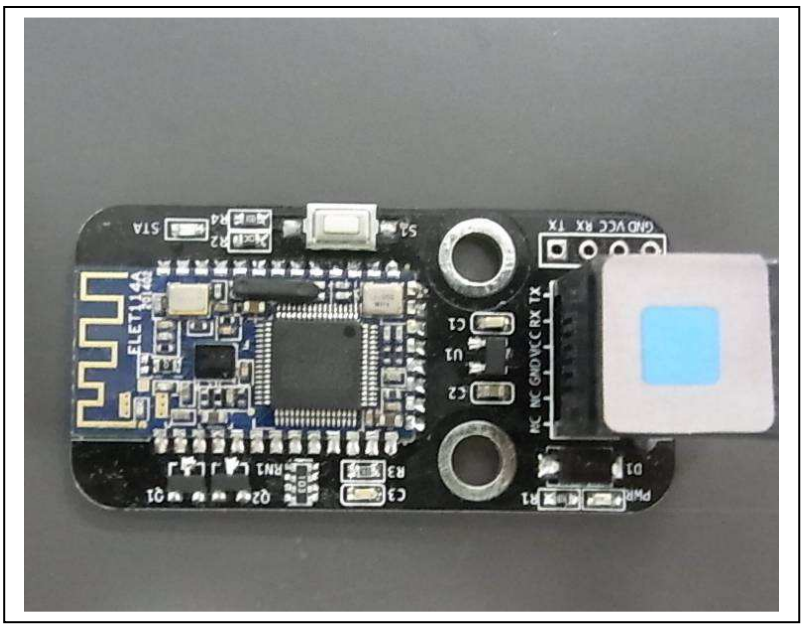


CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## A2. Photos of External Configurations




External Configuration 1


External Configuration 2

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002

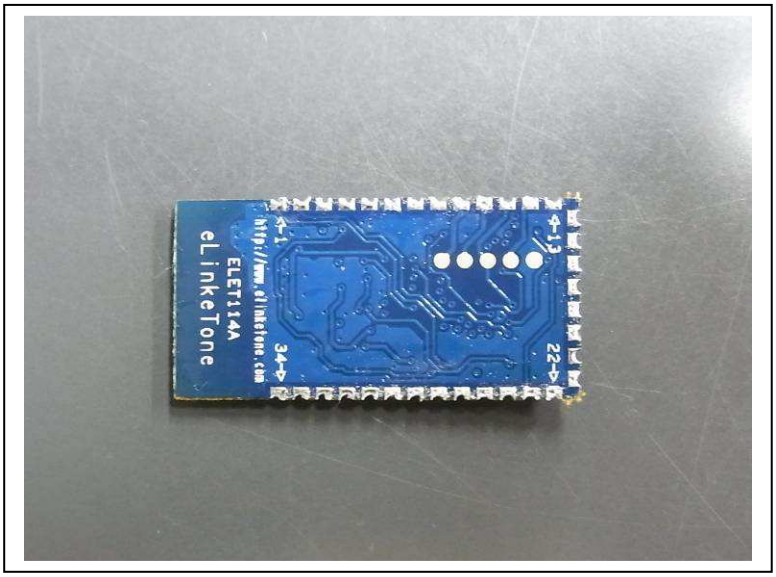


CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

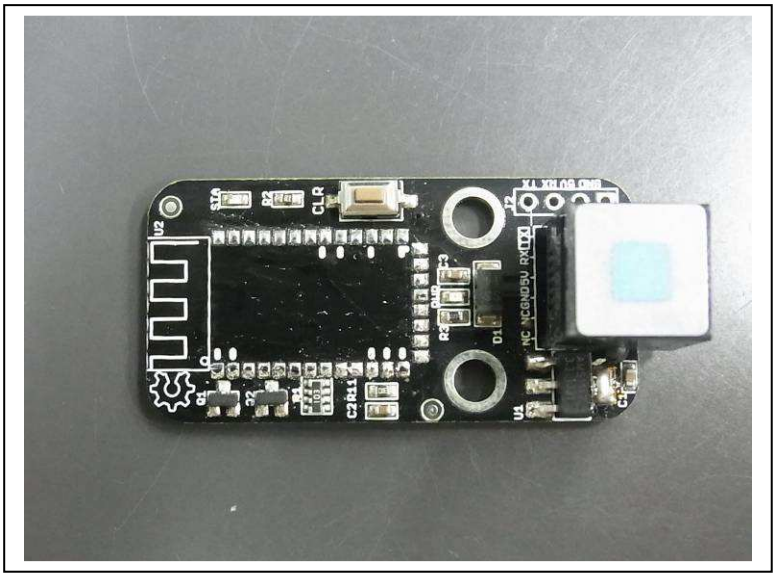
# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## A3. Photos of Internal Configurations




Internal Configuration 1



Internal Configuration 2

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002



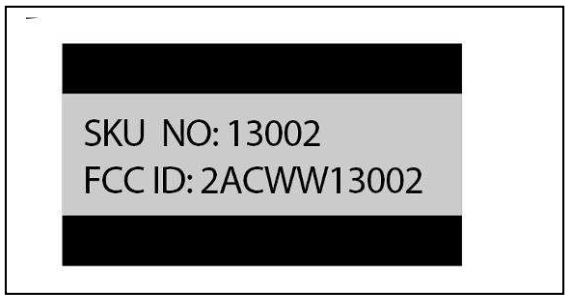
CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## A4. ID Label / Location


ID Label 1




ID Label2

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew



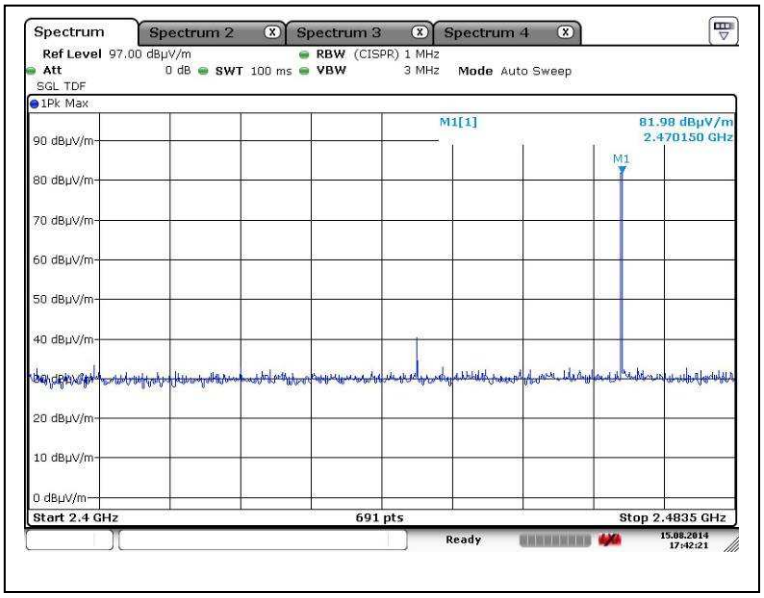


CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

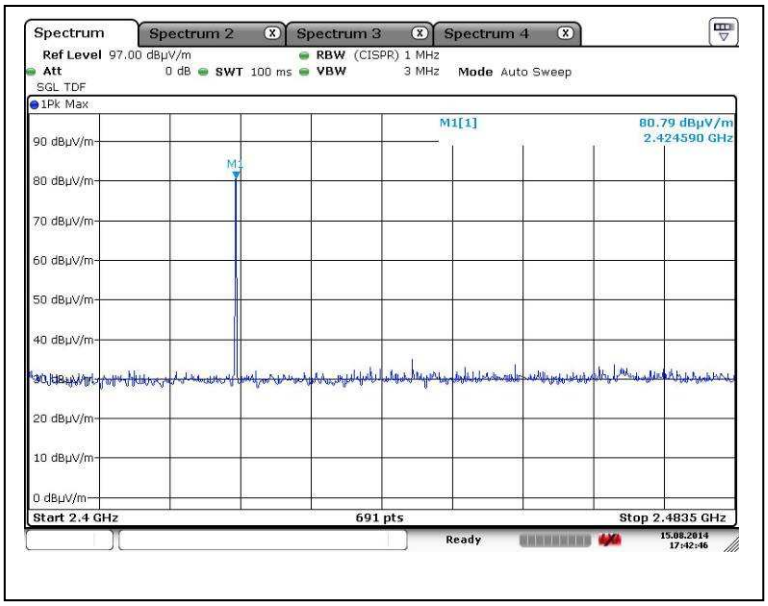
# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## A5. Hopping sequence




1st example of fundamental frequency




2nd example of fundamental frequency

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002

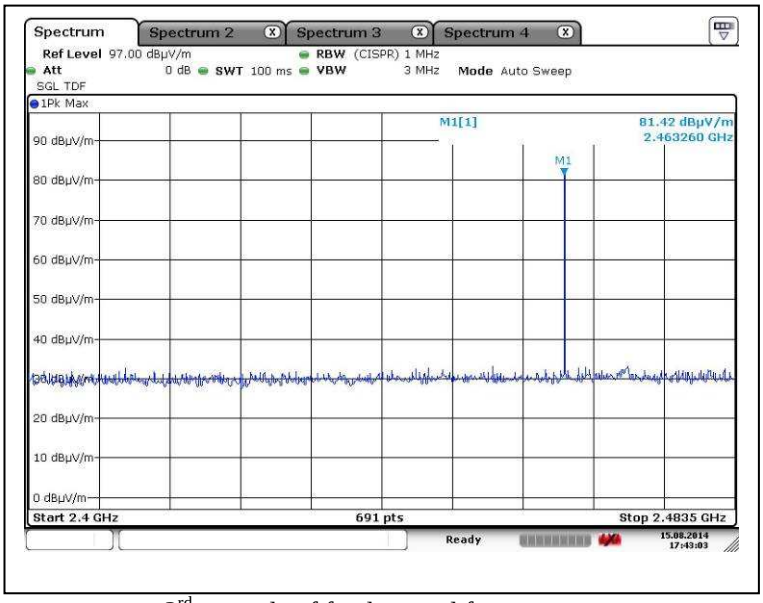


CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

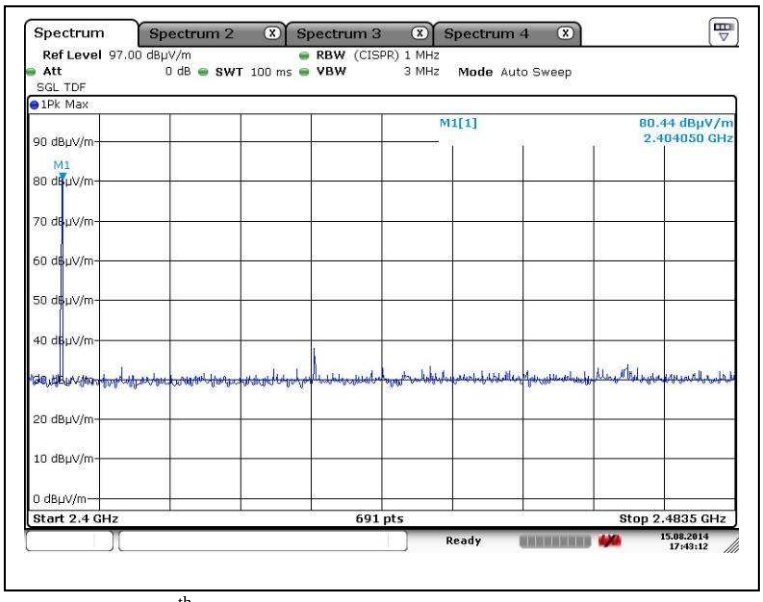
# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## A5. Hopping sequence




3rd example of fundamental frequency




4th example of fundamental frequency

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002



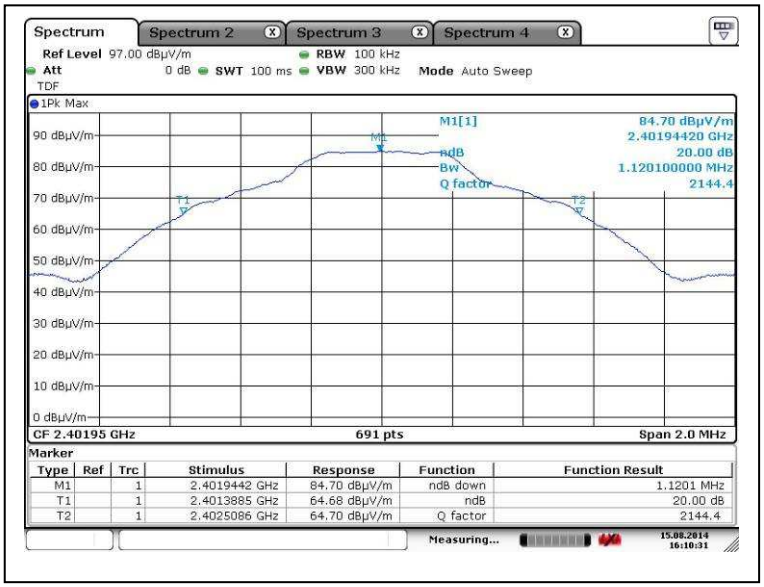
CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

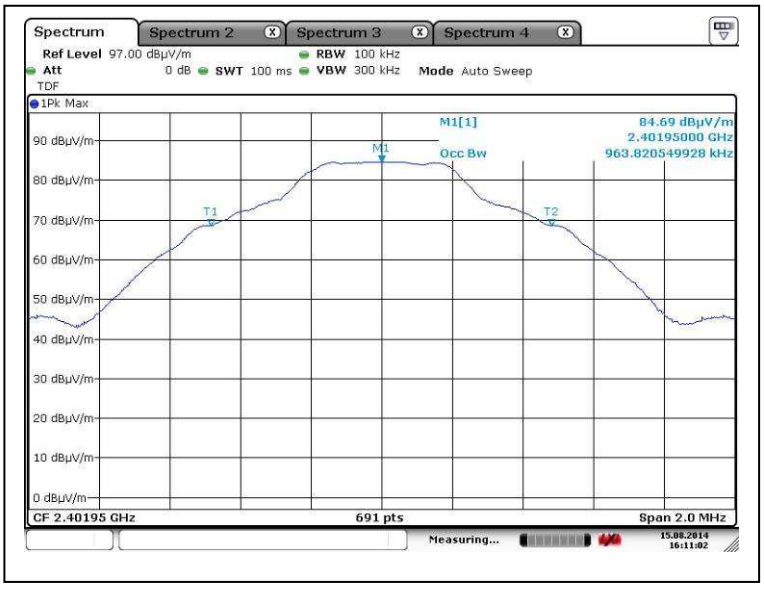
Report No. : AS0049260(0) Date : 18 Aug 2014

## A6. 20 dB bandwidth and 99% bandwidth

Channel: CH00




20 dB bandwidth




99% bandwidth

Tested by: Reviewed by:

Mr. LEUNG Shu-kan, Ken Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002



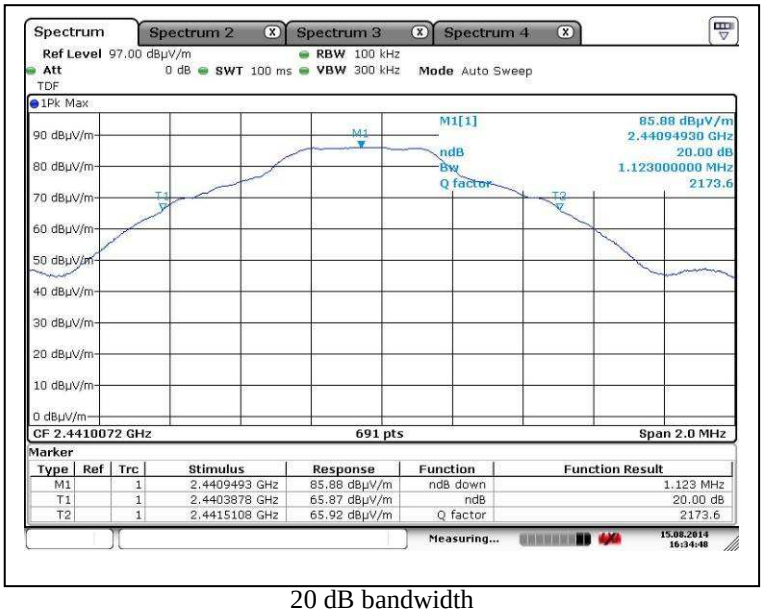
CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

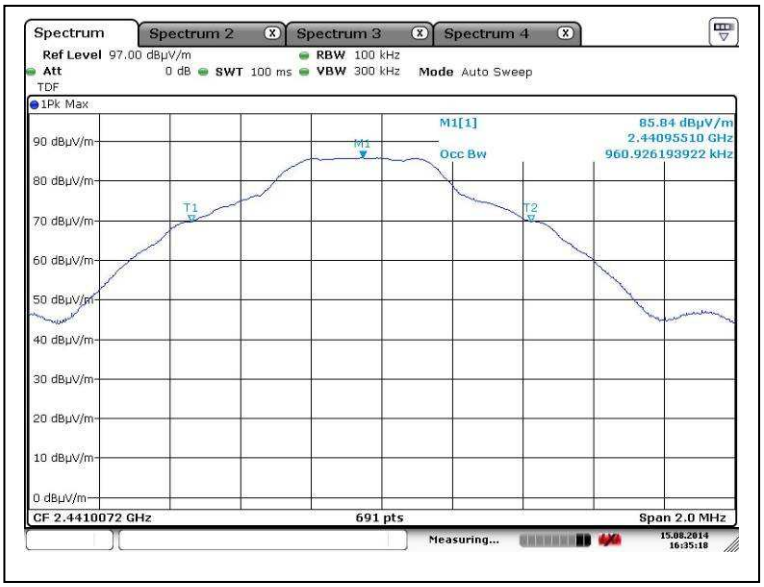
Report No. : AS0049260(0) Date : 18 Aug 2014

## A6. 20 dB bandwidth and 99% bandwidth

Channel: CH39




20 dB bandwidth




99% bandwidth

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002



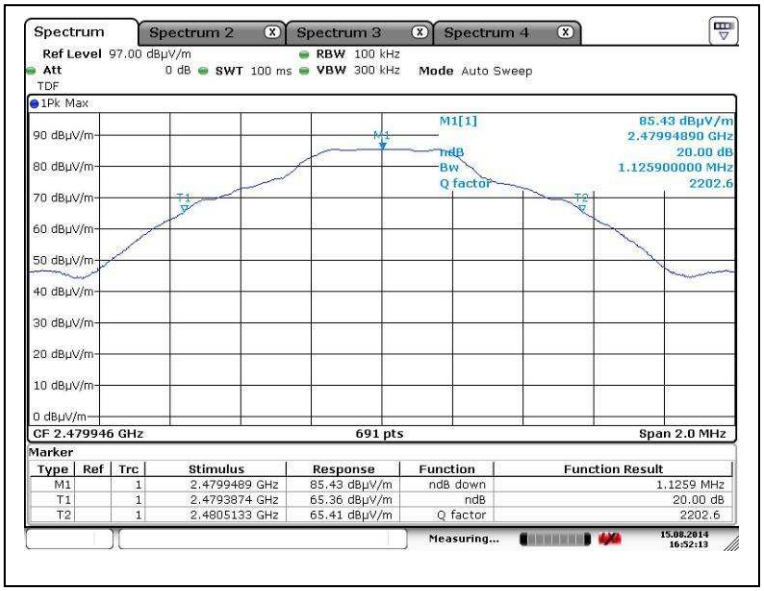
CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

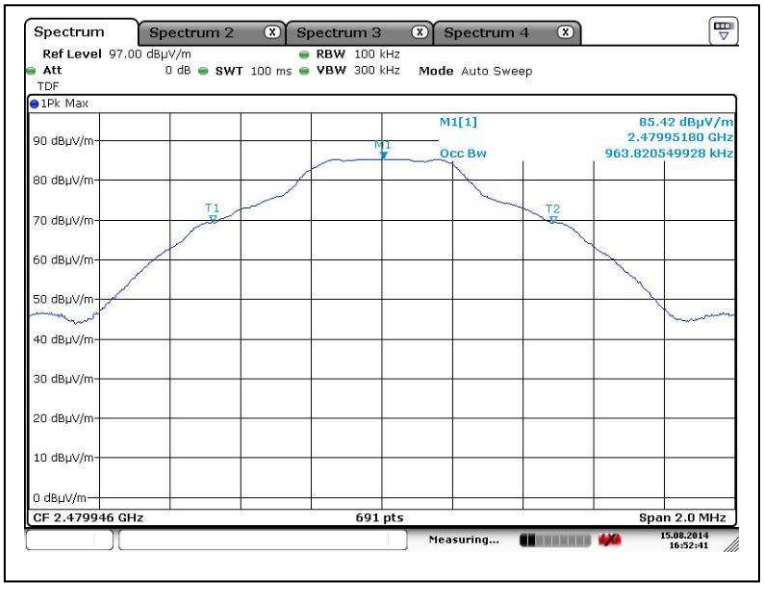
Report No. : AS0049260(0) Date : 18 Aug 2014

## A6. 20 dB bandwidth and 99% bandwidth

Channel: CH78




20 dB bandwidth




99% bandwidth

Tested by: Reviewed by:

Mr. LEUNG Shu-kan, Ken Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002

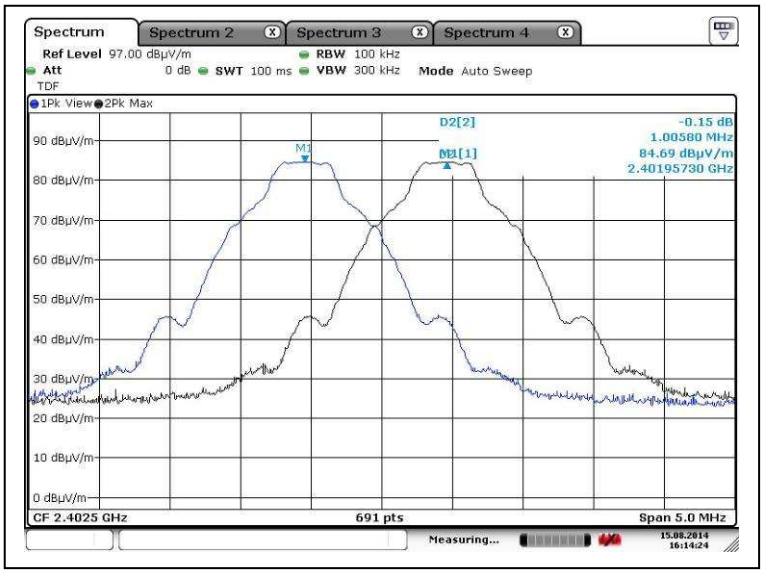


CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

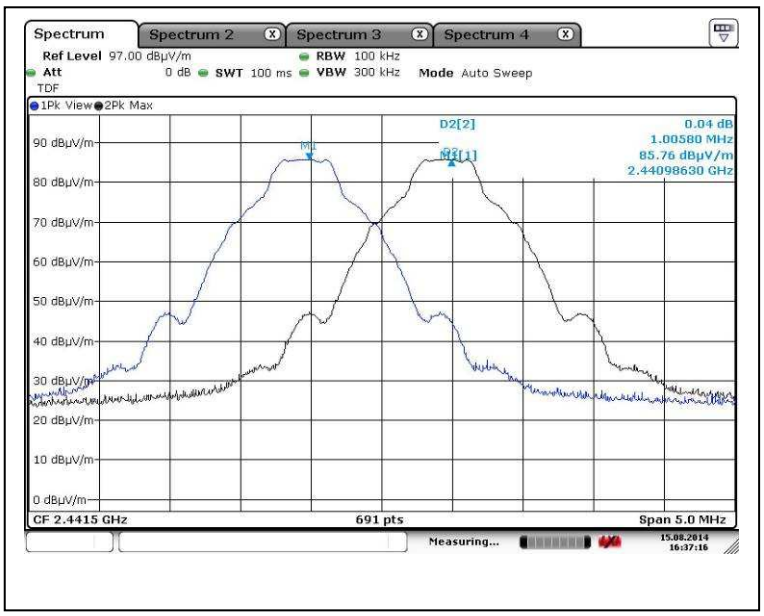
# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## A7. Bluetooth Channel Spacing




CH00-CH01




CH39-CH40

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002

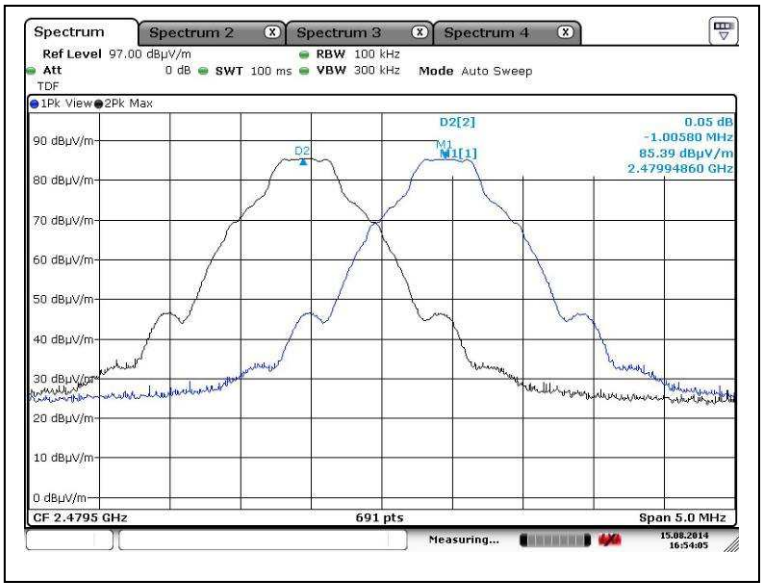


CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## A7. Bluetooth Channel Spacing




CH77-CH78

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002

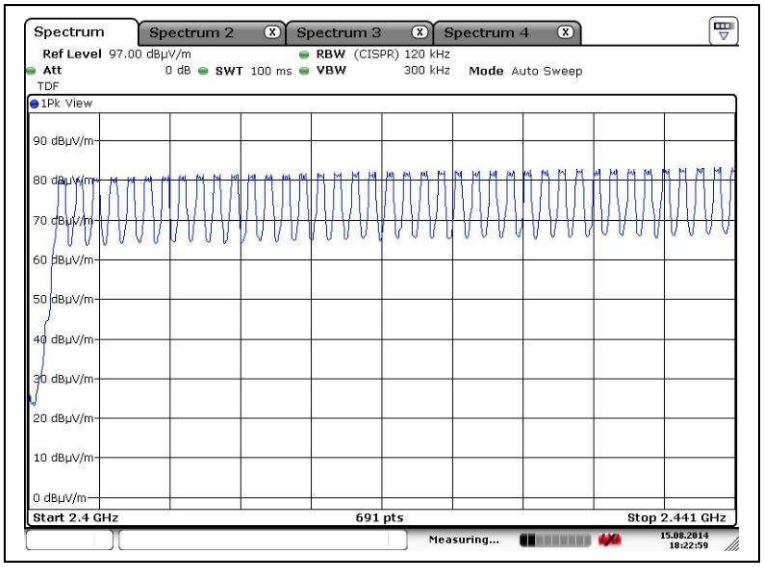


CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

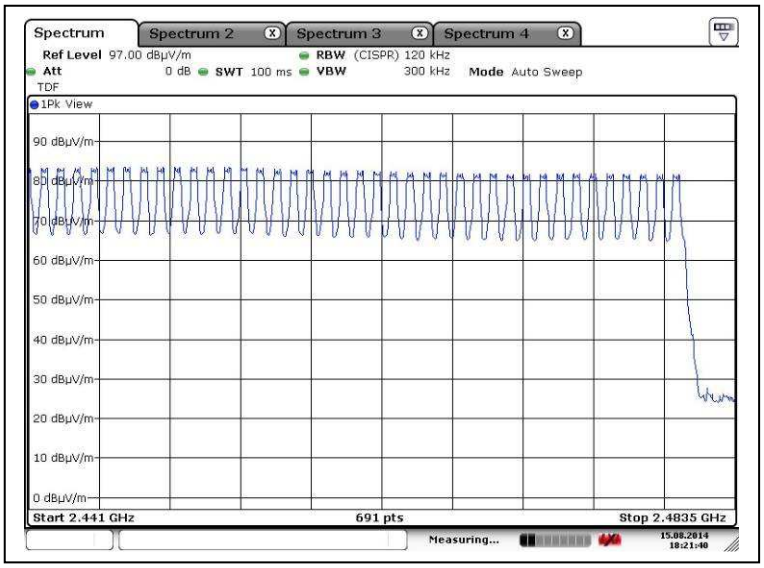
# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## A8. Bluetooth Hopping Channel




CH00-CH39




CH39-CH78

Tested by: Reviewed by:

Mr. LEUNG Shu-kan, Ken Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002

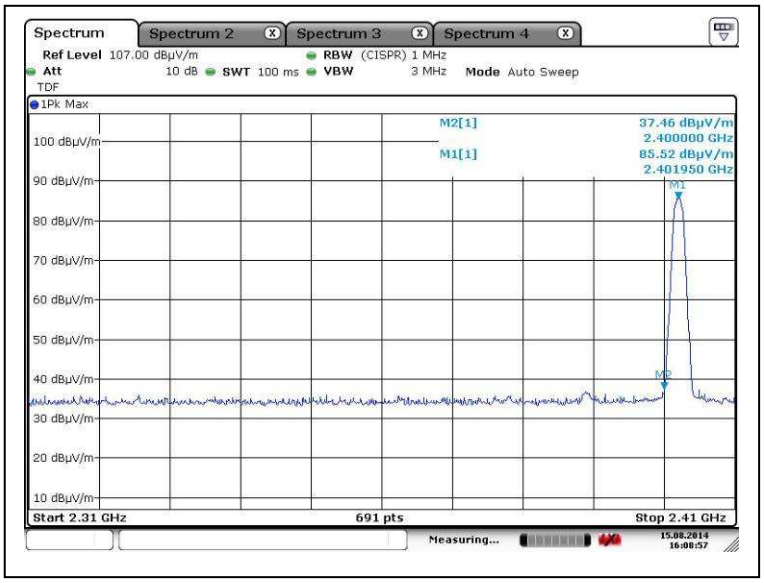


CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

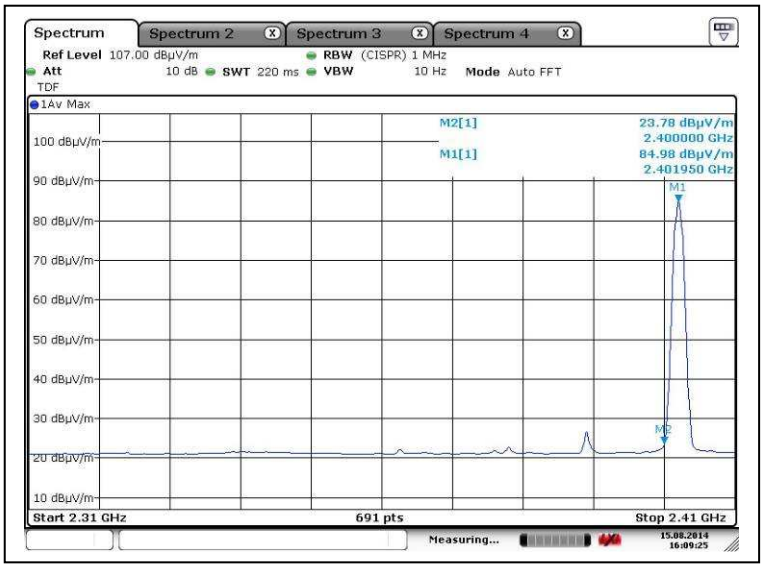
# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## A9. Bluetooth Band Edge




Lower channel (Peak measurement)




Lower channel (Average measurement)

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002

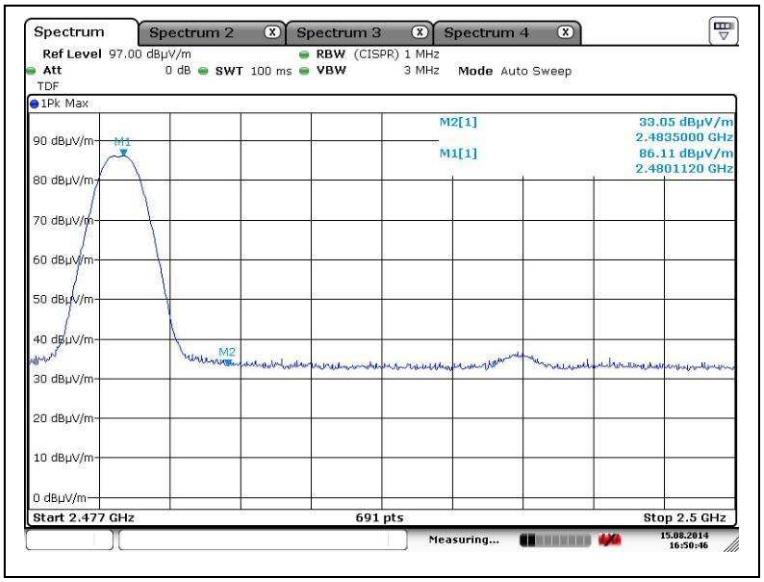


CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

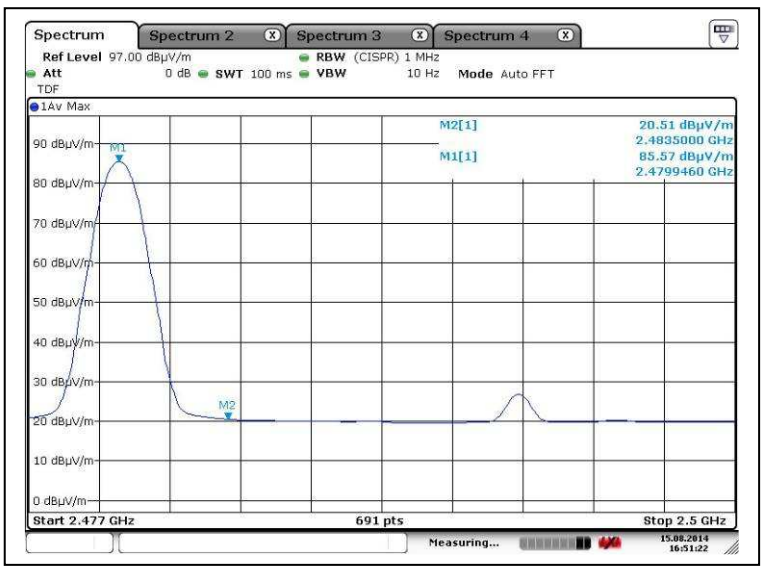
# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## A9. Bluetooth Band Edge




Higher channel (Peak measurement)




Higher channel (Average measurement)

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002



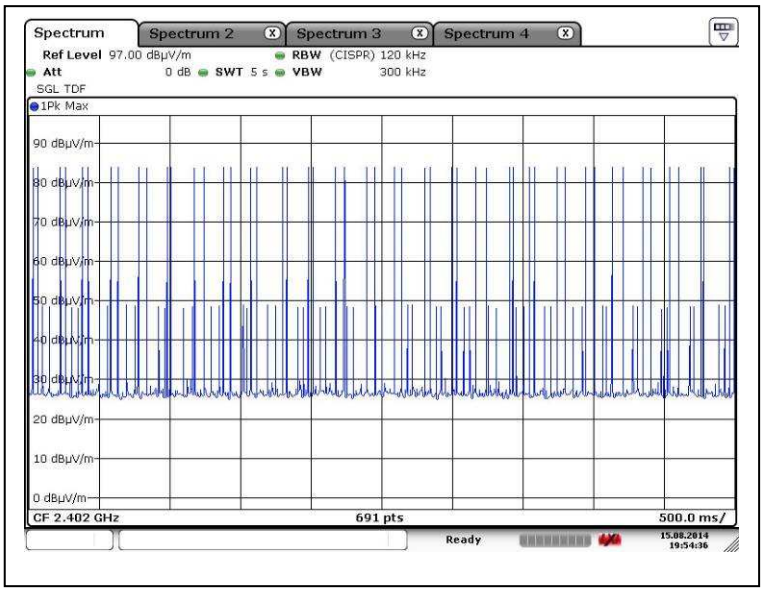
CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

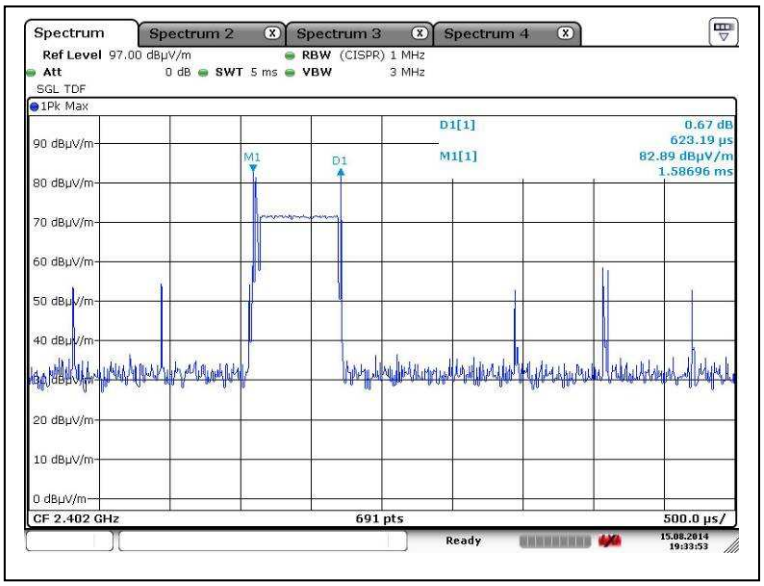
# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## A10. Bluetooth Average On Time

Packet: DH1
Channel: CH00




Tested by: Reviewed by:

Mr. LEUNG Shu-kan, Ken Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002



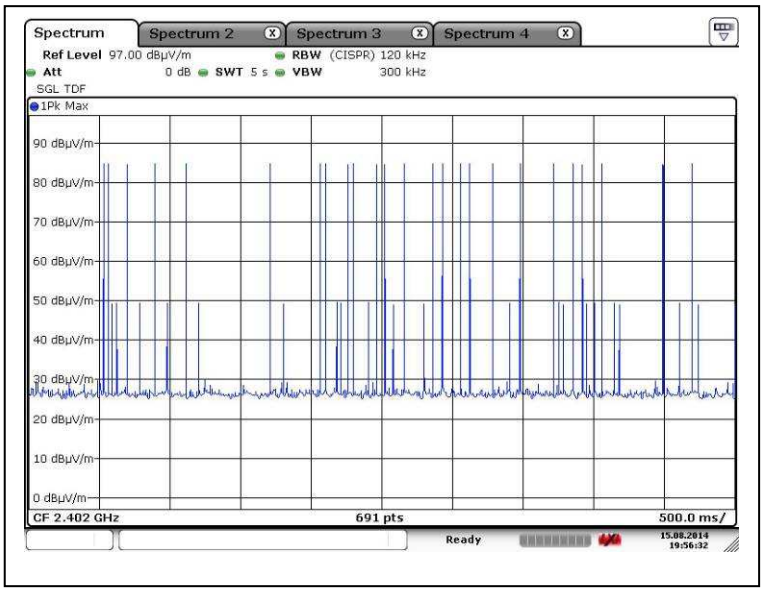
CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

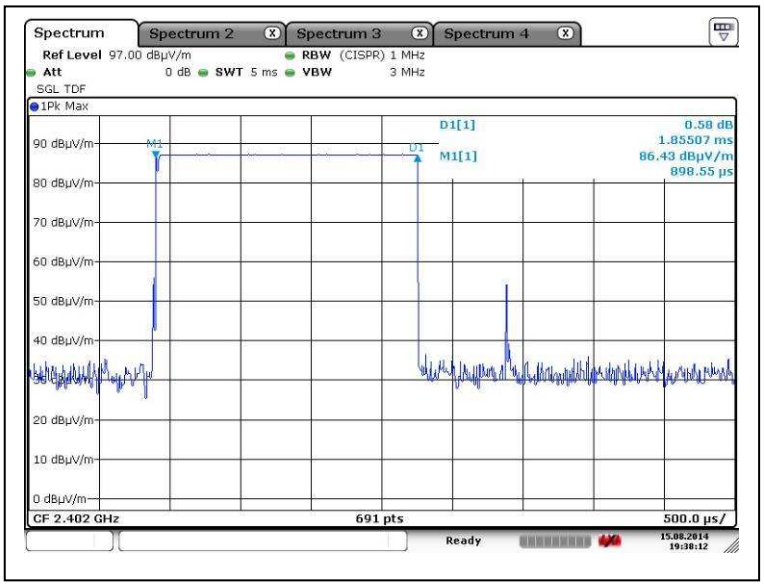
# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## A10. Bluetooth Average On Time

Packet: DH3
Channel: CH00




Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002



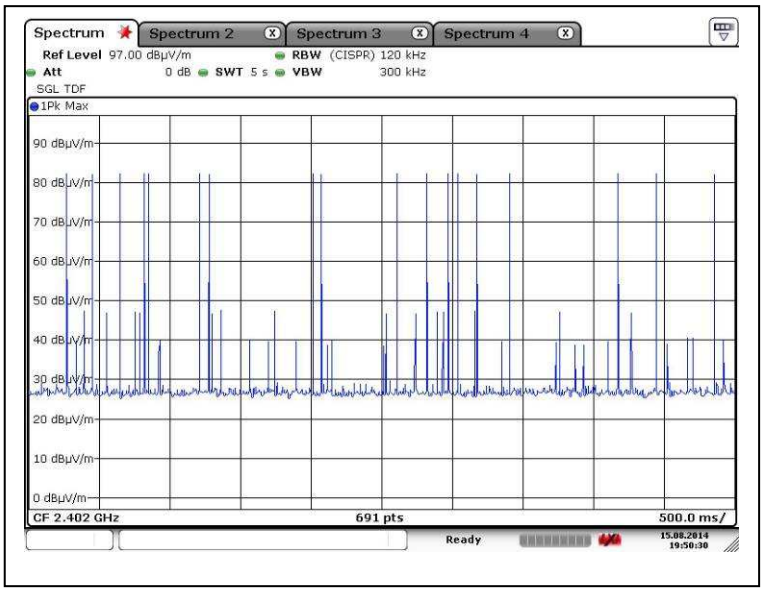
CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

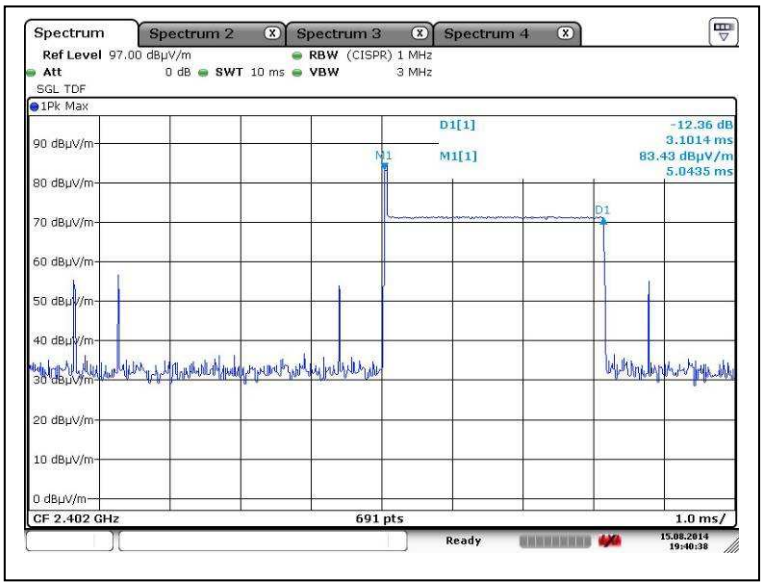
# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## A10. Bluetooth Average On Time

Packet: DH5
Channel: CH00




Tested by: Reviewed by:

Mr. LEUNG Shu-kan, Ken Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002



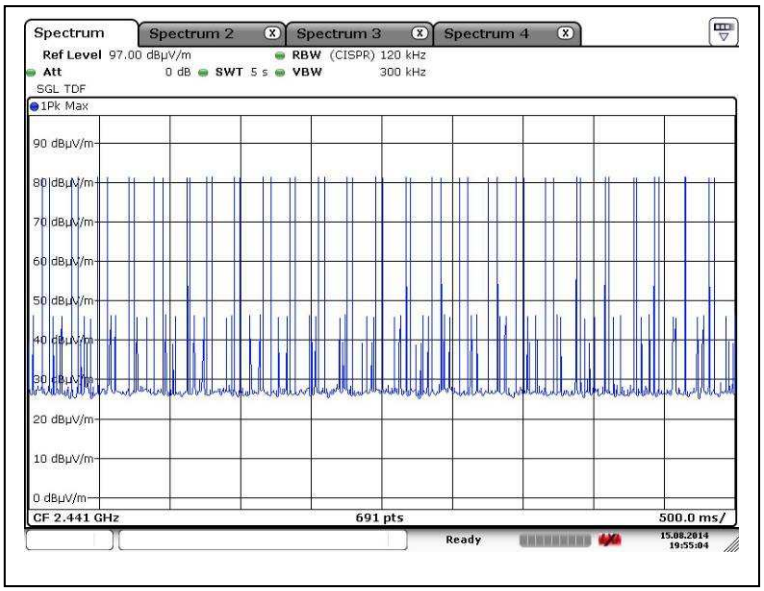
CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

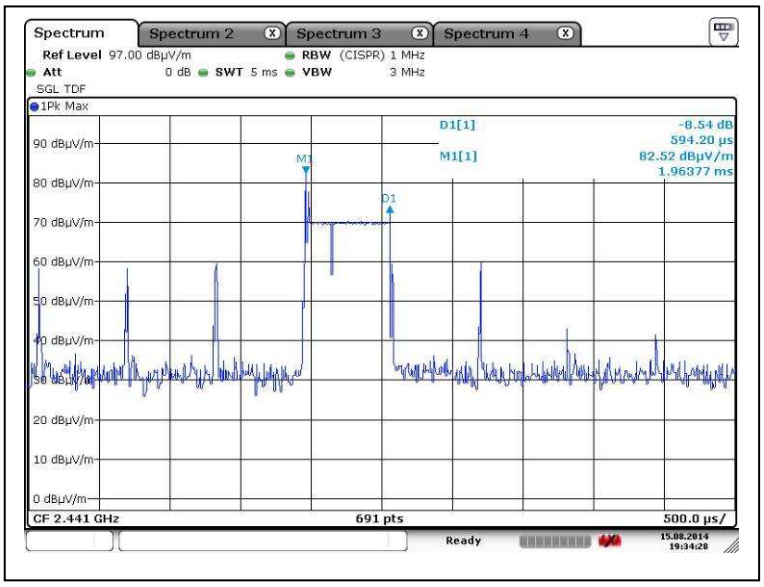
# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## A10. Bluetooth Average On Time

Packet: DH1
Channel: CH39




Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002



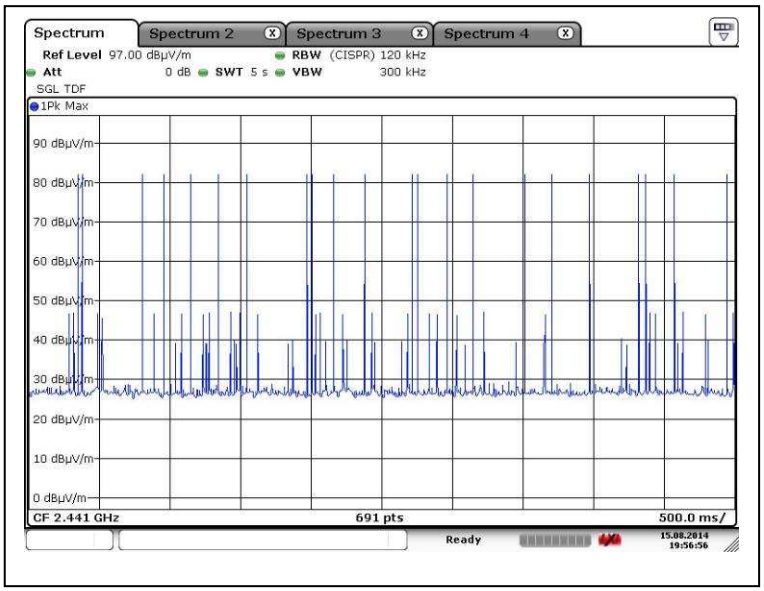
CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

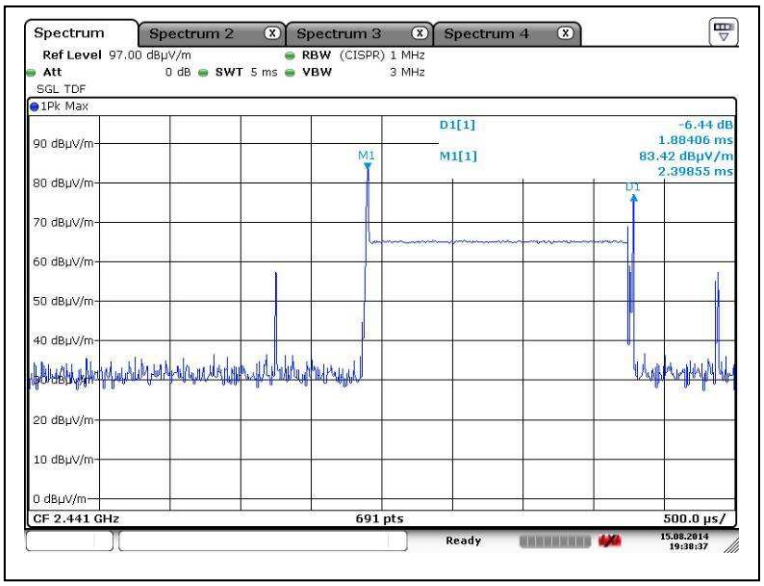
# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## A10. Bluetooth Average On Time

Packet: DH3
Channel: CH39




Tested by: Reviewed by:

Mr. LEUNG Shu-kan, Ken Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002



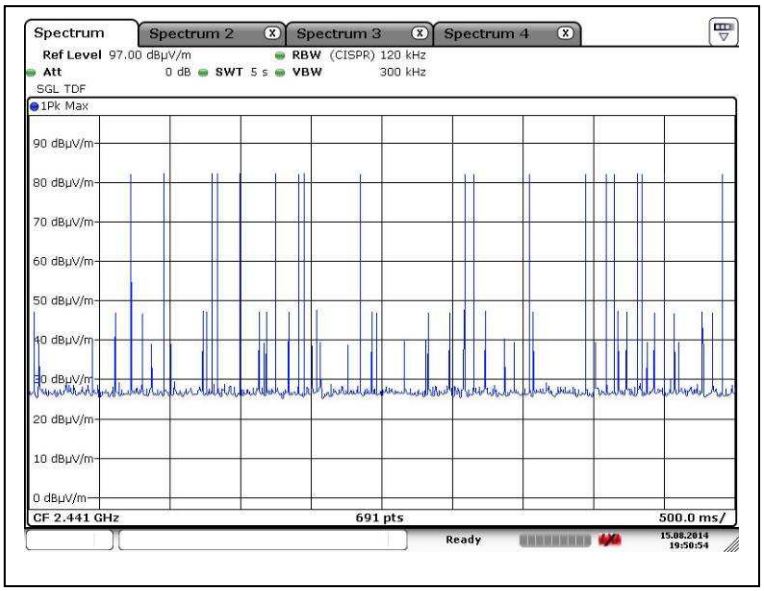
CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

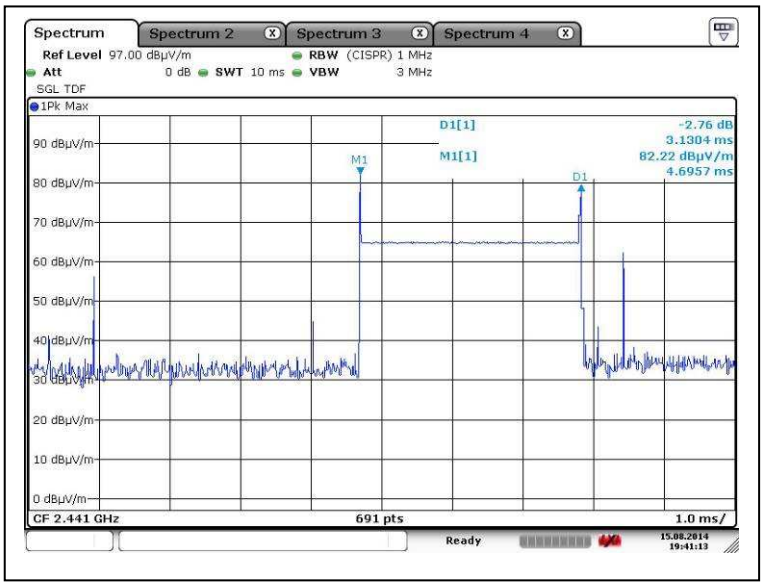
# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## A10. Bluetooth Average On Time

Packet: DH5
Channel: CH39




Tested by: Reviewed by:

Mr. LEUNG Shu-kan, Ken Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002



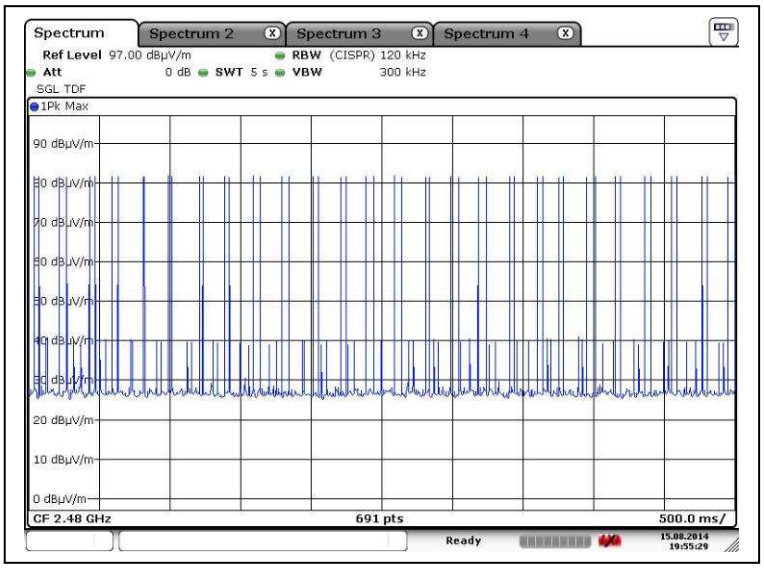
CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

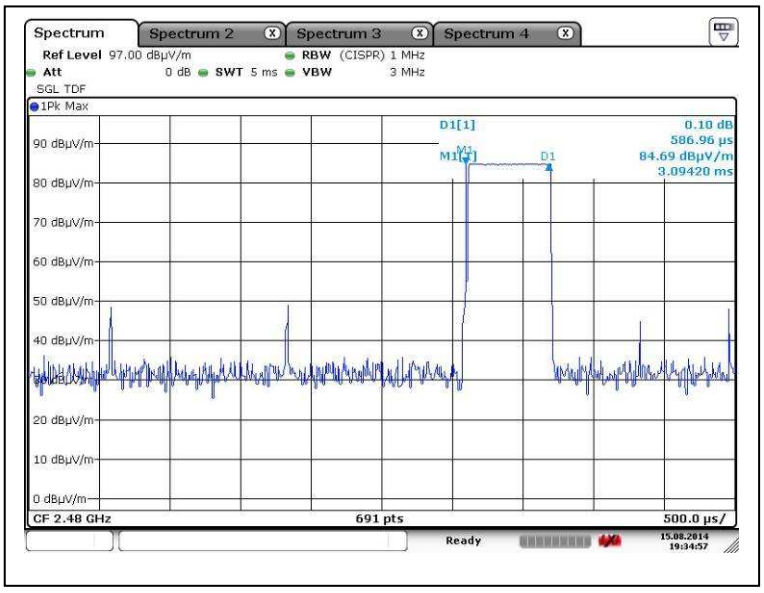
# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## A10. Bluetooth Average On Time

Packet: DH1
Channel: CH78




Tested by: Reviewed by:

Mr. LEUNG Shu-kan, Ken Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002



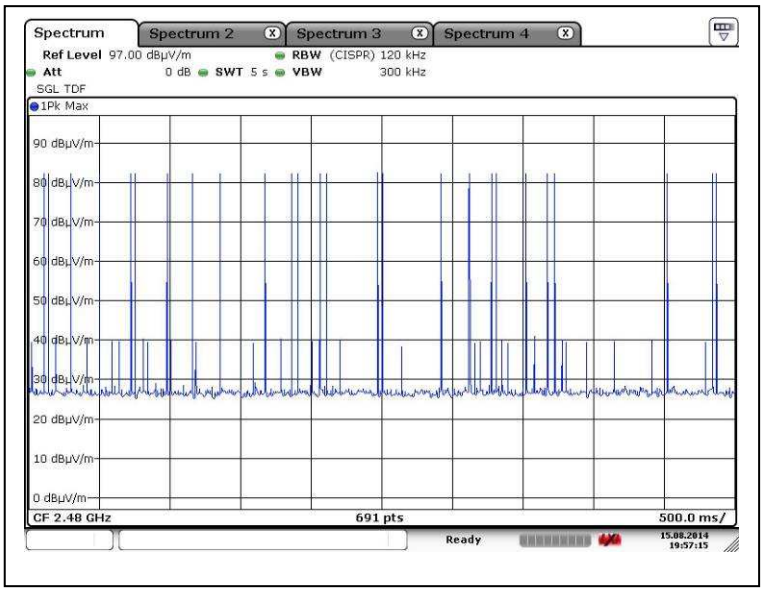
CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

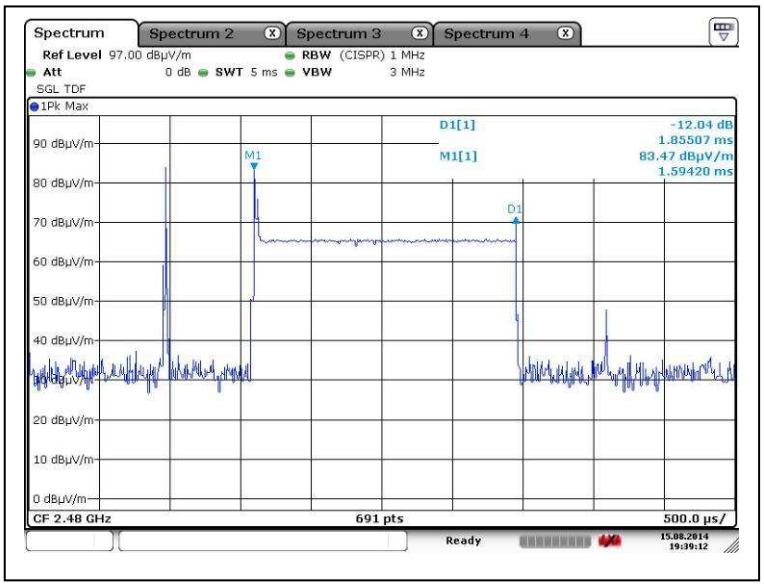
# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## A10. Bluetooth Average On Time

Packet: DH3
Channel: CH78




Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002



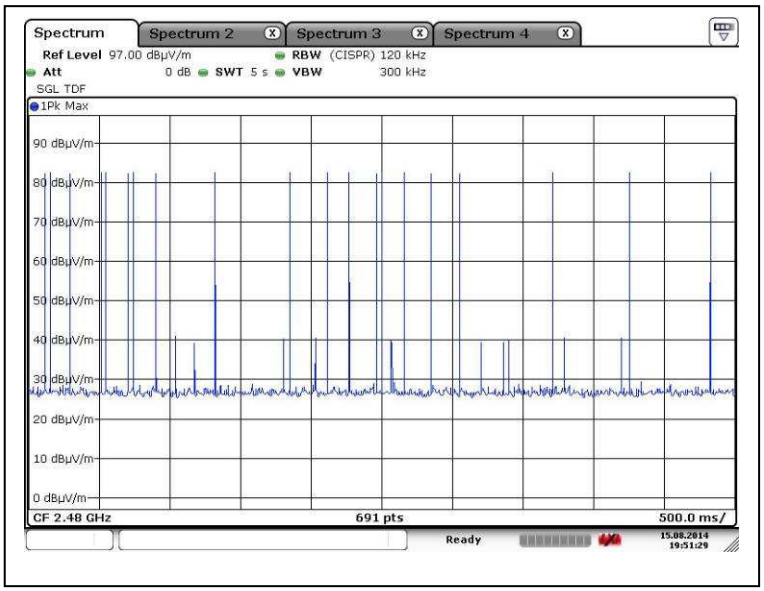
CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

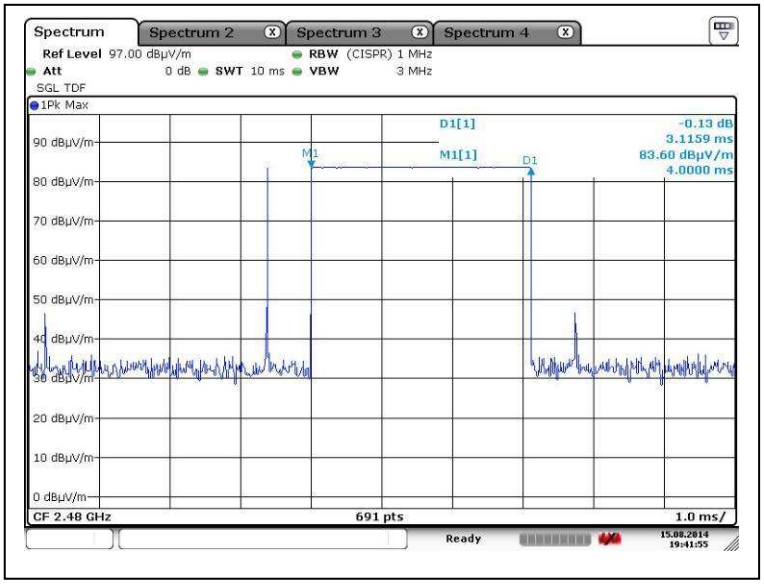
# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## A10. Bluetooth Average On Time

Packet: DH5
Channel: CH78




Tested by: Reviewed by:

Mr. LEUNG Shu-kan, Ken Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002



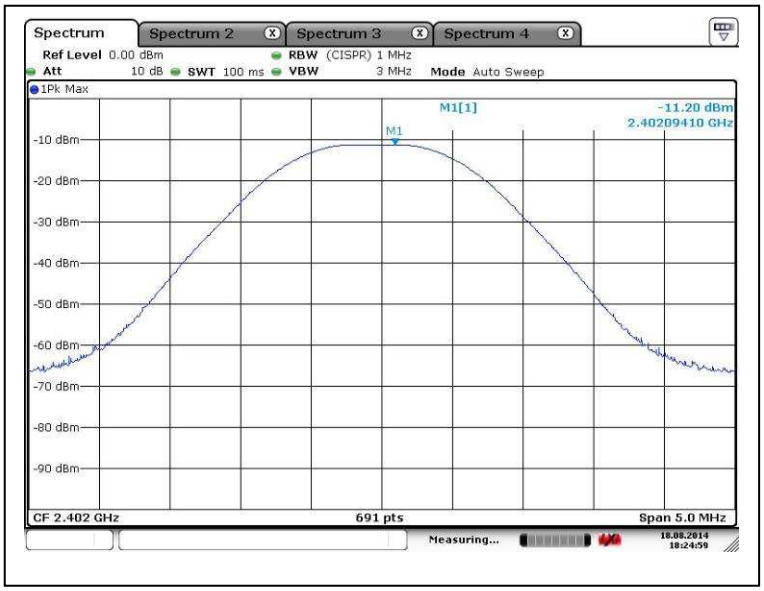
CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

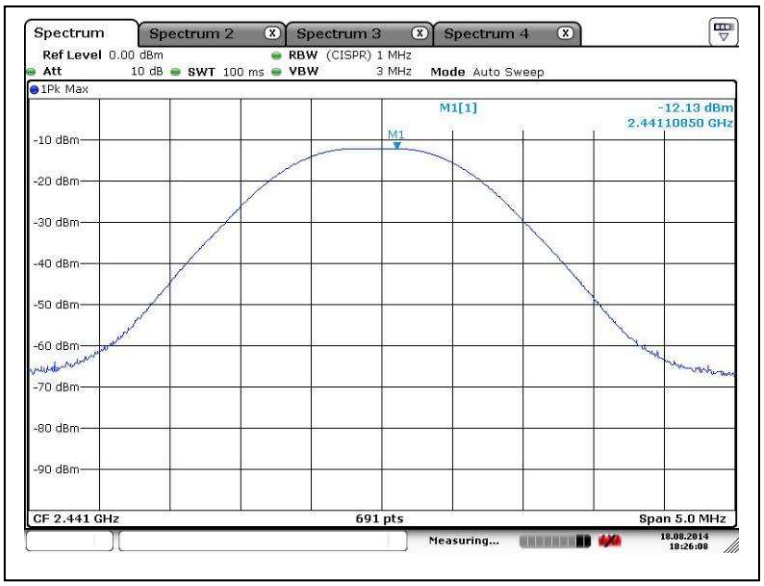
Report No. : AS0049260(0) Date : 18 Aug 2014

## A11. Transmission Power

Channel: CH00




Channel: CH39




Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002



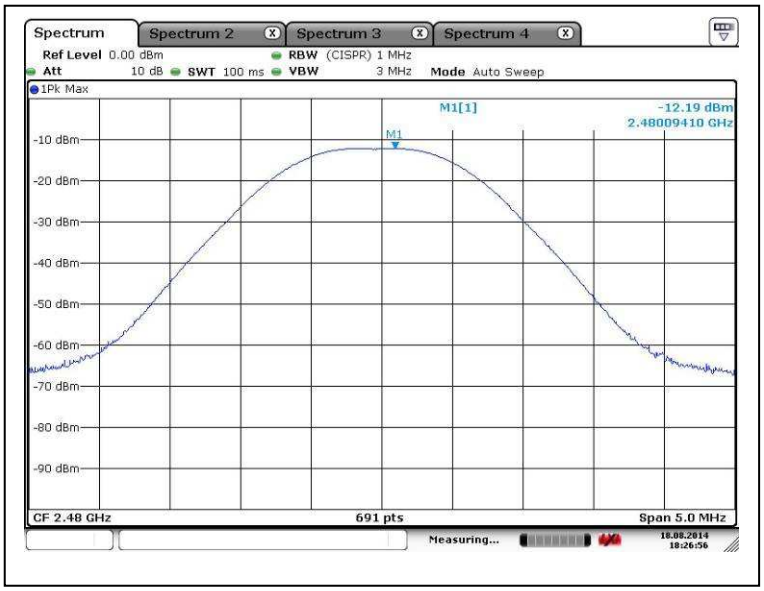
CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com

# TEST REPORT

Report No. : AS0049260(0) Date : 18 Aug 2014

## A11. Transmission Power

Channel: CH78




***** End of Report *****

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew



FCC ID: 2ACWW13002



CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
Tel: (852) 2698 8198 Fax: (852) 2695 4177 E-mail: info@cmatcl.com Web Site: http://www.cmatcl.com