



CMA Testing and Certification Laboratories

廠商會檢定中心

TEST REPORT

Report No. : AS0051793(3)

Date : 28 Aug 2014

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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.

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
Frequency range : 2402MHz – 2480MHz
Number of channel : 40 channels
Output power : -2.99dBm

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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,
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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	1 Year
Spectrum Analyzer	R&S	FSV40	100964	17 Dec 2014	1 Year
Broadband Antenna	Schaffner	CBL6112B	2718	06 Jan 2015	1 Year
Loop Antenna	EMCO	6502	00056620	28 Oct 2015	1 Year
Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-531	09 Oct 2014	1 Year
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170442	17 Jun 2015	2 Years
Broadband Pre-Amplifier	Schwarzbeck	BBV 9718	9718-119	09 Oct 2014	1 Year
Broadband Pre-Amplifier	Schwarzbeck	BBV 9719	9719-010	17 Jun 2015	2 Years
Coaxial Cable	Schaffner	RG 213/U	N/A	06 Jan 2015	1 Year
Coaxial Cable	Suhner	RG 214/U	N/A	06 Jan 2015	1 Year
Coaxial Cable	Suhner	Sucoflex_102	N/A	09 Oct 2014	1 Year



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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



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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.

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 to determine which attitude and configuration produce the highest emission during measurement for Radiated Emission measurement.



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2.2 Test Result

Summary

Section in FCC part 15	Description	Result
15.205(a), 15.209, 15.249(a)	Transmitter radiated spurious field strength and other emissions	Page 9
15.209	Receiver emissions	Page 10
15.215	20dB bandwidth	Page 23, 24
15.209, 15.249(d)	Band Edge	Page 25, 26

Subpart C

Peak Detector data were measured unless otherwise stated.

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

The frequencies from fundamental up to that tenth harmonics 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.

Subpart B

The emissions meeting 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 20 dB below limited were not reported. Thus, those higher emissions were presented on next page (section 2.3).

It was found that the EUT meet the FCC requirement.



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2.3 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

Frequency (MHz)	Polarity (H/V)	Reading at 3m (dB μ V)	Transducer Factor (dB/m)	Field Strength at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
2401.707	V	82.3	- 6.3	76.0	114.0	- 38.0
#4803.460	V	51.0	2.4	53.4	74.0	- 20.6
#4803.481	H	50.0	2.4	52.4	74.0	- 21.6
7205.830	V	31.3	10.8	42.1	74.0	- 31.9

2440.191	V	83.8	- 6.3	77.5	114.0	- 36.5
#4879.435	V	50.6	2.4	53.0	74.0	- 21.0
#4879.456	H	49.7	2.4	52.1	74.0	- 21.9
#7320.650	H	32.1	10.8	42.9	74.0	- 31.1

2480.202	V	85.0	- 6.3	78.7	114.0	- 35.3
#4959.390	V	51.0	2.4	53.4	74.0	- 20.6
#4959.415	H	40.7	2.4	53.1	74.0	- 30.9
#7440.405	V	36.2	10.8	47.0	74.0	- 27.0

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.

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2.3 Radiated Emission Measurement Data (Con't)

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: Quasi-peak, RBW: 120KHz, VBW: 300KHz

Testing frequency range: 9kHz to 25GHz

Frequency (MHz)	Polarity (H/V)	Reading at 3m (dB μ V)	Antenna Factor and Cable Loss (dB/m)	Field Strength at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
97.453	H	23.4	9.7	33.1	43.5	- 10.4
97.477	V	27.9	9.7	37.6	43.5	- 5.9
102.437	H	21.0	12.2	33.2	43.5	- 10.3
120.787	V	19.4	14.4	33.8	43.5	- 9.7
162.511	V	27.0	11.9	38.9	43.5	- 4.6
227.613	H	22.3	11.8	34.1	46.0	- 11.9
292.309	H	22.5	15.4	37.9	46.0	- 8.1

Remark: Other emissions more than 20dB below the limit are not reported.

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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

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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.

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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 20dB Bandwidth

Requirements

According to 15.215(c):

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission,

Test Procedure

The 20dB bandwidth compliance of RF radiated emission should be measured by following the guidance in ANSI C63.4 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW to 100kHz and VBW to 300kHz to measure the peak field strength.

Limit

The 20dB Bandwidth Frequency shall be lie on 2400-2483.5MHz.

Result

The plot saved in TestRpt2.pdf shows the fundamental emission is confined in the specified band. It shows the 20dB bandwidth met the 15.215 requirement for frequency band 2400 to 2483.5 MHz.

5.2 Bandedge

Requirements

According to 15.249(d)

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission

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limits in § 15.209, whichever is the lesser attenuation.

Test Procedure

The band edge compliance of RF radiated emission should be measured by following the guidance in ANSI C63.4 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW to 1MHz and VBW to 3MHz to measure the peak field strength and set RBW to 1MHz and VBW to 10 Hz to measure the average radiated field strength

Limit

The field strength at bandedgehall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

Result

The plot saved in TestRpt3.pdf shows the band edge is fulfil 15.209 requirement.

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6 Appendices

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A2	Photos of External Configurations	1	page
A3	Photos of Internal Configurations	1	page
A4	ID Label/Location	1	page
A5	Band Edge	2	pages
A6	20dB Bandwidth Plot	2	pages
A7	Transmission Power	2	pages

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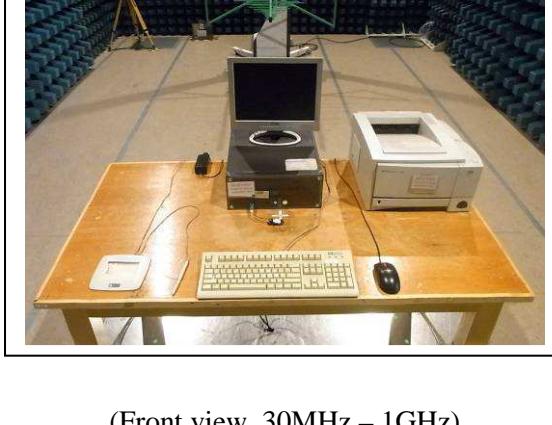
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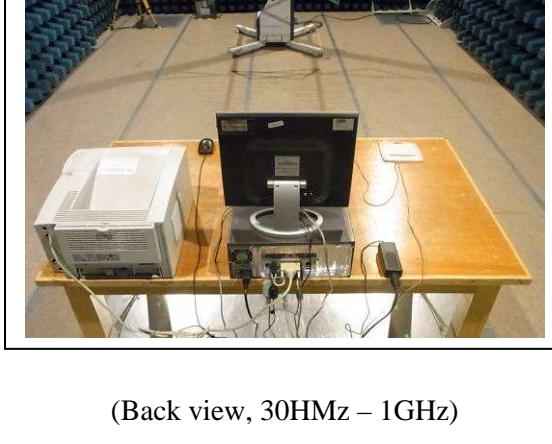
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A1. Photos of the set-up of Radiated Emissions



(Front view, 30MHz – 1GHz)



(Back view, 30MHz – 1GHz)

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Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew

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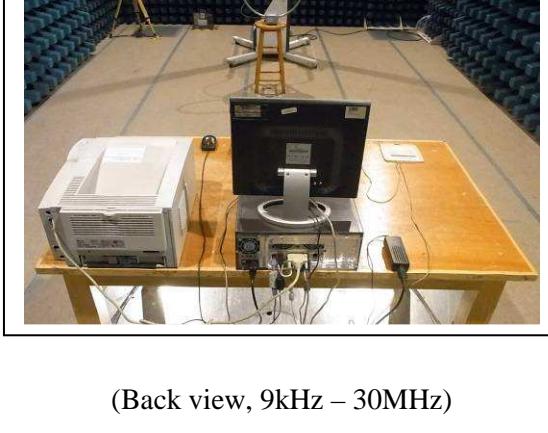
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A1. Photos of the set-up of Radiated Emissions



(Front view, 9kHz – 30MHz)



(Back view, 9kHz – 30MHz)

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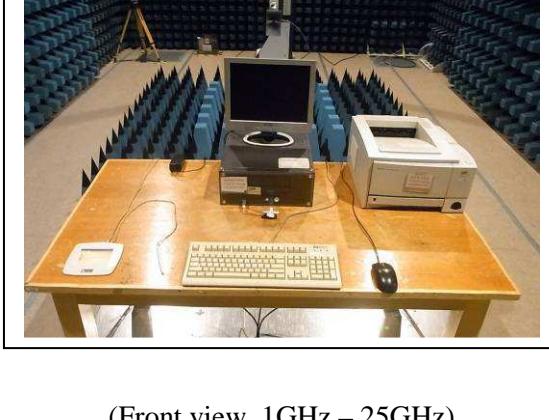
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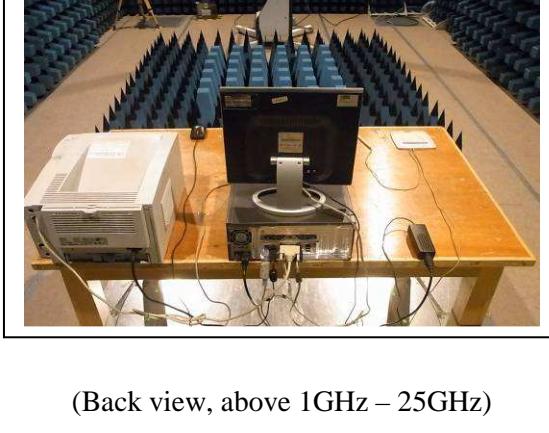
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A1. Photos of the set-up of Radiated Emissions



(Front view, 1GHz – 25GHz)



(Back view, above 1GHz – 25GHz)

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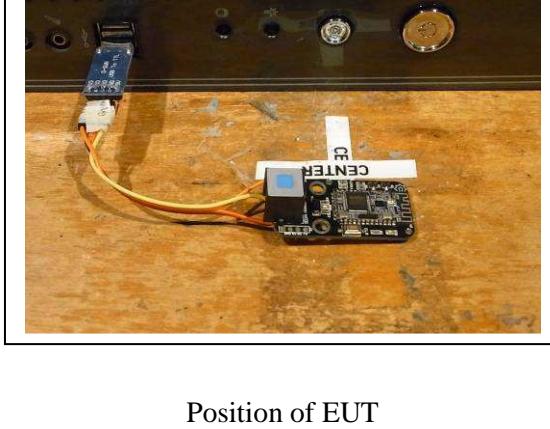
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A1. Photos of the set-up of Radiated Emissions



Position of EUT

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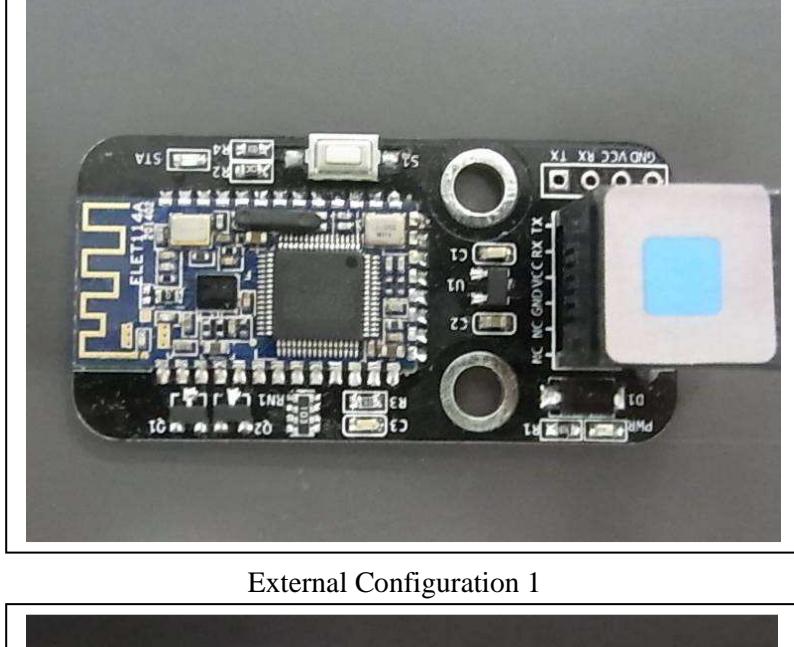
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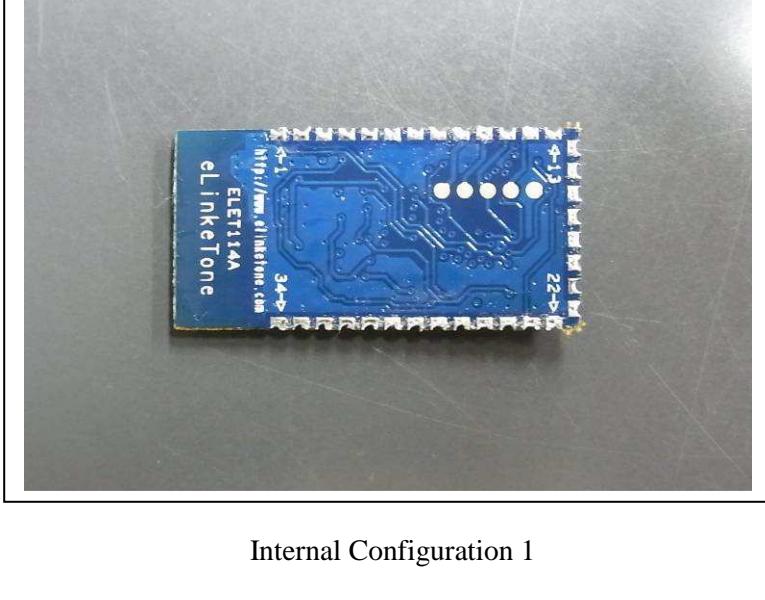
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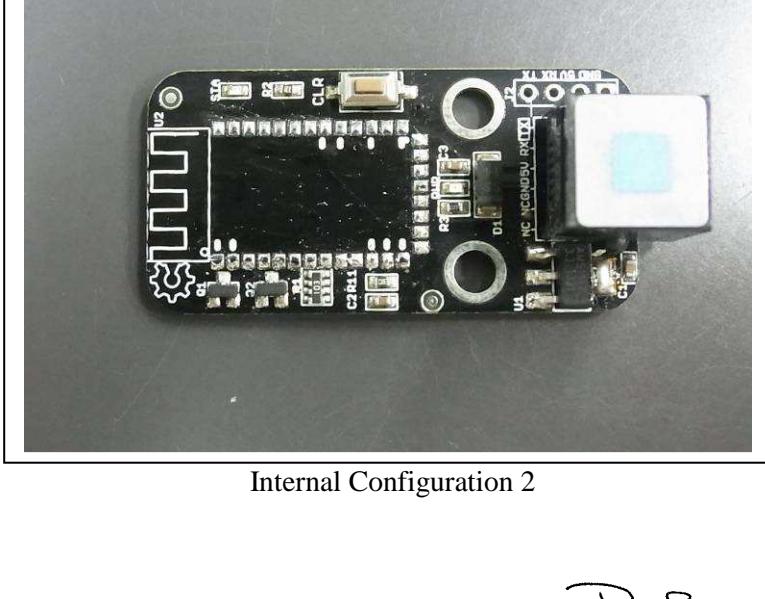
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A3. Photos of Internal Configurations



Internal Configuration 1



Internal Configuration 2

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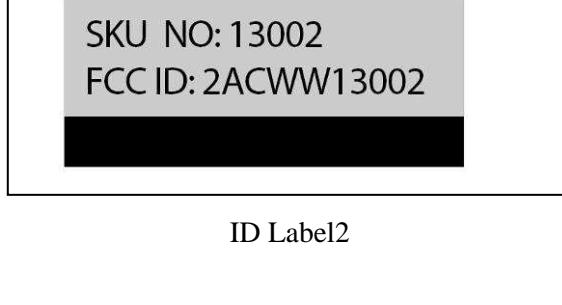
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A4. ID Label / Location



ID Label 1



ID Label2

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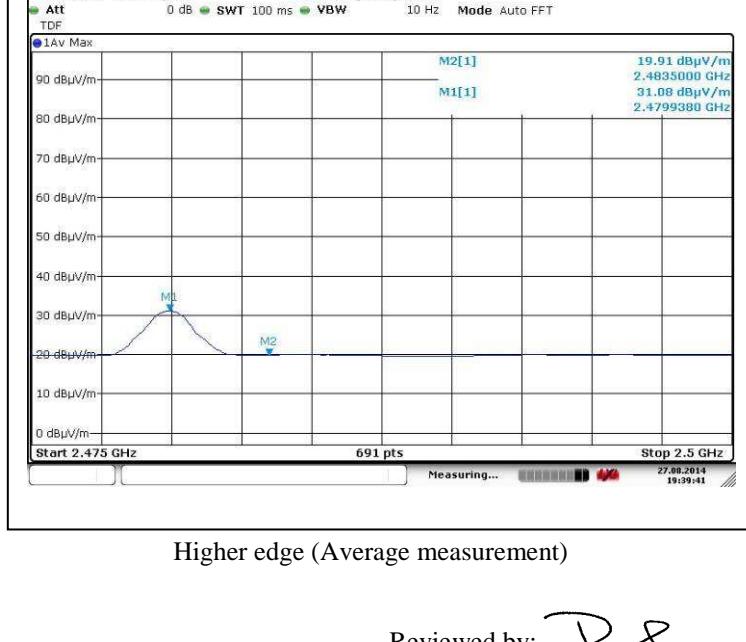
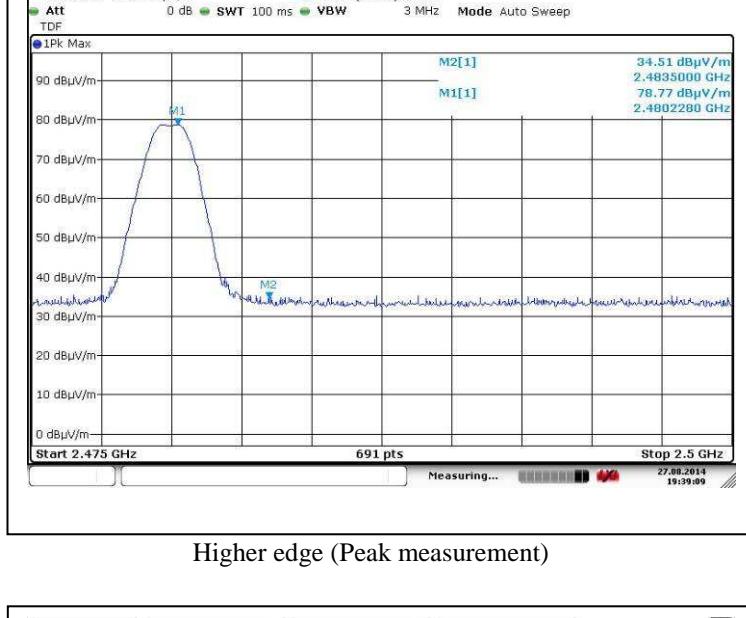
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A5. Band Edge



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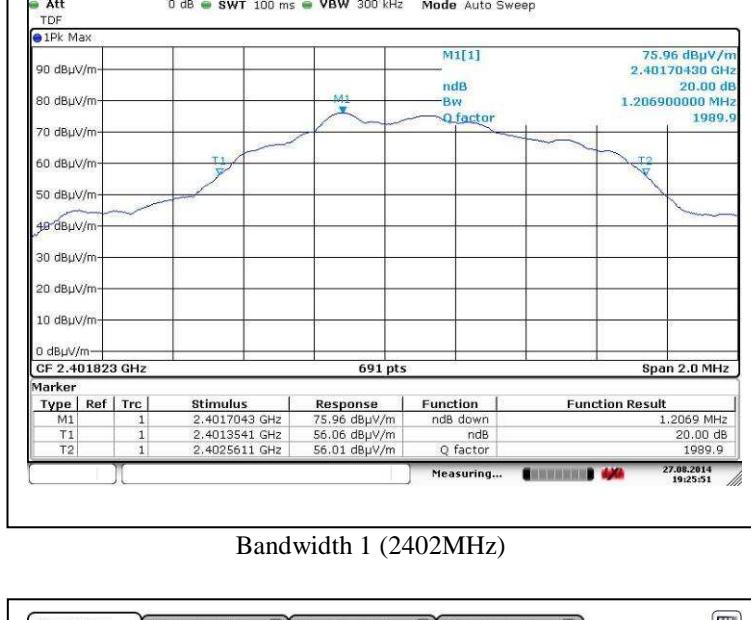
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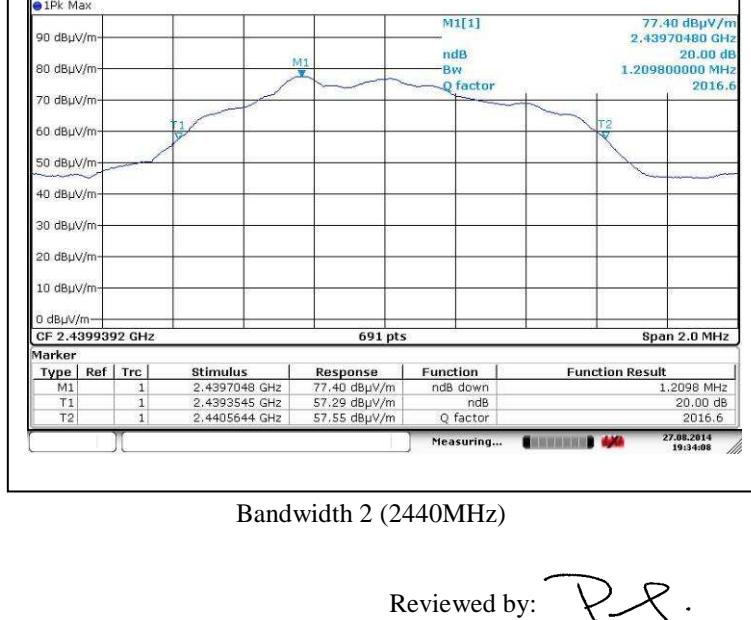
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A6. 20dB Bandwidth Plot



Bandwidth 1 (2402MHz)



Bandwidth 2 (2440MHz)

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Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew

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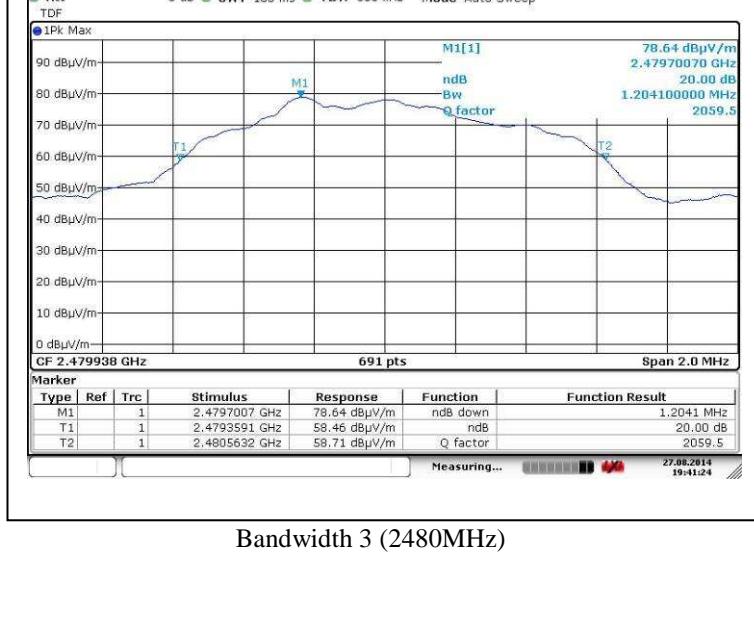
廠商會檢定中心

TEST REPORT

Report No. : AS0051793(3)

Date : 28 Aug 2014

A6. 20dB Bandwidth Plot



Bandwidth 3 (2480MHz)

Tested by:

Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew

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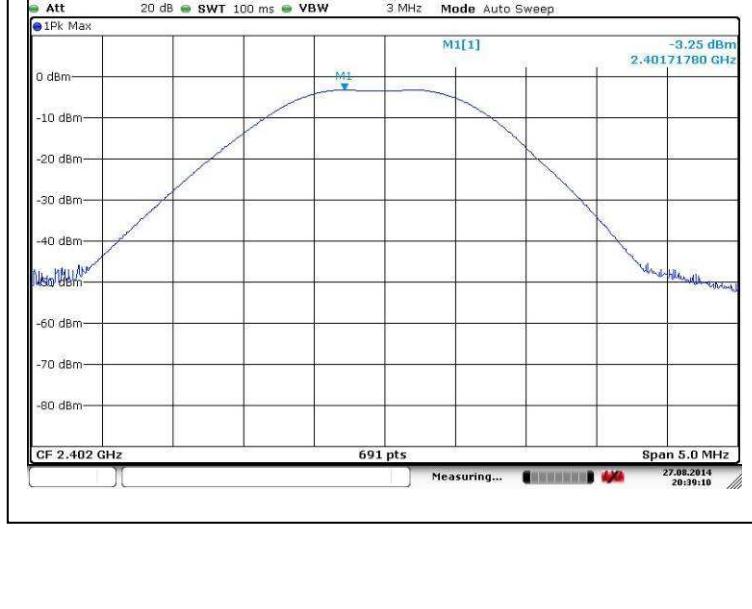
TEST REPORT

Report No. : AS0051793(3)

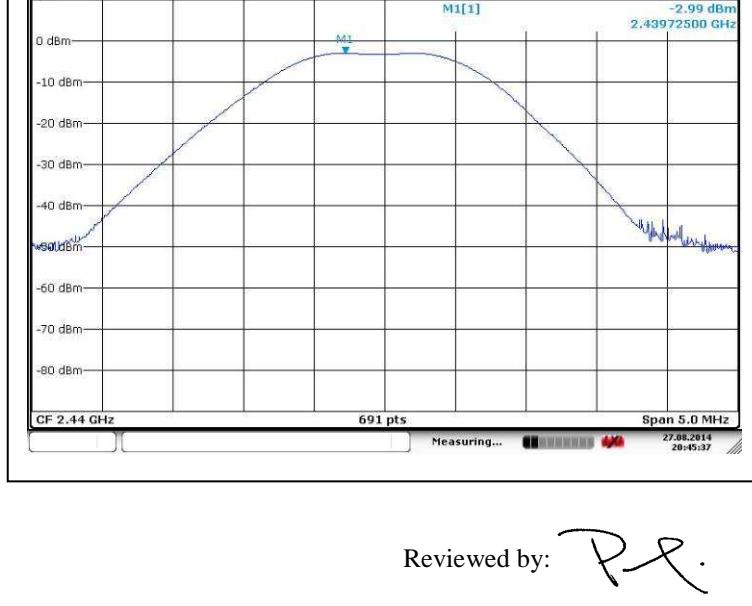
Date : 28 Aug 2014

A7. Transmission Power

Channel: CH00



Channel: CH19



Tested by:

Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew

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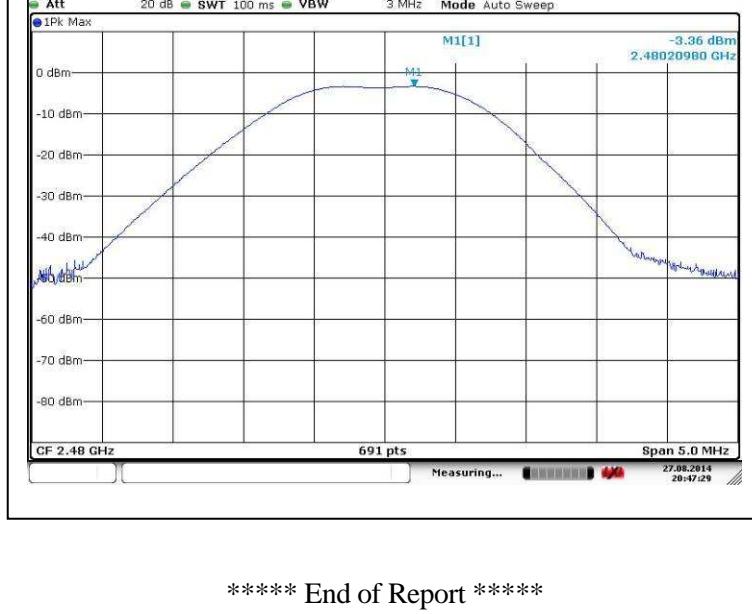
TEST REPORT

Report No. : AS0051793(3)

Date : 28 Aug 2014

A7. Transmission Power

Channel: CH39



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

Tested by:

Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew

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