CMA Testing and Certification Laboratories
廠商會檢定中心

TEST REPORT

Report No.	:	AT0011904(4)	Date :	24 Mar 2015
Application No.	:	LT006601(2)		
Applicant	:	T. F. Watch Ltd Unit 11, 10/F, Asia Trade Centre, No. 79 Lei Muk Road, Kwai Chung, NT		
Sample Description	:	One(1) item of submitted sample stated to be Kisai Link of Model No. L001 Sample registration No. : RT010049-001 Radio Frequency : 2402MHz – 2480 MHz Transceiver Rating : 3.7V rechargeable battery No. of submitted sample : Four (4) piece (s)		
Date Received	:	06 Feb 2015		
Test Period	:	09 Feb 2015 to 25 Feb 2015.		
Test Requested	:	FCC Part 15 Certificate		
Test Method	:	47 CFR Part 15 (10-1-14 Edition), ANSI C63. 4 – 2009		
Test Engineer	:	Mr. LEUNG Shu-kan, Ken		
Test Result	:	See attached sheet(s) from page 2 to 34.		
Conclusion	:	The submitted sample was found to comply with requirement of FCC Part 15 Subpart B and C.		

For and on behalf of
CMA Industrial Development Foundation Limited

Authorized Signature : _____

Mr. WONG Lap-pong, Andrew
Manager
Electrical Division

FCC ID: 2AEAV001

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1 General Information

1.1 General Description

The equipment under test (EUT) is a 2.4GHz wireless device. The EUT is powered by 3.7V rechargeable battery. The EUT will connect smart phone through wireless connection. When there is incoming call, the smart phone will transmit signal to EUT to inform the user there is a call

The brief circuit description is listed as follows:

- X1, X2 and its associated circuit act as oscillator
- U1 and its associated circuit act as MCU
- U4, U5 and its associated circuit act as flash memory
- U2, U3 and its associated circuit act as voltage regulator
- J3 and its associated circuit act as RF module

Device: BLE device
Frequency Range: 2402-2480 MHz
Number of channels: 40
Modulation: GFSK
Antenna: PCB strip antenna
Antenna gain: 0dB
Operating power: 2402-2480 Maximum power 88.5 dBμV/m @ 3 meters
Frequency channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2404 MHz	11	2424 MHz	21	2446 MHz	31	2466 MHz
2	2406 MHz	12	2428 MHz	22	2448 MHz	32	2468 MHz
3	2408 MHz	13	2430 MHz	23	2450 MHz	33	2470 MHz
4	2410 MHz	14	2432 MHz	24	2452 MHz	34	2472 MHz
5	2412 MHz	15	2434 MHz	25	2454 MHz	35	2474 MHz
6	2414 MHz	16	2436 MHz	26	2456 MHz	36	2476 MHz
7	2416 MHz	17	2438 MHz	27	2458 MHz	37	2478 MHz
8	2418 MHz	18	2440 MHz	28	2460 MHz	38	2402 MHz
9	2420 MHz	19	2442 MHz	29	2462 MHz	39	2426 MHz
10	2422 MHz	20	2444 MHz	30	2464 MHz	40	2480 MHz

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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,
Fo Tan, Shatin,
New Territories,
Hong Kong.

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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	ESCI	100152	28 Aug 2015	1Year
Spectrum Analyzer	R&S	FSP30	100628	24 Nov 2015	1Year
Broadband Antenna	Schaffner	CBL6112B	2692	19 Feb 2016	2Years
Loop Antenna	EMCO	6502	00056620	28 Oct 2015	1Year
Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-531	24 Nov 2016	2Years
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170442	18 Jun 2015	2Years
Broadband Pre-Amplifier	Schwarzbeck	BBV 9718	9718-119	24 Nov 2016	2Years
Broadband Pre-Amplifier	Schwarzbeck	BBV 9719	9719-010	17 Jun 2015	2Years
Coaxial Cable	Suhner	Sucoflex_104	N/A	24 Nov 2015	1Year

1.4 Support equipment

Adaptor
Model: A1299

Supply by CMA

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1.5 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

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:	20	° C
Relative humidity:	62	%

Measurement: Peak RBW: 1MHz VBW: 3MHz
Testing frequency range: 9kHz to 25GHz Operation mode: Transmission

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)
2401.728	H	92.6	- 4.1	88.5	114.0	- 25.5
4803.436	V	43.7	3.8	47.5	74.0	- 26.5
4803.598	H	45.0	3.8	48.8	74.0	- 25.2
7205.314	V	40.8	11.7	52.5	74.0	- 21.5
2439.624	V	92.0	- 4.1	87.9	114.0	- 26.1
4879.516	H	47.0	3.8	50.8	74.0	- 23.2
4879.520	V	45.1	3.8	48.9	74.0	- 25.1
7319.490	V	38.4	11.7	50.1	74.0	- 23.9
2479.564	H	92.4	- 4.3	88.1	114.0	- 25.9
4959.564	V	46.9	4.1	54.0	74.0	- 23.0
4959.580	H	48.5	4.1	52.6	74.0	- 21.4
9919.096	H	37.4	14.6	52.0	74.0	- 22.0

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:	20	° C
Relative humidity:	62	%

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

Testing frequency range: 9kHz to 25GHz Operation mode: Transmission

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)
63.873	H	6.7	7.8	14.5	40.0	- 25.5
91.946	H	7.1	10.7	17.8	43.5	- 25.7
131.437	H	6.8	14.1	20.9	43.5	- 22.6
166.990	H	6.5	12.7	19.2	43.5	- 24.3
195.616	H	7.1	11.7	18.8	43.5	- 24.7
230.711	H	6.8	13.0	19.8	46.0	- 26.2
26.0979	H	6.8	15.7	22.6	46.0	- 23.4

Remark: 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 B

Environmental conditions:

Parameter	Recorded value	
Ambient temperature:	20	° C
Relative humidity:	62	%

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

Testing frequency range: 9kHz to 25GHz Operation mode: Receiving

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)
63.971	H	6.7	7.8	14.5	40.0	- 25.5
93.583	H	7.4	10.7	18.1	43.5	- 25.4
131.963	H	6.9	14.1	21.0	43.5	- 22.5
181.125	H	6.8	11.7	18.5	43.5	- 25.0
209.129	H	6.4	12.0	18.4	43.5	- 25.1
248.628	H	9.2	13.0	22.2	46.0	- 23.8
280.992	H	7.5	15.7	23.2	46.0	- 22.8

Remark: 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 B

Environmental conditions:

Parameter	Recorded value	
Ambient temperature:	20	° C
Relative humidity:	62	%

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

Testing frequency range: 9kHz to 25GHz Operation mode: Charging

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)
59.311	H	4.1	10.4	14.5	40.0	- 25.5
92.176	H	7.2	10.7	17.9	43.5	- 25.6
115.303	H	8.3	12.7	21.0	43.5	- 22.5
142.398	H	6.9	13.7	20.6	43.5	- 22.9
184.943	H	6.8	11.7	18.5	43.5	- 25.0
219.616	H	6.9	11.6	18.5	46.0	- 27.5
267.157	H	7.2	15.7	22.9	46.0	- 23.1

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

The EUT is connected to adaptor.

It was found that the EUT met the FCC requirement.

3.3 Graph and Table of Conducted Emission Measurement Data

For electronic filing, the document is saved with filename TestRpt2.pdf.

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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 TSup11.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 ExPho3.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 Bandwidth

The plot saved in TestRpt3.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.

The plot saved in TestRpt4.pdf shows the band edge is fulfil 15.209 requirement.

5.2 Duty cycle

Not Applicable

5.3 Transmission time

Not Applicable

5.4 Power Spectral Density

Not Applicable

5.5 Average on time

Not Applicable

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6 Appendices

A1	Photos of the set-up of Radiated Emissions	4	pages
A2	Photos of the set-up of Conducted Emissions	2	pages
A3	Photos of External Configurations	4	pages
A4	Photos of Internal Configurations	1	page
A5	ID Label/Location	1	page
A6	Conducted Emission Measurement Data	2	pages
A7	Band Edge	2	pages
A8	20dB Bandwidth Plot	2	pages

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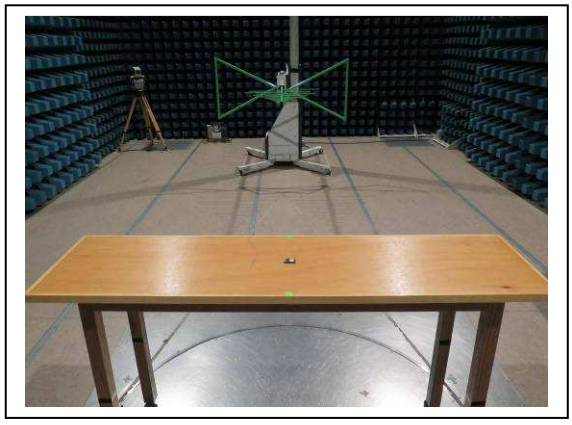
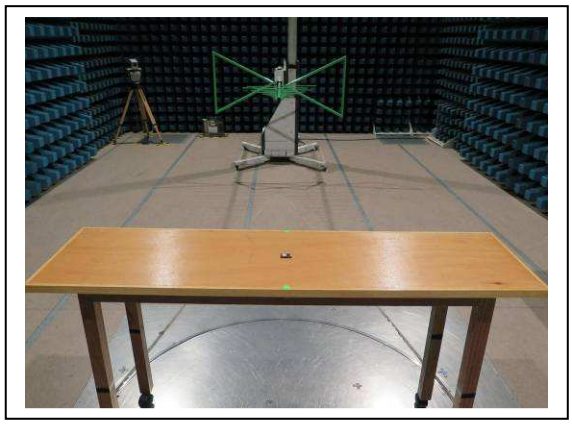
A1. Photos of the set-up of Radiated Emissions



(Front view, 30Hz – 1GHz)



(Back view, 30MHz – 1GHz)

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew

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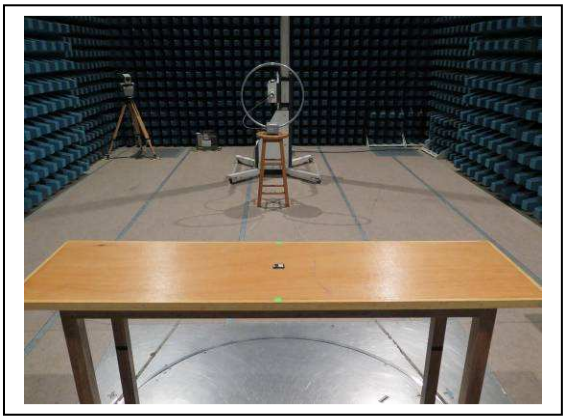
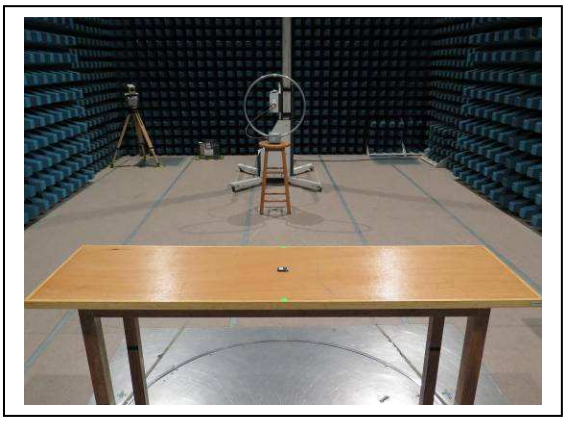
A1. Photos of the set-up of Radiated Emissions



(Front view, 9kHz – 30MHz)



(Back view, 9kHz – 30MHz)

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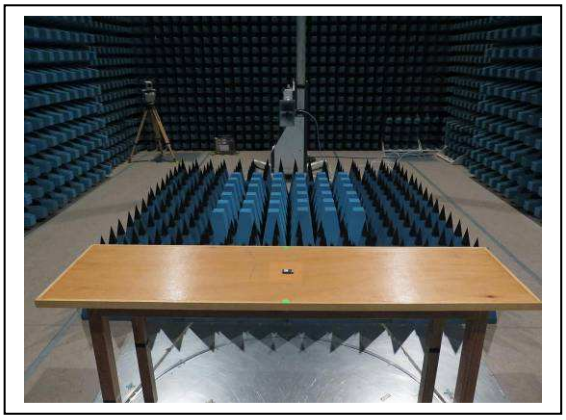
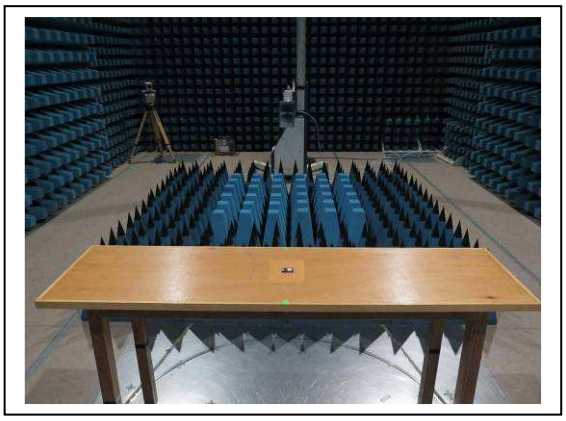
A1. Photos of the set-up of Radiated Emissions



(Front view, above 1GHz)



(Back view, above 1GHz)

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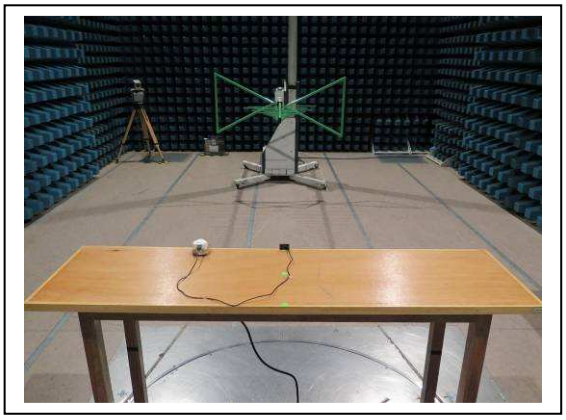
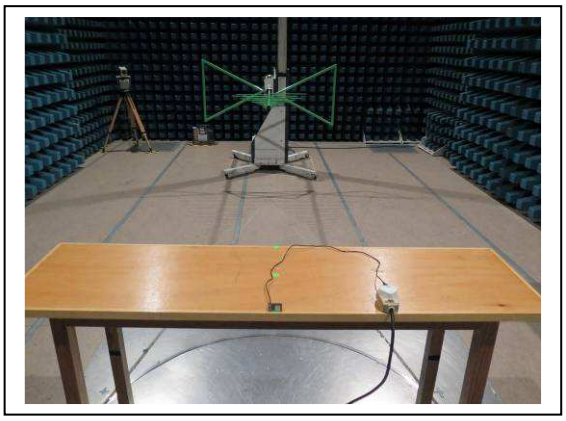
A1. Photos of the set-up of Radiated Emissions



(Front view, charging)



(Back view, charging)

Tested by: Mr. LEUNG Shu-kan, Ken

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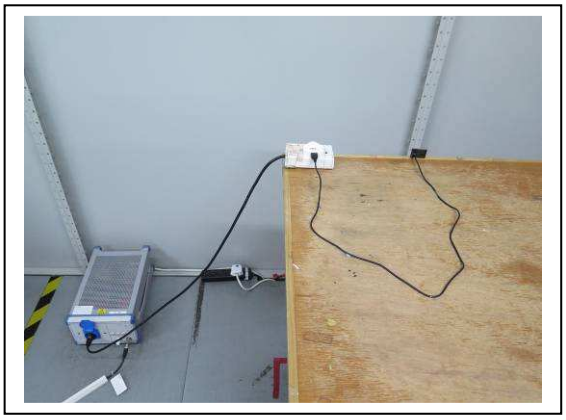
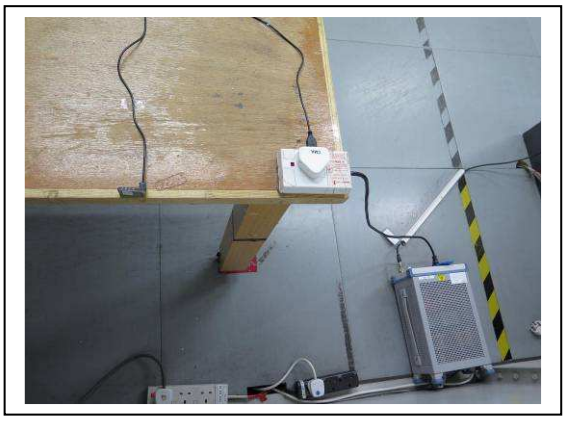
A2. Photos of the set-up of Conducted Emissions



Front view



Back view

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Reviewed by: Mr. WONG Lap-pong, Andrew

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CMA Industrial Development Foundation Limited
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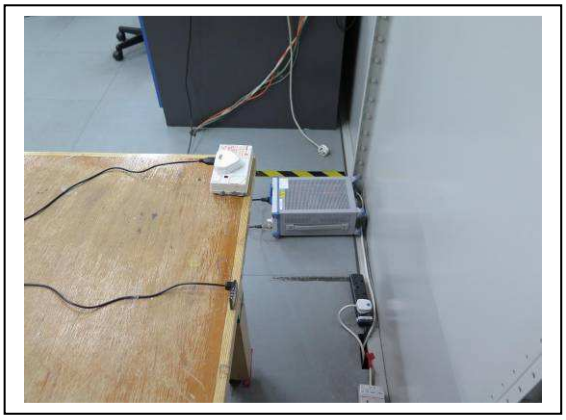
TEST REPORT

Report No. : AT0011904(4) Date : 24 Mar 2015

A2. Photos of the set-up of Conducted Emissions



Side view

Tested by: Mr. LEUNG Shu-kan, Ken

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A3 Photos of External Configurations

External Configuration 1

External Configuration 2

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A3 Photos of External Configurations

External Configuration 3

External Configuration 4

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A3 Photos of External Configurations

External Configuration 5

External Configuration 6

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A3 Photos of External Configurations

External Configuration 7

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TEST REPORT

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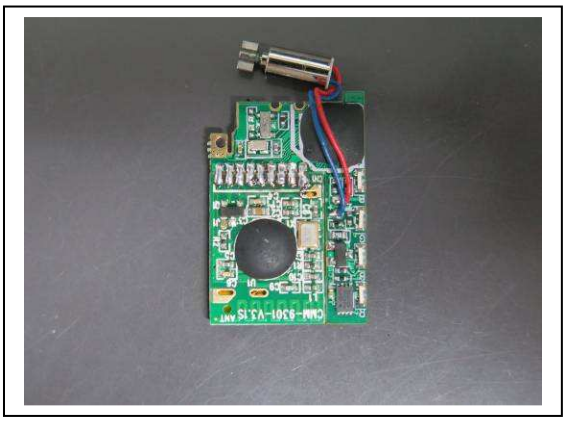
A4. Photos of Internal Configurations

Internal Configuration 1



Internal Configuration 2

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew

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TEST REPORT

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A5. ID Label / Location

ID Label 1

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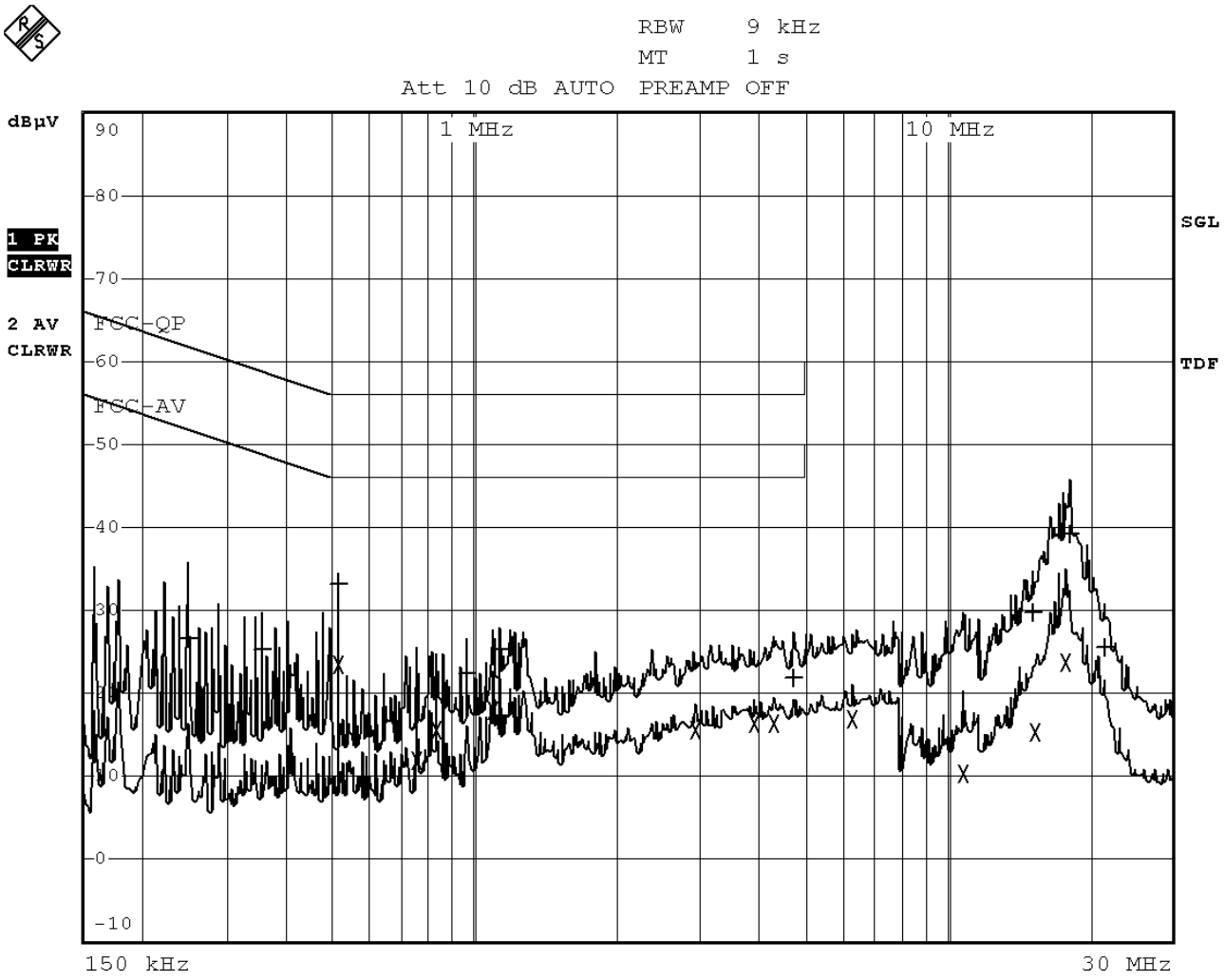
TEST REPORT

Report No. : AT0011904(4) Date : 24 Mar 2015

A6 Conducted Emission Measurement Date



Tested by: Mr. LEUNG Shu-kan, Ken

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A6 Conducted Emission Measurement Date

EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC-QP		
Trace2:	FCC-AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1 Quasi Peak	249 kHz	26.61 L1 gnd	-35.17
1 Quasi Peak	357 kHz	25.20 N gnd	-33.59
1 Quasi Peak	513.5 kHz	33.07 N gnd	-22.92
2 Average	513.5 kHz	23.41 N gnd	-22.58
2 Average	752 kHz	11.99 N gnd	-34.00
2 Average	828.5 kHz	15.66 N gnd	-30.33
1 Quasi Peak	959 kHz	22.44 N gnd	-33.56
2 Average	1.0985 MHz	17.88 N gnd	-28.11
1 Quasi Peak	1.1345 MHz	25.19 N gnd	-30.80
2 Average	2.93 MHz	15.62 N gnd	-30.37
2 Average	3.911 MHz	16.25 N gnd	-29.74
2 Average	4.3115 MHz	16.44 N gnd	-29.55
1 Quasi Peak	4.7525 MHz	21.88 N gnd	-34.11
2 Average	6.2825 MHz	16.82 N gnd	-33.17
2 Average	10.7915 MHz	10.21 L1 gnd	-39.78
1 Quasi Peak	15.2195 MHz	29.72 N gnd	-30.28
2 Average	15.341 MHz	15.33 L1 gnd	-34.66
2 Average	17.9015 MHz	23.72 N gnd	-26.27
1 Quasi Peak	18.266 MHz	39.09 N gnd	-20.90
1 Quasi Peak	21.578 MHz	25.63 N gnd	-34.36

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew

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TEST REPORT

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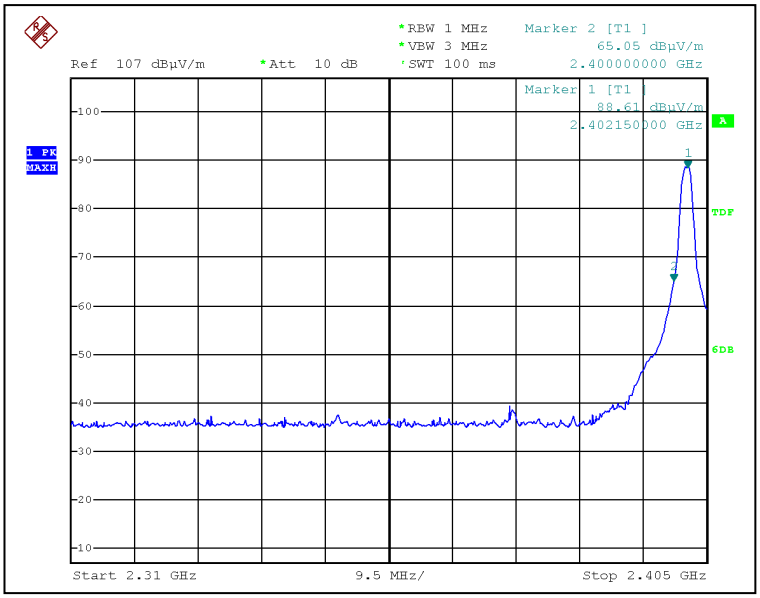
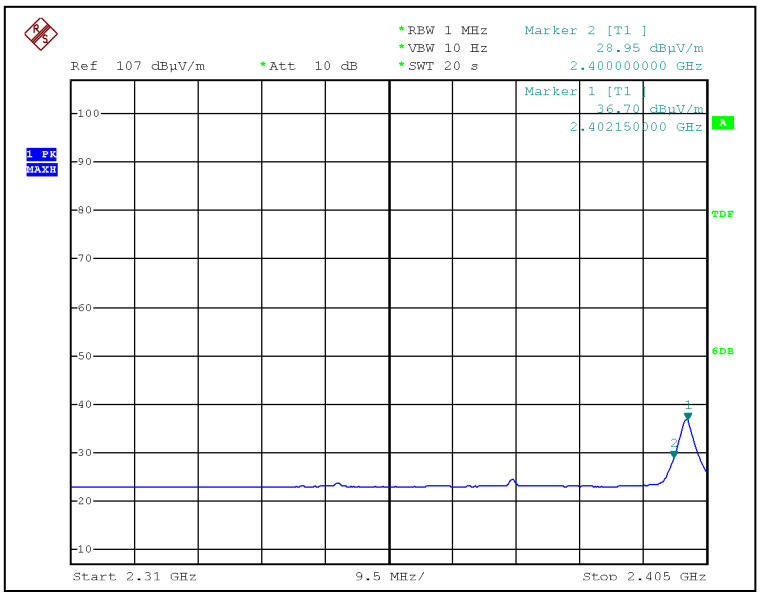
A7. Band Edge



Lower edge (Peak measurement)



Lower edge (Average measurement)

Tested by: Reviewed by:

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

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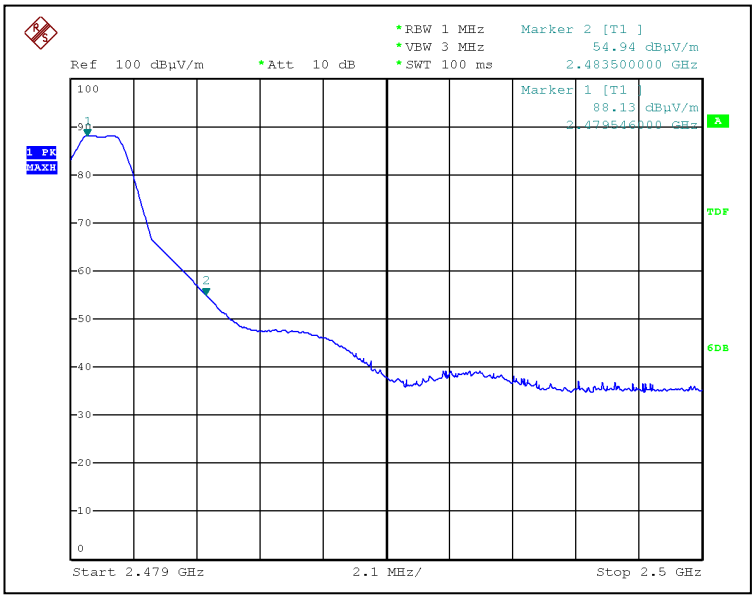
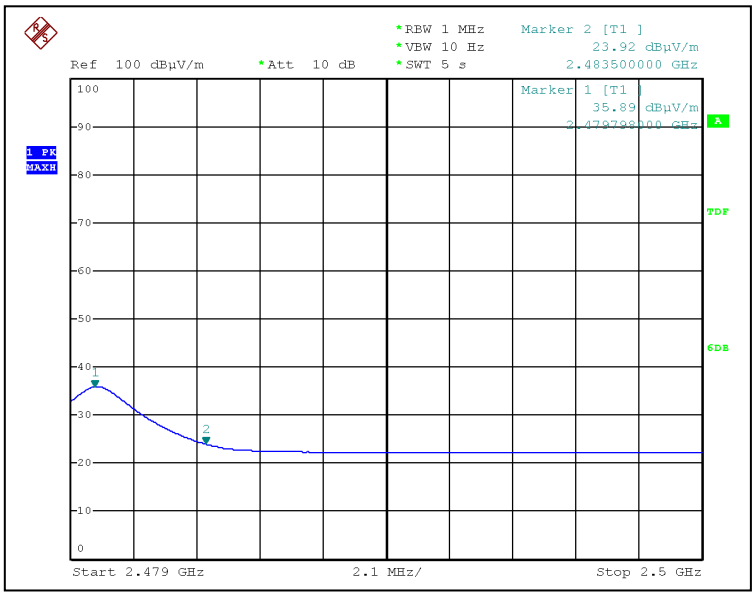
A7. Band Edge



Higher edge (Peak measurement)



Higher edge (Average measurement)

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Reviewed by: Mr. WONG Lap-pong, Andrew

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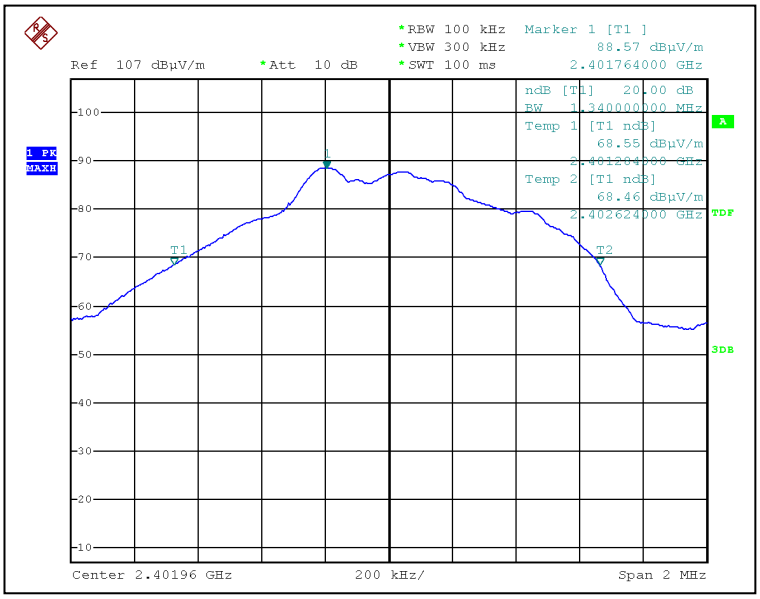
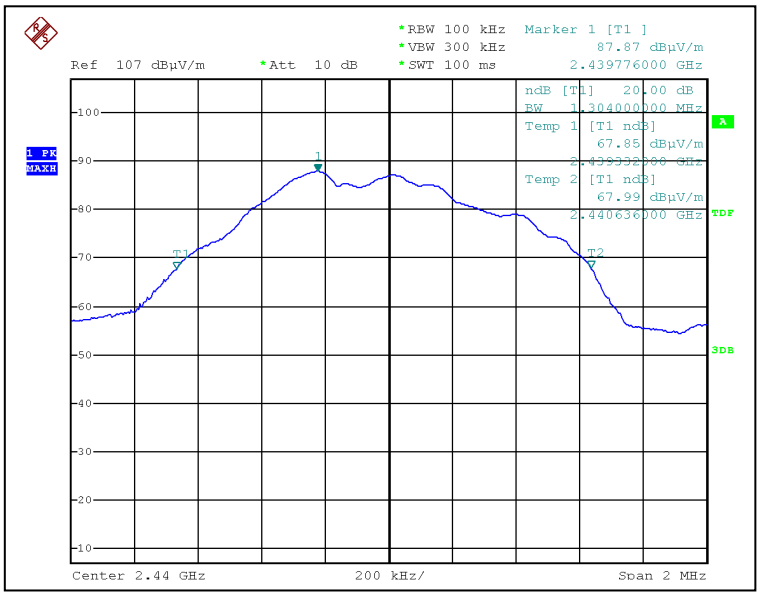
A8. 20dB Bandwidth Plot



Bandwidth 1 (2402MHz)



Bandwidth 2 (2440MHz)

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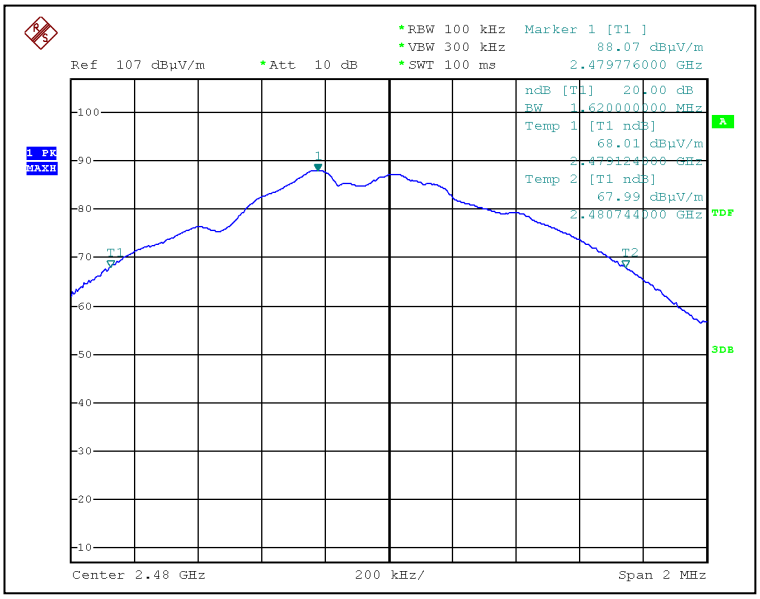
A8. 20dB Bandwidth Plot



Bandwidth 3 (2480MHz)

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

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