CMA Testing and Certification Laboratories
廠商會檢定中心

TEST REPORT

Report No. : AS0058846(9) Date : 06 Oct 2014

Application No. : LS033426(7)

Applicant : Asian Express Holdings Limited
4F,-4, No.669 Jingping Rd., Zhonghe City, TaiPei county 235
Taiwan R.O.C, Taiwan

Client : Asian Express Holdings Limited
Rm804 Sino Centre,582-592 Nathan Road,
Mongkok, Kowloon, Hong Kong.

Sample Description : One(1) item of submitted sample stated to be

Sample Description	Model No.
Quark Micro Drone	PL-1310 / PL-1311 / PL-1312 / PL-1313 / PL-1314 / PL-1315 / PL-1316 / PL-1317 / PL-1318 / PL-1319

Sample registration No. : RS037250-001, RS041399-001
Radio Frequency : 2402MHz – 2475 MHz Transceiver
Rating : 3.7V rechargeable battery
No. of submitted sample : Eight (8) piece (s)

Date Received : 30 Aug 2014, 26 Sep 2014
Test Period : 04 Sep 2014 to 03 Oct 2014.
Test Requested : FCC Part 15 Certificate

Test Method : 47 CFR Part 15 (10-1-12 Edition), ANSI C63.4 – 2009

Test Engineer : Mr. LEUNG Shu-kan, Ken

Test Result : See attached sheet(s) from page 2 to 31.

Conclusion : The submitted sample was found to comply with requirement of FCC Part 15 Subpart C.

Remark : All ten models are the same in circuitry and components; and therefore model PL-1310 was chosen to be the representative of the test sample. The difference between the tested model and the declared model(s) is/are the Model no.

For and on behalf of
CMA Industrial Development Foundation Limited

Authorized Signature : _____ Page 1 of 31
Mr. WONG Lap-pong, Andrew
Manager
Electrical Division

FCC ID: VLEPL1310-R

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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

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1 General Information

1.1 General Description

The equipment under test (EUT) is a transmitter for Quark Micro Drone. The EUT is power by 3.7V rechargeable battery. It operates at 2402MHz – 2475MHz. When it switch on and received radio signal, it will take the corresponding action.

The brief circuit description is listed as follows:

- U3	and its associated circuit act as RF circuit
- U2	and its associated circuit act as MCU
- Y1	and its associated circuit act as oscillator
- Q5	and its associated circuit act as power regulator
- M1, M2, M3, M4	and its associated circuit act as motor
- D1, D2, D3, D4, D5, D6, D7	and its associated circuit act as LED

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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	FSV40	100628	15 Dec 2014	1Year
Broadband Antenna	Schaffner	CBL6112B	2718	06 Jan 2015	1Year
Loop Antenna	EMCO	6502	00056620	28 Oct 2014	1Year
Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-531	09 Oct 2014	1Year
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170442	18 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
LISN	Rohde & Schwarz	ENV216	101232	21 Oct 2014	1Year
Coaxial Cable	Tyco Electronics	RG58C/U	N/A	21 Oct 2014	1Year

1.4 List of supporting equipment

Adaptor: Model: A1299 (Supplied 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

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.

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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:	25	° C
Relative humidity:	59	%

Detector: Peak RBW: 1MHz VBW: 3MHz
Testing frequency range: 9kHz to 25GHz

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)
Low	2401.881	H	82.4	- 6.3	76.1	114.0	- 37.9
	#4803.719	V	46.8	2.4	49.2	74.0	- 24.8
	#4803.779	H	46.4	2.4	48.8	74.0	- 25.2
	7205.633	H	41.2	10.8	52.0	74.0	- 22.0
Middle	2432.890	H	85.6	- 6.3	79.3	114.0	- 34.7
	#4865.750	V	47.7	2.4	50.1	74.0	- 23.9
	#4865.770	H	44.4	2.4	46.8	74.0	- 27.2
	#7298.596	H	37.7	10.8	48.5	74.0	- 25.5
High	2474.899	V	79.2	- 6.3	72.9	114.0	- 41.1
	#4949.722	H	39.4	2.4	41.8	74.0	- 32.2
	#4949.765	V	40.8	2.4	43.2	74.0	- 30.8
	#7424.686	V	34.5	10.8	45.3	74.0	- 28.7

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:	25	° C
Relative humidity:	59	%

Detector: Quasi-peak
RBW: 120kHz
VBW: 300kHz
Testing frequency range: 9kHz to 25GHz

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)
#126.164	H	9.3	14.4	23.7	43.5	- 19.8
206.157	H	9.3	12.0	21.3	43.5	- 22.2
279.166	H	9.9	15.4	25.3	46.0	- 20.7
368.976	H	11.5	16.8	28.3	46.0	- 17.7
470.068	H	10.4	20.6	31.0	46.0	- 15.0
550.078	H	9.9	22.2	32.1	46.0	- 13.9
631.451	H	10.1	22.8	32.9	46.0	- 13.1

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

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.

4 Antenna Requirement

According to the FCC Part 15 Paragraph 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The EUT has a monopole antenna fulfil the requirement of this section.

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5 Photograph

5.1 Photographs of the Test Setup for Radiated Emission and Conducted Emission

For electronic filing, the photos are saved with filename TSup1.jpg to TSup9.jpg.

5.2 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 InPho4.jpg.

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6 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

6.1 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.

6.2 Duty cycle

Not Applicable

6.3 Transmission time

Not Applicable

6.4 Power Spectral Density

Not Applicable

6.5 Average on time

Not Applicable

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7 Appendices

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A8	20dB Bandwidth Plot	2	pages

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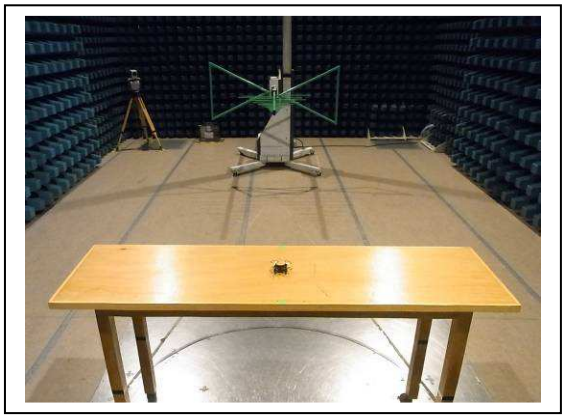
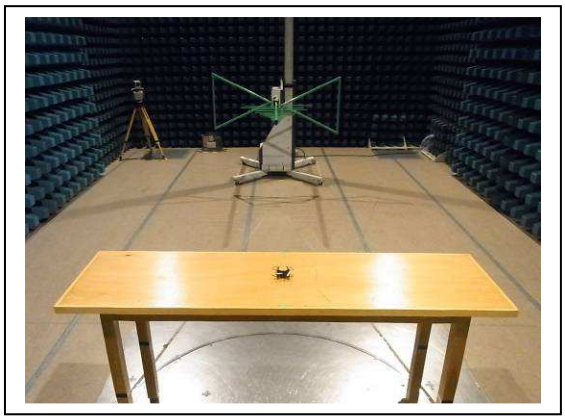
A1. Photos of the set-up of Radiated Emissions



(Front view, 30MHz – 1GHz)



(Back view, 30HMz – 1GHz)

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew

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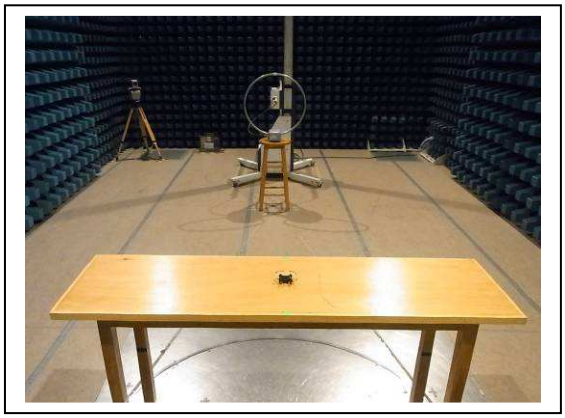
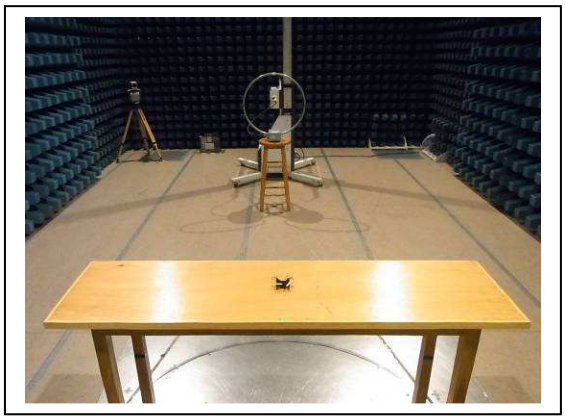
A1. Photos of the set-up of Radiated Emissions



(Front view, 9kHz – 30MHz)



(Back view, 9kHz – 30MHz)

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew

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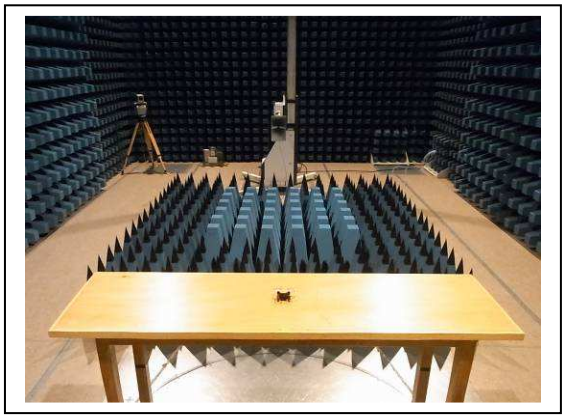
A1. Photos of the set-up of Radiated Emissions



(Front view, 1GHz – 25GHz)

(Back view, above 1GHz – 25GHz)

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew

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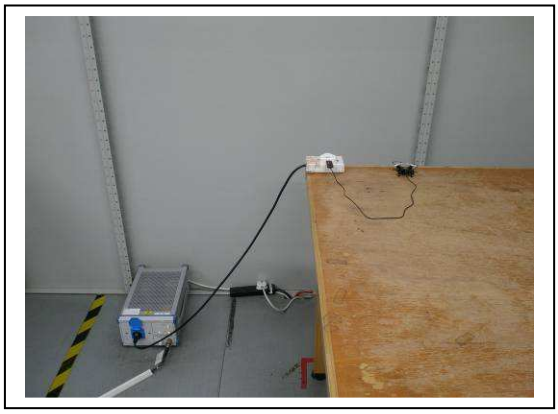
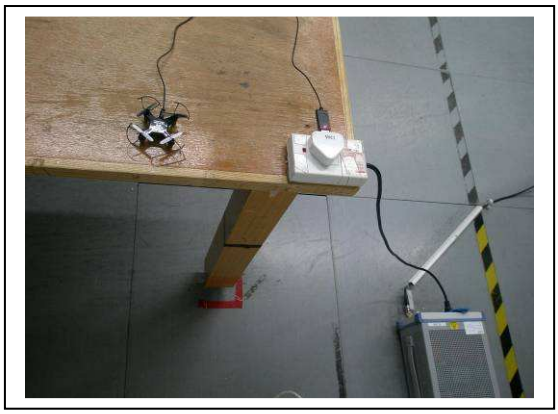
A2. Photos of the set-up of Conducted Emission



(front view)



(rear view)

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew

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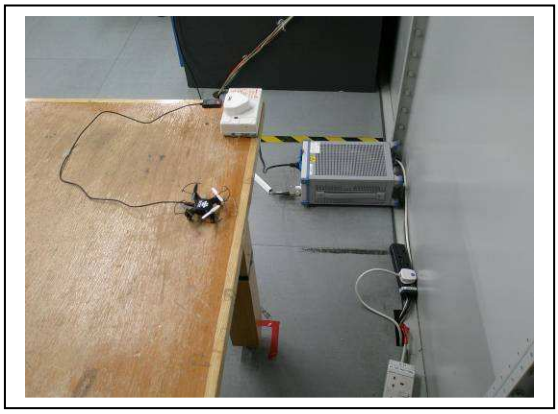
A2. Photos of the set-up of Conducted Emission



(side view)

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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)

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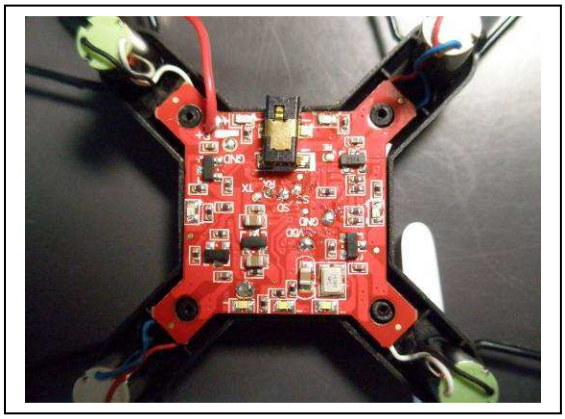
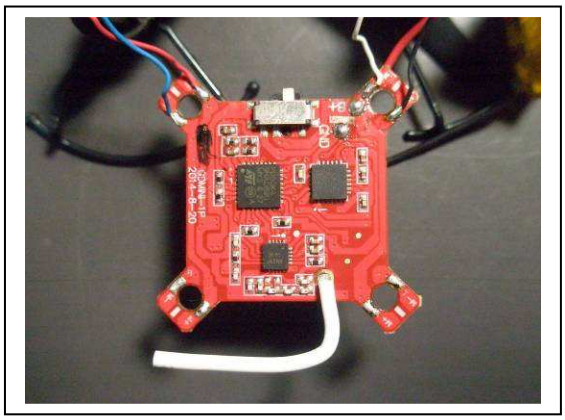
A4. Photos of Internal Configurations



Internal Configuration 1



Internal Configuration 2

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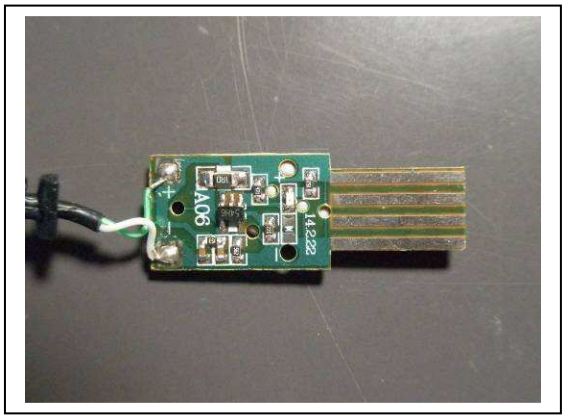
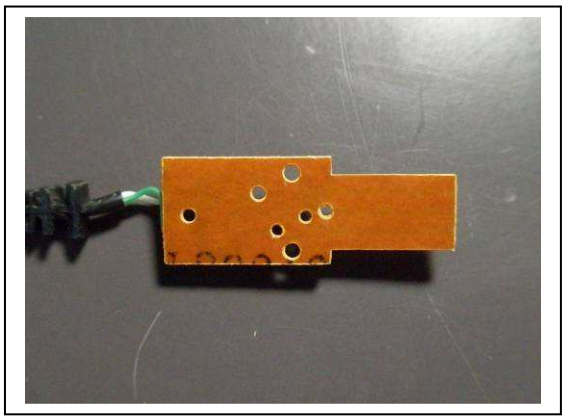
A4. Photos of Internal Configurations



Internal Configuration 3



Internal Configuration 4

Tested by: Mr. LEUNG Shu-kan, Ken

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A5. ID Label / Location

ID Label 1

Tested by: Mr. LEUNG Shu-kan, Ken

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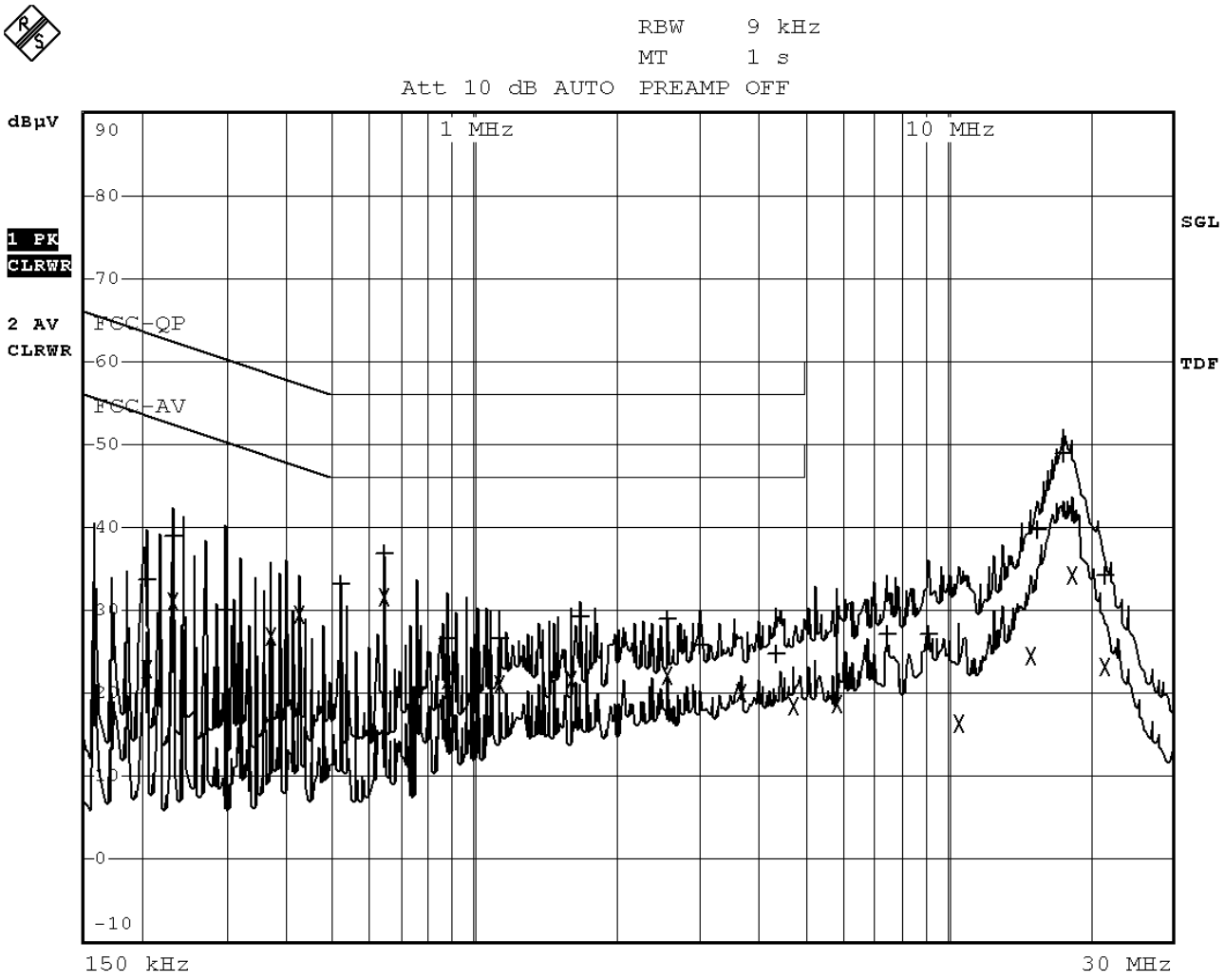
A6. Conducted Emission Measurement Date



Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew

FCC ID: VLEPL1310-R

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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	204 kHz	33.63 L1 gnd	-29.81
2 Average	204 kHz	22.97 N gnd	-30.47
1 Quasi Peak	231 kHz	39.03 N gnd	-23.37
2 Average	231 kHz	31.14 N gnd	-21.26
1 Quasi Peak	298.5 kHz	29.98 N gnd	-30.29
2 Average	375 kHz	26.95 N gnd	-21.44
2 Average	429 kHz	29.62 N gnd	-17.64
1 Quasi Peak	518 kHz	33.24 L1 gnd	-22.75
1 Quasi Peak	639.5 kHz	36.92 N gnd	-19.08
2 Average	639.5 kHz	31.51 N gnd	-14.49
1 Quasi Peak	878 kHz	26.59 N gnd	-29.40
2 Average	878 kHz	21.59 N gnd	-24.40
1 Quasi Peak	1.1255 MHz	26.70 N gnd	-29.29
2 Average	1.1255 MHz	21.20 N gnd	-24.80
2 Average	1.6025 MHz	21.74 N gnd	-24.25
1 Quasi Peak	1.6835 MHz	29.29 N gnd	-26.70
1 Quasi Peak	2.5565 MHz	29.05 N gnd	-26.95
2 Average	2.5565 MHz	22.23 N gnd	-23.76
1 Quasi Peak	3.002 MHz	25.78 N gnd	-30.21
2 Average	3.6815 MHz	19.95 N gnd	-26.04

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew

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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	4.334 MHz	24.78 N gnd	-31.21
2 Average	4.748 MHz	18.37 N gnd	-27.62
2 Average	5.837 MHz	18.87 N gnd	-31.12
1 Quasi Peak	7.4435 MHz	27.10 L1 gnd	-32.89
1 Quasi Peak	9.185 MHz	27.11 N gnd	-32.88
2 Average	10.5935 MHz	16.31 L1 gnd	-33.68
2 Average	14.999 MHz	24.52 L1 gnd	-25.47
1 Quasi Peak	15.467 MHz	39.75 N gnd	-20.25
1 Quasi Peak	17.744 MHz	48.86 N gnd	-11.13
2 Average	18.3515 MHz	34.09 N gnd	-15.90
2 Average	21.5825 MHz	23.23 N gnd	-26.76
1 Quasi Peak	21.623 MHz	34.35 N gnd	-25.64

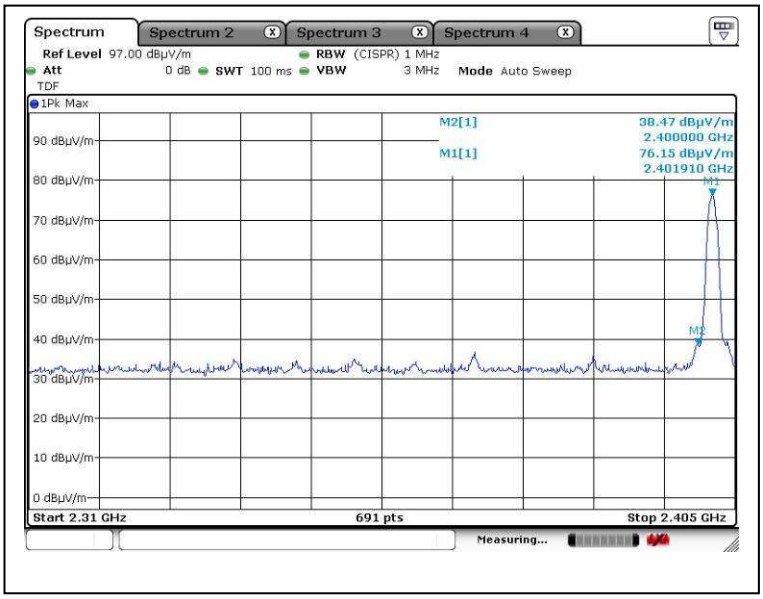
Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew

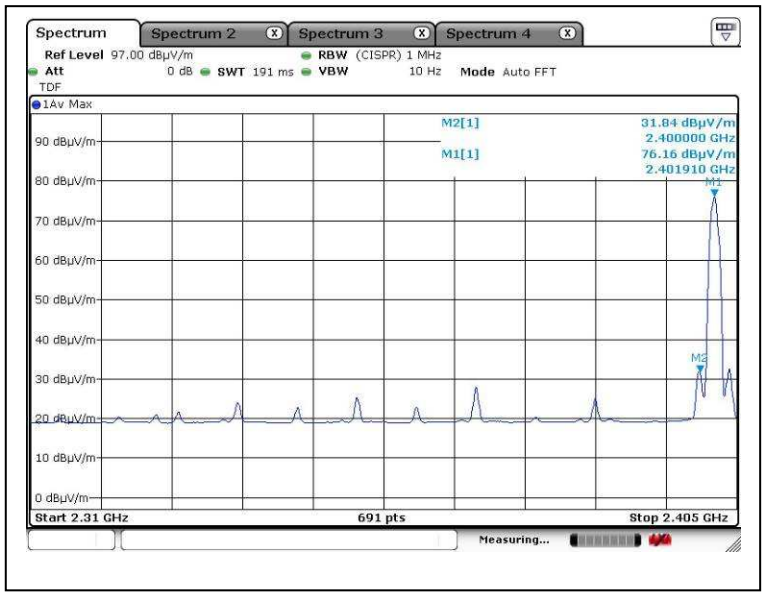
TEST REPORT

Report No. : AS0058846(9) Date : 06 Oct 2014

A7. Band Edge



Lower edge (Peak measurement)



Lower edge (Average measurement)

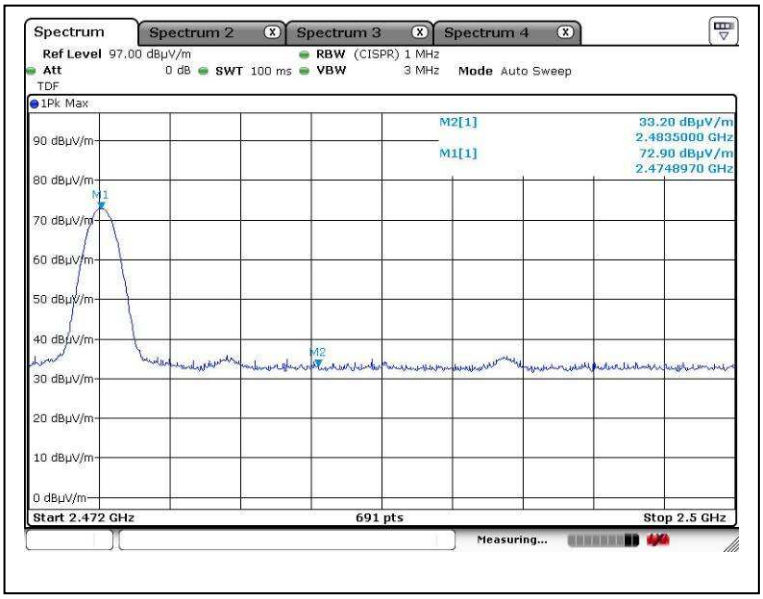
Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew

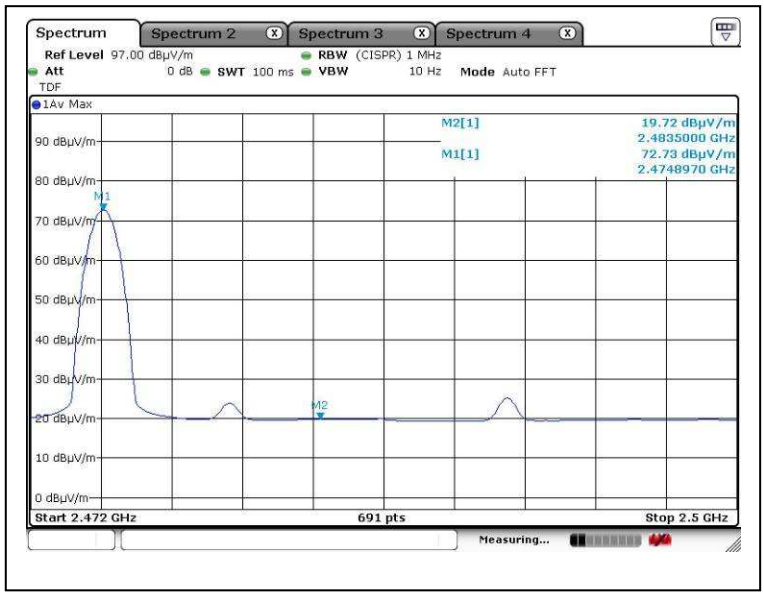
TEST REPORT

Report No. : AS0058846(9) Date : 06 Oct 2014

A7. Band Edge



Higher edge (Peak measurement)



Higher edge (Average measurement)

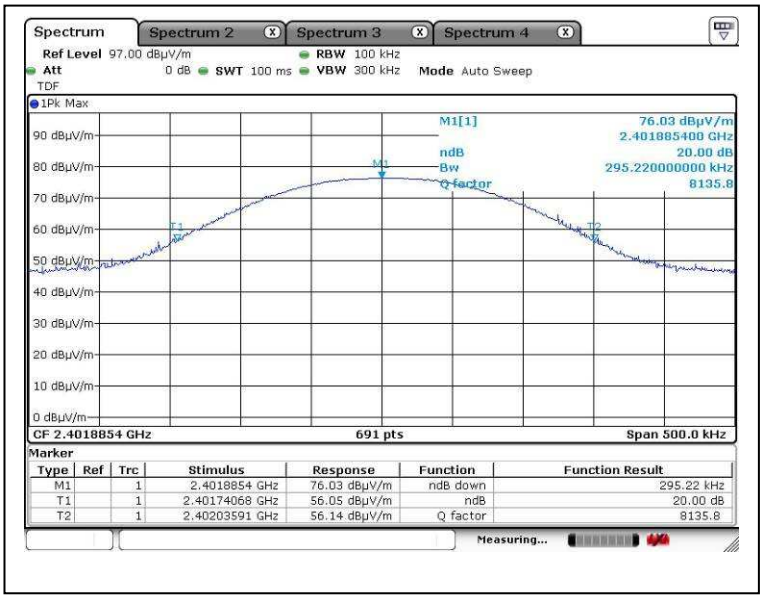
Tested by: Reviewed by:

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

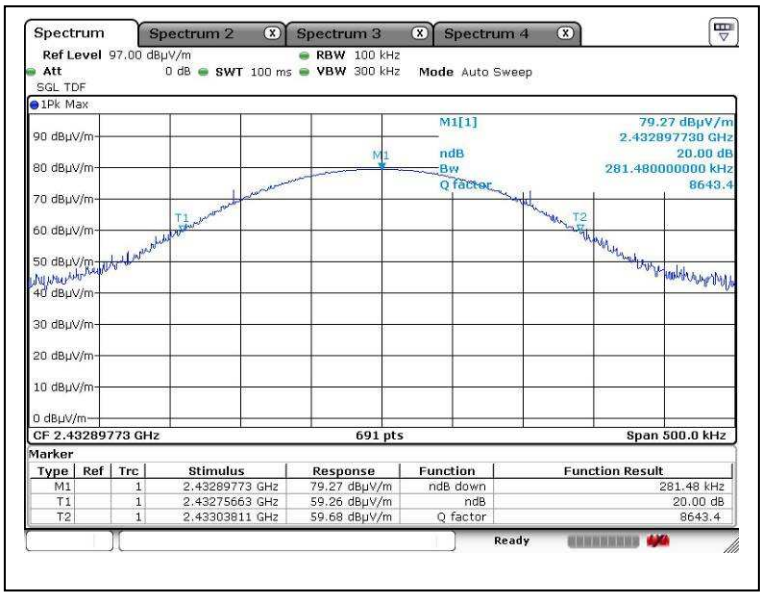
TEST REPORT

Report No. : AS0058846(9) Date : 06 Oct 2014

A8. 20dB Bandwidth Plot



Bandwidth 1 (2402MHz)



Bandwidth 2 (2433MHz)

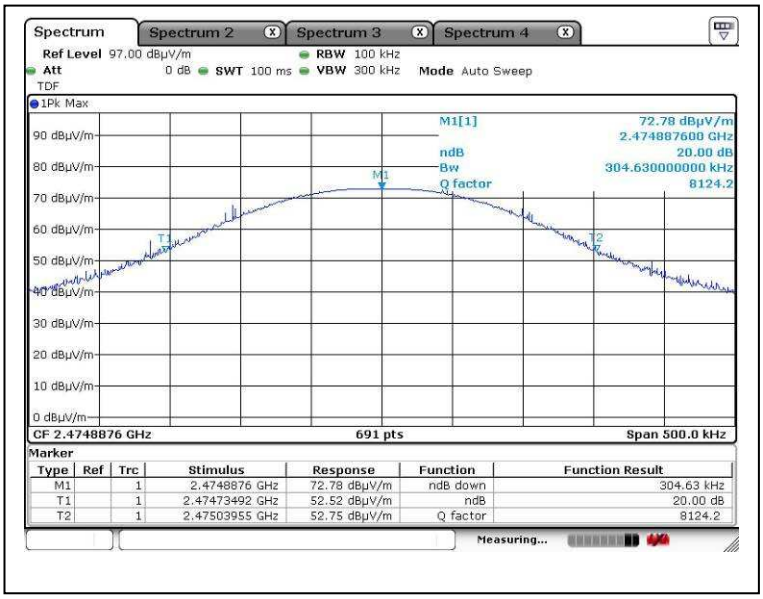
Tested by: Reviewed by:

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

TEST REPORT

Report No. : AS0058846(9) Date : 06 Oct 2014

A8. 20dB Bandwidth Plot



Bandwidth 3 (2475MHz)

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

Tested by: Mr. LEUNG Shu-kan, Ken

Reviewed by: Mr. WONG Lap-pong, Andrew