



CMA Testing and Certification Laboratories

廠商會檢定中心

TEST REPORT

Report No. : AU0050511(1) Date : 25 Aug 2016

Application No. : LU027789(0)

Applicant : Zego Electronic Company Limited
Room 703, Kowloon Building,
555 Nathan Road, Kowloon, HK

Sample Description : One(1) item of submitted sample stated to be Copter of DIY Drone
of Model No. 2770422
Sample registration No. : RU036405-001
Radio Frequency : 2402MHz – 2475MHz Transceiver
Rating : 3.7V rechargeable battery
: USB 5V charging adaptor
No. of submitted sample : Two (2) set (s)

Date Received : 08 Aug 2016

Test Period : 15 Aug 2016 to 19 Aug 2016

Test Requested : FCC Part 15 Certification, FCC Part 15 Verification Procedure

Test Method : 47 CFR Part 15 (10-1-15 Edition)
ANSI C63.4 – 2014, ANSI C63.10 – 2013

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

Page 1 of 34

FCC ID: 2ACS617RX



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廠商會檢定中心

TEST REPORT

Report No. : AU0050511(1)

Date : 25 Aug 2016

Table of Contents

1	General Information	3
1.1	General Description	3
1.2	Location of the test site	4
1.3	List of measuring equipment.....	5
1.4	Measurement Uncertainty.....	6
2	Description of the radiated emission test	7
2.1	Test Procedure	7
2.2	Test Result	8
2.3	Radiated Emission Measurement Data	9
3	Description of the Line-conducted Test	13
3.1	Test Procedure	13
3.2	Test Result	13
3.3	Graph and Table of Conducted Emission Measurement Data	13
4	Photograph	14
4.1	Photographs of the Test Setup for Radiated Emission and Conducted Emission.....	14
4.2	Photographs of the External and Internal Configurations of the EUT	14
5	Supplementary document.....	15
5.1	Bandwidth.....	15
5.2	Antenna requirement.....	15
6	Appendices.....	16



CMA Testing and Certification Laboratories

廠商會檢定中心

TEST REPORT

Report No. : AU0050511(1)

Date : 25 Aug 2016

1 General Information

1.1 General Description

The equipment under test (EUT) is a copter for Ninja Drone. The EUT is power by 3.7V rechargeable battery. It operates at 2402MHz – 2475MHz. When the receiver receives radio signal from transmitter, it will take the corresponding actions.

The brief circuit description is listed as follows:

- | | |
|------------------|--|
| - U1,U3 | and its associated circuit act as MCU |
| - U2 | and its associated circuit act as RF circuit |
| - Y1 | and its associated circuit act as oscillator |
| - Q1, Q2 | and its associated circuit act as LED |
| - M1, M2, M3, M4 | and its associated circuit act as motor |
| - Q4 | and its associated circuit act as power supply |



CMA Testing and Certification Laboratories

廠商會檢定中心

TEST REPORT

Report No. : AU0050511(1)

Date : 25 Aug 2016

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 C63.10 – 2013. 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 C63.10 – 2013. A shielded room is located at :

Ground Floor, Yan Hing Centre,
9 – 13 Wong Chuk Yeung Street,
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廠商會檢定中心

TEST REPORT

Report No. : AU0050511(1)

Date : 25 Aug 2016

1.3 List of measuring equipment

Equipment	Manufacturer	Model No.	Serial No.	Calibration Due Date	Calibration Period
EMI Test Receiver	R&S	ESCI	100152	27 Sep 2016	1Year
Spectrum Analyzer	R&S	FSV40	100628	09 Feb 2017	1Year
Broadband Antenna	Schaffner	CBL6112B	2718	15 Mar 2017	2Years
Loop Antenna	EMCO	6502	00056620	25 Jan 2018	2Years
Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-531	24 Nov 2016	2Years
Broadband Pre-Amplifier	Schwarzbeck	BBV 9718	9718-119	24 Nov 2016	2Years
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170442	02 Aug 2017	2Years
Broadband Pre-Amplifier	Schwarzbeck	BBV 9719	9719-010	02 Aug 2017	2Years
Coaxial Cable	Schaffner	RG 213/U	N/A	18 May 2017	1Years
Coaxial Cable	Suhner	RG 214/U	N/A	18 May 2017	1Years
Coaxial Cable	Suhner	Sucoflex_104	N/A	13 Dec 2016	1Years
LISN	R&S	ENV216	101323	21 Oct 2016	1Year
Coaxial Cable	Tyco Electronics	RG 58C/U	N/A	01 Nov 2016	1Year

Support equipment:

Adaptor

Model: A1299

Supply by CMA



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廠商會檢定中心

TEST REPORT

Report No. : AU0050511(1)

Date : 25 Aug 2016

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)	4.83dB
30MHz ~ 200MHz (Vertical)	4.84dB
200MHz ~ 1000MHz (Horizontal)	4.87dB
200MHz ~ 1000MHz (Vertical)	5.94dB
1GHz ~ 6GHz	4.41dB
6GHz ~ 18GHz	4.64dB

Conducted emissions

Frequency	Uncertainty (U_{lab})
150kHz~30MHz	2.64dB



CMA Testing and Certification Laboratories

廠商會檢定中心

TEST REPORT

Report No. : AU0050511(1)

Date : 25 Aug 2016

2 Description of the radiated emission test

2.1 Test Procedure

Radiated emissions measurements are investigated and taken pursuant to the procedures of ANSI C63.10 – 2013.

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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TEST REPORT

Report No. : AU0050511(1)

Date : 25 Aug 2016

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 tenth harmonics were investigated, and emissions more 20dB below limited were not reported. Thus, those higher emissions were presented in next page (section 2.3).

Subpart B:

Quasi-Peak Detector data were measured unless otherwise stated.

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

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.



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TEST REPORT

Report No. : AU0050511(1)

Date : 25 Aug 2016

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:	26	° C
Relative humidity:	75	%

Measurement: Peak RBW: 1MHz VBW: 3MHz Operation mode: Transmission

Testing frequency range: 9kHz to 25GHz

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)
2402.151	V	80	- 4.2	75.8	114.0	-38.2
#4801.790	V	36.8	3.7	40.5	74.0	-33.5
#4801.990	H	36.3	3.7	40.0	74.0	-34
2433.135	V	80.6	- 4.2	76.4	114.0	-37.6
#4863.750	H	38.8	3.7	42.5	74.0	-31.5
#4863.872	V	24.7	3.7	28.4	74.0	-45.6
2475.154	V	80.5	- 4.3	76.2	114.0	-37.8
#4947.746	V	37.1	4.0	41.1	74.0	-32.9
#4947.812	H	36.6	4.0	40.6	74.0	-33.4

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

The peak measurement values are lower than average limit, therefore average measurement is not necessary



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TEST REPORT

Report No. : AU0050511(1)

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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:	26	° C
Relative humidity:	75	%

Detector: Quasi-peak

Mode; Transmission

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)
89.121	H	8.4	9.7	18.1	43.5	- 25.4
122.930	H	8.1	14.4	22.5	43.5	- 21.0
160.340	H	8.2	11.9	20.1	43.5	- 23.4
185.590	H	8.9	11.2	20.1	43.5	- 23.4
221.174	H	8.5	11.8	20.3	46.0	- 25.7
278.220	H	9.3	15.4	24.7	46.0	- 21.3
313.910	H	8.2	16.8	25.0	46.0	- 21.0

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



CMA Testing and Certification Laboratories

廠商會檢定中心

TEST REPORT

Report No. : AU0050511(1)

Date : 25 Aug 2016

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:	26	° C
Relative humidity:	75	%

Detector: Quasi-peak

Mode: Receiving

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)
112.560	H	9.5	12.2	21.7	43.5	- 21.8
135.660	H	7.5	14.4	21.9	43.5	- 21.6
161.843	H	8.2	11.9	20.1	43.5	- 23.4
201.720	H	9.4	12.0	21.4	43.5	- 22.1
236.555	H	8.9	13.2	22.1	46.0	- 23.9
295.729	H	9.2	15.4	24.6	46.0	- 21.4
335.163	H	9.3	16.8	26.1	46.0	- 19.9

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



CMA Testing and Certification Laboratories

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TEST REPORT

Report No. : AU0050511(1)

Date : 25 Aug 2016

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:	26	° C
Relative humidity:	75	%

Detector: Quasi-peak

Mode; Charging

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)
60.029	H	7.9	7.6	15.5	40.0	- 24.5
99.315	H	9.9	10.1	20.0	43.5	- 23.5
148.860	H	8.0	14.1	22.1	43.5	- 21.4
205.580	H	8.9	12.0	20.9	43.5	- 22.6
243.667	H	10.0	13.2	23.2	46.0	- 22.8
285.120	H	9.4	15.4	24.8	46.0	- 21.2
343.560	H	9.2	16.8	26.0	46.0	- 20.0

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



CMA Testing and Certification Laboratories

廠商會檢定中心

TEST REPORT

Report No. : AU0050511(1)

Date : 25 Aug 2016

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 C63.10 – 2013. The EUT was setup as described in the procedures, and both lines were measured.

3.2 Test Result

The EUT connected to an adaptor for charging.

It was found that the EUT met the FCC requirement.

3.3 Graph and Table of Conducted Emission Measurement Data

The plots in Appendices A6 show the graph and data of conducted emission.



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TEST REPORT

Report No. : AU0050511(1)

Date : 25 Aug 2016

4 Photograph

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

For electronic filing, the photos are saved with filename 2ACS617RX TSup.pdf.

4.2 Photographs of the External and Internal Configurations of the EUT

For electronic filing, the photos are saved with filename 2ACS617RX ExPho.pdf and 2ACS617RX InPho.pdf.



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TEST REPORT

Report No. : AU0050511(1)

Date : 25 Aug 2016

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 in Appendices A8 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 in Appendices A7 shows the band edge is fulfil 15.209 requirement.

5.2 Antenna requirement

Appendices A4 shows the antenna is permanently attached and cannot be changed. Therefore it fulfils the section 15.203 requirement.



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TEST REPORT

Report No. : AU0050511(1)

Date : 25 Aug 2016

6 Appendices

A1	Photos of the set-up of Radiated Emissions	3	pages
A2	Photos of the set-up of Conducted Emissions	1	pages
A3	Photos of External Configurations	4	pages
A4	Photos of Internal Configurations	3	pages
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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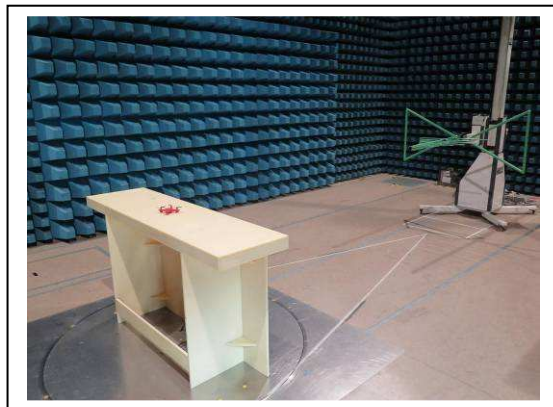
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TEST REPORT

Report No. : AU0050511(1)

Date : 25 Aug 2016

A1. Photos of the set-up of Radiated Emissions



30MHz – 1GHz



9kHz – 30MHz

Tested by:

Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew



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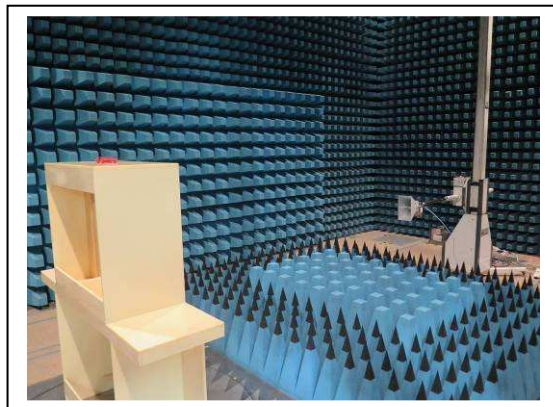
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A1. Photos of the set-up of Radiated Emissions



1GHz – 25GHz

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Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew



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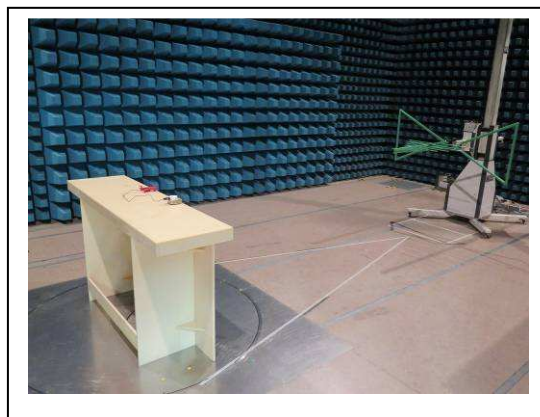
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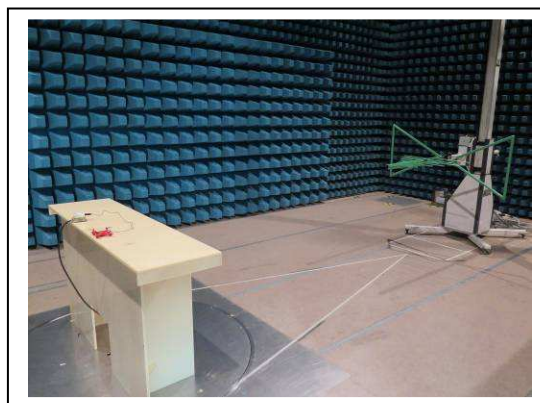
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A1. Photos of the set-up of Radiated Emissions



(front view, charging)



(rear view, charging)

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Reviewed by:

Mr. WONG Lap-pong, Andrew



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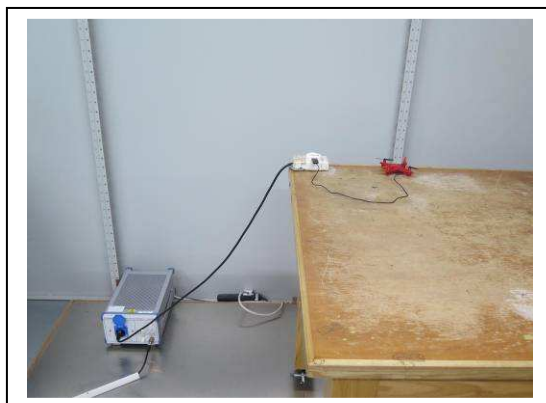
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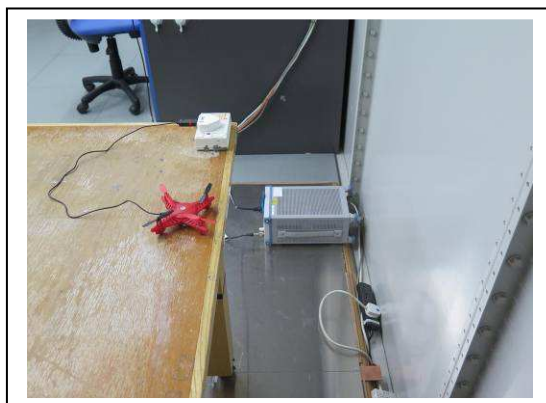
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A2 Photos of the set-up of Conducted Emission



(front view)



(side view)

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Reviewed by:

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A3. Photos of External Configuration



External Configuration 1



External Configuration 2

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Reviewed by:

Mr. WONG Lap-pong, Andrew



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A3. Photos of External Configuration



External Configuration 3



External Configuration 4

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A3. Photos of External Configuration



External Configuration 5



External Configuration 6

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Page 23 of 34

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Report No. : AU0050511(1)

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A3. Photos of External Configuration



External Configuration 7

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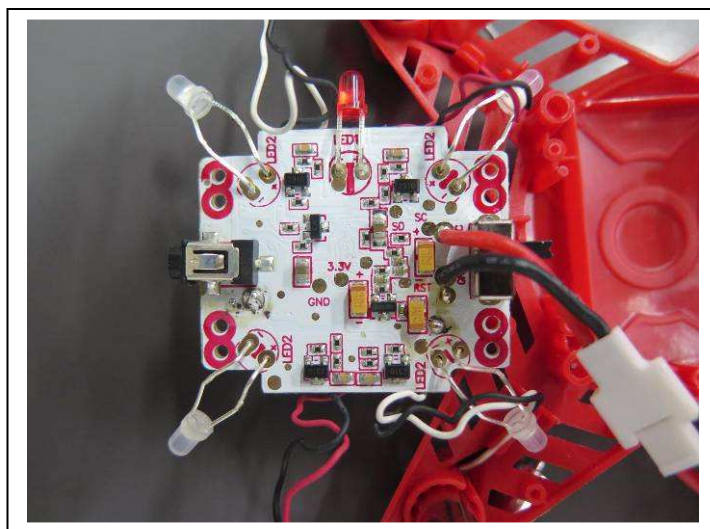
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A4. Photos of Internal Configuration



Internal Configuration 1



Internal Configuration 2

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Page 25 of 34

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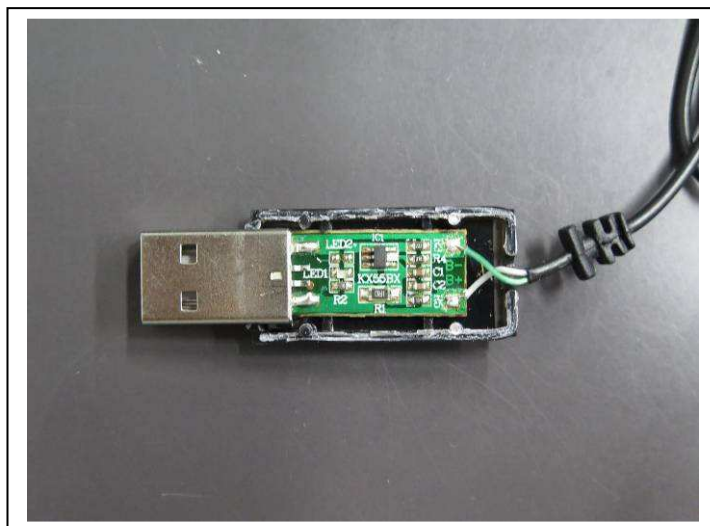
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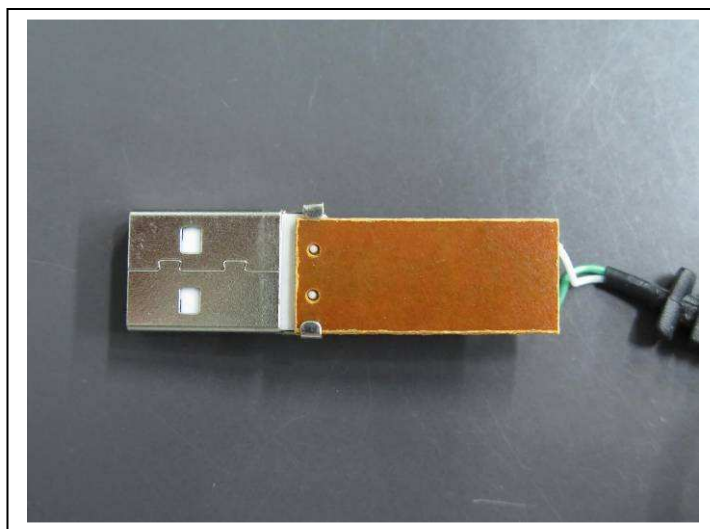
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Date : 25 Aug 2016

A4. Photos of Internal Configuration



Internal Configuration 3



Internal Configuration 4

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Page 26 of 34

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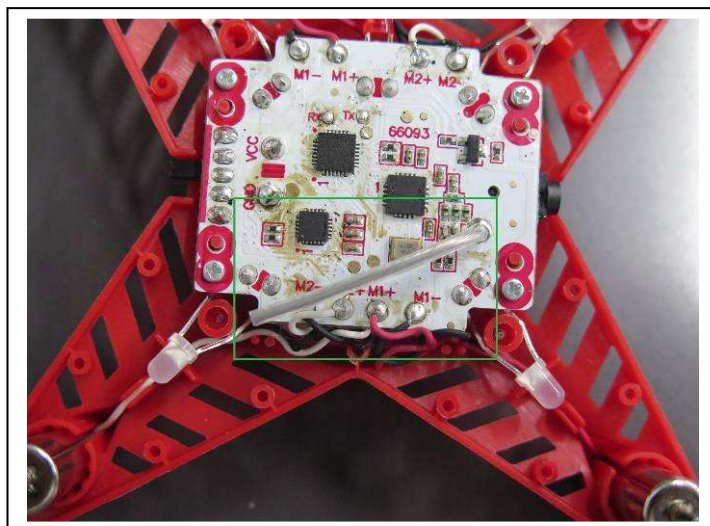
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A4. Photos of Internal Configuration



EUT antenna

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Mr. WONG Lap-pong, Andrew

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Page 27 of 34

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TEST REPORT

Report No. : AU0050511(1)

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A5. ID Label/Location



Label 1



Label 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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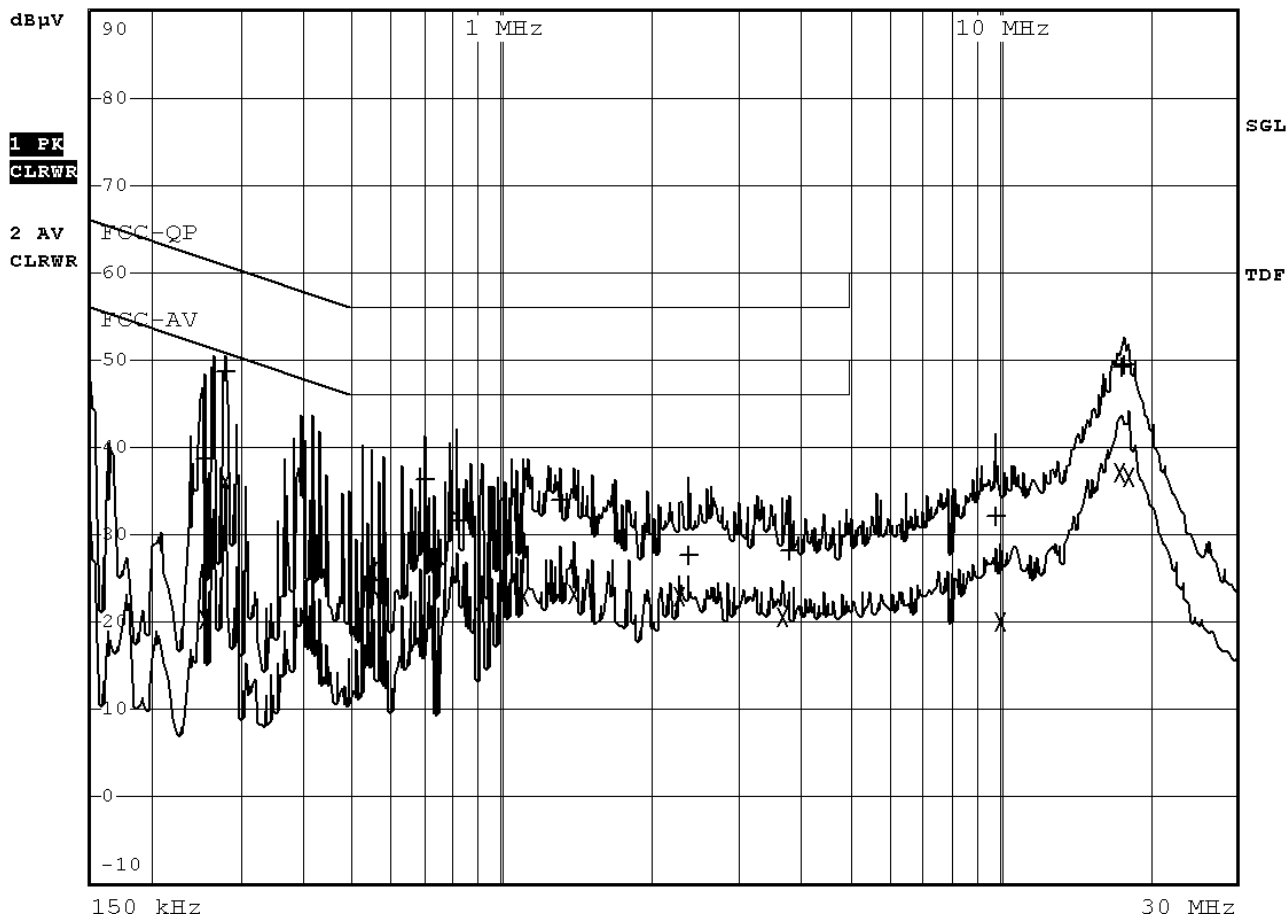
A6 Conducted Emission Measurement Date



RBW 9 kHz

MT 1 s

Att 10 dB AUTO PREAMP OFF



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Mr. LEUNG Shu-kan, Ken

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Mr. WONG Lap-pong, Andrew

FCC ID: 2ACS617RX

Page 29 of 34

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CMA Testing and Certification Laboratories

廠商會檢定中心

TEST REPORT

Report No. : AU0050511(1)

Date : 25 Aug 2016

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	253.5 kHz	38.62	N gnd	-23.01
2 Average	253.5 kHz	20.32	N gnd	-31.31
1 Quasi Peak	280.5 kHz	48.65	N gnd	-12.14
2 Average	280.5 kHz	36.08	N gnd	-14.71
2 Average	549.5 kHz	25.88	N gnd	-20.11
1 Quasi Peak	702.5 kHz	36.27	N gnd	-19.73
1 Quasi Peak	810.5 kHz	31.55	N gnd	-24.44
2 Average	1.103 MHz	22.89	N gnd	-23.10
1 Quasi Peak	1.3145 MHz	33.90	L1 gnd	-22.09
2 Average	1.3955 MHz	23.23	N gnd	-22.76
2 Average	2.273 MHz	22.89	N gnd	-23.10
1 Quasi Peak	2.3675 MHz	27.61	N gnd	-28.38
2 Average	3.6815 MHz	20.64	N gnd	-25.35
1 Quasi Peak	3.7985 MHz	28.07	N gnd	-27.92
1 Quasi Peak	9.824 MHz	32.12	N gnd	-27.87
2 Average	10.0625 MHz	20.06	L1 gnd	-29.93
2 Average	17.501 MHz	37.01	N gnd	-12.98
1 Quasi Peak	17.6225 MHz	49.22	N gnd	-10.78
1 Quasi Peak	17.9285 MHz	49.51	N gnd	-10.48
2 Average	18.23 MHz	36.59	N gnd	-13.40

Tested by:

Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew

FCC ID: 2ACS617RX

Page 30 of 34

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TEST REPORT

Date : 25 Aug 2016

Spectrum

Spectrum 2

Ref Level 97.00 dBμV/m

Att 0 dB RBW (CISPR) 1 MHz

TDF VBW 3 MHz Mode Auto Sweep

● 1Pk Max

Label	Value
M2[1]	54.65 dBμV/m
M1[1]	75.84 dBμV/m

Start 2.31 GHz 1001 pts Stop 2.405 GHz

Measuring...

The screenshot displays a Spectrum Analyzer interface. At the top, the title bar reads "Spectrum 2" with a close button. Below the title bar, the main display area shows a spectrum plot. The y-axis is labeled "dBμV/m" and ranges from 0 to 90. The x-axis is labeled "GHz" and ranges from 2.31 to 2.405. A blue line represents the spectrum, showing a flat baseline with a small peak at 2.405 GHz. The peak is labeled "M1[1]" and "M2[1]". The peak value is 23.67 dBμV/m. The frequency is 2.400000 GHz. The bandwidth is 36.57 dBμV/m. The resolution bandwidth (RBW) is 1 MHz. The video bandwidth (VBW) is 10 Hz. The mode is "Auto Sweep". The reference level is 97.00 dBμV/m. The attenuation (Att) is 0 dB. The sweep time (SWT) is 100 s. The trace is labeled "1Pk Max".

Ref Level 97.00 dBμV/m
 Att 0 dB
 TDF
 RBW (CISPR) 1 MHz
 SWT 100 s
 VBW 10 Hz
 Mode Auto Sweep

1Pk Max

M2[1] 23.67 dBμV/m
 M1[1] 2.400000 GHz
 36.57 dBμV/m
 2.4019160 GHz

90 dBμV/m
 80 dBμV/m
 70 dBμV/m
 60 dBμV/m
 50 dBμV/m
 40 dBμV/m
 30 dBμV/m
 20 dBμV/m
 10 dBμV/m
 0 dBμV/m

Start 2.31 GHz 1001 pts Stop 2.405 GHz

Measuring...

Mr. WONG Lap-pong, Andrew



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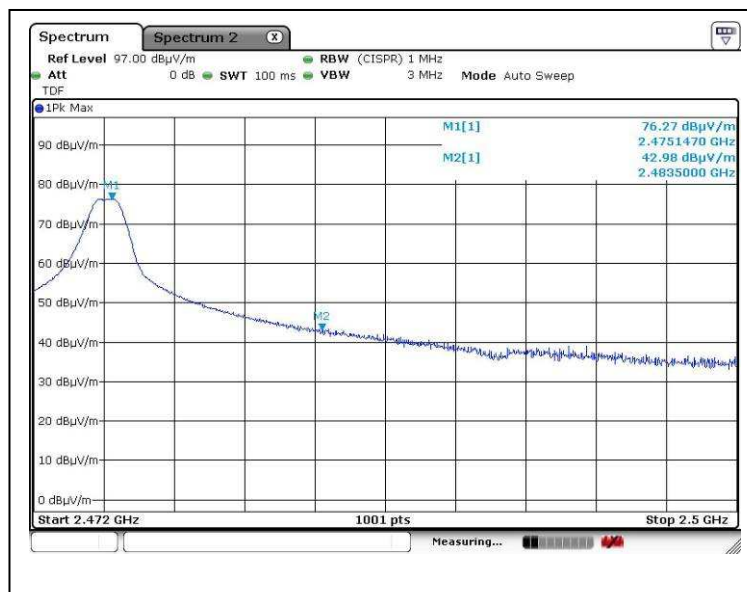
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TEST REPORT

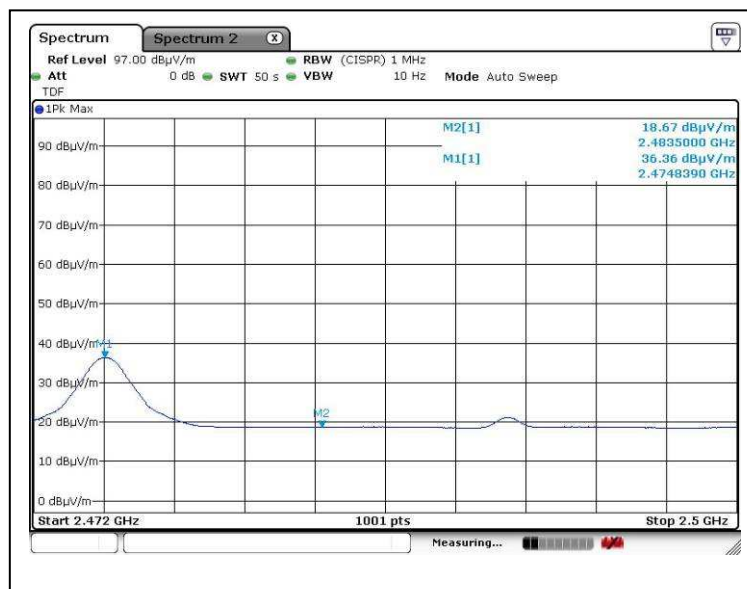
Report No. : AU0050511(1)

Date : 25 Aug 2016

A7. Band Edge



Upper edge (Peak measurement)



Upper edge (Average measurement)

Tested by:

Ken

Mr. LEUNG Shu-kan, Ken

Reviewed by:

PR

Mr. WONG Lap-pong, Andrew

FCC ID: 2ACS617RX

Page 32 of 34

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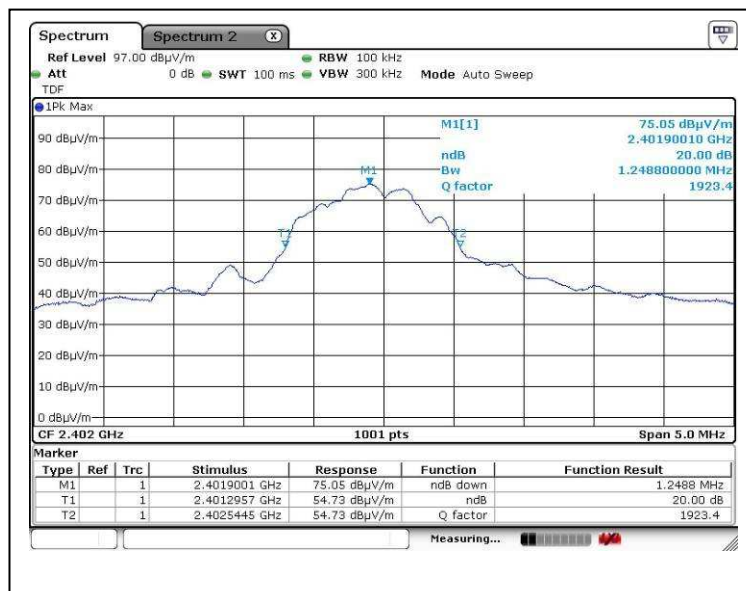
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TEST REPORT

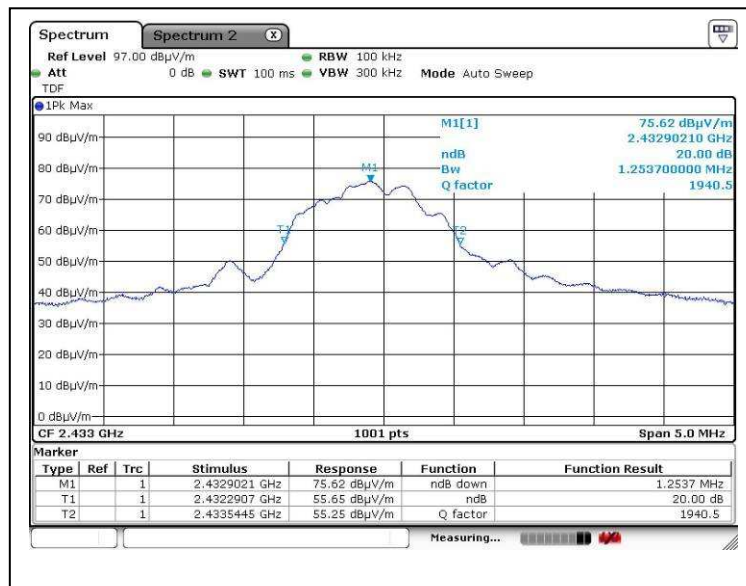
Report No. : AU0050511(1)

Date : 25 Aug 2016

A8. 20dB Bandwidth Plot



Bandwidth 1 (2402MHz)



Bandwidth 2 (2433MHz)

Tested by:

Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew

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Page 33 of 34

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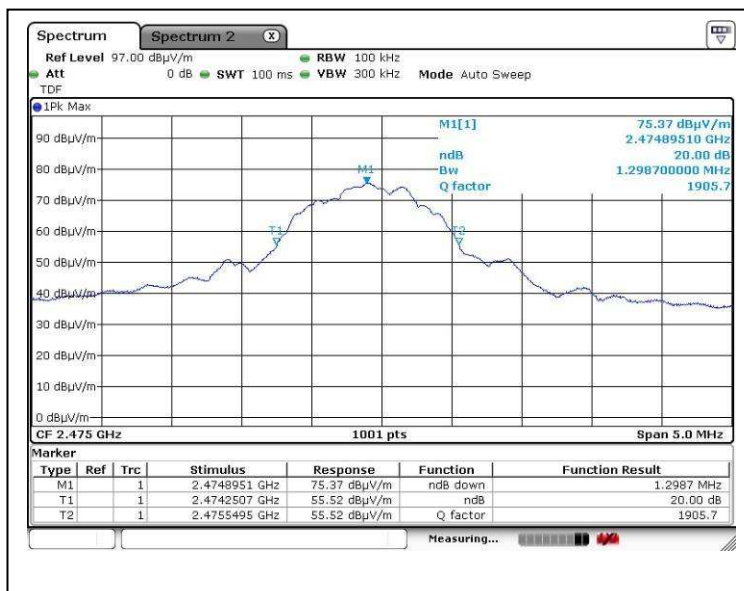
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TEST REPORT

Report No. : AU0050511(1)

Date : 25 Aug 2016

A8. 20dB Bandwidth Plot



Bandwidth 3 (2475MHz)

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

Tested by:

Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew

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Page 34 of 34

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