

廠商會檢定中心

TEST REPORT

Report No.	:	AU0021371(3)		Date :	15 Apr 2016		
Application No.	:	LU011338(5)					
Applicant	:	Room 703, Kowloon Bui	Zego Electronic Company Limited (Shenzhen Yangri Electronic Ltd) Room 703, Kowloon Building, 555 Nathan Road, Kowloon, HK				
Sample Description	:	One(1) item of submitted of Model No. <u>6910</u> Sample registration No. Radio Frequency Rating No. of submitted sample	: RU013467-001 : 2405MHz – 247 : 4 x 1.5V AAA s	5MHz Trans			
Date Received	:	22 Mar 2016					
Test Period	:	24 Mar 2016 to 30 Mar 2	016.				
Test Requested	:	FCC Part 15 Certificate (15.249)				
Test Method	:	47 CFR Part 15 (10-1-15 ANSI C63.4 – 2014, ANS	,				
Test Engineer	:	Mr. LEUNG Shu-kan, Ke	en				
Test Result	:	See attached sheet(s) from	n page 2 to 30.				
Conclusion	:	The submitted sample wa Subpart B and C.	as found to comply	with requirer	nent of FCC Part		

For and on behalf of CMA Industrial Development Foundation Limited

15

Authorized Signature : _ Page 1 of 30 Mr. WONG Lap-pong Andrew Manager Electrical Division FCC ID: 2ACS610TX

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1 General Information

1.1 General Description

The equipment under test (EUT) is a controller for Flapper Bot. The EUT is power by $4 \ge 1.5$ VAAA size batteries. It operates at 2405MHz – 2475MHz. There are buttons and joysticks on the EUT. When the buttons are pressed or the joysticks are moved, the EUT will transmit radio control signal to receiver.

The brief circuit description is listed as follows:

- U3	and its associated circuit act as MCU
- U1(module)	and its associated circuit act as RF circuit
- U1	and its associated circuit act as power supply circuit
- Y1	and its associated circuit act as oscillator
- S2, S3, S4, S5, S6, S7, S8, S9,	and its associated circuit act as copter control
VR1, VR2	•

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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 C63.10 - 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, 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	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 2016	1Years
Coaxial Cable	Suhner	RG 214/U	N/A	18 May 2016	1Years
Coaxial Cable	Suhner	Sucoflex_104	N/A	13 Dec 2016	1Years

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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)	4.83dB
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

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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 C63.10 - 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 for below 1GHz measurement and 1.5m high above the ground for above 1GHz measurement. 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 not meet the FCC requirement

<u>Subpart B:</u> 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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Date : 15 Apr 2016

2.3 Radiated Emission Measurement Data

Radiated emission

pursuant to

the requirement of FCC Part 15 subpart C

 $\circ \alpha$

Environmental conditions:	
Parameter	Recorded value
A with the set of a second second second	22

Ambient temperature:	23	°С	
Relative humidity:	73	%	

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)
2405.182	V	95.1	- 4.2	90.9	114.0	- 23.1
#4809.928	V	54.6	3.7	58.3	74.0	- 15.7
7214.161	Н	49.6	11.5	61.1	74.0	- 12.9
7214.175	V	49.5	11.5	61.0	74.0	- 13.0
2432.713	V	94.7	- 4.2	90.5	114.0	- 23.5
#4869.372	Н	51.7	3.7	55.4	74.0	- 18.6
#7229.586	V	49.0	11.5	60.5	74.0	- 13.5
#7229.651	Н	47.7	11.5	59.2	74.0	- 14.8
2475.193	V	95.2	- 4.3	90.9	114.0	- 23.1
#4947.902	Н	49.9	4.0	53.9	74.0	- 20.1
#7425.593	Н	48.0	11.5	59.5	74.0	- 14.5
#7425.593	V	49.1	11.5	60.6	74.0	- 13.4

Remark: Other emissions more than 20dB below the limit are not reported. EUT was placed flat on the table for maximum emission.

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2.3 Radiated Emission Measurement Data (Con't)

Radiated emission

pursuant to

the requirement of FCC Part 15 subpart C

° C

%

Environmental conditions:	
Parameter	Recorded value
Ambient temperature:	23
Relative humidity:	73

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

Frequency (MHz)	Polarity (H/V)	Peak Field Strength at 3m (dBµV/m)	Average Factor (dB/m)	Average Value at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
2405.182	V	90.9	- 21.2	69.7	94.0	- 24.3
#4809.928	V	58.3	- 21.2	37.1	54.0	- 16.9
7214.161	Н	61.1	- 21.2	39.9	54.0	- 14.1
7214.175	V	61.0	- 21.2	39.8	54.0	- 14.2
2432.713	V	90.5	- 21.2	69.3	94.0	- 24.7
#4869.372	Н	55.4	- 21.2	34.2	54.0	- 19.8
#7229.586	V	60.5	- 21.2	39.3	54.0	- 14.7
#7229.651	Н	59.2	- 21.2	38.0	54.0	- 16.0
2475.193	V	90.9	- 21.2	69.7	94.0	- 24.3
#4947.902	Н	53.9	- 21.2	32.7	54.0	- 21.3
#7425.593	V	59.5	- 21.2	38.3	54.0	- 15.7
#7425.593	Н	60.6	- 21.2	39.4	54.0	- 14.6

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

EUT was placed flat on the table for maximum emission.

Average Value at 3m = Peak Field Strength at 3m + Average Factor.

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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:	21	° C
Relative humidity:	73	%

Detector: Quasi-peak RBW: 120kHz VBW: 300kHz

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

Frequency (MHz)	Polarity (H/V)	Reading at 3m	Antenna Factor and Cable Loss	Field Strength at 3m	Limit at 3m (dBµV/m)	Margin (dB)
		(dBµV)	(dB/m)	(dBµV/m)	•	
49.014	Н	6.3	12.8	19.1	40.0	- 20.9
86.889	Н	8.4	9.7	18.1	40.0	- 21.9
#126.330	Н	8.5	14.4	22.9	43.5	- 20.6
#172.578	Н	7.9	11.9	19.8	43.5	- 23.7
207.454	Н	8.4	12.0	20.4	43.5	- 25.6
#259.149	Н	8.7	15.4	24.1	46.0	- 21.9
304.023	Н	8.3	16.8	25.1	46.0	- 20.9

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

EUT was placed flat on the table for maximum emission.

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Date : 15 Apr 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:	21	°C
Relative humidity:	73	%

Detector: Quasi-peak RBW: 120kHz VBW: 300kHz

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

Frequency (MHz)	Polarity (H/V)	Reading at 3m	Antenna Factor and Cable Loss	Field Strength at 3m	Limit at 3m (dBµV/m)	Margin (dB)
(11112)	(11, 1)	(dBµV)	(dB/m)	$(dB\mu V/m)$	(uDµ V/III)	(02)
48.290	Н	6.6	12.8	19.4	40.0	- 20.6
96.247	Н	9.6	10.1	19.7	43.5	- 23.8
148.755	Н	7.5	14.1	21.6	43.5	- 21.9
204.626	Н	8.5	12.0	20.5	43.5	- 23.0
#243.572	Н	9.9	13.2	23.1	46.0	- 22.9
#278.970	Н	9.0	15.4	24.4	46.0	- 21.6
#324.424	Н	9.0	16.8	25.8	46.0	- 20.2

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

EUT was placed flat on the table for maximum emission.

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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 C63.10 - 2013. 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 battery-operated product.

3.3 Graph and Table of Conducted Emission Measurement Data

Not Applicable

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Date : 15 Apr 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 2ACS610TX TSup.pdf.

4.2 Photographs of the External and Internal Configurations of the EUT

For electronic filing, the photos are saved with filename 2ACS610TX ExPho.pdf and 2ACS610TX InPho.pdf.

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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 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.

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

5.2 EUT Antenna

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

5.3 Duty cycle Calculation

Appendices A8 shows the plots of duty cycle

All channels are using the same data pattern

Time of one cycle: 3.9ms Number of pulses in one cycle: 2 Time of one pulse: 170µs

Duty cycle = $2*170\mu s / 3.9ms = 0.087$

Average factor = $20*\log(0.087) = -21.2$

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	A2	Photos of External Configurations	2	pages	
	A3	Photos of Internal Configurations	2	pages	
	A4	EUT Antenna	1	page	
	A5	ID Label/Location	1	page	
	A6	Band Edge	2	pages	
	A7	20dB Bandwidth Plot	2	pages	
	A8	Duty Cycle Plot	1	page	

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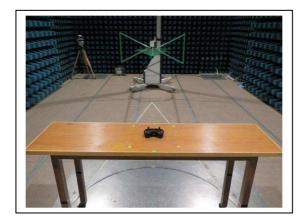


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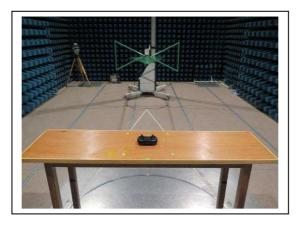
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A1. Photos of the set-up of Radiated Emissions



(Front view, 30MHz - 1GHz)



(Back view, 30MHz - 1GHz)

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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Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew

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Photos of the set-up of Radiated Emissions A1.



(front view, 1GHz - 25GHz)



(rear view, 1GHz – 25GHz)

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Mr. LEUNG Shu-kan, Ken

Reviewed by:

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Photos of External Configuration A2.



External Configuration 1



External Configuration 2

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Reviewed by:

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Photos of External Configuration A2.



External Configuration 3



External Configuration 4

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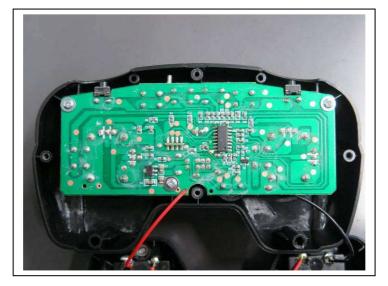


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Photos of Internal Configuration A3.



Internal Configuration 1



Internal Configuration 2

Tested by:

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Reviewed by:

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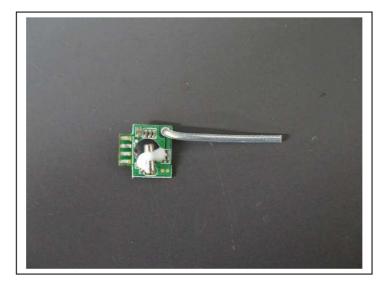
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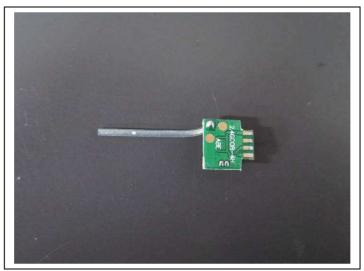
Date :

15 Apr 2016

Photos of Internal Configuration A3.



Internal Configuration 3



Internal Configuration 4

Tested by:

Mr. LEUNG Shu-kan, Ken

Reviewed by:

Mr. WONG Lap-pong, Andrew

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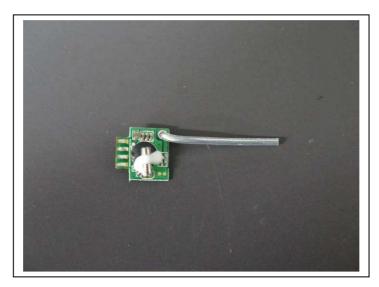


TEST REPORT

Report No. : AU0021371(3)

Date : 15 Apr 2016





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Mr. LEUNG Shu-kan, Ken

Reviewed by: P-R

Mr. WONG Lap-pong, Andrew

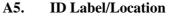
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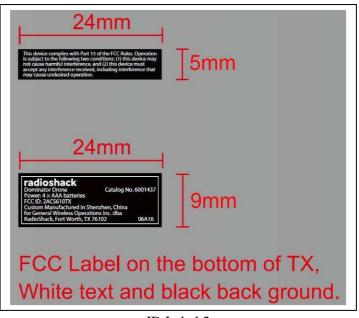
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ID Label 2

Tested by:

-Jan

Mr. LEUNG Shu-kan, Ken

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Mr. WONG Lap-pong, Andrew

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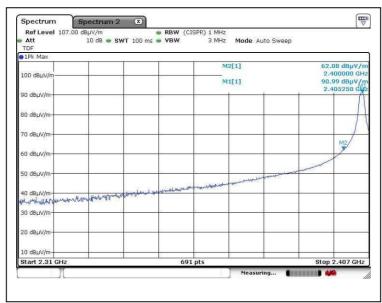
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A6. Band Edge

Lower edge (Peak measurement)

TDF		10 Hz Mode Auto 9		
• 1Pk Max		M2[1]	2	L.42 dBµV/r .400000 GH 7.55 dBµV/r
90 dBµV/m			2	.404960 GH
80 dBµV/m	 	 		
70 dBµV/m	 			
60 dBµV/m	 			
50 dBµV/m	 	 		-
40 dBµV/m	 	 		
30 dBµV/m				M2 M
20 dBµV/m	 			
10 dBµV/m		 		

Lower edge (Average measurement)

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TEST REPORT

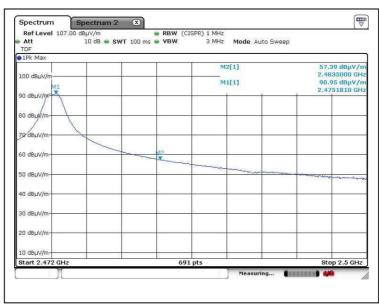
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A6. Band Edge

Upper edge (Peak measurement)

RefLevel 97.0 Att TDF		● RBW (CIS 7T 50 s ● VBW		Sweep	
●1Pk Max	1		M2[1]		19.09 dBµV/n
90 dBµV/m			M1[1]		2.4835000 GH 25.41 dBµV/r 2.4749780 GH
80 dBµV/m				1 1	2.4749700 GH
70 dBµV/m-					
60 dBµV/m					
50 dBµV/m					
40 dBµV/m		<u>.</u>			
30 dBµV/m					
20 dBµV/m		M2			
10 dBµV/m		5			
0 dBµV/m					
Start 2.472 GH	2	<u>े</u>	i91 pts	A	Stop 2.5 GHz

Upper edge (Average measurement)

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Spectrum	i s	ipectrum 2 🛛 🗷			
Ref Level	107.00 0	dBµ∨/m 10 dB — SWT 100 n	RBW 100 kH s > VBW 300 kH		1 Sween
TDF					, energy
1Pk Max		15 U.S.	12 C		
100 dBµV/m	s			M1[1]	90.08 dBµV/ 2.40495660 G
27. 78 27. 78			MI	ndB	20.00
90 dBµV/m-		-	m	BW	1.288000000 M
80 dBµV/m-			A CONTRACT OF A CONTRACT.	Q factor	1867
		TI	1	12	
70 dBµV/m-		Y Y		Ÿ	_
2011/03/250/8896		mont		Lun	
60 dBµV/m-					
50 dBµV/m-					Voun
40 dBµV/m-					
30 dBuV/m-					
00 00001)					
20 dBµV/m-		2	-		
10 10 112					
10 dBµV/m-	L12		691 pts		Span 5.0 MH
Marker	F12		091 pts		apan atu me
	Trc	Stimulus	Response	Function	Function Result
M1	1	2.4049566 GHz	90.08 dBµV/m	ndB down	1.288 MH
T1	1	2.4043054 GHz	70.23 dBµV/m	ndB	20.00 d
T2	1	2.4055933 GHz	70.40 dBµV/m	Q factor	1867.2
	10			Mei	asuring 🚺 🖬 🚧

A7. 20dB Bandwidth Plot

Bandwidth 1 (2405MHz)

Spect			pectrum 2 🛛 🛞			
	evel	107.00 di		RBW 100 kH:		
Att			10 dB 👄 SWT 100 r	ns 🥌 VBW 300 kH	z Mode Auto	Sweep
TDF						40 Geo
O 1PK M	ax		1 1		M1[1]	00 44 40-1
100 dB	N/m-				MILI	89.44 dBpV 2.43294930
100 00				MI	ndB	2.432949304
90 dBµ	/m-				BW	1.309700000
				Jun	O factor	185
80 dBµ	//m		-	m		
	2486210		T1	1	V2	
70 dBµ	//m-		7		7	
			man			
60 dBµ	V/m+					
50 dBu	Ilm	- transfer to a				
30 ubµ	710					
40 dBu	//m-					
in and	14.2.11					
30 dBµ	//m-					
	500000					
20 dBµ	//m		2			
10 dBµ						
CF 2.4		Z		691 pts		Span 5.0 M
Marker		Tree	Stimulus		Function	Function Result
Type M1	Ref	1	2,4329493 GHz	Response 89.44 dBµV/m	ndB down	Function Result 1,3097 M
T1		1	2.4329493 GHz	69.18 dBµV/m	nus uown ndB	20.00
T2		1	2.4336006 GHz	69.69 dBµV/m	Q factor	1857
		17				asuring 🗰 🗰 🗰

Bandwidth 2 (2433MHz)

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Ref Level 97 Att TDF	0 dB 👄 SW	● RBW (CI T 50 s ● VBW		Auto Sweep		
●1Pk Max	1	T I	M2[1]		19.09 dBuV/n	
90 dBµV/m-					2.4835000 GH	
			M1[1]		25.41 dBµ¥/n 2.4749780 GH	
80 dBµV/m-		P 6	-	- 1 - 1		
70 dBµV/m-						
60 dBµV/m-						
50 dBµV/m						
40 dBµV/m-						
30 dBµV/m						
~		M2				
20 dBµV/m-		7				
10 dBµV/m						
0 dBµV/m						
Start 2.472 GF	łz		691 pts		Stop 2.5 GHz	

A7. 20dB Bandwidth Plot

Bandwidth 3 (2475MHz)

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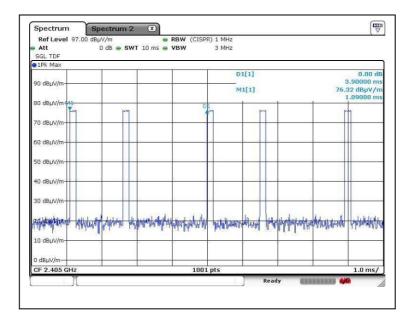
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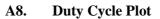
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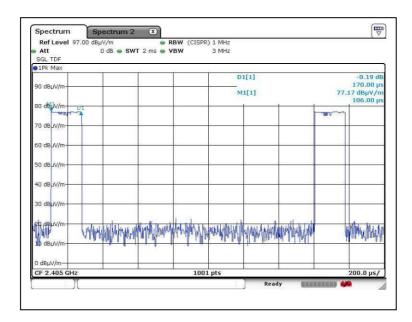
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Date :

15 Apr 2016







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

Reviewed by:

Tested by:

Mr. LEUNG Shu-kan, Ken

Mr. WONG Lap-pong, Andrew

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