

FCC TEST REPORT for STAR WAVE TECHNOLOGY CO., LTD.

2.4G Wireless Mouse Model No.: LW-8

Prepared for : STAR WAVE TECHNOLOGY CO., LTD.

Address : 3 Building the Second Floor, Fuzhong Industrial Park, Fuyong

Town, Baoan District, Shenzhen, Guangdong, China

Prepared By : Shenzhen Anbotek Compliance Laboratory Limited

Address : 1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road,

Nanshan District, Shenzhen, Guangdong, China

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Report Number : 201309872F

Date of Test : Sep. 20~ Oct. 24, 2013

Date of Report : Oct. 25, 2013



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TEST REPORT

Applicant : STAR WAVE TECHNOLOGY CO., LTD.

Manufacturer : STAR WAVE TECHNOLOGY CO., LTD.

EUT : 2.4G Wireless Mouse

Model No. : LW-8
Serial No. : N/A
Trade Mark : N/A

Rating : DC 3.0V Battery

Measurement Procedure Used:

FCC Part15 Subpart C, Paragraph 15.207, 15.249 & 15.209

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without

written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Test:	Sep. 20~ Oct. 24, 2013
Prepared by:	Zock reng
	(Tested Engineer / Rock Zeng)
Reviewer :	Sally. Zhang
_	(Project Manager / Sally Zhang)
Approved & Authorized Signer:	Ton Chen
	(Manager / Tom Chen)



1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT : 2.4G Wireless Mouse

Model Number : LW-8

Test Power Supply: DC 3V

Frequency : 2417MHz, 2421MHz, 2427MHz, 2431MHz, 2434MHz, 2438MHz,

2442MHz, 2447MHz, 2451MHz, 2452MHz, 2455MHz, 2459MHz,

2462MHz, 2466MHz, 2474MHz

No. of Channels : 15

Antenna: Printed Antenna: 0 dBi

Specification

Applicant : STAR WAVE TECHNOLOGY CO., LTD.

Address : 3 Building the Second Floor, Fuzhong Industrial Park, Fuyong

Town, Baoan District, Shenzhen, Guangdong, China

Manufacturer : STAR WAVE TECHNOLOGY CO., LTD.

Address : 3 Building the Second Floor, Fuzhong Industrial Park, Fuyong

Town, Baoan District, Shenzhen, Guangdong, China

Date of receiver : Sep. 20, 2013

Date of Test : Sep. 20~ Oct. 24, 2013



1.2. Auxiliary Equipment Used during Test

PC : Manufacturer: DELL

M/N: OPTIPLEX 380

S/N: 1J63X2X CE , FCC: DOC

MONITOR : Manufacturer: DELL

M/N: E170Sc

S/N: CN-00V539-64180-055-0UPS

CE, FCC: DOC

KEYBOARD : Manufacturer: DELL

M/N: SK-8115

S/N: CN-0DJ313-71616-06C-02XN

CE, FCC: DOC

Cable: 1m, unshielded

Printer : Manufacturer:Brother

M/N: MFC-3360C

S/N: N/A

CE, FCC:DOC

Power Line : Non-Shielded, 1.5m

VGA Cable : Non-Shielded, 1.5m

Network Cable : Non-Shielded, 1.5m



1.3. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS - LAB Code: L3503

Shenzhen Anbotek Compliance Laboratory Limited., Laboratory has been assessed and in compliance with CNAS/CL01: 2006 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2005 General Requirements) for the Competence of Testing Laboratories.

FCC-Registration No.: 752021

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registed and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 752021, July 10, 2013.

IC-Registration No.: 8058A-1

Shenzhen Anbotek Compliance Laboratory Limited., EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada. The acceptance letter from the IC is maintained in our files. Registration 8058A-1, February 22, 2013.

Test Location

All Emissions tests were performed at

Shenzhen Anbotek Compliance Laboratory Limited. at 1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road, Nanshan District, Shenzhen, Guangdong, China

1.4. Measurement Uncertainty

Radiation Uncertainty : Ur = 4.3 dB

Conduction Uncertainty : Uc = 3.4dB



2. Test Procedure

GENERAL: This report shall NOT be reproduced except in full without the written approval of Shenzhen Anbotek Compliance Laboratory Limited. The EUT was transmitting a test signal during the testing.

RADIATION INTERFERENCE: The test procedure used was ANSI STANDARD C63.4-2009 using a spectrum analyzer with a pre-selector. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100KHz and the video bandwidth was 300KHz up to 1.0GHz and 1.0MHz with a video BW of 3.0MHz above 1.0GHz. The ambient temperature of the EUT was 74.3oF with a humidity of 69%.

FORMULA OF CONVERSION FACTORS: The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the Preselector was accounted for in the Spectrum Analyzer Meter Reading.

Example:

Freq (MHz) METER READING + ACF = FS 20 dBuV + 10.36 dB = 30.36 dBuV/m @ 3m

ANSI STANDARD C63.4-2009 10.1.7 MEASUREMENT PROCEDURES: The EUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The EUT was placed in the center of the table (1.5m side). The table used for radiated measurements is capable of continuous rotation.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.



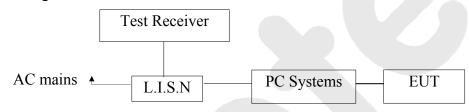
3. Conducted Limits

Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval	
1.	Two-Line	Rohde & Schwarz	ENV216	10055	Apr. 23, 2013	1 Year	
	V-network	Konde & Schwarz	ENV210	10033	Apr. 23, 2013	1 Year	
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Apr. 23, 2013	1 Year	
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Apr. 23, 2013	1 Year	

3.1. Block Diagram of Test Setup

3.1.1. Block diagram of connection between the EUT and simulators



(EUT: 2.4G Wireless Mouse)

3.2. Power Line Conducted Emission Measurement Limits (15.207)

Frequency	Limits dB(μV)				
MHz	Quasi-peak Level	Average Level			
0.15 ~ 0.50	66 ~ 56*	56 ~ 46*			
0.50 ~ 5.00	56	46			
5.00 ~ 30.00	60	50			

Notes: 1. *Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

3.3. Configuration of EUT on Measurement

The following equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner which tends to maximize its emission characteristics in a normal application.

EUT : 2.4G Wireless Mouse

Model Number : LW-8

Applicant : STAR WAVE TECHNOLOGY CO., LTD.



3.4. Operating Condition of EUT

- 3.4.1. Setup the EUT and simulator as shown as Section 3.1.
- 3.4.2. Turn on the power of all equipment.
- 3.4.3. Let the EUT work in test mode (ON) and measure it.

3.5. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.4-2003 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9KHz.

The frequency range from 150KHz to 30MHz is checked.

The test results are reported on Section 3.6.

3.6. Power Line Conducted Emission Measurement Results **PASS.**

The frequency range from 150KHz to 30 MHz is investigated.

Please refer the following pages.



CONDUCTED EMISSION TEST DATA

EUT: 2.4G Wireless Mouse M/N: LW-8

Operating Condition: ON

Test Site: 1# Shielded Room

Operator: Finley Li

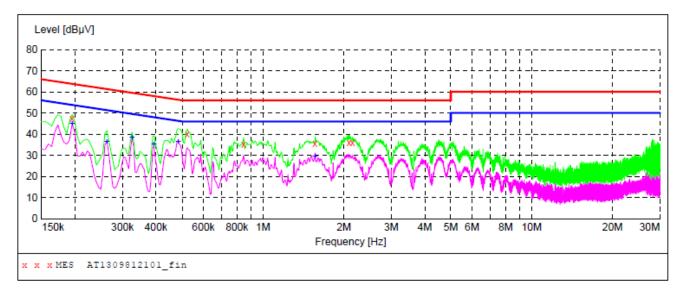
Test Specification: AC 120V/60Hz for PC

Comment: Live Line

Tem:25 °C Hum:50%

SCAN TABLE: "Voltage (150K~30M) FIN"

Short Description: 150K-30M Disturbance Voltages



MEASUREMENT RESULT: "AT1309812101 fin"

9	/20/2013 10:							
	Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
	0.195000	47.60	20.1	64	16.2	QP	L1	GND
	0.523500	40.20	20.1	56	15.8	QP	L1	GND
	0.847500	35.30	20.1	56	20.7	QP	L1	GND
	1.562500	35.60	20.3	56	20.4	QP	L1	GND
	2.089000	36.00	20.3	56	20.0	QP	L1	GND
	2.152000	36.10	20.3	56	19.9	OP	L1	GND

MEASUREMENT RESULT: "AT1309812101 fin2"

9/20/2013 10 Frequency MHz		Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.195000	45.20	20.1	54	8.6	AV	L1	GND
0.262500	36.30	20.1	51	15.1	AV	L1	GND
0.325500	38.40	20.1	50	11.2	AV	L1	GND
0.393000	35.00	20.1	48	13.0	AV	L1	GND
0.483000	36.50	20.1	46	9.8	AV	L1	GND
1.562500	29.50	20.3	46	16.5	AV	L1	GND



CONDUCTED EMISSION TEST DATA

EUT: 2.4G Wireless Mouse M/N: LW-8

Operating Condition: ON

Test Site: 1# Shielded Room

Operator: Finley Li

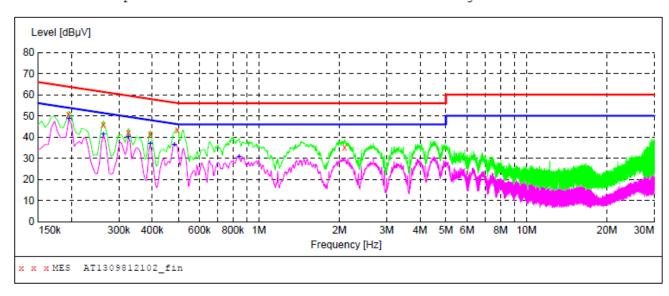
Test Specification: AC 120V/60Hz for PC

Comment: Neutral Line

Tem:25°C Hum:50%

SCAN TABLE: "Voltage (150K~30M) FIN"

Short Description: 150K-30M Disturbance Voltages



MEASUREMENT RESULT: "AT1309812102_fin"

9	/20/2013 10:	22AM						
	Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
	0.195000	50.90	20.1	64	12.9	QP	N	GND
	0.262500	46.00	20.1	61	15.4	QP	N	GND
	0.325500	42.20	20.1	60	17.4	QP	N	GND
	0.393000	41.50	20.1	58	16.5	QP	N	GND
	0.496500	43.20	20.1	56	12.9	QP	N	GND
	2.089000	35.00	20.3	56	21.0	QP	N	GND

MEASUREMENT RESULT: "AT1309812102 fin2"

PE	Line	Detector	Margin dB	Limit dBµV	Transd dB		9/20/2013 10: Frequency MHz
GND	N	AV	5.0	54	20.1	48.80	0.195000
GND	N	AV	9.9	51	20.1	41.50	0.262500
GND	N	AV	9.6	50	20.1	40.00	0.325500
GND	N	AV	11.0	48	20.1	37.00	0.393000
GND	N	AV	9.9	46	20.1	36.40	0.483000
GND	N	AV	15.3	46	20.1	30.70	0.843000



4. Radiation Interference

4.1. Requirements (15.249, 15.209):

FIELD STRENGTH FIELD STRENGTH S15.209

of Fundamental: of Harmonics 30 - 88 MHz 40 dBuV/m

@3M

902-928 MHZ 88 - 216 MHz 43.5 2.4-2.4835 GHz 216 - 960 MHz 46

94 dB μ V/m @3m 54 dB μ V/m @3m ABOVE 960 MHz 54dBuV/m

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 limits in 15.209, whichever is the lesser attenuation.

4.2 Test Procedure

The EUT is placed on a turn table which is 0.8 meter high above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on test.

All readings from 30MHz to 1GHz are quasi-peak values with a resolution bandwidth of 120kHz. All reading are above 1GHz, peak & average values with a resolution bandwidth of 1MHz. The EUT is tested in 9*6*6 Chamber.

The test results are listed in Section 4.3.

Test Equipment

Item	Equipment Manufacturer		Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESCI	101604	Apr. 23, 2013	1 Year
2.	Bilog Broadband	Schwarzbeck	VULB9163	VULB	Apr. 23, 2013	1 Year
	Antenna		V OLD9103	9163-289	Apr. 23, 2013	
3.	Pre-amplifier	SONOMA	310N	186860	Apr. 23, 2013	1 Year
4.	EMI Test					
	Software	SHURPLE	N/A	N/A	N/A	N/A
	EZ-EMC					

Radiation Uncertainty : Ur = 4.3 dB

4.3 Test Results

PASS.

3m



Please refer the following pages.

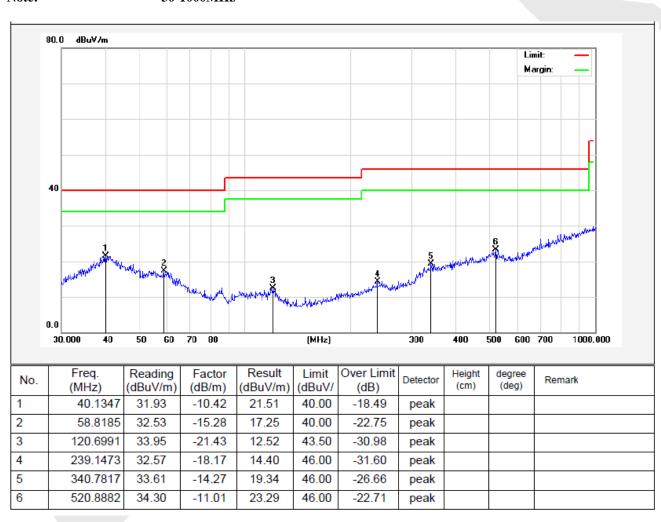
Data:

Below 1GHz:

Job No.: AT1309812F **Polarziation: Horizontal Standard: Power Source:** DC 3V (RE)FCC PART15 C _3m 2013/09/20 Test item: **Radiation Test** Date: 17/38/57 Temp.(C)/Hum.(%RH): 24.3(C)/55%RH Time: EUT: 2.4G Wireless Mouse Test By: **Rock Zeng Distance:**

Model: **LW-8** Mode: ON

Note: 30-1000MHz





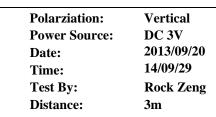
Job No.: AT1309812F

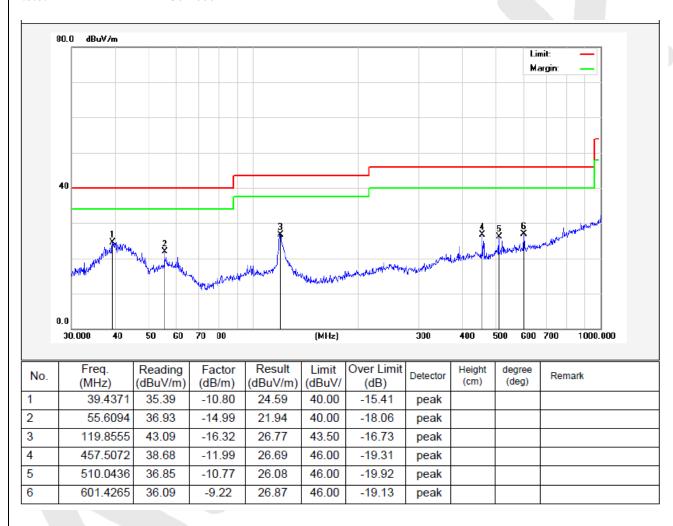
Standard: (RE)FCC PART15 C _3m

Test item: Radiation Test
Temp.(C)/Hum.(%RH): 24.3(C)/55%RH
EUT: 2.4G Wireless Mouse

Model: LW-8 Mode: ON

Note: 30-1000MHz







Above 1 GHz:

Horizonta	ll
CH Low	(2427MHz)

Frequency MHz	Cable Loss dB	Ant Factor dB/m	Preamp Factor dB	Read Level dBµV	Level dBµV/m	Limit dBμV/m	Over Limit dB	Remark
2427.000 2427.000 4854.000 4854.000 7281.000 7281.000 9708.000 9708.000 12135.000	2.17 2.17 2.56 2.56 2.98 2.98	31.21 31.21 34.01 34.01 36.16 36.16	35.30 35.30 34.71 34.71 35.15 35.15	86.13 84.22 41.75 38.02 38.38 28.14	84.21 82.3 43.61 39.88 42.37 32.13	114.0 94.0 74.0 54.0 74.0 54.0	-29.79 -11.7 -30.39 -14.12 -31.63 -21.87	Peak AV Peak AV Peak AV
12135.000								

Vertical

CH Low (2427MHz)

CILLOW	(272/19111	<i>L</i>)						
Frequency	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit	Over Limit	Remark
MHz	dB	dB/m	dB	dBμV	$dB\mu V/m \\$	$dB\mu V/m \\$	dB	
2427.000	2.17	31.21	35.30	87.09	85.17	114.0	-28.83	Peak
2427.000	2.17	31.21	35.30	81.44	79.52	94.0	-14.48	AV
4854.000	2.56	34.01	34.71	41.01	42.87	74.0	-31.13	Peak
4854.000	2.56	34.01	34.71	38.76	40.62	54.0	-13.38	AV
7281.000	2.98	36.16	35.15	37.35	41.34	74.0	-32.66	Peak
7281.000	2.98	36.16	35.15	34.44	38.43	54.0	-15.57	AV
9708.000								
9708.000								
12135.000								
12135.000								



Horizontal CH Middle (2452MHz)

Frequency	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit	Over Limit	Remark
MHz	dB	dB/m	dB	dΒμV	$dB\mu V/m$	$dB\mu V/m$	dB	
2452.000	2.19	31.22	34.60	93.89	92.7	114.0	-21.3	Peak
2452.000	2.19	31.22	34.60	81.12	79.93	94.0	-14.07	AV
4904.000	2.57	35.00	34.58	39.74	42.73	74.0	-31.27	Peak
4904.000	2.57	35.00	34.58	37.53	40.52	54.0	-13.48	AV
7356.000	3.00	36.17	35.14	35.04	39.07	74.0	-34.93	Peak
7356.000	3.00	36.17	35.14	37.90	41.93	54.0	-12.07	AV
9808.000								
9808.000								
12260.000								
12260.000								

Vertical

CH Middle (2452MHz)

Frequency	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit	Over Limit	Remark
MHz	dB	dB/m	dB	$dB\mu V$	$dB\mu V/m$	$dB\mu V/m$	dB	
2452.000	2.19	31.22	34.60	90.54	89.35	114.0	-24.65	Peak
2452.000	2.19	31.22	34.60	82.35	81.16	94.0	-12.84	AV
4904.000	2.57	35.00	34.58	43.72	46.71	74.0	-27.29	Peak
4904.000	2.57	35.00	34.58	42.03	45.02	54.0	-8.98	AV
7356.000	3.00	36.17	35.14	39.82	43.85	74.0	-30.15	Peak
7356.000	3.00	36.17	35.14	38.41	42.44	54.0	-11.56	AV
9808.000								
9808.000								
12260.000								
12260.000								



Horizonta	.1
CH High	(2474MHz)

Frequency MHz	Cable Loss dB	Ant Factor dB/m	Preamp Factor dB	Read Level dBµV	$\begin{array}{c} Level \\ dB\mu V/m \end{array}$	Limit dBμV/m	Over Limit dB	Remark
2474.000	2.20	31.65	36.00	94.12	91.97	114.0	-22.03	Peak
2474.000	2.20	31.65	36.00	82.64	80.49	94.0	-13.51	AV
4948.000	2.58	35.06	34.79	43.78	46.63	74.0	-27.37	Peak
4948.000	2.58	35.06	34.79	37.45	40.3	54.0	-13.7	AV
7422.000	3.02	36.19	34.90	41.36	45.67	74.0	-28.33	Peak
7422.000	3.02	36.20	35.20	36.21	40.23	54.0	-13.77	AV
9896.000								
9896.000								
12370.000								
12370.000							7-	

Vertical	
CH High (2474MHz)	

CII IIIgii (2	T/TIVIIIZ)							
Frequency	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit	Over Limit	Remark
MHz	dB	dB/m	dB	dBμV	$dB\mu V/m$	$dB\mu V/m$	dB	
2474.000	2.20	21.65	26.00	02.61	00.46	1140	22.54	D 1
2474.000	2.20	31.65	36.00	92.61	90.46	114.0	-23.54	Peak
2474.000	2.20	31.65	36.00	82.31	80.16	94.0	-13.84	AV
4948.000	2.58	35.06	34.79	42.85	45.7	74.0	-28.3	Peak
4948.000	2.58	35.06	34.79	39.72	42.57	54.0	-11.43	AV
7422.000	3.02	36.19	34.90	38.05	42.36	74.0	-31.64	Peak
7422.000	3.02	36.20	35.20	36.35	40.37	54.0	-13.63	AV
9896.000								
9896.000								
12370.000								
12370.000								

NOTE: "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured. The results of different modulations are the same.



5. Occupied Bandwidth

5.1. Requirements (15.249):

The field strength of any emissions appearing outside the band edges and up to 10 kHz above and below the band edges shall be attenuated at least 50 dB below the level of the carrier or to the general limits of 15.249.

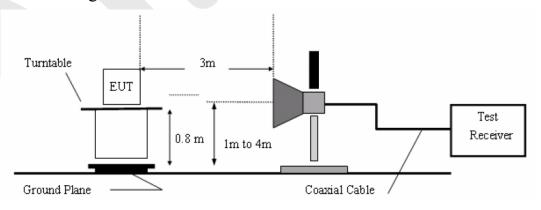
5.2. Test Procedure

The EUT is placed on a turn table which is 0.8 meter high above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on test.

Test Equipment

	1 est Equipment					
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESCI	101604	Apr. 23, 2013	1 Year
2.	Bilog Broadband	Schwarzbeck	VULB9163	VULB	Apr. 23, 2013	1 Year
	Antenna		VULB9103	9163-289	Apr. 23, 2013	
3.	Pre-amplifier	SONOMA	310N	186860	Apr. 23, 2013	1 Year
4.	EMI Test					
	Software	SHURPLE	N/A	N/A	N/A	N/A
	EZ-EMC					

5.3. Test Configuration:



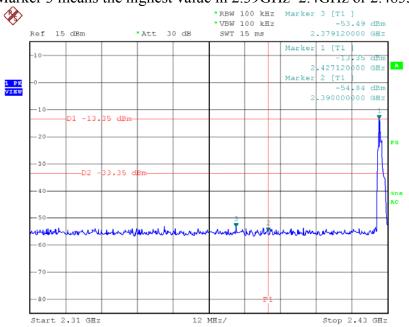


5.4. Test Results

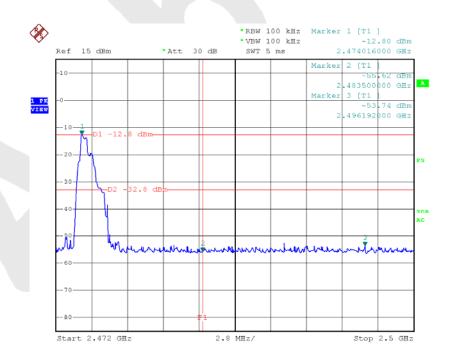
Pass.

Please refer the following plot.

(Note: Marker 3 means the highest value in 2.39GHz~2.4GHz or 2.4835~2.5GHz)



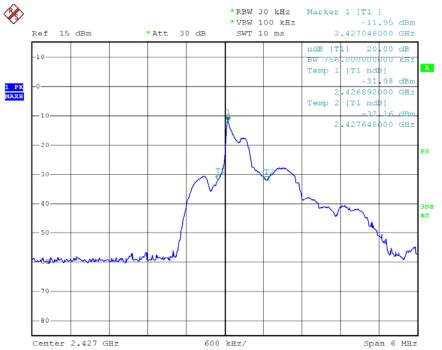
Date: 23.0CT.2013 16:03:13



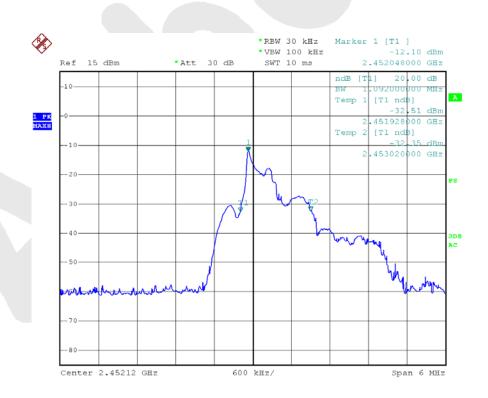
Date: 23.0CT.2013 16:04:39



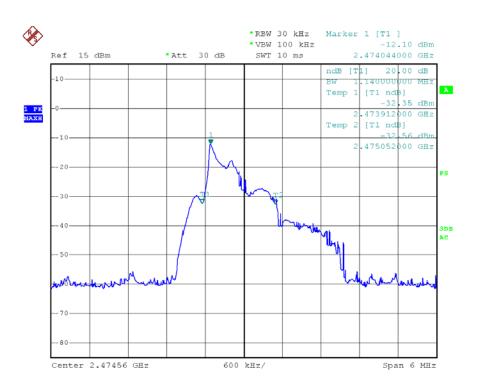
20dB Down:



Date: 23.0CT.2013 15:39:44



Date: 23.0CT.2013 15:40:26

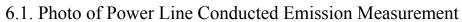


Date: 23.0CT.2013 15:41:09





6. PHOTOGRAPH









6.2. Photo of Radiation Emission Test







APPENDIX I (External Photos)

Figure 1
The EUT-Front View



Figure 2
The EUT-Back View





APPENDIX I (Internal Photos)





Figure 4
The EUT-Inside View







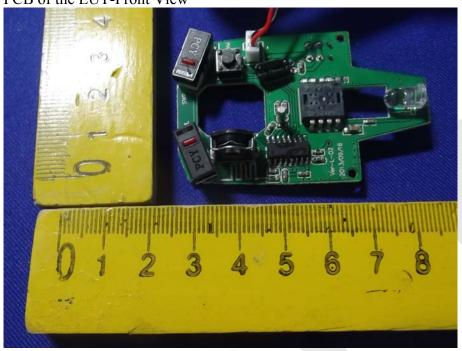


Figure 6 PCB of the EUT-Back View







