

FCC TEST REPORT

for
Wintop Electronics Co., Ltd.

2.4GHz Wireless Optical Mouse
Model No.: WM-676

Prepared for : Wintop Electronics Co., Ltd.
Address : Huaguan Industrial Park, Xinhe Road, Shangmugu, Pinghu
Town, Longgang District, Shenzhen City, China

Prepared By : Shenzhen Anbotek Compliance Laboratory Limited
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Report Number : 201310702F
Date of Test : Oct. 11~ Nov. 06, 2013
Date of Report : Nov. 07, 2013

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APPENDIX I (External Photos) (1 Pages)

APPENDIX II (Internal Photos) (2 Pages)

TEST REPORT

Applicant : Wintop Electronics Co., Ltd.
Manufacturer : Shenzhen Wintop Electronics Co. Limited
EUT : 2.4GHz Wireless Optical Mouse
Model No. : WM-676
Serial No. : N/A
Trade Mark : N/A
Rating : DC 3V, 8mA

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 : _____ Oct. 11~ Nov. 06, 2013

Prepared by : _____
(Tested Engineer / Rock Zeng)

Reviewer : _____
(Project Manager / Sally Zhang)

Approved & Authorized Signer : _____
(Manager / Tom Chen)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT : 2.4GHz Wireless Optical Mouse

Model Number : WM-676

Test Power Supply : DC 3.0V

Frequency : 2402-2480MHz

No. of Channel : 79

Channel Space : 1MHz

Antenna Specification : Printed Antenna:1.52 dBi

Applicant Address : Wintop Electronics Co., Ltd.
: Huaguan Industrial Park, Xinhe Road, Shangmugu, Pinghu Town,
Longgang District, Shenzhen City, China

Manufacturer Address : Shenzhen Wintop Electronics Co. Limited
: Huaguan Industrial Park, Xinhe Road, Baolai Industrial District,
Shangmugu, Pinghu Town, Longgang District, Shenzhen City,
518000 China

Date of receiver : Oct. 11, 2013

Date of Test : Oct. 11~ Nov. 06, 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 registered 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 = 4.3dB

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

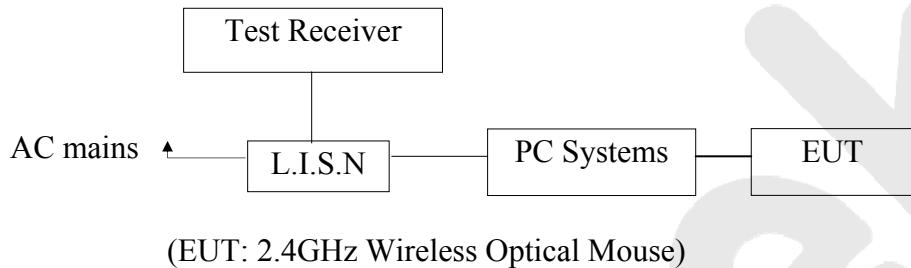
ANSI STANDARD C63.4-2009 10.1.7 MEASUREMENT PROCEDURES: The EUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The EUT was placed in the center of the table (1.5m side). The table used for radiated measurements is capable of continuous rotation.

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

3.1. Block Diagram of Test Setup

3.1.1. Block diagram of connection between the EUT and simulators



3.2. Power Line Conducted Emission Measurement Limits (15.207)

Frequency MHz	Limits dB(μ V)	
	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 : 2.4GHz Wireless Optical Mouse
 Model Number : WM-676
 Applicant : Wintop Electronics 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.

Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Two-Line V-network	Rohde & Schwarz	ENV216	10055	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

3.6. Power Line Conducted Emission Measurement Results

PASS.

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

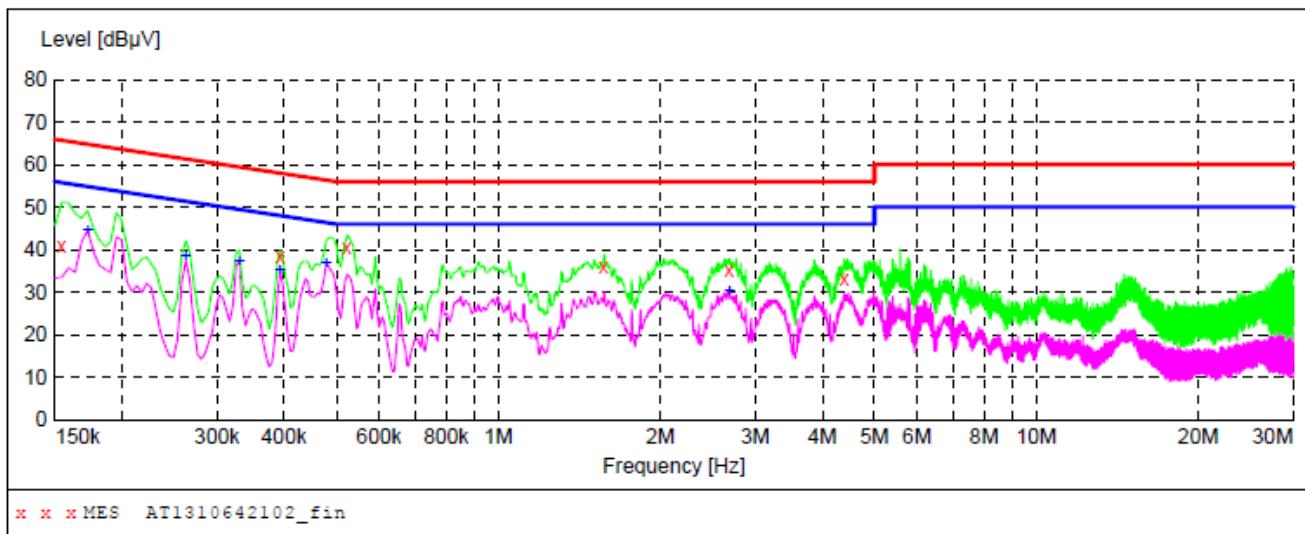
Please refer the following pages.

CONDUCTED EMISSION TEST DATA

EUT: 2.4GHz Wireless Optical Mouse M/N: WM-676
 Operating Condition: ON
 Test Site: 1# Shielded Room
 Operator: Bevan Zhang
 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: "AT1310642102_fin"

10/12/2013 3:06PM	Frequency	Level	Transd	Limit	Margin	Detector	Line	PE
	MHz	dB μ V	dB	dB μ V	dB			
	0.154500	41.00	20.1	66	24.8	QP	L1	GND
	0.393000	38.40	20.1	58	19.6	QP	L1	GND
	0.523500	40.60	20.1	56	15.4	QP	L1	GND
	1.571500	36.00	20.3	56	20.0	QP	L1	GND
	2.687500	35.10	20.4	56	20.9	QP	L1	GND
	4.397500	33.30	20.5	56	22.7	QP	L1	GND

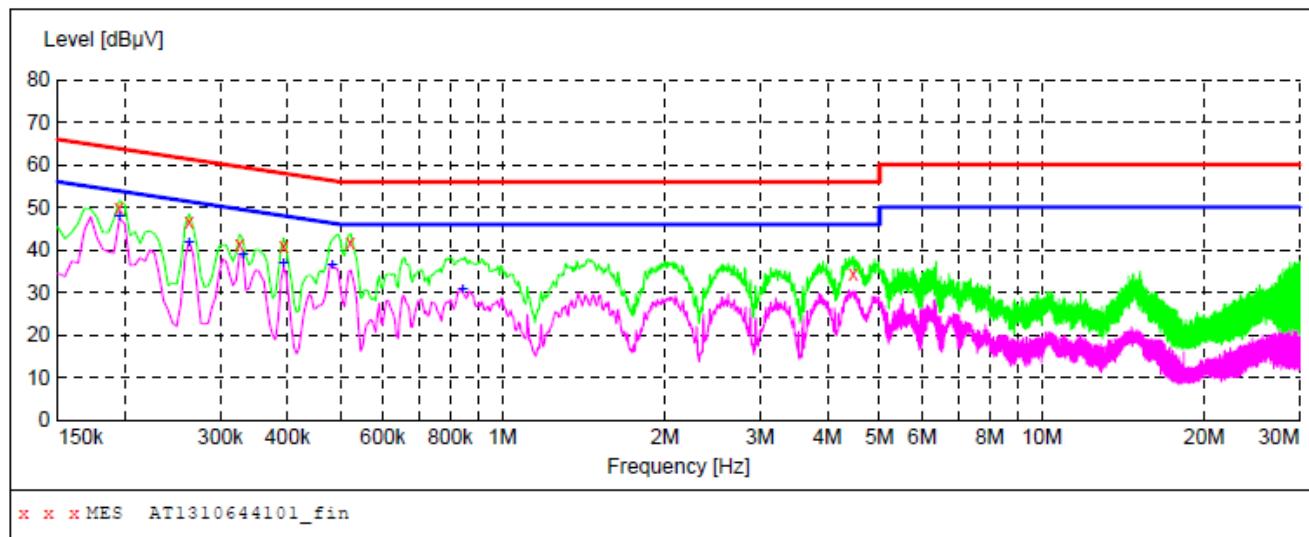
MEASUREMENT RESULT: "AT1310642102_fin2"

10/12/2013 3:06PM	Frequency	Level	Transd	Limit	Margin	Detector	Line	PE
	MHz	dB μ V	dB	dB μ V	dB			
	0.172500	44.50	20.1	55	10.3	AV	L1	GND
	0.262500	38.50	20.1	51	12.9	AV	L1	GND
	0.330000	37.20	20.1	50	12.3	AV	L1	GND
	0.393000	35.30	20.1	48	12.7	AV	L1	GND
	0.478500	36.70	20.1	46	9.7	AV	L1	GND
	2.687500	30.10	20.4	46	15.9	AV	L1	GND

CONDUCTED EMISSION TEST DATA

EUT: 2.4GHz Wireless Optical Mouse M/N: WM-676
 Operating Condition: ON
 Test Site: 1# Shielded Room
 Operator: Bevan Zhang
 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: "AT1310644101_fin"

10/12/2013 3:03PM	Frequency	Level	Transd	Limit	Margin	Detector	Line	PE
	MHz	dB μ V	dB	dB μ V	dB			
	0.195000	50.10	20.1	64	13.7	QP	N	GND
	0.262500	46.50	20.1	61	14.9	QP	N	GND
	0.325500	41.20	20.1	60	18.4	QP	N	GND
	0.393000	41.10	20.1	58	16.9	QP	N	GND
	0.523500	41.60	20.1	56	14.4	QP	N	GND
	4.474000	34.50	20.5	56	21.5	QP	N	GND

MEASUREMENT RESULT: "AT1310644101_fin2"

10/12/2013 3:03PM	Frequency	Level	Transd	Limit	Margin	Detector	Line	PE
	MHz	dB μ V	dB	dB μ V	dB			
	0.195000	47.80	20.1	54	6.0	AV	N	GND
	0.262500	41.80	20.1	51	9.6	AV	N	GND
	0.330000	39.00	20.1	50	10.5	AV	N	GND
	0.393000	36.70	20.1	48	11.3	AV	N	GND
	0.483000	36.30	20.1	46	10.0	AV	N	GND
	0.843000	30.70	20.1	46	15.3	AV	N	GND

4. Radiation Interference

4.1. Requirements (15.249, 15.209):

FIELD STRENGTH of Fundamental: @3M	FIELD STRENGTH of Harmonics	S15.209 30 - 88 MHz	40 dB μ V/m
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	54dB μ V/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.	Spectrum Analysis	Agilent	E4407B	US39390582	Aug. 09, 2013	1 Year
2.	Preamplifier	Instruments corporation	EMC01183 0	980100	Aug. 09, 2013	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	Apr. 23, 2013	1 Year
4.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Aug. 09, 2013	3 Year
5.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	9163-289	Apr. 23, 2013	3 Year
6.	Pre-amplifier	SONOMA	310N	186860	Apr. 23, 2013	1 Year
7.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A

Radiation Uncertainty : Ur = 4.3dB

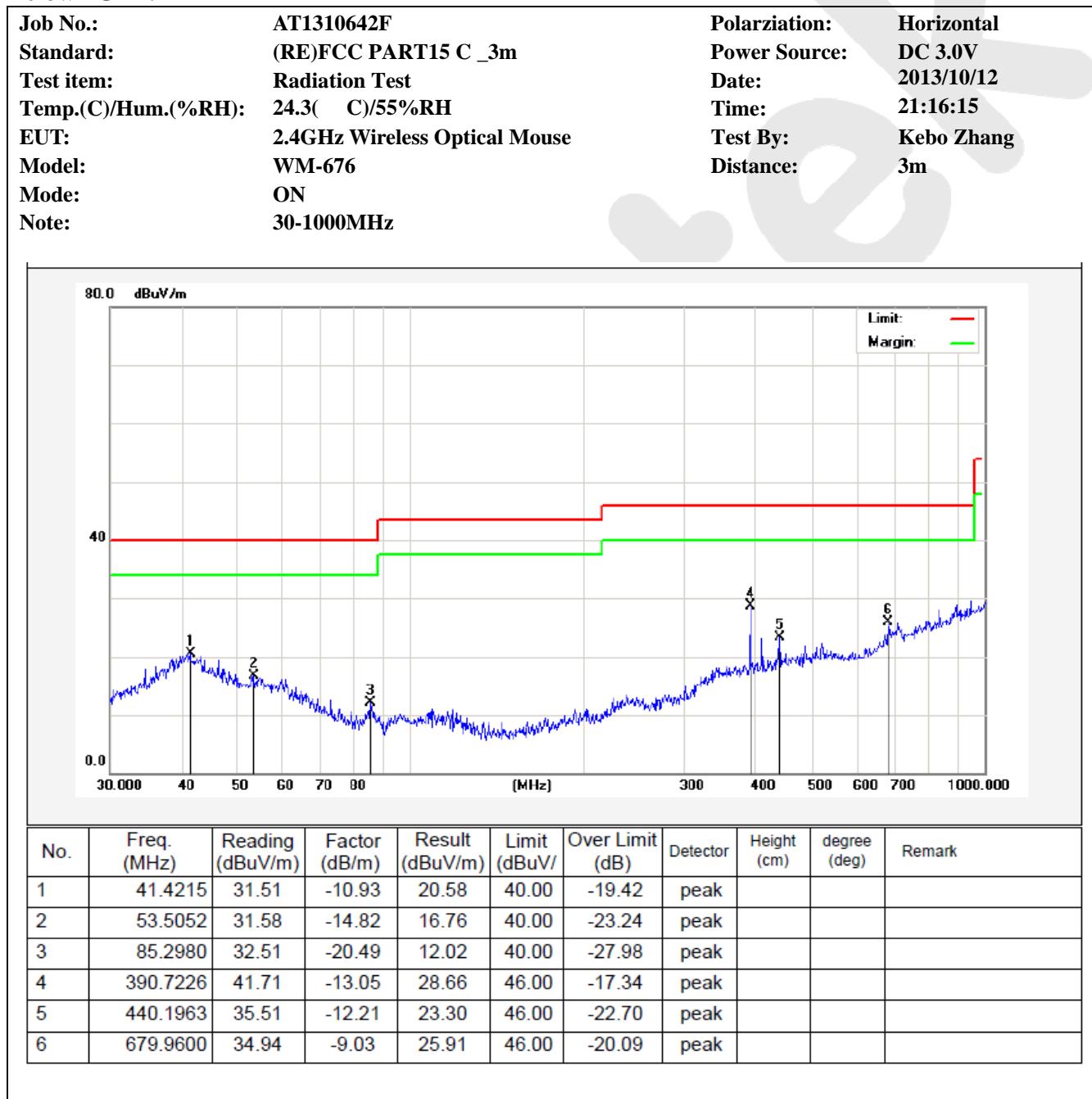
4.3 Test Results

PASS.

Please refer the following pages.

Data:

Below 1GHz:



Job No.:	AT1310642F	Polarization:	Vertical
Standard:	(RE)FCC PART15 C _3m	Power Source:	DC 3.0V
Test item:	Radiation Test	Date:	2013/10/12
Temp.(C)/Hum.(%RH):	24.3(C)/55%RH	Time:	21:14:49
EUT:	2.4GHz Wireless Optical Mouse	Test By:	Kebo Zhang
Model:	WM-676	Distance:	3m
Mode:	ON		
Note:	30-1000MHz		



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	41.2765	37.17	-10.87	26.30	40.00	-13.70	peak			
2	52.5753	32.48	-14.75	17.73	40.00	-22.27	peak			
3	97.7983	32.69	-15.88	16.81	43.50	-26.69	peak			
4	269.4284	32.96	-14.58	18.38	46.00	-27.62	peak			
5	411.8240	33.14	-11.52	21.62	46.00	-24.38	peak			
6	636.1340	33.45	-8.96	24.49	46.00	-21.51	peak			

Above 1 GHz:

 Horizontal
 CH Low (2402MHz)

Frequency MHz	Cable Loss dB	Ant Factor dB/m	Preamp Factor dB	Read Level dB μ V	Level dB μ V/m	Limit dB μ V/m	Over Limit dB	Remark
2402.000	2.17	31.21	35.30	91.57	89.65	114.0	-24.35	Peak
2402.000	2.17	31.21	35.30	83.21	81.29	94.0	-12.71	AV
4804.000	2.56	34.01	34.71	43.79	45.65	74.0	-28.35	Peak
4804.000	2.56	34.01	34.71	35.22	37.08	54.0	-16.92	AV
7206.000	2.98	36.16	35.15	44.07	48.06	74.0	-25.94	Peak
7206.000	2.98	36.16	35.15	29.22	33.21	54.0	-20.79	AV
9608.000	---	---	---	---	---	---	---	---
9608.000	---	---	---	---	---	---	---	---
12010.000	---	---	---	---	---	---	---	---
12010.000	---	---	---	---	---	---	---	---
---	---	---	---	---	---	---	---	---

 Vertical
 CH Low (2402MHz)

Frequency MHz	Cable Loss dB	Ant Factor dB/m	Preamp Factor dB	Read Level dB μ V	Level dB μ V/m	Limit dB μ V/m	Over Limit dB	Remark
2402.000	2.17	31.21	35.30	90.89	88.97	114.0	-25.03	Peak
2402.000	2.17	31.21	35.30	82.46	80.54	94.0	-13.46	AV
4804.000	2.56	34.01	34.71	43.11	44.97	74.0	-29.03	Peak
4804.000	2.56	34.01	34.71	37.72	39.58	54.0	-14.42	AV
7206.000	2.98	36.16	35.15	41.74	45.73	74.0	-28.27	Peak
7206.000	2.98	36.16	35.15	34.55	38.54	54.0	-15.46	AV
9608.000	---	---	---	---	---	---	---	---
9608.000	---	---	---	---	---	---	---	---
12010.000	---	---	---	---	---	---	---	---
12010.000	---	---	---	---	---	---	---	---
---	---	---	---	---	---	---	---	---

Horizontal
 CH Middle (2442MHz)

Frequency MHz	Cable Loss dB	Ant Factor dB/m	Preamp Factor dB	Read Level dB μ V	Level dB μ V/m	Limit dB μ V/m	Over Limit dB	Remark
2442.000	2.19	31.22	34.60	93.22	92.03	114.0	-21.97	Peak
2442.000	2.19	31.22	34.60	84.97	83.78	94.0	-10.22	AV
4884.000	2.57	35.00	34.58	41.59	44.58	74.0	-29.42	Peak
4884.000	2.57	35.00	34.58	39.27	42.26	54.0	-11.74	AV
7326.000	3.00	36.17	35.14	41.33	45.36	74.0	-28.64	Peak
7326.000	3.00	36.17	35.14	38.20	42.23	54.0	-11.77	AV
9768.000	---	---	---	---	---	---	---	---
9768.000	---	---	---	---	---	---	---	---
12210.000	---	---	---	---	---	---	---	---
	---	---	---	---	---	---	---	---

 Vertical
 CH Middle (2442MHz)

Frequency MHz	Cable Loss dB	Ant Factor dB/m	Preamp Factor dB	Read Level dB μ V	Level dB μ V/m	Limit dB μ V/m	Over Limit dB	Remark
2442.000	2.19	31.22	34.60	90.68	89.49	114.0	-24.51	Peak
2442.000	2.19	31.22	34.60	81.25	80.06	94.0	-13.94	AV
4884.000	2.57	35.00	34.58	46.97	49.96	74.0	-24.04	Peak
4884.000	2.57	35.00	34.58	40.08	43.07	54.0	-10.93	AV
7326.000	3.00	36.17	35.14	41.35	45.38	74.0	-28.62	Peak
7326.000	3.00	36.17	35.14	36.11	40.14	54.0	-13.86	AV
9768.000	---	---	---	---	---	---	---	---
9768.000	---	---	---	---	---	---	---	---
12210.000	---	---	---	---	---	---	---	---
	---	---	---	---	---	---	---	---

Horizontal
 CH High (2480MHz)

Frequency MHz	Cable Loss dB	Ant Factor dB/m	Preamp Factor dB	Read Level dB μ V	Level dB μ V/m	Limit dB μ V/m	Over Limit dB	Remark
2480.000	2.20	31.65	36.00	93.87	91.72	114.0	-22.28	Peak
2480.000	2.20	31.65	36.00	81.25	79.1	94.0	-14.9	AV
4960.000	2.58	35.06	34.79	46.71	49.56	74.0	-24.44	Peak
4960.000	2.58	35.06	34.79	35.16	38.01	54.0	-15.99	AV
7440.000	3.02	36.19	34.90	44.33	48.64	74.0	-25.36	Peak
7440.000	3.02	36.20	35.20	36.22	40.24	54.0	-13.76	AV
9920.000	---	---	---	---	---	---	---	---
9920.000	---	---	---	---	---	---	---	---
12400.000	---	---	---	---	---	---	---	---
12400.000	---	---	---	---	---	---	---	---

 Vertical
 CH High (2480MHz)

Frequency MHz	Cable Loss dB	Ant Factor dB/m	Preamp Factor dB	Read Level dB μ V	Level dB μ V/m	Limit dB μ V/m	Over Limit dB	Remark
2480.000	2.20	31.65	36.00	91.94	89.79	114.0	-24.21	Peak
2480.000	2.20	31.65	36.00	82.06	79.91	94.0	-14.09	AV
4960.000	2.58	35.06	34.79	43.54	46.39	74.0	-27.61	Peak
4960.000	2.58	35.06	34.79	36.33	39.18	54.0	-14.82	AV
7440.000	3.02	36.19	34.90	42.71	47.02	74.0	-26.98	Peak
7440.000	3.02	36.20	35.20	36.15	40.17	54.0	-13.83	AV
9920.000	---	---	---	---	---	---	---	---
9920.000	---	---	---	---	---	---	---	---
12400.000	---	---	---	---	---	---	---	---
12400.000	---	---	---	---	---	---	---	---

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

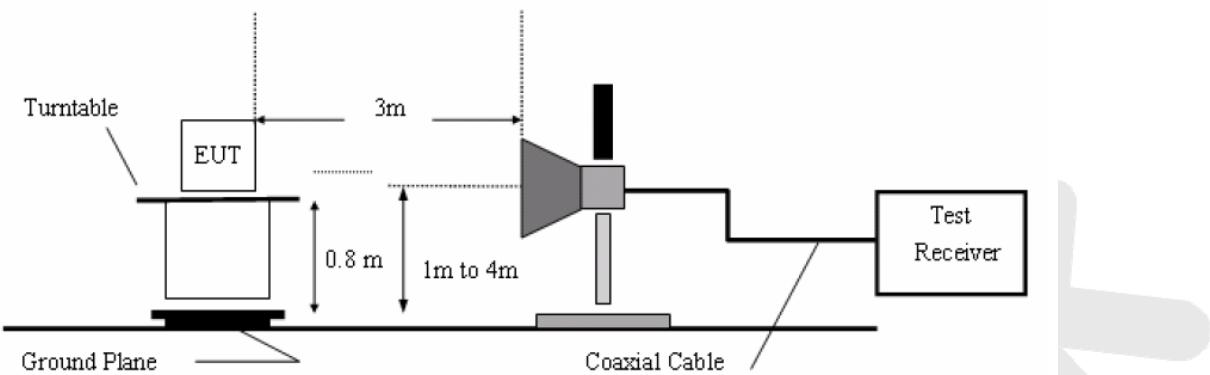
The EUT is placed on a turn table which is 0.8 meter high above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down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

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analysis	Agilent	E4407B	US39390582	Aug. 09, 2013	1 Year
2.	Preamplifier	Instruments corporation	EMC01183 0	980100	Aug. 09, 2013	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	Apr. 23, 2013	1 Year
4.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Aug. 09, 2013	3 Year
5.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Apr. 23, 2013	3 Year
6.	Pre-amplifier	SONOMA	310N	186860	Apr. 23, 2013	1 Year
7.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A

Radiation Uncertainty : Ur = 4.3dB

5.3. Test Configuration:

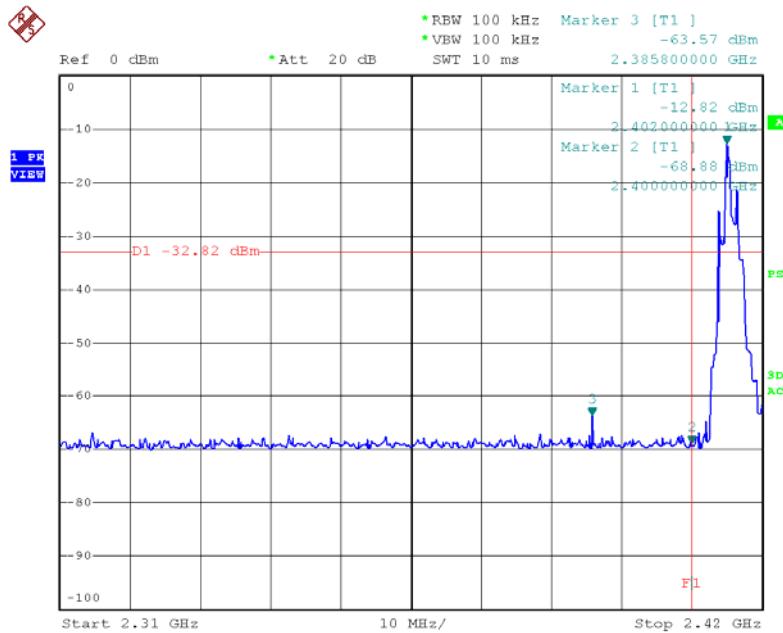


5.4. Test Results

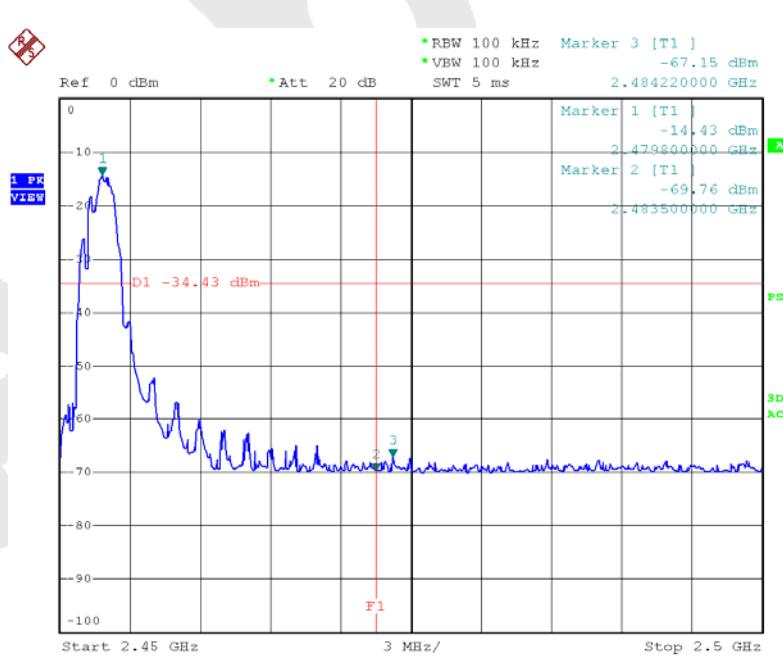
Pass.

Please refer the following plot.

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

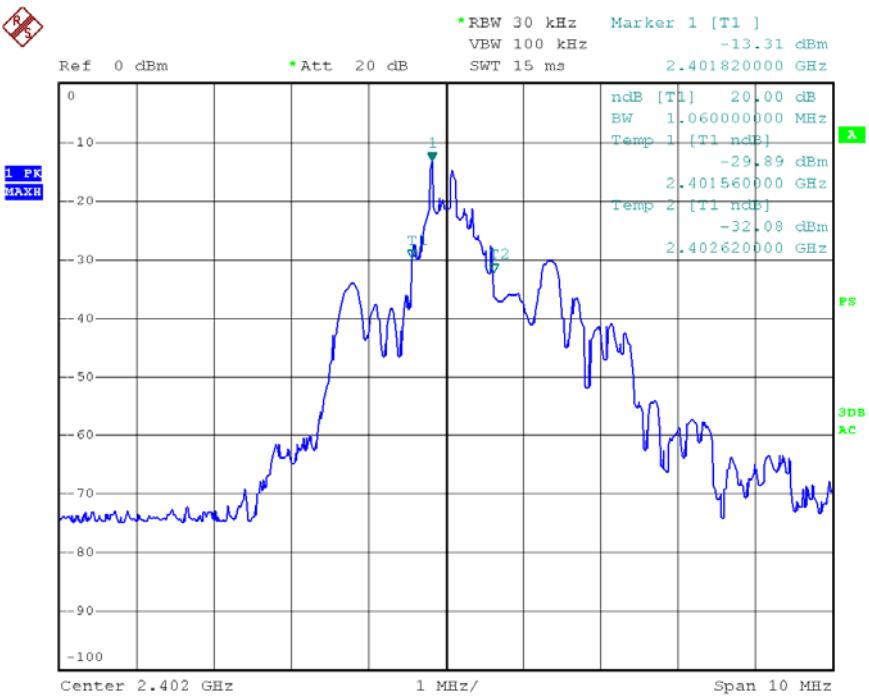


Date: 3.SEP.2013 17:14:08

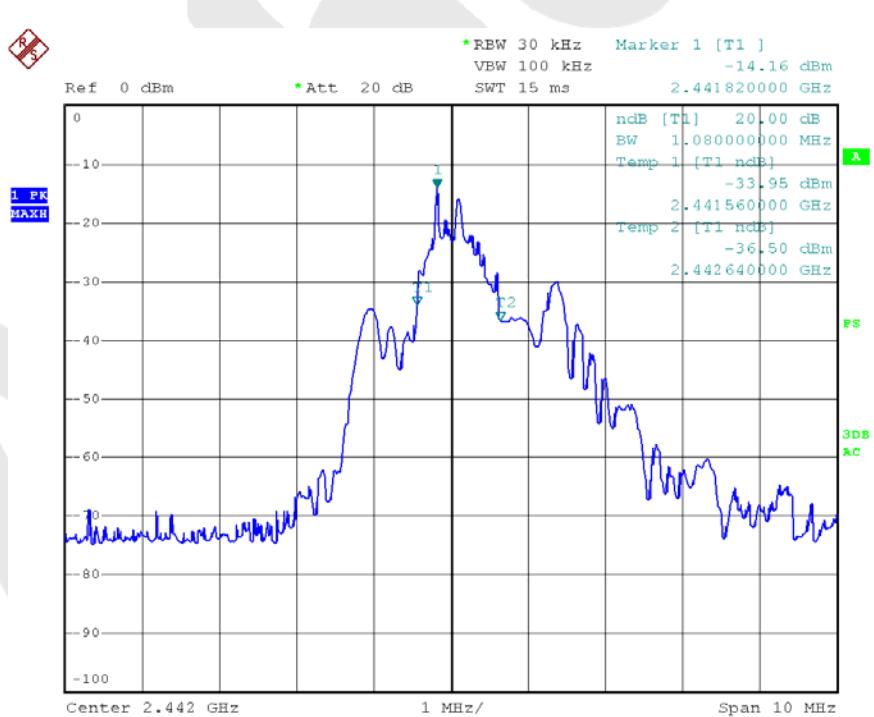


Date: 3.SEP.2013 17:04:07

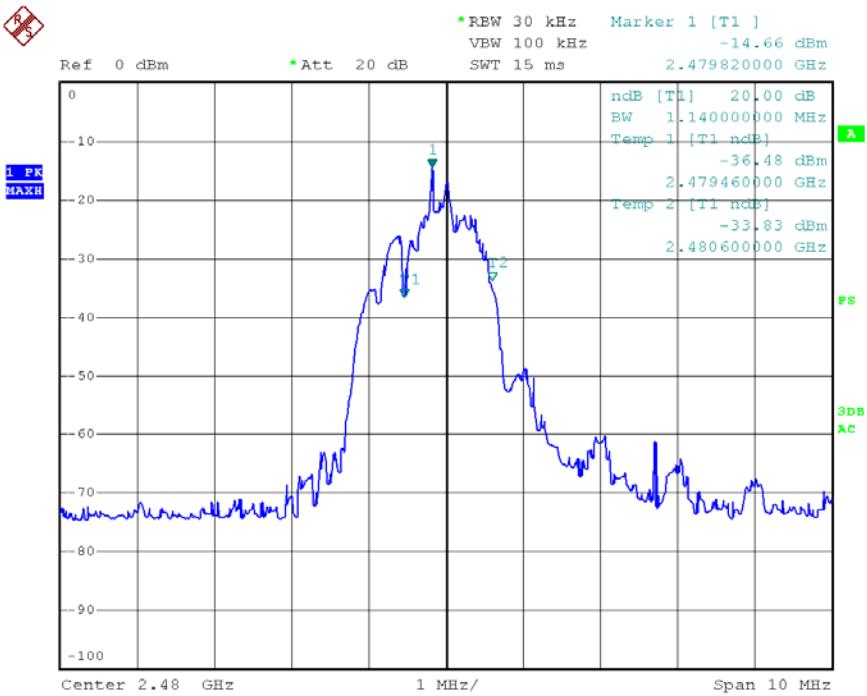
20dB Down:



Date: 3.SEP.2013 16:52:06



Date: 3.SEP.2013 16:54:49



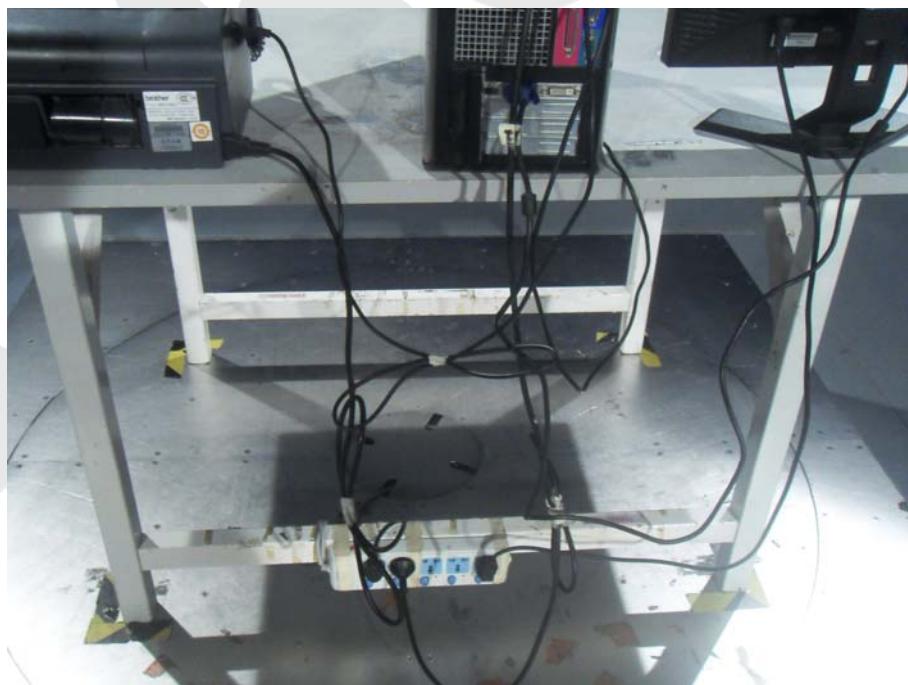
Date: 3.SEP.2013 16:58:06

6. PHOTOGRAPH

6.1. Photo of Power Line Conducted Emission Measurement



6.2. Photo of Radiation Emission Test



APPENDIX I (External Photos)

Figure 1
The EUT-Front View

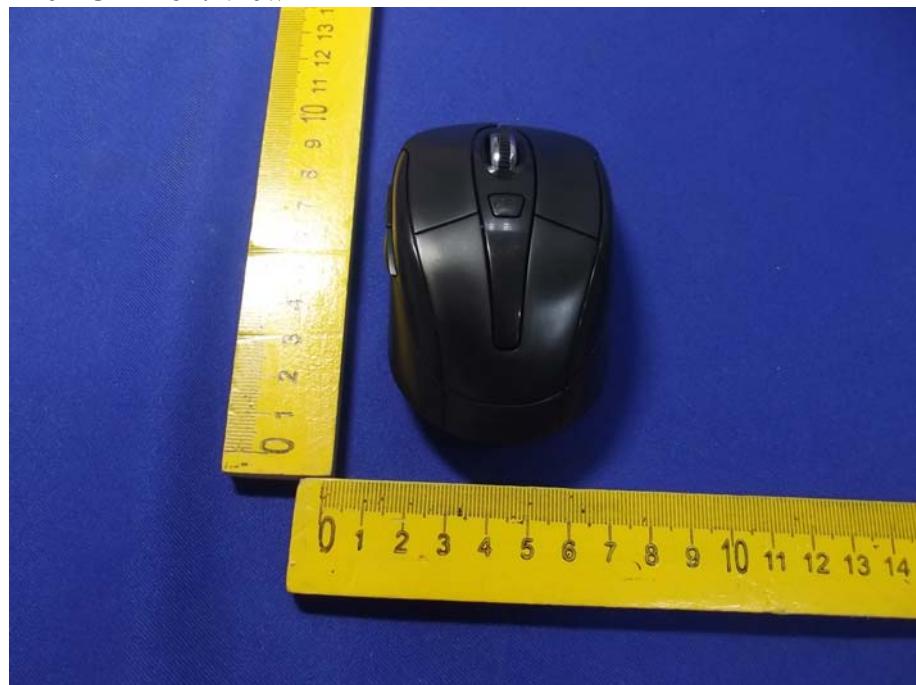


Figure 2
The EUT-Back View



APPENDIX II (Internal Photos)

Figure 3
The EUT-Inside View



Figure 4
PCB of the EUT-Front View

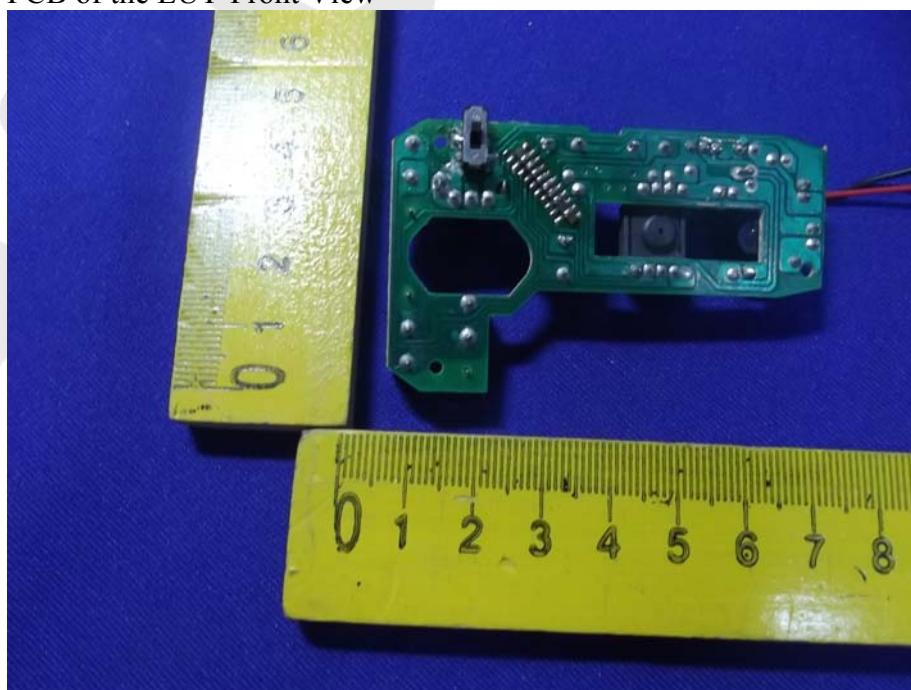


Figure 5
PCB of the EUT-Back View

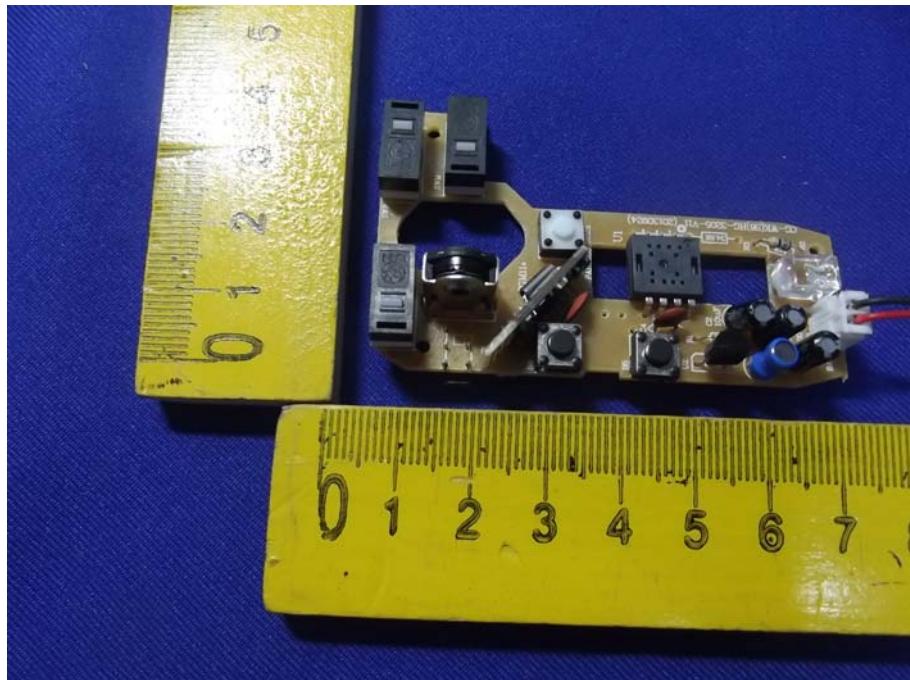


Figure 6
PCB of the EUT-Front View

