

# FCC REPORT

Applicant: Eastern Times Technology Co., Ltd.

Address of Applicant: Building D, Nan An Industry Area, Youganpu Village, Fenggang Town, Dongguan City, Guangdong, China.

Equipment Under Test (EUT)

Product Name: Wireless Optical Mouse

Model No.: DS-2440

Additional Model No.: DS-2406, DS-2435, DS-2456, DS-2449, DS-2419, DS-2503, DS-2483, DS-2520, DS-2519

FCC ID: TUVDS-2440

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.249

Date of sample receipt: Dec. 30, 2014

Date of Test: Jan. 05, to Jan. 09, 2015

Date of report issued: Jan. 13, 2015

Test Result : PASS \*

\* In the configuration tested, the EUT complied with the standards specified above.

**2 Version**

Version No.	Date	Description
00	Jan. 13, 2015	Original

**Prepared By:**



**Date:**

**Jan. 13, 2015**

**Project Engineer**

**Check By:**



**Date:**

**Jan. 13, 2015**

**EMC Manger**

### 3 Contents

	Page
1 COVER PAGE .....	1
2 VERSION .....	2
3 CONTENTS .....	3
4 TEST SUMMARY .....	4
5 GENERAL INFORMATION .....	5
5.1 CLIENT INFORMATION .....	5
5.2 GENERAL DESCRIPTION OF E.U.T. ....	5
5.3 MEASUREMENT UNCERTAINTY .....	6
5.4 TEST MODE .....	7
5.5 LABORATORY FACILITY .....	7
5.6 LABORATORY LOCATION .....	7
5.7 OTHER INFORMATION REQUESTED BY THE CUSTOMER.....	7
5.8 TEST INSTRUMENTS LIST .....	8
6 TEST RESULTS AND MEASUREMENT DATA .....	9
6.1 ANTENNA REQUIREMENT:.....	9
6.2 RADIATED EMISSION .....	10
6.2.1 <i>General Radiated Emissions Data</i> .....	12
6.2.2 <i>Band edge (Radiated Emission)</i> .....	15
6.3 20DB BANDWIDTH.....	16
7 TEST SETUP PHOTO .....	18
8 EUT CONSTRUCTIONAL DETAILS.....	19

## 4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
AC Power Line Conducted Emission	15.207	N/A
Field strength of the fundamental signal	15.249 (a)	Pass
Spurious emissions	15.249 (a) (d)/15.209	Pass
Band edge	15.249 (d)/15.205	Pass
20dB Occupied Bandwidth	15.215 (c)	Pass

*Pass: The EUT comply with the essential requirements in the standard.*

*N/A: Not application for battery device.*

## 5 General Information

### 5.1 Client Information

Applicant:	Eastern Times Technology Co.,ltd
Address of Applicant:	Building D, Nan An Industry Area, Youganpu Village, Fenggang Town, Dongguan City, Guangdong, China.
Manufacturer:	Eastern Times Technology Co.,ltd
Address of Manufacturer:	Building D, Nan An Industry Area, Youganpu Village, Fenggang Town, Dongguan City, Guangdong, China.

### 5.2 General Description of E.U.T.

Product Name:	Wireless Optical Mouse
Model No.:	DS-2440
Additional Model No.:	DS-2406, DS-2435, DS-2456, DS-2449, DS-2419, DS-2503, DS-2483, DS-2520, DS-2519
Operation Frequency:	2408-2474MHz
Channel numbers:	34
Modulation type:	FSK
Antenna Type:	Integrated PCB antenna
Antenna gain:	-2dBi
Power supply:	1.5 V "AA" Battery
Remark:	All models above are identical in interior structure, electrical circuits and components, and just model names are different for the marketing requirement.

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2408	11	2428	21	2448	31	2468
2	2410	12	2430	22	2450	32	2470
3	2412	13	2432	23	2452	33	2472
4	2414	14	2434	24	2454	34	2474
5	2416	15	2436	25	2456		
6	2418	16	2438	26	2458		
7	2420	17	2440	27	2460		
8	2422	18	2442	28	2462		
9	2424	19	2444	29	2464		
10	2426	20	2446	30	2466		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2408
The middle channel	2440
The Highest channel	2474

### 5.3 Measurement uncertainty

The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	Conducted Emission	$\pm 3.28\text{dB}$
2	RF power,conducted	$\pm 0.12\text{dB}$
3	Spurious emissions,conducted	$\pm 0.11\text{dB}$
4	All emissions,radiated(<1G)	$\pm 4.88\text{dB}$
5	All emissions,radiated(>1G)	$\pm 4.88\text{dB}$
6	Temperature	$\pm 0.5^\circ\text{C}$
7	Humidity	$\pm 2\%$

## 5.4 Test mode

<b>Operating Environment:</b>	
Temperature:	24.0 °C
Humidity:	54 % RH
Atmospheric Pressure:	1010 mbar
<b>Test mode:</b>	
Operation mode	Keep the EUT in continuous transmitting with modulation
The sample was placed 0.8m above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.	

## 5.5 Laboratory Facility

<p>The test facility is recognized, certified, or accredited by the following organizations:</p> <ul style="list-style-type: none"> <li>● <b>FCC - Registration No.: 572331</b> Shenzhen TCT Testing Technology Co., Ltd., Shenzhen EMC Laboratory: Shenzhen Tongce Testing Lab</li> <li>The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.</li> <li>● <b>IC - Registration No.: 10668A-1</b> The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing</li> <li>● <b>CNAS - Registration No.: CNAS L6165</b></li> </ul>
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## 5.6 Laboratory Location

All tests were performed at:
Shenzhen Tongce Testing Lab
Address: 1F, Leinuo Watch Building, Fuyong Town, Baoan Dist, Shenzhen, China
Tel: 13410377511
Fax: --

## 5.7 Other Information Requested by the Customer

None.
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## 5.8 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
1	ESPI Test Receiver	ROHDE&SCHWARZ	ESVD	100008	Sep.17, 2014	Sep.16 , 2015
2	Spectrum Analyzer	ROHDE&SCHWARZ	FSEM	848597/001	Sep.17, 2014	Sep.16 , 2015
3	Spectrum Analyzer	ROHDE&SCHWARZ	FSU3	1166.1660.03	Sep.17, 2014	Sep.16, 2015
4	Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Sep.17, 2014	Sep.16 , 2015
5	Pre-amplifier	HP	8447D	2727A05017	Sep.17, 2014	Sep.16 , 2015
6	Loop antenna	ZHINAN	ZN30900A	12024	Dec.15, 2014	Dec.14 , 2015
7	Broadband Antenna	Schwarzbeck	VULB9163	340	Sep.17, 2014	Sep.16 , 2015
8	Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep.17, 2014	Sep.16 , 2015
9	Loop antenna	ZHINAN	ZN30900A	12024	Dec.15, 2014	Dec.14 , 2015
10	Coax cable	TCT	N/A	N/A	Sep.14, 2014	Sep.15 , 2015
11	Coax cable	TCT	N/A	N/A	Sep.14, 2014	Sep.15 , 2015
12	Coax cable	TCT	N/A	N/A	Sep.14, 2014	Sep.15 , 2015
13	Coax cable	TCT	N/A	N/A	Sep.14, 2014	Sep.15 , 2015
14	EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A	N/A

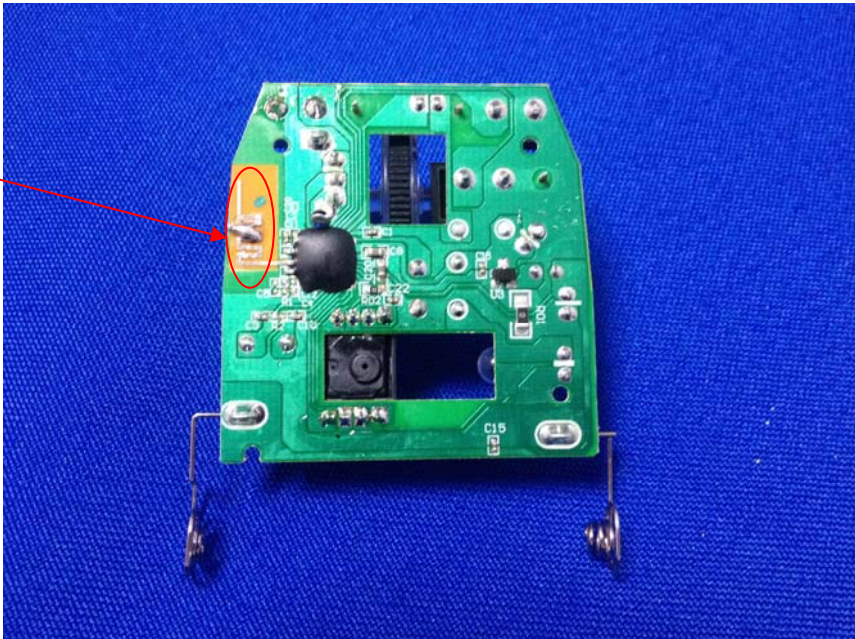
Conducted Emission:						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
1	EMI Test Receiver	R&S	ESCS30	100139	Sep.17, 2014	Sep.16 , 2015
2	LISN-1	AFJ	LS16C	16010947251	Sep.17, 2014	Sep.16 , 2015
3	LISN-2	Schwarzbeck	NSLK 8126	8126453	Sep.17, 2014	Sep.16 , 2015
4	Coax cable	TCT	N/A	164080	Sep.17, 2014	Sep.16 , 2015
5	EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A	N/A

Conducted method test:						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
1	Spectrum Analyzer	ROHDE&SCHWARZ	FSU3	200054	Sep.17, 2014	Sep.16, 2015
2	Spectrum Analyzer	Agilent	N9020A	MY49100060	Oct. 22, 2014	Oct. 23 , 2015



## 6 Test results and Measurement Data

### 6.1 Antenna requirement:

<b>Standard requirement:</b>	FCC Part15 C Section 15.203
<p>15.203 requirement:  <i>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 use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</i></p>	
<b>E.U.T Antenna:</b>	
<p>The antenna is an internal antenna which cannot replace by end-user, the best case gain of the antenna is -2 dBi.</p> <div style="display: flex; align-items: center;"> <div data-bbox="108 817 303 891" style="border: 1px solid red; padding: 2px; margin-right: 10px;">Antenna</div>  </div>	

## 6.2 Radiated Emission

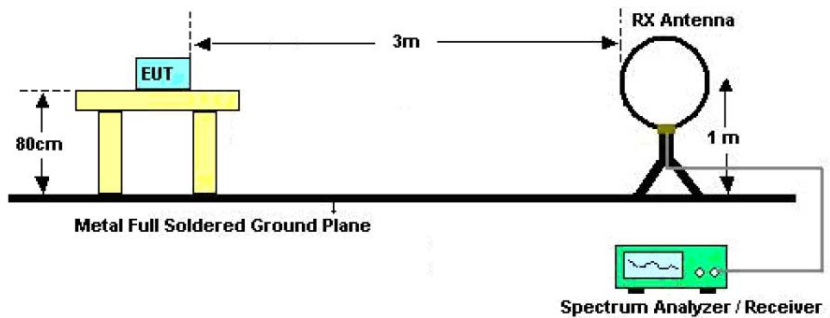
Test Requirement:	FCC Part15 C Section 15.249 and 15.209																													
Test Method:	ANSI C63.4:2003																													
Test Frequency Range:	9kHz to 25000MHz																													
Test site:	Measurement Distance: 3m																													
Receiver setup:	<table border="1"> <thead> <tr> <th>Frequency</th> <th>Detector</th> <th>RBW</th> <th>VBW</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>9kHz- 150kHz</td> <td>Quasi-peak</td> <td>200Hz</td> <td>1kHz</td> <td>Quasi-peak Value</td> </tr> <tr> <td>150kHz- 30MHz</td> <td>Quasi-peak</td> <td>9kHz</td> <td>30kHz</td> <td>Quasi-peak Value</td> </tr> <tr> <td>30MHz-1GHz</td> <td>Quasi-peak</td> <td>100KHz</td> <td>300KHz</td> <td>Quasi-peak Value</td> </tr> <tr> <td rowspan="2">Above 1GHz</td> <td>Peak</td> <td>1MHz</td> <td>3MHz</td> <td>Peak Value</td> </tr> <tr> <td>Peak</td> <td>1MHz</td> <td>10Hz</td> <td>Average Value</td> </tr> </tbody> </table>	Frequency	Detector	RBW	VBW	Remark	9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value	150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value	30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak Value	Above 1GHz	Peak	1MHz	3MHz	Peak Value	Peak	1MHz	10Hz	Average Value
Frequency	Detector	RBW	VBW	Remark																										
9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value																										
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30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak Value																										
Above 1GHz	Peak	1MHz	3MHz	Peak Value																										
	Peak	1MHz	10Hz	Average Value																										
Limit: (Field strength of the fundamental signal)	<table border="1"> <thead> <tr> <th rowspan="2">Fundamental Frequency (MHz)</th> <th colspan="2">Field Strength of Fundamental (3m)</th> <th colspan="3">Field Strength of Harmonics (3m)</th> </tr> <tr> <th>mV/m</th> <th>dBuV/m</th> <th>mV/m</th> <th colspan="2">dBuV/m</th> </tr> </thead> <tbody> <tr> <td>2400-2483.5</td> <td>50</td> <td>94 (Average)</td> <td>114 (Peak)</td> <td>0.5</td> <td>54 (Average)</td> <td>74 (Peak)</td> </tr> </tbody> </table> <p>Note: 1) RF Field Strength (dBuV) = 20 log RF Voltage (uV) 2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system. 3) The emission limit in this paragraph is based on measurement instrumentation employing an average detector.</p>	Fundamental Frequency (MHz)	Field Strength of Fundamental (3m)		Field Strength of Harmonics (3m)			mV/m	dBuV/m	mV/m	dBuV/m		2400-2483.5	50	94 (Average)	114 (Peak)	0.5	54 (Average)	74 (Peak)											
Fundamental Frequency (MHz)	Field Strength of Fundamental (3m)		Field Strength of Harmonics (3m)																											
	mV/m	dBuV/m	mV/m	dBuV/m																										
2400-2483.5	50	94 (Average)	114 (Peak)	0.5	54 (Average)	74 (Peak)																								
Limit: (Spurious Emissions)	<table border="1"> <thead> <tr> <th>Frequency Range (MHz)</th> <th>Distance (m)</th> <th>Field strength (dBuV/m)</th> </tr> </thead> <tbody> <tr> <td>0.009-0.490</td> <td>3</td> <td>20log 2400/F (kHz) + 80</td> </tr> <tr> <td>0.490-1.705</td> <td>3</td> <td>20log 24000/F (kHz) + 40</td> </tr> <tr> <td>1.705-30</td> <td>3</td> <td>20log 30 + 40</td> </tr> <tr> <td>30-88</td> <td>3</td> <td>40.0</td> </tr> <tr> <td>88-216</td> <td>3</td> <td>43.5</td> </tr> <tr> <td>216-960</td> <td>3</td> <td>46.0</td> </tr> </tbody> </table>	Frequency Range (MHz)	Distance (m)	Field strength (dBuV/m)	0.009-0.490	3	20log 2400/F (kHz) + 80	0.490-1.705	3	20log 24000/F (kHz) + 40	1.705-30	3	20log 30 + 40	30-88	3	40.0	88-216	3	43.5	216-960	3	46.0								
Frequency Range (MHz)	Distance (m)	Field strength (dBuV/m)																												
0.009-0.490	3	20log 2400/F (kHz) + 80																												
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1.705-30	3	20log 30 + 40																												
30-88	3	40.0																												
88-216	3	43.5																												
216-960	3	46.0																												
Limit: (band edge)	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 Section 15.209, whichever is the lesser attenuation.																													
Test Procedure:	<ol style="list-style-type: none"> <li>The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li> <li>The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</li> <li>For each suspected emission, the EUT was arranged to its worst</li> </ol>																													

case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

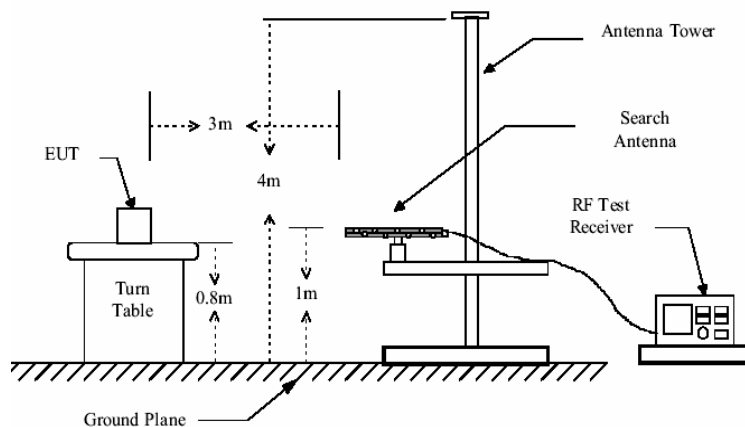
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Test setup:

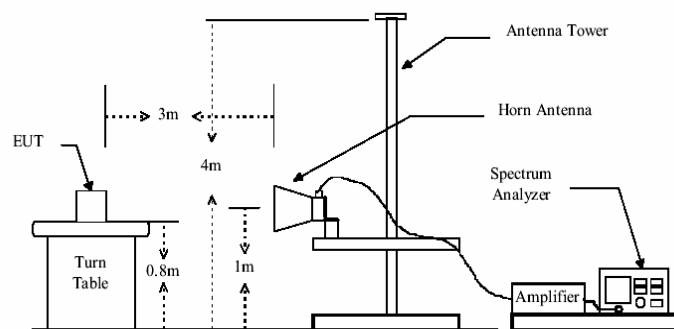
For radiated emissions below 30MHz



30MHz to 1GHz



Above 1GHz



Test Instruments:

Refer to section 5.7

Test mode:

Refer to section 5.3

Test results:

Passed

## Measurement Data

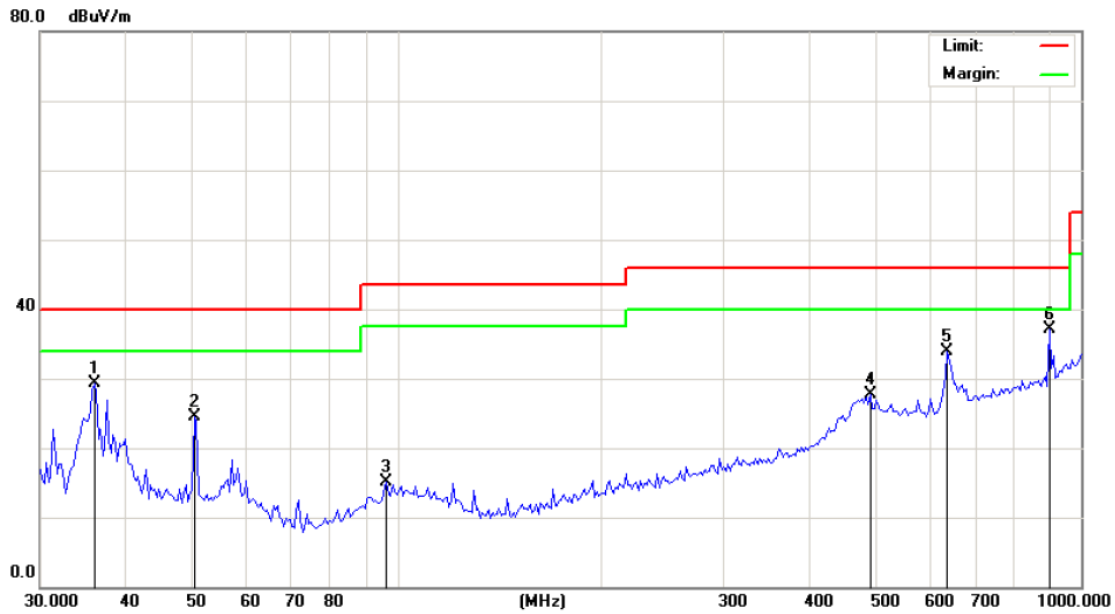
### 6.2.1 General Radiated Emissions Data

#### Radiated Emission (30MHz----1000MHz)

Horizontal

Please refer to following diagram for individual

Low channel: 2408 MHz



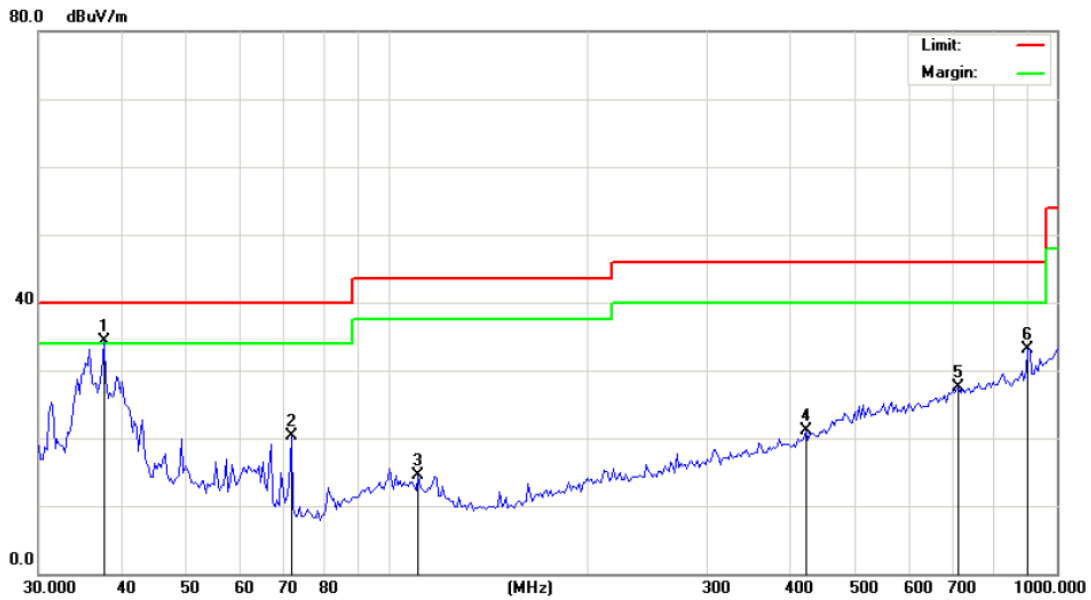
Site	Polarization: <b>Horizontal</b>	Temperature: 23
Limit: FCC Part 15B Class B RE_3 m	Power: DC 1.5V	Humidity: 52 %
EUT: Wireless Optical Mouse	Distance:	
M/N: DS-2440		
Mode: Tx Mode		
Note:		

No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1	36.0140	42.23	-12.97	29.26	40.00	-10.74	peak		0	
2	50.4614	36.51	-12.07	24.44	40.00	-15.56	peak		0	
3	96.3230	27.03	-12.00	15.03	43.50	-28.47	peak		0	
4	491.7700	31.04	-3.24	27.80	46.00	-18.20	peak		0	
5	637.7947	34.97	-1.15	33.82	46.00	-12.18	peak		0	
6 *	899.9577	34.47	2.67	37.14	46.00	-8.86	peak		0	

## Vertical

Please refer to following diagram for individual

Low channel: 2408 MHz



Site	Polarization: <b>Vertical</b>	Temperature: 23
Limit: FCC Part 15B Class B RE_3 m	Power: DC 1.5V	Humidity: 52 %
EUT: Wireless Optical Mouse	Distance:	
M/N: DS-2440		
Mode: Tx Mode		
Note:		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	37.5648	47.02	-12.78	34.24	40.00	-5.76	peak	0	
2		71.7054	36.87	-16.47	20.40	40.00	-19.60	peak	0	
3		110.8581	26.58	-12.13	14.45	43.50	-29.05	peak	0	
4		421.3287	26.54	-5.50	21.04	46.00	-24.96	peak	0	
5		713.6917	27.14	0.31	27.45	46.00	-18.55	peak	0	
6		906.3041	30.24	2.89	33.13	46.00	-12.87	peak	0	

Note: Measurements were conducted in all channels (high, middle, low), and the worst case (low channel) was submitted only.

**6.2.2 Fundamental & Harmonics and Spurious Radiated Emission Data (1000MHz-25000MHz)**

<b>Low channel: 2408 MHz</b>				
Frequency (MHz)	Emission PK/AV (dBuV/m)	Horizontal / Vertical	Limits PK/AV (dBuV/m)	Margin (dB)
2408	70.35(PK)	H	114/94	23.65
2408	74.61(PK)	V	114/94	19.39
4816	41.83(PK)	H	74/54	12.17
4816	40.35(PK)	V	74/54	13.65
16856	42.16(PK)	H	74/54	11.84
16856	43.64(PK)	V	74/54	10.36

<b>Middle channel: 2440 MHz</b>				
Frequency (MHz)	Emission PK/AV (dBuV/m)	Horizontal / Vertical	Limits PK/AV (dBuV/m)	Margin (dB)
2440	70.17(PK)	H	114/94	23.83
2440	73.36(PK)	V	114/94	20.64
4880	40.18(PK)	H	74/54	13.82
4880	40.66(PK)	V	74/54	13.34
17080	43.51(PK)	H	74/54	10.49
17080	42.73(PK)	V	74/54	11.27

<b>High channel: 2474 MHz</b>				
Frequency (MHz)	Emission PK/AV (dBuV/m)	Horizontal / Vertical	Limits PK/AV (dBuV/m)	Margin (dB)
2474	70.19(PK)	H	114/94	23.81
2474	65.92(PK)	V	114/94	28.08
4948	38.32(PK)	H	74/54	15.68
4948	40.27(PK)	V	74/54	13.73
17318	42.82(PK)	H	74/54	11.18
17318	40.18(PK)	V	74/54	13.82

- Note:
- 1) PK= Peak, AV= Average
  - 2) Emission Level = Reading Level + Antenna Factor + Cable Loss.
  - 3) Margin= Limit(AV) – Emission Level
  - 4) If the peak measured value complies with the average limit, it is unnecessary to perform an average measurement. The other emission levels are too small, which are not reported. It is deemed to comply with the requirement of the rule.

**6.2.3 Band edge (Radiated Emission)**

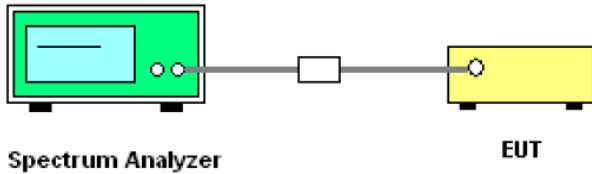
**Low channel:**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Detector	Limit@3m (dB $\mu$ V/m)	Polarization
2400	27.86	Peak	74.00	H
2400	25.74	Peak	74.00	V

**High channel:**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Detector	Limit@3m (dB $\mu$ V/m)	Polarization
2483.5	26.55	Peak	74.00	H
2483.5	24.48	Peak	74.00	V

### 6.3 20dB Bandwidth

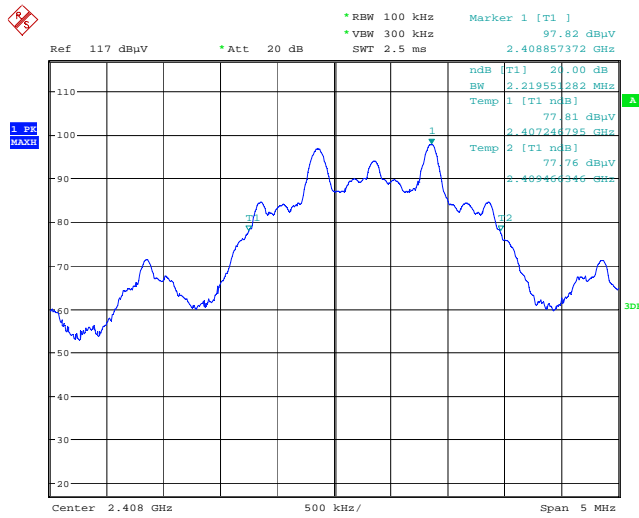
Test Requirement:	FCC Part15 C Section 15.249/15.215
Test Method:	ANSI C63.4:2003
Receiver setup:	RBW=1% to 5% 20dB bandwidth, VBW $\geq$ RBW, detector: Peak
Limit:	Operation Frequency range 2400MHz-2483.5MHz
Test Procedure:	<ol style="list-style-type: none"> <li>1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT.</li> <li>2. Set the EUT to proper test channel.</li> <li>3. Max hold the radiated emissions, mark the peak power frequency point and the -20dB upper and lower frequency points.</li> <li>4. Read 20dB bandwidth.</li> </ol>
Test setup:	 <p style="text-align: center;">Spectrum Analyzer                      EUT</p>
Test Instruments:	Refer to section 4.7 for details
Test mode:	Refer to section 4.3 for details
Test results:	Passed

**Measurement Data:**

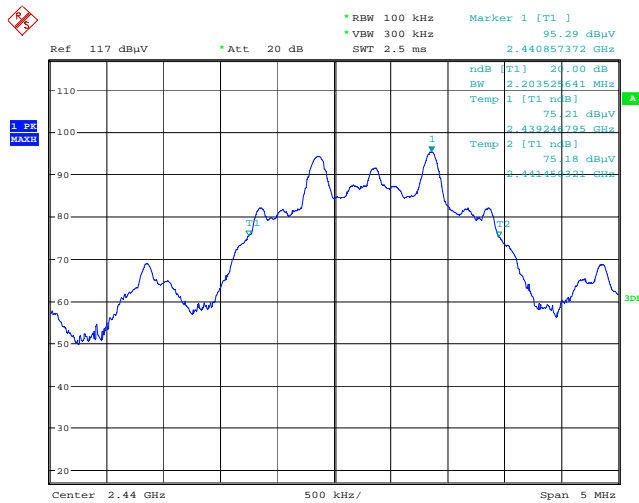
Test channel	20dB bandwidth (MHz)	Results
Lowest	2.220	Pass
Middle	2.204	Pass
Highest	2.236	Pass

Test plot as follows:

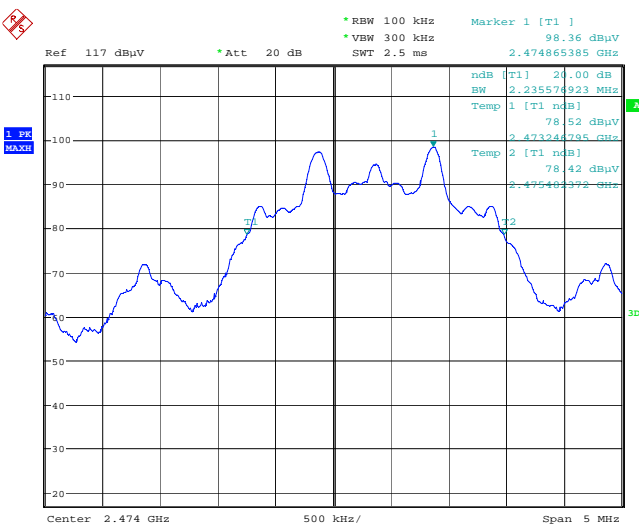




Lowest channel



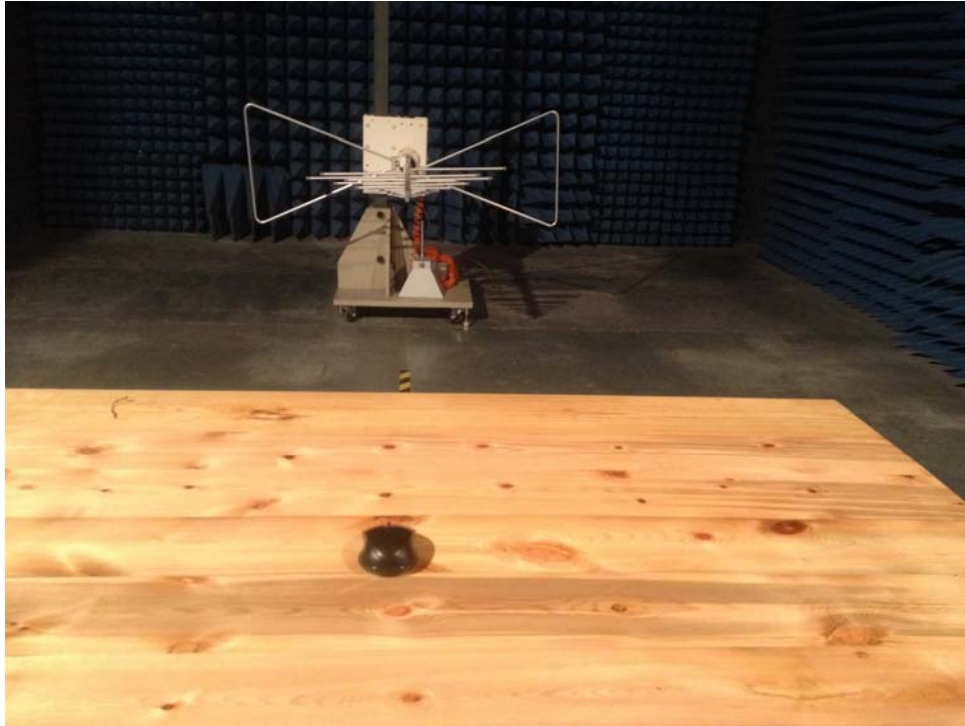
Middle channel



Highest channel

## 7 Test Setup Photo

Radiated spurious emission:



## 8 EUT Constructional Details

Outside view



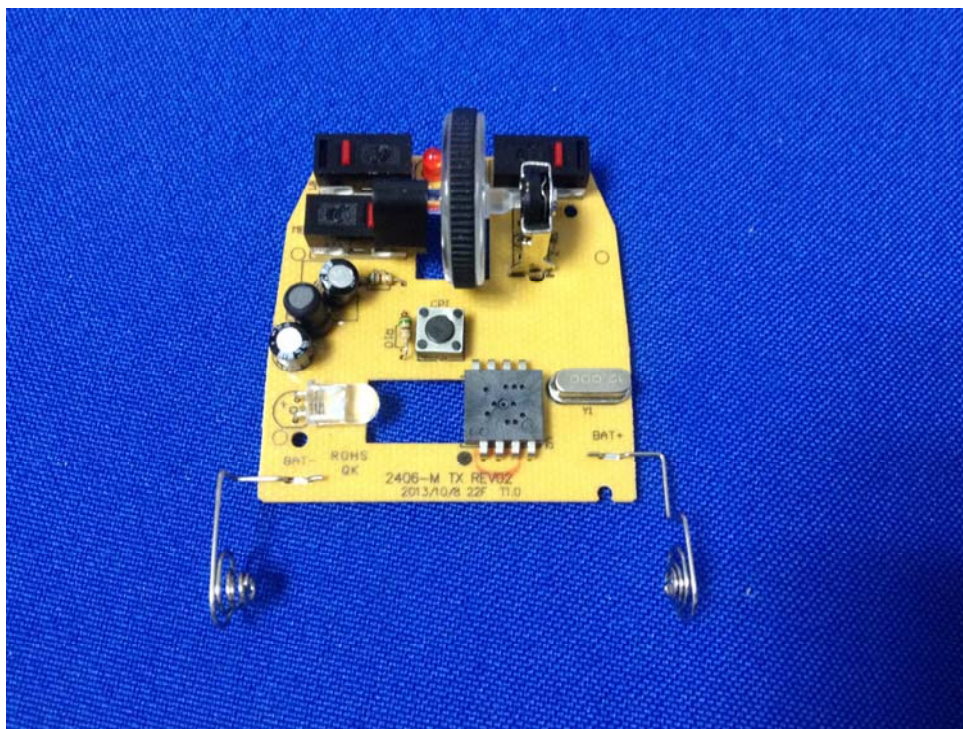


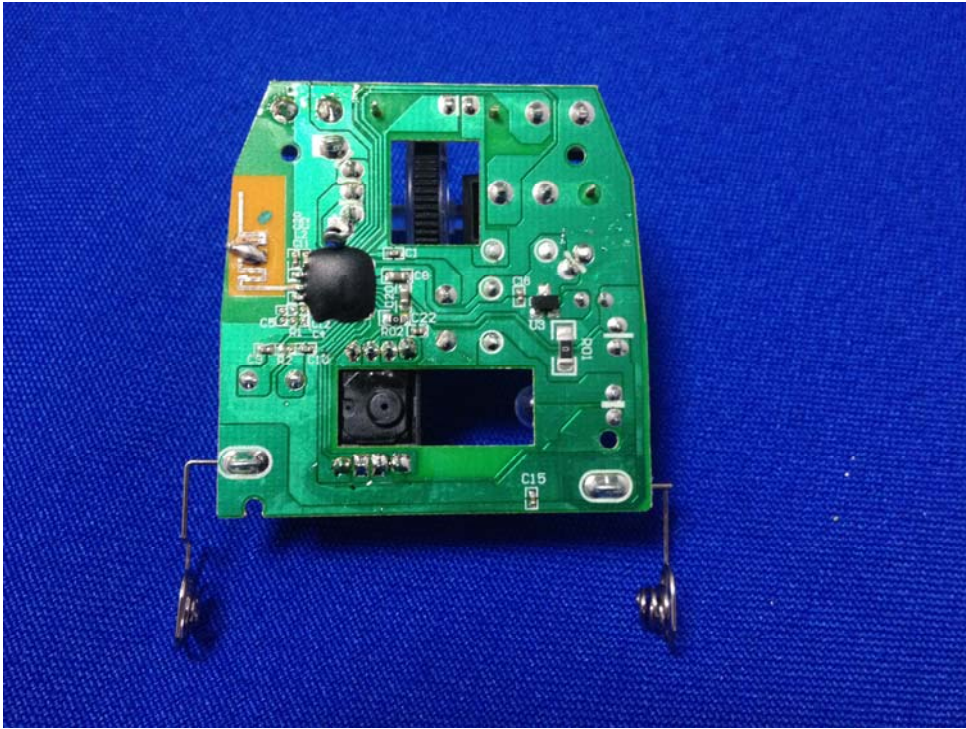






Inside view





-----End of report-----