

## FCC PART 15.249

## TEST REPORT

For

### Wintop Electronics Co., Limited

Unit 04 7/F, Bright Way Tower 33, Mong Kok RD KL, HONGKONG

**FCC ID: 2AB75-WM633MP**

<b>Report Type:</b> Original Report		<b>Product Type:</b> 2.4GHz Wireless Optical Mouse	
<b>Test Engineer:</b>	Dean Liu	<i>Dean Liu</i>	
<b>Report Number:</b>	RDG151111005-00		
<b>Report Date:</b>	2015-11-24		
<b>Reviewed By:</b>	Sula Huang RF Leader	<i>Sula Huang</i>	
<b>Test Laboratory:</b>	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 <a href="http://www.baclcorp.com.cn">www.baclcorp.com.cn</a>		

**Note:** This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan). This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

## TABLE OF CONTENTS

<b>GENERAL INFORMATION.....</b>	<b>3</b>
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	3
OBJECTIVE.....	3
TEST METHODOLOGY.....	3
TEST FACILITY.....	3
<b>SYSTEM TEST CONFIGURATION.....</b>	<b>4</b>
JUSTIFICATION.....	4
EUT EXERCISE SOFTWARE.....	4
EQUIPMENT MODIFICATIONS.....	4
SUPPORT EQUIPMENT LIST AND DETAILS.....	4
EXTERNAL I/O CABLE.....	4
BLOCK DIAGRAM OF TEST SETUP.....	5
<b>SUMMARY OF TEST RESULTS.....</b>	<b>6</b>
<b>FCC§15.203 - ANTENNA REQUIREMENT.....</b>	<b>7</b>
APPLICABLE STANDARD.....	7
ANTENNA CONNECTOR CONSTRUCTION.....	7
<b>FCC§15.205, §15.209&amp;§15.249- RADIATED EMISSIONS.....</b>	<b>8</b>
APPLICABLE STANDARD.....	8
MEASUREMENT UNCERTAINTY.....	8
EUT SETUP.....	9
TEST EQUIPMENT SETUP.....	10
TEST PROCEDURE.....	10
CORRECTED AMPLITUDE & MARGIN CALCULATION.....	10
TEST EQUIPMENT LIST AND DETAILS.....	11
TEST RESULTS SUMMARY.....	11
TEST DATA.....	11
<b>FCC §15.215(C) – 20 DB BANDWIDTH TESTING.....</b>	<b>15</b>
APPLICABLE STANDARD.....	15
TEST PROCEDURE.....	15
TEST EQUIPMENT LIST AND DETAILS.....	15
TEST DATA.....	15
<b>FCC§15.249(D) - OUT OF BAND EMISSION (50 DB ATTENUATION).....</b>	<b>18</b>
APPLICABLE STANDARD.....	18
TEST PROCEDURE.....	18
TEST EQUIPMENT LIST AND DETAILS.....	18
TEST DATA.....	18
<b>DECLARATION LETTER.....</b>	<b>21</b>

## GENERAL INFORMATION

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### Product Description for Equipment under Test (EUT)

The *Wintop Electronics Co., Limited*'s product, model number: *WM-633(FCC ID: 2AB75-WM633MP)* (the "EUT") in this report was a *2.4GHz Wireless Optical Mouse*, was measured approximately: 9.89 cm (L) x 6.12 cm (W) x 3.32 cm(H), rated input voltage: DC3.0V from 2\*1.5V AAA battery.

*Note: the series product, model WM-633, MP2125BLU, MP2225RED, MP2325BLK, MP2425PUR are electrically identical, the differences between them are model name and color, we selected WM-633 for fully testing, the details was explained in the attached declaration letter.*

*\* All measurement and test data in this report was gathered from production sample serial number: 151111005 (Assigned by BACL.Dongguan). The EUT was received on 2015-11-12.*

### Objective

This type approval report is prepared on behalf of *Wintop Electronics Co., Limited*. in accordance with Part 2-Subpart J, and Part 15-Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.209 and 15.249 rules.

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

### Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 06, 2015.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

## SYSTEM TEST CONFIGURATION

### Justification

The system was configured for testing in engineering mode with maximum power output and switched the channels by key.

Channels list as follows:

Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
1	2405	5	2440
2	2413	6	2450
3	2422	7	2460
4	2430	8	2470

Channel 1, 4, 8 were selected to test.

### EUT Exercise Software

No software was used in test.

### Equipment Modifications

No modifications were made to the EUT.

### Support Equipment List and Details

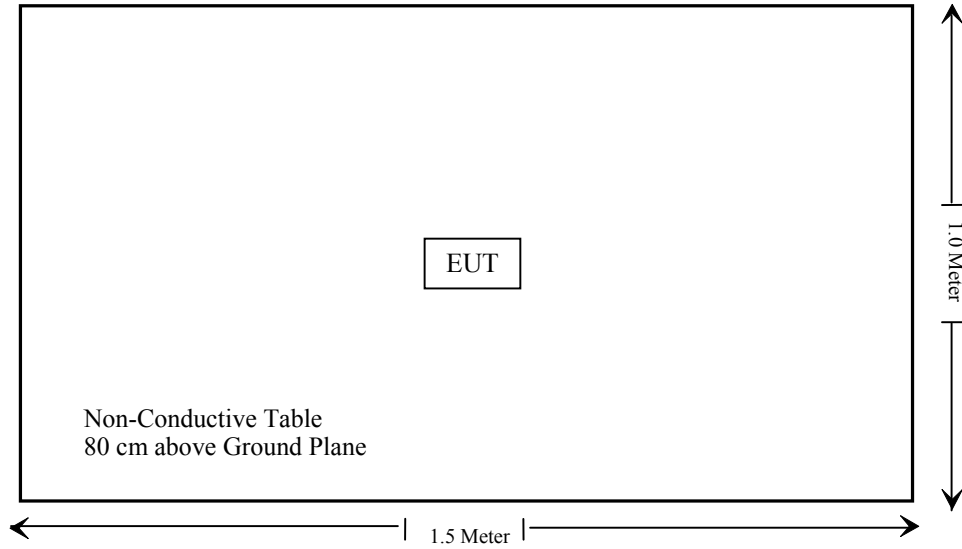
Manufacturer	Description	Model	Serial Number
/	/	/	/

### External I/O Cable

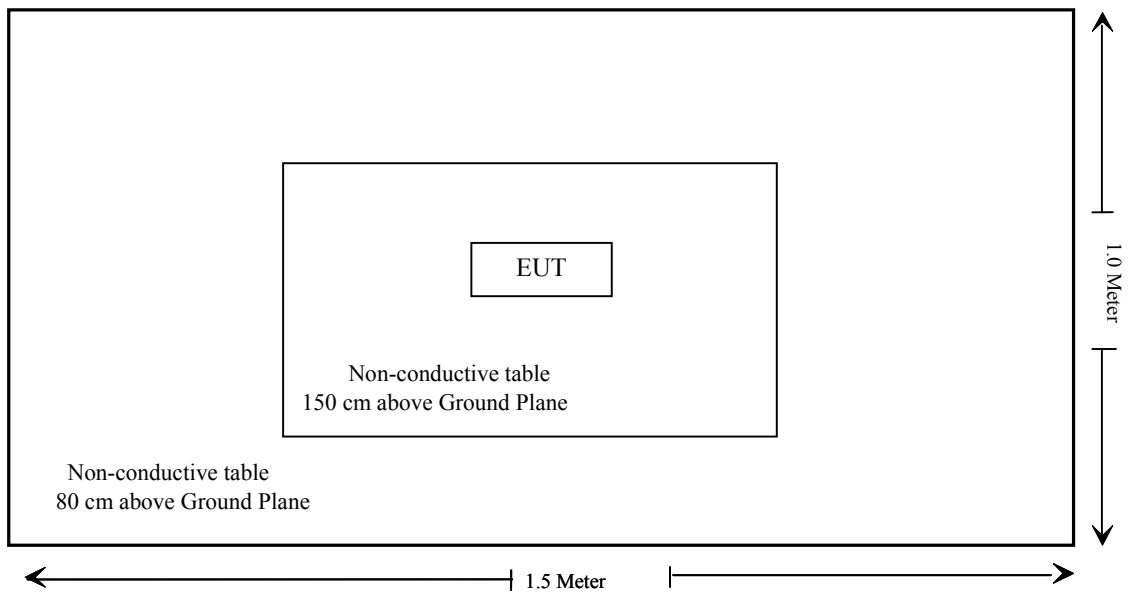
Cable Description	Shielding Type	Ferrite Core	Length (m)	From	To
/	/	/	/	/	/

### Block Diagram of Test Setup

Below 1GHz:



Above 1GHz:



**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207(a)	Conduction Emissions	Not Applicable
15.205, §15.209, §15.249	Radiated Emissions	Compliance
§15.215 (c)	20 dB Bandwidth	Compliance
§15.249(d)	Outside of Band Emission (50dB attenuation)	Compliance

Not Applicable: The EUT is battery operated equipment.

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## **FCC§15.203 - ANTENNA REQUIREMENT**

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### **Applicable Standard**

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used.

### **Antenna Connector Construction**

The EUT has one integral antenna arrangement, which was permanently attached and the antenna gain is -1.0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

**Result:** Compliant.

## **FCC§15.205, §15.209&§15.249- RADIATED EMISSIONS**

### **Applicable Standard**

As per FCC§15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

<b>Fundamental frequency</b>	<b>Field strength of fundamental (millivolts/meter)</b>	<b>Field strength of harmonics (microvolts/meter)</b>
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

As per FCC§15.249 (c), Field strength limits are specified at a distance of 3 meters.

(d) 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.

### **Measurement Uncertainty**

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If  $U_{lab}$  is less than or equal to  $U_{cispr}$  of Table 1, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If  $U_{lab}$  is greater than  $U_{cispr}$  of Table 1, then:

- compliance is deemed to occur if no measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit.

Based on CISPR 16-4-2: 2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is:

30M~200MHz: 5.0 dB

200M~1GHz: 6.2 dB

1G~6GHz: 4.45 dB

6G~18GHz: 5.23 dB

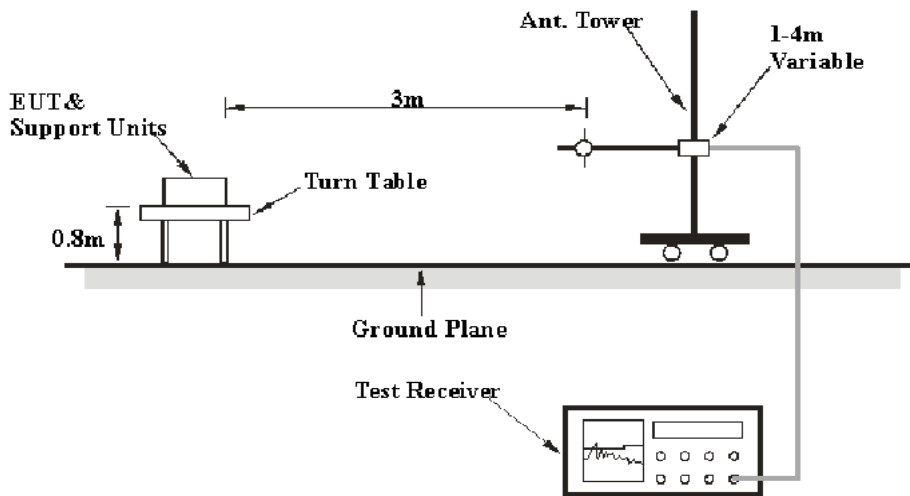


Table 1 – Values of  $U_{cispr}$

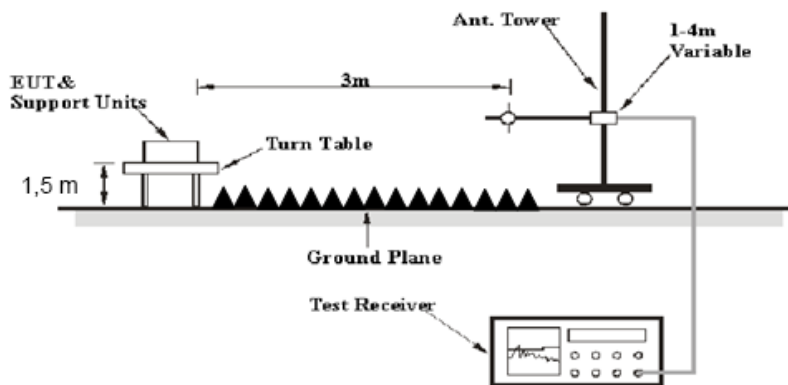
Measurement	$U_{cispr}$
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

**EUT Setup**

Below 1 GHz:



Above 1 GHz:



The radiated emission and out of band emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013 The specification used was the FCC 15.209/15.205 and FCC 15.249 limits.

## Test Equipment Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave.

## Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detection mode from 30 MHz to 1GHz, peak and average detection mode above 1 GHz.

## Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2015-08-03	2016-08-02
Sunol Sciences	Antenna	JB3	A060611-3	2014-11-06	2017-11-05
HP	Amplifier	8447E	2434A02181	2015-09-01	2016-09-01
Agilent	Spectrum Analyzer	E4440A	SG43360054	2014-12-04	2015-12-04
ETS-Lindgren	Horn Antenna	3115	9808-5557	2015-09-06	2018-09-06
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2015-02-19	2016-02-19
R&S	Spectrum Analyzer	FSP 38	100478	2015-05-09	2016-05-09
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-01 1304	2014-06-16	2017-06-15
Quinstar	Amplifier	QLW- 18405536-JO	15964001001	2015-09-06	2016-09-06
N/A	Coaxial Cable	14m	N/A	2015-05-06	2016-05-06
N/A	Coaxial Cable	8m	N/A	2015-05-06	2016-05-06

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Results Summary

According to the data in the following table, the EUT complied with the FCC Part 15.209 & 15.205 & 15.249, with the worst margin reading of:

**0.68 dB at 4940 MHz in the Horizontal polarization**

### Test Data

#### Environmental Conditions

Temperature:	27.3 °C
Relative Humidity:	53%
ATM Pressure:	100.3 kPa

*The testing was performed by Dean Liu on 2015-11-24.*

Test Mode: Transmitting

Note: The field strength (average) of fundamental and harmonic was based on calculated duty cycle correction factor instead of measurement.

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector	Polar (H/V)	Factor (dB(1/m))					
<b>Low Channel: 2405 MHz</b>									
2405	66.86	PK	H	25.65	3.66	0.00	96.17	114.00	17.83
2405	61.5	PK	V	25.65	3.66	0.00	90.81	114.00	23.19
2400	33.28	PK	H	25.64	3.65	0.00	62.57	74.00	11.43
2400	19.35	AV	H	25.64	3.65	0.00	48.64	54.00	5.36
2388.5	39.28	PK	H	25.61	3.63	0.00	62.52	74.00	11.48
2388.5	25.37	AV	H	25.61	3.63	0.00	48.61	54.00	5.39
4810	62.54	PK	H	30.61	5.05	27.41	70.79	74.00	3.21*
7215	52.19	PK	H	34.12	6.62	25.91	67.02	74.00	6.98
9620	48.42	PK	H	35.99	8.54	27.53	65.42	74.00	8.58
267.6	33.21	QP	H	13.56	2.02	21.50	27.29	46.00	18.71
<b>Middle Channel: 2430 MHz</b>									
2430	66.96	PK	H	25.72	3.73	0.00	96.41	114.00	17.59
2430	61.89	PK	V	25.72	3.73	0.00	91.34	114.00	22.66
4860	63.35	PK	H	30.74	5.05	27.42	71.72	74.00	2.28*
7290	53.83	PK	H	34.30	6.71	25.89	68.95	74.00	5.05*
9720	48.67	PK	H	36.23	8.59	27.30	66.19	74.00	7.81
1969	41.68	PK	H	24.54	3.03	27.49	41.76	74.00	32.24
1969	28.63	AV	H	24.54	3.03	27.49	28.71	54.00	25.29
2734	36.01	PK	H	26.51	4.40	27.51	39.41	74.00	34.59
2734	22.76	AV	H	26.51	4.40	27.51	26.16	54.00	27.84
267.6	33.74	QP	H	13.56	2.02	21.50	27.82	46.00	18.18
<b>High Channel: 2470 MHz</b>									
2470	65.55	PK	H	25.82	3.72	0.00	95.09	114.00	18.91
2470	60.23	PK	V	25.82	3.72	0.00	89.77	114.00	24.23
2483.5	32.16	PK	H	25.86	3.67	0.00	61.69	74.00	12.31
2483.5	18.63	AV	H	25.86	3.67	0.00	48.16	54.00	5.84
2486	35.34	PK	H	25.86	3.66	0.00	61.68	74.00	12.32
2486	21.47	AV	H	25.86	3.66	0.00	47.07	54.00	6.93
4940	65.25	PK	H	30.14	5.36	27.43	73.32	74.00	0.68*
7410	53.41	PK	H	34.58	6.85	25.89	68.95	74.00	5.05*
9880	48.86	PK	H	36.61	8.68	26.82	67.33	74.00	6.67
3797	38.02	PK	H	29.45	4.65	27.38	44.74	74.00	29.26
3797	26.27	AV	H	29.45	4.65	27.38	32.99	54.00	21.01
267.6	33.68	QP	H	13.56	2.02	21.50	27.76	46.00	18.24

\*Within measurement uncertainty!

Frequency (MHz)	Peak Measurement@3m (dBµV/m)	Polar (H/V)	Duty Cycle Corrected Factor (dBµV/m)	Average Amp (dBµV/m)	Limit (dBµV/m)	Margin (dB)
<b>frequency: 2405 MHz</b>						
2405	96.17	H	-20.22	75.95	94.00	18.05
2405	90.81	V	-20.22	70.59	94.00	23.41
4810	70.79	H	-20.22	50.57	54.00	3.43
7215	67.02	H	-20.22	46.80	54.00	7.20
9620	65.42	H	-20.22	45.20	54.00	8.80
<b>frequency: 2430 MHz</b>						
2430	96.41	H	-20.22	76.19	94.00	17.81
2430	91.34	V	-20.22	71.12	94.00	22.88
4860	71.72	H	-20.22	51.50	54.00	2.50
7290	68.95	H	-20.22	48.73	54.00	5.27
9720	66.19	H	-20.22	45.97	54.00	8.03
<b>frequency: 2470 MHz</b>						
2470	95.09	H	-20.22	74.87	94.00	19.13
2470	89.77	V	-20.22	69.55	94.00	24.45
4940	73.02	H	-20.22	52.80	54.00	1.20
7410	68.95	H	-20.22	48.73	54.00	5.27
9880	67.33	H	-20.22	47.11	54.00	6.89

Note:

Calculate Average Value based on duty cycle correction factor:

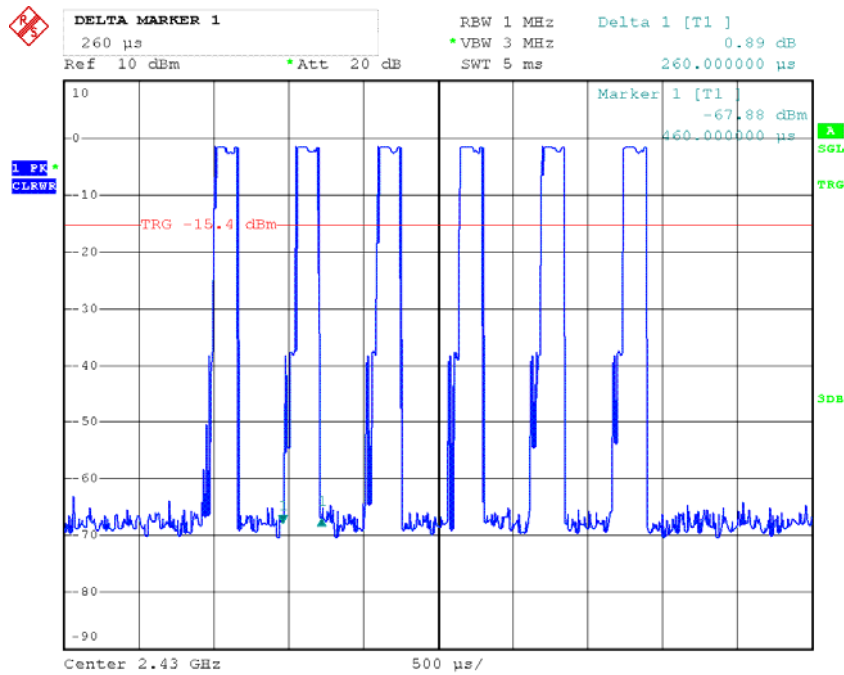
$$\text{Duty cycle} = T_{\text{on}} / T_p = 260 * 6 / 1000 / 16 = 9.75\%$$

$$\text{Duty cycle correction factor} = 20 * \log(\text{duty cycle}) = 20 * \log(9.75\%) = -20.22\text{dB}$$

$$\text{Average} = \text{Peak} + \text{Duty cycle correction factor}$$

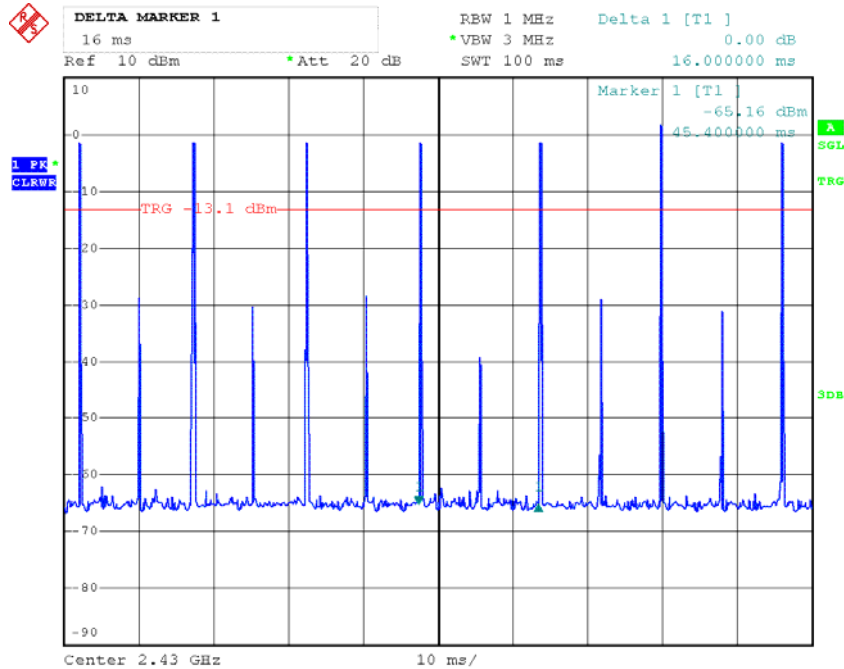
Please refer to following plot.

$T_{on}$



Date: 24.NOV.2015 20:01:14

$T_p$



Date: 24.NOV.2015 19:50:14

## FCC §15.215(c) – 20 dB BANDWIDTH TESTING

### Applicable Standard

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

### Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on the test table without connection to measurement instrument. Turn on the EUT. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSEM	831259/019	2015-07-28	2016-07-27
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2015-05-06	2016-05-06
N/A	Coaxial Cable	0.1m	N/A	2015-05-06	2016-05-06

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	27.3°C
<b>Relative Humidity:</b>	54 %
<b>ATM Pressure:</b>	99.6 kPa

\* The testing was performed by Dean Liu on 2015-11-22.

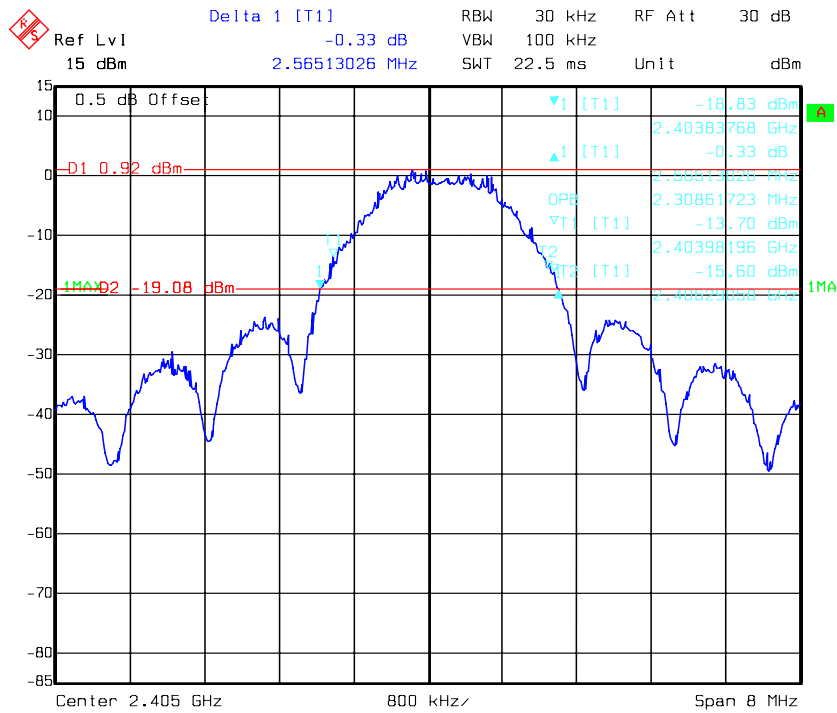
**Test Result:** Compliant.

Please refer to following tables and plots

Test Mode: Transmitting

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	2405	2.565
Middle	2430	2.581
High	2470	2.565

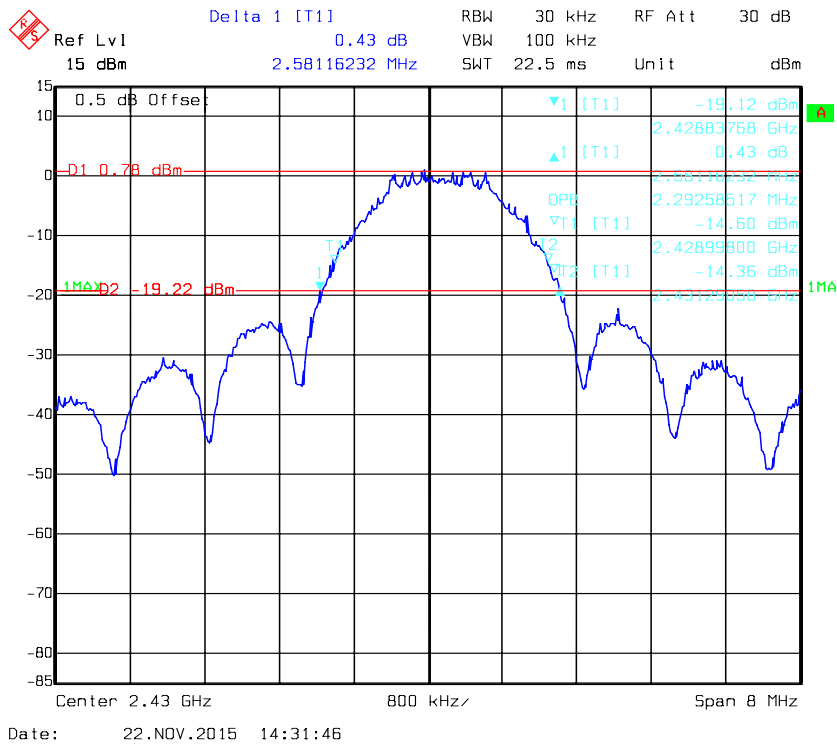
Low Channel



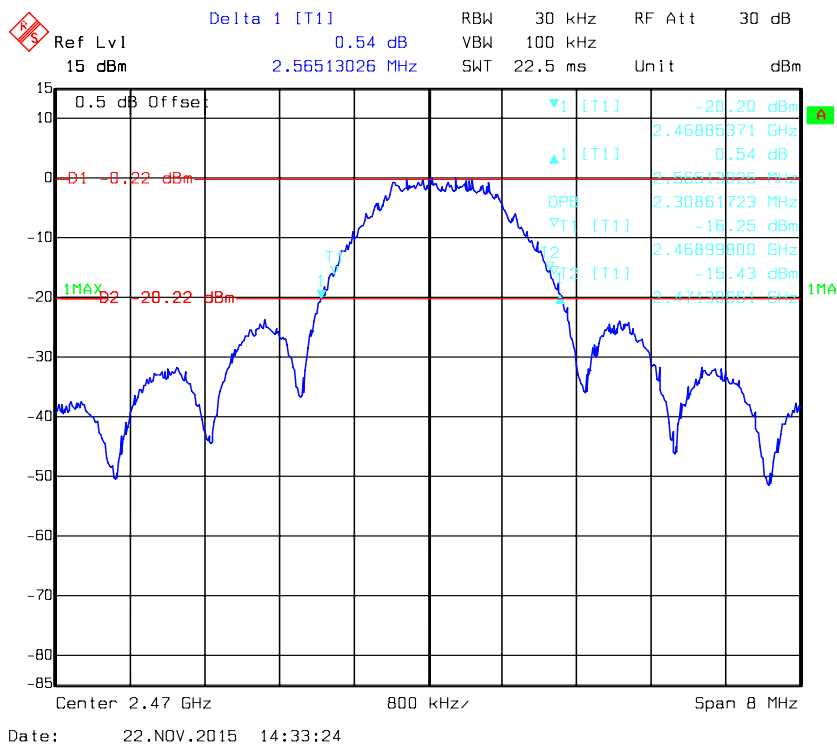
Date: 22.NOV.2015 14:35:16



### Middle Channel



### High Channel



**FCC§15.249(d) - OUT OF BAND EMISSION (50 dB ATTENUATION)****Applicable Standard**

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

**Test Procedure**

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

**Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSEM	831259/019	2015-07-28	2016-07-27
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2015-05-06	2016-05-06
N/A	Coaxial Cable	0.1m	N/A	2015-05-06	2016-05-06

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

**Test Data****Environmental Conditions**

<b>Temperature:</b>	27.3°C
<b>Relative Humidity:</b>	54 %
<b>ATM Pressure:</b>	99.6 kPa

\* The testing was performed by Dean Liu on 2015-11-24.

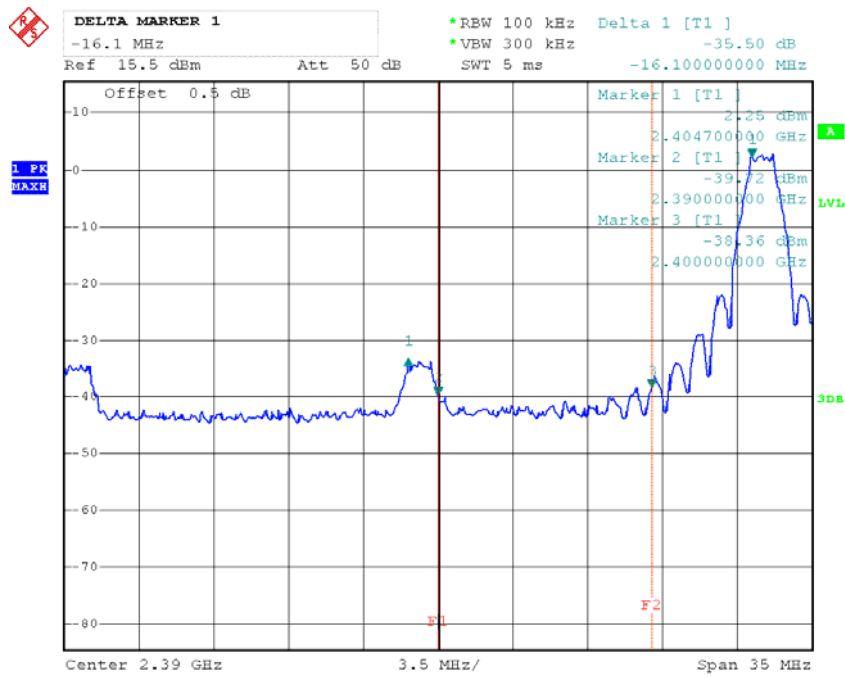
Test Result: Compliant.

Please refer to the following table and plots:

<b>Band Edge</b>	<b>Delta Peak to Band Emission (dBc)</b>	<b>Delta Limit (dBc)</b>
Left	35.50 (note)	50
Right	39.84 (note)	50

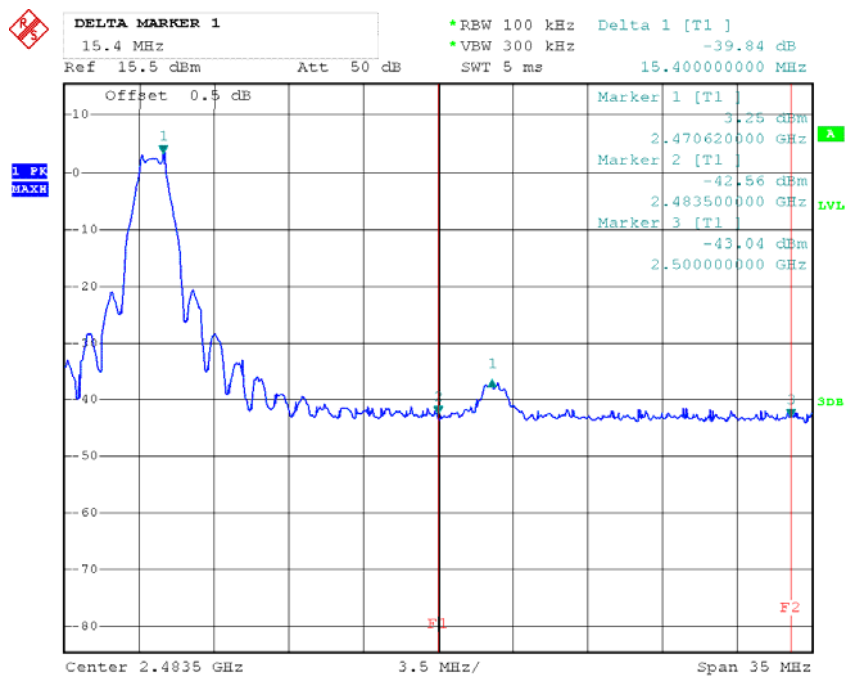
*Note: The band emission compliant with the general radiated emission limits in §15.209.  
Please refer to radiated emissions test section.*

**Band Edge, Left Side**



Date: 24.NOV.2015 17:27:44

**Band Edge, Right Side**



Date: 24.NOV.2015 18:01:58

## DECLARATION LETTER

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Wintop Electronics Co., Limited  
Add: Unit 04 7/F, Bright Way Tower 33, Mong Kok RD KL Hong Kong  
Tel: 86-755-84255795 Fax: 86-755-84255950

### DECLARATION OF SIMILARITY

2015-11-17

To

Bay Area Compliance Laboratories Corp.(Dongguan)  
No.69 Pulong Village, Puxinhu Industry Zone, Tangxia, Dongguan, China  
Tel: +86 769 86858888 Fax: +86 769 86858892  
<http://www.baclcorp.com>

Dear Sir or Madam:

We, Wintop Electronics Co., Limited, hereby declare that testing model product:  
2.4GHz Wireless Optical Mouse , Model number: WM-633. Multiple Models:  
MP2125BLU, MP2225RED MP2325BLK, MP2425PUR. Multiple Model have the  
same structure, PCB, Material and function to the testing product's model, and only  
are different for model name and color.

Besides the differences in the above, we declare the products are identical. We  
guarantee all the information provided above is true, and notice that we'll bear all the  
consequences caused by any false information or concealing.

Please contact me should there be need for any additional clarification or information.

Best Regards,

Signature

Shirly Lee  
Sales Manager



\*\*\*\*\* END OF REPORT \*\*\*\*\*