

FCC PART 15.249

TEST REPORT

For

ChicagoTronics, Inc.

1736 W. Pierce Ave, Chicago, IL 60622 United States

FCC ID: 2AHKSCTW001

Report Type: Original Report		Product Type: 2016 Wireless 5-button mouse	
Test Engineer:	Robin Zheng	Robin Zheng	
Report Number:	RDG160315005-00		
Report Date:	2016-04-06		
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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).

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *ChicagoTronics, Inc.*'s product, model number: *CTW001(FCC ID: 2AHKSCTW001)* (the "EUT") in this report was a *2016 Wireless 5-button mouse*, which was measured approximately: 106 mm (L) x 68 mm (W) x 39 mm (H), rated input voltage: DC3.0V from battery.

All measurement and test data in this report was gathered from production sample serial number: 160315005 (Assigned byBACL, Dongguan). The EUT was received on 2016-03-16.

Objective

This type approval report is prepared on behalf of *ChicagoTronics, Inc.* 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.

Related Submittal(s)/Grant(s)

Submitted with the Part of a system with ID: 2AHKSREV.

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, the maximum power output configured by default setting and switched the channels by keys.

Below is the channels employed:

Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
1	2408	18	2442
2	2410	19	2444
3	2412	20	2446
~	~	~	~
16	2438	33	2472
17	2440	34	2474

Channel 1, 17, 34 were selected to test.

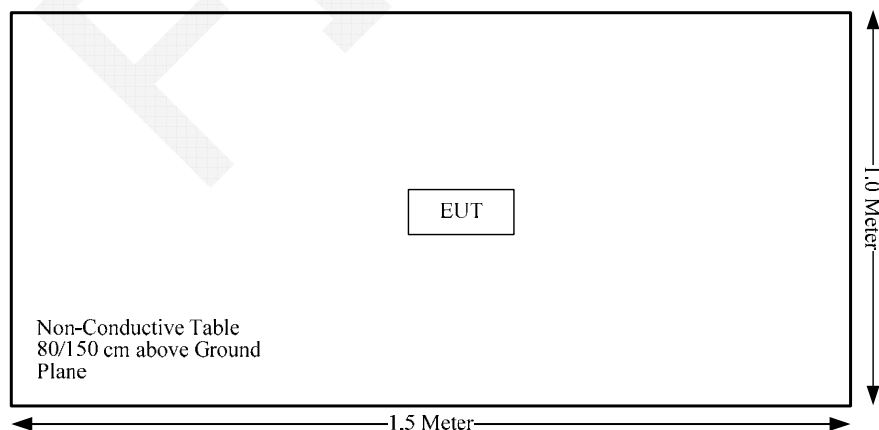
EUT Exercise Software

No software was used during testing.

Equipment Modifications

No modifications were made to the EUT.

Block Diagram of Test Setup



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

Not Applicable*: the device was powered by battery.

FCC§15.203 - ANTENNA REQUIREMENT

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 an internal antenna, the antenna gain is 0dBi, 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:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
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

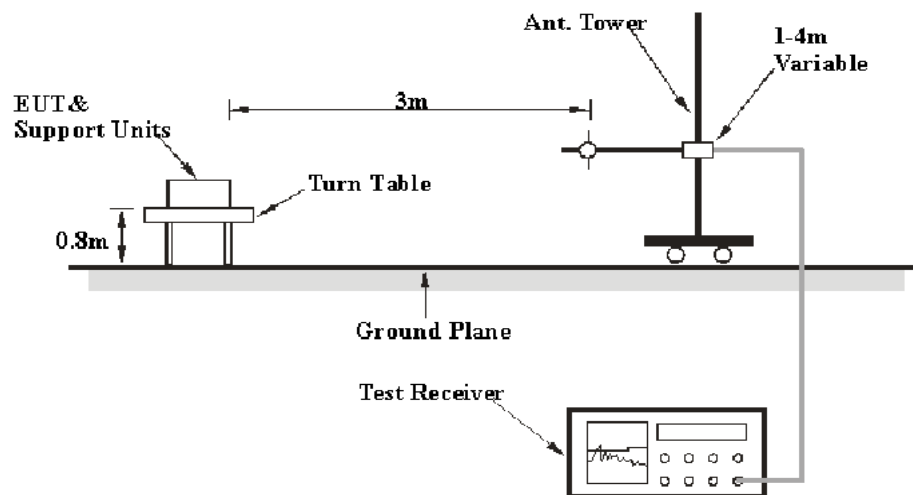
Compliance or non- compliance with a disturbance limit shall be determined in the following manner

Table 1 – Values of U_{cispr}

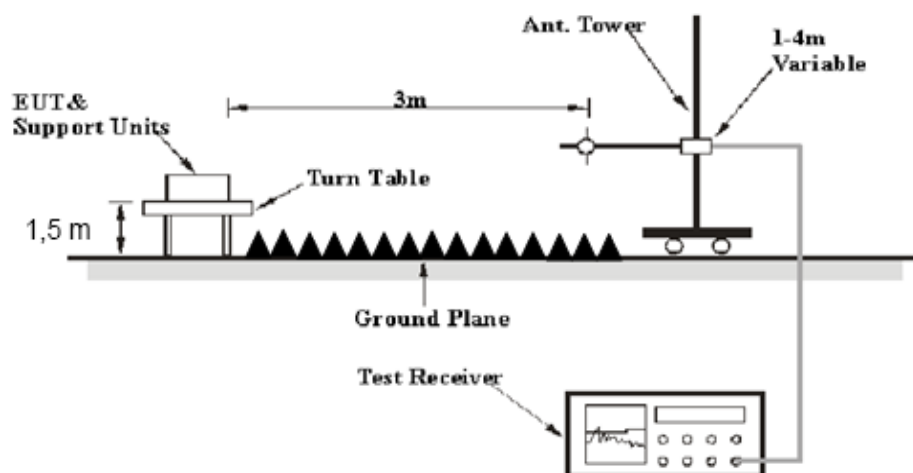
Measurement	U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

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	2015-11-23	2016-11-22
ETS-Lindgren	Horn Antenna	3115	9808-5557	2015-09-06	2018-09-06
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2016-02-19	2017-02-19
R&S	Spectrum Analyzer	FSP 38	100478	2015-11-23	2016-11-22
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.

Test Data**Environmental Conditions**

Temperature:	27.4 °C
Relative Humidity:	58 %
ATM Pressure:	100.9 kPa

The testing was performed by Robin Zheng on 2016-04-05.

Test Mode: Transmitting

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))					
frequency: 2408 MHz									
2408	58.32	PK	H	25.66	3.67	0.00	87.65	114.00	26.35
2408	56.37	AV	H	25.66	3.67	0.00	85.70	94.00	8.30
2408	46.56	PK	V	25.66	3.67	0.00	75.89	114.00	38.11
2408	44.14	AV	V	25.66	3.67	0.00	73.47	94.00	20.53
2400	28.35	PK	H	25.64	3.65	0.00	57.64	74.00	16.36
2400	19.73	AV	H	25.64	3.65	0.00	49.02	54.00	4.98
4816	48.14	PK	H	30.62	5.04	27.41	56.39	74.00	17.61
4816	42.25	AV	H	30.62	5.04	27.41	50.50	54.00	3.50
7224	36.13	PK	H	34.14	6.63	25.90	51.00	74.00	23.00
7224	26.32	AV	H	34.14	6.63	25.90	41.19	54.00	12.81
9632	29.96	PK	H	36.02	8.54	27.50	47.02	74.00	26.98
9632	17.24	AV	H	36.02	8.54	27.50	34.30	54.00	19.70
2710	33.56	PK	H	26.45	4.48	27.50	36.99	74.00	37.01
2710	21.15	AV	H	26.45	4.48	27.50	24.58	54.00	29.42
356	28.6	QP	H	15.45	2.29	21.66	24.68	46.00	21.32
frequency: 2440 MHz									
2440	58.76	PK	H	25.74	3.76	0.00	88.26	114.00	25.74
2440	56.19	AV	H	25.74	3.76	0.00	85.69	94.00	8.31
2440	46.89	PK	V	25.74	3.76	0.00	76.39	114.00	37.61
2440	44.47	AV	V	25.74	3.76	0.00	73.97	94.00	20.03
4880	47.13	PK	H	30.79	5.18	27.42	55.68	74.00	18.32
4880	41.22	AV	H	30.79	5.18	27.42	49.77	54.00	4.23
7320	35.57	PK	H	34.37	6.75	25.88	50.81	74.00	23.19
7320	25.55	AV	H	34.37	6.75	25.88	40.79	54.00	13.21
9760	30.67	PK	H	36.32	8.62	27.21	48.40	74.00	25.60
9760	18.03	AV	H	36.32	8.62	27.21	35.76	54.00	18.24
2740	34.56	PK	H	26.52	4.38	27.52	37.94	74.00	36.06
2740	22.03	AV	H	26.52	4.38	27.52	25.41	54.00	28.59
3040	32.97	PK	H	27.33	6.67	27.50	39.47	74.00	34.53
3040	20.46	AV	H	27.33	6.67	27.50	26.96	54.00	27.04
356	28.6	QP	H	15.45	2.29	21.66	24.68	46.00	21.32
frequency: 2474 MHz									
2474	58.36	PK	H	25.83	3.70	0.00	87.89	114.00	26.11
2474	55.52	AV	H	25.83	3.70	0.00	85.05	94.00	8.95
2474	46.52	PK	V	25.83	3.70	0.00	76.05	114.00	37.95
2474	44.11	AV	V	25.83	3.70	0.00	73.64	94.00	20.36
2483.5	30.83	PK	H	25.86	3.67	0.00	60.36	74.00	13.64
2483.5	19.85	AV	H	25.86	3.67	0.00	49.38	54.00	4.62
4948	47.14	PK	H	30.96	5.37	27.43	56.04	74.00	17.96
4948	40.97	AV	H	30.96	5.37	27.43	49.87	54.00	4.13
7422	34.54	PK	H	34.61	6.87	25.92	50.10	74.00	23.90
7422	24.07	AV	H	34.61	6.87	25.92	39.63	54.00	14.37
9896	30.12	PK	H	36.65	8.69	26.76	48.70	74.00	25.30
9896	17.23	AV	H	36.65	8.69	26.76	35.81	54.00	18.19
2770	35.93	PK	H	26.60	4.41	27.54	39.40	74.00	34.60
2770	23.51	AV	H	26.60	4.41	27.54	26.98	54.00	27.02
356	28.6	QP	H	15.45	2.29	21.66	24.68	46.00	21.32

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

Temperature:	24.5 °C
Relative Humidity:	61 %
ATM Pressure:	101.6 kPa

The testing was performed by Robin Zheng on 2016-03-17.

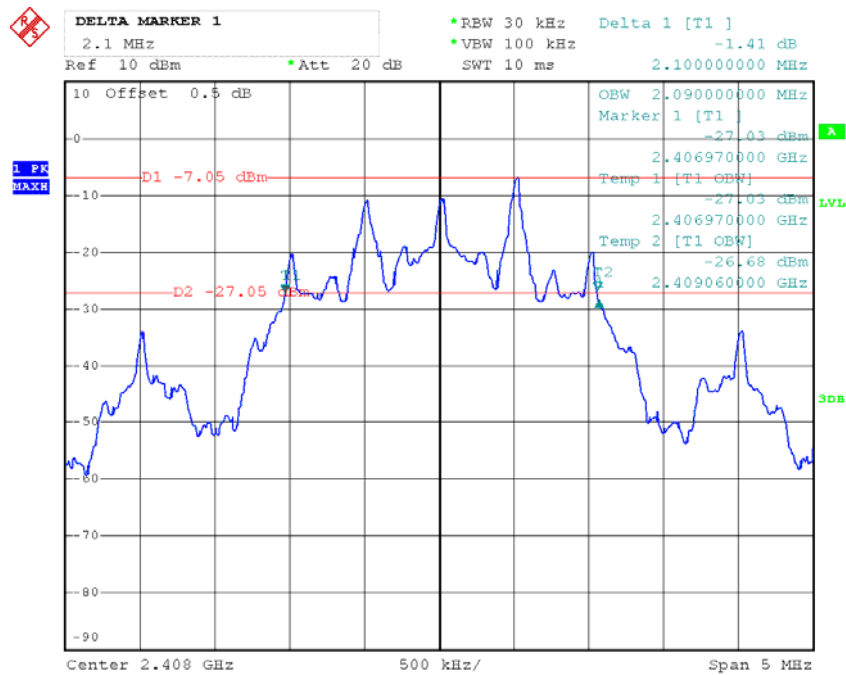
Test Result: Compliant.

Please refer to following tables and plots

Test Mode: Transmitting

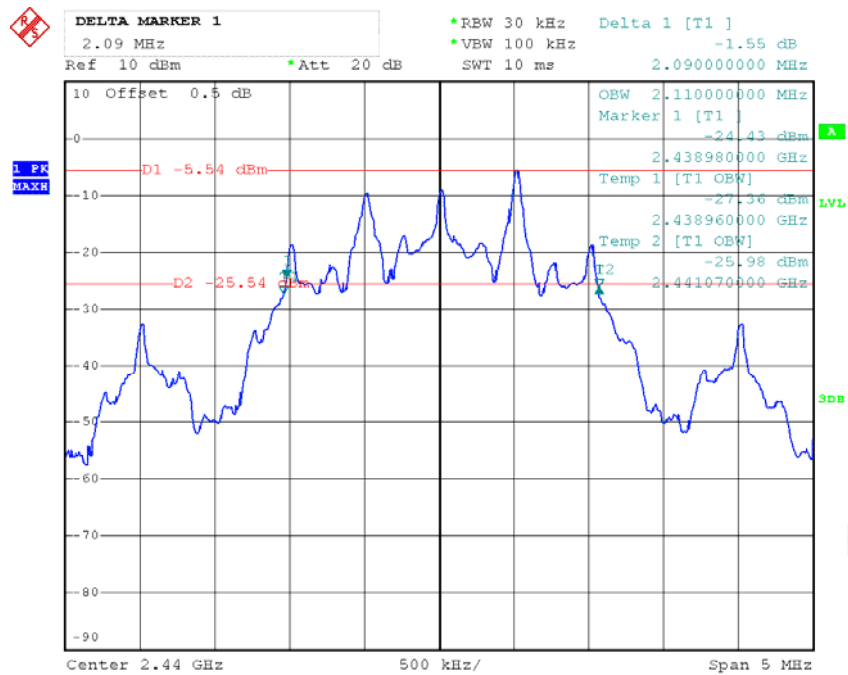
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	2408	2.10
Middle	2440	2.09
High	2474	2.09

Low Channel



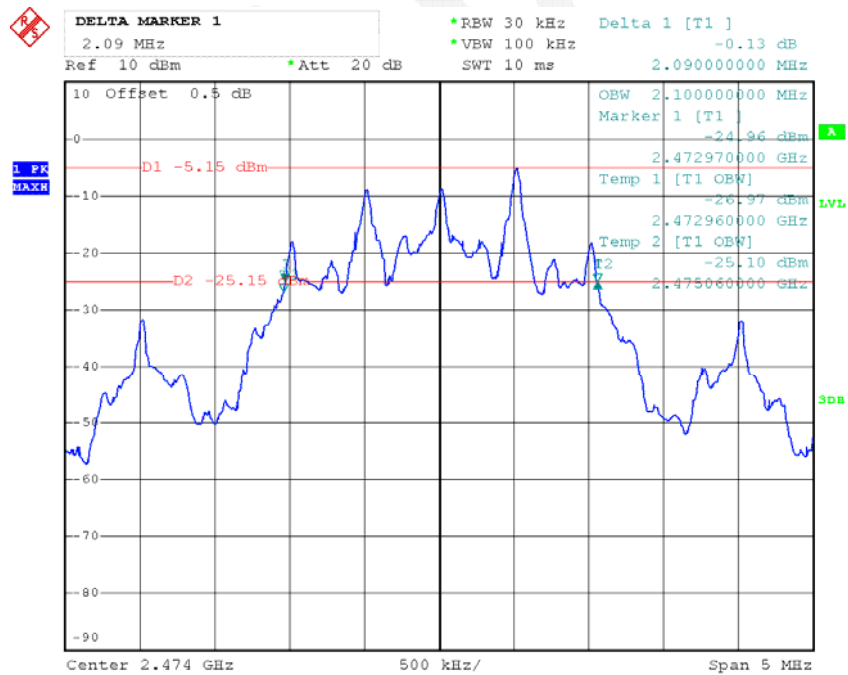
Date: 17.MAR.2016 20:37:50

Middle Channel



Date: 17.MAR.2016 20:39:56

High Channel



Date: 17.MAR.2016 20:32:16

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