



Prüfbericht-Nr.: <i>Test report No.:</i>	50185013 001	Auftrags-Nr.: <i>Order No.:</i>	174091330	Seite 1 von 21 <i>Page 1 of 21</i>
Kunden-Referenz-Nr.: <i>Client reference No.:</i>	N/A	Auftragsdatum: <i>Order date.:</i>	19.09.2018	
Auftraggeber: <i>Client:</i>	Acrox Technologies Co., Ltd. 4F., No.89, Minshan St., Neihu Dist., Taipei, Taiwan			
Prüfgegenstand: <i>Test item:</i>	Wireless Trackball Mouse			
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	G5W			
Auftrags-Inhalt: <i>Order content:</i>	FCC and IC approval			
Prüfgrundlage: <i>Test specification:</i>	CFR47 FCC Part 15: Subpart C Section 15.249 RSS-210 Issue 9 November 2017 CFR47 FCC Part 15: Subpart C Section 15.207 RSS-Gen Issue 5 April 2018 CFR47 FCC Part 15: Subpart C Section 15.209 RSS-102 Issue 5 March 2015 CFR47 FCC Part 2: Section 2.1093			
Wareneingangsdatum: <i>Date of receipt:</i>	19.09.2018	Please refer to photo documents		
Prüfmuster-Nr.: <i>Test sample No.:</i>	A000823182-001/002			
Prüfzeitraum: <i>Testing period:</i>	25.10.2018 - 30.10.2018			
Ort der Prüfung: <i>Place of testing:</i>	TÜV Rheinland (Guangdong) Ltd.			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Guangdong) Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von / tested by:		kontrolliert von / reviewed by:		
				
11.07.2018	Storm Shu / Assistant Project Manager	11.07.2018	Amy Wang / Technical Certifier	
Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>
				Unterschrift <i>Signature</i>
Sonstiges / Other:				
FCC ID: PRDMU68 IC: 6180A-G5W HVIN: G5W				
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged:</i>		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specifications(s) F(ail) = failed a.m. test specifications(s) N/A = not applicable N/T = not tested				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

Test Summary

5.1.1 ANTENNA REQUIREMENT

RESULT: Pass

5.1.2 FUNDAMENTAL & HARMONICS RADIATED EMISSION

RESULT: Pass

5.1.3 20dB BANDWIDTH

RESULT: Pass

5.1.4 99% BANDWIDTH

RESULT: Pass

5.1.5 RADIATED SPURIOUS EMISSION & BAND EDGE

RESULT: Pass

6.1.1 ELECTROMAGNETIC FIELDS

RESULT: Pass

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1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A: Photographs of the Test Set-up

Appendix B: Test Results of General 2.4GHz wireless

2 Test Sites

2.1 Test Facilities

TÜV Rheinland (Guangdong) Ltd.

No.102, 1F of Southwest and No.205, 2F No.767 Tianyuan Road, Tianhe District, Guangzhou 510663,
Guangdong Province P.R. China

FCC Accreditation Designation No.: CN1207

Test site Industry Canada No.: 2932C-1

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

For the measurement Equipment list, refer to the appendix B.

2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table.

Item		Extended Uncertainty
Conducted Emission		± 2.68 dB
Radiated Emission (30-1000MHz)	Field strength (dB μ V/m)	± 5.16 dB
Radiated Emission (above 1000MHz)	Field strength (dB μ V/m)	± 2.22 dB
Radio Spectrum		± 4.51 dB

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Guangdong) Ltd. file for certification follow-up purposes.

2.7 Status of Facility Used for Testing

The TÜV Rheinland (Guangdong) Ltd. Test facility located at No.102, 1F of Southwest and No.205, 2F No.767 Tianyuan Road, Tianhe District, Guangzhou 510663, Guangdong Province P.R. China is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3 General Product Information

3.1 Product Function and Intended Use

The equipment model G5W is Wireless Trackball Mouse of information technology equipment. It's made up of mouse unit and USB dongle unit; and between mouse unit and USB dongle unit operating in 2408-2474MHz with 34 channel for communication.

For details refer to the User Manual, Technical Description and Circuit Diagram.

3.2 Ratings and System Details

Table 2: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment	Wireless Trackball Mouse
Type Designation	G5W
FCC ID	PRDMU68
Operating Voltage	DC 1.5V (battery)
Testing Voltage	DC 1.5V
Type of Modulation	FSK
Channel Number	34 channels
Channel Separation	2MHz
Antenna Type	Integral Antenna (PCB Antenna)
Antenna number	1
Antenna Gain	-5 dBi Max

Table 3: RF Channel and Frequency of General 2.4GHz

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
01	2408.00	10	2426.00	19	2444.00	28	2462.00
02	2410.00	11	2428.00	20	2446.00	29	2464.00
03	2412.00	12	2430.00	21	2448.00	30	2466.00
04	2414.00	13	2432.00	22	2450.00	31	2468.00
05	2416.00	14	2434.00	23	2452.00	32	2470.00
06	2418.00	15	2436.00	24	2454.00	33	2472.00
07	2420.00	16	2438.00	25	2456.00	34	2474.00
08	2422.00	17	2440.00	26	2458.00	--	--
09	2424.00	18	2442.00	27	2460.00	--	--

Test frequencies are lowest channel: 2408 MHz, middle channel: 2440 MHz and highest channel: 2474 MHz for General 2.4GHz

3.3 Independent Operation Modes

The basic operation modes are:

- A. On, General 2.4GHz wireless transmitting mode
 - 1. Low channel
 - 2. Middle channel
 - 3. High channel
- B. On, Normal operation with general 2.4GHz mode
- C. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- Application Form
- Block Diagram
- FCC/IC Label and Location Info
- Operation Description
- Photo Document
- Schematics
- User Manual

4 Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

Radio Spectrum: The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All tests were performed according to the procedures in ANSI C63.10: 2013.

According to clause 3.1, all tests were performed on model G5W in this report.

4.3 Special Accessories and Auxiliary Equipment

Table 4: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model	S/N	Rating
Notebook	DELL	Lutitude 3379	73CMNA00DPC	N/A
Notebook	Lenovo	Thinkpad X250	2014AP6082	N/A

4.4 Countermeasures to Achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF).

No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

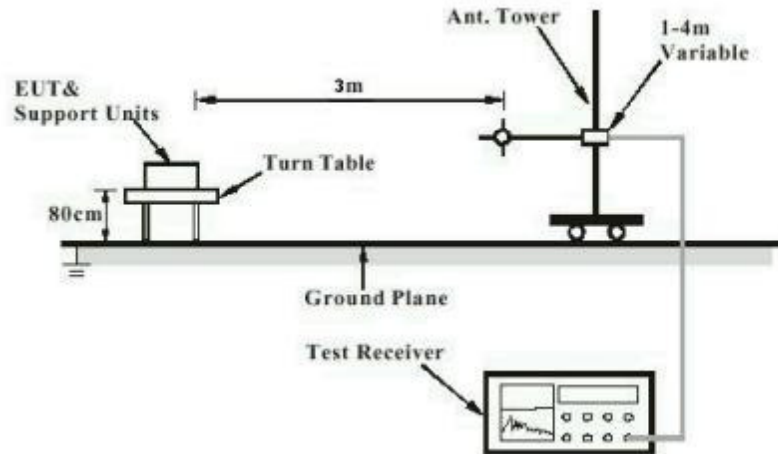


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

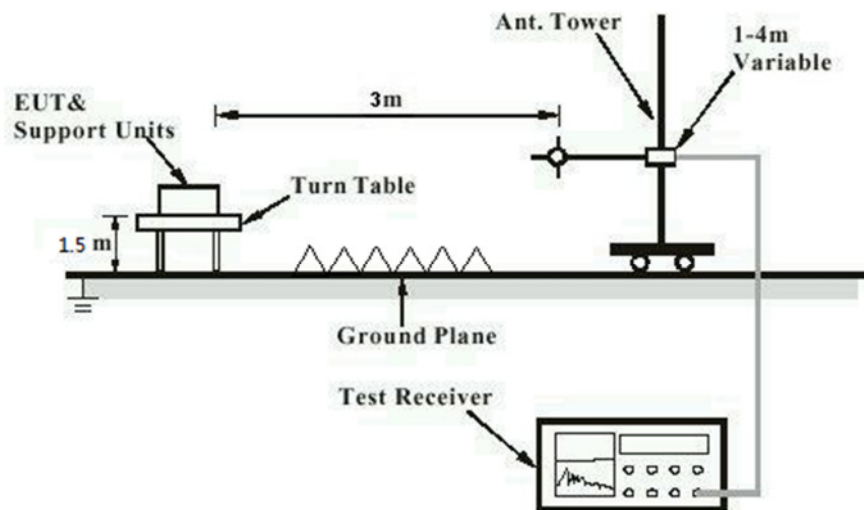


Diagram of Measurement Configuration for Mains Conduction Measurement

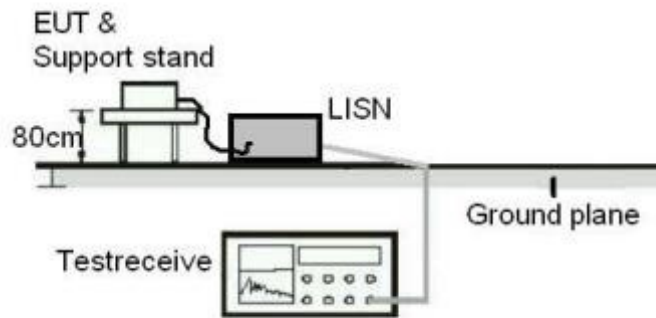
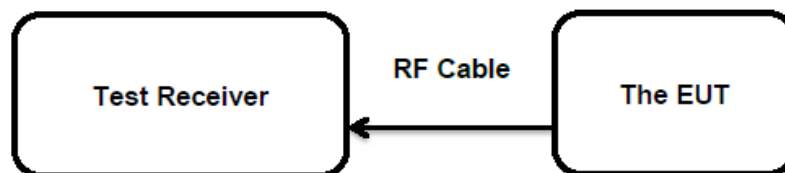


Diagram of Measurement Configuration for Conducted Transmitter Measurement



5 Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT:**Pass****Test Specification**

Test standard : FCC Part 15.247(b)(4) and Part 15.203

According to the manufacturer declared, the EUT has an internal antenna, the directional gain of antenna is -5dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

Therefore the EUT is considered sufficient to comply with the provision.

Refer to EUT Photo for further details.

5.1.2 Fundamental & Harmonics Radiated Emission

RESULT:
Pass
Test Specification

Test standard : FCC Part 15.249(a)
 : RSS-210 B.10
 Basic standard : ANSI C63.10: 2013
 Limits : Refer to FCC Part 15.209(a)
 Kind of test site : Shielded Room

Test Setup

Date of testing : 25.10.2018
 Input voltage : DC 1.5V
 Operation mode : A
 Test channel : Low / Middle / High
 Ambient temperature : 22 °C
 Relative humidity : 56 %
 Atmospheric pressure : 100 kPa

Table 5: Test Result of Maximum Peak Fundamental Radiated Emission

Channel Frequency (MHz)	Measured Peak Output Power		Limit (dB μ V/m)
	(dB μ V/m @ 3m)	(mW)	
2407	Vertical	84.125	< 94
	Horizontal	90.045	
2440	Vertical	86.035	
	Horizontal	90.472	
2474	Vertical	83.911	
	Horizontal	93.017	
Maximum Measured Value	93.017	--	

For the measurement records, refer to the appendix A.

5.1.3 20dB Bandwidth

RESULT:
Pass
Test Specification

Test standard : FCC Part 15.215
 Basic standard : ANSI C63.10: 2013
 Kind of test site : Shielded Room

Test Setup

Date of testing : 25.10.2018
 Input voltage : DC 1.5V
 Operation mode : A
 Test channel : Low / High
 Ambient temperature : 22 °C
 Relative humidity : 56 %
 Atmospheric pressure : 100 kPa

For details refer to following test result.

Table 6: Test Result of 20dB Bandwidth, General 2.4GHz

Channel	Test Mode Test Channel (MHz)	20dB Bandwidth (kHz)	Limit (MHz)
Low Channel	2408	2436.00	Within the assigned frequency band 2400~2483.5MHz
High Channel	2474	2436.00	
Maximum Measured Value	Maximum Measured Value	2436.00	

For the measurement records, refer to following test plot:

Test Plot of 20dB Bandwidth

Low CH



High CH



5.1.4 99% Bandwidth

RESULT:
Pass
Test Specification

Test standard : RSS-Gen Clause 6.6
 Basic standard : ANSI C63.10: 2013
 Kind of test site : Shielded Room

Test Setup

Date of testing : 25.10.2018
 Input voltage : DC 1.5V
 Operation mode : A
 Test channel : Low / Middle / High
 Ambient temperature : 22 °C
 Relative humidity : 56 %
 Atmospheric pressure : 101 kPa

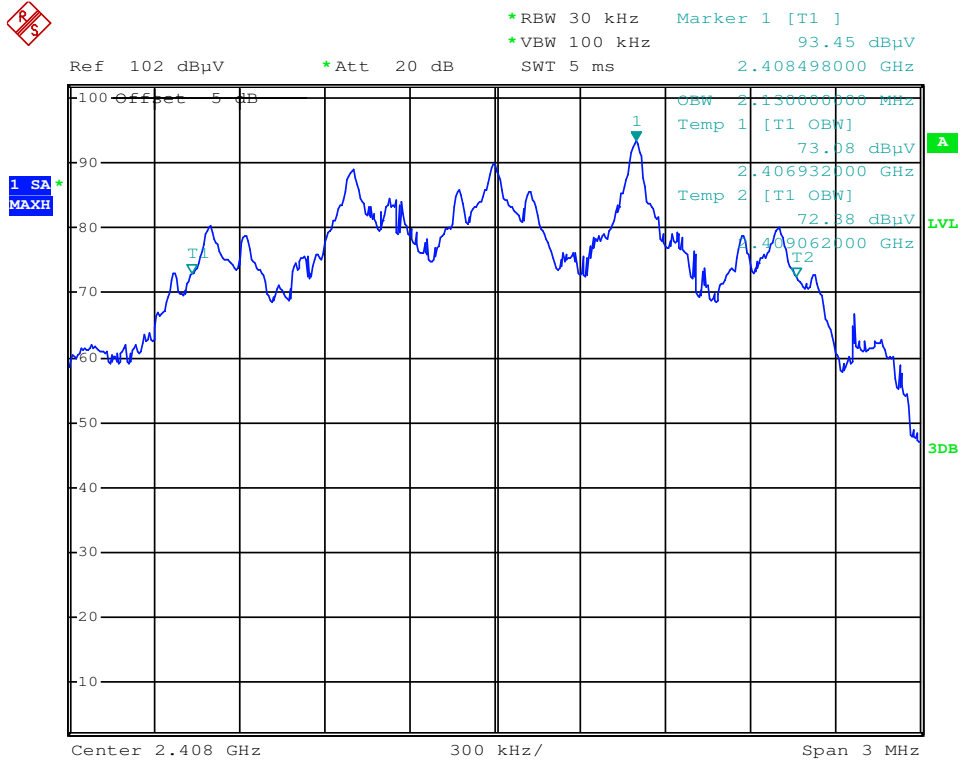
Table 7: Test Result of 99% Bandwidth, General 2.4GHz

Channel	Test Mode Test Channel (MHz)	99% Bandwidth (kHz)	Limit (MHz)
Low Channel	2408	2130.00	/
Middle Channel	2440	2136.00	
High Channel	2474	2130.00	
Maximum Measured Value		2136.00	

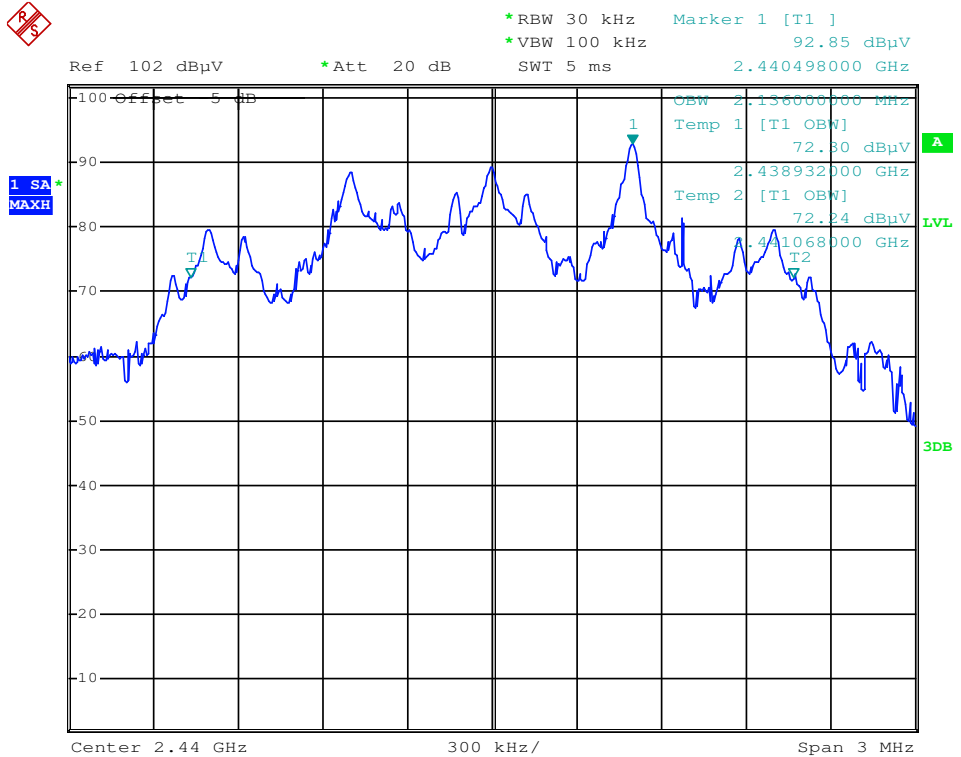
For the measurement records, refer to following test plot:

Test Plot of 20dB Bandwidth

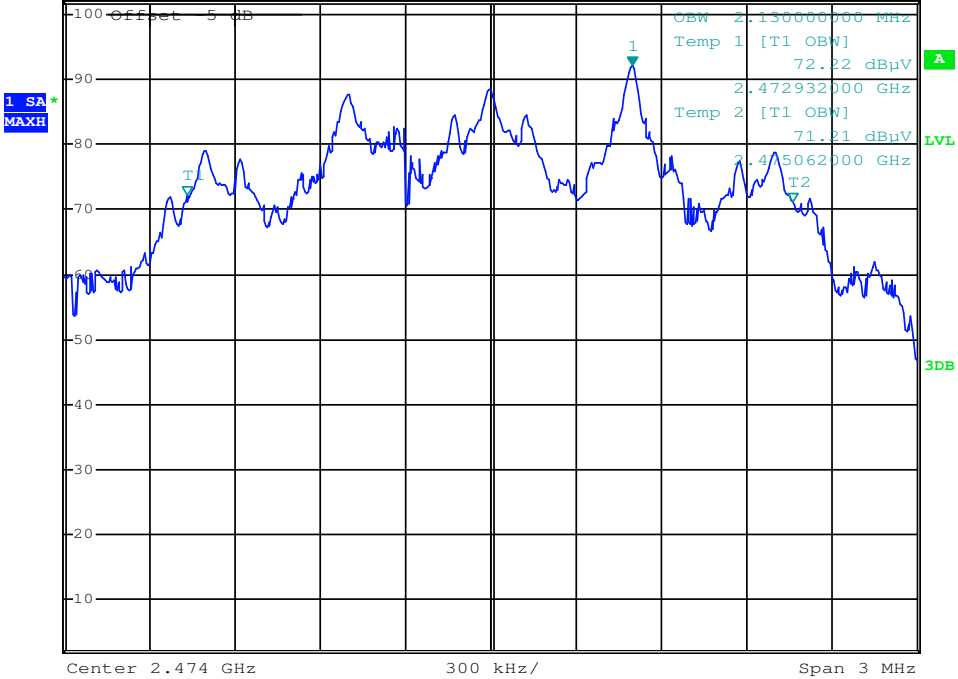
Low CH



Middle CH



High CH


 *RBW 30 kHz Marker 1 [T1]
 *VBW 100 kHz 92.10 dBμV
 Ref 102 dBμV *Att 20 dB SWT 5 ms 2.474498000 GHz


5.1.5 Radiated Spurious Emission & Band Edge

RESULT:**Pass****Test Specification**

Test standard	: FCC Part 15.249 (d) & FCC Part 15.205 RSS-210 B.10
Basic standard	: ANSI C63.10: 2013
Limits	: Refer to 15.209(a) of FCC part 15.247(d)
Kind of test site	: 3m Semi-anechoic Chamber

Test Setup

Date of testing	: Refer to test result
Input voltage	: DC 1.5V
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: 22 °C
Relative humidity	: 56 %
Atmospheric pressure	: 100 kPa

Remark:

Testing was carried out within frequency range 9kHz to the tenth harmonics. Only the worst case spurious emissions configuration of the each mode were reported.

For the measurement records, refer to the appendix B.

6 Safety Human Exposure

6.1 Radio Frequency Exposure Compliance

6.1.1 Electromagnetic Fields

RESULT:**Pass****Test Specification**

Test standard : CFR47 FCC Part 2: Section 2.1093
CFR47 FCC Part 1: Section 1.1310
FCC KDB Publication 447498 D01 v06
RSS-102 Issue 5 March 2015

➤ **FCC requirements**

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1093 this device has been defined as a portable device.

The minimum distance for the EUT is less than 5mm.

The maximum specified e.i.r.p.: 93.017dBu/m @3m = -2.21dBm=0.601mW

Exempted Power: 10mW, hence the EUT is compliance with the RF exposure.

➤ **IC requirements:**

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure. In accordance with RSS-102 section 2.5.1 this device has been defined as a portable device.

The minimum distance for the EUT is less than 5mm.

The maximum specified e.i.r.p.: 93.017dBu/m @3m = -2.21dBm=0.046mW

Exempted Power: 4mW, hence the EUT is compliance with the RF exposure.

7 Photographs of the Test Set-Up

For photographs of the test set-up, refer to the appendix A.

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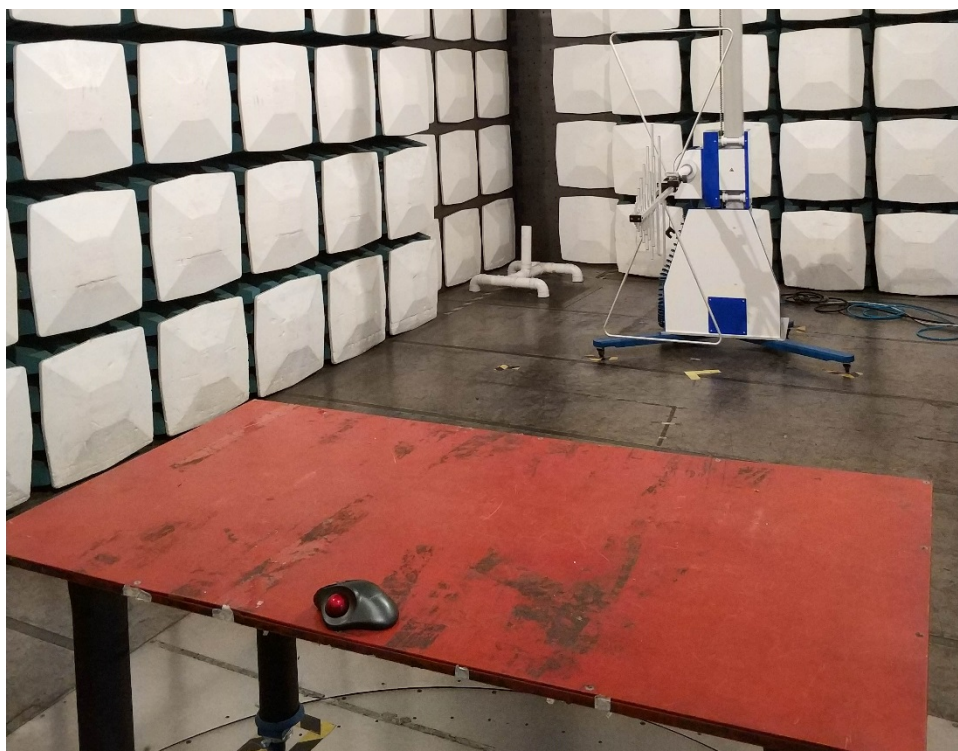
Appendix A: Photographs of the Test Set-Up

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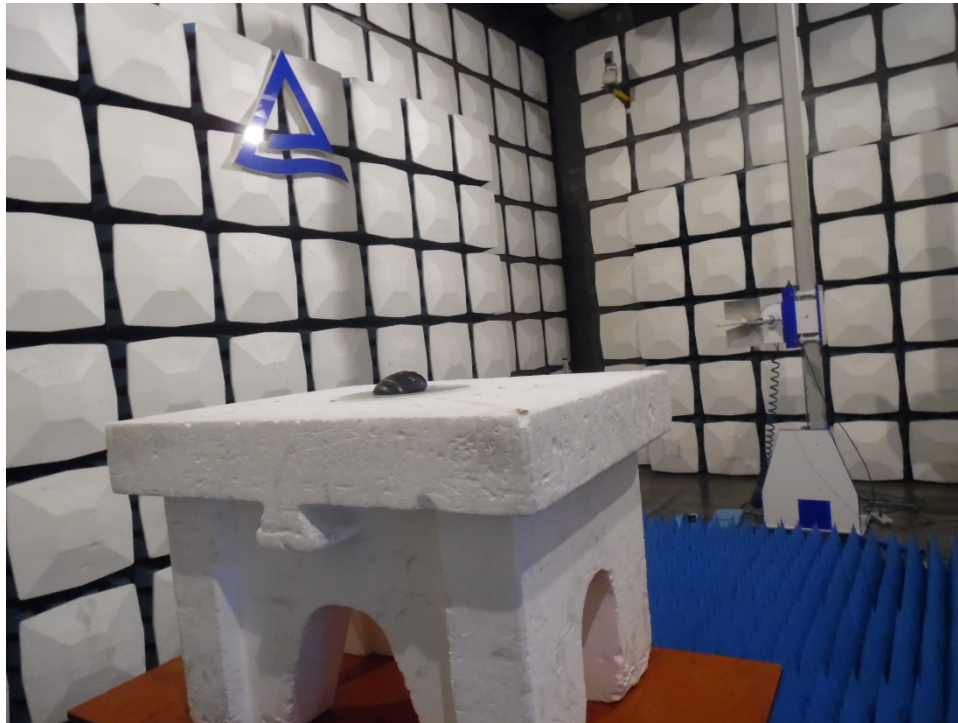
Photograph 1: Set-up for Radiated Spurious Emission, 9kHz - 30MHz



Photograph 2: Set-up for Radiated Spurious Emission, 30MHz - 1GHz



Photograph 3: Set-up for Radiated Spurious Emission, 1GHz - 18GHz



Photograph 4: Set-up for Radiated Spurious Emission, 18GHz - 26.5GHz



Appendix B: Test Results of General 2.4GHz

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Appendix B.1: Measurement Equipment List



Measurement Equipment List

Testing Start Date 25.10.2018
Testing end date 30.10.2018

Project Manager Shu Storm


Test Report Number 50185013 001
Order Item Number 0174091330A00080

Customer Acrox Technology Co., Ltd.
Product Name Wireless Trackball Mouse
Comment

Page 1 of 1

Old ID	Equip.	Description	Model	Manufacturer	Inte. (mon)	Due Date
1.887	1813944	EMI Test Receiver	ESCI	Rohde & Schwarz	12	16.03.2019
1.886	1813943	Two-Line V-Network	ENV216	Rohde & Schwarz	12	11.06.2019
1.807	1813832	EMI Test Receiver	ESCI	Rohde & Schwarz	12	23.08.2019
1.805	1813829	FSP30 Spectrum Analyzer	FSP30	Rohde & Schwarz	12	22.08.2019
1.921B	1814142	Trilog Broadband Antenna	VULB9168(6dB)	SCHWARZBECK	24	20.09.2019
1.822	1813850	Loop Antenna	HFH2-Z2	Rohde & Schwarz	24	14.03.2019
1.808	1813833	Horn Antenna	3160-09	EMCO	60	29.07.2019
1.889C	1814199	Double-Ridged Horn Antenna	HF907(3##	Rohde & Schwarz	24	27.10.2019
1.819C	1814068	Pre-Amplifier	A44-00101800-25-10P-	MITEQ	12	16.03.2019
1.819A	1813846	Band Reject Filter	BRM50702	Micro-Tronics	24	04.07.2020
1.808A	1813834	Pre-Amplifier	A33-18002650-30-8P-4	MITEQ	24	20.07.2019
1.666	1813697	SAC	N/A	Albatross Project	36	08.10.2021
1.913	1814012	Shielding Room	9x4x3.4	Changzhou Yuanping	60	06.12.2020

* No entry for devices that are not subject to regular calibration or require initial verification/calibration only.

Signature: 

Note: Testing was carried out within frequency range 9kHz to the tenth harmonics. The measurement results below 30MHz and 18GHz -26.5GHz were greater than 20dB below the limit, so only the radiated spurious emissions from 30MHz to 18GHz were reported.

Appendix B.2: Fundamental & Harmonics Radiated Emission 30MHz - 1GHz

TUV Rheinland (Guangdong) Ltd.

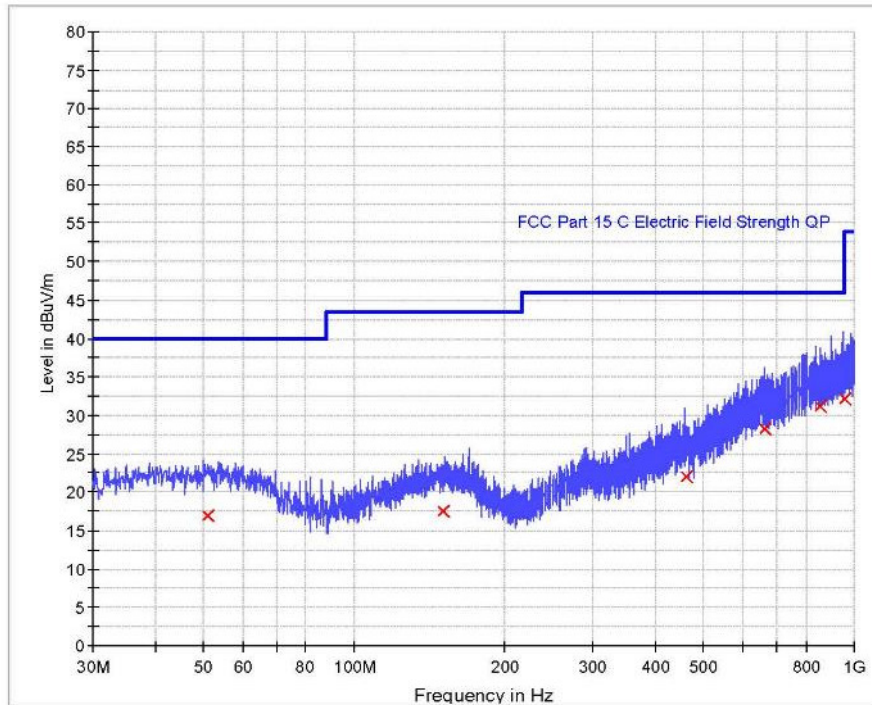
EMC Test Service Hotline: +86-20-28391188

EMC Test Record (Emission)

Common Information

Manufacturer:	Acrox Technologies Co.,Ltd
Test Item:	Wireless Trackball Mouse
Identification:	G5W
Test Standard:	CFR Title 47 Part 15C
Test Detail:	Transmitter spurious
Operation Mode:	Low:2408 MHz
Climate Condition:	22 °C; 50 %RH; 101 kPa
Test Voltage/Freq.:	DC 1.5 V
Receive No.:	174091330
Report No.:	/
Result:	Pass
Comment:	Test distance is 3m;Horizontal

Subrange 1	
Frequency range:	30M--1000MHz
Receiver:	ESCI 3
Transducer:	VULB9168



Tested by: Jason Wu
20181030

Reviewed by: Jacky Chen
20181030

TUV Rheinland (Guangdong) Ltd.

EMC Test Service Hotline: +86-20-28391188

Limit and Margin QP

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)	Comment
50.960000	16.9	1000.0	120.000	H	20.5	23.1	40.0	
151.240000	17.5	1000.0	120.000	H	21.2	26.0	43.5	
461.640000	22.1	1000.0	120.000	H	26.0	23.9	46.0	
662.800000	28.2	1000.0	120.000	H	31.3	17.8	46.0	
853.640000	31.1	1000.0	120.000	H	34.0	14.9	46.0	
956.720000	32.2	1000.0	120.000	H	35.5	13.8	46.0	

Tested by: *Jason Wu* Reviewed by: *Jacky chen*
20181030 20181030

TUV Rheinland (Guangdong) Ltd.

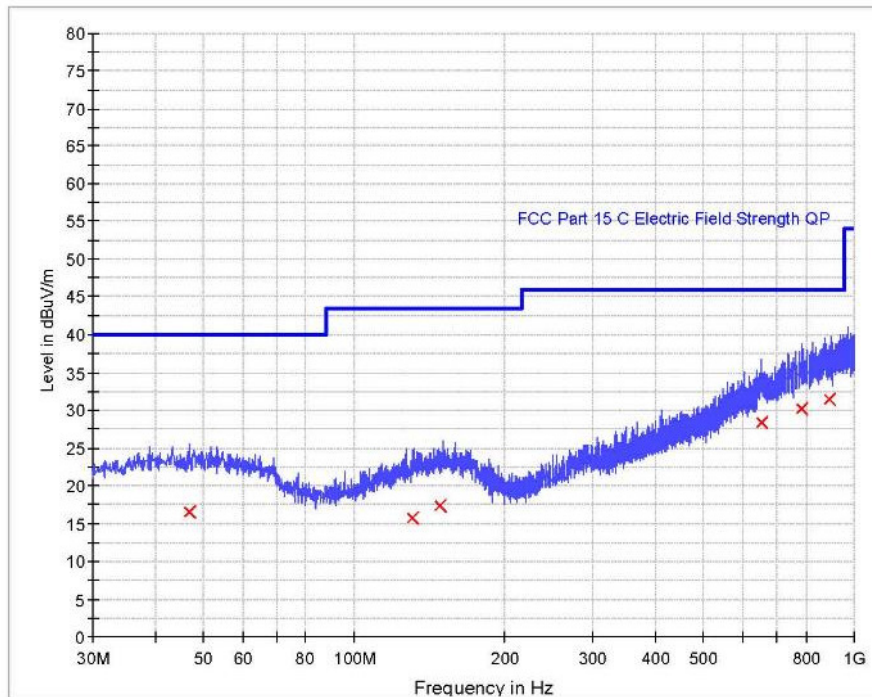
EMC Test Service Hotline: +86-20-28391188

EMC Test Record (Emission)

Common Information

Manufacturer:	Acrox Technologies Co.,Ltd
Test Item:	Wireless Trackball Mouse
Identification:	G5W
Test Standard:	CFR Title 47 Part 15C
Test Detail:	Transmitter spurious
Operation Mode:	Low:2408 MHz
Climate Condition:	22 °C; 50 %RH; 101 kPa
Test Voltage/Freq.:	DC 1.5 V
Receive No.:	174091330
Report No.:	/
Result:	Pass
Comment:	Test distance is 3m,Vertical

Subrange 1	
Frequency range:	30M--1000MHz
Receiver:	ESCI 3
Transducer:	VULB9168



Tested by: Jason Wu
20181030

Reviewed by: Jacky Chen
20181030

TUV Rheinland (Guangdong) Ltd.

EMC Test Service Hotline: +86-20-28391188

Limit and Margin QP

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)	Comment
46.840000	16.6	1000.0	120.000	V	20.5	23.4	40.0	
130.760000	15.8	1000.0	120.000	V	19.8	27.7	43.5	
149.200000	17.3	1000.0	120.000	V	21.1	26.2	43.5	
652.000000	28.4	1000.0	120.000	V	31.6	17.6	46.0	
786.960000	30.3	1000.0	120.000	V	33.4	15.7	46.0	
894.280000	31.3	1000.0	120.000	V	34.5	14.7	46.0	

Tested by:

Jason Wu

20181030

Reviewed by:

Jacky Chen

20181030

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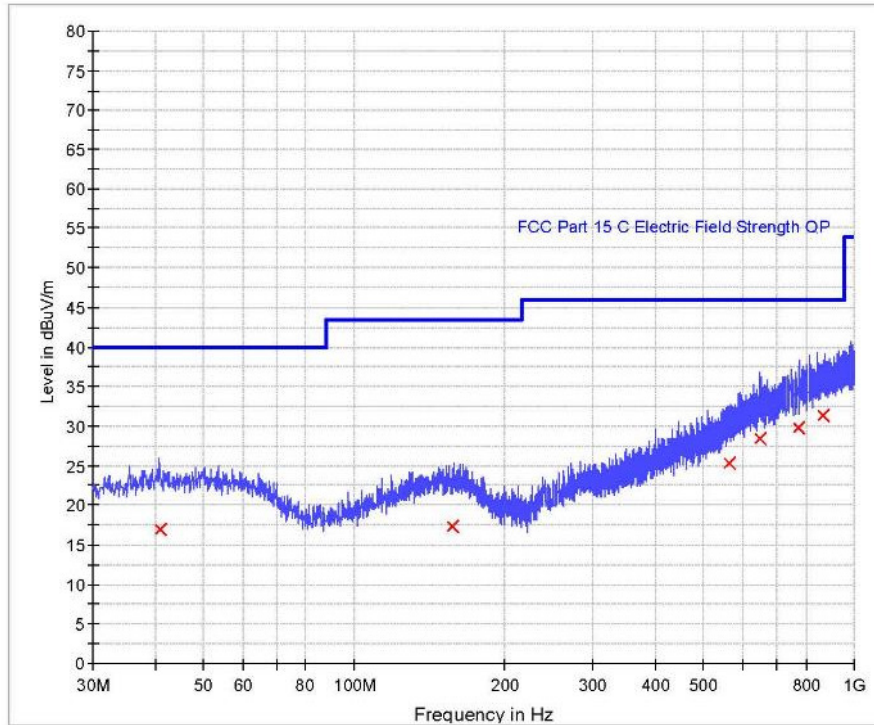
EMC Test Service Hotline: +86-20-28391188

EMC Test Record (Emission)

Common Information

Manufacturer:	Acrox Technologies Co.,Ltd
Test Item:	Wireless Trackball Mouse
Identification:	G5W
Test Standard:	CFR Title 47 Part 15C
Test Detail:	Transmitter spurious
Operation Mode:	Middle:2440 MHz
Climate Condition:	22 °C; 50 %RH; 101 kPa
Test Voltage/Freq.:	DC 1.5 V
Receive No.:	174091330
Report No.:	/
Result:	Pass
Comment:	Test distance is 3m,Horizontal

Subrange 1	
Frequency range:	30M--1000MHz
Receiver:	ESCI 3
Transducer:	VULB9168



Tested by: *Jason Wu* Reviewed by: *Jacky Chen*
20181030 20181030

1GHz - 18GHz

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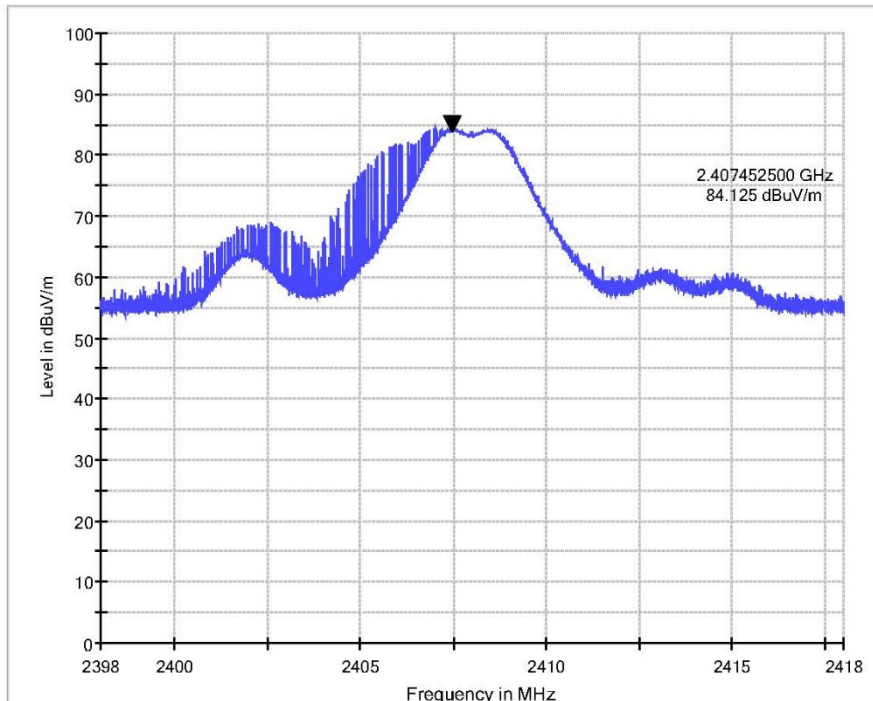
EMC Test Record (Emission)

Common Information

Manufacturer:	Acrox Technologies Co.,Ltd
Test Item:	Wireless Trackball Mouse
Identification:	G5W
Test Standard:	CFR Title 47 Part 15C
Test Detail:	Field Strength of Fundamental
Operation Mode:	Low:2408 MHz
Climate Condition:	22 °C; 50 %RH; 101 kPa
Test Voltage/Freq.:	DC 1.5 V
Receive No.:	174091330
Report No.:	/
Result:	Pass
Comment:	Test distance is 3m;Vertical

Subrange 1	
Frequency range:	1GHz-18GHz
Receiver:	TUV FSP30
Transducer:	TUV SAC HF907/ TUV FSP30-TUV SAC HF907

EMCTT_EREFO11-A02-04_1GHz-18GHz



Tested by:	Jason Wu	Reviewed by:	Jacky Chen
	20181026		20181026