

# FCC CERTIFICATION TEST REPORT

## FOR

**Applicant** : Wireless Computing, Inc.  
**Address** : 3703 Peak Lookout, Austin TX 78738 USA  
**Equipment under Test** : RF-172 Long-Range LED Optical Mouse  
**Model No** : RF-172  
**FCC ID** : L7MR172  
**Manufacturer** : Wireless Computing, Inc.  
**Address** : 3703 Peak Lookout, Austin TX 78738 USA

**Issued By:** Dongguan Dongdian Testing Service Co., Ltd.

**Add:** No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City,  
Guangdong Province, China, 523808

**Tel:** +86-0769-22891499 <http://www.dgddt.com>

# REPORT

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## TEST REPORT DECLARE

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**Manufacturer** : Wireless Computing,Inc.  
**Address** : 3703 Peak Lookout,Austin TX 78738 USA

**Test Standard Used:** FCC Rules and Regulations Part 15 Subpart C: 2012

**Test procedure used:** ANSI C63.10:2009

### We Declare:

The equipment described above is tested by Dongguan Dongdian Testing Service Co., Ltd and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Dongguan Dongdian Testing Service Co., Ltd is assumed of full responsibility for the accuracy and completeness of these tests.

**After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.**

<b>Report No:</b>	DDT-RE130183		
<b>Date of Test:</b>	2013/07/29	<b>Date of Report:</b>	2013/08/06

**Prepared By:**



Leo Liu/Engineer

**Approved By:**



Jamy Yu/EMC Manager

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Dongguan Dongdian Testing Service Co., Ltd.

## 1. Summary of test results

EMISSION		
Description of Test Item	Standard	Results
Power Line Conducted Emission Test	FCC Part 15C: 15.207 ANSI C63.10 :2009	N/A
Radiated Emission Test	FCC Part 15C: 15.209 FCC Part 15C: 15.249 ANSI C63.10 :2009	PASS
20dB Bandwidth Test	FCC Part 15: 15.215 ANSI C63.10 :2009	PASS
N/A is an abbreviation for Not Applicable.		

## 2. General test information

### 2.1. Description of EUT

EUT* Name	:	RF-172 Long-Range LED Optical Mouse
Model Number	:	RF-172
Difference of Model	:	/
EUT function description	:	Please reference user manual of this device
Power supply	:	DC 3V from battery
FCC ID	:	L7MR172
FCC Operation frequency	:	916.5MHz
Antenna Type	:	Integrated PCB antenna, Gain: 0dBi
Date of Receipt	:	2013/07/16
Sample Type	:	Series production

Note: EUT is the ab. of equipment under test.

### 2.2. Accessories of EUT

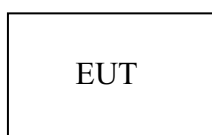
Description of Accessories	Manufacturer	Model number or Type	Other
/	/	/	/

### 2.3. Assistant equipment used for test

Description of Assistant equipment	Manufacturer	Model number or Type	Other
/	/	/	/

### 2.4. Block diagram of EUT configuration for test

TX Mode:



Tested mode, channel, and data rate information		
Mode	Channel	Frequency (MHz)
Tx Mode	/	916.5

## 2.5. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature range:	21-25℃
Humidity range:	40-75%
Pressure range:	86-106kPa

## 2.6. Test laboratory

Dongguan Dongdian Testing Service Co., Ltd

Add: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808 Tel: +86-0769-22891499

FCC Registration Number: 270092 Industry Canada site registration number: 10288A-1

## 2.7. Measurement uncertainty

Test Item	Uncertainty
Occupied Channel Bandwidth	±1%
Uncertainty for radio frequency	$1 \times 10^{-9}$
Temperature	±0.2℃
Humidity	±1%
DC and Low frequency voltage	±0.5%
Time	±1%
Duty Cycle	±1%
Uncertainty for Radiation Emission test (30MHz-1GHz)	3.14 dB (Polarize: V)
	3.16 dB (Polarize: H)
Uncertainty for Radiation Emission test (1GHz to 25GHz)	2.08dB(Polarize: V)
	2.56dB (Polarize: H)
Uncertainty for Conduction emission test(150KHz-30MHz)	2.44dB
Uncertainty for Radiation Emission test (9KHz-150KHz)	3.89dB
Uncertainty for Radiation Emission test (150KHz-30MHz)	3.21dB

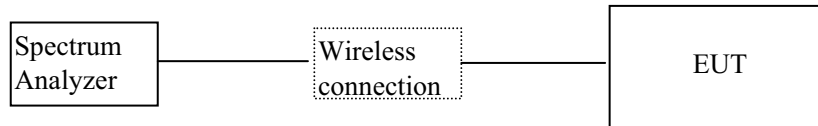
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

### 3. 20dB Bandwidth

#### 3.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	R&S	FSU	1166.1660.26	2012/11/26	1Y

#### 3.2. Block diagram of test setup



#### 3.3. Limits

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.

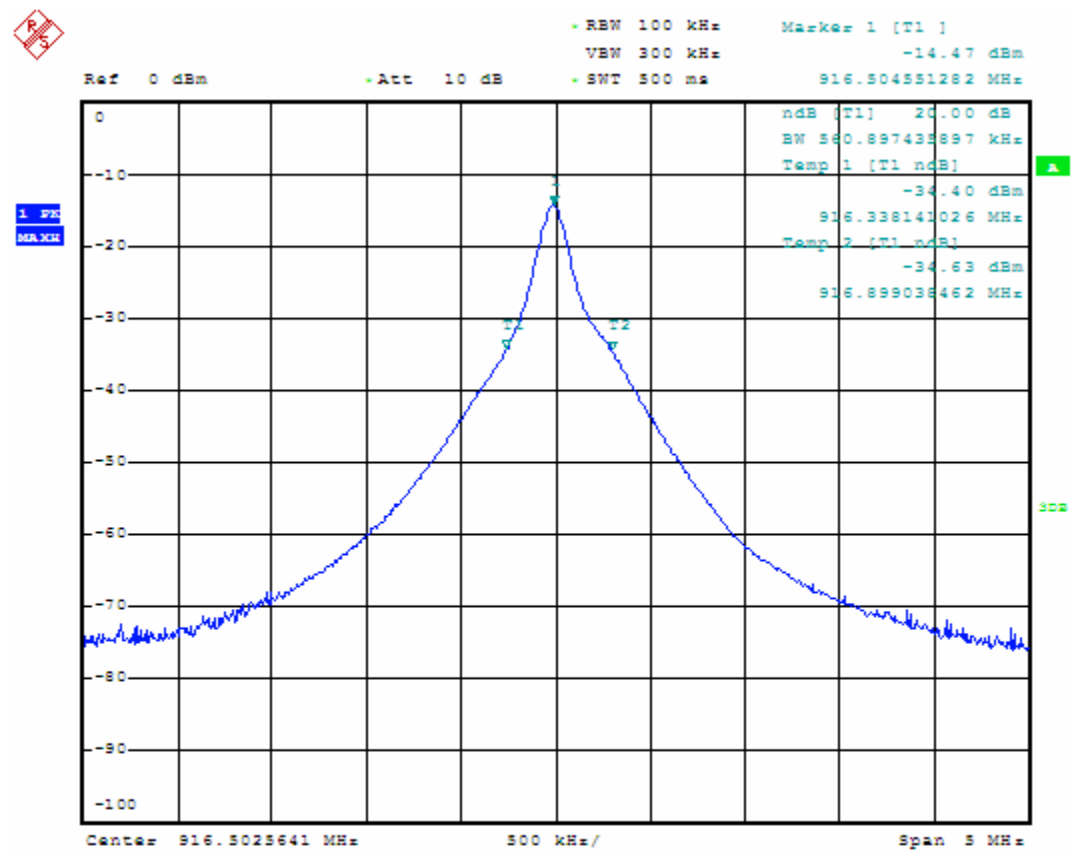
#### 3.4. Test Procedure

- (1) The EUT's RF signal was coupled to spectrum analyzer by a antenna connected to spectrum analyzer.
- (2) Configure EUT work in Tx mode as stated in clause 2.4.
- (3) The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 kHz RBW and 300kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

#### 3.5. Test Result

EUT: RF-172 Long-Range LED Optical Mouse      M/N: RF-172					
Mode	Freq (MHz)	Result (KHz)	Limit (MHz)	Margin (MHz)	Conclusion
Tx Mode	916.5	560.89	/	/	PASS
Test Date : 2013/07/29			Test Engineer :Leo Liu		

### 3.6. Original test data



Date: 29.JUL.2013 08:55:34



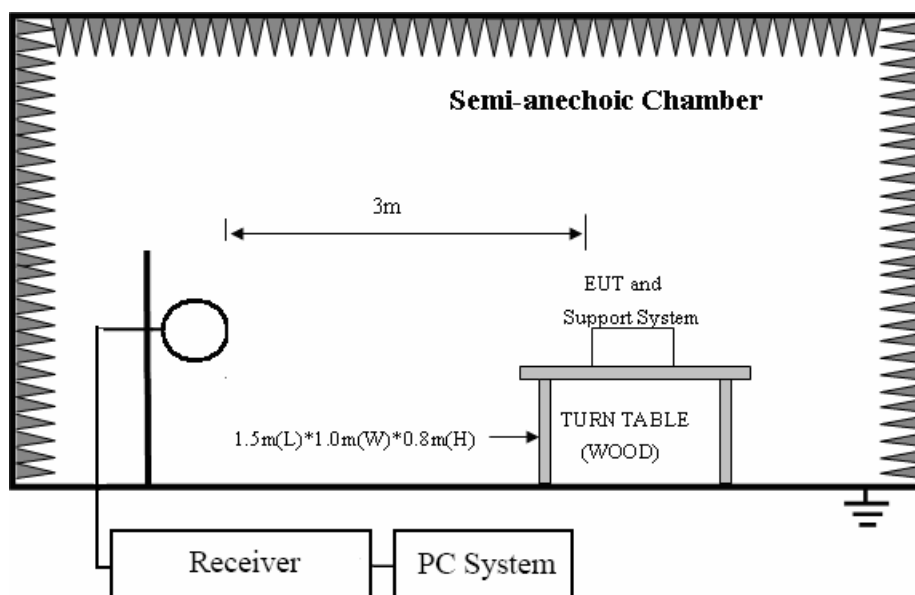
## 4. Radiated emission

### 4.1. Test equipment

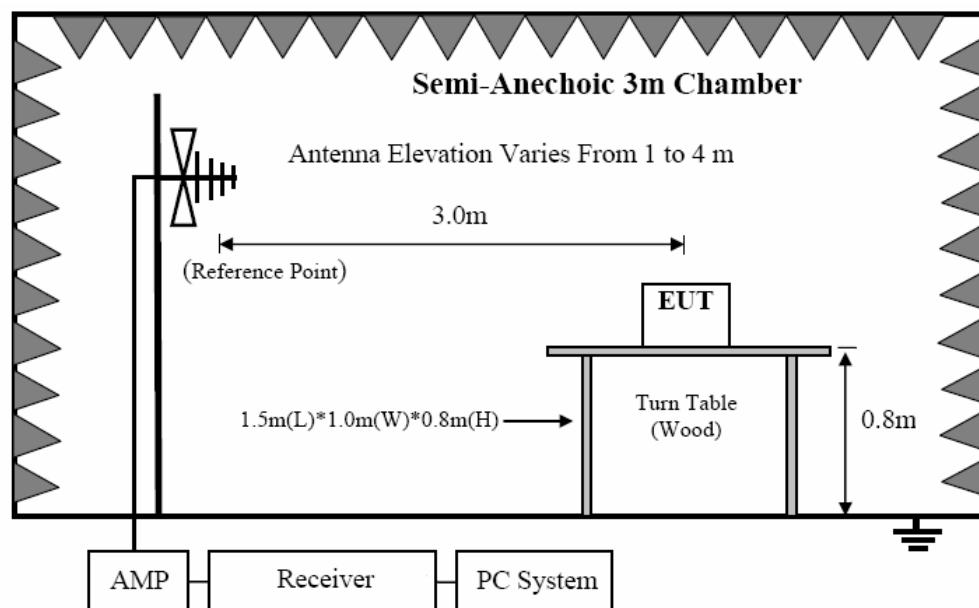
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	EMI Test Receiver	R&S	ESU8	100316	2012/11/26	1 Year
2	Spectrum analyzer	R&S	FSU	1166.1660.26	2012/11/26	1 Year
3	Active Loop antenna	Schwarzbeck	FMZB1519	1519-038	2012/11/26	1 Year
4	Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	2012/11/26	1 Year
5	Double Ridged Horn Antenna	R&S	HF907	100276	2012/11/26	1 Year
6	Horn Antenna	EMCO	3116	00060095	2012/11/26	1 Year
7	Pre-Amplifier	R&S	SCU-01	10049	2012/11/26	1 Year
8	Pre-amplifier	A.H.	PAM0-0118	360	2012/11/26	1 Year
9	Pre-amplifier	A.H.	PAM-1840VH	562	2012/11/26	1 Year
10	RF Cable	R&S	R01	10403	2012/11/26	1 Year
11	RF Cable	R&S	R02	10512	2012/11/26	1 Year

### 4.2. Block diagram of test setup

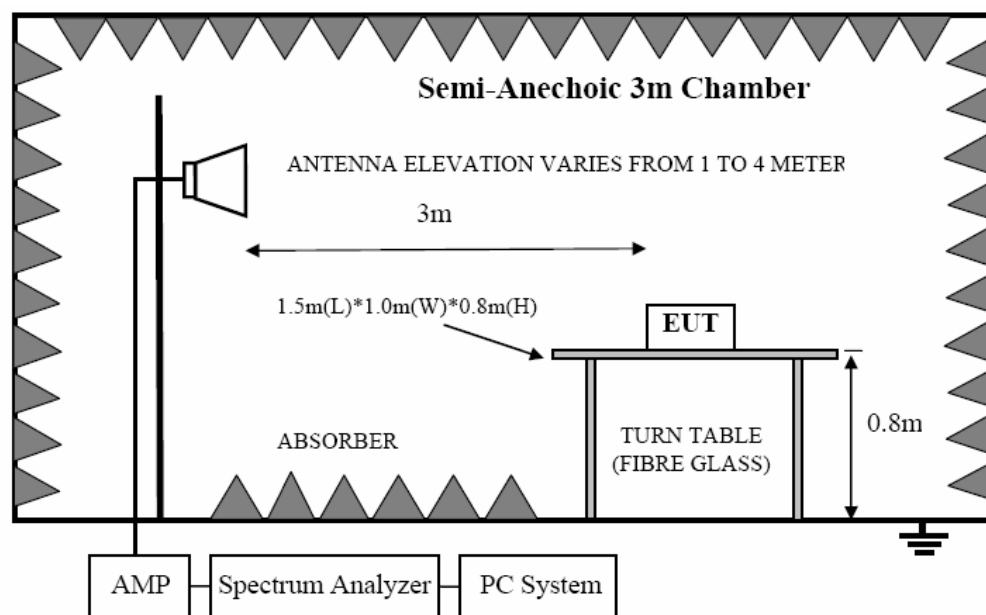
In 3m Anechoic Chamber Test Setup Diagram for 9KHz-30MHz



In 3m Anechoic Chamber Test Setup Diagram for 30MHz-1GHz



In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

### 4.3. Limit

#### 4.3.1 FCC 15.209 limit

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		$\mu\text{V/m}$	$\text{dB}(\mu\text{V})/\text{m}$
0.009 ~ 0.490	300	2400/F(KHz)	67.6-20log(F)
0.490 ~ 1.705	30	24000/F(KHz)	87.6-20log(F)
1.705 ~ 30.0	30	30	29.54
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 $\text{dB}(\mu\text{V})/\text{m}$ (Peak) 54.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average)	

Remark : (1) Emission level  $\text{dB}\mu\text{V} = 20 \log \text{Emission level } \mu\text{V/m}$

- (2) The smaller limit shall apply at the cross point between two frequency bands.
- (3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.
- (4) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
- (5) At frequencies below 30MHz, measurement may be performed at a distance closer than that specified, and the limit at closer measurement distance can be extrapolated by below formula:  

$$\text{Limit}_{3\text{m}}(\text{dB}\mu\text{V/m}) = \text{Limit}_{30\text{m}}(\text{dB}\mu\text{V/m}) + 40\text{Log}(30\text{m}/3\text{m})$$

#### 4.3.2 FCC 15.249 limit

FREQUENCY MHz	DISTANCE Meters	Limit
Field Strength of Fundamental emission for 902MHz-928MHz	3	94.0 $\text{dB}(\mu\text{V})/\text{m}$ (QP)
Field Strength of Harmonics	3	54.0 $\text{dB}(\mu\text{V})/\text{m}$ (QP)

Note: Emissions radiated outside of the specified frequency bands, except for harmonics, shall be

107 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.

#### 4.4. Test Procedure

- (1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.
- (2) Setup EUT and assistant system according clause 2.4 and 4.2
- (3) Test antenna was located 3m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.
  - (a) Change work frequency or channel of device if practicable.
  - (b) Change modulation type of device if practicable.
  - (c) Change power supply range from 85% to 115% of the rated supply voltage
  - (d) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions
- (4) Spectrum frequency from 9KHz to 10GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 9KHz to 30MHz ,so below final test was performed with frequency range from 30MHz to 10GHz.
- (5) For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 2009 on Radiated Emission test.
- (6) For emissions from 30MHz to 1GHz, Quasi-Peak values were measured with EMI Receiver and the bandwidth of Receiver is 120 KHz.
- (7) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure;
- (8) The duty cycle factor was use to calculate Average Level as below formula:

$$\text{Average level} = \text{PK Level} - \text{duty cycle factor}$$

#### 4.5. Test result

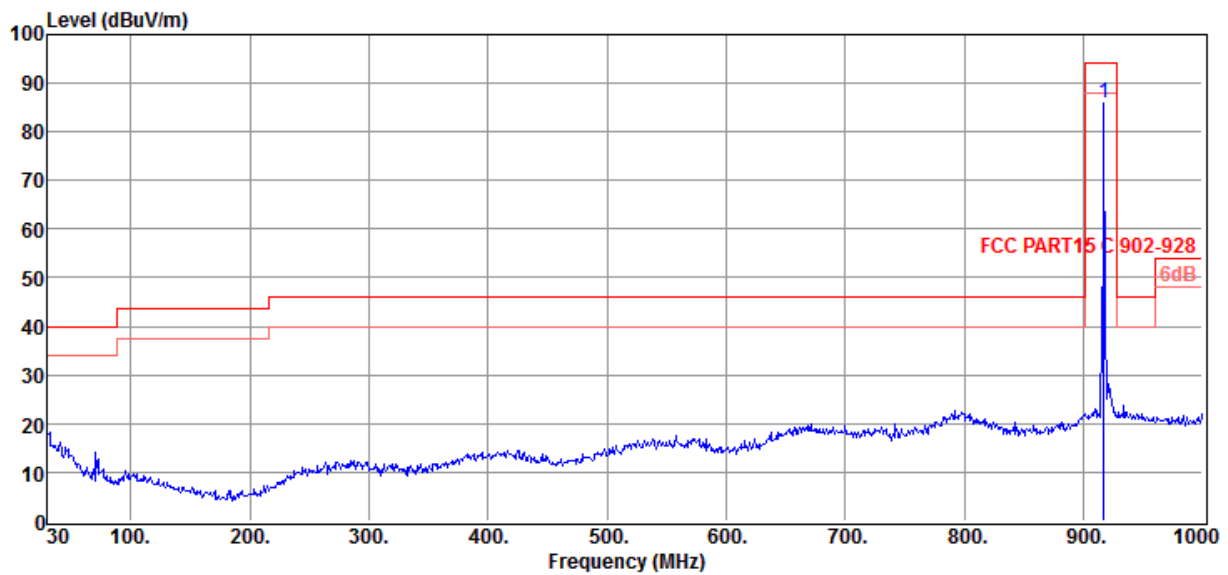
**PASS. (See below detailed test result)**

All the emissions except fundamental emission from 9 KHz to 10GHz comply with 15.209 limits.

## Radiated Emission Test Result

**Test Site** : DDT 3m Chamber **E:\2013 Test Data\ 20130729RE.EM6**  
**Test Date** : 2013-07-29 **Tested By** : Leo  
**EUT** : RF-172 Long-Range LED Optical  
 : Mouse **Model Number** : RF-172  
**Power Supply** : DC 3V from battery **Test Mode** : TX mode  
**Condition** : Temp:24.5'C,Humi:55%,  
 : Press:100.1kPa **Antenna/Distance** : 2013 VULB9163/3m/VERTICAL  
**Memo** :

Data: 5



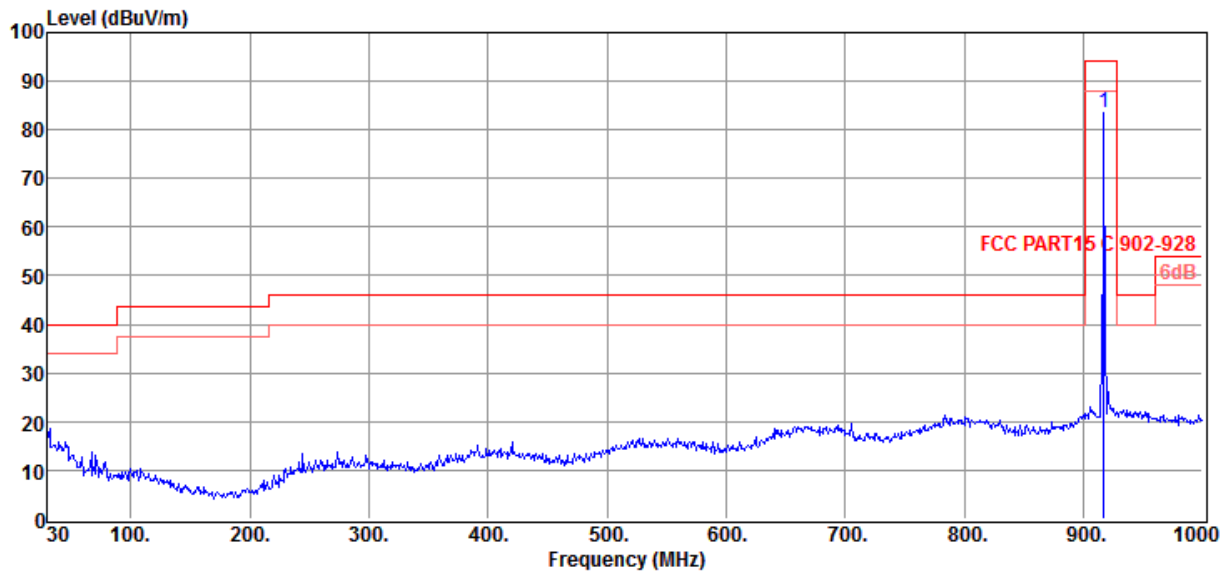
Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	916.50	101.83	22.62	43.40	4.87	85.92	94.00	-8.08	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor  
 2. If Peak Result comply with QP limit, QP Result is deemed to comply with QP limit  
 3. Test setup: RBW: 120kHz, VBW: 300kHz, Sweep time: auto

## Radiated Emission Test Result

<b>Test Site</b>	: DDT 3m Chamber	<b>E:\2013 Test Data\20130729RE.EM6</b>
<b>Test Date</b>	: 2013-07-29	<b>Tested By</b> : Leo
<b>EUT</b>	: RF-172 Long-Range LED Optical : Mouse	<b>Model Number</b> : RF-172
<b>Power Supply</b>	: DC 3V from battery	<b>Test Mode</b> : TX mode
<b>Condition</b>	: Temp:24.5'C,Humi:55%, : Press:100.1kPa	<b>Antenna/Distance</b> : 2013 VULB9163/3m/HORIZONTAL
<b>Memo</b>	:	

Data: 6



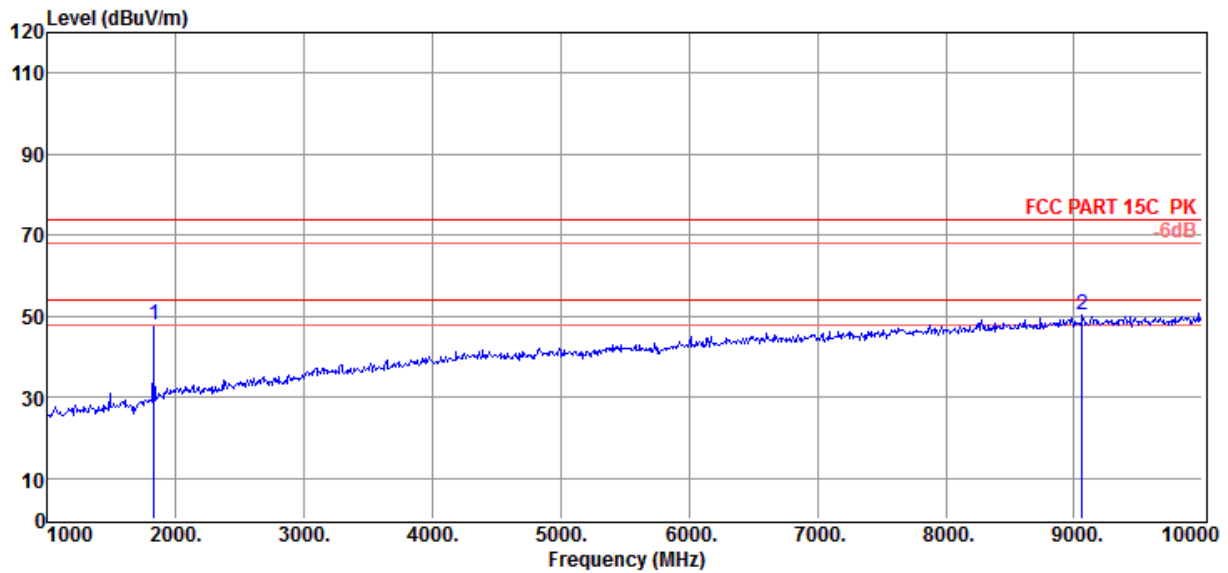
Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	916.50	99.37	22.62	43.40	4.87	83.46	94.00	-10.54	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor  
 2. If Peak Result comply with QP limit, QP Result is deemed to comply with QP limit  
 3. Test setup: RBW: 120kHz, VBW: 300kHz, Sweep time: auto

## Radiated Emission Test Result

**Test Site** : DDT 3m Chamber **E:\2013 Test Data\W\Wireless Computing.EM6**  
**Test Date** : 2013-07-29 **Tested By** : Leo  
**EUT** : RF-172 Long-Range LED Optical Mouse **Model Number** : RF-172  
**Power Supply** : DC 3V from battery **Test Mode** : TX mode  
**Condition** : Temp:24.5'C,Humi:55%, Press:100.1kPa **Antenna/Distance** : HF907 SN100276/3m/VERTICAL  
**Memo** :

Data: 5



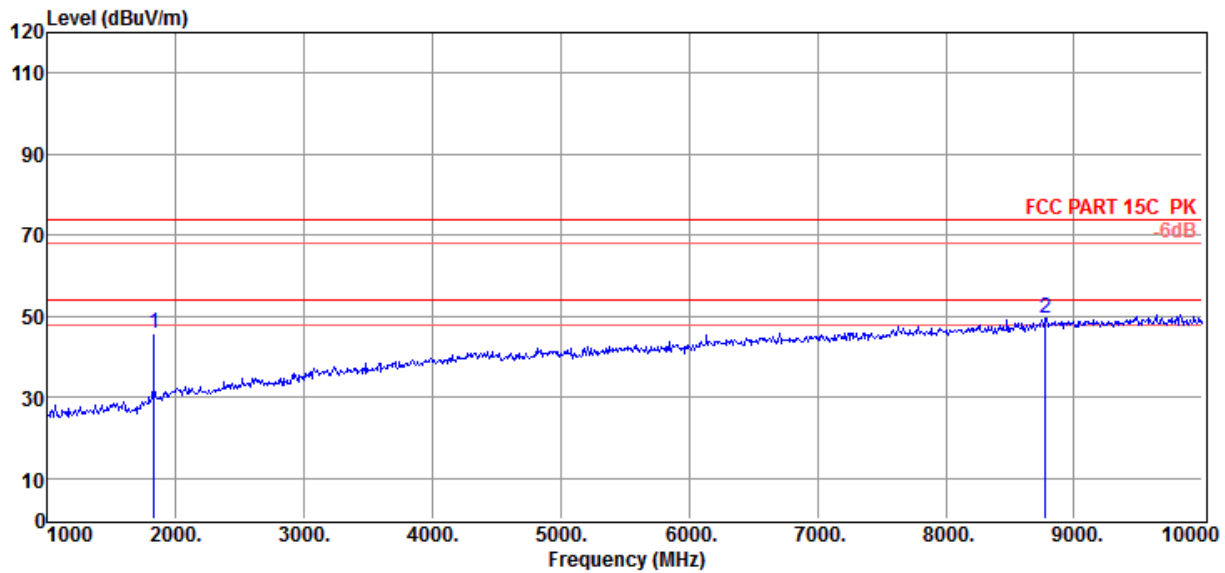
Item (Mark)	Freq (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	1833.00	56.96	27.13	43.60	7.31	47.80	74.00	-26.20	Peak	VERTICAL
2	9064.00	39.74	36.80	43.90	17.58	50.22	74.00	-23.78	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor  
 2. If Peak Result comply with QP limit, QP Result is deemed to comply with QP limit  
 3. Test setup: RBW: 120kHz, VBW: 300kHz, Sweep time: auto

## Radiated Emission Test Result

<b>Test Site</b>	: DDT 3m Chamber	<b>E:\2013 Test Data\W\Wireless Computing.EM6</b>
<b>Test Date</b>	: 2013-07-29	<b>Tested By</b> : Leo
<b>EUT</b>	: RF-172 Long-Range LED Optical Mouse	<b>Model Number</b> : RF-172
<b>Power Supply</b>	: DC 3V from battery	<b>Test Mode</b> : TX mode
<b>Condition</b>	: Temp:24.5'C,Humi:55%, Press:100.1kPa	<b>Antenna/Distance</b> : HF907 SN100276/3m/HORIZONTAL
<b>Memo</b>	:	

Data: 6



Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	1833.00	55.00	27.13	43.60	7.31	45.84	74.00	-28.16	Peak	HORIZONTAL
2	8776.00	39.60	36.76	43.90	17.10	49.56	74.00	-24.44	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor  
 2. If Peak Result comply with QP limit, QP Result is deemed to comply with QP limit  
 3. Test setup: RBW: 120kHz, VBW: 300kHz, Sweep time: auto



## **5. Antenna Requirements**

### **5.1. Limit**

For intentional device, according to FCC 47 CFR Section 15.203, 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.

### **5.2. Result**

The antennas used for this product are integral PCB Antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 0dBi.