



<b>Prüfbericht-Nr.:</b> <i>Test Report No.:</i>	<b>10045003 001</b>	<b>Auftrags-Nr.:</b> <i>Order No.:</i>	<b>114017241</b>	Seite 1 von 23 Page 1 of 23	
<b>Kunden-Referenz-Nr.:</b> <i>Client Reference No.:</i>	N/A	<b>Auftragsdatum:</b> <i>Order date:</i>	December 20, 2013		
<b>Auftraggeber:</b> <i>Client:</i>	ACROX Technologies Co., Ltd., 4F., No.89, Minshan St., Neihu Dist., Taipei City 114, Taiwan, R.O.C.				
<b>Prüfgegenstand:</b> <i>Test item:</i>	2.4 GHz Mouse				
<b>Bezeichnung / Typ-Nr.:</b> <i>Identification / Type No.:</i>	NS-PNM5003-BU, NS-PNM5003-SV, NS-PNM5003-BK, NS-PNM5003-BU-C, NS-PNM5003-SV-C, NS-PNM5003-BK-C				
<b>Auftrags-Inhalt:</b> <i>Order content:</i>	FCC Part 15C and IC Test Report				
<b>Prüfgrundlage:</b> <i>Test specification:</i>	FCC 47CFR Part 15: Subpart C Section 15.249 RSS-210 issue 8 (12-2010) Annex 2.9				
<b>Wareneingangsdatum:</b> <i>Date of receipt:</i>	12/24/2013				
<b>Prüfmuster-Nr.:</b> <i>Test sample No.:</i>	A000033193-002				
<b>Prüfzeitraum:</b> <i>Testing period:</i>	27-Dec-2013 - 31-Dec-2013				
<b>Ort der Prüfung:</b> <i>Place of testing:</i>	EMC Laboratory Taipei				
<b>Prüflaboratorium:</b> <i>Testing laboratory:</i>	TUV Rheinland Taiwan Ltd.				
<b>Prüfergebnis*:</b> <i>Test result*:</i>	Pass				
<b>geprüft von / tested by:</b>		<b>kontrolliert von / reviewed by:</b>			
2014-01-14 Danny S. C. Sung/Project Manager		2014-01-14 Rene Charton/Senior Project Manager			
<b>Datum</b> <i>Date</i>	<b>Name / Stellung</b> <i>Name / Position</i>	<b>Unterschrift</b> <i>Signature</i>	<b>Datum</b> <i>Date</i>	<b>Name / Stellung</b> <i>Name / Position</i>	<b>Unterschrift</b> <i>Signature</i>
					
<b>Sonstiges / Other:</b>					
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> <i>Condition of the test item at delivery:</i>			Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
<p>* 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</p> <p>Legend: 1 = very good      2 = good      3 = satisfactory      4 = sufficient      5 = poor  P(ass) = passed a.m. test specification(s)      F(ail) = failed a.m. test specification(s)      N/A = not applicable      N/T = not tested</p>					
<p><b>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.</b>  <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></p>					

## TEST SUMMARY

### **5.1.1 FIELD STRENGTH OF FUNDAMENTAL**

*RESULT: Passed*

### **5.1.2 99% BANDWIDTH**

*RESULT: Passed*

### **5.1.3 SPURIOUS EMISSION**

*RESULT: Passed*

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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 P: Photo Documentation**

(File Name: 10045003APPENDIX P)

**Appendix D: Test Result of Radiated Emissions**

(File Name: 10045003APPENDIX D)

Test Specifications

The following standards were applied:

**Table 1: Applied Standard and Test Levels**

<b>Radio</b>
FCC 47CFR Part 15: Subpart C Section 15.249 RSS-210 issue 8 (12-2010) Annex 2.9 ANSI C63.4:2009

## 2. Test Sites

### 2.1 Test Facilities

TUV Rheinland Taiwan Ltd.

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.  
Taipei City 105  
Taiwan (R.O.C.)

FCC Registration No.: 365730  
TAF Accredited NCC Test Lab. No.:0759  
TAF ISO17025 Certification effective periods: 2013-Jul-1st to 2016-Jun-30th



**Testing Laboratory**  
**0759**

## 2.2 List of Test and Measurement Instruments

**Table 2: List of Test and Measurement Equipment**

Kind of Equipment	Manufacturer	Type	S/N	Calibrated until
EMI Test Receiver	R&S	ESCI 7	101062	1-Sep-14
Bilog Antenna	TESEQ	CBL6111D	29802	29-Jun-14
Spectrum Analyzer	R&S	FSV 40	100921	10-Dec-14
Horn Antenna	ETS-Lindgren	3117	138160	10-Jan-14
Horn Antenna (18GHz~40GHz)	COM-POWER	AH840	101031	29-Oct-15
Preamplifier (30MHz -1GHz)	HP	8447F	2805A03335	2-Sep-14
Preamplifier (18 GHz -40 GHz)	COM-POWER	PAM-840	461257	2-Sep-14
Pre-Amplifier (1GHz~18GHz)	EM Electronics	EM30180	60558	23-Oct-14
Loop Antenna	Schwarzbeck	FMZB 1513	1513-076	28-Sep-14
EMI Test Receiver	R&S	ESCI	101094	29-Aug-14
LISN (1 phase)	R&S	ENV216	101243	5-Jun-14
LISN	Rolf Heine	NNB-2/16Z	99080	30-Aug-14

## 2.3 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

## 2.4 Calibration

Equipment requiring calibration is calibrated periodically in a suitably accredited Calibration Lab. 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 are as follows:

**Table 3: Emission Measurement Uncertainty**

Parameter	Uncertainty
RF power, conducted	$\pm 1.5$ dB
Adjacent channel power	$\pm 3$ dB
Radiated emission of transmitter, valid up to 26 GHz	$\pm 6$ dB
Radiated emission of receiver, valid up to 26 GHz	$\pm 6$ dB
Temperature	$\pm 2$ °C
Humidity	$\pm 10$ %

## 3. General Product Information

### 3.1 Product Function and Intended Use

A Wireless Mouse which sends control information to a Wireless Dongle, that can be inserted into a Computer. This report covers the Mouse. The three models shown in the cover page are electrically identical and differ in the colour of the enclosure.  
For details refer to the User Guide, Data Sheet and Circuit Diagram.

### 3.2 Ratings and System Details

**Table 4: Basic Information of EUT**

Item	EUT information
Kind of Equipment	2.4 GHz Mouse
Type Designation	NS-PNM5003-BU, NS-PNM5003-SV, NS-PNM5003-BK, NS-PNM5003-BU-C, NS-PNM5003-SV-C, NS-PNM5003-BK-C
Brand Name	
FCC ID	PRDMU23

**Table 5: Technical Specification of EUT**

Technical Specification	Value
Operating Frequencies	2408 2440 2474 MHz
Channel Spacing	2 MHz minimum
Channel number	32
Operation Voltage	1.5 V
Modulation	FSK



### **3.3 Independent Operation Modes**

Basic operation modes are:

- A. Transmitting
  - 1. Low channel
  - 2. Middle channel
  - 3. High channel
- B. Receiving
  - 1. Low channel
  - 2. Middle channel
  - 3. High channel

### **3.4 Noise Generating and Noise Suppressing Parts**

Refer to the Circuit Diagram.

### **3.5 Submitted Documents**

- Circuit Diagram
- Instruction Manual
- Rating Label
- Technical Description

## 4. Test Set-up and Operation Modes

### 4.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum emission level. The test modes were adapted accordingly in reference to the instructions for use.

### 4.2 Test Operation and Test Software

Setup for testing: The production line Test samples are provided with an internal test mode

This software was running on the laptop computer connected to the EUT. It was used to enable the operation modes listed in section 3.3 as appropriate.

Emission Level Measurement Results are obtained with the EUT set to continuous transmission mode. The pulse timing of the actual operation mode is obtained by exercising the optical sensor of the mouse Mouse, in the normal operating mode, with a paper slip attached to the rotor of a DC Fan. Please also refer to the Photo in the Test Setup Section.

Full test was applied on all test modes, but only worst case was shown.

### 4.3 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

Kind of Equipment	Manufacturer	Model Name	S/N
--	--	--	--

## 4.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as shown in the Test Setup Photo Documentation and the Appendix P . No additional measures were employed to achieve compliance.

## 4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test

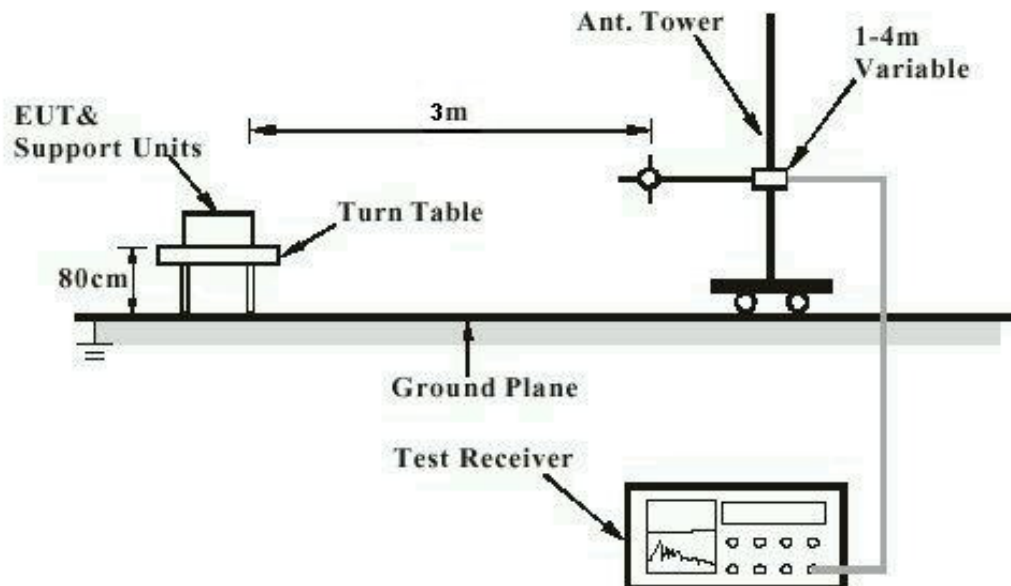
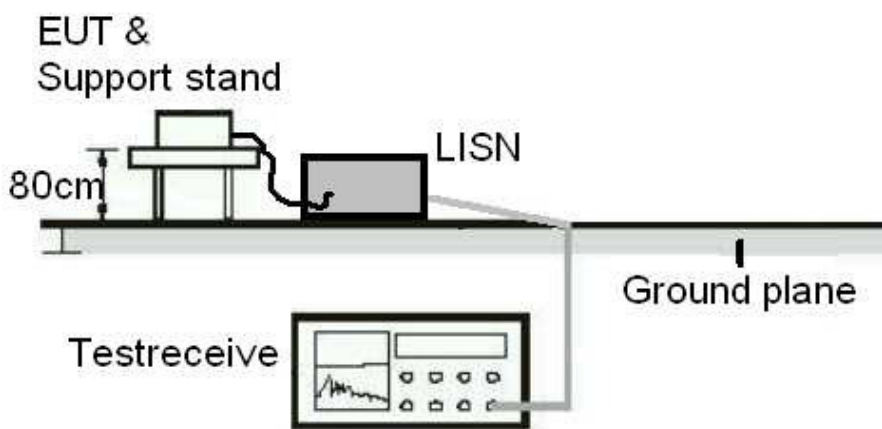


Diagram of Measurement Equipment Configuration for Mains Conduction Measurement (if applicable)



## 5. Test Results

### 5.1 Transmitter Requirement & Test Suites

#### 5.1.1 Field strength of fundamental

**RESULT:****Passed**

Test standard	:	FCC Part 15.249(a), RSS-210 A2.9 LP0002: 3.10.2(2)
Basic standard	:	ANSI C63.10:2009
Kind of test site	:	Semi-Anechoic Chamber

**Test setup**

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A
Atmospheric pressure	:	100-103 kPa

In the table below the maximum results found are reported.

For detailed results of all frequencies tested, please refer to Appendix D.

The EUT employs pulsed operation.

The pulse width is: 961 us  
Pulse repetition interval: 16 ms

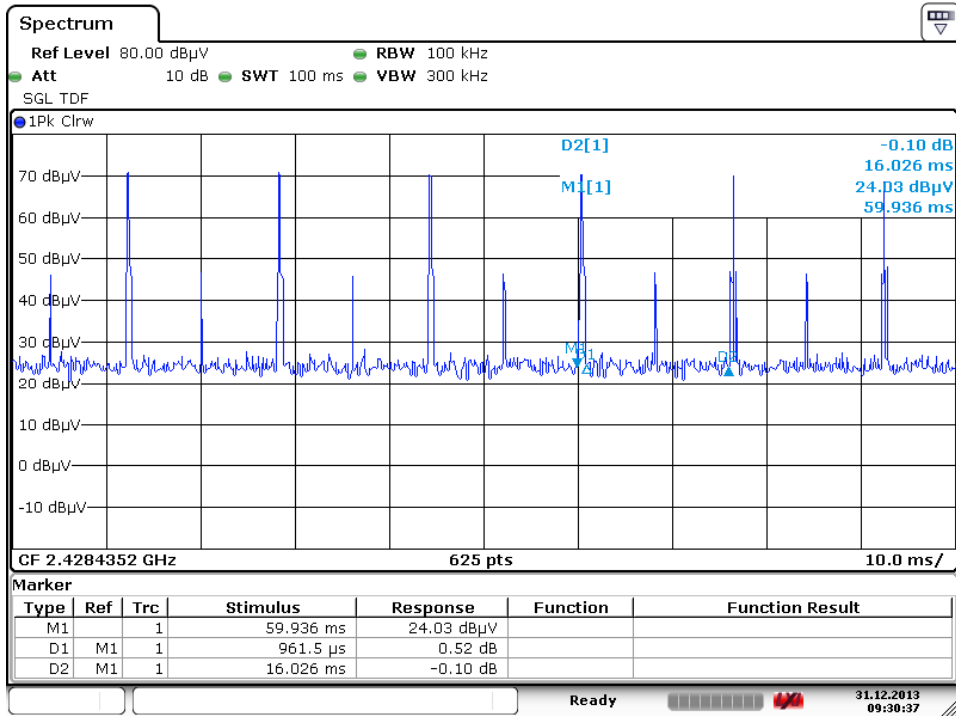
The Tables below show calculated average values from the pulsed emissions measurement data, corrected with the worst case duty cycle factor over 100 msec.

The average values noted are calculated through the application of a duty cycle correction, according to part 15.35c

Duty cycle calculation:

Duty cycle correction (dB) =  $20 \log ( 961 \text{ us} / 16 \text{ ms} ) = - 24 \text{ dB}$ .

### Test Plot pulse width



Date: 31.DEC.2013 09:30:37

**Table 6: Test result of Field strength of fundamental**

Channel Frequency (MHz)	Test result			
	Level (dBuV/m)	Limit (dBuV/m)	Antenna orientation	Detector
2408	97.19	114	Horizontal	Peak
2408	73.19	94		Average
2408	87.11	114	Vertical	Peak
2408	63.11	94		Average
2440	98.19	114	Horizontal	Peak
2440	74.19	94		Average
2440	89.53	114	Vertical	Peak
2440	65.53	94		Average
2474	98.20	114	Horizontal	Peak
2474	74.20	94		Average
2474	89.76	114	Vertical	Peak
2474	65.76	94		Average

Remark: For details refer to Appendix D.

**5.1.2 99% Bandwidth****RESULT:****Passed**

Test standard : RSS-Gen  
Basic standard : ANSI C63.10:2009  
Kind of test site : Semi-Anechoic Chamber

**Test setup**

Test Channel : Low/ Middle/ High  
Operation Mode : A

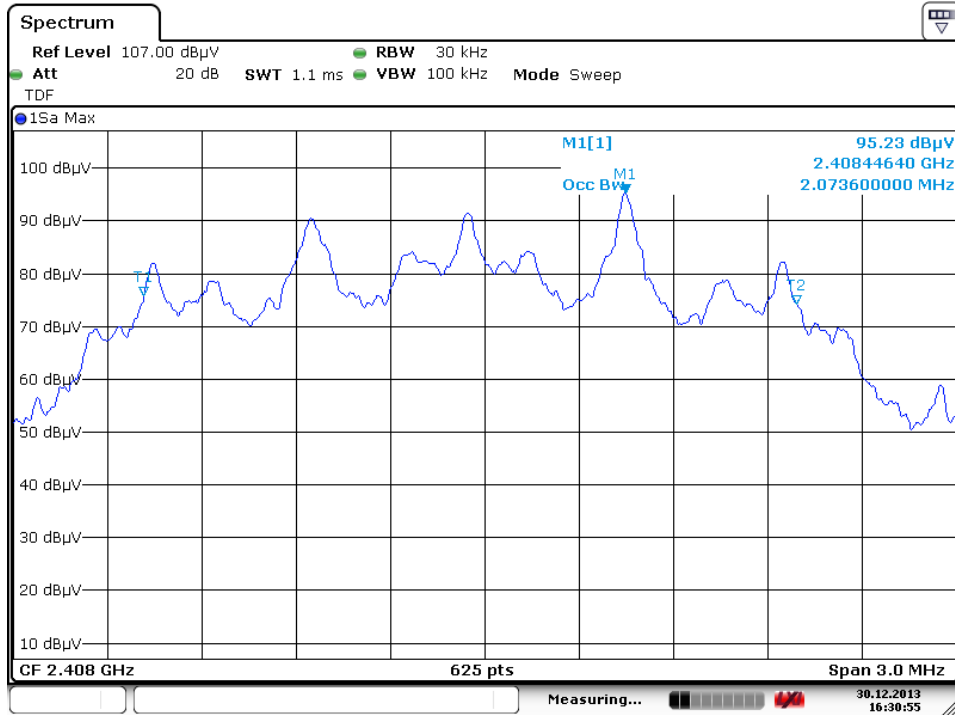
Ambient temperature : 22-26 °C  
Relative humidity : 50-65 %  
Atmospheric pressure : 100-103 kPa

**Table 7: Test result of 99% Bandwidth,**

Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)	
Low Channel	2408	2.073	
Mid Channel	2440	2.068	
High Channel	2474	2.078	

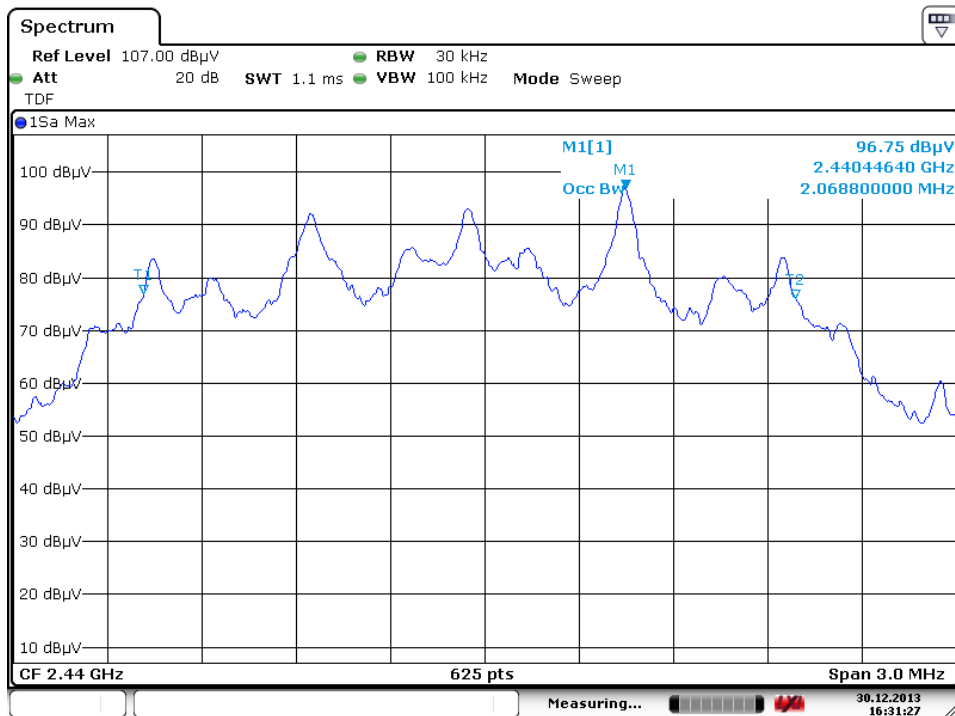
## Test Plot of 99% Bandwidth

### Low Channel



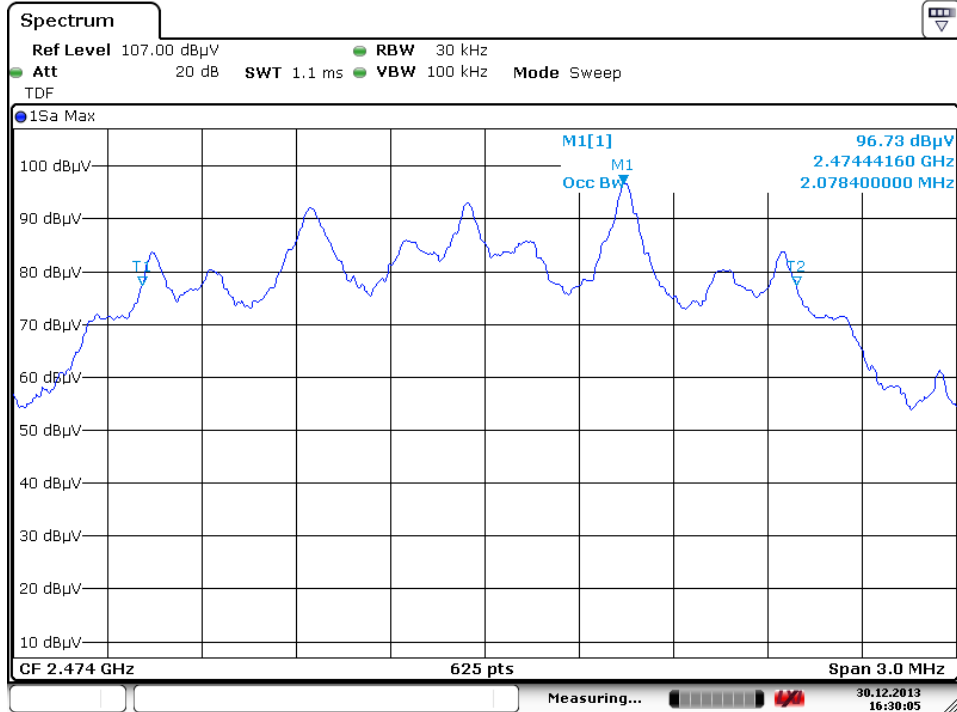
Date: 30.DEC.2013 16:30:55

### Middle Channel



Date: 30.DEC.2013 16:31:27



**High Channel**


Date: 30.DEC.2013 16:30:05

### 5.1.3 Spurious Emission

**RESULT:****Passed**

Test standard	:	FCC part 15.249(d), FCC 15.205, FCC 15.209, RSS-210 2.2, RSS-210 A2.9(b), RSS-Gen 7.2.1
Basic standard	:	LP0002: 2.8
Limits	:	ANSI C63.10: 2009
	:	Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a), must comply with the radiated emission limits specified in FCC 15.209(a). Emission radiated outside the specified frequency bands must comply with the radiated emission limits specified in FCC 15.209(a) and FCC 15.249(a).
Kind of test site	:	3m Semi-Anechoic Chamber

**Test setup**

Test Channel	:	Low/ Middle/ High
Operation mode	:	A

Remark: Testing was carried out within frequency range 30MHz to the tenth harmonic.

For details refer to Appendix D.

The Radiated Emissions testing was performed in the X, Y and Z axis orientation. The X Axis orientation is the worst-case and recorded in this test report. Due to the small size of the product and that there are no inductive components of significant size, 9kHz to 30MHz frequency range is not tested based on technical judgment.

The Radiated Emissions testing was performed in the X, Y and Z axis orientation. The X Axis orientation is the worst-case and recorded in this test report. Due to the small size of the product and that there are no inductive components of significant size, 9kHz to 30MHz frequency range is not tested based on technical judgment.

The EUT employs pulsed operation.

The pulse width is: 480 us

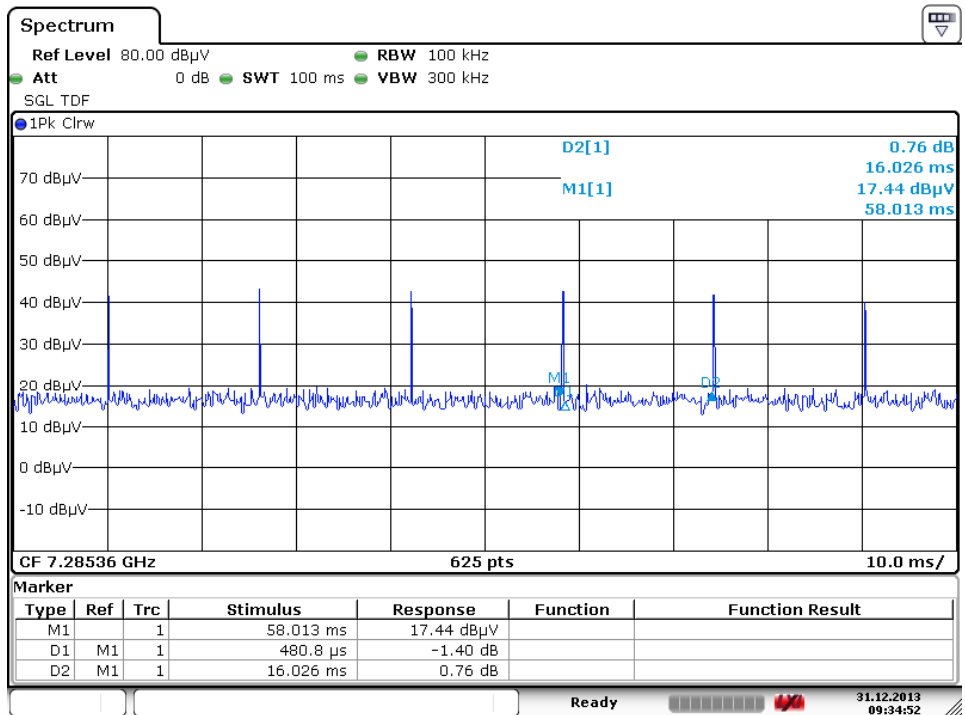
Pulse repetition interval: 16 ms

The average values noted are calculated through the application of a duty cycle correction, according to part 15.35c

Duty cycle calculation:

Duty cycle correction (dB) =  $20 \log ( 480 \text{ us} / 16 \text{ ms} ) = - 30 \text{ dB}$ .

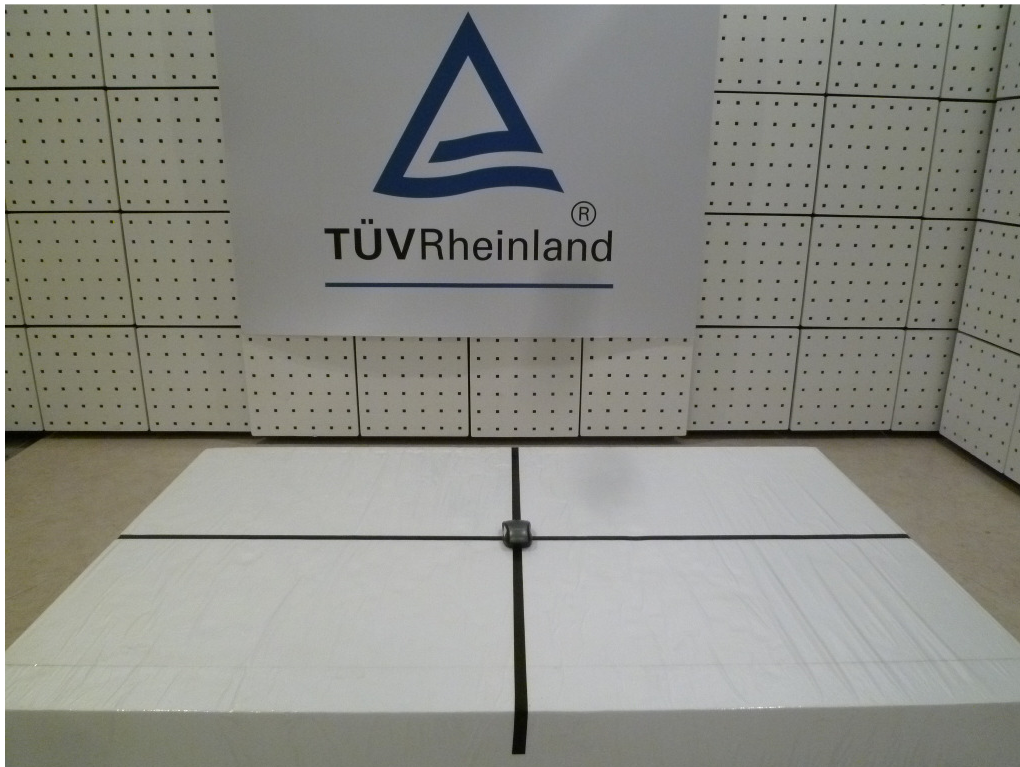
### Test Plot pulse width



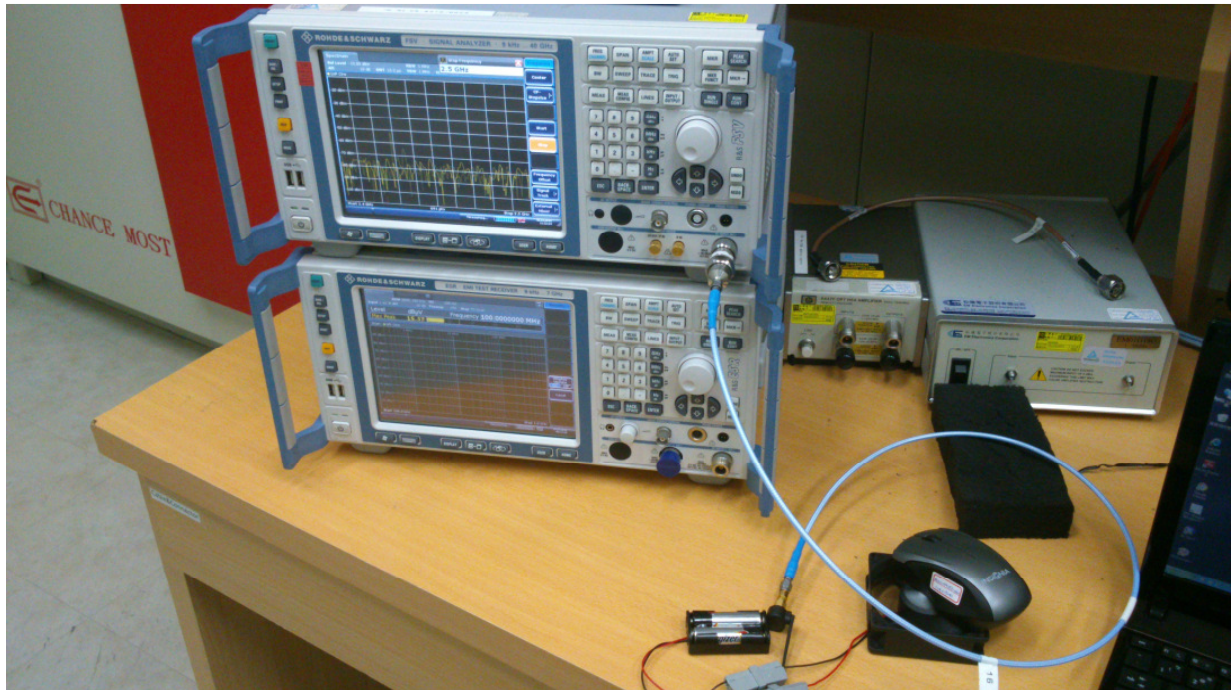
Date: 31.DEC.2013 09:34:51

## 6. Photographs of the Test Set-Up

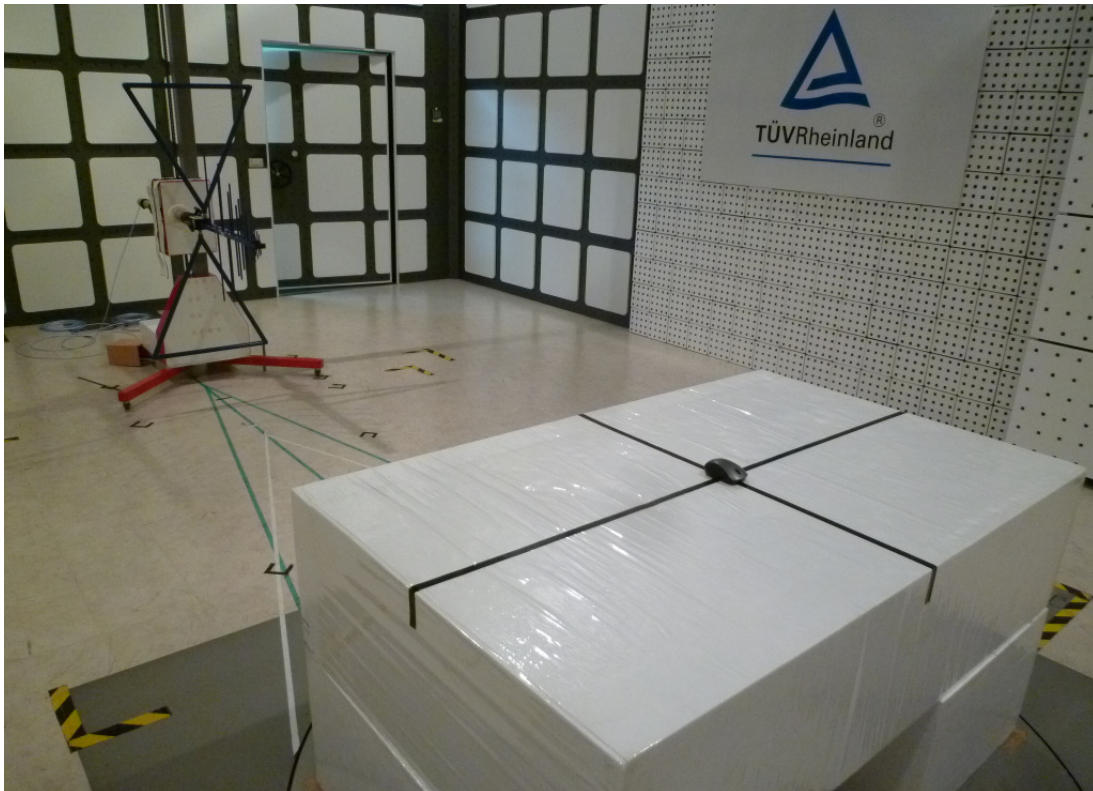
Photograph 1: Set-up for Spurious Emissions (Front View)



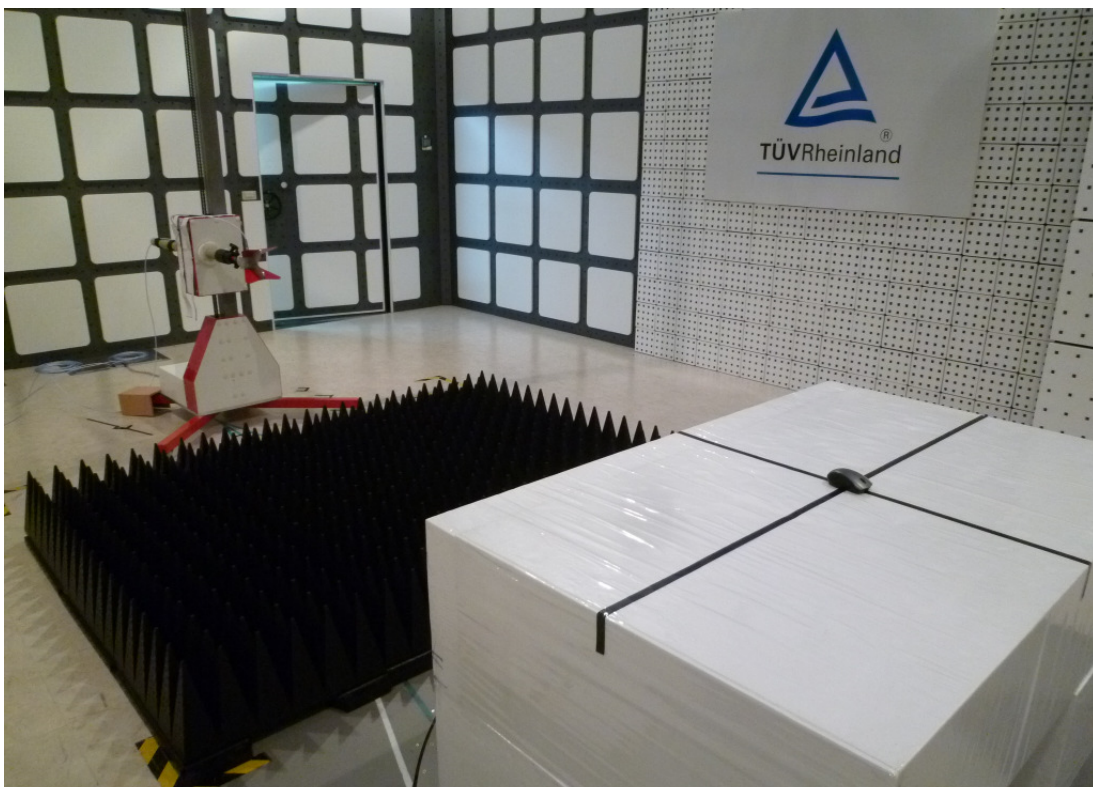
**Photograph 2: Set-up for Exercising Mouse in Normal Operation Mode**



**Photograph 3: Set-up for Spurious Emissions (Back View 1 TX)**



**Photograph 4: Set-up for Spurious Emissions (Back View 2 TX)**



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