

FCC PART 15.249
MEASUREMENT AND TEST REPORT
FOR
Penclic AB

Vendev. 90, 7tr182 32, Danderyd, Sweden

FCC ID: ZRQ-R3

Report Concerns: Original Report	Equipment Type: Penclic Wireless Mouse	
Model:	<u>R2</u>	
Report No.:	<u>STR12048258I</u>	
Test Date:	<u>2012-04-24 to 2012-05-07</u>	
Issue Date:	<u>2012-05-17</u>	
Tested By:	<u>Silin Chen / Engineer</u>	<i>Silin chen</i>
Reviewed By:	<u>Lahm Peng / EMC Manager</u>	<i>Lahm peng</i>
Approved & Authorized By:	<u>Jandy so / PSQ Manager</u>	<i>Jandyso</i>
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by SEM.Test Compliance Service Co., Ltd.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	Penclic AB
Address of applicant:	Vendev. 90, 7tr182 32, Danderyd, Sweden
Manufacturer:	SUNSONNY INTERNATIONAL GROUP LIMITED
Address of manufacturer:	NO.68, Meihua Road, Eastern Area, Baishixia industrial Park, Fuyong Town, Bao' an District, Shenzhen, China

General Description of E.U.T

Items	Description
EUT Description:	Penclic Wireless Mouse
Trade Name:	Penclic
Model No.:	R2
Rated Voltage:	DC 1.5V AAA Battery
Rated Current:	22 mA
Frequency Range:	2405~2476MHz
Antenna Type:	PCB Antenna
For more information refer to the circuit diagram form and the user's manual.	

The test data is gathered from a production sample, provided by the manufacturer..

1.2 Test Standards

The following report is prepared on behalf of the Penclic AB in accordance with FCC Part 15, Subpart B, Subpart C, and section 15.107, 15.203, 15.205, 15.207, 15.209 and 15.249 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.107,15.203, 15.205, 15.207, 15.209 and 15.249 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which results in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted according to the Operating Instructions and let the EUT keep transmitting.

1.4 Test Facility

- **FCC – Registration No.: 994117**
 SEM.Test Compliance Services Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 994117.
- **Industry Canada (IC) Registration No.: 7673A**
 The 3m Semi-anechoic chamber of SEM.Test Compliance Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 7673A.
- **CNAS Registration No.: L4062**
 Shenzhen SEM.Test Electronics Service Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 3/F, Jinbao Commerce Building, Xin’an Fanshen Road, Bao’an District, Shenzhen, P.R.C (518101)

1.5 EUT Exercise Software

The EUT exercise program used during the testing was designed to exercise the system components. The test software is started while the whole system is on.

1.6 Accessories Equipment List and Details

Description	Manufacturer	Model	Serial Number
N/A	N/A	N/A	N/A

1.7 EUT Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
N/A	N/A	N/A	N/A

2. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.203	Antenna Requirement	Compliant
§15.207 (a)	Conducted Emission	Compliant
§15.205	Restricted Band of Operation	Compliant
§15.209	Radiated Emission	Compliant
§15.249 (a)	Field Strength	Compliant
§15.249 (d)	Out of Band Emission	Compliant

3. Antenna Requirement

3.1 Standard Applicable

According to FCC 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

3.2 Test Result

This product has an integral antenna, fulfill the requirement of this section.

4. Radiated Emissions

4.1 Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is ± 5.10 dB.

4.2 Standard Applicable

According to §15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field strength of fundamental (milli-volts/meter)	Field strength of fundamental (micro-volts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

(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.

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

4.3 Test Equipment List and Details

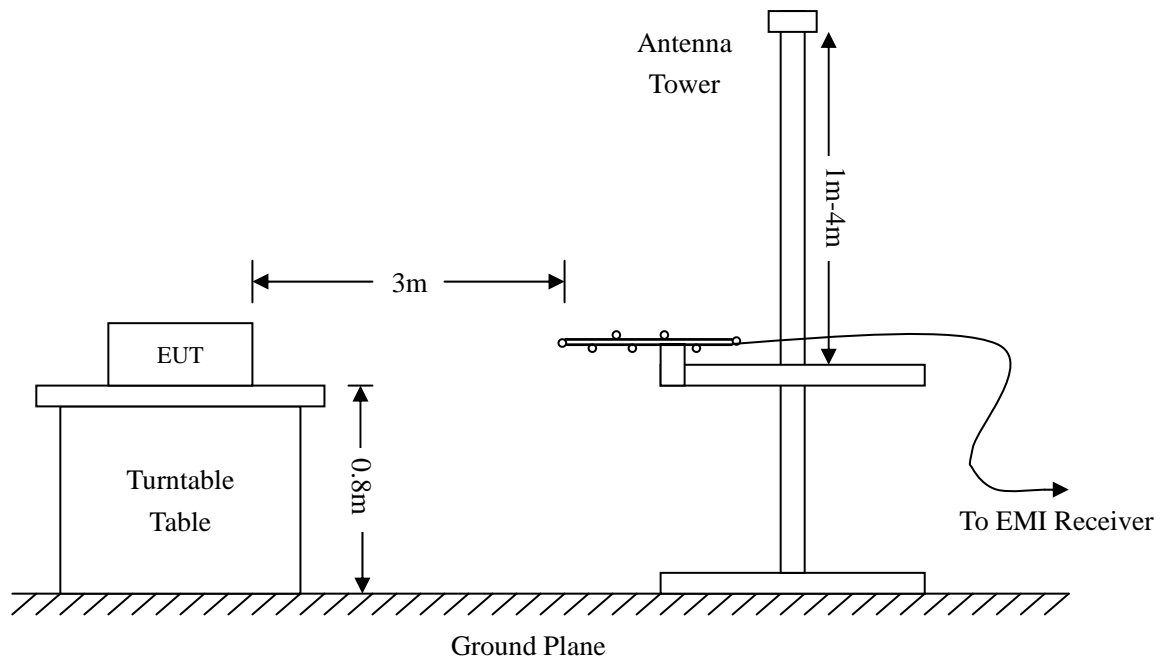
Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2012-03-28	2013-03-27
EMI Test Receiver	R&S	ESVB	825471/005	2012-03-28	2013-03-27
Pre-amplifier	Agilent	8447F	3113A06717	2012-03-28	2013-03-27
Pre-amplifier	Compliance Direction	PAP-0118	24002	2012-03-28	2013-03-27
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2012-02-25	2013-02-24
Horn Antenna	ETS	3117	00086197	2012-02-25	2013-02-24
Horn Antenna	ETS	3116B	00088203	2012-02-25	2013-02-24
Loop Antenna	SCHWARZECK	HFRA 5165	9365	2012-02-25	2013-02-24

4.4 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.205 15.249(a) and FCC Part 15.209 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.



4.5 Corrected Amplitude & Margin Calculation

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

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15 Limit}$$

4.6 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	1012 mbar

4.7 Summary of Test Results/Plots

According to the data below, the FCC Part 15.205, 15.209 and 15.249 standards, and had the worst margin of:

-7.00 dB μ V at 7428.0 MHz in the Horizontal polarization, Low Channel, 9 kHz to 25 GHz, 3Meters

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

Plot of Radiation Emissions Test

Radiated Disturbance

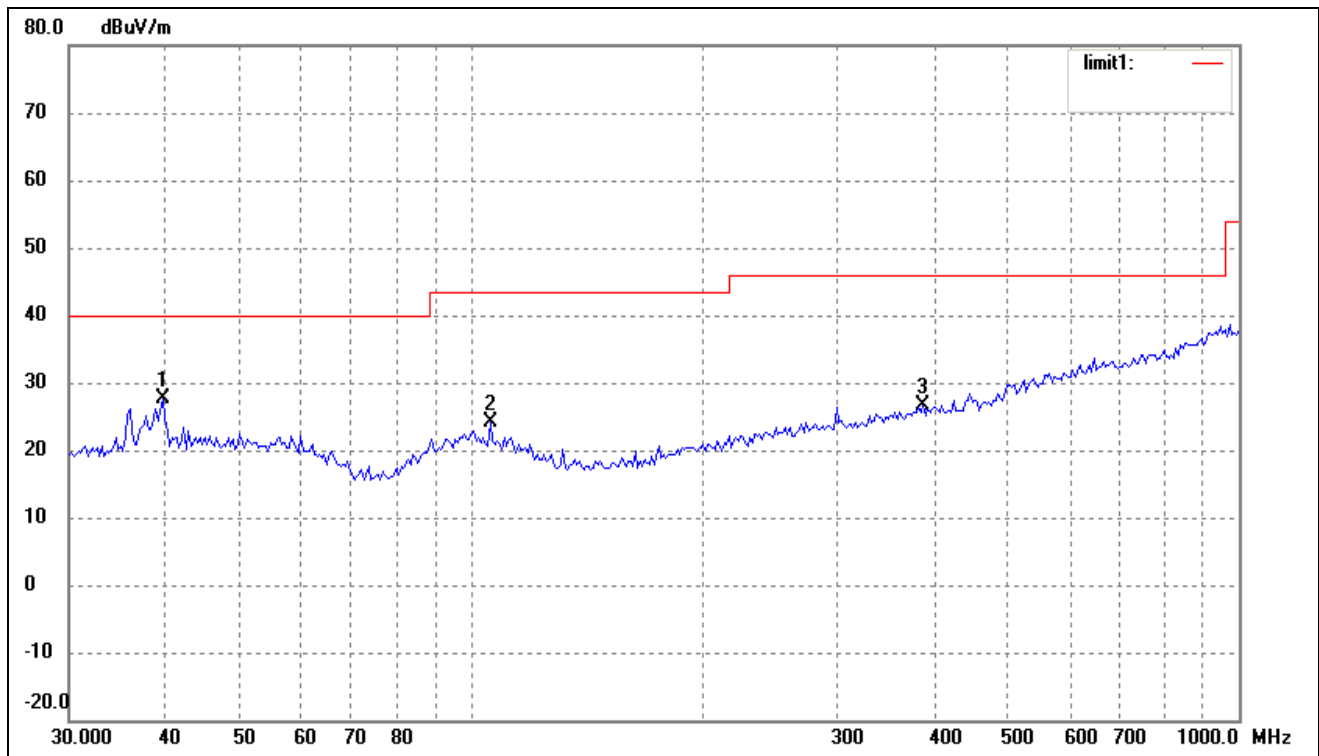
EUT: Pencil wireless Mouse

M/N: R2

Operating Condition: Transmitting Low Channel (2405MHz)

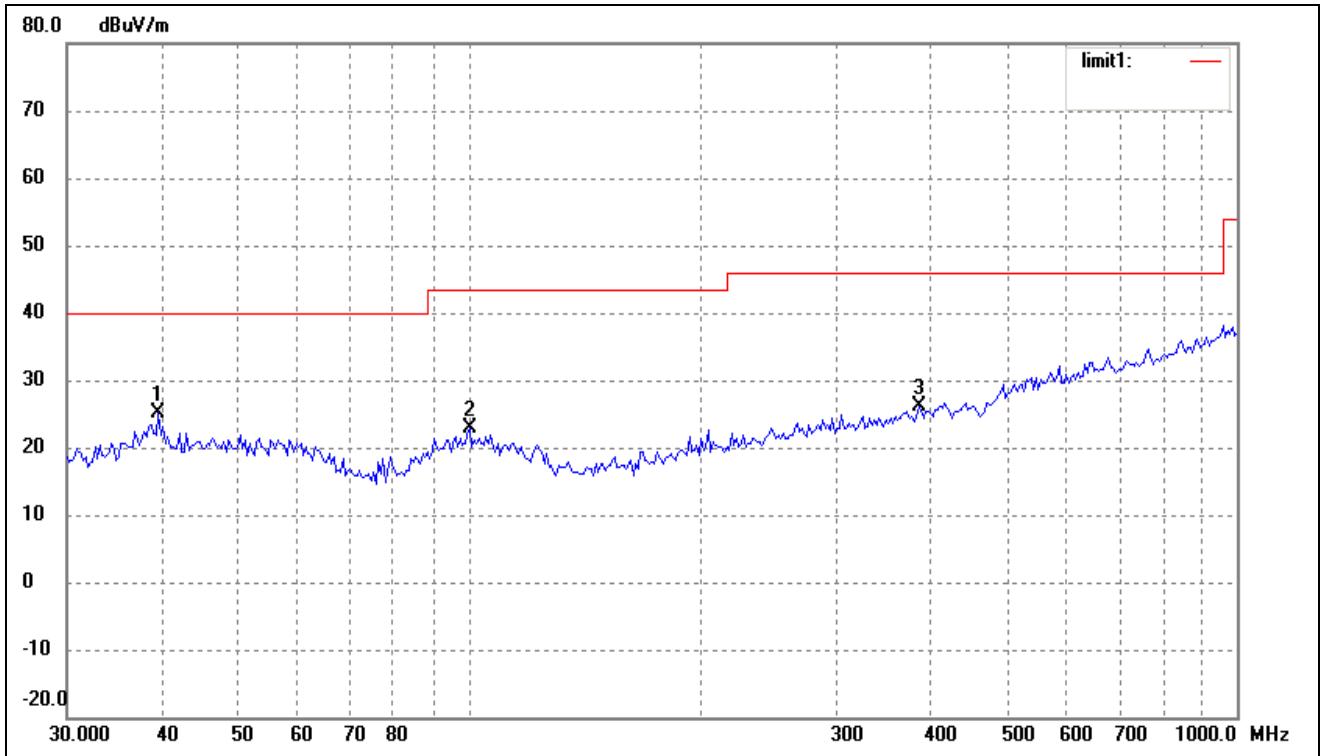
Test Specification: Horizontal & Vertical

Horizontal:



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	39.7147	19.67	8.07	27.74	40.00	-12.26	360	100	peak
2	106.0126	16.23	7.93	24.16	43.50	-19.34	360	100	peak
3	387.9920	15.32	11.29	26.61	46.00	-19.39	360	100	peak

Vertical:



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	39.4372	17.08	7.99	25.07	40.00	-14.93	360	100	peak
2	100.2286	14.41	8.41	22.82	43.50	-20.68	360	100	peak
3	385.2805	14.90	11.25	26.15	46.00	-19.85	360	100	peak

Plot of Radiation Emissions Test

Radiated Disturbance

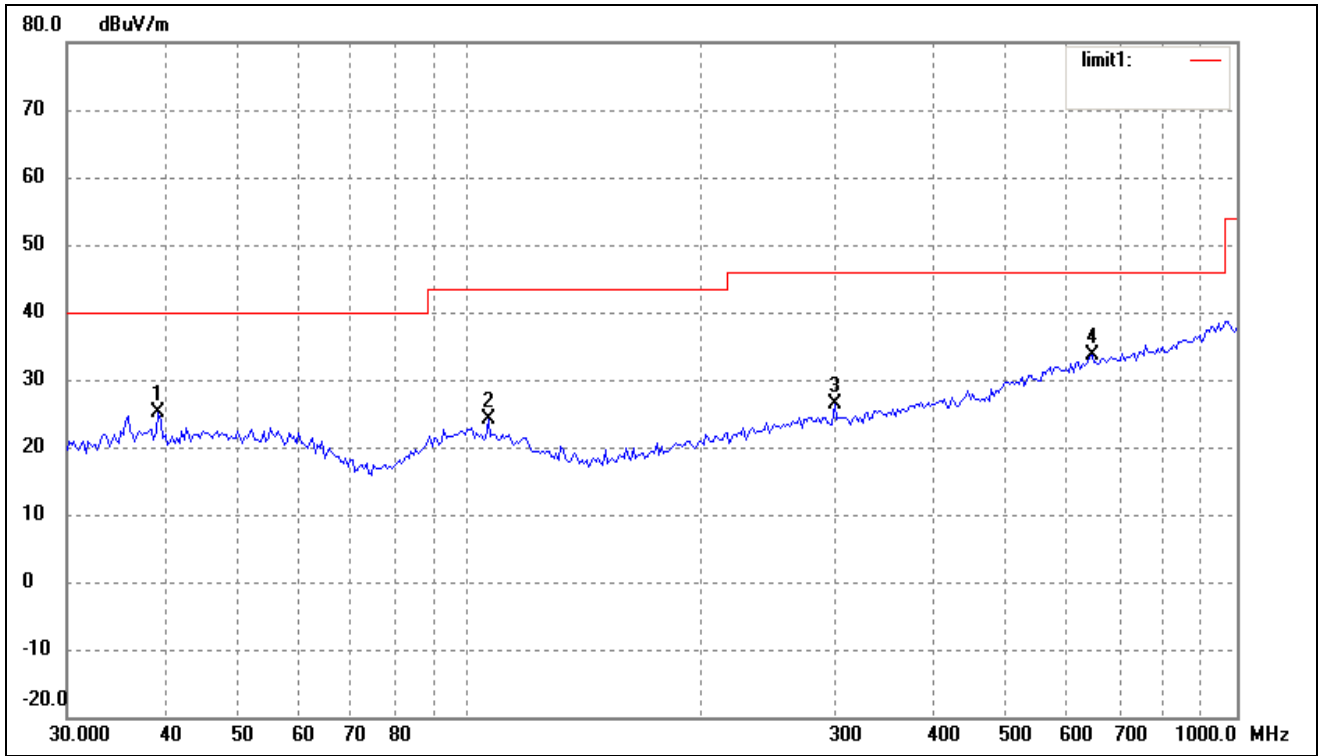
EUT: Pencil wireless Mouse

M/N: R2

Operating Condition: Transmitting Middle Channel (2439MHz)

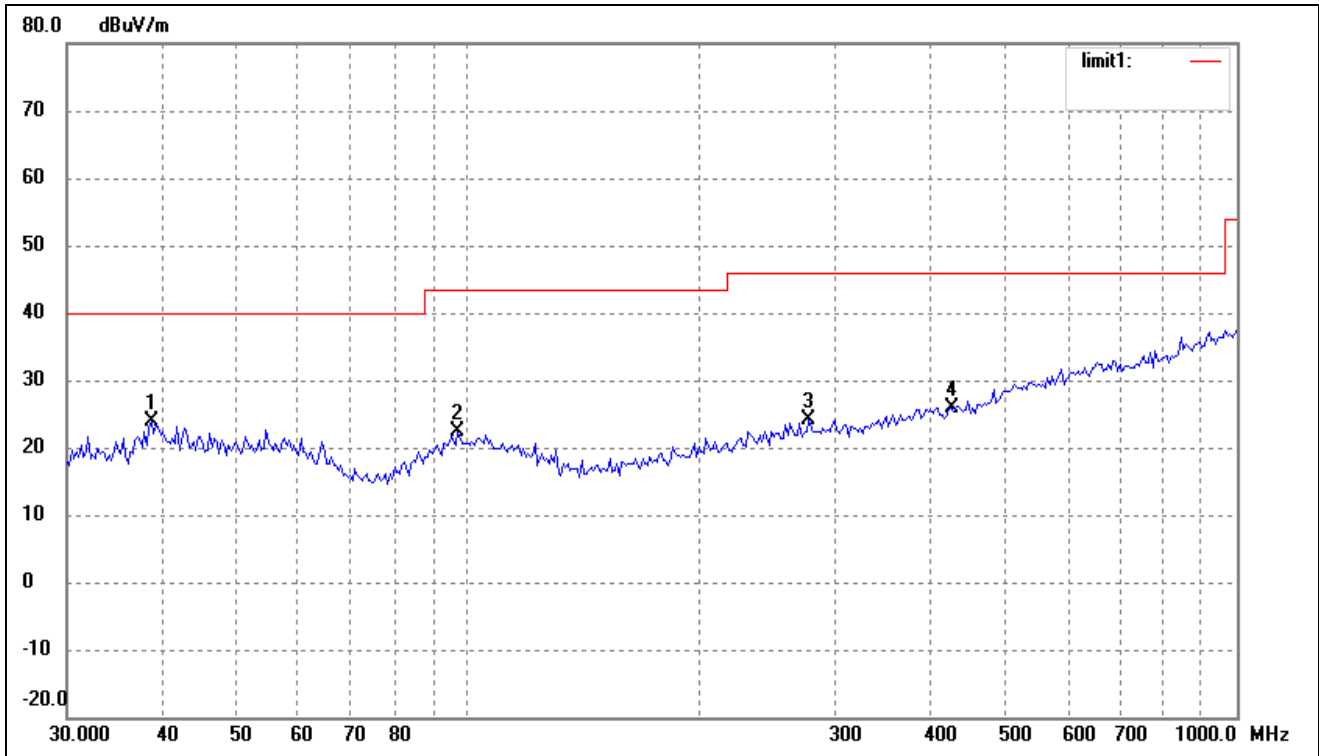
Test Specification: Horizontal & Vertical

Horizontal:



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	39.4372	17.18	7.99	25.17	40.00	-14.83	360	100	peak
2	106.0126	16.23	7.93	24.16	43.50	-19.34	360	100	peak
3	299.3158	16.64	9.77	26.41	46.00	-19.59	360	100	peak
4	647.3856	16.47	17.07	33.54	46.00	-12.46	360	100	peak

Vertical:



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	38.6161	16.22	7.77	23.99	40.00	-16.01	360	100	peak
2	96.7749	14.11	8.19	22.30	43.50	-21.20	360	100	peak
3	277.0935	14.71	9.43	24.14	46.00	-21.86	360	100	peak
4	425.0280	14.43	11.57	26.00	46.00	-20.00	360	100	peak

Plot of Radiation Emissions Test

Radiated Disturbance

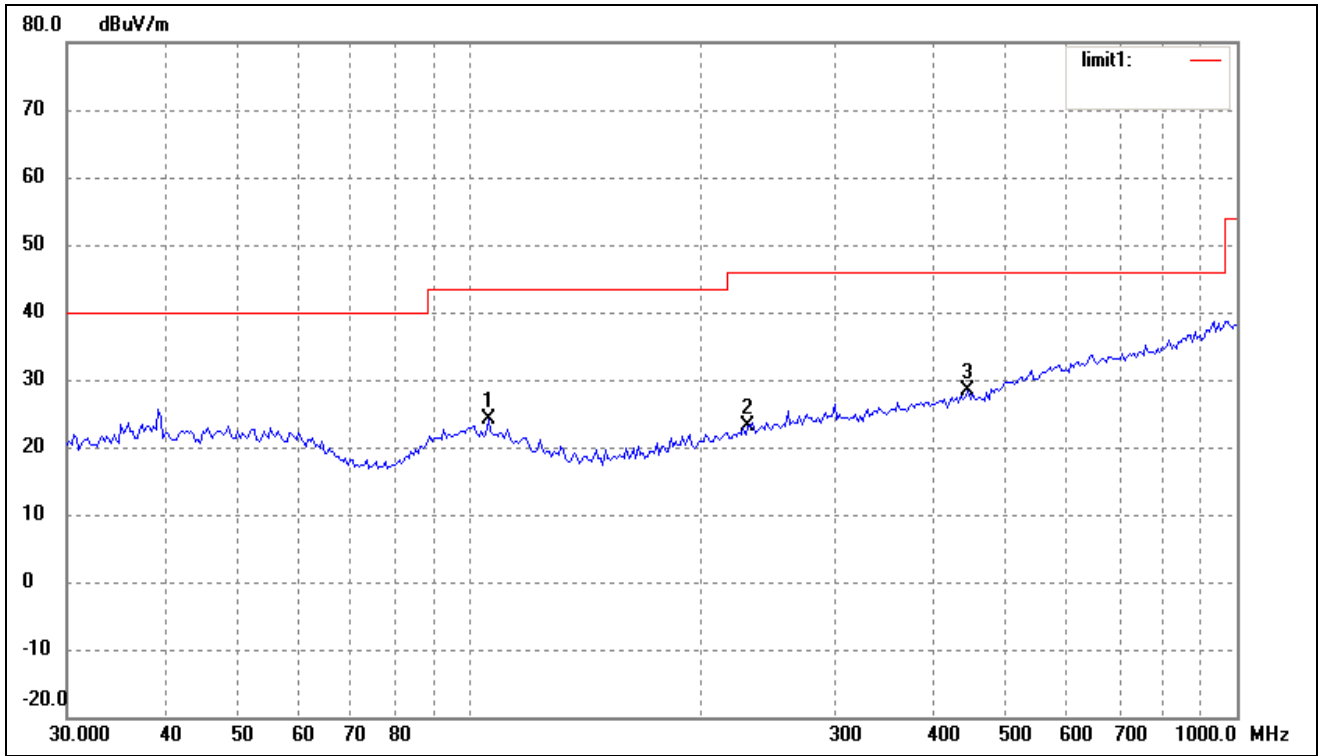
EUT: Penclic wireless Mouse

M/N: R2

Operating Condition: Transmitting High Channel (2476MHz)

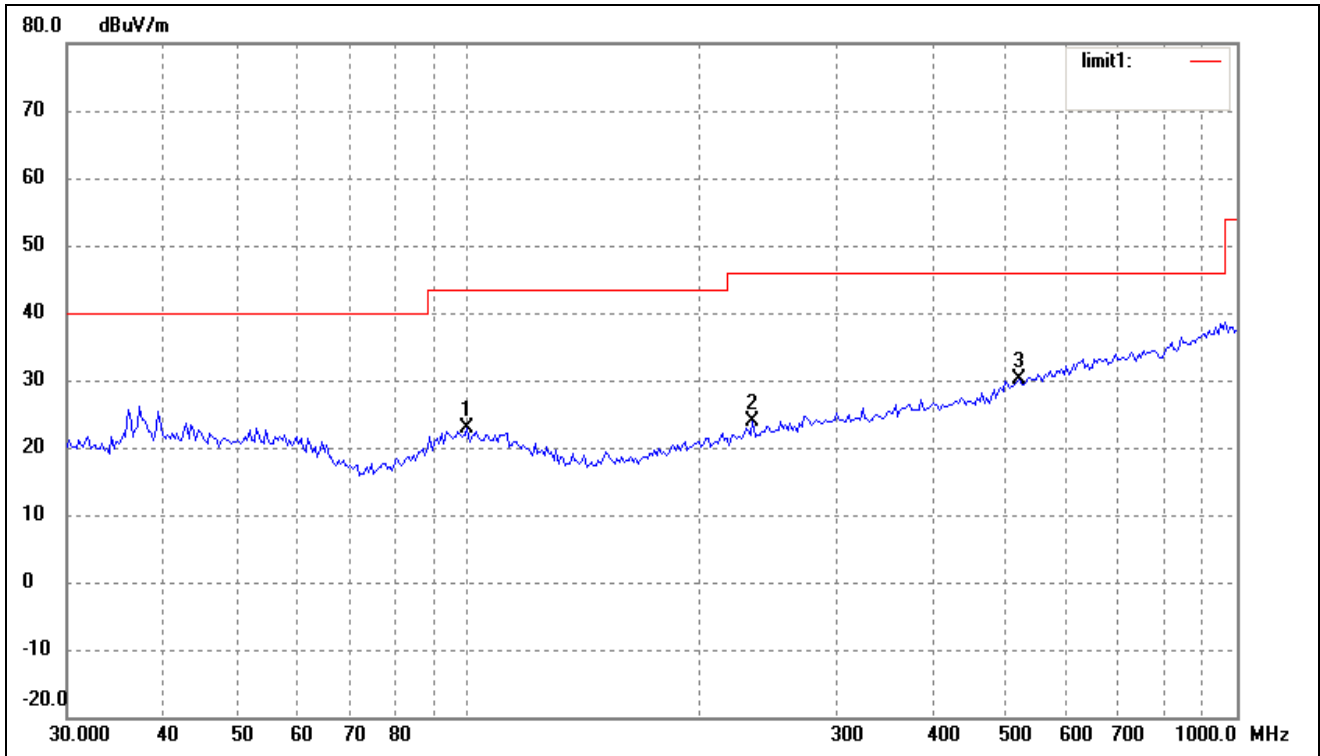
Test Specification: Horizontal & Vertical

Horizontal:



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	106.0126	16.23	7.93	24.16	43.50	-19.34	360	100	peak
2	230.9068	15.12	7.91	23.03	46.00	-22.97	360	100	peak
3	446.4141	16.29	12.05	28.34	46.00	-17.66	360	100	peak

Vertical:



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	99.5281	14.57	8.40	22.97	43.50	-20.53	360	100	peak
2	234.1684	15.69	8.10	23.79	46.00	-22.21	360	100	peak
3	520.8882	15.18	14.89	30.07	46.00	-15.93	360	100	peak

Spurious Emission Above 1GHz

Frequency MHz	Detector	Meter Reading dBuV	Direction Degree	Polar H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Correction Amplitude dBuV/m	Limit dBuV/m	Margin dB
Low Channel (2405MHz)										
4810.0	AV	36.30	57	H	34.1	5.2	33.0	42.6	54	-11.40
4810.0	AV	37.30	35	V	34.1	5.2	33.0	43.6	54	-10.40
4810.0	PK	45.30	65	H	34.1	5.2	33.0	51.6	74	-22.40
4810.0	PK	47.10	98	V	34.1	5.2	33.0	53.4	74	-20.60
7215.0	AV	35.00	60	H	37.4	6.1	33.5	45.0	54	-9.00
7215.0	AV	35.30	79	V	37.4	6.1	33.5	45.3	54	-8.70
7215.0	PK	39.90	256	H	37.4	6.1	33.5	49.9	74	-24.10
7215.0	PK	40.30	185	V	37.4	6.1	33.5	50.3	74	-23.70
2405.0	AV	60.2	45	H	29.1	3.7	34.0	63.0	94	-31.0
2405.0	AV	61.4	359	V	29.1	3.7	34.0	64.9	94	-29.1
2405.0	PK	78.7	78	H	29.1	3.7	34.0	81.6	114	-32.4
2405.0	PK	90.1	44	V	29.1	3.7	34.0	93.9	114	-20.1
Middle Channel (2439MHz)										
4878.0	AV	35.70	24	H	34.1	5.2	33	42.0	54	-12.00
4878.0	AV	36.60	341	V	34.1	5.2	33	42.9	54	-11.10
4878.0	PK	48.30	177	H	34.1	5.2	33	54.6	74	-19.40
4878.0	PK	46.00	28	V	34.1	5.2	33	52.3	74	-21.70
7317.0	AV	39.10	325	H	37.4	6.1	33.5	49.1	54	-4.90
7317.0	AV	35.20	91	V	37.4	6.1	33.5	45.2	54	-8.80
7317.0	PK	40.10	77	H	37.4	6.1	33.5	50.1	74	-23.90
7317.0	PK	41.50	267	V	37.4	6.1	33.5	51.5	74	-22.50
2439.0	AV	60.3	33	H	29.1	3.7	34	63.5	94	-30.5
2439.0	AV	57.3	34	V	29.1	3.7	34	60.4	94	-33.6
2439.0	PK	93.2	164	H	29.1	3.7	34	81.7	114	-32.3
2439.0	PK	87.1	159	V	29.1	3.7	34	90.3	114	-23.7

Frequency MHz	Detector	Meter Reading dBuV	Direction Degree	Polar H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Correction Amplitude dBuV/m	Limit dBuV/m	Margin dB
High Channel (2476MHz)										
4952.0	AV	36.90	17	H	34.1	5.2	33.0	43.2	54	-10.80
4952.0	AV	36.70	13	V	34.1	5.2	33.0	43.0	54	-11.00
4952.0	PK	45.60	50	H	34.1	5.2	33.0	51.9	74	-22.10
4952.0	PK	46.00	59	V	34.1	5.2	33.0	52.3	74	-21.70
7428.0	AV	37.00	355	H	37.4	6.1	33.5	47.0	54	-7.00
7428.0	AV	32.30	66	V	37.4	6.1	33.5	42.3	54	-11.70
7428.0	PK	38.20	269	H	37.4	6.1	33.5	48.2	74	-25.80
7428.0	PK	40.80	64	V	37.4	6.1	33.5	50.8	74	-23.20
2476.0	AV	58.3	63	H	29.1	3.7	34.0	61.5	94	-32.5
2476.0	AV	61.7	85	V	29.1	3.7	34.0	65.3	94	-28.7
2476.0	PK	76.2	85	H	29.1	3.7	34.0	79.8	114	-34.2
2476.0	PK	82.9	55	V	29.1	3.7	34.0	85.4	114	-28.6

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 5th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured. The measurements greater than 20dB below the limit from 9kHz to 30MHz.

5. Out of Band Emissions

5.1 Standard Applicable

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.

5.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2012-03-28	2013-03-27
EMI Test Receiver	R&S	ESVB	825471/005	2012-03-28	2013-03-27
Pre-amplifier	Agilent	8447F	3113A06717	2012-03-28	2013-03-27
Pre-amplifier	Compliance Direction	PAP-0118	24002	2012-03-28	2013-03-27
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2012-02-25	2013-02-24
Horn Antenna	ETS	3117	00086197	2012-02-25	2013-02-24

5.3 Test Procedure

As the radiation test, set the Lowest and Highest Transmitting Channel, observed the outside band of 2400MHz to 2483.5MHz, than mark the higher-level emission for comparing with the FCC rules.

5.4 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	1012 mbar

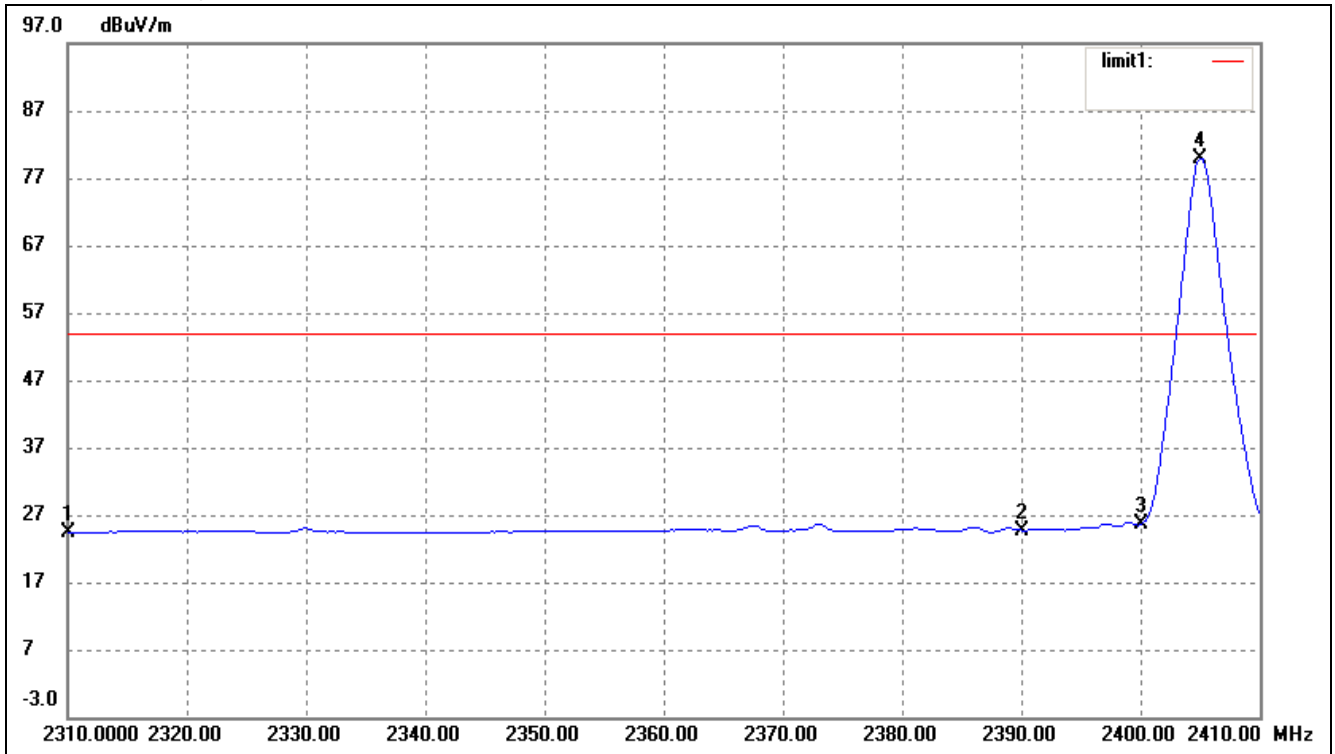
5.5 Summary of Test Results/Plots

Test mode	Frequency	Limit	Result
	MHz	dBuV / dBc	
Lowest	2310.00	<54 dBuV	Pass
	2390.00	<54 dBuV	Pass
	2400.00	>50 dBc	Pass
Highest	2483.50	<54 dBuV	Pass
	2500.00	<54 dBuV	Pass

The edge emissions are below the FCC 15.209 Limits or complies with the 15.247(d) requirements.

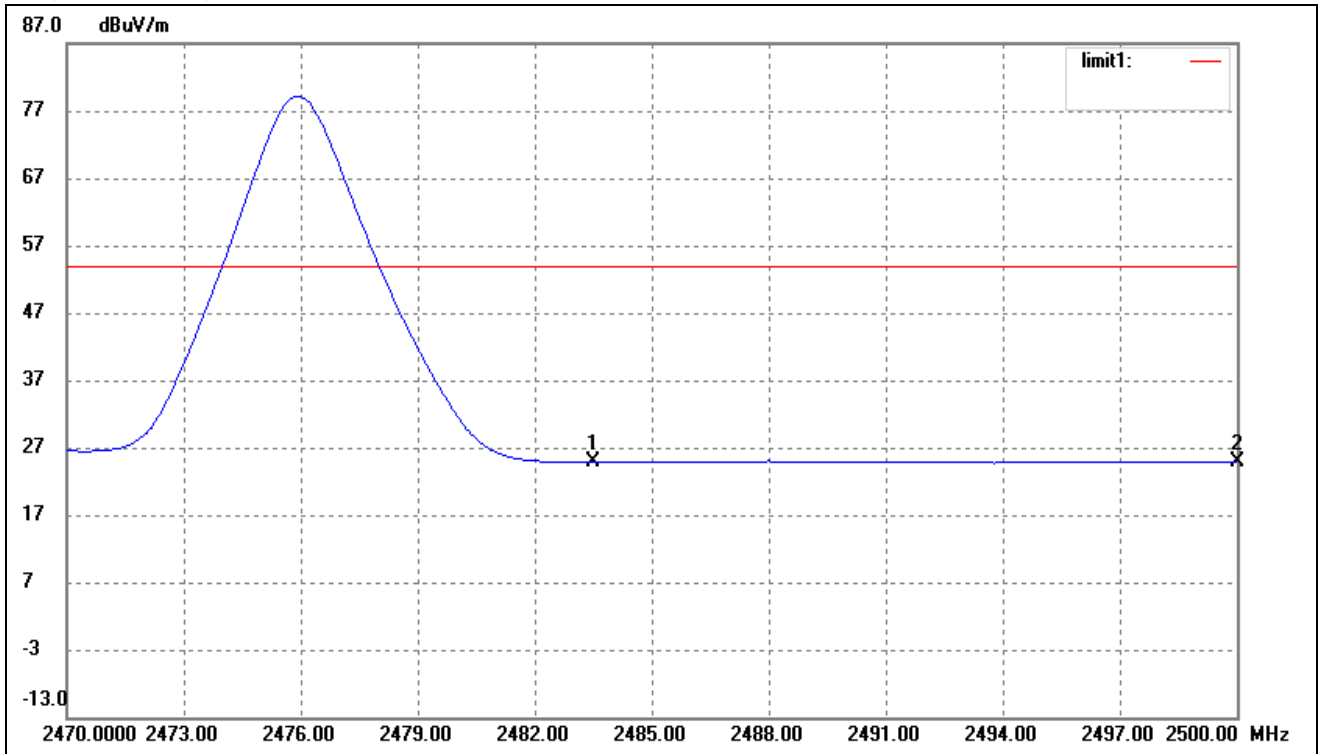
Please refer to the test plots as below.

Lowest Bandedge



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	31.94	-7.51	24.43	54.00	-29.57	Ave Detector
	2310.000	39.63	-7.51	32.12	74.00	-41.88	Peak Detector
2	2390.000	32.07	-7.34	24.73	54.00	-29.27	Ave Detector
	2390.000	39.86	-7.34	32.52	74.00	-41.48	Peak Detector
3	2400.000	32.84	-7.31	25.53	/	/	Ave Detector
4	2405.000	87.15	-7.30	79.85	/	/	Ave Detector

Highest Bandedge



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	31.97	-7.13	24.84	54.00	-29.16	Ave Detector
	2483.500	41.91	-7.13	34.78	74.00	-39.22	Peak Detector
2	2500.000	32.02	-7.08	24.94	54.00	-29.06	Ave Detector
	2500.000	42.10	-7.08	35.02	74.00	-38.98	Peak Detector

6. Conducted Emissions

6.1 Measurement Uncertainty

Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement is ± 2.88 dB.

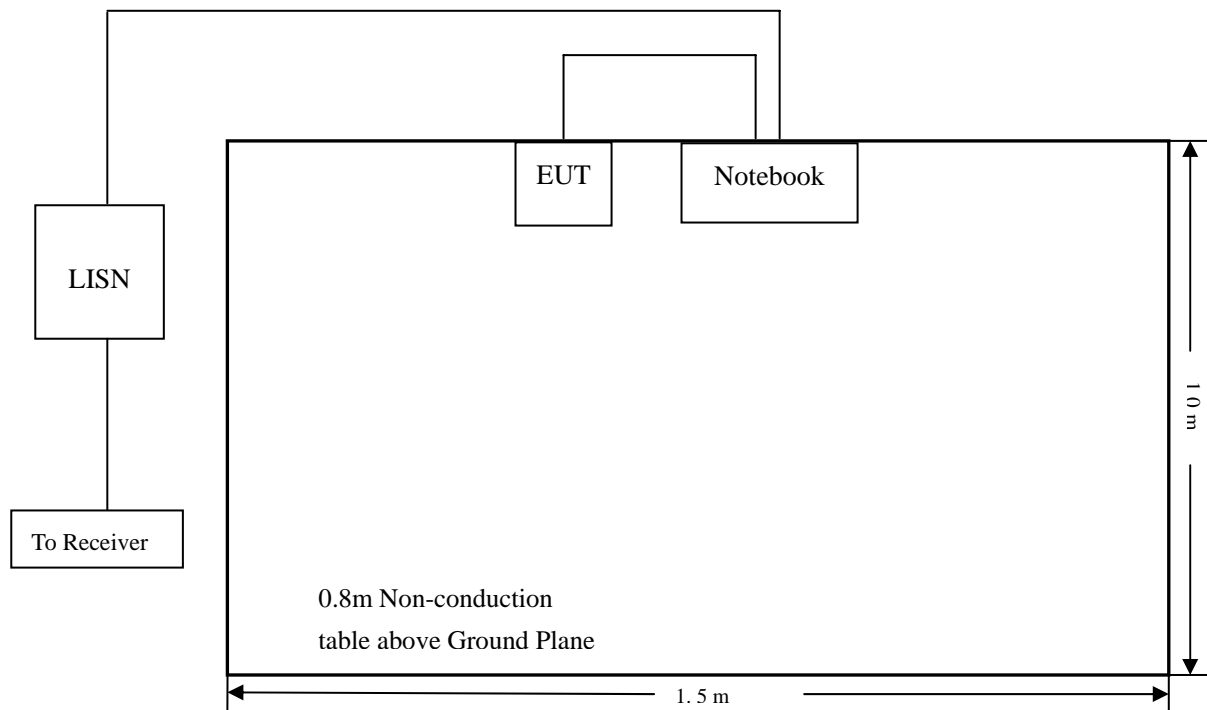
6.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2012-03-28	2013-03-27
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2012-03-28	2013-03-27
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2012-03-28	2013-03-27

6.3 Test Procedure

Test is conducting under the description of ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

6.4 Basic Test Setup Block Diagram



6.5 Environmental Conditions

Temperature:	20° C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

6.6 Summary of Test Results/Plots

According to the data in section 6.7, the EUT complied with the FCC Part 15.207 Conducted margin for a Class B device, with the *worst* margin reading of:

-10.82 dB μ V at 0.318 MHz in the Neutral, QP detector, 0.15-30MHz

6.7 Conducted Emissions Test Data

Plot of Conducted Emissions Test Data

Conducted Disturbance

EUT: Penclic Wireless Mouse

M/N: R2

Operating Condition: Charging

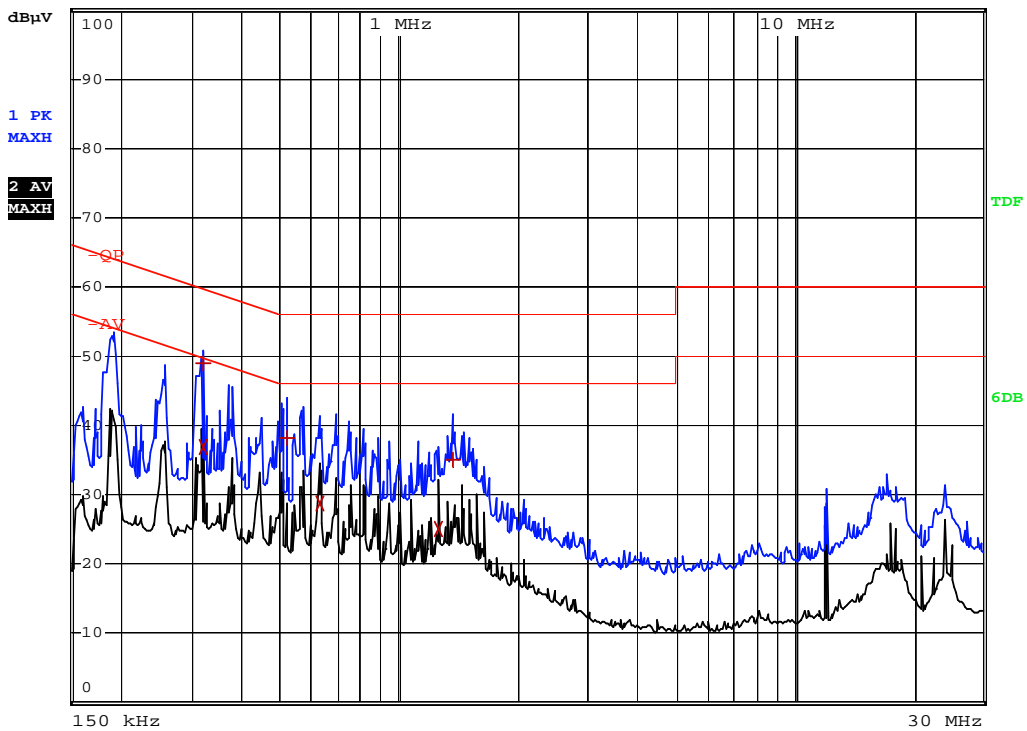
Test Specification: L

Comment: AC 120V/60Hz



RBW 9 kHz
MT 5 s

Att 10 dB AUTO



EDIT PEAK LIST (Final Measurement Results)			
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
Trace1: -QP			
Trace2: -AV			
Trace3: ---			
1 Quasi Peak	318 kHz	48.93	-10.82
2 Average	318 kHz	36.83	-12.92
1 Quasi Peak	522 kHz	38.20	-17.79
2 Average	630 kHz	28.78	-17.21
2 Average	1.262 MHz	24.99	-21.00
1 Quasi Peak	1.374 MHz	34.93	-21.06

Plot of Conducted Emissions Test Data

Conducted Disturbance

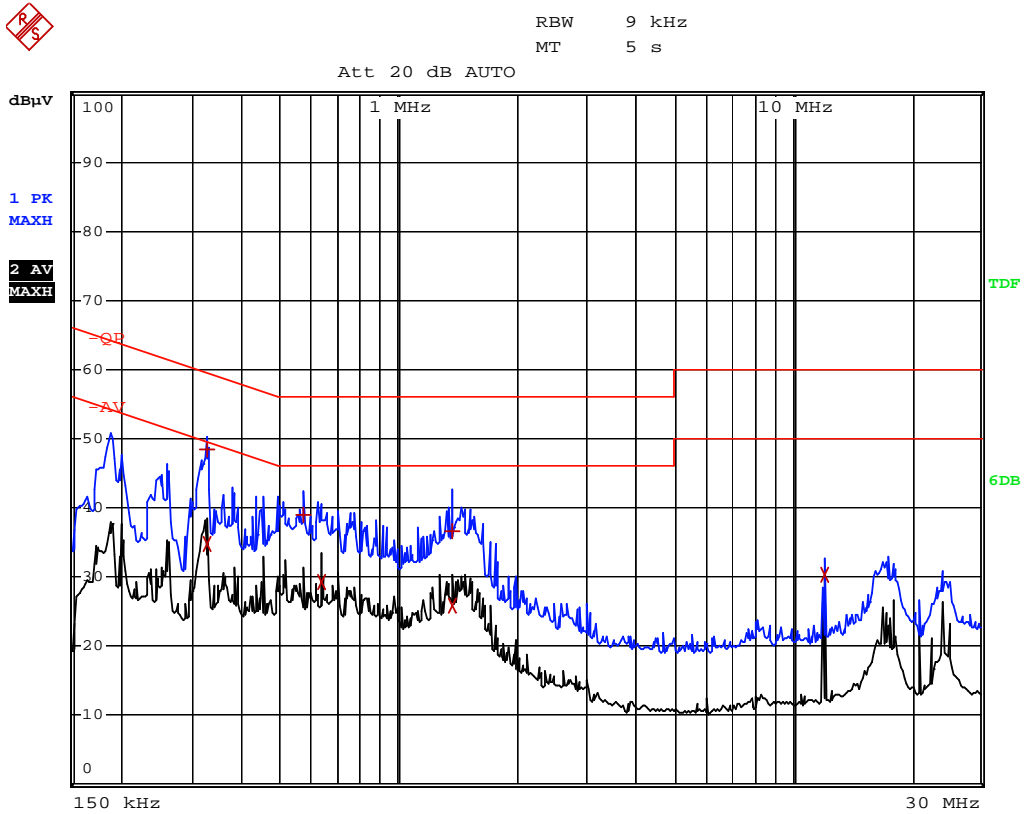
EUT: Penclic wireless Mouse

M/N: R2

Operating Condition: Charging

Test Specification: N

Comment: AC 120V/60Hz



EDIT PEAK LIST (Final Measurement Results)				
Trace1:		-QP		
Trace2:		-AV		
Trace3:		---		
TRACE		FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1	Quasi Peak	326 kHz	48.40	-11.15
2	Average	326 kHz	34.87	-14.68
1	Quasi Peak	574 kHz	39.02	-16.97
2	Average	638 kHz	29.15	-16.84
1	Quasi Peak	1.374 MHz	36.59	-19.40
2	Average	1.374 MHz	25.82	-20.17
2	Average	11.994 MHz	30.30	-19.69

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