

R&TTE (EMC) TEST REPORT
for
Wintop Electronics Co., Limited

2.4GHz Wireless Optical Mouse
Model No.: WM-798

Prepared for : Wintop Electronics Co., Limited
Address : Unit 04 7/F, Bright Way Tower 33, Mong Kok RD KL,
HONGKONG

Prepared By : Shenzhen Anbotek Compliance Laboratory Limited
Address : 1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road,
Nanshan District, Shenzhen, Guangdong, China
Tel: (86) 755-26066544
Fax: (86) 755-26014772

Report Number : R011408196E
Date of Test : Aug. 14~ 21, 2014
Date of Report : Aug. 21, 2014

TABLE OF CONTENT

Description

Page

Test Report

1. GENERAL INFORMATION.....	4
1.1. Description of Device (EUT).....	4
1.2. Description of Test Facility.....	5
1.3. Measurement Uncertainty.....	5
1.4. Test Standards.....	5
1.5. Auxiliary Equipment Used during Test.....	6
2. MEASURING DEVICE AND TEST EQUIPMENT.....	7
2.1. Conducted Emission Measurement.....	7
2.2. Radiated Emission Measurement.....	7
2.3. Electrostatic Discharge Measurement.....	7
2.4. R/S Immunity Measurement.....	7
3. TECHNICAL TEST.....	8
3.1. Summary of Test Results.....	8
3.2. Test Report.....	8
3.2.1. Emission Test – Radiated Emissions.....	10
3.2.2. Emission Test – DC Mains Power Line Conducted Emissions.....	13
3.2.3. Immunity Test – Radiated, RF Electromagnetic Fields.....	16
3.2.4. Immunity Test – Electrostatic Discharge.....	17
APPENDIX I (TEST PHOTOGRAPHS).....	18
1. Photo of Power Line Conducted Emission Test.....	18
2. Photo of Radiated Emission Test.....	18
3. Photo of Electrostatic Discharge Test.....	19
4. Photo of RF Field Strength susceptibility Test.....	19
APPENDIX II (EXTERNAL PHOTOS).....	20
APPENDIX III (INTERNALPHOTOS).....	22

APPENDIX I (Test Photographs) (2Pages)

APPENDIX II (External Photos) (2 Pages)

APPENDIX III (Internal Photos) (2 Pages)

TEST REPORT

Applicant : Wintop Electronics Co., Limited
Manufacturer : Shenzhen Wintop Electronics Co., Limited
EUT : 2.4GHz Wireless Optical Mouse
Model No. : WM-798
Serial No. : N.A.
Trade Mark : N.A.
Rating : DC 3.0V, 8mA

Measurement Procedure Used:

ETSI EN 301 489-1 V1.9.2 (2011-09)
ETSI EN 301 489-3 V1.6.1 (2013-08)

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the EN 301 489-1 & EN 301 489-3 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited

Date of Test : Aug. 14~ 21, 2014

Prepared by :



Rock Zeng
(Tested Engineer / Rock Zeng)

Reviewer :

Amy Ding
(Project Manager / Amy Ding)

Approved & Authorized Signer :

Tom Chen
(Manager / Tom Chen)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT : 2.4GHz Wireless Optical Mouse

Model Number : WM-798

Test Power Supply : DC 3V Via Battery

Frequency : 2405~2472MHz

Antenna gain : -2dBi
(The device uses an integral PCB antenna which is not intended and easy to modify.)

Antenna type : PCB Antenna

Applicant : Wintop Electronics Co., Limited
Address : Unit 04 7/F, Bright Way Tower 33, Mong Kok RD KL, HONGKONG

Manufacturer : Shenzhen Wintop Electronics Co., Limited
Address : Huaguan Industrial Park, Xinhe Road, Baolai Industrial District, Shangmugu, Pinghu Town, Longgang District, Shenzhen City, 518000, China

Factory : Shenzhen Wintop Electronics Co., Limited
Address : Huaguan Industrial Park, Xinhe Road, Baolai Industrial District, Shangmugu, Pinghu Town, Longgang District, Shenzhen City, 518000, China

Date of receipt : Aug. 14, 2014

Date of Test : Aug. 14~ 21, 2014

1.2. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS - LAB Code: L3503

Shenzhen Anbotek Compliance Laboratory Limited., Laboratory has been assessed and in compliance with CNAS/CL01: 2006 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2005 General Requirements) for the Competence of Testing Laboratories.

FCC-Registration No.: 752021

Shenzhen Anbotek Compliance Laboratory Limited, 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. Registration 752021, July 10, 2013.

IC-Registration No.: 8058A-1

Shenzhen Anbotek Compliance Laboratory Limited., EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada. The acceptance letter from the IC is maintained in our files. Registration 8058A-1, February 22, 2013.

Test Location

All Emissions tests were performed at
Shenzhen Anbotek Compliance Laboratory Limited. at 1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road, Nanshan District, Shenzhen, Guangdong, China

1.3. Measurement Uncertainty

Radiation Uncertainty	:	Ur = 4.3dB
Conduction Uncertainty	:	Uc = 3.4dB

1.4. Test Standards

ETSI EN 301 489-1 V1.9.2 (2011-09)

Electromagnetic compatibility and Radio spectrum Matters (ERM);
Electromagnetic Compatibility (EMC) standard for radio equipment and services;
Part 1: Common technical requirements

ETSI EN 301 489-3 V1.6.1 (2013-08)

Electromagnetic compatibility and Radio spectrum Matters (ERM);
ElectroMagnetic Compatibility (EMC) standard for radio equipment and services;
Part 3: Specific conditions for Short-Range Devices (SRD) operating on
frequencies between 9 kHz and 246 GHz

1.5. Auxiliary Equipment Used during Test

PC	: Manufacturer: DELL M/N: OPTIPLEX 380 S/N: 1J63X2X CE , FCC: DOC
MONITOR	: Manufacturer: DELL M/N: E170Sc S/N: CN-00V539-64180-055-0UPS CE , FCC: DOC
KEYBOARD	: Manufacturer: DELL M/N: SK-8115 S/N: CN-0DJ313-71616-06C-02XN CE , FCC: DOC Cable: 1m, unshielded
Power Line	: Non-Shielded, 1.5m
VGA Cable	: Non-Shielded, 1.5m
Network Cable	: Non-Shielded, 1.5m

2. MEASURING DEVICE AND TEST EQUIPMENT

Test equipments list of Shenzhen Anbotek Compliance Laboratory Limited.

2.1. Conducted Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Two-Line V-network	Rohde & Schwarz	ENV216	100055	Apr. 23, 2014	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Apr. 23, 2014	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Apr. 23, 2014	1 Year

Conduction Uncertainty : $U_c = 3.4\text{dB}$

2.2. Radiated Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	Apr. 23, 2014	1 Year
2.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	May 14, 2013	3 Year
3.	Pre-amplifier	SONOMA	310N	186860	Aug. 09, 2014	1 Year

Radiation Uncertainty : $U_r = 4.3\text{dB}$

2.3. Electrostatic Discharge Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	ESD Simulators	KIKUSUI	KES4021	LJ003477	Apr. 25, 2014	1 Year

2.4. R/S Immunity Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	RF Power Meter. Dual Channel	BOONTON	4232A	10539	May 29, 2014	1 year
2.	50ohm Diode Power Sensor	BOONTON	51011EMC	34236/34238	May 29, 2014	1 year
3.	Broad-Band Horn Antenna	SCHWARZBECK	BBHA9120 L3F	332	May 29, 2014	1 year
4.	Power Amplifier	PRANA	AP32MT215	N/A	May 29, 2014	1 year
5.	Power Amplifier	MILMEGA	AS0102-55	N/A	May 29, 2014	1 year
6.	Signal Generator	AEROFLEX	2023B	N/A	May 29, 2014	1 year
7.	Field Strength Meter	HOLADAY	HI-6005	N/A	May 29, 2014	1 year
8.	RS232 Fiber Optic Modem	HOLADAY	HI-4413P	N/A	May 29, 2014	1 year
9.	Log.-Per. Antenna	SCHWARZBECK	VULP 9118E	N/A	May 29, 2014	1 year

3. Technical Test

3.1. Summary of Test Results

No Deviations from the technical specification(s) were ascertained in the course of the tests Performed	
Final Verdict: (only “Passed” if all single measurements are “Passed”)	Passed

3.2. Test Report

Emission (EMI)

EMI Phenomenon	Port	Requirement		EUT Setup	Result	Applicability
		Standard	Basic Standard			
Conducted Interference Voltage	AC Mains	ETSI EN 301 489-1:2011-09 Clause 8.4	EN 55022	Refer to Section 5	N/A	Not Applicable
Conducted Interference Voltage	DC Mains	ETSI EN 301 489-1:2011-09 Clause 8.3	EN 55022	Refer to Section 4	Complies	Applicable
Radiated Interference Field Strength 30~1000MHz	Enclosure	ETSI EN 301 489-1:2011-09 Clause 8.2	EN 55022	Refer to Section 4	Complies	Applicable
Harmonic Current Emissions	AC Mains Input Port	ETSI EN 301 489-1:2011-09 Clause 8.5	EN 61000-3-2	Refer to Section 5	N/A	Not Applicable
Flicker & Voltage Fluctuation	AC Mains Input Port	ETSI EN 301 489-1:2011-09 Clause 8.6	EN 61000-3-3	Refer to Section 5	N/A	Not Applicable

Immunity (EMS)

EMS Phenomenon	Port	Requirement		EUT Setup	Result	Applicability
		Standard	Basic Standard			
Electronic Discharge (ESD)	Enclosure	ETSI EN 301 489-1:2011-09 Clause 9.3	IEC 61000-4-2	Refer to Section 5	Complies	Applicable
RF-Electro-Magnetic Field (80-1000MHz and 1400-2000 MHz)	Enclosure	ETSI EN 301 489-1:2011-09 Clause 9.2	IEC 61000-4-3	Refer to Section 5	Complies	Applicable
Fast Transients, Burst	Power Line	ETSI EN 301 489-1:2011-09 Clause 9.4	IEC 61000-4-4	Refer to Section 5	N/A	Not Applicable
Surge	Power Line (1 Phase)	ETSI EN 301 489-1:2011-09 Clause 9.8	IEC 61000-4-5	Refer to Section 5	N/A	Not Applicable

Transients & Surges Vehicular Environment	Power Line (Car Charge)	ETSI EN 301 489-1:2011-09 Clause 9.6	ISO 7367-1 ISO 7367-2	N/A	N/A	Not Applicable
RF Common Mode (0.15-80MHz)	Power Line	ETSI EN 301 489-1:2011-09 Clause 9.5	IEC 61000-4-6	Refer to Section 5	N/A	Not Applicable
Vol. Dips, Interruptions & Fluctuations (AC Power)	Power Line	ETSI EN 301 489-1:2011-09 Clause 9.7	IEC 61000-4-11	Refer to Section 5	N/A	Not Applicable

N/A=Not Applicable

- Performance criteria A for immunity tests with phenomena of a continuous nature;
Communication between the Tx and Rx in the front of pings should not drop during the test.
- Performance criteria B for immunity tests with phenomena of a transient nature;
N/A
- Performance criteria C for immunity tests with power interruptions exceeding a certain time.
N/A

Note: For details see subclause 7 ETSI EN 301 489-3

3.2.1. Emission Test – Radiated Emissions

This test assesses that ability of ancillary equipment to limit their internal noise from being radiated from the enclosure.

According to EMC basic standard (EN 55022)

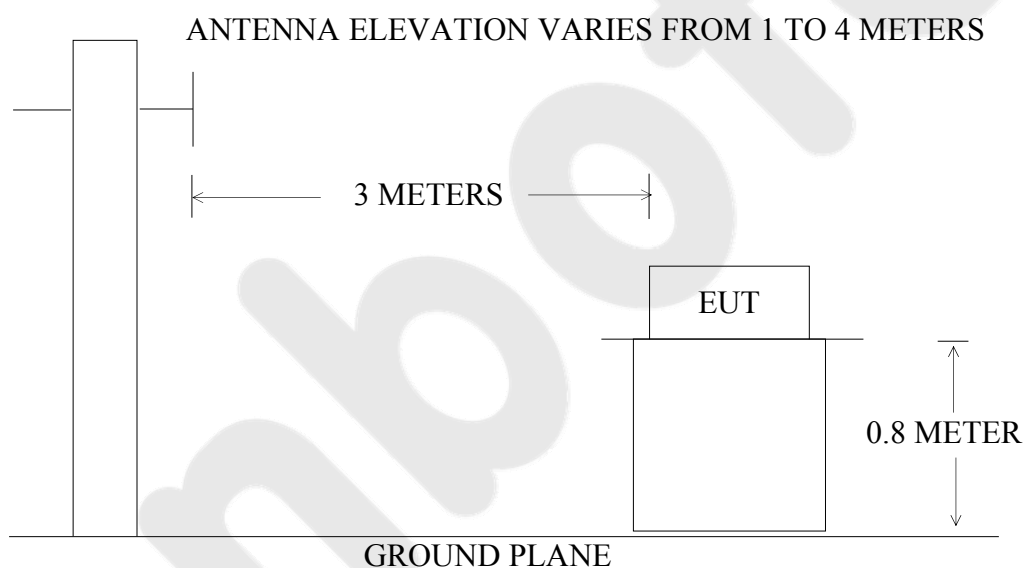
Measurement according to EMC basic standard, The test results correspond to the 3m-OATS result. The EUT and it simulators are placed on a turntable which is 0.8 meter above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna is set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to EN 55013 and EN 55022 on radiated measurement.

Radiated emissions were invested over the frequency range from 30MHz to 1GHz using a receiver bandwidth of 120kHz. Radiated was performed at an antenna to EUT distance of 3 meters.

Test Setup

EUT was setup on a 3m standard OATS



Limits

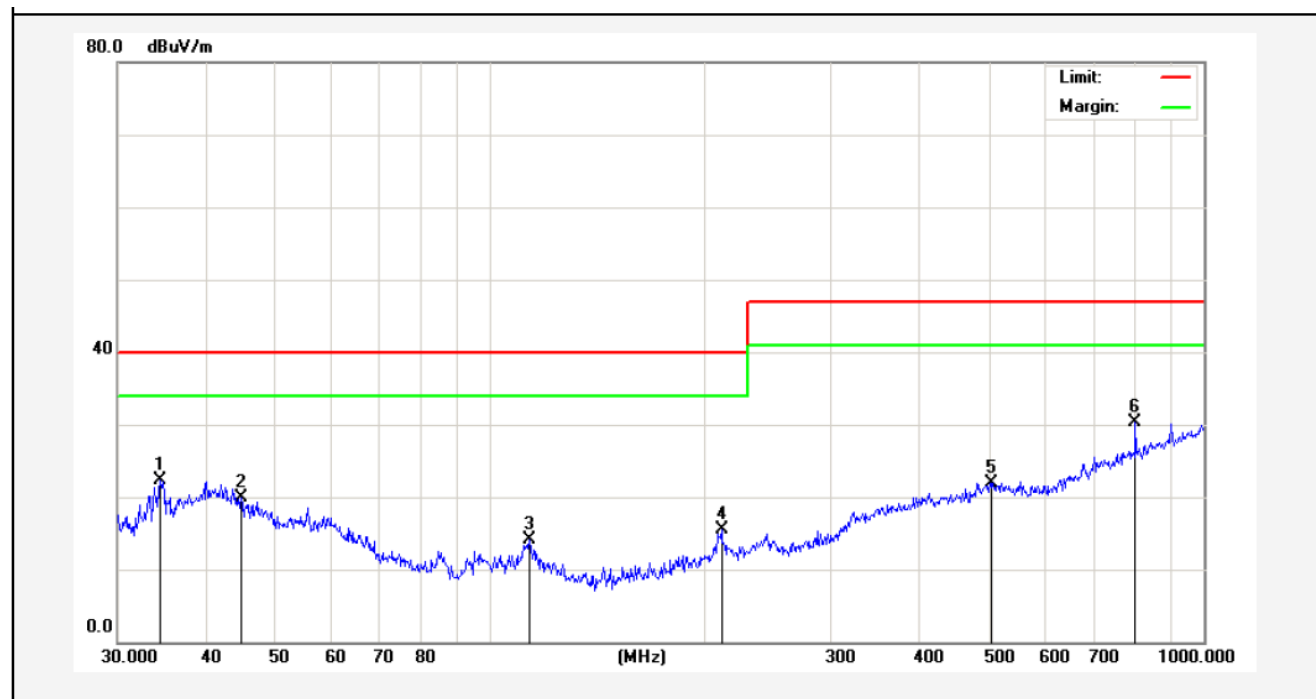
Freq. Range (MHz)	Distance (m)	Field Strength (dB μ V/m)
30 – 230	3	40
230 – 1000	3	47

Results

Receiving Antenna Directed to	Angle of Turntable	Hori. / Vert.	Comment	Result (Passed / Failed)
--	0° - 360°	H/V	EUT Operating Normal	Passed

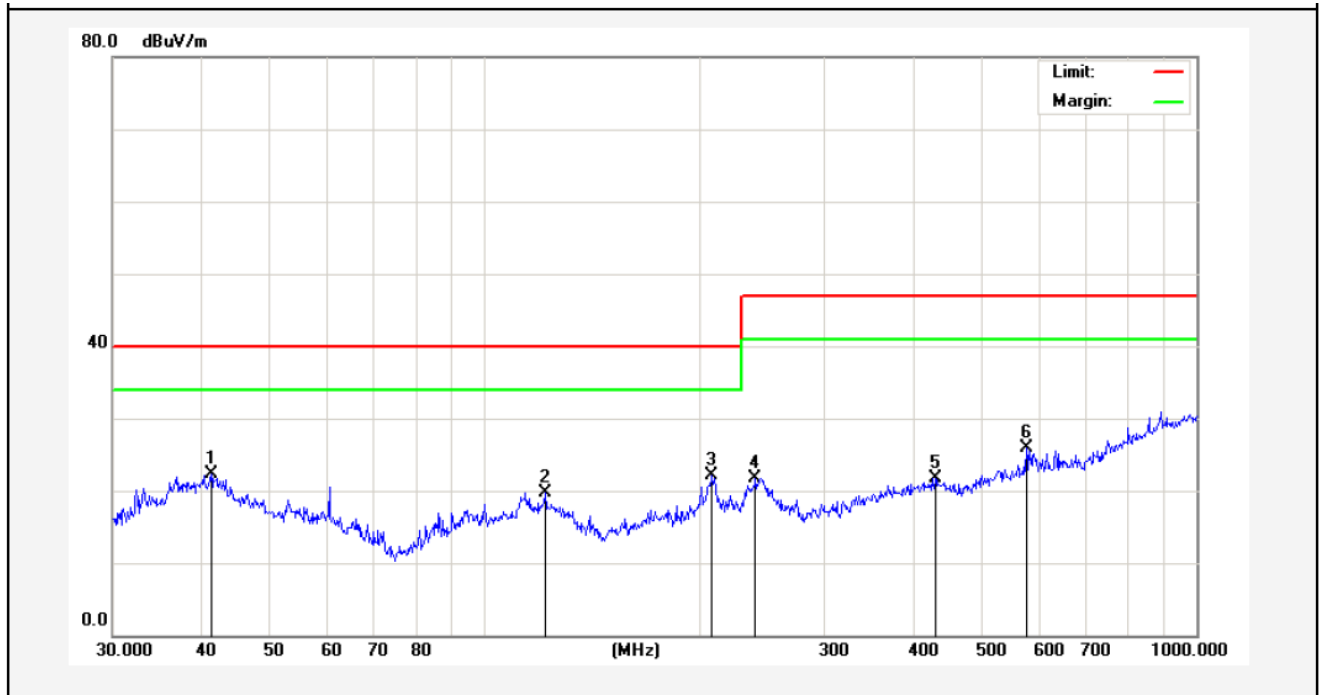
Please refer the following pages.

Job No.:	AT011408196S	Polarziation:	Horizontal
Standard:	(RE)EN 301 489-3_3m	Power Source:	DC 3V
Test item:	Radiation Test	Temp.(C)/Hum.(%RH):	24.3(C)/55%RH
Note:	ON	Distance:	3m



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	34.3964	36.89	-14.61	22.28	40.00	-17.72	peak			
2	44.7433	32.07	-12.23	19.84	40.00	-20.16	peak			
3	113.3163	34.98	-20.86	14.12	40.00	-25.88	peak			
4	210.7860	35.88	-20.46	15.42	40.00	-24.58	peak			
5	502.9395	32.95	-10.96	21.99	47.00	-25.01	peak			
6	801.7863	36.93	-6.54	30.39	47.00	-16.61	peak			

Job No.:	AT011408196S	Polarziation:	Vertical
Standard:	(RE)EN 301 489_3m	Power Source:	DC 3V
Test item:	Radiation Test	Temp.(C)/Hum.(%RH):	24.3(C)/55%RH
Note:	ON	Distance:	3m



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	41.2765	33.12	-10.87	22.25	40.00	-17.75	peak			
2	121.5486	36.26	-16.56	19.70	40.00	-20.30	peak			
3	208.5803	37.57	-15.55	22.02	40.00	-17.98	peak			
4	239.9874	35.71	-14.09	21.62	47.00	-25.38	peak			
5	429.5228	32.99	-11.24	21.75	47.00	-25.25	peak			
6	576.6443	35.61	-9.64	25.97	47.00	-21.03	peak			

3.2.2. Emission Test – DC Mains Power Line Conducted Emissions

This test is applicable for radio equipment and ancillary equipment for fixed use that may have DC cables longer than 3 m (see clause 5.1 - manufacturer's declaration) and for vehicular use irrespective of cable length.

According to EMC basic standard (EN 55022)

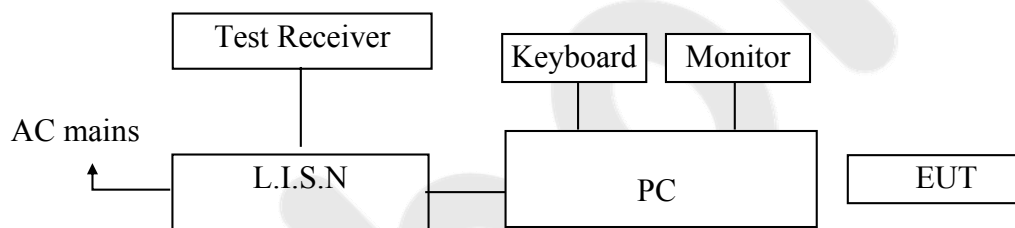
The test method shall be in accordance with EN 55022 [7] and the Artificial Mains Networks (AMNs) shall be connected to the DC mains power source.

The measurement frequency range extends from 150 kHz to 30 MHz. When the EUT is a transmitter operating at frequencies below 30 MHz, then the exclusion band for transmitters applies (see clause 4.3) for measurements in the transmit mode of operation.

For emission measurements on DC output ports of the EUT the relevant port shall be connected via an AMN to a load drawing the rated current of the source. In case where the AC output port is directly connected (or via a circuit breaker) to the DC power input port of the EUT the DC power output port need not to be tested.

Test Setup

EUT was setup as before.



Limits

Frequency (MHz)	Limit (dB μ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66.0 ~ 56.0 *	56.0 ~ 46.0 *
0.50 ~ 5.00	56.0	46.0
5.00 ~ 30.00	60.0	50.0

NOTE1-The lower limit shall apply at the transition frequencies.

NOTE2-The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

Results

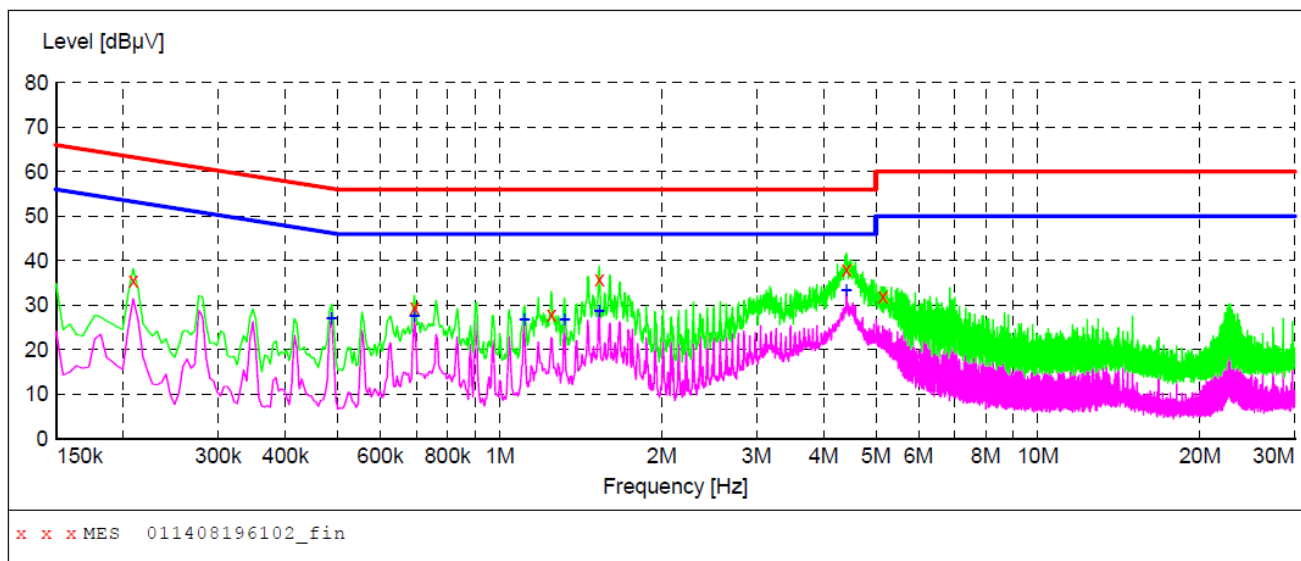
Please refer the following pages.

CONDUCTED EMISSION TEST DATA

Test Site: 1# Shielded Room
Operating Condition: ON
Test Specification: DC 3V
Comment: Live Line
Tem:25℃ Hum:50%

SCAN TABLE: "Voltage (150K~30M) FIN"

Short Description: 150K-30M Disturbance Voltages



MEASUREMENT RESULT: "011408196102_fin"

8/15/2014 10:32AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.208500	35.60	20.1	63	27.7	QP	L1	GND
0.694500	29.50	20.1	56	26.5	QP	L1	GND
1.247500	28.00	20.2	56	28.0	QP	L1	GND
1.531000	35.70	20.3	56	20.3	QP	L1	GND
4.411000	38.10	20.5	56	17.9	QP	L1	GND
5.153500	31.90	20.5	60	28.1	QP	L1	GND

MEASUREMENT RESULT: "011408196102_fin2"

8/15/2014 10:32AM

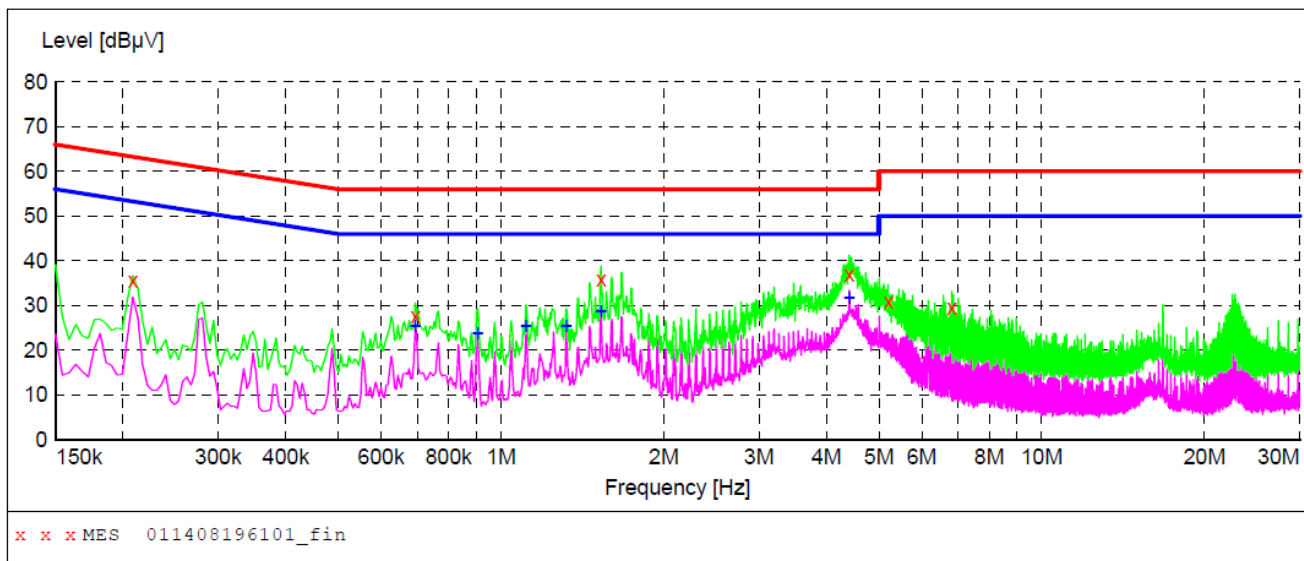
Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.487500	26.90	20.1	46	19.3	AV	L1	GND
0.694500	27.60	20.1	46	18.4	AV	L1	GND
1.112500	26.70	20.2	46	19.3	AV	L1	GND
1.319500	26.70	20.2	46	19.3	AV	L1	GND
1.531000	28.70	20.3	46	17.3	AV	L1	GND
4.411000	33.30	20.5	46	12.7	AV	L1	GND

CONDUCTED EMISSION TEST DATA

Test Site: 1# Shielded Room
Operating Condition: ON
Test Specification: DC 3V
Comment: Neutral Line
Tem:25°C Hum:50%

SCAN TABLE: "Voltage (150K~30M) FIN"

Short Description: 150K-30M Disturbance Voltages



MEASUREMENT RESULT: "011408196101_fin"

8/15/2014 10:20AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.208500	35.60	20.1	63	27.7	QP	N	GND
0.694500	27.50	20.1	56	28.5	QP	N	GND
1.531000	35.90	20.3	56	20.1	QP	N	GND
4.411000	36.80	20.5	56	19.2	QP	N	GND
5.203000	30.90	20.5	60	29.1	QP	N	GND
6.823000	29.60	20.5	60	30.4	QP	N	GND

MEASUREMENT RESULT: "011408196101_fin2"

8/15/2014 10:20AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.694500	25.50	20.1	46	20.5	AV	N	GND
0.906000	23.80	20.1	46	22.2	AV	N	GND
1.112500	25.50	20.2	46	20.5	AV	N	GND
1.319500	25.30	20.2	46	20.7	AV	N	GND
1.531000	28.70	20.3	46	17.3	AV	N	GND
4.411000	31.60	20.5	46	14.4	AV	N	GND

3.2.3. Immunity Test – Radiated, RF Electromagnetic Fields

According to EMC basic standard (IEC 61000-4-3)

- Type of Port: Enclosure
- Performance Criterion: CT/CR
- The distance between the turn-table axis and TX&RX antenna is 3m.
- Field strength = 3V/m (Above 2GHz=1V/m)
- Frequency = 80-1000MHz 1000-2000MHz 2000MHz-2700MHz
- Frequency Step = lin 1MHz
- Modulation = AM, 400Hz, 1kHz, 80%
- Test Mode: ON

Results

Frequency (MHz)	Antenna Polarity	Radiation to	Reaction of the EUT During and after test	Result
80-1000, 1400-2700	Horizontal	Front	No reactions recognized	Passed
80-1000, 1400-2700	Vertical	Front	No reactions recognized	Passed
80-1000, 1400-2700	Horizontal	Rear	No reactions recognized	Passed
80-1000, 1400-2700	Vertical	Rear	No reactions recognized	Passed
80-1000, 1400-2700	Horizontal	Left	No reactions recognized	Passed
80-1000, 1400-2700	Vertical	Left	No reactions recognized	Passed
80-1000, 1400-2700	Horizontal	Right	No reactions recognized	Passed
80-1000, 1400-2700	Vertical	Right	No reactions recognized	Passed

Note: Performance criteria A observed.

Test Procedure

The EUT and load, which are placed on a table that is 0.8 meter above ground, are placed with one coincident with the calibration plane such that the distance from antenna to the EUT was 3 meters. Both horizontal and vertical polarization of the antenna and four sides of the EUT are set on measurement.

In order to judge the EUT performance, a CCD camera is used to monitor EUT screen.

3.2.4. Immunity Test – Electrostatic Discharge

According to EMC basic standard (IEC 61000-4-2)

- Type of Port: Enclosure
- Performance Criterion: CT/CR
For the table top EUT the distance to the reference ground plane should be 80cm.
Direct contact discharge on conducting surfaces of EUT
Indirect air discharge on insulating surfaces of EUT
±2kV, ±4kV direct discharge & ±2kV, ±4kV, ±8kV air discharge
- Test Mode: ON

Test Results

Item	Contact Discharge to conducted surfaces and to coupling planes		Air Discharge at insulating surfaces
	Direct Contact Discharge	Indirect Contact Discharge	
Test Voltage	Reaction of EUT / Result	Reaction of EUT / Result	Reaction of EUT / Result
+2kV	n.r.r. Passed	n.r.r. Passed	n.r.r. Passed
-2kV	n.r.r. Passed	n.r.r. Passed	n.r.r. Passed
+4kV	n.r.r. Passed	n.r.r. Passed	n.r.r. Passed
-4kV	n.r.r. Passed	n.r.r. Passed	n.r.r. Passed
+6kV	-	-	-
-6kV	-	-	-
+8kV	-	-	n.r.r. Passed
-8kV	-	-	n.r.r. Passed

Remarks: n.r.r. = no reaction recognized

Performance Criteria A observed and No any function degraded during the tests.

APPENDIX I (TEST PHOTOGRAPHS)

1. Photo of Power Line Conducted Emission Test



2. Photo of Radiated Emission Test



3. Photo of Electrostatic Discharge Test



4. Photo of RF Field Strength susceptibility Test



APPENDIX II (EXTERNAL PHOTOS)

Figure 1
The EUT-Front View



Figure 2
The EUT-Back View



Figure 3
The EUT-Overall View



APPENDIX III (INTERNALPHOTOS)

Figure 4
The EUT-Inside View

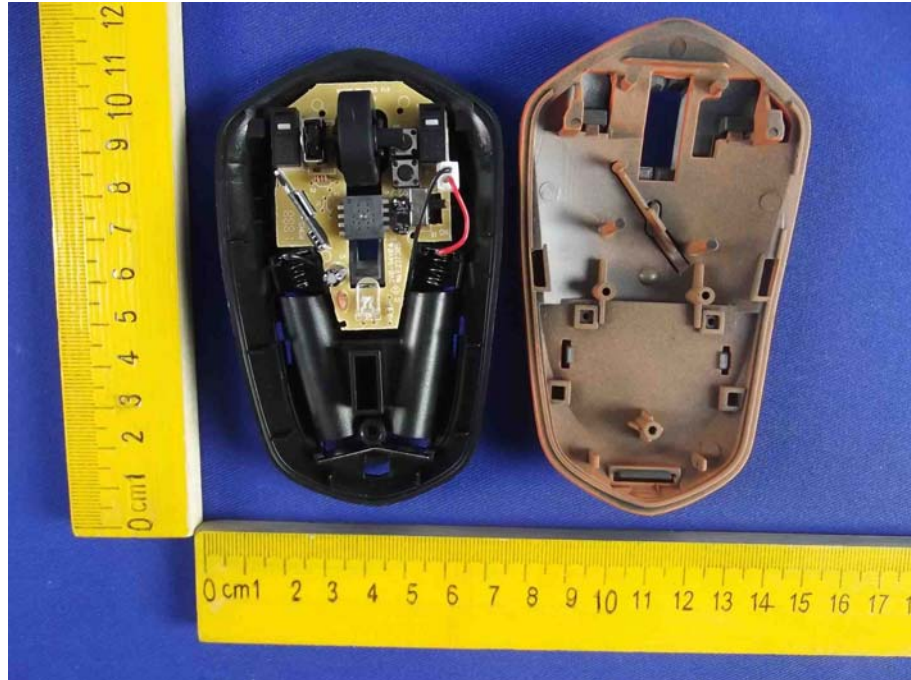


Figure 5
PCB of the EUT-Front View

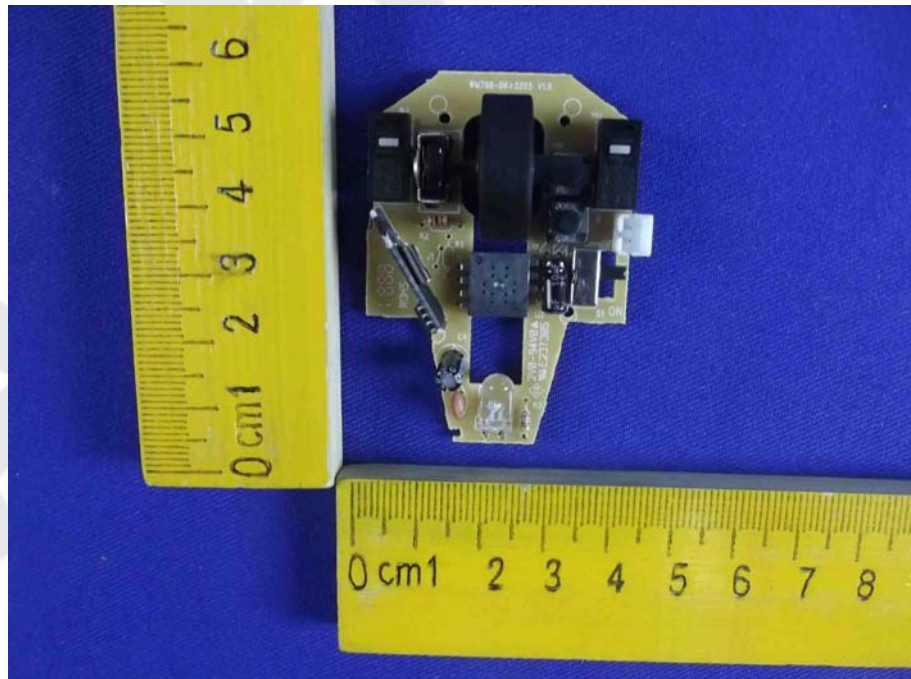


Figure 6
PCB of the EUT-Back View

