



EMC TEST REPORT

for

Bluetooth keyboard

MODEL:

(DR)KB-BT-001,KB-P6-BT,KB-3-BT,KB-BTF1/F2/F3-B/W,KB-BT3/BT4

Trade Mark: N/A

Test Report Number: BCTC-13041197

Issued Date: Nov. 15, 2013

Issued for

Gembird Europe B.V.

Wittevrouwen, 56, 1358CD, Almere Haven, The Netherlands

Issued By

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TABLE OF CONTENTS

1	TEST CERTIFICATION	3
2	TEST RESULT SUMMARY	4
3	EUT DESCRIPTION	5
4	TEST METHODOLOGY	6
	4.1. DECISION OF FINAL TEST MODE	6
	4.2. EUT SYSTEM OPERATION	6
5	SETUP OF EQUIPMENT UNDER TEST.....	7
	5.1. DESCRIPTION OF SUPPORT UNITS.....	7
	5.2. CONFIGURATION OF SYSTEM UNDER TEST	7
6	FACILITIES AND ACCREDITATIONS	8
	6.1. FACILITIES.....	8
	6.2. ACCREDITATIONS	8
7	EMISSION TEST.....	9
	7.1. CONDUCTED EMISSION MEASUREMENT	9
	7.2. RADIATED EMISSION MEASUREMENT	12
	7.3. HARMONICS CURRENT MEASUREMENT	16
	7.4. VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT	19
8	IMMUNITY TEST.....	21
	8.1. GENERAL DESCRIPTION.....	21
	8.2. GENERAL PERFORMANCE CRITERIA DESCRIPTION.....	22
	8.3. ELECTROSTATIC DISCHARGE (ESD).....	24
	8.4. RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD (RS).....	28
	8.5. ELECTRICAL FAST TRANSIENT (EFT).....	32
	8.6. SURGE IMMUNITY TEST	34
	8.7. CONDUCTED RADIO FREQUENCY IMMUNITY (CS).....	37
	8.8. VOLTAGE DIPS & VOLTAGE INTERRUPTIONS.....	39
9	EUT TEST Photos	41
10	Photos of the EUT.....	42



1 TEST CERTIFICATION

Product: Bluetooth keyboard

Model: (DR)KB-BT-001,KB-P6-BT,KB-3-BT,KB-BTF1/F2/F3-B/W,KB-BT3/BT4

Trade Mark: N/A

Applicant: Gembird Europe B.V.

Wittevrouwen, 56, 1358CD, Almere Haven, The Netherlands

Factory: Gembird Electronics Ltd.

5/F, Building B, Shifeng Industry District, Huaning Road, Dalang St.,
Longhua, Bao'an, Shenzhen, Guangdong, China

Tested: Nov. 15, 2013

Test Voltage: DC1.5V from battery

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
ETSI EN 301 489-1 V1.9.2 (2011-09)	No non-compliance noted
ETSI EN 301 489-17 V2.2.1 (2012-09)	No non-compliance noted

Deviation from Applicable Standard
None

The above equipment has been tested by Shenzhen BCTC Technology Co., Ltd., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:

Jeff Fu

Date: Nov. 15, 2013

Check By:

Sophie Lee

Date: Nov. 15, 2013

Approved By:

Casey Wang



Date: Nov. 15, 2013



2 TEST RESULT SUMMARY

Test Item	Test Result	
	Transmitter	Receiver
Conduct Emission	N/A	N/A
Radiation Emission	PASS	N/A
Electrostatic Discharge Immunity	PASS	N/A
Radiated Electromagnetic Field Immunity	PASS	N/A
Fast transients Transient/Burst Immunity	N/A	N/A
Surge Immunity	N/A	N/A
Conducted Radio Frequency Immunity	N/A	N/A
Voltage dips and interruptions Test	N/A	N/A

Note: 1. The test result judgment is decided by the limit of test standard.
2. The information of measurement uncertainty is available upon the customer's request.



3 EUT DESCRIPTION

Product	Bluetooth keyboard
Trade Mark	N/A
Model	(DR)KB-BT-001,KB-P6-BT,KB-3-BT,KB-BTF1/F2/F3-B/W,KB-BT3/BT4
Applicant	Gembird Europe B.V.
Housing material	Plastic
EUT Type	<input type="checkbox"/> Engineering Sample. <input checked="" type="checkbox"/> Product Sample <input type="checkbox"/> Mass Product Sample.
Serial Number	N/A
Antenna Type	Internal Antenna
Operating Voltage	DC1.5V from battery
Temperature Range(Operating)	0 ~ 30°C
Type of the Equipment	Portable Equipment
Operating Frequency	2.4GHz

Note: N/A stand for no applicable.



4 TEST METHODOLOGY

4.1. DECISION OF FINAL TEST MODE

The EUT was tested together with the below additional components, and configuration, which produced the worst emission levels, was selected and recorded in this report.

The measurement was performed at 3 axis for lie orientation, side orientation and stand orientation. The lie orientation is the worst mode, so only the worst mode test data was reported.

the following test mode was recorder in this report.

Test Item	Test mode	
	Transmitter	Receiver
Emission	N/A	N/A
Immunity	Tx Mode	N/A

4.2. EUT SYSTEM OPERATION

1. Set up EUT with the support equipments.
2. Make sure the EUT work normally during the test.



5 SETUP OF EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF SUPPORT UNITS

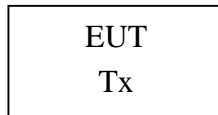
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Equipment	Model No.	Serial No.	FCC ID	Trade Name	Data Cable	Power Cord
1.	--	--	--	--	--	--	--

Note:

- 1) All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
- 2) Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

5.2. CONFIGURATION OF SYSTEM UNDER TEST



(EUT: Bluetooth keyboard)



6 FACILITIES AND ACCREDITATIONS

6.1. FACILITIES

All measurement facilities used to collect the measurement data are located at A.Floor 3, 44 Building, Tanglang Industrial Park B, Taoyuan Street, Nanshan District, Shenzhen, China

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

6.2. ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

USA

FCC (certificate registration number is 131636)
TIMCO (certificate registration number is Q2004)

Germany

TUV Rheinland

Canada

INDUSTRY CANADA
(certificated registration number is 46403-7712)



7 EMISSION TEST

7.1. CONDUCTED EMISSION MEASUREMENT

7.1.1. LIMITS

FREQUENCY (MHz)	Class B (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

NOTE:

- (1) The lower limit shall apply at the transition frequencies.
- (2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
- (3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

7.1.2. TEST INSTRUMENTS

Conducted Emission Shielding Room Test Site (743)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCI	100005	06/24/2013
LISN	AFJ	LS16	16010222119	06/24/2013
LISN(EUT)	Mestec	AN3016	04/10040	06/24/2013

- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).
2. N.C.R = No Calibration Request.



7.1.3. TEST PROCEDURES

Procedure of Preliminary Test

The EUT and Support equipment, if needed, was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane. When the EUT is a floor standing equipment, it is placed on the ground plane, which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.

The EUT test program was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

The test mode(s) described in Item 3.1 were scanned during the preliminary test.

After the preliminary scan, we found the test mode described in Item 3.1 producing the highest emission level.

The EUT configuration and cable configuration of the above highest emission levels were recorded for reference of the final test.

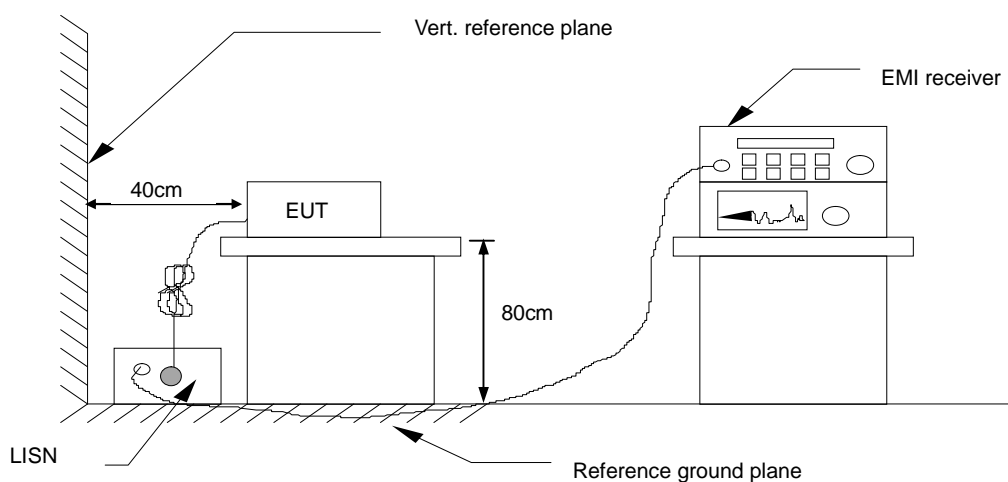
Procedure of Final Test

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.

A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

The test data of the worst-case condition(s) was recorded.

7.1.4. TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.1.5. TEST RESULTS

No applicable (EUT Power Rating: DC1.5V from battery).

Reference to clauses EN 301 489-1§ 8.3 DC power input/output ports.



7.2. RADIATED EMISSION MEASUREMENT

7.2.1. LIMITS

FREQUENCY (MHz)	dBuV/m (At 3m)
	Limit
30 ~ 230	40
230 ~ 1000	47

NOTE: (1) The lower limit shall apply at the transition frequencies.

(2) Emission level (dBuV/m) = 20 log Emission level (uV/m).

7.2.2. TEST INSTRUMENTS

Radiated Emission Test Site (966)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCI	100005	06/24/2013
Spectrum Analyzer	R&S	FSU	100114	06/13/2013
Pre Amplifier	H.P.	HP8447E	2945A02715	06/24/2013
Bilog Antenna	SUNOL Sciences	JB3	A021907	06/10/2013
Cable	TIME MICROWAVE	LMR-400	N-TYPE04	06/09/2013
System-Controller	CCS	N/A	N/A	N.C.R
Turn Table	CCS	N/A	N/A	N.C.R
Antenna Tower	CCS	N/A	N/A	N.C.R

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

2. N.C.R = No Calibration Request.



7.2.3. TEST PROCEDURE

Procedure of Preliminary Test

The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.

Support equipment, if needed, was placed as per EN55022.

All I/O cables were positioned to simulate typical usage as per EN55022.

Mains cables, telephone lines or other connections to auxiliary equipment located outside the test are shall drape to the floor, be fitted with ferrite clamps or ferrite tubes placed on the floor at the point where the cable reaches the floor and then routed to the place where they leave the turntable. No extension cords shall be used to mains receptacle.

The antenna was placed at 3 meter away from the EUT as stated in EN 55022. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.

The Analyzer / Receiver quickly scanned from 30MHz to 1000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

The test mode(s) described in Item 3.1 were scanned during the preliminary test:

After the preliminary scan, we found the test mode described in Item 3.1 producing the highest emission level. The EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for the final test.

Procedure of Final Test

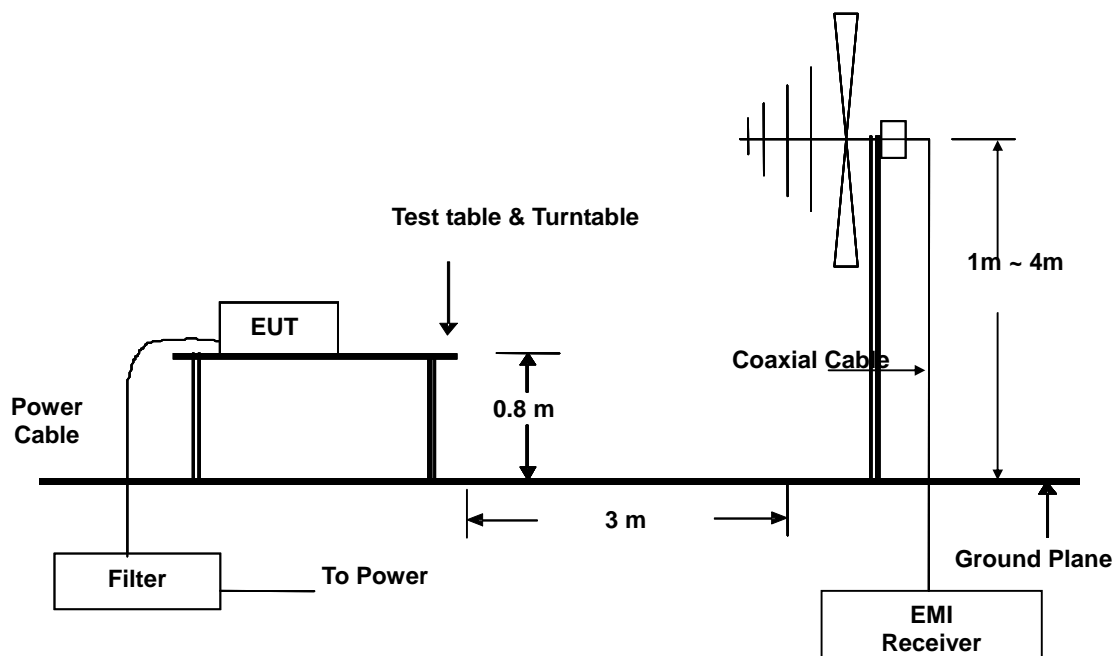
EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test.

The Analyzer / Receiver scanned from 30MHz to 1000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and only Q.P. reading is presented.

The test data of the worst-case condition(s) was recorded.

7.2.4. TEST SETUP

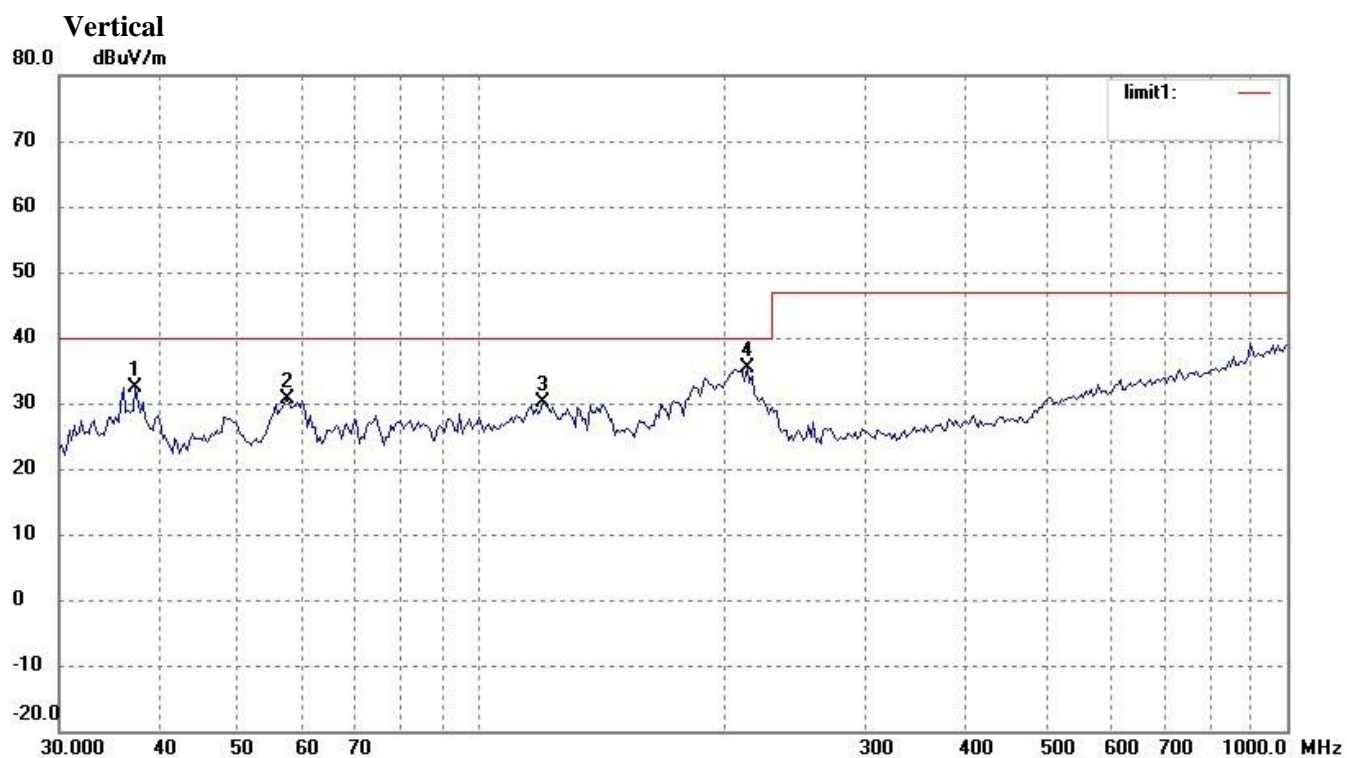
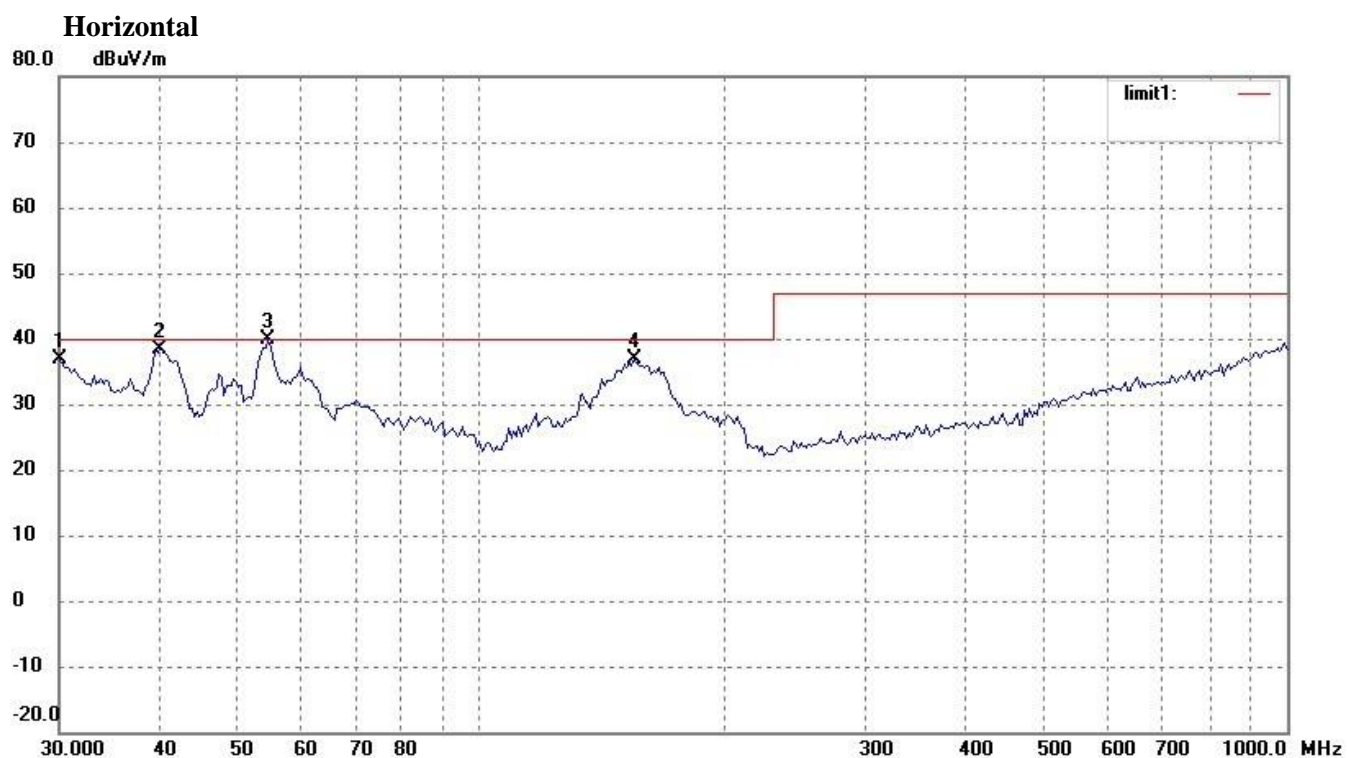


For the actual test configuration, please refer to the related item – Photographs of the Test Configuration

7.2.5 TEST RESULTS

PASSED

Please refer to the following page





7.3. HARMONICS CURRENT MEASUREMENT

7.3.1. LIMITS OF HARMONICS CURRENT MEASUREMENT

Limits for Class A equipment		Limits for Class D equipment		
Harmonics Order n	Max. permissible harmonics current A	Harmonics Order n	Max. permissible harmonics current per watt mA/W	Max. permissible harmonics current A
Odd harmonics		Odd Harmonics only		
3	2.30	3	3.4	2.30
5	1.14	5	1.9	1.14
7	0.77	7	1.0	0.77
9	0.40	9	0.5	0.40
11	0.33	11	0.35	0.33
13	0.21	13	0.30	0.21
15<=n<=39	0.15x15/n	15<=n<=39	3.85/n	0.15x15/n
Even harmonics				
2	1.08			
4	0.43			
6	0.30			
8<=n<=40	0.23x8/n			

NOTE: 1. Class A and Class D are classified according to item 4.4.3.
2. According to section 7 of EN 61000-3-2, the above limits apply for all equipments with a rated power more than 75W, except for lighting equipment.

7.3.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Harmonic & Flicker Tester	California instruments	PACS-3	SB2588/01	06/20/2013
AC Power Source	California instruments	5001iX-CTS-40	SB2588	06/20/2013

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).



7.3.3. TEST PROCEDURE

The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under Normal operating conditions for each successive harmonic component in turn.

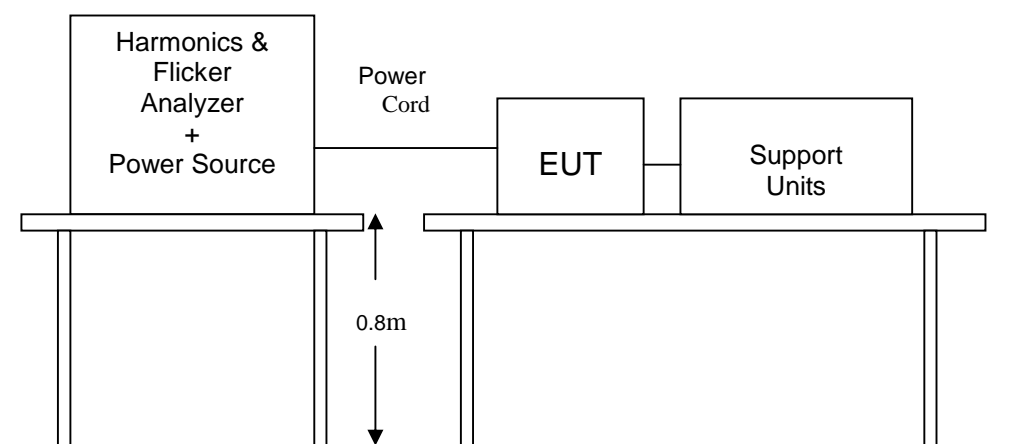
The classification of EUT is according to section 5 of EN 61000-3-2.

The EUT is classified as follows:

- Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.
- Class B: Portable tools; Arc welding equipment which is not professional equipment.
- Class C: Lighting equipment.
- Class D: Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors and television receivers.

The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.

7.3.4. TEST SETUP



For the actual test configuration, please refer to the related item .

7.3.5. TEST RESULTS

No applicable (EUT Power Rating: DC1.5V from battery).

Reference to clauses EN 301 489-1 § 8.5 Harmonic current emissions (AC mains input port)



7.4. VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

7.4.1. LIMITS OF VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

TEST ITEM	LIMIT	REMARK
P_{st}	1.0	P_{st} means short-term flicker indicator.
P_{lt}	0.65	P_{lt} means long-term flicker indicator.
T_{dt} (ms)	500	T_{dt} means maximum time that dt exceeds 3 %.
d_{max} (%)	4%	d_{max} means maximum relative voltage change.
dc (%)	3.3%	dc means relative steady-state voltage change

7.4.2. TEST INSTRUMENTS

IMMUNITY SHIELDED ROOM				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Harmonic & Flicker Tester	California instruments	PACS-3	SB2588/01	06/20/2013
AC Power Source	California instruments	5001iX-CTS-40	SB2588	06/20/2013

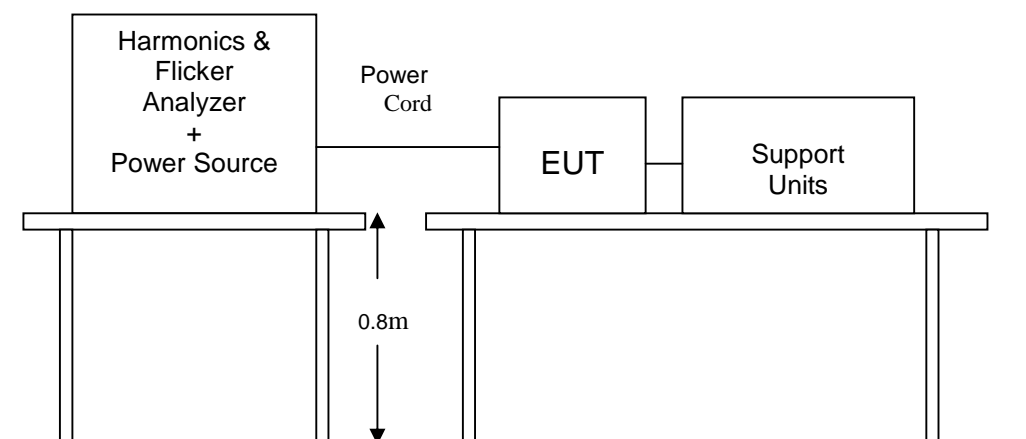
NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

7.4.3. TEST PROCEDURE

The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the most unfavorable sequence of voltage changes under Normal operating conditions.

During the flick measurement, the measure time shall include that part of whole operation cycle in which the EUT produce the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.

7.4.4. TEST SETUP



For the actual test configuration, please refer to the related item .

7.4.5. TEST RESULTS

No applicable (EUT Power Rating: DC1.5V from battery).

Reference to clauses EN 301 489-1 § 8.6 Voltage fluctuations and flicker (AC mains input port)



8 IMMUNITY TEST

8.1. GENERAL DESCRIPTION

Product Standard	ETSI EN 301 489-1 V1.9.2	
	Test Type	Minimum Requirement
Basic Standard, Specification, and Performance Criterion required	EN 61000-4-2	Electrostatic Discharge – ESD: ± 2 kV, ± 4 kV, ± 8 kV air discharge, ± 2 kV, ± 4 kV Contact discharge, Performance Criterion B
	EN 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80 ~1000 MHz, 1400 ~2700 MHz 3V/m, 80% AM(1kHz), Performance Criterion A
	EN 61000-4-4	Electrical Fast Transient/Burst - EFT, Power line: 1kV, Signal line: 0.5kV, Performance Criterion B
	EN 61000-4-5	Surge Immunity Test: 1.2/50 μ s Open Circuit Voltage, 8 /20 μ s Short Circuit Current, Power Port ~ Line to line: 1kV, Line to ground: 2kV Signal Port ~ Lines to ground : 1kV Performance Criterion B
	EN 61000-4-6	Conducted Radio Frequency immunity Test –CS: 0.15 ~ 80 MHz, 3Vrms, 80% AM, 1kHz, Performance Criterion A
	EN 61000-4-11	Voltage Dips: i) >95% reduction for 0.5 period, Performance Criterion B ii) 30% reduction for 25 period, Performance Criterion C Voltage Interruptions: >95% reduction for 250 period Performance Criterion C



8.2. GENERAL PERFORMANCE CRITERIA DESCRIPTION

Class 1 SRD equipment		
Criteria	During test	After test
A	Operate as intended No loss of function For equipment type II the minimum performance shall be 12dB SINAD No unintentional responses	Operate as intended For equipment type II the communication link shall be maintained No loss of function No degradation of performance No loss of stored data or user programmable function
B	May be loss of function (one or more) No unintentional responses	Operate as intended Lost function(s) shall be self-recoverable No degradation of performance No loss of stored data or user programmable functions
Class 2 SRD equipment		
Criteria	During test	After test
A	Operate as intended No loss of function For equipment type II the minimum performance shall be 6dB SINAD No unintentional responses	Operate as intended For equipment type II the communication link shall be maintained No loss of function No degradation of performance No loss of stored data or user programmable function
B	May be loss of function (one or more) No unintentional responses	Operate as intended Lost function(s) shall be self-recoverable No degradation of performance No loss of stored data or user programmable functions
Class 3 SRD equipment		
Criteria	During test	After test
A and B	May be loss of function (one or more) No unintentional responses	Operate as intended, for equipment type II the communication link may be lost, but shall be recoverable by user No degradation of performance Lost functions shall be self-recoverable

**Performance criteria for Continuous phenomena applied to Transmitters(CT)**

For equipment of type I or II including ancillary equipment tested on a stand alone basis, the performance criteria A of the applicable class as given above performance table shall apply.

For equipment of type II or type III that requires a communication link that is maintained during the test, it shall be verified by appropriate means supplied by the manufacturer that the communication link is maintained during each individual exposure in the test sequence.

Where the EUT is a transmitter, tests shall be repeated with the EUT in standby mode to ensure that any unintentional.

Performance criteria for Transient phenomena applied to Transmitter(TT)

For equipment of type I or II, including ancillary equipment tested on a stand alone basis, the performance criteria B of the applicable class as given above performance table shall apply, except for power interruptions exceeding a certain time the performance criteria deviations are specified in other chapter.

For equipment of type II or type III that requires a communication link that is maintained during the test ,this shall be verified by appropriate means supplied by the manufacturer during each individual exposure in the test sequence.

Where the EUT is a transceiver, under no circumstances shall the transmitter operate unintentionally during the test.

Performance criteria for Continuous phenomena applied to Receivers(CR)

For equipment of type I or II, including ancillary equipment tested on a stand alone basis, The performance criteria A of the applicable class as given in above performance table shall apply.

For equipment of type II and III that requires a communication link that is maintained during the test, it shall be verified by appropriate means supplied by the manufacturer that the communication link is maintained during each individual exposure in the test sequence.

Where the EUT is transceiver, under no circumstances shall the transmitter operate unintentionally during the test.

Performance criteria for Transient phenomena applied to Receivers(TR)

For equipment of type I or II, including ancillary equipment tested on a stand alone basis, the performance criteria B of the applicable class as given above performance table shall apply, except for power interruptions exceeding a certain time the performance criteria deviations are specified in other chapter.

For equipment of type II or type III that requires a communication link that is maintained during the test ,this shall be verified by appropriate means supplied by the manufacturer during each individual exposure in the test sequence.

Where the EUT is a transceiver, under no circumstances shall the transmitter operate unintentionally during the test.



8.3. ELECTROSTATIC DISCHARGE (ESD)

8.3.1. TEST SPECIFICATION

Basic Standard:	EN 61000-4-2: 2009
Discharge Impedance:	330 ohm
Charging Capacity:	150pF
Discharge Voltage:	Air Discharge: ± 2 kV, ± 4 kV, ± 8 kV (Direct) Contact Discharge: ± 2 kV, 4 kV (Direct/Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Minimum 10 times at each test point
Discharge Mode:	1 time/s
Performance Criterion:	B

8.3.2. TEST INSTRUMENT

IMMUNITY SHIELDED ROOM				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
ESD 2000	EMC PARTNER	ESD2000	182	06/11/2013

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).



8.3.3. TEST PROCEDURE

The discharges shall be applied in two ways:

a) Contact discharges to the conductive surfaces and coupling planes:

Twenty dischargers (10 with positive and 10 with negative polarity) shall be applied on each accessible metallic part of the enclosure, terminals are excluded. In case of a non-conductive enclosure, dischargers shall be applied on the horizontal or vertical coupling planes. Test shall be performed at a maximum repetition rate of one discharge per second.

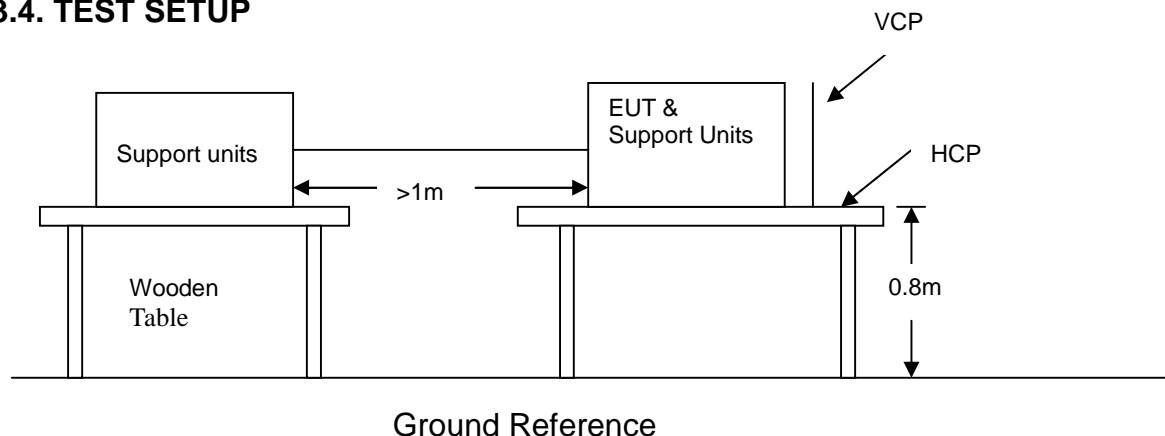
b) Air discharges at slots and apertures and insulating surfaces:

On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally handled by the user. A minimum of 10 single air discharges shall be applied to the selected test point for each such area.

The basic test procedure was in accordance with EN 61000-4-2:

- a) The EUT was located 0.1 m minimum from all side of the **HCP** (dimensions 1.6m x 0.8m).
- b) The support units were located another table 30 cm away from the EUT, but direct support unit was/were located at same location as EUT on the HCP and keep at a distance of 10 cm with EUT.
- c) The time interval between two successive single discharges was at least 1 second.
- d) Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- e) Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.
- f) At least ten single discharges (in the most sensitive polarity) were applied at the front edge of each **HCP** opposite the center point of each unit of the EUT and 0.1 meters from the front of the EUT. The long axis of the discharge electrode was in the plane of the **HCP** and perpendicular to its front edge during the discharge.
- g) At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **Vertical Coupling Plane (VCP)** in sufficiently different positions that the four faces of the EUT were completely illuminated. The **VCP** (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.

8.3.4. TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the **Ground Reference Plane**. The **GRP** consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A **Horizontal Coupling Plane** (1.6m x 0.8m) was placed on the table and attached to the **GRP** by means of a cable with 940k Ω total impedance. The equipment under test, was installed in a representative system as described in section 7 of EN 61000-4-2, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of EN 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.



8.3.5. TEST RESULTS

Temperature:	25°C	Humidity	55% RH
Pressure	996mbar	Test result	Pass
Test mode	Transmitting	Test By	Daisy Zheng

Air Discharge						
Test locations		Test Levels	Results			
		± 8 kV	Pass	Fail	Performance Criterion	Observation
Slots	8Points	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	See 7.2	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2
Button	14Points	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	See 7.2	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2
PORT	10Points	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	See 7.2	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2

Contact Discharge						
Test locations		Test Levels	Results			
		± 4 kV	Pass	Fail	Performance Criterion	Observation
HCP	10Points	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	See 7.2	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2
VCP	10Points	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	See 7.2	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2

NOTE: 1. There was no change compared with initial operation during the test.
2. The loss of function of the EUT during the test and it was recovered by itself operation after the test.



8.4. RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD (RS)

8.4.1. TEST SPECIFICATION

Basic Standard:	EN 61000-4-3: 2006+A1:2008+A2:2010
Frequency Range:	80 MHz ~1000 MHz, 1400 MHz -2700 MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.5m
Performance Criterion:	A

8.4.2. TEST INSTRUMENT

743 RS Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Signal Generator	Maconi	2022D	119246/003	06/09/2013
Power Amplifier	M2S	A00181-1000	9801-112	06/09/2013
Power Amplifier	M2S	AC8113/ 800-250A	9801-179	06/09/2013
Power Antenna	SCHAFFNER	CBL6140A	1204	06/09/2013

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).
2. N.C.R.= No Calibration required

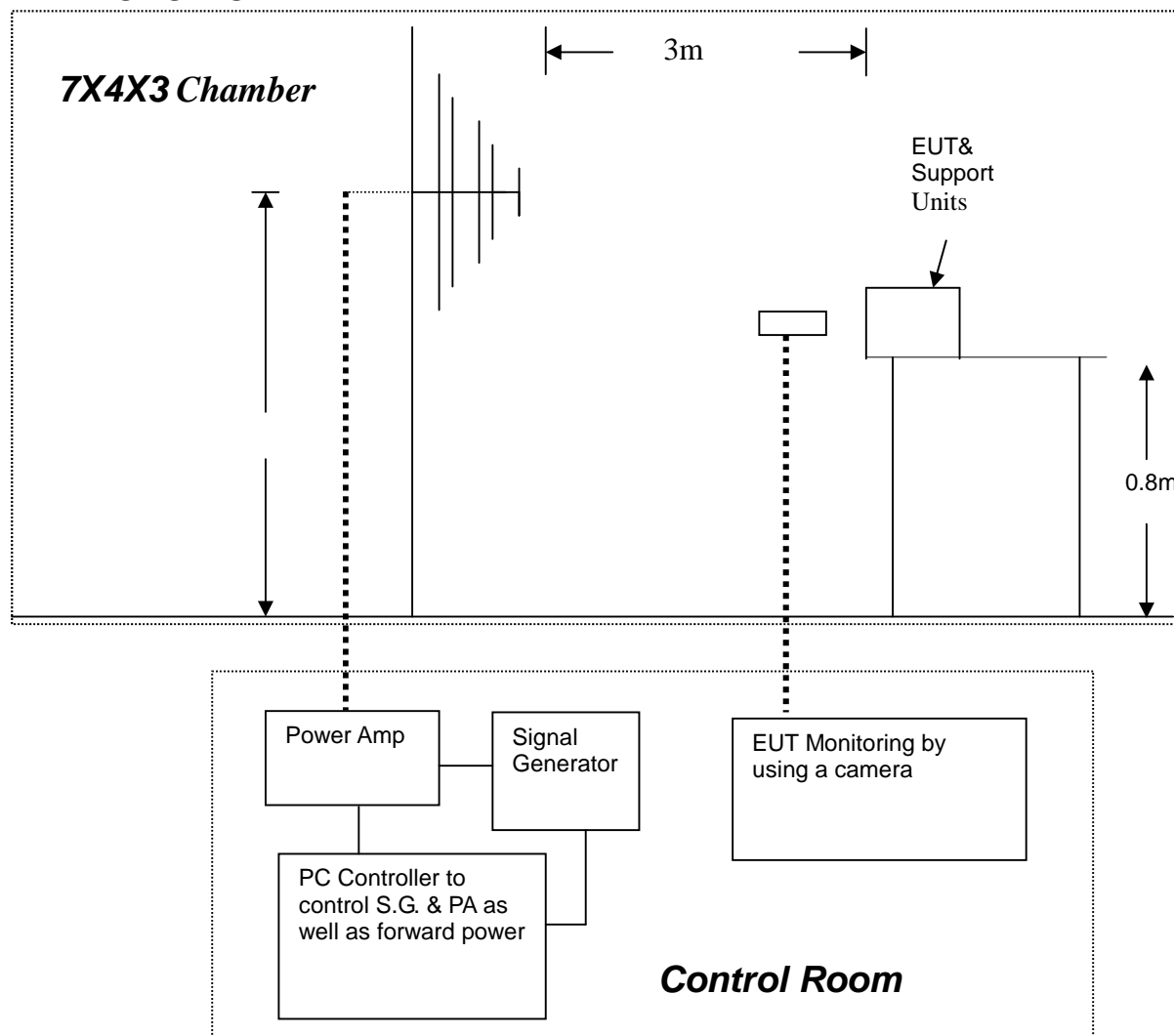


8.4.3. TEST PROCEDURE

The test procedure was in accordance with EN 61000-4-3

- a) The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.
- b) The frequency range is swept from 80 MHz to 1000 MHz and 1400 MHz to 2700 MHz, with the signal 80% amplitude modulated with a 1kHz sine-wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s, where the frequency range is swept incrementally, the step size was 1% of preceding frequency value.
- c) The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- e) The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

8.4.4. TEST SETUP



For the actual test configuration, please refer to the related item.

NOTE:

TABLETOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.



8.4.5. TEST RESULTS

Temperature:	25°C	Humidity	55% RH
Pressure	996mbar	Test result	Pass
Test mode	Transmitting	Test By	Daisy Zheng

Frequency (MHz)	Polarity	Position	Field Strength (V/m)	Observation	Result
80 ~ 1000	V&H	Front	3	See Note	PASS
1400~2700					
80 ~ 1000	V&H	Rear	3	See Note	PASS
1400~2700					
80 ~ 1000	V&H	Left	3	See Note	PASS
1400~2700					
80 ~ 1000	V&H	Right	3	See Note	PASS
1400~2700					

NOTE: 1.There was no change compared with the initial operation during the test.



8.5. ELECTRICAL FAST TRANSIENT (EFT)

8.5.1. TEST SPECIFICATION

Basic Standard:	EN 61000-4-4: 2004+A1:2010
Test Voltage:	Power Line: 1 kV Signal/Control Line: 0.5 kV
Polarity:	Positive & Negative
Impulse Frequency:	5 kHz
Impulse Wave-shape:	5/50 ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	Not less than 1 min.
Performance Criterion:	B

8.5.2. TEST INSTRUMENT

Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMC PARTNER TRANSIENT 2000	EMC PARTNER	TRA2000	881	06/11/2013

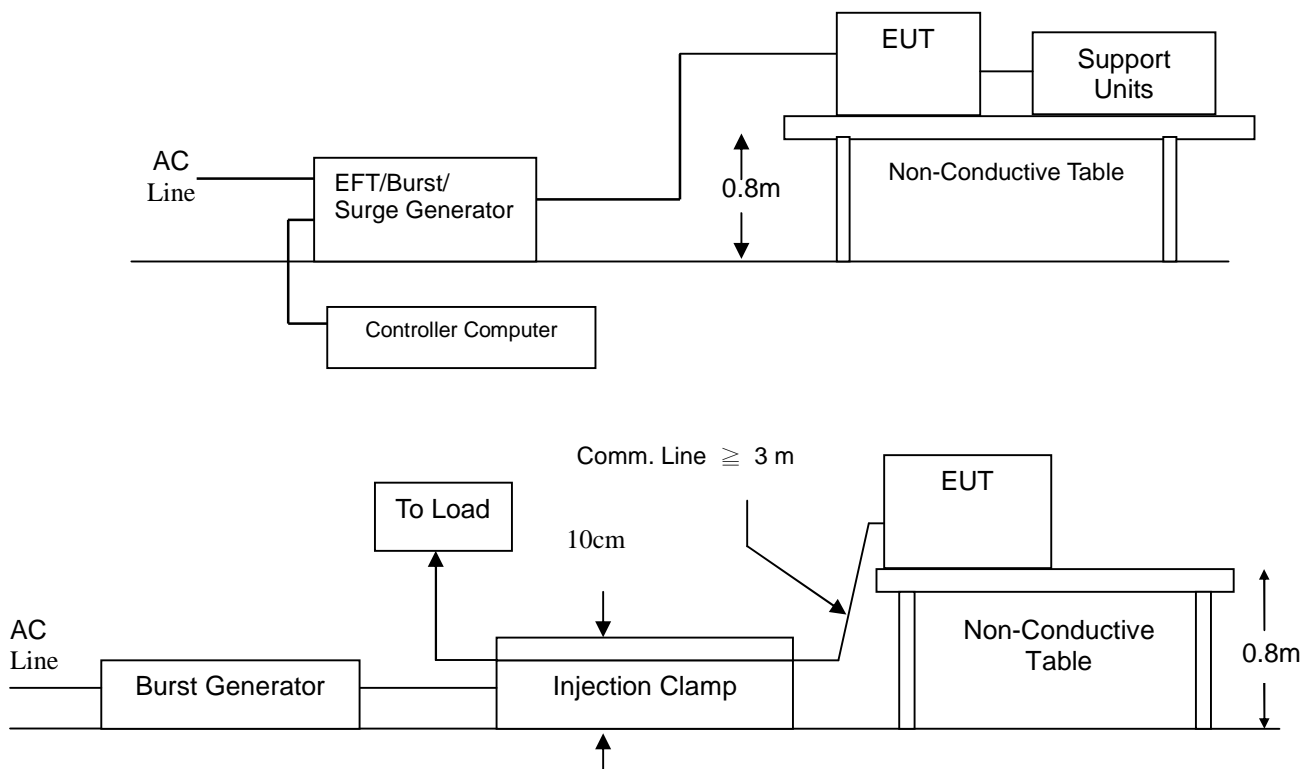
NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

2. N.C.R.= No Calibration required

8.5.3. TEST PROCEDURE

- Both positive and negative polarity discharges were applied.
- The length of the "hot wire" from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 1 meter.
- The duration time of each test sequential was 1 minute.
- The transient/burst waveform was 5/50ns in accordance with EN 61000-4-4, 5/50ns.

8.5.4. TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLETOP EQUIPMENT

The configuration consisted of a wooden table (0.8m high) standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system. A minimum distance of 0.5m was provided between the EUT and the walls of the laboratory or any other metallic structure.

FLOOR STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1-meter thick. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system.

8.5.5. TEST RESULTS

No applicable(EUT Power Rating: DC1.5V from battery).

Reference to clauses EN 301 489-1§ 9.4 Fast transients, common mode (EN 61000-4-4)



8.6. SURGE IMMUNITY TEST

8.6.1 TEST SPECIFICATION

Basic Standard:	EN 61000-4-5: 2006
Wave-Shape:	Combination Wave 1.2/50 us Open Circuit Voltage 8/20 us Short Circuit Current
Test Voltage:	Power line ~ line to line: 1 kV; line to ground: 2kV Telecommunication line: 1 kV;
Surge Input/Output:	Power Line: L1-L2 / L1-PE / L2-PE Telecommunication line: T-Ground / R-Ground
Generator Source Impedance:	2 ohm between networks 12 ohm between network and ground
Polarity:	Positive/Negative
Phase Angle:	0 /90 /180 /270
Pulse Repetition Rate:	1 time / min. (maximum)
Number of Tests:	5 positive and 5 negative at selected points
Performance Criterion:	B

8.6.2. TEST INSTRUMENT

Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMC PARTNER TRANSIENT 2000	EMC PARTNER	TRA2000	881	06/11/2013

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).
2. N.C.R.= No Calibration required



8.6.3. TEST PROCEDURE

a) For EUT power supply:

The surge is applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

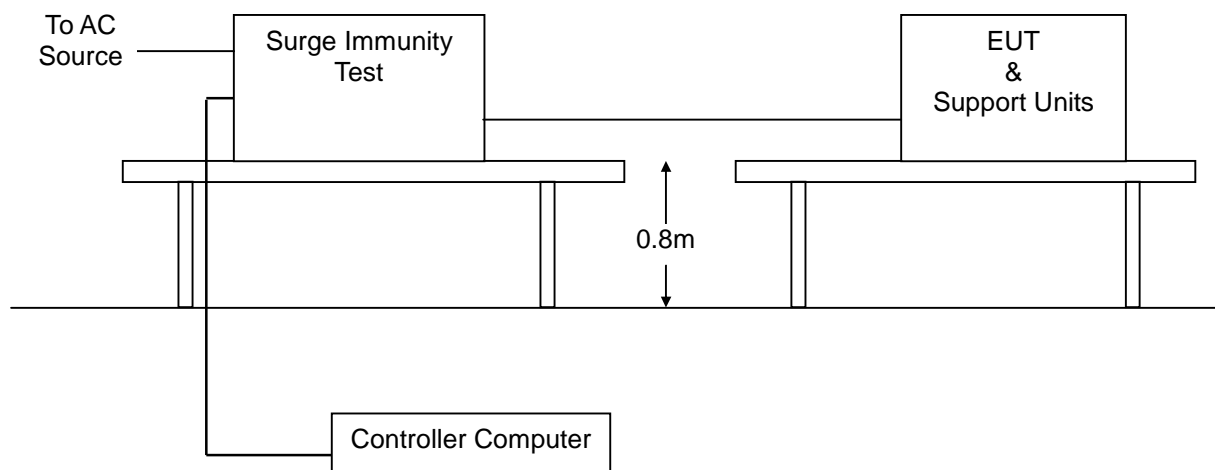
b) For test applied to unshielded un-symmetrically operated interconnection lines of EUT:

The surge was applied to the lines via the capacitive coupling. The coupling / decoupling networks didn't influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

c) For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT:

The surge was applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor were not specified. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

8.6.4. TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

8.6.5. TEST RESULTS

No applicable (EUT Power Rating: DC1.5V from battery)
Reference to clauses EN 301 489-1§ 9.6 Surges (EN 61000-4-5)



8.7. CONDUCTED RADIO FREQUENCY IMMUNITY (CS)

8.7.1. TEST SPECIFICATION

Basic Standard:	EN 61000-4-6: 2009
Frequency Range:	0.15 MHz ~ 80 MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Coupled cable:	Power Mains, Shielded
Coupling device:	CDN-M2 (3 wires)
Performance Criterion:	A

8.7.2. TEST INSTRUMENT

CS Test				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Signal Generator	Maconi	2022D	119246/003	06/09/2013
Power Amplifier	M2S	A00181-1000	9801-112	06/09/2013
CDN	MEB	M3-8016	003683	06/09/2013

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).
2. N.C.R.= No Calibration required

8.7.3. TEST PROCEDURE

The EUT shall be tested within its intended operating and climatic conditions.

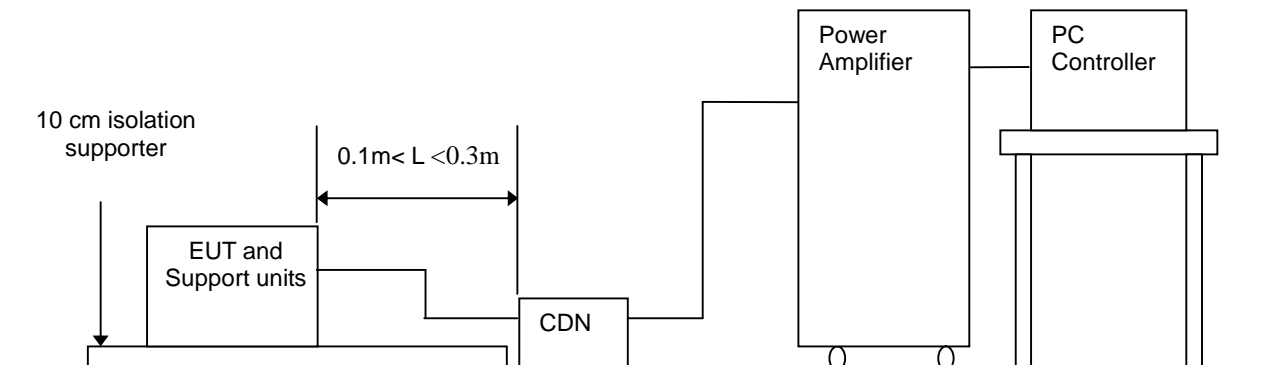
The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.

The frequency range was swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal was modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate was 1.5×10^{-3} decades/s. Where the frequency range is swept incrementally, the step size was 1 % of preceding frequency value from 150 kHz to 80 MHz.

The dwell time at each frequency was less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequency(ies) and harmonics or frequencies of dominant interest, was analyzed separately.

Attempts were made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.

8.7.4. TEST SETUP



- Note:** 1. The EUT is setup 0.1m above Ground Reference Plane
 2. The CDNS and / or EM clamp used for real test depends on ports and cables configuration of EUT.

For the actual test configuration, please refer to the related item.

NOTE:

TABLE-TOP AND FLOOR-STANDING EQUIPMENT

The equipment to be tested is placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.

8.7.5. TEST RESULTS

No applicable (EUT Power Rating: DC1.5V from battery)
 Reference to clauses EN 301 489-1§ 9.5 Radio frequency, common mode
 (EN 61000-4-6)



8.8. VOLTAGE DIPS & VOLTAGE INTERRUPTIONS

8.8.1. TEST SPECIFICATION

Basic Standard:	EN 61000-4-11: 2004
Test duration time:	Minimum three test events in sequence
Interval between event:	Minimum 10 seconds
Phase Angle:	0/45/90/135/180/225/270/315/360
Test cycle:	3 times
Performance Criterion:	Tx Mode : Class 1 SRD equipment B&C, TR

8.8.2. TEST INSTRUMENT

Immunity shielded room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMC PARTNER TRANSIENT 2000	EMC PARTNER	TRA2000	881	06/11/2013

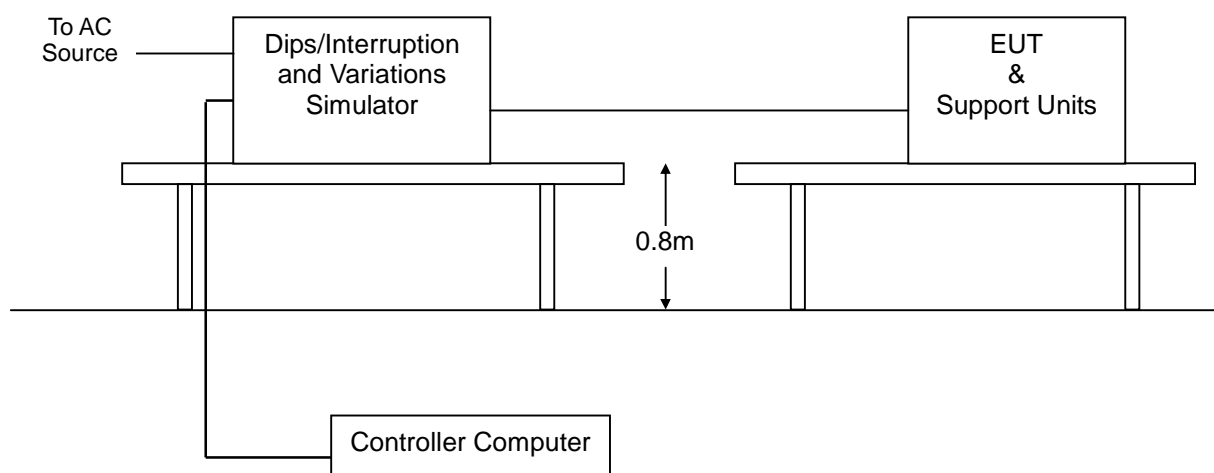
NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).
2. N.C.R.= No Calibration required

8.8.3. TEST PROCEDURE

1. The EUT and support units were located on a wooden table, 0.8 m away from ground floor.
2. Setting the parameter of tests and then perform the test software of test simulator.
3. Conditions changes to occur at 0 degree crossover point of the voltage waveform.
4. Recording the test result in test record form.

8.8.4. TEST SETUP

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

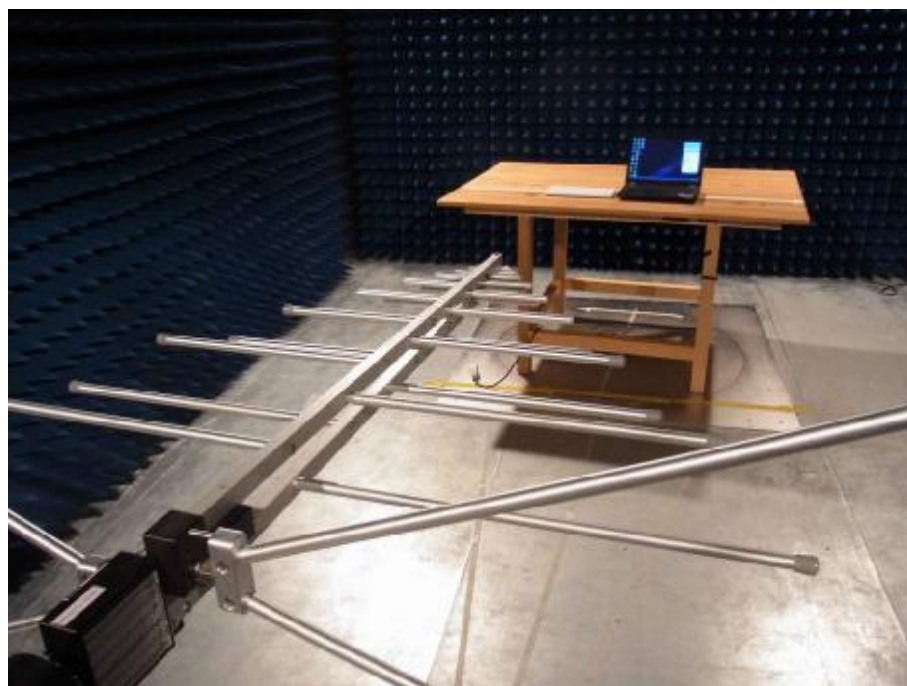


8.8.5. TEST RESULTS

No applicable (EUT Power Rating DC1.5V from battery).

Reference to clauses EN 301 489-1§ 9.7 Voltage dips and interruptions
(EN 61000-4-11)

9 EUT TEST Photos



10 Photos of the EUT

Photo 1



Photo 2



Photo 3

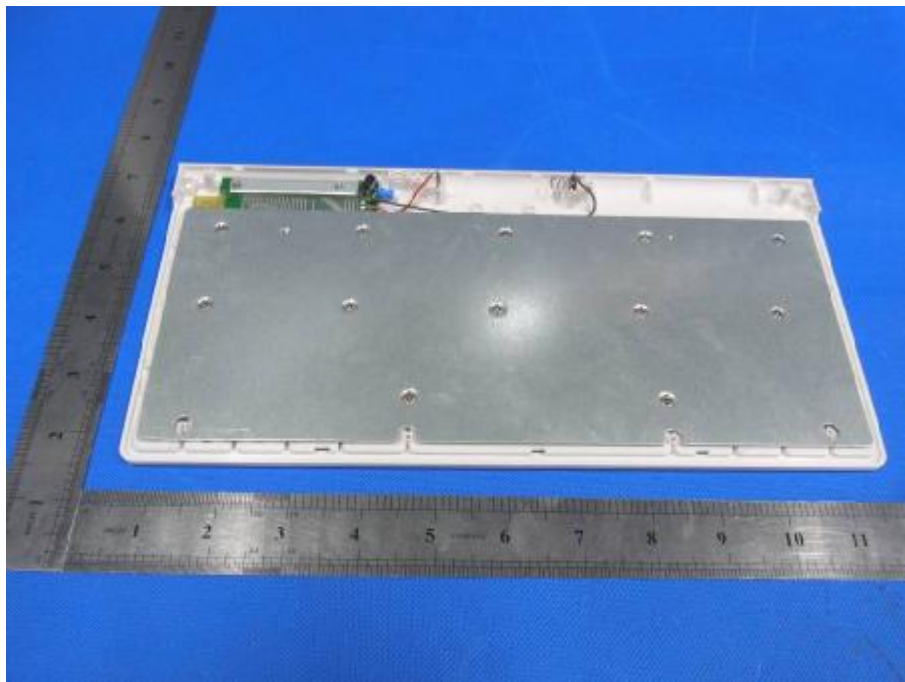


Photo 4



Photo 5

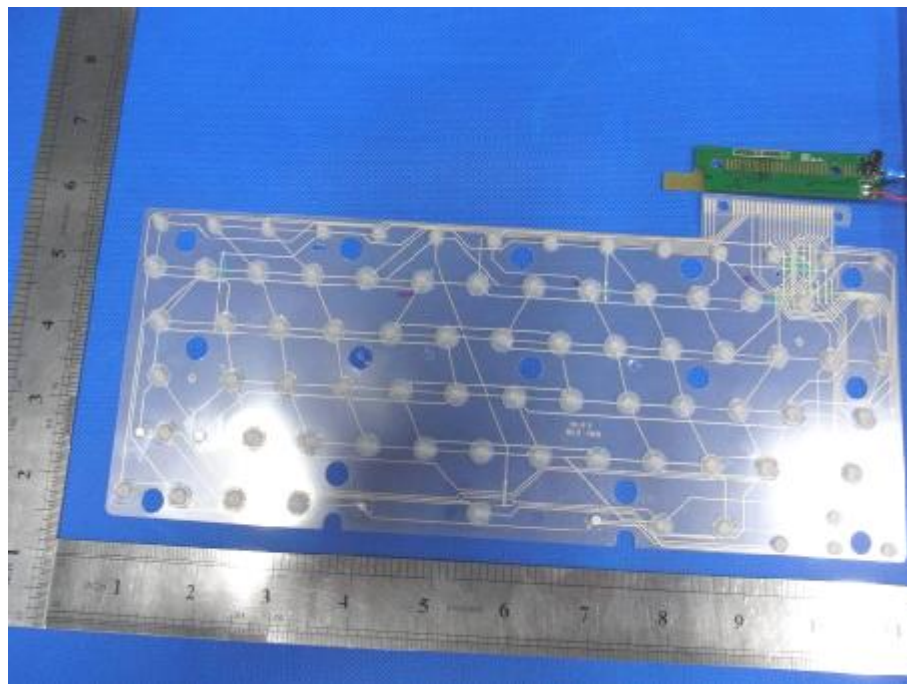
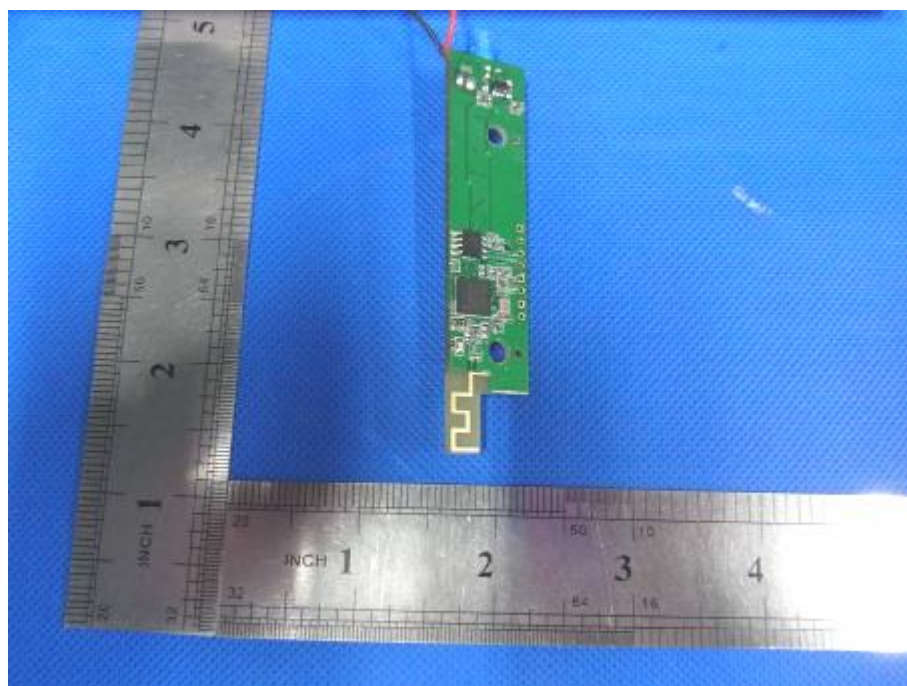


Photo 6



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