EMC Test Report

Report No.: AGC03946180505EE01

PRODUCT DESIGNATION	:	Wireless charging mobile power bank
BRAND NAME	:	N/A
MODEL NAME	:	
MANUFACTURER	:	
DATE OF ISSUE	:	Jun. 06, 2018
STANDARD(S)	:	Draft EN 301 489-1 V2.2.0 (2017-03) Final Draft EN 301 489-3 V2.1.1 (2017-03)
REPORT VERSION		V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

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Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jun. 06, 2018	Valid	Extension Report (Based on the original report-No. AGC04094180503EE01, change the name of EUT, information of manufacturer and factory.)

TABLE OF CONTENTS

1. TEST REPORT CERTIFICATION

Manufacturer	
Address	
Factory	
Address	
Product Designation	Wireless charging mobile power bank
Brand Name	N/A
Test Model	
Date of test	May 17, 2018 to May 21, 2018
Deviation	None
Condition of Test Sample	Normal
Test Result	Pass
Report Template	AGCRT-EC-EMC

We, Attestation of Global Compliance (Shenzhen) Co., Ltd., hereby certify that the submitted samples of the above item, as detailed in chapter 2.1 of this report, has been tested in our facility. The test record, data evaluation and test configuration represented herein are true and accurate accounts of measurements of the sample's EMC characteristics under the conditions herein specified.

Tested by Max Zhang

Max Zhang(Zhang Yi) May 21, 2018

Reviewed by Bart Xie

Bart Xie(Xie Xiaobin)) Jun. 06, 2018

Approved By Forrest Lei

Forrest Lei(Lei Yonggang) Jun. 06, 2018

2. GENERAL INFORMATION

2.1. DESCRIPTION OF EUT

The EUT is a short range, Wireless Charging Pad device.

Details of technical specification refer to the description in follows:

Hardware Version	V1.0
Software Version	V1.0
Operation Frequency range	110-205KHz
Test Frequency	127KHz
Number of Channels	1 Channel
Antenna Type	Integral antenna
Power Supply	Micro USB/TYPE-C Input : 5V/2A USB Output : 5V/2.1A Wireless output : 5V/1A

2.2. OBJECTIVE

Perform Electro Magnetic Interference (EMI) and Electro Magnetic Susceptibility (EMS) tests for CE Marking.

2.3. TEST STANDARDS AND RESULTS

The EUT has been tested according to ETSI EN 301 489-1 V2.2.0 (2017-03) and ETSI EN 301 489-3 V2.1.1 (2017-03).

ETSI EN 301 489-1	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU
ETSI EN 301 489-3	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; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU

2.4. ENVIRONMENTAL CONDITIONS

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

- Temperature: -20-55ºC
- Humidity: 30-60 %
- Atmospheric pressure: 86-106 kPa

3. TEST MODE DESCRIPTION

NO.	TEST MODE DESCRIPTION	WORST
1	Charging with adaptor & load	V
2	standby	--
Note: V means EMI worst mode		

I/O Port Information (☒Applicable ☐Not Applicable)

I/O Port of EUT			
I/O Port Type	**Number**	**Cable Description**	**Tested With**
USB port	1	1m Unshielded	1
TYPE-C	1	--	1

4. MEASUREMENT UNCERTAINTY

The uncertainty is calculated using the methods suggested in the “Guide to the Expression of Uncertainty in measurement” (GUM) published by CISPR and ANSI.

- Uncertainty of Conducted Emission, Uc = ±3.2 dB
- Uncertainty of Radiated Emission below 1GHz, Uc = ±3.9 dB
- Uncertainty of Radiated Emission above 1GHz, Uc = ±4.8 dB

5. SUPPORT EQUIPMENT

Device Type	Manufacturer	Model Name	Serial No.	specification
Adapter	--	RP-PC007	--	DC5V

Note:

1. "-- "means no any support device during testing.
2. The adapter is proved by AGC.

6. IDENTIFICATION OF THE RESPONSIBLE TESTING LOCATION

Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	B112-B113, Building 12, Baoan Building Materials Center, No.1 of Xixiang Inner Ring Road, Baoan District, Shenzhen, Guangdong, P.R.China

TEST EQUIPMENT OF CONDUCTED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESPI	101206	Jun.20, 2017	Jun.19, 2018
LISN	R&S	ESH2-Z5	100086	Aug.21, 2017	Aug.20, 2018

TEST EQUIPMENT OF RADIATED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	Jun.20, 2017	Jun.19, 2018
ANTENNA	SCHWARZBECK	VULB9168	D69250	Mar.01, 2018	Feb.28, 2020
Double-Ridged Waveguide Horn	ETS	3117	00034609	May.18, 2017	May.17, 2019
Broadband Preamplifier	SCHWARZBECK	VULB9168	D69250	Sep.28, 2017	Sep.27, 2018

TEST EQUIPMENT OF POWER HARMONICS / VOLTAGE FLUCTUATION / FLICKER TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Signal Conditioning Unit	Schaffner	CCN1000-1	72431	Aug.21, 2017	Aug.20, 2018
AC Source	Schaffner	NSG1007	56825	Aug.21, 2017	Aug.20, 2018

TEST EQUIPMENT OF SURGE/EFT/DIPSTEST

Description	Manufacturer	Model	S/N	Cal. Date	Cal. Due
EFT、Surge Generator	Schaffner	Modula 6150	34437	Aug.21, 2017	Aug.20, 2018

TEST EQUIPMENT OF ESD TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
ESD Simulator	TESEQ	NSG 438	1509	Jun.04, 2017	Jun.03, 2018

TEST EQUIPMENT OF RS IMMUNITY TEST

Description	Manufacturer	Model	S/N	Cal. Date	Cal. Due
SIGNAL GENERATOR	R&S	E4421B	MY43351603	May.31, 2017	May.30, 2018
POWER SENSOR	R&S	URV5-Z4	100124	May.31, 2017	May.30, 2018
POWER METER	R&S	NRVD	832378/027	Jun.20, 2017	Jun.19, 2018
POWER AMPLIFIER	KALMUS	7100LC	04-02/17-06-001	Jun.20, 2017	Jun.19, 2018
RF AMPLIFIER	Milmega	AS0104-55_55	1004793	Jun.20, 2017	Jun.19, 2018
Double-Ridged Waveguide Horn	ETS	3117	00034609	May.18, 2017	May.17, 2019
Broadband Preamplifier	SCHWARZBECK	VULB9168	D69250	Sep.28, 2017	Sep.27, 2018

TEST EQUIPMENT OF CS IMMUNITY TEST

Description	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Power Amplifier	AR	75A250	18464	Jun.20, 2017	Jun.19, 2018
CDN	Schaffner	M016	21614	Aug.21, 2017	Aug.20, 2018
6dB attenuator	JWF	50FHC-006-50	N/A	Jun.20, 2017	Jun.19, 2018
Electromagnetic Injection Clamp	Luthi	EM101	35773	Aug.21, 2017	Aug.20, 2018
Power Sensor	R&S	URV5-Z4	100124	May.31, 2017	May.30, 2018
Power Meter	R&S	NRVD	8323781027	Jun.20, 2017	Jun.19, 2018
SIGNAL GENERATOR	R&S	E4421B	MY43351603	May.31, 2017	May.30, 2018

7. TEST CONDITIONS AND RESULT

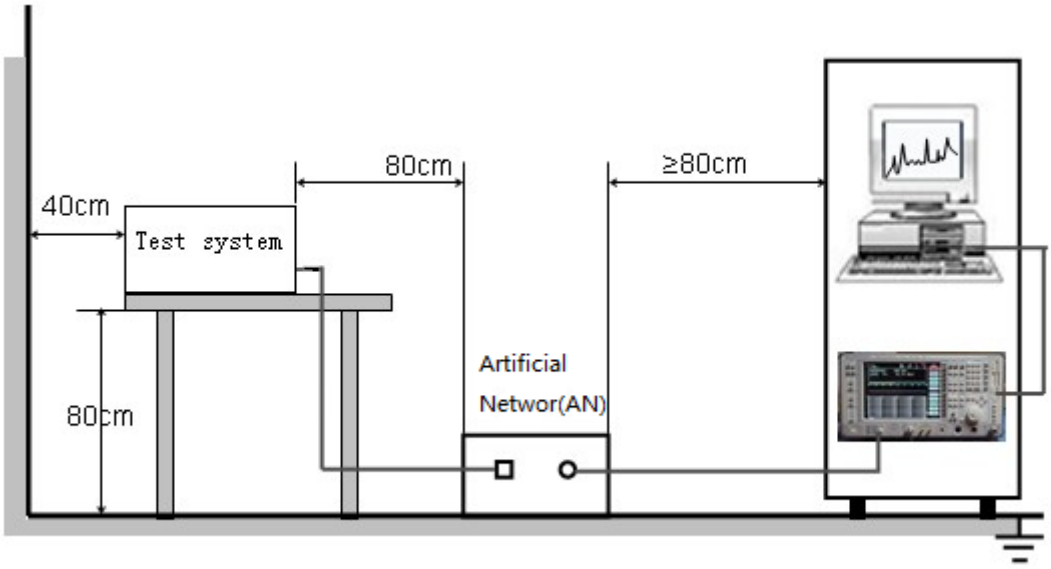
7.1. LINE CONDUCTED EMISSION TEST

7.1.1 LIMITS OF LINE CONDUCTED EMISSION TEST

Frequency	Maximum RF Line Voltage	
	Q.P.(dBuV)	Average(dBuV)
150kHz-500kHz	66-56	56-46
500kHz-5MHz	56	46
5MHz-30MHz	60	50

Note:
1. The lower limit shall apply at the transition frequency.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50MHz.

7.1.2. BLOCK DIAGRAM OF TEST SETUP



7.1.3. PROCEDURE OF LINE CONDUCTED EMISSION TEST

(1) The equipment was set up as per the test configuration to simulate typical actual 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 as per EN55032 (see Test Facility for the dimensions of the ground plane used). 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.

(2) Support equipment, if needed, was placed as per EN55032.

(3) All I/O cables were positioned to simulate typical actual usage as per EN55032.

(4) The EUT received DC24V power through a Artificial Network (AN) as specified in CISPR 25.Thge AN should be connected to a DC power source which supplied power source and was grounded to the ground plane.

(5) The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the AN powering the EUT. The AN has two monitoring points: Line 1 (Positive) and Line 2 (Negative). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.

(6) Analyzer / Receiver scanned from 150 kHz to 30 MHz for emissions in each of the test modes.

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

(8) A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions.

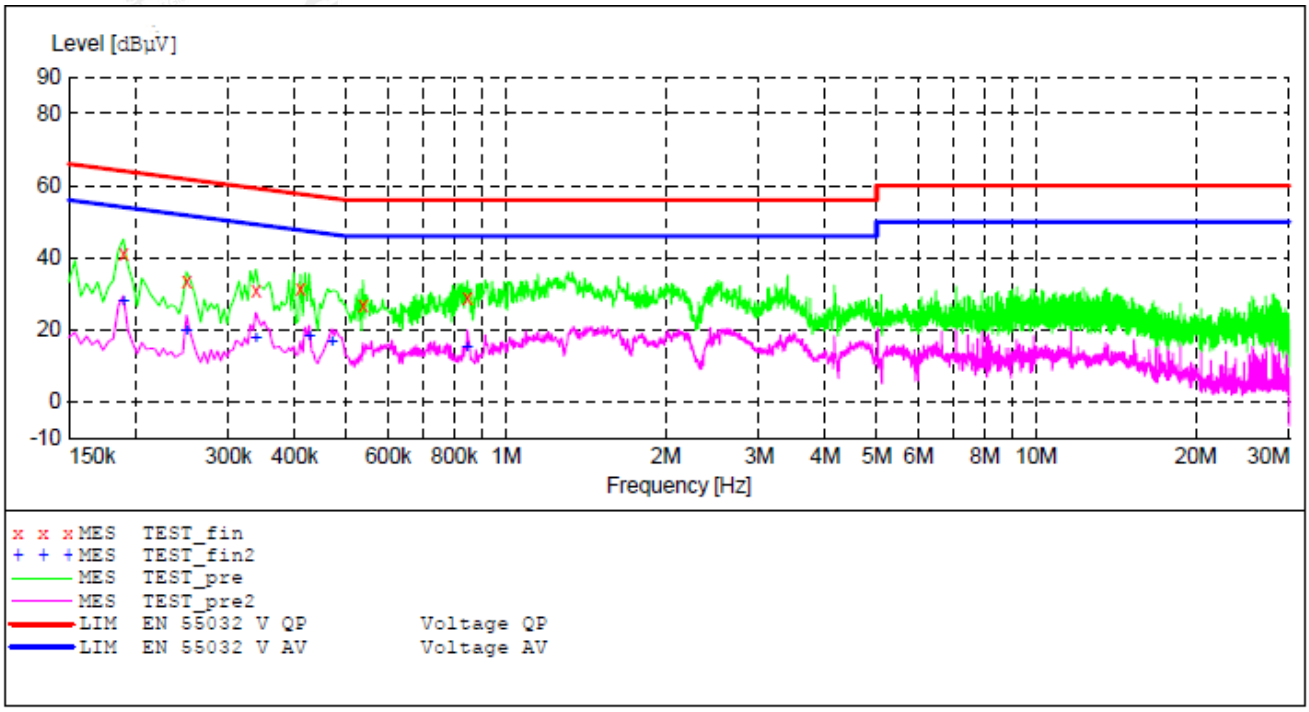
(9) Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less –2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.

7.1.4. TEST RESULT

The test modes were carried out for all modes.

The worst test mode of the EUT was Mode 1, and its test data was showed as the follow:

LINE CONDUCTED EMISSION TEST-Positive



MEASUREMENT RESULT: "TEST fin"

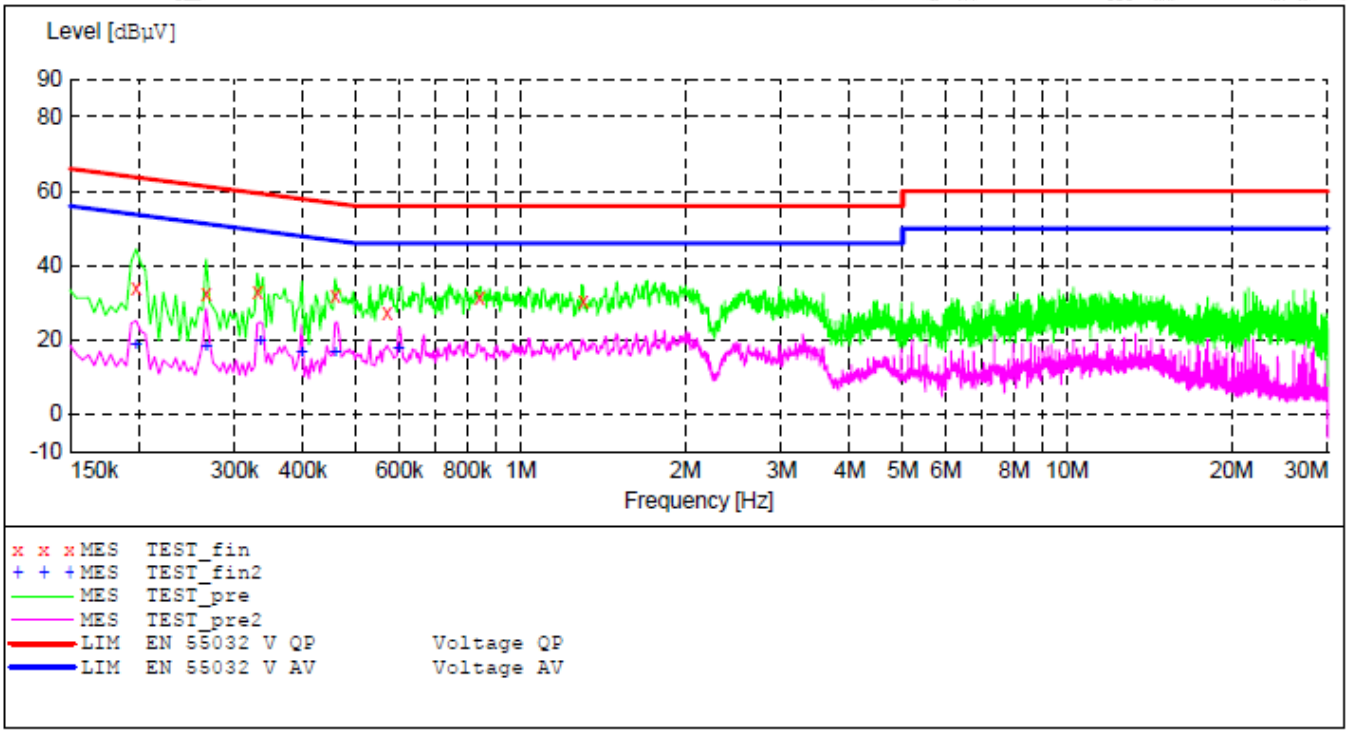
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.190000	41.20	10.1	64	22.8	QP	L1	FLO
0.250000	33.40	10.1	62	28.4	QP	L1	FLO
0.338000	31.00	10.0	59	28.3	QP	L1	FLO
0.410000	31.50	10.0	58	26.1	QP	L1	FLO
0.538000	27.00	9.9	56	29.0	QP	L1	FLO
0.846000	28.70	10.0	56	27.3	QP	L1	FLO

MEASUREMENT RESULT: "TEST_fin2"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.166000	25.40	10.0	55	29.8	AV	N	FLO
0.218000	21.40	10.1	53	31.5	AV	N	FLO
0.270000	17.40	10.1	51	33.7	AV	N	FLO
0.382000	19.70	10.0	48	28.5	AV	N	FLO
0.506000	14.40	9.9	46	31.6	AV	N	FLO
0.782000	15.50	10.0	46	30.5	AV	N	FLO

RESULT: PASS

LINE CONDUCTED EMISSION TEST-Negative



MEASUREMENT RESULT: "TEST_fin"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.198000	34.10	10.1	64	29.6	QP	N	FLO
0.266000	32.50	10.1	61	28.7	QP	N	FLO
0.330000	32.70	10.1	60	26.8	QP	N	FLO
0.458000	31.80	10.0	57	24.9	QP	N	FLO
0.570000	27.30	9.9	56	28.7	QP	N	FLO
0.842000	31.30	10.0	56	24.7	QP	N	FLO
1.302000	30.50	10.1	56	25.5	QP	N	FLO

MEASUREMENT RESULT: "TEST_fin2"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.198000	18.60	10.1	54	35.1	AV	N	FLO
0.266000	18.30	10.1	51	32.9	AV	N	FLO
0.334000	19.50	10.0	49	29.9	AV	N	FLO
0.398000	16.70	10.0	48	31.2	AV	N	FLO
0.458000	16.40	10.0	47	30.3	AV	N	FLO
0.598000	17.80	9.9	46	28.2	AV	N	FLO

RESULT: PASS

7.2. RADIATED DISTURBANCE MEASUREMENT

7.2.1. LIMITS OF RADIATED DISTURBANCES

Limits for radiated disturbance 30M to1 GHz at a measurement distance of 3 m

Frequency range (MHz)	Quasi peak limits(dBuV/m), for Class B ITE, at 3m measurement distance
30 - 230	40
230 - 1000	47

Limits for radiated disturbance above 1 GHz at a measurement distance of 3 m

Frequency range (MHz)	Limits (dBuV/m), Class B ITE	
	Peak	Average
1000-3000MHz	70	50
3000-6000MHz	74	54

Notes:

1. The lower limit shall apply at the transition frequency.
2. Additional provisions may be required for cases where interference occurs.

7.2.2. TEST PROCEDURE

(1). The EUT was placed on the top of an insulating table 0.8 meters above the ground at a semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

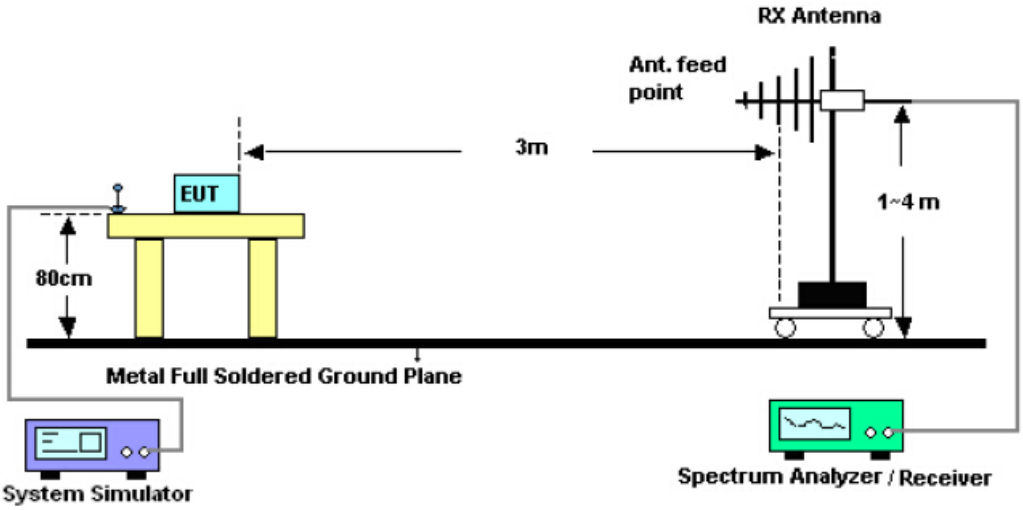
(2). The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

(3).The antenna is a broadband antenna, and its height is varied from 1 to 4 meter above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

(4). For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to the heights from 1 to 4 meters and the ratable table was turned from 0 degrees to 360 degrees to find the maximum reading.

(5).The test-receiver system was set to Peak Detector Function and Specified Bandwidth with Maximum Hold Mode. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emission that did not have 10dB margin would be retested one by one using the quasi-peak method.

7.2.3. BLOCK DIAGRAM OF TEST SETUP



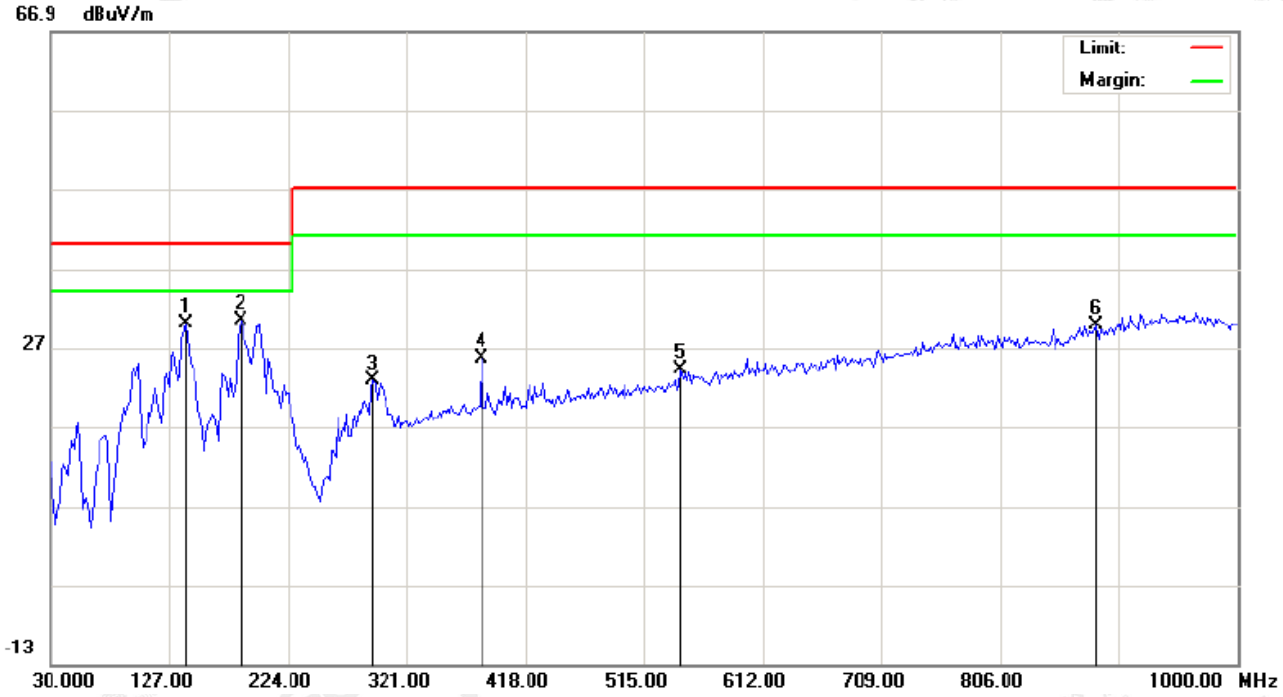
For the actual test configuration, please refer to the related item-Photographs of the Test Configuration.

7.2.4 TEST RESULT

The test modes were carried out for all modes.

The worst test mode of the EUT was Mode 1, and its test data was showed as the follow:

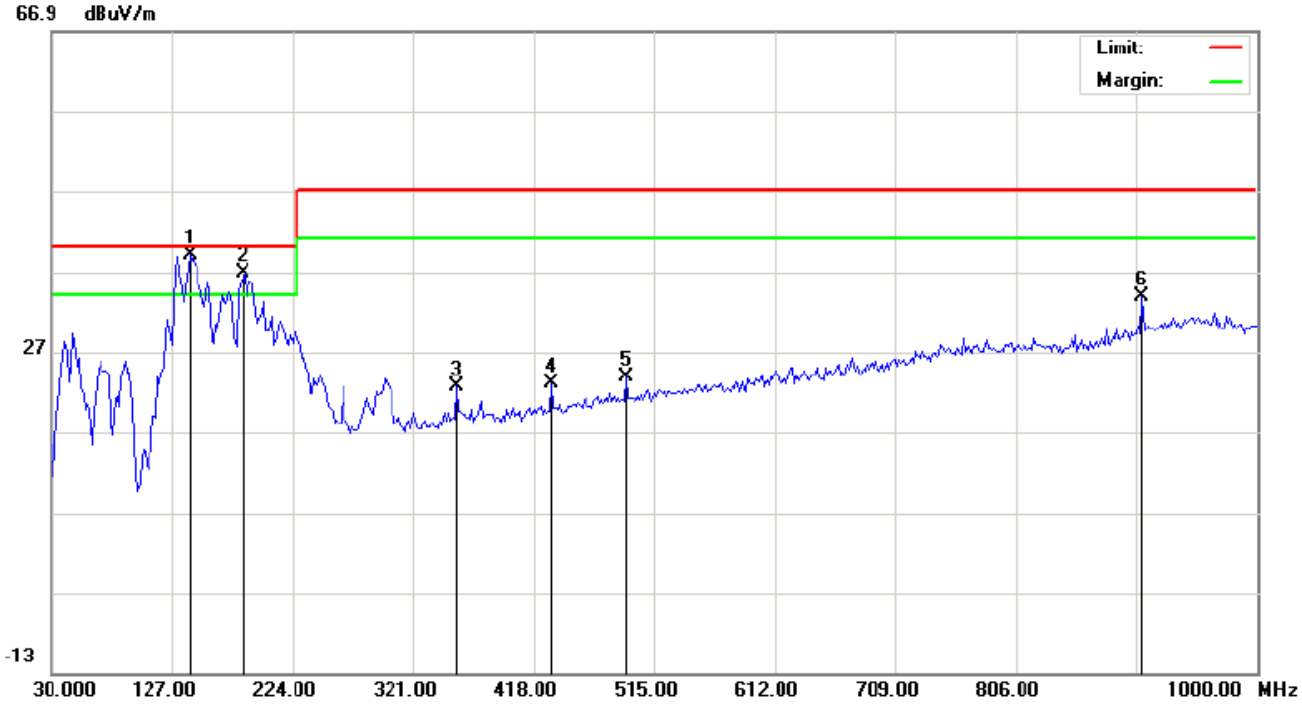
RADIATED EMISSION BELOW 1GHZ– HORIZONTAL



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		139.9333	14.81	15.17	29.98	40.00	-10.02	peak			
2	*	185.2000	19.16	11.31	30.47	40.00	-9.53	peak			
3		293.5167	8.54	14.31	22.85	47.00	-24.15	peak			
4		382.4333	6.74	18.95	25.69	47.00	-21.31	peak			
5		545.7167	1.75	22.36	24.11	47.00	-22.89	peak			
6		883.6000	1.54	28.18	29.72	47.00	-17.28	peak			

RESULT: PASS

RADIATED EMISSION BELOW 1GHZ– VERTICAL



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	141.5500	23.89	15.21	39.10	40.00	-0.90	peak			
2	!	185.1999	23.97	12.75	36.72	40.00	-3.28	peak			
3		356.5667	3.75	18.78	22.53	47.00	-24.47	peak			
4		432.5500	2.89	20.06	22.95	47.00	-24.05	peak			
5		492.3666	2.79	21.05	23.84	47.00	-23.16	peak			
6		907.8500	5.02	28.83	33.85	47.00	-13.15	peak			

RESULT: PASS

7.3. HARMONIC CURRENT MEASUREMENT

7.3.1 LIMITS OF HARMONIC CURRENT

Limits for Class A Equipment	
Harmonics Order n	**Max. permissible harmonic current (A)**
Odd harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
15≤n≤39	0.15×15/n
2	1.08
4	0.43
6	0.30
8≤n≤40	0.23×8/n

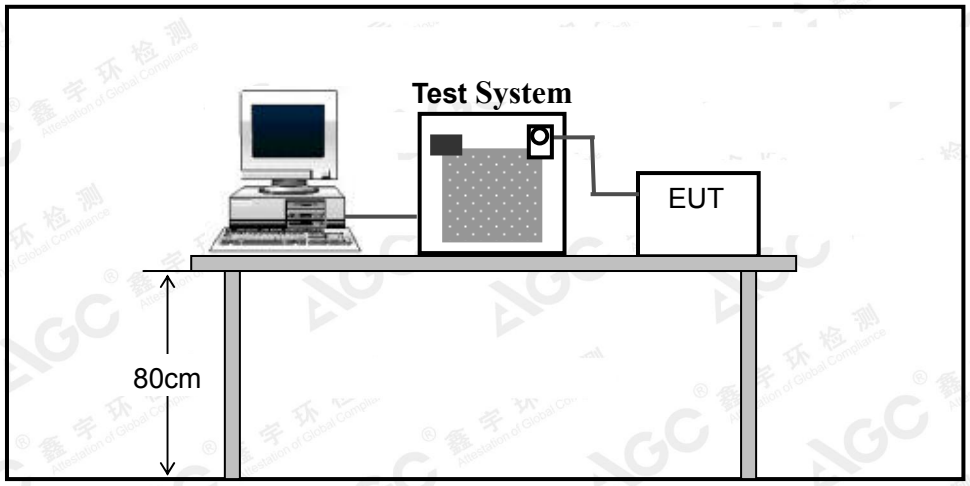
Note:

1. According to section 5 of EN61000-3-2: 2014, the EUT is Class A equipment.
2. The above limits are for all applications having an active input power>75W. No limits apply for equipment with an active input power up to and including 75W.

7.3.2 TEST PROCEDURE

1. 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.
2. 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 necessary for the EUT to be exercised.

7.3.3 TEST SETUP



For the actual test configuration, please refer to Appendix II: Photographs of the Test Configuration.

7.3.4 TEST RESULT

No limits apply for equipment with an active input power up to and including 75W.

7.4. VOLTAGE FLUCTUATIONS AND FLICK MEASUREMENT

7.4.1 LIMITS OF VOLTAGE FLUCTUATIONS AND FLICK

Test Item	Limit	Note
P_{st}	1.0	P_{st} means Short-term flicker indicator
P_{lt}	0.65	P_{lt} means long-term flicker indicator
T_{dt}	0.5	T_{dt} means maximum time that d_t exceeds 3%
d_{max}(%)	4%	d_{max} means maximum relative voltage change.
d_c(%)	3.3%	d_c means relative steady-state voltage change.

7.4.2 TEST PROCEDURE

a. 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 conditions

b. During the flick measurement, the measure time shall include that part of whole operation changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.

7.4.3 TEST SETUP

Same as 3.4.3

7.4.4 TEST RESULT

Test Specification

Test Frequency	50Hz	Test Voltage	AC 230V
Waveform	Sine	Test Time	10 minutes(P_{st}); 2 hours (P_{lt})

Test Result

☒ MODE 1 ☒ MODE 2

Test Parameter	Measurement Value	Limit	Remarks
P_{st}	0.021	1.0	Pass
P_{lt}	0.056	0.65	Pass
$T_{dt(s)}$	0.094	0.5	Pass
d_{max}(%)	0.081%	4%	Pass
d_c(%)	0.069%	3.3%	Pass

8. IMMUNITY TEST

8.1. EUT SETUP AND OPERATING CONDITIONS

The battery was in full voltage and the charger was connected to the EUT to keep the voltage constant during the tests.

Each immunity test was performed according to the requirements of the standard.

8.2. GENERAL PERFORMANCE CRITERIA

1. Performance criteria for Continuous phenomena applied to Transmitter (CT)

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 transmission does not occur.

2. Performance criteria for Transient phenomena applied to Transmitter (TT)

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 transmitter, tests shall be repeated with the EUT in standby mode to ensure that any unintentional transmission does not occur.

3. Performance criteria for Continuous phenomena applied to Receiver (CR)

For equipment of type II or 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 transceiver, under no circumstances shall the transmitter operate unintentionally during the test.

4. Performance criteria for Transient phenomena applied to Receiver (TR)

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.

5. Performance Table

Performance criteria		
Criteria	**During Test**	**After Test**
A	Shall operate as intended. May show degradation of performance. Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance. Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
B	May show loss of function (one or more). May show degradation of performance. No unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance. Shall be no loss of stored data or user programmable functions.
C	May be loss of function (one or more).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance.

8.3. ELECTROSTATIC DISCHARGE IMMUNITY TEST

8.3.1 TEST SPECIFICATION

Basic Standard	EN 61000-4-2
Discharge Impedance	330Ω / 150 pF
Discharge Voltage	Air Discharge:8 kV , Contact Discharge:4 kV
Polarity	Positive / Negative
Number of Discharge	Minimum 20 times at each test point
Discharge Mode	Single discharge
Discharge Period	1-second minimum

8.3.2 TEST PROCEDURE

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

a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.

b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.

c. The time interval between two successive single discharges was at least 1 second.

d. The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.

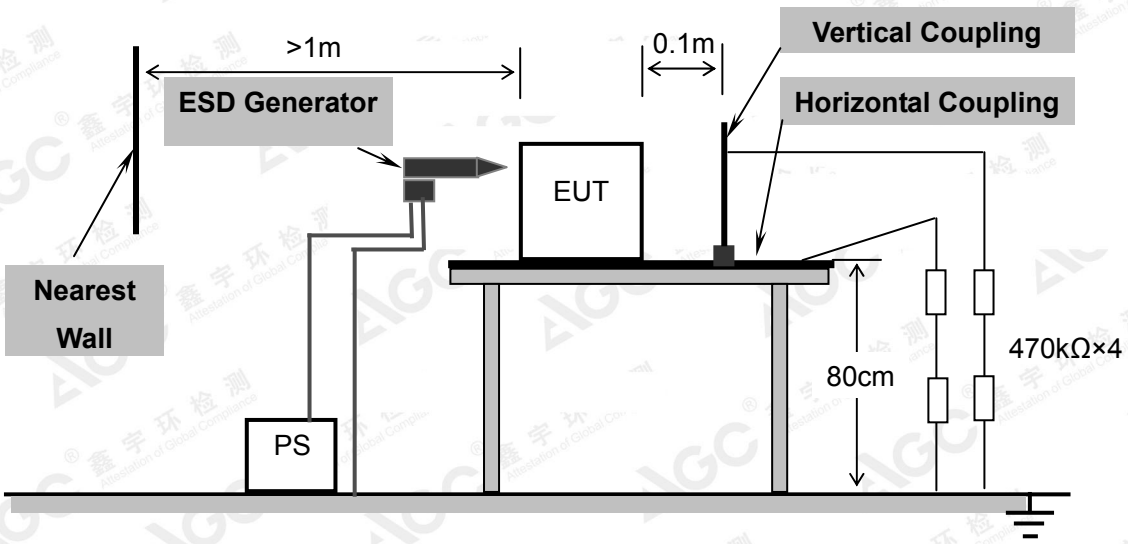
e. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.

f. 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 completed.

g. At least ten single discharges (in the most sensitive polarity) were applied to the Horizontal Coupling Plane at points on each side of the EUT. The ESD generator was positioned vertically at a distance of 0.1 meters from the EUT with the discharge electrode touching the HCP.

h. At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the Vertical Coupling Plane in sufficiently different positions that the four faces of the EUT were completely illuminated. The VCP (dimensions 0.5m×0.5m) was placed vertically to and 0.1 meters from the EUT.

8.3.3 TEST SETUP



For the actual test configuration, please refer to Appendix II: Photographs of the Test Configuration.

8.3.4 TEST RESULT

TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 9.3.2 and EN 61000-4-2 for the measurement methods.

☒ **MODE 1** ☒ **MODE 2**

Amount of Discharges	Voltage	Coupling	Observation	Result (Criteria meet)
Mini 20 / Point	±2kV;±4kV	contact discharge	TR, TT	A
Mini 20 / Point	±2kV;±4kV;±8kV	Air Discharge	TR, TT	A
Mini 20 / Point	±4kV	Indirect Discharge HCP	TR, TT	A
Mini 20 / Point	±4kV	Indirect Discharge VCP	TR, TT	A

8.4. RADIATED, RADIO FREQUENCY ELECTROMAGNETIC FIELD IMMUNITY TEST

8.4.1 TEST SPECIFICATION

Basic Standard	EN 61000-4-3
Frequency Range	80 MHz – 6000MHz
Field Strength	3V/m
Modulation	1 kHz sine wave, 80%, AM modulation
Frequency Step	1% of fundamental
Polarity of Antenna	Horizontal and Vertical
Test Distance	3m
Antenna Height	1.55m
Dwell Time	3 seconds

8.4.2 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 test signal was 80% amplitude modulated with a 1 kHz sine wave.

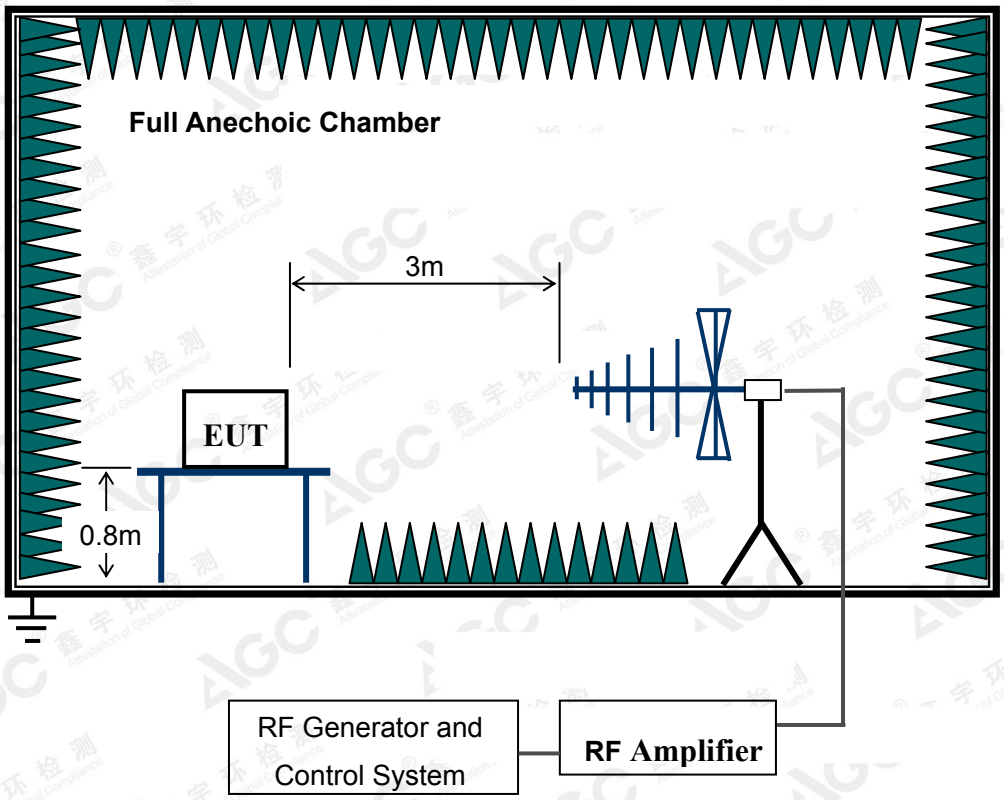
c. The frequency range was swept from 80 MHz to 6000MHz with the exception of the exclusion band for transmitters, receivers and duplex transceivers. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.

d. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.

e. The field strength level was 3V/m.

f. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

8.4.3 TEST SETUP



For the actual test configuration, please refer to Appendix II: Photographs of the Test Configuration.

8.4.4 TEST RESULT

TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 9.2.2, ETSI EN 301 489-3 and EN 61000-4-3 for the measurement methods.

☒ **MODE 1** ☒ **MODE 2**

Freq. Range (MHz)	Field	Modulation	Polarity	Position	Observation	Result (Criteria meet)
80-6000	3V/m	Yes	H	Front	CR, CT	A
80-6000	3V/m	Yes	H	Back	CR, CT	A
80-6000	3V/m	Yes	H	Left	CR, CT	A
80-6000	3V/m	Yes	H	Right	CR, CT	A
80-6000	3V/m	Yes	V	Front	CR, CT	A
80-6000	3V/m	Yes	V	Back	CR, CT	A
80-6000	3V/m	Yes	V	Left	CR, CT	A
80-6000	3V/m	Yes	V	Right	CR, CT	A

8.5. ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

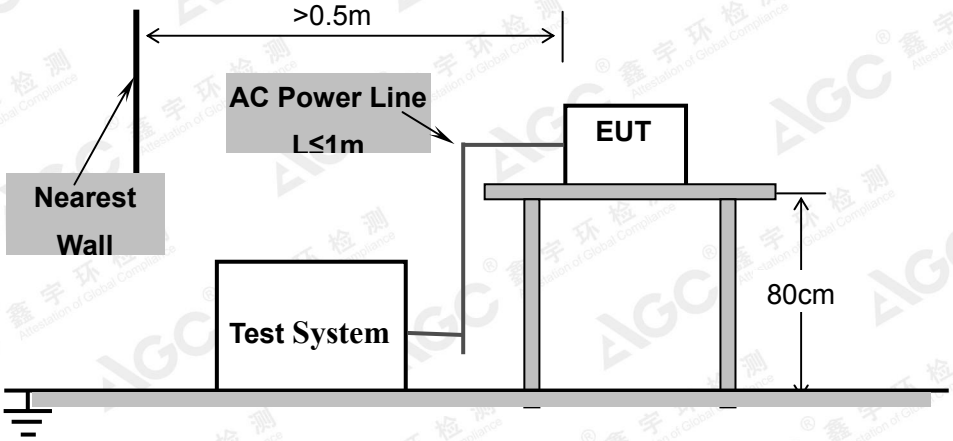
8.5.1 TEST SPECIFICATION

Basic Standard	EN 61000-4-4
Test Voltage	a.c. power port :1 kV
Polarity	Positive/Negative
Impulse Frequency	5kHz
Impulse wave shape	5/50ns
Burst Duration	15ms
Burst Period	300ms
Test Duration	Not less than 1 min.

8.5.2 TEST PROCEDURE

a. The EUT was tested with 1000 volt discharges to the AC power input leads.
b. Both positive and negative polarity discharges were applied.
c. 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.
d. The duration time of each test sequential was 1 minute.
e. The transient/burst waveform was in accordance with EN 61000-4-4, 5/50ns.

8.5.3 TEST SETUP



For the actual test configuration, please refer to Appendix II: Photographs of the Test Configuration.

8.5.4 TEST RESULT

☒ MODE 1 ☒ MODE 2

Test Point	Polarity	Test Level (kV)	Observation	Conclusion
a.c. port, L	+/-	1	TT,TR	A
a.c. port, N	+/-	1	TT,TR	A
a.c. port, L-N	+/-	1	TT,TR	A
a.c. port, L-N	+/-	1	TT,TR	A

8.6. SURGE IMMUNITY TEST

8.6.1 TEST SPECIFICATION

Basic Standard	EN 61000-4-5
Waveform	Voltage 1.2/50 μs; Current 8/20 μs
Test Voltage	a.c. power port, line to ground 2 kV, line to line 1.0 kV
Polarity	Positive/Negative
Phase Angle	0°, 90°, 180°, 270°
Repetition Rate	60sec
Times	5 time/each condition.

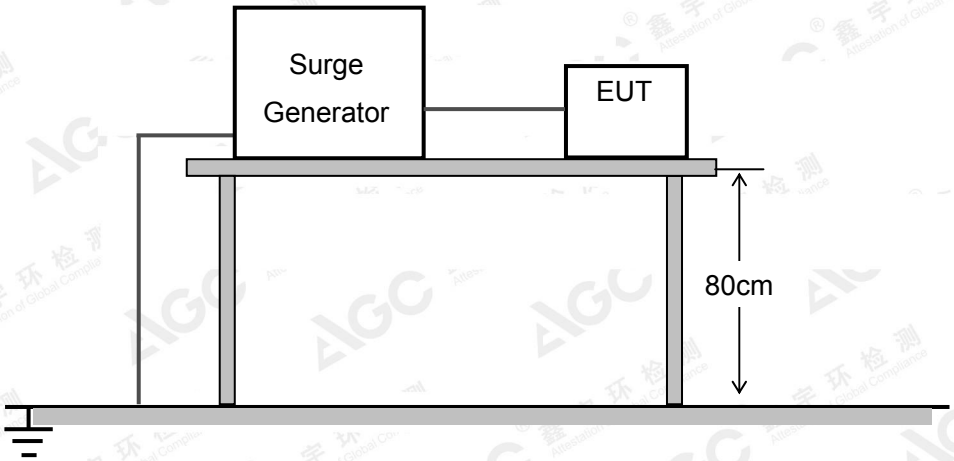
8.6.2 TEST PROCEDURE

a. The EUT and the auxiliary equipment were placed on a table of 0.8m heights above a metal ground reference plane. The size of ground plane is greater than 1m×1m and project beyond the EUT by at least 0.1m on all sides. The ground plane is connected to the protective earth. The length of power cord between the coupling device and the EUT was less than 2 meters (provided by the manufacturer).

b. The EUT was connected to the power mains through a coupling device that directly couples the surge interference signal. The surge noise was applied synchronized to the voltage phase at the zero crossing and the peak value of the AC voltage wave (positive and negative).

c. The surges were applied line to line and line(s) to earth. When testing line to earth the test voltage was applied successively between each of the lines and earth. Steps up to the test level specified increased the test voltage. All lower levels including the selected test level were tested. The polarity of each surge level included positive and negative test pulses.

8.6.3 TEST SETUP



For the actual test configuration, please refer to Appendix II: Photographs of the Test Configuration.

8.6.4 TEST RESULT

☒ MODE 1 ☒ MODE 2

Coupling Line	Polarity	Voltage (kV)	Observation	Conclusion
a.c. power, L-N	+/-	1.0	TT,TR	A

8.7. IMMUNITY TO CONDUCTED DISTURBANCES INDUCED BY RF FIELDS

8.7.1 TEST SPECIFICATION

Basic Standard	EN 61000-4-6
Frequency Range	0.15 MHz – 80 MHz
Field Strength	3Vrms
Modulation	1 kHz Sine Wave, 80% AM
Frequency Step	1% of fundamental
Coupled Cable	a.c. power line
Coupling Device	CDN-M2

8.7.2 TEST PROCEDURE

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

b. 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.

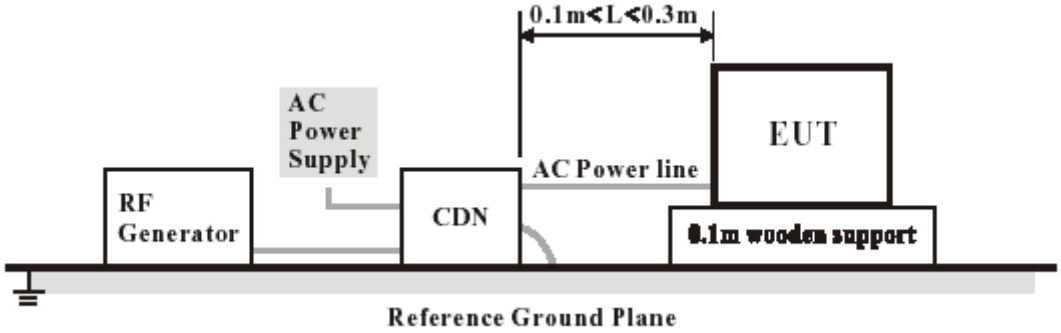
c. The test signal was 80% amplitude modulated with a 1 kHz sine wave

d. The frequency range is 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 sweep rate shall not exceed 1.5×10^{-3} decades/s. The step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value where the frequency is swept incrementally.

e. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequencies and harmonics or frequencies of dominant interest, shall be analyzed separately.

f. Attempts should be made to fully exercise the EUT during test, and to fully interrogate all exercise modes selected for susceptibility.

8.7.3 TEST SETUP



For the actual test configuration, please refer to Appendix II: Photographs of the Test Configuration.

8.7.4 TEST RESULT

For AC Port :

☒ MODE 1 ☒ MODE 2

Test Point	Frequency (MHz)	Field Strength (Vrms)	Observation	Conclusion
a.c. port	0.15 – 80	3	CT,CR	A

8.8. VOLTAGE DIPS AND SHORT INTERRUPTIONS IMMUNITY TEST

8.8.1 TEST SPECIFICATION

Basic Standard	EN 61000-4-11
Voltage Dips	100% reduction, 0.5 Cycle 100% reduction, 1.0 Cycle 30% reduction, 25 Cycles
Voltage Interruptions	100% reduction, 250 Cycles
Voltage Phase Angle	0°, 45°, 90°, 135°, 180°, 225°, 270°, 315°

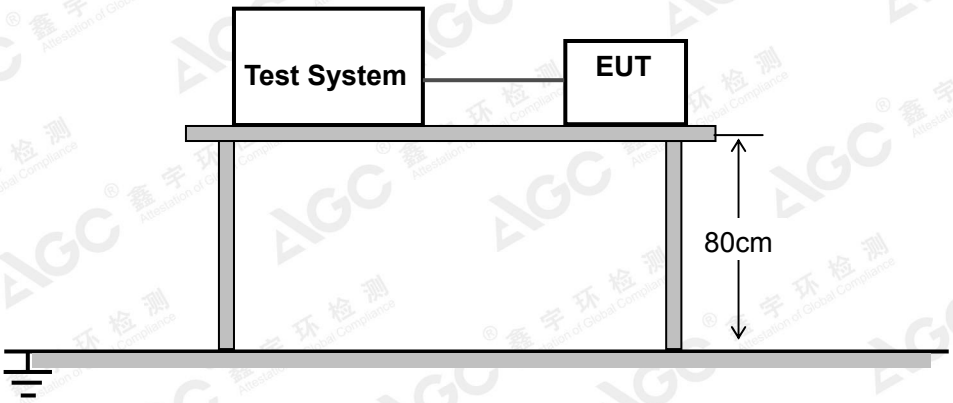
8.8.2 TEST PROCEDURE

a. The power cord was used as supplied by the manufacturer. The EUT was connected to the line output of the Voltage Dips and Interruption Generator.

b. The EUT was tested for (1) 100% voltage dip of supplied voltage with duration of 0.5 cycles, (2)100% voltage dip of supplied voltage and duration 1.0 cycle. (3) 30% voltage dip of supplied voltage and duration 25 cycles. (4) 100% voltage interruption of supplied voltage with duration of 250 Cycles was followed,

c. Voltage reductions occur at 0 degree crossover point of the voltage waveform. The performance of the EUT was checked after the voltage dip or interruption.

8.8.3 TEST SETUP



For the actual test configuration, please refer to Appendix II: Photographs of the Test Configuration.

8.8.4 TEST RESULT

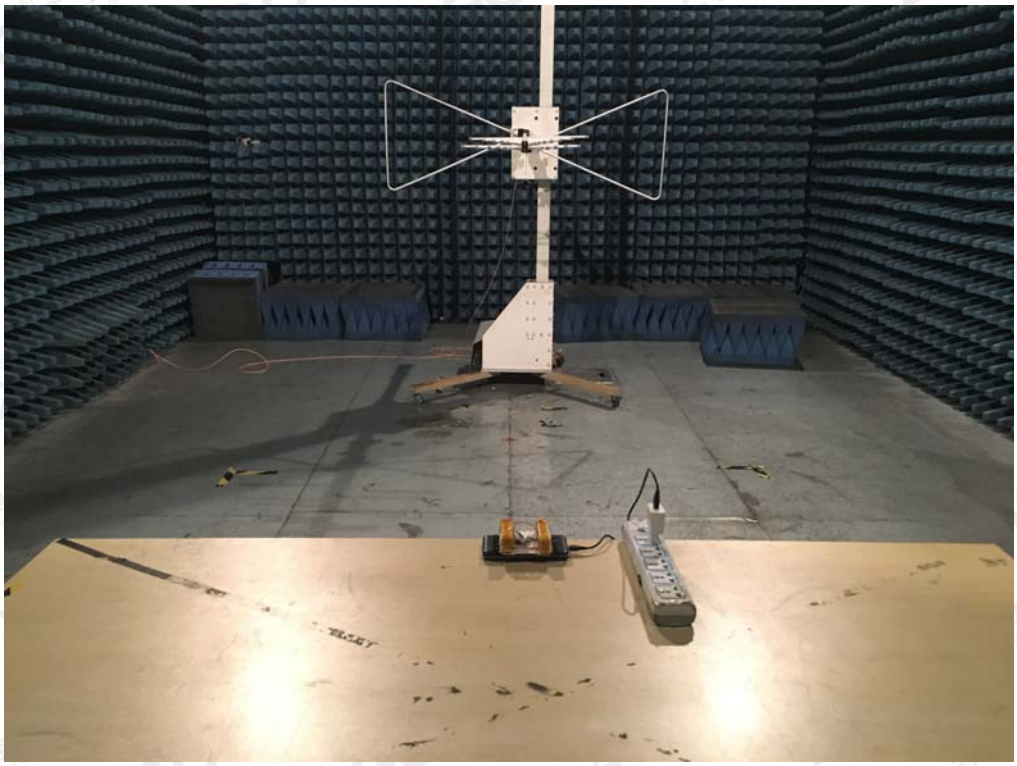
☒ MODE 1 ☒ MODE 2

Test Mode	Voltage Reduction	Duration (cycle)	Times	Interval (Sec)	Observation	Conclusion
Voltage dips	100%	0.5	3	10	TT,TR	A
	100%	1	3	10	TT,TR	A
	30%	25	3	10	TT,TR	A
Voltage interruptions	100%	250	3	10	TT,TR	A

APPENDIX A: PHOTOGRAPHS OF TEST SETUP

LINE CONDUCTED EMISSION TEST SETUP

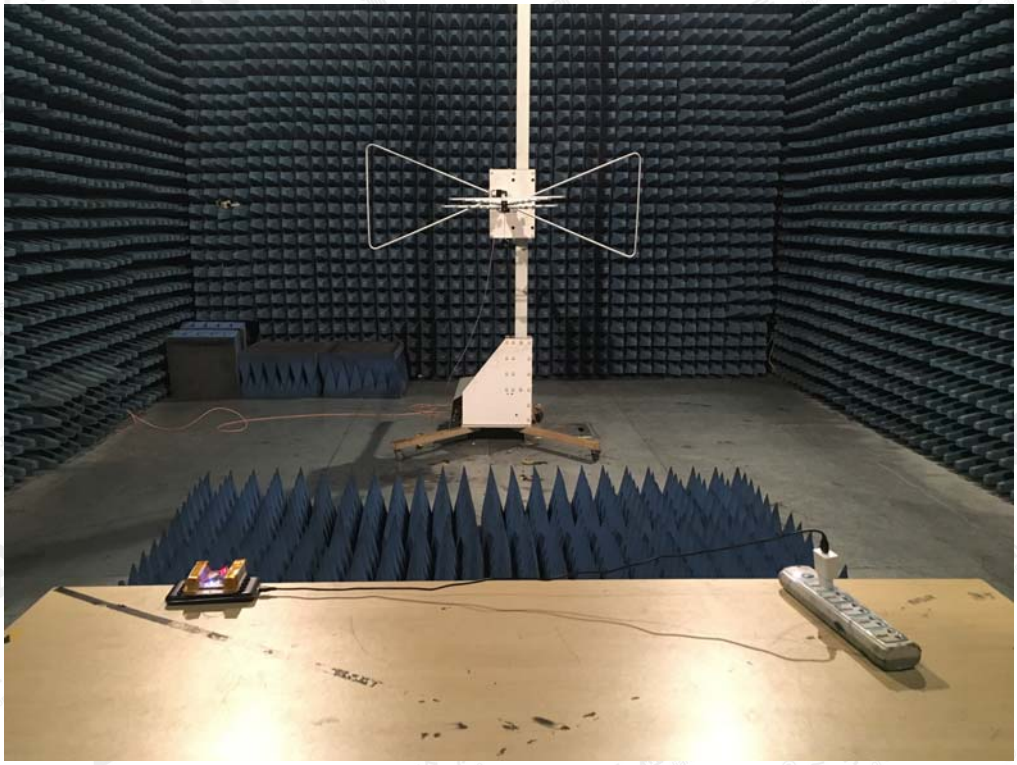
RADIATED EMISSION TEST SETUP



EN 61000-4-2 ESD TEST SETUP

EN61000-3-3 VOLTAGE FLUCTUATION / FLICKER TEST SETUP

EN 61000-4-3 RS TEST SETUP



EN 61000-4-6 CS IMMUNITY TEST SETUP

EN 61000-4-4/-5/-11 EFT/SURGE/DIPS TEST SETUP

----END OF REPORT----