

# EMC Test Report

Report No.: AGC04094190602EE01

**PRODUCT DESIGNATION** : TWS earbuds in wireless chargingcase

**BRAND NAME** : N/A

**MODEL NAME** : P329.12

**APPLACANT** : Xindao B.V.

**DATE OF ISSUE** : Jun. 26, 2019

**STANDARD(S)** : EN 301 489-1 V2.2.1: 2019-03 (draft)  
: EN 301 489-3 V2.1.1: 2019-03  
: EN 301 489-17 V3.2.0: 2017-03 (draft)

**REPORT VERSION** : V1.0

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### Report Revise Record

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V1.0	/	Jun. 26, 2019	Valid	Initial release



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## 1. TEST REPORT CERTIFICATION

<b>Applicant</b>	Xindao B.V.
<b>Address</b>	P.O. Box 3082, 2280 GB, Rijswijk, The Netherlands
<b>Manufacturer</b>	Xindao B.V.
<b>Address</b>	P.O. Box 3082, 2280 GB, Rijswijk, The Netherlands
<b>Factory</b>	Xindao B.V.
<b>Address</b>	P.O. Box 3082, 2280 GB, Rijswijk, The Netherlands
<b>Product Designation</b>	TWS earbuds in wireless chargingcase
<b>Brand Name</b>	N/A
<b>Test Model</b>	P329.12
<b>Date of test</b>	Jun. 12, 2019 to Jun. 26, 2019
<b>Deviation</b>	None
<b>Condition of Test Sample</b>	Normal
<b>Report Template</b>	AGCRT-EC-BLE/EMC (2013-03-01)

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



Sky Dong(Dong Huihui)

Jun. 26, 2019

Reviewed By



Max Zhang(Zhang Yi)

Jun. 26, 2019

Approved By



Forrest Lei(Lei Yonggang)  
Authorized Officer

Jun. 26, 2019



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## 2. GENERAL INFORMATION

### 2.1. DESCRIPTION OF EUT

The EUT are TWS earbuds in wireless charging case

Details of technical specification refer to the description in follows:

Transmitter/Receiver (TX/RX)

<b>Operating Frequency(BT)</b>	2.402 GHz to 2.480GHz
<b>Number of channels(BT)</b>	79 channels
<b>Bluetooth Version(BT)</b>	V4.2
<b>Modulation(BT)</b>	GFSK, $\pi$ /4-DQPSK
<b>Antenna Type(BT)</b>	PCB Antenna
<b>Antenna Gain(BT)</b>	-5.8dBi
<b>Operating Frequency(WPT)</b>	110-205KHz
<b>Modulation(WPT)</b>	ASK
<b>Antenna Type(WPT)</b>	Coil Antenna
<b>Antenna Gain(WPT)</b>	0dBi
<b>Hardware Version</b>	V1.1
<b>Software Version</b>	V1.0
<b>Power Supply</b>	DC 3.7V by battery

Note:1. The EUT doesn't support BLE.

### 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 V2.2.1 (2019-03), ETSI EN 301 489-3 V2.1.1 (2019-03) and ETSI EN 301 489-17 V3.2.0 (2017-03).

<b>ETSI EN 301 489-1</b>	Electro Magnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for Electro Magnetic Compatibility
<b>ETSI EN 301 489-3</b>	Electro Magnetic 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
<b>ETSI EN 301 489-17</b>	Electro Magnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems;



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## 2.4. TEST ITEMS AND THE RESULTS

No.	Basic Standard	Test Type	Result
<b>EMISSION (EN 301 489-1 §7.1)</b>			
1	EN 55032	Radiated emission	PASS
2	EN 55032	Conducted emission, AC ports	PASS
3	EN 55032	Conducted emission, Telecom ports	N/A
4	EN 61000-3-2	Harmonic current emissions	N/A
5	EN 61000-3-3	Voltage fluctuations & flicker	PASS
<b>IMMUNITY (EN 301 489-1 §7.2)</b>			
6	EN 61000-4-2	Electrostatic discharge immunity	PASS
7	EN 61000-4-3	Radiated RF electromagnetic field immunity	PASS
8	EN 61000-4-4	Electrical fast transient/burst immunity	PASS
9	ISO 7637-1, -2	Transients and surges, DC ports	N/A
10	EN 61000-4-5	Surge immunity, AC ports, Telecom ports	PASS
11	EN 61000-4-6	Immunity to conducted disturbances induced by RF fields	PASS
12	EN 61000-4-11	Voltage dips and short interruptions immunity	PASS

**Note:** 1. N/A- Not Applicable.  
2. The latest versions of basic standards are applied.

## 2.5. ENVIRONMENTAL CONDITIONS

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

- Temperature: -10-40°C
- Humidity: 30-60 %
- Atmospheric pressure: 86-106 kPa



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### 3. TEST MODE DESCRIPTION

TEST MODE DESCRIPTION		
NO.	EMI TEST MODE DESCRIPTION	WORST
1	Charging mode by Micro-USB port	V
2	Wireless charging mode	--
3	BT mode	--
NO.	EMS TEST MODE DESCRIPTION	
1	Charging mode by Micro-USB port	V
2	Wireless charging mode	--
3	BT mode	--
<b>Note:</b> 1. V means EMI worst mode. 2. All modes have been tested, and only the worst data recorded in the report.		

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

I/O Port of EUT			
I/O Port Type	Number	Cable Description	Tested With
Micro-USB	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 ISO.

- Uncertainty of Conducted Emission,  $U_c = \pm 3.2\text{dB}$
- Uncertainty of Radiated Emission below 1GHz,  $U_c = \pm 3.9\text{ dB}$
- Uncertainty of Radiated Emission above 1GHz,  $U_c = \pm 4.8\text{ dB}$



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## 5. SUPPORT EQUIPMENT

Device Type	Manufacturer	Model Name	S/N	Data Cable
Adapter	N/A	DYS602-050200W	N/A	N/A
Smartphone	N/A	P8	N/A	N/A
Wireless charging pad	N/A	CP60	N/A	N/A



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## 6. IDENTIFICATION OF THE RESPONSIBLE TESTING LOCATION

<b>Site</b>	Attestation of Global Compliance (Shenzhen) Co., Ltd
<b>Location</b>	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

### TEST EQUIPMENT OF CONDUCTED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESPI	101206	Jun.12, 2019	Jun.11, 2020
LISN	R&S	ESH3-Z5	100086	Aug.21, 2018	Aug.20, 2019

### TEST EQUIPMENT OF RADIATED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Test Receiver	R&S	ESCI	10096	Jun.20, 2019	Jun.19, 2020
Antenna	SCHWARZBECK	VULB9168	D69250	Sep.28, 2018	Sep.27,2019
Horn Antenna	ETS LINDGREN	3117	00034609	Mar.01, 2018	Feb.28,2020
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 08, 2018	Dec.07,2019

### 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, 2018	Aug.20, 2019
AC Source	Schaffner	NSG1007	56825	Aug.21, 2018	Aug.20, 2019

### TEST EQUIPMENT OF ESD TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
ESD Simulator	Schaffner	NSG 438	782	Sep.20, 2018	Sep.19, 2019



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### TEST EQUIPMENT OF RS IMMUNITY TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Signal Generator	R&S	E4421B	MY43351603	Jul. 12, 2019	Jul. 11, 2020
Biconilog Antenna	ETS	3142C	00060447	Sep.28, 2018	Sep.27,2019
Power Sensor	R&S	URV5-Z4	100124	Jul. 12, 2019	Jul. 11, 2020
Power Meter	R&S	NRVD	832378/027	Jun.20, 2019	Jun.19, 2020
Power Amplifier	KALMUS	7100LC	04-02/17-06-001	Jun.20, 2019	Jun.19, 2020
RF Amplifier	Milmega	AS01004-55_55	1004793	Jun.20, 2019	Jun.19, 2020
Horn Antenna	ETS LINDGREN	3117	00034609	Mar.01, 2018	Feb.28, 2020

### TEST EQUIPMENT OF SURGE/EFT/DIPS TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
EFT, Surge, Dips Generator	Schaffner	Modula 6150	34437	Aug.21, 2018	Aug.20, 2019

### TEST EQUIPMENT OF CS IMMUNITY TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Power Amplifier	AR	75A250A	18464	Jul. 12, 2019	Jul. 11, 2020
CDN	Schaffner	M016	21614	Aug.21, 2018	Aug.20, 2019
6dB attenuator	JWF	50FHC-006-50	N/A	Jul. 12, 2019	Jul. 11, 2020
Electromagnetic Injection Clamp	Luthi	EM101	35773	Aug.21, 2018	Aug.20, 2019
Power Sensor	R&S	URV5-Z4	100124	May.14, 2019	May.15, 2020
Power Meter	R&S	NRVD	8323781027	May.14, 2019	May.15, 2020
SIGNAL GENERATOR	R&S	E4421B	MY43351603	May.14, 2019	May.15, 2020



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## 7. RADIATED DISTURBANCE MEASUREMENT

### 7.1. LIMITS OF RADIATED DISTURBANCES

Limits for radiated disturbance 30M to 1 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

Note: 1. The lower limit shall apply at the transition frequency.

2. Additional provisions may be required for cases where interference occurs.

### 7.2. 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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.



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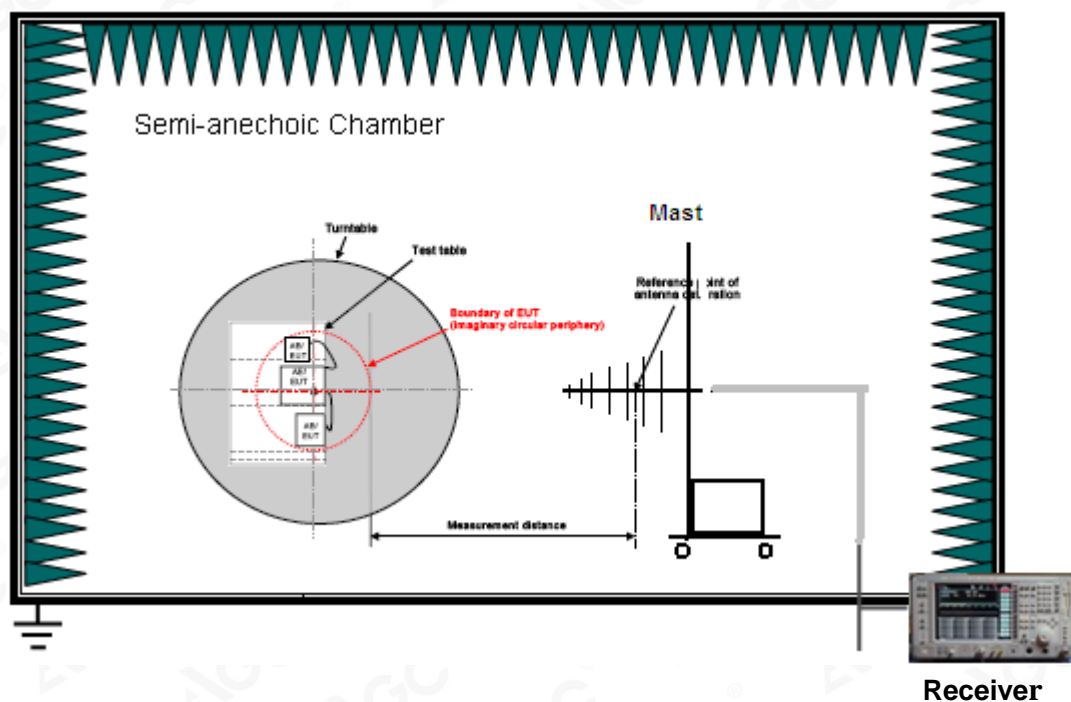
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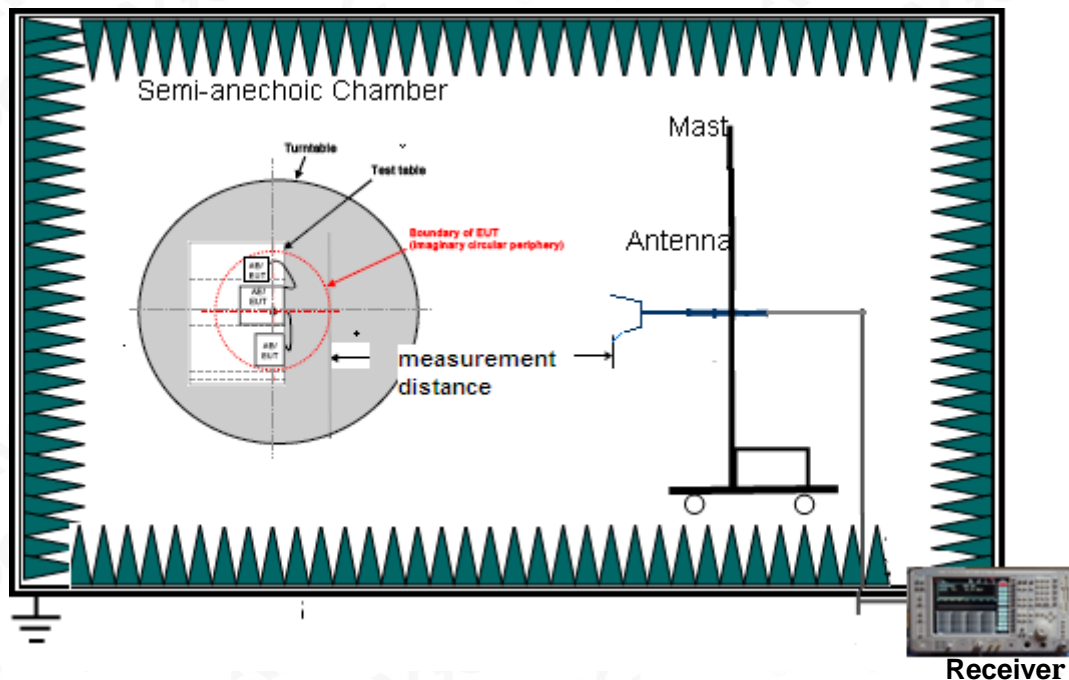
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### 7.3. BLOCK DIAGRAM OF TEST SETUP

#### Radiated Disturbance below 1 GHz



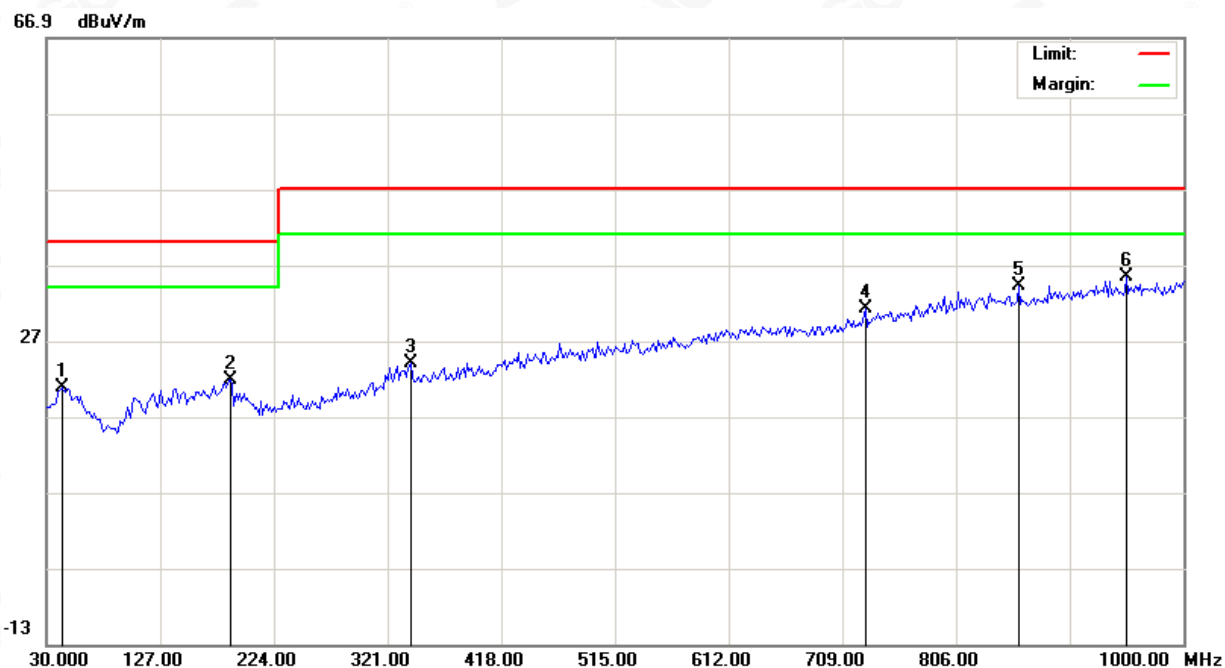
#### Radiated Disturbance above 1 GHz



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

## 7.4 TEST RESULT (Mode 1)

### 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		42.9333	0.80	19.98	20.78	40.00	-19.22	peak			
2		186.8167	5.00	16.77	21.77	40.00	-18.23	peak			
3		340.4000	3.18	20.89	24.07	47.00	-22.93	peak			
4		728.4000	2.35	28.79	31.14	47.00	-15.86	peak			
5		859.3500	3.07	31.18	34.25	47.00	-12.75	peak			
6	*	951.5000	3.23	32.14	35.37	47.00	-11.63	peak			

RESULT: PASS



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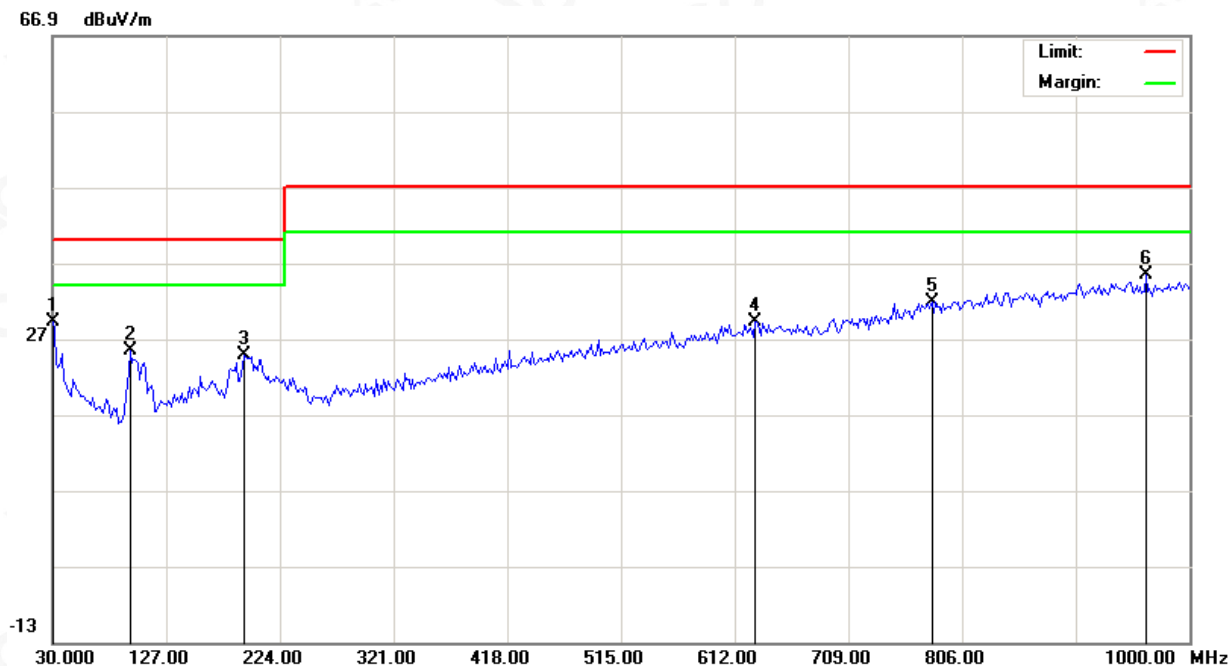
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### RADIATED EMISSION BELOW 1GHz- VERTICAL



No.	Mk	Freq. MHz	Reading dBuV	Factor dB/m	Measurement dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1	*	30.0000	10.94	18.17	29.11	40.00	-10.89	peak			
2		96.2833	9.80	15.63	25.43	40.00	-14.57	peak			
3		193.2833	8.37	16.42	24.79	40.00	-15.21	peak			
4		629.7833	1.97	27.31	29.28	47.00	-17.72	peak			
5		780.1333	1.92	29.96	31.88	47.00	-15.12	peak			
6		962.8167	3.07	32.24	35.31	47.00	-11.69	peak			

### RESULT: PASS

Remark: which 1GHz-6GHz are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.



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## 8. Mains Terminal Disturbance Voltage Measurement

### 8.1. LIMITS OF MAINS TERMINAL DISTURBANCE VOLTAGE

Frequency range (MHz)	Limits (dBuV), Class B ITE	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

**NOTE:**

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

### 8.2. TEST PROCEDURE

- (1) The EUT was placed 0.4 meters from the conducting wall of shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). The LISN provide 50Ω/50μH of coupling impedance for the measuring instrument.
- (2) Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- (3) The frequency range from 150 kHz to 30 MHz was searched. Emission levels over 20dB under the prescribed limits are not reported.



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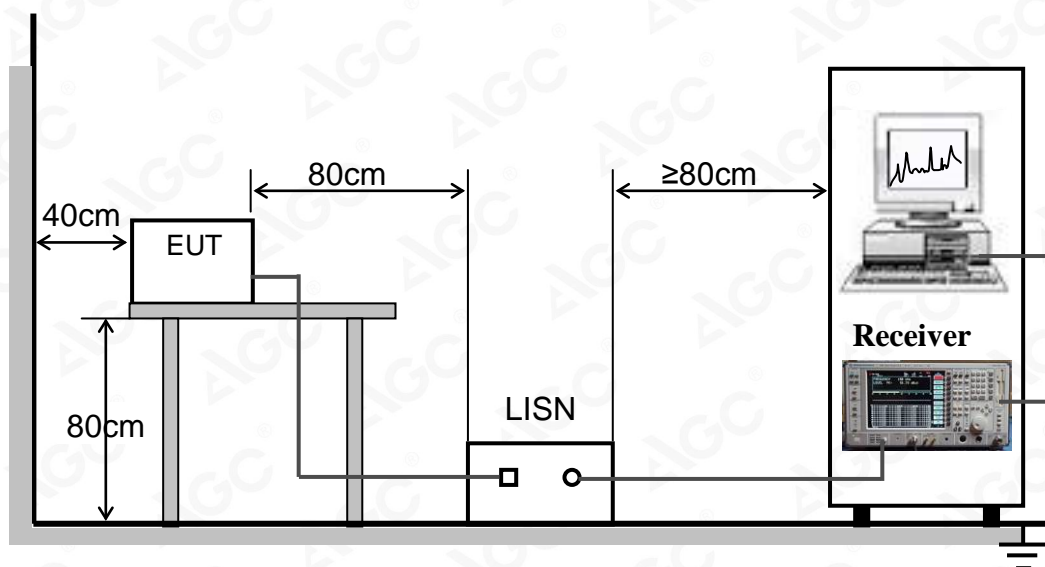
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### 8.3. TEST SETUP



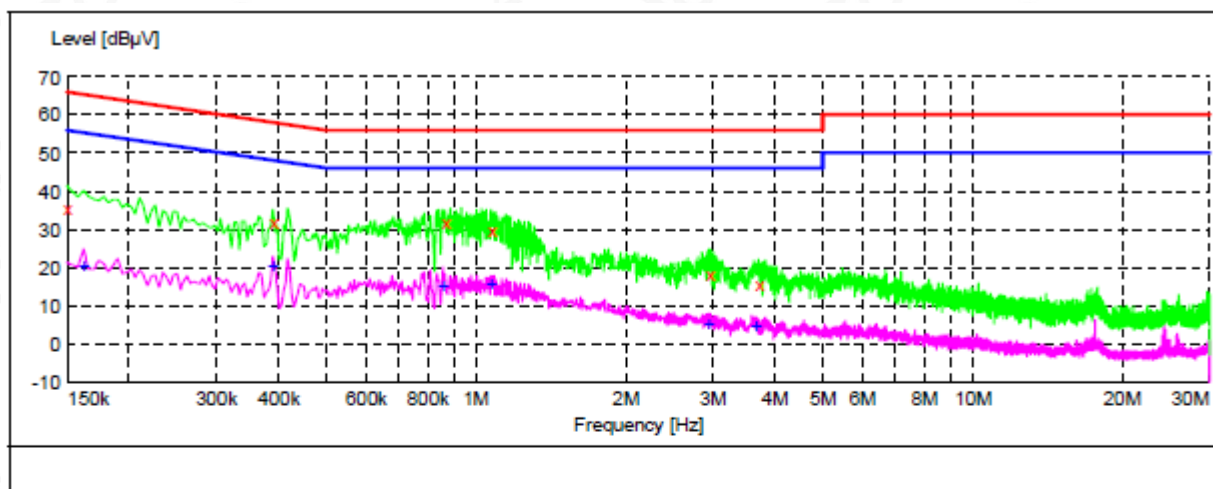
For the actual test configuration, please refer to the related item - Photographs of the Test Configuration.

### 8.4. 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-L



## MEASUREMENT RESULT: "TEST\_fin"

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.150000	35.70	10.8	66	30.3	QP	L1	FLO
0.390000	31.90	10.4	58	26.2	QP	L1	FLO
0.866000	31.90	11.0	56	24.1	QP	L1	FLO
1.074000	29.90	11.4	56	26.1	QP	L1	FLO
2.946000	18.10	11.5	56	37.9	QP	L1	FLO
3.702000	16.00	11.6	56	40.0	QP	L1	FLO

## MEASUREMENT RESULT: "TEST\_fin2"

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.162000	20.50	10.8	55	34.9	AV	L1	FLO
0.390000	20.50	10.4	48	27.6	AV	L1	FLO
0.858000	15.20	11.0	46	30.8	AV	L1	FLO
1.074000	15.60	11.4	46	30.4	AV	L1	FLO
2.938000	5.20	11.5	46	40.8	AV	L1	FLO
3.666000	4.40	11.6	46	41.6	AV	L1	FLO



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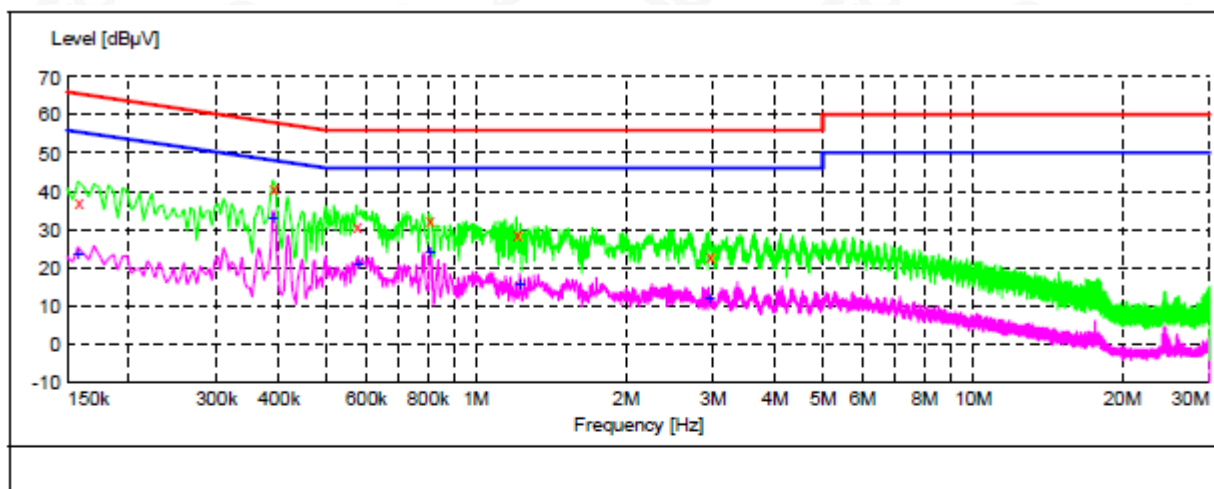
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# LINE CONDUCTED EMISSION TEST-N



## MEASUREMENT RESULT: "TEST\_fin"

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.158000	37.40	10.8	66	28.2	QP	N	FLO
0.390000	41.00	10.4	58	17.1	QP	N	FLO
0.574000	30.90	10.8	56	25.1	QP	N	FLO
0.806000	32.50	10.8	56	23.5	QP	N	FLO
1.206000	29.00	11.5	56	27.0	QP	N	FLO
2.946000	23.20	11.5	56	32.8	QP	N	FLO

## MEASUREMENT RESULT: "TEST\_fin2"

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.158000	23.40	10.8	56	32.2	AV	N	FLO
0.390000	33.10	10.4	48	15.0	AV	N	FLO
0.578000	21.10	10.8	46	24.9	AV	N	FLO
0.810000	24.00	10.8	46	22.0	AV	N	FLO
1.226000	15.60	11.5	46	30.4	AV	N	FLO
2.946000	11.80	11.5	46	34.2	AV	N	FLO



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## 9. HARMONIC CURRENT MEASUREMENT

### 9.1. 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
$15 \leq n \leq 39$	$0.15 \times 15/n$
Even harmonics	
2	1.08
4	0.43
6	0.30
$8 \leq n \leq 40$	$0.23 \times 8/n$

**NOTE:**

1. According to section 5 of EN61000-3-2: 2014, the EUT is Class C 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.

### 9.2. 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.



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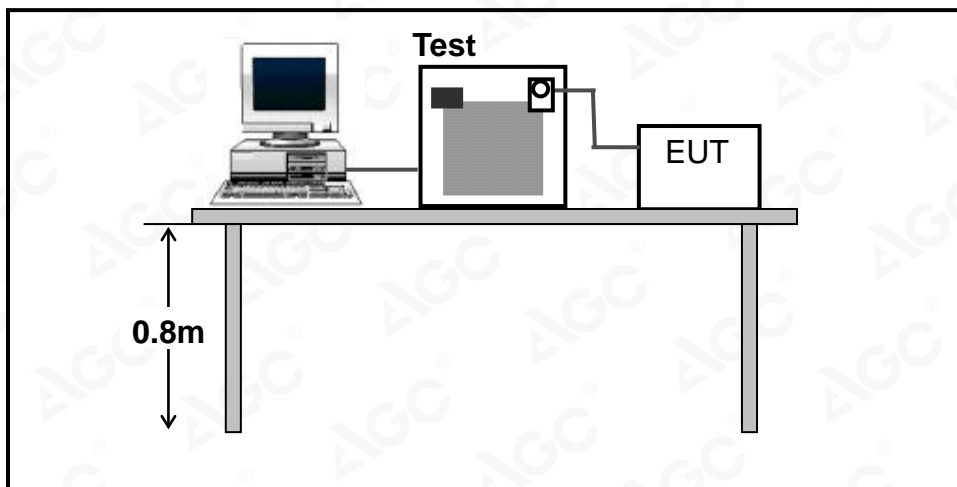
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### 9.3. TEST SETUP



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

### 9.4. TEST RESULT

N/A

## 10. VOLTAGE FLUCTUATIONS AND FLICK MEASUREMENT

### 10.1. 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
$T_{dt}$	0.2	$T_{dt}$ means maximum time that $d_t$ exceeds 3%
$d_{max}(\%)$	4%	$d_{max}$ means maximum relative voltage change.
$d_c(\%)$	3%	$d_c$ means relative steady-state voltage change.

### 10.2. 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 most unfavorable sequence of voltage changes under normal conditions
2. 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.

### 10.3. TEST SETUP

Same as 9.3

### 10.4. TEST RESULT

#### Test Specification

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

#### Test Result

Test Parameter	Measurement Value	Limit	Remarks
$P_{st}$	0.0091	1.0	Pass
$P_{lt}$	0.0059	0.65	Pass
$T_{dt(s)}$	0.0035	0.2	Pass
$d_{max}(\%)$	0.054%	4%	Pass
$d_c(\%)$	0.042%	3%	Pass



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## 11. IMMUNITY TEST

### 11.1. EUT SETUP AND OPERATING CONDITIONS

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

### 11.2. GENERAL PERFORMANCE CRITERIA

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

The performance criteria A shall apply.

Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an ACKnowledgement (ACK) or Not ACKnowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

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

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms

duration, for which performance criteria C shall apply.

Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an acknowledgement (ACK) or not-acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

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

The performance criteria A shall apply.

Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

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

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration for which performance criteria C shall apply.

Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.





### 11.3. ELECTROSTATIC DISCHARGE IMMUNITY TEST

#### 11.3.1 TEST SPECIFICATION

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

#### 11.3.2 TEST PROCEDURE

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

- Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.
- The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
- The time interval between two successive single discharges was at least 1 second.
- 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.
- Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- 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.
- 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.
- 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.



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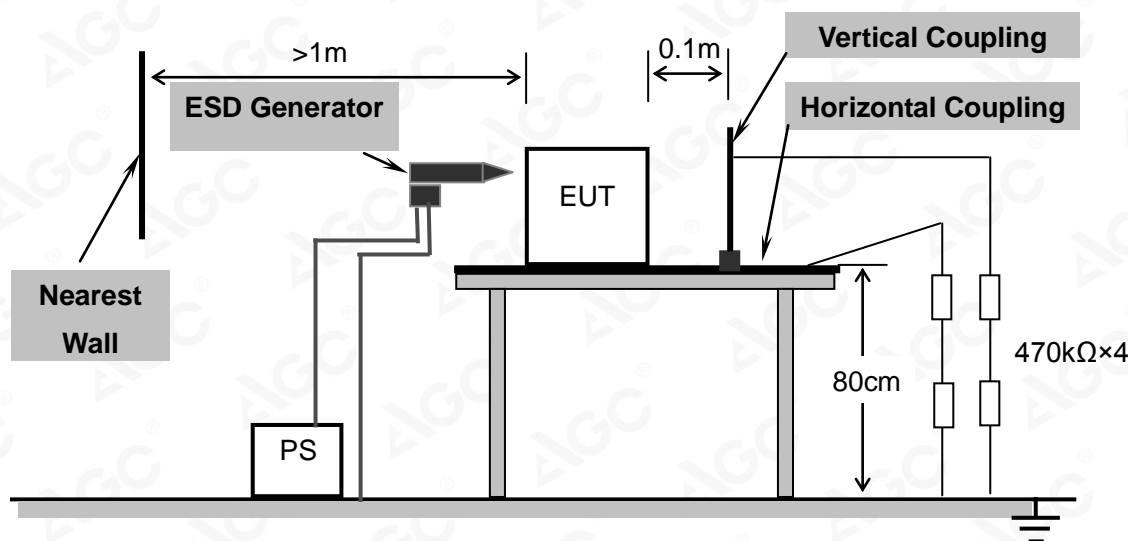
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### 11.3.3 TEST SETUP



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

### 11.3.4 TEST RESULT

Criteria	During Test	After Test
A	Shall operate as intended. May show degradation of performance (see note 1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 2). 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 (see note 1). No unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 2). Shall be no loss of stored data or user programmable functions.

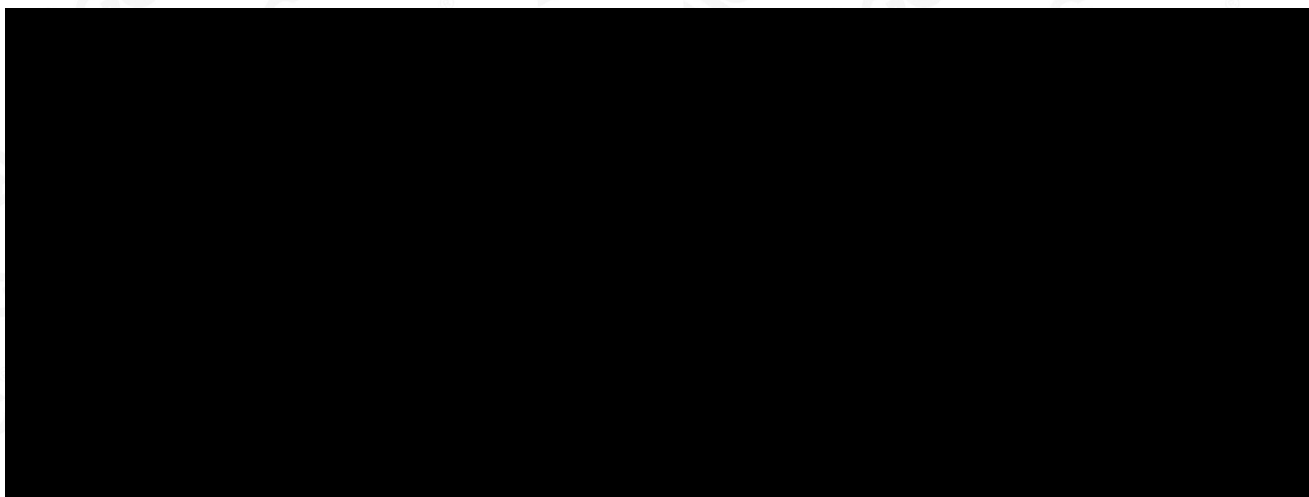
**NOTE 1:** Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

**NOTE 2:** No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

# DESCRIPTION OF THE ELECTROSTATIC DISCHARGES (ESD)

Amount of Discharges	Voltage	Coupling	Observation	Performance	Result (Pass/Fail)
Mini 20 / Point	±2KV, ±4kV	Contact Discharge	No Function Loss	A	Pass
Mini 20 / Point	±2KV, ±4kV, ±8kV	Air Discharge	No Function Loss	A	Pass
Mini 20 / Point	±2KV, ±4kV	Indirect Discharge HCP	No Function Loss	A	Pass
Mini 20 / Point	±2KV, ±4kV	Indirect Discharge VCP	No Function Loss	A	Pass

**Note:** operating mode include all modes of EMS in page 8



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### 11.3.5 PERFORMANCE

<input checked="" type="checkbox"/> <b>Criteria A:</b>	The apparatus continues to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.
<input type="checkbox"/> <b>Criteria B:</b>	The apparatus continues to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
<input type="checkbox"/> <b>Criteria C:</b>	Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

<input checked="" type="checkbox"/> <input type="checkbox"/>
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## 12. RADIATED, RADIO FREQUENCY ELECTROMAGNETIC FIELD IMMUNITY TEST

### 12.1 TEST SPECIFICATION

Basic Standard	EN 61000-4-3
Frequency Range	80 MHz – 6000MHzMHz
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	1.5m
Dwell Time	3 seconds

### 12.2. TEST PROCEDURE

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

- The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.
- The test signal was 80% amplitude modulated with a 1 kHz sine wave.
- 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  $1.5 \times 10^{-3}$  decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- The field strength level was 3V/m.
- The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.



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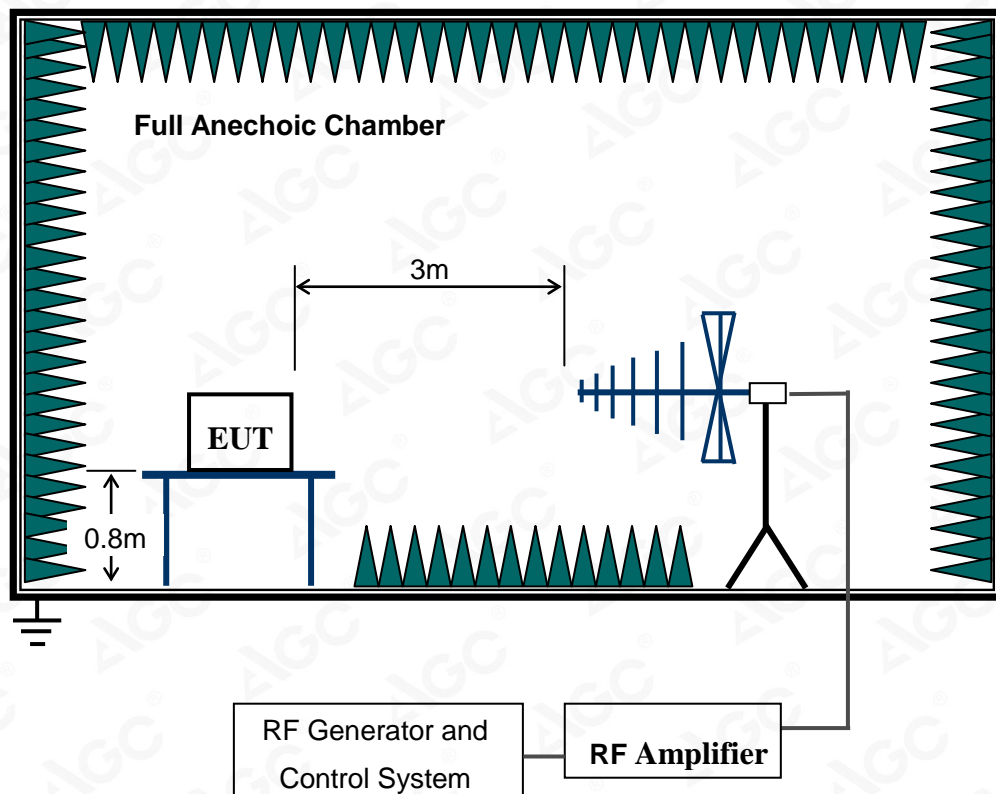
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### 12.3. TEST SETUP



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

## 12.4. TEST RESULT

Criteria	During Test	After Test
A	Shall operate as intended. May show degradation of performance (see note 1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 2). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
<p><b>NOTE 1:</b> Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.</p> <p><b>NOTE 2:</b> No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.</p>		

Freq. Range (MHz)	Field	Modulation	Polarity	Position	Observation	performance	Result (Pass/Fail)
80-6000	3V/m	Yes	H / V	Front	No Function Loss	A	PASS
80-6000	3V/m	Yes	H / V	Back	No Function Loss	A	PASS
80-6000	3V/m	Yes	H / V	Left	No Function Loss	A	PASS
80-6000	3V/m	Yes	H / V	Right	No Function Loss	A	PASS
80-6000	3V/m	Yes	H / V	Top	No Function Loss	A	PASS
80-6000	3V/m	Yes	H / V	Bottom	No Function Loss	A	PASS

**Note:** operating mode include all modes of EMS in page 8



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## 12.5. PERFORMANCE

<input checked="" type="checkbox"/> <b>Criteria A:</b>	The apparatus continues to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.
<input type="checkbox"/> <b>Criteria B:</b>	The apparatus continues to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
<input type="checkbox"/> <b>Criteria C:</b>	Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

<input checked="" type="checkbox"/>	<input type="checkbox"/>
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### 13. ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

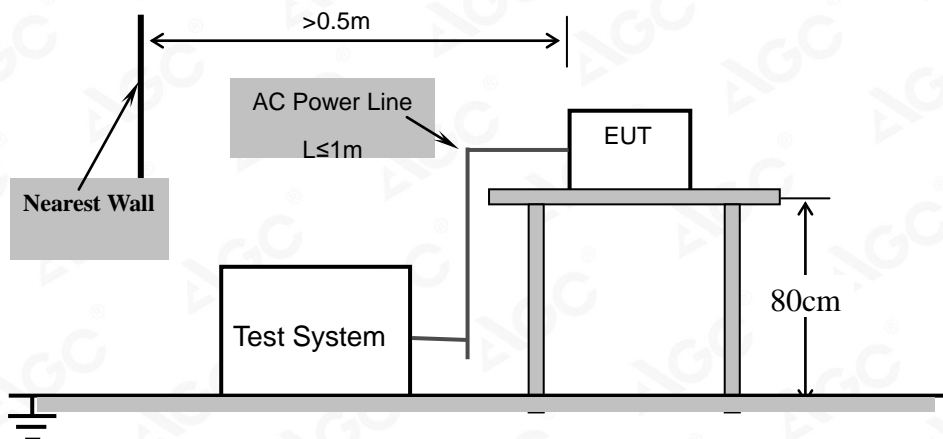
#### 13.1. TEST SPECIFICATION

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

#### 13.2. TEST PROCEDURE

1. The EUT was tested with 1000 volt discharges to the AC power input leads.
2. Both positive and negative polarity discharges were applied.
3. 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.
4. The duration time of each test sequential was 1 minute.
5. The transient/burst waveform was in accordance with IEC 61000-4-4, 5/50ns.

#### 13.3. TEST SETUP



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

#### 13.4. TEST RESULT

Test Point	Polarity	Test Level (kV)	Observation	performance	Conclusion
a.c. port, L	+/-	1	No function loss	A	Pass
a.c. port, N	+/-	1	No function loss	A	Pass
a.c. port, L-N	+/-	1	No function loss	A	Pass

Note: There was not any unintentional transmission discovered in standby mode

**Note:** operating mode include all modes of EMS in page 8

#### 13.5. PERFORMANCE

<input checked="" type="checkbox"/> <b>Criteria A:</b>	The apparatus continues to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.
<input type="checkbox"/> <b>Criteria B:</b>	The apparatus continues to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
<input type="checkbox"/> <b>Criteria C:</b>	Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.



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## 14. SURGE IMMUNITY TEST

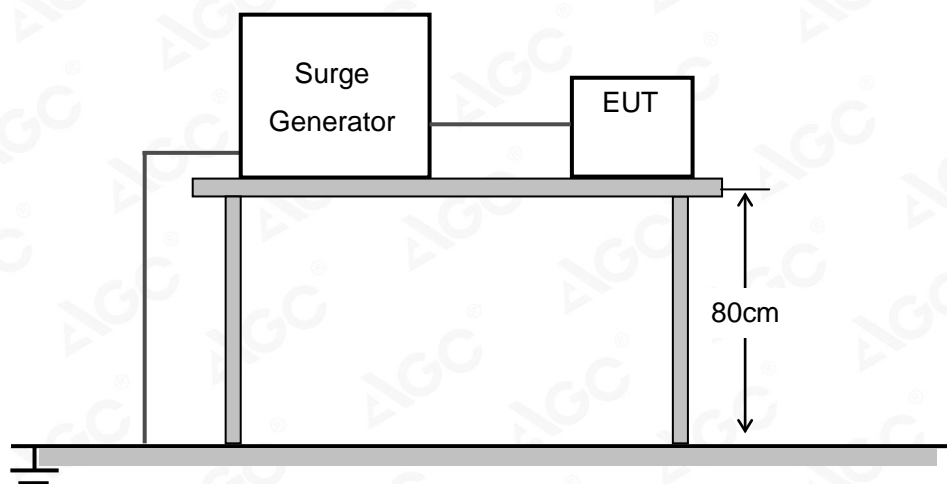
### 14.1. TEST SPECIFICATION

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

### 14.2. TEST PROCEDURE

- 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).
- 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).
- The surges were applied line to line and line(s) to earth. All lower levels including the selected test level were tested. The polarity of each surge level included positive and negative test pulses.

### 14.3. TEST SETUP



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

#### 14.4. TEST RESULT

Coupling Line	Polarity	Voltage (kV)	Observation	performance	Conclusion
a.c. power, L-N	+/-	1.0	No function loss	A	Pass

Note: There was not any unintentional transmission discovered in standby mode

**Note:** operating mode include all modes of EMS in page 8

#### 14.5. PERFORMANCE

<input checked="" type="checkbox"/> <b>Criteria A:</b>	The apparatus continues to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.
<input type="checkbox"/> <b>Criteria B:</b>	The apparatus continues to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
<input type="checkbox"/> <b>Criteria C:</b>	Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

<input checked="" type="checkbox"/>	<input type="checkbox"/>
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## 15. IMMUNITY TO CONDUCTED DISTURBANCES INDUCED BY RF FIELDS

### 15.1. TEST SPECIFICATION

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

### 15.2. TEST PROCEDURE

1. The EUT shall be tested within its intended operating and climatic conditions.
2. 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.
3. The test signal was 80% amplitude modulated with a 1 kHz sine wave
4. 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  $1.5 \times 10^{-3}$  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.
5. 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.
6. Attempts should be made to fully exercise the EUT during test, and to fully interrogate all exercise modes selected for susceptibility.



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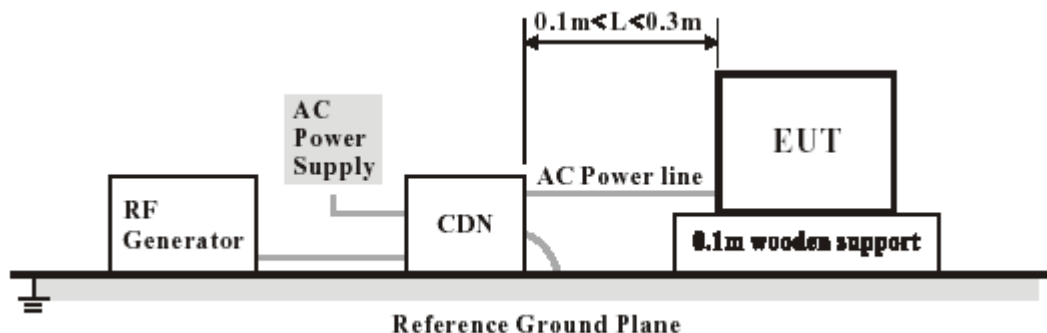
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### 15.3. TEST SETUP



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

### 15.4. TEST RESULT

EUT Working Mode	Test Point	Frequency (MHz)	Field Strength (Vrms)	Observation	performance	Conclusion
Normal	a.c. port	0.15 – 80	3	No function loss	A	Pass

Note: There was not any unintentional transmission in standby mode

**Note:** operating mode include all modes of EMS in page 8

### 15.5. PERFORMANCE

<input checked="" type="checkbox"/> <b>Criteria A:</b>	The apparatus continues to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.
<input type="checkbox"/> <b>Criteria B:</b>	The apparatus continues to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
<input type="checkbox"/> <b>Criteria C:</b>	Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.



## 16. VOLTAGE DIPS AND SHORT INTERRUPTIONS IMMUNITY TEST

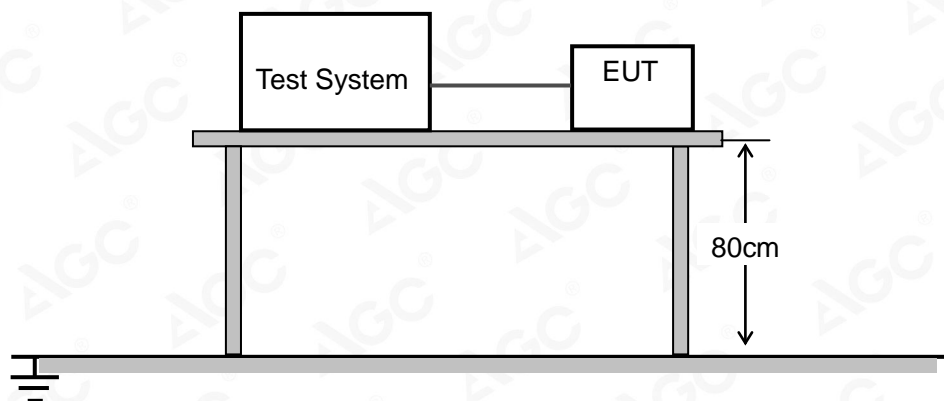
### 16.1. TEST SPECIFICATION

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

### 16.2. TEST PROCEDURE

- 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.
- 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.
- 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.

### 16.3. TEST SETUP



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

#### 16.4. TEST RESULT

Test Mode	Voltage Reduction	Duration (cycle)	Times	Interval (ms)	Observation	performance	Conclusion
Voltage dips	100%	0.5	3	10	No function loss	B	Pass
	100%	1	3	20	No function loss	C	Pass
	30%	25	3	500	No function loss	C	Pass
Voltage interruptions	100%	250	3	5000	No function loss	C	Pass

Note: There was not any unintentional transmission in standby mode

**Note:** operating mode include all modes of EMS in page 8

#### 16.5. PERFORMANCE

<input type="checkbox"/> <b>Criteria A:</b>	The apparatus continues to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.
<input checked="" type="checkbox"/> <b>Criteria B:</b>	The apparatus continues to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
<input checked="" type="checkbox"/> <b>Criteria C:</b>	Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

<input checked="" type="checkbox"/>	<input type="checkbox"/>
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## **APPENDIX A: PHOTOGRAPHS OF TEST SETUP**

Refer to Attached file(Appendix I).

## **APPENDIX B: PHOTOGRAPHS OF EUT**

Refer to Attached file(Appendix I).

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



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