
EMC Test Report

Report No.: AGC03485230603EE01A

PRODUCT DESIGNATION : Round Bamboo wireless speaker

BRAND NAME : N/A

MODEL NAME : MO6428

APPLICANT : Mid Ocean Brands B.V.

DATE OF ISSUE : Aug. 01, 2025

STANDARD(S) : ETSI EN 301 489-1 V2.2.3 (2019-11)
ETSI EN 301 489-17 V3.3.1 (2024-09)

REPORT VERSION : V1.0

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REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Aug. 01, 2025	Valid	Initial release

Note: The original test report AGC03485230603EE01 (dated Jul. 04, 2023 and tested from Jun. 27, 2023 to Jul. 04, 2023) was modified on Aug. 01, 2025, including the following changes and additions:

- Change the address of the applicant;
- Change the address of the manufacture;
- Change the address of the factory;
- Change the positions of certain capacitors and resistors;
- Updated the standard from ETSI EN 301 489-17 V3.2.4 (2020-09) to ETSI EN 301 489-17 V3.3.1 (2024-09)

For above described changes, additional tests for Electrostatic discharge, Conducted emission, Radiated emission.

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1. TEST REPORT CERTIFICATION

Applicant	Mid Ocean Brands B.V.
Address	Unit 711-716, 7/F., Tower A, 83 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong
Manufacturer	Mid Ocean Brands B.V.
Address	Unit 711-716, 7/F., Tower A, 83 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong
Factory	Mid Ocean Brands B.V.
Address	Unit 711-716, 7/F., Tower A, 83 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong
Product Designation	Round Bamboo wireless speaker
Brand Name	N/A
Test Model	MO6428
Date of receipt of test item	Jul. 22, 2025
Date of test	Jun. 27, 2023 to Jul. 04, 2023 and Jul. 22, 2025 to Aug. 01, 2025
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.

Prepared By

Cici Li
(Project Engineer)

Aug. 01, 2025

Reviewed By

Bibo Zhang
(Reviewer)

Aug. 01, 2025

Approved By

Angela Li
(Authorized Officer)

Aug. 01, 2025

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2. GENERAL INFORMATION

2.1. DESCRIPTION OF EUT

The EUT is a short range, lower power, Bluetooth device.

Details of technical specification refer to the description in follows:

Transmitter/Receiver (TX/RX)

Operating Frequency	2402MHz to 2480MHz
Bluetooth Version	V5.3
Modulation Type	BR <input checked="" type="checkbox"/> GFSK 1Mbps; EDR <input checked="" type="checkbox"/> π /4-DQPSK 2Mbps <input checked="" type="checkbox"/> 8DPSK 3Mbps BLE <input checked="" type="checkbox"/> GFSK 1Mbps <input checked="" type="checkbox"/> GFSK 2Mbps
Number of channels	79 Channels for BR/EDR; 40 Channels for BLE
Hardware Version	V1.0
Software Version	V1.0
Antenna Type	PCB Antenna
Antenna Gain	-0.58dBi
Power Supply	DC 3.7V by battery or DC 5V by adapter

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 V2.2.3 (2019-11) and ETSI EN 301 489-17 V3.3.1 (2024-09).

ETSI EN 301 489-1	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility.
ETSI EN 301 489-17	Electro Magnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband and Wideband Data Transmission Systems; Harmonized Standard for Electro Magnetic Compatibility

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2.4. TEST ITEMS AND THE RESULTS

No.	Basic Standard	Test Type	Result
EMISSION (EN 301 489-1 §7.1)			
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
IMMUNITY (EN 301 489-1 §7.2)			
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: 15-35°C
- Relative humidity: 30-60%
- Atmospheric pressure: 86-106kPa

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3. TEST MODE DESCRIPTION

TEST MODE DESCRIPTION		
NO.	EMI TEST MODE DESCRIPTION	WORST
1	BT mode with charging	V
2	BT mode	-
NO.	EMS TEST MODE DESCRIPTION	WORST
1	BT mode with charging	V
2	BT mode	-

Note: 1. V means EMI worst mode.
 2. All modes have been tested and only the worst mode test data recorded in the test report.

I/O Port Information (Applicable Not Applicable)

I/O Port of EUT			
I/O Port Type	Number	Cable Description	Tested With
Type-C Port	1	0.45m unshielded	1

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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, $U_c = \pm 2.9 \text{ dB}$
- Uncertainty of Radiated Emission below 1GHz, $U_c = \pm 3.9 \text{ dB}$
- Uncertainty of Radiated Emission above 1GHz, $U_c = \pm 4.9 \text{ dB}$

5. SUPPORT EQUIPMENT

Device Type	Manufacturer	Model Name	Data Cable
iPod	APPLE	MGG82ZP/A	--
Adapter	jinbaotong	K-T10E0502000E	--

Note: 1.-- “means no any support device during testing.

2. All the cables were provided by AGC Lab.

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6. IDENTIFICATION OF THE RESPONSIBLE TESTING LOCATION

Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	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	Aug. 04, 2022	Aug. 03, 2023
Test Receiver	R&S	ESPI	101206	May 08, 2025	May 07, 2027
Artificial power network	R&S	ESH2-Z5	100086	Jun. 03, 2023	Jun. 02, 2024
Artificial power network	R&S	ESH2-Z5	100086	May 08, 2025	May 07, 2027
Test Software	FARA	EZ-EMC(Ver. AGC-CON03A1)	N/A	N/A	N/A

TEST EQUIPMENT OF RADIATED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Test Receiver	R&S	ESCI	10096	Feb. 18, 2023	Feb. 17, 2024
Test Receiver	R&S	ESCI	10096	Jan. 14, 2025	Jan. 13, 2026
EXA Signal Analyzer	Agilent	N9010A	MY53470504	Aug. 04, 2022	Aug. 03, 2023
EXA Signal Analyzer	Agilent	N9010A	MY53470504	May 08, 2025	May 07, 2027
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	Mar. 23, 2023	Mar. 22, 2024
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	Mar. 27, 2025	Mar. 26, 2026
Preamplifier Assembly	ETS	3117PA	00225134	Sep. 02, 2022	Sep. 01, 2024
Preamplifier Assembly	ETS	3117PA	00225134	N/A	N/A
Wideband Antenna	SCHWARZBEC K	VULB9168	VULB9168-49 4	Jan. 05, 2023	Jan. 04, 2025
Wideband Antenna	SCHWARZBEC K	VULB9168	VULB9168-49 4	Mar. 14, 2025	Mar. 13, 2027
Test Software	FARA	EZ-EMC(Ver.RA-03A)	N/A	N/A	N/A
Test Software	Tonscend	JS32-RE(Ver.2.5)	N/A	N/A	N/A

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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	Jul. 06, 2022	Jul. 05, 2023
AC Source	Schaffner	NSG1007	56825	Jun. 02, 2023	Jun. 01, 2024
Test software	TC	4.29.0	N/A	N/A	N/A

TEST EQUIPMENT OF ESD TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
ESD Simulator	Schaffner	NSG 438	782	Dec. 30, 2022	Dec. 29, 2023
ESD Simulator	Schaffner	NSG 438	782	Nov. 12, 2024	Nov. 11, 2025

TEST EQUIPMENT OF SURGE/EFT/DIPS TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
EFT/Surge Generator	Schaffner	Modula 6150	34437	Jun. 08, 2023	Jun. 07, 2024
Test software	TC	2.31	N/A	N/A	N/A

TEST EQUIPMENT OF RS IMMUNITY TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Signal Generator	Agilent	E4421B	MY43351603	Feb. 17, 2023	Feb. 16, 2024
Power Probe	R&S	URV5-Z4	100124	Mar. 24, 2023	Mar. 23, 2025
Power Meter	R&S	NRVD	8323781027	Mar. 24, 2023	Mar. 23, 2025
Power Amplifier	L2	S2006-0001	BPA00T10W 500-1	N/A	N/A
Power Amplifier	Milmega	AS0104-55_55	1004793	N/A	N/A
Power Amplifier	Rflight	NTWPA-25601 00	17063183	N/A	N/A
Double-Ridged Waveguide Horn	ETS-LINDGREN	3117	00034609	Mar. 23, 2023	Mar. 22, 2024
Wideband Antenna	SCHWARZBECK	VULB9168	VULB9168-4 94	Jan. 05, 2023	Jan. 04, 2025
Bi-log antenna	ETS	3142C	920250	Jun. 08, 2022	Jun. 07, 2024
Test Software	Tonscend	2.0.1.8	N/A	N/A	N/A

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TEST EQUIPMENT OF CS IMMUNITY TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Power Amplifier	AR	75A250	18464	N/A	N/A
CDN	ZHINAN	ZN3751	15004	Aug. 03, 2022	Sep. 02, 2024
6dB attenuator	ZHINAN	E-002	N/A	Aug. 04, 2022	Aug. 03, 2024
Power Probe	R&S	URV5-Z4	100124	Mar. 24, 2023	Mar. 23, 2025
Electromagnetic Injection Clamp	Luthi	EM101	35773	Aug. 12, 2022	Aug. 11, 2024
Power Meter	R&S	NRVD	8323781027	Mar. 24, 2023	Mar. 23, 2025
Signal Generator	Aglient	E4421B	MY43351603	Feb. 17, 2023	Feb. 16, 2024
Test Software	Tonscend	2.0.1.7	N/A	N/A	N/A

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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 3m

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 3m

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

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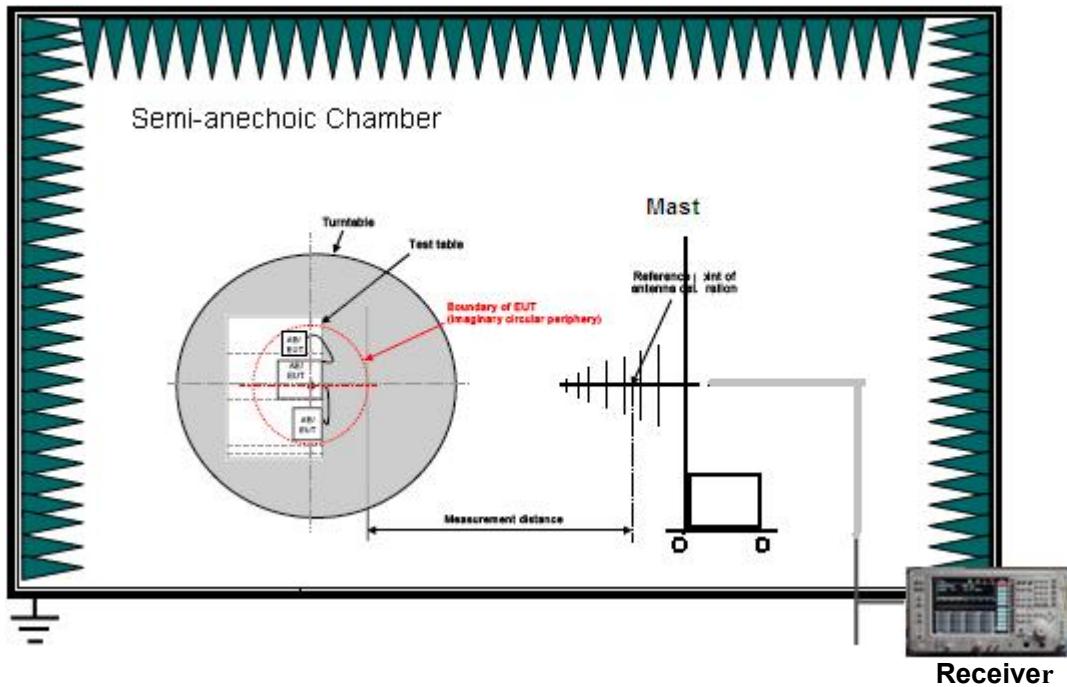
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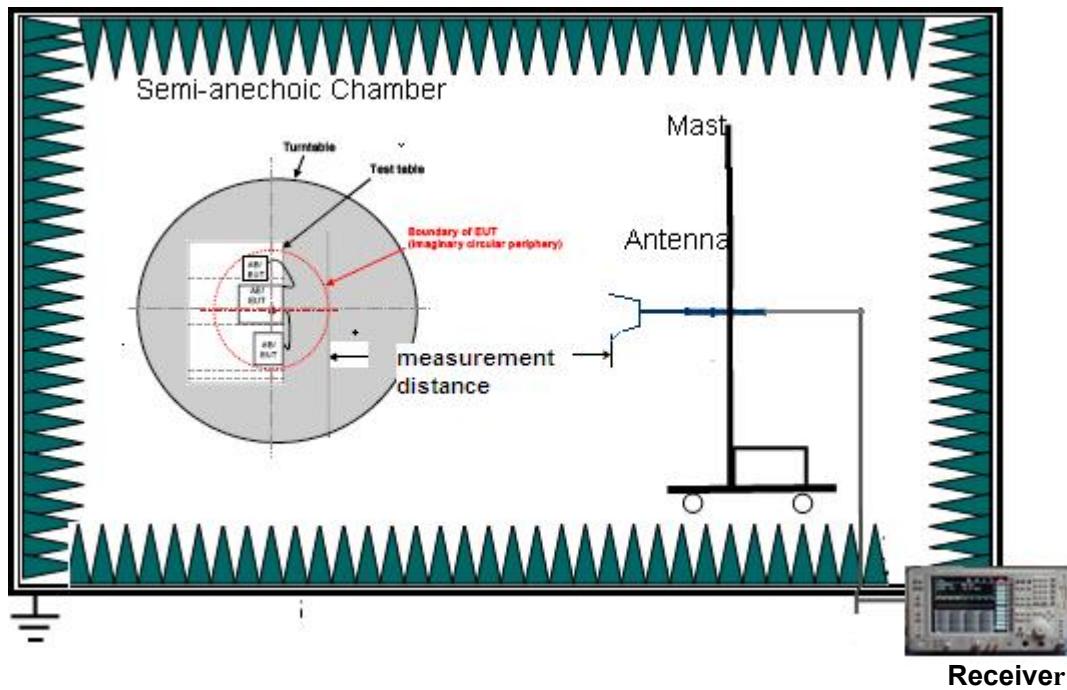
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7.3. BLOCK DIAGRAM OF TEST SETUP

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.

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7.4. 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	Correct	Measure-	Limit	Over	Detector
			Level	Factor	ment			
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1		68.1514	39.18	-25.22	13.96	40.00	-26.04	peak
2	*	143.8295	48.51	-20.85	27.66	40.00	-12.34	peak
3		239.9874	47.64	-21.75	25.89	47.00	-21.11	peak
4		336.0352	44.46	-18.56	25.90	47.00	-21.10	peak
5		413.2706	39.54	-17.07	22.47	47.00	-24.53	peak
6		854.0247	39.52	-9.33	30.19	47.00	-16.81	peak

RESULT: PASS

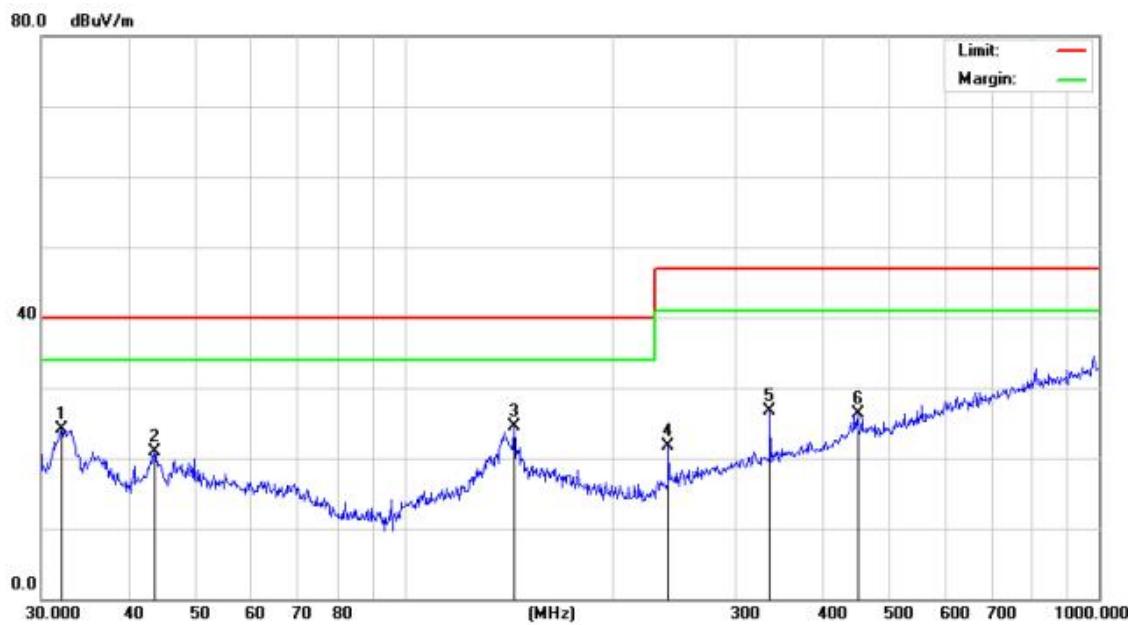
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RADIATED EMISSION BELOW 1GHz- VERTICAL



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		32.0667	47.27	-23.25	24.02	40.00	-15.98	peak
2		43.6584	42.52	-21.52	21.00	40.00	-19.00	peak
3	*	143.8295	44.35	-19.92	24.43	40.00	-15.57	peak
4		239.9874	42.65	-20.92	21.73	47.00	-25.27	peak
5		336.0352	44.62	-17.84	26.78	47.00	-20.22	peak
6		449.5558	41.24	-15.00	26.24	47.00	-20.76	peak

RESULT: PASS

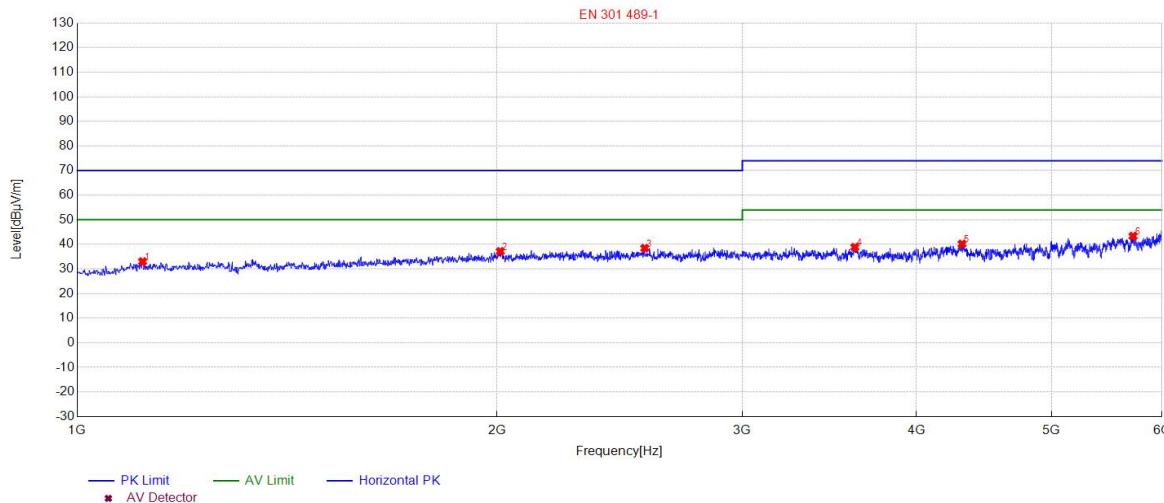
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RADIATED EMISSION ABOVE 1GHz – HORIZONTAL



NO.	Freq. [MHz]	Level [dB μ V/m]	Factor [dB]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1114.0228	33.00	-18.18	70.00	37.00	100	40	Horizontal
2	2011.2022	37.14	-14.16	70.00	32.86	100	120	Horizontal
3	2553.3106	38.45	-12.54	70.00	31.55	100	280	Horizontal
4	3612.5225	38.83	-11.14	74.00	35.17	100	80	Horizontal
5	4312.6625	40.18	-10.10	74.00	33.82	100	40	Horizontal
6	5719.9439	43.34	-6.84	74.00	30.66	100	290	Horizontal

RESULT: PASS

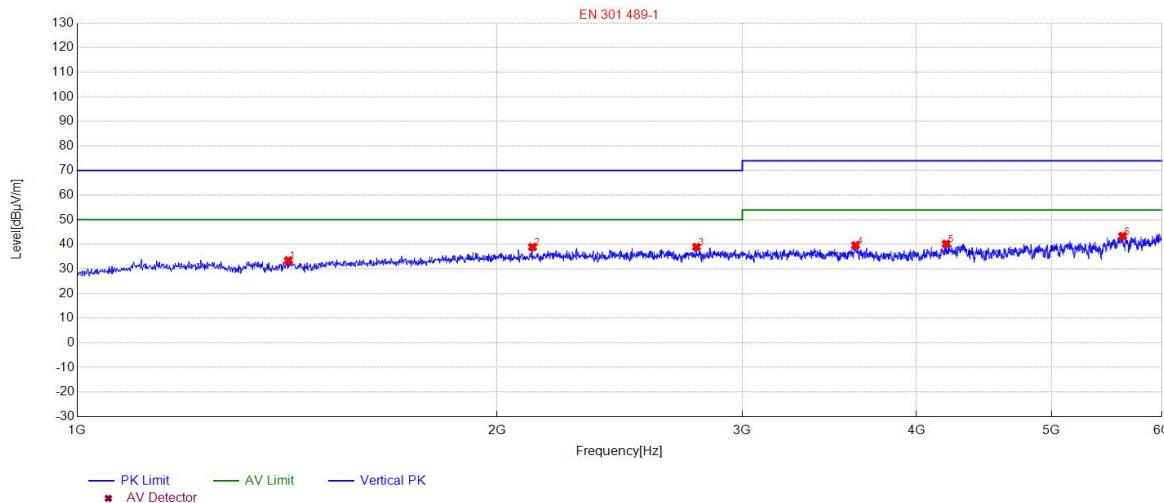
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RADIATED EMISSION ABOVE 1GHz - VERTICAL



NO .	Freq. [MHz]	Level [dB μ V/m]	Factor [dB]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1417.08341	33.45	-17.91	70.00	36.55	100	170	Vertical
2	2121.22424	38.89	-13.81	70.00	31.11	100	100	Vertical
3	2781.35627	38.92	-12.30	70.00	31.08	100	290	Vertical
4	3616.52330	39.58	-11.14	74.00	34.42	100	150	Vertical
5	4200.64012	40.16	-10.51	74.00	33.84	100	300	Vertical
6	5621.92438	43.34	-7.27	74.00	30.66	100	150	Vertical

RESULT: PASS

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8. CONDUCTED EMISSION MEASUREMENT

8.1. LIMITS OF LINE CONDUCTED EMISSION

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 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 EN 55032 (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 EN 55032.
- (3) All I/O cables were positioned to simulate typical actual usage as per EN 55032.
- (4) The EUT received DC 5V power from adapter which received AC 230V 50Hz power through a Line Impedance Stabilization Network (LISN) 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.

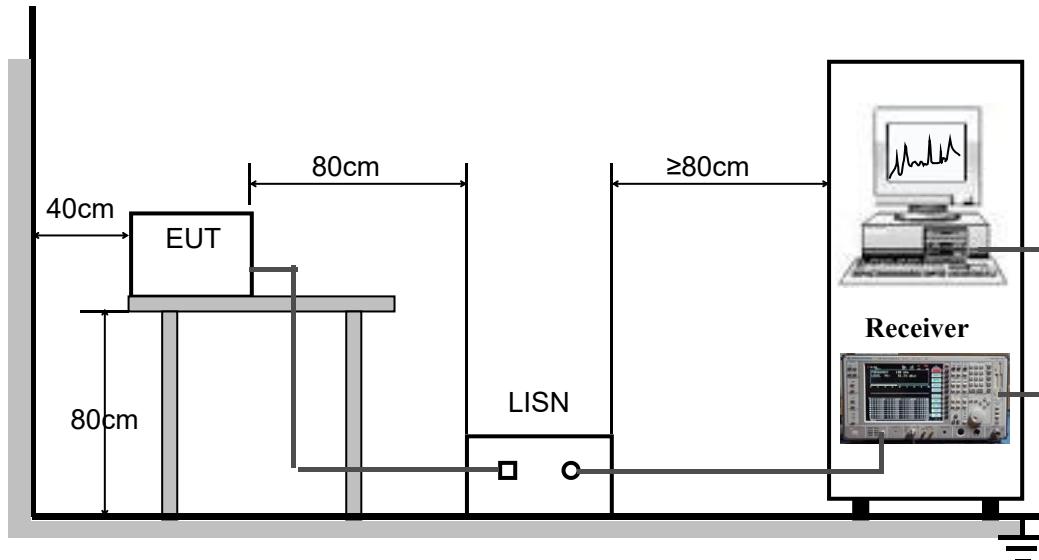
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8.3. TEST SETUP



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

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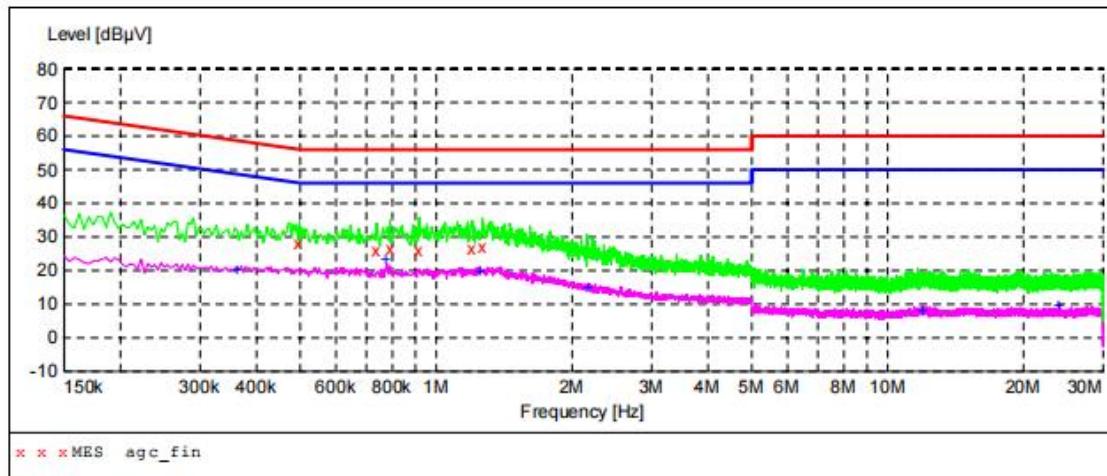
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8.4. TEST RESULT

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 CONCUTED EMISSION TEST-L



MEASUREMENT RESULT: "agc_fin"

2025/7/24 21:14

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line
0.498000	28.30	9.9	56	27.7	QP	L1
0.738000	26.20	9.9	56	29.8	QP	L1
0.790000	26.50	9.9	56	29.5	QP	L1
0.918000	26.00	9.9	56	30.0	QP	L1
1.202000	26.70	9.9	56	29.3	QP	L1
1.266000	26.90	9.9	56	29.1	QP	L1

MEASUREMENT RESULT: "agc_fin2"

2025/7/24 21:14

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line
0.362000	20.30	9.9	49	28.4	AV	L1
0.778000	23.30	9.9	46	22.7	AV	L1
1.250000	19.70	9.9	46	26.3	AV	L1
2.170000	15.00	9.9	46	31.0	AV	L1
11.962000	7.90	10.4	50	42.1	AV	L1
24.002000	9.60	11.0	50	40.4	AV	L1

RESULT: PASS

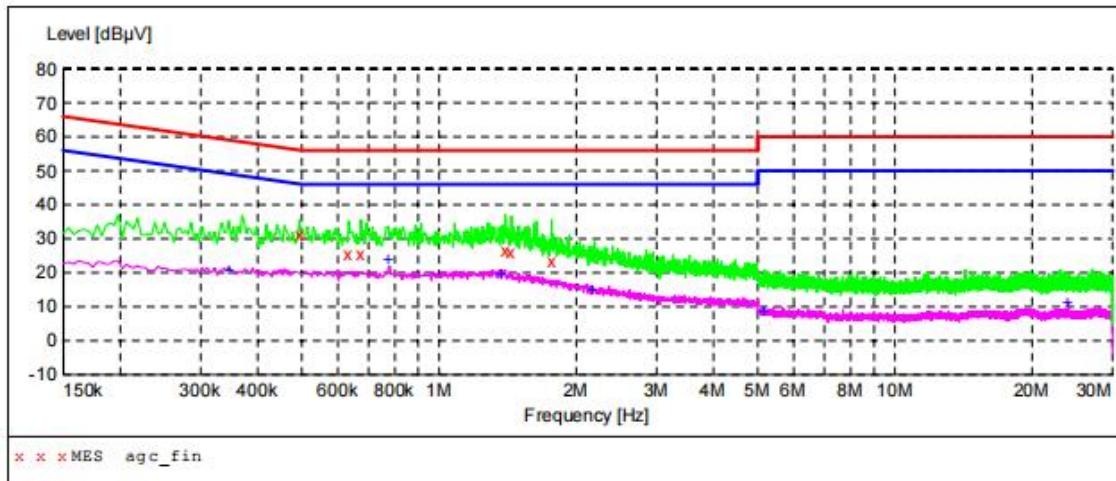
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LINE CONCUTED EMISSION TEST-N


MEASUREMENT RESULT: "agc_fin"

2025/7/24 21:11

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line
0.494000	31.10	9.9	56	25.0	QP	N
0.634000	25.60	9.9	56	30.4	QP	N
0.674000	25.40	9.9	56	30.6	QP	N
1.398000	26.30	9.9	56	29.7	QP	N
1.442000	26.00	9.9	56	30.0	QP	N
1.766000	23.50	9.9	56	32.5	QP	N

MEASUREMENT RESULT: "agc_fin2"

2025/7/24 21:11

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line
0.346000	20.50	9.9	49	28.6	AV	N
0.778000	23.80	9.9	46	22.2	AV	N
1.366000	19.50	9.9	46	26.5	AV	N
2.162000	15.20	9.9	46	30.8	AV	N
5.158000	8.40	10.0	50	41.6	AV	N
24.002000	11.00	11.0	50	39.0	AV	N

RESULT: PASS

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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≤n≤39	0.15×15/n
Even harmonics	
2	1.08
4	0.43
6	0.30
8≤n≤40	0.23×8/n

Note: 1. According to section 5 of EN 61000-3-2: 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.

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.

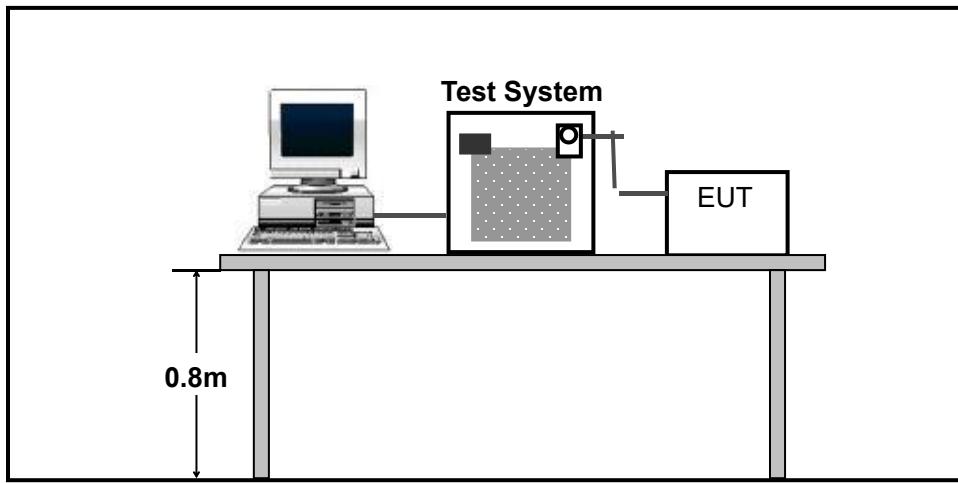
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9.3. TEST SETUP



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

9.4. TEST RESULT

Note: Owing to the power of EUT is less than 75W, so test is not applicable.

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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}	0.5	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.

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}	0.261	1.0	Pass
P _{lt}	0.114	0.65	Pass
T _{dt(s)}	0.0	0.5	Pass
d _{max} (%)	0.00	4%	Pass
d _c (%)	0.00	3.3%	Pass

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11. IMMUNITY TEST

11.1. DESCRIPTION OF PERFORMANCE CRITERIA

The performance criteria are used to take a decision on whether a radio equipment passes or fails immunity tests.

For the purpose of the present document two categories of performance criteria apply:

- Performance criteria for continuous phenomena.
- Performance criteria for transient phenomena.

11.2. GENERAL PERFORMANCE CRITERIA

1. Performance criteria for continuous phenomena

During the test, the equipment shall:

- continue to operate as intended;
- not unintentionally transmit;
- not unintentionally change its operating state;
- not unintentionally change critical stored data.

2. Performance criteria for transient phenomena

For all ports and transient phenomena with the exception described below, the following applies:

- The application of the transient phenomena shall not result in a change of the mode of operation (e.g. unintended transmission) or the loss of critical stored data.
- After application of the transient phenomena, the equipment shall operate as intended.

For surges applied to symmetrically operated wired network ports intended to be connected directly to outdoor lines the following criteria applies:

- For products with only one symmetrical port intended for connection to outdoor lines, loss of function is allowed, provided the function is self-recoverable, or can be otherwise restored. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.
- For products with more than one symmetrical port intended for connection to outdoor lines, loss of function on the port under test is allowed, provided the function is self-recoverable. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

For a 0 % residual voltage dip tests the following performance criteria apply:

- The performance criteria for transient phenomena shall apply.

For a 70 % residual voltage dip and voltage interruption tests, the following performance criteria apply:

- in the case where the equipment is fitted with or connected to a battery back-up, the performance criteria for transient phenomena shall apply;
- in the case where the equipment is powered solely from the AC mains supply (without the use of a parallel battery back-up) volatile user data may have been lost and if applicable the communication link need not to be maintained and lost functions should be recoverable by user or operator;
- no unintentional responses shall occur at the end of the test, when the voltage is restored to nominal;
- in the event of loss of function(s) or in the event of loss of user stored data, this fact shall be recorded.

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3. Performance Table

EN 301 489-17 Performance criteria		
Criteria	During Test	After Test (i.e. as a result of the application of the test)
A	Shall operate as intended. (see note). 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 critical stored data.
B	May be loss of function.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no loss of critical stored data.
C	May be loss of function.	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no loss of critical stored data.
The performance criteria A shall apply for continuous phenomena. The performance criteria B shall apply for transient phenomena, except for voltage dips greater than or equal to 100 ms and voltage interruptions of 5 000 ms duration, for which performance criteria C shall apply. Where the EUT is a transmitter in standby mode or receive mode, unintentional transmission shall not occur during the test. Note: Operate as intended during the test allows a level of degradation in accordance with the Minimum performance level.		
Minimum performance level		
For equipment that supports a PER or FER, the minimum performance level shall be a PER or FER less than or equal to 10 %. For equipment that does not support a PER or a FER, the minimum performance level shall be no loss of the wireless transmission function needed for the intended use of the equipment.		

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12. ELECTROSTATIC DISCHARGE IMMUNITY TEST

12.1 TEST SPECIFICATION

Basic Standard	EN 61000-4-2
Discharge Impedance	330Ω / 150 pF
Discharge Voltage	Air Discharge ±8kV, Contact Discharge ±4kV
Polarity	Positive / Negative
Number of Discharge	Minimum 25 times at each test point
Discharge Mode	Single discharge
Discharge Period	1-second minimum

12.2 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.

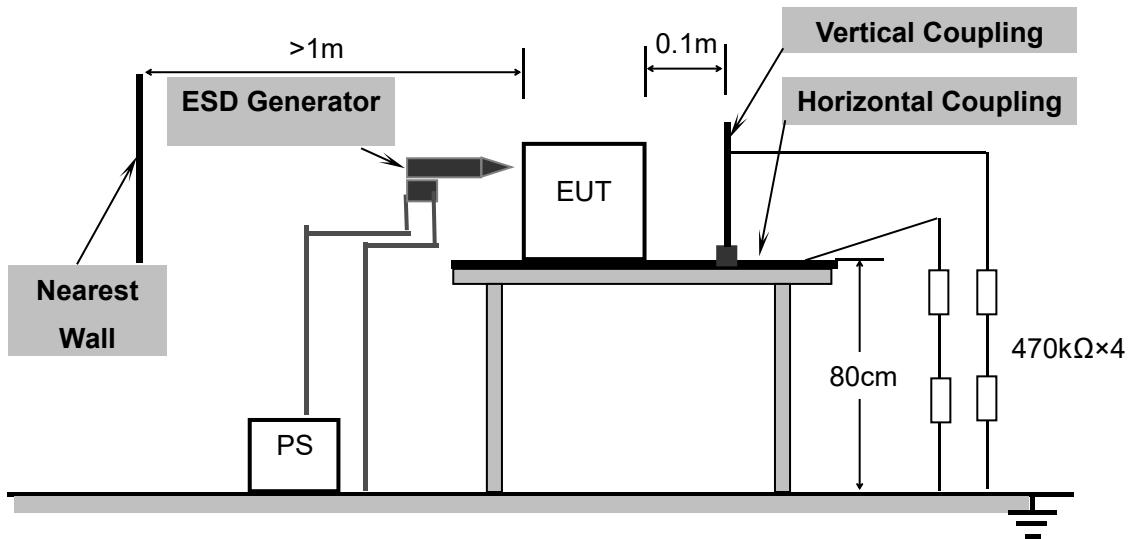
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12.3 TEST SETUP



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

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ESD LOCATION:

Blue line: Air discharge

Red line: Contact discharge



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12.4 TEST RESULT

Times of Discharge	Voltage	Coupling	Test Mode	Performance criteria
Mini 25 / Point	±2kV; ±4kV	Contact discharge	Mode 1/2	A
Mini 25 / Point	±2kV; ±4kV; ±8kV	Air Discharge	Mode 1/2	A
Mini 25 / Point	±4kV	Indirect Discharge HCP	Mode 1/2	A
Mini 25 / Point	±4kV	Indirect Discharge VCP	Mode 1/2	A

A: No degradation in the performance of the EUT was observed.

Note: operating mode include all modes of EMS in page 9.

12.5 PERFORMANCE

<input checked="" type="checkbox"/> Criteria A:	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"/> Criteria 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"/> Criteria C:	Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

Compliance **Not Compliance**

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13. RADIATED, RADIO FREQUENCY ELECTROMAGNETIC FIELD IMMUNITY TEST

13.1. 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	1.55m
Dwell Time	3 seconds

13.2. 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.

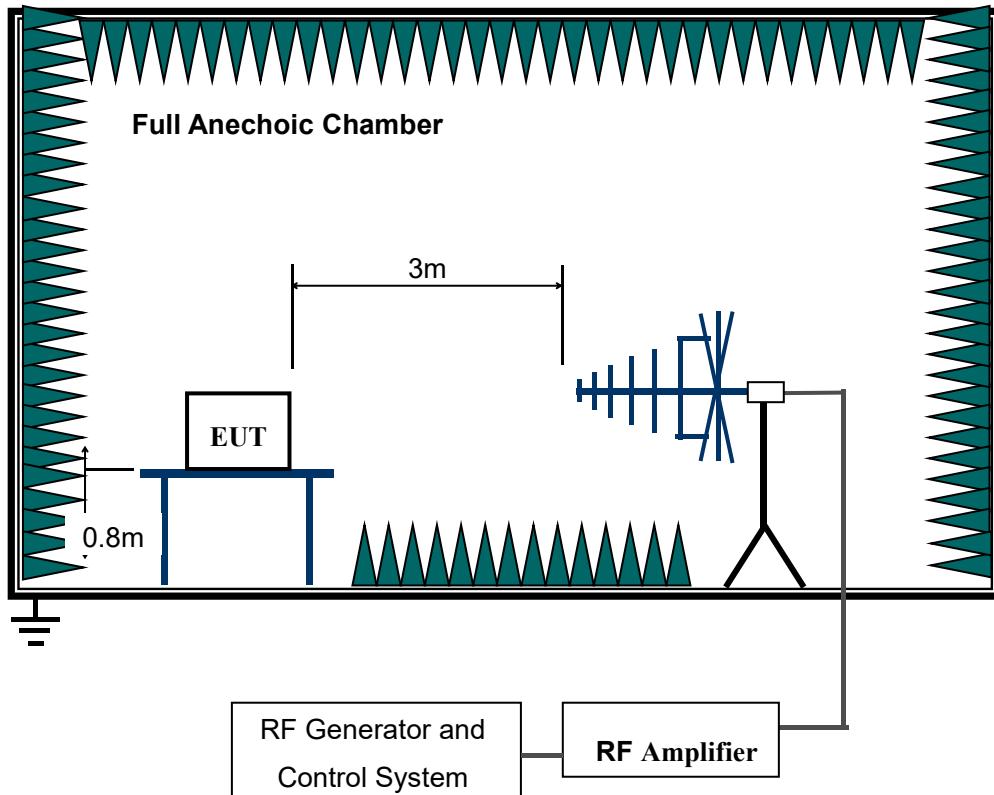
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13.3. TEST SETUP



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

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13.4. TEST RESULT

Freq. Range (MHz)	Field	Modulation	Polarity	Position	Test Mode	Performance criteria
80-6000	3V/m	Yes	H	Front	Mode 1/2	A
80-6000	3V/m	Yes	H	Back	Mode 1/2	A
80-6000	3V/m	Yes	H	Left	Mode 1/2	A
80-6000	3V/m	Yes	H	Right	Mode 1/2	A
80-6000	3V/m	Yes	V	Front	Mode 1/2	A
80-6000	3V/m	Yes	V	Back	Mode 1/2	A
80-6000	3V/m	Yes	V	Left	Mode 1/2	A
80-6000	3V/m	Yes	V	Right	Mode 1/2	A

A: No degradation or PER < 10% in the performance of the EUT was observed.

Note: operating mode include all modes of EMS in page 9.

13.5. PERFORMANCE

<input checked="" type="checkbox"/> Criteria A:	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"/> Criteria 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"/> Criteria C:	Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

Compliance **Not Compliance**

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14. ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

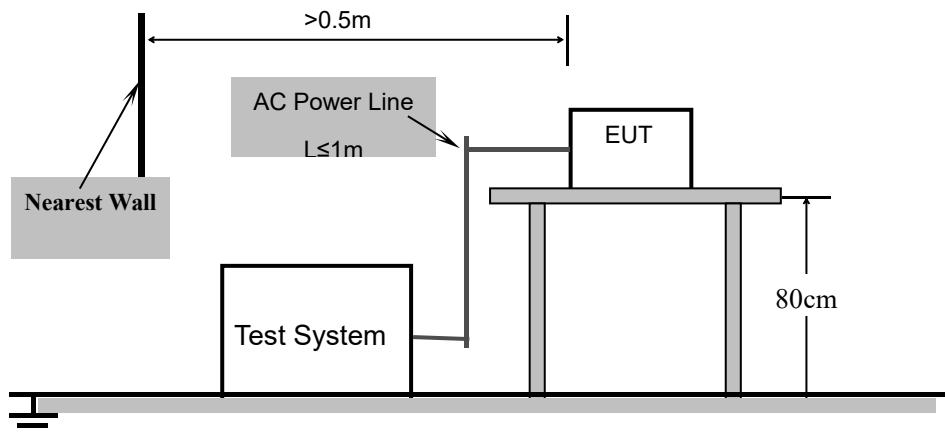
14.1. TEST SPECIFICATION

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.

14.2. 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.

14.3. TEST SETUP



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

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14.4. TEST RESULT

Test Point	Polarity	Test Level (kV)	Test Mode	Performance criteria
a.c. port, L	+/-	1	Mode 1	A
a.c. port, N	+/-	1	Mode 1	A
a.c. port, L-N	+/-	1	Mode 1	A
a.c. port, L-N	+/-	1	Mode 1	A

A: No degradation in the performance of the EUT was observed.

Note: operating mode include all modes of EMS in page 9.

14.5. PERFORMANCE

<input checked="" type="checkbox"/> Criteria A:	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.
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<input type="checkbox"/> Criteria C:	Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

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15. SURGE IMMUNITY TEST

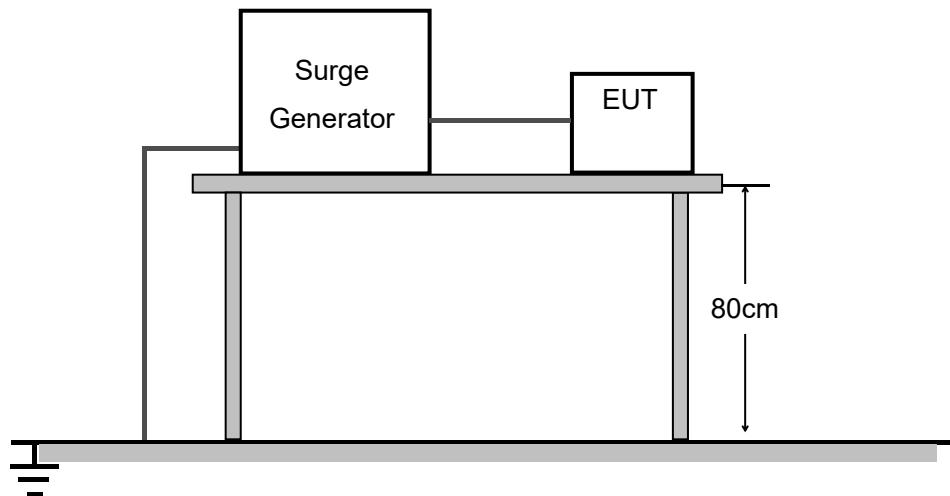
15.1. TEST SPECIFICATION

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

15.2. 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. All lower levels including the selected test level were tested. The polarity of each surge level included positive and negative test pulses.

15.3. TEST SETUP



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

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15.4. TEST RESULT

Coupling Line	Polarity	Voltage (kV)	Test Mode	Performance criteria
a.c. power, L-N	+/-	1.0	Mode 1	A
A: No degradation in the performance of the EUT was observed.				

Note: operating mode include all modes of EMS in page 9.

15.5. PERFORMANCE

<input checked="" type="checkbox"/> Criteria A:	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.
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<input type="checkbox"/> Criteria C:	Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

<input checked="" type="checkbox"/> Compliance	<input type="checkbox"/> Not Compliance
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16. IMMUNITY TO CONDUCTED DISTURBANCES INDUCED BY RF FIELDS

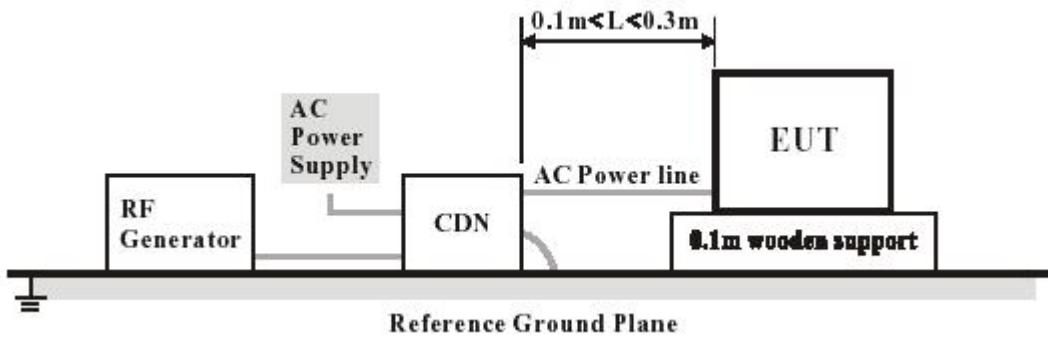
16.1. TEST SPECIFICATION

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

16.2. 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 1.5×10^{-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.

16.3. TEST SETUP



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

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16.4. TEST RESULT

Test Point	Frequency (MHz)	Level (V rms)	Test Mode	Performance criteria
a.c. port	0.15 – 80	3	Mode 1	A

A: No degradation in the performance of the EUT was observed.

Note: operating mode include all modes of EMS in page 9.

16.5. PERFORMANCE

<input checked="" type="checkbox"/> Criteria A:	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.
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17. VOLTAGE DIPS AND SHORT INTERRUPTIONS IMMUNITY TEST

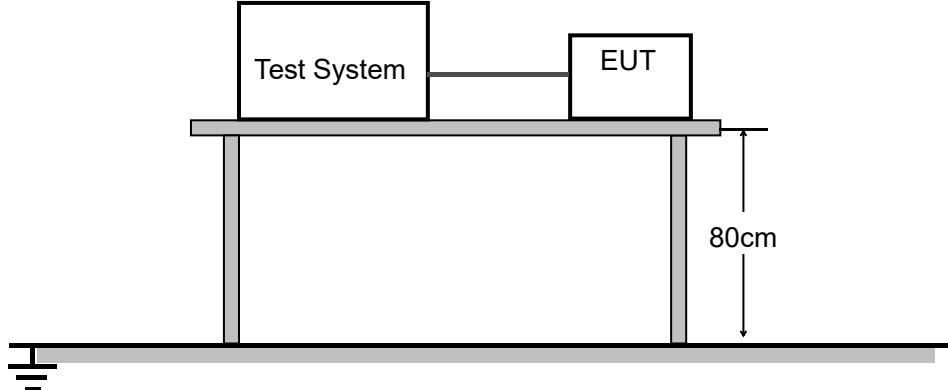
17.1. TEST SPECIFICATION

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°

17.2. 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.

17.3. TEST SETUP



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

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17.4. TEST RESULT

Test Mode	Voltage Reduction	Duration (cycle)	Times	Interval (Sec)	Test Mode	Performance criteria
Voltage dips	100%	0.5	3	10	Mode 1	B
	100%	1	3	10	Mode 1	B
	30%	25	3	10	Mode 1	C
Voltage interruptions	100%	250	3	10	Mode 1	C

A: No degradation in the performance of the EUT was observed.
 B: Stop charging during the test and self-recoverable after test.
 C: Lost functions can be recoverable by user or operator.

Note: operating mode include all modes of EMS in page 9.

17.5. PERFORMANCE

<input type="checkbox"/> Criteria A:	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"/> Criteria 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"/> Criteria C:	Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

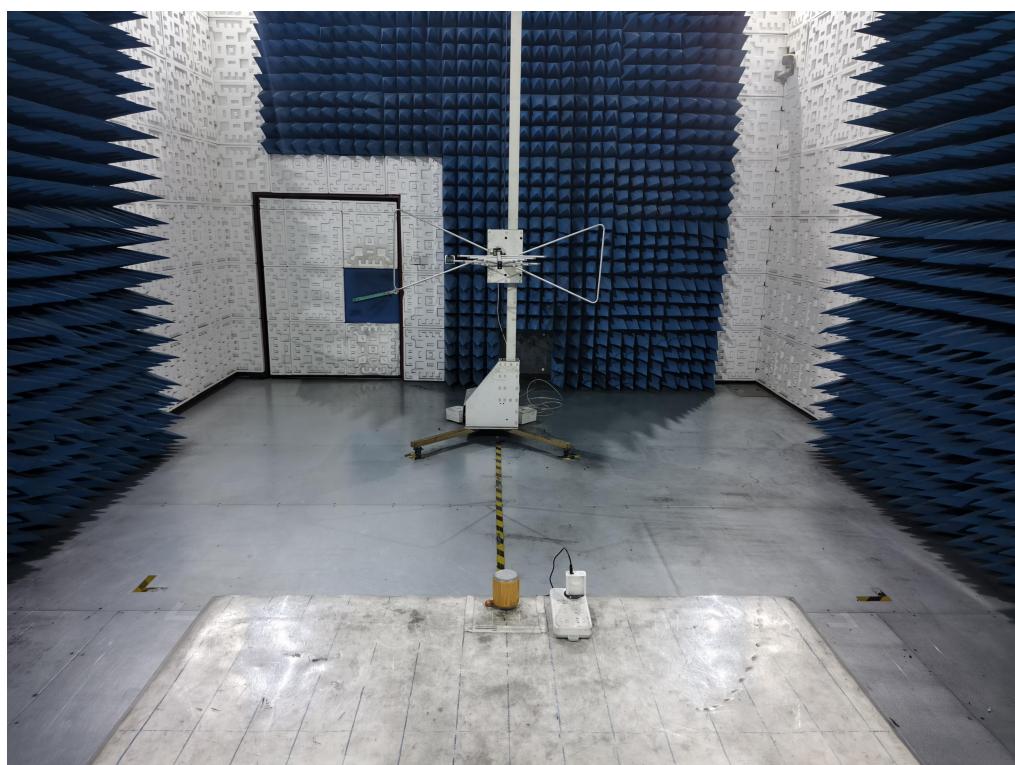
Compliance **Not Compliance**

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APPENDIX A: PHOTOGRAPHS OF TEST SETUP**LINE CONDUCTED EMISSION TEST SETUP****RADIATED EMISSION TEST SETUP BELOW 1GHZ**

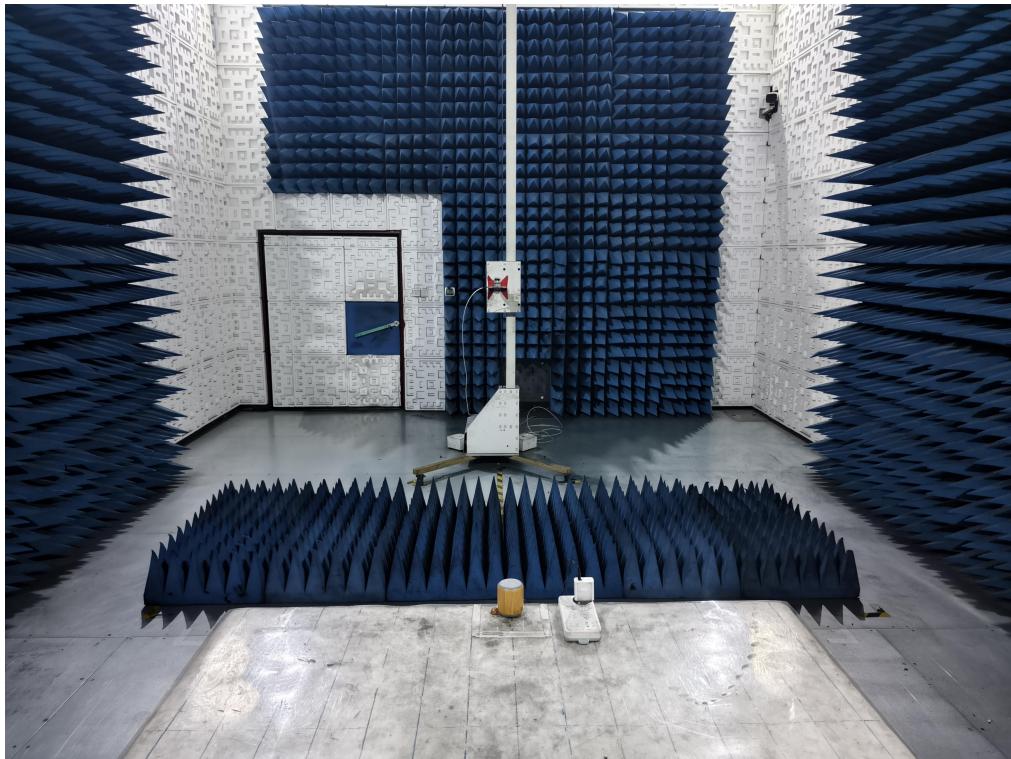
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RADIATED EMISSION TEST SETUP ABOVE 1GHZ



EN 61000-3-3 VOLTAGE FLUCTUATION / FLICKER TEST SETUP



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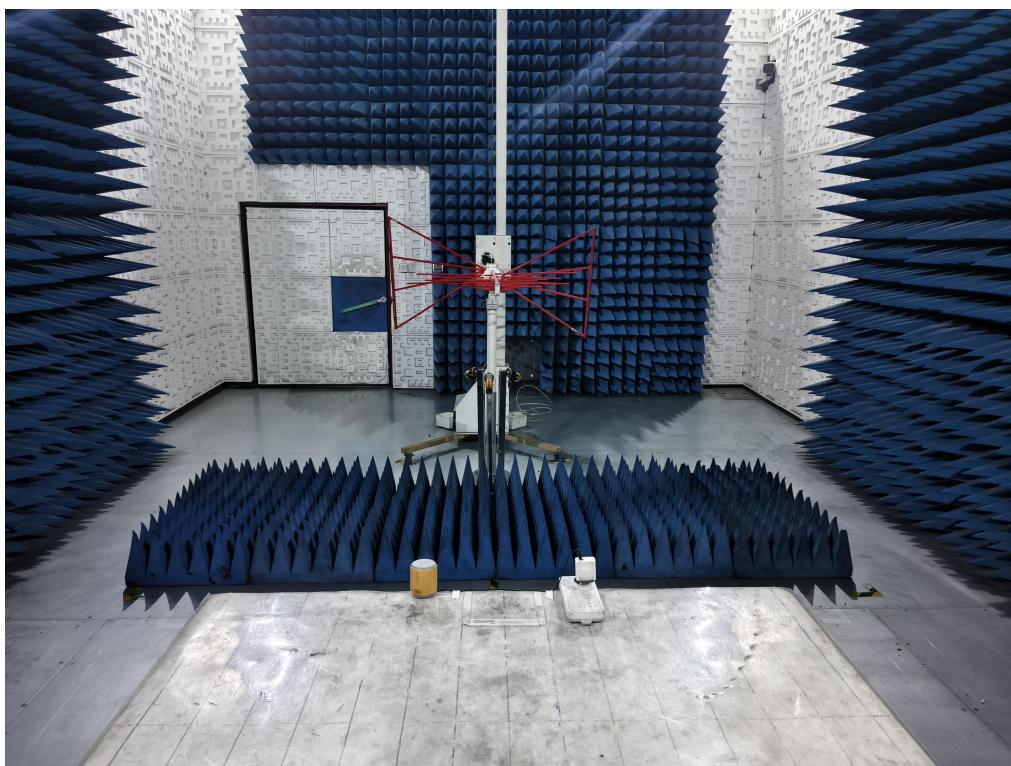
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EN 61000-4-2 ESD TEST SETUP



EN 61000-4-3 RS TEST SETUP BELOW 1GHZ



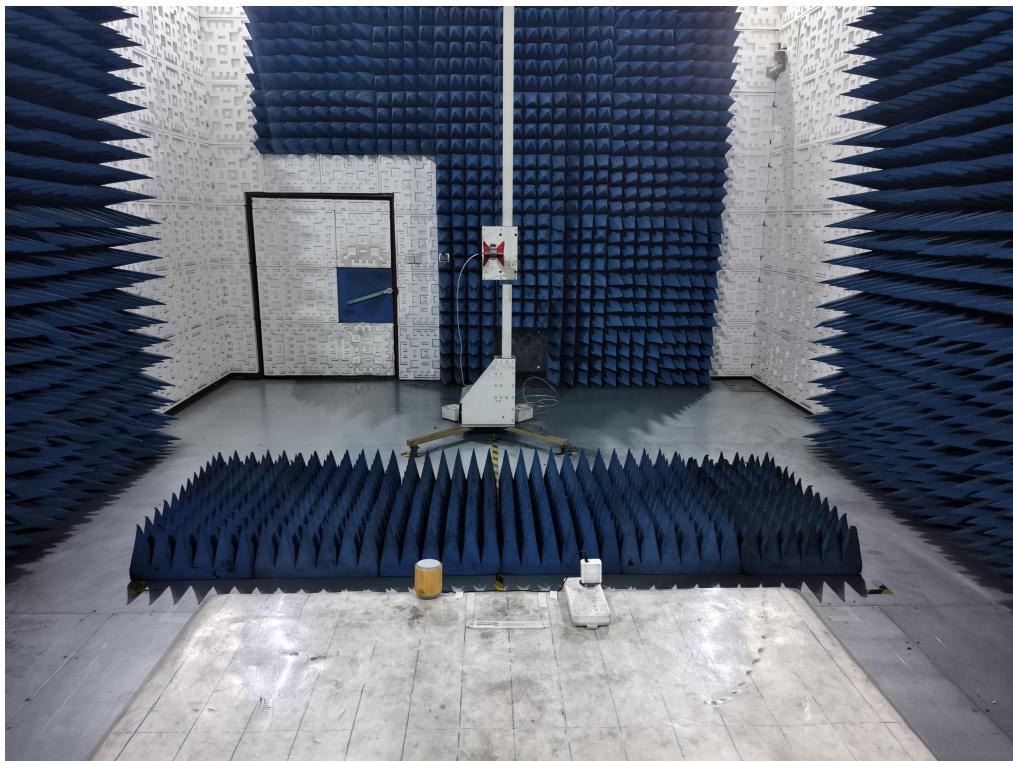
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EN 61000-4-3 RS TEST SETUP ABOVE 1GHZ



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



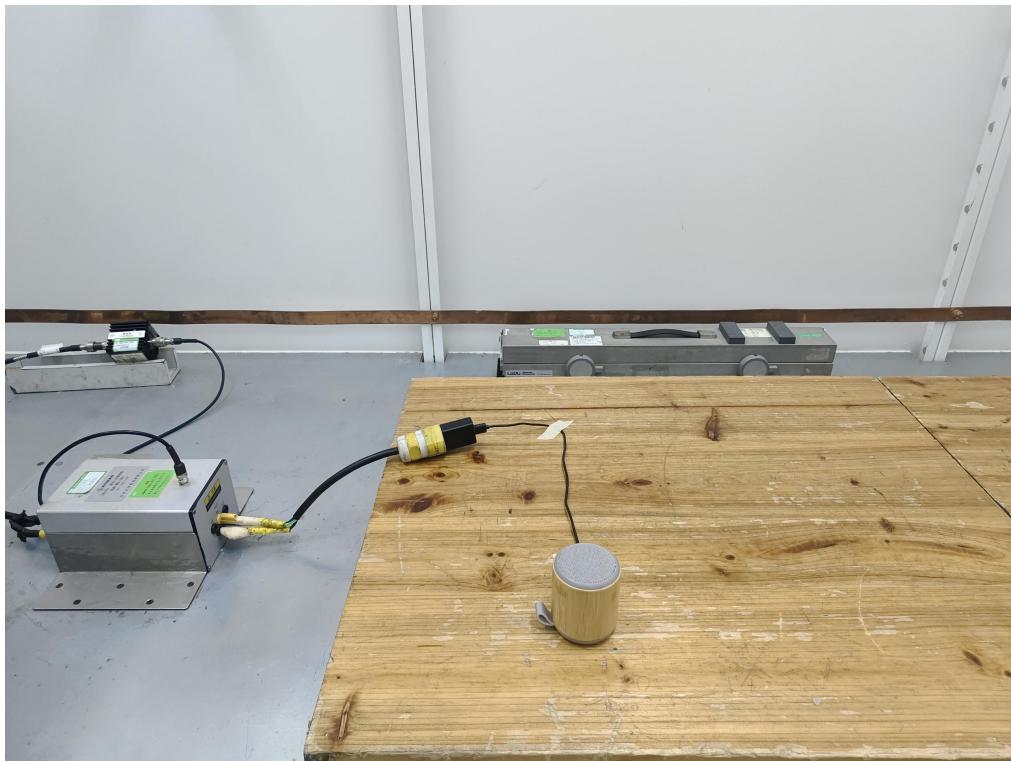
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EN 61000-4-6 CS IMMUNITY TEST SETUP



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APPENDIX B: PHOTOGRAPHS OF EUT

Refer to the Report No.: AGC03485230603AP01A

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Conditions of Issuance of Test Reports

1. All samples and goods are accepted by the Attestation of Global Compliance (Shenzhen) Co., Ltd (the "Company") solely for testing and reporting in accordance with the following terms and conditions. The company provides its services on the basis that such terms and conditions constitute express agreement between the company and any person, firm or company requesting its services (the "Clients").
2. Any report issued by Company as a result of this application for testing services (the "Report") shall be issued in confidence to the Clients and the Report will be strictly treated as such by the Company. It may not be reproduced either in its entirety or in part and it may not be used for advertising or other unauthorized purposes without the written consent of the Company. The Clients to whom the Report is issued may, however, show or send it, or a certified copy thereof prepared by the Company to its customer, supplier or other persons directly concerned. The Company will not, without the consent of the Clients, enter into any discussion or correspondence with any third party concerning the contents of the Report, unless required by the relevant governmental authorities, laws or court orders.
3. The Company shall not be called or be liable to be called to give evidence or testimony on the Report in a court of law without its prior written consent, unless required by the relevant governmental authorities, laws or court orders.
4. In the event of the improper use of the report as determined by the Company, the Company reserves the right to withdraw it, and to adopt any other additional remedies which may be appropriate.
5. Samples submitted for testing are accepted on the understanding that the Report issued cannot form the basis of, or be the instrument for, any legal action against the Company.
6. The Company will not be liable for or accept responsibility for any loss or damage however arising from the use of information contained in any of its Reports or in any communication whatsoever about its said tests or investigations.
7. Clients wishing to use the Report in court proceedings or arbitration shall inform the Company to that effect prior to submitting the sample for testing.
8. The Company is not responsible for recalling the electronic version of the original report when any revision is made to them. The Client assumes the responsibility to providing the revised version to any interested party who uses them.
9. Subject to the variable length of retention time for test data and report stored hereinto as otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of the test report for a period of six years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after retention period. Under no circumstances shall we be liable for damage of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract or warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.

----END OF REPORT----

Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the "Dedicated Testing/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15days after the issuance of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc01@agccert.com.

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