
EMC Test Report

Report No.: AGC05443230510EE01A

PRODUCT DESIGNATION : Spirit level pen in SS

BRAND NAME : N/A

MODEL NAME : M02072

APPLICANT : MID OCEAN BRANDS B.V

DATE OF ISSUE : May 29, 2023

STANDARD(S) : EN IEC 55015:2019+A11:2020
: EN 61547:2009

REPORT VERSION : V1.0



Attestation of Global Compliance (Shenzhen) Co., Ltd

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REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	May 29, 2023	Valid	Initial release

Note: The original test report Ref. No. AGC05443230510EE01 (dated Oct. 12, 2022, tested Sep. 27, 2022~Oct. 12, 2022), was modified on May 29, 2023 to change the product name, no further testing necessary.

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1. VERIFICATION OF CONFORMITY

Applicant	MID OCEAN BRANDS B.V
Address	7/F, Kings Tower, 111 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong
Manufacturer	MID OCEAN BRANDS B.V
Address	7/F, Kings Tower, 111 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong
Factory	MID OCEAN BRANDS B.V
Address	7/F, Kings Tower, 111 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong
Product Designation	Spirit level pen in SS
Brand Name	N/A
Test Model	MO2072
Date of receipt of test item	May 29, 2023
Date of test	N/A
Deviation	No deviation from the test method.
Condition of Test Sample	Normal
Test Result	Pass

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. for compliance with the requirements set forth in the Technical Standards mentioned above. This said equipment in the configuration described in this report shows the maximum emission levels emanating from equipment and the level of the immunity endurance of the equipment are within the compliance requirements.

The test results of this report relate only to the tested sample identified in this report.

Prepared By 

 Jack Gui
 (Project Engineer) May 29, 2023

Reviewed By 

 Calvin Liu
 (Reviewer) May 29, 2023

Approved By 

 Max Zhang
 (Authorized Officer) May 29, 2023

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2. SYSTEM DESCRIPTION

TEST MODE DESCRIPTION		
NO.	TEST MODE DESCRIPTION	WORST
1	Normal operation	V
Note: 1. V means EMI worst mode.		

3. 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 Radiated Emission, $U_c = \pm 3.9\text{dB}$

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4. PRODUCT INFORMATION

Housing Type	Metal
EUT Input Rating	DC 4.5V by battery
Hardware Version	N/A
Software Version	N/A

I/O Port Information (Applicable Not Applicable)

I/O Port of EUT			
I/O Port Type	Number	Cable Description	Tested With
--	--	--	--

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5. SUPPORT EQUIPMENT

Device Type	Manufacturer	Model Name	Serial No.	Data Cable	Power Cable
--	--	--	--	--	--

Note: "-- " means no any support device during testing.

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6. TEST FACILITY

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

7. TEST EQUIPMENT LIST

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
Antenna	SCHWARZBECK	VULB9168	VULB9168-494	Jan. 05, 2023	Jan. 04, 2025
Test software	FARA	EZ-EMC (Ver.RA-03A)	N/A	N/A	N/A

TEST EQUIPMENT OF RADIATED ELECTROMAGNETIC DISTURBANCE TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Triple Loop Antenna	LAPLACE	RF300	9070	Jun. 23, 2022	Jun. 22, 2023
Test Receiver	R&S	ESCI	10096	Feb. 18, 2023	Feb. 17, 2024

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

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TEST EQUIPMENT OF RS IMMUNITY TEST

Description	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Signal Generator	AGILENT	N5182A	MY50140530	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
Amplifer	Milmega	BPA00T10W500 -1	S2006-0001	N/A	N/A
Amplifer	Milmega	CBA 3G-100	743913	N/A	N/A
Amplifer	rflight	NTWPA-256010 0	17063183	N/A	N/A
Antenna	ETS	3142C	00060447	N/A	N/A

TEST EQUIPMENT OF PFMF TEST

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
PFMF system	HTEC	HPFMF	161701	Jun. 23, 2022	Jun. 22, 2023

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8. TEST SUMMARY LIST

Test item	Test Requirement	Test Method	Class/Severity	Result
Conducted emission	EN IEC 55015	EN IEC 55015	0.009MHz -30MHz	N/A
Radiated emission	EN IEC 55015	EN IEC 55015	30MHz -1000MHz	Pass
Radiated electromagnetic disturbance	EN IEC 55015	EN IEC 55015	0.009MHz -30MHz	Pass
Harmonic current emission	EN IEC 61000-3-2	EN IEC 61000-3-2	Class C	N/A
Voltage fluctuations & flicker	EN 61000-3-3	EN 61000-3-3	§5 of EN 61000-3-3	N/A
Electrostatic discharge immunity	EN 61547	EN 61000-4-2	± 8.0 kV (Air Discharge) ± 4.0 kV (Contact Discharge) ± 4.0 kV (Indirect Discharge)	Pass
Radiated electromagnetic field immunity test	EN 61547	EN 61000-4-3	3V/m with 80% AM. 1kHz Modulation.	Pass
Electrical fast transient/burst Immunity	EN 61547	EN 61000-4-4	+/- 1kV for Power Supply Lines	N/A
Surge immunity	EN 61547	EN 61000-4-5	>25W +/-1kV (Line to Line) +/-2kV (Line to Ground) <25W +/-0.5kV (Line to Line) +/-1kV (Line to Ground)	N/A
Immunity to Conducted Disturbances Induced by RF fields	EN 61547	EN 61000-4-6	3V with 80% AM. 1 kHz Modulation	N/A
Power frequency magnetic fields	EN 61547	EN 61000-4-8	50/60 Hz, 3A/m	Pass
Voltage dips and short interruptions immunity	EN 61547	EN 61000-4-11	PHASE ANGLE 0, 45, 90, 135, 180, 225, 270, 315 degrees	N/A

Note: N/A means not applicable.

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9. EN IEC 55015 RADIATED EMISSION TEST

9.1. LIMITS OF RADIATED DISTURBANCES

AT 10M DISTANCES

Frequency (MHz)	Distance (m)	Maximum Field Strength Limit (dBuV/m Q.P.)
30-230	10	30.00
230-1000	10	37.00

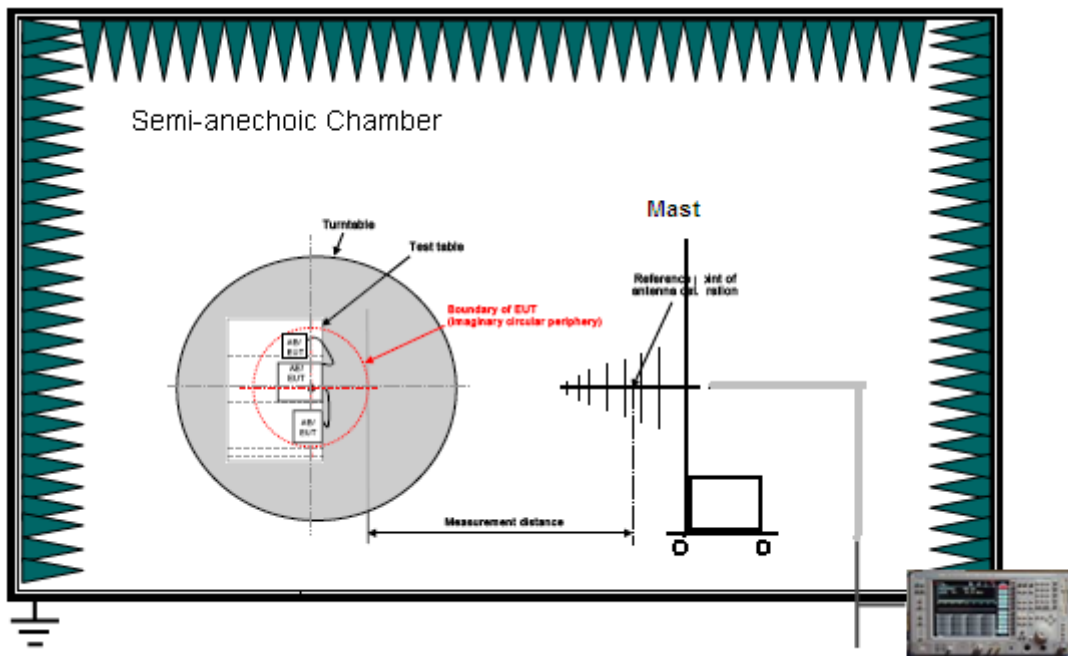
AT 3M DISTANCES

Frequency (MHz)	Distance (m)	Maximum Field Strength Limit (dBuV/m Q.P.)
30-230	3	40.00
230-1000	3	47.00

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

9.2. BLOCK DIAGRAM OF TEST SETUP

System Diagram of Connections between EUT and Simulators



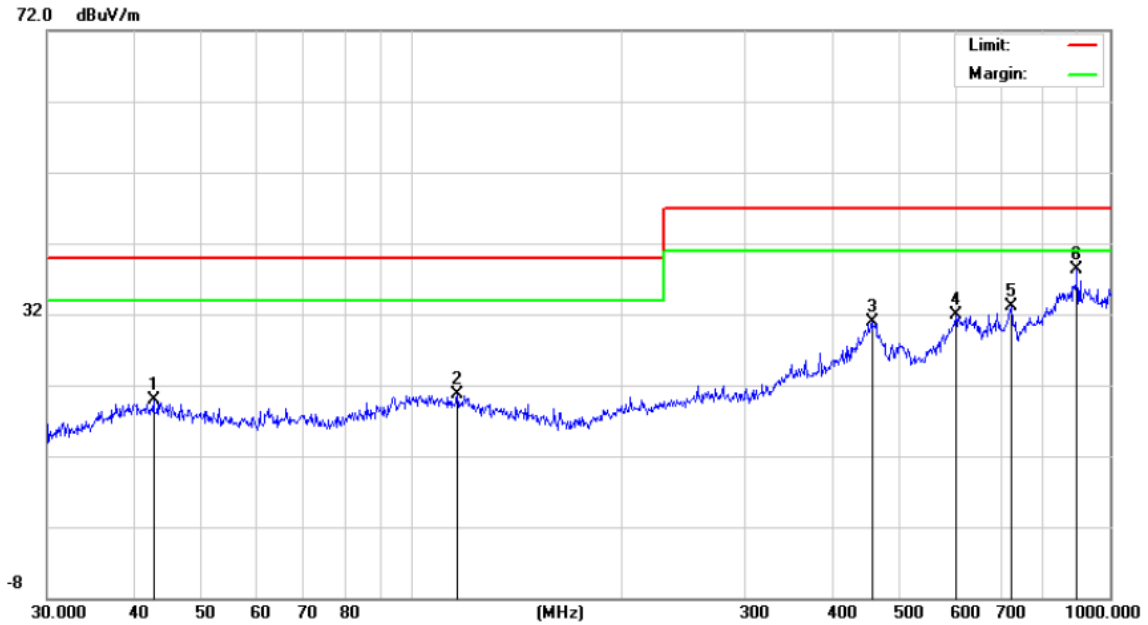
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9.3. PROCEDURE OF RADIATED EMISSION TEST

- (1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane as per EN IEC 55015 (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 10cm non-conductive covering to insulate the EUT from the ground plane.
- (2) Support equipment, if needed, was placed as per EN IEC 55015.
- (3) All I/O cables were positioned to simulate typical actual usage as per EN IEC 55015.
- (4) The EUT was turned on.
- (5) The antenna was placed at 3 meters away from the EUT as stated in EN IEC 55015. The antenna connected to the Analyzer via a cable and at times a pre-amplifier would be used.
- (6) The Analyzer / Receiver quickly scanned from 30MHz to 1000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- (7) The test mode(s) were scanned during the test:
- (8) Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and Q.P./Peak reading is presented.

9.4. TEST RESULT OF RADIATED EMISSION TEST

Radiated Emission Test at 3m Distance-Horizontal



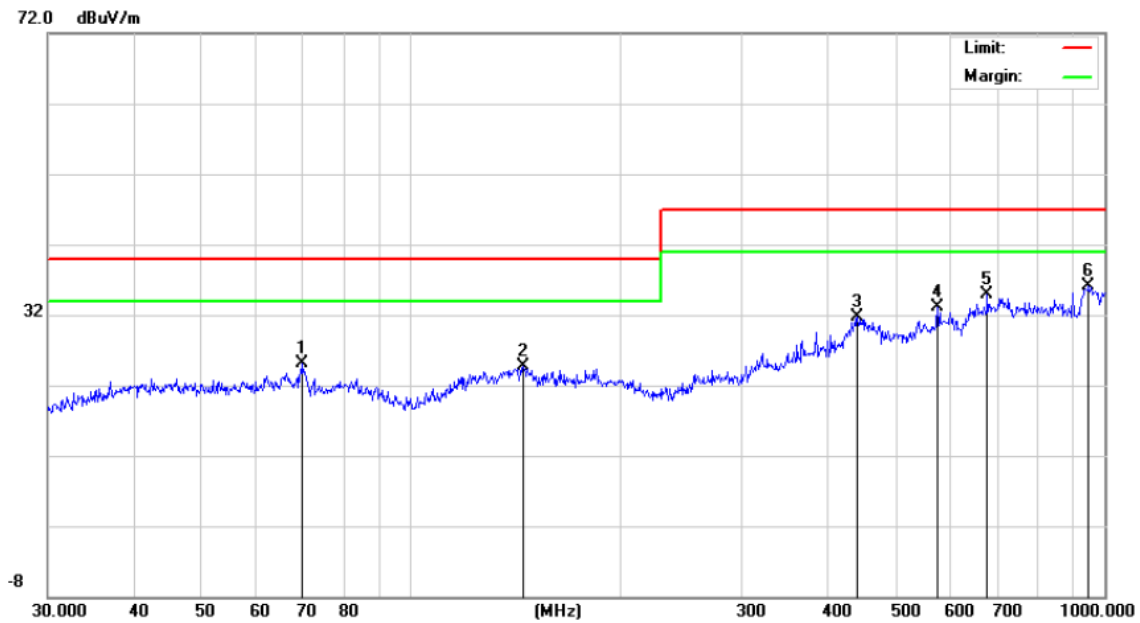
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		42.6000	6.27	13.59	19.86	40.00	-20.14	peak
2		116.1321	6.15	14.55	20.70	40.00	-19.30	peak
3		455.9058	6.05	24.93	30.98	47.00	-16.02	peak
4		601.4265	6.78	25.11	31.89	47.00	-15.11	peak
5		721.7259	6.65	26.46	33.11	47.00	-13.89	peak
6	*	896.9965	6.82	31.42	38.24	47.00	-8.76	peak

RESULT: PASS

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Radiated Emission Test at 3m Distance-Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		69.8450	8.57	16.49	25.06	40.00	-14.94	peak
2		145.3506	6.48	18.20	24.68	40.00	-15.32	peak
3		440.1963	5.56	26.09	31.65	47.00	-15.35	peak
4		574.6258	7.69	25.33	33.02	47.00	-13.98	peak
5		677.5798	7.25	27.68	34.93	47.00	-12.07	peak
6	*	948.7610	5.50	30.65	36.15	47.00	-10.85	peak

RESULT: PASS

Note:

$$\text{Level(dBuV/m)} = \text{Reading(dBuV)} + \text{Factor(dB/m)}$$

$$\text{Factor(dB/m)} = \text{Antenna Factor(dB/m)} + \text{Cable loss(dB)} + \text{Attenuation(dB) for Attenuator}$$

$$\text{Over} = \text{Measurement} - \text{Limit}$$

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10. EN IEC 55015 RADIATED ELECTROMAGNETIC DISTURBANCE TEST

10.1. LIMITS OF RADIATED ELECTROMAGNETIC DISTURBANCE IN THE RANGE 9 KHZ TO 30 MHZ

Frequency Range	Limits for Loop Diameter dB(uA) *		
	2m	3m	4m
9 KHz-70 KHz	88 *	81 *	75 *
70 KHz-150 KHz	88 to 58 * *	81 to 51 * *	75 to 45 * *
150 kHz-3.0 MHz	58 to 22 * *	51 to 15 * *	45 to 9 * *
3.0 MHz-30 MHz	22 * * *	15 to 16 * * *	9 to 12 * * *

Note:

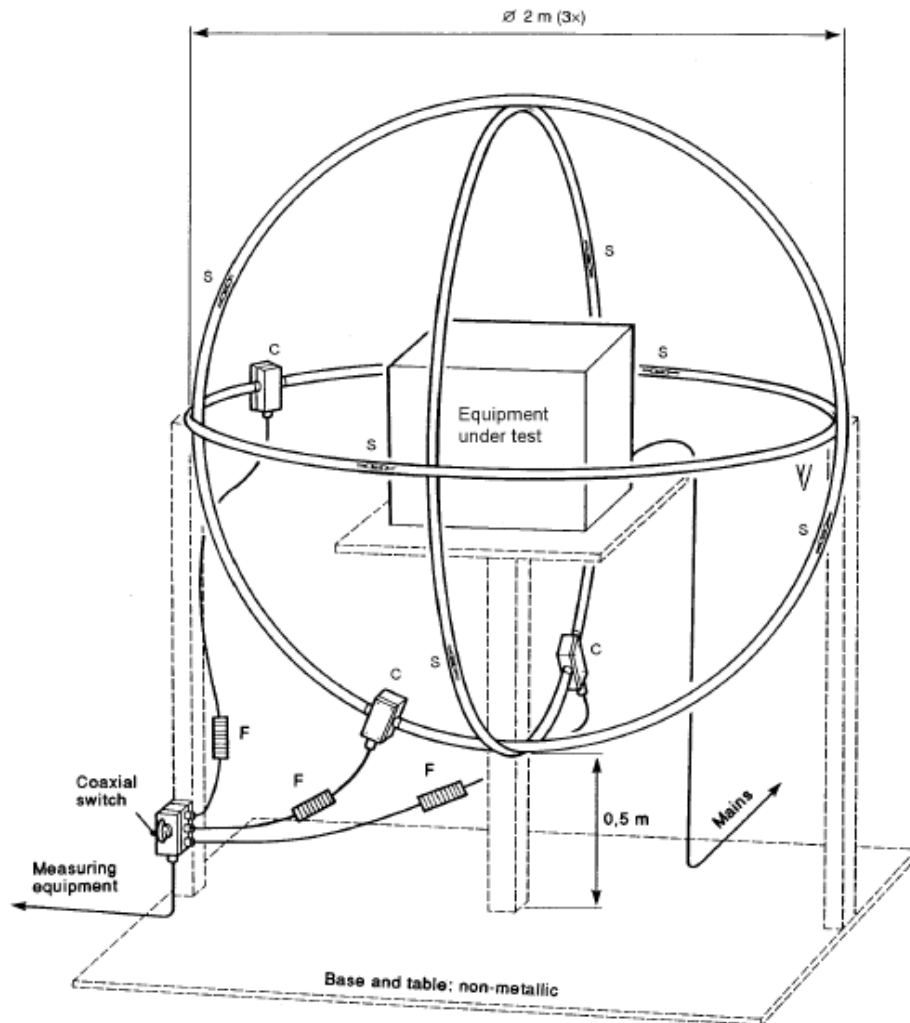
* At the transition frequency, the lower limit applies.

* * Decreasing linearly with the logarithm of the frequency. For electrode less lamps and luminaries, the limit in the frequency range of 2.2 MHz to 3.0 MHz is 58 dB(uA) for 2m, 51 dB(uA) for 3m and 45 dB(uA) for 4m loop diameter.

* * * Increasing linearly with the logarithm of the frequency.

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10.2. BLOCK DIAGRAM OF TEST SETUP



10.3. TEST PROCEDURE

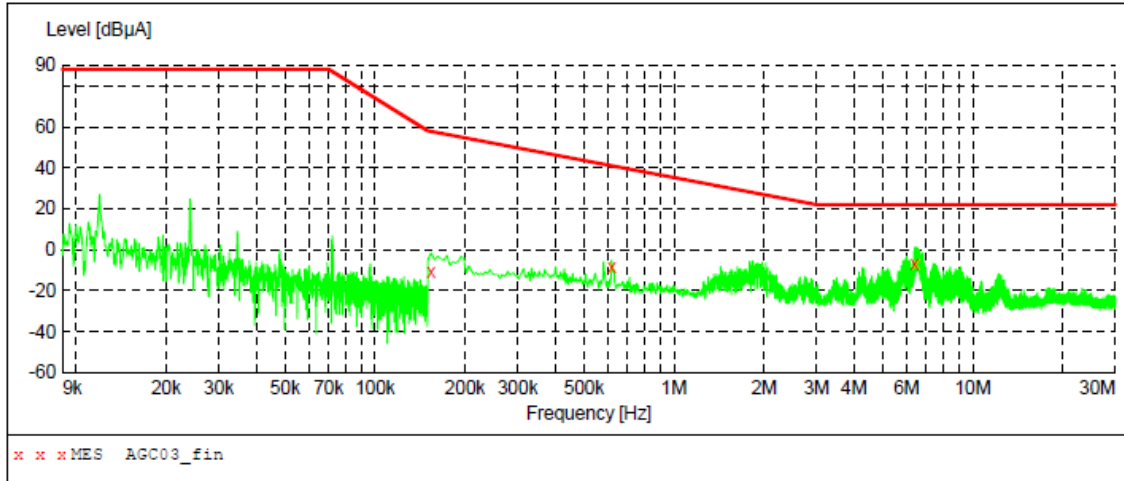
The magnetic component shall be measured by means of a loop antenna as described in EN IEC 55015. The lighting equipment shall be placed in the centre of the antenna, and the position is not critical.

The test object was operated at its upper limit of its rated voltage and its rated frequency. The induced current in the loop antenna is measured by means of a current probe(1V/A) and the CISPR measuring receiver. By means of a coaxial switch the three field directions can be measured in sequence. Each value shall fulfill the requirements given.

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10.4. TEST RESULTS OF RADIATED ELECTROMAGNETIC DISTURBANCE

X



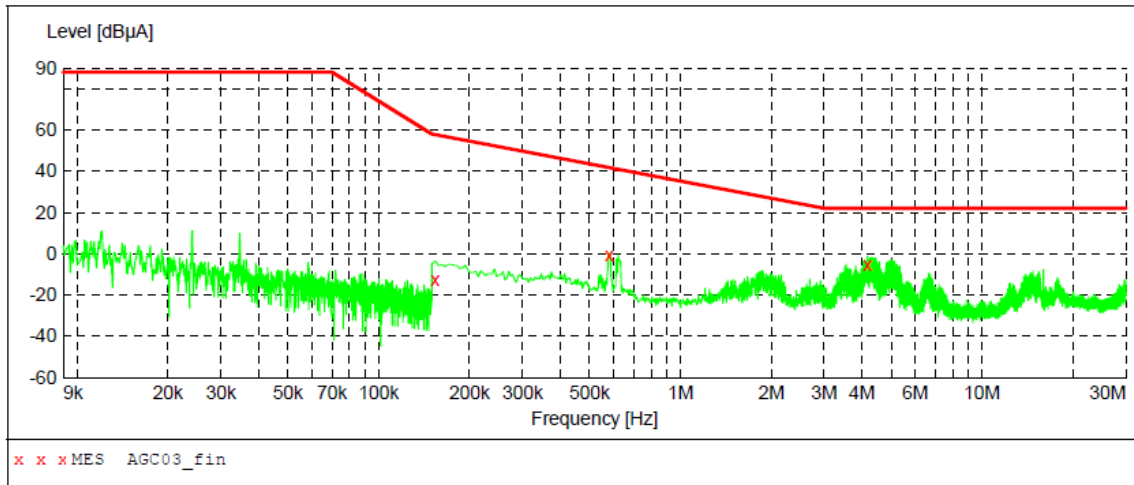
MEASUREMENT RESULT: "AGC03_fin"

Frequency MHz	Level dBµA	Transd dB	Limit dBµA	Margin dB	Det.	Loop	Azimuth deg
0.154000	-11.10	-13.1	58	68.8	QP	X	0.00
0.618000	-8.50	-22.4	41	49.5	QP	X	0.00
6.394000	-6.90	-24.9	22	28.9	QP	X	0.00

RESULT: PASS

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Y



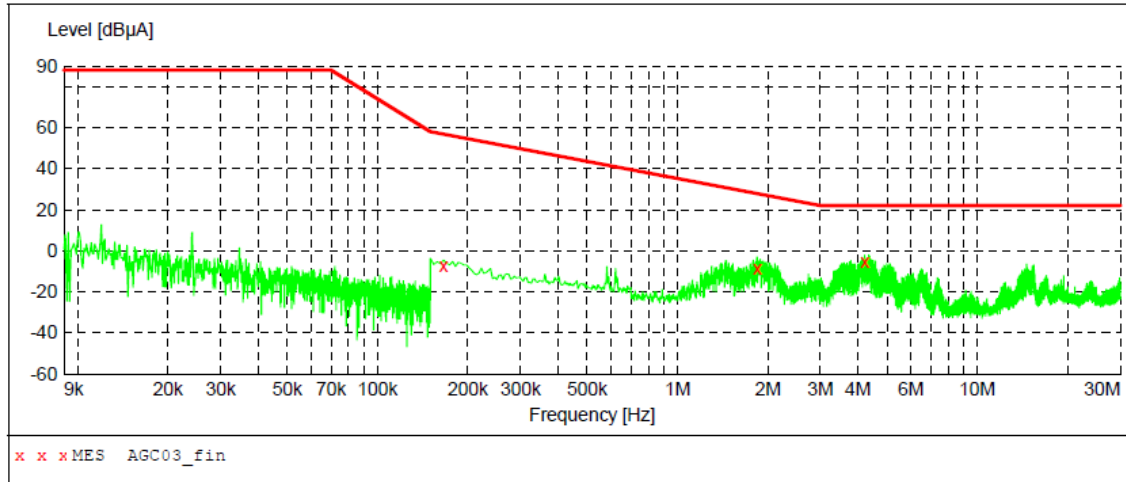
MEASUREMENT RESULT: "AGC03_fin"

Frequency MHz	Level dBµA	Transd dB	Limit dBµA	Margin dB	Det.	Loop	Azimuth deg
0.154000	-12.50	-13.1	58	70.2	QP	Y	0.00
0.582000	-0.90	-22.1	42	42.6	QP	Y	0.00
4.174000	-5.50	-25.1	22	27.5	QP	Y	0.00

RESULT: PASS

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Z



MEASUREMENT RESULT: "AGC03_fin"

Frequency MHz	Level dBµA	Transd dB	Limit dBµA	Margin dB	Det.	Loop	Azimuth deg
0.166000	-7.20	-13.7	57	64.0	QP	Z	0.00
1.842000	-8.70	-24.6	28	36.6	QP	Z	0.00
4.214000	-5.70	-25.1	22	27.7	QP	Z	0.00

RESULT: PASS

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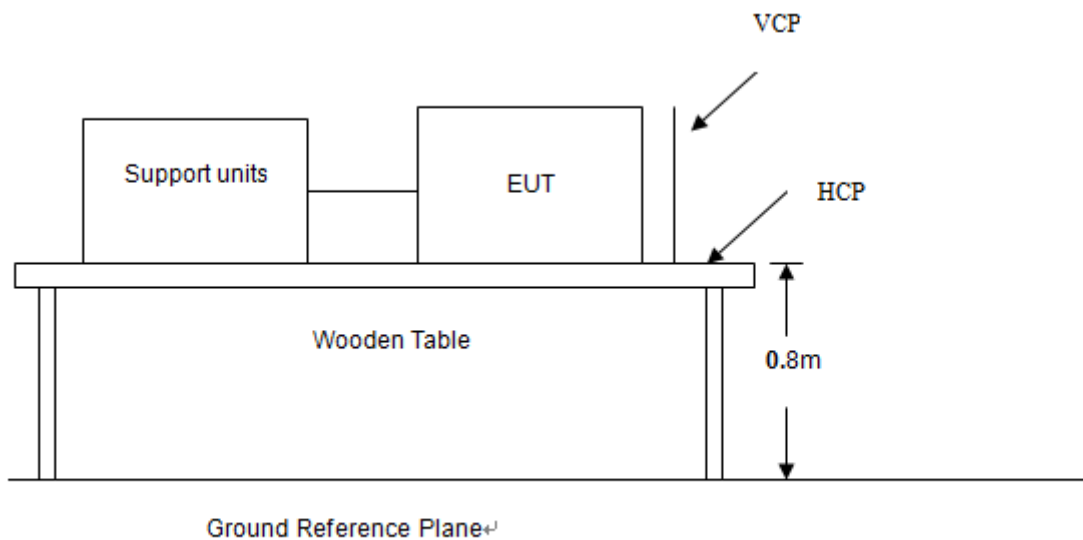
11. EN 61000-4-2 ESD IMMUNITY TEST

ELECTROSTATIC DISCHARGE (ESD) IMMUNITY TEST

Port	Enclosure
Basic Standard	EN 61000-4-2
Test Level	± 8.0 kV (Air Discharge) ± 4.0 kV (Contact Discharge) ± 4.0 kV (Indirect Discharge)
Standard require	B
Temperature	23.6°C
Humidity	58.0% RH

11.1. BLOCK DIAGRAM OF TEST SETUP

(The 470 k ohm resistors are installed per standard requirement)



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ESD LOCATION:

Red line: Contact discharge



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11.2. TEST PROCEDURE

The EUT was located 0.1 m minimum from all side of the HCP.

The support units were located 1 m minimum away from the EUT.

EUT worked with resistance load, and make sure EUT worked normally.

Activates the communication function if the EUT with such port(s).

As per the requirement of EN 61547: Contact discharge is the preferred test method, twenty discharges (10 with positive and 10 with negative polarity) shall be applied on each accessible metallic part of the enclosure, terminals are excluded. Air discharges shall be used where contact discharges cannot be applied. Discharges shall be applied on the horizontal or vertical coupling planes as specified in EN 61000-4-2.

The following test condition was followed during the tests.

Note: As per the A2 to EN 61000-4-2, a bleed resistor cable is connected between the EUT and HCP during the test.

The electrostatic discharges were applied as follows:

Voltage	Coupling	Test Performance	Result
±4kV	Contact Discharge	No function loss	A
±4kV	Indirect Discharge HCP (Front)	No function loss	A
±4kV	Indirect Discharge HCP (Left)	No function loss	A
±4kV	Indirect Discharge HCP (Right)	No function loss	A
±4kV	Indirect Discharge HCP (Back)	No function loss	A
±4kV	Indirect Discharge VCP (Front)	No function loss	A
±4kV	Indirect Discharge VCP (Left)	No function loss	A
±4kV	Indirect Discharge VCP (Back)	No function loss	A
±4kV	Indirect Discharge VCP (Right)	No function loss	A
±8kV	Air Discharge	No function loss	A

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11.3. PERFORMANCE & RESULT

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.
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.
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"/> PASS <input type="checkbox"/> FAIL
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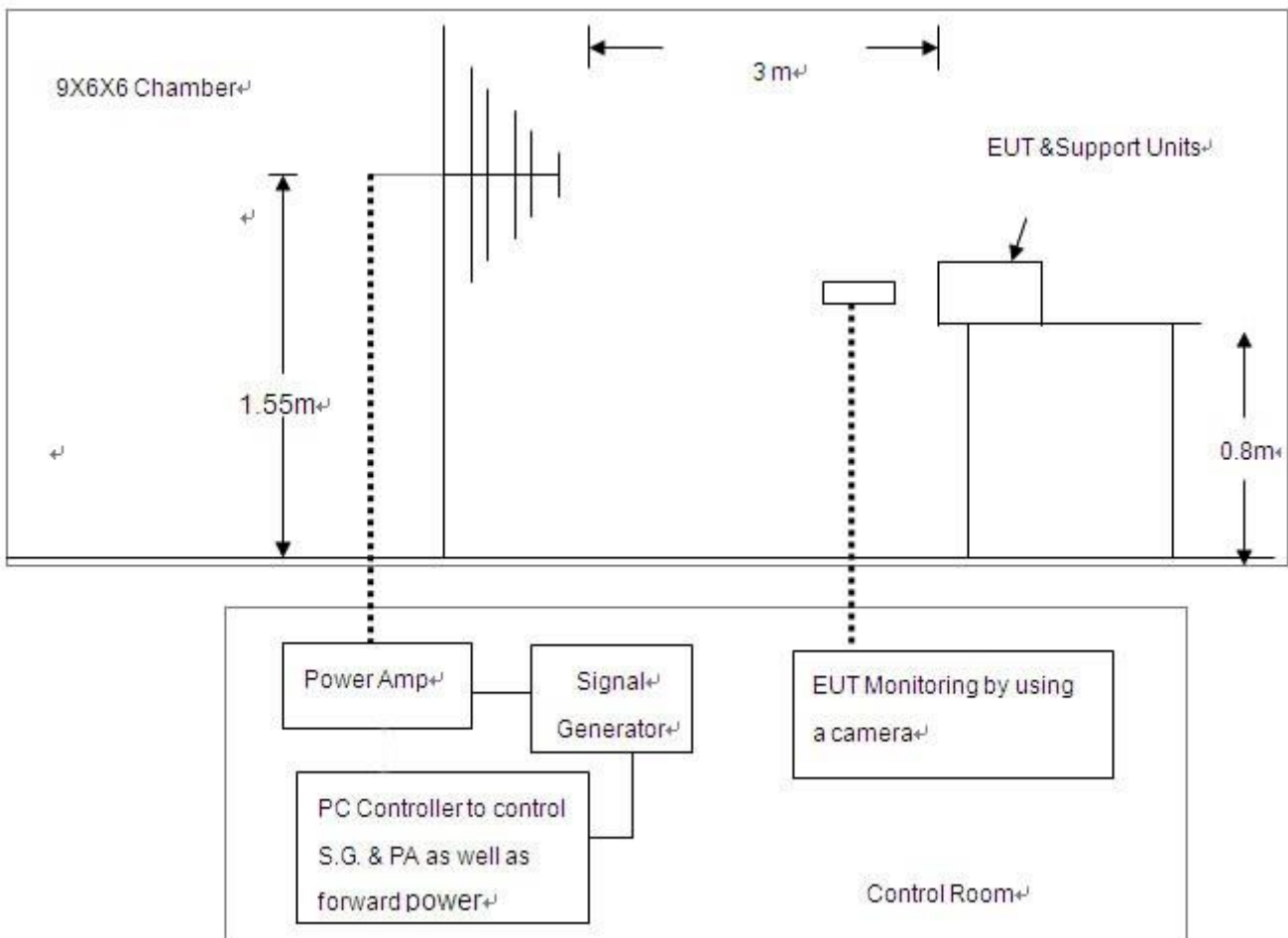
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12. EN 61000-4-3 RS IMMUNITY TEST

RADIATED ELECTROMAGNETIC FIELD IMMUNITY TEST

Port	Enclosure
Basic Standard	EN 61000-4-3
Test Level:	3V/m with 80% AM. 1kHz Modulation.
Standard require	A
Temperature	23.6°C
Humidity	63.5% RH

12.1. BLOCK DIAGRAM OF TEST SETUP



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12.2. TEST PROCEDURE

The EUT was located at the edge of supporting table keep 3 meter away from transmitting antenna, it just the calibrated square area of field uniformity. The support units were located outside of the uniformity area, but the cable(s) connected with EUT were exposed to the calibrated field as per EN 61000-4-3.

EUT worked with resistance load, and make sure EUT worked normally.

Setting the testing parameters of RS test software per EN 61000-4-3.

Performing the test at each side of with specified level (3V/m) at 1% steps and test frequency from 80MHz to 1000MHz.

Recording the test result in following table.

EN 61000-4-3 Final test conditions:

Test level: 3V/m

Steps: 1 % of fundamental

Dwell Time: 1 sec

Range (MHz)	Field	Modulation	Polarity	Position	Test Performance	Result
80-1000	3V/m	AM	H	Front	No function loss	A
80-1000	3V/m	AM	H	Left	No function loss	A
80-1000	3V/m	AM	H	Back	No function loss	A
80-1000	3V/m	AM	H	Right	No function loss	A
80-1000	3V/m	AM	V	Front	No function loss	A
80-1000	3V/m	AM	V	Left	No function loss	A
80-1000	3V/m	AM	V	Back	No function loss	A
80-1000	3V/m	AM	V	Right	No function loss	A

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12.3. PERFORMANCE & RESULT

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.
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.
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"/> PASS	<input type="checkbox"/> FAIL
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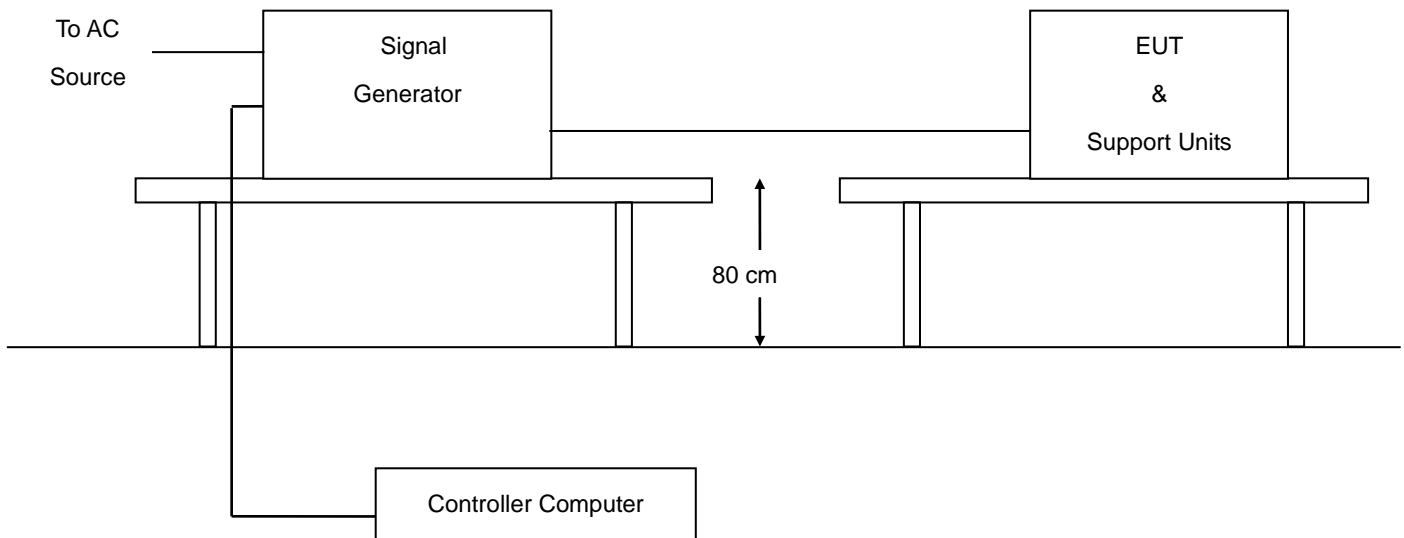
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13. EN 61000-4-8 PFMF TEST

POWER FREQUENCY MAGNETIC FIELDS IMMUNITY TEST

Port	Enclosure
Basic Standard	EN 61000-4-8
Requirements	50/60 Hz, 3A/m
Standard require	A
Temperature	24.3°C
Humidity	60.0% RH

13.1. BLOCK DIAGRAM OF TEST SETUP



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13.2. TEST PROCEDURE

The EUT shall be subjected to the test magnetic field by using the induction coil of standard dimensions (1m x 1m). The induction coil shall then be rotated by 90° in order to expose the EUT to the test field with different orientations.

Test Conditions:

Frequency	Polarity	Level	Test Performance	Performance Result
50 Hz	X	3 A/m	No function loss	A
50 Hz	Y	3 A/m	No function loss	A
50 Hz	Z	3 A/m	No function loss	A

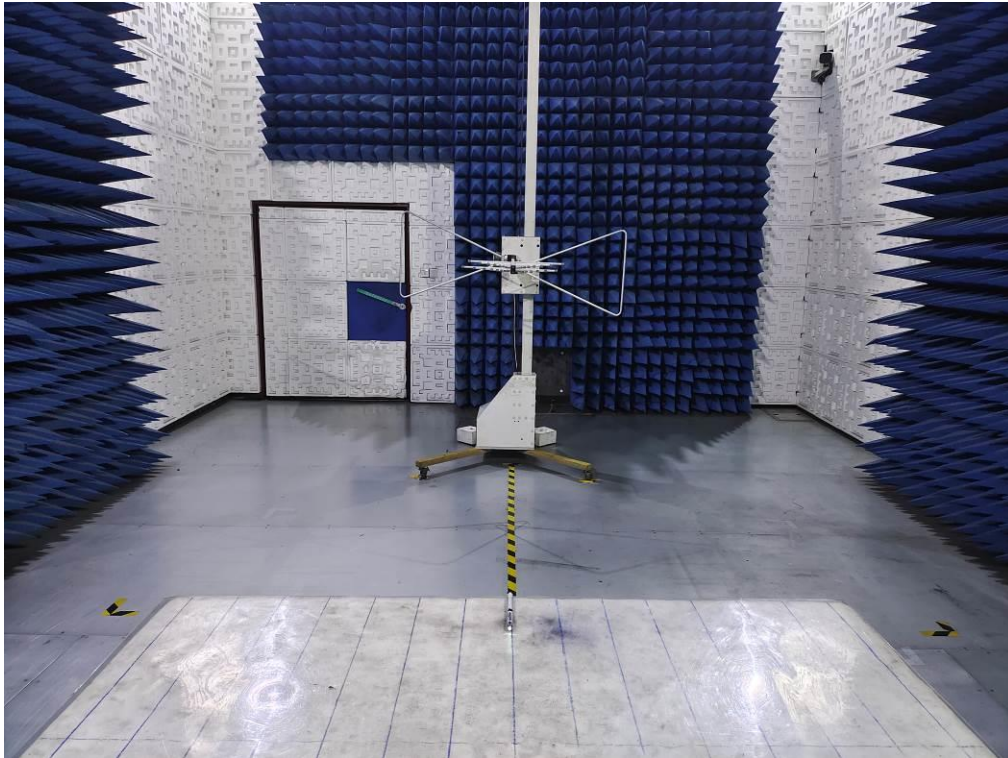
13.3. PERFORMANCE & RESULT

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.
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.
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"/> PASS <input type="checkbox"/> FAIL
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APPENDIX A: PHOTOGRAPHS OF TEST SETUP
EN IEC 55015 RADIATED EMISSION TEST SETUP

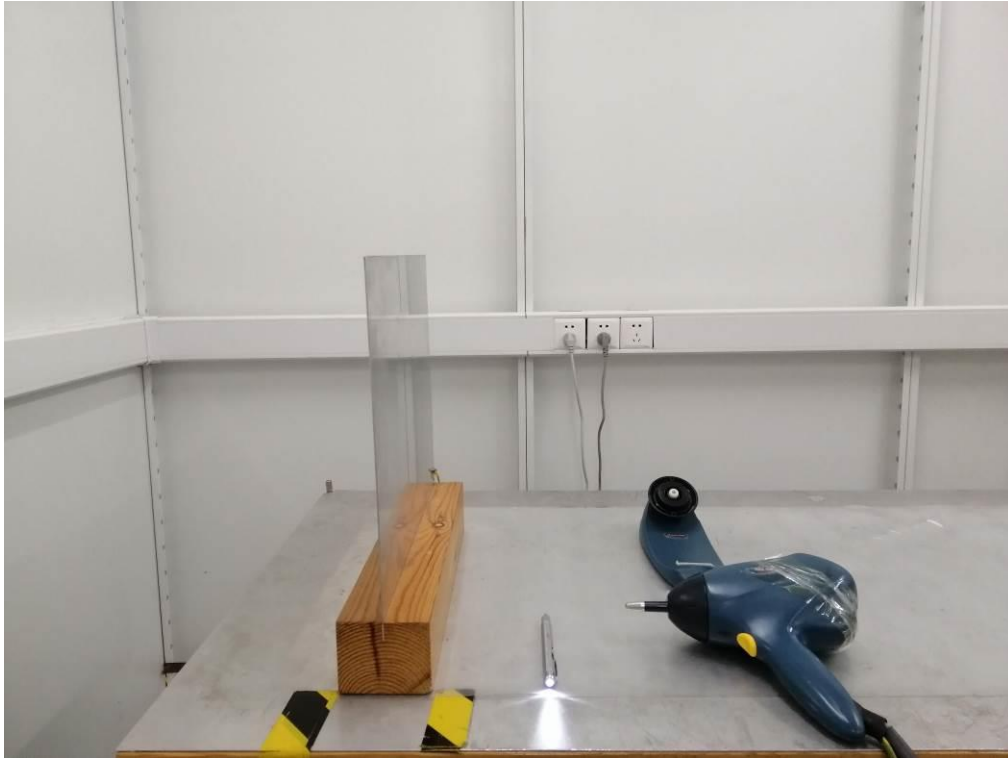


EN IEC 55015 RADIATED ELECTROMAGNETIC DISTURBANCE TEST SETUP

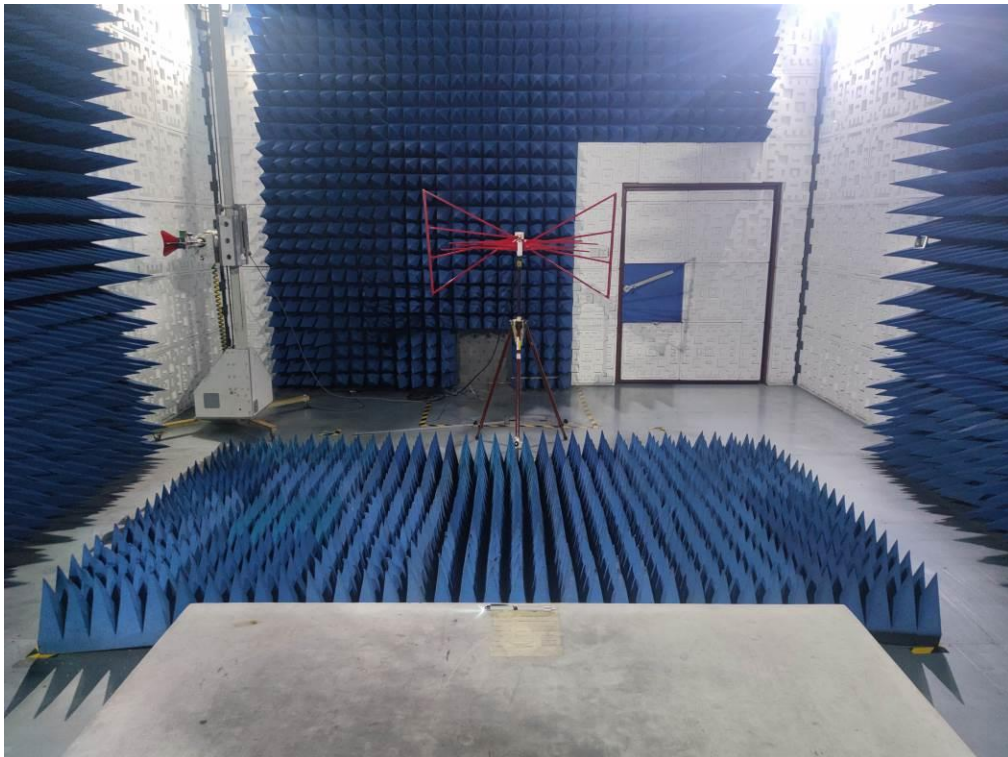


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EN 61000-4-2 ESD IMMUNITY TEST SETUP



EN 61000-4-3 RS IMMUNITY TEST SETUP



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EN 61000-4-8 PFMF TEST SETUP

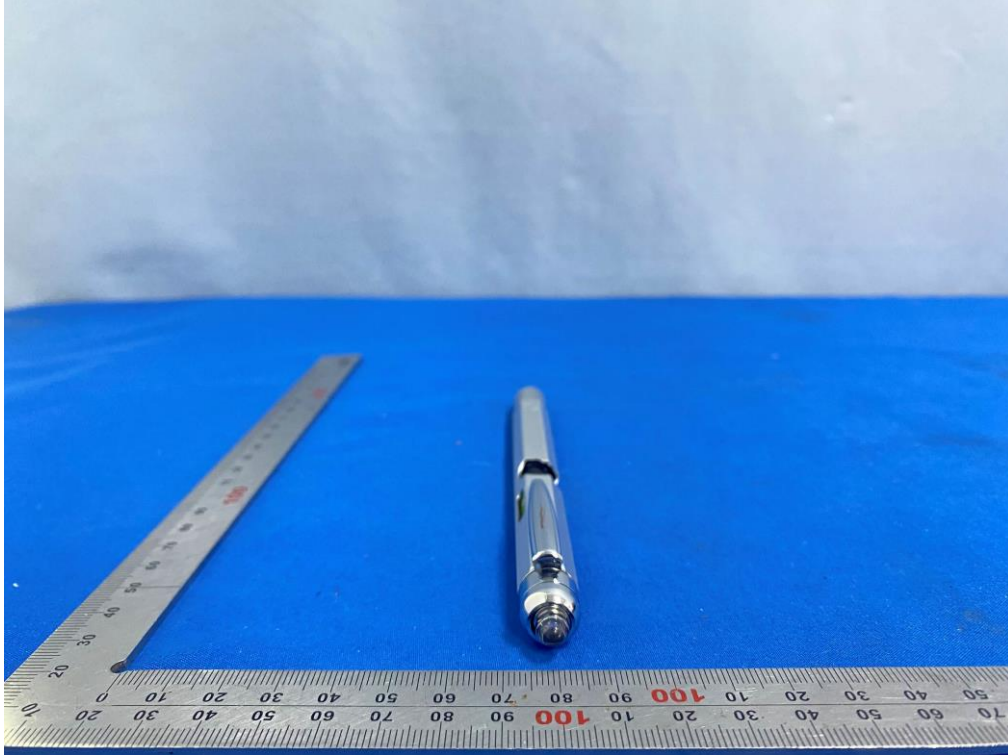


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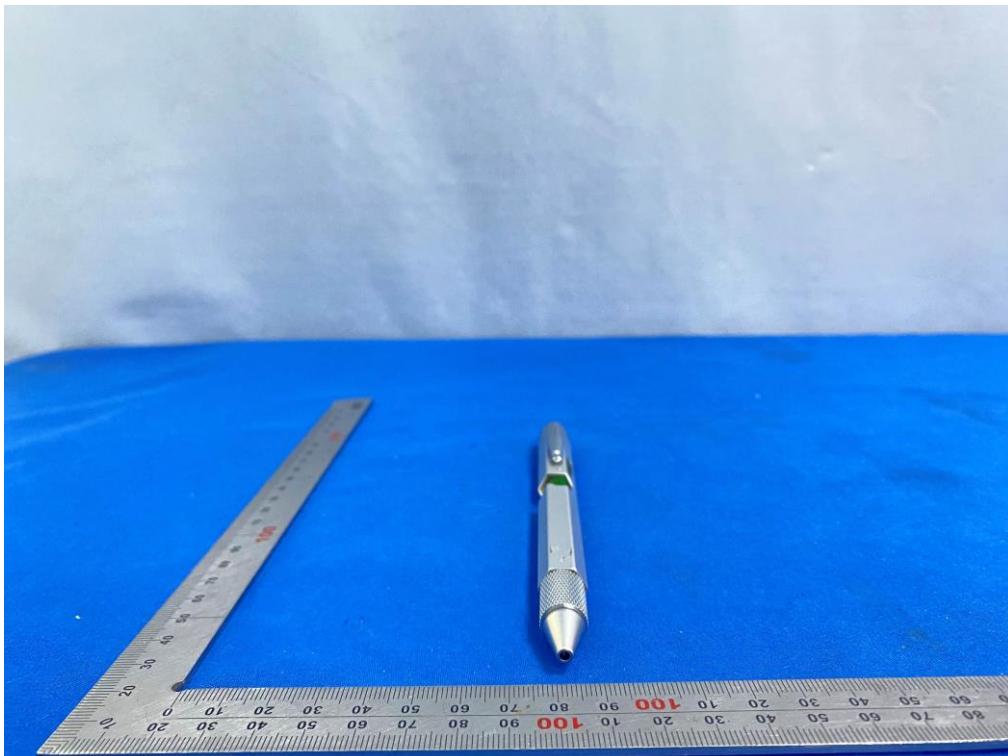
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APPENDIX B: PHOTOGRAPHS OF EUT

TOP VIEW OF EUT



BOTTOM VIEW OF EUT



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FRONT VIEW OF EUT

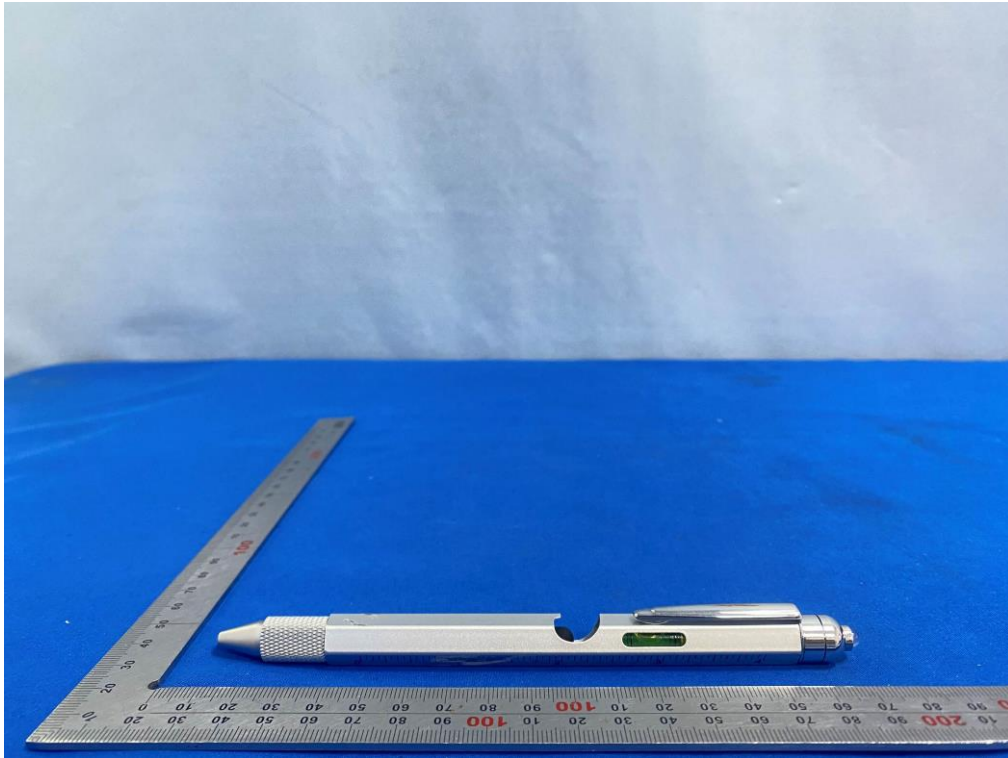


BACK VIEW OF EUT

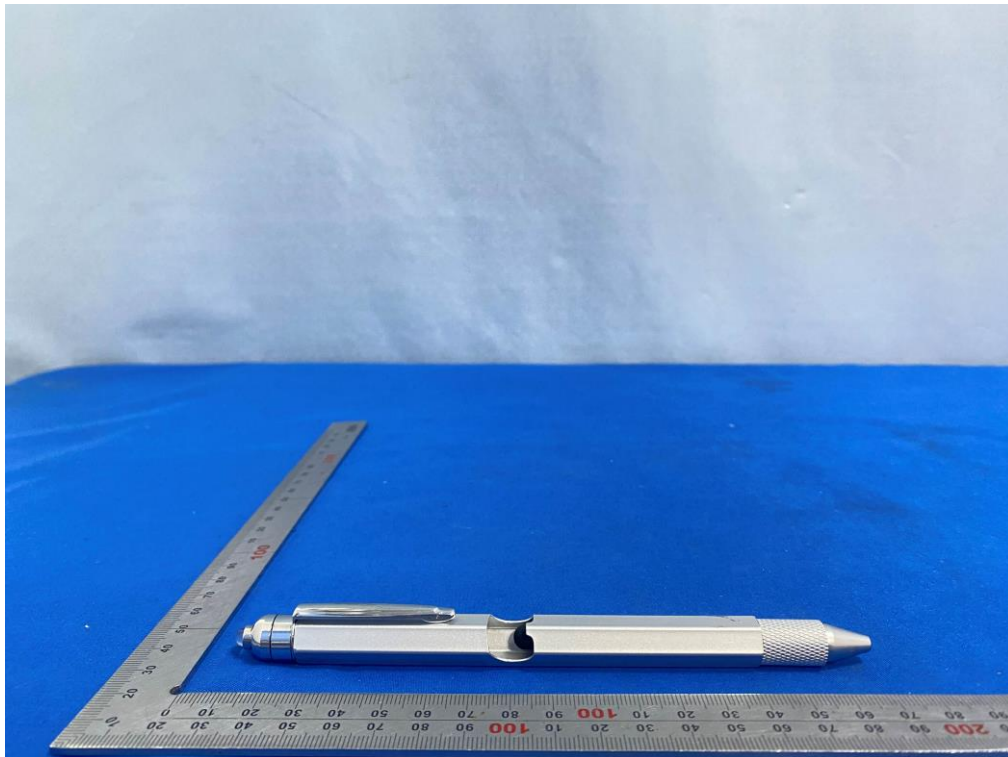


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LEFT VIEW OF EUT



RIGHT VIEW OF EUT



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OPEN VIEW OF EUT



INTERNAL VIEW OF EUT



----END OF REPORT----

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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 of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.

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